Department of Health Services

Division of Drinking Water and Environmental Management

PUBLIC WATER SYSTEM PERMIT AMENDMENT REPORT

No. 04-15-02PA-000

CITY OF GLENDALE

Los Angeles County
System No. 1910043

May 2002

Engineering Report

For Consideration of the Amended Permit Application From
The City of Glendale
Serving City of Glendale and portions of La Crescenta,
Los Angeles County

May 2002

Drinking Water Field Operations Branch
State Department of Health Services

Prepared By

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I. PURPOSE OF REPORT

The City of Glendale (hereinafter, the City) has submitted an application, dated March 12, 2002 (copy in Appendix A) for an amended permit to include Well GS-1 as an approved source of drinking water. A previous permit amendment application included Well GS-1 along with seven (7) other wells, but Well GS-1 was not approved at that time. The purpose of this report is to evaluate the additional information provided along with the previously submitted plans and specifications, to conduct a sanitary engineering review of Well GS-1, and make recommendations regarding the issuance of an amended domestic water supply permit.

II. BRIEF DESCRIPTION OF THE SYSTEM

The City currently operates under a revised public water system permit issued by the State Department of Health Services (DHS) on March 25, 1999 amended on July 28, 2000. As part of the cleanup of the San Fernando Basin Superfund site (the Glendale North and South Operable Units, GOU), the City applied for a permit amendment for eight (8) extraction wells and a facility to treat the contaminated groundwater. A document was prepared pursuant to the Department's Policy 97-005 on the use of extremely impaired water sources. The document focused on the Superfund activity and sources of contamination other than the Los Angeles River. The July 28, 2000 amendment added seven (7) additional wells, the Glendale Water Treatment Plant (GWTP) for the removal of volatile organic chemicals (VOCs), and the Grandview Pump Station (GVPS) where chloramination and blending with water purchased from the Metropolitan Water District (MWD) occurs. Figure 1 in Appendix A is a copy of the City's water system schematic diagram. An eighth new well, Well GS-1 was not included in the permit amendment at the time due to concerns related to the well's proximity to the Los Angeles River and the projected amount of river water that may be drawn into the well.

The City's local water sources currently consist of the three (3) Glorietta wells in the Verdugo basin with a maximum capacity of 2,000 gpm, and a shallow groundwater pick-up system in the same basin. The shallow groundwater is treated at a diatomaceous earth filtration plant with a capacity of 1,150 gpm. The seven (7) new operable unit extraction wells [redacted] were installed as part of the GOU remedial action and produce approximately 4600 gpm. ~~The July 2000 amendment The City's groundwater sources currently provide only about 10 percent of the total demand.~~ The remainder of the City's demand is supplied through three (3) connections to the MWD system.

A detailed description of the water system including the extraction wells used in the Glendale Operable Unit (GOU) is included in the prior reports.

III. INVESTIGATION FINDINGS

Well Location and Description

[redacted]

The Well GS-1 wellhead is located at the ground surface, unlike the remaining seven extraction wells that have been installed in underground vaults. The well has a 16-inch diameter copper bearing steel casing, is 171 feet deep, and is screened with continuous slot wire wrap screens from 51.05 feet to 145.96 feet (length of the screened interval is 94.94 feet). A sanitary seal consisting of 50.52 feet of grout in the 6-inch annular space around the casing in the upper portion is also part of GS-1 construction (Figure 3).

A copy of the well completion report is on file with the Department. Data sheets for the well are included in the Appendix. The well is equipped with a water lubricated vertical turbine pump powered by a 40 hp electric motor. The planned pumping rate is 425 gpm and the maximum capacity of the pump is approximately 600 gpm. The well is also equipped with an inverted, screened air relief valve, casing vent, flow meter, and sampling tap.

In addition to stormwater runoff, the Los Angeles River receives treated wastewater, in excess of that which can be recycled. At the time of the permit amendment for the GOU extraction wells and treatment, the Department did no approve Well GS-1 was because of its vulnerability in the Los Angeles River and the potential components of stormwater and treated wastewater that may be present. The Department requested additional information regarding this well.

Raw Water Quality

Excess recycled wastewater from the Los Angeles/Glendale Joint Water Reclamation Plant and both the City of Burbank's Reclamation Plant and the City of Los Angeles' Tillman Reclamation Plant located further upstream discharge into the Los Angeles River through NPDES permits issued by the Regional Water Quality Control Board. [redacted]

A material storage area containing paints and thinners used by the Los Angeles Parks and Recreation Department is located about 80 feet south of the well. The storage area has a concrete floor and a sheet metal roof. It does not appear to constitute an immediate threat to the well and no organic constituents associated with this area have been found in the water from Well GS-1.

To date, the water from Well GS-1 has been analyzed twice; in January 1999 shortly after the well was drilled and developed, and on February 3, 2000 when the GWTP Packed Tower Aerators were tested. A table summarizing the results is in Appendix B.

The driller's log for this well indicates that the static water level was first found only 22 feet below ground surface. The well also exhibited slightly higher sodium, total

dissolved solids and specific conductance than the other seven (7) wells. Well GS-1 also exhibits manganese (185 μg/L) in excess of the MCL of 50 μg/L. Total organic carbon (TOC), iodide, ammonia nitrogen and two phenolic compounds were detected at low levels in this well and may be related to the recycled water in the Los Angeles River. 5 ng/L of N-nitrosodimethylamine (NDMA) was found in the February 2000 sample of Well GS-1. Chlorate was absent in GS-1, in contrast to the other extraction wells. A microscopic particulate analysis of the well water was also performed but did not provide any substantive indication of surface water influence. Table A presents the significant constituents found in the two Well GS-1 samples to date.

Table A

Constituent	Concentration	Units	MCL or AL	Comment
Total Organic Carbon	1.2	mg/L		May be a result of river infiltration; not detected in other GOU wells.
Ammonia as N	ND - 0.604	mg/L		May be a result of river infiltration; not detected in other GOU wells.
Iodide	20	µg/L		May be a result of river infiltration; not detected in other GOU wells.
MBAS	ND-0.088	mg/L	0.5	May be a result of river infiltration; not detected in other GOU wells.
NDMA	5	ng/L	10	May be a result of river infiltration; not detected in other GOU wells
4-(1,1-dimethylpropyl)phenol (tentatively identified)	0.9	µg/L		May be a result of river infiltration; not detected in other GOU wells
4-(2,2,4-trimethylpentyl)phenol (tentatively identified)	1.0	µg/L		May be a result of river infiltration; not detected in other GOU wells
Total Chromium	5.5-23	mg/L	50	Not remarkable.
Chrome 6	0.2	µg/L	-	Lower than most GOU wells.
Iron	.66 -.35	mg/L	.3	Higher than other GOU Wells.
Manganese	160 - 185	µg/L	50	Higher than other GOU Wells.
Nickel	6.0- 9.6	µg/L	100	Not remarkable.
Lithium	0.015	mg/L		Not remarkable.
Apparent Color	3-5	ACU	15	May be a result Fe/Mn; not detected in other GOU wells.
Gross Alpha	1.6 – 8.4	pCi/L	15	Not remarkable.
Cis-1,2-Dichloroethylene	25-35	µg/L	6	Higher than most GOU wells, but treatable at the GWTP.

Constituent	Concentration	Units	MCL or AL	Comment
Trans-1,2-Dichloroethylene	6.7-11	µg/L	10	Not remarkable, treatable at the GWTP.
PCE	3.0-3.4	µg/L	5	Not remarkable, treatable at the GWTP.
TCE	50-90	µg/L	5	Higher than other South OU wells, treatable.

As seen in the table, the major contaminants detected to date are the VOCs which is consistent with the other GOU wells and for which the treatment plant was designed. The total chromium was almost one half of the MCL. If the iron and manganese remain at the initial levels seen, they would be above the secondary standards in the raw well water. However, these metals will be diluted by the water from the other wells, oxidized in the packed tower aerators (PTAs) and by the chlorination at the treatment plant. In the more oxidized states, the metals tend to precipitate out of solution and would not be expected in the finished water. ~~If enough iron and manganese is present, there may be a buildup of precipitate on the LPGAC which would shorten the life of the carbon beds.~~

Since the mid-1990s, both concern and research about hormones, pharmaceutically active compounds (PhACs), and other organic wastewater contaminants (OWCs) generally identified as endocrine disruptors found in surface waters, recycled wastewater, and drinking water sources has increased in this country and around the world. In addition, the concentration levels in water which may cause harmful effects to humans and the environment will have to be determined. As a result of these efforts, It is likely that official analytical methods for these contaminants will be adopted by the Department or the US EPA some time in the future. Although the percentage river-derived water in the final blended effluent of the GVPS would be about 1.1 percent, additional analysis of the water from Well GS-1 should be required for these contaminants when the official methods are adopted. ~~The City has submitted modeling and calculations which conclude that the contribution of river water in the GWTP effluent would be about two percent of the total GWTP flow if Well GS-1 is pumped at 425 gpm. This dilution would be down to almost 1.1 percent when the GWTP effluent is mixed with water from the Metropolitan Water District (MWD) at the Grandview Pumping Station.~~The City has also requested several minor adjustments to their monitoring program for the GWTP and GVPS facilities.

Treatment and Disinfection

[redacted] A transmission pipeline has been built to convey the water from all the SOU wells to the GWTP. With Well GS-1 out of service, only the other SOU wells have been pumping and the containment of the VOC plume and removal of VOCs has been less efficient.

The water produced by Well GS-1 would be treated in the GWTP along with the water from the other wells in the North and South OUs. The treatment consists of packed tower aeration towers (PTAs) followed by liquid phase granular activated carbon

(LPGAC). The great majority of the VOCs in the water are removed by the PTAs and any small residual VOCs are removed in the LPGAC. The GWTP has consistently and reliably reduced the VOCs in the plant effluent to below the detection limit for reporting purposes (DLR) since September 2000. After going through the PTAs and LPGAC, the water is dosed with 2.5 mg/L of sodium hypochlorite and then flows to the GVPS where ammonia is added to form a chloramine disinfectant. The water now containing the approximately 2.5 mg/L of chloramine disinfectant is blended upon leaving the GVPS with Metropolitan Water District (MWD) water which also contains chloramine. The description and operation provisions for this equipment is provided in the previous engineering reports and permit amendments.

References listed in Appendix B indicate that many of the higher molecular weight hydrophobic molecules making up traces of TOC and PhACs including steroid estrogen hormones and nonylphenols would likely be removed in the LPGAC vessels if they are found to be present in the raw water. In addition, the free chlorine can also oxidize TOC and PhACs (See Appendix B).

The City has submitted additional information and recommendations regarding the influence of the Los Angeles River on Well GS-1 and removal and inactivation of viruses during the well water's subsequent treatment. See Appendix C.

Camp, Dresser and McKee (CDM) has performed modeling and has projected a 60 day time of travel and maximum 23 percent contribution of river water to Well GS-1 if the well is pumped at its design rate of 425 gpm. Since Well GS-1 contributes only about 8.5 percent of the total plant flow to the GWTP, the overall river contribution in the GWTP effluent would be just under two (2) percent. This would be further reduced to about 1.1 percent when the GWTP water is blended at the GVPS with MWD water before it reaches the first customer.

The City's proposal letter indicates that an 8-log virus inactivation will be achieved as follows:

- 2-log inactivation credit for the two month travel time from the river to the well
- More than 4-log inactivation credit by free chlorine as the water leaves the GWTP and moves in the pipeline up to the GVPS. A CT of 4 is needed to achieve 4-log inactivation. The actual CT will be at least 35.
- At least 2-log inactivation is achieved by the chloramine contact at the GVPS with a CT of 365.

The 8-log virus inactivation is 10,000 times greater than the removal required when treating a surface water source.

At the GWTP a Wallace & Tiernan Encore Model 700 chemical metering pump is installed for pumping sodium hypochlorite solution into the plant effluent. A duplicate pump is installed as a backup. Spare parts are kept on hand. A high and low level hypochlorite solution in the storage tank will trigger an alarm. An alarm is also triggered by a metering pump failure condition. The free chlorine level in the effluent water is

continuously monitored by a Sigma Model 8450 amperometric analyzer. If a low chlorine condition occurs (below approximately 1.5 mg/L), an alarm will sound and be transmitted via the autodialer, and the plant will shunt the low chlorine water to the Los Angeles River. These alarms and automation should be tested once a year in addition to the existing requirement that all meters and analyzers be calibrated at the manufacturer's recommended frequency. The chlorine analyzer reading at the GWTP effluent should also be verified monthly with a chlorine field test kit. In addition, the free chlorine is also monitored at the inlet to the GVPS and the combined chlorine concentration in the GVPS blended effluent is monitored and recorded.

IV. ENGINEERING APPRAISAL OF SANITARY HAZARDS AND SAFEGUARDS

A review of the plans and site inspection indicate that the design and construction of the facilities are in accordance with AWWA standards and the California Waterworks Standards. The GOU wells cannot pump the untreated water to waste since the raw water contains VOCs in excess of standards. Instead, the wells may pump to the GWTP and then discharge to the Los Angeles River after treatment. The wells are also equipped with tees on their discharge lines for connection to a portable tank or activated carbon treatment system if required.

V. CEQA Clearance

As lead agency under CEQA, the City of Glendale has included Well GS-1 in the original CEQA Notice of Determination posted in December 1997.

VI. CONCLUSIONS AND RECOMMENDATIONS

The State Department of Health Services finds that Well GS-1 and the treatment, disinfection, and blending facilities are adequate for delivery of safe, wholesome, and potable water to the City's customers. Issuance of an amended domestic water supply permit by the State Department of Health Services to the City is recommended subject to the following provisions:

1. The City shall comply with all state laws applicable to public water systems and any regulations, standards, or orders adopted thereunder.

2. All water supplied by the City for domestic purposes shall meet all Maximum Contaminant Levels (MCLs) and Action Levels (Als) established by the State Department of Health Services. If the water quality does not comply with the California Drinking Water Standards, treatment shall be provided to meet standards.

3. In addition to the sources approved in the permit issued to the City of Glendale on March 25, 1999, the following new sources are approved for use as domestic sources of supply:

- Four (4) new extraction wells [redacted]

Table 1: Glendale OU North Wells

Well	Primary Station Code	Depth, (feet)	Average Capacity* (gpm)	Status
GN-1	G19/043-GWGN1	210	565	Active
GN-2	G19/043-GWGN2	210	565	Active
GN-3	G19/043-GWGN3	200	565	Active
GN-4	G19/043-GWGN4	400	1,600	Active

*Capacity may vary up to 700 gpm for GN-1, GN-2 and GN-3, and up to 1,700 gpm for GN-4.

- Four new extraction wells [redacted]:

Table 2: Glendale OU South Wells

Well	Primary Station Code	Depth, (feet)	Average Capacity* (gpm)	Status
GS-1	G19/043-GWGS2	171	425‡	Active
GS-2	G19/043-GWGS2	183	425	Active
GS-3	G19/043-GWGS3	199	425	Active
GS-4	G19/043-GWGS4	198	425	Active

*Capacity may vary up to 600 gpm for GS-2, GS-3 and GS-4. ‡GS-1 is limited to 425 gpm.

- In addition, the City currently utilizes the following sources and connections:

Table 3: Other Approved Sources

Source	Primary Station Code	Status
Glorietta Well No. 3	01/13W-10F03 S	Active
Glorietta Well No. 4	01/13W-10F01 S	Active

Glorietta Well No. 6	01/13W-10B01 S	Active
Verdugo Park Treatment Plant Influent (Pickup System, Wells A and B)	1910043-019	Active
MWD-G1 Connection	1910043-021	Active
MWD-G2 Connection	1910043-022	Active
MWD-G3 Connection	1910043-023	Active
Burbank, City of	[redacted]	Active and Emergency

4. The extraction wells shall be operated according to the Operation and Maintenance (O and M) Manual or its replacement or amendment. The replacement document or amendments shall be approved by this Department.

5. The only approved treatment processes for Well GS-1 are listed as follows in Table 4:

Table 4: Approved Treatment

Facility / Sources	PS Code	Treatment Process	Treatment Grade
Glendale Water Treatment Plant	G19/043-TW58, G19/043-TW59	Air Stripping, Granular Activated Carbon, Sodium Hypochlorite	T3
Grandview Pump Station	G19/043-FW86	Chloramination, Blending with MWD water	T3

6. The water produced by Well GS-1 shall not operate above 425 gpm and shall not make up more than 9.44 percent of the total influent flow to the GWTP. Well GS-1 shall only be brought on line after the other wells associated with the GOU have a combined flow that would assure that the contribution of water from Well GS-1 will at no time exceed 9.44 percent of the total flow entering the treatment plant. Well GS-1 shall not be used as a lead well or used as the only well operating in the South OU.

7. All treatment facilities shall be operated by personnel who have been certified in accordance with the Operator Certification Regulations, California Code of Regulations, Title 17. Based on these regulations, the GWTP and GVPS facilities are required to be supervised by Grade T3 or higher chief operator, and operated by a Grade T2 or higher shift operator.

8. No changes, additions, or modifications shall be made to the sources or treatment processes outlined in Provisions 3 through 5 unless an amended water permit has first been obtained from the Department.

9. In addition to the monitoring requirements specified in the earlier permit amendment for the GOU, the following additional monitoring shall apply to Well GS-1:

Table 5: Additional Monitoring Requirements

Analysis	Frequency
TOC	Monthly if detected. If not detected for 3 months, quarterly.
Ammonia as N	Monthly if detected. If not detected for 3 months, quarterly.
MBAS	Monthly if detected. If not detected for 3 months, quarterly.
NDMA	Monthly if detected. If not detected for 3 months, quarterly.
Semi-volatile organic BNAs by EPA method 8270	Monthly if any compound detected. If not detected for 3 months, quarterly.
1,4-Dioxane by EPA method 8270c	Quarterly for a year, then re-evaluate.
Apparent Color	Monthly if 3 units or higher. If not above 3 units for 3 months, quarterly.

10. The Department may require additional analyses for other contaminants as analytical methods are adopted.

11. A free chlorine residual of at least 2.5 mg/L shall be continuously and reliably maintained in the GWTP effluent at all times that the water is transferred to the GVPS and used as a source of drinking water. The on-line chlorine monitor shall be checked monthly with a field test kit, and calibrated in accordance with the manufacturer's recommendation.

12. The functioning of the alarms, instrumentation and shut-down automation related to the chlorination system shall be tested and verified at least annually.

13. Monitoring provision 66 of the March 23, 2001 revised amendment is modified to read as follows:

    "66. If 1,2,3-TCP is detected in the monitoring wells, extraction wells, or PTA effluent, monthly testing of low level 1,2,3 TCP in the finished water prior to chlorination (PS code G19/043-TW58) shall be performed. If 1,4-dioxane or any other semi-volatile organic chemical is detected in the monitoring wells, extraction wells, or PTA effluent, testing of the finished water prior to chlorination (PS code G19/043-TW58) for the detected chemical shall be performed *quarterly unless it is detected in the finished*

water in which case it shall be analyzed for monthly. *The quarterly sample shall be taken in a different month than the quarterly PTA sample (Provision 57). The increased testing of the finished water in this provision shall continue unless the compound is not detected at the upstream sampling location in three (3) consecutive samples.* The analysis of the semi-volatile chemical shall utilize drinking water methods if the chemical is amenable to those methods, otherwise, method 8270 shall be utilized. If the detected chemical is listed as an SOC in Title 22, then it shall be monitored per Provision 67."

14. Monitoring provision 38 of the March 23, 2001 revised amendment is modified to read as follows:

"38. The laboratory performing the analyses shall be instructed to report all calibrated peaks on chromatographic analyses. Uncalibrated peaks on chromatographic analyses shall be reported if they are greater than 10 percent of the nearest internal standard and are not known artifacts produced by the instrument. All uncalibrated peaks that can be identified by the mass spectra shall be identified as "Tentatively Identified Compounds" (TICs). All TICs must be reported to the Department along with the other compounds.

If unknown peaks on GC/MS chromatograms are not identified by the laboratory's existing library of spectra, the sample extracts shall be retained and the City or the laboratory shall consult with the Department within seven (7) days of this finding. For volatile organic analyses, additional sampling may be required. Following the consultation, and unless instructed otherwise by the Department, the laboratory analyst shall attempt to identify functional groups and/or tentatively identify the compound(s). This attempt shall be made and the Department notified of the results by telephone and fax within 14 days of the discovery of unknown peaks. The Department may require and allow time for additional work to positively identify the compound(s) and/or additional testing of the GWTP plant effluent to verify removal of the compound(s).

Records of the mass spectra, sample date and sample location for all TICs and unknown chemical species described above shall be maintained by the City in a central location in either paper form or digital form."

15. Provision 73 of the March 23, 2001 revised amendment is modified to read as follows:

"73. The blended water at the designated Point of Introduction to the System, (PS Code G19/043-FW86) shall be continuously monitored for monochloramine, nitrate and free ammonia and the results recorded. A

sample shall be analyzed for nitrate by a certified laboratory *weekly if GVPS influent nitrate level is above the MCL, quarterly if it is half the MCL or higher, and semi annually if it is below half the MCL*. A sample shall be analyzed monthly by a certified laboratory for any chemical such as chlorate, which does not have an MCL or AL and is blended as required by Provision 11."

16. Provision 84.c of the March 23, 2001 revised amendment is modified to read as follows:

"c. *If the nitrate concentration leaving the GWTP exceeds the MCL, include* a spreadsheet showing the influent nitrate concentration, daily calculations of the projected concentration of the nitrate in the blended GVPS effluent at the Point of Introduction Into the System, the amount of blending water to be utilized, the actual nitrate concentration of the water leaving the blending point, and the correlation between the continuous nitrate analyzer and the laboratory confirmation sample."

APPENDIX A

Permit Amendment Application
Glendale System Schematic
Map of Interim Remedial Action Project Facilities
Well GS-1 Construction Drawing and Data Sheet.
Disinfection Data Sheet
Plot Plan
CEQA Clearance
Source Water Assessment

Appendix B

Initial Water Quality Data
AWWA Website Pages on Endocrine Disruptors

Appendix C

Information Letter From the City of Glendale