INFORMATION SHEET

ORDER NO. R5-2006-XXXX
UNIVAR USA INC. AND RIVER CITY BASEBALL GROUP
RALEY FIELD/FORMER VAN WATERS & ROGERS FACILITY SITE
GROUNDWATER TREATMENT AND DISPOSAL SYSTEM
WEST SACRAMENTO, YOLO COUNTY

Univar USA Inc. (Formerly Van Waters & Rogers) operates an existing bioremediation groundwater treatment and disposal system at its former West Sacramento chemical distribution center, currently occupied by the Raley Field Ballpark. The property owner is River City Baseball Group, the current owner and operator of the ballpark facility, a new multi-use 14,000 seat open-air structure stadium facility, that serves as the home of the Sacramento River Cats, the Triple A affiliate of the Oakland Athletics.

Past chemical distribution operations at the Site resulted in solvents, volatile organic compounds (VOCs) such as tetrachlorethene (PCE), trichloroethene (TCE), cis-1,2-DCE and trans-1,2-DCE pollution in soil and groundwater. Cleanup systems for the soil and groundwater were incorporated into the stadium design during construction of Raley Field as part of redevelopment of the 15-acre site in 2000. Van Waters & Rogers operated a soil vapor extraction/air sparge (SVE/AS) system from February 1995 until 1997 to remediate VOCs that may have caused groundwater mounding of the water table beneath the facility and exacerbated offsite migration of VOCs. The highest on-site groundwater VOC concentrations ranged from 2000 to 3000 ug/l in 1999 when Van Waters and Rogers decommissioned the air sparging system and proposed a combination of SVE, groundwater extraction, and enhanced in-situ bioremediation as the preferred remedial alternative for the site.

On 16 June 2000, the Regional Water Board issued Waste Discharge Requirements Order No. 5-00-131 for enhanced in-situ bioremediation, including extraction, treatment, and injection of groundwater amended with a food source and nutrients to stimulate the growth of indigenous bacteria to contain and remediate groundwater containing the VOCs.

Since September 2000, the Discharger has operated an enhanced in-situ bioremediation groundwater treatment and disposal system that re-injects treated or amended groundwater extracted from the aquifer using five groundwater extraction (gradient control (GC)) wells, two combination gradient control/vapor extraction (GCVE) wells, and three injection trenches (Trenches 1, 2 & 3). Extracted groundwater is treated using three above ground liquid–phase granular activated carbon units. Associated piping and instrumentation was used to re-inject treated groundwater outside the in-situ treatment zone areas for containment and to re-inject amended groundwater

to remediate contaminated groundwater within the in-situ treatment zone. After demonstrating that hydraulic capture was achieved within the treatment zone, the Discharger was allowed to inject untreated (i.e. groundwater containing VOCs) into the treatment zone to enhance the effects of in-situ bioremediation at the site. The existing remediation system also includes 22 groundwater monitoring wells. Since 2000, the Discharger has also continued to operate the SVE portion of the system consisting of five vapor extraction (VE-1R, VE-2R, VE-3R, VE-6, & VE-7) wells and the GCVE wells.

The Discharger amended the extracted groundwater with a food source (sodium lactate), nutrients (potassium phosphate), and anaerobic bacteria (microorganisms), to enhance the growth of indigenous (i.e. native to the Central Valley or San Joaquin-Sacramento River Delta areas of California) anaerobic bacteria capable of breaking down the VOC contaminants to carbon dioxide, water, and chlorides via a reductive dechlorination process. In the event that the breakdown to carbon dioxide, water, and chlorides was not sufficiently enhanced, the remedial system also functioned as a groundwater extraction, treatment, and capture system.

This Order rescinds and replaces WDR Order No. 5-00-131, and regulates modifications using different modes of operation of the groundwater recirculation system to enhance biodegradation of the VOCs within the groundwater treatment/containment zone to accelerate the cleanup.

Evaluation of historic groundwater data demonstrates that most of the significant groundwater quality improvements occurred during the first few years (2001 and 2002) of system operation. There are two identified groundwater bearing zones. First encountered groundwater at the Site is about 10 feet below ground surface (bgs). A second water bearing zone is about 75 feet bgs. Most of the mass of VOC pollution remains in the shallow water bearing where total VOC concentrations above 100ug/l are reported to remain in three relatively discrete areas of the site. These three areas are in the vicinity of wells MR-3 and MR-7, GCVE-1, and GCVE-2.

The regional groundwater flow direction in the area of the Site is influenced by the stages of the Sacramento River. The significant changes in the river stage have historically occurred on a seasonal basis (i.e. early winter and spring). Depth-to-water measurements were made in the site monitoring wells during these changes in river stage to confirm if groundwater flow direction change also occurred.

The Discharger will continue to operate the groundwater treatment system in two main extraction/injection configurations depending upon the regional groundwater flow regime.

Historical soil vapor and SVE System operation data indicates that remediation of the pollutants in soil vapor at the site is complete. The Discharger may decommission the SVE system in the future. In the interim, the Discharger may use the decommissioned vapor extraction wells as additional injection points to improve the distribution of amendments in the groundwater treatment zone. A continuous low rate of injection (one gallon per minute) is proposed at these locations to percolate amended groundwater through the vadose zone (0 to 7 feet) and reach the water table. This low injection rate is not expected to affect groundwater capture.

The treatment zone will consist of an in-situ recirculation system using gradient control wells (GCVE-1, GCVE-2, GC-5, GC-6, GC-7, GC-8, & GC-9) to provide hydraulic control of added amendments in the shallow zone surrounding Trench 1 and Trench 2 and the VE wells located directly above the layout of the former VW&R Facility. In addition to the injection trenches and VE wells, wells GCVE-1, GCVE-2, and the GC wells, with the exception of GC-5 where year round extraction is proposed to continue, will be used as injection points during portions of the year when these wells are not being used for groundwater extraction.

The treatment zone boundary is defined by the former VW&R property boundary. Up to approximately 90 gallons per minute (gpm)) groundwater will be extracted and up to approximately 8.5 gpm of amended groundwater per day will be injected within the in-situ treatment zone. Up to approximately 65 gpm of unamended treated groundwater per day will be injected outside the treatment zone. Performance of the recirculation system will be assessed by monitoring groundwater levels, and the decline of VOC concentrations, in the groundwater monitoring wells located in the treatment zone area. The Discharger will continue the extraction of groundwater and discharge treated amended groundwater until the VOCs have been reduced below cleanup goals or the system is no longer effective at reducing VOC concentrations.

The Discharger proposes to initially continue the extraction and injection of groundwater amended with sodium lactate, potassium phosphate, and anaerobic bacteria, to enhance the growth of indigenous bacteria capable of breaking down the VOC contaminants to carbon dioxide, water, and chlorides via a reductive dechlorination process. During reductive dechlorination, anaerobic microorganisms substitute hydrogen for chlorine on the organic compound. The chlorine is the electron acceptor and carbon is the main electron donor. PCE is

reduced to trichloroethene (TCE), then cis-1,2-DCE, then VC, then ethene. Injecting a food source to stimulate growth of indigenous anaerobic microorganisms provides a carbon substrate, therefore accelerating the reductive dechlorination process. PCE and TCE degrade best under anaerobic conditions, but cis-1,2-DCE and VC degrade best under aerobic conditions. Despite this, cis-1,2-DCE and VC should still be reduced by the indigenous microorganisms once the PCE and TCE are reduced because it will be the next available source for the anaerobic microorganisms to substitute hydrogen for chlorine. In the event that the breakdown to carbon dioxide, water, and chlorides is not sufficiently enhanced, additional modes of system operation will be used and the remedial system will also continue to function as a groundwater extraction, treatment, and capture system.

The Discharger will sample groundwater and submit a Baseline Summary Report that establishes baseline concentrations for VOCs, metals and indicator parameters before beginning any new mode of operation and injecting any increased amounts of groundwater amendments. In the event that VOC or breakdown products persist in groundwater in the vicinity of wells MR-3, GCVE-1 or GCVE-2 under the first mode of operation, the Discharger may install an additional shallow extraction well to improve amendment distribution. If VOC concentrations persist, the Discharger will implement a supplemental second mode of operation to further enhance the aerobic dechlorination process. This second mode of operation will consist of adding appropriate batches of nano-scale zero valent iron (NS-ZVI) as a slurry to extracted groundwater and re-injecting this amended groundwater into particular areas within the treatment zone.

In the event that total VOCs or the daughter-product chlorinated hydrocarbons, including but not limited to TCE, cis-1,2-DCE, and VC, persist at concentrations deemed to low to sustain further degradation by anaerobic dechlorination in a particular area of the treatment zone, the Discharger will cease adding electron donor amended groundwater in that area and upon approval, implement a third mode of operation that will change the subsurface condition in these areas to aerobic. The Discharger will conduct microcosm tests to demonstrate that the proposed change in operation is applicable to the proposed area of site groundwater and that it is expected to be effective in expediting groundwater cleanup. This third mode of operation will cease the reduction of the metals and other compounds, by adding appropriate doses of dissolved methane/propane and oxygen which is expected to provide for continued degradation of the remaining VOC pollution to ethylene and chloride.

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