

**STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION**

STAFF REPORT FOR REGULAR MEETING OF DECEMBER 1, 2011

Prepared on November 4, 2011

ITEM NUMBER: 7

SUBJECT: **Waste Discharge Requirements for the Whittaker Groundwater Extraction and Treatment System, San Benito County (Order No. R3-2011-0224)**

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KEY INFORMATION

Facility Name: Whittaker Groundwater Extraction and Treatment System
Facility Owner: Whittaker Corporation
Location: 2751 San Juan Road, Hollister, California
Discharge Type: Industrial, Cleanup Site
Design Capacity: 0.20 million gallons per day (140 gallons per minute)
Treatment Type: Bioreactor (biological treatment) and carbon adsorption units
Disposal Method: Treated groundwater via an onsite injection well
This Action: **Adopt Order No. R3-2011-0224**

SUMMARY

Cleanup and Abatement Order (CAO) No. R3-2009-0015 requires Whittaker Corporation (Whittaker) to characterize and clean up pollution related to their former ordnance manufacturing facility at 2751 San Juan Road in Hollister (Site). Soil, soil vapor, and groundwater are polluted with perchlorate, volatile organic compounds (VOCs) and, to a lesser extent, hexavalent chromium (Cr VI) from past Site operations. These Waste Discharge Requirements Order No. R3-2011-0224 (Order) authorize Whittaker to reinject treated groundwater, allowing it to proceed with groundwater cleanup, consistent with the CAO.

Whittaker plans to extract groundwater from onsite and offsite wells and transport the extracted water to an onsite treatment system which will remove perchlorate, VOCs, and Cr VI to non-detect concentrations (below method detection limits) and treat selenium (a naturally occurring metal) to surface water standards. Whittaker proposes to discharge the treated water to the San Benito River pursuant to the General National Pollutant Discharge Elimination System (NPDES) Permit for Discharge of Highly Treated Groundwater Order No. R3-2006-0067 (NPDES General Permit). However, if the treatment system cannot treat the selenium to surface water requirements, Whittaker will reinject the effluent to the deep (Unit 5) aquifer beneath the Site pursuant to this Order (attached).

This Order establishes effluent limits for perchlorate, VOCs, and Cr VI, in addition to other constituents (e.g., metals including selenium and arsenic) not related to Whittaker's former operation. Central Coast Water Board staff required Whittaker to conduct an anti-degradation analysis because the discharge will contain selenium and arsenic at

concentrations greater than background concentrations (in the receiving water) but less than water quality objectives. Whittaker's analysis indicates that the discharge is consistent with the "State Water Resources Control Board's (State Water Board) Resolution No. 68-16 Statement of Policy with Respect to Maintaining High Quality of Waters in California" (Resolution No. 68-16 or Anti-degradation Policy). The occurrence of selenium and arsenic are unrelated to Whittaker's former operations and without the presence of these metals above background concentrations, Central Coast Water Board staff would regulate the proposed discharge pursuant to the *General Waiver of Waste Discharge Requirements for Specific Types of Discharges* instead of this Order.

Whittaker is required to monitor the nature and extent of groundwater pollution, progress of remediation, and hydraulic control of pollutants pursuant to a site-specific monitoring and reporting program (MRP) No. R3-2009-0022. Central Coast Water Board staff will update the MRP to implement appropriate monitoring to ensure 1) compliance with this Order, 2) effective treatment of extracted waste constituents, and 3) protect receiving water quality.

This Order is needed to ensure progress toward hydraulically containing polluted groundwater from the site and cleaning up groundwater pursuant to Whittaker's CAO.

BACKGROUND

Whittaker constructed a Groundwater Extraction and Treatment System (GETS) and discharged treated groundwater into the San Benito River intermittently from August 2009 to December 2010, pursuant to the NPDES General Permit. The GETS pumped intermittently from six extraction wells at approximately 30 gallons per minute (gpm) at the boundary of the Site, and treated perchlorate and Cr VI in two bioreactors, and treated VOCs with granular activated carbon units. The GETS has successfully treated site-related waste constituents to below effluent and laboratory detection limits; however, the selenium treatment unit (a bioreactor) has not consistently achieved the 5 micrograms per liter ($\mu\text{g/L}$) effluent limit set forth in the NPDES General Permit for protection of aquatic species. Whittaker has spent considerable effort through innovative upgrades and optimization of the existing GETS to treat selenium (a technologically difficult constituent to remediate) to below surface water discharge standards, but Whittaker has not met effluent limits consistently.

This proposed Order represents a major milestone for the Whittaker cleanup project because with adoption of this Order, Whittaker will be able to continuously operate its treatment system, allowing both hydraulic control and treatment of groundwater. Permitting a continuous discharge is essential to Whittaker's cleanup strategy because the GETS can only operate properly if the groundwater is continuously extracted and discharged. Bioreactors require continuous use to sustain conditions that promote biological treatment.

DISCUSSION

Setting – The Site is a 94-acre parcel located at 2751 San Juan Road in southwestern Hollister, San Benito County. The Site has multiple source areas related to former ordnance facility operations including releases from septic tanks, dry wells, burn areas, and surface runoff. The area is rural, with mixed residential and farm land nearby. Whittaker has installed six extraction wells along the perimeter of the Site, and each well is connected to the existing GETS. Whittaker's plans to install two offsite and about seven additional onsite extraction wells, an onsite injection well, and associated

conveyance piping to the GETS. The two offsite extraction wells are within 1,000 feet of the Site, along Old San Juan Hollister Road (see attached Order, Figure 1).

Groundwater Aquifers – Whittaker's extensive hydrogeological investigations (with borings drilled up to 1,000 feet below ground surface) show that there are four main aquifers (Unit 1, 3, 4, and 5) separated by confining units (Unit 2, 3/4, and 4/5) beneath the Site. Unit 3, which is found between approximately 120 feet and 135 feet below ground surface, and Unit 4, approximately 150 feet and 250 feet below ground surface are used regionally for agricultural and drinking water purposes. Unit 5 is of poor water quality (e.g., high TDS and minerals), and Central Coast Water Board staff is not aware of any drinking water wells in the Hollister area that extract from Unit 5. Based on available geologic information, this unit is hydraulically disconnected from the drinking water aquifers by the Unit 4/5 aquitard, which is between 30 and 300 feet thick.

Due to their proximity to the Site, Whittaker monitors three domestic and two agricultural/landscape irrigation supply wells. Most groundwater samples collected from these wells have been non-detect for all waste constituents, but a few have had trace to low concentrations of VOCs. Whittaker has provided eight private well users affected by pollution from the Site with replacement supply wells, water treatment systems, bottled water, and/or facilitated the users' connection to water supplied by the City of Hollister.

Waste Constituent Distribution – Whittaker monitors over 100 depth-discrete monitoring wells in Units 1, 2, 3, and 4. Currently, the perchlorate plume extends approximately one half- to three-quarters of a mile offsite to the southwest in Unit 1 (see attached Order, Figure 3). The trichloroethylene (TCE) groundwater plume extends approximately 1,000 feet, while the Cr VI plume¹ extends approximately 500 feet southwest in Unit 1 offsite. Perchlorate and VOCs are present onsite in Unit 3, but generally do not extend off the property. Perchlorate in Unit 4 extends 800 feet north of the Site boundary towards a decommissioned agricultural supply well. Whittaker has detected degradation products of TCE (i.e., cis-1,2-dichloroethene, vinyl chloride) in onsite groundwater only in Unit 1, but these VOCs have rarely been detected in offsite groundwater in any Unit.

Water Quality – Selenium and arsenic naturally occur in the upper Unit 1 and 3 aquifers (where Whittaker plans to extract and treat groundwater) at concentrations slightly greater than Unit 5 (receiving water). Whittaker reported an average selenium concentration of 12 µg/L and 9 µg/L in Unit 1 and Unit 3 aquifers, respectively. Whittaker reported selenium in Unit 5 at concentrations ranging from 0.95 µg/L to 1.2 µg/L, and anticipates the effluent concentrations will range between 1.7 µg/L to 13 µg/L. For arsenic, the estimated mean background concentration in Unit 5 is 1.1 µg/L, while Whittaker anticipates it will discharge between 1.6 µg/L to 2 µg/L. Concentration data from many monitoring wells in the area that are screened in Unit 1 support that arsenic and selenium are present regionally, and are naturally occurring in the shallower aquifers. Central Coast Water Board staff reviewed the water quality data, and determined appropriate Site-specific effluent limits for discharge of treated water from Unit 1 and Unit 3 into Unit 5.

Whittaker installed a Unit 5 well (SW-1) in 2007 as a potential replacement agricultural supply well for a neighboring farmer. Because the well exceeded the secondary maximum contaminant levels for total dissolved solids (TDS), chloride, sulfate, and specific conductance; the well was not used. Based on SW-1 water quality data, and

¹ AMEC, Geomatrix, Revised Hexavalent Chromium Background Study May 10, 2010.

discussions with San Benito County Water District, Central Coast Water Board staff determined that Unit 5 has a naturally high accumulation of dissolved minerals likely because it is a geologic formation of marine origin, and therefore is not currently used for drinking or agricultural supply in Hollister.

GETS Upgrades, Startup, and Schedule – Whittaker proposed the following upgrades to the treatment process in the August 23, 2011 *Addendum to Revised Final Design Report for the GETS* (Addendum):

- modify pumps and controls in the extraction wells to better control influent flow rate;
- modify the current bioreactor system, which includes a de-aeration fixed film reactor; and two continuous stirred tank reactors (CSTRs), into a single CSTR to simplify the system and reduce the number of components that require process control;
- upgrade the electron donor dosage system to improve control of the CSTR;
- add a continuous, real-time oxygen reduction potential (ORP) monitoring device that automatically puts the GETS in recycle mode when ORP readings are outside performance limits;
- restart the extraction wells in a phased approach, and determine which wells, and if additional wells, are needed to hydraulically capture polluted groundwater; and
- discharge the effluent into Unit 5 via a new injection well, as an alternative to discharging to the San Benito River, if it does not meet the surface water quality requirements.

Central Coast Water Board staff approved the GETS Addendum report in a letter dated September 23, 2011. Whittaker may begin the pump and bioreactor upgrades; however, Whittaker will not install the Unit 5 injection well until this Order is adopted.

In the Addendum, Whittaker proposes to re-start the extraction wells in phases to slowly introduce selenium to the bioreactor to optimize the bioreactor treatment capability, to determine the sustained yield of each water-bearing unit, and to determine which wells and pumping rates will establish perimeter hydraulic control. Phase 1 will focus on Unit 1 wells, and Phase 2 will focus on Unit 3 wells. The startup periods will last until Whittaker observes stable drawdown in the extraction wells and stable influence at the performance monitoring wells. Initially, Whittaker anticipates it will collect the effluent in batches and store it in Baker tanks. Because selenium concentrations are lower in Unit 1 than Unit 3 extraction wells, Whittaker anticipates it will discharge to the San Benito River pursuant to the NPDES General Permit during the Phase 1 re-start, or it may discharge to a neighboring property for irrigation supply pursuant to a General Waiver of Waste Discharge Requirements. If not, it will recycle the water until it meets effluent limits. During Phase 2, Whittaker will extract from RW-5, a Unit 3 well, and determine its capture zone to evaluate the need for extraction from the second Unit 3 well. During the final startup phase, Phase 3, Whittaker will continue to operate the extraction wells and assess long-term performance.

If Whittaker is able to achieve the NPDES General Permit effluent limits consistently, it will likely continue to discharge to the San Benito River. However, if the GETS does not achieve surface water quality effluent limits for selenium, it will then discharge via an injection well into Unit 5 pursuant to this Order.

Whittaker estimated the GETS will run for 20 years to treat onsite and offsite groundwater to water quality targets. After the phased startup, the system should extract between 19 and 78 gpm, depending on how many wells are needed to provide adequate capture, and potentially up to 140 gpm once additional onsite and offsite extraction wells are constructed.

PROPOSED REQUIREMENTS IN ORDER

The proposed Order is consistent with other Central Coast Water Board requirements for comparable discharges within the Central Coast Region. This Order includes prohibitions and limitations that are designed to protect water quality for existing and anticipated beneficial uses of groundwater to the maximum benefit of the people of the state. This Order also considers Site-specific background (receiving water) water quality data.

Effluent Limitations – Central Coast Water Board staff proposes effluent limits (see Table 3 of attached Order, and included below) to ensure protection of beneficial uses. A discussion of staff's basis for establishing these effluent limits is provided below.

Table 3. Effluent Limits for Unit 5 Discharge

Constituent	Units	Quarterly Average	Daily Max
Perchlorate	µg/L	Trace detect ¹	6 ²
PCE	µg/L	Trace detect ¹	5 ²
TCE	µg/L	Trace detect ¹	5 ²
cis-1,2-dichloroethene	µg/L	Trace detect ¹	6 ²
trans-1,2 dichloroethene	µg/L	Trace detect ¹	10 ²
Vinyl chloride	µg/L	Trace detect ¹	0.5 ²
Freon 113	µg/L	Trace detect ¹	1,200 ²
1,1-dichloroethene	µg/L	Trace detect ¹	6 ²
1,1,1-trichloroethane	µg/L	Trace detect ¹	200 ²
Cr VI	µg/L	Trace detect ¹	9.4 ³
Nitrate as NO ₃	mg/L	Trace detect ⁴	45 ²
Manganese, total	mg/L	0.17 ³	0.3 ⁵
Selenium, total	µg/L	16 ⁶	20 ⁷
Arsenic, total	µg/L	5 ⁸	10 ²
pH		--	Between 6.5 to 8.3 ⁷

¹ The intent is to treat these compounds to less than the detection limits, based on best available technology. Quarterly average trace detect is defined as a quarterly average with at least 66% of the samples less than the laboratory practical quantitation limit (PQL).

² MCL, which is the Central Coast Basin Plan objective for municipal and domestic supply.

³ Site-specific background concentration.

⁴ Operation of the system is anticipated to treat nitrate to less than detection limits, based on the treatment technology. Quarter average trace detect is defined as a quarterly average with at least 66% of the samples less than the PQL.

⁵ Established at two times the anticipated GETS effluent concentration which allows flexibility during GETS operation to prevent shutting down the system due to a manganese exceedance as new extraction wells are brought on line and the GETS is stabilized.

⁶ Discharger shall optimize the GETS to minimize selenium in the effluent while maximizing waste constituent containment and cleanup. This concentration is based on best available technology treatment effectiveness.

⁷ Lowest Basin Plan water quality objective. For selenium, it is the agriculture water quality objective; for pH it is the municipal supply standard.

⁸ From a limited data set, the average background concentration is 1.1 µg/L. However, Whittaker has not collected a significant data set; therefore the average concentration is established at 50% of the Basin Plan Objective (MCL) and slightly greater than the known background.

Perchlorate and VOCs: In this Order, the maximum effluent limit for perchlorate and VOCs are based on the MCL, which is the lowest applicable water quality objective in the Central Coast Water Board Basin Plan. The quarterly average effluent limit is non-detect with allowance for limited trace detects, which is consistent with the Anti-Degradation Policy and is expected based on the best available technology.

Cr VI: Like perchlorate and VOCs, the GETS has demonstrated it can consistently achieve less than detection limits (typically 0.5 µg/L) for Cr VI. The maximum effluent limit proposed in this Order is the average background concentration in Unit 1, which was established in the Central Coast Water Board staff-approved May 10, 2010 *Revised Hexavalent Chromium Background Study*. However, the quarterly average concentration must not exceed trace detect, which is consistent with the Anti-Degradation Policy and is expected based on the best available technology.

Nitrate: The advantage of a bioreactor treatment unit for perchlorate is that it also remediates nitrate. Therefore, the GETS is not expected to discharge any nitrate above detection limits (typically 0.23 milligrams per liter [mg/L] to 2.3 mg/L). This proposed Order includes nitrate's MCL as the daily maximum effluent concentration, and like the perchlorate, VOCs, and Cr VI, not to exceed trace detect for a quarterly average consistent with the Anti-Degradation Policy and consistent with the best available technology.

Selenium and Arsenic: The proposed Order sets a quarterly average selenium effluent limit of 16 µg/L, and a daily maximum of 20 µg/L. The order also sets a quarterly average effluent limit for arsenic of 5 µg/L and a 10 µg/L daily maximum effluent limit. The daily maximum concentrations are based on the lowest applicable water quality objective for the receiving water. For selenium, the agricultural standard (20 µg/L) is less than the MCL (50 µg/L) and for arsenic, the MCL is 10 µg/L. Staff conservatively established quarterly average effluent limits for selenium and arsenic to ensure Whittaker will optimize the bioreactor's treatment capability while allowing flexibility for managing the bioreactor's many variables that can result in slight increases in selenium occasionally. The limit is between Whittaker's expected discharge concentrations and the lowest water quality objective. Staff also considered that concentrations may increase and decrease as flow rates change or additional wells are added.

Compliance with Anti-Degradation Policy: This Order finds that some degradation of Unit 5 from selenium and potentially arsenic is acceptable and consistent with State Water Board's Resolution No. 68-16 because:

- The discharge will not result in a significant reduction in water quality. The increase in selenium and arsenic is spatially localized in lateral extent (confined to a mixing zone), estimated to be at the most 700 feet from the injection location beneath the Site in Unit 5. The discharge may improve water quality in terms of concentrations of TDS, sulfate, sodium, and chloride in the Unit 5 zone of mixing.
- Whittaker has demonstrated with bench testing and operations, analysis, and upgrades to the selenium bioreactor, that there is no available treatment technology for selenium that can reduce it to concentrations lower than that which Whittaker predicts achieving.
- Water of drinking water quality is available in Unit 3 and Unit 4, which are located at shallower depths than Unit 5 (lower cost for drilling and operating a supply well). As a result, Unit 5 will likely not be used in the near future for

domestic or municipal supply because the water is of poor quality (high TDS, chloride, sodium, and sulfate).

- Any degradation that may occur will remain below the lowest applicable water quality objective for arsenic and selenium, 10 µg/L and 20 µg/L, respectively.
- The cleanup of perchlorate, VOCs, and Cr VI will result in restoring aquifers to concentrations below drinking water standards and will restore the beneficial uses of the currently used drinking water aquifers.
- Returning treated groundwater to the basin provides for long-term preservation and storage of groundwater resources.

Consideration of TDS, Chloride, Sulfate, Sodium, and Specific Conductance: Because average concentrations of TDS, sulfate, chloride, sodium and specific conductance are much greater in the receiving water than the effluent, concentrations of these constituents will not increase in the receiving water, but rather will likely be reduced (improved) as a result of the discharge. Therefore, consistent with the Basin Plan, staff did not establish effluent limits for these constituents.

Provisions – This Order requires compliance with an Executive Officer-approved MRP. The current MRP No. R3-2009-0022 includes performance monitoring of hydraulic capture and Central Coast Water Board staff will update the MRP during the startup phase testing to account for the changes in the monitoring plan due to the GETS upgrades. Whittaker will be required to monitor the upgraded system and the receiving water in Unit 5. Since Unit 5 is over 700 to 1,090 feet deep, and because Whittaker has demonstrated it is of poor water quality, and will likely not be used in the foreseeable future for domestic, municipal or agricultural water supply, Whittaker has proposed limited monitoring of Unit 5. Whittaker predicts that selenium and arsenic concentrations will increase locally within the zone of mixing but this zone is limited in extent to approximately 300 to 700 feet from the Unit 5 injection well. Whittaker proposes to sample Unit 5 well SW-1 (located 1,400 feet downgradient of the injection well) to verify this prediction. Whittaker will also be required to monitor wells in Unit 4 to confirm there is no upward migration of groundwater from Unit 5 into Unit 4.

ENVIRONMENTAL SUMMARY

In accordance with the California Environmental Quality Act (CEQA) (Public Resources Code, Section 21000, et seq.) and the California Code of Regulations, the Central Coast Water Board is the lead agency for purposes of CEQA, and proposes adoption of Resolution No. R3-2011-0227 for approval of a Negative Declaration, as supported by an Initial Environmental Study (IES) that addresses the upgrades to the GETS. Because the proposed project will not have a significant effect on the environment (although significant water quality improvements are expected), it does not require mitigation measures, and therefore Central Coast Water Board staff prepared a Negative Declaration.

COMPLIANCE HISTORY

Whittaker has complied with Central Coast Water Board staff's information requests and directives. Whittaker has not been able to hydraulically capture and treat groundwater, as required because of the difficulty in treating selenium.

The GETS has been able to consistently remove site-related wastes to concentrations less than detection limits. Whittaker has had two detections of perchlorate above the effluent limit (7.7 µg/L and 28 µg/L) in the last year of operation, and one exceedance of selenium. The NPDES General Permit required mandatory minimum penalties for the selenium

violations, which Whittaker promptly addressed. Whittaker's upgrades, along with this Order, which allows continued operation of the bioreactor, should improve the bioreactors functionality.

COMMENTS RECEIVED ON THE DRAFT ORDER

Central Coast Water Board staff distributed the draft Order No. R3-2011-0224 on September 13, 2011, to a list of interested persons and agencies that have been historically involved with the Whittaker cleanup project. The public had 30 days to comment on the Draft Order; only one minor editorial comment from Whittaker's consultant was received, and staff incorporated the comment into the final Order.

CONCLUSION

This Order establishes effluent limits for treated groundwater from Whittaker's GETS, which comply with the State Water Board's Anti-Degradation Policy and considers background water quality. Adoption of this Order will allow Whittaker to proceed with groundwater treatment. Whittaker will be able to initiate construction of the onsite injection well and additional extraction wells that will hydraulically capture and clean up polluted groundwater beneath and downgradient of the Site.

RECOMMENDATION

Adopt Waste Discharge Requirements Order No. R3-2011-0224 for the GETS, and the associated Resolution No. R3-2011-0227.

ATTACHMENTS

1. Order No. R3-2011-0224

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