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Alameda County Environmental Health
1131 Harbor Bay Parkway
Alameda, CA 94502-6577

Subject: Jordan Property – Former Leaking Underground Storage Tank
Dublin, California
ACEH Case No. R00002918

**UPDATED CORRECTIVE ACTION PLAN**

Dear Mr. Khatri:

We prepared this revised updated corrective action plan (CAP) for remediation of soil and groundwater impacts associated with the former leaking underground storage tank at the Jordan Ranch complex on Fallon Road, Dublin, California (Site). We revised the updated CAP after reviewing the Alameda County Environmental Health Department (ACEH) comment letter dated November 18, 2010. The updated CAP is intended to replace the previous 2006 revised site mitigation plan, which was previously approved by ACEH in 2006 (ICES 2006).

## BACKGROUND

### Site Description

The Site is a former ranch complex located at 4233 Fallon Road in Dublin, California (Site). The 10- to 15-acre ranch complex is a portion of a larger approximately 200-acre parcel. The ranch complex was recently demolished. Remnant foundations and fencing remain at the Site. The previous development included a ranch house, a decorative pond, several barns and equipment sheds. A former underground fuel storage tank was located just south of one of the barn structures. A previous phase I site assessment indicated the tank was removed in the mid-1990s (Berlogar, 2000). The site is currently an active Leaking Underground Storage Tank case (LUST) under the oversight of the ACEH (Case No. R00002918).

## PREVIOUS INVESTIGATIONS/MONITORING

### 2000 – Phase I Environmental Site Assessment (ESA) (Berlogar Geotechnical Consultants, BGC)

BGC determined that the Site has been primarily used for grazing land and dry farming from at least 1957 through 1999. The reconnaissance conducted for the Phase I ESA identified the location of a former underground storage tank (UST), a diesel fuel drum-storage area, and several other areas of potential concern. Potential soil or groundwater contamination source areas identified in the Phase 1 ESA included:

- Former UST located south of Barn #1.
- A diesel fuel drum storage area at Barn #2.
- Stained soil beneath tractors and in the vicinity of storage cans and drums in Barn #1.
- Empty aboveground storage tanks (ASTs) and 55-gallon waste oil drum north of Barn #2.
- An overturned, rusted 55-gallon drum in the stream channel approximately 600 feet south of the stock pond.
- Circular "bare-earth" zones identified in 1982 and 1988 photographs.

2001 – Limited Phase II Environmental Site Assessment (ESA) (Berlogar Geotechnical Consultants, BGC)

The phase II ESA was performed by BGC in 2001 to evaluate some of the concerns identified in the Phase I ESA. The assessment concluded that an unauthorized release of petroleum hydrocarbons had occurred from the former UST. The report recommended that the release be reported to the ACEH. BGC also indicated that additional investigation might be required to determine the lateral and vertical extent of contamination at the UST location. No other environmental concerns were identified from the phase II assessment.

2006 – Soil and Groundwater Quality Investigation (Northgate Environmental Management, Northgate)

The 2006 Northgate study included the following:

- Review of previous environmental investigations performed at the Site.
- Collection and analysis of soil samples to evaluate the potential presence of pesticides and herbicides in shallow soil.
- Collection and analysis of soil and sediment samples to evaluate potential impacts related to two debris disposal areas located on the Site.
- Collection and analysis of soil, groundwater, and soil vapor samples to evaluate potential impacts related to a former underground fuel storage tank.

- Construction of five groundwater monitoring wells with development and sampling.

The Northgate report provided the following conclusions and recommendations:

- *Elevated levels of petroleum hydrocarbons as gasoline are present in soil and groundwater in the vicinity of a former UST located at the ranch complex area of the Site. Based on the sampling performed to date, it appears that elevated levels of hydrocarbons are present in soil at relatively shallow depths in the immediate vicinity of the former fuel pump and tank location, and at depths greater than about 15 feet bgs at distances greater than about 10 feet from the former tank and fuel pump location. The measured concentrations of gasoline hydrocarbon constituents in soil locally exceed Environmental Screening Levels for residential land use established by the RWQCB.*

- *Groundwater samples collected in the area of the former UST indicate that elevated levels of petroleum hydrocarbons as gasoline are present in groundwater at distances of about 150 feet from the former UST. "Grab" groundwater samples collected at distances of about 250 feet downgradient of the former UST did not contain petroleum hydrocarbons.*

- *The concentrations of benzene measured in groundwater samples collected in the immediate vicinity of the former UST exceed the primary drinking water standard and the Environmental Screening Levels for potential indoor air quality impacts in residential land use established by the RWQCB.*

- *Soil vapor samples collected within about 50 feet of the former UST contain benzene at concentrations above the Environmental Screening Levels for potential impacts to indoor air quality in residential land use.*

Northgate recommended that soil and groundwater remediation be performed prior to developing the Site. Northgate identified an excavation area of approximately 30 feet by 50 feet by about 25 feet deep (approximately 1,400 cubic yards) as the highly impacted soil contamination source area.

2006 – Supplementary Site Investigation (ICES)

The purpose of the 2006 ICES investigation was to delineate the horizontal extent of petroleum constituents detected in soil and groundwater that were encountered in previous site investigations associated with the former underground storage tank. A total of three soil samples and three grab groundwater samples were collected from three test pits (TP-1 through TP-3). Test Pit TP-1 was located northwest of the former UST; Test Pit TP-2 was located east of the former UST; and Test Pit TP-3 was located south of the former UST.

The ICES report concluded that the soil and groundwater containing elevated petroleum constituents are limited to the immediate vicinity of the former UST area.

### 2006 – Groundwater Monitoring (ICES)

In July 2006, ICES purged and recovered groundwater samples from the five existing monitoring wells. The analytical results found no detectable fuel-related compounds in three of the five wells. According to the ICES report, *"...it appears that groundwater containing elevated concentrations of petroleum constituents and VOCs which exceed their respective ESLs is limited to the immediate vicinity of the former UST"*.

### 2006 – Revised Site Mitigation Plan (ICES)

The proposed remedial activities included the removal and onsite aeration of the petroleum-affected soil, and removal and recycling of the petroleum-affected groundwater at the Site. The scope of work proposed by ICES included the following tasks:

Task 1: Site Health and Safety Plan
Task 2: Dust Control Measures
Task 3: Site Preparation
Task 4: Soil Removal
Task 5: Soil Aeration
Task 6: Groundwater Extraction
Task 7: Groundwater Disposal
Task 8: Backfill and Compact Excavation
Task 9: Laboratory Analyses
Task 10: Remedial Action Implementation Report

ICES described the removal and onsite aeration of the petroleum-affected soil, and removal and recycling of the petroleum-affected groundwater. According to ICES, the remedial activities would not only remove petroleum-affected soil at and surrounding the former UST, but also approximately 4 feet below the groundwater table within the identified groundwater plume. In addition to the confirmation excavation wall and floor samples, supplementary soil and groundwater samples would also be collected beyond the excavation limits to document the complete removal of petroleum-affected soil and groundwater.

## CONCEPTUAL SITE MODEL

We developed a conceptual site model (CSM) to integrate information on Site conditions as well as potential impacts to receptors. The CSM was developed from the known Site history and results of the soil, soil vapor, and groundwater data collected at the Site to date. A discussion of the source and type of contamination, contaminant migration and extent of impact, and a receptor exposure assessment are presented in the following sections.

## Geology and Hydrogeology

According to boring logs prepared by previous consultants, the subsurface is characterized as containing significant clay content, with some laterally discontinuous layers of sand and gravel in the capillary fringe and saturated zone. During drilling, groundwater was first encountered at depths ranging from 17 to 27 feet bgs. Based on the disparity in depth to groundwater, it appears the groundwater is present in isolated interbedded zones. At the time of the well installations, first groundwater was measured in the wells at depths up to 10 feet shallower than in the corresponding boring, which suggests semi-confined conditions. The groundwater monitoring wells are screened from 15 to 30 feet bgs. The groundwater elevation gradient has ranged from 0.0175 to 0.042 ft/ft and the flow direction is towards the south.

## Nature and Source of Contamination

The constituents of potential concern (COPC) in soil, soil vapor, and groundwater at Site include total petroleum hydrocarbons as gasoline (TPHg), diesel (TPHd), benzene, toluene, ethylbenzene, xylenes (BTEX), methyl tert butyl ether (MTBE), 1,2-dichloroethane (1,2-DCA), naphthalene, n-propylbenzene, 1,3,5-trimethylbenzene, and 1,2,4-trimethylbenzne. Data from previous assessments indicates there were likely two release points: the UST and the dispenser located approximately 25 feet northeast of the UST.

Based on information included in the phase I ESA report, the petroleum release(s) occurred sometime prior to 1995. No permits or other documentation of the UST are known to exist. Based on the lack of significant TPHd impacts, the UST appears to have been used for storing gasoline.

## Contaminant Migration and Extent of Impact

Data from the previous assessments indicates significant vadose zone soil impacts are present in the UST basin backfill and northeast of the UST basin in the vicinity of the former dispenser. TPHg has been detected in vadose zone soil at concentrations up to 1,200 milligrams per kilogram (mg/kg). In addition to TPHg, TPHd, BTEX, and MTBE have been detected in vadose zone soil at concentrations exceeding the Region 2 Environmental Screening Level (ESL) for leaching concerns. The greatest contaminant concentrations were detected in the capillary fringe or smear zone within the vicinity of the UST basin. Within the saturated zone, soil impacts have been detected at concentrations exceeding the ESL for leaching concerns, both in the source area and outside the limits of the inferred source area, extending to depths of at least 24.5 feet bgs.

The greatest groundwater impacts have been detected in the vicinity of the former dispenser, where a grab groundwater sample from the 18 to 20 foot depth interval exhibited a TPHg concentration of 250,000 ug/l. During the last two monitoring events completed in 2008 and 2010, monitoring well MW-5, which is located near the downgradient edge of the UST basin, exhibited TPHg concentrations of 66,000 and 74,000 ug/l and benzene concentrations of 24,000 and 7,500 ug/l. TPHg and benzene concentrations continue to exhibit an increasing trend in wells MW-2 and MW-5, which is an indication that a continuing source remains in the vadose and/or saturated zones near the UST basin and former dispenser. Based on the most recent data collected from MW-3 and MW-4, we estimate the TPHg and BTEX impacts to groundwater terminate approximately 60 feet downgradient from the UST basin. The MTBE impacts to groundwater appear to extend at least 140 feet downgradient from the UST basin, as indicated by the data collected from MW-4 during the most recent monitoring event.

### Receptor Exposure Assessment

The purpose of the receptor exposure assessment is to identify the human health concerns associated with the subsurface impacts found at the Site. Typical exposures to subsurface volatile impacts via three exposure pathways: inhalation of indoor air, ingestion, and dermal contact.

Since there will be no occupied structures within the Site and groundwater beneath the Site will not be used for potable purposes, we conclude that the potential exposure pathways are limited to incidental ingestion of soil and dermal contact with soil. The two identified potential exposure pathways will be addressed by ensuring that the soil cleanup goals are achieved, as discussed in the section below.

## REMEDIAL ACTION OBJECTIVES

The development plans for the Site involve construction of a park and open space. The remedial action objectives (RAOs) of the selected remedial alternative will be to eliminate human health and groundwater quality concerns associated with the subsurface impacts at the Site.

### Applicable or Relevant and Appropriate Requirements

Applicable Requirements are defined as: Those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site.

Relevant and Appropriate Requirements are defined as: Those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not “applicable” to the hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.

Applicable or Relevant and Appropriate Requirements (ARARs) typically are separated into three categories as follows:

Chemical-specific ARARs. Examples include Federal/State drinking water standards, the Clean Water Act, the Clean Air Act, and classification/regulation of hazardous waste.

Location-specific ARARs. An example is the Regional Water Quality Control Board Basin Plan.

Action-specific ARARs. Examples include requirements for the transportation of hazardous waste, occupational health and safety, and hazardous waste generation.

In addition to ARARs, this analysis includes an evaluation of To-Be-Considered (TBC) criteria. TBCs are advisories, criteria, or guidance that may be considered for a particular action or specific issue, as appropriate. TBCs are not ARARs because they are neither promulgated nor enforceable. However, according to the National Contingency Plan (NCP) guidance, these criteria also are to be considered when evaluating and selecting remedial actions necessary to protect human health and the environment. Examples of TBCs include Department of Toxic Substances Control California Human Health Screening Levels (CHHSLs), California Regional Water Quality Control Board Environmental Screening Levels (ESLs), and Environmental Protection Agency Regional Screening Levels (RSLs).

## Cleanup Goals

Numeric cleanup goals were previously proposed in the revised site mitigation plan and approved by ACEH. The soil cleanup goals are based on leaching criteria, and are more stringent than direct contact criteria. The approved cleanup goals are provided in the table below:

| Analyte | Soil (mg/kg) | Groundwater (ug/l) |
|---|---|---|
| TPHg | 100 | 100 |
| TPHd | 100 | --- |
| Benzene | 0.044 | 1 |
| Toluene | 2.9 | 40 |
| Ethylbenzene | 3.3 | 30 |
| Xylenes | 1.5 | 20 |
| MTBE | 0.023 | 5 |
| 1,2-DCA | --- | 0.5 |
| Naphthalene | --- | 17 |
| n-Propylbenzene | --- | 240 |
| 1,3,5-Trimethylbenzene | --- | 12 |
| 1,2,4-Trimethylbenzene | --- | 12 |

We propose to revise the cleanup goals for toluene, ethylbenzene, xylenes, MTBE, n-Propylbenzene, 1,3,5-Trimethylbenzene, and 1,2,4-Trimethylbenzene to reflect the current CDPH MCLs and Drinking Water Notification Levels (DWNL) as follows:

| Proposed Revised Cleanup Goals | | |
|---|---|---|
| **Analyte** | **Groundwater (ug/l)** | **Reference** |
| Toluene | 150 | MCL |
| Ethylbenzene | 300 | MCL |
| Xylenes | 1,750 | MCL |
| MTBE | 13 | MCL |
| n-Propylbenzene | 260 | DWNL |
| 1,3,5-Trimethylbenzene | 330 | DWNL |
| 1,2,4-Trimethylbenzene | 330 | DWNL |

## REMEDIAL ALTERNATIVES EVALUATION

A remedial alternative consists of a technology-based approach to physically reduce contaminant concentrations within the subsurface. The following remedial alternatives could potentially be used to achieve the RAOs for the Site.

### Alternative 1 – Excavation

Excavation is typically the most expeditious and effective method for remediating soil impacts. The process involves directly removing impacted soil from the subsurface using an excavator, backhoe, or auger. A geologist or engineer is typically present to guide the removal of impacted soil by field screening the sidewalls of the excavation using visual observations, and a photo ionization detector (PID). Once it is determined that the impacted soil has been sufficiently removed based on the field screening techniques, confirmation soil samples are collected from the sidewalls of the excavation. The excavated material is either loaded into a truck for transport and disposal at an offsite facility, or it may be treated ex-situ on-site, prior to re-use as backfill.

### Alternative 2 – Groundwater Extraction

Groundwater extraction involves pumping impacted groundwater from the subsurface to an above ground treatment system. The groundwater is typically extracted using submersible pumps placed in wells, french drains, or open excavations. Upon entering the above ground treatment system, contaminants are removed from groundwater through oxidation, biodegradation, or carbon vessels, before discharging the groundwater to the sanitary sewer, storm drain, or re-injecting into the subsurface. Additionally, groundwater can be pumped into baker tanks and trucked to an offsite disposal facility.

### Alternative 3 – Soil Mixing

Soil mixing is an in-situ technique that involves physically churning the soil with a hydraulically powered rotary mixing head which also concurrently injects a biodegradation/oxidation reagent or slurry into the soil. The hydraulic mixing head/injector attaches to the end of an excavator arm. The mixing process is typically completed in vertical lifts of up to 10 feet. Treatment depths greater than 10 feet bgs will require excavation of the overburden material in order to make the treatment zone accessible. When performed in the saturated zone, soil mixing can be used to remediate groundwater.

Alternative 4 – In-Situ Injection

The in-situ injection technique involves pumping a biodegradation/oxidation reagent into the subsurface through a well or temporary boring. This in-situ injection technique typically requires a higher pressure than used in soil mixing, in order to force the reagent through the undisturbed soil matrix. In-situ injections are most often used to remediate groundwater and saturated zone soil, but can also be used to remediate vadose zone soil under certain circumstances. Oxidizers that are typically used for remediation of petroleum impacts include peroxides and permanganates. Biodegradation reagents typically include an electron acceptor (nitrate or oxygen releasing compound) and nutrients (phosphorous or nitrogen) to stimulate indigenous bacteria. Enhanced biodegradation involves adding a bacteria strain to the reagent when populations of indigenous bacteria are insufficient.

## COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

We performed a comparative analysis of the individual remedial alternatives to evaluate the potential effectiveness, ease of implementation, and cost associated with the alternative. Based on the results of the analysis, we selected the remedial alternative or combination of alternatives that ranked highest in all three categories.

Alternative 1 – Excavation

The revised site mitigation plan prepared in 2006 proposed excavating an area roughly defined by sample locations NG-5 to the north and east, NG-3 to the west, SG-2 to the south, and a depth of approximately four feet beneath the groundwater table. The proposed plan involved aerating the excavated soil onsite and re-using the material as backfill.

Effectiveness

The excavation approach proposed in the 2006 mitigation plan would be effective in achieving RAOs for vadose and saturated zone soil within the source area, and within a considerable area outside of the source area. However, residual saturated zone soil impacts could remain untreated south of SG-2.

Implementation

Implementation of Alternative 1 as proposed in the 2006 mitigation plan is not feasible given the current aeration policy enforced by Bay Area Air Quality Management District (BAAQMD).

There are other potential ways to manage the excavated material onsite, such as enhanced biodegradation, which would make implementation of Alternative 1 feasible.

Cost

In our opinion, the proposed approach in the 2006 mitigation plan is not cost effective given the substantial volume of non-impacted overburden soil that would be removed. A more cost effective approach to implementing Alternative 1 would be to limit the excavation to vadose and saturated zone soil impacts located within the immediate source area.

Alternative 2 – Groundwater Extraction

The revised site mitigation plan prepared in 2006 proposed extracting approximately 40,000 gallons of groundwater from an open excavation. The mitigation plan involved temporarily storing the extracted groundwater in onsite tanks, profiling the groundwater for disposal facility acceptance, and trucking the groundwater to the selected offsite disposal facility.

Effectiveness

The groundwater extraction approach proposed in the 2006 mitigation plan would result in significant mass removal from groundwater in the vicinity of the source area. However, the radius of influence would likely not encompass the dissolved portion of the plume downgradient from the excavation. Installation of extraction wells in the downgradient portion of the plume would greatly increase the effectiveness of groundwater extraction.

Implementation

The groundwater extraction methodology proposed in the 2006 mitigation plan would be relatively easy to implement, since no special permitting or equipment installation would be required to pump groundwater from an open excavation and store it in above ground tanks. A significantly greater level of effort would be required to install permanent extraction wells and a long term treatment system, given the permitting and infrastructure that would be necessary.

Cost

The previously proposed groundwater extraction plan, which involved pumping approximately 40,000 gallons from the open excavation, is considered to be cost effective, given the potential mass removal benefit in a relatively short time frame, and the minimal capital costs/infrastructure necessary to implement. The cost to benefit ratio for groundwater extraction decreases when long term pumping is performed from permanent extraction wells. Additional factors that can make groundwater extraction cost prohibitive include low hydraulic conductivity, and the presence of elevated saturated soil impacts.

Alternative 3 – Soil Mixing

Soil mixing was not evaluated in the 2006 revised site mitigation plan; however, this technique is being applied at more sites in recent years, and therefore we have included it in our evaluation. Soil mixing could be used to remediate vadose and saturated zone impacts within the source area, as well as saturated zone impacts downgradient of the source area.

Effectiveness

When applied with a chemical oxidant, soil mixing results in instantaneous mass reduction. The soil disturbance action of the mixing head results in a uniform distribution of reagent. The soil mixing process is able to achieve a considerably more continuous treatment column, when compared to in-situ injections.

Implementation

Implementation of soil mixing at the Site would require a significant amount of planning and capital expenditures given the lateral and vertical extent of impacts. Treatment of the saturated zone would require excavating the upper 15 feet of overburden, and possible shoring in order to make the saturated zone accessible for in-situ soil mixing. Given the footprint of the impacted groundwater plume, a substantial volume of overburden soil would be generated. However, timeframe for treatment would likely be significantly less than groundwater extraction or in-situ injections.

Cost

Implementing soil mixing at the Site would involve substantial up front costs, given the relatively short time period for treatment. Unlike groundwater extraction or other long term strategies, there would be significant excavation contractor and vendor costs associated with performing soil mixing across the impacted area at the Site. However, soil mixing would reduce long term monitoring costs.

Alternative 4 – In-Situ Injection

Although the in-situ injection alternative was not evaluated in the 2006 revised site mitigation plan, it is widely applied at petroleum release sites throughout California. Based on the subsurface geologic conditions, a radius of influence (ROI) would be determined for the individual injection points, and a grid of temporary injection points would be applied across the footprint of the impacted area. As the injections are advanced, the reagent would be pumped continuously thought the vertical soil column until the desired depth is achieved.

Effectiveness

The effectiveness of the in-situ injections would be largely dependent on the hydraulic conductivity of the soil, which greatly influences reagent distribution and contact with the contaminant. Depending on whether an oxidation or biodegradation reagent is applied, the treatment time can vary from several months to years. Given the elevated TPHg and VOC concentrations observed in the source area, biodegradation may not be effective in achieving the cleanup goals. Typically, an oxidant would be more effective under these conditions.

Implementation

Implementing an in-situ injection program at the Site would require a relatively minimal level of effort for two reasons. First, in-situ injections require no installation of permanent infrastructure, or special permitting such as waste discharge requirements (WDRs), since the Site is located in Region 2. Second, the in-situ injection technique will not generate large volumes of impacted soil and groundwater that will need to be managed above ground. The injections will be performed using standard Geoprobe® direct push rigs, which require minimal access and are noon-intrusive to surrounding properties.

Cost

Similar to soil mixing, an in-situ injection program would involve substantial up front contractor and vender costs, since the treatment would be performed under a relatively short time frame. Additionally, there will be follow up monitoring costs associated with any in-situ injection program. However, the cumulative cost to implement an in-situ injection program would likely be less than soil mixing since the approach would not require excavating a large volume of overburden soil, and operational costs for injection equipment is significantly less than soil mixing equipment.

## PREFERRED REMEDIAL ALTERNATIVE

We evaluated the potential effectiveness, implementation, and cost of the four remedial alternatives in the context of the CSM and the identified subsurface impacts. In developing our remedial approach for the Site, we focused on the remedial alternatives that ranked the highest in each of the three evaluation categories. Based on the results of our remedial alternatives evaluation, the preferred remedial alternative consists of a combination of Alternatives 1, 2, and 4. A more detailed description of the proposed remedial alternative is provided in the following section.

## IMPLEMENTATION PLAN AND SCHEDULE

We propose to implement a combination of soil excavation, groundwater extraction, and in-situ injections to remediate the subsurface impacts at the Site. Based on our remedial alternatives evaluation, this remedial approach appears to be the technically most effective, implementable, and cost effective. We plan to implement the remedial approach in a three-step process as follows.

Excavation

The first step in our remedial approach will be to perform a limited excavation within the source area. We believe that a limited excavation is the most cost effective approach for addressing the vadose and saturated zone impacts present near the UST basin and former dispenser. The excavation will be 25 feet in depth, and will consist of two overlapping areas measuring 25 feet by 25 feet centered on the UST basin and former dispenser locations (Figure 2). The excavation will generate approximately 1,100 cubic yards of soil, which will be segregated and temporarily stockpiled on visquene adjacent to the excavation. We anticipate that at least the upper 5 feet of soil will be non-impacted and available for immediate re-use onsite after testing.

Based on the average depth to groundwater observed during drilling (20 feet bgs), we anticipate that the excavation will extend approximately 5 feet below the groundwater table. In order to allow for excavation below the groundwater table, it may be necessary to pump groundwater from the excavation into an above ground storage tank during the excavation activities. Since a portion of the excavated soil will be saturated, measures will be taken to properly manage any runoff water generated from the stockpiles.

Upon completion of the source area excavation, confirmation samples will be collected from the excavation to verify that the soil cleanup goals have been achieved. A total of four confirmation samples will be collected from the base of the excavation and eight confirmation samples will be collected from the sidewalls at a depth of approximately 15 feet bgs. Representative soil samples from the base and sidewalls of the excavation will be collected in the excavator bucket and transferred to stainless steel sample tubes, which will be fitted with teflon, plastic caps, and labeled with a sample ID. The soil samples will be submitted to a State certified laboratory for analysis of TPHg and TPHd by EPA Test Method 8015; and VOCs by EPA Test Method 8260B.

The excavation will be backfilled with clean import material in accordance with the geotechnical engineer’s recommendations, following completion of the excavation and groundwater extraction activities.

We propose to remediate the excavated soil onsite using enhanced biodegradation. After spreading out the stockpile into an 8-inch lift, baseline contaminant concentrations will be determined by collecting and analyzing four discrete samples per 1,000 cubic yards. After reviewing the baseline data, we will determine the appropriate parameters for applying enhanced biodegradation. Enhanced biodegradation will involve treating the stockpile with a proprietary liquid reagent (trade name BioCritters™) which is produced by Catalina Biosolutions. BioCritters™ is a special blend of naturally-occurring microbes grown in carbon pellets and mixed with nutrients. The blend reportedly contains facultative anaerobic microorganisms, which thrive in both anaerobic and aerobic environments. As the reagent is introduced to the stockpile through several disking or tilling applications, oxygen will provide an electron acceptor for the bacteria, which will consume the hydrocarbon compounds through aerobic respiration. The final end product of the biodegradation process is carbon dioxide and water. During the remediation process, interim sampling will be completed to monitor the effectiveness. Interim sampling will be performed on a four discrete samples per 1,000 cubic yards basis. Final screening of the stockpile will be performed in accordance with the *Region 2 Technical Reference Document, Characterization and Reuse of Petroleum Hydrocarbon Impacted Soil as Inert Waste, October 20, 2006.* Based on these guidelines, we will collect and analyze 27 discrete samples on a uniform grid from the remediated stockpile. If any of the samples exceed the cleanup goals, additional remediation and sampling of that location will be performed. The soil cleanup goals are based on leaching criteria and are more stringent than direct contract criteria. Therefore, we propose to reuse the soil as fill in the excavation (above the water table) and adjacent open space portion of the development. In accordance with BAAQMD requirements, we will implement best management practices to minimize aeration of VOCs from the stockpiles. These practices will include moisture conditioning and covering the stockpiles with visqueen after disking/tilling activities are complete. The length of time to complete remediation of the stockpiles will be estimated upon reviewing the initial baseline sample results. If stockpile remediation requires more than three months to reduce the contaminant concentrations to below the cleanup goals, BAAQMD will require a permit. Additionally, the City of Dublin will require a grading permit, however, the bond and deposit for inspection services will waived if already covered under the Jordan Ranch subdivision agreement.

Upon receiving ACEH approval of this workplan, we will commence with scheduling the soil excavation. Depending on the excavation contractor availability, the timeframe for City of Dublin to process the grading permit, and weather conditions, we anticipate that the excavation field activities will begin one month following workplan approval. We estimate the soil excavation and backfill will be completed in three days. Bioremediation of the excavated soil will commence immediately following completion of the excavation, and we estimate the stockpile will undergo bioremediation for at least three months before the cleanup goals are reached. Since the disturbed area will be less than one acre, and the excavation area is not located within the construction area for the residential development, we do not anticipate preparing a SWPPP, unless required by the grading permit.

## Groundwater Extraction

Since we anticipate that impacted groundwater will be present in the source area excavation, we propose to extract the impacted groundwater while it is readily accessible. The cost and level of effort to extract groundwater from an open excavation is relatively minimal, and therefore it is a cost effective means of mass removal.

We estimate that up to five vertical feet of groundwater (45,000 gallons) may be present in the excavation if left open for more than a day. After completing the excavation, we propose to return the following day and use a 3” diameter trash pump to remove approximately 40,000 gallons at a pumping rate of 400 gallons per minute. The groundwater will be pumped into two 20,000 gallon baker tanks, and stored onsite while it undergoes remediation. Remediation of the extracted groundwater will be performed using BioCritters™. If the remediation is successful in achieving the groundwater cleanup goals, the extracted groundwater will be used onsite for dust control. Alternatively, the extracted groundwater could be pumped through carbon vessels or into tanker trucks, and transported to an offsite disposal facility.

Groundwater extraction will be performed concurrent with the excavation activities and prior to the planned backfill. Within two weeks following completion of the groundwater extraction activities, we will profile the containerized water and decide whether the groundwater will be treated for re-use onsite or transported to an offsite disposal facility. If onsite treatment using enhanced biodegradation is determined to be the preferred approach, the biodegradation process would likely be performed for at least three weeks before the groundwater cleanup goals are achieved.

In-Situ Injections

The excavation and groundwater extraction activities will remove the bulk of the contamination, which is located in the source area near the UST basin and former dispenser. However, residual groundwater and saturated soil impacts will still remain outside the limits of the excavation.

We plan to inject BioCritters™ at 24 points, spaced approximately 15 feet apart in a grid pattern across the groundwater remediation area shown on Figure 2. Although a portion of the MTBE impacts extend beyond the proposed groundwater remediation area, we anticipate the downgradient MTBE concentrations will decrease as a result of the mass flux reduction resulting from the source area remediation. The number of injections points and spacing may be revised upon completing an injection flow rate test. At each injection point, a total of 45 gallons of the aqueous reagent will be pumped at 1-foot intervals from 17 to 25 feet bgs. The reagent will be prepared in onsite tanks and transferred to the injection pump for introduction to the subsurface. Given the cohesive soils, the injections will be performed using the “top down” method. Following completion of the injections, the borings will be grouted in accordance with ACEH requirements.

We plan to initiate the injection program within one week after the excavation is backfilled. Depending on the number of injection points, volume, and flow rate, the injection field activities will be completed in approximately one to three weeks. The need for an additional injection event(s) will be evaluated upon completing two quarterly groundwater-monitoring events.

Given the suitability of the reagent to anaerobic and aerobic environments, and the lack of detrimental byproducts such as hexavalent chromium or chlorides, we propose no baseline sampling, in addition to the previously collected quarterly monitoring data.

## POST REMEDIATION MONITORING AND SITE CLOSURE

Given the contaminant concentrations currently observed in wells MW-2 and MW-5, we estimate the timeframe to achieve the groundwater cleanup goals following remediation will likely be at least six to nine months. Following completion of the three-step remediation plan, we propose to perform groundwater monitoring for all five wells on a quarterly basis for one year. If we observe a significant reduction in contaminant concentrations, but the groundwater cleanup goals have not been achieved upon completing the four quarterly groundwater monitoring events, we will discuss with ACEH whether it is appropriate to proceed with a no further action request or proceed with a monitored attenuation approach, with reduced sampling frequency.

## PUBLIC PARTICIPATION

Upon receiving ACEH approval of this updated CAP, we will mail a fact sheet to the list of recipients provided to us by ACEH. Additionally, we will prepare a letter certifying that we mailed the fact sheet. There will be a 30 day public comment period once the fact sheet is mailed out. We will address any public comments in an addendum, which will be attached to the updated CAP.

We look forward to working with you on this project. If you have any questions regarding the scope of this workplan, please do not hesitate to contact us.

Sincerely,

ENGEO Incorporated

Morgan Johnson
Project Manager

Shawn Munger, CHG
Principal

CERTIFIED HYDROGEOLOGIST
SHAWN MUNGER
No. HG 413
CERTIFIED HYDROGEOLOGIST
Exp. 3/31/2011
STATE OF CALIFORNIA

Attachments: References
Figure 1 – Site Vicinity Map
Figure 2 – Proposed Soil Excavation and Groundwater Remediation Areas
Perjury Statement

Copies: Mr. Ravi Nandwana, Mission Valley Homes

## REFERENCES

Alameda County Environmental Health, Letter to Jordan Family Trust re: Technical Comments, Jordan Ranch, 4233 Fallon Road; July 10, 2006.

Alameda County Environmental Health, Letter to Jordan Family Trust re: Technical Comments, Jordan Ranch, 4233 Fallon Road; August 28, 2006.

Alameda County Environmental Health, Letter to Standard Pacific Homes re: SLIC – Geotracker Case, Jordan Ranch, 4233 Fallon Road; March 26, 2009

Alameda County Environmental Health, Letter to Standard Pacific Homes re: Geotracker Status, Jordan Ranch, 4233 Fallon Road; July 24, 2009.

Berlogar Geotechnical Consultants, Limited Phase I Environmental Site Assessment, Jordan Ranch, 4233 Fallon Road, Dublin, California; September 14, 2000.

Berlogar Geotechnical Consultants, Limited Phase II Environmental Site Assessment, Jordan Ranch, 4233 Fallon Road, Dublin, California; January 25, 2001.

ENGEO, Groundwater Monitoring Report, Jordan Ranch, Dublin, California, September 21, 2010.

ICES, Supplementary Site Investigation, Jordan Ranch, 4233 Fallon Road, Dublin, California; March 13, 2006.

ICES, Site Mitigation Plan, Jordan Ranch, 4233 Fallon Road, Dublin, California; March 15, 2006.

ICES, Groundwater Monitoring – July 2006, Jordan Ranch, 4233 Fallon Road, Dublin, California; August 4, 2006.

ICES, Revised Site Mitigation Plan, Jordan Ranch, 4233 Fallon Road, Dublin, California; August 7, 2006.

ICES, Letter re: Technical Comments, Jordan Ranch, 4233 Fallon Road, Dublin, California; August 7, 2006.

Northgate Environmental Management, Soil and Groundwater Quality Investigation, Jordan Ranch, 4233 Fallon Road, Dublin, California; June 16, 2006.


BASE MAP SOURCE: MS STREETS AND TRIPS

ENGEO
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VICINITY MAP
JORDAN RANCH
DUBLIN, CALIFORNIA

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| PROJECT NO.: 7828.000.001 | FIGURE NO. 1 |
| DATE: JANUARY 2011 | |
| DRAWN BY: DLB | CHECKED BY: SM |

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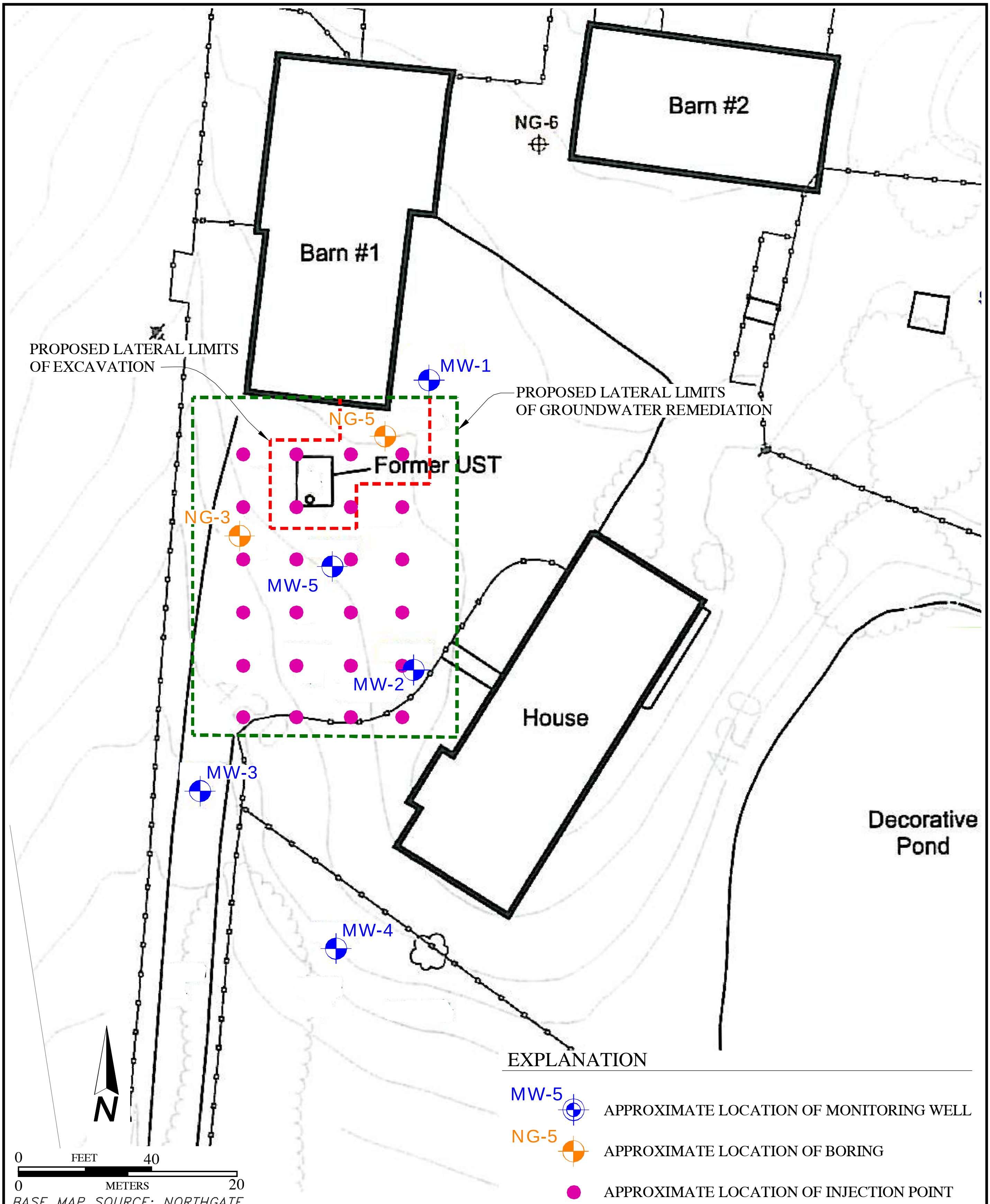


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PROPOSED SOIL EXCAVATION AND
GROUNDWATER REMEDIATION AREAS
JORDAN RANCH
DUBLIN, CALIFORNIA

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| PROJECT NO.: 7828.000.001 | |
| DATE: JANUARY 2011 | |
| DRAWN BY: SRP | CHECKED BY: SM |

FIGURE NO.
2

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ORIGINAL FIGURE PRINTED IN COLOR

Date: JANUARY 18, 2011

Subject: Jordan Ranch Property – Former Leaking Underground Storage Tank
Dublin, California

**PERJURY STATEMENT**

"I declare, that to the best of my knowledge at the present time, the information and/or recommendations contained in the attached document are true and correct."

Submitted by Responsible Party:

ROBERT RADANOVICH
BJP-ROF Jordan Ranch, LLC
5000 Hopyard Road, #170
Pleasanton, CA 94588