



**STATEMENT OF BASIS**

For

Groundwater Remedy at

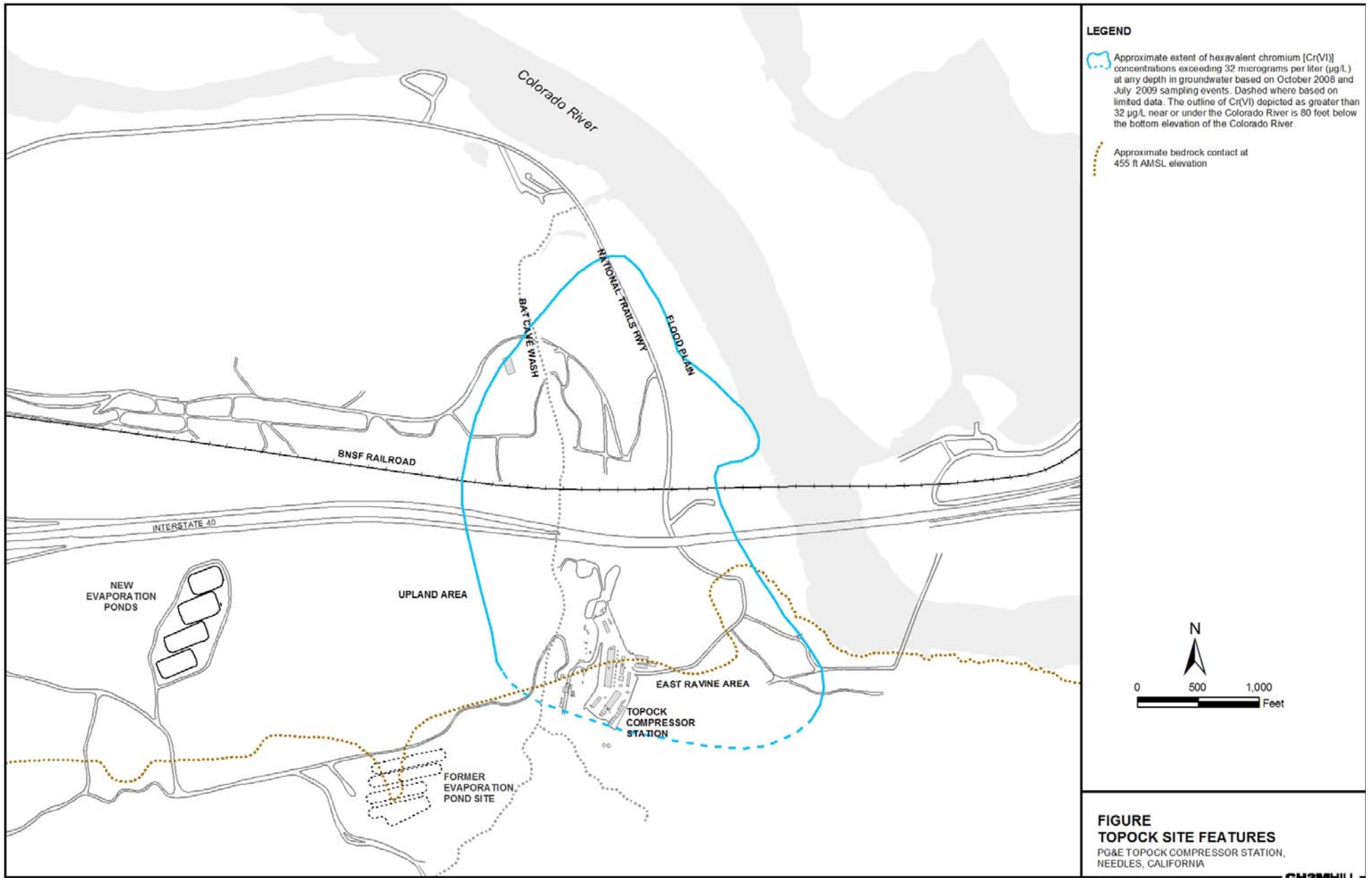
Pacific Gas and Electric Company, Topock Compressor Station

Needles, California

EPA ID NO. CAT080011729

January 31, 2010

# Figure of Proposed Project and Site



# **STATEMENT OF BASIS FOR A PREFERRED REMEDIAL ALTERNATIVE AT PACIFIC GAS AND ELECTRIC COMPANY, TOPOCK COMPRESSOR STATION**

## **INTRODUCTION**

The Department of Toxic Substances Control (DTSC) is issuing this Statement of Basis for a preferred groundwater remedy (Preferred Alternative) at the Pacific Gas and Electric Company (“PG&E”), Topock Compressor Station and its surrounding area affected by the groundwater contamination (“the Site”) located near Needles, California. This Statement of Basis identifies the Preferred Alternative among the remedial action alternatives evaluated for cleaning up groundwater contaminated by past waste disposal practices at the Site.

This Statement of Basis is being issued by DTSC as the lead agency responsible for Corrective Action activities conducted at the Site pursuant to an agreement signed between DTSC and PG&E in 1996 under the authority of the California Health and Safety Code section 25187 and the Resource Conservation and Recovery Act (RCRA) addressing areas contaminated by the historical release of hazardous constituents at the Site. DTSC is coordinating the selection of the Preferred Alternative with the United States Department of the Interior (DOI). As a Federal agency with land ownership interests surrounding the Site area, DOI has a similar, but separate authority under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

DTSC is issuing this Statement of Basis as part of its public participation responsibilities and for administrative documentation of the rationale for the selection of the Preferred Alternative.

After reviewing, considering and responding to the public comments received during the public comment period from June 4, 2010 to July 19, 2010, DTSC is selecting the preferred alternative as described in this Statement of Basis.

Detailed information concerning groundwater contamination at the Site can be found in the 2009 Volume 2 RCRA Facility Investigation/Remedial Investigation (“RFI/RI”) Report and 2009 Volume 2 Addendum. The detailed comparative evaluation of remedial alternatives can be found in the 2009 Corrective Measures Study/Feasibility Study (“CMS/FS”). These and other documents are contained in the Administrative Record file in the public repositories for the Site (see last page for locations). DTSC and DOI encourage the public to review these documents to gain a more comprehensive understanding of the Site and the activities that have been conducted to date.

## **PG&E TOPOCK COMPRESSOR STATION HISTORY**

The PG&E Topock Compressor Station (“Station”) is located adjacent to the Colorado River in eastern San Bernardino County, California, approximately 15 miles southeast of Needles, California, south of Interstate 40, in the north end of the Chemehuevi Mountains. The Station occupies approximately 15 acres of a 65-acre parcel of PG&E-owned land. The PG&E property is surrounded by the Havasu National Wildlife Refuge (“the Refuge”) and lies directly south of land under the jurisdiction of the Bureau of Land Management (BLM) and Bureau of Reclamation (BOR).

PG&E began operations at the Station in December 1951 to compress natural gas supplied from the southwestern United States for transport through pipelines to PG&E’s service territory in central and northern California. Historic records indicate that PG&E held rights to operate a gas pipeline and compressor station dating back to the Federal Act of 2/25/20 (41 Stat. 449, as amended). Based on available title records, PG&E gained full ownership of the land in 1965.

Operations at the Station have been fairly consistent since the facility began operations in 1951. The operations consist of six major activities: compression of natural gas, cooling of

the compressed natural gas and compressor lubricating oil, water conditioning, wastewater treatment, facility and equipment maintenance, and miscellaneous operations. The greatest use of chemical products involves treatment of cooling water, and the greatest volume of waste produced consists of “blowdown” from the cooling towers. Blowdown consists of used cooling water that is periodically removed from the operating circuit because it contains too much salt generated from repeated evaporation of the cooling water.

From 1951 to 1985, hexavalent chromium-based corrosion inhibitors and biocides were added to the cooling water circuit to protect the piping and equipment in the cooling towers. After 1964, the cooling tower blowdown was treated to remove hexavalent chromium prior to discharge. Until approximately 1970, cooling tower blowdown was discharged directly into Bat Cave Wash, an unlined arroyo immediately west of the Station and either percolated into the ground or evaporated at the surface. Around 1970, PG&E discontinued blowdown discharge to the wash and began discharging treated blowdown into four single-lined evaporation ponds located west of Bat Cave Wash. From 1970 to 1973, PG&E injected treated blowdown into bedrock beneath the site using an injection well (well PGE-08), but that process proved impractical and was discontinued.

In 1985, PG&E replaced the hexavalent chromium-based cooling water treatment products with non-hazardous phosphate-based products, at which time PG&E discontinued operation of the chromium blowdown treatment system. Use of the four, single-lined evaporation ponds continued until 1989, when they were replaced with four new double-lined ponds that are still in use under permits by the California Colorado River Basin Regional Water Quality Control Board. The cooling tower blowdown treatment system and the single-lined ponds were physically removed and closed by 1993. Based on closure confirmation sampling results submitted by PG&E, the soil beneath the regulated units are similar to background

concentrations. In June 1995, DTSC accepted PG&E’s closure report.

## **SITE BACKGROUND**

Investigation activities at the Site by PG&E and DTSC date to the late 1980s with the identification of solid waste management units and areas of concern through a RCRA Facility Assessment. In 1996, PG&E and DTSC entered into a Corrective Action Consent Agreement in which PG&E agreed to perform a RCRA Facility Investigation/Corrective Measures Study subject to the oversight and approval of DTSC. In 2005, PG&E and DOI entered into an Administrative Consent Agreement in which PG&E agreed to perform a CERCLA Remedial Investigation/Feasibility Study to characterize the nature and extent of contamination and develop and evaluate cleanup alternatives subject to the oversight and approval of DOI.

Since 2005, DTSC and DOI have coordinated in their oversight of PG&E’s work under these agreements. Investigative and remedial activities have been performed pursuant to both RCRA corrective action and CERCLA remedial action requirements. The RCRA Facility Investigation has been combined with a CERCLA Remedial Investigation (the “RFI/RI Report”) and the RCRA Corrective Measures Study has been combined with the CERCLA Feasibility Study (the “CMS/FS Report”).

To efficiently manage the large volume of information generated by the investigation of the Site and accelerate cleanup of groundwater, the investigation of the Site has been separated into two components: the first is an investigation of groundwater contamination and the second will focus on contaminants in surface and subsurface soil. As a result, the RFI/RI Report has been separated into three volumes. PG&E has completed the 2007 Volume 1 (Site Background and History), 2009 Volume 2 (Hydrogeologic Characterization and Results of Groundwater and Surface Water Investigations), and a 2009 Volume 2 Addendum. Volume 3 is pending and will include final characterization data of soil

contamination and evaluation of the potential for soil contamination to leach into groundwater at the Site.

While the RFI/RI was underway, beginning in 2004, DTSC and DOI directed PG&E to undertake certain measures, known as “Interim Measures” or “Time Critical Removal Actions”, to ensure that hexavalent chromium and other contaminants in the groundwater did not reach the Colorado River. Interim Measures 1, 2, and 3, collectively, involved the construction of treatment facilities and installation of four extraction wells to pump contaminated water out of the aquifer for treatment and disposal. More importantly, these Interim Measures were designed to pull contaminated groundwater away from the Colorado River until a permanent remedy could be selected. DTSC originally envisioned a single remedy decision for soil and groundwater. However, due to the potential threat to the water resource at the site and the Colorado River, selection of a remedy for the groundwater contamination became priority while the soils investigation was delayed. DTSC anticipates a separate soil remediation decision, if necessary, in the future.

## **SITE CHARACTERISTICS**

### Cultural and Environmental Resources

The Site is located within an area considered to be of traditional cultural importance and spiritual significance to federally-recognized Native American tribes with ancestral ties to the region. Nine federally recognized Native American tribes have ancestral ties to the area and have expressed interest in the project: the Chemehuevi Indian Tribe, Cocopah Tribe of Arizona, Colorado River Indian Tribes, Fort Mojave Indian Tribe, Havasupai Indian Tribe, Hualapai Indian Tribe, Quechan Tribe of the Fort Yuma Indian Reservation, Twenty-Nine Palms Band of Mission Indians, and Yavapai-Prescott Tribe. Many of these tribes expressed strong beliefs that the selection of remedial action at the Site must fully consider the significance of cultural resources potentially affected and that adverse

effects must be mitigated to the fullest extent possible.

DTSC, as the California state lead agency on this project, has continually solicited input from interested tribes through out the investigation and planning of this project. Tribal views regarding the significance of the cultural resources potentially affected due to the project and the importance of mitigating adverse effects on those resources has been solicited, and evaluated as part of the January 2011 programmatic Environmental Impact Report (EIR) in accordance with requirements of the California Environmental Quality Act (CEQA). Feasible mitigation measures associated with the potential impacts at the site have been incorporated into the decision-making process and summarized in the EIR. The EIR is available in the public repository for review along with this Statement of Basis.

As noted, the project Site area contains sensitive cultural resources that are of religious and cultural significance to some of these tribes, as well as other identified historic areas, such as portions of Route 66. These cultural resources are subject to the protections provided by numerous federal statutes, regulations, and Executive Orders.

Protection of historic properties and cultural resources, in particular those that are listed, or eligible for listing, on the National Register of Historic Places, requires that DOI, in consultation with State Historic Preservation Offices, the Advisory Council on Historic Preservation, the tribes, and other consulting parties, identify adverse effects associated with remedial action at the Site and seek ways to avoid, minimize, or mitigate such effects. The BLM, on behalf of itself, DOI, Fish and Wildlife Services (FWS), and BOR, is the lead federal agency for historic and cultural issues at the Site. Substantive mitigation measures adopted by the BLM as a result of federal consultation will be satisfied during the design and implementation of the remedy at the site.

DTSC, as the California state lead agency, will continue to seek Tribal views and input during



remedy design, implementation and through out the operation and maintenance phases of the project.

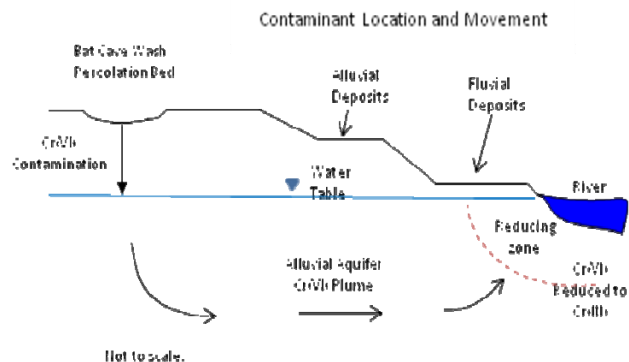
The Site is also located within an environmentally sensitive area that includes the Havasu National Wildlife Refuge, endangered species and migratory bird habitat, and public land formally designated as an Area of Critical Environmental Concern by the BLM. Moreover, much of the Site lies within the floodplain of the Colorado River, a source of drinking water and irrigation for millions of people downstream. Remedial action within this area must comply with the applicable land management requirements established and implemented by BLM, FWS, and BOR. In addition, the contaminated groundwater is located within a groundwater basin that has been designated for beneficial uses under the Colorado River Basin Regional Water Quality Control Board.

#### Hexavalent Chromium Groundwater Plume

The RFI/RI Volume 2 Report for groundwater, completed in February 2009, characterized groundwater and surface water for contamination associated with past PG&E blowdown discharges from the Compressor Station. Groundwater occurs beneath the ground surface in alluvial geologic deposits consisting primarily of sands and gravels, with some silts and clays.

The groundwater data indicate that a plume of groundwater contaminated with mainly hexavalent chromium extends from the location of the former area where blowdown was discharged in Bat Cave Wash to the floodplain area adjacent to the Colorado River, north of the railroad tracks. Current data indicate that hexavalent chromium is not discharging to the Colorado River. Within the plume, hexavalent chromium is typically present at all depth intervals of the upland portion of the aquifer, but is generally limited to deep wells in portions of the floodplain aquifer near the river. Organic-rich and low-oxygen conditions exist in the aquifer and sediments near and underlying the river that convert hexavalent chromium to a less mobile,

less toxic form known as trivalent chromium. This trivalent chromium will drop out of the groundwater under normal subsurface conditions as it will bind to the geologic deposits at the Site.



As hexavalent chromium migrates in groundwater from the upland area deposits to the organic rich conditions near and beneath the river, it undergoes a chemical change to trivalent chromium. Although this condition is generally true, uncertainties remain regarding the extent to which reducing conditions in fluvial deposits provide a pervasive and permanent barrier to Cr(VI) contaminant migration to the river.

Besides hexavalent chromium as the main groundwater contaminant, the February 2009 RFI/RI Volume 2 Addendum also indicated possible additional chemicals of potential concern within localized areas of the groundwater plume that may have originated from PG&E operations. These substances include molybdenum, selenium and nitrate.

#### East Ravine Bedrock Plume

During the 2009 East Ravine Groundwater Investigation, hexavalent chromium was also found in groundwater within the bedrock formations east and southeast of the Compressor Station. The contamination occurs in discrete fractures in the bedrock which limits the flow and overall quantity of groundwater in the bedrock. PG&E has estimated that the mass of the hexavalent chromium in bedrock likely represents

less than one percent of the total hexavalent chromium plume mass.

The lateral extent of East Ravine groundwater contamination appears to extend approximately 1,500 feet east southeast of the Compressor Station. However, the investigation of East Ravine groundwater is ongoing and the source and full extent of the bedrock contamination has not been determined. Studies of the East Ravine area are expected to continue during the remedy design phase of the project which will include additional monitoring wells within the East Ravine area and surrounding the Compressor Station.

## **SUMMARY OF SITE RISKS**

As part of the Site investigation, a baseline risk assessment was conducted to determine the current and future risks posed by contaminants in groundwater to humans and ecological receptors. The primary contaminants of potential concern resulting from the evaluation in the risk assessment include hexavalent chromium, selenium, nitrate, and molybdenum.

Based on the results of the risk assessment, there are no unacceptable risks to human health or the environment from groundwater contamination under current conditions. Currently, there is no direct exposure to groundwater and no current significant contaminant transport pathway from groundwater to surface water.

Hexavalent chromium, however, is present at concentrations that could pose an unacceptable risk to a future hypothetical groundwater user, if the contaminated groundwater were to be used as a source of drinking water. Based on the results of the site investigation and risk assessment, hexavalent chromium was the contaminant risk driver and the contaminant addressed in the detailed alternative analysis in the 2009 Corrective Measures Study/ Feasibility Study that was carried forward into remedy selection.

Three additional contaminants of potential concern, (selenium, nitrate, and molybdenum),

were evaluated in the RFI/RI and groundwater risk assessment. Although the risk assessment concluded that these constituents are not a source of significant risk in comparison to hexavalent chromium, these substances do contribute to a total non-cancer risk at localized areas within the plume boundary in excess of risk assessment guidelines. The presence and extent of these substances will be evaluated further during the soil investigation at the Site. The CMS/FS concluded that institutional controls should be enforced to restrict development of contaminated groundwater as a drinking water supply and monitoring of these constituents should continue as part of the Site-wide groundwater monitoring activities throughout future actions taken at the Site.

Because there is no significant ecological exposure pathway for contact with impacted site groundwater, there are no ecological receptors currently at risk of adverse effects due to the presence of contaminants of potential concern in the groundwater.

Based on the results of the risk assessment, it is DTSC's current judgment that the Preferred Alternative identified in this Statement of Basis, or one of the other alternatives considered in this document, is necessary to protect public health and welfare and the environment from releases of hazardous substances to the environment.

## **REMEDIAL ACTION OBJECTIVES**

The remedial action objectives ("RAOs") are based on the conclusions of the risk assessment and the requirement that the selected remedy attain applicable or relevant and appropriate requirements (ARARs) identified for the Site. The RAOs for groundwater are to:

- Prevent ingestion of groundwater as a drinking water source having hexavalent chromium in excess of the regional background concentration of 32 micrograms per liter.

- Prevent or minimize migration of total chromium and hexavalent chromium in groundwater to ensure concentrations in surface water do not exceed water quality standards that support the designated beneficial uses of the Colorado River (11 micrograms per liter).
- Reduce the mass of total chromium and hexavalent chromium in groundwater at the Site to achieve compliance with ARARs in groundwater. This RAO will be achieved through attainment of a cleanup goal of 32 micrograms per liter of hexavalent chromium.
- Ensure that the current geographic plume boundaries are not permanently expanded following completion of the remedial action.

## **SUMMARY OF REMEDIAL ALTERNATIVES**

The remedial alternatives to address contaminated groundwater at the Site that were evaluated in the 2009 CMS/FS are presented below. The alternatives are identified with letters to correspond with the description of the alternatives within the CMS/FS report.

Generally speaking, Alternatives A and B would not include any active treatment or other measures to remove hexavalent chromium from groundwater. Alternatives C, D, and E would rely primarily on treating the hexavalent chromium underground (also known as “in-situ” treatment) by injecting a carbon food source into the aquifer to “feed” the naturally-occurring bacteria thereby accelerating the change of hexavalent chromium to trivalent chromium by enhancing the naturally occurring biological conditions that degrade hexavalent chromium. Alternative F would extract contaminated groundwater and treat it above-ground using a water treatment plant. Alternatives G and H would combine in-situ treatment with above-ground treatment. Alternative I would continue the existing Interim Measure currently in place by which limited volumes of water are extracted and treated using an existing above-ground treatment

facility. Except for Alternatives A and I, all other alternatives evaluated include the decommissioning of the existing Interim Measure treatment system. Decommissioning would occur after remedy construction and start up, and DTSC deems the remedy to be operating properly and successfully.

Provided below is a more specific description of each alternative. Because of the collaboration between DTSC and DOI, and the substantive equivalence of the remedy selection criteria between RCRA and CERCLA, in the Section that follows (Evaluation of Alternatives), the Alternatives are compared using a combined remedy selection criteria as required by RCRA and CERCLA. As explained in that Section, Alternative E is the DTSC Preferred Alternative for the hexavalent chromium groundwater contamination present at the Site.

### *Alternative A: No Action*

Regulations governing the cleanup programs generally require that the “no action” alternative be evaluated to establish a baseline for comparison. Under the No Action alternative, no active construction or operational activities would occur. There would be no active treatment to reduce chromium concentrations in groundwater. While natural processes converting hexavalent chromium to trivalent chromium would continue to occur within the river sediments near the Colorado River, for the foreseeable future there would be no government restrictions on the use of groundwater in locations where concentrations exceed cleanup levels. No additional groundwater monitoring facilities would be constructed under this alternative, nor would any ongoing sampling or well maintenance activities be conducted to monitor concentrations of contaminants in groundwater or in the Colorado River.

Estimated Capital Cost: \$0

Estimated Time to Achieve RAOs: 220-2,200 years

### *Alternative B – Monitored Natural Attenuation*



No active treatment to reduce hexavalent chromium concentrations in groundwater would occur under this alternative. This alternative would rely only on the naturally occurring organic conditions in shallow groundwater areas of the floodplain to convert and remove hexavalent chromium from groundwater. Restrictions on the use of groundwater in the area of the plume would be maintained during the remediation period. The existing groundwater monitoring network would potentially be enhanced with additional monitoring wells, and the monitoring program of routine sampling, analysis, and reporting would occur until the cleanup goals are attained.

Estimated Net Present Value: \$25,000,000 - \$54,000,000  
Estimated Time to Achieve RAOs: 220-2,200 years

#### *Alternative C – High volume In-situ Treatment*

Alternative C would involve active in-situ groundwater treatment through distribution of an organic carbon food source (such as whey) through high volume injection through a minimum number of wells installed primarily in previously disturbed areas. The organic carbon would be injected to enhance natural biological conditions to convert hexavalent chromium to the less mobile and less toxic trivalent chromium form thereby removing it from groundwater. This alternative would be implemented in two phases; the first phase would treat the plume edge nearest the river, while the second would treat the interior of the plume with a limited number of constructed wells.

Estimated Net Present Value: \$119,000,000 - \$255,000,000  
Estimated Time to Achieve RAOs: 10 to 60 years

#### *Alternative D – Sequential In-situ Treatment*

Under this alternative, treatment of the plume would be accomplished through injection of carbon using wells within the interior of the

plume to convert hexavalent chromium to a less soluble trivalent chromium, thereby removing chromium from groundwater. Treatment would be implemented in several phases involving construction of approximately 12 lines of injection and extraction wells to distribute the carbon food sources over the entire plume.

Estimated Net Present Value: \$118,000,000 - \$254,000,000  
Estimated Time to Achieve RAOs: 10 to 20 years

#### *Alternative E – In-situ Treatment with Fresh Water Flushing*

Alternative E involves flushing to push the plume through an In-situ Reduction Zone (“IRZ”) located along National Trails Highway. Flushing would be accomplished through a combination of fresh water injection and injection of carbon amended groundwater in wells to the west of the plume. This alternative would also include using extraction wells near the Colorado River shoreline to capture the plume, accelerate cleanup of the floodplain, and flush the groundwater with elevated hexavalent chromium through the treatment zone. Additional extraction wells are located in an area northeast of the Compressor Station where the flushing efficiency from injection wells alone is relatively poor. Groundwater extracted from the near-river wells and wells northeast of the Compressor Station would be treated with the carbon food source and the water would be reinjected west of and/or within the hexavalent chromium plume.

Estimated Net Present Value: \$92,000,000 - \$198,000,000  
Estimated Time to Achieve RAOs: 10 to 110 years

#### *Alternative F – Pump and Treat*

This alternative would involve pumping groundwater, above-ground treatment to remove chromium from the extracted groundwater, and reinjection of the treated water back to the aquifer.

Estimated Net Present Value: \$187,000,000 - \$401,000,000  
Estimated Time to Achieve RAOs: 15 to 150 +years

*Alternative G – Combined Floodplain In-situ / Pump and Treat*

This alternative would combine floodplain cleanup by in-situ treatment, with treatment of the uplands portion of the plume by pumping groundwater, above-ground treatment to remove chromium from the extracted groundwater, and reinjection of the treated water back to the aquifer. The floodplain cleanup would involve construction of in-situ treatment zones at National Trails Highway and between National Trails Highway and the Colorado River. This alternative differs from Alternative H in that pump and treat is the dominant feature of the cleanup rather than in-situ treatment.

Estimated Net Present Value: \$177,000,000 - \$380,000,000  
Estimated Time to Achieve RAOs: 10 to 90 years

*Alternative H – Combined Upland In-situ / Pump and Treat*

This alternative would combine in-situ treatment in the upland portions of the plume, with pump-and-treat technology in the floodplain (consisting of pumping groundwater, above-ground treatment to remove chromium from the extracted groundwater, and reinjection of the treated water back to the aquifer). This alternative differs from Alternative G by relying on an in-situ treatment zone as the dominant feature of the cleanup rather than pump and treat.

Estimated Net Present Value: \$127,000,000 - \$273,000,000  
Estimated Time to Achieve RAOs: 10 to 70 years

*Alternative I – Continued Operation of Interim Measure Groundwater Treatment*

This alternative would involve continued operation of the current Interim Measure Groundwater Treatment Plant as the final remedial action at the site. The plant includes a pump and treat system that removes groundwater and utilizes chemical reduction, precipitation and filtration to remove hexavalent chromium. The Interim Measure system would operate with the existing equipment with existing procedures using the existing process at the existing flow rate until RAOs are attained.

Estimated Net Present Value: \$186,000,000 - \$398,000,000  
Estimated Time to Achieve RAOs: 100 to 960 years

**Addressing Chromium in Bedrock in East Ravine**

The development of a hydraulic containment system and treatment system for groundwater in the bedrock is proposed for alternatives C, D, E, F, G, and H instead of developing and evaluating a range of remedial alternatives to attain RAOs in bedrock. East Ravine bedrock groundwater would be addressed through natural attenuation (e.g., dilution) in alternatives A, B and I.

For alternatives C through H, hydraulic containment would involve pumping from a group of wells near the eastern end of the East Ravine. The assumed location for these wells from a hydraulic and infrastructure perspective would be along the former National Trails Highway. The approach for management and treatment of groundwater extracted from the bedrock would vary depending on the alternative. According to the CMS/FS, the quantity of extracted bedrock groundwater is anticipated to be minor relative to alluvial groundwater. For alternatives C, D, and E, bedrock groundwater would be amended with a carbon food source and reinjected in the alluvial aquifer along with amended alluvial groundwater. For alternatives F, G, and H, extracted bedrock groundwater would undergo above ground treatment with extracted alluvial groundwater. For alternative B and I, bedrock groundwater would be monitored

to assure that the concentration of hexavalent chromium is reduced by natural conditions over time and that there is no adverse effect to the Colorado River.

If it is determined that additional measures are needed to achieve RAOs in the East Ravine bedrock, other technologies similar to proposed remedial alternatives in the CMS/FS could be applied to supplement the pumping wells. In addition to pumping for hydraulic control, technologies that may be applicable to East Ravine bedrock would include, but are not limited to, freshwater injection for flushing and injection of carbon amendments for in place (in-situ) treatment of hexavalent chromium.

## EVALUATION OF ALTERNATIVES

Although the RCRA remedy selection criteria differ from the CERCLA nine criteria slightly in terminologies, they are substantively the same. Because of the collaboration between DTSC and DOI, the selection criteria presented combined the RCRA Corrective Action evaluation criteria with the CERCLA remedy selection criteria. Similar to CERCLA, the RCRA remedy selection criteria is divided into the Corrective Action Standards, the remedy selection decision factors and similar public acceptance modifying criteria. These criteria are used to evaluate the different remediation alternatives individually and against each other in order to select a remedy. This section of the Statement of Basis profiles the relative performance of each alternative against the selection criteria, noting how it compares to the other options under consideration. The RCRA/CERCLA combined evaluation criteria are discussed below. “Detailed Analysis of Alternatives” can be found in the CMS/FS.

<b>Remedy Selection Criteria</b>
<b>Protect Human Health and The Environment, Attain Media Cleanup Goals, and Control Sources Of Releases</b> determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
<b>Compliance with ARARs</b> evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that

pertain to the site.
<b>Long-term Effectiveness, Permanence, and Reliability</b> considers the ability of an alternative to maintain protection of human health and the environment over time.
<b>Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment</b> evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
<b>Short-term Effectiveness</b> considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
<b>Implementability</b> considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
<b>Cost</b> includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
<b>State/Support Agency Acceptance</b> considers whether the State agrees with the analyses and recommendations, as described in the Proposed Plan.
<b>Community Acceptance</b> considers whether the local community agrees with DTSC's analyses and preferred alternative. Comments received on the draft Statement of Basis are an important indicator of community acceptance.

As described below, two of these combined criteria, “Protect Human Health and The Environment, Attain Media Cleanup Goals, and Control Sources Of Releases” and “Compliance with ARARs,” are considered Corrective Action Standards or Threshold Criteria. All remedial alternatives must satisfy these standards and criteria in order to be considered for selection. The next five criteria are known as “balancing criteria” or “remedy selection decision factors” which are factors that are used for relative comparison of the remedial alternatives under consideration. Finally, the last two criteria, State/Support Agency Acceptance and Community Acceptance are known as “modifying criteria.”

### 1. Protect Human Health and The Environment, Attain Media Cleanup Goals, and Control Sources Of Releases

Alternative A does not meet the selection criteria for protecting human health and the environment because there would be no institutional controls imposed to restrict use of groundwater in locations where hexavalent chromium concentrations exceed the cleanup goals, and there would be no monitoring to evaluate whether geochemical conditions near the river required to reach the cleanup goals remained in place over the long time period necessary to achieve these goals. The remaining Alternatives (B through I), were all found to meet the standard and threshold criteria of protecting human health and the environment. Alternatives C, D, E, F, G, and H were ranked high for this criterion while Alternatives B and I ranked medium for this criterion primarily because of the long time required to attain cleanup goals, as well as the uncertainty about the robustness of the natural geochemical conditions near the river and the high level of operation and maintenance.

## **2. Compliance with ARARs**

Applicable or Relevant and Appropriate Requirements (ARARs) are those cleanup standards, standards of control, and other substantive federal or more stringent State requirements that have been determined to be legally applicable to, or well suited to (“relevant and appropriate”), addressing hazardous substances, remedial actions, or other circumstances presented at a site. ARARs generally are classified as chemical-specific, location-specific, or action-specific. The ARARs for the Topock Site are identified in Appendix B of the CMS/FS.

Based on the specific circumstances presented at the Topock Site and as described in the CMS/FS, Alternatives A, B and I do not satisfy the requirement established by the California State Water Resources Control Board Resolution 92-49 that cleanup goals be achieved within a “reasonable time frame.” For this reason, Alternatives A, B, and I have been eliminated from further consideration.

Because of the importance of the area to certain Native American tribes with ancestral ties to the region, and the presence of cultural resources of religious and cultural significance, as well as other sensitive cultural resources, several cultural resource protection statutes, regulations, and Executives Orders have been identified as ARARs for the Topock Site. As described in the CMS/FS, none of the alternatives under consideration were eliminated from further consideration based on its failure to satisfy cultural resource ARARs. In order to ensure that the remedy selected attains the substantive requirements established by these ARARs, however, as a remedy is selected, designed, and implemented, the federal agencies will continue to engage in consultation with tribes, State Historic Preservation Officers, and others to identify potential effects on cultural resources and to seek ways to avoid, minimize, or mitigate any adverse effects.

With respect to any remedial action to be undertaken within the Havasu National Wildlife Refuge, the National Wildlife System Administration Act has been identified as an ARAR. As described in the CMS/FS, none of the alternatives under consideration were eliminated from further consideration based on its failure to satisfy this ARAR. After a remedy is selected, the Fish and Wildlife Service will identify, during remedial design and implementation, those measures necessary to ensure that the selected remedy satisfies this ARAR.

## **3. Long-term Effectiveness, Permanence, and Reliability**

Alternative A (No Action) ranked the lowest of all alternatives because this alternative does not include monitoring to verify the effectiveness of natural recovery processes and to determine when the RAOs have been achieved.

Alternative B ranked medium because it would include monitoring and institutional controls; however, this alternative relies on natural attenuation to convert hexavalent chromium to trivalent chromium, and while the reducing

conditions have been shown to be robust, there is no way to prove that these conditions exist everywhere or would persist into the future hundreds to thousands of years from now.

Alternatives F, G, H, and I all ranked medium for long-term effectiveness, permanence, and reliability. These alternatives include ex-situ treatment; the resulting waste generation requiring land disposal of treatment residuals at an offsite, permitted landfill requires long-term containment, management, and monitoring that are not required by the alternatives that include in-situ treatment.

Alternatives C, D, and E ranked medium-high for this criterion. While there is uncertainty regarding the ability to distribute the carbon food source across the targeted area, and Alternative E relies on flushing to remove contaminants from the upland portion of the aquifer, comparatively few long-term controls are expected for these alternatives following attainment of cleanup goals.

#### **4. Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment**

Alternatives F, G, and I are ranked high because the toxicity, mobility, and volume of hexavalent chromium is lessened throughout the plume because the majority of the chromium mass after treatment would be removed and managed in a permitted disposal facility.

C, D, E, and H are ranked medium high because the converted chromium will remain within the subsurface formation. Additionally, byproducts are anticipated from in-situ treatment, but they are expected to be localized and could remain temporarily elevated above baseline and background concentrations in some portions of the aquifer.

Alternatives A and B ranked medium because the amount of plume destroyed or treated is less certain due to the passive nature of treatment and the extent and average capacity of the floodplain

area to naturally reduce hexavalent chromium over time.

#### **5. Short-term Effectiveness**

Alternative B was ranked medium because of the minimal footprint, but relatively long time to cleanup.

Alternatives C and E were ranked medium-low because of the comparatively shorter remediation period and relatively limited construction and operational activities that would occur primarily in previously disturbed areas. Alternatives A, D, F, G, H, and I received a low ranking for short-term effectiveness. Alternative A was ranked low primarily because of the extensive time to cleanup with no controls during the remedial period. Alternatives F, G, H, and I were ranked low as a result of construction and operation of an aboveground treatment plant and the greater amount of construction, aboveground visual impact, worker/operator presence onsite, electrical power requirements, and trucking requirements for chemical delivery and waste transportation and disposal. Alternative D ranked low primarily because the location of remedial facilities would not be limited to previously disturbed areas and because of the need for subsequent additional disturbance from grading, road construction, facility construction, and operation and maintenance.

#### **6. Implementability**

Alternatives A and B are ranked high for implementability because Alternative A involves no remedial action, and the only remedial activities associated with Alternative B are monitoring well construction and maintenance and administration of an institutional control. Alternative I also ranked high because the system has been shown to be technically implementable over the years it has operated. Alternatives D, E, F, G, and H were ranked medium because while these alternatives are administratively implementable, there will be technical challenges associated with the active treatment processes. Alternative E requires additional approvals from

landowners and associated water agencies for the water supply well and pipeline. Alternative C was ranked low for this criterion because of the relatively more complex technical challenges associated with balancing carbon delivery and hydraulic containment of the plume.

## **7. Cost**

The costs for Alternatives A and B are the lowest; therefore, these alternatives are ranked high in cost-effectiveness. Alternatives C, D, E, and H are the next most costly; therefore, these alternatives are ranked medium in cost-effectiveness. Alternatives F, G, and I are the most expensive of the alternatives and are therefore ranked low in cost effectiveness.

## **8. State/Support Agency Acceptance**

DTSC and DOI have worked together in closely coordinating each agency's respective authorities and overseeing PG&E's performance of work under the federal CERCLA Consent Agreement and the State Corrective Active Consent Agreement by which the CMS/FS has been prepared. Through this coordination, both DOI and DTSC approved the CMS/FS in December, 2009. Furthermore, DTSC and DOI worked in partnership to ensure that the April 2010 draft Statement of Basis and the DOI Proposed Plan for the Preferred Alternative are closely coordinated in scope and in content. Based on this coordinated approach, DTSC and DOI, while considering the action independently, reached a similar conclusion on the Preferred Alternative to submit for public review and comment.

Relatively minimal comments were received from reviewing agencies during the comment period. Although comments from the California State Lands Commission advises that proper evaluation and a potential lease would be required for fresh water intake from the Colorado River, and the California Department of Transportation specified that an encroachment permit might be required prior to construction within the Interstate 40 right of way, DTSC did receive a letter from the Metropolitan Water District of Southern

California on December 9, 2010 urging the "expedient implementation of the final groundwater remedy..." and that they "are supportive of the selection of Alternative E" (Attachment 1). Comment from the San Diego County Water Authority also states that they "strongly support the recommendation to utilize Alternative E – In-situ Treatment with Fresh Water Flushing for the Topock remediation due to its effectiveness [in] achieving the Remedial Action Objectives relative to costs, while substantially reducing the amount of hexavalent chromium in the groundwater in a reasonable timeframe with fewer adverse effects to cultural and biological resources than other alternatives analyzed." (ref. Letter A3, Chapter 2, Volume 1 of 2011 EIR)

Based on the comments received, DTSC concludes that the State and reviewing agencies are in general support of the preferred alternative for the groundwater remediation at the site.

## **9. Community Acceptance**

Aside from the 29 comments received from State and reviewing agencies, DTSC received 583 comments from individuals, tribal members, or Native American Tribal Nations. Although a significant portion of the comments asked for clarification of the EIR or the Draft Statement of Basis, many of the comments are in regards to tribal belief that the project area is of cultural and religious importance and the sufficiency of data for remedial determination.

As documented in the Public Comment section of the Corrective Measure Approval package for this project and Volume 1 of the January 2011 EIR, DTSC understands that some Native American tribes and several commenting tribal members consider the project area to be sacred and recommend DTSC to allow the land to "heal itself." Notwithstanding the spiritual interpretation, DTSC understands their preference for remediation to be either Alternative A or Alternative B. However, as discussed above, in accordance with the remedial alternative selection process, Alternatives A, B and I would not be in



conformance with ARARs and are eliminated from consideration as remedial alternatives. DTSC, however, does recognize the importance of the reductive process that occurs naturally in the aquifer and sediments in the floodplain; therefore, the strategic use of monitored natural attenuation process is incorporated as a component of the final remedial process as discussed in the Summary of Preferred Alternative below.

DTSC found, as a conclusion of the January 2011 EIR impact analysis, that due to the spiritual belief of some Native American tribes including the Fort Mojave Indian Tribe (FMIT) and the Hualapai Tribe, the implementation of the proposed project may have, despite mitigation measures, potentially significant and unavoidable Cultural Resources and Noise impacts at the project area. DTSC, however, notes that during the development of the remedial alternatives and as discussed in various leadership partnership meetings, the FMIT perspective was that they may be willing to support Alternative E above other remaining alternatives if Alternative A and B are not viable. Furthermore, in a letter dated February 26, 2009 from Mr. Leo Leonhart, representing FMIT, he expressed a strong offense to the continued impact on the sensitive lands that FMIT consider sacred; however, the letter did provide a position by the FMIT that states “apart from Alternatives A and B, the PG&E-recommended remedial alternative presented in the CMS/FS, Alternative E, appears to be the least disruptive to Tribal lands.”

DTSC, also notes that on April 16, 2007, the Colorado River Indian Tribe (CRIT), passed a tribal council resolution that “...the overriding health and safety concerns of living people shall have priority...” despite the potential of impacts to Mohave cultural sites (ref: Attachment 2, CRIT resolution R-121-07). Although DTSC understands that this resolution represents only the views of the CRIT council, and not the views of other interested tribes around the project area, this is an acknowledgement and support for conducting necessary remediation for the protection of human health and the environment.

A commenting member of the CRIT, however, is concerned with the spiritual implications of leaving non-native trivalent chromium in the subsurface from the in-situ hexavalent to trivalent chromium reduction process. DTSC acknowledges that the preferred alternative will deposit additional trivalent chromium in the subsurface soil, however, that chromium will not impact any human or ecological receptors because of the depth at which the conversion will occur. Chromium does occur naturally in soil, and therefore, the additional deposit of non-native trivalent chromium would not be, from a scientific perspective, significant.

Aside from Native American Tribal considerations, DTSC also received a verbal comment from a community member during the public hearing in Lake Havasu City that acknowledged the efforts and considerations behind the proposed remedy. That member simply charged DTSC to “get it done.”

Although various positions were presented by the community as evident above, DTSC must balance the need to protect the drinking water resources beneath the site and the Colorado River with the potential adverse cultural impacts of the project while respecting the spiritual belief of the tribes which considers the project area a traditional cultural area. DTSC believes that the implementation of the project is important for the welfare of human health and the environment. Therefore, DTSC has prepared a Statement of Overriding Consideration in accordance with the CEQA guidelines for this project which is included in the Corrective Measure Approval package.

## **SUMMARY OF THE PREFERRED ALTERNATIVE**

After the review of the various alternatives and the comments received during the comment period, DTSC has evaluated and responded to all comments with respect to the Preferred Alternative. The responses to comments are included in the Corrective Measure Approval

package along with this Statement of Basis. Based on the analysis and conclusions presented in the CMS/FS, and in conjunction with the findings of potential impacts evaluated in the EIR, DTSC is selecting Alternative E – In-situ Treatment with Fresh Water Flushing as the preferred alternative. Alternative E is recommended because it will achieve the RAOs while substantially reducing, through treatment, the amount of hexavalent chromium in the groundwater [which is the principal threat at the site], and will do so in a reasonable time frame, and with fewer adverse effects to cultural resources and biological resources than other alternatives considered. Alternative E will also allow the decommissioning of the existing Interim Measure treatment plant after PG&E demonstrates, with DTSC’s concurrence, that the remedy is successfully treating and controlling the movement of contaminated groundwater and its secondary byproducts at the Site.

Because DTSC recognizes that the variable nature of the geologic materials beneath the site may result in some localized areas being resistant to in-situ treatment and flushing, these areas may require optimized remedial efforts including focused injection/extraction. Additionally, DTSC’s preferred alternative includes monitored natural attenuation as a long term component to address residual hexavalent chromium that may remain in portions of the aquifer formation after the majority has been treated by the in-situ treatment with fresh water flushing technology. Monitored natural attenuation relies on the naturally occurring degradation and dilution properties of the groundwater system to convert hexavalent chromium to trivalent chromium in groundwater.

Land Use Restrictions – Due to the incomplete evaluation of soil contamination at the Site and the potential unacceptable risk to a future hypothetical groundwater user during the operation and maintenance of the remedy, the proposed remedy requires that certain restrictions be imposed on future land use activities. The proposed restrictions are necessary to protect human health and the environment, and to

maintain the short and long term protectiveness of the remedy. The restrictions may be imposed through a “Covenant to Restrict Use of Property” (“Covenant”) which is an enforceable institutional control mechanism. The Covenant will “run with the land” and apply no matter who owns the property. The land use restrictions may, with regulatory agency approval, be revised if site conditions should change in the future (e.g., new land use). The specific language for the Covenant with PG&E, and other land owners will be developed and put in place as part of the remedial design. However, restrictions to be considered may include, but not limited to the following:

- Growing food crops or any agricultural products
- Drilling for drinking water, oil or gas
- Extraction of ground water for purposes other than ground water monitoring, site remediation or construction dewatering
- Any activity that may disturb or adversely affect the operation and maintenance of the groundwater monitoring network and site remediation system that is not part of a DOI or DTSC approved corrective action work plan or facility closure plan for the property without prior written agency approval.
- Any redevelopment of the property until a Risk Management Plan (RMP) is prepared for the specific project and is approved in writing by DTSC. A RMP identifies, at a minimum, the specific project proposed for construction, the previous site history, the nature and extent of contamination from all media, the potential pathways of receptor exposure and health impacts from existing site contamination, and practical ways to mitigate the impacts for the specific project. The Covenant and the RMP work together to ensure that potential impacts from exposure to contaminated soils, ground water or other media are managed in a manner that is protective of human health and the environment. The RMP may be revised or amended.

Risk Management Activities. The following activities will require risk management at the Site:

- Any activities that will disturb the soil or ground water, such as excavation, grading, removal, trenching, filling, earth moving or mining, shall only be permitted on the property pursuant to a corrective action work plan approved in writing by DTSC, or an RMP approved in writing by DTSC.
- Any contaminated media brought to the surface as a result of remediation related activities including, but not limited to, pumping, grading, excavation, trenching, or backfilling shall be managed in accordance with all applicable provisions of state and federal laws.

#### **Five Year Remedy Performance Evaluation**

**Reports** The purpose of these reports is to provide an evaluation of the long-term effectiveness and reliability of the selected remedy including in-situ treatment and monitored natural attenuation with recommendations for improvement. The report examines such questions as: Are the media cleanup objectives and remedy performance standards being achieved? How well are things working? Are contaminant concentrations levels trending downward? What improvements are necessary and how will they be implemented?

#### **Financial Assurance for The Remedy**

Financial Assurance is required for monitoring, construction, operation and maintenance of any selected remedy. PG&E will be required to comply with the financial responsibility requirements pursuant to California Health and Safety Code Section 25245 to assure that the required remediation work will be completed now and into the future. PG&E must satisfy the financial responsibility requirement within a reasonable period of time as determined by DTSC after selection of the Preferred Alternative. The initial funding level shall be based on the conceptual cost estimate for the alternative as set forth in the CMS/FS. The funding level for financial assurance mechanism will be adjusted to reflect the costs estimate to be revised as part of the final remedy design and updated annually.

#### **Remedy Decision and Findings**

Based on the information currently available, DTSC believes the Preferred Alternative (Alternative E with the addition of monitored natural attenuation) meets the threshold criteria and best addresses the balancing criteria/ remedy selection decision factors. DTSC has also identified mitigation measures during the preparation of the EIR pursuant to CEQA requirements. These mitigation measures are considered a part of the action required for the implementation of the Preferred Alternative (see the EIR for the listing of the mitigation measures). A Mitigation Monitoring and Reporting Program (MMRP) has been prepared to ensure implementation and compliance by PG&E of the specific mitigation measures specified in the EIR. The MMRP is included in Volume 1 of the January 2011 EIR and are provided in the Corrective Measure Approval package.

DTSC expects the groundwater Preferred Alternative as defined above to satisfy all requirements of a final groundwater remedy as required under the RCRA Corrective Action program and will satisfy the requirements in accordance with the 1996 Corrective Action Consent Agreement with PG&E.

#### **COMMUNITY PARTICIPATION**

DTSC, in conjunction with DOI, provided information regarding the cleanup of the PG&E Topock Site to the public through open house/public hearings sessions, the Administrative Record file in the public information repositories for the Site, and announcements published in several local community area newspapers prior to the start of the Public Comment Period. (*Listed on page 17*) Additional information regarding the investigation and cleanup activities that have been and will be conducted at the Site can be found on the project website at: <http://www.dtsc-topock.com>

This Statement of Basis, the January 2011 EIR, project reports, fact sheets, and other project related documents are located in the information repositories listed below:

Needles Library

1111 Bailey Avenue  
Needles, CA 92363  
Contact: Kristen Mouton, (760) 326-9255

Chemehuevi Indian Reservation

Environmental Protection Office  
2000 Chemehuevi Trail  
Havasu Lake, CA 92363  
Contact: Gilbert Parra, (760) 858-1140

Golden Shores/Topock Station Library

13136 S. Golden Shores Parkway  
Topock, AZ 86436  
Contact: Kim Stoddard, (928) 768-2235

Lake Havasu City Library

1770 McCulloch Boulevard  
Lake Havasu City, AZ 86403  
Contact: Audrey LaCommare, (928) 453-0718

Colorado River Indian Tribes Library

Second Avenue and Mohave Road  
Parker, AZ 85344  
Contact: Elvira Bailey-Holgate, (928) 669-1285

Parker Library

1001 Navajo Avenue  
Parker, AZ 85344  
Contact: Jeannie Smith, (928) 669-2622

Department of Toxic Substances Control

5796 Corporate Avenue  
Cypress, CA 90630  
Contact: Julie Johnson, (714) 484-5337  
Please call for an appointment.