Engineering Report
For the Consideration of a Revised Permit for
City of Bakersfield
System No. 1510031
Kern County
March 2010

California Department of Public Health
Southern California Branch
Drinking Water Field Operations
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I. INTRODUCTION

1.1 Purpose of Report

On November 7th and December 5th of 2008, January 13th and 14th of 2009 and again on January 28, 2010 Department of Public Health (Department) staff conducted physical inspections of the City of Bakersfield (City) water system. Mr. Chad Fischer conducted the inspections and was accompanied by Ms. Tammy Johnson, Ms. Stephanie Hearn and Mr. Ron Gibbs. Ms. Johnson, Ms. Hearn and Mr. Gibbs are employed by California Water Service (CWS), the City's contract operator. Ms. Johnson is the Superintendent of Operations, Ms. Hearn is the Water Quality Project Manager and Mr. Gibbs is the Maintenance Superintendent. For a period of approximately one year, from January 2009 through January 2010, Mr. Gibbs was the acting Superintendent of Operations for the City as Ms. Johnson was assigned elsewhere to a temporary special project.

The purpose of the inspections and this engineering report is to document changes in the City water system which have occurred since the last permit was issued. To be clear, inspections conducted by Mr. Fischer were not only conducted for the new system facilities, a full system inspection was completed which included all water system facilities currently in use by the City. The last full permit was issued by the Department in October 1992 and has been amended four times; the most recent permit amendment was issued in November 2000. The details of the aforementioned permit and subsequent permit amendments are provided below in section 1.2. Since the November 2000 permit amendment, the City has made the following improvements to the water system:

- Addition of seventeen (17) new active groundwater sources: Wells Nos. CBK-34, CBK-41, CBK-43, CBK-46, CBK-47, CBK-49, CBK-52,

CBK-53, CBK-54, CBK-55, Olcese Nos. 1 and 2, L207, L208, L210, L211 and L212.

- Addition of one standby groundwater source: Well No. CBK-45.
- Change status of Well No. CBK-34 from inactive to active.
- Addition of six (6) new granular activated carbon (GAC) treatment facilities. The new GAC treatment plants are located at Wells Nos. CBK-45, L207, L208, L210, L211 and L212.
- Addition of purchased treated surface water from the Kern County Water Agency as a source of supply.
- Addition of purchased treated surface water from the CWS-North Garden water system as a source of supply.
- Addition of the City's 10-MG Olcese Interface Tank as arsenic blending treatment.
- Inactive four (4) sources: Wells Nos. CBK-16, CBK-21, CBK-25 and L202.
- Change status of three (3) sources from active to standby: Wells Nos. CBK-29, L201 and L206 from active to standby source status.

1.2 History of the Water System

The City's source of domestic water supply permitted in the 1992 permit and four subsequent amendments was composed of forty one (41) active groundwater wells and two (2) standby wells. With the changes proposed (summarized above) in this engineering report and the accompanying permit, the City's sources of supply will increase to a total of fifty six (56) active groundwater wells, four (4) standby groundwater sources and two (2) sources of purchased surface water.

The City currently treats five (5) of the City's active groundwater wells using granular activated carbon (GAC) to remove hydrogen sulfide and/or specific organic compounds. Six new GAC treatment plants are discussed in this engineering report and will be added as approved treatments, bringing the total approved GAC treatment plants to eleven (11), treating nine (9) active and two (2) standby wells.

All of the City's groundwater wells are currently disinfected using 12.5% sodium hypochlorite solution at the well head before entering the distribution system. Fourteen (14) of the new groundwater wells will be chlorinated in the same fashion while two (2) of the new wells, Olcese Wells Nos. 1 and 2, will not be chlorinated at the well head but rather chlorinated effluent of the new Olcese Interface blending plant.

The City's water system, as reported in the 2008 annual report to the drinking water program (ARDWP), supplies domestic water to approximately 133,000-people in the Bakersfield area through 40,223 service connections. CWS is the contract operator of the City's water system. CWS also owns and operates two

other large water systems in the Bakersfield area, CWS-North Garden and CWS-Bakersfield, bringing the total number of people served in the Bakersfield area through CWS operated systems to more than 350,000.

Prior Inspection

The most recent inspection of the entire City of Bakersfield water system was conducted by Mr. Jose Robledo in July of 1992 in preparation for the last full permit issued to the City. Since that time, the system has been inspected seven (7) times due to numerous system improvements which are addressed in detail in this engineering report.

Permit

The City of Bakersfield operates under Water Supply Permit No. 03-92-024, issued by the Department on October 19, 1992. This permit has been amended four (4) times. A brief summary of the 1992 full permit and each of the subsequent permit amendments is listed below.

Water Supply Permit No. 03-92-024

The City of Bakersfield operates under a Water Supply Permit (Permit No. 03-92-024) issued October 19, 1992. Permit No. 03-92-024 permitted the use of thirty (30) active groundwater wells. This permit contains no provisions.

Permit Amendment No. 03-12-94P-018

Permit No. 03-92-024 was first amended on May 18, 1994, for the addition of three (3) new wells to the system: Wells Nos. CBK 23-01, CBK 27-01 and CBK 30-01. This permit amendment is subject to the following provisions:

1. Prior to the use of the new wells, the City shall obtain water quality analysis for constituents as specified in current regulations and the chemicals contained in the federal Phase II and V regulations.

2. The City shall submit to the Department completed copies of the “Well Completion Reports” for the three new wells.

The City is in compliance with all of the provisions provided in Permit Amendment No. 03-12-94P-018.

Permit Amendment No. 03-12-95P-000

Permit No. 03-92-024 was amended a second time on November 30, 1995, for the addition of six (6) new wells to the system: Wells Nos. CBK 01-02, CBK 22-01, CBK 24-01, CBK 31-01, CBK 33-01 and CBK L204-01. This permit amendment is subject to the following provisions:

1. All of the required water quality sampling shall be conducted for the new wells in accordance with State Standards.

2. The City shall obtain State Well Numbers for the new sources.

3. The City shall monitor the raw untreated water from the wells for bacteriological quality once a month for a minimum of six months.

The City is in compliance with all of the provisions provided in Permit Amendment No. 03-12-95P-000.

Permit Amendment No. 03-12-99PA-008

Permit No. 03-92-024 was amended a third time on September 24, 1999, for the addition of seven (7) new wells to the system: Wells Nos. Well Nos. CBK 35-01, CBK 36-01, CBK 37-01, CBK 38-01, CBK 39-01, L-203 and L-205. This permit amendment is subject to the following provisions:

1. All the required water quality sampling shall be conducted for all new wells as outlined in the permit amendment.

2. The City shall monitor the raw untreated water from the new wells for bacteriological quality once a month for a minimum of six months. All raw water sample results shall be submitted by the 10th day of the month following sample collection. If coliform bacteria is not detected after six months of sampling from each respective source, sampling frequency may be reduced to quarterly.

3. The Department has not permitted Well No. CBK 34-01. At this time this well is not being used due to problems with the development of the property adjacent to the well. The City must submit a permit application for this source once it is added as a source of supply.

4. Well data sheets shall be completed for each of the new sources by November 30, 1999.

The City is in compliance with all of the provisions provided in Permit Amendment No. 03-12-99PA-008.

Permit Amendment No. 03-12-00PA-011

Permit No. 03-92-024 was amended a fourth time on November 15, 2000, for the addition of three (3) new wells to the system: Wells Nos. Well Nos. CBK 32-01, CBK 40-01 and L-206. This permit amendment is subject to the following provisions:

1. All the required water quality sampling shall be conducted for the three wells as outlined in the permit.

2. The City shall monitor the raw untreated water from the wells for bacteriological quality once a month for a minimum of six months. All raw water sample results shall be submitted by the 10th day of the month following sample collection. If coliform bacteria are not detected after six

months of sampling from each respective source then the sampling frequency may be reduced to quarterly.

3. The DBCP monitoring from Well CBK 32-01 shall be conducted in accordance with the operations plan that was submitted with the permit application. The monthly GAC vessel operations report included in the plan shall be submitted by the 10th day of each month to the Department.

4. The City needs to obtain Primary Station Codes for Well CBK 40-01 and L206 from the Department of Water Resources and submit this information to the Department of Health Services (DOHS). These codes are to be used whenever any water quality data is submitted to the DOHS. Once these codes are obtained the water quality results that were submitted with the permit applications will need to be resubmitted via electron data transmission to the DOHS. Otherwise sampling for these sources will appear as being delinquent in the Department's Water Quality Inquiry Database.

5. The source water assessments for these three sources shall be submitted to the DOHS by February 1, 2001

The City is in compliance with all of the provisions provided in Permit Amendment No. 03-12-00PA-011.

1.3 Enforcement History

Enforcement Letter No. 03-12-02E-014, issued in June 2002.
The City failed to submit the required annual nitrate monitoring for Well No. CBK No. 03-01 in 2002. The City returned to compliance in 2003. This was a monitoring and reporting violation. It should be noted that the 2003 sample from Well No. CBK 03-01 showed nitrate at a concentration of 3-milligrams per liter (mg/L) which is representative of the historical nitrate levels of this well.

1.4 Area Served

The City of Bakersfield is located in central Kern County. The City of Bakersfield is the largest metropolitan area in Kern County. The service area for the City water system is typical of a central valley metropolitan area serving single and multiple family residences, commercial, retail and agricultural related establishments. The City serves approximately 133,000 persons through 40,223 service connections. With the exception of approximately 470-connections, all service connections are charged a metered rate. It should be noted that the Bakersfield area has an approximate total population of 500,000 and in addition to the City's water system, several other water systems serve customers in the greater Bakersfield area.

1.5 Production Data

Production data for the City water system is provided below in Table 1. The population and service connection data is sourced from the submitted Annual Reports to the Drinking Water Program, which are on file at the Department's Visalia District office. The production data presented below was provided by the California Water Service engineering office in San Jose, CA.

Table 1 – Production data and population served (2000-2008)

Year	Population	Active Service Connections	Annual Production (MG)	Max. Month (MG)	Max. Day (MG)
2008	132,736	40,223	15,045	1,961	98
2007	142,237	36,216	13,833	1,722	86
2006	-	-	12,216	1,660	83
2005	105,600	38,090	11,356	1,587	79
2004	93,660	32,703	11,505	1,555	78
2003	84,066	30,649	11,226	1,630	82
2002	82,470	28,874	10,983	1,529	76
2001	79,620	26,513	10,725	1,435	72
2000	75,930	25,759	8,994	1,169	58

II. INVESTIGATION AND FINDINGS

2.1 Sources of Supply

The City's source of domestic water supply as permitted in the 1992 water supply permit and subsequent amendments is composed of forty one (41) active groundwater wells and two (2) standby wells. The changes proposed and detailed in this engineering report are additions of seventeen (17) new active groundwater sources of supply, four (4) new standby groundwater sources and two (2) new sources of purchased treated surface water. With these additions and changes, the City's total source of supply will include fifty six (56) active groundwater wells, four (4) standby wells and two (2) sources of purchased treated surface water.

Existing Sources

The City currently utilizes forty one (41) groundwater wells as the source of supply. Construction details of the existing forty one (41) groundwater wells are provided in appendix A to this engineering report. Furthermore, construction details for these forty one (41) groundwater wells have been provided in Permit No. 03-92-024 and the four subsequent permit amendments, all of which are outlined in Section 1.2 of this engineering report and are on file at the Visalia District office. The proposed new sources of supply for the City's water system are detailed below.

Proposed New Sources

The proposed new sources of supply for the City's water system are detailed below. The new sources consist of seventeen (17) new groundwater wells, one (1) new standby groundwater source and two (2) new sources of treated surface water to be purchased from the Kern County Water Agency and the CWS-Bakersfield and CWS-North Garden water systems.

Treated Surface Water from the Kern County Water Agency (KCWA)

The KCWA is a wholesale water distributor which sells treated surface water to the City of Bakersfield, as well as other water systems. The KCWA owns and operates a 45-million gallons per day (MGD) conventional treatment plant located in the northern portion of Bakersfield. The main processes include chemical addition, rapid mixing, flocculation, sedimentation and conventional filtration followed by disinfection (sodium hypochlorite) and corrosion control (zinc orthophosphate sequestration and pH adjustment with sodium hydroxide). The approved sources of supply for the KCWA treatment plant are surface water from the State Project (via the California Aqueduct and Cross Valley Canal), Kern River, and Central Valley Project (via the Friant-Kern Canal), and groundwater. KCWA is finishing construction of a plant expansion which will increase the total capacity from the current 45-million gallons per day (MGD) to approximately 90-MGD. The estimated completion date for this expansion is June 2010.

Treated Surface Water from the CWS-North Garden Water System

The CWS-North Garden water system is located in the northern portion of Bakersfield and serves a population of approximately 18,000 through 5,162 service connections. The CWS-North Garden water system owns and operates an 8-MGD membrane water treatment plant and sells a portion of this treated surface water to the City of Bakersfield. The main processes include chemical addition and membrane filtration followed by disinfection (sodium hypochlorite). The approved sources of supply for the CWS-North Garden treatment plant are surface water from the State Project (via the California Aqueduct and Cross Valley Canal) and the Kern River.

Well CBK 34-Raw

Well No. CBK 34 (PS Code 1510031-042) is [redacted]. The well was drilled on February 8, 1995, to a depth of 720-feet with perforations between 370 and 700-feet. The well is provided with a 350-foot cement grout annular seal. The well is equipped with a 125-horsepower (hp) water-lubricated Ingersoll-Dresser vertical turbine pump with a capacity of approximately 1000-gpm. The nearest sanitary sewer is located approximately 85-feet from the well. This well was initially placed on inactive status due to inadequate demand in the geographical area of the well, but recent growth in the City has produced sufficient demand for this well to now be used; thus, a change in status from inactive to active has been requested.

Well CBK 41-Raw

Well No. CBK 41 (PS Code 1510031-098) [redacted] The Well was drilled on November 15, 2000, to a depth of 720-feet with perforations between 400 and 700-feet. The well is provided with a 380-foot cement grout annular seal. The well is equipped with a 125-hp water-lubricated Floway vertical turbine pump with a capacity of approximately 900-gpm. The nearest sanitary sewer is located approximately 107-feet from the well.

Well CBK 43-Raw

Well No. CBK 43 (PS Code 1510031-117) [redacted] The Well was drilled on February 1, 2007, to a depth of 660-feet with perforations between 410 and 520-feet. The well is provided with a 385-foot cement grout annular seal. The well is equipped with a 200-hp water-lubricated Goulds turbine pump with a capacity of approximately 1200-gpm. The nearest sanitary sewer is located approximately 72-feet from the well.

Well CBK 45-Standby Before GAC

Well No. CBK 45 (PS Code 1510031-104) [redacted] The Well was drilled in April 2005, to a depth of 1,290-feet with perforations between 970 and 1,270-feet. The well is provided with a 920-foot cement grout annular seal. The well is equipped with a 125-hp water-lubricated Flowserve turbine pump with a capacity of approximately 1250-gpm. The nearest sanitary sewer is located approximately 90-feet from the well. Well No. CBK 45 is provided with granular activated carbon (GAC) treatment to mitigate high levels of hydrogen sulfide.

Well CBK 46-Raw

Well No. CBK 46 (PS Code 1510031-109) [redacted] The Well was drilled in August 2005, to a depth of 560-feet with perforations between 360 and 540-feet. The well is provided with a 330-foot cement grout annular seal. The well is equipped with a 200-hp water-lubricated Floway pump with a capacity of approximately 1,100-gpm. The nearest sanitary sewer is located approximately 75-feet from the well.

Well CBK 47-Raw

Well No. CBK 47 (PS Code 1510031-115 [redacted] The Well was drilled on October 1, 2006, to a depth of 750-feet with perforations between 475 and 730-feet. The well is provided with a 445-foot cement bentonite annular seal. The well is equipped

with a 200-hp water-lubricated vertical turbine pump with a capacity of approximately 1,300-gpm. The nearest sanitary sewer is located approximately 110-feet from the well.

Well CBK 49-Raw

Well No. CBK 49 (PS Code 1510031-118 [redacted] The Well was drilled on January 1, 2007, to a depth of 780-feet with perforations between 630 and 730-feet. The well is provided with a 610-foot cement bentonite annular seal. The well is equipped with a 200-hp water-lubricated vertical turbine pump with a capacity of approximately 1,400-gpm. The nearest sanitary sewer is located approximately 190-feet from the well.

Well CBK 52-Raw

Well CBK 52 (PS Code 1510031-119) [redacted] The well was drilled on May 12, 2007, to a depth of 720-feet with perforations between 450 and 700-feet. The well is provided with a 425-foot cement annular seal. Currently, the well has been drilled but not equipped. An initial pump test and water quality sampling was conducted and showed the water produced meets all drinking water standards. The well is to be equipped with a 200-hp water-lubricated vertical turbine pump and have an approximate capacity of approximately 1,450-gpm. The nearest sanitary sewer is located approximately 80-feet from the well.

Well CBK 53-Raw

Well No. CBK 53 (PS Code 1510031-126) is located [redacted] The well was drilled on March 17, 2008, to a depth of 700-feet with perforations between 545 and 670-feet. The well is provided with a 520-foot cement annular seal. Currently, the well has been drilled but not equipped. An initial pump test and water quality sampling was conducted and showed the water produced meets all drinking water standards. The well is to be equipped with a 200-hp water-lubricated vertical turbine pump with and is estimated to have a capacity of approximately 1,300-gpm. The nearest sanitary sewer is located approximately 80-feet from the well.

Well CBK 54- Pending

Well No. CBK 54 (PS Code 1510031-136) [redacted] At this time the well has been drilled, casing installed and is currently capped. Initial water quality sampling has been conducted but not submitted to the Department. The City shall submit the water quality sampling via EDT using the PS Code noted above. Before the well is allowed to be discharged into the system, the City must submit the aforementioned water quality and receive written approval from the Department.

Well CBK 55-Raw

Well No. CBK 55 (PS Code 1510031-127) [redacted]. The well was drilled on May 9, 2008, to a depth of 710-feet with perforations between 550 and 710-feet. The well is provided with a 520-foot cement annular seal. Currently, the well has been drilled but not equipped. An initial pump test and water quality sampling was conducted and showed the water produced meets all drinking water standards. The well is to be equipped with a 200-hp water-lubricated vertical turbine pump which is estimated to have a capacity of approximately 1,300-gpm. The nearest sanitary sewer is located approximately 110-feet from the well.

Well CBK Olcese No. 1- Before Arsenic Blending

Well CBK Olcese No. 1 (PS Code 1510031-102) is [redacted] The Well was drilled in May 1988, to a depth of 700-feet with perforations between 220 and 680-feet. The well is provided with a 200-foot cement grout annular seal. The well is equipped with a 250-hp oil-lubricated General Electric motor and Worthington pump with a capacity of approximately 4000-gpm. The nearest sanitary sewer is located approximately 2.5-miles from the well. Raw water produced by CBK Olcese No. 1 is piped to a 10-MG storage tank to facilitate blending with Well No. CBK Olcese No. 2 and Wells Nos. CBK 22, CBK 24 and CBK 40 before entering the distribution system. The most recent arsenic sample, collected January 1, 2010, showed an arsenic concentration of 2.5-ug/L.

Well CBK Olcese No. 2-Before Arsenic Blending

Well CBK Olcese No. 2 (PS Code 1510031-103) is [redacted] The Well was drilled in June 1981, to a depth of 722-feet with perforations between 300 and 722-feet. The well is provided with a 200-foot cement grout annular seal. The well is equipped with a 250-hp oil-lubricated US Motors motor and Aurora vertical turbine pump with a capacity of approximately 4000-gpm. The nearest sanitary sewer is located approximately three (3) miles from the well. Raw water produced by CBK Olcese No. 2 contains high levels of arsenic (last sample contained arsenic at 11 micrograms per liter), therefore raw water produced by CBK Olcese No. 2 is piped to a 10-MG storage tank to facilitate blending with CBK Olcese No. 2 and Wells Nos. CBK 22, CBK 24 and CBK 40 before entering the distribution system. It should be noted that raw water from this well has never exceeded the arsenic MCL but due to an increasing trend in arsenic concentrations, blending is provided.

Well L207-Before GAC

Well L207 (PS Code 1510031-100) is [redacted]. The Well was drilled on December 13, 1999, to a depth of 720-feet with perforations between 420 and 700-feet. The well is provided with a 400-foot cement grout annular seal. The well is equipped with a 150-hp Floway water-lubricated linear shaft turbine pump with a capacity of approximately 750-gpm. The nearest sanitary sewer is located approximately 75-feet from the well. Raw water from Well No. CBK L207 is treated using GAC to remove high levels of hydrogen sulfide.

Well L208-Before GAC

Well L208 (PS Code 1510031-107) [redacted] The surrounding area is largely residential. The well is housed in a locked concrete block building on a fenced lot. The well is located at the CWS northwest water treatment plant (WTP) and the well shares a building with booster pumps which pump water from the three (3) million gallon (MG) storage tank which the CWS northwest treatment plant discharges to before being boosted into both the City's water system as well as the CWS-North Garden water system. The Well was drilled on December 13, 1999, to a depth of 720-feet with perforations between 420 and 700-feet. The well is provided with a 400-foot cement grout annular seal. The well is equipped with a 125-hp water-lubricated Floway pump with a capacity of approximately 750-gpm. The nearest sanitary sewer is located approximately 75-feet from the well. Raw water from Well No. CBK L208 is treated using GAC to remove high levels of hydrogen sulfide.

Well L210-Before GAC

Well L210 (PS Code 1510031-105) [redacted] The Well was drilled in August 2003, to a depth of 721-feet with perforations between 390 and 700-feet. The well is provided with a 370-foot cement grout annular seal. The well is equipped with a 125-hp oil-lubricated US Motors pump with a capacity of approximately 950-gpm. The nearest sanitary sewer is located approximately 80-feet from the well. Raw water from Well No. CBK L210 is treated using GAC to remove high levels of hydrogen sulfide as well high levels of 1,2-DCP. Raw water concentrations of 1,2-DCP from Well No. L210 are consistently above the 0.5-ug/L trigger level but well below the 5.0-ug/L MCL with average 1,2-DCP levels between 0.5 and 0.8-ug/L.

Well L211-Before GAC

Well L211 (PS Code 1510031-106) [redacted] The Well was drilled in August 2003, to a depth of 720-feet with perforations between 450 and 700-feet. The well is provided with a 430-foot cement grout annular seal. The well is equipped with a 125-hp oil-lubricated

General Electric pump with a capacity of approximately 950-gpm. The nearest sanitary sewer is located approximately 85-feet from the well. Raw water from Well No. CBK L211 is treated using GAC to remove high levels of hydrogen sulfide.

Well L212- Before GAC

Well L212 (PS Code 1510031-108) is [redacted]. The Well was drilled on June 8, 2005, to a depth of 1,215-feet with perforations between 730 and 1,170-feet. The well is provided with a 680-foot cement annular seal. The well is equipped with a 200-hp water-lubricated Floway pump with a capacity of approximately 1,100-gpm. The nearest sanitary sewer is located approximately 80-feet from the well. Raw water from Well No. CBK L212 is treated using GAC to remove high levels of hydrogen sulfide.

2.2 Adequacy of Supply

Table 2 displays the average day, maximum day and peak hour demands during the last eight (8) years for the City. It should be noted that the values provided for average day and maximum day demand are sourced from measured values provided by CWS while the peak hour demand was calculated using the maximum day demand and a peaking factor of 1.5. The total source capacity of the City's wells, both currently permitted and proposed, is approximately 97-million gallons per day (MGD). In addition to 97-MGD from groundwater, the City reports the ability to source up to an additional max day demand of approximately 10-MGD from the proposed surface water sources. To be clear the City's total production capacity is approximately 107-MGD using all active sources. The City also maintains four (4) standby wells with a combined source capacity of approximately 6-MGD.

Table 2: Average Day, Maximum Day and Peak Hour Demand

Year	Average Day (MGD)	Maximum Day (MGD)	Peak Hour (MGD)
2008	41.2	98	147
2007	37.9	86	129
2006	33.5	83	125
2005	31.1	79	119
2004	31.5	78	117
2003	30.8	82	122
2002	30.1	76	115
2001	29.4	72	108

According to California Waterworks Standards, systems serving 1,000-service connections or more should maintain enough capacity including active and standby sources, storage and any emergency connections to provide at least 4-hours of PHD. Since the City maintains approximately 18-MG of storage capacity,

the City maintains (including storage and active and standby sources) a total 4-hour peak production capacity of approximately 117-MG. This total is adequate to nearly satisfy the aforementioned capacity requirement in most of the last eight years; however, up to a 30-MGD flow would need to be maintained through emergency connections to satisfy the flow provided for 2008. The City does maintain emergency connections to the CWS-Bakersfield water system and could be supplied additional surface water from the two active sources of treated purchased surface water; however sourcing an additional 30-MGD flow from these sources is unrealistic even in case of emergency. It should again be noted that the PHD data provided in Table 2 is produced using a series of peaking factors which may tend to exaggerate the actual flows, this may be especially true for 2008. The City does receive complaints of high and low pressure; the 2008 ARDWP reports that the City received 123 pressure related complaints. These complaints may be evidence of suspect source capacity. The above analysis combined with the complaint records should be further investigated in regards to source capacity. Based on the further investigation, the City may need to make appropriate plans to ensure adequate source capacity is maintained.

2.3 Treatment

The City currently disinfects all wells before entering the distribution system. The City also utilizes GAC treatment at five (5) well sites. These existing treatment facilities are summarized below and have been further discussed in previous reports accompanying the applicable permit and/or permit amendments.

The City proposes blending treatment to reduce arsenic concentration in water produced by Olcese Well No. 2. The City also proposes treatment for six wells using Granular Activated Carbon (GAC). Five of the proposed GAC plants are utilized solely for reduction in hydrogen sulfide while one of the proposed GAC plants (Well No. L210) will treat to remove hydrogen sulfide, manganese and 1,2-DCP. The proposed blending and GAC treatments are discussed in detail below in the proposed treatment section of this engineering report.

Existing Treatment

Granular Activated Carbon

The City currently utilizes Granular Activated Carbon Treatment (GAC) at five (5) existing well sites, four active sources (CBK-31, CBK-32, L203 and L205) and one standby source (L206). All of these wells are treated to reduce concentrations of hydrogen sulfide. Hydrogen sulfide is removed primarily for the purpose of improving taste and odor and secondarily for reduction in possible corrosion to which elevated levels of hydrogen sulfide often contribute. The specific GAC treatment utilized is catalytic GAC with the commercial name Centaur Carbon, produced by Calgon Carbon Corporation. The GAC catalyzes an oxidation-reduction reaction of hydrogen sulfide and dissolved oxygen. Several side reactions also occur; the primary products of these reactions are sulfites and

sulfates which remain dissolved in the treated effluent. The product of the primary reaction is elemental sulfur of which a small amount will remain dissolved in the treated effluent, but the majority of the sulfur will either be sorbed into the GAC or precipitate out of solution. As evidence of large amounts of precipitation, Calgon Carbon reports large amounts of sulfur present in Centaur GAC vessels upon change-out.

Data sheets for each of the existing as well as the proposed GAC treatment plants are contained in Appendix B. The City has submitted operations and maintenance plans, which are on file at the Department, for the GAC treatment plants located at the following well sites: CBK-31, CBK-32, L203, and L205. An operations and maintenance plan for the GAC treatment plant at Well No. L206 has not been submitted and will be required as a provision to the permit which accompanies this engineering report.

Disinfection

The City provides disinfection via continuous chlorination at the well head for all but two (2) of the City's active wells. Chlorination is provided using NSF standard 60 12.5% sodium hypochlorite solution. The only two (2) wells not provided with disinfection at the well head are Wells Olcese Nos. 1 and 2 which are chlorinated effluent of Olcese Interface Tank prior to entering the distribution system. Wells which require GAC treatment are chlorinated effluent of the GAC treatment vessels. Sodium hypochlorite solution is stored at each well site and injected using LMI metering pumps. The metering pumps are manually adjusted to deliver a free chlorine dosage such that a 1.0-mg/L is maintained throughout the distribution system. Well sites that are in use are visited by City staff every day, while well sites which are not is use are visited on at least a weekly basis.

Proposed New Treatment

Olcese Blending

Raw water produced by the City's Olcese Well No. 2 is consistently near the MCL for arsenic. The City proposes blending treatment to mitigate the high arsenic concentrations produced by Olcese Well No. 2. The proposed blend includes Olcese Wells Nos. 1 and 2 as well as Well Nos. CBK-22 and CBK-24. Blending takes place at the 10-MG Olcese Interface Tank. Each of the four wells used for blending are discharged into the tank before entering the distribution system. The tank is provided with thirteen booster pumps; each booster pump is 75-horsepower and has an approximate capacity of 700-gpm. Figure 1 provides a plot of the raw water arsenic concentrations for the four wells used in the Olcese Blending Treatment while Table 3 provides the respective well production capacities. It should be noted that the blending treatment is being provided proactively as none of the four blended wells has exceeded the arsenic MCL. In 2007, Olcese Well No. 2 showed an increasing arsenic trend and thus blending treatment was facilitated.

Figure 1: Olcese Blend Raw Water Arsenic Concentrations

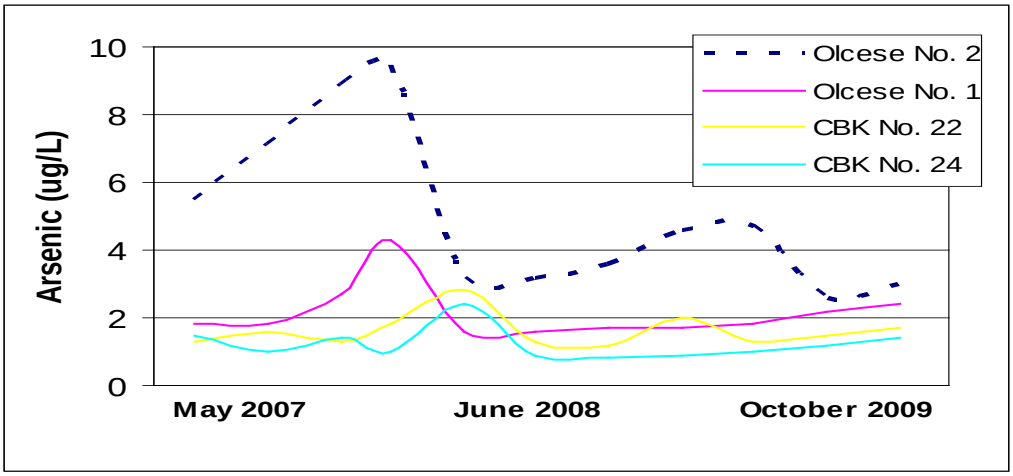


Table 3: Well Production Capacities

Well Number	Production Capacity (gpm)
Well No. CBK-22	2500
Well No. CBK-24	2500
Olcese Well No. 1	3500
Olcese Well No. 2	3500

The City submitted an operations plan, dated April 2007, for the Olcese Blending Treatment Plant. The operations plan includes explanation of how the blend ensures production of water below the arsenic MCL. The operations plan outlines a theoretical blend (mass balance) calculation which will be used to calculate a theoretical arsenic concentration for the blended effluent from which well operation will be stipulated. At the time of this report Wells Nos. CBK-22 and CBK-24 are controlled by the City's SCADA system while Olcese Wells Nos. 1 and 2 are controlled manually. The City reports that both Olcese Wells Nos. 1 and 2 are currently being equipped for SCADA control and that these wells should be SCADA controlled in approximately one month. In a meeting between the Department and CWS in January 2010, the aforementioned theoretical blend calculation was requested to be omitted from monthly report submitted to the Department. Because all of the blended wells produce water with arsenic concentrations below the MCL, the Department grants this request. However, should any of the blended wells produce a raw water sample above the MCL or should the blended effluent produce a result above 80% of the MCL, the City must re-introduce the theoretical blend calculation both as a predictive tool as well as a reporting requirement.

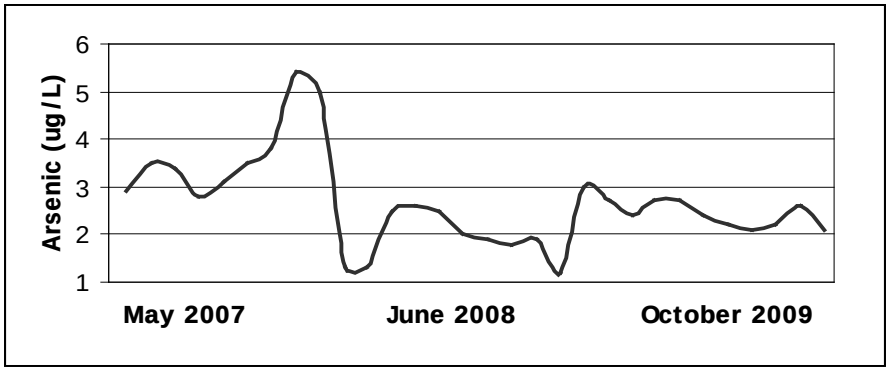
The operations plan proposes a goal of producing blended water with an arsenic concentration less than 8-ppb which is 80% of the arsenic MCL. Operators can use the SCADA system to control the appropriate daily well production and thus control the blend. As a fail-safe, the City has installed a control which does not allow Olcese Well No. 2 to operate without Olcese No. 1 online; in most cases

this control alone should ensure blended water below the arsenic MCL. However, this control alone should not be relied upon in all situations as future water quality can not be forecast. Continued sampling of raw water and blended effluent must be maintained.

The submitted operations plan proposes sampling raw water from each of the blended wells monthly for arsenic while the blended water is sampled weekly. Additionally, blended water will be sampled monthly for chloride, conductivity and total dissolved solids. With the permit that accompanies this engineering report, the operations plan and accompanying sampling frequencies are hereby approved and should be followed in the operation of the Olcese Blending Plant.

The Olcese Blending Tank has been in operation since 2007 and has consistently produced blended water under the arsenic MCL; further detail in regards to the blended water arsenic concentration is presented in Figure 3 below.

Figure 3: Treated Water Effluent of the Olcese Blending Tank



Granular Activated Carbon Treatment for Hydrogen Sulfide

New GAC treatment is proposed at five of the City's well sites for removal of hydrogen sulfide; the well sites for which GAC treatment is proposed are: CBK-45, L207, L208, L211 and L212. GAC data sheets are provided in appendix B for the proposed GAC treatment plants. The proposed GAC treatment plants will treat raw water for removal of hydrogen-sulfide utilizing the same Calgon Centaur GAC product as discussed in the existing GAC treatment section of this engineering report.

Monitoring for the raw and treated water for each of the new GAC plants will be required as outlined below in Tables Nos. 4 and 5. Table 4 provides the required monitoring if the GAC plant has been offline more than five (5) consecutive days and Table 5 provides required monitoring for normal plant operation. Because of the potential of interaction between the installed GAC media and nitrate present in the raw water, it should be noted that all of the wells for which the new GAC plants are provided, produce raw water with nitrate concentrations below half of the nitrate MCL. The most recent nitrate sampling results for the aforementioned

wells is provided in Table 6. Because of the relatively low nitrate concentrations, routine nitrate sampling frequency effluent of the GAC vessels shall be quarterly.

Table 4: Required Monitoring for GAC plants (First month if plant is offline more than five consecutive days)

Sampling Location	Total Coliform	HPC	Nitrate
Raw Water	Weekly	Weekly	Weekly
Post Fliter (pre-chlorine)	Weekly	Weekly	Weekly
Plant Effluent	Weekly	Weekly	--

Table 5: Required Monitoring for GAC plants (Normal operation)

Sampling Location	Total Coliform	HPC	Nitrate
Raw Water	Monthly	Monthly	Annually
Post Fliter (pre-chlorine)	Monthly	Monthly	Quarterly
Plant Effluent	Monthly	Monthly	--

Table 6: Most Recent Nitrate Sampling Results

Well Number	Sample Date	Result (mg/L)
Well No. 45	11/18/2008	ND
L207	11/23/2009	9.8
L208	5/04/2009	ND
L211	9/17/2009	ND
L212	7/21/2009	ND

The PS Codes for treated water effluent of the GAC treatment provided at Wells Nos. CBK-45, L207, L208, L211 and L212 are provided in Table 7 below. As mentioned above, GAC has been installed at these well sites for treatment of hydrogen sulfide. There is no MCL for hydrogen sulfide, although hydrogen sulfide contributes to taste and odor. Odor has a secondary MCL of 3.0 threshold odor numbers (TON). The last raw water sample results for odor for each of the wells are provided in Table 7 below. Removal of hydrogen sulfide through GAC treatment also protects the distribution system against possible corrosion due to the aggressive nature of hydrogen sulfide.

The media utilized for hydrogen sulfide removal is Centaur Carbon GAC manufactured by Calgon Carbon Corporation and has received NSF/ANSI 61 certification. The GAC treatment facilities provided at Wells Nos. CBK-45, L207, L208 and L212 consist of two (2) steel pressure vessels configured in parallel. Each of the vessels has a volume of approximately 667-cubic feet and contains approximately 10,000-pounds of Centaur Carbon. The GAC treatment facility at Well No. L211 is provided with one pressure vessel with a volume of 1,330-cubic feet containing 20,000-punds of Centaur Carbon.

Maximum well production, surface loading rate and empty bed contact time (EBCT) for each of the aforementioned GAC treatment facilities is provided in Table 8 below.

Table 7: Most Recent Odor Sampling Results

Well Number	Treated Water PS Code	Last Raw Water sample	Last Treated Water Sample
CBK-45	1510031-122	5.0	ND
L207	1510031-101	1.0	ND
L208	1510031-123	4.0	ND
L211	1510031-113	ND	ND
L212	1510031-120	2.0	ND

Table 8: GAC Treatment Summary

Well Number	Maximum Well Capacity (gpm)	Surface Loading Rate (gpm/square foot)	Empty Bed Contact Time (min)
CBK-45	1,500	9.55	6.7
L207	1,000	6.37	10.0
L208	750	4.77	13.4
L211	1,100	9.72	9.0
L212	1,600	10.2	6.2

Water effluent from all of the GAC treatment vessels is chlorinated and flows directly into the distribution system. Chlorine residual in the distribution system is maintained at 1.0- mg/L.

Three of the GAC treatment plants are backwashed automatically on a daily basisand can additionally be backwashed manually based on pressure differential. The GAC treatment plant at Well No. L207 is not provided with automatic backwash and is therefore backwashed manually. Operators visit this site daily and will initiate backwash based on pressure differential. Backwash water for all GAC treatment plants is provided by the distribution system. It should be noted that data for L207 has been omitted in Table 9 because there is no operations and maintenance plan on file for the GAC plant at Well No. L207.

Table 9: GAC Backwash Summary

Well Number	Activation; Frequency	Backwash Rate; Time	Backwash Loading rate
CBK-45	Automatic; Daily	300-gpm; 10-min	3.8
L207	Manual; As-needed	500-gpm; 10-min	6.3
L208	**	**	**
L211	Automatic; Daily	300-gpm; 10-min	2.65
L212	Automatic; Daily	300-gpm; 10-min	3.8

** An Operations Plan for the L208 GAC treatment plant has not been submitted.

Recharge of all vessels with new GAC media shall be scheduled as needed by the CWS and generally be dictated by increasing backwash frequency. The treatment plant will be offline during media replacement and prior to returning the treatment plant to service, recharged vessel will be sampled for bacteriological

quality. A vessel will be returned to service only when bacteriological analysis shows absence of total coliform. Additionally, Table 4 above shows the required monitoring for the first month when the plant returns to service. The operations plan for the GAC treatment facility is on file at the Department.

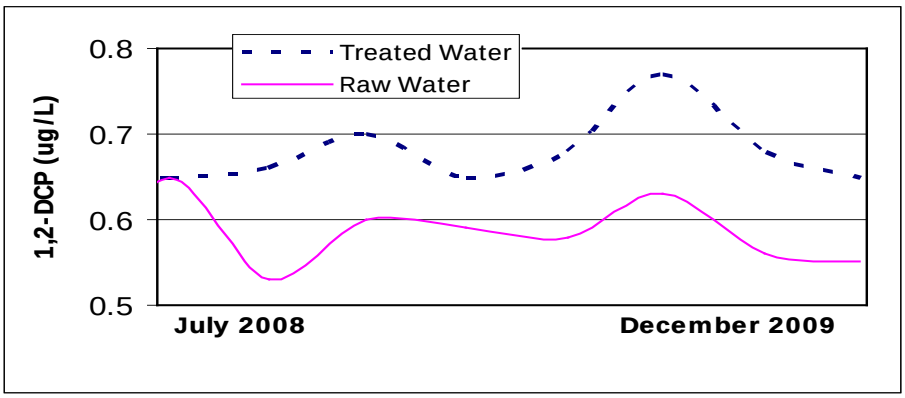
The City has submitted operations and maintenance plans, which are on file at the Department, for the GAC treatment plants located at the following well sites: CBK-31, CBK-32, CBK-45, L203, L205, L207, L210, L211 and L212. **Operations and maintenance plans for the remaining GAC treatment plants (L206 and L208) have not been submitted and are required as a provision to the permit which accompanies this engineering report.**

Granular Activated Carbon Treatment at Well No. L210

The PS Code for treated water effluent of the GAC treatment at No. Well L210 is 1510031-111. GAC has been installed at Well No. L210 for treatment of 1,2-DCP, manganese and hydrogen sulfide.

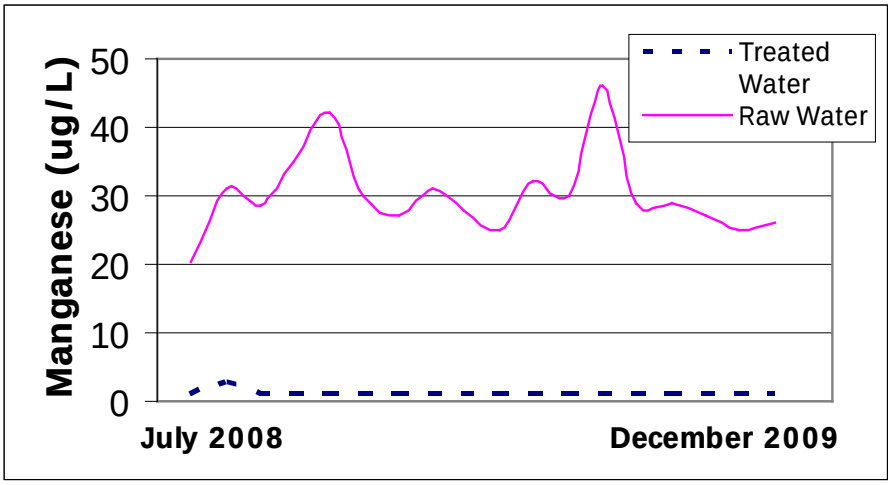
Well No. L210 produces raw water with 1,2-DCP concentrations above the 0.5-µg/L detection limit but below the 5.0-µg/L maximum contaminant level (MCL). 1,2-DCP concentrations produced by Well No. L210 are typically between 0.5 and 0.8-µg/L. The media utilized for 1,2-DCP removal is F200 Carbon GAC manufactured by Calgon Carbon Corporation and has received NSF/ANSI 61 certification. Figure 4 below provides water quality data for both the raw and treated water produced by Well No. L210. It should be noted that analysis of water quality data shows that the treatment is ineffective in reducing concentrations of 1,2-DCP and furthermore that concentrations appear to be increasing after treatment. This data shows the treatment to be ineffective but also raises concerns about the operation of the GAC treatment plant. As a provision to the permit which accompanies this engineering report, the City will be required to submit an updated operations plan paying specific attention to effective removal of 1,2-DCP. Because the concentrations of 1,2-DCP are low, the threat to public health does not appear eminent, however it is still concerning from an operational standpoint.

Figure 4: 1,2-DCP concentrations at Well No. L210



Well No. L210 produces raw water with manganese concentrations above the detection limit but below the MCL of 50.0-µg/L. Figure 5 below provides raw and treated manganese concentrations for L210; the figure shows that the GAC treatment is extremely effective and reduces manganese concentrations to mostly non-detectable levels. The media utilized for manganese removal is Centaur Carbon GAC manufactured by Calgon Carbon Corporation and has received NSF/ANSI 61 certification. The removal of manganese is accomplished in largely the same way as hydrogen sulfide is through the Centaur Carbon bed. The Centaur Carbon catalyses an oxidation reaction which transforms the dissolved manganese to an insoluble state. The majority of the precipitated manganese is discharged during backwash.

Figure 5: Manganese concentrations at Well No. L210



Well No. L210 is additionally treated for the removal of hydrogen sulfide. There is no MCL for hydrogen sulfide, although hydrogen sulfide contributes to taste and odor. Odor has a secondary MCL of 3.0 threshold odor numbers (TON). The last raw water sample (January 6, 2009) from Well No. L210 analyzed for odor threshold showed a non-detectable result. Removal of hydrogen sulfide through GAC treatment also protects the distribution system against possible corrosion due to the aggressive nature of hydrogen sulfide. The media utilized for hydrogen sulfide removal is Centaur Carbon GAC manufactured by Calgon Carbon Corporation and has received NSF/ANSI 61 certification.

The GAC treatment at Well No. L210 consists of two (2) steel pressure vessels configured in series. The first vessel is charged with Centaur Carbon while the second vessel is charged with F200 Carbon. As discussed above the Centaur Carbon catalyses reactions which destroy both hydrogen sulfide and manganese and the F200 Carbon is a sorbtive media which removes organic compounds including 1,2-DCP.

The vessels are designed to accommodate pressure of up to 125-pounds per square inch (psi). Each of the vessels has a volume of 1,330-cubic feet with a

filter bed volume of 750-cubic feet containing approximately 20,000-pounds of GAC. Maximum well production is reported as 1,200-gpm which results in a maximum surface loading rate of 10.6-gpm/ft2 for each vessel. The empty bed contact time (EBCT) for each vessel is 8.2-minutes.

Water effluent from the GAC treatment vessels is chlorinated and flows directly into the distribution system. Chlorine residual in the distribution system is maintained at 1.0- mg/L.

The GAC vessels are backwashed automatically on a daily basis. Backwash water is provided from the distribution system. Additionally, backwash can be initiated manually if needed due to pressure differential through the treatment vessels. Backwash is performed on each vessel separately at a rate of approximately 300-gpm for 10-minutes. This results in a backwash surface loading rate of approximately 3.8- gpm/ft2.

Recharge of the vessels with new GAC media shall be scheduled as needed by the CWS and generally be dictated by increasing backwash frequency. The treatment plant will be offline during media replacement and prior to returning the treatment plant to service, each recharged vessel will be sampled for bacteriological quality. A vessel will be returned to service only when bacteriological analysis shows absence of total coliform. Additionally, Table 4 above shows the required monitoring for the first month when the plant returns to service.

In addition to the required sampling provided in Tables Nos. 4 and 5 above, Well No. L210 is required further sampling for 1,2-DCP, Iron and Manganese; the additional sampling is provided in Tables 10 and 11 below.

Table 10: Required Monitoring for Well No. L210
(First month if plant is offline more than five consecutive days)

Sampling Location	PS Code	Manganese	Iron	1,2-DCP
Raw Water	1510031-105	Weekly	Weekly	Weekly
Intermediate Port	1510031-110	Weekly	Weekly	Weekly
Plant Effluent	1510031-111	Weekly	Weekly	Weekly

Table 11: Required Monitoring for Well No. L210 (Normal operation)

Sampling Location	PS Code	Manganese	Iron	1,2-DCP
Raw Water	1510031-105	Weekly	Weekly	Monthly
Intermediate Port	1510031-110	Weekly	Weekly	Monthly
Plant Effluent	1510031-111	Weekly	Weekly	Monthly

2.4 STORAGE

The City maintains six (6) storage tanks which provide a total storage capacity of 17.5-million gallons. The Olcese blending tank is filled solely by Wells Nos. CBK-22, CBK-24 and Olcese Wells Nos. 1 and 2 while the remaining tanks can be filled by the distribution system and/or the accompanying well. Table 12 below provides a list of the storage tanks used by the City as well as respective capacities, year installed, date of last inspection and date of last cleaning. The Department recommends all storage tanks be inspected at least every five years and cleaned based on the findings of the inspection.

Table 12: Storage Tank Information

Name	Capacity (MG)	Year Installed	Last Inspection	Last Cleaning
Station 11	1	1981	2/5/2004	2/5/2004
Station 12	0.125	1982	1/22/2007	1/22/2007
Station 13	1.25	1983	1/22/2007	1/22/2007
Olcese Interface	10	1997	1997	1997
Station F101	2	1976	5/14/2007	5/14/2007
Station L208	3	2004	2/15/2007	2/15/2007

2.5 DISTRIBUTION SYSTEM

Distribution lines consist of steel, asbestos-cement and PVC pipelines ranging from 0.75-inch to 42-inch in diameter. Normal system pressure is maintained between 60 and 85 pounds per square inch (psi). The system has little elevation change and therefore distinct pressure zones are not a product of changes in elevation; the system is operated as a single pressure zone. New distribution lines are primarily PVC and are installed in conformance with all applicable California waterworks standards. Water and sewer line separation in the distribution system is adequate.

The system contains 1,274 dead ends, of which all are provided with blow-off valves and are flushed as needed. The City reports that approximately ten percent of the dead ends are flushed annually. No low-head lines exist in the distribution system. Each year, the City experiences a number of breaks and leaks in the distribution system as well as a few main breaks and leaks. All of the breaks and leaks are repaired and/or replaced as discovered. The 2008 ARDWP reports 287 service connection and 3 main breaks or leaks occurred and were repaired in 2008.

2.6 OPERATION AND MAINTENANCE

Operation and maintenance of the City's water system are contracted to California Water Service Company (CWS). All operations of the system are under the supervision of CWS Operations Superintendent Ms. Tammy Johnson. CWS

employs several appropriately certified distribution and treatment operators who operate the system on a day to day basis. CWS staff visits each site that is currently in use daily. In low demand seasons, several of the wells are not operated and winterized; these sites are visited once a week while offline. Standby and inactive sources are visited monthly. A complete list of the operators which CWS employs in the Bakersfield area, along with the operator grades and certification numbers, is provided in appendix C to this engineering report. The chief operators of the system are Ms. Johnson (D5;T3), Mr. Ron Gibbs (D3;T3) as well as Mr. Todd Potter (D4; T2).

The City's distribution system is classified as a D4 system, and thus requires a chief operator to be at a minimum certified as a D4 distribution operator and shift operators to be at a minimum certified as a D3. All of the GAC treatment facilities utilized by the City and the Olcese blending tank are classified as T2 treatment facilities and therefore require a chief and shift operator with T2 and T1 certifications respectively. A distribution system classification worksheet as well as treatment classification worksheets for each of the City's approved treatment plants are provided in appendix D.

Cross Connection Control Program

The City administers a cross-connection control program coordinated by Mr. John Graham (Certification No. 000512). According to the 2008 ARDWP, there are 2,121 backflow prevention assemblies in the distribution system, of which 254 were installed in 2008. The ARDWP reports that 2,041 backflow prevention devices were tested in 2008, of which 181 were repaired or replaced.

Compliant Program

The City maintains records of customer complaints. The complaints are individually investigated and corrective action implemented. As reported in the 2008 ARDWP, the City received and investigated a total of 207 complaints in 2008. Of the 207 complaints, 43 were for taste and odor, 38 for color, 1 for turbidity and 123 for high or low pressure.

Emergency Response Plan (ERP)

The City submitted the current revision of the ERP in May 2008. As reviewed by the Department, the submitted ERP appears to adequately address emergency response for the water system. The City takes part in frequent tabletop activities to exercise the ERP.

Consumer Confidence Report (CCR)

The City last distributed a Consumer Confidence Report (CCR) in May 2009 for the 2008 calendar year. The 2009 CCR is due to be sent to consumers by July 1, 2009 and the CCR certification form is due to the Department by October 1, 2009.

Emergency Notification Plan (ENP)

The City submitted an updated Emergency Notification Plan (ENP) on March 25, 2008. Mr. Florn Core, the Water Resources Manager for the City and Mr. Tim Treloar, the CWS District Manager, are designated as the primary and secondary persons responsible for implementation of the ENP. The ENP identifies use of television and radio media outlets as the primary methods of public notification, newspaper as a follow up measure and hand delivery or phone contact to key facilities such as hospitals and schools. The ENP, as reviewed by Department staff, appears to be comprehensive and adequate.

2.7 SOURCE WATER QUALITY MONITORING

Surface Water

(Leave if there is also surface water in system) Surface water delivered to the City's customers is purchased from the KCWA and the CWS-North Garden water system. Because the City purchases surface water from these two utilities, the City is not required to maintain source water quality monitoring for these sources as it is the responsibility of the KCWA and CWS-North Garden systems to maintain appropriate source monitoring. It should be noted that both the purchased surface water from the KCWA as well as CWS-North Garden meet all applicable primary and secondary drinking water standards.

Groundwater

All of the City's wells are classified as source class community-large-groundwater-agricultural (CLGA). The appropriate water quality monitoring schedule for new sources is provided as appendix F while the appropriate water quality monitoring schedule for existing sources is attached as appendix G. The City should continue to monitor in accordance with these applicable schedules.

General Mineral and General Physical

The City is required to sample each active well for general mineral, physical and inorganic chemicals once every three years. All active wells have been sampled for general mineral, physical and inorganic chemicals in the last three years with one exception; Well No. CBK-35 was last sampled for foaming agents in April of 2004 and is correspondingly past due. **Sampling for foaming agents from Well No. CBK-35 should be conducted by May 1, 2010.** At the time of last sampling, all of the City's wells deliver water to the system with all regulated general mineral and general physical constituents present below the respective trigger levels.

Inorganic Chemicals

The City is required to sample each active well for inorganic chemicals every three years. All active wells are being sampled for inorganic chemicals at the appropriate frequency. Inorganic chemicals arsenic and nitrate are discussed in separate sections below, due to the incidence of water quality problems associated with these chemicals in Kern County and the surrounding areas. With

the exception of arsenic and nitrate, all of the City's sources, at the time of last sampling, deliver water with inorganic chemicals present below the respective trigger levels.

Arsenic

The City is required to sample for arsenic every three years for all active sources which produce arsenic at less than the 10-µg/L MCL. Should an active source produce a sample containing greater than 10-µg/L, quarterly monitoring is required for four consecutive quarters to determine compliance with the arsenic MCL. Four of the City's active wells and one standby well are currently sampled quarterly. The balance of the City's wells are sampled every three years. Table 13 below provides data in regards to the five quarterly sampled wells. It should be noted that of the five wells present in Table 13, only one (Olcese No. 1) is provided with arsenic treatment. Discussion of the blending treatment provided for Olcese No. 1 is provided in section 2.3 of this engineering report.

Table 13: Wells Sampled Quarterly for Arsenic

Well Number	Most recent sample result (µg/L)	Most recent sample date	Running annual average (µg/L)
CBK-29 (Standby)	9.4	8/4/2009	10.5
CBK-39	11.4	10/14/2009	9.9
CBK-41	9.7	10/14/2009	8.8
CBK-45 (Standby)	13.9	2/26/2009	13.4
Olcese No. 2	3.0	10/14/2009	3.7

In addition to the wells outlined in Table 13 above, nine of the City's other active wells, at the time of last sampling, contain arsenic in concentrations below the 10-µg/L MCL but above 5-µg/L. The CWS water quality project manager for the City's water system reports increasing arsenic concentrations in many of the City's wells. It is believed this increasing trend generally correlates with lower groundwater table levels.

Nitrate/Nitrite

Public water systems are required to monitor active groundwater sources for nitrate (NO_3) annually if initial monitoring data indicates nitrate concentrations of less 23-mg/L, and quarterly if the concentrations are greater than or equal to 23-mg/L. The City currently has only two active wells which produce raw water above the 23-mg/L trigger: Wells Nos. CBK-14 and CBK-32. The remaining active sources are required to be sampled annually. Table 14 provides recent sampling data from the Wells Nos. CBK-14 and CBK-32.

Table 14: Nitrate Sampling Results

Well Number	Most recent sample result (mg/L)	Most recent sample date
CBK-14	26.0	6/23/2009
CBK-32	27.0	10/14/2009

Public water systems are required to monitor groundwater active sources for nitrite (NO_2) triennially for sources which produce raw water with nitrite concentration less than half of the MCL; the MCL for nitrite is 500.0 micrograms per liter (µg/L). All of the City's wells produce raw water with nitrite concentration below half of the MCL and therefore all wells are required to be monitored for nitrite on a triennial basis.

The City is currently monitoring for both nitrate and nitrite at the appropriate frequency at all wells.

Volatile Organic Chemicals

Volatile organic chemical (VOC) sampling is required for active groundwater sources every three years. New groundwater sources are required to be sampled two consecutive quarters for VOC and four consecutive quarters for MTBE before potential reduction to triennial monitoring. All of the City's wells have been sampled according the aforementioned frequencies with the exception of Well Nos. CBK-47, CBK-49, CBK-52, CBK-53 and CBK-55; each of these wells was sampled for VOCs during only the initial quarter and sampling was not completed as required by conducting a second quarter of sampling for VOCs. Additionally, Wells Nos. L211, CBK-45 and CBK-46 require two more quarters of MTBE monitoring as only two quarters of sampling were initially conducted. **As such, Well Nos. CBK-47, CBK-49, CBK-52, CBK-53 and CBK-55 shall be sampled for VOCs one more quarter and MTBE for three more consecutive quarters before allowance of triennial monitoring. Well Nos. L211, CBK-45 and CBK-46 shall conduct two more quarters of MTBE monitoring before potential allowance of triennial monitoring.**

All of the City's wells currently show concentrations of all regulated VOCs under the respective MCLs. Three of the City's wells have recently produced results above the respective triggers for regulated VOCs. The aforementioned three wells and the respective VOC samples are provided in Table 15 below. It should be noted that Well No. L210 is currently treated for removal of 1,2-DCP utilizing GAC treatment; GAC treatment at Well No. L210 is discussed in detail in section 2.3 of this engineering report.

Table 15: VOC Sampling

Well Number	VOC	MCL (µg/L)	Most recent sample result (µg/L)	Most recent sample date
CBK-13	Tetrachloroethhylene	5.0	0.500	3/18/2008
CBK-53	Benzene	1.0	0.570	3/13/2008
L210	1,2-DCP	5.0	0.550	12/01/2009

Because Wells Nos. CBK-13 and CBK-53 produced sampling results above the respective triggers for the aforementioned VOCs, These wells

are required to be sampled two consecutive quarters for the triggered VOC. After two quarters of sampling, the City can submit written request for sampling reduction. 1,2-DCP sampling frequency for Well No. L210 is discussed in detail in section 2.3 of this engineering report.

Synthetic Organic Chemicals

Synthetic organic chemical (SOC) sampling is required for groundwater sources every three years for vulnerable and every nine years for the water system's specific SOC. However, for new sources, SOC monitoring is required for two consecutive quarters. All of the City's wells have been sampled according the aforementioned frequencies with the exception of Well Nos. CBK-47, CBK-49, CBK-52, CBK-53, CBK-55 and L210; each of these wells were sampled for SOCs during only the initial quarter and sampling was not completed as required by conducting a second quarter of sampling. **As such, Well Nos. CBK-47, CBK-49, CBK-52, CBK-53, CBK-55 and L210 shall be sampled for SOCs one more quarter before allowance of triennial monitoring.**

Five of the City's active wells produce raw water with Dibromochloropropane (DBCP) concentrations above the respective trigger level but below the 0.2-µg/L MCL. These five wells and the last DBCP sample result are provided in Table 16 below. **Because these wells produce sampling results above the respective triggers for DBCP, these wells are required two consecutive quarters of DBCP sampling.** After two quarters of sampling from a groundwater source, the City can submit written request for sampling reduction.

Table 16: SOC Sampling

Well Number	SOC	MCL (µg/L)	Most recent sample result (µg/L)	Most recent sample date
CBK-23	DBCP	0.2	0.11	12/08/2009
CBK-29	DBCP	0.2	0.02	11/13/2008
CBK-32	DBCP	0.2	0.02	11/05/2009
CBK-36	DBCP	0.2	0.02	12/02/2009
CBK-41	DBCP	0.2	0.01	10/29/2009

Radiological

Four quarterly radiological samples are initially required for new groundwater sources. If the first two samples are below the DLR, the remaining samples may be waived by the Department. From this initial sampling, dependent upon results, a frequency is set for future sampling. Appendix H provides a table containing all of the City's active wells, the respective sampling frequency and the date of the last sample collected; this information is provided for both the existing previously permitted wells and the proposed new wells.

Examination of the Department's water quality database shows that Wells Nos. CBK-47, CBK-52, CBK-53, CBK-54 and CBK-55 require further radiological sampling. Well No. CBK-54 shows no radiological

sampling has been conducted; this well is still under construction and thus one quarter of radiological sampling is required before being put online and the subsequent three quarters sampling required once in production. Wells Nos. CBK-47, CBK-52, CBK-53 and CBK-55 have been sampled once initially for both gross alpha and radium-228. The results of the initial sampling is provided below as Table 17.

Table 17: Radiological Sampling

Well Number	Most recent gross alpha sample result	Most recent sample radium-228 result	Most recent sample date
CBK-47	1.44	Non-detect	9/15/2006
CBK-52	Non-detect	Non-detect	4/19/2007
CBK-53	6.5	Non-detect	3/13/2008
CBK-54	No Initial Sampling		
CBK-55	Non-detect	Non-detect	3/06/2008

The City shall continue monitoring at the appropriate frequencies provided in appendix H. Additionally, the City shall complete the initial four quarters sampling for the wells provided in Table 17.

Bacteriological

Source water bacteriological sampling is required from all wells which provide chlorination at the well head. The City chlorinates the groundwater supply at all well sites, with the exception of Olcese Wells Nos. 1 and 2 which are chlorinated after blending. All of the City's wells require source bacteriological monitoring on a monthly basis. The City's wells currently are required to be sampled quarterly, but as a provision to the permit accompanying this engineering report, the City will be required to conduct bacteriological sampling for all active wells on a monthly basis. Monthly bacteriological sampling shall consist of analysis for total coliform with results reported as MPN/100-ml. During times of low demand, the City often does not operate all active wells and therefore it is common for certain wells not to operate for an entire calendar month. If specific wells are not operating for an entire calendar month, source bacteriological monitoring is waived for the month(s) the well is not in operation. A summary of source water bacteriological results for the City is included as appendix J.

Groundwater Rule

The City submitted a plan, dated December 1, 2009, addressing the required monitoring of the Federal Groundwater Rule (GWR). The GWR became effective on January 8, 2008 with compliance effective on December 1, 2009. The City's submitted plan adequately addresses the GWR as it dictates a plan for triggered source water monitoring in the event of a positive bacteriological sample from the distribution system. The plan specifies which sources potentially supply water to each respective distribution sample site and thus provides the sources which will be sampled should any of the routine bacteriological sampling sites produces a positive result. The Department approved the plan in a letter to the City dated

February 10, 2010. The approved GWR triggered source water monitoring plan is on file with the Department at the Visalia District Office.

2.8 DISTRIBUTION SYSTEM WATER QUALITY

Bacteriological Monitoring

The City serves approximately 133,000 people through 40,223 service connections. Based on population and number of service connections the City is required to collect a minimum of 30 bacteriological samples each week. The samples will be analyzed for total coliform bacteria and results shall be sent to the Department by the 10th day of the month following sampling. The current bacteriological siting plan (BSSP), submitted in January 2008 and subsequently approved in February 2008, is on file at the department and provides the appropriate information in regards to number of samples and sampling locations. Should the population, number of service connections or other significant characteristic of the water system change, the BSSP should be reviewed and revised as needed. A summary of the distribution bacteriological results for the City is included as appendix I.

Lead and Copper Rule

The City completed initial monitoring requirements and is now allowed to collect the reduced number of 50 triennial samples. The 90th percentile for lead should be less than 0.015 mg/L and the 90th percentile for copper should be less than 1.3 mg/L. The City last sampled for lead and copper in 2007 and is next required to sample in 2010. Lead and copper monitoring is required during the months of June, July, August or September. The City's lead and copper monitoring history is provided below in Table 18. It should be noted that sampling was not conducted in accordance with regulations for the second six-month sample, as well as the first and second annual samples. However, the last three triennial samples were collected appropriately and all sampling has been well below the respective action levels.

Table 18: Lead and Copper Rule Sampling

Sampling Round	Date Sampled	No. Required	No. Sampled	Lead 90th Percentile (mg/L)	Copper 90th Percentile (mg/L)
1st 6 months	Sept. 1992	60	61	0.009	0.14
2nd 6 months	Feb. 1993	60	59	0.0092	0.13
1st Annual	Aug. 1997	30	26	<0.005	0.07
2nd Annual	Aug. 1998	30	21	0.007	0.09
1st Triennial	Sept. 2001	30	35	<0.005	0.15
2nd Triennial	Aug. 2004	30	30	<0.001	0.10
3rd Triennial	July 2007	50	50	<0.005	0.11
4th Triennial	**50 samples due to be collected between June 1st and September 30th of 2010**				

Disinfection By-Products Rule (DBPR)

The following Stage 1 DBPR and Stage 2 DBPR sections outline the specific requirements of each stage of the DBPR and how the City is complying with those requirements.

Stage 1 DBPR

To comply with the Stage 1 DBPR, the City submitted a Stage 1 disinfection and disinfection by-products monitoring plan dated March 16, 2005. The plan proposed quarterly sampling from four sample sites located within the distribution system. Samples collected in accordance with this plan showed very low results for both total tri-halomethanes (TTHM) as well as halo-acetic acids (HAA5). The highest sample results were 4.3-ug/L TTHM and 2.0-ug/L HAA5, far below the respective MCLs of 80-ug/L and 60-ug/L. Consequently, in a letter dated April 11, 2005 the Department granted reduction (40/30 waiver) of DBP monitoring to one sample per year from one location in the distribution system collected during the warmest month of the year. The City commenced DBP monitoring in accordance with this letter in 2005.

Since 2005, the City added two sources of purchased surface water as sources of supply; the City now purchases treated surface water from both the CWS-North Garden water system and the KCWA. Because the City now purchases and serves customers with purchased treated surface water and DBP monitoring required for surface water is more stringent than the approved one sample per year, the City submitted a revised Stage 1 DBPR monitoring plan on September 9, 2009 and began sampling in accordance with this plan in January (first quarter of 2010 samples). The revised Stage 1 DBPR monitoring plan stipulates sampling from eight sample sites each quarter. The City should continue sampling in accordance with the September 2009 plan.

Stage 2 DBPR

Because the City received a 40/30 waiver as explained in the Stage 1 DBPR section above, the City has satisfied the IDSE requirement for Stage 2 DBPR. As such, the remaining requirement of Stage 2 DBPR to be satisfied by the City is submission of a Stage 2 DBPR standard monitoring plan; the plan is due to be submitted before the City is required to begin Stage 2 DBPR monitoring on April 1, 2012. Based on population, the City's Stage 2 DBPR standard monitoring plan should propose quarterly sampling at eight sample sites within the distribution system. The sample sites should be based on data collected during Stage 1 monitoring. The Department recommends the City collect at least eight quarters of sampling as outlined in the revised Stage 1 plan before submission of a Stage 2 standard monitoring plan. It should be noted that the City is required to sample in accordance with revised Stage 1 monitoring plan until April 1, 2012 when Stage 2 monitoring is required to begin.

Asbestos

Regulation requires monitoring of systems vulnerable to asbestos contamination within the distribution system at a tap served by asbestos-cement pipe. Distribution system monitoring for asbestos is required if asbestos-cement pipe is used and the water produced by the sources has an aggressive index of < 11.5. The aggressive index is an indicator of the corrosivity, and correlates reasonably well with the release of asbestos fibers caused by dissolution of the cement matrix. The aggressive index (AI) is calculated using the following equation:

$$AI = pH + \log (A*H)$$

pH = measured pH of the water
A = alkalinity, mg/L as CaCO3
H = calcium hardness, mg/L as CaCO3

Two of the City's wells, Wells Nos. CBK-6 and CBK-19, yield aggressive indices below 11.5 which indicate potential for asbestos contamination in the distribution system. **Therefore, asbestos monitoring of the distribution system in an area served by asbestos-cement pipe and Wells Nos. CBK-6 and CBK-19 shall commence on a nine year frequency. The first sample shall be collected and results submitted to the Department by July 1, 2010.**

III. ENVIRONMENTAL CLEARANCE

The California Department of Public Health as a responsible agency according to the California Environmental Quality Act (CEQA) has reviewed the Negative Declarations and Initial Environmental Studies prepared by the City of Bakersfield for Wells Nos. CBK-46, CBK-47, CBK-48, CBK-49 and CBK-52. The documents were distributed to the public and circulated through the State Clearinghouse for a 30-day review period. No written comments were received during the review period. Proposed Negative Declarations were filed with the Kern County Clerk. The Department's Environmental Review Unit (ERU) provided environmental clearance of permit issuance of the aforementioned wells in memorandums dated June 25, June 26 and August 28 of 2009. Copies of the Environmental Clearance Memorandums are provided in Appendix K.

It should be noted that the other new facilities detailed in this engineering report did not receive explicit environmental comment or clearance from the Department's ERU. These facilities did not receive ERU clearance as the facility either did not require ERU clearance or because the facility was already in use at the time when ERU clearance was addressed.

It bears further note that as a product of the work conducted in preparation of this engineering report, the Department's ERU has refined the process by which the City, and CWS, will coordinate on CEQA related issues with the Department.

IV. APPRAISAL OF SANITARY HAZARDS & PUBLIC HEALTH SAFEGUARDS

The City's source of supply is of adequate quantity. The City's active source capacity is approximately 107-MGD while standby sources can produce approximately 3-MGD. Furthermore, the City maintains nearly 18-MG of storage. Using active and standby sources as well as storage the City is largely able to meet 4-hours peak demand as required by waterworks standards. It should also be noted that in the case of emergency or severely increased demand, the City's sources of purchased treated surface water could provide increased capacity. Finally, the City maintains an emergency connection which facilitates additional capacity from the CWS-Bakersfield system. As noted in sections 2.2 and 2.6 of this engineering report, the City does receive complaints due to high or low pressure. This could be an indication of inadequate supply depending on when and from where in the distribution system the complaints were received.

The City's active sources of supply meet all primary and secondary drinking water standards. Several of the active sources are treated using GAC to reduce concentration of hydrogen sulfide and thus mitigate taste and odor concerns. Additionally, one active well, Well No. L210, is treated using GAC to reduce concentrations of 1,2-DCP (which does not exceed the MCL) and manganese; raw water concentrations of 1,2-DCP is less than half the respective MCL while raw water manganese concentrations approach the MCL. The City also utilizes blending treatment to mitigate arsenic levels from Well No. Olcese Well No. 2. Blending is accomplished using four active wells which are discharged directly to the 10-MG Olcese Interface Tank. It should again be noted that even before treatment, none of the City's active sources contain raw water concentrations which currently exceed any primary or secondary drinking water standard. However, the City has communicated concern that lower water table levels are currently changing water quality at several of the City's wells; an example of this changing water quality is increasing arsenic levels in many of the City's wells. The City, and CWS, maintains a proactive approach to water quality by keeping extraordinary water quality records and proposing treatment when trends indicate future MCL exceedence.

Although the City predominantly relies on groundwater as the source of supply, the City also purchases treated surface water from both the CWS-North Garden Water System and the KCWA. These purchased water sources represent less than 10-percent of the total production capacity. However, these connections can facilitate large flows in case of emergency. It should be noted that the City is currently in the piloting and design phase of a new surface water treatment plant; the plant, known as the Southwest Plant, is a joint project between the City and CWS and will utilize membrane filtration technology.

The City is under contract with CWS for operation of the water system. It should be noted that CWS owns and operates two other large water systems in the Bakersfield area, the CWS-North Garden and CWS-Bakersfield systems. The

combined service area of these two water systems and the City's water system comprises service connections for a population of over 350,000 people. CWS employs a highly skilled and appropriately certified staff who operate the water system in a highly competent manner. The water system's general good condition and overall reliability, as evidenced by the few water quality and quantity problems experienced by the City, is in large part due to the outstanding operational practices employed by both CWS and the City. Furthermore, the City's forward thinking water planning, including the new Southwest Plant, groundwater recharge practices and proactive treatment policies, should ensure a reliable and high quality water supply in years to come.

CONCLUSIONS AND RECOMMENDATIONS

The Visalia District Office of the CDHS-DWFOB finds that the sources, works, and operation, as described in this report, are capable of producing a safe, wholesome, and potable water supply. The quantity and quality of the water served and City's facilities and operation adequately meet the Department's standards. Issuance of a revised domestic water supply permit by the California Department of Public Health to the City of Bakersfield is recommended, subject the following provisions:

1. The City of Bakersfield 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.

2. The only approved sources of domestic water supply for use by the City are listed in the table below.

City of Bakersfield-Approved Sources

Source Name	Status	Primary Station Number
CBK 01-02 – RAW	AR	1510031-043
CBK 02-01 – RAW	AR	1510031-007
CBK 03-01 – RAW	AR	1510031-008
CBK 04-01 – RAW	AR	1510031-009
CBK 05-01 – RAW	AR	1510031-010
CBK 06-01 – RAW	AR	1510031-011
CBK 07-01 – RAW	AR	1510031-012
CBK 08-01 – RAW	AR	1510031-013
CBK 09-01 – RAW	AR	1510031-014
CBK 10-02 – RAW	AR	1510031-016
CBK 11-01 – RAW	AR	1510031-017
CBK 12-01 – RAW	AR	1510031-018
CBK 13-01 – RAW	AR	1510031-019
CBK 14-01 – RAW	AR	1510031-020
CBK 15-01 – RAW	AR	1510031-021
CBK 17-01 – RAW	AR	1510031-022
CBK 18-01 – RAW	AR	1510031-002

Source Name	Status	Primary Station Number
CBK 20-01 – RAW	AR	1510031-023
CBK 22-01 – RAW	AR	1510031-037
CBK 23-01 – RAW	AR	1510031-030
CBK 24-01 – RAW	AR	1510031-044
CBK 26-01 – RAW	AR	1510031-005
CBK 27-01 – RAW	AR	1510031-033
CBK 28-01 – RAW	AR	1510031-031
CBK 29-01 – RAW	STBY	1510031-032
CBK 30-01 – RAW	AR	1510031-035
CBK 31-01 – BEFORE GAC	AR	1510031-034
CBK 32-01 – BEFORE GAC	AR	1510031-038
CBK 33-01 – RAW	AR	1510031-041
CBK 34-01 – RAW	AR	1510031-042
CBK 35-01 – RAW	AR	1510031-039
CBK 36-01 – RAW	AR	1510031-045
CBK 37-01 – RAW	AR	1510031-046
CBK 38-01 – RAW	AR	1510031-047
CBK 39-01 – RAW	AR	1510031-048
CBK 41-01 – RAW	AR	1510031-098
CBK 43-01 – RAW	AR	1510031-117
CBK 45-01-BEFORE GAC	STBY	1510031-104
CBK 46-01 – RAW	AR	1510031-109
CBK 47-01 – RAW	AR	1510031-115
CBK 49-01 – RAW	AR	1510031-118
CBK 52-01 – RAW	AR	1510031-119
CBK 53-01 – RAW	AR	1510031-126
CBK 54-01 – RAW	PN	1510031
CBK 55-01 – RAW	AR	1510031
WELL L201-01- BEFORE GAC	STBY	1510031-028
WELL L203-01- BEFORE GAC	AR	1510031-049
WELL L204-01- BEFORE GAC	AR	1510031-036
WELL L205-01- BEFORE GAC	AR	1510031-050
WELL L206-01- BEFORE GAC	STBY	1510031-051
WELL L207-01- BEFORE GAC	AR	1510031-100
WELL L208-01- BEFORE GAC	AR	1510031-107
WELL L210-01- BEFORE GAC	AR	1510031-105
WELL L211-01- BEFORE GAC	AR	1510031-106
WELL L212-01- BEFORE GAC	AR	1510031-108
Olcese Well No. 1 – BEFORE AS BLEND	AR	1510031-102
Olcese Well No. 2 – BEFORE AS BLEND	AR	1510031-103
WELL CBK F101-01-RAW	AR	1510031-025
WELL CBK F103-01-RAW	AR	1510031-027
PURCHASED SURFACE WATER FROM KCWA	PT	1510031-128
PURCHASED SURFACE WATER FROM CWS- NORTH GARDEN	PT	1510031-129

3. The only approved treatment facilities for use by the City are provided below. These treatment facilities shall be operated in accordance with the approved operating plans and by appropriate certified operators.

Approved Treatment

Plant Name	Primary Station Number
CBK 31-01 - AFTER GAC	1510031-082
CBK 32-01 - AFTER GAC	1510031-040
CBK 45-01 - AFTER GAC-STBY	1510031-122
WELL L203-01 - AFTER GAC	1510031-094
WELL L205-01 - AFTER GAC	1510031-096
WELL L206-01 - AFTER GAC-STBY	1510031-097
WELL L207-01 - AFTER GAC	1510031-101
WELL L208-01 - AFTER GAC	1510031-123
WELL L210-01 - AFTER GAC	1510031-111
WELL L211-01 - AFTER GAC	1510031-113
WELL L212-01 - AFTER GAC	1510031-120
OLCESE BLEND	1510031-116

4. No additions, changes or modifications to the sources of water supply or water treatment processes outlined in Provisions Nos. 2 and 3 can be made without prior receipt of an amended domestic water supply permit from the Department.

5. 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, CCR, Title 22.

6. Under the operator certification regulation, the City's water system is classified as a D4 system. The City must have a chief distribution operator who is certified, at a minimum, as a D4 distribution system operator.

7. By May 1, 2010, the City shall submit an updated operations plan for the GAC treatment plants at Wells Nos. L206 and L208. The operations plan shall consist of a description of all the treatment facilities, plant performance monitoring program, operation and maintenance procedures, continuous process monitoring and recording equipment, plant alarms, and the fail-safe features and precautionary measures that are provided to prevent treatment process failures.

8. The City shall conduct monthly monitoring of all wells for total coliform bacteria. If a positive total coliform bacteria sample is detected, the sample shall also be analyzed for fecal coliform or E. coliform bacteria. The results of the positive coliform bacteria tests shall be reported as a density (MPN/100 ml), and not solely for the presence of coliform bacteria.

9. The City shall provide continuous chlorination at each active well with exception of Olcese Wells Nos. 1 and 2 which are chlorinated effluent of the Olcese Interface Tank.
10. By May 1, 2010, the City shall submit a storage tank cleaning and inspection plan to the Department for review and approval. This plan shall ensure cleaning and inspection happen on a minimum frequency of five years.
11. By May 1, 2010 the City shall collect a distribution sample from an area served by asbestos-cement pipe and Wells Nos. CBK-6 and CBK-19 to be analyzed for asbestos.
12. The City shall continue to sample in accordance with the approved Olcese blending plant operations plan. The plan dictates monthly raw water arsenic monitoring from each well and weekly arsenic monitoring from the blended effluent.
13. The City shall sample all GAC treatment plants in accordance to the approved operations plans. The dictated sampling is as follows:

Required Monitoring for Well No. L210
(First month if plant is offline more than five consecutive days)

Sampling Location	PS Code	Manganese	Iron	1,2-DCP
Raw Water	1510031-105	Weekly	Weekly	Weekly
Intermediate Port	1510031-110	Weekly	Weekly	Weekly
Plant Effluent	1510031-111	Weekly	Weekly	Weekly

Required Monitoring for Well No. L210 (Normal operation)

Sampling Location	PS Code	Manganese	Iron	1,2-DCP
Raw Water	1510031-105	Weekly	Weekly	Monthly
Intermediate Port	1510031-110	Weekly	Weekly	Monthly
Plant Effluent	1510031-111	Weekly	Weekly	Monthly

14. Well Nos. CBK-48 and CBK-54 shall have all applicable initial water quality monitoring conducted before the well is allowed to be put online. Should the initial sampling show concentrations of any regulated constituent above the respective MCL, the City shall send written notification to the Department and the respective well shall not be put online until future written permission from the Department.

Appendices:

Appendix A: Well Data Sheets
Appendix B: GAC Data Sheets
Appendix C: Certified Operators
Appendix D: Treatment and Distribution Classification Worksheets
Appendix E: System Photographs
Appendix F: Source Water Quality Monitoring Schedule New Sources (CLGA)
Appendix G: Source Water Quality Monitoring Schedule (CLGA)
Appendix H: Radiological Monitoring Frequency
Appendix I: Distribution System Bacteriological Monitoring Report
Appendix J: Source Bacteriological Monitoring Report