3.0 Facility Operations and History

The Topock Compressor Station began operations 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. The compressor station is still active and is anticipated to remain an active facility into the foreseeable future (Riddle 2004). This section provides detailed information on the history of the facility and facility operations.

3.1 Current and Historic Operations

Prior to construction of the compressor station in 1951, the area on which the facility is currently located was mostly undeveloped land. The Teapot Dome restaurant and gas station occupied a small portion of the property at the very northern edge of the facility (Figure 3-1). It is unknown when the Teapot Dome was built; however, based on aerial photography, the Teapot Dome was present at the site in 1936 (the earliest aerial photograph available). It was still present in 1947 but appears to have been demolished prior to, or during construction of, the compressor station in 1951. The property on which the compressor station was built was owned by the State of California. From 1951 to 1965, PG&E leased the property from the State. In 1965, PG&E purchased the property from the State.

The main structures at the facility currently include the compressor building, Cooling Towers A and B, and the auxiliary building. Various auxiliary structures, including an office, a warehouse, a vehicle garage, maintenance buildings, equipment and chemical storage buildings, and a water-softening building, are adjacent to the main building. The facility also has aboveground tanks used for storage of water, water treatment chemicals, odorant, new and used compressor oil, gasoline and diesel, and wastewater. Figure 3-1 presents the layout of the major features of the compressor station.

When originally constructed, the facility was equipped with six compressors and was capable of processing 400 million standard cubic feet per day (scfd) of natural gas (PG&E 1952). As demand increased, additional compressors were added, and existing compressors were upgraded (by turbocharging and supercharging) to increase the volume of gas that could be processed. Most of the upgrades were completed in the early to mid-1950s. Following the upgrades, the facility was capable of processing 1.1 billion scfd. Depending on demand, the facility currently processes between 300 million to 1.1 billion scfd of natural gas per day (Riddle 2004). The facility operates and is staffed 24 hours per day, 7 days a week.

Current operations at the compressor station are very similar to the operations that occurred from the start of facility operations in 1951. The operations at the compressor station consist of:

- Water conditioning.
- Compression of natural gas.

- Cooling of the compressed natural gas and compressor lubricating oil.
- Wastewater treatment.
- Facility and equipment maintenance.
- Miscellaneous operations.

Facility operations and associated chemical product usage are summarized in Table 3-1. Waste generation and management associated with facility operations are summarized in Table 3-2. Available information regarding actual chemical usage is limited to incidental documentation and is summarized in Table 3-3. Facility operations, associated chemical use, and waste generation and management activities are described in detail below.

3.1.1 Water Conditioning Process

Water for use at the compressor station historically has been supplied by wells that tap local groundwater. Water is used at the facility for both domestic and industrial purposes. The primary industrial use of water at the compressor station is for cooling water.

From 1951 through 1960, PG&E wells 1 and 2 (also known as PGE-01 and PGE-02) were used to supply industrial and non-industrial water to the facility. The water from the wells was not used for drinking water; therefore, bottled water was supplied. A December 1951 Hornkohl laboratory report stated that the water from the wells contained high iron and high chloride which would make it disagreeable to the taste and could cause a physiological reaction (Hornkohl 1951). PG&E Wells 1 and 2 were located to the north of the compressor station (in the current I-40 corridor), as shown in Figure 3-2. Because TDS concentrations in the water obtained from PG&E Wells 1 and 2 were relatively high (PG&E 1960), the use of these wells was discontinued in late 1960 or early 1961, and an arrangement was made for water to be supplied from two wells owned by the AT&SF Railway (SGC 1960; ASDOH 1961). The AT&SF wells, Topock Well Nos. 1 and 2 (sometimes referred to as PG&E Wells 3 and 4) were located on the Arizona side of the Colorado River (Figure 3-2). PG&E Wells 1 and 2 were relegated to standby status at that time and were subsequently abandoned between 1964 and 1965 during the construction of I-40. A contract specification issued by PG&E in 1964 indicates that the wells were to be abandoned and capped, the cathodic protection was to be removed, and facilities were to be removed from the freeway construction area. The specification calls for the removal of pumps, motors, piping, and electrical service. Some of the material was salvaged to construct wells PGE-06 and PGE-07 (PG&E 1965a).

To meet the water demand of the facility, Topock Well No. 3 was installed in 1974 to supplement the AT&SF Topock Well Nos. 1 and 2. In 1980, the AT&SF Topock Wells No. 1 and No. 2 were removed from service, and Topock Well No. 2a[2] was installed to replace Topock Well No. 2. Currently, Topock Well No. 2a and No. 3 continue to supply water to the facility (and drinking water to the community of Topock, Arizona). As of 1981, Southwest Gas of Arizona was the registered owner of Topock Wells No. 2 and No. 3. In 1995, the City of Needles became the registered owner of the wells. Available records indicate that approximately 83 acre-feet of water were extracted from Topock Wells No. 2A and No. 3 in 2003, and approximately 72 acre-feet were extracted in 2004 (Kilgore 2005).

[2] Topock Well No. 2a is a replacement well for the original Topock Well No. 2. Current studies refer to Topock Well No. 2a as Topock-2 and Topock Well No. 3 as Topock-3.

The well water is pumped to two 210,000-gallon storage tanks located on the hill south of the station. Groundwater from the wells naturally contains several different types of minerals, most notably sodium chloride. Historically, the water was processed through a water-softening system to remove excess minerals and improve its suitability for use as process water.

3.1.1.1 Chemical Use in the Water Conditioning Process

In 1951, when the facility was first built, a water-conditioning plant, designed by Permutit, was employed to condition water used at the facility (PG&E 1958a). The plant was located in the southern portion of the facility at what has previously been identified as the "water-softening building" (it is currently identified as the "storage building"; see Figure 3-1). The plant consisted of one to two tanks that were used to handle a mixture of soda ash, lime, and sodium aluminate. Water was pumped through the plant to remove excess minerals and thereby soften the water.

In April 1962, the Permutit plant was replaced with a water conditioning system that used self-contained cartridges (PG&E 1962). The cartridge-based system was only used to treat the water used in the closed-loop cooling systems (i.e., the jacket cooling water, auxiliary jacket cooling water, and lubricating oil cooling systems). Water from the Topock wells used for non-industrial purposes (i.e., non-drinking water and cooling tower makeup) was not treated.[3] The cartridge system is still in use today.

3.1.1.2 Waste Generation and Management in the Water Conditioning Process

Lime sludge is known to have been generated as a byproduct of the Permutit water-conditioning process, although there are no records on the volume of lime sludge generated. The sludge was transferred to the sludge drying beds for dehydration (Kearny 1987). In historical aerial photographs from the mid-1950s, the drying beds contain whitish material. A whitish area is also present just south of the sludge drying beds. In addition, a similar-looking whitish area is present in those same photographs at what is now called the Railroad Debris Site (AOC 14, see Sections 4.2.11 for a detailed description of this area). Former plant employees report trucking the sludge to the Railroad Debris Site and spraying it on the ground there for disposal (Russell 2006b). This suggests that some of the dehydrated lime sludge was disposed of in this area between 1951 and 1962.

For the cartridge system, cartridge replacement is handled twice monthly by a contractor who removes the spent cartridges and transports them offsite for regeneration (Russell 2006b). The cartridge system is self-contained; no onsite effluent is generated by this system. Available information suggests that this cartridge removal process has been in place since 1962.

One employee reported that he was personally responsible for placing 200 to 300 bags of unused lime into the Debris Ravine and covering it with soil. This lime may have been left over from the water-softening treatment system; the employee conducting the disposal began work at the compressor station in 1964 (Russell 2006ba).

[3] Although water obtained from the Topock, Arizona wells is potable, bottled drinking water is still supplied to the facility.

3.1.2 Gas Transmission Process

Natural gas is discovered in naturally-occurring reservoirs in natural gas-producing regions such as the San Juan Basin in New Mexico and the Permian Basin in Texas. Natural gas wells are drilled into these reservoirs to allow the natural gas to be produced. From the well, the natural gas goes into gathering lines, which are like branches on a tree, getting larger as they get closer to the central collection point. Some natural gas-gathering systems include a processing facility that performs such functions as removing impurities (e.g., water, carbon dioxide, or sulfur) that may be corrosive or inert gases (e.g., helium) that would reduce the energy value of the gas. Some processing plants can also remove small quantities of hydrocarbon liquids, such as propane, butane, and other hydrocarbons. From the gathering system, the natural gas moves into the natural gas transmission system, which comprises about 272,000 miles of high-strength steel pipe ranging from 20 inches to 42 inches in diameter in the United States (American Gas Association 2004).

These transmission lines move large amounts of natural-gas thousands of miles from the producing regions to local distribution companies. Gas flowing from higher to lower pressure is the fundamental principle of the natural gas delivery system. The pressure of gas in each section of line typically ranges from 200 pounds to 1,500 pounds per square inch (psi), depending on the type of area in which the pipeline is operating. Compressor stations are located along each pipeline to boost the pressure that is lost through the friction of the natural gas moving through the steel pipe. A compressor is a machine driven by an internal combustion or turbine engine that increases the gas pressure to facilitate movement of the gas through the lines.

A schematic of the flow of natural gas through the Topock Compressor Station is provided in Figure 3-3. Natural gas enters the compressor station via three pipelines. Natural gas in two of the pipelines (PG&E's Line 300A and Line 300B) is supplied by the El Paso Natural Gas Company, and the other pipeline is owned by the Transwestern Gas Pipeline Company.

The combined gas from the pipelines flows through the scrubbers. When the station was first operated, the scrubbers contained an oil bath that facilitated the removal of particulate material that had the potential to damage the compressors. The oil in the scrubbers was removed sometime between the mid-1960s and 1970, and the scrubbers have not been used in the oil bath mode since that time (Russell 2006b). However, natural gas still flows through these scrubbers, which continue to collect some pipeline liquids that originate from the upstream pipelines (More 2004; Russell 2006b).

From the scrubbers, the gas flows to the suction header of the compressors. It then flows to the compressors where it is compressed to increase the pressure to facilitate the movement of the gas toward PG&E's service territory in Northern California. The compressor station is currently equipped with 10 natural-gas-powered, two-cycle internal combustion, reciprocating-type compressors (Units K-1 through K-10) that are housed in the Compressor Building. Units K-2 through K-10 are currently operational; unit K-1 is currently partially dismantled. Depending on the load and operating mode, from zero to all nine operational compressors may be in use at any one time. Once compressed, the gas is directed to the discharge header, where pressure can range from 600 to 875 psi, depending on the selected operating mode. From the discharge header, gas flows to Cooling Tower A and/or Cooling

Tower B (depending on the load, one or both cooling towers may be used in parallel mode, never sequentially).

The heated gas is cooled by passing the gas through a tube and shell heat exchanger, which is associated with the cooling tower system. The water that cools the gas in the heat exchanger is cooled in an updraft cooling tower. Typical gas temperatures entering the cooling tower system range from 70 to 180°F, while typical gas temperatures leaving the cooling tower system range from 40 to 120°F. Gas flows out of the station via two pipelines (Lines 300A and 300B).

PG&E measures the odorant content of the gas after the El Paso gas and Transwestern gas have been blended together. PG&E uses this odorant measurement to determine how much additional odorant to add to the gas, to ensure that the gas can be safely detected by smell by PG&E's customers and the public. The gas is odorized by injecting it with a small amount of 50/50 mixture of liquid tertiary butyl mercaptan (TBM) and liquid tetrahydrothiophene (THT). THT (C_4H_8S) and TBM [$(CH_3)_3C–SH$] are flammable colorless liquids with a distinct odor that is recognized by the public as having a distinct "natural-gas smell."

An ancillary part of the gas compression system is electrical power generation. The compressor station is equipped with four electrical generating units (P-1 through P-4) that are used to generate the electricity required to operate the facility. The generators are driven by natural-gas-powered, four-cycle internal combustion engines. The generators are housed in the auxiliary building (Figure 3-1). In addition, a diesel-powered generator, P-5, acts as an emergency generator.

3.1.2.1 Chemical Use in the Gas Compression Process

Chemicals used in the operation of the gas compression process are limited to lubricating oils for the compressor and generator engines and odorants.

The compressor engines and generator engines require lubricants (i.e., oil and grease) to operate. The compressor engines are two-cycle engines that continually consume small amounts of lubricating oil (motor oil); therefore, oil must be continually added to the engines. The generator engines are four-cycle; they consume minor amounts of oil and require periodic oil changes. Used oil from the generator engines is transferred to the waste oil storage tank.

Lubricating oil is the lubricant required in the largest volume. New lubricating oil is stored in a series of four 7,500-gallon above ground storage tank (ASTs) located in the oil and fuel storage area in the eastern portion of the facility (Figure 3-1). The storage area has been in the same location since the station was constructed in 1951. Approximately 25,000 gallons of new lubricating oil are used at the compressor station annually. Minor amounts of grease are also required for engine operation.

Odorant is added before gas is compressed. A 50/50 mixture of liquid TBM and THT is stored in a 3,000-gallon steel AST located in the lower yard (Figure 3-1). There are also two 75-gallon capacity "day" tanks (both ASTs) located in the lower yard that are used to feed the odorant into the pipelines. Odorants are transferred from the storage tank to the day tanks by small pipes. About 5,000 gallons of odorant are used at the facility annually.

Chemicals used in the cooling systems are described as part of the cooling water process (Section 3.1.3).

3.1.2.2 Waste Generation and Management in the Gas Compression Process

The primary waste stream generated by the gas compression process is oily water. However, minor amounts of pipeline liquids are also removed at pipeline drip points and the scrubbers.

Oily Water. Oily water is produced from equipment cleaning, minor leaks, and compressed air blowdown. The oily water is collected in industrial floor drains located in buildings and is routed to the oily water treatment system. Section 3.1.4.2 discusses the handling and treatment of oily water.

Scrubber Waste. As previously stated, from 1951 to between the mid-1960s and 1970, scrubbers were used to remove impurities from the gas prior to compression. The scrubbers used an oil bath system to remove the impurities, which consisted of water and small amounts of sediment. The oil bath included metal mesh frames contained within an oil bath. The oil bath system generated an oily waste contaminated with gas condensate dust, and other impurities. The oily waste from the scrubbers was collected in a sump near the scrubbers (referred to as the scrubber sump). The volume of oily waste collected in scrubber sump is unknown; however, this waste was transferred to the waste oil storage tank prior to disposal (see subsection in Section 3.1.5.2). In the mid-1990s, the scrubber sump was classified as underground storage tank (UST). At that time, the scrubber sump was removed and closed pursuant to UST regulations (Trident 1996a-b). Closure of the scrubber sump was approved by the County of San Bernardino Fire Department (CSBFD), Hazardous Materials Division on June 9, 1997 (CSBFD 1997).

Because modern natural-gas supplies contain fewer impurities and require less cleaning, the oil baths were removed from the scrubbers sometime between the mid-1960s and 1970. Gas still flows through the scrubber units; however, the scrubbers are not in service and only function as an incidental collection point for pipeline liquids. The scrubbers are drained annually to remove accumulated pipeline liquids. Since 1970, only a very small volume of pipeline liquids has been generated at the scrubbers. About 90 gallons of pipeline liquids are removed from the scrubbers roughly once a year (Riddle 2004). The pipeline liquids removed from the scrubbers are combined with the waste oil generated by the station (in the waste oil storage tank) and transported offsite for disposal at an appropriate facility.

Pipeline Liquids. Small amounts of pipeline liquids are removed from the PG&E pipelines outside of the Compressor Station fenceline. Most of the collection points (referred to as drips) are located immediately downstream and at various locations west of the compressor station; one drip is located near the pipeline crossing immediately west of the Colorado River. Downstream of the facility, drips are located relatively close to the compressor station to capture any oils that entered the gas stream during the compression process. Only the location of the former pipeline liquids tank and the drips immediately downstream of the compressor station are within the study area.

Historically, pipeline liquids collected at or near the Topock compressor station were composed of condensate, oils, and very small quantities of water and debris from the pipelines (i.e., the impurities removed by the scrubbers). Condensate is the highest

molecular-weight hydrocarbon fraction in the natural-gas stream and has a composition similar to that of gasoline. It is also referred to as natural gasoline. Historically, condensate made up the largest percentage of the pipeline liquids. Historically, an estimated 500 gallons per month of pipeline liquids were collected in the vicinity of the compressor station. Condensate is a high-value product. In the mid-1980s, El Paso Natural Gas installed a condensate stripper to recover this valuable material, and the volume of pipeline liquids collected dropped to approximately 50 gallons per month (Russell 2006b). In recent years, the pipeline liquids have been composed of primarily compressor oil which becomes entrained in the gas stream during the compression process.

Radon-222 (Rn-222) is a radioactive gas that accumulates in some natural gas reservoirs. As natural gas is removed from these reservoirs, a portion of the Rn-222 in the reservoir accompanies the gas into the pipeline and travels with the gas toward its destination. The vapor pressure of Rn-222 is similar to propane and thus Rn-222 tends to accumulate as a liquid when the pipeline conditions are suitable for forming natural gas condensate/pipeline liquids.

As a radioactive element, Rn-222 undergoes radioactive decay. In the case of Rn-222, the decay half-life is 3.8 days, which means that the concentration of Rn-222 declines by half after 3.8 days, to one-fourth after 7.6 days, to one-eighth after 11.4 days, and so forth. The decay series for Rn-222 includes several short-lived radioactive species and two longer-lived species, lead-210 (Pb-210) and polonium-210 (Po-210). Pb-210 has a half life of 22 years, and Po-210 has a half life of 138 days. Both Pb-210 and Po-210 are solids.

Radon-222 levels in the gas at Topock are fairly low; less than 10 parts per million (ppm) by volume. Because the natural gas that traveled though the compressor station has contained minute quantities of Rn-222, the potential exists for Rn-222 decay species (Pb-210 and Po-210) to exist as solids inside the pipeline and the associated pipeline appurtenances. These materials may also become entrained in pipeline liquids. The natural gas pipelines are closed and pressurized systems, and removal of any Rn-222 and Rn-222 decay species would only occur as part of the removal of pipeline liquids at the drips. Pipeline liquids never enter the oily water treatment system (CH2M HILL 2006a).

Pipeline liquids are removed from the drip points monthly. All pipeline liquids removed from the drip points are brought back to the facility for collection prior to recycling or offsite disposal. The volume of pipeline liquids collected varies but is generally only a few ounces per drip point. Following collection, the pipeline liquids are tested for the presence of polychlorinated biphenyls (PCBs). Testing for PCBs began in 1981. Pipeline liquids containing less than 5 parts per million (ppm) total PCBs are combined with the waste oil generated at the facility and are, ultimately, recycled. However, pipeline liquids containing more than 5 ppm PCBs are handled and disposed of as hazardous waste.

PCBs were not an issue at Topock prior to 1991.

The portion of the Transwestern Gas Pipeline that lies offsite and to the east of the facility historically has been contaminated with PCBs. Transwestern began delivering natural gas to Topock 1991. When the Transwestern gas was brought to the station, PG&E instituted a very rigorous natural gas specification to prevent PCB contamination at Topock. To prevent any possible PCB contamination of the lines at Topock, two phase-separator units were

installed upstream of Topock—one by Transwestern and one by PG&E. In 1998, Transwestern had a failure in their system, and some PCBs entered PG&E's portion of the pipeline system. PG&E tests and appropriately segregates all liquids recovered from the Transwestern pipeline, the compressor station, and PG&E's downstream pipelines (Russell 2006b). Transwestern's response to the PCB contamination was to make improvements to their pipeline to keep its gas extremely dry to prevent transport of PCB fluids in their system. Since those improvements have been made, only an estimated 4 ounces of pipeline liquids are collected from that pipeline over a several month period (Riddle 2004).

Information obtained from employees suggests that pipeline liquids historically may have been sprayed on station roads and unpaved areas for dust control (Russell 2006b). Based on available information, this practice ceased by 1975, and waste oil, including pipeline liquids, was sent offsite for reuse starting in 1975 (PG&E 1980a).

The 300B pipeline liquids collection tank ("drip tank") was removed in 1995. The 900-gallon drip tank was located southeast of the plant on a unpaved shelf in the hill next to the pipeline access road (Trident 1995a). The tank was removed in 1995, and associated piping was emptied, disconnected, and capped at the abandoned ends (Trident 1996c). Oil staining was observed below the center and southern portions of the tank, extending out a maximum of 6 feet from the footprint of the former tank (Trident 1995a). The total stained area was estimated to be approximately 20 feet by 40 feet.

Two samples were collected from a hand-dug test pit dug in the stained soil on the west side of the former tank location. Samples were collected at 1.2 and 2 feet bgs. No staining was observed below 2 feet bgs. The samples were analyzed for total recoverable petroleum hydrocarbons (TRPH), quantified as motor oil by gas chromograph/flame ionization detector. The detected concentrations were 100 milligrams per kilogram (mg/kg) and 13 mg/kg.

A subsequent soil sample (from 0 to 4 inches bgs), collected in April 1996 to characterize the stained soil in anticipation of disposal, indicated that TRPH was present at concentration of 68,000 mg/kg, but volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and PCBs were less than analytical detection limits. Generally, detected metals concentrations were in the same range as currently-estimated background concentrations. Closure activities, consisting of soil excavation and confirmation sampling, were implemented between July 1996 and September 1996. Samples collected during the last two sampling events indicated that the soil remaining in place below and adjacent to the excavation contained less than 1,000 mg/kg TRPH. Residual levels of TRPH ranged from less than analytical detection limits to 150 mg/kg. The soil excavation and sampling results are documented in the Closure Certification Report (Trident 1996d). Closure of the site was approved by San Bernardino County on June 9, 1997.

3.1.3 Cooling Water Systems

The six separate cooling systems at the compressor station are:

- Main jacket cooling water (JCW) system.
- Auxiliary jacket cooling water (AJCW) system.
- Lubricating oil cooling water system (LOCW).

- Auxiliary lubricating oil cooling water system (ALOCW).
- Combustion air cooling system (aqua towers).
- Cooling tower system.

Most of these cooling systems have been in service since the facility began operation in 1951. A schematic of the cooling water systems at the facility is provided in Figure 3-4.

3.1.3.1 Jacket Cooling Water System

The internal combustion compressor engines require a cooling system for temperature control. All compressor engines are cooled directly by using a single cooling system, referred to as the JCW system. The JCW system circulates water through the engine blocks and cylinder heads of each compressor unit. The heated water is then run through air-cooled heat exchanger units to dissipate the heat. The heat exchanger units are located just east of the compressor building (Figure 3-1). The JCW system is a closed-loop system (i.e., no water is added or lost from the system under normal operating conditions).

The JCW system includes two 12,500-gallon tanks that provide surge capacity and ensure a steady flow of cooling water to the heat exchangers and the compressor engines. Currently, the JCW tanks are located in secondary containment. Historically, the JCW operated with a hot well (open-top concrete basin). The hot well was approximately 10 feet deep, with half the height set below ground, and occupied approximately twice the area currently occupied by the JCW tanks. The hot well was replaced with tanks prior to 1990. During installation of secondary containment around the tanks in 1994, remnants of the old hot well were discovered and removed. The soil contained in the former hot well was removed, and the remaining concrete was removed. The concrete and soil were tested for total chromium [Cr(T)] and Cr(VI) and appropriately disposed of offsite. Sampling conducted indicated that soluble chromium at levels exceeding California hazardous waste criteria was present in the soil and concrete associated with the hot well (PG&E 1994).

A small shed, referred to as the mixing shed, was located in this area immediately adjacent to the former hot well. Reports from former employees indicate that when the hot well was in service, coolant chemicals used in the JCW system may have been mixed in the mixing shed before being added to the hot well (Russell 2006b).

3.1.3.2 Auxiliary Jacket Cooling Water System

The generator engines are cooled by a similar closed-loop, common cooling system referred to as the AJCW system. The AJCW system circulates water through the engine blocks and cylinder heads of each generator engine. The heated water is then pumped through air-cooled heat exchanger units to dissipate the heat. The heat exchanger units are located just north of the auxiliary building (Figure 3-1). The AJCW system is a closed-loop system (i.e., no water is added or lost from the system under normal operating conditions). There is no information to suggest that any major structural changes to this system have occurred, nor is there any information to suggest that the system ever had a hot well (Russell 2006a).

3.1.3.3 Lubricating Oil Cooling System

The lubricating oil used in the compressor engines requires cooling to prevent excessive deterioration. The lubricating oil from each compressor engine is circulated through a shell-and-tube heat exchanger. LOCW is circulated through the heat exchangers to remove

heat from the oil. The heated LOCW is cooled by circulating it through the plate and frame heat exchangers located at the cooling towers. Historically, the LOCW was circulated through tube bundles in the cooling towers (see discussion of Original Cooling Towers n Section 3.1.3.6, below). The LOCW system used to cool the compressor engine oil is also a closed-loop system (i.e., no water is added or lost from the system under normal operating conditions). No major structural changes to this system have occurred since the 1950s.

3.1.3.4 Auxiliary Lubricating Oil Cooling System

The lubricating oil used in the generator engines also requires cooling to prevent excessive deterioration. The lubricating oil from each generator engine is circulated through the tubes of a shell-and-tube heat exchanger. ALOCW is circulated through the shell of these heat exchangers to remove heat from the oil. The heated ALOCW is then cooled by running it through the larger air-cooled heat exchangers located just north of the auxiliary building (Figure 3-1). The ALOCW system used to cool the compressor engine oil is a closed-loop system (i.e., no water is added or lost from the system under normal operating conditions). No major structural changes to this system have occurred since the 1950s.

3.1.3.5 Combustion Air Cooling System (Aqua Towers)

The aqua towers were installed in the late 1950s and early 1960s when turbochargers were added to the compressor engines to increase horsepower. The aqua towers are used to cool the air used for combustion in the compressor engines. Each compressor engine is equipped with an individual aqua tower, located just east of the compressor building. Compressor engine combustion air is first drawn into the aqua tower through a paper-element filter, then through the main chamber of the aqua tower, prior to entering the compressor engine turbochargers. A fill material is installed in the main chamber of the aqua towers, which is continuously wetted by a pump and spray circulating water system. The air is cooled as it passes through the wetted fill material. After the gas passes through the turbochargers, it is cooled again in the intercooler heat exchangers mounted on the sides of the engine. The intercoolers are cooled by circulating the water from the cold basin in the aqua tower through the intercooler and returning the water to the top of the aqua tower.

The aqua towers are considered to be an open cooling system, because fresh water is added to make up for evaporative losses. In addition, the water in the system continues to concentrate the naturally-occurring chemicals in the water due to evaporation and must be periodically removed from the system to prevent the formation of scale on the heat transfer surfaces. Water drained from the system is referred to as blowdown. Blowdown from all of the aqua towers drains to a common sump and is pumped from there to the two cooling towers, where it is considered to be a source of make-up water for the cooling towers. The available information indicates that the blowdown from the aqua towers has always been directed to the cooling towers.

3.1.3.6 Cooling Tower System

A re-circulating cooling water system is used at the facility to cool the compressed natural gas and compressor engine LOCW. The cooling towers are open systems where cooling water is lost to evaporation and drift and therefore require regular removal and replenishment of water. A cooling water system has been in place since the facility began operation in 1951. Cooling Tower A was constructed as a four-cell tower in 1951. Cooling

Tower B was constructed as a two-cell tower in 1954 but was expanded to a four-cell tower in 1958 (PG&E 1958b). In 2001, the original Cooling Tower A was replaced with a new unit. Likewise, in 2002, the original Cooling Tower B was replaced. Both new cooling towers were built in the same location as the original towers.

Original Cooling Towers. Original Towers A and B were induced-draft counterflow coil-shed cooling towers (PG&E 1991a) (see Figure 3-5). Each tower was about 25 feet wide, 97 feet long, 34 feet high, and had a water capacity of 49,300 gallons. The original cooling towers were constructed of metal, concrete, and wooden components. Wooden components consisted of the frame, packing materials, upper basin, and drift eliminators. Cooling of the natural gas and LOCW was accomplished by circulating the fluids through cooling coils that ran inside the towers. Each tower had 16 natural-gas cooling coils and six LOCW coils (commonly referred to as "bundles"). Heat transfer occurred by the conduction of heat from the surface of the bundles to the circulated water and updrafted air.

Water entered the towers by means of a makeup water line that emptied into the hot water basin at the bottom of the tower. The cooling towers functioned in a two-step continuous process. In the first step, the water from the hot basin was cooled. Water was pumped to the top of the towers to a distribution system. The distribution system cascaded the water over honeycombed-shaped packing material, while a fan was used to pull air upwards through the packing material from the bottom (counterflow to the water). This process cooled the water. It also resulted in evaporation of some of the water. After the water passed through the packing, it was collected in the cold water basin near the middle portion of the tower.

In the second step, the cooled water was drained from the cold water basin and distributed over the gas and LOCW bundles in the lower portion of the tower to provide cooling of the gas and LOCW. The water was then once again collected in the hot water basin to be re-circulated through the process. The hot water basins were constructed of concrete and were at grade or slightly below grade. The concrete hot basins are now exposed (the new cooling towers are set into, but do not use, the old hot basins), and appear to be in good condition (no cracks or other defects are visible).

The original cooling towers were both open systems. Water losses from the cooling towers were caused by drift, evaporation, and blowdown. Drift is the loss of water that becomes physically entrained in the air that is circulated through the towers. If the entrained water is not removed from the airstream, it is lost to the atmosphere as the air exits the tower. Both cooling towers had drift eliminators that trapped entrained water and minimized water loss due to drift. Maximum drift loss was estimated to be less than 1 gallon per minute (gpm) (Wilber 1999). Approximately 80 to 100 gpm were lost to evaporation (PG&E 1991b). Because of evaporation, treatment chemicals and naturally-occurring minerals increase in concentration in the cooling water. To prevent chemical buildup and scale formation, a portion of the water is periodically removed (i.e., blowdown) and replaced with freshwater (i.e., makeup water).

New Cooling Towers. In 2001 and 2002, Cooling Towers A and B were replaced with new units.[4] The lower concrete basins of the original units were used as foundations for the new

[4] All wooden components and other potentially contaminated components of the original cooling towers were transported offsite for disposal at the McKittrick Waste Treatment Site in McKittrick, California.

towers (i.e., the new towers are in the same location as the original towers). The concrete basins are in good condition, with no obvious deterioration. The new units are metal and are self-contained (i.e., water does not flow outside the units into the concrete basins). The units are linked to heat exchangers located adjacent to the cooling towers. Each heat exchanger contains four tube bundles for natural gas and four tube bundles for lubricating oil cooling water. The cooling water within the heat exchangers is still circulated within an open system. Because it is an open system, some water is lost to evaporation and blowdown is still required.

Each of the two new cooling towers consists of three cells. Hot water from the LOCW heat exchangers enters at the top of the cooling tower cell and fills the basins on the east and west sides. These are called the hot basins. The nozzles that penetrate the bottom of the hot basins direct the hot water over the plastic cooling tower fill. The cooling tower fill is designed in such a way as to maximize surface area of the water as it flows down the fill. The fan in the center of each cell draws air through the fill and exhausts the air out of the top of the cooling tower. The air flowing over the wetted fill evaporates a portion of the water, causing the cooling effect. The cooled water drops by gravity into the lower cold basin. Cold water from the lower basin is pumped first to the four gas coolers. The four gas coolers are shell-and-tube heat exchangers. The cold water runs through the tubes, and the natural gas flows through the shell. The water exits the gas coolers and then flows through the four LOCW heat exchangers. These are plate-and-frame-type heat exchangers with cooling tower water on one side of the plates and LOCW on the other side of the plates. The cooling water exits the LOCW heat exchangers and flows back to the cooling tower hot basins to begin the cycle again.

As water is evaporated from the cooling tower, scale may begin to form on heat exchange surfaces, corrosion may occur, and biological growth may accelerate; therefore, the composition of the cooling water must be carefully maintained at optimal conditions. The cooling tower is equipped with a controller that automatically discharges water from the cooling tower when a specified electrical conductivity is reached. As needed, the controller automatically adds sulfuric acid, a phosphate-based corrosion inhibitor, a scale dispersant, and a biocide. Automatic level controls allow freshwater to flow into the cold basins to maintain a proper water level in the cooling towers.

3.1.3.7 Chemical Use in the Cooling Water System

Historically, cooling water was treated with chemicals to prevent corrosion of the metal components, fungus attack on wooden components (the original cooling towers contained some wooden components), algae and bacterial growth; and deposition of minerals (scale). With the exception of the need to control fungus attacks on wooden components (the new towers are constructed of all-metal components), cooling water treatment still serves the same purposes today. As described above, six separate cooling water systems are used at the compressor station (i.e., the JCW system, the AJCW system, the LOCW system, the ALOCW system, the combustion-air cooling system, and the cooling-tower system). Currently, water treatment chemicals are used in all of the cooling systems except the combustion-air cooling system; however, it appears that treatment chemicals may have been used in the combustion-air cooling system in the past (Riddle 2006a).

Cooling water in the cooling towers is currently treated using a multi-component additive system, consisting of a phosphate-based corrosion inhibitor, a biocide, and a dispersant. In addition, sulfuric acid is used to control the pH in the cooling towers. The closed-loop cooling systems currently use a molybdate-based additive system that serves the same functions. Concentrations of the additives are monitored and adjusted weekly.

From 1951 to 1985, Cr(VI)-based corrosion inhibitors and biocides were added to the cooling water. Several different corrosion inhibitors were used during this period; however, all are believed to have contained Cr(VI). Product specification sheets available for one of the additives (Krom-Trol X-5, also known as DE-307) indicates that it contained 30 percent sodium chromate (Betz 1985). In the early 1960s, a separate biocide was also apparently added to assist in the control algae, fungi, and/or bacteria (Betz 1965).

Scale control in the towers is achieved by adding a dispersant and controlling the pH. The function of the dispersant is to keep small particles of mineral salts in suspension in the cooling water to prevent the particles from precipitating on the tower components. It appears that dispersant may not have been required initially but was added when the mineral content of the makeup water began to increase. To control deposition of minerals, the pH of the cooling tower water was kept close to neutral (i.e., 7.0 pH units) through the addition of sulfuric acid (H_2SO_4).

The Cr(VI)-based corrosion inhibitors were maintained in a control range that differed for each cooling system and also varied over time. There is no available information on the control range for the Cr(VI)-based corrosion inhibitors prior to 1968. However, it is estimated that, prior to 1964/1965, chromate concentrations in the cooling towers were in the range of 77 to 101 ppm (Meredith/Boli & Associates 1999). Chromium control limits for the cooling towers after 1968 were in the range of 7 to 12 ppm chromate (Betz 1967a, 1969a). These control limits were in effect until at least 1978 (Betz 1978a). In general, chromate concentrations within the cooling towers from 1968 to 1985 appear to have been maintained at or near a control range of 7 to 12 ppm (Betz 1969a, 1972, 1978a, 1981).

Historically, the closed loop systems also used a chromium-based additive system similar to the system used for the cooling towers. Information on chromate control limits and actual chromate concentrations for the closed-loop cooling systems is limited. Information from 1978 (Betz 1978b, c) indicates that the target ranges were 250 to 300 ppm chromate in the JCW, AJCW, and ALOCW systems and 1,000 to 1,500 ppm in the LOCW system. The latter control limits were reduced to 800 to 1,000 ppm chromate in August 1978 (Betz 1978a). By the early 1980s, the LOCW system chromate control range was reduced to the same concentration range as the remaining closed-loop cooling systems (Betz 1981, 1982). No other pertinent information is available regarding historic chemical use in the cooling systems.

In September 1985, treatment of the cooling water in the cooling towers was changed to a non-hazardous, phosphate-based corrosion inhibitor, dispersant, and biocide package. The closed loop systems were converted to a molybdenum-based corrosion protection system at about the same time (Russell 2006a). Although the formulations of the phosphate-based treatment products used at the compressor station have varied slightly, the overall additive chemistry has not changed significantly since 1985. Table 3-4 summarizes the type, composition, and target concentrations of treatment products currently used in the cooling

water systems at the compressor station. In addition to the treatment chemicals, sulfuric acid (H_2SO_4) is used to keep the cooling water neutral (i.e., at 7.0 pH units).

3.1.3.8 Waste Generation and Management for the Cooling Water System

The primary waste product generated by the cooling water system is blowdown water. During operation of the cooling towers, about 80 to 100 gpm are lost to evaporation (PG&E 1991b). As water is lost to evaporation, naturally-occurring minerals and cooling water treatment chemicals build up in the cooling water. Periodically, a portion of the water in the cooling towers must be removed (i.e., blowdown) and replaced with fresh makeup water to prevent excessive scale formation.

The amount of blowdown generated each day depends on the mineral content of the makeup water, the effectiveness of the scale-control additives, the time of year (higher air temperatures result in greater evaporative losses), the total additive load,[5] and the compressor load. The number of "cycles" is the allowable concentration factor for certain scale-forming minerals. Thus, if the makeup water contains 10 ppm of certain minerals, a cooling tower operating at 10 cycles would discharge blowdown water containing 100 ppm of these minerals (i.e., a tenfold increase in concentration).

The daily blowdown rate ranges from as low as 10,000 gallons per day (gpd) or less on a low-load winter day to the maximum of 50,000 gpd on a high-load hot summer day (Riddle 2004). The facility operated at the highest number of cycles (14.3 to 17.6 cycles) immediately after startup (Betz 1952a-b). With increasing hardness of the makeup water, cooling tower cycles decreased to approximately five cycles in the mid-1960s (Betz 1965, 1967b) and dropped to as low as three to four cycles in the late 1960s (Betz 1969b). In the late 1970s and early 1980s, typical values were in the range of seven to eight cycles (Betz 1980a,b). The new cooling towers currently operate at approximately six cycles (Riddle 2006a).

The actual rate of blowdown from the towers during the 1950s and early 1960s cannot be determined. The earliest available information, which is from 1968, indicates that the average daily blowdown was on the order of 48,500 gpd and ranged from a minimum of 25,300 gpd in the winter to a maximum of 64,300 gpd in the summer (PG&E 1968a). The concentration of TDS in the blowdown ranged from about 4,600 to 6,600 mg/L (PG&E 1968a, 1993) but may have been as high as 11,000 mg/L (Water Board 1969).

A secondary waste stream associated with the cooling water system was sulfuric acid sludge. Documentation from 1982 indicates that some sulfuric acid sludge was generated in the sulfuric acid storage tanks. The storage tanks were constructed of unlined steel, and the sludge was a result of the interaction between the acid and the steel. About 2,000 pounds of sulfuric acid sludge per year were generated; disposal occurred approximately every 7 years (PG&E 1982). The sludge was removed and transported to an approved Class I disposal site. In 1984, new epoxy-lined acid storage tanks were installed (PG&E 1984a). No sludge has been removed since that time.

[5] The absolute amount of cooling water treatment additives added to the cooling water.

3.1.4 Wastewater Treatment Process

Wastewater generated at the compressor station consists primarily of cooling-tower blowdown (about 95 percent) and a minor volume of water discharged from the oily-water treatment system from facility operation and maintenance activities (about 5 percent) (PG&E 1993). As described above, wastewater generation has generally decreased through time as the cooling water system has been modernized. Discharge has ranged from about 17 million gallons per year in 1968 (the first year of recorded discharge) to about to 6 million gallons per year in 2003.

3.1.4.1 Cooling Water Blowdown Treatment

In late 1963 to early 1964, PG&E began treating the chromium-bearing blowdown (wastewater) from the cooling towers (PG&E 1965b). From 1964 through 1969, treatment was performed using a single-step treatment system. The original single-step system used an 800-square-foot treatment pond. Based on PG&E documentation (PG&E 1968a) and aerial photographs, the treatment pond was constructed within one of the sludge-drying beds (Figure 3-1). The sludge-drying beds were constructed of concrete. The exact design and construction details (e.g. joint locations) of the beds are unknown.

In the treatment pond, chromium-bearing wastewater was injected with sulfur dioxide (ferrous sulfide appears to have been used initially but was subsequently replaced with sulfur dioxide) to reduce Cr(VI) to Cr(III) (PG&E 1965c, 1968a). Samples of the effluent from the single-step treatment system contained Cr(T) at concentrations of 13.81 and 14.41 ppm (PG&E 1968a). No sludge was generated by this system.

In late 1969, a two-step treatment system was installed in the lower yard of the compressor station (Figure 3-1).[6] In Step 1, the blowdown was treated by reducing Cr(VI) to Cr(III) in the chromate reduction tank. Wastewater in the chromate reduction tank was injected with sulfur dioxide gas to maintain the pH between 2.9 and 3.2 units. Within this pH range, Cr(VI) was reduced to Cr(III). In Step 2, the effluent from the chromate reduction tank was transferred to the precipitation tank and was treated to remove chromium from solution. Wastewater in the precipitation tank was injected with sodium hydroxide to elevate the pH to between 6.7 and 7.2 units. Within this pH range, Cr(III) combined with the hydroxide ions to form a chromic hydroxide sludge that settled to the bottom of the tank (PG&E 1982). From 1970 to 1974 (the time during which injection well PGE-08 was operated), Poly Floc II and ferric sulfate were used, along with the sodium hydroxide, to further enhance the removal of chromium (PG&E 1975, 1985a) and other particulates to facilitate the injection of water into PG&E-08. After the use of PG&E-08 was discontinued, Poly Floc II and ferric sulfate were no longer used in the wastewater treatment process. According to the 1986 Closure Plan, which contained laboratory reports of wastewater samples collected in the mid 1970s, wastewater treated using the two-step treatment process generally contained 1 ppm or less of chromium (Mittelhauser 1986).

In 1985, a phosphate-based corrosion inhibitor replaced the Cr(VI)-based inhibitor. Blowdown from the cooling towers containing phosphate-based inhibitors is non-hazardous

[6] Historic documents indicate that the system was installed and began operation sometime between November 1969 and March 1970.

and does not require treatment prior to being discharged. Therefore, the treatment of cooling water blowdown ceased in October 1985.

3.1.4.2 Oily Water Treatment

Several of the industrial buildings within the compressor station are equipped with floor drains that capture liquids released to the floor of the building and convey the liquid to the Oil/Water Separator System (OWSS). In addition, other industrial facilities, such as the steam cleaning area and the main jacket water surge tanks, are equipped with drains that capture overflow and spills. A pipe trench that extends from just north of the steam cleaning area to the east side of the compressor building also drains to the OWSS, and has been included in this AOC. Collectively, these drains are referred to as industrial floor drains to distinguish their use and intent from the storm drains that are also present at the facility. These industrial floor drains are found in the following buildings and facilities: Compressor Building, Auxiliary Building, Jacket Cooing Water Pumps, Oil Storage Tank Area, Steam Rack (steam cleaning area), and Fire Water Pump Building (Former Water Softener Building). About 200,000 gallons per year are derived from floor drainage (Kearny 1987). In addition, about 10,000 gallons per year are generated from compressor engine-cleaning operations, and about 10,000 gallons per year are generated from steam-cleaning operations (Kearny 1987).

From 1951 to 1989, oily water produced at the facility was treated using a system that consisted of an oil/water holding tank and an oil/water separator (OWS), both located in the southern portion of the lower yard (Figure 3-1). From the collection points, the oily water was directed to the oil/water holding tank (a 3,000-gallon-capacity steel tank).[7] From this tank, the oily water flowed to an adjacent OWS. The OWS consisted of a concrete vault set below grade. The unit was equipped with an underflow weir and suction pump to separate and remove oil from the water.

Floating oil was pumped to a portable waste oil storage tank. When the portable tank was full, it was moved to the tank farm on the east side of the facility (Figure 3-1), and the oil was transferred from the portable tank into the stationary waste oil storage tank.

Available documentation indicates that treated effluent water from the OWS has routinely been combined with cooling water blowdown effluent prior to discharge, although the point of confluence has varied. Prior to 1964, treated water from the OWS was directed to the transfer sump prior to being discharged. From 1964 to 1969, treated effluent from the OWS may have been directed to a treatment pond and processed along with the cooling water blowdown through the single-step chromium treatment system prior to discharge. From 1969 through October 1985, treated effluent from the OWS was routed to the chromate reduction tank and was processed along with the cooling water blowdown through the two-step chromium treatment system prior to being discharged. In November 1985, the chromate reduction tank was converted into a holding tank (Kearny 1987), and the discharge from the OWS was routed to either the holding tank or the transfer sump prior to discharge.

[7] The RFA (Kearny 1987) indicates that the oil/water holding tank in place at the time of the RFA (1987) was installed in 1970. It is unknown whether the RFA information is incorrect, whether another oil/water holding tank was in place prior to 1970, or whether, prior to 1970, oily water flowed directly to the OWS.

In 1989, a new oily water treatment system was installed at the facility, and this system is still in use today. The oily water treatment system currently consists of a grit tank, an oily water collection tank, an OWS, a waste oil holding tank, and a clean water tank. The grit tank is located in the central portion of the lower yard within a concrete secondary containment enclosure (Figure 3-1). The oily water collection tank, OWS, waste oil holding tank, and clean water tank are all located within one large concrete secondary containment enclosure located in the southern portion of the lower yard (Figure 3-1).

The oily water flows from the collection points to the grit tank (a 3,000-gallon plastic tank) where sediment is allowed to settle out. Accumulated sediment in the grit tank is periodically removed and transported offsite for disposal at an appropriate facility. From the grit tank, the oily water flows to the sump and then is pumped to the oily water holding tank (a 3,000-gallon plastic tank). The oily water collection tank is elevated to provide sufficient head to operate the OWS. The OWS consists of a 3,000-gallon capacity, horizontal steel tank with internal partitions to separate the oil from the water. Separated oil is pumped to the waste oil holding tank, while the treated water is pumped to the clean water tank.

The waste oil holding tank is a 3,500-gallon plastic tank. At one point, the accumulated waste oil was pumped by pipeline from the holding tank to the waste oil sump and from there to waste oil storage tank (both located in the tank farm on the east side of the facility; Figure 3-1). Currently, a waste management contractor removes the waste oil generated by the oily water treatment system directly from the holding tank. Water discharged from the OWS generally contains about 48 mg/L oil and grease and about 3 mg/L total petroleum hydrocarbons (TPH) (PG&E 1993).

The clean water tank is a 9,200-gallon plastic tank. Treated water from the OWS is pumped to this tank, combined with the cooling water blowdown, and then periodically pumped to the evaporation ponds.

3.1.4.3 Chemical Use in the Wastewater Treatment Process

From 1964 to 1969, the single-step treatment system used sulfur dioxide to treat chromium-bearing cooling water blowdown. The sulfur dioxide used in this system was contained in a 1-ton liquid cylinder that was stored adjacent to the treatment pond.

In 1969, the two-step chromium treatment unit that used both sulfur dioxide and sodium hydroxide was installed. For the two-step system, a liquid sulfur dioxide cylinder was located next to the chromate reduction tank, and liquid sodium hydroxide was kept adjacent to the precipitation tank. From 1970 to 1973 (the time during which injection well PGE-08 was operated), Betz Poly Floc II and ferric sulfate were used along with the sodium hydroxide in the precipitation tank to further enhance the removal of chromium (PG&E 1975, 1985a). The use of the Poly Floc II and ferric sulfate appears to have been discontinued sometime after 1974. Since 1985 (when the use of chromium-based corrosion inhibitors was discontinued), no chemicals have been used in the wastewater treatment process.

3.1.4.4 Waste Generation and Management in the Wastewater Treatment Process

Wastes associated with the wastewater treatment process consist of the wastewater itself, sludge, and waste oil. The management of each waste stream is discussed below.

Wastewater Disposal. From 1951, when the compressor station first began operation, until 1970, when injection well PGE-8 went into operation, industrial wastewater (including effluent from both the cooling water blowdown and oily water treatment processes) generated at the facility was discharged to Bat Cave Wash (Figure 3-1). Based on historic aerial photographs, it appears that during the 1950s, wastewater was released to the wash without impoundment. Wastewater was released to the wash through a pipe that ran from the sludge drying beds area in the lower yard down the slope into Bat Cave Wash. Eleven aerial photographs taken between 1951 and 1970 were reviewed. The photographs show a light-colored flow in the wash that originates at the discharge point and, at least once, extends to the railroad tracks about 1,600 feet downstream. The light-colored flow does not extend beyond the railroad tracks in any of the 11 aerial photos reviewed. Based on this evidence, it does not appear likely that discharge routinely (or possibly ever) extended beyond this point.

In about 1964, a percolation bed was created in Bat Cave Wash west of the former sludge drying beds area, as depicted in Figure 3-6 (PG&E 1968a).[8] The bed was created by berming up soil on the west and south sides of the area (the sidewall of Bat Cave Wash formed the eastern boundary). PG&E documentation indicates that the percolation bed had an area of approximately 17,600 square feet (PG&E 1968a). Wastewater was discharged to this area from two pipelines (one 12-inch-diameter pipe and one 4-inch-diameter pipe) that ran from the lower yard down into Bat Cave Wash. Remnants of the -4-inch-diameter discharge pipe are still present on the slope above Bat Cave Wash. The percolation bed was not lined, and discharged wastewater was allowed to percolate into the ground and/or evaporate in this area.

By 1967, a graded impoundment is visible on aerial photographs on the inside loop of the access road that runs from the lower yard down into Bat Cave Wash (Figure 3-6). This portion of the impoundment is located in the area that has commonly been identified as the location for the former percolation bed in previous documents including the *Bat Cave Wash Soil Investigation* (Brown and Caldwell 1988). Based on field observations and information from aerial photographs, the impoundment was created by bulldozing soil from the center of the loop area and berming the soil up along the southern edge of the access road. This area represents the northern boundary of the percolation bed. Ponded water can be seen in this general area in aerial photographs from 1967 and 1969.

Former employees have reported that a crust would form on the impounded liquid and would have to be broken up. In addition, employees also reported that over time, the infiltration rate would decrease in a specific location, and a new impoundment would be constructed in the same general area of Bat Cave Wash (Russell 2006a).

Water Board Order 69-25 required PG&E to cease discharging industrial wastewater by infiltration no later than January 1, 1970 and required any retention of wastewater to be in basins from which no infiltration or surface run-off may occur (Water Board 1969). In response to this order, PG&E constructed wastewater injection well PGE-08. Injection of wastewater began in May 1970 and continued to August 1973. Records from the time (Dames & Moore 1970) indicate that there were some initial difficulties with the operation of

[8] The exact date for construction of the percolation pond is unknown but, based on aerial photographs, it appears to have been constructed in 1964 along with the single-step treatment system.

the injection well. From May 1970 to September 1971, some wastewater may have been temporarily discharged to the percolation bed in Bat Cave Wash when injection well PGE-08 was offline for repairs or maintenance. Based on available information, it is estimated that between approximately 29.4 million to 42 million gallons of wastewater were injected into PGE-08 while it was operational (PGE 1984a).

Pond 1, the first of four single-lined evaporation ponds (i.e., SWMU 10; the Old Evaporation Ponds), was completed September 1971. From September 1971 through August 1973, Pond 1 may have also been used temporarily for the disposal of wastewater when injection well PGE-08 was offline for repairs or maintenance. The 1972 annual report pursuant to Order 70-72 (Water Board 1970a) indicates that 1.6 million gallons of wastewater were discharged to Pond 1 in 1972 (PG&E 1972). This volume constitutes approximately 10 percent of the average annual wastewater volume at the time.[9] The remainder of the wastewater was injected into the injection well. In August and December 1973, treated wastewater was discharged alternately on a 3-day cycle between the injection well and Pond 1 (PG&E 1973a). Beginning in December 1973, wastewater was permanently routed to the evaporation ponds. Ponds 2 through 4 were subsequently completed in 1974 and began receiving wastewater shortly thereafter. Industrial wastewater generated at the compressor station between 1973 and 1989 was discharged to the single-lined evaporation ponds.

Handwritten notes indicate that between 1975 and 1980, the daily discharge rate ranged from 0 to 30,000 gpd, with average annual daily discharges ranging from approximately 8,000 to 17,600 gpd (i.e., between 20 percent and 40 percent of the flow documented in the Water Board Order) (PG&E 1980a).

The four single-lined evaporation ponds were replaced by four new, Class II (double-lined) evaporation ponds in 1989 (i.e., Ponds #1 through #4) constructed on BLM property. Since 1989, all industrial wastewater from the compressor station has been disposed of at the Class II ponds. The original, single-lined ponds were clean closed in 1993 (Trident 1993; DTSC 1995). A discussion of the closure process is summarized in Section 4.1.9.

Sludge Disposal. From 1969 through May 1985, sludge generated in the precipitation tank from the treatment of cooling-tower blowdown was transferred to the sludge drying beds for dehydration prior to disposal (Water Board 1970b; Kearny 1987). The sludge drying beds were constructed of concrete. The exact design and construction details of the beds are unknown. Prior to 1969, only a single-step treatment system was used to treat cooling water; therefore, very little sludge, if any, was generated. From May 1985 to October 1985, the sludge was pumped directly from the precipitation tank and transported offsite for disposal as a hazardous waste. The volume of chromic hydroxide sludge generated per year was relatively constant and averaged about 15,000 gallons per year (PG&E 1985b). PG&E data from 1984 (PG&E 1984b) indicate that the chromium hydroxide sludge contained Cr(T) at 570 mg/kg and Cr(IV) at 0.03 mg/kg. Soluble threshold limits concentration data for the elutriate derived from the same sample were reported as 170 mg/L Cr(T) and 0.98 mg/L Cr(VI).

[9] The reported average daily discharge rate at the time was 48,500 gallons, or approximately 17.7 million gallons per year (Water Board 1969).

A 1970 letter (PG&E 1970) indicates that PG&E was planning to bury the initial batch of sludge on or near the compressor station; however, there is no documentation to confirm whether this onsite disposal occurred. Several former long-term employees who were working at the facility during this time period were recently interviewed. None of them recalled the burial of sludge (Russell 2006a). Water Board Order 70-73, specifying the disposal requirements (location and placement) for the chromium hydroxide sludge at Needles Landfill, was issued on October 29, 1970 (Water Board 1970b). It appears that the chromium hydroxide sludge was disposed of at Needles Landfill from that time (October 1970) until 1983, although no specific documentation exists for 1971 and 1972.[10] Sludge shipping documents compiled by PG&E (PG&E 1984c) indicate that 166,500 gallons of sludge were disposed of at the Needles Landfill between 1973 and 1983. Annual volumes shipped varied widely, from 0 to 33,600 gallons, suggesting that there was storage capacity in the sludge drying beds. In response to California Department of Health Services (CDHS) directives (CDHS 1984a), no shipments were sent to the Needles Landfill after 1983 (PG&E 1984b-c). From January 1984 to October 1985, the dried sludge was transported offsite to an approved Class I hazardous waste facility (PG&E 1984c; CDHS 1984b).

Although there are non-PG&E references to sludge having been removed from the single-lined ponds (Kearny 1987; CDHS 1985), no first hand references have been located and it appears unlikely that the facility would have jeopardized the integrity of the pond liner by employing mechanical means of sludge removal. In addition, due to the size and depth of the ponds, it is unlikely that routine removal of sludge would have been required. The "sludge" that would have been present in the ponds would have consisted predominately of mineral salts found in the makeup water and dust blown into the ponds (Riddle 2004). Some solids were found in the ponds and tested as part of an overall sampling program for the wastewater treatment system (Brown and Caldwell 1985a). Based on information obtained from PG&E, it is likely that sludge removal would only have occurred if repairs were required to one of the ponds (Riddle 2004).

Very little sludge, if any, is generated using the phosphate-based cooling water treatment system. The current Class II evaporation ponds were designed for a 20-year life and have accumulated less than 12 inches of residue in the bottom since being placed into service in 1989. About 80 percent of the accumulated solids have recently been removed from the ponds as a maintenance function to ensure effective continuing operation of the ponds.

Waste Oil. Waste oil removed from oily wastewater is collected and transported offsite for disposal or recycling (additional information on the management of waste oil is provided in Section 3.1.5.2).

3.1.5 Facility and Equipment Maintenance

The fifth major activity at the compressor station is maintenance of the equipment at the facility and the facility itself. Typical maintenance tasks include:

- Preventive maintenance of mechanical and electrical systems.
- Mechanical and electrical repairs of operating equipment.

[10] Offsite disposal of chromium hydroxide sludge does not appear to have been performed at routine (e.g., quarterly) intervals, but appears to have been performed only sporadically. This suggests that the sludge was stockpiled onsite and disposed of only as necessary. This may explain the absence of disposal records for 1971 and 1972.

- Minor maintenance of buildings and structures on the property.
- Fueling and servicing of vehicles required for station operations.
- Chemical testing of cooling water.
- Construction.

Equipment maintenance consists of preventive maintenance and repairs for the mechanical and electrical equipment at the facility. Routine maintenance of small system components occurs on an as-needed basis. Special maintenance tasks consist primarily of compressor engine and generator engine overhauls. Compressor engines are overhauled when necessary, as indicated by equipment monitoring. Prior to 1998, compressor engines were overhauled after approximately every 30,000 hours of operating time (about 3.5 years of continuous operation); however, due to increased preventive maintenance, the engines are currently overhauled much less frequently (Riddle 2004). In addition, the closed-loop cooling water systems are drained on an as-needed basis, which is currently less than once per year. There is no information on the historical frequency of closed-loop cooling water system change-outs. Historically, maintenance also included maintaining mercury-containing meters (see Section 3.1.7).

Formerly, indicator chemicals were used to monitor the concentrations of cooling water additives in the various cooling water systems. Testing was performed in the onsite laboratory, and wastes were discharged to the laboratory sink, which drains to the septic system adjacent to the maintenance building.

Construction activities are conducted as needed to maintain and modernize the facility. Construction activities may include repairs to pipeline components, relocation or replacement of pipelines, replacement of major operating equipment, and construction/modification of small buildings. The plant access road was recently repaved, and a berm was added on the south side of the access road (Russell 2006b). No major construction has occurred at the facility since the cooling towers were replaced in 2001 and 2002.

3.1.5.1 Chemical Use in Facility and Equipment Maintenance

Chemical products used during performance of facility and equipment maintenance consist of fuels (i.e., gasoline and diesel), lubricants, solvents, paint, pesticides, and herbicides.

Historically, the facility had seven USTs including (Figure 3-1):

- One scrubber sump located in the lower yard.
- Two tanks adjacent to the compressor building used to temporarily store clean engine oil during compressor engine servicing.
- One tank adjacent to the auxiliary building used to temporarily store clean engine oil during generator engine servicing.
- One waste oil sump located in the tank farm on the east side of the facility (adjacent to the visitor parking lot).
- One 2,000-gallon gasoline tank located northwest of the office.
- One 1,000-gallon diesel tank located northwest of the office.

With the exception of the waste oil sump, all of the USTs have been closed in accordance with UST regulations in the late 1990s. UST closure was coordinated with, and approved by, the CSBFD (CSBFD 1997; Riddle 2004). The fuel and clean oil USTs were replaced with ASTs (the ASTs were generally placed in the same location as the removed USTs). The waste oil sump is still in active use and is permitted and operated under the jurisdiction of the CSBFD.

There are currently four fuel ASTs at the facility (Figure 3-1): a 1,000-gallon diesel AST, a 2,000-gallon gasoline AST used to fuel vehicles are located just northwest of the office, a 2,000-gallon diesel AST that provides fuel storage for the emergency electrical generator, and a 140-gallon diesel AST that provides fuel storage for an emergency fire water pump. There have been no releases associated with the fuel ASTs.

Currently, there are also eight ASTs used for oil storage at the facility (Figure 3-1). Five of the oil storage ASTs are located in the tank farm on the east side of the facility; of these five ASTs, four are used to store new oil product, and the fifth is used to store waste oil. Each of these five oil ASTs is constructed of steel and has a capacity of 7,500 gallons. The three remaining oil ASTs are used to temporarily hold oil that is drained from the compressor and generator engines during servicing. Two of these ASTs are located adjacent to the compressor building, and the third is located adjacent to the auxiliary building. Each of these three ASTs is constructed of steel and has a capacity of approximately 1,500 gallons (Riddle 2004). There have been no releases associated with the oil storage ASTs.

The station has an emergency battery backup system that has been in place for about 15 to 20 years. The battery backup system is used to operate the station controls, emergency lighting, and communications equipment during emergencies. There are eight Absolyte IIP Type 90A-23 batteries and eight Deka Unigy II Type 6AVR 2/85-9 batteries. Maintenance consists of an annual load test and quarterly inspections. The manufacturer replaces individual batteries if the load test shows the cells are bad. The batteries are also returned to the manufacturer for recycling at the end of their life. Historically, they were apparently sent to Wiley Wrecking for salvaging (PG&E 1980a).

Based on interviews with station personnel, weed and insect control is conducted by a contractor. Herbicides and pesticides are applied as necessary around the facility. Rodent control is performed by station personnel (Riddle 2004). No historical information is available regarding the specific chemicals used, quantities used, or specific application locations.

The compressor station has a small onsite chemical laboratory, located in the Auxiliary Building, an original plant building. Routine testing of the cooling water is performed to monitor chemical content and pH of the cooling water. There is no direct information on when the laboratory was first put into service. However, the plant would have needed to test its cooling treatment processes from the start of operations, which suggests that that laboratory has been in use since the inception of the facility. None of the former employees interviewed recalled the chemical laboratory ever being located in any other locations than the auxiliary building (Russell 2006b). Current testing includes pH, conductivity, concentration of corrosion inhibitors in all four cooling systems, and concentration of scale-control additive in the cooling towers. Test chemicals consist of indicator reagents supplied by the cooling water treatment chemical company.

Chemicals are brought to the site in cans, bags, drums, and tanker trucks (gasoline and diesel). Historically, Betz, the cooling water treatment chemical supplier, also provided cooling water treatment chemicals in bulk. It is likely that lubricating oil was also delivered in bulk; however, no records exist regarding historical lubricant deliveries. Bulk chemicals (lubricating oil, sulfuric acid, odorant, and water treatment chemicals) are stored in tanks. Drums of hazardous materials are stored in the hazardous materials storage area. Small containers of chemicals, primarily those used in maintenance activities, are currently stored in approved hazardous materials cabinets near the location of their intended use throughout the facility. Historically, at least some of these materials were stored in the chemical storage sheds formerly located near the cooling towers. Table 3-3 provides a list of chemicals that were known to be stored at the facility during various years for which information was available.

3.1.5.2 Waste Generation and Management Associated with Facility and Equipment Maintenance

The compressor engines and generator engines produce a small amount of waste oil. The compressor engines are two-cycle engines that consume small amounts of their lubricating oil. Therefore, oil must be continually added to the compressor engines. The generator engines are four-cycle engines and, therefore, consume only minor amounts of lubricating oil. The generator engines require periodic oil changes. Waste oil is generated from the engines when the oil must be removed during servicing or when the oil becomes contaminated due to operational problems (e.g., contamination by cooling water). During compressor maintenance requiring access to the interior of the engine, the oil is drained into a specially-designed storage system (i.e., the two storage ASTs for reusable oil discussed above) and is then returned to the engine crankcase when the maintenance activities have been completed. Any waste oil generated is pumped directly from the engines to the waste oil sump and then transferred from the sump to the waste oil storage tank. The waste oil sump is approximately 15 to 20 feet deep and 6 feet square. It was originally constructed as a concrete sump. It is now equipped with an inner steel liner, and the original concrete tank acts as secondary containment (Riddle 2004). The depth of the waste oil sump was historically designed to allow gravity flow of oil to the sump.

Handwritten notes (without an identified author) from 1980 regarding waste- and chemical-handling activities at the facility indicate that the waste oil storage tank was emptied approximately once every 9 months (PG&E 1980a). Assuming that the notes are accurate, prior to 1975, the oil may have been sprayed on facility roads for dust control (PG&E 1980a). This is consistent with information provided by former employees (Russell 2006b), which indicates that waste oil was sprayed on station roads and other unpaved areas. However, starting in 1975, the waste oil was apparently delivered to local power plants to be used as fuel. Since the early 1980s, the waste oil has been removed from the facility by a licensed contractor who transports the oil offsite for recycling (PG&E 1983a-b). The facility currently generates about 12,000 gallons of waste oil per year (Riddle 2004).

Steam cleaning also occurs at the facility in the area often referred to as the wash rack or wash down area. The discharge from the steam cleaning activities is routed to the oil-water separator. Other hazardous wastes generated as part of routine maintenance operations—such as oily rags, air filters, oil filters, contaminated "dry sweep" (oil absorbent), small quantities of paint, and spent aerosol cans of paint and solvent—are accumulated in

approved containers in the maintenance work areas. Building and facility maintenance also generates fluorescent lights in addition to the other wastes generated by equipment maintenance. Drums of hazardous waste and spent batteries are stored in the hazardous materials storage area. In the early 1980s, it appears that items such as oily rags, air filters, oil filters, and spent aerosol cans were disposed of with the domestic garbage (PG&E 1980a). Spent mercury, and cleaning materials contaminated with mercury were generated as part of the meter maintenance process (see Section 3.1.7). There is no information regarding disposal practices for mercury contaminated cleaning materials prior to the early 1980s.

No information is available regarding the handling of asbestos-containing materials (ACM) prior to the early 1980s. However, former employees indicated that ACM may have been disposed of by burial in two locations near the Transwestern Intertie and one location near the Old Evaporation Ponds. A few pieces of what may be transite panels have been noted in the Debris Ravine. In addition, asbestos was present in the Railroad Debris site, although it is not known if the material was placed there by PG&E. The ACM present that the Railroad Debris Site was removed in 1998 (PG&E 1999a). Since the early 1980s, all hazardous and controlled wastes have been transported offsite to an appropriate disposal facility (McCurdy 2004).

Construction wastes are similar to wastes generated by routine equipment maintenance but may also include construction materials such as waste concrete and asphalt. Concrete, asphalt, and recyclable metals are stockpiled for recycling. Miscellaneous construction wastes are handled like other maintenance wastes (Russell 2006b).

Laboratory waste chemicals (test solutions and small quantities of cooling water) historically have been and are currently disposed of by discharging them to the septic system (PG&E 1980a; Riddle 2004). According to handwritten notes (PG&E 1980a), approximately 1 pint per day of test chemicals was disposed of into the drain that is connected to the septic system. Laboratory chemicals identified on historical inventories and requisitions included silver nitrate, phenolphthalein, potassium chromate indicator, sulfuric acid (50-percent solution), Starfanic indicator, iodide crystals, sodium thiosulphate N/10, sulfanic acid, sodium hydroxide, potassium iodide (5 percent solution), and various indicators. Empty containers were drummed and disposed of offsite. (PG&E 1974).

3.1.6 Miscellaneous Operations

Other sources of wastes at the compressor station consist of miscellaneous wastes, domestic wastes, stormwater runoff, and domestic sewage. A central stormwater collection system for the compressor station does not exist. Stormwater is directed off the facility through numerous culverts to surrounding drainages including Bat Cave Wash, the Debris Ravine, the East Ravine, and an unnamed ravine to the northeast of the station.

Handwritten notes (PG&E 1980a) describe four miscellaneous waste streams: domestic waste, large metal scraps, empty 55-gallon drums, and laboratory chemicals. According to this document, most empty drums were returnable; the remainder were steam-cleaned and used at the station or donated to charity. Large scrap metal was stored in a designated 300,000-square-foot area and in one bin. Approximately 20 tons of large scrap metal were generated each year and sold to Wiley Wrecking. During this period old batteries were also sold to Wiley Wrecking (PG&E 1980a).

Domestic waste consisted of scrap paper, food waste, miscellaneous parts such as gaskets, small metal and wood scrap, tires, and vegetation. Domestic waste historically has been disposed of at the San Bernardino County Landfill (formerly known as the Needles Landfill). Currently, domestic waste is removed from the facility by Tri-State Disposal and is disposed of at the Mohave Valley Sanitary Landfill near El Rodeo, Arizona. A recent field visit to the facility revealed that some garbage appeared to have been disposed of along the southern portion of the Debris Ravine in the past. This is consistent with reports by former employees regarding disposal of domestic garbage at the Debris Ravine (Russell 2006b). Small amounts of wood, metal scraps, and a partially-melted graduated cylinder were observed on the upper bank of the ravine.

3.1.7 Mercury

Some of the monitoring instruments (e.g., manometers, thermometers, and flow meters) formerly used at the Topock Compressor Station contained mercury. This is the only known use of mercury at the facility (Russell 2006b). As part of PG&E's effort to reduce the use of hazardous materials at the facility, all mercury-containing equipment was removed from service beginning in the 1980s. The removal effort was completed by 1996 (Russell 2006b). The work consisted of draining the elemental mercury from each instrument and physical removal of all instruments and associated piping that had contained the mercury. The elemental mercury was transported offsite for recycling, and the instrument carcasses and other debris was transported offsite for disposal as hazardous waste. Details regarding the removal of the final mercury-containing equipment are provided in the *Closure Report for the Removal of Mercury Containing Instruments and Piping at PG&E's Topock Compressor Station and Related Facilities* (Trident 1997). An inspection of the facility following the removal confirmed that no other mercury-containing equipment remained at the Topock compressor station (Trident 1997).

In the 1960s, when mercury-containing equipment was in use, station employees would reportedly periodically empty the meters, clean the mercury to remove accumulated debris, and then refill the meters with mercury. The facility reportedly maintained approximately 40 to 50 pounds of mercury onsite (Russell 2006b). The facility owned a mercury vacuum for cleaning up mercury spills. PG&E had a company-wide mercury cleanup program in place by 1985.

3.1.8 Incidental Release History

During the operational history of the compressor station, some incidental releases of chemicals or waste products have occurred. When incidental releases occurred, the proper authorities were notified and the spill was cleaned up. Although the investigation and cleanup of incidental releases has not been performed under the RFI, the reporting of releases is required under the terms of the CACA (DTSC 1996). These incidental releases were reported to the appropriate regulatory agency (as described for each release, below). These minor cleanup activities are typically performed as maintenance activities and do not require, nor have they received, agency approval. Seventeen incidental releases have been documented at the facility since 1995, as summarized in Table 3-5. The location of each release is depicted in Figure 3-7. Details of each release are provided below. Although the site history has been extensively researched, quantities, precise dates, and follow-up

information regarding spills that may have occurred prior to 1995 are generally not available.

3.1.8.1 Spills Prior to 1995

Specific documentation regarding spills that occurred prior to 1995 does not exist. The following spill information is based on information that was gathered during employee interviews. The reported use of pipeline liquids and condensate for dust control was described earlier, and the information is not repeated here.

Mercury Spills. Two past employees recalled mercury spills. One spill reportedly occurred in the machine shop and consisted of 15 to 20 pounds of mercury. The employee could not recall how the spill was cleaned up. The former employee reported that mercury periodically was drained from the meters, accumulated debris was removed from the mercury, and the mercury was cleaned with chamois. He also indicated that the facility typically stored on the order of 40 to 50 pounds of mercury (Russell 2006b). The other spill reportedly occurred at the meter building in the lower yard, and the mercury reportedly entered a drain that leads to Bat Cave Wash (Bezanson 2006).

Cooling Water Spills. As described earlier (See Section 3.1.3.1), the jacket cooling water system originally was designed with a hot well that acted as a surge tank for the jacket cooling water system. There was no overflow control system on the hot well, and employees stated that they periodically overflowed. When the jacket cooling water system leaked (pump seals and/or valve seals may fail, causing leakage from the actual system) or the hot well overflowed, the cooling water would flow onto the graveled area near the pumps and sometimes onto the paved area between the jacket water system and the visitor parking lot/warehouse, then down the main entrance road leading to the station. The water flowing down the road typically stayed on the north side of the road and simply dried up before it flowed off the paved surface. However, if there was enough water, it could run over the other side of the road into the East Ravine (Russell 2006b).

Leaks could also have occurred at the AJCW pumps. The cooling water would have entered the unpaved areas around the AJCW pumps, and, in the event of a larger spills, could have entered a storm drain trench in the vicinity of the pumps.

One former employee indicated that he observed a release from Cooling Tower B into the Northeast Ravine.[11] There are three stormwater discharge pipes that appear to originate in the vicinity of Cooling Tower B and lead to the Northeast Ravine.

3.1.8.2 October 1995 Mercury Release

During the week of October 16, 1995, a length of gas meter piping adjacent to the east side of the compressor building was being removed to facilitate construction in the area. When the line was cut, metallic mercury (which was apparently trapped in the line) was released to an area of exposed soil. The area impacted by the mercury release measured about 18 feet long by 9 feet wide. Initial samples collected from the release area contained mercury ranging from 200 to 12,000 mg/kg.

[11] Plant personnel often refer to the AOC 10, officially called the East Ravine in the various documents pertaining to the RCRA program, as the South Ravine, and the ravine to the northeast of the plant as the East Ravine. Here the ravine to the northeast of the plant is referred to as the Northeast Ravine to avoid confusion.

Between November 20 and December 1, 1995, soil was excavated from the release area. Based on visual observations and interim sampling, the excavation ranged from 2 to 4 feet deep, and it extended laterally over the entire impacted area. When completed, 3,730 pounds of mercury-contaminated soil had been removed. The contaminated soil was placed into 55-gallon drums and shipped offsite for disposal at the Chemical Waste Management, Inc. facility in Kettleman City, California.

Following excavation, 12 samples were collected from the base of the excavation, and one sample was collected from each of the north and south walls. In addition, at the request of the CSBFD, samples were collected on both sides of a wooden form located adjacent to the release area. The results of confirmation samples are summarized in Table 3-6.

The results of the confirmation samples indicate that all soil containing mercury at concentrations exceeding the California hazardous waste standards and the United States Environmental Protection Agency (USEPA) preliminary remediation goals for both residential and industrial soil had been removed. In addition, a risk assessment performed following the removal action indicated that the residual concentrations of mercury that remained did not pose an unacceptable treat to human health (PG&E 1996a).

Details regarding the incident and the remediation effort were reported to the CSBFD in 1996 (PG&E 1996a). As previously indicated, removal of all mercury-containing instrumentation was completed in 1996 (Trident 1997). All mercury debris removed from the facility was transported offsite for disposal at the Chemical Waste Management, Inc. facility in Kettleman City, California.

3.1.8.3 June 1996 Cooling Tower Water Release

On Sunday, June 30, 1996, approximately 200 gallons of water from the lower basin of Cooling Tower A overflowed (PG&E 1996b). The overflow entered a facility drain that discharges to Bat Cave Wash. The portion of the wash that was affected by the spill was reportedly on PG&E property.

The overflow was caused by a failure of one of the cooling tower basin level controllers. Scale build-up on the float mechanism of the controller caused it to stick in the “fill” position. As a result, the makeup water line continuously filled the basin until it overflowed. Upon discovering the problem, the facility operator manually closed the makeup water line to stop the overflow. Water from the tower was then pumped to the evaporation ponds to achieve adequate freeboard in the basin.

At the time of the release, cooling water in the tower was non-hazardous and contained phosphate-based corrosion inhibitors. Analysis of cooling water samples collected prior to the release indicated an electrical conductivity of 9,000 micromhos and a pH of 7. The conductivity of the released water was thought to be lower due to dilution with the makeup (fresh) water.

The Water Board was notified of the release on Monday, July 1, 1996. Surface soil that was contacted by the overflow adjacent to the cooling tower basin and in Bat Cave Wash was removed (PG&E 1996b). No soil sampling was requested by the Water Board. Enhanced inspection and maintenance schedules were implemented to avoid recurrence of this incident.

3.1.8.4 August 1998 Cooling Tower Water Release

On August 4, 1998, during a routine daily facility inspection, an operator observed process water being released from Cooling Tower A. The majority of the water flowed onto the soil adjacent to the cooling tower. A small volume of water flowed down the side of the hill into the Bat Cave Wash area. The total release volume was estimated at about 500 gallons. The cooling tower water contained low concentrations of a non-hazardous, phosphate-based corrosion inhibitor. All of the water released evaporated rapidly due to the high summertime temperature. The Water Board was notified of the incident in a report dated August 11, 1998 (PG&E 1998). No sampling was conducted because future investigation of Bat Cave Wash was planned.

The cause of the release was determined to be a fouled screen associated with a drain return line. The screen was cleaned and the tower was restored to normal operating conditions.

3.1.8.5 December 2000 Wastewater Release

During the period from December 3 through 5, 2000, approximately 20,000 gallons of wastewater were accidentally released from a pipeline near Bat Cave Wash (PG&E 2002b). The wastewater release was associated with routine maintenance and cleaning of the cooling towers. The wastewater was normally pumped from the facility to the evaporation ponds via an underground pipeline. The release occurred as a result of the mechanical failure of an air vent valve on the pipeline northwest of Bat Cave Wash. The released wastewater flowed downhill, along the access road to the Old Evaporation Ponds, and eventually into Bat Cave Wash.

The release was discovered on December 5, 2000. The valve was immediately repaired, and no further releases occurred. Following the discovery, DTSC was notified by telephone on December 7, 2000 (within 48 hours of the incident, as required by the CACA). The affected area was inspected, and soil samples were collected from the affected area. Samples were also collected from unaffected areas for comparison purposes. The samples were subsequently submitted to a laboratory for analysis for Title 22 metals, several other general parameters and soluble concentrations of Cr(VI) (using the California Waste Extraction Test method). The results of these samples are summarized in Table 3-7.

Concentrations of metals in the samples from the affected areas did not appear to be significantly different than concentrations in samples from the unaffected areas. No detectable concentrations of Cr(VI) were identified in any of the samples. The pH level in affected samples also appeared to be consistent with background. Based on these results, no additional sampling or soil removal was performed. The results of the cleanup were provided to the Water Board; however, no response was received from that agency.

Corrective measures implemented following this release consist of weekly external inspections of the air vent valves. In addition, annual internal inspections and preventive maintenance of the valves has also been implemented.

3.1.8.6 August 2001 Oily Water Release

On Thursday, August 23, 2001, a small amount of oil was discovered in one of the new Class II evaporation ponds (Pond No. 1) (PG&E 2001). The cause of the release to the pond was determined to be a malfunctioning OWS at the compressor station. Work to service the OWS

and restore its ability to function properly began on August 24, 2001. During servicing of the separator, the waste oil tank used to collect oil from the separator became unusually full. Early Saturday morning, August 25, 2001, a waste oil transfer pipe that had been out of service was used to move the waste oil from the waste oil tank at the separator to a larger waste oil storage tank located at the tank farm. At some point later that morning, oily water apparently leaked out of the transfer pipe and into the subsurface trench through which the pipe passes.

Once the piping trench filled up, the oily water overflowed out onto the ground, ran downhill across the site, through a storm drain, and out into Bat Cave Wash, running downhill and along the dirt access road. The length of the spill occurring outside of the facility fence line was approximately 150 linear feet. Although outside the fence line of the facility, the release area was entirely on PG&E-owned property. Of the 300 gallons released, it is believed 100 gallons were waste compressor lubricating oil and 200 gallons were wastewater. In accordance with the CACA, DTSC was notified of the incident by telephone on August 25, 2001 (within 48 hours of the incident).

After discovery of the release, facility personnel took immediate steps to ensure the leakage from the pipe was stopped and constructed a berm around the storm drain to prevent any further releases. Cleanup efforts began immediately and included removing the accumulated oily water from the piping trench and Pond No. 1, removing the vast majority of oil-saturated soil both onsite and offsite, and cleaning the storm drain. Confirmatory samples were collected on October 1, 2001 and tested for Title 22 Metals, Cr(VI), and TPH. Metal concentrations were all below residential USEPA preliminary remediation goals (PRGs) with the exception of Cr(T) which exceeded industrial PRGs for one of the samples collected. The results of confirmatory samples collected following cleanup are presented in Table 3-8.

The waste oil transfer piping has been physically disconnected from the waste oil tank at the OWS to eliminate the potential for future oil transfers from one tank to another. Waste oil is currently pumped directly from the waste oil collection tank into a tank truck that transports the oil offsite for recycling. No soil removal was conducted.

3.1.8.7 August 2002 K-10 Aqua Tower Release

On Saturday evening, August 24, 2002, approximately 100 gallons of water containing a dilute, buffered hydrochloric acid and corrosion inhibitor mixture was accidentally released onto a paved area of the facility (PG&E 2002c). The corrosion inhibitor (Nalco A-Z-Lite 7356) contained 5 to 10 percent phosphoric acid and 1 to 5 percent zinc chloride. The release occurred during a descaling operation involving the aqua tower and after-cooler system heat exchanger on compressor unit K-10. Upon discovery of the release, operators quickly blocked a nearby storm drain, and the release was stopped. It is estimated that 25 gallons of the solution were trapped in the facility street gutter where it quickly evaporated. The remaining 75 gallons entered the storm drain on the east side of the station and flowed into a nearby gully, dampening the soil for about 35 feet. Neither the storm drain nor the gully drain into Bat Cave Wash or the Colorado River.

DTSC was initially notified of the release by telephone on August 25, 2002 (within 48 hours of the incident), in accordance with the CACA. The State of California Office of Emergency

Services (OES) was also notified by the station superintendent on August 24, 2002, and OES issued control No. 024593 for this event. The CSBFD was also notified.

On August 25, 2002, a sample was collected from the affected soil in the gully and submitted for laboratory analysis for pH, Title 22 metals, and Cr(VI). A sample of unaffected soil was also collected and analyzed for comparison purposes. The results of the analysis of these samples are summarized in Table 3-9. The results indicate that pH may have been slightly below background in the affected area but was still at a neutral 7.0 units. Metals concentrations in the affected area may also have been slightly elevated above background levels, but the concentrations were significantly below California hazardous waste standards and USEPA PRGs for industrial soil. Neither sample contained any detectable concentrations of Cr(VI). Based on these results, no additional soil sampling or soil removal was performed.

No new acid cleaning of this type is planned for the aqua tower and cooling equipment in the future. However, if this activity does ever become necessary, corrective actions associated with this activity include covering all storm drains, surrounding the cleaning area with temporary berms, and inspecting all piping prior to cleaning.

3.1.8.8 September 2002 Grit Tank Release

The grit tank is part of the compressor station wastewater system that treats oily water prior to the water being pumped to the evaporation ponds (Section 3.1.4.2). Water is collected from a number of drains located under pumps and other operating equipment in the upper yard that may at times generate oil and oily water. The drains deliver wastewater by gravity to the 1,350-gallon grit tank in the lower yard. A secondary containment berm surrounds the grit tank and associated sump. The purpose of the grit tank is to allow particulate matter to settle out of the wastewater. After flowing through the grit tank, water enters a sump located at the bottom of the bermed area, where a pump then transfers the water to an OWS. The sump pump is controlled automatically by a float mechanism that senses the level of the water.

At some point during the evening of September 1, 2002, the sump pump level controls failed, and water overflowed the sump and surrounding berm (PG&E 2002c). Approximately 500 gallons of oily wastewater overflowed the berm, traveled down an inclined area of the facility yard, and entered a storm drain at the northwest end of the station. The water traveled through a drainpipe and was released into Bat Cave Wash. The release was discovered during a routine facility inspection. A nearby surface drain was subsequently covered to prevent any additional water from being released offsite, and the inlet valve to the grit tank was shut off. However, some water continued to leak out of the bermed area. The OES was notified of the release within 24 hours of the event on September 2, 2002, and DTSC was notified within 48 hours of the event on September 3, 2002.

An inspection of the area following the release revealed that the water had a slight oily sheen. Soil in the facility yard that was contacted by the water became dry within 24 hours. During an inspection on September 6, 2002, only a few small areas (less than approximately 1 square foot) appeared stained. None of the soil in Bat Cave Wash appeared stained.

Soil samples were collected from the affected areas on September 5 and 9, 2002. A sample of unaffected soil was also collected from the area for comparison purposes. The samples were submitted to a laboratory and analyzed for TPH, Title 22 metals, and Cr(VI). The samples were also analyzed for PCBs as a precaution. The analytical results are summarized in Table 3-10.

The sample collected at the grit tank contained TPH as motor oil and as diesel at concentrations of 3,000 mg/kg and 390 mg/kg, respectively. Only minor concentrations of TPH were identified in the remaining samples collected from affected areas. Detected concentrations of metals in samples from the affected areas appeared to be slightly elevated for arsenic, barium, copper, lead, and molybdenum. Total chromium concentrations in samples from affected areas ranged from 11 to 360 mg/kg. PCB Aroclor-1254 was detected in only two samples from the affected area at concentrations of 0.30 and 0.086 mg/kg. Because soil affected by the release did not contain any concentrations of metals or PCBs exceeding California hazardous waste standards or USEPA PRGs for industrial soil, no additional sampling or soil removal was performed.

Corrective actions taken after the release was contained include repairing the sump pump controls and instituting weekly inspection of the equipment (PG&E 2006a).

3.1.8.9 April 2003 Cooling Water Release

On April 21, 2003, approximately 1,000 gallons of cooling tower water overflowed from the upper cooling tray of Cooling Tower A as the result of high winds. The water flowed from the facility yard down into Bat Cave Wash. The cooling water contained a non-hazardous, phosphate-based corrosion inhibitor. DTSC was notified within 24 hours of the release on April 22, 2003.

Surface and subsurface soil samples were collected and analyzed for Title 22 metals, pH, conductivity, and TDS. The results of these samples indicated that no hazardous constituents were present in the areas affected by the release; therefore, no soil removal was performed.

3.1.8.10 March 2004 Scrubber Pipeline Liquids Release

Topock Compressor Station is equipped with gas scrubbers that were formerly used to remove pipeline liquids from gas in the pipeline (Section 3.1.2). The quality of natural gas has improved greatly since the compressor station went into operation in 1951; consequently, the scrubbers no longer collect large quantities of liquids. Pipeline liquids at the facility are currently composed almost entirely of used compressor lubricating oil.

Once a year each scrubber is blown down to remove the accumulated liquids. A 2-inch-diameter blowdown line from each scrubber connects to a common 2-inch-diameter header that is buried below grade. The header ends in an aboveground hose fitting to which a drip tank is connected during blowdown. On March 3, 2004, a facility employee was engaged in the annual blowdown of the gas transmission line 300A scrubbers. When the underground scrubber drip header was pressurized, oil and gas began to bubble out of the ground (PG&E 2004). The employee immediately isolated the underground header from the scrubbers. As the header slowly depressurized, approximately 2 gallons of oil bubbled to

the surface and then soaked back into the ground. The scrubber blowdown valves were then immediately cleared and tagged for non-operation.

A sample taken from the affected soil contained 23,000 mg/kg TPH as motor oil but no detectable concentrations of PCBs (<0.3 mg/kg as Aroclor-1260). The 2-inch-diameter header in the area where the oil bubbled out of the ground was subsequently exposed and excavated. Standing oil and all visibly oil-stained soil on the surface and below ground was removed on the day of the release (March 3, 2004). The affected area was localized and could be readily defined because of the dark color of the oil. Approximately 200 pounds of soil were removed during excavation and cleanup. The soil was placed into drums and transported under manifest to the Chemical Waste Management, Inc. facility located in Kettleman City, California on June 15, 2004.

Two confirmatory samples were collected following soil removal and analyzed for TPH and benzene, toluene, ethylbenzene, and xylenes (BTEX). The results are summarized in Table 3-11. The TPH analysis on these samples was inadvertently performed for gasoline rather than motor oil. No subsequent samples were collected and analyzed for TPH as motor-oil. There were no detectable concentrations of TPH in either sample, and only one sample contained any BTEX (xylenes at 5.6 mg/kg). Although the TPH analysis was not specific to motor oil, the results suggest that no significant residual hydrocarbon concentrations remained in soil at the release location.

DTSC was notified of the release by email on March 5, 2004 and in writing in early April 2004. A final report on the release was submitted to DTSC on November 15, 2004 (PG&E 2004).

3.1.8.11 August 16, 2005 Bat Cave Wash Wastewater Release

On August 16, 2005, soil movement resulting from a heavy rainstorm event caused a boulder to fall on a 4-inch fiberglass pipeline. The pipeline cracked and approximately 1,000 gallons of nonhazardous facility wastewater (including cooling tower blowdown) were released onto HNWR property (Russell 2005). The pipeline was repaired, and the eroded soil was backfilled. Engineering studies have been conducted, and a pipeline replacement/erosion protection plan is currently being implemented. The Water Board, HNWR, BLM, FMIT, and DTSC were all notified on August 16, 2005, and soil sampling was requested by the agencies.

3.1.8.12 December 19, 2005 Grit Tank Spill

The purpose of the grit tank is to allow particulate matter to settle out of the wastewater. After flowing through the grit tank, water enters a sump located at the bottom of the bermed area, where a pump then transfers the water to an OWS. The grit tank is part of the compressor station wastewater system that treats oily water prior to the water being pumped to the evaporation ponds (Section 3.1.4.2).

On December 19, 2005, a joint failure occurred on the transfer piping between the grit tank and OWS. The failure occurred when a glued joint just upstream from a 45 degree bend separated. This joint failure resulted in the release of approximately 300 gallons of oily water that bubbled up aboveground. The Water Board, CSBFD, and DTSC were all notified within 24 hours. The separated joint was cleaned and re-glued. Following the proper cure

time, the joint was hydrostatically tested. A concrete thrust block was later installed at the 45 degree bend. This completed the permanent repair of the pipe.

On December 20, 2005, thee soil samples were taken in the affected areas of the release (Table 3-12). Two additional samples were taken from unaffected areas to be used as background sample results. All samples were tested for TPH in the diesel, gasoline, and motor-oil/hydraulic oil range. TPH-diesel and TPH-gasoline were not detected in any of the soil samples collected. TPH-motor-oil was detected in all three samples collected within the affected areas with concentrations ranging from 20 mg/kg to 420 mg/kg. The highest concentration was detected in the sample collected near the end of the release path in Bat Cave Wash. TPH-motor-oil was detected in the background sample collected from Bat Cave Wash at a concentration of 59 mg/kg. The TPH-motor oil concentration detected in affected soil originating from the December 19, 2005 release is not considered a hazardous waste (PG&E 2006b).

3.1.8.13 December 24, 2005 Compressor Lubricating Oil Release

On December 24, 2005, a rupture occurred in the copper tubing on top of the K-6 compressor lubricating oil filter. Oil was observed on the concrete under the filters and the soil area between the concrete and pavement on the east side of the Compressor Building. Oil also spread under the K-6 aqua cooling tower and toward the K-7 aqua cooling tower (PG&E 2006b). K-6 was shut down which depressurized the oil system and terminated the leak. An absorbent was then spread on the oil. Approximately 50 gallons of oil was released. California State OES, CSBFD, and DTSC were all notified within 24 hours.

The ¼-inch copper tubing connected to the K-6 oil filters and strainer was replaced and all of the oil on the concrete under the filters was cleaned up. Since the oil was contained and the further spread of the oil on the soil was unlikely, clean-up was delayed until a later date. Heavily-stained soil was removed from the affected area on December 27, 2005. On February 8, 2006, an additional approximately 10 cubic yards of soil was removed. The spill occurred under the walkways in areas of aboveground piping and footings, therefore the soil clean-up was difficult The soil was broken-up manually and then vacuumed up.

Three soil samples (Samples 2, 3, and 4) and one composite sample (Sample 1) were collected on March 8, 2006 within the release area. All samples were analyzed for Title 22 metals as well as TPH using the California LUFT method. A summary of these results is presented in Table 3-13. TPH in the motor oil/hydraulic oil range were detected in Samples 1 through 4 from the December 24, 2005 release. TPH motor oil/hydraulic oil concentrations ranged from 220 mg/kg (Sample 2) in the visually clean soil sample to 4,800 mg/kg (Sample 3) in the heavily stained soil sample. Soil with TPH concentrations less than 10,000 mg/kg is considered a non-hazardous waste and can be disposed of at a Class II landfill using a non-hazardous waste manifest. Title 22 metal concentrations were all below USEPA industrial soil PRGs.

3.1.8.14 December 27, 2005 Bat Cave Wash Wastewater Release

On December 27, 2005, a vent valve failure occurred which resulted in approximately 4,000 gallons of facility wastewater (including cooling tower blowdown) being released into Bat Cave Wash. USFWS, OES, CSBFD, and DTSC were all notified within 24 hours. The vent valve and all associated piping were replaced.

Six soil samples were collected following the spill, two of which were collected in areas that were not contacted by the released water (Table 3-14). A water sample was also collected from the OWS clean water tank. Test results show that none of the soil samples exceeded the California total threshold limit concentration for Title 22 metals. The metal concentrations detected were similar to those found in the soil samples not affected by the release. In addition, none of the USEPA PRGs for chromium, copper, nickel, and zinc were exceeded. General mineral levels (chlorides, sulfates, pH, conductivity, and total dissolved solids) were all comparable to those found in the two soil samples collected outside of the release area, and are considered background. Title 22 metals found in the clean water tank sample were generally less than 1 mg/L with the exception of molybdenum at 6.7 mg/L (PG&E 2006c).

3.1.8.15 January 2, 2006 JCW Release

On January 2, 2006, a valve located on one of the main jacket cooling water tanks failed, resulting in the release of approximately 120 gallons of treated cooling water. The treated cooling water contained molybdate-based corrosion inhibitors. Approximately 100 gallons of the treated cooling water was confined to the secondary containment; however, approximately 20 gallons of water soaked into the nearby soil. The Colorado River Water Board, CSBFD, and DTSC were all notified within 24 hours. The valve and associated PVC piping were replaced with metal piping and valve. No soil samples were requested by the agencies (McCurdy 2006).

3.1.8.16 April 16, 2006 Wastewater Release

On April 16, a section of the fiberglass pipe that transports wastewater to the new Class II evaporation ponds failed. After preliminary investigation, it was determined that the water was coming from the 4-inch fiberglass wastewater pipeline under the emergency capital stock warehouse (PG&E 2006d). To minimize leakage, the wastewater pumps were shut down. Temporary piping was installed to bypass the section of leaking fiberglass pipe. The temporary piping consisted of approximately 140 feet of 4-inch threaded carbon steel pipe, and sections of 4-inch plastic hose totaling 120 feet; all above ground. This action allowed the compressor station to continue to operate while more permanent repairs were made.

The failure in the pipe resulted in the release of approximately 200 gallons of facility wastewater (including cooling tower blowdown). The majority of the spill was confined to PG&E property; however, approximately 5 gallons of the wastewater ran into a nearby stormwater drain that empties into the Bat Cave Wash. The water did not reach the bottom of the Bat Cave Wash and the release was confined to PG&E property. The Colorado River Water Board, CSBFD, and DTSC were all notified on April 18, 2006.

On April 16, one wastewater sample was collected from the wastewater pipeline and one from the OWS. These samples were taken to confirm the source of the release. Two soil samples were collected on April 26, 2006 within the release area; one was collected in wet soil and the other was collected in dry soil. All collected samples were submitted to the laboratory for analysis on April 28, 2006. The soil samples were analyzed for Title 22 metals and general chemistry parameters (chlorides, sulfates, pH, conductivity and TDS). The wastewater samples were only analyzed for general chemistry parameters. A summary of these results is presented in Table 3-15. Test results show that none of the soil samples

exceeded the California total threshold limit concentrations for Title 22 metals. In addition, all of the metal concentrations detected in the soil samples were below the USEPA industrial soil PRGs.

3.1.8.17 April 23, 2006 Compressor Lubricating Oil Release

After a two-month-long overhaul of K-6, the unit was placed back into operation on April 23, 2006. On April 23, 2006, failure of another portion of the copper tubing on top of the K-6 Compressor lubricating oil filter caused the release of approximately 50 gallons of lubricating oil below the filters onto the concrete slab and then onto the soil between K-6 and K-7. An area of soil approximately 18 inches wide and 25 feet long was covered with oil from the release (PG&E 2006b). No oil was released to the nearby street and no oil was released offsite. A previous rupture in a different portion of the copper tubing occurred on December 24, 2005 causing a similar release (Section 3.1.8.13). The California State OES, Water Board, CSBFD, and DTSC were all notified within 24 hours. The pipeline fittings were replaced with new stainless steel fittings. Additionally, plans are underway to replace the oil filter air vent tubing system on all of the other compressor units at Topock.

The operator used a large vacuum to capture much of the released oil, and a dry sweep absorbent material was spread on the liquid that could not be vacuumed up. Four samples (Samples 1 through 4) were collected on April 26, 2006 within the release area. Sample 1 was an oil sample collected from the K-6 lube filter. The sample was used as a standard for analysis for TPH as lubricating oil. Sample 2 was collected from the saturated absorbent material near the K-6 filter. Samples 3 and 4 were surface soil samples collected near the K-6 filter. Samples 2 through 4 were analyzed for TPH using the California LUFT method. A summary of these results is presented in Table 3-13. TPH as lubricating oil was the only constituent detected in the samples collected from the release. TPH as lubricating oil was detected in Samples 2 through 4 at concentrations ranging from 510 mg/kg (Sample 3) to 240,000 mg/kg (Sample 2). Heavily-stained soil was removed during the week of April 30, 2006.

3.1.8.18 April 29 and May 2, 2006 Wastewater Release

A section of the temporary piping which was installed after the April 16, 2006 spill (Section 3.1.8.16) developed a crack. On April 29, 2006, approximately 30 gallons of facility wastewater (including cooling tower blowdown) were released within the compressor station fence line (PG&E 2006d). Approximately 5 gallons of wastewater ran down an old dirt road leading to Bat Cave Wash. The cause of the discharge was a crack in a flexible hose at the OWS. The station operator discovered the leak and turned the system off. The entire release was confined to PG&E property. Courtesy notifications were made to Water Board and CSBFD within 24 hours. The spill was also discussed with DTSC. The temporary piping was repaired. On May 2, 2006, following the April 29, 2006 leak, the cracked section of flexible hose was removed and replaced with all steel pipe. However, during a pressurized leak check of the repaired pipe, another section of flexible hose connecting the bypass piping to the original fiberglass pipe burst. The system was immediately shut down. Approximately 200 gallons of wastewater were released to an excavated area where the pipe was bypassed. Another 100 gallons of wastewater were pumped into temporary holding tank. This release was also confined to PG&E property, although just outside of fence line. All remaining plastic flexible lines were then removed and replaced with threaded carbon

steel pipe and fittings within the week. Because of the history of releases associated with this wastewater line, plans are underway to conduct extensive repairs, which may consist of activities up to and including complete replacement of the pipeline. The Water Board and the CSBFD were notified within 24 hours. An email was sent to DTSC summarizing the spills that occurred on April 17, April 29, and May 2, 2006.

Four soil samples (Samples SS-1 through SS-4) were collected on May 2 and 3, 2006, following the April 29 and May 2, 2006 releases. Samples SS-1 and SS-2 were collected within the April 29 release area, and Sample SS-3 was collected in the May 2 release area. Sample SS-4, which was collected outside of the release area, was collected to determine background concentrations. Samples were submitted to the laboratory on May 4, 2006 and analyzed for Title 22 metals, chlorides, sulfates, pH, conductivity and total dissolved solids. Test results show that all of the samples were below the California total threshold limit concentrations for Title 22 metals. In addition, all of the concentrations detected were below the USEPA industrial soil PRGs.

3.2 Chronology of Major Events

Current operations at the compressor station are very similar to the operations that occurred from the start of facility operations in 1951. However, the compressor station has undergone changes and has been upgraded since it was first constructed in 1951. A chronological summary of the major operational changes at the facility is provided in Table 3-16. Major regulatory agency directives and RCRA corrective action activities performed by PG&E are summarized in Table 3-17.

3.3 Historic Aerial Photographs

Historic aerial photographs were obtained for the area and reviewed to provide information on historic activities at and near the facility and how activities changed over time. Historic aerial photographs were obtained for the period from 1936 to 1997, which covers the entire period from before the facility was built (i.e., 1951) to recent time. Table 3-18 presents a summary of the information obtained from each of the historic aerial photographs. The aerial photographs are presented in Figures 3-8 through 3-27. Higher-resolution digital copies of the aerial photographs are provided on a CD that is included in Appendix B.

TABLE 3-1
Chemical Products Usage
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Process/Operation	Approximate Time Period	Products Used	Wastes Generated
Water conditioning	1951 to 1962	Soda ash, lime, and sodium aluminate	Lime softener sludge
	1962 to present	Self-contained canisters	Spent canisters (regenerated)
Natural gas compression	1951 to present	Odorants (THT & TBM) and lubricants	Oily water, scrubber waste, and pipeline liquids
Cooling	1951 to 1985	Chromium-based corrosion inhibitors, dispersants, and biocides; sulfuric acid	Wastewater containing metals (primarily chromium) and sulfuric acid sludge[a]
	1985 to present	Phosphate-based corrosion inhibitors, dispersants, and biocides; sulfuric acid. Molybdate-based corrosion inhibitors in closed-loop cooling systems.	Non-hazardous wastewater containing phosphates
Wastewater treatment	1964 to 1969	Sulfur dioxide	Waste oil
	1969 to 1985	Sulfur dioxide and sodium hydroxide	Waste oil and chromium-bearing sludge
	1985 to present	None	Waste oil
Equipment and facility maintenance	1951 to present	Gasoline and diesel fuel, lubricants, solvents, paint, asbestos-containing insulation, mercury, pesticides, and herbicides	Oily wastewater, waste oil, air filters, oil filters, oily rags, oil absorbent, asbestos-containing materials, spent aerosol cans, and spent batteries
Miscellaneous operations	1951 to present	Laboratory test solutions	Scrap metal, domestic garbage, liquid laboratory wastes, and domestic sewage

Notes:
[a] Sulfuric acid sludge generation ended in 1984 when the steel tanks were replaced by fiberglass tanks.

TABLE 3-2
Waste Generation and Management
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Process/Operation	Products Used	Wastes Generated	Approximate Time Period	Treated Onsite?	Disposition
Water conditioning	Soda ash, lime, and sodium aluminate	Lime softener sludge	1951 to 1962	No	Exact disposition is unknown. Reportedly disposed of at the Railroad Debris Site, and possibly Debris Ravine.
	Self-contained canisters	Spent canisters	1962 to present	NA	Removed and regenerated by contractor
Natural gas compression	Odorants (TBM and THT)	Oily water	1951 to 1970	Yes	Treated water – Bat Cave Wash
					Waste oil – Waste Oil Storage Tank
	Lubricants		1970 to 1973	Yes	Treated water – Injection well PGE-08
					Waste oil – Waste Oil Storage Tank
			1973 to 1989	Yes	Treated water – Single-lined evaporation ponds
					Waste oil – Waste Oil Storage Tank
			1989 to present	Yes	Treated water – Double-lined evaporation ponds
					Waste oil – Waste Oil Storage Tank
		Pipeline liquids (from drips and scrubbers)	1951 to 1981	No	Waste oil – Waste Oil Storage Tank
			1981 to present	No	If PCB concentrations are below 5 ppm, collected in Waste Oil Storage tank. If PCB concentration exceeds 5 ppm, transported offsite as PCB-containing waste.

TABLE 3-2
Waste Generation and Management
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Process/Operation	Products Used	Wastes Generated	Approximate Time Period	Treated Onsite?	Disposition
Cooling	Chromium-based corrosion inhibitors, dispersants, and biocides; sulfuric acid	Wastewater containing metals (primarily chromium)	1951 to 1964	No	Bat Cave Wash
			1964 to 1970	Yes	Bat Cave Wash [a]
			1970 to 1973	Yes	Injection well PGE-08 [a,b]
			1971 to 1985	Yes	Single-lined evaporation ponds [b]
	Phosphate-based corrosion inhibitors, dispersants, and biocides; sulfuric acid. Molybdate-based additives in closed loop cooling systems.	Non-hazardous wastewater containing phosphates	1985 to 1989	No	Single-lined evaporation ponds
			1989 to present	No	Double-lined evaporation ponds
	Sulfuric acid	Sulfuric acid sludge	Unknown to 1984	No	Transported offsite for Class I disposal
Wastewater treatment	None	Waste oil	1951 to present	No	Collected in Waste Oil Storage tank. Reportedly used in early years on roads for dust control. Reused (power plant fuel) offsite starting in 1975. Since the early 1980s, waste oil has been transported offsite for recycling.
	Sulfur dioxide and sodium hydroxide	Chromium-bearing sludge	1969 to 1983	No	Needles Landfill
			1984 to 1985	No	Transported offsite for Class I disposal

TABLE 3-2
Waste Generation and Management
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Process/Operation	Products Used	Wastes Generated	Approximate Time Period	Treated Onsite?	Disposition
Equipment and facility maintenance	Gasoline and diesel fuel, lubricants, solvents, paint, pesticides, and herbicides	Oily water	1951 to 1970	Yes	Treated water – Bat Cave Wash
					Waste Oil – Waste Oil Storage Tank
			1970 to 1973	Yes	Treated water – Injection well PGE-08
					Waste Oil – Waste Oil Storage Tank
			1973 to 1989	Yes	Treated water – Single-lined evaporation ponds
					Waste Oil – Waste Oil Storage Tank
			1989 to present	Yes	Treated water – Double-lined evaporation ponds
					Waste Oil – Waste Oil Storage Tank
		Waste oil	1951 to present	No	Collected in Waste Oil Storage tank. Possibly used in early years on roads for dust control. Reused (power plant fuel) offsite starting in 1975. Since the early 1980s, waste oil has been transported offsite for recycling.
		Air filters, oil filters, oily rags, oil absorbent, and spent aerosol cans	1951 to 1980s	NA	Needles Landfill
			1980s to present	NA	Transported offsite for disposal under appropriate regulations
		Spent batteries	1951 to present	NA	Transported offsite by contractor/manufacturer

TABLE 3-2
Waste Generation and Management
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Process/Operation	Products Used	Wastes Generated	Approximate Time Period	Treated Onsite?	Disposition
	Asbestos-containing materials	Asbestos-containing materials	Unknown	NA	Small amounts taken to railroad debris site, possibly buried at the facility (AOC 12), possibly buried east of Old Evaporation Ponds (Potential Pipeline Disposal Area), possibly placed into Debris Ravine (AOC 4)
			late 1970s to present	NA	Transported offsite for disposal under appropriate regulations
	Mercury	Mercury-contaminated cleaning materials	1951 to early 1980s	No	Unknown
			early 1980s to 1996	No	Transported offsite for disposal under appropriate regulations
Miscellaneous operations	Laboratory test solutions	Scrap metal	1951 to present	NA	Transported offsite for recycling
		Domestic garbage	1951 to present	NA	Needles Landfill
		Laboratory test solutions	1951 to present	No	Septic tank/leach field east of auxiliary building
		Domestic sewage	1951 to present	Yes	Leach fields

Notes:
[a] Some disposal to Bat Cave Wash may have occurred between May 1970 and September 1971 when injection well PGE-08 was offline for maintenance or repairs.
[b] Some disposal to Pond 1 occurred during the September 1971 to August 1973 time period when injection well PGE-08 was offline for maintenance or repair.
NA = not applicable.

TABLE 3-3
Chemical Storage and Use Information, 1968 -1995 [a]
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Date (Year)	Chemical	Amount Ordered or Stored[b]
1968	Dianodic 971	20,000 lbs.
1968	Dianodic 109	4,000 lbs
1968	Dianodic AC	6,000 lbs
1968	Dianodic A9	110 gals.
1968	Kromtrol Y-7	13,500 lbs
1968	Slimicide A9	110 gals.
1968	Algicide	2,700 lbs.
1968	Sulfuric Acid	95,240 lbs
1969	Kromtrol Y-7	6,600 lbs.
1969	Kromtrol A9	440 gals.
1969	Kromtrol 403	7,500 lbs.
1969	Kromtrol 109	4,500 lbs.
1969	Kromtrol CP5	1,800 lbs
1973	Algicide C-5P	1,600 lbs.
1973	Krom—trol Y-7	4,800 lbs.
1973	Slimicide A-9	1,100 lbs.
1973	Slimicide C-35	4,675 lbs.
1973	Dianodic K-7	2,400 lbs.
1973	Dianodic 403	3,600 lbs.
1973	Poly-Floc #3	3,200 lbs.
1973	Sodium hydroxide	55 gals.
1973	Ferric sulphate	1,120 lbs.
1973	Sulfuric Acid N/50 Solution	6 quarts
1973	Silver Nitrate 207	2 gal.
1973	Phenolphthalein	2 pints
1973	Potassium Chromate Indicator	4 pints
1973	Sulphuric Acid 50% solution	11 pints
1973	Starfanic indicator	2,000 grams
1973	Iodide crystals	1,500 grams
1973	Sodium thiosulphate N/10	2 gals.

TABLE 3-3
Chemical Storage and Use Information, 1968 -1995 [(a)]
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Date (Year)	Chemical	Amount Ordered or Stored[(b)]
1973	Acid Sulfanic	2,000 grams
1973	Sodium hydroxide	1 quart
1973	Potassium iodide 5% solution	3 quarts
1973	Starch indicator	4 pints
1973	Hardness indicator	1,000 grams
1973	Hardness buffer reagent powder	2,000 grams
1973	Hardness titrating solution	3 gal.
1973	Calcium indicator	1,500 grams
1973	Methyl purple indicator	4 pints
1973	Potassium Permanganate N/10	1 gal.
1973	Sulfuric Acid 5%	2 pints
1974	Algicide C-5P	400 lbs.
1974	Krom—trol Y-7	4,200 lbs.
1974	Slimicide A-9	550 lbs.
1974	Dianodic 109	400 lbs.
1974	Dianodic 403	300 lbs.
1974	Poly-Floc #3	2,000 lbs.
1974	Sodium hydroxide	330 gals.
1974	Ferric sulphate	80 lbs.
1974	Silver Nitrate 207	1 gal.
1974	Phenolphthalein	1 pint
1974	Potassium Chromate Indicator	1 pint
1974	Sulphuric Acid 50% solution	8 pints
1974	Starfanic indicator	1,000 grams
1974	Iodide crystals	1,000 grams
1974	Sodium thiosulphate N/10	2 gals.
1974	Acid Sulfanic	1,000 grams
1974	Sodium hydroxide	1 quart
1974	Potassium iodide 5% solution	10 quarts
1974	Starch indicator	3 pints

TABLE 3-3
Chemical Storage and Use Information, 1968 -1995 [a]
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Date (Year)	Chemical	Amount Ordered or Stored[b]
1974	Hardness indicator	1,500 grams
1974	Hardness buffer reagent powder	500 grams
1974	Hardness titrating solution	1 gal.
1974	Calcium indicator	1,000 grams
1974	Methyl purple indicator	4 pints
1983	Algicide C-343	380 lbs.
1983	Slimicide C-30	4,60 lbs.
1983	Krom—trol X-5	1,170 lbs.
1983	Slimicide A-9	1,100 lbs.
1983	Sodium hydroxide	440 gals.
1983	Sulfuric Acid N/50 Solution	3 gals.
1983	Silver Nitrate 207	2 gals.
1983	Phenolphthalein	2 pints
1983	Potassium Chromate Indicator	4 pints
1983	Sulphuric Acid 50% solution	2 pints
1983	Starfanic indicator	1,000 grams
1983	Iodide crystals	1,000 grams
1983	Sodium thiosulphate N/10	3 quarts
1983	Acid Sulfanic	1,500 grams
1983	Sodium hydroxide	5 quarts
1983	Potassium iodide 5% solution	3 quarts
1983	Starch indicator	3 quarts
1983	Hardness indicator	1,000 grams
1983	Hardness buffer reagent powder	1,000 grams
1983	Hardness titrating solution	1 gal.
1983	Calcium indicator	2,000 grams
1983	Methyl purple indicator	2 pints
1983	Swipe Selig #68	165 gals.
1983	Skasol	110 gals.
1983	Kelite #24	200 lbs.

TABLE 3-3
Chemical Storage and Use Information, 1968 -1995 [(a)]
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Date (Year)	Chemical	Amount Ordered or Stored[(b)]
1983	Big Joe	55 gals.
1983	Kelite #29	110 gals.
1983	Sulphur Dioxide	2
1983	Liquid Dust Mop	5 gals.
1983	Sulfuric Acid 66	300 gals.
1986	Betz 2020 (Potassium Hydroxide Phosphoric Acid)	500 gals.
1986	Betz 2040 (Potassium Hydroxide Phosphoric Acid)	500 gals.
1986	C-30 Slimicide	110 gals.
1986	Unleaded Gasoline	2,000 gals.
1986	Diesel Fuel	1,000 gals.
1986	Acetylene	NA
1986	Solvents	330 gals.
1986	Sulfuric Acid	3,000 gals.
1986	Odorant	2,000 lbs.
1986	Hydrogen	476 cf
1986	Crankcase Oil	28,500 gals.
1986	Paint	200 gals.
1986	Muriatic Acid	220 gals.
1986	Swipp Cleaning Compound	220 gals.
1988	Algicide C63	3 PL
1988	Phenolphthalein Indicator 942	10 boxes
1988	Silver Nitrate	3 cartons
1988	Choride 2	5 boxes
1988	ETDA Terrasodium Salt	8 cartons
1988	Calcium Calver 2	19 boxes
1988	Potassium Hydroxide Solution	8 Bottles
1988	Hexaver CTDA 0.800	11 cartons
1988	Hardness buffer solution	8 Bottles
1988	Manver 2 Pillow	2 boxes
1988	Molyver 1 Molyloderum Pillow	8 boxes

TABLE 3-3
Chemical Storage and Use Information, 1968 -1995 [a]
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Date (Year)	Chemical	Amount Ordered or Stored[b]
1988	Molyver 2 Molyloderum Pillow	8 boxes
1988	Molyver 3 Molyloderum Pillow	9 boxes
1988	Sulfuric Acid	10 Bottles
1988	Molybdate Reagent	5 Bottles
1988	Amino Acid Pillows	11 boxes
1988	Polymer Reagent Betz 1253	2 Bottles
1988	Polymer Buffer Betz 1254	12 Bottles
1988	Sulfuric Acid 1 600	1 carton
1988	Bromcresol Green Methyl Red	2 boxes
1994	Acetylene	2,045 cf
1994	Argon Gas	535 cf
1994	Betz 2020 (Potassium Hydroxide Phosphoric Acid)	1,000 gals.
1994	Betz 2040 (Potassium Hydroxide Phosphoric Acid)	1,000 gals.
1994	Betz C-77	1,000 gals.
1994	Betz Foam-trol	55 gals.
1994	Betz Powerline 3200	440 gals.
1994	Betz Slimicide 508 (Alkyl Dimethyl Benzyl Ammonium Chloride/Ethanol	110 gals
1994	Betz Slimicide 508 (Tributyl Tin Oxide)	55 gals.
1994	Big Joe	55 gals.
1994	Crankcase oil (hydrocarbon based oils)	28,400 gals.
1994	Diesel	3,000 gals.
1994	Dimethyl sulfide/Nitrogen	1020 cf
1994	Helium	2,000 cf
1994	Hydrogen	510 cf
1994	Marvel mystery oil	110 gals.
1994	Mineral Spirits	110 gals.
1994	Mobil DelVac 15W-40	165 gals.
1994	Mobil DTE	385 gals.
1994	Mobil Rarus 824	220 gals.

TABLE 3-3
Chemical Storage and Use Information, 1968 -1995 [(a)]
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Date (Year)	Chemical	Amount Ordered or Stored[(b)]
1994	Mobilith AW-2 Grease	60 tubes
1994	Mobilube 80W-90	55 gals
1994	MP gearlube 85/140	110 gals.
1994	National Sanitary Supply Breakthru	55 gals.
1994	Nitrogen	25,000 cf
1994	Odorant	3,000 gals.
1994	Oil	580 gals.
1994	Oxygen	890 cf
1994	Paint	275 gals.
1994	Selig 33XG heavy duty compound	240 gals.
1994	Selig descaler 1107	550 gals.
1994	Selig Swype 68	220 gals.
1994	Sulfuric Acid	5,200 gals.
1994	Testing gas (methane)	600 cf
1994	Toluene	110 gals.
1994	Unleaded gasoline	2,000 gals.
1995	Acetylene	2,045 cf
1995	Argon Gas	535 cf
1995	Betz 2020 (Potassium Hydroxide Phosphoric Acid)	1,000 gals.
1995	Betz 2040 (Potassium Hydroxide Phosphoric Acid)	1,000 gals.
	Betz C-77P	1,000 lbs.
1995	Betz Foam-trol	55 gals.
1995	Betz Powerline 3200	730 gals.
1995	Betz Slimicide 508 (Alkyl Dimethyl Benzyl Ammonium Chloride/Ethanol	110 gals
1995	Betz Slimicide 508 (Tributyl Tin Oxide)	55 gals.
1995	Big Joe	55 gals.
1995	Chemsearch ND150	70 gals.
1995	Crankcase oil (hydrocarbon based oils)	28,400 gals.
1995	Diesel	3,000 gals.

TABLE 3-3
Chemical Storage and Use Information, 1968 -1995 [a]
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Date (Year)	Chemical	Amount Ordered or Stored[b]
1995	Dimethyl sulfide/Nitrogen	1020 cf
1995	Helium	280 cf
1995	Hydrogen	510 cf
1995	Mineral Spirits	110 gals.
1995	Mobil DelVac 15W-40	165 gals.
1995	Mobil DTE Heavy	165 gals.
1995	Mobil DTE Light	165 gals.
1995	Mobil Rarus 824	220 gals.
1995	Mobilith AW-2 Grease	60 tubes
1995	Mobilube 80W-90	55 gals
1995	MP gearlube 85/140	110 gals.
1995	National Sanitary Supply Breakthru	110 gals.
1995	Nitrogen	25,000 cf
1995	Odorant	3,000 gals.
1995	Oil	580 gals.
1995	Oxygen	890 cf
1995	Paint	75 gals.
1995	Selig 33XG heavy duty compound	240 gals.
1995	Selig descaler 1107	550 gals.
1995	Selig Swype 68	220 gals.
1995	Sulfuric Acid	5,200 gals.
1995	Testing gas (methane)	600 cf
1995	Toluene	110 gals.
1995	Unleaded gasoline	2,000 gals.
1995	Voltz	220 gals.

Notes:
[a] Items listed above are based on chemical inventory sheets for various years with the exception of chemicals listed for 1968 and 1969 which are based a handwritten sheet of ordered chemicals. (PG&E 1968c, 1969, 1973b, 1974, 1986, 1988, 1994a, 1995a)
[b] Amounts ordered or stored may be for portions of a year; annual consumption information is not available.

TABLE 3-4
Currently-used Cooling Water Treatment Products
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

System(s)	Product	Application	Primary Constituents	Target Range[a]
Cooling towers	NALCO 3D Trasar 3D T184	Corrosion inhibitor	Phosphoric acid (5 - 10%) Zinc chloride (1 - 5%)	40 ppm
	NALCO 3D TRASAR 3D T192	Dispersant	Sodium tolyltriazole (1 - 5%)	100 ppm
	NALCO STRABREX ST70	Biocide	Sodium hydroxide (1-5%) Sodium hypochlorite (6.36%) Sodium bromide (9.23%)	5 ppm
Closed loop[b]	NALCO 8322	Corrosion inhibitor	Sodium hydroxide (1-5%) Sodium molybdate (1-5%) Sodium tolyltriazole (1-5%) Sodium metaborate (1-5%)	300 ppm

Notes:
[a] Target range as product.
[b] Jacket water, auxiliary jacket water, lubricating oil, and auxiliary lubricating oil cooling systems.

TABLE 3-5[a]
Summary of Incidental Releases, 1995 - 2006
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Release Identification	Release Date	Description	Sampling/ Investigations	Removal Actions	Status
Mercury release	October 16, 1995	During the removal of a length of gas meter piping on the east side of the compressor building, elemental mercury apparently contained within the pipe was released to an area of exposed soil measuring about 18 feet long by 9 feet wide.	Confirmatory soil samples were collected following soil excavation and analyzed for mercury.	Impacted soil was excavated and removed to depths up to 4 feet bgs. soil with mercury concentrations exceeding California hazardous waste standards, and/or residential and industrial soil PRGs was removed. A risk assessment indicated that residual concentrations did not pose an unacceptable risk to human health.	No further action proposed. Reports detailing the incident and remediation efforts were submitted to the CSBFD, Hazardous Materials Division on February 7 and June 25, 1996
Cooling tower water release	June 30, 1996	Approximately 200 gallons of non-hazardous water from the lower basin of Cooling Tower A overflowed due to the mechanical failure of a level controller. The overflow entered a facility drain that discharges to Bat Cave Wash. The portion of the wash that was affected by the spill was on PG&E property.	Cooling water samples collected prior to the release indicated an electrical conductivity of 9,000 micromhos and a pH of 7. No soil samples were collected because no samples were requested by the agencies.	Surface soil that was contacted by the overflow (adjacent to the cooling tower basin and in Bat Cave Wash) was removed.	No further action proposed. The Water Board was notified of the release on July 1, 1996, and a report of the incident was submitted on July 18, 1996.
Cooling tower water release	August 4, 1998	Approximately 500 gallons on non-hazardous process water were released from Cooling Tower A due to a fouled screen in a drain return. The process water flowed onto the soil adjacent to the tower, and a small volume of the water flowed down the hill into the Bat Cave Wash Area. All the water evaporated quickly due to the high temperatures.	No samples were collected because the affected area will be investigated as part of the investigation of Bat Cave Wash.	The screen was cleaned and the tower restored to normal operating conditions. No soil removal was conducted.	No further action proposed. The Water Board was notified of the release in a report dated August 11, 1998.
Wastewater release	December 3-5, 2000	Approximately 20,000 gallons of non-hazardous facility wastewater was released from a pipeline into Bat Cave Wash. The wastewater normally is transported to the evaporation ponds. The release was caused by a mechanical failure of an air vent valve.	Surface and subsurface soil samples were obtained and analyzed for Title 22 metals, pH, conductivity, TDS, and soluble Cr(VI).	Soil sample analytical results were all below hazardous waste standards and soluble threshold limit concentrations. Soil removal was not warranted.	No further action proposed. DTSC was initially notified on December 7, 2000, and a final closure report was submitted on January 9, 2002.

TABLE 3-5[a]
Summary of Incidental Releases, 1995 - 2006
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Release Identification	Release Date	Description	Sampling/ Investigations	Removal Actions	Status
Oily water release	August 25, 2001	Approximately 300 gallons of oily water were released during the repair of a malfunctioning OWS. The oily water flowed downhill across the site, through a storm drain, and entered Bat Cave Wash. Of the 300 gallons released, about 100 gallons were believed to be compressor lubricating oil and 200 gallons were wastewater.	Samples of soil were taken and analyzed for Title 22 metals, Cr(T), Cr(VI) and TPH.	The storm drain was cleaned and oil-stained soil was removed. Oily water handling equipment was also reconfigured to minimize the potential for further releases. Title 22 metal concentrations were all below residential PRGs, with the exception of one sample which contained Cr(T) above the industrial PRG. No soil removal was conducted.	No further action proposed. DTSC was initially notified on August 25, 2001, and a report was submitted on September 6, 2001.
Compressor K-10 Aqua Tower release	August 24, 2002	Approximately 100 gallons of water containing a dilute, buffered hydrochloric acid and corrosion inhibitor mixture was released onto a paved area of the facility during a descaling operation involving the Aqua Tower and the after-cooler system heat exchanger on Compressor K-10. About 25 gallons trapped in the gutter quickly evaporated. The remaining 75 gallons entered a storm drain on the east side of the facility and emptied into a nearby gully, dampening the soil.	Soil samples were obtained and analyzed for Title 22 metals, pH, and Cr(VI).	Soil samples results were all below hazardous waste standards and USEPA PRGs. Soil removal was not warranted.	No further action proposed. DTSC was initially notified on August 25, 2002, and a final closure report was submitted on October 4, 2002.
Grit tank release	September 1, 2002	Approximately 500 gallons of oily water overflowed an existing berm, traveled through a drainpipe, and then into Bat Cave Wash. The release was due to the failure of a sump pump level controller. The sump pump normally transfers water accumulated in the bermed sump to the facility OWS.	Samples of soil were taken and analyzed for Title 22 metals, Cr(VI), PCBs, and TPH.	The sump pump was repaired and weekly inspection of the equipment was instituted. TPH in the motor oil range was detected at a maximum concentration of 3,000 mg/kg; TPH-diesel was detected at a maximum concentration of 390 mg/kg. All metals were below industrial PRGs, and only a trace level of PCBs (Arocolor 1254 at 0.30 and 0.086 mg/kg respectively) was detected. No additional soil sampling or removal was performed.	No further action proposed. DTSC was initially notified on August 25, 2002, and a final closure report was submitted on October 4, 2002.

TABLE 3-5[a]
Summary of Incidental Releases, 1995 - 2006
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Release Identification	Release Date	Description	Sampling/ Investigations	Removal Actions	Status
Cooling Tower A water release	April 21, 2003	Approximately 1,000 gallons of cooling tower water overflowed the upper cooling tray as the result of high winds. The water flowed from the facility yard and into Bat Cave Wash.	Surface and subsurface soil samples were obtained and analyzed for Title 22 metals, pH, conductivity, and TDS.	Soil sample test results showed that no hazardous constituents were present in affected areas.	No further action proposed. DTSC was notified on April 22, 2002.
Scrubber pipeline liquids release	March 3, 2004	Pipeline liquids leaked into subsurface soil from a corroded transfer pipe during a routine blowdown of one of the facility gas scrubbers. Approximately 2 gallons of oil were released.	Surface and subsurface soil were analyzed for TPH, BTEX, and PCBs.	The leaking section of transfer pipe was replaced with new pipe. Visibly-stained soil was removed, drummed, and disposed of via a licensed hazardous waster hauler to an approved hazardous waste disposal facility. Confirmation testing indicated that the affected area is free from detectable levels of TPH and PCBs. Xylene was the only BTEX constituent detected (at 5.6 mg/kg).	No further action proposed. DTSC was initially notified via e-mail on March 5, 2004, and a final report was issued on November 15, 2004.
Bat Cave Wash Wastewater release	August 18, 2005	Erosion of soil due to a heavy rainstorm event caused a heavy boulder to fall on a 4” fiberglass pipeline. The pipeline cracked and approximately 1,000 gallons of facility wastewater was released.	The agencies did not request soil samples for this incident.	The pipeline was repaired and eroded soil backfilled. Engineering studies have been conducted and a pipeline replacement/erosion protection plan was developed and is currently being implemented.	No further action proposed. DTSC was notified on August 16, 2005.
Grit tank release	December 19, 2005	A joint failure occurred on the transfer piping between the grit solids settling tank and the OWS. This joint failure resulted in the release of approximately 300 gallons of oily water.	Surface and Subsurface soil samples were obtained and sampled for TPH.	The pipeline was repaired. TPH concentrations ranged from 20 mg/kg to 420 mg/kg. No soil removal was conducted.	No further action proposed. DTSC was notified on Dec. 20, 2005.

TABLE 3-5[a]
Summary of Incidental Releases, 1995 - 2006
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Release Identification	Release Date	Description	Sampling/ Investigations	Removal Actions	Status
Compressor Lubricating Oil Release	December 24, 2005	A rupture occurred in the copper tubing on top of the K-6 compressor lubricating oil filter causing the release of approximately 50 gallons of lubricating oil below the oil filter and onto the soil adjacent to the K-6 compressor building.	Soil samples were obtained on March 8, following excavation of stained soil, and analyzed for Title 22 metals and TPH.	The pipe fitting was replaced. Heavily stained soil was removed form the area on December 27. An additional approximately 10 cubic yards of heavily stained soil was removed in February. None of the soil samples exceeded the California TTLC for Title 22 metals. TPH in the motor oil range was detected in the samples collected (maximum 4,800 mg/kg).	No further action proposed. DTSC was notified on Dec. 25, 2005.
Bat Cave Wash Wastewater Release	December 27, 2005	A vent valve failure resulted in approximately 4,000 gallons of facility waste water (including tower blowdown) being released into Bat Cave Wash.	Surface and Subsurface soil samples were obtained and analyzed for Title 22 metals, pH, conductivity, and TDS.	The vent valve and all associated piping were replaced. Test results show that none of the soil samples exceeded the California TTLC for Title 22 metals.	No further action proposed. DTSC was notified on Dec. 28, 2005.
Jacket Cooling Water Release	Jan 2, 2006	A valve located on one of the main jacket cooling water tanks failed resulting in the release of approximately 120 gallons of cooling water which contained molybdate based corrosion inhibitors. Approximately 100 gallons of were confined to the secondary containment; 20 gallons of water soaked into the nearby soil.	The agencies did not request soil samples for this incident.	The valve and associated PVC piping were replaced with metal piping and valve. No follow-up sampling was conducted in the area.	No further action proposed. DTSC was notified on Jan. 2, 2006.
PG&E Property Wastewater Release	April 16, 2006	A section of the fiberglass pipe that transports wastewater to the evaporation ponds failed. The failure in the pipe resulted in the release of approximately 200 gallons of facility waste water (including cooling tower blowdown). Approximately 5 gallons of the wastewater were released into Bat Cave Wash.	Wastewater and soil samples were collected n April 16 and 26. Soil samples were analyzed for Title 22 metals, pH, conductivity, and TDS; wastewater samples were analyzed of pH, conductivity, and TDS.	Temporary piping was installed to bypass the section of leaking fiberglass pipe. Test results show that none of the soil samples exceeded the California total threshold limit concentration or industrial PRG for Title 22 metals.	No further action proposed. DTSC was notified on April 18, 2006.

TABLE 3-5[a]
Summary of Incidental Releases, 1995 - 2006
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Release Identification	Release Date	Description	Sampling/ Investigations	Removal Actions	Status
Compressor Lubricating Oil Release	April 23, 2006	Failure of another portion of the copper tubing on top of the K-6 Compressor lubricating oil filter caused the release of approximately 50 gallons of lubricating oil below the filters and onto soil adjacent to K-6 compressor building.	Samples were obtained on April 26 and analyzed for TPH.	TPH in the lubricating oil range was detected in the samples collected (maximum 240,000 mg/kg). Heavily stained soil was removed during the week of April 30, 2006.	No further action proposed. DTSC was notified on April 24, 2006.
PG&E Property Wastewater Release	April 29, 2006	A section of the temporary piping which was installed after the April 16, 2006 spill developed a crack. Approximately 30 gallons of facility wastewater (including cooling tower blowdown) were released. Approximately 25 gallons were confined with the station fence line. Approximately 5 gallons of wastewater ran down an old dirt road leading to Bat Cave Wash.	Soil samples were collected and analyzed for Title 22 metals, pH, conductivity, and TDS.	The temporary piping was repaired.	No further action proposed. DTSC was notified on May 2, 2006.
PG&E Property Wastewater Release	May 2, 2006	Another section of the temporary piping, which was installed after the April 16, 2006 spill, failed during a pressure check following temporary piping repairs. Approximately 200 gallons of wastewater were released but confined to PG&E property.	Soil samples were collected and analyzed for Title 22 metals, pH, conductivity, and TDS.	The temporary piping that resulted in the two small releases in the area (April 16 and April 29 2006) was replaced with a threaded carbon steel pipe. Test results show that none of the soil samples exceeded the California total threshold limit concentration or industrial PRG for Title 22 metals in soil.	No further action proposed. DTSC was notified on May 2, 2006.

Note:
[a] Available information regarding pre-1995 releases is provided in Section 3.1.8

TABLE 3-6
Soil Sample Results
Mercury Release, October 1995
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Sample	Total Mercury (mg/kg)	Soluble Mercury (mg/L)
C1	0.72	-
C2	0.76	-
C3	0.55	-
C4	0.025	-
C5	0.38	-
C6	3.4	<0.005
C7	0.071	-
C8	0.26	-
C9 (#2)	0.008	-
C10	0.60	-
C11	2.1	<0.005
C12	0.083	-
South Wall	0.12	-
North Wall	0.19	-
South Lateral (inside wooden form)	0.82	-
North Lateral (inside wooden form)	2.8	<0.005
North Lateral (outside wooden form)	0.65	-
CA Title 22 total threshold limit concentration [a]	20	-
CA Title 22 soluble threshold limit concentration [b]	-	0.2
Residential soil PRG [c]	23	-
Industrial soil RRG [c]	310	-

Notes:
All analyses performed using USEPA Method 7471 modified.
[a] California Title 22 TTLC - Total Threshold Limit Concentration.
[b] California Title 22 STLC - Soluble Threshold Limit Concentration.
[c] USEPA Region 9 PRGs (October 2004).

TABLE 3-7
Soil Sample Results
Wastewater Release, December 2000
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Sample No.:	**1**	**2**	**3**	**4**	**5**	**6**			
Analyte (units)	**Affected Topsoil**	**Affected Topsoil Sample No. 1 at 12-inch depth**	**Unaffected Topsoil Adjacent to Sample No.1**	**Affected Soil Near Vent Valve**	**Affected Soil Near Vent Valve Sample 4 at 12-inch depth**	**Unaffected Topsoil Adjacent to Vent Valve Sample No. 4**	**USEPA Residential Soil PRGs[a]**	**USEPA Industrial Soil PRGs[a]**	**CA Title 22 STLC [c]**
Title 22 Metals (mg/kg)									
Antimony		ND (<2.0)	ND (<2.0)	ND (<2.0)	ND (<2.0)	ND (<2.0)	31	410	
Arsenic	4.9	ND (<1.0)	ND (<1.0)	1.7	3.1	1.6	0.39[b]	1.6[b]	
Barium	270	84	74	140	200	230	5,400	67,000	
Beryllium	ND (<0.50)	ND (<0.50)	ND (<0.50)	ND (<0.50)	ND (<0.50)	ND (<0.50)	150	1,900	
Cadmium	0.87	0.69	0.65	0.78	0.6	0.64	37	450	
Total Chromium	11	12	11	8.2	8.6	9.4	210	450	
Cobalt	4.5	4.9	4.6	2.7	3.7	3.9	900	1,900	
Copper	17	12	11	18	6.7	7.9	3,100	41,000	
Lead	5.0	3.3	2.8	1.7	2.8	2.4	400, 150 [d]	800	
Mercury	ND (<0.05)	ND (<0.05)	ND (<0.05)	ND (<0.05)	ND (<0.05)	ND (<0.05)	23	310	
Molybdenum	9.7	ND (<1.0)	ND (<1.0)	17	1.3	ND (<1.0)	390	5,100	
Nickel	9.4	10	8.7	5.8	6.7	6.1	1,600	20,000	
Selenium	ND (<2.0)	ND (<2.0)	ND (<2.0)	ND (<2.0)	ND (<2.0)	ND (<2.0)	390	5,100	
Silver	ND (<1.0)	ND (<1.0)	ND (<1.0)	ND (<1.0)	ND (<1.0)	ND (<1.0)	390	5,100	
Thallium	ND (<1.0)	ND (<1.0)	ND (<1.0)	ND (<1.0)	ND (<1.0)	ND (<1.0)	5.2	67	
Vanadium	23	20	19	15	18	18	78	1,000	
Zinc	150	29	27	240	29	49	23,000	100,000	

TABLE 3-7
Soil Sample Results
Wastewater Release, December 2000
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Sample No.:	**1**	**2**	**3**	**4**	**5**	**6**			
Analyte (units)	**Affected Topsoil**	**Affected Topsoil Sample No. 1 at 12-inch depth**	**Unaffected Topsoil Adjacent to Sample No.1**	**Affected Soil Near Vent Valve**	**Affected Soil Near Vent Valve Sample 4 at 12-inch depth**	**Unaffected Topsoil Adjacent to Vent Valve Sample No. 4**	**USEPA Residential Soil PRGs[a]**	**USEPA Industrial Soil PRGs[a]**	**CA Title 22 STLC [c]**
Iron [e]	12,000	11,000	11,000	13,000	8,800	9,500	23,000	100,000	
California WET Test Results [f]									
Hexavalent Chromium (mg/L)	ND (<0.20)	ND (<0.20)	ND (<0.20)	ND (<0.20)	ND (<0.20)	ND (<0.20)			5.0
Chloride (as Cl) (mg/L)	115	17	3.2	33	20	0.71			
Sulfate (as SO_4) (mg/L)	109	14	2.7	48	81	1.4			
pH	8.26	8.72	9.57	8.23	9.18	9.43			
Conductivity (mmho/cm)	0.8	0.2	ND (<0.10)	0.4	0.4	ND (<0.10)			
TDS (mg/L)	450	126	55	204	208	57			

Notes:
[a] USEPA Region 9 PRGs for residential and industrial soil (2004).
[b] Arsenic is a compound whose natural background concentrations in California typically exceed the PRGs.
[c] California Title 22 Soluble Threshold Limit Concentration.
[d] USEPA and California-modified residential PRGs, respectively.
[e] Iron is not a Title 22 metal but was analyzed for informational purposes.
[f] Title 22 WET Test - Results are from modified Waste Extraction Test method; samples extracted using deionized water instead of citric acid.
ND = not detected (detection limit in parentheses).

TABLE 3-8
Soil Sample Results
Oily Water Release, August 2001
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Sample ID:	**Sample #1**	**Sample #2**	**Sample #3**	**Sample #4**	**USEPA Residential Soil PRGs [a]**	**USEPA Industrial Soil PRGs [a]**
Sample Date:	**10/02/2001**	**10/02/2001**	**10/10/2001**	**10/10/2001**		
Analyte						
Metals (mg/kg)						
Antimony	<2.0	<2.0	<2.0	<2.0	31	410
Arsenic	<1.0	4.7	<1.0	2.2	0.39[b]	1.6[b]
Barium	79	200	78	150	5,400	67,000
Beryllium	<0.5	<0.5	<0.5	<0.5	150	1,900
Cadmium	<0.5	<0.5	<0.5	<0.5	37	450
Chromium (total)	63	1,100	13	15	210	450
Chromium (hexavalent)	<0.2	0.2	<0.2	<0.2	30	64
Cobalt	5.5	2.8	4.7	4	900	1,900
Copper	18	63	12	8.6	3,100	41,000
Lead	9.6	110	2.3	4.3	400, 150[c]	800
Molybdenum	4.2	270	<1.0	6.2	390	5,100
Nickel	11	9.1	8.9	7.4	1,600	20,000
Selenium	<2.0	<2.0	<2.0	<2.0	390	5,100
Silver	<1.0	<1.0	<1.0	<1.0	390	5,100
Thallium	<1.0	<1.0	1.7	<1.0	5.2	67
Vanadium	29	18	20	19	78	1,000
Zinc	74	650	25	27	23,000	100,000
Mercury	<0.05	0.07	<0.05	<0.05	23	310
Petroleum Hydrocarbons (mg/kg)						
Diesel	300	1,400	<1.0	1.1	NA	NA
Motor Oil	6,900	27,000	<50	<50	NA	NA

Source: PG&E 2001.
[a] USEPA Region 9 PRGs for residential and industrial soil (2004).
[b] Arsenic is a compound whose natural background concentrations in California typically exceed the PRGs.
[c] USEPA and California-modified residential PRGs, respectively.
NA = Not Applicable.

TABLE 3-9
Soil Sample Results
K-10 Aqua Tower Release, August 2002
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Sample ID: / Sample Date:	K-10 Drain 8/25/2002	#3 9/9/2002	
Analyte	**Affected Soil[a] K-10 Release Area**	**Comparison Location Near K-10**	**USEPA Industrial Soil PRGs [b]**
Title 22 Metals (mg/kg)			
Antimony	ND (<2.0)	ND (<2.0)	410
Arsenic	6.1	2.0	1.6[c]
Barium	110	66	67,000
Beryllium	ND (<0.50)	ND (<0.50)	1,900
Cadmium	2.3	0.73	450
Total Chromium	35	6.6	450
Cobalt	5.0	2.8	1,900
Copper	140	5.0	41,000
Lead	77	4.5	800
Mercury	0.074	0.066	310
Molybdenum	420	ND (<1.0)	5,100
Nickel	16	5.8	20,000
Selenium	ND (<2.0)	ND (<2.0)	5,100
Silver	ND (<1.0)	ND (<1.0)	5,100
Thallium	ND (<1.0)	ND (<1.0)	67
Vanadium	11	12	1,000
Zinc	160	16	100,000
Additional Parameters			
pH (units)	7.0	9.1	
Hexavalent Chromium (mg/kg)	ND (<0.01)	ND (<0.20)	

Notes:
[a] The cleaning solution released from K-10 drain was a dilute mixture of buffered hydrochloric acid and corrosion inhibitor containing 5-10% phosphoric acid and 1-5% zinc chloride.
[b] USEPA Region 9 PRGs for industrial soil (2004).
[c] Arsenic is a compound whose natural background concentrations in California typically exceed the PRGs.

ND = not detected (detection limits in parentheses).

Source: PG&E 2002c.

TABLE 3-10
Soil Sample Results
Grit Tank Release, August 2002
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Sample ID: Sample Date: Analyte	#1 9/5/2002 B29 Valve Grit Tank	#2 9/5/2002 Trench Grit Tank Area	#4 9/9/2002 TW Drip Bat Cave Wash	#5 9/9/2002 Photo Location #7 Bat Cave Wash	#6 9/9/2002 Comparison Location Bat Cave Wash	USEPA Industrial Soil PRGs[a]
Petroleum Hydrocarbons (mg/kg)						
Diesel	390	5.6	8.6	2.3	ND (<1.0)	NA
Motor Oil	3,000	69	110	62	ND (<50)	NNA
Title 22 Metals (mg/kg)						
Antimony	ND (<2.0)	ND (<2.0)	ND (<2.0)	ND (<2.0)	ND (<2.0)	410
Arsenic	2.7	2.9	1.0	ND (<1.0)	ND (<1.0)	1.6[b]
Barium	140	260	72	58	37	67,000
Beryllium	ND (<0.50)	ND (<0.50)	ND (<0.50)	ND (<0.50)	ND (<0.50)	1,900
Cadmium	1.2	1.4	1.2	1.1	1.1	450
Total Chromium	11	25	360	53	16	450
Cobalt	4.2	4.2	4.4	4.0	4.2	1,900
Copper	21	13	19	8.1	6.2	41,000
Lead	9.6	64	8.7	6.1	2.7	800
Mercury	0.26	0.19	0.094	ND (<0.050)	0.072	310
Molybdenum	13	1.2	7.9	6.8	ND (<1.0)	5,100
Nickel	8.8	9.8	8.3	8.0	7.6	20,000
Selenium	ND (<2.0)	ND (<2.0)	ND (<2.0)	ND (<2.0)	ND (<2.0)	5,100
Silver	ND (<1.0)	ND (<1.0)	ND (<1.0)	ND (<1.0)	ND (<1.0)	5,100
Thallium	ND (<1.0)	2.9	ND (<1.0)	ND (<1.0)	ND (<1.0)	67
Vanadium	16	17	18	15	15	1,000
Zinc	29	55	75	38	28	100,000
Additional Parameter (mg/kg)						
Hexavalent Chromium	ND (<0.20)	ND (<0.20)	0.20	ND (<0.20)	ND (<0.20)	310

TABLE 3-10
Soil Sample Results
Grit Tank Release, August 2002
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Sample ID: **Sample Date:** **Analyte**	**#1** **9/5/2002** **B29 Valve Grit Tank**	**#2** **9/5/2002** **Trench Grit Tank Area**	**#4** **9/9/2002** **TW Drip Bat Cave Wash**	**#5** **9/9/2002** **Photo Location #7 Bat Cave Wash**	**#6** **9/9/2002** **Comparison Location Bat Cave Wash**	**USEPA Industrial Soil PRGs[a]**
PCBs (mg/kg)						
Aroclor 1016	ND (<0.50)	ND (<0.050)	ND (<0.050)	ND (<0.050)	ND (<0.050)	21 [c]
Aroclor 1221	ND (<0.50)	ND (<0.050)	ND (<0.050)	ND (<0.050)	ND (<0.050)	0.74[d]
Aroclor 1232	ND (<0.50)	ND (<0.050)	ND (<0.050)	ND (<0.050)	ND (<0.050)	0.74[d]
Aroclor 1242	ND (<0.50)	ND (<0.050)	ND (<0.050)	ND (<0.050)	ND (<0.050)	0.74[d]
Aroclor 1248	ND (<0.50)	ND (<0.050)	ND (<0.050)	ND (<0.050)	ND (<0.050)	0.74[d]
Aroclor 1254	ND (<0.50)	0.30	ND (<0.050)	0.086	ND (<0.050)	0.74[d]
Aroclor 1260	ND (<0.50)	ND (<0.050)	ND (<0.050)	ND (<0.050)	ND (<0.050)	0.74[d]

Notes:

[a] USEPA Region 9 PRGs for industrial soil (2004).
[b] Arsenic is a compound whose natural background concentrations in California typically exceed the PRGs.
[c] Composite PRG for low risk isomers.
[d] Composite PRG for high risk isomers.
ND = not detected (detection limits in parentheses).
Source: PG&E 2002c.

TABLE 3-11
Sample Results
Scrubber Oil Release, March 2004
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Sample ID:	**#1**	**#2**	**#3**	**USEPA Industrial Soil PRGs[a]**
(Sample Date):	**(05/21/2004)**	**(05/21/2004)**	**(05/21/2004)**	
Description:	**West Side of Trench**	**East Side of Trench**	**2' Blowdown Pipe**	
Parameter				
Petroleum Hydrocarbons (mg/kg)				
Gasoline	ND (<1.0)	ND (<1.0)	--	NA
BTEX (µg/kg)				
Benzene	ND (<3.0)	ND (<3.0)	--	1,400
Toluene	ND (<3.0)	ND (<3.0)	--	520,000
Ethylbenzene	ND (<3.0)	ND (<3.0)	--	400,000
Total Xylenes	ND (<3.0)	5.6	--	420,000
PCBs (mg/kg)				
Aroclor-1260	ND (<0.30)	ND (<0.30)	2.0	0.74[b]

Notes:
[a] USEPA Region 9 PRGs for industrial soil (2004).
[b] Composite PRG for high risk isomers.
ND = not detected (detection limits in parentheses).
µg/kg = micrograms per kilogram.

TABLE 3-12
Soil Sample Results
Grit Tank Release, December 19, 2005
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Sample ID: **Sample Date:** **Analyte**	**#1** **12/20/05** **Hole at Pipe Break**	**#2** **12/20/05** **Near Facility Yard Drain**	**#3** **12/20/05** **Unaffected Area near Leak Source (Background)**	**#4** **12/20/05** **Near end of Release Path in Bat Cave Wash**	**#5** **12/20/05** **Unaffected Area Near Sample No. 4 (Background)**	**USEPA Industrial Soil PRGs**
Petroleum Hydrocarbons (mg/kg)						
Gasoline	ND (< 20)	ND (< 20)	ND (< 20)	ND (< 40)	ND (< 20)	NA
Diesel	ND (< 10)	ND (< 10)	ND (< 10)	ND (< 20)	ND (< 10)	NA
Motor Oil / Hydraulic Oil	79	20	ND (< 20)	420	59	NA

Notes:
ND = not detected (detection limits in parentheses).
NA = not available.
Source: PG&E 2006a.

TABLE 3-13
Soil Sample Results
Compressor Lubricating Oil Release, December 24. 2005 and April 23, 2006
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Sample No.:	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	
Sample Date:	**3/8/06**	**3/8/06**	**3/8/06**	**3/8/06**	**4/26/06**	**4/26/06**	**4/26/06**	**4/26/06**	
Analyte (units)	**Composite Surface Sample[a]**	**Visually Clean - Surface Sample**	**Heavily-stained Soil**	**Moderately-stained Soil**	**Oil obtained from K-6 Filter (used as a standard for analysis)**	**Saturated Absosrbant material obtained near the K-6 Filter**	**Stained Surface Soil Northeast Intersection Below Walkway, near K-6 Filter**	**Clean Appearing Surface Soil Obtained Near Sample # 3**	**USEPA Industrial Soil PRGs[c]**
Petroleum Hydrocarbons (mg/kg)									
Gasoline	N/A	ND (< 20)	ND (< 410)	ND (< 400)	N/A	ND (< 16000)	ND (< 2000)	ND (< 40)	NA
Diesel	N/A	ND (< 10)	ND (< 200)	ND (< 200)	N/A	ND (<8000)	ND (< 1000)	ND (< 20)	NA
Kerosene	N/A	ND (< 20)	ND (< 200)	ND (< 200)	N/A	ND (< 8000)	ND (< 1000)	ND (< 20)	NA
Motor Oil / Hydraulic Oil	5200	220	4800	3900	N/A	240,000[b]	25,000[b]	510[b]	NA
Title 22 Metals (mg/kg)									
Antimony	ND (< 10)	ND (< 5.0)	ND (< 5.0)	ND (< 10)	N/A	N/A	N/A	N/A	410
Arsenic	3.3	2.9	4.5	3.9	N/A	N/A	N/A	N/A	1.6[d]
Barium	160	96	100	160	N/A	N/A	N/A	N/A	67,000
Beryllium	0.47	ND (< 0.50)	ND (< 0.50)	ND (<1.0)	N/A	N/A	N/A	N/A	1,900
Cadmium	0.39	ND (< 0.50)	ND (< 0.50)	ND (<1.0)	N/A	N/A	N/A	N/A	450
Total Chromium	49	13	20	51	N/A	N/A	N/A	N/A	450
Hexavalent Chromium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	64
Cobalt	7.5	3.3	4.6	ND (< 5.0)	N/A	N/A	N/A	N/A	1,900
Copper	26	7.5	13	43	N/A	N/A	N/A	N/A	41,000
Lead	46	57	24	170	N/A	N/A	N/A	N/A	800

TABLE 3-13
Soil Sample Results
Compressor Lubricating Oil Release, December 24. 2005 and April 23, 2006
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Sample No.:	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	
Sample Date:	**3/8/06**	**3/8/06**	**3/8/06**	**3/8/06**	**4/26/06**	**4/26/06**	**4/26/06**	**4/26/06**	
Analyte (units)	**Composite Surface Sample[a]**	**Visually Clean - Surface Sample**	**Heavily-stained Soil**	**Moderately-stained Soil**	**Oil obtained from K-6 Filter (used as a standard for analysis)**	**Saturated Absosrbant material obtained near the K-6 Filter**	**Stained Surface Soil Northeast Intersection Below Walkway, near K-6 Filter**	**Clean Appearing Surface Soil Obtained Near Sample # 3**	**USEPA Industrial Soil PRGs[c]**
Mercury	ND (< 0.16)	ND (< 0.16)	ND (< 0.16)	ND (< 0.16)	N/A	N/A	N/A	N/A	310
Molybdenum	ND (< 5.0)	ND (< 2.5)	ND (< 2.5)	15	N/A	N/A	N/A	N/A	5,100
Nickel	22	7.8	13	13	N/A	N/A	N/A	N/A	20,000
Selenium	ND (<1.0)	ND (< 0.50)	ND (< 0.50)	1.0	N/A	N/A	N/A	N/A	5,100
Silver	ND (<1.0)	ND (< 0.50)	ND (< 0.50)	ND (1.0)	N/A	N/A	N/A	N/A	5,100
Thallium	ND (< 10)	ND (< 5.0)	ND (< 5.0)	ND (< 10)	N/A	N/A	N/A	N/A	67
Vanadium	37	16	30	23	N/A	N/A	N/A	N/A	1,000
Zinc	140	42	65	200	N/A	N/A	N/A	N/A	100,000

Notes:

Samples collected on March 8, 2006 are associated with the December 24, 2005 release.

[a] Sample is a composite of Samples 2, 3 and 4. The sample was mistakenly composited by the testing laboratory.

[b] Sample analyzed for K-6 Lube Oil. A sample was collected from the K-6 Lube Oil filter and used as an analytical standard.

[c] USEPA Region 9 PRGs for industrial soil (2004).

[d] Arsenic is a compound whose natural background concentrations in California typically exceed the PRGs.

ND = not detected (detection limit in parentheses).

N/A = constituent not analyzed.

NA = not available.

TABLE 3-14
Soil Sample Results
Wastewater Release, December 27, 2005
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Sample No.:	**1**	**2**	**3**	**4**	**5**	**6**	**7**	
Sample Date:	**12/29/05**	**12/29/05**	**12/29/05**	**12/29/05**	**12/29/05**	**12/29/05**	**12/29/05**	
Analyte (units)	**End of Wet Soil in BC Wash - Surface Sample**	**End of Wet Soil in BC Wash - 1 ft. Depth Sample**	**BC Wash - Background Sample**	**BC Wash - Immediately Downstream of Valve Vault - Surface Sample**	**BC Wash - Immediately Downstream of Valve Vault - 1 ft. Depth Sample**	**BC Wash - Background Sample Near Valve Vault**	**Oily Water Separator Clean Water Tank Sample**	**USEPA Industrial Soil PRGs[a]**
Title 22 Metals (mg/kg)							**(µg/L)**	
Antimony	ND (< 5.0)	ND (< 5.0)	ND (< 5.0)	ND (< 5.0)	ND (< 5.0)	ND (< 5.0)	270	410
Arsenic	1.1	0.95	3.8	2.4	2.5	3.4	ND (< 50)	1.6[b]
Barium	57	88	110	160	180	200	100	67,000
Beryllium	ND (< 0.50)	ND (< 0.50)	ND (< 0.50)	ND (< 0.50)	ND (< 0.50)	ND (< 0.50)	ND (< 10)	1,900
Cadmium	ND (< 0.50)	ND (< 0.50)	ND (< 0.50)	ND (< 0.50)	ND (< 0.50)	ND (< 0.50)	ND (< 10)	450
Total Chromium	22	18	20	11	11	12	47	450
Hexavalent Chromium	ND (<0.20)	ND (<0.20)	ND (<0.20)	ND (<0.20)	ND (<0.20)	ND (<0.20)	0.03 mg/L	64
Cobalt	4.8	5.5	5.9	3.4	4.5	4.4	ND (< 50)	1,900
Copper	8.5	11	10	11	6.4	7.4	85	41,000
Lead	3.2	3	5.9	3.4	3.4	3.9	ND (<50)	800
Mercury	ND (<0.14)	ND (<0.16)	ND (<0.16)	ND (<0.16)	ND (<0.16)	ND (<0.16)	ND (< 0.20)	310
Molybdenum	ND (< 2.5)	ND (< 2.5)	ND (<2.5)	ND (<2.5)	ND (<2.5)	ND (<2.5)	6700	5,100
Nickel	12	11	12	6	7	8.3	ND (< 10)	20,000
Selenium	0.82	0.88	ND (<.87)	0.68	0.57	0.7	ND (< 100)	5,100
Silver	ND (<0.5)	ND (<0.5)	ND (<0.50)	ND (<0.5)	ND (<0.5)	ND (<0.5)	ND (< 10)	5,100

TABLE 3-14
Soil Sample Results
Wastewater Release, December 27, 2005
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Sample No.:	**1**	**2**	**3**	**4**	**5**	**6**	**7**	
Sample Date:	**12/29/05**	**12/29/05**	**12/29/05**	**12/29/05**	**12/29/05**	**12/29/05**	**12/29/05**	
Analyte (units)	**End of Wet Soil in BC Wash - Surface Sample**	**End of Wet Soil in BC Wash - 1 ft. Depth Sample**	**BC Wash - Background Sample**	**BC Wash - Immediately Downstream of Valve Vault - Surface Sample**	**BC Wash - Immediately Downstream of Valve Vault - 1 ft. Depth Sample**	**BC Wash - Background Sample Near Valve Vault**	**Oily Water Separator Clean Water Tank Sample**	**USEPA Industrial Soil PRGs[a]**
Thallium	ND (< 5.0)	ND (< 5.0)	ND (< 5.0)	ND (< 5.0)	ND (<5.0)	ND (<5.0)	ND (< 100)	67
Vanadium	22	24	28	21	25	26	62	1,000
Zinc	29	29	39	120	27	24	660	100,000
Additional Parameters								
Chlorides, mg/kg (as Cl^-)	12	9	0.58	17	10	8.2	1300 mg/L	
Sulfates, mg/kg as ($SO_4^=$)	8.2	6.5	20	9.2	9.3	80	690 mg/L	
PH (units)	8.05	8.46	7.86	8.05	8.32	7.71	7.64	
Conductivity (mmho/cm^3)	1400	120	120	200	150	280	5700	
Total Dissolved Solids (mg/kg)	100	89	85	150	110	180	3800	

Notes:
[a] USEPA Region 9 PRGs for industrial soil (2004).
[b] Arsenic is a compound whose natural background concentrations in California typically exceed the PRGs.
[c] California Title 22 Soluble Threshold Limit Concentration.

ND = not detected (detection limit in parentheses).
Source: PG&E 2006c.

TABLE 3-15
Soil Sample Results
Wastewater Release, April 16, April 29, and May 2, 2006
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Sample No.:	**1**	**2**	**3**	**4**	**SS1**	**SS2**	**SS3**	**SS4**	
Sample Date:	**4/26/06**	**4/26/06**	**4/16/06**	**4/16/06**	**5/2/06**	**5/2/06**	**5/2/06**	**5/3/06**	
Analyte (units)	**Wet soil Near Release**	**Dry Soil near release**	**Waste-water from pipe**	**Waste-water from O/W Separator**	**Within the 4/29/06 Release**	**Within the 4/29/06 Release**	**With the 5/2/06 Release**	**Background sample**	**USEPA Industrial Soil PRGs[a]**
Title 22 Metals (mg/kg)									
Antimony	ND	ND	N/A	N/A	ND	ND	ND	ND	410
Arsenic	2.3	4.6	N/A	N/A	4.1	2.5	4.8	1.9	1.6[b]
Barium	140	210	N/A	N/A	140	160	170	58	67,000
Beryllium	ND	ND	N/A	N/A	ND	ND	0.56	ND	1,900
Cadmium	ND	ND	N/A	N/A	ND	1.1	ND	ND	450
Total Chromium	35	20	N/A	N/A	30	42	27	23	450
Cobalt	5.3	7	N/A	N/A	6.3	7.5	6.3	7.7	1,900
Copper	10	11	N/A	N/A	16	19	15	11	41,000
Lead	18	6.2	N/A	N/A	11	67	9.5	6.6	800
Mercury	ND	ND	N/A	N/A	ND	ND	ND	ND	310
Molybdenum	2.7	ND	N/A	N/A	5.3	7.3	3.6	ND	5,100
Nickel	15	15	N/A	N/A	16	27	16	17	20,000
Selenium	ND	ND	N/A	N/A	ND	ND	ND	ND	5,100
Silver	ND	ND	N/A	N/A	ND	ND	ND	ND	5,100
Thallium	ND	ND	N/A	N/A	ND	ND	ND	ND	67
Vanadium	24	34	N/A	N/A	35	39	38	34	1,000
Zinc	78	42	N/A	N/A	30	150	58	45	100,000

TABLE 3-15
Soil Sample Results
Wastewater Release, April 16, April 29, and May 2, 2006
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Sample No.:	**1**	**2**	**3**	**4**	**SS1**	**SS2**	**SS3**	**SS4**	
Sample Date:	**4/26/06**	**4/26/06**	**4/16/06**	**4/16/06**	**5/2/06**	**5/2/06**	**5/2/06**	**5/3/06**	
Analyte (units)	**Wet soil Near Release**	**Dry Soil near release**	**Waste-water from pipe**	**Waste-water from O/W Separator**	**Within the 4/29/06 Release**	**Within the 4/29/06 Release**	**With the 5/2/06 Release**	**Background sample**	**USEPA Industrial Soil PRGs[a]**
Additional Parameters									
pH (units)	8.25	8.41	7.59	7.5	8.06	9.11	8.26	8.57	NA
Chloride (mg/kg [as Cl^-])	530	380	1200	1100	1900	58	170	11	NA
Sulfate (mg/kg as [$SO_4^=$])	230	1700	560	520	750	60	470	17	NA
Electrical conductivity @ 25°C (mmho/cm^3)	320	610	5000	4700	900	120	210	80	NA

Notes:
[a] USEPA Region 9 PRGs for industrial soil (2004).
[b] Arsenic is a compound whose natural background concentrations in California typically exceed the PRGs.

ND = not detected (detection limit in parentheses).
N/A = constituent not analyzed.

TABLE 3-16
Chronology of Major Operational Changes
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Year	Action
1951	Topock Compressor Station begins operation with six compressor units (K-1 through K-6), three generator units (P-1 through P-3), and one four-cell cooling tower (Cooling Tower A). Cooling tower blowdown discharged directly to Bat Cave Wash.
1953	Two additional compressor units (K-7 and K-8) and one additional generator unit (P-4) are installed.
1954	Another compressor unit (K-9) is installed. Cooling Tower B constructed (two cells).
1957	Another compressor unit (K-10) is installed.
1958	Cooling Tower B expanded to four cells.
1960 to 1961	Use of water production wells PG&E Nos. 1 and 2 ceases; water for the facility is procured from wells across the Colorado River in Topock, Arizona (Topock Wells Nos. 1 and 2).
1962	Original Permutit water conditioning unit is removed from service; canister-type water conditioning system is installed.
1964	Single-step treatment system to reduce Cr(VI) in cooling water blowdown installed; a percolation bed for impoundment of treated cooling tower blowdown constructed in Bat Cave Wash.[a]
1964	Interstate 40 is constructed. Wells PG&E Nos. 1 and 2 are destroyed, and new standby wells PGE-06 and PGE-07 are installed.
1969	Two-step treatment system to reduce Cr(VI) and remove chromium from cooling tower blowdown is installed. Injection well PGE-08 also installed at this time.
1970	Use of injection well PGE-08 for underground injection of facility wastewater begins. From May 1970 to September 1971, wastewater is diverted to percolation bed when injection well PGE-08 is out of service. Gas scrubbers removed from service between mid-1960s and 1970.
1971	Construction of single-lined evaporation Pond No. 1 is completed. From September 1971 to August 1973, Pond No. 1 receives facility wastewater only when injection well PGE-08 is out of service. Between August and December 1973, wastewater disposal alternates on a 3-day cycle between PGE-08 and Pond No. 1.
1974	Single-lined evaporation Pond Nos. 2 through 4 are completed and all facility wastewater is conveyed directly to these ponds. PGE-08 is permanently taken out of service.
1974	Topock Well No. 3 is installed.
1980	Topock Well No. 1 is removed from service. Topock Well No. 2a replaces Topock Well 2. Topock Well Nos. 2a and 3 are used to supply water to the compressor station.
1985	Chromium-based cooling water additives are replaced with phosphate-based additives for the open system, and molybdate-based system for the closed-loop systems. Operation of the two-step chromium treatment unit ceases.
1989	Four new double-lined evaporation ponds are completed and all facility wastewater is directed to these ponds. The four single-lined evaporation ponds (i.e., the Old Evaporation Ponds) are removed from service.
1989 to 1990	The two-step chromium treatment unit is closed and removed. The original oily wastewater treatment system is removed and replaced with a new system.
2001	The original coil shed Cooling Tower A is replaced with a new cooling tower/heat exchanger unit.
2002	The original coil shed Cooling Tower B is replaced with a new cooling tower/heat exchanger unit.

Note:
[a] The exact date for construction of the percolation pond is unknown, but based on aerial photographs, it appears to have been constructed in 1964 (i.e., with the single-step treatment system).

.

TABLE 3-17
Chronology of Major Regulatory Agency Directives and RCRA Corrective Action Activities
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Date	Event
August 14, 1969	Water Board adopts Resolution 69-25 requiring PG&E to cease discharging industrial wastewater containing hexavalent chromium by infiltration to Bat Cave Wash (Water Board 1969)..
November 6, 1970	PG&E submits a Report of Waste Discharge to the Water Board for disposal of industrial wastewater from cooling tower operations into single-lined evaporation Pond #1.
December 10, 1970	Water Board adopts Resolution 70-72 regulating the discharge of treated wastewater into single-lined evaporation pond #1 (Water Board 1970a).
December 10, 1970	Water Board adopts Resolution No. 70-73, regulating the disposal of chromic hydroxide sludge at an approved offsite facility (Needles Dump) (Water Board 1970b).
September 11, 1975	Water Board rescinds Resolution No. 70-72 and adopts Board Order No. 75-52 for four single-lined evaporation ponds (SWMU 10; Old Evaporation Ponds). On November 20, the Water Board issued a revised Board Order No. 75-52 changing the minimum freeboard requirement from 2 feet to 1 foot (Water Board 1975). Also, the Board Order prohibited the discharge of wastewater to the Colorado River or to any channel draining to the Colorado River. In addition, the Board Order specified that chemical residues obtained by chemical flocculation or evaporation of process wastewater shall be discharged only at a solid waste disposal site approved to receive these wastes.
August 18, 1980	As required by RCRA, PG&E files a Notification of Hazardous Waste Activity Form with the USEPA for the two-step wastewater treatment system, which included the chromic hydroxide sludge drying beds.
November 17, 1980	PG&E submits a RCRA Part A application to the DTSC covering all hazardous waste management facilities at the compressor station (i.e., the former two-step wastewater treatment system and the four former single-lined evaporation ponds).
April 6, 1981	An Interim Status Document, which outlines the requirements for operation of the Topock Compressor Station as a RCRA hazardous waste facility (USEPA ID No. CAT080011729), is issued by the DTSC to PG&E.
June 9, 1981	PG&E files a Notification of Hazardous Waste Site with USEPA Region 9, pursuant to Section 103 (c) of CERCLA.
March 11, 1983	Water Board adopts Order 83-29 that rescinds Order 69-25.
December 15, 1982	Pursuant to a request from DTSC, PG&E submits an Operation Plan for the hazardous waste facilities covered by the Interim Status Document.
May 8, 1985	USEPA Region 9 requests that PG&E prepare a Part B Permit Application for the waste treatment units at Topock Compressor Station. After a review of applicable regulations affecting the operation of the hazardous waste management facilities, PG&E submits a notice to the USEPA on September 6 of its intent to decommission and close these facilities (including the four old evaporation ponds).
October 2, 1985	The Water Board adopts Board Order No. 85-99 for the four former single-lined evaporation ponds, which superseded Board Order No. 75-52 (Water Board 1985). Order No. 85-99 allows PG&E to replace the chromate-based cooling tower water treatment process with phosphate-based inhibitors. Phosphate-based inhibitors are in use today.
November 7, 1985	PG&E submits a Closure Plan (dated October 28, 1985) to USEPA with copies to DTSC and Water Board. This Closure Plan covered closure of all hazardous waste management facilities at Topock identified in the Part A RCRA permit application, including the two-step wastewater treatment system (Phase 1 and 2 closure) and the four former single-lined evaporation ponds (Phase 3 Closure).

TABLE 3-17
Chronology of Major Regulatory Agency Directives and RCRA Corrective Action Activities
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Date	Event
August 14, 1986	PG&E submits a revised Closure Plan for hazardous waste management facilities at Topock identified in the Part A RCRA permit application.
May 19, 1987	The Water Board determines that PG&E Topock Compressor Station's old evaporation ponds were not subject to regulation under the California Toxic Pits Control Act.
June 26 and July 10, 1987	The Closure Plan (and subsequent revisions) for closure of the hazardous waste management facilities at Topock identified in the Part A RCRA permit application (the two-step wastewater treatment system and the four single-lined evaporation ponds) is approved by USEPA Region 9 (June 26) and DTSC (July 10).
July 7, 1987	DTSC, Water Board, and USEPA approve the Closure Plan for the hazardous waste facilities (PG&E receives notification of approval on September 7, 1987).
August 1987	USEPA completes an RFA for the Topock Compressor Station. The RFA identified 13 SWMUs (Units 4.1 through 4.13) through records review, data evaluation, interviews, and a visual site inspection.
January 27, 1988	Water Board rescinds Board Order No. 85-99 and adopts Board Order No. 88-30, which is revised on March 23, 1988 (Water Board 1988). Revised Order No. 88-30 allows discharge to four Class II surface impoundments.
March 9, 1988	DTSC issued a Stipulation and Order on January 27, 1988 (Docket No. HWCA 87/88-018), which set forth the agreement reached between DTSC and PG&E regarding events that would trigger upgrading the groundwater monitoring system at the four single-lined evaporation ponds and settling the alleged monitoring deficiencies identified in 1986.
November, 1988	PG&E began closure activities of hazardous waste management facilities at Topock identified in the Part A RCRA permit application. Closure activities associated with the two-step wastewater treatment system consisting of the chromate reduction tank, precipitation tank, process pump tank, transfer sump, sludge drying beds, and associated piping were completed in 1990 (Phases 1 and 2). Closure of the four single-lined evaporation ponds could not proceed until new surface impoundments were constructed to replace the old evaporation ponds and the waste had dried sufficiently.
September, 1989	DTSC issues a Report of Violation. This report listed essentially the same groundwater monitoring violations settled by the Stipulation and Order issued March 9, 1988.
July 23, 1990	PG&E submits a Closure Certification Report for clean closure of the facilities in Phases 1 and 2 (the two-step wastewater treatment system) to DTSC, USEPA, and Water Board.
February 25, 1991	DTSC issues a Corrective Action Order listing the same alleged violations as contained in the previous Report of Violations and the Stipulation and Order.
September to November 1993	PG&E conducts closure construction work at the four former single-lined evaporation ponds.
December 31, 1993	PG&E submits the *Closure Certification Report for the Old Evaporation Ponds* dated December 27, 1993 to DTSC and the Water Board.
November to December 1994	In response to regulatory agency concerns, additional site excavation work at the four former single-lined evaporation ponds area is conducted.
May 11, 1995	The Water Board approves the clean closure of the four former single-lined evaporative ponds.

TABLE 3-17
Chronology of Major Regulatory Agency Directives and RCRA Corrective Action Activities
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Date	Event
June 26, 1995	The DTSC approves clean closure of the former two-step wastewater treatment system and the four former single-lined evaporation ponds (the former hazardous waste management facilities) and considers these waste management units clean closed.
August 3, 1995	DTSC submits a letter to PG&E requesting that a Corrective Action Program be conducted at the site.
February 26,1996	PG&E and the DTSC enter into a CACA, whereby PG&E agreed to address past waste discharges at the Bat Cave Wash project site and to conduct an RFI and implement corrective action, if warranted. The CACA identifies 10 SWMUs (SWMU 1 through SWMU 10) and three AOCs (AOC 1 through AOC 3) at the Topock Compressor Station. Eight of the SWMUs identified in the CACA were also identified as SWMUs in the RFA. However, four SWMUs identified in the RFA were not included in the CACA; the CACA combined two of the RFA SWMUs into one SWMU; and the CACA listed two additional SWMUs and three additional AOCs that were not identified in the RFA.
July 2, 1996	DTSC acknowledges the receipt of the Current Conditions Report, RFI Work Plan, Health and Safety Plan, and Public Involvement Plan.
December 19, 1996	DTSC approves the RFI work plan, Current Conditions Report, and the Health and Safety Plan.
January 12, 1998	PG&E receives, from DTSC, the RFA prepared by A.T. Kearny (August 1987).
February 19, 1998	DTSC approves the RFI work plan amendment per comments given in a February 11, 1996 DTSC memorandum prepared by the Geological Support Unit of DTSC.
May 14, 1998	Water Board rescinds Order No. 88-30 and adopts Order No. 98-050 regulating the Class II ponds (Water Board 1998). The Class II ponds are currently regulated under Order No. 98-050.
April 17, 2000	PG&E submits the Draft RFI Report to DTSC.
October 12, 2000	PG&E submits a work plan for additional soils sampling to DTSC. The work plan identifies 10 potentially-impacted areas associated with the Topock Compressor Station that required investigation. The areas were identified through a review of historic aerial photographs, interviews with knowledgeable employees, a review of chemical use processes, and a field reconnaissance within and around the compressor station.
January 4, 2001	DTSC issues a letter to PG&E indicating that the 10 potentially-impacted areas identified in PG&E's October 12, 2000 work plan are considered AOCs under the RCRA corrective action process.
December 2002	PG&E submits the Draft Corrective Measures Study Work Plan.
June 24, 2003	DTSC approves the Draft Corrective Measure Study Work Plan.
August 11, 2003	DTSC is established as the lead agency for the Topock project at a meeting of the Cal/USEPA Site Designation Committee.
August 2003	DTSC requests that PG&E install a pilot groundwater extraction and treatment system and that the CWG, with representatives from regional, state, and federal agencies, be rechartered.
February 2004	PG&E submits revised Draft RFI Report to DTSC.
February 9, 2004	DTSC directs PG&E to begin pumping, transport and disposal of groundwater from existing monitoring wells at the MW-20 cluster and monthly surface water sampling at six locations (Interim Measure No. 2).

TABLE 3-17
Chronology of Major Regulatory Agency Directives and RCRA Corrective Action Activities
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Date	Event
March 8, 2004	PG&E begins implementation of Interim Measure No. 2.
May 17, 2004	DTSC directs PG&E to prepare a revised RFI Report.
June 30, 2004	To continue to achieve the objectives of the interim measures, DTSC issues a California Environmental Quality Act notice of exemption for increased groundwater extraction, piping and conveyance of extracted water to treatment system on nearby land owned by Metropolitan Water District, and management of treatment waste streams (Interim Measure No. 3).
September 2004	PG&E completes purchase of land parcel owned by Metropolitan Water District for Interim Measure No. 3 and begins grading work in preparation for Interim Measure No. 3 construction.
October 13, 2004	Water Board adopts Orders for three options to manage the treated water from Interim Measures No. 3: subsurface injection, discharge to the Colorado River under a National Pollutant Discharge Elimination System permit, and re-use of the treated water at the Topock Compressor Station.
February 2005	PG&E submits a revised Draft RFI Report to DTSC
July, 2005	PG&E completes construction of Interim Measure No. 3. Groundwater injection begins.
July 11, 2005	DOI, BOR, USFWS, BLM, and PG&E enter into an Administrative Order on Consent for the Topock project. The order defines how cooperation will be facilitated between the federal agencies and PG&E, and includes an agreement that cleanup activities will be completed pursuant with CERCLA.
March 23, 2006	Water Board adopts Order R7-2006-0008 for implementation of a Floodplain Reductive Zone In-situ Pilot Test.
July 13, 2006	DTSC provides comments on the Site History and Background portions of the 2005 Draft RFI. DTSC identifies four new AOCs, and provides AOC designations for two previously-undesignated areas. DTSC also requests additional soil investigation at eight SWMUs associated with the cooling water blowdown and oily treatment processes that had been closed by DTSC in the 1990s.

TABLE 3-18
Summary of Aerial Photographs, 1936 to 1997
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Year	Description
1936 (Figure 3-8)	The AT&SF railroad line and Route 66 are the primary manmade features visible in this photograph. The original railroad line crosses the Colorado River on the northernmost bridge (the Red Rock Bridge) and turns northward to run along the western bank of the river (part of the right-of-way may currently being occupied by National Trails Highway). Route 66 crosses the river to the south of the railroad using the Old Trails Arch bridge and runs westward in a fairly circuitous route. Route 66 runs through the future compressor station site (a portion of this route is now used as the entrance to the compressor station) and a single structure is present at the northern end of the future site of the facility. The structure is believed to be the Teapot Dome restaurant and gas station (CH2M HILL 2004). The Topock Maze is also visible in the photograph. There are also numerous structures located on the east side of the Colorado River in Topock. Most of the structures are clustered around the railroad line and Route 66. North of the railroad bridge, the river is quite wide and not well defined, indicating that it has not been dredged.
1942 (Figure 3-9)	No significant changes in land use can be seen between this photograph and the 1936 photograph. The river appears to be much lower in this photograph (when compared to the 1936 photograph) and numerous sand bars can be seen along the western edge of the river north of the railroad bridge.
1944 (Figure 3-10)	Construction of the re-alignment of the AT&SF railroad line is visible in this photograph. The right-of-way is graded and bridge piers are present in the river channel, but the track and bridge have not yet been completed. A small spur now appears to connect Route 66 and the railroad right-of-way near the western end of the railroad bridge. Several structures are also present just south of the western end of the railroad bridge. The nature of these structures in unknown. A detour for Route 66 has been constructed where it crosses the new railroad grade; the original route was apparently blocked by railroad cut and fill activities. There is also a large graded area and construction activity in the location that is now known as the Railroad Debris site (AOC 4).
1947 (Figure 3-11)	The new AT&SF railroad line and trestle have been completed. Route 66 has been re-aligned. Route 66 now occupies the original railroad right-of-way and uses the Red Rock Bridge to cross the Colorado River. The former alignment of Route 66 has become a secondary road. The structure believed to be Teapot Dome is still present.
1953 (Figure 3-12)	The paths of the railroad and Route 66 have been altered on the east side of the river. The compressor station is present and it includes the main compressor building, cooling tower A, generator building, carport, warehouse, and water tanks. The scrubber units and sludge drying beds are also present on the lower bench just west of the main facility. There is what appears to be a light colored liquid flow beginning in Bat Cave Wash that appears to originate downslope of the bench on the northwest side the facility (near the current location of monitoring well MW-10) and ends on the south side of the railroad tracks. The river channel appears more defined upstream of the railroad trestle and sand dunes appear on both sides of the main channel, suggesting that dredging has occurred. There are also what appear to be several structures near the mouth of Bat Cave Wash on Route 66. The structures appear to be a gas station and motel known to have occupied this area at the time (CH2M HILL 2004).
1955a (Figure 3-13)	Cooling tower B is now present at the facility. Another new building is also present in the southeast corner of the facility across from the generator building. The sludge drying beds (SWMU 5) are now visible in the lower yard on the western side of the facility. A large whitish area is also present just south of the sludge drying beds. There is what appears to be a light-colored liquid flow in Bat Cave Wash beginning just downslope of the sludge drying beds area and extending to the railroad tracks. There is also what appears to be a light colored liquid flow that originates downslope of the lower yard on the northwest side the facility (near the current location of monitoring well MW-10) that meets the lighter colored flow in Bat Cave Wash. There is a large white patch just north of the station and just east of Bat Cave Wash, at what is now called the Railroad Debris site. An unpaved road runs from the north end of the compressor station of the facility to this area. The river channel is more defined upstream of the railroad trestle and sand dunes are present on the eastern side of the river. The structures located at the end of Bat Cave wash are still present.

TABLE 3-18
Summary of Aerial Photographs, 1936 to 1997
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Year	Description
1955b (Figure 3-14)	In this oblique aerial photograph looking to the northeast, the layout of the compressor station is clearly visible, including the main facility and the lower yard. There is a large white patch located just south of the sludge drying beds. There is also a pipe that runs down the slope of Bat Cave Wash just west of the sludge drying beds. A light-colored flow emanates from the pipe and flows northward down Bat Cave Wash. Another liquid flow appears to originate on the slope on the northwest side of the facility (near the current location of monitoring well MW-10) and meets the lighter colored flow in Bat Cave Wash. No evidence of a holding pond (i.e., percolation bed) (SWMU 1) can be seen in this photograph. A large white patch and some debris is present at what is now called the Railroad Debris site. An unpaved road (a portion of the old Route 66) runs from the north end of the compressor station of the facility to this area. Several structures are also clearly evident on the eastern side of the river.
1955c (Figure 3-15)	An oblique aerial photograph looking to the northwest. An unpaved road (a portion of the former Route 66) runs from the north end of the compressor station to the Railroad Debris site. There appear to be materials stored in the southern end of the lower bench. A small shed is present on the southeast side of the facility, just above the slope down into the East Ravine. Debris is present around the shed and down the slope. There are also two drainage channels that run from the compressor station into East Ravine. At least one drainage appears to contain (or to have recently contained) flowing liquid.
1961 (Figure 3-16)	There are two additional pipeline crossings downstream of Route 66. Cooling Tower B has been enlarged to 4 cells and a new office building is located at the east entrance to the facility. There is a light-colored patch on the east side of Bat Cave Wash just down slope of the sludge drying beds area. There are also several dark patches at the bottom of the wash in that same area. The 1962 photograph covers more area to the north of the compressor station. The Park Moabi facility appears to be under construction.
1962 (Figure 3-17)	The light-colored patch on the east side of Bat Cave Wash just down slope of the sludge drying beds area is still visible. There also appears to be a minor amount of liquid flow in Bat Cave Wash originating from that same area. The Park Moabi facility is still under construction, and a dredge can be seen operating at the mouth of the side channel that leads to the Park Moabi Marina.
1964 (Figure 3-18)	The compressor station is clearly visible and it appears that the road leading up to the facility and the onsite access roads have been paved. The flowing liquid identified in Bat Cave Wash in earlier photographs is no longer visible. The sludge drying beds are dark, suggesting that liquid is present in the beds. There is what appears to be an impoundment containing liquid east of the facility and south of the entrance road to the site (in the East Ravine). There is also a small patch of light-colored material in a drainage area near the southeast fence line of the facility. The river is very well defined suggesting more dredging had occurred, and there appears to be the beginning of vegetation growth in the sand dunes north of the railroad.
1966 (Figure 3-19)	The 1966 photograph encompasses a narrow east-west swath along the newly constructed I-40. Coverage extends from the northern edge of the compressor station to the railroad line. The white powder in the Railroad Debris site appears to have been covered with soil (although it is still partially exposed in some areas). Wells PG&E-6 (SWMU 3) and PG&E-7 (SWMU 4) are visible with what appears to be a pipeline connecting the two. There appears to be a small depression containing liquid on the north side of Bat Cave Wash, just northwest of the facility. This is the same area where liquid flows were previously identified. The very northern edge of the holding pond can also be seen inside the loop of the road that runs from the lower yard down into Bat Cave Wash. Route 66 has been replaced with the newly constructed I-40, located between the compressor station and the Railroad Debris site. The original railroad bridge crossing the river has also been replaced.

TABLE 3-18
Summary of Aerial Photographs, 1936 to 1997
RCRA Facility Investigation/Remedial Investigation (Volume 1), PG&E Topock Compressor Station, Needles, California

Year	Description
1967a (Figure 3-20)	There is what appears to be ponded water in the holding pond located in Bat Cave Wash. The ponded water appears as a dark crescent in the inside loop of the road that leads from the lower yard down into Bat Cave Wash. A light colored patch is also present in Bat Cave Wash in the southern portion of the holding pond, in the area where liquid discharge originating on the northwest side of the facility was observed in earlier photographs. The small impoundment in the East Ravine identified in the 1964 photograph is still present. The sludge drying beds appear dark, suggesting liquid within the beds. Moabi Regional Park is visible upriver from the compressor station. Two constructed ponds containing water are also visible just south of Moabi Park.
1967b (Figure 3-21)	An impounded area (i.e., the holding pond or former percolation bed [SWMU 1]) is clearly evident in this photograph. The impoundment area lies inside the curve of the access road that runs from the lower yard to into Bat Cave Wash. Evidence of recent grading in this area can be discerned. The impoundment has been created by bulldozing soil from the center of the area and berming it up along the edge of the access road. A dark area that appears to be liquid can be seen ponded along the western edge of the impounded area. The sludge drying beds also appear to contain liquid.
1969 (Figure 3-22)	There is still what appears to be ponded water in the holding pond located in Bat Cave Wash. The ponded water appears as a dark crescent in the inside loop of the road that leads from the lower yard down into Bat Cave Wash. There is a light colored patch in the Debris Ravine just south of the facility. The sludge drying beds still appear dark, suggesting liquid within the beds.
1975 (Figure 3-23)	The holding pond area is visible in this photograph, although it does not appear to contain any liquid. The area of the holding pond that formerly held ponded water appears lighter in color than surrounding soil. Four evaporation ponds (i.e., the Former Evaporation Ponds, SWMU 10) are present to the southwest of the facility. All of the ponds appear to contain water.
1983 (Figure 3-24)	The old Route 66 bridge across the river has been removed. The marina on the eastern side of the river is clearly visible. The buildings (or remnants of such) at the mouth of Bat Cave Wash are still present. The mouth of Bat Cave Wash immediately west of Route 66 is heavily vegetated. The Railroad Debris site is no longer visible. The former site of the ponded water in the east ravine has an orange-brown tint.
1994 (Figure 3-25)	Some structures are now present on the bench located to the east of the compressor station. The former location of the four evaporation ponds (SWMU 10) is visible to the southwest of the compressor station. Four new Class II ponds are present further to the west. The new oil/water separator can also be seen in the lower yard. All other features appear similar to the 1983 photograph.
1997 (Figure 3-26)	Additional structures and construction activities are present on the bench located to the east of the compressor station. The Colorado River is very clearly defined. Remnants or foundations of the buildings located at the mouth of Bat Cave Wash are still visible; however, it does not appear that the buildings are still intact. All other features appear similar to the 1994 photograph.
2004 (Figure 3-27)	This photograph reflects the station as it is currently configured with the new cooling towers in place. Activities on the MW-20 bench can also be seen. All other features appear similar to the 1997 photograph.