FINAL

Olympic Well Field Effective Treatment and Monitoring – Step 4 of 97-005 Evaluation

Prepared for
City of Santa Monica
July 2022

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1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethylene
1,2,3-TCP	1,2,3-trichloropropane
1,4-D	1,4-dioxane
AOP	advanced oxidation process
AWTF	Advanced Water Treatment Facility
CIP	clean-in-place
cis-1,2-DCE	cis-1,2-dichloroethylene
City	City of Santa Monica
Cl_2	chlorine
COPC	constituent of potential concern
DDW	Division of Drinking Water
DLR	detection limit for purposes of reporting
GAC	granular activated carbon
gpm	gallons per minute
H_2O_2	hydrogen peroxide
HPC	heterotrophic plate count
H_2SO_4	sulfuric acid
H_2SiF_6	hydrofluorosilicic acid
µg/L	micrograms per liter
MCL	maximum contaminant level
µg/L	micrograms per liter
MG	million gallon
mg/L	milligrams per liter
MTBE	methyl tert-butyl ether
MWD	Metropolitan Water District of Southern California
NaF	sodium fluoride
$NaHSO_3$	sodium bisulfite
NaOH	sodium hydroxide
ND	non-detect
ng/L	nanogram per liter
$(NH_4)_2SO_4$	ammonium sulfate
NL	notification level
OMMP	Operations, Maintenance, and Monitoring Plan
PACL	polyaluminum chloride
PCE	tetrachloroethylene
PFOA	perfluorooctanoic acid
PLC	programmable logic controller
RL	reporting limit
RO	reverse osmosis
SCADA	supervisory control and data acquisition
SV	surrogate value
TCE	trichloroethylene
UCL95	95 percent upper confidence limit of the population mean
UV/H_2O_2	ultraviolet light with hydrogen peroxide advanced oxidation process
UVT	ultraviolet transmittance at 254 nm
VGAC	vapor phase granular activated carbon
VOC	volatile organic compound
WTP	Water Treatment Plant

Section 1

Introduction

This document presents the Effective Treatment and Monitoring Report for the City of Santa Monica (City) Olympic Well Field Restoration Project. This report fulfills the requirements of the Step 4 evaluation process, i.e., “Effective Treatment and Monitoring,” of the Revised Process Memo 97-005 issued by the California State Water Resources Control Board, Division of Drinking Water (DDW).

1.1 Process Memo 97-005

Process Memo 97-005-R2020 - Revised Guidance for Direct Domestic Use of Extremely Impaired Sources (DDW 2020a) documents the process and principles by which DDW evaluates proposals, establishes appropriate permit conditions, and approves the use of an extremely impaired source for direct potable use. The evaluation process comprises the following 10 elements, or steps.

The 10 steps of Process Memo 97-005 are:

1. Drinking Water Source Assessment and Contaminant Assessment
2. Full Characterization of Raw Water Quality
3. Drinking Water Source Protection
4. Effective Treatment and Monitoring
5. Human Health Risks Associated with Failure of Proposed Treatment
6. Completion of the California Environmental Quality Act Review of the Project
7. Submittal of a Permit Application
8. Public Hearing
9. DDW Evaluation
10. Issuance or Denial of Permit

The first three elements are covered in the following documents:

Step 1. *Olympic Well Field Drinking Water Source Assessment and Contaminant Assessment Report,* prepared by ICF and finalized in May 2020. The Step 1 report identifies the source and characterizes the distribution of all known contaminants that are present in the groundwater within the producing well field. Available data gleaned from several decades of investigation, site cleanup, monitoring, and modeling indicated that four volatile organic compounds (VOC) are present in the monitoring and production wells that are at, or above, their respective maximum contaminant level (MCL) or notification level (NL):

- Tetrachloroethylene (PCE)
- Trichloroethylene (TCE)
- 1,4-dioxane (1,4-D), and
- 1,2,3-trichloropropane (1,2,3-TCP)

Step 2. The Revised Final *Full Raw Water Quality Characterization Step 2 of 97-005 Evaluation,* prepared by Advisian and ICF was submitted to DDW in August 2021. The purpose of the Step 2 report was to fully characterize constituents in the raw water produced by the Olympic Well Field, thereby ensuring a treatment system can be properly designed. The analyses included screening water quality data against specific criteria and regulatory values to identify constituents of potential concern (COPC), analyzing water quality data to estimate future treatment plant influent concentrations, assessing trends over time for historical water quality parameters, and analyzing variability to understand how water quality has changed under the influence of certain factors such as pumping and seasonal variation in precipitation. A multi-step approach was used to analyze water quality data and identified COPCs. At the end of the analysis, 15 synthetic organic chemicals were confirmed as COPCs, four of which were estimated to potentially rise to concentrations above their respective MCL or NL: 1,4-D, PCE, TCE, and 1,2,3-TCP.

Step 3. *Olympic Well Field Drinking Water Source Protection Plan,* prepared by ICF and submitted to DDW in October 2020. The Step 3 report established the source water protection plan to prevent future contamination plumes at the Olympic Well Field. The protection plan outlined measures already employed, including a monitoring well network, quarterly groundwater monitoring and reporting, adaptive well field management, and a discharge permitting program for industrial users.

This report documents **Step 4** of the 97-005 evaluation process, i.e., “Effective Treatment and Monitoring” for the City-owned-and-operated Olympic Well Field. This evaluation selects the appropriate treatment technologies that will be used to remove contaminants. The 97-005 evaluation process requires treatment to the detection limit for purposes of reporting (DLR) or other appropriate levels, as required by DDW. This report focuses on the following treatability assessments:

- Selection of treatment technologies, including rationale for process selection, multi-barrier treatment, and order of operation, as supported by a process flow diagram.
- Performance standards of treatment, including a list of COPCs, associated design-basis influent concentrations, treatment goals, and a treatment facility water quality test plan for initial plant startup.
- Operations, Maintenance, and Monitoring Plan (OMMP), including the following components:
    - Description of the treatment facility, including an overview of the sources of supply, design considerations, disinfection, storage, and the controls/supervisory control and data acquisition (SCADA) system.
    - System operating procedures, including design features, operating scenarios, maintenance activities, and descriptions of programmable logic controls (PLC) during pre-startup, startup, normal operation, maintenance, and shutdown.
    - Water quality monitoring and testing, including identification of drinking water wells and early warning monitoring wells, locations for sample collection, monitoring parameters, and sampling frequency and analytical methods.
    - Reporting and record keeping, including typical reporting forms for operational and maintenance records, and instructions for proper waste handling, disposal, and documentation of unintended or incidental waste.
- Reliability features, which include multi-treatment barriers, automated controls and alarms, up-gradient monitoring plan, response plan, notification plan, and compliance monitoring and reporting program.
- DDW evaluation of proposed treatment and monitoring, including contaminant concentrations, treatment objectives, and monitoring plan.
- Evaluation of treated water quality goals, including surrogate values, exceptions, and MCL-equivalent calculations.

It is recommended that the precursor Step 1 – 3 reports for the Olympic Well Field 97-005 Evaluation are read prior to, or in conjunction with, this report, "*as each step relies upon the findings and conclusions of the prior step.*" (DDW 2020a)

1.2 Background

The City of Santa Monica provides its own retail management of drinking water by treating and distributing water to residents and other users within its boundaries. The City currently serves approximately 18,000 metered customers with a current average annual water demand of approximately 11,600 acre-feet per year. Approximately 50 to 60 percent of the City's current water supply is derived from local groundwater resources, with the remainder supplied by imported water from the Metropolitan Water District of Southern California (MWD), which wholesales treated water to the City imported from the Colorado River Aqueduct and the State Water Project. To reduce reliance on costly imported water supplies, the City seeks to increase the Arcadia Water Treatment Plant (WTP) capacity from 10 million gallons per day (mgd) to 13 mgd to accommodate additional flow from the Olympic Well Field and future wells. The project will also restore the Olympic Well Field's pumping capacity by treating groundwater impacted by contamination through a new Olympic Advanced Water Treatment Facility (Olympic AWTF) co-located at the Arcadia WTP.

The City is currently the only municipal agency that pumps groundwater from the Santa Monica Basin with groundwater production wells at the Charnock, Olympic, and Arcadia Well Fields, which are treated at the Arcadia WTP. The Charnock Well Field is comprised of five groundwater production wells: CH-13, CH-16, CH-18, CH-19, and CH-20 (replaced CH-15). Three (CH-13, 19, and 20) of the five groundwater wells are contaminated with methyl tert-butyl ether (MTBE) and tertiary butyl alcohol and are treated at the Charnock WTP with greensand filtration and granular activated carbon (GAC) prior to blending with CH-16 and CH-18 for further treatment at the Arcadia WTP. The Arcadia Well Field production wells treated at the Arcadia WTP are ARC-4 and ARC-5. Design considerations for the Arcadia WTP, Charnock WTP, and Arcadia Well Field are discussed in the *Domestic Water Supply Permit Amendment 1910146PA-004*, dated August 22, 2016.

Olympic Wells SM-3 and SM-4 are currently treated at the Arcadia WTP, but their production is limited due to contamination. New wells SM-8 and SM-9 (replacing SM-3) are being added and will be treated at the new Olympic AWTF. The production capacity of the existing Arcadia WTP, new Olympic AWTF and Arcadia WTP expansion, and potential future groundwater wells (e.g., Airport Wells) from the Coastal Sub-basin are described in Table 1-1.

Table 1-1. Production Well Capacities

Well	Units	Existing	Initial Design	Future Design
Olympic Wells				
SM-3/SM-9[a]	gpm	300 to 900	500 to 900[a]	500 to 900[a]
SM-4	gpm	300 to 900	500 to 900[a]	500 to 900[a]
SM-8[a]	gpm	-	500 to 900[a]	500 to 900[a]
Arcadia Wells				
ARC-4	gpm	135	135	135
ARC-5	gpm	95	95	95
Charnock Wells				
CH-13, 16, 18, 19, and 20	gpm	4,800 to 7,000	4,800 to 7,000[b]	4,800 to 7,000[b]
Future Well[c]	gpm	-	-	900
Airport Wells				
Airport-1	gpm	-	-	300
Airport-2	gpm	-	-	300
Airport-3	gpm	-	-	300
Subtotals				
Maximum Combined Olympic Flow	gpm	1,800	2,000	2,000
Arcadia/Charnock/Airport	gpm	5,030 to 7,000	5,030 to 7,230	5,930 to 8,130
Reclaimed Washwater Return[d]	gpm	542	0	0
Totals				
Total Arcadia WTP Capacity	gpm	7,542[e]	9,097[f]	9,097[f]

a. Total maximum flow from the Olympic Well Field will be limited to 2,000 gpm. For Step 2 Report, modeling assumed 600 gpm from SM-3/9, 700 gpm from SM-4, and 700 gpm from SM-8.
b. Total pumping capacity of the existing Charnock wells (13, 16, 18, 19, and 20) varies based on well age and time of well replacement.
c. The Future Well would be a back-up for existing Charnock wells.
d. Will be demolished as part of plant upgrades.
e. Limited to 7,000 gpm total from wells and 542 gpm from reclaimed washwater return.
f. Limited to 9,097 gpm total from wells.
gpm = gallons per minute

1.2.1 Olympic Well Field Restoration

To be classified as an Extremely Impaired Source by DDW, a water source must meet two or more of the 10 DDW-developed criteria to identify such sources. Based on the Step 2 Report evaluation of available water quality data, groundwater in the vicinity of the Olympic Well Field has the following three criteria and is therefore considered extremely impaired:

1. Contains a contaminant, i.e., 1,4-D, that exceeds 10 times its NL based on chronic health effects.
2. Is extremely threatened with contamination due to known contaminating activities within the long-term, steady-state capture zone of a drinking water well or within the watershed of a surface water intake. As identified in the Step 1 Report, former Gillette and Boeing facilities, which are located within the Olympic Well Field study area, are identified contamination sites.
3. Contains a mixture of contaminants of health concern beyond what is typically seen in terms of number and concentration of contaminants, i.e., 1,4-D, PCE and TCE.

The Olympic Well Field is currently limited to two production wells, SM-3 and SM-4; restoration under a separate project includes equipping a new well (SM-8) and replacing SM-3 with a new well (SM-9). The City proposes to amend the existing Water Supply Permit to include production from the Olympic Well Field and treatment through the new Olympic AWTF before further treatment at the Arcadia WTP.

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Section 2

Summary of Olympic Well Field Water Quality and Definition of Design COPC Concentrations

The Step 2 analysis (described in the Step 2 Report) fully characterized constituents in the raw water produced by the Olympic Well Field, thereby ensuring a treatment system can be properly selected and designed (Advisian and ICF, 2021). The analysis included screening of water quality data against specific criteria and regulatory values to identify COPCs, analyzing water quality data to estimate future treatment plant influent concentrations, assessing trends over time for historical water quality parameters, and analyzing variability to understand how water quality has changed under the influence of certain factors such as pumping and seasonal variation in precipitation. Ultimately, 15 synthetic organic chemicals were confirmed as COPCs based on two criteria: 1) chemicals are synthetic organic compounds, and 2) chemicals had a ratio of maximum concentration to MCL or NL greater than 50 percent. Statistical analysis and flow-weighting calculations were then conducted to estimate future treatment plant influent concentrations using monitoring well groundwater quality data for all constituents, including the identified COPCs. The results of this analysis projected four COPCs to be at concentrations above their respective MCL or NL: 1,4-dioxane, PCE, TCE, and 1,2,3-TCP.

The Step 2 Report also provides information on monitoring well selection and evaluation approach (Advisian and ICF, 2021). A conservative 95 percent upper confidence limit of the population mean (UCL95) water quality value was selected for the flow-weighted concentration estimates to project concentrations at each production well in the Olympic Well Field. A safety factor, selected based on best engineering judgement and available information, was applied to the UCL95 water quality value to provide a second layer of conservatism to design the multi-barrier treatment system for the Olympic Well Field.

- **Initial Design.** Table 2-1 provides the design concentrations for the Initial design and construction. A safety factor of 1.5 on the UCL95 values was used for all the constituents except 1,2,3-TCP, unlike the other COPCs, as well sampling from 2018 to 2019 showed a range of 1,2,3-TCP concentrations, with 55 percent of the values below the MCL. Thus, a safety factor of 1.2 on the UCL95 value was used for 1,2,3-TCP to minimize over-estimation of expected influent concentrations and over-design of the facility.
- **Contingency Design.** Table 2-2 provides the design concentrations for the potential future Contingency Design and construction, which uses a safety factor of 2.0 for all COPCs, including 1,2,3-TCP. The Olympic Well Field Restoration Project incorporates the ability to increase contaminant removal, if necessary, should future groundwater monitoring results indicate contaminant levels above what is currently detected and modeled. This potential future Contingency Design includes expansion of the ultraviolet (UV) light with hydrogen peroxide (H_2O_2) advanced oxidation process to increase treatment if one or more COPC rises above the Initial Design concentrations to the point where additional treatment is needed. It also includes increased Arcadia WTP capacity from future increased Charnock well flow.

Table 2-1. Olympic Influent Concentrations: Initial Design

Constituent of Potential Concern	Units	MCL	NL	1.5X UCL95 Estimates, Except 1,2,3-TCP (1.2X)			Olympic AWTF Influent[a]
				SM-4	SM-8	SM-9	
1,1-Dichloroethane (1,1-DCA)	µg/L	5	-	0.41	0.06	0.02	0.21
1,1-Dichloroethylene (1,1-DCE)	µg/L	6	-	1.65	0.30	0.12	0.86
1,2,3-Trichloropropane (1,2,3-TCP)	µg/L	0.005	-	0.045	0.018	0.017	0.030
1,4-Dioxane (1,4-D)	µg/L	-	1	54	4	4	27
Carbon Tetrachloride	µg/L	0.5	-	0.54	0.07	0.04	0.27
Cis-1,2-Dichloroethylene (cis-1,2-DCE)	µg/L	6	-	0.33	3.15	0.08	1.04
Tetrachloroethylene (PCE)	µg/L	5	-	42	2	3	20
Trichloroethylene (TCE)	µg/L	5	-	34	2	1	16
1,1,2-Trichloroethane	µg/L	5	-	0.50	ND	ND	0.23
1,2-Dichloroethane	µg/L	0.5	-	0.20	0.10	0.10	0.15
Benzene	µg/L	1	-	0.10	0.20	ND	0.10
Methyl tert-butyl ether (MTBE)	µg/L	13	-	0.30	0.30	ND	0.22
Perfluorooctanoic acid (PFOA)	ng/L	-	0.1	1.70	0.10	0.20	0.85
trans-1,2-Dichloroethylene	µg/L	10	-	ND	0.10	0.10	0.06
Vinyl Chloride	µg/L	0.5	-	ND	0.20	ND	0.06

a. *Blended* treated water concentration assuming Olympic well flows of SM-4 = 900 gpm, SM-8 = 550 gpm, SM-9 = 550 gpm. Note: SM-4 flow is elevated and SM-8 and SM-9 reduced to create the most conservate blend concentration at the maximum flow (SM-4 at maximum flow).

µg/L = microgram per liter

ng/L = nanogram per liter

Table 2-2. Olympic Influent Concentrations: Contingency Design

Constituent of Potential Concern	Units	MCL	NL	2.0X UCL95 Estimates			Olympic AWTF Influent[a]
				SM-4	SM-8	SM-9	
1,1-DCA	µg/L	5	-	0.60	0.10	0.10	0.33
1,1-DCE	µg/L	6	-	2.20	0.40	0.16	1.14
1,2,3-TCP	µg/L	0.005	-	0.074	0.030	0.028	0.049
1,4-D	µg/L	-	1	71	5	5	35
Carbon Tetrachloride	µg/L	0.5	-	0.80	0.10	0.10	0.42
cis-1,2-DCE	µg/L	6	-	0.50	4.20	0.10	1.41
PCE	µg/L	5	-	56	2	3	27
TCE	µg/L	5	-	45	2	1	21
1,1,2-Trichloroethane	µg/L	5	-	0.60	ND	ND	0.27
1,2-Dichloroethane	µg/L	0.5	-	0.20	0.10	0.10	0.15
Benzene	µg/L	1	-	0.10	0.20	ND	0.10
MTBE	µg/L	13	-	0.40	0.40	ND	0.29
PFOA	ng/L	-	0.1	2.20	0.10	0.30	1.10
trans-1,2-Dichloroethylene	µg/L	10	-	ND	0.10	0.10	0.06
Vinyl Chloride	µg/L	0.5	-	ND	0.20	ND	0.06

a. *Blended treated water concentration assuming Olympic well flows of SM-4 = 900 gpm, SM-8 = 550 gpm, SM-9 = 550 gpm. Note: SM-4 flow is elevated, and SM-8 and SM-9 reduced to create the most conservate blend concentration at the maximum flow (SM-4 at maximum flow).*

The blended Olympic Well Field influent water quality concentrations assume Olympic well flows of 900 gpm for SM-4, 550 gpm for SM-8, and 550 gpm for SM-9 to create the most conservate blend concentration at the maximum flow (SM-4 at maximum flow; see Section 4 for details on mass balance development). Ten of the 15 identified COPCs have concentrations at the individual production wells that are below the MCL or NL. Concentrations at the production wells for four of the constituents (1,2,3-TCP, 1,4-D, PCE, and TCE) exceed the MCL or NL and will govern the treatment technology selection as described in Section 1.1. The historical water quality data is summarized in Appendix A.

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Section 3

Selection of Treatment Technology

This section described the approach used by the City to evaluate, select, and define treatment criteria for the best technology combination to remove the identified COPCs.

3.1 Rationale for Selection of the Best Available Technology

Known, effective technologies to remove three of the four COPCs expected to be above their MCLs or NLs (1,4-D, TCE, and PCE) are advanced oxidation processes (AOP), which use H_2O_2 with UV light or ozone to produce hydroxyl radicals that react with and destroy contaminants.

The City previously conducted a literature review and technology evaluation for the key COPCs with respect to operating criteria, potential byproduct formation, and residual stream production. The *Olympic Treatment Plant – Pilot Treatment Study* (Black and Veatch 2016) reviewed best available technologies for VOC removal: GAC, air stripping, air stripping and GAC in series, and air stripping and fluidized bed bioreactor in series were considered. A range of AOPs were also evaluated: ozone/H_2O_2, UV/ozone, UV/H_2O_2, UV/chlorine, and UV/electrode. Pilot testing was performed for combinations of air stripping and ozone/H_2O_2, air stripping and UV/H_2O_2, and UV/chlorine and air stripping. The pilot test configurations included pretreatment with chlorine oxidation and greensand filtration, softening with RO, and post-treatment with RO bypass and decarbonation, as they were recommended by the study and already in use at the Arcadia WTP. Based on the outcome of this evaluation, UV/H_2O_2 was selected to treat the groundwater from the Olympic Well Field.

3.2 Treatment Technology Description

The UV/H_2O_2 AOP system for the new Olympic AWTF is designed to treat the maximum (unblended) well concentrations for the three target contaminants (1,4-D, TCE, and PCE as summarized in Table 2-1) and can be expanded to meet the treatment targets necessitated by the higher concentrations in Table 2-2 through the addition of more rows of UV lamps (i.e., higher intensity light) if needed. Because the hydroxyl radical yield from the UV/H_2O_2 process is low, UV/H_2O_2 AOP results in measurable residual hydrogen peroxide concentrations downstream of the reactors. Lead-lag GAC treatment will be provided downstream of the AOP process to quench the excess, residual hydrogen peroxide and provide treatment via adsorption for COPCs, including 1,2,3-TCP.

Several existing systems at the Arcadia WTP will be modified or expanded to increase capacity. Two of the six existing greensand filters will be re-plumbed and dedicated to the new Olympic AWTF; the remaining four greensand filters will continue to treat water from the Charnock WTP and Arcadia Well Field. The RO system is being modified to enhance the recovery of RO permeate.

3.3 Rationale for Order of Operation

The purpose of each treatment process and reason for the proposed order of treatment is summarized below.

1. Greensand filtration will be used for both the Charnock/Arcadia and Olympic well flows to remove iron and manganese. Removing iron and manganese will reduce UV lamp fouling from the Olympic well flow and RO membrane fouling by both the Charnock/Arcadia and Olympic well flows.
2. UV/H_2O_2 AOP will be used to remove 1,4-D, TCE, and PCE from the Olympic Well Field to below their respective DLRs or detection limit as the primary mode of treatment for these contaminants.
3. GAC will be used to quench the hydrogen peroxide from the UV/H_2O_2 effluent and provide treatment via adsorption (e.g., removal of 1,2,3-TCP).
4. Treated water from the UV/H_2O_2 AOP + GAC (Olympic well flows) will be combined with Charnock/Arcadia well flows in the RO feed tank and be treated via RO to reduce total dissolved solids, water hardness, and other low concentration contaminants to below the DLR. An RO bypass stream will be used to re-mineralize the final treated water.
5. The combined RO permeate and RO bypass will pass through the decarbonators.
6. The exhaust gas from the decarbonators will be treated via vapor-phase GAC.
7. Post-decarbonation, ammonium sulfate and sodium hypochlorite will be added to create a disinfectant residual (monochloramine), fluoride will be added to leave a residual, and sodium hydroxide will be added for corrosion control of the final treated water.

3.4 Multi-barrier Treatment

Both the existing and future Arcadia WTP treatment trains provide multiple treatment barriers to produce high-quality drinking water. The existing and planned upgraded treatment trains are described in this section.

3.4.1 Existing Multi-barrier Treatment Train

The existing Charnock WTP treatment train consists of downhole chlorination, and an equalization basin with aeration, greensand filters, and GAC treatment for three of the five wells located in the Charnock Well Field. The other two Charnock Wells are not contaminated and are not treated. No modifications to the Charnock WTP are proposed for this Olympic Well Field Restoration Project. Two new wells will be added at the Olympic Well Field: SM-8 and SM-9 (SM-9 replaces SM-3).

The following summarizes each treatment process at the existing Arcadia WTP. Equipment configuration in this section is described using the notation (duty + standby). Figure 3-1 provides a process flow diagram of the existing system.

- **Contact Basin.** One contact basin provides additional contact time for iron and manganese oxidation after injection of sodium hypochlorite.
- **Greensand Filters.** Three filter feed pumps (2 + 1) boost flow through six greensand filters (6 + 0) remove iron and manganese and protect the UV lamps and RO membranes from fouling. Each filter contains two independently operating cells. Backwash is discharged to the City of Los Angeles sewer.
- **RO Feed Tank.** One RO feed tank provides flow equalization to ensure steady-state operation of the RO trains.

- **Low Pressure RO Feed Pumps and Cartridge Filters.** Three low-pressure RO feed pumps (2 + 1) convey flow from the RO feed tank through three cartridge filters (3 + 1). The cartridge filters serve to protect the RO membranes by capturing any large particles that may be in the feed water.
- **RO Trains.** Three high-pressure RO feed pumps (3 + 1) boost flow through three RO trains (3 + 1) to remove dissolved minerals and salts. Approximately 14 to 18 percent of the RO feed water bypasses the RO system to control for post-treatment stabilization. RO permeate is blended with RO bypass flows upstream of the decarbonation process. RO concentrate (brine) is currently discharged to the City's sanitary sewer.
- **Decarbonators.** Combined RO permeate and RO bypass flows are passed through two decarbonators (2 + 0). The decarbonators remove carbon dioxide to increase pH and reduce the required sodium hydroxide dosage for post treatment. The decarbonators also achieve approximately 1 log removal each of TCE and PCE.
- **Vapor-Phase GAC (VGAC).** Three VGAC contactors (3 + 0) remove VOCs from airflow from the reservoir mechanical aeration system and decarbonators per South Coast Air Quality Management District permit requirements.
- **Post Treatment.** Disinfection, fluoridation, and stabilization of treated water is achieved by adding sodium hypochlorite, ammonium sulfate, fluoride, and sodium hydroxide, respectively.
- **Reservoir.** Treated water is stored in a 5-million-gallon (MG) reservoir that is equipped with an aeration system to remove remaining VOCs before distribution to the potable water system.

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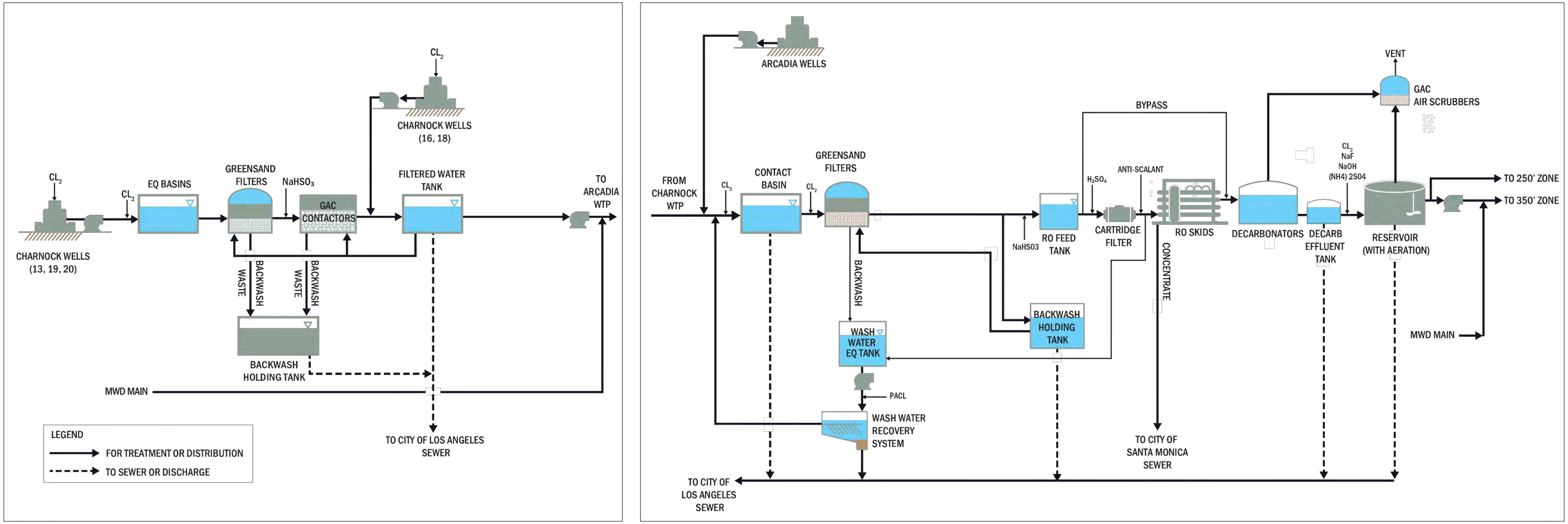

CHARNOCK WTP

ARCADIA WTP

Figure 3-1. Existing Arcadia WTP process flow diagram

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3.4.2 Upgraded Multi-barrier Treatment Train

The upgraded multi-barrier treatment train includes addition of the new Olympic AWTF and modification and expansion of some existing processes at the Arcadia WTP as described in the following sections.

3.4.2.1 Olympic AWTF

The new Olympic AWTF consists of the following new or modified processes:

- **Greensand Filters.** Two (2 + 0) of the six existing greensand filters will be modified to remove iron and manganese from the Olympic Well Field flow. A physical separation will be made to avoid any cross-connection to the other four greensand filters. Backwash water from the greensand filters will be discharged to the City of Los Angeles sewer system. Filtrate from the Olympic greensand filters will not be used to backwash any greensand filters. A new connection from the 350-foot pressure zone booster pump discharge header will fill the backwash holding tank with treated water to provide flexibility in using either final treated water or Charnock greensand filtrate for backwash supply. Raw water flow from the Olympic wells will be blown down to the washwater equalization tank until a turbidity permissive is met and then redirected into the greensand filters.
- **UV/H_2O_2 AOP.** Two UV trains (1 +1) using hydrogen peroxide as the oxidant will be constructed to provide contaminant removal. Each UV reactor includes 12 reactor sections with 11 sections filled with UV lamps to meet Initial Design requirements (lamps can be added to the 12th reactor section for additional contaminant removal should constituent levels rise).
  - **Hydrogen Peroxide.** Two metering pumps (1 + 1) will add hydrogen peroxide (50 percent weight per weight) to UV/H_2O_2 AOP influent. Hydrogen peroxide is the oxidant for the UV-AOP treatment process.
- **GAC.** Four GAC trains (3 + 1) each including two vessels filled with GAC media operating in lead-lag will be constructed to quench residual hydrogen peroxide and provide treatment via adsorption (e.g., adsorption of 1,2,3-TCP). Treatment capacity requirements are met if one train is offline due to backwashing or maintenance but all vessels will typically remain in operation when flows are high enough to maintain proper hydraulics through all four trains.

A site plan of the Olympic AWTF (co-located at the existing Arcadia WTP) and Arcadia WTP expansion is provided in Figure 3-2.

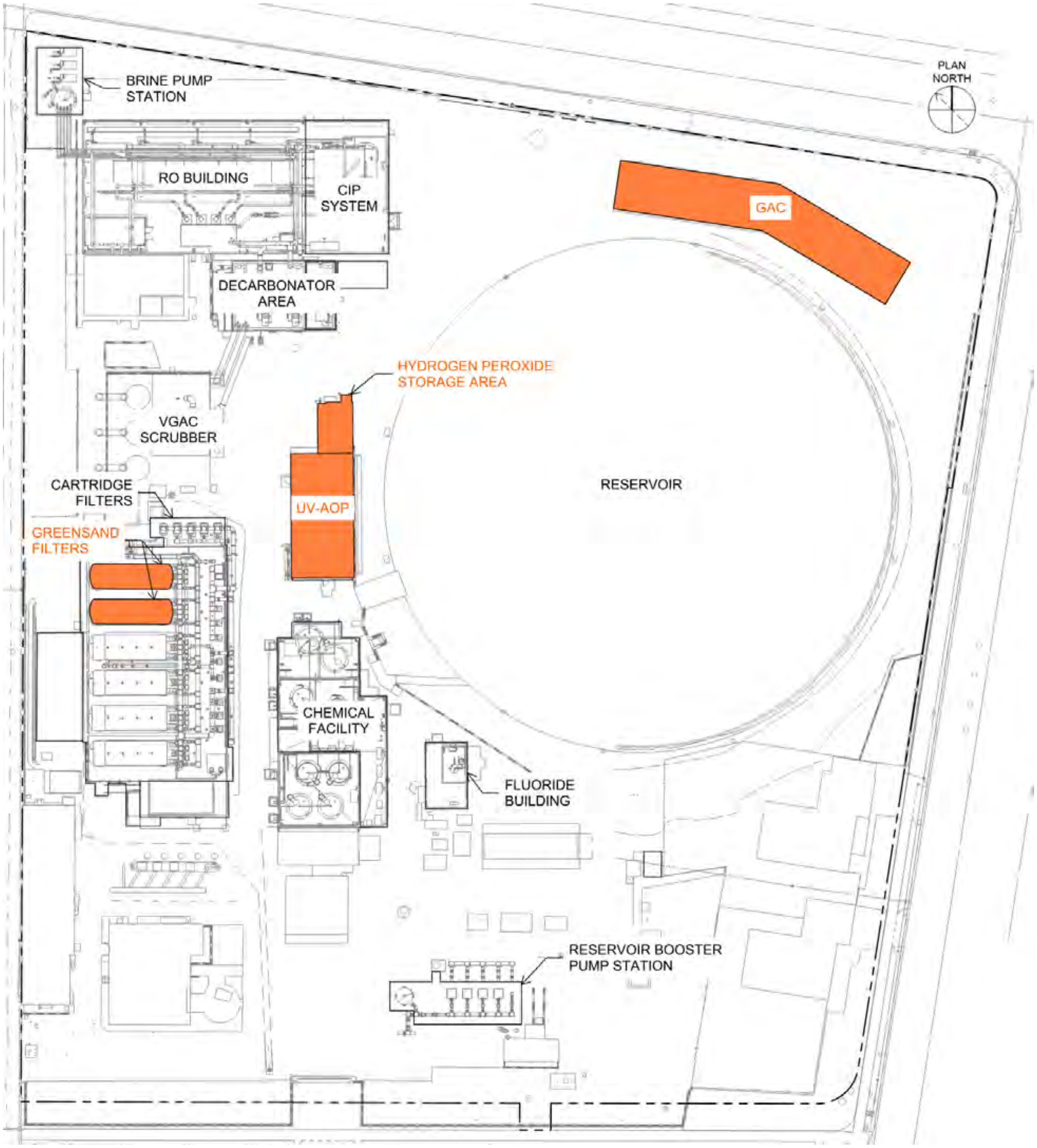

Figure 3-2. Olympic AWTF and Arcadia WTP expansion site plan

Olympic AWTF shown in orange

3.4.2.2 Arcadia WTP Expansion

The following modifications will be made as part of the Arcadia WTP expansion:

- **RO Feed Tank.** A new inlet pipe penetration will be added to the RO feed tank for Olympic AWTF effluent. Groundwater from the Charnock WTP and Arcadia Well Field (both pre-treated with greensand filtration) will be blended with Olympic AWTF effluent within the RO feed tank.
- **Low-pressure RO Feed Pumps and Cartridge Filters.** One additional low-pressure RO feed pump (for a total of 3 + 1) and one additional cartridge filter (for a total of 4 + 1) will be constructed to handle increased flows from addition of the Olympic AWTF. The additional low-pressure RO feed pump and cartridge filter will match the existing equipment.
- **RO Trains.** The existing RO trains (4 + 0) will be retrofitted to flow reversal reverse osmosis (FRRO) to increase system recovery from 83 percent to 90 percent, or greater. Pilot testing has been performed to confirm that FRRO will increase system recovery while maintaining high salt rejection. During the Initial Design, approximately 24 percent of the RO feed flow will be bypassed around the RO based on a hardness target of ~160 mg/L as calcium carbonate ($CaCO_3$). In the Initial Design, the retrofitted RO trains will operate in a 3 duty, 1 standby mode based on available influent water. Should additional groundwater wells be available, from other future wells, summarized in Table 1-1, all RO trains will operate in a 4 duty, no standby mode. When a RO train goes offline due to cleaning or maintenance, plant operating capacity will be reduced temporarily and supplemented by the City's imported water source. A new Clean in Place (CIP) system will be constructed inside an expanded RO Building to improve the efficacy of membrane cleanings.
- **Brine Tank and Pump Station.** One brine tank and pump station will be constructed to equalize the RO concentrate for disposal via the existing 8-inch brine disposal line that connects to the City's sanitary sewer system. An air gap will be provided in the concentrate piping from each RO system to the brine tank.
- **Decarbonators.** One additional decarbonator (for a total of 3 + 0) will be constructed to handle increased flows. The Arcadia WTP expansion will continue to be able to achieve 1-log reduction of TCE and PCE. With the addition of the Olympic AWTF, the City's existing reservoir aeration system may no longer be required to meet treatment goals.
- **Vapor Phase GAC.** Three VGAC contactors (3 + 0) will treat airflow from the decarbonators and the mechanical aeration system per South Coast Air Quality Management District permit requirements.
- **Post Treatment.** New flash mix pumps will be installed downstream of the decarbonator effluent tank to enhance chemical mixing for post-treatment disinfection and stabilization. The chemical feed has been re-ordered to ammonium sulfate, fluoride, sodium hypochlorite and sodium hydroxide. Sodium fluoride will be replaced with hydrofluorosilicic acid for fluoridation.
- **Reservoir Booster Pump Station.** The 5-MG reservoir has two outlets; the first outlet sends water to the Arcadia booster pumps to supply the 350-foot pressure zone and the second outlet flows by gravity directly to the 250-foot pressure zone. A new booster pump station will be constructed to supply the 500-foot pressure zone using the 250-foot pressure zone reservoir outlet.
- **Chemical Systems.** The following chemical dosing systems will be used at the new Olympic AWTF and Arcadia WTP expansion. Chemical strength concentration percentages are noted as weight per weight.
  - **Sodium Hypochlorite.** Two pairs of metering pumps (1 + 1 shared standby for each location) will add sodium hypochlorite (12.5 percent is purchased, 11.5 percent is used for tank and pump sizing) to raw water contact tank influent and non-Olympic greensand filter influent.

Three pairs of metering pumps (1 + 1 for each location) will add sodium hypochlorite to greensand filter influent to enhance iron and manganese removal, downstream of GAC to form chloramine prior to RO treatment if only the Olympic Well Field is running (Charnock/Arcadia flow uses residual chlorine from the greensand process), and downstream of the decarbonator effluent tank for disinfection residual.

- **Ammonium Sulfate.** Three pairs of metering pumps (1 + 1 for each location) will add ammonium sulfate (40 percent) to non-Olympic greensand effluent, GAC effluent, and decarbonator effluent. Ammonium sulfate is added along with sodium hypochlorite to form chloramines to control RO biofouling and for disinfection.
- **Sulfuric Acid.** Two metering pumps (1 + 1) will add sulfuric acid (93 percent) to UV/H_2O_2 influent. Two pairs of metering pumps (1 + 1 shared standby at each location) will add sulfuric acid to RO influent and RO clean-in-place (CIP). Sulfuric acid is added to maintain pH in the RO feed at 6.6 to minimize scaling on the RO membranes, to create low pH RO cleaning solutions, and to neutralize spent RO CIP waste prior to sewer disposal. It may also be used to enhance UV/H_2O_2 treatment efficiency.
- **Antiscalant.** Two metering pumps (1 + 1) will add antiscalant (Avista Vitec-4,000 or AWC A-119) to cartridge filter effluent to reduce inorganic scaling on the membrane surface.
- **Hydrofluorosilicic Acid.** Two metering pumps (1 + 1) will add hydrofluorosilicic acid (23 percent) downstream of the decarbonator effluent tank. The hydrofluorosilicic acid system will replace the existing sodium fluoride metering pumps and powder/saturator system. Hydrofluorosilicic acid is added for fluoridation.
- **Sodium Hydroxide.** Three metering pumps (2 + 1) will add sodium hydroxide (25 percent) downstream of the decarbonator effluent tank to achieve a pH between 8.0 to 8.5 to match the potable distribution system water quality and minimize corrosion. It is also used to create RO cleaning solutions and neutralize spent RO CIP waste prior to sewer disposal.

A process flow diagram of the new Olympic AWTF and Arcadia WTP expansion is provided on Figure 3-3. Table 3-1 presents the flow balance for the system. Refer to Appendix B for a detailed process flow diagram and complete flow balance of the system showing order of operation, pumps, chemical injection points, and static mixers. Refer to the OMMP in Appendix C for detailed design criteria, operating procedures, and vendor documentation. The vapor-phase GAC permit is included in Appendix D.

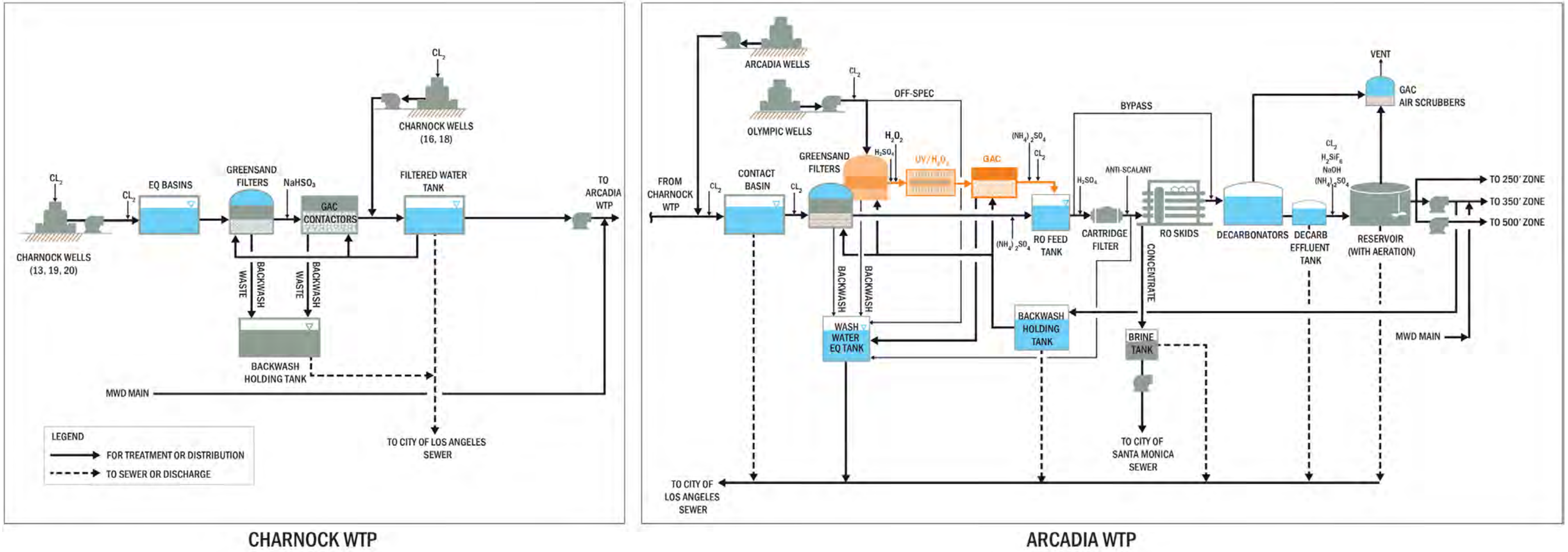

Figure 3-3. Olympic AWTF and Arcadia WTP expansion process flow diagram

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Table 3-1. Olympic AWTF and Arcadia WTP Expansion Flow Balance

Description	Units	Initial Design	Contingency Design[a]
Olympic AWTF			
Greensand Filters Influent from Olympic Wells	gpm	2,000	2,000
UV-AOP Influent[b]	gpm	2,000	2,000
GAC Influent	gpm	2,000	2,000
RO Feed Tank Influent from Olympic Wells[b]	gpm	2,000	2,000
Arcadia WTP			
Charnock WTP Effluent	gpm	4,800	5,067
Arcadia Wells Influent	gpm	230	230
Airport Wells Influent	gpm	0	900
Arcadia WTP Contact Basin Influent	gpm	5,030	7,097
Greensand Filters Influent from Charnock, Arcadia, and Airport Wells	gpm	5,030	7,097
RO Feed Tank Influent from Charnock, Arcadia, and Airport Wells[b]	gpm	5,030	7,097
RO Feed Tank Effluent	gpm	7,030	9,097
RO Bypass[c]	gpm	1,697	2,092
RO Feed	gpm	5,333	7,005
RO Permeate[d]	gpm	4,800	6,304
RO Concentrate/Brine[d]	gpm	533	700
Decarbonator Influent	gpm	6,497	8,397
Treated Water Production	gpm	6,497	8,397

a. Contingency Design assumes future increased flows from Charnock well field.

b. GAC and greensand filter backwash supply provided by treated water. Losses due to filter-to-waste or backwash waste not deducted due to infrequent operations.

c. RO bypass equals 24% and 23% of Initial and Contingency design RO feed tank effluent, respectively.

d. Based on 90% recovery for the Initial and Contingency design of the RO membrane system.

3.4.3 Summary of Contaminant Reduction through the Treatment Train

The existing Charnock WTP and Arcadia WTP provides multiple barriers of treatment, as will the expanded and upgraded plant. Projected removal efficiency of COPCs for all treatment processes are derived from a combination of literature values and field observations. The modeled removals of the 15 COPCs by process are summarized in Tables 3-2 and 3-3 for the initial and contingency designs, respectively. Ten of the 15 COPCs identified in the Step 2 Report (Advisian and ICF, 2021) are projected to be below their respective MCL or NL in all wells, but their reduction is considered here as well.

Table 3-2. Modeled Removals by Process in the Initial Design

Constituent of Potential Concern	UV/H_2O_2 AOP	GAC	RO	Decarbonator
1,1-DCA	0%[a]	0%[b]	90%[c]	30%[d]
1,1-DCE	99.4%[e]	90%[b]	26%[f]	30%[d]
1,2,3-TCP	0%[a]	92%[g]	60%[h]	15%[h]
1,4-D	99.6%[g]	0%[a]	80%[f]	0%[a]
Carbon Tetrachloride	0%[a]	90%[i]	75%[c]	90%[i]
cis-1,2-DCE	99.4%[g]	90%[j]	30%[f]	50%[d]
PCE	99.5%[g]	90%[b,i]	70%[c,f,k]	91%[l]
TCE	99.4%[g]	90%[b,i]	30%[c,f,k]	89%[l]
1,1,2-Trichloroethane	0%[a]	0%[i,m]	85%[c]	40%[i]
1,2-Dichloroethane	0%[a]	0%[b]	70%[c]	90%[i]
Benzene	0%[n]	90%[i]	85%[i]	90%[i]
MTBE	0%[n]	0%[b]	80%[o]	75%[p]
PFOA	0%[a]	90%[q]	90%[o]	0%[a]
trans-1,2-Dichloroethylene	0%[n]	90%[j]	35%[k]	58%[d]
Vinyl Chloride	0%[n]	0%[b]	80%[c]	90%[i]

a. Not a BAT.
b. Short breakthrough relative to 1,2,3-TCP per Kempitsty et al. 2019. Assume not operated for removal of these COPCs.
c. Altalyan et al. 2016.
d. Conservatively estimated from EPA 1983.
e. Conservative log removal based on Trojan kinetic model.
f. Removal based on FRRO pilot data gathered July – Sept 2020.
g. Design removal based on performance guarantee.
h. Provost and Pritchard 2014.
i. Estimate based on data in EPA. 2009.
j. Adams, Clark and Miltner. 1989.
k. Kim, Amy, and Drewes 2005.
l. Per Arcadia WTP decarbonator water quality data (2017-2019).
m. Short breakthrough relative to 1,2,3-TCP per Roccaro 2016. Assume not operated for removal of this COPC.
n. As the concentrations are all well below the detection limit at design values, the system does not target treatment of these constituents.
o. Konradt et al. 2021.
p. Ramakrishnan et al. 2004.
q. Kempitsty et al., 2022.

Table 3-3. Modeled Removals by Process in the Contingency Design

Constituent of Potential Concern	UV/H_2O_2 AOP	GAC	RO	Decarbonator
1,1-DCA	0%[a]	0%[b]	90%[c]	30%[d]
1,1-DCE	99.6%[e]	90%[b]	26%[f]	30%[d]
1,2,3-TCP	0%[a]	92%[g]	60%[h]	15%[h]
1,4-D	99.75%[g]	0%[a]	80%[f]	0%[a]
Carbon Tetrachloride	0%[a]	90%[i]	75%[c]	90%[i]
cis-1,2-DCE	99.6%[g]	90%[j]	30%[f]	50%[d]
PCE	99.7%[g]	90%[b,i]	70%[c,f,k]	91%[l]
TCE	99.6%[g]	90%[b,i]	30%[c,f,k]	89%[l]
1,1,2-Trichloroethane	0%[a]	0%[i,m]	85%[c]	40%[i]
1,2-Dichloroethane	0%[a]	0%[b]	70%[c]	90%[i]
Benzene	0%[n]	90%[i]	85%[i]	90%[i]
MTBE	0%[n]	0%[b]	80%[o]	75%[p]
PFOA	0%[a]	90%[q]	90%[o]	0%[a]
trans-1,2-Dichloroethylene	0%[n]	90%[j]	35%[k]	58%[d]
Vinyl Chloride	0%[n]	0%[b]	80%[c]	90%[i]

a. *Not a BAT.*
b. *Short breakthrough relative to 1,2,3-TCP per Kempitsty et al. 2019. Assume not operated for removal of these COPCs.*
c. *Altalyan et al. 2016.*
d. *Conservatively estimated from EPA 1983.*
e. *Conservative log removal based on Trojan kinetic model.*
f. *Removal based on FRRO Pilot data gathered July – September 2020.*
g. *Design removal based on performance guarantee.*
h. *Provost and Pritchard 2014.*
i. *Estimate based on data in EPA. 2009.*
j. *Adams, Clark and Miltner. 1989.*
k. *Kim, Amy, and Drewes 2005.*
l. *Per Arcadia WTP decarbonator water quality data (2017-2019).*
m. *Short breakthrough relative to 1,2,3-TCP per Roccaro 2016. Assume not operated for removal of this COPC.*
n. *As the concentrations are all well below the detection limit at design values, the system does not target treatment of these constituents.*
o. *Konradt et al. 2021.*
p. *Ramakrishnan et al. 2004.*
q *Kempitsty et al., 2022.*

As described in previous sections, a level of contingency is provided in the treatment system design to provide additional contaminant removal should constituent levels rise (Table 3-3). The contingency design includes expanding the UV/H_2O_2 AOP treatment train to provide greater removal of 1,1-DCE, 1,4-D, cis-1,2-DCE, PCE, and TCE. Expanding the UV/AOP system would include installing additional lamp drivers in the partially filled UV power distribution centers and lamps and sleeves within the empty section of the UV reactors and connecting them. Excluding current supply chain and demand variability, expanding the UV/AOP can be completed in approximately 2 – 4 months. In such a scenario, the Olympic wells' flows would be adjusted to maintain concentrations at or below design levels until the system expansion was complete.

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Section 4

Performance Standards of Treatment

A mass balance model was developed to estimate effluent concentrations for each treatment process for all COPCs. The mass balance calculations apply the removals listed in Tables 3-2 and 3-3 to the Olympic well water influent concentrations listed in Tables 2-1 and 2-2. Operating assumptions are summarized in Table 4-1. Tables 4-2 and 4-3 summarize the mass balance model results for Initial and Contingency Designs, respectively, for plant operations at the design flow (water from Charnock, Arcadia and Olympic Well Fields). At design flow conditions, all COPCs are below their respective MCLs and NLs. With only Olympic wells running at the design flow and concentrations, all COPCs are also below their respective MCLs and NLs (Tables 4-4 and 4-5). Operating the Olympic AWTF and Arcadia WTP on Olympic wells only is not anticipated for normal operations and will be limited to occurring only if the entire Charnock Well Field is offline for new well drilling.

Table 4-1. Mass Balance Model Flows and RO Bypass and Recovery

Parameter	Units	Initial	Contingency
Olympic Wells			
SM-4	gpm	900	900
SM-8	gpm	550	550
SM-9	gpm	550	550
Arcadia Well Blend	gpm	230	230
Charnock Well Blend	gpm	4,800	5,067[a]
RO Recovery	%	90	90
Bypass Flow	%	24	23

a. Includes additional capacity from Airport Wells

An Acceptance Test Plan (to be submitted separately) will outline treatment facility startup activities to demonstrate that the treatment technology and programming operate as designed.

Table 4-2. Mass Balance: Initial Design Concentrations at Design Flow

Constituent of Potential Concern	Units	MCL	NL	Olympic Influent Blend (SM-4/8/9)	UV-AOP Effluent	GAC Effluent	Arcadia Well Blend	Charnock Well Blend	Charnock/ Arcadia Blend	GAC Effl. + Charnock/ Arcadia Blend	RO Permeate + Bypass	Treated Water
1,1-DCA	µg/L	5	-	0.207	0.207	0.207	ND	ND	ND	0.059	0.020	0.014
1,1-DCE	µg/L	6	-	0.858	0.005	0.001	ND	ND	ND	0.0001	0.0001	0.0001
1,2,3-TCP	µg/L	0.005	-	0.030	0.030	0.002	ND	ND	ND	0.001	0.0004	0.0003
1,4-D	µg/L	-	1	26.5	0.106	0.106	ND	ND	ND	0.030	0.012	0.012
Carbon Tetrachloride	µg/L	0.5	-	0.273	0.273	0.027	0.059	ND	0.003	0.010	0.004	0.0004
cis-1,2-DCE	µg/L	6	-	1.04	0.006	0.001	ND	ND	ND	0.0002	0.0001	0.0001
PCE	µg/L	5	-	20.3	0.101	0.010	ND	0.055	0.053	0.040	0.020	0.002
TCE	µg/L	5	-	16.1	0.097	0.010	ND	0.698	0.666	0.479	0.373	0.041
1,1,2-Trichloroethane	µg/L	5	-	0.225	0.225	0.225	ND	ND	ND	0.064	0.024	0.014
1,2-Dichloroethane	µg/L	0.5	-	0.145	0.145	0.145	ND	ND	ND	0.041	0.020	0.002
Benzene	µg/L	1	-	0.100	0.100	0.010	ND	ND	ND	0.003	0.001	0.0001
MTBE	µg/L	13	-	0.218	0.218	0.218	ND	0.186	0.178	0.189	0.077	0.019
PFOA	ng/L	-	5.1[a]	0.848	0.848	0.085	ND	ND	ND	0.024	0.008	0.008
trans-1,2-Dichloroethylene	µg/L	10	-	0.055	0.055	0.006	ND	ND	ND	0.002	0.001	0.0005
Vinyl Chloride	µg/L	0.5	-	0.055	0.055	0.055	ND	ND	ND	0.016	0.006	0.001

a. PHG-recommended NL is 0.1 ng/L.

Table 4-3. Mass Balance: Contingency Design Concentrations at Design Flow

Constituent of Potential Concern	Units	MCL	NL	Olympic Influent Blend (SM-4/8/9)	UV-AOP Effluent	GAC Effluent	Arcadia Well Blend	Charnock Well Blend	Charnock/ Arcadia/Future Wells[a] Blend	GAC Effl. + Charnock/ Arcadia/Future Wells[a] Blend	RO Permeate + Bypass	Treated Water
1,1-DCA	µg/L	5	-	0.325	0.325	0.325	ND	ND	ND	0.071	0.023	0.016
1,1-DCE	µg/L	6	-	1.14	0.005	0.0005	ND	ND	ND	0.0001	0.0001	0.0001
1,2,3-TCP	µg/L	0.005	-	0.049	0.049	0.004	ND	ND	ND	0.001	0.0005	0.0004
1,4-D	µg/L	-	1	34.7	0.087	0.087	ND	ND	ND	0.019	0.008	0.008
Carbon Tetrachloride	µg/L	0.5	-	0.415	0.415	0.042	0.059	ND	0.003	0.011	0.005	0.0005
cis-1,2-DCE	µg/L	6	-	1.41	0.006	0.001	ND	ND	ND	0.0001	0.0001	0.00005
PCE	µg/L	5	-	26.6	0.080	0.008	ND	0.055	0.053	0.043	0.020	0.002
TCE	µg/L	5	-	21.1	0.084	0.008	ND	0.698	0.668	0.523	0.405	0.045
1,1,2-Trichloroethane	µg/L	5	-	0.270	0.270	0.270	ND	ND	ND	0.059	0.021	0.013
1,2-Dichloroethane	µg/L	0.5	-	0.145	0.145	0.145	ND	ND	ND	0.032	0.015	0.002
Benzene	µg/L	1	-	0.100	0.100	0.010	ND	ND	ND	0.002	0.001	0.0001
MTBE	µg/L	13	-	0.290	0.290	0.290	ND	0.186	0.178	0.203	0.081	0.020
PFOA	ng/L	-	5.1[b]	1.10	1.100	0.110	ND	ND	ND	0.024	0.008	0.008
trans-1,2-Dichloroethylene	0.848	0.848	0.848	0.055	0.055	0.006	ND	ND	ND	0.001	0.001	0.0004
Vinyl Chloride	µg/L	10	-	0.055	0.055	0.055	ND	ND	ND	0.012	0.005	0.0005

a. *Because these future wells are not drilled yet and water quality data are not available, the calculations assume that water quality from these future wells would be similar to that measured in the wells with the worst water quality, i.e., the Charnock Wells.*

b. *PHG-recommended NL is 0.1 ng/L.*

Table 4-4. Mass Balance: Initial Design Concentrations for Olympic Flows Only

Constituent of Potential Concern	Units	MCL	NL	Olympic Influent Blend[a] (SM-4/8/9)	UV-AOP Effluent	GAC Effluent	Arcadia Well Blend[b]	Charnock Well Blend[b]	Charnock/ Arcadia Blend	GAC Effl. + Charnock/ Arcadia Blend	RO Permeate + Bypass	Treated Water
1,1-DCA	µg/L	5	-	0.207	0.207	0.207	NA	NA	NA	0.207	0.069	0.048
1,1-DCE	µg/L	6	-	0.858	0.005	0.001	NA	NA	NA	0.001	0.0004	0.0003
1,2,3-TCP	µg/L	0.005	-	0.030	0.030	0.002	NA	NA	NA	0.002	0.001	0.001
1,4-D	µg/L	-	1	26.5	0.106	0.106	NA	NA	NA	0.106	0.043	0.043
Carbon Tetrachloride	µg/L	0.5	-	0.273	0.273	0.027	NA	NA	NA	0.027	0.012	0.001
cis-1,2-DCE	µg/L	6	-	1.04	0.006	0.001	NA	NA	NA	0.001	0.0005	0.0002
PCE	µg/L	5	-	20.3	0.101	0.010	NA	NA	NA	0.010	0.005	0.0004
TCE	µg/L	5	-	16.1	0.097	0.010	NA	NA	NA	0.010	0.008	0.001
1,1,2-Trichloroethane	µg/L	5	-	0.225	0.225	0.225	NA	NA	NA	0.225	0.084	0.050
1,2-Dichloroethane	µg/L	0.5	-	0.145	0.145	0.145	NA	NA	NA	0.145	0.070	0.007
Benzene	µg/L	1	-	0.100	0.100	0.010	NA	NA	NA	0.010	0.004	0.0004
MTBE	µg/L	13	-	0.218	0.218	0.218	NA	NA	NA	0.218	0.089	0.022
PFOA	ng/L	-	5.1[c]	0.848	0.848	0.085	NA	NA	NA	0.085	0.028	0.028
trans-1,2-Dichloroethylene	µg/L	10	-	0.055	0.055	0.006	NA	NA	NA	0.006	0.004	0.002
Vinyl Chloride	µg/L	0.5	-	0.055	0.055	0.055	NA	NA	NA	0.055	0.022	0.002

a. SM-4 = 900 gpm, SM-8 =550 gpm, SM-9 = 550 gpm

b. Arcadia Well Blend = 0 gpm; Charnock Well Blend = 0 gpm

c. PHG-recommended NL is 0.1 ng/L.

Table 4-5. Mass Balance: Contingency Design Concentrations for Olympic Flows Only

Constituent of Potential Concern	Units	MCL	NL	Olympic Influent Blend[a] (SM-4/8/9)	UV-AOP Effluent	GAC Effluent	Arcadia Well Blend[b]	Charnock Well Blend[b]	Charnock/ Arcadia/ Future Wells Blend	GAC Effl. + Charnock/ Arcadia Blend	RO Permeate + Bypass	Treated Water
1,1-DCA	µg/L	5	-	0.325	0.325	0.325	N/A	N/A	N/A	0.325	0.105	0.074
1,1-DCE	µg/L	6	-	1.14	0.005	0.000	N/A	N/A	N/A	0.0005	0.0004	0.0003
1,2,3-TCP	µg/L	0.005	-	0.049	0.049	0.004	N/A	N/A	N/A	0.004	0.002	0.002
1,4-D	µg/L	-	1	34.7	0.087	0.087	N/A	N/A	N/A	0.087	0.035	0.035
Carbon Tetrachloride	µg/L	0.5	-	0.415	0.415	0.042	N/A	N/A	N/A	0.042	0.018	0.002
cis-1,2-DCE	µg/L	6	-	1.41	0.006	0.001	N/A	N/A	N/A	0.001	0.0004	0.0002
PCE	µg/L	5	-	26.6	0.080	0.008	N/A	N/A	N/A	0.008	0.004	0.0003
TCE	µg/L	5	-	21.1	0.084	0.008	N/A	N/A	N/A	0.008	0.007	0.001
1,1,2-Trichloroethane	µg/L	5	-	0.270	0.270	0.270	N/A	N/A	N/A	0.270	0.098	0.059
1,2-Dichloroethane	µg/L	0.5	-	0.145	0.145	0.145	N/A	N/A	N/A	0.145	0.069	0.007
Benzene	µg/L	1	-	0.100	0.100	0.010	N/A	N/A	N/A	0.010	0.004	0.0004
MTBE	µg/L	13	-	0.290	0.290	0.290	N/A	N/A	N/A	0.290	0.116	0.029
PFOA	ng/L	-	5.1[c]	1.10	1.10	0.110	N/A	N/A	N/A	0.110	0.036	0.036
trans-1,2-Dichloroethylene	µg/L	10	-	0.055	0.055	0.006	N/A	N/A	N/A	0.006	0.004	0.002
Vinyl Chloride	µg/L	0.5	-	0.055	0.055	0.055	N/A	N/A	N/A	0.055	0.022	0.002

a. SM-4 = 900 gpm, SM-8 =550 gpm, SM-9 = 550 gpm

b. Arcadia Well Blend = 0 gpm; Charnock Well Blend = 0 gpm

c. PHG-recommended NL is 01 ng/L.

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Section 5

Operation, Maintenance, and Monitoring Plan

An OMMP is intended to be used by any authorized treatment facility operator as reference for all aspects of a treatment facility and is included in Appendix C. The OMMP focuses on the following components:

- Description of the treatment facility, including an overview of the sources of supply, design considerations, disinfection, storage, and the controls/SCADA.
- System operating procedures, including design features, operating scenarios, and descriptions of PLCs during pre-startup, startup, normal operation, maintenance, and shutdown (planned and emergency). A list of approved operations staff (number of staff, grade of certifications, and responsibilities) and contact information for technical assistance and vendors is included.
- Water quality monitoring and testing, including identification of drinking water wells and early warning monitoring wells, locations for sample collection, monitoring parameters, and sampling frequency and analytical methods.
- Reporting and record keeping, including typical reporting forms for operational and maintenance records, and instructions for proper waste handling, disposal, and documentation of unintended or incidental waste.

5.1 Description of Facility

The OMMP will provide a description of the existing Charnock WTP, new Olympic AWTF, and expanded Arcadia WTP consistent with the description provided in Section 3.

5.2 Treatment Facility Operating Procedures

Descriptions of PLCs and manual/automatic controls for pre-startup, startup, normal operation, maintenance, and short-term and long-term shutdown procedures are provided in the OMMP. Some treatment processes are controlled by individual PLCs that communicate with the Arcadia WTP master plant PLC/SCADA system. The individual PLCs allow for either manual or auto modes of operation. The Plant PLC system sends permissive signals that allow different operating modes to be initiated for each treatment process.

The O&M manual (to be provided at a later time) will include SOPs for regular maintenance of major items and related systems. A list of major equipment maintenance requirements and triggers for action is included in Table 5-1.

Table 5-1. Typical Maintenance Items for Major Equipment

Equipment	Trigger for Maintenance	Maintenance Action
Greensand Filters	• High headloss, runtime, totalized volume of filtered water, or iron concentration in filtered water	• Perform filter backwash
	• Filtered water quality not acceptable after backwashing	• Investigate backwash procedure • Investigate oxidation chemistry upstream • Reactivate greensand media • Replace greensand media
UV/H_2O_2	• Lamp failure	• Replace burned out lamp
	• Lamp driver failure	• Replace lamp driver
	• Wiper failure	• Replace failed wiper
	• UV meters or sensors failure	• Replace failed UV intensity sensor • Repair or calibrate UVT analyzer • Replace failed flowmeter
	• Low log removal or lamp intensity reduced below the minimum level for adequate UV dose delivery (e.g., excessive fouling, lamp aging, faulty intensity sensor)	• Check UV intensity sensor calibration • Replace lamp sections (if indicated by lamp age) • Check sleeves; clean if required; adjust wiper frequency
	• Ultraviolet transmittance (UVT) analyzer reads high or low (relative to typical operations)	• Check UV intensity sensor calibration • Check UVT analyzer calibration • Compare UVT analyzers' results against each other; calibrate errant analyzer • Clean sensor if needed
	• Monthly maintenance	• Inventory spare parts on site • Perform reference UV intensity sensor checks • Inspect UV intensity sensor O-rings • Check hydraulic system fluid level • Check hydrogen peroxide dosing system, including pump calibration and H_2O_2 bulk concentration • Clean UVT analyzer sensor • Calibrate UVT analyzer
	• Annual maintenance	• Check high-voltage power distribution center • Reference UV intensity sensor calibration • Refresher training for personnel • Replace hydraulic system fluid filter • Inspect hydraulic hoses • Inspect lamp cables • Replace wiper seals • Replace UVT analyzer wiper • Replace hydraulic fluid
GAC Vessels	• High headloss or maximum runtime reached	• Initiate backwash or bump (low-flow backwash to reduce air entrainment and compaction)
	• Lowest sample port of lead vessel indicates hydrogen peroxide is only partially quenched (still quenched at the effluent)	• Confirm hydrogen peroxide quenching through the depth of the GAC bed (all ports and combined effluent) • Schedule media replacement, switch lead-lag order of GAC
	• Lowest sample port of lead vessel indicates breakthrough of target contaminant(s)	• Schedule media replacement, switch lead-lag order of GAC
Low-Pressure and High-Pressure Feed Pumps	• Decrease in High-Pressure RO feed pump suction pressure, failure of Low-Pressure or High-Pressure RO feed pumps	• Check VFD settings • Schedule maintenance for failed pump

Table 5-1. Typical Maintenance Items for Major Equipment

Equipment	Trigger for Maintenance	Maintenance Action
Cartridge Filters	• High differential pressure across cartridge filter	• Isolate and replace failed cartridge filters for failed vessel(s)
RO Trains	• Elevated fouling rate or cleaning frequency	• Monitor FRRO automation and verify sequencing is operating properly; inspect FRRO valves • Optimize antiscalant dose and pH • Inspect greensand filters if iron and manganese concentrations are elevated. Adjust greensand filter operating parameters (e.g., backwash frequency and chlorine residual) as needed. • Verify/adjust chemical dosing for chloramines upstream of RO feed tank
	• Elevated RO permeate or finished water conductivity	• Inspect membranes for failed O-ring connections • Replace failed membranes
Decarbonators	• Blower failure	• Schedule regular blower inspection • Reduce RO production if it is greater than the capacity of 2 online blowers and the 3rd decarbonator blower fails (evaluate impact on treatment as needed)
	• High differential pressure across packed media bed	• Clean decarbonator media if it becomes fouled
Chemical Systems	• Metering pump does not meet required dose at minimum or maximum speed • Calibration test indicates pump dosing is inaccurate	• Manually adjust metering pump stroke length (diaphragm pumps) • Replace tubing (peristaltic pumps)
	• Dose exceeds setpoint	• Manually trim dosage rate • Inspect analyzer or flowmeter corresponding to affected chemical system
	• Low level in bulk feed tank	• Inspect bulk feed tank during daily rounds • Replace malfunctioning/failed level sensor • Schedule chemical delivery

Flow measurement for influent and effluent to all processes at the Arcadia WTP are summarized in Table 5-2. Monitoring locations, flowmeters and sampling points are shown on Figure 5-1.

Table 5-2. Flow Measurement

Process	Flow Measurement
Olympic Greensand Filter Influent	Totalized in SCADA from flowmeters on individual Olympic Well Field effluent lines
Olympic Greensand Filter Effluent/UV/H_2O_2 AOP Influent	Flowmeter on UV/H_2O_2 AOP influent line
UV/H_2O_2 AOP Effluent/GAC Influent	Flowmeter on UV/H_2O_2 AOP influent line
GAC Effluent/RO Feed Tank Influent	Totalized in SCADA from flowmeters on GAC system
Contact Basin Influent	Flowmeter on contact basin influent line
Contact Basin Effluent/Non-Olympic Greensand Filter Influent	Totalized in SCADA from flowmeters on individual non-Olympic greensand filter influent lines
Non-Olympic Greensand Filter Effluent/RO Feed Tank Influent	Totalized in SCADA from flowmeters on individual non-Olympic greensand filter effluent lines
RO Feed Tank Effluent/Cartridge Filter Influent	Totalized in SCADA from flowmeters on RO permeate, RO concentrate, and RO bypass lines
Cartridge Filter Effluent/RO Train Influent	Totalized in SCADA from flowmeters on RO permeate, RO concentrate, and RO bypass lines
RO Bypass	Flowmeter on RO bypass line
RO Train Effluent/Decarbonator Influent	Totalized in SCADA from flowmeters on individual RO train permeate lines
Decarbonator Effluent Tank Effluent/Reservoir Influent	Flowmeter on reservoir influent line

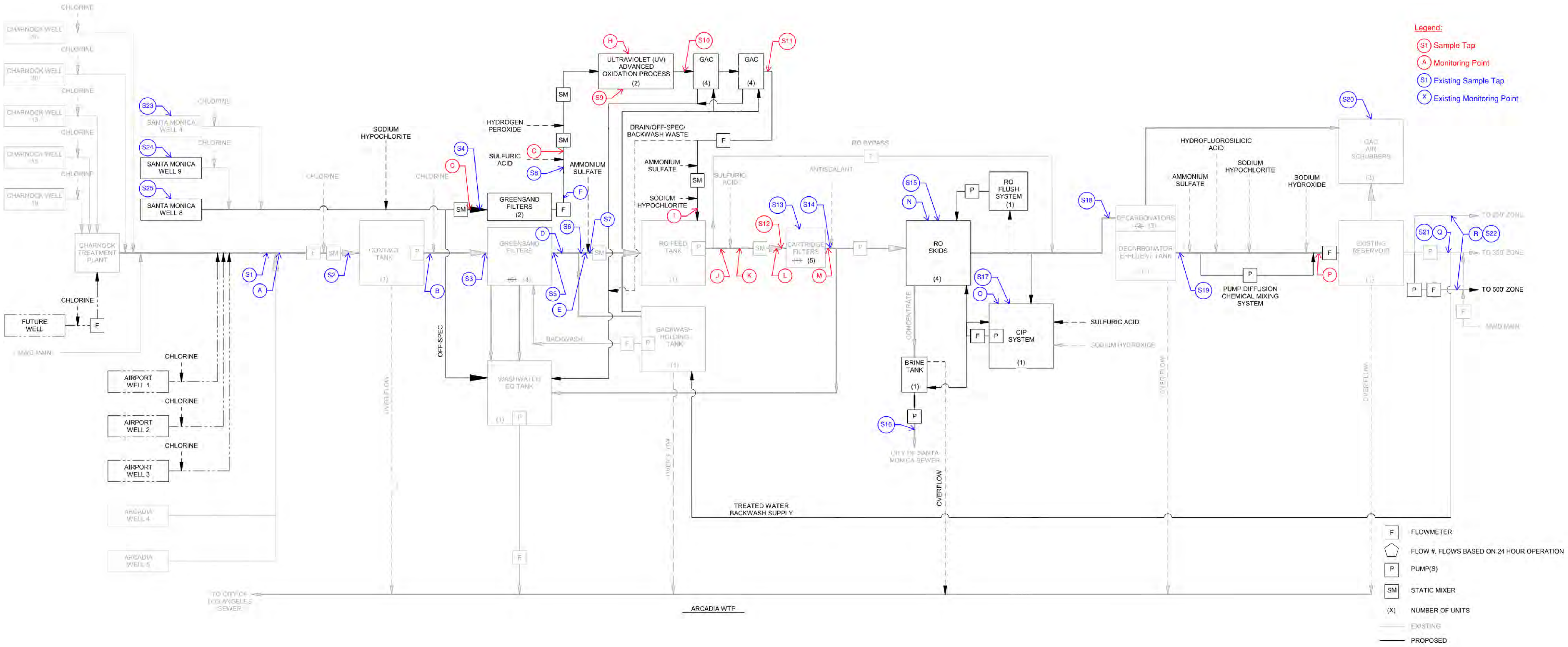

Figure 5-1. Arcadia WTP sample collection, flowmeters, and monitoring instrument(s) locations

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5.3 Reporting and Record Keeping

Operations and maintenance records are necessary to document treatment settings and performance, such that future evaluations can use historical data. Operational data from the on-line monitoring instruments is collected automatically through the SCADA system and generated into electronic reports. Maintenance records will be documented and include the date, time, duration of the procedure, and outcomes. In accordance with all requirements, the City will provide reports and records of past, current, and projected operational information pertaining to the Arcadia WTP (including the new Olympic AWTF) to DDW.

The following monitoring records will be retained for a DDW-directed period.

- Sampling location, date, and time (sampling locations are shown in Figure 5-1).
- Name(s) of individual(s) performing the sampling.
- Analytical results.
- Analytical methods/techniques used.
- Date of the analyses.
- Name of laboratory conducting the analyses with its Environmental Laboratory Accreditation Program certification documentation.
- Documentation of QA/QC, including chain of custody

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Section 6

Reliability Features and Water Quality Monitoring

This section discusses the reliability features and water quality monitoring plan for the new Olympic AWTF and Arcadia WTP expansion.

6.1 Reliability Features

The new Olympic AWTF and Arcadia WTP expansion have been designed to provide a safe and reliable system that produces water meeting all federal and state drinking water quality requirements. Reliability features to achieve consistent, optimized removal of COPCs are further discussed in the OMMP. The reliability features include, but are not limited to:

- Up-gradient monitoring wells selected based on the particle tracking simulation results presented in the Step 2 Report (see Appendix A of the Step 2 Report for the modeled capture zones and monitoring well locations). They are used as an early warning system to detect potential increases in contaminant concentrations that may later reach the production wells in the Olympic Well Field. A similar early warning system is currently in place for the City's Charnock Well Field and Charnock Treatment Plant.
- Multi-barrier treatment as described in Section 3.4 of this report.
- Automated monitoring and controls to ensure consistent treatment.
- PLCs with safety interlocks that automatically shut down the system if electrical, mechanical, or hydraulic parameters are beyond the preset operating range. All PLCs will communicate with the SCADA system.
- Double-contained chemical feed lines equipped with leak detection. Chemical storage tanks will be equipped with high-level alarms and quick connects to maximize operator safety. Concrete containment area with a sump will be provided for each chemical stored at the Charnock WTP and Arcadia WTP to contain chemical spills.
- Facility failure response plan, notification plan, and restart procedures.
- Compliance monitoring and reporting program for the Charnock WTP and the Arcadia WTP to confirm that water produced by the Arcadia WTP meets all state and federal requirements for potable water. Includes sampling and monitoring locations and frequencies to confirm that the treatment systems are achieving DDW permitting requirements.
- Laboratory turnaround and vendor response times managed to facilitate proper treatment and corrective actions.
- Backup generators to maintain operating continuity in the event of a plantwide power outage. In the event of backup generators being used, Olympic wells and UV/H_2O_2 are offline.

6.2 Compliance Monitoring and Reporting Program

This section describes monitoring of source water and the multi-barrier treatment system.

6.2.1 Monitoring of Extremely Impaired Source

The Olympic Well Field Monitoring Program has documented and reported quarterly groundwater monitoring activities since 2011, including groundwater flow maps and contaminant iso-concentration maps (e.g., ICF, 2020a). The data supported full characterization of the Olympic Well Field and was used to screen for COPCs and estimate future Arcadia WTP influent concentrations in the Step 2 Report (Advisian and ICF, 2021). Capture zones were generated for each production well and used to select monitoring wells. Attachment A of the Step 2 Report details the results of the particle tracking simulation and provides information on capture zones, monitoring well selection, and travel times for each aquifer zone.

6.2.2 Monitoring of the Multi-Barrier Treatment System

A compliance monitoring and reporting program to confirm that water produced by the new Olympic AWTF and Arcadia WTP expansion meets or exceeds all state and federal requirements for potable water is presented in the OMMP. In addition to routine sampling at the production wells (reported to the DDW via SDWIS), samples will also be collected quarterly at the Olympic Well Field monitoring wells and reported to the Los Angeles RWQCB (Case # 904040434), available via Geotracker. Monitoring well data will be used to inform operation of the well field and multi-barrier treatment system. A similar monitoring and reporting process is currently being used for the City’s Charnock Well Field.

Water quality monitoring will be performed for the 15 COPCs previously identified in the Step 2 Report as described in the OMMP (to be provided separately. After 1 year of monthly sampling and approval from DDW, monitoring frequency will be as specified by DDW. A table is provided in the OMMP that lists the sampling locations, frequencies, and test methods for monitoring of each COPC. Draft monitoring reporting sheets are also provided.

Sample collection locations and/or on-line monitoring instrument(s) are provided upstream and downstream of all treatment processes for operations and process control. The Arcadia WTP’s compliance point for finished water quality is downstream of the 5-MG reservoir. Data from the monitoring instruments are automatically collected and stored through the SCADA system. The OMMP shows all sampling and monitoring locations at the Arcadia WTP and summarizes the purpose of each location. Table 6-1 summarizes this information. All online analyzers listed in Table 6-1 will be confirmed with routine grab sample monitoring. Figure 5-1 maps the monitoring locations onto the PFD. Proposed water quality and quantity reporting forms are included in Appendix E.

Table 6-1. Water Quality Test Standards for Monitoring and Compliance

Parameter	Point of Monitoring and/or Compliance (Refer to Figure 5-1)	Monitoring Location	Type/Frequency of Measurement	Acceptable Operation Standard
Chlorine residual	A	Contact tank influent	Online[a] chlorine analyzers	Chlorine within target setpoint range
Chlorine residual Turbidity	B	Contact tank effluent	Online[a] chlorine and turbidity analyzers	Chlorine within target setpoint range Turbidity monitored for information purposes (no setpoint)
Chlorine residual Turbidity	C	Olympic greensand filter influent	Online[a] chlorine and turbidity analyzers	Chlorine within target setpoint range Turbidity monitored for information purposes (no setpoint)
Turbidity	D	Charnock-Arcadia blend[b] greensand filter effluent	Online[a] turbidity analyzer	Turbidity within target setpoint range
Chlorine residual	E	Charnock-Arcadia blend[b] greensand filter effluent	Online[a] chlorine analyzer	Chlorine below maximum setpoint
Turbidity	F	Olympic greensand filter effluent	Online[a] turbidity analyzer	Indicator of need for backwash
UVT, pH, flow	G	UV AOP influent	Online[a] UVT and pH analyzers and flowmeter	Parameters within permitted range (UVT, flow) pH may be used based on startup testing results
UV lamp status and intensity	H	UV system control center	Online[a]	Lamps online UV lamp intensity above required minimum value
Chlorine residual	I	GAC effluent	Online[a] chlorine analyzer	Chloramine within setpoint range when used (in Olympic wells only mode)
Chlorine residual	J	RO feed tank effluent (upstream of sulfuric acid injection)	Online[a] chlorine analyzer	Effluent chlorine for determining additional chemical needed to meet finished water setpoint
Ammonia residual and monochloramine residual	K	RO feed tank effluent (downstream of sulfuric acid injection)	Online[a] ammonia and monochloramine analyzers	Ammonia and chloramine within setpoint range
Turbidity	L	Cartridge filter influent	Online[a] turbidity analyzer	For informational purposes (no setpoint)
Oxidation reduction potential (ORP), temperature, pH, conductivity, turbidity, chlorine residual	M	Cartridge filter effluent	Online[a] ORP, temperature, pH, conductivity, turbidity, and chlorine analyzers	Within specified operating range as indicated by online monitors
ORP, chlorine residual, conductivity, pH	N	RO Trains[c]	Online[a] ORP, chlorine, conductivity and pH analyzers	Parameters are within the setpoint range
Temperature, pH	O	CIP system	Online[a] pH analyzer	Temperature and pH within target range

Table 6-1. Water Quality Test Standards for Monitoring and Compliance

Parameter	Point of Monitoring and/or Compliance (Refer to Figure 5-1)	Monitoring Location	Type/Frequency of Measurement	Acceptable Operation Standard
Temperature, pH, fluoride, turbidity, conductivity, free ammonia residual, monochloramine residual	P	Decarbonator effluent tank effluent	Online[a] temperature, pH, fluoride, turbidity, conductivity, free ammonia, and monochloramine analyzers	Within the setpoint range; temperature for informational purposes only
Chlorine residual, pH, temperature	Q	Reservoir effluent to 350' zone	Online[a] chlorine, pH and temperature analyzers	Residual and pH within target setpoint window; temperature for informational purposes (no setpoint)
Chlorine residual, pH, temperature	R	Reservoir effluent to 250' and 500' zone	Online[a] chlorine, pH, and temperature analyzers	Residual and pH within target setpoint window; temperature for informational purposes (no setpoint)

NOTE: Final version will use PS codes system.

a. Online analyzer provides continuous monitoring.

b. If Future Wells are added in the future, will be included in this blend.

c. ORP and chlorine residual analyzers provided for combined inlet to the RO system. Conductivity and pH analyzers provided for individual RO trains. Weekly conductivity profiles will also be collected for individual RO trains.

6.3 Emergency Notification Plan

No changes will be made to the existing Emergency Notification Plan, provided as an attachment to the OMMP. The plan lists contact information for City, DDW, and County Health Department personnel that are assigned to the Arcadia WTP in the event of a plant issue or failure that poses imminent danger to the health of water users.

Section 7

DDW Evaluation of Proposed Treatment and Monitoring

Over the course of the project, the City and its consultants have met with DDW on a regular basis to provide updates and summaries of activities and materials being developed to facilitate review and decision making for both DDW and the City. Table 7-1 lists the dates of meetings with DDW, meeting goals, and decisions.

Table 7-1. DDW Meetings as of June 8, 2022

Meeting Date	Meeting Goals	DDW Requests and Responses to Concerns
February 27, 2020	• Provide overview of the project and the need for DDW input	• Used recommended procedures for sampling plan for raw water quality characterization • Used all available existing data to assess all contaminants at the production wells (sampling has been completed since then and influent concentrations have been updated) • Submitted results from the first two sampling events and highlighted the results that required attention
May 18, 2020	• Provide an overview of and key findings from the Source and Contaminant Characterization Report to facilitate DDW review • Discuss additional plans for characterization of raw water quality • Identify any areas of potential concern for DDW	• Revised raw water quality sampling list based on initial assessment (see Step 2 Report for details on analytical approach) as DDW deemed it more comprehensive than necessary given the background was just shared on source contamination (e.g., explosives may not be needed since ordinances were not a source of contamination for Olympic).
June 15, 2020	• Confirm alignment on Drinking Water Source Assessment and Contaminant Assessment Report • Obtain feedback on preliminary direction for drinking water source protection • Discuss water quality results to date, overview on process train, and water quality implications on process sizing	• Incorporated DDW's comments on the Drinking Water Source Assessment and Contaminant Assessment Report • Described potential new sources and how the City will protect against them in the source water protection program. Also looked into land use ordinances. • Provided a list of permitted underground storage tanks and inventory of abandoned wells in the source water protection program
July 21, 2020	• Discuss water quality results to date • Discuss process train and water quality implications on process sizing	• Included drought years in water quality results • Added nitrate to list of contaminants of potential concern in response to concern about sloughing from GAC
August 26, 2020	• Discuss Step 2 Raw Water Quality Characterization Approach and Flow Weighed Influent Concentration Analysis • Discuss water quality implications on process sizing	• Provided operating guidelines for each treatment system • Showed different operating scenarios for well combinations, maximum design concentrations, and limitations of treatment technologies
September 21, 2020	• Discuss refined Step 2 Raw Water Quality Characterization Approach • Discuss water quality implications for UV/AOP and GAC sizing	• Incorporated perfluorooctane sulfonate (PFOS) and PFOA into the City's annual comprehensive monitoring event • Revisited scavenging assumptions for UV/AOP based on sampling results from SM-8 and SM-9

Table 7-1. DDW Meetings as of June 8, 2022

Meeting Date	Meeting Goals	DDW Requests and Responses to Concerns
October 19, 2020	• Discuss UV/AOP and GAC equipment configuration and operational goals • Discuss acceptance and demonstration testing • Discuss Operation, Maintenance, and Monitoring Plan	• Inquired with labs to determine 1,4-D reporting limits • Provided figure in the OMMP showing all components upstream of the Arcadia WTP, monitoring locations, chemical injection points, analyzers, and sample grab points
November 19, 2020	• Discuss UV/AOP and GAC influent concentration assumptions and treatment goals • Discuss acceptance and demonstration testing • Discuss diversion plan for off-spec water • Request Quality Assurance Project Plan (QAPP)	• Added MWD connections and locations of alarms to process flow diagram • Added note stating that 1,4-D does not have a DLR • Confirmed QAPP will be included with the demonstration test plan
January 25, 2021	• Discuss mass balance and MCL-equivalent • Clarify permit documentation needs • Obtain DDW feedback on treatment process	• Updated process flow diagram to highlight which process will treat water from which wells • Well(s) used for monitoring associated with each production well are documented in the full Step 2 Report
June 29, 2021	• Review draft Step 2 Report contents • Discuss MCL-equivalent calculations • Begin review of Step 4 Report contents	• Additional decimals will be added in MCL equivalent calculations • Continue to develop details to review in the next meeting

July 22, 2021	• Continue review of Step 2 Report
	• Continue review of Step 4 Report and OMMP contents
		• HPC, total and fecal coliform and *E. coli* water quality values will be added to the Step 2 Report
		• Step 4 Report/OMMP inclusion requests from DDW:
		  • Include discussion of how predicted SM-8 and SM-9 nitrate concentrations will affect potential sloughing – Step 4
		  • Discussion of multiple barrier approach – Step 4
		  • A summary table of site-specific equipment (components manufacturer), including NSF 60 and 61 certifications – OMMP
		  • Propose a format for a monthly monitoring form that would be acceptable to both the City and DDW – Step 4.
		  • Bookmark the OMMP sections and be sure it is searchable – BOTH
		  • Develop compliance monitoring points in Section 4 (linked to permit conditions)
		  • Include instrument calibration and procedures and off-spec operations – OMMP
		  • Include a table of setpoints/triggers for control actions; for example, what criteria might trigger lamp or GAC media replacement? – BOTH
		  • Startup procedures and testing will be developed in a separate document

Table 7-1. DDW Meetings as of June 8, 2022

Meeting Date	Meeting Goals	DDW Requests and Responses to Concerns

August 23, 2021	• Continue review of the Step 4 Report
	• Introduce DDW to the Step 5 Report
		• Proposed monitoring schedule for the wells and various points in the process requests from DDW:
		  • Compliance samples to be collected at the effluent of the reservoir.
		  • Include sampling points at both influent and effluent of each component
		  • Existing compliance requirements from Charnock and Arcadia can be combined with the new compliance requirements from this project
		• Step 4 Report additions requested by DDW:
		  • Process flow diagram in report include flows, locations of MWD tie ins, new configuration of the RO and cartridge filters, and locations of flowmeters and where flows will be totalized
		  • Include the permit for GAC air scrubbers, and tie ins to sewer system
		• Draft Step 5 Report
		  • DDW agreed that we should not rely on GAC for 1,4-D removal in the Contingency Design
		  • DDW would like to see failure of the individual treatment processes
		  • DDW would like all 15 COPCs included because they will increase the health risks considering that they are not expected to be removed

September 20, 2021	• Continue the review of the Step 5 Report	• DDW agreed with using 1 µg/L NL and $3x10^{-6}$ cancer risk for 1,4-D
		• DDW would like BC to use OEHHA's recommended NL of 0.1 ng/L for PFOA
		• DDW requested a fault tree be added
		• DDW suggested adding the following:
		  • Existing upgradient monitoring will provide an early warning detection system
		  • A description of visible inspection and rounds by knowledgeable and skilled certified operators

October 18, 2021	• Continue the review of the Step 5 Report • Review fluoridation report	• City will need a failure response plan in their O&M manuals • DDW requested BC use OEHHA's draft PHG of 0.007 ng/L for PFOA in the risk calculations and present results calculated with the current NL of 5.1 ng/L in an appendix for reference • DDW requested that the OMMP include how SCADA detects process issues such as lamp failures • DDW would like to review the fluoridation design as part of the report to DDW
November 15, 2021	• Reviewed Step 5 report fault trees	• DDW requested that loss of communication between a process unit and the plant be a failure mode and that loss of communication should be paged out 24 hours a day • DDW asked to include grab sampling for monitoring and risk assessments, including frequency and what constituents are tested for (included in the OMMP)
December 13, 2021	• Provide a broad overview of the 97-005 permitting process for DDW staff new to the project	• None
February 14, 2022	• Continue the review of the Step 5 Report • Provide an overview of the 97-005 permitting schedule	• DDW requested that the lab turnaround times be limited to 7 days maximum.

Table 7-1. DDW Meetings as of June 8, 2022

Meeting Date	Meeting Goals	DDW Requests and Responses to Concerns
March 14, 2022	• Review 97-005 permitting schedule, including Acceptance Testing, CEQA (Step 6), permit application (Step 7), and public hearing (Step 8) • Discuss UV/AOP and GAC equipment configuration for initial and contingency designs • Review fluoridation reporting requirements	• DDW requested that the Olympic AWTF operates to waste until the final water supply permit amendment is provided. • DDW requested that the CEQA Mitigated Negative Declaration is submitted to DDW, as it represents Step 6 of the 97-005 process memo. • DDW requested that the City provide a venue (and translator if necessary) and help with the announcement for the public hearing. • DDW requested that a technical memo for the fluoridation design is submitted, including design details, differences between the existing solid batching system and proposed bulk liquid system, how the proposed system meets CDC requirements, deviations from CDC requirements, data sheets, and how fluoride off-gassing will be handled.
April 26, 2022	• Continue review of 97-005 permitting schedule, including Acceptance Testing • Discuss DDW comments on the Step 4 report	• DDW requested that the 97-005 permitting schedule is updated to provide DDW 2 weeks to review the Acceptance Test results. • DDW requested that Olympic Well data is uploaded to SDWIS. • DDW requested that GAC is configured as lead-lag to address concerns regarding treated water concentration of 1,2,3-TCP.
May 9, 2022	• Continue review of 97-005 permitting schedule • Continue discussion of DDW comments on the Step 4 report • Discuss DDW comments on the Step 5 report	• DDW would like to see an explanation of how the frequency of failure was selected in the Step 5 report.
June 8, 2022	• Continue review of 97-005 permitting schedule • Discuss the Acceptance Test Plan table of contents	• None

Section 8

Evaluation of Treated Water Goals

The treated water goals and ability of the proposed treatment processes to remove the COPCs were evaluated in terms of MCL-equivalents, or MCL-surrogate equivalents in absence of MCLs, with the goal of keeping the contaminant concentrations and MCL-equivalents as low as feasible. Based on MCL-equivalent calculations, the proposed treatment process meets all treated water goals and provides flexibility to adapt to any anticipated potential changes in water quality for the operating conditions outlined in Section 4.

8.1 Surrogate Values

Some of the COPCs discussed in the above sections are regulated with MCLs, whereas others have surrogate values (SV). SVs can be NLs, reporting limits (RL), or health advisories for lifetime exposure set by the U.S. Environmental Protection Agency (USEPA 2018; 2018 Edition of the Drinking Water Standards and Health Advisories Tables). When an MCL is not available for a contaminant, an SV is used. In absence of an MCL, the SV will be 0.1 x RL, unless the NL is greater than this value; in this case, the NL can be used. The SVs that were considered in the MCL-equivalent calculations are presented in Section 8.3.

8.2 Exceptions

Certain non-regulated emerging carcinogens may be difficult to treat with the drinking water treatment technologies commonly used today, and newer and more costly treatment techniques may be needed. In this case, alternative approaches can be used to calculate the MCL-equivalent, and existing treatment techniques or blending can be considered as acceptable removal methods. Such situations are considered "exceptions."

All of the COPCs discussed in this document have MCLs, NLs, or RLs; therefore, exceptions were not considered.

8.3 MCL-Equivalent Calculation

MCL-equivalent calculation followed the guidance provided in the *Process Memo 97-005 User Guide* (DDW 2020b). MCL-equivalents must be calculated separately based on each contaminant's health effects according to the following endpoints: acute contaminants, chronic cancerous contaminants, and chronic non-cancerous contaminants. Tables 8-1 and 8-2 summarize the treated water quality for each COPC, with corresponding MCLs and SVs, DLR, health effects and endpoints, MCL-equivalent calculation, and ratio, for the Initial and Contingency Designs' treated water concentrations presented in Table 4-2 and 4-3.

Table 8-1. Treated Water Quality Goals, MCLs, NLs, RLs, DLR, Health Effects, Endpoints, and MCL-Equivalents: Initial Design

Constituent of Potential Concern	Units	Treated Water Concentration	MCL	NL	RL	0.1 x RL	DLR	Rationale for Ratio[a]	Ratio
Chronic, Cancer Endpoints[b]									
1,1-DCA	µg/L	0.014	5				0.5	Concentration < DLR	0
1,2,3-TCP	µg/L	0.0001	0.005				0.005	Concentration < DLR	0
1,4-D	µg/L	0.012	--	1	35	3.5	--[c]	0.012/1	0.012
Carbon tetrachloride	µg/L	0.0004	0.5				0.5	Concentration < DLR	0
PCE	µg/L	0.002	5				0.5	Concentration < DLR	0
TCE	µg/L	0.041	5				0.5	Concentration < DLR	0
1,1,2-Trichloroethane	µg/L	0.014	5				0.5	Concentration < DLR	0
1,2-Dichloroethane	µg/L	0.002	0.5				0.5	Concentration < DLR	0
Benzene	µg/L	0.000	1				0.5	Concentration < DLR	0
MTBE	µg/L	0.019	13				3	Concentration < DLR	0
PFOA	ng/L	0.008	--	5.1	10	1	--[d]	0.008/5.1	0.002
trans-1,2-Dichloroethylene	µg/L	0.0005	10				0.5	Concentration < DLR	0
Vinyl Chloride	µg/L	0.001	0.5				0.5	Concentration < DLR	0
Total MCL-equivalent, chronic, cancer endpoints								0.014 < 1	
Chronic, Non-cancer Endpoints[b]									
1,1-DCE	µg/L	0.0001	6				0.5	Concentration < DLR	0
cis-1,2-DCE	µg/L	0.0001	6				0.5	Concentration < DLR	0
Total MCL-equivalent, chronic, non-cancer endpoints								0 < 1	

a. *A ratio of zero was used when the treated water concentration was lower than the DLR.*

b. *California Office of Environmental Health Hazard Assessment (OEHHA), California Public Health Goals for Chemicals in Drinking Water.*

c. *There is no official DLR for 1,4-Dioxane; the recommended reporting limit is 1 µg/L.*

d. *There is no DLR for PFOA.*

Table 8-2. Treated Water Quality Goals, MCLs, NLs, RLs, DLR, Health Effects, Endpoints, and MCL-Equivalents: Contingency Design

Constituent of Potential Concern	Units	Treated Water Concentration[a]	MCL	NL	RL	0.1 x RL	DLR	Rationale for Ratio[b]	Ratio
Chronic, Cancer Endpoints[c]									
1,1-DCA	µg/L	0.016	5				0.5	Concentration < DLR	0
1,2,3-TCP	µg/L	0.0003	0.005				0.005	Concentration < DLR	0
1,4-D	µg/L	0.008	--	1	35	3.5	--[d]	0.008/1	0.008
Carbon tetrachloride	µg/L	0.0005	0.5				0.5	Concentration < DLR	0
PCE	µg/L	0.002	5				0.5	Concentration < DLR	0
TCE	µg/L	0.045	5				0.5	Concentration < DLR	0
1,1,2-Trichloroethane	µg/L	0.013	5				0.5	Concentration < DLR	0
1,2-Dichloroethane	µg/L	0.002	0.5				0.5	Concentration < DLR	0
Benzene	µg/L	0.0001	1				0.5	Concentration < DLR	0
MTBE	µg/L	0.020	13				3	Concentration < DLR	0
PFOA	ng/L	0.008	--	5.1	10	1	--[e]	0.008/5.1	0.002
trans-1,2-Dichloroethylene	µg/L	0.0005	10				0.5	Concentration < DLR	0
Vinyl Chloride	µg/L	0.001	0.5				0.5	Concentration < DLR	0
Total MCL-equivalent, chronic, cancer endpoints									0.010 < 1
Chronic, Non-cancer Endpoints[b]									
1,1-DCE	µg/L	0.0001	6				0.5	Concentration < DLR	0
Cis 1,2-DCE	µg/L	0.00005	6				0.5	Concentration < DLR	0
Total MCL-equivalent, chronic, non-cancer endpoints									0 < 1

a. *Treated water concentrations listed represent the Contingency Design scenario with the additional treatment (expanded UV/H_2O_2).*
b. *A ratio of zero was used when the treated water concentration was lower than the DLR.*
c. *OEHHA, California Public Health Goals for Chemicals in Drinking Water.*
d. *There is no official DLR for 1,4-Dioxane; the recommended reporting limit is 1 µg/L.*
e. *There is no DLR for PFOA.*

Tables 8-3 and 8-4 present the same parameters presented in Tables 4-4 and 4-5, where only the Olympic Wells are operating. As required, ratios include one significant figure unless the treated water concentration is lower than the DLR, in which case a ratio of zero was used. Appendix F includes alternative MCL-equivalent calculations using an NL of 0.1 ng/L for PFOA (OEHHA-recommended value) for reference.

Table 8-3. Treated Water Quality Goals, MCLs, NLs, RLs, DLR, Health Effects, Endpoints, and MCL-Equivalents: Initial Design Concentrations for Olympic Flows Only

Constituent of Potential Concern	Units	Treated Water Concentration	MCL	NL	RL	0.1 x RL	DLR	Rationale for Ratio[a]	Ratio
Chronic, Cancer Endpoints[b]									
1,1-DCA	µg/L	0.048	5				0.5	Concentration < DLR	0
1,2,3-TCP	µg/L	0.001	0.005				0.005	Concentration < DLR	0
1,4-D	µg/L	0.043	--	1	35	3.5	-- [c]	0.043/1	0.043
Carbon tetrachloride	µg/L	0.001	0.5				0.5	Concentration < DLR	0
PCE	µg/L	0.0004	5				0.5	Concentration < DLR	0
TCE	µg/L	0.001	5				0.5	Concentration < DLR	0
1,1,2-Trichloroethane	µg/L	0.050	5				0.5	Concentration < DLR	0
1,2-Dichloroethane	µg/L	0.007	0.5				0.5	Concentration < DLR	0
Benzene	µg/L	0.0004	1				0.5	Concentration < DLR	0
MTBE	µg/L	0.022	13				3	Concentration < DLR	0
PFOA	ng/L	0.028	--	5.1	10	1	--[d]	0.028/5.1	0.005
trans-1,2-Dichloroethylene	µg/L	0.002	10				0.5	Concentration < DLR	0
Vinyl Chloride	µg/L	0.002	0.5				0.5	Concentration < DLR	0
Total MCL-equivalent, chronic, cancer endpoints									0.048< 1
Chronic, Non-cancer Endpoints[b]									
1,1-DCE	µg/L	0.0003	6				0.5	Concentration < DLR	0
Cis 1,2-DCE	µg/L	0.0002	6				0.5	Concentration < DLR	0
Total MCL-equivalent, chronic, non-cancer endpoints									0 < 1

a. *A ratio of zero was used when the treated water concentration was lower than the DLR.*
b. *OEHHA, California Public Health Goals for Chemicals in Drinking Water.*
c. *There is no official DLR for 1,4-Dioxane; the recommended reporting limit is 1 µg/L.*
d. *There is no DLR for PFOA.*

Table 8-4. Treated Water Quality Goals, MCLs, NLs, RLs, DLR, Health Effects, Endpoints, and MCL-Equivalents: Contingency Design Concentrations for Olympic Flows Only

Constituent of Potential Concern	Units	Treated Water Concentration[a]	MCL	NL	RL	0.1 x RL	DLR	Rationale for Ratio[b]	Ratio
Chronic, Cancer Endpoints[c]									
1,1-DCA	μg/L	0.074	5				0.5	Concentration < DLR	0
1,2,3-TCP	μg/L	0.002	0.005				0.005	Concentration < DLR	0
1,4-D	μg/L	0.035	--	1	35	3.5	-- [d]	0.035/1	0.035
Carbon tetrachloride	μg/L	0.002	0.5				0.5	Concentration < DLR	0
PCE	μg/L	0.0003	5				0.5	Concentration < DLR	0
TCE	μg/L	0.001	5				0.5	Concentration < DLR	0
1,1,2-Trichloroethane	μg/L	0.059	5				0.5	Concentration < DLR	0
1,2-Dichloroethane	μg/L	0.007	0.5				0.5	Concentration < DLR	0
Benzene	μg/L	0.0004	1				0.5	Concentration < DLR	0
MTBE	μg/L	0.029	13				3	Concentration < DLR	0
PFOA	ng/L	0.036	--	5.1	10	1	--[e]	0.036/5.1	0.007
trans-1,2-Dichloroethylene	μg/L	0.002	10				0.5	Concentration < DLR	0
Vinyl Chloride	μg/L	0.002	0.5				0.5	Concentration < DLR	0
Total MCL-equivalent, chronic, cancer endpoints									0.042 < 1
Chronic, Non-cancer Endpoints[c]									
1,1-DCE	μg/L	0.0003	6				0.5	Concentration < DLR	0
Cis 1,2-DCE	μg/L	0.0002	6				0.5	Concentration < DLR	0
Total MCL-equivalent, chronic, non-cancer endpoints									0 < 1

a. *Treated water concentrations listed represent the Contingency Design scenario with the additional treatment (expanded UV/H_2O_2).*
b. *A ratio of zero was used when the treated water concentration was lower than the DLR.*
c. *OEHHA, California Public Health Goals for Chemicals in Drinking Water.*
d. *There is no official DLR for 1,4-Dioxane; the recommended reporting limit is 1 μg/L.*
e. *There is no DLR for PFOA.*

Results indicate that the sums of ratios are less than 1 for all groups of contaminants, including contaminants with acute endpoints, chronic cancer endpoints, and chronic non-cancer endpoints, for both the Initial and Contingency Designs. As shown in Appendix F, similar results are obtained when a more conservative approach is used for PFOA (i.e., using OEHHA's recommended NL of 0.1 ng/L).

8.4 Post-GAC Nitrate Management

Nitrate has been observed in the Olympic well SM-4 at concentrations up to half the MCL. As nitrate adsorption and subsequent rapid desorption from GAC when putting vessels into service following a backwash has been observed elsewhere, the impact of elevated nitrate release from the Olympic AWTF GAC on treated water quality was evaluated.

Table 8-5 presents the modeled worst-case Arcadia WTP source influent concentrations. Tables 8-6 and 8-7 present the Arcadia WTP maximum historical source influent concentrations and modeled treated concentrations for initial/contingency designs and nitrate spikes to 2 to 3 times the highest Olympic well concentrations with only Olympic flow to pick the worst-case condition. The model results show that downstream RO treatment will reduce the finished water nitrate concentration to below the MCL.

Table 8-5. Olympic Influent Concentrations: Nitrate, mg/L as N

Nitrate Concentration	MCL	Olympic Wells, Initial and Contingency[a]			GAC Peak Influent	GAC Effluent Peak at 2x Maximum Influent Concentration	GAC Effluent Peak at 3x Maximum Influent Concentration
		SM-4	SM-8	SM-9			
Well maximum values	10	6.82	0.62	3.30	4.15[a]	8.30	12.5

a. *Blended treated water concentration assuming Olympic Well flows of SM-4 = 900 gpm, SM-8 = 550 gpm, SM-9 = 550 gpm.*

Table 8-6. Mass Balance Model Results: Nitrate Peaking, mg/L as N, Design Flow

Operating Scenario	UV/H_2O_2 Influent	UV-AOP Effl.	GAC Effl.[a]	Arcadia Blend	Charnock Blend	Charnock/ Arcadia Blend	Charnock/ Arcadia Blend + GAC Effl. Blend	RO Permeate + Bypass	Treated Water
Normal Operations									
Maximum, Initial	4.15	4.15	0.42	4.27	2.70	2.77	2.10	0.94	0.94
Maximum, Contingency	4.15	4.15	0.42	4.27	2.70	2.77	2.12	0.93	0.93
Simulated Nitrate Release from GAC									
2X SM-4 GAC Effluent, Initial			8.30	4.27	2.70	2.77	4.34	1.94	1.94
2X SM-4 GAC Effluent, Contingency			8.30	4.27	2.70	2.77	4.28	1.87	1.87
3X SM-4 GAC Effluent, Initial			12.5	4.27	2.70	2.77	5.54	2.47	2.47
3X SM-4 GAC Effluent, Contingency			12.5	4.27	2.70	2.77	5.43	2.37	2.37

a. *Blended treated water concentration assuming breakthrough at modeled concentration; Olympic well flows of SM-4 = 900 gpm, SM-8 = 550 gpm, SM-9 = 550 gpm.*

Table 8-7. Mass Balance Model Results: Nitrate Peaking, mg/L as N, Olympic Flow Only

Operating Scenario	UV/H_2O_2 Influent	UV-AOP Effl.	GAC Effl.[a]	Arcadia Blend	Charnock Blend	Charnock/ Arcadia Blend	Charnock/ Arcadia Blend + GAC Effl. Blend	RO Permeate + Bypass	Treated Water
Normal Operations									
Maximum, Initial	4.15	4.15	0.42	--	--	--	0.42	0.19	0.19
Maximum, Contingency	4.15	4.15	0.42	--	--	--	0.42	0.18	0.18
2X SM-4 GAC Effluent, Initial			8.30	--	--	--	8.30	3.70	3.70
2X SM-4 GAC Effluent, Contingency			8.30	--	--	--	8.30	3.63	3.63
3X SM-4 GAC Effluent, Initial			12.5	--	--	--	12.5	5.57	5.57
3X SM-4 GAC Effluent, Contingency			12.5	--	--	--	12.5	5.46	5.46

a. *Blended treated water concentration assuming breakthrough at modeled concentration; blended treated water concentration assuming Olympic well flows of SM-4 = 900 gpm, SM-8 = 550 gpm, SM-9 = 550 gpm.*

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Section 9

Limitations

This document was prepared solely for the City of Santa Monica, Department of Public Works – Water Resources Division in accordance with professional standards at the time the services were performed and in accordance with the contract between the City of Santa Monica and Walsh Construction, dated March 20, 2020, from which BC maintains a subcontract for engineering services. This document is governed by the specific scope of work authorized by City of Santa Monica; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work.

BC exercised independent professional judgement in relying on the material provided to them by the City and did not solely rely upon the City's representations relating to design concepts to design the project.

All data, drawings, documents, or information contained within this report have been prepared exclusively for the person or entity to whom it was addressed and may not be relied upon by any other person or entity without the prior written consent of Walsh Construction and/or Brown and Caldwell unless otherwise provided by the Agreement pursuant to which these services were provided.

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Section 10

References

Adams, J.Q., Clark, E.M., and Miltner, R.J. 1989. Controlling Organics with GAC: A Cost and Performance Analysis. J. Am. Water Works Assoc. 81(4):132-140.

Advisian and ICF, 2021. Full Raw Water Quality Characterization Step 2 of 97-005 Evaluation, City of Santa Monica.

Altalyan, H. N., Jones, B., Bradd, J., Nghiem, L. D. & Alyazichi, Y. M. (2016). Removal of volatile organic compounds (VOCs) from groundwater by reverse osmosis and nanofiltration. Journal of Water Process Engineering, 9 9-21

Black and Veatch, 2016. Olympic Treatment Plant – Pilot Treatment Study, City of Santa Monica.

Black and Veatch, 2019. Preliminary Development of Alternatives Technical, City of Santa Monica.

Division of Drinking Water, 2020a. Process Memo 97-005-R2020; Revised Guidance for Direct Domestic Use of Extremely Impaired Sources. Revised August 20, 2020. Division of Drinking Water, 2020.

Division of Drinking Water, 2020b. Process Memo 97-005 User Guide, Issued July 2020. Division of Drinking Water, 2020.

EPA. 1983.Treatment of Volatile Organic Compounds in Drinking Water. EPA-600/8-83-019.

EPA. 2009. Water Treatment Technology Feasibility Support Document for Chemical Contaminants for the Second Six-Year Review of National Primary Drinking Water Regulations. EPA 815-B-09-007.

ICF, 2020a. Olympic Well Field Drinking Water Source Assessment and Contaminant Assessment Report, City of Santa Monica.

ICF, 2020b. Olympic Well Field Drinking Water Source Protection Plan, City of Santa Monica.

Kempitsty, D.M., Arevalo, E., Spinelli, A.M., Edeback, V., Dickenson, E.R.V., Husted, C., Higgins, C.P., Summers, R.S., Knappe, D.R.U. 2022. Granular activated carbon adsorption of perfluoroalkyl acids from ground and surface water. AWWA Water Science, 4(1):1 -14.

Kempitsty, D.M., Summers, R.S., Abulikemu, G., Deshpande, N.V., Rebholz, J.A., Roberts, K., Pressman, J.G. 2019. Granular activated carbon adsorption of carcinogenic volatile organic compounds at low influent concentrations J. Am. Water Works Assoc. 1(2):1 – 11.

Kim, T.U., Amy, G., and Drewes, J. 2005. Rejection of Trace Organic Compounds by Reverse Osmosis and Nanofiltration Membranes. AWWA Membrane Technology Conference.

Konradt, N., Kuhlen, J.G., Rohns, H.P., Schmitt, B., Fischer, U., Binder, T., Schumacher, V., Wagner, C., Kamphausen, S., Müller, U., Sacher, F., Janknecht, P., Hobby, R., El Sherbiny, I.M.A., and Panglisch, S. Removal of Trace Organic Contaminants by Parallel Operation of Reverse Osmosis and Granular Activated Carbon for Drinking Water Treatment. 2021. Membranes, 11(33):1-18.

Provost and Pritchard. 2014. City of Tulare 1,2,3-TCP Mitigation Study.

Ramakrishnan, B., Sorial, G.A., Speth, T.F., Clark, P., Zaffiro, A., Patterson, C., Hand, D.W. 2004. Remediation of MTBE from drinking water: air stripping followed by off-gas adsorption. J Air Waste Manag Assoc, 54(5):529-39.

Roccaro, J.V. 2016. Water Treatment Pilot Studies at SCWA. Retrieved from Microsoft PowerPoint - Lunch & Learn - final.pptx (scwa.com), March 2021.

USEPA, 2018. 2018 Edition of the Drinking Water Standards and Health Advisories Tables, USEPA.

Walsh and Brown and Caldwell, 2020. Olympic Well Field Restoration and Arcadia Water Treatment Plant Expansion Basis of Design Report, City of Santa Monica.

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Appendix A: Water Quality Sampling

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Background Water Quality Data

	1/14/2019	1/22/2019	1/28/2019	2/11/2019	2/19/2019	2/25/2019	3/11/2019	3/18/2019	3/25/2019	4/8/2019
	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST
LAB #	92336	94394	92453	92591	92656	92719	92852	92049	92972	93102
TIME SAMPLED	6:12	6:18	6:13	6:39	6:13	6:08	6:16	6:24	6:09	6:10
SAMPLER	GC	GC	GC	GC	GC	GC	GC	GC	GC	GC
TEMP., °C	20.6	20.6	20.4	20.4	20.0	19.8	20.6	21.1	20.5	21.0
TOTAL CL2 (ppm)	2.70	2.60	2.55	2.65	2.80	2.65	2.75	2.50	2.85	2.70
FREE CL2 (ppm)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
COND., µS	437	510	515	498	508	496	504	517	527	487
calc. factor	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59
TDS, ppm (calc.)	258	301	304	294	300	293	297	305	311	287
TDS, ppm (grav.)	254			306			294			287
TURBIDITY, (ntu)	0.13	0.09	0.09	0.12	0.10	0.14	0.09	0.15	0.09	0.09
pH	8.19	8.34	8.30	8.16	8.15	8.30	8.17	8.15	8.17	8.28
VOL. ALKALINITY TITRANT	9.33	11.23	11.10	10.77	10.84	10.67	10.84	11.11	11.25	10.90
corr. Factor	9.88	9.88	9.88	9.88	9.88	9.88	9.88	9.88	9.88	9.88
ALKALINITY, (ppm as CaCO3)	92.2	111	110	106	107	105	107	110	111	108
COLOR	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
ODOR, (ton)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
VOL. EDTA HARDNESS	7.48	8.30	8.22	8.50	8.41	8.62	8.82	8.51	8.84	8.34
dil. factor	1	1	1	1	1	1	1	1	1	1
corr. factor	19.70	19.70	19.70	19.70	19.70	19.70	19.70	19.70	19.70	19.70
HARDNESS, (ppm as CaCO3)	147	164	162	167	166	170	174	168	174	164
VOL. EDTA CALCIUM	4.54	4.98	5.18	5.27	4.92	5.61	5.30	5.20	5.19	5.16
dil. factor	1	1	1	1	1	1	1	1	1	1
corr. factor	7.88	7.88	7.88	7.88	7.88	7.88	7.88	7.88	7.88	7.88
CALCIUM, (ppm as Ca+2)	35.8	39.2	40.8	41.5	38.8	44.2	41.8	41.0	40.9	40.7
	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST
LAB #	92336	94394	92453	92591	92656	92719	92852	92049	92972	93102
AGGRESSIVE INDEX	12.1	12.4	12.3	12.2	12.2	12.4	12.2	12.2	12.2	12.3
LANGLIER INDEX	0.12	0.38	0.34	0.20	0.15	0.35	0.22	0.21	0.22	0.33
FLUORIDE SI, (ppm)						0.71			0.56	
FLUORIDE IC, (ppm)										
CHLORIDE IC, (ppm)	33.5			38.3			39.2			38.1
BROMIDE IC, (ppm)	0.5			0.5			0.5			0.5
NITRATE IC, (ppm as N)	0.7			0.7			0.7			0.7
SULFATE IC, (ppm)	61.1			76.3			79.3			76.4
SODIUM IC, (ppm)										
POTASSIUM IC, (ppm)										
MAGNESIUM IC, (ppm)										
CALCIUM IC, (ppm)										

	4/15/2019	4/22/2019	5/13/2019	5/20/2019	5/28/2019	6/10/2019	6/17/2019	6/24/2019	7/8/2019	7/15/2019
	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST
LAB #	93160	93225	93401	93461	93525	93654	93716	93779	93921	93980
TIME SAMPLED	6:29	9:32	6:06	6:13	6:15	6:10	6:22	6:15	6:08	6:14
SAMPLER	GC	GC	GC	JAM	GC	JAM	GC	JAM	GC	JAM
TEMP., °C	21.1	21.4	21.3	20.7	20.9	21.4	21.5	21.1	21.4	21.6
TOTAL CL2 (ppm)	2.60	2.40	2.75	2.80	2.50	2.65	2.55	2.65	2.70	2.55
FREE CL2 (ppm)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
COND., µS	502	491	488	492	493	526	522	582	512	540
calc. factor	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59
TDS, ppm (calc.)	296	290	288	290	291	310	308	343	302	319
TDS, ppm (grav.)	290		289			311			297	
TURBIDITY, (ntu)	0.09	0.09	0.12	0.15	0.14	0.09	0.18	0.12	0.10	0.13
pH	8.27	8.32	8.38	8.33	8.24	8.28	8.25	8.24	8.26	8.14
VOL. ALKALINITY TITRANT	11.07	10.74	10.88	10.85	10.93	11.61	11.80	11.98	11.33	12.14
corr. Factor	9.88	9.88	9.88	9.88	9.88	9.88	9.88	9.88	9.88	9.88
ALKALINITY, (ppm as CaCO3)	109	106	107	107	108	115	117	118	112	120
COLOR	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
ODOR, (ton)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
VOL. EDTA HARDNESS	8.37	8.45	7.85	7.73	8.64	8.20	8.33	9.15	8.26	8.40
dil. factor	1	1	1	1	1	1	1	1	1	1
corr. factor	19.70	19.70	19.70	19.70	19.70	19.70	19.70	19.60	19.60	19.60
HARDNESS, (ppm as CaCO3)	165	166	155	152	170	162	164	179	162	165
VOL. EDTA CALCIUM	5.14	5.29	4.60	4.72	4.85	5.04	5.30	5.51	5.22	5.19
dil. factor	1	1	1	1	1	1	1	1	1	1
corr. factor	7.88	7.88	7.88	7.88	7.88	7.88	7.88	7.84	7.84	7.84
CALCIUM, (ppm as Ca+2)	40.5	41.7	36.2	37.2	38.2	39.7	41.8	43.2	40.9	40.7
	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST
LAB #	93160	93225	93401	93461	93525	93654	93716	93779	93921	93980
AGGRESSIVE INDEX	12.3	12.4	12.4	12.3	12.3	12.3	12.3	12.3	12.3	12.2
LANGLIER INDEX	0.33	0.39	0.39	0.33	0.26	0.35	0.35	0.35	0.34	0.24
FLUORIDE SI, (ppm)		0.74		0.69				0.72		
FLUORIDE IC, (ppm)										
CHLORIDE IC, (ppm)			38.3			43.7			41.2	
BROMIDE IC, (ppm)			0.5			0.5			0.5	
NITRATE IC, (ppm as N)			0.7			0.8			0.8	
SULFATE IC, (ppm)			74.1			79.2			75.4	
SODIUM IC, (ppm)										
POTASSIUM IC, (ppm)										
MAGNESIUM IC, (ppm)										
CALCIUM IC, (ppm)										

	7/22/2019	8/12/2019	8/19/2019	8/26/2019	9/9/2019	9/16/2019	9/23/2019	10/14/2019	10/21/2019	10/28/2019
	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST
LAB #	94057	95248	94318	94390	94523	94584	94644	94821	94880	94950
TIME SAMPLED	6:13	6:13	6:28	6:27	6:23	6:24	6:20	6:10	6:27	6:16
SAMPLER	GC	GC	GC	GC	GC	JAM	JAM	JAM	JAM	CD
TEMP., °C	21.0	21.6	21.4	21.6	21.0	21.5	21.7	21.0	21.5	20.6
TOTAL CL2 (ppm)	2.70	2.80	2.75	2.85	2.80	2.40	2.70	2.85	2.85	3.15
FREE CL2 (ppm)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
COND., µS	527	514	509	501	486	494	507	472	456	477
calc. factor	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59
TDS, ppm (calc.)	311	303	300	296	287	291	299	278	269	281
TDS, ppm (grav.)		330			297			286		
TURBIDITY, (ntu)	0.12	0.11	0.10	0.09	0.08	0.10	0.08	0.09	0.12	0.16
pH	8.28	8.37	8.28	8.37	8.18	8.16	8.27	8.03	8.08	8.00
VOL. ALKALINITY TITRANT	11.76	11.49	11.60	11.23	10.75	11.23	11.42	10.50	10.28	10.08
corr. Factor	9.88	9.88	9.88	9.88	9.88	9.88	9.88	9.88	9.88	9.88
ALKALINITY, (ppm as CaCO3)	116	114	115	111	106	111	113	104	102	100
COLOR	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
ODOR, (ton)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
VOL. EDTA HARDNESS	8.96	8.55	7.95	8.34	8.58	7.75	8.14	7.36	7.92	7.55
dil. factor	1	1	1	1	1	1	1	1	1	1
corr. factor	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60
HARDNESS, (ppm as CaCO3)	176	168	156	163	168	152	160	144	155	148
VOL. EDTA CALCIUM	5.21	5.14	4.96	4.88	4.80	4.57	4.85	4.35	4.66	4.50
dil. factor	1	1	1	1	1	1	1	1	1	1
corr. factor	7.84	7.84	7.84	7.84	7.84	7.84	7.84	7.84	7.84	7.84
CALCIUM, (ppm as Ca+2)	40.8	40.3	38.9	38.3	37.6	35.8	38.0	34.1	36.5	35.3
	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST
LAB #	94057	95249	94318	94390	94523	94584	94644	94821	94880	94950
AGGRESSIVE INDEX	12.4	12.4	12.3	12.4	12.2	12.2	12.3	12.0	12.0	11.9
LANGLIER INDEX	0.36	0.45	0.35	0.42	0.19	0.18	0.33	-0.01	0.08	-0.05
FLUORIDE SI, (ppm)	0.69			0.74			0.68			0.80
FLUORIDE IC, (ppm)										
CHLORIDE IC, (ppm)		42.5			39.7			38.6		
BROMIDE IC, (ppm)		0.5			0.5			0.5		
NITRATE IC, (ppm as N)		0.7			0.7			0.7		
SULFATE IC, (ppm)		78.5			71.2			69.5		
SODIUM IC, (ppm)										
POTASSIUM IC, (ppm)										
MAGNESIUM IC, (ppm)										
CALCIUM IC, (ppm)										

	11/11/2019	11/18/2019	11/25/2019	12/9/2019	12/16/2019	12/23/2019	1/13/2020	1/21/2020	1/27/2020
	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST
LAB #	95082	95141	95212	95342	95407	95470	95648	95707	95765
TIME SAMPLED	6:10	8:50	6:22	7:05	6:25	6:31	6:30	6:28	6:26
SAMPLER	GC	GC	CD	JAM	GC	GC	GC	GC	GC
TEMP., °C	21.3	22.0	19.7	20.4	23.0	21.0	27.0	20.7	20.9
TOTAL CL2 (ppm)	2.80	2.55	3.10	2.70	2.90	2.40	2.70	2.65	2.70
FREE CL2 (ppm)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
COND., µS	455	530	556	504	497	493	489	465	468
calc. factor	0.59	0.59	0.59	0.59	0.60	0.60	0.60	0.60	0.60
TDS, ppm (calc.)	268	313	328	297	298	296	293	279	281
TDS, ppm (grav.)	274			307			290		
TURBIDITY, (ntu)	0.07	0.09	0.12	0.08	0.06	0.08	0.13	0.08	0.07
pH	7.98	8.16	8.22	8.23	8.15	8.22	8.09	8.16	8.09
VOL. ALKALINITY TITRANT	10.16	10.85	12.73	10.98	10.93	11.30	10.55	10.45	10.41
corr. Factor	9.82	9.82	9.82	9.82	9.82	9.82	9.82	9.82	9.82
ALKALINITY, (ppm as CaCO3)	100	107	125	108	107	111	104	103	102
COLOR	<5	<5	<5	<5	<5	<5	<5	<5	<5
ODOR, (ton)	<1	<1	<1	<1	<1	<1	<1	<1	<1
VOL. EDTA HARDNESS	7.11	8.43	9.21	8.27	8.32	8.48	8.78	7.00	7.45
dil. factor	1	1	1	1	1	1	1	1	1
corr. factor	19.60	19.60	19.60	19.60	19.60	19.60	19.50	19.50	19.50
HARDNESS, (ppm as CaCO3)	139	165	181	162	163	166	171	137	145
VOL. EDTA CALCIUM	4.10	5.22	5.60	5.00	5.31	4.76	4.88	4.26	4.89
dil. factor	1	1	1	1	1	1	1	1	1
corr. factor	7.84	7.84	7.84	7.84	7.84	7.84	7.80	7.80	7.80
CALCIUM, (ppm as Ca+2)	32.1	40.9	43.9	39.2	41.6	37.3	38.1	33.2	38.1
	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST	ARC BOOST
LAB #	95082	95141	95212	95342	95407	95470	95648	95707	95765
AGGRESSIVE INDEX	11.9	12.2	12.4	12.3	12.2	12.2	12.1	12.1	12.1
LANGLIER INDEX	-0.09	0.23	0.33	0.25	0.25	0.25	0.23	0.10	0.09
FLUORIDE SI, (ppm)			0.68			0.65			0.81
FLUORIDE IC, (ppm)									
CHLORIDE IC, (ppm)	36.6			39.5			39.8		
BROMIDE IC, (ppm)	0.5			0.5			0.5		
NITRATE IC, (ppm as N)	0.6			0.7			0.7		
SULFATE IC, (ppm)	65.1			76.8			69.0		
SODIUM IC, (ppm)					40.8			42.7	
POTASSIUM IC, (ppm)					0.9			1.0	
MAGNESIUM IC, (ppm)					16.2			13.8	
CALCIUM IC, (ppm)					36.3			32.3	

	2/5/2018	5/7/2018	7/2/2018	8/6/2018	11/5/2018	2/4/2019	5/6/2019	8/5/2019	11/4/2019	2/3/2020
	ARC#4	ARC#4	ARC#4	ARC#4	ARC#4	ARC#4	ARC#4	ARC#4	ARC#4	ARC#4
LAB #	88892	89753	90348	90689	91655	92522	93338	94191	95019	95824
TIME SAMPLED	6:19	6:23	6:11	6:03	6:09	6:22	6:15	6:20	6:16	6:24
SAMPLER	PP	PP	CG	PP	PP	GC	GC	GC	JAM	JAM
TEMP., °C		20.7		20.7	20.7	20.7	20.7	21.0	20.7	20.7
TOTAL CL2 (ppm)									<0.05	
FREE CL2 (ppm)									<0.05	
COND., µS		1238		1259	1249	1265	1258	1229	1263	1245
TDS, ppm (calc.)		891		906	924	936	931	909	935	921
TDS, ppm (grav.)				921				885		
TURBIDITY, (ntu)		0.11		0.22	0.15	0.10	0.21	0.16	0.11	0.14
pH		7.00		6.94	6.90	6.86	7.00	6.82	7.04	6.70
ALKALINITY, (ppm as CaCO3)		260		258	256	257	260	269	261	246
COLOR		6		3.75	7	2.5	16	2.5	2.5	2.5
ODOR, (ton)		<1		<1	<1	<1	<1	<1	<1	<1
HARDNESS, (ppm as CaCO3)		512		510	549	525	583	478	501	544
CALCIUM, (ppm as Ca+2)		117		120	136	119	120	113	120	119
AGGRESSIVE INDEX		11.9		11.8	11.8	11.7	11.9	11.7	11.9	11.6
LANGLIER INDEX		-0.24		-0.29	-0.28	-0.38	-0.23	-0.41	-0.19	-0.56
FLUORIDE SI, (ppm)		0.31		0.32	0.30	0.29	0.30	0.30	0.30	0.30
CHLORIDE IC, (ppm)		123		123	131	120	123	122	122	120
BROMIDE IC, (ppm)		0.3		0.3	0.3	0.3	0.3	0.3	0.3	0.3
NITRATE IC, (ppm as N)		4.1		4.8	4.4	4.7	4.0	4.2	5.2	5.2
SULFATE IC, (ppm)		222		229	240	226	229	229	225	226
SODIUM IC, (ppm)		77.6		74.3	75.9					79.3
POTASSIUM IC, (ppm)		3.3		2.3	2.6					0.6
MAGNESIUM IC, (ppm)		53.7		52.5	52.0					55.8
CALCIUM IC, (ppm)		116		109	111					107
ANIONS, (meq/l)		13.6		13.8	14.1	13.6	13.7	13.9	13.7	13.4
CATIONS, (meq/l)		13.7		13.2	13.2					13.4
ION BALANCE, (% difference)		0.2		-2.2	-3.5					0.1
BICARBONATE (ppm)				315.0						
ALUMINUM (ppb)	ND									
ANTIMONY (ppb)	ND									
ARSENIC (ppb)	ND									
BARIUM (ppb)	69									
BERYLLIUM (ppb)	ND									
CADMIUM (ppb)	ND									

	2/5/2018	5/7/2018	7/2/2018	8/6/2018	11/5/2018	2/4/2019	5/6/2019	8/5/2019	11/4/2019	2/3/2020
	ARC#4	ARC#4	ARC#4	ARC#4	ARC#4	ARC#4	ARC#4	ARC#4	ARC#4	ARC#4
LAB #	88892	89753	90348	90689	91655	92522	93338	94191	95019	95824
TIME SAMPLED	6:19	6:23	6:11	6:03	6:09	6:22	6:15	6:20	6:16	6:24
CHROMIUM (ppb as total Cr)	ND									
COPPER (ppb)	ND									
IRON (ppb)	33.6									
LEAD (ppb)	ND									
MANGANESE (ppb)	11									
NICKEL (ppb)	ND									
SELENIUM (ppb)	ND									
SILVER (ppb)	ND									
THALLIUM (ppb)	ND									
ZINC (ppb)	ND									
MERCURY (ppb)			ND							
SILICA (ppm)	40	40	40	40	40	40	40	40	40	40

	2/5/2018	5/7/2018	7/2/2018	8/6/2018	11/5/2018	2/4/2019	5/6/2019	8/5/2019	11/4/2019	2/3/2020
	ARC#5	ARC#5	ARC#5	ARC#5	ARC#5	ARC#5	ARC#5	ARC#5	ARC#5	ARC#5
LAB #	88893	89754	90349	90690	91656	92523	93339	94192	95020	95825
TIME SAMPLED	6:28	6:34	6:17	6:18	6:21	6:18	6:08	6:25	6:12	6:19
SAMPLER	PP	PP	GC	PP	PP	GC	GC	GC	JAM	JAM
TEMP., °C		21.0		21.0	20.7	20.9	21.0	21.0	20.7	20.9
TOTAL CL2 (ppm)									<0.05	
FREE CL2 (ppm)									<0.05	
COND., µS		1217		1234	1231	1210	1216	1201	1221	1209
calc. factor		0.72		0.72	0.74	0.74	0.74	0.74	0.74	0.74
TDS, ppm (calc.)		876		888	911	895	900	889	904	895
TDS, ppm (grav.)		NA		903	NA	NA	NA	863	NA	NA
TURBIDITY, (ntu)		0.29		0.33	0.33	0.24	0.23	0.24	0.46	0.26
pH		7.11		7.07	7.10	7.00	7.00	6.99	7.02	6.85
VOL. ALKALINITY TITRANT		28.0		28.5	28.1	27.4	27.7	29.4	28.0	27.7
corr. Factor		9.72		9.72	9.72	9.88	9.88	9.88	9.82	9.82
ALKALINITY, (ppm as CaCO3)		272		277	273	270	274	290	275	272
COLOR		14		3.75	9	2.5	11	2.5	2.5	2.5
ODOR, (ton)		<1		<1	<1	<1	<1	<1	<1	<1
VOL. EDTA HARDNESS		7.81		25.15	8.87	7.89	8.27	7.31	6.78	7.70
dil. factor		3.33		1	3.33	3.33	3.33	3.33	3.33	3.33
corr. factor		19.50		19.50	19.70	19.70	19.70	19.60	19.60	19.50
HARDNESS, (ppm as CaCO3)		507		490	582	518	543	477	443	500
VOL. EDTA CALCIUM		4.44		4.39	4.55	4.43	4.32	4.28	3.95	4.51
dil. factor		3.33		3.33	3.33	3.33	3.33	3.33	3.33	3.33
corr. factor		7.80		7.80	7.88	7.88	7.88	7.84	7.84	7.80
CALCIUM, (ppm as Ca+2)		115		114	119	116	113	112	103	117
		ARC#5		ARC#5	ARC#5	ARC#5	ARC#5	ARC#5	ARC#5	ARC#5
LAB #		89754		90690	91656	92523	93339	94192	95020	95825
AGGRESSIVE INDEX		12.0		12.0	12.0	11.9	11.9	11.9	11.9	11.8
LANGLIER INDEX		-0.10		-0.14	-0.11	-0.22	-0.22	-0.21	-0.25	-0.36
FLUORIDE SI, (ppm)		0.33		0.34	0.33	0.32	0.33	0.34	0.33	0.33
FLUORIDE IC, (ppm)										
CHLORIDE IC, (ppm)		113		113	120	110	111	111	110	108
BROMIDE IC, (ppm)		0.3		0.3	0.3	0.3	0.3	0.3	0.3	0.3
NITRATE IC, (ppm as N)		1.9		2.4	2.0	1.7	1.7	2.0	3.0	2.9
SULFATE IC, (ppm)		222		226	237	221	222	223	218	216
SODIUM IC, (ppm)		79.2		78.7	77.5					74.6
POTASSIUM IC, (ppm)		3.6		3.6	3.1					0.8
MAGNESIUM IC, (ppm)		51.8		51.8	50.6					53.0
CALCIUM IC, (ppm)		113		109	108					102
ANIONS, (meq/l)		13.4		13.6	13.9	13.2	13.4	13.7	13.4	13.2

	2/5/2018	5/7/2018	7/2/2018	8/6/2018	11/5/2018	2/4/2019	5/6/2019	8/5/2019	11/4/2019	2/3/2020
	ARC#5	ARC#5	ARC#5	ARC#5	ARC#5	ARC#5	ARC#5	ARC#5	ARC#5	ARC#5
LAB #	88893	89754	90349	90690	91656	92523	93339	94192	95020	95825
TIME SAMPLED	6:28	6:34	6:17	6:18	6:21	6:18	6:08	6:25	6:12	6:19
CATIONS, (meq/l)		13.4		13.4	13.0					12.7
ION BALANCE, (% difference)		0.2		-0.7	-3.4					-1.9
BICARBONATE (ppm)				338.0						
ALUMINUM (ppb)	ND									
ANTIMONY (ppb)	ND									
ARSENIC (ppb)	ND									
BARIUM (ppb)	61									
BERYLLIUM (ppb)	ND									
CADMIUM (ppb)	ND									
CHROMIUM (ppb as total Cr)	ND									
COPPER (ppb)	ND									
IRON (ppb)	130									
LEAD (ppb)	1.2									
MANGANESE (ppb)	53.8									
NICKEL (ppb)	ND									
SELENIUM (ppb)	ND									
SILVER (ppb)	ND									
THALLIUM (ppb)	ND									
ZINC (ppb)	ND									
MERCURY (ppb)			ND							
SILICA (ppm)	40	40	40	40	40	40	40	40	40	40

	2/5/2018	5/7/2018	8/6/2018	10/17/2018	11/5/2018	2/4/2019	5/6/2019	8/5/2019	11/4/2019	2/3/2020
	SM#3	SM#3	SM#3	SM#3	SM#3	SM#3	SM#3	SM#3	SM#3	SM#3
LAB #	88895	89756	90806	91482	91657	92525	93341	94194	95022	95827
TIME SAMPLED	8:56	9:07	13:50	9:25	9:04	9:25	7:09	7:04	7:19	7:10
SAMPLER	GC	PP	JAM	JM	GC	JAM	GC	JAM	GC	CD
TEMP., °C		20.5	20.8		20.5	19.6	20.1	20.4	20.4	20.0
TOTAL CL2 (ppm)		NC	NC		NC	NC	NC	NC	<0.05	NC
FREE CL2 (ppm)		NC	NC		NC	NC	NC	NC	<0.05	NC
COND., µS		1244	1606		1374	1219	1216	1229	1216	1200
calc. factor		0.72	0.72		0.74	0.74	0.74	0.74	0.74	0.74
TDS, ppm (calc.)		896	1156		1017	902	900	909	900	888
TDS, ppm (grav.)		NA	1232		NA	NA	NA	925	NA	NA
TURBIDITY, (ntu)		0.17	1.90		0.11	0.14	0.10	0.12	0.09	0.11
pH		7.42	7.26		7.28	7.15	7.40	7.25	7.15	7.16
VOL. ALKALINITY TITRANT		32.3	41.2		31.96	31.2	31.55	31.72	31.00	31.48
corr. Factor		9.72	9.72		9.72	9.88	9.88	9.88	9.82	9.82
ALKALINITY, (ppm as CaCO3)		314	401		311	308	312	313	304	309
COLOR		12	3.75		2.5	2.5	11	2.5	2.5	2.5
ODOR, (ton)		<1	<1		<1	<1	<1	<1	<1	<1
VOL. EDTA HARDNESS		8.62	11.79		10.01	8.73	8.70	8.14	7.68	8.88
dil. factor		3.33	3.33		3.33	3.33	3.33	3.33	3.33	3.33
corr. factor		19.50	19.50		19.70	19.70	19.70	19.60	19.60	19.50
HARDNESS, (ppm as CaCO3)		560	766		657	573	571	531	501	577
VOL. EDTA CALCIUM		5.10	6.74		5.07	5.02	4.84	4.77	4.91	5.82
dil. factor		3.33	3.33		3.33	3.33	3.33	3.33	3.33	3.33
corr. factor		7.80	7.80		7.88	7.88	7.88	7.84	7.84	7.80
CALCIUM, (ppm as Ca+2)		132	175		133	132	127	125	128	151
		SM#3	SM#3		SM#3	SM#3	SM#3	SM#3	SM#3	SM#3
LAB #		89756	90806		91657	92525	93341	94194	95022	95827
AGGRESSIVE INDEX		12.4	12.5		12.3	12.2	12.4	12.2	12.1	12.2
LANGLIER INDEX		0.32	0.35		0.16	0.01	0.26	0.11	0.01	0.09
FLUORIDE SI, (ppm)		0.36	0.39		0.36	0.34	0.34	0.36	0.34	0.35
FLUORIDE IC, (ppm)		NA	NA		NA	NA	NA	NA	NA	NA
CHLORIDE IC, (ppm)		81.8	121		88.0	81.6	82.2	83.1	82.3	80.8
BROMIDE IC, (ppm)		0.4	0.6		0.5	0.4	0.4	0.4	0.4	0.4
NITRATE IC, (ppm as N)		4.4	3.9		5.1	4.4	4.5	4.6	6.7	6.0
SULFATE IC, (ppm)		252	346		266	247	246	246	240	240
SODIUM IC, (ppm)		69.2	72.1		67.1	NA	NA	NA	NA	68.5
POTASSIUM IC, (ppm)		3.1	2.1		2.3	NA	NA	NA	NA	0.8
MAGNESIUM IC, (ppm)		57.5	69.45		55.6	NA	NA	NA	NA	58.0
CALCIUM IC, (ppm)		128	165		122	NA	NA	NA	NA	115
ANIONS, (meq/l)		14.2	18.9		14.6	13.9	14.0	14.1	13.9	13.9
CATIONS, (meq/l)		14.2	18.6		13.6					13.5

	2/5/2018	5/7/2018	8/6/2018	10/17/2018	11/5/2018	2/4/2019	5/6/2019	8/5/2019	11/4/2019	2/3/2020
	SM#3	SM#3	SM#3	SM#3	SM#3	SM#3	SM#3	SM#3	SM#3	SM#3
LAB #	88895	89756	90806	91482	91657	92525	93341	94194	95022	95827
TIME SAMPLED	8:56	9:07	13:50	9:25	9:04	9:25	7:09	7:04	7:19	7:10
ION BALANCE, (% difference)		0.1	-1.0		-3.4					-1.4
BICARBONATE (ppm)			489.0							
ALUMINUM (ppb)	ND									
ANTIMONY (ppb)	ND									
ARSENIC (ppb)	ND									
BARIUM (ppb)	59.5									
BERYLLIUM (ppb)	ND									
CADMIUM (ppb)	ND									
CHROMIUM (ppb as total Cr)	ND									
COPPER (ppb)	ND									
IRON (ppb)	19.2									
LEAD (ppb)	ND									
MANGANESE (ppb)	6.7									
NICKEL (ppb)	ND									
SELENIUM (ppb)	2.7									
SILVER (ppb)	ND									
THALLIUM (ppb)	ND									
ZINC (ppb)	ND									
MERCURY (ppb)				ND						
SILICA (ppm)	50	50	50	50	50	50	50	50	50	50

	2/5/2018	5/7/2018	7/2/108	8/6/2018	11/5/2018	2/4/2019	5/6/2019	8/5/2019	11/4/2019	2/3/2020	6/30/2020
	SM#4	SM#4	SM#4	SM#4	SM#4	SM#4	SM#4	SM#4	SM#4	SM#4	SM#4
LAB #	88896	89757	90351	90692	91658	92526	93342	94195	95023	95828	Weck
TIME SAMPLED	14:11	9:17	9:05	9:02	9:22	9:34	7:28	7:20	7:30	7:24	9:45
SAMPLER	GC	PP	GC	JAM	GC	JAM	GC	JAM	GC	CD	
TEMP., °C		21.7		22.0	21.7	20.6	21.4	22.0	21.0	20.6	20.0
TOTAL CL2 (ppm)		NC		NC	0.10	0.10	NC	NC	0.05	NC	0.05
FREE CL2 (ppm)		NC		NC	<0.05	<0.05	NC	NC	<0.05	NC	0.035
COND., µS		1381		1410	1367	1362	1366	1384	1365	1358	1500
calc. factor		0.72		0.72	0.74	0.74	0.74	0.74	0.74	0.74	
TDS, ppm (calc.)		994		1015	1012	1008	1011	1024	1010	1005	990
TDS, ppm (grav.)		NA		1010	NA	NA	NA	999	NA	NA	
TURBIDITY, (ntu)		0.19		0.19	0.17	0.18	0.09	0.25	0.10	0.10	48.00
pH		7.20		7.19	7.08	7.13	7.12	7.02	7.10	7.09	7.23
VOL. ALKALINITY TITRANT		33.6		33.1	33.09	33.1	33.15	34.76	33.21	33.08	
corr. Factor		9.72		9.72	9.72	9.88	9.88	9.88	9.82	9.82	
ALKALINITY, (ppm as CaCO3)		327		322	322	327	328	343	326	325	360
COLOR		8		3.75	5	2.5	15	2.5	2.5	2.5	1.5
ODOR, (ton)		<1		<1	<1	<1	<1	<1	<1	<1	4
VOL. EDTA HARDNESS		8.84		29.19	9.86	8.98	8.95	8.62	8.28	9.18	
dil. factor		3.33		1	3.33	3.33	3.33	3.33	3.33	3.33	
corr. factor		19.50		19.50	19.70	19.70	19.70	19.60	19.60	19.50	
HARDNESS, (ppm as CaCO3)		574		569	647	589	587	563	540	596	642
VOL. EDTA CALCIUM		4.89		5.43	5.21	5.63	4.88	4.88	5.24	5.30	
dil. factor		3.33		3.33	3.33	3.33	3.33	3.33	3.33	3.33	
corr. factor		7.80		7.80	7.88	7.88	7.88	7.84	7.84	7.80	
CALCIUM, (ppm as Ca+2)		127		141	137	148	128	127	137	138	
		SM#4		SM#4	SM#4	SM#4	SM#4	SM#4	SM#4	SM#4	SM#4
LAB #		89757		90692	91658	92526	93342	94195	95023	95828	Weck
AGGRESSIVE INDEX		12.2		12.2	12.1	12.2	12.1	12.1	12.1	12.1	12.4
LANGLIER INDEX		0.11		0.14	0.01	0.08	0.02	-0.05	0.02	0.00	0.48
FLUORIDE SI, (ppm)		0.34		0.34	0.34	0.33	0.32	0.34	0.33	0.33	
FLUORIDE IC, (ppm)		NA		NA	NA	NA	NA	NA	NA	NA	0.3
CHLORIDE IC, (ppm)		111		112	120	111	112	116	113	112	120
BROMIDE IC, (ppm)		0.6		0.5	0.7	0.5	0.6	0.6	0.6	0.5	0.5
NITRATE IC, (ppm as N)		5.9		6.8	6.4	5.8	5.9	6.1	6.8	6.2	5.8
SULFATE IC, (ppm)		253		259	272	257	258	260	253	254	280
SODIUM IC, (ppm)		90.9		89.4	87.9	NA	NA	NA	NA	86.2	83.0
POTASSIUM IC, (ppm)		3.4		2.3	2.7	NA	NA	NA	NA	0.6	3.9
MAGNESIUM IC, (ppm)		60.0		58.9	58.5	NA	NA	NA	NA	65.8	68.4
CALCIUM IC, (ppm)		129		124	124	NA	NA	NA	NA	122	144
ANIONS, (meq/l)		15.4		15.5	16.0	15.5	15.5	16.0	15.5	15.4	17.0
CATIONS, (meq/l)		15.4		15.3	14.9					15.3	17.0
ION BALANCE, (% difference)		0.1		-0.7	-3.4					-0.4	
BICARBONATE (ppm)				393.0							440.0

	2/5/2018	5/7/2018	7/2/108	8/6/2018	11/5/2018	2/4/2019	5/6/2019	8/5/2019	11/4/2019	2/3/2020	6/30/2020
	SM#4	SM#4	SM#4	SM#4	SM#4	SM#4	SM#4	SM#4	SM#4	SM#4	SM#4
LAB #	88896	89757	90351	90692	91658	92526	93342	94195	95023	95828	Weck
TIME SAMPLED	14:11	9:17	9:05	9:02	9:22	9:34	7:28	7:20	7:30	7:24	9:45
ALUMINUM (ppb)	ND										2400.0
ANTIMONY (ppb)	ND										0.2
ARSENIC (ppb)	0.6										2.0
BARIUM (ppb)	76										60.0
BERYLLIUM (ppb)	ND										0.1
CADMIUM (ppb)	ND										0.2
CHROMIUM (ppb as total Cr)	ND										7.2
COPPER (ppb)	17.7										16.0
IRON (ppb)	51										3200.0
LEAD (ppb)	ND										4.0
MANGANESE (ppb)	25.1										67.0
NICKEL (ppb)	ND										4.1
SELENIUM (ppb)	3.1										4.3
SILVER (ppb)	ND										0.1
THALLIUM (ppb)	ND										0.0
ZINC (ppb)	ND										22.0
MERCURY (ppb)			ND								0.02
SILICA (ppm)											50.00

	5/7/2018	8/6/2018	11/5/2018	2/4/2019	5/6/2019	8/5/2019	11/4/2019	2/3/2020
	COMB CART	COMB CART	COMB CART	COMB CART	COMB CART	COMB CART	COMB CART	COMB CART
LAB #	89777	90712	91679	92547	93363	94216	95044	95849
TIME SAMPLED	6:33	6:19	6:28	6:39	6:04	6:37	6:34	6:35
SAMPLER	GC	JAM	JAM	JAM	JAM	CD	JAM	CD
TEMP., °C	21.0	21.3	21.0	21.0	21.0	21.3	21.1	20.6
TOTAL CL2 (ppm)	0.90	0.80	1.00	1.40	1.00	0.80	1.25	1.35
FREE CL2 (ppm)	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	<0.05	<0.05
COND., µS	1433	1456	1447	1449	1470	1456	1494	1464
calc. factor	0.72	0.72	0.74	0.74	0.74	0.74	0.74	0.74
TDS, ppm (calc.)	1032	1048	1071	1072	1088	1077	1106	1083
TDS, ppm (grav.)	NA	1065	NA	NA	NA	NA	NA	NA
TURBIDITY, (ntu)	0.12	0.13	0.11	0.06	0.06	0.18	0.09	0.20
pH	7.51	7.64	6.96	7.19	7.28	7.24	7.48	7.17
VOL. ALKALINITY TITRANT	33.5	33.6	33.47	30.4	30.33	31.87	31.49	31.8
corr. Factor	9.72	9.72	9.72	9.88	9.88	9.88	9.82	9.82
ALKALINITY, (ppm as CaCO3)	326	327	325	300	300	315	309	312
COLOR	11	<5	6	<5	12	<5	<5	<5
ODOR, (ton)	<1	<1	<1	<1	<1	<1	<1	<1
VOL. EDTA HARDNESS	9.04	30.39	10.24	9.40	9.22	8.99	9.18	10.21
dil. factor	3.33	1	3.33	3.33	3.33	3.33	3.33	3.33
corr. factor	19.50	19.50	19.70	19.70	19.70	19.60	19.60	19.50
HARDNESS, (ppm as CaCO3)	587	593	672	617	605	587	599	663
VOL. EDTA CALCIUM	5.28	6.20	5.75	5.57	5.56	5.22	5.42	6.18
dil. factor	3.33	3.33	3.33	3.33	3.33	3.33	3.33	3.33
corr. factor	7.80	7.80	7.88	7.88	7.88	7.84	7.84	7.80
CALCIUM, (ppm as Ca+2)	137	161	151	146	146	136	142	161
	COMB CART	COMB CART	COMB CART	COMB CART	COMB CART	COMB CART	COMB CART	COMB CART
LAB #	89777	90712	91679	92547	93363	94216	95044	95849
AGGRESSIVE INDEX	12.6	12.8	12.0	12.2	12.3	12.3	12.5	12.3
LANGLIER INDEX	0.43	0.63	-0.09	0.10	0.18	0.14	0.38	0.12
FLUORIDE SI, (ppm)	0.33	0.34	0.33	0.32	0.31	0.33	0.32	0.32
FLUORIDE IC, (ppm)	NA	NA	NA	NA	NA	NA	NA	NA
CHLORIDE IC, (ppm)	120	126	133	120	125	125	126	128
BROMIDE IC, (ppm)	0.6	0.6	0.7	0.6	0.6	0.6	0.6	0.6

	5/7/2018	8/6/2018	11/5/2018	2/4/2019	5/6/2019	8/5/2019	11/4/2019	2/3/2020
	COMB CART	COMB CART	COMB CART	COMB CART	COMB CART	COMB CART	COMB CART	COMB CART
LAB #	89777	90712	91679	92547	93363	94216	95044	95849
TIME SAMPLED	6:33	6:19	6:28	6:39	6:04	6:37	6:34	6:35
NITRATE IC, (ppm as N)	3.3	2.4	2.2	1.5	1.5	2.0	1.7	2.3
SULFATE IC, (ppm)	289	203	361	325	331	323	322	328
SODIUM IC, (ppm)	98.6	105	95.0	NA	NA	NA	NA	95.3
POTASSIUM IC, (ppm)	3.8	2.4	3.2	NA	NA	NA	NA	0.8
MAGNESIUM IC, (ppm)	57.6	60.2	57.3	NA	NA	NA	NA	61.1
CALCIUM IC, (ppm)	138	136	135	NA	NA	NA	NA	130
ANIONS, (meq/l)	16.2	14.5	17.9	16.3	16.5	16.7	16.6	16.9
CATIONS, (meq/l)	16.0	16.4	15.7	NA	NA	NA	NA	15.7
ION BALANCE, (% difference)	-0.5	6.1	-6.8	NA	NA	NA	NA	-3.6

	5/7/2018	8/6/2018	8/27/2018	10/17/2018	11/5/2018	2/4/2019	5/6/2019	8/5/2019	11/4/2019	2/3/2020
	CH #13	CH #13	CH #13	CH#13	CH #13	CH #13	CH #13	CH #13	CH #13	CH #13
LAB #	OFFLINE	90947	90947	91481	91659	92527	93343	94196	95024	95829
TIME SAMPLED	OFFLINE	8:48	8:48	10:03	8:44	9:09	9:06	7:31	9:37	7:36
SAMPLER	OFFLINE	PP	PP	JM	JAM	GC	JAM	GC	CD	GC
TEMP., °C		21.4			21.4	21.1	21.4	21.4	21.3	21.4
TOTAL CL2 (ppm)									<0.05	
FREE CL2 (ppm)									<0.05	
COND., µS		1767			1719	1769	1769	1766	1804	1788
calc. factor	0.72	0.72			0.74	0.74	0.74	0.74	0.74	0.74
TDS, ppm (calc.)		1272			1272	1309	1309	1307	1335	1323
TDS, ppm (grav.)		1449						1430		
TURBIDITY, (ntu)		1.25			0.25	0.31	0.16	0.67	0.10	0.34
pH		7.51			7.40	7.44	7.43	7.38	7.31	7.35
VOL. ALKALINITY TITRANT		32.4			32.62	32.0	32.89	36.56	33.69	33.69
corr. Factor	9.72	9.72			9.72	9.88	9.88	9.88	9.82	9.82
ALKALINITY, (ppm as CaCO3)		315			317	316	325	361	331	331
COLOR		12			9	<5	13	7	<5	<5
ODOR, (ton)		<1			<1	1	<1	<1	<1	<1
VOL. EDTA HARDNESS	OFFLINE	13.75			12.31	12.53	12.11	11.34	11.07	12.01
dil. factor	3.33	3.33			3.33	3.33	3.33	3.33	3.33	3.33
corr. factor	19.50	19.50			19.70	19.70	19.70	19.60	19.60	19.50
HARDNESS, (ppm as CaCO3)		893			808	822	794	740	723	780
VOL. EDTA CALCIUM	OFFLINE	7.26			7.01	7.26	6.92	6.69	6.98	8.12
dil. factor	3.33	3.33			3.33	3.33	3.33	3.33	3.33	3.33
corr. factor	7.80	7.80			7.88	7.88	7.88	7.84	7.84	7.80
CALCIUM, (ppm as Ca+2)		189			184	191	182	175	182	211
	CH #13	CH #13			CH #13	CH #13	CH #13	CH #13	CH #13	CH #13
LAB #	OFFLINE	90947			91659	92527	93343	94196	95024	95829
AGGRESSIVE INDEX		12.7			12.6	12.6	12.6	12.6	12.5	12.6
LANGLIER INDEX		0.53			0.41	0.46	0.45	0.43	0.33	0.44
FLUORIDE SI, (ppm)		0.33			0.35	0.34	0.32	0.34	0.32	0.31
FLUORIDE IC, (ppm)		NA			NA	NA	NA	NA	NA	NA
CHLORIDE IC, (ppm)		168			188	173	173	173	176	177
BROMIDE IC, (ppm)		0.7			0.9	0.9	1.2	1.0	1.1	1.2
NITRATE IC, (ppm as N)		0			1.1	0.6	0.6	0.8	2.7	1.0
SULFATE IC, (ppm)		460			436	438	430	429	430	445
SODIUM IC, (ppm)		97.05			102	NA	NA	NA	NA	118
POTASSIUM IC, (ppm)		4.9			4.3	NA	NA	NA	NA	0.9
MAGNESIUM IC, (ppm)		78.1			68.6	NA	NA	NA	NA	79.6
CALCIUM IC, (ppm)		177			167	NA	NA	NA	NA	158
ANIONS, (meq/l)		20.6			20.8	20.4	20.4	21.1	20.7	20.9
CATIONS, (meq/l)		19.4			18.5					19.6

	5/7/2018	8/6/2018	8/27/2018	10/17/2018	11/5/2018	2/4/2019	5/6/2019	8/5/2019	11/4/2019	2/3/2020
	CH #13	CH #13	CH #13	CH#13	CH #13	CH #13	CH #13	CH #13	CH #13	CH #13
LAB #	OFFLINE	90947	90947	91481	91659	92527	93343	94196	95024	95829
TIME SAMPLED	OFFLINE	8:48	8:48	10:03	8:44	9:09	9:06	7:31	9:37	7:36
ION BALANCE, (% difference)		-3.0			-5.8					-3.4
BICARBONATE (ppm)			384.0							
ALUMINUM (ppb)			20.9							
ANTIMONY (ppb)			ND							
ARSENIC (ppb)			1.4							
BARIUM (ppb)			117.0							
BERYLLIUM (ppb)			ND							
CADMIUM (ppb)			ND							
CHROMIUM (ppb as total Cr)			ND							
COPPER (ppb)			10.2							
IRON (ppb)			212.0							
LEAD (ppb)			1.5							
MANGANESE (ppb)			204.0							
NICKEL (ppb)			ND							
SELENIUM (ppb)			ND							
SILVER (ppb)			ND							
THALLIUM (ppb)			ND							
ZINC (ppb)			ND							
MERCURY (ppb)				ND						
SILICA (ppm)	40	40	40	40	40	40	40	40	40	40

	2/5/2018	5/7/2018	7/2/2018	8/6/2018	11/5/2018	2/4/2019	5/6/2019	8/5/2019	11/4/2019	2/3/2020
	CH #16	CH #16	CH #16	CH #16	CH #16	CH #16	CH #16	CH #16	CH #16	CH #16
LAB #	88897	89758	90352	90693	91660	92528	93344	94197	95025	95830
TIME SAMPLED	9:13	9:03	8:47	7:41	8:29	9:18	8:58	7:40	9:30	7:28
SAMPLER	PP	GC	JM	GC	JAM	GC	JAM	NV	CD	GC
TEMP., °C		21.6		21.7	21.4	21.2	21.2	21.3	21.0	21.0
TOTAL CL2 (ppm)		NC		NC	NC	NC	NC	NC	<0.05	NC
FREE CL2 (ppm)		NC		NC	NC	NC	NC	NC	<0.05	NC
COND., µS		1152		1220	1125	1151	1204	1213	1229	1262
calc. factor		0.72		0.72	0.74	0.74	0.74	0.74	0.74	0.74
TDS, ppm (calc.)		829		878	833	852	891	898	909	934
TDS, ppm (grav.)		NA		922	NA	NA	NA	880	NA	NA
TURBIDITY, (ntu)		0.21		0.57	0.27	0.67	0.80	0.81	0.48	0.35
pH		7.52		7.49	7.36	7.57	7.59	7.39	7.38	7.33
VOL. ALKALINITY TITRANT		30.0		30.4	30.29	30.0	31.14	33.17	30.86	31.34
corr. Factor		9.72		9.72	9.72	9.88	9.88	9.88	9.82	9.82
ALKALINITY, (ppm as CaCO3)		292		295	294	297	308	328	303	308
COLOR		9		<5	18	<5	18	<5	<5	<5
ODOR, (ton)		<1		<1	<1	<1	<1	<1	<1	<1
VOL. EDTA HARDNESS		7.41		25.15	8.53	9.00	8.41	7.51	7.43	8.32
dil. factor		3.33		1	3.33	3.33	3.33	3.33	3.33	3.33
corr. factor		19.50		19.50	19.70	19.70	19.70	19.60	19.60	19.50
HARDNESS, (ppm as CaCO3)		481		490	560	590	552	490	485	540
VOL. EDTA CALCIUM		4.48		5.00	4.98	4.66	4.69	4.60	5.00	5.10
dil. factor		3.33		3.33	3.33	3.33	3.33	3.33	3.33	3.33
corr. factor		7.80		7.80	7.88	7.88	7.88	7.84	7.84	7.80
CALCIUM, (ppm as Ca+2)		116		130	131	122	123	120	131	132
		CH #16		CH #16	CH #16	CH #16	CH #16	CH #16	CH #16	CH #16
LAB #		89758		90693	91660	92528	93344	94197	95025	95830
AGGRESSIVE INDEX		12.4		12.5	12.3	12.5	12.6	12.4	12.4	12.3
LANGLIER INDEX		0.36		0.38	0.25	0.43	0.46	0.28	0.26	0.22
FLUORIDE SI, (ppm)		0.37		0.36	0.36	0.35	0.33	0.36	0.34	0.34
FLUORIDE IC, (ppm)		NA		NA	NA	NA	NA	NA	NA	NA
CHLORIDE IC, (ppm)		82.5		95.9	93.1	88.4	95.9	97.8	98.3	101
BROMIDE IC, (ppm)		0.3		0.3	0.3	0.3	0.4	0.3	0.4	0.4
NITRATE IC, (ppm as N)		1.2		2.3	2.0	1.6	1.6	1.6	2.9	2.4
SULFATE IC, (ppm)		221		241	211	201	214	217	222	231
SODIUM IC, (ppm)		72.5		72.9	70.6	NA	NA	NA	NA	73.8
POTASSIUM IC, (ppm)		3.5		3.6	2.9	NA	NA	NA	NA	0.9
MAGNESIUM IC, (ppm)		46.2		48.9	43.9	NA	NA	NA	NA	54.0
CALCIUM IC, (ppm)		115		118	108	NA	NA	NA	NA	117
ANIONS, (meq/l)		12.9		13.8	13.1	12.7	13.4	14.0	13.7	14.0

	2/5/2018	5/7/2018	7/2/2018	8/6/2018	11/5/2018	2/4/2019	5/6/2019	8/5/2019	11/4/2019	2/3/2020
	CH #16	CH #16	CH #16	CH #16	CH #16	CH #16	CH #16	CH #16	CH #16	CH #16
LAB #	88897	89758	90352	90693	91660	92528	93344	94197	95025	95830
TIME SAMPLED	9:13	9:03	8:47	7:41	8:29	9:18	8:58	7:40	9:30	7:28
CATIONS, (meq/l)		12.8		13.6	12.1					13.5
ION BALANCE, (% difference)		-0.3		-0.7	-3.7					-1.8
BICARBONATE (ppm)				360.0						
ALUMINUM (ppb)	4.3									
ANTIMONY (ppb)	ND									
ARSENIC (ppb)	0.8									
BARIUM (ppb)	56.5									
BERYLLIUM (ppb)	ND									
CADMIUM (ppb)	ND									
CHROMIUM (ppb as total Cr)	ND									
COPPER (ppb)	ND									
IRON (ppb)	164									
LEAD (ppb)	ND									
MANGANESE (ppb)	69.9									
NICKEL (ppb)	ND									
SELENIUM (ppb)	ND									
SILVER (ppb)	ND									
THALLIUM (ppb)	ND									
ZINC (ppb)	ND									
MERCURY (ppb)			ND							
SILICA (ppm)	40	40	40	40	40	40	40	40	40	40

	2/5/2018	5/7/2018	7/2/2018	8/6/2018	11/5/2018	2/4/2019	5/6/2019	8/5/2019	11/4/2019	2/3/2020
	CH #18	CH #18	CH #18	CH #18	CH #18	CH #18	CH #18	CH #18	CH #18	CH #18
LAB #	88898	89759	90353	90694	91661	92529	93345	94198	95026	95831
TIME SAMPLED	8:36	8:36	8:58	6:19	9:02	8:46	9:16	8:13	9:51	7:48
SAMPLER	PP	GC	JM	GC	JAM	GC	JAM	NV	CD	GC
TEMP., °C		21.0		21.0	21.0	20.5	21.0	21.2	21.0	21.0
TOTAL CL2 (ppm)		NC		NC	NC	NC	NC	NC	<0.05	NC
FREE CL2 (ppm)		NC		NC	NC	NC	NC	NC	<0.05	NC
COND., µS		1163		1184	1156	1145	1147	1143	1149	1143
calc. factor		0.72		0.72	0.74	0.74	0.74	0.74	0.74	0.74
TDS, ppm (calc.)		837		852	855	847	849	846	850	846
TDS, ppm (grav.)		NA		832	NA	NA	NA	787	NA	NA
TURBIDITY, (ntu)		3.96		7.16	5.00	4.81	1.91	4.85	0.74	3.50
pH		7.91		7.55	7.43	7.44	7.39	7.43	7.46	7.09
VOL. ALKALINITY TITRANT		34.0		34.0	33.55	32.1	32.44	34.92	32.33	31.75
corr. Factor		9.72		9.72	9.72	9.88	9.88	9.88	9.82	9.82
ALKALINITY, (ppm as CaCO3)		330		330	326	317	321	345	317	312
COLOR		75		25	51	<5	28	60	36	18
ODOR, (ton)		1		<1	1	<1	1	<1	1	<1
VOL. EDTA HARDNESS		7.62		24.73	8.57	8.31	7.74	7.24	7.31	7.82
dil. factor		3.33		1	3.33	3.33	3.33	3.33	3.33	3.33
corr. factor		19.50		19.50	19.70	19.70	19.70	19.60	19.60	19.50
HARDNESS, (ppm as CaCO3)		495		482	562	545	508	473	477	508
VOL. EDTA CALCIUM		4.52		5.29	5.10	4.83	4.45	4.37	4.45	4.68
dil. factor		3.33		3.33	3.33	3.33	3.33	3.33	3.33	3.33
corr. factor		7.80		7.80	7.88	7.88	7.88	7.84	7.84	7.80
CALCIUM, (ppm as Ca+2)		117		137	134	127	117	114	116	122
		CH #18		CH #18	CH #18	CH #18	CH #18	CH #18	CH #18	CH #18
LAB #		89759		90694	91661	92529	93345	94198	95026	95831
AGGRESSIVE INDEX		12.9		12.6	12.5	12.4	12.4	12.4	12.4	12.1
LANGLIER INDEX		0.79		0.50	0.36	0.33	0.26	0.32	0.32	-0.04
FLUORIDE SI, (ppm)		0.31		0.36	0.31	0.30	0.30	0.32	0.32	0.32
FLUORIDE IC, (ppm)		NA		NA	NA	NA	NA	NA	NA	NA
CHLORIDE IC, (ppm)		65.7		66.8	72.3	64.2	64.8	64.8	63.7	61.9
BROMIDE IC, (ppm)		0.3		0.3	0.3	0.3	0.3	ND	0.3	0.3
NITRATE IC, (ppm as N)		1.3		0.7	0.2	1.7	1.3	ND	0.8	1.4
SULFATE IC, (ppm)		223		230	246	227	229	232	226	225
SODIUM IC, (ppm)		74.6		72.9	71.6	NA	NA	NA	NA	67.8
POTASSIUM IC, (ppm)		3.7		3.7	3.0	NA	NA	NA	NA	1.0
MAGNESIUM IC, (ppm)		49.0		49.4	47.8	NA	NA	NA	NA	51.2
CALCIUM IC, (ppm)		117		111	113	NA	NA	NA	NA	104
ANIONS, (meq/l)		13.2		13.3	13.7	13.0	13.1	NA	12.9	12.8

	2/5/2018	5/7/2018	7/2/2018	8/6/2018	11/5/2018	2/4/2019	5/6/2019	8/5/2019	11/4/2019	2/3/2020
	CH #18	CH #18	CH #18	CH #18	CH #18	CH #18	CH #18	CH #18	CH #18	CH #18
LAB #	88898	89759	90353	90694	91661	92529	93345	94198	95026	95831
TIME SAMPLED	8:36	8:36	8:58	6:19	9:02	8:46	9:16	8:13	9:51	7:48
CATIONS, (meq/l)		13.2		13.1	12.8	NA	NA	NA	NA	12.4
ION BALANCE, (% difference)		0.0		-0.7	-3.6	NA	NA	NA	NA	-1.6
BICARBONATE (ppm)				403						
ALUMINUM (ppb)	ND									
ANTIMONY (ppb)	ND									
ARSENIC (ppb)	0.9									
BARIUM (ppb)	66									
BERYLLIUM (ppb)	ND									
CADMIUM (ppb)	ND									
CHROMIUM (ppb as total Cr)	ND									
COPPER (ppb)	ND									
IRON (ppb)	749									
LEAD (ppb)	ND									
MANGANESE (ppb)	52.8									
NICKEL (ppb)	ND									
SELENIUM (ppb)	ND									
SILVER (ppb)	ND									
THALLIUM (ppb)	ND									
ZINC (ppb)	ND									
MERCURY (ppb)			ND							
SILICA (ppm)	40	40	40	40	40	40	40	40	40	40

	2/5/2018	5/7/2018	7/2/2018	8/6/2018	11/5/2018	2/4/2019	5/6/2019	8/5/2019	11/4/2019	2/3/2020
	CH #19	CH #19	CH #19	CH #19	CH #19	CH #19	CH #19	CH #19	CH #19	CH #19
LAB #	88899	89760	90354	90695	91662	92530	93346	94199	95027	95832
TIME SAMPLED	9:02	8:56	9:14	7:20	9:34	8:59	9:32	9:00	10:10	8:02
SAMPLER	PP	GC	JM	GC	JAM	GC	JAM	NV	CD	GC
TEMP., °C		21.8		21.1	21.0	21.0	20.7	20.8	20.7	20.7
TOTAL CL2 (ppm)		0.15		0.15	NC	NC	NC	NC	<0.05	NC
FREE CL2 (ppm)		<0.05		<0.05	NC	NC	NC	NC	<0.05	NC
COND., µS		1584		1591	1568	1569	1655	1634	1654	1635
calc. factor		0.72		0.72	0.74	0.74	0.74	0.74	0.74	0.74
TDS, ppm (calc.)		1140		1146	1160	1161	1225	1209	1224	1210
TDS, ppm (grav.)		NA		1207	NA	NA	NA	1171	NA	NA
TURBIDITY, (ntu)		0.19		0.31	0.26	0.25	0.52	0.35	0.07	0.16
pH		7.54		7.38	7.20	7.25	7.27	7.20	7.65	7.09
VOL. ALKALINITY TITRANT		34.5		35.2	37.57	38.2	38.83	41.10	38.56	38.63
corr. Factor		9.72		9.72	9.72	9.88	9.88	9.88	9.82	9.82
ALKALINITY, (ppm as CaCO3)		335		342	365	377	384	406	379	379
COLOR		6		<5	11	<5	15	24	<5	<5
ODOR, (ton)		1		1	1	1	1	<1	1	1
VOL. EDTA HARDNESS		9.84		33.41	10.50	9.95	10.10	9.69	9.94	10.21
dil. factor		3.33		1	3.33	3.33	3.33	3.33	3.33	3.33
corr. factor		19.50		19.50	19.70	19.70	19.70	19.60	19.60	19.50
HARDNESS, (ppm as CaCO3)		639		651	689	653	663	632	649	663
VOL. EDTA CALCIUM		6.10		6.30	6.22	6.23	6.32	5.95	5.91	6.59
dil. factor		3.33		3.33	3.33	3.33	3.33	3.33	3.33	3.33
corr. factor		7.80		7.80	7.88	7.88	7.88	7.84	7.84	7.80
CALCIUM, (ppm as Ca+2)		158		164	163	163	166	155	154	171
		CH #19		CH #19	CH #19	CH #19	CH #19	CH #19	CH #19	CH #19
LAB #		89760		90695	91662	92530	93346	94199	95027	95832
AGGRESSIVE INDEX		12.7		12.5	12.4	12.4	12.5	12.4	12.8	12.3
LANGLIER INDEX		0.54		0.38	0.23	0.29	0.31	0.24	0.65	0.14
FLUORIDE SI, (ppm)		0.34		0.31	0.32	1.25	0.31	0.32	0.32	0.31
FLUORIDE IC, (ppm)		NA		NA	NA	NA	NA	NA	NA	NA
CHLORIDE IC, (ppm)		156		148	158	141	147	149	146	145
BROMIDE IC, (ppm)		0.8		0.8	1.1	1.0	1.1	1.1	1.0	1.0
NITRATE IC, (ppm as N)		2.5		2.8	2.4	2.0	1.0	0.9	1.3	1.6
SULFATE IC, (ppm)		315		330	317	295	322	329	328	335
SODIUM IC, (ppm)		112		112	114	NA	NA	NA	NA	127
POTASSIUM IC, (ppm)		4.2		4.0	3.3	NA	NA	NA	NA	0.8
MAGNESIUM IC, (ppm)		62.3		61.7	59.6	NA	NA	NA	NA	64.2
CALCIUM IC, (ppm)		154		149	145	NA	NA	NA	NA	139
ANIONS, (meq/l)		17.9		18.1	18.5	17.9	18.6	19.3	18.6	18.8

	2/5/2018	5/7/2018	7/2/2018	8/6/2018	11/5/2018	2/4/2019	5/6/2019	8/5/2019	11/4/2019	2/3/2020
	CH #19	CH #19	CH #19	CH #19	CH #19	CH #19	CH #19	CH #19	CH #19	CH #19
LAB #	88899	89760	90354	90695	91662	92530	93346	94199	95027	95832
TIME SAMPLED	9:02	8:56	9:14	7:20	9:34	8:59	9:32	9:00	10:10	8:02
CATIONS, (meq/l)		17.8		18.0	17.2	NA	NA	NA	NA	17.8
ION BALANCE, (% difference)		-0.2		-0.2	-3.8	NA	NA	NA	NA	-2.8
BICARBONATE (ppm)				417.0						
ALUMINUM (ppb)	ND									
ANTIMONY (ppb)	ND									
ARSENIC (ppb)	0.9									
BARIUM (ppb)	70									
BERYLLIUM (ppb)	ND									
CADMIUM (ppb)	ND									
CHROMIUM (ppb as total Cr)	ND									
COPPER (ppb)	ND									
IRON (ppb)	90.7									
LEAD (ppb)	ND									
MANGANESE (ppb)	53.5									
NICKEL (ppb)	ND									
SELENIUM (ppb)	ND									
SILVER (ppb)	ND									
THALLIUM (ppb)	ND									
ZINC (ppb)	ND									
MERCURY (ppb)			ND							
SILICA (ppm)	40	40	40	40	40	40	40	40	40	40

	2/5/2018	5/7/2018	7/2/2018	8/6/2018	11/5/2018	2/4/2019	5/6/2019	8/5/2019	11/4/2019	2/3/2020
	CH #20	CH #20	CH #20	CH #20	CH #20	CH #20	CH #20	CH #20	CH #20	CH #20
LAB #	88900	89761	90355	90696	91663	92531	93347	94200	95028	95833
TIME SAMPLED	8:46	8:43	9:05	6:45	9:19	8:52	9:23	8:28	10:03	7:54
SAMPLER	PP	GC	JM	GC	JAM	GC	JAM	NV	CD	GC
TEMP., °C		21.2		21.4	21.4	21.0	20.3	21.5	21.4	21.2
TOTAL CL2 (ppm)		NC		NC	NC	NC	NC	NC	<0.05	NC
FREE CL2 (ppm)		NC		NC	NC	NC	NC	NC	<0.05	NC
COND., µS		1754		1799	1771	1755	1771	1760	1772	1746
calc. factor		0.72		0.72	0.74	0.74	0.74	0.74	0.74	0.74
TDS, ppm (calc.)		1263		1295	1311	1299	1311	1302	1311	1292
TDS, ppm (grav.)		NA		1328	NA	NA	NA	1324	NA	NA
TURBIDITY, (ntu)		0.51		2.34	1.31	1.65	1.94	2.01	1.18	1.98
pH		7.50		7.44	7.31	7.43	7.42	7.34	7.43	7.23
VOL. ALKALINITY TITRANT		37.2		37.3	38.11	36.6	36.75	38.87	36.11	37.09
corr. Factor		9.72		9.72	9.72	9.88	9.88	9.88	9.82	9.82
ALKALINITY, (ppm as CaCO3)		362		363	370	361	363	384	355	364
COLOR		10		<5	21	<5	32	25	9	<5
ODOR, (ton)		<1		<1	<1	<1	<1	<1	<1	<1
VOL. EDTA HARDNESS		11.17		36.62	11.69	12.10	11.37	10.57	10.53	11.58
dil. factor		3.33		1	3.33	3.33	3.33	3.33	3.33	3.33
corr. factor		19.50		19.50	19.70	19.70	19.70	19.60	19.60	19.50
HARDNESS, (ppm as CaCO3)		725		714	767	794	746	690	687	752
VOL. EDTA CALCIUM		6.40		7.08	7.31	6.88	6.78	6.69	6.81	7.43
dil. factor		3.33		3.33	3.33	3.33	3.33	3.33	3.33	3.33
corr. factor		7.80		7.80	7.88	7.88	7.88	7.84	7.84	7.80
CALCIUM, (ppm as Ca+2)		166		184	192	181	178	175	178	193
		CH #20		CH #20	CH #20	CH #20	CH #20	CH #20	CH #20	CH #20
LAB #		89761		90696	91663	92531	93347	94200	95028	95833
AGGRESSIVE INDEX		12.7		12.7	12.6	12.6	12.6	12.6	12.6	12.5
LANGLIER INDEX		0.52		0.51	0.41	0.48	0.45	0.41	0.47	0.32
FLUORIDE SI, (ppm)		0.32		0.33	0.32	0.31	0.32	0.33	0.32	0.32
FLUORIDE IC, (ppm)		NA		NA	NA	NA	NA	NA	NA	NA
CHLORIDE IC, (ppm)		158		166	176	161	164	163	162	163
BROMIDE IC, (ppm)		0.9		1.2	1.5	1.4	1.4	1.4	1.4	1.5
NITRATE IC, (ppm as N)		0.7		3.4	0.2	1.2	ND	ND	1.8	1.3
SULFATE IC, (ppm)		377		405	438	402	407	406	395	408
SODIUM IC, (ppm)		126		124	124	NA	NA	NA	NA	113
POTASSIUM IC, (ppm)		4.7		3.0	4.0	NA	NA	NA	NA	0.8
MAGNESIUM IC, (ppm)		68.1		66.7	67.1	NA	NA	NA	NA	72.4
CALCIUM IC, (ppm)		168		165	168	NA	NA	NA	NA	152
ANIONS, (meq/l)		19.6		20.6	21.5	20.2	NA	NA	20.0	20.5

	2/5/2018	5/7/2018	7/2/2018	8/6/2018	11/5/2018	2/4/2019	5/6/2019	8/5/2019	11/4/2019	2/3/2020
	CH #20	CH #20	CH #20	CH #20	CH #20	CH #20	CH #20	CH #20	CH #20	CH #20
LAB #	88900	89761	90355	90696	91663	92531	93347	94200	95028	95833
TIME SAMPLED	8:46	8:43	9:05	6:45	9:19	8:52	9:23	8:28	10:03	7:54
CATIONS, (meq/l)		19.6		20.0	19.4	NA	NA	NA	NA	18.5
ION BALANCE, (% difference)		-0.1		-1.4	-5.2	NA	NA	NA	NA	-5.1
BICARBONATE (ppm)				443						
ALUMINUM (ppb)	ND									
ANTIMONY (ppb)	ND									
ARSENIC (ppb)	1.3									
BARIUM (ppb)	91									
BERYLLIUM (ppb)	ND									
CADMIUM (ppb)	ND									
CHROMIUM (ppb as total Cr)	ND									
COPPER (ppb)	ND									
IRON (ppb)	830									
LEAD (ppb)	ND									
MANGANESE (ppb)	65.1									
NICKEL (ppb)	ND									
SELENIUM (ppb)	ND									
SILVER (ppb)	ND									
THALLIUM (ppb)	ND									
ZINC (ppb)	ND									
MERCURY (ppb)			ND							
SILICA (ppm)	40	40	40	40	40	40	40	40	40	40

Contaminant Water Quality Data

SM-3 Well Data - Contaminants

Analyte	Value	Units	Date	Notes
Temp	N/A	C	5/6/2019	
Temp	20.4	C	6/17/2019	
Temp	20.4	C	7/1/2019	
Temp	20.2	C	8/12/2019	
Temp	19.6	C	10/7/2019	
Temp	19.1	C	8/26/2019	
CaCO3	600	mg/L	8/26/2019	
CaCO3	571	mg/L	5/6/2019	
CaCO3	556	mg/L	8/12/2019	
CaCO3	546	mg/L	10/7/2019	
CaCO3	544	mg/L	7/1/2019	
CaCO3	526	mg/L	6/17/2019	
Cyanide	ND	mg/L	8/23/2018	
MBAS	0.1	mg/L	8/30/2018	<0.1
Nitrate as N	5.42	mg/L	10/7/2019	
Nitrate as N	4.64	mg/L	8/26/2019	
Nitrate as N	4.62	mg/L	6/17/2019	
Nitrate as N	4.56	mg/L	8/12/2019	
Nitrate as N	4.52	mg/L	5/6/2019	
Nitrate as N	4.52	mg/L	7/1/2019	
Surfactants	ND	mg/L	8/16/2018	
TOC	ND	mg/L	8/12/2019	
TOC	0.49	mg/L	5/6/2019	
TOC	0.38	mg/L	6/17/2019	
TOC	0.32	mg/L	8/26/2019	
TOC	0.31	mg/L	7/1/2019	
TOC	0.25	mg/L	10/7/2019	
1,1,1,2-Tetrachloroethane	ND	ug/L	8/9/2019	
1,1,1,2-Tetrachloroethane	ND	ug/L	8/25/2018	
1,1,1,2-Tetrachloroethane	ND	ug/L	8/9/2019	
1,1,1-Trichloroethane	ND	ug/L	8/9/2019	
1,1,1-Trichloroethane	ND	ug/L	8/25/2018	
1,1,1-Trichloroethane	ND	ug/L	8/9/2019	
1,1,2,2-Tetrachloroethane	ND	ug/L	8/9/2019	
1,1,2,2-Tetrachloroethane	ND	ug/L	8/25/2018	
1,1,2,2-Tetrachloroethane	ND	ug/L	8/9/2019	
1,1,2-Trichloroethane	ND	ug/L	8/9/2019	
1,1,2-Trichloroethane	ND	ug/L	8/25/2018	
1,1,2-Trichloroethane	ND	ug/L	8/9/2019	
1,1-Dichloroethane	ND	ug/L	8/9/2019	
1,1-Dichloroethane	ND	ug/L	8/25/2018	
1,1-Dichloroethane	ND	ug/L	8/9/2019	

SM-3 Well Data - Contaminants

Analyte	Value	Units	Date	Notes
1,1-Dichloroethylene	ND	ug/L	8/9/2019	
1,1-Dichloroethylene	ND	ug/L	8/25/2018	
1,1-Dichloroethylene	ND	ug/L	8/9/2019	
1,1-Dichloropropene	ND	ug/L	8/9/2019	
1,1-Dichloropropene	ND	ug/L	8/25/2018	
1,1-Dichloropropene	ND	ug/L	8/9/2019	
1,2,3-Trichlorobenzene	ND (LE)	ug/L	8/25/2018	
1,2,3-Trichlorobenzene	ND	ug/L	8/9/2019	
1,2,3-Trichlorobenzene	ND	ug/L	8/9/2019	
1,2,3-Trichloropropane	ND	ug/L	8/9/2019	
1,2,3-Trichloropropane	ND	ug/L	8/25/2018	
1,2,3-Trichloropropane	ND	ug/L	8/9/2019	
1,2,3-Trichloropropane	ND	ug/L	8/8/2019	
1,2,3-Trichloropropane	NA	ug/L	3/29/2018	
1,2,3-Trichloropropane	NA	ug/L	4/18/2018	
1,2,3-Trichloropropane	NA	ug/L	5/22/2018	
1,2,3-Trichloropropane	NA	ug/L	6/4/2018	
1,2,3-Trichloropropane	NA	ug/L	7/2/2018	
1,2,3-Trichloropropane	NA	ug/L	8/6/2018	
1,2,3-Trichloropropane	NA	ug/L	9/1/2018	
1,2,3-Trichloropropane	NA	ug/L	10/1/2018	
1,2,3-Trichloropropane	NA	ug/L	11/1/2018	
1,2,3-Trichloropropane	NA	ug/L	12/1/2018	
1,2,3-Trichloropropane	NA	ug/L	1/1/2019	
1,2,3-Trichloropropane	NA	ug/L	2/1/2019	
1,2,3-Trichloropropane	NA	ug/L	3/1/2019	
1,2,3-Trichloropropane	NA	ug/L	4/1/2019	
1,2,3-Trichloropropane	NA	ug/L	5/1/2019	
1,2,3-Trichloropropane	NA	ug/L	6/1/2019	
1,2,3-Trichloropropane	NA	ug/L	7/1/2019	
1,2,3-Trichloropropane	NA	ug/L	8/1/2019	
1,2,3-Trichloropropane	NA	ug/L	9/1/2019	
1,2,3-Trichloropropane	NA	ug/L	10/1/2019	
1,2,3-Trichloropropane	NA	ug/L	11/1/2019	
1,2,3-Trichloropropane	NA	ug/L	12/1/2019	
1,2,3-Trichloropropane	NA	ug/L	1/1/2020	
1,2,3-Trichloropropane	NA	ug/L	2/1/2020	
1,2,3-Trichloropropane	NA	ug/L	3/1/2020	
1,2,3-Trichloropropane	0.0016	ug/L	8/8/2019	0.0016J
1,2,4-Trichlorobenzene	ND	ug/L	8/9/2019	
1,2,4-Trichlorobenzene	ND	ug/L	8/25/2018	
1,2,4-Trichlorobenzene	ND	ug/L	8/9/2019	

SM-3 Well Data - Contaminants

Analyte	Value	Units	Date	Notes
1,2,4-Trimethylbenzene	ND (R7)	ug/L	8/25/2018	
1,2,4-Trimethylbenzene	ND	ug/L	8/9/2019	
1,2,4-Trimethylbenzene	ND	ug/L	8/9/2019	
1,2-Dichloroethane	ND	ug/L	8/9/2019	
1,2-Dichloroethane	ND	ug/L	8/25/2018	
1,2-Dichloroethane	ND	ug/L	8/9/2019	
1,2-Dichloropropane	ND	ug/L	8/9/2019	
1,2-Dichloropropane	ND	ug/L	8/25/2018	
1,2-Dichloropropane	ND	ug/L	8/9/2019	
1,3,5-Trimethylbenzene	ND	ug/L	8/9/2019	
1,3,5-Trimethylbenzene	ND	ug/L	8/25/2018	
1,3,5-Trimethylbenzene	ND	ug/L	8/9/2019	
1,3-Dichloropropane	ND	ug/L	8/9/2019	
1,3-Dichloropropane	ND	ug/L	8/25/2018	
1,3-Dichloropropane	ND	ug/L	8/9/2019	
1,4 - Dioxane	23	ug/L	8/28/2006	
1,4 - Dioxane	22	ug/L	2/27/2006	
1,4 - Dioxane	20	ug/L	11/28/2005	
1,4 - Dioxane	20	ug/L	5/22/2006	
1,4 - Dioxane	19	ug/L	2/25/2008	
1,4 - Dioxane	18	ug/L	8/27/2007	
1,4 - Dioxane	17	ug/L	5/26/2009	
1,4 - Dioxane	16	ug/L	5/23/2005	
1,4 - Dioxane	16	ug/L	5/29/2007	
1,4 - Dioxane	15	ug/L	11/26/2007	
1,4 - Dioxane	15	ug/L	8/24/2009	
1,4 - Dioxane	13	ug/L	2/26/2007	
1,4 - Dioxane	12.9	ug/L	2/23/2009	
1,4 - Dioxane	12	ug/L	8/22/2005	
1,4 - Dioxane	12	ug/L	8/23/2010	
1,4 - Dioxane	11	ug/L	2/2/2010	
1,4 - Dioxane	10	ug/L	2/28/2005	
1,4 - Dioxane	10	ug/L	11/30/2009	
1,4 - Dioxane	8.8	ug/L	10/21/2010	
1,4 - Dioxane	8.5	ug/L	11/24/2008	
1,4 - Dioxane	7.9	ug/L	10/22/2012	
1,4 - Dioxane	7.3	ug/L	11/19/2002	
1,4 - Dioxane	7.2	ug/L	7/23/2012	
1,4 - Dioxane	6.6	ug/L	4/22/2013	
1,4 - Dioxane	6.2	ug/L	1/28/2013	
1,4 - Dioxane	5.9	ug/L	2/25/2002	
1,4 - Dioxane	5	ug/L	2/20/2003	

SM-3 Well Data - Contaminants

Analyte	Value	Units	Date	Notes
1,4 - Dioxane	4.6	ug/L	10/24/2011	
1,4 - Dioxane	4.3	ug/L	4/23/2012	
1,4 - Dioxane	4.2	ug/L	1/30/2012	
1,4 - Dioxane	4.1	ug/L	5/28/2002	
1,4 - Dioxane	3.4	ug/L	8/26/2002	
1,4 - Dioxane	3.2	ug/L	3/28/2011	
1,4 - Dioxane	1.9	ug/L	8/25/2014	
1,4 - Dioxane	1.9	ug/L	10/7/2019	
1,4 - Dioxane	1.9	ug/L	10/7/2019	
1,4 - Dioxane	1.8	ug/L	1/6/2020	
1,4 - Dioxane	1.8	ug/L	1/6/2020	
1,4 - Dioxane	1.6	ug/L	7/27/2015	
1,4 - Dioxane	1.5	ug/L	7/1/2019	
1,4 - Dioxane	1.5	ug/L	7/1/2019	
1,4 - Dioxane	1.5	ug/L	7/8/2019	
1,4 - Dioxane	1.4	ug/L	10/27/2014	
1,4 - Dioxane	1.4	ug/L	10/26/2015	
1,4 - Dioxane	1.4	ug/L	7/25/2016	
1,4 - Dioxane	1.4	ug/L	10/24/2016	
1,4 - Dioxane	1.3	ug/L	4/27/2015	
1,4 - Dioxane	1.3	ug/L	4/25/2016	
1,4 - Dioxane	1.2	ug/L	1/26/2015	
1,4 - Dioxane	1.2	ug/L	1/25/2016	
1,4 - Dioxane	1.2	ug/L	1/23/2017	
1,4 - Dioxane	1.2	ug/L	1/23/2017	
1,4 - Dioxane	1.2	ug/L	4/1/2019	
1,4 - Dioxane	1.2	ug/L	4/1/2019	
1,4 - Dioxane	1.2	ug/L	4/8/2020	
1,4 - Dioxane	1.1	ug/L	4/24/2017	
1,4 - Dioxane	1.1	ug/L	4/24/2017	
1,4 - Dioxane	1.1	ug/L	10/2/2017	
1,4 - Dioxane	1.1	ug/L	10/2/2017	
1,4 - Dioxane	1.1	ug/L	1/2/2018	
1,4 - Dioxane	1.1	ug/L	1/2/2018	
1,4 - Dioxane	1.1	ug/L	8/14/2018	
1,4 - Dioxane	1.1	ug/L	1/11/2018	
1,4 - Dioxane	1.1	ug/L	8/21/2018	
1,4 - Dioxane	1	ug/L	7/24/2017	
1,4 - Dioxane	1	ug/L	7/24/2017	
1,4 - Dioxane	1	ug/L	4/24/2018	<1
1,4 - Dioxane	1	ug/L	10/1/2018	<1
1,4 - Dioxane	1.0	ug/L	1/7/2019	

SM-3 Well Data - Contaminants

Analyte	Value	Units	Date	Notes
1,4 - Dioxane	1	ug/L	1/7/2019	<1
1,4 - Dioxane	0.99	ug/L	1/9/2019	
1,4 - Dioxane	0.95	ug/L	4/2/2018	
1,4 - Dioxane	0.83	ug/L	10/10/2018	
1,4 - Dioxane	0.8	ug/L	10/1/2018	
1,4 - Dioxane		ug/L	7/2/2018	
2,2-Dichloropropane	ND	ug/L	8/9/2019	
2,2-Dichloropropane	ND	ug/L	8/25/2018	
2,2-Dichloropropane	ND	ug/L	8/9/2019	
2,4,5-TP (Silvex)	1	ug/L	11/16/2018	<1
2,4-D	ND	ug/L	8/25/2018	
2,4-D	10	ug/L	11/16/2018	<10.0
2-Butanone (MEK)	ND	ug/L	8/9/2019	
2-Butanone (MEK)	ND	ug/L	8/25/2018	
2-Butanone (MEK)	ND	ug/L	8/9/2019	
4-Methyl-2-Pentanone (MIBK)	ND	ug/L	8/9/2019	
4-Methyl-2-Pentanone (MIBK)	ND	ug/L	8/25/2018	
4-Methyl-2-Pentanone (MIBK)	ND	ug/L	8/9/2019	
Alachlor (Alanex)	ND	ug/L	8/30/2018	
Alachlor (Alanex)	ND	ug/L	8/22/2018	
Alachlor (Alanex)	1	ug/L	11/16/2018	<1.0
Alachlor (Alanex)	1	ug/L	11/16/2018	<1.0
Atrazine (Aatrex)	ND	ug/L	8/30/2018	
Atrazine (Aatrex)	0.5	ug/L	11/16/2018	<0.5
Bentazon (Basagran)	ND	ug/L	8/25/2018	
Bentazon (Basagran)	2	ug/L	11/16/2018	<2
Benzene	ND	ug/L	8/9/2019	
Benzene	ND	ug/L	8/25/2018	
Benzene	ND	ug/L	8/9/2019	
Benzo(a)pyrene	0.1	ug/L	11/16/2018	<0.1
Bromobenzene	ND (R7)	ug/L	8/25/2018	
Bromobenzene	ND	ug/L	8/9/2019	
Bromobenzene	ND	ug/L	8/9/2019	
Bromochloromethane	ND	ug/L	8/9/2019	
Bromochloromethane	ND	ug/L	8/25/2018	
Bromochloromethane	ND	ug/L	8/9/2019	
Bromodichloromethane	ND	ug/L	8/9/2019	
Bromodichloromethane	ND	ug/L	8/25/2018	
Bromodichloromethane	ND	ug/L	8/9/2019	
Bromoethane	ND (R7)	ug/L	8/25/2018	
Bromoethane	ND	ug/L	8/9/2019	
Bromoethane	ND	ug/L	8/9/2019	

SM-3 Well Data - Contaminants

Analyte	Value	Units	Date	Notes
Bromoform	ND (LK)	ug/L	8/25/2018	
Bromoform	ND	ug/L	8/9/2019	
Bromoform	0.4	ug/L	8/9/2019	0.40J
Bromomethane (Methyl Bromide)	ND (R7)	ug/L	8/25/2018	
Bromomethane (Methyl Bromide)	ND (LM)	ug/L	8/9/2019	
Bromomethane (Methyl Bromide)	ND (LM)	ug/L	8/9/2019	
Carbofuran (Furadan)	ND	ug/L	8/21/2018	
Carbofuran (Furadan)	5	ug/L	11/16/2018	<5.0
Carbon disulfide	ND (LK)	ug/L	8/25/2018	
Carbon disulfide	ND	ug/L	8/9/2019	
Carbon disulfide	ND	ug/L	8/9/2019	
Carbon Tetrachloride	ND	ug/L	8/9/2019	
Carbon Tetrachloride	ND	ug/L	8/25/2018	
Carbon Tetrachloride	ND	ug/L	8/9/2019	
Chlordane	ND	ug/L	8/22/2018	
Chlordane	0.1	ug/L	11/16/2018	<0.1
Chlorobenzene	ND	ug/L	8/9/2019	
Chlorobenzene	ND	ug/L	8/25/2018	
Chlorobenzene	ND	ug/L	8/9/2019	
Chlorodibromomethane	ND	ug/L	8/25/2018	
Chlorodibromomethane	ND	ug/L	8/9/2019	
Chlorodibromomethane	0.26	ug/L	8/9/2019	0.26J
Chloroethane	ND	ug/L	8/9/2019	
Chloroethane	ND	ug/L	8/25/2018	
Chloroethane	ND	ug/L	8/9/2019	
Chloroform (Trichloromethane)	1.4	ug/L	8/9/2019	
Chloroform (Trichloromethane)	1.4	ug/L	8/9/2019	
Chloroform (Trichloromethane)	0.55	ug/L	8/25/2018	
Chloromethane(Methyl Chloride)	ND	ug/L	8/9/2019	
Chloromethane(Methyl Chloride)	ND	ug/L	8/25/2018	
Chloromethane(Methyl Chloride)	ND	ug/L	8/9/2019	
cis-1,2-Dichloroethylene	ND (R7)	ug/L	8/25/2018	
cis-1,2-Dichloroethylene	ND	ug/L	8/9/2019	
cis-1,2-Dichloroethylene	0.29	ug/L	8/9/2019	0.29J
cis-1,3-Dichloropropene	ND	ug/L	8/9/2019	
cis-1,3-Dichloropropene	ND	ug/L	8/25/2018	
cis-1,3-Dichloropropene	ND	ug/L	8/9/2019	
Cyanide	100	ug/L	8/30/2018	<100
Dalapon	10	ug/L	11/16/2018	<10.0
Di(2-ethylhexyl) Adipate	5	ug/L	11/16/2018	<5.0
Di(2-Ethylhexyl)phthalate	ND	ug/L	8/30/2018	
Dibromochloropropane (DBCP)	ND	ug/L	8/30/2018	

SM-3 Well Data - Contaminants

Analyte	Value	Units	Date	Notes
Dibromochloropropane (DBCP)	0.01	ug/L	11/16/2018	<0.01
Dibromomethane	ND	ug/L	8/9/2019	
Dibromomethane	ND	ug/L	8/25/2018	
Dibromomethane	ND	ug/L	8/9/2019	
Dichlorodifluoromethane	ND	ug/L	8/9/2019	
Dichlorodifluoromethane	ND	ug/L	8/25/2018	
Dichlorodifluoromethane	ND	ug/L	8/9/2019	
Dichloromethane	ND	ug/L	8/9/2019	
Dichloromethane	ND	ug/L	8/25/2018	
Dichloromethane	ND	ug/L	8/9/2019	
Diethylhexylphthalate (DEHP)	3	ug/L	11/16/2018	<3.0
Di-isopropyl ether	ND	ug/L	8/9/2019	
Di-isopropyl ether	ND	ug/L	8/25/2018	
Di-isopropyl ether	ND	ug/L	8/9/2019	
Dinoseb	ND	ug/L	8/25/2018	
Dinoseb (DNBP)	2	ug/L	11/16/2018	<2
Diquat	ND (M2)	ug/L	8/20/2018	
Diquat	4	ug/L	11/16/2018	<4
Endothall	ND	ug/L	8/21/2018	
Endothall	45	ug/L	11/16/2018	<45
Endrin	ND	ug/L	8/22/2018	
Endrin	0.1	ug/L	11/16/2018	<0.1
Ethyl benzene	ND	ug/L	8/9/2019	
Ethyl benzene	ND	ug/L	8/25/2018	
Ethyl benzene	ND	ug/L	8/9/2019	
Ethylene Dibromide (EDB)	ND	ug/L	8/30/2018	
Ethylene Dibromide (EDB)	0.02	ug/L	11/16/2018	<0.02
Glyphosate	ND	ug/L	8/21/2018	
Glyphosate	25	ug/L	11/16/2018	<25
Heptachlor	0.01	ug/L	11/16/2018	<0.01
Heptachlor Epoxide	0.01	ug/L	11/16/2018	<0.01
Hexachlorobenzene	0.5	ug/L	11/16/2018	<0.5
Hexachlorobutadiene	ND	ug/L	8/9/2019	
Hexachlorobutadiene	ND	ug/L	8/25/2018	
Hexachlorobutadiene	ND	ug/L	8/9/2019	
Hexachlorocyclopentadiene	1	ug/L	11/16/2018	<1.0
Isopropylbenzene	ND	ug/L	8/9/2019	
Isopropylbenzene	ND	ug/L	8/25/2018	
Isopropylbenzene	ND	ug/L	8/9/2019	
Lindane (gamma-BHC)	ND	ug/L	8/22/2018	
Lindane (gamma-BHC)	0.2	ug/L	11/16/2018	<0.2
m,p-Xylenes	ND	ug/L	8/9/2019	

SM-3 Well Data - Contaminants

Analyte	Value	Units	Date	Notes
m,p-Xylenes	ND	ug/L	8/25/2018	
m,p-Xylenes	ND	ug/L	8/9/2019	
m-Dichlorobenzene (1,3-DCB)	ND	ug/L	8/9/2019	
m-Dichlorobenzene (1,3-DCB)	ND	ug/L	8/25/2018	
m-Dichlorobenzene (1,3-DCB)	ND	ug/L	8/9/2019	
Methoxychlor	ND	ug/L	8/22/2018	
Methoxychlor	10	ug/L	11/16/2018	<10.0
Methyl Tert-butyl ether (MTBE)	ND	ug/L	8/9/2019	
Methyl Tert-butyl ether (MTBE)	ND	ug/L	8/25/2018	
Methyl Tert-butyl ether (MTBE)	ND	ug/L	8/9/2019	
Molinate (Ordram)	2	ug/L	11/16/2018	<2
Naphthalene	ND (LE)	ug/L	8/25/2018	
Naphthalene	ND	ug/L	8/9/2019	
Naphthalene	ND	ug/L	8/9/2019	
n-Butylbenzene	ND	ug/L	8/9/2019	
n-Butylbenzene	ND	ug/L	8/25/2018	
n-Butylbenzene	ND	ug/L	8/9/2019	
n-Propylbenzene	ND	ug/L	8/9/2019	
n-Propylbenzene	ND	ug/L	8/25/2018	
n-Propylbenzene	ND	ug/L	8/9/2019	
o-Chlorotoluene	ND	ug/L	8/9/2019	
o-Chlorotoluene	ND	ug/L	8/25/2018	
o-Chlorotoluene	ND	ug/L	8/9/2019	
o-Dichlorobenzene (1,2-DCB)	ND	ug/L	8/9/2019	
o-Dichlorobenzene (1,2-DCB)	ND	ug/L	8/25/2018	
o-Dichlorobenzene (1,2-DCB)	ND	ug/L	8/9/2019	
Oxamyl (Vydate)	ND	ug/L	8/21/2018	
Oxamyl (Vydate)	20	ug/L	11/16/2018	<20
o-Xylene	ND	ug/L	8/9/2019	
o-Xylene	ND	ug/L	8/25/2018	
o-Xylene	ND	ug/L	8/9/2019	
PCB-1016 (as Decachlorobiphenyl (DCB))	0.5	ug/L	11/16/2018	<0.5
PCB-1221 (as DCB)	0.5	ug/L	11/16/2018	<0.5
PCB-1232 (as DCB)	0.5	ug/L	11/16/2018	<0.5
PCB-1242 (as DCB)	0.5	ug/L	11/16/2018	<0.5
PCB-1248 (as DCB)	0.5	ug/L	11/16/2018	<0.5
PCB-1254 (as DCB)	0.5	ug/L	11/16/2018	<0.5
PCB-1260 (as DCB)	0.5	ug/L	11/16/2018	<0.5
p-Chlorotoluene	ND	ug/L	8/9/2019	
p-Chlorotoluene	ND	ug/L	8/25/2018	
p-Chlorotoluene	ND	ug/L	8/9/2019	
p-Dichlorobenzene (1,4-DCB)	ND	ug/L	8/9/2019	

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Analyte	Value	Units	Date	Notes
p-Dichlorobenzene (1,4-DCB)	ND	ug/L	8/25/2018	
p-Dichlorobenzene (1,4-DCB)	ND	ug/L	8/9/2019	
Pentachlorophenol (PCP)	ND	ug/L	8/25/2018	
Pentachlorophenol (PCP)	0.2	ug/L	11/16/2018	<0.2
Perchlorate	ND	ug/L	8/18/2018	
Perchlorate	4	ug/L	8/30/2018	<4
Picloram	1	ug/L	11/16/2018	<1.0
p-Isopropyltoluene	ND	ug/L	8/9/2019	
p-Isopropyltoluene	ND	ug/L	8/25/2018	
p-Isopropyltoluene	ND	ug/L	8/9/2019	
Polychlorinated Biphenyls, Total, as DCB	0.5	ug/L	11/16/2018	<0.5
sec-Butylbenzene	ND	ug/L	8/9/2019	
sec-Butylbenzene	ND	ug/L	8/25/2018	
sec-Butylbenzene	ND	ug/L	8/9/2019	
Simazine (Princep)	ND	ug/L	8/30/2018	
Simazine (Princep)	1	ug/L	11/16/2018	<1
Styrene	ND (R7)	ug/L	8/25/2018	
Styrene	ND	ug/L	8/9/2019	
Styrene	ND	ug/L	8/9/2019	
tert-amyl Methyl Ether	ND	ug/L	8/9/2019	
tert-amyl Methyl Ether	ND	ug/L	8/25/2018	
tert-amyl Methyl Ether	ND	ug/L	8/9/2019	
tert-Butyl Ethyl Ether	ND	ug/L	8/9/2019	
tert-Butyl Ethyl Ether	ND	ug/L	8/25/2018	
tert-Butyl Ethyl Ether	ND	ug/L	8/9/2019	
tert-Butylbenzene	ND (R7)	ug/L	8/25/2018	
tert-Butylbenzene	ND	ug/L	8/9/2019	
tert-Butylbenzene	ND	ug/L	8/9/2019	
Tetrachloroethylene (PCE)	Offline	ug/L	6/1/2018	
Tetrachloroethylene (PCE)	Offline	ug/L	7/1/2018	
Tetrachloroethylene (PCE)	26.6	ug/L	8/1/2018	
Tetrachloroethylene (PCE)	26.6	ug/L	8/8/2018	
Tetrachloroethylene (PCE)	11.1	ug/L	3/28/2016	
Tetrachloroethylene (PCE)	10.1	ug/L	4/25/2016	
Tetrachloroethylene (PCE)	9.4	ug/L	1/25/2016	
Tetrachloroethylene (PCE)	9.4	ug/L	2/22/2016	
Tetrachloroethylene (PCE)	9.2	ug/L	6/27/2016	
Tetrachloroethylene (PCE)	9	ug/L	8/22/2016	
Tetrachloroethylene (PCE)	8.6	ug/L	11/6/2017	
Tetrachloroethylene (PCE)	8.6	ug/L	11/6/2017	
Tetrachloroethylene (PCE)	8.6	ug/L	2/1/2019	
Tetrachloroethylene (PCE)	8.6	ug/L	2/4/2019	

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Analyte	Value	Units	Date	Notes
Tetrachloroethylene (PCE)	8.4	ug/L	12/1/2019	
Tetrachloroethylene (PCE)	8.4	ug/L	12/16/2019	
Tetrachloroethylene (PCE)	8.3	ug/L	7/25/2016	
Tetrachloroethylene (PCE)	8.1	ug/L	1/1/2018	
Tetrachloroethylene (PCE)	8.1	ug/L	1/2/2018	
Tetrachloroethylene (PCE)	8.1	ug/L	2/1/2018	
Tetrachloroethylene (PCE)	8.1	ug/L	2/5/2018	
Tetrachloroethylene (PCE)	8.1	ug/L	4/1/2018	
Tetrachloroethylene (PCE)	8.1	ug/L	4/2/2018	
Tetrachloroethylene (PCE)	8	ug/L	12/4/2017	
Tetrachloroethylene (PCE)	8	ug/L	12/4/2017	
Tetrachloroethylene (PCE)	8	ug/L	12/1/2018	
Tetrachloroethylene (PCE)	8	ug/L	12/3/2018	
Tetrachloroethylene (PCE)	8	ug/L	6/1/2019	
Tetrachloroethylene (PCE)	8	ug/L	6/3/2019	
Tetrachloroethylene (PCE)	8	ug/L	8/1/2019	
Tetrachloroethylene (PCE)	8	ug/L	8/5/2019	
Tetrachloroethylene (PCE)	8	ug/L	10/1/2019	
Tetrachloroethylene (PCE)	8	ug/L	10/7/2019	
Tetrachloroethylene (PCE)	7.9	ug/L	4/1/2019	
Tetrachloroethylene (PCE)	7.9	ug/L	4/1/2019	
Tetrachloroethylene (PCE)	7.9	ug/L	9/1/2019	
Tetrachloroethylene (PCE)	7.9	ug/L	9/3/2019	
Tetrachloroethylene (PCE)	7.8	ug/L	10/2/2017	
Tetrachloroethylene (PCE)	7.8	ug/L	10/2/2017	
Tetrachloroethylene (PCE)	7.7	ug/L	8/22/2016	
Tetrachloroethylene (PCE)	7.7	ug/L	9/26/2016	
Tetrachloroethylene (PCE)	7.6	ug/L	3/1/2018	
Tetrachloroethylene (PCE)	7.6	ug/L	3/5/2018	
Tetrachloroethylene (PCE)	7.5	ug/L	6/26/2017	
Tetrachloroethylene (PCE)	7.5	ug/L	6/26/2017	
Tetrachloroethylene (PCE)	7.5	ug/L	2/1/2020	
Tetrachloroethylene (PCE)	7.5	ug/L	2/3/2020	
Tetrachloroethylene (PCE)	7.4	ug/L	11/1/2019	
Tetrachloroethylene (PCE)	7.4	ug/L	11/4/2019	
Tetrachloroethylene (PCE)	7.3	ug/L	10/24/2016	
Tetrachloroethylene (PCE)	7.3	ug/L	3/1/2019	
Tetrachloroethylene (PCE)	7.3	ug/L	3/4/2019	
Tetrachloroethylene (PCE)	7.2	ug/L	2/27/2017	
Tetrachloroethylene (PCE)	7.2	ug/L	2/27/2017	
Tetrachloroethylene (PCE)	7.2	ug/L	4/24/2017	
Tetrachloroethylene (PCE)	7.2	ug/L	4/27/2017	

SM-3 Well Data - Contaminants

Analyte	Value	Units	Date	Notes
Tetrachloroethylene (PCE)	7.1	ug/L	11/1/2018	
Tetrachloroethylene (PCE)	7.1	ug/L	11/5/2018	
Tetrachloroethylene (PCE)	7.1	ug/L	1/1/2019	
Tetrachloroethylene (PCE)	7.1	ug/L	1/7/2019	
Tetrachloroethylene (PCE)	7	ug/L	3/1/2020	
Tetrachloroethylene (PCE)	7	ug/L	3/2/2020	
Tetrachloroethylene (PCE)	6.8	ug/L	12/26/2016	
Tetrachloroethylene (PCE)	6.8	ug/L	5/1/2018	
Tetrachloroethylene (PCE)	6.8	ug/L	5/7/2018	
Tetrachloroethylene (PCE)	6.8	ug/L	10/1/2018	
Tetrachloroethylene (PCE)	6.8	ug/L	10/1/2018	
Tetrachloroethylene (PCE)	6.8	ug/L	5/1/2019	
Tetrachloroethylene (PCE)	6.8	ug/L	5/6/2019	
Tetrachloroethylene (PCE)	6.8	ug/L	8/5/2019	
Tetrachloroethylene (PCE)	6.8	ug/L	8/9/2019	
Tetrachloroethylene (PCE)	6.8	ug/L	8/9/2019	
Tetrachloroethylene (PCE)	6.8	ug/L	8/9/2019	
Tetrachloroethylene (PCE)	6.7	ug/L	11/28/2016	
Tetrachloroethylene (PCE)	6.6	ug/L	8/28/2017	
Tetrachloroethylene (PCE)	6.6	ug/L	8/28/2017	
Tetrachloroethylene (PCE)	6.6	ug/L	7/1/2019	
Tetrachloroethylene (PCE)	6.6	ug/L	7/1/2019	
Tetrachloroethylene (PCE)	6.5	ug/L	3/27/2017	
Tetrachloroethylene (PCE)	6.5	ug/L	3/27/2017	
Tetrachloroethylene (PCE)	6.4	ug/L	9/1/2018	
Tetrachloroethylene (PCE)	6.4	ug/L	9/4/2018	
Tetrachloroethylene (PCE)	6.3	ug/L	1/23/2017	
Tetrachloroethylene (PCE)	6.3	ug/L	1/23/2017	
Tetrachloroethylene (PCE)	6.2	ug/L	5/23/2016	
Tetrachloroethylene (PCE)	6.1	ug/L	5/22/2017	
Tetrachloroethylene (PCE)	6.1	ug/L	5/22/2017	
Tetrachloroethylene (PCE)	6.1	ug/L	9/5/2017	
Tetrachloroethylene (PCE)	6.1	ug/L	9/5/2017	
Tetrachloroethylene (PCE)	5.8	ug/L	1/1/2020	
Tetrachloroethylene (PCE)	5.8	ug/L	1/6/2020	
Tetrachloroethylene (PCE)	5.6	ug/L	7/24/2017	
Tetrachloroethylene (PCE)	5.6	ug/L	7/24/2017	
Tetrachloroethylene (PCE)	5.2	ug/L	8/14/2018	
Tetrachloroethylene (PCE)	5.2	ug/L	8/25/2018	
Tetrachloroethylene (PCE)	5.2	ug/L	8/25/2018	
Thiobencarb (Bolero)	1	ug/L	11/16/2018	<1.0
Thiobencarb (ELAP)	ND	ug/L	8/30/2018	

SM-3 Well Data - Contaminants

Analyte	Value	Units	Date	Notes
Toluene	ND	ug/L	8/9/2019	
Toluene	ND	ug/L	8/25/2018	
Toluene	ND	ug/L	8/9/2019	
Total 1,3-Dichloropropene	ND	ug/L	8/9/2019	
Total 1,3-Dichloropropene	ND	ug/L	8/25/2018	
Total 1,3-Dichloropropene	ND	ug/L	8/9/2019	
Total THM	1.4	ug/L	8/9/2019	
Total THM	1.4	ug/L	8/9/2019	
Total THM	1.4	ug/L	8/9/2019	
Total THM	0.55	ug/L	8/25/2018	
Total THM	0.55	ug/L	8/25/2018	
Total xylenes	ND	ug/L	8/9/2019	
Total xylenes	ND	ug/L	8/25/2018	
Total xylenes	ND	ug/L	8/9/2019	
Toxaphene	ND	ug/L	8/22/2018	
Toxaphene	1	ug/L	11/16/2018	<1.0
trans-1,2-Dichloroethylene	ND	ug/L	8/9/2019	
trans-1,2-Dichloroethylene	ND	ug/L	8/25/2018	
trans-1,2-Dichloroethylene	ND	ug/L	8/9/2019	
trans-1,3-Dichloropropene	ND	ug/L	8/9/2019	
trans-1,3-Dichloropropene	ND	ug/L	8/25/2018	
trans-1,3-Dichloropropene	ND	ug/L	8/9/2019	
Trichloroethylene (TCE)	Offline	ug/L	6/1/2018	
Trichloroethylene (TCE)	Offline	ug/L	7/1/2018	
Trichloroethylene (TCE)	ND	ug/L	8/25/2018	
Trichloroethylene (TCE)	4.3	ug/L	3/28/2016	
Trichloroethylene (TCE)	4.2	ug/L	2/1/2019	
Trichloroethylene (TCE)	4.2	ug/L	2/4/2019	
Trichloroethylene (TCE)	4.2	ug/L	6/1/2019	
Trichloroethylene (TCE)	4.2	ug/L	6/3/2019	
Trichloroethylene (TCE)	4.2	ug/L	8/1/2019	
Trichloroethylene (TCE)	4.2	ug/L	8/5/2019	
Trichloroethylene (TCE)	4.1	ug/L	4/1/2019	
Trichloroethylene (TCE)	4.1	ug/L	4/1/2019	
Trichloroethylene (TCE)	4.1	ug/L	9/1/2019	
Trichloroethylene (TCE)	4.1	ug/L	9/3/2019	
Trichloroethylene (TCE)	4	ug/L	10/1/2019	
Trichloroethylene (TCE)	4	ug/L	10/7/2019	
Trichloroethylene (TCE)	3.9	ug/L	4/25/2016	
Trichloroethylene (TCE)	3.8	ug/L	12/1/2018	
Trichloroethylene (TCE)	3.8	ug/L	12/3/2018	
Trichloroethylene (TCE)	3.8	ug/L	3/1/2019	

SM-3 Well Data - Contaminants

Analyte	Value	Units	Date	Notes
Trichloroethylene (TCE)	3.8	ug/L	3/4/2019	
Trichloroethylene (TCE)	3.8	ug/L	2/1/2020	
Trichloroethylene (TCE)	3.8	ug/L	2/3/2020	
Trichloroethylene (TCE)	3.7	ug/L	1/1/2019	
Trichloroethylene (TCE)	3.7	ug/L	1/7/2019	
Trichloroethylene (TCE)	3.7	ug/L	5/1/2019	
Trichloroethylene (TCE)	3.7	ug/L	5/6/2019	
Trichloroethylene (TCE)	3.7	ug/L	3/1/2020	
Trichloroethylene (TCE)	3.7	ug/L	3/2/2020	
Trichloroethylene (TCE)	3.6	ug/L	8/22/2016	
Trichloroethylene (TCE)	3.6	ug/L	11/1/2019	
Trichloroethylene (TCE)	3.6	ug/L	11/4/2019	
Trichloroethylene (TCE)	3.5	ug/L	6/27/2016	
Trichloroethylene (TCE)	3.4	ug/L	2/22/2016	
Trichloroethylene (TCE)	3.4	ug/L	10/2/2017	
Trichloroethylene (TCE)	3.4	ug/L	10/2/2017	
Trichloroethylene (TCE)	3.4	ug/L	11/6/2017	
Trichloroethylene (TCE)	3.4	ug/L	11/6/2017	
Trichloroethylene (TCE)	3.4	ug/L	7/1/2019	
Trichloroethylene (TCE)	3.4	ug/L	7/1/2019	
Trichloroethylene (TCE)	3.4	ug/L	8/5/2019	
Trichloroethylene (TCE)	3.4	ug/L	8/9/2019	
Trichloroethylene (TCE)	3.4	ug/L	8/9/2019	
Trichloroethylene (TCE)	3.3	ug/L	1/25/2016	
Trichloroethylene (TCE)	3.3	ug/L	7/25/2016	
Trichloroethylene (TCE)	3.3	ug/L	9/26/2016	
Trichloroethylene (TCE)	3.1	ug/L	10/24/2016	
Trichloroethylene (TCE)	3.1	ug/L	2/27/2017	
Trichloroethylene (TCE)	3.1	ug/L	2/27/2017	
Trichloroethylene (TCE)	3.1	ug/L	4/24/2017	
Trichloroethylene (TCE)	3.1	ug/L	4/27/2017	
Trichloroethylene (TCE)	3.1	ug/L	6/26/2017	
Trichloroethylene (TCE)	3.1	ug/L	6/26/2017	
Trichloroethylene (TCE)	3.1	ug/L	1/1/2018	
Trichloroethylene (TCE)	3.1	ug/L	1/2/2018	
Trichloroethylene (TCE)	3.1	ug/L	11/1/2018	
Trichloroethylene (TCE)	3.1	ug/L	11/5/2018	
Trichloroethylene (TCE)	3	ug/L	11/28/2016	
Trichloroethylene (TCE)	3	ug/L	12/26/2016	
Trichloroethylene (TCE)	3	ug/L	3/27/2017	
Trichloroethylene (TCE)	3	ug/L	3/27/2017	
Trichloroethylene (TCE)	3	ug/L	12/4/2017	

SM-3 Well Data - Contaminants

Analyte	Value	Units	Date	Notes
Trichloroethylene (TCE)	3	ug/L	12/4/2017	
Trichloroethylene (TCE)	3	ug/L	2/1/2018	
Trichloroethylene (TCE)	3	ug/L	2/5/2018	
Trichloroethylene (TCE)	3	ug/L	1/1/2020	
Trichloroethylene (TCE)	3	ug/L	1/6/2020	
Trichloroethylene (TCE)	2.9	ug/L	8/22/2016	
Trichloroethylene (TCE)	2.8	ug/L	1/23/2017	
Trichloroethylene (TCE)	2.8	ug/L	1/23/2017	
Trichloroethylene (TCE)	2.8	ug/L	5/22/2017	
Trichloroethylene (TCE)	2.8	ug/L	5/22/2017	
Trichloroethylene (TCE)	2.8	ug/L	8/28/2017	
Trichloroethylene (TCE)	2.8	ug/L	8/28/2017	
Trichloroethylene (TCE)	2.8	ug/L	10/1/2018	
Trichloroethylene (TCE)	2.8	ug/L	10/1/2018	
Trichloroethylene (TCE)	2.7	ug/L	8/28/2017	
Trichloroethylene (TCE)	2.7	ug/L	3/1/2018	
Trichloroethylene (TCE)	2.7	ug/L	3/5/2018	
Trichloroethylene (TCE)	2.7	ug/L	4/1/2018	
Trichloroethylene (TCE)	2.7	ug/L	4/2/2018	
Trichloroethylene (TCE)	2.7	ug/L	8/1/2018	
Trichloroethylene (TCE)	2.7	ug/L	8/8/2018	
Trichloroethylene (TCE)	2.6	ug/L	9/5/2017	
Trichloroethylene (TCE)	2.6	ug/L	9/5/2017	
Trichloroethylene (TCE)	2.5	ug/L	5/23/2016	
Trichloroethylene (TCE)	2.5	ug/L	7/24/2017	
Trichloroethylene (TCE)	2.5	ug/L	7/24/2017	
Trichloroethylene (TCE)	2.4	ug/L	5/1/2018	
Trichloroethylene (TCE)	2.4	ug/L	5/7/2018	
Trichloroethylene (TCE)	2	ug/L	9/1/2018	
Trichloroethylene (TCE)	2	ug/L	9/4/2018	
Trichloroethylene (TCE)	1.8	ug/L	12/1/2019	
Trichloroethylene (TCE)	1.8	ug/L	12/16/2019	
Trichloroethylene (TCE)	0.5	ug/L	8/14/2018	
Trichlorofluoromethane	ND	ug/L	8/9/2019	
Trichlorofluoromethane	ND	ug/L	8/25/2018	
Trichlorofluoromethane	ND	ug/L	8/9/2019	
Trichlorotrifluoroethane(Freon 113)	ND	ug/L	8/9/2019	
Trichlorotrifluoroethane(Freon 113)	ND	ug/L	8/25/2018	
Trichlorotrifluoroethane(Freon 113)	ND	ug/L	8/9/2019	
Vinyl chloride (VC)	ND (R7)	ug/L	8/25/2018	
Vinyl chloride (VC)	ND	ug/L	8/9/2019	
Vinyl chloride (VC)	ND	ug/L	8/9/2019	

SM-3 Well Data - Contaminants

Analyte	Value	Units	Date	Notes
pH	6.67		8/12/2019	
pH	6.66		5/6/2019	
pH	6.54		6/17/2019	
pH	6.31		10/7/2019	
pH	6.14		7/1/2019	
pH	6.03		8/26/2019	
UVT	101.4		8/26/2019	
UVT	100.5		10/7/2019	
UVT	98.2		6/17/2019	
UVT	98.2		8/12/2019	
UVT	97.2		7/1/2019	
UVT	92.1		5/6/2019	

SM-4 Well Data - Contaminants

COLL DATE	ANALYTE	RESULT	MEASURE
06/30/2020	1-(3,4-Dichlorophenyl)-3-methylurea ND	ND	ug/L
06/30/2020	1-(3,4-Dichlorophenyl)urea ND	ND	ug/L
06/30/2020	1,1,1,2-Tetrachloroethane ND	ND	ug/L
06/30/2020	1,1,1,2-Tetrachloroethane ND	ND	ug/L
06/30/2020	1,1,1-Trichloroethane ND	ND	ug/L
06/30/2020	1,1,1-Trichloroethane ND	ND	ug/L
06/30/2020	1,1,2,2-Tetrachloroethane ND	ND	ug/L
06/30/2020	1,1,2,2-Tetrachloroethane ND	ND	ug/L
06/30/2020	1,1,2-Trichloroethane ND	ND	ug/L
06/30/2020	1,1,2-Trichloroethane ND	ND	ug/L
06/30/2020	1,1-Dichloroethane 0.16	0.16	ug/L
06/30/2020	1,1-Dichloroethane ND	ND	ug/L
06/30/2020	1,1-Dichloroethene 1.2	1.2	ug/L
06/30/2020	1,1-Dichloroethene ND	ND	ug/L
06/30/2020	1,1-Dichloropropene ND	ND	ug/L
06/30/2020	1,1-Dichloropropene ND	ND	ug/L
06/30/2020	1,1-Dimethylhydrazine	ND	ug/L
06/30/2020	1,2,3-Trichlorobenzene ND	ND	ug/L
06/30/2020	1,2,3-Trichlorobenzene ND	ND	ug/L
06/30/2020	1,2,3-Trichloropropane	0.0026	ug/l
06/30/2020	1,2,3-Trichloropropane	ND	ug/l
06/30/2020	1,2,4-Trichlorobenzene	ND	ug/L
06/30/2020	1,2,4-Trichlorobenzene ND	ND	ug/L
06/30/2020	1,2,4-Trichlorobenzene ND	ND	ug/L
06/30/2020	1,2,4-Trimethylbenzene ND	ND	ug/L
06/30/2020	1,2,4-Trimethylbenzene ND	ND	ug/L
06/30/2020	1,2-Dibromo-3-chloropropane ND	ND	ug/L
06/30/2020	1,2-Dibromo-3-chloropropane ND	ND	ug/L
06/30/2020	1,2-Dibromoethane (EDB) ND	ND	ug/L
06/30/2020	1,2-Dibromoethane (EDB) ND	ND	ug/L
06/30/2020	1,2-Dichlorobenzene	ND	ug/L
06/30/2020	1,2-Dichlorobenzene-d4	9.84	ug/l
06/30/2020	1,2-Dichloroethane ND	ND	ug/L
06/30/2020	1,2-Dichloroethane ND	ND	ug/L
06/30/2020	1,2-Dichloropropane ND	ND	ug/L
06/30/2020	1,2-Dichloropropane ND	ND	ug/L
06/30/2020	1,2-Diphenylhydrazine/Azobenzene	ND	ug/L
06/30/2020	1,3,5-Trimethylbenzene ND	ND	ug/L
06/30/2020	1,3,5-Trimethylbenzene ND	ND	ug/L
06/30/2020	1,3,5-Trinitrobenzene	ND	ug/L
06/30/2020	1,3,5-Trinitrobenzene	ND	ug/L
06/30/2020	1,3-Dichlorobenzene	ND	ug/L
06/30/2020	1,3-Dichloropropane ND	ND	ug/L
06/30/2020	1,3-Dichloropropane ND	ND	ug/L

SM-4 Well Data - Contaminants

COLL DATE	ANALYTE	RESULT	MEASURE
06/30/2020	1,3-Dichloropropene, Total ND	ND	ug/L
06/30/2020	1,3-Dichloropropene, Total ND	ND	ug/L
06/30/2020	1,3-Dinitrobenzene	ND	ug/L
06/30/2020	1,4-Dichlorobenzene	ND	ug/L
06/30/2020	1,4-Dioxane	20	ug/L
06/30/2020	11Cl-PF3OUdS	ND	ng/l
06/30/2020	11Cl-PF3OUdS ND	ND	ng/L
06/30/2020	13C2-PFDA	34.8	ng/l
06/30/2020	13C2-PFHxA	44.0	ng/l
06/30/2020	2,2-Dichloropropane ND	ND	ug/L
06/30/2020	2,2-Dichloropropane ND	ND	ug/L
06/30/2020	2,3,7,8-TCDD (Dioxin) ND		pg/L
06/30/2020	2,4,5-T	ND	ug/L
06/30/2020	2,4,5-TP (Silvex)	ND	ug/L
06/30/2020	2,4,5-Trichlorophenol	ND	ug/L
06/30/2020	2,4,6-Trichlorophenol	ND	ug/L
06/30/2020	2,4,6-Trinitrotoluene	ND	ug/L
06/30/2020	2,4-D	ND	ug/L
06/30/2020	2,4-DB	ND	ug/L
06/30/2020	2,4-Dichlorophenol	ND	ug/L
06/30/2020	2,4-Dimethylphenol	ND	ug/L
06/30/2020	2,4-Dinitrophenol	ND	ug/L
06/30/2020	2,4-Dinitrotoluene	ND	ug/L
06/30/2020	2,4-Dinitrotoluene	ND	ug/L
06/30/2020	2,4-Dinitrotoluene ND	ND	ug/L
06/30/2020	2,6-Dinitrotoluene	ND	ug/L
06/30/2020	2,6-Dinitrotoluene	ND	ug/L
06/30/2020	2,6-Dinitrotoluene ND	ND	ug/L
06/30/2020	2-Amino-4,6-Dinitrotoluene	ND	ug/L
06/30/2020	2-Butanone ND	ND	ug/L
06/30/2020	2-Butanone ND	ND	ug/L
06/30/2020	2-Chloroethyl vinyl ether	ND	ug/L
06/30/2020	2-Chloronaphthalene	ND	ug/L
06/30/2020	2-Chlorophenol	ND	ug/L
06/30/2020	2-Chlorotoluene ND	ND	ug/L
06/30/2020	2-Chlorotoluene ND	ND	ug/L
06/30/2020	2-Hexanone ND	ND	ug/L
06/30/2020	2-Hexanone ND	ND	ug/L
06/30/2020	2-Methyl-4,6-dinitrophenol	ND	ug/L
06/30/2020	2-Methylnaphthalene	ND	ug/L
06/30/2020	2-Methylphenol	ND	ug/L
06/30/2020	2-Nitroaniline	ND	ug/L
06/30/2020	2-Nitrophenol	ND	ug/L
06/30/2020	2-Nitrotoluene	ND	ug/L

SM-4 Well Data - Contaminants

COLL DATE	ANALYTE	RESULT	MEASURE
06/30/2020	3 & 4-Methylphenol	ND	ug/L
06/30/2020	3,3'-Dichlorobenzidine	ND	ug/L
06/30/2020	3,4-Dichloroaniline ND	ND	ug/L
06/30/2020	3,5-Dichlorobenzoic acid	ND	ug/L
06/30/2020	3-Hydroxycarbofuran	ND	ug/L
06/30/2020	3-Nitroaniline	ND	ug/L
06/30/2020	3-Nitrotoluene	ND	ug/L
06/30/2020	4,4´-DDD	ND	ug/L
06/30/2020	4,4´-DDD ND	ND	ug/L
06/30/2020	4,4´-DDE	ND	ug/L
06/30/2020	4,4´-DDE ND	ND	ug/L
06/30/2020	4,4´-DDT	ND	ug/L
06/30/2020	4,4´-DDT ND	ND	ug/L
06/30/2020	4-Amino-2,6-Dinitrotoluene	ND	ug/L
06/30/2020	4-Bromofluorobenzene	9.67	ug/l
06/30/2020	4-Bromophenyl phenyl ether	ND	ug/L
06/30/2020	4-Chloro-3-methylphenol	ND	ug/L
06/30/2020	4-Chloroaniline	ND	ug/L
06/30/2020	4-Chlorophenyl phenyl ether	ND	ug/L
06/30/2020	4-Chlorotoluene ND	ND	ug/L
06/30/2020	4-Chlorotoluene ND	ND	ug/L
06/30/2020	4-Methyl-2-pentanone ND	ND	ug/L
06/30/2020	4-Methyl-2-pentanone ND	ND	ug/L
06/30/2020	4-Nitroaniline	ND	ug/L
06/30/2020	4-Nitrophenol	ND	ug/L
06/30/2020	4-Nitrotoluene	ND	ug/L
06/30/2020	4-Nonylphenol	ND	ng/L
06/30/2020	4-Octylphenol	ND	ng/L
06/30/2020	4-tert-Octylphenol	ND	ng/L
06/30/2020	4-tert-Octylphenol diethoxylate	ND	ng/L
06/30/2020	4-tert-Octylphenol monoethoxylate	ND	ng/L
06/30/2020	9Cl-PF3ONS	ND	ng/l
06/30/2020	9Cl-PF3ONS ND	ND	ng/L
06/30/2020	Acenaphthene	ND	ug/L
06/30/2020	Acenaphthene ND	ND	ug/L
06/30/2020	Acenaphthylene	ND	ug/L
06/30/2020	Acenaphthylene ND	ND	ug/L
06/30/2020	Acetaldehyde	ND	mg/L
06/30/2020	Acetochlor ESA	ND	ng/L
06/30/2020	Acetochlor ND	ND	ug/L
06/30/2020	Acetochlor OA	6.8	ng/L
06/30/2020	Acetone 790	790	ug/L
06/30/2020	Acetone ND	ND	ug/L
06/30/2020	Acetonitrile 0.32	0.32	ug/L

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COLL DATE	ANALYTE	RESULT	MEASURE
06/30/2020	Acetonitrile 7.9	7.9	ug/L
06/30/2020	Acifluorfen	ND	ug/L
06/30/2020	Acrolein ND	ND	ug/L
06/30/2020	Acrolein ND	ND	ug/L
06/30/2020	Acrylonitrile ND	ND	ug/L
06/30/2020	Acrylonitrile ND	ND	ug/L
06/30/2020	ADONA	ND	ng/l
06/30/2020	ADONA ND	ND	ng/L
06/30/2020	Aggressive Index	12.4	ug/L
06/30/2020	Alachlor ESA	ND	ng/L
06/30/2020	Alachlor ND	ND	ug/L
06/30/2020	Alachlor OA	ND	ng/L
06/30/2020	Aldicarb	ND	ug/L
06/30/2020	Aldicarb sulfone	ND	ug/L
06/30/2020	Aldicarb sulfoxide	ND	ug/L
06/30/2020	Aldrin	ND	ug/L
06/30/2020	Aldrin ND	ND	ug/L
06/30/2020	Alkalinity as CaCO3	360	mg/L
06/30/2020	Allyl chloride ND	ND	ug/L
06/30/2020	Allyl chloride ND	ND	ug/L
06/30/2020	alpha-BHC	ND	ug/L
06/30/2020	alpha-BHC ND	ND	ug/L
06/30/2020	alpha-Chlordane ND	ND	ug/L
06/30/2020	Aluminum, Dissolved	3.4	mg/L
06/30/2020	Aluminum, Total	2400	ug/L
06/30/2020	Ammonia as N	ND	mg/L
06/30/2020	Aniline	ND	ug/L
06/30/2020	Anthracene	ND	ug/L
06/30/2020	Anthracene ND	ND	ug/L
06/30/2020	Antimony, Dissolved	0.072	ug/L
07/01/2020	Antimony, Total	0.2	ug/L
06/30/2020	Aroclor 1016	ND	ug/L
06/30/2020	Aroclor 1221	ND	ug/L
06/30/2020	Aroclor 1232	ND	ug/L
06/30/2020	Aroclor 1242	ND	ug/L
06/30/2020	Aroclor 1248	ND	ug/L
06/30/2020	Aroclor 1254	ND	ug/L
06/30/2020	Aroclor 1260	ND	ug/L
06/30/2020	Arsenic III	ND	ug/L
06/30/2020	Arsenic III, Dissolved	ND	ug/L
07/01/2020	Arsenic V	1.1	ug/L
07/01/2020	Arsenic V, Dissolved	0.33	ug/L
07/01/2020	Arsenic, Dissolved	0.71	ug/L
07/01/2020	Arsenic, Total	2	ug/L

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COLL DATE	ANALYTE	RESULT	MEASURE
06/30/2020	Asbestos	ND	MFL
06/30/2020	Atrazine ND	ND	ug/L
07/01/2020	Barium, Dissolved	45	ug/L
07/01/2020	Barium, Total	60	ug/L
06/30/2020	Bentazon	ND	ug/L
06/30/2020	Benzaldehyde	ND	mg/L
06/30/2020	Benzene ND	ND	ug/L
06/30/2020	Benzene ND	ND	ug/L
06/30/2020	Benzidine	ND	ug/L
06/30/2020	Benzo (a) anthracene	ND	ug/L
06/30/2020	Benzo (a) anthracene ND	ND	ug/L
06/30/2020	Benzo (a) pyrene	ND	ug/L
06/30/2020	Benzo (a) pyrene ND	ND	ug/L
06/30/2020	Benzo (b) fluoranthene	ND	ug/L
06/30/2020	Benzo (b) fluoranthene ND	ND	ug/L
06/30/2020	Benzo (g,h,i) perylene	ND	ug/L
06/30/2020	Benzo (g,h,i) perylene ND	ND	ug/L
06/30/2020	Benzo (k) fluoranthene	ND	ug/L
06/30/2020	Benzo (k) fluoranthene ND	ND	ug/L
06/30/2020	Benzoic acid	ND	ug/L
06/30/2020	Benzyl alcohol	ND	ug/L
06/30/2020	Beryllium, Dissolved	ND	ug/L
07/01/2020	Beryllium, Total	0.088	ug/L
06/30/2020	beta-BHC	ND	ug/L
06/30/2020	beta-BHC ND	ND	ug/L
07/01/2020	Bicarbonate Alkalinity as HCO3	440	mg/L
06/30/2020	Biochemical Oxygen Demand	ND	mg/L
06/30/2020	Bis(2-chloroethoxy)methane	ND	ug/L
06/30/2020	Bis(2-chloroethyl)ether	ND	ug/L
06/30/2020	Bis(2-chloroisopropyl)ether	ND	ug/L
06/30/2020	Bis(2-ethylhexyl)adipate ND	ND	ug/L
06/30/2020	Bis(2-ethylhexyl)phthalate	ND	ug/L
06/30/2020	Bis(2-ethylhexyl)phthalate ND	ND	ug/L
07/01/2020	Boron, Dissolved	130	ug/L
07/01/2020	Boron, Total	130	mg/L
06/30/2020	Bromacil ND	ND	ug/L
06/30/2020	Bromate	ND	ug/L
07/01/2020	Bromide	540	ug/L
06/30/2020	Bromobenzene ND	ND	ug/L
06/30/2020	Bromobenzene ND	ND	ug/L
06/30/2020	Bromochloroacetic acid (bcaa)	ND	ug/L
06/30/2020	Bromochloromethane ND	ND	ug/L
06/30/2020	Bromochloromethane ND	ND	ug/L
06/30/2020	Bromodichloromethane 0.095	0.095	ug/L

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COLL DATE	ANALYTE	RESULT	MEASURE
06/30/2020	Bromodichloromethane ND	ND	ug/L
06/30/2020	Bromoform 1.5	1.5	ug/L
06/30/2020	Bromoform ND	ND	ug/L
06/30/2020	Bromomethane ND	ND	ug/L
06/30/2020	Bromomethane ND	ND	ug/L
06/30/2020	Butachlor ND	ND	ug/L
06/30/2020	Butanal	ND	ug/L
06/30/2020	Butyl benzyl phthalate	ND	ug/L
06/30/2020	Butyl benzyl phthalate 3.7	3.7	ug/L
06/30/2020	Cadmium, Dissolved	0.083	ug/L
06/30/2020	Cadmium, Total	0.17	ug/L
06/30/2020	Caffeine ND	ND	ug/L
06/30/2020	Calcium, Dissolved	143	mg/L
06/30/2020	Calcium, Total	144	mg/L
06/30/2020	Captan ND	ND	ug/L
06/30/2020	Carbaryl	ND	ug/L
06/30/2020	Carbazole	0.41	ug/L
06/30/2020	Carbofuran	ND	ug/L
06/30/2020	Carbon Disulfide ND	ND	ug/L
06/30/2020	Carbon Disulfide ND	ND	ug/L
06/30/2020	Carbon tetrachloride	0.13	ug/L
06/30/2020	Carbon tetrachloride ND	ND	ug/L
06/30/2020	Carbonate Alkalinity as CaCO3	ND	mg/L
06/30/2020	Chloramben	ND	ug/L
06/30/2020	Chlorate	91	ug/L
06/30/2020	Chlordane (tech)	ND	ug/L
06/30/2020	Chloride, Total	120	mg/L
06/30/2020	Chlorine Residual, Free	0.035	mg/L
06/30/2020	Chlorine Residual, Free	0.035	mg/L
06/30/2020	Chlorine Residual, Total	0.048	mg/L
06/30/2020	Chlorite	13	ug/L
06/30/2020	Chlorobenzene ND	ND	ug/L
06/30/2020	Chlorobenzene ND	ND	ug/L
06/30/2020	Chloroethane ND	ND	ug/L
06/30/2020	Chloroethane ND	ND	ug/L
06/30/2020	Chloroform 2.2	2.2	ug/L
06/30/2020	Chloroform ND	ND	ug/L
06/30/2020	Chloromethane ND	ND	ug/L
06/30/2020	Chloromethane ND	ND	ug/L
06/30/2020	Chlorothalonil	ND	ug/L
06/30/2020	Chlorpropham ND	ND	ug/L
06/30/2020	Chromium 6+	1.1	ug/L
06/30/2020	Chromium, Dissolved	0.93	ug/L
06/30/2020	Chromium, Total	7.2	ug/L

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COLL DATE	ANALYTE	RESULT	MEASURE
06/30/2020	Chrysene	ND	ug/L
06/30/2020	Chrysene ND	ND	ug/L
06/30/2020	cis-1,2-Dichloroethene 0.45	0.45	ug/L
06/30/2020	cis-1,2-Dichloroethene ND	ND	ug/L
06/30/2020	cis-1,3-Dichloropropene ND	ND	ug/L
06/30/2020	cis-1,3-Dichloropropene ND	ND	ug/L
06/30/2020	cis-Nonachlor ND	ND	ug/L
06/30/2020	Cobalt, Dissolved	0.09	ug/L
06/30/2020	Cobalt, Total	1	ug/L
06/30/2020	Color	ND	CU
06/30/2020	Copper, Dissolved	3.3	ug/L
06/30/2020	Copper, Total	16	ug/L
06/30/2020	Crotonaldehyde	ND	ug/L
06/30/2020	Cyanazine ND	ND	ug/L
06/30/2020	Cyanide, Total	ND	ug/L
06/30/2020	Cyclohexanone	ND	ug/L
06/30/2020	d5-EtFOSAA	32.3	ng/l
06/30/2020	Dalapon	ND	ug/L
06/30/2020	DCPA	ND	ug/L
06/30/2020	Decanal	ND	ug/L
06/30/2020	delta-BHC	ND	ug/L
06/30/2020	delta-BHC ND	ND	ug/L
06/30/2020	Diazinon ND	ND	ug/L
06/30/2020	Dibenzo (a,h) anthracene	ND	ug/L
06/30/2020	Dibenzo (a,h) anthracene ND	ND	ug/L
06/30/2020	Dibenzofuran	ND	ug/L
06/30/2020	Dibromoacetic acid (dbaa)	ND	ug/L
06/30/2020	Dibromochloromethane ND	ND	ug/L
06/30/2020	Dibromochloromethane ND	ND	ug/L
06/30/2020	Dibromomethane ND	ND	ug/L
06/30/2020	Dibromomethane ND	ND	ug/L
06/30/2020	Dicamba	ND	ug/L
06/30/2020	Dichloramine	0.007	mg/L
06/30/2020	Dichloroacetic acid (dcaa)	ND	ug/L
06/30/2020	Dichlorodifluoromethane (Freon 12)	ND	ug/L
06/30/2020	Dichlorodifluoromethane (Freon 12)	ND	ug/L
06/30/2020	Dichloroprop	ND	ug/L
06/30/2020	Dieldrin	ND	ug/L
06/30/2020	Dieldrin ND	ND	ug/L
06/30/2020	Diethyl phthalate	ND	ug/L
06/30/2020	Diethyl phthalate ND	ND	ug/L
06/30/2020	Di-isopropyl ether ND	ND	ug/L
06/30/2020	Di-isopropyl ether ND	ND	ug/L
06/30/2020	Dimethoate ND	ND	ug/L

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COLL DATE	ANALYTE	RESULT	MEASURE
06/30/2020	Dimethyl phthalate	ND	ug/L
06/30/2020	Dimethyl phthalate ND	ND	ug/L
06/30/2020	Di-n-butyl phthalate	ND	ug/L
06/30/2020	Di-n-butyl phthalate ND	ND	ug/L
06/30/2020	Di-n-octyl phthalate	0.23	ug/L
06/30/2020	Di-n-octyl phthalate ND	ND	ug/L
06/30/2020	Dinoseb	ND	ug/L
06/30/2020	Diphenamid ND	ND	ug/L
06/30/2020	Diquat	ND	ug/L
06/30/2020	Disulfoton ND	ND	ug/L
06/30/2020	Diuron ND	ND	ug/L
06/30/2020	E. coli	ND	MPN/100 mL
06/30/2020	Endosulfan I	ND	ug/L
06/30/2020	Endosulfan I ND	ND	ug/L
06/30/2020	Endosulfan II	ND	ug/L
06/30/2020	Endosulfan II ND	ND	ug/L
06/30/2020	Endosulfan sulfate	ND	ug/L
06/30/2020	Endosulfan sulfate ND	ND	ug/L
06/30/2020	Endothall	ND	ug/L
06/30/2020	Endrin	ND	ug/L
06/30/2020	Endrin aldehyde	ND	ug/L
06/30/2020	Endrin aldehyde ND	ND	ug/L
06/30/2020	Endrin ketone ND	ND	ug/L
06/30/2020	Endrin ND	ND	ug/L
06/30/2020	EPTC ND	ND	ug/L
06/30/2020	EtFOSAA	ND	ng/l
06/30/2020	EtFOSAA ND	ND	ng/L
06/30/2020	Ethanol	ND	mg/L
06/30/2020	Ethion ND	ND	ug/L
06/30/2020	Ethyl methacrylate ND	ND	ug/L
06/30/2020	Ethyl methacrylate ND	ND	ug/L
06/30/2020	Ethyl tert-butyl ether ND	ND	ug/L
06/30/2020	Ethyl tert-butyl ether ND	ND	ug/L
06/30/2020	Ethylbenzene ND	ND	ug/L
06/30/2020	Ethylbenzene ND	ND	ug/L
06/30/2020	Ethylene glycol	ND	ug/L
06/30/2020	Fecal Coliform	ND	MPN/100 mL
06/30/2020	Fluoranthene	ND	ug/L
06/30/2020	Fluoranthene ND	ND	ug/L
06/30/2020	Fluorene	ND	ug/L
06/30/2020	Fluorene ND	ND	ug/L
06/30/2020	Fluoride, Total	0.29	mg/L
06/30/2020	Fonofos	ND	ng/L
06/30/2020	Formaldehyde	ND	ug/L

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COLL DATE	ANALYTE	RESULT	MEASURE
06/30/2020	Freon 113 ND	ND	ug/L
06/30/2020	Freon 113 ND	ND	ug/L
06/30/2020	gamma-BHC (Lindane) ND	ND	ug/L
06/30/2020	gamma-Chlordane ND	ND	ug/L
06/30/2020	Gasoline Range Organics	160	ug/L
06/30/2020	Glyoxal	ND	ug/L
06/30/2020	Glyphosate	ND	ug/L
06/30/2020	Gross Alpha	3.5	pCi/L
06/30/2020	Gross Beta	8.1	pCi/L
06/30/2020	HAA5, Total	ND	ug/L
06/30/2020	Hardness as CaCO3	642	mg/L
06/30/2020	Heptachlor epoxide ND	ND	ug/L
06/30/2020	Heptachlor ND	ND	ug/L
06/30/2020	Heptanal	ND	ug/L
06/30/2020	Heterotrophic Plate Count	22	CFU/mL
06/30/2020	Hexachlorobenzene	ND	ug/L
06/30/2020	Hexachlorobenzene ND	ND	ug/L
06/30/2020	Hexachlorobutadiene	ND	ug/L
06/30/2020	Hexachlorobutadiene ND	ND	ug/L
06/30/2020	Hexachlorobutadiene ND	ND	ug/L
06/30/2020	Hexachlorocyclopentadiene	ND	ug/L
06/30/2020	Hexachlorocyclopentadiene ND	ND	ug/L
06/30/2020	Hexachloroethane	ND	ug/L
06/30/2020	Hexanal	ND	ug/L
06/30/2020	HFPO-DA	ND	ng/l
06/30/2020	HFPO-DA ND	ND	ng/L
06/30/2020	HFPO-DA-13C3	43.6	ng/l
06/30/2020	HMX	ND	ug/L
06/30/2020	Hydrazine	ND	ug/L
06/30/2020	Hydroxide Alkalinity as CaCO3	ND	mg/L
06/30/2020	Indeno (1,2,3-cd) pyrene	ND	ug/L
06/30/2020	Indeno (1,2,3-cd) pyrene ND	ND	ug/L
06/30/2020	Iodide	6.9	ug/L
06/30/2020	Iodomethane ND	ND	ug/L
06/30/2020	Iodomethane ND	ND	ug/L
06/30/2020	Iron, Dissolved	1.4	mg/L
06/30/2020	Iron, Total	3.2	mg/L
06/30/2020	Isophorone	ND	ug/L
06/30/2020	Isopropyl alcohol	ND	ug/L
06/30/2020	Isopropylbenzene ND	ND	ug/L
06/30/2020	Isopropylbenzene ND	ND	ug/L
06/30/2020	Langelier Index @ 60	0.985	--
06/30/2020	Langelier Index @ Source Temp	0.476	--
06/30/2020	Lead, Dissolved	0.22	ug/L

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COLL DATE	ANALYTE	RESULT	MEASURE
06/30/2020	Lead, Total	4	ug/L
06/30/2020	Linuron ND	ND	ug/L
06/30/2020	Lithium, Dissolved	ND	ug/L
06/30/2020	Lithium, Total	ND	ug/L
06/30/2020	m,p-Xylene ND	ND	ug/L
06/30/2020	m,p-Xylene ND	ND	ug/L
06/30/2020	Magnesium, Dissolved	66.8	mg/L
06/30/2020	Magnesium, Total	68.4	mg/L
06/30/2020	Manganese, Dissolved	33	ug/L
06/30/2020	Manganese, Total	67	ug/L
06/30/2020	MBAS	ND	mg/L
06/30/2020	m-Dichlorobenzene ND	ND	ug/L
06/30/2020	m-Dichlorobenzene ND	ND	ug/L
06/30/2020	MeFOSAA	ND	ng/l
06/30/2020	MeFOSAA ND	ND	ng/L
06/30/2020	Mercury, Dissolved	ND	ug/L
06/30/2020	Methacrylonitrile ND	ND	ug/L
06/30/2020	Methacrylonitrile ND	ND	ug/L
06/30/2020	Methanol	ND	ug/L
06/30/2020	Methiocarb	ND	ug/L
06/30/2020	Methomyl	ND	ug/L
06/30/2020	Methoxychlor ND	ND	ug/L
06/30/2020	Methyl Glyoxal	ND	ug/L
06/30/2020	Methyl methacrylate ND	ND	ug/L
06/30/2020	Methyl methacrylate ND	ND	ug/L
06/30/2020	Methyl tert-butyl ether (MTBE) ND	ND	ug/L
06/30/2020	Methyl tert-butyl ether (MTBE) ND	ND	ug/L
06/30/2020	Methylene chloride ND	ND	ug/L
06/30/2020	Methylene chloride ND	ND	ug/L
06/30/2020	Metolachlor ESA	ND	ng/L
06/30/2020	Metolachlor ND	ND	ug/L
06/30/2020	Metolachlor OA	3.9	ng/L
06/30/2020	Metribuzin ND	ND	ug/L
06/30/2020	Mirex ND	ND	ug/L
06/30/2020	Molybdenum, Dissolved	7.4	ug/L
06/30/2020	Molybdenum, Total	7.5	ug/L
06/30/2020	Monobromoacetic acid (mbaa)	ND	ug/L
06/30/2020	Monochloramine	0.006	mg/L
06/30/2020	Monochloroacetic acid (mcaa)	ND	ug/L
06/30/2020	Monomethylhydrazine (MMH)	ND	ug/L
06/30/2020	Naphthalene	ND	ug/L
06/30/2020	Naphthalene ND	ND	ug/L
06/30/2020	Naphthalene ND	ND	ug/L
06/30/2020	Naphthalene ND	ND	ug/L

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COLL DATE	ANALYTE	RESULT	MEASURE
06/30/2020	n-Butylbenzene ND	ND	ug/L
06/30/2020	n-Butylbenzene ND	ND	ug/L
06/30/2020	Nickel, Dissolved	0.54	ug/L
06/30/2020	Nickel, Total	4.1	ug/L
06/30/2020	Nitrate as N	5.8	mg/L
06/30/2020	Nitrite as N	ND	ug/L
06/30/2020	Nitrobenzene	ND	ug/L
06/30/2020	Nitrobenzene	ND	ug/L
06/30/2020	Nitrobenzene ND	ND	ug/L
06/30/2020	Nitrobenzene ND	ND	ug/L
06/30/2020	N-Nitrosodiethylamine (NDEA)	1.5	ng/L
06/30/2020	N-Nitrosodimethylamine	ND	ug/L
06/30/2020	N-Nitrosodimethylamine	ND	ng/L
06/30/2020	N-Nitrosodi-n-butylamine	ND	ng/L
06/30/2020	N-Nitrosodi-n-propylamine	ND	ug/L
06/30/2020	N-Nitrosodi-n-propylamine	ND	ng/L
06/30/2020	N-Nitrosodiphenylamine	ND	ug/L
06/30/2020	N-Nitrosomethylethylamine	ND	ng/L
06/30/2020	N-Nitrosomorpholine	12	ng/L
06/30/2020	N-Nitrosopiperidine	ND	ng/L
06/30/2020	N-Nitrosopyrrolidine	ND	ng/L
06/30/2020	NO2+NO3 as N	5800	ug/L
06/30/2020	Nonanal	ND	ug/L
06/30/2020	Nonylphenol	16	ng/L
06/30/2020	Nonylphenol diethoxylate	50	ng/L
06/30/2020	Nonylphenol monoethoxylate	11	ng/L
06/30/2020	n-Propylbenzene ND	ND	ug/L
06/30/2020	n-Propylbenzene ND	ND	ug/L
06/30/2020	o-Dichlorobenzene ND	ND	ug/L
06/30/2020	o-Dichlorobenzene ND	ND	ug/L
06/30/2020	Oil & Grease (HEM)	3.1	mg/L
06/30/2020	o-Phosphate as P	0.08	mg/L
06/30/2020	Oxamyl	ND	ug/L
06/30/2020	o-Xylene ND	ND	ug/L
06/30/2020	o-Xylene ND	ND	ug/L
06/30/2020	Paraquat	ND	ug/L
06/30/2020	PBDE-100	ND	ng/L
06/30/2020	PBDE-138	ND	ng/L
06/30/2020	PBDE-153	ND	ng/L
06/30/2020	PBDE-154	ND	ng/L
06/30/2020	PBDE-17	ND	ng/L
06/30/2020	PBDE-28	ND	ng/L
06/30/2020	PBDE-47	ND	ng/L
06/30/2020	PBDE-49	ND	ng/L

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COLL DATE	ANALYTE	RESULT	MEASURE
06/30/2020	PBDE-85	ND	ng/L
06/30/2020	PBDE-99	ND	ng/L
06/30/2020	p-Dichlorobenzene ND	ND	ug/L
06/30/2020	p-Dichlorobenzene ND	ND	ug/L
06/30/2020	Pentachloroethane ND	ND	ug/L
06/30/2020	Pentachloroethane ND	ND	ug/L
06/30/2020	Pentachloronitrobenzene (PCNB) ND	ND	ug/L
06/30/2020	Pentachlorophenol	ND	ug/L
06/30/2020	Pentachlorophenol	ND	ug/L
06/30/2020	Pentachlorophenol ND	ND	ug/L
06/30/2020	Pentanal	ND	ug/L
06/30/2020	Perchlorate	1.6	ug/L
06/30/2020	PFBS	2.7	ng/l
06/30/2020	PFBS ND	ND	ng/L
06/30/2020	PFDA	ND	ng/l
06/30/2020	PFDA ND	ND	ng/L
06/30/2020	PFDoA	ND	ng/l
06/30/2020	PFDoA ND	ND	ng/L
06/30/2020	PFHpA	1.7	ng/l
06/30/2020	PFHpA	0.71	ng/L
06/30/2020	PFHxA	4.6	ng/l
06/30/2020	PFHxA ND	ND	ng/L
06/30/2020	PFHxS	2.8	ng/l
06/30/2020	PFHxS ND	ND	ng/L
06/30/2020	PFNA	ND	ng/l
06/30/2020	PFNA ND	ND	ng/L
06/30/2020	PFOA	0.96	ng/l
06/30/2020	PFOA ND	ND	ng/L
06/30/2020	PFOS	ND	ng/l
06/30/2020	PFOS ND	ND	ng/L
06/30/2020	PFTeDA	ND	ng/l
06/30/2020	PFTeDA ND	ND	ng/L
06/30/2020	PFTrDA	ND	ng/l
06/30/2020	PFTrDA ND	ND	ng/L
06/30/2020	PFUnA	ND	ng/l
06/30/2020	PFUnA ND	ND	ng/L
06/30/2020	pH	7.31	
06/30/2020	pH	7.14	
06/30/2020	Phenanthrene	ND	ug/L
06/30/2020	Phenanthrene ND	ND	ug/L
06/30/2020	Phenol	ND	ug/L
06/30/2020	Phosphorus as PO4, Total	62	mg/L
06/30/2020	Picloram	ND	ug/L
06/30/2020	p-Isopropyltoluene ND	ND	ug/L

SM-4 Well Data - Contaminants

COLL DATE	ANALYTE	RESULT	MEASURE
06/30/2020	p-Isopropyltoluene ND	ND	ug/L
06/30/2020	Potassium, Dissolved	3.1	mg/L
06/30/2020	Potassium, Total	3.9	mg/L
06/30/2020	Prometon ND	ND	ug/L
06/30/2020	Prometryn	ND	ug/L
06/30/2020	Propachlor	ND	ug/L
06/30/2020	Propachlor ND	ND	ug/L
06/30/2020	Propanal	ND	ug/L
06/30/2020	Propoxur (Baygon)	ND	ug/L
06/30/2020	Pyrene	ND	ug/L
06/30/2020	Pyrene ND	ND	ug/L
06/30/2020	Pyridine	ND	ug/L
06/30/2020	Radium-226	0.643	pCi/L
06/30/2020	Radium-228	0.241	pCi/L
06/30/2020	RDX	ND	ug/L
06/30/2020	sec-Butylbenzene ND	ND	ug/L
06/30/2020	sec-Butylbenzene ND	ND	ug/L
06/30/2020	Selenium, Dissolved	4.6	ug/L
06/30/2020	Selenium, Total	4.3	ug/L
06/30/2020	Silica as SiO2, Dissolved	36	mg/L
06/30/2020	Silica as SiO2, Total	50	mg/L
06/30/2020	Silver, Dissolved	ND	ug/L
06/30/2020	Silver, Total	ND	ug/L
06/30/2020	Simazine ND	ND	ug/L
06/30/2020	Sodium, Dissolved	82	mg/L
06/30/2020	Sodium, Total	83	mg/L
06/30/2020	Specific Conductance (EC) 1500	1500	umhos/cm
06/30/2020	Strontium-90	-0.161	pCi/L
06/30/2020	Styrene ND	ND	ug/L
06/30/2020	Styrene ND	ND	ug/L
06/30/2020	Sulfate as SO4	280	mg/L
06/30/2020	Sulfide, Soluble	ND	mg/L
06/30/2020	Temperature	20	o
06/30/2020	Tentatively Identified Compounds ND	ND	ug/L
06/30/2020	Terbacil ND	ND	ug/L
06/30/2020	Terbufos	ND	ng/L
06/30/2020	Tert-amyl methyl ether ND	ND	ug/L
06/30/2020	Tert-amyl methyl ether ND	ND	ug/L
06/30/2020	Tert-butyl alcohol ND	ND	ug/L
06/30/2020	Tert-butyl alcohol ND	ND	ug/L
06/30/2020	tert-Butylbenzene ND	ND	ug/L
06/30/2020	tert-Butylbenzene ND	ND	ug/L
06/30/2020	Tetrachloroethene	41	ug/l
06/30/2020	Tetrachloroethene ND	ND	ug/L

SM-4 Well Data - Contaminants

COLL DATE	ANALYTE	RESULT	MEASURE
06/30/2020	Tetrachloroethylene (TIC)	13	ug/L
06/30/2020	Tetrahydrofuran ND	ND	ug/L
06/30/2020	Tetrahydrofuran ND	ND	ug/L
06/30/2020	Tetryl	ND	ug/L
06/30/2020	Thallium, Dissolved	ND	ug/L
06/30/2020	Thallium, Total	0.033	ug/L
06/30/2020	Thiobencarb ND	ND	ug/L
06/30/2020	THMs, Total 3.7	3.7	ug/L
06/30/2020	THMs, Total ND	ND	ug/L
06/30/2020	Thorium, Dissolved	ND	ug/L
06/30/2020	Thorium, Total	0.42	ug/L
06/30/2020	Threshold Odor Number	4	TON
06/30/2020	Toluene ND	ND	ug/L
06/30/2020	Toluene ND	ND	ug/L
06/30/2020	Total Anions	17	mg/L
06/30/2020	Total Cations	17	mg/L
06/30/2020	Total Coliform	6.9	ng/L
06/30/2020	Total Dissolved Solids	990	mg/L
06/30/2020	Total Hardness as CaCO3	642	mg/L
06/30/2020	Total Organic Carbon (TOC)	1.3	mg/L
06/30/2020	Total Settleable Solids	ND	mg/L
06/30/2020	Total Suspended Solids	54	mg/L
06/30/2020	Toxaphene	ND	ug/L
06/30/2020	trans-1,2-Dichloroethene ND	ND	ug/L
06/30/2020	trans-1,2-Dichloroethene ND	ND	ug/L
06/30/2020	trans-1,3-Dichloropropene ND	ND	ug/L
06/30/2020	trans-1,3-Dichloropropene ND	ND	ug/L
06/30/2020	trans-1,4-Dichloro-2-butene ND	ND	ug/L
06/30/2020	trans-1,4-Dichloro-2-butene ND	ND	ug/L
06/30/2020	Trichloroacetic acid (tcaa)	ND	ug/L
06/30/2020	Trichloroethene	43	ug/l
06/30/2020	Trichlorofluoromethane ND	ND	ug/L
06/30/2020	Trifluralin	ND	ug/L
06/30/2020	Trifluralin ND	ND	ug/L
06/30/2020	Trithion ND	ND	ug/L
06/30/2020	Tritium	-39.9	pCi/L
06/30/2020	Turbidity	48	NTU
06/30/2020	Uranium Rad	7.1	pCi/L
06/30/2020	UV 254	99.5	% T
06/30/2020	UV 254	ND	1/cm
06/30/2020	UV 254	0.008	1/cm
06/30/2020	UV 254	98.2	% T
06/30/2020	UV254	0.008	/cm
06/30/2020	UVT	98.2%	

SM-4 Well Data - Contaminants

COLL DATE	ANALYTE	RESULT	MEASURE
06/30/2020	Vanadium, Dissolved	4.2	ug/L
06/30/2020	Vanadium, Total	14	ug/L
06/30/2020	Vinyl acetate ND	ND	ug/L
06/30/2020	Vinyl acetate ND	ND	ug/L
06/30/2020	Vinyl chloride ND	ND	ug/L
06/30/2020	Vinyl chloride ND	ND	ug/L
06/30/2020	Xylenes, Total ND	ND	ug/L
06/30/2020	Xylenes, Total ND	ND	ug/L
06/30/2020	Zinc, Dissolved	9.1	ug/L
06/30/2020	Zinc, Total	22	ug/L

SM-8 Well Data - Contaminants

SAMP ID NO	COLL DATE	ANALYTE	RESULT	MEASURE
SM-8	06/09/2020	1-(3,4-Dichlorophenyl)-3-methylurea	ND	ug/l
SM-8	06/09/2020	1-(3,4-Dichlorophenyl)urea	ND	ug/l
SM-8	06/09/2020	1,1,1,2-Tetrachloroethane	ND	ug/l
SM-8	06/09/2020	1,1,1-Trichloroethane	ND	ug/l
SM-8	06/09/2020	1,1,2,2-Tetrachloroethane	ND	ug/l
SM-8	06/09/2020	1,1,2-Trichloroethane	ND	ug/l
SM-8	06/09/2020	1,1-Di+C656chloroethane	0.12	ug/l
SM-8	06/09/2020	1,1-Dichloroethene	0.72	ug/l
SM-8	06/09/2020	1,1-Dichloropropene	ND	ug/l
SM-8	06/09/2020	1,1-Dimethylhydrazine	ND	ug/l
SM-8	06/09/2020	1,2,3-Trichlorobenzene	ND	ug/l
SM-8	06/09/2020	1,2,3-Trichloropropane	ND	ug/l
SM-8	06/09/2020	1,2,4-Trichlorobenzene	ND	ug/l
SM-8	06/09/2020	1,2,4-Trimethylbenzene	ND	ug/l
SM-8	06/09/2020	1,2-Dibromo-3-chloropropane	ND	ug/l
SM-8	06/09/2020	1,2-Dibromoethane (EDB)	ND	ug/l
SM-8	06/09/2020	1,2-Dichlorobenzene	ND	ug/l
SM-8	06/09/2020	1,2-Dichlorobenzene-d4	12.4	ug/l
SM-8	06/09/2020	1,2-Dichlorobenzene-d4	12.4	ug/l
SM-8	06/09/2020	1,2-Dichloroethane	ND	ug/l
SM-8	06/09/2020	1,2-Dichloroethane-d4	51.7	ug/l
SM-8	06/09/2020	1,2-Dichloropropane	ND	ug/l
SM-8	06/09/2020	1,2-Diphenylhydrazine/Azobenzene	ND	ug/l
SM-8	06/09/2020	1,3,5-Trimethylbenzene	ND	ug/l
SM-8	06/09/2020	1,3,5-Trinitrobenzene	ND	ug/l
SM-8	06/09/2020	1,3,5-Trinitrobenzene	ND	ug/l
SM-8	06/09/2020	1,3-Dichlorobenzene	ND	ug/l
SM-8	06/09/2020	1,3-Dichloropropane	ND	ug/l
SM-8	06/09/2020	1,3-Dichloropropene, Total	ND	ug/l
SM-8	06/09/2020	1,3-Dimethyl-2-nitrobenzene	5.09	ug/l
SM-8	06/09/2020	1,3-Dinitrobenzene	ND	ug/l
SM-8	06/09/2020	1,4-Dichlorobenzene	ND	ug/l
SM-8	06/09/2020	1,4-Dioxane	5.3	ug/l
SM-8	06/09/2020	1,4-Dioxane-d8	10.3	ug/l
SM-8	06/09/2020	11Cl-PF3OUdS	ND	ng/l
SM-8	06/09/2020	13C2-PFDA	33.0	ng/l
SM-8	06/09/2020	13C2-PFHxA	33.2	ng/l
SM-8	06/09/2020	17-a-Estradiol	ND	ng/l
SM-8	06/09/2020	17-a-Ethynylestradiol	ND	ng/l
SM-8	06/09/2020	17-b-Estradiol	ND	ng/l
SM-8	06/09/2020	2,2-Dichloropropane	ND	ug/l
SM-8	06/09/2020	2,3,7,8-TCDD (Dioxin)	ND	pg/l
SM-8	06/09/2020	2,4,5-T	ND	ug/l
SM-8	06/09/2020	2,4,5-TFAP	15.9	ug/l
SM-8	06/09/2020	2,4,5-TP (Silvex)	ND	ug/l
SM-8	06/09/2020	2,4,5-Trichlorophenol	ND	ug/l
SM-8	06/09/2020	2,4,6-Tribromophenol	46.6	ug/l
SM-8	06/09/2020	2,4,6-Trichlorophenol	ND	ug/l
SM-8	06/09/2020	2,4,6-Trinitrotoluene	ND	ug/l
SM-8	06/09/2020	2,4-D	ND	ug/l
SM-8	06/09/2020	2,4-DB	ND	ug/l
SM-8	06/09/2020	2,4-DCAA	9.39	ug/l
SM-8	06/09/2020	2,4-Dichlorophenol	ND	ug/l

SM-8 Well Data - Contaminants

SAMP ID NO	COLL DATE	ANALYTE	RESULT	MEASURE
SM-8	06/09/2020	2,4-Dimethylphenol	ND	ug/l
SM-8	06/09/2020	2,4-Dinitrophenol	ND	ug/l
SM-8	06/09/2020	2,4-Dinitrotoluene	ND	ug/l
SM-8	06/09/2020	2,4-Dinitrotoluene	ND	ug/l
SM-8	06/09/2020	2,4-Dinitrotoluene	ND	ug/l
SM-8	06/09/2020	2,6-Dinitrotoluene	ND	ug/l
SM-8	06/09/2020	2,6-Dinitrotoluene	ND	ug/l
SM-8	06/09/2020	2,6-Dinitrotoluene	ND	ug/l
SM-8	06/09/2020	2-Amino-4,6-Dinitrotoluene	ND	ug/l
SM-8	06/09/2020	2-Bromobutyric acid	10.7	ug/l
SM-8	06/09/2020	2-Butanone	ND	ug/l
SM-8	06/09/2020	2-Chloroethyl vinyl ether	ND	ug/l
SM-8	06/09/2020	2-Chloronaphthalene	ND	ug/l
SM-8	06/09/2020	2-Chlorophenol	ND	ug/l
SM-8	06/09/2020	2-Chlorotoluene	ND	ug/l
SM-8	06/09/2020	2-Fluorobiphenyl	20.3	ug/l
SM-8	06/09/2020	2-Fluorophenol	29.7	ug/l
SM-8	06/09/2020	2-Hexanone	ND	ug/l
SM-8	06/09/2020	2-Methyl-4,6-dinitrophenol	ND	ug/l
SM-8	06/09/2020	2-Methylnaphthalene	ND	ug/l
SM-8	06/09/2020	2-Methylphenol	ND	ug/l
SM-8	06/09/2020	2-Nitroaniline	ND	ug/l
SM-8	06/09/2020	2-Nitrophenol	ND	ug/l
SM-8	06/09/2020	2-Nitrotoluene	ND	ug/l
SM-8	06/09/2020	3 & 4-Methylphenol	ND	ug/l
SM-8	06/09/2020	3,3'-Dichlorobenzidine	ND	ug/l
SM-8	06/09/2020	3,4-Dichloroaniline	ND	ug/l
SM-8	06/09/2020	3,5-Dichlorobenzoic acid	ND	ug/l
SM-8	06/09/2020	3-Hydroxycarbofuran	ND	ug/l
SM-8	06/09/2020	3-Nitroaniline	ND	ug/l
SM-8	06/09/2020	3-Nitrotoluene	ND	ug/l
SM-8	06/09/2020	4,4´-DDD	ND	ug/l
SM-8	06/09/2020	4,4´-DDE	ND	ug/l
SM-8	06/09/2020	4,4´-DDT	ND	ug/l
SM-8	06/09/2020	4-Amino-2,6-Dinitrotoluene	ND	ug/l
SM-8	06/09/2020	4-Bromofluorobenzene	49.4	ug/l
SM-8	06/09/2020	4-Bromofluorobenzene	11.9	ug/l
SM-8	06/09/2020	4-Bromofluorobenzene	11.9	ug/l
SM-8	06/09/2020	4-Bromofluorobenzene	49.5	ug/l
SM-8	06/09/2020	4-Bromophenyl phenyl ether	ND	ug/l
SM-8	06/09/2020	4-Chloro-3-methylphenol	ND	ug/l
SM-8	06/09/2020	4-Chloroaniline	ND	ug/l
SM-8	06/09/2020	4-Chlorophenyl phenyl ether	ND	ug/l
SM-8	06/09/2020	4-Chlorotoluene	ND	ug/l
SM-8	06/09/2020	4-Methyl-2-pentanone	ND	ug/l
SM-8	06/09/2020	4-Nitroaniline	ND	ug/l
SM-8	06/09/2020	4-Nitrophenol	ND	ug/l
SM-8	06/09/2020	4-Nitrotoluene	ND	ug/l
SM-8	06/09/2020	4-Nonylphenol	ND	ng/l
SM-8	06/09/2020	4-Nonylphenol-d4	552	ng/l
SM-8	06/09/2020	4-Octylphenol	ND	ng/l
SM-8	06/09/2020	4-tert-Octylphenol	ND	ng/l
SM-8	06/09/2020	4-tert-Octylphenol diethoxylate	ND	ng/l

SM-8 Well Data - Contaminants

SAMP ID NO	COLL DATE	ANALYTE	RESULT	MEASURE
SM-8	06/09/2020	4-tert-Octylphenol monoethoxylate	ND	ng/l
SM-8	06/09/2020	9Cl-PF3ONS	ND	ng/l
SM-8	06/09/2020	Acenaphthene	ND	ug/l
SM-8	06/09/2020	Acenaphthene	ND	ug/l
SM-8	06/09/2020	Acenaphthylene	ND	ug/l
SM-8	06/09/2020	Acenaphthylene	ND	ug/l
SM-8	06/09/2020	Acetaldehyde	ND	ug/l
SM-8	06/09/2020	Acetaminophen	ND	ng/l
SM-8	06/09/2020	Acetochlor	ND	ug/l
SM-8	06/09/2020	Acetochlor ESA	ND	ng/l
SM-8	06/09/2020	Acetochlor OA	ND	ng/l
SM-8	06/09/2020	Acetone	ND	ug/l
SM-8	06/09/2020	Acetonitrile	ND	ug/l
SM-8	06/09/2020	Acifluorfen	ND	ug/l
SM-8	06/09/2020	Acrolein	ND	ug/l
SM-8	06/09/2020	Acrylonitrile	ND	ug/l
SM-8	06/09/2020	ADONA	ND	ng/l
SM-8	06/09/2020	Aggressive Index	12.1	N/A
SM-8	06/09/2020	Alachlor	ND	ug/l
SM-8	06/09/2020	Alachlor ESA	ND	ng/l
SM-8	06/09/2020	Alachlor OA	ND	ng/l
SM-8	06/09/2020	Aldicarb	ND	ug/l
SM-8	06/09/2020	Aldicarb sulfone	ND	ug/l
SM-8	06/09/2020	Aldicarb sulfoxide	ND	ug/l
SM-8	06/09/2020	Aldrin	ND	ug/l
SM-8	06/09/2020	Aldrin	ND	ug/l
SM-8	06/09/2020	Alkalinity as CaCO3	250	mg/l
SM-8	06/09/2020	Alkalinity as CaCO3	250	mg/l
SM-8	06/09/2020	Allyl chloride	ND	ug/l
SM-8	06/09/2020	alpha-BHC	ND	ug/l
SM-8	06/09/2020	alpha-BHC	ND	ug/l
SM-8	06/09/2020	alpha-Chlordane	ND	ug/l
SM-8	06/09/2020	Aluminum, Dissolved	1.9	ug/l
SM-8	06/09/2020	Aluminum, Total	5.3	ug/l
SM-8	06/09/2020	Aluminum, Total	5.3	ug/l
SM-8	06/09/2020	Ammonia as N	0.034	mg/l
SM-8	06/09/2020	Amoxicillin	5.5	ng/l
SM-8	06/09/2020	Aniline	ND	ug/l
SM-8	06/09/2020	Anthracene	ND	ug/l
SM-8	06/09/2020	Anthracene	ND	ug/l
SM-8	06/09/2020	Antimony, Dissolved	0.093	ug/l
SM-8	06/09/2020	Antimony, Total	0.099	ug/l
SM-8	06/09/2020	Antimony, Total	0.099	ug/l
SM-8	06/09/2020	Aroclor 1016	ND	ug/l
SM-8	06/09/2020	Aroclor 1221	ND	ug/l
SM-8	06/09/2020	Aroclor 1232	ND	ug/l
SM-8	06/09/2020	Aroclor 1242	ND	ug/l
SM-8	06/09/2020	Aroclor 1248	ND	ug/l
SM-8	06/09/2020	Aroclor 1254	ND	ug/l
SM-8	06/09/2020	Aroclor 1260	ND	ug/l
SM-8	06/09/2020	Arsenic III	0.077	ug/l
SM-8	06/09/2020	Arsenic III, Dissolved	0.17	ug/l
SM-8	06/09/2020	Arsenic V	0.74	ug/l

SM-8 Well Data - Contaminants

SAMP ID NO	COLL DATE	ANALYTE	RESULT	MEASURE
SM-8	06/09/2020	Arsenic V, Dissolved	0.49	ug/l
SM-8	06/09/2020	Arsenic, Dissolved	0.69	ug/l
SM-8	06/09/2020	Arsenic, Total	0.80	ug/l
SM-8	06/09/2020	Arsenic, Total	0.80	ug/l
SM-8	06/09/2020	Asbestos	ND	MFL
SM-8	06/09/2020	Atenolol	0.28	ng/l
SM-8	06/09/2020	Atorvastatin	ND	ng/l
SM-8	06/09/2020	Atrazine	ND	ug/l
SM-8	06/09/2020	Azithromycin	ND	ng/l
SM-8	06/09/2020	Azobenzene/1,2-Diphenylhydrazine	ND	ug/l
SM-8	06/09/2020	Barium, Dissolved	60	ug/l
SM-8	06/09/2020	Barium, Total	58	ug/l
SM-8	06/09/2020	Barium, Total	58	ug/l
SM-8	06/09/2020	BDMC	8.98	ug/l
SM-8	06/09/2020	Bentazon	ND	ug/l
SM-8	06/09/2020	Benzaldehyde	ND	ug/l
SM-8	06/09/2020	Benzene	ND	ug/l
SM-8	06/09/2020	Benzidine	ND	ug/l
SM-8	06/09/2020	Benzo (a) anthracene	ND	ug/l
SM-8	06/09/2020	Benzo (a) anthracene	ND	ug/l
SM-8	06/09/2020	Benzo (a) pyrene	ND	ug/l
SM-8	06/09/2020	Benzo (a) pyrene	ND	ug/l
SM-8	06/09/2020	Benzo (b) fluoranthene	ND	ug/l
SM-8	06/09/2020	Benzo (b) fluoranthene	ND	ug/l
SM-8	06/09/2020	Benzo (g,h,i) perylene	ND	ug/l
SM-8	06/09/2020	Benzo (g,h,i) perylene	ND	ug/l
SM-8	06/09/2020	Benzo (k) fluoranthene	ND	ug/l
SM-8	06/09/2020	Benzo (k) fluoranthene	ND	ug/l
SM-8	06/09/2020	Benzoic acid	ND	ug/l
SM-8	06/09/2020	Benzyl alcohol	ND	ug/l
SM-8	06/09/2020	Beryllium, Dissolved	ND	ug/l
SM-8	06/09/2020	Beryllium, Total	ND	ug/l
SM-8	06/09/2020	Beryllium, Total	ND	ug/l
SM-8	06/09/2020	beta-BHC	ND	ug/l
SM-8	06/09/2020	beta-BHC	ND	ug/l
SM-8	06/09/2020	Bicarbonate Alkalinity as HCO3	300	mg/l
SM-8	06/09/2020	Biochemical Oxygen Demand	ND	mg/l
SM-8	06/09/2020	Bis(2-chloroethoxy)methane	ND	ug/l
SM-8	06/09/2020	Bis(2-chloroethyl)ether	ND	ug/l
SM-8	06/09/2020	Bis(2-chloroisopropyl)ether	ND	ug/l
SM-8	06/09/2020	Bis(2-ethylhexyl)adipate	ND	ug/l
SM-8	06/09/2020	Bis(2-ethylhexyl)phthalate	ND	ug/l
SM-8	06/09/2020	Bis(2-ethylhexyl)phthalate	ND	ug/l
SM-8	06/09/2020	Bisphenol A	2.7	ng/l
SM-8	06/09/2020	Boron, Dissolved	140	ug/l
SM-8	06/09/2020	Boron, Total	140	ug/l
SM-8	06/09/2020	Bromacil	ND	ug/l
SM-8	06/09/2020	Bromate	ND	ug/l
SM-8	06/09/2020	Bromide	230	ug/l
SM-8	06/09/2020	Bromobenzene	ND	ug/l
SM-8	06/09/2020	Bromochloroacetic acid (bcaa)	ND	ug/l
SM-8	06/09/2020	Bromochloromethane	ND	ug/l
SM-8	06/09/2020	Bromodichloromethane	ND	ug/l

SM-8 Well Data - Contaminants

SAMP ID NO	COLL DATE	ANALYTE	RESULT	MEASURE
SM-8	06/09/2020	Bromoform	ND	ug/l
SM-8	06/09/2020	Bromomethane	ND	ug/l
SM-8	06/09/2020	Butachlor	ND	ug/l
SM-8	06/09/2020	Butanal	ND	ug/l
SM-8	06/09/2020	Butyl benzyl phthalate	ND	ug/l
SM-8	06/09/2020	Butyl benzyl phthalate	ND	ug/l
SM-8	06/09/2020	Cadmium, Dissolved	ND	ug/l
SM-8	06/09/2020	Cadmium, Total	0.23	ug/l
SM-8	06/09/2020	Cadmium, Total	0.23	ug/l
SM-8	06/09/2020	Caffeine	0.91	ng/l
SM-8	06/09/2020	Caffeine	ND	ug/l
SM-8	06/09/2020	Calcium, Dissolved	90.6	mg/l
SM-8	06/09/2020	Calcium, Total	88.3	mg/l
SM-8	06/09/2020	Captan	ND	ug/l
SM-8	06/09/2020	Carbamazepine	ND	ng/l
SM-8	06/09/2020	Carbaryl	ND	ug/l
SM-8	06/09/2020	Carbazole	ND	ug/l
SM-8	06/09/2020	Carbofuran	ND	ug/l
SM-8	06/09/2020	Carbon Disulfide	ND	ug/l
SM-8	06/09/2020	Carbon tetrachloride	0.15	ug/l
SM-8	06/09/2020	Carbonate Alkalinity as CaCO3	ND	mg/l
SM-8	06/09/2020	Chloramben	ND	ug/l
SM-8	06/09/2020	Chlorate	ND	ug/l
SM-8	06/09/2020	Chlordane (tech)	ND	ug/l
SM-8	06/09/2020	Chloride, Total	110	mg/l
SM-8	06/09/2020	Chlorine Residual, Free	0.0090	mg/l
SM-8	06/09/2020	Chlorine Residual, Free	ND	mg/l
SM-8	06/09/2020	Chlorine Residual, Total	0.019	mg/l
SM-8	06/09/2020	Chlorite	14	ug/l
SM-8	06/09/2020	Chlorobenzene	ND	ug/l
SM-8	06/09/2020	Chloroethane	ND	ug/l
SM-8	06/09/2020	Chloroform	0.66	ug/l
SM-8	06/09/2020	Chloromethane	ND	ug/l
SM-8	06/09/2020	Chlorothalonil	ND	ug/l
SM-8	06/09/2020	Chlorpropham	ND	ug/l
SM-8	06/09/2020	Chromium 6+	0.81	ug/l
SM-8	06/09/2020	Chromium, Dissolved	0.051	ug/l
SM-8	06/09/2020	Chromium, Total	1.9	ug/l
SM-8	06/09/2020	Chromium, Total	1.9	ug/l
SM-8	06/09/2020	Chrysene	ND	ug/l
SM-8	06/09/2020	Chrysene	ND	ug/l
SM-8	06/09/2020	Ciprofloxacin	ND	ng/l
SM-8	06/09/2020	cis-1,2-Dichloroethene	0.22	ug/l
SM-8	06/09/2020	cis-1,3-Dichloropropene	ND	ug/l
SM-8	06/09/2020	cis-Nonachlor	ND	ug/l
SM-8	06/09/2020	Cobalt, Dissolved	0.16	ug/l
SM-8	06/09/2020	Cobalt, Total	0.15	ug/l
SM-8	06/09/2020	Color	ND	Color Units
SM-8	06/09/2020	Copper, Dissolved	0.14	ug/l
SM-8	06/09/2020	Copper, Total	8.5	ug/l
SM-8	06/09/2020	Copper, Total	8.5	ug/l
SM-8	06/09/2020	Cotinine	ND	ng/l
SM-8	06/09/2020	Crotonaldehyde	ND	ug/l

SM-8 Well Data - Contaminants

SAMP ID NO	COLL DATE	ANALYTE	RESULT	MEASURE
SM-8	06/09/2020	Cyanazine	ND	ug/l
SM-8	06/09/2020	Cyanide, Total	ND	ug/l
SM-8	06/09/2020	Cyclohexanone	ND	ug/l
SM-8	06/09/2020	d5-EtFOSAA	29.6	ng/l
SM-8	06/09/2020	Dalapon	ND	ug/l
SM-8	06/09/2020	DCPA	ND	ug/l
SM-8	06/09/2020	Decachlorobiphenyl	0.0908	ug/l
SM-8	06/09/2020	Decanal	ND	ug/l
SM-8	06/09/2020	DEET	1.0	ng/l
SM-8	06/09/2020	delta-BHC	ND	ug/l
SM-8	06/09/2020	delta-BHC	ND	ug/l
SM-8	06/09/2020	Diazepam	ND	ng/l
SM-8	06/09/2020	Diazinon	ND	ug/l
SM-8	06/09/2020	Dibenzo (a,h) anthracene	ND	ug/l
SM-8	06/09/2020	Dibenzo (a,h) anthracene	ND	ug/l
SM-8	06/09/2020	Dibenzofuran	ND	ug/l
SM-8	06/09/2020	Dibromoacetic acid (dbaa)	ND	ug/l
SM-8	06/09/2020	Dibromochloromethane	ND	ug/l
SM-8	06/09/2020	Dibromomethane	ND	ug/l
SM-8	06/09/2020	Dicamba	ND	ug/l
SM-8	06/09/2020	Dichloramine	0.0040	mg/l
SM-8	06/09/2020	Dichloroacetate	492	ug/l
SM-8	06/09/2020	Dichloroacetic acid (dcaa)	ND	ug/l
SM-8	06/09/2020	Dichlorodifluoromethane (Freon 12)	ND	ug/l
SM-8	06/09/2020	Dichloroprop	ND	ug/l
SM-8	06/09/2020	Diclofenac	ND	ng/l
SM-8	06/09/2020	Dieldrin	ND	ug/l
SM-8	06/09/2020	Dieldrin	ND	ug/l
SM-8	06/09/2020	Diethyl phthalate	ND	ug/l
SM-8	06/09/2020	Diethyl phthalate	ND	ug/l
SM-8	06/09/2020	Diethylstilbestrol	ND	ng/l
SM-8	06/09/2020	Di-isopropyl ether	ND	ug/l
SM-8	06/09/2020	Dimethoate	ND	ug/l
SM-8	06/09/2020	Dimethyl phthalate	ND	ug/l
SM-8	06/09/2020	Dimethyl phthalate	ND	ug/l
SM-8	06/09/2020	Di-n-butyl phthalate	ND	ug/l
SM-8	06/09/2020	Di-n-butyl phthalate	ND	ug/l
SM-8	06/09/2020	Di-n-octyl phthalate	ND	ug/l
SM-8	06/09/2020	Di-n-octyl phthalate	ND	ug/l
SM-8	06/09/2020	Dinoseb	ND	ug/l
SM-8	06/09/2020	Diphenamid	ND	ug/l
SM-8	06/09/2020	Diquat	ND	ug/l
SM-8	06/09/2020	Disulfoton	ND	ug/l
SM-8	06/09/2020	Diuron	ND	ug/l
SM-8	06/09/2020	E. coli	ND	MPN/100ml
SM-8	06/09/2020	Endosulfan I	ND	ug/l
SM-8	06/09/2020	Endosulfan I	ND	ug/l
SM-8	06/09/2020	Endosulfan II	ND	ug/l
SM-8	06/09/2020	Endosulfan II	ND	ug/l
SM-8	06/09/2020	Endosulfan sulfate	ND	ug/l
SM-8	06/09/2020	Endosulfan sulfate	ND	ug/l
SM-8	06/09/2020	Endothall	ND	ug/l
SM-8	06/09/2020	Endrin	ND	ug/l

SM-8 Well Data - Contaminants

SAMP ID NO	COLL DATE	ANALYTE	RESULT	MEASURE
SM-8	06/09/2020	Endrin	ND	ug/l
SM-8	06/09/2020	Endrin aldehyde	ND	ug/l
SM-8	06/09/2020	Endrin aldehyde	ND	ug/l
SM-8	06/09/2020	Endrin ketone	ND	ug/l
SM-8	06/09/2020	Epitestosterone	ND	ng/l
SM-8	06/09/2020	EPTC	ND	ug/l
SM-8	06/09/2020	Estriol	ND	ng/l
SM-8	06/09/2020	Estrone	ND	ng/l
SM-8	06/09/2020	EtFOSAA	ND	ng/l
SM-8	06/09/2020	Ethanol	ND	mg/l
SM-8	06/09/2020	Ethion	ND	ug/l
SM-8	06/09/2020	Ethyl methacrylate	ND	ug/l
SM-8	06/09/2020	Ethyl tert-butyl ether	ND	ug/l
SM-8	06/09/2020	Ethylbenzene	ND	ug/l
SM-8	06/09/2020	Ethylene glycol	ND	mg/l
SM-8	06/09/2020	Fecal Coliform	ND	MPN/100ml
SM-8	06/09/2020	Fluoranthene	ND	ug/l
SM-8	06/09/2020	Fluoranthene	ND	ug/l
SM-8	06/09/2020	Fluorene	ND	ug/l
SM-8	06/09/2020	Fluorene	ND	ug/l
SM-8	06/09/2020	Fluoride, Total	0.24	mg/l
SM-8	06/09/2020	Fluoxetine	ND	ng/l
SM-8	06/09/2020	Fonofos	ND	ng/l
SM-8	06/09/2020	Formaldehyde	ND	ug/l
SM-8	06/09/2020	Freon 113	ND	ug/l
SM-8	06/09/2020	Galaxolide (HHCB)	4.8	ng/l
SM-8	06/09/2020	gamma-BHC (Lindane)	ND	ug/l
SM-8	06/09/2020	gamma-BHC (Lindane)	ND	ug/l
SM-8	06/09/2020	gamma-Chlordane	ND	ug/l
SM-8	06/09/2020	Gasoline Range Organics	ND	ug/l
SM-8	06/09/2020	Gemfibrozil	0.098	ng/l
SM-8	06/09/2020	Glyoxal	ND	ug/l
SM-8	06/09/2020	Glyphosate	ND	ug/l
SM-8	06/09/2020	Gross Alpha	4.35	pCi/L
SM-8	06/09/2020	Gross Beta	4.4	pCi/L
SM-8	06/09/2020	HAA5, Total	ND	ug/l
SM-8	06/09/2020	Hardness as CaCO3, Total	387	mg/l
SM-8	06/09/2020	Heptachlor	ND	ug/l
SM-8	06/09/2020	Heptachlor	ND	ug/l
SM-8	06/09/2020	Heptachlor epoxide	ND	ug/l
SM-8	06/09/2020	Heptachlor epoxide	ND	ug/l
SM-8	06/09/2020	Heptanal	ND	ug/l
SM-8	06/09/2020	Heterotrophic Plate Count	360	CFU/ml
SM-8	06/09/2020	Hexachlorobenzene	ND	ug/l
SM-8	06/09/2020	Hexachlorobenzene	ND	ug/l
SM-8	06/09/2020	Hexachlorobenzene	ND	ug/l
SM-8	06/09/2020	Hexachlorobutadiene	ND	ug/l
SM-8	06/09/2020	Hexachlorobutadiene	ND	ug/l
SM-8	06/09/2020	Hexachlorocyclopentadiene	ND	ug/l
SM-8	06/09/2020	Hexachlorocyclopentadiene	ND	ug/l
SM-8	06/09/2020	Hexachlorocyclopentadiene	ND	ug/l
SM-8	06/09/2020	Hexachloroethane	ND	ug/l
SM-8	06/09/2020	Hexanal	ND	ug/l

SM-8 Well Data - Contaminants

SAMP ID NO	COLL DATE	ANALYTE	RESULT	MEASURE
SM-8	06/09/2020	HFPO-DA	ND	ng/l
SM-8	06/09/2020	HFPO-DA-13C3	33.5	ng/l
SM-8	06/09/2020	HMX	ND	ug/l
SM-8	06/09/2020	Hydrazine	ND	ug/l
SM-8	06/09/2020	Hydroxide Alkalinity as CaCO3	ND	mg/l
SM-8	06/09/2020	Ibuprofen	ND	ng/l
SM-8	06/09/2020	Indeno (1,2,3-cd) pyrene	ND	ug/l
SM-8	06/09/2020	Indeno (1,2,3-cd) pyrene	ND	ug/l
SM-8	06/09/2020	Iodide	34	ug/l
SM-8	06/09/2020	Iodomethane	ND	ug/l
SM-8	06/09/2020	Iopromide	ND	ng/l
SM-8	06/09/2020	Iron, Dissolved	ND	ug/l
SM-8	06/09/2020	Iron, Total	290	ug/l
SM-8	06/09/2020	Iron, Total	0.29	mg/l
SM-8	06/09/2020	Isophorone	ND	ug/l
SM-8	06/09/2020	Isopropyl alcohol	ND	mg/l
SM-8	06/09/2020	Isopropylbenzene	ND	ug/l
SM-8	06/09/2020	Langelier Index @ 60 C	0.730	N/A
SM-8	06/09/2020	Langelier Index @ Source Temp	0.266	N/A
SM-8	06/09/2020	Lead, Dissolved	0.13	ug/l
SM-8	06/09/2020	Lead, Total	1.2	ug/l
SM-8	06/09/2020	Lead, Total	1.2	ug/l
SM-8	06/09/2020	Linuron	ND	ug/l
SM-8	06/09/2020	Lithium, Dissolved	ND	ug/l
SM-8	06/09/2020	Lithium, Total	ND	ug/l
SM-8	06/09/2020	m,p-Xylene	ND	ug/l
SM-8	06/09/2020	Magnesium, Dissolved	41.6	mg/l
SM-8	06/09/2020	Magnesium, Total	40.5	mg/l
SM-8	06/09/2020	Manganese, Dissolved	46	ug/l
SM-8	06/09/2020	Manganese, Total	45	ug/l
SM-8	06/09/2020	Manganese, Total	45	ug/l
SM-8	06/09/2020	MBAS	0.049	mg/l
SM-8	06/09/2020	m-Dichlorobenzene	ND	ug/l
SM-8	06/09/2020	MeFOSAA	ND	ng/l
SM-8	06/09/2020	Meprobamate	ND	ng/l
SM-8	06/09/2020	Mercury, Dissolved	0.023	ug/l
SM-8	06/09/2020	Mercury, Total	0.019	ug/l
SM-8	06/09/2020	Methacrylonitrile	ND	ug/l
SM-8	06/09/2020	Methadone	ND	ng/l
SM-8	06/09/2020	Methanol	ND	mg/l
SM-8	06/09/2020	Methiocarb	ND	ug/l
SM-8	06/09/2020	Methomyl	ND	ug/l
SM-8	06/09/2020	Methoxychlor	ND	ug/l
SM-8	06/09/2020	Methoxychlor	ND	ug/l
SM-8	06/09/2020	Methyl Glyoxal	ND	ug/l
SM-8	06/09/2020	Methyl methacrylate	ND	ug/l
SM-8	06/09/2020	Methyl tert-butyl ether (MTBE)	ND	ug/l
SM-8	06/09/2020	Methylene chloride	ND	ug/l
SM-8	06/09/2020	Metolachlor	ND	ug/l
SM-8	06/09/2020	Metolachlor ESA	ND	ng/l
SM-8	06/09/2020	Metolachlor OA	ND	ng/l
SM-8	06/09/2020	Metribuzin	ND	ug/l
SM-8	06/09/2020	Mirex	ND	ug/l

SM-8 Well Data - Contaminants

SAMP ID NO	COLL DATE	ANALYTE	RESULT	MEASURE
SM-8	06/09/2020	Molinate	ND	ug/l
SM-8	06/09/2020	Molybdenum, Dissolved	5.5	ug/l
SM-8	06/09/2020	Molybdenum, Total	5.3	ug/l
SM-8	06/09/2020	Monobromoacetic acid (mbaa)	ND	ug/l
SM-8	06/09/2020	Monochloramine	0.0060	mg/l
SM-8	06/09/2020	Monochloroacetic acid (mcaa)	ND	ug/l
SM-8	06/09/2020	Monomethylhydrazine (MMH)	ND	ug/l
SM-8	06/09/2020	Morphine	ND	ng/l
SM-8	06/09/2020	Naphthalene	ND	ug/l
SM-8	06/09/2020	Naphthalene	ND	ug/l
SM-8	06/09/2020	Naphthalene	ND	ug/l
SM-8	06/09/2020	Naproxen	ND	ng/l
SM-8	06/09/2020	n-Butylbenzene	ND	ug/l
SM-8	06/09/2020	NDMA-d6	24.2	ng/l
SM-8	06/09/2020	Nickel, Dissolved	1.7	ug/l
SM-8	06/09/2020	Nickel, Total	1.8	ug/l
SM-8	06/09/2020	Nickel, Total	1.8	ug/l
SM-8	06/09/2020	Nitrate as N	0.62	mg/l
SM-8	06/09/2020	Nitrite as N	ND	ug/l
SM-8	06/09/2020	Nitrobenzene	ND	ug/l
SM-8	06/09/2020	Nitrobenzene	ND	ug/l
SM-8	06/09/2020	Nitrobenzene	ND	ug/l
SM-8	06/09/2020	Nitrobenzene-d5	19.0	ug/l
SM-8	06/09/2020	N-Nitrosodiethylamine	ND	ng/l
SM-8	06/09/2020	N-Nitrosodimethylamine	ND	ug/l
SM-8	06/09/2020	N-Nitrosodimethylamine	ND	ng/l
SM-8	06/09/2020	N-Nitrosodi-n-butylamine	ND	ng/l
SM-8	06/09/2020	N-Nitrosodi-n-propylamine	ND	ug/l
SM-8	06/09/2020	N-Nitrosodi-n-propylamine	ND	ng/l
SM-8	06/09/2020	N-Nitrosodiphenylamine	ND	ug/l
SM-8	06/09/2020	N-Nitrosomethylethylamine	ND	ng/l
SM-8	06/09/2020	N-Nitrosomorpholine	ND	ng/l
SM-8	06/09/2020	N-Nitrosopiperidine	ND	ng/l
SM-8	06/09/2020	N-Nitrosopyrrolidine	ND	ng/l
SM-8	06/09/2020	NO2+NO3 as N	620	ug/l
SM-8	06/09/2020	Nonanal	ND	ug/l
SM-8	06/09/2020	Nonylphenol	ND	ng/l
SM-8	06/09/2020	Nonylphenol diethoxylate	ND	ng/l
SM-8	06/09/2020	Nonylphenol monoethoxylate	ND	ng/l
SM-8	06/09/2020	n-Propylbenzene	ND	ug/l
SM-8	06/09/2020	o-Dichlorobenzene	ND	ug/l
SM-8	06/09/2020	Oil & Grease (HEM)	2.2	mg/l
SM-8	06/09/2020	o-Phosphate as P	0.15	mg/l
SM-8	06/09/2020	Oxamyl	ND	ug/l
SM-8	06/09/2020	Oxybenzone	3.9	ng/l
SM-8	06/09/2020	o-Xylene	ND	ug/l
SM-8	06/09/2020	Paraquat	ND	ug/l
SM-8	06/09/2020	PBDE-100	ND	ng/l
SM-8	06/09/2020	PBDE-138	ND	ng/l
SM-8	06/09/2020	PBDE-153	ND	ng/l
SM-8	06/09/2020	PBDE-154	ND	ng/l
SM-8	06/09/2020	PBDE-17	ND	ng/l
SM-8	06/09/2020	PBDE-28	ND	ng/l

SM-8 Well Data - Contaminants

SAMP ID NO	COLL DATE	ANALYTE	RESULT	MEASURE
SM-8	06/09/2020	PBDE-47	ND	ng/l
SM-8	06/09/2020	PBDE-49	ND	ng/l
SM-8	06/09/2020	PBDE-85	ND	ng/l
SM-8	06/09/2020	PBDE-99	ND	ng/l
SM-8	06/09/2020	PCBs, Total	ND	ug/l
SM-8	06/09/2020	p-Dichlorobenzene	ND	ug/l
SM-8	06/09/2020	Pentachloroethane	ND	ug/l
SM-8	06/09/2020	Pentachloronitrobenzene (PCNB)	ND	ug/l
SM-8	06/09/2020	Pentachlorophenol	ND	ug/l
SM-8	06/09/2020	Pentachlorophenol	ND	ug/l
SM-8	06/09/2020	Pentachlorophenol	ND	ug/l
SM-8	06/09/2020	Pentanal	ND	ug/l
SM-8	06/09/2020	Perchlorate	ND	ug/l
SM-8	06/09/2020	Perylene-d12	244	ng/l
SM-8	06/09/2020	Perylene-d12	4.37	ug/l
SM-8	06/09/2020	PFBS	ND	ng/l
SM-8	06/09/2020	PFDA	ND	ng/l
SM-8	06/09/2020	PFDoA	ND	ng/l
SM-8	06/09/2020	PFHpA	1.3	ng/l
SM-8	06/09/2020	PFHxA	ND	ng/l
SM-8	06/09/2020	PFHxS	ND	ng/l
SM-8	06/09/2020	PFNA	ND	ng/l
SM-8	06/09/2020	PFOA	ND	ng/l
SM-8	06/09/2020	PFOS	ND	ng/l
SM-8	06/09/2020	PFTeDA	ND	ng/l
SM-8	06/09/2020	PFTrDA	ND	ng/l
SM-8	06/09/2020	PFUnA	ND	ng/l
SM-8	06/09/2020	pH	7.37	Units
SM-8	06/09/2020	pH, Field	6.25	pH Units
SM-8	06/09/2020	Phenanthrene	ND	ug/l
SM-8	06/09/2020	Phenanthrene	ND	ug/l
SM-8	06/09/2020	Phenol	ND	ug/l
SM-8	06/09/2020	Phenol-d5	17.8	ug/l
SM-8	06/09/2020	Phenytoin (Dilantin)	ND	ng/l
SM-8	06/09/2020	Phosphorus as PO4, Total	0.46	mg/l
SM-8	06/09/2020	Picloram	ND	ug/l
SM-8	06/09/2020	p-Isopropyltoluene	ND	ug/l
SM-8	06/09/2020	Potassium, Dissolved	2.5	mg/l
SM-8	06/09/2020	Potassium, Total	2.5	mg/l
SM-8	06/09/2020	Praziquantel	ND	ng/l
SM-8	06/09/2020	Primidone	ND	ng/l
SM-8	06/09/2020	Progesterone	ND	ng/l
SM-8	06/09/2020	Prometon	ND	ug/l
SM-8	06/09/2020	Prometryn	ND	ug/l
SM-8	06/09/2020	Propachlor	ND	ug/l
SM-8	06/09/2020	Propachlor	ND	ug/l
SM-8	06/09/2020	Propanal	ND	ug/l
SM-8	06/09/2020	Propoxur (Baygon)	ND	ug/l
SM-8	06/09/2020	Pyrene	ND	ug/l
SM-8	06/09/2020	Pyrene	ND	ug/l
SM-8	06/09/2020	Pyridine	ND	ug/l
SM-8	06/09/2020	Quinoline	ND	ng/l
SM-8	06/09/2020	Radium-226	0.0604	pCi/L dry

SM-8 Well Data - Contaminants

SAMP ID NO	COLL DATE	ANALYTE	RESULT	MEASURE
SM-8	06/09/2020	Radium-228	0.451	pCi/L dry
SM-8	06/09/2020	RDX	ND	ug/l
SM-8	06/09/2020	Salicylic Acid	1000	ng/l
SM-8	06/09/2020	sec-Butylbenzene	ND	ug/l
SM-8	06/09/2020	Selenium, Dissolved	0.51	ug/l
SM-8	06/09/2020	Selenium, Total	0.61	ug/l
SM-8	06/09/2020	Selenium, Total	0.61	ug/l
SM-8	06/09/2020	Silica as SiO2, Dissolved	46	mg/l
SM-8	06/09/2020	Silica as SiO2, Total	45	mg/l
SM-8	06/09/2020	Silver, Dissolved	ND	ug/l
SM-8	06/09/2020	Silver, Total	ND	ug/l
SM-8	06/09/2020	Silver, Total	ND	ug/l
SM-8	06/09/2020	Simazine	ND	ug/l
SM-8	06/09/2020	Sodium, Dissolved	72	mg/l
SM-8	06/09/2020	Sodium, Total	70	mg/l
SM-8	06/09/2020	Specific Conductance (EC)	1000	umhos/cm
SM-8	06/09/2020	Strontium-90	-0.504	pCi/L dry
SM-8	06/09/2020	Styrene	ND	ug/l
SM-8	06/09/2020	Sucralose	ND	ng/l
SM-8	06/09/2020	Sulfamethoxazole	0.26	ng/l
SM-8	06/09/2020	Sulfate as SO4	140	mg/l
SM-8	06/09/2020	Sulfide, Soluble	ND	mg/l
SM-8	06/09/2020	TCEP	0.54	ng/l
SM-8	06/09/2020	TCPP	1.8	ng/l
SM-8	06/09/2020	TDCPP	1.5	ng/l
SM-8	06/09/2020	Temperature, Degrees C	23.5	°C
SM-8	06/09/2020	Tentatively Identified Compounds	ND	ug/l
SM-8	06/09/2020	Tentatively Identified Compounds	ND	ug/l
SM-8	06/09/2020	Tentatively Identified Compounds	ND	ug/l
SM-8	06/09/2020	Terbacil	ND	ug/l
SM-8	06/09/2020	Terbufos	ND	ng/l
SM-8	06/09/2020	Terphenyl-d14	24.1	ug/l
SM-8	06/09/2020	Tert-amyl methyl ether	ND	ug/l
SM-8	06/09/2020	Tert-butyl alcohol	ND	ug/l
SM-8	06/09/2020	tert-Butylbenzene	ND	ug/l
SM-8	06/09/2020	Testosterone	ND	ng/l
SM-8	06/09/2020	Tetrachloroethene	0.39	ug/l
SM-8	06/09/2020	Tetrachloro-meta-xylene	0.0646	ug/l
SM-8	06/09/2020	Tetrahydrofuran	ND	ug/l
SM-8	06/09/2020	Tetryl	ND	ug/l
SM-8	06/09/2020	Thallium, Dissolved	ND	ug/l
SM-8	06/09/2020	Thallium, Total	ND	ug/l
SM-8	06/09/2020	Thallium, Total	ND	ug/l
SM-8	06/09/2020	Thiobencarb	ND	ug/l
SM-8	06/09/2020	THMs, Total	0.66	ug/l
SM-8	06/09/2020	Thorium, Dissolved	0.064	ug/l
SM-8	06/09/2020	Thorium, Total	ND	ug/l
SM-8	06/09/2020	Threshold Odor Number	100	T.O.N.
SM-8	06/09/2020	Toluene	ND	ug/l
SM-8	06/09/2020	Toluene-d8	50.6	ug/l
SM-8	06/09/2020	Total Anions	11	meq/l
SM-8	06/09/2020	Total Anions	11	meq/l
SM-8	06/09/2020	Total Cations	11	meq/l

SM-8 Well Data - Contaminants

SAMP ID NO	COLL DATE	ANALYTE	RESULT	MEASURE
SM-8	06/09/2020	Total Coliform	ND	MPN/100ml
SM-8	06/09/2020	Total Dissolved Solids	650	mg/l
SM-8	06/09/2020	Total Hardness as CaCO3	387	mg/l
SM-8	06/09/2020	Total Organic Carbon (TOC)	1.4	mg/l
SM-8	06/09/2020	Total Settleable Solids	ND	ml/l/hr
SM-8	06/09/2020	Total Suspended Solids	2	mg/l
SM-8	06/09/2020	Toxaphene	ND	ug/l
SM-8	06/09/2020	trans-1,2-Dichloroethene	ND	ug/l
SM-8	06/09/2020	trans-1,3-Dichloropropene	ND	ug/l
SM-8	06/09/2020	trans-1,4-Dichloro-2-butene	ND	ug/l
SM-8	06/09/2020	Trichloroacetic acid (tcaa)	ND	ug/l
SM-8	06/09/2020	Trichloroethene	7.0	ug/l
SM-8	06/09/2020	Trichlorofluoromethane	ND	ug/l
SM-8	06/09/2020	Triclosan	ND	ng/l
SM-8	06/09/2020	Trifluralin	ND	ug/l
SM-8	06/09/2020	Trifluralin	ND	ug/l
SM-8	06/09/2020	Trimethoprim	0.28	ng/l
SM-8	06/09/2020	Triphenyl phosphate	311	ng/l
SM-8	06/09/2020	Triphenyl phosphate	5.28	ug/l
SM-8	06/09/2020	Trithion	ND	ug/l
SM-8	06/09/2020	Tritium	37.7	pCi/L dry
SM-8	06/09/2020	Turbidity	1.3	NTU
SM-8	06/09/2020	Uranium Rad	5.1	pCi/L
SM-8	06/09/2020	UV 254	0.014	1/cm
SM-8	06/09/2020	Vanadium, Dissolved	6.1	ug/l
SM-8	06/09/2020	Vanadium, Total	6.1	ug/l
SM-8	06/09/2020	Vinyl acetate	ND	ug/l
SM-8	06/09/2020	Vinyl chloride	ND	ug/l
SM-8	06/09/2020	Xylenes, Total	ND	ug/l
SM-8	06/09/2020	Zinc, Dissolved	54	ug/l
SM-8	06/09/2020	Zinc, Total	110	ug/l
SM-8	06/09/2020	Zinc, Total	110	ug/l

SM-9 Well Data - Contaminants

COLL DATE	ANALYTE	RESULT	MEASURE
05/27/2020	1-(3,4-Dichlorophenyl)-3-methylurea	ND	ug/l
05/27/2020	1-(3,4-Dichlorophenyl)urea	ND	ug/l
05/27/2020	1,1,1,2-Tetrachloroethane	ND	ug/l
05/27/2020	1,1,1-Trichloroethane	ND	ug/l
05/27/2020	1,1,2,2-Tetrachloroethane	ND	ug/l
05/27/2020	1,1,2-Trichloroethane	ND	ug/l
05/27/2020	1,1-Dichloroethane	ND	ug/l
05/27/2020	1,1-Dichloroethene	ND	ug/l
05/27/2020	1,1-Dichloropropene	ND	ug/l
05/27/2020	1,1-Dimethylhydrazine	ND	ug/l
05/27/2020	1,2,3-Trichlorobenzene	ND	ug/l
05/27/2020	1,2,3-Trichloropropane	ND	ug/l
05/27/2020	1,2,4-Trichlorobenzene	ND	ug/l
05/27/2020	1,2,4-Trimethylbenzene	ND	ug/l
05/27/2020	1,2-Dibromo-3-chloropropane	ND	ug/l
05/27/2020	1,2-Dibromoethane (EDB)	ND	ug/l
05/27/2020	1,2-Dichlorobenzene	ND	ug/l
05/27/2020	1,2-Dichlorobenzene-d4	8.05	ug/l
05/27/2020	1,2-Dichlorobenzene-d4	8.05	ug/l
05/27/2020	1,2-Dichlorobenzene-d4	10.0	ug/l
05/27/2020	1,2-Dichlorobenzene-d4	10.9	ug/l
05/27/2020	1,2-Dichlorobenzene-d4	7.97	ug/l
05/27/2020	1,2-Dichlorobenzene-d4	7.97	ug/l
05/27/2020	1,2-Dichloroethane	ND	ug/l
05/27/2020	1,2-Dichloroethane-d4	52.0	ug/l
05/27/2020	1,2-Dichloropropane	ND	ug/l
05/27/2020	1,2-Diphenylhydrazine/Azobenzene	ND	ug/l
05/27/2020	1,3,5-Trimethylbenzene	ND	ug/l
05/27/2020	1,3,5-Trinitrobenzene	ND	ug/l
05/27/2020	1,3-Dichlorobenzene	ND	ug/l
05/27/2020	1,3-Dichloropropane	ND	ug/l
05/27/2020	1,3-Dichloropropene, Total	ND	ug/l
05/27/2020	1,3-Dimethyl-2-nitrobenzene	5.07	ug/l
05/27/2020	1,3-Dinitrobenzene	0.32	ug/l
05/27/2020	1,4-Dichlorobenzene	ND	ug/l
05/27/2020	1,4-Dioxane	3.3	ug/l
05/27/2020	1,4-Dioxane-d8	9.36	ug/l
05/27/2020	11Cl-PF3OUdS	ND	ng/l
05/27/2020	13C2-PFDA	36.9	ng/l
05/27/2020	13C2-PFDA	35.9	ng/l
05/27/2020	13C2-PFHxA	36.8	ng/l
05/27/2020	13C2-PFHxA	35.2	ng/l
05/27/2020	17-a-Estradiol	ND	ng/l
05/27/2020	17-a-Ethynylestradiol	ND	ng/l

SM-9 Well Data - Contaminants

COLL DATE	ANALYTE	RESULT	MEASURE
05/27/2020	17-b-Estradiol	ND	ng/l
05/27/2020	2,2-Dichloropropane	ND	ug/l
05/27/2020	2,3,7,8-TCDD (Dioxin)	ND	pg/l
05/27/2020	2,4,5-T	ND	ug/l
05/27/2020	2,4,5-TFAP	8.76	ug/l
05/27/2020	2,4,5-TP (Silvex)	ND	ug/l
05/27/2020	2,4,5-Trichlorophenol	ND	ug/l
05/27/2020	2,4,6-Tribromophenol	34.6	ug/l
05/27/2020	2,4,6-Trichlorophenol	ND	ug/l
05/27/2020	2,4,6-Trinitrotoluene	ND	ug/l
05/27/2020	2,4-D	ND	ug/l
05/27/2020	2,4-DB	ND	ug/l
05/27/2020	2,4-DCAA	9.38	ug/l
05/27/2020	2,4-Dichlorophenol	ND	ug/l
05/27/2020	2,4-Dimethylphenol	ND	ug/l
05/27/2020	2,4-Dinitrophenol	ND	ug/l
05/27/2020	2,4-Dinitrotoluene	ND	ug/l
05/27/2020	2,6-Dinitrotoluene	ND	ug/l
05/27/2020	2-Amino-4,6-Dinitrotoluene	ND	ug/l
05/27/2020	2-Bromobutyric acid	10.8	ug/l
05/27/2020	2-Butanone	ND	ug/l
05/27/2020	2-Chloroethyl vinyl ether	ND	ug/l
05/27/2020	2-Chloronaphthalene	ND	ug/l
05/27/2020	2-Chlorophenol	ND	ug/l
05/27/2020	2-Chlorotoluene	ND	ug/l
05/27/2020	2-Fluorobiphenyl	19.5	ug/l
05/27/2020	2-Fluorophenol	31.3	ug/l
05/27/2020	2-Hexanone	ND	ug/l
05/27/2020	2-Methyl-4,6-dinitrophenol	ND	ug/l
05/27/2020	2-Methylnaphthalene	ND	ug/l
05/27/2020	2-Methylphenol	ND	ug/l
05/27/2020	2-Nitroaniline	ND	ug/l
05/27/2020	2-Nitrophenol	ND	ug/l
05/27/2020	2-Nitrotoluene	ND	ug/l
05/27/2020	2-Octene, (Z)-	34	ug/l
05/27/2020	3 & 4-Methylphenol	ND	ug/l
05/27/2020	3,3'-Dichlorobenzidine	ND	ug/l
05/27/2020	3,4-Dichloroaniline	ND	ug/l
05/27/2020	3,5-Dichlorobenzoic acid	ND	ug/l
05/27/2020	3-Hydroxycarbofuran	ND	ug/l
05/27/2020	3-Nitroaniline	ND	ug/l
05/27/2020	3-Nitrotoluene	ND	ug/l
05/27/2020	4,4´-DDD	ND	ug/l
05/27/2020	4,4´-DDE	ND	ug/l

SM-9 Well Data - Contaminants

COLL DATE	ANALYTE	RESULT	MEASURE
05/27/2020	4,4´-DDT	ND	ug/l
05/27/2020	4-Amino-2,6-Dinitrotoluene	ND	ug/l
05/27/2020	4-Bromofluorobenzene	50.5	ug/l
05/27/2020	4-Bromofluorobenzene	7.89	ug/l
05/27/2020	4-Bromofluorobenzene	46.7	ug/l
05/27/2020	4-Bromofluorobenzene	9.89	ug/l
05/27/2020	4-Bromofluorobenzene	10.8	ug/l
05/27/2020	4-Bromofluorobenzene	7.91	ug/l
05/27/2020	4-Bromophenyl phenyl ether	ND	ug/l
05/27/2020	4-Chloro-3-methylphenol	ND	ug/l
05/27/2020	4-Chloroaniline	ND	ug/l
05/27/2020	4-Chlorophenyl phenyl ether	ND	ug/l
05/27/2020	4-Chlorotoluene	ND	ug/l
05/27/2020	4-Methyl-2-pentanone	ND	ug/l
05/27/2020	4-Nitroaniline	ND	ug/l
05/27/2020	4-Nitrophenol	ND	ug/l
05/27/2020	4-Nitrotoluene	ND	ug/l
05/27/2020	4-Nonylphenol	ND	ng/l
05/27/2020	4-Nonylphenol-d4	426	ng/l
05/27/2020	4-Octylphenol	ND	ng/l
05/27/2020	4-tert-Octylphenol	ND	ng/l
05/27/2020	4-tert-Octylphenol diethoxylate	ND	ng/l
05/27/2020	4-tert-Octylphenol monoethoxylate	ND	ng/l
05/27/2020	9Cl-PF3ONS	ND	ng/l
05/27/2020	Acenaphthene	ND	ug/l
05/27/2020	Acenaphthylene	ND	ug/l
05/27/2020	Acetaldehyde	ND	ug/l
05/27/2020	Acetaminophen	ND	ng/l
05/27/2020	Acetochlor	ND	ug/l
05/27/2020	Acetochlor ESA	ND	ng/l
05/27/2020	Acetochlor OA	ND	ng/l
05/27/2020	Acetone	22	ug/l
05/27/2020	Acetone	380	ug/l
05/27/2020	Acetonitrile	ND	ug/l
05/27/2020	Acifluorfen	ND	ug/l
05/27/2020	Acrolein	ND	ug/l
05/27/2020	Acrylonitrile	ND	ug/l
05/27/2020	ADONA	ND	ng/l
05/27/2020	Aggressive Index	12.4	N/A
05/27/2020	Alachlor	ND	ug/l
05/27/2020	Alachlor ESA	ND	ng/l
05/27/2020	Alachlor OA	ND	ng/l
05/27/2020	Aldicarb	ND	ug/l
05/27/2020	Aldicarb sulfone	ND	ug/l

SM-9 Well Data - Contaminants

COLL DATE	ANALYTE	RESULT	MEASURE
05/27/2020	Aldrin	ND	ug/l
05/27/2020	Alkalinity as CaCO3	430	mg/l
05/27/2020	Allyl chloride	ND	ug/l
05/27/2020	alpha-BHC	ND	ug/l
05/27/2020	alpha-Chlordane	ND	ug/l
05/27/2020	Aluminum, Dissolved	2.5	ug/l
05/27/2020	Aluminum, Total	2.3	ug/l
05/27/2020	Ammonia as N	ND	mg/l
05/27/2020	Amoxicillin	ND	ng/l
05/27/2020	Aniline	ND	ug/l
05/27/2020	Anthracene	ND	ug/l
05/27/2020	Antimony, Dissolved	0.15	ug/l
05/27/2020	Antimony, Total	0.13	ug/l
05/27/2020	Aroclor 1016	ND	ug/l
05/27/2020	Aroclor 1221	ND	ug/l
05/27/2020	Aroclor 1232	ND	ug/l
05/27/2020	Aroclor 1242	ND	ug/l
05/27/2020	Aroclor 1248	ND	ug/l
05/27/2020	Aroclor 1254	ND	ug/l
05/27/2020	Aroclor 1260	ND	ug/l
05/27/2020	Arsenic III	ND	ug/l
05/27/2020	Arsenic III, Dissolved	ND	ug/l
05/27/2020	Arsenic V	1.4	ug/l
05/27/2020	Arsenic V, Dissolved	0.98	ug/l
05/27/2020	Arsenic, Dissolved	0.74	ug/l
05/27/2020	Arsenic, Total	0.78	ug/l
05/27/2020	Asbestos	ND	MFL
05/27/2020	Atenolol	ND	ng/l
05/27/2020	Atorvastatin	ND	ng/l
05/27/2020	Atrazine	ND	ug/l
05/27/2020	Azithromycin	ND	ng/l
05/27/2020	Azobenzene/1,2-Diphenylhydrazine	ND	ug/l
05/27/2020	Barium, Dissolved	34	ug/l
05/27/2020	Barium, Total	34	ug/l
05/27/2020	BDMC	10.1	ug/l
05/27/2020	Bentazon	ND	ug/l
05/27/2020	Benzaldehyde	ND	ug/l
05/27/2020	Benzene	ND	ug/l
05/27/2020	Benzidine	ND	ug/l
05/27/2020	Benzo (a) anthracene	ND	ug/l
05/27/2020	Benzo (a) pyrene	ND	ug/l
05/27/2020	Benzo (b) fluoranthene	ND	ug/l
05/27/2020	Benzo (g,h,i) perylene	ND	ug/l
05/27/2020	Benzo (k) fluoranthene	ND	ug/l

SM-9 Well Data - Contaminants

COLL DATE	ANALYTE	RESULT	MEASURE
05/27/2020	Benzoic acid	ND	ug/l
05/27/2020	Benzyl alcohol	ND	ug/l
05/27/2020	Beryllium, Dissolved	ND	ug/l
05/27/2020	Beryllium, Total	ND	ug/l
05/27/2020	beta-BHC	ND	ug/l
05/27/2020	Bicarbonate Alkalinity as HCO3	520	mg/l
05/27/2020	Biochemical Oxygen Demand	ND	mg/l
05/27/2020	Bis(2-chloroethoxy)methane	ND	ug/l
05/27/2020	Bis(2-chloroethyl)ether	ND	ug/l
05/27/2020	Bis(2-chloroisopropyl)ether	ND	ug/l
05/27/2020	Bis(2-ethylhexyl)adipate	ND	ug/l
05/27/2020	Bis(2-ethylhexyl)phthalate	ND	ug/l
05/27/2020	Bisphenol A	1.4	ng/l
05/27/2020	Boron, Dissolved	130	ug/l
05/27/2020	Boron, Total	130	ug/l
05/27/2020	Bromacil	ND	ug/l
05/27/2020	Bromate	ND	ug/l
05/27/2020	Bromide	850	ug/l
05/27/2020	Bromobenzene	ND	ug/l
05/27/2020	Bromochloroacetic acid (bcaa)	ND	ug/l
05/27/2020	Bromochloromethane	ND	ug/l
05/27/2020	Bromodichloromethane	0.10	ug/l
05/27/2020	Bromodichloromethane	ND	ug/l
05/27/2020	Bromoform	ND	ug/l
05/27/2020	Bromomethane	ND	ug/l
05/27/2020	Butachlor	ND	ug/l
05/27/2020	Butanal	ND	ug/l
05/27/2020	Butyl benzyl phthalate	ND	ug/l
05/27/2020	Cadmium, Dissolved	0.12	ug/l
05/27/2020	Cadmium, Total	0.11	ug/l
05/27/2020	Caffeine	31	ng/l
05/27/2020	Caffeine	ND	ug/l
05/27/2020	Calcium, Dissolved	181	mg/l
05/27/2020	Calcium, Total	183	mg/l
05/27/2020	Captan	ND	ug/l
05/27/2020	Carbamazepine	0.090	ng/l
05/27/2020	Carbaryl	ND	ug/l
05/27/2020	Carbazole	ND	ug/l
05/27/2020	Carbofuran	ND	ug/l
05/27/2020	Carbon Disulfide	ND	ug/l
05/27/2020	Carbon tetrachloride	ND	ug/l
05/27/2020	Carbonate Alkalinity as CaCO3	ND	mg/l
05/27/2020	Chloramben	ND	ug/l
05/27/2020	Chlorate	93	ug/l

SM-9 Well Data - Contaminants

COLL DATE	ANALYTE	RESULT	MEASURE
05/27/2020	Chlordane (tech)	ND	ug/l
05/27/2020	Chloride, Total	130	mg/l
05/27/2020	Chlorine Residual, Free	0.0020	mg/l
05/27/2020	Chlorine Residual, Free	ND	mg/l
05/27/2020	Chlorine Residual, Total	0.0080	mg/l
05/27/2020	Chlorite	ND	ug/l
05/27/2020	Chlorobenzene	ND	ug/l
05/27/2020	Chloroethane	ND	ug/l
05/27/2020	Chloroform	0.90	ug/l
05/27/2020	Chloroform	ND	ug/l
05/27/2020	Chloromethane	ND	ug/l
05/27/2020	Chlorothalonil	ND	ug/l
05/27/2020	Chlorpropham	ND	ug/l
05/27/2020	Chromium 6+	0.25	ug/l
05/27/2020	Chromium, Dissolved	0.24	ug/l
05/27/2020	Chromium, Total	0.28	ug/l
05/27/2020	Chrysene	ND	ug/l
05/27/2020	Ciprofloxacin	6.5	ng/l
05/27/2020	cis-1,2-Dichloroethene	ND	ug/l
05/27/2020	cis-1,3-Dichloropropene	ND	ug/l
05/27/2020	cis-Nonachlor	ND	ug/l
05/27/2020	Cobalt, Dissolved	0.071	ug/l
05/27/2020	Cobalt, Total	0.072	ug/l
05/27/2020	Color	ND	Color Units
05/27/2020	Copper, Dissolved	2.3	ug/l
05/27/2020	Copper, Total	3.0	ug/l
05/27/2020	Cotinine	1.2	ng/l
05/27/2020	Crotonaldehyde	ND	ug/l
05/27/2020	Cyanazine	ND	ug/l
05/27/2020	Cyanide, Total	ND	ug/l
05/27/2020	Cyclohexanone	ND	ug/l
05/27/2020	d5-EtFOSAA	37.6	ng/l
05/27/2020	d5-EtFOSAA	36.3	ng/l
05/27/2020	Dalapon	ND	ug/l
05/27/2020	DCPA	ND	ug/l
05/27/2020	Decachlorobiphenyl	0.0786	ug/l
05/27/2020	Decanal	ND	ug/l
05/27/2020	DEET	0.80	ng/l
05/27/2020	delta-BHC	ND	ug/l
05/27/2020	Diazepam	ND	ng/l
05/27/2020	Diazinon	ND	ug/l
05/27/2020	Dibenzo (a,h) anthracene	ND	ug/l
05/27/2020	Dibenzofuran	ND	ug/l
05/27/2020	Dibromoacetic acid (dbaa)	ND	ug/l

SM-9 Well Data - Contaminants

COLL DATE	ANALYTE	RESULT	MEASURE
05/27/2020	Dibromochloromethane	ND	ug/l
05/27/2020	Dibromomethane	ND	ug/l
05/27/2020	Dicamba	ND	ug/l
05/27/2020	Dichloramine	0.0020	mg/l
05/27/2020	Dichloroacetate	501	ug/l
05/27/2020	Dichloroacetate	528	ug/l
05/27/2020	Dichloroacetic acid (dcaa)	ND	ug/l
05/27/2020	Dichlorodifluoromethane (Freon 12)	ND	ug/l
05/27/2020	Dichloroprop	ND	ug/l
05/27/2020	Diclofenac	ND	ng/l
05/27/2020	Dieldrin	ND	ug/l
05/27/2020	Diethyl phthalate	ND	ug/l
05/27/2020	Diethylstilbestrol	ND	ng/l
05/27/2020	Di-isopropyl ether	ND	ug/l
05/27/2020	Dimethoate	ND	ug/l
05/27/2020	Dimethyl phthalate	ND	ug/l
05/27/2020	Di-n-butyl phthalate	0.19	ug/l
05/27/2020	Di-n-butyl phthalate	ND	ug/l
05/27/2020	Di-n-octyl phthalate	ND	ug/l
05/27/2020	Dinoseb	ND	ug/l
05/27/2020	Diphenamid	ND	ug/l
05/27/2020	Diquat	ND	ug/l
05/27/2020	Disulfoton	ND	ug/l
05/27/2020	Diuron	ND	ug/l
05/27/2020	E. coli	ND	MPN/100ml
05/27/2020	Endosulfan I	ND	ug/l
05/27/2020	Endosulfan II	ND	ug/l
05/27/2020	Endosulfan sulfate	ND	ug/l
05/27/2020	Endothall	ND	ug/l
05/27/2020	Endrin	ND	ug/l
05/27/2020	Endrin aldehyde	ND	ug/l
05/27/2020	Endrin ketone	ND	ug/l
05/27/2020	Epitestosterone	ND	ng/l
05/27/2020	EPTC	ND	ug/l
05/27/2020	Estriol	ND	ng/l
05/27/2020	Estrone	ND	ng/l
05/27/2020	EtFOSAA	ND	ng/l
05/27/2020	Ethanol	ND	mg/l
05/27/2020	Ethion	ND	ug/l
05/27/2020	Ethyl methacrylate	ND	ug/l
05/27/2020	Ethyl tert-butyl ether	ND	ug/l
05/27/2020	Ethylbenzene	ND	ug/l
05/27/2020	Ethylene glycol	ND	mg/l
05/27/2020	Fecal Coliform	ND	MPN/100ml

SM-9 Well Data - Contaminants

COLL DATE	ANALYTE	RESULT	MEASURE
05/27/2020	Fluoranthene	ND	ug/l
05/27/2020	Fluorene	ND	ug/l
05/27/2020	Fluoride, Total	0.33	mg/l
05/27/2020	Fluoxetine	1.1	ng/l
05/27/2020	Fonofos	ND	ng/l
05/27/2020	Formaldehyde	ND	ug/l
05/27/2020	Freon 113	ND	ug/l
05/27/2020	Galaxolide (HHCB)	140	ng/l
05/27/2020	gamma-BHC (Lindane)	ND	ug/l
05/27/2020	gamma-Chlordane	ND	ug/l
05/27/2020	Gasoline Range Organics	140	ug/l
05/27/2020	Gemfibrozil	ND	ng/l
05/27/2020	Glyoxal	ND	ug/l
05/27/2020	Glyphosate	ND	ug/l
05/27/2020	Gross Alpha	9.58	pCi/L
05/27/2020	Gross Beta	6.7	pCi/L
05/27/2020	HAA5, Total	ND	ug/l
05/27/2020	Hardness as CaCO3, Total	834	mg/l
05/27/2020	Heptachlor	ND	ug/l
05/27/2020	Heptachlor epoxide	ND	ug/l
05/27/2020	Heptanal	ND	ug/l
05/27/2020	Heterotrophic Plate Count	400	CFU/ml
05/27/2020	Hexachlorobenzene	ND	ug/l
05/27/2020	Hexachlorobutadiene	ND	ug/l
05/27/2020	Hexachlorocyclopentadiene	ND	ug/l
05/27/2020	Hexachloroethane	ND	ug/l
05/27/2020	Hexanal	ND	ug/l
05/27/2020	HFPO-DA	ND	ng/l
05/27/2020	HFPO-DA-13C3	34.6	ng/l
05/27/2020	HFPO-DA-13C3	33.9	ng/l
05/27/2020	HMX	ND	ug/l
05/27/2020	Hydrazine	ND	ug/l
05/27/2020	Hydroxide Alkalinity as CaCO3	ND	mg/l
05/27/2020	Ibuprofen	1.3	ng/l
05/27/2020	Indeno (1,2,3-cd) pyrene	ND	ug/l
05/27/2020	Iodide	1.4	ug/l
05/27/2020	Iodomethane	ND	ug/l
05/27/2020	Iopromide	ND	ng/l
05/27/2020	Iron, Dissolved	ND	ug/l
05/27/2020	Iron, Total	34	ug/l
05/27/2020	Isophorone	ND	ug/l
05/27/2020	Isopropyl alcohol	ND	mg/l
05/27/2020	Isopropylbenzene	ND	ug/l
05/27/2020	Langelier Index @ 60 C	0.979	N/A

SM-9 Well Data - Contaminants

COLL DATE	ANALYTE	RESULT	MEASURE
05/27/2020	Langelier Index @ Source Temp	0.486	N/A
05/27/2020	Lead, Dissolved	0.20	ug/l
05/27/2020	Lead, Total	0.93	ug/l
05/27/2020	Linuron	ND	ug/l
05/27/2020	Lithium, Dissolved	ND	ug/l
05/27/2020	Lithium, Total	ND	ug/l
05/27/2020	m,p-Xylene	ND	ug/l
05/27/2020	Magnesium, Dissolved	91.2	mg/l
05/27/2020	Magnesium, Total	91.5	mg/l
05/27/2020	Manganese, Dissolved	3.5	ug/l
05/27/2020	Manganese, Total	3.4	ug/l
05/27/2020	MBAS	ND	mg/l
05/27/2020	m-Dichlorobenzene	ND	ug/l
05/27/2020	MeFOSAA	ND	ng/l
05/27/2020	Meprobamate	ND	ng/l
05/27/2020	Mercury, Dissolved	ND	ug/l
05/27/2020	Mercury, Total	0.017	ug/l
05/27/2020	Methacrylonitrile	ND	ug/l
05/27/2020	Methadone	ND	ng/l
05/27/2020	Methanol	ND	mg/l
05/27/2020	Methiocarb	ND	ug/l
05/27/2020	Methomyl	ND	ug/l
05/27/2020	Methoxychlor	ND	ug/l
05/27/2020	Methyl Glyoxal	ND	ug/l
05/27/2020	Methyl methacrylate	ND	ug/l
05/27/2020	Methyl tert-butyl ether (MTBE)	ND	ug/l
05/27/2020	Methylene chloride	ND	ug/l
05/27/2020	Methylene chloride	ND	ug/l
05/27/2020	Metolachlor	ND	ug/l
05/27/2020	Metolachlor ESA	ND	ng/l
05/27/2020	Metolachlor OA	ND	ng/l
05/27/2020	Metribuzin	ND	ug/l
05/27/2020	Mirex	ND	ug/l
05/27/2020	Molinate	ND	ug/l
05/27/2020	Molybdenum, Dissolved	8.3	ug/l
05/27/2020	Molybdenum, Total	8.2	ug/l
05/27/2020	Monobromoacetic acid (mbaa)	ND	ug/l
05/27/2020	Monochloramine	0.0040	mg/l
05/27/2020	Monochloroacetic acid (mcaa)	ND	ug/l
05/27/2020	Monomethylhydrazine (MMH)	ND	ug/l
05/27/2020	Morphine	0.58	ng/l
05/27/2020	Naphthalene	ND	ug/l
05/27/2020	Naproxen	1.1	ng/l
05/27/2020	n-Butylbenzene	ND	ug/l

SM-9 Well Data - Contaminants

COLL DATE	ANALYTE	RESULT	MEASURE
05/27/2020	NDMA-d6	20.0	ng/l
05/27/2020	Nickel, Dissolved	0.90	ug/l
05/27/2020	Nickel, Total	0.95	ug/l
05/27/2020	Nitrate as N	3.3	mg/l
05/27/2020	Nitrite as N	ND	ug/l
05/27/2020	Nitrobenzene	ND	ug/l
05/27/2020	Nitrobenzene-d5	22.0	ug/l
05/27/2020	N-Nitrosodiethylamine	ND	ng/l
05/27/2020	N-Nitrosodimethylamine	ND	ug/l
05/27/2020	N-Nitrosodi-n-butylamine	ND	ng/l
05/27/2020	N-Nitrosodi-n-propylamine	ND	ug/l
05/27/2020	N-Nitrosodiphenylamine	ND	ug/l
05/27/2020	N-Nitrosomethylethylamine	ND	ng/l
05/27/2020	N-Nitrosomorpholine	39	ng/l
05/27/2020	N-Nitrosopiperidine	ND	ng/l
05/27/2020	N-Nitrosopyrrolidine	ND	ng/l
05/27/2020	NO2+NO3 as N	3300	ug/l
05/27/2020	Nonanal	ND	ug/l
05/27/2020	Nonylphenol	ND	ng/l
05/27/2020	Nonylphenol diethoxylate	ND	ng/l
05/27/2020	Nonylphenol monoethoxylate	ND	ng/l
05/27/2020	n-Propylbenzene	ND	ug/l
05/27/2020	n-Propylbenzene	ND	ug/l
05/27/2020	o-Dichlorobenzene	ND	ug/l
05/27/2020	o-Dichlorobenzene	ND	ug/l
05/27/2020	Oil & Grease (HEM)	ND	mg/l
05/27/2020	o-Phosphate as P	0.098	mg/l
05/27/2020	Oxamyl	ND	ug/l
05/27/2020	Oxybenzone	4.1	ng/l
05/27/2020	o-Xylene	ND	ug/l
05/27/2020	Paraquat	ND	ug/l
05/27/2020	PBDE-100	ND	ng/l
05/27/2020	PBDE-138	ND	ng/l
05/27/2020	PBDE-153	ND	ng/l
05/27/2020	PBDE-154	ND	ng/l
05/27/2020	PBDE-17	ND	ng/l
05/27/2020	PBDE-28	ND	ng/l
05/27/2020	PBDE-47	ND	ng/l
05/27/2020	PBDE-49	ND	ng/l
05/27/2020	PBDE-85	ND	ng/l
05/27/2020	PBDE-99	ND	ng/l
05/27/2020	PCBs, Total	ND	ug/l
05/27/2020	p-Dichlorobenzene	ND	ug/l
05/27/2020	Pentachloroethane	ND	ug/l

SM-9 Well Data - Contaminants

COLL DATE	ANALYTE	RESULT	MEASURE
05/27/2020	Pentachloronitrobenzene (PCNB)	ND	ug/l
05/27/2020	Pentachlorophenol	ND	ug/l
05/27/2020	Pentanal	ND	ug/l
05/27/2020	Perchlorate	ND	ug/l
05/27/2020	Perylene-d12	204	ng/l
05/27/2020	Perylene-d12	4.42	ug/l
05/27/2020	PFBS	5.1	ng/l
05/27/2020	PFBS	ND	ng/l
05/27/2020	PFDA	ND	ng/l
05/27/2020	PFDA	ND	ng/l
05/27/2020	PFDoA	ND	ng/l
05/27/2020	PFHpA	2.5	ng/l
05/27/2020	PFHpA	ND	ng/l
05/27/2020	PFHxA	12	ng/l
05/27/2020	PFHxA	ND	ng/l
05/27/2020	PFHxS	4.7	ng/l
05/27/2020	PFHxS	ND	ng/l
05/27/2020	PFNA	0.62	ng/l
05/27/2020	PFNA	0.94	ng/l
05/27/2020	PFOA	2.9	ng/l
05/27/2020	PFOA	0.52	ng/l
05/27/2020	PFOS	ND	ng/l
05/27/2020	PFTeDA	ND	ng/l
05/27/2020	PFTrDA	ND	ng/l
05/27/2020	PFUnA	ND	ng/l
05/27/2020	pH	7.15	Units
05/27/2020	pH	7.05	pH Units
05/27/2020	Phenanthrene	ND	ug/l
05/27/2020	Phenanthrene	ND	ug/l
05/27/2020	Phenol	ND	ug/l
05/27/2020	Phenol-d5	20.8	ug/l
05/27/2020	Phenytoin (Dilantin)	ND	ng/l
05/27/2020	Phosphorus as PO4, Total	0.26	mg/l
05/27/2020	Picloram	ND	ug/l
05/27/2020	p-Isopropyltoluene	ND	ug/l
05/27/2020	Potassium, Dissolved	3.0	mg/l
05/27/2020	Potassium, Total	3.0	mg/l
05/27/2020	Praziquantel	ND	ng/l
05/27/2020	Primidone	3.4	ng/l
05/27/2020	Progesterone	ND	ng/l
05/27/2020	Prometon	ND	ug/l
05/27/2020	Prometryn	ND	ug/l
05/27/2020	Propachlor	ND	ug/l
05/27/2020	Propanal	ND	ug/l

SM-9 Well Data - Contaminants

COLL DATE	ANALYTE	RESULT	MEASURE
05/27/2020	Propoxur (Baygon)	ND	ug/l
05/27/2020	Pyrene	ND	ug/l
05/27/2020	Pyridine	ND	ug/l
05/27/2020	Quinoline	ND	ng/l
05/27/2020	Radium-226	0.000	pCi/L dry
05/27/2020	Radium-228	0.683	pCi/L dry
05/27/2020	RDX	ND	ug/l
05/27/2020	Salicylic Acid	850	ng/l
05/27/2020	sec-Butylbenzene	ND	ug/l
05/27/2020	Selenium, Dissolved	4.4	ug/l
05/27/2020	Selenium, Total	4.2	ug/l
05/27/2020	Silica as SiO2, Dissolved	32	mg/l
05/27/2020	Silica as SiO2, Total	32	mg/l
05/27/2020	Silver, Dissolved	ND	ug/l
05/27/2020	Silver, Total	ND	ug/l
05/27/2020	Simazine	ND	ug/l
05/27/2020	Sodium, Dissolved	74	mg/l
05/27/2020	Sodium, Total	74	mg/l
05/27/2020	Specific Conductance (EC)	1800	umhos/cm
05/27/2020	Strontium-90	0.255	pCi/L dry
05/27/2020	Styrene	ND	ug/l
05/27/2020	Sucralose	9.3	ng/l
05/27/2020	Sulfamethoxazole	0.26	ng/l
05/27/2020	Sulfate as SO4	320	mg/l
05/27/2020	Sulfide, Soluble	ND	mg/l
05/27/2020	TCEP	ND	ng/l
05/27/2020	TCPP	ND	ng/l
05/27/2020	TDCPP	3.4	ng/l
05/27/2020	Temperature, Degrees C	21.0	°C
05/27/2020	Tentatively Identified Compounds	ND	ug/l
05/27/2020	Terbacil	ND	ug/l
05/27/2020	Terbufos	ND	ng/l
05/27/2020	Terphenyl-d14	25.8	ug/l
05/27/2020	Tert-amyl methyl ether	ND	ug/l
05/27/2020	Tert-butyl alcohol	ND	ug/l
05/27/2020	tert-Butylbenzene	ND	ug/l
05/27/2020	Testosterone	ND	ng/l
05/27/2020	Tetrachloroethene	41	ug/l
05/27/2020	Tetrachloroethene	ND	ug/l
05/27/2020	Tetrachloroethylene (TIC)	12	ug/l
05/27/2020	Tetrachloro-meta-xylene	0.0809	ug/l
05/27/2020	Tetrahydrofuran	ND	ug/l
05/27/2020	Tetryl	ND	ug/l
05/27/2020	Thallium, Dissolved	ND	ug/l

SM-9 Well Data - Contaminants

COLL DATE	ANALYTE	RESULT	MEASURE
05/27/2020	Thallium, Total	ND	ug/l
05/27/2020	Thiobencarb	ND	ug/l
05/27/2020	THMs, Total	0.90	ug/l
05/27/2020	Thorium, Dissolved	ND	ug/l
05/27/2020	Thorium, Total	ND	ug/l
05/27/2020	Threshold Odor Number	2.0	T.O.N.
05/27/2020	Toluene	ND	ug/l
05/27/2020	Toluene-d8	49.1	ug/l
05/27/2020	Total Anions	19	meq/l
05/27/2020	Total Cations	20	meq/l
05/27/2020	Total Coliform	2.2	MPN/100ml
05/27/2020	Total Dissolved Solids	1200	mg/l
05/27/2020	Total Hardness as CaCO3	834	mg/l
05/27/2020	Total Organic Carbon (TOC)	0.51	mg/l
05/27/2020	Total Settleable Solids	ND	ml/l/hr
05/27/2020	Total Suspended Solids	0.2	mg/l
05/27/2020	Toxaphene	ND	ug/l
05/27/2020	trans-1,2-Dichloroethene	ND	ug/l
05/27/2020	trans-1,3-Dichloropropene	ND	ug/l
05/27/2020	trans-1,4-Dichloro-2-butene	ND	ug/l
05/27/2020	Trichloroacetic acid (tcaa)	ND	ug/l
05/27/2020	Trichloroethene	ND	ug/l
05/27/2020	Trichlorofluoromethane	ND	ug/l
05/27/2020	Triclosan	ND	ng/l
05/27/2020	Trifluralin	ND	ug/l
05/27/2020	Trimethoprim	ND	ng/l
05/27/2020	Triphenyl phosphate	299	ng/l
05/27/2020	Trithion	ND	ug/l
05/27/2020	Tritium	57.5	pCi/L dry
05/27/2020	Turbidity	0.050	NTU
05/27/2020	Unknown #1 (possible alkane MW=140)	9.7	ug/l
05/27/2020	Unknown #1 (possible ester MW=368)	2.8	ug/l
05/27/2020	Unknown #2 (possible alkane MW=158)	8.8	ug/l
05/27/2020	Uranium Rad	14	pCi/L
05/27/2020	UV 254	0.009	1/cm
05/27/2020	Vanadium, Dissolved	3.5	ug/l
05/27/2020	Vanadium, Total	3.6	ug/l
05/27/2020	Vinyl acetate	ND	ug/l
05/27/2020	Vinyl chloride	ND	ug/l
05/27/2020	Xylenes, Total	ND	ug/l
05/27/2020	Zinc, Dissolved	84	ug/l
05/27/2020	Zinc, Total	73	ug/l
05/27/2020	Zinc, Total	73	ug/l

ARC-4 Well Data - Contaminants

Analyte	Result	Units	Date	Notes	MRL
Manganese Total ICAP	0.014	mg/L	1/4/2018		0.002
Iron Total ICAP	0.037	mg/L	1/4/2018		0.02
Carbon disulfide	0.11	ug/L	8/8/2019	J	0.5
Chloroform (Trichloromethane)	0.64	ug/L	8/8/2019		0.5
Total THM	0.64	ug/L	8/9/2019		0.5
Chloroform (Trichloromethane)	0.74	ug/L	8/17/2018		0.5
Total THM	0.74	ug/L	8/17/2018		0.5
1,2,3-Trichloropropane	NA	ug/L	3/1/2020		5
1,2,3-Trichloropropane	NA	ug/L	2/1/2020		5
1,2,3-Trichloropropane	NA	ug/L	1/1/2020		5
1,2,3-Trichloropropane	NA	ug/L	12/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	11/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	10/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	9/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	8/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	7/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	6/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	5/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	4/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	3/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	2/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	1/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	12/1/2018		5
1,2,3-Trichloropropane	NA	ug/L	11/1/2018		5
1,2,3-Trichloropropane	NA	ug/L	10/1/2018		5
1,2,3-Trichloropropane	NA	ug/L	9/1/2018		5
1,2,3-Trichloropropane	NA	ug/L	8/6/2018		5
1,2,3-Trichloropropane	NA	ug/L	7/2/2018		5
1,2,3-Trichloropropane	NA	ug/L	6/4/2018		5
1,2,3-Trichloropropane	NA	ug/L	5/22/2018		5
1,2,3-Trichloropropane	NA	ug/L	4/18/2018		5
1,2,3-Trichloropropane	NA	ug/L	3/29/2018		5
1,4 - Dioxane	NA	ug/L	1/6/2020		0.5
1,4 - Dioxane	NA	ug/L	10/7/2019		0.5
1,4 - Dioxane	NA	ug/L	7/1/2019		0.5
1,4 - Dioxane	NA	ug/L	4/1/2019		0.5
1,4 - Dioxane	NA	ug/L	1/7/2019		0.5
1,4 - Dioxane	NA	ug/L	10/1/2018		0.5
1,4 - Dioxane	NA	ug/L	7/2/2018		0.5
1,4 - Dioxane	NA	ug/L	4/2/2018		0.5
1,4 - Dioxane	NA	ug/L	1/2/2018		0.5
1,4 - Dioxane	NA	ug/L	10/2/2017		0.5

ARC-4 Well Data - Contaminants

Analyte	Result	Units	Date	Notes	MRL
1,4 - Dioxane	NA	ug/L	7/24/2017		0.5
1,4 - Dioxane	NA	ug/L	4/24/2017		0.5
1,4 - Dioxane	NA	ug/L	1/23/2017		0.5
1,2,3-Trichloropropane	ND	ug/L	8/9/2019		0.5
1,2,3-Trichloropropane	ND	ug/L	8/8/2019		0.005
1,2,3-Trichloropropane	ND	ug/L	8/17/2018		0.5
Alachlor (Alanex)	ND	ug/L	11/16/2018		0.05
Alachlor (Alanex)	ND	ug/L	8/24/2018		0.05
Alachlor (Alanex)	ND	ug/L	11/8/2018		0.1
Alachlor (Alanex)	ND	ug/L	8/8/2018		0.1
Tetrachloroethylene (PCE)	ND	ug/L	3/1/2020		0.5
Tetrachloroethylene (PCE)	ND	ug/L	2/1/2020		0.5
Tetrachloroethylene (PCE)	ND	ug/L	1/1/2020		0.5
Tetrachloroethylene (PCE)	ND	ug/L	12/1/2019		0.5
Tetrachloroethylene (PCE)	ND	ug/L	11/1/2019		0.5
Tetrachloroethylene (PCE)	ND	ug/L	10/1/2019		0.5
Tetrachloroethylene (PCE)	ND	ug/L	9/1/2019		0.5
Tetrachloroethylene (PCE)	ND	ug/L	8/1/2019		0.5
Tetrachloroethylene (PCE)	ND	ug/L	7/1/2019		0.5
Tetrachloroethylene (PCE)	ND	ug/L	6/1/2019		0.5
Tetrachloroethylene (PCE)	ND	ug/L	5/1/2019		0.5
Tetrachloroethylene (PCE)	ND	ug/L	4/1/2019		0.5
Tetrachloroethylene (PCE)	ND	ug/L	3/1/2019		0.5
Tetrachloroethylene (PCE)	ND	ug/L	2/1/2019		0.5
Tetrachloroethylene (PCE)	ND	ug/L	1/1/2019		0.5
Tetrachloroethylene (PCE)	ND	ug/L	12/1/2018		0.5
Tetrachloroethylene (PCE)	ND	ug/L	11/1/2018		0.5
Tetrachloroethylene (PCE)	ND	ug/L	10/1/2018		0.5
Tetrachloroethylene (PCE)	ND	ug/L	9/1/2018		0.5
Tetrachloroethylene (PCE)	ND	ug/L	8/1/2018		0.5
Tetrachloroethylene (PCE)	ND	ug/L	7/1/2018		0.5
Tetrachloroethylene (PCE)	ND	ug/L	6/1/2018		0.5
Tetrachloroethylene (PCE)	ND	ug/L	5/1/2018		0.5
Tetrachloroethylene (PCE)	ND	ug/L	4/1/2018		0.5
Tetrachloroethylene (PCE)	ND	ug/L	3/1/2018		0.5
Tetrachloroethylene (PCE)	ND	ug/L	2/1/2018		0.5
Tetrachloroethylene (PCE)	ND	ug/L	1/1/2018		0.5
Tetrachloroethylene (PCE)	ND	ug/L	12/4/2017		0.5
Tetrachloroethylene (PCE)	ND	ug/L	11/6/2017		0.5
Tetrachloroethylene (PCE)	ND	ug/L	10/2/2017		0.5
Tetrachloroethylene (PCE)	ND	ug/L	9/5/2017		0.5
Tetrachloroethylene (PCE)	ND	ug/L	8/28/2017		0.5

ARC-4 Well Data - Contaminants

Analyte	Result	Units	Date	Notes	MRL
Tetrachloroethylene (PCE)	ND	ug/L	7/24/2017		0.5
Tetrachloroethylene (PCE)	ND	ug/L	6/26/2017		0.5
Tetrachloroethylene (PCE)	ND	ug/L	5/22/2017		0.5
Tetrachloroethylene (PCE)	ND	ug/L	4/24/2017		0.5
Tetrachloroethylene (PCE)	Offline	ug/L	3/27/2017		0.5
Tetrachloroethylene (PCE)	Offline	ug/L	2/27/2017		0.5
Tetrachloroethylene (PCE)	Offline	ug/L	1/23/2017		0.5
Tetrachloroethylene (PCE)	ND	ug/L	8/9/2019		0.5
Tetrachloroethylene (PCE)	ND	ug/L	8/17/2018		0.5
Trichloroethylene (TCE)	ND	ug/L	3/1/2020		0.5
Trichloroethylene (TCE)	ND	ug/L	2/1/2020		0.5
Trichloroethylene (TCE)	ND	ug/L	1/1/2020		0.5
Trichloroethylene (TCE)	ND	ug/L	12/1/2019		0.5
Trichloroethylene (TCE)	ND	ug/L	11/1/2019		0.5
Trichloroethylene (TCE)	ND	ug/L	10/1/2019		0.5
Trichloroethylene (TCE)	ND	ug/L	9/1/2019		0.5
Trichloroethylene (TCE)	ND	ug/L	8/1/2019		0.5
Trichloroethylene (TCE)	ND	ug/L	7/1/2019		0.5
Trichloroethylene (TCE)	ND	ug/L	6/1/2019		0.5
Trichloroethylene (TCE)	ND	ug/L	5/1/2019		0.5
Trichloroethylene (TCE)	ND	ug/L	4/1/2019		0.5
Trichloroethylene (TCE)	ND	ug/L	3/1/2019		0.5
Trichloroethylene (TCE)	ND	ug/L	2/1/2019		0.5
Trichloroethylene (TCE)	ND	ug/L	1/1/2019		0.5
Trichloroethylene (TCE)	ND	ug/L	12/1/2018		0.5
Trichloroethylene (TCE)	ND	ug/L	11/1/2018		0.5
Trichloroethylene (TCE)	ND	ug/L	10/1/2018		0.5
Trichloroethylene (TCE)	ND	ug/L	9/1/2018		0.5
Trichloroethylene (TCE)	ND	ug/L	8/1/2018		0.5
Trichloroethylene (TCE)	ND	ug/L	7/1/2018		0.5
Trichloroethylene (TCE)	ND	ug/L	6/1/2018		0.5
Trichloroethylene (TCE)	ND	ug/L	5/1/2018		0.5
Trichloroethylene (TCE)	ND	ug/L	4/1/2018		0.5
Cyanide	ND	mg/L	8/14/2018		0.025
Surfactants	ND	mg/L	8/8/2018		0.1
1,1,1,2-Tetrachloroethane	ND	ug/L	8/9/2019		0.5
1,1,1-Trichloroethane	ND	ug/L	8/9/2019		0.5
1,1,2,2-Tetrachloroethane	ND	ug/L	8/9/2019		0.5
1,1,2-Trichloroethane	ND	ug/L	8/9/2019		0.5
1,1-Dichloroethane	ND	ug/L	8/9/2019		0.5
1,1-Dichloroethylene	ND	ug/L	8/9/2019		0.5
1,1-Dichloropropene	ND	ug/L	8/9/2019		0.5

ARC-4 Well Data - Contaminants

Analyte	Result	Units	Date	Notes	MRL
1,2,3-Trichlorobenzene	ND	ug/L	8/9/2019		0.5
Trichloroethylene (TCE)	ND	ug/L	3/1/2018		0.5
1,2,4-Trichlorobenzene	ND	ug/L	8/9/2019		0.5
1,2,4-Trimethylbenzene	ND	ug/L	8/9/2019		0.5
1,2-Dichloroethane	ND	ug/L	8/9/2019		0.5
1,2-Dichloropropane	ND	ug/L	8/9/2019		0.5
1,3,5-Trimethylbenzene	ND	ug/L	8/9/2019		0.5
1,3-Dichloropropane	ND	ug/L	8/9/2019		0.5
2,2-Dichloropropane	ND	ug/L	8/8/2019		0.5
2-Butanone (MEK)	ND	ug/L	8/8/2019		5
4-Methyl-2-Pentanone (MIBK)	ND	ug/L	8/8/2019		5
Benzene	ND	ug/L	8/8/2019		0.5
Bromobenzene	ND	ug/L	8/8/2019		0.5
Bromochloromethane	ND	ug/L	8/8/2019		0.5
Bromodichloromethane	ND	ug/L	8/8/2019		0.5
Bromoethane	ND	ug/L	8/8/2019		0.5
Bromoform	ND	ug/L	8/8/2019		0.5
Carbon Tetrachloride	ND	ug/L	8/8/2019		0.5
Chlorobenzene	ND	ug/L	8/8/2019		0.5
Chlorodibromomethane	ND	ug/L	8/8/2019		0.5
Chloroethane	ND	ug/L	8/8/2019		0.5
Chloromethane(Methyl Chloride)	ND	ug/L	8/8/2019		0.5
cis-1,2-Dichloroethylene	ND	ug/L	8/8/2019		0.5
cis-1,3-Dichloropropene	ND	ug/L	8/8/2019		0.5
Dibromomethane	ND	ug/L	8/8/2019		0.5
Dichlorodifluoromethane	ND	ug/L	8/8/2019		0.5
Dichloromethane	ND	ug/L	8/8/2019		0.5
Di-isopropyl ether	ND	ug/L	8/8/2019		3
Ethyl benzene	ND	ug/L	8/8/2019		0.5
Hexachlorobutadiene	ND	ug/L	8/8/2019		0.5
Isopropylbenzene	ND	ug/L	8/8/2019		0.5
m,p-Xylenes	ND	ug/L	8/8/2019		0.5
m-Dichlorobenzene (1,3-DCB)	ND	ug/L	8/8/2019		0.5
Methyl Tert-butyl ether (MTBE)	ND	ug/L	8/8/2019		0.5
Naphthalene	ND	ug/L	8/8/2019		0.5
n-Butylbenzene	ND	ug/L	8/8/2019		0.5
n-Propylbenzene	ND	ug/L	8/8/2019		0.5
o-Chlorotoluene	ND	ug/L	8/8/2019		0.5
o-Dichlorobenzene (1,2-DCB)	ND	ug/L	8/8/2019		0.5
o-Xylene	ND	ug/L	8/8/2019		0.5
p-Chlorotoluene	ND	ug/L	8/9/2019		0.5
p-Dichlorobenzene (1,4-DCB)	ND	ug/L	8/9/2019		0.5

ARC-4 Well Data - Contaminants

Analyte	Result	Units	Date	Notes	MRL
p-Isopropyltoluene	ND	ug/L	8/9/2019		0.5
sec-Butylbenzene	ND	ug/L	8/9/2019		0.5
Styrene	ND	ug/L	8/9/2019		0.5
tert-amyl Methyl Ether	ND	ug/L	8/9/2019		3
tert-Butyl Ethyl Ether	ND	ug/L	8/9/2019		3
tert-Butylbenzene	ND	ug/L	8/9/2019		0.5
Trichloroethylene (TCE)	ND	ug/L	2/1/2018		0.5
Toluene	ND	ug/L	8/9/2019		0.5
Total 1,3-Dichloropropene	ND	ug/L	8/9/2019		0.5
Total xylenes	ND	ug/L	8/9/2019		0.5
trans-1,2-Dichloroethylene	ND	ug/L	8/9/2019		0.5
trans-1,3-Dichloropropene	ND	ug/L	8/9/2019		0.5
Trichloroethylene (TCE)	ND	ug/L	1/1/2018		0.5
Trichlorofluoromethane	ND	ug/L	8/9/2019		0.5
Trichlorotrifluoroethane(Freon 113)	ND	ug/L	8/9/2019		0.5
Vinyl chloride (VC)	ND	ug/L	8/9/2019		0.3
Trichloroethylene (TCE)	ND	ug/L	12/4/2017		0.5
Trichloroethylene (TCE)	ND	ug/L	11/6/2017		0.5
Chlordane	ND	ug/L	11/8/2018		0.1
Endrin	ND	ug/L	11/8/2018		0.01
Heptachlor	ND	ug/L	11/8/2018		0.01
Heptachlor Epoxide	ND	ug/L	11/8/2018		0.01
Lindane (gamma-BHC)	ND	ug/L	11/8/2018		0.01
Methoxychlor	ND	ug/L	11/8/2018		0.05
PCB 1016 Aroclor	ND	ug/L	11/8/2018		0.08
PCB 1221 Aroclor	ND	ug/L	11/8/2018		0.1
PCB 1232 Aroclor	ND	ug/L	11/8/2018		0.1
PCB 1242 Aroclor	ND	ug/L	11/8/2018		0.1
PCB 1248 Aroclor	ND	ug/L	11/8/2018		0.1
PCB 1254 Aroclor	ND	ug/L	11/8/2018		0.1
PCB 1260 Aroclor	ND	ug/L	11/8/2018		0.1
Total PCBs	ND	ug/L	11/8/2018		0.1
Toxaphene	ND	ug/L	11/8/2018		0.5
2,4,5-TP (Silvex)	ND	ug/L	11/16/2018		0.2
2,4-D	ND	ug/L	11/16/2018		0.1
Bentazon	ND	ug/L	11/16/2018		0.5
Dalapon	ND	ug/L	11/16/2018		1
Dinoseb	ND	ug/L	11/16/2018		0.2
Pentachlorophenol	ND	ug/L	11/16/2018		0.04
Picloram	ND	ug/L	11/16/2018		0.1
Dibromochloropropane (DBCP)	ND	ug/L	11/9/2018		0.01
Ethylene Dibromide (EDB)	ND	ug/L	11/9/2018		0.01

ARC-4 Well Data - Contaminants

Analyte	Result	Units	Date	Notes	MRL
Trichloroethylene (TCE)	ND	ug/L	10/2/2017		0.5
Atrazine	ND	ug/L	11/16/2018		0.05
Benzo(a)pyrene	ND	ug/L	11/16/2018		0.02
Di-(2-Ethylhexyl)adipate	ND	ug/L	11/16/2018		0.6
Di(2-Ethylhexyl)phthalate	ND	ug/L	11/16/2018		0.6
Hexachlorobenzene	ND	ug/L	11/16/2018		0.05
Hexachlorocyclopentadiene	ND	ug/L	11/16/2018		0.05
Molinate	ND	ug/L	11/16/2018		0.1
Simazine	ND	ug/L	11/16/2018		0.05
Thiobencarb (ELAP)	ND	ug/L	11/16/2018		0.2
Endothall	ND	ug/L	11/8/2018		20
Glyphosate	ND	ug/L	11/10/2018		6
Carbofuran (Furadan)	ND	ug/L	11/8/2018		0.5
Oxamyl (Vydate)	ND	ug/L	11/8/2018		0.5
Diquat	ND	ug/L	11/9/2018		0.4
Trichloroethylene (TCE)	ND	ug/L	9/5/2017		0.5
Chlordane	ND	ug/L	8/8/2018		0.1
Endrin	ND	ug/L	8/8/2018		0.01
Lindane (gamma-BHC)	ND	ug/L	8/8/2018		0.01
Methoxychlor	ND	ug/L	8/8/2018		0.05
Toxaphene	ND	ug/L	8/8/2018		0.5
2,4-D	ND	ug/L	8/15/2018		0.1
Bentazon	ND	ug/L	8/15/2018		0.5
Dinoseb	ND	ug/L	8/15/2018		0.2
Pentachlorophenol	ND	ug/L	8/15/2018		0.04
Dibromochloropropane (DBCP)	ND	ug/L	8/18/2018		0.01
Ethylene Dibromide (EDB)	ND	ug/L	8/18/2018		0.01
Trichloroethylene (TCE)	ND	ug/L	8/28/2017		0.5
Atrazine	ND	ug/L	8/24/2018		0.05
Di(2-Ethylhexyl)phthalate	ND	ug/L	8/24/2018		0.6
Simazine	ND	ug/L	8/24/2018		0.05
Thiobencarb (ELAP)	ND	ug/L	8/24/2018		0.2
Endothall	ND	ug/L	8/10/2018		20
Glyphosate	ND	ug/L	8/10/2018		6
Carbofuran (Furadan)	ND	ug/L	8/8/2018		0.5
Oxamyl (Vydate)	ND	ug/L	8/8/2018		0.5
Diquat	ND	ug/L	8/9/2018		0.4
Perchlorate	ND	ug/L	8/10/2018		2
1,1,1,2-Tetrachloroethane	ND	ug/L	8/17/2018		0.5
1,1,1-Trichloroethane	ND	ug/L	8/17/2018		0.5
1,1,2,2-Tetrachloroethane	ND	ug/L	8/17/2018		0.5
1,1,2-Trichloroethane	ND	ug/L	8/17/2018		0.5

ARC-4 Well Data - Contaminants

Analyte	Result	Units	Date	Notes	MRL
1,1-Dichloroethane	ND	ug/L	8/17/2018		0.5
1,1-Dichloroethylene	ND	ug/L	8/17/2018		0.5
1,1-Dichloropropene	ND	ug/L	8/17/2018		0.5
1,2,3-Trichlorobenzene	ND	ug/L	8/17/2018		0.5
Trichloroethylene (TCE)	ND	ug/L	7/24/2017		0.5
1,2,4-Trichlorobenzene	ND	ug/L	8/17/2018		0.5
1,2,4-Trimethylbenzene	ND	ug/L	8/17/2018		0.5
1,2-Dichloroethane	ND	ug/L	8/17/2018		0.5
1,2-Dichloropropane	ND	ug/L	8/17/2018		0.5
1,3,5-Trimethylbenzene	ND	ug/L	8/17/2018		0.5
1,3-Dichloropropane	ND	ug/L	8/17/2018		0.5
2,2-Dichloropropane	ND	ug/L	8/17/2018		0.5
2-Butanone (MEK)	ND	ug/L	8/17/2018		5
Benzene	ND	ug/L	8/17/2018		0.5
Bromobenzene	ND	ug/L	8/17/2018		0.5
Bromochloromethane	ND	ug/L	8/17/2018		0.5
Bromodichloromethane	ND	ug/L	8/17/2018		0.5
Bromoethane	ND	ug/L	8/17/2018		0.5
Bromoform	ND	ug/L	8/17/2018		0.5
Bromomethane (Methyl Bromide)	ND	ug/L	8/17/2018		0.5
Carbon disulfide	ND	ug/L	8/17/2018		0.5
Carbon Tetrachloride	ND	ug/L	8/17/2018		0.5
Chlorobenzene	ND	ug/L	8/17/2018		0.5
Chlorodibromomethane	ND	ug/L	8/17/2018		0.5
Chloroethane	ND	ug/L	8/17/2018		0.5
Chloromethane(Methyl Chloride)	ND	ug/L	8/17/2018		0.5
cis-1,2-Dichloroethylene	ND	ug/L	8/17/2018		0.5
cis-1,3-Dichloropropene	ND	ug/L	8/17/2018		0.5
Dibromomethane	ND	ug/L	8/17/2018		0.5
Dichloromethane	ND	ug/L	8/17/2018		0.5
Di-isopropyl ether	ND	ug/L	8/17/2018		3
Ethyl benzene	ND	ug/L	8/17/2018		0.5
Hexachlorobutadiene	ND	ug/L	8/17/2018		0.5
Isopropylbenzene	ND	ug/L	8/17/2018		0.5
m,p-Xylenes	ND	ug/L	8/17/2018		0.5
m-Dichlorobenzene (1,3-DCB)	ND	ug/L	8/17/2018		0.5
Methyl Tert-butyl ether (MTBE)	ND	ug/L	8/17/2018		0.5
Naphthalene	ND	ug/L	8/17/2018		0.5
n-Butylbenzene	ND	ug/L	8/17/2018		0.5
n-Propylbenzene	ND	ug/L	8/17/2018		0.5
o-Chlorotoluene	ND	ug/L	8/17/2018		0.5
o-Dichlorobenzene (1,2-DCB)	ND	ug/L	8/17/2018		0.5

ARC-4 Well Data - Contaminants

Analyte	Result	Units	Date	Notes	MRL
o-Xylene	ND	ug/L	8/17/2018		0.5
p-Chlorotoluene	ND	ug/L	8/17/2018		0.5
p-Dichlorobenzene (1,4-DCB)	ND	ug/L	8/17/2018		0.5
p-Isopropyltoluene	ND	ug/L	8/17/2018		0.5
sec-Butylbenzene	ND	ug/L	8/17/2018		0.5
Styrene	ND	ug/L	8/17/2018		0.5
tert-amyl Methyl Ether	ND	ug/L	8/17/2018		3
tert-Butyl Ethyl Ether	ND	ug/L	8/17/2018		3
tert-Butylbenzene	ND	ug/L	8/17/2018		0.5
Trichloroethylene (TCE)	ND	ug/L	6/26/2017		0.5
Toluene	ND	ug/L	8/17/2018		0.5
Total 1,3-Dichloropropene	ND	ug/L	8/17/2018		0.5
Total xylenes	ND	ug/L	8/17/2018		0.5
trans-1,2-Dichloroethylene	ND	ug/L	8/17/2018		0.5
trans-1,3-Dichloropropene	ND	ug/L	8/17/2018		0.5
Trichloroethylene (TCE)	ND	ug/L	5/22/2017		0.5
Trichlorofluoromethane	ND	ug/L	8/17/2018		0.5
Trichlorotrifluoroethane(Freon 113)	ND	ug/L	8/17/2018		0.5
Vinyl chloride (VC)	ND	ug/L	8/17/2018		0.3
Dichlorodifluoromethane	ND (LK)	ug/L	8/17/2018		0.5
Bromomethane (Methyl Bromide)	ND (LM)	ug/L	8/8/2019		0.5
4-Methyl-2-Pentanone (MIBK)	ND (VC)	ug/L	8/17/2018		5
Trichloroethylene (TCE)	ND	ug/L	4/24/2017		0.5
Trichloroethylene (TCE)	Offline	ug/L	3/27/2017		0.5
Trichloroethylene (TCE)	Offline	ug/L	2/27/2017		0.5
Trichloroethylene (TCE)	Offline	ug/L	1/23/2017		0.5
Trichloroethylene (TCE)	ND	ug/L	8/9/2019		0.5
Trichloroethylene (TCE)	ND	ug/L	8/17/2018		0.5

ARC-5 Well Data - Contaminants

Analyte	ARC 4	Units	Date	Notes
Manganese Total ICAP	0.046	mg/L	1/4/2018	
Iron Total ICAP	0.047	mg/L	1/4/2018	
Dichlorodifluoromethane	0.1	ug/L	8/9/2019	J
Carbon disulfide	0.13	ug/L	8/9/2019	J
Bromoform	0.21	ug/L	8/9/2019	J
Chlorodibromomethane	0.26	ug/L	8/9/2019	J
trans-1,3-Dichloropropene	0.28	ug/L	8/9/2019	J
Chloroform (Trichloromethane)	0.32	ug/L	8/9/2019	J
1,2,3-Trichloropropane	NA	ug/L	3/1/2020	
1,2,3-Trichloropropane	NA	ug/L	2/1/2020	
1,2,3-Trichloropropane	NA	ug/L	1/1/2020	
1,2,3-Trichloropropane	NA	ug/L	12/1/2019	
1,2,3-Trichloropropane	NA	ug/L	11/1/2019	
1,2,3-Trichloropropane	NA	ug/L	10/1/2019	
1,2,3-Trichloropropane	NA	ug/L	9/1/2019	
1,2,3-Trichloropropane	NA	ug/L	8/1/2019	
1,2,3-Trichloropropane	NA	ug/L	7/1/2019	
1,2,3-Trichloropropane	NA	ug/L	6/1/2019	
1,2,3-Trichloropropane	NA	ug/L	5/1/2019	
1,2,3-Trichloropropane	NA	ug/L	4/1/2019	
1,2,3-Trichloropropane	NA	ug/L	3/1/2019	
1,2,3-Trichloropropane	NA	ug/L	2/1/2019	
1,2,3-Trichloropropane	NA	ug/L	1/1/2019	
1,2,3-Trichloropropane	NA	ug/L	12/1/2018	
1,2,3-Trichloropropane	NA	ug/L	11/1/2018	
1,2,3-Trichloropropane	NA	ug/L	10/1/2018	
1,2,3-Trichloropropane	NA	ug/L	9/1/2018	
1,2,3-Trichloropropane	NA	ug/L	8/6/2018	
1,2,3-Trichloropropane	NA	ug/L	7/2/2018	
1,2,3-Trichloropropane	NA	ug/L	6/4/2018	
1,2,3-Trichloropropane	NA	ug/L	5/22/2018	
1,2,3-Trichloropropane	NA	ug/L	4/18/2018	
1,2,3-Trichloropropane	NA	ug/L	3/29/2018	
1,4 - Dioxane	NA	ug/L	1/6/2020	
1,4 - Dioxane	NA	ug/L	10/7/2019	
1,4 - Dioxane	NA	ug/L	7/1/2019	
1,4 - Dioxane	NA	ug/L	4/1/2019	
1,4 - Dioxane	NA	ug/L	1/7/2019	
1,4 - Dioxane	NA	ug/L	10/1/2018	
1,4 - Dioxane	NA	ug/L	7/2/2018	
1,4 - Dioxane	NA	ug/L	4/2/2018	
1,4 - Dioxane	NA	ug/L	1/2/2018	

ARC-5 Well Data - Contaminants

Analyte	ARC 4	Units	Date	Notes
1,4 - Dioxane	NA	ug/L	10/2/2017	
1,4 - Dioxane	NA	ug/L	7/24/2017	
1,4 - Dioxane	NA	ug/L	4/24/2017	
1,4 - Dioxane	NA	ug/L	1/23/2017	
Tetrachloroethylene (PCE)	ND	ug/L	3/1/2020	
Tetrachloroethylene (PCE)	ND	ug/L	2/1/2020	
Tetrachloroethylene (PCE)	ND	ug/L	1/1/2020	
Tetrachloroethylene (PCE)	ND	ug/L	12/1/2019	
Tetrachloroethylene (PCE)	ND	ug/L	11/1/2019	
Tetrachloroethylene (PCE)	ND	ug/L	10/1/2019	
Tetrachloroethylene (PCE)	ND	ug/L	9/1/2019	
Tetrachloroethylene (PCE)	ND	ug/L	8/1/2019	
Tetrachloroethylene (PCE)	ND	ug/L	7/1/2019	
Tetrachloroethylene (PCE)	ND	ug/L	6/1/2019	
Tetrachloroethylene (PCE)	ND	ug/L	5/1/2019	
Tetrachloroethylene (PCE)	ND	ug/L	4/1/2019	
Tetrachloroethylene (PCE)	ND	ug/L	3/1/2019	
Tetrachloroethylene (PCE)	ND	ug/L	2/1/2019	
Tetrachloroethylene (PCE)	ND	ug/L	1/1/2019	
Tetrachloroethylene (PCE)	ND	ug/L	12/1/2018	
Tetrachloroethylene (PCE)	ND	ug/L	11/1/2018	
Tetrachloroethylene (PCE)	ND	ug/L	10/1/2018	
Tetrachloroethylene (PCE)	ND	ug/L	9/1/2018	
Tetrachloroethylene (PCE)	ND	ug/L	8/1/2018	
Tetrachloroethylene (PCE)	ND	ug/L	7/1/2018	
Tetrachloroethylene (PCE)	ND	ug/L	6/1/2018	
Tetrachloroethylene (PCE)	ND	ug/L	5/1/2018	
Tetrachloroethylene (PCE)	ND	ug/L	4/1/2018	
Tetrachloroethylene (PCE)	ND	ug/L	3/1/2018	
Tetrachloroethylene (PCE)	ND	ug/L	2/1/2018	
Tetrachloroethylene (PCE)	ND	ug/L	1/1/2018	
Tetrachloroethylene (PCE)	ND	ug/L	12/4/2017	
Tetrachloroethylene (PCE)	ND	ug/L	11/6/2017	
Tetrachloroethylene (PCE)	ND	ug/L	10/2/2017	
Tetrachloroethylene (PCE)	ND	ug/L	9/5/2017	
Tetrachloroethylene (PCE)	ND	ug/L	8/28/2017	
Tetrachloroethylene (PCE)	ND	ug/L	7/24/2017	
Tetrachloroethylene (PCE)	ND	ug/L	6/26/2017	
Tetrachloroethylene (PCE)	ND	ug/L	5/22/2017	
Tetrachloroethylene (PCE)	ND	ug/L	4/24/2017	
Tetrachloroethylene (PCE)	ND	ug/L	3/27/2017	
Tetrachloroethylene (PCE)	ND	ug/L	2/27/2017	

ARC-5 Well Data - Contaminants

Analyte	ARC 4	Units	Date	Notes
Tetrachloroethylene (PCE)	ND	ug/L	1/23/2017	
Trichloroethylene (TCE)	ND	ug/L	3/1/2020	
Trichloroethylene (TCE)	ND	ug/L	2/1/2020	
Trichloroethylene (TCE)	ND	ug/L	1/1/2020	
Trichloroethylene (TCE)	ND	ug/L	12/1/2019	
Trichloroethylene (TCE)	ND	ug/L	11/1/2019	
Trichloroethylene (TCE)	ND	ug/L	10/1/2019	
Trichloroethylene (TCE)	ND	ug/L	9/1/2019	
Trichloroethylene (TCE)	ND	ug/L	8/1/2019	
Trichloroethylene (TCE)	ND	ug/L	7/1/2019	
Trichloroethylene (TCE)	ND	ug/L	6/1/2019	
Trichloroethylene (TCE)	ND	ug/L	5/1/2019	
Trichloroethylene (TCE)	ND	ug/L	4/1/2019	
Trichloroethylene (TCE)	ND	ug/L	3/1/2019	
Trichloroethylene (TCE)	ND	ug/L	2/1/2019	
Trichloroethylene (TCE)	ND	ug/L	1/1/2019	
Trichloroethylene (TCE)	ND	ug/L	12/1/2018	
Trichloroethylene (TCE)	ND	ug/L	11/1/2018	
Trichloroethylene (TCE)	ND	ug/L	10/1/2018	
Trichloroethylene (TCE)	ND	ug/L	9/1/2018	
Trichloroethylene (TCE)	ND	ug/L	8/1/2018	
Trichloroethylene (TCE)	ND	ug/L	7/1/2018	
Trichloroethylene (TCE)	ND	ug/L	6/1/2018	
Trichloroethylene (TCE)	ND	ug/L	5/1/2018	
Trichloroethylene (TCE)	ND	ug/L	4/1/2018	
Trichloroethylene (TCE)	ND	ug/L	3/1/2018	
Trichloroethylene (TCE)	ND	ug/L	2/1/2018	
Trichloroethylene (TCE)	ND	ug/L	1/1/2018	
Trichloroethylene (TCE)	ND	ug/L	12/4/2017	
Trichloroethylene (TCE)	ND	ug/L	11/6/2017	
Trichloroethylene (TCE)	ND	ug/L	10/2/2017	
Trichloroethylene (TCE)	ND	ug/L	9/5/2017	
Trichloroethylene (TCE)	ND	ug/L	8/28/2017	
Trichloroethylene (TCE)	ND	ug/L	7/24/2017	
Trichloroethylene (TCE)	ND	ug/L	6/26/2017	
Trichloroethylene (TCE)	ND	ug/L	5/22/2017	
Trichloroethylene (TCE)	ND	ug/L	4/24/2017	
Trichloroethylene (TCE)	ND	ug/L	3/27/2017	
Trichloroethylene (TCE)	ND	ug/L	2/27/2017	
Trichloroethylene (TCE)	ND	ug/L	1/23/2017	
Cyanide	ND	mg/L	8/13/2018	
Surfactants	ND	mg/L	8/8/2018	

ARC-5 Well Data - Contaminants

Analyte	ARC 4	Units	Date	Notes
1,1,1,2-Tetrachloroethane	ND	ug/L	8/9/2019	
1,1,1,2-Tetrachloroethane	ND	ug/L	8/17/2018	
1,1,1-Trichloroethane	ND	ug/L	8/9/2019	
1,1,1-Trichloroethane	ND	ug/L	8/17/2018	
1,1,2,2-Tetrachloroethane	ND	ug/L	8/9/2019	
1,1,2,2-Tetrachloroethane	ND	ug/L	8/17/2018	
1,1,2-Trichloroethane	ND	ug/L	8/9/2019	
1,1,2-Trichloroethane	ND	ug/L	8/17/2018	
1,1-Dichloroethane	ND	ug/L	8/9/2019	
1,1-Dichloroethane	ND	ug/L	8/17/2018	
1,1-Dichloroethylene	ND	ug/L	8/9/2019	
1,1-Dichloroethylene	ND	ug/L	8/17/2018	
1,1-Dichloropropene	ND	ug/L	8/9/2019	
1,1-Dichloropropene	ND	ug/L	8/17/2018	
1,2,3-Trichlorobenzene	ND	ug/L	8/9/2019	
1,2,3-Trichlorobenzene	ND	ug/L	8/17/2018	
1,2,3-Trichloropropane	ND	ug/L	8/9/2019	
1,2,3-Trichloropropane	ND	ug/L	8/8/2019	
1,2,3-Trichloropropane	ND	ug/L	8/17/2018	
1,2,4-Trichlorobenzene	ND	ug/L	8/9/2019	
1,2,4-Trichlorobenzene	ND	ug/L	8/17/2018	
1,2,4-Trimethylbenzene	ND	ug/L	8/9/2019	
1,2,4-Trimethylbenzene	ND	ug/L	8/17/2018	
1,2-Dichloroethane	ND	ug/L	8/9/2019	
1,2-Dichloroethane	ND	ug/L	8/17/2018	
1,2-Dichloropropane	ND	ug/L	8/9/2019	
1,2-Dichloropropane	ND	ug/L	8/17/2018	
1,3,5-Trimethylbenzene	ND	ug/L	8/9/2019	
1,3,5-Trimethylbenzene	ND	ug/L	8/17/2018	
1,3-Dichloropropane	ND	ug/L	8/9/2019	
1,3-Dichloropropane	ND	ug/L	8/17/2018	
2,2-Dichloropropane	ND	ug/L	8/9/2019	
2,2-Dichloropropane	ND	ug/L	8/17/2018	
2,4,5-TP (Silvex)	ND	ug/L	11/16/2018	
2,4-D	ND	ug/L	11/16/2018	
2,4-D	ND	ug/L	8/15/2018	
2-Butanone (MEK)	ND	ug/L	8/9/2019	
2-Butanone (MEK)	ND	ug/L	8/17/2018	
4-Methyl-2-Pentanone (MIBK)	ND	ug/L	8/9/2019	
Alachlor (Alanex)	ND	ug/L	9/19/2018	
Alachlor (Alanex)	ND	ug/L	11/16/2018	
Alachlor (Alanex)	ND	ug/L	11/8/2018	

ARC-5 Well Data - Contaminants

Analyte	ARC 4	Units	Date	Notes
Alachlor (Alanex)	ND	ug/L	8/9/2018	
Atrazine	ND	ug/L	9/19/2018	
Atrazine	ND	ug/L	11/16/2018	
Bentazon	ND	ug/L	11/16/2018	
Bentazon	ND	ug/L	8/15/2018	
Benzene	ND	ug/L	8/9/2019	
Benzene	ND	ug/L	8/17/2018	
Benzo(a)pyrene	ND	ug/L	11/16/2018	
Bromobenzene	ND	ug/L	8/9/2019	
Bromobenzene	ND	ug/L	8/17/2018	
Bromochloromethane	ND	ug/L	8/9/2019	
Bromochloromethane	ND	ug/L	8/17/2018	
Bromodichloromethane	ND	ug/L	8/9/2019	
Bromodichloromethane	ND	ug/L	8/17/2018	
Bromoethane	ND	ug/L	8/9/2019	
Bromoethane	ND	ug/L	8/17/2018	
Bromoform	ND	ug/L	8/17/2018	
Bromomethane (Methyl Bromide)	ND	ug/L	8/17/2018	
Carbofuran (Furadan)	ND	ug/L	11/8/2018	
Carbofuran (Furadan)	ND	ug/L	8/8/2018	
Carbon disulfide	ND	ug/L	8/17/2018	
Carbon Tetrachloride	ND	ug/L	8/9/2019	
Carbon Tetrachloride	ND	ug/L	8/17/2018	
Chlordane	ND	ug/L	11/8/2018	
Chlordane	ND	ug/L	8/9/2018	
Chlorobenzene	ND	ug/L	8/9/2019	
Chlorobenzene	ND	ug/L	8/17/2018	
Chlorodibromomethane	ND	ug/L	8/17/2018	
Chloroethane	ND	ug/L	8/9/2019	
Chloroethane	ND	ug/L	8/17/2018	
Chloroform (Trichloromethane)	ND	ug/L	8/17/2018	
Chloromethane(Methyl Chloride)	ND	ug/L	8/9/2019	
Chloromethane(Methyl Chloride)	ND	ug/L	8/17/2018	
cis-1,2-Dichloroethylene	ND	ug/L	8/9/2019	
cis-1,2-Dichloroethylene	ND	ug/L	8/17/2018	
cis-1,3-Dichloropropene	ND	ug/L	8/9/2019	
cis-1,3-Dichloropropene	ND	ug/L	8/17/2018	
Dalapon	ND	ug/L	11/16/2018	
Di-(2-Ethylhexyl)adipate	ND	ug/L	9/19/2018	
Di-(2-Ethylhexyl)adipate	ND	ug/L	11/16/2018	
Di(2-Ethylhexyl)phthalate	ND	ug/L	9/19/2018	
Di(2-Ethylhexyl)phthalate	ND	ug/L	11/16/2018	

ARC-5 Well Data - Contaminants

Analyte	ARC 4	Units	Date	Notes
Dibromochloropropane (DBCP)	ND	ug/L	11/9/2018	
Dibromochloropropane (DBCP)	ND	ug/L	8/18/2018	
Dibromomethane	ND	ug/L	8/9/2019	
Dibromomethane	ND	ug/L	8/17/2018	
Dichloromethane	ND	ug/L	8/9/2019	
Dichloromethane	ND	ug/L	8/17/2018	
Di-isopropyl ether	ND	ug/L	8/9/2019	
Di-isopropyl ether	ND	ug/L	8/17/2018	
Dinoseb	ND	ug/L	11/16/2018	
Dinoseb	ND	ug/L	8/15/2018	
Diquat	ND	ug/L	11/9/2018	
Diquat	ND	ug/L	8/9/2018	
Endothall	ND	ug/L	11/8/2018	
Endothall	ND	ug/L	8/10/2018	
Endrin	ND	ug/L	11/8/2018	
Endrin	ND	ug/L	8/9/2018	
Ethyl benzene	ND	ug/L	8/9/2019	
Ethyl benzene	ND	ug/L	8/17/2018	
Ethylene Dibromide (EDB)	ND	ug/L	11/9/2018	
Ethylene Dibromide (EDB)	ND	ug/L	8/18/2018	
Glyphosate	ND	ug/L	11/10/2018	
Glyphosate	ND	ug/L	8/10/2018	
Heptachlor	ND	ug/L	11/8/2018	
Heptachlor Epoxide	ND	ug/L	11/8/2018	
Hexachlorobenzene	ND	ug/L	9/19/2018	
Hexachlorobenzene	ND	ug/L	11/16/2018	
Hexachlorobutadiene	ND	ug/L	8/9/2019	
Hexachlorobutadiene	ND	ug/L	8/17/2018	
Hexachlorocyclopentadiene	ND	ug/L	9/19/2018	
Hexachlorocyclopentadiene	ND	ug/L	11/16/2018	
Isopropylbenzene	ND	ug/L	8/9/2019	
Isopropylbenzene	ND	ug/L	8/17/2018	
Lindane (gamma-BHC)	ND	ug/L	11/8/2018	
Lindane (gamma-BHC)	ND	ug/L	8/9/2018	
m,p-Xylenes	ND	ug/L	8/9/2019	
m,p-Xylenes	ND	ug/L	8/17/2018	
m-Dichlorobenzene (1,3-DCB)	ND	ug/L	8/9/2019	
m-Dichlorobenzene (1,3-DCB)	ND	ug/L	8/17/2018	
Methoxychlor	ND	ug/L	11/8/2018	
Methoxychlor	ND	ug/L	8/9/2018	
Methyl Tert-butyl ether (MTBE)	ND	ug/L	8/9/2019	
Methyl Tert-butyl ether (MTBE)	ND	ug/L	8/17/2018	

ARC-5 Well Data - Contaminants

Analyte	ARC 4	Units	Date	Notes
Molinate	ND	ug/L	9/19/2018	
Molinate	ND	ug/L	11/16/2018	
Naphthalene	ND	ug/L	8/9/2019	
Naphthalene	ND	ug/L	8/17/2018	
n-Butylbenzene	ND	ug/L	8/9/2019	
n-Butylbenzene	ND	ug/L	8/17/2018	
n-Propylbenzene	ND	ug/L	8/9/2019	
n-Propylbenzene	ND	ug/L	8/17/2018	
o-Chlorotoluene	ND	ug/L	8/9/2019	
o-Chlorotoluene	ND	ug/L	8/17/2018	
o-Dichlorobenzene (1,2-DCB)	ND	ug/L	8/9/2019	
o-Dichlorobenzene (1,2-DCB)	ND	ug/L	8/17/2018	
Oxamyl (Vydate)	ND	ug/L	11/8/2018	
Oxamyl (Vydate)	ND	ug/L	8/8/2018	
o-Xylene	ND	ug/L	8/9/2019	
o-Xylene	ND	ug/L	8/17/2018	
PCB 1016 Aroclor	ND	ug/L	11/8/2018	
PCB 1221 Aroclor	ND	ug/L	11/8/2018	
PCB 1232 Aroclor	ND	ug/L	11/8/2018	
PCB 1242 Aroclor	ND	ug/L	11/8/2018	
PCB 1248 Aroclor	ND	ug/L	11/8/2018	
PCB 1254 Aroclor	ND	ug/L	11/8/2018	
PCB 1260 Aroclor	ND	ug/L	11/8/2018	
p-Chlorotoluene	ND	ug/L	8/9/2019	
p-Chlorotoluene	ND	ug/L	8/17/2018	
p-Dichlorobenzene (1,4-DCB)	ND	ug/L	8/9/2019	
p-Dichlorobenzene (1,4-DCB)	ND	ug/L	8/17/2018	
Pentachlorophenol	ND	ug/L	11/16/2018	
Pentachlorophenol	ND	ug/L	8/15/2018	
Perchlorate	ND	ug/L	8/10/2018	
Picloram	ND	ug/L	11/16/2018	
p-Isopropyltoluene	ND	ug/L	8/9/2019	
p-Isopropyltoluene	ND	ug/L	8/17/2018	
sec-Butylbenzene	ND	ug/L	8/9/2019	
sec-Butylbenzene	ND	ug/L	8/17/2018	
Simazine	ND	ug/L	9/19/2018	
Simazine	ND	ug/L	11/16/2018	
Styrene	ND	ug/L	8/9/2019	
Styrene	ND	ug/L	8/17/2018	
tert-amyl Methyl Ether	ND	ug/L	8/9/2019	
tert-amyl Methyl Ether	ND	ug/L	8/17/2018	
tert-Butyl Ethyl Ether	ND	ug/L	8/9/2019	

ARC-5 Well Data - Contaminants

Analyte	ARC 4	Units	Date	Notes
tert-Butyl Ethyl Ether	ND	ug/L	8/17/2018	
tert-Butylbenzene	ND	ug/L	8/9/2019	
tert-Butylbenzene	ND	ug/L	8/17/2018	
Tetrachloroethylene (PCE)	ND	ug/L	8/9/2019	
Tetrachloroethylene (PCE)	ND	ug/L	8/17/2018	
Thiobencarb (ELAP)	ND	ug/L	9/19/2018	
Thiobencarb (ELAP)	ND	ug/L	11/16/2018	
Toluene	ND	ug/L	8/9/2019	
Toluene	ND	ug/L	8/17/2018	
Total 1,3-Dichloropropene	ND	ug/L	8/9/2019	
Total 1,3-Dichloropropene	ND	ug/L	8/17/2018	
Total PCBs	ND	ug/L	11/8/2018	
Total THM	ND	ug/L	8/9/2019	
Total THM	ND	ug/L	8/17/2018	
Total xylenes	ND	ug/L	8/9/2019	
Total xylenes	ND	ug/L	8/17/2018	
Toxaphene	ND	ug/L	11/8/2018	
Toxaphene	ND	ug/L	8/9/2018	
trans-1,2-Dichloroethylene	ND	ug/L	8/9/2019	
trans-1,2-Dichloroethylene	ND	ug/L	8/17/2018	
trans-1,3-Dichloropropene	ND	ug/L	8/17/2018	
Trichloroethylene (TCE)	ND	ug/L	8/9/2019	
Trichloroethylene (TCE)	ND	ug/L	8/17/2018	
Trichlorofluoromethane	ND	ug/L	8/9/2019	
Trichlorofluoromethane	ND	ug/L	8/17/2018	
Trichlorotrifluoroethane(Freon 113)	ND	ug/L	8/9/2019	
Trichlorotrifluoroethane(Freon 113)	ND	ug/L	8/17/2018	
Vinyl chloride (VC)	ND	ug/L	8/9/2019	
Vinyl chloride (VC)	ND	ug/L	8/17/2018	
Benzo(a)pyrene	ND (LE)	ug/L	9/19/2018	
Dichlorodifluoromethane	ND (LK)	ug/L	8/17/2018	
Bromomethane (Methyl Bromide)	ND (LM)	ug/L	8/9/2019	
4-Methyl-2-Pentanone (MIBK)	ND (VC)	ug/L	8/17/2018	

CH-13 Well Data - Contaminants

Analyte	Result	Units	Date	Notes	MRL
Cyanide	ND	mg/L	9/4/2018		0.025
Surfactants	ND	mg/L	8/29/2018		0.1
Cyanide		mg/L			0.025
Surfactants		mg/L			0.1
Carbon disulfide	0.12	ug/L	8/9/2019	J	0.5
Chloroform (Trichloromethane)	0.18	ug/L	8/9/2019	J	0.5
Bromoform	0.2	ug/L	8/9/2019	J	0.5
Tetrachloroethylene (PCE)	0.2	ug/L	3/1/2020	J	0.5
Tetrachloroethylene (PCE)	0.2	ug/L	1/1/2019	J	0.5
Tetrachloroethylene (PCE)	0.2	ug/L	12/1/2018	J	0.5
Tetrachloroethylene (PCE)	0.2	ug/L	11/1/2018	J	0.5
Tetrachloroethylene (PCE)	0.2	ug/L	10/1/2018	J	0.5
Tetrachloroethylene (PCE)	0.2	ug/L	8/28/2017	J	0.5
Methyl Tert-butyl ether (MTBE)	0.25	ug/L	8/9/2019	J	0.5
trans-1,3-Dichloropropene	0.28	ug/L	8/9/2019	J	0.5
Tetrachloroethylene (PCE)	0.3	ug/L	2/1/2020	J	0.5
Tetrachloroethylene (PCE)	0.3	ug/L	4/1/2019	J	0.5
Tetrachloroethylene (PCE)	0.3	ug/L	3/1/2019	J	0.5
Tetrachloroethylene (PCE)	0.3	ug/L	2/1/2019	J	0.5
Tetrachloroethylene (PCE)	0.3	ug/L	11/6/2017	J	0.5
Tetrachloroethylene (PCE)	0.3	ug/L	9/5/2017	J	0.5
Tetrachloroethylene (PCE)	0.4	ug/L	9/1/2019	J	0.5
Tetrachloroethylene (PCE)	0.4	ug/L	8/1/2019	J	0.5
Tetrachloroethylene (PCE)	0.4	ug/L	6/1/2019	J	0.5
Tetrachloroethylene (PCE)	0.4	ug/L	5/1/2019	J	0.5
Tetrachloroethylene (PCE)	0.4	ug/L	10/2/2017	J	0.5
Tetrachloroethylene (PCE)	0.4	ug/L	7/24/2017	J	0.5
Tetrachloroethylene (PCE)	0.5	ug/L	1/1/2020		0.5
Tetrachloroethylene (PCE)	0.5	ug/L	11/1/2019		0.5
Tetrachloroethylene (PCE)	0.5	ug/L	10/1/2019		0.5
Tetrachloroethylene (PCE)	0.5	ug/L	7/1/2019		0.5
Tetrachloroethylene (PCE)	0.5	ug/L	6/26/2017		0.5
Tetrachloroethylene (PCE)	0.6	ug/L	4/24/2017		0.5
Tetrachloroethylene (PCE)	0.6	ug/L	3/27/2017		0.5
Tetrachloroethylene (PCE)	0.6	ug/L	2/27/2017		0.5
Tetrachloroethylene (PCE)	0.6	ug/L	1/23/2017		0.5
Trichloroethylene (TCE)	0.6	ug/L	8/1/2018		0.5
cis-1,2-Dichloroethylene	0.61	ug/L	8/9/2019		0.5
Trichloroethylene (TCE)	0.61	ug/L	9/7/2018		0.5
Tetrachloroethylene (PCE)	0.7	ug/L	12/1/2019		0.5
Tetrachloroethylene (PCE)	0.9	ug/L	5/22/2017		0.5
1,1-Dichloroethylene	0.92	ug/L	8/9/2019		0.5
Trichloroethylene (TCE)	1.2	ug/L	9/1/2018		0.5
Trichloroethylene (TCE)	2.6	ug/L	3/1/2020		0.5
Trichloroethylene (TCE)	3.4	ug/L	2/1/2020		0.5
Trichloroethylene (TCE)	4.4	ug/L	12/1/2018		0.5

CH-13 Well Data - Contaminants

Analyte	Result	Units	Date	Notes	MRL
Trichloroethylene (TCE)	4.4	ug/L	10/1/2018		0.5
Trichloroethylene (TCE)	4.5	ug/L	8/28/2017		0.5
Trichloroethylene (TCE)	4.6	ug/L	1/1/2020		0.5
Trichloroethylene (TCE)	4.6	ug/L	11/1/2018		0.5
Trichloroethylene (TCE)	4.9	ug/L	1/1/2019		0.5
Trichloroethylene (TCE)	4.9	ug/L	8/9/2019		0.5
Trichloroethylene (TCE)	5	ug/L	2/1/2019		0.5
Trichloroethylene (TCE)	5.4	ug/L	8/1/2019		0.5
Trichloroethylene (TCE)	5.4	ug/L	4/1/2019		0.5
Trichloroethylene (TCE)	5.7	ug/L	9/1/2019		0.5
Trichloroethylene (TCE)	5.7	ug/L	3/1/2019		0.5
Trichloroethylene (TCE)	5.9	ug/L	5/1/2019		0.5
Trichloroethylene (TCE)	6.1	ug/L	9/5/2017		0.5
Trichloroethylene (TCE)	6.2	ug/L	10/1/2019		0.5
Trichloroethylene (TCE)	6.2	ug/L	11/6/2017		0.5
Trichloroethylene (TCE)	6.4	ug/L	11/1/2019		0.5
Trichloroethylene (TCE)	6.5	ug/L	6/1/2019		0.5
Trichloroethylene (TCE)	7	ug/L	10/2/2017		0.5
Trichloroethylene (TCE)	7.2	ug/L	7/24/2017		0.5
Trichloroethylene (TCE)	7.6	ug/L	7/1/2019		0.5
Trichloroethylene (TCE)	7.8	ug/L	12/1/2019		0.5
Trichloroethylene (TCE)	8.3	ug/L	6/26/2017		0.5
Trichloroethylene (TCE)	8.7	ug/L	1/23/2017		0.5
Trichloroethylene (TCE)	8.9	ug/L	2/27/2017		0.5
Trichloroethylene (TCE)	9	ug/L	4/24/2017		0.5
Trichloroethylene (TCE)	10.8	ug/L	3/27/2017		0.5
Trichloroethylene (TCE)	11.4	ug/L	5/22/2017		0.5
1,2-Dichloroethane-d4	101	ug/L	8/9/2019		
1,2,3-Trichloropropane	NA	ug/L	3/1/2020		5
1,2,3-Trichloropropane	NA	ug/L	2/1/2020		5
1,2,3-Trichloropropane	NA	ug/L	1/1/2020		5
1,2,3-Trichloropropane	NA	ug/L	12/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	11/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	10/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	9/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	8/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	7/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	6/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	5/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	4/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	3/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	2/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	1/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	12/1/2018		5
1,2,3-Trichloropropane	NA	ug/L	11/1/2018		5
1,2,3-Trichloropropane	NA	ug/L	10/1/2018		5

CH-13 Well Data - Contaminants

Analyte	Result	Units	Date	Notes	MRL
1,2,3-Trichloropropane	NA	ug/L	9/1/2018		5
1,2,3-Trichloropropane	NA	ug/L	8/6/2018		5
1,2,3-Trichloropropane	NA	ug/L	7/2/2018		5
1,2,3-Trichloropropane	NA	ug/L	6/4/2018		5
1,2,3-Trichloropropane	NA	ug/L	5/22/2018		5
1,2,3-Trichloropropane	NA	ug/L	4/18/2018		5
1,2,3-Trichloropropane	NA	ug/L	3/29/2018		5
1,4 - Dioxane	NA	ug/L	1/6/2020		0.5
1,4 - Dioxane	NA	ug/L	10/7/2019		0.5
1,4 - Dioxane	NA	ug/L	7/1/2019		0.5
1,4 - Dioxane	NA	ug/L	4/1/2019		0.5
1,4 - Dioxane	NA	ug/L	1/7/2019		0.5
1,4 - Dioxane	NA	ug/L	10/1/2018		0.5
1,4 - Dioxane	NA	ug/L	7/2/2018		0.5
1,4 - Dioxane	NA	ug/L	4/2/2018		0.5
1,4 - Dioxane	NA	ug/L	1/2/2018		0.5
1,4 - Dioxane	NA	ug/L	10/2/2017		0.5
1,4 - Dioxane	NA	ug/L	7/24/2017		0.5
1,4 - Dioxane	NA	ug/L	4/24/2017		0.5
1,4 - Dioxane	NA	ug/L	1/23/2017		0.5
Tetrachloroethylene (PCE)	ND	ug/L	9/1/2018		0.5
Tetrachloroethylene (PCE)	ND	ug/L	8/1/2018		0.5
1,2,3-Trichloropropane	ND	ug/L	9/7/2018		0.5
1,2,3-Trichloropropane	ND	ug/L	8/9/2019		0.5
1,2,3-Trichloropropane	ND	ug/L	8/8/2019		
1,4 - Dioxane	ND	ug/L	9/6/2018		0.5
1,4 - Dioxane	ND	ug/L	8/16/2019		0.5
Alachlor (Alanex)	ND	ug/L	9/11/2018		0.05
Alachlor (Alanex)	ND	ug/L	11/16/2018		0.05
Alachlor (Alanex)	ND	ug/L	8/31/2018		0.1
Alachlor (Alanex)	ND	ug/L	11/8/2018		0.1
Tetrachloroethylene (PCE)	ND	ug/L	9/7/2018		0.5
Tetrachloroethylene (PCE)	ND	ug/L	8/9/2019		0.5
Chlordane	ND	ug/L	8/31/2018		0.1
Endrin	ND	ug/L	8/31/2018		0.01
Heptachlor	ND	ug/L	8/31/2018		0.01
Heptachlor Epoxide	ND	ug/L	8/31/2018		0.01
Lindane (gamma-BHC)	ND	ug/L	8/31/2018		0.01
Methoxychlor	ND	ug/L	8/31/2018		0.05
PCB 1016 Aroclor	ND	ug/L	8/31/2018		0.08
PCB 1221 Aroclor	ND	ug/L	8/31/2018		0.1
PCB 1232 Aroclor	ND	ug/L	8/31/2018		0.1
PCB 1242 Aroclor	ND	ug/L	8/31/2018		0.1
PCB 1248 Aroclor	ND	ug/L	8/31/2018		0.1
PCB 1254 Aroclor	ND	ug/L	8/31/2018		0.1
PCB 1260 Aroclor	ND	ug/L	8/31/2018		0.1

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Analyte	Result	Units	Date	Notes	MRL
Total PCBs	ND	ug/L	8/31/2018		0.1
Toxaphene	ND	ug/L	8/31/2018		0.5
2,4,5-TP (Silvex)	ND	ug/L	9/8/2018		0.2
2,4-D	ND	ug/L	9/8/2018		0.1
Bentazon	ND	ug/L	9/8/2018		0.5
Dalapon	ND	ug/L	9/8/2018		1
Dinoseb	ND	ug/L	9/8/2018		0.2
Pentachlorophenol	ND	ug/L	9/8/2018		0.04
Picloram	ND	ug/L	9/8/2018		0.1
Dibromochloropropane (DBCP)	ND	ug/L	9/8/2018		0.01
Ethylene Dibromide (EDB)	ND	ug/L	9/8/2018		0.01
Atrazine	ND	ug/L	9/11/2018		0.05
Benzo(a)pyrene	ND	ug/L	9/11/2018		0.02
Di-(2-Ethylhexyl)adipate	ND	ug/L	9/11/2018		0.6
Di(2-Ethylhexyl)phthalate	ND	ug/L	9/11/2018		0.6
Hexachlorobenzene	ND	ug/L	9/11/2018		0.05
Hexachlorocyclopentadiene	ND	ug/L	9/11/2018		0.05
Molinate	ND	ug/L	9/11/2018		0.1
Simazine	ND	ug/L	9/11/2018		0.05
Thiobencarb (ELAP)	ND	ug/L	9/11/2018		0.2
Endothall	ND	ug/L	9/12/2018		20
Glyphosate	ND	ug/L	9/2/2018		6
Carbofuran (Furadan)	ND	ug/L	9/1/2018		0.5
Oxamyl (Vydate)	ND	ug/L	9/1/2018		0.5
Diquat	ND	ug/L	9/4/2018		0.4
Perchlorate	ND	ug/L	8/31/2018		2
1,1,1,2-Tetrachloroethane	ND	ug/L	9/7/2018		0.5
1,1,1-Trichloroethane	ND	ug/L	9/7/2018		0.5
1,1,2,2-Tetrachloroethane	ND	ug/L	9/7/2018		0.5
1,1,2-Trichloroethane	ND	ug/L	9/7/2018		0.5
1,1-Dichloroethane	ND	ug/L	9/7/2018		0.5
1,1-Dichloroethylene	ND	ug/L	9/7/2018		0.5
1,1-Dichloropropene	ND	ug/L	9/7/2018		0.5
1,2,4-Trichlorobenzene	ND	ug/L	9/7/2018		0.5
1,2,4-Trimethylbenzene	ND	ug/L	9/7/2018		0.5
1,2-Dichloroethane	ND	ug/L	9/7/2018		0.5
1,2-Dichloropropane	ND	ug/L	9/7/2018		0.5
1,3,5-Trimethylbenzene	ND	ug/L	9/7/2018		0.5
1,3-Dichloropropane	ND	ug/L	9/7/2018		0.5
2,2-Dichloropropane	ND	ug/L	9/7/2018		0.5
2-Butanone (MEK)	ND	ug/L	9/7/2018		5
4-Methyl-2-Pentanone (MIBK)	ND	ug/L	9/7/2018		5
Benzene	ND	ug/L	9/7/2018		0.5
Bromobenzene	ND	ug/L	9/7/2018		0.5
Bromochloromethane	ND	ug/L	9/7/2018		0.5
Bromodichloromethane	ND	ug/L	9/7/2018		0.5

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Analyte	Result	Units	Date	Notes	MRL
Bromoethane	ND	ug/L	9/7/2018		0.5
Bromoform	ND	ug/L	9/7/2018		0.5
Bromomethane (Methyl Bromide)	ND	ug/L	9/7/2018		0.5
Carbon disulfide	ND	ug/L	9/7/2018		0.5
Carbon Tetrachloride	ND	ug/L	9/7/2018		0.5
Chlorobenzene	ND	ug/L	9/7/2018		0.5
Chlorodibromomethane	ND	ug/L	9/7/2018		0.5
Chloroethane	ND	ug/L	9/7/2018		0.5
Chloroform (Trichloromethane)	ND	ug/L	9/7/2018		0.5
Chloromethane(Methyl Chloride)	ND	ug/L	9/7/2018		0.5
cis-1,2-Dichloroethylene	ND	ug/L	9/7/2018		0.5
cis-1,3-Dichloropropene	ND	ug/L	9/7/2018		0.5
Dibromomethane	ND	ug/L	9/7/2018		0.5
Dichlorodifluoromethane	ND	ug/L	9/7/2018		0.5
Dichloromethane	ND	ug/L	9/7/2018		0.5
Di-isopropyl ether	ND	ug/L	9/7/2018		0.5
Ethyl benzene	ND	ug/L	9/7/2018		0.5
Hexachlorobutadiene	ND	ug/L	9/7/2018		0.5
Isopropylbenzene	ND	ug/L	9/7/2018		0.5
m,p-Xylenes	ND	ug/L	9/7/2018		0.5
m-Dichlorobenzene (1,3-DCB)	ND	ug/L	9/7/2018		0.5
Methyl Tert-butyl ether (MTBE)	ND	ug/L	9/7/2018		0.5
Naphthalene	ND	ug/L	9/7/2018		0.5
n-Butylbenzene	ND	ug/L	9/7/2018		0.5
n-Propylbenzene	ND	ug/L	9/7/2018		0.5
o-Chlorotoluene	ND	ug/L	9/7/2018		0.5
o-Dichlorobenzene (1,2-DCB)	ND	ug/L	9/7/2018		0.5
o-Xylene	ND	ug/L	9/7/2018		0.5
p-Chlorotoluene	ND	ug/L	9/7/2018		0.5
p-Dichlorobenzene (1,4-DCB)	ND	ug/L	9/7/2018		0.5
p-Isopropyltoluene	ND	ug/L	9/7/2018		0.5
sec-Butylbenzene	ND	ug/L	9/7/2018		0.5
Styrene	ND	ug/L	9/7/2018		0.5
tert-amyl Methyl Ether	ND	ug/L	9/7/2018		3
tert-Butyl Ethyl Ether	ND	ug/L	9/7/2018		3
tert-Butylbenzene	ND	ug/L	9/7/2018		0.5
Toluene	ND	ug/L	9/7/2018		0.5
Total 1,3-Dichloropropene	ND	ug/L	9/7/2018		0.5
Total THM	ND	ug/L	9/7/2018		0.5
Total xylenes	ND	ug/L	9/7/2018		0.5
trans-1,2-Dichloroethylene	ND	ug/L	9/7/2018		0.5
trans-1,3-Dichloropropene	ND	ug/L	9/7/2018		0.5
Trichlorofluoromethane	ND	ug/L	9/7/2018		0.5
Trichlorotrifluoroethane(Freon 113)	ND	ug/L	9/7/2018		0.5
Vinyl chloride (VC)	ND	ug/L	9/7/2018		0.3
1,1,1,2-Tetrachloroethane	ND	ug/L	8/9/2019		0.5

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Analyte	Result	Units	Date	Notes	MRL
1,1,1-Trichloroethane	ND	ug/L	8/9/2019		0.5
1,1,2,2-Tetrachloroethane	ND	ug/L	8/9/2019		0.5
1,1,2-Trichloroethane	ND	ug/L	8/9/2019		0.5
1,1-Dichloroethane	ND	ug/L	8/9/2019		0.5
1,1-Dichloropropene	ND	ug/L	8/9/2019		0.5
1,2,3-Trichlorobenzene	ND	ug/L	8/9/2019		0.5
1,2,4-Trichlorobenzene	ND	ug/L	8/9/2019		0.5
1,2,4-Trimethylbenzene	ND	ug/L	8/9/2019		0.5
1,2-Dichloroethane	ND	ug/L	8/9/2019		0.5
1,2-Dichloropropane	ND	ug/L	8/9/2019		0.5
1,3,5-Trimethylbenzene	ND	ug/L	8/9/2019		0.5
1,3-Dichloropropane	ND	ug/L	8/9/2019		0.5
2,2-Dichloropropane	ND	ug/L	8/9/2019		0.5
2-Butanone (MEK)	ND	ug/L	8/9/2019		5
4-Methyl-2-Pentanone (MIBK)	ND	ug/L	8/9/2019		5
Benzene	ND	ug/L	8/9/2019		0.5
Bromobenzene	ND	ug/L	8/9/2019		0.5
Bromochloromethane	ND	ug/L	8/9/2019		0.5
Bromodichloromethane	ND	ug/L	8/9/2019		0.5
Bromoethane	ND	ug/L	8/9/2019		0.5
Carbon Tetrachloride	ND	ug/L	8/9/2019		0.5
Chlorobenzene	ND	ug/L	8/9/2019		0.5
Chlorodibromomethane	ND	ug/L	8/9/2019		0.5
Chloroethane	ND	ug/L	8/9/2019		0.5
Chloromethane(Methyl Chloride)	ND	ug/L	8/9/2019		0.5
cis-1,3-Dichloropropene	ND	ug/L	8/9/2019		0.5
Dibromomethane	ND	ug/L	8/9/2019		0.5
Dichlorodifluoromethane	ND	ug/L	8/9/2019		0.5
Dichloromethane	ND	ug/L	8/9/2019		0.5
Di-isopropyl ether	ND	ug/L	8/9/2019		3
Ethyl benzene	ND	ug/L	8/9/2019		0.5
Hexachlorobutadiene	ND	ug/L	8/9/2019		0.5
Isopropylbenzene	ND	ug/L	8/9/2019		0.5
m,p-Xylenes	ND	ug/L	8/9/2019		0.5
m-Dichlorobenzene (1,3-DCB)	ND	ug/L	8/9/2019		0.5
Naphthalene	ND	ug/L	8/9/2019		0.5
n-Butylbenzene	ND	ug/L	8/9/2019		0.5
n-Propylbenzene	ND	ug/L	8/9/2019		0.5
o-Chlorotoluene	ND	ug/L	8/9/2019		0.5
o-Dichlorobenzene (1,2-DCB)	ND	ug/L	8/9/2019		0.5
o-Xylene	ND	ug/L	8/9/2019		0.5
p-Chlorotoluene	ND	ug/L	8/9/2019		0.5
p-Dichlorobenzene (1,4-DCB)	ND	ug/L	8/9/2019		0.5
p-Isopropyltoluene	ND	ug/L	8/9/2019		0.5
sec-Butylbenzene	ND	ug/L	8/9/2019		0.5
Styrene	ND	ug/L	8/9/2019		0.5

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Analyte	Result	Units	Date	Notes	MRL
tert-amyl Methyl Ether	ND	ug/L	8/9/2019		3
tert-Butyl Ethyl Ether	ND	ug/L	8/9/2019		3
tert-Butylbenzene	ND	ug/L	8/9/2019		0.5
Toluene	ND	ug/L	8/9/2019		0.5
Total 1,3-Dichloropropene	ND	ug/L	8/9/2019		0.5
Total THM	ND	ug/L	8/9/2019		0.5
Total xylenes	ND	ug/L	8/9/2019		0.5
trans-1,2-Dichloroethylene	ND	ug/L	8/9/2019		0.5
Trichlorofluoromethane	ND	ug/L	8/9/2019		0.5
Trichlorotrifluoroethane(Freon 113)	ND	ug/L	8/9/2019		0.5
Vinyl chloride (VC)	ND	ug/L	8/9/2019		0.3
Chlordane	ND	ug/L	11/8/2018		0.1
Endrin	ND	ug/L	11/8/2018		0.01
Heptachlor	ND	ug/L	11/8/2018		0.01
Heptachlor Epoxide	ND	ug/L	11/8/2018		0.01
Lindane (gamma-BHC)	ND	ug/L	11/8/2018		0.01
Methoxychlor	ND	ug/L	11/8/2018		0.05
PCB 1016 Aroclor	ND	ug/L	11/8/2018		0.08
PCB 1221 Aroclor	ND	ug/L	11/8/2018		0.1
PCB 1232 Aroclor	ND	ug/L	11/8/2018		0.1
PCB 1242 Aroclor	ND	ug/L	11/8/2018		0.1
PCB 1248 Aroclor	ND	ug/L	11/8/2018		0.1
PCB 1254 Aroclor	ND	ug/L	11/8/2018		0.1
PCB 1260 Aroclor	ND	ug/L	11/8/2018		0.1
Total PCBs	ND	ug/L	11/8/2018		0.1
Toxaphene	ND	ug/L	11/8/2018		0.5
2,4,5-TP (Silvex)	ND	ug/L	11/16/2018		0.2
2,4-D	ND	ug/L	11/16/2018		0.1
Bentazon	ND	ug/L	11/16/2018		0.5
Dalapon	ND	ug/L	11/16/2018		1
Dinoseb	ND	ug/L	11/16/2018		0.2
Pentachlorophenol	ND	ug/L	11/16/2018		0.04
Picloram	ND	ug/L	11/16/2018		0.1
Dibromochloropropane (DBCP)	ND	ug/L	11/9/2018		0.01
Ethylene Dibromide (EDB)	ND	ug/L	11/9/2018		0.01
Atrazine	ND	ug/L	11/16/2018		0.05
Benzo(a)pyrene	ND	ug/L	11/16/2018		0.02
Di-(2-Ethylhexyl)adipate	ND	ug/L	11/16/2018		0.6
Di(2-Ethylhexyl)phthalate	ND	ug/L	11/16/2018		0.6
Hexachlorobenzene	ND	ug/L	11/16/2018		0.05
Hexachlorocyclopentadiene	ND	ug/L	11/16/2018		0.05
Molinate	ND	ug/L	11/16/2018		0.1
Simazine	ND	ug/L	11/16/2018		0.05
Thiobencarb (ELAP)	ND	ug/L	11/16/2018		0.2
Endothall	ND	ug/L	11/8/2018		20
Glyphosate	ND	ug/L	11/10/2018		6

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Analyte	Result	Units	Date	Notes	MRL
Carbofuran (Furadan)	ND	ug/L	11/8/2018		
Oxamyl (Vydate)	ND	ug/L	11/8/2018		
1,2,3-Trichlorobenzene	ND (LE)	ug/L	9/7/2018		0.5
Bromomethane (Methyl Bromide)	ND (LM)	ug/L	8/9/2019		0.5
Diquat	ND (M2)	ug/L	11/9/2018		
Tetrachloroethylene (PCE)	Offline	ug/L	7/1/2018		0.5
Tetrachloroethylene (PCE)	Offline	ug/L	6/1/2018		0.5
Tetrachloroethylene (PCE)	Offline	ug/L	5/1/2018		0.5
Tetrachloroethylene (PCE)	Offline	ug/L	4/1/2018		0.5
Tetrachloroethylene (PCE)	Offline	ug/L	3/1/2018		0.5
Tetrachloroethylene (PCE)	Offline	ug/L	2/1/2018		0.5
Tetrachloroethylene (PCE)	Offline	ug/L	1/1/2018		0.5
Trichloroethylene (TCE)	Offline	ug/L	7/1/2018		0.5
Trichloroethylene (TCE)	Offline	ug/L	6/1/2018		0.5
Trichloroethylene (TCE)	Offline	ug/L	5/1/2018		0.5
Trichloroethylene (TCE)	Offline	ug/L	4/1/2018		0.5
Trichloroethylene (TCE)	Offline	ug/L	3/1/2018		0.5
Trichloroethylene (TCE)	Offline	ug/L	2/1/2018		0.5
Trichloroethylene (TCE)	Offline	ug/L	1/1/2018		0.5
1,2,3-Trichloropropane		ug/L			0.5
Alachlor (Alanex)		ug/L			0.1
Tetrachloroethylene (PCE)		ug/L	12/4/2017		0.5
Tetrachloroethylene (PCE)		ug/L			0.5
Trichloroethylene (TCE)		ug/L	12/4/2017		0.5
Chlordane		ug/L			0.1
Endrin		ug/L			0.01
Lindane (gamma-BHC)		ug/L			0.01
Methoxychlor		ug/L			0.05
Toxaphene		ug/L			0.5
2,4-D		ug/L			0.1
Bentazon		ug/L			0.5
Dinoseb		ug/L			0.2
Pentachlorophenol		ug/L			0.04
Dibromochloropropane (DBCP)		ug/L			0.01
Ethylene Dibromide (EDB)		ug/L			0.01
Endothall		ug/L			20
Glyphosate		ug/L			6
Carbofuran (Furadan)		ug/L			0.5
Oxamyl (Vydate)		ug/L			0.5
Diquat		ug/L			0.4
Perchlorate		ug/L			2
1,1,1,2-Tetrachloroethane		ug/L			0.5
1,1,1-Trichloroethane		ug/L			0.5
1,1,2,2-Tetrachloroethane		ug/L			0.5
1,1,2-Trichloroethane		ug/L			0.5
1,1-Dichloroethane		ug/L			0.5

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Analyte	Result	Units	Date	Notes	MRL
1,1-Dichloroethylene		ug/L			0.5
1,1-Dichloropropene		ug/L			0.5
1,2,3-Trichlorobenzene		ug/L			0.5
1,2,4-Trichlorobenzene		ug/L			0.5
1,2,4-Trimethylbenzene		ug/L			0.5
1,2-Dichloroethane		ug/L			0.5
1,2-Dichloropropane		ug/L			0.5
1,3,5-Trimethylbenzene		ug/L			0.5
1,3-Dichloropropane		ug/L			0.5
2,2-Dichloropropane		ug/L			0.5
2-Butanone (MEK)		ug/L			5
4-Methyl-2-Pentanone (MIBK)		ug/L			5
Benzene		ug/L			0.5
Bromobenzene		ug/L			0.5
Bromochloromethane		ug/L			0.5
Bromodichloromethane		ug/L			0.5
Bromoethane		ug/L			0.5
Bromoform		ug/L			0.5
Bromomethane (Methyl Bromide)		ug/L			0.5
Carbon disulfide		ug/L			0.5
Carbon Tetrachloride		ug/L			0.5
Chlorobenzene		ug/L			0.5
Chlorodibromomethane		ug/L			0.5
Chloroethane		ug/L			0.5
Chloroform (Trichloromethane)		ug/L			0.5
Chloromethane(Methyl Chloride)		ug/L			0.5
cis-1,2-Dichloroethylene		ug/L			0.5
cis-1,3-Dichloropropene		ug/L			0.5
Dibromomethane		ug/L			0.5
Dichlorodifluoromethane		ug/L			0.5
Dichloromethane		ug/L			0.5
Di-isopropyl ether		ug/L			3
Ethyl benzene		ug/L			0.5
Hexachlorobutadiene		ug/L			0.5
Isopropylbenzene		ug/L			0.5
m,p-Xylenes		ug/L			0.5
m-Dichlorobenzene (1,3-DCB)		ug/L			0.5
Methyl Tert-butyl ether (MTBE)		ug/L			0.5
Naphthalene		ug/L			0.5
n-Butylbenzene		ug/L			0.5
n-Propylbenzene		ug/L			0.5
o-Chlorotoluene		ug/L			0.5
o-Dichlorobenzene (1,2-DCB)		ug/L			0.5
o-Xylene		ug/L			0.5
p-Chlorotoluene		ug/L			0.5
p-Dichlorobenzene (1,4-DCB)		ug/L			0.5

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Analyte	Result	Units	Date	Notes	MRL
p-Isopropyltoluene		ug/L			0.5
sec-Butylbenzene		ug/L			0.5
Styrene		ug/L			0.5
tert-amyl Methyl Ether		ug/L			3
tert-Butyl Ethyl Ether		ug/L			3
tert-Butylbenzene		ug/L			0.5
Toluene		ug/L			0.5
Total 1,3-Dichloropropene		ug/L			0.5
Total THM		ug/L			0.5
Total xylenes		ug/L			0.5
trans-1,2-Dichloroethylene		ug/L			0.5
trans-1,3-Dichloropropene		ug/L			0.5
Trichloroethylene (TCE)		ug/L			0.5
Trichlorofluoromethane		ug/L			0.5
Trichlorotrifluoroethane(Freon 113)		ug/L			0.5
Vinyl chloride (VC)		ug/L			0.3

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Analyte	Result	Units	Date	Notes	MRL
1,4 - Dioxane	0.087	ug/L	8/16/2019	J	0.5
Carbon disulfide	0.14	ug/L	8/9/2019	J	0.5
Trichlorotrifluoroethane(Freon 113)	0.14	ug/L	8/9/2019	J	0.5
Tetrachloroethylene (PCE)	0.2	ug/L	3/27/2017	J	0.5
cis-1,3-Dichloropropene	0.23	ug/L	8/9/2019	J	0.5
Tetrachloroethylene (PCE)	0.3	ug/L	9/1/2018	J	0.5
Tetrachloroethylene (PCE)	0.3	ug/L	8/1/2018	J	0.5
Tetrachloroethylene (PCE)	0.3	ug/L	7/1/2018	J	0.5
Tetrachloroethylene (PCE)	0.3	ug/L	6/1/2018	J	0.5
Tetrachloroethylene (PCE)	0.3	ug/L	5/1/2018	J	0.5
Tetrachloroethylene (PCE)	0.3	ug/L	4/1/2018	J	0.5
Tetrachloroethylene (PCE)	0.3	ug/L	2/1/2018	J	0.5
Tetrachloroethylene (PCE)	0.3	ug/L	8/28/2017	J	0.5
Tetrachloroethylene (PCE)	0.4	ug/L	7/1/2019	J	0.5
Tetrachloroethylene (PCE)	0.4	ug/L	4/1/2019	J	0.5
Tetrachloroethylene (PCE)	0.4	ug/L	3/1/2019	J	0.5
Tetrachloroethylene (PCE)	0.4	ug/L	12/1/2018	J	0.5
Tetrachloroethylene (PCE)	0.4	ug/L	11/1/2018	J	0.5
Tetrachloroethylene (PCE)	0.4	ug/L	1/1/2018	J	0.5
Tetrachloroethylene (PCE)	0.4	ug/L	12/4/2017	J	0.5
Tetrachloroethylene (PCE)	0.4	ug/L	7/24/2017	J	0.5
Tetrachloroethylene (PCE)	0.4	ug/L	4/24/2017	J	0.5
Tetrachloroethylene (PCE)	0.4	ug/L	2/27/2017	J	0.5
Chloroform (Trichloromethane)	0.45	ug/L	8/9/2019	J	0.5
Tetrachloroethylene (PCE)	0.5	ug/L	6/1/2019		0.5
Tetrachloroethylene (PCE)	0.5	ug/L	5/1/2019		0.5
Tetrachloroethylene (PCE)	0.5	ug/L	2/1/2019		0.5
Tetrachloroethylene (PCE)	0.5	ug/L	1/1/2019		0.5
Tetrachloroethylene (PCE)	0.5	ug/L	3/1/2018		0.5
Tetrachloroethylene (PCE)	0.5	ug/L	11/6/2017		0.5
Tetrachloroethylene (PCE)	0.5	ug/L	10/2/2017		0.5
Tetrachloroethylene (PCE)	0.5	ug/L	6/26/2017		0.5
Tetrachloroethylene (PCE)	0.5	ug/L	1/23/2017		0.5
Tetrachloroethylene (PCE)	0.6	ug/L	9/5/2017		0.5
Tetrachloroethylene (PCE)	0.67	ug/L	8/9/2019		0.5
Tetrachloroethylene (PCE)	0.7	ug/L	5/22/2017		0.5
Tetrachloroethylene (PCE)	0.8	ug/L	9/1/2019		0.5
Tetrachloroethylene (PCE)	0.8	ug/L	8/1/2019		0.5
Tetrachloroethylene (PCE)	0.9	ug/L	11/1/2019		0.5
Tetrachloroethylene (PCE)	0.9	ug/L	10/1/2019		0.5
Tetrachloroethylene (PCE)	1	ug/L	2/1/2020		0.5
Tetrachloroethylene (PCE)	1.1	ug/L	1/1/2020		0.5
Tetrachloroethylene (PCE)	1.2	ug/L	12/1/2019		0.5
1,1-Dichloroethylene	2.1	ug/L	8/9/2019		0.5

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Analyte	Result	Units	Date	Notes	MRL
1,1-Dichloroethylene	2.2	ug/L	8/18/2018		0.5
Trichloroethylene (TCE)	3.2	ug/L	10/1/2018		0.5
Trichloroethylene (TCE)	8.3	ug/L	3/27/2017		0.5
Trichloroethylene (TCE)	9.4	ug/L	5/1/2018		0.5
Trichloroethylene (TCE)	9.7	ug/L	6/1/2018		0.5
Trichloroethylene (TCE)	9.7	ug/L	4/1/2018		0.5
Trichloroethylene (TCE)	9.9	ug/L	7/1/2018		0.5
Trichloroethylene (TCE)	10.3	ug/L	7/1/2019		0.5
Trichloroethylene (TCE)	10.4	ug/L	8/28/2017		0.5
Trichloroethylene (TCE)	10.5	ug/L	8/1/2018		0.5
Trichloroethylene (TCE)	11	ug/L	8/18/2018		0.5
Trichloroethylene (TCE)	11.2	ug/L	4/1/2019		0.5
Trichloroethylene (TCE)	11.6	ug/L	12/1/2018		0.5
Trichloroethylene (TCE)	11.6	ug/L	2/1/2018		0.5
Trichloroethylene (TCE)	11.7	ug/L	9/1/2018		0.5
Trichloroethylene (TCE)	12.4	ug/L	5/1/2019		0.5
Trichloroethylene (TCE)	12.4	ug/L	11/1/2018		0.5
Trichloroethylene (TCE)	12.6	ug/L	6/1/2019		0.5
Trichloroethylene (TCE)	13.3	ug/L	3/1/2019		0.5
Trichloroethylene (TCE)	13.6	ug/L	1/1/2018		0.5
Trichloroethylene (TCE)	13.7	ug/L	2/1/2019		0.5
Trichloroethylene (TCE)	13.8	ug/L	4/24/2017		0.5
Trichloroethylene (TCE)	14	ug/L	8/9/2019		0.5
Trichloroethylene (TCE)	14	ug/L	12/4/2017		0.5
Trichloroethylene (TCE)	14.4	ug/L	1/1/2019		0.5
Trichloroethylene (TCE)	15.1	ug/L	8/1/2019		0.5
Trichloroethylene (TCE)	15.3	ug/L	3/1/2018		0.5
Trichloroethylene (TCE)	16	ug/L	11/6/2017		0.5
Trichloroethylene (TCE)	16.1	ug/L	9/1/2019		0.5
Trichloroethylene (TCE)	16.2	ug/L	7/24/2017		0.5
Trichloroethylene (TCE)	16.4	ug/L	10/1/2019		0.5
Trichloroethylene (TCE)	16.5	ug/L	11/1/2019		0.5
Trichloroethylene (TCE)	16.7	ug/L	2/27/2017		0.5
Trichloroethylene (TCE)	17	ug/L	2/1/2020		0.5
Trichloroethylene (TCE)	17	ug/L	6/26/2017		0.5
Trichloroethylene (TCE)	17.6	ug/L	1/1/2020		0.5
Trichloroethylene (TCE)	17.9	ug/L	1/23/2017		0.5
Trichloroethylene (TCE)	18	ug/L	9/5/2017		0.5
Trichloroethylene (TCE)	18.3	ug/L	10/2/2017		0.5
Trichloroethylene (TCE)	19.7	ug/L	12/1/2019		0.5
Trichloroethylene (TCE)	22.1	ug/L	5/22/2017		0.5
1,4 - Dioxane	NA	ug/L	1/6/2020		0.5
1,4 - Dioxane	NA	ug/L	10/7/2019		0.5
1,4 - Dioxane	NA	ug/L	7/1/2019		0.5

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Analyte	Result	Units	Date	Notes	MRL
1,4 - Dioxane	NA	ug/L	4/1/2019		0.5
1,4 - Dioxane	NA	ug/L	1/7/2019		0.5
1,4 - Dioxane	NA	ug/L	10/1/2018		0.5
1,4 - Dioxane	NA	ug/L	7/2/2018		0.5
1,4 - Dioxane	NA	ug/L	4/2/2018		0.5
1,4 - Dioxane	NA	ug/L	1/2/2018		0.5
1,4 - Dioxane	NA	ug/L	10/2/2017		0.5
1,4 - Dioxane	NA	ug/L	7/24/2017		0.5
1,4 - Dioxane	NA	ug/L	4/24/2017		0.5
1,4 - Dioxane	NA	ug/L	1/23/2017		0.5
1,2,3-Trichloropropane	NA	ug/L	3/1/2020		5
1,2,3-Trichloropropane	NA	ug/L	2/1/2020		5
1,2,3-Trichloropropane	NA	ug/L	1/1/2020		5
1,2,3-Trichloropropane	NA	ug/L	12/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	11/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	10/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	9/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	8/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	7/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	6/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	5/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	4/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	3/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	2/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	1/1/2019		5
1,2,3-Trichloropropane	NA	ug/L	12/1/2018		5
1,2,3-Trichloropropane	NA	ug/L	11/1/2018		5
1,2,3-Trichloropropane	NA	ug/L	10/1/2018		5
1,2,3-Trichloropropane	NA	ug/L	9/1/2018		5
1,2,3-Trichloropropane	NA	ug/L	8/6/2018		5
1,2,3-Trichloropropane	NA	ug/L	7/2/2018		5
1,2,3-Trichloropropane	NA	ug/L	6/4/2018		5
1,2,3-Trichloropropane	NA	ug/L	5/22/2018		5
1,2,3-Trichloropropane	NA	ug/L	4/18/2018		5
1,2,3-Trichloropropane	NA	ug/L	3/29/2018		5
Tetrachloroethylene (PCE)	ND	ug/L	10/1/2018		0.5
1,1,1,2-Tetrachloroethane	ND	ug/L	8/9/2019		0.5
1,1,1-Trichloroethane	ND	ug/L	8/9/2019		0.5
1,1,2,2-Tetrachloroethane	ND	ug/L	8/9/2019		0.5
1,1,2-Trichloroethane	ND	ug/L	8/9/2019		0.5
1,1-Dichloroethane	ND	ug/L	8/9/2019		0.5
1,1-Dichloropropene	ND	ug/L	8/9/2019		0.5
1,2,3-Trichlorobenzene	ND	ug/L	8/9/2019		0.5
1,2,4-Trichlorobenzene	ND	ug/L	8/9/2019		0.5

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Analyte	Result	Units	Date	Notes	MRL
1,2,4-Trimethylbenzene	ND	ug/L	8/9/2019		0.5
1,2-Dichloroethane	ND	ug/L	8/9/2019		0.5
1,2-Dichloropropane	ND	ug/L	8/9/2019		0.5
1,3,5-Trimethylbenzene	ND	ug/L	8/9/2019		0.5
1,3-Dichloropropane	ND	ug/L	8/9/2019		0.5
2,2-Dichloropropane	ND	ug/L	8/9/2019		0.5
2-Butanone (MEK)	ND	ug/L	8/9/2019		5
4-Methyl-2-Pentanone (MIBK)	ND	ug/L	8/9/2019		5
Benzene	ND	ug/L	8/9/2019		0.5
Bromobenzene	ND	ug/L	8/9/2019		0.5
Bromochloromethane	ND	ug/L	8/9/2019		0.5
Bromodichloromethane	ND	ug/L	8/9/2019		0.5
Bromoethane	ND	ug/L	8/9/2019		0.5
Bromoform	ND	ug/L	8/9/2019		0.5
Carbon Tetrachloride	ND	ug/L	8/9/2019		0.5
Chlorobenzene	ND	ug/L	8/9/2019		0.5
Chlorodibromomethane	ND	ug/L	8/9/2019		0.5
Chloroethane	ND	ug/L	8/9/2019		0.5
Chloromethane(Methyl Chloride)	ND	ug/L	8/9/2019		0.5
cis-1,2-Dichloroethylene	ND	ug/L	8/9/2019		0.5
Dibromomethane	ND	ug/L	8/9/2019		0.5
Dichlorodifluoromethane	ND	ug/L	8/9/2019		0.5
Dichloromethane	ND	ug/L	8/9/2019		0.5
Di-isopropyl ether	ND	ug/L	8/9/2019		3
Ethyl benzene	ND	ug/L	8/9/2019		0.5
Hexachlorobutadiene	ND	ug/L	8/9/2019		0.5
Isopropylbenzene	ND	ug/L	8/9/2019		0.5
m,p-Xylenes	ND	ug/L	8/9/2019		0.5
m-Dichlorobenzene (1,3-DCB)	ND	ug/L	8/9/2019		0.5
Methyl Tert-butyl ether (MTBE)	ND	ug/L	8/9/2019		0.5
Naphthalene	ND	ug/L	8/9/2019		0.5
n-Butylbenzene	ND	ug/L	8/9/2019		0.5
n-Propylbenzene	ND	ug/L	8/9/2019		0.5
o-Chlorotoluene	ND	ug/L	8/9/2019		0.5
o-Dichlorobenzene (1,2-DCB)	ND	ug/L	8/9/2019		0.5
o-Xylene	ND	ug/L	8/9/2019		0.5
p-Chlorotoluene	ND	ug/L	8/9/2019		0.5
p-Dichlorobenzene (1,4-DCB)	ND	ug/L	8/9/2019		0.5
p-Isopropyltoluene	ND	ug/L	8/9/2019		0.5
sec-Butylbenzene	ND	ug/L	8/9/2019		0.5
Styrene	ND	ug/L	8/9/2019		0.5
tert-amyl Methyl Ether	ND	ug/L	8/9/2019		3
tert-Butyl Ethyl Ether	ND	ug/L	8/9/2019		3
tert-Butylbenzene	ND	ug/L	8/9/2019		0.5

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Analyte	Result	Units	Date	Notes	MRL
Toluene	ND	ug/L	8/9/2019		0.5
Total 1,3-Dichloropropene	ND	ug/L	8/9/2019		0.5
Total THM	ND	ug/L	8/9/2019		0.5
Total xylenes	ND	ug/L	8/9/2019		0.5
trans-1,2-Dichloroethylene	ND	ug/L	8/9/2019		0.5
trans-1,3-Dichloropropene	ND	ug/L	8/9/2019		0.5
Trichlorofluoromethane	ND	ug/L	8/9/2019		0.5
Vinyl chloride (VC)	ND	ug/L	8/9/2019		0.3
Alachlor (Alanex)	ND	ug/L	11/8/2018		0.1
Chlordane	ND	ug/L	11/8/2018		0.1
Endrin	ND	ug/L	11/8/2018		0.01
Heptachlor	ND	ug/L	11/8/2018		0.01
Heptachlor Epoxide	ND	ug/L	11/8/2018		0.01
Lindane (gamma-BHC)	ND	ug/L	11/8/2018		0.01
Methoxychlor	ND	ug/L	11/8/2018		0.05
PCB 1016 Aroclor	ND	ug/L	11/8/2018		0.08
PCB 1221 Aroclor	ND	ug/L	11/8/2018		0.1
PCB 1232 Aroclor	ND	ug/L	11/8/2018		0.1
PCB 1242 Aroclor	ND	ug/L	11/8/2018		0.1
PCB 1248 Aroclor	ND	ug/L	11/8/2018		0.1
PCB 1254 Aroclor	ND	ug/L	11/8/2018		0.1
PCB 1260 Aroclor	ND	ug/L	11/8/2018		0.1
Total PCBs	ND	ug/L	11/8/2018		0.1
Toxaphene	ND	ug/L	11/8/2018		0.5
2,4,5-TP (Silvex)	ND	ug/L	11/16/2018		0.2
2,4-Dichlorophenyl acetic acid	ND	ug/L	11/16/2018		0.1
Bentazon	ND	ug/L	11/16/2018		0.5
Dalapon	ND	ug/L	11/16/2018		1
Dinoseb	ND	ug/L	11/16/2018		0.2
Pentachlorophenol	ND	ug/L	11/16/2018		0.04
Picloram	ND	ug/L	11/16/2018		0.1
Dibromochloropropane (DBCP)	ND	ug/L	11/9/2018		0.01
Ethylene Dibromide (EDB)	ND	ug/L	11/9/2018		0.01
Alachlor (Alanex)	ND	ug/L	11/16/2018		0.05
Atrazine	ND	ug/L	11/16/2018		0.05
Benzo(a)pyrene	ND	ug/L	11/16/2018		0.02
Di-(2-Ethylhexyl)adipate	ND	ug/L	11/16/2018		0.6
Di(2-Ethylhexyl)phthalate	ND	ug/L	11/16/2018		0.6
Hexachlorobenzene	ND	ug/L	11/16/2018		0.05
Hexachlorocyclopentadiene	ND	ug/L	11/16/2018		0.05
Molinate	ND	ug/L	11/16/2018		0.1
Simazine	ND	ug/L	11/16/2018		0.05
Thiobencarb (ELAP)	ND	ug/L	11/16/2018		0.2
Endothall	ND	ug/L	11/8/2018		20

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Analyte	Result	Units	Date	Notes	MRL
Glyphosate	ND	ug/L	11/10/2018		6
Carbofuran (Furadan)	ND	ug/L	11/9/2018		0.5
Oxamyl (Vydate)	ND	ug/L	11/9/2018		0.5
Diquat	ND	ug/L	11/9/2018		0.4
Alachlor (Alanex)	ND	ug/L	8/10/2018		0.1
Chlordane	ND	ug/L	8/10/2018		0.1
Endrin	ND	ug/L	8/10/2018		0.01
Lindane (gamma-BHC)	ND	ug/L	8/10/2018		0.01
Methoxychlor	ND	ug/L	8/10/2018		0.05
Toxaphene	ND	ug/L	8/10/2018		0.5
2,4-Dichlorophenyl acetic acid	ND	ug/L	8/15/2018		0.1
Bentazon	ND	ug/L	8/15/2018		0.5
Dinoseb	ND	ug/L	8/15/2018		0.2
Pentachlorophenol	ND	ug/L	8/15/2018		0.04
Dibromochloropropane (DBCP)	ND	ug/L	8/18/2018		0.01
Ethylene Dibromide (EDB)	ND	ug/L	8/18/2018		0.01
Alachlor (Alanex)	ND	ug/L	8/24/2018		0.05
Atrazine	ND	ug/L	8/24/2018		0.05
Di(2-Ethylhexyl)phthalate	ND	ug/L	8/24/2018		0.6
Simazine	ND	ug/L	8/24/2018		0.05
Thiobencarb (ELAP)	ND	ug/L	8/24/2018		0.2
Endothall	ND	ug/L	8/10/2018		20
1,4 - Dioxane	ND	ug/L	8/15/2018		0.5
Glyphosate	ND	ug/L	8/10/2018		6
Carbofuran (Furadan)	ND	ug/L	8/8/2018		0.5
Oxamyl (Vydate)	ND	ug/L	8/8/2018		0.5
Diquat	ND	ug/L	8/9/2018		0.4
Perchlorate	ND	ug/L	8/10/2018		2
1,1,1,2-Tetrachloroethane	ND	ug/L	8/18/2018		0.5
1,1,1-Trichloroethane	ND	ug/L	8/18/2018		0.5
1,1,2,2-Tetrachloroethane	ND	ug/L	8/18/2018		0.5
1,1,2-Trichloroethane	ND	ug/L	8/18/2018		0.5
1,1-Dichloroethane	ND	ug/L	8/18/2018		0.5
1,1-Dichloropropene	ND	ug/L	8/18/2018		0.5
1,2,3-Trichlorobenzene	ND	ug/L	8/18/2018		0.5
1,2,4-Trichlorobenzene	ND	ug/L	8/18/2018		0.5
1,2,4-Trimethylbenzene	ND	ug/L	8/18/2018		0.5
1,2-Dichloroethane	ND	ug/L	8/18/2018		0.5
1,2-Dichloropropane	ND	ug/L	8/18/2018		0.5
1,3,5-Trimethylbenzene	ND	ug/L	8/18/2018		0.5
1,3-Dichloropropane	ND	ug/L	8/18/2018		0.5
2,2-Dichloropropane	ND	ug/L	8/18/2018		0.5
2-Butanone (MEK)	ND	ug/L	8/18/2018		5
Benzene	ND	ug/L	8/18/2018		0.5

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Analyte	Result	Units	Date	Notes	MRL
Bromobenzene	ND	ug/L	8/18/2018		0.5
Bromochloromethane	ND	ug/L	8/18/2018		0.5
Bromodichloromethane	ND	ug/L	8/18/2018		0.5
Bromoethane	ND	ug/L	8/18/2018		0.5
Bromoform	ND	ug/L	8/18/2018		0.5
Bromomethane (Methyl Bromide)	ND	ug/L	8/18/2018		0.5
Carbon disulfide	ND	ug/L	8/18/2018		0.5
Carbon Tetrachloride	ND	ug/L	8/18/2018		0.5
Chlorobenzene	ND	ug/L	8/18/2018		0.5
Chlorodibromomethane	ND	ug/L	8/18/2018		0.5
Chloroethane	ND	ug/L	8/18/2018		0.5
Chloroform (Trichloromethane)	ND	ug/L	8/18/2018		0.5
Chloromethane(Methyl Chloride)	ND	ug/L	8/18/2018		0.5
cis-1,2-Dichloroethylene	ND	ug/L	8/18/2018		0.5
cis-1,3-Dichloropropene	ND	ug/L	8/18/2018		0.5
Dibromomethane	ND	ug/L	8/18/2018		0.5
Dichloromethane	ND	ug/L	8/18/2018		0.5
Di-isopropyl ether	ND	ug/L	8/18/2018		3
Ethyl benzene	ND	ug/L	8/18/2018		0.5
Hexachlorobutadiene	ND	ug/L	8/18/2018		0.5
Isopropylbenzene	ND	ug/L	8/18/2018		0.5
m,p-Xylenes	ND	ug/L	8/18/2018		0.5
m-Dichlorobenzene (1,3-DCB)	ND	ug/L	8/18/2018		0.5
Methyl Tert-butyl ether (MTBE)	ND	ug/L	8/18/2018		0.5
Naphthalene	ND	ug/L	8/18/2018		0.5
n-Butylbenzene	ND	ug/L	8/18/2018		0.5
n-Propylbenzene	ND	ug/L	8/18/2018		0.5
o-Chlorotoluene	ND	ug/L	8/18/2018		0.5
o-Dichlorobenzene (1,2-DCB)	ND	ug/L	8/18/2018		0.5
o-Xylene	ND	ug/L	8/18/2018		0.5
p-Chlorotoluene	ND	ug/L	8/18/2018		0.5
p-Dichlorobenzene (1,4-DCB)	ND	ug/L	8/18/2018		0.5
p-Isopropyltoluene	ND	ug/L	8/18/2018		0.5
sec-Butylbenzene	ND	ug/L	8/18/2018		0.5
Styrene	ND	ug/L	8/18/2018		0.5
tert-amyl Methyl Ether	ND	ug/L	8/18/2018		3
tert-Butyl Ethyl Ether	ND	ug/L	8/18/2018		3
tert-Butylbenzene	ND	ug/L	8/18/2018		0.5
Toluene	ND	ug/L	8/18/2018		0.5
Total 1,3-Dichloropropene	ND	ug/L	8/18/2018		0.5
Total THM	ND	ug/L	8/18/2018		0.5
Total xylenes	ND	ug/L	8/18/2018		0.5
trans-1,2-Dichloroethylene	ND	ug/L	8/18/2018		0.5
trans-1,3-Dichloropropene	ND	ug/L	8/18/2018		0.5

CH-16 Well Data - Contaminants

Analyte	Result	Units	Date	Notes	MRL
Trichlorofluoromethane	ND	ug/L	8/18/2018		0.5
Trichlorotrifluoroethane(Freon 113)	ND	ug/L	8/18/2018		0.5
Vinyl chloride (VC)	ND	ug/L	8/18/2018		0.3
Tetrachloroethylene (PCE)	ND	ug/L	8/18/2018		0.5
1,2,3-Trichloropropane	ND	ug/L	8/9/2019		5
1,2,3-Trichloropropane	ND	ug/L	8/8/2019		5
1,2,3-Trichloropropane	ND	ug/L	8/18/2018		5
Cyanide	ND	mg/L	8/14/2018		0.025
Surfactants	ND	mg/L	8/8/2018		0.1
Dichlorodifluoromethane	ND (LK)	ug/L	8/18/2018		0.5
Bromomethane (Methyl Bromide)	ND (LM)	ug/L	8/9/2019		0.5
4-Methyl-2-Pentanone (MIBK)	ND (VC)	ug/L	8/18/2018		5
Tetrachloroethylene (PCE)		ug/L	3/1/2020		0.5
Trichloroethylene (TCE)		ug/L	3/1/2020		0.5

CH-18 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
1,1,1,2-Tetrachloroethane	ND	ug/L	0.5	
1,1,1,2-Tetrachloroethane	ND	ug/L	0.5	
1,1,1-Trichloroethane	ND	ug/L	0.5	
1,1,1-Trichloroethane	ND	ug/L	0.5	
1,1,2,2-Tetrachloroethane	ND	ug/L	0.5	
1,1,2,2-Tetrachloroethane	ND	ug/L	0.5	
1,1,2-Trichloroethane	ND	ug/L	0.5	
1,1,2-Trichloroethane	ND	ug/L	0.5	
1,1-Dichloroethane	ND	ug/L	0.5	
1,1-Dichloroethane	ND	ug/L	0.5	
1,1-Dichloroethylene	ND	ug/L	0.5	
1,1-Dichloroethylene	ND	ug/L	0.5	
1,1-Dichloropropene	ND	ug/L	0.5	
1,1-Dichloropropene	ND	ug/L	0.5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichlorobenzene	ND	ug/L	0.5	
1,2,3-Trichlorobenzene	ND	ug/L	0.5	
1,2,3-Trichloropropane	ND	ug/L	0.5	

CH-18 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
1,2,3-Trichloropropane	ND	ug/L	0.005	
1,2,3-Trichloropropane	ND	ug/L	0.5	
1,2,4-Trichlorobenzene	ND	ug/L	0.5	
1,2,4-Trichlorobenzene	ND	ug/L	0.5	
1,2,4-Trimethylbenzene	ND	ug/L	0.5	
1,2,4-Trimethylbenzene	ND	ug/L	0.5	
1,2-Dichloroethane	ND	ug/L	0.5	
1,2-Dichloroethane	ND	ug/L	0.5	
1,2-Dichloropropane	ND	ug/L	0.5	
1,2-Dichloropropane	ND	ug/L	0.5	
1,3,5-Trimethylbenzene	ND	ug/L	0.5	
1,3,5-Trimethylbenzene	ND	ug/L	0.5	
1,3-Dichloropropane	ND	ug/L	0.5	
1,3-Dichloropropane	ND	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	0.44	ug/L	0.5	0.44J
1,4-Dioxane	ND	ug/L	0.5	
2,2-Dichloropropane	ND	ug/L	0.5	
2,2-Dichloropropane	ND	ug/L	0.5	
2,4,5-TP (Silvex)	ND	ug/L	0.2	
2,4-D	ND	ug/L	0.1	
2,4-D	ND	ug/L	0.1	
2-Butanone (MEK)	ND	ug/L	5	
2-Butanone (MEK)	ND	ug/L	5	
4-Methyl-2-Pentanone (MIBK)	ND	ug/L	5	
4-Methyl-2-Pentanone (MIBK)	ND (VC)	ug/L	5	
Alachlor	ND	ug/L	0.05	
Alachlor	ND	ug/L	0.05	
Alachlor (Alanex)	ND	ug/L	0.1	
Alachlor (Alanex)	ND	ug/L	0.1	

CH-18 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
Atrazine	ND	ug/L	0.05	
Atrazine	ND	ug/L	0.05	
Bentazon	ND	ug/L	0.5	
Bentazon	ND	ug/L	0.5	
Benzene	ND	ug/L	0.5	
Benzene	ND	ug/L	0.5	
Benzo(a)pyrene	ND	ug/L	0.02	
Bromobenzene	ND	ug/L	0.5	
Bromobenzene	ND	ug/L	0.5	
Bromochloromethane	ND	ug/L	0.5	
Bromochloromethane	ND	ug/L	0.5	
Bromodichloromethane	ND	ug/L	0.5	
Bromodichloromethane	ND	ug/L	0.5	
Bromoethane	ND	ug/L	0.5	
Bromoethane	ND	ug/L	0.5	
Bromoform	ND	ug/L	0.5	
Bromoform	ND	ug/L	0.5	
Bromomethane (Methyl Bromide	ND	ug/L	0.5	
Bromomethane (Methyl Bromide)	ND (LM)	ug/L	0.5	
Carbofuran (Furadan)	ND	ug/L		
Carbofuran (Furadan)	ND	ug/L	0.5	
Carbon disulfide	0.14	ug/L	0.5	0.14J
Carbon disulfide	ND	ug/L	0.5	
Carbon Tetrachloride	ND	ug/L	0.5	
Carbon Tetrachloride	ND	ug/L	0.5	
Chlordane	ND	ug/L	0.1	
Chlordane	ND	ug/L	0.1	
Chlorobenzene	ND	ug/L	0.5	
Chlorobenzene	ND	ug/L	0.5	
Chlorodibromomethane	0.27	ug/L	0.5	0.27J
Chlorodibromomethane	ND	ug/L	0.5	
Chloroethane	ND	ug/L	0.5	
Chloroethane	ND	ug/L	0.5	
Chloroform (Trichloromethane)	ND	ug/L	0.5	
Chloroform (Trichloromethane)	ND	ug/L	0.5	
Chloromethane(Methyl Chloride	ND	ug/L	0.5	
Chloromethane(Methyl Chloride)	ND	ug/L	0.5	
cis-1,2-Dichloroethylene	0.22	ug/L	0.5	0.22J
cis-1,2-Dichloroethylene	ND	ug/L	0.5	
cis-1,3-Dichloropropene	ND	ug/L	0.5	
cis-1,3-Dichloropropene	ND	ug/L	0.5	
Cyanide	ND	mg/L	0.025	

CH-18 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
Dalapon	ND	ug/L	1	
Di-(2-Ethylhexyl)adipate	ND	ug/L	0.6	
Di(2-Ethylhexyl)phthalate	ND	ug/L	0.6	
Di(2-Ethylhexyl)phthalate	ND	ug/L	0.6	
Dibromochloropropane (DBCP)	ND	ug/L	0.01	
Dibromochloropropane (DBCP)	ND	ug/L	0.01	
Dibromomethane	ND	ug/L	0.5	
Dibromomethane	ND	ug/L	0.5	
Dichlorodifluoromethane	ND	ug/L	0.5	
Dichlorodifluoromethane	ND (LK)	ug/L	0.5	
Dichloromethane	ND	ug/L	0.5	
Dichloromethane	ND	ug/L	0.5	
Di-isopropyl ether	ND	ug/L	3	
Di-isopropyl ether	ND	ug/L	3	
Dinoseb	ND	ug/L	0.2	
Dinoseb	ND	ug/L	0.2	
Diquat	ND	ug/L		
Diquat	ND	ug/L	0.4	
Endothall	ND	ug/L		
Endothall	ND	ug/L	20	
Endrin	ND	ug/L	0.01	
Endrin	ND	ug/L	0.01	
Ethyl benzene	ND	ug/L	0.5	
Ethyl benzene	ND	ug/L	0.5	
Ethylene Dibromide (EDB)	ND	ug/L	0.01	
Ethylene Dibromide (EDB)	ND	ug/L	0.01	
Glyphosate	ND	ug/L		
Glyphosate	ND	ug/L	6	
Heptachlor	ND	ug/L	0.01	
Heptachlor Epoxide	ND	ug/L	0.01	
Hexachlorobenzene	ND	ug/L	0.05	
Hexachlorobutadiene	ND	ug/L	0.5	
Hexachlorobutadiene	ND	ug/L	0.5	
Hexachlorocyclopentadiene	ND	ug/L	0.05	
Isopropylbenzene	ND	ug/L	0.5	
Isopropylbenzene	ND	ug/L	0.5	
Lindane (gamma-BHC)	ND	ug/L	0.01	
Lindane (gamma-BHC)	ND	ug/L	0.01	
m,p-Xylenes	ND	ug/L	0.5	
m,p-Xylenes	ND	ug/L	0.5	
m-Dichlorobenzene (1,3-DCB)	ND	ug/L	0.5	
m-Dichlorobenzene (1,3-DCB)	ND	ug/L	0.5	

CH-18 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
Methoxychlor	ND	ug/L	0.05	
Methoxychlor	ND	ug/L	0.05	
Methyl Tert-butyl ether (MTBE)	ND	ug/L	0.5	
Methyl Tert-butyl ether (MTBE)	ND	ug/L	0.5	
Molinate	ND	ug/L	0.1	
Naphthalene	ND	ug/L	0.5	
Naphthalene	ND	ug/L	0.5	
n-Butylbenzene	ND	ug/L	0.5	
n-Butylbenzene	ND	ug/L	0.5	
n-Propylbenzene	ND	ug/L	0.5	
n-Propylbenzene	ND	ug/L	0.5	
o-Chlorotoluene	ND	ug/L	0.5	
o-Chlorotoluene	ND	ug/L	0.5	
o-Dichlorobenzene (1,2-DCB)	ND	ug/L	0.5	
o-Dichlorobenzene (1,2-DCB)	ND	ug/L	0.5	
Oxamyl (Vydate)	ND	ug/L		
Oxamyl (Vydate)	ND	ug/L	0.5	
o-Xylene	ND	ug/L	0.5	
o-Xylene	ND	ug/L	0.5	
PCB 1016 Aroclor	ND	ug/L	0.08	
PCB 1221 Aroclor	ND	ug/L	0.1	
PCB 1232 Aroclor	ND	ug/L	0.1	
PCB 1242 Aroclor	ND	ug/L	0.1	
PCB 1248 Aroclor	ND	ug/L	0.1	
PCB 1254 Aroclor	ND	ug/L	0.1	
PCB 1260 Aroclor	ND	ug/L	0.1	
p-Chlorotoluene	ND	ug/L	0.5	
p-Chlorotoluene	ND	ug/L	0.5	
p-Dichlorobenzene (1,4-DCB)	ND	ug/L	0.5	
p-Dichlorobenzene (1,4-DCB)	ND	ug/L	0.5	
Pentachlorophenol	ND	ug/L	0.04	
Pentachlorophenol	ND	ug/L	0.04	
Perchlorate	ND	ug/L	2	
Picloram	ND	ug/L	0.1	
p-Isopropyltoluene	ND	ug/L	0.5	
p-Isopropyltoluene	ND	ug/L	0.5	
sec-Butylbenzene	ND	ug/L	0.5	
sec-Butylbenzene	ND	ug/L	0.5	
Simazine	ND	ug/L	0.05	
Simazine	ND	ug/L	0.05	
Styrene	ND	ug/L	0.5	
Styrene	ND	ug/L	0.5	

CH-18 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
Surfactants	ND	mg/L	0.1	
tert-amyl Methyl Ether	ND	ug/L	3	
tert-amyl Methyl Ether	ND	ug/L	3	
tert-Butyl Ethyl Ether	ND	ug/L	3	
tert-Butyl Ethyl Ether	ND	ug/L	3	
tert-Butylbenzene	ND	ug/L	0.5	
tert-Butylbenzene	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	0.1	ug/L	0.5	0.1 J
Tetrachloroethylene (PCE)	0.1	ug/L	0.5	0.1 J
Tetrachloroethylene (PCE)	0.1	ug/L	0.5	0.1 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.3	ug/L	0.5	0.3 J
Tetrachloroethylene (PCE)	0.3	ug/L	0.5	0.3 J
Tetrachloroethylene (PCE)	0.3	ug/L	0.5	0.3 J
Tetrachloroethylene (PCE)	0.3	ug/L	0.5	0.3 J

CH-18 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
Tetrachloroethylene (PCE)	0.3	ug/L	0.5	0.3 J
Tetrachloroethylene (PCE)	0.3	ug/L	0.5	0.3 J
Tetrachloroethylene (PCE)	0.3	ug/L	0.5	0.3 J
Tetrachloroethylene (PCE)	0.3	ug/L	0.5	0.3 J
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Thiobencarb (ELAP)	ND	ug/L	0.2	
Thiobencarb (ELAP)	ND	ug/L	0.2	
Toluene	ND	ug/L	0.5	
Toluene	ND	ug/L	0.5	
Total 1,3-Dichloropropene	ND	ug/L	0.5	
Total 1,3-Dichloropropene	ND	ug/L	0.5	
Total PCBs	ND	ug/L	0.1	
Total THM	ND	ug/L	0.5	
Total THM	ND	ug/L	0.5	
Total xylenes	ND	ug/L	0.5	
Total xylenes	ND	ug/L	0.5	
Toxaphene	ND	ug/L	0.5	
Toxaphene	ND	ug/L	0.5	
trans-1,2-Dichloroethylene	ND	ug/L	0.5	
trans-1,2-Dichloroethylene	ND	ug/L	0.5	
trans-1,3-Dichloropropene	ND	ug/L	0.5	
trans-1,3-Dichloropropene	ND	ug/L	0.5	
Trichloroethylene (TCE)	0.5	ug/L	0.5	
Trichloroethylene (TCE)	0.6	ug/L	0.5	
Trichloroethylene (TCE)	0.7	ug/L	0.5	
Trichloroethylene (TCE)	0.8	ug/L	0.5	
Trichloroethylene (TCE)	0.8	ug/L	0.5	
Trichloroethylene (TCE)	0.8	ug/L	0.5	
Trichloroethylene (TCE)	0.8	ug/L	0.5	
Trichloroethylene (TCE)	0.8	ug/L	0.5	
Trichloroethylene (TCE)	0.8	ug/L	0.5	
Trichloroethylene (TCE)	0.8	ug/L	0.5	
Trichloroethylene (TCE)	0.8	ug/L	0.5	
Trichloroethylene (TCE)	0.8	ug/L	0.5	
Trichloroethylene (TCE)	0.8	ug/L	0.5	
Trichloroethylene (TCE)	0.8	ug/L	0.5	
Trichloroethylene (TCE)	0.8	ug/L	0.5	
Trichloroethylene (TCE)	0.8	ug/L	0.5	
Trichloroethylene (TCE)	0.9	ug/L	0.5	
Trichloroethylene (TCE)	0.9	ug/L	0.5	
Trichloroethylene (TCE)	0.9	ug/L	0.5	

CH-18 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
Trichloroethylene (TCE)	0.9	ug/L	0.5	
Trichloroethylene (TCE)	0.9	ug/L	0.5	
Trichloroethylene (TCE)	0.9	ug/L	0.5	
Trichloroethylene (TCE)	0.9	ug/L	0.5	
Trichloroethylene (TCE)	0.9	ug/L	0.5	
Trichloroethylene (TCE)	0.9	ug/L	0.5	
Trichloroethylene (TCE)	0.9	ug/L	0.5	
Trichloroethylene (TCE)	0.9	ug/L	0.5	
Trichloroethylene (TCE)	0.9	ug/L	0.5	
Trichloroethylene (TCE)	0.9	ug/L	0.5	
Trichloroethylene (TCE)	0.9	ug/L	0.5	
Trichloroethylene (TCE)	1	ug/L	0.5	
Trichloroethylene (TCE)	1	ug/L	0.5	
Trichloroethylene (TCE)	1	ug/L	0.5	
Trichloroethylene (TCE)	1	ug/L	0.5	
Trichloroethylene (TCE)	1	ug/L	0.5	
Trichloroethylene (TCE)	1	ug/L	0.5	
Trichloroethylene (TCE)	1.1	ug/L	0.5	
Trichloroethylene (TCE)	1.1	ug/L	0.5	
Trichloroethylene (TCE)	1.1	ug/L	0.5	
Trichloroethylene (TCE)	0.68	ug/L	0.5	
Trichloroethylene (TCE)	1.1	ug/L	0.5	
Trichlorofluoromethane	ND	ug/L	0.5	
Trichlorofluoromethane	ND	ug/L	0.5	
Trichlorotrifluoroethane(Freon 113)	ND	ug/L	0.5	
Trichlorotrifluoroethane(Freon 113)	ND	ug/L	0.5	
Vinyl chloride (VC)	ND	ug/L	0.3	
Vinyl chloride (VC)	ND	ug/L	0.3	

CH-19 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
1,1,1,2-Tetrachloroethane	ND	ug/L	0.5	
1,1,1,2-Tetrachloroethane	ND	ug/L	0.5	
1,1,1-Trichloroethane	ND	ug/L	0.5	
1,1,1-Trichloroethane	ND	ug/L	0.5	
1,1,2,2-Tetrachloroethane	ND	ug/L	0.5	
1,1,2,2-Tetrachloroethane	ND	ug/L	0.5	
1,1,2-Trichloroethane	ND	ug/L	0.5	
1,1,2-Trichloroethane	ND	ug/L	0.5	
1,1-Dichloroethane	ND	ug/L	0.5	
1,1-Dichloroethane	ND	ug/L	0.5	
1,1-Dichloroethylene	1.7	ug/L	0.5	
1,1-Dichloroethylene	3	ug/L	0.5	
1,1-Dichloropropene	ND	ug/L	0.5	
1,1-Dichloropropene	ND	ug/L	0.5	
1,2,3-Trichlorobenzene	ND	ug/L	0.5	
1,2,3-Trichlorobenzene	ND	ug/L	0.5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	0.0024	ug/L	0.005	0.0024J

CH-19 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
1,2,3-Trichloropropane	ND	ug/L	0.5	
1,2,3-Trichloropropane	ND	ug/L	0.5	
1,2,4-Trichlorobenzene	ND	ug/L	0.5	
1,2,4-Trichlorobenzene	ND	ug/L	0.5	
1,2,4-Trimethylbenzene	ND	ug/L	0.5	
1,2,4-Trimethylbenzene	ND	ug/L	0.5	
1,2-Dichloroethane	ND	ug/L	0.5	
1,2-Dichloroethane	ND	ug/L	0.5	
1,2-Dichloropropane	ND	ug/L	0.5	
1,2-Dichloropropane	ND	ug/L	0.5	
1,3,5-Trimethylbenzene	ND	ug/L	0.5	
1,3,5-Trimethylbenzene	ND	ug/L	0.5	
1,3-Dichloropropane	ND	ug/L	0.5	
1,3-Dichloropropane	ND	ug/L	0.5	
1,4-Dioxane	0.2	ug/L	0.5	0.20J
1,4-Dioxane	ND	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
2,2-Dichloropropane	ND	ug/L	0.5	
2,2-Dichloropropane	ND	ug/L	0.5	
2,4,5-TP (Silvex)	ND	ug/L	0.2	
2,4-D	ND	ug/L	0.1	
2,4-D	ND	ug/L	0.1	
2-Butanone (MEK)	ND	ug/L	5	
2-Butanone (MEK)	ND	ug/L	5	
4-Methyl-2-Pentanone (MIBK)	ND	ug/L	5	
4-Methyl-2-Pentanone (MIBK)	ND (VC)	ug/L	5	
Alachlor (Alanex)	ND	ug/L	0.1	
Alachlor (Alanex)	ND	ug/L	0.1	
Alachlor (Alanex)	ND	ug/L	0.05	
Alachlor (Alanex)	ND	ug/L	0.05	

CH-19 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
Atrazine	ND	ug/L	0.05	
Atrazine	ND	ug/L	0.05	
Bentazon	ND	ug/L	0.5	
Bentazon	ND	ug/L	0.5	
Benzene	ND	ug/L	0.5	
Benzene	ND	ug/L	0.5	
Benzo(a)pyrene	ND	ug/L	0.02	
Bromobenzene	ND	ug/L	0.5	
Bromobenzene	ND	ug/L	0.5	
Bromochloromethane	ND	ug/L	0.5	
Bromochloromethane	ND	ug/L	0.5	
Bromodichloromethane	ND	ug/L	0.5	
Bromodichloromethane	ND	ug/L	0.5	
Bromoethane	ND	ug/L	0.5	
Bromoethane	ND	ug/L	0.5	
Bromoform	0.63	ug/L	0.5	
Bromoform	ND	ug/L	0.5	
Bromomethane (Methyl Bromide)	ND	ug/L	0.5	
Bromomethane (Methyl Bromide)	ND (LM)	ug/L	0.5	
Carbofuran (Furadan)	ND	ug/L	0.5	
Carbofuran (Furadan)	ND	ug/L	0.5	
Carbon disulfide	0.13	ug/L	0.5	0.13J
Carbon disulfide	ND	ug/L	0.5	
Carbon Tetrachloride	ND	ug/L	0.5	
Carbon Tetrachloride	ND	ug/L	0.5	
Chlordane	ND	ug/L	0.1	
Chlordane	ND	ug/L	0.1	
Chlorobenzene	ND	ug/L	0.5	
Chlorobenzene	ND	ug/L	0.5	
Chlorodibromomethane	ND	ug/L	0.5	
Chlorodibromomethane	ND	ug/L	0.5	
Chloroethane	ND	ug/L	0.5	
Chloroethane	ND	ug/L	0.5	
Chloroform (Trichloromethane)	0.26	ug/L	0.5	0.26J
Chloroform (Trichloromethane)	ND	ug/L	0.5	
Chloromethane(Methyl Chloride)	ND	ug/L	0.5	
Chloromethane(Methyl Chloride)	ND	ug/L	0.5	
cis-1,2-Dichloroethylene	0.81	ug/L	0.5	
cis-1,2-Dichloroethylene	2	ug/L	0.5	
cis-1,3-Dichloropropene	ND	ug/L	0.5	
cis-1,3-Dichloropropene	ND	ug/L	0.5	
Cyanide	ND	mg/L	0.025	

CH-19 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
Dalapon	ND	ug/L	1	
Dalapon	ND	ug/L	1	
Di-(2-Ethylhexyl)adipate	ND	ug/L	0.6	
Di(2-Ethylhexyl)phthalate	ND	ug/L	0.6	
Di(2-Ethylhexyl)phthalate	ND	ug/L	0.6	
Dibromochloropropane (DBCP)	ND	ug/L	0.01	
Dibromochloropropane (DBCP)	ND	ug/L	0.01	
Dibromomethane	ND	ug/L	0.5	
Dibromomethane	ND	ug/L	0.5	
Dichlorodifluoromethane	0.10J	ug/L	0.5	0.10J
Dichlorodifluoromethane	ND (LK)	ug/L	0.5	
Dichloromethane	ND	ug/L	0.5	
Dichloromethane	ND	ug/L	0.5	
Di-isopropyl ether	ND	ug/L	3	
Di-isopropyl ether	ND	ug/L	3	
Dinoseb	ND	ug/L	0.2	
Dinoseb	ND	ug/L	0.2	
Diquat	ND	ug/L	0.4	
Diquat	ND	ug/L	0.4	
Endothall	ND	ug/L	20	
Endothall	ND	ug/L	20	
Endrin	ND	ug/L	0.01	
Endrin	ND	ug/L	0.01	
Ethyl benzene	ND	ug/L	0.5	
Ethyl benzene	ND	ug/L	0.5	
Ethylene Dibromide (EDB)	ND	ug/L	0.01	
Ethylene Dibromide (EDB)	ND	ug/L	0.01	
Glyphosate	ND	ug/L	6	
Glyphosate	ND	ug/L	6	
Heptachlor	ND	ug/L	0.01	
Heptachlor Epoxide	ND	ug/L	0.01	
Hexachlorobenzene	ND	ug/L	0.05	
Hexachlorobutadiene	ND	ug/L	0.5	
Hexachlorobutadiene	ND	ug/L	0.5	
Hexachlorocyclopentadiene	ND	ug/L	0.05	
Isopropylbenzene	ND	ug/L	0.5	
Isopropylbenzene	ND	ug/L	0.5	
Lindane (gamma-BHC)	ND	ug/L	0.01	
Lindane (gamma-BHC)	ND	ug/L	0.01	
m,p-Xylenes	ND	ug/L	0.5	
m,p-Xylenes	ND	ug/L	0.5	
m-Dichlorobenzene (1,3-DCB)	ND	ug/L		

CH-19 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
m-Dichlorobenzene (1,3-DCB)	ND	ug/L	0.5	
Methoxychlor	ND	ug/L	0.05	
Methoxychlor	ND	ug/L	0.05	
Methyl Tert-butyl ether (MTBE)	0.62	ug/L	0.5	
Methyl Tert-butyl ether (MTBE)	0.74	ug/L	0.5	
Molinate	ND	ug/L	0.1	
Naphthalene	ND	ug/L	0.5	
Naphthalene	ND	ug/L	0.5	
n-Butylbenzene	ND	ug/L	0.5	
n-Butylbenzene	ND	ug/L	0.5	
n-Propylbenzene	ND	ug/L	0.5	
n-Propylbenzene	ND	ug/L	0.5	
o-Chlorotoluene	ND	ug/L	0.5	
o-Chlorotoluene	ND	ug/L	0.5	
o-Dichlorobenzene (1,2-DCB)	ND	ug/L	0.5	
o-Dichlorobenzene (1,2-DCB)	ND	ug/L	0.5	
Oxamyl (Vydate)	ND	ug/L	0.5	
Oxamyl (Vydate)	ND	ug/L	0.5	
o-Xylene	ND	ug/L	0.5	
o-Xylene	ND	ug/L	0.5	
PCB 1016 Aroclor	ND	ug/L	0.08	
PCB 1221 Aroclor	ND	ug/L	0.1	
PCB 1232 Aroclor	ND	ug/L	0.1	
PCB 1242 Aroclor	ND	ug/L	0.1	
PCB 1248 Aroclor	ND	ug/L	0.1	
PCB 1254 Aroclor	ND	ug/L	0.1	
PCB 1260 Aroclor	ND	ug/L	0.1	
p-Chlorotoluene	ND	ug/L	0.5	
p-Chlorotoluene	ND	ug/L	0.5	
p-Dichlorobenzene (1,4-DCB)	ND	ug/L	0.5	
p-Dichlorobenzene (1,4-DCB)	ND	ug/L	0.5	
Pentachlorophenol	ND	ug/L	0.04	
Pentachlorophenol	ND	ug/L	0.04	
Perchlorate	ND	ug/L	2	
Picloram	ND	ug/L	0.1	
p-Isopropyltoluene	ND	ug/L	0.5	
p-Isopropyltoluene	ND	ug/L	0.5	
sec-Butylbenzene	ND	ug/L	0.5	
sec-Butylbenzene	ND	ug/L	0.5	
Simazine	ND	ug/L	0.05	
Simazine	ND	ug/L	0.05	
Styrene	ND	ug/L	0.5	

CH-19 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
Styrene	ND	ug/L	0.5	
Surfactants	ND	mg/L	0.1	
tert-amyl Methyl Ether	ND	ug/L	0.5	
tert-amyl Methyl Ether	ND	ug/L	3	
tert-Butyl Ethyl Ether	ND	ug/L	3	
tert-Butyl Ethyl Ether	ND	ug/L	3	
tert-Butylbenzene	ND	ug/L	3	
tert-Butylbenzene	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	1.2	ug/L	0.5	
Tetrachloroethylene (PCE)	1.3	ug/L	0.5	
Tetrachloroethylene (PCE)	0.6	ug/L	0.5	
Tetrachloroethylene (PCE)	0.9	ug/L	0.5	
Tetrachloroethylene (PCE)	0.9	ug/L	0.5	
Tetrachloroethylene (PCE)	0.9	ug/L	0.5	
Tetrachloroethylene (PCE)	1	ug/L	0.5	
Tetrachloroethylene (PCE)	1.1	ug/L	0.5	
Tetrachloroethylene (PCE)	1.1	ug/L	0.5	
Tetrachloroethylene (PCE)	1.2	ug/L	0.5	
Tetrachloroethylene (PCE)	1.2	ug/L	0.5	
Tetrachloroethylene (PCE)	1.2	ug/L	0.5	
Tetrachloroethylene (PCE)	1.2	ug/L	0.5	
Tetrachloroethylene (PCE)	1.3	ug/L	0.5	
Tetrachloroethylene (PCE)	1.3	ug/L	0.5	
Tetrachloroethylene (PCE)	1.3	ug/L	0.5	
Tetrachloroethylene (PCE)	1.3	ug/L	0.5	
Tetrachloroethylene (PCE)	1.3	ug/L	0.5	
Tetrachloroethylene (PCE)	1.3	ug/L	0.5	
Tetrachloroethylene (PCE)	1.3	ug/L	0.5	
Tetrachloroethylene (PCE)	1.4	ug/L	0.5	
Tetrachloroethylene (PCE)	1.4	ug/L	0.5	
Tetrachloroethylene (PCE)	1.5	ug/L	0.5	
Tetrachloroethylene (PCE)	1.5	ug/L	0.5	
Tetrachloroethylene (PCE)	1.5	ug/L	0.5	
Tetrachloroethylene (PCE)	1.5	ug/L	0.5	
Tetrachloroethylene (PCE)	1.6	ug/L	0.5	
Tetrachloroethylene (PCE)	1.6	ug/L	0.5	
Tetrachloroethylene (PCE)	1.6	ug/L	0.5	
Tetrachloroethylene (PCE)	1.6	ug/L	0.5	
Tetrachloroethylene (PCE)	1.7	ug/L	0.5	
Tetrachloroethylene (PCE)	1.7	ug/L	0.5	
Tetrachloroethylene (PCE)	1.7	ug/L	0.5	
Tetrachloroethylene (PCE)	1.8	ug/L	0.5	

CH-19 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
Tetrachloroethylene (PCE)	2	ug/L	0.5	
Tetrachloroethylene (PCE)	2	ug/L	0.5	
Tetrachloroethylene (PCE)	2	ug/L	0.5	
Tetrachloroethylene (PCE)	2.1	ug/L	0.5	
Tetrachloroethylene (PCE)	2.1	ug/L	0.5	
Tetrachloroethylene (PCE)	2.1	ug/L	0.5	
Tetrachloroethylene (PCE)		ug/L	0.5	
Thiobencarb (ELAP)	ND	ug/L	0.2	
Thiobencarb (ELAP)	ND	ug/L	0.2	
Toluene	ND	ug/L	0.5	
Toluene	ND	ug/L	0.5	
Total 1,3-Dichloropropene	ND	ug/L	0.5	
Total 1,3-Dichloropropene	ND	ug/L	0.5	
Total PCBs	ND	ug/L	0.1	
Total THM	0.63	ug/L	0.5	
Total THM	ND	ug/L	0.5	
Total xylenes	ND	ug/L	0.5	
Total xylenes	ND	ug/L	0.5	
Toxaphene	ND	ug/L	0.5	
Toxaphene	ND	ug/L	0.5	
trans-1,2-Dichloroethylene	ND	ug/L	0.5	
trans-1,2-Dichloroethylene	ND	ug/L	0.5	
trans-1,3-Dichloropropene	ND	ug/L	0.5	
trans-1,3-Dichloropropene	ND	ug/L	0.5	
Trichloroethylene (TCE)	9.3	ug/L	0.5	
Trichloroethylene (TCE)	15	ug/L	0.5	
Trichloroethylene (TCE)	3	ug/L	0.5	
Trichloroethylene (TCE)	5.2	ug/L	0.5	
Trichloroethylene (TCE)	6.2	ug/L	0.5	
Trichloroethylene (TCE)	6.5	ug/L	0.5	
Trichloroethylene (TCE)	7.9	ug/L	0.5	
Trichloroethylene (TCE)	8.3	ug/L	0.5	
Trichloroethylene (TCE)	8.6	ug/L	0.5	
Trichloroethylene (TCE)	9.1	ug/L	0.5	
Trichloroethylene (TCE)	9.6	ug/L	0.5	
Trichloroethylene (TCE)	9.8	ug/L	0.5	
Trichloroethylene (TCE)	9.9	ug/L	0.5	
Trichloroethylene (TCE)	10.6	ug/L	0.5	
Trichloroethylene (TCE)	10.9	ug/L	0.5	
Trichloroethylene (TCE)	11	ug/L	0.5	
Trichloroethylene (TCE)	11.9	ug/L	0.5	
Trichloroethylene (TCE)	12	ug/L	0.5	

CH-19 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
Trichloroethylene (TCE)	12.1	ug/L	0.5	
Trichloroethylene (TCE)	13.5	ug/L	0.5	
Trichloroethylene (TCE)	14	ug/L	0.5	
Trichloroethylene (TCE)	14.1	ug/L	0.5	
Trichloroethylene (TCE)	14.2	ug/L	0.5	
Trichloroethylene (TCE)	14.5	ug/L	0.5	
Trichloroethylene (TCE)	14.5	ug/L	0.5	
Trichloroethylene (TCE)	14.5	ug/L	0.5	
Trichloroethylene (TCE)	14.8	ug/L	0.5	
Trichloroethylene (TCE)	15.4	ug/L	0.5	
Trichloroethylene (TCE)	15.4	ug/L	0.5	
Trichloroethylene (TCE)	15.8	ug/L	0.5	
Trichloroethylene (TCE)	16.1	ug/L	0.5	
Trichloroethylene (TCE)	16.3	ug/L	0.5	
Trichloroethylene (TCE)	16.6	ug/L	0.5	
Trichloroethylene (TCE)	16.8	ug/L	0.5	
Trichloroethylene (TCE)	17.2	ug/L	0.5	
Trichloroethylene (TCE)	17.4	ug/L	0.5	
Trichloroethylene (TCE)	18	ug/L	0.5	
Trichloroethylene (TCE)	18.2	ug/L	0.5	
Trichloroethylene (TCE)	18.3	ug/L	0.5	
Trichloroethylene (TCE)	19.5	ug/L	0.5	
Trichloroethylene (TCE)		ug/L	0.5	
Trichlorofluoromethane	ND	ug/L	0.5	
Trichlorofluoromethane	ND	ug/L	0.5	
Trichlorotrifluoroethane(Freon 113)	ND	ug/L	0.5	
Trichlorotrifluoroethane(Freon 113)	ND	ug/L	0.5	
Uranium ICAP/MS	16	pCi/L	1	
Uranium ICAP/MS	22	pCi/L	1	
Uranium ICAP/MS	26	pCi/L	1	
Uranium ICAP/MS	29	pCi/L	1	
Uranium ICAP/MS	24	pCi/L	0.7	
Uranium ICAP/MS	33	pCi/L	0.7	
Uranium ICAP/MS	39	pCi/L	0.7	
Uranium ICAP/MS	43	pCi/L	0.7	
Vinyl chloride (VC)	ND	ug/L	0.5	
Vinyl chloride (VC)	ND	ug/L	0.3	

CH-20 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
1,1,1,2-Tetrachloroethane	ND	ug/L	0.5	
1,1,1,2-Tetrachloroethane	ND	ug/L	0.5	
1,1,1-Trichloroethane	ND	ug/L	0.5	
1,1,1-Trichloroethane	ND	ug/L	0.5	
1,1,2,2-Tetrachloroethane	ND	ug/L	0.5	
1,1,2,2-Tetrachloroethane	ND	ug/L	0.5	
1,1,2-Trichloroethane	ND	ug/L	0.5	
1,1,2-Trichloroethane	ND	ug/L	0.5	
1,1-Dichloroethane	ND	ug/L	0.5	
1,1-Dichloroethane	ND	ug/L	0.5	
1,1-Dichloroethylene	0.61	ug/L	0.5	
1,1-Dichloroethylene	ND	ug/L	0.5	
1,1-Dichloropropene	ND	ug/L	0.5	
1,1-Dichloropropene	ND	ug/L	0.5	
1,2,3-Trichlorobenzene	ND	ug/L	0.5	
1,2,3-Trichlorobenzene	ND	ug/L	0.5	
1,2,3-Trichloropropane	ND	ug/L	0.5	
1,2,3-Trichloropropane	ND	ug/L	0.005	
1,2,3-Trichloropropane	ND	ug/L	0.5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	

CH-20 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,3-Trichloropropane	NA	ug/L	5	
1,2,4-Trichlorobenzene	ND	ug/L	0.5	
1,2,4-Trichlorobenzene	ND	ug/L	0.5	
1,2,4-Trimethylbenzene	ND	ug/L	0.5	
1,2,4-Trimethylbenzene	ND	ug/L	0.5	
1,2-Dichloroethane	ND	ug/L	0.5	
1,2-Dichloroethane	ND	ug/L	0.5	
1,2-Dichloropropane	ND	ug/L	0.5	
1,2-Dichloropropane	ND	ug/L	0.5	
1,3,5-Trimethylbenzene	ND	ug/L	0.5	
1,3,5-Trimethylbenzene	ND	ug/L	0.5	
1,3-Dichloropropane	ND	ug/L	0.5	
1,3-Dichloropropane	ND	ug/L	0.5	
1,4-Dioxane	ND	ug/L	0.5	
1,4-Dioxane	ND	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
1,4-Dioxane	NA	ug/L	0.5	
2,2-Dichloropropane	ND	ug/L	0.5	
2,2-Dichloropropane	ND	ug/L	0.5	
2,4,5-TP (Silvex)	ND	ug/L	0.2	
2,4-D	ND	ug/L	0.1	
2,4-D	ND	ug/L	0.1	
2-Butanone (MEK)	ND	ug/L	5	
2-Butanone (MEK)	ND	ug/L	5	
4-Methyl-2-Pentanone (MIBK)	ND	ug/L	5	
4-Methyl-2-Pentanone (MIBK)	ND	ug/L	5	
Alachlor (Alanex)	ND	ug/L	0.1	
Alachlor (Alanex)	ND	ug/L	0.1	
Alachlor (Alanex)	ND	ug/L	0.05	
Alachlor (Alanex)	ND	ug/L	0.05	

CH-20 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
Atrazine	ND	ug/L	0.05	
Atrazine	ND	ug/L	0.05	
Bentazon	ND	ug/L	0.5	
Bentazon	ND	ug/L	0.5	
Benzene	ND	ug/L	0.5	
Benzene	ND	ug/L	0.5	
Benzo(a)pyrene	ND	ug/L	0.02	
Bromobenzene	ND	ug/L	0.5	
Bromobenzene	ND	ug/L	0.5	
Bromochloromethane	ND	ug/L	0.5	
Bromochloromethane	ND	ug/L	0.5	
Bromodichloromethane	ND	ug/L	0.5	
Bromodichloromethane	ND	ug/L	0.5	
Bromoethane	ND	ug/L	0.5	
Bromoethane	ND	ug/L	0.5	
Bromoform	ND	ug/L	0.5	
Bromoform	ND	ug/L	0.5	
Bromomethane (Methyl Bromide)	ND	ug/L	0.5	
Bromomethane (Methyl Bromide)	ND (LM)	ug/L	0.5	
Carbofuran (Furadan)	ND	ug/L	0.5	
Carbofuran (Furadan)	ND	ug/L	0.5	
Carbon disulfide	ND	ug/L	0.5	
Carbon disulfide	ND	ug/L	0.5	
Carbon Tetrachloride	ND	ug/L	0.5	
Carbon Tetrachloride	ND	ug/L	0.5	
Chlordane	ND	ug/L	0.1	
Chlordane	ND	ug/L	0.1	
Chlorobenzene	ND	ug/L	0.5	
Chlorobenzene	ND	ug/L	0.5	
Chlorodibromomethane	ND	ug/L	0.5	
Chlorodibromomethane	ND	ug/L	0.5	
Chloroethane	ND	ug/L	0.5	
Chloroethane	ND	ug/L	0.5	
Chloroform (Trichloromethane)	ND	ug/L	0.5	
Chloroform (Trichloromethane)	ND	ug/L	0.5	
Chloromethane(Methyl Chloride)	ND	ug/L	0.5	
Chloromethane(Methyl Chloride)	ND	ug/L	0.5	
cis-1,2-Dichloroethylene	ND	ug/L	0.5	
cis-1,2-Dichloroethylene	ND	ug/L	0.5	
cis-1,3-Dichloropropene	ND	ug/L	0.5	
cis-1,3-Dichloropropene	ND	ug/L	0.5	
Cyanide by manual distillation	ND	mg/L	0.005	

CH-20 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
Dalapon	ND	ug/L	1	
Dalapon	ND	ug/L	1	
Di-(2-Ethylhexyl)adipate	ND	ug/L	0.6	
Di(2-Ethylhexyl)phthalate	ND	ug/L	0.6	
Di(2-Ethylhexyl)phthalate	ND	ug/L	0.6	
Dibromochloropropane (DBCP)	ND	ug/L	0.01	
Dibromochloropropane (DBCP)	ND	ug/L	0.01	
Dibromomethane	ND	ug/L	0.5	
Dibromomethane	ND	ug/L	0.5	
Dichlorodifluoromethane	ND	ug/L	0.5	
Dichlorodifluoromethane	ND	ug/L	0.5	
Dichloromethane	ND	ug/L	0.5	
Dichloromethane	ND	ug/L	0.5	
Di-isopropyl ether	ND	ug/L	3	
Di-isopropyl ether	ND	ug/L	3	
Dinoseb	ND	ug/L	0.2	
Dinoseb	ND	ug/L	0.2	
Diquat	ND	ug/L	0.4	
Diquat	ND	ug/L	0.4	
Endothall	ND	ug/L	20	
Endothall	ND	ug/L	20	
Endrin	ND	ug/L	0.01	
Endrin	ND	ug/L	0.01	
Ethyl benzene	ND	ug/L	0.5	
Ethyl benzene	ND	ug/L	0.5	
Ethylene Dibromide (EDB)	ND	ug/L	0.01	
Ethylene Dibromide (EDB)	ND	ug/L	0.01	
Glyphosate	ND	ug/L	6	
Glyphosate	ND	ug/L	6	
Heptachlor	ND	ug/L	0.01	
Heptachlor Epoxide	ND	ug/L	0.01	
Hexachlorobenzene	ND	ug/L	0.05	
Hexachlorobutadiene	ND	ug/L	0.5	
Hexachlorobutadiene	ND	ug/L	0.5	
Hexachlorocyclopentadiene	ND	ug/L	0.05	
Isopropylbenzene	ND	ug/L	0.5	
Isopropylbenzene	ND	ug/L	0.5	
Lindane (gamma-BHC)	ND	ug/L	0.01	
Lindane (gamma-BHC)	ND	ug/L	0.01	
m,p-Xylenes	ND	ug/L	0.5	
m,p-Xylenes	ND	ug/L	0.5	
m-Dichlorobenzene (1,3-DCB)	ND	ug/L	0.5	

CH-20 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
m-Dichlorobenzene (1,3-DCB)	ND	ug/L	0.5	
Methoxychlor	ND	ug/L	0.05	
Methoxychlor	ND	ug/L	0.05	
Methyl Tert-butyl ether (MTBE)	ND	ug/L	0.5	
Methyl Tert-butyl ether (MTBE)	ND	ug/L	0.5	
Molinate	ND	ug/L	0.1	
Naphthalene	ND	ug/L	0.5	
Naphthalene	ND	ug/L	0.5	
n-Butylbenzene	ND	ug/L	0.5	
n-Butylbenzene	ND	ug/L	0.5	
n-Propylbenzene	ND	ug/L	0.5	
n-Propylbenzene	ND	ug/L	0.5	
o-Chlorotoluene	ND	ug/L	0.5	
o-Chlorotoluene	ND	ug/L	0.5	
o-Dichlorobenzene (1,2-DCB)	ND	ug/L	0.5	
o-Dichlorobenzene (1,2-DCB)	ND	ug/L	0.5	
Oxamyl (Vydate)	ND	ug/L	0.5	
Oxamyl (Vydate)	ND	ug/L	0.5	
o-Xylene	ND	ug/L	0.5	
o-Xylene	ND	ug/L	0.5	
PCB 1016 Aroclor	ND	ug/L	0.08	
PCB 1221 Aroclor	ND	ug/L	0.1	
PCB 1232 Aroclor	ND	ug/L	0.1	
PCB 1242 Aroclor	ND	ug/L	0.1	
PCB 1248 Aroclor	ND	ug/L	0.1	
PCB 1254 Aroclor	ND	ug/L	0.1	
PCB 1260 Aroclor	ND	ug/L	0.1	
p-Chlorotoluene	ND	ug/L	0.5	
p-Chlorotoluene	ND	ug/L	0.5	
p-Dichlorobenzene (1,4-DCB)	ND	ug/L	0.5	
p-Dichlorobenzene (1,4-DCB)	ND	ug/L	0.5	
Pentachlorophenol	ND	ug/L	0.04	
Pentachlorophenol	ND	ug/L	0.04	
Perchlorate	ND	ug/L	2	
Picloram	ND	ug/L	0.1	
p-Isopropyltoluene	ND	ug/L	0.5	
p-Isopropyltoluene	ND	ug/L	0.5	
sec-Butylbenzene	ND	ug/L	0.5	
sec-Butylbenzene	ND	ug/L	0.5	
Simazine	ND	ug/L	0.05	
Simazine	ND	ug/L	0.05	
Styrene	ND	ug/L	0.5	

CH-20 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
Styrene	ND	ug/L	0.5	
Surfactants	ND	mg/L	0.1	
tert-amyl Methyl Ether	ND	ug/L	3	
tert-amyl Methyl Ether	ND	ug/L	3	
tert-Butyl Ethyl Ether	ND	ug/L	3	
tert-Butyl Ethyl Ether	ND	ug/L	3	
tert-Butylbenzene	ND	ug/L	0.5	
tert-Butylbenzene	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	0.1	ug/L	0.5	0.1 J
Tetrachloroethylene (PCE)	0.1	ug/L	0.5	0.1 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	0.2	ug/L	0.5	0.2 J
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	

CH-20 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	ND	ug/L	0.5	
Tetrachloroethylene (PCE)	Offline	ug/L	0.5	
Tetrachloroethylene (PCE)	Offline	ug/L	0.5	
Tetrachloroethylene (PCE)	Offline	ug/L	0.5	
Tetrachloroethylene (PCE)	Offline	ug/L	0.5	
Tetrachloroethylene (PCE)	Offline	ug/L	0.5	
Thiobencarb (ELAP)	ND	ug/L	0.2	
Thiobencarb (ELAP)	ND	ug/L	0.2	
Toluene	ND	ug/L	0.5	
Toluene	ND	ug/L	0.5	
Total 1,3-Dichloropropene	ND	ug/L	0.5	
Total 1,3-Dichloropropene	ND	ug/L	0.5	
Total PCBs	ND	ug/L	0.1	
Total THM	ND	ug/L	0.5	
Total THM	ND	ug/L	0.5	
Total xylenes	ND	ug/L	0.5	
Total xylenes	ND	ug/L	0.5	
Toxaphene	ND	ug/L	0.5	
Toxaphene	ND	ug/L	0.5	
trans-1,2-Dichloroethylene	ND	ug/L	0.5	
trans-1,2-Dichloroethylene	ND	ug/L	0.5	
trans-1,3-Dichloropropene	ND	ug/L	0.5	
trans-1,3-Dichloropropene	ND	ug/L	0.5	
Trichloroethylene (TCE)	2.8	ug/L	0.5	
Trichloroethylene (TCE)	0.28	ug/L	0.5	0.28J
Trichloroethylene (TCE)	0.5	ug/L	0.5	
Trichloroethylene (TCE)	0.5	ug/L	0.5	
Trichloroethylene (TCE)	0.5	ug/L	0.5	
Trichloroethylene (TCE)	0.6	ug/L	0.5	
Trichloroethylene (TCE)	0.6	ug/L	0.5	
Trichloroethylene (TCE)	0.6	ug/L	0.5	
Trichloroethylene (TCE)	0.6	ug/L	0.5	
Trichloroethylene (TCE)	0.7	ug/L	0.5	
Trichloroethylene (TCE)	0.7	ug/L	0.5	
Trichloroethylene (TCE)	0.7	ug/L	0.5	
Trichloroethylene (TCE)	0.7	ug/L	0.5	
Trichloroethylene (TCE)	0.8	ug/L	0.5	
Trichloroethylene (TCE)	0.9	ug/L	0.5	
Trichloroethylene (TCE)	1	ug/L	0.5	
Trichloroethylene (TCE)	1.2	ug/L	0.5	
Trichloroethylene (TCE)	1.2	ug/L	0.5	

CH-20 Well Data - Contaminants

Analyte	Result	Units	MRL	Notes
Trichloroethylene (TCE)	1.3	ug/L	0.5	
Trichloroethylene (TCE)	1.3	ug/L	0.5	
Trichloroethylene (TCE)	1.4	ug/L	0.5	
Trichloroethylene (TCE)	1.7	ug/L	0.5	
Trichloroethylene (TCE)	2.5	ug/L	0.5	
Trichloroethylene (TCE)	2.6	ug/L	0.5	
Trichloroethylene (TCE)	2.7	ug/L	0.5	
Trichloroethylene (TCE)	2.7	ug/L	0.5	
Trichloroethylene (TCE)	2.7	ug/L	0.5	
Trichloroethylene (TCE)	0.2	ug/L	0.5	0.2 J
Trichloroethylene (TCE)	0.3	ug/L	0.5	0.3 J
Trichloroethylene (TCE)	0.3	ug/L	0.5	0.3 J
Trichloroethylene (TCE)	0.3	ug/L	0.5	0.3 J
Trichloroethylene (TCE)	0.4	ug/L	0.5	0.4 J
Trichloroethylene (TCE)	0.4	ug/L	0.5	0.4 J
Trichloroethylene (TCE)	0.4	ug/L	0.5	0.4 J
Trichloroethylene (TCE)	0.4	ug/L	0.5	0.4 J
Trichloroethylene (TCE)	0.4	ug/L	0.5	0.4 J
Trichloroethylene (TCE)	Offline	ug/L	0.5	
Trichloroethylene (TCE)	Offline	ug/L	0.5	
Trichloroethylene (TCE)	Offline	ug/L	0.5	
Trichloroethylene (TCE)	Offline	ug/L	0.5	
Trichloroethylene (TCE)	Offline	ug/L	0.5	
Trichlorofluoromethane	ND	ug/L	0.5	
Trichlorofluoromethane	ND	ug/L	0.5	
Trichlorotrifluoroethane(Freon 113)	ND	ug/L	0.5	
Trichlorotrifluoroethane(Freon 113)	ND	ug/L	0.5	
Vinyl chloride (VC)	ND	ug/L	0.3	
Vinyl chloride (VC)	ND	ug/L	0.3	

Appendix B: Detailed Process Flow Diagram and Complete Flow Balance

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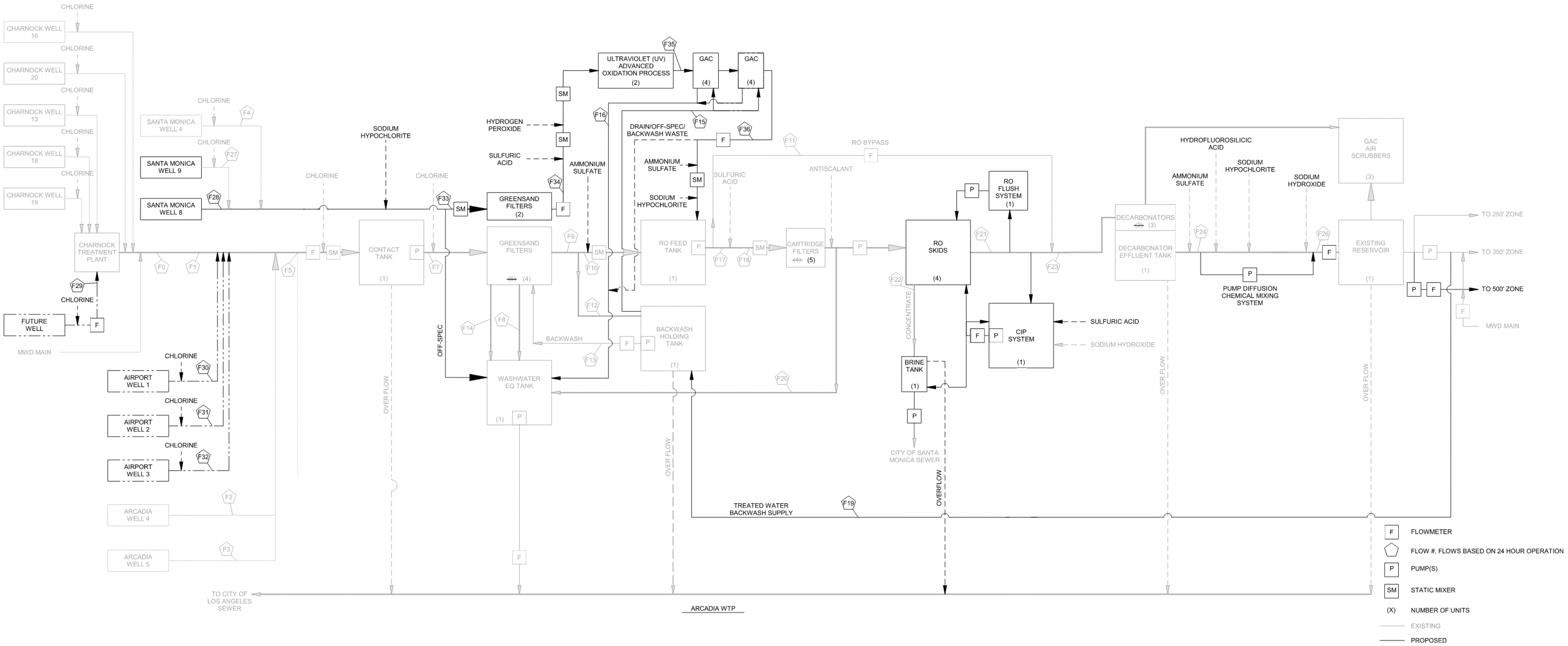

Figure B-1. Olympic AWTF and Arcadia WTP Expansion Detailed Process Flow Diagram

Flow # :		F0	F1	F2	F3	F4	F5	F6	F7	F8[1]		F9[7]	F10	F11[4]	F12[8]	F13	F14		F15[2]	F16[2]	F17	F18	F19[6]	F20	F21[3]	F22[3]	F23	F24	F25	F26	F27	F28	F29	F30	F31	F32	F33	F34[7]	F35	F36[7]
		Charnock Wells	Charknock Wellhead Treatment Effluent	Arcadia Well #4	Arcadia Well #5	Santa Monica Well #4	Inlet Vault Influent	NOT USED	Greensand Filters Influent from Charnock, Arcadia, and Future Wells	Greensand Filters Backwash Effluent from Charnock, Arcadia, and Future Wells	Greensand Filters Backwash Effluent from Olympic Wells	Greensand Filters Effluent from Charnock, Arcadia, and Future Wells	RO Feed Tank Influent from Charnock, Arcadia, and Future Wells	RO Bypass	Backwash Holding Tank Influent	Backwash Holding Tank Effluent	Greensand Filter to Waste from Charnock, Arcadia, and Future Wells	Greensand Filter to Waste from Olympic Wells	GAC Contactor Backwash Supply	GAC Contactor Backwash Waste	RO Feed Tank Effluent	Cartridge Filter Feed with Chemical	Treated Water Backwash Supply	Cartridge Filter Waste to EQ Basin	RO Permeate	RO Concentrate/Brine	Combined RO Permeate and Bypass	Decarbonator Effluent	NOT USED	Treated Water	Santa Monica Well #9	Santa Monica Well #8	Future Well	Airport Well #1	Airport Well #2	Airport Well #3	Greensand Filters Influent from Olympic Wells	Greensand Filter Effluent from Olympic Wells	UV-AOP Effluent	RO Feed Tank Influent from Olympic Wells
Initial Phase	(gpm)	4,800		135	95	900	5,030		5,030	16	9	5,030	5,030	1,697	0	26	8	3	2	2	5,333	5,333	26	0	4,800	533	6,497	6,497		6,497	550	550	-	-	-	-	2,000	2,000	2,000	2,000
	(mgd)	6.91		0.19	0.14	1.30	7.24		7.24	0.02	0.01	7.24	7.24	2.44	0.00	0.04	0.01	0.00	0.00	0.00	7.68	7.68	0.04	0.00	6.91	0.77	9.36	9.36		9.36	0.79	0.79	-	-	-	-	2.88	2.88	2.88	2.88
Ultimate	(gpm)	5,067		135	95	900	7,097		7,097	30	9	7,097	7,097	2,092	0	42	21	3	3	3	7,005	7,005	42	0	6,304	700	8,397	8,397		8,397	550	550	900	300	300	300	2,000	2,000	2,000	2,000
	(mgd)	7.30		0.19	0.14	1.30	10.22		10.22	0.04	0.01	10.22	10.22	3.01	0.00	0.06	0.03	0.00	0.00	0.00	10.09	10.09	0.06	0.00	9.08	1.01	12.09	12.09		12.09	0.79	0.79	1.30	0.43	0.43	0.43	2.88	2.88	2.88	2.88

1. INSTANTANEOUS FLOW RATE IS 2,500 GPM FOR 15 MINUTES.
2. BASED ON AVERAGE DAILY FLOW RATE, INSTANTANEOUS FLOW RATE IS 300 TO 1,300 GPM FOR 15 TO 45 MINUTES.
3. BASED ON 90% RECOVERY BY THE RO MEMBRANE SYSTEM.
4. RO BYPASS EQUALS 24% OF FEED FLOW IN INITIAL AND 23% IN ULTIMATE BASED ON TARGET BLENDED WATER QUALITY.
5. REPLACEMENT WELL TO SM-3.
6. BASED ON AVERAGE DAILY FLOW RATE, INSTANTANEOUS FLOW RATE IS 96 TO 504 GPM FOR 2 HOURS.
7. LOSSES DUE TO FILTER TO WASTE OR BACKWASH WASTE NOT DEDUCTED AS THESE OPERATIONS ARE INFREQUENT.
8. NON-OLYMPIC GREENSAND FILTERS WILL RETAIN THE ABILITY TO FILL THE BACKWASH HOLDING TANK WITH GREENSAND FILTRATE IF TREATED WATER IS NOT AVAILABLE FOR BACKWASH SUPPLY.

Figure B-2. Olympic AWTF and Arcadia WTP Expansion Complete Flow Balance

Appendix C: Operations, Maintenance, and Monitoring Plan (OMMP)

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FINAL

Arcadia Water Treatment Plant
Operations, Maintenance, and Monitoring Plan

Prepared for
City of Santa Monica
July 2022

FINAL

Arcadia Water Treatment Plant
Operations, Maintenance, and Monitoring Plan

Prepared for
City of Santa Monica
July 2022

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μg/L	microgram per liter
1,1-DCA	1,1-Dichloroethane
1,1-DCE	1,1-Dichloroethylene
1,2,3-TCP	1,2,3-Trichloropropane
1,4-D	1,4-dioxane
ANSI	American National Standards Institute
AOP	advanced oxidation process
AWTF	Advanced Water Treatment Facility
CF	cubic feet
CIP	clean-in-place
cis-1,2-DCE	cis-1,2-Dichloroethylene
City	City of Santa Monica
Cl_2	chlorine
COPC	constituent of potential concern
DDW	Division of Drinking Water
DLR	detection limit for purposes of reporting
EBCT	empty bed contact time
ft	foot/feet
ft^2	square foot/feet
FRRO	flow reversal reverse osmosis
GAC	granular activated carbon
gph	gallons per hour
gpm	gallons per minute
H_2O_2	hydrogen peroxide
hp	horsepower
HPC	heterotrophic plate count
HMI	human machine interface
HSC	hydraulic system center
H_2SO_4	sulfuric acid
H_2SiF_6	hydrofluorosilicic acid
LCP	local control panel
MCL	maximum contaminant level
MG	million gallon
mgd	million gallons per day
mg/L	milligrams per liter
MSDS	material safety data sheet
MTBE	methyl tert-butyl ether
NaOH	sodium hydroxide
ND	non-detect
ng/L	nanogram per liter
$(NH_4)_2SO_4$	ammonium sulfate
NL	notification level
NTU	nephelometric turbidity unit
OIT	operator interface
OMMP	Operations, Maintenance, and Monitoring Plan
O-O-R	On-Off-Remote
ORP	oxidation-reduction potential
PCE	tetrachloroethylene
PDC	power distribution center
PFOA	perfluorooctanoic acid
PLC	programmable logic controller
psi	pounds per square inch
psig	pounds per square inch gauge
RO	reverse osmosis
SCADA	supervisory control and data acquisition
SCC	system control center
SCFM	standard cubic feet per minute
TCE	trichloroethylene
UCL95	95 percent upper confidence limit of the population mean
UPS	uninterruptible power supply
UV/H_2O_2	ultraviolet light with hydrogen peroxide advanced oxidation process
UVT	ultraviolet transmittance at 254 nm
VFD	variable-frequency drive
VGAC	vapor phase granular activated carbon
VOC	volatile organic compound
WTP	Water Treatment Plant

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Section 1

Introduction

This Operations, Maintenance, and Monitoring Plan (OMMP) is provided as part of Step 4 Effective Treatment and Monitoring of the 97-005 evaluation process for the Arcadia Water Treatment Plant (WTP) expansion permit modification. The OMMP is intended to be used by any authorized treatment facility operator as a reference for all aspects of a treatment facility. Per *Process Memo 97-005-R2020 - Revised Guidance for Direct Domestic Use of Extremely Impaired Sources* (DDW 2020), the OMMP focuses on the following components:

- Description of the treatment facility, including an overview of the sources of supply, design considerations, disinfection, storage, and the controls/supervisory control and data acquisition (SCADA) system.
- System operating procedures, including design features for good system control, operating scenarios, maintenance activities, and descriptions of programmable logic controllers (PLCs) during pre-startup, startup, normal operation, and shutdown. A list of approved operations staff (including number of staff, grade of certifications, and responsibilities) and contact information for technical assistance and vendors is included.
- Water quality monitoring and testing, including identification of drinking water wells and early warning monitoring wells, locations for sample collection, sampling frequency and analytical methods.
- Reporting and recordkeeping, including typical reporting forms for operational and maintenance records, and instructions for proper waste handling, disposal, and documentation of unintended or incidental waste.

This OMMP represents project data available at the current level of project development. Additional information will be added to the final OMMP where noted. The current DDW Amended Water Supply Permit is included in Attachment A.

1.1 Plan Organization

This OMMP is organized into four major sections as described in Table 1-1.

Table 1-1. OMMP Organization

Section	Description
1. Introduction	Includes an overview of the sources of supply, treatment systems, disinfection, storage, and the controls/SCADA
2. System Operating Procedures	Provides descriptions of design features, instruments, PLCs, manual controls, and alarms for pre-startup, startup, normal operation, and short-term and long-term shutdown of each treatment system. Approved maintenance operations and safety considerations for each treatment system is included. A list of approved operators and vendor contacts is also included.
3. Water Quality Monitoring and Testing	Identifies source wells and up-gradient monitoring wells. Includes the sampling analytes, frequency, and location for each component of the treatment facility, analytical methods required by the California drinking water regulations, and sampling techniques.
4. Reporting and Record Keeping	Summarizes required information for operational and maintenance record keeping. Includes considerations for proper handling, disposal, and documentation of potential unintended or incidental waste residual.

1.2 Description of Treatment Facility

The City of Santa Monica (City) provides its own retail management of drinking water by treating and distributing water to residents and other users within its boundaries. The City currently serves approximately 18,000 metered customers with a current average annual water demand of approximately 11,600 acre-feet per year. Approximately 50 to 60 percent of the City's current water supply is derived from local groundwater resources, with the remainder supplied by imported water from the Metropolitan Water District of Southern California (MWD), which wholesales treated water to the City imported from the Colorado River Aqueduct and the State Water Project. To reduce reliance on costly imported water supplies, the City seeks to increase the Arcadia WTP capacity from 10 million gallons per day (mgd) to 13 mgd to accommodate additional flow from the Olympic Well Field and future wells. The project will also restore the Olympic Well Field's pumping capacity by treating groundwater impacted by contamination through a new Olympic Advanced Water Treatment Facility (Olympic AWTF) co-located at the Arcadia WTP.

The City is currently the only municipal agency that pumps groundwater from the Santa Monica Basin with groundwater production wells at the Charnock, Olympic, and Arcadia well fields, which is treated at the Arcadia WTP. The Charnock Well Field is comprised of five groundwater production wells: CH-13, CH-16, CH-18, CH-19, and CH-20 (replaced CH-15). Three (CH-13, 19, and 20) of the five groundwater wells are contaminated with methyl tert-butyl ether (MTBE) and tertiary butyl alcohol and are treated at the Charnock WTP with greensand filtration and granular activated carbon (GAC) prior to blending with CH-16 and CH-18 for further treatment at the Arcadia WTP. The Arcadia Well Field production wells treated at the Arcadia WTP are ARC-4 and ARC-5. Design considerations for the Arcadia WTP, Charnock WTP, and Arcadia Well Field are discussed in the *Domestic Water Supply Permit Amendment 1910146PA-004*, dated August 22, 2016.

Olympic Wells SM-4, SM-8 and SM-9 (replacing SM-3) are treated at the new Olympic AWTF. The production capacity of the existing Arcadia WTP, new Olympic AWTF, and Arcadia WTP expansion, and potential future groundwater wells (e.g., Airport wells) from the Coastal Sub-basin are described in Table 1-2.

Table 1-2. Production Well Capacities

Well	Units	Existing	Initial Design	Future Design
Olympic Wells				
SM-3/SM-9	gpm	300 - 900	500 to 900[a]	500 to 900[a]
SM-4	gpm	300 - 900	500 to 900[a]	500 to 900[a]
SM-8	gpm	-	500 to 900[a]	500 to 900[a]
Arcadia Wells				
ARC-4	gpm	135	135	135
ARC-5	gpm	95	95	95
Charnock Wells				
CH-13, 16, 18, 19, and 20	gpm	4,800 to 7,000	4,800 to 7,000[b]	4,800 to 7,000[b]
Future Well[c]	gpm	-	-	900
Airport Wells				
Airport-1	gpm	-	-	300
Airport-2	gpm	-	-	300
Airport-3	gpm	-	-	300
Subtotals				
Maximum Combined Olympic Flow	gpm	1,800	2,000	2,000
Arcadia/Charnock/Airport	gpm	5,030 – 7,000	5,030 – 7,230	5,930 to 8,130
Reclaimed Washwater Return[d]	gpm	542	0	0
Totals				
Total Arcadia WTP Capacity	gpm	7,542[e]	9,097[f]	9,097[f]

a. Total maximum flow from the Olympic Well Field will be limited to 2,000 gpm. For Step 2 Report, modeling assumed 600 gpm from SM-3/9, 700 gpm from SM-4, and 700 gpm from SM-8 (Advisian and ICF, 2021).

b. Total pumping capacity of the existing Charnock wells (13, 16, 18, 19, and 20) varies based on well age and time of well replacement.

c. The Future Well would be a back-up for existing Charnock wells.

d. Will be demolished as part of plant upgrades.

e. Limited to 7,000 gpm total from wells and 542 gpm from reclaimed washwater return.

f. Limited to 9,097 gpm total from wells.

gpm = gallons per minute

1.3 Water Source Design Criteria Development

To be classified as an Extremely Impaired Source by DDW, a water source must meet two or more of the 10 DDW-developed criteria to identify such sources. Based on the Step 2 Report evaluation of available water quality data, groundwater in the vicinity of the Olympic Well Field has the following three criteria and is, therefore, considered extremely impaired:

1. Contains a contaminant, i.e., 1,4-D, that exceeds 10 times its notification level (NL) based on chronic health effects.
2. Is extremely threatened with contamination due to known contaminating activities within the long-term, steady-state capture zone of a drinking water well or within the watershed of a surface water intake. As identified in the Step 1 Report (ICF, 2020), former Gillette and Boeing facilities, which are located within the Olympic Well Field study area, are identified contamination sites.

3. Contains a mixture of contaminants of health concern beyond what is typically seen in terms of number and concentration of contaminants, i.e., 1,4-D, tetrachloroethylene (PCE) and trichloroethylene (TCE).

The Step 2 analysis (described in the Step 2 Report) fully characterized constituents in the raw water produced by the Olympic Well Field, thereby ensuring a treatment system can be properly selected and designed (Advisian and ICF, 2021). The analysis included screening of water quality data against specific criteria and regulatory values to identify constituents of potential concern (COPC), analyzing water quality data to estimate future treatment plant influent concentrations, assessing trends over time for historical water quality parameters, and analyzing variability to understand how water quality has changed under the influence of certain factors, such as pumping and seasonal variation in precipitation. Ultimately, 15 synthetic organic chemicals were confirmed as COPCs based on two criteria: 1) chemicals are synthetic organic compounds, and 2) chemicals had a ratio of maximum concentration to maximum contaminant level (MCL) or NL greater than 50 percent. Statistical analysis and flow-weighting calculations were then conducted to estimate future treatment plant influent concentrations using monitoring well groundwater quality data for all constituents, including the identified COPCs. The results of this analysis projected four COPCs to be at concentrations above their respective MCL or NL: 1,4-dioxane, PCE, TCE, and 1,2,3-trichloropropane (1,2,3-TCP).

The Step 2 Report also provides information on the monitoring well selection and evaluation approach (Advisian and ICF, 2021). A conservative 95 percent upper confidence limit of the population mean (UCL95) water quality value was selected for the flow-weighted concentration estimates to project concentrations at each production well in the Olympic Well Field. A safety factor, selected based on best engineering judgement and available information, was applied to the UCL95 water quality value to provide a second layer of conservatism to design the multi-barrier treatment system for the Olympic Well Field.

- **Initial Design.** Table 1-3 provides the design concentrations for the Initial Design and construction. A safety factor of 1.5 on the UCL95 values was used for all the constituents except 1,2,3-TCP, unlike the other COPCs, as well sampling from 2018 to 2019 showed a range of 1,2,3-TCP concentrations, with 55 percent of the values below the MCL. Thus, a safety factor of 1.2 on the UCL95 value was used for 1,2,3-TCP to minimize over-estimation of expected influent concentrations and over-design of the facility.
- **Contingency Design.** Table 1-4 provides the design concentrations for the potential future Contingency Design and construction, which uses a safety factor of 2.0 for all COPCs, including 1,2,3-TCP. The Olympic Well Field Restoration Project incorporates the ability to increase contaminant removal, if necessary, should future groundwater monitoring results indicate contaminant levels above what is currently detected and modeled. This potential future Contingency Design includes potential expansion of the ultraviolet light with hydrogen peroxide advanced oxidation process (UV/H_2O_2) to increase treatment if one or more COPCs rises above the Initial Design concentrations to the point where additional treatment is needed. It also includes increased Arcadia WTP capacity from future increased Charnock well flow.

The blended Olympic Well Field influent water quality concentrations assume Olympic well flows of 900 gpm for SM-4, 550 gpm for SM-8, and 550 gpm for SM-9 to create the most conservative blend concentration at the maximum flow (SM-4 at maximum flow; see Step 4 Report (BC 2021) for details on mass balance development). Ten of the 15 identified COPCs have concentrations at the individual production wells that are below the MCL or NL. Concentrations at the production wells for four of the constituents (1,2,3-TCP, 1,4-D, PCE, and TCE) exceed the MCL or NL and govern the treatment technology selection as described in the Step 4 Report. The historical water quality data is summarized in Appendix A of the Step 4 Report.

Table 1-3. Olympic Influent Concentrations: Initial Design

Constituent of Potential Concern	Units	MCL	NL	1.5X UCL95 Estimates, Except 1,2,3-TCP (1.2X)			Olympic AWTF Influent[a]
				SM-4	SM-8	SM-9	
1,1-Dichloroethane (1,1-DCA)	µg/L	5	-	0.41	0.06	0.02	0.21
1,1-Dichloroethylene (1,1-DCE)	µg/L	6	-	1.65	0.30	0.12	0.86
1,2,3-TCP	µg/L	0.005	-	0.045	0.018	0.017	0.030
1,4-D	µg/L	-	1	54	4	4	27
Carbon tetrachloride	µg/L	0.5	-	0.54	0.07	0.04	0.27
Cis-1,2-Dichloroethylene (cis-1,2-DCE)	µg/L	6	-	0.33	3.15	0.08	1.04
PCE	µg/L	5	-	42	2	3	20
TCE	µg/L	5	-	34	2	1	16
1,1,2-Trichloroethane	µg/L	5	-	0.50	ND	ND	0.23
1,2-Dichloroethane	µg/L	0.5	-	0.20	0.10	0.10	0.15
Benzene	µg/L	1	-	0.10	0.20	ND	0.10
MTBE	µg/L	13	-	0.30	0.30	ND	0.22
Perfluorooctanoic acid (PFOA)	ng/L	-	0.1	1.70	0.10	0.20	0.85
trans-1,2-Dichloroethylene	µg/L	10	-	ND	0.10	0.10	0.06
Vinyl chloride	µg/L	0.5	-	ND	0.20	ND	0.06

a. *Blended treated water concentration assuming Olympic well flows of SM4 = 900 gpm, SM8 = 550 gpm, SM9 = 550 gpm. Note: SM-4 flow is elevated and SM-8 and SM-9 reduced to create the most conservative blend concentration at the maximum flow (SM-4 at maximum flow).*

µg/L = microgram per liter, ND = non-detect, ng/L = nanograms per liter

Table 1-4. Olympic Influent Concentrations: Contingency Design

Constituent of Potential Concern	Units	MCL	NL	2.0X UCL95 Estimates			Olympic AWTF Influent[a]
				SM-4	SM-8	SM-9	
1,1-DCA	µg/L	5	-	0.60	0.10	0.10	0.33
1,1-DCE	µg/L	6	-	2.20	0.40	0.16	1.14
1,2,3-TCP	µg/L	0.005	-	0.074	0.030	0.028	0.049
1,4-D	µg/L	-	1	71	5	5	35
Carbon tetrachloride	µg/L	0.5	-	0.80	0.10	0.10	0.42
cis-1,2-DCE	µg/L	6	-	0.50	4.20	0.10	1.41
PCE	µg/L	5	-	56	2	3	27
TCE	µg/L	5	-	45	2	1	21
1,1,2-Trichloroethane	µg/L	5	-	0.60	ND	ND	0.27
1,2-Dichloroethane	µg/L	0.5	-	0.20	0.10	0.10	0.15
Benzene	µg/L	1	-	0.10	0.20	ND	0.10
MTBE	µg/L	13	-	0.40	0.40	ND	0.29
PFOA	ng/L	-	0.1	2.20	0.10	0.30	1.10
trans-1,2-Dichloroethylene	µg/L	10	-	ND	0.10	0.10	0.06
Vinyl chloride	µg/L	0.5	-	ND	0.20	ND	0.06

a. *Blended treated water concentration assuming Olympic well flows of SM4 = 900 gpm, SM8 = 550 gpm, SM9 = 550 gpm. Note: SM-4 flow is elevated, and SM-8 and SM-9 reduced to create the most conservate blend concentration at the maximum flow (SM-4 at maximum flow).*

The UV/H_2O_2 system for the new Olympic AWTF is designed to treat the maximum (unblended) well concentrations for the three target contaminants (1,4-D, TCE, and PCE as summarized in Table 1-3) and can be expanded to meet the treatment targets necessitated by the higher concentrations in Table 1-4 by adding more rows of lamps (i.e., higher-intensity light) if needed. Because the hydroxyl radical yield from the UV/H_2O_2 process is low, UV/H_2O_2 AOP results in high residual hydrogen peroxide concentrations downstream of the reactors. Lead-lag GAC treatment is provided downstream of the AOP process to quench the excess residual hydrogen peroxide and provide treatment via adsorption for COPCs, including 1,2,3-TCP.

Several existing systems at the Arcadia WTP are modified or expanded to increase capacity. Two of the six existing greensand filters are re-plumbed and dedicated to the new Olympic AWTF; the remaining four greensand filters will continue to treat water from the Charnock WTP and Arcadia Well Field. The reverse osmosis (RO) system is being modified to enhance the recovery of RO permeate.

The purpose of each treatment process and reason for its order of treatment is summarized below.

1. Greensand filtration is used for both the Charnock/Arcadia and Olympic well flows to remove iron and manganese. Removing iron and manganese will reduce UV lamp fouling from the Olympic well flow and RO membrane fouling by both the Charnock/Arcadia and Olympic well flows.
2. UV/H_2O_2 AOP is used to remove 1,4-D, TCE, and PCE from the Olympic Well Field to below their respective detection limit for purposes of reporting (DLR) or detection limit as the primary mode of treatment for these contaminants.
3. Granular activated carbon (GAC) is used to quench the hydrogen peroxide from the UV/H_2O_2 effluent and provide treatment via adsorption (e.g., removal of 1,2,3-TCP).
4. Treated water from the UV/H_2O_2 AOP + GAC (Olympic well flows) will be combined with Charnock/Arcadia well flows in the RO feed tank and be treated via RO to reduce total dissolved solids, hardness, and remove low-concentration contaminants to below the DLR. An RO bypass stream is used to re-mineralize the final treated water.
5. The combined RO permeate and RO bypass flow through the decarbonators. The exhaust gas from the decarbonators is treated via vapor-phase GAC.
6. Post-decarbonation, ammonium sulfate and sodium hypochlorite are added to create a disinfection residual (monochloramine), fluoride is added to leave residual, and sodium hydroxide is added for corrosion control of the final treated water.

1.4 Treatment Processes

Several existing systems at the Arcadia WTP are modified or expanded to increase capacity. The Olympic AWTF is co-located at the Arcadia WTP and separately treat groundwater from the Olympic Well Field before blending the post-GAC effluent with the greensand-filtered Charnock WTP and Arcadia Well Field flows in the RO feed tank. A site plan of the Olympic AWTF (co-located at the existing Arcadia WTP) and Arcadia WTP expansion is provided in Figure 1-1. A process flow diagram of the new Olympic AWTF and Arcadia WTP expansion is provided on Figure 1-2 that shows order of operation, pumps, chemical injection points, and static mixers. Figure 1-3 presents the flow balance for the system.

The new Olympic AWTF includes greensand filters, UV/H_2O_2, and GAC systems to treat groundwater from the Olympic Well Field prior to blending with other sources in the RO feed tank. Two of the six greensand filters are dedicated to the Olympic AWTF; the remaining filters will continue to treat water from the Charnock WTP and Arcadia Well Field. Greensand filters will remove iron and manganese and reduce fouling on the UV reactor lamp sleeves and RO membranes. UV/H_2O_2 AOP will remove 1,4-D, TCE, and PCE and other constituents to below their respective DLRs or detection limits. UV/H_2O_2 AOP followed by GAC will provide residual hydrogen peroxide quenching and treatment via adsorption for COPCs removal, including 1,2,3-TCP. Existing post-RO water quality management practices (i.e., corrosion control, disinfection residual concentrations) are maintained. A new flash mixing system for post-RO water is installed to ensure proper mixing of ammonia sulfate and sodium hypochlorite.

The details of each process are summarized in the following subsections. Equipment configuration in this section is described using the notation (duty + standby). Construction Drawings are provided in Attachment B. Manufacturer documentation will be provided as part of the final OMMP in Attachment C.

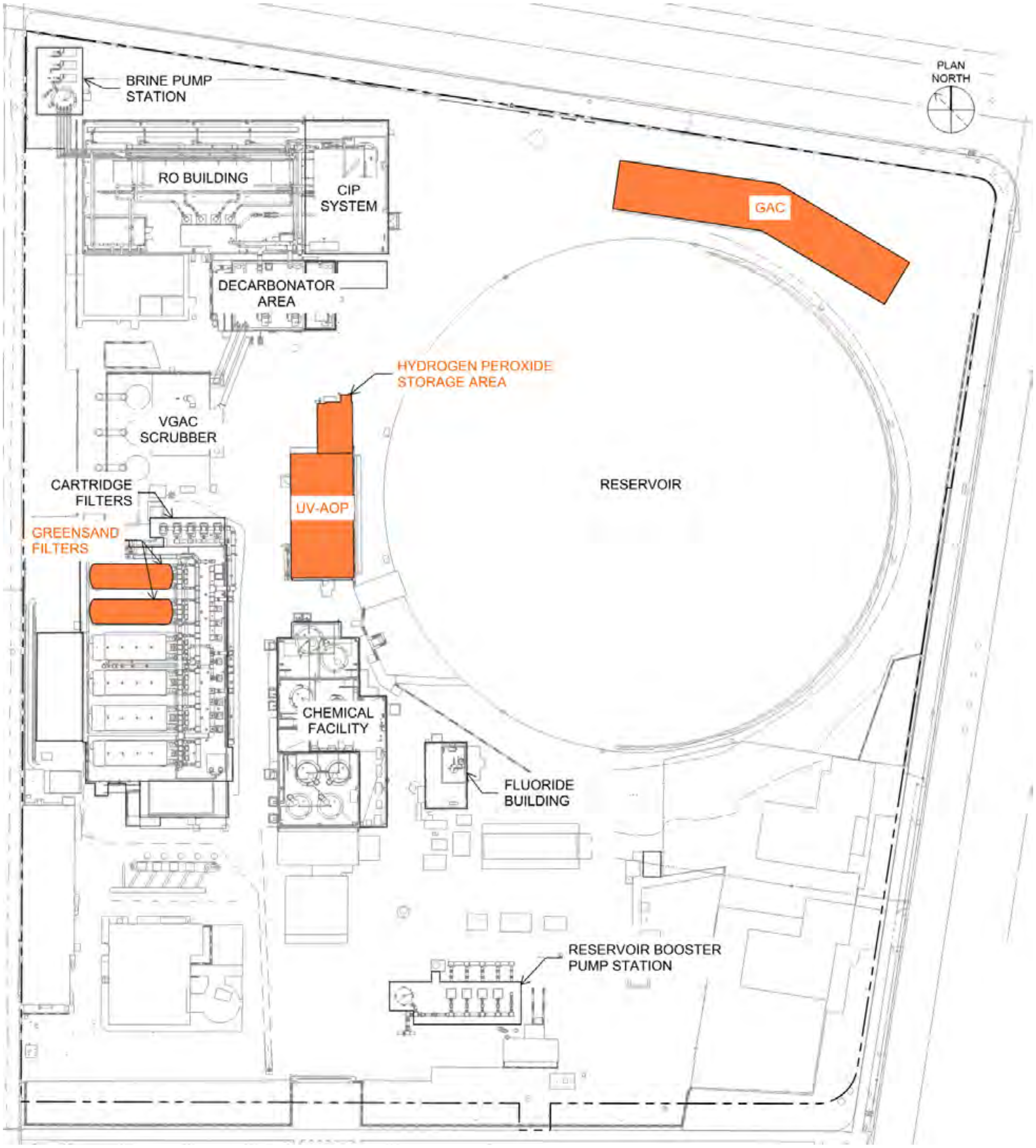

Figure 1-1. Olympic AWTF and Arcadia WTP expansion site plan

Olympic AWTF shown in orange

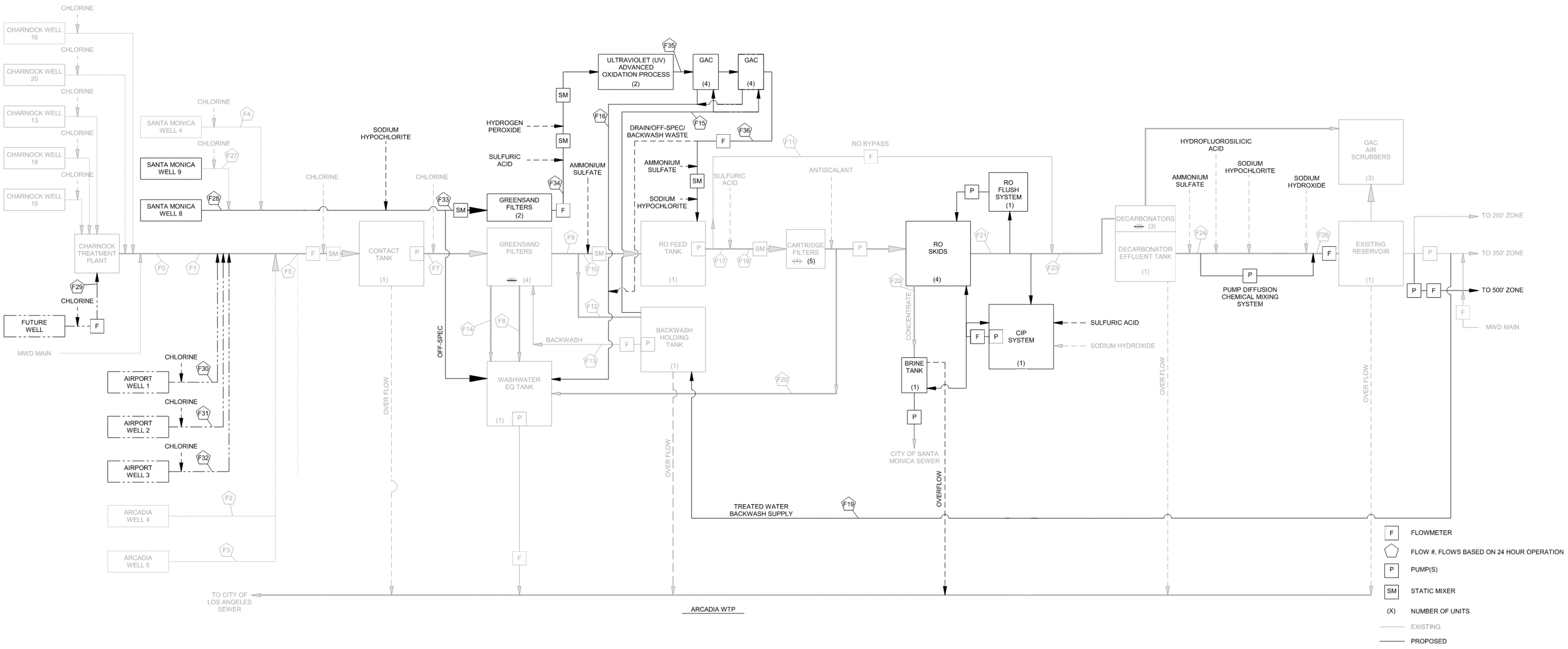

Figure 1-2. Arcadia WTP expansion process flow diagram

Flow # :		F0	F1	F2	F3	F4	F5	F6	F7	F8[1]		F9[7]	F10	F11[4]	F12[8]	F13	F14	
		Charnock Wells	Charknock Wellhead Treatment Effluent	Arcadia Well #4	Arcadia Well #5	Santa Monica Well #4	Inlet Vault Influent	NOT USED	Greensand Filters Influent from Charnock, Arcadia, and Future Wells	Greensand Filters Backwash Effluent from Charnock, Arcadia, and Future Wells	Greensand Filters Backwash Effluent from Olympic Wells	Greensand Filters Effluent from Charnock, Arcadia, and Future Wells	RO Feed Tank Influent from Charnock, Arcadia, and Future Wells	RO Bypass	Backwash Holding Tank Influent	Backwash Holding Tank Effluent	Greensand Filter to Waste from Charnock, Arcadia, and Future Wells	Greensand Filter to Waste from Olympic Wells
Initial Phase	(gpm)	4,800		135	95	900	5,030		5,030	16	9	5,030	5,030	1,697	0	26	8	3
	(mgd)	6.91		0.19	0.14	1.30	7.24		7.24	0.02	0.01	7.24	7.24	2.44	0.00	0.04	0.01	0.00
Ultimate	(gpm)	5,067		135	95	900	7,097		7,097	30	9	7,097	7,097	2,092	0	42	21	3
	(mgd)	7.30		0.19	0.14	1.30	10.22		10.22	0.04	0.01	10.22	10.22	3.01	0.00	0.06	0.03	0.00

Flow # :		F15[2]	F16[2]	F17	F18	F19[6]	F20	F21[3]	F22[3]	F23	F24	F25	F26	F27	F28	F29	F30	F31	F32	F33	F34[7]	F35	F36[7]
		GAC Contactor Backwash Supply	GAC Contactor Backwash Waste	RO Feed Tank Effluent	Cartridge Filter Feed with Chemical	Treated Water Backwash Supply	Cartridge Filter Waste to EQ Basin	RO Permeate	RO Concentrate/Brine	Combined RO Permeate and Bypass	Decarbonator Effluent	NOT USED	Treated Water	Santa Monica Well #9	Santa Monica Well #8	Future Well	Airport Well #1	Airport Well #2	Airport Well #3	Greensand Filters Influent from Olympic Wells	Greensand Filter Effluent from Olympic Wells	UV-AOP Effluent	RO Feed Tank Influent from Olympic Wells
Initial Phase	(gpm)	2	2	5,333	5,333	26	0	4,800	533	6,497	6,497		6,497	550	550	-	-	-	-	2,000	2,000	2,000	2,000
	(mgd)	0.00	0.00	7.68	7.68	0.04	0.00	6.91	0.77	9.36	9.36		9.36	0.79	0.79	-	-	-	-	2.88	2.88	2.88	2.88
Ultimate	(gpm)	3	3	7,005	7,005	42	0	6,304	700	8,397	8,397		8,397	550	550	900	300	300	300	2,000	2,000	2,000	2,000
	(mgd)	0.00	0.00	10.09	10.09	0.06	0.00	9.08	1.01	12.09	12.09		12.09	0.79	0.79	1.30	0.43	0.43	0.43	2.88	2.88	2.88	2.88

1. INSTANTANEOUS FLOW RATE IS 2,500 GPM FOR 15 MINUTES.
2. BASED ON AVERAGE DAILY FLOW RATE, INSTANTANEOUS FLOW RATE IS 300 TO 1,300 GPM FOR 15 TO 45 MINUTES.
3. BASED ON 90% RECOVERY BY THE RO MEMBRANE SYSTEM.
4. RO BYPASS EQUALS 24% OF FEED FLOW IN INITIAL AND 23% IN ULTIMATE BASED ON TARGET BLENDED WATER QUALITY.
5. REPLACEMENT WELL TO SM-3.
6. BASED ON AVERAGE DAILY FLOW RATE, INSTANTANEOUS FLOW RATE IS 96 TO 504 GPM FOR 2 HOURS.
7. LOSSES DUE TO FILTER TO WASTE OR BACKWASH WASTE NOT DEDUCTED AS THESE OPERATIONS ARE INFREQUENT.
8. NON-OLYMPIC GREENSAND FILTERS WILL RETAIN THE ABILITY TO FILL THE BACKWASH HOLDING TANK WITH GREENSAND FILTRATE IF TREATED WATER IS NOT AVAILABLE FOR BACKWASH SUPPLY.

Figure 1-3. Olympic AWTF and Arcadia WTP expansion flow balance

1.4.1.1 Greensand Filters

Greensand filters provide critical pretreatment through the removal of iron and manganese. Manganese greensand is a purple-black medium, derived by coating the naturally occurring glauconite sand with a thin layer of manganese dioxide by treating it with manganous sulfate and potassium permanganate. Removal of iron and manganese in the raw water occurs through both filtration and adsorption, and chlorine is added upstream to continuously regenerate the media. A layer of anthracite media over the greensand media removes a portion of the precipitating ferric hydroxide particles, thereby reducing overall rate of headloss accumulation through the filter and maximizing run time prior to backwashing.

Four (4 + 0) greensand filters remove iron and manganese from the Arcadia WTP flow. Two (2 + 0) greensand filters are dedicated to removing iron and manganese from the Olympic Well Field flow. A physical separation avoids any cross-contamination to the other four greensand filters. Each filter contains two, independently operating cells. The system is designed to maintain the same total filtrate production for normal operation when all filter cells are in service, when one filter cell is offline, and when one filter vessel or two cells are offline. Design criteria for the greensand filters are provided in Table 1-5. Refer to Sections 2.2.3.5 and 2.4.3 for operating scenarios and maintenance.

Table 1-5. Greensand Filters Design Criteria

Description	Units	Design – Olympic AWTF	Design - Arcadia WTP
Type of Filters	-	Pressure	
Filters	No.	2 (2 + 0)	4 (4 + 0)
Cells Per Filter	No.	2	2
Design Feed Flow	gpm	2,000	7,097
Filter Area Per Cell	ft^2	227	227
Recovery	%	99.4%	99.3%
Loading Rate, all cells in service	gpm/ft^2	2.2	3.9
Loading Rate, 1 cell out of service	gpm/ft^2	2.9	4.5
Loading Rate, 2 cells out of service	gpm/ft^2	4.4	5.2

ft^2 = square feet
gpm = gallons per minute

The greensand filters use the existing backwash system. The cells are backwashed with a combination of air and water, as further described in Section 2.2.3.5. The 350-foot pressure zone booster pump discharge header fills the backwash holding tank with treated water. Piping will separate Olympic greensand filtrate from non-Olympic greensand filtrate, allowing only non-Olympic greensand filtrate to fill the backwash holding tank. Backwash waste from the greensand filters and Olympic Wells blowdown during start-up will be sent to the washwater equalization (EQ) tank before final discharge to the City of Los Angeles sewer system. Olympic Wells blowdown will continue until an acceptable turbidity setpoint is met and water may be conveyed to the greensand filters. Solids will be kept in suspension within the tank through submersible mixers and discharged through submersible pumps. Table 1-6 lists the backwash system design criteria.

Table 1-6. Greensand Filter Backwash System Design Criteria

Description	Units	Design – Olympic AWTF	Design – Arcadia WTP
Backwash Frequency Per Cell	hours	293	165
Backwash Rate	gpm/ft^2	11	11
Backwash Duration	min	15	15
Backwash Holding Tank Type	-	Cast-in-place Reinforced Concrete	
Tanks	No.	1 (1 + 0)	
Useable Volume	gal	73,700	
Number of Pumps	No.	2 (1 + 1)	
Rated Capacity, each	gpm	3,450	
Rated Head	ft	45	
Motor Size	hp	75	
Drive	Type	VFD	
Number of Blowers	No.	2 (1 + 1)	
Motor Size	hp	25	
Rated Capacity, each	SCFM	675	
Washwater EQ Tank Type	-	Cast-in-place Reinforced Concrete	
Tanks	No.	1 (1 + 0)	
Volume	gal	58,000	
Pumps	No.	2 (1 + 1)	
Rated Capacity, each	gpm	650	
Rated Head	ft	42	
Motor Size	hp	10	
Drive	Type	VFD	
Mixers	No.	2 (2 + 0)	
Motor Size	hp	8	

hp = horsepower
SCFM = standard cubic feet per minute
VFD = variable-frequency drive

1.4.1.2 UV/H_2O_2 AOP

UV/H_2O_2 AOP uses hydrogen peroxide with UV light to produce hydroxyl radicals that, react with, and destroy contaminants. Because the hydroxyl radical yield from the UV/H_2O_2 process is low, UV/H_2O_2 AOP results in residual hydrogen peroxide downstream of the reactors. Parallel GAC treatment will be provided downstream of the AOP process to quench this excess hydrogen peroxide.

Two UV trains (1 + 1) use hydrogen peroxide as the oxidant. Each UV reactor includes 12 reactor sections, with 11 sections filled with UV lamps to meet Initial Design requirements. The system will achieve 2.4-log removal of 1,4-D, 2.3-log removal of PCE, and 2.2-log removal of TCE with a hydrogen peroxide dose of 40 milligrams per liter (mg/L). Capacity of both UV trains can be expanded by adding more UV lamps on the empty 12th reactor section during the Contingency Design if constituent levels rise and additional treatment is required. The expanded system will achieve 2.6-log removal of 1,4-D, 2.5-log removal of PCE, and 2.4-log removal of TCE with a hydrogen peroxide dose of 40 mg/L. Design criteria for the UV trains are provided in Table 1-7. Refer to Sections 2.2.3.2 and 2.4.4 for operating scenarios and maintenance.

Table 1-7. UV/H_2O_2 AOP Design Criteria

Description	Units	Design – Olympic AWTF	Treatment Contingency (potential future)
Lamp Type	-	LPHO	
Oxidant Type	-	Hydrogen Peroxide	
Design Feed Flow (Minimum - Maximum)	gpm	1,000 - 2,000	
Number of Trains	-	2 (1 + 1)	
Number of Reactors Per Train	-	1	
Design Log Removal 1,4 Dioxane	-	2.4	2.6
Design Log Removal PCE	-	2.3	2.5
Design Log Removal TCE	-	2.2	2.4
UV Transmittance at 254 nm	%	96	96
Hydrogen Peroxide Dose	mg/L	40	40
Lamps Per Train	-	264	288
UV Intensity Sensors Per Train	-	11	12
Total Connected Load	kilowatt	596	647
Reactor Power Turndown	%	30 - 100	
Lamp Power	watt	1,000	
Guaranteed Lamp Life	hr	15,000	
Maximum Operating Pressure	psi	87	
Maximum Headloss Across Reactor Train at Design Flow	in of WC	3.0	

hr = hours
in of WC = inches of water column
psi = pounds per square inch

1.4.1.3 GAC

GAC catalytically degrades hydrogen peroxide into oxygen and water and is used to quench residual hydrogen peroxide from the UV reactor; it is also a physical adsorption process that removes some organic and inorganic compounds.

The GAC system has four trains (4 + 0) each train consists of two, 12-ft-diameter GAC contactor vessels capable of holding up to 40,000 lbs. of media each, operating in lead-lag to quench residual hydrogen peroxide and provide treatment via adsorption (e.g., adsorption of 1,2,3-TCP. Design criteria for the GAC system is based on one train offline due to backwashing or maintenance. During normal operation when flows are high enough to permit, the GAC system will operate in a four duty, no standby configuration to prevent stagnant water within the vessels.

A non-catalytic carbon has been selected because GAC will be used for both quenching and adsorption. Changeout frequency when operating as lead/lag for contaminant removal will depend on contaminant concentrations and background water quality (e.g., total organic carbon). Design criteria for the GAC contactors and backwash system are provided in Table 1-8 and Table 1-9. Refer to Sections 2.2.3.3 and 2.4.5 for operating scenarios and maintenance.

Table 1-8. GAC Design Criteria

Description	Units	Design – Olympic AWTF
Type of Contactors	-	Cylindrical, Pressure
Contactor Media	-	GAC
Contactor Orientation	-	Vertical
Media Effective Size	mm	0.55 – 1.1
Vessel Diameter	ft	12
Design Feed Flow	mgd	2.9
Recovery	%	99.8%
Trains	No.	4 (3 + 1)
Contactors Per Train	No.	2
Contactor Operation	-	Contactors within each train in lead/lag
EBCT, all trains in service	min	17.8
EBCT, duty trains in service	min	13.3
GAC Media Weight Per Contactor	lb	40,000
GAC Media Depth	ft	10.5
Contactor Loading Rate, duty trains in service	gpm/ft^2	5.9
Contactor Loading Rate, all trains in service	gpm/ft^2	4.4

lb = pounds
min = minutes
mm = millimeters

Table 1-9. GAC Backwash System Design Criteria

Description	Units	Design – Olympic AWTF
Maximum Backwash Rate, 75°F	gpm/ft^2	8.9
Maximum Backwash Duration, 75°F	min	42
Maximum Backwash Frequency	No./month	1
Bump Rate	gpm/ft^2	5.0
Bump Duration	min	15
Maximum Bump Frequency	No./month	12
Backwash/Bump Pumps	-	Shared with greensand filter system, see Table 1-5

°F = degrees Fahrenheit

GAC pressure vessel backwash cycles and bumps (short term backwash) are accommodated using the greensand filter system backwash pumps. Since the flowrate required for GAC backwashes are lower than that for greensand filters, part of the backwash flow is diverted back into the backwash water supply tank to provide controlled GAC backwash loading rate.

1.4.1.4 RO Feed Tank

A new inlet pipe penetration is added to the RO feed tank for Olympic AWTF effluent. Groundwater from the Charnock WTP and Arcadia Well Field (both pre-treated with greensand filtration) is blended with Olympic AWTF effluent within the RO feed tank. Design criteria for the RO feed tank are provided in Table 1-10. Refer to Sections 2.2.3.1 and 2.4.7 for operating scenarios and maintenance.

Table 1-10. RO Feed Tank Design Criteria

Description	Units	Design (Ultimate Flow)
Type	-	Cast-in-place Reinforced Concrete
Tanks	No.	1 (1 + 0)
Useable Volume	gal	154,100
Hydraulic Retention Time	-	17 min at 9,097 gpm

1.4.1.5 Low-pressure RO Feed Pumps and Cartridge Filters

Design criteria for the low-pressure RO feed pumps and cartridge filters are provided in Table 1-11 and Table 1-12. Refer to Sections 2.2.3.1 and 2.4.6 for operating scenarios and maintenance.

Table 1-11. Low-Pressure RO Feed Pumps Design Criteria

Description	Units	Design (Ultimate Flow)
Total Pumps	No.	4 (3 + 1)
Motor Size	hp	3 at 125 (existing) 1 at 150 (new)
Rated Capacity, each	gpm	3,500
Rated Head	ft	103
Drive	Type	VFD

Table 1-12. Cartridge Filters Design Criteria

Description	Units	Design (Ultimate Flow)
Vessels	No.	5 (5 + 0)
Flow Per Vessel	gpm	1,401
Cartridge Filter Material	-	Polypropylene
Vessel Orientation	-	Horizontal
Maximum Pressure Drop - Dirty Filter	psi	15
Cartridge Filters Per Vessel (40-inch filters)	No.	176
Cartridge Filter Rating	micron	5
Cartridge Filter Length	inches	40
Cartridge Filter Element Diameter	inches	2.5
Cartridge Filter Nominal Flow Rate Per 10-inch Equivalent	gpm	2.0

1.4.1.6 RO Trains

RO is a separation process that produces purified water (permeate) and reject concentrate (brine) from a feed stream. Water under pressure flows through a non-porous, semi-permeable membrane which retains and concentrates salts on the feed side. Additional stage(s) of membranes are added to further purify concentrate from previous stage(s), thereby increasing recovery of the overall system. Interstage pumps maintain optimum flux rate through subsequent stage(s). Subsequent stages require greater feed pressure since osmotic pressure is directly related to solution concentration.

Flow reversal reverse osmosis (FRRO) achieves higher system recoveries by switching the feed and concentrate connections periodically. During typical operations, the system functions as a conventional RO membrane system with a three-stage array of membrane pressure vessels. After a preset timer is reached or operator request is sent, the RO PLC automatically actuates pneumatic ball valves to open or close pressure vessel connections rotating the third stage vessels into first stage and some of the first stage vessels into third stage. The second stage vessels flow direction is also reversed during this process. The RO PLC also automatically adjusts the interstage pump speed for each stage. This flow reversal and block rotation process sweeps away potential scale deposition with under-saturated feed solution inhibiting scale formation on membrane surfaces.

An RO clean-in-place (CIP) system is required to remove fouling and scaling that accumulates on RO membranes over time. The CIP sequence is comprised of four steps: the immersion heater is called to run until a temperature setpoint is met; the CIP Pump is called to run and modulates speed to circulate CIP solution through the RO train at an operator adjustable flow rate and duration; SCADA automatically closes valves on the RO train to soak the membranes over an operator adjustable duration; RO CIP solution is neutralized and discharged to the brine tank.

A RO flush system flushes the membranes with permeate to prevent fouling whenever a RO train is called to stop. The membranes are also flushed after a CIP sequence is performed. SCADA automatically actuates valves to switch the feed water to flush water, opens the concentrate valves, opens the off-spec permeate valves, and closes the permeate valves

The RO trains (4 + 0) are retrofitted to FRRO to achieve 90 percent or greater recovery. Approximately 24 percent of the RO feed flow is bypassed around the RO based on a water hardness target of ~160 mg/L as calcium carbonate ($CaCO_3$). The RO trains include a high-pressure RO feed pump, a RO interstage pump between stages 1 and 2 and stages 2 and 3, piping and valving manifolds, and control system. In the initial design, the retrofitted RO trains can operate in a three duty, one standby, mode based on available influent water. Should additional groundwater wells be available from other future wells (summarized in Table 1-2), all RO trains will operate in duty mode with no standby. When an RO train goes offline due to cleaning or maintenance, plant operating capacity will be reduced temporarily and supplemented by the City’s imported water source. The CIP and flush water systems are located inside the RO Building. Design criteria for the RO system are provided in Table 1-13 through Table 1-17. Refer to Sections 2.2.3.1 and 2.4.7 for operating scenarios and maintenance.

Table 1-13. High-Pressure RO Feed Pumps Design Criteria

Description	Units	Design (Ultimate Flow)
Pumps	No.	4 (4 + 0)
Motor Size	hp	250
Rated Capacity, each	gpm	1,900
Rated Head	ft	360
Drive	Type	VFD

Table 1-14. RO Interstage Pumps Design Criteria

Description	Units	Design (Ultimate Flow)
Stage 1-2 Booster Pump		
Pumps Per Skid	No.	1
Motor Size	hp	40
Flow Per Pump	gpm	762
Rated Head	ft	69
Drive	Type	VFD
Stage 2-3 Booster Pump		
Pumps Per Skid	No.	1
Motor Size	hp	30
Flow Per Pump	gpm	313
Rated Head	ft	92
Drive	Type	VFD

Table 1-15. RO Trains Design Criteria

Description	Units	Design (Ultimate Flow)
RO Feed Tank Inflow	gpm	9,097
RO Bypass Flow	gpm	2,092
Feed Flow Per Train	gpm	1,650 – 1,900
Permeate Flow Per Train	gpm	1,353 – 1,710
RO Concentrate Flow Per Train	gpm	165 - 342
Design System Recovery	%	82 – 90
Membrane Material	-	Composite Polyamide
Membrane Type	-	High Rejection, Low Fouling
Membrane Area Per Element	ft^2	440
Trains (duty & standby)	No.	4 (4 + 0)
Stages Per Train	No.	3
Pressure Vessel Configuration	No.	43:21:9
Pressure Vessel Diameter	inches	8
Height of RO Trains	No. of Vessels	7
Elements Per Pressure Vessel	No.	6
Maximum Average Flux	GFD	12.8

GFD = gallons per square foot per day

Table 1-16. RO Flush System Design Criteria

Description	Units	Design (Ultimate Flow)
Flush Tanks	No.	1 (1 + 0)
Flush Tank Volume	gal	18,500
Flush Pumps	No.	2 (1 + 1)
Rated Capacity, each	gpm	600
Rated Head	ft	140
Motor Size	hp	40
Drive	Type	VFD

Table 1-17. RO CIP System Design Criteria

Description	Units	Design (Ultimate Flow)
CIP and Neutralization Tanks		
CIP Tanks	No.	1 (1 + 0)
CIP Tank Volume	gal	6,600
Heaters Per CIP Tank	No.	1
CIP Tank Heater Power , each	kilowatts	200
CIP Pumps	No.	2 (1 + 1)
Rated Capacity, each	gpm	1,085
Rated Head	ft	197
Motor Size	hp	100
Drive	Type	VFD
Neutralization Tanks	No.	None (neutralize in CIP tank)
CIP Cartridge Filter		
Vessels	No.	1 (1 + 0)
Flow Per Vessel	gpm	1,085
Cartridge Filter Material	-	Polypropylene
Vessel Orientation	-	Horizontal
Maximum Pressure Drop - Dirty Filter	psi	15
Cartridge Filters Per Vessel (40-inch filters)	No.	86
Cartridge Filter Rating	microns	5
Cartridge Filter Length	inches	40
Cartridge Filter Element Diameter	inches	2.5
Cartridge Filter Nominal Flow Rate Per 10-inch Equivalent	gpm	3.2

Table 1-17. RO CIP System Design Criteria

Description	Units	Design (Ultimate Flow)
Volumetric Screw Feeder with Mixing Tank		
Mixing Tanks	No.	1 (1 + 0)
Mixing Tank Volume, each	gal	75
Transfer Pumps	No.	1 (1 + 0)
Rated Capacity, each	gpm	15
Rated Head	ft	25
Motor Size	hp	0.5
Drive	Type	Constant Speed
Hoppers	No.	1 (1 + 0)
Rated Capacity, each	CF	3.6
Accuracy	%	1% of volume

1.4.1.7 Brine Tank and Pump Station

A brine tank and pump station equalize the RO concentrate for disposal via an 8-inch brine disposal line that connects to the City's sanitary sewer system. An air gap is provided in the concentrate piping from each RO system to the brine tank. The brine tank reduces the back pressure placed on the RO system, which has an adverse impact on the RO system performance. The brine tank receives CIP waste from the new CIP system in the RO Building. A control interlock and valve prevent neutralized CIP waste from being discharged to the brine tank unless pH setpoints are met. Design criteria for the brine tank and pump station are provided in Table 1-18. Refer to Sections 2.2.3.4 and 2.4.8 for operating scenarios and maintenance.

Table 1-18. Brine Tank and Pump Station Design Criteria

Description	Units	Design (Ultimate Flow)
Type	-	Fiber-reinforced plastic
Tanks	No.	1 (1 + 0)
Useable Volume	gal	5,287
Hydraulic Residence Time	-	4.2 min at 1,261 gpm to 8.4 min at 630 gpm
Pumps	No.	3 (2 + 1)
Rated Capacity, each	gpm	630
Rated Head	ft	289
Motor Size	hp	100
Drive	Type	VFD

1.4.1.8 Decarbonators

Decarbonators remove carbon dioxide to increase pH and reduce the required sodium hydroxide dosage for post treatment. The decarbonators are also used to remove VOCs from the combined RO permeate and RO bypass. Water is spread over a packed media bed and subjected to an updraft of air, enhancing volatilization of carbon dioxide and VOCs from the feed water.

Three decarbonators (3 + 0) treat the blended RO permeate and bypass flows. By maintaining the loading rate of the decarbonators, the Arcadia WTP expansion can achieve reduction of TCE and PCE. With the addition of the Olympic AWTF, the City's existing reservoir aeration system may no longer be required to meet treatment goals. Design criteria for the decarbonators are provided in Table 1-19. Refer to Sections 2.2.3.6 and 2.4.9 for operating scenarios and maintenance.

Table 1-19. Decarbonators Design Criteria

Description	Units	Design (Ultimate Flow)
Towers	No.	3 (3 + 0)
Flow Per Tower	gpm	2,799
Diameter Per Tower	ft	11
Blowers	No.	3 (3 + 0)
Blower Capacity, each	SCFM	9,000
Motor Size	hp	40
Fill Media	-	2" Tripack
Media Depth	ft	5
Liquid Loading Rate	gpm/ft^2	29.5
Gas Loading Rate	CFM/gpm	3.2
Air:Water Ratio	-	24.1

CFM = cubic feet per minute

1.4.1.9 Post Treatment Chemical Addition

Flash mix pumps downstream of the decarbonator effluent tank enhance chemical mixing for post-treatment disinfection and stabilization. The chemical feed order is hydrofluorosilicic acid, sodium hypochlorite, and sodium hydroxide. Design criteria for the flash mix pumps are provided in Table 1-20. Refer to Sections 2.2.3.7and 2.4.10 for operating scenarios and maintenance.

Table 1-20. Flash Mix Pumps Design Criteria

Description	Units	Design (Ultimate Flow)
Pumps	No.	2 (1 + 1)
Rated Capacity, each	gpm	196
Rated Head	ft of water	23
Motor Size	hp	3
Drive	Type	Constant Speed

1.4.1.10 Reservoir and Booster Pump Station

The 5-MG treated-water reservoir has two outlets. The first outlet sends water to the Arcadia booster pumps to supply the 350-foot pressure zone. The second outlet flows by gravity directly to the 250-foot pressure zone. A booster pump station supplies the 500-foot pressure zone using the 250-foot pressure zone reservoir outlet. A bladder-type surge tank will dissipate transient surges in the system in the event of a power failure at the 500-foot pressure zone booster pump station. Design criteria for the reservoir are provided in Table 1-21. Design criteria for the booster pump station are provided in Table 1-22. Refer to Sections 2.2.3.8 and 2.4.11 for operating scenarios and maintenance activities.

Table 1-21. Treated Water Reservoir Design Criteria

Description	Units	Design (Ultimate Flow)
Type	-	Cast-in-place Reinforced Concrete
Tanks	No.	1 (1 + 0)
Usable Volume	gal	2,340,000
Hydraulic Residence Time	hours	4.6 hours at 8,397 gpm

Table 1-22. Booster Pump Station Design Criteria

Description	Units	Design (Ultimate Flow)
Pumps	-	4 (3 + 1)
Rated Capacity, each	gpm	1,200
Rated Head	ft of water	290
Motor Size	hp	125
Drive	Type	VFD
Type of Surge Tanks	-	Hydropneumatic Bladder-Type, Vertical on Legs
Tanks	No.	1
Tank Volume	gal	2,500
Tank Diameter	ft	8
Rated Design Pressure	psig	215

psig = pounds per square inch gauge

1.4.1.11 Vapor Phase GAC (VGAC)

The VGAC system treats airflow from the reservoir aeration system and decarbonators. The VGAC permit is included in Appendix C of the Step 4 report. Design criteria for the VGAC system are provided in Table 1-23.

Table 1-23. VGAC Design Criteria

Description	Units	Design (Ultimate Flow)
Media Type	Type	Coal
Media Effective Size	mm	4
Number of Contactors	No.	3
Vessel Diameter	ft	12
Number of GAC Media Beds per Contactor	No.	2
GAC Media Depth per Bed	ft	3
GAC Media Volume per Contactor	CF	679
Airflow from Reservoir	SCFM	0
Airflow from Decarbonators	SCFM	27,000
Total Airflow	SCFM	27,000
Number of Heaters per Contactor	No.	1
Total Number of Heaters	No.	3

CF = cubic feet

SCFM = standard cubic feet per minute

1.4.1.12 Chemical Systems

The following chemical dosing systems are used at the Olympic AWTF and Arcadia WTP expansion. Chemical strength concentration percentages are noted as weight per weight. Average and maximum doses are based on expected influent concentrations or expected effluent concentrations as described in the Step 4 Report *Effective Treatment and Monitoring*. All chemicals are NSF 60 certified.

Sodium Hypochlorite

Two pairs of metering pumps (1 + 1 shared standby for each location) add sodium hypochlorite (12.5 percent is purchased, 11.5 percent is used for tank and pump sizing) to raw water contact tank influent and non-Olympic greensand filter influent. Three pairs of metering pumps (1 + 1 for each location) add sodium hypochlorite to Olympic greensand filter influent to enhance iron and manganese removal, downstream of GAC to form chloramine prior to RO treatment if only the Olympic Well Field is running (Charnock/Arcadia flow uses residual chlorine from the greensand process), and downstream of the decarbonator effluent tank for disinfection residual. Design criteria for the sodium hypochlorite system are provided in Table 1-24.

Table 1-24. Sodium Hypochlorite (12.5 percent) Design Criteria

Description	Units	Design (Ultimate Flow)
Tanks	No.	2
Total Storage Capacity	gal	11,200
Days of Storage @ Average Dose	days	21
Days of Storage @ Maximum Dose	days	14
Influent to Contact Tank (Charnock + Arcadia Flows)		
Minimum Dose	mg/L	0.5
	mg/L as Cl_2	0.5
Average Dose	mg/L	2.1
	mg/L as Cl_2	2.0
Maximum Dose	mg/L	2.6
	mg/L as Cl_2	2.5
Metering Pumps	No.	2 (1 + 1 Shared Standby)
Minimum Pumping Capacity Required	gph	0.2
Maximum Pumping Capacity Required	gph	10.2
Maximum Injection Pressure	psi	40
Post Contact Tank after Filter Feed Pumps		
Minimum Dose	mg/L	0.5
	mg/L as Cl_2	0.5
Average Dose	mg/L	2.1
	mg/L as Cl_2	1.0
Maximum Dose	mg/L	2.6
	mg/L as Cl_2	2.5
Metering Pumps	No.	2 (1 + 1 Shared Standby)
Minimum Pumping Capacity Required	gph	0.2
Maximum Pumping Capacity Required	gph	12.2
Maximum Injection Pressure	psi	40
Olympic Wells – Upstream of Greensand Filters		
Minimum Dose	mg/L	0.5
	mg/L as Cl_2	0.5
Average Dose	mg/L	2.1
	mg/L as Cl_2	2.0
Maximum Dose	mg/L	2.6
	mg/L as Cl_2	2.5
Metering Pumps	No.	2 (1 + 1)
Minimum Pumping Capacity Required	gph	0.2
Maximum Pumping Capacity Required	gph	2.9
Maximum Injection Pressure	psi	60
Olympic Wells – Downstream of GAC Contactors		
Minimum Dose	mg/L	0.5
	mg/L as Cl_2	0.5

Table 1-24. Sodium Hypochlorite (12.5 percent) Design Criteria

Description	Units	Design (Ultimate Flow)
Average Dose	mg/L	1.0
	mg/L as Cl_2	1.0
Maximum Dose	mg/L	2.6
	mg/L as Cl_2	2.5
Metering Pumps	No.	2 (1 + 1)
Minimum Pumping Capacity Required	gph	0.2
Maximum Pumping Capacity Required	gph	2.9
Maximum Injection Pressure	psi	20
Treated Water		
Minimum Dose	mg/L	1.0
	mg/L as Cl_2	1.0
Average Dose	mg/L	1.8
	mg/L as Cl_2	1.7
Maximum Dose	mg/L	2.6
	mg/L as Cl_2	2.5
Metering Pumps	No.	2 (1 + 1)
Minimum Pumping Capacity Required	gph	0.6
Maximum Pumping Capacity Required	gph	12.1
Maximum Injection Pressure	psi	10

gph = gallons per hour

Ammonium Sulfate

Three pairs of metering pumps (1 + 1 for each location) add ammonium sulfate (40 percent) to non-Olympic greensand effluent, GAC effluent, and decarbonator effluent. Ammonium sulfate is added along with sodium hypochlorite to form chloramines to control RO biofouling and for disinfection. Design criteria for the ammonium sulfate system are provided in Table 1-25.

Table 1-25. Ammonium Sulfate (40 percent) Design Criteria

Description	Units	Design (Ultimate Flow)
Tanks	No.	1
Total Storage Capacity	gal	6,800
Days of Storage @ Average Dose	days	60
Days of Storage @ Max Dose	days	42
RO Feed (Non-Olympic Greensand Filtrate)		
Minimum Dose	mg/L	0.8
	mg/L as N	0.2
Average Dose	mg/L	3.1
	mg/L as N	0.7
Maximum Dose	mg/L	3.9
	mg/L as N	0.8
Metering Pumps	No.	2 (1 + 1)

Table 1-25. Ammonium Sulfate (40 percent) Design Criteria

Description	Units	Design (Ultimate Flow)
Minimum Pumping Capacity Required	gph	0.1
Maximum Pumping Capacity Required	gph	4.1
Maximum Injection Pressure	psi	10
GAC Effluent		
Minimum Dose	mg/L	0.8
	mg/L as N	0.2
Average Dose	mg/L	1.6
	mg/L as N	0.3
Maximum Dose	mg/L	3.9
	mg/L as N	0.8
Metering Pumps	No.	2 (1 +1)
Minimum Pumping Capacity Required	gph	0.1
Maximum Pumping Capacity Required	gph	1.2
Maximum Injection Pressure	psi	20
Treated Water		
Minimum Dose	mg/L	0.9
	mg/L as N	0.2
Average Dose	mg/L	1.6
	mg/L as N	0.3
Maximum Dose	mg/L	2.4
	mg/L as N	0.5
Metering Pumps	No.	2 (1 +1)
Minimum Pumping Capacity Required	gph	0.2
Maximum Pumping Capacity Required	gph	2.9
Maximum Injection Pressure	psi	10

Sulfuric Acid

Two metering pumps (1 + 1) will add sulfuric acid (93 percent) to UV/H_2O_2 influent. Two pairs of metering pumps (1 + 1 shared standby for each location) will add sulfuric acid (93 percent) to RO influent and RO CIP. Sulfuric acid is added to maintain pH in the RO feed at 6.7 to minimize scaling on the RO membranes, to create low pH RO cleaning solutions, and to neutralize spent RO CIP waste prior to sewer disposal. It may also be used to enhance UV/H_2O_2 treatment efficiency. Design criteria for the sulfuric acid system is provided in Table 1-26.

Table 1-26. Sulfuric Acid (93 percent) Design Criteria

Description	Units	Design (Ultimate Flow)
Tanks	No.	2
Total Storage Capacity	gal	17,800
Days of Storage @ Average Dose	days	21
Days of Storage @ Max Dose	days	15
UV Feed		
Minimum Dose	mg/L	50.0
Average Dose	mg/L	70.0
Maximum Dose	mg/L	90.0
Metering Pumps	No.	2 (1 + 1)
Minimum Pumping Capacity Required	gph	1.4
Maximum Pumping Capacity Required	gph	7.6
Maximum Injection Pressure	psi	50
RO Feed		
Minimum Dose	mg/L	20.0
Average Dose	mg/L	145.0
Maximum Dose	mg/L	205.0
Metering Pumps	No.	2 (1 + 1 Shared Standby)
Minimum Pumping Capacity Required	gph	1.0
Maximum Pumping Capacity Required	gph	60.5
Maximum Injection Pressure	psi	40
RO CIP (pH Adjustment)		
Metering Pumps	No.	2 (1 + 1 Shared Standby)
Maximum Pumping Capacity Required	gph	50.6
Maximum Injection Pressure	psi	40

Hydrogen Peroxide

Two metering pumps (1 + 1) add hydrogen peroxide (50 percent) to UV/H_2O_2 AOP influent. Hydrogen peroxide is the oxidant for the UV/AOP treatment process. Design criteria for the hydrogen peroxide system are provided in Table 1-27.

Table 1-27. Hydrogen Peroxide (50 percent) Design Criteria

Description	Units	Design (Ultimate Flow)
Tanks	No.	1
Total Storage Capacity	gal	4,800
Days of Storage @ Average Dose	days	25
Days of Storage @ Max Dose	days	25
UV AOP		
Average Dose – Ultimate Flow	mg/L	40.0
Maximum Dose – Ultimate Flow	mg/L	40.0
Metering Pumps	No.	2 (1 +1)
Minimum Pumping Capacity Required	gph	1.2
Maximum Pumping Capacity Required	gph	9.6
Maximum Injection Pressure	psi	50

Antiscalant

Two metering pumps (1 + 1) add antiscalant (Avista Vitec 4,000 or AWC A-119) to cartridge filter effluent to reduce inorganic scaling on the membrane surface. Design criteria for the antiscalant system are provided in Table 1-28.

Table 1-28. Antiscalant (Avista Vitec 4,000 or AWC A-119) Design Criteria

Description	Units	Design (Ultimate Flow)
Tanks	No.	1
Total Storage Capacity	gal	2,200
Days of Storage @ Average Dose	days	97
Days of Storage @ Max Dose	days	53
RO Feed		
Minimum Dose	mg/L	0.4
Average Dose	mg/L	2.8
Maximum Dose	mg/L	5.0
Metering Pumps	No.	2 (1 + 1)
Minimum Pumping Capacity Required	gph	0.02
Maximum Pumping Capacity Required	gph	2.0
Maximum Injection Pressure	psi	50

Hydrofluorosilicic Acid

Two metering pumps (1 + 1) add hydrofluorosilicic acid (23 percent) downstream of the decarbonator effluent tank. The hydrofluorosilicic acid system replaces the previous sodium fluoride metering pumps and powder/saturator system. Hydrofluorosilicic acid is added to treated water to comply with California drinking water regulations for fluoridation. Design criteria for the hydrofluorosilicic acid system are provided in Table 1-29.

Table 1-29. Hydrofluorosilicic Acid (23 percent) Design Criteria

Description	Units	Design (Ultimate Flow)
Bulk Tanks	No.	1
Day Tanks	No.	1
Total Bulk Storage Capacity	gal	750
Total Day Tank Storage Capacity	gal	50
Days of Storage @ Average Dose	days	20
Days of Storage @ Max Dose	days	11
Treated Water		
Minimum Dose	mg/L	0.6
Average Dose	mg/L	0.9
Maximum Dose	mg/L	1.5
Metering Pumps	No.	2 (1 + 1)
Minimum Pumping Capacity Required	gph	0.2
Maximum Pumping Capacity Required	gph	2.7
Maximum Injection Pressure	psi	20

Sodium Hydroxide

Sodium hydroxide (caustic soda) will be delivered to the site as a 50 percent solution and stored in heat traced and insulated bulk storage tanks. The 50 percent sodium hydroxide will be diluted on-site to 25 percent sodium hydroxide. Three metering pumps (2 + 1) will add sodium hydroxide (25 percent) downstream of the decarbonator effluent tank to achieve a pH between 8.0 to 8.5 to match the MWD water quality and minimize corrosion. It is also used to create RO cleaning solutions and neutralize spent RO CIP waste prior to sewer disposal. Design criteria for the sodium hydroxide system is provided in Table 1-30.

Table 1-30. Sodium Hydroxide (25 percent) Design Criteria

Description	Units	Design (Ultimate Flow)
Tanks	No.	2
Total Storage Capacity	gal	13,500
Days of Storage @ Average Dose	days	68
Days of Storage @ Max Dose	days	50
Treated Water		
Minimum Dose	mg/L	5.0
Average Dose	mg/L	12.5
Maximum Dose	mg/L	17.0
Metering Pumps	No.	3 (2 + 1)
Minimum Pumping Capacity Required	gph	1.3
Maximum Pumping Capacity Required	gph	32.1
Maximum Injection Pressure	psi	10

1.5 Controls/SCADA Overview

As part of this project, the overall system controls integration is updated for greater process automation, enhanced system safety and interlocks, and integration of new treatment processes. Some major treatment processes are controlled by individual PLCs that communicate with the Arcadia WTP SCADA system. The individual PLCs allow for either manual or automatic (auto) modes of operation. The SCADA system sends permissive signals that allow different operating modes to be initiated for each treatment process. The Arcadia WTP recently installed an Ignition HMI platform using Perspective by Inductive Automation for SCADA monitoring and control.

The primary logic controller platform in use at the Olympic AWTF and Arcadia WTP is Rockwell Automation/Allen Bradley. ControlLogix and CompactLogix are the primary controllers for the existing plant processes. These controllers are programmed using RSLogicx5000 programming software. PLC communication in the plant between PLC and RIO panels is via ControlNet. There is also an Ethernet network used within the plant that connects internal Arcadia PLCs, Arcadia HMIs, SCADA workstations, printers, vendor-packaged PLC systems, and vendor-packaged HMI systems. This ethernet network uses copper cable (CAT-5) within the plant. Fiber optic cables connect major process areas within the plant.

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Section 2

System Operating Procedures

2.1 Normal Pre-Startup Procedures

Setpoints shall be confirmed, and any alarm(s) shall be acknowledged and cleared. Any equipment, instruments, valves, or appurtenances will be inspected and/or tested as recommended by manufacturers. Normal pre-startup procedures for the Charnock WTP, Olympic Wells, Olympic AWTF, and Arcadia WTP expansion are as follows:

- Check there are no active lockout/tagout (LOTO) on system(s) to start.
- Check with shift supervisor that system(s) will be placed into service.
- Ensure proper personal protective equipment (PPE) for activity (e.g., chemical systems may require specific PPE)
- If necessary, energize equipment from local disconnect switch and/or MCC area. Call electrical support as necessary.
- Check chemical tank level, as necessary.
- Walk the piping and process area to double check system is ready and all manual valves are in proper position.
- Identify manual valves as applicable.
- Confirm all powered valves are powered and in the Remote-Ready Position.
- Confirm all equipment and local control panels are powered and in the Remote Position.
- Confirm there are no alarms on the local control panels that require acknowledgement.
- From SCADA, verify that there are no alarms associated with equipment to be started.
- From SCADA, verify that all equipment to start is available and can be placed into remote-auto.
- From SCADA, confirm telemetry (signal output) from applicable instrumentation (levels, flow, pressure, etc.)
- Confirm whether there are any other prechecks per site or specific equipment requirements needed prior to startup.
- Proceed to startup

2.2 Normal Startup and Normal Operation

Descriptions of design features, instruments, PLCs (e.g., alarms and safety interlocks), and manual controls are provided for startup and normal operation of each treatment system. Control descriptions will be refined during construction when meetings with the integrator start.

2.2.1 Charnock WTP

Normal startup and normal operation of the Charnock WTP can be found in Sections 4 and 5 of the *Charnock Wellfield Restoration Project Operations Plan – Charnock* (Black and Veatch, 2009).

2.2.2 Olympic Wells

There are three production wells (SM-4, SM-8, and SM-9) in operation at the Olympic Well Field and will pump raw groundwater to the new Olympic AWTF. Minimum flow to the Olympic AWTF is 1,000 gpm and maximum flow is 2,000 gpm. A minimum of two wells are typically in operation at any given time, with all three in operation during maximum flows.

Downhole chlorination with sodium hypochlorite will control microbial activity in the wells and oxidize iron and manganese. Metering pumps and bulk storage tanks are provided at each well site.

2.2.2.1 Controls/SCADA Overview

A flow meter is provided for each well pump to monitor the flow for the respective well. The SM-8 and SM-9 well pumps are equipped with VFDs that communicate with wellhead PLCs. SM-4 well pump is continuous speed and communicates directly with the wellhead PLC. The VFD will adjust one of the in-service Olympic well pump's speed to maintain the setpoint for the Olympic Well Field flow rate. The other in-service Olympic well pump(s) will operate at a constant speed. The wellhead PLCs communicate with SCADA over an existing telephone line. The VFDs are equipped with soft starter bypasses. The pumps can operate in either local manual, remote manual, or remote auto modes. In local manual mode, the pump speed can be adjusted using controls on the VFD. In remote manual mode, the HMI can be used to turn the pump on or off and control speed. In remote auto mode, the pumps are controlled by the SCADA system to meet the City's diurnal water demands.

2.2.2.2 Startup

The well pumps are turned on and placed into remote auto mode. A control interlock prevents the well pumps from operating if the ready-to-receive-feed-water signal from the Olympic greensand filter system is not provided. The SCADA system brings the required number of pumps online through the wellhead PLCs. The wellhead PLC receives data, such as pump flow rate, discharge pressure, local off remote switch status, pump VFD status, and waste valve position, then display these data on the local HMI screen and send them to the SCADA system. The discharge piping for the Olympic Wells at the treatment plant is plumbed to allow for blowdown into the washwater EQ tank and disposal to sewer to reduce particle loading to the greensand filters. Raw water from the wells will be blown down until a turbidity permissive is met, i.e., 0.5 nephelometric turbidity units (NTU). If the turbidity permissive is exceeded, a system alarm will be triggered. The well pumps continue to operate unless a high-high setpoint is exceeded over a timer duration (operator adjustable).

2.2.2.3 Normal Operation

The well pumps operate in remote auto mode. The number of pumps online and pump speeds depend on the City's diurnal water demands. During VFD operation, the discharge valve will be either fully open or fully closed and the discharge pressure setpoint (operator adjustable) is 20 psig. During soft starter operation, the discharge valve is operated as a pressure-reducing valve because the pump discharge pressure at maximum pump speed would otherwise exceed the maximum allowed pressure at the Arcadia WTP.

2.2.2.4 Alarms

The following alarms (with operator-adjustable setpoints) are provided through the wellhead PLC:

- Well water level reaches high level
- Well water level reaches low level
- Well pump discharge pressure reaches high
- Well pump discharge pressure reaches low
- Well pump discharge flow rate reaches high
- Well pump discharge flow rate reaches low
- Well pump waste flow rate reaches high
- Well pump waste flowrate reaches low

2.2.2.5 Safety Interlocks

The following permissive conditions are required for Olympic Well operation:

- Well water level is not at high-high level or low-low level over a timer duration (operator adjustable)
- Well pump discharge pressure is not at high-high or low-low over a timer duration (operator adjustable)
- Well pump discharge flow rate is not at high-high or low-low over a timer duration (operator adjustable)
- Well pump waste flow rate is not at high-high or low-low over a timer duration (operator adjustable)

2.2.3 Olympic AWTF and Arcadia WTP Expansion

Figure 2-1 provides a logic diagram showing the normal startup and operation sequence for the Olympic AWTF and Arcadia WTP expansion. **The system control logic is preliminary and will be refined as operations controls are progressed.** The following sections summarize operating scenarios for each process, listed in order relative to the system control logic. The order of process operations presented follows the logic of the flow diagram.

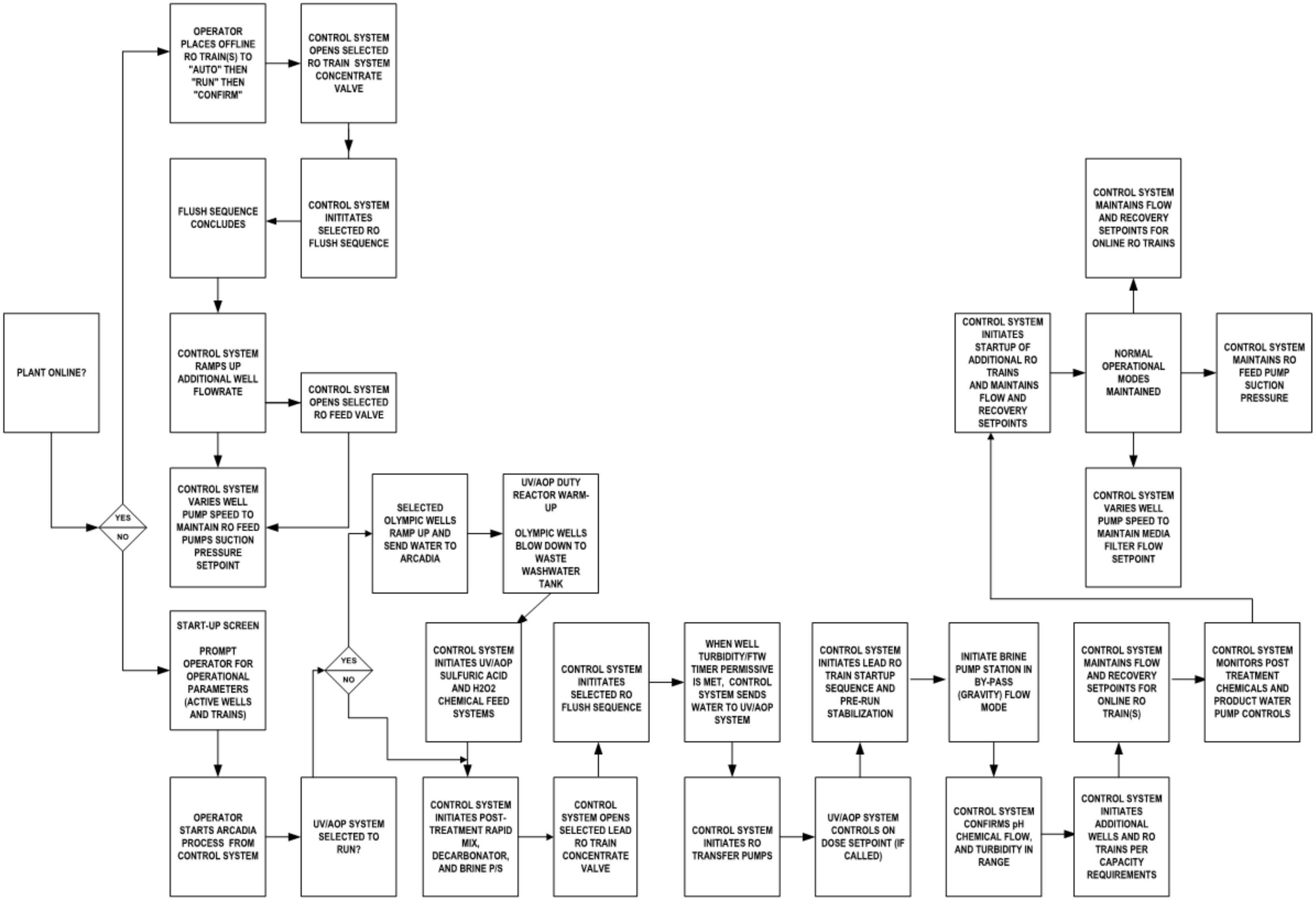

Figure 2-1. Normal startup and operation sequence

2.2.3.1 RO Feed Tank, Low-Pressure RO Feed Pumps, Cartridge Filters, and RO Trains

One RO feed tank (ROF-TNK-1001) and four low-pressure RO feed pumps (ROF-PVE-1101, ROF-PVE-1201, ROF-PVE-1301, ROF-PVE-1401) will feed water to the RO bypass valve (ROF-VBF-1002) and five cartridge filters (RO-FLC-1101, RO-FLC-2101, RO-FLC-3101, RO-FLC-4101, RO-FLC-5101).

There are four RO trains, each containing one high-pressure RO feed pump (RO-PVE-1101, RO-PVE-2101, RO-PVE-3101, RO-PVE-4101) and two interstage booster pumps (RO-PVE-1102, RO-PVE-1103, RO-PVE-2102, RO-PVE-2103, ROVE-P-3102, RO-PVE-3103, RO-PVE-4102, RO-PVE-4103).

Controls/SCADA Overview

A level indicator (ROF-LIT-1001), high-high level switch (ROF-LSHH-1001), and low-low level switch (ROF-LSLL-1001) are provided for the RO feed tank. A combined free ammonia and monochloramine residual analyzer (ROF-AIT-1016) and combined free chlorine and total chlorine analyzer (ROF-AIT-1103) are provided for the RO feed tank effluent. The low-pressure RO feed pumps are equipped with VFDs (ROF-AFD-1101, ROF-AFD-1201, ROF-AFD-1301, ROF-AFD-1401) that communicate with SCADA over ethernet. The combined pump discharge header is equipped with a high-pressure switch (ROF-PSH-1001). The pumps can operate in either local manual, remote manual, or remote auto modes. In local manual mode, the pump speed can be adjusted using controls on the VFD. In remote manual mode, the HMI can be used to turn the pump on or off and control speed. In remote auto mode, the pumps are controlled by a proportional integral controller with the setpoint being the high-pressure RO feed pump suction pressure (RO-PIT-1001). The suction pressure initial value is 30 to 35 psi and is operator adjustable.

The plant PLC (PLC-1) allows for either local manual, remote manual, and remote auto modes for the RO bypass valve. In local manual mode, RO bypass flow is controlled by manually overriding the valve positioner. In remote manual mode, the HMI is used to select the valve position. In remote auto mode, the RO bypass valve can be controlled through its proportional-integral-derivative (PID) controller in two different modes.

- If Directly Flow Splitting Control Mode is selected, the Operator can enter a percent of bypass flow based on the combined RO feed flow. The RO bypass valve PID controller is controlled by a feedback signal from the RO bypass flow meter (ROF-FIT-1003).
- If Finished Water Hardness Control Mode is selected, the bypass flow is automatically adjusted using three preset conditions. Table 2-1 illustrates an example of the preset conditions for Finished Water Hardness Control Mode. Depending on the percent difference between the actual finished water hardness (measured by the conductivity analyzer on the decarbonator effluent) and setpoint, the bypass valve will be adjusted by varying degrees for different durations. The percent bypass should not be allowed to exceed the design value (24%); which may be refined at startup. The ratio of hardness to conductivity can be adjusted through the HMI.

Table 2-1. Finished Water Hardness Control Mode

Description	Condition 1	Condition 2	Condition 3
Finished Water Hardness Variance	< or > 50%	< or > 25%	< or > 5%
Bypass Flow Volume Adjustment	10%	5%	1%
Adjustment Duration	2 min	5 min	10 min

The cartridge filters are operated in manual mode only and require an operator to exercise inlet and outlet valves. The cartridge filters are equipped with instruments to monitor and indicate inlet pressure (ROF-PIT-1101), differential pressure (ROF-PDIT-1001), inlet turbidity (ROF-AIT-1015), outlet oxidation-reduction potential (ORP) (ROF-AIT-1102), outlet total chlorine (ROF-AIT-1103), outlet pH and temperature (ROF-AIT-1104), outlet conductivity (ROF-AIT-1105), outlet turbidity (ROF-AIT-1106), and outlet pH (ROF-AIT-1107). All instruments send signals to the SCADA system, which communicates with the RO PLC. The RO PLC controls the feed-water-to-waste valve (DRN-VBF-1002) that is located downstream of the cartridge filters for off-spec conditions. Off spec conditions are defined by the alarm setpoints for cartridge filter outlet turbidity, pH, ORP, conductivity, total chlorine, and temperature listed in this section.

A flow meter (ROR-FIT-1104, ROR-FIT-2104, ROR-FIT-3104, ROR-FIT-4104), conductivity and pH analyzer (ROR-AIT-1109, ROR-AIT-2109, ROR-AIT-3109, ROR-AIT-4109), and pressure transmitter (ROR-PIT-1107, ROR-PIT-2107, ROR-PIT-3107, ROR-PIT-4107) are provided on the brine header for each RO train. A flow meter (ROP-FIT-1100, ROP-FIT-2100, ROP-FIT-3100, ROP-FIT-4100), conductivity analyzer (ROP-AIT-1102, ROP-AIT-2102, ROP-AIT-3102, ROP-AIT-4102), and pressure transmitter (ROP-PIT-1102, ROP-PIT-2102, ROP-PIT-3102, ROP-PIT-4102) are provided on the permeate header for each RO train.

A ready-to-receive-feed-water signal is maintained from the RO PLC to the SCADA system if the RO trains are ready to receive feed water. The SCADA system will bring online the required number of low-pressure RO feed pumps and RO trains. The RO PLC will rotate trains to allow equal operating time of each train to prevent degradation of membranes and moving parts. Valves on the feed and permeate lines are periodically actuated by the RO PLC to reverse the flow direction based on a preset timer or operator selection. When a train is taken offline, the plant PLC will automatically initiate the RO flush system. The plant PLC allows for either remote manual or remote auto modes for the RO CIP system valves.

Startup

The entire RO system is turned on and placed into remote auto mode. After a call to run, the selected RO trains undergo an initial flush sequence prior to operation. The SCADA system brings the required number of low-pressure RO feed pumps online through the VFDs. Flow is equally distributed to all online cartridge filters and RO trains.

Normal Operation

The RO system operates in remote auto mode with the flow split evenly between the online equipment. The plant PLC varies the low-pressure RO feed pump speed(s) to maintain the high-pressure RO feed pump suction pressure setpoint. The RO PLC varies the high-pressure RO feed pump speed(s) to maintain the RO permeate production setpoint. All available cartridge filters are used irrespective of the number of RO trains operating to prevent water stagnation and biological growth within the cartridge filters. **Control strategy for vessel rotation, valve actuation, and interstage pump controls will be refined as operations controls are progressed.**

The RO flush system is automatically initiated by the plant PLC whenever an RO train is called to stop or after a CIP sequence is performed. The RO CIP system is initiated in a semi-automated mode by operators if the normalized permeate flow, normalized differential pressure, or normalized salt passage exceed preset tolerances. The RO PLC opens the RO feed-water-to-waste valve when water quality requirements are not met. The Plant PLC will operate the lead low pressure RO feed pump at minimum speed during wasting. Wasting duration is operator adjustable.

The plant PLC will automatically start a standby low-pressure RO feed pump to replace a failed duty pump. The RO PLC will automatically start a standby high-pressure RO feed pump or RO train to replace a failed duty pump or train.

Alarms NOTE: Highlighted values to be finalized for final OMMP. Typical for all sections.

The following alarms (with operator adjustable setpoints) are provided through the plant PLC:

- RO feed tank level reaches high-high level (ROF-LSHH-1001 = 11.5 ft)
- RO feed tank level is greater than high-high level (ROF LSHH-1001 > 11.5 ft)
- RO feed tank level reaches low-low level (ROF-LSLL-1001 = 4.5 ft)
- RO feed tank is lower than low-low level (ROF-LSLL-1001 < 4.5 ft)
- RO feed tank effluent free chlorine residual is greater than zero (ROF-AIT-1002 > 0 mg/L)
- RO feed tank effluent free ammonia residual is high (ROF-AIT-1016 > 1 mg/L)
- RO feed tank effluent monochloramine residual is high (ROF-AIT-1016 > 3 mg/L)
- Low-pressure RO feed pump discharge pressure reaches high (ROF-PSH-1001 = 40 psig)
- Low-pressure RO feed pump VFD will alarm in the event of pump drive failure or shutdown
- Difference between the setpoint for RO bypass flow meter (ROF-FIT-1003) and the calculated percentage of bypass flow is greater than 5 percent over a timer duration (operator adjustable)
- RO bypass valve does not close within a timer duration (operator adjustable) after a command to close is initiated
- Cartridge filter inlet pressure is greater than 40 psig (ROF-PIT-1101 > 40 psig)
- Cartridge filter differential pressure is greater than 15 psi (ROF-PDIT-1001 > 15 psi)
- Cartridge filter inlet turbidity is greater than 0.5 NTU (ROF-AIT-1015 > 0.5 NTU)
- Cartridge filter outlet / RO inlet ORP is greater than 250 millivolts (mV) (ROF-AIT-1102 > 700 mV)
- Cartridge filter outlet / RO inlet total chlorine is greater than 0.1 mg/L (ROF-AIT-1103 total chlorine > 0.1 mg/L)
- Cartridge filter outlet / RO inlet pH is greater than 7 (ROF-AIT-1104 and ROF-AIT-1107 pH < 7)
- Cartridge filter outlet / RO inlet pH is less than 6 (ROF-AIT-1104 and ROF-AIT-1107 pH < 6)
- Cartridge filter outlet / RO inlet temperature is greater than 75 °F (ROF-AIT-1104 > 75 °F)
- Cartridge filter outlet / RO inlet conductivity is greater than 1,750 microsiemens per centimeter (µS/cm) (ROF-AIT-1105 > 1,750 µS/cm)
- Cartridge filter outlet / RO inlet turbidity is greater than 0.3 NTU (ROF-AIT-1106 > 0.3 NTU)
- CIP makeup tank level reaches low-low level (CIPS-LSLL-1111 = TBD ft)
- CIP makeup tank temperature reaches high (CIPS-TI-1101 = TBD °F)
- CIP pump discharge flow is low (CIPS-FIT-1011 < TBD gpm)
- CIP solution pH is low (CIPS-AIT-1001 < TBD)
- CIP solution pH is high (CIPS-AIT-1001 > TBD)
- CIP cartridge filter differential pressure reaches high (CIPS-PDSH-1001 = TBD psig)

The following major alarms (with operator adjustable setpoints) are provided through the RO PLC:

Note: This list is not inclusive of all alarms. Alarms for RO system will be refined as operations controls are progressed.

- High-pressure RO feed pump suction pressure reaches low (RO-PSL-1101 < 25 psig, RO-PSL-2101 < 25 psig, RO-PSL-3101 < 25 psig, RO-PSL-4101 < 25 psig)

- High-pressure RO feed pump VFD will alarm in the event of pump drive failure or shutdown
- Stage 2 interstage booster pump discharge pressure reaches high (RO-PSH-1104, RO-PSH-2104, RO-PSH-3104, RO-PSH-4104 > TBD psig)
- Stage 3 interstage booster pump discharge pressure reaches high (RO-PSH-1106, RO-PSH-2106, RO-PSH-3106, RO-PSH-4106 > TBD psig)
- RO permeate pressure reaches high (ROP-PIT-1102, ROP-PIT-2102, ROP-PIT-3102, ROP-PIT-4102 > TBD psig)
- RO reject pressure reaches high (ROR-PIT-1107, ROR-PIT-2107, ROR-PIT-3107, ROR-PIT-4107 > TBD psig)
- RO PLC will alarm in the event of RO train failure or shutdown
- RO PLC will alarm in the event of actuated pneumatic ball valve failure

Safety Interlocks

The following permissive conditions are required for low-pressure RO feed pump operation:

- No alarms or shutdown conditions
- No invalid setpoint selections
- RO feed tank water level is high enough for operation

The following permissive conditions are required for RO system operation:

- No alarms or shutdown conditions
- No invalid setpoint selections
- Permissive signals from the antiscalant system, sulfuric acid system, brine tank, brine pumps, and decarbonators
- Reservoir is ready to accept finished water

The following permissive conditions are required for flush sequence of a RO train:

- Brine tank is ready to accept RO reject
- No RO train flush sequence is active
- RO flush tank is above low water level

2.2.3.2 UV/H_2O_2

There are two UV/H_2O_2 trains (OXW-RUV-1110, OXW-RUV-2110), each containing one UV reactor.

Controls/SCADA Overview

The UV/H_2O_2 control system consists of a master control panel (i.e., system control center [SCC]), local control panels (LCP), power distribution centers (PDC) and hydraulic system centers (HSC).

- **System Control Center.** The SCADA system communicates with the SCC and is able to read and write status and control information for the UV/H_2O_2 system. The SCC includes the host Controller of the UV system, an operator interface (OIT), and related electrical components. The SCC communicates to the LCPs through Ethernet protocols. The SCC OIT allows users to interface with the UV system.
- **Local Control Panel.** Each UV train has one LCP for control and monitoring. The LCP controls one or more UV chambers within a train, as well as supervisory control and monitoring of associated HSC. The LCP OIT allows users to operate the UV train.
- **Power Distribution Center.** The PDC houses the lamp drivers. Each PDC contains an embedded controller that manages communications to the lamp drivers and the cabinet inputs and outputs.

The PDC performs the lamp driver communications and control, and PDC monitoring and protection.

- **Hydraulic System Center.** Each HSC contains a central controller for the hydraulic wiping operations. The HSC controls automatic and manual wiping operations, hydraulic parameter measurements, and hydraulic pump protection.
- **Hydrogen Peroxide Dosing.** The hydrogen peroxide dose is controlled through the SCC. Oxidant concentration is set by the hydrogen peroxide pump flow rate (each pump has a flowmeter) and chemical supply concentration (specific gravity is entered into the SCC). The pumps will have regular calibration checks and the bulk hydrogen peroxide concentration will also be periodically verified.

Startup

Once the system is turned on and the required flowrate is sent from SCADA, the SCC brings a UV reactor online; the SCC indicates when the startup and warmup stage is complete, and the system is ready for operation. Once the system is ready, the SCC controller provides the following functions:

- Communicates max flow capacity available to the SCADA system
- Brings the system into operation once the flow target setpoint is achieved (open UV reactor inlet and outlet valves (OXW-MOV-1101, OXW-MOV-1122, OXW-MOV-2101, OXW-MOV-2122), give permissive to start flow, cycle GAC valves to change from off-spec water diversion (to washwater EQ tank) to GAC system in operation)
- Communicates with the hydrogen peroxide dosing system and SCADA to regulate hydrogen peroxide pumping rate at specified dose setpoint

Normal Operation

During operation, the SCC will:

- Measure system process variables (UV transmittance at 254 nm [UVT] (OXW-AIT-1003, OXW-AIT-1004), flow rate (OXW-FIT-1001), lamp intensity (OXW-AIT-1111, OXW-AIT-2111), and lamp power)
- Verify adequate log removal
- Monitor and control the operating capacity of each reactor by bringing lamp sections on and offline, changing lamp power and/or changing hydrogen peroxide dose to maintain the required operating capacity
- Provide SCADA communications (e.g., tell SCADA to open or close valves, divert flow, turn wells on or off, etc.)

Operation of the UV/H_2O_2 system is fully automated with a variety of alarms to prevent under-treated water from exiting the UV system. The AOP system must operate at or above a DDW-approved UV dose, hydrogen peroxide dose, and UVT. UV dose, hydrogen peroxide dose, and UVT is monitored continuously, and all alarms and compliance values are based on a 15-minute running average. The SCC provides safety interlocks that will shut down the system if electrical, mechanical, or hydraulic parameters are out of the preset operating range. Major alarm conditions shut down the UV/H_2O_2 system, while less-critical alarms notify operators via the SCADA system that the UV process requires attention.

Off-spec water resulting from any or a combination of factors listed above results in diversion of UV/H_2O_2 effluent to the washwater EQ tank through the cycling of GAC system valves. Upon restart, flow continues to be diverted until the residence time of UV/H_2O_2 effluent within effluent piping and the GAC system has been exceeded, allowing all off-spec water to be flushed out of the treatment system.

If flow is not registered in a train that has a request to open signal, a low-flow alarm is initiated. The SCC will de-energize the valve open request and close both the inlet and outlet valves if at any time during operation the following alarm conditions occur:

- A train becomes unhealthy and is ready to shut off
- A train becomes unhealthy and needs to immediately shut off due to imminent shutdown (e.g., high chamber temperature, low water level)
- The SCC has rotated train priority and is ready to shut off the train
- A flow target set point value of zero is specified from SCADA

The SCC monitors the operating capacity of each UV train so that the actual flow of the operating train does not exceed the operating capacity without the appropriate response (e.g., alarms, additional sections or reactor brought into service, diversion).

- In the event of a power failure at the SCC, the LCP controllers and SCADA will generate communications failures with the SCC. The wells are stopped, UV influent pumps stop, and hydrogen peroxide injection is halted.
- In the event of a communications failure between the SCC and SCADA, the operation of the system is based solely on the actual flow rate being received and the default UVT (operator-programmed setpoint). Therefore, if the system is operating and the flow rate drops to zero, the system will shut down, and the valves are closed.
- In event of a power failure at the LCP, the SCC will detect a communication failure with the affected LCP controller. The UV train is deemed unhealthy. The system diverts flow while a replacement UV train is brought into operation (if available); appropriate valves are closed).
- In the event of a communications failure between the SCC and LCP controllers, the operation of the affected UV train is based on the actual flow. If a UV train is operating and the flow drops to zero, the UV train is taken out of operation and the UV reactor is de-energized. If the UV train is not in operation and there is flow, the train is brought into operation using the number of UV reactor sections required for actual flow.

Alarms

The following major alarms are provided through the UV/H_2O_2 PLC. A complete list of UV/H_2O_2 AOP system alarms including setpoints is provided in Attachment C.1.

- UV/H_2O_2 inlet flow is less than the minimum flow
- UV/H_2O_2 inlet flow is greater than the operating capacity
- Log removal is below the required value(s)
- UVT is less than the permitted value
- UV reactor temperature reached high
- UV reactor water level reached low level
- Hydrogen peroxide tank reaches low level
- Hydrogen peroxide pump failure

Safety Interlocks

The following permissive conditions are required for Olympic well flow and UV/H_2O_2 system operation:

- No major alarms or shutdown conditions
- No invalid setpoint selections
- Permissive signal from the hydrogen peroxide system
- UV/H_2O_2 system warmup complete

2.2.3.3 GAC

There is a total of eight GAC contactors (GAC-RC-1100, GAC-RC-1200, GAC-RC-2100, GAC-RC-2200, GAC-RC-3100, GAC-RC-3200, GAC-RC-4100, GAC-RC-4200). GAC Train 1 is comprised of GAC-RC-1100 and GAC-RC-1200, GAC Train 2 is comprised of GAC-RC-2100 and GAC-RC-2200, GAC Train 3 is comprised of GAC-RC-3100 and GAC-RC-3200, and GAC Train 4 is comprised of GAC-RC-4100 and GAC-RC-4200.

Controls/SCADA Overview

A ready-to-receive-feed-water signal is maintained from the GAC PLC (PLC-7) to the SCADA system if the GAC contactors are ready to receive feed water from the UV system. The GAC PLC allows for either manual or auto modes of operation. In manual mode, the GAC PLC isolates the GAC train by closing all valves; the operator can manually open and close any of the valves. The GAC contactors normally operate in auto mode, where the corresponding modes are auto online, auto offline, and auto backwash. The GAC PLC automatically opens, closes, and modulates the filter cell valves during remote auto mode.

A combined free chlorine and total chlorine analyzer (ROF-AIT-1013) is provided for the GAC effluent downstream of ammonium sulfate addition, to ensure that there is no chlorine residual in the GAC effluent.

Startup

Once the GAC system is ready for operation, the GAC PLC will:

- Allow for manual or automatic operation modes
- Communicate with the plant SCADA system to receive feed water
- Modulate control valves located downstream of each vessel pair to control the filtration rate and thus balance headloss across the GAC contactor pairs
- Monitor headloss across each vessel
- Trigger a backwash cycle when GAC contactor run time or head loss reaches a setpoint or allow for manual initiation of a backwash cycle

Normal Operation

The GAC contactors operate in remote auto mode. The backwash sequence is automatically initiated based on runtime, a differential pressure design setpoint (GAC-PDIT-1103, GAC-PDIT-1203, GAC-PDIT-2103, GAC-PDIT-2203, GAC-PDIT-3103, GAC-PDIT-3203, GAC-PDIT-4103, GAC-PDIT-4203), or by operator selection. The design assumes one GAC contactor will require backwash each month; however, given the low level of solids, backwashes may only occur during media replacement. The backwash system also allows for low flow rate “bumps” to reduce compaction of the media and remove entrained air from the bed. It is projected that each GAC contactor will require a bump every two weeks.

The GAC contactors share the same backwash system as the greensand filters. Only one backwash is allowed at a time for a greensand filter cell or GAC contactor.

If all GAC trains are not already in service, the GAC PLC automatically starts a standby GAC train to replace a duty train that must be taken offline. If power failure is local to a GAC train, a replacement GAC train is brought online.

Alarms

The following alarms (with operator adjustable setpoints) are provided through the GAC PLC:

- Differential pressure is greater than alarm setpoint (GAC-PDIT-1103, GAC-PDIT-1203, GAC-PDIT-2103, GAC-PDIT-2203, GAC-PDIT-3103, GAC-PDIT-3203, GAC-PDIT-4103, or GAC-PDIT-4203 >10 psi)
- Differential pressure reaches high setpoint (GAC-PDIT-1103, GAC-PDIT-1203, GAC-PDIT-2103, GAC-PDIT-2203, GAC-PDIT-3103, GAC-PDIT-3203, GAC-PDIT-4103, or GAC-PDIT-4203 = TBD)
- Flow exceeds design limit (GAC-FDIT-1020, GAC-FDIT-2020, GAC-FDIT-3020, or GAC-FDIT-4020 > 1500 gpm)
- GAC effluent free chlorine residual is greater than zero (ROF-AIT-1013 > 0 mg/L)

Safety Interlocks

The following permissive conditions are required for GAC system operation:

- No alarms or shutdown conditions
- No invalid setpoint selections
- UV/H_2O_2 is treating water
- UV/H_2O_2 volume timer expired for off-spec flow diversion

The following permissive conditions are required for a backwash sequence of a GAC train:

- No alarms or shutdown conditions
- No invalid setpoint selections
- No GAC system or greensand filter backwash sequence active
- Blow-off sequence for Olympic Wells startup is not active
- Washwater EQ tank is ready to accept backwash waste
- Backwash holding tank water level is above low-low level
- There is a permissive signal from backwash supply pumps

2.2.3.4 Brine Tank and Pump Station

There is one brine tank (ROR-TNK-1000), three brine pumps (ROR-PCL-1110, ROR-PCL-1210, ROR-PCL-1310), and one brine bypass valve (ROR-VBF-1005).

Controls/SCADA Overview

Two level indicators (ROR-LIT-1001, ROR-LIT-1002) are provided for the brine tank. The brine pumps are equipped with VFDs (ROR-AFD-1110, ROR-AFD-1210, ROR-AFD-1310) that communicate with SCADA over Ethernet. The pumps can operate in either local manual, remote manual, or remote auto modes. In local manual mode, the pump speed can be adjusted using controls on the VFD. In remote manual mode, the HMI can be used to turn the pump on or off and control speed. In local manual mode, the pump speed can be adjusted using controls on the VFD. In remote manual mode, the HMI can be used to turn the pump on or off and control speed. In remote auto mode, the pump speed is adjusted to maintain a brine tank level setpoint of 4 ft. The pumps begin operation when the brine tank level reaches 6 ft and stop when the level reaches 3 ft.

RO flush sequences are inhibited based on an operator-adjustable setpoint for the brine tank maximum level. If the brine tank level exceeds the setpoint over a timer duration (operator adjustable), then the RO flush sequence will be delayed until the brine tank level is within the setpoint range.

Startup

The brine pumps are turned on and placed into remote auto mode. The brine tank will send a permissive signal to the SCADA system. If the brine level is high enough for operation, the SCADA system will close the brine bypass valve and bring online the required number of pumps through the VFDs.

Normal Operation

The tank is equipped with a brine bypass valve that is normally open to drain the brine tank via gravity. When the tank level rises, SCADA closes the brine bypass valve and starts the brine pumps.

The brine pumps operate in remote auto mode. The number of pumps online depends on the tank level and discharge pressure, which is based on a preset value. The SCADA system automatically starts a standby brine pump to replace a failed duty pump, and alarm in the event of drive failure or shutdown. Pumps are also programmed to stop immediately and alarm in the event of a VFD fault or emergency stop. Pumps also shut down if the discharge pressure reaches 110 psi, to protect the downstream brine line.

Alarms

The following alarms (with operator adjustable setpoints) are provided through the plant PLC:

- Brine tank level is greater than high level (ROR-LIT-1002 > 6 ft)
- Brine pump discharge pressure greater than high (ROR-PIT-1020 > 110 psi)

Safety Interlocks

The following permissive conditions are required for brine pumps operation:

- No alarms or shutdown conditions
- No invalid setpoint selections
- Brine tank level is above low level
- Brine bypass valve is closed

2.2.3.5 Greensand Filters

There are a total of six greensand filters (PF-FLT-1001, PF-FLT-2001, PF-FLT-3001, PF-FLT-4001, PF-FLT-5001, PF-FLT-6001) in operation at the Arcadia WTP, each containing two cells. PF-FLT-1001 through PF-FLT-4001 treat flows from Charnock and Arcadia well fields, while filters PF-FLT-5001 and PF-FLT-6001 treat flows from Olympic Well Field.

Controls/SCADA Overview

A ready-to-receive-feed-water signal is maintained from the pressure filter PLC to the SCADA system if the greensand filters are ready to receive feed water. The pressure filter PLC allows for either remote manual or remote auto modes. In manual mode, the pressure filter PLC isolates the filter cell by closing all filter cell valves. The operator can manually open and close any of the filter cell valves through the pressure filter PLC. In remote auto mode, the pressure filter PLC automatically opens, closes, and modulates the filter cell valves depending on the operation mode. The modes are auto online, auto offline, or auto backwash. The pressure filter PLC and SCADA system communicate to determine the number of filter cells needed for any given flow and adjust the discharge pressure by modulating filter cell effluent valves.

A turbidity analyzer (RW-AIT-1001) and free chlorine residual analyzer (RW-AIT-1002) are provided for the non-Olympic greensand filter influent. A free chlorine residual analyzer (FLT-AIT-1001) is provided for the non-Olympic greensand filter effluent upstream of ammonium sulfate addition. A turbidity analyzer (RW-AIT-1101) is provided for the Olympic greensand filter influent. A free chlorine residual analyzer (FLT-AIT-1012) is provide for the Olympic greensand filter effluent.

The backwash sequence is able to be initiated based on a headloss setpoint, runtime setpoint, totalized volume of filtered water setpoint, or manually. The pressure filter PLC will send a backwash request to the SCADA system to initiate the sequence. Only one backwash is allowed at a time for a greensand filter cell or GAC contactor. The backwash sequence includes four steps: air scour, concurrent air-water wash, backwash only, and filter to waste.

When the backwash holding tank reaches the low-low level, the SCADA system opens the valve (FS-MOV-1006) on the new piping from the reservoir booster pump discharge header. To control velocities, the valve position will not exceed 25 percent open. Piping is sized to fill the backwash holding tank within 2 hours.

Startup

The non-Olympic greensand filter system is turned on and placed into remote auto mode. The contact basin sends a permissive signal to the SCADA system if the water level is high enough for operation. The SCADA system will bring the required number of feed pumps and filter cells online through the filter feed pump VFDs and pressure filter PLC. Flow is equally distributed to all online filter cells.

The Olympic greensand filter system is turned on and placed into remote auto mode. The SCADA system brings the required number of filter cells online through the pressure filter PLC, depending on the flow from Olympic Well Field. Flow is equally distributed to all online filter cells.

Normal Operation

All greensand filters operate in remote auto mode with flow split evenly between the online filter cells. Backwashing is manually initiated when the combined iron and manganese concentration in the filtrate reaches 0.05 mg/L. Backwashing can also be initiated by a headloss setpoint, run time setpoint, and totalized volume of filtered water setpoint.

The pressure filter PLC will automatically start a standby greensand filter to replace a failed duty greensand filter and alarm in the event of failure or shutdown.

Alarms

The following alarms (with operator-adjustable setpoints) are provided through the pressure filter PLC:

- Non-Olympic greensand filter inlet turbidity is greater than 0.5 NTU (RW-AIT-1001 > 0.5 NTU)
- Non-Olympic greensand filter inlet free chlorine is greater than 2.5 mg/L (RW-AIT-1002 > 2.5 mg/L)
- Olympic greensand filter inlet turbidity is greater than 0.5 NTU (RW-AIT-1101 > 0.5 NTU)
- Olympic greensand filter effluent free chlorine is greater than 1.0 mg/L (FLT-AIT-1012 > 1.0 mg/L)
- Required Arcadia plant production is greater than the available pressure filters’ capacity

Safety Interlocks

The following permissive conditions are required for non-Olympic greensand filter system operation:

- No alarms or shutdown conditions
- No invalid setpoint selections
- RO feed tank is ready to accept water

The following permissive conditions are required for Olympic greensand filter system operation:

- No alarms or shutdown conditions
- No invalid setpoint selections
- Permissive signals from UV/H_2O_2 AOP system, GAC system, and RO feed tank

The following permissive conditions are required for backwash sequence of a greensand filter (both Olympic and non-Olympic):

- No alarms or shutdown conditions
- No invalid setpoint selections
- No GAC system or greensand filter backwash sequence active
- Blow-off sequence for Olympic Wells startup is not active
- Cartridge filter feed-water-to-waste valve (DRN-VBF-1002) is not open
- Washwater EQ tank is ready to accept backwash waste (WW-LIT-1001 <2 ft)
- Backwash holding tank water level is not at low-low level (BW-LSLL-1001 >TBD ft)
- Permissive signal from backwash supply pumps

2.2.3.6 Decarbonators

There are three decarbonators (DC-DC-1101, DC-DC-1201, DC-DC-1301), three decarbonator blowers (DC-BLC-1101, DC-BLC-1201, DC-BLC-1301), and one decarbonator effluent tank (DC-TNK-1001).

Controls/SCADA Overview

A differential pressure indicator (DC-DPI-1102, DC-DPI-1202, DC-DPI-1302) is provided for each decarbonator to measure the headloss through the media bed. The blowers operate at constant speed and are dedicated to their respective decarbonator. The blowers can operate in either local manual, remote manual, or remote auto modes. In local manual mode, the blowers can be turned on or off through the blower control panel. In remote manual mode, the blowers can be turned on or off through the HMI. In remote auto mode, the blowers are automatically turned on or off by the SCADA system, depending on the RO system operation.

A level indicator (DC-LIT-1001), pressure-transducer type level indicator (DC-LIT-1002), and high-high level switch (DC-LSHH-1001) are provided for the decarbonator effluent tank. DC-LIT-1002 has primary level control over the decarbonator effluent tank. DC-LIT-1001 provides level measurement for reference only.

Startup

The decarbonator blowers are turned on and placed into remote auto mode. The SCADA system automatically starts the decarbonator blowers once the RO system is called to run. Flow is equally distributed to each decarbonator and can be manually throttled to balance flow using the isolation valves on the decarbonator inlets.

Normal Operation

The decarbonator blowers operate in remote auto mode. All three decarbonators and decarbonator blowers are online. If a decarbonator blower is taken offline for maintenance and RO production is greater than the capacity of the remaining two online blowers, then RO production should be reduced. The decarbonator effluent tank passes treated water to the reservoir by gravity. The tank has a minimum operating level needed to maintain a residence time and allow entrained air bubbles from the decarbonation process to escape. The water level in the decarbonator tank is maintained through a flow control valve (FS-VBF-1001) and flow meter (FS-FIT-1001) in the reservoir inlet vault.

If the finished water alkalinity is low, the fraction of RO bypass flow can be changed by manually adjusting valves that send RO feed tank flow directly to the decarbonator effluent tank.

Alarms

The following alarms (with operator-adjustable setpoints) are provided for the decarbonator system through the plant PLC:

- Decarbonator effluent tank has reached high level (DC-LIT-1001 > 9.5 ft, DC-LIT-1002 > 9.5 ft)
- Decarbonator effluent tank has reached low level (DC-LIT-1001 < 2 ft, DC-LIT-1002 < 2 ft)
- Decarbonator effluent tank is at high-high level (DC-LSHH-1001 = 10ft)
- Plant PLC will alarm in the event of blower failure or shutdown

Safety Interlocks

The following permissive conditions are required for decarbonator system operation:

- No alarms or shutdown conditions
- No invalid setpoint selections
- RO system is treating water
- Post-treatment system is ready to receive water

2.2.3.7 Post Treatment Chemical Addition

There are two flash mix pumps (DC-PCL-2101, DC-PCL-2201) downstream of the decarbonator effluent tank to enhance post-treatment stabilization.

Controls/SCADA Overview

Analyzers for conductivity (DC-AIT-1005), turbidity (DC-AIT-1004), fluoride (DC-AIT-1002), free ammonia and monochloramine residual (DC-AIT-1003), and pH and temperature (DC-AIT-1001) are provided downstream of the flash mix pumps. The flash mix pumps can operate in either local manual, remote manual, or remote auto modes. In local manual mode, the pumps can be turned on or off through the flash mix pump control panel. In remote manual mode, the pumps can be turned on or off through the HMI. In remote auto mode, the pumps are automatically turned on or off by the SCADA system.

Startup

The flash mix pumps are turned on and placed into remote auto mode. The SCADA system automatically starts the flash mix pumps during plant startup.

Normal Operation

The flash mix pumps operate in remote auto mode. The SCADA system rotates pumps to allow equal operating time of each flash mix pump to prevent degradation.

Ammonium sulfate and sodium hypochlorite is added at a ratio of ~5:1 chlorine:nitrogen to maintain a target monochloramine concentration in the distribution system. Adequate separation is provided by adding ammonium sulfate upstream of the decarbonators and adding sodium hypochlorite downstream of the decarbonator effluent tank. Flash mix pumps provide mixing before the treated water is conveyed to the reservoir through an additional 735 ft of pipe.

A standby flash mix pump is programmed to automatically start to replace a failed duty pump, and alarm in the event of drive failure or shutdown.

Alarms

The following alarms (with operator-adjustable setpoints) are provided through the plant PLC:

- Post-treatment effluent pH is low (DC-AIT-1001 < 7.5)
- Post-treatment effluent pH is high (DC-AIT-1001 > 8.5)
- Post-treatment effluent temperature is high (DC-AIT-1001 > 85 °F)
- Post-treatment effluent fluoride level is high (DC-AIT-1002 > 1.2 mg/L)
- Post-treatment effluent monochloramine residual is low (DC-AIT-1003 < 1.0 mg/L)
- Post-treatment effluent turbidity is high (DC-AIT-1004 > 1 NTU)
- Post-treatment effluent conductivity is high (DC-AIT-1005 > 500 µs/cm)

Safety Interlocks

The following permissive conditions are required for post-treatment system operation:

- No alarms or shutdown conditions
- No invalid setpoint selections
- Permissive signals from the ammonium sulfate system, sodium hypochlorite system, hydrofluorosilicic acid system, and sodium hydroxide system
- Ammonium sulfate, sodium hypochlorite, hydrofluorosilicic acid, and sodium hydroxide tank levels are above the low-low level
- Decarbonators are in operation

2.2.3.8 Reservoir Booster Pump Station

The reservoir booster pump station supplies the 500-ft pressure zone and has four pumps installed (FS-PVE-1101, FS-PVE-1201, FS-PVE-1301, FS-PVE-1401). Treated water is partially diverted from the 250-ft pressure zone reservoir outlet to the booster pump station.

Controls/SCADA Overview

Analyzers for chlorine residual (FS-AIT-1003) and pH and temperature (FS-AIT-1004) are provided on the 250-ft pressure zone reservoir outlet. The booster pumps are equipped with VFDs that communicate with SCADA over Ethernet. The pumps can operate in either local manual, remote manual, or remote auto modes. In local manual mode, the pump speed can be adjusted using controls on the VFD (FS-AFD-1101, FS-AFD-1201, FS-AFD-1301, FS-AFD-1401). In remote manual mode, the HMI can be used to turn the pump on or off and control speed. In remote auto mode, the pumps are controlled by a pressure setpoint (FS-PIT-1002) for the 500-ft pressure zone. The static discharge head is 107 psi. The SCADA system has a control interlock that prevents the San Vicente booster pump station and reservoir booster pump station from operating simultaneously.

Startup

The booster pumps are turned on and placed into remote auto mode. The SCADA system brings the required number of pumps online through the VFDs.

Normal Operation

The reservoir will send a permissive signal to the SCADA system if the reservoir level is high enough for operation. The reservoir high-water level is 249.7 ft., and the low-water level is 242.0 ft. The booster pumps operate in remote auto mode. The number of pumps online depends on the pressure within the 500-ft pressure zone, which is communicated to the SCADA system. The VFDs will rotate pumps to allow equal operating time of each pump to prevent degradation. Pumps are programmed to stop immediately and alarm in the event of a VFD fault or emergency stop. The SCADA system will automatically start a standby pump to replace a failed duty pump. The San Vicente booster pump station will operate for all flow demands below 600 gpm.

A pressure-reducing valve is provided on the recirculation line from the booster pump combined discharge header to the booster pump combined suction header. The pressure-reducing valve provides relief during an extended surge event and has a setpoint of 165 psig.

Alarms

The following alarms (with operator-adjustable setpoints) are provided through the plant PLC:

- 500-ft pressure zone chlorine residual is low (FS-AIT-1003 < 0.2 mg/L)
- 500-ft pressure zone pH is low (FS-AIT-1004 < 7.5)
- 500-ft pressure zone pH is high (FS-AIT-1004 > 9)
- 500-ft pressure zone temperature is high (FS-AIT-1004 > 150°F)

Safety Interlocks

The following permissive conditions are required for the 500-ft pressure zone booster pump station operation:

- Reservoir water level is high enough for operation
- Surge tank isolation valve is not closed (FS-VBF-1001 = FALSE)
- San Vicente booster pump station is not operating

2.2.3.9 Chemical Systems

- **Sodium Hypochlorite.** There are three metering pumps (NOCL-PDM-4001, NOCL-PDM-5001, NOCL-PDM-6001) to add sodium hypochlorite (12.5 percent is purchased, 11.5 percent is used for tank and pump sizing) to raw water contact tank influent and non-Olympic greensand filter influent. There are six metering pumps (NOCL-PDM-3101, NOCL-PDM-3201, NOCL-PDM-9101, NOCL-PDM-9201, NOCL-PDM-7001, NOCL-PDM-8001) for adding sodium hypochlorite (12.5 percent) to Olympic greensand filter influent, GAC effluent, and downstream of the decarbonator effluent tank. There are two sodium hypochlorite tanks (NOCL-TNK-1101, NOCL-TNK-1201).
- **Ammonium Sulfate.** There are six metering pumps (NSO4-PDM-1001, NSO4-PDM-2001, NSO4-PDM-3001, NSO4-PDM-4001, NSO4-PDM-5001, NSO4-PDM-6001) to add ammonium sulfate (40 percent) to non-Olympic greensand effluent, GAC effluent, and decarbonator effluent. There is one ammonium sulfate tank (NSO4-TNK-1101).
- **Sulfuric Acid.** There are two metering pumps (HSO4-PDM-4001, HSO4-PDM-5001) to add sulfuric acid (93 percent) to UV/AOP influent. There are three metering pumps (HSO4-PDM-1001, HSO4-PDM-2001, HSO4-PDM-3001) to add sulfuric acid (93 percent) to RO influent and RO CIP. There are two sulfuric acid tanks (HSO4-TNK-7101, HSO4-TNK-7201).
- **Hydrogen Peroxide.** There are two metering pumps (H2O2-PPS-1101, H2O2-PPS-1201) to add hydrogen peroxide (50 percent) to UV/AOP influent. There is one hydrogen peroxide tank (H2O2-TNK-1000).
- **Antiscalant.** There are two metering pumps (AS-PDM-1001, AS-PDM-2001) to add antiscalant (Avista Vitec 4,000 or AWC A-119) to cartridge filter effluent. There is one antiscalant tank (AS-TNK-1101).
- **Hydrofluorosilicic Acid.** There are two metering pumps (HF-PDM-1101, HF-PDM-2101) to add hydrofluorosilicic acid (23 percent) downstream of the decarbonator effluent tank. There is one hydrofluorosilicic acid tank (HF-TNK-1101).

- **Sodium Hydroxide.** There are three metering pumps (NAOH-PDM-1001, NAOH-PDM-2001, NAOH-PDM-3001) to add sodium hydroxide (25 percent) downstream of the decarbonator effluent tank. There is one sodium hypochlorite tank (NAOH-TNK-1111).

Controls/SCADA Overview

Each chemical bulk storage tank is provided with a level transmitter to monitor the liquid level. The level transmitter will provide high-level and low-level alarms. The bulk chemical storage tank will send a permissive signal to the SCADA system if the liquid level is high enough for operation. If the liquid level reaches the low level, the tank will send a signal to stop the metering pumps.

The metering pumps can operate in either local manual, remote manual, or remote auto modes. Local control of the metering pumps is provided through an On-Off-Remote (O-O-R) switch on the metering pump control panel. In local manual mode, the O-O-R switch is in the “On” position and the pump on/off and speed are controlled using the local adjustment device on the panel. Stroke length control is adjusted manually at the pump only. In remote manual mode, control is provided through the PLC when the O-O-R selector switch on the metering pump control panel is in the “Remote” position and “Manual” is selected at the HMI. The pump on/off is controlled from the HMI using operator manual commands, and the speed is manually adjusted from the HMI. In remote auto mode, the SCADA system calculates the dosage rate and controls pump speed.

Startup

The entire chemical system is turned on and placed into remote auto mode.

Normal Operation

The metering pumps will operate in remote auto mode. Standby metering pumps are programmed to automatically start to replace a failed duty pump, and alarm in the event of drive failure or shutdown due to high discharge pressure. Standby metering pumps are also programmed to automatically start when metering demands require both pumps to be in operation. Metering pumps will not operate if the tank level is at or below the low-low level.

During normal operation, dosage rates are controlled as follows:

- **Sodium Hypochlorite to Raw Water Mixing.** Operator shall select dose setpoint with flow pacing to the raw water flow meter (RW-FIT-1001). Dosage rate can be trimmed to maintain operator-selected chlorine residual downstream of the pressure filters (FLT-AIT-1001).
- **Sodium Hypochlorite to Non-Olympic Greensand Filter Influent.** Operator shall select dose setpoint with flow pacing to the raw water flow meter (RW-FIT-1001). Dosage rate can be trimmed to maintain operator-selected chlorine residual downstream of the pressure filters (FLT-AIT-1001). This dosing point is a secondary location and available if a temporary boost in chlorine residual is required upstream of the Non-Olympic Greensand Filters (e.g., Charnock WTP is offline).
- **Ammonium Sulfate to Non-Olympic Greensand Filter Effluent.** Operator shall select dose setpoint with flow pacing to the totalized greensand filter effluent flow. Dosage rate can be trimmed to maintain operator-selected chlorine residual downstream of the pressure filters (ROF-AIT-1001).
- **Sodium Hypochlorite to Olympic Greensand Filter Influent.** Operator shall select dose setpoint with flow pacing to the combined SM-4, SM-8, and SM-9 flow rates. Dosage rate can be trimmed to maintain operator-selected chlorine residual downstream of the pressure filters (FLT-AIT-1012).

- **Sulfuric Acid to UV/AOP Influent.** Operator shall select dose setpoint with flow pacing to the UV/AOP influent flow meter (OXW-FIT-1001). Dosage rate can be trimmed to maintain pH at the UV/AOP inlet (OXW-AIT-1005).
- **Hydrogen Peroxide to UV/AOP Influent.** The dose setpoint shall be set by the UV/AOP SCC based on treatment goals, influent flow, UVT and UV intensity level.
- **Ammonium Sulfate to GAC Effluent.** Dosage rate shall be calculated from the free chlorine analyzer reading at the Olympic greensand effluent (FLT-AIT-1012). Dosage rate can be trimmed based on free chlorine analyzer (ROF-AIT-1013) value at the RO feed tank inlet. Dosing will only be used if only Olympic Well Field is online.
- **Sodium Hypochlorite to GAC Effluent.** Operator shall select the dose setpoint with flow pacing to the totalized flow from the GAC flow meters (GAC-FIT-1020, GAC-FIT-2020, GAC-FIT-3020, GAC-FIT-4020). Dosage rate can be trimmed to ensure there is no chlorine residual in GAC effluent (ROF-AIT-1013). Dosing will only be used if only Olympic Well Field is online.
- **Sulfuric Acid to Cartridge Filter Influent.** Operator shall select dose setpoint with flow pacing to the totalized flow in SCADA from flow meters on RO permeate, RO bypass, and RO concentrate lines. Dosage rate can be trimmed to maintain pH at the RO train inlet (ROF-AIT-1107).
- **Antiscalant to RO Train Influent.** Operator shall select dose setpoint with flow pacing to the totalized flow in SCADA from flow meters on RO permeate, RO bypass, and RO concentrate lines.
- **Sulfuric Acid to RO CIP System.** Operator shall select dose setpoint with flow pacing to the RO CIP flow meter (CIP-FIT-1011). Dosage rate can be manually trimmed by operator input from the HMI based on the observed pH (CIP-AIT-1001).
- **Ammonium Sulfate to Finished Water.** Dosage rate shall be calculated from the free ammonia/monochloramine analyzer reading at the decarbonator effluent (DC-AIT-1003). Dosage rate can be trimmed based on the ammonia/monochloramine analyzer value at the decarbonator effluent (DC-AIT-1003).
- **Hydrofluorosilicic Acid to Finished Water.** Operator shall select dose setpoint to result in final effluent fluoride residual (DC-AIT-1002). Metering pump is flow-paced to final effluent (to reservoir) flow meter (FS-FIT-1001).
- **Sodium Hypochlorite to Finished Water.** Operator shall select dose setpoint with flow paced to treated water discharge flow meter (FS-FIT-1001). Dosage rate can be trimmed based on the free ammonia/monochloramine analyzer reading at the decarbonator effluent (DC-AIT-1003).
- **Sodium Hydroxide to Finished Water.** Operator shall select dose setpoint with flow paced to treated water discharge flow meter (FS-FIT-1001). Dosage rate can be trimmed to maintain pH in decarbonator effluent (DC-AIT-1001).

Alarms

- **Sodium Hypochlorite.** The following alarms (with operator-adjustable setpoints) are provided through the plant PLC:
  - Sodium hypochlorite tank 1 level is high (NOCL-LIT-1101 > 8 ft)
  - Sodium hypochlorite tank 1 level is low (NOCL-LIT-1101 < 2 ft)
  - Sodium hypochlorite tank 2 level is high (NOCL-LIT-1201 > 8 ft)
  - Sodium hypochlorite tank 2 level is low (NOCL-LIT-1201 < 2 ft)

- **Ammonium Sulfate.** The following alarms (with operator-adjustable setpoints) are provided through the plant PLC:
  - Ammonium sulfate tank level is high (NSO4-LIT-1101 > TBD ft)
  - Ammonium sulfate tank level is low (NSO4-LIT-1101 < TBD ft)
- **Sulfuric Acid.** The following alarms (with operator-adjustable setpoints) are provided through the plant PLC:
  - Sulfuric acid tank 1 level is high (HSO4-LIT-7101 > TBD ft)
  - Sulfuric acid tank 1 level is low (HSO4-LIT-7101 < TBD ft)
  - Sulfuric acid tank 2 level is high (HSO4-LIT-7201 > TBD ft)
  - Sulfuric acid tank 2 level is low (HSO4-LIT-7201 < TBD ft)
- **Hydrogen Peroxide.** The following alarms (with operator-adjustable setpoints) are provided through the UV/AOP PLC:
  - Hydrogen peroxide tank level is high (H2O2-LIT-1001 > TBD ft)
  - Hydrogen peroxide tank level is low (H2O2-LIT-1001 < TBD ft)
- **Antiscalant.** The following alarms (with operator-adjustable setpoints) are provided through the plant PLC:
  - Antiscalant tank level is high (AS-LIT-1101 > TBD ft)
  - Antiscalant tank level is low (AS-LIT-1101 < TBD ft)
- **Hydrofluorosilicic Acid.** The following alarms (with operator-adjustable setpoints) are provided through the plant PLC:
  - Hydrofluorosilicic acid tank level is high (HF-LIT-1101 > TBD ft)
  - Hydrofluorosilicic acid tank level is low (HF-LIT-1101 <TBD ft)
- **Sodium Hydroxide.** The following alarms (with operator-adjustable setpoints) are provided through the plant PLC:
  - Sodium hydroxide tank 1 level is high (NAOH-LIT-1101 > 8 ft)
  - Sodium hydroxide tank 1 level is low (NAOH-LIT-1101 < 2 ft)
  - Sodium hydroxide tank 2 level is high (NAOH-LIT-1201 > 8 ft)
  - Sodium hydroxide tank 2 level is low (NAOH-LIT-1201 < 2 ft)

Safety Interlocks

- For all chemical systems, metering pumps will not operate if the tank level is at or below the low-low level.
- If a metering pump fails and a standby pump is not available, where essential to the safe and proper system functioning the plant PLC will initiate shutdown.

2.2.3.10 Instrument Calibration

Refer to the Operations and Maintenance Manual for provisions for regular calibration. Table 2-2 summarizes critical pieces of equipment and instruments that should have regular calibration.

Table 2-2. Calibration Schedule

Equipment/Instrument	Equipment/Instrument Tag	Calibration Frequency
All chemical metering pumps	• NOCL-PDM-4001, NOCL-PDM-5001, NOCL-PDM-6001, NOCL-PDM-3101, NOCL-PDM-3201, NOCL-PDM-9101, NOCL-PDM-9201, NOCL-PDM-7001, NOCL-PDM-8001 • NSO4-PDM-1001, NSO4-PDM-2001, NSO4-PDM-3001, NSO4-PDM-4001, NSO4-PDM-5001, NSO4-PDM-6001 • HSO4-PDM-4001, HSO4-PDM-5001, HSO4-PDM-1001, HSO4-PDM-2001, HSO4-PDM-3001 • H2O2-PPS-1101, H2O2-PPS-1201 • AS-PDM-1001, AS-PDM-2001 • HF-PDM-1101, HF-PDM-2101 • NAOH-PDM-1001, NAOH-PDM-2001, NAOH-PDM-3001	Monthly
UVT analyzers	• OXW-AIT-1003, OXW-AIT-1004	Monthly
UV sensors	N/A	As needed

Additional instrumentation may be added in final OMMP after startup

2.3 Shutdown

2.3.1 Charnock WTP

Shutdown of the Charnock WTP can be found in Section 5 of the *Charnock Wellfield Restoration Project Operations Plan – Charnock* (Black and Veatch, 2009).

2.3.2 Olympic AWTF

The following conditions will initiate shutdown of the Olympic AWTF:

- Failure or shutdown of at least two Olympic wells
- UV/H_2O_2 system log removal is below the DDW approved value based on a 15-minute running average and if it ever drops below the minimum permitted value [TBD; to prevent excessive undertreatment] and the second train is unhealthy
- UV/H_2O_2 system flow meter failure
- Hydrogen peroxide pumps fail
- Hydrogen peroxide tank below the low-low level
- UVT drops below the minimum permitted value
- Plantwide power failure or UV/H_2O_2-specific power failure

In the event of the above conditions for the Olympic AWTF, the following shutdown sequence is initiated:

- Failure alarm is sent to the SCADA system and the plant PLC begins shutdown of Olympic AWTF
- Olympic feed wells shut down
- GAC filter-to-waste valves open and remain open until all off-spec water from the UV/H_2O_2 AOP system has been discharged through the GAC contactors and to the backwash wastewater tank
- Valves for active UV/H_2O_2 train are closed by the UV/H_2O_2 PLC or SCADA system. Once the flow is zero, the UV reactor(s) in operation de-energizes.
  - Restart of the UV/H_2O_2 system requires approximately 10 minutes for lamps to warm up and startup of Olympic feed wells.

- Hydrogen peroxide system shuts down after the UV/H_2O_2 influent drops below a preset flow setpoint

Note, the Arcadia WTP can remain operational without the Olympic Well Field and Olympic AWTF operating.

2.3.3 Arcadia WTP

The following conditions will initiate a shutdown of the Arcadia WTP:

- Failure of all feed wells
- Failure of RO system, decarbonators, or post-treatment system
- Plantwide power failure

In the event of the above conditions for the Arcadia WTP, the following shutdown sequence is initiated:

- Failure alarm is sent to the SCADA system and the plant PLC begins shutdown
- Feed wells shut down
- Greensand filter isolation valves close
- RO system continues treating water until the RO feed tank low-low level is reached
- RO trains automatically flush with RO flush system permeate and shut down in cascading order
- Decarbonator blowers shut down
- Post-treatment chemical metering pumps shut down
- GAC filter-to-waste valves open and remain open until all off-spec water from the UV/H_2O_2 AOP system has been discharged through the GAC contactors and to the backwash wastewater tank
- Valves for the active UV/H_2O_2 train are closed by the UV/ H_2O_2 PLC or SCADA system. Once the flow is zero, the UV reactor(s) in operation de-energize.
    - Restart of the UV/H_2O_2 system requires approximately 10 minutes for lamps to warm up and startup of Olympic feed wells.
- Hydrogen peroxide system shuts down after the UV/H_2O_2 AOP influent drops below a preset flow setpoint

2.4 Approved Maintenance Operations

To maintain optimal system performance, operators should follow standard operations and maintenance procedures and a regular maintenance schedule as outline in standard operating procedures. Operators should consult the equipment manuals provided by the manufacturer for preventative maintenance recommendations for each piece of equipment. Table 2-3 provides contact information for each piece of equipment.

Table 2-3. Arcadia WTP Manufacturer Contact Information

Equipment	Manufacturer	Contact Information	National Sanitation Foundation (NSF) Certification No.
Greensand Filters	WesTech	(801) 265-1000	TBD
UV/H_2O_2 System	Trojan Technologies	(519) 457-3400	TBD
GAC Contactors	Calgon Carbon	(412) 787-6700	TBD
GAC Media	Calgon Carbon	(412) 787-6700	TBD
Low-pressure RO Feed Pumps	Goulds (125 hp), Flowserve (150 hp)	(315) 568-2811 (Goulds) (972) 443-6500 (Flowserve)	TBD (Goulds) C0169307-01 (Flowserve)
Cartridge Filters	Parker Filtration	(1-800) 272 7537	TBD
RO Trains	ROTEC (RO Trains) Toray (RO Membranes)	972-4-6209154 (ROTEC) (858) 218-2360 (Toray)	TBD
High pressure RO Feed Pumps	Sulzer	(203) 238-2700	TBD
Brine Tank	Perry Fiberglass Products	(321) 609-9036	TBD
Brine Pumps	PumpWorks	(855) 602-3024	TBD
Decarbonators	Hungerford and Terry (Decarbonators 1 and 2) Perry Fiberglass Products (Decarbonator 3) The New York Blower Company (Decarbonator 3 blower)	(856) 881-3200 (Hungerford and Terry) (321) 609-9036 (Perry Fiberglass Products, Inc.) (1-800) 208-7918 (The New York Blower Company)	TBD
Flash Mix Pumps	Patterson	(706) 886-2101	TBD
Reservoir Booster Pump Station Pumps	Flowserve	(972) 443-6500	C0169307-01
Reservoir Booster Pump Station Surge Tank	Pulsco	(949) 261-1717	TBD
Chemical Metering Pumps	Milton Roy (diaphragm pumps) Verder (peristaltic pumps)	(215) 441-0800 (Milton Roy) TBD (Verder)	TBD
Chemical Bulk Storage Tanks	Perry Fiberglass Products, Inc. (antiscalant, ammonium sulfate) Poly Processing (hydrogen peroxide and hydrofluorosilicic acid) Steel Structures, Inc. (sulfuric acid) TBD (sodium hypochlorite and sodium hydroxide)	(321) 609-9036 (Perry Fiberglass Products, Inc.) (866) 765-9957 (Poly Processing) (559) 673-8021 (Steel Structures, Inc.)	TBD
Chemical Storage Area Sump Pumps	TBD	TBD	TBD
Chemical Injection Quills	SAF-T-FLO	(714) 632-3013	TBD
Static Mixers	Komax, Westfall	(915) 591-4551 (Komax) (401) 253-3799 (Westfall)	TBD
Standby Diesel Generator	Quinn Power Systems	(562) 999-4839	TBD
Low-voltage Motor Control Centers	TBD	TBD	TBD
Control System and Instrumentation	Rockwell Automation/Allen Bradley (primary logic controller platform) Inductive Automation (HMI platform)	(888) 382-1583 (Rockwell Automation/Allen Bradley) (1-800) 266-7798 (Inductive Automation)	TBD

Table 2-4 summarizes triggers for maintenance items for major equipment. The following sections discuss the procedures in greater detail.

Table 2-4. Typical Maintenance Items for Major Equipment

Equipment	Trigger for Maintenance	Maintenance Action
Greensand Filters	• High headloss, runtime, totalized volume of filtered water, or iron concentration in filtered water trigger value	• Perform filter backwash
	• Filtered water quality not acceptable after backwashing	• Investigate backwash procedure • Investigate oxidation chemistry upstream • Reactivate greensand media • Replace greensand media
UV/H_2O_2 AOP	• Lamp failure	• Replace burned out lamp
	• Low UV intensity sensor indicator	• UV intensity sensor calibration check • Replace section of lamps (if indicated by lamp age) • Check sleeves; clean if required; adjust wiper frequency
	• Lamp driver failure	• Replace lamp driver
	• UVT monitor reads high or low (relative to typical operations)	• Check UV intensity sensor calibration • Check UVT analyzer calibration • Compare UVT analyzers' results against each other; calibrate errant analyzer • Clean sensor if needed
	• Monthly maintenance	• Inventory spare parts on site • Perform reference UV intensity sensor checks • Inspect UV intensity sensor O-rings • Check hydraulic system fluid level • Check hydrogen peroxide dosing system, including pump calibration and H_2O_2 bulk concentration • Clean UVT analyzers • Calibrate UVT analyzers
	• Annual maintenance	• High-voltage power distribution center check • Reference UV intensity sensor calibration • Refresher training for personnel • Replace hydraulic system fluid filter • Inspect hydraulic hoses • Inspect lamp cables • Replace wiper seals • Replace UVT analyzer wiper • Replace hydraulic fluid
GAC Vessels	• High headloss or maximum runtime reached	• Initiate backwash or bump (low-flow backwash to reduce air entrainment and compaction)
	• Unbalanced filtration rate among GAC contactor trains	• Initiate bump (low flow backwash to reduce air entrainment and compaction)
	• Lowest interim sample port of lead vessel indicates hydrogen peroxide is only partially quenched (still quenched at the effluent)	• Confirm hydrogen peroxide quenching through the depth of the GAC bed (all ports and combined effluent) • Schedule media replacement, switch lead-lag order of GAC
	• Lowest interim sample port of lead vessel indicates breakthrough of target contaminant(s)	• Schedule media replacement, switch lead-lag order of GAC

Table 2-4. Typical Maintenance Items for Major Equipment

Equipment	Trigger for Maintenance	Maintenance Action
Low-Pressure and High-Pressure Feed Pumps	• Decrease in High-Pressure RO feed pump suction pressure, failure of Low-Pressure or High-Pressure RO feed pumps,	• Check VFD settings • Schedule maintenance for failed pump
Cartridge Filters	• High differential pressure across cartridge filter	• Isolate and replace failed cartridge filters for failed vessel(s)
RO Trains	• Elevated fouling rate or cleaning frequency	• Monitor FRRO automation and verify sequencing is operating properly; inspect FRRO valves • Optimize antiscalant dose and pH • Inspect greensand filters if iron and manganese concentrations are elevated. Adjust greensand filter operating parameters (e.g., backwash frequency and chlorine residual) as needed. • Verify/adjust chemical dosing for chloramines upstream of RO feed tank
	• Elevated RO permeate or finished water conductivity	• Inspect membranes for failed O-ring connections • Replace failed membranes • Reduce RO bypass flow
Decarbonators	• Blower failure	• Schedule regular blower inspection • Reduce RO production if it is greater than the capacity of 2 online blowers and the 3rd decarbonator blower fails (evaluate impact on treatment as needed)
	• High differential pressure across packed media bed	• Clean decarbonator media if it becomes fouled
VGAC	• VGAC outlet indicates breakthrough of target contaminants	• Schedule and replace carbon
Chemical Systems	• Metering pump does not meet required dose at minimum or maximum speed • Calibration test indicates pump dosing is inaccurate	• Manually adjust metering pump stroke length
	• Dose exceeds setpoint	• Manually trim dosage rate • Inspect analyzer or flow meter corresponding to affected chemical system
	• Low level in bulk feed tank	• Inspect bulk feed tank during daily rounds • Replace malfunctioning/failed level sensor • Schedule chemical delivery

2.4.1 Charnock WTP

Operations staff should consult the equipment manuals provided by the equipment suppliers for preventative maintenance recommendations for each piece of equipment. Equipment suppliers and approved maintenance operations for the Charnock WTP can be found in Section 6 of the *Charnock Wellfield Restoration Project Operations Plan – Charnock* (Black and Veatch, 2009).

2.4.2 Olympic Wells

Operations staff should consult the equipment manuals provided by the equipment suppliers for preventative maintenance recommendations for Olympic Well pumps, valves, appurtenances, instruments, and chemical dosing equipment. Equipment manuals will be provided in Attachment C in the final OMMP.

2.4.3 Greensand Filters

If filtrate water quality after backwashing is not acceptable, the backwashing procedure shall be investigated. This includes checking the air and water flow rates and backwash duration. Visual inspection should be performed to confirm even flow distribution during backwashing. The backwashing procedure shall also be checked if media loss is occurring, since the losses are typically in the backwash flow.

If the filter run time is decreasing over time, the oxidation chemistry upstream shall be investigated. The chlorine dose may need to be adjusted if influent manganese and iron concentrations rise. If the oxidation chemistry upstream is working correctly, the greensand media may need to be reactivated. It is estimated that reactivation is required every 5 to 10 years.

Activation of greensand filter media is accomplished by soaking the media in an oxidized solution for a minimum of four hours. The solution can be of either free chlorine or potassium permanganate. Free chlorine was successfully used for activation during the pilot study in 2008 and plant start-up in 2010. Free chlorine can be neutralized and easily disposed, whereas potassium permanganate contains manganese solids when neutralized.

Greensand filters shall be routinely inspected in accordance with manufacturer requirements for acceptable differential pressure, abnormal vibration, and leaks. Filtrate shall be sampled as required to monitor and maintain greensand filter performance. Operators will perform preventative and corrective maintenance activities in accordance with instrumentation and greensand filter manufacturer requirements.

If the facility is shut down for extended periods of time, the greensand filter beds should be refreshed with influent flow for about 45 minutes every 1 to 2 weeks.

2.4.4 UV/H_2O_2 AOP

The UV/H_2O_2 AOP system components listed below will need to be changed periodically. Part replacement frequency is typically based on hours of operation unless a failure occurs. Operators will follow standard maintenance schedules and respond to system alarms to determine when part replacement is required. Each UV train can be isolated by actuating the valves on the individual feed and discharge lines. Routine parts replacement includes:

- Lamp replacement
- Quartz sleeve replacement
- Lamp driver replacement
- Wiper rings replacement
- UV sensor calibration checks and replacement
- UVT monitor lamp replacement

The automatic wiping system driven by the HSC provides continuous cleaning of the lamp quartz sleeves to minimize fouling.

Part calibration frequency is typically based on hours of operation and is specified by the manufacturer. Typical calibration activity includes:

- **UV Intensity Sensor.** Check duty sensor with reference sensor. Send sensor back to vendor for re-calibration as needed.
- **Flow meter.** Check flow meter with reference meter according to vendor protocol and recommended frequency.
- **UVT meter.** Calibrate UVT meter according to vendor protocol and recommended frequency.

- **pH meter.** Calibrate pH meter electrode with recommended buffer solutions.

Hydrogen peroxide residual should be checked on a routine basis via the triiodide method as described in the standard operating procedure for hydrogen peroxide determination. Pump tube replacement is specified by the manufacturer.

If the SCC indicates low log removal or lamp intensity being reduced below the minimum level for adequate UV dose delivery while lamp age is still low (<15,000 hours), the system should be checked for excessive fouling of lamp sleeves, lamp aging, or a faulty UV intensity sensor. Lamp sleeve wiper frequency may need to be adjusted to address sleeve fouling. If the SCC indicates low UVT, check UVT analyzer calibration and compare UVT analyzers' results against each other. The errant analyzer should be taken offline for maintenance.

If the SCC indicates under-dosing of H_2O_2, the H_2O_2 feed pump run status and pump speed should be verified. Refer to Section 2.4.12 for recalibration of feed pumps. If the concentration of H_2O_2 in the feed tank is low, the bulk concentration can be updated in the SCC if needed. The H_2O_2 bulk chemical tank level should be visually checked by operators during daily rounds, and the level sensor should be replaced if malfunctioning.

2.4.5 GAC

Media changeout should be scheduled for the lead vessel when the lowest interim sample port indicates breakthrough of target contaminant(s) or hydrogen peroxide is only partially quenched (still quenched at the effluent). After media changeout of the lead vessel is completed, the lead-lag order of the GAC vessels should be switched. Quenching can be routinely monitored using hydrogen peroxide test strips, which can be verified. If low hydrogen peroxide is present, it can be further quantified via the triiodide method. A 4-inch connection is provided at the top and bottom of each GAC contactor to remove exhausted media and fill with new media. The media exchange is performed by the media manufacturer, who also typically provides a trailer-mounted gasoline-powered air compressor (it can also be rented). Treated water is used to slurry in the new media, and compressed air is used to move the slurry into the contactor. The contactor shall be isolated prior to media changeout by actuating the valves on the feed and discharge lines.

If the filtration rate among GAC trains is unbalanced, the flow control valves and flowmeters should be inspected for failure. Perform bumps as required to reduce air entrainment and compaction. The flow control valves can be manually throttled to balance flow.

GAC contactors shall be routinely inspected in accordance with manufacturer requirements for acceptable differential pressure, abnormal vibration, and leaks. GAC effluent shall be sampled as required at sample ports along the depth of the GAC and on the combined flow to monitor and maintain GAC performance. Other preventative and corrective maintenance activities (e.g., for flow meters) is performed in accordance with instrumentation and GAC contactor manufacturer requirements.

2.4.6 RO Feed Tank, Low-Pressure RO Feed Pumps, Cartridge Filters, and RO Trains

The RO feed tank must be isolated from the greensand filters and GAC effluent prior to draining. The low-pressure RO feed pumps deliver flow to the RO system for treatment until the pumps stop at the tank low level. The RO feed tank contains a permanent sump pump (ROF-PSS-1001) to drain water below the tank low level. To avoid cross-contamination, the sump pump is not directly connected to the storm drain system. The sump pump discharge piping only extends to the top of the tank and terminates at a quick-connect coupling, allowing for pump-over into the storm drain system.

Each low-pressure RO feed pump can be manually isolated by directly operating the valve on the individual discharge line. Low-pressure RO pumps shall be routinely inspected in accordance with manufacturer requirements for proper operating pressure, flow, objectionable noise, and vibration. Operators will conduct routine measurements of temperature and vibration of each pump and will perform preventative and corrective maintenance activities in accordance with instrumentation, VFD, and pump manufacturer requirements. When the differential pressure between the feed and discharge headers for a cartridge filter exceeds a setpoint, the operators will take that pressure vessel offline and replace cartridge filters. If multiple cartridge filter vessels require replacement, cartridge filter vessels are taken out of service sequentially until all cartridge filters requiring replacement are replaced and the differential pressure across all vessels is within acceptable operating range. Each cartridge filter is manually isolated by directly operating the valves on the individual feed and discharge lines.

Cartridge filters shall be routinely inspected in accordance with manufacturer requirements for acceptable differential pressure range, abnormal vibration, and leaks. Cartridge filter effluent shall be sampled for silt density index levels (preferably < 3). Operators shall perform preventative and corrective maintenance activities in accordance with instrumentation and cartridge filter manufacturer requirements.

2.4.7 RO Trains

If the RO membrane fouling rate or cleaning frequency is elevated, monitor FRRO automation and verify sequencing is operating properly. The antiscalant dose and pH should also be optimized as needed. If the RO membrane fouling rate is still elevated, the iron and manganese concentration and HPC should be investigated at the RO feed tank. If the iron and manganese concentrations are elevated, the greensand filters should be checked. Adjust the greensand filter operating parameters (e.g., backwash frequency and chlorine residual) as needed. Adjust chemical dosing for chloramines upstream of the RO feed tank if free chlorine residual upstream of RO feed tank is above setpoint or monochloramine/ammonia concentrations downstream of RO feed tank is below setpoint.

If the RO permeate or finished water conductivity is elevated, the membranes at the skid or stage with elevated conductivity should be inspected for failed O-ring connections by conducting a membrane conductivity profile. If the O-ring connections are undamaged, new membranes may need to be installed. The failed membranes can be tested by the manufacturer to determine the cause of high RO permeate conductivity. If the RO membranes are in good condition and the finished water conductivity is elevated, the RO bypass flow may need to be reduced.

If the finished water alkalinity is low, the RO bypass flow may need to be increased. Operation for the decarbonators can also be adjusted.

RO trains and associated piping, valves, flushing system, and CIP system shall be inspected in accordance with manufacturer requirements for unusual vibration, noise, or leaks. RO permeate pressure, conductivity, pH, and flow trends shall be monitored to track performance and effectiveness of operational, cleaning, and backwash cycles. Sampling and on-site testing shall be conducted as required to monitor and maintain RO performance. Preventative and corrective maintenance activities are performed in accordance with instrumentation and FRRO manufacturer requirements.

2.4.8 Brine Tank and Pump Station

Each brine pump can be manually isolated by directly operating the valves on the individual suction and discharge lines. Brine pumps shall be routinely inspected in accordance with manufacturer requirements for proper operating pressure, flow, objectionable noise, and vibration. Routine measurements of temperature and vibration of each brine pump is performed. Operators should perform preventative and corrective maintenance activities in accordance with instrumentation, VFD, and pump manufacturer requirements.

The brine tank shall be routinely inspected for corrosion or scaling in accordance with manufacturer requirements. Operators will perform preventative and corrective maintenance activities in accordance with tank should requirements.

If the facility is shut down for extended periods, the brine tank must be isolated from the RO system prior to draining. The brine pumps deliver flow to the sewer system until the pumps stop at the tank low level. The brine tank is equipped with a 4-inch drain to empty brine below the tank low level.

2.4.9 Decarbonators

Decarbonators, blowers, and effluent tank shall be routinely inspected in accordance with manufacturer requirements for proper operating pressure, flow, objectionable noise, and vibration. Operators will conduct routine measurements of the decarbonator effluent tank as required to help inform dosing. They will perform preventative and corrective maintenance activities in accordance with instrumentation, decarbonator, and blower manufacturer requirements.

In the event of 1 of the 3 blowers failing, the RO production should be reduced if it is greater than the capacity of the remaining 2 online blowers.

If air stripping performance is decreased and differential pressure through the packed media bed is high, the media should be cleaned of any fouling.

The decarbonator effluent tank must be isolated from the RO trains and RO bypass prior to draining by closing valves RO-VBF-1107, RO-VBF-2107, RO-VBF-3107, RO-VBF-4107, and ROF-VBF-1002. Water will continue to be treated and sent to the reservoir until the water level reaches the minimum operating level. The tank is emptied to the storm drain system by manually opening a drain valve. Drainage from the decarbonator effluent tank should first be stabilized and free of chlorine prior to discharge.

2.4.10Post Treatment Chemical Addition

Each flash mix pump can be manually isolated by directly operating the valves on the individual suction and discharge lines. Flash mix pumps shall be routinely inspected in accordance with manufacturer requirements for proper operating pressure, flow, objectionable noise, and vibration. Routine measurements of temperature and vibration of each flash mix pump is conducted. Preventive and corrective maintenance activities should be performed in accordance with instrumentation and pump manufacturer requirements.

2.4.11Reservoir Booster Pump Station

Each booster pump can be manually isolated by directly operating the valves on the individual suction and discharge lines. Booster pumps shall be routinely inspected in accordance with manufacturer requirements for proper operating pressure, flow, objectionable noise, and vibration. Routine measurements of temperature and vibration of each booster pump are conducted. Preventative and corrective maintenance activities should be performed in accordance with instrumentation, VFD, and pump manufacturer requirements.

2.4.12Chemical Systems

If a chemical dose exceeds the setpoint, the dosage rate can be manually trimmed. The analyzer or flow meter corresponding to the affected chemical system should be inspected and calibrated. Optionally, the metering pump stroke length can be adjusted if calibration testing indicates that the pump dosing is inaccurate. The stroke length can be manually reduced if the pump exceeds the required dose at minimum speed; the stroke length can be manually increased if the pump cannot meet the required dose at the maximum pump speed.

The following procedures shall be followed during tank filling operations for all bulk chemical storage tanks:

- Disconnect the dust cap from the fill line of the appropriate chemical tank. Connect fill line to the cam lock male connector provided.
- Open the tank fill valve and begin filling.
- Watch the level indicator closely until the tank is filled with the desired chemical. If the storage tank is not visible from the filling point, be alert for the overfill alarm.
- Stop filling when the tank is full and close the tank fill valve.
- Disconnect the fill line and replace the dust cap.
- Confirm that any spilled liquid drains to a provided sump or is disposed in accordance with local environmental regulations.

2.5 Safety Considerations

Although the Olympic AWTF and Arcadia WTP are designed with safety in mind, there are mechanical dangers, hazards, and chemical exposures that may cause injuries or death if proper precautions are not taken while working on or around WTP equipment. Only trained and experienced maintenance and operations personnel who are familiar with the WTP equipment should be allowed to operate and maintain the facility. Precautions that shall be taken when working within the facility include, but are not limited to the following:

- The facility can be a wet environment and care should be taken to avoid slips. Handrails should be used when going up and down stairs. Post warning signs whenever such conditions are first noticed and resolve them at the earliest opportunity.
- The facility employs several chemicals that can be hazardous. Operators shall review safety data sheets (SDS) to ensure that proper precautions are taken. In the event of a spill that poses personnel and/or environmental hazards, the personnel's Supervisor shall be immediately notified. All chemicals should be stored with secondary containment.
- The City's electrical safety procedures shall be followed when working around all WTP equipment and components. Prior to working on WTP equipment, personnel shall perform their own checks and tests. Never assume that the tagging procedure has been properly conducted.
- Some WTP systems operate with high-pressure air, water, and oil sub-systems. Operators shall never open a vent or drain valve or open a flange connection unless it is proven that the pressure source has been shut down and the pressure has dissipated.
- Several WTP components and tanks are designated as confined spaces. Personnel shall ensure they have a confined space permit and follow proper confined space procedures prior to and during maintenance activities in these areas.
- Personnel shall notify the plant Supervisor of any potential safety hazards in or around the facility.
- Emergency showers and eyewash stations are provided and should be tested regularly by operations staff.
  - Operators shall be trained in proper emergency procedures. For emergency showers and eyewash stations to be effective, the American National Standards Institute (ANSI) Standard for Emergency Eyewash and Shower Equipment (ANSI Z358.1-2014) recommends that the affected body part shall be flushed immediately and thoroughly for at least 15 minutes using a large supply of clean fluid under low pressure. Large amounts of water are needed since water does not neutralize contaminants, but only dilutes and washes them away.

Note, however, that other references recommend flushing for at least 20 minutes if the nature of the contaminant is not known. The flushing or rinsing time can be modified if the identity and properties of the chemical are known.

  - A minimum 5-minute flushing time is recommended for mildly irritating chemicals
  - At least 20 minutes for moderate-to-severe irritants
  - Twenty minutes for non-penetrating corrosives
  - At least 60 minutes for penetrating corrosives
- Personnel shall review the Safety Data Sheets for emergency shower and eyewash requirements to determine wash time periods before entering a particular hazardous chemical area.
- Exposure to UV light is extremely harmful to eyes and skin. The UV/H_2O_2 system shall be de-energized and UV-resistant protective clothing and eyewear shall be worn when servicing the UV/H_2O_2 system. Use rubber gloves and eye protection when handing hydrogen peroxide as it can damage clothing, burn skin, and damage eyes.
- Personnel shall keep work areas clean and free of any obstructions that may impede access.

2.6 Staffing Plan and Contact Information

Table 2-5 outlines the staff for the Arcadia WTP.

Table 2-5. Arcadia WTP Staff

Staff	Position	Treatment and Distribution Grade	Hours and Contact Information	Distance from Arcadia WTP
TBD-	TBD-	TX #XXXXX DX #XXXXX	TBD-	TBD-

Operator names, grades, license numbers with expiration dates will be provided with the draft final version of the OMMP closer to startup.

Emergency contact information for the City of Santa Monica is provided in the Water Quality Emergency Notification Plan in Attachment D. City of Santa Monica and LASAN Industrial Waste Permits for the Arcadia WTP are provided in Attachment E. Table 2-6 provides DDW contact information for the Arcadia WTP.

Table 2-6. Contact Person at DDW

	General Contact	Direct Contact
Name	Central – District 16 Division of Drinking Water	TBD
Address	500 North Central Avenue, Suite 500 Glendale, CA 91203	TBD
Phone	(818) 551-2004	TBD
Email	Dwpdist16@waterboards.ca.gov	TBD

Section 3

Water Quality Monitoring and Testing

This section describes the water quality monitoring and testing required for the source water and multi-barrier treatment system. Detailed sampling protocols are provided in SOPs for each site. Sampling procedures and frequency are described in Sections 3.2 and 3.3, respectively.

3.1 Monitoring Requirements

This section describes the monitoring of the source waters and at the treatment plants. All monitoring is in accordance with current or anticipated DDW regulations and requirements.

3.1.1 Olympic Well Field Well Monitoring Program

Grab sample water quality monitoring is performed at the Olympic wells for all 15 COPCs. After 1 year of monthly sampling and approval from DDW, monitoring frequency will be as specified by DDW. Samples are also collected quarterly at the Olympic Well Field monitoring wells. The groundwater monitoring results, including the COPCs identified for the project, are documented and reported to the Los Angeles Regional Water Quality Control Board via GeoTracker under Case No. 904040434 (https://geotracker.waterboards.ca.gov/). The data generated from the implementation of these monitoring programs are stored in the Olympic Well Field EQuIS database. Monitoring well data will be used as well to inform operation of the well field and multi-barrier treatment system. A similar monitoring and reporting process is currently being used for the City's Charnock Well Field.

3.1.2 Charnock Well Field and Charnock WTP

Grab samples are collected monthly at the Charnock Wells and Charnock WTP and tested for volatile organic compound concentrations, namely MTBE and TBA. Monthly sampling is also performed for total coliform, heterotrophic plate count (HPC), total dissolved solids, uranium, iron, manganese, TCE, and 1,1-DCE (Black and Veatch, 2009). Charnock Well Field and Charnock WTP sampling procedures and techniques were not modified by the expansion project.

Sample collection locations and/or on-line monitoring instrument(s) are provided upstream and downstream of all treatment processes at the Charnock WTP for operations and process control. Flow, conductivity, turbidity, pH, fluoride, and total chlorine data from the monitoring instruments are automatically collected and stored through the SCADA system.

3.1.3 Arcadia WTP

Table 3-1 identifies all monitoring locations at the Arcadia WTP. Table 3-2 provides the sampling location, parameters that grab samples are tested for, and sampling frequency. The parameters include the 15 COPCs and nitrate, as listed in the Proposed Monthly Monitoring Forms under Attachment F. Exhaust at the VGAC contactor outlet is sampled quarterly for TCE and PCE using EPA method TO-15 or other method(s) approved by the South Coast Air Quality Management District, as outlined in Appendix C of the Step 4 report. The analytical methods are defined in Section 3.3.

Sample collection locations and/or on-line monitoring instrument(s) are provided upstream and downstream of all treatment process for operations and process control. The Arcadia WTP's compliance point for finished water quality is downstream of the 5-MG reservoir. Data from the monitoring instruments are automatically collected and stored instantaneously through the SCADA system.

Flow measurement for influent and effluent to all processes at the Arcadia WTP are summarized in Table 3-3. The continuous online water quality monitoring for operational control and compliance are listed in Table 3-4. Figure 3-1 shows all sample collection, monitoring instrument(s), and flow measurement locations at the Arcadia WTP. Sample taps are prefixed with "S-" and monitoring instruments are assigned alphabetic codes.

Table 3-1. Arcadia WTP Monitoring Locations

Location Code (per Figure 3-1)	Status	Location	Purpose
S23	New	SM-4	Collect water quality samples to document water quality
S24	New	SM-8	Collect water quality samples to document water quality
S25	New	SM-9	Collect water quality samples to document water quality
S1, S2	Existing	Contact Tank Influent	Collect water quality samples to document water quality
A	Existing	Contact Tank Influent	Monitor chlorine residual to adjust chlorine dose
B	Existing	Contact Tank Effluent	Monitor chlorine residual to adjust chlorine dose Monitor turbidity for information purposes
S3, S4, S5, S8	Existing	Greensand Filter Influent and Effluent (Olympic and Non-Olympic)	Collect water quality samples to document water quality and treatment performance
C	New	Olympic Greensand Filter Influent	Monitor chlorine residual to confirm proper operating conditions Monitor turbidity to determine backwash cycle frequency
D	Existing	Charnock-Arcadia Blend[a] Greensand Filter Effluent	Monitor turbidity to determine backwash cycle frequency
S6, S7	Existing	Charnock-Arcadia Blend[a] Greensand Filter Effluent	Collect water quality samples to document water quality and treatment performance
E	Existing	Charnock-Arcadia Blend[a] Greensand Filter Effluent	Monitor chlorine residual to determine ammonium sulfate dose
F	Existing	Olympic Greensand Filter Effluent	Monitor turbidity to determine backwash cycle frequency
G	New	UV/H_2O_2 Influent	Monitor UVT for online dose-monitoring algorithm Monitor pH to maintain value within required range for good performance of UV-AOP and RO [if required in permit—to be updated after startup activities]
H	New	UV System Control Center	Monitor UV lamp status and intensity to confirm required dose delivery; reads flow and UVT signals
S9	New	UV Reactor Influent and Effluent	Collect water quality samples to document water quality and treatment performance
S10, S11	New	GAC Influent and Effluent	Collect water quality samples to document water quality and treatment performance
I	New	GAC Effluent	Monitor chlorine residual to confirm quenching and to use as a trim when dosing chemicals prior to the RO Feed Tank

Table 3-1. Arcadia WTP Monitoring Locations

Location Code (per Figure 3-1)	Status	Location	Purpose
J	New	RO Feed Tank Effluent (Upstream of Sulfuric Acid Injection)	Monitor chlorine residual to confirm proper chemical dosing
K	New	RO Feed Tank Effluent (Downstream of Sulfuric Acid Injection)	Monitor ammonia residual, chloramine residual, and chlorine to ammonia N ratio at tank outlet to confirm proper chemical dosing
L	Existing	Cartridge Filter Influent	Monitor turbidity to confirm proper RO feed water quality conditions
S12	New	Cartridge Filter Influent	Collect water quality samples to document water quality and treatment performance
S13	Existing	Cartridge Filters	Collect water quality samples to document water quality and treatment performance
S14	Existing	Cartridge Filter Effluent	Collect water quality samples to document water quality and treatment performance
M	New	Cartridge Filter Effluent	Monitor ORP, temperature, pH, conductivity, turbidity, and chlorine residual to determine antiscalant dose (used for RO feed off-spec control) and confirm good operation [b]
N	Existing	RO Trains	Monitor ORP and chlorine residual for combined inlet, conductivity for permeate, and monitors conductivity and pH for concentrate (permeate conductivity is used for manual RO train off-spec)
S15	Existing	RO Trains	Collect water quality samples to document water quality and treatment performance
S16	Existing	RO Reject	Collect water quality samples to document water quality and treatment performance
O	Existing	CIP System	Monitor pH to determine sulfuric acid and sodium hydroxide dose Monitor temperature for process control
S17	Existing	CIP System	Collect water quality samples to document water quality and treatment performance
S18, S19	Existing	Decarbonator Influent and Effluent	Collect water quality samples to document water quality and treatment performance
P	New	Post Treatment Chemical Addition Effluent	Monitor temperature, pH, fluoride, turbidity, conductivity, free ammonia residual, and monochloramine residual to determine ammonium sulfate, hydrofluorosilicic acid, sodium hypochlorite, and sodium hydroxide doses [b]
S20	Existing	VGAC Effluent	Air quality sampling for regulatory compliance
Q	Existing	Reservoir Effluent to 350’ Zone	Monitor chlorine residual, pH, and temperature for regulatory compliance
S21	Existing	Reservoir Effluent to 350’ Zone	Collect water quality samples to document water quality and treatment performance
R	Existing	Reservoir Effluent to 250’ and 500’ Zone	Monitor chlorine residual, pH, and temperature for regulatory compliance
S22	Existing	Reservoir Effluent to 250’ and 500’ Zone	Collect water quality samples to document water quality and treatment performance

NOTE: Final version will use PS codes system.

a. If Future Wells are added in the future, are included in this blend.

b Modifications to existing panel.

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Table 3-2. Sampling at the Olympic AWTF and Arcadia WTP

						Wells[5]										Charnock Water Treatment Plant			Olympic Advanced Water Treatment Facility				Arcadia Water Treatment Plant						
Parameter	Unit	MCL	NL	Test Method	Analysis	SM#4	SM#8	SM#9	CH#13	CH#19	CH#20	CH#16	CH#18	ARC#4	ARC#5	Raw Water Equalization Tank	Combined GAC Effluent[2]	Filtered Water Tank Outlet	Greensand Filter Influent	Greensand Filter Effluent	UV-AOP Effluent	Combined GAC Effluent	Greensand Filter Effluent	Cartridge Filter Combined Effluent	Arcadia RO Combined Permeate before Bypass	Arcadia Decarbonator Influent	Decarbonator Tank Effluent	Arcadia Reservoir Influent	Arcadia Treated Effluent
General Process																													
pH			-		Certified Lab	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Weekly
Conductivity	µmhom/cm	900[1]	-		Certified Lab	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Weekly	-	-	-	-
Odor	TON	3[1]	-		Field Test	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Monthly
Alkalinity	mg/L as $CaCO_3$		-		Certified Lab	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Monthly
Total Hardness	mg/L as $CaCO_3$		-		Certified Lab	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Monthly
Aggressiveness Index			-		Certified Lab	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Monthly
Langlier Index			-		Certified Lab	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Monthly
Inorganics																													
Iron	µg/L	300[1]	-		Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	-	-	-	-	Weekly	-	-	Weekly	-	-	-	-	-	Monthly
Manganese	µg/L	50[1]	-		Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	-	-	-	-	Weekly	-	-	Weekly	-	-	-	-	-	Monthly
Chlorine Residual	mg/L		-		Field Test	-	-	-	-	-	-	-	-	-	-	-	-	Daily	-	-	-	-	-	-	-	-	-	-	-
Combined Chlorine	mg/L		-		Field Test	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Daily
Fluoride	mg/L	2	-		Certified Lab	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Every six months	-	Weekends and Holidays
Nitrate	mg/L as N	10	-	EPA 353.2	Certified Lab	Quarterly	Quarterly	Quarterly	Annually	Annually	Annually	Annually	Annually	Quarterly	Quarterly	-	Monthly	-	Monthly	-	-	Monthly[4]	-	-	-	-	-	-	Monthly
TDS	mg/L	500[1]	-		Certified Lab	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Monthly
Sulfate	mg/L	250[1]	-		Certified Lab	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Monthly	-	-	-	Monthly
Bacteriological																													
Total Coliform	P/A		-		Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	-	Weekly	-	-	-	-	-	Monthly	-	-	-	-	-	Monthly
HPC	cfu/ml		-		Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	-	Weekly	-	-	-	-	-	Monthly	-	-	-	-	-	Monthly
Radionucleides																													
Uranium	pCi/L	20	-		Certified Lab	-	-	-	-	Quarterly	-	-	-	-	-	-	-	-	-	-	-	-	-	Quarterly	Quarterly	-	-	-	Quarterly
VOCs																													
1,1-Dichloroethane	µg/L	5	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	Monthly	-	-	Weekly	-	Quarterly	Weekly	Weekly	-	Weekly	Weekly
1,1-Dichloroethylene	µg/L	6	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	Monthly	-	Weekly	Weekly	-	Quarterly	Weekly	Weekly	-	Weekly	Weekly
1,2,3-Trichloropropane	µg/L	0.005	-	SRL 524M-TCP	Certified Lab	Monthly	Monthly	Monthly	-	-	-	-	-	-	-	-	-	-	Monthly	-	-	Weekly	-	Quarterly	Weekly	Weekly	-	Weekly	Weekly
1,4-Dioxane	µg/L	-	1	EPA 522	Certified Lab	Monthly	Monthly	Monthly	Annually	Annually	Annually	Annually	Annually	Annually	Annually	-	-	-	Monthly	-	Weekly	Weekly	-	Quarterly	Weekly	Weekly	-	Weekly	Weekly
Carbon Tetrachloride	µg/L	0.5	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	Monthly	-	-	Weekly	-	Quarterly	Weekly	Weekly	-	Weekly	Weekly
Cis-1,2-Dichloroethylene	µg/L	6	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	Monthly	-	Weekly	Weekly	-	Quarterly	Weekly	Weekly	-	Weekly	Weekly
Tetrachloroethylene	µg/L	5	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	Monthly	-	Weekly	Weekly	-	Quarterly	Weekly	Weekly	-	Weekly	Weekly
Trichloroethylene	µg/L	5	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	Monthly	-	Weekly	Weekly	-	Quarterly	Weekly	Weekly	-	Weekly	Weekly
1,1,2-Trichloroethane	µg/L	5	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	-	-	-	-	-	-	-	-	-	-	Monthly	-	-	Weekly	-	Quarterly	Weekly	Weekly	-	Weekly	Monthly
1,2-Dichloroethane	µg/L	0.5	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	Monthly	-	-	Weekly	-	Quarterly	Weekly	Weekly	-	Weekly	Monthly
Benzene	µg/L	1	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	Monthly	-	-	Weekly	-	Quarterly	Weekly	Weekly	-	Weekly	Monthly
Methyl tert-Butyl Ether	µg/L	13	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	Monthly	-	-	Weekly	-	Quarterly	Weekly	Weekly	-	Weekly	Monthly
Perfluorooctanoic acid	µg/L	-	5.1	EPA 537.1	Certified Lab	Monthly	Monthly	Monthly	-	-	-	-	-	-	-	-	-	-	Monthly	-	-	Weekly	-	Quarterly	Weekly	-	-		Monthly
Trans-1,2-Dichloroethylene	µg/L	10	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	Monthly	-	-	Weekly	-	Quarterly	Weekly	Weekly	-	Weekly	Monthly
Vinyl Chloride	µg/L	0.5	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	Monthly	-	-	Weekly	-	Quarterly	Weekly	Weekly	-	Weekly	Monthly
Methylene Chloride	µg/L	5	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	-	-	-	-	-	Quarterly	-	Weekly	-	Weekly	Weekly
Diisopropyl Ether	-	-	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	-	-	-	-	-	Quarterly	-	Weekly	-	Weekly	Weekly
Ethyl tert-Butyl Ether	-	-	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	-	-	-	-	-	Quarterly	-	Weekly	-	Weekly	Weekly
Chloroform	-	-	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	-	-	-	-	-	Quarterly	-	Weekly	-	Weekly	Weekly
1,1,1-Trichloroethane	µg/L	200	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	-	-	-	-	-	Quarterly	-	Weekly	-	Weekly	Weekly
tert-Amyl Methyl Ether	-	-	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	-	-	-	-	-	Quarterly	-	Weekly	-	Weekly	Weekly
Bromodichloromethane	-	-	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	-	-	-	-	-	Quarterly	-	Weekly	-	Weekly	Weekly
Toluene	µg/L	150	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	-	-	-	-	-	Quarterly	-	Weekly	-	Weekly	Weekly
Dibromochloromethane	-	-	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	-	-	-	-	-	Quarterly	-	Weekly	-	Weekly	Weekly
Ethylbenzene	µg/L	300	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	-	-	-	-	-	Quarterly	-	Weekly	-	Weekly	Weekly
m&p-Xylene	µg/L	1750	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	-	-	-	-	-	Quarterly	-	Weekly	-	Weekly	Weekly
o-Xylene	-	-	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	-	-	-	-	-	Quarterly	-	Weekly	-	Weekly	Weekly
Bromoform	-	-	-	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly	Weekly	Weekly	-	-	-	-	-	Quarterly	-	Weekly	-	Weekly	Weekly
tert-Butyl Alcohol	µg/L	-	12	EPA 524.2	Certified Lab	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Quarterly	Quarterly	Monthly[6]	Weekly[6]	Weekly[6]	-	-	-	-	-	Quarterly[6]	-	Weekly[6]	-	Weekly[6]	Weekly[6]

1. Secondary MCL
2. See Charnock GAC Filters monthly monitoring form spreadsheet for individual GAC filter monitoring requirements.

4. Sample 1 lead vessel following return to service.
5. For VOCs listed as quarterly frequency, VOCs detected at the source, at concentrations greater than the DLR, but less than the MCL or NL are analyzed quarterly; the frequency is increased to monthly for all VOCs detected at levels greater than the MCL or NL.
6. Collect sample only If MTBE is detected at any of the Charnock Wells.

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Table 3-3. Flow Measurement

Process	Flow Measurement
Olympic Greensand Filter Influent	Totalized in SCADA from flow meters on individual Olympic Well Field effluent lines
Olympic Greensand Filter Effluent/UV/H_2O_2 AOP Influent	Flowmeter on UV/H_2O_2 AOP influent line
UV/H_2O_2 AOP Effluent/GAC Influent	Flowmeter on UV/H_2O_2 AOP influent line
GAC Effluent/RO Feed Tank Influent	Totalized in SCADA from flow meters on GAC system
Contact Basin Influent	Flowmeter on contact basin influent line
Contact Basin Effluent/Non-Olympic Greensand Filter Influent	Totalized in SCADA from flow meters on individual non-Olympic greensand filter influent lines
Non-Olympic Greensand Filter Effluent/RO Feed Tank Influent	Totalized in SCADA from flow meters on individual non-Olympic greensand filter effluent lines
RO Feed Tank Effluent/Cartridge Filter Influent	Totalized in SCADA from flow meters on RO permeate, RO concentrate, and RO bypass lines
Cartridge Filter Effluent/RO Train Influent	Totalized in SCADA from flow meters on RO permeate, RO concentrate, and RO bypass lines
RO Bypass	Flowmeter on RO bypass line
RO Train Effluent/Decarbonator Influent	Totalized in SCADA from flow meters on individual RO train permeate lines
Decarbonator Effluent Tank Effluent/Reservoir Influent	Flowmeter on reservoir influent line

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Table 3-4. Online Water Quality Monitoring for Operational Control and Compliance

Parameter	Point of Monitoring and/or Compliance (Refer to Figure 3-1)	Monitoring Location	Type/Frequency of Measurement	Acceptable Operation Standard
Chlorine residual	A	Contact tank influent	Online[c] chlorine analyzers	Chlorine within target setpoint range
Chlorine residual turbidity	B	Contact tank effluent	Online[c] chlorine and turbidity analyzers	Chlorine within target setpoint range Turbidity monitored for information purposes
Chlorine residual turbidity	C	Olympic greensand filter influent	Online[c] chlorine and turbidity analyzers	Chlorine within target setpoint range Turbidity monitored for information purposes
Turbidity	D	Charnock-Arcadia blend greensand filter effluent	Online[c] turbidity analyzer	Indicate potential performance issues with greensand filters, indicator for backwash
Chlorine residual	E	Charnock-Arcadia blend greensand filter effluent	Online[c] chlorine analyzer	Chlorine below maximum setpoint
Turbidity	F	Olympic greensand filter effluent	Online[c] turbidity analyzer	Indicate potential performance issues with greensand filters, indicator for backwash
UVT, pH, flow[a]	G	UV/H_2O_2 influent	Online[c] UVT and pH analyzers and flowmeter	Parameters are within permitted range (UVT, flow) pH may be used based on startup testing results
UV lamp status and intensity	H	UV system control center	Online[c]	Lamps on UV lamp intensity above required minimum value
Chlorine residual	I	GAC effluent	Online[c] chlorine analyzer	No free chlorine
Chlorine residual	J	RO feed tank effluent (upstream of sulfuric acid injection)	Online[c] chlorine analyzer	No free chlorine
Ammonia and monochloramine residual, and chlorine to ammonia N ratio	K	RO feed tank effluent (downstream of sulfuric acid injection)	Online[c] ammonia, monochloramine, and chlorine-to-ammonia-N ratio analyzer	Ammonia, monochloramine and chlorine-to-ammonia-N ratio within setpoint range
Turbidity	L	Cartridge filter influent	Online[c] turbidity analyzer	For informational purposes
ORP, temperature, pH, conductivity, turbidity, chlorine residual	M	Cartridge filter effluent	Online[c] ORP, temperature, pH, conductivity, turbidity, and chlorine analyzers	Within specified operating range (used for manual off-spec monitoring if RO train water quality is off)
ORP, chlorine residual, conductivity, pH	N	RO Trains[d]	Online[c] ORP, chlorine residual, conductivity, and pH analyzers	Parameters are within the setpoint range
pH	O	CIP system	Online[c] pH and temperature analyzers	Temperature and pH within target range

Table 3-4. Online Water Quality Monitoring for Operational Control and Compliance

Parameter	Point of Monitoring and/or Compliance (Refer to Figure 3-1)	Monitoring Location	Type/Frequency of Measurement	Acceptable Operation Standard
Temperature, pH, fluoride, turbidity, conductivity, free ammonia residual, monochloramine residual	P	Decarbonator effluent tank effluent	Online[c] temperature, pH, fluoride, turbidity, conductivity, free ammonia, and monochloramine analyzers	Within the setpoint range
Chlorine residual, pH, temperature	Q	Reservoir effluent to 350’ zone	Online[c] chlorine, pH and temperature analyzers	Residual and pH within target setpoints; temperature for informational purposes
Chlorine residual, pH, temperature	R	Reservoir effluent to 250’ and 500’ zone	Online[c] chlorine, pH, and temperature analyzers	Residual and pH within target setpoints; temperature for informational purposes

NOTE: Final version will use PS codes system.

a. Flow rate is not a water quality parameter but is included here for completeness as it is a control parameter used for monitoring UV dose delivery

b. If Future Wells are added in the future, are included in this blend.

c. Online analyzer provides continuous monitoring.

d. ORP and chlorine residual analyzers provided for combined inlet to the RO system. Conductivity and pH analyzers provided for individual RO trains. Weekly conductivity profiles will also be collected for individual RO trains.

3.1.4 Industrial Waste Discharge

Samples are collected semi-annually at the designated sample point to verify greensand filter backwash, GAC backwash, and off-spec water complies with the City of Los Angeles Industrial Waste Permit. Samples are collected every two months at the designated sample point to verify RO concentrate complies with the City of Santa Monica Industrial Waste Permit. Industrial waste discharge sampling procedures and techniques will not be modified by the expansion project. Discharge limitations, monitoring, and reporting for both sewer systems are outlined in the Industrial Waste Permits provided in Attachment E.

3.2 Sampling Procedures and Sampling Techniques

3.2.1 Sampling Methods

Proper sample collection procedures are essential to ensure that representative and reliable data are collected. Samples will be collected in accordance with sample collection SOPs. The QA/QC procedures will be fulfilled by adhering to all requirements detailed here and in the sampling SOPs, and adherence will be demonstrated through appropriate documentation of sampling procedures within the field logbook and field sheets as described herein.

The following general procedures will be followed during sample collection:

- Samples will be collected into laboratory-supplied sampling containers.
- Samples will be collected using the specified equipment and methods necessary to obtain a sample that is representative of the given sampling station.
- Field quality control samples will be collected.
- Samples will be handled carefully to minimize exposure to external influences such as wind, dust, or rain.
- Sample bottles will be labeled with a minimum of date, time of collection, sample identification, preservative information, filtered or unfiltered, and the sampler’s initials.
- Sampling date and time and the sampler’s initials will be added to the COPC form immediately after sampling.
- If problems occur during sampling, it will be notes. The source of the problem will be identified, and the appropriate corrective action taken. These incidents will be documented in the monitoring reports. If the problem compromises the quality of collected data, the data will be flagged within the database.

3.2.2 Sample Handling and Custody

Once sample containers have been filled, they will be labeled, placed in re-sealable plastic bags, and stored in a cooler on ice. Identification information for each sample will be recorded on the appropriate field data sheet at the time of sample collection. COPC forms are to be completed immediately after sample collection and before the samples are released to another individual or organization.

The samples shall be transported or shipped to the analytical lab in insulated containers to arrive within the appropriate holding time and temperature for the specified analyses and will be accompanied by a COPC form that identifies the sample bottles, date and time of sample collection, and analyses requested. If shipment is needed, the samples will be packaged with custody seals and shipped in accordance with U.S. Department of Transportation standards.

The original COPC form will be given to the lab with the samples, and the monitoring contractor will retain a copy in the project files. Once received by the laboratory, a sample receipt and storage record will be generated.

3.2.3 Analytical Methods

All sample containers, labels, and preservatives will be obtained from the analytical laboratory, laboratory supplier, or laboratory equipment provider. Samples must be preserved and analyzed within the holding times. The laboratory will be notified prior to sample shipment to ensure the holding time is not exceeded. All sample collection and preparation instructions provided by the analytical laboratory will be followed throughout the duration of each project.

Samplers are responsible for ensuring that laboratory QC is performed in accordance with the specified method and the procedures contained in the QAPP.

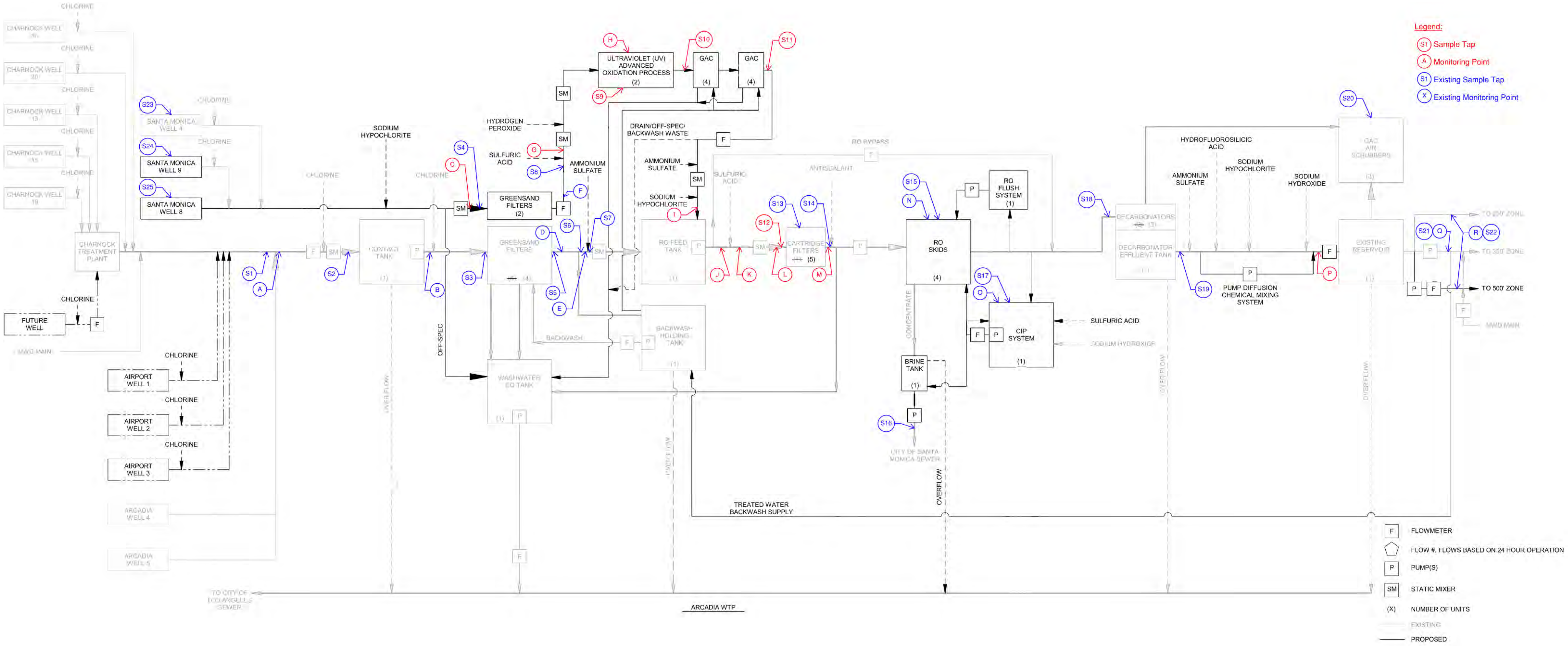

Figure 3-1. Arcadia WTP sample collection, flowmeters and monitoring instrument(s) locations

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3.3 Laboratory Analysis

Lab testing of the collected samples is performed for the 15 COPCs and nitrate. Samples collected as part of this monitoring program are analyzed using United States Environmental Protection Agency (EPA) Method 8760. Table 3-5 provides the analytical method for each COPC. Proposed water quality and quantity reporting forms are included in Attachment F.

Table 3-5. Test Method for COPCs

Contaminant	Test Method
1,1-DCA	EPA 524.2
1,1-DCE	EPA 524.2
1,2,3-TCP	SRL 524M-TCP[a]
1,4-D	EPA 522[b]
Carbon tetrachloride	EPA 524.2
Cis-1,2-DCE	EPA 524.2
PCE	EPA 524.2
TCE	EPA 524.2
1,1,2-Trichloroethane	EPA 524.2
1,2-Dichloroethane	EPA 524.2
Benzene	EPA 524.2
MTBE	EPA 524.2
PFOA	EPA 537.1
Trans-1,2-Dichloroethylene	EPA 524.2
Vinyl chloride	EPA 524.2
Nitrate	EPA 353.2

a. *Additional analysis conducted since EPA Method 8760 laboratory method reporting limits for 1,2,3-TCP is above the MCL of 0.005 µg/L.*

b. *Additional analysis conducted since EPA Method 8760 laboratory method reporting limits for 1,4-D is above the NL of 1 µg/L.*

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Section 4

Reporting and Records

4.1 Reporting Procedure

Operational and maintenance records are necessary to document treatment settings and performance, such that future evaluations can use historical data. Operational data from the monitoring instruments are collected automatically through the SCADA system and generated into electronic reports. Maintenance records are documented and include the date, time, duration of the procedure, and outcomes. In accordance with all requirements, the City provides reports and records of past, current, and projected operational information pertaining to the Arcadia WTP to DDW.

The following monitoring records are retained for a time as directed by DDW:

- Sampling location, date, and time
- Name(s) of individual(s) performing the sampling
- Analytical results
- Analytical methods/techniques used
- Date of the analyses
- Name of laboratory conducting the analyses with its Environmental Laboratory Accreditation Program (ELAP) certification documentation
- Documentation of QA/QC, including chain of custody

4.2 Operating and Monitoring Records

Table 3-3 summarizes operations and monitoring data that are automatically collected by the SCADA system and generated into electronic reports. Manual records are documented in an operations log book and note the date, time, duration of the procedure, and outcomes. Manual records are required for operations tasks such as:

- Draining of main process tanks for cleaning, inspection, or maintenance of equipment
- Draining and disposal of rainwater and chemical spills at chemical containments areas
- Clearing and disposal of debris and oil accumulated in the storm water interceptors

4.3 Unintended or Incidental Waste

Dedicated drains are provided for the chemical containment areas and truck drainage aprons to route any drips or leaks to separate collection drains and sumps. Dedicated hazardous waste handling tanker truckers will properly dispose of the spilled chemicals offsite.

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Section 5

Limitations

This document was prepared solely for the City of Santa Monica, Department of Public Works – Water Resources Division in accordance with professional standards at the time the services were performed and in accordance with the contract between the City of Santa Monica and Walsh Construction, dated March 20, 2020, from which BC maintains a subcontract for engineering services. This document is governed by the specific scope of work authorized by City of Santa Monica; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work.

BC exercised independent professional judgement in relying on the material provided to them by the City and did not solely rely upon the City's representations relating to design concepts to design the project.

All data, drawings, documents, or information contained within this report have been prepared exclusively for the person or entity to whom it was addressed and may not be relied upon by any other person or entity without the prior written consent of Walsh Construction and/or Brown and Caldwell unless otherwise provided by the Agreement pursuant to which these services were provided.

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Section 6

References

Advisian, 2019. 97-005 Raw Water Characterization Sampling and Analysis Work Plan, City of Santa Monica.

Advisian and ICF, 2021. Full Raw Water Quality Characterization Step 2 of 97-005 Evaluation, City of Santa Monica.

Black and Veatch, 2009. Charnock Wellfield Restoration Project Operations Plan – Charnock, City of Santa Monica.

Brown and Caldwell, 2021 Draft Step 4 Report -- Olympic Well Field Effective Treatment and Monitoring, City of Santa Monica, 2021.

Division of Drinking Water, Process Memo 97-005 – Revised Guidance for Direct Domestic Use of Extremely Impaired Sources, Division of Drinking Water, 2020.

ICF 2020. Olympic Well Field Drinking Water Source Assessment and Contaminant Assessment Report, City of Santa Monica.

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Attachment A: DDW Amended Water Supply Permit

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State of California—Health and Human Services Agency
California Department of Public Health

CDPH

Ron Chapman, MD, MPH
Director & State Health Officer

EDMUND G. BROWN JR.
Governor

February 27, 2014

Gilbert Borboa Jr., P.E.
Water Resources Manager
City of Santa Monica
1212 Fifth Street, 3rd Floor
Santa Monica, CA 90401

Dear Mr. Borboa:

SYSTEM NO. 1910146 – CITY OF SANTA MONICA (CITY)
AMENDED PERMIT 1910146PA-003 (REVISED)
CHARNOCK WELL FIELD RESTORATION PROJECT AND CHARNOCK WELL 20

I am pleased to forward a **revision** of your amended domestic water supply permit for the City's Charnock Well Field Restoration Project and the permit to operate Charnock Well 20 issued by the Department on December 12, 2012. The Charnock Well Field Restoration Project includes the activation of five Charnock wells, Charnock Water Treatment Facility with granular activated carbon (GAC) for the removal of VOCs, the associated improvements at the Arcadia Water Treatment Facility, addition of Reverse Osmosis softening system, and implementation of chloramination and fluoridation treatments. This packet includes the revised Permit Amendment and the accompanying Engineering Report on which the permit amendment is founded.

Please acknowledge receipt of this permit and your willingness to comply with the permit provisions in writing within 15 days. If you have any questions regarding the document, please contact Ms. Milagros Alora at (818) 551-2026.

Sincerely,

Sutida Bergquist

Sutida Bergquist, P.E.
District Engineer
Central District

Enclosure

Southern California Drinking Water Field Operations Branch, Southern California Section
500 North Central Ave., Suite 500, Glendale, CA 91203
Telephone: (818)551-2004 Fax: (818)551-2054
Internet Address: www.cdph.ca.gov

cc: Myriam Cardenas
Assistant Manager
City Of Santa Monica - Water Division
1228 S. Bundy Drive
Los Angeles, CA 90025

G. Borboa

Los Angeles County
System No. 1910146

August 22, 2016

California Department of
PublicHealth
Drinking Water Field Operations
Southern California Branch

PERMIT AMENDMENT 1910146PA-004

City of Santa Monica-Water Division

Los Angeles County
System No. 1910146

August 22, 2016

CALIFORNIA
Water Boards

STATE WATER RESOURCES CONTROL BOARD
DIVISION OF DRINKING WATER

CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

State Water Resources Control Board
Division of Drinking Water

August 22, 2016

Gilbert Borboa Jr., P.E.
Water Resources Manager
City of Santa Monica
1212 Fifth Street, 3rd Floor
Santa Monica, CA 90401

Dear Mr. Borboa:

SYSTEM NO. 1910146 – PERMIT AMENDMENT NO. 1910146PA-004

Enclosed please find a copy of the Domestic Water Supply Permit Amendment 1910146PA-004 for operating the fluoridation facilities at the City of Santa Monica – Water Division at the revised optimal fluoride level of 0.7 mg/L. This permit action is due to the US Department of Health and Human Services Agency's decision to revise the recommended level of fluoride for community water fluoridation from temperature dependent range of 0.7 to 1.2 mg/L to an optimal fluoride level of 0.7 mg/L in April 2015. Section 116525 of California Health and Safety Code authorizes the Division of Drinking Water (Division) to amend a permit whenever the Division deems it necessary for the protection of public health, whether or not an application has been filed.

According to HHS, sources of fluoride have increased since the early 1960s. At that time, nearly all fluoride intakes came from drinking water and from food and from beverages prepared with fluoridated water. Today, water is one of several sources of fluoride. Other sources include dental products such as toothpaste and mouth rinses, prescription fluoride supplements, and professionally applied fluoride products such as varnish and gels. HHS concluded that it is now possible to receive enough fluoride with slightly lower amount of fluoride in water.

In September 2010, HHS convened a federal interdepartmental, interagency panel of scientists to review scientific evidence relevant to the 1962 Drinking Water Standards for fluoride concentrations in drinking water in the United States and to update these recommendations based on current science. The federal panel evaluated recent systematic reviews of fluoride in drinking water to prevent dental caries, as well as published reports about the epidemiology of dental caries and fluorosis in the United States and the relationship of these conditions with varying water fluoridation concentrations. Dental fluorosis is the only unwanted health effect of community water fluoridation. It is a change in the appearance of the dental enamel that occurs in children whose teeth are forming under the gums. The risk of dental fluorosis increases as children ingest higher levels of fluoride. The most common impact of fluorosis is faint white spots on teeth that usually only a dental professional would notice.

The panel also reviewed existing recommendations for fluoride in drinking water and newer data on the relationship between water intake in children and outdoor air temperature in the United States - a relationship that had served as the basis for the 1962 recommendations. The panel recommended the optimal fluoride concentration in drinking water for prevention of dental caries in the United State to be reduced to 0.7 mg/L, based on the following information:

- Community water fluoridation remains an effective public health strategy for delivering fluoride to prevent tooth decay and is the most feasible and cost-effective strategy for reaching the entire communities.
- In addition to drinking water, other sources of fluoride exposure have contributed to the prevention of dental caries and an increase in dental fluorosis prevalence.
- Caries preventive benefits can be achieved and the risk of dental fluorosis reduced at 0.7 mg/L.
- Recent data do not show a convincing relationship between water intake and outdoor air temperature. Thus, recommendations for water fluoride concentrations that differ based on outdoor temperature are unnecessary.

The Division will be developing amendments to the California Code of Regulations to incorporate the new HHS recommendation. To maintain the benefit of fluoridation while minimizing the chances that children develop dental fluorosis, the Division has determined that water systems practicing fluoridation should adjust the targeted fluoride level to match with the revised optimal fluoride level recommended by HHS immediately.

Please acknowledge receipt of this permit amendment and your willingness to comply with the permit conditions in writing within 15 days. If you have any questions, please contact Milagros Alora at (818) 551-2026.

Sincerely,

Sutida Bergquist, P.E.
District Engineer
Central District

Enclosure: Permit Amendment No. 1910146PA-004

PERMIT AMENDMENT 1910146PA-004

City of Santa Monica-Water Division

Los Angeles County
System No. 1910146

August 22, 2016

CALIFORNIA
Water Boards

STATE WATER RESOURCES CONTROL BOARD
DIVISION OF DRINKING WATER

State Water Resources Control Board
Drinking Water Field Operations Branch

PERMIT AMENDMENT 1910146PA-004

City of Santa Monica – Water Division

Los Angeles County

System No. 1910146

August 22, 2016

STATE OF CALIFORNIA

AMENDMENT TO THE

DOMESTIC WATER SUPPLY PERMIT ISSUED TO

City of Santa Monica – Water Division

Public Water System Number–1910146

ORIGINAL PERMIT: *Not Numbered*	DATE OF ISSUE: *03/22/1966*
PERMIT AMENDMENT: *03-89-000*	EFFECTIVE DATE: *08/21/1989*
PERMIT AMENDMENT: *04-16-02PA-000*	EFFECTIVE DATE: *05/15/2002*
PERMIT AMENDMENT: *1910146PA-001*	EFFECTIVE DATE: *04/09/2004*
	CORRECTED: *01/20/2005*
PERMIT AMENDMENT: *1910146PA-002*	EFFECTIVE DATE: *12/03/2007*
PERMIT AMENDMENT: *1910146PA-003*	EFFECTIVE DATE: *12/12/2012*
PERMIT AMENDMENT: *1910146PA-003-Revised*	EFFECTIVE DATE: *02/27/2014*
PERMIT AMENDMENT: *1910146PA-004*	**EFFECTIVE DATE: *08/22/2016***

WHEREAS:

I. On December 3, 2007 and February 27, 2014, two permit amendments were issued to the ***City of Santa Monica – Water Division (hereinafter, City)***, for the City to operate the fluoridation system at the Well 1 Station (1910146PA-002) and at the Arcadia Treatment Plant (1910146PA-003) respectively. The permit amendments prescribed the temperature-dependent optimal fluoride level and control range.

II. On April 27, 2015, the US Department of Health and Human Services Agency (hereinafter, HHS) announced its decision to revise the recommended level of fluoride for community water fluoridation from temperature dependent range of 0.7 to 1.2 mg/L to an optimal fluoride level of 0.7 mg/L.

III. Section 116525 of the California Health and Safety Code authorizes the ***Division of Drinking Water of the State Water Resources Control Board (hereinafter, the Division)*** to amend a permit whenever the Division deems it necessary for the protection of public health, whether or not an application has been filed.

IV. The purpose of this amendment is to allow the ***City*** to make the following modification to the public water system:

Adjust the target fluoride level for the Arcadia Treatment Plant and the Well 1 Station to match the revised optimal fluoride level of 0.7 mg/L recommended by HHS.

THEREFORE:

I. The Domestic Water Supply Permit issued to the City on **February 27, 2014** is hereby amended as follows:

The fluoridation addition at the Arcadia Treatment Plant and Well 1 Station are approved treatment, with the optimal fluoride level of 0.7 mg/L.

II. This permit amendment is subject to the following conditions:

General

1. This document amends and adds to the domestic water supply permit issued to the City on March 22, 1966 and five subsequent permit amendments issued on August 21, 1989, May 15, 2002, January 20, 2005, December 3, 2007 and February 27, 2014. If any condition of this amendment conflicts with the permit and the subsequent amendments, the conditions of this amendment shall be followed.

2. The City shall comply with all the requirements set forth in the California Safe Drinking Water Act, California Health and Safety Code, and any regulations, standards or orders adopted thereunder.

3. The only approved sources of domestic water supply are listed in Tables 1 and 2. The only treatment facilities approved and permitted for the City's sources are listed in Table 3. Primary Station Codes (PS Codes) are provided in each table.

TABLE 1: Approved Groundwater Sources

Sources	Status	PS Code	Capacity (gpm)	Drilled
Charnock Well 13	Active	1910146-005	1,900	
Charnock Well 16	Active	1910146-008	2,098	
Charnock Well 18	Active	1910146-010	1,800	
Charnock Well 19	Active	1910146-011	2,000	
Charnock Well 20	Active	1910146-073	1,400	
Arcadia Well 4	Active	1910146-003	250	
Arcadia Well 5	Active	1910146-001	300	
Santa Monica Well 1	Active	1910146-012	250	
Santa Monica Well 3	Active	1910146-015	850	

Sources	Status	PS Code	Capacity (gpm)	Drilled
Santa Monica Well 4	Active	1910146-017	1,200	

TABLE 2: Interconnections

Supplier	Location	Capacity	Status	PS Code
MWD SMN-1	Western Terminus of the Santa Monica Feeder at Arcadia Water Treatment Facility	19.4 MGD	Active	1910146-024
MWD SMN-2	Western Terminus of the Culver City Feeder at Charnock Water Treatment Facility	15 MGD	Active	1910146-025

TABLE 3: Treatment Facility and Classification

Treatment Facility	Process		Sources	Treatment Facility Classification
Charnock Water Treatment Facility (CWTF)	Greensand Filtration (pre-treatment) and Granular Activated Carbon (GAC) treatment		Charnock Well 13 Charnock Well 19 Charnock Well 20	T3
	Blending	> 60%(Charnock Wells 13, 19, & 20) < 40%(Charnock Wells16 & 18)	GAC effluent water Charnock Well 16 Charnock Well 18	
Arcadia Water Treatment Facility (AWTF)	Greensand Filtration, Reverse Osmosis, Decarbonation, Mechanical Surface Aeration (MSA), Fluoridation, and Chloramination		CWTF effluent Arcadia Well 4 Arcadia Well 5 Santa Monica Well 3 Santa Monica Well 4	T4
Santa Monica Well 1 Fluoridation System	Fluoridation and Chlorination		Santa Monica Well 1	T1

4. No additions, changes or modifications to the sources of water supply or water treatment processes outlined in Provision 3 shall be made without prior receipt of an amended domestic water supply permit from the Division.

Water Quality

5. All water produced, treated and distributed by the City for domestic use shall meet the Maximum Contaminant Levels (MCLs) established by the Division. If the water quality does not comply with the California Drinking Water Standards, treatment shall be provided to meet standards. The plans and specifications for

the proposed treatment facilities shall be submitted to the Division for review and approval prior to construction.

7. The City shall monitor the groundwater source listed in Table 1 in accordance with Title 22, Chapter 15, California Code of Regulations and the Division's most recent Vulnerability Assessment and Monitoring Frequency Guidelines.

8. Except for bacteriological analyses and constituents without chemical storet numbers, all water quality monitoring results obtained at a certified laboratory shall be submitted to the Division by Electronic Data Transfer using the appropriate Primary Station (PS) Codes listed in Table 1 for sources and Table 3 for treatment facilities. Analytical results of all sample analyses completed in a calendar month shall be reported to the Division no later than the tenth day of the following month.

Operator Certifications

9. All treatment facilities shall be operated by personnel who have been certified in accordance with the regulations relating to Certification of Water Treatment Facility Operation, California Code of Regulations (CCR), Title 22. The treatment facility classifications are listed in Table 3. The chief and shift operators for the CWTF shall have a minimum of T3 and T2 certifications, respectively. The chief and shift operators for the AWTF shall have a minimum of T4 and T3 certifications, respectively. The treatment plant classification for the fluoridation and chlorination treatment for the Santa Monica Well 1 is T1.

Cross-Connection Control Program

10. The City shall maintain an active cross-connection control program in accordance with the California Code of Regulations (CCR) to prevent the water system and treatment facilities from contamination as a result of cross-connections. All cross-connections shall be abated within 30 days of their identification. Annual cross-connection surveys shall be conducted. Backflow prevention devices shall be tested at least annually.

Direct Additives

11. The City shall only use additives that have been tested and certified as meeting the specification of American National Standard Institute/National Sanitation Foundation (ANSI/NSF) Standard 60. This requirement shall be met under testing conducted by a product certification organization accredited by the ANSI for this purpose.

Indirect Additives

12. The City shall only use chemicals, materials, lubricants, or products that have been tested and certified as meeting the specification of ANSI/NSF Standard 61 in

the production, treatment or distribution of drinking water that will result in its contact with the drinking water, including process media, protection materials (i.e. coating, linings, liners), joining and sealing materials, pipe and related products, and mechanical devices used in treatment/transmission/distribution system, unless conditions listed in Section 64593, Title 22, CCR are met. This requirement shall be met under testing conducted by a product certification organization accredited by the ANSI for this purpose.

Chloramination

13. Except for the service area supplied by Santa Monica Well 1, the water supplied by the City contains chloramines. The public served chloraminated water by the City including dialyses centers shall be periodically notified that chloramines are used to disinfect the water. Notification shall be repeated yearly in the City's consumer confidence report to the consumers.

Fluoridation Operations

14. The City shall operate its fluoridation facilities in accordance with the most recent, Division-approved Operations, Maintenance, and Monitoring Plan (OMMP) for the Arcadia Treatment Facility and Santa Monica Well 1 Station. All additions, deletions, or amendments to the OMMP shall be approved by the Division prior to implementation. The City is responsible for ensuring that the OMMP, at all times, is representative of the operations, maintenance, and monitoring of the facility and appropriate changes to the OMMP are submitted to the Division for approval in a timely manner.

15. The City shall comply with the most recent, Division approved Contingency Plan.

16. The City shall adjust fluoride dosing rate to achieve an optimal fluoride level of 0.7 mg/L in the distribution system.

17. At least one daily fluoride sample shall be taken at downstream of the fluoride injection point at each site to verify the accuracy of the metering pumps and SCADA calculation.

18. The City shall calibrate the fluoride probe analyzer prior to sample analysis with the factory standard solutions. The City shall also compare the readings from the fluoride probe analyzer with the split samples analyzed with a certified lab at least once every month.

19. Alarm set points and automatic shutdown features shall be tested regularly to ensure proper function.

20. The City shall maintain and calibrate all fluoridation treatment equipment and instrument according to methods and frequencies recommended by the manufacturer. Records of instrument calibrations shall be maintained by the City for at least five years, and made available to the Division when requested.

21. The City shall analyze raw water sample from the Santa Monica Well 1 for fluoride level at the frequency of no less than annually.

22. By the tenth day of each month following the month being reported, the City shall submit operational reports to the Division. The monthly reports shall include:

    - Daily total volume of water treated, total volume of fluoride compounds used, and the calculated fluoride dose in mg/L;
    - Information on any interruptions in the fluoridation treatment which may have occurred during the month including the duration of the interruptions, an explanation of causes, and what corrective actions were taken to insure that fluoridation treatment was resumed in a timely manner;
    - The results of the daily monitoring for fluoride in the water distribution system, reported in terms of daily results and the number of samples collected; and
    - The results of monthly split sample(s) analyzed by a certified laboratory.

23. **Within 90 days** of receipt of this permit amendment, the City shall submit to the Division an updated Operations Plan to reflect the changes in the optimal fluoride level and the control range, including the changes of alarm set points.

24. The City shall notify Los Angeles County Department of Public Health and consumers, pharmacists, dentists, and physicians in the area served by the City whenever fluoridation treatment is suspended for more than 90 days or reinitiated after a suspension of more than 90 days. However, if the suspension of the use of the one or more City's fluoridation facilities does not cause the level of fluoride being served to the consumers to be outside the control range, no notification is required.

25. If a fluoride overfeed exceeding 10.0 mg/L occurs, the City shall notify the Division by the end of the business day of the occurrence or within 24 hours if the Division office is closed.

26. The City shall notify the Division within three business days if the fluoride level in the distribution system is found to be less than the control range in two or more water samples in a month, or if the fluoride level in the distribution system is found to be 0.1 mg/L or more above the control range, up to 10.0 mg/L.

27. The City shall submit an annual report to the Division on the operation and maintenance costs of fluoridation treatment incurred during the fiscal year (July 1 to June 30) for the previous year to the Division by August 1.

This amendment shall be appended to and shall be considered to be an integral part of the Domestic Water Supply Permit issued to the ***City of Santa Monica – Water Division*** on ***March 22, 1966.***

FOR THE DIVISION OF DRINKING WATER

August 22, 2016
Date

Sutida Bergquist, P.E.
District Engineer
Centra District
Southern California Section

California Department of Public Health
Drinking Water Field Operations Branch

PERMIT AMENDMENT 1910146PA-003 (Revised)

CITY OF SANTA MONICA WATER DIVISION

Los Angeles County

System No. 1910146

February 27, 2014

STATE OF CALIFORNIA

AMENDMENT TO THE DOMESTIC WATER SUPPLY PERMIT ISSUED TO

City of Santa Monica - Water Division

Public Water System – 1910146

ORIGINAL PERMIT:	***Not Numbered***	DATE OF ISSUE:	***03/22/66***
PERMIT AMENDMENT:	***03-89-000***	EFFECTIVE DATE:	***08/21/89***
PERMIT AMENDMENT:	***04-16-02PA-000***	EFFECTIVE DATE:	***05/15/02***
PERMIT AMENDMENT:	***1910146PA-001***	EFFECTIVE DATE:	***04/09/04***
		CORRECTED:	***01/20/05***
PERMIT AMENDMENT:	***1910146PA-002***	EFFECTIVE DATE:	***12/03/07***
PERMIT AMENDMENT:	***1910146PA-003***	EFFECTIVE DATE:	***12/12/12***
PERMIT AMENDMENT:	***1910146PA-003-Revised***	EFFECTIVE DATE:	***02/27/14***

WHEREAS:

I. The ***City of Santa Monica Water Division (hereinafter, City)*** submitted two applications to the California Department of Public Health on ***March 31, 2010 and April 11, 2012*** for an amendment to the Domestic Water Supply Permit issued to the ***City*** on ***March 22, 1966.***

II. The purpose of the amendment, is to allow the ***City*** to make the following modifications to the public water system:

The permit amendment application dated March 31, 2010 requested to amend the existing water supply permit for the City to reactivate Charnock Wells 13, 15, 16, 18, and 19. Charnock Wells 13, 15, and 19 are provided with GAC treatment. The amendment includes the associated Arcadia Water Treatment Facility improvements comprising of reverse osmosis softening, chloramination and fluoridation systems.

The permit amendment application received on April 11, 2012 indicated the City's intent to abandon Charnock Well 15 and to construct and operate a replacement well named Charnock Well 20.

III. ***The City*** has submitted all of the supporting information required to evaluate the application.

IV. The ***California Department of Public Health (hereinafter, Department)*** has evaluated the application and the supporting material and has determined that the proposed modifications comply with all applicable State drinking water requirements.

THEREFORE:

I. The Department hereby approves the application submitted by the ***City*** for a permit amendment. The Domestic Water Supply Permit issued to the ***City*** on ***March 22, 1966*** is hereby amended as follows:

The City may operate Charnock wells 13, 16, 18, 19, and 20. GAC treatment shall be provided at all the times for Charnock Wells 13, 19, and 20. The City may also operate the associated Arcadia Water Treatment Facility improvements including reverse osmosis, chloramination and fluoridation.

II. This permit amendment is subject to the following conditions:

GENERAL

1. This document amends and adds to the domestic water supply permit issued to the City by the Department on March 22, 1966. If any provision(s) of this amendment conflicts with the previously issued permit, the provisions of this amendment shall govern.

2. The City shall comply with all the requirements set forth in the California Safe Drinking Water Act, California Health and Safety Code and any regulations, standards, or orders adopted thereunder.

3. All water treated and produced by the City shall meet the Maximum Contaminant Levels (MCLs) established by the Department. If the water supplied to the system is determined to exceed any standard, additional treatment shall be provided to bring the water into compliance with the standards.

4. The City's only approved sources for potable supply are those listed in Tables 1 and 2. The Primary Station Codes (PS Codes) associated with the sources are provided in these tables. The only treatment facilities approved and permitted for the City's sources are listed in Table 3.

TABLE 1: Sources

Sources	Status	PS Code	Capacity (gpm)
Charnock Well 13	Active	1910146-005	1,900
Charnock Well 16	Active	1910146-008	2,098
Charnock Well 18	Active	1910146-010	1,800
Charnock Well 19	Active	1910146-011	2,000
Charnock Well 20	Active	1910146-073	1,400
Arcadia Well 4	Active	1910146-003	250
Arcadia Well 5	Active	1910146-001	300
Santa Monica Well 1	Active	1910146-012	250
Santa Monica Well 3	Active	1910146-015	850
Santa Monica Well 4	Active	1910146-017	1,200

TABLE 2: Interconnections

Supplier	Location	Capacity	Status	PS Code
MWD	SMN-1 Western Terminus of the Santa Monica Feeder at Arcadia Water Treatment Facility	19.4 MGD	Active	1910146-024
MWD	SMN-2 Western Terminus of the Culver City Feeder at Charnock Water Treatment Facility	15 MGD	Active	1910146-025

TABLE 3: Treatment Facility and Classification

Treatment Facility	Process		Sources	Treatment Facility Classification
Charnock Water Treatment Facility (CWTF)	Greensand Filtration (pre-treatment) and Granular Activated Carbon (GAC) treatment		Charnock Well 13 Charnock Well 19 Charnock Well 20	T3
	Blending	> 60%(Charnock Wells 13, 19, & 20) < 40%(Charnock Wells16 & 18)	GAC effluent water Charnock Well 16 Charnock Well 18	
Arcadia Water Treatment Facility (AWTF)	Greensand Filtration, Reverse Osmosis, Decarbonation, Mechanical Surface Aeration (MSA), Fluoridation, and Chloramination		CWTF effluent Arcadia Well 4 Arcadia Well 5 Santa Monica Well 3 Santa Monica Well 4	T4
Santa Monica Well 1 Fluoridation System	Fluoridation and Chlorination		Santa Monica Well 1	T1

5. No additions, changes or modifications to the sources of water supply or water treatment facilities outlined in Provision 4 shall be made without prior receipt of an amended domestic water supply permit from the Department.

6. All groundwater wells listed in Provision 4 shall be monitored in accordance with regulations contained in Title 22, California Code of Regulations (CCR), and the most recent Vulnerability Assessment and Monitoring Frequency Guidelines. All results shall be submitted to the Department electronically.

7. All sources listed in listed in Condition 4 shall be monitored in accordance with Title 22, Chapter 15, California Code of Regulation (CCR) and the Department's Vulnerability Assessment and Monitoring Frequency Guidelines.

8. All treatment facilities shall be operated by personnel who have been certified in accordance with the regulations relating to Certification of Water Treatment Facility Operation, California Code of Regulations (CCR), Title 22. The treatment plant

classification for the CWTF is T3. The chief and shift operators for the CWTF shall have a minimum of T3 and T2 certifications, respectively. The treatment plant classification for the AWTF is T4. The chief and shift operators for the AWTF shall have a minimum of T4 and T3 certifications, respectively. The treatment plant classification for the fluoridation and chlorination treatment for the Santa Monica Well 1 is T1.

9. Pursuant to Section 64590, Title 22, CCR, no chemical or product shall be added to drinking water as a part of the treatment process unless it has been certified as meeting the specifications of American National Standard Institute/National Sanitation Foundation (ANSI/NSF) Standard 60.

10. The City shall only use chemicals, materials, lubricants, or products that have been tested and certified as meeting the specifications of ANSI/NSF Standard 61 in the production, treatment or distribution of drinking water that will result in its contact with the drinking water, including process media, protection materials (i.e. coating, linings, liners), joining and sealing materials, pipe and related products, and mechanical devices used in treatment/transmission/distribution system, unless conditions listed in Section 64593, Title 22, CCR are met. This requirement shall be met under testing conducted by a product certification organization accredited for this purpose by ANSI.

11. Except for the service area supplied by Santa Monica Well 1, the water supplied by the City contains chloramines. The public served chloraminated water by the City including the dialyses centers, shall be periodically notified that chloramines are used to disinfect the water. The notification shall be repeated yearly in the City's consumer confidence report to the consumers.

12. The City shall comply with requirements of Title 17, Title 22, CCR, to prevent the water system and all treatment facilities from being contaminated by possible cross-connections. The City shall maintain a program for the protection of the domestic water system against backflow from premises having dual or unsafe water systems in accordance with Title 17. All backflow prevention devices shall be tested annually.

CHARNOCK WATER TREATMENT FACILITY (CWTF)

Charnock Well 20

13. Prior to using Charnock Well 20, the City shall disinfect the well in accordance with the AWWA standards and bacteriological samples including HPCs shall be collected. The results shall be absent for total coliforms with HPCs below 500 cfu/mL. All results shall be submitted to the Department for review and approval before the well is placed into service.

14. The City shall provide a retaining wall and a drain system on the north side of the Charnock Well 20 to divert surface runoff away from the well.

15. In November 2012 Charnock Well 20 replaced Charnock Well 15 in the City's Charnock Water Treatment Facility operations. The City shall submit a copy of the destruction permit and reports for Charnock Well 15 to the Department upon completion.

Granular Activated Carbon (GAC)

16. Charnock Wells 13, 19, and 20 shall not operate without the GAC treatment.

17. The CWTF shall be operated such that more than 60% of the total flow rate of the Charnock wells is GAC treated and drawn from Charnock Wells 13, 19, and 20 .

18. The CWTF GAC shall be operated in two-stage series mode of five trains in a parallel configuration at a maximum capacity of 3,750 gpm. Each train of GAC shall not be operated above its design capacity of 750 gpm.

19. The activated carbon in a designated lead vessel shall be replaced when breakthrough of any VOCs is detected at levels greater than 50 percent of the MCL in any water sample collected at the effluent of the lead vessel, and the lag vessel shall be placed in the lead position. The activated carbon in the lead vessel in a series shall also be replaced and the lag vessel shall be placed in the lead when any VOCs is detected greater than the DLR. For MTBE, detection in the lag vessel of greater than 1.0 ppb will trigger the activated carbon in the lead vessel to be replaced. A limit of 3 ppb for TBA is imposed for water leaving the CWTP at all times.

20. Virgin carbon that is NSF 61 certified for use as drinking water system shall be initially used for all GAC beds. Virgin carbon of similar characteristics, such as size and iodine number, shall be used to augment the original volume.

21. A plan shall be submitted to the Department for approval prior to any use of reactivated carbon. If any carbon in the vessels is to be replaced with reactivated carbon rather than virgin carbon, the carbon shall be NSF Standard 61 certified and tested for adsorptive capacity before use. The adsorptive capacity of the reactivated carbon shall be at least 80 percent of the baseline value.

22. Department's approval will be required if and when the need arises to operate Charnock Wells 16 and 18 with GAC treatment.

23. The treated effluent concentration goal of the CWTF shall be below the detection limit for reporting (DLRs) for MTBE and TBA at all times.

24. Water leaving the CWTF shall be pumped directly to the AWTF for further treatment.

Monitoring

25. The City shall complete the initial radiological monitoring requirement for the Charnock wells by collecting four consecutive quarterly samples for the analyses of gross alpha, uranium, radium 226, and radium 228. Future monitoring requirements will be determined once the initial monitoring requirements are met.

26. The Charnock wells shall be sampled in accordance with the raw water monitoring schedule outlined in the approved Operations, Monitoring, and Maintenance Plan (OMMP). The City shall revise its raw water monitoring plan if:

    - Additional chemicals are detected in the early warning monitoring wells that may affect the quality of water produced by the Charnock Wells,
    - New chemicals are detected in the Charnock Wells,
    - The monitoring data indicating a rapid change in a contaminant's concentrations warrants more frequent monitoring.

27. Prior to proceeding with the requirements for further monitoring following the initial detection of a chemical, the City may first confirm the analytical result, as follows: Within seven days from the notification of an initial detection from a laboratory reporting the presence of one or more chemicals in a water sample, the City shall collect one or two additional samples to confirm the initial finding. Confirmation of the initial finding shall be shown by the presence of the chemical in either the first or second additional sample, and the detected level of the contaminant for compliance purposes, if applicable, shall be the average of the initial and the confirmation samples. The initial finding shall be disregarded if two additional samples do not show the presence of the chemical.

28. The City shall comply with any additional monitoring and treatment requirements the Department deems necessary based on any newly identified constituents. If necessary, the Department may modify the monitoring provisions specified herein based on additional information. The City may request a modification of any monitoring provision based upon substantiating data at any time.

29. All analyses for compliance purposes shall be performed by a laboratory certified by the Environmental Laboratory Accreditation Program (ELAP) of the State Department of Public Health for the specific analytical procedure and analytical results shall be submitted through electronic data transfer (EDT) using PS Codes.

30. The City shall be responsible for and require timely notification from the laboratory by e-mail, telephone or fax of analytical results.

31. When operating the Charnock Water Treatment Facility, the City shall monitor for constituents listed in Tables 4 and 5.

CHARNOCK WATER TREATMENT FACILITY (CWTF)

TABLE 4: CWTF Sampling Points

Sampling Point	PS Code	Parameter	Frequency	Analysis
Charnock Well 13	1910146-005	VOCs, TBA*, Manganese, Iron, Coliforms and HPCs	Monthly	Certified Lab
		Nitrate	Annually	
		1,4-Dioxane	Annually	
Charnock Well 19	1910146-011	VOCs, TBA*, Manganese, Iron, Coliforms and HPCs	Monthly	Certified Lab
		Nitrate	Annually	
		Uranium	Quarterly	
		1,4-Dioxane	Annually	
Charnock Well 20	1910146-073	VOCs, TBA*, Manganese, Iron, Coliforms and HPCs	Monthly	Certified Lab
		Nitrate	Annually	
		1,4-Dioxane	Annually	
CH- Raw Water Equalization Tank Effluent	1910146-034	VOCs, TBA*	Monthly	Certified Lab

Sampling Point	PS Code	Parameter	Frequency	Analysis
Charnock Well 16	1910146-008	VOCs, TBA*, Manganese, Iron, Coliforms and HPCs Nitrate 1,4-Dioxane	Monthly Annually Annually	Certified Lab
Charnock Well 18	1910146-010	VOCs, TBA*, Manganese, Iron, Coliforms and HPCs Nitrate 1,4-Dioxane	Monthly Annually Annually	Certified Lab
CWTF effluent water (blended) CH-Filtered Water Tank Outlet	1910146-066	VOCs, TBA* Total Chlorine Residual	Weekly Daily	Certified Lab Field Test

TABLE 5: CWTF GAC Sampling Points

Sampling Point		PS Code	Parameter	Frequency	Analysis
CH-GAC <u>Lead Vessel</u> 41% port	1A	1910146-035	VOCs,TBA*	Monthly until VOCs are detected; then, sample 73% port	Certified Lab
	1B	1910146-038			
	2A	1910146-041			
	2B	1910146-044			
	3A	1910146-047			
	3B	1910146-050			
	4A	1910146-053			
	4B	1910146-056			
	5A	1910146-059			
	5B	1910146-062			
CH-GAC <u>Lead Vessel</u> 73% port	1A	1910146-036	VOCs,TBA*	To confirm immediately after VOCs are detected at 41% port. Monthly until VOCs are detected; then, sample vessel effluent.	Certified Lab
	1B	1910146-039			
	2A	1910146-042			
	2B	1910146-045			
	3A	1910146-048			
	3B	1910146-051			
	4A	1910146-054			
	4B	1910146-057			
	5A	1910146-060			
	5B	1910146-063			
CH-GAC Vessel Effluent Port	1A	1910146-037	VOCs, TBA* Coliforms HPCs	<u>As Lead vessel,</u> immediately after VOCs are detected at 73% port, then weekly thereafter. When 50% MCL is reached, make lag vessel as lead and change spent	Certified Lab
	1B	1910146-040			
	2A	1910146-043			
	2B	1910146-046			
	3A	1910146-049			
	3B	1910146-052			

Sampling Point		PS Code	Parameter	Frequency	Analysis
CH-GAC Vessel Effluent Port	4A	1910146-055		carbon from vessel. As <u>Lag Vessel,</u> test for VOC when either is detected at the combined GAC effluent (1910146-065) Test all vessels for coliform bacteria and HPC when either total coliform is positive or there is sudden significant rise in bacterial count at the combined GAC effluent (PS Code 1910146-065).	
	4B	1910146-058			
	5A	1910146-061			
	5B	1910146-064			
Combined GAC Effluent		1910146-065	VOCs	Weekly	Certified Lab
			TBA*	Weekly	Certified Lab
			Nitrate	Monthly	Certified Lab
CH-Combined GAC Outlet			Coliforms	Weekly	Certified Lab
			HPCs	Weekly	Certified Lab

* Collect sample if MTBE is detected at any of the Charnock wells.

<u>Early Warning Monitoring Wells</u>

32. The early warning monitoring wells shall be sampled and analyzed for a wide range of organic and inorganic contaminants, including reporting of unknown peaks and tentatively identified compounds (TICs) and in accordance to the sampling and analysis procedures for extremely impaired sources. A copy of these records shall be available to the Department upon request.

33. After one full year of operation under this permit, the City shall prepare an annual report to the Department, which shall provide an evaluation and technical review of the water quality data gathered from the early warning monitoring wells and discuss any changes in the characteristics of the plume and the possible impact on the Charnock Water Treatment Facility.

ARCADIA WATER TREATMENT FACILITY (AWTF)

34. The AWTF shall operate at a maximum capacity of 10 MGD inclusive of the CWTF effluent, Arcadia Wells 4 and 5, and Santa Monica Wells 3 and 4.

35. Water leaving the AWTF shall comply with all the primary and secondary Maximum Contaminant Levels (MCLs) and the Notification Levels (NL) established by the Department at all times. If the water quality does not comply with the California Drinking Water Standards, the City shall not use the water from the AWTF until the exceedance is remedied or additional treatment is provided to meet standards.

36. At all times the flow through the existing Mechanical Surface Aeration (MSA) system shall not exceed 10,000 gpm capacity.

37. The existing MSA system at the AWTF shall not be bypassed at any time the water is to be used for drinking purposes.

38. Blending shall be optimized at the 5-MG reservoir such that the concentration goal of 1,4-dioxane at the effluent is below the notification level. The City must ensure that sources with the lowest concentration of 1,4-dioxane go online prior to Santa Monica Wells 3 and 4.

39. All water entering the distribution system from AWTF shall be continuously and reliably disinfected. The total chlorine residual shall be measured daily at the effluent of the existing 5-MG Arcadia Reservoir.

Greensand Filtration (For CWTF and AWTF)

40. The design filter surface loading rate is 3.3 gpm/ft^2 and 3.0 gpm/ ft^2 for CWTF and AWTF, respectively.

41. The filtration plant shall be in operation when the wells that exceed the iron and manganese SMCL are in service.

42. The City shall at all times properly operate and maintain the filtration treatment plant at the CWTF and AWTF to achieve compliance with the secondary standards for iron and manganese.

Reverse Osmosis (RO)

43. The City shall at all times operate the RO system at the AWTF not exceeding the design feed water flow rate of 1,900 gpm per train with flux rates not to exceed 14 gallons per square foot per day.

44. The City shall operate the RO system over a recovery range of 70 to 85 percent. The bypass flow shall not exceed 30 percent of the total flow.

Fluoridation (AWTF and Santa Monica Well 1)

45. The City shall adjust fluoride levels to achieve an optimal fluoride level of 0.8 mg/L at the AWTF and at the Santa Monica Well 01 fluoridation station effluents with a control range of 0.7 mg/L to 1.3 mg/L. The optimal fluoride levels should be adjusted as determined based on the procedures described in Section 64433.2 of Title 22, CCR, using the annual average of maximum daily air temperatures based on the five calendar years immediately preceding the current calendar year.

46. The City shall operate its fluoridation facilities in accordance with the most recent, Department-approved Fluoridation Operations and Contingency Plan for the Arcadia Treatment Facility and Santa Monica Well 1 Stations.

47. The City shall maintain daily operational records for the fluoridation treatment including total volume of water treated, total volume of fluoride compounds used, and the calculated dosage fed each day. A copy of these records shall be available to the Department upon request. A monthly report with results of compliance monitoring and a description of any unusual occurrences shall be submitted to the Department by the 10th day of each month following the month being reported.

48. The City shall compare readings from the fluoride analyzers with the split samples analyzed with a certified laboratory at least once every month.

49. At least one daily fluoride sample shall be taken at downstream of the fluoride injection point at each site to verify the accuracy of the metering pumps and SCADA calculation.

50. The City shall analyze raw water sample from the Santa Monica Well 1 for fluoride level at the frequency of no less than annually.

51. By August 1, the City shall submit an annual report to the Department on the operation and maintenance costs of fluoridation treatment incurred during the fiscal year (July 1 to June 30) for the previous year.

Monitoring

52. When operating the Arcadia Water Treatment Facility, the City shall monitor for constituents listed in Table 6.

ARCADIA WATER TREATMENT FACILITY (AWTF)

TABLE 6: AWTF Sampling Points

Sampling Point	PS Code	Parameter	Frequency	Analysis
Santa Monica Well 3	1910146-015	VOCs > MCL Nitrate Total Coliform & HPC 1) 1,4-Dioxane	Quarterly 2) and/or Monthly 3) Quarterly Monthly Quarterly	Certified Lab
Santa Monica Well 4	1910146-017	VOCs > MCL Nitrate Total Coliform & HPC 1) 1,4-Dioxane	Quarterly 2) and/or Monthly 3) Quarterly Monthly Quarterly	Certified Lab
Arcadia Well 5 / Arcadia Well 4 *(Arcadia wells operate one well at a time)*	1910146-001 / 1910146-003	VOCs > MCL, MTBE & TBA Nitrate Iron and Manganese Total Coliform & HPC 1)	Quarterly 2) and/or Monthly 3) Quarterly Quarterly Monthly	Certified Lab
Arcadia Filter Plant Effluent ARC-Combined Filtrate	1910146-067	Iron & Manganese Coliform HPC Turbidity	Weekly Monthly Monthly Continuous	Certified Lab Online Analyzer
Cartridge Filter Combined Effluent ARC-Combined Cartridge Filter Outlet	1910146-068	VOC TBA* Uranium Conductivity pH (process control for RO)	Quarterly Quarterly Quarterly Continuous Continuous	Certified Lab Online Analyzer Online Analyzer

Sampling Point	PS Code	Parameter	Frequency	Analysis
Arcadia RO Combined Effluent before Bypass ARC-Combined RO Permeate	1910146-069	Uranium Conductivity Sulfate 1,4-Dioxane	Quarterly Weekly Monthly Quarterly	Certified Lab
Arcadia Decarbonator Influent	1910146-072	VOC TBA*	Weekly Weekly	Certified Lab
Fluoride Pre-Injection ARC – Decarbonator Tank Effluent	1910146-074	Fluoride	Every six months	Certified Lab
Arcadia RO Effluent and Bypass Water ARC- Reservoir Influent	1910146-070	VOC TBA*	Weekly	Certified Lab
AWTF Treated Effluent Arcadia TP-Treated	1910146-071	VOCs TBA* Nitrate Iron Manganese Sulfate Odor Fluoride Uranium pH Alkalinity Total Hardness TDS Combined Chlorine Total Coliform HPC Aggressive Index Langelier Index @ 60^0C 1,4-Dioxane	Weekly Monthly Monthly Monthly Monthly Monthly Weekends&Holidays Quarterly Weekly Monthly Monthly Monthly Daily Monthly Monthly Monthly Monthly Quarterly	Certified Lab

*Collect sample if MTBE is detected at any of the Charnock wells.

[1] **HPC** – If either total coliform is present or significant rise in bacterial count in the routine and confirmation samples, it is advisable to remove the well(s) from service and have it disinfected. The well(s) shall be tested for and found free of bacteriological contamination prior to resuming as the domestic source.

[2] **Quarterly** – VOCs detected at the source, at concentrations greater than DLR, but less than MCL are analyzed quarterly; the frequency is increased to monthly for all VOCs detected at the levels greater than MCL.

[3] **Monthly** – VOCs detected at the source at concentrations greater than MCLs are analyzed monthly; the frequency is reduced to quarterly when the VOC is detected greater than DLR but less than MCL in at least six subsequent monthly samples.

OPERATIONS AND MAINTENANCE FOR CHARNOCK WATER TREATMENT FACILITIES, (TABLE 3)

53. The status of the production wells shall be recorded daily, and the treatment facilities shall be inspected daily for any abnormal occurrences including, but not limited to, leaks, unusual noises, or pressure readings. A checklist of items to be examined shall be filled out daily and maintained for a minimum of five years.

54. The City shall minimize system downtime by working with the carbon supplier(s) to arrange for timely carbon change out. However, if the system must be shut down and if the shutdown lasts over two weeks, the vessels shall be drained and filled with water from the filtered water tank. The procedures recommended by the manufacturer shall be followed. When the vessels are started up again, bacteriological samples shall be collected and the carbon beds shall be checked to see if a disinfection of carbon bed is required. Once the disinfection is completed, the vessel shall be backwashed prior to startup.

55. All treatment systems shall be maintained according to the manufacturer's specifications.

56. All instruments, including but not limited to, chemical analyzers and flow meters, shall be calibrated at the frequencies and by the methods recommended by their respective manufacturers. Records for all instrument calibrations shall be maintained by the City for at least five years, and made available to the Department when requested.

57. Sampling ports for the wells, GAC vessels, filter vessels, RO vessels, decarbonators, fluoridation, and the reservoirs' inlets/outlets shall be maintained in good operating condition.

58. The City shall revise the Charnock Operations Plan and the Arcadia Operations Report dated December 2009 to include, but not limited to: water quality monitoring for compliance and operational control, reporting, and maintenance plan. The revised documents will be the City's OMMP as referred to in this permit. The OMMP shall be submitted within **90 days of receipt of this permit** for Department's review and approval.

59. Except as specified, the City shall operate the treatment facilities in accordance with the most recent Department-approved OMMP.. All additions, deletions, or amendments to the OMMP shall be approved by the Department prior to implementation. The City is responsible for ensuring that the OMMP is, at all times, representative of the operations, maintenance, and monitoring of the treatment plant, and appropriate changes to the OMMP are submitted to the Department for approval in a timely manner.

60. All plant operators and supervisory personnel involved with the operation or oversight of the operations at the treatment facilities shall have a copy and shall be familiar with the OMMP and the conditions of this letter, and the provisions of all valid permits previously issued to the City. A copy of the OMMP shall be maintained at the treatment complex offices for reference.

61. Personnel should be available at all times (on duty or on call) to respond to emergencies, including nights weekends, and holidays.

62. A monthly performance report of each treatment facility shall be submitted to the Department by the 10th day of the following month. As a minimum, the report shall include:

- A summary of analytical results, bacteriological and chemical, received by the City in the reporting calendar month.
- A summary of all contaminants in the early warning monitoring wells, the GAC vessels' combined effluent, the filter vessels' combined effluent, the RO combined effluent, and the AWTF 5-MG reservoir effluent detected at or above MCLs or NLs.
- A summary of the wells' operational schedules, noting problems, scheduled interruptions, unscheduled interruptions, and repairs made with the facilities.
- The daily operational records, including as a minimum, flow rates, total volume treated, chlorine measurements, operational changes and unusual occurrences.

63. Within **90 days from the date of this permit,** the City shall submit a technical performance report describing the CWTF and AWTF performance after one full year of operation that was required under Provision 48 of Department Approval Letter (Charnock Well Field Restoration Project) dated October 29, 2010. The report shall include, but not be limited to: compliance with all permit provisions, the treatment plant's status, condition, and performance; a table noting dates and concentrations of each contaminant detected in the plant's effluent and the corresponding source concentrations; and a summary of all operational changes and the reasons for such changes.

64. The City should maintain "as built" plans of the water treatment system at the treatment facilities and be made available upon Department's request.

This amendment shall be appended to and shall be considered to be an integral part of the Domestic Water Supply Permit issued to the ***City of Santa Monica – Water Division*** on ***March 22, 1966.***

FOR THE CALIFORNIA DEPARTMENT OF PUBLIC HEALTH

Sutida Bergquist

Date

Sutida Bergquist, P.E., District Engineer
Central District
Los Angeles

Engineering Report

For Consideration of the Amended Permit Application from

THE CITY OF SANTA MONICA – WATER DIVISION

February 27, 2014

Southern California Branch
Drinking Water Field Operations
State Department of Health Services

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1. INTRODUCTION

1.1 PURPOSE OF THE REPORT

On April 5, 2010 the Department received from the City of Santa Monica (City) a permit amendment application dated March 31, 2010 (Appendix A) to amend its existing water supply permit to include reactivation of five Charnock production wells with GAC treatment and the associated improvements to the Arcadia Water Treatment Facility comprising of Greensand Filtration, Reverse Osmosis, Chloramination, and Fluoridation treatments. The GAC treatment is intended to remove methyl tertiary-butyl ether (MTBE) and tertiary butyl alcohol (TBA) in the Charnock's production wells. Additional treatments at the Arcadia Water Treatment Facility provide additional safety barriers. Water produced at the Charnock well field flows to the Arcadia Water Treatment Facility prior to distribution. There are no customers between the Charnock and Arcadia treatment facilities.

The City's goal in undertaking the Charnock well field Restoration Project to fully restore local groundwater supplies is to reduce dependency on imported water and meet sustainability. Majority of the City's groundwater production comes from the Charnock well field. The shutdown of the well field in 1996 due to MTBE contamination prompted the City to increase MWD purchased water to approximately 85 percent of its total water demand. The restoration of the Charnock well field allows the City to provide water from its local source. The Charnock well field currently consists of five active production wells namely: Charnock Well 13 (CH-13), Charnock Well 19 (CH-19), Charnock Well 16 (CH-16), Charnock Well 18 (CH-18), and Charnock Well 20 (CH-20). All documents submitted for the review and approval of this project included Charnock Well 15 that was later abandoned in November 2012 and replaced by the new Charnock Well 20. Charnock Well 15 will be destroyed to accommodate the athletic field expansion of Winward High School.

Due to the nature of the contamination, this report is prepared in accordance with the Department of Public Health (CDPH) Policy Memorandum No. 97-005 entitled "Guidance for Direct Domestic Use of Extremely Impaired Sources" (97-005), see Appendix B. The purpose of this report is to document the engineering review, evaluate the proposed design and operation of domestic wells CH-13, CH16, CH18, CH19, and CH-20, the Charnock and Arcadia Water Treatment Facilities' plans and appurtenances, and to make recommendations regarding the issuance of an amendment to the system's domestic water supply permit.

1.2 BACKGROUND AND BRIEF DESCRIPTION OF THE SYSTEM

The City currently operates its water system under a domestic water supply permit issued by the Department on March 22, 1966 and four subsequent amendments issued by the Department after. The permit history and status of each permit are summarized in the following table:

Table 1.2: Permit History

Issue Date	**Permit Number**	**Permit Type**	**Description**
March 22, 1966	NA		Original Permit
August 21, 1989	03-89-000	Amendment	Addition of three new wells; Santa Monica Well 2A, Arcadia Well 5, Charnock Well 19
July 1992	NA	Approval Letter	Addition of Mechanical Surface Aeration (MSA) – VOC treatment inside the Arcadia 5-MG reservoir
May 15, 2002	04-16-02PA-000	Amendment	Addition of the Arcadia GAC (PARS) Facility for Arcadia Wells 4 and 5 for VOC treatment
April 9, 2004 / January 20, 2005	1910146PA-001 / PA corrected	Amendment	Placing on standby the Arcadia GAC (PARS) Facility and changing status of Santa Monica Well 3 from inactive to active
December 3, 2007	1910146PA-002	Amendment	Addition of fluoridation treatment for Santa Monica Well 1
December 12, 2012	1910146PA-003	Amendment	Addition of the Charnock Water Treatment Facility (GAC) for Charnock wells for VOC treatment, upgrade of the Arcadia Water Treatment Facility, and addition of new Charnock Well 20 to replace Charnock Well 15.
February 27, 2014	**1910146PA-003**	**Revised**	**Revision to the Permit Amendment issued on 12/12/12**

The City is a community water system. According to the 2012 Annual Report to the Drinking Water Program, the City has a current population of 89,735 served through 17,964 active service connections. There are 13,929 residential, 2,352 commercial, and 582 connections for irrigation in agricultural and non-agricultural. The City is located in the West Los Angeles County and serves an eight square mile area bounded by the San Vicente Boulevard to the north, Dewey Street to the south, Centinela Avenue to the east, and the Pacific Ocean to the west. There are three pressure zones in the distribution system: 250-foot zone, 350-foot zone, and 500-foot zone. The City has a combined storage capacity of about 40.1 million gallons (MG) from four reservoirs. The service area, pressure zones, and water system schematic are included in the City's site map attached in Appendix C.

The City derives its groundwater supply from three sub-basins within the Santa Monica Groundwater Basin part of the Coastal Plain of Los Angeles County: the Charnock Sub-Basin, Arcadia Sub-Basin and Olympic Sub-Basin (Appendix D). The City has five wells in the Charnock Sub-Basin (Charnock Wells), two wells in the Arcadia Sub-Basin (Arcadia Wells), and three wells in the Olympic Sub-Basin (Santa Monica Wells). The Charnock well field is located within the City of Los Angeles.

In 1996, the Charnock and Arcadia wells were shut down due to MTBE contamination. The City's water demand was supplied by the three Santa Monica wells and two surface water connections with the MWD. Majority of the water supply was obtained from MWD.

The permit amendment issued on May 15, 2002, granted permission to reactivate the Arcadia wells (Arcadia Well 4 and Arcadia Well 5) with GAC treatment. The GAC treatment was installed at the Arcadia site. The project was called Production Aquifer Remediation System (PARS). The GAC was designed to remove MTBE and tertiary-butyl alcohol (TBA) from Arcadia Wells 4 and 5. In a permit amendment in 2004, the City was allowed to bypass the PARS treatment facility, thus placing the GAC (PARS) treatment in standby. This permit amendment was corrected in 2005 to update Santa Monica Well 3 status as an active source.

Department records show that since 2002, both Arcadia Well 4 and Arcadia Well 5 indicated results for VOCs below the detection levels. The Arcadia well field was impacted by the operation of the Mobil service station 18-LDM (Site), located at 12054 Wilshire Boulevard in Los Angeles, across an alley immediately north of the Arcadia well field. The post-remediation monitoring conducted for the Regional Water Quality Control Board (Board) reported that since 2006 the MTBE contamination in the groundwater aquifer has been mitigated. The Board terminated the cleanup and abatement order on September 15, 2009. All treatment units used for PARS were demolished in 2009.

The Charnock Water Treatment Facility (CWTF) is designed to remove MTBE and TBA from three of the five Charnock wells using GAC. The three southern wells are expected to capture the contamination when the well field starts in operation. Two northern Charnock wells are not anticipated to contain MTBE and TBA contamination, as long as the pumping scheme includes more than 60 percent of flow from the contaminated wells. This pumping configuration is based on previous investigations from groundwater modeling by GeoTrans and WorleyParsons. GAC treated water from the southern wells is combined with water from the northern wells and the resulting blend is transported to the Arcadia Water Treatment Facility (AWTF) to undergo further treatment with the City's other groundwater sources. The Charnock treated water received at the AWTF mixes with water from the City's two Arcadia wells and Santa Monica Wells 3 and 4 at the site.

The AWTF is located approximately five miles away from the Charnock well field. The City upgraded AWTF along with the treatment installations made at the CWTF. The AWTF provides redundancy to the extremely impaired source treatment process at the CWTF. Improvements made at the AWTF include the reverse osmosis (RO), greensand filtration, decarbonation, and fluoridation. The RO replaced the former ion exchange water softening system of the City intended to reduce the total hardness of its groundwater. The City's wells produce water that has calcium carbonate concentration above 500 mg/L. At this level of concentration is considered high-hardness water. With the facility upgrade, all former treatment units related to PARS were decommissioned in 2009. The mechanical surface aeration (MSA) installed in the 5-MG reservoir and its associated air scrubber are still intact.

The MSA has a treatment capacity of 14 million gallons (MG). The MSA was approved by the Department in July 1992 as a treatment to remove VOCs from the Santa Monica wells 3 and 4. Water produced from all of the City's wells except of Santa Monica Well 1 goes to the Arcadia treatment train and receives chemical treatment at the 5-MG reservoir influent prior to distribution. The Arcadia Water Treatment Facility being described in this permit is the same as the Santa Monica Water Treatment Plant (SMWTP) identified in other documents.

Santa Monica Well 1 feeds directly to the 350-foot pressure zone at 19th Street and San Vicente Boulevard after treatment. This is a stand-alone well that is provided with its own disinfection (chlorine pellets) and fluoridation treatments. The chlorine pellets feed directly into the well. The well accounts only three percent of the City's production.

There are two surface water connections with the Metropolitan Water District (MWD), designated as SMN-1 and SMN-2. The MWD SMN-1 is located at the Arcadia Water Treatment Facility downstream of the 5-MG reservoir. The connection feeds water directly to the 500-foot pressure zone through an 18-inch transmission water line. Water not immediately needed for demand in the 500 foot pressure zone is relieved to the 350 foot pressure zone through a 24 inch transmission main. The MWD SMN-2 is located at the CWTF. This connection feeds to the pipeline that conveys the treated Charnock water to the Arcadia Water Treatment Facility. MWD SMN-2 is now placed on standby and will be placed in service in the event of treatment shutdown at the CWTF and/or additional water is required. Water from MWD SMN-2 can also be used to fill the 5-MG Arcadia reservoir if needed. The MWD SMN-2 water feeds to the Charnock transmission line and directed to the reservoir bypassing the Arcadia treatment operations.

The City reports indicated that the MWD SMN-1 receives water from the MWD Jensen Water Treatment Plant (State Water Project) while the MWD SM-2 comes from the MWD Weymouth Water Treatment Plant treating blend of State Water Project water and Colorado River water. After the Department verification with MWD, it was explained that both connections have the capability of receiving water from both of the MWD treatment plants, either from the Jensen Water Treatment Plant or the Weymouth Water Treatment Plant depending on MWD's operation scheme. This was also confirmed by the City during the Arcadia Water Treatment Facility inspection in June 2012.

2. INVESTIGATION AND FINDINGS

The information used to prepare this report was gathered from the files of the Department's Los Angeles office of the Drinking Water Field Operations Branch (DWFOB), from the City staff, reports prepared by Environ, WorleyParsons Komex, and Black and Veatch. WorleyParsons Komex prepared the reports necessary for the 97-005 permitting process while Black and Veatch served as the engineering consultant and water treatment construction project manager for the Charnock and Arcadia treatment facilities.

On June 21, 2012 and June 27, 2012, Milagros Alora conducted field inspections of the CWTF and the Arcadia Water Treatment Facility respectively. During the inspections, Myriam Cardenas, Gary Richnick, and Josette Descalzo of the City provided relevant information.

The investigation, analysis, and preparation of this report were undertaken by Milagros Alora, Sanitary Engineer with the Central District. The report was reviewed by Grazyna Newton and approved by Sutida Bergquist, P.E., District Engineer.

2.1 CHARNOCK WELL FIELD

2.1.1 SITE BACKGROUND AND HISTORY

The Charnock well field is located within the City of Los Angeles. The site is approximately 470,000 square feet in area. It is bounded by Sawtelle Boulevard to the east, Westminster Avenue to the south, Butler Avenue to the west, and the Westwood Flood Control Channel (Westwood Channel) to the north. The land use is primarily residential within a quarter mile radius.

The Charnock well field property includes five production wells, MWD connection (SMN-2), a booster station, power substation, chemical treatment and storage, greensand filtration, GAC treatment, backwash treatment system, below-grade basins, and Windward High School facility. A portion of the property is leased by Windward High School since 1982.

In 1996 MTBE was detected in the City's groundwater wells at the Charnock and Arcadia well fields at levels above the then provisional action level (AL) of 35 ug/L set by the Department. Consequently, these wells were shut down immediately in the same year. The highest MTBE concentration from the Charnock well field was detected in a sample collected on March 15, 1996 from Well CH-19 is 610 ug/L. The presence of MTBE in the groundwater is caused by the release of gasoline to the soil from nearby gasoline service stations. MTBE was extensively used as a fuel additive in motor gasoline. Overtime, MTBE contamination can breakdown in groundwater to form Tertiary butyl alcohol (TBA). TBA has not been detected in the production wells. However, TBA has been detected in samples collected from surrounding regional monitoring wells.

In 1997 the Regional Water Quality Control Board (RWQCB) and the United States Environmental Protection Agency (USEPA) entered into a joint State and Federal response action to address MTBE contamination in the Charnock Sub-Basin Investigation area (Komex, 2003). Thirty two facilities were identified as potentially responsible parties (PRPs) in this effort. The list of facilities is included in the City's Source Water Assessment Report for the Charnock Wellfield Restoration Project (WorleyParsons 2009). This document also includes discussions of each facility status and water quality data.

Chevron, ExxonMobil, Shell, Thrifty Oil, Texaco, and Best California Gas took full responsibility for the MTBE contamination in the Charnock aquifer. The City entered into various settlement agreements with the oil companies and reached an agreement effective October 2006 in the restoration of the Charnock wells into operation including the monitoring of the Charnock regional monitoring wells being conducted by the City. Three oil companies (Shell, Chevron, and ExxonMobil) formed the Charnock Technical Advisory Group were involved in the settlement with the City.

Completion dates for Charnock wells according to the Well Data Sheets are as follows:

Charnock Well 13 – October 6, 1966
Charnock Well 16 - October 31, 1980
Charnock Well 18 - May 30, 1984
Charnock Well 19 - November 1, 1989
Charnock Well 20 – July 19, 2012

The following summarizes important dates as they relate to the Charnock well field site:

August 28, 1995 – MTBE detected from Charnock Well 13 at 95 ug/L
March 25, 1996 – MTBE levels increased to 610 ug/L from Charnock Well 19
June 13, 1996- shut down of Charnock wells due to MTBE contamination

1997- Regional Water Quality Control Board (RWQCB) and the United States Environmental Protection Agency (USEPA) entered into a joint State and Federal response action to address MTBE contamination in the Charnock Sub-Basin Investigation area (Komex, 2003).

Between 1997 and 1999, the RWQCB and the USEPA identified 32 facilities as potentially responsible parties (PRPs) (Komex, 2003).

Between 1997 and April 2000, the PRP group hired Geomatrix to perform the regional investigation, including regional well installation, groundwater monitoring, modeling and reporting.

Between July 2000 and July 2005, the PRP group hired Environ and Kennedy/Jenks to conduct regional groundwater monitoring, installation of additional regional monitoring wells and reporting.

Between October 2005 and October 2006, the City on behalf of the Charnock Engineering Committee hired Environ to continue regional groundwater monitoring and reporting.

November 1999, Shell Oil Company began operating a groundwater extraction and treatment system on Tuller Avenue south of Venice Boulevard. This system is extracting and treating shallow and deep groundwater from wells on both the west side and east side of the 405 freeway along with wells on and adjacent to an operating Shell gas station. This system, which has a treatment capacity of approximately 300 gallons per minute, increased its operations to approximately 450 gallons per minute as of January 2002. USEPA and the Regional Board have required periodic adjustments in the operation of this system in order to clean up the area around the Venice and Sepulveda intersection (USEPA, 2006).

Between 1997 and 2006, the City entered into various settlement agreements with Chevron, ExxonMobil, Shell, Thrifty Oil, Texaco and Best California Gas, in which the oil companies took full responsibility for the MTBE contamination in the Charnock Aquifer

December 17, 2003, the city of Santa Monica and some of the companies responsible for the MTBE contamination of the Charnock sub basin received court approval for a settlement under which the companies will fund construction and operation of a treatment plant at the City's Charnock well field.

February 21, 2006- The Charnock sub-basin has been identified by the Department as an extremely impaired source and subject to the 97-005 Policy.

December 2006, the City reached an agreement (effective October 2006) with the members of the Charnock Technical Advisory Group (CTAG), which was comprised of Shell, Chevron, and ExxonMobil, whereby the restoration of the Charnock well field to operational status, including monitoring of the Charnock regional monitoring wells.

After the December 2006 settlement between the City and the PRP group, the City assumed responsibility for the groundwater monitoring and reporting. In 2006, the City hired Environ to conduct semi-annual groundwater monitoring and reporting. Environ is currently conducting the semi-annual groundwater monitoring and reporting program.

Prior to the Charnock operation, the water quality data indicated that MTBE and TBA were not detected in Charnock wells. Studies predicted that the MTBE and TBA plume will migrate to the wells when the production wells start drawing water from the Silverado Aquifer.

2.1.2 GROUNDWATER CONTAMINATION

After the MTBE contamination finding in the Charnock aquifer, extensive groundwater monitoring, modeling and reporting were done to investigate and determine the extent of the plume. Regional monitoring wells were installed to monitor groundwater. Geomatrix was hired initially by the PRP to perform the regional investigation and Environ was later contracted to conduct the regional groundwater investigation. Environ continued the groundwater monitoring and reporting when the City assumed responsibility for the groundwater monitoring and reporting after the December 2006 settlement. Environ currently conducts the semi-annual groundwater monitoring and reporting program for the City. Groundwater monitoring consists of sampling and evaluation of the regional monitoring well network and reporting the results to the RWQCB. The groundwater samples are analyzed for TPH, VOCs and fuel oxygenates including MTBE and TBA; and some are analyzed for semi-volatile organic compounds and inorganics in addition. All monitoring results meet the standards set forth by the RWQCB. The contamination in the Charnock sub-basin is well documented. The MTBE and TBA plumes are well characterized as supported by almost 15 years of data from the regional monitoring wells and individual PRP sites. Fifty four regional monitoring wells were used evaluate the hydrogeology and the migration of MTBE and TBA plumes. Those sites identified to have leaking underground storage tanks (LUST) have their own network of monitoring wells to determine the nature and extent of impacts to the groundwater. Results are reported to the RWQCB and posted on the state Geotracker database. RWQCB is the lead agency for all of the individual source site cleanups.

Historically, the groundwater concerns in the Santa Monica Basin included TDS, nitrate, VOCs and MTBE. The Charnock Sub-basin is one of the several fault-block Sub-basins that make up the Santa Monica groundwater basin. There are two aquifers included in the Charnock sub-basin: the Shallow aquifer and the Silverado aquifer. The Silverado aquifer is the source of groundwater supply for the Charnock wells. The Silverado aquifer is divided into two zones: the Upper Silverado and the Lower Silverado. Investigations showed that the principal aquifers that are affected by the MTBE and TBA plumes are the Shallow and Upper Silverado aquifers. The Shallow aquifer begins at depths of 30 to 150 feet bgs while the Silverado Aquifer is present at depths from approximately 100 to 500 feet bgs. The Charnock wells are constructed with screens ranging from 200 to 455 feet below ground surface (bgs).

A summary of historical analytical results for fuel constituents from 1997 to 2009 is included in the 2009 quarterly regional groundwater monitoring report prepared by Environ (Appendix E). The following shows the historical maximum concentrations of MTBE and TBA in the contaminated aquifer.

Shallow Aquifer:

- MTBE at 7,600 ug/L sampled from RMW-16A on 7/28/2000
- TBA at 1,100 ug/L (estimated value) sampled from RMW-48 on 3/24/2003
- TBA at 910 ug/L sampled from RMW-10 on 1/10/2005 (highest in Jan 2008 @60 ug/L)

Upper Silverado Aquifer:

- MTBE at 17,000 ug/L sampled from RMW-14 on 7/30/1998 and 1/27/1999
- TBA at 5,100 ug/L (estimated value) sampled from RMW-6 on 3/26/2003
- TBA at 3,400 ug/L sampled from RMW-14 on 10/29/1998

In a letter by the Department dated February 21, 2006 (Appendix F), the City was informed that the Charnock sub-basin has been classified by the Department as an extremely impaired source and is subject to the Department Procedure Memorandum 97-005. The City hired WorleyParsons to assist in the preparation of documents necessary in the 97-005 permitting process. Black and Veatch was hired to do the water treatment design and construction at the Charnock and Arcadia facilities.

For Raw Water Quality Characterization, Black and Veatch (B&V) sampled the Charnock production wells in July and August 2008. Twelve regional monitoring wells sampled by Environ in July and September were chosen to represent varying distances from the well field. Six of the twelve monitoring wells represent the Shallow Aquifer and the remaining six represent the Upper Silverado Aquifer. The list of twelve regional monitoring wells and the rationale of selection is included in Section 3.1 of WorleyParsons' Raw Water Characterization dated June 2010 (on file). The following summarizes the highest concentrations in 2008 of MTBE and TBA in the Shallow and upper Silverado Aquifers:

Shallow Aquifer:

- MTBE at 9.4 ug/L sampled from RMW-55 on 7/29/2008
- MTBE at 7.3 ug/L sampled from RMW-10 on 7/29/2008
- TBA at 26 ug/L sampled from RMW-10 on 7/30/2008

Well RMW-10 is closer to the well field and is located approximately 750 feet south of the well field.

Upper Silverado Aquifer:

- MTBE at 93 ug/L sampled from RMW-19 on 7/28/2008
- TBA at 25 ug/L (estimated value) sampled from RMW-19 on 7/28/2008

Well RMW-19 is located approximately 1,900 feet south-southeast of the well field.

The configuration of the twelve regional monitoring wells with respect to the well field is illustrated in Appendix D Figures 4 and 5.
A comparison of previous results with the 2009 groundwater analytical results of fuel constituents of the above regional monitoring wells are summarized in the following table:

Table 2.1.2 A. Shallow Aquifer

Regional Monitoring Well	Chemical	Highest Detection in ug/L	2009
RMW-16A	MTBE	7,600 (7/28/2000)	<0.3
RMW-55	MTBE	9.4 (7/29/2008)	5.1
RMW-48	TBA	1,100J* (3/24/2003)	<3.5
RMW-10	TBA	910 (1/10/2005)	10J*

*J - estimate

Table 2.1.2.B Upper Silverado Aquifer

Regional Monitoring Well	Chemical	Highest Detection in ug/L	2009
RMW-14	MTBE	17,000 (7/30/1998 & 1/27/1999)	< 0.3
RMW-6	TBA	5,100J* (3/26/2003)	< 3.5
RMW-14	TBA	3,400 (10/29/1998)	< 3.5

*J - estimate

This shows that large quantities of MTBE and TBA has already been extracted and current levels at the surrounding monitoring wells mostly have been reduced to below the defined detection level.

The five Charnock production wells were below the detection levels for reporting of MTBE and TBA in the 2008 samples collected for the raw water quality characterization. Another set of samples for raw water quality characterization was collected in 2010 to confirm and verify the detectable analytes from the Charnock wells. A comparison of the test results in 2008 and 2010 is included in Appendix G.

The Executive Officer's Report of the RWQCB dated May 7, 2009, reported that as of February 2009, a total of 799 million gallons of groundwater in the Charnock Sub-Basin have been treated. As of May of 2009, a total of 2,361 pounds of MTBE have been removed from groundwater and 4,263 pounds of MTBE from soil. In addition, 15,887 pounds of gasoline have been removed from groundwater and 246,816 pounds from soil.

2.1.3 BRIEF DESCRIPTION OF THE PROJECT

The court approved settlement in 2003, required the oil companies to fund the construction and operation of a treatment plant at the Charnock well field. The construction of the treatment plan enabled the reactivation of the City's five Charnock wells to production. The treatment plant is intended to remove MTBE for drinking water supply and also is expected to clean up residual regional contamination.

Black and Veatch (B&V) designed and constructed the treatment plant. The primary treatment process is GAC. The GAC was designed in the removal of VOCs, MTBE, and TBA. TBA is the principal metabolite of MTBE. The treatment involves GAC filtration of three out of five "contaminated" Charnock wells (CH-13, CH-19, and CH-20) and blending the treated effluent with the remaining two "uncontaminated" Charnock wells (CH-16 and

CH-18). The contaminated wells are described as the wells that are expected to be impacted by the MTBE and TBA plumes once groundwater extraction from the Charnock sub-basin resumes. The "uncontaminated" wells are believed to be not influenced by the plume movement. The City has to maintain a 60 percent pumping of the contaminated wells to protect the uncontaminated wells from drawing the plumes. The new Charnock Well 20 replaces Charnock Well 15. The new well was constructed within the Charnock well field and was designed to match the construction of the Charnock Well 15.

The Charnock Water Treatment Facility consists of down-hole chlorination of the five Charnock wells, greensand filtration, granular activated carbon (GAC), blending, and disinfection. The primary treatment process of VOCs, MTBE, and TBA removal is the GAC. The greensand filtration process is intended as pre-treatment for the GAC. It lowers the iron and manganese levels in the influent water prior to GAC. Greensand filtration also reduces the total hardness of Charnock groundwater. The greensand filtration effluent is dechlorinated prior to GAC to protect the GAC media. Blending of GAC treated water with water from the uncontaminated wells will reduce the overall VOC concentrations of the Charnock treated water.

Treated Charnock blend water (CWTF effluent) receives chlorine to produce residual during its transport to the Arcadia Water Treatment Facility. The treated Charnock water is piped approximately 3.4 miles to the Arcadia Water Treatment Facility. There are no customers in between the facilities.

The Arcadia Water Treatment Facility serves as redundancy to the treatment provided at the Charnock facility. Charnock facility effluent is mixed with water from the Arcadia wells and Santa Monica wells 3 and 4. This blend goes to the treatment train at the Arcadia facility. The Arcadia treatment train consists of down-hole chlorination of the Arcadia and two Santa Monica wells, CWTF effluent, greensand filtration, reverse osmosis (RO), decarbonation, chloramination, fluoridation, and the mechanical surface aeration installed in the 5-MG Arcadia reservoir. The greensand filtration serves to protect the RO unit from iron and manganese and is considered a pre-treatment for RO. Chlorine is removed from the effluent of the greensand filtration to prevent degradation of the RO membranes. Because of the corrosive nature of effluent water from RO, a decarbonator is included at the RO effluent to raise the pH. Sodium hydroxide can be injected for further pH adjustment. The decarbonator is used intermittently when needed.

Chlorine is injected at different locations to satisfy the residual requirement for each of the processes i.e. down-hole chlorination, oxidation of iron and manganese, regeneration of greensand media, and protective disinfection while treated Charnock water is transported to the Arcadia Water Treatment Facility. Final disinfection is undertaken by injecting chlorine upstream of the 5-MG Arcadia reservoir followed by injection of ammonium sulfate. Fluoride in the form of four percent solution of sodium fluoride is also injected prior to the 5-MG Arcadia reservoir.

The final treatment happens inside the covered 5-MG Arcadia reservoir where the finished water flows through a series of baffles. Fifteen floating mechanical surface aerators (three 15hp and twelve 10hp) are installed to accomplish the MSA treatment. The MSA removes VOCs from the finished water. VOCs from the off-gas are removed in a separate treatment unit consisting of a vapor phase activated carbon adsorption unit.

The arrangement of the treatment train for the Charnock wells followed by the Arcadia treatment facilities has been demonstrated to produce a final effluent treated to non-detectable contaminant levels for TBA, MTBE and other VOCs. Other detectable chemicals are reduced below their respective maximum contaminant levels (MCL). A summary of 2012 water quality results from the Department's database is presented below:

Table 2.1.3: 2011-2012 VOC range for Charnock and Arcadia Treatment Facilities

Chemical of Concern	CHARNOCK		ARCADIA	
	Influent (Source 034)	Effluent (Source 066)	Influent * (Source 068)	Effluent * (Source 071)
MTBE	ND – 2.2	ND	ND	ND
TBA	ND – 7.4	ND - 3.2	ND	ND
TCE	2.6 -7.6	ND – 6.4	10.8 - 15	ND
1,1-DCE	ND – 3.4	ND – 4.3	ND – 2.3	ND – 2.2
PCE	ND-0.6	ND	4.5 – 5.6	ND

*Arcadia Influent and Effluent are combination of Charnock Wellfield effluent and other wells pumping directly to the Arcadia Treatment Facility.

2.1.4 PROJECT DESCRIPTION

2.1.4.1 CHARNOCK WELLS

The Charnock well field has five production wells; three southern wells and two northern wells. The wells CH-13, CH-19, and CH-20 are located along the southern edge of the well field while the two remaining wells CH-16 and CH-18 are situated to the north. Simulations of the plume movement indicated that the southern wells will capture the MTBE and TBA plume if all five Charnock wells are operated at the same time and the southern wells has been designated as the "contaminated" wells. The two northern wells are designated as "uncontaminated" wells. Different pumping scenarios suggests that the "uncontaminated" wells will not draw the MTBE and TBA plume as long as the City maintains a pumping configuration to include more than 60 percent of flow from the Charnock "contaminated" wells. Historically, these wells were operated with three or four wells pumping at a time.

Southern Charnock Wells:

Charnock Well 13 (CH-13) was drilled in October 1966. The well is equipped with a 16-inch diameter well casing and is 410 feet deep. It has a single perforation interval between 200 to 390 feet below ground surface (bgs). The well has a pumping capacity of approximately 1900 gpm and a 49-foot annular seal. A copy of the well data sheet is provided in **Appendix H.**

Charnock Well 19 (CH-19) was drilled in 1989. The well is equipped with a 18-inch diameter well casing and is 550 feet deep. The well is screened from 200 to 450 feet bgs and has a pumping capacity of approximately 1780 gpm. The well is gravel packed with a 150-foot sanitary seal. A copy of the well data sheet is provided in **Appendix H.**

Charnock Well 20 (CH-20) was drilled in July 2012. The well is 450 feet deep, screened from 242 to 385 feet bgs, and constructed with a 36-inch diameter casing. The well has an annular seal filled with cement grout to a depth of 150 feet. The pumping capacity is 1,400 gpm. A copy of the well data sheet is provided in **Appendix H**.

For the permitting of the new Charnock Well 20, a more detailed discussion is included in Section 2.1.4.5.

Northern Charnock Wells:

Charnock Well 16 (CH-16) was drilled in October 1980. The well is equipped with a 20-inch diameter well casing and is 430 feet deep. It has a single perforation interval between 220 to 390 feet below ground surface (bgs). The well has a pumping capacity of approximately 2,098 gpm and a 190-foot annular seal. A copy of the well data sheet is provided in **Appendix H.**

Charnock Well 18 (CH-18) was drilled in May 1984. The well is 480 feet deep, screened from 240 to 455 feet bgs, and constructed with a 18-inch diameter casing. The well is gravel packed with a 100-foot sanitary seal. The well has a pumping capacity of approximately 1800 gpm. A copy of the well data sheet is provided in **Appendix H.**

2.1.4.2 GROUNDWATER QUALITY

Water produced by the City including groundwater from the Charnock well field has high concentrations of $CaCO_3$. According to the Department's database and recent samplings for raw water quality characterization, the Charnock wells total hardness ranges from 403 mg/L to 626 (698/SM4) mg/L as $CaCO_3$. The City uses water softening system at the Arcadia Water Treatment Facility to reduce water hardness.

Black and Veatch conducted groundwater sampling of the five Charnock wells in 2008. Results of the sampling were used in the design of the treatment plant and Raw Water Quality Characterization Report as part of the requirements to the Department 97-005 application process. Tabulated summary of analytical results of the 2008 Raw Water Quality Sampling of the Charnock Production wells is included in **Appendix G.**

Iron and manganese have been detected from the five Charnock wells. CH-18 and CH-19 exceed the secondary maximum contaminant level (SMCL) for iron and manganese respectively. The SMCL for iron is 300 ug/L while manganese is 50 ug/L. The historical detected concentration range of iron and manganese for the Charnock wells is included in Table 2.5.1.2 A

The Charnock wells have detectable nitrates ranging from 2.04 mg/L to 25.1 mg/L. Nitrate samples collected in 2012 indicate that CH-13, CH-16, and CH-19 have nitrate concentrations of 21.2 mg/L, 25.1 mg/L, and 21.4 mg/L respectively. Recent samples collected in 2013 indicate lower concentrations for nitrate from CH-13, CH-16 and CH-19 which are 14.3 mg/L, 16.2 mg/L, and 9.3 mg/L respectively. If any of the Charnock wells reaches a level of 23 mg/L, quarterly samples should be initiated. Other detectable inorganic chemicals are included in the Raw Water Characterization Report by WorleyParsons (on file).

Water Quality Characterization samples collected in 2008 from CH-19 exceed the uranium MCL of 20 pCi/L at a maximum concentration of 74 pCi/L. According to the Department's water quality database, from October 2012 to October 2013 CH-19 had consistently exceeded the uranium MCL ranging from 23 PCI/L to 26 PCI/L. The City should continue to collect quarterly samples for uranium from CH-19. CH-13, CH-16, Ch-18, and CH-20 have detectable uranium but not exceeding the MCL.

As already mentioned earlier, the levels of MTBE and TBA in the Charnock wells were below the established detected level for reporting purposes (DLR) based on the 2008 water quality characterization sampling in 2008. Other VOCs that already have been known to be present in the Charnock aquifer were detected from samples collected in the Charnock wells. 1,1-DCE MCL of 6 ug/L was exceeded at concentrations ranging from 11 ug/L to 18 ug/L from CH-13, CH-16, and CH-19. TCE with an MCL of 5 ug/L was also exceeded at concentration range of 11 ug/L to 43 ug/L form these three Charnock wells.

From 1994 to 2013 historical water quality data from the Department's database and ranges of constituents other than MTBE and TBA from the Charnock wells is summarized below. Data from the 2008 and 2010 Raw Water Quality Characterization (RWQC) are included in the table below.

Table 2.1.4.2 A : Charnock Wells Historical Water Quality Data

Constituent	CH-13	CH-19	CH-20	CH-16	CH-18
Hardness (Total) As Caco3 mg/L	504-580	541-626	520	403-417	460-519
Total Dissolved Solids mg/L	787-922	1110-1121	840	655-670	710-778
Nitrate (2011) mg/L	ND-22.6	ND - 6.99	1.9	3.9-25.1	ND
Iron ug/L	ND - 563	125 - 800	375 - 510	ND - 340	810 - 1150
Manganese ug/L	32 - 173	57.4 -88 (RWQC)	30 – 63.2	8.22 - 67.2	7.1 - 63
Gross Alpha - pci/L	ND - 13.1	5.6 – 35 (RWQC)	3.3 – 5.7	ND - 12	ND - 3.7
Uranium - pci/L	3.2 - 13 (RWQC)	5 - 67 (RWQC)	6.6 – 10.0	ND - 10.6	ND - 4
1,1-DCE ug/L	ND – 13 (RWQC)	ND - 10 (RWQC)	ND – 1.0	0.9 - 13.6	ND
TCE ug/L	ND - 17.5	ND - 25 (RWQC)	ND – 2.1	1.1 - 14.2	ND - 1.2

Another set of water quality samples were collected in 2010 to verify the presence of detected chemicals in the Raw Water Quality Characterization conducted in 2008. A comparison of the data is included in Appendix G. Both sampling event did not indicate the presence of MTBE or TBA from the Charnock wells.

However, the first arrival of MTBE was observed from a sample collected on January 24, 2011 from Charnock Well 19 at 1.1 ug/L. Subsequent monthly sampling confirmed MTBE presence in Charnock Well 19 at a maximum concentration of 8.4 ug/L from a sample collected on 3/28/11. Results of samples collected towards the end of 2011 showed decrease in concentrations to below the DLR. WorleyParsons issued a Technical Memorandum to the City dated April 29, 2011 regarding the early arrival of MTBE at the Charnock well field. The memorandum explained that the MTBE detected at Charnock

Well 19 was a residual pocket of MTBE-impacted groundwater closer to the well field and is not part of the regional plume. The Technical Memorandum is included in Appendix I.

TBA has also been detected from CH-13, CH-16, and CH-19. The highest level of TBA was observed from a sample collected in August and September 2011 from CH-19 at a concentration of 11 ug/L. Other VOC recent detection is cis-1,2-dichloroethylene detected from CH-13 and CH-19 at concentrations of 7.1 ug/L (April 25, 2011) and 1.2 ug/L (December 27, 2010) respectively. CH-13 exceeded cis-1,2-dichloroethylene MCL of 6 ug/L on April 25, 2011. Ch-13 is being monitored for cis-1,2-dichloroethylene monthly from the Charnock wells. Majority of the results indicated levels below the detection limit for reporting.

According to a review of the January 2011 to November 2013 analytical results submitted to the Department database, four of the five Charnock wells have detections of MTBE below the MCL of 5 ug/L. Charnock Well 19 sample results indicated MTBE detections ranging from 3.0 ug/L to 8.4 ug/L. In 2011, seven samples from this well exceeded the MTBE MCL. Most recent results of MTBE collected from Charnock Well 19 indicate low level detections ranging from 1.1 ug/L to 4.3 ug/L, which are below the MCL. TBA has been detected from all five Charnock well above the DLR of 2.0 ug/L. The following summarizes the MTBE and TBA detections from Charnock wells from January 2011 to November 2013:

Table 2.1.4.2 B: MTBE and TBA range for Charnock Wells (2010 – 2013)

Source	MTBE range in ug/L	TBA range in ug/L
CH-13	ND – 1.8	ND – 4.2
CH-16	ND	ND – 8.6
CH-18	ND	ND - 6.6
CH-19	ND - 8.4	2.0 - 11
CH-20	ND – 4.5	ND – 4.3

ND – non detect = results below DLR

The City collects samples for TBA when any of the Charnock wells MTBE sample result is above the DLR of 3.0 ug/L.

2.1.4.3 CHARNOCK TREATMENT PROCESS – BRIEF DESCRIPTION

The groundwater flow and solute transport modeling conducted by GeoTrans and WorleyParsons determined the pumping strategy to be implemented for the Charnock wells. Different simulations of pumping scenarios were evaluated. The modeling indicated that if the five wells were operated at the same time, the plume would be captured by the southern Charnock wells. This pumping strategy uses the southern wells to intercept and capture the MTBE/TBA contamination but requires a pumping configuration of more than 60 percent flow from the southern Charnock wells. The combined flow from the southern "contaminated" wells (CH-13, CH-19, and CH-20) undergo GAC treatment while the remaining two wells (CH-16 and CH-18) is not be treated and allowed to blend with the treated water from GAC. CH-16 and CH-18 contain other VOCs but are not expected to draw MTBE and TBA from the contamination plume as long as the City maintains the pumping configuration of greater than 60 percent flow from the contaminated wells. A detailed discussion about the MTBE/TBA modeling is included under Section 3 of WorleyParsons 97-005 Effective Monitoring and Treatment dated June 2010 (on file).

The CWTF is designed based on the sustainable yield pumping rate of the well field of 5,000 gpm. This includes 3,000 gpm of treatment from the contaminated wells to blend with 2,000 gpm from the uncontaminated wells.

The CWTF process starts from down-hole chlorination of the Charnock wells using 12.5 percent sodium hypochlorite. This practice controls the microbial activity in the well and aids the precipitation of iron and manganese by oxidation into insoluble compounds. Water from CH-13, CH-19, and CH-20 is directed to a raw water equalization tank equipped with an aeration system. The raw water equalization tank is an 86 x 14 feet reinforced concrete structure located under the greensand filtration and Granular Activated Carbon (GAC) treatment systems. The aeration system provides additional dissolved oxygen to assist in the oxidation of iron and manganese. Blended water from the equalization tank is pumped to the greensand filtration system. The effluent is dechlorinated using 25 percent sodium bisulfite, and directed to a GAC treatment system. Treated water from GAC then flows to a reinforced concrete filtered water tank where more blending occurs with water from CH-16 and CH-18. The combined Charnock well field water from the filtered water tank receives chlorine to form a residual and is pumped through a booster station to the Arcadia Water Treatment Facility (AWTF). There are five existing boosters at the CWTF. Water from the CWTF is transported to the AWTF through approximately 3.4 miles of pipeline between the facilities.

2.1.4.3.1 GREENSAND FILTRATION

The purpose of greensand filtration in this project is to remove iron and manganese from the water to protect the GAC system. Reducing the concentrations of iron and manganese at the feed water to the GAC minimizes backwash frequency. This improves the GAC performance and extends the service life of the media. Greensand filtration is an approved technology in the removal of iron and manganese to reduce concentrations below their respective SMCL. The Charnock wells exceed the SMCL for iron and/or manganese. The greensand filtration system at the Charnock well field reduces the iron and manganese concentrations of the CH-13, Ch-19, and CH-20 to below their respective SMCL. Blending the GAC treated water with the two untreated Charnock well lowers the iron and manganese concentrations from CH-16 and CH-18.

Water containing excessive amounts of iron and manganese promotes the growth of iron bacteria which form thick slime growths on the walls of the piping system and on well screens. The City performs down-hole chlorination to control the iron bacteria growth in the wells and to initiate oxidation of iron and manganese oxidation in the wells. The removal of the precipitated iron and manganese is achieved by greensand filtration. The City implements several oxidation pretreatment procedures prior to greensand filtration. It starts with the down-hole chlorination, followed by aeration in the raw water equalization tank, and oxidation by chlorine injection at the feed water of the greensand filters.

Chlorinated water from CH-13, CH-19, and CH-20 are directed to a raw water equalization tank. The raw water equalization tank is equipped with an aeration eductor designed to deliver a minimum of 5.0 mg/L of dissolved oxygen to the system. Aeration provides the dissolved oxygen needed to convert the iron and manganese from their ferrous and manganous state to their insoluble oxidized ferric and manganic state. Chlorine is further injected upstream of the greensand filtration system. A chlorine residual concentration between 0.5 mg/L to 1.0 mg/L at the filter effluent is necessary to ensure continuous regeneration of the greensand media and to ensure that the chlorine demand needed for the oxidation of iron and manganese is satisfied. This control range for the greensand filtration was determined from a pilot test conducted in 2008 for reverse osmosis, where greensand filtration was one of the components. The pilot test used water from CH-19. The Membrane Softening Pilot Report is included in the Effective Monitoring and Treatment document as one component of the 97-005 documents (on file).

Blended water from the raw water equalization tank feeds to the filtration system. The greensand filtration system is designed to continuously remove iron and manganese from the influent water using catalytic oxidation. The greensand media consists of higher manganese oxide coatings that provide its special chemical oxidation-reduction properties for the removal of iron and manganese. With this capability, the greensand media acts not only as a filter but as a further oxidation agent for manganese. It also assists to oxidize and filter iron.

The CWTF greensand filtration system consists of three horizontal pressure filters. Each filter vessel contains two independently-operating cells. The pressure vessels are mounted on an outdoor pad above the concrete reinforced structure basins for raw water equalization tank, filtered water storage, and spent backwash storage. The greensand filters are operated in parallel configuration. The pressure vessels are designed and manufactured by WestTech. The total surface area of the filter media is 1362 ft^2. The surface loading rate is 3.3 gpm/ft^2. Two types of media are loaded into each cell: 12-inch of anthracite and 18-inch of MnGS media. Table 2.5.1.3.1 summarizes the greensand filtration system design parameters.

Table 2.1.4.3.1: Greensand Filtration Design

Greensand Filters Design Criteria		
Filters		
	Number	3
	Cells Per Filter	2
	Design Loading Rate, gpm/sf	3.3
	Type of Filter Control	Discharge Flow Control Valve
	Backwash Rate, gpm/sf	13
	Backwash Duration, minutes	15
Filter Size		
	Length (overall), feet	40
	Diameter, feet	12
	Working Pressure, psi	75
Filter Media		
	Media Surface Area per cell, sf	227
	Media Type	Dual
	Media Depth, inches	30
Media Material Anthracite		
	Depth, inches	12
	Effective Size, mm	0.6 – 0.8
	Uniformity Coefficient	<1.6
Greensand		
	Depth, inches	18
	Effective Size, mm	0.3 – 0.35
	Uniformity Coefficient	<1.6

The process and instrumentation diagram and design drawings of the treatment units are provided in Appendix J. Appendix R contains a copy of the manganese greensand media specifications.

2.1.4.3.2 GRANULAR ACTIVATED CARBON (GAC)

The GAC system at the CWTF consists of five parallel trains. The vessels are manufactured by WesTech Engineering Incorporated. Each train has two vessels operating in series operating in a lead-lag configuration. Each vessel is 12 feet in diameter having appropriate empty volume of 4,230 gallons. The vessels are loaded with Calgon OLC 12x40 coconut activated carbon having a media surface area of 113.1 square feet for each vessel. The GAC system is designed to treat 3,000 gpm which can be handled by four trains only. Each train is designed at a maximum flow of 750 gpm with each vessel having an empty bed contact time (EBCT) of seven minutes. The fifth train is a standby to treat a maximum GAC treatment plant flow of 3,750 gpm. The spare GAC train will be rotated periodically. All trains will be operated and rotated periodically to prevent the out-of service time for no more than three days. Under normal operations, the City may also consider operating all five trains of 600 gpm flow per train. When carbon change-out is necessary, one train will be taken offline and the 3,000 gpm flow requirement will be distributed evenly in the remaining four trains. The flow to each train is equalized by individual flow control valve and monitored by individual flow meter on each train's influent line. It should be noted that the flow to each vessel should not be less than 300 gpm, to avoid channeling caused by insufficient pressure drop across the vessel.

Each vessel has an inlet and an outlet for carbon addition and removal, provision for utility water addition and removal, vent valves, and pressure gauges. Each vessel is provided with four in-bed sample ports. For operational monitoring, the City will be using two in-bed sample ports to indicate the progression of the adsorption zone and spent carbon. These sample ports are located at 41 percent and 71 percent of the bed depth from the top of the bed to withdraw water samples during operation.

Two kinds of GAC are proposed: F400 bituminous coal-based and OLC coconut-based carbon manufactured by Calgon Carbon. Both carbons meet the American National Standards Institute/National Sanitation Foundation (ANSI/NSF) Standard 61 for potable water application. The following table summarizes the specifications for F400 and OLC carbon.

Table 2.1.4.3.2

CARBON PROPERTIES

Parameter	Calgon F400	Calgon OLC
Carbon Type	Bituminous coal	Coconut shell
Mesh Size	12 x 40	12 x 40
Minimum Iodine Number	1,000 mg/g	1,050 mg/g
Minimum Abrasion Number	75 wt%	85 wt%
Minimum Apparent Density	0.52 g/cc	0.48 g/cc
Maximum Total Ash	9 wt%	4 wt%

The data sheet for the GAC system is provided in Appendix K. The layout of the GAC system, the design drawing for one train of the GAC vessels, and the SCADA screen printout of the GAC system are provided in Appendix L.

2.1.4.3.2.1 GAC TREATMENT PROCESS

In the series configuration, influent to each train flows downward through both carbon beds in each vessel. The first (lead) bed in the series receives the highest contaminant loading and is thus the first to be exhausted. The second (lag) bed receives the less contaminant loading and serves as a polishing step. When the carbon is exhausted and the lead vessel is removed from service for carbon change-out, the lag vessel takes on the role as the lead vessel. After carbon change-out, the previous lead vessel is placed back into service as the lag vessel. The freshest GAC is always the last step in the series. The GAC change-out frequency is expected to be between one month and three months when the plume of MTBE contamination emerges from the aquifer.

The GAC treatment system is designed to reduce the levels of MTBE and TBA below their detection limits of 3 ug/L and 2 ug/L, respectively, in water produced by three Charnock wells: CH-13, CH-19 and CH-20. The combined GAC effluent is collected in the filtered water basin where it is blended with raw water from wells CH-16 and CH-18. Well CH-16 has high levels of VOC that exceeds the MCL for TCE ranging from 8.1 ug/L to 19 ug/L; 1,1-DCE ranging from 6.8 ug/L to 14.1 ug/L (2011-2013 data). Well CH-18 exceeds the iron SMCL ranging from 705 ug/L to 1,560 ug/L (2011 – 2013 data). Water from CH-16 and CH-18 does not undergo greensand filtration and GAC treatment, because study conducted by WorleyParsons concluded that these two wells are not being influenced by the MTBE and TBA contamination as long as the City maintains the intended pumping configuration of the three contaminated Charnock wells. The combined CWTF plant effluent flows to the Arcadia Water Treatment Facility (AWTF) for additional treatment.

2.1.4.3.2.2 BACKWASH

The greensand filtration Programmable Logic Controller provides the options of remote manual and remote auto modes for backwash. There are four different automatic backwash control options for the greensand filtration system: reset head loss, preset time, preset amount of totalized flow, and operator initiated. During normal operation the filtration system is in remote automatic mode. Backwash is determined in a preset time. The City schedules the backwash during daytime so the operators can monitor closely the water available for backwash from the filtered water tank. Only one backwash is allowed at a time from a pressure filter cells or GAC vessel. The backwashing sequence of one pressure filter cell is completed after 16 minutes and generates about 41,000 gallons of water per backwash. The pressure filters are backwashed using the GAC-filtered water from the Filtered Water Tank. The system uses a combined air-water backwash to remove built-up solids. Backwash description is included in the City's OMMP.

The GAC vessel is backwashed after fresh carbon has been loaded prior to being placed into service. GAC filtered water is used for the backwash. Backwashing an adsorber consists of directing flow upward under the carbon bed, expanding the carbon bed to remove entrained air, suspended solids and carbon fines. Backwashing for each GAC vessel is performed at a flow rate of 10 to 12 gpm/sf for 10 to 15 minutes generating about 20,500 gallons of spent wash water. During the addition of fresh carbon, backwashing is extended to remove the fines. This process is estimated to generate up to 34,000 gallons of spent wash water. Air scour is not used during a GAC backwash. The backwash waste stream is discharged to the Backwash Recovery Tank for treatment through the package plate settler.

The greensand filtration and GAC backwash streams are combined in a Backwash Recovery Tank constructed under the location of the greensand filters. Backwash pumps are provided for greensand filter and GAC backwashing. The pumps automatically start and stop based on tank level. The backwash recovery tank is sufficient to contain two full greensand filter backwashes. It is equipped with a mixer to keep solids in suspension. Backwash water is pumped to a plate settler where iron, manganese, and GAC fines are allowed to settle. Poly-aluminum chloride is injected upstream of the plate settler to aid coagulation of solids. The clarified effluent is recovered and flows by gravity to the raw water equalization tank. The concentrated solids collected from the inclined plates are directed into a sludge hopper for disposal to the City of Los Angeles sanitary sewer.

2.1.4.3.2.3 CARBON CHANGEOUTS

The criteria for GAC change out are determined by the breakthrough of either VOCs or TBA at the effluent of the lead vessel in a series. If either VOCs or TBA is detected at levels greater than 50 percent of the MCL in any water sample collected at the effluent of the lead vessel, and the lag vessel shall be placed in the lead position. The vessel containing the fresh carbon will be placed in the lag position.

When the GAC in a vessel is changed out, the GAC is removed and placed in an empty bulk material transport trailer. The GAC is removed from the adsorber and transferred to the bulk trailer by pressurizing the GAC vessel and using compressed air to force the GAC from the vessel into the trailer. Once the carbon removal operation is completed, a charge of fresh virgin GAC is transferred into the empty vessel. This is accomplished by saturating the GAC in the bulk trailer with water and partially filling the vessel with water. The bulk trailer is then pressurized with compressed air to force the GAC from the trailer and into the vessel. The GAC is allowed to sit in the vessel for up to 24 hours to become fully saturated with water, followed by GAC backwashing as described above, before entering service.

2.1.4.4 FILTERED WATER TANK

Treated water exiting the GAC vessels is directed to the filtered water tank. The filtered water tank, raw water equalization tank, and backwash recovery tank are concrete below grade basins constructed under the greensand and GAC treatment facilities. Raw water from Ch-16 and CH-18 combines with the GAC treated water in the filtered water tank. This represents a total production of the Charnock well field of 5,000 gpm. The City is going to operate these two wells based on a forty percent flow ratio to the combined raw water pumped from CH-13, CH-19, and CH-20. Chlorine is injected at the effluent of the filtered water tank prior to pumping it to the AWTF.

The filtered water tank also serves as the backwash supply. It is designed to hold sufficient volume of two greensand filter backwashes plus a volume equal to one train out of service during the backwashing sequence.

2.1.4.5 CHARNOCK WELL 20

The City replaced its Charnock Well 15 with a new well Charnock Well 20 to accommodate the expansion project for the athletic field of the Windward High School. The Charnock Well 20 is located approximately 80 feet south-southeast of Charnock Well 15 within the Charnock well field.

Charnock Well 20 was drilled in July 2012 using the reverse circulation drilling method. The bore hole was drilled to a depth of 450 feet below ground surface (bgs). Well #20 has a depth of 425 feet. Well #20 was drilled by expanding a previous 450 feet deep pilot well; when the pilot well completed a successful pilot study, the pilot well hole was expanded to accommodate Well #20. A 16-inch diameter Type 304 stainless steel casing was installed from the ground surface to 405 feet bgs. A 36-inch diameter low carbon steel conductor casing was installed from ground surface to a depth of 52 feet. The well has a 150-foot deep annular seal filled with cement grout. It is also gravel packed and surface sealed. The well is perforated from 242 to 295, and 315 to 385 bgs using an 16" ID by 5/16" wall thickness Type 304L stainless steel, ful-flo louvered casing with 0.065-inch slot opening. The total length of the screened interval is 123 feet. The distances to the highest perforation, static water level and pumping water levels are 242, 101, and 136 feet bgs, respectively. The well has an estimated yield capacity of 1,400 gpm, based on a pump test conducted on September 10, 2012.

On October 31, 2012, Terrence Kim and Mauricio Santos of the Department visited the Charnock well field and inspected the newly drilled Charnock Well 20. Charnock Well 15 has been shut down and its motor has been removed. The City intended to transfer the existing pump and housing of Charnock Well 15 to the newly constructed Charnock Well 20. At the time of inspection, the new well has not been equipped with a motor but has been provided with a watertight cap. The well is surrounded with a concrete pad sloping towards the street drain. The distribution line intake was ready to be connected with appurtenances including check valve, air vacuum release, flow meter, and sample tap. The electrical panel was also in place. The drilled well is constructed with a pedestal that is approximately 12 inches deep and 32 inches wide. Access openings are provided at the well pedestal including a screened casing vent, plugged sounding tube, capped gravel fill pipe, and capped camera tube. The well location is approximately 35 feet away from an eight-inch gravity sewer line along Westminster Avenue. According to the City, the sewer line is made of vitrified clay pipe (VCP) and is located approximately 14.5 feet below existing grade. Charnock Well 20 does not meet the 50-foot minimum horizontal separation to a sewer line as required by the California Water Works Standard. To compensate for the deficiency the well's annular seal depth was extended down to 150 feet below ground surface. It was also observed that the finished concrete pad surrounding the well slopes only in one direction to the south, towards the street. The northern side of the concrete pad is lower than the ground surface.

In an email on November 13, 2012, the City informed the Department that the Charnock Well 20 is equipped with the old pump that was used for Charnock Well 15. This is an oil lubricated vertical turbine pump, which had a 100-horsepower electric motor with a former pumping capacity of 1,150 gpm. The new Charnock Well 20 is also equipped with the appropriate appurtenances such as an inverted screened air relief valve, inverted casing vent, flow meter, sounding tube, sampling tap, and a camera tube. A pump to waste line will be connected to the backwash recovery basin and directed to the plate settler for treatment prior to discharge to the sewer along Westminster Avenue. An air gap is provided between the waste line and the recovery basin. To correct the grading issue of the well slab, the City informed the Department that the concrete slab will be modified by grinding to slope such that it slopes away in all directions from the well. There will be concrete block wall that will be installed by Windward School along the north side of the well house. The wall will retain all the soil along with the athletic field turf. The field's drainage is discharged to approximately 25 feet west of the well site.

More details on the well are provided on the well location map, well diagram, and well data sheet in Appendix S. In addition, the City also provided the pump test results, well construction permit issued by the Los Angeles County Health Department, and well completion report. These additional documents are provided in Appendix S, with the exception of the well completion report since it contains confidential information related to the exact well location. A copy of the well completion report will be kept on file with the Department.

Charnock Well 20 will be disinfected with 1 ppm chlorination maintained from the well pump down to the contact basin. It is the same procedure for down-hole chlorination practice with the other Charnock wells. The well will be receiving chlorine from the site's centralized chlorine unit. Water from Charnock Well 20 is pumped to the raw water equalization tank at the CWTF where it blends with Charnock Wells 13 and 19. This blend comprises the "contaminated wells" water for VOC removal using GAC treatment at the CWTF.

Raw Water Quality

Initial raw water samples collected from the Charnock Well 20 in September 2012 indicate that the well water is in compliance with all primary MCLs. MTBE was the only detected VOC at a level of 0.91 ug/L. The well detected iron at a level of 510 ug/L exceeding the SMCL of 300 ug/L. Other parameters that exceeded the recommended consumer acceptance contaminant level range include sulfate, conductivity, and total dissolved solids at 260 mg/L, 1,230 umhos/c, and 840 mg/L respectively. A copy of the results including general mineral, general physical, inorganic, and organic compounds is attached in Appendix T.

The Company shall monitor Charnock Well 20 and other groundwater sources in accordance with both the regulations in Title 22, California Code of Regulations (CCR), and the most recent Vulnerability Assessment and Monitoring Frequency Guidelines. All results shall be submitted to the Department electronically.

Based on the waiver monitoring application submitted to the Department in April 2011, a source class code of LGLB has been assigned to the City's groundwater wells including the wells in the Charnock well field. Under this class code, the City to is required conduct two consecutive quarterly monitoring for certain SOCs by December 2013 as specified in the attached Vulnerability Assessment and Monitoring Frequency Guidelines for the current monitoring period from January 1, 2011 to December 31, 2013 (See Appendix N). The City collected samples from Charnock Well 20 for most SOCs on October 3, 2012. The City was advised to collect missing samples by December 2013. The City was also advised that they are required to collect SOC samples in two consecutive quarters from the time the Charnock Well 20 is placed into service and repeat the monitoring requirement every three years thereafter.

The California perchlorate MCL of 0.006 mg/L became effective on October 18, 2007. To comply with the initial perchlorate monitoring requirement of this regulation for Charnock Well 20, the Company collected samples on September 10, 2012 and May 28, 2013. Both results were below the detection level of 4 ug/L.

Initial monitoring requirement for radioactivity is included under Section 64442 (b) (3), Title 22, CCR. This requires the City to complete the initial radiological monitoring requirement for the Charnock Well 20 by collecting four consecutive quarterly samples for the analyses of gross alpha, radium 228, radium 226 and uranium. The initial sample collected from Charnock Well 20 that was analyzed for radionuclides was collected on September 10, 2012. The City collected more samples for radionuclides during each quarter of 2013. These four consecutive quarterly samples were analyzed for gross alpha and uranium but radium 226 and radium 228 were not analyzed in one out of four of the samples collected. The City will collect the fourth quarterly sample from the well in January 2014. All radionuclides results are below the MCLs.

Drinking Water Source Assessment

The Drinking Water Source Assessment for the Charnock Well 20 was conducted by the Richard C. Slade & Associates LLC on November 2, 2012 and a copy is kept on file with the Department. The well is considered to have 'moderate' physical barrier effectiveness (PBE) and most vulnerable to NPDES/WDR permitted discharges, dry cleaners, drinking water treatment plant, high density housing (>1house/0.5 acres), parks, above ground storage tanks, water supply wells, transportation corridors – freeways/state highways, automobile gas stations, auto repair shops, photo processing/printing, parking lots/malls, and storm drain discharge points.

2.2 ARCADIA WATER TREATMENT FACILITY (AWTF)

The 5,000 gpm flow from the Charnock well field is blended with water from the City's other production wells namely: Santa Monica Well 3, Santa Monica Well 4, Arcadia Well 4, and Arcadia Well 5. The Arcadia wells are approximately 25 feet apart. Typically, Arcadia Well 5 operates as the primary pumping well. Arcadia Well 4 is intermittently operated to sustain production when Arcadia Well 5 is offline. Currently, due to aquifer drawdown levels and pump interference, the Arcadia wells are not operated continuously and are put in service as needed.

The designed flow from the Santa Monica and Arcadia wells is 2,000 gpm. The 7,000 gpm combined flow from Charnock and Arcadia well fields go to a contact tank that feeds into the greensand filtration. 12.5 percent of sodium hypochlorite is injected in the raw water inlet (24-inch pipeline) located upstream of the contact tank to oxidize iron and manganese. The raw water inlet is provided with an inline static mixer to ensure proper mixing of chlorine and the feed water. An incoming recycled wash water stream via an 8-inch pipeline mixes with the influent water prior to the sodium hypochlorite injection.

The concrete contact tank with a capacity of approximately 190,000 gallon is constructed below the greensand filtration pressure vessels. It provides a minimum of 15 minutes detention time to allow precipitation of iron and manganese. In addition, a baffle wall is provided in the tank which provides longer flow path and improves hydraulic efficiency. The inlet pipe has a diffuser to evenly distribute water across the contact tank. Two vertical turbine pumps convey water to the greensand filtration system. One vertical turbine pump serves as standby in addition to the duty pumps.

2.2.1 GREENSAND FILTRATION:

The greensand filtration system at the AWTF will remove manganese from the water produced by Arcadia Well 5, and iron from Charnock 18. The SMCL for manganese and iron are exceeded from Arcadia Well 5 and CH-18, respectively. The City believes that blending water produced by the Charnock well field and the Arcadia well field reduces the overall concentrations of iron and manganese to below their respective SMCLs. The project is designed to provide the greensand filtration at the Charnock and Arcadia treatment facilities for the protection of the GAC media and the RO membranes. Iron and manganese oxides can accumulate at the surface of the GAC media and RO membranes and cause fouling of the media and membranes. Greensand filtration is an approved technology for the removal of iron and manganese. Compliance for the iron and manganese SMCL is determined at the effluent of the existing 5-MG reservoir at the AWTF.

Feed water to the greensand filtration is pretreated by chlorine injection at a raw water inlet vault and allowed enough contact time to precipitate iron and manganese in a baffled contact tank. The chlorine dose is maintained to provide residual across the filters and to continuously regenerate the greensand media. Free chlorine residual, up to 1 mg/L, is sustained through the filters at all times.

The greensand filtration pressure vessels' design, construction and manufacturer at the Charnock and Arcadia Treatment Facilities are identical. There are six horizontal pressure filters at the Arcadia Water Treatment Facility. Each filter vessel splits into two, independently-operating cells, giving a total of 12 filter cells. The filters are sized to ensure that the surface loading rate does not exceed 3 gpm/sf when one cell is off-line for backwashing.

The following table includes the design criteria for the greensand filtration system at the Arcadia Water Treatment Facility.

Table 2.6.1
Pressure Filters Design Criteria

Parameter	Criteria
Filters	
Number	6
Cells Per Filter	2
Design Loading Rate, gpm/sf	3.0
Type of Filter Control	Rate Of Flow Control
Filter Size	
Overall Length, feet (2 filter cells)	40
Diameter, feet	12
Working Pressure, psi	75
Filter Media	
Media Surface Area, sf per cell	227
Media Type	Dual
Media Depth, inches	36
Media Material	
Anthracite	
Depth, inches	18
Effective Size, mm	0.6 – 0.8
Uniformity Coefficient	<1.6
Greensand	
Depth, inches	18
Effective Size, mm	0.3 – 0.35

Parameter	Criteria
Uniformity Coefficient	<1.6
Backwash	
Rate, gpm/sf	15
Duration, min	10

The greensand filtration effluent advances to the Reverse Osmosis (RO) softening system. A portion of the effluent is diverted to a backwash holding tank for backwashing of the greensand filters. Filter backwashing includes air scour techniques and surface wash. Surface wash or media rinsing is employed during the first 15 to 25 minutes after a backwash. Rinse or wash water and backwash effluent flows by gravity to the Washwater Equalization Tank. The capacity of the tank allows for at least two 15-minute filter backwashes. It is designed to empty between backwashes. Spent backwash water is pumped to a Packaged Treatment Unit (PTU) where coagulated solids are separated from the spent water. The clarified effluent from the PTU flows back to the Contact Tank. The sludge collected is intermittently drained to the City of Los Angeles sewer line.

A detailed description and design specification of backwash and spent water treatment are included in the City's Arcadia Operations Report (Appendix S).

2.2.2 REVERSE OSMOSIS

The principal treatment system at the AWTF is the Reverse Osmosis (RO). RO replaced the Ion Exchange softening system formerly used by the City. The RO softening system is intended to reduce total hardness from the City's groundwater. Charnock wells CH-13, CH-19, and Santa Monica wells 3, 4 produce high levels of total hardness. All of the City's groundwater well exceeds the recommended consumer acceptance contaminant level range for total dissolved solids (TDS), and specific conductance. The RO system is also capable of reducing MTBE, TBA, uranium, and gross alpha.

The RO process includes a feed tank, low pressure feed pumps, sodium bisulfite injection, anti-scalant injection system, sodium bisulfite injection system, four horizontal five-micron cartridge filters, high pressure vertical turbine pumps, four three-stage RO membranes, CIP system, Flush system, and decarbonators.
The table below summarizes the major components of the existing RO water treatment system and their functions:

Table 2.2.2A: Major RO Water Treatment Components and Functions

Components	Functions
Antiscalant Injection System	Antiscalant (Threshold Inhibitor) - added to the RO feed water to minimize the potential for inorganic scaling on the membrane surface
Sulfuric Acid Injection System	Sulfuric Acid - added to the RO feed water to maintain the desired pH within the range of 6.7 to 7.0 to minimize scaling on the RO membranes
Sodium Bisulfite Injection	Sodium Bisulfite - to remove any residual free chlorine present in the RO feed water
RO Feed Tank	Serve as containment to provide equalize flow of feed water to RO irrespective of pressure filter operation.
5-Micron Cartridge Filters 4 units (3 duty, 1	To remove particles in the feed water larger than 5-

Components	Functions
standby)	micron diameter. Removal of particulate material is critical to prevent fouling of the feed channels in the RO membrane elements.
3-stage Reverse Osmosis System 4 units (3 duty, 1 standby)	To remove dissolved salts from the water.
Low Pressure RO Feed Pumps 3 units (2 duty, 1 standby)	To pump water from the feed tank to the cartridge filters and to the RO bypass pipeline. Water is diverged so that 82 percent is directed to the High Pressure RO Feed Pumps and the remaining 18 percent is bypassed in the treatment.
High Pressure RO Pumps 4 units (one dedicated for each RO unit)	Boost the pressure of the feed water coming off the Cartridge Filters through the RO membranes and to the Decarbonators.
Decarbonators (2)	RO permeate post treatment to stabilize and mitigates the corrosive nature of the permeate.
Flush System	Support system to automatically flush RO train that is periodically taken out of service for reduced demand or train rotation.
CIP System	Support System for cleaning the membranes periodically and maintaining their performance.
Chemical Storage and Feed Area	To store and distribute chemicals to all process related injection points.

Filtered water from the greensand filtration unit received in the RO Feed Tank is de-chlorinated using 25 percent sodium bisulfite. Chlorine attacks the RO membranes that result in degradation and lose of efficiency. To prevent biological growth in the RO Feed Tank, chlorine is provided occasionally and effluent is de-chlorinated downstream. In addition, anti-scalant and sulfuric acid are added to the RO feed water. Anti-scalant inhibits scale formation within the RO membranes. Sulfuric acid (93% solution) helps to maintain the desired pH within the range of 6.7 to 7.0 to minimize scaling on the RO membranes.

Low pressure, vertical turbine pumps at the RO Feed Tank conveys water from the RO Feed Tank through the Cartridge Filters. Water pumped by these Low Pressure RO Feed Pumps splits between the RO system inlet and the blend by-pass system. About 82 percent passes though the Cartridge Filters for RO treatment and 18 percent is directed to the RO Bypass Pipeline.

The cartridge filter housings contain 5-micron filter cartridges, which remove particulate matter from the feed stream. Removal of particulate material is critical to prevent fouling of the feed channels in the RO membrane elements.

Four cartridge filter vessels are connected to a common feed and discharge header. Each vessel is designed to treat 1,900 gpm with allowable loading rate of 3.5 gpm/10-inch equivalent length of cartridge filter element. During normal operation, there are three duty vessels and one standby unit. The duty vessels operate in a set differential pressure. When the differential pressure between the feed and discharge header exceeds the set point, the spare vessel is brought into service and elements in each of the duty vessels are sequentially replaced. The last duty vessel becomes the spare vessel. All duty vessels are used irrespective of the number of RO units operating, to prevent water stagnation within a cartridge filter and biological growth.

The design criteria for the Cartridge Filters are summarized in the following table:

Table 2.2.2B: Cartridge Filters Design Criteria

Parameter	Value
Number of cartridge filter vessels	4 units (3 duty, 1 standby)
Design flow rate per vessel	1,900 gpm
Design loading rate	3.5 gpm/10" equivalent length
Vessel orientation	Horizontal
Pressure rating	100 psi
Cartridge filter element dimensions	2.5" diameter and 40" long
Cartridge filter element rating	5 µm nominal pore size

The filtered and chemically conditioned water from the Cartridge Filters is boosted to the RO trains by high pressure vertical turbine pumps. Each RO train has its own dedicated pump. This allows different operating conditions on individual train as determined by the degree of membrane fouling. The RO high pressure feed pumps are driven by Adjustable Frequency Drive (AFD) to maintain the permeate flow set point.

The RO softening system is an enclosed building that houses four RO trains (3 duty and 1 standby). Each train is designed at a feed rate of 1,900 gpm. With three trains in operation, the combined feed rate is 5,700 gpm. The RO system is expected to operate over a recovery range of 82 percent (but designed for between 70 and 85 percent) and allowing 18 percent of water to bypass the RO process. The recovery is controlled by the energy recovery device and a concentrate control valve.

Each RO train has a three-stage system; each stage consists of a set of pressure vessels connected in parallel. Pressurized feed water entering the RO membranes is separated into two streams: the water flowing through the membrane (permeate) which is directed to the Decarbonators and the water flowing along the brine channel and exiting the membranes in a more concentrated state (concentrate, reject water, or brine) which is disposed via a 15-inch City of Los Angeles sewer located at Bundy Drive. Permeate from all stages will be blended and leave the system through a common header. The bypass flow is blended with the RO permeate prior to stabilization. The residual head on the RO permeate conveys the softened water to the Decarbonators.

The following table lists the design parameters for the RO System. Values are shown for recovery at 82 percent and 85 percent.

Table 2.2.2C: Reverse Osmosis Design Criteria

Parameter	Value	
	85% recovery	82% recovery
RO trains		
Number of RO trains	4 (3 duty, 1 standby)	
Design permeate flow rate per train (gpm)	1,615	1,560
Design feed water flow rate per train (gpm)	1,900	
Number of stages per train	3	
Minimum number of pressure vessels per train (stage 1: stage 2: stage 3)[1]	38:19:9 using 440 ft^2 elements	
Number of elements per pressure vessel	6	

Pressure in the permeate header (psi)	20
Flux	
First stage permeate flux (gfd)	< 15
System flux (gfd)	13.5 to 14
RO membrane elements	
Membrane diameter and length (inches)	8 x 40
Membrane material	Polyamide based
Membrane area (ft2)	440
Energy recovery device (ERD)	
Type	Concentrate pressure driven turbine type energy recovery device integrated with a centrifugal booster pump
Drive	Direct by motor
Concentrate influent to ERD: flow & pressure	284 gpm @ 70 to 95 psi depending on membrane used
Feed water influent to ERD	879 gpm @ 74 to 88 psi pressure depending on age of membrane
Pressure boost (psi)	18
(1) The system will need 42:21:10 pressure vessels if it is required to accommodate the more common 400ft2 elements. If elements with the higher 440ft2 area are used in a 42:21:10 array, some pressure vessels will be left blank to allow for future conversion to 400ft2 if necessary. This it to maintain the same flux irrespective of which elements are used during the life of the facility.	

There are two support systems included with the RO softening system: RO Flush System and Clean-In-Place (CIP) System.

The Flush System consisting of a flush tank and pumps provides the water necessary to flush the RO trains that are not in service due to reduced demand or to standby trains. Periodically, the spare RO train/s is brought into operation to prevent degradation of membranes. Whenever an RO train is taken out of service, it is flushed automatically with permeate. A portion of permeate from the common outlet header off the RO System is diverted to fill the flush tank. During flushing, the generated concentrate and permeate are disposed to the sewer.

The clean-in-place (CIP) system cleans the membranes periodically to maintain performance. Cleaning is triggered by three parameters: permeate flow drops by more than 10 percent, differential pressure across any stage increased by 15 percent, 10 percent increase of salt passage. The relevant RO train is taken out of service when cleaning is triggered. Cleaning can be either acidic or basic solutions, or both. Inorganic and organic foulants are removed by acidic and basic solutions respectively. The City uses 50 percent solution of citric acid and sodium hydroxide solution with detergents for these purposes.

The CIP system consists of two chemical solution makeup tanks, a neutralization tank, CIP pumps and a cartridge filter. The cartridge filter ensures that no particulate contaminants in the makeup tanks are inadvertently pumped through the RO units during recirculation of the CIP chemical. Cleaning and flushing are performed on one RO train at a time. After either acidic or basic cleaning, the cleaning solution is sent to the neutralization tank for pH adjustment prior to discharge to the local sewer. Any sources containing the cleaning solutions, for example, RO train (cleaning and spent flush water), chemical solution makeup tanks, and CIP containment area are directed to the neutralization tank and discharged to the sewer after pH correction.

Table 2.2.2D: RO Flushing System Design Criteria

Parameter	Value
Flush tank	1
Flush tank usable volume (gallons)	3,800
Flush tank material	FRP
Number of Flush Pumps	2 (1 duty, 1 standby)
Flush pump parameters	2,100 gpm @60 psi

The design and detailed description of the RO support systems is discussed in the City's Arcadia Operation Report (on file).

2.2.3 DECARBONATORS

As mentioned earlier, feed water to the Arcadia Water Treatment Facility has high concentration of alkalinity, measured as calcium carbonate. The RO process removes alkalinity producing a soft and acidic permeate. Because of the corrosive nature of water, adjustment of alkalinity and pH is necessary to stabilize water characteristic. The first adjustment is letting the bypass flow which contains the RO feed water alkalinity blend with the RO permeate. The blended permeate is directed to the Decarbonators. Decarbonation removes carbon dioxide and increases the pH. Further adjustment is made by injection of sodium hydroxide before water enters the existing 5-MG reservoir. The process of decarbonation reduces the amount of sodium hydroxide needed in adjusting the pH.

Two decarbonators are installed downstream of the RO system, adjacent to the RO building. Each decarbonator treats 50-percent of the flow and has dedicated blower to force air through the media, counter-current to the direction of the water flow. The design is based on removing CO_2 to about 12 mg/L. Valves are provided on the inlet and outlet piping for isolation of the equipment during maintenance. The decarbonators are elevated allowing treated water to flow into the reservoir by gravity.

The design criteria for the Decarbonators are summarized in the table below.

Table 2.2.3: Decarbonator Design Criteria

Parameter	Criteria
Number	**2**
Design Capacity	
Each Unit, gpm (mgd)	**3,050 (4.4)**
Total, gpm (mgd)	**6,100 (8.8)**
Size	
Diameter, Feet	**11**
Blower Capacity, Scfm	**9,000**
Fill Media	
Type	**2" polypropylene media**
Depth, Feet	**5**
Inlet Pipeline	

Diameter, Inches	**16**
Velocity, Fps	**4.9**
Material	**Stainless Steel**
Outlet Pipeline	
Diameter, Inches	**24**
Velocity, Fps	**2.2**
Material	**Stainless Steel**

The decarbonators are installed on the top of a concrete reservoir serving as the effluent tank. The Decarbonator Effluent Tank not only raises the elevation of the decarbonators, it also allows air introduced during decarbonation to escape from the water. Small air bubbles entrained in the water may interfere with the sampling and flow measurement instrumentation in the piping downstream. The Decarbonator Effluent Tank provides at least 10 minutes of retention time between the minimum and maximum water levels at maximum flow, and has a baffled wall to prevent short-circuiting between the inlet and outlet of the tank. Design and specification of the Decarbonator tower is included in Appendix J.

A 25 percent sodium hydroxide solution is injected into the water pipeline from the decarbonator effluent tank, to raise the pH and alkalinity to levels that are compatible with the existing concrete pipework and the reservoir. The City is supplied with a 50 percent grade sodium hydroxide. This 50 percent solution is diluted in the chemical storage building in Arcadia into a 25 percent sodium hydroxide solution before injection to the water line. Higher dosage of sodium hydroxide will be required if the decarbonators are bypassed. Dosage calculations are determined in the City's OMMP.

Vented air from the Decarbonators is directed to an off-gas treatment system. The City is required to ensure that a permit is obtained from the Air Quality Management District (AQMD) for this process.

2.2.4 CHLORAMINATION

Chlorination using 12.5 percent sodium hypochlorite is used at different locations to provide the required residual for each process. On-line chlorine analyzers monitor and adjust the required dosage at each location. For final disinfection, 40 percent solution of ammonium sulfate is injected upstream of the 5-MG reservoir for chloramination. A proportion of 5:1 chlorine ammonia mass ratio is the target to be maintained to ensure monochloramine formation. Maintaining good control of the chlorine to ammonia feed ratio is essential to preventing nitrification. The City aims to create a chloramine residual which is compatible with the water purchased from the Metropolitan Water District of Southern California (MWD) to facilitate blending of City's chloraminated groundwater with MWD's treated surface water. The City has been distributing chloraminated water from MWD in most areas of the distribution system since the Charnock wells were shut down in 1996. Santa Monica Well 1 supplies free-chlorinated water in a very small flow of about 259 gpm directly into the distribution system.

2.2.5 FLUORIDATION

The City started its first Department-approved fluoridation system at the Santa Monica Well 1 in December 2007. The second fluoridation system provided for the Arcadia Water Treatment Facility is addressed by this permit amendment.

2.2.5.1 ARCADIA FLUORIDATION SYSTEM

The City fluoridates the finished water from the Arcadia Water Treatment Facility. Fluoride is added in the form of four percent solution of sodium fluoride. The City purchase dry granulated sodium fluoride (44% F) in 50 pound bags or 1,000 pound bulk bags (super-sacks) stored in the fluoride building. The solid sodium fluoride is converted to a four percent solution in saturators. The solution is pumped from the saturator tanks and injected upstream of the 5-MG gallon reservoir. The sodium fluoride injection is located along with the other chemical injection points provided for the finished water: sodium hydroxide for pH adjustment after decarbonator treatment, and ammonium sulfate and sodium hypochlorite for chloramination. Water for solution make-up comes from the RO permeate. Cartridge-type water softeners are provided for back-up if the RO system is not in operation. The fluoridation building is located adjacent to the chemical building. It is equipped with a fire sprinkler system.

The fluoridation facility consists of a storage area for the granulated sodium fluoride, two saturators, and an overhead crane. Bags of sodium fluoride are stored on pallets and unloaded into a bag dump station. Sodium fluoride may come in bags or super-sacks. Sodium fluoride granules in the 50-pound bags are manually transferred to a silo located above the saturators. For super-sacks, a monorail crane system lifts 1-ton super-sacks and empties them into the saturators. Dust collectors are provided in the system. The saturated fluoride solution is hauled weekly by a truck to fill the 200 gal fluoride tank at the Santa Monica Well 1 fluoridation system. The following table summarizes the fluoride design criteria including the existing off site fluoridation system for the Santa Monica Well 1.

Table 2.2.5.1: Fluoride Design Criteria

Sodium Fluoride Feed System		
Chemical Information		
Delivered Chemical, % F	44%	
Delivered Form	Dry	
Concentration of solution as NaF	4%	
Feed Point 1	Finished Water	
Feed Point 2	Well SM-1	
Dosage, as F		
Maximum, mg/l	0.8	
Average, mg/l	0.6	
Minimum mg/l	0.4	
Flow	**Finished Water**	**Well SM-1***
Maximum, MGD	8.8	0.43
Average, MGD	8.8	0.43
Minimum, MGD	2.9	0.43
Feed Rate, Dry Wt, as F		

Sodium Fluoride Feed System		
Maximum, ppd as F	58.8	2.9
Average, ppd as F	44.1	2.2
Minimum, ppd as F	9.7	1.4
Feed Rate, Dry Wt, as NaF		
Maximum, ppd bulk	133.8	6.5
Average, ppd bulk	100	4.9
Minimum, ppd bulk	22	3.3
Feed Rate, Liquid		
Maximum, gph	16.7	0.82
Average, gph	12.5	0.62
Minimum, gph	2.75	0.41
Turndown Ratio	5.7 : 1	
Saturator/Solution Tanks		
Number of Saturators	Two (2)	
Volume, each, gal	345	
NaF Capacity, lbs each	1000	
Feed Equipment	Diaphragm metering pumps	
Pump Number	Two (1 – duty, 1 – standby)	
Pump Flow	2 – 18.1 gph	
Pump Control	Manual stroke, automatic speed control with manual override	

* Fluoride solution is delivered by truck to the existing feed system at Well SM-1.

A diaphragm fluoride metering pump by Milton Roy Series B is used to dispense the sodium fluoride solution from the saturators to the water line between the decarbonator and the 5-MG reservoir. There are two fluoride metering pumps of which one serves as redundancy to the other. The pumps are located next to the saturators inside the fluoridation building. The chemical feed system is equipped with calibration column, pressure relief valve, and other appurtenances.

The sodium fluoride the City purchase is distributed by Westco Chemicals and is a product of Youxian Longjiang Chemical Plant that has been certified as meeting the specifications of NSF/American National Standard Institute (NSF/ANSI) Standard 60.

The saturators are provided with a concrete base encasement for spill. A drain on the concrete encasement is connected to the sewer. The fluoridation building is inspected daily for meter accuracy, pumps malfunctioning, supply of chemicals, and volumetric readings. All logs are kept in the SCADA rooms.

2.2.5.2 SANTA MONICA WELL 1 FLUORIDATION SYSTEM

The fluoridation system for Santa Monica Well 1 was permitted in 2007. Santa Monica Well 1 is located in a below grade vault with its own chlorination and fluoridation system. Santa Monica Well 1 is chlorinated using chlorine pellets injected down into the well. The saturated sodium fluoride solution comes from the Arcadia Water Treatment Facility. A four percent sodium fluoride is prepared in the area of the welding shop. A 400-pound upflow saturator is used to generate the 4 percent sodium fluoride solution. The solution flows from the saturator into a 175-gallon storage tank. A transfer pump is provided to allow the operators to pump the sodium fluoride solution into a truck-mounted solution container. This skid mounted container is used to transport the sodium fluoride solution from the solution tank at the Arcadia site to the Santa Monica Well 1 fluoridation system. The fluoride day tank at the Santa Monica Well 1 fluoridation system is filled with sodium fluoride solution by gravity from the truck. This is done weekly.

The fluoridation injection system is located near the Santa Monica Well1 in a separate below grade vault. The fluoridation vault consists of a 200-gallon fluoride day tank with level probe transmitter, calibration column, two fluoride metering pumps (Milton Roy Series B), control panels for the fluoride metering pumps, pressure relief valves, electrical panel, self-contained eyewash station, sump for overflows with pump, sump pump control panel, vault fan, and other appurtenances. The fluoride metering pump is flow paced and has a maximum feed capacity of 8.8 gals. per hour. The metering pump draws fluoride from the day tank and is injected at the head of the Santa Monica Well 1 through a double contained pipe connecting the between the vaults of the fluoride system and the well. Just above the ground of the well vault is a dedicated sample tap where daily chlorine and fluoride samples are collected. A small underground vault approximately four feet deep is built near the Santa Monica Well 1 where the fluoride and chlorine analyzers are regularly monitored. The fluoride analyzer is a Hach 610.

2.2.5.3 FLUORIDATION DOSE

Purchased and produced water supplied by the City receives fluoridation. The City purchase fluoridated water from the MWD. There are two fluoridation facilities operated by the City: Arcadia Water Treatment Facility and the Santa Monica Well 1 Treatment Plant. Majority of water produced by the City is treated at the AWTF and stored in the Arcadia 5-MG reservoir. Treated water from the reservoir flows directly to the 350-foot and/or 250-foot pressure zones. Santa Monica Well 1 flows directly to the 350-foot pressure zone. Fluoridated MWD water supply at the SM1 feeder goes directly to the 500-foot pressure zone.

In a letter from the City dated November 21, 2012 the City determined that the annual average of maximum daily air temperature for five years is 71.4 degrees. The temperature was based on the 2007-2011 data obtained from the National Oceanic and Atmospheric Administration (NOAA) collection site in Culver City. According to the City, this location is the closest site with five years data and most representative of the weather throughout the city of Santa Monica. According to Section 64433.2 of Title 22, California Code of Regulations (CCR), this temperature requires a fluoride optimal level and control range of 0.8 mg/L and 0.7mg/L to 1.3 mg/L respectively. The separate fluoridation system for the Santa Monica Well 1 uses the same parameters. The City's fluoride optimal level is likewise consistent with the fluoride level provided by MWD in purchased water.

Fluoride dose is monitored downstream from the fluoride injection point using an online analyzer. The online analyzer is tied to the City's SCADA system which is continuously monitored. The City uses Hach 610 online fluoride analyzers for Arcadia and Santa Monica Well 1 fluoridation system. Continuous readings are recorded and alarm set points are programmed to alert the operators of underfeeding and overfeeding. Fluoridation Data Sheet is appended to this report (Appendix K).

2.2.5.4 FLUORIDE MONITORING

The fluoride analyzer continuously monitors fluoride level at the decarbonator effluent downstream of the fluoride injection point before water enters the 5-MG reservoir. Alarms are programmed at the lower and upper limits of the operation range (0.7 – 1.3 mg/L). If fluoride level is out of the range, the fluoridation system will alarm the operator and automatically shuts down the fluoridation system when no acknowledgement or adjustments are made within a set time frame.

The table below summarizes the routine fluoride monitoring:

Table 2.2.5.4A: Routine Fluoride Monitoring

Sampling Location	P.S. Code	Monitoring Frequency
Santa Monica Well 1	1910146-012	Annually (Certified Laboratory)
Decarbonator Tank Effluent (Pre-fluoridation)	1910146-074	Every six months (Certified Laboratory)
5-MG Arcadia Reservoir Treated Water Effluent (Post-fluoridation treatment)	1910146-071	Continuous (On-line Fluoride Analyzer) Daily Distribution sample (Laboratory) Monthly Split Sample (On-line analyzer and Certified Laboratory)

The City has five sampling locations in the distribution system for fluoride monitoring. Each sample is analyzed by the City's accredited in house laboratory. The City collects one sample daily during the week from one of the sampling sites. On weekends, fluoride sample is collected from the treated water effluent of the Arcadia reservoir. The weekend samples are preserved and analyzed by the in-house laboratory the first day of the week. Once a week, the City collects sample from the treated/finished water analyzed by the in-house laboratory and compared to the on-line analyzer reading. The data are reported to the Department as a split sample. The following table summarizes the distribution system fluoride monitoring program.

Table 2.2.5.4B: Distribution System Fluoride Monitoring

Sampling Location	Monitoring Requirements	Compliance
1. Main St & Strand St. 2. 33rd St. & Pearl St. 3. Stanford St. & Berkley St. 4. Chelsea St. & Arizona Ave. 5. 7th St. & Palisades Ave.	One sample from one site daily. Sample sites to be rotated to be representative of the water throughout the distribution system. One split sample monthly.	Optimal Level: 0.8 mg/L Control Range: 0.7 to 1.3 mg/L

2.2.5.5 FLUORIDATION OPERATION, MONITORING AND MAINTENANCE PLAN

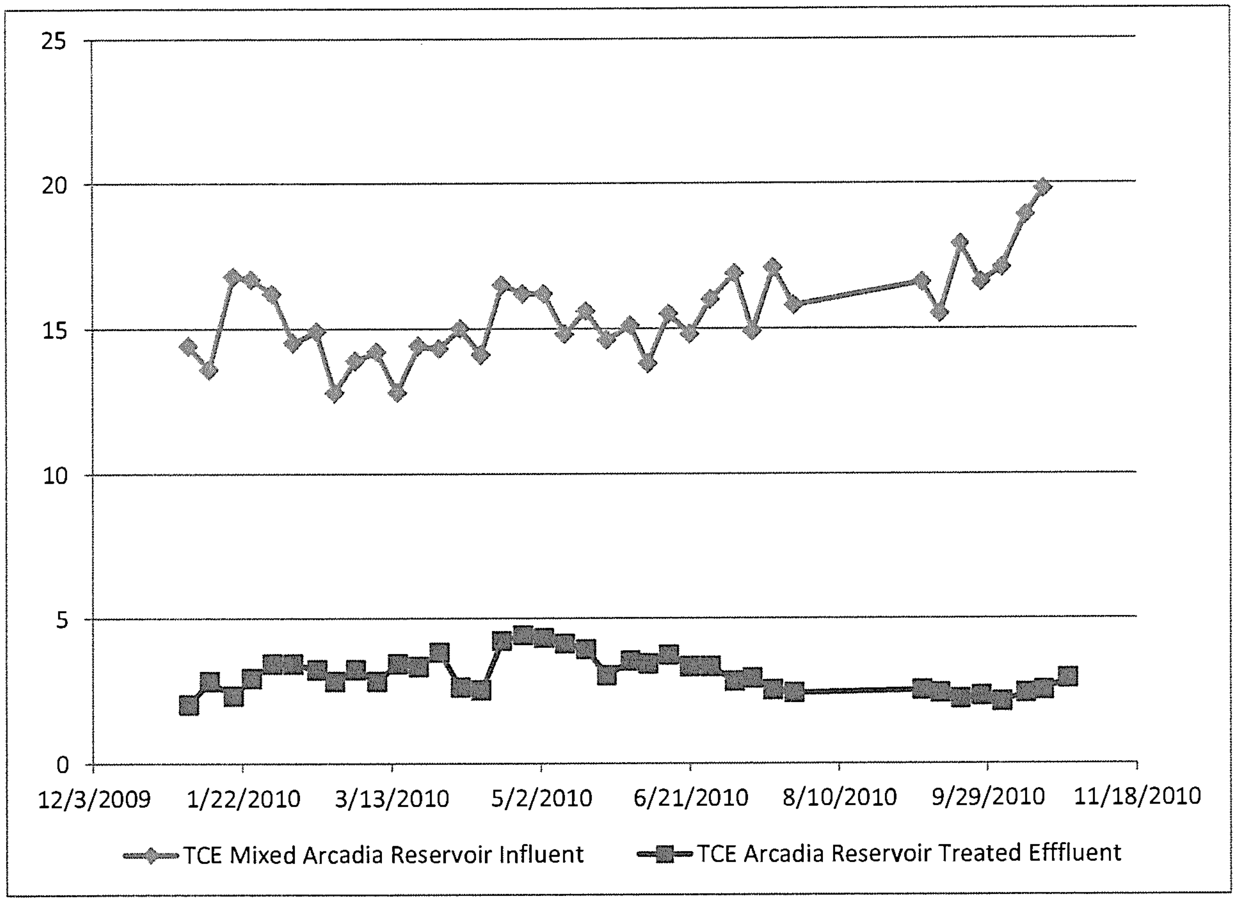
The City has submitted a fluoridation system Operations Contingency Plan for the Santa Monica Well 1 and Arcadia treatment facility dated December 2007 and November 2010, respectively. The fluoridation operations contingency plans outline the procedures for shutting down the fluoridation equipment if there is fluoride overfeed, the procedures for investigating the cause of fluoride overfeed or underfeed, the procedures for implementing the emergency notification plan, and the procedures for conducting public notifications.

The fluoridation operations contingency plans for the Arcadia and Santa Monica Well1 systems need to be updated to reflect distribution fluoride monitoring schedule and list of actions to be implemented in the event the fluoride level in the distribution system sample is found to be out of the control range. The two fluoridation contingency plans may be combined into one single document. This document should include all comments provided by the Department in a letter dated August 20, 2012 regarding fluoridation and any changes based upon experience.

2.2.6 MECHANICAL SURFACE AERATION

In a letter to the City in July 1992, the Department approved the use of Mechanical Surface Aerators (MSA) treatment designed to remove VOCs from the Santa Monica Wells 3 and 4. There are currently 15 floating mechanical surface aerators in the subsurface of the 5-MG Arcadia Reservoir where the MSA process takes place. The aerators consist of three 15-hp and twelve 10-hp capacities. The aerators spray the water up into an airstream. The air is collected into a square duct and carried to the off-gas treatment facility. VOCs from the off-gas are removed using a vapor phase activated carbon adsorption unit. The MSA treatment has a treatment capacity of 14 MGD.

A review of 2010 water quality data indicates that the MSA removes VOCs below their respective MCLs. The following graph represents the trichloroethylene concentrations in 2010 before and after the installation of the MSA treatment. In a letter dated October 29, 2010 the City received from the Department conditional approval to operate the Charnock and the Arcadia water treatment facilities. Majority of the City's operations have changed. Since then, there are no representative data to solely evaluate the performance of the MSA.



The effluent of the Arcadia Water Treatment Plant flows into the existing 5-MG reservoir located in the Arcadia Water Treatment Facility. Chlorine and ammonia are added to the reservoir effluent for disinfection and fluoride for dental health purposes before the treated water is discharged to the distribution system.

2.2.7 CHEMICAL STORAGE BUILDING

All chemical storage and feed systems except for sodium fluoride and the clean-in-place chemicals are located in the chemical storage building at the AWTF. This is a covered structural steel roof canopies equipped with a fire sprinkler system. The chemicals are provided with secondary containment sufficient to hold the volume of the largest tank plus 20 minutes of sprinkler flow. Vehicular access is available for deliveries to all of the chemical storage units. Deliveries are generally in bulk by tanker truck or as liquids in totes. Drainage from bulk chemical containment areas will be collected within separate spill containment curbs or pits each with a collection sump. A portable sump pump with hose will be used for the main chemical storage area. Flows collected in the sump will be disposed using a tanker truck and proper off-site disposal.

2.2.8 SCADA SYSTEM

A supervisory control and data acquisition (SCADA) system is located in the control building at the Arcadia Water Treatment Facility. Operation of the Charnock and Arcadia facilities are fully automated via SCADA system. The SCADA continuously track operation of the treatment system components. Most operating data including on-line monitoring data is collected automatically by the SCADA system, and reports are generated electronically.

In the event of a failure of any major mechanical components, the facility will automatically shut down and the on duty operator will be notified by alarms via the SCADA system. Less critical alarms including parameters out of the control limits only notify the operators. Notification of the SCADA system also includes dial out to pre-determined phone numbers.

2.3 OPERATIONS AND MAINTENANCE

2.3.1 OPERATIONS PLAN

In December 2009 the City submitted Operations Plan for the CWTF and Operations Report for the Arcadia Water Treatment Facility. The documents describe proposed groundwater monitoring at the source wells, blended raw water monitoring, process monitoring, and treated water monitoring. These documents outline the proposed operations at the two treatment facilities including treatment process, control systems equipment operations, and startup and shutdown procedures. Each operation document is divided into 11 sections:

- Introduction
- Source of Supply
- Water Treatment Facilities
- Normal Operation and Controls
- Startup and Shutdown
- Abnormal Operation
- Process and Water Quality Monitoring
- Preventative Maintenance
- Safety
- Staffing Plan
- Emergency Procedures and Contacts

The CWTF and the Arcadia Water Treatment Facility shall be conducted in accordance to the approved operations plans. All operations of the wells, boosters, and treatment equipment of both treatment facilities are controlled and monitored by the SCADA system. Operators will routinely run checks on the system and the SCADA system will continuously track operation of the system components. However, the City's operating staff must be present at the site every time any of the treatment facilities start operating.

All operations of the wells, booster, and treatment equipment of the CWTF are controlled and monitored by a control system located in the Control Building control room at the site. A PC work station is provided in the control room. The computer uses a Windows XP operating system. It is provided with third-party alarming software capable to dial out and notify field staff of alarms by pager. A master programmable logic controller (PLC) for communicating with other PLCs over a fiber optic or a metallic cable using Enthernet is provided in the control room. Operation of the Charnock treatment process can be conducted remotely from the Arcadia site via the SCADA system through a leased telephone line.

2.3.2 RELIABILITY / ALARMS

Operation of the treatment facilities are fully automated with alarms. The PLCs incorporate a series of alarms. All alarms are displayed at the main control panel at the Arcadia SCADA system. Various alarm conditions for the treatment process is provided in the operations plans for Charnock and Arcadia (Appendix S). Major alarm conditions will automatically shut down the facility including a power failure, while less critical alarms will notify operators via the SCADA system. These alarms stay on until the problem condition is acknowledged. An operator will then be dispatched to address the problem.

There are staffs that are based and reside at the Arcadia Water Treatment Facility available to provide rapid response to any alarms and operational needs for both the Charnock and Arcadia facilities.

2.3.3 MAINTENANCE

The Charnock and Arcadia treatment facilities are expected to operate 24 hours a day, 7 days a week, with occasional shut downs for media changeouts, adjustments to valves and pumps, and for maintenance. The City must follow all manufacturers' recommendations for calibrating and maintaining testing devices, instruments and flow meters. The City should also follow manufacturers' recommendations for inspection and maintenance.

During routine inspection, certified operators should check for any unusual noise from electric motors, pumps, air blower, system valves, and the oil level of all electric motors. Operators should check if all chemical feed pumps are in good working order and if the amount of chemicals in the chemical storage tanks is sufficient. Operators should also check all equipment, piping, valves, vessels, and chemical storage tanks for signs of leakage or corrosion. Annual leak testing of critical valves such as the bypass valves must be performed.

The City must maintain records for at least five years of the activities for both treatment facilities documenting procedures performed including date, time, duration of the procedure, and outcomes.

The operation and maintenance manuals for the treatment facilities shall be updated based on the first year of operational experience or whenever deemed necessary. The updated manuals shall be submitted to the Department within 15 months after receipt of the water system permit amendment. Additionally, the City will also submit, after the initial year of operations, a performance report of the Charnock and Arcadia treatment facilities.

2.4 OPERATOR CERTIFICATION

The new Operator Certification Regulations of Title 22, CCR, which the Department adopted on January 1, 2001, establish treatment facility classifications based upon influent water characteristics, treatment processes, and flow rates. The City's treatment facilities were evaluated based on these factors. The City requested that a separate evaluation of treatment classification be done for each of the Charnock and Arcadia Water Treatment Facility. The CWTF is classified as Class T3 while the Arcadia Water Treatment Facility is classified as Class T4. The facilities' Treatment Plant Classification Worksheet is included in Appendix M.

The CWTF requires a T3 certified operator as the chief operator and any designated shift operator must hold at least a valid T2 certificate, as issued by the Department's Operator Certification Program.

The chief operator designated for the Arcadia Water Treatment Facility must hold at least a valid T3 certificate, and any operator designated as shift operator must hold at least a valid T3 certificate.

The chief operator will be responsible for all decisions involving feed adjustments, process controls, and operational changes. The following tables list the City's certified operators and their corresponding level of certification.

Table 2.4A: Treatment Plant Operators

Name	**Operator Number**	**Grade of Operator**	**Renewal/Expiration Date**
Myriam Cardenas	12794	T4	11/01/2014
Gary Richinick	22490	T4	07/01/2014
John Watts	17232	T4	05/01/2014
Eddie Milton	24816	T4	07/01/2013
Randy Bussart	27880	T3	07/01/2014
Abel Noriega	22479	T3	07/01/2013
Gary Paxman	15582	T3	11/01/2013
Josette Descalzo	28764	T2	07/01/2013
Jeff Moss	14663	T2	06/01/2014
Walter Moosshoolzadeh	17140	T2	06/01/2013
Jack Miyamoto	33058	T2	07/01/2014

Table 2.4B: Distribution Operators

Name	**Operator Number**	**Grade of Operator**	**Renewal/Expiration Date**
Myriam Cardenas	14585	D5	01/01/2015
Gary Welling	34191	D4	09/01/2014
Gary Richinick	9352	D5	01/01/2014
Jaime Gomez	9378	D3	08/01/2012
Stuart Jose	9730	D3	08/01/2012
John Watts	6303	D5	06/01/2015
Eddie Milton	23572	D4	05/01/2012
Gary Paxman	3135	D4	08/01/2012
Randy Bussart	18896	D4	07/01/2014
Abel Arroyo	34287	D3	04/01/2013
Abel Noriega	27487	D2	06/01/2013
Chris Camacho	9479	D3	08/01/2012
Josette Descalzo	30870	D2	03/01/2013
Charlie Salazar	32880	D1	05/01/2013

Name	Operator Number	Grade of Operator	Renewal/Expiration Date
Isaac Garcia	15059	D5	07/01/2013
Anthony Esparza	30031	D3	12/01/2014
Duncan McGill	15464	D3	01/01/2014
Ed Bell	9532	D2	08/01/2012
Gerald Delacerda	15056	D2	08/01/2012
John Evans	37388	D2	04/01/2013
Felipe Sanchez	15066	D2	08/01/2012
Cedric Burris	31535	D1	10/01/2012
Trent Martinsen	35865	D1	08/01/2012
Saul Perez	30980	D1	01/01/2015
Dennis Rosa	34066	D1	04/01/2014
David Webb	31006	D1	06/01/2015
Felipe Sanchez	15066	D2	08/01/2012

2.5 WATER QUALITY MONITORING REQUIREMENTS

The City should conduct the required water quality monitoring according to the Department approved Operations, Monitoring, and Maintenance Plan (OMMP). Therefore the City should combine the Charnock Operations Plan and the Arcadia Operations Report to incorporate all necessary water sampling for operational control and compliance purposes. The City should also include in the OMMP a maintenance plan for both facilities. The City shall ensure that results from sampling locations assigned with Primary Station Codes (PS Code) shall be transmitted by the City's contracted laboratory to the Department water quality data base by electronic data transmission (EDT).

2.5.1 UPGRADIENT SURVEILLANCE WELLS

The model used to simulate the groundwater flow and solute transport in the Charnock well field was developed by GeoTrans using USGS code MODFLOW that uses the RT3D transpot simulator. To establish the 10-year capture zone for the Charnock well field, a forward particle tracking with MODPATH version 3 was used. Twelve from the fifty regional monitoring wells were selected to represent varying distances from the Charnock well field. The simulation was done in September 2006 to delineate the two-year, five-year, and ten-year capture zones. Six of the twelve wells monitor the raw water quality in the Shallow Aquifer while the remaining six monitor the Upper Silverado Aquifer. These wells will also serve as the early warning wells for the Charnock well field. The wells are classified in two monitoring groups: for plume tracking and for monitoring of the ambient groundwater quality within the Charnock sub-basin. The twelve wells located within and in the vicinity of the ten years capture zone of the Charnock wells are listed in Table 2.6.1.

Table 2.5.1: Early Warning Wells

Aquifer	Plume Tracking Wells		Ambient Groundwater Quality Monitoring Wells	
	Well ID	Capture Zone	Well ID	Capture Zone
Shallow Aquifer	RMW-10	1 to 2 year	RPZ-4	5 to 10 year
	RMW-20	2 to 5 year	RPZ-7	5 to 10 year
	RMW-55	2 year	RPZ-9	5 year

Aquifer	Plume Tracking Wells		Ambient Groundwater Quality Monitoring Wells	
	Well ID	Capture Zone	Well ID	Capture Zone
Upper Silverado Aquifer	RMW-9	1 year	RPZ-8	5 to 10 year
	RMW-19	5 to 10 year	RPZ-5	10 year
	RMW-54	2 to 5 year	RPZ-6	5 to 10 year

Water samples from the upgradient wells shall be analyzed for a wide range of organic and inorganic contaminants, including reporting of unknown peaks and TICs. The initial monitoring frequencies for the Plume Tracking Wells and the Ambient Groundwater Quality Monitoring Wells were quarterly and annually respectively. Sample analysis should be in accordance with the Department requirement of the use of extremely impaired sources. The required sampling frequencies for the surveillance wells have been adjusted to yearly and every two years for the Plume Tracking Monitoring Wells. RMW-10 and RMW-9 which are closest to the wellfield are sampled every year. The Ambient Monitoring Wells is sampled every three years. The frequency is based on the latest City's Work Plan for Early Warning Groundwater Quality Monitoring dated September 2012 revised by the City on February 19, 2013.

2.5.2 PRODUCTION WELLS

The City should monitor the water quality of its production wells as required by Title 22, CCR and in accordance to the parameters included in the most recent Vulnerability Assessment and Monitoring Frequency Table issued by the Department (Appendix N). In addition, samples should be collected from the Charnock wells at least monthly for VOCs, TBA (if MTBE is detected), iron, manganese, coliform bacteria, and heterotrophic plate count (HPC) analysis. Annual samples should be collected from the wells for nitrate and 1,4-dioxane. Charnock Well 19 should be sampled for uranium quarterly.

The City should conduct additional raw water sampling for the Charnock wells according to the approved monitoring plan in the OMMP. The City should revise its raw water monitoring plan if additional chemicals are found in the upgradient surveillance wells that might threaten the quality of water produced by the CWTF. If new chemicals are detected from the Charnock well field or if the monitoring data indicates a rapid change in a contaminant concentration, more frequent monitoring may be necessary as well as a reassessment of the treatment scheme.

When a contaminant that was not previously detected shows up in the Charnock wells, the City should conduct a treatability assessment immediately. The City should revise its production well raw water monitoring and treated water monitoring accordingly.

Additional monitoring requirements for the Arcadia and Santa Monica Wells are included in Table 6 of the permit amendment. The City should collect samples annually for fluoride from Santa Monica Well 1 in accordance to Section 64433.3 (d)Title 22, CCR.

2.5.3 CHARNOCK WATER TREATMENT FACILITY (CWTF)

The City should collect monthly samples for VOCs and TBA from the effluent of the Raw Water Equalization tank. This stream represents the blended water of the southern

Charnock wells anticipated to contain the MTBE and TBA plumes. Prior to the GAC treatment system, this stream undergoes to a greensand filtration system. The greensand filtration serves to protect the GAC unit. Each GAC vessel has three designated sampling port to verify the stages of breakthrough for operational control. These ports are designated at 41%, 73%, and the GAC vessel effluent ports. The City should collect monthly samples at the 41% port for VOCs and TBA until any VOCs or TBA are detected. If detected at the 41% port, the City should confirm immediately of VOCs and TBA at the 73% port and collects monthly samples until VOCs or TBA are detected. When VOCs or TBA are detected at the 73% port, the City should sample at the GAC vessel effluent. The sampling requirement varies depending whether the GAC vessel serves as Lead or Lag Vessel. As Lead Vessel, weekly samples for VOCs and TBA should be collected. When 50% MCL is reached, the City should make the lag vessel as lead vessel and change spent carbon from vessel. As Lag Vessel, the City should test immediately for VOCs and TBA at the combined GAC effluent.

The City should sample weekly for the combined GAC effluent for VOCs, TBA, coliform bacteria, and HPC and monthly for nitrate. When the GAC effluent bacteriological sample is positive for total coliform or there is sudden significant rise in bacterial count, the City should test each individual GAC vessels for coliform bacteria and HPC.

Treated water from the Southern Charnock wells (CH-13, CH-19, and CH-20) is directed to the Filtered Water Tank to blend with untreated Northern Charnock wells (CH-16 and CH-18). This blend represents the CWTF effluent water. The City should sample the CWTF effluent water for VOCs and TBA weekly.

2.5.4 ARCADIA WATER TREATMENT FACILITY

The following table includes the operation and compliance monitoring requirement for the Arcadia Water Treatment Facility. The MSA VOC removal system requires the 5-MG Arcadia reservoir influent and the treated water monitored for all VOCs that were detected from the Santa Monica Wells and Arcadia Wells above their respective MCLs including TBA if MTBE is detected from any of the Charnock wells. Fluoride is sampled weekly at the reservoir influent and analyzed by the City's in house certified laboratory.

Table 2.5.4 Arcadia Water Treatment Facility Monitoring Requirement

Sampling Point	PS Code	Parameter	Frequency	Analysis
Santa Monica Well 3	1910146-015	VOCs > MCL Nitrate Total Coliform & HPC 1) 1,4-Dioxane	Quarterly 2) and/or Monthly 3) Quarterly Monthly Quarterly	Certified Lab
Santa Monica Well 4	1910146-017	VOCs > MCL Nitrate Total Coliform & HPC 1) 1,4-Dioxane	Quarterly 2) and/or Monthly 3) Quarterly Monthly Quarterly	Certified Lab

Sampling Point	PS Code	Parameter	Frequency	Analysis
Arcadia Well 5 / Arcadia Well 4 (On-line Well)	1910146-001 / 1910146-003	VOCs > MCL, MTBE & TBA Nitrate Iron and Manganese Total Coliform & HPC 1)	Quarterly 2) and/or Monthly 3) Quarterly Quarterly Monthly	Certified Lab
Arcadia Filter Plant Effluent ARC-Combined Filtrate	1910146-067	Manganese, Iron, Coliform HPC Turbidity	Weekly Monthly Monthly Continuous	Certified Lab Online Analyzer
Cartridge Filter Combined Effluent ARC-Combined Cartridge Filter Outlet	1910146-068	VOC TBA* Uranium Conductivity pH (process control for RO)	Quarterly Quarterly Quarterly Continuous Continuous	Certified Lab Online Analyzer Online Analyzer
Arcadia RO Combined Effluent before Bypass ARC-Combined RO Permeate	1910146-069	Uranium Conductivity Sulfate 1,4-Dioxane	Quarterly Weekly Monthly Quarterly	Certified Lab
Arcadia Decarbonator Influent	1910146-072	VOC TBA*	Weekly Weekly	Certified Lab
Fluoride Pre-Injection ARC – Decarbonator Tank Effluent	1910146-074	Fluoride	Every six months	Certified Lab
Arcadia RO Effluent and Bypass Water ARC- Reservoir Influent	1910146-070	VOC, TBA*	Weekly	Certified Lab

Sampling Point	PS Code	Parameter	Frequency	Analysis
AWTF Treated Effluent Arcadia TP - Treated	1910146-071	VOCs	Weekly	Certified Lab
		TBA*		
		Nitrate	Monthly	
		Iron	Monthly	
		Manganese	Monthly	
		Sulfate	Monthly	
		Odor	Monthly	
		Fluoride	Weekends&Holidays	
		Uranium	Quarterly	
		pH	Weekly	
		Alkalinity	Monthly	
		Total Hardness	Monthly	
		TDS	Monthly	
		Combined Chlorine	Daily	
		Total Coliform	Monthly	
		HPC	Monthly	
		Aggressive Index	Monthly	
		Langelier Index @ 60^{0}C	Monthly	
		1,4-Dioxane	Quarterly	

*Collect sample if MTBE is detected at any of the Charnock wells.

[1] **HPC** – If either total coliform is present or significant rise in bacterial count in the routine and confirmation samples, it is advisable to remove the well(s) from service and have it disinfected. The well(s) shall be tested for and found free of bacteriological contamination prior to resuming as the domestic source.

[2] **Quarterly** – VOCs detected at the source, at concentrations greater than DLR, but less than MCL are analyzed quarterly; the frequency is increased to monthly for all VOCs detected at the levels greater than MCL.

[3] **Monthly** – VOCs detected at the source at concentrations greater than MCLs are analyzed monthly; the frequency is reduced to quarterly when the VOC is detected greater than DLR but less than MCL in at least six subsequent monthly samples.

3. APPRAISAL OF SANITARY HAZARDS AND SAFEGUARDS

3.1. EVALUATION OF POLICY MEMO NO. 97-005 SUBMITTAL BY THE CITY

On November 5, 1997, the Department issued Policy Memo No. 97-005, a policy guidance for direct domestic use of extremely impaired sources (see Appendix B). To assist the Department in evaluating a request to use an extremely impaired source, the policy lists specific subject matter that must be addressed with the permit application as listed below. WorleyParsons on behalf of the City prepared reports covering the topics.

1. Introduction
2. Source water Assessment
3. Characterization of Raw Water Quality
4. Source Protection
5. Effective Monitoring and Treatment
6. Human Health Risks Associated with Failure of the Proposed Treatment
7. Identification of Alternatives to the Use of the Impaired Sources.

3.1.1. OVERALL EVALUATION

Initial proposal of the GAC treatment for the Charnock wells consisted of Biological GAC treatment for the removal of MTBE and TBA. According to B&V, TBA can be removed by the biological degradation of biomass that grows in the GAC contactors. The City expects that the GAC adsorbers support the growth of naturally occurring bacteria that can remove MTBE and degrade TBA present in the water from Charnock wells. The process does not involve organism seeding and nutrient feeding to the GAC. No biological activity parameters are proposed for operation control. This treatment proposal will need further evaluation by the Department Technical Committee.

Packed Tower Aeration has been identified by the Department as the Best Available Technology (BAT) for the removal of VOCs from drinking water. However, GAC is also an established technology for VOC removal. In addition to MTBE and TBA, Charnock well water contamination includes TCE, 1,1-Dichloroethylene, and other VOCs. The Charnock treatability assessment was performed on the chemicals of concern to effectively remove VOCs and other organics. The City's past experience at the Arcadia Production Aquifer Remediation System (PARS)/GAC demonstrated the removal of MTBE and TBA from the groundwater produced by the Arcadia well field. Since the Department had issued a permit for the PARS/GAC system in 2002, there were no additional pilot and demonstration testing conducted for the Charnock well field Restoration Project of similar design and technology. The Charnock GAC treatment system was designed to match the peak design concentrations of MTBE and TBA of the Arcadia PARS/GAC system which is 180 ug/L and 50 ug/L respectively. Therefore the Charnock GAC treatment system should be capable of removing higher concentrations of MTBE and TBA compared to its intended peak design concentrations of 70 ug/L and 10 ug/L respectively.

The Arcadia Water Treatment Facility adds another level of redundancy to the treatment process of the City's drinking water supply. With the RO as the primary treatment process to reduce the City's water hardness, the RO's supporting pretreatment and post treatment i.e. greensand filtration and decarbonation, have incidental removal of some contaminants present in the City's water supply. Greensand filtration removes iron and manganese while decarbonation reduces the levels of VOCs. The Charnock wells have levels that exceed the secondary MCL for iron and manganese ranging from non-detect to 2,243 ug/L and 7.1 – 173 ug/L respectively. The January 2011- June 2012 Arcadia Well 5 Well iron and manganese ranges are 82 – 106 ug/L and 33.0 – 58.6 ug/L respectively. The Arcadia Well 4, Santa Monica Well 3, and Santa Monica Well 4 have levels below the secondary MCL for iron and manganese. At the effluent of the greensand filtration, the levels of iron and manganese are reduced to below the secondary MCL from non-detect to 54 ug/L and non-detect to 15.3 ug/L respectively. The VOC concentration of blended water from the Charnock, Arcadia, and Santa Monica Wells before the decarbonator particularly PCE, TCE, and 1,1-DCE range from 3.1 – 5.6 ug/L, 9.0 – 15.0 ug/L, and non – detect to 2.3 ug/L respectively. After the decarbonator unit, the PCE and 1,1,-DCE concentrations have been reduced to non-detect. TCE levels have concentration range from non-detect to 1.4 ug/L.

The RO itself is capable of reducing uranium and nitrate. Some study indicated that RO can reduce 1,4-dioxane levels. A review of the January 2011- June 2012 City's water quality data indicates that RO influent blended water has uranium level concentrations from 6.6 pCi/L to 13 pCi/L. The RO effluent were reduced to below the uranium detection level of 1 pCi/L. Nitrate levels of water from the Arcadia, Santa Monica, and three out of five Charnock wells are approaching 50% of the MCL for nitrate. The Arcadia Water Treatment Facility effluent showed nitrate reductions to levels ranging from 3.5 mg/L to 6.0

mg/L. The Santa Monica Wells 3 and 4 has historical high levels of 1,4-dioxane up to 23 ug/L (8/28/06) and 28 ug/L (12/1/09), respectively. Recent data from 2011 shows 1,4-dioxane ranges for Santa Monica Well 3 is from 3.2 – 4.3 ug/L while Santa Monica Well 4 is from 10.0 – 16.0 ug/L. The 1,4-dioxane level at the RO effluent before the bypass shows reduction to below the DLR of 1.0 ug/L. The finished water from the Arcadia Water Treatment Facility contains traceable amount of 1,4-dioxane up to 1.1 ug/L.

The Charnock wells are contaminated with VOCs including MTBE, TBA, iron/manganese, nitrate, and uranium. Arcadia Wells 4 and 5 are contaminated with iron and/or manganese and nitrate. Santa Monica Wells 3 and 4 are contaminated with VOCs, nitrate, and 1,4-dioxane. Currently, the Department's policy allows public water systems having one or more of these contaminants present in their water, to continue to utilize the wells provided that the system employs a multi-barrier treatment producing effluent meeting the MCLs and/or Public Health Goals (PHGs). As is the case for all public water systems, if concentrations rise significantly, or if new MCLs are established, the City will have to either provide additional treatment or cease using their wells.

Since the City's active wells are drawing from an aquifers contaminated with numerous organic and inorganic contaminants, the Department requires additional and more frequent monitoring than required by Title 22 of the California Code of Regulations (CCR) to further ensure the public health risk is minimized.

For Charnock Well 20, a review of the plans indicates that the design and construction of the new well is in accordance with AWWA standards and the California Waterworks Standards.

According to the City, the well is 35 feet away from an existing sewer. The initial water quality analysis for the Charnock Well 20 did not indicate presence of nitrates. The City should consider more frequent monitoring for nitrates because of its proximity to the sewer.

3.1.2. SECTION 1: SOURCE WATER ASSESSMENT

The Source Water Assessment requires the evaluation of source water capture zones and identification of sources of contamination including origin, level trend, chemical use, and vulnerability of water source to contaminating activities. Information used in the preparation of the report was gathered from records and database review of previous investigations by the State Department of Water Resources, Environ, Geotrans, Komex, etc., groundwater flow models, and water quality data from GeoTracker and Underwriters Laboratories, Inc.

The report included discussions of the following subjects:

- Hydrogeology and groundwater flow conditions beneath the Charnock well field and the site vicinity, defining the 10-year groundwater capture zone for the Shallow and Silverado Aquifers based on previous reports;
- Extent of petroleum hydrocarbon contamination, including MTBE and TBA, in soil and groundwater in the vicinity of the site based on previous reports;

- Identified potential contaminating facilities and potential contaminants that may be released from such facilities within the 10-year groundwater capture zone for the Shallow and Silverado Aquifers using groundwater modeling; and
- Assessment of the fate and transport of such contaminants and evaluation of the vulnerability of groundwater resources to these sources of contamination.

The Source Water Assessment prepared and submitted to the Department to fulfill the requirements of the 97-005 process was undertaken considering the entire Charnock well field. The report focused mainly on VOC contamination from identified potential contaminating facilities. Other elements for source water assessment i.e. possible contaminating activities (PCA) in residential/municipal and others was not included in the report. The City should submit a source water assessment for each Charnock well.

3.1.2.1. EVALUATION: SECTION 1: SOURCE WATER ASSESSMENT

The area surrounding the Charnock well field is mostly residential. Other includes institutional, recreational, and commercial facilities. The hydrogeology of the Charnock sub-basin has been examined and the continuing monitoring program of production wells and the on-going semi-annual groundwater monitoring for regional monitoring wells by the City offers substantial database of chemical results.

The site-specific cleanup of the identified potential contaminating facilities is ongoing. The RWQCB reported that several PRP sites and soil remediation sites using Soil Vapor Extraction have completed the cleanup. USEPA finds that the treatment plant will provide a protective remedy it does not plan to undertake additional remedy selection at the site. It is estimated that the contamination in the Charnock sub-basin will be removed after about ten years.

3.1.3. SECTION 2: RAW WATER QUALITY CHARACTERIZATION

The Raw Water Quality Characterization requires the full characterization of groundwater produced by the Charnock well field for treatment at the Charnock Water Treatment Facility. The characterization included the following activities:

- The City collected groundwater samples from the five Charnock production wells and 12 regional monitoring wells. These samples were analyzed for a comprehensive list of constituents including:
    - Title 22, State drinking water regulated and unregulated chemicals
    - All chemicals for which drinking water action/notification levels are established
    - Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65)
    - Microbiological quality□
    - Priority pollutants
    - Gross contaminant measures
    - Any chemicals identified in the Source Water Assessment (Section 2 of Policy Memo 97-005).

- The City examined historic water quality analyses of the Charnock production wells and regional monitoring wells including MTBE, TBA, and other VOC contaminations.

- Investigations of available water quality records and new test results showed that the contaminants of concern in the source wells are TBA, MTBE, other VOCs, uranium, iron and manganese.

- During the third quarter of 2008, groundwater sampling was completed from the five Charnock production wells and 12 regional monitoring wells for Title 22 of the California Code of Regulations. A complete listing of chemicals is included in the Raw Water Quality Characterization Report dated June 2010 by WorleyParsons. The listing also contains tentatively identified compounds (TICs) including Non-Target Volatile Organic Compounds and Non-Target Semi-Volatile Organic Compounds.

- The City investigated historical water quality in relation to time and pumping rate of the Charnock production wells. A groundwater flow and solute transport model by GeoTrans was used to simulate the concentrations of MTBE and TBA in the raw water over time, under a range of pumping conditions. The groundwater flow model was developed using the USGS code MODFLOW with RT3D transport simulator. The model was also used to establish the 10-year capture zone for the Charnock well field utilizing forward particle tracking with MODPATH version 3 discussed thoroughly in the Source Water Assessment report. The worst-case (highest mass) plume configuration was used to simulate concentrations for the Charnock well filed remediation pumping. The results were the basis for the design of the Charnock treatment plant.

3.1.3.1. EVALUATION: SECTION 2: RAW WATER QUALITY CHARACTERIZATION

The following Table summarizes the concentrations for water quality constituents of concern at the Charnock wells as indicated in the water quality testing conducted in 2008 and in 2010. Analytical methods and results are included in **Appendix G.**

Table 3.1.3.1 Summary of Water Quality comparison 2008 and 2010

Chemicals of Concern	**MCL**	**2008**	**2010**
VOC			
1,1- dichloroethene (ug/L)	6.0	0.7-18	0.6-14
cis- 1,2-dichloroethene(ug/L)	6.0	1.9	1.2
TCE (ug/L)	5.0	1.6 - 43	1.5 - 26
Inorganics			
Arsenic (ug/L)	10	ND – 2.9	
Iron (ug/L)	300	240 - 2900	150 - 1200
Manganese (ug/L)	50	30 -160	27 - 74
Uranium (pCi/L)	20	9.4 - 74	1.0 - 51

Other VOCs that already have been known to be present in the Charnock aquifer were detected from samples collected in the Charnock wells. 1,1-DCE MCL of 6 ug/L was exceeded at concentrations ranging from 11 ug/L to 18 ug/L from Charnock wells 13, 16, and 19. TCE with an MCL of 5 ug/L was also exceeded at concentration range of 11 ug/L to 43 ug/L form these three Charnock wells.

A review of the water quality from the Department's database indicates that water in the Charnock production wells is hard and shows presence of several VOCs. Among the chemicals detected that exceeded the MCLs are iron and manganese, uranium, and VOCs namely: MTBE, TCE, 1,1,-dichloroethylene, 1,2-dichloroethane, dichloromethane, and latest detection of cis-1,2-dichloroethylene. Historically, TBA was not detected in samples collected from the Charnock wells but it has been detected in some surrounding regional monitoring wells. Water quality samples collected from the production wells in 2008 and 2010 did not show presence of MTBE and TBA. The groundwater flow and transport modeling predicted the breakthrough of MTBE and TBA plumes at peak concentrations at the production wells after approximately three years of well field pumping.

3.1.4. SECTION 3: SOURCE PROTECTION

The source protection section requires a program to control the level of contamination. The City's Source Protection Plan describes the administrative and engineering controls being implemented to minimize the potential for future contamination from the PRP sites and eliminate or minimize the dependence on wellhead treatment. The document enumerated five elements in carrying out the source protection plan namely: contaminant source removal and hydraulic containment, groundwater monitoring, groundwater flow and transport modeling, agency oversight and coordination, and land use planning. The document also identified protection of the well field and water source aquifer including regional development reviews, LARWQCB agenda reviews, and storm water management. The City works closely with the City of Los Angeles to identify development activities that have potential to impact water quality in the Charnock sub-basin. The Charnock well field and the entire 10-year capture zone are located in the City of Los Angeles. Upgradient surveillance wells were designated to validate model predictions of plume behavior and to track overall raw water quality conditions within the 10-year capture zone of the Charnock well field.

3.1.4.1. EVALUATION: SECTION 3: SOURCE PROTECTION

The City submitted a Work Plan for Early Warning Groundwater Quality Monitoring dated September 2010. Twelve sentry wells were identified to validate model predictions of plume behavior and to track overall raw water quality conditions within the 10-year capture zone of the Charnock well field in the Shallow Aquifer and the Upper Silverado Aquifer. The sentry wells are the same regional monitoring wells used for the raw water quality characterization. The City's Work Plan for Early Warning Groundwater Quality Monitoring indicates initial sampling frequency of quarterly of the sentry wells, analyzed for VOCs by EPA Method 8260B. This method does not meet the analysis requirements of the use of extremely impaired sources. Water samples from the upgradient surveillance wells or sentry wells intended to monitor the ambient water quality within the Charnock sub-basin should be analyzed for a wide range of organic and inorganic contaminants, including reporting of unknown peaks and TICs. Sample analysis should be in accordance to the Department requirement of the use of extremely impaired sources.

3.1.5. SECTION 4. EFFECTIVE MONITORING AND TREATMENT

The effective monitoring and treatment portion of the 97-005 policy guidance requires an evaluation of the following:

- Best available treatment technology,
- Reliability features,
- No bypassing of the treatment process,
- Use of multi-barrier treatment processes,
- Process optimization and the use of blending with other water sources prior to entry into the distribution system as an added safety factor, and
- Appropriate performance, process monitoring, operations and reporting,

The Technical Report includes:

- Identification of contaminants of concern,
- A description of treatment design,
- A description of the treatment processes,
- A discussion of the performance standards that the plant will achieve,
- A discussion of the operations and reliability features
- Process monitoring covering source wells, and process influent and effluent water quality,
- Failure responses,
- Shut down triggers,
- A proposed monitoring program covering the production wells, the Charnock and Arcadia treatment facilities, and the “upgradient surveillance” monitoring wells.

3.1.5.1. EVALUATION: SECTION 4: EFFECTIVE MONITORING AND TREATMENT

The Charnock Water Treatment Facility was designed to remove MTBE and TBA using GAC to levels below their respective DLRs. Three of the five Charnock wells are anticipated to contain the contamination plume when the production wells resume in operations. The other two wells are not anticipated to be impacted by the plume if the City maintains 60 percent production from the contaminated wells. The two untreated Charnock wells blend with the GAC treated water.

This project also includes improvements to the Arcadia Water Treatment Facility where 100 percent flow of treated and blended water from the Charnock well field is received. The improvement at the Arcadia Water Treatment Facility includes the installation of a reverse osmosis system to replace the former ion exchange softening system. The RO system has its associated pre and post treatments associated to it including greensand filtration, decarbonation, and pH adjustment. Arcadia wells 4 and 5, and Santa Monica wells 3 and 4 blend with the Charnock well field stream prior to undergoing the treatment train at the Arcadia well field. Additional treatment includes chloramination, fluoridation and the City’s existing MSA system installed in the 5-MG reservoir for the removal of VOCs from the Santa Monica wells. Finished water from the 5-MG reservoir goes the distribution system. The treatment train at the Arcadia well field serves as redundancy to the Charnock treatment system.

The City installed different monitoring locations for operational control. Both the Charnock and Arcadia treatment facilities' controls for operation are fully automated system connected to the supervisory control and data acquisition (SCADA) in the control building at the Arcadia Water Treatment Facility.

A supervisory control and data acquisition (SCADA) system for the AWTF is in the control building located at the Arcadia well field site. This automation enables 24-hour operation of the plant. The facility is equipped with automatic systems which, when triggered, immediately notify the City's personnel of system irregularities.

The efficiency of each of the unit processes and the overall process can be easily monitored. The treatment train involving Charnock Water Treatment Facility has demonstrated the ability to reliably reduce the levels of concentrations below the DLRs for MTBE and TBA. Other VOCs will be treated at the Arcadia Water Treatment Facility to levels below the MCL.

If the finished water at the Arcadia Water Treatment Facility does not meet MCLs for treatable constituents, the treatment system will be manually shutdown. Special monitoring provisions are established in the domestic water supply permit.

3.1.6. SECTION 5: HUMAN HEALTH RISKS ASSOCIATED WITH FAILURE OF THE PROPOSED TREATMENT IDENTIFICATION OF ALTERNATIVES TO THE USE OF THE IMPARED SOURCES

The policy guidance calls for an evaluation of the risks of failure of the proposed treatment system and an assessment of potential health risks associated with such failure.

The technical report presented Black & Veatch Corporation 11 possible failure scenarios including potential failure at the Charnock site, failures at the Arcadia site, and blending failures. Concentration of contaminants in the finished water under these failure scenarios was evaluated. WorleyParsons calculated the health effects if failures of the treatment facility occurred. The calculations were done considering two scenarios: utilized the worst case finished water quality concentrations from the failed treatment scenarios developed by Black & Veatch and using Black & Veatch's worst case influent concentrations, assuming no treatment.

The City concluded that overall, the potential health risks associated with the Charnock and Arcadia Treatment units are extremely low. The multi-barrier approach at both the Charnock and Arcadia treatment facilities help keep the contaminant concentrations low in the finished water, even if a portion of the system of process fails. The facilities are equipped with automation and alarms to ensure that the treatment units are performing according to the design and treatment objective.

3.1.7. SECTION 6. IDENTIFICATION OF ALTERNATIVES TO THE USE OF THE IMPAIRED SOURCES

The policy guidance calls for an identification of alternative sources of drinking water and a comparison of the potential health risks.

The report presented the following alternatives with discussions on the implementation, effectiveness, and comparison of water quality of each alternative source:

- Water Purchase from MWD
- New Well construction within the Santa Monica Basin
- GAC Treatment of Charnock Wells

3.1.7.1. EVALUATION: SECTION 6: IDENTIFICATION OF ALTERNATIVES TO THE USE OF THE IMPARED SOURCES

According to the City's report, water from MWD has the least risk in terms of water quality since it does not require any additional treatment by the City. New well construction within the Santa Monica Basin at a location yet to be determined could present water quality issues.

The City concluded that GAC treatment of Charnock wells is the preferred alternative that is readily implementable in technically effective manner and meets the City's goal of self-sufficiency.

Restoration of the Charnock wells with a treatment plant is a protective remedy that supports the cleanup of the residual regional MTBE contamination. Having the Charnock wells in production will provide additional sources of water supply in emergency situations including earthquakes, fires, and interruptions in other interconnecting adjacent water companies.

3.1.8. SECTIONS 7 AND 8. CEQA AND PERMIT APPLICATION

The City of Santa Monica is the lead agency for this project. The Department is the responsible agency issuing this amended water supply permit.

The Department Environmental Review Unit reviewed the documents prepared by the City namely: Initial Study/Mitigated Negative Declaration (MND) dated March 2008, Notice of Preparation (NOP) dated May 2008, Final Environmental Impact Report (FEIR) dated November 2008, Addendum No.1 dated October 2009, and Addendum No.2 dated June 2010. The Draft Environmental Impact Report (DEIR) was prepared in August 2008.

The City circulated these documents through the State Clearinghouse, identification number SCH# 2008031109. The MND circulated for a 30-day review period beginning on March 24, 2008 and ending on April 23, 2008; the NOP circulated for a 30-day review period beginning on May 20, 2008 and ending on June 18, 2008; the DEIR circulated for a 45-day review period beginning August 18, 2008 and ending on October 1, 2008; the FEIR was submitted November 13, 2008 which included appendixes.

Multiple written comments were received during the review period of the MND, thus triggering the preparation of a NOP and EIR to better evaluate traffic, aesthesis, air quality, and noise impacts. During the review period of the DEIR, eight written comment letters were received and responded to in the FEIR. Addendum No.1 was drafted due to minor changes in the pipeline layout and modification of the chemical storage and feed building.

Addendum No. 2 was drafted to address the physical environmental effects associated with the replacement of a generator at the Charnock Water Treatment Facility.

The FEIR further evaluated the following environmental factors that would potentially have an environmental effect without appropriate mitigation: Aesthetics, Hydrology and Water Quality, Construction Effects, Neighborhood Effects, Geology and Soils, Noise, and Hazards and Hazardous Materials. Addendum No. 1 addressed the need for project alteration due to the discovered groundwater at higher levels than anticipated and additional mitigation regarding the aesthetics of the adjusted project. Addendum No. 2 addressed the physical environmental effects associated with replacement of a generator at the Charnock Facility, which was not previously addressed in the EIR or in Addendum No. 1. The analysis focused on aesthetics, air quality, noise and construction effects and mitigation that was incorporated. Neither of the revisions determined that the project will have significant effect on the environment; thus the minor adjustments made to the project warranted the addendum.

The project was adopted and approved by the City Council on November 25, 2008, Resolution No. 10362. The City filed a Notice of Determination (NOD) through the State Clearinghouse on December 2, 2008. A copy is included in Appendix O. The City was unable to produce documentation indicating the Department of Fish and Game filing fee receipt was paid in full.

The Department received the City's application for a permit amendment on March 31, 2010.

3.1.8.1. EVALUATION: SECTIONS 7 AND 8: CEQA AND PERMIT APPLICATION

The California Department of Public Health (CDPH) as "responsible agency" pursuant to the California Environmental Quality Act (CEQA) has reviewed the Initial Study/Mitigated Negative Declaration (MND), dated March 2008; Notice of Preparation (NOP), dated May 2008; Final Environmental Impact Report (FEIR), dated November 2008; Addendum No. 1, dated October 2009; and Addendum No. 2, dated June 2010. The Draft Environmental Impact Report, dated August 2008, was unavailable at the time of request.

The City prepared the documents and circulated them through the State Clearinghouse, identification number SCH# 2008031109. The MND circulated for a 30 day review period beginning on March 24, 2008 and ending on April 23, 2008; the NOP circulated for a 30 day review period beginning on May 20, 20008 and ending on June 18, 2008; the DEIR circulated for a 45 day review period beginning August 18, 2008 and ending on October 1, 2008; the FEIR was submitted November 13, 2008 which included appendixes – no circulation date was made available.

The proposed project includes construction of backwash storage and treatment system (72,000 gallon backwash storage tank, packaged treatment unit, and greensand filtration), raw water (55,000 gallon) and filtered water (93,000 gallon) equalization tanks, chlorine treatment (sodium hypochlorite) and storage building, and granular activated carbon treatment system. Multiple written comments were received during the review period of the MND, thus triggering the preparation of a NOP and EIR to better evaluate traffic, aesthesis, air quality, and noise impacts. During the review period of the DEIR, eight written comment letters were received and responded to in the FEIR. Addendum No. 1 was drafted due to minor changes in the pipeline layout and modification of the chemical storage and feed building. Addendum No. 2 was drafted to address the physical environmental effects associated with replacement of a generator at the Charnock Facility, which was not discussed in the previous documents.

The FEIR further evaluated the following environmental factors that would potentially have an environmental effect without appropriate mitigation: Aesthetics, Hydrology and Water Quality, Construction Effects, Neighborhood Effects, Geology and Soils, Noise, and Hazards and Hazardous Materials. Addendum No. 1 addressed the need for project alteration due to the discovered groundwater at higher levels than anticipated and additional mitigation regarding the aesthetics of the adjusted project. Addendum No. 2 addressed the physical environmental effects associated with replacement of a generator at the Charnock Facility, which was not previously addressed in the EIR or in Addendum No. 1. The analysis focused on aesthetics, air quality, noise and construction effects and mitigation that was incorporated. Neither of the revisions determined that the project will have significant effect on the environment; thus the minor adjustments made to the project warranted the addendum.

The project was adopted and approved by the City Council on November 25, 2008, Resolution No. 10362. The City filed a Notice of Determination (NOD) through the State Clearinghouse on December 2, 2008. The City was unable to produce documentation indicating the Department of Fish and Game filing fee receipt was paid in full.

As a responsible agency, CDPH has considered the MND, FEIR and both addendums together with all comments received during the environmental review period and hereby makes the following findings for the permit amendment:

Based on the preparation of an EIR and as specified on the NOD, the project will result in significant impacts. No indication was made within the City's NOD, or within the Resolution adopting and certifying the EIR, to whether or not Findings were made; however, it will be assumed that with the development of an EIR, Findings were made. The prior statement also pertains to the Statement of Overriding Consideration – there is no way of confirming if the project warranted this. Issuance of a water supply permit for the operation of the facility will not result in any significant impacts.

CDPH also has reviewed the Worksheet for CEQA Exemptions prepared by the City on April 26, 2012 for the construction of Charnock Well 20. The well replaces Charnock Well 15 and is drilled southeast, 80 feet away. Charnock Well 15 will be destroyed to accommodate Windward High School expansion of its existing athletic field. The City as the lead agency determined that the project is categorically exempt from the CEQA under Class 1, Existing Facilities exemption pursuant to CCR, Title 14, Section 15301 and Title 22, Section 60101(a). The City filed a Notice of Exemption (NOE) through the County's Clerk's office on February 2, 2012. The CDPH Environmental Review Unit (ERU) concurs that the project is exempt from CEQA. The ERU will file a NOE through the Governor's Office of Planning and Research, State Clearinghouse upon issuance of the amended water supply permit. The California Department of Fish and Game filing fees do not apply to this project.

As a responsible agency, CDPH has considered the Worksheet for CEQA Exemptions and project description and hereby makes the following findings for the permit amendment:

The construction of Charnock Well 20 as replacement for Charnock Well 15 is exempt from CEQA under Class 2 of CCR, Title 14, Sec 15302 and Title 22, Section 60101 (b).

3.1.9. SECTION 9. PUBLIC COMMENT AND PUBLIC HEARING

During June 9 and June 12, 2010, the City posted a public notice in the Santa Monica Daily Press to inform its customers about the proposed plan to restore and operate the Charnock well field. The public notice solicited comments and directed parties to submit written comments to the City of Santa Monica Water Resources Division. The 30-day public review started on June 9, 2010. The technical reports prepared according to the CDPH Policy Memorandum No. 97-005 for the public review were accessible at nine public locations including the City of Santa Monica's: Water Resources Division, City Engineering Division, City Planning Counter, City Clerk, Public Work's Counter, and four City Libraries at the Main, Fairview, Montana Avenue, and Ocean Park branches. A copy of the public notice is attached (Appendix P).

The City did not receive any written comments to justify a formal public hearing. In addition to the public notice, the City included information regarding the Charnock Water Treatment Facility in the City's 2010 Annual Water Quality Report or the Consumer Confidence Report, provided news articles in the City's quarterly newsletter, Seascape and the Santa Monica Daily Press. A ribbon-cutting ceremony for the Charnock treatment plant was held in February 2011.

3.1.9.1. SECTION 9. PUBLIC HEARING

The Department determines that sufficient public health protection is provided with the multi-barrier treatment. The 2011 preliminary monitoring data and a review of compliance reports submitted to the Department indicates that the Charnock Water Treatment Facility along with the Arcadia Water Treatment Facility enable the City to reduce the constituents of concern below their respective MCs. For this reason, the Department waives Step 9 of the CDPH Policy Memorandum No. 97-005 evaluation process. No public hearing was held prior to issuance of an approval to operate the Charnock Water Treatment Facility in October 2010.

4. CONCLUSIONS AND RECOMMENDATIONS

Issuance of an amended domestic water supply permit by the State of California Department of Public Health to the City for the operation of the Charnock Water Treatment Facility and the improvements at the Arcadia Water Treatment Facility located in the City of Los Angeles is recommended, subject to the following provisions:

General Provisions

1. This document amends and adds to the domestic water supply permit issued to the City by the Department on March 22, 1966. If any provision(s) of this amendment conflicts with the previously issued permit, the provisions of this amendment shall

govern.

2. The City shall comply with all the requirements set forth in the California Safe Drinking Water Act, California Health and Safety Code and any regulations, standards, or orders adopted thereunder.

3. All water treated and produced by the City shall meet the Maximum Contaminant Levels (MCLs) established by the California Department of Public Health. If the water supplied to the system is determined to exceed any standard, additional treatment shall be provided to bring the water into compliance with the standards.

4. The City's only approved sources for potable supply are those listed in Tables 1 and 2. The Primary Station Codes (PS Codes) associated with the sources are provided in these tables. The only treatment facilities approved and permitted for the City's sources are listed in Table 3.

TABLE 1: Sources

Sources	Status	PS Code	Capacity (gpm)
Charnock Well 13	Active	1910146-005	1,900
Charnock Well 16	Active	1910146-008	2,098
Charnock Well 18	Active	1910146-010	1,800
Charnock Well 19	Active	1910146-011	2,000
Charnock Well 20	**Active**	**1910146-073**	**1,400**
Arcadia Well 4	Active	1910146-003	250
Arcadia Well 5	Active	1910146-001	300
Santa Monica Well 1	Active	1910146-012	250
Santa Monica Well 3	Active	1910146-015	850
Santa Monica Well 4	Active	1910146-017	1,200

TABLE 2: Interconnections

Supplier	Location	Capacity	Status	PS Code
MWD	SMN-1 Western Terminus of the Santa Monica Feeder at Arcadia Water Treatment Facility	19.4 MGD	Active	1910146-024
MWD	SMN-2 Western Terminus of the Culver City Feeder at Charnock Water Treatment Facility	15 MGD	Active	1910146-025

TABLE 3: Treatment Facility and Classification

Treatment Facility	Process		Sources	Treatment Facility Classification
Charnock Water Treatment Facility (CWTF)	Greensand Filtration (pre-treatment) and Granular Activated Carbon (GAC) treatment		Charnock Well 13 Charnock Well 19 Charnock Well 20	T3
	Blending	> 60%(Charnock Wells 13, 19, & 20) < 40%(Charnock Wells16 & 18)	GAC effluent water Charnock Well 16 Charnock Well 18	
Arcadia Water Treatment Facility (AWTF)	Greensand Filtration, Reverse Osmosis, Decarbonation, Mechanical Surface Aeration (MSA), Fluoridation, and Chloramination		CWTF effluent Arcadia Well 4 Arcadia Well 5 Santa Monica Well 3 Santa Monica Well 4	T4
Santa Monica Well 1 Fluoridation System	Fluoridation and Chlorination		Santa Monica Well 1	T1

5. No additions, changes or modifications to the sources of water supply or water treatment facilities outlined in Provision 4 shall be made without prior receipt of an amended domestic water supply permit from the Department.

6. All groundwater wells listed in Provision 4 shall be monitored in accordance with regulations contained in Title 22, California Code of Regulations (CCR), and the most recent Vulnerability Assessment and Monitoring Frequency Guidelines. All results shall be submitted to the Department electronically.

7. All sources listed in listed in Condition 4 shall be monitored in accordance with Title 22, Chapter 15, California Code of Regulation (CCR) and the Department's Vulnerability Assessment and Monitoring Frequency Guidelines.

8. All treatment facilities shall be operated by personnel who have been certified in accordance with the regulations relating to Certification of Water Treatment Facility Operation, California Code of Regulations (CCR), Title 22. The treatment plant classification for the CWTF is T3. The chief and shift operators for the CWTF shall have a minimum of T3 and T2 certifications, respectively. The treatment plant classification for the AWTF is T4. The chief and shift operators for the AWTF shall have a minimum of T4 and T3 certifications, respectively. The treatment plant classification for the fluoridation and chlorination treatment for the Santa Monica Well 1 is T1.

9. Pursuant to section 64590, Title 22 of the California Code of Regulations, no chemical or product shall be added to drinking water as a part of the treatment process unless it has been certified as meeting the specifications of American National Standard Institute/National Sanitation Foundation (ANSI/NSF) Standard 60.

10. The City shall only use chemicals, materials, lubricants, or products that have been tested and certified as meeting the specifications of ANSI/NSF Standard 61 in the production, treatment or distribution of drinking water that will result in its contact with the drinking water, including process media, protection materials (i.e. coating, linings, liners), joining and sealing materials, pipe and related products, and mechanical devices used in treatment/transmission/distribution system, unless conditions listed in Section 64593, Title 22, CCR are met. This requirement shall be met under testing conducted by a product certification organization accredited for this purpose by ANSI.

11. Except for the service area supplied by Santa Monica Well 1, the water supplied by the City contains chloramines. The public served chloraminated water by the City including the dialyses centers, shall be periodically notified that chloramines are used to disinfect the water. The notification shall be repeated yearly in the City's consumer confidence report to the consumers.

12. The City shall comply with requirements of Title 17, Title 22, CCR, to prevent the water system and all treatment facilities from being contaminated by possible cross-connections. The City shall maintain a program for the protection of the domestic water system against backflow from premises having dual or unsafe water systems in accordance with Title 17. All backflow prevention devices shall be tested annually.

CHARNOCK WATER TREATMENT FACILITY (CWTF)

Charnock Well 20

13. Prior to using Charnock Well 20, the City shall disinfect the well in accordance with the AWWA standards and bacteriological samples including HPCs shall be collected. The results shall be absent for total coliforms with HPCs below 500 cfu/mL. All results shall be submitted to the Department for review and approval before the well is placed into service.

14. The City shall provide a retaining wall and a drain system on the north side of the Charnock Well 20 to divert surface runoff away from the well.

15. In November 2012 Charnock Well 20 replaced Charnock Well 15 in the City's Charnock Water Treatment Facility operations. The City shall submit a copy of the destruction permit and reports for Charnock Well 15 to the Department upon completion.

Granular Activated Carbon (GAC)

16. Charnock Wells 13, 19, and 20 shall not operate without the GAC treatment.

17. The CWTF shall be operated such that more than 60% of the total flow rate of the Charnock wells is GAC treated and drawn from Charnock Wells 13, 19, and 20 .

18. The CWTF GAC shall be operated in two-stage series mode of five trains in a parallel configuration at a maximum capacity of 3,750 gpm. Each train of GAC shall not be operated above its design capacity of 750 gpm.

19. The activated carbon in a designated lead vessel shall be replaced when breakthrough of any VOCs is detected at levels greater than 50 percent of the MCL in any water sample collected at the effluent of the lead vessel, and the lag vessel shall be placed in the lead position. The activated carbon in the lead vessel in a series shall also be replaced and the lag vessel shall be placed in the lead when any VOCs is detected greater than the DLR. For MTBE, detection in the lag vessel of greater than 1.0 ppb will trigger the activated carbon in the lead vessel to be replaced. A limit of 3 ppb for TBA is imposed for water leaving the CWTP at all times.

20. Virgin carbon that is NSF 61 certified for use as drinking water system shall be initially used for all GAC beds. Virgin carbon of similar characteristics, such as size and iodine number, shall be used to augment the original volume.

21. A plan shall be submitted to the Department for approval prior to any use of reactivated carbon. If any carbon in the vessels is to be replaced with reactivated carbon rather than virgin carbon, the carbon shall be NSF Standard 61 certified and tested for adsorptive capacity before use. The adsorptive capacity of the reactivated carbon shall be at least 80 percent of the baseline value.

22. Department's approval will be required if and when the need arises to operate Charnock Wells 16 and 18 with GAC treatment.

23. The treated effluent concentration goal of the CWTF shall be below the detection limit for reporting (DLRs) for MTBE and TBA at all times.

24. Water leaving the CWTF shall be pumped directly to the AWTF for further treatment.

Monitoring

25. The City shall complete the initial radiological monitoring requirement for the Charnock wells by collecting four consecutive quarterly samples for the analyses of gross alpha, uranium, radium 226, and radium 228. Future monitoring requirements will be determined once the initial monitoring requirements are met.

26. The Charnock wells shall be sampled in accordance with the raw water monitoring schedule outlined in the approved Operations, Monitoring, and Maintenance Plan (OMMP). The City shall revise its raw water monitoring plan if:

    - Additional chemicals are detected in the early warning monitoring wells that may affect the quality of water produced by the Charnock Wells,
    - New chemicals are detected in the Charnock Wells,
    - The monitoring data indicating a rapid change in a contaminant's concentrations warrants more frequent monitoring.

27. Prior to proceeding with the requirements for further monitoring following the initial detection of a chemical, the City may first confirm the analytical result, as follows: Within seven days from the notification of an initial detection from a laboratory reporting the presence of one or more chemicals in a water sample, the City shall collect one or two additional samples to confirm the initial finding. Confirmation of the initial finding shall be shown by the presence of the chemical in either the first or second additional sample, and the detected level of the contaminant for compliance purposes, if applicable, shall be the average of the initial and the confirmation samples. The initial finding shall be disregarded if two additional samples do not show the presence of the chemical.

28. The City shall comply with any additional monitoring and treatment requirements the Department deems necessary based on any newly identified constituents. If necessary, the Department may modify the monitoring provisions specified herein based on additional information. The City may request a modification of any monitoring provision based upon substantiating data at any time.

29. All analyses for compliance purposes shall be performed by a laboratory certified by the Environmental Laboratory Accreditation Program (ELAP) of the State Department of Public Health for the specific analytical procedure and analytical results shall be submitted through electronic data transfer (EDT) using the PS Codes.

30. The City shall be responsible for and require timely notification from the laboratory by e-mail, telephone or fax of analytical results.

31. When operating the Charnock Water Treatment Facility, the City shall monitor for constituents listed in Tables 4 and 5.

CHARNOCK WATER TREATMENT FACILITY (CWTF)

TABLE 4: CWTF Sampling Points

Sampling Point	PS Code	Parameter	Frequency	Analysis
Charnock Well 13	1910146-005	VOCs, TBA*, Manganese, Iron, Coliforms, and HPCs	Monthly	Certified Lab
		Nitrate	Annually	
		1,4-Dioxane	Annually	
Charnock Well 19	1910146-011	VOCs, TBA*, Manganese, Iron, Coliforms, and HPCs	Monthly	Certified Lab
		Nitrate	Annually	
		Uranium	Quarterly	
		1,4-Dioxane	Annually	
Charnock Well 20	**1910146-073**	VOCs, TBA*, Manganese, Iron, Coliforms, and HPCs	Monthly	Certified Lab
		Nitrate	Annually	
		1,4-Dioxane	Annually	

Sampling Point	PS Code	Parameter	Frequency	Analysis
CH- Raw Water Equalization Tank Effluent	1910146-034	VOCs, TBA*	Monthly	Certified Lab
Charnock Well 16	1910146-008	VOCs, TBA*, Manganese, Iron, Coliforms, and HPCs Nitrate 1,4-Dioxane	Monthly Annually Annually	Certified Lab
Charnock Well 18	1910146-010	VOCs, TBA*, Manganese, Iron, Coliforms, and HPCs Nitrate 1,4-Dioxane	Monthly Annually Annually	Certified Lab
CWTF effluent water (blended) CH-Filtered Water Tank Outlet	1910146-066	VOCs, TBA* Total Chlorine Residual	Weekly Daily	Certified Lab Field Test

TABLE 5: CWTF GAC Sampling Points

Sampling Point		PS Code	Parameter	Frequency	Analysis
CH-GAC Lead Vessel 41% port	1A	1910146-035	VOCs,TBA*	Monthly until VOCs or TBA are detected; then, sample 73% port	Certified Lab
	1B	1910146-038			
	2A	1910146-041			
	2B	1910146-044			
	3A	1910146-047			
	3B	1910146-050			
	4A	1910146-053			
	4B	1910146-056			
	5A	1910146-059			
	5B	1910146-062			
CH-GAC Lead Vessel 73% port	1A	1910146-036	VOCs,TBA*	To confirm immediately after VOCs or TBA are detected at 41% port. Monthly until VOCs are detected; then, sample vessel effluent.	Certified Lab
	1B	1910146-039			
	2A	1910146-042			
	2B	1910146-045			
	3A	1910146-048			
	3B	1910146-051			
	4A	1910146-054			
	4B	1910146-057			
	5A	1910146-060			
	5B	1910146-063			
CH-GAC Vessel Effluent Port	1A	1910146-037	VOCs, TBA* Coliforms HPCs	As Lead vessel, immediately after VOCs and/or TBA are detected at 73% port, then weekly thereafter. When 50% MCL is reached, make lag vessel as lead and	Certified Lab
	1B	1910146-040			
	2A	1910146-043			
	2B	1910146-046			
	3A	1910146-049			
	3B	1910146-052			

Sampling Point		PS Code	Parameter	Frequency	Analysis
CH-GAC Vessel Effluent Port	4A	1910146-055		change spent carbon from vessel. As Lag Vessel, test for VOC or TBA when either is detected at the combined GAC effluent (1910146-065) Test all vessels for coliform bacteria and HPC when either total coliform is positive or there is sudden significant rise in bacterial count at the combined GAC effluent (PS Code 1910146-065).	
	4B	1910146-058			
	5A	1910146-061			
	5B	1910146-064			
Combined GAC Effluent		1910146-065	VOCs	Weekly	Certified Lab
			TBA*	Weekly	Certified Lab
			Nitrate	Monthly	Certified Lab
CH-Combined GAC Outlet			Coliforms	Weekly	Certified Lab
			HPCs	Weekly	Certified Lab

* Collect sample if MTBE is detected at any of the Charnock wells.

Early Warning Monitoring Wells

32. The early warning monitoring wells shall be sampled and analyzed for a wide range of organic and inorganic contaminants, including reporting of unknown peaks and tentatively identified compounds (TICs) and in accordance to the sampling and analysis procedures for extremely impaired sources. A copy of these records shall be available to the Department upon request.

33. The City shall prepare an annual report to the Department, which shall provide an evaluation and technical review of the water quality data gathered from the early warning monitoring wells and discuss any changes in the characteristics of the plume and the possible impact on the Charnock Water Treatment Facility.

ARCADIA WATER TREATMENT FACILITY (AWTF)

34. The AWTF shall operate at a maximum capacity of 10 MGD inclusive of the CWTF effluent, Arcadia Wells 4 and 5, and Santa Monica Wells 3 and 4.

35. Water leaving the AWTF shall comply with all the primary and secondary Maximum Contaminant Levels (MCLs) and the Notification Levels (NL) established by the Department at all times. If the water quality does not comply with the California Drinking Water Standards, the City shall not use the water from the AWTF until the exceedance is remedied or additional treatment is provided to meet standards.

36. At all times the flow through the existing Mechanical Surface Aeration (MSA) system shall not exceed 10,000 gpm capacity.

37. The existing MSA system at the AWTF shall not be bypassed at any time the water is to be used for drinking purposes.

38. Blending shall be optimized at the 5-MG reservoir such that the concentration goal of 1,4-dioxane at the effluent is below the notification level. The City must ensure that sources with the lowest concentration of 1,4-dioxane go online prior to Santa Monica Wells 3 and 4.

39. All water entering the distribution system from AWTF shall be continuously and reliably disinfected. The chlorine residual shall be measured daily at the effluent of the existing 5-MG Arcadia Reservoir.

Greensand Filtration (For CWTF and AWTF)

40. The design filter surface loading rate is 3.3 gpm/ft^2 and 3.0 gpm/ ft^2 for CWTF and AWTF, respectively.

41. The filtration plant shall be in operation when the wells that exceed the iron and manganese SMCL are in service.

42. The City shall at all times properly operate and maintain the filtration treatment plant at the CWTF and AWTF to achieve compliance with the secondary standards for iron and manganese.

Reverse Osmosis (RO)

43. The City shall at all times operate the RO system at the AWTF not exceeding the design feed water flow rate of 1,900 gpm per train with flux rates not to exceed 14 gallons per square foot per day.

44. The City shall operate the RO system over a recovery range of 70 to 85 percent. The bypass flow shall not exceed 30 percent of the total flow.

Fluoridation (AWTF and Santa Monica Well 1)

45. The City shall adjust fluoride levels to achieve an optimal fluoride level of 0.8 mg/L at the AWTF and Santa Monica Well 01 fluoridation stations effluent with a control range of 0.7 mg/L to 1.3 mg/L. The optimal fluoride levels should be adjusted as determined based on the procedures described in Section 64433.2 of Title 22, CCR, using the annual average of maximum daily air temperatures based on the five calendar years immediately preceding the current calendar year.

46. The City shall operate its fluoridation facilities in accordance with the most recent, Department-approved Fluoridation Operations and Contingency Plan for the Arcadia Treatment Facility and Santa Monica Well 1 Station.

47. The City shall maintain daily operational records for the fluoridation treatment including total volume of water treated, total volume of fluoride compounds used, and the calculated dosage fed each day. A copy of these records shall be available to the Department upon request. A monthly report with results of compliance monitoring and a description of any unusual occurrences shall be submitted to the Department by the 10th day of each month following the month being reported.

48. The City shall compare readings from the fluoride analyzers with the split samples analyzed with a certified laboratory at least once every month.

49. At least one daily fluoride sample shall be taken at downstream of the fluoride injection point at each site to verify the accuracy of the metering pumps and SCADA calculation.

50. The City shall analyze raw water sample from the Santa Monica Well 1 for fluoride level at the frequency of no less than annually.

51. By August 1, the City shall submit an annual report to the Department on the operation and maintenance costs of fluoridation treatment incurred during the fiscal year (July 1 to June 30) for the previous year.

Monitoring

52. When operating the Arcadia Water Treatment Facility, the City shall monitor for constituents listed in Table 6.

ARCADIA WATER TREATMENT FACILITY (AWTF)

TABLE 6: AWTF Sampling Points

Sampling Point	PS Code	Parameter	Frequency	Analysis
Santa Monica Well 3	1910146-015	VOCs > MCL Nitrate Total Coliform & HPC 1) 1,4-Dioxane	Quarterly 2) and/or Monthly 3) Quarterly Monthly Quarterly	Certified Lab
Santa Monica Well 4	1910146-017	VOCs > MCL Nitrate Total Coliform & HPC 1) 1,4-Dioxane	Quarterly 2) and/or Monthly 3) Quarterly Monthly Quarterly	Certified Lab
Arcadia Well 5 / Arcadia Well 4 *(Arcadia wells operate one well at a time)*	1910146-001 / 1910146-003	VOCs > MCL, MTBE & TBA Nitrate Iron and Manganese Total Coliform & HPC 1)	Quarterly 2) and/or Monthly 3) Quarterly Quarterly Monthly	Certified Lab
Arcadia Filter Plant Effluent ARC-Combined Filtrate	1910146-067	Iron & Manganese Coliform HPC Turbidity	Weekly Monthly Monthly Continuous	Certified Lab Online Analyzer
Cartridge Filter Combined Effluent ARC-Combined Cartridge Filter Outlet	1910146-068	VOC TBA* Uranium Conductivity pH (process control for RO)	Quarterly Quarterly Quarterly Continuous Continuous	Certified Lab Online Analyzer Online Analyzer

Sampling Point	PS Code	Parameter	Frequency	Analysis
Arcadia RO Combined Effluent before Bypass ARC-Combined RO Permeate	1910146-069	Uranium Conductivity Sulfate 1,4-Dioxane	Quarterly Weekly Monthly Quarterly	Certified Lab
Arcadia Decarbonator Influent	1910146-072	VOC TBA*	Weekly Weekly	Certified Lab
Fluoride Pre-Injection ARC – Decarbonator Tank Effluent	1910146-074	Fluoride	Every six months	Certified Lab
Arcadia RO Effluent and Bypass Water ARC- Reservoir Influent	1910146-070	VOC TBA*	Weekly	Certified Lab
AWTF Treated Effluent Arcadia TP-Treated	1910146-071	VOCs TBA* Nitrate Iron Manganese Sulfate Odor Fluoride Uranium pH Alkalinity Total Hardness TDS Combined Chlorine Total Coliform HPC Aggressive Index Langelier Index @ 60^0C 1,4-Dioxane	Weekly Monthly Monthly Monthly Monthly Monthly Weekends&Holidays Quarterly Weekly Monthly Monthly Monthly Daily Monthly Monthly Monthly Monthly Quarterly	Certified Lab

*Collect sample if MTBE is detected at any of the Charnock wells.

[1] **HPC** – If either total coliform is present or significant rise in bacterial count in the routine and confirmation samples, it is advisable to remove the well(s) from service and have it disinfected. The well(s) shall be tested for and found free of bacteriological contamination prior to resuming as the domestic source.

[2] **Quarterly** – VOCs detected at the source, at concentrations greater than DLR, but less than MCL are analyzed quarterly; the frequency is increased to monthly for all VOCs detected at the levels greater than MCL.

[3] **Monthly** – VOCs detected at the source at concentrations greater than MCLs are analyzed monthly; the frequency is reduced to quarterly when the VOC is detected greater than DLR but less than MCL in at least six subsequent monthly samples.

OPERATIONS AND MAINTENANCE FOR CHARNOCK WATER TREATMENT FACILITIES, (TABLE 3)

53. The status of the production wells shall be recorded daily, and the treatment facilities shall be inspected daily for any abnormal occurrences including, but not limited to, leaks, unusual noises, or pressure readings. A checklist of items to be examined shall be filled out daily and maintained for a minimum of five years.

54. The City shall minimize system downtime by working with the carbon supplier(s) to arrange for timely carbon change out. However, if the system must be shut down and if the shutdown lasts over two weeks, the vessels shall be drained and filled with water from the filtered water tank. The procedures recommended by the manufacturer shall be followed. When the vessels are started up again, bacteriological samples shall be collected and the carbon beds shall be checked to see if a disinfection of carbon bed is required. Once the disinfection is completed, the vessel shall be backwashed prior to startup.

55. All treatment systems shall be maintained according to the manufacturer's specifications.

56. All instruments, including but not limited to, chemical analyzers and flow meters, shall be calibrated at the frequencies and by the methods recommended by their respective manufacturers. Records for all instrument calibrations shall be maintained by the City for at least five years, and made available to the Department when requested.

57. Sampling ports for the wells, GAC vessels, filter vessels, RO vessels, decarbonators, fluoridation, and the reservoirs' inlets/outlets shall be maintained in good operating condition.

58. The City shall revise the Charnock Operations Plan and the Arcadia Operations Report dated December 2009 to include, but not limited to: water quality monitoring for compliance and operational control, reporting, and maintenance plan. The revised documents will be the City's OMMP as referred to in this permit. The OMMP shall be submitted within **90 days of receipt of this permit** for Department review and approval.

59. Except as specified, the City shall operate the treatment facilities in accordance with the most recent Department-approved OMMP. All additions, deletions, or amendments to the OMMP shall be approved by the Department prior to implementation. The City is responsible for ensuring that the OMMP is, at all times, representative of the operations, maintenance, and monitoring of the treatment plant, and appropriate changes to the OMMP are submitted to the Department for approval in a timely manner.

60. All plant operators and supervisory personnel involved with the operation or oversight of the operations at the treatment facilities shall have a copy and shall be familiar with the OMMP and the conditions of this letter, and the provisions of all valid permits previously issued to the City. A copy of the OMMP shall be maintained at the treatment complex offices for reference.

61. Personnel should be available at all times (on duty or on call) to respond to emergencies, including nights weekends, and holidays.

62. A monthly performance report of each treatment facility shall be submitted to the Department by the 10th day of the following month. As a minimum, the report shall include:

    - A summary of analytical results, bacteriological and chemical, received by the City in the reporting calendar month.
    - A summary of all contaminants in the early warning monitoring wells, the GAC vessels' combined effluent, the filter vessels' combined effluent, the RO combined effluent, and the AWTF 5-MG reservoir effluent detected at or above MCLs or NLs.
    - A summary of the wells' operational schedules, noting problems, scheduled interruptions, unscheduled interruptions, and repairs made with the facilities.
    - The daily operational records, including as a minimum, flow rates, total volume treated, chlorine measurements, operational changes and unusual occurrences.

63. Within **90 days from the date of this permit,** the City shall submit a technical performance report describing the CWTF and AWTF performance after one full year of operation that was required under Provision 48 of Department Approval Letter (Charnock well field Restoration Project) dated October 29, 2010. The report shall include, but not be limited to: compliance with all permit provisions, the treatment plant's status, condition, and performance; a table noting dates and concentrations of each contaminant detected in the plant's effluent and the corresponding source concentrations; and a summary of all operational changes and the reasons for such changes.

64. The City should maintain "as built" plans of the water treatment system at the treatment facilities and be made available upon Department's request.

Appendix A

Permit Amendment Application

STATE OF CALIFORNIA
APPLICATION
FOR
DOMESTIC WATER SUPPLY PERMIT

Applicant: City of Santa Monica (Utilities Division)

(Enter the name of legal owner, person(s) or organization)

Address: 1212 Fifth Street, 3rd Floor, Santa Monica, CA 90401

System Name: Santa Monica - City, Water Division

System Number: 1910146

To: Department of Health Services
Drinking Water Field Operations Branch
Los Angeles Office, Central District
1449 West Temple Street, Room 202
Los Angeles, CA 90026

Pursuant and subject to the requirements of the California Health and Safety Code, Division 104, Part 12, Chapter 4 (California Safe Drinking Water Act), Article 7, Section 116525, relating to domestic water supply permits, application is hereby made to amend the existing water supply permit for the Santa Monica Water Treatment Plant (WTP; "Arcadia") to include: 1) reactivation of the Charnock Well Field (Wells 13, 15, 16, 18, and 19), 2) a new granular activated carbon water treatment system at Charnock, 3) a new reverse osmosis softening system at Arcadia to replace the old ion exchange system, 4) a new disinfection system at Arcadia, and 5) a new fluoridation system at Arcadia.
The Charnock Well Field is located at 11375 Westminster Ave in Los Angeles, CA.
The Santa Monica WTP is located at 1228 South Bundy Drive in West Los Angeles, CA.

I (We) declare under penalty of perjury that the statements on this application and on the accompanying attachments are correct to my (our) knowledge and that I (we) are acting under authority and direction of the responsible legal entity under whose name this application is made.

Signed By:

Print Name: Gilbert M. Borboa, Jr.

Title: Water Resources Manager

Address: 1212 Fifth Street, 3rd Floor
Santa Monica, CA 90401

Telephone: 310 458-8230

Dated: 3/31/10

Rev. 08/2007

Appendix B

Guidance for Direct Domestic Use of Extremely Impaired Sources

State of California

Department of Health Services

Memorandum

Date: November 5, 1997

To: Drinking Water Program
Regional and District Engineers

From: Division of Drinking Water and
Environmental Management

Subject: Policy Memo 97-005 Policy Guidance for Direct Domestic Use of Extremely Impaired Sources

A. General Philosophy

The primary goal of the Drinking Water Program (DWP) is to assure that all Californians are, to the extent possible, provided a reliable supply of safe drinking water. In furtherance of this goal, the DWP continues to subscribe to the basic principle that only the best quality sources of water reasonably available to a water utility should be used for drinking. When feasible choices are available, the sources presenting the least risk to public health should be utilized. Furthermore, these sources should be protected against contamination. Whenever possible, lower quality source waters should be used for nonconsumptive uses, such as irrigation, recreation, or industrial uses, which pose lower health risk.

The use of contaminated water as a drinking water source always poses a greater health risk and hazard to the public than the use of an uncontaminated source because of the chance that the necessary treatment may fail.

The use of an extremely impaired source should not be approved unless the additional health risk, relative to the use of other available drinking water sources, are known, minimized, and considered acceptable.

Water utilities (including wholesalers) should be encouraged to minimize the concentration of man-made toxic substances, naturally occurring contaminants, and pathogenic microorganisms in drinking water supplies, maximum contaminant levels (MCLs) notwithstanding.

Extremely impaired sources that contain or are likely to contain high concentrations of contaminants, multiple contaminants, or unknown contaminants (such as groundwater subject to contamination from a hazardous waste disposal site) should not be considered for direct human consumption where alternatives are available.

Where reasonable alternatives are available, high quality drinking water should not be allowed to be degraded by the planned addition of contaminants. In other words, the MCLs should not be used to condone contamination up to those levels where the addition of those contaminants can be reasonable avoided.

Drinking water quality and public health shall be given greater consideration than costs or cost savings when evaluating alternative drinking water sources or treatment processes.

The DWP recognizes that there are extremely impaired sources in California that need to be cleaned up and for which the resulting product water represents a significant resource that should not be wasted. In some situations, it may be reasonable to consider the use of these treated extremely impaired sources for domestic use. Some communities may not have any choice. In such cases, the public health principles as set forth in this policy should be used to guide the evaluation of such situations.

B. Purpose of Policy Guidance

The purpose of this guidance document is to set forth the position and the basic tenets by which DWP would evaluate proposals, establish appropriate permit conditions, and approve the use of an extremely impaired source for any direct potable use.

An extremely impaired source meets one or more of the following criteria:

- exceeds 10 times an MCL or action level (AL) based on chronic health effects,
- exceeds 3 times an MCL or AL based on acute health effects,
- is a surface water that requires more than 4 log *Giardia*/5 log virus reduction,
- is extremely threatened with contamination due to proximity to known contaminating activities
- contains a mixture of contaminants of health concern
- is designed to intercept known contaminants of health concern.

Examples include:

- Extremely contaminated ground water
- Effluent dominated surface water
- Oilfield produced water
- Water that is predominantly recycled water; urban storm drainage; treated or untreated wastewater; or agricultural return water
- Products of toxic site cleanup programs

It is recognized that the circumstances surrounding each situation may be different. Proposals for the use of extremely impaired sources, therefore, must be considered on a case-by-case basis.

C. Elements of an Evaluation Process for an Extremely Impaired Drinking Water Source

1. Source Water Assessment:

The purpose of the source water assessment for the extremely impaired source is to determine the extent to which the aquifer or surface water is vulnerable to contaminating activities in the area. There may be other contaminants associated with activities that contribute to the known contamination, or other contamination sources that have yet to impact the drinking water source. There may not be drinking water MCLs, Als or monitoring requirements established for these additional contaminants, but health related information may be available through other programs. The appropriate level of monitoring and treatment to produce a safe drinking water cannot be determined unless the activities that are affecting or may impact raw water quality are understood. The assessment should include:

- Delineation of the source water capture zone
- Identification of contaminant sources
    - Identify the origin of known contaminants found in the source water and predict contaminant level trends
    - Identify chemicals or contaminants used at or generated by facilities responsible for the known contamination
    - Identify all potential contaminant sources and determine the vulnerability of the water source to these contaminant sources

2. Full characterization of the raw water quality:

The appropriate level of monitoring and treatment to produce a safe drinking water cannot be determined unless the raw water quality is fully understood. The following categories should be considered to fully characterize the source water quality:

- Title 22 drinking water regulated and unregulated chemicals
- All chemicals for which drinking water action levels are established
- All chemicals listed pursuant to Safe Drinking Water and Toxic Enforcement Act of 1986
- Microbiological quality
- Priority pollutants
- Gross contaminant measures [total organic carbon (TOC), etc.]
- Any compounds identified under source water assessment.
- Determine variability of contaminant concentrations with time (seasonal and long term)
- Determine variability of contaminant concentrations with pumping rate.
- The detection of any contaminant identified in the raw water quality characterization (step 2) should require assessment of the impact on the source water pursuant to the source water assessment (step 1).

3. Source Protection:

There must be a program in place to control the level of contamination. At a minimum, best management practices for waste handling and waste reduction should be required. In addition, monitoring at the source should be conducted to determine the level of contamination and to reasonable assure that the contamination level will not increase. Unless the level of contamination is known a determination cannot be made that the proposed treatment is sufficiently adequate and reliable to render the water potable.

If the use of an extremely impaired source is to be approved, the source of the contamination must be controlled to:

- Prevent the level of contamination from rising.
- Minimize the dependence on treatment.

4. Effective Monitoring and Treatment:

The treatment process used to treat the extremely impaired source prior to direct usage in a domestic water distribution system must be commensurate with the degree of risk associated with the contaminants present. As a minimum, treatment of extremely impaired sources shall include use of the best available treatment technology defined for the contaminant(s) by the Environmental Protection Agency. Furthermore, the treatment processes must have reliability features consistent with the type and degree of contamination.

All treatment processes used must be optimized to reliably produce water that contains the lowest concentration of contaminants feasible at all times. The entire flow from the extremely impaired source must pass through the complete treatment process or processes. Any water from other sources that is available for blending prior to entry into the distribution system should be used to provide an additional safety factor.

Multi-barrier treatment is a set of independent treatment processes placed in series, and designed and operated to reduce the levels of a contaminant. Each barrier should effectively reduce the contaminant by a significant fraction of the total required reduction. The treatment processes should address all the contaminants of public health concern in an extremely impaired source. Multi-barrier treatment may be appropriate when:

- The primary treatment is not sufficiently reliable;
- The primary treatment is of uncertain effectiveness;
- There is no direct way to measure the contaminant (e.g., pathogenic microorganism);
- The health effect of the contaminant is acute; and/or
- Very large reductions in contaminant concentration are required.

The description of the proposed monitoring and treatment should include the following:

- Performance standards (field measurable indicator of treatment efficiency);
    - Identify level to assure compliance with the treatment objective
    - The treatment objective for all contaminants should be optimized to the lowest extent feasible and must assure compliance with the MCL/AL at all times.

  - Facilities for treating water containing specific contaminants for which the MCL is higher than the maximum contaminant level goal (MCLG) should be designed and operated to meet the MCLG where this can be accomplished in a cost effective manner.

- Operations plan that identifies all operational procedures, failure response triggers, and loading rates, including:
  - Process monitoring plan
  - Process optimization procedures
  - Established water quality objectives or goals
  - Level of operator qualification

- Reliability features
  - Response Plan for failure to meet the treatment objective
  - Alternative disposal methods
  - Shutdown triggers and restart procedures

- Compliance monitoring and reporting program
- Notification plan
- Extremely impaired source water quality surveillance plan

  The water quality surveillance plan should include monitoring between the origin of the contamination and the extremely impaired source that is proposed for drinking water.

5. Human Health Risks Associated with Failure of Proposed Treatment:

   Treatment technologies are not failure proof, and insufficiently treated or untreated water may, on occasion, pass through the treatment process and into the distribution system. An assessment must be performed that includes:

   - An evaluation of the risks of failure of the proposed treatment system.

     The proposed treatment system must be evaluated in terms of its probability to fail, thereby exposing customers to insufficiently treated or untreated drinking water from the extremely impaired source.

     All treatment failure modes are to be evaluated. The evaluation must include an assessment of the proposed frequency of monitoring as it relates to protection of the public from insufficiently treated or untreated drinking water.

   - An assessment of potential health risks associated with failure of the proposed treatment system. The health assessment must take into account:

- the duration of exposure to contaminated drinking water that would result from such a failure
- the human health risks associated with such exposure to insufficiently treated or untreated water over the course of that failure, considering the risks of disease from microbiological organism, and the risks of acute and chronic effects (including cancer risks) from chemical contaminants
- potential cumulative risks, due to multiple failures

When risks of adverse health effects from treatment failure are not acceptable, then additional treatment safeguards must be used for the protection of public health, or the proposal must be rejected.

6. Identification of alternatives to the use of the extremely impaired source and compare the potential health risk associated with these to the project's potential health risk.

Use of alternative sources of drinking water reasonably available to a water utility should be evaluated as to health risk (assuming MCLs are, or can be, met), and compared to the use of the extremely impaired source.

In evaluating the relative risk comparison of the extremely impaired source and alternative drinking water sources, additive effects of multiple contaminants are an important consideration. Generally, consideration of allowing direct potable use of an extremely impaired source should be limited to a single toxic contaminant or a limited number of similar chemicals that can be reliably treated with the same process.

The comparison of alternatives should include a comparison of the risks of treatment failure for the alternatives, as well as for the extremely impaired source (step 5).

7. Completion of the California Environmental Quality Act (CEQA) review of the project:

CEQA review of the project must be completed.

8. Submittal of a permit application:

The public water system(s) collecting, treating and distributing water from the extremely impaired source must submit a permit application for the use of the extremely impaired source that includes the items identified above. A supplier of treated water to a public water system is a water wholesaler and must be permitted as a public water system, as required by the Safe Drinking Water Act.

9. Public hearing:

A public hearing must be held to identify concerns of consumers who will be served water from the extremely impaired source and to assure that all parties have a chance to provide relevant information.

10. DHS evaluation:

DHS staff shall conduct an evaluation of the application and make recommendations.

11. Requirements for DHS approval:

The following findings are required of DHS for approval to use an extremely impaired source:

- Drinking water MCLs and Als will not be exceeded if the permit is complied with, and
- The potential for human health risk is minimized, and the risk associated with the project is less than or equal to the alternatives.

12. Issuance or denial of permit:

DHS either issues a permit or denies a permit for the use of the extremely impaired source. If a permit is issued, it shall include all necessary treatment, compliance monitoring, operational, and reporting requirements.

<Original signed by>

David P. Spath, Ph.D., P.E., Chief

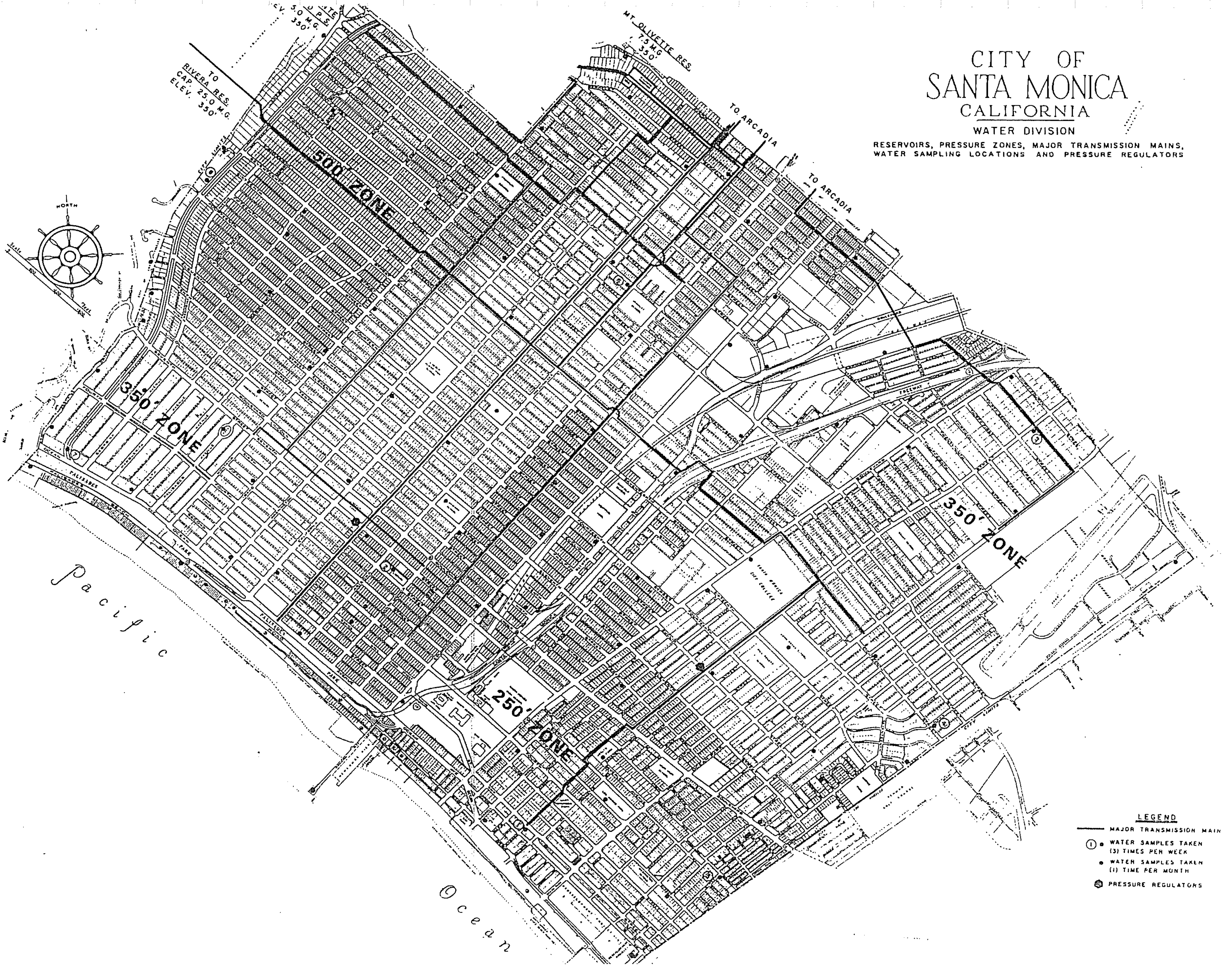
Appendix C

Service Area, Pressure Zones, and Water System Schematic

CITY OF SANTA MONICA CALIFORNIA

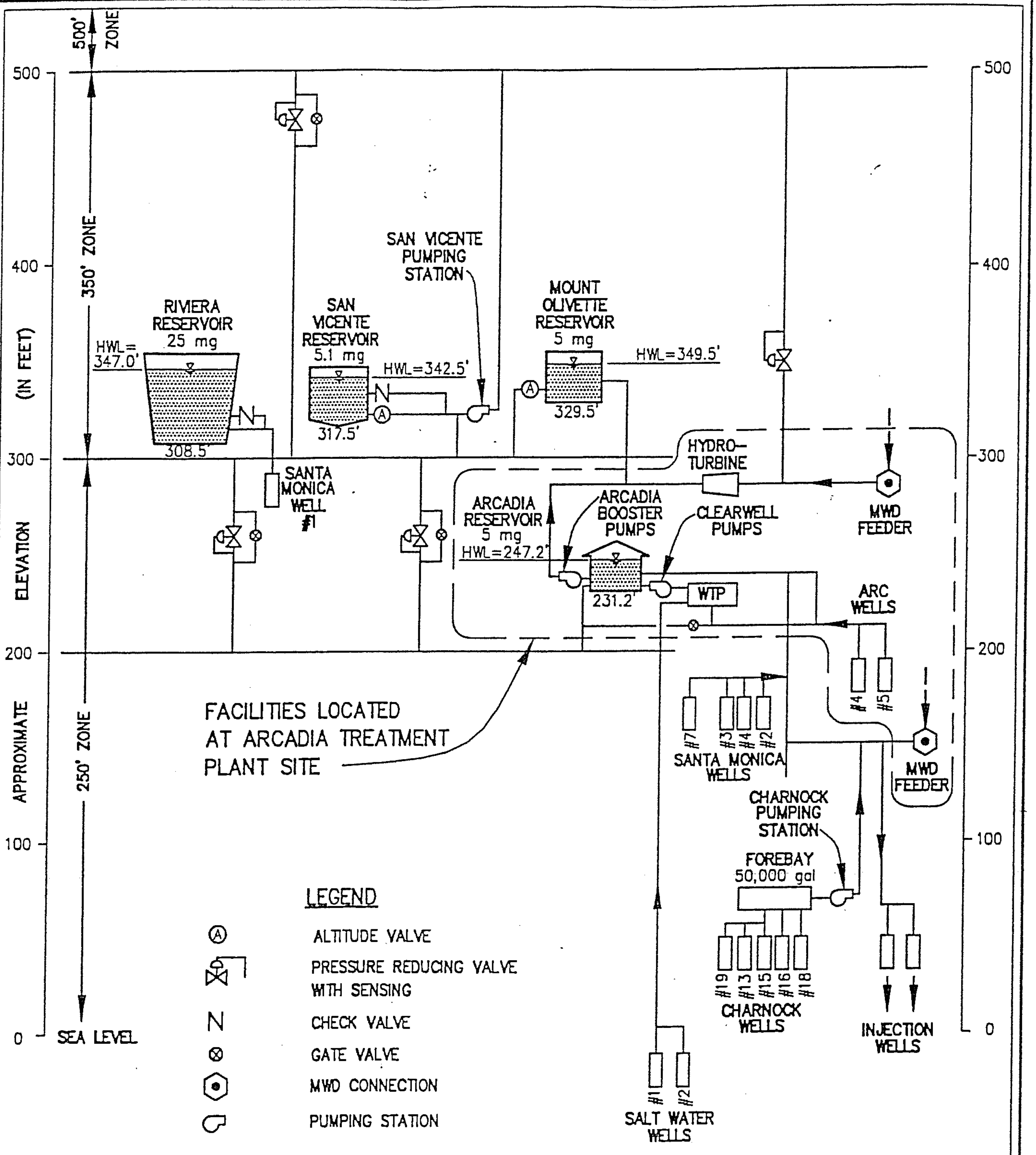
WATER DIVISION

RESERVOIRS, PRESSURE ZONES, MAJOR TRANSMISSION MAINS, WATER SAMPLING LOCATIONS AND PRESSURE REGULATORS



LEGEND

- MAJOR TRANSMISSION MAIN
- ① ● WATER SAMPLES TAKEN (3) TIMES PER WEEK
- ● WATER SAMPLES TAKEN (1) TIME PER MONTH
- ⬢ PRESSURE REGULATORS



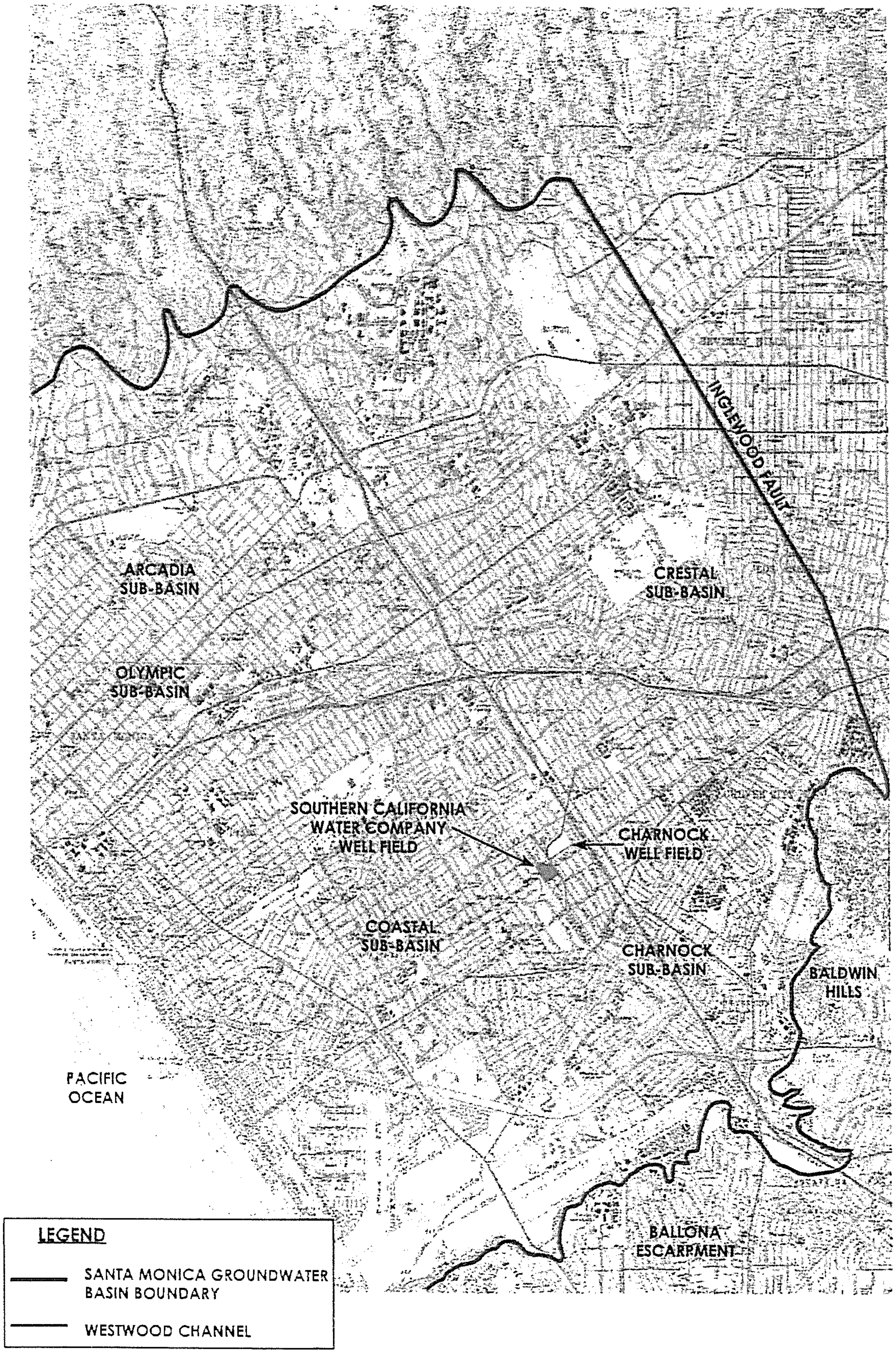
Kennedy/Jenks Consultants

FIGURE NO. 3 - CITY OF SANTA MONICA WATER SYSTEM SCHEMATIC

NOTE: PIPING NOT SHOWN AT ACTUAL ELEVATION.

Appendix D

Site Location and Charnock Well Field Layout



CITY OF SANTA MONICA
CHARNOCK WATER TREATMENT SYSTEM

WorleyParsons
resources & energy

SITE LOCATION MAP

DRAWN BY:	EDITED BY:	DATE:
WRM	WRM	03/2008

APPROVED:
TW
#170,064

1

Approximate Scale in Feet

CITY OF SANTA MONICA
CHARNOCK TREATMENT SYSTEM

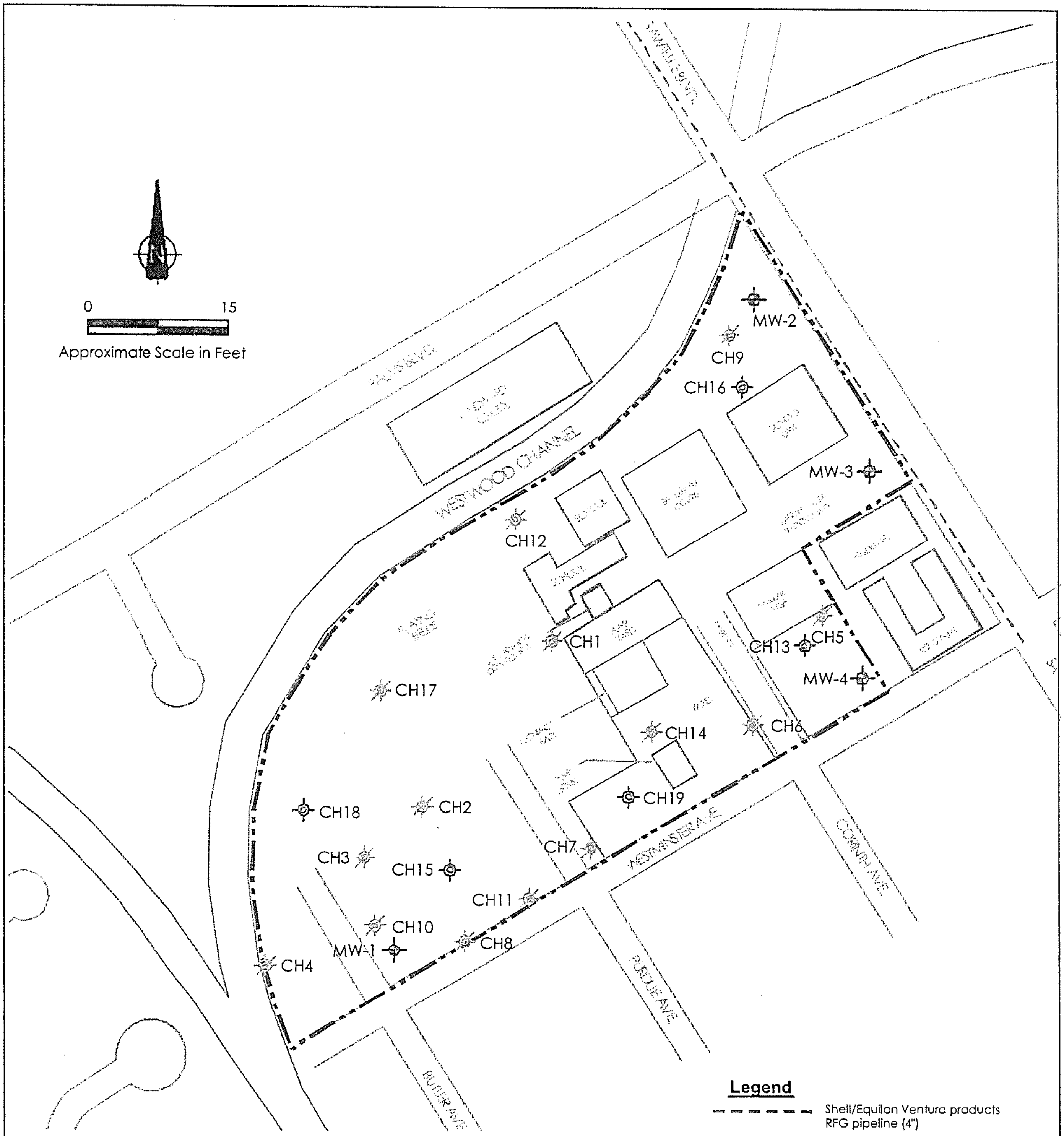
WorleyParsons
resources & energy

CHARNOCK WELL FIELD

DRAWN BY:	EDITED BY:	DATE:
WRM	WRM	03/2008

APPROVED:
TW
#170,065

2



Legend

- - - - - Shell/Equilon Ventura products RFG pipeline (4")

—— - - —— Well field boundary

⊕ Groundwater monitoring well

✳ Abandoned water production well

⊕ Existing groundwater production well

Note

MW-1 and MW-2 possibly screened in both Shallow Unnamed Aquifer (SUA) and Upper Silverado Aquifer (USA)

CITY OF SANTA MONICA
CHARNOCK TREATMENT SYSTEM

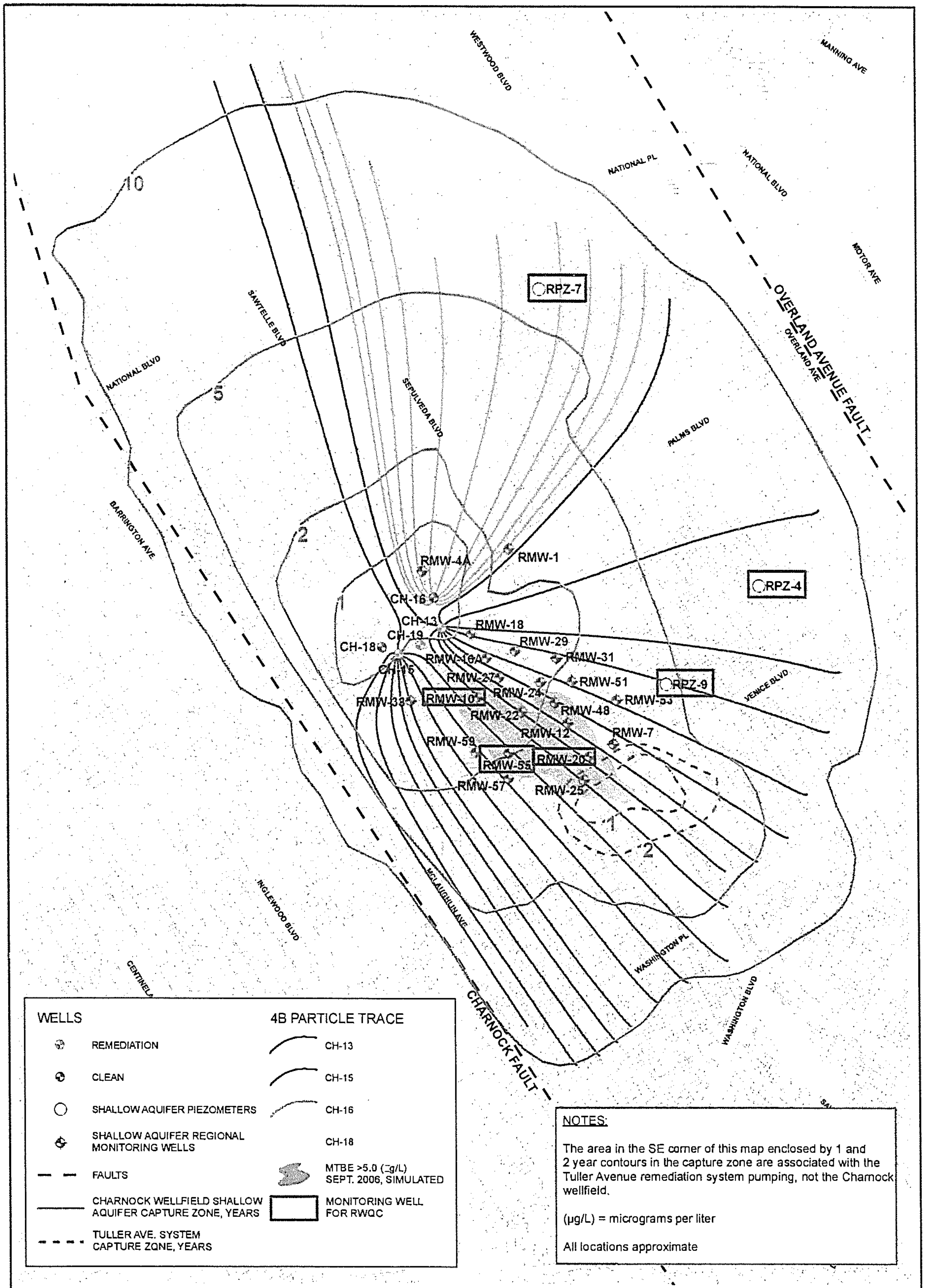
WorleyParsons
resources & energy

SITE LAYOUT

DRAWN BY:	EDITED BY:	DATE:
WRM	WRM	03/2008

APPROVED:
TW
#170,066

3



NOTES:

The area in the SE corner of this map enclosed by 1 and 2 year contours in the capture zone are associated with the Tuller Avenue remediation system pumping, not the Charnock wellfield.

(µg/L) = micrograms per liter

All locations approximate

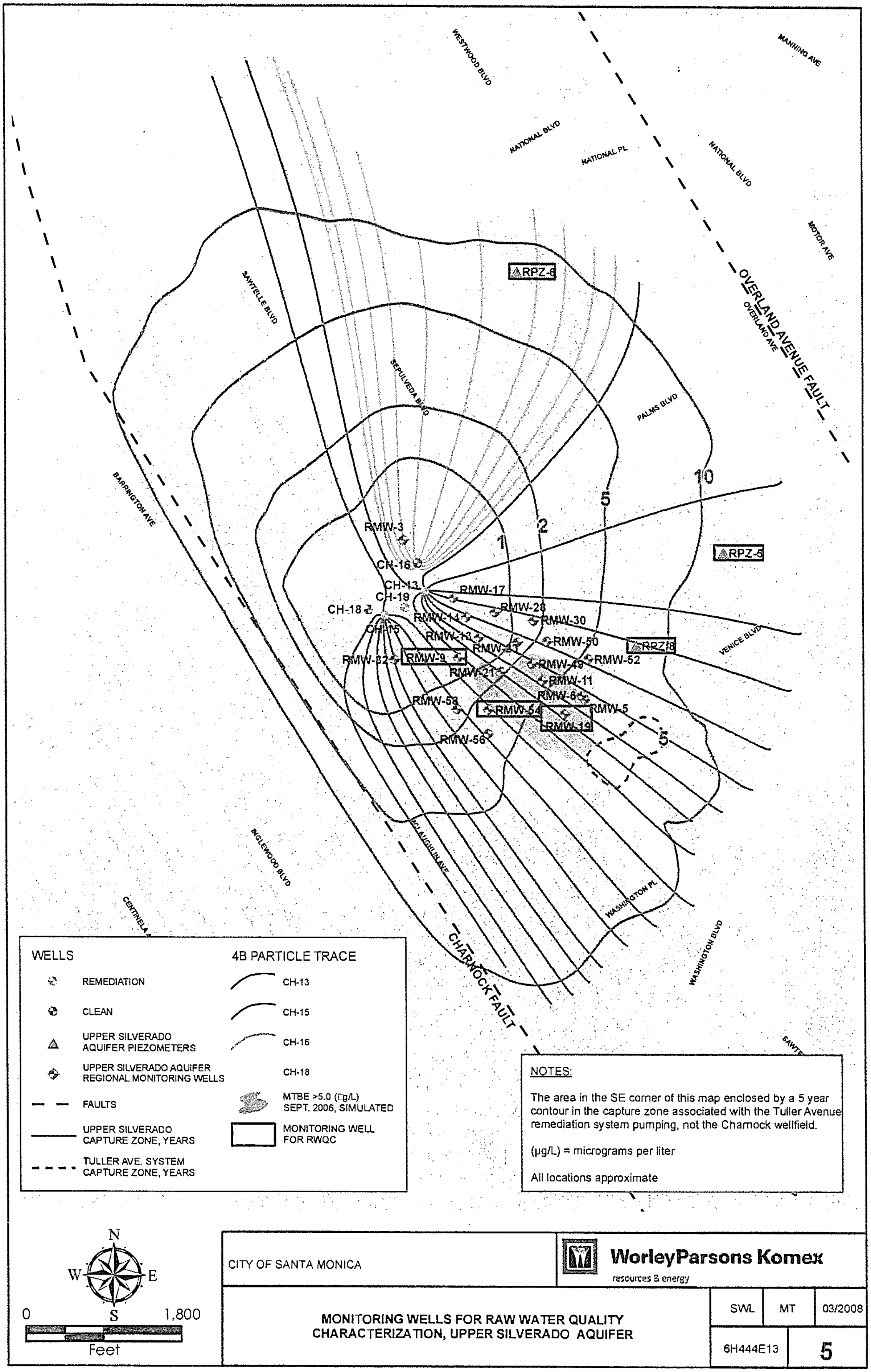
N
W E
S
0 1,800
Feet

CITY OF SANTA MONICA

WorleyParsons
resources & energy

MONITORING WELLS FOR RAW WATER QUALITY CHARACTERIZATION, SHALLOW AQUIFER

SWL	MT	6/2009
6H444E13	4	



NOTES:

The area in the SE corner of this map enclosed by a 5 year contour in the capture zone associated with the Tuller Avenue remediation system pumping, not the Charnock wellfield.

(µg/L) = micrograms per liter

All locations approximate

CITY OF SANTA MONICA

WorleyParsons Komex
resources & energy

MONITORING WELLS FOR RAW WATER QUALITY CHARACTERIZATION, UPPER SILVERADO AQUIFER

SWL	MT	03/2008
6H444E13		5

Appendix E

Environ 2009 Quarterly Regional Groundwater Monitoring Report

TABLE 5a. SUMMARY OF GROUNDWATER ANALYTICAL RESULTS, July 2009 - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Well No.	Aquifer	Sample Date	MTBE	TBA	TAME	DIPE	ETBE	1,2,4-TMB	1,3,5-TMB	Ethanol	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Volatile Fuel Hydrocarbons	
			EPA Method 8260B													C6-C12	C4-C12
EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*1.0*	*1.0*	*100*	*0.50*	*1.0*	*1.0*	*1.0*	*1.0*	*50*	*50*
Shallow AQUIFER																	
RMW-10	Shallow	7/17/09	**2.1**	**10J**	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
RMW-12	Shallow	7/14/09	**3.5**	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
RMW-20	Shallow	7/14/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
RMW-22	Shallow	7/17/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
RMW-25	Shallow	7/15/09	**0.72J**	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
RMW-48	Shallow	7/13/09	**1.2J**	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
RMW-55	Shallow	7/13/09	**5.1**	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
RMW-57	Shallow	7/16/09	**120**	**5.7J**	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	**94**
RMW-59	Shallow	7/16/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
SILVERADO AQUIFER																	
RMW-6	Upper Silverado	7/15/09	**0.84J**	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
RMW-11	Upper Silverado	7/14/09	**1.8J**	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
RMW-19	Upper Silverado	7/14/09	**12**	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
RMW-19 fd	Upper Silverado	7/14/09	**12**	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
RMW-49	Upper Silverado	7/13/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
RMW-52	Upper Silverado	7/15/09	**2.1**	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
RMW-52 fd	Upper Silverado	7/15/09	**2.0**	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
RMW-54	Upper Silverado	7/13/09	**2.0**	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
RMW-54 fd	Upper Silverado	7/13/09	**1.8J**	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
RMW-56	Upper Silverado	7/16/09	**28**	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
RMW-56 fd	Upper Silverado	7/16/09	**28**	**6.4J**	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
RMW-58	Upper Silverado	7/16/09	**1.8J**	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	**44J**	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48

Notes:

All units are in micrograms per liter (µg/l), or parts per billion

EQL = Estimated Quantitation Limit

fd = duplicate sample

<xx = Analyte not detected above the indicated detection limit

J = Estimated value

Volatile fuel hydrocarbons are analyzed using the California Department of Health Services (DHS) LUFT method.

TABLE 5b. SUMMARY OF QC SAMPLE RESULTS, July 2009 - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Sample ID No.	Sample Type	Sample Date	MTBE	TBA	TAME	DIPE	ETBE	1,2,4-TMB	1,3,5-TMB	Ethanol	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Volatile Fuel Hydrocarbons	
			EPA Method 8260B													C6-C12	C4-C12
EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*1.0*	*1.0*	*100*	*0.50*	*1.0*	*1.0*	*1.0*	*1.0*	*50*	*50*
rmw-6-090715-eb	eb	7/15/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
rmw-6-090715-ab	ab	7/15/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24		
rmw-10-090717-tb	tb	7/17/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24		
rmw-10-090717-eb	eb	7/17/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
rmw-10-090717-ab	ab	7/17/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24		
rmw-11-090714-eb	eb	7/14/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
rmw-11-090714-ab	ab	7/14/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24		
rmw-12-090714-eb	eb	7/14/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
rmw-19-090714-tb	tb	7/14/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24		
rmw-19-090714-eb	eb	7/14/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
rmw-19-090714-ab	ab	7/14/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24		
rmw-20-090714-eb	eb	7/14/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
rmw-22-090717-eb	eb	7/17/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
rmw-22-090717-ab	ab	7/17/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24		
rmw-25-090715-eb	eb	7/15/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
rmw-25-090715-ab	ab	7/15/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24		
rmw-48-090713-eb	eb	7/13/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
rmw-48-090713-ab	ab	7/13/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24		
rmw-49-090713-eb	eb	7/13/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
rmw-52-090715-tb	tb	7/15/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24		
rmw-52-090715-eb	eb	7/15/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
rmw-52-090715-ab	ab	7/15/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24		
rmw-54-090713-tb	tb	7/13/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24		
rmw-54-090713-eb	eb	7/13/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
rmw-54-090713-ab	ab	7/13/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24		
rmw-55-090713-eb	eb	7/13/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
rmw-56-090716-tb	tb	7/16/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24		
rmw-56-090716-eb	eb	7/16/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
rmw-56-090716-ab	ab	7/16/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	**49J**	<0.28	<0.22	<0.33	<0.45	<0.24		

TABLE 5b. SUMMARY OF QC SAMPLE RESULTS, July 2009 - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Sample ID No.	Sample Type	Sample Date	MTBE	TBA	TAME	DIPE	ETBE	1,2,4-TMB	1,3,5-TMB	Ethanol	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Volatile Fuel Hydrocarbons	
			EPA Method 8260B													C6-C12	C4-C12
EQL (μg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*1.0*	*1.0*	*100*	*0.50*	*1.0*	*1.0*	*1.0*	*1.0*	*50*	*50*
rmw-57-090716-eb	eb	7/16/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
rmw-58-090716-eb	eb	7/16/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48
rmw-58-090716-ab	ab	7/16/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24		
rmw-59-090716-eb	eb	7/16/09	<0.3	<3.5	<0.28	<0.31	<0.27	<0.24	<0.23	<43	<0.28	<0.22	<0.33	<0.45	<0.24	<48	<48

Notes:

ab = Atmospheric blank
eb = Equipment blank
tb = Trip blank
na = Not analyzed
J = Estimated value

TBA = Tert-Butyl Alcohol
TAME = Tert-Amyl Methyl Ether
DIPE = Di-isopropyl Ether
ETBE = Ethyl tert-Butyl Ether

U, V, or X = Data are qualified due to a detection in an associated equipment blank, trip blank, method blank, or other QC issue (1.3U, 1.3V, or 1.3X means <1.3 μg/l).

"V" indicates that the detection limit for the qualified data is higher than the instrument detection limit for the analyte.

"X" indicates that the detection limit for the qualified data was raised to the EQL for the analyte.

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

			VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
Regional Well No.	Aquifer	Sample Date	EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				1.0	10	2.0	2.0	2.0	0.5	1.0	1.0	1.0	1.0	2.0	C6-C12	C4-C12
MWM-1	Upper Silverado	1/18/00	8260a	220	5.0J	<2	<2	<2								
MWM-1	Upper Silverado	1/18/00	8020	230					<1	1.4J	<1			16	53	
MWM-1	Upper Silverado	1/27/00	8260a	200	54	<2	<2	<2								
MWM-1	Upper Silverado	1/27/00	8020	150					<1	6.6	<1			25	150	
MWM-1	Upper Silverado	4/26/00	8260a	240	14J	<2	<2	<2								
MWM-1	Upper Silverado	4/26/00	8020	240					<1	1.8J	<1			14	69	
MWM-1	Upper Silverado	12/12/00	8260b	120J	<5	<0.68	<0.5	<2	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	13U	
MWM-1	Upper Silverado	1/26/01	8260b	120	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<10
MWM-1	Upper Silverado	5/3/01	8260b	150	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	10J	59J
MWM-1	Upper Silverado	7/27/01	8260b	140	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		59J
MWM-1	Upper Silverado	10/26/01	8260b	140	6.8J	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	63J
MWM-1 (dup)	Upper Silverado	10/26/01	8260b	170	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	64J
MWM-1	Upper Silverado	1/15/02	8260b	180	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	68J
MWM-1	Upper Silverado	4/16/02	8260b	330	38	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	<10	99J
MWM-1	Upper Silverado	7/18/02	8260b	410	7.4J	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	19J	170
MWM-1	Upper Silverado	9/30/02	8260b	270J	8.8J	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
MWM-1	Upper Silverado	10/17/02	8260b	320	6.1J	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	13J	130
MWM-1 (dup)	Upper Silverado	10/17/02	8260b	290	6.1J	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	16	<50
MWM-1	Upper Silverado	12/19/02	8260b	330J	23J	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.52	<0.24	<0.52		
MWM-1	Upper Silverado	1/16/03	8260b	490	100J	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	50XJ	120
MWM-1	Upper Silverado	3/11/03	8260b	350	33J	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
MWM-1	Upper Silverado	3/27/03	8260b	390	77J	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
MWM-1	Upper Silverado	4/17/03	8260b	380	35J	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	160
MWM-1	Upper Silverado	5/29/03	8260b	280	53	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
MWM-1	Upper Silverado	6/26/03	8260b	500	70	<0.64	<0.53	<0.66	<0.58	<0.39	<0.7	<0.34	<0.32	<0.32		
MWM-1	Upper Silverado	7/17/03	8260b	420	120J	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79	<44	<44
MWM-1	Upper Silverado	8/28/03	8260b	410	100J	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79		
MWM-1	Upper Silverado	10/2/03	8260b	450	93J	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79		
MWM-1	Upper Silverado	10/16/03	8260b	490	69J	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79	<44	140
MWM-1	Upper Silverado	1/15/04	8260b	380	160J	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79	<44	<44
MWM-1 (dup)	Upper Silverado	1/15/04	8260b	350	160J	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79	<44	<44
MWM-1	Upper Silverado	4/15/04	8260b	290	110J	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79	<44	140
MWM-1 (dup)	Upper Silverado	4/15/04	8260b	270	110J	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79	<44	140
MWM-1	Upper Silverado	1/13/05	8260b	58	290	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	<44
MWM-1 (dup)	Upper Silverado	1/13/05	8260b	77	340	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	<44

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
	EQL (µg/l):			1.0	10	2.0	2.0	2.0	0.5	1.0	1.0	1.0	1.0	2.0	C6-C12	C4-C12
MWM-1	Upper Silverado	4/14/05	524.2	110	260	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
MWM-1	Upper Silverado	7/14/05	8260b	120	220	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	86
MWM-1 (dup)	Upper Silverado	7/14/05	8260b	110	250	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	73
MWM-1	Upper Silverado	10/19/05	8260b	42	230	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
MWM-1	Upper Silverado	4/19/06	524.2	13J	76J	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<44	<44
MWM-1	Upper Silverado	7/21/06	8260b	11	230	<0.33	<0.33	<0.33	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
MWM-1	Upper Silverado	10/18/06	8260b	6.5	310	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
MWM-2	Upper Silverado	1/25/00	8260a	86	<5	<2	<2	<2								
MWM-2	Upper Silverado	1/25/00	8020	56					<1	<1	<1			12	49	
MWM-2	Upper Silverado	1/27/00	8260a	64	15	<2	<2	<2								
MWM-2	Upper Silverado	1/27/00	8020	65					<1	5.9	<1			23	140	
MWM-2	Upper Silverado	4/28/00	8260a	31	<5	<2	<2	<2								
MWM-2	Upper Silverado	4/28/00	8020	28					<1	2.7	<1			9.0	91	
MWM-2	Upper Silverado	12/12/00	8260b	99J	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	12U	
MWM-2	Upper Silverado	1/16/01	8260b	140	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
MWM-2	Upper Silverado	4/18/01	8260b	100	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
MWM-2	Upper Silverado	5/30/01	8260b	1,000	30	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
MWM-2	Upper Silverado	6/27/01	8260b	1,300	130	<0.68	<0.5	<0.57	<0.11	<0.18	0.11J	<0.69	<0.14	<0.82		
MWM-2 (dup)	Upper Silverado	6/27/01	8260b	1,300	150	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
MWM-2	Upper Silverado	7/25/01	8260b	1,000	28	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		450
MWM-2	Upper Silverado	10/31/01	8260b	620	48	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	110
MWM-2	Upper Silverado	11/28/01	8260b	670J	8.8J	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
MWM-2 (dup)	Upper Silverado	11/28/01	8260b	650J	9.3J	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
MWM-2	Upper Silverado	12/26/01	8260b	480	22J	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
MWM-2 (dup)	Upper Silverado	12/26/01	8260b	330	16J	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
MWM-2	Upper Silverado	1/30/02	8260b	580	26	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	10J	110J
MWM-2	Upper Silverado	2/27/02	8260b	560	23J	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
MWM-2	Upper Silverado	3/27/02	8260b	460	66	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
MWM-2	Upper Silverado	4/24/02	8260b	520	58	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	<10	90J
MWM-2	Upper Silverado	5/29/02	8260b	400	76	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
MWM-2	Upper Silverado	6/26/02	8260b	410	100	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
MWM-2	Upper Silverado	7/31/02	8260b	220	66	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
MWM-2	Upper Silverado	8/28/02	8260b	240	120	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
MWM-2	Upper Silverado	9/25/02	8260b	150J	50	0.68UJ	0.5UJ	0.57UJ	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
MWM-2	Upper Silverado	10/30/02	8260b	140J	61	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	58J

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
MWM-2	Upper Silverado	11/27/02	8260b	**220**	70	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.52	<0.24	<0.52		
MWM-2	Upper Silverado	12/18/02	8260b	**130**	**65J**	0.33UJ	<0.78	<0.61	<0.28	<0.25	<0.49	<0.52	<0.24	<0.52		
MWM-2	Upper Silverado	1/29/03	8260b	**72**	**51J**	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
MWM-2	Upper Silverado	2/26/03	8260b	**110**	**47J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
MWM-2 (dup)	Upper Silverado	2/26/03	8260b	**110**	**43J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
MWM-2	Upper Silverado	3/26/03	8260b	**93**	**110J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
MWM-2	Upper Silverado	4/30/03	8260b	**39**	**78J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
MWM-2 (dup)	Upper Silverado	4/30/03	8260b	**36**	**55J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
MWM-2	Upper Silverado	5/28/03	8260b	**46**	**41J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
MWM-2 (dup)	Upper Silverado	5/28/03	8260b	**46**	**42J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
MWM-2	Upper Silverado	6/25/03	8260b	**47**	**80**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
MWM-2	Upper Silverado	7/30/03	8260b	**25**	**60**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
MWM-2	Upper Silverado	8/27/03	8260b	**32**	44	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
MWM-2 (dup)	Upper Silverado	8/27/03	8260b	**32**	**50**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
MWM-2	Upper Silverado	9/24/03	8260b	**31**	**87**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
MWM-2	Upper Silverado	10/29/03	8260b	**30**	**91**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
MWM-2 (dup)	Upper Silverado	10/29/03	8260b	**32**	**94**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
MWM-2	Upper Silverado	1/28/04	8260b	**5.5**	**17J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	**0.26J**	**0.17J**	**0.43J**	<44	<44
MWM-2	Upper Silverado	4/28/04	8260b	**1.6J**	**15J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
MWM-2	Upper Silverado	1/26/05	8260b	**13**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	<44
MWM-2	Upper Silverado	4/27/05	524.2	**8.4**	30	<0.32	<0.27	<0.33	<0.049	<0.029	**0.053J**	<0.069	<0.034	--	<44	<44
MWM-2	Upper Silverado	7/27/05	8260b	**7.7**	74	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
MWM-2	Upper Silverado	10/19/05	8260b	**2.3**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
MWM-2	Upper Silverado	4/19/06	524.2	**0.61**	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	**0.11J**	<0.03	<0.016	--	<44	<44
MWM-2	Upper Silverado	7/20/06	8260b	**14**	**55**	<0.33	<0.33	<0.33	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
MWM-2	Upper Silverado	10/18/06	8260b	**7.3**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
MWM-3	Upper Silverado	2/11/00	8260a	**93**	<5	<2	<2	<2	<1	<1	<1			<1	<10	
MWM-3	Upper Silverado	2/11/00	8020	**50**												
MWM-3	Upper Silverado	4/26/00	8260a	**100**	**7.2J**	<2	<2	<2	<1	**1.5J**	<1			**11**	**58**	
MWM-3	Upper Silverado	4/26/00	8020	**120**												
MWM-3	Upper Silverado	12/12/00	8260b	**130J**	**9.4J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	13U	
MWM-3	Upper Silverado	1/26/01	8260b	**87**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<10
MWM-3	Upper Silverado	5/3/01	8260b	**140**	**13J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	**63J**
MWM-3	Upper Silverado	7/27/01	8260b	**200**	**5.6J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		**79J**
MWM-3	Upper Silverado	10/26/01	8260b	**220**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	**72J**

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
MWM-3	Upper Silverado	1/15/02	8260b	**290**	**48**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	**93J**
MWM-3	Upper Silverado	4/16/02	8260b	**560**	**63**	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	50XJ	160V
MWM-3	Upper Silverado	7/18/02	8260b	**130**	**30**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	**69J**
MWM-3	Upper Silverado	9/30/02	8260b	**150**	**28**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
MWM-3 (dup)	Upper Silverado	9/30/02	8260b	**160**	**26**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
MWM-3	Upper Silverado	10/17/02	8260b	**200**	**43**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	**10J**	**96J**
MWM-3 (dup)	Upper Silverado	10/17/02	8260b	**190**	**44**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	**11J**	**99J**
MWM-3	Upper Silverado	11/27/02	8260b	**190**	**51**	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.52	<0.24	<0.52		
MWM-3	Upper Silverado	12/19/02	8260b	470	**160**	0.33UJ	<0.78	<0.61	<0.28	<0.25	<0.49	<0.52	<0.24	<0.52		
MWM-3	Upper Silverado	1/16/03	8260b	**150J**	44	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	**60J**
MWM-3 (dup)	Upper Silverado	1/16/03	8260b	**160J**	43	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
MWM-3	Upper Silverado	3/11/03	8260b	**110**	**76J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
MWM-3	Upper Silverado	3/27/03	8260b	**41**	**52J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
MWM-3	Upper Silverado	4/17/03	8260b	**76**	**48J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
MWM-3	Upper Silverado	5/29/03	8260b	**170**	**180**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
MWM-3 (dup)	Upper Silverado	5/29/03	8260b	**170**	**170**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
MWM-3	Upper Silverado	6/26/03	8260b	**190**	**230**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
MWM-3	Upper Silverado	7/17/03	8260b	**180J**	**240**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
MWM-3 (dup)	Upper Silverado	7/17/03	8260b	**190**	**230**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
MWM-3	Upper Silverado	8/28/03	8260b	**110**	**210**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
MWM-3	Upper Silverado	9/25/03	8260b	**150**	**230**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
MWM-3	Upper Silverado	10/16/03	8260b	**130**	**240**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**54**
MWM-3	Upper Silverado	1/15/04	8260b	**18**	**59J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
MWM-3	Upper Silverado	4/15/04	8260b	**2.2**	**4.9UJ**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
MWM-3 (dup)	Upper Silverado	4/15/04	8260b	**2.3**	**4.9UJ**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
MWM-3	Upper Silverado	1/13/05	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	<44
MWM-3 (dup)	Upper Silverado	1/13/05	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	<44
MWM-3	Upper Silverado	4/14/05	524.2	**5.9**	**72**	<0.32	<0.27	<0.33	<0.049	<0.029	**0.053J**	<0.069	<0.034	--	<44	<44
MWM-3	Upper Silverado	7/14/05	8260b	**11**	**90**	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
MWM-3	Upper Silverado	10/19/05	8260b	**10**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
MWM-3	Upper Silverado	4/19/06	524.2	**0.21J**	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	0.5X	<0.03	<0.016	--	<44	<44
MWM-3	Upper Silverado	7/20/06	8260b	**14**	<3.9	<0.33	<0.33	<0.33	<0.26	<0.17	**0.72J**	**0.59J**	**0.54J**	--	<48	<48
MWM-3	Upper Silverado	10/18/06	8260b	**13**	**50**	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-1	Shallow	4/15/97	8020-conf	<2					<0.3	<0.2	**0.51J**	<0.8	<0.3	<0.5		
RMW-1	Shallow	4/15/97	8020	<2					<0.3	<0.2	**0.74J**	<0.8	<0.3	<0.5		

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-1	Shallow	7/2/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-1	Shallow	7/2/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-1	Shallow	9/18/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-1	Shallow	9/18/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-1	Shallow	10/29/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-1	Shallow	10/29/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-1	Shallow	2/10/98	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-1	Shallow	2/10/98	8020	**2.7**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-1	Shallow	2/10/98	8260a	<2	<3	<2	<0.4	<2								
RMW-1	Shallow	4/22/98	8020	<2					<1	<1	<1			<1		
RMW-1	Shallow	4/22/98	8260a	<2	<50	<2	<2	<2								
RMW-1	Shallow	7/28/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-1	Shallow	7/28/98	8260a	<2	<50	<2	<2	<2								
RMW-1	Shallow	10/26/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-1	Shallow	10/26/98	8260a	<2	<50	<2	<2	<2								
RMW-1	Shallow	1/25/99	8020	**3J**					<1	<1	<1	<2	<1	<2		
RMW-1	Shallow	1/25/99	8260a	<2	<50	<2	<2	<2								
RMW-1	Shallow	4/26/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-1	Shallow	4/26/99	8260a	<2	<50	<2	<2	<2								
RMW-1	Shallow	7/26/99	8020	**160**					<1	<1	<1	<1	<1	<1		
RMW-1	Shallow	7/26/99	8260a	**150**	<50	<2	<2	<2								
RMW-1	Shallow	8/6/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-1	Shallow	8/6/99	8260a	**3.4J**	<50	<2	<2	<2								
RMW-1 (dup)	Shallow	8/6/99	8020	**5.3**					<1	<1	<1	<1	<1	<1		
RMW-1 (dup)	Shallow	8/6/99	8260a	**3.8J**												
RMW-1	Shallow	9/21/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-1	Shallow	9/21/99	8260a	<2	<50	<2	<2	<2								
RMW-1	Shallow	10/27/99	8260a	**41**	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-1 (dup)	Shallow	10/27/99	8260a	**110**	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-1	Shallow	4/26/00	8260a	**27**	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-1 (dup)	Shallow	4/26/00	8260a	**22**	**12J**	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-1	Shallow	7/26/00	8260b	**5.9**	**11J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-1	Shallow	10/31/00	8260b	**11**	**8.2J**	<0.68	<0.5	<0.57	**0.95**	**0.18J**	**2.8**	**1.3**	**0.65J**	**1.9J**	**20J**	
RMW-1	Shallow	3/5/01	8260b	**490**	**56J**	<3.4	<2.5	<2.8	<0.55	<0.9	<0.47	<3.4	<0.7	<4.1		**190**
RMW-1	Shallow	5/1/01	8260b	74	91	<0.68	<0.5	<0.57	<0.11	<0.18	0.1VJ	<0.69	<0.14	<0.82	<10	<50

H:\Charnock\03-15184D1\2009_Semiannual_July-Dec\Report\Tables\
Table 06 historic gw summary_Jul 09.xls

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-1	Shallow	7/17/01	8260b	**5.3**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-1	Shallow	11/28/01	8260b	**57**	**29**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	<50
RMW-1 (dup)	Shallow	11/28/01	8260b	**52**	**29**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-1	Shallow	1/24/02	8260b	**30**	**6.5J**	<0.68	0.5UJ	<0.57	**0.37J**	**0.56J**	2.1V	**3**	**0.86J**	**3.9**	10J	<50
RMW-1 (dup)	Shallow	1/24/02	8260b	**74**	**13J**	<0.68	0.5UJ	<0.57	**0.19J**	**0.3J**	1XJ	**1.5**	**0.47J**	**2**	<10	<50
RMW-1	Shallow	4/25/02	8260b	**20**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	50XJ	<50
RMW-1	Shallow	7/25/02	8260b	**5.9**	<5	<0.68	<0.5	<0.57	**0.13J**	<0.18	**0.13J**	<0.69	<0.14	<0.82	50XJ	<50
RMW-1	Shallow	10/23/02	8260b	**0.99J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	50XJ	<50
RMW-1 (dup)	Shallow	10/23/02	8260b	**0.48J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	<50
RMW-1	Shallow	1/23/03	8260b	**2.4**	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-1	Shallow	4/22/03	8260b	**3.9**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-1	Shallow	7/22/03	8260b	**0.74J**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-1 (dup)	Shallow	7/22/03	8260b	**0.66J**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-1	Shallow	10/21/03	8260b	**0.73J**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-1	Shallow	1/20/04	8260b	**2.3**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-1	Shallow	4/20/04	8260b	**3.1**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-1	Shallow	4/19/05	524.2	<0.28	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-1	Shallow	4/12/06	524.2	**3.9**	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	**0.1J**	**0.22J**	<0.016	--	<48	<48
RMW-2A	Lower Silverado	4/15/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-2A	Lower Silverado	4/15/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-2A (dup)	Lower Silverado	4/15/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-2A (dup)	Lower Silverado	4/15/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-2A	Lower Silverado	7/2/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-2A	Lower Silverado	7/2/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-2A	Lower Silverado	9/18/97	8020-conf	<2					<0.3	<0.2	**0.31J**	<0.8	<0.3	<0.5		
RMW-2A	Lower Silverado	9/18/97	8020	<2					<0.3	<0.2	**0.39J**	<0.8	<0.3	<0.5		
RMW-2A	Lower Silverado	10/29/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-2A	Lower Silverado	10/29/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-2A	Lower Silverado	2/10/98	8020-conf	**8.6**					<0.3	<0.2	**0.4**	<0.8	<0.3	<0.5		
RMW-2A	Lower Silverado	2/10/98	8020	**6.7**					<0.3	<0.2	**0.42**	<0.8	<0.3	<0.5		
RMW-2A	Lower Silverado	4/22/98	8020	<2					<1	<1	<1			<1		
RMW-2A	Lower Silverado	4/22/98	8260a	<2	<50	<2	<2	<2								
RMW-2A	Lower Silverado	7/28/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-2A	Lower Silverado	7/28/98	8260a	<2	<50	<2	<2	<2								

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-2A	Lower Silverado	10/26/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-2A	Lower Silverado	10/26/98	8260a	<2	<50	<2	<2	<2								
RMW-2A	Lower Silverado	1/25/99	8020	<2					<1	<1	<1	<2	<1	<2		
RMW-2A	Lower Silverado	1/25/99	8260a	<2	<50	<2	<2	<2								
RMW-2A	Lower Silverado	4/26/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-2A	Lower Silverado	4/26/99	8260a	<2	<50	<2	<2	<2								
RMW-2A	Lower Silverado	7/26/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-2A	Lower Silverado	7/26/99	8260a	<2	<50	<2	<2	<2								
RMW-2A	Lower Silverado	10/27/99	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-2A	Lower Silverado	2/23/00	8260a	<2	<5	<2	<2	<2	**1.0J**	<1	**2.6**	<2	<1	<2		
RMW-2A	Lower Silverado	4/26/00	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-2A	Lower Silverado	7/26/00	8260a	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-2A (dup)	Lower Silverado	7/26/00	8260a	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-2A	Lower Silverado	10/31/00	8260b	**0.61J**	<5	<0.68	<0.5	<0.57	**1.1**	<0.18	**3.3**	**1.1**	**0.52J**	**1.6J**	**24J**	
RMW-2A	Lower Silverado	3/5/01	8260b	**5.3**	<5	<0.68	<0.5	<0.57	**0.15J**	<0.18	<0.093	<0.69	<0.14	<0.82		**200**
RMW-2A	Lower Silverado	5/1/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-2A	Lower Silverado	7/17/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-2A	Lower Silverado	10/16/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-2A (dup)	Lower Silverado	10/16/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-2A	Lower Silverado	1/24/02	8260b	2XJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	1XJ	1XJ	2XJ	<10	<50
RMW-2A	Lower Silverado	4/25/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.28J**	<0.69	<0.14	<0.82	50XJ	<50
RMW-2A (dup)	Lower Silverado	4/25/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.20J**	<0.69	<0.14	<0.82	50XJ	<50
RMW-2A	Lower Silverado	7/25/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	<50
RMW-2A	Lower Silverado	10/23/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.5	<0.14	<0.82	<10	<50
RMW-2A	Lower Silverado	1/23/03	8260b	<0.33	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-2A	Lower Silverado	4/22/03	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-2A	Lower Silverado	7/22/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-2A	Lower Silverado	10/21/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-2A	Lower Silverado	1/20/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-2A	Lower Silverado	4/20/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-2A	Lower Silverado	4/19/05	524.2	<0.28	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-2A	Lower Silverado	4/12/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	**0.091J**	<0.016	--	<48	<48
RMW-3	Upper Silverado	5/7/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-3	Upper Silverado	5/7/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	EPA Method	VOLATILE ORGANICS (µg/l)											VOLATILE FUEL HYDROCARBONS EPA Method 8015	
				MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-3	Upper Silverado	7/1/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-3	Upper Silverado	7/1/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-3	Upper Silverado	9/17/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-3	Upper Silverado	9/17/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-3	Upper Silverado	10/28/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-3	Upper Silverado	10/28/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-3	Upper Silverado	10/28/97	8260a	<2	<3	<2	<0.4	<2								
RMW-3	Upper Silverado	2/10/98	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-3	Upper Silverado	2/10/98	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-3	Upper Silverado	2/10/98	8260a	<2	<3	<2	<0.4	<2								
RMW-3	Upper Silverado	4/21/98	8020	<2					<1	<1	<1			<1		
RMW-3	Upper Silverado	4/21/98	8260a	<2	<50	<2	<2	<2								
RMW-3	Upper Silverado	7/28/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-3	Upper Silverado	7/28/98	8260a	<2	<50	<2	<2	<2								
RMW-3	Upper Silverado	10/27/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-3	Upper Silverado	10/27/98	8260a	<2	<50	<2	<2	<2								
RMW-3	Upper Silverado	1/26/99	8020	<2					<1	<1	<1	<2	<1	<2		
RMW-3	Upper Silverado	1/26/99	8260a	<2	<50	<2	<2	<2								
RMW-3	Upper Silverado	4/27/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-3	Upper Silverado	4/27/99	8260a	<2	<50	<2	<2	<2								
RMW-3	Upper Silverado	7/27/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-3	Upper Silverado	7/27/99	8260a	<2	<50	<2	<2	<2								
RMW-3	Upper Silverado	10/28/99	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-3	Upper Silverado	2/22/00	8260a	<2	<5	<2	<2	<2	<1	<1	**1.8J**	<2	<1	<2		
RMW-3	Upper Silverado	4/26/00	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-3	Upper Silverado	7/25/00	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	**16J**	
RMW-3	Upper Silverado	10/31/00	8260b	**9.6**	<5	<0.68	<0.5	<0.57	**9.2**	**2.5**	**33**	**18**	**9.8**	**28**	**100**	
RMW-3	Upper Silverado	1/15/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-3 (dup)	Upper Silverado	1/15/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-3	Upper Silverado	6/8/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	**0.13J**	<0.18	**0.39J**	<0.69	**0.19J**	<0.82		
RMW-3 (dup)	Upper Silverado	6/8/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	**0.15J**	<0.18	**0.39J**	<0.69	**0.22J**	<0.82		
RMW-3	Upper Silverado	7/17/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-3	Upper Silverado	10/16/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	**14J**	<50
RMW-3	Upper Silverado	1/31/02	8260b	2XJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	0.23J	<0.69	<0.14	<0.82	**15J**	<50

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-3	Upper Silverado	4/18/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	**0.19J**	1XJ	<0.69	<0.14	<0.82	**39J**	<50
RMW-3 (dup)	Upper Silverado	4/18/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	**0.20J**	1XJ	<0.69	<0.14	<0.82	**46J**	<50
RMW-3	Upper Silverado	7/16/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	**14J**	<50
RMW-3	Upper Silverado	11/6/02	8260b	0.28UJ	<5	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	<50
RMW-3	Upper Silverado	2/3/03	8260b	0.33UJ	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	50XJ	50UJ
RMW-3	Upper Silverado	4/21/03	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-3	Upper Silverado	7/21/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-3	Upper Silverado	10/20/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-3	Upper Silverado	2/10/04	8260b	**0.5J**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	**0.41J**	**0.27J**	<0.16	**0.27J**	<44	<44
RMW-3	Upper Silverado	4/19/04	8260b	**0.63J**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-3 (dup)	Upper Silverado	4/19/04	8260b	**0.57J**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-3	Upper Silverado	4/18/05	524.2	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-3	Upper Silverado	7/19/05	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	44J
RMW-3	Upper Silverado	10/13/05	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-3 (dup)	Upper Silverado	10/13/05	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-3	Upper Silverado	4/11/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	**0.12J**	**0.091J**	<0.016	--	<44	<44
RMW-3 (dup)	Upper Silverado	4/11/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	**0.091J**	<0.03	<0.016	--	<44	<44
RMW-3	Upper Silverado	7/21/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.33	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-3	Upper Silverado	10/24/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-3 (dup)	Upper Silverado	10/24/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-3	Upper Silverado	4/24/07	8260b	<0.23	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-3	Upper Silverado	1/31/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-3	Upper Silverado	1/16/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-4A	Shallow	5/7/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-4A	Shallow	5/7/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-4A	Shallow	7/1/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-4A	Shallow	7/1/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-4A	Shallow	9/17/97	8020-conf	<2					<0.3	<0.2	**0.3J**	<0.8	<0.3	<0.5		
RMW-4A	Shallow	9/17/97	8020	<2					<0.3	<0.2	**0.31J**	<0.8	<0.3	<0.5		
RMW-4A	Shallow	10/29/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-4A	Shallow	10/29/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-4A	Shallow	2/10/98	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-4A	Shallow	2/10/98	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-4A	Shallow	2/10/98	8260a	<2	<3	<2	<0.4	<2								

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-4A	Shallow	4/21/98	8020	<2					<1	<1	<1			<1		
RMW-4A	Shallow	4/21/98	8260a	<2	<50	<2	<2	<2								
RMW-4A	Shallow	7/28/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-4A	Shallow	7/28/98	8260a	<2	<50	<2	<2	<2								
RMW-4A	Shallow	10/27/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-4A	Shallow	10/27/98	8260a	<2	<50	<2	<2	<2								
RMW-4A	Shallow	1/26/99	8020	<2					<1	<1	<1	<2	<1	<2		
RMW-4A	Shallow	1/26/99	8260a	<2	<50	<2	<2	<2								
RMW-4A	Shallow	4/27/99	8020	**2J**					<1	<1	<1	<1	<1	<1		
RMW-4A	Shallow	4/27/99	8260a	<2	<50	<2	<2	<2								
RMW-4A	Shallow	7/27/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-4A	Shallow	7/27/99	8260a	<2	<50	<2	<2	<2								
RMW-4A	Shallow	10/28/99	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-4A	Shallow	2/22/00	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-4A	Shallow	4/26/00	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-4A	Shallow	7/26/00	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-4A	Shallow	10/31/00	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-4A	Shallow	1/23/01	8260b	<0.28	5UJ	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<10
RMW-4A	Shallow	4/17/01	8260b	<0.28	5UJ	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	**10J**	<50
RMW-4A (dup)	Shallow	4/17/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-4A	Shallow	7/17/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-4A (dup)	Shallow	7/17/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-4A	Shallow	11/7/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.1J**	<0.69	<0.14	<0.82	<10	<50
RMW-4A	Shallow	1/31/02	8260b	<0.28	5UJ	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-4A	Shallow	4/18/02	8260b	<0.28	<5	<0.68	0.5UJ	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	50XJ	<50
RMW-4A	Shallow	7/16/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-4A	Shallow	11/6/02	8260b	0.28UJ	<5	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	<50
RMW-4A	Shallow	2/3/03	8260b	0.33UJ	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	50XJ	<50
RMW-4A	Shallow	4/21/03	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-4A	Shallow	7/21/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-4A (dup)	Shallow	7/21/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-4A	Shallow	10/20/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-4A	Shallow	2/10/04	8260b	**1.7J**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	**0.75J**	**0.54J**	**0.19J**	**0.73J**	<44	<44
RMW-4A	Shallow	4/19/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-4A	Shallow	4/18/05	524.2	<0.28	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-4A	Shallow	4/11/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<48	<48
RMW-4A (dup)	Shallow	4/11/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	0.5X	<0.03	<0.016	--		
RMW-4A	Shallow	4/12/07	8260b	<0.23	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-4A	Shallow	1/23/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	**0.36J**	<0.54	<0.17	--	<48	<48
RMW-4A	Shallow	1/12/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-5	Upper Silverado	4/24/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-5	Upper Silverado	4/24/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-5	Upper Silverado	5/7/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-5	Upper Silverado	5/7/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-5	Upper Silverado	7/2/97	8260a	<2					<0.2	<0.3	<0.3	<0.8	<0.3	<2		
RMW-5	Upper Silverado	9/18/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-5	Upper Silverado	9/18/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-5	Upper Silverado	10/29/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-5	Upper Silverado	10/29/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-5	Upper Silverado	2/10/98	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-5	Upper Silverado	2/10/98	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-5	Upper Silverado	2/10/98	8260a	<2	<3	<2	<0.4	<2								
RMW-5	Upper Silverado	4/22/98	8020	<2					<1	<1	<1			<1		
RMW-5	Upper Silverado	4/22/98	8260a	<2	<50	<2	<2	<2								
RMW-5	Upper Silverado	7/30/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-5	Upper Silverado	7/30/98	8260a	<2	<50	<2	<2	<2								
RMW-5	Upper Silverado	10/27/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-5	Upper Silverado	10/27/98	8260a	<2	<50	<2	<2	<2								
RMW-5	Upper Silverado	1/26/99	8020	<2					<1	<1	<1	<2	<1	<2		
RMW-5	Upper Silverado	1/26/99	8260a	<2	<50	<2	<2	<2								
RMW-5	Upper Silverado	4/29/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-5	Upper Silverado	4/29/99	8260a	<2	<50	<2	<2	<2								
RMW-5	Upper Silverado	7/27/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-5	Upper Silverado	7/27/99	8260a	<2	<50	<2	<2	<2								
RMW-5	Upper Silverado	10/29/99	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-5	Upper Silverado	2/23/00	8260a	<2	<5	<2	<2	<2	**1.4J**	<1	**4**	<2	<1	<2		
RMW-5	Upper Silverado	4/26/00	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-5	Upper Silverado	7/26/00	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-5	Upper Silverado	11/3/00	8260b	0.91UJ	<5	<0.68	<0.5	<0.57	1.1	<0.18	**4.0**	**1.9**	**0.91J**	**2.8**	31U	
RMW-5	Upper Silverado	1/26/01	8260b	**0.52J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	**0.83J**	<10	

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-5	Upper Silverado	4/18/01	8260b	**0.38J**	<5	<0.68	<0.5	<0.57	**0.24J**	<0.18	**0.46J**	<0.69	<0.14	<0.82	<10	<50
RMW-5	Upper Silverado	7/25/01	8260b	**0.34J**	<5	<0.68	<0.5	<0.57	**0.31J**	<0.18	**0.2J**	<0.69	<0.14	<0.82		<50
RMW-5	Upper Silverado	11/7/01	8260b	<0.28	<5	0.68UJ	<0.5	<0.57	**0.2J**	<0.18	**0.16J**	<0.69	<0.14	<0.82	<10	<50
RMW-5	Upper Silverado	1/30/02	8260b	**1.1J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	0.28VJ	<0.69	<0.14	<0.82	50XJ	<50
RMW-5	Upper Silverado	4/24/02	8260b	2XJ	<5	<0.68	<0.5	<0.57	**0.14J**	1XJ	1.3V	2.3V	1XJ	3V	50XJ	<50
RMW-5	Upper Silverado	7/31/02	8260b	**0.75J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-5	Upper Silverado	10/30/02	8260b	2XJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	<50
RMW-5	Upper Silverado	1/29/03	8260b	**0.79J**	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	50XJ	<50
RMW-5	Upper Silverado	4/30/03	8260b	**0.55J**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-5	Upper Silverado	7/30/03	8260b	**0.55J**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-5	Upper Silverado	10/29/03	8260b	**1.8J**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-5	Upper Silverado	1/28/04	8260b	**2.1**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-5	Upper Silverado	4/28/04	8260b	**4.3**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-5	Upper Silverado	6/1/05	524.2	1X	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	**0.053J**	<0.069	<0.034	--	<44	<44
RMW-5	Upper Silverado	1/21/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-6	Upper Silverado	4/24/97	8260a	**41**					<0.2	<0.3	<0.3	<0.8	**1J**	<2		
RMW-6	Upper Silverado	4/24/97	8020-conf	**36**					<0.3	**0.55J**	<0.3	<0.8	**1.1J**	**1.1J**		
RMW-6	Upper Silverado	4/24/97	8020	**40**					<0.3	**0.8J**	<0.3	<0.8	**1.6J**	**1.6J**		
RMW-6	Upper Silverado	5/8/97	8260a	**10**					<0.2	<0.3	<0.3	<0.8	<0.3	<2		
RMW-6	Upper Silverado	5/8/97	8020-conf	**36**					<0.3	<0.2	<0.3	<0.8	<0.3			
RMW-6	Upper Silverado	5/8/97	8020	**42**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-6	Upper Silverado	7/2/97	8260a	**26**					**0.39J**	<0.3	<0.3	<0.8	<0.3	<2		
RMW-6	Upper Silverado	7/2/97	8020-conf	**30**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-6	Upper Silverado	7/2/97	8020	**32**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-6 (dup)	Upper Silverado	7/2/97	8020-conf	**28**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-6 (dup)	Upper Silverado	7/2/97	8020	**30**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-6	Upper Silverado	9/18/97	8020-conf	**36**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-6	Upper Silverado	9/18/97	8020	**30**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-6 (dup)	Upper Silverado	9/18/97	8020-conf	**41**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-6 (dup)	Upper Silverado	9/18/97	8020	**48**					**0.39J**	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-6 (dup)	Upper Silverado	9/18/97	8260a	**34**					**0.28J**	<0.3	<0.3	<0.8	<0.3	<2		
RMW-6	Upper Silverado	10/29/97	8260a	**32**					**0.2J**	<0.3	<0.3	<0.8	<0.3	<2		
RMW-6	Upper Silverado	10/29/97	8020-conf	**38**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-6	Upper Silverado	10/29/97	8020	**40**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-6 (dup)	Upper Silverado	10/29/97	8020-conf	**38**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-6 (dup)	Upper Silverado	10/29/97	8020	**39**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-6	Upper Silverado	2/11/98	8020-conf	**46**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-6	Upper Silverado	2/11/98	8020	**47**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-6	Upper Silverado	2/11/98	8260a	**69**	**250**	<2	<0.4	<2								
RMW-6 (dup)	Upper Silverado	2/11/98	8020-conf	**44**					<0.3	<0.2	<0.3	<0.8	<0.8	<0.5		
RMW-6 (dup)	Upper Silverado	2/11/98	8020	**46**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-6 (dup)	Upper Silverado	2/11/98	8260a	**26**	**5**	<2	<0.4	<2								
RMW-6	Upper Silverado	4/23/98	8020	**35**					<1	<1	<1			<1		
RMW-6	Upper Silverado	4/23/98	8020	**22**					<1	<1	<1			<1		
RMW-6	Upper Silverado	4/23/98	8260a	**36**	<50	<2	<2	<2								
RMW-6	Upper Silverado	4/23/98	8260a	**19**	<50	<2	<2	<2								
RMW-6 (dup)	Upper Silverado	4/23/98	8020	**33**					<1	<1	<1			<1		
RMW-6 (dup)	Upper Silverado	4/23/98	8260a	**41**	<50	<2	<2	<2								
RMW-6	Upper Silverado	7/30/98	8020	**24**					<1	<1	<1	<2	<1	<1		
RMW-6	Upper Silverado	7/30/98	8260a	**27**	<50	<2	<2	<2								
RMW-6 (dup)	Upper Silverado	7/30/98	8020	**23**					<1	<1	<1	<2	<1	<1		
RMW-6 (dup)	Upper Silverado	7/30/98	8260a	**29**	<50	<2	<2	<2								
RMW-6	Upper Silverado	10/27/98	8020	**15**					<1	<1	<1	<2	<1	<1		
RMW-6	Upper Silverado	10/27/98	8260a	**21**	<50	<2	<2	<2								
RMW-6 (dup)	Upper Silverado	10/27/98	8020	**14**					<1	<1	<1	<2	<1	<1		
RMW-6 (dup)	Upper Silverado	10/27/98	8260a	**20**	<50	<2	<2	<2								
RMW-6	Upper Silverado	1/26/99	8020	**16**					<1	<1	<1	<2	<1	<2		
RMW-6	Upper Silverado	1/26/99	8260a	**9.7**	<50	<2	<2	<2								
RMW-6	Upper Silverado	4/29/99	8020	**15**					<1	<1	<1	<1	<1	<1		
RMW-6	Upper Silverado	4/29/99	8260a	**12**	<50	<2	<2	<2								
RMW-6	Upper Silverado	7/27/99	8020	**8.9**					<1	<1	<1	<1	<1	<1		
RMW-6	Upper Silverado	7/27/99	8260a	**14**	<50	<2	<2	<2								
RMW-6 (dup)	Upper Silverado	7/27/99	8020	**10**					<1	<1	<1	<1	<1	<1		
RMW-6 (dup)	Upper Silverado	7/27/99	8260a	**13**	<50	<2	<2	<2								
RMW-6	Upper Silverado	10/29/99	8260a	**11**	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-6	Upper Silverado	2/23/00	8260a	**39**	<5	<2	<2	<2	**1.0J**	<1	**2.6**	<2	<1	<2		
RMW-6	Upper Silverado	4/27/00	8260a	**70**	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-6	Upper Silverado	7/27/00	8260a	**52**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-6 (dup)	Upper Silverado	7/27/00	8260a	**58**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	**10J**	

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-6	Upper Silverado	11/3/00	8260b	**46**	<5	<0.68	<0.5	<0.57	**1.2**	<0.18	**4.6**	**1.9**	**0.94J**	**2.9**	23U	
RMW-6	Upper Silverado	1/16/01	8260b	**33**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	**0.88J**	<0.14	**1.4J**	<10	
RMW-6	Upper Silverado	4/18/01	8260b	**130**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.28J**	<0.69	<0.14	<0.82	<10	<50
RMW-6	Upper Silverado	7/25/01	8260b	**340**	**9.8J**	<0.68	<0.5	<0.57	<0.11	<0.18	**0.17J**	<0.69	<0.14	<0.82		**170**
RMW-6	Upper Silverado	10/31/01	8260b	**750**	**49**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	**140**
RMW-6	Upper Silverado	12/26/01	8260b	**190**	**63**	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-6	Upper Silverado	1/30/02	8260b	**1,000**	**130**	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	**210J**
RMW-6	Upper Silverado	2/27/02	8260b	**790**	**110**	<0.68	**0.55J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-6	Upper Silverado	3/27/02	8260b	**470**	**110**	<0.68	**0.54J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-6	Upper Silverado	4/24/02	8260b	**600**	**96**	<0.68	**0.54J**	<0.57	<0.11	<0.18	**0.16J**	<0.69	<0.14	<0.82	50XJ	**87J**
RMW-6	Upper Silverado	5/29/02	8260b	**680**	**290**	<0.68	**0.77J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-6	Upper Silverado	6/26/02	8260b	**880**	**350**	<0.68	**0.93J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-6	Upper Silverado	7/31/02	8260b	**420**	**170**	0.68UJ	**0.84J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	**170**
RMW-6	Upper Silverado	8/28/02	8260b	**630**	**440**	<0.68	**0.88J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-6	Upper Silverado	9/25/02	8260b	**370**	**400**	0.68UJ	**0.76J**	0.57UJ	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-6 (dup)	Upper Silverado	9/25/02	8260b	**360**	**400**	0.68UJ	**0.80J**	0.57UJ	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-6	Upper Silverado	10/30/02	8260b	**440J**	**540**	<0.68	**0.85J**	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	**130**
RMW-6	Upper Silverado	11/27/02	8260b	**250**	**900**	<0.33	**0.93J**	<0.61	<0.28	<0.25	<0.49	<0.52	<0.24	<0.52		
RMW-6	Upper Silverado	12/18/02	8260b	**110**	**2,900**	0.33UJ	**0.93J**	0.61UJ	<0.28	<0.25	<0.49	<0.52	<0.24	<0.52		
RMW-6 (dup)	Upper Silverado	12/18/02	8260b	**130J**	**2,600**	0.33UJ	**0.93J**	0.61UJ	<0.28	<0.25	<0.49	<0.52	<0.24	<0.52		
RMW-6	Upper Silverado	1/29/03	8260b	**51**	**3,700**	<0.33	**1.0J**	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	50XJ	**50J**
RMW-6	Upper Silverado	2/26/03	8260b	**56**	**3,900J**	<0.32	**0.96J**	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-6 (dup)	Upper Silverado	2/26/03	8260b	**55**	**3,900J**	<0.32	**0.96J**	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-6	Upper Silverado	3/26/03	8260b	**19**	**5,100J**	<0.32	**0.92J**	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-6	Upper Silverado	4/30/03	8260b	**14**	**4,600**	<0.32	**0.83J**	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-6	Upper Silverado	5/28/03	8260b	**9.2**	**2,900J**	<0.32	**0.88J**	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-6	Upper Silverado	6/25/03	8260b	**6.2J**	**4,100**	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79		
RMW-6	Upper Silverado	7/30/03	8260b	**9.6J**	**3,300**	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79	<44	**91**
RMW-6	Upper Silverado	8/27/03	8260b	**5.3J**	**2,200**	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79		
RMW-6	Upper Silverado	9/24/03	8260b	**5.5J**	**1,800**	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79		
RMW-6 (dup)	Upper Silverado	9/24/03	8260b	**6.1J**	**1,800**	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79		
RMW-6	Upper Silverado	10/29/03	8260b	**9.2J**	**1,900**	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79	<44	**69**
RMW-6	Upper Silverado	1/28/04	8260b	**1.8J**	**2,100J**	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79	<44	**52**
RMW-6	Upper Silverado	4/28/04	8260b	**2.7J**	**2,800**	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79	<44	<44
RMW-6	Upper Silverado	4/27/05	524.2	<1.4	**1,400**	<1.6	<1.3	<1.6	<0.25	<0.15	<0.19	<0.35	<0.17	--	<44	<44

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

			VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
Regional Well No.	Aquifer	Sample Date	EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-6	Upper Silverado	7/27/05	8260b	<1.5	**760**	<1.6	<1.6	<1.9	<1.3	<0.87	<1.7	<1.9	<1.0	--	<44	<44
RMW-6	Upper Silverado	10/19/05	8260b	**0.47J**	**980**	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	**58**
RMW-6	Upper Silverado	4/19/06	524.2	<0.027	**900J**	<0.015	**0.59J**	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<44	**48J**
RMW-6	Upper Silverado	7/24/06	8260b	**1.2J**	**1,300J**	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-6 (dup)	Upper Silverado	7/24/06	8260b	**1.2J**	**1,300J**	<0.33	**0.42J**	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-6	Upper Silverado	10/18/06	8260b	**0.34J**	**720**	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-6 (dup)	Upper Silverado	10/18/06	8260b	**0.34J**	**670**	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-6	Upper Silverado	4/11/07	8260b	<0.23	**80**	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	48UJ	48UJ
RMW-6 (dup)	Upper Silverado	4/11/07	8260b	<0.23	**99**	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	48UJ	48UJ
RMW-6	Upper Silverado	7/11/07	8260b	<0.26	**64**	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	**59**
RMW-6 (dup)	Upper Silverado	7/11/07	8260b	<0.26	**63**	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	**48J**
RMW-6	Upper Silverado	1/23/08	8260b	<0.26	**28**	<1.1	<0.33	<0.18	<0.14	<0.23	0.50J	<0.54	<0.17	--	<48	<48
RMW-6	Upper Silverado	7/7/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-6 (dup)	Upper Silverado	7/7/08	8260b	**0.67J**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-6	Upper Silverado	1/21/09	8260b	**1.1**	**12**	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-6	Upper Silverado	7/15/09	8260b	**0.84J**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-7	Shallow	5/8/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-7	Shallow	5/8/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-7	Shallow	7/1/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-7	Shallow	7/1/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-7	Shallow	9/18/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-7	Shallow	9/18/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-7	Shallow	10/29/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-7	Shallow	10/29/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-7	Shallow	2/10/98	8020-conf						<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-7	Shallow	2/10/98	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-7	Shallow	2/10/98	8260a	<2	<3	<2	<0.4	<2								
RMW-7	Shallow	4/22/98	8020	<2					<1	<1	<1			<1		
RMW-7	Shallow	4/22/98	8260a	<2	<50	<2	<2	<2								
RMW-7	Shallow	7/30/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-7	Shallow	7/30/98	8260a	<2	<50	<2	<2	<2								
RMW-7	Shallow	10/27/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-7	Shallow	10/27/98	8260a	<2	<50	<2	<2	<2								

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-7	Shallow	1/26/99	8020	<2					<1	<1	<1	<2	<1	<2		
RMW-7	Shallow	1/26/99	8260a	<2	<50	<2	<2	<2								
RMW-7	Shallow	4/27/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-7	Shallow	4/27/99	8260a	<2	<50	<2	<2	<2								
RMW-7	Shallow	7/27/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-7	Shallow	7/27/99	8260a	<2	<50	<2	<2	<2								
RMW-7	Shallow	10/29/99	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-7	Shallow	2/23/00	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-7	Shallow	4/26/00	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-7	Shallow	7/26/00	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-7	Shallow	11/3/00	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-7	Shallow	1/16/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-7	Shallow	4/18/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	**14J**	<50
RMW-7	Shallow	7/25/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-7	Shallow	10/31/01	8260b	<0.28	<5	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-7	Shallow	1/30/02	8260b	**0.8J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	0.24VJ	<0.69	<0.14	<0.82	<10	<50
RMW-7	Shallow	4/24/02	8260b	2XJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	<50
RMW-7	Shallow	7/31/02	8260b	2XJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-7	Shallow	10/30/02	8260b	<0.28	5UJ	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	<50
RMW-7	Shallow	1/29/03	8260b	<0.33	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	50XJ	<50
RMW-7	Shallow	4/30/03	8260b	**0.67J**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-7	Shallow	7/30/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-7	Shallow	10/29/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-7	Shallow	1/28/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-7	Shallow	4/28/04	8260b	0.4J	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-7	Shallow	6/1/05	524.2	<0.28	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	**0.055J**	<0.069	<0.034	--	<44	<44
RMW-7	Shallow	4/26/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<44	<44
RMW-7	Shallow	1/21/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-7 (dup)	Shallow	1/21/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-8	Lower Silverado	7/22/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-8	Lower Silverado	7/22/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-8	Lower Silverado	9/17/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-8	Lower Silverado	9/17/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-8	Lower Silverado	10/28/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-8	Lower Silverado	10/28/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-8	Lower Silverado	10/28/97	8260a	<2	<3	<2	<0.4	<2								
RMW-8	Lower Silverado	2/9/98	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-8	Lower Silverado	2/9/98	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-8	Lower Silverado	2/9/98	8260a	<2	<3	<2	<0.4	<2								
RMW-8	Lower Silverado	4/21/98	8020	<2					<1	<1	<1			<1		
RMW-8	Lower Silverado	4/21/98	8260a	<2	<50	<2	<2	<2								
RMW-8	Lower Silverado	7/27/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-8	Lower Silverado	7/27/98	8260a	<2	<50	<2	<2	<2								
RMW-8	Lower Silverado	10/26/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-8	Lower Silverado	10/26/98	8260a	<2	<50	<2	<2	<2								
RMW-8	Lower Silverado	1/25/99	8020	<2					<1	<1	<1	<2	<1	<2		
RMW-8	Lower Silverado	1/25/99	8260a	<2	<50	<2	<2	<2								
RMW-8	Lower Silverado	4/26/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-8	Lower Silverado	4/26/99	8260a	<2	<50	<2	<2	<2								
RMW-8	Lower Silverado	7/26/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-8	Lower Silverado	7/26/99	8260a	<2	<50	<2	<2	<2								
RMW-8	Lower Silverado	10/28/99	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-8	Lower Silverado	2/22/00	8260a	<2	<5	<2	<2	<2	<1	<1	**2.8**	<2	<1	<2		
RMW-8	Lower Silverado	4/25/00	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-8	Lower Silverado	7/25/00	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-8	Lower Silverado	10/30/00	8260b	**5.1**	<5	<0.68	<0.5	<0.57	**5.5**	**1.5**	**21**	**11**	**5.3**	**16**	**66**	
RMW-8 (dup)	Lower Silverado	10/30/00	8260b	**5.2**	<5	<0.68	<0.5	<0.57	**5.9**	**1.6**	**23**	**12**	**5.8**	**17**	**73**	
RMW-8	Lower Silverado	1/22/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-8	Lower Silverado	4/16/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	0.18UJ	0.27VJ	0.69UJ	0.14UJ	0.82UJ	14VJ	<50
RMW-8 (dup)	Lower Silverado	4/16/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	0.18UJ	0.29VJ	0.69UJ	0.14UJ	0.82UJ	1VJ	<50
RMW-8	Lower Silverado	7/16/01	8260b	**13**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-8 (dup)	Lower Silverado	7/16/01	8260b	**12**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-8	Lower Silverado	10/31/01	8260b	**18**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	<50R
RMW-8 (dup)	Lower Silverado	10/31/01	8260b	**20**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	<50R
RMW-8	Lower Silverado	1/14/02	8260b	**11**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	52V	**58J**
RMW-8 (dup)	Lower Silverado	1/14/02	8260b	**11**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50X	<50
RMW-8	Lower Silverado	4/15/02	8260b	**7J**	5UJ	<0.68	<0.5	<0.57	<0.11	**0.21J**	1XJ	<0.69	<0.14	<0.82	**57**	**54J**
RMW-8	Lower Silverado	7/15/02	8260b	**11**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-8	Lower Silverado	10/14/02	8260b	**10**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	**11J**	<50
RMW-8 (dup)	Lower Silverado	10/14/02	8260b	**9.9**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	<50
RMW-8	Lower Silverado	1/13/03	8260b	**6.3**	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-8 (dup)	Lower Silverado	1/13/03	8260b	**7.4**	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	**11J**	<50
RMW-8	Lower Silverado	4/14/03	8260b	**6.8**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-8	Lower Silverado	7/14/03	8260b	**3.3**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-8 (dup)	Lower Silverado	7/14/03	8260b	**3.2**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-8	Lower Silverado	10/13/03	8260b	**1.5J**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-8 (dup)	Lower Silverado	10/13/03	8260b	**1.5J**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-8	Lower Silverado	1/12/04	8260b	**1.2J**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-8	Lower Silverado	5/20/04	8260b	**3.5**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-8	Lower Silverado	4/29/05	524.2	**0.81J**	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-8	Lower Silverado	4/10/06	524.2	**0.25J**	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	0.5X	<0.03	<0.016	--	<48	<48
RMW-8 (dup)	Lower Silverado	4/10/06	524.2	**0.24J**	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	0.5X	**0.24J**	<0.016	--		
RMW-8	Lower Silverado	4/9/07	8260b	**0.29J**	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-8	Lower Silverado	1/30/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-8	Lower Silverado	1/19/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-8 fd	Lower Silverado	1/19/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-9	Upper Silverado	7/22/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-9	Upper Silverado	7/22/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-9 (dup)	Upper Silverado	7/22/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-9 (dup)	Upper Silverado	7/22/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-9	Upper Silverado	9/17/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-9	Upper Silverado	9/17/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-9	Upper Silverado	10/28/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-9	Upper Silverado	10/28/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-9	Upper Silverado	10/28/97	8260a	<2	<3	<2	<0.4	<2								
RMW-9	Upper Silverado	2/9/98	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-9	Upper Silverado	2/9/98	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-9	Upper Silverado	2/9/98	8260a	<2	<3	<2	<0.4	<2								
RMW-9	Upper Silverado	4/21/98	8020	<2					<1	<1	<1			<1		
RMW-9	Upper Silverado	4/21/98	8260a	<2	<50	<2	<2	<2								
RMW-9	Upper Silverado	7/27/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-9	Upper Silverado	7/27/98	8260a	<2	<50	<2	<2	<2								

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-9	Upper Silverado	10/26/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-9	Upper Silverado	10/26/98	8260a	<2	<50	<2	<2	<2								
RMW-9	Upper Silverado	1/25/99	8020	<2					<1	<1	<1	<2	<1	<2		
RMW-9	Upper Silverado	1/25/99	8260a	<2	<50	<2	<2	<2								
RMW-9	Upper Silverado	4/26/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-9	Upper Silverado	4/26/99	8260a	<2	<50	<2	<2	<2								
RMW-9	Upper Silverado	7/26/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-9	Upper Silverado	7/26/99	8260a	<2	<50	<2	<2	<2								
RMW-9	Upper Silverado	10/28/99	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-9	Upper Silverado	2/22/00	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-9	Upper Silverado	4/25/00	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-9	Upper Silverado	7/25/00	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-9	Upper Silverado	10/30/00	8260b	**0.62J**	<5	<0.68	<0.5	<0.57	**0.91**	<0.18	**3.6**	**1.9**	**0.93J**	**2.8**	**21J**	
RMW-9	Upper Silverado	1/15/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-9	Upper Silverado	4/16/01	8260b	**0.39J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.11J**	<0.69	<0.14	<0.82	<10	<50
RMW-9	Upper Silverado	7/16/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-9	Upper Silverado	10/15/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-9	Upper Silverado	1/14/02	8260b	**2.8**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-9	Upper Silverado	4/15/02	8260b	**14**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	**62**	**60J**
RMW-9 (dup)	Upper Silverado	4/15/02	8260b	**11J**	<5	<0.68	<0.5	<0.57	<0.11	**0.18J**	1XJ	<0.69	<0.14	<0.82	**76**	**72J**
RMW-9	Upper Silverado	7/15/02	8260b	**18**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.16J**	<0.69	<0.14	<0.82	<10	<50
RMW-9	Upper Silverado	10/14/02	8260b	**2.7**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	50XJ	<50
RMW-9	Upper Silverado	1/13/03	8260b	**6.4**	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-9 (dup)	Upper Silverado	1/13/03	8260b	**6.8**	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-9	Upper Silverado	4/14/03	8260b	**2.1**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-9	Upper Silverado	7/14/03	8260b	**2.8**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-9	Upper Silverado	10/13/03	8260b	**2.7**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-9	Upper Silverado	1/12/04	8260b	**6.9**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-9	Upper Silverado	4/12/04	8260b	**2.9**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-9	Upper Silverado	1/10/05	8260b	**1.5J**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	<44
RMW-9 (dup)	Upper Silverado	1/10/05	8260b	**2.1**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	<44
RMW-9	Upper Silverado	4/29/05	524.2	**0.76J**	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-9	Upper Silverado	7/19/05	8260b	2.3VJ	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-9	Upper Silverado	10/26/05	8260b	**3.9**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-9	Upper Silverado	4/10/06	524.2	**5.7**	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	**0.13J**	<0.03	<0.016	--	<44	<44

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-9	Upper Silverado	7/11/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.33	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-9	Upper Silverado	10/24/06	8260b	**0.71J**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-9	Upper Silverado	4/23/07	8260b	**1.2**	**12**	<0.5	0.39UJ	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-9	Upper Silverado	1/30/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-9	Upper Silverado	1/19/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-10	Shallow	7/22/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-10	Shallow	7/22/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-10	Shallow	9/17/97	8020-conf	<2					<0.3	<0.2	**0.73J**	<0.8	**0.4J**	**1.2J**		
RMW-10	Shallow	9/17/97	8020	<2					<0.3	<0.2	**0.67J**	**0.9J**	**0.47J**	**1.4J**		
RMW-10	Shallow	10/28/97	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-10	Shallow	10/28/97	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-10	Shallow	10/28/97	8260a	<2	<3	<2	<0.4	<2								
RMW-10	Shallow	2/9/98	8020-conf	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-10	Shallow	2/9/98	8020	<2					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-10	Shallow	2/9/98	8260a	<2	<3	<2	<0.4	<2								
RMW-10	Shallow	4/21/98	8020	<2					<1	<1	<1			<1		
RMW-10	Shallow	4/21/98	8260a	<2	<50	<2	<2	<2								
RMW-10	Shallow	7/27/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-10	Shallow	7/27/98	8260a	<2	<50	<2	<2	<2								
RMW-10	Shallow	10/26/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-10	Shallow	10/26/98	8260a	<2	<50	<2	<2	<2								
RMW-10	Shallow	1/25/99	8020	<2					<1	<1	<1	<2	<1	<2		
RMW-10	Shallow	1/25/99	8260a	<2	<50	<2	<2	<2								
RMW-10	Shallow	4/26/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-10	Shallow	4/26/99	8260a	<2	<50	<2	<2	<2								
RMW-10	Shallow	7/26/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-10	Shallow	7/26/99	8260a	<2	<50	<2	<2	<2								
RMW-10	Shallow	10/28/99	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-10	Shallow	2/22/00	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-10	Shallow	4/25/00	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-10	Shallow	7/25/00	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-10	Shallow	10/30/00	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-10	Shallow	1/15/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-10	Shallow	4/16/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	**0.24J**	**4.7J**	**11J**	**28J**	**9.6J**	**37J**	<10	<50

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-10	Shallow	7/16/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-10 (dup)	Shallow	7/16/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-10	Shallow	10/15/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50R
RMW-10	Shallow	1/14/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-10	Shallow	4/15/02	8260b	**12J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	69V	100XJ
RMW-10	Shallow	7/15/02	8260b	**160**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	**59J**
RMW-10	Shallow	10/14/02	8260b	**610**	**94**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	**120**
RMW-10	Shallow	11/22/02	8260b	**870**	**130**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82		
RMW-10	Shallow	12/19/02	8260b	**1,100**	**11J**	0.66UJ	<1.6	<1.2	<0.56	<0.50	<0.98	<1	<0.48	<1		
RMW-10 (dup)	Shallow	12/19/02	8260b	**900**	**27J**	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.52	<0.24	<0.52		
RMW-10	Shallow	1/13/03	8260b	**1,000**	**25**	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	**270**
RMW-10	Shallow	3/11/03	8260b	**1,000**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-10	Shallow	3/27/03	8260b	**1,100**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0:16	<0.16		
RMW-10	Shallow	4/14/03	8260b	**1,100**	17J	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**560**
RMW-10	Shallow	5/29/03	8260b	**1,000**	**5.9J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-10	Shallow	6/26/03	8260b	**1,100**	<49	<3.2	<2.7	<3.3	<2.9	<1.9	<3.5	<1.7	<1.6	<1.6		
RMW-10	Shallow	7/14/03	8260b	**1,300**	<49	<3.2	<2.7	<3.3	<2.9	<1.9	<3.5	<1.7	<1.6	<1.6	<44	**560**
RMW-10	Shallow	9/25/03	8260b	**1,200**	<49	<3.2	<2.7	<3.3	<2.9	<1.9	<3.5	<1.7	<1.6	<1.6		
RMW-10 (dup)	Shallow	9/25/03	8260b	**1,200**	130J	<3.2	<2.7	<3.3	<2.9	<1.9	<3.5	<1.7	<1.6	<1.6		
RMW-10	Shallow	10/13/03	8260b	**1,200**	<49	<3.2	<2.7	<3.3	<2.9	<1.9	<3.5	<1.7	<1.6	<1.6	<44	**710**
RMW-10	Shallow	1/12/04	8260b	**2,500**	**830J**	<3.2	<2.7	<3.3	<2.9	<1.9	<3.5	<1.7	<1.6	<1.6	<44	**380**
RMW-10 (dup)	Shallow	1/12/04	8260b	**2,600**	440J	<3.2	<2.7	<3.3	<2.9	<1.9	<3.5	<1.7	<1.6	<1.6	<44	**380**
RMW-10	Shallow	4/12/04	8260b	**2,700**	430J	<6.4	<5.3	<6.6	<5.8	<3.9	<7	<3.4	<3.2	<3.2	<44	**1,400**
RMW-10	Shallow	1/10/05	8260b	**2,000**	**910**	<6.6	<6.5	<7.8	<5.1	<3.5	<6.9	<7.6	<4.2	<4.2	<44	**620**
RMW-10 (dup)	Shallow	1/10/05	8260b	**2,000**	**910**	<6.6	<6.5	<7.8	<5.1	<3.5	<6.9	<7.6	<4.2	<4.2	<44	**630**
RMW-10	Shallow	4/29/05	524.2	**1,400**	**890**	<6.4	<5.3	<6.6	<0.98	<0.59	<0.76	<1.4	<0.68	--	<44	**490**
RMW-10	Shallow	7/19/05	8260b	**570J**	**700**	<0.33	**0.34J**	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	**71**	**350**
RMW-10	Shallow	10/26/05	8260b	**270**	**470**	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-10	Shallow	4/10/06	524.2	**160**	**210**	<0.015	<0.011	<0.025	<0.014	<0.021	**0.11J**	<0.03	<0.016	--	<44	**140**
RMW-10	Shallow	7/11/06	8260b	**11**	<3.9	<0.33	<0.33	<0.33	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-10	Shallow	10/24/06	8260b	**140**	**280**	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	**130**
RMW-10	Shallow	4/9/07	8260b	**110**	**210**	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-10	Shallow	7/9/07	8260b	**57**	**110J**	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-10 (dup)		7/9/07	8260b	**59**	**110J**	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-10	Shallow	1/30/08	8260b	**22**	**60**	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-10	Shallow	7/10/08	8260b	**8.2**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-10	Shallow	1/19/09	8260b	**4.9**	10V	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-10	Shallow	7/17/09	8260b	**2.1**	**10J**	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-11	Upper Silverado	1/6/98	8020-conf	**33**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-11	Upper Silverado	1/6/98	8020	**35**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-11	Upper Silverado	1/6/98	8260a	**34**												
RMW-11 (dup)	Upper Silverado	1/6/98	8020-conf	**30**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-11 (dup)	Upper Silverado	1/6/98	8020	**32**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-11	Upper Silverado	2/11/98	8020-conf	**31**					**0.75J**	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-11	Upper Silverado	2/11/98	8020	**33**					**0.75J**	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-11	Upper Silverado	2/11/98	8260a	**38**	**150**	<2	<0.4	<2								
RMW-11	Upper Silverado	4/23/98	8020	**35**					<1	<1	<1			<1		
RMW-11	Upper Silverado	4/23/98	8020	**5.8**					<1	<1	<1			<1		
RMW-11	Upper Silverado	4/23/98	8260a	**45**	<50	<2	<2	<2								
RMW-11	Upper Silverado	4/23/98	8260a	**7.5**	<50	<2	<2	<2								
RMW-11 (dup)	Upper Silverado	4/23/98	8020	**39**					<1	<1	<1			<1		
RMW-11 (dup)	Upper Silverado	4/23/98	8260a	**46**	<50	<2	<2	<2								
RMW-11	Upper Silverado	7/29/98	8020	**25**					<1	<1	<1	<2	<1	<1		
RMW-11	Upper Silverado	7/29/98	8260a	**30**	<50	<2	<2	<2								
RMW-11 (dup)	Upper Silverado	7/29/98	8020	**20**					<1	<1	<1	<2	<1	<1		
RMW-11 (dup)	Upper Silverado	7/29/98	8260a	**28**	<50	<2	<2	<2								
RMW-11	Upper Silverado	10/29/98	8020	**26**					<1	<1	<1	<1	<1	<1		
RMW-11	Upper Silverado	10/29/98	8260a	**32**	<50	<2	<2	<2								
RMW-11 (dup)	Upper Silverado	10/29/98	8020	**28**					<1	<1	<1	<1	<1	<1		
RMW-11 (dup)	Upper Silverado	10/29/98	8260a	**31**	<50	<2	<2	<2								
RMW-11	Upper Silverado	1/26/99	8020	**16**					<1	<1	<1	<2	<1	<2		
RMW-11	Upper Silverado	1/26/99	8260a	**27**	<50	<2	<2	<2								
RMW-11	Upper Silverado	4/27/99	8020	**66**					<1	<1	<1	<1	<1	<1		
RMW-11	Upper Silverado	4/27/99	8260a	**57**	<50	<2	<2	<2								
RMW-11	Upper Silverado	7/29/99	8020	**70**					<1	<1	<1	<1	<1	<1		
RMW-11	Upper Silverado	7/29/99	8260a	**57**	<50	<2	<2	<2								
RMW-11 (dup)	Upper Silverado	7/29/99	8020	**69**					<1	<1	<1	<1	<1	<1		
RMW-11 (dup)	Upper Silverado	7/29/99	8260a	**67**	<50	<2	<2	<2								
RMW-11	Upper Silverado	10/29/99	8260a	**54**	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-11	Upper Silverado	2/24/00	8260a	**35**	<5	<2	<2	<2	<1	<1	**1.5J**	<2	<1	<2		

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
EQL (µg/l):				1.0	10	2.0	2.0	2.0	0.5	1.0	1.0	1.0	1.0	2.0		
RMW-11	Upper Silverado	4/27/00	8260a	**26**	<5	<2	<2	<2	<1	<1	**1**	<2	<1	<2		
RMW-11	Upper Silverado	7/27/00	8260b	**27**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.12J**	<0.69	<0.14	<0.82	**15J**	
RMW-11	Upper Silverado	11/1/00	8260b	**26**	<5	<0.68	<0.5	<0.57	1.8U	**0.47J**	6.6U	3.3U	1.7U	4.9U	30U	
RMW-11 (dup)	Upper Silverado	11/1/00	8260b	**28**	<5	<0.68	<0.5	<0.57	1.7U	**0.46J**	6.3U	<3.0	1.5U	4.6U	29U	
RMW-11	Upper Silverado	1/23/01	8260b	**34**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		**17J**
RMW-11	Upper Silverado	4/19/01	8260b	**73**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.23J**	<0.69	<0.14	<0.82	**12J**	<50
RMW-11	Upper Silverado	5/30/01	8260b	**54J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.43J**	<0.69	<0.14	<0.82		
RMW-11	Upper Silverado	6/26/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-11	Upper Silverado	7/18/01	8260b	**11**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-11	Upper Silverado	10/15/01	8260b	**22**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	50XJ	<50
RMW-11	Upper Silverado	11/26/01	8260b	**20**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-11	Upper Silverado	12/28/01	8260b	**62**	**11J**	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82		
RMW-11	Upper Silverado	2/1/02	8260b	**88J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-11	Upper Silverado	2/22/02	8260b	**140**	**15J**	<0.68	0.5UJ	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82		
RMW-11	Upper Silverado	4/8/02	8260b	**160**	**18J**	<0.68	**0.53J**	<0.57	<0.11	<0.18	1XJ	<0.69	**0.21J**	**0.88J**		
RMW-11	Upper Silverado	4/30/02	8260b	**350**	**6.5J**	<0.68	**0.55J**	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	50XJ	**86J**
RMW-11	Upper Silverado	5/28/02	8260b	**570**	**22J**	<0.68	**0.73J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-11	Upper Silverado	6/28/02	8260b	**700**	<5	<0.68	**0.73J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-11	Upper Silverado	8/7/02	8260b	**530**	<5	<0.68	**0.67J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	**210**
RMW-11	Upper Silverado	8/23/02	8260b	**530**	**21J**	<1.4	<1	<1.1	<0.22	<0.36	<0.19	<1.4	<0.28	<1.6		
RMW-11 (dup)	Upper Silverado	8/23/02	8260b	**480**	<5	<0.68	**0.68J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-11	Upper Silverado	9/26/02	8260b	**360**	**13J**	<0.68	**0.59J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-11 (dup)	Upper Silverado	9/26/02	8260b	**420J**	**11J**	<0.68	**0.61J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-11	Upper Silverado	10/24/02	8260b	**330**	<5	<0.68	**0.64J**	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	50XJ	**140**
RMW-11	Upper Silverado	11/26/02	8260b	**280**	<5	<0.68	**0.53J**	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82		
RMW-11	Upper Silverado	12/20/02	8260b	**470J**	**11J**	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.52	<0.24	<0.52		
RMW-11	Upper Silverado	1/24/03	8260b	**400**	**8.2J**	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	50XJ	**110**
RMW-11	Upper Silverado	2/28/03	8260b	**440**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-11	Upper Silverado	3/25/03	8260b	**390**	**32J**	<0.32	0.38J	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-11	Upper Silverado	4/29/03	8260b	**750**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**320**
RMW-11 (dup)	Upper Silverado	4/29/03	8260b	**720**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**280**
RMW-11	Upper Silverado	5/30/03	8260b	**1,100**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-11 (dup)	Upper Silverado	5/30/03	8260b	**1,100**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-11	Upper Silverado	6/24/03	8260b	**1,500**	<49	<3.2	<2.7	<3.3	<2.9	<1.9	<3.5	<1.7	<1.6	<1.6		
RMW-11 (dup)	Upper Silverado	6/24/03	8260b	**1,700**	<49	<3.2	<2.7	<3.3	<2.9	<1.9	<3.5	**1.9J**	<1.6	**1.9J**		

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

			VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
Regional Well No.	Aquifer	Sample Date	EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-11	Upper Silverado	7/25/03	8260b	**1,200**	<49	<3.2	<2.7	<3.3	<2.9	<1.9	<3.5	<1.7	<1.6	<1.6	<44	**840**
RMW-11	Upper Silverado	8/26/03	8260b	**1,700**	<49	<3.2	<2.7	<3.3	<2.9	<1.9	<3.5	<1.7	<1.6	<1.6		
RMW-11	Upper Silverado	9/26/03	8260b	**2,200**	**650**	<3.2	<2.7	<3.3	<2.9	<1.9	<3.5	<1.7	<1.6	<1.6		
RMW-11	Upper Silverado	10/24/03	8260b	**2,600**	<99	<6.4	<5.3	<6.6	<5.8	<3.9	<7	<3.4	<3.2	<3.2	<44	**1,200**
RMW-11 (dup)	Upper Silverado	10/24/03	8260b	**2,700**	<99	<6.4	<5.3	<6.6	<5.8	<3.9	<7	<3.4	<3.2	<3.2	<44	**1,200**
RMW-11	Upper Silverado	1/23/04	8260b	**1,600**	**260J**	<6.4	<5.3	<6.6	<5.8	<3.9	<7	<3.4	<3.2	<3.2	<44	**1,100**
RMW-11	Upper Silverado	4/23/04	8260b	**1,200**	310	<3.2	<2.7	<3.3	<2.9	<1.9	<3.5	<1.7	<1.6	<1.6	<44	**730**
RMW-11	Upper Silverado	1/11/05	8260b	**540**	**120J**	<3.3	<3.3	<3.9	<2.6	<1.7	<3.5	<3.8	<2.1	<2.1	<44	**70J**
RMW-11	Upper Silverado	4/22/05	524.2	**140**	**29**	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	**110**
RMW-11	Upper Silverado	7/18/05	8260b	**190J**	**41**	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-11	Upper Silverado	11/11/05	8260b	**96**	**48**	<0.33	<0.33	<0.39	<0.26	<0.17	**0.35J**	<0.38	<0.21	--	<44	**98**
RMW-11	Upper Silverado	4/20/06	524.2	**77**	**9.5J**	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<44	**61**
RMW-11	Upper Silverado	7/17/06	8260b	**95**	<3.9	<0.33	<0.33	<0.33	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	**60**
RMW-11	Upper Silverado	10/16/06	8260b	**74**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	**59**
RMW-11	Upper Silverado	4/20/07	8260b	**1.3**	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-11	Upper Silverado	7/10/07	8260b	**4.0**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-11 (dup)	Upper Silverado	7/10/07	8260b	**4.0**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-11	Upper Silverado	1/17/08	8260b	**1.7**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-11	Upper Silverado	7/8/08	8260b	**1.6J**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-11	Upper Silverado	1/15/09	8260b	**0.96J**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-11	Upper Silverado	7/14/09	8260b	**1.8J**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-12	Shallow	1/6/98	8020-conf	**29**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-12	Shallow	1/6/98	8020	**31**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-12 (dup)	Shallow	1/6/98	8020-conf	**33**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-12 (dup)	Shallow	1/6/98	8020	**32**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-12	Shallow	2/11/98	8020-conf	**44**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-12	Shallow	2/11/98	8020	**36**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-12	Shallow	2/11/98	8260a	**15**	<3	<2	<0.4	<2								
RMW-12 (dup)	Shallow	2/11/98	8020-conf	**32**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-12 (dup)	Shallow	2/11/98	8020	**29**					<0.3	<0.2	<0.3	<0.8	<0.3	<0.5		
RMW-12 (dup)	Shallow	2/11/98	8260a	**31**	<3	<2	<0.4	<2								
RMW-12	Shallow	4/23/98	8020	**34**					<1	<1	<1			<1		
RMW-12	Shallow	4/23/98	8020	**28**					<1	<1	<1			<1		
RMW-12	Shallow	4/23/98	8260a	**40**	<50	<2	<2	<2								
RMW-12	Shallow	4/23/98	8260a	**39**	<50	<2	<2	<2								

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-12	Shallow	7/29/98	8020	**15**					<1	<1	<1	<2	<1	<1		
RMW-12	Shallow	7/29/98	8260a	**15**	<50	<2	<2	<2								
RMW-12 (dup)	Shallow	7/29/98	8020	**16**					<1	<1	<1	<2	<1	<1		
RMW-12 (dup)	Shallow	7/29/98	8260a	**16**	<50	<2	<2	<2								
RMW-12	Shallow	10/28/98	8020	**9.7**					<1	<1	<1	<2	<1	<1		
RMW-12	Shallow	10/28/98	8260a	**11**	<50	<2	<2	<2								
RMW-12	Shallow	1/26/99	8020	**4.7J**					<1	<1	<1	<2	<1	<2		
RMW-12	Shallow	1/26/99	8260a	<2	<50	<2	<2	<2								
RMW-12	Shallow	4/27/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-12	Shallow	4/27/99	8260a	<2	<50	<2	<2	<2								
RMW-12 (dup)	Shallow	4/27/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-12 (dup)	Shallow	4/27/99	8260a	<2	<50	<2	<2	<2								
RMW-12	Shallow	7/29/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-12	Shallow	7/29/99	8260a	<2	<50	<2	<2	<2								
RMW-12	Shallow	10/29/99	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-12	Shallow	2/24/00	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-12	Shallow	4/27/00	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-12	Shallow	7/27/00	8260b	**260**	**25**	<0.68	<0.5	<0.57	<0.11	<0.18	**0.3J**	<0.69	**0.2J**	<0.82	<10	
RMW-12	Shallow	11/1/00	8260b	**71**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-12	Shallow	1/23/01	8260b	**57**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		**20J**
RMW-12 (dup)	Shallow	1/23/01	8260b	**86**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		**24J**
RMW-12	Shallow	4/19/01	8260b	**93**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	**11J**	<50
RMW-12	Shallow	5/30/01	8260b	**1,400J**	**56**	<0.68	<0.5	<0.57	<0.11	<0.18	**0.16J**	<0.69	<0.14	<0.82		
RMW-12	Shallow	6/26/01	8260b	**1,800**	<25	<3.4	<2.5	<2.8	<0.55	<0.9	<0.46	<3.4	<0.7	<4.1		
RMW-12	Shallow	7/19/01	8260b	**170**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		**92J**
RMW-12 (dup)	Shallow	7/19/01	8260b	**170**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		**70J**
RMW-12	Shallow	10/19/01	8260b	**150J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**1XJ**	<0.69	<0.14	<0.82	<10	<50
RMW-12	Shallow	11/26/01	8260b	**180**	**13J**	<0.68	<0.5	<0.57	**0.37J**	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-12	Shallow	12/28/01	8260b	**160**	**39**	<0.68	<0.5	<0.57	**0.5XJ**	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-12	Shallow	2/1/02	8260b	**500**	**14J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	**10J**	**120**
RMW-12	Shallow	2/22/02	8260b	**310**	**9.3J**	<0.68	<0.5	<0.57	**0.16J**	<0.18	**1XJ**	<0.69	<0.14	<0.82		
RMW-12	Shallow	3/25/02	8260b	**520**	**62**	<0.68	<0.5	<0.57	**0.23J**	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-12	Shallow	4/30/02	8260b	**580**	**26**	<0.68	<0.5	<0.57	**0.12J**	<0.18	<0.093	<0.69	<0.14	<0.82	**50XJ**	**150**
RMW-12	Shallow	5/28/02	8260b	**880**	**200**	<0.68	<0.5	<0.57	**0.32J**	<0.18	**1XJ**	<0.69	<0.14	<0.82		
RMW-12	Shallow	6/28/02	8260b	**770**	**5.1J**	<0.68	<0.5	<0.57	**0.19J**	<0.18	<0.093	<0.69	<0.14	<0.82		

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-12	Shallow	8/7/02	8260b	**700**	<5	<0.68	<0.5	<0.57	**0.42J**	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	**280**
RMW-12	Shallow	8/23/02	8260b	**700**	<5	<0.68	<0.5	<0.57	**0.79**	**1.1**	<0.093	**10**	**4.7**	**15**		
RMW-12	Shallow	9/26/02	8260b	**640J**	**17J**	<0.68	<0.5	<0.57	**0.24J**	<0.18	<0.093	<0.69	**0.52J**	<0.82		
RMW-12	Shallow	10/24/02	8260b	**610**	<5	<0.68	<0.5	<0.57	**0.54**	<0.18	<0.093	<0.5	<0.14	<0.82	50XJ	**190**
RMW-12	Shallow	11/26/02	8260b	**520**	**10J**	<0.33	<0.78	<0.61	**0.62**	<0.25	<0.49	<0.52	<0.24	<0.52		
RMW-12	Shallow	12/20/02	8260b	**370J**	**5.0J**	0.33UJ	<0.78	0.61UJ	**0.40J**	<0.25	<0.49	<0.52	<0.24	<0.52		
RMW-12	Shallow	1/24/03	8260b	**270**	**7.2J**	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	50XJ	**72J**
RMW-12	Shallow	2/28/03	8260b	**260**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-12	Shallow	3/25/03	8260b	**210**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-12	Shallow	4/29/03	8260b	**210**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**110**
RMW-12 (dup)	Shallow	4/29/03	8260b	**240**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**100**
RMW-12	Shallow	5/30/03	8260b	**170**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	1X	<0.16	2X		
RMW-12	Shallow	6/24/03	8260b	**190**	<4.9	<0.32	<0.27	<0.33	**1.7**	<0.19	**0.57J**	**0.73J**	**0.24J**	**0.97J**		
RMW-12	Shallow	7/25/03	8260b	**140**	<4.9	<0.32	<0.27	<0.33	**0.32J**	<0.19	<0.35	<0.17	<0.16	<0.16	<44	62
RMW-12	Shallow	8/26/03	8260b	**140**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-12	Shallow	9/26/03	8260b	**260**	**24J**	<0.64	<0.53	<0.66	<0.58	<0.39	<0.7	<0.34	<0.32	<0.32		
RMW-12	Shallow	10/24/03	8260b	**190**	<9.9	<0.64	<0.53	<0.66	<0.58	<0.39	<0.7	<0.34	<0.32	<0.32	<44	**110**
RMW-12	Shallow	1/23/04	8260b	**160**	4.9UJ	<0.64	<0.53	<0.66	<0.58	<0.39	<0.7	<0.34	<0.32	<0.32	<44	**110**
RMW-12	Shallow	4/23/04	8260b	**130**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**87**
RMW-12	Shallow	1/11/05	8260b	**37**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	<44
RMW-12	Shallow	4/22/05	524.2	**82**	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	**68**
RMW-12	Shallow	7/18/05	8260b	**180J**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-12	Shallow	11/11/05	8260b	**260**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	**47J**
RMW-12	Shallow	4/21/06	524.2	**230**	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	0.5X	**0.10J**	<0.016	--	<44	<44
RMW-12	Shallow	7/17/06	8260b	**560**	<20	<1.6	<1.6	<1.9	<1.3	<0.87	<1.7	<1.9	<1.0	--	<48	**330**
RMW-12	Shallow	10/16/06	8260b	**570**	<20	<1.6	<1.6	<1.9	<1.3	<0.87	<1.7	<1.9	<1.0	--	<48	**300**
RMW-12	Shallow	4/20/07	8260b	**460J**	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	**280**
RMW-12	Shallow	7/10/07	8260b	**64**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	**87**
RMW-12	Shallow	1/17/08	8260b	**62**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	**49J**
RMW-12	Shallow	7/8/08	8260b	**73**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	**49J**
RMW-12	Shallow	1/15/09	8260b	**2.1**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-12	Shallow	7/14/09	8260b	**3.5**	<3.5U	<0.28U	<0.31U	<0.27U	<0.28U	<0.22U	<0.33U	<0.45U	<0.24U	--	<48U	<48U
RMW-13	Upper Silverado	5/18/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-13	Upper Silverado	7/28/98	8020	<2					<1	<1	<1	<2	<1	**2J**		
RMW-13	Upper Silverado	7/28/98	8260a	<2	<50	<2	<2	<2								

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-13	Upper Silverado	10/28/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-13	Upper Silverado	10/28/98	8260a	<2	<50	<2	<2	<2								
RMW-13	Upper Silverado	1/27/99	8020	**15**					<1	<1	<1	<2	<1	<2		
RMW-13	Upper Silverado	1/27/99	8260a	**7.5**	<50	<2	<2	<2								
RMW-13	Upper Silverado	4/28/99	8020	**29**					<1	<1	<1	<1	<1	<1		
RMW-13	Upper Silverado	4/28/99	8260a	**38**	<50	<2	<2	<2								
RMW-13	Upper Silverado	7/28/99	8020	**290**					<1	<1	<1	<1	<1	<1		
RMW-13	Upper Silverado	7/28/99	8260a	**420**	<50	<2	<2	<2								
RMW-13	Upper Silverado	10/26/99	8260a	**6,300**	**250J**	<20	<20	<20	<10	<10	<10	<20	<10	<20		
RMW-13	Upper Silverado	2/25/00	8260a	**1,500**	**97J**	<10	<10	<10	<5	<5	<5	<10	<5	<10		
RMW-13	Upper Silverado	4/28/00	8260a	**200**	**26**	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-13 (dup)	Upper Silverado	4/28/00	8260a	**160**	**21J**	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-13	Upper Silverado	7/27/00	8260b	**640**	**59**	<0.68	<0.5	<0.57	<0.11	<0.18	**0.12J**	<0.69	<0.14	<0.82	**12J**	
RMW-13	Upper Silverado	11/2/00	8260b	**510**	**67J**	<3.4	<2.5	<2.8	**2.8**	<0.9	**11**	**5.5**	**2.9J**	**8.4J**	**89**	
RMW-13	Upper Silverado	1/24/01	8260b	**720**	**260**	<3.4	<2.5	<2.8	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		**300**
RMW-13	Upper Silverado	2/20/01	8260b	**250**	**58J**	<2.7	<2	<2.3	<0.44	<0.72	<0.37	<2.8	**0.56J**	<3.3		
RMW-13	Upper Silverado	3/12/01	8260b	**150**	**31**	<0.68	<0.5	<0.57	**0.16J**	<0.18	**0.45J**	<0.69	**0.15J**	<0.82		**75**
RMW-13	Upper Silverado	5/31/01	8260b	**150**	**13J**	<0.68	<0.5	<0.57	<0.11	<0.18	0.29VJ	<0.69	<0.14	<0.82		
RMW-13	Upper Silverado	6/26/01	8260b	**190**	**8.8J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-13	Upper Silverado	7/23/01	8260b	**180**	**15J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		**65J**
RMW-13 (dup)	Upper Silverado	7/23/01	8260b	**190**	**14J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		**65J**
RMW-13	Upper Silverado	10/19/01	8260b	**64**	**10J**	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	<10	<50
RMW-13 (dup)	Upper Silverado	10/22/01	8260b	**74**	**9.4J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-13	Upper Silverado	11/20/01	8260b	**65**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-13	Upper Silverado	12/19/01	8260b	**21**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82		
RMW-13 (dup)	Upper Silverado	12/19/01	8260b	**18**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82		
RMW-13	Upper Silverado	1/25/02	8260b	**14V**	<5	0.68UJ	<0.5	0.57UJ	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	**19J**	<50
RMW-13	Upper Silverado	2/25/02	8260b	**46**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-13	Upper Silverado	3/21/02	8260b	**75**	**7.9J**	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-13 (dup)	Upper Silverado	3/21/02	8260b	**74**	**8.9J**	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-13	Upper Silverado	4/26/02	8260b	**43J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	**52**	**53J**
RMW-13	Upper Silverado	5/23/02	8260b	**41**	**11J**	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82		
RMW-13	Upper Silverado	6/21/02	8260b	**84J**	<5	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-13	Upper Silverado	7/26/02	8260b	**60**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-13	Upper Silverado	8/26/02	8260b	**48**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-13	Upper Silverado	10/25/02	8260b	**13**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	50XJ	<50
RMW-13	Upper Silverado	1/22/03	8260b	**6.0**	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-13	Upper Silverado	4/23/03	8260b	**68**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-13	Upper Silverado	7/23/03	8260b	**24**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**51**
RMW-13 (dup)	Upper Silverado	7/23/03	8260b	**23**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-13	Upper Silverado	10/31/03	8260b	**28**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-13	Upper Silverado	1/21/04	8260b	**5.5**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-13	Upper Silverado	4/21/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-13	Upper Silverado	4/20/05	524.2	<0.28	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-13	Upper Silverado	4/18/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<48	<48
RMW-13	Upper Silverado	1/13/09	8260b	<0.3	3.5UJ	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-13 (dup)	Upper Silverado	1/13/09	8260b	<0.3	3.5UJ	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-14	Upper Silverado	7/15/98	8020	**12,000**					<1	<1	<1	<2	<1	<1		
RMW-14	Upper Silverado	7/15/98	8260a	**16,000**												
RMW-14	Upper Silverado	7/30/98	8020	**10,000**					<1	<1	<1	<2	<1	<1		
RMW-14	Upper Silverado	7/30/98	8260a	**17,000**	**660**	<5	<5	<5								
RMW-14 (dup)	Upper Silverado	7/30/98	8020	**14,000**					<1	<1	<1	<2	<1	<1		
RMW-14 (dup)	Upper Silverado	7/30/98	8260a	**15,000**	**1,200**	<5	<5	<5								
RMW-14	Upper Silverado	8/28/98	8020	**12,000**					<1	<1	<1	<2	<1	<1		
RMW-14	Upper Silverado	8/28/98	8260a	**14,000**	**620**	**4.6J**	**2.5J**	<2								
RMW-14 (dup)	Upper Silverado	8/28/98	8020	**13,000**					**3.1**	<1	<1	<2	<1	<1		
RMW-14 (dup)	Upper Silverado	8/28/98	8260a	**14,000**	**560**	**4.4J**	**2.4J**	<2								
RMW-14	Upper Silverado	10/29/98	8020	**11,000**					<1	<1	<1	<1	<1	<1		
RMW-14	Upper Silverado	10/29/98	8260a	**13,000**	**3,400**	<5	<5	<5								
RMW-14 (dup)	Upper Silverado	10/29/98	8020	**16,000**					<1	<1	<1	<1	<1	<1		
RMW-14 (dup)	Upper Silverado	10/29/98	8260a	**13,000**	**3,300**	<5	<5	<5								
RMW-14	Upper Silverado	1/27/99	8020	**17,000**					<1	<1	<1	<2	<1	<2		
RMW-14	Upper Silverado	1/27/99	8260a	**11,000**	**390**	<4	<4	<4								
RMW-14 (dup)	Upper Silverado	1/27/99	8020	**16,000**					<1	<1	<1	<2	<1	<2		
RMW-14 (dup)	Upper Silverado	1/27/99	8260a	**15,000**	**360**	**4.0J**	<4	<4								
RMW-14	Upper Silverado	4/28/99	8020	**15,000**					<1	<1	<1	<1	<1	<1		
RMW-14	Upper Silverado	4/28/99	8260a	**14,000**	**220**	**4.2J**	<2	<2								
RMW-14	Upper Silverado	7/28/99	8020	**6,300**					<1	<1	<1	<1	<1	<1		
RMW-14	Upper Silverado	7/28/99	8260a	**7,900**	**420**	<2	<2	<2								
RMW-14	Upper Silverado	10/26/99	8260a	**2,400**	**140**	<2	<2	<2	<1	<1	<1	<2	<1	<2		

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-14	Upper Silverado	2/25/00	8260a	**530**	**40**	<2	<2	<2	**1J**	<1	**3**	<2	<1	<2		
RMW-14	Upper Silverado	4/28/00	8260a	**42**	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-14	Upper Silverado	7/28/00	8260b	**40**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-14	Upper Silverado	11/2/00	8260b	**11**	<5	<0.68	<0.5	<0.57	**0.7**	**0.26J**	**3.3**	**1.8**	**0.99J**	**2.8**	17J	
RMW-14	Upper Silverado	1/25/01	8260b	**7.4**	<5	<0.68	<0.5	<0.57	**0.22J**	<0.18	<0.093	<0.69	<0.14	<0.82		**10J**
RMW-14	Upper Silverado	2/20/01	8260b	**9.8**	<5	<0.68	<0.5	<0.57	**0.18J**	<0.18	**1.0**	**0.78J**	**0.34J**	**1.1J**		
RMW-14	Upper Silverado	3/12/01	8260b	**9.7**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.3J**	<0.69	<0.14	<0.82		**10J**
RMW-14	Upper Silverado	5/2/01	8260b	**14**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-14	Upper Silverado	5/29/01	8260b	**14J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.36J**	<0.69	<0.14	<0.82		
RMW-14	Upper Silverado	6/25/01	8260b	**8.6**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.21J**	<0.69	<0.14	<0.82		
RMW-14	Upper Silverado	7/26/01	8260b	**6.6**	<5	<0.68	0.5UJ	<0.57	<0.11	<0.18	**0.12J**	<0.69	<0.14	<0.82		<50
RMW-14	Upper Silverado	10/22/01	8260b	**6.4**	<5	<0.68	0.5UJ	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	<10	<50
RMW-14	Upper Silverado	1/18/02	8260b	2.4V	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-14 (dup)	Upper Silverado	1/18/02	8260b	2.5V	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-14	Upper Silverado	4/19/02	8260b	**1.7J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	50XJ	<50
RMW-14	Upper Silverado	7/19/02	8260b	**4.6**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-14 (dup)	Upper Silverado	7/19/02	8260b	**4.6**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-14	Upper Silverado	10/18/02	8260b	**0.60J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	<50
RMW-14	Upper Silverado	1/17/03	8260b	**0.41J**	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	50XJ	<50
RMW-14 (dup)	Upper Silverado	1/17/03	8260b	**0.61J**	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-14	Upper Silverado	4/18/03	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-14 (dup)	Upper Silverado	4/18/03	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-14	Upper Silverado	7/18/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-14	Upper Silverado	10/17/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-14	Upper Silverado	1/16/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-14 (dup)	Upper Silverado	1/16/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-14	Upper Silverado	4/16/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-14	Upper Silverado	1/14/05	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	<44
RMW-14	Upper Silverado	4/15/05	524.2	<0.28	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-14	Upper Silverado	7/15/05	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-14	Upper Silverado	10/14/05	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-14	Upper Silverado	4/14/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<44	<44
RMW-14	Upper Silverado	7/10/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.33	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-14	Upper Silverado	10/23/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-14 (dup)	Upper Silverado	10/23/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	EPA Method	VOLATILE ORGANICS (µg/l)											VOLATILE FUEL HYDROCARBONS EPA Method 8015	
				MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-14	Upper Silverado	4/13/07	8260b	<0.23	**11**	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-14 (dup)	Upper Silverado	4/13/07	8260b	<0.23	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-14	Upper Silverado	1/22/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-14	Upper Silverado	1/16/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-15	Lower Silverado	8/28/98	8020	**3.2J**					<1	<1	<1	<2	<1	<1		
RMW-15	Lower Silverado	8/28/98	8260a	**2.2J**	<50	<2	<2	<2								
RMW-15	Lower Silverado	10/28/98	8020	<2					<1	<1	<1	<2	<1	<1		
RMW-15	Lower Silverado	10/28/98	8260a	<2	<50	<2	<2	<2								
RMW-15	Lower Silverado	1/27/99	8020	<2					<1	<1	<1	<2	<1	<2		
RMW-15	Lower Silverado	1/27/99	8260a	<2	<50	<2	<2	<2								
RMW-15	Lower Silverado	4/28/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-15	Lower Silverado	4/28/99	8260a	<2	<50	<2	<2	<2								
RMW-15	Lower Silverado	7/28/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-15	Lower Silverado	7/28/99	8260a	<2	<50	<2	<2	<2								
RMW-15	Lower Silverado	10/26/99	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-15	Lower Silverado	2/25/00	8260a	<2	<5	<2	<2	<2	<1	<1	**2.5**	<2	<1	<2		
RMW-15	Lower Silverado	4/28/00	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-15	Lower Silverado	7/28/00	8260b	1.3UJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.12J**	<0.69	<0.14	<0.82	**11J**	
RMW-15	Lower Silverado	11/2/00	8260b	**1.8J**	<5	<0.68	<0.5	<0.57	**2.1**	**0.46J**	**8.1**	**4.0**	**1.9**	**6.0**	36U	
RMW-15	Lower Silverado	1/25/01	8260b	**0.73J**	<5	<0.68	<0.5	<0.57	**0.19J**	<0.18	<0.093	<0.69	<0.14	<0.82		<10
RMW-15	Lower Silverado	5/2/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-15 (dup)	Lower Silverado	5/2/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-15	Lower Silverado	7/26/01	8260b	<0.28	<5	<0.68	0.5UJ	<0.57	<0.11	<0.18	**0.17J**	<0.69	<0.14	<0.82		<50
RMW-15	Lower Silverado	10/24/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-15 (dup)	Lower Silverado	10/24/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	<10	<50
RMW-15	Lower Silverado	1/18/02	8260b	2XJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-15	Lower Silverado	4/19/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1.3V	<0.69	<0.14	<0.82	99V	**88J**
RMW-15 (dup)	Lower Silverado	4/19/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1.0V	<0.69	<0.14	<0.82	64V	**57J**
RMW-15	Lower Silverado	7/19/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-15	Lower Silverado	10/18/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	<50
RMW-15 (dup)	Lower Silverado	10/18/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	<50
RMW-15	Lower Silverado	1/17/03	8260b	2XJ	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	50XJ	<50
RMW-15 (dup)	Lower Silverado	1/17/03	8260b	2XJ	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-15	Lower Silverado	4/18/03	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-15 (dup)	Lower Silverado	4/18/03	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-15	Lower Silverado	7/18/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-15	Lower Silverado	10/17/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-15 (dup)	Lower Silverado	10/17/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-15	Lower Silverado	1/16/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-15	Lower Silverado	4/16/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-15 (dup)	Lower Silverado	4/16/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-15	Lower Silverado	1/14/05	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	<44
RMW-15	Lower Silverado	4/15/05	524.2	<0.28	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-15 (dup)	Lower Silverado	4/15/05	524.2	<0.28	<4.9	<0.32	<0.27	<0.33	**0.051J**	<0.029	0.5X	<0.069	<0.034	--	<44	<44
RMW-15	Lower Silverado	7/15/05	8260b	0.29UJ	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-15	Lower Silverado	10/14/05	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-15	Lower Silverado	4/14/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<44	<44
RMW-15	Lower Silverado	7/10/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-15 (dup)	Lower Silverado	7/10/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-15	Lower Silverado	10/23/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-15	Lower Silverado	4/13/07	8260b	<0.23	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-15	Lower Silverado	1/22/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-15 (dup)	Lower Silverado	1/22/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-15	Lower Silverado	1/16/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-15 fd	Lower Silverado	1/16/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-16A	Shallow	8/28/98	8020	**240**					<1	<1	<1	<2	<1	<1		
RMW-16A	Shallow	8/28/98	8260a	**270**	<50	<2	<2	<2								
RMW-16A	Shallow	10/28/98	8020	**730**					<1	<1	<1	<2	<1	<1		
RMW-16A	Shallow	10/28/98	8260a	**700**	<50	<2	<2	<2								
RMW-16A	Shallow	1/27/99	8020	**1,200**					<1	<1	<1	<2	<1	<2		
RMW-16A	Shallow	1/27/99	8260a	**760**	<50	<2	<2	<2								
RMW-16A	Shallow	4/28/99	8020	**600**					<1	<1	<1	<1	<1	<1		
RMW-16A	Shallow	4/28/99	8260a	**560**	<50	<2	<2	<2								
RMW-16A(dup)	Shallow	4/28/99	8020	**460**					<1	<1	<1	<1	<1	<1		
RMW-16A(dup)	Shallow	4/28/99	8260a	**520**	<50	<2	<2	<2								
RMW-16A	Shallow	7/28/99	8020	**1,400**					<1	<1	<1	<1	<1	<1		
RMW-16A	Shallow	7/28/99	8260a	**2,000**	**170**	<2	<2	<2								
RMW-16A	Shallow	10/26/99	8260a	**2,600**	**120**	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-16A	Shallow	2/25/00	8260a	**4,900**	**520**	<10	<10	<10	<5	<5	<5	<10	<5	<10		
RMW-16A	Shallow	4/28/00	8260a	**3,500**	**900**	<2	<2	<2	<1	<1	<1	<2	<1	<2		

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-16A	Shallow	7/28/00	8260b	**7,600**	**510**	**2.5J**	**1.5J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	**36J**	
RMW-16A	Shallow	11/3/00	8260b	**1,300**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	**110**	
RMW-16A	Shallow	1/25/01	8260b	**4,000**	**420**	**1.7J**	**0.84J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		**2,500**
RMW-16A	Shallow	2/20/01	8260b	**2,800**	**94J**	<3.4	<2.5	<2.8	<0.55	<0.9	<0.47	<3.4	<0.7	<4.1		
RMW-16A	Shallow	3/12/01	8260b	**1,800**	**140J**	<6.8	<5	<5.7	<1.1	<1.8	<0.93	<6.9	<1.4	<8.2		**960**
RMW-16A	Shallow	5/31/01	8260b	**1,800**	**66J**	<6.8	<5	<5.7	**1.4UJ**	<1.8	<0.93	<6.9	<1.4	<8.2		
RMW-16A	Shallow	6/26/01	8260b	**1,600**	**44**	**0.76J**	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-16A	Shallow	7/26/01	8260b	**1,200**	**50**	<0.68	0.5UJ	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		**450**
RMW-16A	Shallow	10/24/01	8260b	**320**	**8.6J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50X	**170**
RMW-16A	Shallow	11/26/01	8260b	**140**	**6.1J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-16A	Shallow	12/19/01	8260b	**51**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-16A	Shallow	1/18/02	8260b	**40**	**5.5J**	<0.68	<0.5	<0.57	<0.11	<0.18	**0.1J**	<0.69	<0.14	<0.82	<10	<50
RMW-16A	Shallow	2/26/02	8260b	**28J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-16A	Shallow	3/26/02	8260b	**9**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-16A	Shallow	4/19/02	8260b	**14**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	50XJ	<50
RMW-16A	Shallow	5/23/02	8260b	**22**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-16A	Shallow	6/21/02	8260b	11VJ	<5	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-16A	Shallow	7/19/02	8260b	**8.3J**	**7.9J**	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	<50
RMW-16A	Shallow	8/27/02	8260b	**6.7**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-16A	Shallow	10/18/02	8260b	**3.5**	<5	<0.68	<0.5	<0.57	**0.12J**	<0.18	<0.093	<0.5	<0.14	<0.82	<10	<50
RMW-16A	Shallow	1/17/03	8260b	**9.4**	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-16A	Shallow	4/18/03	8260b	**5.3**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-16A	Shallow	7/18/03	8260b	**0.91J**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-16A	Shallow	10/17/03	8260b	**0.42J**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-16A	Shallow	1/16/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-16A(dup)	Shallow	1/16/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-16A	Shallow	4/16/04	8260b	**0.49J**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-16A	Shallow	1/14/05	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	<44
RMW-16A	Shallow	4/15/05	524.2	<0.28	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-16A	Shallow	7/15/05	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-16A	Shallow	4/14/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	**0.091J**	<0.016	--	<44	<44
RMW-16A	Shallow	7/10/06	8260b	**0.39J**	<3.9	<0.33	<0.33	<0.33	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-16A	Shallow	10/23/06	8260b	**0.61J**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-16A	Shallow	4/13/07	8260b	**0.29J**	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-16A	Shallow	1/22/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-16A	Shallow	1/16/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-17	Upper Silverado	8/24/99	8020	<2					<1	<1	<1	<1	<1	<1		
RMW-17	Upper Silverado	8/24/99	8260a	<2	<50	<2	<2	<2								
RMW-17	Upper Silverado	10/27/99	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-17	Upper Silverado	2/24/00	8260a	<2	<5	<2	<2	<2	<1	<1	**1.7J**	<2	<1	<2		
RMW-17	Upper Silverado	4/27/00	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-17	Upper Silverado	7/27/00	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.1J**	<0.69	<0.14	<0.82	<10	
RMW-17	Upper Silverado	11/2/00	8260b	0.42U	<5	<0.68	<0.5	<0.57	**0.35J**	<0.18	**1.3**	<0.69	**0.34J**	**0.96J**	15U	
RMW-17	Upper Silverado	1/25/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	**0.18J**	<0.18	<0.093	<0.69	<0.14	<0.82		<10
RMW-17	Upper Silverado	5/8/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	**0.25J**	**0.69J**	**1.5**	**0.42J**	**1.9J**	<10	<50
RMW-17	Upper Silverado	7/20/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-17	Upper Silverado	10/24/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	50XJ	<50
RMW-17	Upper Silverado	1/24/02	8260b	2XJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-17	Upper Silverado	4/18/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	50XJ	<50
RMW-17	Upper Silverado	7/16/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-17	Upper Silverado	10/21/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	<50
RMW-17	Upper Silverado	1/20/03	8260b	<0.33	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	50XJ	<50
RMW-17	Upper Silverado	4/21/03	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-17	Upper Silverado	7/21/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-17	Upper Silverado	10/20/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-17 (dup)	Upper Silverado	10/20/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-17	Upper Silverado	1/19/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-17 (dup)	Upper Silverado	1/19/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-17	Upper Silverado	4/19/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-17	Upper Silverado	4/18/05	524.2	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-17	Upper Silverado	4/17/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	**0.083J**	<0.021	0.5X	<0.03	<0.016	--	<48	<48
RMW-17	Upper Silverado	11/8/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-17	Upper Silverado	4/23/07	8260b	<0.23	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-17	Upper Silverado	1/29/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-17 (dup)	Upper Silverado	1/29/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-17	Upper Silverado	1/22/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-18	Shallow	8/24/99	8020	**6.7**					<1	<1	<1	<1	<1	<1		
RMW-18	Shallow	8/24/99	8260a	**2.4J**	<50	<2	<2	<2								
RMW-18	Shallow	10/27/99	8260a	**2.3J**	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-18 (dup)	Shallow	10/27/99	8260a	**2.7J**	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-18	Shallow	4/27/00	8260a	<2	<5	<2	<2	<2	<1	<1	<1	<2	<1	<2		
RMW-18	Shallow	7/28/00	8260b	**1J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	
RMW-18	Shallow	11/2/00	8260b	**2.5**	<5	<0.68	<0.5	<0.57	**0.64**	**0.22J**	**2.6**	**1.5**	**0.78J**	**2.2**	**17J**	
RMW-18	Shallow	1/25/01	8260b	**1.8J**	<5	<0.68	<0.5	<0.57	**0.13J**	<0.18	<0.093	<0.69	<0.14	<0.82		<10
RMW-18	Shallow	5/8/01	8260b	**2.1**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-18	Shallow	7/20/01	8260b	**2J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-18 (dup)	Shallow	7/20/01	8260b	**1.9J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-18	Shallow	11/7/01	8260b	**2**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-18	Shallow	1/24/02	8260b	2XJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-18	Shallow	4/18/02	8260b	**0.54J**	<5	<0.68	<0.5	<0.57	<0.11	**0.28J**	1XJ	**0.8J**	<0.14	**0.9J**	**92**	**88J**
RMW-18	Shallow	7/16/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-18	Shallow	10/21/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	<50
RMW-18	Shallow	1/20/03	8260b	<0.33	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	50XJ	<50
RMW-18	Shallow	4/21/03	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-18	Shallow	7/21/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-18	Shallow	10/20/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-18	Shallow	1/19/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-18	Shallow	4/19/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-18	Shallow	4/18/05	524.2	<0.28	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-18	Shallow	4/17/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	0.5X	<0.03	<0.016	--	<48	<48
RMW-18	Shallow	11/8/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-18	Shallow	4/23/07	8260b	<0.23	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-18	Shallow	1/29/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-18	Shallow	1/22/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-19	Upper Silverado	11/1/00	8260b	**0.91J**	<5	<0.68	<0.5	<0.57	**0.28J**	<0.18	**0.49J**	<0.69	<0.14	<0.82	**11J**	
RMW-19	Upper Silverado	1/23/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<10
RMW-19	Upper Silverado	4/20/01	8260b	0.63VJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	0.24VJ	<0.69	<0.14	<0.82	<10	<50
RMW-19 (dup)	Upper Silverado	4/20/01	8260b	0.51VJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	0.19VJ	<0.69	<0.14	<0.82	<10	<50
RMW-19	Upper Silverado	7/19/01	8260b	0.31VJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-19	Upper Silverado	11/7/01	8260b	**2.6J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	<50
RMW-19	Upper Silverado	1/17/02	8260b	4.2V	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-19	Upper Silverado	2/22/02	8260b	2.2V	<5	<0.68	0.5UJ	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82		
RMW-19 (dup)	Upper Silverado	2/22/02	8260b	2.3V	<5	<0.68	0.5UJ	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82		
RMW-19	Upper Silverado	3/25/02	8260b	**5.1**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-19	Upper Silverado	4/30/02	8260b	3.4	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	<50

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-19	Upper Silverado	5/28/02	8260b	2XJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-19	Upper Silverado	6/25/02	8260b	**0.39J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.13J**	<0.69	<0.14	<0.82		
RMW-19	Upper Silverado	7/30/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-19	Upper Silverado	8/28/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	**3.4**	**2.7**	**6.1**		
RMW-19	Upper Silverado	9/30/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-19	Upper Silverado	10/24/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	**0.11J**	<0.18	<0.093	<0.5	<0.14	<0.82	<10	<50
RMW-19	Upper Silverado	11/26/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82		
RMW-19 (dup)	Upper Silverado	11/26/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82		
RMW-19	Upper Silverado	12/20/02	8260b	0.33UJ	<1.9	0.33UJ	<0.78	0.61UJ	<0.28	<0.25	<0.49	<0.52	<0.24	<0.52		
RMW-19	Upper Silverado	1/23/03	8260b	**0.44J**	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	50XJ	<50
RMW-19	Upper Silverado	2/28/03	8260b	2XJ	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-19	Upper Silverado	3/25/03	8260b	**3.4**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-19	Upper Silverado	4/29/03	8260b	**12**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-19 (dup)	Upper Silverado	4/29/03	8260b	**12**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-19	Upper Silverado	5/30/03	8260b	**17**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-19	Upper Silverado	6/27/03	8260b	**28**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-19	Upper Silverado	7/25/03	8260b	**40**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-19	Upper Silverado	8/26/03	8260b	**57**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-19 (dup)	Upper Silverado	8/26/03	8260b	**56**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-19	Upper Silverado	9/26/03	8260b	**84**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-19 (dup)	Upper Silverado	9/26/03	8260b	**89**	**6.4J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-19	Upper Silverado	10/24/03	8260b	**41**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-19	Upper Silverado	1/23/04	8260b	**130**	**13J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**86**
RMW-19	Upper Silverado	4/23/04	8260b	**190**	<4.9	<0.32	0.3J	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**120**
RMW-19	Upper Silverado	1/11/05	8260b	**900**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	**100**
RMW-19	Upper Silverado	4/22/05	524.2	**640**	4.9UJ	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	**290**
RMW-19	Upper Silverado	7/18/05	8260b	**760**	<39	<3.3	<3.3	<3.9	<2.6	<1.7	<3.5	<3.8	<2.1	--	<44	**66**
RMW-19	Upper Silverado	11/11/05	8260b	**320**	<3.9	<0.33	**0.35J**	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	**250**
RMW-19	Upper Silverado	4/21/06	524.2	**160**	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	0.5X	<0.03	<0.016	--	<44	<44
RMW-19	Upper Silverado	7/17/06	8260b	**2,400J**	**740**	**0.41J**	<0.33	<0.33	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	**820**
RMW-19	Upper Silverado	10/16/06	8260b	**1,700**	**340**	**0.39J**	**0.52J**	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	**890**
RMW-19	Upper Silverado	4/20/07	8260b	**1,100J**	**500**	<2.5	<1.9	<2.3	<0.96	<0.67	<1.1	<1.4	<0.85	--	<48	**780**
RMW-19	Upper Silverado	7/10/07	8260b	**640**	**210**	<5.6	<1.7	<0.92	<0.7	<1.1	<1.4	<2.7	<0.84	--	<48	**290**
RMW-19	Upper Silverado	1/17/08	8260b	**730**	**75**	<5.6	<1.7	<0.92	<0.7	<1.1	<1.4	<2.7	<0.84	--	<48	**340**
RMW-19	Upper Silverado	7/10/08	8260b	**320**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	**170**

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-19	Upper Silverado	1/15/09	8260b	**73**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	**61**
RMW-19 (dup)	Upper Silverado	1/15/09	8260b	**61**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	**63**
RMW-19	Upper Silverado	7/14/09	8260b	**12**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-19 (dup)	Upper Silverado	7/14/09	8260b	**12**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-20	Shallow	11/1/00	8260b	**3.0**	<5	<0.68	<0.5	<0.57	**1.2**	**0.35J**	**4.8**	**2.5**	**1.3**	**3.8**	**29J**	
RMW-20	Shallow	1/23/01	8260b	5 UJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		**14J**
RMW-20	Shallow	4/20/01	8260b	**3.5**	<5	<0.68	<0.5	<0.57	**0.15J**	<0.18	0.19VJ	<0.69	<0.14	<0.82	**11J**	<50
RMW-20	Shallow	7/19/01	8260b	**1.5J**	<5	<0.68	<0.5	<0.57	**0.11J**	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-20	Shallow	10/19/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-20	Shallow	12/19/01	8260b	3.6V	<5	0.68UJ	<0.5	0.57UJ	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-20	Shallow	1/17/02	8260b	7V	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	50XJ	<50
RMW-20 (dup)	Shallow	1/17/02	8260b	7.2V	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	<50
RMW-20	Shallow	2/22/02	8260b	3.8V	<5	<0.68	0.5UJ	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-20	Shallow	3/25/02	8260b	**5.0**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-20	Shallow	4/30/02	8260b	**3.3**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	51V	<50
RMW-20	Shallow	5/28/02	8260b	**4.1**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-20 (dup)	Shallow	5/28/02	8260b	4.0	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82		
RMW-20	Shallow	6/25/02	8260b	**7.3**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-20	Shallow	7/30/02	8260b	**2.9**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-20	Shallow	8/28/02	8260b	**3.4**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	**1.0**	**2.0**	**3.1**		
RMW-20	Shallow	9/30/02	8260b	**5.2J**	<5	0.68UJ	0.5UJ	0.57UJ	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-20	Shallow	10/24/02	8260b	**13**	5UJ	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	<50
RMW-20	Shallow	11/26/02	8260b	**5.5**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82		
RMW-20	Shallow	12/20/02	8260b	**6.5J**	1.9UJ	0.33UJ	<0.78	0.61UJ	<0.28	<0.25	<0.49	<0.52	<0.24	<0.52		
RMW-20	Shallow	1/23/03	8260b	**6.1**	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	50XJ	<50
RMW-20	Shallow	2/28/03	8260b	**3.1**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-20	Shallow	3/25/03	8260b	**2.2**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-20	Shallow	4/29/03	8260b	**1.8J**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-20 (dup)	Shallow	4/29/03	8260b	**1.8J**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-20	Shallow	5/30/03	8260b	**3.1**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-20	Shallow	6/27/03	8260b	**2.1**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-20	Shallow	7/25/03	8260b	**6.3**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-20	Shallow	8/26/03	8260b	**20**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-20	Shallow	9/26/03	8260b	**14**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-20	Shallow	10/24/03	8260b	**9.1**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-20	Shallow	1/23/04	8260b	**4.6**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-20	Shallow	4/23/04	8260b	**12**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-20	Shallow	1/11/05	8260b	**940**	**5.9J**	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	**110**
RMW-20	Shallow	5/31/05	524.2	**530J**	**5.1J**	0.32UJ	0.27UJ	0.33UJ	0.049UJ	0.029UJ	**0.09J**	0.069UJ	0.034UJ	--	44UJ	**240J**
RMW-20 (dup)	Shallow	5/31/05	524.2	**540J**	4.9UJ	0.32UJ	0.27UJ	0.33UJ	0.049UJ	0.029UJ	**0.079J**	0.069UJ	0.034UJ	--	44UJ	**240J**
RMW-20	Shallow	7/18/05	8260b	**670**	<39	<3.3	<3.3	<3.9	<2.6	<1.7	<3.5	<3.8	<2.1	--	<44	**63**
RMW-20	Shallow	11/11/05	8260b	**1,500**	<3.9	**0.33J**	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	**680**
RMW-20	Shallow	4/21/06	524.2	**130J**	<0.79	0.015UJ	0.011UJ	0.025UJ	<0.014	<0.021	<0.02	<0.03	<0.016	--	<44	<44
RMW-20	Shallow	7/17/06	8260b	**92**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-20	Shallow	10/16/06	8260b	**300**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	**180**
RMW-20	Shallow	4/20/07	8260b	**360J**	**15**	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	**230**
RMW-20	Shallow	7/10/07	8260b	**350J**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	**130**
RMW-20	Shallow	1/17/08	8260b	**6.3**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-20 (dup)	Shallow	1/17/08	8260b	**6.1**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-20	Shallow	7/10/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-20 (dup)	Shallow	7/10/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-20	Shallow	1/15/09	8260b	**28**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	**50**
RMW-20	Shallow	7/14/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-21	Upper Silverado	1/24/01	8260b	**2.3J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<10
RMW-21	Upper Silverado	2/21/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	**0.16J**	<0.18	<0.093	<0.69	<0.14	**1.0J**		
RMW-21 (dup)	Upper Silverado	2/21/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	**0.12J**	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-21	Upper Silverado	3/13/01	8260b	**2.8J**	<5	<0.68	<0.5	<0.57	**0.21J**	<0.18	0.60 UJ	<0.69	**0.18J**	<0.82		<10
RMW-21	Upper Silverado	4/30/01	8260b	**6.8**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	**10J**	<50
RMW-21	Upper Silverado	5/29/01	8260b	**170**	**6.6J**	<0.68	<0.5	<0.57	<0.11	<0.18	**0.28J**	<0.69	<0.14	<0.82		
RMW-21 (dup)	Upper Silverado	5/29/01	8260b	**180**	**5.4J**	<0.68	<0.5	<0.57	<0.11	<0.18	**0.29J**	<0.69	<0.14	<0.82		
RMW-21	Upper Silverado	6/25/01	8260b	**760**	**56**	<0.68	<0.5	<0.57	<0.11	<0.18	**0.23J**	<0.69	<0.14	<0.82		
RMW-21	Upper Silverado	7/23/01	8260b	**52**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-21	Upper Silverado	10/22/01	8260b	**190**	**9.1J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-21	Upper Silverado	11/30/01	8260b	**160**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-21 (dup)	Upper Silverado	11/30/01	8260b	**170**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-21	Upper Silverado	12/28/01	8260b	**2,100**	**360**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-21	Upper Silverado	1/25/02	8260b	**3,200**	**280**	6.8VJ	<5	5.7VJ	<1.1	<1.8	<0.93	<6.9	<1.4	<8.2	50XJ	**710**
RMW-21	Upper Silverado	2/25/02	8260b	**3,400J**	**100**	0.68UJ	**0.74J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-21	Upper Silverado	3/21/02	8260b	**3,300**	**480**	**0.77J**	**0.7J**	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82		
RMW-21 (dup)	Upper Silverado	3/21/02	8260b	**3,200**	**340**	**0.81J**	**0.74J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
EQL (µg/l):				1.0	10	2.0	2.0	2.0	0.5	1.0	1.0	1.0	1.0	2.0		
RMW-21	Upper Silverado	4/26/02	8260b	4,400J	290	1.2J	0.95J	<0.57	0.34J	<0.18	1XJ	<0.69	<0.14	<0.82	68J	590
RMW-21	Upper Silverado	5/30/02	8260b	3,900	240	1.1J	0.77J	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-21	Upper Silverado	6/27/02	8260b	3,100	37	0.74J	0.63J	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-21	Upper Silverado	7/26/02	8260b	3,100	69	0.81J	0.78J	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	330
RMW-21	Upper Silverado	8/26/02	8260b	2,800	330	0.76J	0.56J	<0.57	<0.11	<0.18	<0.093	0.81J	0.73J	1.5J		
RMW-21	Upper Silverado	9/26/02	8260b	2,600	69J	<6.8	<5	<5.7	<1.1	<1.8	<0.93	<6.9	<1.4	<8.2		
RMW-21 (dup)	Upper Silverado	9/26/02	8260b	2,500	62J	<6.8	<5	<5.7	<1.1	<1.8	<0.93	<6.9	<1.4	<8.2		
RMW-21	Upper Silverado	10/25/02	8260b	2,300	12J	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	50XJ	740
RMW-21	Upper Silverado	11/22/02	8260b	1,800	99	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82		
RMW-21 (dup)	Upper Silverado	11/22/02	8260b	1,600	350	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82		
RMW-21	Upper Silverado	12/18/02	8260b	1,200J	30J	1.3UJ	<3.1	<2.4	<1.1	<1	<2	<2.1	<0.96	<2.1		
RMW-21 (dup)	Upper Silverado	12/18/02	8260b	1,400J	28J	1.3UJ	<3.1	<2.4	<1.1	<1	<2	<2.1	<0.96	<2.1		
RMW-21	Upper Silverado	1/22/03	8260b	910	70	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	470
RMW-21	Upper Silverado	2/26/03	8260b	25	10UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-21	Upper Silverado	3/26/03	8260b	8.0	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-21	Upper Silverado	4/23/03	8260b	12	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-21 (dup)	Upper Silverado	4/23/03	8260b	12	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-21	Upper Silverado	5/28/03	8260b	15	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-21	Upper Silverado	6/25/03	8260b	4.4	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-21	Upper Silverado	7/23/03	8260b	5.9	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-21	Upper Silverado	8/27/03	8260b	1.7J	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-21	Upper Silverado	9/24/03	8260b	5.9	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-21	Upper Silverado	10/31/03	8260b	6.2	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-21	Upper Silverado	1/21/04	8260b	6.3	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-21	Upper Silverado	4/21/04	8260b	1.9J	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-21	Upper Silverado	1/12/05	8260b	0.97J	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	<44
RMW-21	Upper Silverado	4/20/05	524.2	<0.28	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-21	Upper Silverado	7/13/05	8260b	2.0	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-21	Upper Silverado	10/12/05	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-21	Upper Silverado	4/18/06	524.2	1.3	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	0.5X	<0.03	<0.016	--	<44	<44
RMW-21	Upper Silverado	7/14/06	8260b	5.5	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-21	Upper Silverado	10/27/06	8260b	0.36J	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-21	Upper Silverado	4/17/07	8260b	0.39J	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-21	Upper Silverado	1/25/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-21	Upper Silverado	1/13/09	8260b	<0.3	3.5UJ	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-22	Shallow	1/24/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<10
RMW-22 (dup)	Shallow	1/24/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<10
RMW-22	Shallow	2/21/01	8260b	**0.36J**	<5	<0.68	<0.5	<0.57	**0.16J**	**0.27J**	**0.87J**	**1.6**	**0.65J**	**2.3**		
RMW-22	Shallow	3/13/01	8260b	0.28U	<5	<0.68	<0.5	<0.57	<0.11	<0.18	0.34 UJ	<0.69	<0.14	<0.82		<10
RMW-22	Shallow	4/30/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-22	Shallow	5/29/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	0.18J	<0.69	<0.14	<0.82		
RMW-22	Shallow	6/25/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-22	Shallow	7/23/01	8260b	<0.28	<5	<0.68	0.5UJ	<0.57	<0.11	**0.42J**	<0.093	**1.2**	**0.14J**	**1.4J**		<50
RMW-22	Shallow	10/22/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-22	Shallow	11/30/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-22	Shallow	12/28/01	8260b	2XJ	<5	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-22	Shallow	1/25/02	8260b	<2.5	<5	0.68UJ	<0.5	0.57UJ	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	**12J**	<50
RMW-22	Shallow	2/25/02	8260b	**2.7**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-22	Shallow	3/21/02	8260b	2XJ	<5	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-22	Shallow	4/26/02	8260b	5.6V	<5	<0.68	<0.5	<0.57	**0.39J**	<0.18	1XJ	<0.69	<0.14	<0.82	50XJ	<50
RMW-22 (dup)	Shallow	4/26/02	8260b	9.4V	<5	<0.68	<0.5	<0.57	**0.44J**	<0.18	1XJ	<0.69	<0.14	<0.82	50XJ	<50
RMW-22	Shallow	5/30/02	8260b	**0.84J**	<5	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-22	Shallow	6/27/02	8260b	**0.4J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-22	Shallow	8/12/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	0.5XJ	<0.18	1XJ	<0.69	<0.14	<0.82	50XJ	<50
RMW-22 (dup)	Shallow	8/12/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	0.5XJ	1XJ	1XJ	1.4V	1XJ	2XJ	50XJ	<50
RMW-22	Shallow	8/26/02	8260b	**0.47J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-22	Shallow	9/26/02	8260b	**0.44J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-22	Shallow	11/1/02	8260b	2XJ	5UJ	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	50XJ	<50
RMW-22	Shallow	11/22/02	8260b	2V	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82		
RMW-22	Shallow	12/18/02	8260b	**6.6J**	<1.9	0.33UJ	<0.78	0.61UJ	<0.28	<0.25	<0.49	<0.52	<0.24	<0.52		
RMW-22	Shallow	1/22/03	8260b	**16**	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-22	Shallow	2/26/03	8260b	**36**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-22	Shallow	3/26/03	8260b	**82**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-22	Shallow	4/23/03	8260b	**96**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**50J**
RMW-22	Shallow	5/28/03	8260b	**110**	**21J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-22	Shallow	6/25/03	8260b	**43**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-22	Shallow	7/23/03	8260b	**20**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**48J**
RMW-22	Shallow	8/27/03	8260b	**61**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-22	Shallow	9/24/03	8260b	**75**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-22	Shallow	10/31/03	8260b	**16**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-22	Shallow	1/21/04	8260b	**12**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-22	Shallow	4/21/04	8260b	**5.9**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-22	Shallow	1/12/05	8260b	**10**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	<44
RMW-22	Shallow	4/20/05	524.2	**71**	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-22	Shallow	7/13/05	8260b	**6.3**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-22	Shallow	10/12/05	8260b	**340**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	**51**
RMW-22	Shallow	4/18/06	524.2	**0.095J**	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<44	<44
RMW-22	Shallow	7/14/06	8260b	**32**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-22	Shallow	10/27/06	8260b	**20**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-22	Shallow	4/17/07	8260b	**4.4**	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-22 (dup)	Shallow	4/17/07	8260b	**4.2**	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-22	Shallow	7/13/07	8260b	**0.82J**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-22	Shallow	1/25/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-22	Shallow	7/7/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-22	Shallow	1/13/09	8260b	**0.49J**	3.5UJ	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-22	Shallow	7/17/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-23	Upper Silverado	12/11/00	8260b	**1,100J**	<50	<0.68	<5	<5.7	<1.1	<1.8	1.4U	<6.9	<1.4	<8.2	18U	
RMW-23	Upper Silverado	1/22/01	8260b	**1,700**	**30J**	<2.7	<2	<2.3	<0.44	<0.72	<0.37	<2.8	<0.56	<3.3	<10	
RMW-23	Upper Silverado	2/21/01	8260b	**1,700**	**280**	<0.68	<0.5	<0.57	**0.11J**	<0.18	**0.35J**	<0.69	**0.17J**	<0.82		
RMW-23	Upper Silverado	3/13/01	8260b	**1,600**	**38J**	<1.4	<1	<1.1	<0.22	<0.36	<0.19	<1.4	<0.28	<1.6		**530**
RMW-23	Upper Silverado	4/19/01	8260b	**1,800**	<100	<14	<10	<11	<2.2	<3.6	**4.6J**	<14	<2.8	<16	**130J**	**590**
RMW-23	Upper Silverado	6/1/01	8260b	**1,300**	**15J**	<0.68	<0.5	<0.57	**0.13J**	<0.18	**0.26J**	<0.69	<0.14	<0.82		
RMW-23	Upper Silverado	6/28/01	8260b	**1,200**	**150**	<0.68	<0.5	<0.57	<0.11	<0.18	**0.24J**	<0.69	**0.14J**	<0.82		
RMW-23	Upper Silverado	7/18/01	8260b	**1,400**	**220**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		**510**
RMW-23 (dup)	Upper Silverado	7/18/01	8260b	**130**	**170**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		**400**
RMW-23	Upper Silverado	10/18/01	8260b	**1,100**	**55**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<20	**320**
RMW-23 (dup)	`Upper Silverado	10/18/01	8260b	**1,100**	**64**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	**260**
RMW-23	Upper Silverado	11/21/01	8260b	**1,100**	**23J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-23	Upper Silverado	12/20/01	8260b	**1,400**	**31**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-23 (dup)	Upper Silverado	12/20/01	8260b	**1,600**	**25**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-23	Upper Silverado	1/16/02	8260b	**2,200**	**270**	<6.8	<5	<5.7	<1.1	<1.8	<0.93	<6.9	<1.4	<8.2	50XJ	**1,200**
RMW-23	Upper Silverado	2/21/02	8260b	**2,600J**	**19J**	**0.75J**	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82		
RMW-23 (dup)	Upper Silverado	2/21/02	8260b	**2,700J**	**29**	**0.71J**	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82		
RMW-23	Upper Silverado	3/22/02	8260b	**2,600**	**480**	2.7V	2V	2.3V	0.44V	0.72V	0.37V	2.8V	0.56V	3.3V		
RMW-23 (dup)	Upper Silverado	3/22/02	8260b	**1,700**	**140**	3.4V	2.5V	2.8V	**0.6J**	0.9V	**0.7J**	3.4V	0.7V	4.1V		

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-23	Upper Silverado	4/29/02	8260b	**920**	**76**	<1.4	<1	<1.1	<0.22	<0.36	2XJ	<1.4	<0.28	<1.6	52V	**410**
RMW-23 (dup)	Upper Silverado	4/29/02	8260b	**1,200**	**81**	<1.4	<1	<1.1	<0.22	<0.36	<0.19	<1.4	<0.28	<1.6	50XJ	**460**
RMW-23	Upper Silverado	5/24/02	8260b	**2,900**	**110J**	**0.94J**	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-23	Upper Silverado	6/24/02	8260b	**2,900**	**12J**	**0.86J**	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-23	Upper Silverado	7/24/02	8260b	**1,800**	**42**	**0.69J**	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	**11J**	**340J**
RMW-23 (dup)	Upper Silverado	7/24/02	8260b	**1,900**	**36**	**0.71J**	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	**11J**	**300J**
RMW-23	Upper Silverado	8/22/02	8260b	**1,200**	<12	<1.7	<1.2	<1.4	<0.28	<0.45	<0.23	<1.7	<0.35	<2.0		
RMW-23	Upper Silverado	9/23/02	8260b	**920**	**36**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-23 (dup)	Upper Silverado	9/23/02	8260b	**900**	**47**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-23	Upper Silverado	10/22/02	8260b	**500**	**7.8J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	50XJ	**200**
RMW-23	Upper Silverado	11/25/02	8260b	**350**	**5.1J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82		
RMW-23	Upper Silverado	12/23/02	8260b	**330J**	**5.6J**	0.33UJ	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38		
RMW-23	Upper Silverado	1/21/03	8260b	**190**	**6.6J**	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	50XJ	**65J**
RMW-23	Upper Silverado	2/25/03	8260b	**170J**	12UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-23	Upper Silverado	3/24/03	8260b	**110**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-23 (dup)	Upper Silverado	3/24/03	8260b	**130**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-23	Upper Silverado	4/25/03	8260b	**36**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-23	Upper Silverado	5/27/03	8260b	**39**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-23	Upper Silverado	6/23/03	8260b	**41**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-23 (dup)	Upper Silverado	6/23/03	8260b	**40**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-23	Upper Silverado	7/24/03	8260b	**27**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-23	Upper Silverado	8/25/03	8260b	**5.3**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-23 (dup)	Upper Silverado	8/25/03	8260b	**4.3**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-23	Upper Silverado	9/29/03	8260b	**83**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-23	Upper Silverado	10/23/03	8260b	**19**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-23	Upper Silverado	1/22/04	8260b	**7.8**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-23	Upper Silverado	4/22/04	8260b	**2.8**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-23	Upper Silverado	4/21/05	524.2	**1.8**	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-23	Upper Silverado	7/11/05	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-23	Upper Silverado	11/18/05	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-23	Upper Silverado	4/11/06	524.2	**0.31J**	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<44	<44
RMW-23	Upper Silverado	7/13/06	8260b	**1.2J**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-23	Upper Silverado	10/26/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-23	Upper Silverado	4/24/07	8260b	<0.23	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-23	Upper Silverado	1/25/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-23	Upper Silverado	1/20/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-24	Shallow	12/11/00	8260b	**2,200**	<100	<14	<10	<11	<2.2	<3.6	<1.9	<14	<2.8	<16	22U	
RMW-24	Shallow	1/22/01	8260b	**2,600**	**31J**	<3.4	<2.5	<2.8	<0.55	<0.9	<0.47	<3.4	<0.7	<4.1	<10	
RMW-24 (dup)	Shallow	1/22/01	8260b	**2,400**	**56**	**1.1J**	<0.5	<0.57	<0.11	<0.18	<0.093	**0.73J**	<0.14	<0.82	<10	
RMW-24	Shallow	2/21/01	8260b	**2,700**	**220**	**0.94J**	<0.5	<0.57	**0.11J**	<0.18	**0.48J**	<0.69	**0.21J**	<0.82		
RMW-24	Shallow	3/13/01	8260b	**2,700J**	**57J**	<3.4	<2.5	<2.8	<0.55	<0.9	<0.47	<3.4	<0.7	<4.1		**1,300**
RMW-24	Shallow	4/19/01	8260b	**4,600**	<500	<68	<50	<57	<11	<18	<9.3	<69	<14	<82	**470J**	**2,700**
RMW-24	Shallow	6/1/01	8260b	<0.28	**41**	**1.3J**	<0.5	<0.57	0.19VJ	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-24	Shallow	6/28/01	8260b	**3,400**	**540**	**1.3J**	<0.5	<0.57	<0.11	<0.18	0.28VJ	<0.69	0.15VJ	<0.82		
RMW-24	Shallow	7/18/01	8260b	**3,700**	**6.1J**	**1.4J**	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		**1,700**
RMW-24	Shallow	10/18/01	8260b	**3,500**	**170**	1.1J	**0.69J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	**18J**	**1,700**
RMW-24	Shallow	11/21/01	8260b	**5,800**	**210**	**1.8J**	**0.8J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-24	Shallow	12/20/01	8260b	**5,700**	**220**	**1.7J**	**0.89J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-24	Shallow	1/16/02	8260b	**3,000**	**260**	**1J**	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	56V	**1,900**
RMW-24	Shallow	2/21/02	8260b	**3,000J**	**19J**	**0.87J**	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-24	Shallow	3/22/02	8260b	**2,600**	**130J**	6.8V	5V	5.7V	1.1V	1.8V	**1.1J**	6.9V	1.4V	8.2V		
RMW-24	Shallow	4/29/02	8260b	**1,900**	**110**	<2.7	<2	<2.3	<0.44	<0.72	<0.37	<2.8	<0.56	<3.3	50XJ	**820**
RMW-24	Shallow	5/24/02	8260b	**1,100**	**46J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-24 (dup)	Shallow	5/24/02	8260b	**1,100**	**54J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-24	Shallow	6/24/02	8260b	**780**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-24	Shallow	7/24/02	8260b	**1,100**	**24J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	**190J**
RMW-24	Shallow	8/22/02	8260b	**1,200**	**56J**	<1.7	<1.2	<1.4	**0.60J**	<0.45	<0.23	<1.7	<0.35	<2.0		
RMW-24 (dup)	Shallow	8/22/02	8260b	**950**	**45J**	<1.7	<1.2	<1.4	<0.28	<0.45	<0.23	<1.7	<0.35	<2.0		
RMW-24	Shallow	9/23/02	8260b	**960**	**51**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-24	Shallow	10/22/02	8260b	**810**	**18J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	50XJ	**310**
RMW-24 (dup)	Shallow	10/22/02	8260b	**810**	**17J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	50XJ	**310**
RMW-24	Shallow	11/25/02	8260b	**790**	**8.0J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82		
RMW-24	Shallow	12/23/02	8260b	**470J**	**14J**	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38		
RMW-24	Shallow	1/21/03	8260b	**240**	**8.8J**	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	50XJ	100XJ
RMW-24	Shallow	2/25/03	8260b	**320J**	**42J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-24	Shallow	3/24/03	8260b	**480**	**7.4J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-24 (dup)	Shallow	3/24/03	8260b	**460**	**5.5J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-24	Shallow	4/25/03	8260b	**280**	**4.9UJ**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-24	Shallow	5/27/03	8260b	**160**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-24	Shallow	6/23/03	8260b	**180**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-24	Shallow	7/24/03	8260b	**110**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**64**
RMW-24 (dup)	Shallow	7/24/03	8260b	**120**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**90**
RMW-24	Shallow	8/25/03	8260b	**82**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-24	Shallow	9/29/03	8260b	**230**	<25	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79		
RMW-24	Shallow	10/23/03	8260b	**92**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**57**
RMW-24	Shallow	1/22/04	8260b	**6.7**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-24	Shallow	4/22/04	8260b	**0.64J**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-24	Shallow	4/21/05	524.2	**22**	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-24	Shallow	7/27/05	8260b	**0.52J**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-24	Shallow	10/17/05	8260b	**0.53J**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-24	Shallow	4/20/06	524.2	**0.56**	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<44	<44
RMW-24	Shallow	7/13/06	8260b	**1.1J**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-24	Shallow	10/26/06	8260b	**0.37J**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-24	Shallow	4/24/07	8260b	**0.38J**	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-24	Shallow	1/25/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-24 (dup)	Shallow	1/25/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-24	Shallow	1/20/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-24 (dup)	Shallow	1/20/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-25	Shallow	8/6/01	8260b	**0.51J**	<5	<0.68	**1.2J**	<0.57	**0.17J**	<0.18	1X	<0.69	**0.15J**	<0.82		**90J**
RMW-25	Shallow	11/8/01	8260b	**0.48J**	<5	<0.68	**1J**	<0.57	**0.12J**	<0.18	1XJ	<0.69	<0.14	<0.82	**85**	**99J**
RMW-25	Shallow	1/21/02	8260b	2XJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	<50
RMW-25	Shallow	4/22/02	8260b	**0.62J**	<5	<0.68	**0.75J**	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	51V	**50J**
RMW-25	Shallow	7/22/02	8260b	2XJ	<5	<0.68	**0.69J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	**39J**	<50
RMW-25	Shallow	10/31/02	8260b	**0.78J**	<5	<0.68	**0.59J**	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	**33J**	<50
RMW-25	Shallow	1/30/03	8260b	**0.71J**	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	**27J**	<50
RMW-25	Shallow	4/22/03	8260b	**0.43J**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-25	Shallow	7/22/03	8260b	**0.46J**	<4.9	<0.32	0.33J	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-25	Shallow	10/21/03	8260b	**0.52J**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-25	Shallow	1/20/04	8260b	**0.41J**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-25	Shallow	4/20/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-25	Shallow	4/19/05	524.2	<0.28	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-25	Shallow	4/17/06	524.2	**31**	<0.79	<0.015	**0.21J**	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<44	<44
RMW-25	Shallow	7/14/06	8260b	**260J**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	**92**	**110**
RMW-25	Shallow	10/27/06	8260b	**290**	25X	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-25	Shallow	4/12/07	8260b	**150**	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				1.0	10	2.0	2.0	2.0	0.5	1.0	1.0	1.0	1.0	2.0	C6-C12	C4-C12
RMW-25	Shallow	7/11/07	8260b	34	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	74V
RMW-25	Shallow	1/18/08	8260b	13	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-25	Shallow	7/7/08	8260b	2.2	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-25	Shallow	1/27/09	8260b	0.95J	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-25	Shallow	7/15/09	8260b	0.72J	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-27	Shallow	2/20/01	8260b	2,000	76J	<6.8	<5	<5.7	<1.1	<1.8	1.2J	<6.9	<1.4	<8.2		
RMW-27	Shallow	3/12/01	8260b	1,400	54	<0.68	<0.5	<0.57	0.11J	<0.18	0.30J	<0.69	<0.14	<0.82		720
RMW-27 (dup)	Shallow	3/12/01	8260b	1,500J	100	<0.68	<0.5	<0.57	0.12J	<0.18	0.38J	<0.69	0.14J	<0.82		670
RMW-27	Shallow	4/30/01	8260b	1,300	97	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	15J	540
RMW-27 (dup)	Shallow	4/30/01	8260b	1,400	95	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	16J	510
RMW-27	Shallow	5/29/01	8260b	1,300	57J	<2.7	<2	<2.3	<0.44	<0.72	0.68VJ	<2.8	<0.56	<3.3		
RMW-27	Shallow	6/25/01	8260b	1,600	30J	<1.4	<1	<1.1	<0.22	<0.36	0.36J	<1.4	<0.28	<1.6		
RMW-27 (dup)	Shallow	6/25/01	8260b	1,400	30J	<1.4	<1	<1.1	<0.22	<0.36	0.34J	<1.4	<0.28	<1.6		
RMW-27	Shallow	7/23/01	8260b	2,100	69	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		550
RMW-27	Shallow	10/22/01	8260b	690	92J	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	260
RMW-27	Shallow	11/20/01	8260b	1,100J	5.7J	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-27	Shallow	12/19/01	8260b	1,200	21J	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-27	Shallow	1/25/02	8260b	410	35	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	200
RMW-27	Shallow	2/25/02	8260b	440	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-27	Shallow	3/21/02	8260b	420	30	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-27	Shallow	4/26/02	8260b	390J	14J	<0.68	<0.5	<0.57	0.51	<0.18	0.29J	<0.69	<0.14	<0.82	50XJ	77J
RMW-27 (dup)	Shallow	4/26/02	8260b	490J	14J	<0.68	<0.5	<0.57	0.51	<0.18	0.32J	<0.69	<0.14	<0.82	50XJ	78J
RMW-27	Shallow	5/23/02	8260b	640	120	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82		
RMW-27 (dup)	Shallow	5/23/02	8260b	550	120	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-27	Shallow	6/21/02	8260b	580J	12J	0.68UJ	<0.5	<0.57	<0.11	<0.18	0.53J	<0.69	<0.14	<0.82		
RMW-27 (dup)	Shallow	6/21/02	8260b	620J	14J	0.68UJ	<0.5	<0.57	<0.11	<0.18	0.57J	<0.69	<0.14	<0.82		
RMW-27	Shallow	7/26/02	8260b	360	7.2J	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-27 (dup)	Shallow	7/26/02	8260b	360	6J	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-27	Shallow	8/26/02	8260b	260	28	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-27	Shallow	10/25/02	8260b	170	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	<50
RMW-27	Shallow	1/22/03	8260b	32	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-27	Shallow	4/23/03	8260b	350	25J	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	120
RMW-27	Shallow	7/23/03	8260b	83	11J	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	78
RMW-27 (dup)	Shallow	7/23/03	8260b	83	10J	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	72
RMW-27	Shallow	10/31/03	8260b	7.2	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-27	Shallow	1/21/04	8260b	**2.5**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-27	Shallow	4/21/04	8260b	**1.6J**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-27	Shallow	4/20/05	524.2	**2.0**	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-27	Shallow	4/18/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	0.5X	<0.03	<0.016	--	<48	<48
RMW-27	Shallow	1/13/09	8260b	**0.63J**	3.5UJ	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-28	Upper Silverado	1/26/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	**0.25J**	<0.18	<0.093	<0.69	<0.14	<0.82		<10
RMW-28	Upper Silverado	5/2/01	8260b	**1J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-28	Upper Silverado	7/26/01	8260b	<0.28	5UJ	<0.68	0.5UJ	<0.57	<0.11	<0.18	0.12VJ	<0.69	<0.14	<0.82		50UJ
RMW-28	Upper Silverado	10/25/01	8260b	**0.49J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	<10	<50
RMW-28 (dup)	Upper Silverado	10/25/01	8260b	**0.44J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	<10	<50
RMW-28	Upper Silverado	1/31/02	8260b	**0.84J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-28	Upper Silverado	4/25/02	8260b	**0.64J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	<50
RMW-28	Upper Silverado	7/25/02	8260b	2XJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	<50
RMW-28	Upper Silverado	10/31/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	**0.19J**	1XJ	**0.55J**	<0.14	<0.82	<10	<50
RMW-28	Upper Silverado	1/30/03	8260b	<0.33	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-28	Upper Silverado	4/24/03	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-28	Upper Silverado	7/31/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-28	Upper Silverado	10/30/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-28	Upper Silverado	1/29/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	44UJ	44UJ
RMW-28	Upper Silverado	4/29/04	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-28	Upper Silverado	4/28/05	524.2	<0.28	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-28	Upper Silverado	4/24/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<48	<48
RMW-28	Upper Silverado	1/23/09	8260b	**0.86J**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-29	Shallow	1/26/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	**0.27J**	<0.18	<0.093	<0.69	<0.14	<0.82		<10
RMW-29	Shallow	5/2/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	0.13VJ	<0.18	0.12VJ	<0.69	<0.14	<0.82	<10	<50
RMW-29	Shallow	7/26/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.19J**	<0.69	<0.14	<0.82		50UJ
RMW-29	Shallow	10/25/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-29	Shallow	1/31/02	8260b	**0.5J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-29	Shallow	4/25/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-29	Shallow	7/25/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	<50
RMW-29 (dup)	Shallow	7/25/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	<50
RMW-29	Shallow	10/31/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	<50
RMW-29	Shallow	1/30/03	8260b	<0.33	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-29	Shallow	4/24/03	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-29	Shallow	7/31/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-29	Shallow	10/30/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-29	Shallow	1/29/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	44UJ	44UJ
RMW-29	Shallow	4/29/04	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-29	Shallow	4/28/05	524.2	<0.28	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-29	Shallow	4/24/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<48	<48
RMW-29	Shallow	1/23/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-30	Upper Silverado	8/7/01	8260b	**190**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1X	<0.69	<0.14	<0.82		90J
RMW-30	Upper Silverado	10/26/01	8260b	**200**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	76J
RMW-30	Upper Silverado	12/18/01	8260b	**100**	<5	<0.68	<0.5	<0.57	**1.5**	**1.8**	**6.3**	**7.2**	**1.8**	**9**		
RMW-30	Upper Silverado	12/27/01	8260b	**97J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-30	Upper Silverado	1/23/02	8260b	**48**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	<50
RMW-30	Upper Silverado	2/27/02	8260b	**57**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-30	Upper Silverado	3/27/02	8260b	**60**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-30	Upper Silverado	4/17/02	8260b	**28**	<5	<0.68	0.5UJ	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	**69**	**66J**
RMW-30	Upper Silverado	6/5/02	8260b	**50J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-30	Upper Silverado	6/26/02	8260b	**44**	25XJ	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-30	Upper Silverado	7/17/02	8260b	**40**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-30 (dup)	Upper Silverado	7/17/02	8260b	**39**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-30	Upper Silverado	8/21/02	8260b	**34**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-30	Upper Silverado	10/16/02	8260b	**17**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	<50
RMW-30	Upper Silverado	1/15/03	8260b	**26**	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-30 (dup)	Upper Silverado	1/15/03	8260b	**26**	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-30	Upper Silverado	4/16/03	8260b	**18**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-30	Upper Silverado	7/16/03	8260b	**32**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-30	Upper Silverado	10/15/03	8260b	**19**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-30 (dup)	Upper Silverado	10/15/03	8260b	**20**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-30	Upper Silverado	1/14/04	8260b	**7.7**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-30	Upper Silverado	4/14/04	8260b	**1.7J**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-30 (dup)	Upper Silverado	4/14/04	8260b	**1.4J**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-30	Upper Silverado	4/13/05	524.2	**2.9**	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-30	Upper Silverado	5/31/06	524.2	**9.6**	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<48	<48
RMW-30	Upper Silverado	4/19/07	8260b	**0.73J**	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-30	Upper Silverado	1/21/08	8260b	**1.3**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-30	Upper Silverado	1/14/09	8260b	**2.5**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-31	Shallow	9/6/01	8260b	5X	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-31	Shallow	10/26/01	8260b	**0.62J**	<5	<0.68	<0.5	<0.57	**0.2J**	**0.39J**	**1.2**	**1.6**	**0.52J**	**2.2**	<10	<50
RMW-31	Shallow	12/18/01	8260b	0.28UJ	<5	0.68UJ	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82		
RMW-31	Shallow	12/27/01	8260b	0.28UJ	<5	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-31	Shallow	1/23/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	<50
RMW-31 (dup)	Shallow	1/23/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	<50
RMW-31	Shallow	2/27/02	8260b	2XJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-31	Shallow	3/27/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-31	Shallow	4/17/02	8260b	<0.28	<5	<0.68	0.5UJ	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	50XJ	<50
RMW-31	Shallow	6/5/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-31	Shallow	6/26/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-31	Shallow	7/17/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-31	Shallow	8/21/02	8260b	0.28UJ	<5	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-31	Shallow	10/16/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.43J**	<0.5	<0.14	<0.82	<10	<50
RMW-31	Shallow	1/15/03	8260b	<0.33	<1.9	0.33UJ	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-31	Shallow	4/16/03	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-31	Shallow	7/16/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-31	Shallow	10/15/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-31	Shallow	1/14/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-31 (dup)	Shallow	1/14/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-31	Shallow	4/14/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-31	Shallow	4/13/05	524.2	<0.28	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-31	Shallow	5/31/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<48	<48
RMW-31	Shallow	1/14/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-31 (dup)	Shallow	1/14/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	**53**
RMW-32	Upper Silverado	6/7/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.3J**	<0.69	<0.14	<0.82		
RMW-32	Upper Silverado	8/6/01	8260b	<0.28	5UJ	<0.68	<0.5	<0.57	<0.11	<0.18	**0.13J**	<0.69	<0.14	<0.82		<50
RMW-32	Upper Silverado	11/8/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	**10J**	<50
RMW-32	Upper Silverado	1/21/02	8260b	2XJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	<50
RMW-32 (dup)	Upper Silverado	1/21/02	8260b	2XJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	<50
RMW-32	Upper Silverado	4/22/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	**0.28J**	1XJ	**0.82J**	**0.14J**	**0.96J**	50XJ	<50
RMW-32 (dup)	Upper Silverado	4/22/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	**0.19J**	1XJ	<0.69	<0.14	<0.82	50XJ	<50
RMW-32	Upper Silverado	7/22/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	10UJ	50UJ
RMW-32 (dup)	Upper Silverado	7/22/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	10UJ	50UJ
RMW-32	Upper Silverado	10/23/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	50XJ	<50

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-32	Upper Silverado	1/24/03	8260b	<0.33	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-32	Upper Silverado	4/24/03	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-32	Upper Silverado	7/31/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-32	Upper Silverado	10/30/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-32 (dup)	Upper Silverado	10/30/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-32	Upper Silverado	1/29/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	44UJ	44UJ
RMW-32	Upper Silverado	4/29/04	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-32	Upper Silverado	4/28/05	524.2	<0.28	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-32	Upper Silverado	4/13/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<48	<48
RMW-32	Upper Silverado	1/12/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-32 (dup)	Upper Silverado	1/12/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-33	Shallow	6/7/01	8260b	1.4VJ	<5	<0.68	<0.5	<0.57	**0.12J**	<0.18	**0.23J**	<0.69	<0.14	<0.82		
RMW-33	Shallow	8/6/01	8260b	**1.1J**	5UJ	<0.68	<0.5	<0.57	<0.11	<0.18	**0.11J**	<0.69	<0.14	<0.82		<50
RMW-33	Shallow	11/8/01	8260b	**0.76J**	<5	<0.68	<0.5	<0.57	**1.4**	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-33	Shallow	1/21/02	8260b	2XJ	<5	<0.68	<0.5	<0.57	**0.18J**	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-33	Shallow	4/22/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	50XJ	<50
RMW-33	Shallow	7/22/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	50UJ
RMW-33	Shallow	10/23/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	50XJ	<50
RMW-33	Shallow	1/24/03	8260b	<0.33	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-33	Shallow	4/24/03	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-33	Shallow	7/31/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-33	Shallow	10/30/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-33	Shallow	1/29/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	44UJ	44UJ
RMW-33	Shallow	4/29/04	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-33	Shallow	4/28/05	524.2	<0.28	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-33	Shallow	4/13/06	524.2	**0.11J**	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<48	<48
RMW-33	Shallow	1/12/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-48	Shallow	5/8/01	8260b	**0.58J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-48	Shallow	6/1/01	8260b	0.58VJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.23J**	<0.69	<0.14	<0.82		
RMW-48 (dup)	Shallow	6/1/01	8260b	0.61VJ	<5	<0.68	<0.5	<0.57	**0.12J**	<0.18	**0.22J**	<0.69	<0.14	<0.82		
RMW-48	Shallow	6/28/01	8260b	0.4VJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.25J**	<0.69	<0.14	<0.82		
RMW-48	Shallow	7/20/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-48	Shallow	10/18/01	8260b	2XJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	<10	<50
RMW-48	Shallow	11/21/01	8260b	2XJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-48	Shallow	12/20/01	8260b	**55**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

			VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
Regional Well No.	Aquifer	Sample Date	EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-48	Shallow	1/16/02	8260b	**1,600**	**230**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	**570**
RMW-48	Shallow	2/21/02	8260b	**1,400**	**120**	<0.68	<0.5	<0.57	<0.11	**0.19J**	1XJ	**0.7J**	**0.53J**	**1.2J**		
RMW-48	Shallow	3/22/02	8260b	**1,700**	**12J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	**0.24J**	<0.82		
RMW-48	Shallow	4/29/02	8260b	**2,800J**	**91J**	<6.8	<5	<5.7	<1.1	<1.8	<0.93	<6.9	<1.4	<8.2	100V	**1,100**
RMW-48	Shallow	5/24/02	8260b	**3,700**	**120**	**1.6J**	**0.64J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-48	Shallow	6/24/02	8260b	**4,400**	<5	**1.2J**	**0.6J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-48	Shallow	7/24/02	8260b	**3,600**	**300**	**1.5J**	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	**17J**	**480**
RMW-48	Shallow	8/22/02	8260b	**3,200**	**370**	**1.2J**	**0.51J**	<0.57	<0.11	<0.18	<0.093	**4.0**	**2.9**	**6.9**		
RMW-48 (dup)	Shallow	8/22/02	8260b	**3,200**	**350**	**0.92J**	<0.5	<0.57	<0.11	<0.18	<0.093	**4.3**	**3.2**	**7.5**		
RMW-48	Shallow	9/23/02	8260b	**2,000**	**140**	**1.0J**	**0.56J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-48 (dup)	Shallow	9/23/02	8260b	**1,600**	**150**	**1.1J**	**0.60J**	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-48	Shallow	10/22/02	8260b	**2,700**	**21J**	**1.1J**	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	50XJ	**600**
RMW-48	Shallow	11/25/02	8260b	**3,600**	**120**	**1.2J**	**0.65J**	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82		
RMW-48	Shallow	12/23/02	8260b	**1,600**	**29J**	<1.3	<3.1	<2.4	<1.1	<1	<2	<1.5	<0.96	<1.5		
RMW-48	Shallow	1/21/03	8260b	**1,800**	**190**	**0.91J**	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	50XJ	**600**
RMW-48	Shallow	2/25/03	8260b	**2,600J**	**780J**	**0.76J**	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-48	Shallow	3/24/03	8260b	**2,400**	**1,100J**	**0.57J**	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-48	Shallow	4/25/03	8260b	**2,000**	**46J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**740**
RMW-48	Shallow	5/27/03	8260b	**1,200**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	**1.8J**	**1.4J**	**0.53J**	**1.9J**		
RMW-48	Shallow	6/23/03	8260b	**2,000**	<49	<3.2	<2.7	<3.3	<2.9	<1.9	<3.5	<1.7	<1.6	<1.6		
RMW-48	Shallow	7/24/03	8260b	**1,800**	<49	<3.2	<2.7	<3.3	<2.9	<1.9	<3.5	<1.7	<1.6	<1.6	<44	**1,000**
RMW-48	Shallow	8/25/03	8260b	**1,800**	<49	<3.2	<2.7	<3.3	<2.9	<1.9	<3.5	<1.7	<1.6	<1.6		
RMW-48	Shallow	9/29/03	8260b	**1,400**	<99	<6.4	<5.3	<6.6	<5.8	<3.9	<7	<3.4	<3.2	<3.2		
RMW-48	Shallow	10/23/03	8260b	**1,200**	<49	<3.2	<2.7	<3.3	<2.9	<1.9	<3.5	<1.7	<1.6	<1.6	<44	**640**
RMW-48	Shallow	1/22/04	8260b	**530**	**89J**	<3.2	<2.7	<3.3	<2.9	<1.9	<3.5	<1.7	<1.6	<1.6	<44	**230**
RMW-48	Shallow	4/22/04	8260b	**590**	<25	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79	<44	**390**
RMW-48	Shallow	1/17/05	8260b	**9.8**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	<44
RMW-48	Shallow	5/31/05	524.2	**6.9J**	4.9UJ	0.32UJ	0.27UJ	0.33UJ	0.049UJ	0.029UJ	**0.74J**	0.069UJ	0.034UJ	--	44UJ	44UJ
RMW-48	Shallow	7/11/05	8260b	**10**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-48	Shallow	11/18/05	8260b	**2J**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-48	Shallow	5/31/06	524.2	**3.5**	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<48	<48
RMW-48	Shallow	7/13/06	8260b	**5.1**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-48	Shallow	10/26/06	8260b	**8.7**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-48	Shallow	4/19/07	8260b	**7.3**	**12**	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-48 (dup)	Shallow	4/19/07	8260b	**8.5**	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-48	Shallow	7/13/07	8260b	**4.1**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-48	Shallow	1/18/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-48	Shallow	7/8/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-48	Shallow	1/20/09	8260b	**10**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-48	Shallow	7/13/09	8260b	**1.2J**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-49	Upper Silverado	5/8/01	8260b	**290**	**5J**	<0.68	<0.5	<0.57	<0.11	<0.18	0.15VJ	<0.69	<0.14	<0.82	<10	**170**
RMW-49	Upper Silverado	6/1/01	8260b	**240**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.24J**	<0.69	<0.14	<0.82		
RMW-49	Upper Silverado	6/28/01	8260b	**290**	**30**	<0.68	<0.5	<0.57	<0.11	<0.18	**0.29J**	<0.69	<0.14	<0.82		
RMW-49	Upper Silverado	7/20/01	8260b	**21**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-49	Upper Silverado	10/18/01	8260b	**49**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	<10	<50
RMW-49	Upper Silverado	11/21/01	8260b	**130**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-49	Upper Silverado	12/20/01	8260b	**42**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-49	Upper Silverado	1/16/02	8260b	**330**	**33**	<0.68	<0.5	<0.57	<0.11	<0.18	**0.16J**	<0.69	<0.14	<0.82	50XJ	**140**
RMW-49 (dup)	Upper Silverado	1/16/02	8260b	**360**	**34**	<0.68	<0.5	<0.57	<0.11	<0.18	**0.17J**	<0.69	<0.14	<0.82	50XJ	**150**
RMW-49	Upper Silverado	2/21/02	8260b	**93**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.11J**	<0.69	<0.14	<0.82		
RMW-49	Upper Silverado	3/22/02	8260b	**270**	**20J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-49 (dup)	Upper Silverado	3/22/02	8260b	**330**	**29**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-49	Upper Silverado	4/29/02	8260b	**520**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	78V	**230**
RMW-49	Upper Silverado	5/24/02	8260b	**410**	**13J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-49	Upper Silverado	6/24/02	8260b	**540**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-49 (dup)	Upper Silverado	6/24/02	8260b	**630**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-49	Upper Silverado	7/24/02	8260b	**660**	**19J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	**18J**	**150J**
RMW-49	Upper Silverado	8/22/02	8260b	**780**	**42J**	<1.4	<1	<1.1	<0.22	**1.0J**	<0.19	**9.4**	**5.7**	**15**		
RMW-49	Upper Silverado	9/23/02	8260b	**1,300**	**65**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	**1.0**	**1.5J**		
RMW-49	Upper Silverado	10/22/02	8260b	**1,400**	**31**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	**0.19J**	<0.82	50XJ	**520**
RMW-49	Upper Silverado	11/25/02	8260b	**340**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82		
RMW-49 (dup)	Upper Silverado	11/25/02	8260b	**360**	**8.2J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82		
RMW-49	Upper Silverado	12/23/02	8260b	**180**	**6.8J**	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38		
RMW-49	Upper Silverado	1/21/03	8260b	**370**	**40**	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	50XJ	**280**
RMW-49	Upper Silverado	2/25/03	8260b	**360J**	**59J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-49	Upper Silverado	3/24/03	8260b	**230**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-49 (dup)	Upper Silverado	3/24/03	8260b	**260**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16		
RMW-49	Upper Silverado	4/25/03	8260b	**140**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**110**
RMW-49	Upper Silverado	5/27/03	8260b	**330**	**13J**	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	**0.21J**	<0.16	**0.21J**	<44	**110**

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-49	Upper Silverado	6/23/03	8260b	**390**	<9.9	<0.64	<0.53	<0.66	<0.58	<0.39	**0.74J**	**1.3J**	<0.32	**1.3J**		
RMW-49 (dup)	Upper Silverado	6/23/03	8260b	**370**	**12J**	<0.64	<0.53	<0.66	<0.58	<0.39	<0.74	**0.54J**	<0.32	**0.54J**		
RMW-49	Upper Silverado	7/24/03	8260b	**400**	**11J**	<0.64	<0.53	<0.66	<0.58	<0.39	<0.7	<0.34	<0.32	<0.32	<44	**260**
RMW-49	Upper Silverado	8/25/03	8260b	**450J**	<9.9	<0.64	<0.53	<0.66	<0.58	<0.39	<0.7	<0.34	<0.32	<0.32		
RMW-49	Upper Silverado	9/29/03	8260b	**600**	**45J**	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	5XJ	<0.79	10XJ		
RMW-49	Upper Silverado	10/23/03	8260b	**850**	<25	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79	<44	**460**
RMW-49	Upper Silverado	1/22/04	8260b	**470**	**43J**	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79	<44	**180**
RMW-49	Upper Silverado	4/22/04	8260b	**350**	<25	<1.6	<1.3	<1.6	<1.5	<0.97	<1.8	<0.85	<0.79	<0.79	<44	**240**
RMW-49	Upper Silverado	1/17/05	8260b	**27**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	<44
RMW-49	Upper Silverado	5/31/05	524.2	**3.3J**	4.9UJ	0.32UJ	0.27UJ	0.33UJ	0.049UJ	0.029UJ	0.038UJ	0.069UJ	0.034UJ	--	44UJ	44UJ
RMW-49	Upper Silverado	7/11/05	8260b	**11**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-49	Upper Silverado	10/17/05	8260b	**13**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-49	Upper Silverado	5/31/06	524.2	**16J**	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<48	<48
RMW-49	Upper Silverado	7/13/06	8260b	**17**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-49	Upper Silverado	10/26/06	8260b	**3.1**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-49 (dup)	Upper Silverado	10/26/06	8260b	**3.1**	**4.8J**	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-49	Upper Silverado	4/19/07	8260b	**3.9**	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-49	Upper Silverado	7/13/07	8260b	**0.95J**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-49	Upper Silverado	1/18/08	8260b	**2.9**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-49(dup)	Upper Silverado	1/18/08	8260b	**3.3**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-49	Upper Silverado	7/8/08	8260b	**3.4**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-49 (dup)	Upper Silverado	7/8/08	8260b	**3.2**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-49	Upper Silverado	1/20/09	8260b	**5.3**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-49	Upper Silverado	7/13/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-50	Upper Silverado	5/3/01	8260b	**270**	**7J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	**140**
RMW-50 (dup)	Upper Silverado	5/3/01	8260b	**280**	**5.6J**	0.68UJ	**0.61J**	0.57UJ	<0.11	<0.18	0.12VJ	<0.69	<0.14	<0.82	<10	**140**
RMW-50	Upper Silverado	5/30/01	8260b	**510**	<10	<1.4	<1	<1.1	<0.22	<0.36	**0.22J**	<1.4	<0.28	<1.6		
RMW-50	Upper Silverado	6/27/01	8260b	**170**	**14J**	<0.68	<0.5	<0.57	<0.11	<0.18	0.36VJ	<0.69	0.21VJ	<0.82		
RMW-50 (dup)	Upper Silverado	6/27/01	8260b	**170**	**16J**	<0.68	<0.5	<0.57	<0.11	<0.18	0.36VJ	<0.69	0.21VJ	<0.82		
RMW-50	Upper Silverado	7/27/01	8260b	**340**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.24J**	<0.69	**0.15J**	<0.82		**120**
RMW-50	Upper Silverado	10/17/01	8260b	**250**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	**110**
RMW-50	Upper Silverado	11/28/01	8260b	**180J**	**7J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-50 (dup)	Upper Silverado	11/28/01	8260b	**160J**	**11J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-50	Upper Silverado	12/27/01	8260b	**140J**	**8.4J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-50 (dup)	Upper Silverado	12/27/01	8260b	**98J**	**5J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-50	Upper Silverado	1/23/02	8260b	**160**	**10J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-50	Upper Silverado	2/20/02	8260b	**100**	**12J**	<0.68	<0.5	<0.57	<0.11	<0.18	**0.12J**	<0.69	<0.14	<0.82		
RMW-50 (dup)	Upper Silverado	2/20/02	8260b	**120**	**12J**	<0.68	<0.5	<0.57	**1.4**	**4.9**	**0.54J**	**2.3**	**0.48J**	**2.8**		
RMW-50	Upper Silverado	3/26/02	8260b	**180**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-50	Upper Silverado	5/1/02	8260b	**130**	<5	<0.68	<0.5	<0.57	0.59V	1.7V	4.2V	6.7V	2V	8.7V	50XJ	76J
RMW-50	Upper Silverado	5/30/02	8260b	**160**	25XJ	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-50	Upper Silverado	6/27/02	8260b	**150**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-50 (dup)	Upper Silverado	6/27/02	8260b	**160**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-50	Upper Silverado	7/17/02	8260b	**100**	<5	<0.68	<0.5	<0.57	**0.15J**	<0.18	<0.093	<0.69	<0.14	<0.82	22J	54J
RMW-50 (dup)	Upper Silverado	7/17/02	8260b	**140**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-50	Upper Silverado	8/21/02	8260b	**110**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	**0.18J**	<0.82		
RMW-50 (dup)	Upper Silverado	8/21/02	8260b	**95**	<5	<0.68	<0.5	<0.57	0.5XJ	1XJ	1XJ	1V	**0.22J**	2XJ		
RMW-50	Upper Silverado	10/16/02	8260b	**98**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	73J
RMW-50 (dup)	Upper Silverado	10/16/02	8260b	**100**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	61J
RMW-50	Upper Silverado	1/15/03	8260b	**100**	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-50 (dup)	Upper Silverado	1/15/03	8260b	**100**	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-50	Upper Silverado	4/16/03	8260b	67	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-50	Upper Silverado	7/16/03	8260b	**4.6**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-50	Upper Silverado	10/15/03	8260b	7.4	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-50	Upper Silverado	1/14/04	8260b	**23**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-50 (dup)	Upper Silverado	1/14/04	8260b	**21**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-50	Upper Silverado	4/14/04	8260b	**18**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-50 (dup)	Upper Silverado	4/14/04	8260b	**17**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-50	Upper Silverado	1/12/05	8260b	**2.6**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	<44
RMW-50 (dup)	Upper Silverado	1/12/05	8260b	**2.6**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	<44
RMW-50	Upper Silverado	4/13/05	524.2	**1.1**	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-50 (dup)	Upper Silverado	4/13/05	524.2	**1.0**	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-50	Upper Silverado	7/13/05	8260b	**1.9J**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-50 (dup)	Upper Silverado	7/13/05	8260b	**2.0**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-50	Upper Silverado	10/12/05	8260b	**0.59J**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-50 (dup)	Upper Silverado	10/12/05	8260b	**0.4J**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-50	Upper Silverado	6/1/06	524.2	**3.7**	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<48	<48
RMW-50	Upper Silverado	7/12/06	8260b	**3.3**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-50	Upper Silverado	10/25/06	8260b	**2.0**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-50	Upper Silverado	4/11/07	8260b	**5.6**	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	48UJ	48UJ
RMW-50 (dup)	Upper Silverado	4/11/07	8260b	**5.4**	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	48UJ	48UJ

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-50	Upper Silverado	1/28/08	8260b	**3.1**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-50	Upper Silverado	1/14/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-51	Shallow	5/3/01	8260b	**5.5**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.15J**	<0.69	<0.14	<0.82	<10	<50
RMW-51	Shallow	5/30/01	8260b	94J	<5	<0.68	<0.5	<0.57	<0.11	<0.18	0.35VJ	<0.69	**0.14J**	<0.82		
RMW-51 (dup)	Shallow	5/30/01	8260b	**94J**	**5.5J**	<0.68	<0.5	<0.57	<0.11	<0.18	0.33VJ	<0.69	<0.14	<0.82		
RMW-51	Shallow	6/27/01	8260b	**40**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.41J**	<0.69	**0.25J**	<0.82		
RMW-51	Shallow	7/27/01	8260b	**13**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.22J**	<0.69	**0.15J**	<0.82		<50
RMW-51	Shallow	10/17/01	8260b	**7.6**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-51	Shallow	11/28/01	8260b	**2.2J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-51	Shallow	12/27/01	8260b	2.5VJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-51	Shallow	1/23/02	8260b	**1.1J**	<5	0.68UJ	0.5UJ	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-51	Shallow	2/20/02	8260b	**0.65J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-51 (dup)	Shallow	2/20/02	8260b	**0.77J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-51	Shallow	3/26/02	8260b	2XJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.13J**	<0.69	<0.14	<0.82		
RMW-51	Shallow	5/1/02	8260b	4.2V	**17J**	<0.68	<0.5	<0.57	7V	6.3V	22V	24V	7.5V	32	50XJ	<50
RMW-51	Shallow	5/31/02	8260b	2XJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-51	Shallow	6/27/02	8260b	2XJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-51	Shallow	7/17/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	**0.15J**	<0.69	**0.21J**	**0.87J**	<10	<50
RMW-51	Shallow	8/21/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-51	Shallow	10/16/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	<50
RMW-51	Shallow	1/15/03	8260b	2XJ	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-51	Shallow	4/16/03	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-51	Shallow	7/16/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-51	Shallow	10/28/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-51	Shallow	1/14/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-51	Shallow	4/14/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-51	Shallow	1/12/05	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	<44
RMW-51	Shallow	4/13/05	524.2	<0.28	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-51	Shallow	7/13/05	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-51	Shallow	10/12/05	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-51	Shallow	6/1/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<48	<48
RMW-51	Shallow	7/12/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-51	Shallow	10/25/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-51 (dup)	Shallow	10/25/06	8260b	<0.29	**5.4J**	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-51	Shallow	4/11/07	8260b	<0.23	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	48UJ	48UJ

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-51	Shallow	1/28/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-51	Shallow	1/14/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-52	Upper Silverado	8/31/01	8260b	**170**	**15**	<0.68	<0.5	<0.57	<0.11	<0.18	**0.13J**	<0.69	<0.14	<0.82		**100**
RMW-52	Upper Silverado	11/19/01	8260b	**120**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	**0.69J**	**0.24J**	**0.93J**	50XJ	<50
RMW-52	Upper Silverado	12/18/01	8260b	**60**	<5	0.68UJ	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82		
RMW-52 (dup)	Upper Silverado	12/18/01	8260b	**50**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82		
RMW-52	Upper Silverado	12/26/01	8260b	**42J**	<5	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-52	Upper Silverado	1/15/02	8260b	**46**	**6.7J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-52 (dup)	Upper Silverado	1/15/02	8260b	**53**	**6.3J**	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	**15J**	<50
RMW-52	Upper Silverado	2/26/02	8260b	**45J**	5UJ	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-52	Upper Silverado	3/28/02	8260b	**39**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-52	Upper Silverado	4/16/02	8260b	**68**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	50XJ	**58J**
RMW-52 (dup)	Upper Silverado	4/16/02	8260b	**74**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	50XJ	**56J**
RMW-52	Upper Silverado	5/31/02	8260b	**43**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-52 (dup)	Upper Silverado	5/31/02	8260b	**41**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-52	Upper Silverado	6/28/02	8260b	**49**	<5	<0.68	<0.5	<0.57	0.99V	1XJ	1XJ	1.4V	1XJ	2XJ		
RMW-52 (dup)	Upper Silverado	6/28/02	8260b	**48**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82		
RMW-52	Upper Silverado	7/18/02	8260b	**38**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-52	Upper Silverado	8/27/02	8260b	**48**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-52	Upper Silverado	10/17/02	8260b	**33**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.5	<0.14	<0.82	<10	<50
RMW-52 (dup)	Upper Silverado	10/17/02	8260b	**32**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.5	<0.14	<0.82	<10	<50
RMW-52	Upper Silverado	1/16/03	8260b	**73J**	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-52 (dup)	Upper Silverado	1/16/03	8260b	**71J**	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	**10J**	<50
RMW-52	Upper Silverado	4/17/03	8260b	**140**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**48J**
RMW-52	Upper Silverado	7/17/03	8260b	**180**	8.3J	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-52	Upper Silverado	10/16/03	8260b	**130**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**53**
RMW-52 (dup)	Upper Silverado	10/16/03	8260b	**140**	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**55**
RMW-52	Upper Silverado	1/15/04	8260b	**62**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-52	Upper Silverado	4/15/04	8260b	**79**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**44J**
RMW-52 (dup)	Upper Silverado	4/15/04	8260b	**80**	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	**47J**
RMW-52	Upper Silverado	1/13/05	8260b	**34**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	<44
RMW-52	Upper Silverado	4/14/05	524.2	**32**	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-52	Upper Silverado	7/14/05	8260b	**25**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	<44
RMW-52	Upper Silverado	10/13/05	8260b	**49**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<44	**70**
RMW-52	Upper Silverado	4/13/06	524.2	**3.2**	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<44	<44

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-52	Upper Silverado	7/21/06	8260b	**38**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-52	Upper Silverado	10/19/06	8260b	**9.9**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-52 (dup)	Upper Silverado	10/19/06	8260b	**9.9**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-52	Upper Silverado	4/12/07	8260b	**8.6**	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-52	Upper Silverado	7/11/07	8260b	**7.8**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	**49J**
RMW-52	Upper Silverado	1/28/08	8260b	**2.9**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-52 (dup)	Upper Silverado	1/28/08	8260b	**2.6**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-52	Upper Silverado	7/7/08	8260b	**1.7J**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-52	Upper Silverado	1/22/09	8260b	**4.5**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-52 (dup)	Upper Silverado	1/22/09	8260b	**5.4**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-52	Upper Silverado	7/15/09	8260b	**2.1**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-52 (dup)	Upper Silverado	7/15/09	8260b	**2.0**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-53	Shallow	8/31/01	8260b	**0.3J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<50
RMW-53	Shallow	11/19/01	8260b	0.28UJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	50XJ	<50
RMW-53	Shallow	12/18/01	8260b	2XJ	5UJ	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82		
RMW-53	Shallow	12/26/01	8260b	2XJ	<5	0.68UJ	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-53	Shallow	1/15/02	8260b	**0.6J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-53	Shallow	2/26/02	8260b	2XJ	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-53	Shallow	3/28/02	8260b	**0.84J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-53	Shallow	5/1/02	8260b	**2.9**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	1XJ	<0.69	<0.14	<0.82	50XJ	<50
RMW-53	Shallow	5/31/02	8260b	**0.32J**	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-53	Shallow	6/28/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	0.71V	1.5V	5.9V	5.8V	1.3V	7V		
RMW-53	Shallow	7/18/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-53 (dup)	Shallow	7/18/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82	<10	<50
RMW-53	Shallow	8/27/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RMW-53	Shallow	10/17/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	50XJ	<50
RMW-53 (dup)	Shallow	10/17/02	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.5	<0.14	<0.82	<10	<50
RMW-53	Shallow	1/16/03	8260b	2XJ	<1.9	<0.33	<0.78	<0.61	<0.28	<0.25	<0.49	<0.38	<0.24	<0.38	<10	<50
RMW-53	Shallow	4/17/03	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-53	Shallow	7/17/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-53	Shallow	10/16/03	8260b	<0.28	<4.9	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-53	Shallow	1/15/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-53 (dup)	Shallow	1/15/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-53	Shallow	4/15/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44
RMW-53 (dup)	Shallow	4/15/04	8260b	<0.28	4.9UJ	<0.32	<0.27	<0.33	<0.29	<0.19	<0.35	<0.17	<0.16	<0.16	<44	<44

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

			VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
Regional Well No.	Aquifer	Sample Date	EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes	C6-C12	C4-C12
	EQL (µg/l):			*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*		
RMW-53	Shallow	1/13/05	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	<0.21	<44	<44
RMW-53	Shallow	4/14/05	524.2	<0.28	<4.9	<0.32	<0.27	<0.33	<0.049	<0.029	<0.038	<0.069	<0.034	--	<44	<44
RMW-53	Shallow	4/13/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<44	**49J**
RMW-53	Shallow	4/12/07	8260b	<0.23	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-53 (dup)	Shallow	4/12/07	8260b	<0.23	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-53	Shallow	1/28/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-53	Shallow	1/22/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-54	Upper Silverado	2/16/06	8260b	**23**	<10	<2.0	<2.0	<2.0	<0.050	<1.0	<1.0	<1.0	<1.0	--		<50
RMW-54	Upper Silverado	4/25/06	524.2	**20**	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<44	<44
RMW-54	Upper Silverado	7/12/06	8260b	**57**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	**56**
RMW-54	Upper Silverado	10/25/06	8260b	**36**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-54	Upper Silverado	4/17/07	8260b	**54**	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-54	Upper Silverado	7/9/07	8260b	**36**	5.4UJ	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-54	Upper Silverado	1/21/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-54	Upper Silverado	7/11/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-54	Upper Silverado	1/23/09	8260b	**16**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-54 fd	Upper Silverado	1/23/09	8260b	**21**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-54	Upper Silverado	7/13/09	8260b	**2.0**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-54 (dup)	Upper Silverado	7/13/09	8260b	**1.8J**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-55	Shallow	2/16/06	8260b	**37**	<10	<2.0	<2.0	<2.0	<0.050	<1.0	<1.0	<1.0	<1.0	--		**53**
RMW-55	Shallow	4/25/06	524.2	**55**	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<44	<44
RMW-55	Shallow	7/12/06	8260b	**120**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	**87**
RMW-55	Shallow	10/25/06	8260b	**43**	**4.0J**	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-55	Shallow	4/17/07	8260b	**100**	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	**55**
RMW-55	Shallow	7/9/07	8260b	**25**	5.4UJ	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-55	Shallow	1/21/08	8260b	**13**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-55 (dup)	Shallow	1/21/08	8260b	**11**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-55	Shallow	7/11/08	8260b	**20**	<5.4	<1.1	<0.33	<0.18	<0.14U	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-55	Shallow	1/23/09	8260b	**48**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-55	Shallow	7/13/09	8260b	**5.1**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-56	Upper Silverado	4/27/06	524.2	**7.0**	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<44	<44
RMW-56	Upper Silverado	7/18/06	8260b	**11**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-56	Upper Silverado	11/8/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-56	Upper Silverado	4/16/07	8260b	**18**	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-56 (dup)	Upper Silverado	4/16/07	8260b	**18**	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-56	Upper Silverado	7/12/07	8260b	**1.7J**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-56 (dup)	Upper Silverado	7/12/07	8260b	**2.0J**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-56	Upper Silverado	1/16/08	8260b	**29**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-56	Upper Silverado	7/9/08	8260b	**22**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-56 (dup)	Upper Silverado	7/9/08	8260b	**24**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-56	Upper Silverado	1/28/09	8260b	**76**	**7.3J**	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	**64**
RMW-56	Upper Silverado	7/16/09	8260b	**28**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-56 (dup)	Upper Silverado	7/16/09	8260b	**28**	**6.4J**	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-57	Shallow	4/27/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<44	<44
RMW-57	Shallow	7/18/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-57	Shallow	11/8/06	8260b	**13**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-57	Shallow	4/16/07	8260b	<0.23	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-57	Shallow	7/12/07	8260b	**0.29J**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-57	Shallow	1/16/08	8260b	**43**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-57	Shallow	7/9/08	8260b	**83**	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-57	Shallow	1/28/09	8260b	**110**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	77
RMW-57	Shallow	7/16/09	8260b	**120**	**5.7J**	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	**94**
RMW-58	Upper Silverado	3/3/06	8260b	<1.0	<10	<2.0	<2.0	<2.0	<0.050	<1.0	<1.0	<1.0	<1.0	--		<50
RMW-58	Upper Silverado	4/24/06	524.2	<0.027	0.79UJ	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<44	<44
RMW-58	Upper Silverado	7/18/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-58	Upper Silverado	10/17/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-58 (dup)	Upper Silverado	10/17/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-58	Upper Silverado	4/16/07	8260b	<0.23	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-58	Upper Silverado	7/12/07	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-58	Upper Silverado	1/16/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-58	Upper Silverado	7/9/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-58	Upper Silverado	1/28/09	8260b	**0.94J**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-58	Upper Silverado	7/16/09	8260b	**1.8J**	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-59	Shallow	3/3/06	8260b	<1.0	<10	<2.0	<2.0	<2.0	<0.050	<1.0	<1.0	<1.0	<1.0	--		<50
RMW-59	Shallow	4/24/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<44	<44
RMW-59	Shallow	7/18/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RMW-59	Shallow	10/17/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	**4.8**	<0.17	**1.3**	**2.0**	**1.1**	--	<48	<48

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents

Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12
RMW-59	Shallow	4/16/07	8260b	<0.23	<9.2	<0.5	<0.39	<0.46	<0.19	<0.13	<0.23	<0.27	<0.17	--	<48	<48
RMW-59	Shallow	7/12/07	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-59	Shallow	1/16/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-59 (dup)	Shallow	1/16/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-59	Shallow	7/9/08	8260b	<0.26	<5.4	<1.1	<0.33	<0.18	<0.14	<0.23	<0.27	<0.54	<0.17	--	<48	<48
RMW-59	Shallow	1/28/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RMW-59	Shallow	7/16/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RPZ-4	Shallow	6/11/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RPZ-4	Shallow	4/25/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<48	<48
RPZ-4 (dup)	Shallow	4/25/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--		
RPZ-4	Shallow	1/27/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RPZ-5	Upper Silverado	6/11/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	0.11VJ	<0.69	<0.14	<0.82		
RPZ-5	Upper Silverado	4/25/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<48	<48
RPZ-5	Upper Silverado	1/27/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RPZ-6	Upper Silverado	3/6/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<10
RPZ-6	Upper Silverado	6/12/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		
RPZ-6	Upper Silverado	4/26/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<48	<48
RPZ-6	Upper Silverado	1/26/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RPZ-7	Shallow	3/6/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	<0.093	<0.69	<0.14	<0.82		<10
RPZ-7	Shallow	6/12/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	0.13VJ	<0.69	<0.14	<0.82		
RPZ-7 (dup)	Shallow	6/12/01	8260b	<0.28	<5	<0.68	<0.5	<0.57	<0.11	<0.18	0.12VJ	<0.69	<0.14	<0.82		
RPZ-7	Shallow	4/26/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<48	<48
RPZ-7	Shallow	1/26/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RPZ-7 fd	Shallow	1/26/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RPZ-8	Upper Silverado	4/27/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<48	<48
RPZ-8 (dup)	Upper Silverado	4/27/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--		
RPZ-8	Upper Silverado	7/27/06	8260b	**2.5**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RPZ-8	Upper Silverado	10/19/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	**0.4J**	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RPZ-8	Upper Silverado	1/26/09	8260b	<0.3	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48
RPZ-9	Shallow	4/27/06	524.2	<0.027	<0.79	<0.015	<0.011	<0.025	<0.014	<0.021	<0.02	<0.03	<0.016	--	<48	<48
RPZ-9	Shallow	7/27/06	8260b	**0.95J**	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RPZ-9	Shallow	10/19/06	8260b	<0.29	<3.9	<0.33	<0.33	<0.39	<0.26	<0.17	<0.35	<0.38	<0.21	--	<48	<48
RPZ-9	Shallow	1/26/09	8260b	0.3U	<3.5	<0.28	<0.31	<0.27	<0.28	<0.22	<0.33	<0.45	<0.24	--	<48	<48

TABLE 6. SUMMARY OF HISTORICAL GROUNDWATER ANALYTICAL RESULTS - Fuel Constituents
Charnock Sub-Basin; Los Angeles, California

Regional Well No.	Aquifer	Sample Date	VOLATILE ORGANICS (µg/l)												VOLATILE FUEL HYDROCARBONS EPA Method 8015	
			EPA Method	MTBE	TBA	TAME	DIPE	ETBE	Benzene	Ethyl-benzene	Toluene	m,p-Xylenes	o-Xylene	Total Xylenes		
EQL (µg/l):				*1.0*	*10*	*2.0*	*2.0*	*2.0*	*0.5*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	C6-C12	C4-C12

Notes:

All units are in micrograms per liter (µg/l), or parts per billion.

EQL = Estimated Quantitation Limit

<xx = Analyte not detected above the indicated detection limit.

J = Estimated value

U, V, or X = Data are qualified due to a detection in an associated equipment blank, trip blank, method blank, or other QC issue (1.3U, 1.3V, or 1.3X means <1.3 µg/l).
"V" indicates that the detection limit for the qualified data is higher than the instrument detection limit for the analyte.
"X" indicates that the detection limit for the qualified data was raised to EQL for the analyte.

8020-conf = EPA Method 8020 second confirmation column. The second GC column results are considered to provide qualitative confirmation that the analyte peak quantified using the primary GC column was identified correctly. The quantified results for the samples analyzed by EPA Method 8020 are listed under "8020" in this table.

TABLE 7. SUMMARY OF DUPLICATE SAMPLE ANALYSES - DETECTED COMPOUNDS ONLY
2009 Semiannual Sampling (July 2009)
Charnock Sub-Basin; Los Angeles, California

Well	Sample Date	Primary Sample ID	Compound	Units	Primary Sample Result	Duplicate Sample Result	Relative Percent Difference
EPA Method 8260B							
RMW-19	7/14/09	gmx-rmw19-071409	Methyl Tert-Butyl Ether (MTBE)	µg/l	12	12	0%
RMW-52	7/15/09	gmx-rmw52-071509	Methyl Tert-Butyl Ether (MTBE)	µg/l	2.1	2.0	5%
RMW-54	7/13/09	gmx-rmw54-071309	Methyl Tert-Butyl Ether (MTBE)	µg/l	2.0	1.8 J	11%
RMW-56	7/16/09	gmx-rmw56-071609	Methyl Tert-Butyl Ether (MTBE)	µg/l	28	28	0%

Appendix F

CDPH Letter February 21, 2006: Charnock sub-basin as Extremely Impaired Source

State of California—Health and Human Services Agency
Department of Health Services

California
Department of
Health Services
SANDRA SHEWRY
Director

ARNOLD SCHWARZENEGGER
Governor

February 21, 2006

Gilbert Borboa Jr., P.E
City of Santa Monica
1212 Fifth Street, 3rd Floor
Santa Monica, CA 90401

Dear Mr. Borboa:

SYSTEM 1910146 – GENERAL REQUIREMENTS FOR THE CHARNOCK PROJECT

The California Regional Water Quality Control Board, Los Angeles Region (RWQCB) has issued "General Requirements" and a sampling schedule for the subsurface investigations at the Charnock sub-basin area, letter dated January 20, 2006 (attached). The California Department of Health Services (Department) Policy Memorandum 97-005 – "Guidance for Direct Domestic Use of Extremely Impaired Sources" (97-005 Policy) sets forth the position and the basic tenets by which the Department would evaluate proposals, establish appropriate permit conditions, and approve the use of an extremely impaired source for any direct potable use. The Charnock sub-basin has been identified by the Department as an extremely impaired source and subject to the 97-005 Policy. As part of the evaluation for the use of extremely impaired sources, the purveyor must identify possible sources of contamination and fully characterize the raw water quality of the impacted area.

The General Requirements developed by the RWQCB set guidelines for the investigation of the Charnock sub-basin. The Department is requesting that the City of Santa Monica (City) follow these General Requirements for the evaluation of the Charnock project. The Department understands that the City, as part of the Charnock Technical Advisory Group (CTAG), has been conducting investigations and groundwater monitoring for the Charnock project. In their January 20, 2006 letter, the RWQCB has set a monitoring schedule for the monitoring wells in the Charnock sub-basin. The City should submit a copy of the monitoring results to the Department in accordance with the schedule specified by the RWQCB.

The Department intents to collaborate with the RWQCB in evaluating the progress of the Charnock project. The Department will also forward RWQCB comments and recommendations as related to the Charnock project.

Southern California Drinking Water Field Operations Branch, Los Angeles Region
1449 West Temple Street, Room 202, Los Angeles, CA, 90026
Telephone: (213) 580-5723 Fax: (213) 580-5711
Internet Address: www.dhs.ca.gov/ps/ddwem/

If you have questions regarding this letter, please contact Mr. Diep at (213) 580-5727 or myself at (213) 580-3127.

Sincerely,

Stefan Cajina, P.E.
District Engineer
Central District

Enclosure:

cc:
Hari Patel, State Water Resources Control Board, UST Cleanup Fund
Weixing Tong, Ph.D., CA Regional Water Quality Control Board LA Region
Yue Rong, Ph.D. CA Regional Water Quality Control Board LA Region
Craig Perkins, Environmental & Public Works, City of Santa Monica
Lisette Bauersachs, City of Santa Monica
Toby Moore, Golden State Water Company
James Farrow, Komex H2O Science
Brad Boschetto, Shell Oil Products US
Mike Bauer, Chevron Products Company
Roy I. Thun, BP/ARCO
Tim Strawn, ExxonMobil
Michael Mailloux, Unocal Corporation
Chris Panaitescu, Thrifty Oil Co.
Jack Fraim, Cedar Creek Consulting
Mark Aebi, ConocoPhillips
Allen Gimenez, Winall Oil Company
Fred Hancz, Power Gas Company
Kenneth Ehrlich, Jeffer Mangels
Phillip Tangalakis, Tangalakis & Tangalakis
Mark Novak, Novak & Bases, LLP
Adam Leiter, Wayne Perry, Inc.
Jessica Donovan, ENVIRON Corporation

Appendix G

2008 and 2010 Charnock Production Well Detectable Analytes Comparison

Table 1 Charnock Production Well RWQC Comparison of Detectable Analytes Data of 2008 with 2010 Raw Water Quality Sampling; Charnock Sub-Basin, Los Angeles, CA

	Analyte	Unit	Method	Cal DPH	Well ID	2008	2010	Change	
VOCs	1,1-Dichloroethene	µg/L	EPA 524.2 &	MCL = 6	**CH-13**	**13**	**14**	Increase	1.0
			EPA 624	PHG = 10	**CH-15**	**0.7**	**0.6**	Decrease	0.1
					CH-16	**11**	**11**	No Change	0
					CH-19	**18**	**8.7**	Decrease	9.3
	cis-1,2-Dichloroethene	µg/L	EPA 524.2 &	MCL = 6	**CH-19**	**1.9**	**1.2**	Decrease	0.7
			EPA 624	PHG = 100					
	Trichloroethene (TCE)	µg/L	EPA 524.2 &	MCL = 5	**CH-13**	**16**	**23**	Increase	7.0
			EPA 624	PHG = 1.7	**CH-15**	**1.6**	**1.5**	Decrease	0.1
					CH-16	**11**	**15**	Increase	4.0
					CH-19	**43**	**26**	Decrease	17
Unregulated VOCs	Bromodichloromethane	µg/L	EPA 524.2		**CH-19**	**0.6**	<0.177u	Decrease	>0.423
	Bromoform	µg/L	EPA 524.2		**CH-19**	**1.6**	<0.142u	Decrease	>1.456
			EPA 624		**CH-19**	**1.3**	<0.142u	Decrease	>1.158
	Chloroform	µg/L	EPA 524.2		**CH-13**	**0.8**	**1.1**	Increase	0.3
					CH-16	**1.0**	**0.97**	Decrease	0.03
					CH-19	<0.5	**0.53**	Increase	
			EPA 624		**CH-13**	**0.8**	**1.1**	Increase	0.3
					CH-16	**0.99**	**0.97**	Decrease	0.02
					CH-19	<0.5	**0.54**	Increase	
	Dibromochloromethane	µg/L	EPA 524.2		**CH-19**	**1.4**	<0.062u	Decrease	>1.338
			EPA 624		**CH-19**	**0.9**	<0.062u	Decrease	>0.838
Non-volatile SOCs	Di(2-ethylhexyl)phthalate	µg/L	SW 8270C	MCL = 4	**CH-13**	**35.3**	<0.149u	Decrease	>35.151
				PHG = 12	**CH-19**	**0.256**	<0.149u	Decrease	>0.107
			EPA 525.2		**CH-19**	**0.7**	<0.149u	Decrease	>0.551
Unregulated Non-volatile SOCs	Acenaphthylene	µg/L	EPA 8270C		**CH-19**	**0.0057**	NA	Decrease	
			EPA 525.2		**CH-19**	NA	<0.014u		
	Benz(a)anthracene	µg/L	EPA 8270C		**CH-19**	**0.0053**	NA	Decrease	
			EPA 525.2		**CH-19**	NA	<0.011u		
	Chrysene	µg/L	EPA 8270C		**CH-19**	**0.0099**	NA	Decrease	
			EPA 525.2		**CH-19**	NA	<0.014u		
	2-Methylnaphthalene	µg/L	EPA 8270C		**CH-16**	**0.0189**	<5.0	Decrease	
			EPA 8270C		**CH-19**	**0.0013**	<5.0	Decrease	
	N-Nitrosodiethylamine (NDEA)	ng/L	EPA 521	NL = 10 RL = 30 times the NL = 300	**CH-18**	**16**	<2.0	Decrease	>14.0
	N-Nitrosodi-n-butylamine (NDBA)	ng/L	EPA 521		**CH-18**	**16**	<2.0	Decrease	>14.0
Inorganics *(Analytes above Cal DPH)*	Arsenic, Total	µg/L	EPA 200.8	MCL = 10	**CH-13**	<1.0	**1.1**	Increase	
				PHG = 0.004	**CH-15**	**2.2**	**1.7**	Decrease	0.5
					CH-16	**1.0**	<0.06J	Decrease	
					CH-18	**2.9**	**1.3**	Decrease	1.6
					CH-19	**1.6**	**1.3**	Decrease	0.3
	Cadmium, Total	µg/L	EPA 200.8	MCL = 5	**CH-19**	**0.69**	<0.012J	Decrease	>0.878
				PHG = 0.04					
	Iron, Total	mg/L	EPA 200.7	SMCL = 0.3	**CH-13**	**0.84**	**0.21**	Decrease	0.63
					CH-15	**2.9**	**0.83**	Decrease	2.07
					CH-16	**0.24**	**0.15**	Decrease	0.09
					CH-18	**0.70**	**1.2**	Increase	0.5
					CH-19	**0.52**	**0.21**	Decrease	0.31
	Lead, Total	µg/L	EPA 200.8	MCL = 15	**CH-13**	**1.7**	<0.038J	Decrease	
				PHG = 0.2	**CH-16**	**2.6**	**0.7**	Decrease	1.9
	Manganese, Total	µg/L	EPA 200.8	SMCL = 50	**CH-13**	**37**	**48**	Increase	11
				NL = 500	**CH-15**	**95**	**54**	Decrease	41
					CH-16	**30**	**27**	Decrease	3.0
					CH-18	**50**	**43**	Decrease	7.0
					CH-19	**160**	**74**	Decrease	86
	Uranium, ICPMS	pCi/L	EPA 200.8	MCL = 20 pCi/L (Cal EPA)	**CH-13**	**13**	**15**	Increase	2.0
					CH-15	**9.4**	**6.3**	Decrease	3.1
					CH-16	**9.4**	**11**	Decrease	1.6
					CH-18	<0.70	**1**	Increase	
					CH-19	**74**	**51**	Decrease	23

Notes:

▨ = Above Maximum Contaminant Level (MCL)
▧ = Above Secondary Maximum Contaminant Level (SMCL)
░ = Above Public Health Goal (PHG) or Notification Limit (NL)
BOLD Indicates a detection above the laboratory reporting limit
RL = Response Levels (at which Cal DPH recommends removal of source from service)
NA = Not Analyzed
VOC = Volatile Organic Compound
SOC = Synthetic Organic Compound

Cal EPA = California Evironmental Protection Agency
Cal DPH = California Department of Public Health
ng/L = Nanograms per Liter
µg/L = Micrograms per Liter
mg/L = Milligrams per Liter
pCi/L = pico Curies per Liter
IC = Ion chromatography
ICAP/MS = Inductively coupled plasma mass spectrometry

Appendix H

Well Data Sheets

WELL DATA SHEET (Page 1 of 3)

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.
** Indicates items required for Source Water Assessment*
*** Indicates additional items required for assessments and Ground Water Rule*

	(separate multiple entries in field with semi-colon)	Actual, Estimated or Default?
DATA SHEET GENERAL INFORMATION		
System Name	City of Santa Monica	*from DHS database*
System Number	1910146	*from DHS database*
Source of Information *(well log, DHS/County files, system, etc)*	well log/DPH files/system	
Organization Collecting Information *(DHS, County, System, other)*	DPH	
Date Information Collected/Updated	August 1, 2010	
WELL IDENTIFICATION		
* Well Number or Name	Charnock Well 13	*from DHS database*
* DHS Source Identification Number (**FRDS ID No.**)	1910146-005	
DWR Well Log on File? ("YES" or "NO")	Yes	
State Well Number (from DWR)	02S/15W-11C17S	
Well Status (Active, Standby, Inactive)	Active	*from DHS database*
WELL LOCATION		
Latitude	34` 0' 59.95" N	*from DHS database*
Longitude	118` 25' 30.27" W	*from DHS database*
Ground Surface Elevation (ft above Mean Sea Level)	102.18'	
Street Address	11375 Westminster Ave	
Nearest Cross Street	Corinth Ave	
City	Los Angeles	
County	Los Angeles	
* Neighborhood/Surrounding Area *(see Note 1)*	Residential	
Site plan on file? ("YES" or "NO")	Yes	
DWR Ground Water Basin	Santa Monica	*to come from DWR*
DWR Ground Water Sub-basin	Charnock	*to come from DWR*
SANITARY CONDITIONS		
** Distance to closest Sewer Line, Sewage Disposal, Septic Tank (ft)		
Distance to Active Wells (ft)		
Distance to Abandoned Wells (ft)		
Distance to Surface Water (ft)		
** Size of controlled area around well (square feet)		
* Type of access control to well site *(fencing, building, etc)*	Fencing	
* Surface Seal? (Concrete slab)("YES", "NO" or "UNKNOWN")		
* Dimensions of concrete slab: Length(ft)/ Width(ft)/ Thick(in)	14' x 14' x 6"	
* Within 100 year flood plain? ("YES", "NO" or "UNKNOWN")		
* Drainage away from well? ("YES" or "NO")	Yes	
ENCLOSURE/HOUSING		
Enclosure Type *(building, vault, none, etc.)*	Building	
Floor material		
Located in Pit? ("YES" or "NO")		
Pit depth (feet) (if applicable)		
WELL CONSTRUCTION		
Date drilled	Oct-66	
Drilling Method	Reverse rotary	
Depth of Bore Hole (feet below ground surface)	410	
Casing Beginning Depth/Ending Depth(ft below surface); 2nd Casing Beginning Depth/Ending Depth; 3rd Casing, etc.	0-49'; 0-410'	
Casing Diameter (inches); 2nd Casing Diameter; 3rd Casing, etc.	32"; 16'	
Casing Material; 2nd Casing Material; 3rd Casing, etc.	Stainless steel	

WELL DATA SHEET (Page 2 of 3)

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.

* *Indicates items required for Source Water Assessment*

** *Indicates additional items required for assessments and Ground Water Rule*

	(separate multiple entries in field with semi-colon)	Actual, Estimated or Default?
WELL CONSTRUCTION (continued)		
Conductor casing used? ("YES", "NO" or "UNKNOWN") *(See Note 2)*		
Conductor casing removed? ("YES", "NO" or "UNKNOWN")		
* Depth to highest perforations/screens (ft below surface) (or "UNKNOWN")	200'	
Screened Interval Beginning Depth/Ending Depth (ft below surface); 2nd Screened Interval Beg. Depth/Ending Depth; 3rd Screened Interval, etc.	200'-390'	
* Total length of screened interval (ft) *(default = 10% pump capacity in gpm)* (or "UNKNOWN")	190'	
* Annular Seal?("YES", "NO" or "UNKNOWN") *(See Note 3)*		
* Depth of Annular Seal (ft)		
Material of Annular Seal *(cement grout, bentonite, etc.)*		
Gravel pack, Depth to top (ft below ground surface)		
Total length of gravel pack (ft)		
AQUIFER		
* Aquifer Materials *(list all that apply: sand, silt, clay, gravel, rock, fractured rock)*		
* Effective porosity (decimal percent) *(default = 0.2)* (or "UNKNOWN")		
* Confining layer (Impervious Strata) above aquifer? ("YES", "NO" or "UNKNOWN")		
Thickness of confining layer, if known (ft)		
Depth to confining layer, if known (ft below ground)		
* Static water level (ft below ground surface)		
Static water level measurement: Date/Method		
Pumping water level (ft below ground surface)		
Pumping water level measurement: Date/Method		
WELL PRODUCTION		
Well Yield (gpm)	1900	
Well Yield Based On (i.e., pump test, etc.)	pump test	
Date measured	8/19/2010	
Is the well metered? ("YES" or "NO")	Yes	
Production (gallons per year)		
Frequency of Use (hours/year)	Daily	
Typical pumping duration (hours/day)	Continuous	
PUMP		
Make	Worthington	
Type	Vertical Turbine	
Size (hp)	100	
* Capacity (gpm)	1900	
Depth to suction intake (ft below ground surface)	278	
Lubrication Type		
Type of Power: *(i.e., electric, diesel, etc.)*	Electric	
Auxiliary power available? ("YES" or "NO")	No	
Operation controlled by: *(i.e., level in tank, pressure, etc.)*	City SCADA	
Pump to Waste capability? ("YES" or "NO")	Yes	
Discharges to: *(i.e., distribution system, storage, etc.)*	Raw Water EQ Tank	
REMARKS AND DEFECTS (use additional sheets as necessary)		

WELL DATA SHEET (Page 3 of 3)

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.

** Indicates items required for Source Water Assessment*

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NOTES

1. Neighborhood/Surrounding Area (list all that apply): A= Agricultural, Ru = Rural, Re = Residential, Co = Commercial, I = Industrial, Mu = Municipal, P = Pristine, O = Other
2. Conductor Casing - Oversized casing used to stabilize bore hole during well construction. Should be removed during installation of annular seal.
3. Annular Seal - Seal of grout in the space between the well casing and the wall of the drilled hole. Sometimes called "sanitary seal".

Please Note:

The information on this Well Data Sheet is considered confidential. To allow the information to be included in the permit report, or made available subject to a public information act request, the waiver clause below has to to be signed and dated by the owner (public water system). In lieu of this signature, the WDS has to be retained in a confidential file, or the information shown in the shaded rows has to be "blacked out."

I/We, (Name)____________________________________,

certify that I/We am/are the present owners of the well described on this well data sheet. I/We have reviewed the information presented on this well data sheet and I/We take no exception to having the information inlcuded in the Department of Health Services' Engineering Report. I/We understand that by including the well data sheet in the Engineering Report, it will be part of a public document that can be reviewed and copied subject to the public information act request.

____________________ ________________

(Signature) (Date)

WELL DATA SHEET (Page 7 of 3)

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.
* *Indicates items required for Source Water Assessment*
** *Indicates additional items required for assessments and Ground Water Rule*

	(separate multiple entries in field with semi-colon)	Actual, Estimated or Default?
DATA SHEET GENERAL INFORMATION		
System Name	City of Santa Monica	*from DHS database*
System Number	1910146	*from DHS database*
Source of Information *(well log, DHS/County files, system, etc)*	well log/DPH files/system	
Organization Collecting Information *(DHS, County, System, other)*	DPH	
Date Information Collected/Updated	August 1, 2010	
WELL IDENTIFICATION		
* Well Number or Name	Charnock Well 16	*from DHS database*
* DHS Source Identification Number (**FRDS ID No.**)	1910146-008	
DWR Well Log on File? ("YES" or "NO")	Yes	
State Well Number (from DWR)	02S/15W-11C19S	
Well Status (Active, Standby, Inactive)	Active	*from DHS database*
WELL LOCATION		
Latitude	34` 1' 03.25" N	*from DHS database*
Longitude	118` 25' 30.63" W	*from DHS database*
Ground Surface Elevation (ft above Mean Sea Level)	105.83'	
Street Address	11375 Westminster Ave	
Nearest Cross Street	Sawtelle	
City	Los Angeles	
County	Los Angeles	
* Neighborhood/Surrounding Area *(see Note 1)*	Residential	
Site plan on file? ("YES" or "NO")	Yes	
DWR Ground Water Basin	Santa Monica	*to come from DWR*
DWR Ground Water Sub-basin	Charnock	*to come from DWR*
SANITARY CONDITIONS		
** Distance to closest Sewer Line, Sewage Disposal, Septic Tank (ft)		
Distance to Active Wells (ft)		
Distance to Abandoned Wells (ft)		
Distance to Surface Water (ft)		
** Size of controlled area around well (square feet)		
* Type of access control to well site *(fencing, building, etc)*	Fencing and building	
* Surface Seal? (Concrete slab)("YES", "NO" or "UNKNOWN")		
* Dimensions of concrete slab: Length(ft)/ Width(ft)/ Thick(in)	13' x 12' x 6"	
* Within 100 year flood plain? ("YES", "NO" or "UNKNOWN")		
* Drainage away from well? ("YES" or "NO")	Yes	
ENCLOSURE/HOUSING		
Enclosure Type *(building, vault, none, etc.)*		
Floor material		
Located in Pit? ("YES" or "NO")		
Pit depth (feet) (if applicable)		
WELL CONSTRUCTION		
Date drilled	Oct-80	
Drilling Method	Reverse rotary	
Depth of Bore Hole (feet below ground surface)	430'	
Casing Beginning Depth/Ending Depth(ft below surface); 2nd Casing Beginning Depth/Ending Depth; 3rd Casing, etc.	0-180; 180-410	
Casing Diameter (inches); 2nd Casing Diameter; 3rd Casing, etc.	20"; 20"	
Casing Material; 2nd Casing Material; 3rd Casing, etc.	Stainless steel	

WELL DATA SHEET (Page 8 of 3)

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.
** Indicates items required for Source Water Assessment*
*** Indicates additional items required for assessments and Ground Water Rule*

	(separate multiple entries in field with semi-colon)	Actual, Estimated or Default?
WELL CONSTRUCTION (continued)		
Conductor casing used? ("YES", "NO" or "UNKNOWN") *(See Note 2)*		
Conductor casing removed? ("YES", "NO" or "UNKNOWN")		
* Depth to highest perforations/screens (ft below surface) (or "UNKNOWN")	220'	
Screened Interval Beginning Depth/Ending Depth (ft below surface); 2nd Screened Interval Beg. Depth/Ending Depth; 3rd Screened Interval, etc.	220'-390'	
* Total length of screened interval (ft) *(default = 10% pump capacity in gpm)* (or "UNKNOWN")	170'	
* Annular Seal?("YES", "NO" or "UNKNOWN") *(See Note 3)*	Yes	
* Depth of Annular Seal (ft)	190'	
Material of Annular Seal *(cement grout, bentonite, etc.)*	9 sack grout cement	
Gravel pack, Depth to top (ft below ground surface)		
Total length of gravel pack (ft)		
AQUIFER		
* Aquifer Materials *(list all that apply: sand, silt, clay, gravel, rock, fractured rock)*		
* Effective porosity (decimal percent) *(default = 0.2)* (or "UNKNOWN")		
* Confining layer (Impervious Strata) above aquifer? ("YES", "NO" or "UNKNOWN")		
Thickness of confining layer, if known (ft)		
Depth to confining layer, if known (ft below ground)		
* Static water level (ft below ground surface)		
Static water level measurement: Date/Method		
Pumping water level (ft below ground surface)		
Pumping water level measurement: Date/Method		
WELL PRODUCTION		
Well Yield (gpm)	2098	
Well Yield Based On (i.e., pump test, etc.)	Pump test	
Date measured	8/18/2010	
Is the well metered? ("YES" or "NO")	Yes	
Production (gallons per year)		
Frequency of Use (hours/year)	Daily	
Typical pumping duration (hours/day)	Continuous	
PUMP		
Make	Ingersoll Rand	
Type	Vertical Turbine	
Size (hp)	125	
* Capacity (gpm)	2098	
Depth to suction intake (ft below ground surface)	282	
Lubrication Type		
Type of Power: *(i.e., electric, diesel, etc.)*	Electric	
Auxiliary power available? ("YES" or "NO")	No	
Operation controlled by: *(i.e., level in tank, pressure, etc.)*	City SCADA	
Pump to Waste capability? ("YES" or "NO")	Yes	
Discharges to: *(i.e., distribution system, storage, etc.)*	Filtered Water Tank	
REMARKS AND DEFECTS (use additional sheets as necessary)		

WELL DATA SHEET (Page 9 of 3)

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.

** Indicates items required for Source Water Assessment*

*** Indicates additional items required for assessments and Ground Water Rule*

NOTES

1. Neighborhood/Surrounding Area (list all that apply): A= Agricultural, Ru = Rural, Re = Residential, Co = Commercial, I = Industrial, Mu = Municipal, P = Pristine, O = Other
2. Conductor Casing - Oversized casing used to stabilize bore hole during well construction. Should be removed during installation of annular seal.
3. Annular Seal - Seal of grout in the space between the well casing and the wall of the drilled hole. Sometimes called "sanitary seal".

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______________________ ________________
(Signature) (Date)

WELL DATA SHEET (Page 10 of 3)

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.
** Indicates items required for Source Water Assessment*
*** Indicates additional items required for assessments and Ground Water Rule*

	(separate multiple entries in field with semi-colon)	Actual, Estimated or Default?
DATA SHEET GENERAL INFORMATION		
System Name	City of Santa Monica	*from DHS database*
System Number	1910146	*from DHS database*
Source of Information *(well log, DHS/County files, system, etc)*	well log/DPH files/system	
Organization Collecting Information *(DHS, County, System, other)*	DPH	
Date Information Collected/Updated	August 1, 2010	
WELL IDENTIFICATION		
* Well Number or Name	Charnock Well 18	*from DHS database*
* DHS Source Identification Number (**FRDS ID No.**)	1910146-010	
DWR Well Log on File? ("YES" or "NO")	Yes	
State Well Number (from DWR)	02S/15W-11A01S	
Well Status (Active, Standby, Inactive)	Active	*from DHS database*
WELL LOCATION		
Latitude	34` 0' 57.92" N	*from DHS database*
Longitude	118` 25' 36.82" W	*from DHS database*
Ground Surface Elevation (ft above Mean Sea Level)	106.17'	
Street Address	11375 Westminster Ave	
Nearest Cross Street	Butler	
City	Los Angeles	
County	Los Angeles	
* Neighborhood/Surrounding Area *(see Note 1)*	Residential	
Site plan on file? ("YES" or "NO")	Yes	
DWR Ground Water Basin	Santa Monica	*to come from DWR*
DWR Ground Water Sub-basin	Charnock	*to come from DWR*
SANITARY CONDITIONS		
** Distance to closest Sewer Line, Sewage Disposal, Septic Tank (ft)		
Distance to Active Wells (ft)		
Distance to Abandoned Wells (ft)		
Distance to Surface Water (ft)		
** Size of controlled area around well (square feet)		
* Type of access control to well site *(fencing, building, etc)*	Fencing	
* Surface Seal? (Concrete slab)("YES", "NO" or "UNKNOWN")		
* Dimensions of concrete slab: Length(ft)/ Width(ft)/ Thick(in)	13' x 15.5' x 6"	
* Within 100 year flood plain? ("YES", "NO" or "UNKNOWN")		
* Drainage away from well? ("YES" or "NO")	Yes	
ENCLOSURE/HOUSING		
Enclosure Type *(building, vault, none, etc.)*	Building	
Floor material		
Located in Pit? ("YES" or "NO")		
Pit depth (feet) (if applicable)		
WELL CONSTRUCTION		
Date drilled	May-84	
Drilling Method	Reverse rotary	
Depth of Bore Hole (feet below ground surface)	480	
Casing Beginning Depth/Ending Depth(ft below surface); 2nd Casing Beginning Depth/Ending Depth; 3rd Casing, etc.	0-100; 0-480	
Casing Diameter (inches); 2nd Casing Diameter; 3rd Casing, etc.	34"; 18"	
Casing Material; 2nd Casing Material; 3rd Casing, etc.	Steel	

WELL DATA SHEET (Page 11 of 3)

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** Indicates items required for Source Water Assessment*
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	(separate multiple entries in field with semi-colon)	Actual, Estimated or Default?
WELL CONSTRUCTION (continued)		
Conductor casing used? ("YES", "NO" or "UNKNOWN") *(See Note 2)*		
Conductor casing removed? ("YES", "NO" or "UNKNOWN")		
* Depth to highest perforations/screens (ft below surface) (or "UNKNOWN")	240	
Screened Interval Beginning Depth/Ending Depth (ft below surface); 2nd Screened Interval Beg. Depth/Ending Depth; 3rd Screened Interval, etc.	240-455	
* Total length of screened interval (ft) *(default = 10% pump capacity in gpm)* (or "UNKNOWN")	215'	
* Annular Seal?("YES", "NO" or "UNKNOWN") *(See Note 3)*	Yes	
* Depth of Annular Seal (ft)	100'	
Material of Annular Seal *(cement grout, bentonite, etc.)*	9 sack grout	
Gravel pack, Depth to top (ft below ground surface)		
Total length of gravel pack (ft)		
AQUIFER		
* Aquifer Materials *(list all that apply: sand, silt, clay, gravel, rock, fractured rock)*		
* Effective porosity (decimal percent) *(default = 0.2)* (or "UNKNOWN")		
* Confining layer (Impervious Strata) above aquifer? ("YES", "NO" or "UNKNOWN")		
Thickness of confining layer, if known (ft)		
Depth to confining layer, if known (ft below ground)		
* Static water level (ft below ground surface)		
Static water level measurement: Date/Method		
Pumping water level (ft below ground surface)		
Pumping water level measurement: Date/Method		
WELL PRODUCTION		
Well Yield (gpm)	1800	
Well Yield Based On (i.e., pump test, etc.)	Pump test	
Date measured	8/19/2010	
Is the well metered? ("YES" or "NO")	Yes	
Production (gallons per year)		
Frequency of Use (hours/year)	Daily	
Typical pumping duration (hours/day)	Continuous	
PUMP		
Make	Worthington	
Type	Vertical Turbine	
Size (hp)	150	
* Capacity (gpm)	1800	
Depth to suction intake (ft below ground surface)	272	
Lubrication Type		
Type of Power: *(i.e., electric, diesel, etc.)*	Electric	
Auxiliary power available? ("YES" or "NO")	No	
Operation controlled by: *(i.e., level in tank, pressure, etc.)*	City SCADA	
Pump to Waste capability? ("YES" or "NO")	Yes	
Discharges to: *(i.e., distribution system, storage, etc.)*	Filtered Water Tank	

REMARKS AND DEFECTS (use additional sheets as necessary)

WELL DATA SHEET (Page 12 of 3)

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.
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NOTES

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2. Conductor Casing - Oversized casing used to stabilize bore hole during well construction. Should be removed during installation of annular seal.
3. Annular Seal - Seal of grout in the space between the well casing and the wall of the drilled hole. Sometimes called "sanitary seal".

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________________________ ________________
(Signature) (Date)

WELL DATA SHEET (Page 13 of 3)

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.

** Indicates items required for Source Water Assessment*

*** Indicates additional items required for assessments and Ground Water Rule*

	(separate multiple entries in field with semi-colon)	Actual, Estimated or Default?
DATA SHEET GENERAL INFORMATION		
System Name	City of Santa Monica	*from DHS database*
System Number	1910146	*from DHS database*
Source of Information *(well log, DHS/County files, system, etc)*	well log/DPH files/system	
Organization Collecting Information *(DHS, County, System, other)*	DPH	
Date Information Collected/Updated	August 1, 2010	
WELL IDENTIFICATION		
* Well Number or Name	Charnock Well 19	*from DHS database*
* DHS Source Identification Number (**FRDS ID No.**)	1910146-011	
DWR Well Log on File? ("YES" or "NO")	Yes	
State Well Number (from DWR)	02S/15W-11C21S	
Well Status (Active, Standby, Inactive)	Active	*from DHS database*
WELL LOCATION		
Latitude	34` 0' 56.46" N	*from DHS database*
Longitude	118` 25' 32.42" W	*from DHS database*
Ground Surface Elevation (ft above Mean Sea Level)	100.05'	
Street Address	11375 Westminster Ave	
Nearest Cross Street	Corinth Ave	
City	Los Angeles	
County	Los Angeles	
* Neighborhood/Surrounding Area *(see Note 1)*	Residential	
Site plan on file? ("YES" or "NO")	Yes	
DWR Ground Water Basin	Santa Monica	*to come from DWR*
DWR Ground Water Sub-basin	Charnock	*to come from DWR*
SANITARY CONDITIONS		
** Distance to closest Sewer Line, Sewage Disposal, Septic Tank (ft)		
Distance to Active Wells (ft)		
Distance to Abandoned Wells (ft)		
Distance to Surface Water (ft)		
** Size of controlled area around well (square feet)		
* Type of access control to well site *(fencing, building, etc)*	Fencing	
* Surface Seal? (Concrete slab)("YES", "NO" or "UNKNOWN")		
* Dimensions of concrete slab: Length(ft)/ Width(ft)/ Thick(in)	14' x 14' x 6"	
* Within 100 year flood plain? ("YES", "NO" or "UNKNOWN")		
* Drainage away from well? ("YES" or "NO")	Yes	
ENCLOSURE/HOUSING		
Enclosure Type *(building, vault, none, etc.)*	Building	
Floor material		
Located in Pit? ("YES" or "NO")		
Pit depth (feet) (if applicable)		
WELL CONSTRUCTION		
Date drilled	Nov-89	
Drilling Method	Reverse rotary	
Depth of Bore Hole (feet below ground surface)	550	
Casing Beginning Depth/Ending Depth(ft below surface); 2nd Casing Beginning Depth/Ending Depth; 3rd Casing, etc.	0-510	
Casing Diameter (inches); 2nd Casing Diameter; 3rd Casing, etc.	18-5/8	
Casing Material; 2nd Casing Material; 3rd Casing, etc.	Stainless steel	

WELL DATA SHEET (Page 14 of 3)

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable. ** Indicates items required for Source Water Assessment* *** Indicates additional items required for assessments and Ground Water Rule*		
	(separate multiple entries in field with semi-colon)	Actual, Estimated or Default?
WELL CONSTRUCTION (continued)		
Conductor casing used? ("YES", "NO" or "UNKNOWN") *(See Note 2)*		
Conductor casing removed? ("YES", "NO" or "UNKNOWN")		
* Depth to highest perforations/screens (ft below surface) (or "UNKNOWN")	200	
Screened Interval Beginning Depth/Ending Depth (ft below surface); 2nd Screened Interval Beg. Depth/Ending Depth; 3rd Screened Interval, etc.	200-450	
* Total length of screened interval (ft) *(default = 10% pump capacity in gpm)* (or "UNKNOWN")	250'	
* Annular Seal?("YES", "NO" or "UNKNOWN") *(See Note 3)*	Yes	
* Depth of Annular Seal (ft)	150	
Material of Annular Seal *(cement grout, bentonite, etc.)*	sand	
Gravel pack, Depth to top (ft below ground surface)		
Total length of gravel pack (ft)		
AQUIFER		
* Aquifer Materials *(list all that apply: sand, silt, clay, gravel, rock, fractured rock)*		
* Effective porosity (decimal percent) *(default = 0.2)* (or "UNKNOWN")		
* Confining layer (Impervious Strata) above aquifer? ("YES", "NO" or "UNKNOWN")		
Thickness of confining layer, if known (ft)		
Depth to confining layer, if known (ft below ground)		
* Static water level (ft below ground surface)		
Static water level measurement: Date/Method		
Pumping water level (ft below ground surface)		
Pumping water level measurement: Date/Method		
WELL PRODUCTION		
Well Yield (gpm)		
Well Yield Based On (i.e., pump test, etc.)	Pump test	
Date measured		
Is the well metered? ("YES" or "NO")	Yes	
Production (gallons per year)		
Frequency of Use (hours/year)	Daily	
Typical pumping duration (hours/day)	Continuous	
PUMP		
Make		
Type	Vertical Turbine	
Size (hp)	125	
* Capacity (gpm)	2000	
Depth to suction intake (ft below ground surface)	277	
Lubrication Type		
Type of Power: *(i.e., electric, diesel, etc.)*	Electric	
Auxiliary power available? ("YES" or "NO")	No	
Operation controlled by: *(i.e., level in tank, pressure, etc.)*	City SCADA	
Pump to Waste capability? ("YES" or "NO")	Yes	
Discharges to: *(i.e., distribution system, storage, etc.)*	Raw Water EQ Tank	
REMARKS AND DEFECTS (use additional sheets as necessary)		

WELL DATA SHEET (Page 15 of 3)

Complete as much information as possible. Leave blank if information is not available, use N.A. if not applicable.

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NOTES

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3. Annular Seal - Seal of grout in the space between the well casing and the wall of the drilled hole. Sometimes called "sanitary seal".

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______________________________ ____________________

(Signature) (Date)

WELL DATA SHEET (Sheet 1 of 3)

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** Indicates items required for Source Water Assessment*
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	(separate multiple entries in field with semi-colon)	Actual, Estimated or Default?
DATA SHEET GENERAL INFORMATION		
System Name	City of Santa Monica	*from CDPH database*
System Number	1910146	*from CDPH database*
Source of Information *(well log, DHS/County files, system, etc)*	Well log/CDPH files/system	
Organization Collecting Information *(DHS, County, System, other)*	CDPH	
Date Information Collected/Updated	10/15/2012	
WELL IDENTIFICATION		
* Well Number or Name	Charnock Well 20	
* DHS Source Identification Number (**FRDS ID No.**)	1910146-073	
DWR Well Log on File? (yes or no)	Yes	
State Well Number (from DWR)	02S15W11D003S	
Well Status (Active, Standby, Inactive)	Active	
WELL LOCATION		
Latitude	34.015079	
Longitude	118.426147	
Ground Surface Elevation (ft above MSL)	99.52'	
Street Address	11375 Westminster Av	
Nearest Cross Street	Purdue Av	
City	Los Angeles	
County	Los Angeles	
* Neighborhood/Surrounding Area *(see Note 1)*	Residential	
Site plan on file? (yes or no)	Yes	
DWR Ground Water Basin	Coastal Plain of Los Angeles	*from DWR*
DWR Ground Water Sub-basin	Santa Monica	*from DWR*
SANITARY CONDITIONS		
** Distance to closest Sewer Line, Sewage Disposal, Septic Tank (ft)	35	
Distance to Active Wells (ft)	225	
Distance to Abandoned Wells (ft)	80	
Distance to Surface Water (ft)	330	
** Size of controlled area around well (square feet)	238	
* Type of access control to well site *(fencing, building, etc)*	Fencing	
* Surface Seal? (Concrete slab)(yes or no)	Concrete Slab	
* Dimensions of concrete slab: Length(ft)/ Width(ft)/ Thick(in)	14' x 17' x 6'	
* Within 100 year flood plain? (yes or no)	Not Sure	
* Drainage away from well? (yes or no)	Yes	
ENCLOSURE/HOUSING		
Enclosure Type *(building, vault, none, etc.)*	Building	
Floor material	Concrete	
Located in Pit? (yes or no)	No	
Pit depth (feet) (if applicable)	N/A	
WELL CONSTRUCTION		
Date drilled	7/13-19/2012	
Drilling Method	Reverse Circulation Rotary	
Depth of Bore Hole (feet below ground surface)	450	
Casing Beginning Depth/Ending Depth(ft below surface); 2nd Casing Beginning	0-405	
Casing Diameter (inches); 2nd Casing Diameter; 3rd Casing, etc.	36; 16-5/8 (remainder)	
Casing Material; 2nd Casing Material; 3rd Casing, etc.	Low Carbon Steel; stainless steel (remainder)	

WELL DATA SHEET (Sheet 2 of 3)

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	(separate multiple entries in field with semi-colon)	Actual, Estimated or Default?
WELL CONSTRUCTION (continued)		
Conductor casing used? (yes, no or not sure) *(See Note 2)*	Yes	
Conductor casing removed? (yes, no or not sure)	No	
* Depth to highest perforations/screens(ft below surface)	242	
Screened Interval Beginning Depth/Ending Depth (ft below surface); 2nd Screened Interval Beg. Depth/Ending Depth; 3rd Screened Interval, etc.	242-295	
* Total length of screened interval (ft) *(default = 10% pump capacity in gpm)*	123	
* Annular Seal?(yes, no, or not sure) *(See Note 3)*	Yes	
* Depth of Annular Seal (ft)	150	
Material of Annular Seal *(cement grout, bentonite, etc.)*	Cement	
Gravel pack, Depth to top (ft below ground surface)	150-425	
Total length of gravel pack (ft)	275	
AQUIFER		
Aquifer Materials *(list all that apply: sand, silt, clay, gravel, rock, fractured rock)*	Sand; silt; gravel	
* Effective porosity (decimal percent) *(default = 0.2)*	0.2	
* Confining layer (Impervious Strata) above aquifer? (yes, no or not sure)	No	
Thickness of confining layer, if known (ft)	N/A	
Depth to confining layer, if known (ft below ground)	N/A	
* Static water level (ft below ground surface)	101	
Static water level measurement: Date/Method	9/10/2012; transducer	
Pumping water level (ft below ground surface)	106	
Pumping water level measurement: Date/Method	9/10/2012; transducer	
WELL PRODUCTION		
Well Yield (gpm)	1400	
Well Yield Based On (i.e., pump test, etc.)	Pump test	
Date measured	9/10/2012	
Is the well metered? (yes or no)	Yes	
Production (gallons per year)	500 MG (est)	
Frequency of Use (hours/year)	Daily	
Typical pumping duration (hours/day)	Continuous	
PUMP		
Make	American	
Type	Vertical Turbine	
Size (hp)	100	
* Capacity (gpm)	1150	
Depth to suction intake (ft below ground surface)	242	
Lubrication Type	Oil lube	
Type of Power: *(i.e., electric, diesel, etc.)*	Electric	
Auxiliary power available?(yes or no)	No	
Operation controlled by: *(i.e., level in tank, pressure, etc.)*	City SCADA	
Pump to Waste capability? (yes or no)	Yes	
Discharges to: *(i.e., distribution system, storage, etc.)*	Raw Water EQ Tank	
REMARKS AND DEFECTS (use additional sheets as necessary)		

WELL DATA SHEET (Sheet 3 of 3)

WELL DATA SHEET NOTES

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3. Annular Seal - Seal of grout in the space between the well casing and the wall of the drilled hole. Sometimes called "sanitary seal".

Appendix I

Technical Memorandum April 29, 2011: Early Arrival of MTBE

WorleyParsons
resources & energy

Infrastructure & Environment
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Toll-Free: 1 877 566 3942
www.worleyparsons.com

Proj. No.: 308006-00073
File Loc.: Long Beach

29 April 2011

CITY OF SANTA MONICA
Water Resources Department
1228 S. Bundy Dr.
Los Angeles, CA 90025

Attention: Ms. Myriam Cardenas

Dear Ms. Cardenas:

RE: TECHNICAL MEMORANDUM, EARLY ARRIVAL OF MTBE AT THE CHARNOCK WELL FIELD

Groundwater flow and transport modeling of the breakthrough of MTBE and TBA plumes at the Charnock well field predicted peak concentrations of MTBE in the combined influent to the treatment plant occurring after 2.8 to 3.0 years of well field pumping (see Figures 1 to 7 of the Effective Monitoring and Treatment Report, WorleyParsons, June 2010). The model simulations did not report the timing of the first arrival of MTBE at low concentrations, for example 1 ug/L. Nonetheless, the expectation from the modeling was that MTBE arrival would occur at least several months after the well field began pumping. Consequently, the first arrival of 1.1 ug/L at well CH-19 on January 24, 2011, less than two months after the start of pumping, was unexpected. Subsequent MTBE concentrations increasing up to 8.4 ug/L by March 28, 2011, also occurred earlier than predicted by the modelling.

The attached Figure 1 shows the predicted arrival of MTBE for the first year of operation for model scenario 4C, with CH-15 and CH-19 pumping at 1500 GPM each, and clean wells CH-16 and CH-18 pumping at 1000 GPM each. While the actual operation of the well field varied appreciably from the modeled scenarios, Scenario 4C is a reasonable approximation of the first several months of pumping. Figure 1 also shows the actual observed concentrations of MTBE in CH-19, and the actual combined influent concentrations from samples collected from the raw water equalization tank which reflect the combination of wells pumping approximately 20 minutes before sample collection, and therefore probably do not reflect the daily average or longer-term combined influent concentration.

In general, the arrival of MTBE concentrations at CH-19 occurred between 5 and 8 months earlier than predicted by the model. For example, the model predicted the arrival of 1.1 ug/L at CH-19 on June 26, 2011, a difference of 5 months from the observed arrival of that concentration. Similarly, the model predicted the arrival of 8.4 ug/L at CH-19 to occur on November 13, 2011, a difference of 7.6 months. Moreover, the occurrence of about 2 ug/L in the raw water equalization tank in late February , 2011, was predicted to occur in the combined influent in late August, 2011, a difference of six months.

The observed breakthrough curve for MTBE at CH-19 increases much more sharply than the modeled breakthrough curve. This indicates less dispersion of the observed plume, which reflects a shorter migration distance than the modeled plume. In other words, the observed plume appears to have been closer to CH-19 than the plume modeled in the simulations. After peaking at 8.4 ug/L on March 28, 2011, MTBE concentration at CH-19 began to decrease, declining to 6.6 ug/L on April 25 2011. The combined evidence of a steep breakthrough curve followed by declining concentrations suggests that the MTBE observed at CH-19 was not from the regional MTBE plume that was modeled, but a residual pocket of MTBE-impacted groundwater separate from the regional plume, and much closer to the well field.

The attached Figure 9C from the Source Water Assessment Report (WorleyParsons June 2010) shows the capture zones of the wells for Scenario 4C, with the concentrations of MTBE in monitoring wells in January 2010. While most of the regional monitoring wells nearest the well field did not have detectable MTBE, RMW-32, the well closest to CH-19, had 0.3 ug/L MTBE in January 2010. This detection of MTBE may have been reflecting the edge of the MTBE-impacted pocket that was subsequently intercepted by CH-19.

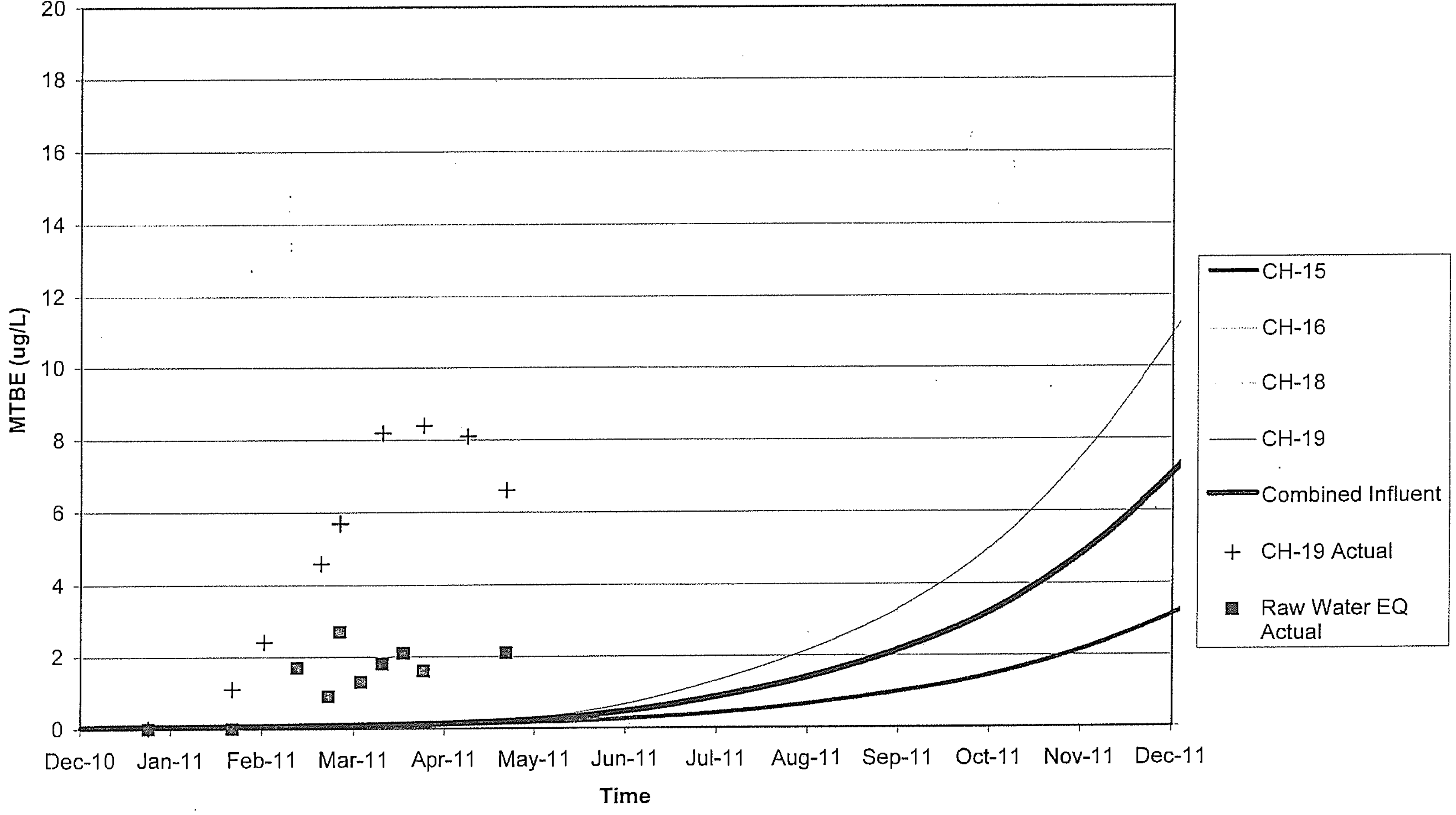
Overall, the observed early arrival of MTBE up to 8.4 ug/L at CH-19 appears to represent an artifact of the plume resolution that is possible with the existing monitoring well network. Moreover, the MTBE detections represent a minor, but not consequential, departure from the model predictions. We expect that the model predictions will still be a fair, and in fact, conservative, representation of the longer-term breakthrough of the regional MTBE plume at the Charnock well field.

Sincerely,
WorleyParsons

Mark Trudell, Ph.D., PG, CHG
Principal Hydrogeologist

enc.

FIGURE 1
Comparison of Modeled MTBE Breakthrough With Actual MTBE Concentrations at the Charnock Well Field (Scenario 4C, CH-15, CH-19 @ 1500 GPM/well; CH-16, CH-18 @ 1000 gpm/well)



♦ PRODUCTION WELLS

♦ SELECTED PRP SITE MW

♦ REGIONAL MONITORING WELLS

- - - TULLER AVE. SYSTEM CAPTURE ZONE, YEARS

—— UPPER SILVERADO CAPTURE ZONE

— — FAULTS

4C PARTICLE TRACE

—— CH-13

—— CH-16

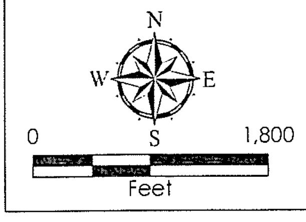
CH-18

—— CH-19

NOTES:

The area in the SE corner of this map enclosed by the 5 year contour in the capture zone are associated with the Tuller Avenue remediation system pumping, not the Charnock wellfield.

All locations approximate



CITY OF SANTA MONICA

WorleyParsons Komex
resources & energy

CHARNOCK WELL FIELD SILVERADO AQUIFER
CAPTURE ZONES FOR REMEDIATION WELLS
CH-13 AND CH-19, AND CLEAN WELLS CH-16 AND CH-18

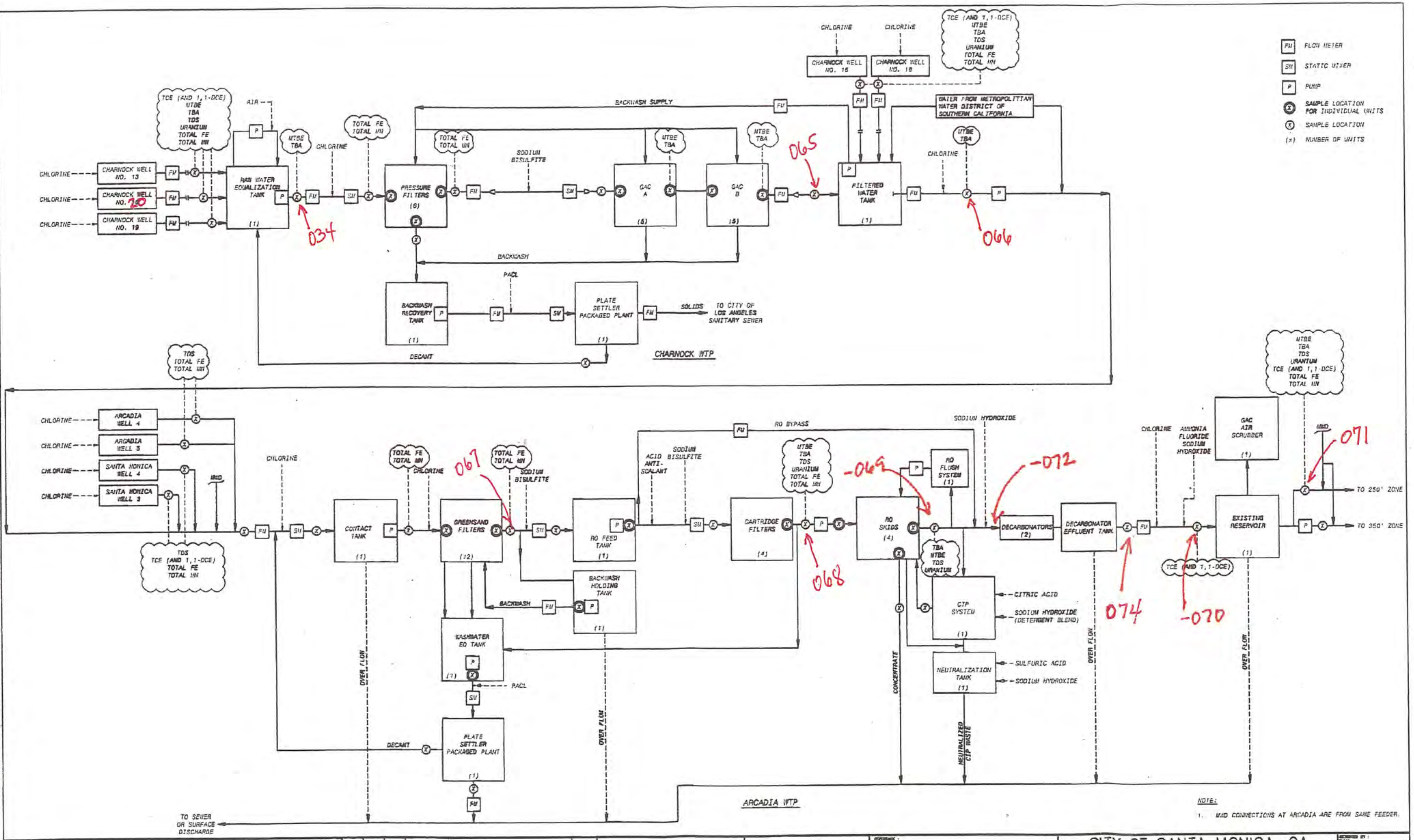
SWL	MT	5/2010
6H444E13		9C

Appendix J

Process and Schematic Diagrams

GCA0002-A

CHARNOCK WELL FIELD RESTORATION PROJECT



NOTE:

1. MWD CONNECTIONS AT ARCADIA ARE FROM SAME FEEDER.

City of Santa Monica
Civil Engineering & Architecture
1437 4TH STREET, SUITE 300, SANTA MONICA, CA 90401
TEL. (310) 458-8721 FAX. (310) 393-4425

REVISIONS

BLACK & VEATCH
Black & Veatch Corporation
Los Angeles, California
CONSULTANT

REVIEWED BY: DATE: ____ 20__
REVIEWED BY: DATE: ____ 20__
REVIEWED BY: DATE: ____ 20__
CITY CLIENTS

REFERENCE:
DATE: ____ 20__
COMPUTER FILE NAME:
SUBMITTED BY:
SP-FILE NO.:
APPROVED BY: ANTHONY ANTICH, P.E. CITY ENGINEER DATE: ____ 20__
CIVIL ENGINEERING & ARCHITECTURE

CITY OF SANTA MONICA, CA
WELL FIELD RESTORATION PROJECT
ONGOING MONITORING

GENERAL SAMPLING LOCATIONS
CHARNOCK/ARCADIA PFD

PROJECT AND SHEET TITLE

DESIGNED BY: DAW
DRAWN BY:
CHECKED BY:
CONSULTANT JOB/SHEET NO.
DRAWING NO.
GCA0002-A

DWG 6601

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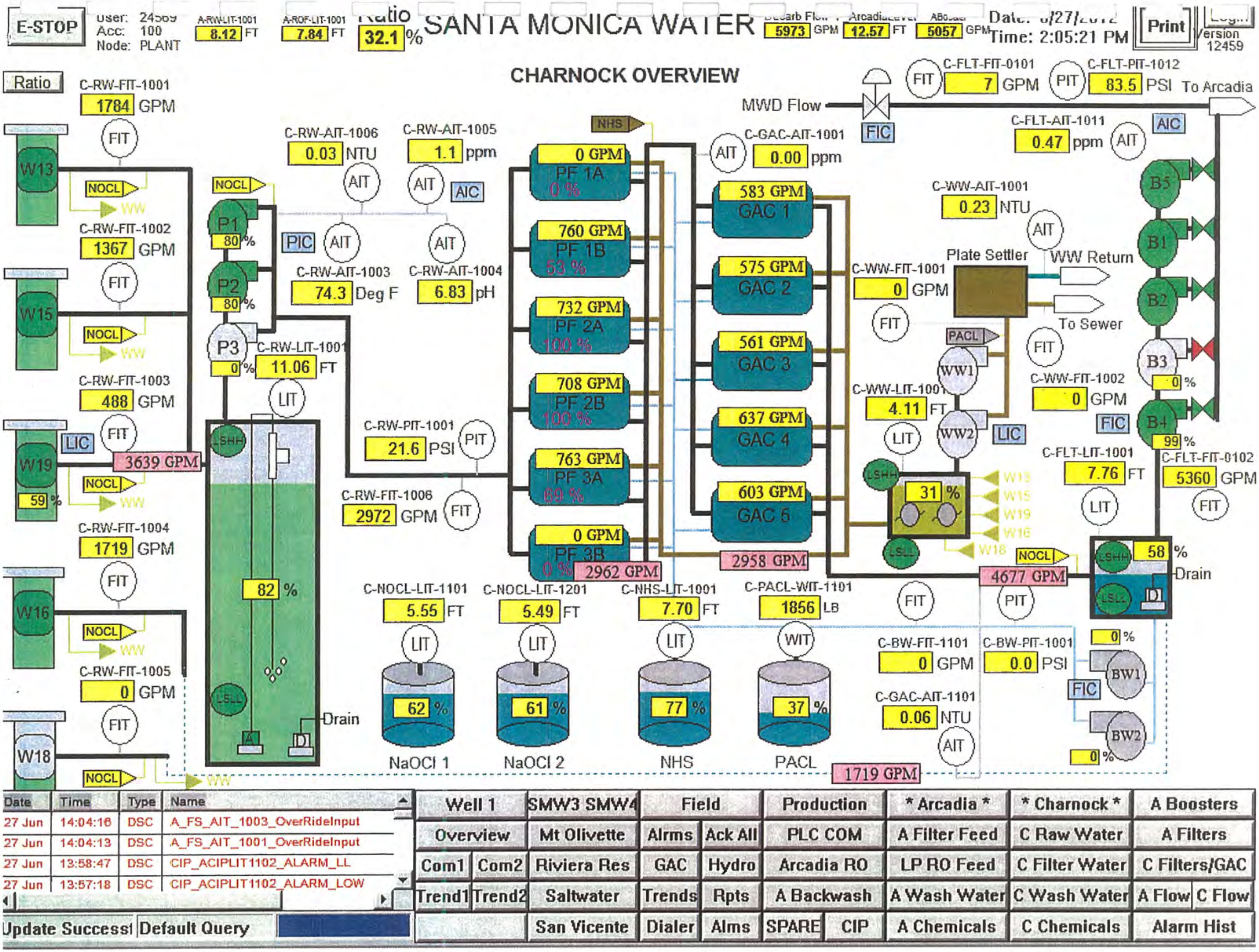

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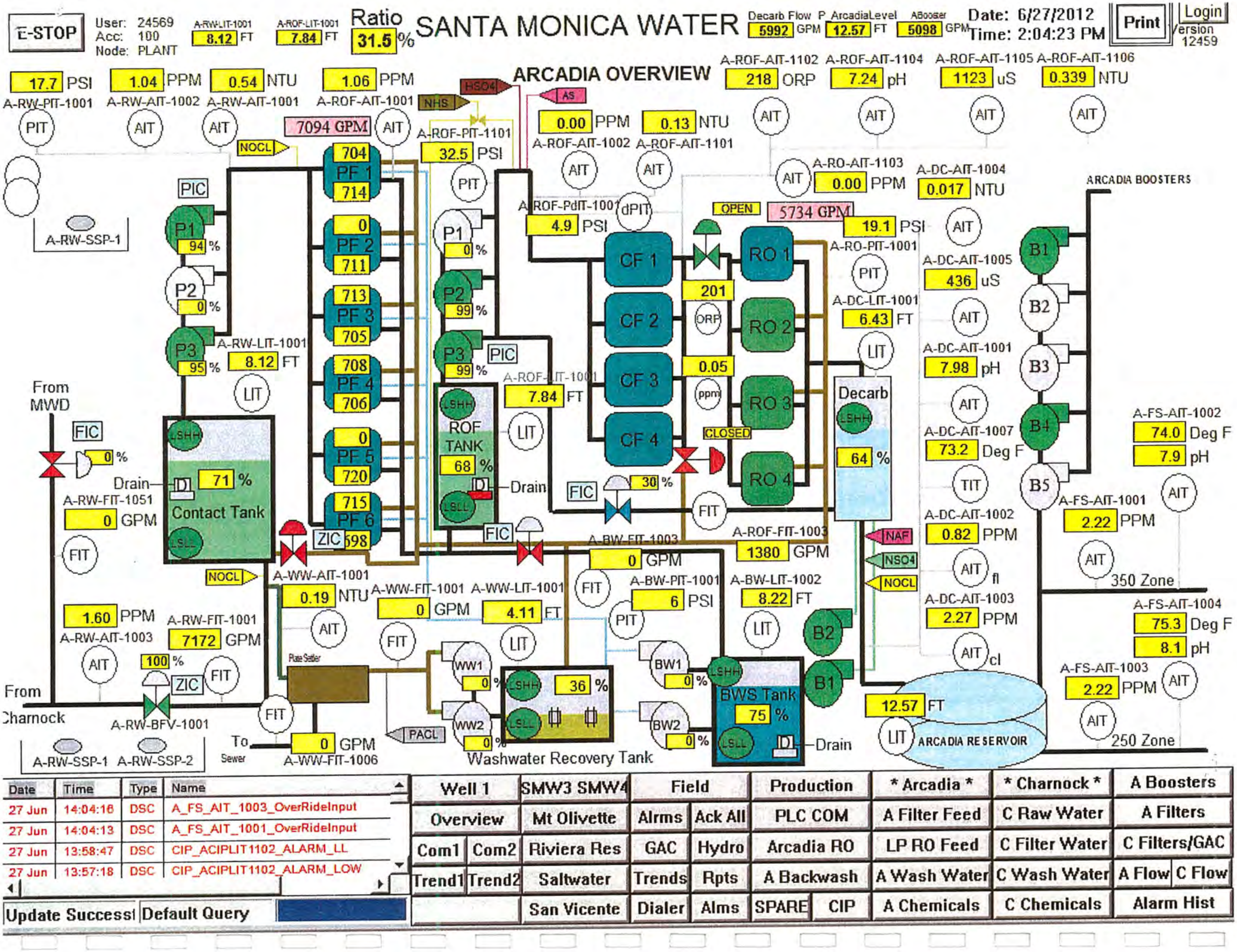
Date    Time      Type  Name
27 Jun  14:04:16  DSC   A_FS_AIT_1003_OverRideInput
27 Jun  14:04:13  DSC   A_FS_AIT_1001_OverRideInput
27 Jun  13:58:47  DSC   CIP_ACIPLIT1102_ALARM_LL
27 Jun  13:57:18  DSC   CIP_ACIPLIT1102_ALARM_LOW
```

Update Successi Default Query



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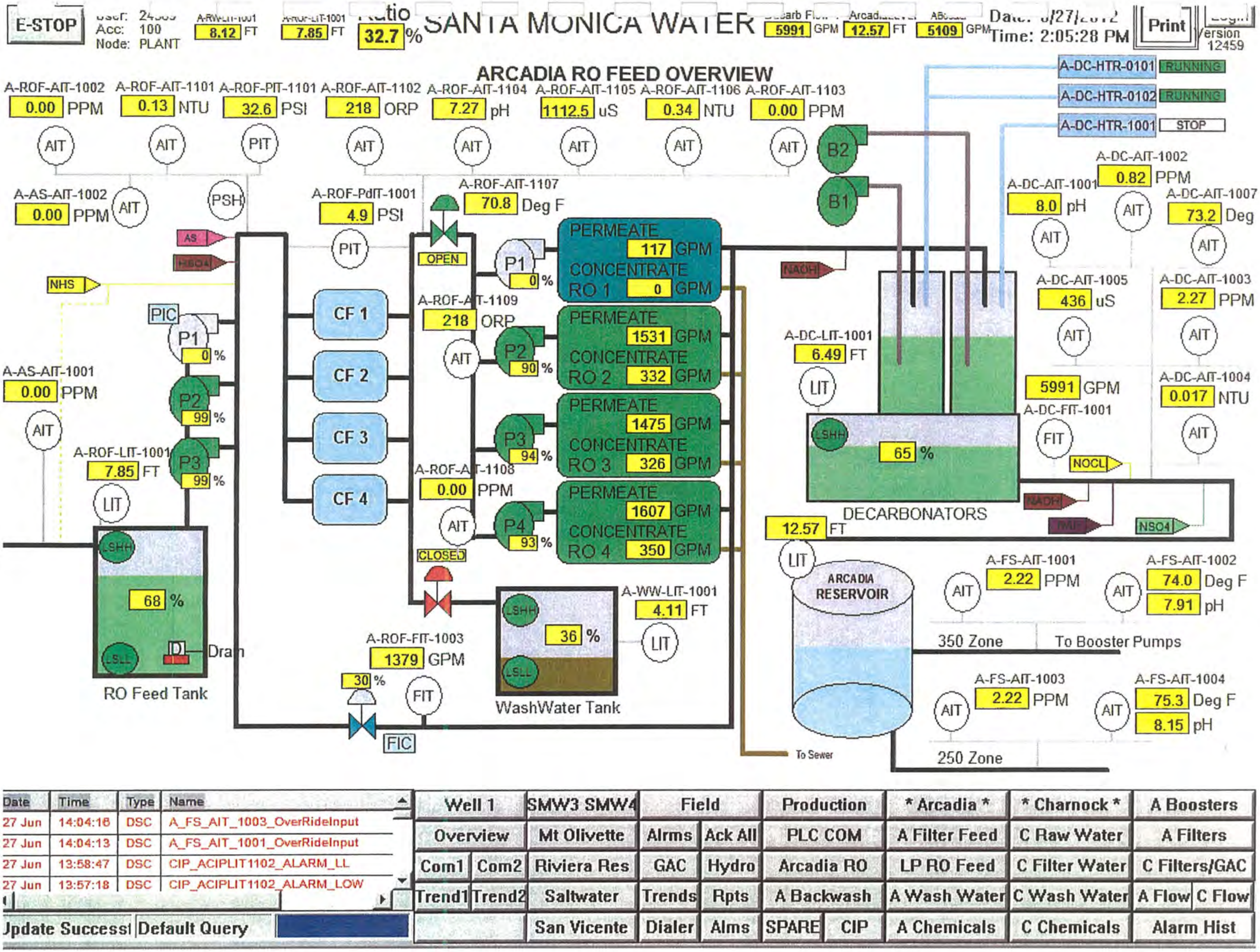

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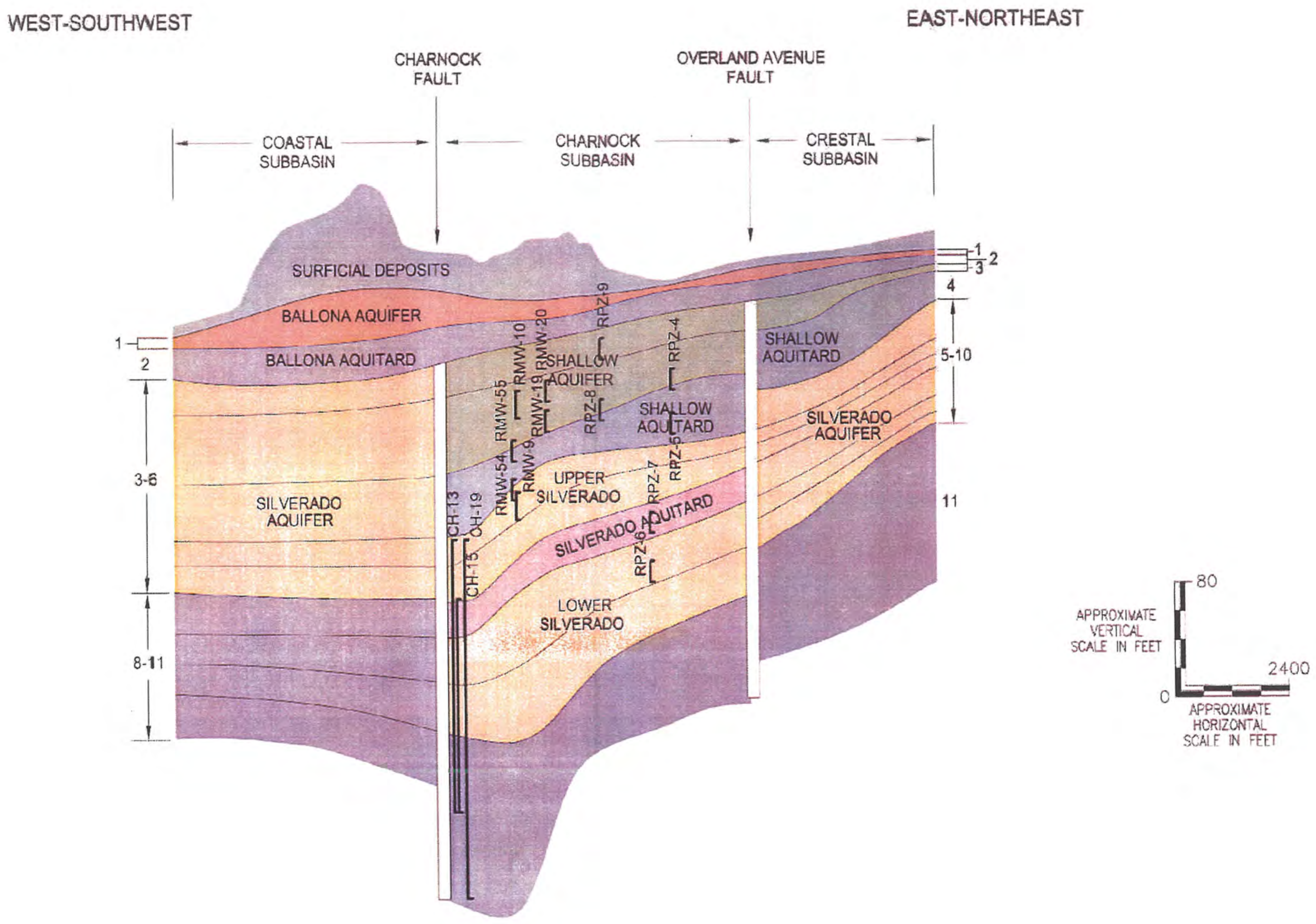


Note 1. Ballona Aquifer also called the Perched Aquifer

2. Shallow Aquitard also called the San Pedro Aquitard

Source: GeoTrans 2005

CHARNOCK WELL FIELD RESTORATION PROJECT
CITY OF SANTA MONICA

WorleyParsons
resources & energy

SCHEMATIC CROSS SECTION WITH SENTRY WELLS AND CHARNOCK WELLS

DRAWN BY:	APPROVED:	DATE:
MH	MT	6/2010

6H444G20

7

Appendix K

Treatment Data Sheets

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC HEALTH
DIVISION OF DRINKING WATER

IRON AND MANGANESE REMOVAL PLANT DATA

System Name: City of Santa Monica **System No.:** 1910146
Source of Information: Equipment Vendor
Collected by: City of Santa Monica **Date:** 4-4-11
Name of water treatment plant: Charnock Treatment Unit(CTU)

GENERAL INFORMATION

Plant flow and variations: 5.4 MGD, Maximum; 4.32 MGD Minimum
Design flow: 5.4 MGD
Year operation began: 2010
Frequency plant checked: Daily

Raw Water Pumps

Source	Production capacity	Horse power	Flow variation	Control
Well No. 13	1900 gpm		%	
Well No. 15	gpm		%	
Well No. 16	2098 gpm	125	%	
Well No. 18	1800 gpm	150	%	
Well No. 19	gpm		%	

Type and method of control: Vertical Turbine
Maximum Capacity: see above
Capacity of each:

CHEMICAL DATA FOR DISINFECTION/OXIDATION

Type: 12.5% Sodium Hypochlorite, 10.6 as chlorine
Purpose: Downhole chlorination & oxidation of iron/manganese
Dosage: 2.5 mg/L for all 5 wells
Is the chemical added continuously? Yes

Chemical Storage

Capacity: 2 x 5200 gal/tank
Days of storage: 9.6/31.4
Chemical form when it is added to the system: Liquid
Points of application: Downhole @ each well, in pressure filter influent, after filtered water tank.

Feeding and Injection Equipment

Type: peristaltic metering pumps
Capacity: 0.36 - 13.93 GPH
What determines the dose that will be used? Desired Residual

OTHER CHEMICAL USE

Purpose: Sodium bisulfite
Type: 25% Sodium bisulfite
Dosage: 1.5 mg/L
Is the chemical added continuously? No

Chemical Storage

Capacity: 1 - 5800 gal tank
Days of storage: 108/270 days
Chemical form when it is added to the system: Liquid
Points of application: Upstream of GAC vessels

Feeding and Injection Equipment

Type: . Peristaltic metering pumps

Capacity: 0.05 - 2.27 GPH

What determines the dose that will be used?

OTHER CHEMICAL USE Poly-Aluminum Chloride (PACL)

Purpose: Coagulant aid. Used in the disposal of sediment, Fe/Mn from water

Type:

Dosage: 10 mg/L

Is the chemical added continuously?

Chemical Storage

Capacity: 1-250 gal tank

Days of storage:

Chemical form when it is added to the system: Liquid

Points of application: Upstream of the plate settler

Feeding and Injection Equipment

Type: . Diaphragm metering pumps

Capacity: 0.10 - 0.38 GPH

What determines the dose that will be used?

CHEMICAL MIXING

Type:

Number:

Mixing energy (G):

Mixing time/flow:

FILTERS

Type: Greensand Filters Number: 6

Filter inside dimensions: 19' x 12'

Describe filter maintenance: TBD

Media	Depth	Effective Size	Uniformity Coefficient	Specific Gravity
Anthracite	12"	0.6 - 0.8 mm	< 1.6	
Greensand	18"	0.3- 0.35 mm	< 1.6	

Gravel-Number of Layers: 1 Total depth: 12"

Media area per filter: 228 sq. ft. Total media area: 1368 sq. ft.

Under drain type: Arched plate

Filtration Rate at Design Flow:

All filters in service: 3.0-3.3 gpm/ft2 = 684gpm/vsl * 6 vsls = 4104 gpm/4514 gpm

One filter is not in service: 3420 gpm/3762 gpm

How is filtration rate controlled: SCADA

Filter backwash

What determines the time or interval of backwashing?

Filter to waste capability?

Type of surface wash:

Surface wash rate: 13 gpm/sq.ft Surface wash duration: 15 min.

Source of backwash water: Filtered water tank

Can spent backwash be visually observed? Yes

Maximum backwash rate: 2964 gpm
Percent expansion during backwash:
Describe backwash cycle:

Waste Washwater Basins

Type of basin: Underground concrete tank
Number of basins: 1 Detention time:
Volume of wastewater per backwash: 44,460
Washwater disposal or recycling: Backwash treatment system for GAC and pressure filter, will be used. Clarified effluent to Raw Water EQ tank; sludge to sewer.
Sludge disposal: Sludge from inclined plate settlers conveyed to sewer

CLEARWELL: Filtered Water Tank

Type: Underground concrete tank Capacity: 93,300
Detention time:

RELIABILITY FEATURES AND MONITORING

Parameter	Location	Grab Sample (frequency)	Continuous Monitoring	Recording	Alarm	Shutdown
Flow	Influent					
Flow	Effluent					
Turbidity	Influent					
Turbidity	Effluent					
Chlorine residual	Effluent					
Other residual						
Temperature						
pH						
Chemical feed flow						
Low level chemical						
Iron						
Manganese						

Standby equipment:
Standby power:
Discussion and Appraisal:

TREATED WATER QUALITY

Effluent residual:
% of iron reduction: Range of Effluent Iron Level:
% of manganese reduction: Range of Effluent Manganese Level:

OPERATIONS

Describe records maintained:
Is operations plan adequate, if not describe needed changes:
Required level of certification:
Number and level of certified operators:

Constituent	Monitoring Frequency (continuous/daily/weekly/monthly)
Iron, Manganese, color, odor, and turbidity	weekly at plant influent and effluent, monthly at well source
Free and total chlorine residual, turbidity	every two hours;continous for plant effluent turbidity& residual
Ammonia Nitrogen	daily

State of California

Department of Public Health

GAC FILTRATION DATA

System Name: Charnock Water Treatment Unit **System No.** 1910146
Source of Information Equipment Vendor
Collected By: City of Santa Monica **Date:** 4-4-11

Location:	Charnock
Purpose: (DBCP, etc.)	MTBE and TBA Removal
Year Operation Began:	2010
Operation Plan/Schematic On File?	Yes
FLOW	
Average:	8 vessels, 3000 gpm, 750 per vessel
Maximum:	10 vessels, 3750 gpm, 750 per vessel
Hours of Operation:	24/7
Flow Meter(s)/Location(s)	Inlet to GAC Vessels, combined effluent
FILTERS	
Number of Vessels:	10
Mode Of Operation:	5 trains of 2 in series (Downflow)
Type of GAC:	
Vessel Capacity (cu. ft.):	20,000 lbs GAC
Cross Section Bed Area (ft^2):	113.6
Bed Depth (ft):	
Empty Bed Contact Time (min.):	6
Design Pressure (@ Temp.):	
Flow Rate/Equalization Control:	
FILTER MONITORING	
Frequency:	Monthly at 41% port until detection
Number Sampling Taps:	41%, 73%, and effluent ports
Type of Monitoring:	VOCs, Total Coliform, HPC, Nitrate
BACKWASH	
Rate:	12 gpm/ft^2
Source:	Filtered Water Tank
Drain to:	Backwash Storage Tank
GAC REPLACEMENT	
Determined By:	Detection of VOCs at effluent port
Time Required to Replace:	TBD once operation begins or plume arrives
DISINFECTANT	
Type:	Sodium Hypochlorite
Source:	Onsite supply
Dose:	TBD
Reliability Features:	
WATER	
Received From:	Charnock Wells
Delivered to:	Arcadia Water Treatment Unit
Defects/Remarks:	

State of California

Department of Public Health

MEMBRANE PLANT DATA

System Name: Arcadia Water Treatment Unit (WTU) **System No:** 1910146
Source of Information: Reverse Osmosis Equipment Vendor
Collected By: City of Santa Monica **Date:** 8-16-10

Plant Name	Arcadia WTU	Year Operation Began	2010
Plant Flow & Variation		Design Flow	10 MGD (incl. bypass), RO Feed 8.2 MGD (1898/train)

RAW WATER SOURCE CAPACITY AND QUALITY

Source Name & Type (GW, SW, GWUDI)	Arcadia Combined Influent, GW				
Source Capacity, gpm	10 MGD, 7,000 gpm				
Temperature	Max 25°C	Min	TDS	Max 1000	Min
pH	Max 7.5	Min 7.1	Hardness	Max	Min
Turbidity	Max 27	Min 2	Other	Max	Min

PRETREATMENT

Type	Chemical & Manufacture	Dosage, mg/l	Type	Chemical & Manufacture	Dosage, mg/l
pH Adjustment	Sulfuric Acid	20	Sequestrant/Fouling		
Dechlorination	Sodium Bisulfite	1.5	Antiscalant	Antiscalant	4
Other…			Other…		

PREFILTRATION

Type	Cartridge Filters	No. of Vessel/filters	4 units (3 duty, 1 standby)
Nominal Data	5 um	Power	
Inlet Pressure		Outlet Pressure	
Describe Backwash Cycle	Spare vessel brought online during replacement in order not to exceed cartridge element loading rate.		

FEED PUMPING SYSTEM

Type	Vertical Turbine Barrel	Make	
Capacity	1900	Power	
Inlet Pressure	135 psi	Outlet Pressure	

MEMBRANE FILTRATION UNITS

Type	Reverse Osmosis	Make	BiWater
No. of Trains	4 (3 duty, 1 standby)	No. of Pr. Vessels/train	40:20:10
Nominal Pore size (microns)			
Inlet Pr.		Energy Recovery System	Yes
Flow Rate per Train, gpm	1560	Max Flow Rate per train, gpm @ design flow	1615
Average Flux Rate, gpd/sf		Age of membranes	new
Percent Brine Generated	18%	Percent Brine Recycled	0%
Describe Brine/ Reject Disposal Practices			

MEMBRANE CLEANING

Membrane Cleaning Method		Time or Interval of Cleaning	Based on permeate flow, diff p across any stage, or salt passage > 10%
Cleaning Chemicals Used, dosages	Citric Acid or Sodium Hydroxide		
Describe Cleaning Cycle	One RO train cleaned at a time; clean 1st stage first, cleaning solution sent to neutralization tank & also flush water, pH then adjusted & discharged to sewer.		

POST-TREATMENT

Type	Chemical & Manufacture	Dosage, mg/l	Type	Chemical & Manufacture	Dosage, mg/l
pH Adjustment	Sodium Hydroxide	9	Corrosion Control		
Disinfection	Sodium Hypochlorite + Ammonium Sulfate	2.5 0.4	Other - Fluoridation	Sodium Fluoride	0.7 -1.3

State of California Department of Public Health

FLUORIDATION DATA

System Name: City of Santa Monica **System No:** 1910146

Source of Information: Equipment Vendor

Collected By: City of Santa Monica **Date:** 4-4-11

Location	
Address	1228 S. Bundy Dr.
Type of Fluoridating Agent Used	Sodium Fluoride (NaF)
Application	
Water Treated (raw, filtered, etc.)	Potable Water
Demand Character	
Point of Application	Downstream of decarbonator
Mixing	In pipe
Contact Time	N/A
Minimum Contact Time Before Residual Test	45 seconds
How was Contact Time Measured/Determined?	Volume of pipe
Air Temperature	Ambient
Optimum Fluoride Level	0.9 ppm
Background Fluoride Level	0.18 ppm
Actual Fluoride Dose	0.72 ppm
Water Flow Variation	
Average Daily	8.35 MGD
Maximum Daily	8.35 MGD
Peak Hourly Flow	8.35 MGD
Machine (Feeder System)	
Make and Model	N/A
Type	Bag + Bulk Feeder
Capacity	90 cu. Ft.
Condition	New
Housing (Type)	
Insulation	N/A
Heating	N/A
Chemical Added	
Percent Fluoridating Agent, Form	Delivered 44% (NaF)
Cylinder or Crock Capacity	
Safety Features (locks, lighting ventilation, alarms, etc.)	
Operation and Maintenance	See O&M Manual
Lapse During Changes	
Repairs	
Spare Parts on Hand	
Ability to Make Repairs	
Equipment Inspection Frequency	Daily/Weekly/Monthly
Distance to Travel	
Other Duties	
Operator Certification	

Fluoridation Data (cont'd)

Residual Tests	
Test Made	Analyzer
Type of Instrumentation	Online
Continuous/Grab	Continuous
Where Test Made	Decarbonator Effluent
Type	Liquid
Frequency of Tests	Continuous
Records	Electronic
Frequency of Equipment Calibration	Monthly
Reliability Features	
Auxiliary Power	Backup Generator
Automatic Switchover	No
Condition of Scales (if any)	N/A
Alarms (if any)	High-High, High, Low, Low-Low
Defects or Remarks	

State of California Department of Public Health

CHLORAMINATION DATA

System Name: City of Santa Monica **System No:** 1910146

Source of Information: Equipment Vendor

Collected By: City of Santa Monica **Date:** 4-4-11

APPLICATION:

Water Treated (raw, filtered, etc.): Filtered Water

Point of Application (Attach schematic of treatment process):

Chlorine: Downstream of Decarbonator

Ammonia: Downstream of Decarbonator

Ammonia Form When Added: Ammonium Sulfate

Ammonia Dosage Applied: 0.5 mg/l

Chloramine Demand Character: Groundwater treated by RO has low demand

Mixing: In-Line Static Mixer

Contact Time Before Use: N/A

Water Flow Variation: 1900 gpm to 5700 gpm

How Measured? Flow meter

CHEMICAL ADDED (AMMONIA):

Chemical Name, Synonym, Official Name: Ammonium Sulfate

Trade Designation or Product ID:

Manufacturing Company's Name:

Address:

Maximum NSF/UL Recommended Dosage (mg/1): 5:1 Cl:Ammonia as N, Design value = 0.5 mg/l

FEEDING AND INJECTION EQUIPMENT:

Make: Milton Roy

Type: Chemical Feed and Pump

Capacity: 2.1 gph

Condition: New

Continuous Feed? Yes

What Determines the Dose that will be Applied? Chlorine residual

Blending Ratio: 5:1 Cl:Ammonia as N, Design value = 0.5 mg/l

How is Ratio Monitored? flow paced and based on chlorine residual, manual NH3 measurements

Controls to Maintain Blending Ratio: Manual NH3 measurements

Holds Setting Well? Yes: Chlorine demand is low and residuals are consistent

Reliability (Flow Sensors, Backup Pump, etc.): Standby Metering Pump

FEEDING AND INJECTION EQUIPMENT: (Cont'd)

Cylinder or Crock Capacity: 2 auto-changeover 440 gallon totes

Stock on Hand: 3 - 250 gallon totes

CT Value Determination: N/A for this groundwater

Required Total Log Treatment (Removal and Inactivation) for Giardia and Virus:

Not applicable for this groundwater

Chlorination Log Inactivation: N/A

Required Log Inactivation From Chloramination:

Point of Chloramine Residual Measurement: Upstream & downstream of 5 MG reservoir

Volume of Storage Tank/Clearwell (MG): 5

Maximum Flow Rate (MGD): 8.2

Contact Time (Min): N/A

Critical Conditions (Summer, Winter)? N/A

PH: N/A Temperature: N/A

Chloramine Log Inactivation: N/A

Frequency of CT Parameter Monitoring: N/A

Frequency of CT Verification: N/A

OPERATION AND MAINTENANCE:

Lapse During Feed Changes: None due to auto changeover equipment

Lapse During Repairs: None due to backup system

Spare Parts on Hand: None due to backup system

Ability to Make Repairs: Inhouse maintenance staff

Monitoring of Feed Equipment:

When and How Often?

Distance to Travel:

Duties:

Residual Tests:

Type of Test (DPD, etc.):

Tester Equipment Used:

How Often?

Where Test Made:

Records:

CONDITION OF SCALES (if any): New

COMPLAINTS:

DEFECTS AND REMARKS:

see page 9 for
media spec

Section 11236

PRESSURE FILTERS

1.00 SCOPE. This section covers the supply of horizontal pressure filters, filtration media, frontal piping and valves, air scour blower skid, control system, and instrumentation. Backwash water pumps for the filters will be provided by others. A total of nine filters shall be supplied to two different sites. All filters shall be identical to reduce the supplier's engineering effort as well as to simplify operation and maintenance. A PLC based control system shall be furnished for each site.

The vessels shall be as follows:

Location	No. of Vessels	Cells per Vessel	Tag Numbers
Charnock Well Field	3	2	A-GSF-FLT-1001/2001/3001/4001/5001/6001
Arcadia Water Treatment Plant	6	2	C-GSF-FLT-1001/2001/3001

Each cell shall be operationally isolated from its companion cell during all phases of operation. Vessel design shall permit any cell out of service at atmospheric pressure, while the remaining cells continue to operate at full working pressure. Filter cells, piping, and valving shall be designed for independent operation and cleaning.

Each cell shall be provided with a differential pressure transmitter and a turbidity meter for the filtered water. The differential pressure transmitters and the turbidity meters shall be skid-mounted on the filters.

The pressure filtration system at each site shall be furnished with a control system as specified herein. A master control panel with redundant processor shall be furnished with a standalone air-conditioned local control panel which will be located outdoors. Remote I/O (RIO) rack local control panel shall be provided as needed. If required, RIO shall communicate with the master control panel through redundant ControlNet data highway. The master control panel shall contain Allen Bradley ControlLogix Programmable Logic Controllers (PLC). The master control panel shall contain an Allen Bradley Panelview operator interface terminal (OIT) for control of equipment and for displaying of equipment status, process variables, and alarms. The operator shall be able to control and adjust setpoints for the pressure filtration system from the OIT or from the Plant Control System. The master control panel shall be furnished with an Ethernet switch for

coupling bolts shall not be acceptable due to their "dead spot" characteristics and inability to uniformly collect and distribute flow laterally.

4.06.03 Underdrain Encasement. Following installation, each filter cell underdrain shall be concrete encased as recommended by the filter manufacturer.

4.07 Access Manways. Each filter cell shall be provided with two 24 inch diameter access manways per cell. Hatches shall provide a watertight and pressure tight seal.

5.00 AIRWASH SYSTEM. The airwash system shall be designed to provide even distribution of air throughout the entire filter bed at the required air flow rates to ensure the complete scouring of filtration media. The system used shall consist of a rigid, structurally supported, stainless steel airwash grid or approved equal. Systems utilizing flexible piping or hoses shall not be acceptable.

Rotary-lobe, positive-displacement blowers shall be provided. Duty and standby blowers shall be supplied, mounted on a common skid frame with 304 stainless steel, schedule 10 discharge and header piping. Blowers shall be supplied with acoustical enclosures. Noise levels from the blowers shall not exceed 65 dBA at a distance of 3 feet from the acoustical enclosures. A complete skidded system shall be furnished for each plant. The skids shall be identical. The blowers shall be suitable for outdoor installation.

The operation of the airwash system shall be controlled by the pressure filtration system PLC.

6.00 MEDIA. Filter media materials shall comply with AWWA B100 except as modified herein. Gradation sizes shall be based on square hole sieves conforming to ASTM E11. Sufficient quantities of each type of media shall be provided to produce the specified thickness after removal of excess fine materials during washing, scraping, and skimming operations in accordance with AWWA B100.

Filter Gravel

Specific Gravity	2.60 minimum
Thickness	12 inches minimum

Manganese Greensand

Specific Gravity	2.4 minimum
Thickness	18 inches minimum
Effective size	0.3 mm
Uniformity coefficient, after under cutting	1.6

Anthracite

Specific Gravity	1.5 minimum
Thickness	18 inches minimum
Effective size	0.6-0.8 mm
Uniformity coefficient	1.6

6.01 Media Installation. Filter media placement shall comply with AWWA B100, except as modified herein. Installation of the media shall be completed by others, under the direct supervision and control of a competent and experienced field representative employed by the filter equipment supplier.

The bottom layer of media shall be carefully placed to avoid damage to the filter underdrain system. Each layer shall be completed before starting the layer above.

7.00 ELECTRICAL. The Supplier shall be responsible for furnishing and installing all power and control wiring to devices on each filter and each equipment skid, including cable, conduit, circuit protection devices, and enclosures. All the power and control wirings on any equipment skid shall be pre-wired by Supplier to termination junction boxes for field connections. All electrical work shall comply with specifications listed elsewhere in this package. All work performed and all materials used shall be in accordance with the National Electrical Code, and with applicable local regulations and ordinances. Where mandated by codes, panels, assemblies, materials, and equipment shall be listed by Underwriters' Laboratories or other testing organizations acceptable to the governing authority as required. Supplier shall, as part of their work, arrange for and obtain all necessary permits, inspections, and approvals by the authorities having local jurisdiction of such work. This shall include any third-party inspections and testing of panels and equipment.

7.01 Power Supply. If 480 volt equipment is supplied, power supply to the equipment will be 480 volt, 60 Hz, 3 phase. Supplier shall be responsible for providing step-down transformers where lower voltages are required. Power supply for the PLC panel and controls shall not exceed 120 volts, single phase (SP), 60 Hz.

8.00 INSTRUMENTATION AND CONTROLS.

The equipment shall include all instrumentation and controls related to the pressure filtration system as identified in the specifications, as shown on the P&ID drawings, and as necessary to measure and display the process parameters described herein and as specified in section 13500.

The pressure filtration system shall be designed to operate unattended 24 hours per day at design capacity. The pressure filtration system automatic

Biwater

CARTRIDGE FILTER

RO HORIZONTAL CARTRIDGE FILTER VESSEL
&
CIP VERTICAL CARTRIDGE FILTER VESSEL

www.biwater-aewt.com

Formerly known as: Advanced Environmental Water Technologies, Inc.

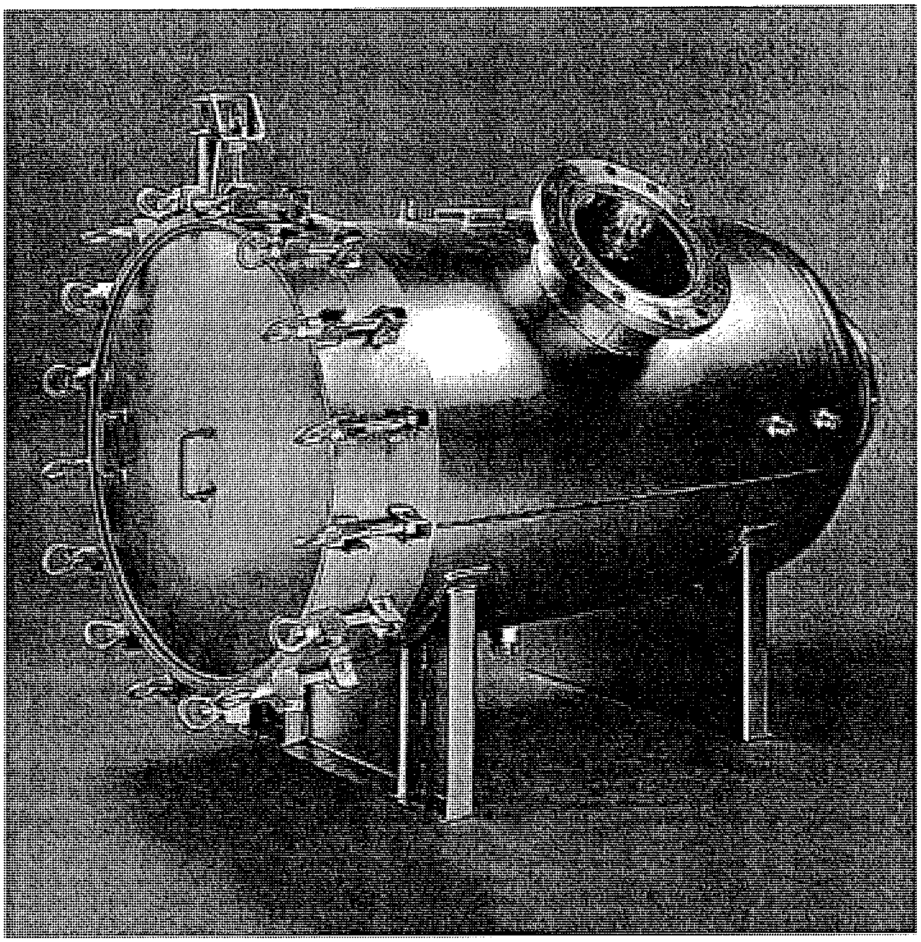
Biwater AEWT, Inc.
136 East Lemon Avenue, Monrovia, CA 91016, USA
Tel +1 (626)358-7707 Fax +1 (626)358-7737

C-3075

Fulflo® MP Filter Vessels

Fulflo® MP (Membrane Protectors) Filter Vessels Protect Membranes by Prefiltering R.O. Feed Water

MP Filter Vessels are ideal for a wide range of filtration applications including prefiltration of brackish, process and sea water. All MP Series vessels are built in accordance with ASME boiler and Pressure Vessel Code, U stamp. All MP vessels have dual purpose bottom seats for use with either double-open-end or 222 O-ring design.



Benefits

- Flow rates from 108 gpm to 3520 gpm
- Pressure ratings from 100 psi (6.9 bar) to 150 psi (10.3 bar)
- 304L or 316L stainless steel
- Stainless steel welded attachments
- Swing bolt closure for quick opening, with hex nuts for use with pneumatic tools
- Optional stainless steel bolting and davit assembly
- Horizontal vessels provide for easy cartridge installation
- Dual pupose cartridge seats for use with double open end and 2-222 O-ring single-open-end cartridges
- Glassbead blasted exteriors
- Passivated interior and exterior surfaces to remove free carbon and protect against corrosion
- Buna-N O-ring closure seal provides positive cover sealing
- Horizontal vessel utilizes removalbe internal cartridge support plate
- Large size clean and dirty drain for uniform piping and valve size

Applications

- Brackish and Sea Water
- Semiconductor Process Water
- Boiler Feed Water
- Reverse Osmosis Prefiltering
- Potable Water
- Electronic Rinse Water
- Deionized Water

Parker

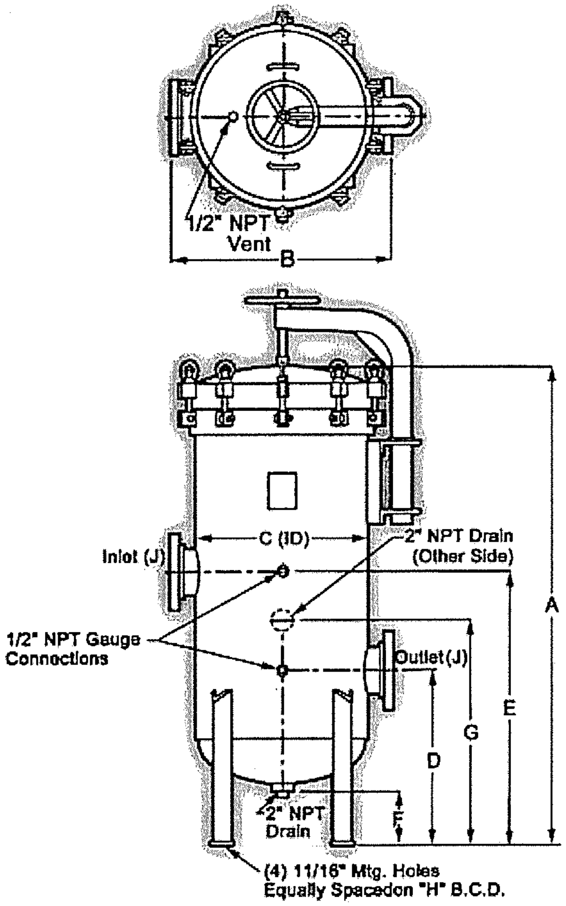
ENGINEERING **YOUR** SUCCESS.

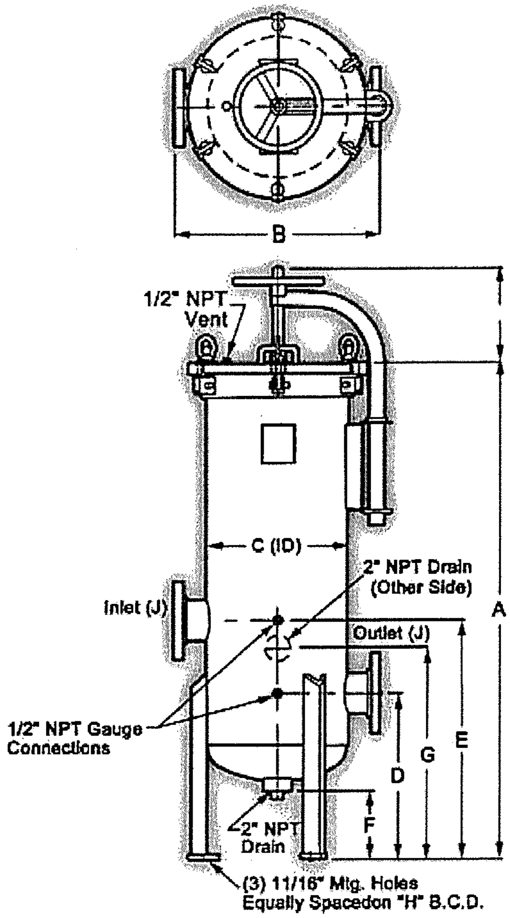
Fulflo® MP Filter Vessels

Fulflo® MP Filter Series Throughput
Based on flow of water (in gpm) per 10-inch cartridge

10 inch Cartridges	Filter Model	At 3 gpm** per 10 inch		At 3.5 gpm per 10 inch		At 4.5 gpm per 10 inch		At 5 gpm per 10 inch	
		(gpm)*	(mgd)	(gpm)	(mgd)	(gpm)	(mgd)	(gpm)	(mgd)
VERTICAL VESSELS									
36	MP12-3-3FK1	108	0.2	126	0.2	162	0.2	180	0.3
48	MP12-4-3FK1	144	0.2	168	0.3	216	0.3	240	0.3
63	MP21-3-4FK1	189	0.3	221	0.4	284	0.4	315	0.5
84	MP21-3-4FK1	252	0.4	294	0.5	378	0.5	420	0.6
87	MP29-3-4FK1	261	0.4	305	0.5	392	0.6	435	0.6
105	MP35-3-6FK1	315	0.5	368	0.6	473	0.7	525	0.8
116	MP29-4-6FK1	348	0.5	406	0.7	522	0.8	580	0.8
120	MP40-3-6FK1	360	0.5	420	0.7	540	0.8	600	0.9
140	MP35-4-6FK1	420	0.6	490	0.8	630	0.9	700	1.0
156	MP52-3-6FK1	468	0.7	546	0.9	702	1.0	780	1.1
160	MP40-4-6FK1	480	0.7	560	0.9	720	1.0	800	1.2
208	MP52-4-8FK1	624	0.9	728	1.2	936	1.3	1040	1.5
258	MP86-3-8FK1	774	1.1	903	1.5	1161	1.7	1290	1.9
309	MP103-3-8FK1	927	1.3	1082	1.8	1391	2.0	1545	2.2
344	MP86-4-10FK1	1032	1.5	1204	2.0	1548	2.2	1720	2.5
412	MP103-4-10FK1	1236	1.8	1442	2.4	1854	2.7	2060	3.0
472	MP118-4-12FK1	1416	2.0	1652	2.7	2124	3.1	2360	3.4
704	MP176-4-14FK1	2115	3.0	2464	4.1	3168	4.6	3520	5.1
HORIZONTAL VESSELS									
120	MP40H-3-6FK1	360	0.5	420	0.7	540	0.8	600	0.9
156	MP52H-3-6FK1	468	0.7	546	0.9	702	1.0	780	1.1
160	MP40H-4-6FK1	480	0.7	560	0.9	720	1.0	800	1.2
208	MP52H-4-8FK1	624	0.9	728	1.2	936	1.3	1040	1.5
258	MP86H-3-8FK1	774	1.1	903	1.5	1161	1.7	1290	1.9
309	MP103H-3-8FK1	927	1.3	1082	1.8	1391	2.0	1545	2.2
344	MP86H-4-10FK1	1032	1.5	1204	2.0	1548	2.2	1720	2.5
412	MP103-4-10FK1	1236	1.8	1442	2.4	1854	2.7	2060	3.0
472	MP118H-4-12FK1	1416	2.0	1652	2.7	2124	3.1	2360	3.4
704	MP176H-4-~~14~~FK1	2112	3.0	2464	4.1	3168	4.6	3520	5.1

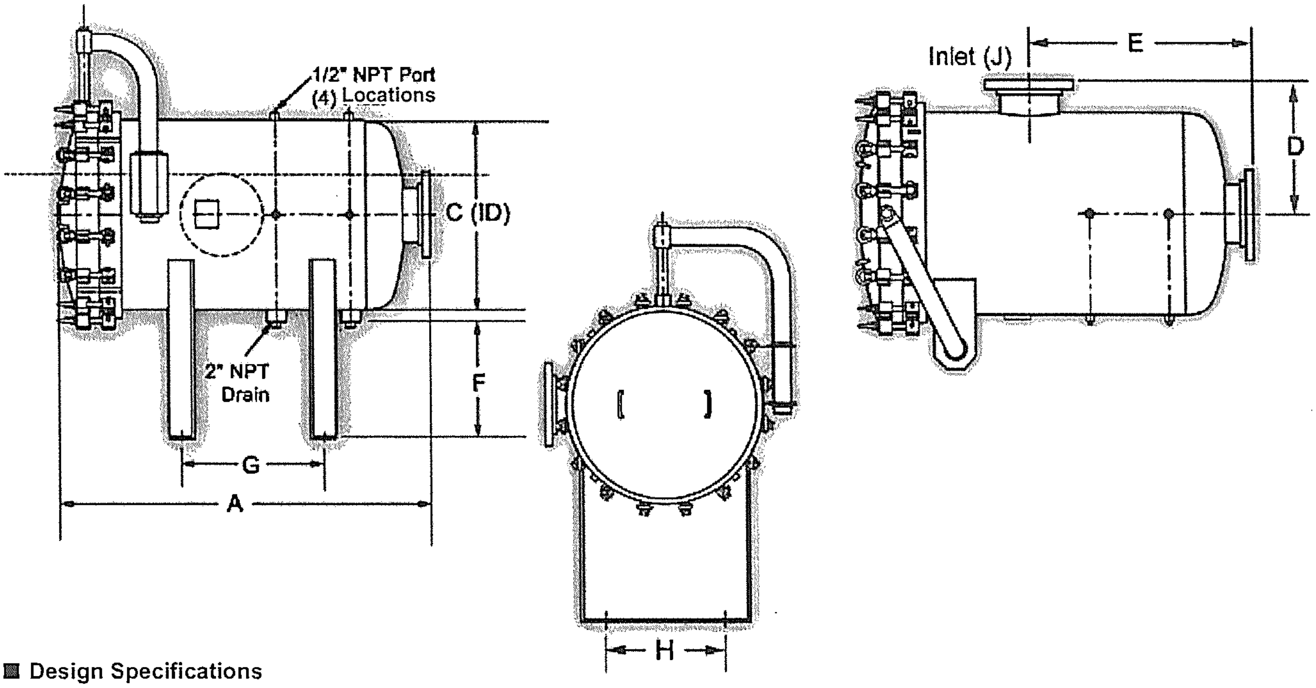
* gpm = gallons per minute; mgd = millions of gallons per day
** Actual flow rate is dependent on fluid viscosity, micron rating, contaminant and media type. Consult flow charts for each application.





Design Specifications

Model	No. & Length of Cartridges *(in)*	Dimensions *(in)* A	B	C	D	E	F	G	H	J	K	Shipping Weight *(lbs)*
MP12-3-3FK1	12 (30)	67.75	20.00	12.813	18.50	27.00	8.00	23.75	12.50	3 NPS	3	390
MP12-4-4FK1	12 (40)	77.75	20.00	12.813	18.50	27.00	8.00	23.75	12.50	4 NPS	3	420
MP21-3-4FK1	21 (30)	68.75	24.00	16.063	19.25	27.75	8.00	24.50	15.75	4 NPS	3	500
MP21-4-4FK1	21 (40)	78.75	24.00	16.063	19.25	27.75	8.00	24.50	15.75	4 NPS	3	530
MP29-3-4FK1	29 (30)	75.25	26.00	18.063	22.00	33.25	8.00	28.25	17.88	4 NPS	3	570
MP29-4-6FK1	29 (40)	85.25	26.00	18.063	22.00	33.25	8.00	28.25	17.88	6 NPS	3	620
MP35-3-6FK1	35 (30)	76.00	28.00	20.063	22.50	34.00	8.00	28.75	19.88	6 NPS	3	650
MP35-4-6FK1	35 (40)	86.00	28.00	20.063	22.50	34.00	8.00	28.75	19.88	6 NPS	3	680
MP40-3-6FK1	40 (30)	77.00	30.00	22.063	23.00	34.25	8.00	29.25	21.88	6 NPS	4	710
MP40-4-6FK1	40 (40)	87.00	30.00	22.063	23.00	34.25	8.00	29.25	21.88	6 NPS	4	750
MP52-3-6FK1	52 (30)	80.75	32.00	24.063	25.50	40.00	8.00	32.75	23.75	6 NPS	4	790
MP52-4-8FK1	52 (40)	90.75	32.00	24.063	25.50	40.00	8.00	32.75	23.75	8 NPS	4	860
MP86-3-8FK2	86 (30)	86.75	40.00	30.063	29.00	46.50	8.00	37.75	30.00	8 NPS	4	1280
MP86-4-10FK2	86 (40)	96.75	40.00	30.063	29.00	46.50	8.00	37.75	30.00	10 NPS	4	1380
MP103-3-8FK2	103 (30)	87.75	42.00	32.063	29.50	47.00	8.00	38.25	32.00	8 NPS	4	1410
MP103-4-10FK2	103 (40)	97.75	42.00	32.063	29.50	47.00	8.00	38.25	32.00	10 NPS	4	1510
MP118-4-12FK2	118 (40)	102.00	46.00	36.063	32.50	52.25	8.00	42.00	35.88	12 NPS	4	1830
MP176-4-14FK2	176 (40)	107.00	54.00	42.063	35.00	57.00	8.00	45.50	42.00	14 NPS	4	2650



Design Specifications

Model	Elements (in)	Dimensions (in)									Shipping Weight (lbs)
		A	B	C	D	E	F	G	H	J	
MP40H-3-6FKI	40 (30)	55.50	62.00	22.063	15.00	32.00	23.00	23.00	12.00	6 NPS	850
MP40H-4-6FKI	40 (40)	65.50	62.00	22.063	15.00	36.00	23.00	32.00	12.00	6 NPS	880
MP52H-3-6FKI	52 (30)	55.25	63.00	24.063	16.00	32.00	22.00	23.00	14.00	6 NPS	920
MP52H-4-8FKI	52 (40)	65.25	63.00	24.063	16.00	36.00	22.00	32.00	14.00	8 NPS	990
MP86H—3-8FKI	86 (30)	60.25	66.00	30.063	20.00	34.00	19.00	24.00	20.00	8 NPS	1490
MP86H-4-10FKI	86 (40)	68.25	66.00	30.063	20.00	38.00	19.00	32.00	20.00	10 NPS	1560
MP103H-3-8FKI	103 (30)	60.75	67.00	32.063	21.00	34.00	18.00	24.00	22.00	8 NPS	1620
MP103H-4-10FKI	103 (40)	68.75	67.00	32.063	21.00	38.00	18.00	32.00	22.00	10 NPS	1700
MP118H-4-12FKI	118 (40)	72.00	69.00	36.063	23.00	40.00	16.00	32.00	26.00	12 NPS	2040
MP176H-4-14FKI	176 (40)	74.75	72.00	42.063	27.00	41.00	13.00	32.00	32.00	14 NPS	2820

Ordering Information

☐ ☐ ☐ — ☐ — ☐ ☐

Material
4L = 304L SS
6L = 316L SS

Design
MP = Vertical Series (12-176 Columns)
MPXXH = Horizontal Series (40-176 Columns)

Columns
# of Columns

Cartridge Length (x 10 in)

Inlet/Outlet
F = Flange size in inches

Coverlift
No Symbol = None
K1 = Mechanical
K2 - Hydraulic

Specifications are subject to change without notification.
*Viton is a registered trademark of E.I. DuPont de Nemours & Co., Inc.

SPEC-C3075-Rev. A 01/08

Biwater

Pressure Vessel

Codeline 8" Standard Membrane Housings
80S Series

Product Data Sheet

www.biwater-aewt.com

Formerly known as: Advanced Environmental Water Technologies, Inc.

Biwater AEWT, Inc.
136 East Lemon Avenue, Monrovia, CA 91016, USA
Tel +1 (626)358-7707 Fax +1 (626)358-7737

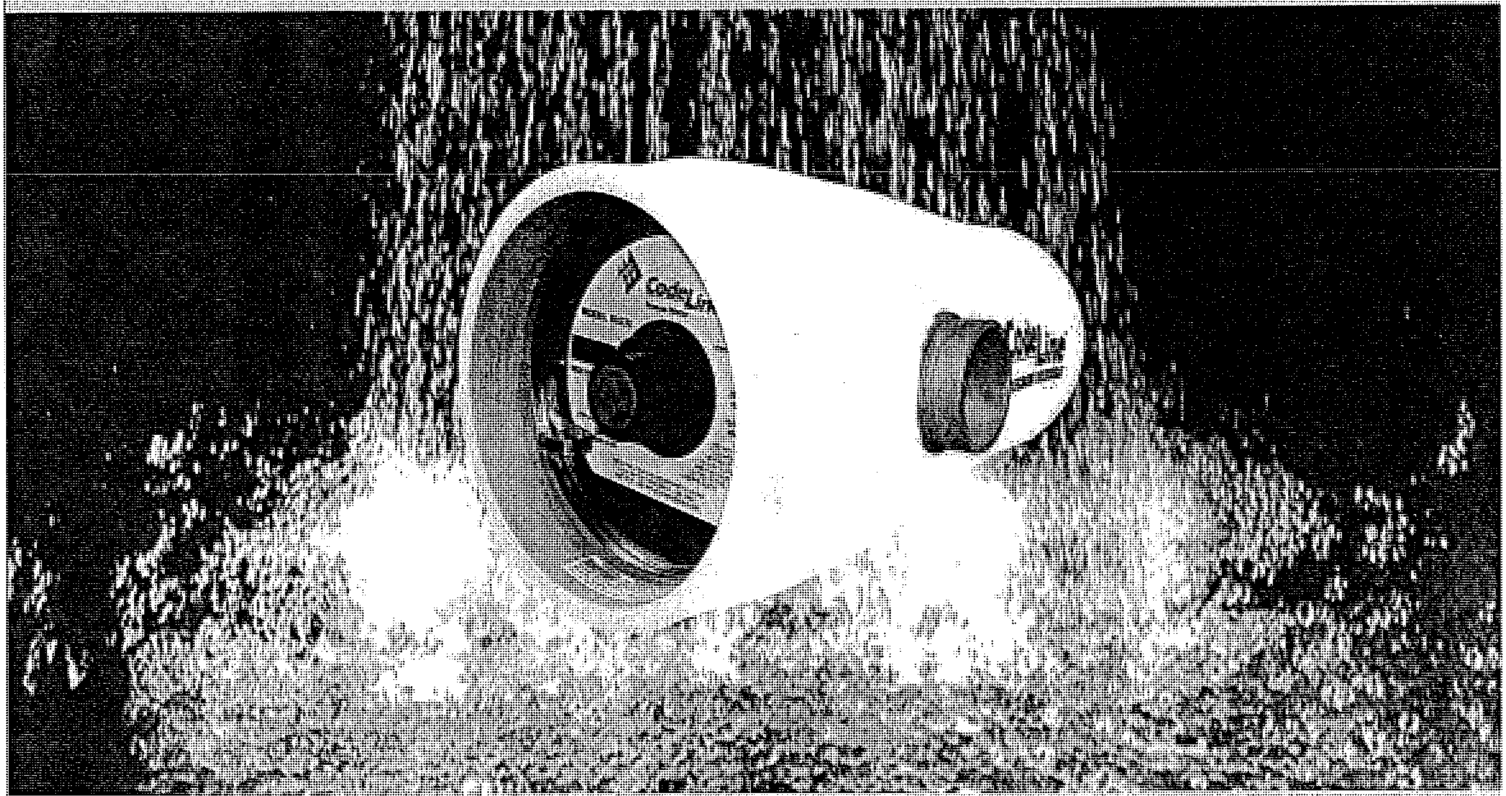
CodeLine™

Pentair Water

Performance Industry Trusts

8" Standard Membrane Housings

80S Series



With over 400,000 vessels in service world-wide, for three decades, CodeLine™ has been setting the standards in the industry with continuous innovation and uncompromising reliability making it the most trusted name in the water treatment industry.

Features

- Side Entry Design
- Available in pressure ratings of 75, 150, 300, 450, 600, 1000 & 1200 psi
- Can accommodate any standard make of 8" membrane element.

Benefits

- Mirror finish I.D for easy & quick loading & unloading of membranes.
- Multi-Porting option for connecting vessels to each other.
- High operation temperature up to 190˚F comes as a standard feature.
- Quick lock head retention system for quick access to membranes.
- Exteriors coated with high gloss polyurethane paint for UV resistance.
- ASME compliant & CE marking.
- Single piece high grade glass-filled engineering plastic head cuts down number of spares (available up to 600 psi for non-coded option)
- Octagonal shape provides flat surface for superior and reliable sealing of side ports.
- Threaded side ports for quick and easy onsite maintenance /serviceability.

Specifications: 80S Series

CODED

Model	Drawing Number	Design/Operating Pressure	Max. Operating Temperature	Qualification Pressure	Element Length
80S05	99180	75 PSI / 5 Bar	120°F / 49°C	450 PSI / 31 Bar	1 - 8
80S15	99159	150 PSI / 10 Bar	190°F / 88°C	900 PSI / 62 Bar	1 - 8
80S30	99160	300 PSI / 20 Bar	190°F / 88°C	1800 PSI / 124 Bar	1 - 8
80S45	99161	450 PSI / 31 Bar	190°F / 88°C	2700 PSI / 186 Bar	1 - 8
80S60	99162	600 PSI / 41 Bar	190°F / 88°C	3600 PSI / 248 Bar	1 - 8
80S100	99163	1000 PSI / 68 Bar	150°F / 66°C	6000 PSI / 413 Bar	1 - 8
80S120	99164	1200 PSI / 82 Bar	150°F / 66°C	7200 PSI / 496 Bar	1 - 8

NON-CODED

Model	Drawing Number	Design/Operating Pressure	Max. Operating Temperature	Qualification Pressure	Element Length
80S05	100121	75 PSI / 5 Bar	120°F / 49°C	450 PSI / 31 Bar	1 - 8
80S15	99171	150 PSI / 10 Bar	190°F / 88°C	900 PSI / 62 Bar	1 - 8
80S30	99172	300 PSI / 20 Bar	190°F / 88°C	1800 PSI / 124 Bar	1 - 8
80S45	99173	450 PSI / 31 Bar	190°F / 88°C	2700 PSI / 186 Bar	1 - 8
80S60	99174	600 PSI / 41 Bar	190°F / 88°C	3600 PSI / 248 Bar	1 - 8

- Please refer to sales drawings for multi-port options.
- ASME stamped vessels available on request.
- All specifications mentioned are subject to change without prior notice.

CodeLine™ : Setting the Standards of Quality

CodeLine™ is committed to quality. Each vessel is subject to rigorous quality inspection and hydro-testing before shipping. Pentair's quality certifications follow from independent and separate accreditations for materials, standards and practices at its manufacturing facility.

International Organization for Standardization

Certified to NSF / ANSI 61

AUTHORIZED USER OF ASME CODE SYMBOL

CodeLine™ is a part of Pentair, a global diversified operating company serving the commercial, industrial, municipal and residential markets through innovative solutions under strong brand names. Pentair's Water Segment – including global Filtration, Flow Technologies, and Pool and Spa businesses – helps deliver safe, clean water to people who need it. Pentair's Technical Products Segment helps protect electrical and electronic equipment and the people who use it. With 16,000 employees worldwide, Pentair generated 2008 sales of $3.35 billion.

CONTACTS:

AUSTRALIA	+61-3-9574-4029
CHINA	+86-21-3211-4588
INDIA	+91-832-288-3300
MIDDLE EAST	+971-6-572-0552
SINGAPORE	+65-6795-2213
SPAIN	+34-635-2211-56
UNITED KINGDOM	+44-77-6879-3901
USA	+1-440-286-4116

Pentair Water

Biwater

Pressure Vessel

Codeline 80S30 Membrane Housing

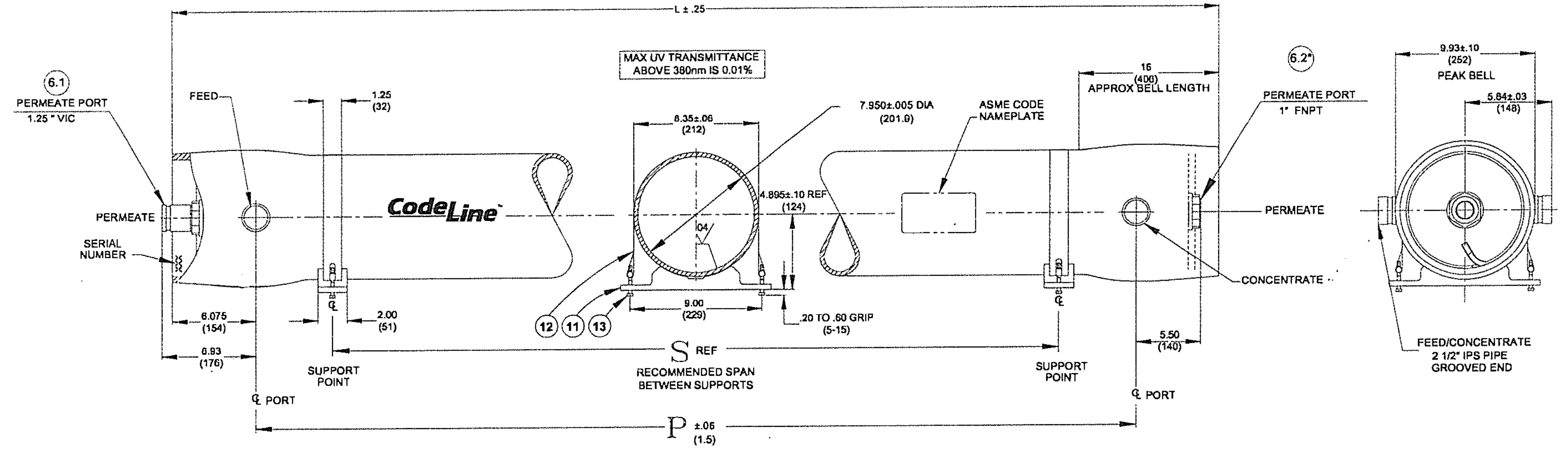
Drawing

www.biwater-aewt.com

Formerly known as: Advanced Environmental Water Technologies, Inc.

Biwater AEWT, Inc.
136 East Lemon Avenue, Monrovia, CA 91016, USA
Tel +1 (626)358-7707 Fax +1 (626)358-7737

300 PSI

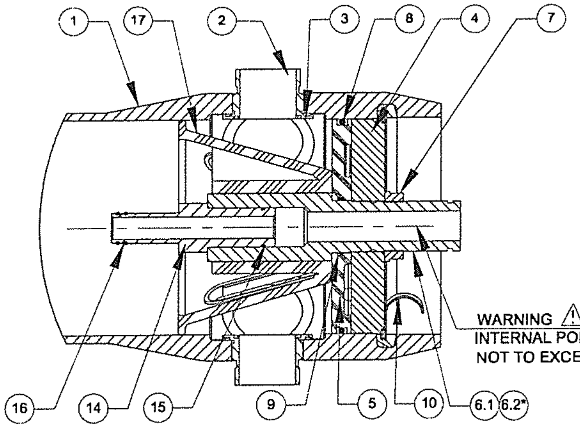


VIEW AT CENTER SUPPORT

CENTER VESSEL ON 3 SUPPORTS
AT SPANS "S"

CAUTION: INCORRECT MANIFOLDING WILL CAUSE SEVERE LOCAL STRESS AROUND PORT AND MAY RESULT IN LEAKS AND PREMATURE FAILURE; TAKE EVERY PRECAUTION LISTED ON REVERSE, SEE INSTALLATION INSTRUCTIONS FOR FURTHER DETAILS

DWG REF	QTY	PART NUMBER	DESCRIPTION	MATERIAL
			SHELL	
1	1	ORDER SECTION	SHELL	Filament Wound Epoxy/Glass composites - Head locking grooves integrally wound in place.
2	A/R	98026	2.5" F/C Port	CF3M #
3	A/R	96079	2.5" F/C Port Seal	Ethylene Propylene.
			HEAD	
4	1	96156	Bearing Plate	6061-T6 Aluminium alloy - Hard anodized
5	2	96160	Sealing Plate	Engineering Thermoplastic.
6.1	1	96932	Permeate Port 1.25"VIC	Engineering Thermoplastic.
6.2*	1	96162	Permeate Port 1" FNPT	Engineering Thermoplastic.
7	1	45066	Port Nut	Engineering Thermoplastic.
8	2	96000	Head Seal	Ethylene Propylene - O - Ring
9	2	45312	Perm Port Seal	Ethylene Propylene - O - Ring
			HEAD INTERLOCK	
10	2	47336	QuikRelease Spiral Ring	316 Stainless Steel.
			VESSEL SUPPORT	
11	3	52169	Saddle	Engineering Thermoplastic.
12	3	45042	Strap Assy.	304 Stainless Steel-PVC Cushion.
13	6	46265	Strap screw.	5/16-18 UNC, 18-8 Stainless Steel.
			ELEMENT INTERFACE	
14	2	50624	Adapter	Engineering Thermoplastic.
15	2	52245	Adapter seal	Ethylene Propylene - O - Ring
16	4	45305	PWT Seal	Ethylene Propylene - O - Ring
17	1	96163	Thrust Cone	Engineering Thermoplastic.



WARNING ⚠
INTERNAL PORT PRESSURE
NOT TO EXCEED 125 PSI

SECTION THROUGH END CLOSURE

NOTES:-
- MAX. ANGULAR VARIATION BETWEEN ANY PORTS ±0.5°.
- DIMENSION IN INCHES (MM APPROX.)
- SHELL EXTERIOR COATED WITH WHITE, HIGH GLOSS POLYURETHANE PAINT.
- NOT TO BE USED FOR CONSTRUCTION UNLESS CERTIFIED.
- ITEM 17 DOWNSTREAM ONLY.

GRADE CF3M PER ASME SA-351/316L AS PER SA-479
* NOT SHOWN IN THE SECTION VIEW.

MODEL : 80S30-6
CUSTOMER : BIWATER
PROJECT : SANTA MONICA

S.No.	Port Configuration	Vessel QTY
1	2F 4F 6F	56
2	4F 6F 8F	56
3	2F 4F 6F 8F	84
4	2F 6F 8F	28
5	2F 4F 8F	28
6	2F6F	20
7	4F8F	20

Dash Length	L IN(MM)	P IN(MM)	S IN(MM)	Approx Weight LB(KG)
-6	259.15 (6582)	247 (6274)	92X2 (2337)	159 (72)

CodeLine
Pentair Water

DRAWN DATE	KR 04JUNE09	CODELINE - 80S30 MEMBRANE HOUSING	
CHECKED DATE	RD 04JUNE09	ECN 1583	DWG. NO. 100303	REV. C
APPROVED DATE	RM 04JUNE09	DATE 29JUNE09	SCALE NONE	SIZE A3	SHEET 1 OF 2

RATING:

DESIGN PRESSURE....................300 PSIG at 120°F (2.1 MPa at 49°C)

MIN. OPERATING TEMP..............................20°F (-7°C)

FACTORY TEST PRESSURE.... ... . ASME 330 PSIG (2.27 MPa)

QUALIFICATION PRESSURE ....1800 PSI (12.4 MPa)

INTENDED USE:

The CodeLine 80S30 Fiberglass RO Pressure Vessel is designed for continuous, long term use as a housing for reverse osmosis membrane elements to desalt typical brackish waters at pressures up to 300 psi. Any make of eight-inch nominal diameter spiral-wound element is easily accommodated; the appropriate interfacing hardware for the element specified is furnished with the vessel.

The CodeLine 80S30 is designed in accordance with the engineering standards of the Boiler and Pressure Vessel Code of the American Society of Mechanical Engineers (ASME) Code. At small additional cost vessels can be inspected during construction by an ASME Authorized Inspector and ASME Code stamped.

The CodeLine 80S30 must be installed, operated and maintained in accordance with the listed precautions and good industrial practice to assure safe operation over a long service life.

The high performance Filament wound FRP shell must be allowed to expand under pressure; undue restraint at support points or piping connections can cause leaks to develop in the shell. This side-ported vessel requires special precautions in mounting and connection to piping so that the vessel will not be subjected to excessive stress due to bending moments acting at the side openings in the fiberglass shell. The end closure, incorporating close fitting, interlocking metal components, must be kept dry and free of corrosion; deterioration can lead to catastrophic mechanical failure of the head.

Pentair Water will assist the purchaser in determining the suitability of this standard vessel for their specific operating conditions. The final determination however, including evaluation of the standard material of construction for compatibility with the specific corrosive environment, shall be the responsibility of the purchaser. Alternate materials with enhanced corrosion resistance are available on special order.

Specifications are subject to change without notice.

PRECAUTIONS:

DO...read, understand and follow all instructions; failure to take every precaution will void warranty and may result in vessel failure

DO...mount the shell on horizontal members at span "S" using compliant vessel supports furnished; Shim saddles if required. Tighten hold down straps just snug

DO...align and center side ports with the manifold header. Correct, causes of misalignment in a row of vessels connected to the same header

DO...use flexible type grooved-end pipe couplings, Victaulic® Style 77 or equal. at side ports; allow full, 0.125 inch gap between port and piping, and position piping to maximize flexibility of connection.

DO...provide flexibility in, and support for piping manifolds so that vessel can grow in length under pressure without undue restraint; provide additional flexible joints in large pipes leading to manifold header.

DO...provide overpressure protection for vessel set at not more than 105% of design pressure

DO...inspect end closures regularly; replace components that have deteriorated and correct causes of corrosion

DO NOT...work on any component until first verifying that pressure is relieved from vessel

DO NOT...make rigid piping connections to ports or clamp vessel in any way that resists growth of fiberglass shell under pressure:
***ΔDIA = 0.015 in. (0.4mm) and
***ΔL = 0.2 in. (6mm) for a length code –8 vessel

DO NOT... hang piping manifolds from ports or use vessel in any way to support other components

DO NOT...tighten Permeate Port connection more than one turn past hand tight

DO NOT... operate vessel without connecting both Permeate Ports internally to complete set of elements or otherwise plug ports internally so that external piping connection is not subjected to feed pressure

DO NOT...install Spacer on downstream end of vessel

DO NOT...operate vessel without Thrust Cone installed downstream

DO NOT...pressurize vessel until double-checking to verify that the Locking Ring is in place and fully seated.

DO NOT...operate vessel at pressure and temperature in excess of its rating.

DO NOT...operate vessel with permeate pressure in excess of 125 psi at 120°F (0.86 Mpa at 49°C).

DO NOT...tolerate leaks or allow end closures to be routinely wetted in any way

DO NOT...operate outside the pH range 3-10.

ORDERING:

Using the chart below, please check the features you require and fax them with your purchase order to our customer service department for further processing.
For optional materials and / or feature not listed below, please consult the factory for pricing and availability

VESSEL LENGTH CODE – please check one

MODEL 80S30 ☐ -1 ☐ -1.5 ☐ -2 ☐ -3 ☐ -4 ☐ -4.5 ☐ -5 ☒ -6 ☐ -7 ☐ -7.5 ☐ -8
Consult Sales Manager for Eight Element Housings.

MEMBRANE BRAND AND MODEL – please check one and fill in information

☒ Please supply adapters for the following membrane brand and specific model
Brand_____TORAY_____ Model_____TMG20-430C_____

☐ Membrane brand and model information is not currently available, but will be supplied to Pentair Water on or before the following date. ___ / ___ / ___

CERTIFICATION REQUIRED

☒ ASME Stamped and National Board Registered (Please consult factory for pricing)

☐ CE Marked

☐ Standard, Certified by Pentair water.

MATERIAL AND PORT CONFIGURATIONS OPTIONS – please check one

☒ Standard: all materials and port configurations as per drawing 100303 on the previous page
NOTE: The options listed below will increase the vessel price. Call factory for pricing details.

☐ Option: Customer specified port configuration. Using the chart below, please indicate the customized options you require for each end of the pressure vessel (multiple options are available at each end).
(Please consult factory as these options will affect pricing and vessel lead time)

PORT SIZE CODE	
F	2½" GROOVED END

FEED PORT CONFIGURATION

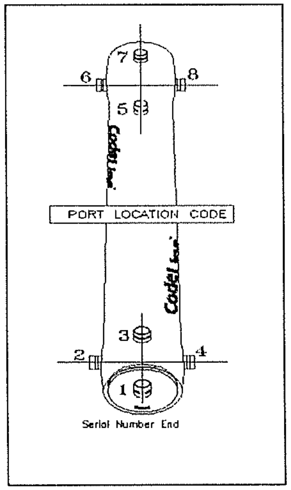
☐ Standard – 1½" IPS pipe, grooved ends, with ports in-line
☒ Optional – Multi-Ports™
Port configurations as per drawing 100303 on the previous page

Serial number end ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
Opposite end ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

PERMEATE PORT CONFIGURATION:

☒ Standard 1" FNPT.
☒ Optional – 1.25" VIC.

For complete information on proper use of the vessel
Please refer to the 80S Series USER'S GUIDE 94182.



Installation, Operation, and Maintenance Instruction Manual

For

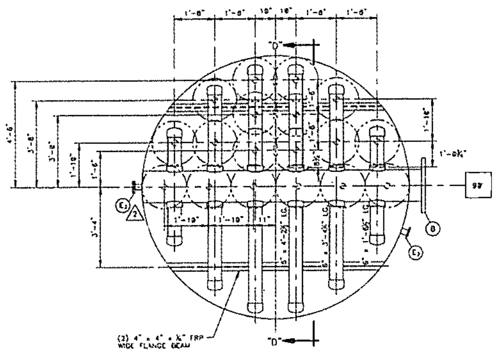
City of Santa Monica
Charnock Well Field Restoration Project

(2) Decarbonator Towers

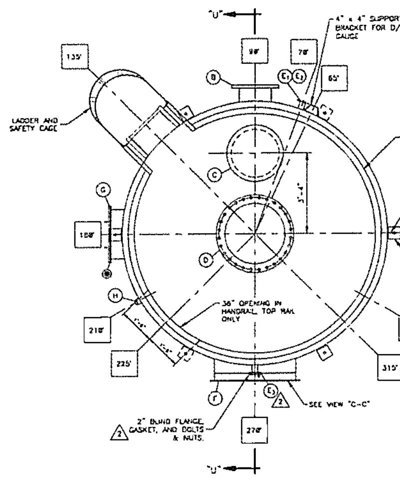
HUNGERFORD & TERRY, INC.
P.O. Box 650
226 Atlantic Ave.
Clayton, New Jersey 08312

Phone: (856) 881-3200
Fax: (856) 881-6859

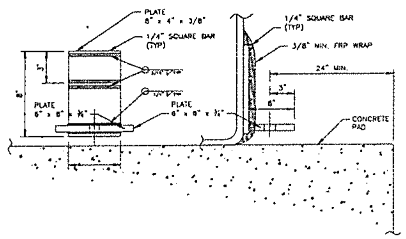
Office Hours: 8:00 AM – 4:30 PM EST Monday-Friday



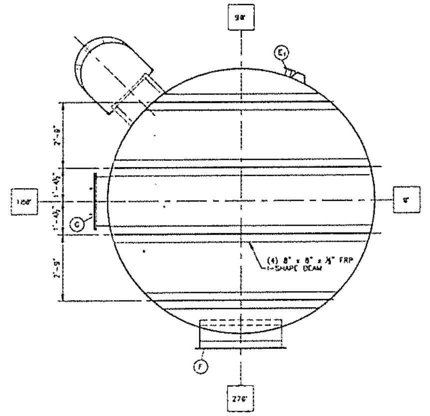
SECTION "A-A"
PVC PIPE AND LATERALS BY H&T, FRP MANIFOLD BY TANK FABRICATOR



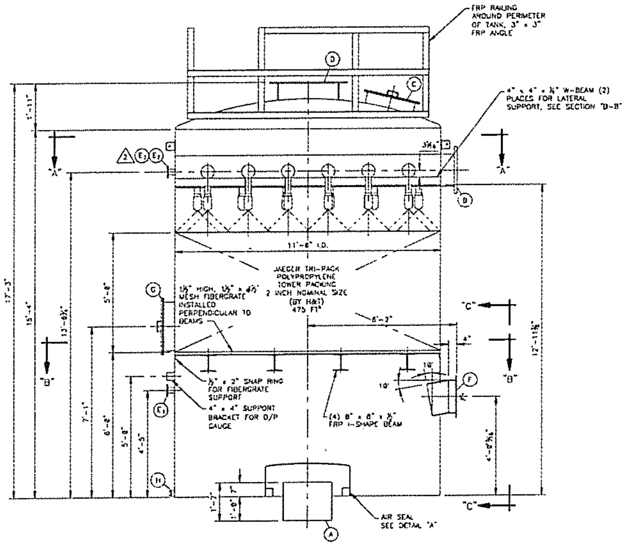
PLAN



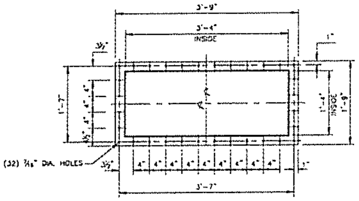
TIE DOWN LUG



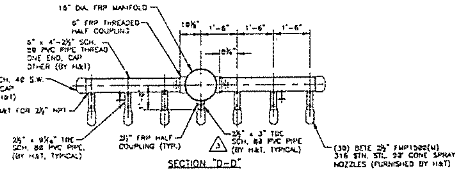
SECTION "B-B"



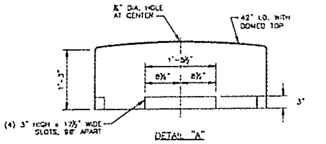
SECTION "U-U"
SEE PLAN VIEW FOR PROPER ORIENTATION OF ALL CONNECTIONS



Ⓕ VIEW "C-C"



SECTION "D-D"
PVC PIPE AND LATERALS BY H&T, FRP MANIFOLD BY TANK FABRICATOR
SEE SECTION "A-A" FOR DETAILS OF ALL LATERALS



DETAIL "A"
AIR SEAL (1-REQUIRED)

CONNECTION CHART		
CONN.	FUNCTION	DESCRIPTION
Ⓐ	WATER OUTLET	24" x 1'-7" LONG FRP PIPE THROUGH TANK BOTTOM
Ⓑ	WATER INLET	16" x 23½" O.D. 150 LB. F.F FLANGE WITH (16) 1⅛" HOLES ON 21¼" B.C
Ⓒ	TOP MANWAY	24" DIA. ACCESS MANWAY WITH FRP COVER
Ⓓ	VENT	30" x 38¾" O.D. 150 LB. F.F FLANGE WITH (28) 1" HOLES ON 36" B.C.
Ⓔ	PRESSURE	2" x 6" O.D. 150 LB. F.F FLANGE WITH (4) ¾" HOLES ON 4¾" B.C.
Ⓕ	AIR INLET	40" I.D. x 16" I.D., 45" O.D. x 21" O.D. DUCT CONNECTION, SEE SECTION "C-C"
Ⓖ	SIDE MANWAY	24" DIA. ACCESS MANWAY WITH FRP COVER
Ⓗ	DRAIN	2" THREADED FRP HALF-COUPLING WITH PVC PLUG AS LOW AS POSSIBLE IN TANK

NOTE:
1. DESIGN FLOW RATE OF 3,100 GPM
2. VESSEL INSIDE DIAMETER = 11'-8"
3. APPROXIMATE VESSEL WEIGHT: 4,200 LB.
4. RESIN: VINYL ESTER ADC F810
5. REINFORCEMENT: GLASS FIBER WITH A SUITABLE COUPLING AGENT
SURFACING MAT: BURLINGTON FORMED FABRICS "NEXUS VEIL", MICROFIBERS "SURMAT 100", OR EQUAL
PLASTIC LAMINATE: IN CONFORMITY WITH THE APPLICABLE GOVERNING STANDARDS
EXPOSED METAL: AISI TYPE 316L STAINLESS STEEL
PROTECTED METAL: CARBON STEEL, ASTM A36, WITH FIBERGLASS REINFORCED PLASTIC COATING.
6 CONSTRUCTION SHALL BE IN ACCORDANCE WITH ASTM D3299, "FILAMENT-WOUND GLASS FIBER REINFORCED POLYESTER CHEMICAL RESISTANT VESSELS"
7. COLOR: "HIDDEN FOREST" (DE6381)
8. ◉: ⅛" HYPALON OR VITON FULL GASKET
9. ALL BOLTS, FASTENERS, HANGERS, LIFTING LUGS, ETC. TO BE 316L STN. STL.

NO.	REVISIONS	DATE	CK'D
3	ADDED PVC NIPS FOR INLET MANIFOLD SPRAY NOZZLES	7-23-18	RKB
2	AS-BUILT, ADD EXTRA CONNECTION "E₁"	6-15-18	RKB
1	PER B&V RETURNED PRINT, 2-22-18	2-27-18	PKB

HUNGERFORD & TERRY, INC.
MANUFACTURERS OF WATER TREATING EQUIPMENT
CLAYTON, NEW JERSEY

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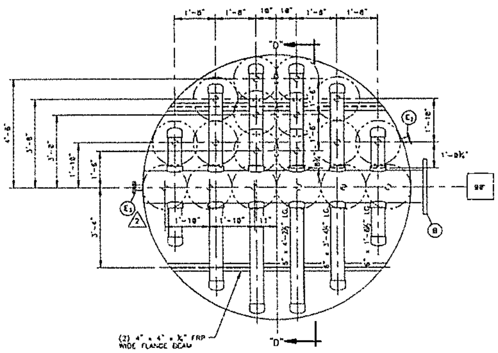
BLACK & VEATCH
FOR: CITY OF SANTA MONICA
CHARNOCK WELL FIELD RESTORATION PROJECT
DECARBONATORS
B&V PROJECT NO. 160823.65.1430

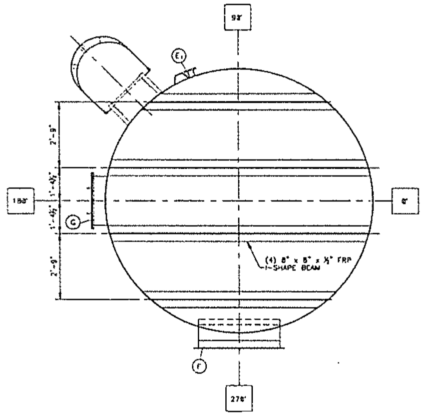
DECARBONATOR TOWER NO. 1 DETAILS
(DC-DC-1101)

DATE			SCALE	1/2" = 1'-0"
STARTED	1/8/18		FORM NO.	
FINISHED	1/13/18		CONT NO.	U-091
CHECKED	1/23/18		DRAWING NO.	32420-A01
APPROVED				

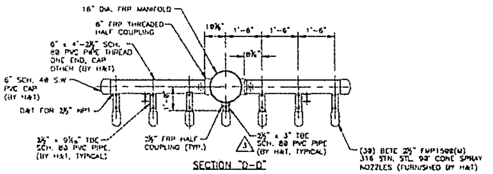


SECTION "A-A"

PVC PIPE AND LATERALS BY H&T, FRP MANIFOLD BY TANK FABRICATOR

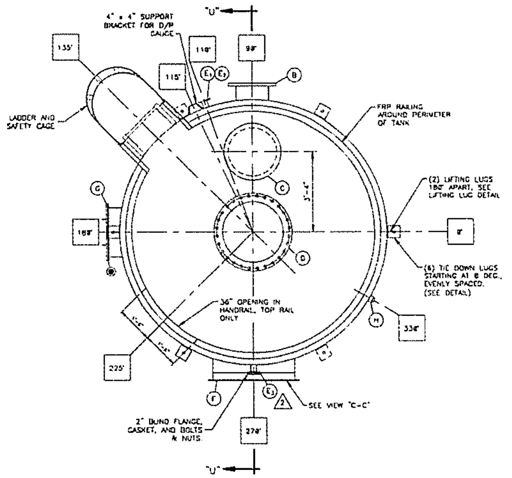


SECTION "B-B"

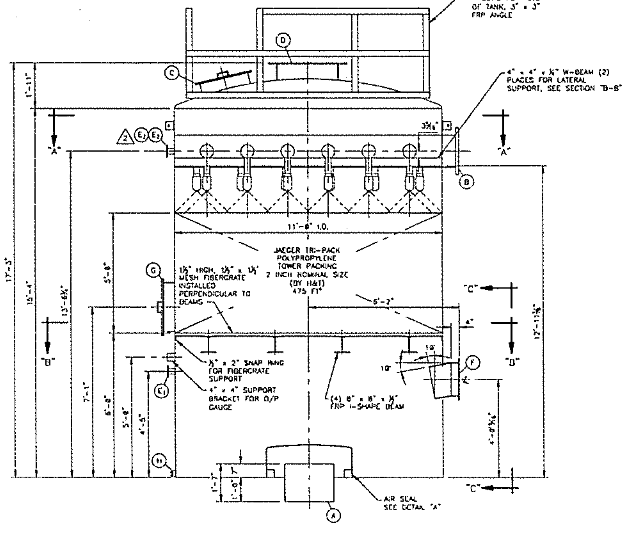


SECTION "D-D"

PVC PIPE AND LATERALS BY H&T, FRP MANIFOLD BY TANK FABRICATOR SEE SECTION "A-A" FOR DETAILS OF ALL LATERALS



PLAN



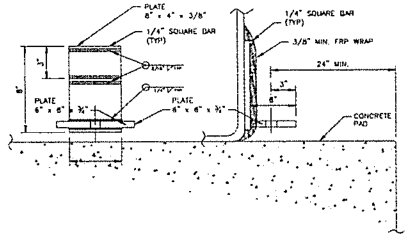
SECTION "U-U"

SEE PLAN VIEW FOR PROPER ORIENTATION OF ALL CONNECTIONS

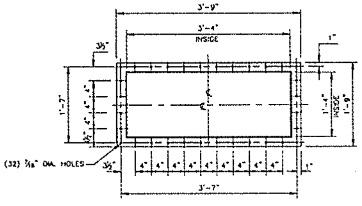
CONNECTION CHART		
CONN.	FUNCTION	DESCRIPTION
Ⓐ	WATER OUTLET	24" x 1'-7" LONG FRP PIPE THROUGH TANK BOTTOM
Ⓑ	WATER INLET	16" x 23½" O.D. 150 LB. F.F FLANGE WITH (16) 1⅛" HOLES ON 21¼" B.C.
Ⓒ	TOP MANWAY	24" DIA. ACCESS MANWAY WITH FRP COVER
Ⓓ	VENT	30" x 38¾" O.D. 150 LB. F.F FLANGE WITH (28) 1" HOLES ON 36" B.C.
Ⓔ	PRESSURE	2" x 6" O.D. 150 LB. F.F FLANGE WITH (4) ¾" HOLES ON 4¾" B.C.
Ⓕ	AIR INLET	40" I.D. x 16" I.D., 45" O.D. x 21" O.D. DUCT CONNECTION, SEE SECTION "C-C"
Ⓖ	SIDE MANWAY	24" DIA. ACCESS MANWAY WITH FRP COVER
Ⓗ	DRAIN	2" THREADED FRP HALF-COUPLING WITH PVC PLUG AS LOW AS POSSIBLE IN TANK

NOTE:

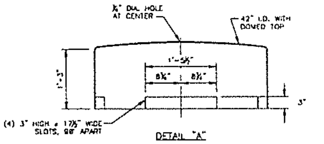
1. DESIGN FLOW RATE OF 3,100 GPM
2. VESSEL INSIDE DIAMETER = 11'-8"
3. APPROXIMATE VESSEL WEIGHT: 4,200 LB.
4. RESIN: VINYL ESTER AOC F010
5. REINFORCEMENT: GLASS FIBER WITH A SUITABLE COUPLING AGENT
   SURFACING MAT: BURLINGTON FORMED FABRICS "NEXUS VEIL", MICROFIBERS "SURMAT 100", OR EQUAL
   PLASTIC LAMINATE: IN CONFORMITY WITH THE APPLICABLE GOVERNING STANDARDS
   EXPOSED METAL: AISI TYPE 316L STAINLESS STEEL
   PROTECTED METAL: CARBON STEEL, ASTM A36, WITH FIBERGLASS REINFORCED PLASTIC COATING.
6. CONSTRUCTION SHALL BE IN ACCORDANCE WITH ASTM D3299, "FILAMENT-WOUND GLASS FIBER REINFORCED POLYESTER CHEMICAL RESISTANT VESSELS"
7. COLOR: "HIDDEN FOREST" (DE6381)
8. ●: ⅛" HYPALON OR VITON FULL GASKET
9. ALL BOLTS, FASTENERS, HANGERS, LIFTING LUGS, ETC. TO BE 316L STN. STL.



TIE DOWN LUG



Ⓕ VIEW "C-C"



DETAIL "A"

AIR SEAL (1-REQUIRED)

NO.	REVISIONS	DATE	CK'D
3	ADDED PVC NIPS FOR INLET MANIFOLD SPRAY NOZZLES	7-28-18	RKB
2	AS-BUILT, ADD EXTRA CONNECTION "E3"	6-15-18	RKB
1	PER B&V RETURNED PRINT, 2-22-18	2-27-18	RKB

H&T INC. PURE WATER

HUNGERFORD & TERRY, Inc.
MANUFACTURERS OF WATER TREATING EQUIPMENT
CLAYTON, NEW JERSEY

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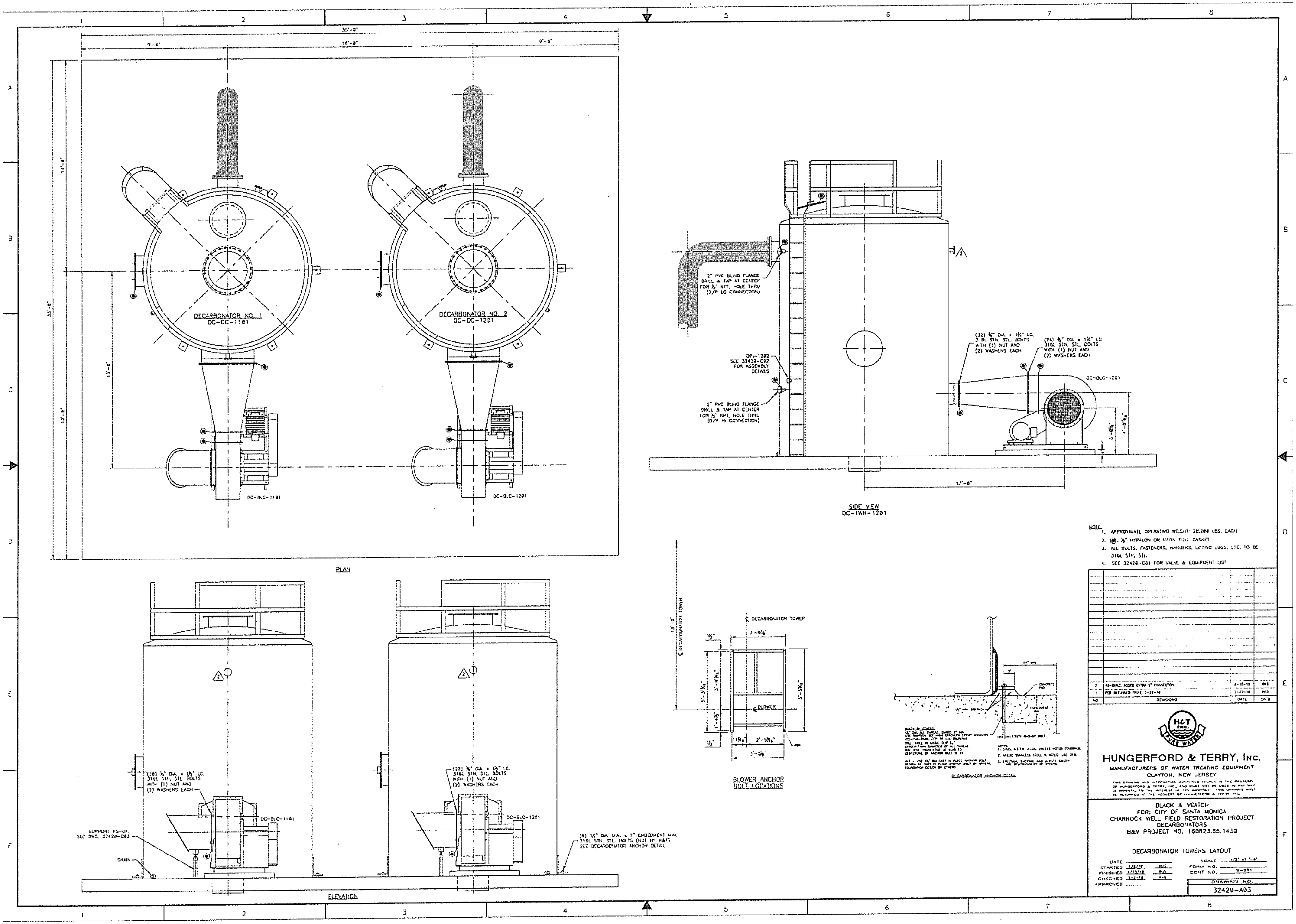
BLACK & VEATCH
FOR: CITY OF SANTA MONICA
CHARNOCK WELL FIELD RESTORATION PROJECT
DECARBONATORS
B&V PROJECT NO. 160823.65.1430

DECARBONATOR TOWER NO. 2 DETAILS
(DC-DC-1201)

DATE			
STARTED	1/8/18	RG	SCALE 1/2" = 1'-0"
FINISHED	1/13/18	RG	FORM NO.
CHECKED	1/23/18	RKB	CONT NO. U-851
APPROVED			DRAWING NO. 32420-A02



NOTE

1. APPROXIMATE OPERATING WEIGHT: 28,200 LBS. EACH
2. ◉: ⅛" HYPALON OR VITON FULL GASKET
3. ALL BOLTS, FASTENERS, HANGERS, LIFTING LUGS, ETC. TO BE 316L STN. STL.
4. SEE 32420-C01 FOR VALVE & EQUIPMENT LIST

NO	REVISIONS	DATE	CK'D
2	AS-BUILT, ADDED EXTRA 2" CONNECTION	6-15-18	RKB
1	PER RETURNED PRINT, 2-22-18	2-22-18	RKB

HUNGERFORD & TERRY, Inc.
MANUFACTURERS OF WATER TREATING EQUIPMENT
CLAYTON, NEW JERSEY

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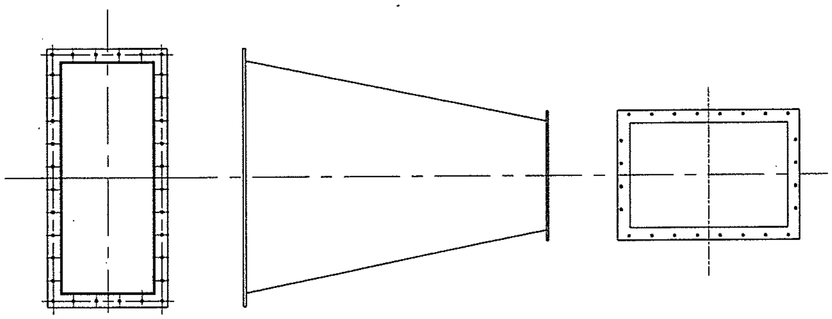
BLACK & VEATCH
FOR: CITY OF SANTA MONICA
CHARNOCK WELL FIELD RESTORATION PROJECT
DECARBONATORS
B&V PROJECT NO. 160823.65.1430

DECARBONATOR TOWERS LAYOUT

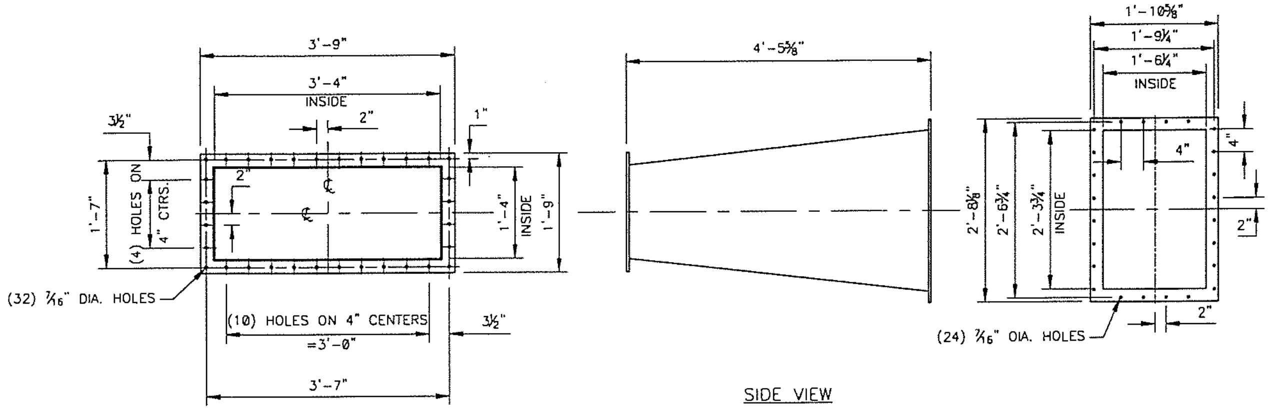
DATE
STARTED 1/8/18 RC
FINISHED 1/13/18 RC
CHECKED 2-2-18 RKB
APPROVED

SCALE 1/2" = 1'-0"
FORM NO.
CONT NO. U-891

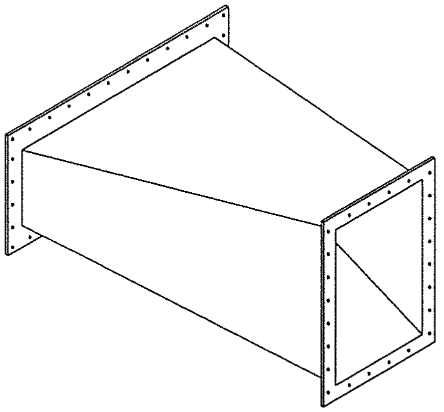
DRAWING NO.
32420-A03



TOP VIEW



SIDE VIEW



NOTE:

1. RESIN: VINYL ESTER AOC F010
2. REINFORCEMENT: GLASS FIBER WITH A SUITABLE COUPLING AGENT
   SURFACING MAT: BURLINGTON FORMED FABRICS "NEXUS VEIL", NICROFIBERS "SURMAT 100", OR EOUAL
   PLASTIC LAMINATE: IN CONFORMITY WITH THE APPLICABLE GOVERNING STANDARDS
   PROTECTED METAL: CARBON STEEL, ASTM A36, WITH FIBERGLASS REINFORCED PLASTIC COATING.
3. CONSTRUCTION SHALL BE IN ACCORDANCE WITH ASTM D3299, "FILAMENT-WOUND GLASS FIBER REINFORCED POLYESTER CHEMICAL RESISTANT VESSELS"
4. COLOR: "HIODEN FORREST" (DE6301)

NO.	REVISIONS	DATE	CK'D
1	ADDED COLOR	2-22-10	RKB

HUNGERFORD & TERRY, INC.
MANUFACTURERS OF WATER TREATING EQUIPMENT
CLAYTON, NEW JERSEY

BLACK & VEATCH
FOR: CITY OF SANTA MONICA
CHARNOCK WELL FIELD RESTORATION PROJECT
DECARBONATORS
B&V PROJECT NO. 160823.65.1430

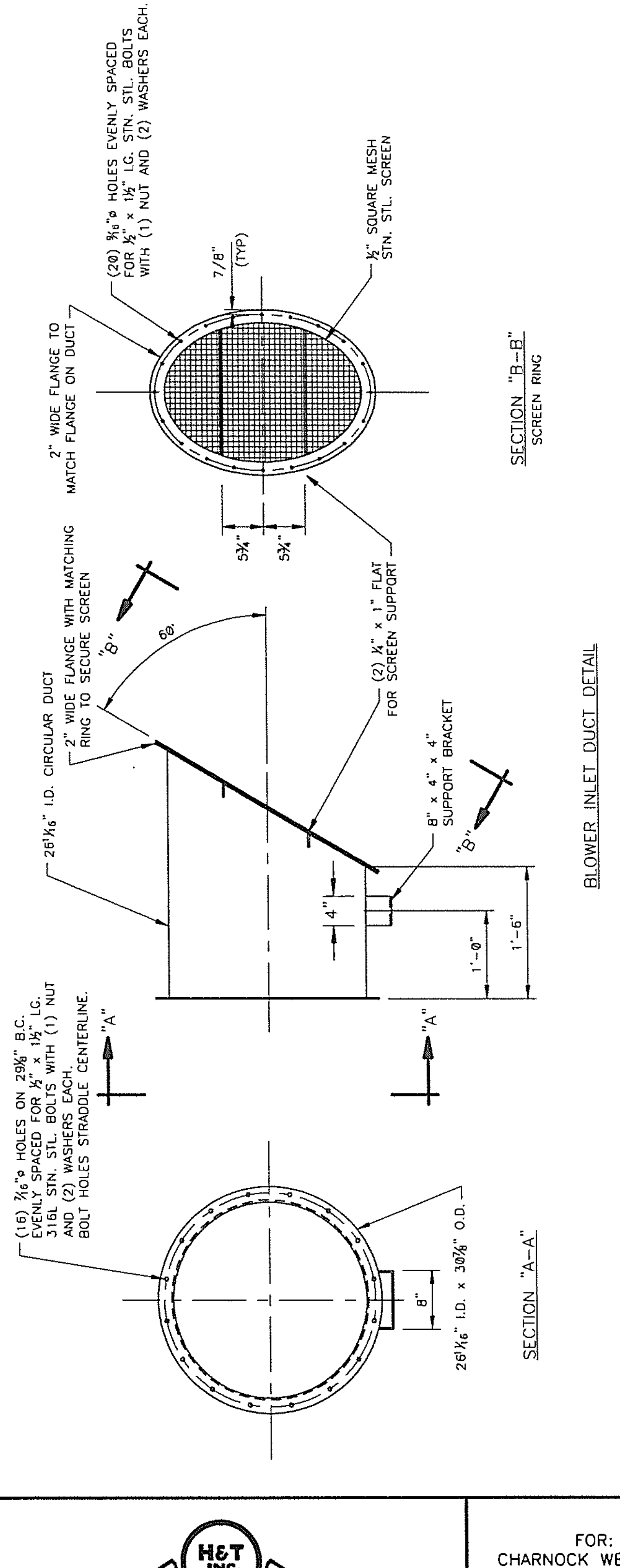
DECARBONATOR BLOWER TRANSITION DUCT

DATE		
STARTED	2-1-10	RST
FINISHED	2-1-10	RST
CHECKED	2-2-10	RKB
APPROVED		

SCALE 3/4" = 1'-0"
FORM NO.
CONT NO. M-081

DRAWING NO.	REV.
32420-B01	1

NOTE:
1. RESIN: VINYL ESTER AOC F010
2. REINFORCEMENT: GLASS FIBER WITH A SUITABLE COUPLING AGENT
SURFACING MAT: BURLINGTON FORMED FABRICS "NEXUS VEIL", NICROFIBERS "SURMAT 100", OR EQUAL
PLASTIC LAMINATE: IN CONFORMITY WITH THE APPLICABLE GOVERNING STANDARDS
PROTECTED METAL: CARBON STEEL, ASTM A36, WITH FIBERGLASS REINFORCED PLASTIC COATING.
3. CONSTRUCTION SHALL BE IN ACCORDANCE WITH ASTM D3299, "FILAMENT-WOUND GLASS FIBER REINFORCED POLYESTER CHEMICAL RESISTANT VESSELS"
4. COLOR: "HIDDEN FORREST" (DE6301)



NO.	REVISIONS	DATE	CK'D
1	ADDED COLOR	2-22-10	RKB

H&T INC. PURE WATER

HUNGERFORD & TERRY, INC.
MANUFACTURERS OF WATER TREATING EQUIPMENT
CLAYTON, NEW JERSEY

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BLACK & VEATCH
FOR: CITY OF SANTA MONICA
CHARNOCK WELL FIELD RESTORATION PROJECT
DECARBONATORS
B&V PROJECT NO. 160823.65.1430

DECARBONATOR BLOWER SUCTION DUCT

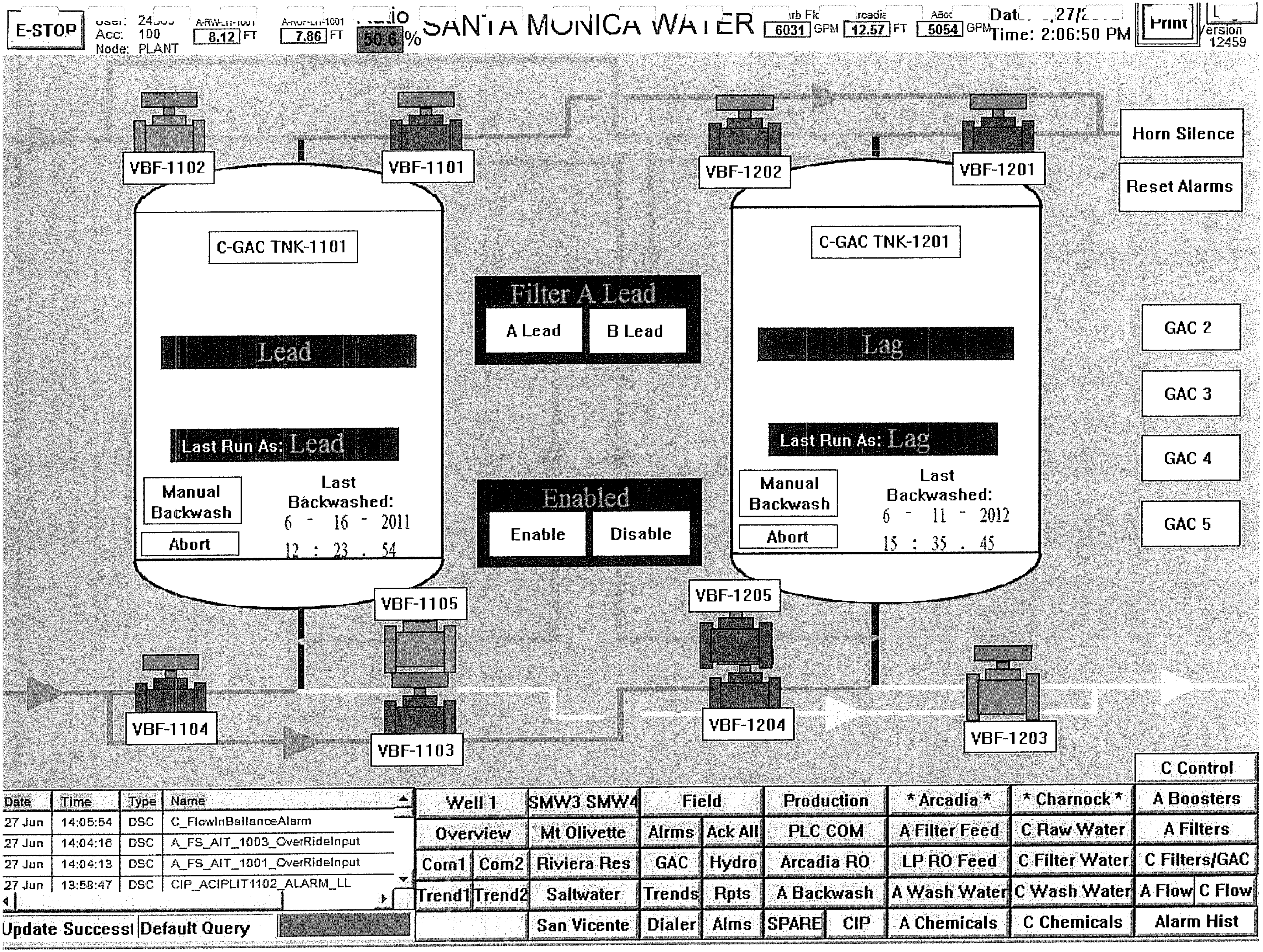
DATE		
STARTED	2-1-10	RST
FINISHED	2-1-10	RST
CHECKED	2-2-10	RKB
APPROVED		

SCALE 3/4" = 1'-0"
FORM NO.
CONT NO. M-081

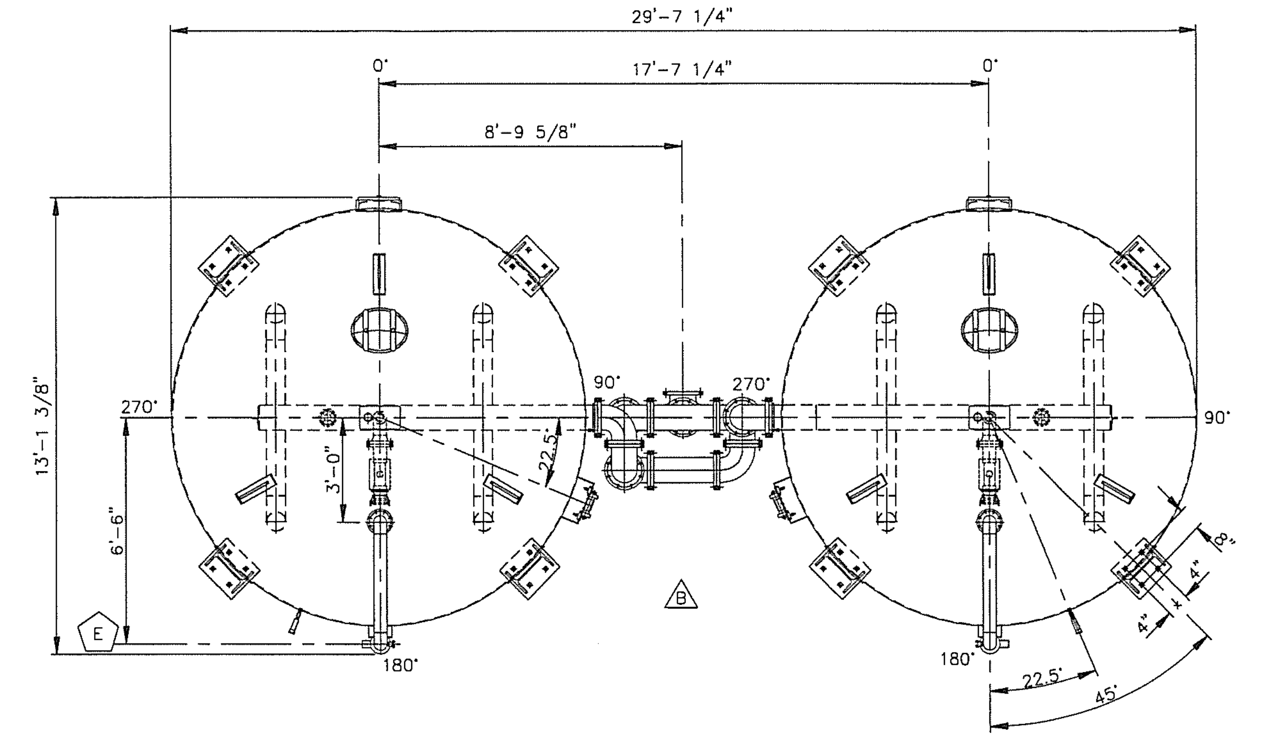
DRAWING NO.	REV.
32420-B02	1

Appendix L

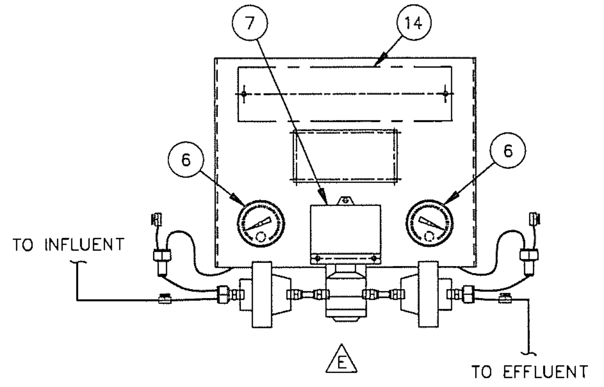
GAC Design, Layout, and SCADA Screen Printout



Date	Time	Type	Name
27 Jun	14:05:54	DSC	C_FlowInBallanceAlarm
27 Jun	14:04:16	DSC	A_FS_AIT_1003_OverRideInput
27 Jun	14:04:13	DSC	A_FS_AIT_1001_OverRideInput
27 Jun	13:58:47	DSC	CIP_ACIPLIT1102_ALARM_LL

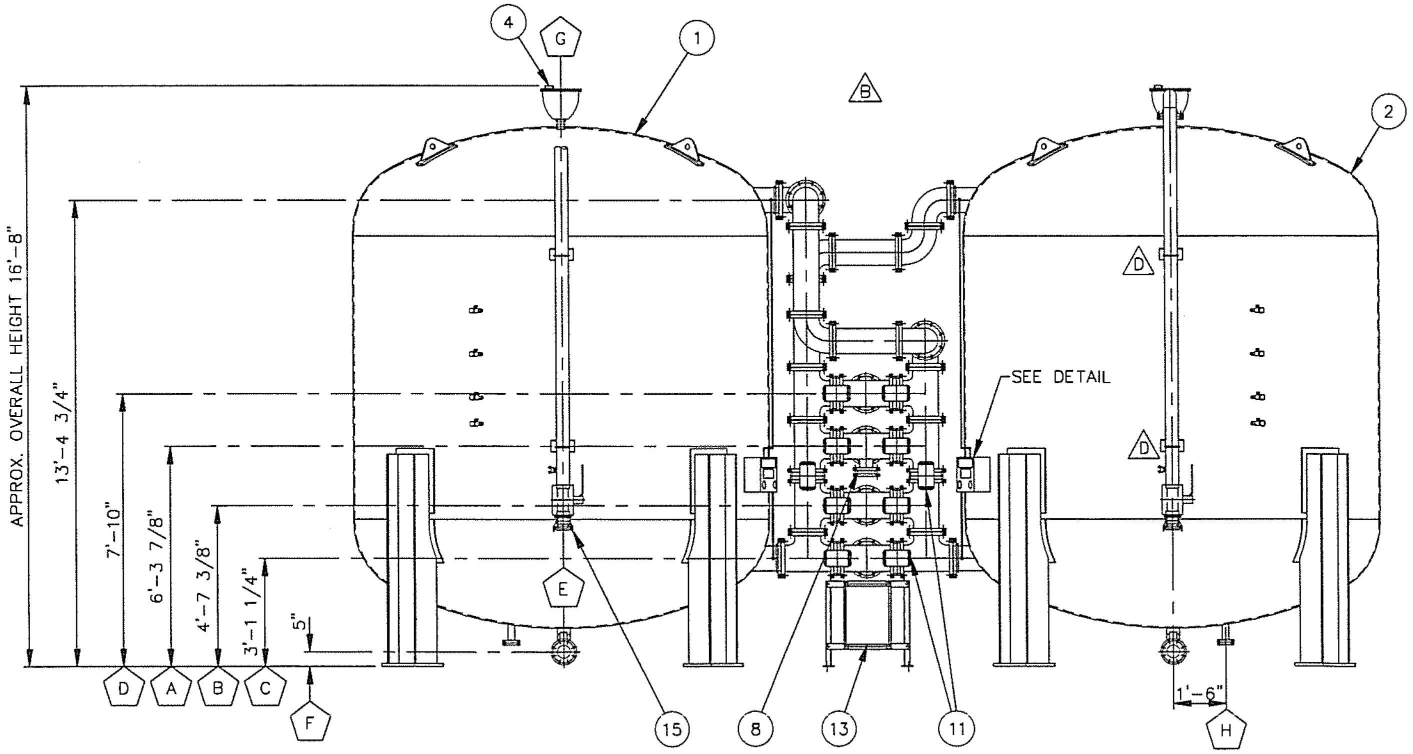


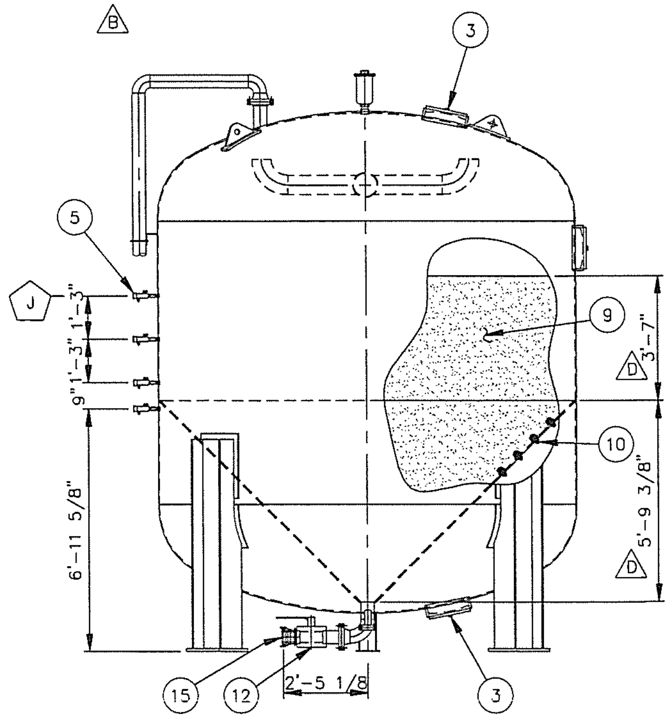
ASME CODE SPECIFICATIONS		
VESSEL TO BE CONSTRUCTED IN STRICT ACCORDANCE WITH THE LATEST EDITION OF THE ASME CODE SECTION VIII. DIV. I. FOR PRESSURE VESSELS AND IS TO BE SO STAMPED. COMPLETED VESSEL TO BE INSPECTED BY AN AUTHORIZED INSPECTOR.		
DESIGN DATA	MAX ALLOW WORKING PRESS. (PSIG)	75
	TEMPERATURE (°F)	120°
	WIND SPEED (MPH)	85
	SEISMIC ZONE	D
	SHIPPING WEIGHT LBS.	15,000
	DRY WEIGHT LBS.	52,000
	OPERATING WEIGHT LBS.	98,500



	ITEM	EQUIPMENT DESCRIPTION	MAT'L
	1	GAC CONTACTOR-1	STL
	2	GAC CONTACTOR-2	STL
	3	(3) MANWAYS 14" X 18" (PER TANK)	STL
	4	AIR RELEASE VALVE	CI
	5	(4) SAMPLE TAPS 1/2" (PER TANK)	–
	6	PRESSURE GAUGES (1-INLET, 1-OUTLET)	–
	7	DIFFERENTIAL PRESSURE SWITCH	–
	8	RUPTURE DISC 4"	–
	9	GRANULAR ACTIVATED CARBON (GAC)	–
	10	FILTER NOZZLES (264 PER TANK)	PP
A	11	(10) ACTUATED BUTTERFLY VALVES 8"	CI
	12	(2) BALL VALVES 4" (PER TANK)	SS
C A	13	PIPE SUPPORT & ELECTRICAL BOX	–
	14	NAME PLATE	STL
A	15	GLOBAL CAM QUICK CONNECT MALE END	SS

	NOZZLE	SIZE	NOZZLE SUMMARY
A	A	8"	INFLUENT NOZZLE
A	B	8"	EFFLUENT NOZZLE
A	C	8"	BACKWASH INLET NOZZLE
A	D	8"	BACKWASH OUTLET NOZZLE
	E	4"	MEDIA INLET
	F	4"	MEDIA OUTLET
	G	2"	AIR VACUUM RELEASE
	H	2"	DRAIN W/ BLIND FLANGE
	J	1/2"	(4) SAMPLE LINES





B A (SAMPLE TAPS ARE ROTATED FOR CLARITY)

NOTE:
1. WORK THIS DRAWING WITH B200, D202, D203, P&ID01, P&ID02, P&ID03, P&ID04, P&ID05.
A 2. ALL FLANGES TO BE 150 LB. F.F.S.O.
C 3. AIR SUPPLY TO VALVES BY OTHERS.

PROJECT: CITY OF SANTA MONICA, CALIFORNIA
CHARNOCK WELL FIELD RESTORATION PROJECT

PREPARED FOR: BLACK & VEATCH CONSTRUCTION, INC.
KANSAS CITY, MISSOURI

ENGINEER: BLACK & VEATCH CORPORATION
LOS ANGELES, CALIFORNIA

PREPARED BY: WESTECH ENGINEERING, INC.
SALT LAKE CITY, UTAH

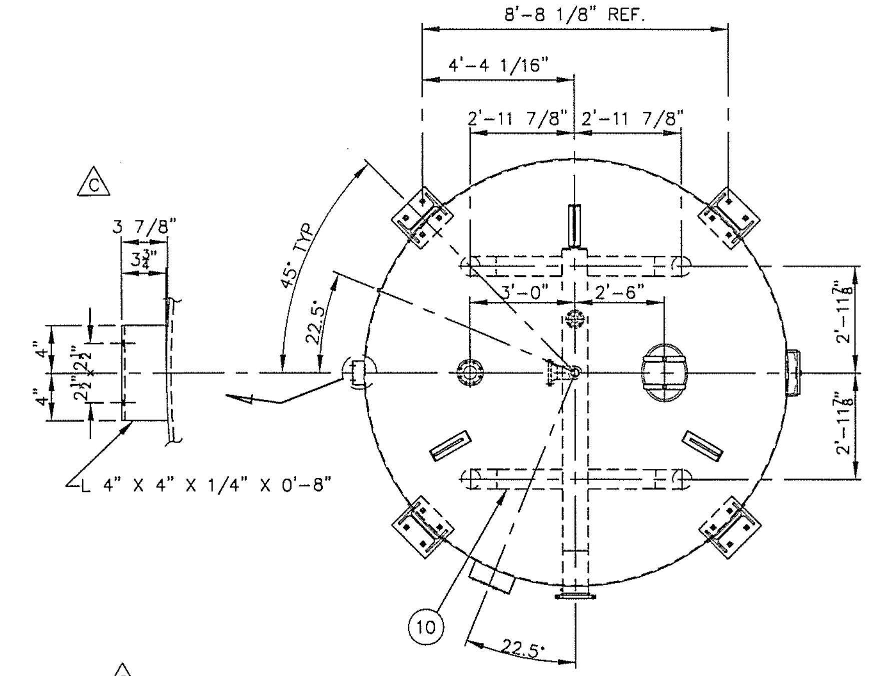
REVISION	BY	CHKD	DATE	LTR
REVISED LINES ON INSTRUMENT PANEL	AJ		6/7/10	E
ADDED PIPE SUPPORTS AND MEDIA DIMENSION	JEB	AJ	11/11/09	D
ADDED ELECTRICAL BOX & NOTE 3	JEB	AW	10/28/09	C
ROTATED TANKS 45 DEG. & MOVED DIMENSIONS	JEB	AW	10/22/09	B
REVISED AS PER CUSTOMER RETURN SUBMITTAL	JEB	AW	07/01/09	A

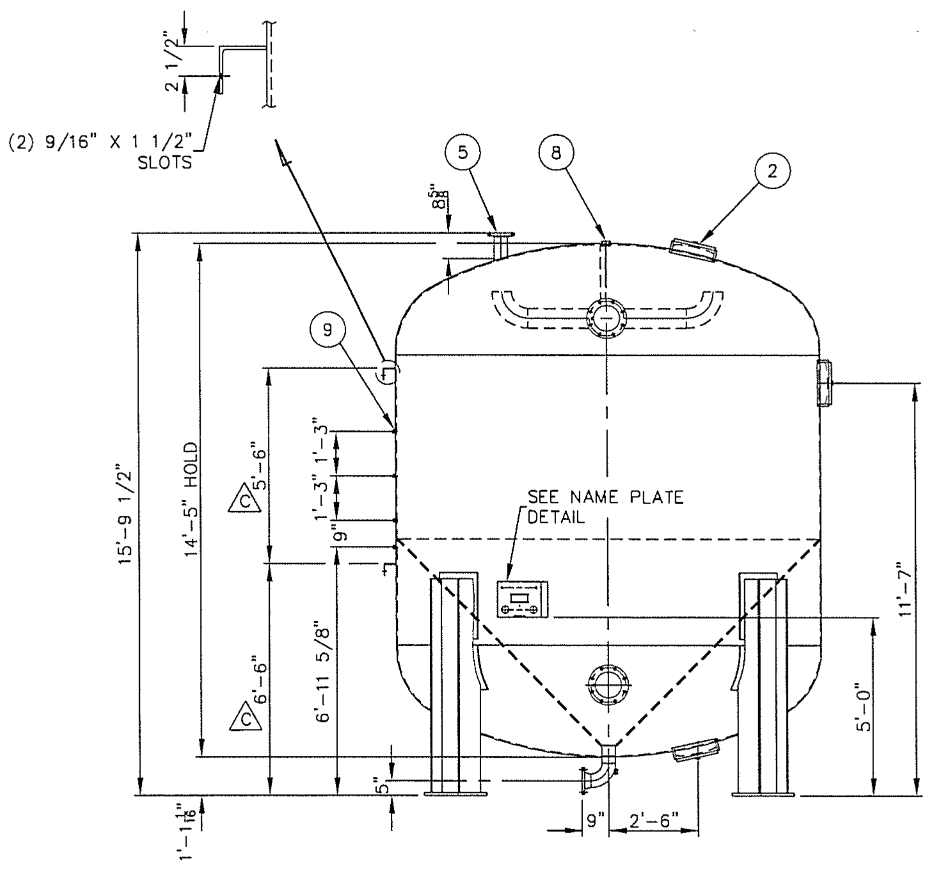
GENERAL ARRANGEMENT
DESCRIPTION
GAC CONTACTORS
MODEL
12'-0 DIA.
SIZE

DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD
				1/2"=1'-0	04/09	JEB	AJ	AW

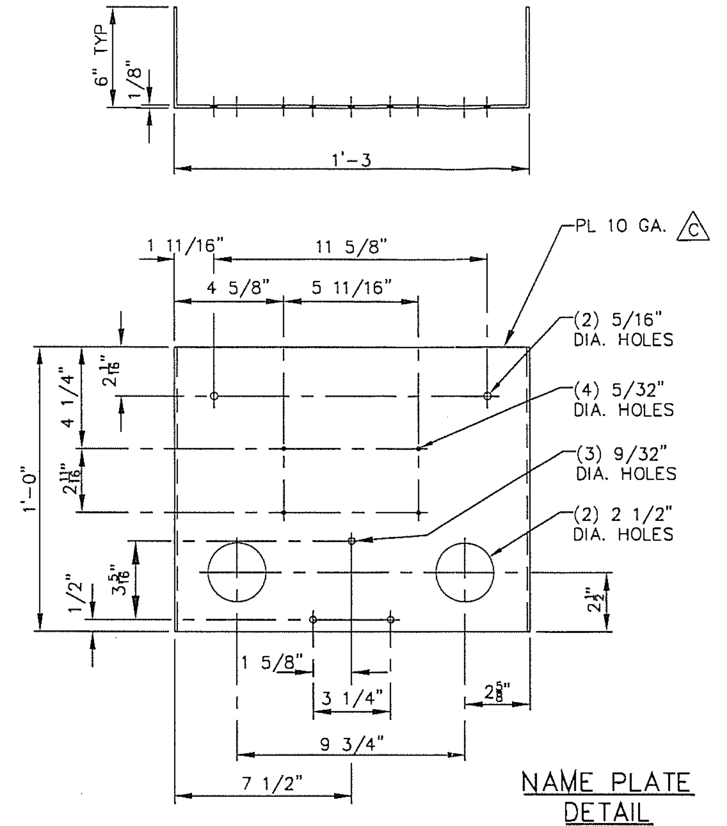
WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
D201	20742B	E

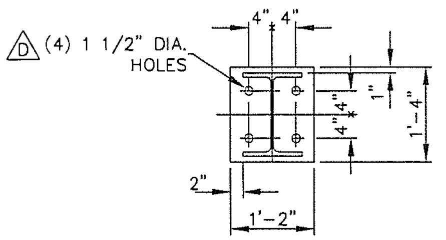




(ITEM 9 ROTATED FOR CLARITY)

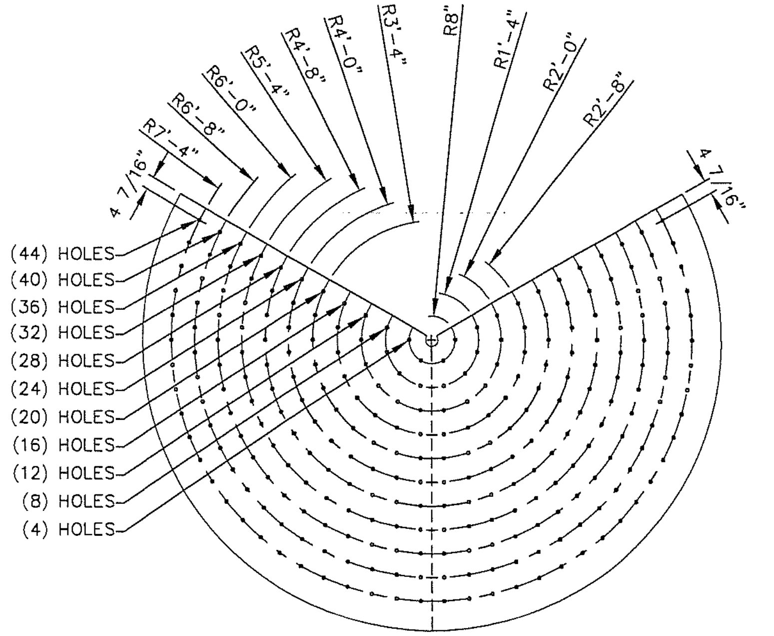


NAME PLATE DETAIL



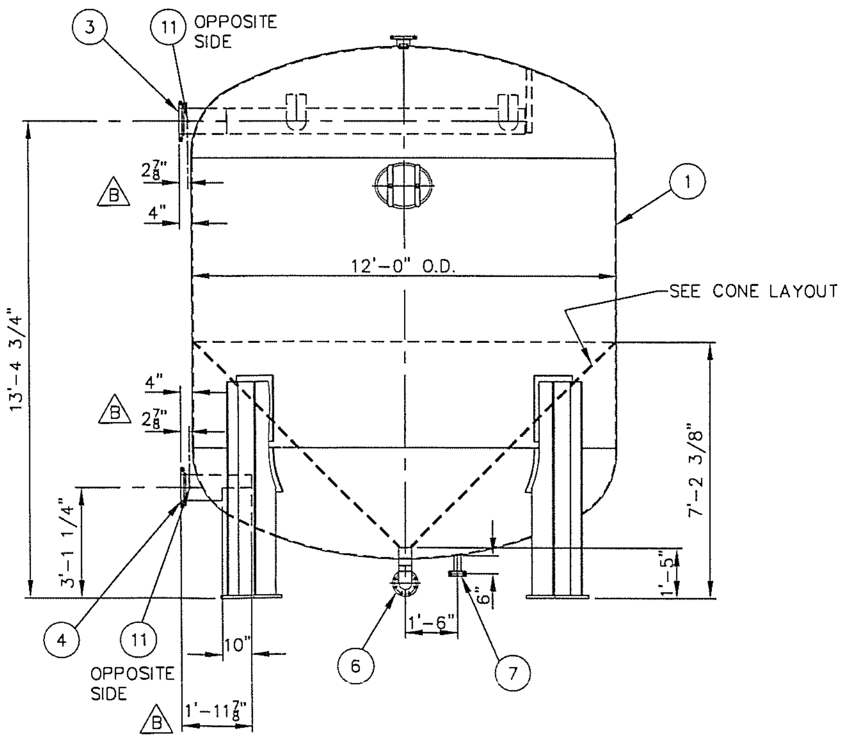
ANCHOR BOLT LAYOUT

ITEM		EQUIPMENT DESCRIPTION	MAT'L.
	①	GAC CONTACTOR	STL
△C	②	(3) MANWAYS 14" X 18" W/ GASKET & SS FASTENERS	STL
	③	8" INFLUENT/ BACKWASH OUTLET NOZZLE	STL
	④	8" EFFLUENT/ BACKWASH INLET NOZZLE	STL
	⑤	4" MEDIA INLET NOZZLE	STL
	⑥	4" MEDIA OULET NOZZLE	STL
△C	⑦	2" DRAIN NOZZLE W/ BLIND FLANGE, NEOPRENE GASKET & SS FASTENERS	STL
	⑧	2" HALF COUPLING	STL
	⑨	(4) 1/2" HALF COUPLING	STL
	⑩	(4) 6" LATERALS	SS
	⑪	(2) 1/4" HALF COUPLING	STL



CONE LAYOUT

(ALL HOLES ARE TO BE 1 1/8" DIA. &
EQUALLY SPACED ALONG CENTER LINES)



(TOP & BOTTOM MANWAY NOT
SHOWN IN THIS VIEW)

NOTE:
1. WORK THIS DRAWING WITH B200, D201, & D203.
2. LIFTING LUGS ARE ONLY SHOWN IN PLAN VIEW
3. LIFTING LUGS ARE TO BE FABRICATOR'S DESIGN & STD.
4. USE 2:1 ELLIPTICAL HEADS.

REVISION	BY	CHKD	DATE	LTR
CHANGED ANCHOR BOLT HOLE DIAMETER	JEB		11/25/09	△D
ADDED PIPE SUPPORTS AND NOTES	JEB	AJ	11/11/09	△C
CHANGED NOZZLE EXTRUSION	JEB	AW	10/20/09	△B
REVISED AS PER CUSTOMER RETURN SUBMITTAL	JEB	AW	07/28/09	△A

PROJECT: CITY OF SANTA MONICA, CALIFORNIA
CHARNOCK WELL FIELD RESTORATION PROJECT

PREPARED FOR: BLACK & VEATCH CONSTRUCTION, INC.
KANSAS CITY, MISSOURI

ENGINEER: BLACK & VEATCH CORPORATION
LOS ANGELES, CALIFORNIA

PREPARED BY: WESTECH ENGINEERING, INC.
SALT LAKE CITY, UTAH

GENERAL ARRANGEMENT–TANK 1
CESCRIPTION

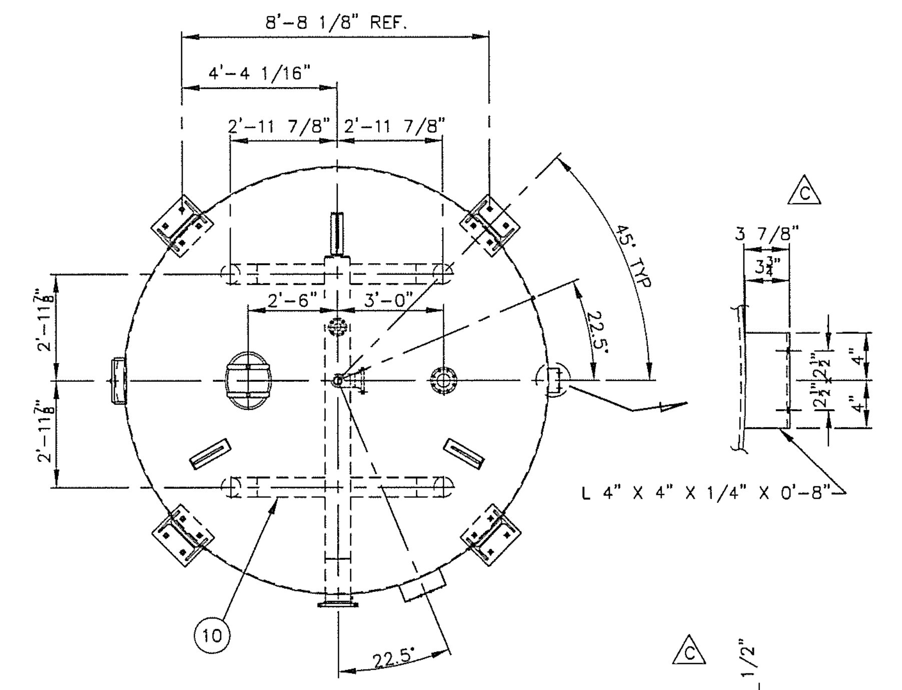
GAC CONTACTOR	12'–0 DIA.
MODEL	SIZE

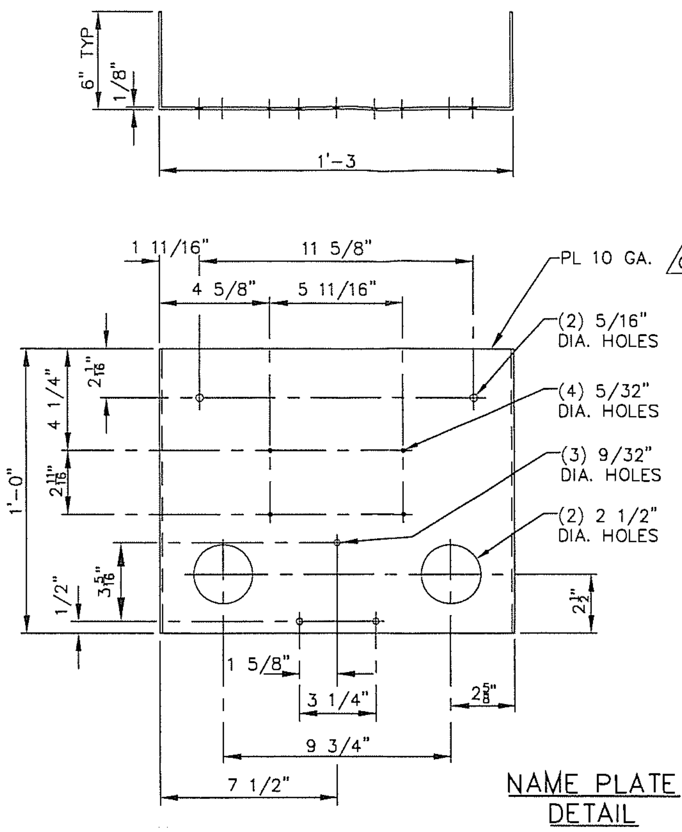
				1/2"=1'–0	04/09	JEB	AJ	AW
DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD

WESTECH

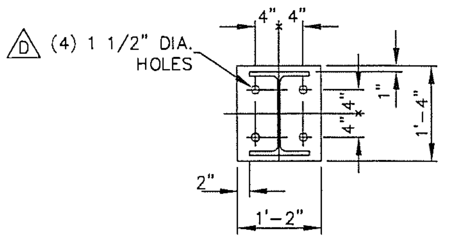
DRAWING NUMBER	PROJECT NUMBER	REV.
D202	20742B	△D

ITEM	EQUIPMENT DESCRIPTION	MAT'L
①	GAC CONTACTOR	STL
②	(3) MANWAYS 14" X 18" W/ GASKET & SS FASTENERS	STL
③	8" INFLUENT/ BACKWASH OUTLET NOZZLE	STL
④	8" EFFLUENT/ BACKWASH INLET NOZZLE	STL
⑤	4" MEDIA INLET NOZZLE	STL
⑥	4" MEDIA OULET NOZZLE	STL
⑦	2" DRAIN NOZZLE W/ BLIND FLANGE, NEOPRENE GASKET & SS FASTENERS	STL
⑧	2" HALF COUPLING	STL
⑨	(4) 1/2" HALF COUPLING	STL
⑩	(4) 6" LATERALS	SS
⑪	(2) 1/4" HALF COUPLING	STL

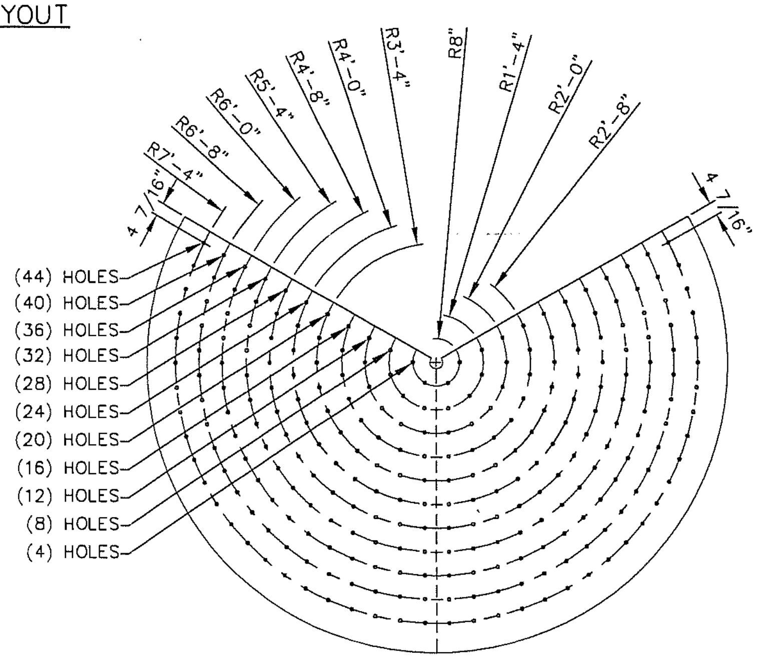




NAME PLATE DETAIL

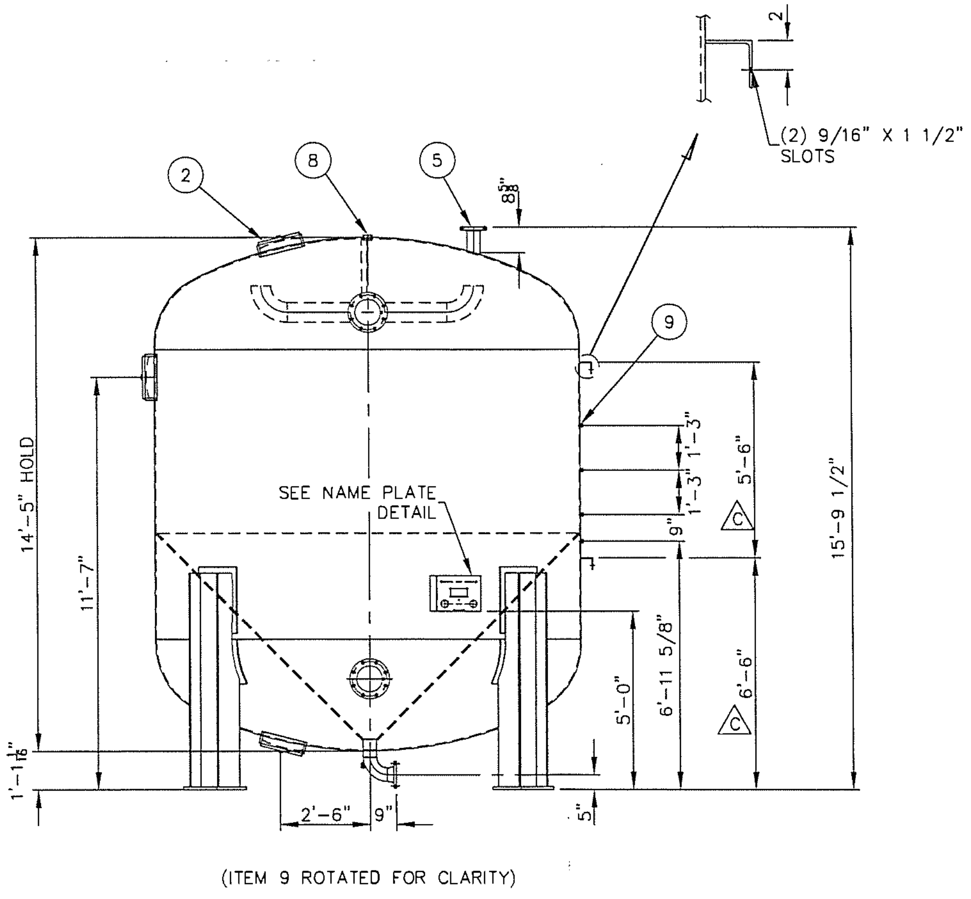


ANCHOR BOLT LAYOUT

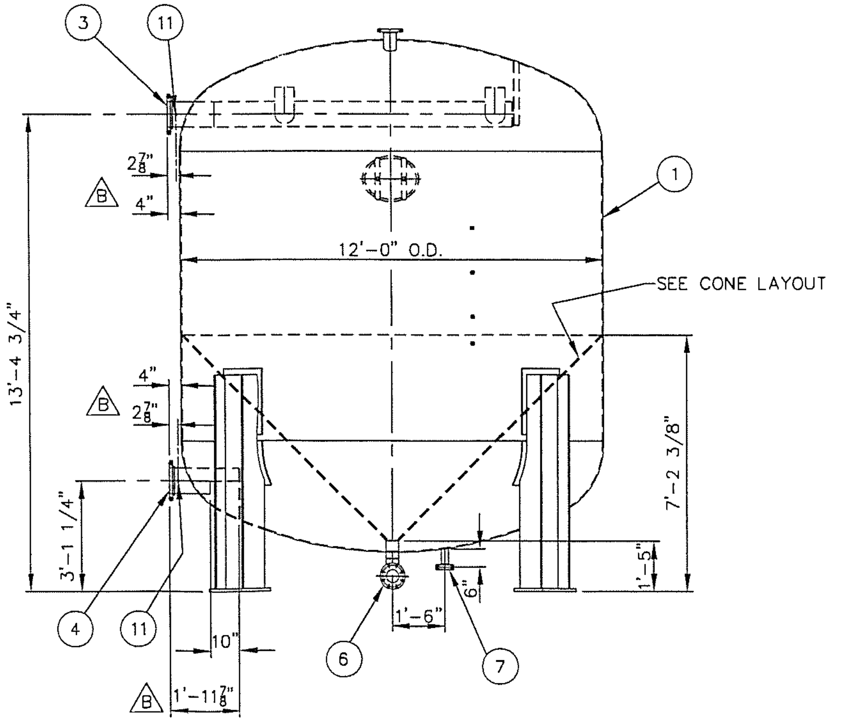


CONE LAYOUT

(ALL HOLES ARE TO BE 1 1/8" DIA. & EQUALLY SPACED ALONG CENTER LINES)



(ITEM 9 ROTATED FOR CLARITY)



(NAME PLATE NOT SHOWN IN THIS VIEW)

NOTE:
1. WORK THIS DRAWING WITH B200, D201, & D202.
2. LIFTING LUGS ARE ONLY SHOWN IN PLAN VIEW
3. LIFTING LUGS ARE TO BE FABRICATOR'S DESIGN & STD.
4. USE 2:1 ELLIPTICAL HEADS.

REVISION	BY	CHKD	DATE	LTR
CHANGED HOLE ANCHOR BOLT HOLE DIAMETER	JEB		11/25/09	D
ADDED PIPE SUPPORTS AND NOTE	JEB	AW	11/11/09	C
CHANGED NOZZLE EXTRUSION	JEB	AW	10/20/09	B
REVISED AS PER CUSTOMER RETURN SUBMITTAL	JEB	AW	07/28/09	A

PROJECT: CITY OF SANTA MONICA, CALIFORNIA
CHARNOCK WELL FIELD RESTORATION PROJECT

PREPARED FOR: BLACK & VEATCH CONSTRUCTION, INC.
KANSAS CITY, MISSOURI

ENGINEER: BLACK & VEATCH CORPORATION
LOS ANGELES, CALIFORNIA

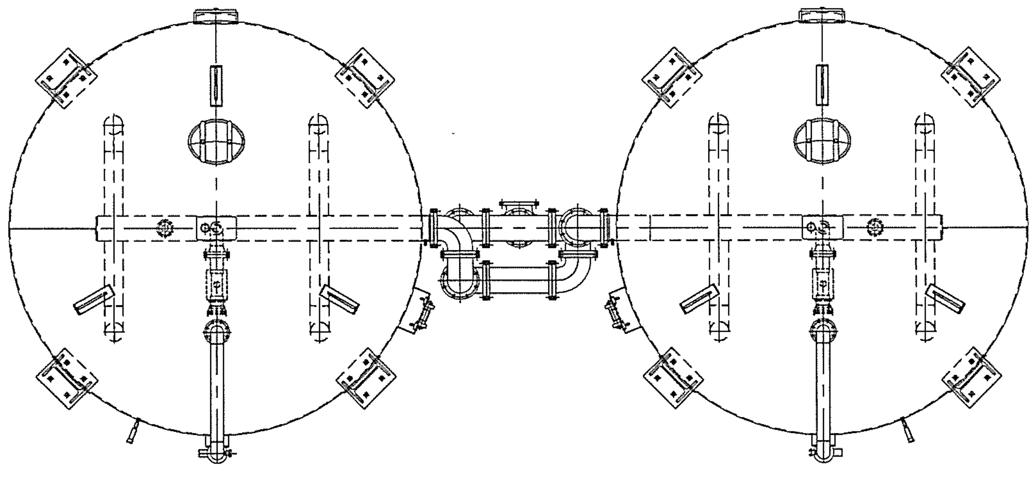
PREPARED BY: WESTECH ENGINEERING, INC.
SALT LAKE CITY, UTAH

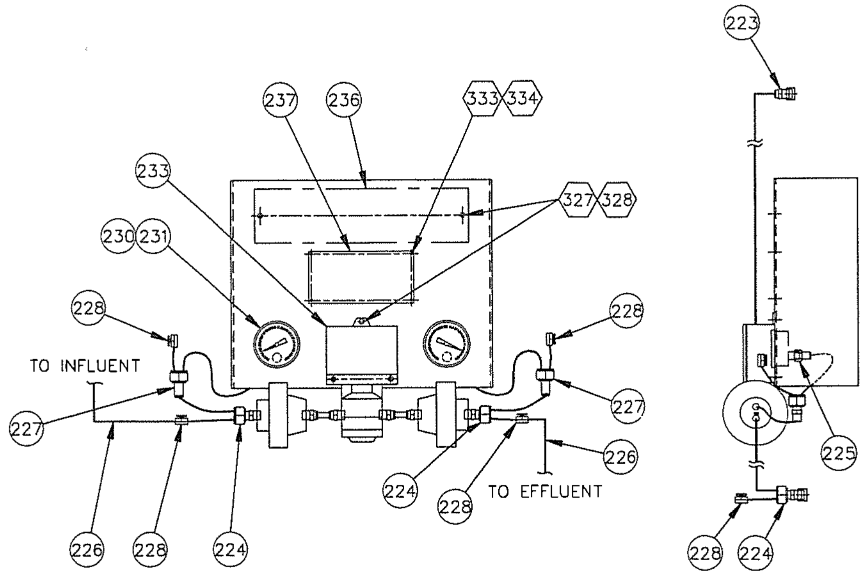
GENERAL ARRANGEMENT-TANK 2
DESCRIPTION
GAC CONTACTOR 12'-0 DIA.
MODEL SIZE

DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD
				1/2"=1'-0	04/09	JEB	AJ	AW

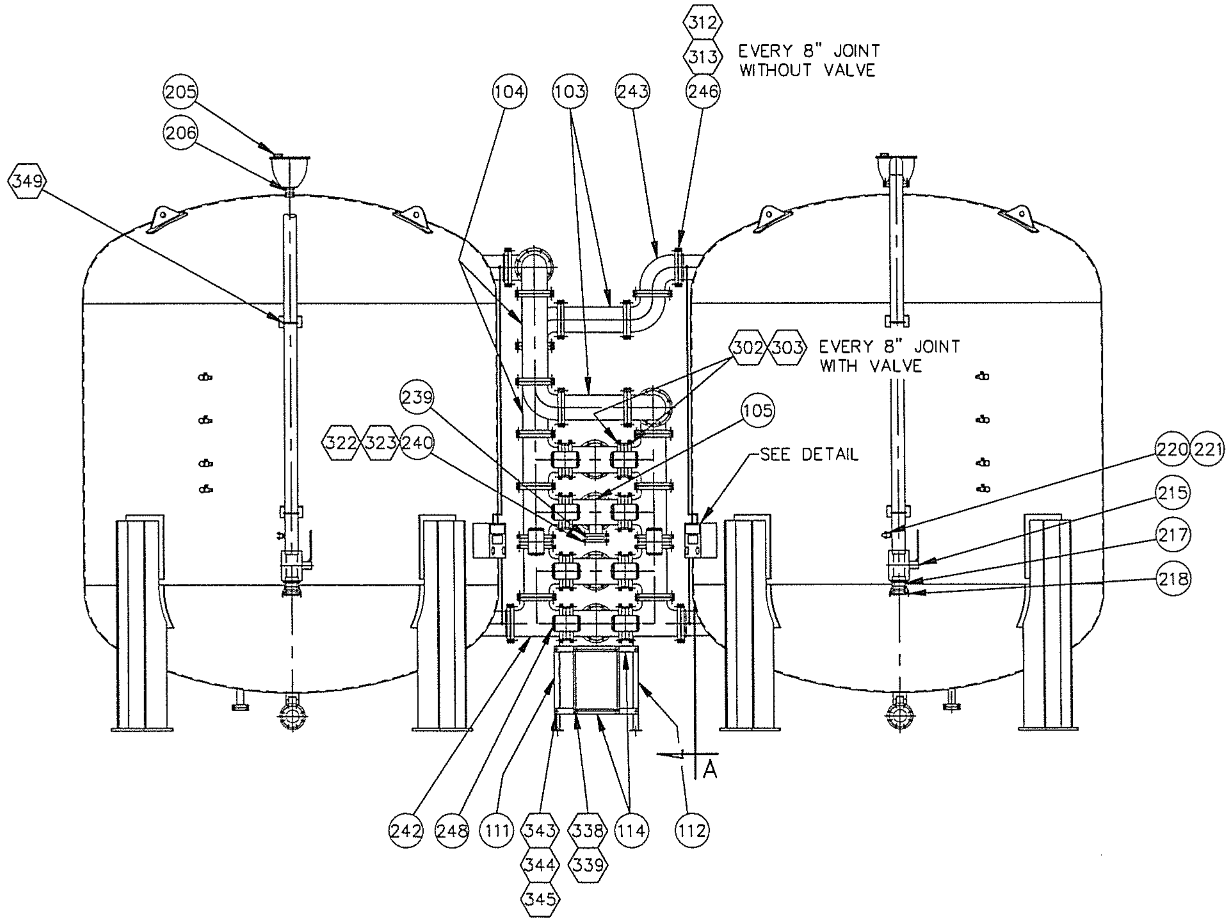
WESTECH

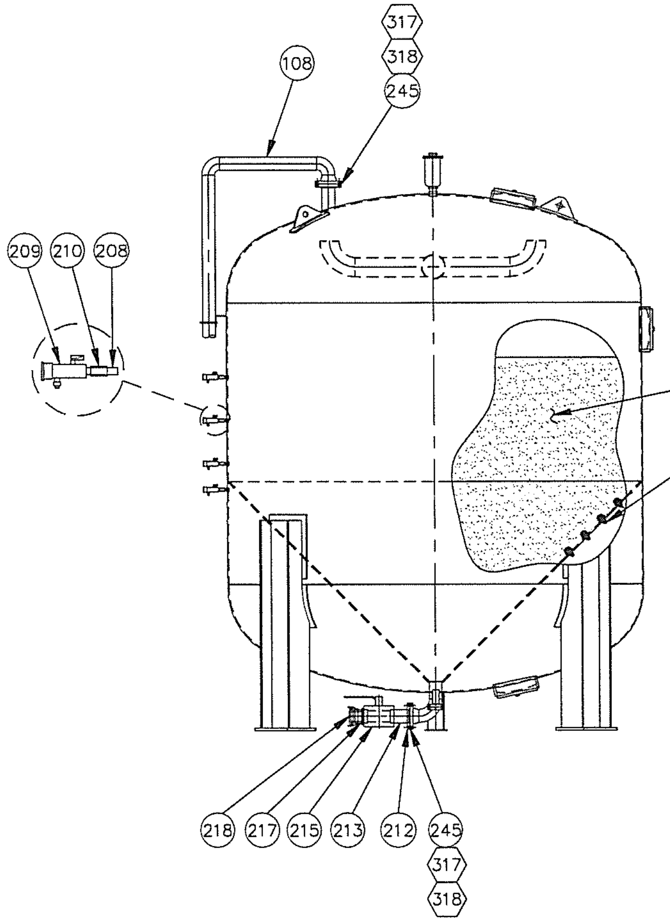
DRAWING NUMBER	PROJECT NUMBER	REV.
D203	20742B	D

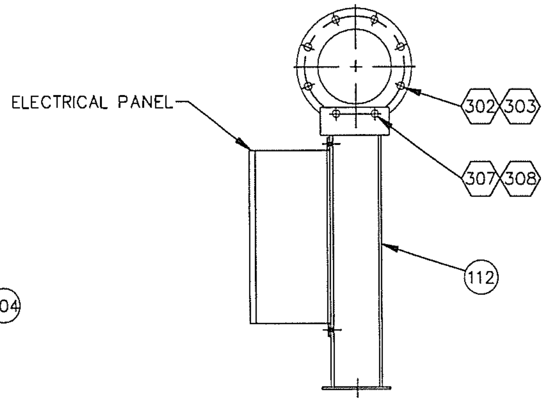




△ INSTRUMENT PANEL DETAIL







SECTION A

NOTE:
1. WORK THIS DRAWING WITH THE GENERAL ARRANGEMENT DRAWINGS AND THE PARTS LIST.

CHANGED PRESSURE GAUGE LINE LAYOUT	JEB		06/02/10	△A
REVISION	BY	CHKD	DATE	LTR

BACKCHARGES FOR FIELD WORK OF ANY KIND ARE NOT ACCEPTABLE WITHOUT PRIOR WRITTEN AUTHORIZATION BY WESTECH ENGINEERING, INC.

GAC CONTACTOR ASSEMBLY
DESCRIPTION

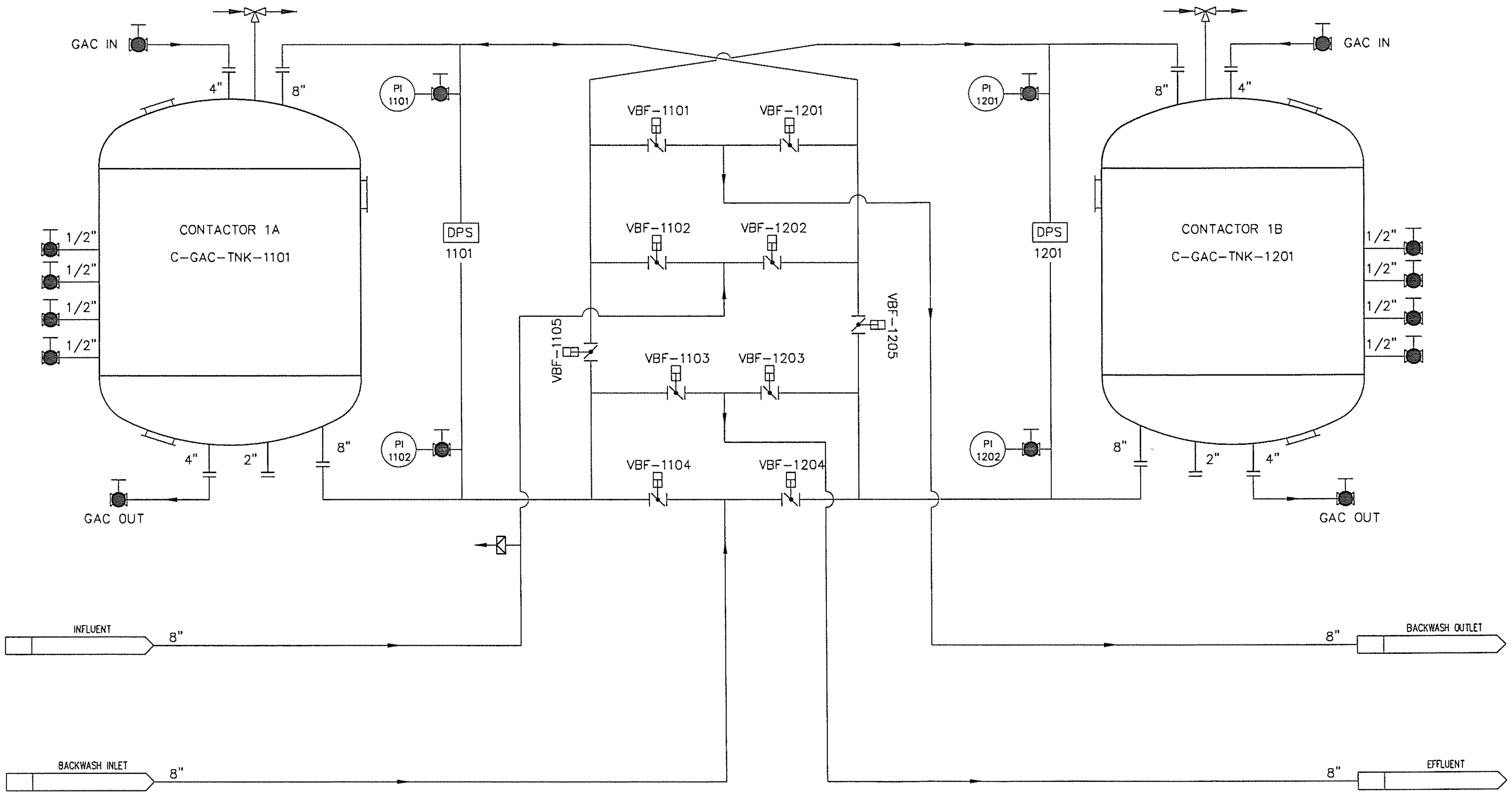
GAC CONTACTORS — TYPE
12'-0 DIA. — SIZE

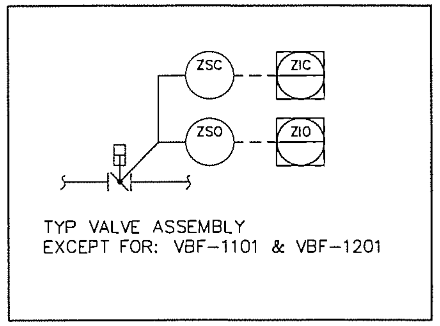
DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD
				3/8" =1'-0	11/09	JEB	AW	AW

ALL COMPONENTS MUST BE FABRICATED AND MACHINED ACCORDING TO WESTECH STANDARD SPECIFICATION (DRAWING P24Z-024A), UNLESS SPECIFICALLY NOTED ON THIS DRAWING.

WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
D210	20742B	△A





TYP VALVE ASSEMBLY
EXCEPT FOR: VBF-1101 & VBF-1201

CHARNOCK GAC TRAIN 1

NOTE:
1. WORK THIS DRAWING WITH D200, & D201.

PROJECT: CITY OF SANTA MONICA, CALIFORNIA
CHARNOCK WELL FIELD RESTORATION PROJECT

PREPARED FOR: BLACK & VEATCH CONSTRUCTION, INC.
KANSAS CITY, MISSOURI

ENGINEER: BLACK & VEATCH CORPORATION
LOS ANGELES, CALIFORNIA

PREPARED BY: WESTECH ENGINEERING, INC.
SALT LAKE CITY, UTAH

PIPING & INSTRUMENTATION DIAGRAM
DESCRIPTION
GAC CONTACTORS
MODEL
12'-0 DIA.
SIZE 1 x 1

				NONE	04/09	JEB	AJ	AW
DATE	STD. BY	STD.CHKD.	STD.APPVD	SCALE	DATE	PROJ. BY	PROJ.CHKD.	PROJ.APPVD

				D
				C
				B
REVISED AS PER CUSTOMER RETURN SUBMITTAL	JEB		08/06/09	A
REVISION	BY	CHKD	DATE	LTR

WESTECH

DRAWING NUMBER	PROJECT NUMBER	REV.
P&ID01	20742B	A

5

Appendix M

Treatment Plant Classification Worksheet

TREATMENT PLANT AND OPERATOR CLASSIFICATION

System Name: City of Santa Monica
System No.: 1910146
Reviewing Engineer: Milagros Alora
Date of Classification: July 23, 2010
Facility Name: Charnock Water Treatment Plant (CWTP)
Plant Capacity: 5,000 gpm (

Section 64413.1. Water Treatment Facilities Classification

Total Points	Class
Less than 20	T1
20 through 39	T2
40 through 59	T3
60 through 79	T4
80 or more	T5

Total Points: 57
Treatment Facility Class: T3
Minimum Chief Operator Grade: T3
Minimum Shift Operator Grade: T2

Instructions:

For Nos. 1-4, 6, and 10-11, enter "1" in the value box if the description applies. Otherwise, leave blank. For Nos. 5, 7-9, and 12, enter in the value box the number of treatment processes the description applies to. For No. 13, enter in the value box the maximum capacity of the treatment facility in MGD (enter "50" under calculations if result is over 50).

1) Type of source water used by the facility	**Points**	**Value**	**Calculation**
Groundwater and/or purchased treated water meeting primary and secondary drinking water standards, as defined in section 116275 of the Health and Safety Code	2	1	2
Water that includes any surface water or groundwater under the direct influence of surface water	5		0
2) Median Coliform Density Most Probable Number Index	**Points**	**Value**	**Calculation**
less than 1 per 100 mL	0		0
1 through 100 per 100 mL	2		0
greater than 100 through 1,000 per 100 mL	4		0
greater than 1,000 through 10,000 per 100 mL	6		0
greater than 10,000 per 100 mL	8		0
3) Maximum Influent Turbidity Level Nephelometric Turbidity Units (NTU)	**Points**	**Value**	**Calculation**
Less than 15	0		0
15 through 100	2		0
Greater than 100	5		0
4) Nitrate and Nitrite Data Average	**Points**	**Value**	**Calculation**
Less than or equal to the maximum contaminant level (MCL), as	0	5	0
Greater than the MCL	5		0
5) Contaminant Data Average	**Points**	**Value**	**Calculation**
Less than or equal to the MCL	0		0
for each contaminant greater than the MCL	2	3	6
for each contaminant 5 times the MCL or greater	5	1	5
6) Surface Water Filtration Treatment	**Points**	**Value**	**Calculation**
Conventional, direct, or inline	15		0
Diatomaceous earth	12		0
Slow sand, membrane, cartridge, or bag filter	8		0
Backwash recycled as part of process	5		0

TREATMENT PLANT AND OPERATOR CLASSIFICATION

7) Other Treatment Process for Primary MCL Reduction	**Points**	**Value**	**Calculation**
each treatment process utilitized not included in No. 6 used to reduce the concentration of one or more contaminants with a primary MCL (including blending)	10	2	20
8) Other Treatment Process for Secondary MCL Reduction	**Points**	**Value**	**Calculation**
each treatment process utilitized not included in No. 6 or No. 7 used to reduce the concentration of one or more contaminants with a secondary MCL (including blending)	3	1	3
9) Corrosion Control or Fluoridation	**Points**	**Value**	**Calculation**
each treatment process utilitized not included in No. 6, No. 7, or No. 8 used for corrosion control or fluoridation	3		0
10) Disinfection Treatment Process with Inactivation Credit	**Points**	**Value**	**Calculation**
Ozone	10		0
Chlorine and/or chloramine	10		0
Chlorine dioxide	10		0
Ultra violet (UV)	7		0
11) Disinfection/Oxidation Treatment Process without Inactivation Credit	**Points**	**Value**	**Calculation**
Ozone	5		0
Chlorine and/or chloramine	5	1	5
Chlorine dioxide	5		0
Ultra violet (UV)	3		0
Other oxidants	5		0
12) any other treatment process that alters the physical or chemical characteristics of drinking water not included in Nos. 6, 7, 8, 9, 10, or 11	**Points** 3	**Value**	**Calculation** 0
13) Facility Flow	**Points**	**Value**	**Calculation**
2 per MGD or fraction of maximum permitted treatment facility capacity, maximum of 50 points	2	8	16
TOTAL POINTS			**57**
TREATMENT FACILITY CLASSIFICATION			**T3**

Five groundwater wells (CH-13, CH-15, CH-16, CH-18, and CH-19)
(5)1,1-DCE; Uranium; > MCL / TCE 5x MCL
(7) GAC and Blending at Filtered Water Tank
(8) Greensand Filtration
(11) Chlorination without Inactivation

TREATMENT PLANT AND OPERATOR CLASSIFICATION

System Name: City of Santa Monica
System No.: 1910146
Reviewing Engineer: Milagros Alora
Date of Classification: July 23, 2010
Facility Name: Arcadia Water Treatment Plant (AWTP)
Plant Capacity: 5,000 gpm (

Section 64413.1. Water Treatment Facilities Classification

Total Points	Class
Less than 20	T1
20 through 39	T2
40 through 59	T3
60 through 79	T4
80 or more	T5

Total Points: 70
Treatment Facility Class: T4
Minimum Chief Operator Grade: T4
Minimum Shift Operator Grade: T3

Instructions:

For Nos. 1-4, 6, and 10-11, enter "1" in the value box if the description applies. Otherwise, leave blank. For Nos. 5, 7-9, and 12, enter in the value box the number of treatment processes the description applies to. For No. 13, enter in the value box the maximum capacity of the treatment facility in MGD (enter "50" under calculations if result is over 50).

1) Type of source water used by the facility	**Points**	**Value**	**Calculation**
Groundwater and/or purchased treated water meeting primary and secondary drinking water standards, as defined in section 116275 of the Health and Safety Code	2	1	2
Water that includes any surface water or groundwater under the direct influence of surface water	5		0
2) Median Coliform Density Most Probable Number Index	**Points**	**Value**	**Calculation**
less than 1 per 100 mL	0		0
1 through 100 per 100 mL	2		0
greater than 100 through 1,000 per 100 mL	4		0
greater than 1,000 through 10,000 per 100 mL	6		0
greater than 10,000 per 100 mL	8		0
3) Maximum Influent Turbidity Level Nephelometric Turbidity Units (NTU)	**Points**	**Value**	**Calculation**
Less than 15	0		0
15 through 100	2		0
Greater than 100	5		0
4) Nitrate and Nitrite Data Average	**Points**	**Value**	**Calculation**
Less than or equal to the maximum contaminant level (MCL), as	0	1	0
Greater than the MCL	5		0
5) Contaminant Data Average	**Points**	**Value**	**Calculation**
Less than or equal to the MCL	0		0
for each contaminant greater than the MCL	2	3	6
for each contaminant 5 times the MCL or greater	5		0
6) Surface Water Filtration Treatment	**Points**	**Value**	**Calculation**
Conventional, direct, or inline	15		0
Diatomaceous earth	12		0
Slow sand, membrane, cartridge, or bag filter	8		0
Backwash recycled as part of process	5		0

TREATMENT PLANT AND OPERATOR CLASSIFICATION

7) Other Treatment Process for Primary MCL Reduction	**Points**	**Value**	**Calculation**
each treatment process utilitized not included in No. 6 used to reduce the concentration of one or more contaminants with a primary MCL (including blending)	10	2	20
8) Other Treatment Process for Secondary MCL Reduction	**Points**	**Value**	**Calculation**
each treatment process utilitized not included in No. 6 or No. 7 used to reduce the concentration of one or more contaminants with a secondary MCL (including blending)	3	2	6
9) Corrosion Control or Fluoridation	**Points**	**Value**	**Calculation**
each treatment process utilitized not included in No. 6, No. 7, or No. 8 used for corrosion control or fluoridation	3	2	6
10) Disinfection Treatment Process with Inactivation Credit	**Points**	**Value**	**Calculation**
Ozone	10		0
Chlorine and/or chloramine	10	1	10
Chlorine dioxide	10		0
Ultra violet (UV)	7		0
11) Disinfection/Oxidation Treatment Process without Inactivation Credit	**Points**	**Value**	**Calculation**
Ozone	5		0
Chlorine and/or chloramine	5		0
Chlorine dioxide	5		0
Ultra violet (UV)	3		0
Other oxidants	5		0
12) any other treatment process that alters the physical or chemical characteristics of drinking water not included in Nos. 6, 7, 8, 9, 10, or 11	**Points**	**Value**	**Calculation**
	3		0
13) Facility Flow	**Points**	**Value**	**Calculation**
2 per MGD or fraction of maximum permitted treatment facility capacity, maximum of 50 points	2	10	20
TOTAL POINTS			**70**
TREATMENT FACILITY CLASSIFICATION			**T4**

Four groundwater wells (SM-3, SM-4 , AR-4, AR-5)
(5)TCE, PCE, CTC
(7) MSA and Blending
(8) Filtration and RO
(9) Decarbonation and Fluoridation
(13) Plant Design Capacity: Charnock + Arcadia = 7,000 gpm = 10MGD

Appendix N

Vulnerability Assessment and Monitoring Frequency Table

CALIFORNIA DEPARTMENT OF PUBLIC HEALTH, DRINKING WATER FIELD OPERATIONS BRANCH

Vulnerability Assessment and Monitoring Frequency Guidelines

Source Class Code: LGLB, Community Water System, Groundwater, Population > 3300

Monitoring Period: January 1, 2011 to December 31, 2013

System No. «SYS_NO» - «SYS_NAME»

INORGANIC CHEMICALS Table 64431-A	MCL (mg/L)	Vulnerability	Monitoring Frequency
Aluminum (See Also Secondary Standards)	1.	N/A	Every Three Years
Antimony	0.006	N/A	Every Three Years
Arsenic	0.010	N/A	Every Three Years
Asbestos	7 MFL*	Non-Vulnerable	Waived
Barium	1.	N/A	Every Three Years
Beryllium	0.004	N/A	Every Three Years
Cadmium	0.005	N/A	Every Three Years
Chromium	0.05	N/A	Every Three Years
Cyanide	0.15	Vulnerable	Every Three Years
Fluoride	2.0	N/A	Every Three Years
Mercury	0.002	N/A	Every Three Years
Nickel	0.1	N/A	Every Three Years
Nitrate (as NO_3)	45.	N/A	Annually if < 1/2 MCL Quarterly if ≥ 1/2 MCL but ≤ MCL
Nitrite (as Nitrogen)	1.0	N/A	Every Three Years if < 1/2 MCL Quarterly if ≥ 1/2 MCL but ≤ MCL
Perchlorate	0.006	N/A	Every Three Years Annually if required to do so in previous period** Quarterly if ≥ DLR but ≤ MCL
Selenium	0.05	N/A	Every Three Years
Thallium	0.002	N/A	Every Three Years

*MFL - Million fibers per liter; MCL for fibers exceeding 10 um in length

**In the last period, the Department required some sources to have annual monitoring due to known contamination. The attached Perchlorate Table serves as a reminder of which sources need annual perchlorate monitoring. You do not need to conduct annual monitoring if a Perchlorate Table is not attached.

GENERAL MINERAL **Section 64449 (b)(2)**	**MCL (mg/L)**	**Vulnerability**	**Monitoring Frequency**
Bicarbonate Alkalinity	---	N/A	Every Three Years
Calcium	---	N/A	Every Three Years
Carbonate Alkalinity	---	N/A	Every Three Years
Hydroxide Alkalinity	---	N/A	Every Three Years
Magnesium	---	N/A	Every Three Years
Sodium	---	N/A	Every Three Years
Total Hardness	---	N/A	Every Three Years
pH	---	N/A	Every Three Years
SECONDARY STANDARDS **Tables 64449-A**	**MCL (mg/L)**	**Vulnerability**	**Monitoring Frequency**
Aluminum	0.2 mg/L	N/A	Every Three Years
Color	15 Units	N/A	Every Three Years
Copper	1.0 mg/L	N/A	Every Three Years
Foaming Agents (MBAS)	0.5 mg/L	N/A	Every Three Years
Iron	0.3 mg/L	N/A	Every Three Years
Manganese	0.05 mg/L	N/A	Every Three Years
Odor - Threshold	3 Units	N/A	Every Three Years
Silver	0.1 mg/L	N/A	Every Three Years
Thiobencarb	0.001 mg/L	N/A	Follow monitoring requirement in Table 64444-A Part (b)
Turbidity	5 NTU	N/A	Every Three Years
Zinc	5.0 mg/L	N/A	Every Three Years
Methyl-*tert*-butyl ether (MTBE)	0.005 mg/L	N/A	Follow monitoring requirement in Table 64444-A Part (a)
SECONDARY STANDARDS **Tables 64449-B**	**MCL (mg/L)**	**Vulnerability**	**Monitoring Frequency**
Total Dissolved Solids (TDS)	500-1000 mg/L	N/A	Every Three Years
Specific Conductance	900 - 1600 umhos	N/A	Every Three Years
Chloride	250-500 mg/L	N/A	Every Three Years
Sulfate	250-500 mg/L	N/A	Every Three Years
RADIONUCLIDES **Sections 64442 and 64443**	**MCL (pCi/L)**	**Vulnerability**	**Monitoring Frequency**
Gross Alpha Particle Activity	15	Based on your last round of monitoring results • < DLR, collect 1 sample in 9 years • ≥ DLR but ≤ 1/2 MCL, collect 1 sample in 6 years • > 1/2 MCL but ≤ MCL, collect 1 sample in 3 years Please refer to the most recent CDPH letter regarding radionuclide monitoring for your sources.	
Combined Radium-226 and Radium-228	5		
Uranium	20		
Tritium	20,000	Non-Vulnerable, unless notified by CDPH	Waived, unless notified by CDPH
Strontium	8		
Beta/photon emitters	4 millirem/year		

VOLATILE ORGANIC CHEMICALS (VOCs) Table 64444-A Part (a)	**MCL (mg/L)**	**Vulnerability**	**Monitoring Frequency**
Benzene	0.001	Vulnerable	**Annually** **Quarterly if ≥ DLR but ≤ MCL** **Monthly if > MCL**
Carbon Tetrachloride	0.0005	Vulnerable	As Above
1,2-Dichlorobenzene	0.6	Vulnerable	As Above
1,4-Dichlorobenzene	0.005	Vulnerable	As Above
1,1-Dichloroethane	0.005	Vulnerable	As Above
1,2-Dichloroethane	0.0005	Vulnerable	As Above
1,1-Dichloroethylene	0.006	Vulnerable	As Above
cis-1,2-Dichloroethylene	0.006	Vulnerable	As Above
trans-1,2-Dichloroethylene	0.01	Vulnerable	As Above
Dichloromethane	0.005	Vulnerable	As Above
1,2-Dichloropropane	0.005	Vulnerable	As Above
1,3-Dichloropropene	0.0005	Vulnerable	As Above
Ethylbenzene	0.3	Vulnerable	As Above
Methyl-*tert*-butyl ether (MTBE)	0.013	Vulnerable	As Above
Monochlorobenzene	0.07	Vulnerable	As Above
Styrene	0.1	Vulnerable	As Above
1,1,2,2-Tetrachloroethane	0.001	Vulnerable	As Above
Tetrachloroethylene	0.005	Vulnerable	As Above
Toluene	0.15	Vulnerable	As Above
1,2,4-Trichlorobenzene	0.005	Vulnerable	As Above
1,1,1-Trichloroethane	0.200	Vulnerable	As Above
1,1,2-Trichloroethane	0.005	Vulnerable	As Above
Trichlorofluoromethane	0.15	Vulnerable	As Above
1,1,2-Trichloro-1,2,2-trifluoroethane	1.2	Vulnerable	As Above
Trichloroethylene	0.005	Vulnerable	As Above
Vinyl Chloride	0.0005	Vulnerable	As Above
Xylenes	1.750	Vulnerable	As Above

SYNTHETIC ORGANIC CHEMICALS (SOCs) Table 64444-A Part (b)	MCL (mg/L)	Vulnerability	Monitoring Frequency
Alachlor	0.002	Vulnerable	Two consecutive quarters every 3 years
Atrazine	0.001	Vulnerable	Two consecutive quarters every 3 years
Bentazon	0.018	Vulnerable	Two consecutive quarters every 3 years
Benzo (a) pyrene	0.0002	Non-Vulnerable	Waived
Carbofuran	0.018	Vulnerable	Two consecutive quarters every 3 years
Chlordane	0.0001	Vulnerable	Two consecutive quarters every 3 years
2,4-D	0.07	Vulnerable	Two consecutive quarters every 3 years
Dalapon	0.2	Non-Vulnerable	Waived
1,2-Dibromo-3-chloropropane (DBCP)	0.0002	Vulnerable	Two consecutive quarters every 3 years
Di (2-ethylhexyl) adipate	0.4	Non-Vulnerable	Waived
Di (2-ethylhexyl) phthalate (DEHP)	0.004	Vulnerable	Two consecutive quarters every 3 years
Dinoseb	0.007	Vulnerable	Two consecutive quarters every 3 years
Diquat	0.02	Vulnerable	Two consecutive quarters every 3 years
Endothall	0.1	Vulnerable	Two consecutive quarters every 3 years
Endrin	0.002	Vulnerable	Two consecutive quarters every 3 years
Ethylene Dibromide (EDB)	0.00005	Vulnerable	Two consecutive quarters every 3 years
Glyphosate	0.7	Vulnerable	Two consecutive quarters every 3 years
Heptachlor	0.00001	Non-Vulnerable	Waived
Heptachlor Epoxide	0.00001	Non-Vulnerable	Waived
Hexachlorobenzene	0.001	Non-Vulnerable	Waived
Hexachlorocyclopentadiene	0.05	Non-Vulnerable	Waived
Lindane	0.0002	Vulnerable	Two consecutive quarters every 3 years
Methoxychlor	0.03	Vulnerable	Two consecutive quarters every 3 years
Molinate	0.02	Non-Vulnerable	Waived
Oxamyl (Vydate)	0.05	Vulnerable	Two consecutive quarters every 3 years
Pentachlorophenol	0.001	Vulnerable	Two consecutive quarters every 3 years
Picloram	0.5	Non-Vulnerable	Waived
Polychlorinated Biphenyls (PCBs)	0.0005	Non-Vulnerable	Waived
Simazine	0.004	Vulnerable	Two consecutive quarters every 3 years
Thiobencarb	0.07	Vulnerable	Two consecutive quarters every 3 years
Toxaphene	0.003	Vulnerable	Two consecutive quarters every 3 years
2,3,7,8-TCDD (Dioxin)	3x10-8	Non-Vulnerable	Waived
2,4,5-TP (Silvex)	0.05	Non-Vulnerable	Waived

Appendix O

CEQA Documents

CITY OF SANTA MONICA
PLANNING AND COMMUNITY DEVELOPMENT DEPARTMENT
City Hall, 1685 Main Street, Room 212, Santa Monica, California 90401-3295

NOTICE OF DETERMINATION

TO: (x) Office of Planning and Research
1400 Tenth Street, Room 121
Sacramento, California 95814

(x) County Clerk
County of Los Angeles
12400 East Imperial Highway
Norwalk, CA 90650

FROM: Planning and Community
Development Department
City of Santa Monica
P.O. Box 2200
Santa Monica, CA 90406

SUBJECT: Filing of Notice of Determination in compliance with Section 21108 or 21152, Public Resources Code, and Resolution 6694 (CCS) of the City of Santa Monica.

PROJECT TITLE: Charnock Well Field Restoration Project
PROJECT LOCATION: Charnock Well Field, 11375 Westminster Ave., Los Angeles, CA and Santa Monica Water Treatment Plant, 1228 S. Bundy Dr., Los Angeles, CA
STATE CLEARINGHOUSE NO. 2008031109
CONTACT PERSON: Mark Cuneo, Principal Civil Engineer PHONE: (310) 458-8721

PROJECT DESCRIPTION: The Charnock Well Field Restoration Project involves implementation of a water treatment system to remove groundwater contamination from the Charnock groundwater sub-basin and restore this resource as a water supply for the City of Santa Monica. Improvements are proposed at two existing City-operated water service facilities; the Charnock Well Field site and the Santa Monica Water Treatment Plant (SMWTP). The improvements proposed at the Charnock Well Field site involve the installation of a Granular Activated Carbon (GAC) absorption system to treat contaminated groundwater from three (3) wells within the Charnock well field. The proposed improvements at the SMWTP facility include demolition of three onsite structures and installation of a greensand filtration facility, reverse osmosis facility, air striping decarbonators, chemical storage and feed facilities for disinfection and fluoridation and electrical upgrades. The treatment process includes filtration using greensand filters to remove iron and manganese and a softening system utilizing reverse osmosis membrane technology.

This is to advise that on November 25, 2008, the Santa Monica City Council, as the Lead Agency, certified an Environmental Impact Report and adopted a Mitigation Monitoring Program. The City Council made the following determinations regarding the project:

1. The project in its approved form will have a significant effect on the environment. However, the significant environmental effects identified in this Final EIR can feasibly be avoided and have been eliminated or substantially lessened to below a level of significance.

2. An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA and Resolution 6694 (CCS) of the City of Santa Monica. A copy of the EIR with comments and responses and record of project approval is available at:

   Public Works Department, Civil Engineering and Architecture Division, 1437 4th Street, Suite 300, Santa Monica, California.

3. Mitigation measures were made a condition of approval for the project and a Mitigation Monitoring Program was adopted.

11-26-08
Date

Mark Cuneo
Principal Civil Engineer
Civil Engineering and Architecture Division
Public Works Department

NOTICE OF INTENT TO ADOPT
A MITIGATED NEGATIVE DECLARATION
FOR SANTA MONICA CHARNOCK WELL FIELD RESTORATION PROJECT

The City of Santa Monica has prepared an Initial Study and Mitigated Negative Declaration (IS/MND) for the Charnock Well Field Restoration Project. The Charnock Well Field Restoration Project is intended to enhance the City's water supply by treating and restoring water production from the Charnock groundwater sub-basin. The project involves improvements at two separate existing facilities that are owned and operated by the City of Santa Monica. These include improvements at the Charnock Well Field and at the Santa Monica Water Treatment Plant (SMWTP). Improvements for the SMWTP may include two salt water wells that would replace existing salt water wells located on Santa Monica beach. The proposed project involves the implementation of various water treatment measures in order to restore the groundwater resource of the Charnock groundwater sub-basin to its full beneficial use in the most expeditious and technically effective manner possible.

In accordance with Section 15072 of the State CEQA guidelines, the City of Santa Monica has prepared this Notice of Intent to provide responsible agencies and other interested parties with information describing the proposal and its potential environmental effects. Environmental factors which would be potentially affected by the project include:

- Aesthetics
- Construction Effects
- Geology and Soils
- Hazards and Hazardous Materials
- Hydrology and Water Quality
- Noise

PROJECT APPLICANT:

City of Santa Monica Environmental Public Works Management Department
Civil Engineering & Architecture Services
1437 4th Street, Suite 300
Santa Monica, CA 90401
Spiros Lazaris, P.E.
(310) 458-2283

PROJECT LOCATION:

The Charnock well field site encompasses a 10-acre parcel located at 11375 Westminster Ave in the Palms-Mar Vista-Del Rey Community Plan Area of the City of Los Angeles. The Santa Monica Water Treatment Plant (SMWTP) site encompasses a 4.8-acre parcel located at 1228 S. Bundy Drive in the West Los Angeles Community Plan Area of the City of Los Angeles. These sites are located in the western portion of Los Angeles County, in the City of Los Angeles. The SMWTP has a water softening system that utilizes salt water that is piped from two salt water wells located on Santa

Monica beach. The two existing salt water wells are located west of Pacific Street and Ocean Avenue on Santa Monica beach.

PROJECT DESCRIPTION:

The project involves implementation of a water treatment system and other improvements that would help to remove groundwater contamination from the Charnock groundwater sub-basin and restore this resource as a water supply for the City of Santa Monica (City). As part of the project upgrades, improvements will be required at two existing City-operated water service facilities. The City is planning to return the Charnock groundwater wells to full production using a well head treatment system to be constructed at the Charnock well field. The treatment system will use filtration with granular activated carbon (GAC) to treat water from the three contaminated wells at the well field. The treated water will be pumped to the Santa Monica Water Treatment Plant for final treatment and distribution. Water treatment improvements are also proposed for the Santa Monica Water Treatment Plant including water disinfection and water softening. Improvements for the SMWTP may include two salt water wells, as part of the water softening treatment system, which would replace existing salt water wells located on Santa Monica beach.

AVAILABILITY OF ENVIRONMENTAL DOCUMENTATION: Copies of the Initial Study and proposed Mitigated Negative Declaration on the proposed project may be viewed at the following locations:

City Engineering and Architecture Services
1437 4th Street, Suite 300
Santa Monica, CA

City Planning Counter, Room 214
1685 Main Street
Santa Monica, CA

Santa Monica Public Library
Main Branch
1324 5th Street
Santa Monica, CA

Santa Monica Public Library
Fairview Branch
2101 Ocean Park Blvd.
Santa Monica, CA

City Clerk, Room 102
1685 Main Street
Santa Monica, CA

Santa Monica Public Library
Montana Avenue Branch
1704 Montana Avenue
Santa Monica, CA

Santa Monica Public Library
Ocean Park Branch
2601 Main Street
Santa Monica, CA

Len Nguyen, Field Deputy
Councilman Bill Rosendahl
Council District 11
1645 Corinth Avenue, Room 201
Los Angeles, CA 90025

Donald Bruce Kaufman
Brentwood Library
11820 San Vicente Boulevard
Los Angeles, CA 90049

Mar Vista Library
12006 Venice Boulevard
Los Angeles, CA 90066

State of California
Department of Public Health
Contact: Stefan Cajina, P.E.
1449 West Temple Street, Room 202
Los Angeles, CA 90026

REVIEW PERIOD: As specified by the State CEQA guidelines, a 30-day public review period for the Mitigated Negative Declaration will commence on March 24, 2008 and end on April 23, 2008. The City of Santa Monica welcomes agency and public comments on the document during this period. Any written comments on the Mitigated Negative Declaration must be received within the public review period. **Comments may be submitted, in writing, by 5:30 p.m. on April 23, 2008** and addressed to:

Spiros Lazaris, PE
Civil Engineering and Architecture Services
1437 4th Street, Suite 300
Santa Monica, CA 90401
Telephone: (310) 458-2283
E-mail: spiros.lazaris@smgov.net

c/o Spyron / Milagros

RECEIVED
MAY 2008
CDPH
DWFOB LOS ANGELES

CITY OF SANTA MONICA
ENVIRONMENTAL PUBLIC WORKS MANAGEMENT DEPARTMENT
1437 4TH STREET, ROOM 300
SANTA MONICA, CA 90401

NOTICE OF PREPARATION OF A DRAFT ENVIRONMENTAL IMPACT REPORT CHARNOCK WELL FIELD RESTORATION PROJECT

DATE: May 20, 2008

TO: State Clearinghouse, Responsible Agencies, Trustee Agencies, Organizations and Interested Parties

LEAD AGENCY:
City of Santa Monica
Environmental Public Works Management Department
1437 4th Street, Suite 300
Santa Monica, CA 90401
Contact: Spiros Lazaris, P.E.
Phone: (310) 458-2283

SCH#: **2008031109**

The City of Santa Monica intends to prepare an Environmental Impact Report (EIR) for the Charnock Well Field Restoration Project. In accordance with Section 15082 of the State CEQA Guidelines, the City of Santa Monica has prepared this Notice of Preparation to provide Responsible Agencies and other interested parties with information describing the proposal and its potential environmental effects. The City has prepared the attached Initial Study. The following environmental factors, identified in the initial study, that would potentially be affected by the project include:

- Aesthetics
- Construction Effects
- Geology and Soils
- Hazards and Hazardous Materials
- Hydrology and Water Quality
- Neighborhood Effects
- Noise

PROJECT APPLICANT:
City of Santa Monica
1685 Main Street
Santa Monica, CA 90407

PROJECT LOCATIONS:
1375 Westminster Avenue, Los Angeles, California
1228 Bundy Drive, Los Angeles, California

PROJECT DESCRIPTION: The project involves implementation of a water treatment system and other improvements that would help to remove groundwater contamination from the Charnock groundwater sub-basin and restore this resource as a water supply for the City of Santa Monica (City). As part of the project upgrades, improvements will be required at two existing City-operated water service facilities. The City is planning to return the Charnock groundwater wells to full production using a well head treatment system to be constructed at the Charnock well field. The treatment system will use filtration with granular activated carbon (GAC) to treat water from the three contaminated wells at the well field. The treated water will be pumped to the Santa Monica Water Treatment Plant for final treatment and distribution. Water treatment improvements are also proposed for the Santa Monica Water Treatment Plant including water disinfection and water softening. Improvements for the SMWTP may include two salt water wells, as part of a water softening treatment system, that would replace existing salt water wells located on Santa Monica beach. The attached map provides the project locations.

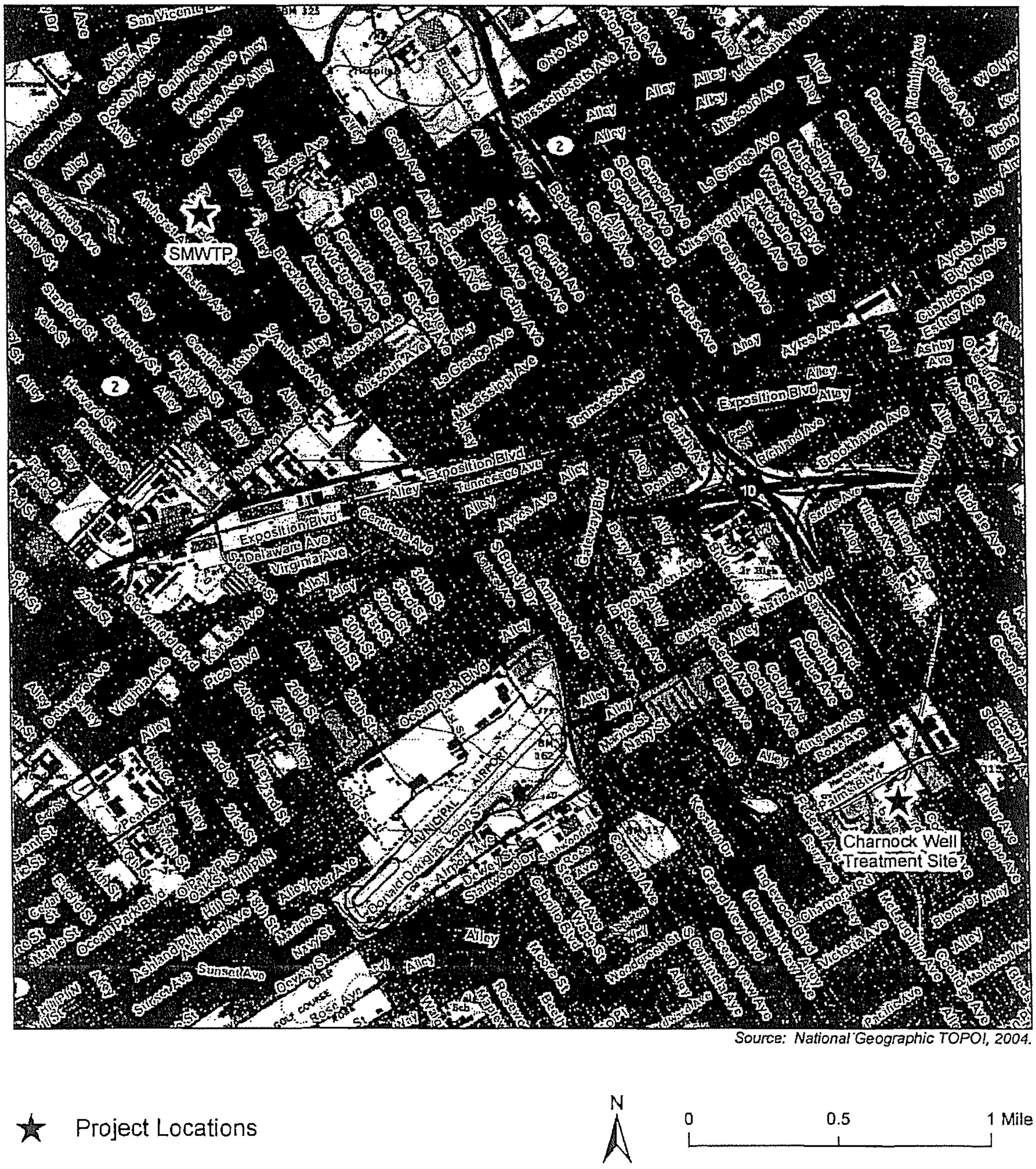
REVIEW PERIOD: As specified by the State CEQA Guidelines, the Notice of Preparation will be circulated for a 30-day review period. The City of Santa Monica welcomes agency and public input during this period regarding the scope and content of environmental information related to your agency's responsibility that must be included in the Draft EIR. **Comments may be submitted, in writing, by 5:30 p.m. on June 18, 2008** and addressed to:

Spiros Lazaris, PE
Civil Engineering and Architecture Services
1437 4th Street, Suite 300
Santa Monica, CA 90401
Telephone: (310) 458-2283
E-mail: spiros.lazaris@smgov.net

ESPAÑOL: Este es una noticia para la preparación de un reporte sobre los posibles efectos ambientales en referencia a la construcción propuesta de un edificio de 19 unidades residenciales, lo cual puede ser de interés a usted. Para más información, llame a Carmen Gutiérrez, al número (310) 458-8341.

Michael P. Gialketsis
Consultant to the City of Santa Monica

May 19, 2008
Date



Source: National Geographic TOPOI, 2004.

Project Locations

Figure 1

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INITIAL STUDY

1. **Project title:** Charnock Well Field Restoration Project

2. **Lead agency name and address:** City of Santa Monica, Environmental Public
Works Management Department
1437 4th Street, Room 300
Santa Monica, CA 90401

3. **Contact Person:** Spiros Lazaris, P.E.
(310) 458-8341

4. **Project location:** 1375 Westminster Avenue, Los Angeles, California
1228 Bundy Drive, Los Angeles, California

5. **Project sponsor's name and address:** City of Santa Monica
1427 Fourth Street
Santa Monica, CA 90401-2308

6. **General Plan designation:** Open Space (Charnock location)
Public Facilities (SMWTP location)

7. **Zoning:** OS-1XL (Charnock location)
QPF-1XL (SMWTP location)

8. **Project History:** On March 24, 2008 the City of Santa Monica circulated a Notice of Intent to Adopt a Negative Declaration (NOI) and an Initial Study/Mitigated Negative Declaration (IS/MND) for the proposed project. A detailed Environmental Checklist with discussion was included. The project was assigned State Clearinghouse number 2008031109. The document was circulated for a 30- day public review process that included 2 public meetings to receive public input on the content and findings of the IS/MND. Based on the input received, the City has subsequently re-examined the project and will be preparing an Environmental Impact Report (EIR) for this project.

9. **Description of project:** The project involves implementation of a water treatment system and other improvements that would help to remove groundwater contamination from the Charnock groundwater sub-basin and restore this resource as a water supply for the City of Santa Monica (City). As part of the project upgrades, improvements will be required at two existing City-operated water service facilities. The City is planning to return the Charnock groundwater wells to full production using a well head treatment system to be constructed at the Charnock well field. The treatment system will use filtration with granular activated carbon (GAC) to treat water from the three contaminated wells at the well field. The treated water will be pumped to the Santa Monica Water Treatment Plant for final treatment and distribution. Water treatment improvements are also proposed for the Santa Monica Water Treatment Plant (SMWTP) including water disinfection and water softening. Improvements for the SMWTP may

include two salt water wells, as part of a water softening treatment system, that would replace existing salt water wells located on Santa Monica beach.

The Charnock site has historically been operated by the City as a ground water well field but is not currently active. The existing facilities at the Charnock well field include: Five City water supply wells (#13, #15, #16, #18, and #19), a 116,500-gallon contact basin, a booster station, a Metropolitan Water District (MWD) turnout, a chlorine building, a power substation, a control room, and city storage yards. Additionally, 14 abandoned water production wells (#1 to #12, #14 and #17) are also located at the well field. In addition to the water facilities, a portion of the Charnock well field site is leased and is currently occupied by the Windward School. The school facility includes classrooms, playing fields, a gymnasium, a library and administration buildings. Current enrollment is approximately 500 students.

The SMWTP facility services a large portion of the City's water supply needs. The following water treatment systems are located at the SMWTP site: a contact basin, a chlorine building, an ion exchange system (out of service), a clearwell and pH adjustment, a reservoir/mechanical aeration basin, and the distribution system booster pumps. When it was in use, the ion exchange system utilized two salt water wells that are located on Santa Monica Beach and piped to this facility. The two existing salt water wells are located west of Pacific Street and Ocean Avenue on Santa Monica Beach.

10. **Surrounding land uses and setting:** Surrounding land uses for Charnock location include residential and a private 7-12 grade school. Surrounding land uses for SMWTP location include residential and commercial development. Surrounding land uses for the salt water well location include recreational and residential development.

11. **Necessary Public Agency Approvals:**

- *Certification of the Final EIR and City-approval to proceed with Final Engineering and Implementation of the Charnock Well Field Restoration Project (City Council)*
- *California Coastal Commission (Salt Water Wells)*
- *State Water Resources Control Board*
- *Any other incidental discretionary approvals needed for the construction and operation of the proposed project.*

ENVIRONMENTAL FACTORS AFFECTED

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is "Potentially Significant" or "Potentially Significant Unless Mitigation Incorporated" as indicated by the checklist on the following pages.

☒ Aesthetics
☐ Biological Resources
☐ Economics and Social Impacts
☒ Hydrology/Water Quality
☒ Neighborhood Effects
☐ Public Services
☐ Transportation/Traffic

☐ Agriculture Resources
☒ Construction Effects
☒ Geology/Soils
☐ Land Use/Planning
☒ Noise
☐ Recreation
☐ Utilities/Service Systems

☐ Air Quality
☐ Cultural Resources
☒ Hazards & Hazardous Materials
☐ Mineral Resources
☐ Population/Housing
☐ Shadows
☐ Mandatory Findings of Significance

DETERMINATION:

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☒ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and (2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potential significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

Michael P. Gialketsis
Consultant to the City of Santa Monica

May 19, 2008
Date

ENVIRONMENTAL CHECKLIST

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
I. AESTHETICS – Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☒	☐	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

a, b) The proposed project involves water treatment infrastructure improvements in an urbanized area of Los Angeles and Santa Monica. Project development would have no effect on a scenic vista, nor would it damage scenic resources such as trees, rock outcroppings or historic buildings within a state scenic highway. There would be **no impact.**

c) The proposed project involves infrastructure improvements at two existing water treatment facilities and the possible installation of two new salt water extraction wells in the vicinity of two existing City-owned salt water wells at Santa Monica Beach. For the Charnock location, the proposed new facilities would include 15 GAC cylindrical vessels that will be approximately 24 feet tall as well as several other proposed tanks and storage buildings. Surrounding land uses include Windward School to the north, east and west and residential uses to the south. The proposed new structures at the SMWTP location may include a 7,500 square foot building that would house a reverse osmosis treatment system. As part of the SMWTP treatment upgrades, two new salt water wells may need to be installed on Santa Monica beach. The proposed project has the potential to result in buildings and facilities that are incompatible with the existing character of their surroundings; this is considered to be a **potentially significant impact unless mitigation incorporated.** This issue will be explored further in the EIR.

d) Security lighting is currently provided at each of the two water facilities. Development of the proposed improvements is not expected to substantially alter the current lighting on either of these sites and thus, the project would not be expected to result in increased nighttime lighting at either of the two existing facilities. As a result, **no impacts** are anticipated.

The proposed improvements would slightly increase the surface area of structures and tankage that could generate increased glare at the project sites. However, the new proposed new facilities do not include the use of reflective materials and therefore would not substantially alter glare conditions in either of the site locations. The project's contribution to overall glare conditions would **less than significant.**

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
II. **AGRICULTURAL RESOURCES** – Would the project:				
a) Convert Prime Farmland, Unique Farmland, Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☐	☒

a-c) The project would involve improvements at existing developed water facility sites that are surrounded by existing urban development. The project sites are not in the general vicinity of any existing or planned agricultural land. The proposed project would not convert farmland or conflict with any land zoned for agriculture (City of Los Angeles Department of Building and Safety website, December 2007). In addition, none of the improvement locations are within areas zoned for agricultural development, nor are they under Williamson Act contracts. Further, the proposed water system improvement project would not result in any indirect effects that could result in conversion of farmland to non-agricultural use. Therefore, **no impacts** to agricultural resources would occur.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
III. **AIR QUALITY** -- Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
III. AIR QUALITY -- Would the project:				
d) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☒	☐
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐

The project site is within the South Coast Air Basin (SCAB), a 6,600-square mile basin encompassing all of Orange County, most of Los Angeles and Riverside Counties, and the western portion of San Bernardino County, which is under the jurisdiction of the South Coast Air Quality Management District (SCAQMD). The local air quality management agency is required to monitor air pollutant levels to ensure that the air quality standards are met and, if they are not met, to develop strategies to meet the standards. Ambient pollution concentrations recorded in Los Angeles County are among the highest in the four counties comprising the SCAB. The South Coast Air Quality Management District (SCAQMD) measures concentrations of the following air pollutants at over 37 monitoring stations: ozone, carbon monoxide, nitrogen dioxide, particulate matter, sulfur dioxide, and lead.

Depending on whether or not the standards are met or exceeded, the air basin is classified as being in "attainment" or "nonattainment." The South Coast Air Basin is currently designated as a nonattainment area for both the federal and state standards for ozone and PM_{10}, and the state standard for $PM_{2.5}$. Thus, the basin currently exceeds state and federal ambient air quality standards and is required to implement strategies that would reduce the pollutant levels to recognized acceptable standards. This non-attainment status is a result of several factors, the primary ones being the naturally adverse meteorological conditions that limit the dispersion and diffusion of pollutants, the limited capacity of the local airshed to eliminate pollutants from the air, and the number, type, and density of emission sources within the South Coast Air Basin. The SCAQMD has adopted an Air Quality Management Plan (AQMP) that provides a strategy for the attainment of state and federal air quality standards.

The SCAQMD has adopted the following thresholds for temporary construction-related pollutant emissions:

- *75 pounds per day ROC*

- *100 pounds per day* NO_x
- *550 pounds per day CO*
- *150 pounds per day of* PM_{10}
- *150 pounds per day of* SO_x

The SCAQMD also has established the following significance thresholds for project operations within the South Coast Air Basin:

- *55 pounds per day of ROC*
- *55 pounds per day of* NO_x
- *550 pounds per day of CO*
- *150 pounds per day of* PM_{10}
- *150 pounds per day of* SO_x

Impacts relating to carbon monoxide (CO) concentrations are also considered significant if the additional CO from a project creates a "hot spot" where either the California one-hour standard of 20 parts per million (ppm) or the federal and state eight-hour standard of 9.0 ppm of carbon monoxide is exceeded.

The SCAB is further subdivided into Receptor Forecast and Monitoring areas, of which the project locations are located in the Northwest Los Angeles County Coastal (NWLACC) monitoring area and is characterized by readings taken at the nearest SCAQMD monitoring station located in the region. Readings of ozone and carbon monoxide at the coastal station seldom attain high concentrations compared to inland portions of the Basin. The nearest monitoring station for particulate matter is located at the downtown Los Angeles Station. In the year 2005, the NWLACC station recorded zero days where the federal or state standards for nitrogen dioxide or carbon monoxide were exceeded. The State standard for 1-hour ozone levels were exceeded 7 days in 2005, and 8-hour ozone levels were exceeded 5 days in 2005. Federal standards for 1-hour ozone levels were not exceeded, and 8-hour ozone levels were exceeded 1 day in 2005.

a-e) Facility improvements associated with the proposed project would be within existing water facilities and would not be expected to generate a substantial number of new employment positions or large volumes of new traffic. Further, with the exception of incremental increases (<5%) in the electrical usage for pumps and other equipment, the project would not be expected to generate any new stationary source emissions. Thus the proposed projects would not result in a considerable net increase of a pollutant for which the project region is in non-attainment (ozone and particulate matter), or expose sensitive receptors to substantial pollutant concentrations. Because of the nature of these improvements, the project would not generate significant air emissions that exceed any SCAQMD thresholds. The impact is less than significant and no mitigation is required. This issue will not be further discussed in the EIR; however a brief discussion below outlines each project component.

Charnock Well Field

The Charnock site is anticipated to have two full time staff report to the site. Two trips a day are anticipated for site operation and maintenance. In addition, site activities will also include periodic water treatment related deliveries, carbon change-outs and pick-ups.

Trucks will be required for these activities and will occur on average of two to three times per month.

The Charnock treatment system formally used chlorine gas for disinfection however it will switch to sodium hypochlorite. This product is generally considered safer to use and store while retaining the same disinfection qualities. The liquid sodium hypochlorite will be housed in a storage building and be utilized only in enclosed environs. It is not anticipated to emit objectionable odors affecting a substantial number of people or any other volatile air emissions. In addition the Charnock facility will be operating a Granular Activated Charcoal (GAC) water treatment system. Absorption of organic compounds by GAC is a proven and widely used technology for removing contaminants from groundwater. GAC porous structure provides a large surface area per unit weight, which permits the absorption and accumulation of a large number of organic molecules. This is a closed system that does not vent to the atmosphere and will treat the groundwater. It is not anticipated to emit substantial (if any) odors or air emissions. Potable water providers adhere to standards of the American Water Works Association (AWWA) on the storage, delivery and handling of water treatment chemicals. The AWWA Standards describe minimum requirements for water supply materials/equipment and represent a consensus of the water supply industry that a product designed to such standards will provide safety and service. The standards are revised approximately every 5 years. The risk of hazards due to use of common water treatment chemicals would be reduced or effectively eliminated due to adherence to these standards. Specific standards would include secondary containment, spill detection, alarm systems, backflow prevention devices and double lining of chemical transmission lines.

Deliveries of the carbon would be expected to occur up to 4 times a year during the initial stages of the project with reduced deliveries in the later stages. Carbon change outs will involve one truck per vessel. Each truck has two compartments, one that holds virgin (new) carbon and the other which is empty. Each truck would pump the spent (used) carbon into its empty compartment and then pump virgin carbon to the re-fill the vessel. Some air venting is required for this process; however, no contaminants (due to the absorption by the GAC) are expected to volatize into the air nor are any objectionable odors expected from this process.

Although the Charnock location is adjacent to Windward School to the north and a residential neighborhood to the south, both of which are considered to be sensitive receptors, none of the proposed site operations or activities are expected to expose any sensitive receptors to substantial pollutant concentrations. Therefore, the project would have a less than **significant impact** on air quality at this facility.

Santa Monica Water Treatment Plant

Fourteen full and part time staff currently report to the SMWTP. No new staff is anticipated to be required to operate new facilities that may be implemented at the SMWTP treatment facility. Proposed new site activities may include deliveries of water treatment compounds. It is anticipated that these additional trips would occur up to twice per month.

The SMWTP currently uses chlorine gas for the water treatment. The SMWTP treatment systems are currently under evaluation. Several treatment options that are being evaluated would include the use of sodium fluoride and ammonia. These proposed water treatment products would be housed in storage and feed buildings and would not be anticipated to emit objectionable odors affecting a substantial number of people.

The proposed improvements at the SMWTP involve upgrades to the existing water treatment facilities, including the water softening system, fluoridation system, and disinfection treatment system. The project may also involve the construction of one additional 7,500 square foot structure that would house a membrane filtration system; however, this system would replace the existing ion exchange softening system. Given the nature of these improvements, the project would not generate significant air emissions that exceed any of the SCAQMD thresholds listed above.

Salt Water Wells

If the existing ion exchange system is rehabilitated, two new salt water wells will need to be installed to maintain sufficient salinity levels. New pumping systems needed for this facility will require use of additional electricity and will also require periodic maintenance. However, since the proposed new system will be used to offset other water treatment sources used by the City, this increase in electrical usage are expected to be minimal. In addition, the wells currently in place are expected to be abandoned. As such, the addition of two new wells, if necessary, is not expected to have any substantial long term operational air quality effects. The salt water well location would require the use of sodium hypochlorite. This product would be housed in a storage building and is not anticipated to emit objectionable odors affecting a substantial number of people or any other volatile air emissions. Thus, the project impacts related to air quality would be less than significant.

Temporary air quality impacts related to project construction are discussed *Construction Effects.*

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
IV. BIOLOGICAL RESOURCES -- Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☒	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional	☐	☐	☒	☐

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?				
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☒	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☒	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☒	☐

a-d, f) The Charnock and SMWTP sites are located within the City of Los Angeles. The new salt water wells, if necessary, would be located in the City of Santa Monica. The Charnock and SMWTP sites are located in urbanized areas, which lack sensitive plant and animal species. These two sites are surrounded by pavement and urban structures (commercial and residential buildings). These areas are highly urbanized and there is no potential for adverse effects to wildlife resources or their habitat either directly or indirectly (Rincon Consultants, December 2007).

The potential new salt water wells would be located in the vicinity of two existing City owned salt water wells located west of Pacific Street and Ocean Avenue on the Santa Monica beach.

The City of Santa Monica Draft Master Environmental Assessment (MEA) (2002, Section 7) indicates that Santa Monica is generally lacking in native biological resources. The only native terrestrial habitat is located along the Palisades Bluff, and this area is highly disturbed. As a consequence, vegetation resources within the City are those that are capable of surviving in urban conditions. Important biological resources (sensitive species and relatively undisturbed habitats) are generally relegated to the coastal (beach and intertidal) and marine environments.

If new salt water wells are required on the beach, there is some potential that these new facilities could adversely impact nesting habitat for the federally threatened western snowy plover (Charadruis alexandrinus nivosus). According to the Western Snowy Plover Draft Recovery Plan (May 2001), the entire stretch of beach along the western boundary of the City of Santa Monica is contained within the Snowy Plover Management Area (CA-104). In addition, a more limited portion of the beach is within proposed critical habitat unit CA 21 (Santa Monica Bay) for the western snowy plover (Federal Register Vol. 69, No. 242). Unit CA 21 stretches roughly 0.9 miles from Montana Avenue to the mouth of Santa Monica Canyon, which is approximately 1 mile north of the anticipated location of the new wells.

The general location of the new wells is not within an area designated for plover protection. The project would disrupt a small portion of beach, approximately a 30 foot by 80 foot area. The beach area adjacent to the current wells, Santa Monica State Beach, is owned by the California State Parks and operated by the City of Santa Monica. Current actions to limit public access into the snowy plover colony are expected to continue into the future. Given that there is an active management plan that complies with the Recovery Plan recommendations for this area, it is not anticipated that the potential new wells would have an adverse effect on the Western snowy plover, and potential impacts to this and other sensitive species are considered less **than significant.**

e) Several public street trees are located on Westminster Avenue adjacent the Charnock site (Rincon Consultants, December 2007), however the site plan shows that these trees will not be affected by any construction activities related to the project. No public trees that would be affected by the proposed project modifications are in the vicinity of the SMWTP or salt water well sites. Thus, there would be no adverse impact to public trees. **No impact** associated with consistency with local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance, would occur.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
V. <u>CONSTRUCTION EFFECTS</u>– Would the project:				
a) Have considerable construction-period impacts due to the scope, or location of construction activities.	☐	☒	☐	☐

a) The proposed project would involve construction over a period of up to 18 months. Construction activity may temporarily re-route traffic. During construction staging, the storage of construction equipment may require the use of street parking. Construction activity may also require the temporary closure of the sidewalks adjacent to the project locations, thus disrupting pedestrian activity in the area. In addition to the reduction of on-street parking capacity, during construction of the proposed project, construction site workers would temporarily compete with other users for parking facilities, thus temporarily reducing the available supply of public parking. Impacts to pedestrian and vehicular flow in the area and the temporary reduction of on-street parking capacity would be potentially significant temporary impacts.

In addition, noise generated by construction equipment, diesel and dust air pollutant emissions generated by grading activities, and sediment transported by runoff are potentially adverse effects that will be further discussed under Section III *Air Quality*, Section XIV *Noise*, and Section X *Hydrology and Water Quality*.

Construction impacts will be discussed further in the EIR.

	Potentially Significant Impact	**Potentially Significant Unless Mitigation Incorporated**	**Less than Significant Impact**	**No Impact**
VI. CULTURAL RESOURCES -- Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource as defined in §15064.5?	☐	☐	☒	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☒	☐
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☒	☐

a) Historic designation may be given to a property by National, State, or local authorities. In order for a building to qualify for listing in the National Register of Historic Places, the California Register of Historical Resources, or as a locally significant property in the City of Los Angeles, it must meet one or more identified criteria of significance. For the City of Los Angeles, the Office of Historic Resources in the Department of City Planning oversees the City's historic preservation program. The property must also retain sufficient architectural integrity to continue to evoke the sense of place and time with which it is historically associated.

The proposed project would involve infill improvements on existing developed sites. These locations are described further below.

Charnock Well Field

The existing water related structures on the Charnock site were constructed in the 1960s. Due to the age of the Charnock structures, less than 50 years old and criteria set forth by the City of Los Angeles Office of Historical Resources, they do not qualify as potentially significant historic resources.

Santa Monica Water Treatment Plant

Water related activities have occurred at the SMWTP since at least the 1930's, however extensive structural improvements have taken place at the site. The majority of the existing water related structures on the SMWTP site were constructed in the 1960s; in addition, remodeling and added improvements occurred in the mid 1990's. Since the structures are less than 50 years old, they would not qualify as potentially significant historic resources.

Salt Water Wells

The potential two new wells would be located on Santa Monica beach west of Pacific Street and Ocean Avenue. No structures are in the immediate vicinity of the potential well locations.

There is no evidence to suggest presence of either archaeological or historical resources on the Charnock, SMWTP or salt water well locations. The project sites are highly disturbed due to former development of the water treatment systems and due to urbanization that has occurred in the vicinity of the sites. Therefore, the likelihood of finding intact significant archaeological resources is very low.

The project sites do not contain resources that would be eligible for listing on the National Register of Historic Places, the California Register of Historic Resources, or the City of Los Angeles historic landmarks or districts list. Therefore, the proposed project would not result in a significant impact to historic resources. **No impact** to historical resources would occur.

b-d) There is no evidence to suggest the presence of either archaeological or paleontological resources on the project sites. The project sites are highly disturbed due to onsite buildings and urbanization that has occurred in the vicinity of the sites. Therefore the likelihood of finding intact significant archaeological resources is very low. In addition, Section 9.04.16.01.030(p) of the Santa Monica Municipal Code states:

> *"If any archaeological remains are uncovered during excavation or construction work in the affected area shall be suspended and a recognized specialist shall be contacted to conduct a survey of the affected area at the project owner's expense. A determination shall then be made by the Director of Planning to determine the significance of the survey findings and appropriate actions and requirements, if any, to address such findings."*

Therefore, because project development would occur on existing developed sites, and due to existing City Municipal Code requirements, the project would have a **less than significant impact** on cultural or paleontological resources.

The issue of cultural resources will not be further discussed in the EIR.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
VII. ECONOMIC and SOCIAL IMPACTS -- Would the project:				
a) Have economic or social effects which would result in additional physical changes (e.g. if a new shopping center located away from downtown shopping area would take business away from downtown and thereby cause business closures and eventual deterioration of the downtown)?	☐	☐	☐	☒

a) The project involves water quality and water supply infrastructure improvements for the City of Santa Monica and would have an overall beneficial effect on regional water supplies. The project would not have economic or social effects that would result in adverse physical changes or deterioration of the surrounding areas. Therefore, **no impacts** would result.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
VIII. GEOLOGY and SOILS – Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault?	☐	☐	☒	☐
ii) Strong seismic ground shaking?	☐	☐	☒	☐
iii) Seismic-related ground failure, including liquefaction?	☐	☒	☐	☐
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
c) Be located on a geologic unit or soil that is unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence,				

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
VIII. GEOLOGY and SOILS – Would the project:				
liquefaction, or collapse?	☐	☒	☐	☐
d) Be located on expansive soil, as defined in Table 1-B of the Uniform Building Code, creating substantial risks to life or property?	☐	☒	☐	☐
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒

a.i, ii) There are no Alquist-Priolo Earthquake Fault Zones in the immediate vicinity of the project locations. The closest significant faults are the Newport-Inglewood Fault Zone, about 3 miles southeast of the SMWTP, approximately 2 ½ miles east of the Charnock site, and about 6 miles east of the Salt Water Well location. The Santa Monica-Hollywood Fault Zone is located about 0.5 miles south of the SMWTP, approximately 1 mile north of the Charnock site and about 2 miles north of the Salt Water Well location. Several other faults have been identified in the vicinity of the project locations. As the project site is located in a seismically active area, impacts could be potentially adverse and effects will be further discussed in the EIR.

a.iii) According to the Safety Element of the City of Los Angeles General Plan (1996), the SMWTP site is located within a liquefaction area (the Charnock location is not within this area). The Safety Element defines these areas as containing recent alluvial deposits and groundwater at less than 30 feet deep. The proposed salt water wells are identified as being in high liquefaction area (City of Santa Monica Safety Element, 1995). For the SMWTP and the salt water well locations, impacts from liquefaction are considered **potentially significant unless mitigation incorporated**. This item will be further discussed in the EIR.

a.iv) According to the Safety Element of the City of Los Angeles General Plan (1996) and the City of Santa Monica Safety Element, 1995, none of the sites are located in areas with potential for landslide hazards. There would be **no impact**.

b) Implementation of the proposed water facility improvements would involve trenching and limited grading in order to build the new facilities and to reconfigure the piping that would connect the project elements. These activities would cause the disruption and displacement of on-site soils. Soils underlying the project sites generally have low erosion potential (Safety Element of the City of Los Angeles General Plan, 1996). In addition the project sites are situated on relatively flat terrain. Nevertheless, construction activities could result in increased erosion and offsite sedimentation. Implementation of standard erosion control techniques such as the use of silt fencing, detention areas, and plastic covering over exposed sediment, would reduce soil erosion effects to a **less than significant level**.

c, d) According to the Geologic Map of the Beverly Hills-Van Nuys (South ½) Quadrangle (Dibblee, 1992), the Charnock and SMWTP project locations are located on Quaternary age older alluvial gravel, sand, silt and clay derived mainly from the Santa Monica Mountains and also includes gravels and sands from stream channels. These Quaternary age sediments overlie Tertiary-age marine bedrock units of the drilled on Fernando and Monterey formations.

For the salt water wells the regional geologic mapping (Geologic Map of California, Los Angeles Sheet, 1991) and Dibblee (1992) depict the project area as consisting of Quaternary-age alluvium. The alluvium is described as "beach sand". These Quaternary-age sediments overlie Tertiary-age marine bedrock units of the Monterey and Fernando formations.

The soils within the improvement sites are composed of sandy alluvium, have a very low expansion index and are well drained (City of Santa Monica Safety Element, 1995). Therefore, the potential for impacts relating to soil instability is considered low. As noted above, the SMWTP and the salt water well locations are located within liquefaction areas and thus, impacts from liquefaction are considered **potentially significant** unless mitigation incorporated. This item will be further discussed in the EIR.

e) The proposed project would not utilize septic tanks. **No impacts** would occur.

The issue of Geology and Soils will be further discussed in the EIR.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
IX. HAZARDS and HAZARDOUS MATERIALS - Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☒	☐	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☒	☐	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within ¼ mile of an existing or proposed school?	☐	☒	☐	☐
d) Be located on a site which is included on a list of hazardous material sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a	☐	☒	☐	☐

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
significant hazard to the public or the environment?				
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h) Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

a-c) The City's goal is to restore the groundwater resource of the Charnock sub-basin to its full beneficial use in the most expeditious and technically effective manner possible. The groundwater has been contaminated with gasoline additives methyl tertiary-butyl ether (MTBE) and tertiary-butyl alcohol (TBA) from gasoline stations in the vicinity of the site. The project will require the use and storage of chemicals. Hazards and risk of upset could be associated with chemicals utilized in the treatment of potable water such as sodium hypochlorite, antiscalants, aqueous ammonia and hydrochloric acid. In addition, remediation of the existing contamination will require disposal of water, sludge and carbon that will be contaminated with MTBE and TBA. The proposed site usage could pose health hazards to sensitive receptors such as the students at Windward school (located adjacent the Charnock well site) or residents in the vicinity of the SMWTP (located approximately 200 feet from the site). These impacts are **potentially significant unless mitigation is incorporated.** This issue will be further discussed in the EIR.

d) The site is not included on a list of hazardous material sites compiled pursuant to Government Code Section 65962.5. The proposed project involves the remediation of existing groundwater contamination due to MTBE and TBA. These chemicals will be removed from the groundwater through the use of GAC, the use of which is described above. The GAC is not in itself hazardous, but remediation would require disposal of saturated carbon, and could require disposal of contaminated water. Mitigation is required to assure that hazards associated with the remediation of existing contamination and hazards associated with water treatment are minimized. These mitigation measures will assure that risks are minimized and the.

contamination is removed from the Charnock sub-basin groundwater supply. The impact is **potentially significant unless mitigation incorporated.** This issue will be further discussed in the EIR.

e, f) The project sites are not located within an airport land use plan or airstrip, and the nearest airport, the Santa Monica Airport, is located more than one mile west of the Charnock site, 2.5 miles south of the SMWTP location and 5 miles west of the salt water well location (Google Earth, 2007). **No impact** would occur.

g) The proposed project's objective includes making improvements to the City's water treatment infrastructure. The City's goal is to restore the groundwater resource of the Charnock sub-basin to its full beneficial use in the most expeditious and technically effective manner possible. It would not impair implementation of an adopted emergency access plan. **No impact** would occur.

h) The proposed project's objective includes making improvements to the City's water treatment infrastructure. The City's goal is to restore the groundwater resource of the Charnock sub-basin to its full beneficial use in the most expeditious and technically effective manner possible. Therefore the proposed project would not expose people or structures to a significant risk of loss, injury or death involving wildland fires. **No impact** would occur.

Impacts related to Hazards and Hazardous Materials will be further discussed in the EIR.

	Potentially Significant Impact	**Potentially Significant Unless Mitigation Incorporated**	**Less than Significant Impact**	**No Impact**
X. <u>HYDROLOGY and WATER QUALITY</u> – Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☒	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering or the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☒	☐
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☒	☐	☐
d) Substantially alter the existing drainage pattern of the site or area, including the	☐	☒	☐	☐

	Potentially Significant Impact	**Potentially *Significant* Unless Mitigation Incorporated**	**Less than Significant Impact**	**No Impact**
X. **HYDROLOGY and WATER QUALITY** – Would the project:				
alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?				
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☒	☐	☐
f) Otherwise substantially degrade water quality?	☐	☐	☒	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☒	☐
j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☒	☐

a) The City's goal is to restore the groundwater resource of the Charnock sub-basin to its full beneficial use in the most expeditious and technically effective manner possible. The proposed project would not be anticipated to violate water quality standards or waste discharge requirements, however the project will require approval from both the California Department of Public Health (DPH) and State Water Resources Control Board approval. The impact for the project would be **less than significant** with respect to water quality standards and waste discharge requirements A further discussion of this is provided in Section XX, *Utilities and Service Systems*.

b) The City's goal is to restore the groundwater resource of the Charnock sub-basin to its full beneficial use in the most expeditious and technically effective manner possible. The Charnock wells have a total pumping capacity of 9,000 gallons per minute (gpm), however this production flow rate is not sustainable, as it exceeds the perennial safe yield from the Charnock subbasin, estimated to be 5,500 gpm. Historically, the well field was operated with three of the five wells pumping at a time, yielding a long-term average production rate of 5,200 gpm (7.5

MGD). Because the well field has not been operated since 1996, the aquifer has recharged, or refilled. As a result of this extra volume of available water, the Charnock well field can be safely pumped at flow rates greater than the safe yield for up to seven years before the production rate must be decreased to the less than the perennial safe yield of the sub-basin. Provided that the treatment system is operated within the safe yield parameters, the proposed project would not significantly impact groundwater supplies and would enhance ground water quality. This would be a less **than significant impact**.

c, d) The project locations are located within urbanized areas of Los Angeles and Santa Monica. The project sites are already developed and no streams or rivers are present at each location. Because the project locations are relatively flat and historically have been developed as water supply facilities, the onsite improvements that are proposed are not expected to result in substantial topographical modification or other changes that would materially affect on or offsite drainage patterns or characteristics. However, temporary sedimentation impacts could occur if bare ground was exposed during winter rains. This, combined with other onsite construction activities, has the potential to result in short-term water quality impacts. This is considered a **potentially significant impact** and will be further discussed in the EIR.

e) The footprint associated with each project element would be similar to the existing footprint. Urban run-off from the locations would not be expected to increase. As part of the proposed improvements, facilities are proposed to be upgraded and brought back online. An NPDES permit may also be required for both the Charnock location and the SMWTP site. In addition, construction activities has the potential to result in short-term water quality impacts. This is considered a **potentially significant impact** and will be further discussed in the EIR.

f) The proposed project would involve additional water treatment systems at existing water treatment facilities. The main goal and purpose of the project is to treat contaminated groundwater and restore this source to domestic drinking water use. Thus the project will increase overall water quality for the region. The impact is **less than significant** and no mitigation is required.

g-h) According to the Federal Emergency Management Agency (FEMA) maps, the project locations are located within Flood Zone C, which is characterized by a minimal risk of flooding. Therefore, the proposed project would not expose people or structures to significant flood hazards and would not impede or redirect flood flows. **No impact** would occur.

i-j) No dams or levees are located in the vicinity of the project sites. Therefore, the potential for flooding due to dam failure is low. The Charnock and SMWTP sites are not located near any major bodies of surface water; therefore, impacts from tsunamis and seiches are not expected.

The potential salt water well sites would be located on Santa Monica beach in the vicinity of two existing wells which is identified as a potential tsunami inundation area (City of Santa Monica Safety Element, 1995). Tsunamis are spontaneous water waves that are usually caused when hundreds to thousands of square miles of submerged continental shelf or slope are rapidly displaced several feet in a vertical direction during a large earthquake. This is **potentially significant** and will be further in the EIR.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XI. LAND USE AND PLANNING - Would the proposal:				
a) Physically divide an established community?	☐	☐	☒	☐
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐
c) Conflict with an applicable habitat conservation plan or natural community conservation plan?	☐	☐	☒	☐

a) Each of the project site locations contain existing facilities and would involve improvements at the locations of the existing facilities. The proposed improvements and upgrades would not physically divide an established community. The impact would be **less than significant.**

b) The Charnock site is within the Mar Vista community of the City of Los Angeles. The zoning designation for the Charnock location is designated OS-1XL and the General Plan Use is "Open Space". The SMWTP project site is within the West Los Angeles Community of the City of Los Angeles. The zoning designation for the SMWTP location is designated [Q}PF-1XL and the General Plan Use is "Public Facilities". The potential salt water well sites would be within the Santa Monica General Plan Parks District. This District includes parks, beaches, and median strips. The City's zoning designation for these sites are designated DP, Designated Parks. The salt water well sites are located within the Coastal Zone and would be required to be consistent with the Local Coastal Program or Coastal Act.

The salt water wells if constructed would extend about 200 feet below the ground surface, and would be located within structures that are 15' x 15' x 20'. The well structures would be buried such that only the top 5' of the structures would be visible. Two new structures would be constructed along the beach in the vicinity of the existing well structures. The exiting wells would be abandoned (due to their ineffectiveness) and effectively replaced by the two new wells. The two existing structures are located on the beach about 140 feet west of the Ocean Front Walk adjacent a public parking lot. The structures are coastal dependent that is their purpose is to draw salt water for the existing ion exchange water softening process at the SMWTP. They are relatively small at 15' x 15' x 5' (above ground height) as compared with Santa Monica Beach. This segment of Santa Monica Beach, extending from the Santa Monica Pier to Hill Street, is approximately 5,000 feet long and 600 feet wide. If constructed, these two new well structures would occupy 450 square feet or 0.015% of this portion of Santa Monica Beach.

There is no adopted local coastal program for this portion of the Santa Monica Beach area; therefore, the proposed expansion of salt water wells was evaluated pursuant to the Coastal Act (as amended effective January 1, 2007). Chapter 3 of the Coastal Act contains Coastal Resources Planning and Management Policies. The articles and consistency determinations for each article are outlined below.

- Article 1 outlines policies governing local coastal programs and is thus not applicable.
- Article 2 governs protection of public access. If constructed, these wells with supporting structures would not impede access to the beach as they would occupy 450 square feet, or 0.015% of a portion of Santa Monica Beach. Thus, the project appears consistent with Article 2.
- Article 3 governs recreational uses. The proposed improvements would be constructed within a park that is intended to satisfy recreational needs. The park already contains the two existing salt water wells which are similarly enclosed in the 15′ x 15′ x 5′ (above ground) structures. The two existing wells would be abandoned since they would no longer be needed. The proposed structures are relatively small in comparison to the entire beach park and would not detract from the recreational value of the beach park. As noted above, these structures would occupy 450 square feet or 0.015% of a portion of Santa Monica Beach, with the remaining 99.98% of the park available for recreation. Moreover, the intended use is coastal dependent, required to be located in close proximity to the ocean for the purpose of extracting saltwater. Thus, the project appears consistent with Article 3.
- Article 4 governs the marine environment. The proposed wells would be located about 200 feet from the waters edge, depending on the tide, and would draw from seawater from the sediments beneath the beach. The wells would draw saltwater, which would be pumped to the SMWTP. At the SMWTP the ionization softening process would exchange calcium and magnesium for sodium in the seawater. The resultant effluent would be discharged in accordance with NPDES requirements. Adverse effects to marine resources are not anticipated. Thus the project appears consistent with Article 4.
- Article 5 Land Resources. This article governs protection of environmentally sensitive habitat areas, agricultural lands, timber lands, and archaeological/paleontological resources. The wells, if constructed would be located on sandy beach within Santa Monica Beach. There are no environmentally sensitive habitat areas, agricultural lands or timber lands within the Santa Monica Beach. However, as previously discussed in Section 3.4 Biological Resources, there are protected management areas for the federally protected snowy plover about 1 mile north of the salt water well site. The SMMC also contains provisions for the protection of archaeological resources, if unknown resources are discovered during construction. Thus the project appears consistent with Article 5.
- Article 6 Development. This article specifies siting new development in close proximity to existing development, provides for the protection of scenic coastal resources, provides for maintenance of public access, directs to minimize adverse impacts, directs for expansion of public works facilities to support uses encouraged under the Coastal Act, and gives priority to coastal dependent uses. The proposed wells are coastal dependent uses because the purpose of the wells is to draw saltwater. The project structures would appear similar to those already present, which are the color of the sand and blend in with the surrounding environment. The

structures are low to the ground (5 feet) and would not block views or affect the scenic vista. Moreover, the project would assist the City in continuing to meet the water demands of local residents and coastal dependent/coastal related uses and would remediate an existing contaminated groundwater subbasin. The proposed project would not impede access and appears to be consistent with Article 6.

The project site lies within the Coastal Zone and appears to be consistent with Chapter 3 of the California Coastal Act (as amended effective January 1, 2007). The proposed project would be required to obtain a Coastal Development Permit and an "Approval in Concept" from the City of Santa Monica.

In general, the proposed project involves water system infrastructure improvements that would enhance the water quality and water supply within the City and southern California region. The proposed improvements are generally consistent with existing land uses on both the Charnock and SMWTP sites and would be expected to meet all zoning and building codes. The installation of two wells within the Coastal Zone at Santa Monica Beach appears to be consistent with Chapter 3 of the Coastal Act and the effects with respect to land use and planning would be **less than significant.**

c) As previously discussed in Section 3.4 Biological Resources, there are protected management areas for the federally protected snowy plover about 1 mile north of the salt water well site. However, because the project would be located within a highly utilized stretch of urban beach within Santa Monica Beach, which is located about 1 mile from these protected habitat areas, the impact to habitat conservation plans would be **less than significant.**

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XII. MINERAL RESOURCES -- Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☒

a-b) The project sites are located in developed urban areas that does not provide any mineral resource value. Development of the proposed project would not result in the loss of the availability of a known mineral resource that would be of value locally, regionally, or to the State (California Geological Survey/U.S. Geological Survey, 2003). Therefore, no impacts to mineral resources would occur.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XIII. NEIGHBORHOOD EFFECTS – Would the project result in:				
a) Have considerable effects on the project neighborhood?	☐	☒	☐	☐

a) As future use of the project locations would be similar to the existing and past use of the sites, it is not anticipated that the proposed development would substantially increase the noise level in the vicinity of the project sites compared to existing conditions. However, the proposed project would have temporary noise, air quality, and traffic impacts associated with construction of the development. In addition, there is potential for adverse neighborhood impacts at the Charnock facility due to potential adverse impacts related to aesthetics and hazards and hazardous materials. These potentially significant adverse effects will be explored and discussed in greater detail in the EIR.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XIV. NOISE – Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☒	☐	☐
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒
c) A substantial permanent increase in ambient noise levels above levels existing without the project?	☐	☐	☒	☐
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☒	☐	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XIV. NOISE – Would the project result in:				
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise?	☐	☐	☐	☒

a-d) The project involves water quality and water supply infrastructure improvements for potentially three locations. Each location would be similar to the existing or previous use. It is not anticipated that the proposed development would substantially alter the ambient noise levels in the vicinity of the project site, however, there could be potentially significant temporary noise impacts due to construction activities. Both short- and long-term noise issues will be explored and discussed in more detail in the EIR.

e-f) The nearest airport, the Santa Monica Airport, is located more than one mile west of the Charnock site, 2.5 miles south of the SMWTP location and 5 miles west of the Salt Water Well location (Google Earth, 2007). These locations are not located within an airport land use plan and are outside the 60-dBA contour for airport noise associated with the Santa Monica Airport (Santa Monica General Plan Noise Element, 1992). Thus, no impacts would result.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XV. POPULATION AND HOUSING — Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

a-c) The project involves water quality and water system improvements for the City of Santa Monica and overall benefits the regional water supplies. No residential structural development exists on the project sites, and no resident or tourist attracting elements or structures are proposed as part of the project. The proposed project would not involve altering any growth restricting infrastructure. Therefore, the project would have **no impact** to population and housing within the project areas.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XVI. PUBLIC SERVICES				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
i) Fire protection?	☐	☐	☐	☒
ii) Police protection?	☐	☐	☐	☒
iii) Schools?	☐	☐	☒	☐
iv) Parks?	☐	☐	☐	☒
v) Other public facilities?	☐	☐	☐	☒

ai-iii) The project does not negatively impact the use of any governmental facilities, and therefore would not increase demand for public services within the City of Santa Monica or the City of Los Angeles. The project does not include any measures that would alter the existing demand for fire or police protection, schools or other public facilities in the vicinity of the site. Therefore, the project would result in **no impacts** to public services.

The proposed salt water wells, if implemented, would create a temporary impact on beach parking. However, the parking area located at Pacific Street and Ocean Avenue is of sufficient size to accommodate the temporary construction impact. Therefore, the project would result in **less than significant impact** to parks.

The project does not negatively impact the use of any governmental facilities, and therefore would not increase demand for public services within the City of Santa Monica or the City of Los Angeles. The project does not include any measures that would alter the existing demand for fire or police protection, schools or other public facilities in the vicinity of the site. Therefore, the project would result in **no impacts** to public services.

The proposed salt water wells, if implemented, would create a temporary impact on beach parking. However, the parking area located at Pacific Street and Ocean Avenue is of sufficient size to accommodate the temporary construction impact. Therefore, the project would result in **less than significant impact** to parks.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XVII. RECREATION —				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

a-b) The project would not require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment. The project would not permanently impact existing recreational facilities in the vicinity. **No impacts** would result.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XVIII. SHADOWS —				
a) Would the project produce extensive shadows affecting adjacent uses or properties?	☐	☐	☒	☐

a) The proposed project's objective includes making site improvement to existing City water treatment facilities to restore the groundwater resource of the Charnock sub-basin to its full beneficial use in the most expeditious and technically effective manner possible. A shadow analysis was performed for the new facilities proposed at the Charnock site to examine whether the proposed improvements would adversely affect shadow sensitive uses, such as Windward School. As discussed in *Aesthetics Effects* above, the project will not generate shadows that would extend off site or affect any of the neighboring uses. The project would result in less **than significant impact** to shadows, however this issue will be discussed and evaluated further in the EIR in the Aesthetics section.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XIX. TRANSPORTATION / TRAFFIC — Would the project:				
a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	☐	☐	☒	☐
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	☐	☐	☒	☐
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☒	☐
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible use (e.g., farm equipment)?	☐	☐	☒	☐
e) Result in inadequate emergency access?	☐	☐	☒	☐
f) Result in inadequate parking capacity?	☐	☐	☒	☐
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☒	☐
h) Involve right-of-way dedication resulting in a reduced lot area?	☐	☐	☒	☐
i) Reduce access to other properties and uses?	☐	☐	☒	☐
j) Create abrupt grade differential between public and private property?	☐	☐	☒	☐

a-j) The proposed project would be served by existing City staffing levels and is not expected to generate any significant new permanent employment positions within the City. As such, implementation of the treatment upgrades would not be expected to cause a significant increase in traffic, adversely affect peak hour volume to capacity ratios, would not exceed a level of service standard, substantially increase hazards due to a design feature, or reduce access to other properties and uses.

Charnock Well Field

The Charnock site is currently not in operation however it is periodically used for the storing of City of Santa Monica Water Department parts and equipment. It is estimated that Santa Monica Water Department personnel currently visit the site about once per week. With implementation of the proposed new facility, the Charnock facility would be visited by one or two staff per day resulting in about 4 new daily trips on the local street system. In addition, there would be periodic carbon change outs, delivery of supplies and materials and disposal of backwash water and sludge. Table 2 provides the trip generation estimates for the Charnock facility when it is in full operation.

Table 2 Charnock Trip Generation Estimates

Trip Uses	Trips	Vehicles per activity	AM Peak Hour Trips	PM Peak Hour Trips
Water Department Staff	2 per day	2 (4 ADT)	0-2	0-2
GAC Change Outs	4 per year	4 (8 ADT - 4 times per year)	0-4	0-4
Sodium Hypochlorite Deliveries	1 per month	2 (4 ADT - 12 times per year)	0-2	0-2
GAC Backwash Pick-up*	6 per year	1 (2 ADT 6 times per year)	0-1	0-1
GAC Backwash Sludge Pick-Up	1 per month	3 (6 ADT – 12 times per year)	0-3	0-3

** Backwash water may be disposed via storm drain pending water sample results and approved NPDES permit*

As shown in Table 2 the project would involve up to 10 daily trips (regular staff plus GAC change out) during a peak activity and would involve generation of up to 6 peak hour trips onto the local street system. The GAC carbon change out peak activity would be expected to occur up to 4 times per year during the first years of operation; reducing in subsequent years as the change out frequency declines. This level of traffic generation is not expected to adversely impact traffic or circulation patterns in the project vicinity and would not be expected to result in a decline in any peak hour levels of service at nearby roads or intersections.

Further, the project would not change air traffic patterns, create inadequate emergency access, conflict with adopted transportation policies, involve right of way dedication resulting in a reduced lot area, or create an abrupt differential between public and private property.

The project may result in temporary reductions in street parking during the construction period, however, it is expected that some of the construction workers will be able to park onsite. Temporary impacts to transportation and traffic related to project construction are discussed in *Construction Effects*. No significant long-term impacts related to transportation and traffic would result from project operation, therefore Charnock traffic impacts would be less than significant.

Santa Monica Water Treatment Plant

This site is currently in operation 24 hours a day, 7 days a week and has 10 full time and 4 part time employees that report to the site. No new additional employee related trips are anticipated for the SMWTP. Table 3 provides the trip generation estimates for the SMWTP location once the proposed site modifications are implemented.

Table 3 SMWTP Trip Generation Estimates

Trip Uses	Trips	Vehicles per activity	AM Peak Hour Trips	PM Peak Hour Trips
Sodium Hypochlorite Deliveries	1 per month	2 ADT (12 times per year)	0-1	0-1
Fluoride Deliveries	6 per year	2 ADT (6 times per year)	0-1	0-1
Ammonia	1 per month	2 ADT (12 times per year)	0-1	0-1
Antiscalant	1 per month	2 ADT (12 times per year)	0-1	0-1

As shown in Table 3 the project improvements may involve up to 4 daily trips during a peak activity and would involve generation of up to 4 peak hour trips onto the local street system. The peak activity would not be likely to occur given the relative infrequent delivery schedules. This level of traffic generation is not expected to adversely impact traffic or circulation patterns in the project vicinity and would not be expected to result in a decline in any peak hour levels of service at nearby roads or intersections.

The proposed improvements at the SMWTP maintenance would not result in permanent modifications to the existing traffic patterns. The projects would not change air traffic patterns, create inadequate emergency access, conflict with adopted transportation policies, involve right of way dedication resulting in a reduced lot area, or create an abrupt differential between public and private property.

Because there is adequate parking onsite, the proposed improvements at the SMWTP would not result in temporary reductions in street parking during the construction period. Temporary impacts to transportation and traffic related to project construction are discussed in *Construction Effects*. No significant long-term impacts related to transportation and traffic would result from project operation, therefore impacts would be less than significant.

Salt Water Wells

Operation and maintenance of the potential new salt water wells would require a weekly visit for a visual inspection (2 ADT/1 day/week). This visit would occur from existing water department staff. In addition, the salt water will be treated with sodium hypochlorite. This will require a monthly vendor delivery (2 ADT/1 day/monthly). This level of traffic generation is not expected to adversely impact traffic or circulation patterns in the project vicinity and would not be expected to result in a decline in any peak hour levels of service at nearby roads or intersections.

The well operation and maintenance would not result in permanent modifications to the existing traffic patterns. The projects would not change air traffic patterns, create inadequate emergency access, conflict with adopted transportation policies, involve right of way dedication resulting in a reduced lot area, or create an abrupt differential between public and private property.

The new wells could result in temporary reductions in street parking during the construction period, however, it is expected that some of the construction workers will be able to park onsite. Temporary impacts to transportation and traffic related to project construction are discussed in *Construction Effects.* No significant long-term impacts related to transportation and traffic would result from project operation, therefore impacts would be less than significant.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XX. <u>UTILITIES AND SERVICE SYSTEMS</u> — Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☒	☐
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☒	☐
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☒	☐
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☒	☐
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☒	☐
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐

	Potentially Significant Impact	**Potentially Significant Unless Mitigation Incorporated**	**Less than Significant Impact**	**No Impact**
XX. <u>UTILITIES AND SERVICE SYSTEMS</u> — Would the project:				
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☒	☐

a) The project involves water quality and water supply improvements for the City of Santa Monica and overall increases to the regional water supplies. This will require the addition of new water treatment systems and upgrading current water treatment features at up to three site locations. The Charnock site may require approval from the State Water Resources Control Board for a National Pollution Discharge Elimination Permit (NPDES) permit. This permit would be related to GAC backwash discharges. The City will determine the backwash discharge methodology and the need for this permit during the final design phase of this project. The ultimate system that would be employed would be determined based on proven and previously permitted technologies. Therefore, the City does not expect to exceed any permit requirements that are set forth.

The SMWTP facility may require approval from the State Water Resources Control Board for a NPDES permit. The City will pursue this permit related to potential brine discharges if a membrane system is installed at the SMWTP. The City will determine the water softening methodology and the need for this permit during the final design phase of this site. The City does not expect to exceed any permit requirements that are set forth.

If the salt water wells are implemented they would require several permits including a County of Los Angeles Department of Public Health well permit, Coastal Development Permit and Santa Monica Environmental and Public Works Management Department Permit; Planning and Community Development Department Construction Permit. The sites may require additional permits however; the City does not expect to exceed any permit requirements that are set forth. Impacts would be **less than significant.**

b) The project itself involves improvements to the City's water supply system and will not otherwise require construction or involve impact to other water treatment facilities. Impacts would be **less than significant.**

c,e) No new storm water drainage facilities will be required at any of the project locations project locations. The City of Santa Monica Environmental and Public Works Management Department maintains pump stations that convey effluent to treatment facilities operated by the City of Los Angeles under a municipal sewage treatment contract. The project is not anticipated to substantially increase discharges to the sewage treatment system.

The Charnock and SMWTP sites may involve stormwater discharges. The City will pursue NPDES permits as necessary and follow the necessary requirements set forth. A further discussion of this topic is found in *Hydrology and Water Quality*. Impacts would be **less than significant.**

d) The two sources of drinking water for the City of Santa Monica are imported water purchased from the Metropolitan District of Southern California (MWD) and local groundwater. The City of Santa Monica Environmental and Public Works Management Department administers and maintains the distribution facilities and water supplies. Groundwater pumping from the Charnock groundwater basin is expected to be approximately 8,000 acre-feet per year. The City has owned and maintained the water rights for the Charnock groundwater basin since the 1920's. No new entitlements will be required for the implementation of this project. The proposed extraction of salt water to be used in the water softening process would be done consistent with all permit conditions, should this option be selected. Since this is a non-potable source the use of salt water to supply the softening process would not have any affect on potable water sources. Impacts would be **less than significant.**

f, g) The project may generate sludge during the backwashing of the GAC Vessels. Backwash events are expected to occur on each lead vessel every 4 to 6 weeks. A total of 54,400 gallons will be generated each time the 4 vessels are backwashed, however it is estimated that only a small portion will need to be disposed of offsite. Additional sludge may be generated from water collected in the 10,000 gallon sump tank. This water will be sampled and disposed to off-site facilities. It is anticipated that disposal will occur once per month. Any sludge or wastewater that is transported off-site is anticipated to be non-hazardous and will comply with all current federal, state and local statutes and regulations related to solid waste. There are currently several options that would be available for sludge disposal.

Overall, the project is not expected to include any modifications that would alter the existing demand for utilities, thus impacts to utilities and service systems would be **less than significant.**

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less than Significant Impact	No Impact
XXI. <u>MANDATORY FINDINGS OF SIGNIFICANCE</u> —				
a) Does the project have the potential to substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self- sustaining levels, eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☒	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when	☐	☒	☐	☐

	Potentially Significant Impact	**Potentially Significant Unless Mitigation Incorporated**	**Less than Significant Impact**	**No Impact**
viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?				
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☒	☐	☐

a) As discussed in Section 3.4, *Biological Resources*, the proposed locations for the water system improvements are all within urbanized areas and the proposed development would not significantly impact biological resources. Although the Pacific Ocean is located adjacent to the locations where salt water wells may be implemented, there are no existing waterways connecting the ocean to that specific area. The lack of large-scale contiguous native habitats and the ease of public access to the shoreline have resulted in little opportunity for sensitive plant and animal species to remain in the City of Santa Monica. This project would not result in significant impacts to the community and/or wildlife. The limited wildlife that exists in the area has adapted to the urban environment and there are no known migratory wildlife corridors.

The potential salt water well sites and adjacent beach includes bare sand that could potentially support nesting habitat for the federally threatened western snowy plover (Charadruis alexandrinus nivosus). However, the general area considered for these well sites are not located within a designated western snowy plover protection area. The beach area adjacent to the project site, Santa Monica Beach, is owned and managed by California State Parks. Current actions to limit public egress into the snowy plover colony are expected to continue into the future. Given that there is an active management plan that complies with the Recovery Plan recommendations for this area, it is not anticipated that the project would have an adverse effect on the Western snowy plover, and potential impacts to this and other sensitive species are considered less than significant.

Further, there is no evidence to suggest presence of either archaeological or historical resources on the Charnock, SMWTP or salt water well locations. The project sites are highly disturbed due to former development of the water treatment systems and due to urbanization that has occurred in the vicinity of the sites. Impacts would be less **than significant.**

b) The proposed project would generate potentially significant impacts related to aesthetics, construction effects, geology, hazards and hazardous materials and noise. These potentially adverse impacts will be explored and discussed in more detail in the EIR.

c) The proposed project has potential for adverse effects to human beings due to hazards and hazardous materials. The potential for adverse effects will be explored and discussed in more detail in the EIR.

REFERENCES

Bass, Ronald E., Herson, Albert I., Bogdan, Kenneth M, (ed.), *CEQA Deskbook,* 1999, 2001 *Supplement,* November 2000.

Bolt, Beranek, and Newman, *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances,* prepared for the US EPA, 1971.

California Air Resources Board, Air Quality and Meteorological Information System, http://www.arb.ca.gov/aqd/aqinfo.htm, accessed December 2007.

California Air Resources Board, Quality Assurance Air Monitoring Site Information, http://www.arb.ca.gov/qaweb/sitelist_create.php, accessed December 2007.

California Air Resources Board, *URBEMIS 2007, Version 9.2.2.*

California Department of Conservation, Division of Mines and Geology, 1999, Seismic Hazard Zone Map, Beverly Hills 7.5-minute Quadrangle, Los Angeles County, California, Released March 25, 1999. Map is available online at http://gmw.consrv.ca.gov/shmp/download/pdf/ozn_bevh.pdf

Dibblee, T. W. Jr., 1992, *Geologic Map of the Beverly Hills and Van Nuys (South ½) Quadrangles,* Los Angeles County, California, Dibblee Geological Foundation.

Federal Emergency Management Agency, *The National Flood Insurance Program Community Status Book,* available online at http://www.fema.gov/fema/csb.shtm, accessed December 2007.

Google Earth, December 2007.

Los Angeles, City of, Department of Building and Safety website, accessed December 2007.

Los Angeles, City of, Noise Ordinance, Chapter XI, updated 2004.

Los Angeles, City of, Safety Element of General Plan, 1996.

McCulloch, D.S. Evaluating Tsunami Potential. In Ziony (Ed.), *Evaluating Earthquake Hazards in the Los Angeles Region, An Earth-Science Perspective* (pp. 374-413). U.S. Geological Survey, Professional Paper 1360, 1985.

Santa Monica, City of, Environmental Programs Division 2002 *Water Efficiency Strategic Plan,* 2002.

Santa Monica, City of, Municipal Code, available on-line at http://www.codemanage.com/santamonica/, accessed December 2007.

Santa Monica, City of, Master Environmental Assessment Update, 2002.

Santa Monica, City of, Noise Element, 1992.

Santa Monica, City of, Noise Ordinance, updated 2004.

Santa Monica, City of, Official Homepage http://santa-monica.org, accessed December 2007.

Santa Monica, City of, Safety Element, 1995.

Santa Monica, City of, Safety Element EIR, 1995.

U.S. Fish and Wildlife Service, Region 1, Western Snowy Plover (*Charadrius alesandrinus nivosus*) Pacific Coast Population Draft Recovery Plan, May 2001.

WorleyParsons Komex, Preliminary Design Report, July 2007. Report available at the City's Civil Engineering & Architectural Services Division

Appendix P

Public Notice

City of
Santa Monica®

Water Production & Treatment Unit
Water Resources Division
1228 S. Bundy Dr.
Los Angeles, CA 90025

July 14, 2010

Ms. Sutida Bergquist, P.E.
District Engineer

CA Department of Public Health
Drinking Water Program - Central District
500 North Central Avenue, Suite 500
Glendale, CA 91203

Dear Ms. Bergquist,

Subject: Charnock Well Field Restoration Project, City of Santa Monica

The public notice concerning the plans to reactivate shuttered water wells in the City of Santa Monica was published in the Santa Monica Daily Press Wednesday, June 9th and Saturday, June 12th, commencing the 30-day public review period on the 9th. The technical reports (97-005) prepared for the public review were accessible at nine public locations, resulting in no written submissions.

Please note that a communication was received via email during the comment period, but does not appear to be in response to the notice of the public comment period.

Sincerely,

Myriam Cardenas for G. Borboa

Gil Borboa
Water Resources Manager

CC: Kurt Souza, P.E./DPH
Mark Trudell, Taly Williams/WP
Ms. Milagros Alora, Sanitary Engineer/DPH

Attachment: Notice Published in the Newspaper
Email communication

tel: 310 826-6712 • fax: 310 820-3747

From: Enrico [mailto:invmny4u@yahoo.com]
Sent: Monday, June 28, 2010 9:50 PM
To: Myriam Cardenas
Subject: Fluoridation, pay attention there is a lawsuit here!

Oh, and its poison!!!! After watching this, I suggest you seriously considering the removal of this toxic waste from our your and our bodies. You could be setting yourself up for a class action lawsuit against the city of SM.

Jay

The truth will set you free:

http://www.youtube.com/watch?v=xP7IPDfC3yg&feature=player_embedded

http://www.youtube.com/watch?v=1SYgUi_f5yY&feature=player_embedded#!

PUBLIC NOTICE
City of Santa Monica
Water Resources Division

The City of Santa Monica Water Resources Division wants you to know that plans are on schedule to reactivate shuttered water wells in conjunction with the **Charnock Well Field Restoration Project**. Water from the Charnock Well Field will be used in our system starting in August 2010. The City's primary goal is to return the Charnock Well Field to full production by December 31, 2010 which will fully restore local groundwater supplies, reduce the use of imported water from Northern California and the Colorado River, and help meet the City's sustainability objectives.

The Charnock Well Field, located in Mar Vista, has been used as a drinking water source since 1924. In 1996, the well field was shut down after routine water testing revealed that the gasoline additive, Methyl tertiary-Butyl Ether (MTBE) had infiltrated the aquifer supplying the wells. The source of the gasoline compound was leakage from underground storage tanks at local gasoline service stations. After subsurface investigation and site cleanup was instituted, the City of Santa Monica pursued restitution and eventually reached a monetary settlement agreement with the principal responsible parties.

After years of studies to evaluate the optimum solution for treating the water, the City has installed a Granular Activated Carbon filtration system to remove MTBE and another potential gasoline additive, tertiary-Butyl Alcohol (TBA) from the Charnock Well Field water. The MTBE and TBA plume is not expected to reach the Charnock wells for at least two years after pumping starts, based on computer modeling by expert hydrogeologists commissioned by the City.

An additional component of the Project is the replacement of the City's obsolete water softening facility at the Santa Monica Water Treatment Plant, with a new Reverse Osmosis softening system that includes Fluoridation and Chloramination capabilities. The facility is located in West Los Angeles.

In order to ensure that all water quality regulations and drinking water permitting requirements for the new treatment facilities are being met, the City is working with the California Department of Public Health (DPH), the responsible agency for regulatory oversight and the enforcement of the federal and California Safe Drinking Water Acts to assure the delivery of safe drinking water to Santa Monica residents.

AVAILABILITY OF DOCUMENTATION:
The City prepared a series of technical reports to support the drinking water permit application to the Department of Public Health and the City is soliciting comments or input from its customers. Documents regarding the Charnock Well Field Restoration Project may be viewed at the Water Resources Division, 1212 Fifth Street, 3rd Floor, Santa Monica and the following

City Engineering Division
1437 4th Street, Suite #300
Santa Monica, CA

City Planning Counter, Room 214
1685 Main Street
Santa Monica, CA

Santa Monica Public Library
Main Branch
601 Santa Monica Bl.
Santa Monica, CA

Santa Monica Public Library
Fairview Branch
2101 Ocean Park Blvd.
Santa Monica, CA

City Clerk, Room 102
1685 Main Street
Santa Monica, CA

Santa Monica Public Library
Montana Avenue Branch
1704 Montana Avenue
Santa Monica, CA

Santa Monica Public Library
Ocean Park Branch
2601 Main Street
Santa Monica, CA

Public Work's Counter
1685 Main Street, Room 113
Santa Monica, CA

REVIEW PERIOD: A 30-day public review period for the document will commence on June 9, 2010 and end on July 8, 2010. The City of Santa Monica welcomes public comments on the document during this period. Any written comments must be received within the public review period. **Comments may be submitted, in writing, by 5:30 p.m. on July 7, 2010** and addressed to:

Myriam Cardenas
City of Santa Monica
Water Resources Division
1212 Fifth Street, 3rd Floor
Santa Monica, CA 90401
E-mail: myriam.cardenas@smgov.net

PUBLIC NOTICE
City of Santa Monica
Water Resources Division

The City of Santa Monica Water Resources Division wants you to know that plans are on schedule to reactivate shuttered water wells in conjunction with the **Charnock Well Field Restoration Project** as early as July 2010. The City's primary goal is to return the Charnock Well Field to full production by December 31, 2010 which will fully restore local groundwater supplies, reduce the use of imported water from Northern California and the Colorado River, and help meet the City's sustainability objectives.

The Charnock Well Field, located in Mar Vista, has been used as a drinking water source since 1924. In 1996, the well field was shut down after routine water testing revealed that the gasoline additive, Methyl tertiary-Butyl Ether (MTBE) had infiltrated the aquifer supplying the wells. The source of the gasoline compound was leakage from underground storage tanks at local gasoline service stations. After subsurface investigation and source remediation was instituted, the City of Santa Monica pursued restitution and eventually reached a monetary settlement agreement with the principal responsible parties.

After years of studies to evaluate the optimum solution for treating the water, the City installed a Granular Activated Carbon (GAC) filtration system to remove MTBE and another potential gasoline additive, tertiary-Butyl Alcohol (TBA). An additional component of the Project is the replacement of the City's obsolete water softening facility at the Santa Monica Water Treatment Plant, with a new Reverse Osmosis (RO) softening system that includes Fluoridation and Chloramination capabilities. The facility is located in West Los Angeles.

In order to ensure that all clean water regulatory and permitting requirements are being met, the City is working with the California Department of Public Health (DPH), the responsible agency for the enforcement of the federal and California Safe Drinking Water Acts (SDWAs), and the regulatory oversight of the project to assure the delivery of safe drinking water to Santa Monica residents.

AVAILABILITY OF DOCUMENTATION:
Documents regarding the Charnock Well Field Restoration Project may be viewed at the Water Resources Division, 1212 Fifth Street, 3rd Floor, Santa Monica and the following locations:

City Engineering Division
1437 4th Street, Suite #300
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City Planning Counter, Room 214
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2601 Main Street
Santa Monica, CA

Public Work's Counter
1685 Main Street, Room 113
Santa Monica, CA

REVIEW PERIOD: A 30-day public review period for the document will commence on June 8, 2010 and end on July 7, 2010. The City of Santa Monica welcomes public comments on the document during this period. Any written comments must be received within the public review period. **Comments may be submitted, in writing, by 5:30 p.m. on July 6, 2010** and addressed to:

Myriam Cardenas
City of Santa Monica
Water Resources Division
1212 Fifth Street, 3rd Floor
Santa Monica, CA 90401
E-mail: myriam.cardenas@smgov.net

Appendix Q

Chemicals and Feed System Specifications and NSF Certifications

ONLINE CERTIFICATIONS DIRECTORY

FDPH.MH47183
Drinking Water Treatment Chemicals

Page Bottom

Drinking Water Treatment Chemicals

See General Information for Drinking Water Treatment Chemicals

YOUXIAN LONGJIANG CHEMICAL PLANT
TAOSHUI COUNTRY
TAOSHUI TOWN
YOUXIAN, HUNAN 412000 CHINA

MH47183

ANSI/NSF STANDARD 60

Plant at: Hunan, CHINA

Trade Dsg	Category	Max Use Level (mg/L)
Sodium fluoride (a)	Miscellaneous Treatment Application Products	2.3

(a) - This maximum use level corresponds to a maximum Fluoride concentration of 1.2 mg/L

Last Updated on 2009-11-19

Questions? Notice of Disclaimer Page Top

Distributed by:
Westco Chemicals, Inc.
12551 Saticoy St. South
North Hollywood, CA 91605
Tel: 818-255-3655 Fax: 818-255-3650

CERTIFICATE OF ANALYSIS

NAME OF PRODUCT:SODIUM FLUORIDE
INVOICE NO.: 49966
Production date :SEP.2010
QUANTITY:19.954MT
Lot No.: 1043
Manufacturer: Youxian Longjiang Chemical Plant.
Packing: 50LB NET BROWN PAPER BAGS.
Expiration Date: TWO YEARS.
Test Method: GB4293-84

ITEMS	STANDARDS	RESULTS
Purity	⩾97.00%	98.40%
Fluoride Content	⩽43. 8%	42.3%
Water insolubles	⩽0.3%	0.28%
Moisture	⩽0.5%	0.20%
Heavy Metals(as Pb)	⩽0.5%	0.04%
Na_2SiF_6	⩽1.5%	0.71%
Na_2CO_3	⩽0.5%	0.04%
PH	7. 2-8. 0	7.5
Particle size analysis: +32 mesh	0-5%	3.1%
32-60 mesh	45-75%	67.3%
60-100mesh	20-40%	27%
100-325mesh	0-8%	2.6%
-325mesh	0%	0%

Westco Chemicals, Inc.
12551-61 Saticoy Street South - North Hollywood, CA 91605
TEL:323- 877-0077 818-255-3655 FAX: 818-255-3650

Data Sheet

Material Safety Data Sheet
Sodium Fluoride

Suppliers Name: Westco Chemicals, Inc.
Address: 12551-61 Saticoy Street South
North Hollywood, CA 9160
Telephone: 818-255-3655 or 323-877-0077

EMERGENCY TELEPHONE NUMBER: 800-424-9300

1. Product Identification

Synonyms: Floridine; sodium monofluoride; disodium difluoride; natrium fluoride;
CAS No.: 7681-49-4
Molecular Weight: 41.99
Chemical Formula: NaF

Composition / Information on Ingredients

Ingredient	CAS No.	Percent	Hazardous
Sodium Fluoride	7681-49-4	100	Yes

3. Hazards Identification

Emergency Overview

DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. AFFECTS RESPIRATORY SYSTEM, HEART, SKELETON, CIRCULATORY SYSTEM, CENTRAL NERVOUS SYSTEM AND KIDNEYS. CAUSED IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. IRRITATION EFFECTS MAY BE DELAYED.

HMIS Rating

Health Rating: 3 Severe (Poison)
Flammability Rating: 0 None
Reactivity Rating: 1 (Slight)
Contact Rating: 2 Moderate
Lab Protective Equipment: Goggles, Lab Coat, Vent Hood, Proper Gloves

otential Health Effects

inhaled or swallowed, this compound can cause fluoride poisoning. Early symptoms include nausea, vomiting, diarrhea, and weakness. Later effects include central nervous system effects, cardiovascular effects and death.

Inhalation: Causes severe irritation to the respiratory tract, symptoms may include coughing, sore throat, and labored breathing. May be absorbed through inhalation of dust; symptoms may parallel those from ingestion exposure. Irritation effects may not appear immediately.

Ingestion: Toxic! May cause salivation, nausea, vomiting, diarrhea, and abdominal pain. Symptoms of weakness, tremors, shallow respiration, cardopedal spasm, convulsions, and coma may follow. May cause brain and kidney damage. Affects heart and circulatory system. Death may occur from respiratory paralysis. Estimated lethal dose=5-10 grams.

Skin Contact: Causes irritation, with redness and pain. Solutions are corrosive. Effects may not appear immediately.

Eye Contact: Eye Irritant! May cause irritation and serious eye damage. Effects may not immediately appear.

Chronic Exposure: Chronic exposure may cause mottling of teeth and bone damage (osteosclerosis) and fluorosis. Symptoms of fluorisis include brittle bones, weight loss, anemia, calcified ligaments, general ill health and joint stiffness.

Aggravation of Pre-existing Conditions: Populations that appear to be at increased risk from the effects of fluoride are individuals that suffer from diabetes insipidus or some forms of renal impairment.

4. First Aid Measures

First Aid procedures should be pre-planned for fluoride compound emergencies.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. CALL A PHYSICIAN IMMEDIATELY.

Ingestion: Administer milk, chewable calcium carbonate tablets or milk of magnesia. Never give anything by mouth to an unconscious person. CALL A PHYSICIAN IMMEDIATELY.

Skin Contact: Wipe off any excess material from skin and then immediately flush skin with large amounts of soapy water. Remove contaminated clothing and shoes. Wash clothing before re-use. Apply bandages soaked in magnesium sulfate. CALL A PHYSICIAN IMMEDIATELY.

Eye Contact: Immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting lower and upper eyelids occasionally. CALL A PHYSICIAN IMMEDIATELY.

Note to Physician: For large exposures, systemic effects (hypocalcaemia and hypomagnesia) may occur.

5. Fire Fighting Measures

Fire: Not considered to be a fire hazard.
Explosion: Not considered to be an explosion hazard.
Fire Extinguishing Media: Use any means suitable for extinguishing surrounding fire.
Special Instructions: In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full face-piece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is 800-424-8802.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Separate from acids and oxidizing materials. Containers of this material may be hazardous when empty since they retain product residues (dusts, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls / Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL): 2.5 mg(F)/m3 (TWA)

-ACGIH Threshold Limit Value (TLV): 2.5 mg(F)/m3 (TWA)

Ventilation System: A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, Industrial Ventilation, A Manual of Recommended Practices, most recent edition, for details.

Personal Respirators (NIOSH Approved): If the exposure limit is exceeded, a half-face dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency, or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator.

Skin Protection: Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection: Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance: White crystals
Odor: Odorless
Solubility: 4 g/100 ml water @ 15 °C (59°F)
Specific Gravity: 2.78
pH: No information found
% Volatiles by volume @ 21°C (70°F): 0
Boiling Point: 1700°C (3092°F)
Melting Point: 993°C (1819°F)
Vapor Density (Air=1): No information found
Vapor Pressure (mm Hg): 1 @ 1077°C (1971°C)
Evaporation Rate (BuAc=1): No information found

10. Stability and Reactivity

Stability: Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products: Burning may produce hydrogen fluoride vapors.
Hazardous Polymerization: Will not occur.
Incompatibilities: Reacts with acids to form hydrogen fluoride.
Conditions to Avoid: In information found.

11. Toxicological Information

Oral rat LD50: 52 mg/kg; Eye Rabbit (standard Draize) 20 mg/24-hr, moderate; Investigated as a tumorigen, mutagen, reproductive effector.

--------\Cancer Lists\--

	-----NTP Carcinogen-----		
Ingredient	Known	Anticipated	IARC Category
Sodium Fluoride (7681-49-4)	No	No	None

12. Ecological Information

Environmental Fate: No information found.
Environmental Toxicity: This material is not expected to be toxic to aquatic life. The LC50/96-hour values for fish are over 100 mg/l. LD50, oral (goat, sheep) 100 mg/kg; LD50, oral (wild bird) 110 mg/kg.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Mane: Sodium Fluoride
Hazard Class: 6.1
UN/NA: UN1690
Packing Group: III
Information reported for product/size: 250 lb

International (Water, I.M.O.)

Proper Shipping Name: Sodium Fluoride, Solid
Hazard Class: 6.1
UN/NA: UN1690
Packing Group: III
Information reported for product/size: 250 lb

15. Regulatory Information

Chemical Inventory Status - Part 1

Ingredient	TSCA	EC	Japan	Australia
Sodium Fluoride (7681-49-4)	Yes	Yes	Yes	Yes

Chemical Inventory Status - Part 2

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
Sodium Fluoride (7681-49-4)	Yes	Yes	No	Yes

Federal, State & International Regulations - Part 1

	-SARA 302-		--SARA 313--	
Ingredient	RQ	TPQ	List	Chemical Catg.
Sodium Fluoride (7681-49-4)	No	No	No	No

Federal, State & International Regulations - Part 2

		-RCRA-	-TSCA-
Ingredient	CERCLA	261.33	8(d)
Sodium Fluoride (7681-49-4)	1000	No	No

Chemical Weapons Convention: Yes

TSCA 12 (b): No
CDTA: No

SARA 311/312: Acute: Yes
Chronic: Yes
Fire: No
Pressure: No

Reactivity: No (pure/solid)

Australian Hazchem Code: 2Z
Poison Schedule: S2

WHMIS: This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 0

Label Hazard Warning:
DANGER! MAY BE FATAL IF SWALLOWED OR INHALED, AFFECTS RESPIRATORY SYSTEM, HEART, SKELETON, CIRCULATORY SYSTEM, CENTRAL NERVOUS SYSTEM AND KIDNEYS. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. IRRITATION EFFECTS MAY BE DELAYED.

Label Precautions:
Do not breathe dust
Keep container closed
Use only with adequate ventilation
Wash thoroughly after handling
Avoid contact with eyes, skin and clothing.

Label First Aid: In all cases call a physician immediately. First Aid procedures should be pre-planned for fluoride compound emergencies. If swallowed, administer milk, chewable calcium carbonate tablets or milk of magnesia. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give artificial respiration. In case of skin contact wipe off any excess material then immediately flush skin with large amounts of soapy water. Remove contaminated clothing and shoes. Wash clothing before re-use. Apply bandages soaked in magnesium sulfate. In case of eye contact, immediately flush eyes with gentle but large stream of water for at least 15 minutes, lifting upper and lower eyelids occasionally.

Revision date: 7/2/04 Review Date: 10/3/06

Underwriters Laboratories Inc.®

Research Triangle Park,
North Carolina • (919) 549-1400
Camas, Washington • (360) 817-

CERTIFICATE OF COMPLIANCE

CERTIFICATE NUMBER: 020502 - MH18026
ISSUE DATE: 02 May 2002

Page 1 of 1

Issued to:

JCI Jones Chemicals Inc.
808 Sarasota Quay
Sarasota, FL 34236

Report Reference: MH18026-May 02, 2002

This is to Certify that representative samples of:

Product	Maximum Use Level
Sodium Bisulfite 38 - 40%	18mg/L

Have been investigated by Underwriters Laboratories Inc.® in accordance with the Standard(s) indicated on this Certificate.

Standard(s) for Safety: ANSI/NSF Standard 60 - Drinking Water Additives - Health Effects

Additional Information: Factory location: Warwick, New York

Only those products bearing the UL Classification Marking should be considered as being covered by UL's Classification and Follow-Up Service.

The UL Classification Marking includes: UL in a circle symbol: with the word "CLASSIFIED" (as shown); a control number (may be alphanumeric) assigned by UL; a statement to indicate the extent of UL's evaluation of the product; and, the product category name (product identity) as indicated in the appropriate UL Directory.

LOOK FOR THE UL CLASSIFICATION MARKING ON THE PRODUCT

Engineer:
Doug Frederick
Underwriters Laboratories Inc.

Review Engineer:
Richard Winton
Underwriters Laboratories Inc.

NSF Product and Service Listings

These NSF Official Listings are current as of **Monday, June 11, 2012** at 12:15 a.m. Eastern Time. Please contact NSF International to confirm the status of any Listing, report errors, or make suggestions.

Alert: NSF is concerned about fraudulent downloading and manipulation of website text. Always confirm this information by clicking on the below link for the most accurate information:
http://www.nsf.org/Certified/PwsChemicals/Listings.asp?CompanyName=Avista&

NSF/ANSI STANDARD 60
Drinking Water Treatment Chemicals - Health Effects

Avista Technologies

140 Bosstick Boulevard
San Marcos, CA 92069
United States
760-744-0536
Visit this company's website

Facility : # 1 USA

Miscellaneous Treatment Chemical

Trade Designation	*Product Function*	*Max Use*
AntiChlor® 427[1]	Dechlorination	8mg/L

[1] This product contains sulfite.
Sulfites have been known to cause potentially lethal allergic reactions in sulfite-sensitive individuals.
The maximum recommended allowable residual sulfite level in the finished drinking water is 100 ppb (0.1 mg/L).

Miscellaneous Water Supply Products

Trade Designation	*Product Function*	*Max Use*
AvistaClean MF3000[2] [3]	Membrane Cleaner	NA
AvistaClean P112[2] [3]	Other	NA
AvistaClean P312[2] [3]	Membrane Cleaner	NA
Phoenix 3000[2]	Other	NA
RoClean L211[2]	Membrane Cleaner	NA
RoClean L212[2] [3]	Membrane Cleaner	NA
RoClean L403[2]	Membrane Cleaner	NA
RoClean L811[2] [3]	Membrane Cleaner	NA
RoClean P111[4]	Membrane Cleaner	NA
RoClean P112[2] [3]	Membrane Cleaner	NA

RoClean P303[2] [3]	Membrane Cleaner	NA
RoClean P703[2] [3]	Membrane Cleaner	NA
SafeGuard 100[2] [5]	Other	NA
Vitec® 1000	Reverse Osmosis Antiscalant	28mg/L
Vitec® 3000	Reverse Osmosis Antiscalant	7mg/L
Vitec® 3000UL	Reverse Osmosis Antiscalant	7mg/L
Vitec® 3025	Reverse Osmosis Antiscalant	25mg/L
Vitec® 4000	Reverse Osmosis Antiscalant	7mg/L
Vitec® 5100	Reverse Osmosis Antiscalant	13mg/L
Vitec® 7000	Reverse Osmosis Antiscalant	7mg/L
Vitec® 8200	Reverse Osmosis Antiscalant	7mg/L
Vitec® S1410	Reverse Osmosis Antiscalant	3mg/L
Vitec® SI425	Reverse Osmosis Antiscalant	3mg/L

[2] This product is designed to be used off-line and is to be flushed out prior to using the system for drinking water, following the manufacturer's use instructions.

[3] The pH of the influent and effluent water should be monitored to ensure that all traces of the product have been removed before placing into service.

[4] This product is designed to be used off-line and is to be flushed out prior to using the system for drinking water. The system should be flushed with 5 bed/volumes of water, before being placed back on-line.

[5] This product is Certified for use as a storage preserver for reverse osmosis elements.

Polymer Blends

Trade Designation	*Product Function*	*Max Use*
RoQuest® 3000[PD] [PY]	Coagulation & Flocculation	125mg/L
RoQuest® 4000[PD] [PY]	Coagulation & Flocculation	285mg/L
RoQuest® 6000[PD] [PY]	Coagulation & Flocculation	285mg/L

[PD] Certification is based on a maximum carryover of 50 ug/L DADMAC polymer.

[PY] Polyamines Certified by NSF International comply with 40 CFR 141.111 requirements for percent monomer and dose.

Number of matching Manufacturers is 1
Number of matching Products is 27
Processing time was 0 seconds

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Manufacturing : int
RHODIA INC
20720 SOUTH WILMINGTON AVENUE
90810-1034 LONG BEACH
USA

Rhodia Inc.
8 Cedar Brook Drive
08512-7500 Cranbury
USA

UNIVAR USA INC
12522 LOS NIETOS RD
SANTA FE SPRINGS CA 90670

Certificate of analysis

Print date:
02/03/2012
Purchase order item/Date
LA-708350 / 02/02/2012
Delivery item/Date
82065881 900001 / 02/03/2012
Order item/Date
1314802 000010 / 02/02/2012
Customer
2025038
Truck number/Seal number
/

Material: Our / Your reference
86598 SULFURIC ACID 93% N BLK

Batch D120130T33

Characteristic	Unit	Value	Lower Limit	Upper Limit
Acid Strength	%	94.18	93.20	94.20
Specific Gravity @ 60°F		1.8386		
Iron	ppm	2		50
Sulfur Dioxide	ppm	9		40

* Denotes determinations made on a periodic basis.

Excellence in Performance # Pride in Achievement

Batch released on : 01/30/2012

William P. Chan

William Chan - Laboratory Supervisor

DO-GEN10A
1 10/30/2011

NSF
CERTIFIED TO
ANSI/NSF STD 60
MAXIMUM DOSE
FOR POTABLE WATER
50MG/L

NSF Product and Service Listings

These NSF Official Listings are current as of **Tuesday, June 19, 2012** at 12:15 a.m. Eastern Time. Please contact NSF International to confirm the status of any Listing, report errors, or make suggestions.

Alert: NSF is concerned about fraudulent downloading and manipulation of website text. Always confirm this information by clicking on the below link for the most accurate information:
http://www.nsf.org/Certified/PwsChemicals/Listings.asp?CompanyName=Canexus&

NSF/ANSI STANDARD 60
Drinking Water Treatment Chemicals - Health Effects

Canexus Chemicals

801 7th Avenue Southwest
6th Floor
Calgary, AB T2P 3P7
Canada
403-571-7478

Facility : No. Vancouver, British Columbia, Canada

Chlorine[CL]

Trade Designation	*Product Function*	*Max Use*
Chlorine	Disinfection & Oxidation	30mg/L

[CL] The residual levels of chlorine (hypochlorite ion and hypochlorous acid), chlorine dioxide, chlorate ion, chloramine and disinfection by-products shall be monitored in the finished drinking water to ensure compliance to all applicable regulations.

Sodium Hydroxide

Trade Designation	*Product Function*	*Max Use*
50% Diaphragm-Grade Caustic	Corrosion & Scale Control pH Adjustment	100mg/L
50% Membrane-Grade Caustic Soda	Corrosion & Scale Control pH Adjustment	100mg/L
Caustic Soda 50% Sol'n, Membrane Grade	Corrosion & Scale Control pH Adjustment	100mg/L
Sodium Hydroxide Solution	Corrosion & Scale Control pH Adjustment	100mg/L

Number of matching Manufacturers is 1
Number of matching Products is 5
Processing time was 0 seconds

NSF Product and Service Listings

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http://www.nsf.org/Certified/PwsChemicals/Listings.asp?CompanyName=JCI&

NSF/ANSI STANDARD 60
Drinking Water Treatment Chemicals - Health Effects

JCI Jones Chemicals, Inc.

Road 185 Km. 19.0
Box 1723, Juncos 00777-1723
Puerto Rico
787-653-3700

Facility : Juncos, Puerto Rico

Chlorine[CL]

Trade Designation	*Product Function*	*Max Use*
Sunny Sol Chlorine	Disinfection & Oxidation	10mg/L

[CL] The residual levels of chlorine (hypochlorite ion and hypochlorous acid), chlorine dioxide, chlorate ion, chloramine and disinfection by-products shall be monitored in the finished drinking water to ensure compliance to all applicable regulations.

Number of matching Manufacturers is 1
Number of matching Products is 1
Processing time was 0 seconds

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MARTIN
MIDSTREAMPARTNERS

Ammonium Sulfate 40% Solution for Water Treatment
Certificate of Typical Analysis

Ammonium Sulfate
Formula: $(NH_4)_2SO_4$ Formula wt: 132.14 CAS: [7783-20-2]
Water
Formula: H_2O Formula wt: 18.02 CAS: [7732-18-5]

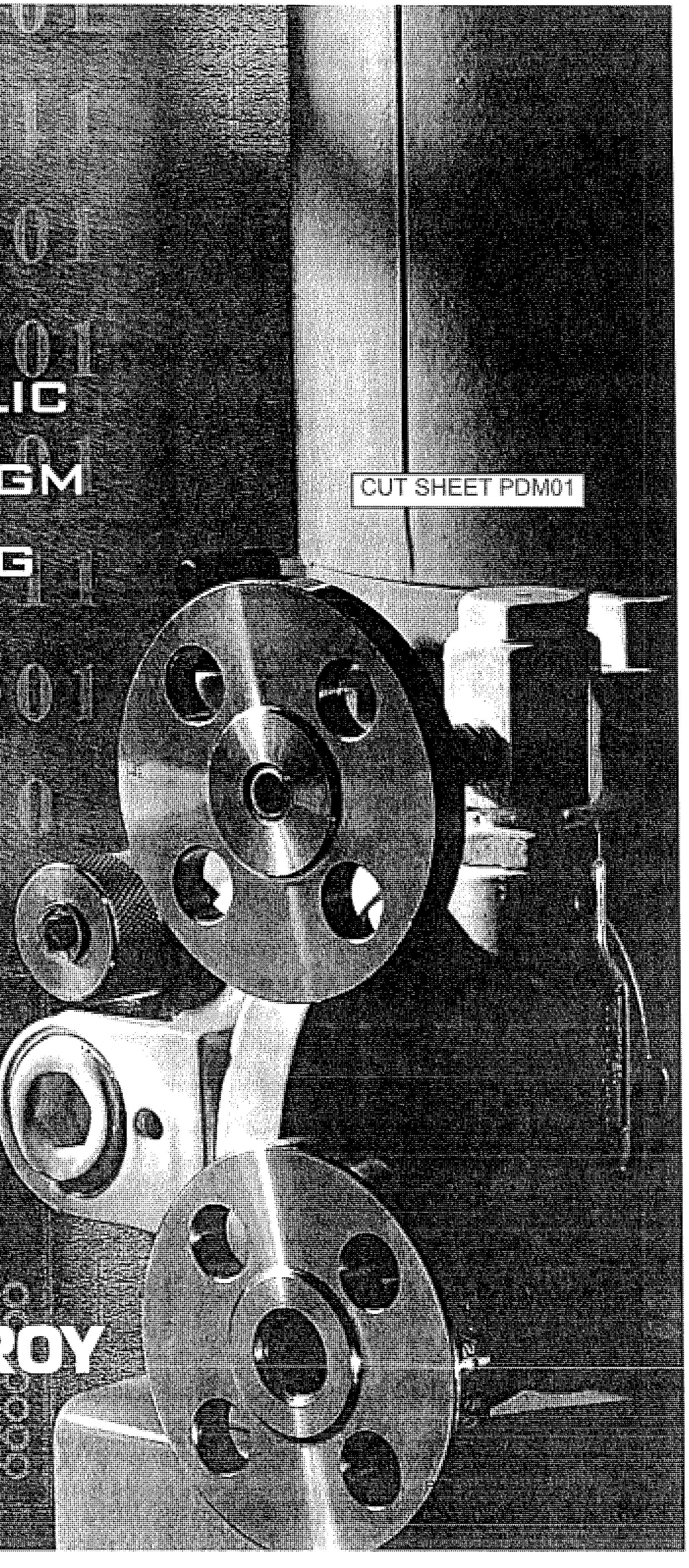
Standard	Our Typical Analysis
Assay: Not less than 39.0%	39.5% to 41.5%
Ammonia as NH_3 not < 10.0%	10.1% to 10.6%
Impurities: (Based on Quarterly Analysis)	
Fe - Iron	2 to 10 ppm
Heavy metals	Our Typical Analysis
Metal	ppm
As - Arsenic	<0.05
Cd - Cadmium	<0.01
Cu - Copper	<0.05
Pb - Lead	<0.175
Hg - Mercury	<0.001
Mo - Molybdenum	<0.5
Ni - Nickel	<1.0
Se - Selenium	<0.2
Zn - Zinc	<0.05

DRINKING WATER TREATMENT ADDITIVES CLASSIFIED BY UNDERWRITERS LABORATORIES INC.
to ANSI/NSF Standard 60

MAXIMUM USE LEVEL, 62.5 mg/L

mRoy™

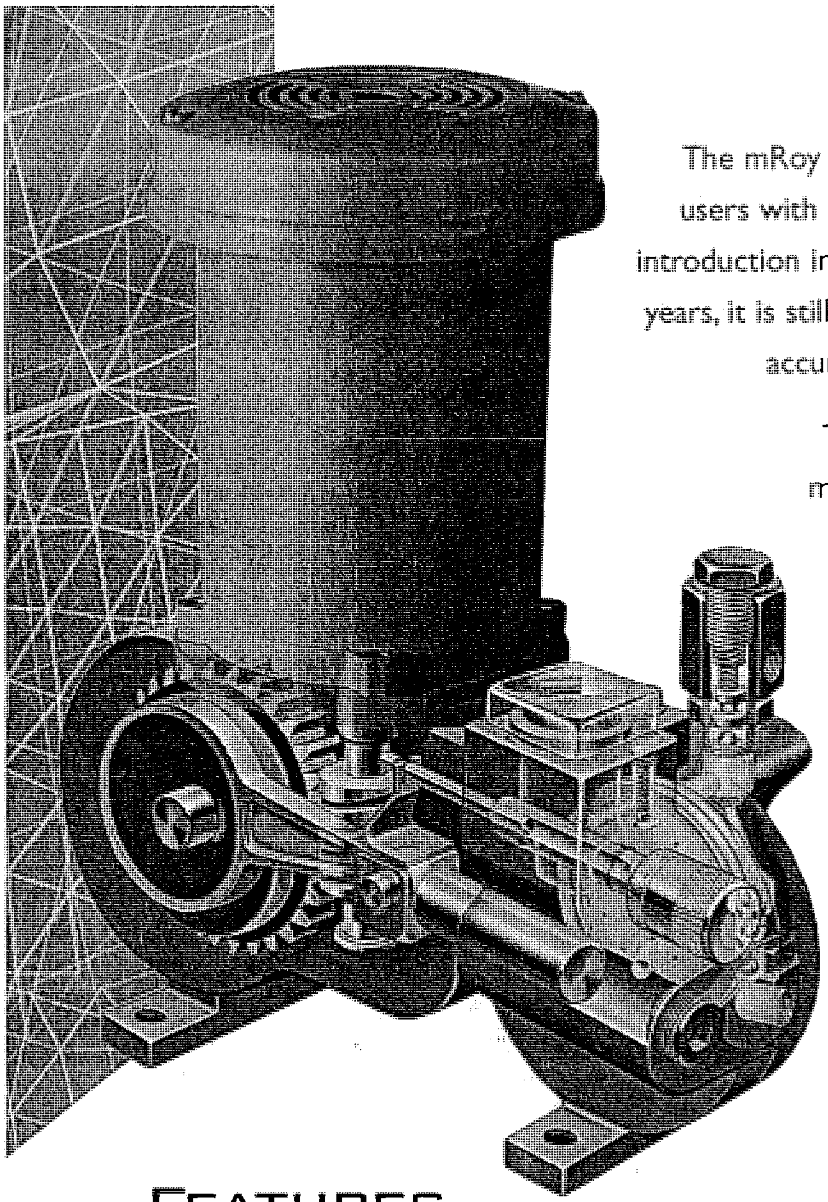
Series
Hydraulic
Diaphragm
Metering
Pumps



CUT SHEET PDM01

SPECIFIC PUMP
MODEL SHEETS
FOLLOW FOR
EACH PUMP SET

MILTON ROY



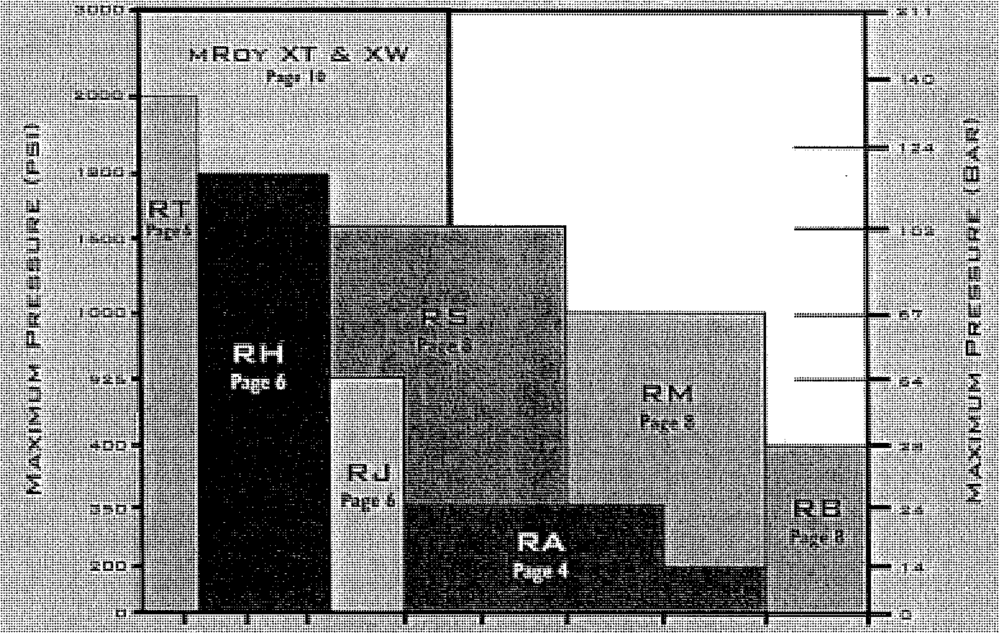
The mRoy series of metering pumps have provided users with high performance and reliability since its introduction in 1962. Enhanced and improved over the years, it is still the industry standard for durability and accuracy in the most demanding applications.

The mRoy is available in several different model series to meet the demands of any application with optimum performance and efficiency.

FEATURES

- Electric, hydraulic or air motor drives ensure that your mRoy will operate in all environments and power supplies
- Dust-tight cast iron drive housing provides a rugged enclosure that will operate in all plant and field environments
- Worm & pinion drive produces a smooth, continuous mechanical motion that eliminates "wear and tear" of mechanical "lost motion" designs
- Oil bath lubrication eliminates the continuous maintenance of packed grease, or auxiliary oil lubrication systems
- Tapered roller-bearing pinion shaft support maintains pinion gear and motor shaft alignment
- One piece connecting rod with integral bearing surfaces
- One piece floating cross head/plunger assembly designed to eliminate plunger seals
- Micrometer capacity adjustment for accurate output flow control
- Double or single ball high-performance cartridge-type check valves provide positive, repeatable sealing on every pump stroke
- Metallic and non-metallic liquid end materials for corrosion resistance in any chemical application
- Solid PTFE diaphragm provides seal-less design and eliminates plunger packing maintenance
- Automatic hydraulic system bypass maintains accurate balance between hydraulic and process flow
- Internal hydraulic pressure relief valve automatically protects the hydraulic system from over pressure conditions
- Front mount oil fill and sight provide convenient location for oil replacement and level monitoring

PERFORMANCE RANGE



APPLICATIONS

The reliability of the mRoy has been proven in hundreds of thousands of installations worldwide. The mRoy provides a great deal of value to customers whether they have routine or demanding applications. Its outstanding performance has allowed process engineers to trust the mRoy in the most critical of services. Installations are found in every applicable industry including chemical or hydrocarbon processing, water treatment, food and beverage, mining, power, pulp and paper, textile and many others.

Once installed, the mRoy's "uptime" design makes it one less thing for operators and maintenance personnel to worry about. The mRoy is built to run 24 hours a day, 7 days a week. It's not unusual to find mRoy pumps still operating at design performance after 20 or more years in service.

For decades, customers have been secure in their choice of mRoy pumps. Your application can also benefit from mRoy's durability and Milton Roy's experience.

mRoy® SERIES A

PERFORMANCE MAXIMUM RANGE:

Simplex: 30 GPH (329 liter/hr)
Duplex: 60 GPH (658 liter/hr)
350 psi (24 Bar)

GENERAL SPECIFICATIONS

Liquid End Type:
Hydraulically Actuated Disc Diaphragm

Capacity Adjustment:
Hydraulic Bypass from 0 to 100%
While Running or Stopped

Capacity Control:
Manual Micrometer (standard)
Electronic (optional)
Pneumatic (optional)
Variable Speed (optional)

Steady State Accuracy:
± 1.0 % over 10:1 Turndown

Internal Relief Valve:
Adjustable (Standard)

Number of Pumping Heads:
Simplex Standard, Duplex Optional

Liquid Temperature Range:
Metallic Heads: 20° to 200° F (-7° to 93° C)
Plastic Heads: 20° to 145° F (-7° to 62° C)

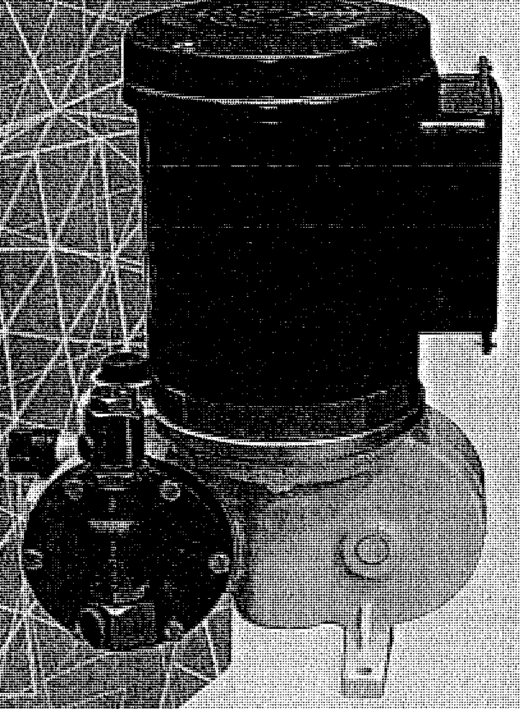
Coating System:
Polyester TGIC Powdercoating

Warranty:
Three Year Standard (details available separately)

Average Shipping Weight:
Simplex - 75 lbs (34 kg)
Duplex - 85 lbs (38.5 kg)

Stroke Length:
0.7" (17.8 mm)

Motor Requirements:
Simplex - 1/4 Horsepower (0.25 kW)
Duplex - 1/3 Horsepower (0.25 kW)



mRoy A simplex with manual micrometer capacity adjustment, metallic liquid end, close coupled motor mount.

CAPACITY/PRESSURE TABLE

Capacities are based on simplex liquid end configurations

SERIES	GEAR RATIO CODE	SPM@ 1725 RPM	METALLIC LIQUID ENDS						PLASTIC LIQUID ENDS	
			CAPACITY WITH MOTOR OPERATING AT 1725 RPM							
			100 PSI (7 BAR)		200 PSI (14 BAR)		350 PSI (24 BAR)		150 PSI (10 BAR)	
			GPH	LITER/	GPH	LITER/	GPH	LITER/	GPH	LITER/HR
7/16" (11 mm) Plunger	77	23	See mRoy H Page 6						0.46	1.7
	48	37							0.62	2.3
	24	73							1.5	5.7
	15	117							2.4	9.1
5/8" (16 mm) Plunger	48	37	1.8	6.8	1.7	6.4	1.6	6.1	1.5	5.7
	24	73	3.8	14.4	3.7	14.0	3.5	13.2	3.4	12.9
	15	117	6.2	23.5	6.0	22.7	5.7	21.6	5.5	20.8
1 1/16" (27 mm) Plunger	48	37	6.1	23.1	5.9	22.3	5.5	20.8	5.6	21.2
	24	73	12.3	46.6	12.1	45.8	11.2	42.4	11.2	42.4
	15	117	19.4	73.4	19.2	72.7	18.1	68.5	18.0	68.1
	10	185	30.0	113.6	29.0	109.8	-	-	-	-

HIGH VISCOSITY OPTION

The "A" series is available with a high viscosity option. The pump is renamed a "P" series and capacities above are reduced by 10%. Gear ratio code 10 is not available for "P" series.

MODEL CODE SELECTION

Additional options are available. Consult with your representative

NOCL-PDM-1001
NOCL-PDM-2001
AS-PDM-1001
AS-PDM-2001

1.43 GPH @ 100 PSI

End Item Code: R A
Option Select Number: Number Heads | Material Code – Plunger Diameter | Gear Ratio | Mount/Motor | Suction Connection | Discharge Connection | Capacity Control | Rupture Detection & Base

Number Heads

Code	Description
[✓ 1]	Simplex
2	Duplex

Material Code

Code	Description
0	Cast Iron
1	316 SS
[✓ 2]	PVC (N/A with Gear Code 10)
7	PVDF (N/A with Gear Code 10)
5	Alloy 20
6	Alloy C22

Plunger Diameter

Code	Description
[✓ 07]	7/16" (11 mm)
10	5/8" (16 mm)
17	1-1/16" (27 mm)

Gear Ratio

	SPM @ RPM	
Code	1725	1425
77	23 spm	19 spm
48	37 spm	30 spm
[✓ 24]	73 spm	60 spm
15	117 spm	96 spm
10	185 spm	152 spm

Motor/Motor Mount

Mount with Motor

Code	Description
A1	1/4 HP TE 1/60/115 Close Coupled (STANDARD)
A8	1/4 HP TE 3/60/230/460 Close Coupled

Motor Mount

Code	Description
SR	Close Coupled NEMA 56C
SS	Close Coupled IEC Frame 71, B5 Flange
[✓ FR]	API Flange NEMA 56C
FS	API Flange IEC Frame 71, B5 Flange

(Other Available)

Suction Connection

Metallic Heads

Code	Description
SE	NPT Female (STANDARD)
T1	ANSI 150# RF 1/2" Threaded
T3	ANSI 300# RF 1/2" Threaded
S1	ANSI 150# RF 1/2" Socket Welded
S3	ANSI 300# RF 1/2" Socket Welded

Plastic Heads

Code	Description
[✓ SE]	NPT Male (STANDARD)
T1	150# 1/2" Threaded Flange

Discharge Connection

Codes are same as suction connections

Capacity Control

Code	Description
[✓ M2]	Manual Micrometer (STANDARD)
E1	Electronic - NEMA 4, 4-20 mA, 115 Volt
E2	Electronic - NEMA 4, 4-20 mA, 220 Volt
EA	Electronic - Ex Proof, 4-20 mA, 115 Volt
EB	Electronic - Ex Proof, 4-20 mA, 220 Volt
PN	Pneumatic, 3-15 psi, Direct Acting

***When using control other than manual, derate pump capacity by 5% for plunger codes 07 and 10, and 10% for plunger code 17.**

Rupture Detection & Base

Metallic Liquid Ends

Code	Description
NN	None (STANDARD)
NB	Base Only - Recommended with Flanges
C5	Rupture Detection with Base & Gauge
SN	Rupture Detect with Base, Gauge, & NEMA 4 Switch
S7	Rupture Detect with Base, Gauge, & Ex Proof Switch
DD	Double Diaphragm with Base
DP	Double Diaphragm with Base & Conductivity Probe

Plastic Liquid Ends

Code	Description
[✓ NB]	Base Only (STANDARD)
DD	Double Diaphragm with Base
DP	Double Diaphragm with Base & Conductivity Probe

***When using rupture detection or double diaphragm, derate pump capacity by 5%.**

MATERIALS OF CONSTRUCTION

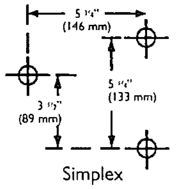
LIQUID END MATERIAL	DIAPHRAGM	HEAD	VALVE BODY	SEATS	BALLS	SEALS	CONTOUR PLATE	CHECK VALVE SPRING
Cast Iron	PTFE	Cast Iron	316 ss	316 ss	316 ss	Viton & Buna N	316 ss	316 ss
316 ss		316 ss	316 ss	316 ss	316 ss		316 ss	316 ss
PVC		PVC	PVC	PVC	Ceramic		PVC	N/A
PVDF		PVDF	PVDF	PVDF	Ceramic		PVDF	N/A
Alloy 20		Alloy 20	Alloy 20	Alloy 20	Alloy 20		Alloy 20	Alloy C
Alloy C22		Alloy C22	Alloy C22	Alloy C22	Alloy C22		Alloy C22	Alloy C

PIPING CONNECTION SIZES

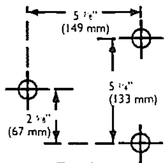
DESCRIPTION	SUCTION	DISCHARGE
Metallic Liquid Ends (Codes 0, 1, 5, & 6)	1/2" NPT Female	1/4" NPT Female
Plastic Liquid Ends (Codes 2, 7)	1/2" NPT Male	1/2" NPT Male

BOLT HOLE DIMENSIONS

Bolt holes accommodates 5/16" (8 mm) diameter bolts

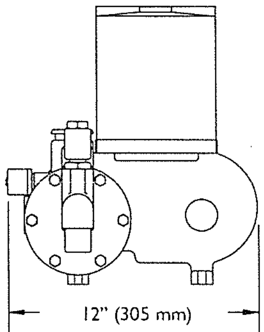


Simplex

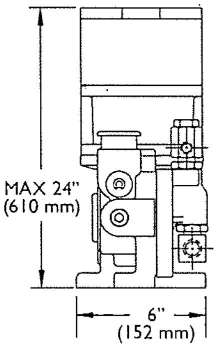


Duplex

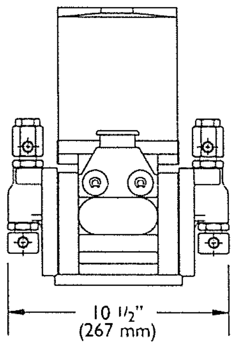
DIMENSIONS Approximate for envelope estimations. Certified prints are available



Simplex & Duplex Side View



Simplex Front View



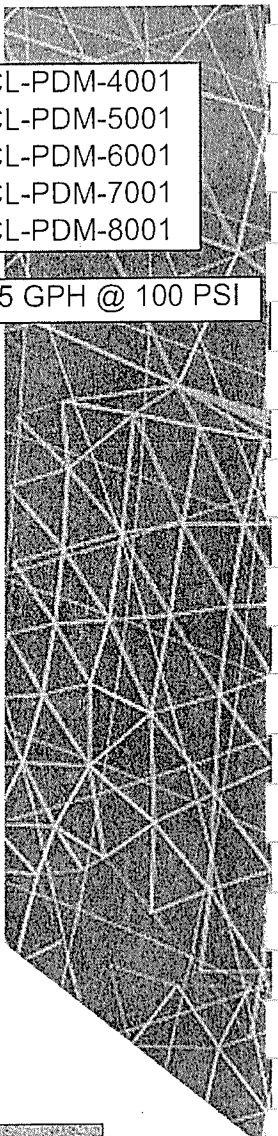
Duplex Front View

MODEL CODE SELECTION

Additional options are available. Consult with your representative

NOCL-PDM-4001
NOCL-PDM-5001
NOCL-PDM-6001
NOCL-PDM-7001
NOCL-PDM-8001

10.75 GPH @ 100 PSI



End Item Code	Option Select Number								
R A	☐	☐ -	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐
	Number Heads	Material Code	Plunger Diameter	Gear Ratio	Mount/ Motor	Suction Connection	Discharge Connection	Capacity Control	Rupture Detection & Base

Number Heads

Code	Description
1	Simplex
2	Duplex

Material Code

Code	Description
0	Cast Iron
1	316 SS
2	PVC (N/A with Gear Code 10)
7	PVDF (N/A with Gear Code 10)
5	Alloy 20
6	Alloy C22

Plunger Diameter

Code	Description
07	7/16" (11 mm)
10	5/8" (16 mm)
17	1-1/16" (27 mm)

Gear Ratio

	SPM @ RPM	
Code	1725	1425
77	23 spm	19 spm
48	37 spm	30 spm
24	73 spm	60 spm
15	117 spm	96 spm
10	185 spm	152 spm

Motor/Motor Mount

Mount with Motor

Code	Description
A1	1/4 HP TE 1/60/115 Close Coupled (STANDARD)
A8	1/4 HP TE 3/60/230/460 Close Coupled

Motor Mount

Code	Description
SR	Close Coupled NEMA 56C
SS	Close Coupled IEC Frame 71, B5 Flange
FR	API Flange NEMA 56C
FS	API Flange IEC Frame 71, B5 Flange

(Other Available)

Suction Connection

Metallic Heads

Code	Description
SE	NPT Female (STANDARD)
T1	ANSI 150# RF 1/2" Threaded
T3	ANSI 300# RF 1/2" Threaded
S1	ANSI 150# RF 1/2" Socket Welded
S3	ANSI 300# RF 1/2" Socket Welded

Plastic Heads

Code	Description
SE	NPT Male (STANDARD)
T1	150# 1/2" Threaded Flange

Discharge Connection

Codes are same as suction connections

Capacity Control

Code	Description
M2	Manual Micrometer (STANDARD)
E1	Electronic - NEMA 4, 4-20 mA, 115 Volt
E2	Electronic - NEMA 4, 4-20 mA, 220 Volt
EA	Electronic - Ex Proof, 4-20 mA, 115 Volt
EB	Electronic - Ex Proof, 4-20 mA, 220 Volt
PN	Pneumatic, 3-15 psi, Direct Acting

***When using control other than manual, derate pump capacity by 5% for plunger codes 07 and 10, and 10% for plunger code 17.**

Rupture Detection & Base

Metallic Liquid Ends

Code	Description
NN	None (STANDARD)
NB	Base Only - Recommended with Flanges
CS	Rupture Detection with Base & Gauge
SN	Rupture Detect with Base, Gauge, & NEMA 4 Switch
S7	Rupture Detect with Base, Gauge, & Ex Proof Switch
DD	Double Diaphragm with Base
DP	Double Diaphragm with Base & Conductivity Probe

Plastic Liquid Ends

Code	Description
NB	Base Only (STANDARD)
DD	Double Diaphragm with Base
DP	Double Diaphragm with Base & Conductivity Probe

***When using rupture detection or double diaphragm, derate pump capacity by 5%.**

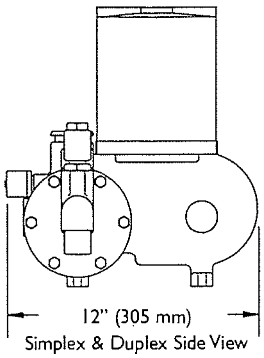
MATERIALS OF CONSTRUCTION

LIQUID END MATERIAL	DIAPHRAGM	HEAD	VALVE BODY	SEATS	BALLS	SEALS	CONTOUR PLATE	CHECK VALVE SPRING
Cast Iron	PTFE	Cast Iron	316 ss	316 ss	316 ss	Viton & Buna N	316 ss	316 ss
316 ss		316 ss	316 ss	316 ss	316 ss		316 ss	316 ss
→ PVC		PVC	PVC	PVC	Ceramic		PVC	N/A
PVDF		PVDF	PVDF	PVDF	Ceramic		PVDF	N/A
Alloy 20		Alloy 20	Alloy 20	Alloy 20	Alloy 20		Alloy 20	Alloy C
Alloy C22		Alloy C22	Alloy C22	Alloy C22	Alloy C22		Alloy C22	Alloy C

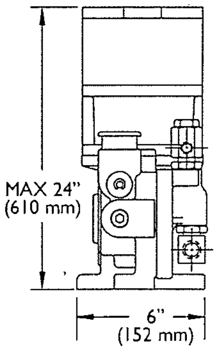
PIPING CONNECTION SIZES

DESCRIPTION	SUCTION	DISCHARGE
Metallic Liquid Ends (Codes 0, 1, 5, & 6)	1/2" NPT Female	1/4" NPT Female
Plastic Liquid Ends (Codes 2, 7)	1/2" NPT Male	1/2" NPT Male

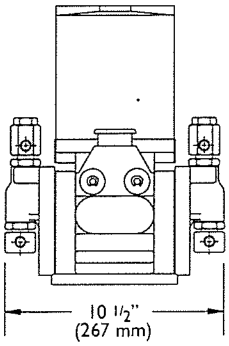
DIMENSIONS Approximate for envelope estimations. Certified prints are available



Simplex & Duplex Side View



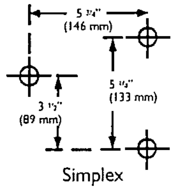
Simplex Front View



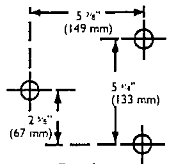
Duplex Front View

BOLT HOLE DIMENSIONS

Bolt holes accommodates 5/16" (8 mm) diameter bolts



Simplex



Duplex

MODEL CODE SELECTION

NHS-PDM-1001
NHS-PDM-2001

Additional options are available. Consult with your representative

5.3 GPH @100 PSI

End Item Code: R A
Option Select Number: ☐ ☐ - ☐☐ ☐☐ ☐☐ ☐☐ ☐☐ ☐☐ ☐☐

End Item Code	Number Heads	Material Code	Plunger Diameter	Gear Ratio	Mount/ Motor	Suction Connection	Discharge Connection	Capacity Control	Rupture Detection & Base
R A	☐	☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐

Number Heads

Code	Description
1	Simplex
2	Duplex

Material Code

Code	Description
0	Cast Iron
1	316 SS
2	PVC (N/A with Gear Code 10)
7	PVDF (N/A with Gear Code 10)
5	Alloy 20
6	Alloy C22

Plunger Diameter

Code	Description
07	7/16" (11 mm)
10	5/8" (16 mm)
17	1-1/16" (27 mm)

Gear Ratio

	SPM @ RPM	
Code	1725	1425
77	23 spm	19 spm
48	37 spm	30 spm
24	73 spm	60 spm
15	117 spm	96 spm
10	185 spm	152 spm

Motor/Motor Mount

Mount with Motor

Code	Description
A1	1/4 HP TE 1/60/115 Close Coupled (STANDARD)
A8	1/4 HP TE 3/60/230/460 Close Coupled

Motor Mount

Code	Description
SR	Close Coupled NEMA 56C
SS	Close Coupled IEC Frame 71, B5 Flange
FR	API Flange NEMA 56C
FS	API Flange IEC Frame 71, B5 Flange

(Other Available)

Suction Connection

Metallic Heads

Code	Description
SE	NPT Female (STANDARD)
T1	ANSI 150# RF 1/2" Threaded
T3	ANSI 300# RF 1/2" Threaded
S1	ANSI 150# RF 1/2" Socket Welded
S3	ANSI 300# RF 1/2" Socket Welded

Plastic Heads

Code	Description
SE	NPT Male (STANDARD)
T1	150# 1/2" Threaded Flange

Discharge Connection

Codes are same as suction connections

Capacity Control

Code	Description
M2	Manual Micrometer (STANDARD)
E1	Electronic - NEMA 4, 4-20 mA, 115 Volt
E2	Electronic - NEMA 4, 4-20 mA, 220 Volt
EA	Electronic - Ex Proof, 4-20 mA, 115 Volt
EB	Electronic - Ex Proof, 4-20 mA, 220 Volt
PN	Pneumatic, 3-15 psi, Direct Acting

***When using control other than manual, derate pump capacity by 5% for plunger codes 07 and 10, and 10% for plunger code 17.**

Rupture Detection & Base

Metallic Liquid Ends

Code	Description
NN	None (STANDARD)
NB	Base Only - Recommended with Flanges
C5	Rupture Detection with Base & Gauge
SN	Rupture Detect with Base, Gauge, & NEMA 4 Switch
S7	Rupture Detect with Base, Gauge, & Ex Proof Switch
DD	Double Diaphragm with Base
DP	Double Diaphragm with Base & Conductivity Probe

Plastic Liquid Ends

Code	Description
NB	Base Only (STANDARD)
DD	Double Diaphragm with Base
DP	Double Diaphragm with Base & Conductivity Probe

***When using rupture detection or double diaphragm, derate pump capacity by 5%.**

MATERIALS OF CONSTRUCTION

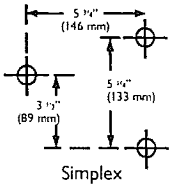
LIQUID END MATERIAL	DIAPHRAGM	HEAD	VALVE BODY	SEATS	BALLS	SEALS	CONTOUR PLATE	CHECK VALVE SPRING
Cast Iron	PTFE	Cast Iron	316 ss	316 ss	316 ss	Viton & Buna N	316 ss	316 ss
316 ss		316 ss	316 ss	316 ss	316 ss		316 ss	316 ss
→ PVC		PVC	PVC	PVC	Ceramic		PVC	N/A
PVDF		PVDF	PVDF	PVDF	Ceramic		PVDF	N/A
Alloy 20		Alloy 20	Alloy 20	Alloy 20	Alloy 20		Alloy 20	Alloy C
Alloy C22		Alloy C22	Alloy C22	Alloy C22	Alloy C22		Alloy C22	Alloy C

PIPING CONNECTION SIZES

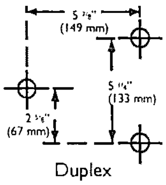
DESCRIPTION	SUCTION	DISCHARGE
Metallic Liquid Ends (Codes 0, 1, 5, & 6)	1/2" NPT Female	1/4" NPT Female
Plastic Liquid Ends (Codes 2, 7)	1/2" NPT Male	1/2" NPT Male

BOLT HOLE DIMENSIONS

Bolt holes accommodates 5/16" (8 mm) diameter bolts



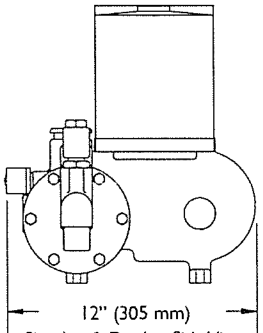
Simplex



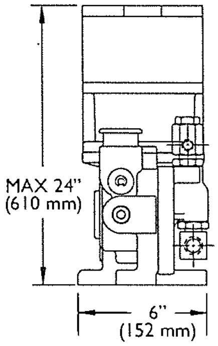
Duplex

DIMENSIONS

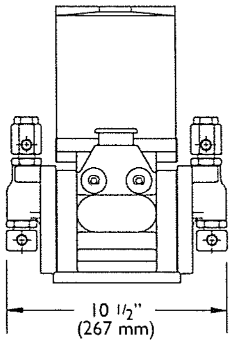
Approximate for envelope estimations. Certified prints are available



Simplex & Duplex Side View



Simplex Front View



Duplex Front View

MODEL CODE SELECTION

Additional options are available. Consult with your representative

NSO4-PDM-1001
NSO4-PDM-2001
PCL-PDM-1001
PCL-PDM-2001

2.38 GPH @ 100 PSI

End Item Code: R A

Option Select Number: ☐ Number Heads ☐ Material Code - ☐☐ Plunger Diameter ☐☐ Gear Ratio ☐☐ Mount/Motor ☐☐ Suction ☐☐ Discharge Connection ☐☐ Capacity Control ☐☐ Rupture Detection & Base

Number Heads

Code	Description
1	Simplex
2	Duplex

Material Code

Code	Description
0	Cast Iron
1	316 SS
2	PVC (N/A with Gear Code 10)
7	PVDF (N/A with Gear Code 10)
5	Alloy 20
6	Alloy C22

Plunger Diameter

Code	Description
07	7/16" (11 mm)
10	5/8" (16 mm)
17	1-1/16" (27 mm)

Gear Ratio

	SPM @ RPM	
Code	1725	1425
77	23 spm	19 spm
48	37 spm	30 spm
24	73 spm	60 spm
15	117 spm	96 spm
10	185 spm	152 spm

Motor/Motor Mount

Mount with Motor

Code	Description
A1	$1/_4$ HP TE 1/60/115 Close Coupled (STANDARD)
A8	$1/_4$ HP TE 3/60/230/460 Close Coupled

Motor Mount

Code	Description
SR	Close Coupled NEMA 56C
SS	Close Coupled IEC Frame 71, B5 Flange
FR	API Flange NEMA 56C
FS	API Flange IEC Frame 71, B5 Flange

(Other Available)

Suction Connection

Metallic Heads

Code	Description
SE	NPT Female (STANDARD)
T1	ANSI 150# RF 1/2" Threaded
T3	ANSI 300# RF 1/2" Threaded
S1	ANSI 150# RF 1/2" Socket Welded
S3	ANSI 300# RF 1/2" Socket Welded

Plastic Heads

Code	Description
SE	NPT Male (STANDARD)
T1	150# 1/2" Threaded Flange

Discharge Connection

Codes are same as suction connections

Capacity Control

Code	Description
M2	Manual Micrometer (STANDARD)
E1	Electronic - NEMA 4, 4-20 mA, 115 Volt
E2	Electronic - NEMA 4, 4-20 mA, 220 Volt
EA	Electronic - Ex Proof, 4-20 mA, 115 Volt
EB	Electronic - Ex Proof, 4-20 mA, 220 Volt
PN	Pneumatic, 3-15 psi, Direct Acting

***When using control other than manual, derate pump capacity by 5% for plunger codes 07 and 10, and 10% for plunger code 17.**

Rupture Detection & Base

Metallic Liquid Ends

Code	Description
NN	None (STANDARD)
NB	Base Only - Recommended with Flanges
C5	Rupture Detection with Base & Gauge
SN	Rupture Detect with Base, Gauge, & NEMA 4 Switch
S7	Rupture Detect with Base, Gauge, & Ex Proof Switch
DD	Double Diaphragm with Base
DP	Double Diaphragm with Base & Conductivity Probe

Plastic Liquid Ends

Code	Description
NB	Base Only (STANDARD)
DD	Double Diaphragm with Base
DP	Double Diaphragm with Base & Conductivity Probe

***When using rupture detection or double diaphragm, derate pump capacity by 5%.**

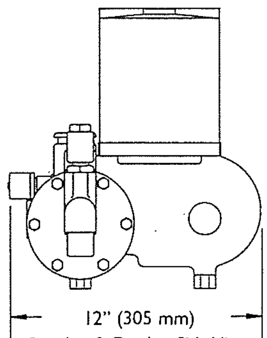
MATERIALS OF CONSTRUCTION

LIQUID END MATERIAL	DIAPHRAGM	HEAD	VALVE BODY	SEATS	BALLS	SEALS	CONTOUR PLATE	CHECK VALVE SPRING
Cast Iron	PTFE	Cast Iron	316 ss	316 ss	316 ss	Viton & Buna N	316 ss	316 ss
316 ss		316 ss	316 ss	316 ss	316 ss		316 ss	316 ss
→ PVC		PVC	PVC	PVC	Ceramic		PVC	N/A
PVDF		PVDF	PVDF	PVDF	Ceramic		PVDF	N/A
Alloy 20		Alloy 20	Alloy 20	Alloy 20	Alloy 20		Alloy 20	Alloy C
Alloy C22		Alloy C22	Alloy C22	Alloy C22	Alloy C22		Alloy C22	Alloy C

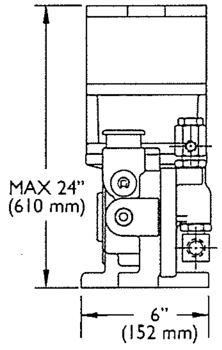
PIPING CONNECTION SIZES

DESCRIPTION	SUCTION	DISCHARGE
Metallic Liquid Ends (Codes 0, 1, 5, & 6)	1/2" NPT Female	1/4" NPT Female
Plastic Liquid Ends (Codes 2, 7)	1/2" NPT Male	1/2" NPT Male

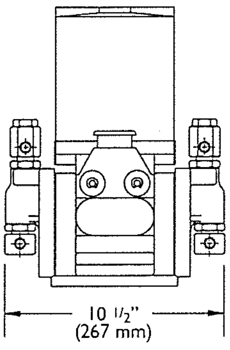
DIMENSIONS Approximate for envelope estimations. Certified prints are available



Simplex & Duplex Side View



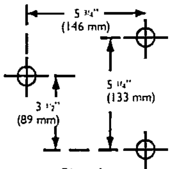
Simplex Front View



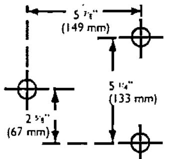
Duplex Front View

BOLT HOLE DIMENSIONS

Bolt holes accommodates 5/16" (8 mm) diameter bolts



Simplex



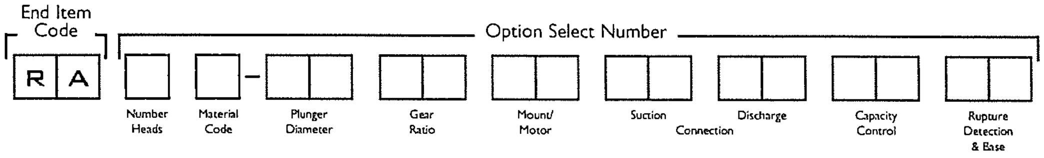
Duplex

NAOH-PDM-1001
NAOH-PDM-2001

18.1 GPH @ 100 PSI

MODEL CODE SELECTION

Additional options are available. Consult with your representative



Number Heads

Code	Description
1	Simplex
2	Duplex

Material Code

Code	Description
0	Cast Iron
1	316 SS
2	PVC (N/A with Gear Code 10)
7	PVDF (N/A with Gear Code 10)
5	Alloy 20
6	Alloy C22

Plunger Diameter

Code	Description
07	7/16" (11 mm)
10	5/8" (16 mm)
17	1-1/16" (27 mm)

Gear Ratio

	SPM @ RPM	
Code	1725	1425
77	23 spm	19 spm
48	37 spm	30 spm
24	73 spm	60 spm
15	117 spm	96 spm
10	185 spm	152 spm

Motor/Motor Mount

Mount with Motor

Code	Description
A1	1/4 HP TE 1/60/115 Close Coupled (STANDARD)
A8	1/4 HP TE 3/60/230/460 Close Coupled

Motor Mount

Code	Description
SR	Close Coupled NEMA 56C
SS	Close Coupled IEC Frame 71, B5 Flange
FR	API Flange NEMA 56C
FS	API Flange IEC Frame 71, B5 Flange

(Other Available)

Suction Connection

Metallic Heads

Code	Description
SE	NPT Female (STANDARD)
T1	ANSI 150# RF 1/2" Threaded
T3	ANSI 300# RF 1/2" Threaded
S1	ANSI 150# RF 1/2" Socket Welded
S3	ANSI 300# RF 1/2" Socket Welded

Plastic Heads

Code	Description
SE	NPT Male (STANDARD)
T1	150# 1/2" Threaded Flange

Discharge Connection

Codes are same as suction connections

Capacity Control

Code	Description
M2	Manual Micrometer (STANDARD)
E1	Electronic - NEMA 4, 4-20 mA, 115 Volt
E2	Electronic - NEMA 4, 4-20 mA, 220 Volt
EA	Electronic - Ex Proof, 4-20 mA, 115 Volt
EB	Electronic - Ex Proof, 4-20 mA, 220 Volt
PN	Pneumatic, 3-15 psi, Direct Acting

***When using control other than manual, derate pump capacity by 5% for plunger codes 07 and 10, and 10% for plunger code 17.**

Rupture Detection & Base

Metallic Liquid Ends

Code	Description
NN	None (STANDARD)
NB	Base Only - Recommended with Flanges
C5	Rupture Detection with Base & Gauge
SN	Rupture Detect with Base, Gauge, & NEMA 4 Switch
S7	Rupture Detect with Base, Gauge, & Ex Proof Switch
DD	Double Diaphragm with Base
DP	Double Diaphragm with Base & Conductivity Probe

Plastic Liquid Ends

Code	Description
NB	Base Only (STANDARD)
DD	Double Diaphragm with Base
DP	Double Diaphragm with Base & Conductivity Probe

***When using rupture detection or double diaphragm, derate pump capacity by 5%.**

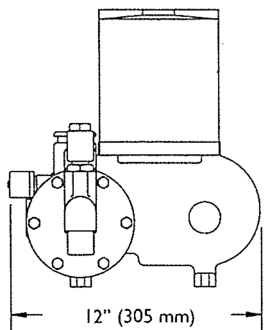
MATERIALS OF CONSTRUCTION

Liquid End Material	Diaphragm	Head	Valve Body	Seats	Balls	Seals	Contour Plate	Check Valve Spring
Cast Iron	PTFE	Cast Iron	316 ss	316 ss	316 ss	Viton & Buna N	316 ss	316 ss
→ 316 ss		316 ss	316 ss	316 ss	316 ss		316 ss	316 ss
PVC		PVC	PVC	PVC	Ceramic		PVC	N/A
PVDF		PVDF	PVDF	PVDF	Ceramic		PVDF	N/A
Alloy 20		Alloy 20	Alloy 20	Alloy 20	Alloy 20		Alloy 20	Alloy C
Alloy C22		Alloy C22	Alloy C22	Alloy C22	Alloy C22		Alloy C22	Alloy C

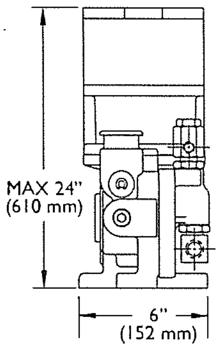
PIPING CONNECTION SIZES

Description	Suction	Discharge
Metallic Liquid Ends (Codes 0, 1, 5, & 6)	1/2" NPT Female	1/4" NPT Female
Plastic Liquid Ends (Codes 2, 7)	1/2" NPT Male	1/2" NPT Male

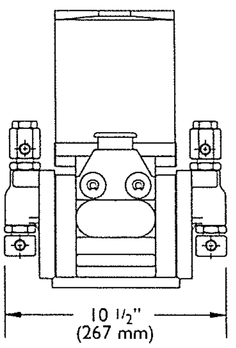
DIMENSIONS Approximate for envelope estimations. Certified prints are available



Simplex & Duplex Side View



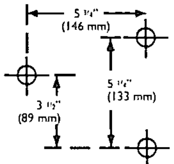
Simplex Front View



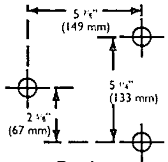
Duplex Front View

BOLT HOLE DIMENSIONS

Bolt holes accommodates 5/16" (8 mm) diameter bolts



Simplex



Duplex

HSO4-PDM-1001
HSO4-PDM-2001
HSO4-PDM-3001

MODEL CODE SELECTION

Additional options are available. Consult with your representative

End Item Code		Option Select Number								
R	A	Number Heads	Material Code	Plunger Diameter	Gear Ratio	Mount/ Motor	Suction Connection	Discharge Connection	Capacity Control	Rupture Detection & Base

11.7GPH @ 100 PSI

Number Heads

Code	Description
1	Simplex
2	Duplex

Material Code

Code	Description
0	Cast Iron
1	316 SS
2	PVC (N/A with Gear Code 10)
7	PVDF (N/A with Gear Code 10)
5	Alloy 20
6	Alloy C22

Plunger Diameter

Code	Description
07	7/16" (11 mm)
10	S/8" (16 mm)
17	1-1/16" (27 mm)

Gear Ratio

	SPM @ RPM	
Code	1725	1425
77	23 spm	19 spm
48	37 spm	30 spm
24	73 spm	60 spm
1S	117 spm	96 spm
10	185 spm	152 spm

Motor/Motor Mount

Mount with Motor

Code	Description
A1	1/4 HP TE 1/60/115 Close Coupled (STANDARD)
A8	1/4 HP TE 3/60/230/460 Close Coupled

Motor Mount

Code	Description
SR	Close Coupled NEMA 56C
SS	Close Coupled IEC Frame 71, B5 Flange
FR	API Flange NEMA S6C
FS	API Flange IEC Frame 71, B5 Flange

(Other Available)

Suction Connection

Metallic Heads

Code	Description
SE	NPT Female (STANDARD)
T1	ANSI 150# RF 1/2" Threaded
T3	ANSI 300# RF 1/2" Threaded
S1	ANSI 150# RF 1/2" Socket Welded
S3	ANSI 300# RF 1/2" Socket Welded

Plastic Heads

Code	Description
SE	NPT Male (STANDARD)
T1	150# 1/2" Threaded Flange

Discharge Connection

Codes are same as suction connections

Capacity Control

Code	Description
M2	Manual Micrometer (STANDARD)
E1	Electronic - NEMA 4, 4-20 mA, 115 Volt
E2	Electronic - NEMA 4, 4-20 mA, 220 Volt
EA	Electronic - Ex Proof, 4-20 mA, 115 Volt
EB	Electronic - Ex Proof, 4-20 mA, 220 Volt
PN	Pneumatic, 3-15 psi, Direct Acting

***When using control other than manual, derate pump capacity by 5% for plunger codes 07 and 10, and 10% for plunger code 17.**

Rupture Detection & Base

Metallic Liquid Ends

Code	Description
NN	None (STANDARD)
NB	Base Only - Recommended with Flanges
C5	Rupture Detection with Base & Gauge
SN	Rupture Detect with Base, Gauge, & NEMA 4 Switch
S7	Rupture Detect with Base, Gauge, & Ex Proof Switch
DD	Double Diaphragm with Base
DP	Double Diaphragm with Base & Conductivity Probe

Plastic Liquid Ends

Code	Description
NB	Base Only (STANDARD)
DD	Double Diaphragm with Base
DP	Double Diaphragm with Base & Conductivity Probe

***When using rupture detection or double diaphragm, derate pump capacity by 5%.**

MATERIALS OF CONSTRUCTION

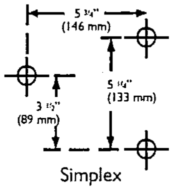
Liquid End Material	Diaphragm	Head	Valve Body	Seats	Balls	Seals	Contour Plate	Check Valve Spring
Cast Iron	PTFE	Cast Iron	316 ss	316 ss	316 ss	Viton & Buna N	316 ss	316 ss
316 ss		316 ss	316 ss	316 ss	316 ss		316 ss	316 ss
PVC		PVC	PVC	PVC	Ceramic		PVC	N/A
PVDF		PVDF	PVDF	PVDF	Ceramic		PVDF	N/A
→ Alloy 20		Alloy 20	Alloy 20	Alloy 20	Alloy 20		Alloy 20	Alloy C
Alloy C22		Alloy C22	Alloy C22	Alloy C22	Alloy C22		Alloy C22	Alloy C

PIPING CONNECTION SIZES

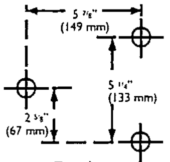
Description	Suction	Discharge
Metallic Liquid Ends (Codes 0, 1, 5, & 6)	1/2" NPT Female	1/4" NPT Female
Plastic Liquid Ends (Codes 2, 7)	1/2" NPT Male	1/2" NPT Male

BOLT HOLE DIMENSIONS

Bolt holes accommodates 5/16" (8 mm) diameter bolts

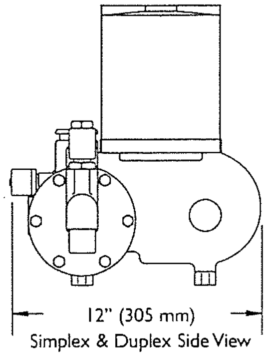


Simplex

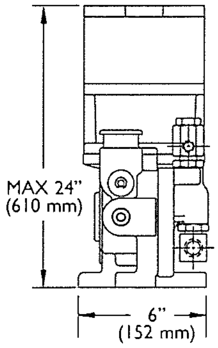


Duplex

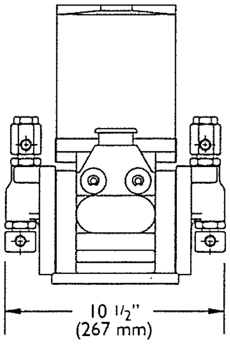
DIMENSIONS Approximate for envelope estimations. Certified prints are available



Simplex & Duplex Side View



Simplex Front View



Duplex Front View

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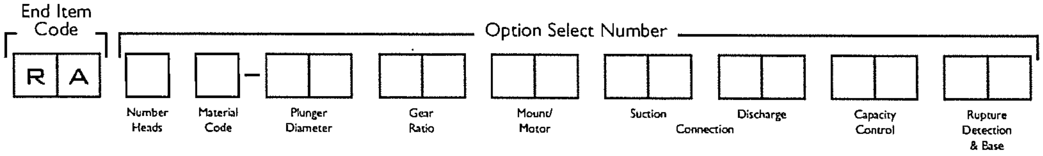
MODEL CODE SELECTION

Additional options are available. Consult with your representative



NAF-PDM-1101
NAF-PDM-2101

18.1 GPH @100 PSI

Number Heads

Code	Description
1	Simplex
2	Duplex

Material Code

Code	Description
0	Cast Iron
1	316 SS
2	PVC (N/A with Gear Code 10)
7	PVDF (N/A with Gear Code 10)
5	Alloy 20
6	Alloy C22

Plunger Diameter

Code	Description
07	7/16" (11 mm)
10	5/8" (16 mm)
17	1-1/16" (27 mm)

Gear Ratio

	SPM @ RPM	
Code	1725	1425
77	23 spm	19 spm
48	37 spm	30 spm
24	73 spm	60 spm
15	117 spm	96 spm
10	185 spm	152 spm

Motor/Motor Mount

Mount with Motor

Code	Description
A1	1/4 HP TE 1/60/115 Close Coupled (STANDARD)
A8	1/4 HP TE 3/60/230/460 Close Coupled

Motor Mount

Code	Description
SR	Close Coupled NEMA 56C
SS	Close Coupled IEC Frame 71, B5 Flange
FR	API Flange NEMA 56C
FS	API Flange IEC Frame 71, B5 Flange

(Other Available)

Suction Connection

Metallic Heads

Code	Description
SE	NPT Female (STANDARD)
T1	ANSI 150# RF 1/2" Threaded
T3	ANSI 300# RF 1/2" Threaded
S1	ANSI 150# RF 1/2" Socket Welded
S3	ANSI 300# RF 1/2" Socket Welded

Plastic Heads

Code	Description
SE	NPT Male (STANDARD)
T1	150# 1/2" Threaded Flange

Discharge Connection

Codes are same as suction connections

Capacity Control

Code	Description
M2	Manual Micrometer (STANDARD)
E1	Electronic - NEMA 4, 4-20 mA, 115 Volt
E2	Electronic - NEMA 4, 4-20 mA, 220 Volt
EA	Electronic - Ex Proof, 4-20 mA, 115 Volt
EB	Electronic - Ex Proof, 4-20 mA, 220 Volt
PN	Pneumatic, 3-15 psi, Direct Acting

***When using control other than manual, derate pump capacity by 5% for plunger codes 07 and 10, and 10% for plunger code 17.**

Rupture Detection & Base

Metallic Liquid Ends

Code	Description
NN	None (STANDARD)
NB	Base Only - Recommended with Flanges
C5	Rupture Detection with Base & Gauge
SN	Rupture Detect with Base, Gauge, & NEMA 4 Switch
57	Rupture Detect with Base, Gauge, & Ex Proof Switch
DD	Double Diaphragm with Base
DP	Double Diaphragm with Base & Conductivity Probe

Plastic Liquid Ends

Code	Description
NB	Base Only (STANDARD)
DD	Double Diaphragm with Base
DP	Double Diaphragm with Base & Conductivity Probe

***When using rupture detection or double diaphragm, derate pump capacity by 5%.**

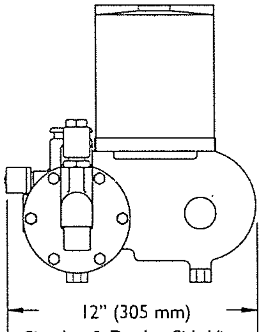
MATERIALS OF CONSTRUCTION

Liquid End Material	Diaphragm	Head	Valve Body	Seats	Balls	Seals	Contour Plate	[illegible] Spring
Cast Iron	PTFE	Cast Iron	316 ss	316 ss	316 ss	Viton & Buna N	316 ss	316 ss
316 ss		316 ss	316 ss	316 ss	316 ss		316 ss	316 ss
PVC		PVC	PVC	PVC	Ceramic		PVC	N/A
PVDF		PVDF	PVDF	PVDF	Ceramic		PVDF	N/A
Alloy 20		Alloy 20	Alloy 20	Alloy 20	Alloy 20		Alloy 20	Alloy C
Alloy C22		Alloy C22	Alloy C22	Alloy C22	Alloy C22		Alloy C22	Alloy C

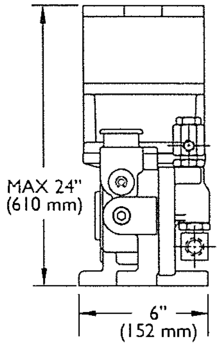
PIPING CONNECTION SIZES

Description	Suction	Discharge
Metallic Liquid Ends (Codes 0, 1, 5, & 6)	1/2" NPT Female	1/4" NPT Female
Plastic Liquid Ends (Codes 2, 7)	1/2" NPT Male	1/2" NPT Male

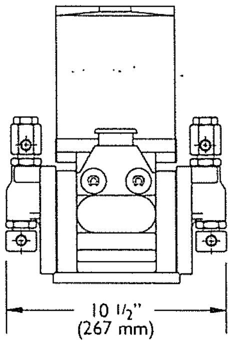
DIMENSIONS Approximate for envelope estimations. Certified prints are available



Simplex & Duplex Side View



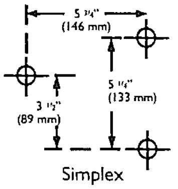
Simplex Front View



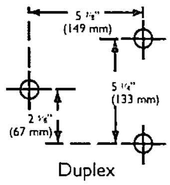
Duplex Front View

BOLT HOLE DIMENSIONS

Bolt holes accommodates 5/16" (8 mm) diameter bolts



Simplex



Duplex

mRoy® SERIES S, M, AND B

NAOH-PDM-3001
NAOH-PDM-4001

PERFORMANCE MAXIMUM RA

Simplex: 87 GPH (329 liter/hr)
Duplex: 174 GPH (658 liter/hr)
1500 psi (103 Bar)

GENERAL SPECIFICATIONS

Liquid End Type:
Hydraulically Actuated Disc Diaphragm

Capacity Adjustment:
Hydraulic Bypass from 0 to 100%
While Running or Stopped

Capacity Control:
Manual Micrometer (standard)
Electronic (optional)
Pneumatic (optional)
Variable Speed (optional)

Steady State Accuracy:
± 1.0 % over 10:1 Turndown

Internal Relief Valve:
Adjustable (Standard)

Number of Pumping Heads:
Simplex Standard, Duplex Optional

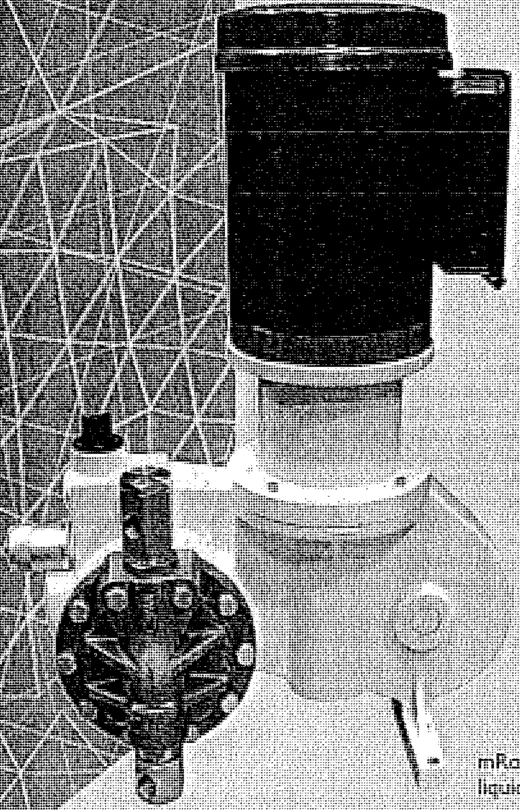
Liquid Temperature Range:
Metallic Heads: 20° to 200° F (-7° to 93° C)
Plastic Heads: 20° to 145° F (-7° to 62° C)

Coating System:
Polyester TGIC Powdercoating

Warranty:
Three Year Standard (details available separately)

Average Shipping Weight:
Simplex - 95 lbs (43 kg)
Duplex - 165 lbs (75 kg)

Stroke Length:
1.5" (38 mm)



mRoy B simplex with metallic liquid end and API motor mount.

CAPACITY/PRESSURE TABLE

Capacities are based on simplex liquid end configurations

Series	Gear Ratio Code	SPM@ 1725 RPM	CAPACITY WITH MOTOR OPERATING AT 1725 RPM											
			PLASTIC & METALLIC				METALLIC ONLY							
			100 psi (7 BAR)		150 psi (10 BAR)		400 psi (28 BAR)		600 psi (41 BAR)		1000 psi (67 BAR)		1500 psi (103 BAR)	
			GPH	LITER/	GPH	LITER/	GPH	LITER/	GPH	LITER/HR	GPH	LITER/HR	GPH	LITER/HR
mRoy S 19/32" (15.1 mm) Plunger	38	48	**4.7**	17.8	**4.6**	17.4	**4.4**	16.7	**4.2**	15.9	**3.8**	14.4	**3.3**	12.5
	25	72	**7.0**	26.5	**6.9**	26.1	**6.7**	25.4	**6.5**	24.6	**6.1**	23.1	**5.6**	21.2
	19	96	**9.5**	36	**9.4**	36	**8.9**	34	**8.6**	33	**7.9**	30	**7.1**	27
	12	144	**13.3**	50	**13.2**	50	**12.8**	48	**12.5**	47	**12.0**	45	**11.4**	43
mRoy M 7/8" (22.2 mm) Plunger	38	48	**10**	38	**10**	37	**8**	31	**7**	26	**5**	18		
	25	72	**16**	61	**16**	59	**14**	54	**13**	50	**11**	42		
	19	96	**21**	79	**21**	78	**19**	73	**18**	69	**16**	61		
	12	144	**30**	115	**30**	114	**29**	109	**28**	106	**26**	97		
mRoy B 1 7/16" (36.5 mm) Plunger	38	48 (a)	**27**	102	**26**	98	**21**	79						
	25	72 (a)	**42**	159	**41**	155	**36**	136						
	19	96 (b)	**57**	216	**56**	212	**51**	193						
	12	144 (b)	**85**	322	**84**	318	**79**	299						
	Gear code 10 (below) available at 1425 RPM & below. Ratings are @ 1425 RPM													
	10	148	**87**	329	**86**	326	**80**	303						

(a). Duplex 1 7/16" plunger pumps gear codes 38 & 25 are limited to 350 psi (24 BAR).
(b). Duplex 1 7/16" plunger pumps gear codes 19, 12, & 10 are limited to 250 psi (17 BAR).

MINIMUM MOTOR HP (KW)

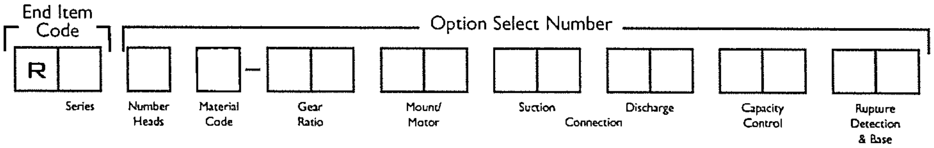
	3 PHASE	1 PHASE
Non-Shaded	1/2 HP (0.37 KW)	3/4 HP (0.55 KW)
Shaded	3/4 HP (0.55 KW)	1 HP (0.75 KW)

NAOH-PDM-3001
NAOH-PDM-4001

57 GPH@100 PSI

MODEL CODE SELECTION

Additional options are available --- Consult with your representative



Series

Code	Description
S	19/32" Plunger S Series
M	7/8" Plunger M Series
B	1 7/16" Plunger B Series

Number Heads

Code	Description
1	Simplex
2	Duplex

Material Code

Code	Description
1	316 SS
2	PVC (not available on "S" series)
5	Alloy 20
7	PVDF (Only available on "M" & "B" series)

Gear Ratio

Code	SPM @ RPM 1725	SPM @ RPM 1425
38	48 spm	40 spm
25	72 spm	60 spm
19	96 spm	80 spm
12	144 spm	120 spm
10	N/A	148 spm

Motor Mount

Code	Description
FR	API Flange NEMA 56C (STANDARD)
F4	API Flange Mount, NEMA T143TC/T145TC
F8	Flange Mount IEC Frame 80, BS Flange
F9	Flange Mount IEC Frame 90, BS Flange

Suction Connection

Metallic Heads (Material Code 1 or 5)

Code	Description
SE	NPT Female (STANDARD)
T1	ANSI 150# RF 1/2" Threaded
T3	ANSI 300# RF 1/2" Threaded
S1	ANSI 150# RF 1/2" Socket Welded
S3	ANSI 300# RF 1/2" Socket Welded

Plastic Heads (Material Code 2 or 7)

Code	Description
SE	NPT Male (STANDARD)
T1	150# 1/2" Threaded Flange

Discharge Connection

Codes are same as suction connections

Capacity Control

Code	Description
AL	Manual Micrometer (STANDARD)
E1	Electronic - NEMA 4, 4-20 mA, 115 Volt
E2	Electronic - NEMA 4, 4-20 mA, 220 Volt
EA	Electronic - Ex Proof, 4-20 mA, 115 Volt
EB	Electronic - Ex Proof, 4-20 mA, 220 Volt
PN	Pneumatic, 3-15 psi, Direct Acting

***When using control other than manual, derate pump capacity by 10% series "M" & "B" only.**

Rupture Detection & Base

All Liquid Ends

Code	Description
NN	None (STANDARD)
NB	Base Only - Recommended with Flanges

Metallic Heads (Material Code 1 or 5)

Code	Description
CS	Rupture Detection with Base & Gauge
SN	Rupture Detect with Base, Gauge, & NEMA 4 Switch
57	Rupture Detect with Base, Gauge, & Ex Proof Switch

Plastic Heads (Material Code 2 or 7)

Code	Description
DD	Double Diaphragm with Base
DP	Double Diaphragm with Base & Conductivity Probe

***When using rupture detection or double diaphragm, derate pump capacity by 5%.**

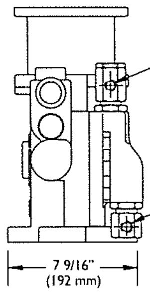
MATERIALS OF CONSTRUCTION

Liquid End Material	Diaphragm	Head	Valve Body	Seats	Balls	Seals	Contour Plate	Check Valve Spring
316 ss	PTFE	316 ss	316 ss	316 ss	316 ss	Viton & Buna N	316 ss	316 ss
PVC		PVC	PVC	PVC	Ceramic		PVC	N/A
PVDF		PVDF	PVDF	PVDF	Ceramic		PVDF	N/A
Alloy 20		Alloy 20	Alloy 20	Alloy 20	Alloy 20		Alloy 20	Alloy C

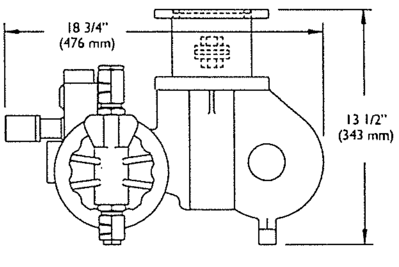
PIPING CONNECTION SIZES

Description	S Series		M & B Series	
	Suction	Discharge	Suction	Discharge
Metallic Liquid Ends (Codes 1, 5)	1/2" NPT Female	1/4" NPT Female	1/2" NPT Female	3/8" NPT Female
Plastic Liquid Ends (Codes 2, 7)	Not Available			

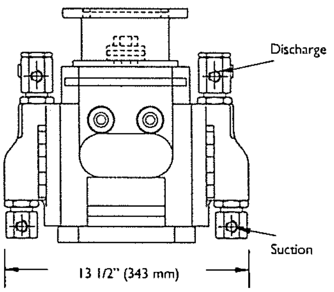
DIMENSIONS (LESS MOTOR) Approximate for envelope estimations. Certified prints are available



Simplex Front View



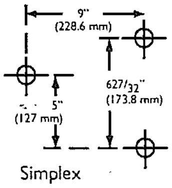
Simplex & Duplex Side View



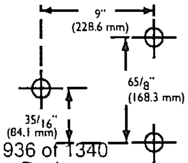
Duplex Front View

BOLT HOLE DIMENSIONS

Bolt holes accommodates 5/16" (8 mm) diameter bolts



Simplex



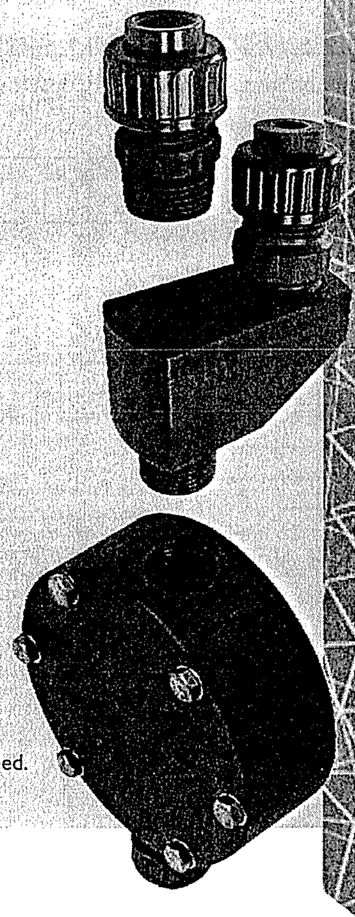
Page 936 of 1340

Duplex

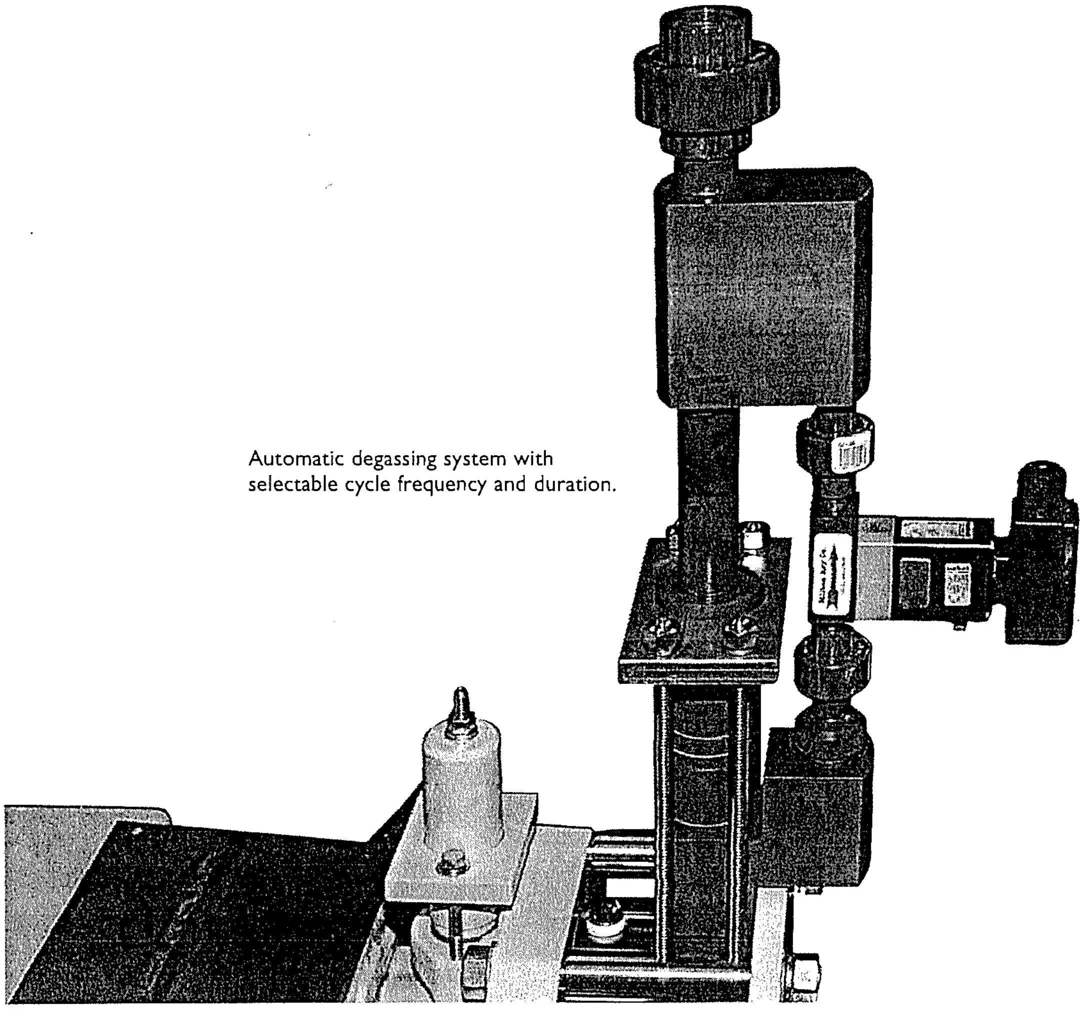
DEGASSING

Chemical decomposition causes certain chemicals to exhibit off-gassing within the process. Gas can accumulate within the piping system and also within the liquid end of the pump and cause vapor lock. This situation is common, especially for pumps used in intermittent service. Sodium Hypochlorite is the most common chemical with this characteristic.

Milton Roy offers several solutions based on your application. The options range from a simple bleed valve to facilitate start-up to automatic degassing systems that can be custom configured to your process.



Degassing valve option featuring continuous bleed.



Automatic degassing system with selectable cycle frequency and duration.

Appendix R

Treatment Media specifications and NSF Certifications

ACTIVATED CARBON & RELATED SERVICE

CARBON ACTIVATED CORP.

250E Manville Street
Manville, CA 90220
Phone: (310) 885-4555
Fax: (310) 885-4558
E-mail: info@carbonactivatedcorp.com
Website: www.carbonactivatedcorp.com

May 23, 2011

City of Santa Monica
Purchasing Department
1717 Fourth Street Suite 250
Santa Monica, CA 90401
Attn: Kelee Mac Donald
Senior Buyer

This letter is to address our qualifications, references, provide labor, and material for the complete turnkey change-out your filters. The President of the Corporation, Mr. Lionel Perera, has over 29 years' experience in manufacturing and applications using Activated Carbon and filter media. Carbon Activated Corporation has 15 years' experience in using all known, and has developed other methods of removal and placement of Activated Carbon and filter media. Below is a list of references on removal and replacement of Activated Carbon using our Pneumatic Tanker and Carbon.

City or Company Name	No. of years	Carbon Type and Mesh Size	Contact Name	Phone Number
City of Riverside	6	12X30 Coconut Shell	Adam Ly	(951) 351-6331
City of Monterey	2	8X30 Coal Base	Ralph Martinez	(626) 280-5552 Cell (626) 926-9007
City of San Bernardino	6	12X30 Coconut Shell	Mike Garland	(909) 379-2618 Cell (909) 379-2618
Golden State Water Company	10	12X30 Coconut Shell and Coal Base	John Hughs	(562) 907-9200 ext. 401 cell (562) 201-3238
Valley County Water District	1	12X30 Coconut Shell	Bill Wilson	(626) 201-9449
San Gabriel Valley Water Company	5		Tom Shevie	(626) 712-8007

Regards,

Dale Kerr
Operations/Sales

CARBON ACTIVATED CORPORATION

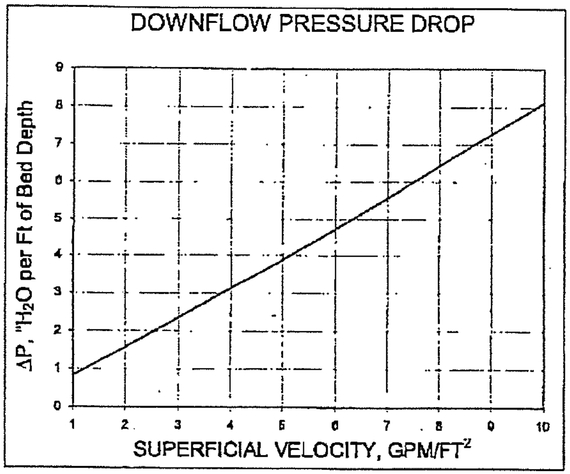
ACTIVATED CARBON & RELATED SERVICES

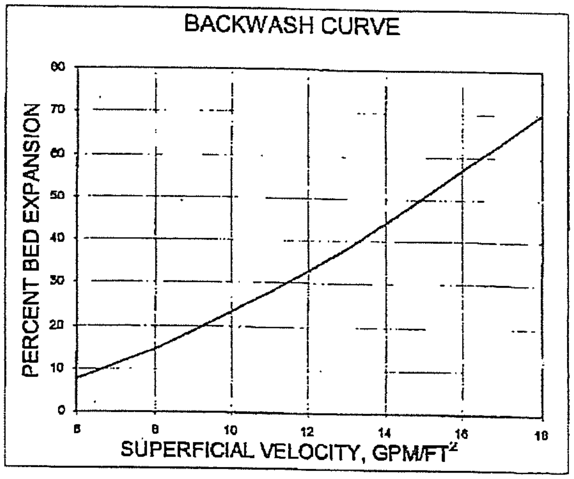
PRODUCT BULLETIN

COC – L 60 (12x40)

Liquid Phase Coconut Shell Base Carbon

COC-L60 Granular Activated Carbon (GAC) is manufactured from select grades of coconut shell and features a high density, large micropore volume and high surface area. It's commonly used for the purification of potable water, beverage manufacture, dialysis, aquarium water and a variety of food grade applications. In properly designed systems, ***COC-L60*** will effectively remove chlorine, chloramines, lead, TCE, PCE, THM's, Phenols, pesticides, detergents, taste & odor, etc. ***COC-L60*** meets AWWA Standard B-600-74, ANSI/NSF Standard 61 and Food Chemicals Codex Standards for drinking water applications.


DOWNFLOW PRESSURE DROP


BACKWASH CURVE

TYPICAL PHYSICAL PROPERTIES / SPECIFICATIONS

Total Surface Area (BET), m^2/g	1150-1200
Iodine Number per ASTM D4607	1100-1150
Carbon Tetrachloride Activity g/100 g min.	60
Apparent Density (ASTM 2854), lb/ft^3	0.46-0.52
Hardness per ASTM D3802 min.	95
Abrasion No., min.	85
Particle Sizes:	12 x 40
Larger than No. 12 max.	5%
Smaller than No. 40 max	4%
Ash Content	3% max.
Water Soluble ash	1% max.
Water Extractable per Food Chemical Codex	0.5% max.
Moisture as packed, max.	4%
Effective Size	0.55 – 0.75mm
Uniformity Coefficient, max.	1.9

STANDARD PACKAGING: 5lb or 27.5lb Poly Lined Polypropylene Bags and1,100lb Super Sacks.

This information is offered solely for your consideration and verification. It has been gathered from reference materials and/or test procedures and is believed to be true and accurate. None of this information shall constitute a warranty or representation, expressed or implied for which we assume legal responsibility or that the information or goods is fit for any particular use either alone or in combination with other goods or processes.

NSF

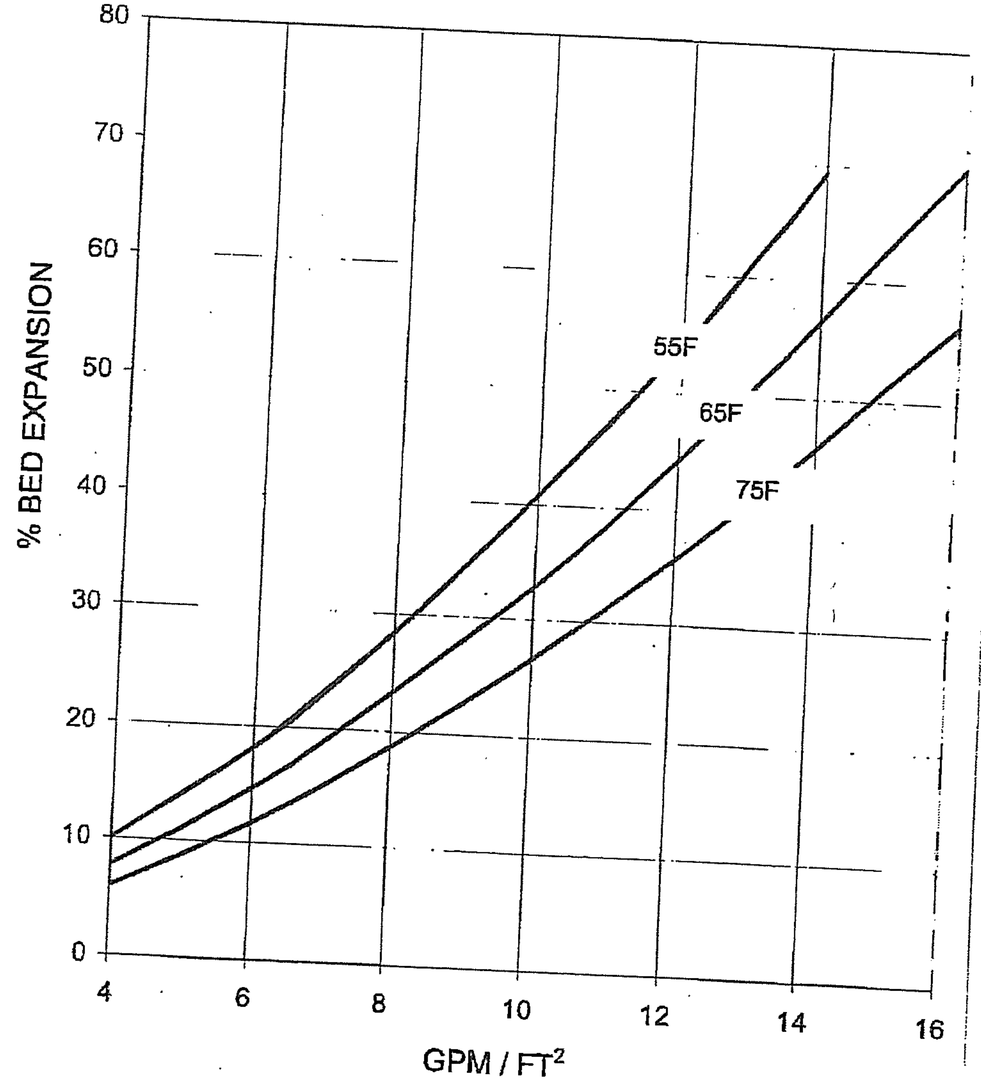
021904 CERTIFIED

AWWA
MEMBER

Quality
Endorsed
Company

CARBON ACTIVATED CORP.

BACK WASH BED EXPANSION
TYPE COL-GL60
12x40 MESH



For further information, contact your Carbon Activated representative or:

CARBON ACTIVATED CORP, 250 E. Manville Street, Compton, CA 90220 (310) 885-4555
www.carbonactivatedcorp.com

NSF Product and Service Listings

These NSF Official Listings are current as of **Monday, April 25, 2011** at 12:15 a.m. Eastern Time. Please contact NSF International to confirm the status of any Listing, report errors, or make suggestions.

Alert: NSF is concerned about fraudulent downloading and manipulation of website text. Always confirm this information by clicking on the below link for the most accurate information:
http://nsf.com/Certified/PwsComponents/Listings.asp?Company=C0035066&Standard=061&

NSF/ANSI STANDARD 61
Drinking Water System Components - Health Effects

NOTE: Unless otherwise indicated for Materials, Certification is only for the Water Contact Material shown in the Listing. Click here for a list of Abbreviations used in these Listings.

Carbon Activated Corporation

250 East Manville Street
Compton, CA 90220
United States
310-885-4555

Facility : # 1 Indonesia

Process Media

Trade Designation	Size	Water Contact Temp	Water Contact Material
Granular Activated Carbon[1]			
Coconut Shell Activated Carbon	[2]	CLD 23	GAC

[1] The carbon source is coconut shell.

[2] Certified for the following mesh sizes: 8 x 14, 8 x 16, 8 x 30, 10 x 30, 12 x 30, 12 x 40, 20 x 40, 20 x 50, 30 x 60, and, 30 x 70.

NOTE: Certified for water treatment plant applications.
This product has not been evaluated for point of use applications.

Number of matching Manufacturers is 1
Number of matching Products is 1
Processing time was 0 seconds

CARBON ACTIVATED CORP.
250 E. Manville Street, Compton, CA 90220
Tel (310) 885-4555 Fax (310) 885-4558

January 01, 2008

MATERIAL SAFETY DATA SHEET

IN CASE OF EMERGENCY OUTSIDE OF NORMAL BUSINESS HOURS CALL LIONEL PERERA (310) 885-4555.

SECTION 1-IDENTIFICATION

CHEMICAL NAME : CARBON
CAS NUMBER : 7440-44-0 (CARBON)
COMMON NAME : ACTIVATED CARBON
TYPE : COCONUT SHELL BASE GRANULAR ACTIVATED CARBON (12X40 MESH)

CHEMICAL FORMULA : C

SECTION 2- HAZARDOUS INGREDIENTS

CHEMICAL	8	PEL (OSHA)	TLV (ACGIH)	OTHER
CARBON	100	N/A	N/A	N/A

CAUTION SHOULD BE TAKEN FOR A RESPIRABLE DUST.
THE ACGIH TWA FOR RESPIRABLE DUST IS 1.0mg/M3.
CARCINOGENIC PROPERTIES: NONE

SECTION 3- PHYSICAL DATA

DESCRIPTION: ODORLESS BLACK SOLID GRANULES.

VAPOR PRESSURE: N/A
APPARENT DENSITY: 0.3 TO 0.6gm/cc
SOLUBILITY: STABLE

MELTING POINT: 6656 F (3680 C)
BOILING POINT: 7592 F (4200 C)

EMPHASIZE PROTECTION AGAINST REPETITIVE OR LONG TERM EXPOSURE TO CARBON DUST INHALATION.

SECTION 4- FIRE AND EXPLOSION HAZARD DATA

★★★★★★★★★★★★★★★★★★★★★

FLASH POINT: N/A
EXTINGUISHING MEDIA: WATER, FOAM, CO2, OR DRY CHEMICAL.
SPECIAL FIRE FIGHTING PRECAUTIONS: NONE

UNUSUAL FIRE AND EXPLOSION HAZARDS: CONTACT WITH STRONG OXIDIZERS MAY RESULT IN FIRE.

SECTION 5-REACTIVITY DATA

★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★

STABILITY: STABLE
CONDITION TO AVOID: NONE
INCOMPATIBILITY: AVOID CONTACT WITH STRONG OXIDIZERS.
HAZARDOUS DECOMPOSITION PRODUCT: CARBON MONOXIDE MAY BE FORMED IN THE EVENT OF A FIRE.

SECTION 6-HEALTH DATA

★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★★

ROUTE(S) OF ENTRY:

INGESTION: THIS PRODUCT IS NON-TOXIC THROUGH INGESTION THE ACTIVE ORAL LD 50 (RAT) IS >10 gm/kg.

INHALATION: THE PHYSICAL NATURE OF THIS PRODUCT MAY IRRITATE THE RESPIRATORY SYSTEM. THE ACUTE LC5 (RAT) IS>64.4 mg/L (NOMINAL CONCENTRATION)

DERMAL EXPOSURE: THIS MATERIAL IS NON-TOXIC THROUGH SKIN ABSORPTION.

ACTIVATED CARBON IS NOT A PRIMARY SKIN IRRITANT.
NO SENSITIZATION EFFECTS ARE KNOWN.
EYE IRRITATION: THE PHYSICAL NATURE OF THIS PRODUCT MAY PRODUCE EYE IRRITATION.

FIRST AID: IN CASE OF EYE CONTACT FLUSH WITH WATER FOR AT LEAST 15 MINUTES.

OTHER: THE EFFECTS OF CHRONIC AND SUBCHRONIC EXPOSURE HAVE NOT BEEN DETERMINED. SAFE HANDLING ON A LONG TERM BASIS SHOULD EMPHASIZE PROTECTION AGAINST REPETITIVE OR LONG TERM EXPOSURE TO CARBON DUST INHALATION.

SECTION 7-SPILL OR LEAK PROCEDURE

★★★★★★★★★★★★★★★★★★★★★★★★★★★

IF THE MATERIAL IS RELEASED OR SPILLED: UNUSED PRODUCT SHOULD BE SWEPT UP AND DISCARD OR REPACKAGED.

WASTE DISPOSAL METHOD:
UNUSED CARBON MAY BE DISPOSED OF BY ANY APPROPRIATE MEANS. USED PRODUCTS MAY CONTAIN HAZARDOUS CHEMICALS OR EXHIBIT HAZARDOUS PROPERTIES THAT MAY HAVE TO BE EXAMINED TO DETERMINE APPROPRIATE DISPOSAL METHOD. THIS PRODUCT MUST BE DISPOSED OF IN ACCORDANCE WITH ALL FEDERAL, STATE,AND LOCAL REGULATIONS.

SECTION 8- HANDLING AND STORAGE

★★★★★★★★★★★★★★★★★★★★★★★★★★

EYE PROTECTION: SAFETY GLASSES OR GOGGLES RECOMMENDED.

PROTECTIVE GLOVES: RECOMMENDED.

OTHER PROTECTIVE CLOTHING: NONE REQUIRED.

RESPIRATORY PROTECTION: A HIGH EFFICIENCY PARTICULATE FILTER IS RECOMMENDED WHENEVER EXCESSIVE DUST MAY BE GENERATED.

VENTILATION: LOCAL EXHAUST IS RECOMMENDED SUFFICIENT TO CONTROL DUST.

WORK/HYGIENIC: WASH THOROUGHLY AFTER HANDLING.

SECTION 9 - TRANSPORTATION DATA

★★★★★★★★★★★★★★★★★★★★★★★★★★★

PROPER SHIPPING (Article) NAME: STEAM ACTIVATED CARBON, NON-REGULATED OR CARBON, ACTIVATED, NON-REGULATED

DOT CLASSIFICATION: NMFC 40560 / DOT MARKING: N/A / DOT PLACARD: N/A

SECTION 10 – DANGEROUS GOODS REGULATION

ACTIVATED CARBON IS NOT CLASSIFIED AS DANGEROUS GOODS AS PER UN NO 1362, CLASS OR DIVISION 4.2, PACKING GROUP III, SPECIAL PROVISIONS 925.

SPECIAL PROVISION 925: THE PROVISIONS FOR THIS CODE DOES NOT APPLY TO:

A CONSIGNMENT OF CARBON IF IT PASSES THE TEST FOR SELF HEATING SUBSTANCES AS REFLECTED IN THE UN MANUAL OF TEST AND CRITERIA (SEE SEC. 33.3.1.3.3) AND IS ACCOMPANIED BY A CERTIFICATE FROM LABORATORY ACCREDITED BY THE COMPETENT AUTHORITY, STATING THAT THE PRODUCT TO BE LAOED HAS BEEN CORRECTLY SAMPLED BY TRAINED STAFF FROM THAT LABORATORY AND THAT THE SAMPLE WAS CORRECTLY TETED AND HAS PASSED THE TEST. EMPLOYERS SHOULD USE THIS INFORMATION ONLY AS SUPPLEMENT TO OTHER INFORMATION GATHERED BY THEM AND SHOULD MAKE INDEPENDENT JUDGEMENT OF SUITABILITY OF THIS INFORMATION TO ENSURE PROPER USE AND PORTET THE HEALTH AND SAFETY OF THEIR EMPLOYEES. THIS INFORMATION IS FURNISHED WITHOUT A WARRANTY AND ANY USE OF THE PRODUCT NOT IN CONFORMANCE WITH THIS MATERIAL SAFETY DATA SHEET OR IN COMBINATION WITH ANY OTHER PRODUCT OR PROCESS IS THE RESPONSIBILITY OF THE USER.

EMERGENCY ACCIDENT PRECAUTIONS AND PROCEDURES:

CONTACT: CARBON ACTIVATED CORPORATION
PHONE: 310 885 4555

PRECAUTIONS TO BE TAKEN IN TRANSPORTATION: N/A

OTHER CAUTION: WET ACTIVATED CARBON REMOVES OXYGEN FROM THE AIR CAUSING A SEVERE HAZARD TO WORKERS IN REQUIRED SPACE. SAMPLING AND WORK PROCEDURES FOR LOW OXYGEN LEVELS SHOULD BE TAKEN WHENEVER WORKERS MAY BE ENTERING CARBON VESSELS ENCLOSED OR CONFINED SPACE.ALL FEDERAL STATE AND LOCAL REGULATIONS SHOULD BE OBSERVED.

BLACK & VEATCH CORPORATION

8400 Ward Parkway, P.O. Box No. 8405, Kansas City, Missouri 64114, (913) 458-2000

65.1010 – Transmittal 008 – Section 11200 – Item #15

City of Santa Monica
Charnock Well Field Restoration Project
160823.65.1010 – Granulated Activated Carbon Systems
Submittal Review

B&V Project: 160823
B&V Submittal: **Transmittal 008**
B&V File: **65.1010.10**
07.15.2010

WesTech Engineering, Inc.
3625 South West Temple
Salt Lake City, UT 84115-4409

Attention: Alan Walker

Gentlemen:

Reference is made to your submittal reviewed by BLACK & VEATCH on **07/15/2010**. The following data pertains to Transmittal 008 of 65.1010 – Granulated Activated Carbon Equipment Requirements of the Specifications.

			Review Status						Distribution			
Identification	Manufacturer	Description	No Exceptions Noted	Exceptions Noted	Record Copy	Returned For Correction	Not Acceptable	Submit Corrected Copies	Subcontractors*	City of Santa Monica File *	BVCI Construction Manager *	CYGNET File
Section 11200	WesTech	Media	X						X	X	X	X

* Paper and Electronic Copy

REMARKS: **This submittal is being returned No Exceptions Noted.**

By: **Holly Shorney-Darby / Rick Bond**

BLACK & VEATCH CORPORATION

Roy Bravo, Jr.

Engineering Manager

cc:
Beavens
Big Sky Electric
SSC Construction

WESTECH
Municipal and Industrial Process Equipment
3625 South West Temple, Salt Lake City, Utah 84115-4409 Phone: (801) 265-1000 Fax: (801) 265-1080

LETTER OF TRANSMITTAL

To: Black & Veatch
8400 Ward Parkway
Kansas City, MO 64114

Attn: Roy Bravo
Phone: (913) 458-3348

Date: 7/6/10 **Group:** 5
Project No: 20742B
Project Name: Charnock
Re:
Date needed on site: / /
Status:

We are sending you: ☐ Attached ☐ Under Separate Cover **Via:** ☐ Best Way ☒ Other: Ibackup
the following items:
☐ Shop Drawings ☐ Submittal Drawings ☐ O&M Manuals ☐ Specifications
☐ Copy of Letter ☐ Change Order ☒ Other: Submittal information

COPIES	NUMBER	REV	DESCRIPTION
1	20742B		Technical Submittal #15 - Media manufacturer and detailed media information

These are transmitted as checked below:
☒ For Approval
☐ For Your Use
☐ As Requested
☐ For Review and Comment
☐ Approved as Submitted
☐ Approved as Noted
☐ Returned for Corrections
☐ Returned ____ Corrected Prints
☐ For Bids Due / /
☐ Prints Returned After Loan to WEI
☐ Returned ____ Approved Prints
☐ ____________

☐ Please Return Submittal By / / to Avoid Delaying Project.

Black & Veatch
Date: 07/15/2010
Reviewer: H. Shorney-Darby
R. Bond
Status: NEN

Remarks:

Copy to: File No:
Agent:
Reader File:

Signed

Mark Fisher
WesTech Engineering, Inc.

WESTECH AN EMPLOYEE OWNED COMPANY

DOCUMENT TITLE:

TECHNICAL SUBMITTAL
ITEM NO. 15
MEDIA MANUFACTURER AND DETAILED MEDIA INFORMATION

PROJECT:

CHARNOCK WELL FIELD RESTORATION PROJECT
BLACK & VEATCH PO NO. 164407.65.1010

EQUIPMENT:

GRANULAR ACTIVATED CARBON SYSTEMS
CHARNOCK PLANT
EQUIPMENT TAG NO. C-GAC-TNK-1101/1201/2101/2201/3101/3201/4101/4201/5101/5201

WESTECH JOB NO. 20742B
JULY 6, 2010

OLC 12x40

Coconut Activated Carbon

CALGON
CALGON CARBON CORPORATION

Specification

Test	Min	Max	Calgon Carbon Test Method
IODINE NO., mg/g	1050	-	ASTM D 4607
MOISTURE, wt%, as packed	-	3	ASTM D 2867
A.D., g/cc	0.48	-	ASTM D 2854
HARDNESS NO.	95	-	ASTM D 3802
US SIEVE SERIES			ASTM D 2862
> 12 US MESH	-	5	
16 US MESH	-	-	
20 US MESH	-	-	
30 US MESH	-	-	
40 US MESH	-	-	
< 40 US MESH	-	0.5	

Safety Message

Wet activated carbon preferentially removes oxygen from air. In closed or partially closed containers and vessels, oxygen depletion may reach hazardous levels. If workers are to enter a vessel containing carbon, appropriate sampling and work procedures for potentially low oxygen spaces should be followed, including all applicable Federal and State requirements.

CALGON
CALGON CARBON CORPORATION

Making Water and Air Safer and Cleaner

Your local representative

Calgon Carbon Corporation
P.O. Box 717
Pittsburgh, PA USA 15230-0717
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Tel: 1-412-787-6700
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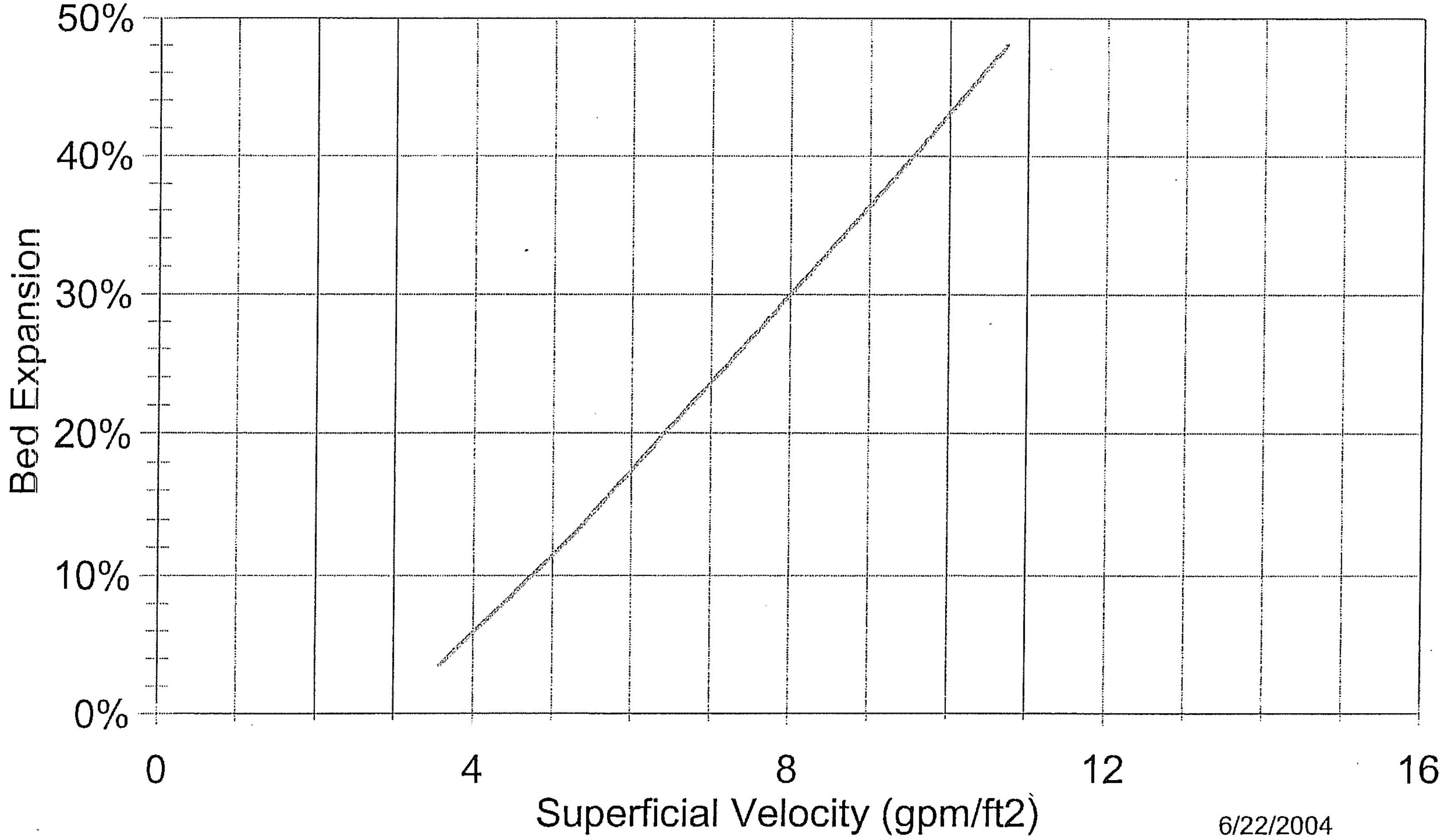
Bed Expansion Curve

Water at 60F, 12 x 40 Mesh Coconut GAC



6/22/2004
JSR

Material Safety Data Sheet

U.S. Department of Labor
Occupational Safety and Health Administration
This form is consistent with ANSI standard for preparation of MSDS's in accordance with OSHA's Hazard Communication Standard, 29 CFR 1910.1200.

Product Type: **OLC 12X40**	
Product Code: 2490	**Profile No:** 2
Effective Date: **March 31, 2008**	**Supersedes:**

SECTION I - PRODUCT AND COMPANY INFORMATION

Company Identification (USA)	**Calgon Carbon Corporation** P.O. Box 717 Pittsburgh, PA 15230-0717	
Telephone Number(s)	Information	412-787-6700
	Emergency	412-787-6700
Company Identification (Europe)	**Chemviron Carbon** Zoning Industriel de Feluy B-7181 Feluy, Belgium	
Telephone Number(s)	Information	32 64 51 18 11
	Emergency	32 64 51 18 11
Date Prepared November 3, 2008	Signature of Preparer (optional)	

SECTION II – COMPOSITION /INFORMATION ON INGREDIENTS

Nonhazardous components are listed at 3% or greater; acute hazards are listed when present at 1% or greater and chronic hazards are listed when present at 0.01% or greater. This is not intended to be a complete compositional disclosure.

Ingredient / Component	**CAS No**	**% by Wt**
Activated Carbon (Coconut based)	7440-44-0	100

SECTION III – HAZARD(S) IDENTIFICATION

Emergency Overview: Black particulate solid, pellet or powder. Contact may cause eye irritation. Dust may be slightly irritating to eyes and respiratory tract. Avoid generation of dust or fines during handling.

CAUTION: Wet activated carbon removes oxygen from air causing a severe hazard to workers in enclosed or confined space. Before entering such an area, sampling and work procedures for low oxygen levels should be taken to ensure ample oxygen availability, observing all local, state and federal regulations

OSHA Regulatory Status	Not regulated		
HMIS Ratings	Health	0	4 = Extreme/Severe 3 = High/Serious 2 = Moderate 1 = Slight 0 = Minimum W = Water Reactive OX = Oxidizer
(NFPA)	Flammability	1	
	Reactivity	0	
	Special		
Protective Equipment	Safety glasses with side shields or goggles, gloves, long sleeve shirt or lab coat, long pants recommended.		
Health Effects	See Section IV		
Environmental Effects	See Section XII		

SECTION IV – FIRST-AID MEASURES

Route of exposure	
Eyes	Dust may cause mild irritation, possibly reddening.
Skin	Dust may cause mild irritation, possibly reddening.
Inhalation	Dust may cause mild irritation to the upper respiratory tract.
Ingestion	Dust may cause mild irritation to digestive track resulting in nausea or diarrhea. .
Signs/Symptoms of Exposure	Dust may cause irritation and redness of eyes, irritation of skin and respiratory system. The effects of long-term, low-level exposures to this product have not been determined.
Emergency and First Aid Procedures	For eye contact, immediately flush with copious amounts of water for at least 15 minutes, lifting both the upper and lower lids occasionally; seek medical attention. For skin contact, wash with soap and water; seek medical attention. For inhalation, Remove to fresh air and rest as needed; seek medical attention for any breathing difficulty. For ingestion, drink plenty of water; seek medical attention.
Medical Conditions Generally Aggravated by Exposure	People with pre-existing skin conditions or eye problems or impaired respiratory function may be more susceptible to the potential effects of the dust.

SECTION V – FIRE FIGHTING MEASURES

Suitable Extinguishing Media	Use an extinguishing media suitable for the surrounding fire
Unsuitable Extinguishing Media	None known
Specific Hazards	As with most organic solids, fire is possible at elevated temperatures or by contact with an ignition source. Activated carbon is difficult to ignite and tends to burn slowly (smolder) without producing smoke or flame. Carbon monoxide and carbon dioxide gas may be emitted upon combustion of material. Contact with strong oxidizers such as ozone or liquid oxygen may cause rapid combustion
Protective Equipment and Procedures	Wear NIOSH approved self-contained breathing apparatus suitable for the surrounding fire.

SECTION VI – ACCIDENTAL RELEASE MEASURES

Personal Precautions	Wear protective equipment, keep unnecessary personnel away, ventilate area of spill
Environmental Precautions	The material is not soluble but can cause a particulate emission if discharged to waterways; therefore, dike all entrances to sewers and drains to avoid introducing the material into the waterways.
Containment & Clean-up	Dike all entrances to sewers and drains. Vacuum or shovel spilled material and place in closed container for disposal. Remove product to appropriate storage area until it can be properly disposed of in accordance with local, state and federal regulations. Avoid dust formation. See section XIII
Other information	NA

SECTION VII – HANDLING AND STORAGE

Handling	Avoid prolonged contact with eyes and skin. Keep away from ignition sources. Use in well ventilated areas. Protect containers from physical damage. Wash hands after handling.
Storage	Store in cool, dry, ventilated area and in closed containers. Keep away from oxidizers, heat or flames. Store away from ignition sources.

SECTION VIII – EXPOSURE CONTROLS/PERSONAL PROTECTION

Component	OSHA PEL	ACGIH TLV	Other limits
Activated Carbon	5 mg/M^3 (Resp)	5 mg/M^3 (Resp)	

Exposure Guidelines	Wet activated carbon removes oxygen from air posing a hazard to workers in enclosed or confined space. Before entering such an area, sample the air to assure sufficient oxygen supply. Use work procedures for low oxygen levels, observing all local, stated and federal regulations.
Engineering Controls	No special ventilation requirements. Good general ventilation should be adequate for open areas. Mechanical ventilation is recommended for enclosed or confined spaces
Personal Protective Equipment	Use of NIOSH approved particulate filter is recommended if dust is generated in handling. The usual precautionary measures for handling chemicals should be followed, i.e. gloves, safety glasses w/side shields or goggles, long sleeve shirt or lab coat, dust respirator if dusty. Other protective clothing/equipment as appropriate.
General Hygiene	The usual precautionary measures for handling chemicals should be followed: i.e. Keep away from food and beverage; remove contaminated clothing immediately; wash hands before breaks or eating; avoid contact with eyes and skin.

SECTION IX – PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point	NA	**Melting Point**	NA
Vapor Pressure (mm Hg.)	0	**Evaporation Rate**	NA
Vapor Density (AIR = 1)	solid	**Flash Point**	NA
Specific Gravity	0.4 to 0.7	**UEL**	NA
		LEL	NA
Flammability Limits	Ignition Temperature > 220° C		
Odor	None		
Solubility in Water	Product is not soluble.		
Appearance	Black granular or powder material.		

SECTION X – STABILITY AND REACTIVITY

STABILITY	**UNSTABLE**		**CONDITIONS TO AVOID:** None
	STABLE	**XX**	
HAZARDOUS REACTION	**MAY OCCUR**		**CONDITIONS TO AVOID:** None
	WILL NOT OCCUR	**XX**	
Caution: High concentrations of organics in air will cause temperature rise due to heat of adsorption. At very high concentration levels this may result in a thermal excursion, referred to as a bed fire. High concentrations of Ketones and Aldehydes may cause a bed temperature rise due to adsorption and oxidation.			
Incompatible Materials		Alkali Metals and Strong Oxidizers such as ozone, oxygen, permanganate, chlorine	
Hazardous Decomposition Products		Carbon monoxide and carbon dioxide gas may be generated during combustion of this material.	

SECTION XI – TOXICOLOGICAL INFORMATION

Acute Effects		
Toxicity Studies	Oral LD_{50}	Not determined on the finished product.
	Dermal LD_{50}	Not determined on the finished product.
Inhalation	See section IV	
Ingestion	See section IV	
Eye Irritation	See section IV	
Skin Irritation	See section IV	
Sensitization	Not determined on the finished product.	
Target Organ (s) or System		Eyes, Skin and Upper Respiratory System
Signs and symptoms of Exposure		Irritation and redness of eyes, irritation of skin and respiratory system may result from exposure to carbon dust See Sections III and IV
Chronic Effects		
Carcinogenicity		Not Determined on the finished product.
Mutagenicity		Not Determined on the finished product.
Reproductive Effects		Not Determined on the finished product.
Developmental Factors		Not Determined on the finished product.

SECTION XII – ECOLOGICAL INFORMATION

Ecotoxicity	Not Determined on the finished product.
Persistence/degradability	Not Determined on the finished product.
Bioaccumulation/Accumulation	Not Determined on the finished product.
Mobility in Environmental Media	Not Determined on the finished product.
Other Adverse Effects	Not Determined on the finished product.

SECTION XIII – DISPOSAL CONSIDERATIONS

Vacuum or shovel material into a closed container. Storage and disposal should be in accordance with applicable local, state and federal laws and regulations. Local regulations may be more stringent than state or federal requirements. Consult with the US EPA Guidelines listed in 40 CFR Part 261.3 for the classifications of hazardous waste prior to disposal

SECTION XIV – TRANSPORT INFORMATION

This information as presented below only applies to the material as shipped. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations.

Land	DOT Regulations	Proper Shipping Description	OLC 12X40 (Steam Activated Carbon)
	Canadian WHMIS	Hazard Class	NA See note below
		UN/NA	UN 1362
Water	IMO / IMDG	Proper Shipping Description	OLC 12X40 (Steam Activated Carbon)
		Hazard Class	NA See note below
		UN/NA	UN 1362
Air	IACO / IATA	Proper Shipping Description	OLC 12X40 (Steam Activated Carbon)
		Hazard Class	NA See note below
		UN/NA	UN 1362
		Information reported for product/size: 0.5 Kg	

This product has been tested according to the *United Nations Transport of Dangerous Goods* test protocol for a "self-heating substance". It has been specifically determined that this product does not meet the definition of a self heating substance or any other hazard class, and therefore is not a hazardous material. Please note that this information is applicable only for the Activated Carbon Product identified in this document.

SECTION XV – REGULATORY INFORMATION

SARA Title III 302	Product is not subject to SARA Title III, section 302 regulation.	
SARA Title III 313	Product is not subject to SARA Title III, section 313 regulation.	
TSCA	Product is listed	
California Proposition 65	Product is not listed	
Canadian classification	**WHMIS**	Product is listed.
	DSL #	Product is listed.
EEC Council Directives relating to the classification, packaging, and labeling of dangerous substances and preparations.		
Risk and Safety Phrases	R36: Irritating to the eyes, R37: Irritating to the respiratory system, R38: Irritating to the skin,	

SECTION XVI – OTHER INFORMATION

Intended Use	The material is generally used for treatment of gases (and liquids)
The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to determine the suitability and completeness of this information for their particular use.	
While the information and recommendations set forth herein are believed to be accurate as of the date hereof, Calgon Carbon Corporation makes no warranty with respect to same and disclaims all liability for reliance there on.	

References:

NA	not applicable

Legend:

ACGIH	- American Conference of Governmental Industrial Hygienists
ANSI	- American National Standards Institute
ATSDR	- Agency for Toxic Substances and Disease Registry
Ceil	- Ceiling (limit value)
CAS #	- Chemical Abstracts Service Registry Number
CERCLA	- Comprehensive Environmental Response, Compensation, and Liability Act
CEPA	- Canadian Environmental Protection Act
CFR	- Code of Federal Regulations
DOT	- Department of Transportation
DSL	- Domestic Substances List
EINECS	- European Inventory of Existing Commercial Chemical Substances
ERAP	- Emergency Response Assistance Plan
IATA	- International Air Transportation Association
IARC	- International Agency for Research on Cancer
ICAO	- International Civil Aviation Organization
IDLH	- Immediately Dangerous to Life and Health
IMO	- International Maritime Organization
IMDG	- International Maritime Dangerous Goods
LC_{50}	- The concentration of material in air expected to kill 50% of a group of test animals
LD_{50}	- Lethal Dose expected to kill 50% of a group of test animals
NFPA	- National Fire Protection Association
NIOSH	- National Institute for Occupational Safety and Health
NTP	- National Toxicology Program
OSHA	- Occupational Safety and Health Association
PEL	- Permissible Exposure Limit
RCRA	- Resource conservation and Recovery Act
RQ	- Reportable Quantity
SARA	- Superfund Amendments and Reauthorization Act
STEL	- Short Term Exposure Limit
TDG	- Transportation of Dangerous Goods Act/Regulation
TLV	- Threshold Limit Value
TSCA	- Toxic Substances Control Act
TWA	- Time Weighted Average
WHMIS	- Workplace Hazardous Material Information System

* * * END OF MATERIAL SAFETY DATA SHEET * * *

Brackish Water RO Elements

TMG (8" C-Style)

Type	Diameter inch	Membrane Area ft^2 (m^2)	Salt Rejection %	Product Flow Rate gpd (m^3/d)
TMG10	4"	87 (8)	99.5	2,400 (9.1)
TMG20-370C	8"	370 (34)	99.5	9,500 (36.0)
TMG20-400C	8"	400 (37)	99.5	10,200 (38.6)
TMG20-430C	8"	430 (40)	99.5	11,000 (41.6)

1. Membrane Type		Cross Linked Fully Aromatic Polyamide Composite
2. Test Conditions	Feed Water Pressure	110psi (0.76 MPa)
	Feed Water Temperature	77 °F (25 °C)
	Feed Water Concentration	500mg/l NaCl
	Recovery Rate	15 %
	Feed Water pH	7
3. Minimum Salt Rejection		99.0 %
4. Minimum Product Flow Rate		2,000 gpd (7.6 m^3/d) (TMG10) 7,500 gpd (28 .4m^3/d) (TMG20-370) 8,200 gpd (31 .0m^3/d) (TMG20-400) 8,800 gpd (33 .3m^3/d) (TMG20-430)

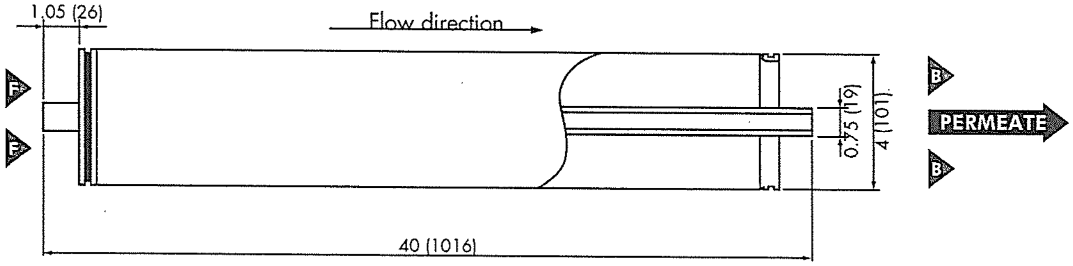
Dimensions

All dimensions shown in inches (millimeter).

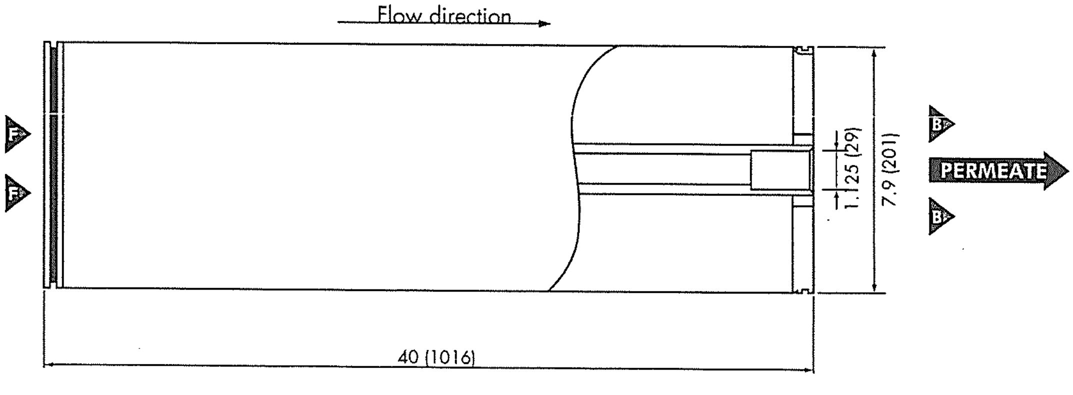
▷F Feed Water

▷B Concentrated Brine

TMG10



TMG20-370C
TMG20-400C
TMG20-430C



Operating Limits

Maximum Operating Pressure	365 psi (2.5MPa)
Maximum Feed Water Temperature	113 °F (45 °C)
Maximum Feed Water SDI15	5
Feed Water Chlorine Concentration	Not Detectable
Feed Water pH Range, Continuous Operation	2-11
Feed Water pH Range, Chemical Cleaning	1-12
Maximum Pressure Drop per Element	20 psi (0.14 MPa)
Maximum Pressure Drop per Vessel	60 psi (0.4 MPa)

Operating Information

1. For the recommended design range, please consult the latest Toray technical bulletin, design guide lines, computer design program, and/or call an application specialist. If the operating limits given in this Product Information Bulletin are not strictly followed, the Limited Warranty will be null and void.
2. All elements are wet tested, treated with a 1% by weight percent sodium bisulfite storage solution, and then vacuum packed in oxygen barrier bags. To prevent biological growth during short term storage, shipment, or system shutdown, it is recommended that Toray elements be immersed in a protective solution containing 500 - 1,000 ppm of sodium bisulfite (food grade) dissolved in permeate.
3. Permeate from the first hour of operation shall be discarded.
4. The customer is fully responsible for the effects of chemicals that are incompatible with the elements. Their use will void the element Limited Warranty.

Notice

1. Toray accepts no responsibility for results obtained by the application of this information or the safety or suitability of Toray's products, either alone or in combination with other products. Users are advised to make their own tests to determine the safety and suitability of each product combination for their own purposes.
2. All data may change without prior notice, due to technical modifications or production changes.

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RO Membrane Products Department

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Urayasu, Chiba 279-8555, Japan
Tel: +81 47 350 6030
Fax: +81 47 350 6066
http://www.toraywater.com

Americas:
Toray Membrane USA, Inc.
Sales Office

12140 Community Road Suite B,
Poway, Ca 92064, USA
Tel: +1 858 218 2390
Fax: +1 858 486 3063

Europe, Middle East and Africa:
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CH-4142 Münchenstein 1, Switzerland
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Inversand Company
226 Atlantic Avenue, P.O. 650 • Clayton, NJ 08312
[illegible]
[illegible]

GREENSANDPLUS™ TECHNICAL DATA

GREENSAND*plus*™

Performance Media for Water Filtration

Removes iron, manganese, hydrogen sulfide, arsenic and radium.

GreensandPlus™ is a black filter media used for removing soluble iron, manganese, hydrogen sulfide, arsenic and radium from groundwater supplies.

The manganese dioxide coated surface of GreensandPlus acts as a catalyst in the oxidation reduction reaction of iron and manganese.

The silica sand core of GreensandPlus allows it to withstand waters that are low in silica, TDS and hardness without breakdown.

GreensandPlus is effective at higher operating temperatures and higher differential pressures than standard manganese greensand. Tolerance to higher differential pressure can provide for longer run times between backwashes and a greater margin of safety.

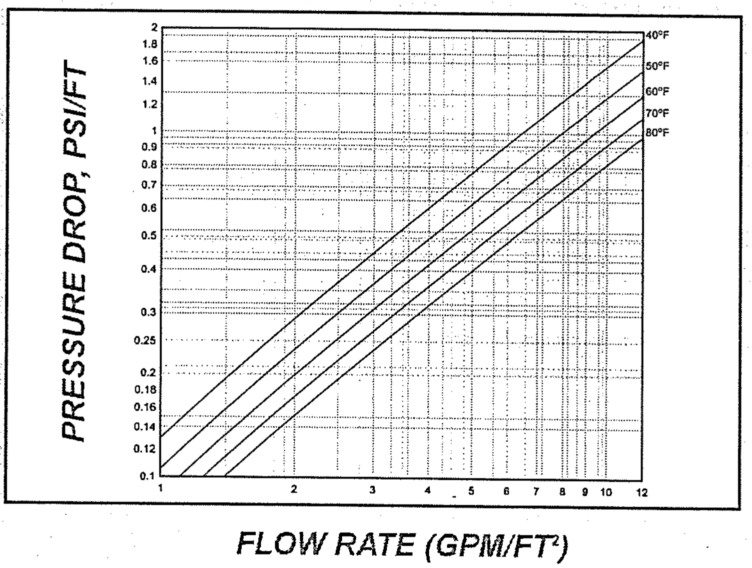
Systems may be designed using either vertical or horizontal pressure filters, as well as gravity filters.

GreensandPlus is a proven technology for iron, manganese, hydrogen sulfide, arsenic and radium removal. Unlike other media, there is no need for extensive preconditioning of filter media or lengthy startup periods during which required water quality may not be met.

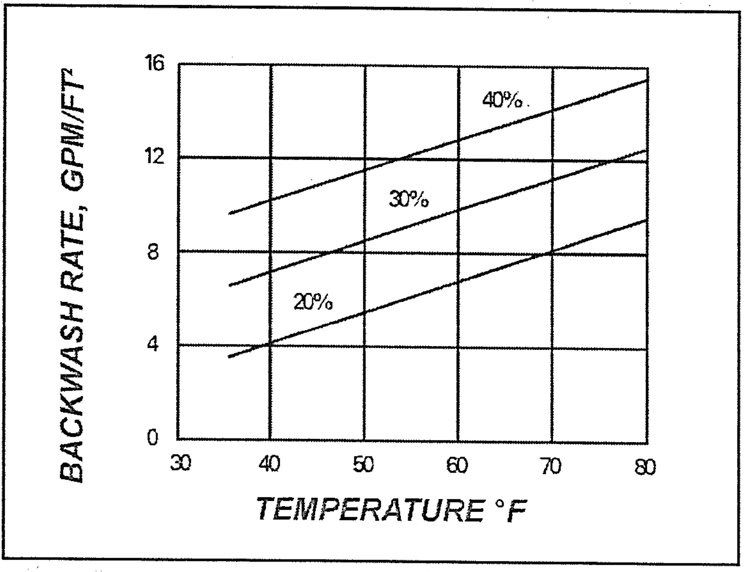
GreensandPlus is an exact replacement for manganese greensand. It can be used in CO or IR applications and requires no changes in backwash rate or times or chemical feeds.

GreensandPlus has the WQA Gold Seal Certification for compliance with NSF/ANSI 61. Packaging is available in 1/2 cubic foot bags or 1 metric ton (2,205 lbs) bulk sacks.

GREENSANDPLUS PRESSURE DROP (CLEAN BED)



BED EXPANSION DURING BACKWASHING



PHYSICAL CHARACTERISTICS

Physical Form
Black, nodular granules shipped in a dry form

Apparent Density
88 pounds per cubic foot net (1410.26 kg/m3)

Shipping Weight
90 pounds per cubic foot gross (1442.31 kg/m3)

Specific Gravity
Approximately 2.4

Porosity
Approximately 0.45

Screen Grading (dry)
18 X 60 mesh

Effective Size
0.30 to 0.35 mm

Uniformity Coefficient
Less than 1.60

pH Range
6.2-8.5 (see General Notes)

Maximum Temperature
No limit

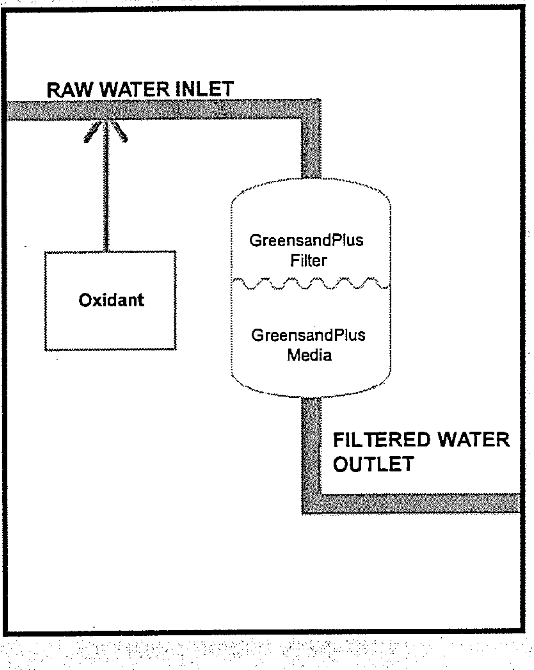
Backwash Rate
Minimum 12 gpm/sq. ft. at 55°F
(29.4 m/hr @ 12.78*C) (see expansion chart)

Service Flow Rate
2 – 12 gpm/sq. ft. (4.9m/hr - 29.4 m/hr)

Minimum Bed Depth
15 inches (381 mm) of each media for dual media beds or 30 inches minimum (762 mm) of GreensandPlus alone.

METHOD OF OPERATION CO

GreensandPlus: Catalytic Oxidation (CO)



Catalytic Oxidation (CO) operation is recommended in applications where iron removal is the main objective in well waters with or without the presence of manganese. This method involves the feeding of a predetermined amount of chlorine (Cl_2) or other strong oxidant directly to the raw water before the GreensandPlus Filter.

Chlorine should be fed at least 10-20 seconds upstream of the filter, or as far upstream of the filter as possible to insure adequate contact time. A free chlorine residual carried through the filter will maintain GreensandPlus in a continuously regenerated condition.

For operation using chlorine, the demand can be estimated as follows:

mg/L Cl_2 = (1 x mg/L Fe) + (3 x mg/L Mn) + (6x mg/L H_2S) + (8 x mg/L NH_3)

SUGGESTED OPERATING CONDITIONS

Bed Type
Dual media; anthracite 15-18 in. (381 mm-457 mm) and GreensandPlus 15-24 in. (381 mm - 610 mm)

Capacity

700-1200 grains of oxidized iron and manganese/sq.ft. of bed area based on oxidant demand and operation to iron break through or dp limitations.

Backwash
Sufficient rate using treated water to produce 40% bed expansion until waste water is clear, or for 10 minutes, whichever occurs first.

Air/Water Scour
Optional using 0.8-2.0 cfm/sq. ft. (15 m/hr -37 m/hr) with a simultaneous treated water backwash at 4.0-4.5 gpm/sq. ft. (9.8 m/hr - 11.03 m/hr)

Raw Water Rinse
At normal service flow rate for 3 minutes or until effluent is acceptable.

Flow Rate
Recommended flow rates with CO operation are 2-12 gpm/sq. ft. (4.9 m/hr - 29.4 m/hr). High concentrations of iron and manganese usually require lower flow rates for equivalent run lengths. Higher flow rates can be considered with low concentrations of iron and manganese. For optimizing design parameters, pilot plant testing is recommended.The run length between backwashes can be estimated as follows:

What is the run length for a water containing 1.7 mg/L iron and 0.3 mg/L manganese at a 4 gpm/sq. ft. service rate:

Contaminant loading
= (1 x mg/L Fe) + (2 x mg/L Mn)
= (1 x 1.7) + (2 x 0.3)
= (2.3 mg/L or 2.3/17.1 = 0.13 grains/gal. (gpg)

At 1,200 grains / sq. ft. loading ÷ 0.13 gpg
= 9,230 gal./sq. ft.

At 4 gpm / sq. ft. service rate 9,230/4
= 2,307 min.

The backwash frequency is approximately every 32-38 hours of actual operation.

The Intermittent regeneration (IR) operation is available for certain applications. Contact your Inversand representative for additional information.

GENERAL NOTES

pH

Raw waters having natural pH of 6.2 or above can be filtered through GreensandPlus without pH correction. Raw waters with a pH lower than 6.2 should be pH-corrected to 6.5-6.8 before filtration. Additional alkali should be added following the filters if a pH higher than 6.5-6.8 is desired in the treated water. This prevents the possible adverse reaction and formation of a colloidal precipitate that sometimes occurs with iron and alkali at a pH above 6.8.

Initial Conditioning of GreensandPlus

GreensandPlus media must be backwashed prior to adding the anthracite cap. The GreensandPlus backwash rate must be a minimum of 12 gpm/sq. ft. @ 55 °F.

This initial backwash could last for up to 60 minutes to thoroughly remove the fine dust. After backwashing is complete, the GreensandPlus must be conditioned. Mix 0.5 gal. (1.9 L) of 6% household bleach or

Initial Conditioning of GreensandPlus

0.2 gal (0.75 L) of 12% sodium hypochlorite for every 1 cu. ft. (28.3 L cu. m) of GreensandPlus into 6.5 gallons (25 L) of water.

Drain the filter enough to add the diluted chlorine mix. Apply the diluted chlorine to the filter being sure to allow the solution to contact the GreensandPlus media. Let soak for a minimum of 4 hours, then rinse to waste until the "free" chlorine residual is less than 0.2 mg/L. The GreensandPlus is now ready for service.

REFERENCES

USA

American Water Company, CA
San Jacinto, CA
City of Tallahassee, FL
Adedge Technologies, Inc., Buford, GA
City of Mason City, IL
City of Goshen, IN
City of Hutchinson, KS
City of Burlington, MA
Dedham Water Co., MA
Raynham Center, MA
Northbrook Farms, MD
Sykesville, MD
Tonka Equipment Company, Plymouth, MN
City of New Bern, NC
Onslow County, NC
Hungerford & Terry, Inc., Clayton, NJ
Fort Dix, NJ
Jackson Twsp. MUA, NJ

Radium and Arsenic Removal Using GreensandPlus

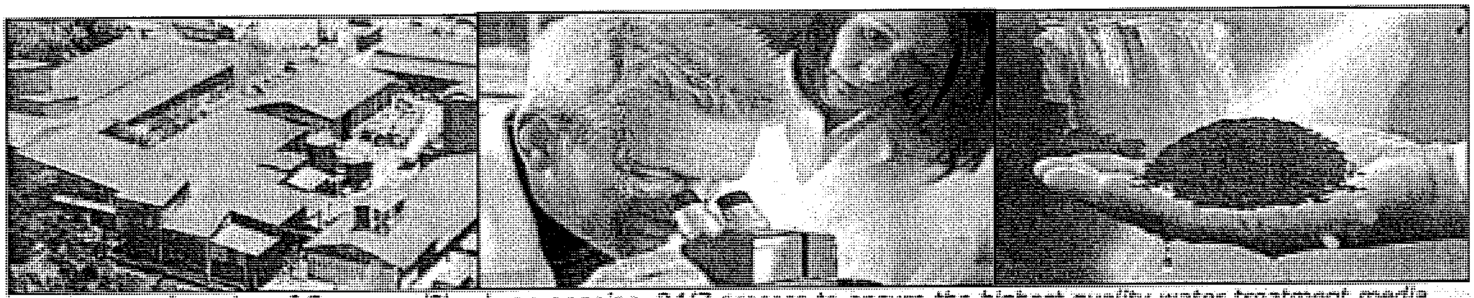
The GreensandPlus CO process has been found to be successful in removing radium and arsenic from well water. This occurs via adsorption onto the manganese and/or iron precipitates that are formed. For radium removal, soluble manganese must be present in or added to the raw water for removal to occur. Arsenic removal requires iron to be present in or added to the raw water to accomplish removal. Pilot plant testing is recommended in either case.

USA

Churchill County, NV
Suffolk County Water Authority, NY
City of Urbana, OH
Roberts Filter Group, Darby, PA

International

Watergroup, Saskatoon, SK Canada
BI Pure Water, Surrey, BC Canada
Sydney, Nova Scotia, Canada
PT Besflo Prima, Jakarta, Indonesia
Eurotrol, Milanese, Italy
Gargon Industrial, Mexico City, Mexico
Filtration Tech, Auckland, New Zealand
Alamo Water Poland, Izabelin, Poland
Aquatrol Company, Moscow, Russia
Impulse Group, St. Petersburg, Russia
Brenntag Nordic, Taby, Sweden
Nema Kimya, Istanbul, Turkey
Minh Tam, Ho Chi Minh City, Vietnam



The manufacturing of GreensandPlus is an ongoing, 24/7 process to ensure the highest quality water treatment media.

Distributed by:

C USA

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GreensandPlus™ is a black filter media used for removing soluble iron, manganese, and hydrogen sulfide from water supplies.

GreensandPlus™

The manganese dioxide coated surface of GreensandPlus™ promotes the oxidation reaction of iron, manganese, and hydrogen sulfide.

The silica sand core of GreensandPlus allows it to withstand operating conditions in waters that are low in silica, TDS and hardness.

GreensandPlus is effective at higher operating temperatures and higher differential pressures than ordinary Manganese Greensand. Tolerance to higher differential pressure can provide for longer run times between backwashes and a greater margin of safety.

Systems may be designed using either vertical or horizontal pressure filters, as well as open gravity filters.

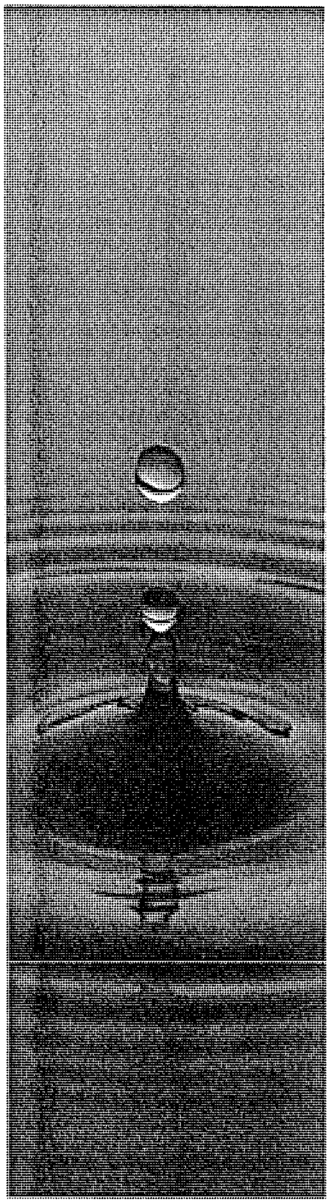
GreensandPlus is a proven technology for iron, manganese, and hydrogen sulfide removal. There is no need for extensive preconditioning of filter media or lengthy startup periods.

GreensandPlus is an exact replacement for Manganese Greensand. It can be used in Continuous Regeneraton or Intermittent Regeneraion applications and requires no changes in backwash rate, times or chemical feeds.

GreensandPlus is NOT shipped in a regenerated form; therefore it is necessary, prior to use, to regenerate it by contacting the bed for a minimum of 4 hours.

A regeneration level of 4 ounces of $KMn0_4$ or chlorine per cubic foot of GreensandPlus is recommended. Before placing into service, the filter must be rinsed of all remaining traces of potassium permanganate.

GreensandPlus has the WQA Gold Seal Certification for compliance with NSF/ANSI Standard 61.



PHYSICAL PROPERTIES

- Physical Form: Black, nodular granules. Shipped in a dry form.
- Shipping Weight: 89 lbs./cu.ft. gross (1426 kg/m³ gross)
- Specific Gravity: Approximately 2.4
- Porosity: Approximately 0.45
- Screen Grading (dry): 18 x 60 mesh
- Effective Size: 0.30 to 0.35 mm
- Uniformity Coefficient: Less than 1.60
- pH Range: 6.2-8.5
- Maximum Temperature: 100°F/38°C
- Backwash Rate: Minimum 12 gpm/sq.ft. at 55°F (30 m/hr at 13°C)
- Service Flow Rate: 2-5 gpm/sq.ft. (5-12 m/hr)
- Minimum Bed Depth: 24 in. (0.6m) 15 - 18 in. (0.4m-0.45m) of each media for dual media beds

CONDITIONS FOR OPERATION

- Bed Type: Dual media: Anthracite 15-36 in. (0.4-0.9 m) and GreensandPlus 15-24 in. (0.4-0.6 m)
- Capacity: 700-1200 grains of oxidized iron and manganese/sq.ft. of bed area (490-840 g/m²) based on oxidant demand and operation to iron break through.
- Backwash: Sufficient rate using treated water to produce 40% bed expansion.
- Air/Water Scour: Optional using 0.8-2.0 cfm/sq.ft. (15-37 m/hr) with a simultaneous treated water backwash at 4.0-4.5 gpm/sq.ft. (10-11 m/hr).
- Raw Water Rinse: At normal service flow rate for 3-5 minutes or until effluent is acceptable.
- Flow Rate: Recommended flow rates with Continuous Regeneration operation are 2-5 gpm/sq. ft. (5-12 m/hr). Extremely high concentrations of iron and manganese usually require lower flow rates for equivalent run lengths. Higher flow rates can be considered with very low concentrations of iron and manganese. For optimum design parameters, pilot plant testing is recommended. The run length between backwashes can be estimated as follows:

What is the run length for a water containing 1.7 mg/L iron and 0.3 mg/L manganese at a 4 gpm/sq. ft. (10 m/hr) operating rate?

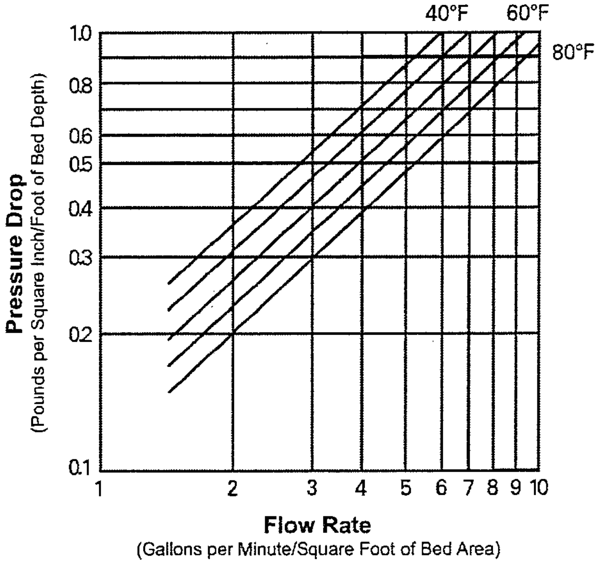
$KMn0_4$ demand
= (1 x mg/L Fe) + (2 x mg/L Mn)
= (1 x 1.7) + (2 x 0.3)
= (2.3 mg/L or 2.3/17.1 = 0.13 grains/gal. (gpg) (2.3 g/m³)

At 1,000 grains/sq. ft. loading: 1000 grain/sq. ft. ÷ 0.13 gpg = 7,692 gal./sq. ft. (313.4 m³/m²

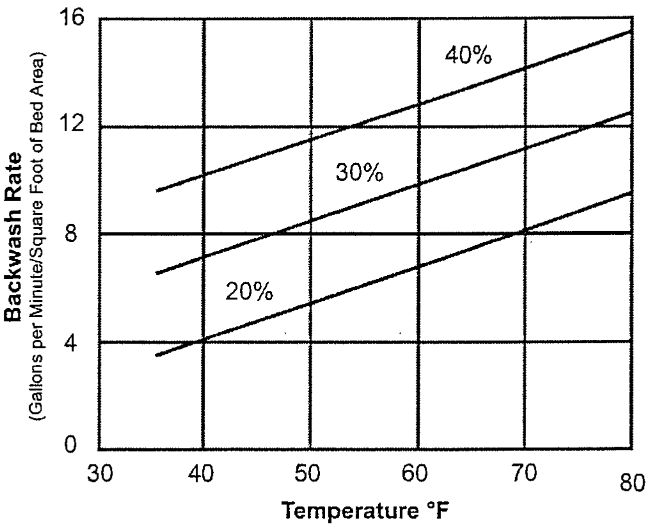
At 4 gpm/sq. ft. (10 m/hr) service rate: 7,692 gal./sq. ft. ÷ 4 gpm/sq. ft. = 1,923 minutes

The backwash frequency is approximately every 30-36 hours of actual operation.

Pressure Drop (Clean Bed)



Bed Expansion During Backwashing



GreensandPlus™ is tested and certified by WQA against NSF/ANSI Standard 61 for material requirement(s) only.

GreensandPlus™ is manufactured by Inversand Company.

ORDER INFORMATION

Part No.	Description	Cu. Ft./Bag	Wt./Cu. Ft.*	Bags/Pallet	Weight/Pallet	Pallet Dimensions
A8042	GreensandPlus™	0.5	89 Lbs.	55	2497 Lbs.	44" x 44" x 30"

*Weight per cubic foot is approximate. Packaged in approximately 45 lb. bags. 27.5 cubic feet per pallet. Sold by the cubic foot (2 bags).

GreensandPlus™ is a trademark of Inversand Company.

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The information and recommendations given in this publication should not be understood as recommending the use of our products in violation of any patent or as a license to use any patents of the Clack Corporation.

The filter medias listed in this brochure do not remove or kill bacteria. Do not use with water that is microbiologically unsafe or of unknown quality without adequate disinfection before or after the system.

Clack will not be liable under any circumstance for consequential or incidental damages, including but not limited to, lost profits resulting from the use of our products.

CALIFORNIA PROPOSITION 65 WARNING: This product contains crystalline silica which is known to the State of California to cause cancer and other substances which are known to the State of California to cause cancer, birth defects and reproductive harm.

Clack
www.clackcorp.com

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