



Technical Memorandum

Addendum to the Remedial Design/Remedial Action Work Plan for the Monk Hill Treatment System

National Aeronautics and Space Administration, Jet Propulsion Laboratory

Final

December 2009

1.0 INTRODUCTION

To address chemicals in off-facility groundwater, the National Aeronautics and Space Administration (NASA) is funding removal of perchlorate and volatile organic compounds (VOCs) from the aquifer at four Pasadena Water and Power Department (PWP) drinking water wells by adding a treatment facility to treat pumped groundwater. The plan for implementing this response action is documented in the approved Remedial Design/Remedial Action (RD/RA) Work Plan.¹ Additional information regarding the site characteristics (i.e., site setting, nature and extent of chemicals, fate and transport, and exposure pathways) can be found in the Record of Decision (ROD) for Operable Unit 3 (OU-3).²

The purpose of this RD/RA Work Plan Addendum is to present details of a new, preferred method for treating initial well development water. The original approach presented in Appendix L of the RD/RA Work Plan¹ included two different methods for disposing of the initial well development water:

1. Temporary containment and off-site disposal
2. On-site treatment and disposal

A third option, consisting of a temporary pipeline to the Operable Unit 1 (OU-1) source area treatment plant, was identified after the approval of the RD/RA Work Plan. The temporary pipeline option is less labor intensive, uses fewer resources, and has a lower environmental impact than the original approach. Therefore, the temporary pipeline is NASA's preferred approach for treating approximately 1.2 million gallons of initial well development water. This addendum describes the temporary pipeline approach, and identifies appropriate safety precautions and monitoring.

¹ National Aeronautics and Space Administration (NASA). 2009. Remedial Design/Remedial Action Work Plan for the Monk Hill Treatment System, *National Aeronautics and Space Administration, Jet Propulsion Laboratory, Pasadena, California*. March.

² National Aeronautics and Space Administration (NASA). 2007. *Final Interim Record of Decision for Operable Unit 3, Off-Facility Groundwater*, *National Aeronautics and Space Administration, Jet Propulsion Laboratory, Pasadena, California*. May.

2.0 INITIAL WELL DEVELOPMENT WATER

Water and debris removed from the production wells during initial well cleaning cannot be treated at the new Monk Hill Treatment System (MHTS) due to the high solids content. Two treatment options were initially evaluated for this initial well development water: 1) temporary containment and off-site disposal and 2) temporary on-site treatment and disposal. A third and preferred option consisting of a temporary pipeline to NASA's OU-1 source area groundwater treatment system was identified after the RD/RA Work Plan was approved.

Attachment A contains an evaluation of all three disposal options for initial development water generated during the well rehabilitation efforts. The City of Pasadena has reviewed and approved use of the temporary pipeline for initial development water. Attachment B contains an addendum to the Mitigated Negative Declaration, which was issued by the City of Pasadena.

Temporary Pipeline

This temporary pipeline option utilizes NASA's existing OU-1 treatment system to treat development water generated during initial well cleaning activities. A temporary pipeline capable of transferring 1.2 million gallons of water will be installed from the Ventura sump to the NASA's OU-1 groundwater treatment system located in the north-central portion of the Jet Propulsion Laboratory (JPL).

Development water from each of the production wells will be transferred to the OU-1 system for treatment via existing below-ground piping (i.e., from the Windsor well to Ventura sump) and approximately 5,300 feet of temporary above-ground piping extending from the Ventura sump to the OU-1 treatment system. The temporary pipeline will be constructed of 4-inch diameter high density polyethylene (HDPE) Standard Dimension Ratio (SDR) 11 piping rated at 160 pounds per square inch (psi). All joints will be heat welded to prevent leakage, and the pipeline will be anchored using a combination of wooden stakes and sandbags. At locations near existing utility corridors where deep staking will be required, utility locating will be performed.

The pipeline will be able to accommodate a 50 gpm maximum flowrate. To overcome the roughly 150 foot head difference and pipeline friction loss, an electric or gasoline powered booster pump will be installed at the Ventura sump to lift the water to the OU-1 treatment system. The pumps and generators will be approved and permitted by the South Coast Air Quality Management District (SCAQMD), with required spill prevention and record keeping. To minimize water hammer and excessive stress on joints in the pipeline, check valves will be installed approximately every 500 feet. It is anticipated that the temporary pipeline will be in place for approximately six months.

Vehicle and Pedestrian Traffic Flow

Installing the temporary piping in the Arroyo and through JPL will have a relatively minor impact on traffic flow. To minimize the impact of the temporary pipeline on JPL and the Arroyo Seco, routing in areas that are not used for vehicle or pedestrian traffic will be utilized wherever possible. When vehicle or pedestrian traffic may be impacted, below-grade trenches or speed-bump crossing pipe will be utilized to keep the roadway open. Trenches will be temporarily covered with steel trench plates during pipeline use and repaired after the

temporary pipeline is removed. Any work done in the roadway will be done during non-business hours so that traffic is not impacted. Utility locating will be completed, as appropriate, prior to trenching.

Safety Precautions and Monitoring

To address the potential for pipeline leaks or breaks, the pipeline will only be operated while operators are present. In addition, a pipeline inspection will be performed multiple times each day during operations. During non-working hours, the pipeline will be emptied. If any leaks are detected, the transfer of water will be halted until the leak is repaired. The temporary pipeline will be equipped with valves at the check valve locations (approximately one every 500 feet) so that sections of the pipeline can be isolated for repair, if needed.

Pipeline Location

The temporary pipeline would be installed from the Ventura sump to the NASA's OU-1 groundwater treatment system. Attachment C contains a proposed layout for the temporary pipeline.

3.0 RECOMMENDATION

Utilizing the temporary pipeline and the existing OU-1 treatment facility will allow the water to be treated and reinjected without mobilizing a separate treatment facility. This is important due to the limited amount of space in the Arroyo Seco around the production wells. In addition, the temporary pipeline will cost less and have a reduced environmental impact (both in terms of aesthetics and carbon footprint). The OU-1 system is already equipped to handle impacted groundwater in a safe and efficient manner and can accommodate the water quality anticipated for this initial well development water.

Based on the information presented above, the temporary pipeline option will be implemented to treat the development water generated during the initial well cleaning. This option is less labor intensive, uses fewer resources, and has a lower environmental impact than the original approach. NASA has coordinated with and obtained approval from the City of Pasadena and the JPL facility on the temporary pipeline approach.

Attachment A

Evaluation of Disposal Options



Technical Memorandum

Evaluation of Disposal Options for Initial Development Water Generated during Operable Unit 3 Municipal Production Well Rehabilitation

National Aeronautics and Space Administration, Jet Propulsion Laboratory, Pasadena, California

Final

October 2009

1.0 INTRODUCTION

To address chemicals in off-facility groundwater, NASA has agreed to fund removal of target chemicals (perchlorate and volatile organic compounds [VOCs]) from the aquifer at four City of Pasadena (CoP) drinking water wells by adding a treatment facility to treat pumped groundwater at the Windsor Reservoir. This treatment facility will be known as the Monk Hill Treatment System (MHTS). In this remedy, NASA will directly administer the work associated with designing, permitting, and constructing the MHTS. Groundwater from four CoP drinking water wells – Arroyo Well, Well 52, Windsor Well, and Ventura Well – will be cleaned in this new treatment facility by a liquid-phase granular activated carbon (LGAC) system to remove VOCs, and an ion exchange system to remove perchlorate.

Due to the age and recent inoperation of these wells, they must be rehabilitated prior to activation. A significant volume of water is expected to be generated during the initial phase of the rehabilitation effort (e.g. initial well cleaning) and during subsequent well development and performance testing activities. During the initial well cleaning, the anticipated water quality (i.e. particulate and chemical load: biomass, mineral precipitate, silt/sand content, metallic corrosion, etc.) will be such that MHTS cannot be used for treatment due to design limitations. Therefore, an alternate means of treatment, such as off-site disposal or temporary on-site treatment and disposal, must be used. Because the initial well cleaning will substantially increase the quality of extracted water, it is anticipated that water generated during the latter stages of the rehabilitation effort (well development and performance testing) can be routed through the MHTS for treatment and subsequent disposal/reuse. This technical memorandum evaluates the cost/feasibility of different options for disposal of water from the initial well cleaning.

2.0 INITIAL WELL CLEANING ACTIVITIES

After the equipment has been removed from the well and inspected, an initial well cleaning will be performed to remove debris that may have accumulated on the well casing over time. During the initial well cleaning, it is anticipated that one or more of the procedures will be utilized: brushing, dual-swab airlifting, chemical treatment, air bursting, and AquaFreed®.

Brushing is utilized as a preparative step before other rehabilitation techniques are utilized in the well, and will likely be performed in each well. The inside of the existing well casing will be brushed with a wire or nylon brush to remove debris and incrustations. Following the brushing activities, material that has accumulated in the sump will be removed using a suction bailer, or open-ended air lift pumping tool.

Dual-Swab Airlifting is designed to dislodge debris from the casing and remove it from the well. The tool consists of a vertical discharge pipe (eductor) with a smaller airline suspended down the middle of the pipe. A perforated section of pipe with two rubber swab flanges is connected and located at the bottom of the eductor pipe. The swabs are primarily designed for cleaning and stabilization of the assembly in the well. The airline discharge is installed above the surge blocks inside the pipe. Compressed air is pumped through the airline from the surface with an air compressor and is released into the eductor pipe causing a

mixture of air bubbles and water. Continued injection of compressed air causes the mixture to flow up and out of the eductor pipe. It is anticipated that the dual-swab tool will be moved up and down within the well over an approximately 10-15 foot interval while simultaneously pumping the well. The actual field-applied method depends upon a number of factors, including air volume, submergence (i.e., the depth below the static water level at which the air is introduced), total lift, and the cross-sectional area of the discharge or eductor pipe (i.e., diameter of discharge pipe). Dual-swab airlifting will likely be implemented in each well following the initial brushing. This technique will be performed over a 24-hour period at a maximum flow rate of 300 gallons per minute (gpm), and will result in approximately 300,000 gallons of water and debris being removed from the well.

Chemical Treatment may be performed on the well casing using acids, dispersants, or disinfectants. The chemicals will be mixed above-ground and injected into the well via a tremie pipe between dual/swabs with rubbers set 10 feet apart. The injected chemicals will have a sufficient quantity to displace at least one complete borehole volume and have a concentration sufficient enough to not become diluted. The injected chemical solution will remain in the well for a period of time (chemical-specific) that is sufficient for the chemicals to react with and dislodge or dissolve the debris that has accumulated on the well casing. Once the chemical treatment has reacted with the debris, the solution will be removed from the well. Upon removal, the solution will be tested for residual chemical concentrations and neutralized accordingly. Typically acids are neutralized with soda ash, and sodium hypochlorite (i.e. Bleach) is neutralized with sodium thiosulphate.

Air Bursting may be performed in the well to further clean the casing. This method is performed using an air gun device (BoreBlast®) that is lowered into the well on a high pressure hose. The gun is pressurized with an inert gas (e.g., nitrogen) when it reaches the perforations in the well casing. As the pressure is released, the pressure wave dislodges mineral scale from the casing and scours the casing surface as the inert gas rushes to the surface.

AquaFreed® is a method that involves the controlled injection of liquid and vapor-phase carbon dioxide (CO₂) into a well. The well is sealed after three injection lines have been strategically placed throughout the perforated zones of the well. The CO₂ expands up to 500 times when the liquid converts to a gas; this rapid expansion allows for excellent penetration of the gravel pack and formation. The groundwater in the well will become saturated with CO₂ forming a mild carbonic acid that will assist in the breakup the matrix of the mineral deposits within the well. The resulting physical agitation scours the casing and gravel pack. Injection of the CO₂ creates a pressurized environment inside the sealed well casing and depresses the column of water in the casing down to the top of the perforations where it begins to constantly surge the well in response to the injection process.

The initial well cleaning is anticipated to generate approximately 300,000 gallons of development water from each well, for a total of 1.2 million gallons. The vast majority of this water is generated during the dual-swab airlifting process at an estimated maximum flow rate of 300 gpm.

3.0 DEVELOPMENT WATER DISPOSAL OPTIONS

Water and debris removed from the production wells during initial well cleaning will have to be disposed of accordingly. Three disposal options have been evaluated: temporary containment and offsite disposal, temporary on-site treatment and disposal, and transfer via temporary pipeline to NASA's Operable Unit (OU-1) groundwater treatment system. The following subsections discuss these options in detail.

3.1 Temporary Containment and Offsite Disposal

This disposal option consists of temporary on-site containment and subsequent offsite disposal of water generated during initial well cleaning activities. The containment process consists of connecting approximately eight 21,000-gallon Baker® tanks to the discharge line in series. The tanks will be staged adjacent to each wellhead during well cleaning. Although the total capacity of these tanks is slightly more than half that of the estimated volume of development water (300,000 gallons), space restrictions at the wellheads dictate that the use of additional tanks is not logistically feasible. The first one to two tanks in series will serve as settling tanks for the significant quantity of solids (i.e., sand and debris) that is expected to be generated during the initial well cleaning. As needed, water will be removed from the Baker® tanks using a vacuum truck and transported offsite for disposal. Samples of the development water will need to be collected and analyzed prior to removal to determine the appropriate disposal method. The estimated volume of development water necessitates roughly 64 change-outs using vacuum trucks, resulting in significant increased traffic flow around the wells. The change-outs will need to occur during well cleaning activities due to the aforementioned storage restrictions. Table 1 presents the advantages, disadvantages, and approximate cost associated with the temporary containment and offsite disposal option.

Table 1. Summary of Development Water Disposal Options

Disposal Option	Advantages	Disadvantages	Approximate Cost
Temporary Containment and Offsite Disposal	• No temporary treatment system required to treat water prior to disposal • Wells developed in series, so only one set of equipment is necessary	• Cost and labor intensive • Required number of change-outs results in increased traffic and noise • Increased resource usage – 64 tanker truck change-outs required per well (consumes roughly 5,200 gallons of gasoline/ diesel) • Logistical difficulties – space for Baker® tanks is limited near the production wells • Extraction rate and duration limited by the number of tanks and the change-out frequency • Development water cannot be reclaimed • Must relocate equipment between wells	\$725,000 ^(a)
On-Site Treatment and Disposal	• Wells developed in series, so treatment system can be installed at a single central location • Development water can be reclaimed through infiltration • Less labor intensive • Lower cost • Less resource usage • Minimal traffic and noise • Extraction rate not limited by storage volume	• Treated water must meet RWQCB WDRs prior to disposal • Water must be routed significant distances (>2,000 ft) from the wellheads to the TTS • Discharge piping must cross access road	\$540,000 to \$690,000 ^(b)
Temporary Pipeline	• Development water can be treated by OU-1 treatment system • Development water can be reclaimed through injection • Lower carbon footprint • Less labor intensive • Lower cost	• Pipeline runs through Hahamonga park, JPL parking lot, and onto JPL property • Pipeline must be inspected on a routine basis to ensure that it is not leaking • Piping must cross roads, drainage swales, and a bridge • Repairs will be required at road crossings	\$135,000 ^(c)

	• Less resource usage • Additional laboratory analyses not necessary (covered by OU-1 sampling schedule)	at project completion	
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- (a) Approximate cost is based on subcontractor estimates for temporary containment, off-site transportation and disposal.
- (b) Approximate cost is based on two subcontractor estimates for rental of equipment for on-site treatment and disposal.
- (c) Based on initial estimates for installation and servicing. Based on 6 month time span.

3.2 *On-Site Treatment and Disposal*

This disposal option consists of on-site treatment and subsequent disposal of development water generated during well cleaning activities. Table 1 presents the advantages, disadvantages, and approximate cost associated with this treatment option. A temporary treatment system (TTS) capable of handling a 300 gpm influent would be installed at the Ventura well site during the entire duration of the initial well cleaning. Development water from each of the wells would be transferred to the TTS for treatment via existing below-ground piping (i.e. 12" ductile iron pipeline from the Windsor well to the Ventura sump) and up to 2,500 ft of temporary above-ground piping (to connect the Arroyo and Well 52 wells to the Ventura Well). Water from each well will first be routed through two interconnected 21,000 gallon Baker® tanks at the wellhead that will serve as settling tanks. The development water will be treated to meet the Regional Water Quality Control Board (RWQCB) General Waste Discharge Requirements (WDRs) prior to disposal. To meet these requirements, the TTS will be engineered to consist of a three-step process that includes a filtration step, an adsorption step, and an ion exchange (IX) step. The filtration step will consist of a sand filter that is designed to remove particulate and coagulated particles, resulting in effluent water having turbidity less than 0.5 NTU. The second step will consist of volatile organic compound (VOC) adsorption by granular activated carbon (GAC), and the third step will consist of a perchlorate-sensitive IX resin that will be utilized to remove perchlorate (and to a lesser degree sulfate and nitrate) from the water.

Treated water leaving the TTS will be routed through a holding (Baker®) tank, where composite samples will be periodically collected for analysis to ensure that the WDRs are being met. Water from the holding tank will be discharged via temporary above-ground piping to Arroyo Seco Spreading Basin 10, which is located approximately 90 ft northwest of the Ventura well. Discharge of the water to basin 10 will be by gravity feed or gasoline powered transfer pump assisted. This temporary piping will cross the access road in at least one location.

3.3 *Temporary Pipeline to NASA's OU-1 Treatment System*

This disposal option utilizes NASA's existing OU-1 treatment and subsequent aquifer re-injection of development water generated during initial well cleaning activities. Table 1 presents the advantages, disadvantages, and approximate cost associated with this treatment option. A temporary pipeline capable of transferring 1.2 million gallons of water would be installed from the Ventura sump to the NASA's OU-1 groundwater treatment system located at the Jet Propulsion Laboratory.

Development water from each of the wells would be transferred to the JPL OU-1 system for treatment via existing below-ground piping (i.e. from the Windsor well to Ventura sump) and approximately 5,300 ft of temporary above-ground piping (i.e. extending from the Ventura sump to the OU-1 treatment system). The temporary pipeline will be constructed of 4" diameter High Density Polyethylene (HDPE) Standard Dimension Ratio (SDR) 11 piping rated at 160 psi. All joints will be heat welded to prevent leakage, and the pipeline will be anchored using a combination of wooden stakes and sandbags. The pipeline is designed with a 50 gpm maximum flowrate and 10 psi friction loss. To overcome the ~150 foot head difference and pipeline friction loss, a gasoline powered booster pump will be installed at the Ventura site to lift the water to the OU-1 treatment system.

A second 4" HDPE SDR 11 temporary above-ground pipeline will be installed connecting the Arroyo, Well 52, and the Ventura wells. The second pipeline will have an approximate length of 1,400 feet. This pipeline will allow water to be transferred back to the Ventura sump prior to being pumped to the OU-1 treatment system.

Generalized process flow:

Water from each well will first be routed through a roll-off bin (i.e. 17' x 8' x 4' tank for solids collection), and then transferred with gasoline powered transfer pump to a 21,000 gallon Baker® tank. The use of two initial holding tanks will allow the entrained solids to settle. The water will then be pumped through a sand filter to remove particulates and placed into a second 21,000 gallon Baker® tank. Next the water will be pumped with a gasoline powered pump from the second Baker® tank to the 38,000 gallon Ventura sump. The final step will involve pumping water from the Ventura sump through the 5,300 foot temporary pipeline to the OU-1 treatment system for processing.

Well-specific process flows:

Windsor Well

Initial development water generated during the rehabilitation of the Windsor well will utilize the same generalized process flow mentioned above. Water will be pumped from the second Baker® tank to the Ventura sump via the existing CoP 12" ductile iron pipeline. Access to the pipeline will be through a pipeline flange located approximately 40 feet from the Windsor well. To ensure that water flows to the sump, CoP valves #1, #2, and #10 will need to be closed. Once the water reaches the sump, it will then be pumped with a gasoline powered pump through the 5,300 foot temporary pipeline to the OU-1 treatment system for processing.

Arroyo Well

Initial development water generated during the rehabilitation of the Arroyo well will utilize the same generalized process flow mentioned above; however due to space limitations, only a roll-off bin will be staged at the Arroyo well. Water will be pumped from the roll-off bin to a Baker® tank located at the Well 52 site through the second temporary pipeline. Next water will be pumped through a sand filter to remove particulates and placed into a second 21,000 gallon Baker® tank. Next the water will be pumped through the remaining section of the second pipeline to the Ventura sump. Upon reaching the sump, the water will then be pumped through the 5,300 foot temporary pipeline to the OU-1 treatment system for processing.

Well 52

Initial development water generated during the rehabilitation of Well 52 will utilize the same generalized process flow mentioned above. Water will be pumped (using a temporary gasoline powered transfer pump) from the second Baker® tank to the 38,000 gallon sump via the second pipeline. The water will be pumped out of the Ventura sump and transferred via the 5,300 foot temporary pipeline to the OU-1 treatment system for processing.

Ventura Well

Initial development water generated during the rehabilitation of the Ventura well will utilize the same generalized process flow mentioned above. Water will be pumped (using a temporary gasoline powered transfer pump) from the second Baker® tank to the 38,000 gallon sump via above ground piping. The water will be pumped out of the Ventura sump and transferred via the 5,300 foot temporary pipeline to the OU-1 treatment system for processing.

Installation and removal schedule:

It is anticipated that the temporary pipeline will be installed in early January 2010, and will be removed in June 2010. This schedule is based on the MHTS construction schedule. The pipeline will be removed by the installation contractor and it is assumed that it will be recycled or reused.

Hours of operation:

The transfer of initial development water through the temporary pipelines will occur during regular work hours (i.e. Monday – Friday 07:00 – 17:00). At the completion of days when the pipeline is utilized, potable water will be flushed through the pipelines. The pipelines will be visually inspected and monitored five times per day (i.e. 07:00, 09:30, 12:00, 14:30, and 17:00) during its use.

Figure 1, below, shows the 5,300 foot temporary pipeline layout as well as swale, road, and bridge crossing. Attachment A contains more detailed routing locations for the temporary piping. The piping, beginning from the Ventura well site, will:

1. Route along the east side of the Karl Johnson parkway above grade;
2. Cross the road below grade near the northern access gate (i.e. near Arroyo well);
3. Travel above grade and along the eastern edge of the Oak grove (i.e. behind boulders);
4. Cross a drainage swale sufficiently elevated and secured to accommodate possible storm flows;
5. Laid above grade on the west side of the JPL East Lot western fence-line;
6. Cross the northern CoP access road below grade to the spreading basins;
7. Transitioned to the east side of the JPL East Lot western fence-line so as to not impact the native plant habitat; and
8. Cross the northern side of the JPL Bridge leading into the JPL facility, and routed to the JPL OU-1 treatment plant for treatment of the water.

The second 1,400 foot pipeline (see detail in Attachment A) from Arroyo to Ventura well sites, will:

1. Cross the road near the Arroyo well;
2. Route along the east side of the Karl Johnson parkway above grade;
3. Ball valves and Tee connectors at Arroyo, Well 52, and Ventura.

Pipelines will be buried beneath high traffic areas located off the JPL property. At the completion of the initial well cleaning, all temporary pipelines and supporting hardware will be removed from the property, pipeline trenches will be backfilled, compacted, and the surface restored to the CoP Public Works' requirements.

The development water will be treated to meet the EPA, CA Department of Public Health, and Regional Water Quality Control Board's requirements for the OU-1 treatment system prior to re-injection.



Figure 1 Pipeline Overview

4.0 RECOMMENDATIONS

Based on the information presented above, it is recommended that the temporary pipeline option be implemented to handle the development water generated during the initial well cleaning. Although this option requires a significant up-front coordination with CoP, Hahamonga Watershed Park, and the JPL facility, it is less labor intensive, uses fewer resources and has a lower carbon footprint. In addition, this option is lower in cost and allows for reclamation of extracted water.

Attachment A

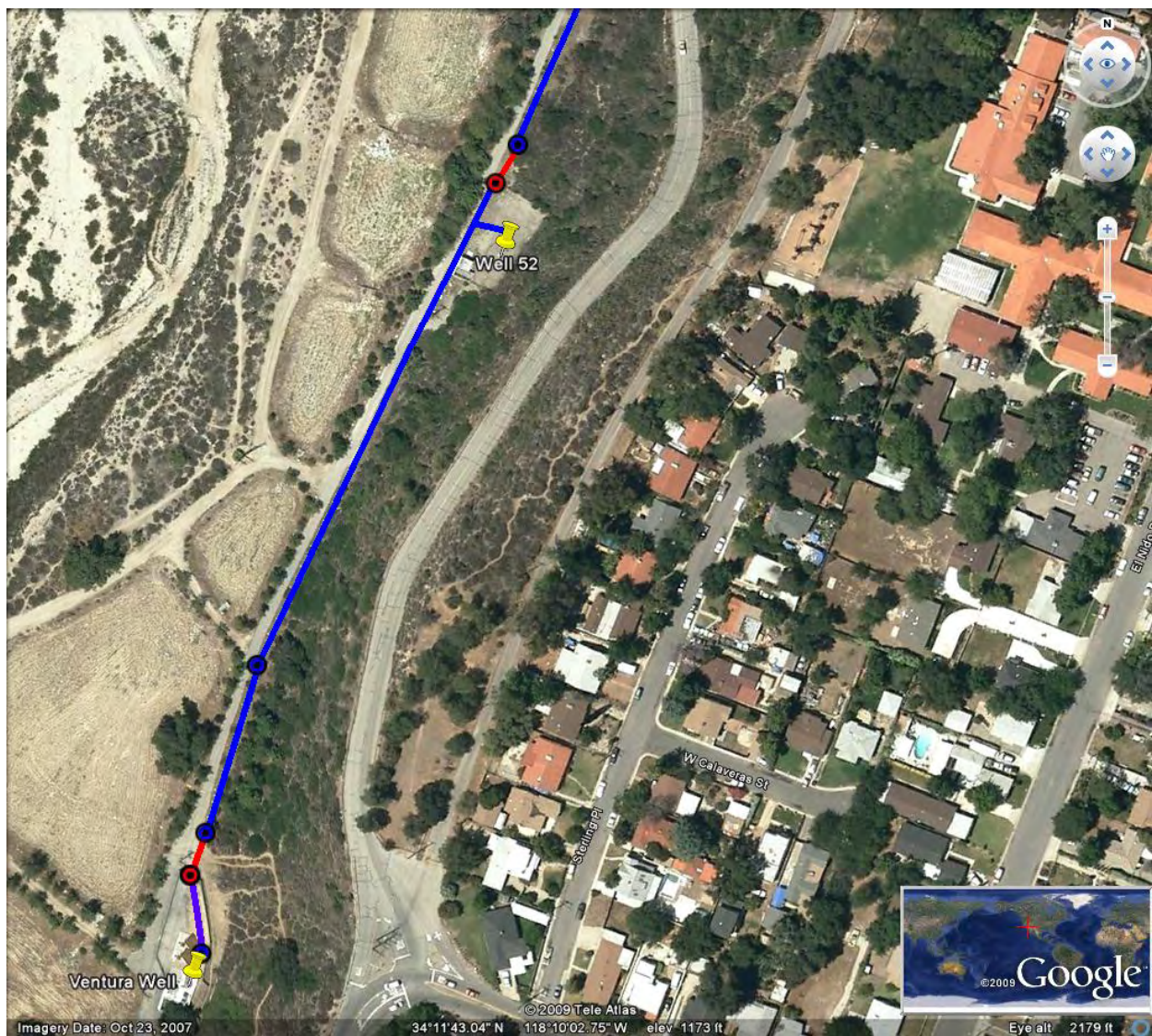
Temporary Pipeline Layout

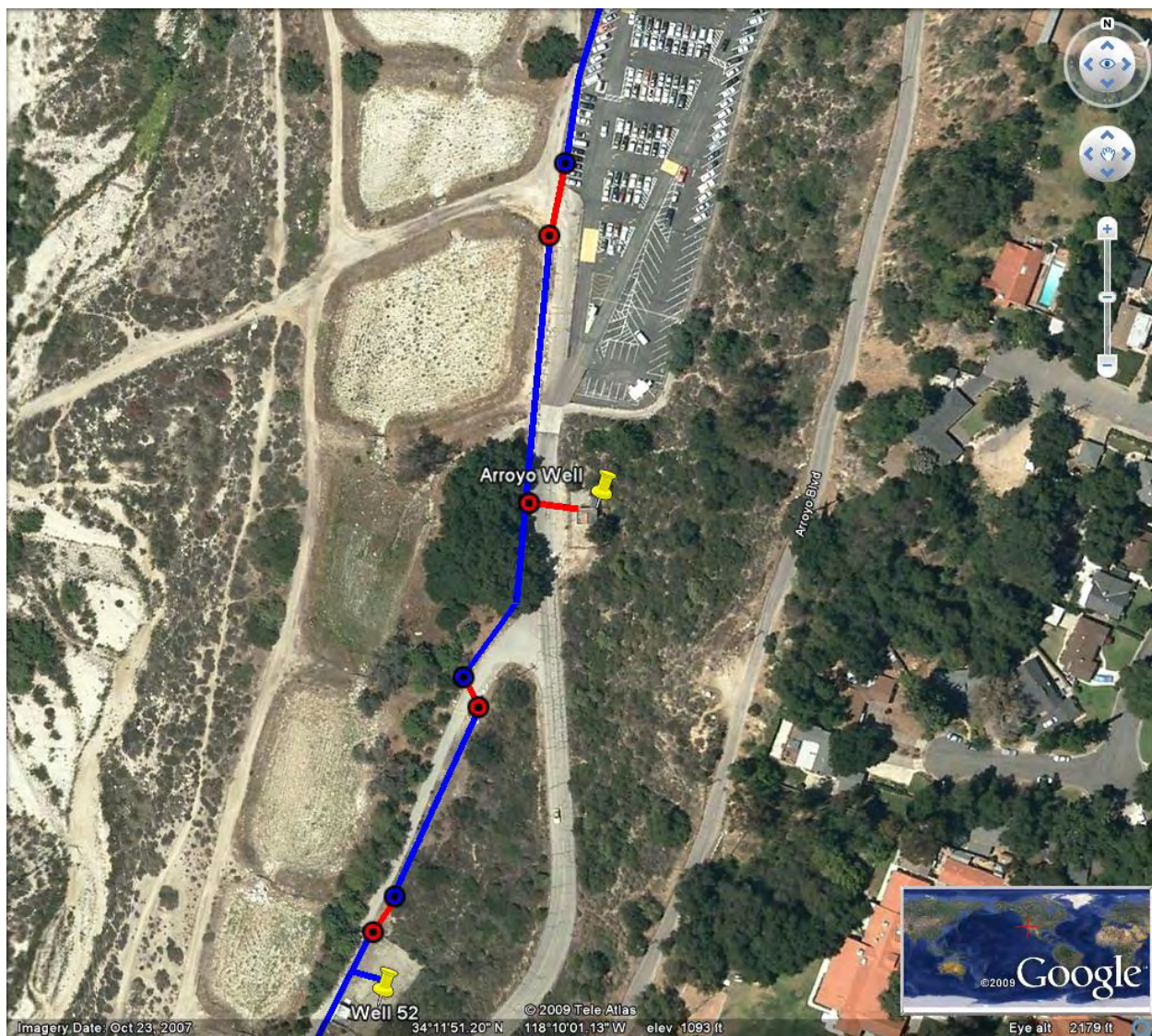


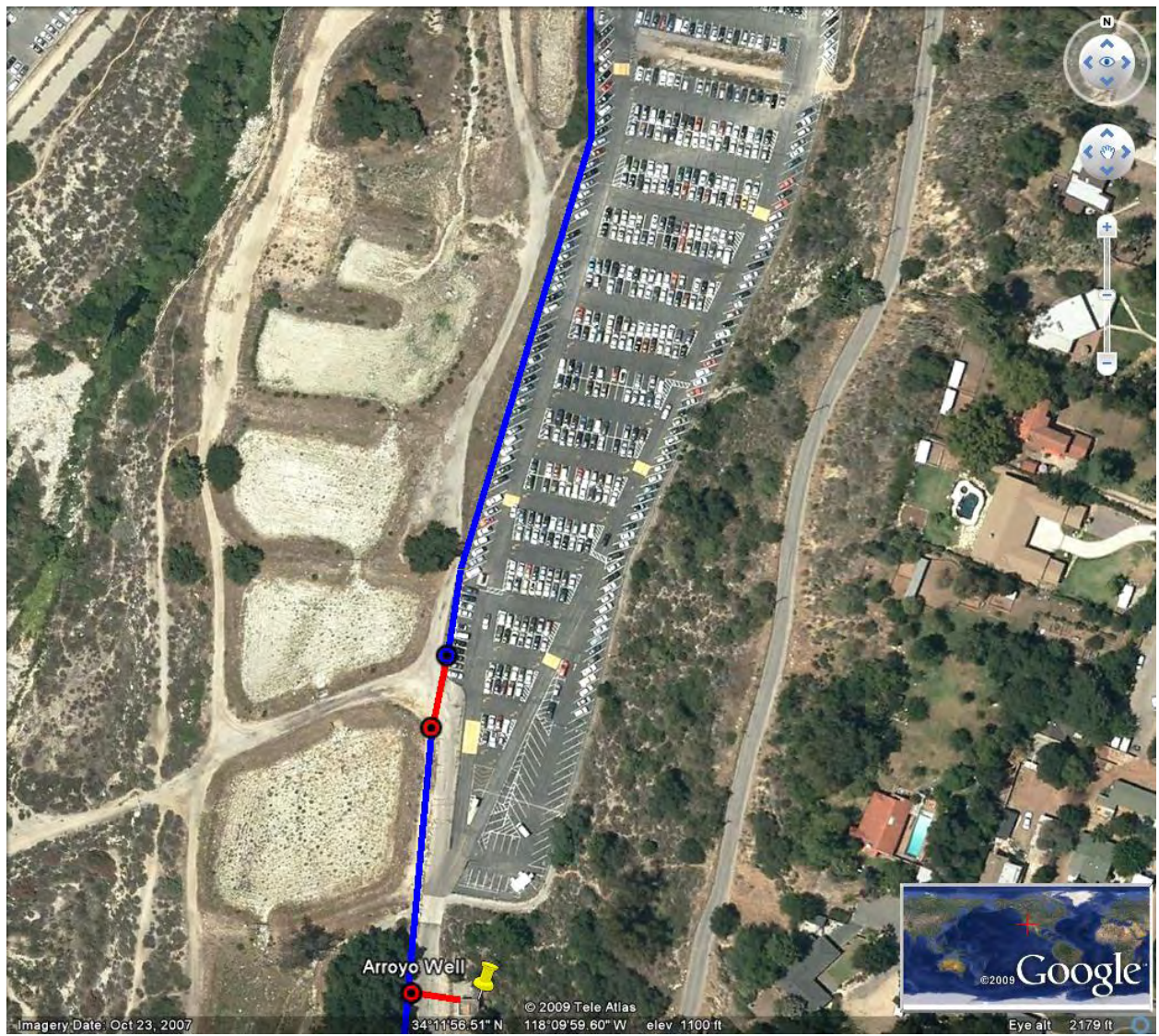
*Red Pipeline sections are the proposed locations where the pipeline will need to go underground for vehicle crossings.



Black line indicates existing underground piping to be utilized









*After the road crossing the pipeline will need to transition to the east side of the fence so as to not impact the native plant habitat.

Attachment B

**Addendum to the Mitigated Negative Declaration for
MHTS 2696 Windsor Ave, Pasadena, CA**

**ADDENDUM TO THE MITIGATED NEGATIVE DECLARATION FOR THE
MONK HILL TREATMENT SYSTEM PROJECT LOCATED AT 2696 WINDSOR AVENUE,
PASADENA, CALIFORNIA**

SUMMARY:

At a public meeting on July 10, 2008, the Hearing Officer, pursuant to the California Environmental Quality Act (CEQA), adopted a Mitigated Negative Declaration to construct, install, and operate an ion exchange (IX) and liquid granular activated carbon (LGAC) treatment system and a disinfection facility to treat groundwater from four Pasadena and Water (PWP) wells. Groundwater extracted from these four wells will be treated using IX to remove perchlorate, LGAC to remove volatile organic compounds (VOCs), followed with disinfectant consisting of gas chlorine and ammonium hydroxide prior to storing the treated water in the Windsor Reservoir for distribution.

Since this date, PWP has decided to modify the well rehabilitation portion of the approved project. After reviewing the revised project description and determining the project has minimally changed in scope and form from what was originally reviewed and approved, the city has determined the previously adopted Mitigated Negative Declaration applies to the revised project and has prepared this addendum pursuant to Section 15162(b) of the CEQA Guidelines.

PREVIOUS PROJECT DESCRIPTION:

To address chemicals in off-facility groundwater, the National Aeronautics and Space Administration (NASA) agreed to fund removal of target chemicals (perchlorate and VOCs) from the aquifer at four PWP drinking water wells by adding a treatment facility to treat pumped groundwater at the Windsor Reservoir. This new treatment facility will be known as the Monk Hill Treatment System (MHTS). Groundwater from the four wells – Arroyo Well, Well 52, Windsor Well, and Ventura Well – will be cleaned of the target chemicals with this new treatment facility.

Due to the age and recent inoperation of the four wells, they must be rehabilitated prior to activation. A significant volume of water is expected to be generated during the initial phase of the rehabilitation effort (e.g. initial well cleaning) and during subsequent well development and performance testing activities. During the initial well cleaning, the anticipated water quality (i.e. particulate and chemical load: biomass, mineral precipitate, silt/sand content, metallic corrosion, etc.) will be such that MHTS cannot be used for treatment due to design limitations. Therefore, an alternate means of treatment, such as off-site disposal or temporary on-site treatment and disposal, must be used. Because the initial well cleaning will substantially increase the quality of extracted water, it is anticipated that water generated during the latter stages of the rehabilitation effort (well development and performance testing) can be routed through the MHTS for treatment and subsequent disposal/reuse.

PWP applied for a Conditional Use Permit to construct, install, and operate the MHTS including additional work to support the treatment plant and treatment processes (i.e. pipelines, valves, foundation and substructures, well rehabilitation, etc.).

In the approved CUP and adopted Initial Study for this treatment project, the scope for well rehabilitation described two options for handling water generated during the initial well cleaning.

▪ **Temporary Containment and Offsite Disposal**

This option consists of temporary on-site containment and subsequent offsite disposal of water generated during initial well cleaning activities. Eight Baker® tanks will be staged adjacent to each wellhead during well cleaning. The first one to two tanks will serve as settling tanks for the significant quantity of solids (i.e., sand and debris) expected to be generated during the initial well cleaning. As needed, water will be removed from the tanks using a vacuum truck and transported offsite for disposal. Samples of the water will be collected and analyzed prior to removal to determine the appropriate disposal method. The estimated volume of development water necessitates roughly 64 change-outs using vacuum trucks, resulting in significant increased traffic flow around the wells. See Table 1 in the attachment, which presents the advantages, disadvantages, and approximate cost associated with the temporary containment and offsite disposal option.

▪ **On-Site Treatment and Disposal**

This option consists of on-site treatment and subsequent disposal of development water generated during well cleaning activities. Table 1 in the attachment presents the advantages, disadvantages, and approximate cost associated with this treatment option. A temporary treatment system (TTS) capable of handling 300 gallons per minute would be installed at the Ventura well site during the entire duration of the initial well cleaning. Water from each of the wells would be transferred to the TTS for treatment via existing below-ground piping and temporary above-ground piping.

Treated water leaving the TTS will be routed through a holding tank, where samples will be periodically collected for analysis to ensure that it complies with state and local discharge requirements. Water from the tank will be discharged via temporary above-ground piping to Arroyo Seco Spreading Basin 10, which is located approximately 90 ft northwest of the Ventura well.

REVISED PROJECT DESCRIPTION:

The approved project has been revised as follows:

1. A third option for handling water generated during the initial well cleaning has been developed. This option utilizes NASA's existing Operable Unit 1 (OU-1) treatment facility to treat the water prior to re-injection of the treated water into the aquifer. Table 1 in the attachment presents the advantages, disadvantages, and approximate cost associated with this treatment option. A temporary pipeline capable of transferring 1.2 million gallons of water would be installed from the Ventura sump, located at 21 Karl Johnson Parkway (immediately adjacent to Arroyo Seco Spreading Basin 11), to the NASA's OU-1 groundwater treatment system located at the Jet Propulsion Laboratory (JPL).

Development water from each of the wells would be transferred to the JPL OU-1 system for treatment via existing below-ground piping (i.e. from the Windsor well to Ventura sump) and approximately 5,300 ft of temporary above-ground 4-inch-diameter piping (i.e. extending from the Ventura sump to the OU-1 treatment system) to be installed as part of this project.

A second 4-inch pipeline will be installed connecting Arroyo, Well 52, and Ventura wells to the Ventura sump. The second pipeline will have an approximate length of 1,400 feet. This pipeline will allow water to be transferred from the three wells to the Ventura sump prior to being pumped to the OU-1 treatment system.

2. Generalized Process Flow

As each well is rehabilitated one at a time, the initial development water generated during this work will be processed as described below.

Water from each well will first be routed through a roll-off bin (i.e. 17' x 8' x 4') for solids collection, and then the water is boosted from the bin with a gasoline powered pump to a 21,000 gallon Baker® tank. The use of the holding tanks will allow the solids to settle. The water will then be pumped through a filter to remove remaining particulates and placed into a third tank. Next the water will be pumped from the tank to the 38,000 gallon Ventura sump. The final step will involve pumping water from the Ventura sump through the 5,300 foot temporary pipeline to the OU-1 treatment system for processing.

Depending on space limitations, one or more tanks maybe stored at the individual well site. If space is limited, the tanks will be stationed at the Ventura sump.

3. Installation and Removal Schedule

It is anticipated that the temporary pipeline will be installed in early January 2010, and will be removed in June 2010. This schedule is based on the MHTS construction schedule. The temporary pipelines will be removed by the installation contractor and it is assumed that it will be recycled or reused.

4. Hours of Operation

The transfer of initial development water through the temporary pipelines will occur during regular work hours (i.e. Monday – Friday 07:00 – 17:00). At the completion of days when the pipeline is utilized, potable water will be flushed through the pipelines. The pipelines will be visually inspected and monitored five times per day (i.e. 07:00, 09:30, 12:00, 14:30, and 17:00) during its use.

5. Pipeline Overview

Figure 1 (see attachment) shows the 5,300 foot temporary pipeline layout, swale, road, and bridge crossing. The attachment contains detailed routing locations for the temporary piping. The second 1,400 foot pipeline from Arroyo to Ventura well sites will be placed adjacent to the 5,300 foot temporary pipeline.

Pipelines will be buried beneath high traffic areas located off the JPL property. The trench for the pipe will be cut approximately 12" to 18" in width and 18" to 24" in depth. The fill will be compacted and leveled to the adjacent roadway. At the completion of the initial well cleaning, all temporary pipelines and supporting hardware will be removed from the property, pipeline trenches will be backfilled, compacted, and the surface restored to the City Public Works' requirements.

The development water will be treated to meet the Environmental Protection Agency, California Department of Public Health, and Regional Water Quality Control Board's requirements for the OU-1 treatment system prior to re-injection.

CEQA Requirements

Pursuant to CEQA, the City of Pasadena is the Lead Agency, and as part of their decision making process, the Lead Agency must consider the project's environmental consequences.

In accordance with CEQA, if changes to a project or its circumstances occur or new information becomes available after adoption of a negative declaration, the Lead Agency shall determine whether to prepare a Subsequent Environmental Impact Report (EIR), a Subsequent Negative Declaration, an Addendum to the Negative Declaration, or no further documentation (State CEQA Guidelines Section 15162[b]).

State CEQA Guidelines Section 15162(a) identifies when additional CEQA documentation requiring public review is required. This section states:

When an EIR has been certified or negative declaration adopted for a project, no subsequent EIR shall be prepared for that project unless the lead agency determines, on the basis of substantial evidence in the light of the whole record, one or more of the following:

- (1) Substantial changes are proposed in the project which will require major revision of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects; or
- (2) Substantial changes occur with respect to the circumstances under which the project is undertaken which will require major revisions of the previous EIR or Negative Declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects; or
- (3) New information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at
- (4) the time the previous EIR was certified as complete or the Negative Declaration was adopted, shows any of the following:
 - (A) The project will have one or more significant effects not discussed in the previous EIR or negative declaration;
 - (B) Significant effects previously examined will be substantially more severe than shown in the previous EIR;
 - (C) Mitigation measures or alternatives previously found not to be feasible would in fact be feasible, and would substantially reduce one or more significant effects of the project, but the project proponents decline to adopt the mitigation measure or alternative; or
 - (D) Mitigation measures or alternatives which are considerably different from those analyzed in the previous EIR would substantially reduce one or more significant effects on the

environment, but the project proponents decline to adopt the mitigation measure or alternative.

State CEQA Guidelines Section 15164(b) identifies when an Addendum to an adopted Negative Declaration is appropriate. This section states:

An addendum to an adopted negative declaration may be prepared if only minor technical changes or additions are necessary or none of the conditions described in Section 15162 calling for the preparation of a subsequent EIR or negative declaration have occurred.

Environmental Considerations

The revised project has not substantially changed from the originally approved project analyzed in the Mitigated Negative Declaration that was adopted on July 10, 2008. The installation of temporary pipelines between Ventura sump and OU-1 will not impede the flow of traffic and will not result in removal of any trees. The installation will provide for groundwater recharge and will be temporary in nature. There are no new significant impacts or mitigation measures as a result of the revisions. Therefore, pursuant to Sections 15162 and 15164 of the California Environmental Quality Act (CEQA) this addendum has been prepared.

Determination

The proposed changes to the project description do not trigger any of the conditions identified in State CEQA Guidelines Section 15162 that require additional CEQA documentation to be circulated for public review, and this addendum clarifies the changes to the project that occurred after the Mitigated Negative Declaration was adopted.

Prepared By: Gary Takara Date: 11/5/2009

Gary Takara, Principal Engineer, Pasadena Water and Power

Reviewed By: [Signature] Date: 11/4/09

Kevin Johnson, Acting Senior Planner

**Addendum to the Mitigated Negative Declaration for the Monk Hill Treatment System Project
Located at 2696 Windsor Avenue, Pasadena, California**

Table 1 - Summary of Development Water Disposal Options

Disposal Option	Advantages	Disadvantages	Approximate Cost
Temporary Containment and Offsite Disposal	• No temporary treatment system required to treat water prior to disposal • Wells developed in series, so only one set of equipment is necessary	• Cost and labor intensive • Required number of change-outs results in increased traffic and noise • Increased resource usage – 64 tanker truck change-outs required per well (consumes roughly 5,200 gallons of gasoline/diesel) • Logistical difficulties – space for Baker® tanks is limited near the production wells • Extraction rate and duration limited by the number of tanks and the change-out frequency • Development water cannot be reclaimed • Must relocate equipment between wells	\$725,000 ^(a)
On-Site Treatment and Disposal	• Wells developed in series, so treatment system can be installed at a single central location • Development water can be reclaimed through infiltration • Less labor intensive • Lower cost • Less resource usage • Minimal traffic and noise • Extraction rate not limited by storage volume	• Treated water must meet Regional Water Quality Control Board Waste Discharge Requirements (WDRs) prior to disposal. • Water must be routed significant distances (>2,000 ft) from the wellheads to the TTS • Discharge piping must cross access road	\$540,000 to \$690,000 ^(b)
Temporary Pipeline	• Development water can be treated by OU-1 treatment system • Development water can be reclaimed through injection • Lower carbon footprint • Less labor intensive • Lower cost • Less resource usage • Additional laboratory analyses not necessary (covered by OU-1 sampling schedule)	• Pipeline runs through Hahamonga park, JPL parking lot, and onto JPL property • Pipeline must be inspected on a routine basis to ensure that it is not leaking • Piping must cross roads, drainage swales, and a bridge • Repairs will be required at road crossings at project completion	\$135,000 ^(c)

(a) Approximate cost is based on subcontractor estimates for temporary containment, off-site transportation and disposal.

(b) Approximate cost is based on two subcontractor estimates for rental of equipment for on-site treatment and disposal.

(c) Based on initial estimates for installation and servicing. Based on 6 month time span.

Source: NASA, Technical Memorandum, Evaluation of Disposal Options for Initial Development Water Generated During Operable Unit 3 Municipal Production Well Rehabilitation, October 2009

Addendum to the Mitigated Negative Declaration for the Monk Hill Treatment System Project 2696 Windsor Avenue, Pasadena, California

(Source: NASA, Technical Memorandum, Evaluation of Disposal Options for
Initial Development Water Generated During Operable Unit 3 Municipal
Production Well Rehabilitation, October 2009)

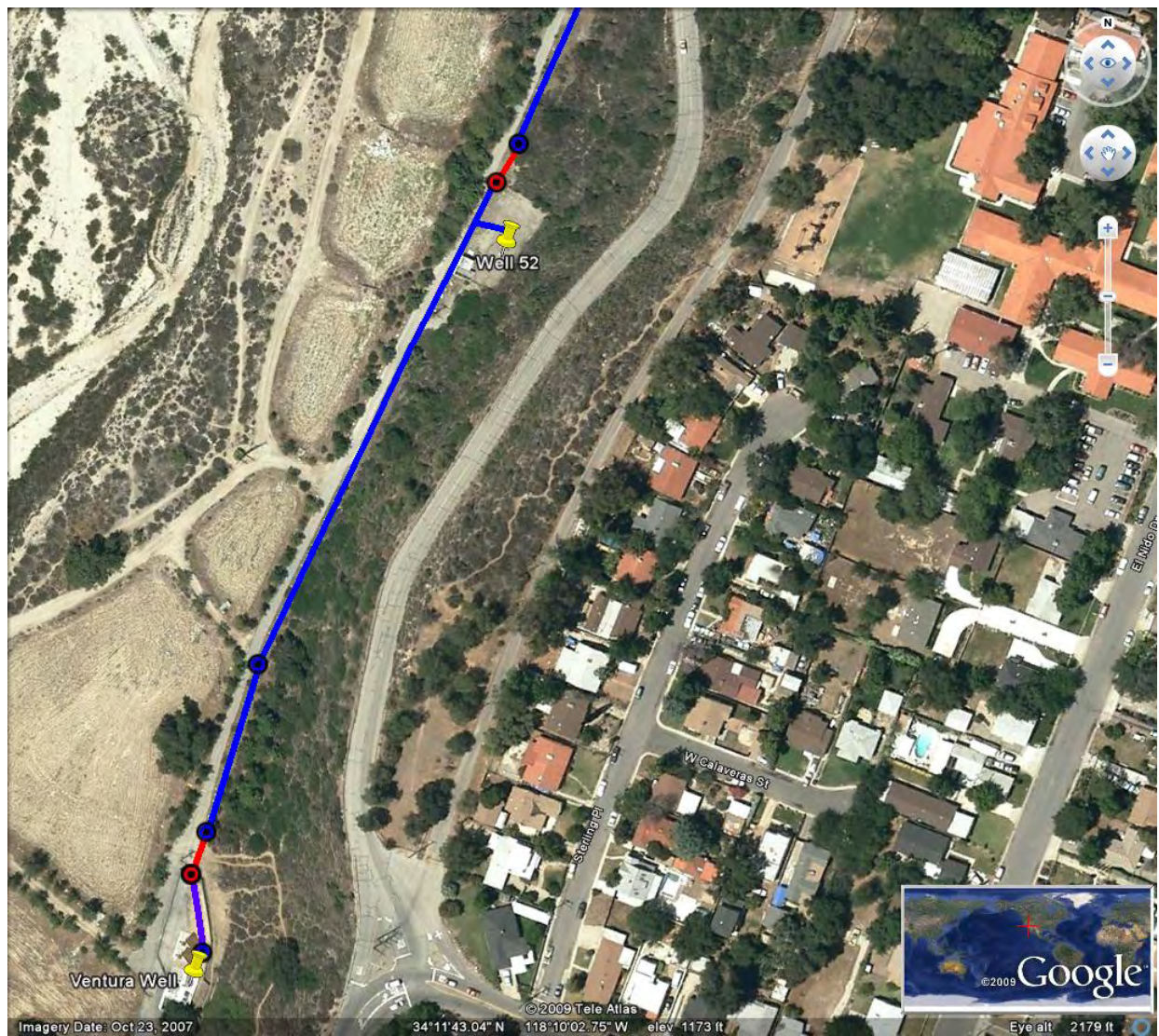
Temporary Pipeline Layout

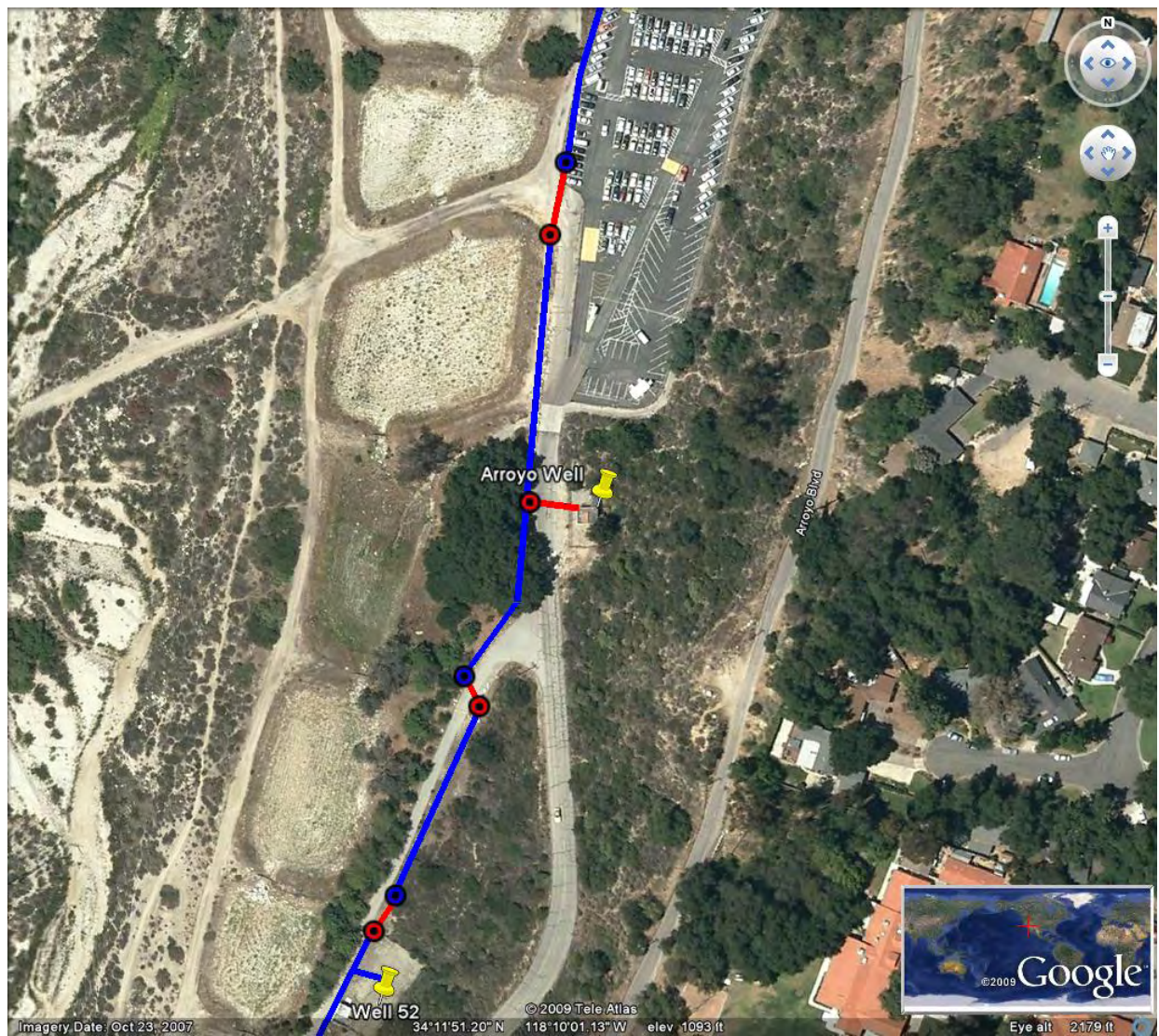


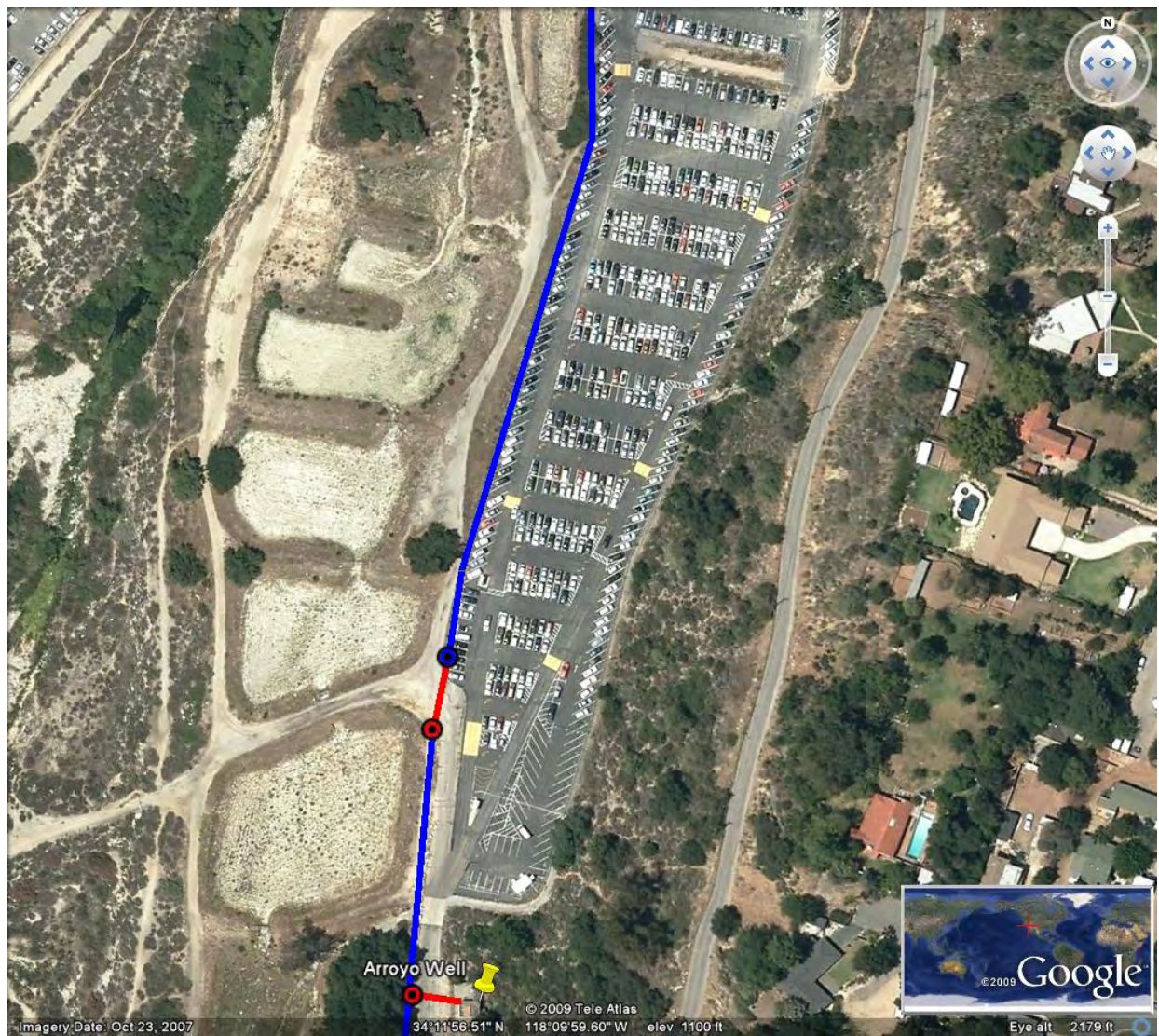
*Red Pipeline sections are the proposed locations where the pipeline will need to go underground for vehicle crossings.



Black line indicates existing underground piping to be utilized









*After the road crossing the pipeline will need to transition to the east side of the fence so as to not impact the native plant habitat.

Attachment C
Temporary Pipeline Layout on JPL



Overview of Pipeline Run on JPL Facility



Red Pipeline sections are the proposed locations where the pipeline will need to go underground or in a temporary speed bump for vehicle crossing.





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Imagery Date: Oct 23, 2007

34°12'09.18" N 118°10'10.22" W elev 1214 ft

Eye alt 1526 ft



2 Tanks will be located in parking spaces for the duration of the project