# FINAL

## Remedial Action Completion Report

## Operable Unit No. 1
## Brown & Bryant Superfund Site
## Arvin, California

U.S. Environmental Protection Agency Region 9
San Francisco, California

September 2011

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**List of Acronyms**

| | |
|---|---|
| 1,2-DCP | 1,2-Dichloropropane |
| 1,2,3-TCP | 1,2,3-Trichloropropane |
| 1,3-DCP | 1,3-Dichloropropane |
| 4,4-DDE | dichloroethylene |
| ARARs | Applicable or Relevant and Appropriate Requirements |
| ASTM | American Society for Testing and Materials |
| B&B | Brown & Bryant |
| bgs | below ground surface |
| BHHRA | Baseline Human Health Risk Assessment |
| CDHS | California Department of Health Services |
| CDPR | California Department of Pesticides Regulation Endangered Species Project Species |
| CDQM | Chemical Data Quality Management |
| $^{o}$C | Celsius degrees |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| CHHSLs | California Human Health Screening Levels |
| cm/sec | centimeters per second |
| $cm^2$/sec | square centimeters per second |
| COC | Chain of Custody |
| COCs | Contaminants of Concern |
| COR | Contracting Officers Representative |
| CQC | Construction Quality Control |
| CVRWQCB | Central Valley Regional Water Quality Control Board |
| CW-1 | Arvin City Well-1 |
| DBCP | 1,2-Dibromo-3-chloropropane |
| DDT | Dichlorodiphenyltrichloroethane |
| DNAPL | Dense Non-Aqueous Phase Liquid |
| DQOs | Data Quality Objectives |
| DTSC | California Department of Toxic Substances Control |
| EDB | Ethylene dibromide, also called l,2-Dibromoethane |
| EPA | Environmental Protection Agency |
| ESD | Explanation of Significant Difference |
| EW | Extraction Well |
| $^{0}$F | Fahrenheit degrees |
| FS | Feasibility Study |
| Facility | Brown and Bryant Arvin Pesticide Reformulation Facility |
| ft/ft | foot per foot |
| GCL | geosynthetic clay liner |
| gpm | gallons per minute |
| GAC | Granular Activated Carbon |
| IAG | Interagency Agreement |
| in/yr | inches per year |
| ITSI | Innovative Technical Solutions, Inc |
| IW | Injection Well |
| “J” | Estimated value (laboratory qualifier) |
| $K_h$ | Horizontal Hydraulic Conductivity |

| | |
|---|---|
| $K_v$ | Vertical Hydraulic Conductivity |
| LPGAC | Liquid Phase Granular Activated Carbon |
| MCL | Maximum Contaminant Level |
| mg/Kg | milligrams per kilogram |
| MK | Morrison Knudsen Corporation |
| mph | miles per hour |
| MW | Monitoring Well |
| NAPL | Non-Aqueous Phase Liquids |
| NPL | National Priority List |
| O&M | Operation and Maintenance |
| OU | Operable Unit |
| Panacea | Panacea, Inc. |
| PCB | Polychlorinated Biphenyls |
| PID | Photo Ionization Detector |
| PRAC | Pre Placed Remedial Action Contract |
| PRP | Principle Responsible Party |
| PWP | Project Work Plans |
| QA/QC | Quality Assurance/ Quality Control |
| RA | Remedial Action |
| RAOs | Remedial Actions Objectives |
| RCRA | Resource Conservation and Recovery Act |
| RD | Remedial Design |
| RI/FS | Remedial Investigation/Feasibility Study |
| ROD | Record of Decision |
| SAP | Sampling and Analysis Plan |
| SCFM | Standard Cubic Feet Per Minute |
| Site | Brown and Bryant Superfund Site |
| SPT | Standard Penetrometer Test |
| SVE | Soil-Vapor Extraction |
| SVOCs | Semi-Volatile Organic Compounds |
| TPH | Total Petroleum Hydrocarbons |
| TWA | Time Weighted Average |
| µg/L | micrograms per liter |
| µg/Kg | micrograms per Kilogram |
| USACE | United States Army Corps of Engineers |
| USEPA | United States Environmental Protection Agency |
| USGS | United States Geological Survey |
| UST | Underground Storage Tank |
| UV | Ultraviolet |
| VOCs | Volatile Organic Compounds |

# 1.0 Introduction

This report is prepared to document remedial actions that have been completed in accordance with the Comprehensive, Environmental Response, Compensation and Liability Act (CERCLA) at the Operable Unit No. 1 (OU-1) Brown and Bryant Superfund Site (Site), CERCLIS ID No. CAD 052384021, located in Arvin, Kern County, California. This Remedial Action (RA) Completion Report presents information on construction, cost and performance for the OU-1 remedy at the Site. The RA Completion Report is prepared consistent with the "Closeout Procedures for National Priorities List Sites" OSWER Directive 9320.2-09A-P, January 2000.

## 1.1 Site Description

The Site is located at 600 South Derby Street in the City of Arvin, California, approximately 18 miles southeast of the City of Bakersfield (Figure 1-1). The Site is located on the east side of Derby Street, north of its intersection with Franklin Street. The Site covers an area approximately 4.7 acres in size and is a generally rectangular, fenced-in parcel that is elongated towards the southeast. Union Pacific's railroad track extends along the western and southern boundaries of the Site outside of the fenced area.

Arvin, California, is located in the Tulare river basin on the southeastern edge of California's Central Valley Mountains at an average elevation of 440 feet above mean sea level. Arvin is primarily an agricultural community of approximately 9,000 people. The Site is located in a light industrial and commercial area within the city, and is bordered on the east by irrigated agricultural fields, on the north and south by food packing and shipping facilities, and on the west by South Derby Street, which is a paved two-lane highway separating the Site from a residential area to the west. The residential area contains two schools (Gospel Tabernacle of Arvin and Stepping Stones Child Care Center) and a park (Bear Mountain Recreation and Park Center), located within 0.5 miles of the Site. The Morning Star Preschool, at 416 North Hill Street, is located one mile away from the Site.

Precipitation and agricultural irrigation are the two main sources of surface water runoff at the Site. Runoff from irrigation of adjacent agricultural land to the east tends to run onto the Site, in the absence of engineered controls. In some locations, surface water tends to flow towards the south and southeast off the Site.

The Site is currently vacant. A warehouse and an open metal shed are on the property. The property is secured by a chain-link fence and paved with asphalt. The asphalt covers a RCRA cap in the Site's southern portion, and a non-RCRA cap in the Site's northern portion.

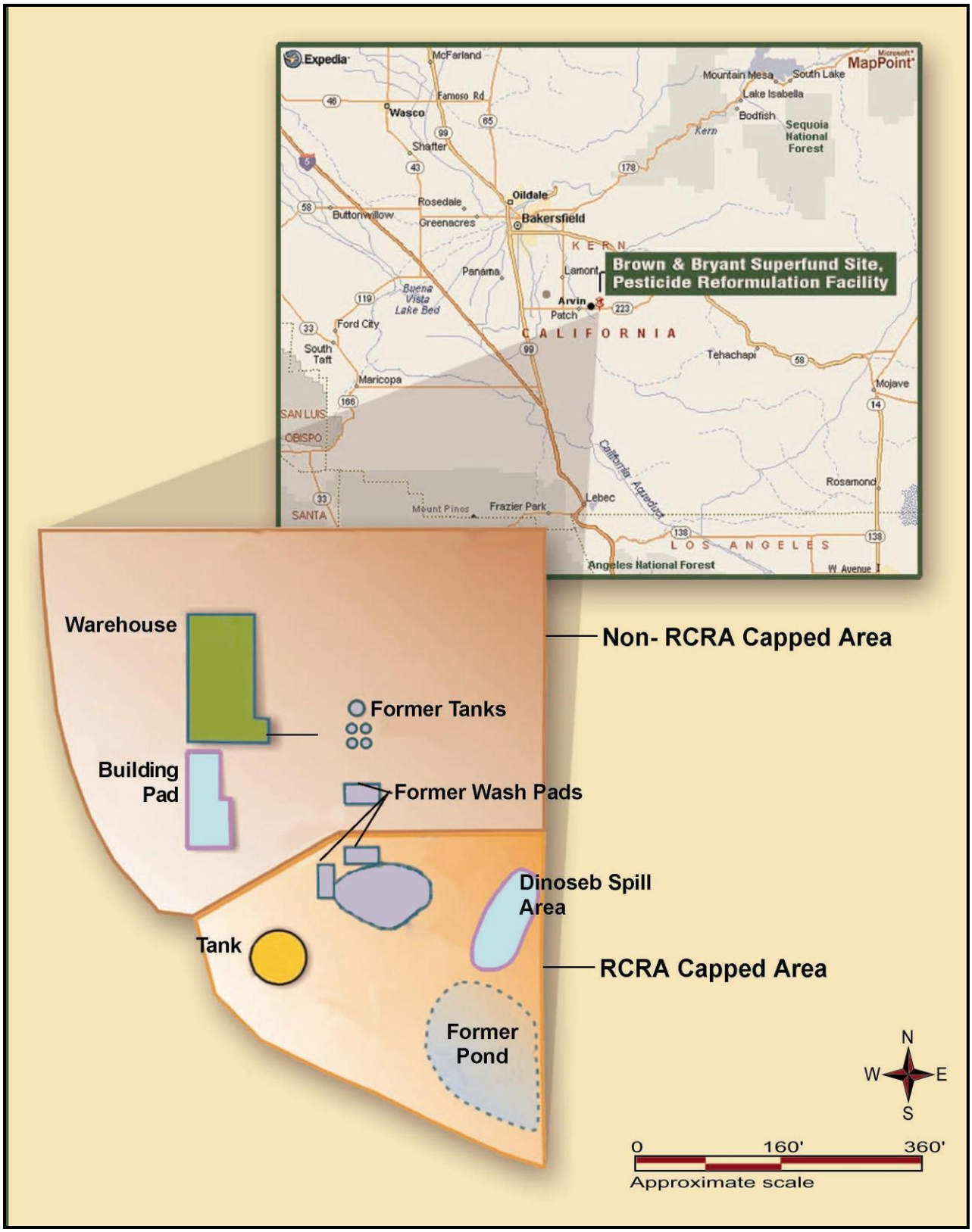


**Figure 1-1: Brown & Bryant Superfund Site Location**
(Reproduced from fig 1-1, B&B OU-2 ROD, Sep 2007)

## 1.2 Site Operation and Waste Management Practices

The Brown & Bryant pesticide reformulation facility (B&B) in Arvin operated as a pesticide re-formulator and custom applicator facility from 1960 to 1989. Prior to this time, the facility was farmland. In 1960, an unlined earthen sump was constructed in the center of the Site. The sump was used to collect wash water from a pad where equipment and tanks used for liquid fertilizers and fumigants were washed. Water from the sump was drained to a pond through an underground pipeline. In 1980, the unlined sump was replaced with two double-lined sumps. In April 1981, the Brown & Bryant facility was licensed under RCRA as a hazardous waste transporter.

Contamination of soil and groundwater resulted from inadequate procedural controls, chemical spills during operations, and leaks from a surface wastewater pond and sumps. Inspections by the California Valley Regional Water Quality Control Board (CVRWQCB) documented numerous instances of poor facility operations and maintenance practices during Brown & Bryant's occupancy of the Site. Described in more detail below, an onsite tank holding the chemical dinoseb, and two unlined ponds for pesticide rinse water were noted as being potential contaminant release areas. One 250,000-gallon pond was noted as overflowing twice. The onsite tank, 560,000 gallons in capacity, was reported to have leaked. In 1984, the California Department of Health Services (CDHS) identified various pesticides in analytical sampling results collected from onsite wells, including 1,2-dibromo-3-chloropropane, ethylene dibromide, dinoseb, 1,2-dichloropropane, and chlorobenzene.

The largest releases onsite were from a waste pond, a sump area, and a dinoseb spill area (Figure 1-1). The waste pond in the southwest portion of the Site was originally excavated as an unlined earthen pond in 1960. Historically, the pond was used to collect stormwater runoff from the yard and from two sumps (since excavated). The pond was also used to collect rinse water from rinsing tanks used for spraying fumigants. Excess pond water and stormwater runoff also collected in a topographically low area to the east and south of the pond. In addition, water which collected on the Site from precipitation and irrigation runoff occasionally overflowed the berm in the southeast corner of the Site and drained into the pond. The pond was double lined with a synthetic liner in November 1979.

Dinoseb was stored in a smaller tank storage area along the eastern fence, just north of the pond. In 1983, there was a significant dinoseb spill in this area. As a result, the soil and groundwater underlying this portion of the Site has been reported to contain the highest concentrations of dinoseb.

## 1.3 Regulatory and Enforcement History

In compliance with RCRA regulations, B&B notified EPA in July 1980 that it generated, transported, treated, stored and disposed of hazardous waste at the Arvin facility. In April 1981, B&B notified EPA that the Arvin facility was limited to the transport of hazardous waste and that only the Shafter facility operated by B&B was a treatment, storage and disposal facility (TSDF) for hazardous wastes. As a result, the Arvin facility was not permitted as a TSDF, but was issued a transporter license.

In May 1983, the CDHS inspected the Site to determine compliance with hazardous waste laws. At the time of the inspection, several violations involving storage, disposal, and transportation of hazardous waste were noted. Following the inspection, the CDHS directed B&B facility to correct the violations and conduct a site assessment. Between 1983 and 1988, under the supervision of CDHS, investigations were conducted at the Site to evaluate the nature and extent of contamination in the soil and groundwater. Based on the findings of these investigations, the Site was listed by the United States Environmental

Protection Agency (EPA) on the National Priorities List (NPL) of Superfund sites on October 4, 1989, and in that same year, all Site operations ceased. Subsequently, various emergency and removal actions were initiated to minimize (or eliminate) immediate threats to human health and the environment.

The principal threats that formed the basis for EPA's listing of the Site on the NPL were the presence of groundwater contamination, which could potentially migrate to Arvin drinking water wells, and the potential for exposure to highly contaminated soils on the Site. In March 1990, EPA's "Emergency Response Action" conducted a Site assessment and subsequently performed various tasks to treat the most contaminated on-site soils and remove a number of on-site structures in 1991. In December 1990, the EPA began a Remedial Investigation/Feasibility Study (RI/FS) for OU-1 at the Site.

In June 1991, EPA issued Unilateral Administrative Order (UAO) # 91-6 to the Atchison, Topeka and Santa Fe Railway, and Southern Pacific Transportation Company. The objective of the UAO was to identify and prevent any potential "imminent and substantial endangerment to the public health or welfare or the environment because of the release or threatened release of hazardous substances from the B&B site." The UAO #91-6 directed the railroads to install seven shallow and four deep groundwater wells in the perched and unconfined water bearing units located within and near the Site. Installation of these wells was completed in the spring of 1992.

## 1.4 Site Investigations and Findings

Several investigations have been conducted to assess the nature and extent of contamination within OU-1. The OU-1 study area included surface soil, soil in the unsaturated A-zone, and the A-zone groundwater. Summaries of the Site investigation are provided below.

From 1983 through 1988, B&B conducted several soil and groundwater investigations and remedial actions under CDHS supervision. The most significant work included the installation of ten monitoring wells and the removal of some heavily contaminated soil beneath the two sumps and waste.

B&B hired two engineering firms to conduct the Site investigations. During Site investigations, on-site soil samples were collected and analyzed for organics and metals. The results of the analyses indicated high concentrations of pesticides in soil generally confined within the first few feet of the ground surface, but also to greater depths in other locations. The higher soil concentrations were detected in samples collected from the former chemical handling areas. These areas include the former sump location, the former waste pond, and the dinoseb spill area.

The investigation also provided information on the shallow soil and A-zone soil characteristics. Additional work was completed by other organizations in support of the Southern Pacific Transportation Company and the Atchison, Topeka and Santa Fe Railway Company (hereinafter referred to as the potentially responsible parties (PRPs)). The groundwater and soil investigations at the Site were conducted in response to the EPA June, 1991, UAO. These investigations were completed in August of 1992, and the results were incorporated into the RI findings, summarized below.

The geology at the Site consists of alluvial deposits of alternating layers and mixtures of unconsolidated sands, silts and clays. The stratigraphy is very heterogeneous and the layers tend to be discontinuous across the Site. The Site geology has been divided into three zones. The A-zone includes unsaturated soils from 65 to 85 feet, and the first water-bearing unit, the A-zone groundwater. The base of the A-zone is a thin sandy clay layer between 75 and 85 feet bgs. The B-zone begins at the bottom of the

A-zone and ends at the top of the Corcoran Clay regional geological feature at about 275 feet bgs. The C-zone begins at the top of the Corcoran Clay feature and its thickness varies from several hundred feet to over 1,000 feet. Figure 1-2 presents a schematic diagram of the naming conventions used at the Site for zone designations. A-zone, B-zone and C-zone are continuous across the Site. The clay layer and A-zone groundwater occur beneath the entire Site, but disappear between 500 and 600 feet south of the Site, 200 feet east of the Site, and 300 feet west of the Site.

Surface soils to seven feet bgs were analyzed for metals. Analytical sampling results also detected volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and dinoseb. Surface soils sampling results from the surface soil identified only dinoseb at concentrations exceeding 7,000,000 µg/Kg. The extent of dinoseb contamination was investigated from the surface to seven feet bgs. Four areas were identified as having the highest concentrations of dinoseb , including two locations along the eastern fence line (including the dinoseb spill area), the northeastern corner of the Site, and the area east of the large storage tank (tank UN-32). At least one soil sample in each area exceeded the health-based cleanup level for dinoseb of 80 milligrams per kilogram (mg/Kg). The highest concentrations of dinoseb were detected in the area of a former spill area along the east fence-line, and beneath a former pond and sump.

Soil contamination was found from seven feet bgs to 65 feet bgs (the A-zone groundwater )at locations across the Site, but was primarily concentrated under three areas: the sump area, the dinoseb spill area, and the waste pond and a topographic low area between the pond and the large storage tank in the southwest corner of the Site. Within these three areas and the Site, six chemicals were found at the highest concentrations and to the greatest extent within the A-zone soils. These chemicals are: 1,2-dichloropropane (1,2-DCP); 1,3-dichloropropane (1,3-DCP); dibromochloropropane (DBCP); 1,2,3-trichloropropene (1,2,3-TCP); ethylene dibromide (EDB); and dinoseb. All of these chemicals were used at the facility during its operations. All of these chemicals, except dinoseb, are VOCs.

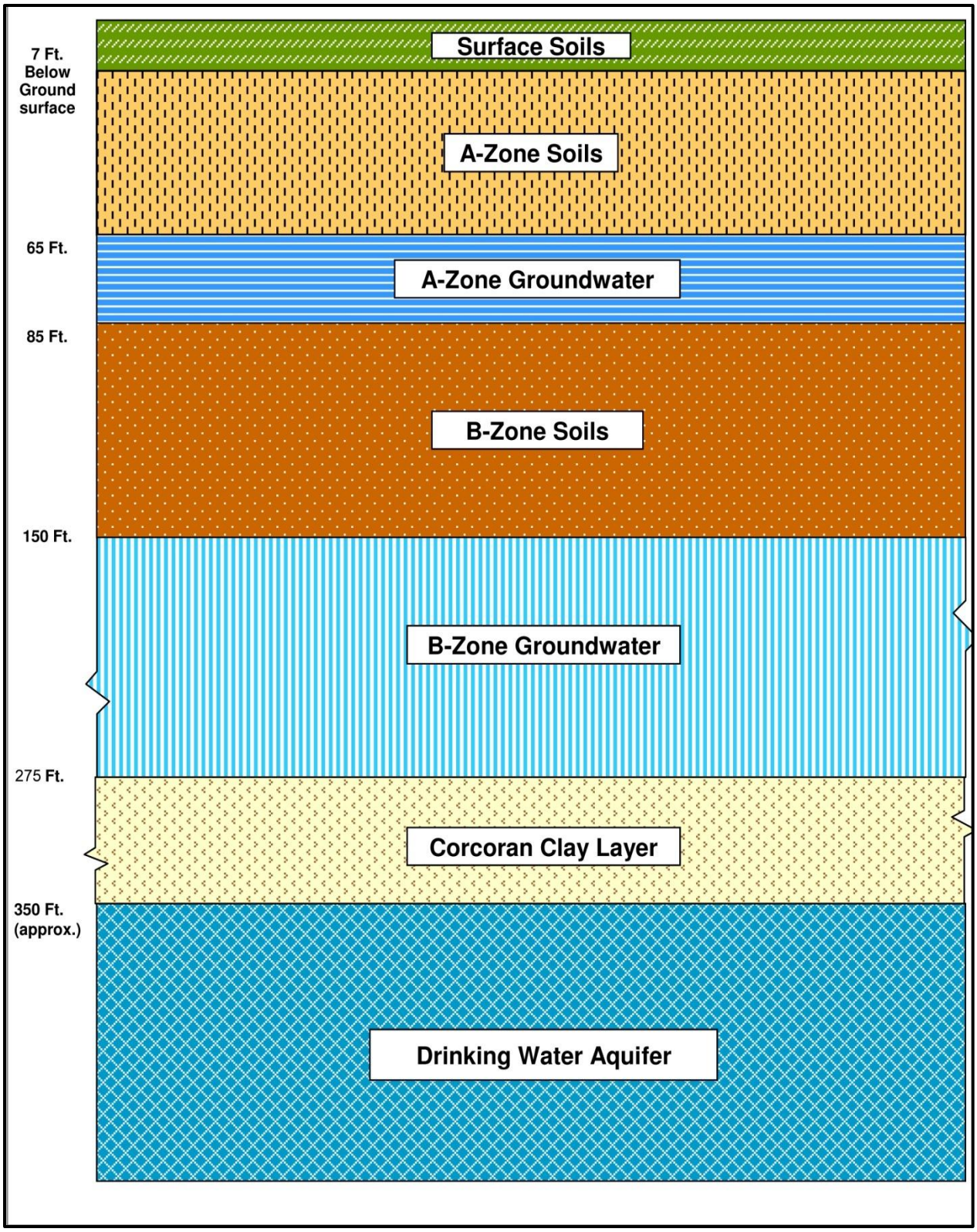


**Figure 1-2: B&B Site Soil & Groundwater Layering System**
(Reproduced from fig 5-2, B&B OU-2 ROD, Sep 2007)

Dinoseb was found, primarily, in the top 30 feet of the soil within spill area, and then declined significantly in concentration down to the A-zone groundwater. In the pond and sump areas, the concentrations were significantly less than in the spill area. VOCs were found in the subsurface soils across the entire Site, but were found in the highest concentrations in the sump area. These contaminants were also found at significant levels in the area of the waste pond, and then were found in relatively low concentrations elsewhere at the Site. In the sump area, concentrations were highest from 20 and 30 ft bgs, but were also found at concentrations greater than 1,000 µg/Kg over most of the A-zone within this area. 1,2-DCP was the volatile contaminant found at highest concentrations, followed by DBCP, 1,2-3 TCP, EDB, and 1,3-DCP. In the area of the pond, concentrations were highest from 30 to 40 ft bgs, but in general were found throughout the A-zone.

Groundwater monitoring of wells in the A-zone and B-zone was conducted as a part of the OU-1 investigation, to assess groundwater flow in each zone, and to evaluate changes in the concentrations and distribution of the seven COCs and other chemicals over time in the aquifers beneath the Site. Wells in the A- and B-zones were sampled quarterly and the data analyzed to assess the extent of contamination from the COCs and other chemicals.

The A-zone groundwater appears to be a perched groundwater zone, with a saturated zone up to about ten feet thick, overlying a silty clay zone a few feet thick. The same six chemicals found in the subsurface soils plus chloroform, were found in high concentrations in the A-zone groundwater. Chloroform was used for transport of fumigants. The total mass of contamination in the A-zone groundwater is significantly larger than was found in any other contaminated media at the Site. Concentrations for each of the seven contaminants, except for 1,3-DCP, were found at levels as high as 1,000 to 100,000 µg/L. The highest concentrations were consistently observed near the sump and near the pond. The distribution of contaminants was consistent with the locations of the major source areas and follows a pattern consistent with the groundwater flow in the A-zone. In general, contamination was observed at slightly higher levels at wells near the pond when compared with the wells near the sump; 1,2-DCP was a notable exception. The A-zone groundwater is not a current or potential source of drinking water. The A-zone groundwater percolates vertically into the B-zone.

The B-zone groundwater includes a series of groundwater units designated as B-1, B-2, B-3 and B-4, designated from shallowest to deepest. All of the new wells in the B-zone were installed in the B-2 groundwater unit, located approximately 170 feet bgs. The direction of flow in this unit is to the south, and the gradient is very flat (0.0004). Permeability is much higher than for the A-zone groundwater. A pump test indicated that wells could be pumped at 7 gallons per minute (gpm) for an extended period.

In the B-zone, 1,2-DCP was also observed at least once in every well at levels significantly higher than any other contaminant. The highest observed concentration of 1,2-DCP in the B-zone was 1,700 µg/L in well WB2-1, which is directly south of the Site (the maximum contaminant level (MCL) for 1,2-DCP is 5 µg/L). Dinoseb and DBCP were the only other principal contaminants from the A-zone groundwater also observed above the respective MCL in the B-zone. Dinoseb was detected only once above the MCL of 7.0 µg/L in two wells, WB2-1 and WB2-2, at a concentration of 8.0 µg/L. DBCP was detected above the MCL of 0.2 µg/L in the same two wells at average concentrations of 29 µg/L and 7 µg/L, respectively.

Based on data from the city well closest to the Site, B-zone contamination is not currently impacting drinking water above health-based levels. Based on an ecological evaluation of risk, EPA determined there is no significant ecological risk at the Site.

Site risks were formally characterized for the surface soil. Risks from ingestion of contaminated surface soil were characterized for a child and young adult, and risk from ingestion of contaminated soil in the construction zone was characterized for an adult worker. Each of these exposure scenarios exceeded the threshold for deleterious effects to human health for the maximum detected concentration and only the child exposure scenario exceeded the threshold for the average detected concentration.

The other potential pathway of concern at the Site was exposure from ingestion of contaminated groundwater, either as a result of contamination reaching the city well or from future use of the B-zone groundwater as a drinking water supply. Groundwater models were used to predict whether contaminated groundwater could potentially impact existing and potential drinking water supplies. Model predictions of contaminant levels were compared to drinking water MCLs or other published health-based levels where MCLs were not available. Contaminant levels in the B-zone groundwater exceeded MCLs in two wells for both 1,2-DCP and DBCP. However, model results and data from the city well closest to the Site indicate that B-zone contamination is not currently impacting drinking water above health-based levels. Concentrations in the A-zone groundwater exceeded MCLs by several orders of magnitude. However, the A-zone groundwater is not a potential drinking water source. The A-zone was evaluated primarily for its potential as a source of contamination to the B-zone groundwater.

EPA determined there are no significant ecological risks at the Site. In addition, surface water contamination is not an issue for the Site, except that surface water runoff and infiltration may potentially contribute to the mobilization of the contamination that is left in the subsurface soils within the A-zone and in the unsaturated portions of the B-zone.

## 1.5 Prior Remedial Activities

From 1983 through 1988, B&B conducted several soil and groundwater remedial activities under CDHS supervision. The most significant work included the installation of 10 monitoring wells and the removal of some heavily contaminated soil beneath the two sumps and waste pond. The waste pond was double lined with a synthetic liner in November 1979. The liner and additional soil were excavated in August 1987. Approximately 640 cubic yards of contaminated soil were removed from the pond and disposed offsite. The depths of this excavation ranged from approximately 1.5 feet bgs on the sides to 5 feet bgs near the center. B & B hired two engineering firms to conduct investigations of soil and groundwater beneath the Site. Soils impacted with contaminants of concern (COCs) were removed during one of these investigations.

In 1989, the Site was listed on the NPL. Subsequently, various emergency and removal actions were initiated to minimize or eliminate immediate threats to human health and the environment. EPA immediately conducted an emergency response assessment and identified two areas needing immediate attention, a dinoseb spill area (hot spot), and the groundwater, which appeared to pose an imminent and substantial endangerment to the municipal drinking water. During April 1991, EPA, as an emergency removal action, excavated approximately 80 cubic yards of the dinoseb contaminated soil from the dinoseb spill area. The excavated soil was treated by washing with water in several cycles to lower dinoseb concentration in below the 10 mg/Kg treatment action level. The treated soil was placed back into the excavation.

In May 1991, the leachate from the soil washing process was treated by a UV/Ozonolysis process, which degraded the dinoseb.

## 1.6 Site Operable Units

EPA has divided the Site into two operable units. The first operable unit (OU-1), as defined by the OU-1 ROD, included the source area of contamination (facility waste pond, tanks, sump area and the dinoseb spill area), the surface soils, the subsurface soils to the first water bearing unit (A-zone soils), and the first water bearing unit (A-zone groundwater) located approximately 65 to 70 feet bgs.

However, remediation of the A-zone groundwater was deferred to the OU-2 ROD because information obtained during the remedial design phase indicated the remedy selected for the A-zone groundwater could not be implemented (see later discussion in Section 2-4. OU-1, the subject of this Remedial Action Completion Report, consists only of the source area soils.

The OU-2, as defined in the OU-2 ROD, includes the A-Zone groundwater, subsurface soil from the base of the A-zone groundwater to the second water-bearing unit, and the B-zone groundwater. The OU-2 ROD was signed on September 28 2007.

# 2.0 Operable Unit No. 1 Background

OU-1 is the first of the two operable units for the Site. OU-1 consisted of the original source area of contamination (facility waste pond, tanks, sump area and the dinoseb spill area), the surface soils, the subsurface soils to the first water bearing unit (A-zone soils), and the first water bearing unit, the A-zone groundwater located approximately 65 to 70 feet bgs. The OU-1 ROD addresses the principal threat at the Site in the A-zone groundwater and surface soils. The Record of Decision (ROD) for the OU-1 was signed on November 8, 1993. Response actions for the surface soils constituted a final remedy for the surface soils. Remedial actions for the subsurface soil and the A-zone groundwater were interim actions.

## 2.1 OU-1 Requirements

The major components of the selected remedy in the November 1993 ROD for OU-1 included:

- Extraction, treatment and re-injection of the shallowest groundwater unit (later deferred to the OU-2 ROD);
- Consolidating contaminated surface soil on a 1.2 acre portion of the Site and constructing a RCRA Subtitle C cap over it;
- Capping the remaining portion of the Site with a basic, non-RCRA, asphalt cap; and
- Institutional controls (ICs) consisting of deed restrictions prohibiting residential use of the Site and ensuring that the RCRA cap is maintained

The second and third components of the selected remedy were implemented and are the subject of this report, while the first component was deferred to the OU-2 ROD. The fourth component, ICs, has yet to be implemented.

The specific requirements that are applicable or relevant and appropriate Requirements (ARARs) for the Site OU-1 soil remedy can be classified into chemical-specific regulations and action-specific regulations. There were no location-specific ARARs at this Site. The ARARs for Brown & Bryant OU-1 are:

- Health Standards for the Management of Hazardous Waste, CCR Title 22, Div. 4.5, Chapter. 15;
- Article 10, Sections 66265.190 — 66265.200 (Tanks);
- Article 9, Section 66265.170 — 66265.177 (Containers);
- Article 11, Sections 66265.228 (Surface Impoundments, Closure); and
- Underground Injection Control Regulation, 40 CFR Parts 144-147

The subsurface soil contaminant levels were also evaluated with respect to protecting the B-zone groundwater. The vadose zone modeling of the contaminant transport in the A-zone showed that if a cap were installed, the only contaminant with a potential to impact the B-zone groundwater would be 1,2-DCP and this contaminant could be captured hydraulically in the A-zone, prior to reaching the B-zone groundwater. EPA determined that it would be more cost-effective to capture the contamination when it reached the A-zone groundwater rather than excavate the soil or implement other soil treatment options. The A-zone groundwater contamination is addressed in the September 28, 2007 OU-2 ROD.

The remediation levels for the surface soil were based on human health calculations considering the ingestion pathway. Dinoseb was the only chemical found in the upper seven feet of soil in appreciable amounts (detected in more than 5% of soil samples). Since dinoseb is a systemic toxicant, the cleanup level was developed based on the most sensitive subgroup, young children. The 80 mg/Kg cleanup level for dinoseb was developed assuming a child ingests 0.2 mg/day of soil over a five-year period using calculations for RCRA no-action (Proposed Subpart S - Federal Register Vol. 55, No. 145, July 1990).

The goal of this remedial action is to prevent exposure to soil contaminated above health-based levels and to control the source of contamination to the B-zone groundwater. Based on the information obtained during the remedial investigation and analysis of all the remedial alternatives, EPA believed the selected remedy would be able to achieve this goal. Specific requirements of the selected remedy were as follows:

- Move contaminated surface soils from the area not included in the RCRA Subtitle C cap to the waste pond and adjacent area where the RCRA Subtitle C cap, will be placed. Remaining soil shall be tested to confirm that all surface soil containing pesticides above the 80mg/L health-based levels has been moved. In addition, the surface soil surrounding the Site shall be tested to assure that levels of contamination off-property do not exceed the 80mg/L health-based levels. If any soil is found exceeding health-based levels, that soil shall be removed and consolidated with other soils under the cap.

- After consolidation of the contaminated soil to the southern portion of the Site, the northern and western portion of the Site shall be re-graded and covered with a basic cap, such as asphalt. The purpose of the basic cap is to prevent stormwater infiltration. The northern and western portion of the Site will then, be considered clean.

- Institutional controls shall be implemented, which will consist of deed restrictions to prohibit residential use of the Site and ensure that the RCRA cap area is maintained.

- A RCRA Subtitle C cap shall be installed on the waste pond, sump area, dinoseb spill area and adjacent areas. The cap shall be designed to prevent exposure and minimize infiltration.

- All capped areas shall be maintained as appropriate.

- The A-zone groundwater shall be extracted. After extraction, the water shall be treated using ultra violet (UV)/Oxidation, and/or possibly, granular activated carbon (GAC), treated and then re-injected into the A-zone groundwater. Re-injection shall be carefully monitored to ensure control of the extracted water. If the water required for re-injection is less than the water produced during treatment, the additional treated water shall be discharged to the sanitary sewer system.

- The extraction/re-injection system will be phased in, to allow for optimal design of the system. Re-injection rates will be monitored to prevent build-up of excess head of water that might spread contamination further. The number of extraction/re-injection wells, location of these wells, and extraction and re-injection rates for the initial phase will be established during the remedial design. Expansion of the system will be considered after evaluating the effectiveness of the initial system.

- After completion of the remedial investigation of the second operable unit, and the extraction and treatment system has been in operation long enough to estimate the rate of contamination removal, an analysis of the cost-effectiveness of further A-zone treatment versus capturing contaminated groundwater in the B-zone shall be made.

- As required by the State Hazardous Substances Control Act, the period of groundwater monitoring shall not be less than thirty years.

## 2.2 Basis for OU-1 Cleanup Goals

The following chemicals were identified as COCs for surface and subsurface soils:

| Surface Soil | Subsurface Soil |
|---|---|
| Dinoseb | 1,2-DCP |
| | 1,3-DCP |
| | DBCP |
| | 1,2,3-TCP |
| | EDB |
| | Dinoseb |

As part of the 1993 OU-1 RI/FS, EPA conducted a Baseline Human Health Risk Assessment (BHHRA) to determine the current and future effects of COCs on human health. The BHHRA evaluated only the dominant exposure pathways and contaminants that could significantly contribute to the potential Site risk. Dinoseb was selected as the only COC that could significantly contribute to the Site risk due to its frequency of detection in analyzed soil samples. Other COCs were not detected in greater than 5% of the collected samples. Incidental ingestion of surface soil was selected as the dominant route of exposure. The exposure assumptions used to develop the BHHRA identified children, young adult trespassers and a construction worker as potential receptors. Dinoseb is not classified as carcinogenic; however, the calculated non-cancer hazards indicate that there may be concern for potential adverse health effects.

The Site is vacant, and is secured by a chain link fence with restricted access. The area around the Site is residential and agricultural. Future reasonably anticipated land use options for the Site include light industrial and commercial, which is supported by the current infrastructure that includes highway and railroad access. The potential for on-site residential land use is the most conservative scenario used as a basis for reasonable exposure assessment assumptions and risk characterization conclusions. The surrounding land uses are anticipated to be mixed light industrial/commercial, agricultural and residential.

## 2.3 OU-1 Remedial Design

Remedial design for the Site OU-1 remedy was completed in phases for construction logistics. USACE, Sacramento District, completed the first phase of the design surface remedial activities in December 1997. USACE prepared design specification drawings for remedial activities, including the following:

- Site Topography
- Site Plan

- Demolition Plan (Asphalt; concrete; plastic liners; UST; railroad rail; pumps, hoses and piping associated with tank UN-32; contaminated soil piles; disposal of material in warehouse; miscellaneous structures; etc.)
- Utilities Demolition Plan
- Sampling Plan
- Grading & Drainage Plan
- Extraction, Injection and Monitoring Well Detail
- RCRA and Basic caps
- Fence and Gate Detail
- Miscellaneous Details for the RCRA and Basic caps

The USACE design also included preliminary design for the A-zone groundwater extraction, treatment and injection system. Simultaneously with construction activities for the above activities, the contractor, Morrison Knudsen Corporation (MK), completed design specification drawings for the extraction, treatment and injection system during the period from January to April of 1999. Remedial action construction Project Work Plans (PWPs) were prepared consistent with the design specifications, and included in the Work Plan.

## 2.4 OU-1 ROD Amendments and Explanation of Significant Differences (ESDs)

There are no OU-1 ROD amendments or ESDs. However, the component of the remedy that was intended to address the A-zone aquifer (groundwater extraction, treatment and re-injection for source control) was deferred to the OU-2 ROD, signed on September 28, 2007. This component was deferred based on information obtained during the remedial design phase, which indicated that the A-zone selected remedy could not be implemented, as specified by the OU-1 ROD. A treatability study for the A-zone groundwater extraction was conducted from December 1998 to April 1999, and an aquifer pump test was performed during May and June of 1999. An August 1999 report, describing the results of this work, indicated the yield from any of the wells tested was <0.1 gpm. The sustainable pumping rates were generally quite low, <0.5 gpm in all cases. These low rates, which result in a low obtainable pore volume exchange rate, indicated that pump and treat, using conventional well design, was not a viable method for remediating the groundwater at the Site. Additional investigation was necessary for adequate design and implementation of A-zone groundwater remediation component. The A-zone groundwater extraction and treatment component of OU-1 selected remedy was not installed, but was carried over to the OU-2, to be addressed in conjunction with actions for the B-zone groundwater.

# 3.0 Remedial Construction Activities

This section describes remedial construction activities performed at the Site as a result of the 1993 ROD for OU-1. The Site OU-1 remedial action activities specified in the 1993 ROD were conducted with EPA Region 9 as the lead agency and the California Department of Toxic Substances Control (DTSC) as the State Agency. An Interagency Agreement (AIG) was executed in 1997, between EPA and the United States Army Corps of Engineers (USACE) providing the USACE with construction contracting and oversight responsibility for the Site OU-1 remedial action. The USACE utilized an existing pre-placed remedial action contract, DACWO5-94-D-0017 to retain Morrison Knudsen Corporation (MK) to provide design and construction services for the OU-1 remedy specified in the 1993 OU-1 ROD. The construction of OU-1 remedy was completed in phases for logistic construction implementation.

## 3.1 OU-1 Remedy Pre-Construction Site Preparation

A significant amount of surface debris, tumbleweeds, structures and buildings, tanks, dirt piles, drums, containers, equipment and materials from previous operations was located at the site. Pre-construction site cleaning and preparation work, consisting of demolition and disposal of structures, buildings, sheds, miscellaneous debris and waste, was necessary prior to filling, grading and constructing the basic non-RCRA and RCRA caps. USACE retained MK through Task Order #17 under contract DACW 05-94-D-0017 to prepare a Project Work Plan for first phase of the OU-1 remedy construction. USACE and MK representatives visited the Site on October 21, 1996, for initial assessment of the site preparation work. MK developed a Project Work Plan for this work on October 31, 1996. The plan was revised on November 6, 1996, to incorporate USACE and EPA comments. A Contractor Quality Control (CQC) Plan and Chemical Data Quality Management Plan (CDQMP) were prepared for the work.

### 3.1.1 Site Cleanup and Preparation

USACE issued the Delivery Order No. 0017 on October 29, 1996, to MK to proceed with the Site cleaning and preparation work. MK mobilized on November 4, 1996. Completion of the Site cleaning and preparation work included the following activities:

- The replacement of 166 linear feet chain link fence at the Rail-Gate near the southwest corner of the Site, and the restoration repair of 360 linear feet of chain link fence along the west perimeter of the site. The removed fence components were transported to the Golden State Metal Recycling Facility, in Bakersfield, California.

- The collection and burning of tumbleweeds that accumulated along the fence lines, next to buildings and within the Site property. Residual ash from this operation was disposed of at the Kern County Landfill.

- A new cover grate was fabricated and installed over the West Sump adjacent to the waste pond.

- The fence around the chemical storage enclosure was removed, pressure washed and sent off site for recycling (Golden State).

- Tank A was emptied of its solid crystalline contents, pressure washed, cut into manageable sections and disposed of at the Kern County Landfill. The contents of Tank A exhibited no chemicals of concern, and were also sent to the Kern County Landfill for disposal.

- Tank 1 was emptied of its solid crystalline contents, pressure washed, cut into manageable sections and disposed of at the Kern County Landfill. The contents of Tank 1 exhibited no chemicals of concern, and were also sent to the Kern County Landfill for disposal.

- The liquid contents from Tank 2 were removed with a vacuum truck for the purpose of relocating the tank into the warehouse, within secondary containment. After the Tank was moved to the warehouse, the contents were pumped out of the vacuum truck and back into the tank. Tank 2 and its contents will remain in storage until final disposition is determined.

- A temporary water treatment system, placed onsite to treat surface water runoff, was dismantled and removed. It consisted of a vertical poly hopper, attached to the underside of a vertical poly tank, a second vertical poly tank, two oversized corroding drums of granulated activated carbon (GAC), a bin of sludge, piping and filters. These components were all contained within two large circular poly tubs. The GAC exhibited detectable levels of 1,2 dichioropropane (102 µg/Kg) and was drummed and placed in the warehouse. Sludge from the bin exhibited elevated levels of total zinc (16,460 mg/Kg) and was drummed and placed in the warehouse. The poly tanks and containers were rinsed and disposed, along with other materials at the Kern County Landfill. The rinsate from this operation was filtered and pumped to the concrete impoundment. The sludge captured on the filters was placed in drums and stored in the warehouse.

- Wooden sheds with metal siding were disassembled and pressure washed. Both metal and wood materials were sent to recycling facilities. The wood recycling facility was operated by the City of Bakersfield. The metal was sent to Golden State facility.

- The metal roof covering the concrete slab south of the concrete impoundment was demolished, disassembled, and pressure washed. This metal was also recycled.

- The empty drum in the waste pond was removed, pressure washed and stored in the warehouse.

- Wooden pallets were collected and sent to the wood recycling facility. Railroad ties were sent to the Kern County Landfill for disposal.

- Bollards were removed, pressure washed and sent to the metal recycling facility.

- Concrete saddles were removed, washed and demolished. Concrete and rebar were sent to recycling facilities.

- The Maintenance Building was decontaminated and demolished. All metal was sent to the recycling facility. Wood debris and trash were sent to the Kern County Landfill for disposal.

- The warehouse was thoroughly cleaned by pressure washing. Doors and metal siding were also repaired. All debris was sent to the Kern County Landfill for disposal.

- Soil cores from the metal sheds were relocated to the warehouse. The metal sheds were pressure washed and removed.

- One tractor tire was removed from the warehouse and sent to a tire recycling facility.

A Sampling and Analysis program was implemented to determine the contents of drums, tanks, soil stockpiles and other materials for characterization and disposal. The sampling and analysis was not intended for any Site Confirmation Sampling. The data quality objectives (DQOs) for this plan were to determine the presence of dinoseb and other contaminants of concern at the Site, specifically: 1,2-Dichioropropane using EPA Method 8260 A and dinoseb using EPA Method 8150 B, at detection limits established in the General Management Plan. Several small soil piles at the Site, consisting of a total of approximately 70 cubic yards, were identified to contain dinoseb-contaminated soil. This soil would be moved to the former waste pond area in the southern portion of the Site at a later date. During this phase of the site cleanup and preparation activities, EPA representative also investigated unmarked and corroded drums.

The Work Plan anticipated that all materials on-site, with the exception of the soil stockpiles and 55-gallon drums containing drill cuttings and soil samples, were free of pesticide contamination (no chemicals of concern: dinoseb, 1,2-dichioropropane, and 2-butanone) and were non-hazardous. This was proven true through sampling and analysis, with the exception of the liquid in Tank #2, which exhibited elevated levels of dinoseb. The container of sludge in the water treatment area had elevated levels of zinc. These materials were placed in the warehouse for disposition in subsequent phases of site remediation.

In developing the Work Plan, it was assumed that the drums containing soil cuttings required no action at this phase of remediation. However, it was later determined, during the on-site visit of EPA's Emergency Response Team, that sampling and characterization of drum contents was required for waste disposal. Also, drums were to be catalogued, labeled, and relocated into the warehouse. Drums that showed signs of corrosion were placed in over-pack containers, and six representative soil samples were collected from the drums. These samples were analyzed for waste disposal characteristics as well as dinoseb. Dinoseb was detected in each sample ranging from 0.6 to 14 mg/Kg. No metals above toxic levels (California-established Total Threshold Limit Concentration, TTLC) were detected.

An additional field variation was discovered outside the south boundary fence. During a routine site inspection, the USACE representative noticed stained soils running parallel with the railroad tracks. A surface soil sample was collected on November 19, 1996, the analysis showed presence of 12.13 mg/Kg of dinoseb. Since analytical results on this sample were not available prior to demobilization, no action was taken. This material would be excavated and brought inside the fence line, and added to the existing soil piles.

After completion of the work, the Site was inspected by the USACE Representative and MK personnel. A punch list of 15 items was developed from conditions observed during this inspection. These 15 items were corrected as part of site restoration prior to demobilization. Additionally, all water used for pressure washing and rinsate was pumped through carbon filters and emptied into the concrete impoundment. Sludge and other media collected on the filters were placed in drums and stored in the warehouse.

A total of 65 tons of non-hazardous debris and materials, and 40 cubic yards of wood scrap, were removed from the site and disposed of as follows:

- 2 tons of concrete and rebar to Granite Construction recycling facility
- 47 tons of trash and debris to Kern County Landfill (Beria facility)
- 40 cubic yards to City of Bakersfield Wood Recycling Facility
- 16 tons of metal debris to Golden State Metal Recycling Facility

Field construction activities for the Site cleaning and preparation were completed on November 26, 1996. A completion report for this work was prepared in January 1997. A Site Layout drawing showing locations of structures, tanks, ponds, dirt piles, pond, concrete sumps and other features, and action taken for the Site cleaning and preparation work was included in the January 1997 Completion Report, which is included as Figure A-1 in Appendix A of this Report. Progress photographs of the Site cleanup and preparation work are included in Appendix D of the January 1997 Completion Report. Selected photographs from the December 1996 Completion Report are included in Appendix B of this Report.

### 3.1.2 Railroad Spur Dinoseb Impacted Soil Removal

A Work Plan for Minor Soil Cleanup was prepared on March 3, 1997, to address discolored soil identified by the railroad tracks south of the Site in November 1996 during the Site cleaning and preparation work. MK performed the dinoseb contaminated soil removal work under the same contract (DACWO5-94-D-0017) with USACE. MK excavated the soil from the stained area, placed the soil into 55 gallon drums, and stored the drums in the on-site warehouse. It was originally estimated that one to four drums of soil would be excavated from the area. Six soil samples were to be taken to determine the dinoseb levels found within the excavation.

The soil was excavated using shovels and placed into five gallon plastic buckets and then dumped into the drums. The soil was to be excavated down to a depth of six inches bgs to remove staining. As the stained surface soil was removed, it appeared that the staining was very shallow and the four drums available would be of sufficient capacity to contain the excavated soil. As the excavation continued to the west, the soil exposed earlier began to dry and more staining became evident. A three-foot wide trench was excavated through the middle of the earlier excavation to a depth of 14 inches. As the soil in the trench dried, a yellow band of stained soil became evident. This impacted soil layer was four inches thick and was located approximately four inches bgs. The excavation of the trench continued to the west until five additional drums were filled with soil. It became apparent the impacted soil covered a much larger area than initially thought. The source appeared to be a spill of dinoseb, which had been covered with soil. The decision was made to end the present excavation and to sample the excavated area to determine dinoseb levels. If the dinoseb levels were found to be above action levels, additional soil investigation excavation would be performed during the next phase of OU-1 remedy construction.

The nine drums containing excavated soil were moved and stored in the warehouse for disposal at a later date. Six samples taken at the site were sent to Associated Laboratories of Orange, California for analysis by EPA Method 8150 for dinoseb. The laboratory results were received by MK on March 17, 1997, and are included in the report provided by the April 1, 1997, correspondence for the Railroad Spur Dinoseb Impacted Soil Removal. The results show that the excavated soil was above the dinoseb cleanup level of 80 mg/Kg. Photographs of the backfilled excavation, as well as excavated soil drums in the warehouse, are included in Appendix B.

## 3.2 Demolition, Decontamination, Contaminated Soil Consolidation and Waste Disposal

Following completion of the first phase of Site cleanup and preparation work, the USACE retained MK in October 1998 utilizing the existing pre-placed remedial action contract DACWO5-94-D-0017 for the second phase to provide design and construction services for the OU-1 remedy specified in the November 1993 ROD listed below:

- Extraction, treatment and re-Injection of the shallowest groundwater unit (this work was eventually deferred to OU-2 ROD);
- Consolidating contaminated surface soil on a 1.2 acre portion of the Site and constructing a Resource Conservation and Recovery Act (RCRA) Subtitle C cap over it; and
- Capping the remaining portion of the Site with a basic non-RCRA cap.

MK utilized subcontractors as necessary to complete construction for the OU-1 remedy. MK provided the final closure report for the Site OU-1 remedial action in July 2000 describing construction activities executed by MK for the OU-1 remedy construction.

### 3.2.1 Project Work Planning & Mobilization

Prior to the start of field construction activities for the OU-1, MK prepared the following project work plans (PWP) for the construction activities:

- Health and Safety Program
- Site Health and Safety Plan
- Ambient Air Sampling and Analysis Plan
- Dust Control Contingency Plan
- Sampling and Analysis Plan
- Demolition Plan
- Extraction Well installation Plan
- Monitoring Well Installation Plan
- Injection Well Installation Plan
- Treatability Study Work Plan
- Site Specific Spill and Discharge Plan
- Site Specific Materials Handling Plan
- Site Specific Quantity Survey Plan
- Site Specific Security Plan
- Stormwater Pollution Prevention Plan
- Construction Quality Control Plan

These plans were submitted to the EPA and USACE prior to the start of remedial construction. The PWP, which comprised the above plans, was approved by the EPA and USACE. MK mobilized to the Site in November 1998 with its own crew and hired laborers, operators, and subcontractors as necessary to perform remedial construction activities.

### 3.2.2 Demolition, Contaminated Soil Consolidation and Waste Disposal

Prior to construction of the RCRA and non-RCRA caps, twelve decontamination, demolition, removal and waste disposal, and contaminated sediment consolidation tasks needed completion, which were not

completed in the first phase 1996 Site cleaning and preparation. A Demolition Plan for these tasks is shown on Figure A-2 (Appendix A). Completion of these tasks is summarized in the following subsections.

#### 3.2.2.1 Contaminated Soil Consolidation

The ROD specified moving contaminated surface soil from areas outside the RCRA Subtitle C cap area to the waste pond and adjacent area where the RCRA Subtitle C cap would be placed. There were several small dinoseb contaminated soil piles consisting totaling approximately 70 cubic yards associated with previous remedial activities. These soils were moved to the RCRA cap area and compacted. This task began on December 28, 1998, and was completed on January 5, 1999.

#### 3.2.2.2 Temporary Berms

An existing concrete berm surrounded the Site. This existing berm was removed as part of the concrete demolition task and temporary earthen berms were installed in its place as it was removed. The temporary earthen berm was constructed around the perimeter of the Site to mitigate precipitation run-on/run-off during remedial activities. The temporary berms were constructed of clean imported fill. The removal of the concrete berm began on February 15, 1999, and was completed on March 9, 1999. The concrete berm was broken up, decontaminated, and disposed with the other demolished concrete.

### 3.2.3 Concrete Demolition and Disposal

The concrete demolition was started on January 6, 1999 and finished on March 18, 1999. During this period, approximately 175 cubic yards of concrete were removed. All the concrete structures within the Site fence were demolished with the exception of the concrete slabs contiguous to the warehouse building. This task was accomplished using a Caterpillar 435 Backhoe equipped with a hydraulic hoe ram attachment and a Caterpillar 966 front end loader used to move the concrete pieces. The concrete from the structures around the Site was broken into manageable pieces and moved to a central location at the south end of the Site where the pieces were double rinsed with a high pressure washer to remove soil adhered to the concrete. After the pieces were washed twice, the concrete pieces, which were too large for disposal (greater than 2 feet in the largest dimension), were further reduced in size and the concrete was placed in a stockpile for eventual removal from the Site.

The pressure washing was performed on a concrete slab and the wash water captured in a concrete basin adjacent to this slab. The water from the wash procedure was pumped from the concrete containment vault into tank UN-32 for subsequent treatment/disposal. Following the washing of a batch of concrete, rinsate samples were collected and sent to Associated Laboratories for analysis. Following the receipt of analytical results demonstrating the rinsate was free of contaminants, the concrete was shipped off-site for recycling. The concrete debris was hauled by MP Environmental Services and taken to the Granite Construction yard in Bakersfield, California.

### 3.2.4 Asphalt Removal

The Site was covered with asphalt which varied in thickness from approximately two to seven inches. The asphalt removal was performed using a Caterpillar D-6 dozer to rip the asphalt and push it into a low stockpile. The D-6 was used to crush the asphalt to a size suitable for disposal in the former waste pond area. The 570 cubic yards of crushed asphalt was hauled to the waste pond and placed and

compacted. The asphalt removal was started on January 6. 1999, and completed on March 9, 1999.

### 3.2.5 Plastic Liner Removal

A bermed area on the east side of the Site was lined with plastic and filled with soil presumed to be contaminated. The soil from this area was removed and placed in the RCRA cap pond area. The plastic liner was removed, cut up and placed in drums for temporary storage. The liner material was subsequently removed from the drums, placed in a roll-off container and pressure washed to remove any residual soil prior to disposal. Rinse water from decontamination operations was captured in a concrete box and pumped into tank UN-32. This liner material was hauled to the Kern County sanitary landfill by MP Environmental Services.

### 3.2.6 Underground Storage Tank Removal

A 1200-gallon underground storage tank (UST) located at the southeast corner of the warehouse structure was excavated and removed from the Site. The UST was empty at the time of excavation. The removal and disposal of this unit was performed by MP Environmental Services. The removal was completed on February 5, 1999. Six soil samples were collected and analyzed by Methods 8021 for BTEX and MTBE and 8150 for Total Petroleum Hydrocarbons (TPHs). Results demonstrated that concentrations were acceptable for closure. The tank was hauled and disposed at the Safety Kleen/Laidlaw facility in Buttonwillow, California on February 5, 1999. Waste profiles and manifests were prepared for waste disposal.

### 3.2.7 Structural Demolition

Small structures, including tank UN-32 ancillary equipment and handrails associated with existing structures were demolished and disposed of during the remedial action. These materials were high pressure washed to remove visible soil and potential surface contamination and then shipped off-site for salvage. Wash water from the decontamination was captured in a concrete box and pumped into the tank UN-32. MP Environmental hauled this material to Golden State Metals and it was included with rail disposal. This portion of the material was approximately 40 cubic feet.

### 3.2.8 Rail Demolition

An existing 200 foot long rail spur entering the Site from the south was removed during the remedial activities during January 1999. After removal, the steel rail was pressure washed to remove visible soil, cut in 10-foot sections, and then shipped off-site for salvage. The wash water from the rail demolition was pumped into tank UN-32. MP Environmental hauled away the rails with other metal debris on February 24 and April 15, 1999. A railroad tie was sampled and analyzed for chlorinated pesticides and Polychlorinated Biphenyls (PCBs), which showed non-detect. The wood rail ties were hauled off site by MP Environmental and disposed at the Safety Kleen/Laidlaw facility.

### 3.2.9 Utility Demolition/Abandonment

Existing underground utilities were excavated and removed or abandoned in place. These utilities included existing water lines, abandoned gas lines and electrical utilities associated with the historic Site activities. Utilities which would interfere with grading for the final profile of the Site were removed. Those utilities which did not interfere with grading operations were abandoned in place.

### 3.2.10 Removal of Drums and Tank from Warehouse

The drums and vessels in the warehouse were emptied and triple rinsed prior to being removed from the Site for disposal. After triple rinsing, the metal drums were crushed prior to being hauled to the local Kern County sanitary landfill for disposal. The plastic drums and over packs were triple rinsed and then cut up prior to disposal. The soil from the drums, including excavated and drummed soils from the railroad spur, was placed in the waste pond area. The washable debris (e.g. plastic, metal) from the drums was rinsed in the same fashion as the plastic liner and disposed off site. A 1200-gallon plastic tank containing decontamination water from previous Site operations was decontaminated (triple rinsed), cut up and disposed at the sanitary landfill in April 1999.

### 3.2.11 Warehouse Washing

After the drums and vessels were removed from the warehouse, the structure walls and floor were high pressure washed during April 1999. The soil samples from previous Site activities were covered with plastic to prevent the containers from exposure to water during wash down operations.

### 3.2.12 Waste Disposal

All solid waste not disposed under the RCRA cap was either decontaminated and hauled to the local sanitary landfill or manifested and hauled to Safety Kleen/Laidlaw facility. Waste manifests were prepared for all disposals. All water from decontamination operations (equipment, concrete, structural/steel decontamination) was disposed in the existing tank UN-32. All metal was hauled by MP Environmental Services to Golden State Metals. Bins, hoses, and other items left by previous contractors, and six boxes of soil samples collected by MK for geotechnical analyses were removed and disposed of prior to demobilization.

The tank UN-32 content (water and sludge) removal and disposal was not completed during the construction activities. It was deferred to the operation and maintenance phase following completion of all of the remedial construction and decontamination activities. This tank was eventually demolished and removed from the site as one component of 2009 operation and maintenance activities.

## 3.3 Confirmatory Surface Soil Sampling

The 1993 ROD specified moving contaminated surface soil from areas outside of the RCRA Subtitle C cap footprint to the waste pond and adjacent area where the RCRA Subtitle C cap would be placed. Confirmation soil samples were collected from excavated areas and analyzed, to ensure that all surface soils were below the 80 mg/Kg health-based levels for dinoseb. In addition, the surface soil surrounding the Site was to be tested to ensure that levels of contamination off-site did not exceed the 80 mg/Kg dinoseb health-based levels. If any soil was found exceeding health-based level.

### 3.3.1 On-site Surface Soil Sampling and Analysis

Soil confirmation sampling was performed in accordance with the Sampling and Analysis Plan (SAP) across the entire areal extent of the Site within the perimeter fence during December 1998 and January 1999, to confirm that areas with dinoseb contaminated soil in excess of 80 mg/Kg were removed. These samples were collected in accordance with a grid developed as part of the Remedial Design (RD) drawings and specifications. The samples were collected at the grid intersection points, which were on

minimum 50-foot centers. The grid intersection points east of and adjacent to the warehouse building were on 25-foot centers as were the grid intersection points covering the dinoseb and sump areas. The sample points were marked and holes were cut in the existing asphalt to permit sample collection. The sample points were marked with pin flags on which a number corresponding to a particular grid intersection point was written. A total of 125 soil confirmation samples were collected across the Site profile; which included 14 samples from perimeter soil, one sample from contaminated soil pile, two samples from beneath the small concrete slab on the south end of the Site, four samples from the dinoseb spill area and six samples from the sump area.

Samples were analyzed by EPA Method 8150B only for dinoseb. On-site soil sampling locations and results are shown on Figure A-3 (Appendix A). The results included: 29 samples with non-detects, 84 with dinoseb concentrations less than 1 mg/Kg, 7 with concentrations greater than 1 mg/Kg but less than 10 mg/Kg, and 4 at concentrations greater than 10 mg/Kg. The highest concentration of dinoseb found during confirmation soil sampling activities was 58.4 mg/Kg at Location 120. Soil from this location ultimately was placed beneath the RCRA cap despite the fact that the dinoseb concentration was less than the action level. Dinoseb concentrations in all of the on-site surface soil samples outside of the RCRA cap area were less than the 80 mg/Kg health-based level.

Of the 14 perimeter samples collected and analyzed for dinoseb, only 1 sample exceeded 1 mg/Kg at Location 12 with a concentration of 8.1 mg/Kg. That location was adjacent to the former waste pond. The dinoseb concentration in a sample collected from one of the contaminated soil piles was 32.1 mg/Kg. The two samples beneath the concrete slab showed dinoseb levels at 12.8 and 17.3 mg/Kg. One sample of the four taken from the dinoseb area was non-detect, and the other three had dinoseb concentrations less than 0.1 mg/Kg. Results for the six sump area samples were all less than 0.15 mg/Kg.

### 3.3.2 Off-site Soil Sampling and Analysis

Off-site surface soil sampling was performed on February 8-9, 1999, in the area outside of the perimeter fence, just south and southwest of the fence, between the fence and the railroad track. These samples were collected to determine whether any remediation was required outside of the fence, in addition to the soil excavation conducted in March 1997. A total of 28 distinct locations were sampled at 4 to 8 inches bgs and 12 to 18 inches bgs for a total of 56 samples. Sample locations are shown on Figure A-3 (Appendix A). The soil sampling was performed in accordance with the SAP and the Off-Site (Option 1) Investigation Work Plan (Section 7.0 of the PWP) and the Option 1 Investigation Report.

The off-site samples were analyzed by Associated Laboratories using the following methods: 8270 for semi-volatile organics, 1010 for ignitability, 7060A for arsenic, 7421 for lead, 7471 A for mercury, 7740 for selenium,, 8015 for petroleum hydrocarbons, 8080 for chlorinated pesticides and polychlorinated biphenyls, 8150B for dinoseb, 8270C for acid/base/neutral extractables, 9010.A for cyanide, and 9045 for pH. Most of the results were non-detects.

Where there were some constituents detected, the detected concentrations were below health-based criteria. The highest level of dinoseb detected in the off-site soil samples was 5.18 mg/Kg.

## 3.4 Backfilling and Re-Grading of Northern Portion of the Site

The ROD specified that after consolidation of the contaminated soil to the southern portion of the Site, the northern and western portion of the Site would be re-graded and covered with a basic (non-RCRA)

cap, such as asphalt. The purpose of the basic cap is to prevent stormwater infiltration. The confirmatory soil sampling, as discussed in Section 3.3.1 above, indicated that all contaminated soil was moved to the RCRA cap area (southern portion of the Site).

It was necessary to import clean borrow fill soil to increase elevation to promote integration of the caps with existing/remaining facilities. Grading was completed after placement of fill in the northern and western portions of the Site, and in the southern portion of the Site to prepare the surface for construction of the RCRA and non-RCRA caps. A borrow soil source soil, located and sampled in December 1998, showed non-detects for all COCs. Therefore, it was found to be a suitable material for clean fill.

Following the demolition of concrete and utilities on the Site, clean fill sand was imported to bring the Site footprint to sub-grade elevation. This work was done in stages and was completed on May 5, 1999. The fill sand was obtained from the Granite Construction Arvin Pit, located approximately four miles from the Site. Approximately 10,090 tons of clean fill sand was imported during the sub-grade construction of the RCRA and non-RCRA caps. The imported fill sand was hauled to the Site by MP Environmental Services. The fill sand was spread and graded using a Caterpillar 966 front end loader, Caterpillar 426 backhoe and a Caterpillar 12G motor grader.

Compaction of sub-grade material was performed using an Ingersoll Rand steel wheel vibratory compactor. Moisture and dust control was accomplished using fire hoses to wet the material in stockpiles and as the material was spread. Imported fill sand was compacted to 95 percent of maximum dry density per ASTM 1557. Compaction testing was performed by MK subcontractor Arrow Engineering Services.

Grading of the imported sand fill material was performed. The initial staking for the sub-grade elevations and RCRA cap boundary was performed by Arrow Engineering Services. Grading was conducted according to specifications to ensure that slopes and drainage would be correct after completion of the caps. Final elevations are provided on the As-Built Survey.

## 3.5 Cap Construction

The ROD specified consolidation of the contaminated surface soil on a 1.2 acre southern portion of the Site and construction of a RCRA Subtitle C cap over it. The ROD also specified capping the remaining portion of the site (northern and western portion) with a basic cap. Location of the RCRA cap is shown on Figure A-17 (Appendix A) of this Report. The remaining portions of the Site are covered with a non-RCRA cap.

### 3.5.1 RCRA Cap Construction

The RCRA cap specifications consisted of the following features:

- 6-inch Geogrid/Sand Layer
- Geosynthetic Clay Liner
- 6-inch Sand Filter Layer
- 6-inch Aggregate Base Course
- 3-inch Asphaltic Concrete

The RCRA cap cross section is shown in Figure A-4 (Appendix A). Work on the RCRA cap began on June *15,* 1999, and was completed on August 31, 1999, with the application of fog seal to the asphaltic concrete.

The sub-grade for the RCRA cap consisted of imported sand fill material placed over the consolidated waste materials, which had been placed in the existing waste pond in the southern portion of the Site, as described in Section 3.4. This sub-grade material was then compacted to 95 percent maximum dry density per American Society for Testing and Materials (ASTM) 1557. Compaction testing was completed by Arrow Engineering Services.

After the RCRA cap area was brought to sub-grade elevation, a 6-inch sand/geogrid layer was constructed. This geogrid layer consisted of a 3-inch layer of fill sand covered with geoweb fabric covered with another 3-inch layer of fill sand. Approximately 52,500 square feet of geogrid of nominal 10-foot width was placed with the ends butted and tied with no overlap. A total 1,212 tons of sand was placed. The geogrid layer was compacted with the Ingersoll Rand roller/compactor. The sand/geogrid layer was placed and compacted.

Following placement of the geogrid layer, a geosynthetic clay liner (GCL) was deployed over sand/geogrid layer. The GCL consisted of a bentonite impregnated woven fabric. The 12-foot wide rolls of GCL material were overlapped 18 inches and sealed using bentonite granules between the overlapped layers. Approximately 60,000 square feet of GCL were used.

After the GCL had been deployed over the RCRA cap area, it was necessary to place small pieces of GCL material around the cluster of wells and bollards in the south/central portion of the site and around three existing wells in the north RCRA cap area. Subsequent to the deployment of GCL material around the wells/bollards, GCL material was used to seal the wells and bollards. Pieces of GCL material were secured to the wells and bollards using an adhesive compound. The bottom of the piece was then sealed to the deployed GCL layer by overlapping with the main layer and placing a layer of bentonite granules between the two.

A 6-inch thick sand filter layer was placed over the GCL material. This sand filter layer consisted of 60 percent concrete fine aggregate (918 tons) and 40 percent concrete course aggregate (577 tons). The sand filter layer was compacted with a minimum of four passes with a steel wheel roller. No compaction tests were required on the sand filter layer.

A 6-inch thick layer of aggregate base Class III (1,500 tons) was placed on the sand filter layer in the RCRA cap area. Grading was conducted to meet gradient requirements. This material was imported from the Granite Construction Arvin Pit. The aggregate base layer was compacted to a minimum of 95 percent of maximum dry density per ASTM 1557. Compaction testing on the aggregate base course was performed by Arrow Engineering Services.

Following completion of the aggregate base course placement, a 3-inch layer of asphalt was placed and compacted over the entire area inside the perimeter fence. A total of 3,500 tons of asphaltic concrete was placed from July 13 through 17, 1999, on the area. Additional 46 tons of asphaltic concrete was placed on the RCRA cap slopes on August 11 and 12, 1999.

The placement of the asphaltic concrete was completed on the RCRA and non-RCRA caps during the same period without differentiation. The total of 3,546 tons asphalt concrete was placed both caps

consistent with the design mix. The asphalt concrete placement was tested for design mix content and density standards. Following placement of the asphalt, the RCRA cap area was sprayed with fog seal. The fog seal was applied to both the RCRA and non-RCRA cap areas.

### 3.5.2 Non-RCRA Cap Construction

The non-RCRA cap consisted of the total areal extent of the property within the perimeter fence and not covered by the RCRA cap. The non-RCRA cap consisted of compacted sub-grade material overlaid with 3 inches of asphaltic concrete. Figure A-5 (Appendix A) shows a cross section of the non-RCRA cap. Sub-grade preparation, placement of asphalt concrete and fog seal was similar to the one described in Section 3.5.1. The specifications, requirements, and standards met for construction of the RCRA cap were those applied for construction of the non-RCRA cap.

## 3.6 A-Zone Groundwater Remedy Construction

The ROD specified extraction, treatment and re-Injection of the A-zone groundwater. Although this component of the remedy was not implemented, extraction and monitoring wells were constructed. Extraction wells were used during the remedial design phase to determine extraction and re-injection rates, and the monitoring wells have provided information to evaluate the effectiveness of the cap in reducing infiltration of contaminants into the groundwater. The initial design (which was to be expanded as needed) specified three extraction wells, two injection wells and four monitoring wells located in the contamination source area and within the RCRA cap area for the initial phase, as shown on A-6 Figure (Appendix A). These wells were installed following the re-grading in the RCRA cap area and prior to installation of the RCRA cap. Construction of these wells is described in the following subsections.

### 3.6.1 Groundwater Monitoring Well Installation

In February 1999, three test holes were drilled using a CME-85 auger drill and sampled in the vicinity of the proposed extraction well locations. These holes vary in location from 8 to 15 feet away from the extraction wells. Continuous soil sampling was performed in the holes from the surface to 80 feet bgs. In May 1999, these holes were completed into groundwater monitoring wells (MW) MW-1, MW-2 and MW-3. The design of the extraction wells was based on the laboratory testing performed on selected monitoring well test hole samples. An additional monitoring well, MW-4, was also constructed. The monitoring wells were installed to serve as observation wells during aquifer testing of three adjacent extraction wells, and for remedy operation and performance monitoring. The drilling and installation of the monitoring wells followed specifications prepared by the USACE and the project Test Hole Report and Monitoring Well Installation Plan. The samples were described on a boring log prepared by a California registered geologist.

Two-inch diameter monitoring wells were constructed with 5-foot long continuous wrap stainless steel screens with a slot width of 0.006 inches due to the fine-grained formation soil. A 30-70 gradation filter pack was placed adjacent to the screen and extended 10 feet above the top of the screen. Schedule 40, two-inch diameter PVC casing extended from the top of the screen to above the ground surface. All joints were flush-threaded and used an “O” ring to provide for a watertight connection. Two vacuum monitoring ports were constructed through the hollow-stem augers within the annular space of the four groundwater monitoring wells. These were placed consecutively within the vadose zone immediately above the well screen bentonite seal. Well development was conducted by extracting 20 to 40 gallons

of water from the wells using a bailer. A 6-foot long, 8-inch diameter steel protective casing was embedded two feet into the borehole and concreted in place. The RCRA cap approximately 21 inches thick was constructed around the steel casing. The steel casing extended approximately 2 feet above the RCRA cap and the two-inch PVC casing approximately 1 foot. A PVC end cap and lockable aluminum cover over the steel casing completes the installation. Grundfos groundwater sampling pumps were installed in these monitoring wells. Monitoring well locations are shown on Figure A-6 (Appendix A). Monitoring well completion records are summarized in Figures A-7 to A-10 (Appendix A).

### 3.6.2 A-Zone Groundwater Extraction Well Installation

Groundwater extraction wells (EW), EW-1, EW-2 and EW-3 were installed within the southern portion of the proposed RCRA cap, prior to cap construction. The drilling and installation of the extraction wells followed the Project Specifications prepared by the US ACE and the Extraction Well Installation Plan. The drilling and well construction was conducted from May 3 to May 5, 1999. A CME-75 auger drill rig was used to advance the holes. Hollow-stem augers having dimensions of 4¼ inches I.D. and 8¼ inches O.D. were used to drill an initial pilot hole and for obtaining in-place soil samples. The three extraction well holes were continuously sampled from 65 feet to 80 feet. Soil samples were obtained by driving a 2-inch ID modified California split-barrel Standard Penetrometer (SPT) Sampler. The samples were described on a boring log prepared by a California registered. Prior to installing the wells, the holes were reamed to approximately 11 inches in diameter using augers having 6¼ inches I.D. and 10¼ inches O.D.

The perched groundwater table beneath the Site was first encountered at a depth of approximately 70 feet bgs. Based on soil sampling, it appears the aquifer consists of two to three isolated saturated zones a few inches thick between approximately 70 to 75 feet bgs. Additional wet stringers may be present to nearly 80 feet bgs where a clayey aquitard is encountered. The total thickness of the saturated zones is probably no more than 1 foot. The saturated stringers do not appear to be laterally continuous. The water bearing zones consist of silty, very fine sand to very fine sandy silt.

All well construction was accomplished using an eight foot long, four inch wide, I.D. hollow stem auger, which eliminates the need to use a tremie pipe to place the backfill materials. The well installation plan required the use of 5-foot long well screens. EW-2 was the first well constructed with a 5-foot screen. Based on a water level depth of approximately 68 feet bgs measured after well construction, and an 80-foot total depth, it was decided to use 15-foot screens in wells EW- 1 and EW-3 in order to capture as many water bearing sand stringers as possible. The well screens consisted of 4-inch diameter continuous slot stainless steel having a 0.006-inch slot width with a compatible filter pack having a gradation of 30-70 placed adjacent to the screen and approximately 2 feet above it. Due to the shorter screen in EW-2, the filter pack extended *5* feet above the screen to capture any shallow water bearing stringers. Schedule 40, 4-inch diameter PVC casing extended from the top of the screen to above the ground surface. All joints were flush-threaded and used an “O” ring to provide a watertight connection.

The wells were completed with approximately 3 feet bentonite seal above the filter pack and Portland cement grout from top of the bentonite seal to approximately 2 feet bgs. A 6-foot long, 8-inch diameter steel protective casing was embedded 2 feet into the borehole and concreted in place. The RCRA cap is approximately 21 inches thick and was constructed around the steel casing. The steel casing extends approximately 2 feet above the RCRA cap and the 4-inch PVC casing approximately 1 foot. A PVC end cap and lockable aluminum cover over the steel casing will complete the installation.

The three extraction wells were developed immediately after construction using a 10-foot long dart bailer. Approximately 20 to 25 gallons of water were removed from each well. In all cases, the wells were relatively free of suspended solids. The wells were further developed using a 2-inch diameter Grundfos Rediflow 2 submersible pump. Extraction well locations are shown on Figure A-6 in Appendix A. Extraction well completion records are summarized in Figures A-11 to A-13 (Appendix A).

### 3.6.3 Injection Well Installation

Two injection wells, IW-1 and IW-2 were constructed just north of the RCRA cap area, as shown on Figure A-6 in Appendix A. Wells IW-1 and IW-2 were constructed in accordance with the project specifications prepared by the USACE and the injection Well Installation Plan (MK, March 1999) to re-inject treated water back into the A-zone aquifer after treatment in the treatment system. The groundwater extraction system was designed to pump contaminated groundwater to an on-site water treatment system. After treatment to discharge levels, the water was to be re-injected via the injection wells into the underlying A-zone perched groundwater.

The drilling and well construction was conducted from May 19 to May 21, 1999 using a CME-75 auger drill rig to advance the holes. Hollow-stem augers, having dimensions of 4¼ inches I.D. and 8¼ inches O.D., were used to drill an initial pilot hole and for obtaining in-place soil samples. Prior to installing the wells, the holes were reamed to approximately 13 inches in diameter using augers having 8¼ inches I.D. and 12¼ inches O.D. The soil samples were obtained similar to the extraction wells.

The well screens consisted of 15-foot long, 6-inch diameter continuous slot stainless steel with a slot width of 0.006-inch and a filter pack having a gradation of 30-70 placed adjacent to the screen and approximately 3 feet above the top of the screen. Schedule 40, 6-inch diameter PVC casing extended from the top of the screen to above the ground surface. All joints were flush-threaded and used an “O” ring to provide for a watertight connection. Bentonite seals and grout were placed similar to the extraction wells. A 6-foot long, 8-inch diameter steel protective casing was embedded 2 feet into the borehole and concreted in place. A concrete pad measuring 3 feet by 3 feet was poured around the steel casing. The steel casing extends approximately 4 feet above the ground surface and the 6-inch PVC casing approximately 3 feet. PVC end caps and a lockable aluminum cover over the steel casing complete the installation. The well development was conducted similar to the extraction wells. Injection well locations are shown on Figure A-6 in Appendix A. Injection well completion records are summarized in Figures A-14 and A-15 in Appendix A.

### 3.6.4 Aquifer Test

This section summarizes the results from a series of aquifer tests that were performed during May and June of 1999. After completion of well construction, an aquifer test was performed by an MK hydrogeologist and MK geologist. The aquifer test was performed to determine the sustainable yield at the test locations and to determine well efficiency and specific capacity for each of the test wells. This work was performed in accordance with project specifications prepared by the USACE and approved by EPA. The Aquifer Test Report was prepared.

The purpose of the aquifer test program was to characterize the A-zone groundwater in an area of dinoseb contamination at the site. Specific objectives were to:

- Determine the sustainable yield at each of the five test locations
- Determine well efficiency and specific capacity for each of the test wells
- Estimate the hydraulic properties of the perched aquifer
- Provide interpretation of the results with respect to the viability of using the pump and treat method for remediating the perched aquifer

The test procedure involved three phases: static water level monitoring, step-drawdown tests, and constant rate aquifer tests. Step-drawdown and constant rate aquifer tests were performed in each of five wells (EW-1, EW-2, EW-3, IW-1, and IW-2). Water level recovery monitoring was performed as part of both step-drawdown and constant rate aquifer tests. The appropriate locations of the observation wells (MW-1, MW-2 and MW-3) adequately monitored the drawdown and/or recovery within the aquifer so that the specific objectives of the study could be answered. Water levels were monitored in the test wells and monitoring wells to determine antecedent trends and to evaluate the effects of external influences.

#### 3.6.4.1 Step-Drawdown Aquifer Test

Step-drawdown tests were performed prior to each of the five constant rate tests. The primary purpose of each step-test was to determine the optimum pumping/injection rate for the constant rate test. The optimum rate of discharge is equal or slightly less than the sustainable yield, since this allows for continuous pumping while maximizing the likelihood of obtaining measurable drawdown in observation wells. The estimated sustainable pumping rate was approximately 0.1 gallons per minute (gpm) in all cases. This value is somewhat less than the maximum pumping rate in the extraction well step-tests based on the fact that the available drawdown at the end of each test was only a couple of feet and that the water level had not yet stabilized.

Lower initial pumping rates were selected for the injection well step-tests and the discharge rate was step-wise increased as per standard procedure for a step-drawdown test. In both cases, the low rate of pumping resulted in the majority of the pumped water being provided by wellbore storage. During the step-test at IW-2, for example, the drawdown was 3.66 feet after 60 minutes pumping at 0.25 gpm and 7.67 feet 40 minutes later after increasing the rate to 0.5 gpm. Assuming an effective porosity of 0.3 for the filter pack, the total volume pumped after 100 minutes was approximately 35 gallons, of which 25 gallons (71 percent) was provided by wellbore storage.

#### 3.6.4.2 Constant Rate Aquifer Test

A total of five constant rate aquifer tests were performed: a pumping test at each of the three extraction wells (EW-1, EW-2, and EW-3) and an injection test at each of the two injection wells (IW-1 and IW-2).

#### 3.6.4.3 Aquifer Test Conclusions

Analysis of the test data indicates that the A-zone perched aquifer underlying the Site is relatively homogeneous in the horizontal but vertically anisotropic, as a result of stratification. Best estimates of horizontal hydraulic conductivity ($K_h$) range from 2.6 x$10^{-4}$ cm/sec to 1 .5 x $I0^{-3}$ cm/sec. The $K_h$ values fall within the range typical for silt.

Specific conclusions based on the test results are as follows:

- The sustainable pumping rates are generally quite low, significantly less than 0.5 gpm in all cases. The low sustainable rates of pumping are a potential hindrance to remediation by the pump-and-treat method due to the low obtainable pore volume exchange rate.

- The per-well sustainable pumping rate would be decreased further for multiple pumping wells with overlapping cones of depression. The use of injection wells potentially offsets the multiple pumping well effect, by raising the pumping water level and increasing the pore volume exchange rate. On the other hand, injection wells are prone to clogging and can cause off-site migration unless complete hydraulic capture is achieved by the extraction wells.

- The injection rates into IW-1 and IW-2 were significantly higher than the estimated sustainable withdrawal rates based on pumping during the step-drawdown tests. The higher injection rates can be attributed to flow in the unsaturated interval near/above the original water table.

- Water-level recovery from the long-term extraction tests was incomplete. The possibility of semi-permanently dewatering the perched aquifer poses a potential obstacle to pump-and-treat remediation.

- In combination, geologic data, low but discernable barometric efficiency, and intermediate effective storage coefficients indicate that the A-zone is stratified and has a lower vertical hydraulic conductivity ($K_v$) than horizontal hydraulic conductivity ($K_h$).

In summary, the sustainable pumping rates are generally quite low, less than 0.5 gpm in all cases. These low rates, which result in a low obtainable pore volume exchange rate, indicate that pump and treat is not a realistic method for remediating the groundwater at the Site. This is supported further by a statement provided in Design Analysis Brown & Bryant, First Operable Unit, Phase II (USACE, April 1998). In this report, the authors state: “Results of aquifer testing at the site indicate that pumping from conventional wells is not a viable method of groundwater extraction due to extremely low well yields.”

### 3.6.5 Soil Vapor Extraction Pilot Study

Dinoseb, DCP, TCP, and chloroform were detected at elevated concentrations in two groundwater samples collected from extraction well EW-2 during May 1999. The chemical characteristics of these compounds suggest a medium to very high potential for mobility within soil (Seiber, 1987). The density of all four compounds is greater than that of water; therefore, they are commonly referred to as dense non-aqueous phase liquids (DNAPLs) with respect to groundwater contamination. Consequently, their detection in groundwater is expected following a substantial spill of the respective product. Complete removal of these types of contaminants from the groundwater at several sites throughout the U.S. has proved to be difficult (Mackay and Cherry, 1989). The low sustainable groundwater yield at the B&B site exacerbates the challenge of removing these compounds from the upper aquifer.

In an effort to inhibit further contamination of the aquifer, vacuum extraction of the soil vapor, which is commonly referred to as Soil Vapor Extraction (SVE), was proposed as part of the recommended remedial action for the soils within the upper 70 feet of the sediments underlying the site. The basic premise of SVE is that the induction of airflow and simultaneous removal of soil vapor enhances the volatilization and mobilization of the contaminants, and therefore, reduces their concentration/mass

within the soil. Application of this methodology at the B&B site could also enhance remediation of the perched aquifer via volatilization of the contaminants from the groundwater, and thereby reducing the potential migration of the contaminants to the deeper regional aquifer.
A pilot study to evaluate the effectiveness of contaminant removal efficiency of SVE was essential prior to implementing a fill-scale system. The purpose of this study was to evaluate the effectiveness of SVE as a remedial alternative for the soils at the site.

The objectives of the study were to:

- Determine the vapor flow rate and optimum vacuum level of the vapor extraction wells.
- Determine the radius of influence, or the zone in which the effect of the vacuum observed for each vapor extraction test.
- Estimate the soil permeability to vapor flow.
- Monitor the effects of the vacuum on the water levels in the monitoring wells.
- Sample and analyze the soil vapor for volatile organic compounds.
- Calculate removal efficiencies of the SVE treatment unit.

Two soil vapor extraction tests were performed during August 1999. The tests were conducted in accordance with the Soil Vapor Extraction Pilot Study Work Plan. The USACE and EPA approved the Work Plan on July 1, 1999. The Soil Vapor Extraction Pilot Study Report was prepared. The pilot study consisted of two SVE tests using wells EW-I and EW-3 as the vapor extraction wells. The tests were designated as Test EW-l and Test EW-3. Both wells are 4 inches in diameter and approximately 80 feet deep. The length of the well screen in both wells is 15 feet, of which approximately 5 feet extends above the water table. They were installed with two vacuum monitoring ports. Well EW-2 and monitoring wells MW-I, MW-3 and MW-4 were used to measure the change in water level within the aquifer as a result of the applied vacuum. A trailer mounted, 250 standard cubic feet per minute (scfm) thermal oxidation system was used to treat extracted vapors for the two pilot tests.

The performance and effects of the SVE system were monitored to meet the objectives of the study. The monitored parameters included vapor flow rates, vacuum, wellhead temperature, water level fluctuations and vapor concentration and compositions. The removal efficiencies of the thermal oxidation system exceeded 99 percent for both tests. As previously stated, the San Joaquin Valley Unified Air Pollution Control District requires VOC emission reductions of 95 percent for thermal oxidation treatment. These results demonstrated that the thermal oxidation unit was capable of meeting the District's requirements.

#### 3.6.5.1 Soil Vapor Extraction Pilot Study Conclusions

Two SVE tests were conducted as part of a pilot study to evaluate the effectiveness of soil vapor extraction as a remedial alternative for the upper 70 feet of sediments underlying the site. The findings were as follows:

- Site conditions and well construction are such that average flow rates of approximately 12 scfm for extraction Well EW-1, and approximately 8.5 scfm for well EW-3 are optimal for implementing an SVE system at the Site.

- Conducting the tests near these flow rates, it was estimated that approximately 3 pore volumes of soil vapor were extracted during Test EW- 1 and approximately 2 pore volumes were extracted during Test EW-3.

- The estimated average radius of influence for vacuum extraction is in excess of 46 feet for the Site. Vacuum response was greatest in the monitoring ports screened from 61 to 62 feet versus those screened from 56 to 57 feet, which suggests a decrease in air permeability vertically upward within the sediments.

- Soil permeability to vapor flow is estimated to be in the range of 6 darcys to 8 darcys for the soil in the vicinity of the extraction wells.

- Water level changes occurred in each of the monitoring wells, as a result of the vacuum applied during the tests.

- Relatively high concentrations of 1,2-dichloropropane were recovered during the test periods, and the concentrations increased steadily throughout each of the tests.

- Several other VOCs were detected at relatively low concentrations in the vapor samples, however, their occurrence is considered questionable and/or insignificant.

Finally, based on these findings, this evaluation concludes that soil vapor extraction is an effective remedial method to reduce the volume of VOCs in the soils at the site. Relatively high concentrations of 1,2-DCP were recovered during the two soil vapor extraction tests. The average removal rates were approximately 130 grams/day during Test EW-1 and 3 grams/day during Test EW-3. The findings of the study indicate that soil vapor extraction may be an effective way to reduce the mass of 1,2-DCP in the vadose zone at the site. Further data is needed regarding the total mass and extent of 1,2-DCP in the soil to confirm this premise. SVE is not expected to be effective for removing contaminants that have a low vapor pressure and/or Henry's constant, such as dinoseb, which is the primary COC at the Site.

### 3.7 A-Zone Groundwater Extraction/Treatment System

The OU-1 selected remedy included A-zone groundwater extraction, treatment and re-injection for source control. An extraction/treatment system was a component of the selected remedy and part of the original scope of work of the MK Contract. The extraction/re-injection system was to be implemented in phases, to allow for optimal design of the system. As discussed in Section 3.6.4 and 3.6.5, an aquifer testing and a SVE pilot study were performed which demonstrated a very low pumping rate of 0.35 gpm. These low rates, which result in a low obtainable pore volume exchange rate, indicate that pumping from conventional extraction wells is not a viable method of groundwater extraction due to extremely low well yields. The SVE pilot study demonstrated that VOCs could be removed from contaminated groundwater; however, the process does not remove the primary COC, dinoseb. With the low extraction rate, treatment would not be operationally efficient or cost effective.

MK was finalizing procurement packages to be sent to vendors, when notified by USACE that EPA had decided, with the concurrence of DTSC, to issue a stop work order for construction work associated with the remainder of Extraction/Treatment system. Therefore, the A-zone groundwater extraction and treatment component of OU-1 selected remedy was not installed.

Additional investigation was necessary for adequate design and implementation of A-zone groundwater remediation component. Since the treatment of the A-zone groundwater cannot proceed as prescribed in the ROD, a decision was made by EPA to transfer the A-zone groundwater remedy to the OU-2, to be addressed in conjunction with actions for the B-zone groundwater.

## 3.8 Miscellaneous Construction

During the MK contract for OU-1 remedy construction, other miscellaneous items were identified for Site operation or security. The water line repair and installation, truck scale pit filling and compacting, and power drop installation tasks were added to the contract. Fencing was included in the original contract.

### 3.8.1 Water Line

A 400 lineal feet of 2-inch water supply pipe was installed. This water pipe line was connected at the city water main at the existing shut-off valve using a new back-flow preventer. This line was tied into the existing water supply line to the warehouse and extended to a location east of the centerline of the tank UN-32. Piping and valves were installed such that the water supply for either the warehouse or the tank location can be shut off independently of each other. This work was completed from May 17 through June 2, 1999. Approximate location of the water line is shown on Figure A-16 in Appendix A.

### 3.8.2 Fill Truck Scale Pit

The truck scale pit was backfilled in lifts with clean backfill material and compacted to 95 percent of maximum dry density. This work was completed on April 13, 1999. The approximate location of the scale is shown on Figure A-16 (Appendix A).

### 3.8.3 Power Drop

A contract modification was issued to MK for installation of a power drop for future use at the Site. A power pole, transformer, electric line through a weather head and a locked breaker panel were installed. The breaker panel provided power for one 220-volt outlet, six 110-volt outlets, and a meter socket. A licensed electric company installed a power pole with a meter combination panel and four weatherproof receptacles. Both poles were installed on site property at the fence line southeast of tank UN-32. The poles were installed by drilling a hole through the non-RCRA cap. These holes were sealed with concrete prior to demobilization. This work was completed on September 22, 1999. The approximate location of the power drop is shown on Figure A-16 (Appendix A).

### 3.8.4 Fence Installation

A new 6-foot high chain-link fence was installed around the southern portion of the Site. The area enclosed by the new fence included the RCRA cap area, the new injection wells and tank UN-32. Total fence installation amounted to approximately 1100 lineal feet. The chain link fence was topped with three strands of barbed wire. Fence installation was performed by Alcorn Fence of Sun Valley, California.

### 3.9 Operation and Maintenance

The major components of the selected remedy in the OU-1 ROD included a RCRA cap over the contaminated surface and subsurface soils in the southern portion of the Site, a non-RCRA cap over the northern and western area of the Site for watershed management, and an A-zone groundwater extraction, treatment and re-injection system. As discussed in Section 3.7, the A-zone groundwater component construction was not implemented because it was determined that pumping from conventional extraction wells would not be operationally efficient or cost effective due to the low extraction rates. EPA decided to transfer the A-zone groundwater treatment to OU-2, the B-zone groundwater operable unit. The constructed OU-1 remedy does not require any operation. Maintenance of the caps and other ancillary features at the Site is necessary for maintaining long-term protectiveness of the OU-1 remedy.

For the completed OU-1 construction, it is necessary to inspect the Site on a regular basis and take action as necessary to maintain the long-term integrity of the corrective actions. A Post-Closure Site Control Plan was prepared in accordance with the RCRA and other federal regulations as specified in 40 CFR 264 and 40 CFR 258. Portions of this particular plan are considered Operations and Maintenance (O&M) for the constructed remedies for OU-1. The Post-Closure Site Plan specifies inspection of the following items no less than twice per year, as well as performance of necessary repairs identified necessary repair and maintenance.

- **RCRA Cap:** The RCRA regulation requires post-closure care for 30 years for RCRA cap. Any increase or decrease of the length of this period must be made by the Director (EPA or DTSC, whichever agency has responsibility). Inspections should include a site walk through and visual inspection of the asphalt layer over the RCRA cap. Asphalt should be inspected for cracks, fissures, intrusion through the asphalt and areas of settlement. Perform necessary repair and maintenance. Details of the RCRA cap maintenance are provided in the Post-Closure Plan.

- N**on-RCRA Cap:** Inspection should include a site walk-through to visually inspect the asphalt layer. Asphalt should be inspected for cracks, fissures, intrusion through the asphalt and areas of settlement. Perform necessary repair and maintenance. Details of the non-RCRA cap maintenance are provided in the Pos-Closure Plan.

- **Fence:** Inspection should include a walk of the fence perimeter to confirm fence integrity and site security. Inspection personnel should look for signs of damage to fence and/or evidence of entry into Site. Any damage to the fence should be repaired.

- **Wells:** Wells should be inspected to confirm integrity of paint and security of the locks and locking caps. The paint on the well casings should be inspected for signs of degradation. Wells are painted yellow to identify them as a safety hazard. Any issues identified should be corrected.

- **Bollards:** The pipe bollards should be inspected for damage during the well inspection. The paint on protective bollards should be inspected for signs of degradation. Pipe bollards are painted yellow to identify them as a safety hazard. Since access to the Site is restricted, there should be limited opportunity for vehicles to come in contact with the bollards. Bollards should not be replaced, except as a last measure. If they are bent, any straightening efforts should be conducted in a manner to protect the integrity of the cap.

- **Warehouse:** The warehouse building should be inspected for signs of entry. Locks on doors should be inspected for signs of tampering or damage. Any damage should be repaired. There is an additional issue relating to bat and bird excrement. The only apparent action is to ensure the integrity of the roof and walls. Any holes should be patched. Cracks at windows and doors need to be evaluated and kept at a width as to restrict entry. If bird nests are built, they should be removed as soon as possible in conjunction with identifying entry locations and closing them.
- **Tank UN-32:** Tank UN-32, which had been verified clean in 2001, was demolished and removed in 2009. The tank was removed by cold cutting to a depth of eight inches below the existing grade, after which it was cut into small pieces and hauled off-site for recycling. The footprint of the tank was finished to match the existing RCRA cap surface through placement of a compacted base course and four inch asphalt pavement. Other structures (truck scales, steel post and awning, and wooden structure attached to the warehouse) were also removed. Metal components were sent for recycling, while wood was sent to the county landfill.

- **Water Meter*:*** The water meter for municipal water service to the site was located on the north end of the property, west of the north gate and between the two parallel fences. This meter should be inspected for signs of water usage. The meter reading should be recorded and compared to the reading recorded during the previous inspection. Any usage noted should prompt a more detailed inspection of the property to determine if there is a sign of water leakage. Arvin Community Service District maintains the municipal potable water supply system. Any apparent damage should be reported to the District at 661-854-2127 or after hours and on holidays at 661-854-3418.

- **Valve Box:** The valve boxes located on the north perimeter boundary, west of the north access gate should be opened and inspected for signs of leakage or damage. The valves should also be inspected to verify that they are in the off position. The 3-foot by 2-foot box with backflow preventer services the new potable water line, which runs to the south end of the property. The small valve box on the north end of the property contains a 2-inch gate valve on the water line, which services the warehouse building.

A Site inspection form is included in the Post-Closure Plan. The Post-Closure Plan also includes the Site post-closure land use, Site security and access restriction, sign posting, inspection documentation and reporting requirements, and potential deed recordation for institutional controls. An as-built survey for the Site is shown on Figure A-17 included in Appendix A.

## 4.0 Chronology of Events

A chronology of events associated with the Site is listed in Table 4-1 below.

**Table 4-1: B&B Site Chronology of Events**

| Date | Event |
|---|---|
| April 1981 | B&B notified EPA that Arvin facility was transporting Hazardous waste. B&B Facility was given a RCRA for transporter license. |
| May 1983 | California Department of Health Services inspected the Site to determine compliance with hazardous waste laws. |
| June 1985 | California Department of Toxic Substance Control issued an Order for B&B |
| 1983 - 1988 | B&B Facility conducted site investigations under the supervision of CDHS. |
| August 1987 | B&B Facility excavated 640 cubic yards of dinoseb contaminated soils. |
| October 1989 | B&B Site listed on National Priority List. |
| April 1991 | EPA treated the dinoseb contaminated soil under its emergency response authorities. |
| June 1991 | EPA issued the Railroads an Unilateral Administrative Order to conduct certain investigations of the groundwater at the site |
| May 1993 | OU-1 RI/FS completed. |
| November 1993 | EPA issued a Record of Decision for the OU-1. |
| December 1996 | Completed Site cleanup and preparation work for remedy construction which included sampling and assessment, debris cleanup, decontamination, demolition, removal and disposal. |
| April 1997 | Railroad spur dinoseb impacted soil removal |
| December 1997 | OU-1 Remedial Design completed |
| September 1998 | OU-1 Remedial Action Work Plan Completed. |
| November 1998 | OU-1 remedy construction, second phase, implementation |
| October 1999 | OU-1 remedy construction pre-final inspection |
| July 2000 | OU-1 remedy construction completion & operation and maintenance implementation |
| July 2001 | B&B Site First Five-Year Review |
| September 2005 | OU-2 RI/FS Completed |
| August 2006 | B&B Site Second Five-Year Review |
| June 2007 | EPA issued a OU-2 Proposed Plan of Action |
| September 2007 | OU-2 Record of Decision signed by EPA |
| March 2009 | Tank UN-32 demolition and removal |
| February 12, 2009 | OU-1 Final Inspection by EPA and DTSC |
| July 1, 2010 | O & F Determination |

# 5.0 Performance Standards and Construction Quality Control

Comprehensive monitoring and testing activities were conducted during the Site cleanup and preparation, and the OU-1 remedy construction to verify compliance with performance standards and specifications established in the RD and the RA Project Work Plans. The performance standards and specifications are developed to meet the remedial action objectives (RAOs) in the ROD.

## 5.1 Technology Performance

The performance requirements for each of the OU-1 selected remedy components to achieve its RAOs are discussed below.

### 5.1.1 Removal & Consolidation Contaminated Surface Soils

The main objective for removing on-site and off-site contaminated soils above the 80 mg/Kg dinoseb health-based cleanup level, from the areas outside of the RCRA cap and consolidating in the RCRA cap area, was to prevent threat of potential exposure by direct dermal contact and ingestion pathways. As discussed in Section 3.2.2.1, existing dinoseb contaminated soil piles consisting of a total of approximately 70 cubic yards, associated with previous remedial activities and operations, were removed from the area in the northern portion of the Site. The soil piles were collected with a Caterpillar 966 front end loader and deposited in the former waste pond located at the southeast corner of the Site. Soil was compacted using an Ingersoll-Rand vibratory compactor as required by contract specifications. Analytical sampling results from 139 confirmatory soil samples collected across the entire areal extent of the Site within the perimeter fence (outside the RCRA cap area) indicated that the remaining on-site surface soil is well below the dinoseb cleanup level. Also, a total of 56 off-site soil samples at 4 to 8 inches bgs and 12 to 18 inches bgs at 28 locations were analyzed for several constituents including metals, pesticides, herbicides, VOCs and semi-VOCs. Analytical sampling results indicated that soils outside the perimeter fence and adjacent to the rail road tracks were below all cleanup levels. The remedial action objective of preventing threat of potential exposure to contaminated soils by direct dermal contact and ingestion pathways was attained.

### 5.1.2 Re-grade Northern and Western Portion of the Site

The remedial action objective for re-grading and capping the northern and western portion of the Site, after consolidating the contaminated soils to the RCRA cap area, is to control stormwater runoff, and minimize infiltration and charging of the A-zone perched groundwater, to reduce contamination mobility in the A-zone. As discussed in Section 3.4, the excavations and pits in the northern and western portion of the Site (total areal extent of the Site within the perimeter fence and not covered by the RCRA cap) were backfilled with clean backfill material, graded using a Caterpillar motor grader to the specified cap subgrade elevation, and compacted to 95% compaction using vibratory compactor. Following re-grading and compaction, the northern and western portions of the Site were capped with a basic, non-RCRA cap. The basic cap consisted of compacted subgrade and 3-inch bituminous course with fog seal on top as discussed in Section 3.5. The objective of controlling stormwater runoff and minimizing the infiltration and charging the A-zone perched groundwater to reduce contamination mobility in the A-zone was achieved.

### 5.1.3 RCRA Cap Construction on the Consolidated Contaminated Soil Area

The objectives of RCRA cap on the consolidated contaminated soil area (waste pond, sump area, dinoseb spill area) in the southern portion of the Site was to: 1) prevent risk of potential exposure to the consolidated contaminated soils by direct dermal contact and ingestion pathways, 2) prevent mobilization of contamination from consolidated contaminated surface soils and the A-zone soils; and, 3) prevent further degradation of the A-zone perched groundwater. As discussed in Section 3.5.1, a RCRA cap with the designed specifications was constructed over the consolidated contaminated soils.

Subgrade for the RCRA cap was prepared by backfilling, grading and compaction to the design specifications. After the RCRA cap area had been brought to subgrade elevation, the RCRA cap consisting of 6-inch geogrid/sand layer, geosynthetic clay Liner, 6-inch Sand Filter Layer, 6-inch Aggregate Base Course, and 3-inch Asphaltic Concrete were constructed followed by an application of a fog seal. The constructed RCRA cap achieved performance requirement of preventing exposure to contaminated soils and contamination mobilization from the consolidated contaminated soils, A-zone soils and prevention of further shallow perched groundwater degradation.

### 5.1.4 Basic Cap Construction

The objective of the basic cap was to control stormwater runoff and prevent infiltration through contaminated soil to the A-zone groundwater. Construction of the basic cap consisting of compacted sub-grade material overlaid with 3 inches of asphaltic concrete followed by a fog seal attained the objective of controlling the stormwater runoff and minimizing infiltration.

### 5.1.5 Extraction, Treatment and Re-injection of the A-Zone Groundwater

The A-zone groundwater extraction and treatment component of OU-1 selected remedy was not installed but was carried over to the OU-2 to be addressed in conjunction with actions for the B-zone groundwater. The September 2007 OU-2 ROD selected remedy includes the A-zone groundwater extraction and treatment component with the RAO to remove or control contaminants in the A-zone groundwater such that it is no longer a source of contamination to the B-zone groundwater. The objective for the A-zone groundwater extraction, treatment and re-injection is no longer an objective of the OU-1 remedy.

### 5.1.6 Remedial Action Objective Attainment Summary

Performance results comparison with the remedial objectives and cleanup goals summarized in Table 5-1 demonstrate that remedial action for OU-1 is complete.

**Table 5-1: Performance Results Compared with Remedial Objectives/Cleanup Goals**

| Remedy Component | Remedial Objectives/Cleanup Goals | Performance Result |
|---|---|---|
| Non-RCRA cap area (northern and western portion of the Site) | Excavate and move contaminated soils exceeding 80 mg/Kg dinoseb cleanup level from the Non-RCRA cap area to RCRA cap area (southern portion of the Site). | Results of the soil sampling on-site demonstrate that soil in non-RCRA cap area is below the health-based dinoseb cleanup level of 80 mg/Kg. |

| | | |
|---|---|---|
| Off-Site area surrounding the site | Surface soil surrounding the site are below the dinoseb health-based level of 80 mg/Kg. | Results of the soil sampling off-site demonstrate that surface soil surrounding the Site is below the health-based dinoseb cleanup level of 80 mg/Kg requiring no further remediation. |
| Non-RCRA cap area | Fill, grade and cover the non-RCRA cap area (northern and western portion of the Site) with a basic (non-RCRA) cap to control stormwater runoff and further charging of A-zone perched ground water. | The area was filled with clean import material, graded and compacted. Site survey results demonstrate performance standard for grading attained. Construction of a basic, non-RCRA cap with the following design specifications attains the remedial action performance standard.<br>•Subgrade compacted @ 95%<br>•3" Bituminous Course<br>•Fog seal |
| RCRA cap Area (southern portion of the Site) with dinoseb contaminated soil | Placement of a RCRA cap over the southern portion of the Site area where all dinoseb contaminated soils are consolidated to immobilize contamination and prevent further degradation of A-zone groundwater. | Construction completion of the RCRA cap over the southern portion of the Site with the following design specifications attains the remedial action performance standard.<br>•Subgrade soil to 95% compaction<br>•6-inch Geogrid/Sand Layer<br>•Geosynthetic Clay Liner<br>•6-inch Sand Filter Layer<br>•6-inch Aggregate Base Course<br>•3-inch Asphaltic Concrete<br>•Fog seal |

## 5.2 Construction Quality Assurance and Control

A quality control program was implemented for Site cleanup and preparation phase and the OU-1 remedy construction phase. The CQC Plan and the CDQM Plan were developed and implemented during the 1996 Site cleanup and preparation work. The Quality Assurance (QA) Plan was prepared by the USACE for the project. The CQC Plan was prepared by the contractor, MK, and submitted to the USACE prior to the start of the OU-1 remedy construction activities. The CQC Plan was approved by USACE and EPA. All of the remedial construction activities were performed in accordance with the CQC Plan. The CQC Plan included: quality control organization; CQC staff qualifications, coordination and planning; management, review and certifications; completion inspections/test plans; method of inspection, noncompliance, performance documentation, construction control data; documentation requirements, document changes, submittals; identifying and documenting deficiencies, disposition of nonconforming items, notifications; and data acquisition.

MK provided a full time CQC manager for the duration of the construction activities. The MK CQC manager was responsible for ensuring that features of the work were in compliance with the CQC Plan. The CQC manager had many roles and responsibilities including:

- Evaluate equipment and materials, workmanship, testing methods and sample collection for conformance of plans, specifications and industry standards.
- Perform the three phase inspection process - preparatory, initial, and follow-up phases.
- Ensure that submittals are in compliance with the contract.
- Review and complete as-built drawings throughout the project.

- Prepare a punch list of open items and ensure that they are completed prior to demobilization.

Daily QC reports and Daily Log of Construction were provided to the USACE Contracting Officer's Representative (COR) throughout the course of the project. The reports summarized the work performed during the day and other significant topics, which included:

- QC narratives (general comments, site inspections and safety, verbal instructions given by USACE, any delays in work progress and other comments of importance)
- Preparatory/Initial Dates (Prep and initial dates held for work to be completed and advance notice)
- Activity Start/Finish
- QC Requirements (Identification of any QC requirement associated with the day's activity)
- QA/QC Comments (QC comments issued, report QA and QC comments corrected)
- Contractors on Site
- Labor Hours
- Equipment Hours (list of equipment used and authorized hours of operation)
- Equipment Checks (Type of equipment, safety check status, and number of authorized hours)
- Safety Corrections (A report of corrective actions taken for safety violations)
- Accident Reporting (Description of any accidents on Site)

The Contactor Daily Report included the contractor certification with the QC manager signature. In addition to the CQC Plan, the following PWPs were prepared for various construction activities for OU-1 remedy and submitted to USACE and EPA:

- Safety and Health Program
- Site Safety and Health Plan
- Ambient Air Sampling and Analysis Plan
- Dust Control Contingency Plan
- Sampling and Analysis Plan
- Demolition Plan
- Extraction Well installation Plan
- Monitoring Well Installation Plan
- Injection Well Installation Plan
- Treatability Study Work Plan
- Site Specific Spill and Discharge Plan
- Site Specific Materials Handling Plan
- Site Specific Quantity Survey Plan
- Site Specific Security Plan
- Stormwater Pollution Prevention Plan

The plans were prepared to assure that all construction activities were performed in accordance with the design specifications. Specifications for preparation of the plans were followed. The plans were submitted to the USACE prior to the start of remedial construction with the following noted exceptions. The three Well Installation Plans were submitted after the borehole drilling had been completed.

The Draft Treatability Study Work Plan was submitted in April 1999, after remedial construction work had started. The PWP, comprising of the above plans, and the CQC Plan were approved by the USACE and EPA.

All remedial construction activities were performed in accordance with the PWP and CQC Plan. All of the demolition activities; including concrete demolition, asphalt removal, liner and UST removal, rail road track demolition and utility demolition were performed in accordance with the Demolition Plan. Concrete rinsate sampling was performed after washing the concrete, which indicated that the concrete was free of contaminants. RCRA and basic cap construction was completed in accordance with the CQC Plan. Testing for cap construction, such as compaction testing were performed using ASTM methods by Arrow Engineering Services, Inc., a USACE approved geotechnical testing company.

Extraction, injection and monitoring well construction and completion, including well screen, filter pack, casing, bentonite seal, grout and surface completion during the OU-1 remedy, were completed according to the material and specifications specified in the well installation plans. Soil samples collected during drilling were analyzed using ASTM and EPA methods by Arrow Engineering Services, Inc.

### 5.3 Performance Data Quality Assurance

The SAP, CQCP and the QAP were developed and implemented to ensure that the quality of performance data are adequate to demonstrate that remedial activities for the OU-1 remedy construction meet design criteria and objectives. Sampling and analysis were performed to confirm attainment of performance standard specified in the OU-1 remedy design.

The SAP and CDQM Plan were implemented to determine the contents of drums, tanks, soil stockpiles and other materials for characterization and disposal during the November 1996 Site cleanup and preparation phase of the OU-1 remedy construction. The sampling and analysis was not intended for any Site confirmation sampling.

The data quality objectives for the SAP were to determine the presence of dinoseb and other contaminants of concern at the site, specifically: 1,2-Dichioropropane using EPA Method 8260 A and dinoseb using EPA Method 8150 B, at detection limits established in the General Management Plan. During this phase of the site cleanup and preparation activities, EPA representatives also investigated unmarked and corroded drums.

MK conducted soil, water and sludge sampling and analysis activities in accordance with the SAP. The sample collection and handling procedures were identified in the SAP. The SAP also specified EPA methods for analysis of samples. Accredited, CDHS and USACE certified laboratories were used for sample analysis. USACE periodically conducted oversight of the field sampling activities. Samples were submitted the same day they were collected to laboratories completing analysis requested on the Chain-of-Custody (COC) forms. Matrix spikes, duplicates, and blank samples were analyzed by the laboratories, and the results were provided with the reports. Ten percent of confirmatory samples were split for submission to the USACE Quality Assurance Laboratory, Sequoia Analytical Laboratories of Petaluma, California. Split samples were processed in the same way as described above and submitted to the laboratory on the day of collection. Data validation was performed by Enviro-Chem, Inc.. The CDHS also reviewed the data and found data to be acceptable.

A total of 139 confirmatory soil samples for dinoseb contamination and 56 off-site investigative samples for numerous parameters were collected during the OU-1 construction activities. The samples were collected in accordance with the SAP. The samples for dinoseb were analyzed by Associated Laboratories, a CDHS and USACE certified laboratory, using EPA method 8150B. The off-site samples were also analyzed by Associated Laboratories, using the following EPA methods: 8270 for semi-volatile organics, 1010 for ignitability, 7060A for arsenic, 7421 for lead, 7471A for mercury, 7740 for selenium, 8015 for petroleum hydrocarbons, 8080 for chlorinated pesticides and polychlorinated biphenyl, 8150B for dinoseb, 8270C for acid/base/neutral extractables, 9010A for cyanide, and 9045 for pH. The soil sampling QC included collection of seven soil sampling equipment rinsate samples. The seven samples were analyzed for dinoseb, using Method 8150B, which show that the highest concentration reported was 43 µg/Liter. This concentration of dinoseb in rinse water does not indicate a potential for cross-contamination during subsequent soil sampling.

A sludge sample from the tank UN-32 was collected and analyzed in accordance with the SAP for waste characteristics. The sludge sample was analyzed by the Associated Laboratory using EPA methods: 6010B for ICP metals, 7060A for arsenic, 7421 for lead, 7471A for mercury, 7740 for selenium, 8021B for HVO, 8081A for chlorinated pesticides and PCBs, 8150B for herbicides, 8260B for VOCs, and 8270C for acid/base/neutral extractables. Water samples from wells and tank UN-32 were collected and analyzed, in accordance with the SAP.

Water sampling for a treatability study and potable water from the new water line was also performed in accordance with the SAP. The samples were analyzed by Associated Laboratories for dinoseb, using EPA method 8150B, VOCs using EPA method 8260B, and method 504 for EDB and DBCP. The treatability study water samples were also analyzed for metals, inorganics and other parameters using EPA methods. Results of the treatability study samples provided data to determine feasibility of treatment of the extracted groundwater. The results for the potable sampling showed that all analytes were below the method detection limit and the water was acceptable for all construction activities including dust control.

Sampling and analysis was also performed in accordance with the Ambient Air Monitoring Plan to monitor potential health hazards to workers, public and the environment during the OU-1 construction activities. PM 10 (particulate matter less than 10 microns) and dinoseb samples were collected at the monitoring stations around the perimeter of the site, to assess potential environmental impacts during construction. Worker exposures were evaluated for dinoseb by collecting samples in the workers' breathing zones. Total dust and VOC direct-reading measurements were collected also to evaluate potential hazards. The equipment, sampling methods and analysis in the Ambient Air Monitoring Plan were adequate to ensure protection of workers and environment at specified standards. The sampling and analysis data met the objective of adequately evaluating and assessing health and safety impacts to workers, public and the environment during the OU-1 construction activities.

Overall, the sampling and analysis program enabled EPA to determine that all analytical results reported were accurate and representative to ensure execution of the remedial activities for OU-1 in a satisfactory conformation with the performance standards, and in a manner consistent with the requirements of the ROD.

# 6.0 Final Inspection and Certification

This section presents inspections and documentation that the OU-1 soil remedy was completed and was declared operational and functional as of July 1, 2010. Also, a summary of health and safety requirements implemented during the remedial action is discussed.

## 6.1 Pre-Final Inspection

A pre-final inspection was conducted on October 7, 1999, with representatives from USACE, EPA, DTSC, and MK to determine that the OU-1 remedy, with the exception of A-zone groundwater component, was constructed as designed. The following minor items were identified during and after the inspection, and were matters to be resolved and completed prior to demobilization:

1. MK to Provide estimate to dispose of core samples from previous drilling operations.
2. USACE to provide records of analyses of core samples.
3. MK to dispose of well drilling core samples when disposing of tank UN-32 sludge.
4. MK to install signs on RCRA cap area fence showing load limit for asphalt.
5. MK to number wells. Number is to be on inside of well head cover.
6. MK to install combination locks on well head covers. All locks shall have the same combination.
7. MK to install 2-inch PVC caps for monitoring well casings.
8. MK to install combination locks on access gates and on the wells installed by MK. Combinations shall be the same as well head cover locks.
9. MK to concrete around new utility power pole, service pole and guide wire anchor point in asphalt.
10. MK to send weather station to USACE.
11. MK to insert inspections for bird nesting into an Operational and Maintenance (O&M) manual.
12. MK to dispose of E&E and other contractor's equipment in warehouse.
13. MK to provide one Final Report in three ring binders and the remaining in pressboard binders, side or top bound.
14. MK to provide as-built survey drawing. Provide size of berm around warehouse on as built and include dimensions of RCRA cap.
15. MK to provide SVE Pilot Study Report including: procedures, data, conclusions and recommendations.

16. MK to provide Aquifer Test Report including: procedures, data, conclusions and recommendations.

17. MK to provide Closure Report.

18. MK and USACE to conduct Credit Modification negotiations for contract close-out and final payment.

All of the above items were resolved and completed prior to demobilization in November 26, 1999. A decision was made by EPA and USCE to dispose of the tank UN-32 content (water and sludge) during the operation and maintenance phase, following completion of all of the remedial construction and decontamination activities. Disposal of the samples, item 3, would be completed when disposing tank UN-32 content. Therefore, MK did not have to provide the estimate required in item 1, USACE did not need to provide records of analyses mentioned in item 2, and MK did not have to complete item 3.

Six boxes of samples resulting from MK OU-1 construction activities were disposed of by MK prior to demobilization. Installation of signs, numbering of wells, combination lock installation on well head covers and access gates, PVC caps for monitoring wells and concrete around poles and anchor point, as listed in Items 4 through 9 were completed prior to demobilization. Weather station mentioned in Item 10 was stored in the warehouse. MK inserted inspection provisions into the O&M manual for bird nesting as specified in Item 11. Other contractor's equipment listed in Item 12, were left in the warehouse 3. MK provided a final report, as-built survey drawing, SVE Pilot Study Report, and Aquifer Test Report as required by Items 13 through 16. A closure report, as required by Item 17, which included all of the remedial construction activity documentation, was provided by MK in July 2000. MK demobilized in November 1999. USACE and MK completed modification negotiation for contract close out.

A final inspection of the constructed OU-1 remedy was performed on February 12, 2009, to review the condition of the constructed remedy, including caps, in preparation for transferring the O & M activities to the State. At that time, the caps were more than ten years old. EPA agreed to repair existing cracks and declared that O & F was achieved on July 1, 2010 (see letter to DTSC, Appendix D). The cracks are scheduled for repair in October of 2011, and the State has otherwise assumed responsibility for O & M.

## 6.2 Health and Safety

Remedial activities were completed in accordance with the Health and Safety Program, Site Safety and Health Plan, Ambient Air Sampling and Analysis Plan and Dust Control Contingency Plan included in the OU-1 Work Plan for the OU-1 construction activities. The plans included personnel and responsibilities, employee training, safety meetings, medical monitoring, Site access control actions, potential health hazards and safety risks, personal protective requirements, personnel and area monitoring, exposure controls and decontamination procedures. All subcontractors working on-site were either required to adhere to the existing health and safety plans or to develop their own health and safety plan for specific work that they conduct at the Site to compliment the overall project health and safety plan.

MK provided a safety officer responsible for implementation of health and safety plan at the Site. Daily safety meetings were conducted during the OU-1 construction. Daily Site inspection included activity hazard analysis. Health and safety deficiencies and concerns were identified, and safety correction actions were taken. The meetings, inspections, labor hours, safety inspections, deficiencies, corrective

actions, any reported accident were included in the contractors daily log of construction reports. Dust levels were controlled throughout the project to below the action levels.

Sampling and analysis was also performed in accordance with the Ambient Air Monitoring Plan to monitor potential health hazards to workers, public and the environment during the OU-1 construction activities. Both PM 10 (particulate matter less than 10 microns) and dinoseb samples were collected at the monitoring stations around the perimeter of the site to assess potential environmental impacts during construction. Air monitoring station locations are shown on Figure A-18 in Appendix A. Action level for PM-10 sampling was 150 µg/, $m^3$ for a 24-hour time weighed average (TWA). Worker exposures were evaluated for dinoseb by collecting samples in the workers' breathing zones. The action level for dinoseb in air was established at 3.7µg/$m^3$ for a 24-hr TWA. Total dust and VOC direct-reading measurements were also collected to evaluate potential hazards. Air monitoring for VOCs was conducted in conjunction with the dust monitoring.

PM-10 sampling was conducted on an average frequency of every 2.3 calendar days, which exceeded the target sampling frequency of one sample every three days specified by the Air Monitoring Plan. Dinoseb ambient air sampling was conducted whenever site activities had potential to generate emissions of dinoseb. Samples were collected on 48 day intervals, equating to about one sample for every two calendar days, exceeding the target of one sample for every three days. All PM- 10 sampling results were well below the 24-hour NAAQS of 150 µg/$m^3$. The maximum PM-10 concentration along the site perimeter was 103 µg/$m^3$. The mean daily average concentration measured at the site was 29 µg/$m^3$, with a standard deviation of 23 µg/$m^3$.

Low volume area samples were analyzed for dinoseb, which showed that the mass of dinoseb on the sample media was below the analytical detection limit for all but 11 samples. Analytical detection limits ranged from 0.1 to 0.4 µg for each sample, with typical detection limits of about 0.15 µg. Using a typical sampling rate of 100 ml/min for 24 hours, the concentration detection limit ranged from 0.69 to 2.9 µg/$m^3$, which is below the detection limit criterion for dinoseb of 3.7 µg/$m^3$.

A total of 37 personnel samples were collected for dinoseb analysis during the remedial activities conducted at the Site. Samples collected between December 23, 1998, and January 15, 1999, were analyzed using OSHA Method 32 without implementing a required modification to permit accurate detection of dinoseb. However, dinoseb concentration results obtained for these samples were determined to be artificially high and were not considered valid. After identification of the issue, the contractor shut down the job immediately and USACE personnel were notified. Reanalysis, utilizing OSHA Method 32, implementing the appropriate protocols provided acceptable results.

Dinoseb concentrations from personnel samples ranged from below the detection limit (typically 3 to 49 µg/$m^3$). The average concentration for the six samples with concentrations above the detection limit was 12 µg/$m^3$ with a standard deviation of 19 µg/$m^3$. Although there are no applicable occupational exposure standards for dinoseb, all but two personnel samples were below the 24-hour time-weighted average ambient air criterion of 3.7 µg/$m^3$ and the highest observed concentration is only about a factor of 10 above the ambient criteria level. Allowable occupational exposures are typically a factor of 10 to 1,000 greater than allowable exposures to the public. Therefore, based on the personnel monitoring results, no Site workers were exposed to unacceptable dinoseb concentrations in air.

Results from real-time monitoring with the hand held MiniRAe showed that the measured concentrations downwind of site activities were below 150 µg/$m^3$ on most days. During the morning of

January 15, 1999, elevated dust concentrations up to 380 µg/m$^3$ were monitored along the south fence. However, a background concentration of 200 µg/m$^3$ was measured shortly after the elevated downwind concentrations. Since there was no site activity conducted during these measurements and the background concentration was very high, it was suspected that all downwind concentrations measured on this day were primarily a result of the high background concentrations. This conclusion was further supported by time-integrated PM-10 sampling results for January 15, that indicate relatively high PM- 10 concentrations at all monitoring stations. Elevated MiniRAe readings were also recorded on March 16, 1999, for both upwind and downwind locations. It was suspected that these readings may have been artificially elevated because of high humidity (humidity at or near 100 percent causes a positive interference with the MiniRAe). Bakersfield data for precipitation available from NOAA indicated 0.02 inches of precipitation. PM-b sampling data collected on the following day further indicated that PM-10 concentrations were below 10 µg/m$^3$.

Monitoring for VOCs, using a MultiRae photo ionization detector (PID) monitor, showed that no VOCs were detected in all measurements, with the exception of two measurements from inside the UST. The readings of 7 and 9 mg/Kg were not unexpected and did not indicate worker or public health risks.

The health and safety program implemented during the OU-1 remedial construction activities adequately protected workers health and safety.

### 6.3 Institutional Controls

The OU-1 ROD specified implementation of Institutional Controls, consisting of deed restrictions excluding residential use of the site, and assurances that the RCRA cap area is maintained. Currently this component of the remedy has not been implemented. However, access to the Site is restricted and controlled by EPA, for purposes of conducting O&M activities for OU-1 and constructing the OU-2 remedy. Residential use of the site and any excavation within the RCRA cap area cannot occur as long as Site access is controlled and restricted.

The deed restriction will list:

- The contact information for EPA Region 9
- The contact(s) or agent(s) of the owners

The deed restriction will include the following information and provisions:

- The property was part of a remedial action performed under EPA Region 9 as the lead agency citing the CERCLA Docket Number, if any.
- Two caps exist on the property; one RCRA cap and one non-RCRA cap completed under the direction of the EPA.
- No soil originating from within the restricted access area (the entire site) shall be removed or transported out of the restricted access area.
- No invasive construction activities may be conducted at any depth within or around the immediate area of the RCRA cap.
- No permanent structures or features may be constructed on the site due to the presence of caps.
- There are ongoing maintenance obligations with respect to the site.

- The future use of the property is limited to non-residential land use.
- The new owner must amend the deed if changes in ownership are made.

The deed restriction will provide:

- A surveyed location, the legal description of the site boundaries, and the location of placement of contaminated material in the RCRA capped area.
- A description of where the two caps are joined and how the two caps were connected during construction.
- A description of the two areas of cleanup and those areas labeled on an attached map: the restricted access area of cleanup with soil dinoseb concentrations of less than 80 mg/Kg, and the restricted access area of cleanup with dinoseb concentrations potentially greater than 80 mg/Kg.

# 7.0 Operation and Maintenance

The major component of the selected remedy in the OU-1 ROD included a RCRA cap over the consolidated contaminated surface and subsurface soils in the southern portion of the Site, a non-RCRA cap over the northern and western area of the Site for watershed management, and an A-zone groundwater extraction, treatment and re-injection system. As discussed in Section 3.7, the construction of the A-zone groundwater remedy component, was not completed during the OU-1 remedy construction. The testing at the Site indicated that pumping from conventional extraction wells was not a viable method of groundwater extraction and would not be operationally efficient or cost effective, due to the low extraction rates. A decision was made by EPA to transfer the A-zone groundwater treatment to OU-2, the B-zone groundwater operable unit. The RCRA cap and non-RCRA cap attained the remedial action objectives upon construction completion. The constructed OU-1 remedy does not require any operation. Maintenance of the caps and other ancillary features at the Site is necessary for maintaining long-term protectiveness of the OU-1 remedy. The ROD also specified a period of groundwater monitoring for no less than thirty years.

## 7.1 Post Construction Operation and Maintenance

For the completed OU-1 construction, it is necessary to inspect the Site on a regular basis and take action, as needed, to maintain the long-term integrity of the corrective actions. A Post-Closure Site Control Plan was prepared in accordance with the RCRA and other federal regulations as specified in 40 CFR 264 and 40 CFR 258. The RCRA regulation requires post-closure care of the RCRA cap for 30 years. Any increase or decrease of the length of this period must be made by the Director (EPA or DTSC, whichever agency has responsibility). A Post-Closure Site Control Plan was prepared for the O&M of the OU-1 constructed remedy. The O&M of the OU-1 constructed remedy is an ongoing task that began in January 2000, following completion of construction.

The post-closure plan includes inspection and necessary repair and maintenance of the following constructed items to assure that the constructed remedy maintains its remedial action objectives:

- RCRA cap
- Non RCRA (Basic) cap
- Fence & Gates
- Wells and Bollards
- Warehouse
- Tank UN-32
- Water Meter & Valve Box

Inspections and necessary repair and maintenance were performed as specified in the post-closure plan for the OU-1 remedy. A summary of the repair and maintenance activities associated with major components of the remedy are described below.

### 7.1.1 Inspections

Inspections of the above OU-1 remedy constructed components were conducted by USACE representatives and its contractors. The caps were inspected for cracks, fissures, intrusion through the asphalt and areas of settlement. Site fence inspections included a walk of the fence perimeter to

confirm fence integrity and site security. Wells were inspected to confirm integrity of paint and security of the locks and locking caps. Paint on the well casings was inspected for signs of degradation. Pipe bollards were inspected for damage and paint degradation during the well inspection. Pipe bollards are painted yellow to identify them as a safety hazard.

Since access to the Site is restricted, there is a limited opportunity for vehicles to come in contact with the bollards. The warehouse building was inspected for any signs of entry. Locks on doors were checked for any signs of tampering or damage. The integrity of the roof and walls of the warehouse were inspected. The warehouse was also checked for bird nests. The water meter for municipal water service to the site and the valve boxes were inspected for leakage or damage. The meter was inspected for signs of water usage. Meter reading were recorded and compared to the reading recorded, during the previous inspection to determine any leakage. Valves were also inspected to verify that they are in the off position.

Tank UN-32 contained water and sludge from previous decontamination efforts at the Site. The tank UN-32 content removal & disposal was completed in November 2001. Tank UN-32 was inspected for signs of tampering or vandalism. The ladder leading to the top of the tank is fitted with a door equipped with a security lock. The lock was inspected for signs of damage or tampering. The man-way at the bottom of the tank was also inspected for signs of tampering or damage.

The Site was also inspected for sign postings, debris and trash. The inspection findings were documented. Any repair or maintenance actions needed based on inspections were performed.

### 7.1.2 Repair and Maintenance

Minor repairs and maintenance of items identified by the inspections, such as general debris and trash cleanup, fence and sign maintenance, etc., were performed as necessary by the USCAE groundwater monitoring contractor and local subcontractors. In June 2007, USACE contracted Innovative Technical Solutions, Inc. (ITSI) under contract #W912PL-06-D-0007 to perform cap and fence repair at the Site. The repair scope work included involved repairing the boundary fence and security barbed wire, surveying the RCRA and non-RCRA asphalt concrete with a 25 foot grid pattern and well points with Global Positioning System (GPS) and USGS Stationing, weed abatement and slurry seal of the RCRA and non-RCRA asphalt concrete. Activities for the cap and fence repair are summarized below:

- On September 10, 2007, ITSI, Quality Consulting, and the USACE PM met at the Site to begin surveying the RCRA and Non-RCRA asphalt concrete with a 25 foot grid pattern and well points. The survey was completed on September 11, 2007.

- The weed abatement and application of slurry seal on the RCRA and non-RCRA AC cap was conducted by ITSI and Vern Perry Construction from September 17 through September 19, 2007. All surface cracks and holes were filled and repaired with crack sealant prior to slurry seal placement.

- The fence repair was conducted by ITSI and San Joaquin Fence from October 15 through October 22, 2007.

- ITSI conducted a pre-final walk through inspection with the ITSI PM, ITSI Site Superintendent and USACE PM on November 28, 2007. The site inspection found some cracks that need to be resealed.

- ITSI and Vern Perry Construction crew returned to Site to re-seal the cracks in the new RCRA and Non-RCRA asphalt concrete on December 21, 2007. The crack repairs were not completed, due to onsite ponding from recent storms.

- ITSI returned to the Site on January 15, 2008, to continue the crack repairs. At this time, new cracks emerged from previously sealed cracks. Some of the cracks resealed in October and December 2007 had widened resulting in a new crack on the old crack seal. In addition, new crack lines have developed in the center of the Non-RCRA site. A large crack at the north and east corner of non-RCRA cap appears to have an empty space beneath the asphalt surface. Water ponds were still present on site. ITSI applied four (4) gallons of crack sealer over new and existing cracks to the best of our ability. ITSI documented the situation in the daily production report and photos, which were sent to USACE PM.

- ITSI submitted to USACE PM topographic and well location maps overlaid with commercial aerial photo as a visual reference of the well locations outside Site area on March 20, 2008.

An USACE representative performed full time oversight of the work. ITSI completed all necessary measures to meet the SOW and to seal the asphalt concrete pavement cracks. ITSI provided a Final Project Completion Report in April 2008 for the caps and fence repair at the Site. The report included project daily reports, material submittals, health and safety reports, photographic documentation and survey maps. Some of the photographs from the ITSI report for the cap and fence repair are included in Appendix B to this report.

Further repair work for the caps, which includes re-grading of the cap surface to avoid ponding, and complete sealing of the remaining asphalt concrete cracks, was started in February 2009, and is expected to be completed in 2011.

### 7.1.3 Tank UN-32 Content Removal & Disposal

USACE requested Panacea, under existing contract DACW09-00-D-0014 for groundwater monitoring, to conduct a supplemental sampling of the tank content. In March 2000, Panacea conducted the supplemental sampling by collecting a total of 14 liquid samples. Each sample was analyzed for stratification of liquid and the presence of the following contaminants: ethylene dibromide (EDB), CAM metals, pesticides, herbicides and VOCs. A total of six sludge samples were also collected. All collected sludge samples including QA/QC samples were analyzed for the presence of CAM metals, pesticides, herbicides and VOC's. Based on the analytical results, a recommendation was made that the tank content needed to be remediated in order to meet Arvin sewer discharge requirements. Following a preliminary review of remedial alternatives, liquid phase granular activated carbon (LPGAC) was selected as the feasible approach for remediating the tank content. Based on this recommendation, Panacea was contracted to design the system. The system design was completed in May 2000 (Panacea, May 2000). Following the completion of the design, the USACE contracted R. Simons Co. Inc., to install and operate the system. The system was installed in March 2001, and the remediation of the tank content was completed in May 2001.

After the remediation system achieved the discharge requirements and approval from the City of Arvin, the remediated liquid was discharged into the sewer system. The liquid was discharged at a discharge rate of approximately 32 gpm into the sewer over five days. Following the completion of liquid discharge, an inspection of the tank indicated that approximately 12,000 pounds of sludge remained at the base of the tank. Based on direction from the USACE and the opinion that the profile of the sludge might have changed after the treatment of the liquid, Panacea collected a total of ten samples including two QA/QC samples for analysis. A review of the results indicated that VOC's, metals, semi-VOCs, and organopesticides were present in some of the collected and analyzed samples. USACE contracted Panacea to remove the sludge and clean tank UN-32.

On November 20 and 21, 2001, field personnel equipped with safety gear, entered the tank and started removing the sludge through its 3-foot by 3-foot entrance. The removal was achieved by vacuuming the sludge via a hose connected to a Supersucker, an industrial piece of vacuum equipment. The process was completed on November 21, 2001. The sludge was place into two bins pending further sampling for off-site disposal.

On November 25, 2001 and November 29, 2001, and following sludge removal, the interior of the tank was triple rinsed and washed with high-pressure water. All rinsate was removed using the Supersucker vacuum and squeegees and stored in 2 separate bins. Following the completion of pressure washing of the tank interior, a confirmatory sampling of the tank was conducted, by collecting thirteen randomly selected wipe samples from the tank walls. Thirteen wipe samples were collected from the inside of the tank wall following the removal of rinsate. The collected samples were submitted to Del Mar Analytical, a State of California Certified Laboratory, for analysis of dinoseb. Dinoseb is the least soluble compound of the 7 COC's and the lack of its presence indicate that the other COC's were not present as well. Ten of the thirteen collected samples were analyzed for dinoseb using EPA Method No. 8151A. A review of the data indicates that all the confirmation samples were non-detect in the analysis.

The entry route was welded back in place, the positive/forced mechanical ventilation was removed, and the primary entry route was closed following a review of the data indicating that no detectable concentration of dinoseb was reported in any of the collected and analyzed wipe samples.

To dispose of the waste (solid and liquid) generated during the operation, a composite sample was collected from each bin. A total of four samples were collected and sent to Del Mar Analytical. The collected samples were analyzed in accordance with the approved work plan. The results indicated that content of one of the bin (1320-2) would classify as California hazardous waste. The content of the bin 1320-2 classified as California hazardous waste was transported to a Class I landfill (i.e., Dome Rock Industries, Inc.) in Arizona. The sludge in bin 1317-1, along with the rinsate in bins 1322 and *152* classified as non-hazardous, were transported to a recycling facility (i.e., Resource Renewal Technology, Inc.) in Maricopa, California.

In summary, cleaning of tank UN-32, which includes the removal and disposal of all contaminated materials resulting from previous site activities, was completed during 2001-2002, and resulted in removal of approximately 12,000 pounds of sludge and removal of 244,000 gallons of rinsate water. Details of tank UN-32 cleaning are provided in the February 2003 tank UN-32 Closure Report.

### 7.1.4 Tank UN-32 and Structure Removal and Disposal

The USACE retained Innovative Technical Solutions, Inc. (ITSI) in February 2009 to remove and dispose tank UN-32, and perform various maintenance activities for the OU-1 remedy. A Work Plan and Health and Safety Plan for this effort were prepared by ITSI, and approved by USACE and EPA. The removal, disposal and maintenance activities were performed during the period of February through April 2009, which consisted of the following tasks:

- **Tank UN-32 Removal and Disposal:** The tank UN-32 removal and disposal activities were performed in March 2009. As discussed in Section 7.1.3, the tank content were removed and disposed of in 2001. Also in 2001, the tank was decontaminated and verified clean, by performing confirmatory swipe sampling of the tank walls. The tank UN-32 was located within the RCRA cap area. The tank ancillary equipment, such as the metal ladder, was removed. The tank was removed by cold cutting to a depth of eight inches below the existing grade. The tank was cut up in small pieces and hauled off-site for disposal by recycling.

  The tank area excavation was backfilled with clean fill material and compacted to 90% compaction to eight inches below the existing RCRA cap surface grade. A four-inch base consisting of course material was placed at 90% compaction. A four-inch asphalt pavement layer was placed on top of the compacted base course layer. The finished grade matched the existing RCRA cap surface.

- **Truck Scales Removal and Disposal:** The truck scales were located within the non-RCRA cap area at the southeast corner of the existing metal building. The truck scales and associated scale equipment below the grade were removed. The metal from the scales and equipment were sized and hauled off-site for disposal by recycling. The scale and equipment excavation was backfilled with clean fill material to 90% compaction to 4 inches below the existing non-RCRA cap surface, followed by placement of a four inch asphalt pavement layer. The finished grade matched the existing non-RCRA cap surface.

- **Steel Post and Awning Structure Removal and Disposal:** Steel posts and the awning structure located to the south of the existing building within the non-RCRA cap area were removed. The metal awning was dismantled. The posts were removed by cold cutting. The post holes were plugged with asphalt to the non-RCRA cap surface. Metal from awning structure and the posts was sized and hauled off-site for disposal by recycling.

- **Wooden Structure Removal and Disposal**: The wooden structure portion at the southeast corner of the existing metal building was removed. The metal wall opening was closed with corrugated metal siding for safety and security. The wood debris from the dismantled wooden structure was disposed of in the Kern County landfill.

- **Asphalt Berm Placement:** A 12-inch asphalt berm was placed around the base of the existing building leaving only two access points. Location of the two access points were identified in the field by the USACE representative.

- **Easement Area Clearance:** The easement area of the property in accordance with County easement records on the perimeter outside the site east property line fence was cleared. The area was cleared of all weeds and debris and was graded to drain away from the site six to ten feet.

An environmental hazard survey, which included lead and mercury based paint survey on the surface of Tank UN-32 and Scale Building, was completed by Tierra Dynamic Company in 2008. Lead and Mercury base paint and fluorescent light ballasts were not present in the Scale House. Based on the analytical results in the Tierra Dynamic report, the Tank UN-32 exterior surface did not contain presence of regulated levels of lead or mercury. Therefore, the tank could be dismantled and disposed of, at an appropriate recycling facility as scrap metal with special precautions regarding release of aspirable particulate pollution. A total of 36.33 tons of scrap metal from Tank UN-32 decommissioning and various maintenance activities were sent to SA Recycling LLC in Bakersfield, California for recycling. The recycling facility received the scrap metal on March 12 and 13, 2009. A Project Completion Report detailing the removal and disposal activities was prepared by ITSI in June 2009 and was submitted to USACE and EPA. As-built (Figure A-19) for these activities is included in Appendix A, and photographic documentation is included in Appendix B.

### 7.1.5 BarCad® Installation

The BarCad® system was installed on all monitoring wells at the Site as a part of the Site maintenance activities. The conventional Grundfos groundwater sampling pumps needed to be replaced about every two years, resulting in very expensive maintenance. The BarCad® system improves groundwater sampling as the sampling-induced turbidity problem can be reduced or eliminated using the BarCad® sampling methodology. The BarCad® sampling equipment involves purging of very low water volumes. Other advantages of the BarCad® system include reduction in sampling costs, primarily due to reduction in sampling time, elimination of decontamination of pumps and bailers, prevention of possible cross contamination, and minimization of sampling wastes with reduction in purge and decontamination volumes.

The BarCad® system is a groundwater sampling instrument designed for permanent installation at a fixed elevation in groundwater monitoring wells. The system is made up of the BarCad® unit, which consists of a ceramic porous filter (approximately 1.5 inches in diameter and 16 inches long), a 1-inch-diameter PVC stinger pipe connecting the BarCad® unit to the top of the well, and a stainless steel probe with polyethylene tubing leading up the inside of the PVC stinger pipe to the well head. At the well head, attached to the top of the PVC riser tube, is a fitting equipped with an airtight Swagelok® fitting, for the polyethylene tubing to exit the interior of the PVC stinger pipe and a quick-connect fitting to connect the pressurized inert gas supply. The BarCad® system works by applying pressurized inert gas (nitrogen) to the inside of the PVC stinger pipe, which in turn pressurizes the water column inside the BarCad® unit, and drives the existing water into the stainless steel probe and up the polyethylene tubing to the surface. Subsequently, the inert gas displaces all of the water in the BarCad® unit and PVC stinger pipe through the stainless steel probe and polyethylene tubing, purging the BarCad® system of all existing water. After the system is purged, inert gas pressure is removed from the BarCad® system to allow groundwater to flow into the BarCad® unit. Inert gas pressure is reapplied and the resulting water can be collected as a sample for laboratory analysis.

## 7.2 Groundwater Monitoring

Groundwater monitoring of wells in the A-zone and B-zone was also continued during to 1999 as a part of the OU-1 investigation, to assess the groundwater flow in each zone, to evaluate the changes in concentration and distribution of the seven COCs and other chemicals over time, in the aquifers beneath the Site and the adjoining properties. A number of wells in A-zone and B-zone were sampled quarterly, and data were analyzed to assess the extent of contamination from the COCs and other chemicals in the A-zone and B-zone. Results of this groundwater monitoring are incorporated in the OU-2 RI/FS Report. Groundwater monitoring sampling in the A-zone and B-zone wells was continued from July 2000 to January 2004 on a quarterly basis for OU-2 investigations. The results of these sampling events are presented in the OU-2 RI/FS Report.

## 7.3 Closure Activities

As discussed previously in Section 5, all constructed components of the OU-1 ROD selected remedy attained remedial action goals and performance standards following construction completion in 1999. A final inspection by EPA and DTSC in February 2009 determined that the remedy would be deemed operational and functional on July 1, 2010. At that time, the State will assume responsibility for maintaining the constructed soil remedy comprised of the RCRA and non-RCRA caps.

Institutional controls have not yet been implemented.

## 8.0 Summary of Project Costs

A cost summary for RD/RA and O & M elements and a comparison of the actual project costs with the OU-1 ROD estimate is provided, below, in Table 8-1.

**Table 8-1: Cost Summary**

| Cost Item | ROD Estimate (1993 $$) | ROD Estimate (1999 $$)[1] | Actual Cost |
|---|---|---|---|
| RD-RA Capital Cost | $3,637,500 | $4,333,233 | $3,013,871 |
| O&M Costs (Through FY2008) | $594,400 | $824,632 | $2,702,371 |
| **Total** | **$4,231,900** | **$5,157,865** | **$5,716,242** |
| Projected (FY2009 – FY2029) O&M Cost | $1,386,000 | $3,037,119 | $3,037,119 |
| Difference, Actual Cost and ROD Estimate to date | $558,377 or 11% | | |

Note: The 1993 ROD cost estimate was adjusted from 1993 $$ to 1999 $$ when construction was performed using 3% annual inflation rate. The 1993 ROD annual O&M cost estimates were adjusted from 1993 $$ using 3% annual inflation rate.

The total actual cost for the OU-1 project to date is $5,716,242, approximately 11%, higher than the adjusted 1993 ROD estimate, primarily due to a lower RD/RA capital cost. The actual RD/RA capital cost is 30% lower than the ROD estimate, because the A-zone groundwater extraction & treatment system construction was not completed.

Construction of three extraction wells, two injection wells, four monitoring wells and a feasibility study for extraction system was completed. Based on the feasibility study, the A-zone groundwater extraction & treatment system was transferred to OU-2, to be addressed in conjunction with B-zone groundwater remediation.

The actual O&M cost through FY2008 is significantly higher than the adjusted 1993 ROD estimate primarily due to extensive maintenance and replacement of dedicated groundwater sampling pumps, replacement of dedicated sampling pumps with new sampling device (BarCad® system), and tank UN-32 content treatment, removal and disposal. These items were unexpected and were not included in the ROD O&M estimate.

The actual O&M cost also includes quarterly sampling and analysis of 21 additional A-zone and B-zone monitoring wells, which were not included in the groundwater monitoring specified in the ROD. This quarterly sampling assessed the extent of contamination from the COCs and other chemicals in the A-zone and B-zone. Extensive work required for the RCRA and non-RCRA caps cracks and subsidence increased the O&M costs. Details of the OU-1 costs are provided in Appendix C.

## 9.0 Observations and Lessons Learned

This section presents the successes and challenges encountered in the implementation of the RA. Observations and lessons learned for the Site OU-1 are provided below.

- **Operable Units Organization:** The Site is divided in two operable units. OU-1 was established to address surface soils, subsurface soils, and the A-zone groundwater. The second operable unit, OU-2, was planned for the deeper B-zone groundwater. The OU-1 ROD selected remedy included extraction, treatment and re-injection of the A-zone groundwater using conventional extraction well design. Due to insufficient hydrogeologic characterization during the RI/FS, an aquifer test and a treatability study were conducted during remedial action construction. The aquifer test indicated that pumping from conventional wells is not a viable method of groundwater extraction at the Site due to extremely low well yields. The construction of the A-zone groundwater extraction and treatment component was not completed, and a decision was made for efficiency to transfer A-zone groundwater component of the OU-1 ROD to OU-2. The A-zone groundwater will be addressed in conjunction with the B-zone groundwater in OU-2. All other components of the OU-1 remedy were completed.

- **Tank UN-32 Content Removal and Disposal:** Tank UN-32 was a 405,000-gallon above ground storage tank with sludge and water, used during the facility operation. The treatment of the tank contents, removal and disposal were planned to be part of the OU-1 remedy construction work. However, during the construction activities, the tank UN-32 was used to store decontamination water, so the removal of the tank was deferred to O&M. The ROD O&M cost estimate did not include addressing the tank UN-32, which was a major task with unanticipated costs. This task should have been completed during the construction phase of the project.

# 10.0 B&B Site OU-1 Contact Information

## 10.1 EPA-DTSC Project Managers

Travis Cain, EPA Remedial Project Manager
US EPA, Region 9
75 Hawthorne Street
San Francisco, CA 94105
Phone: (415) 972-3161

Emmanuel Mensah, DTSC Project Manager
DTSC
1001 I Street
Sacramento, CA 95814-2828
Phone: (916) 255-3704

## 10.2 Contracting & Oversight Contractor

An interagency agreement (IAG) was executed between EPA and the USACE, providing the USACE with construction contracting and oversight responsibility for the B&B OU1 remedial action.

Cecilia Horner
Project Manager
U.S. Army Corps of Engineers, Albuquerque District
4101 Jefferson Plaza, NE
Albuquerque, NM 87109
Phone: (505) 342-3477

## 10.3 Remedial Design and Remedial Action Contractor

The USACE utilized an existing pre-placed remedial action contract (PRAC) to hire Morrison Knudsen Corporation to provide design and construction management services for OU-1. MK conducted this work under contract (DACW05-94-D-0017) to the U.S. Army Corps of Engineers (USACE). Washington Group, Inc. acquired Morrison Knudsen in 1996. In 2007, Washington Group, Inc. became a division of URS Corporation based in San Francisco.

Morrison Knudsen Corporation/URS Corporation
17300 Redhill Ave.
Suite 150
Irvine, CA 92614-5640
Phone: (949) 756-6006

## 10.4 Remedial Action Subcontractors

MK utilized subcontractors to complete construction for the OU-1 remedy. Listed below is the contact information for the subcontractors used.

- RCRA and Non-RCRA Cap Construction:

  Griffith Company
  PO Box 70157
  1898 South Union Avenue
  Bakersfield, CA 93387-0157
  Phone: (661)831-7331
  Fax: (661)831-0113

- RCRA Cap Geosynthetic Clay Liner Placement:

  Alpine Lining of Bakersfield
  18300 Rosedale Highway
  Bakersfield, CA 93314
  Phone: (661) 587-7150

- Drilling and Well Construction:

  BC2 Environmental
  1150 West Trenton Avenue
  Orange, CA 92867
  Phone: (714) 744-2990

- UST Removal, Rail Demolition Tank-UN32 Demolition and Hauling for Disposal:

  MP Environmental Services
  3400 Manor Street
  Bakersfield, CA 93308
  Phone: 800-458-3036
  Fax: (661) 393-0508

- Waste and UST Disposal:

  Safety Kleen/Laidlaw Facility
  2500 West Lokern Road
  Button Willow, California 93206

  Concrete Recycling:
  Granite Construction
  3000 James Rd
  Bakersfield, CA 93308
  Phone: (661) 399-3361

  Metal Recycling:
  Golden State Metals
  2000 East Brundage Lane
  Bakersfield, CA 93307
  Phone: (661) 327-3559

- Power Drop and Electrical Services:

  Pacific Gas & Electric
  1918 H Street
  Bakersfield CA, 93301
  Phone: (661) 398-5894

  A-C Electric Company
  (California C-10 License 99849)
  P.O. Box 1834
  315 30th Street (93301)
  Bakersfield, CA 93303
  Phone: (661) 633-5368
  Fax: (661) 324-2761

- Chain-Link Fence Installation:

  Alcorn Fence Co.
  9901 Glenoaks Blvd
  Sun Valley, CA 91352-1023
  Phone: (818) 983-0650

- Soil and Water Sample Analysis:

  Associated Laboratories
  806 North Batavia Street
  Orange, CA 92868
  Phone: (714) 771-6900

- Surveying and Geotechnical Analysis:

  Arrow Engineering Services, Inc.
  42138 10th St West
  Lancaster, CA 93534-7004
  Phone: (661) 949-2525

- Air Monitoring Sample Analysis:

  Truesdail Laboratories, Inc.
  14201 Franklin Avenue
  Tustin, CA 92780
  Phone: (714) 730-6239

- Analytical Data Validation:

  Enviro-Chem, Inc.
  1214 East Lexington Avenue,
  Pomona, CA 91766
  Phone: (909) 590-5905

- Quality Assurance Analysis of Split Samples for USACE:

  Sequoia Analytical Laboratories
  1455 McDowell Boulevard, #D
  Petaluma, California 94594
  Phone: (707)792-1865

## 10.5 Operation & Maintenance Contractors and Subcontractors

Panacea, Inc.
14700 Firestone Boulevard
Suite 118
La Mirada, CA 90638
Phone: (714) 228-1286

Eco & Associates
1855 W Katella Avenue
Orange, CA 92867
Phone: (714) 289-0995

Del Mar Analytical
2852 Alton Avenue
Irvine, CA 92606
Phone: (949) 261-0858

Advanced Industrial Services
6701 McDivitt Drive
Bakersfield, CA 93313
Phone: (661) 837-0477

R. Simons Co. Inc.
730 Garrett Lane
Arroyo Grande, CA 93420-9619
Phone: (805) 343-9111

Tierra Dynamic Company
2222 W. Parkside Lane – Suite 105
Phoenix, AZ 85027
Phone: (602) 864-3990

Innovative Technical Solutions, Inc.
2730 Shadelands Drive
Suite 100
Walnut Creek, CA 94598
Phone: (888) 545-4874

San Joaquin Fence & Supply
1933 E California Avenue
Bakersfield, CA 93307
Phone: (661) 322-9700

Vern Perry Asphalt Paving Inc.
1017 E Chestnut Avenue
Santa Ana, CA 92701
Phone: (714) 550-7711

## 11.0 References

The following Site documents were reviewed for preparing this Remedial Action Report:


- Phase I - Investigation Report, Arvin and Shafter Facilities, Kern County California, prepared for Brown & Bryant, Inc., Arvin and Shafter, California, Canonie Environmental, November 1987.

- Brown and Bryant Soil Washing Funded Removal Action, Arvin, California, Ecology and Environment, Inc., May 31, 1991.

- Remedial Investigation/Feasibility Study Report, First Operable Unit - Source Control, Brown and Bryant Superfund Site, Arvin California, USEPA Region IX, May 28, 1993.

- EPA Superfund Record of Decision, Brown & Bryant, Inc. (Arvin Plant), EPA ID CAD052384021, OU 01, Arvin, CA, November 8, 1993 (EPA/ROD/R09-94/108).

- Completion Report for Remedial Action, Brown and Bryant Superfund Site, Arvin California, Morrison Knudsen Corporation, January 1997.

- Correspondence, Railroad Spur Dinoseb Impacted Soil Removal, Morrison Knudsen Corporation, April 1, 1997.

- Project Work Plan, Brown & Bryant, Arvin Facility Superfund Site, First Operable Unit, Phase II, Arvin, California, Morrison Knudsen Corporation, September 1998.

- Design Analysis Report, Groundwater Extraction and Treatment System, Brown & Bryant EPA Superfund Site, First Operable Unit, Arvin, CA, Morrison Knudsen Corporation, April 6, 1999.

- Treatability Study Report, Groundwater Extraction and Treatment System, Brown & Bryant EPA Superfund Site, First Operable Unit, Arvin, CA, Morrison Knudsen Corporation, April 6, 1999.

- Aquifer Test Report, Brown and Bryant Superfund Site, Arvin California, Morrison Knudsen Corporation, August 1999.

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- Site-Specific Groundwater Sampling and Analysis Plan, Final, Brown & Bryant Superfund Site, Arvin, California, Panacea, Inc., July 2000.

- Memorandum, Five-Year Review for the Brown & Bryant Superfund Site, Arvin, CA, from Travis L. Cain, July 12, 2001.

- UN-32 Tank Closure Report, Final, Brown and Bryant Superfund Site, Arvin California, Panacea, Inc., February 2003

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- Second Five-Year Review Report for Brown and Bryant Superfund Site, Arvin, California, U.S. Environmental Protection Agency, Region 9, San Francisco, California, August 22, 2006.

- Proposed Plan, Brown & Bryant Superfund Site Operable Unit No. 2, City of Arvin, Kern County, California, United States Environmental Protection Agency, Region 9, San Francisco, California, June 2007.

- August 2007 Groundwater Monitoring Report, Brown and Bryant Superfund Site, Arvin, California, Eco and Associates, Inc., September 2007.

- Record of Decision, Brown and Bryant Operable Unit No. 2 Superfund Site, Arvin, CA, U. S. Environmental Protection Agency, Region 9, September 2007.

- Final Project Completion Report, Cap and Fence Repair at the Brown and Bryant Superfund Site, Arvin, California, Innovative Technical Solutions, Inc., April 2008.

- Project Completion Report, Various Maintenance Activities, Brown and Bryant Superfund Site, Arvin, California, Innovative Technical Solutions, Inc., June 2009.

- USEPA Brown & Bryant, Inc. (Arvin Plant) Website, http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/ViewByEPAID/CAD052384021?OpenDocument

- DTSC Envirostor Website, Brown And Bryant Inc, Arvin Facility, http://www.envirostor.dtsc.ca.gov/public/profile_report.asp?global_id=15280011

# APPENDIX A
# FIGURES

## Figure A-1: Site Layout

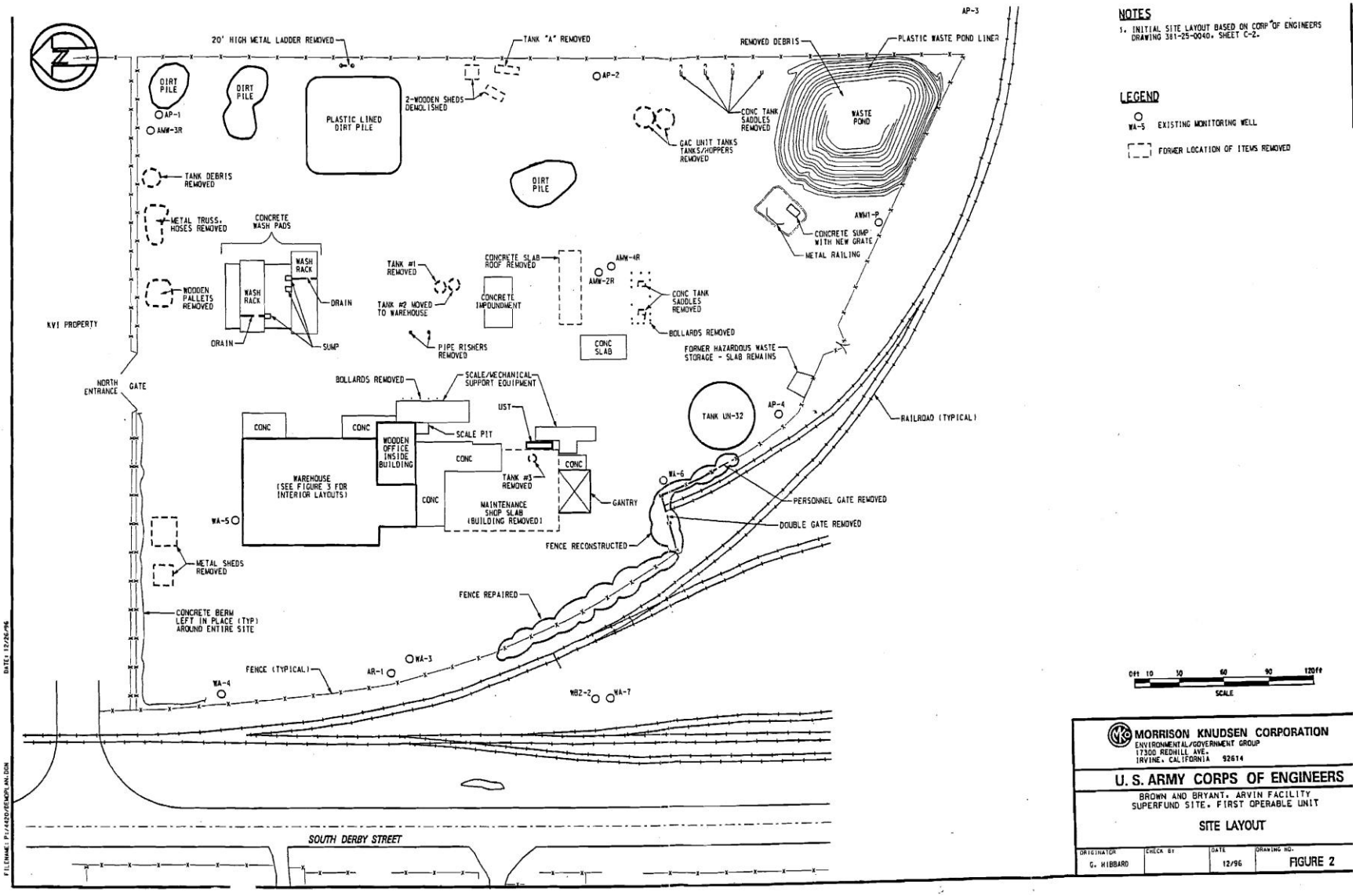


**Figure A-2: Demolition Plan**

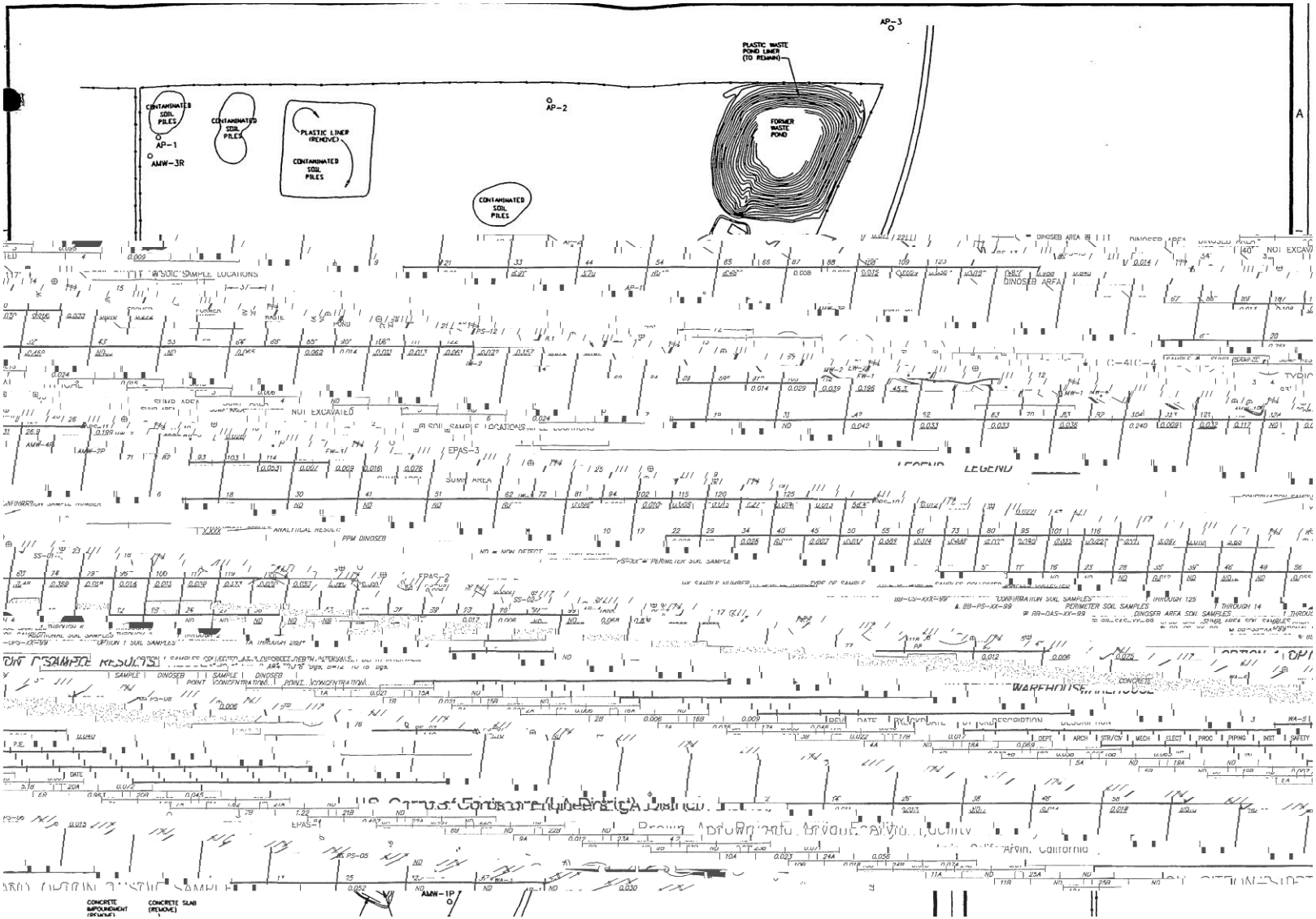
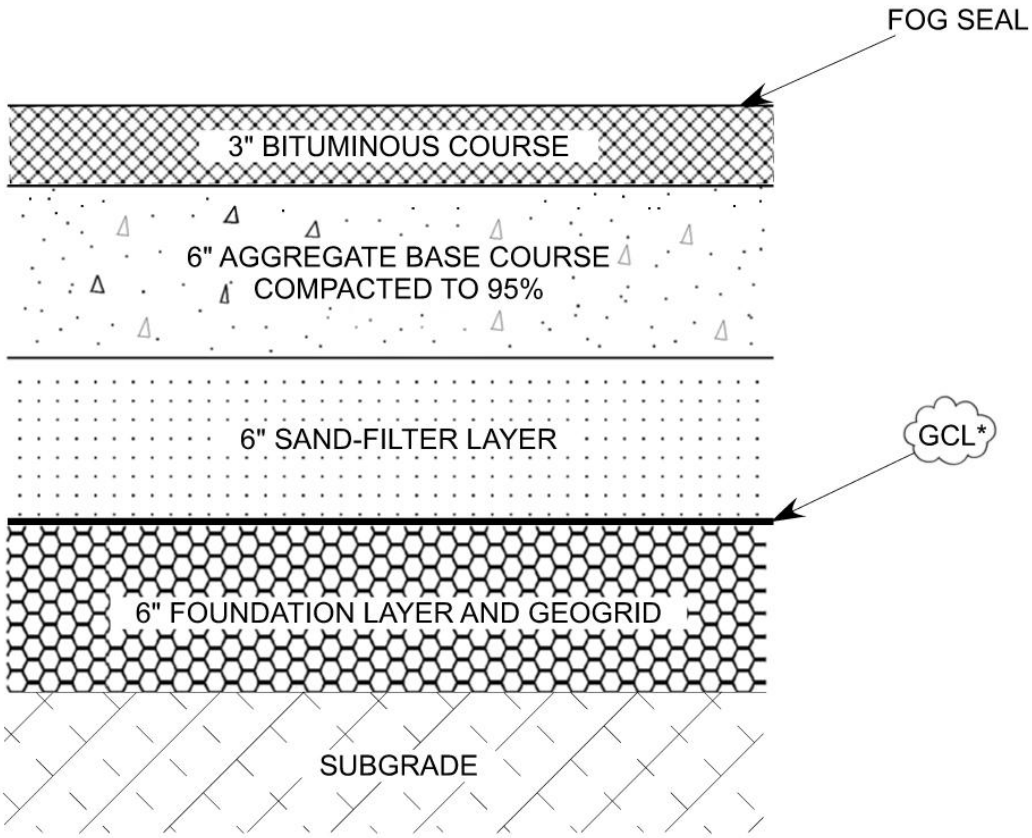
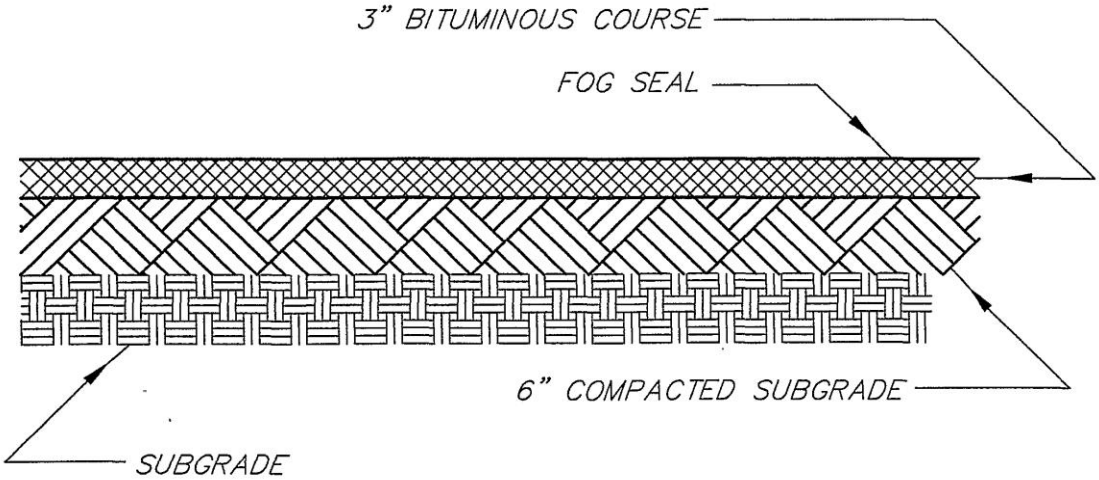


**Figure A-4: RCRA Cap Cross Section**




GCL: Geosynthetic Clay Liner
Scale: None

**Figure A-5: Basic Cap Cross Section**




Scale: None

**Figure A-6: Well Locations**

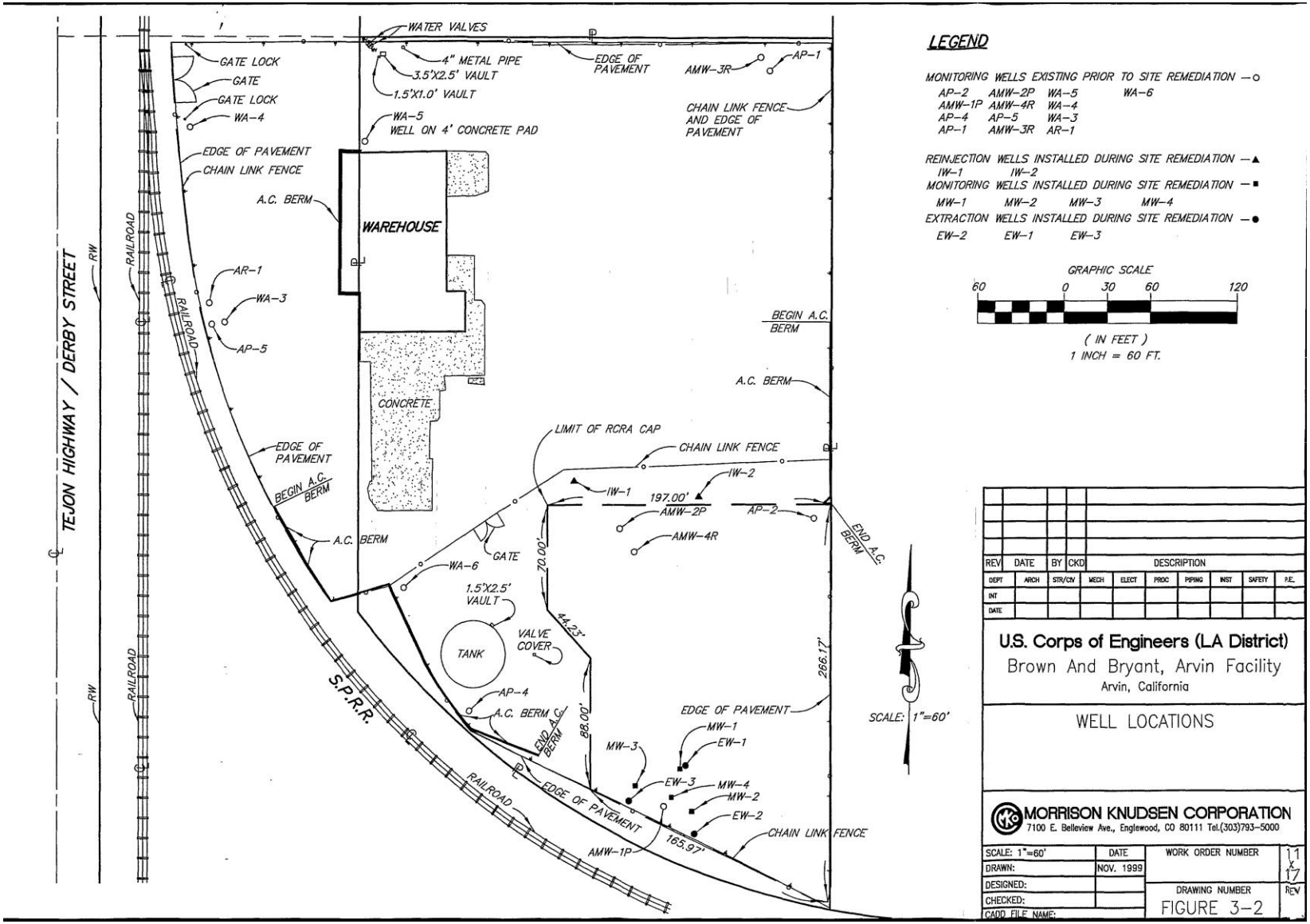
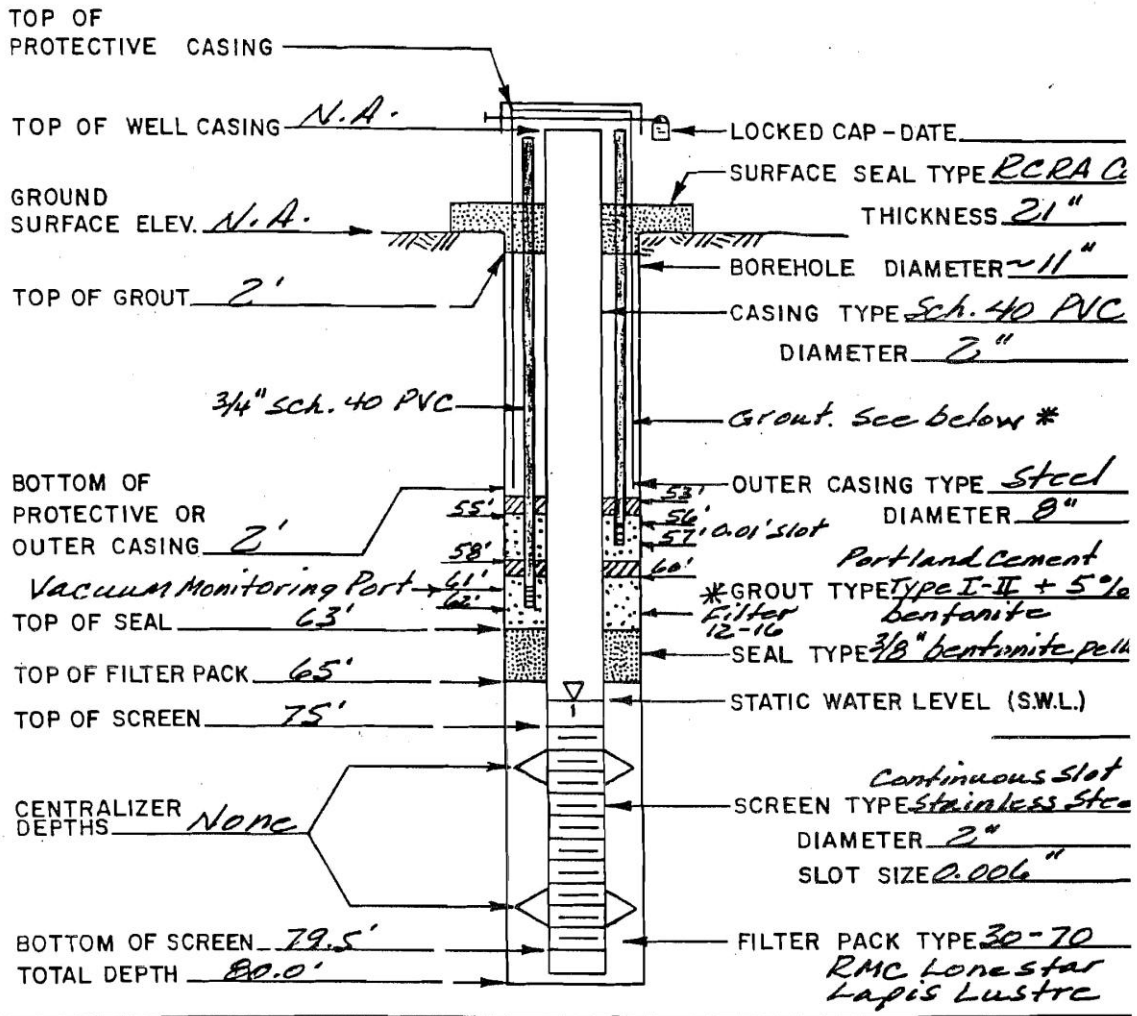


**Figure A-7**

## WELL COMPLETION RECORD

PROJECT Brown & Bryant LOCATION South end of site
WELL NUMBER MW-1 DATE INSTALLED 5/22/99
MKE REPRESENTATIVE A. Benfer DRILLER BC² Environmental




COMMENTS All pipes is flush-threaded with "O" rings. Vacuum ports constructed in annulus above well Screen Are sealed with bentonite

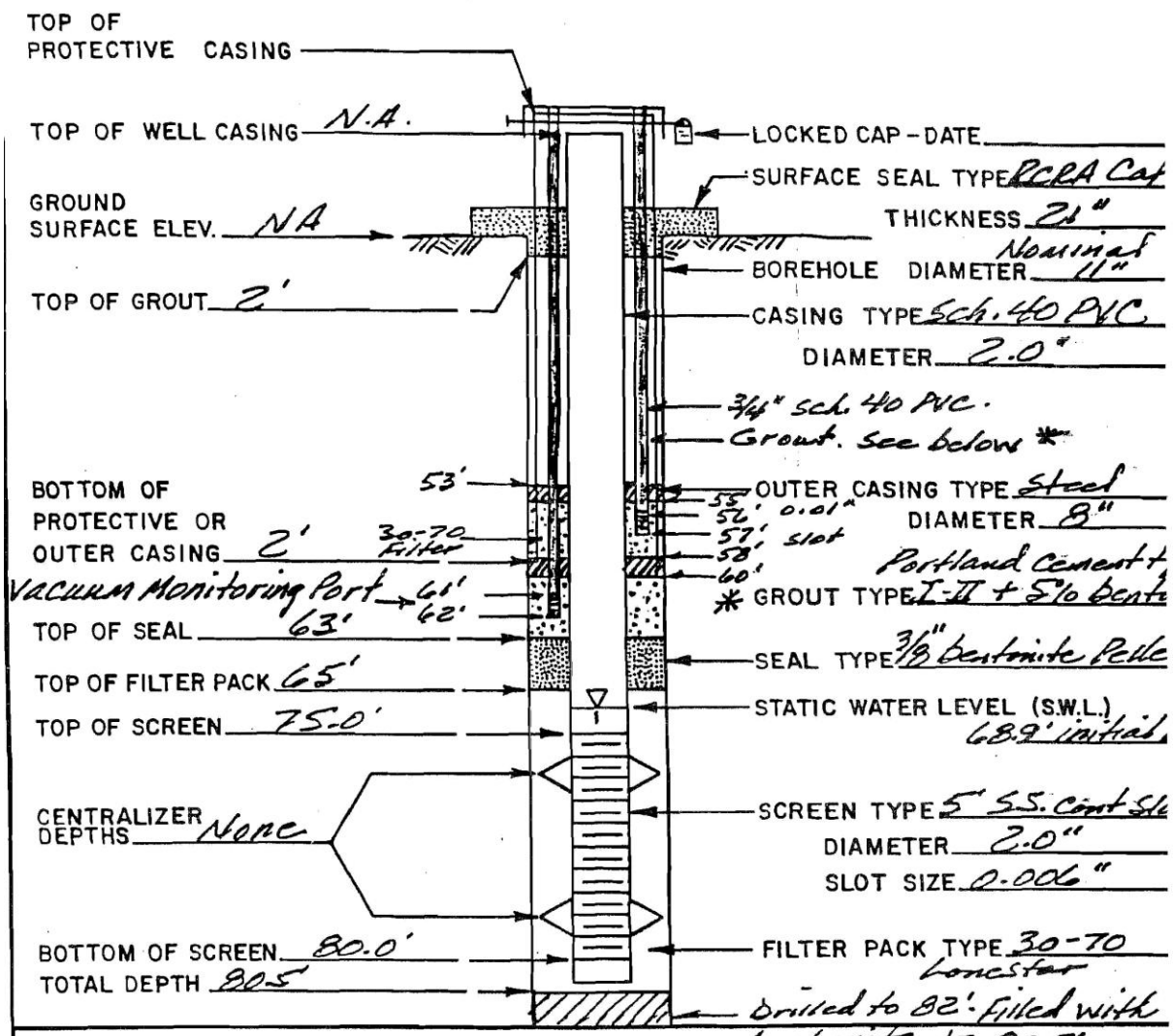
MKE REPRESENTATIVE SIGNATURE [signature] DATE 5/22/99
Ca. RG 3405

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES DIVISION

**Figure A-8**

## WELL COMPLETION RECORD

PROJECT Brown & Bryant
LOCATION South end of site
WELL NUMBER MW-2
DATE INSTALLED 5/6/99
MKE REPRESENTATIVE A. Benfer
DRILLER BC² Environmental




COMMENTS
All pipe Flush-threaded with "O" rings.
Vacuum ports constructed in annulus above well screen.
Are sealed with bentonite

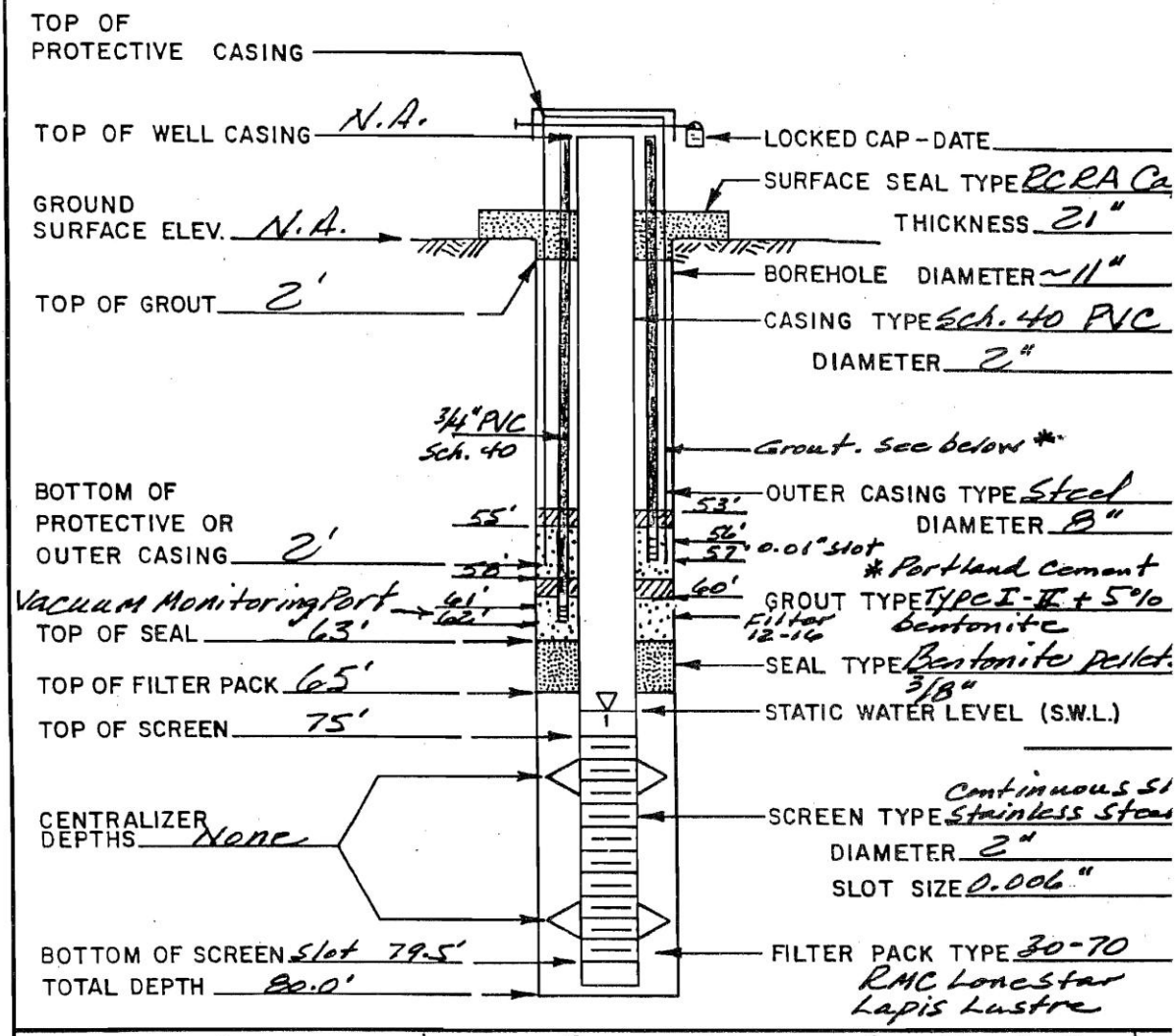
MKE REPRESENTATIVE SIGNATURE A. Alan Benfer DATE 5/6/99
Ca. RG 3405

MORRISON KNUDSEN CORPORATION

**Figure A-9**

## WELL COMPLETION RECORD

PROJECT Brown & Bryant LOCATION South end of site
WELL NUMBER MW-3 DATE INSTALLED 5/21/99
MKE REPRESENTATIVE A. Benfer DRILLER BC² Environmental




COMMENTS All well pipe is flush-threaded with "O" rings 3/4" Vacuum ports constructed in annulus above well Scree Are sealed with bentonite

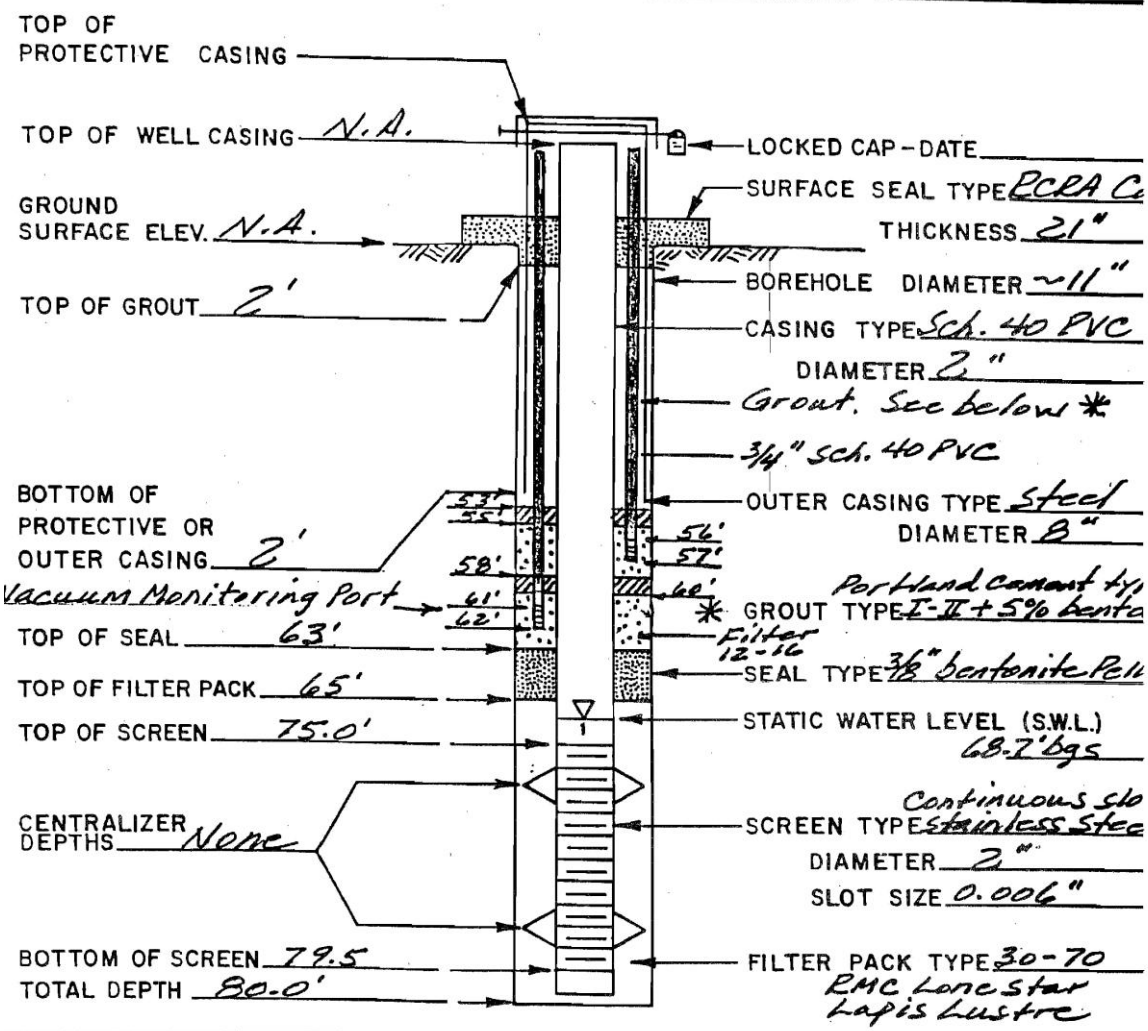
MKE REPRESENTATIVE SIGNATURE Alan Benfer DATE 5/21/99

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES DIVISION

**Figure A-10**

## WELL COMPLETION RECORD

PROJECT Brown + Bryant LOCATION South end of site
WELL NUMBER MW-4 DATE INSTALLED 5/22/99
MKE REPRESENTATIVE A. Benfer DRILLER BC² Environmental




COMMENTS All pipe flush threaded with "O" rings. Vacuum Ports constructed in annulus above well screen. Are sealed with bentonite.

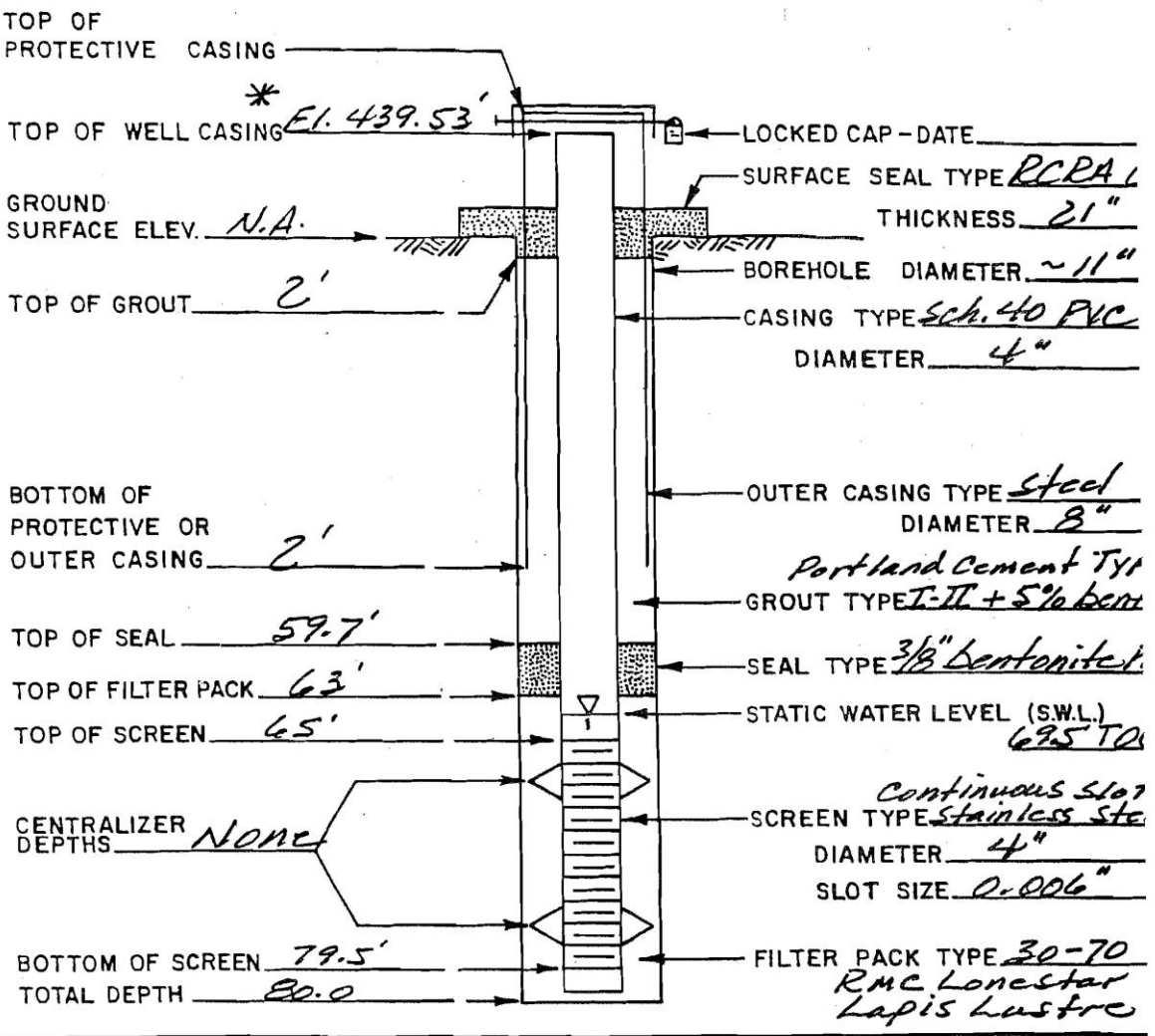
MKE REPRESENTATIVE SIGNATURE [signature] DATE 5/22/9
Ca. RG 3405

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES DIVISION

**Figure A-11**

## WELL COMPLETION RECORD

PROJECT Brown & Bryant LOCATION South end of site
WELL NUMBER EW-1 DATE INSTALLED 5/5/99
MKE REPRESENTATIVE A. Benfer DRILLER BC² Environmental




COMMENTS All pipe is flush-threaded with "O" rings
* Approximately 2-feet of PVC casing will be added in the future

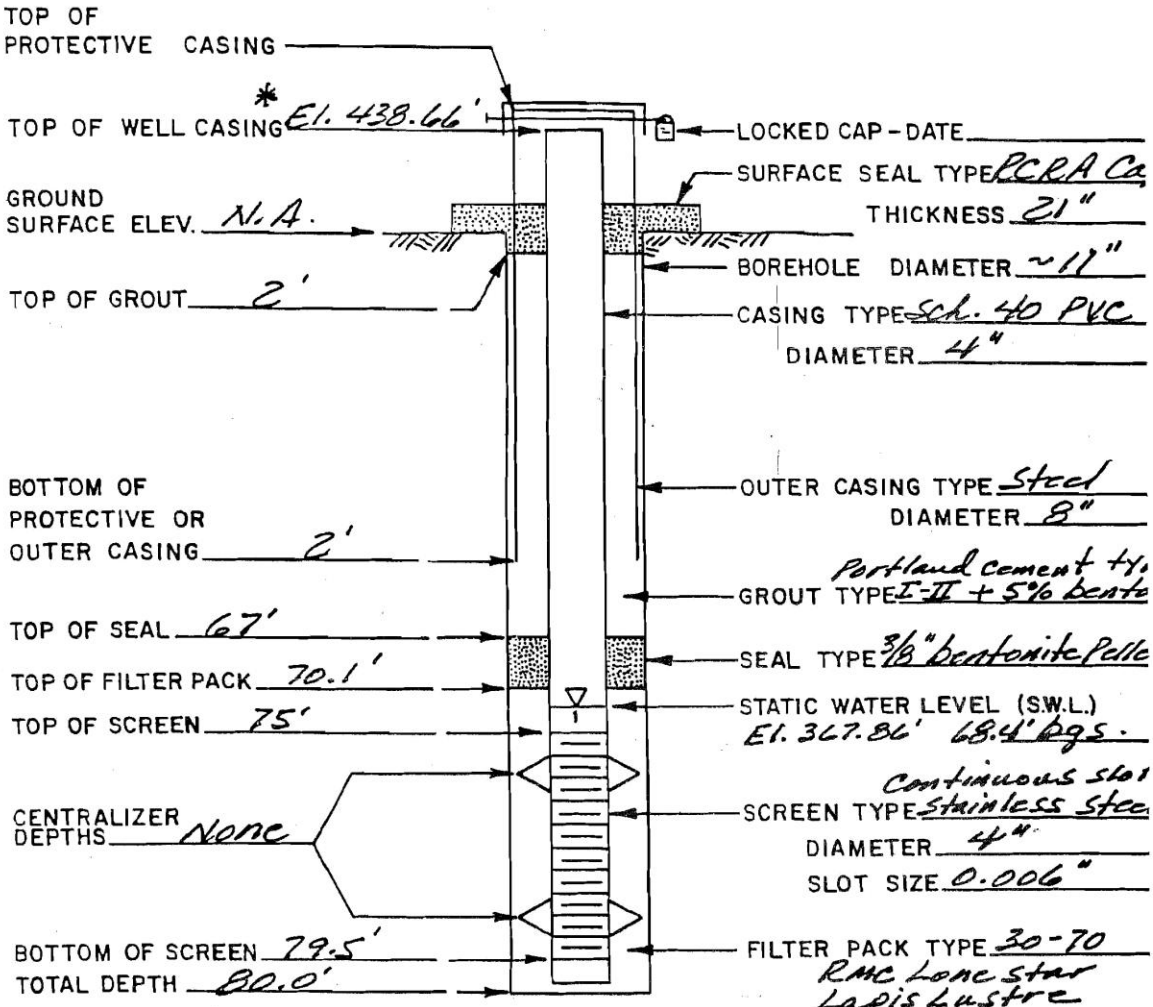
MKE REPRESENTATIVE SIGNATURE A. Benfer DATE 5/5/99
Ca. RG 3405

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES DIVISION

**Figure A-12**

## WELL COMPLETION RECORD

PROJECT Brown + Bryant
LOCATION south end of site
WELL NUMBER E.W-2
DATE INSTALLED 5/3 - 5/4/99
MKE REPRESENTATIVE A. Benfer
DRILLER BC² Environmental




COMMENTS All pipe is flush-threaded with "O" rings
* Approximately 2-feet of casing will be added in the fut

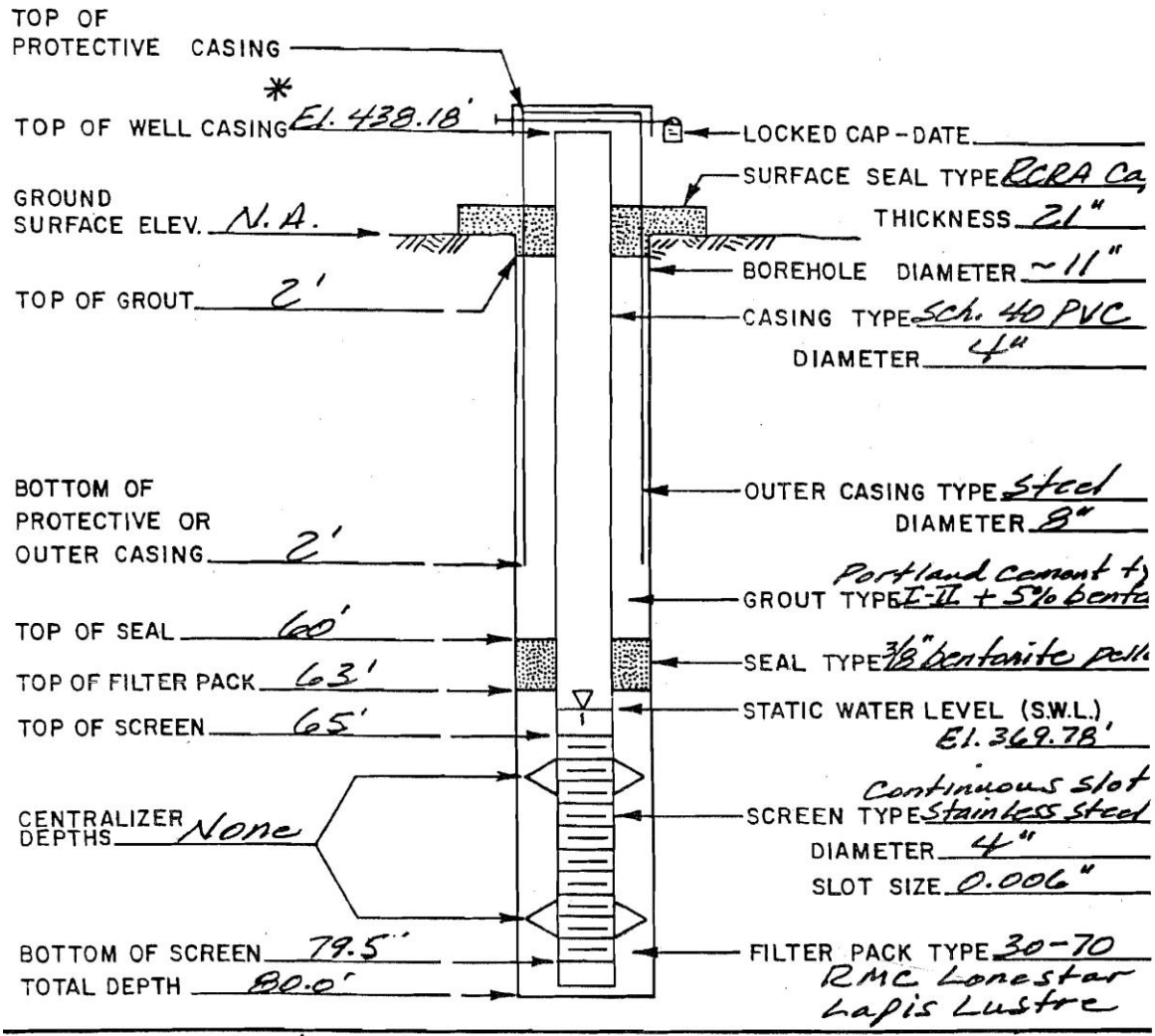
MKE REPRESENTATIVE SIGNATURE Allan Benfer Ca. RG 3405 DATE 5/4/99

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES DIVISION

**Figure A-13**

## WELL COMPLETION RECORD

PROJECT Brown & Bryant LOCATION South end of site
WELL NUMBER EW-3 DATE INSTALLED 5/4-5/5/99
MKE REPRESENTATIVE A. Benfer DRILLER BC² Environmental




COMMENTS All pipe is flush-threaded with "O" rings.
* Approximately 2-feet of casing will be added in the futu

MKE REPRESENTATIVE SIGNATURE [signature] DATE 5/5/99
Ca. RG 3405

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES DIVISION

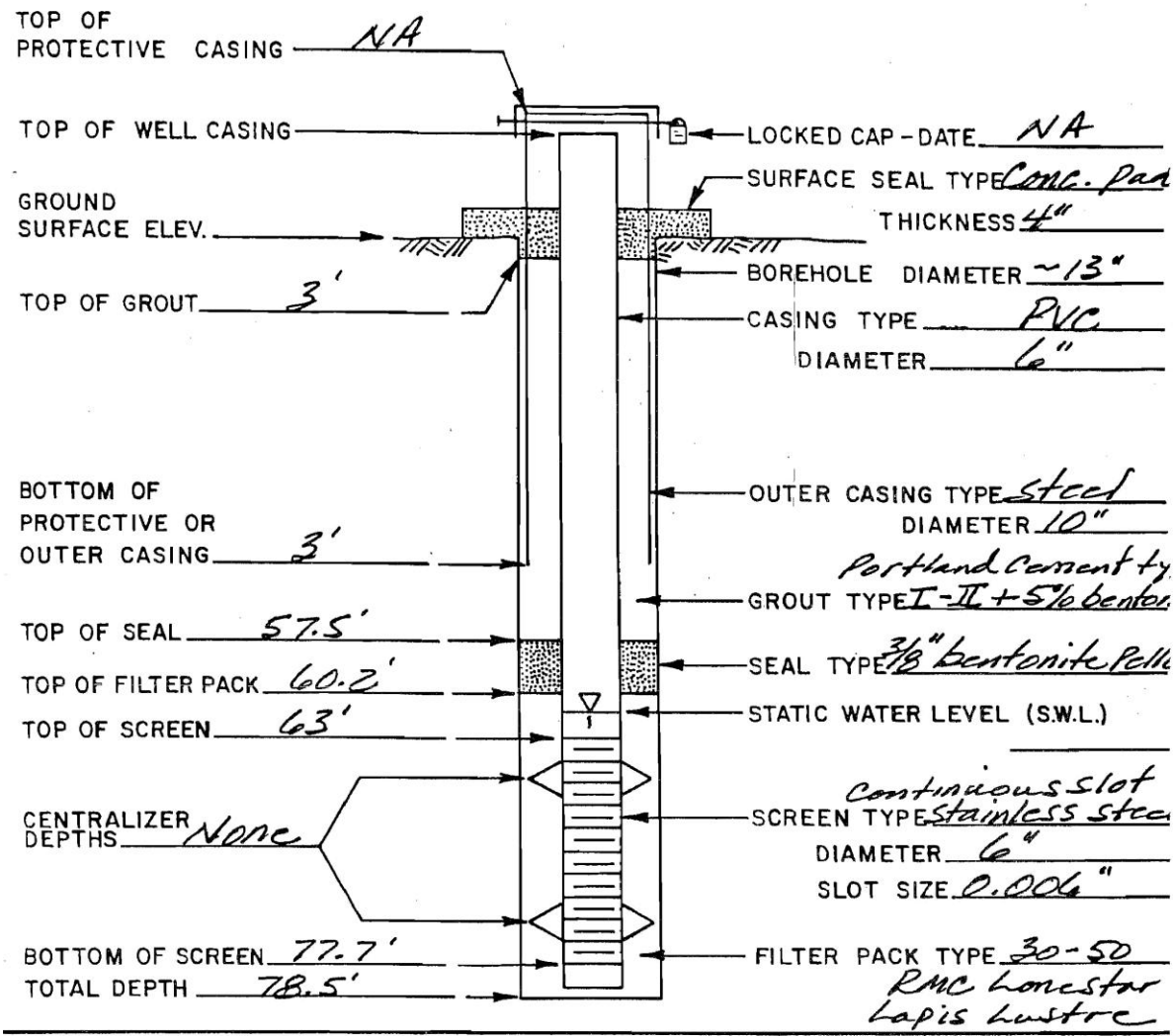
**Figure A-14**

## WELL COMPLETION RECORD

PROJECT Brown & Bryant LOCATION Near Center of site

WELL NUMBER IW-1 DATE INSTALLED 5/20-5/21/99

MKE REPRESENTATIVE A. Benfer DRILLER BC² Environmental




COMMENTS All pipe is flush-threaded with "O" rings.

MKE REPRESENTATIVE SIGNATURE A. Alan Benfer DATE 5/21/99
Ca. RG 3405

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES DIVISION

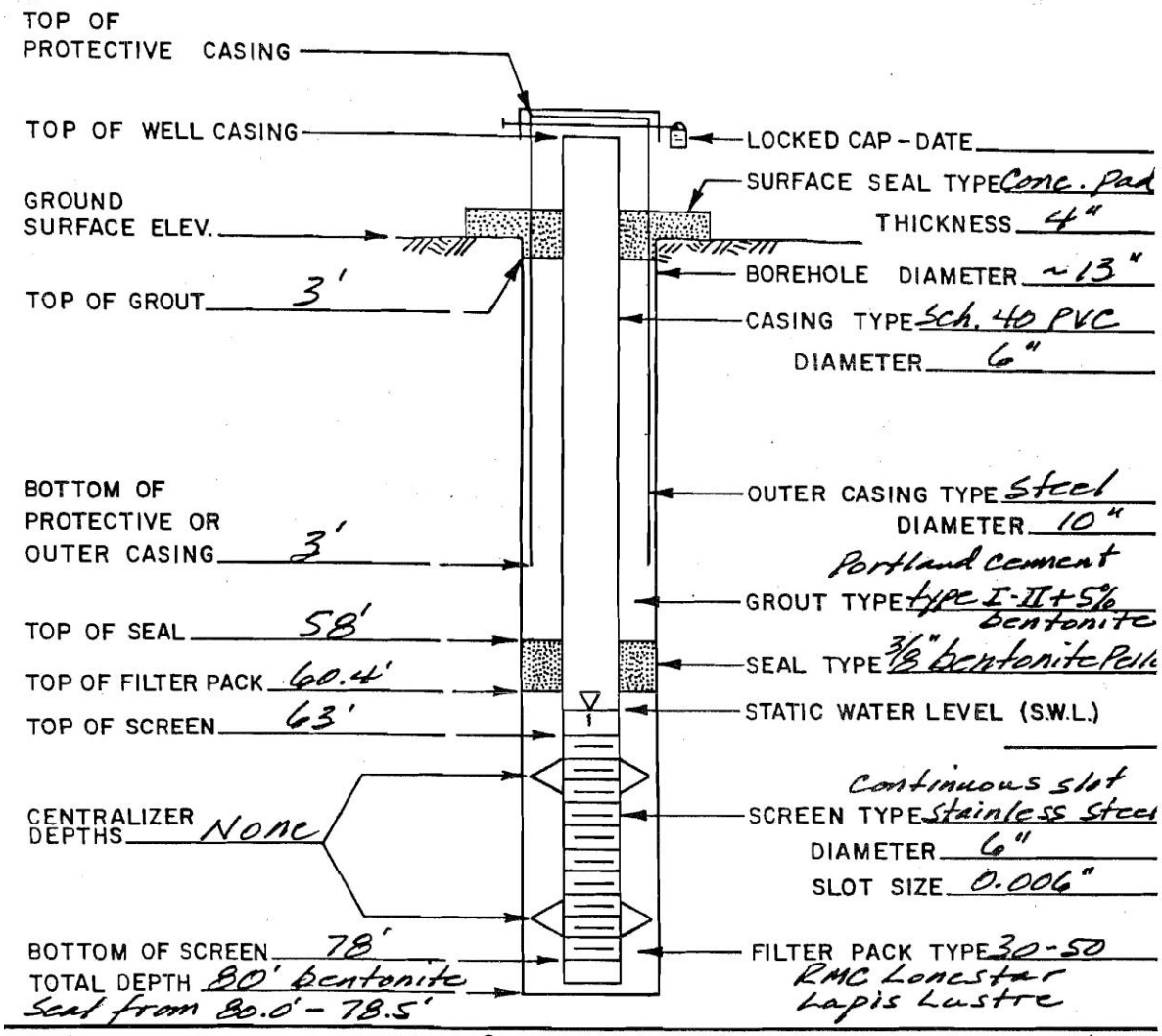
**Figure A-15**

WELL COMPLETION RECORD

PROJECT Brown & Bryant LOCATION Near Center of site

WELL NUMBER IW-2 DATE INSTALLED 5/21/99

MKE REPRESENTATIVE A. Benfer DRILLER BC² Environmental

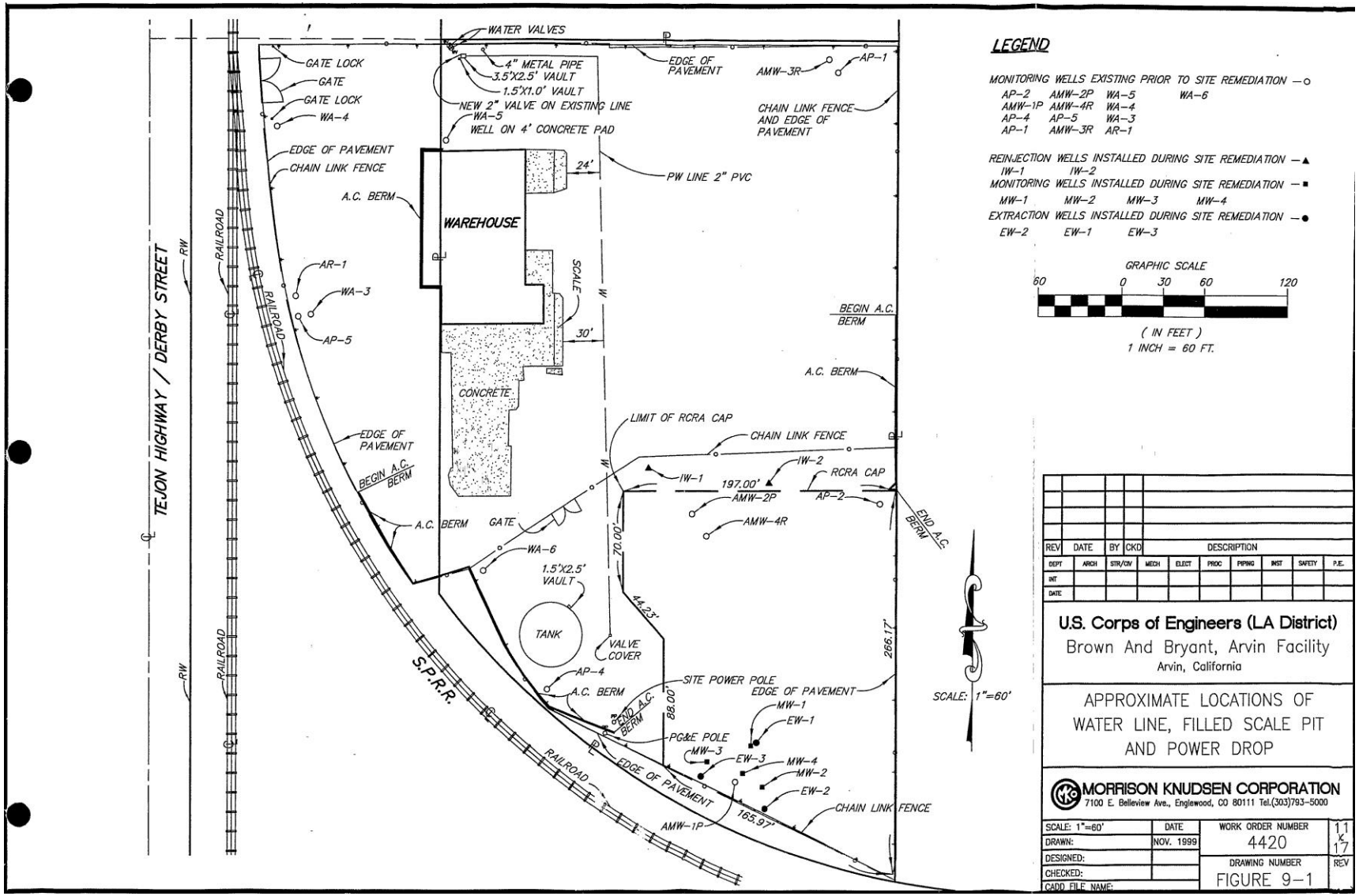



COMMENTS All pipe is flush-threaded with "O" rings

MKE REPRESENTATIVE SIGNATURE [signature] Ca. RG 3405 DATE 5/21/99

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES DIVISION

**Figure A-16: Approximate Locations of Water Line, Filled Scale Pit and Power Drop**



## Figure A-17: Site As-Built Survey

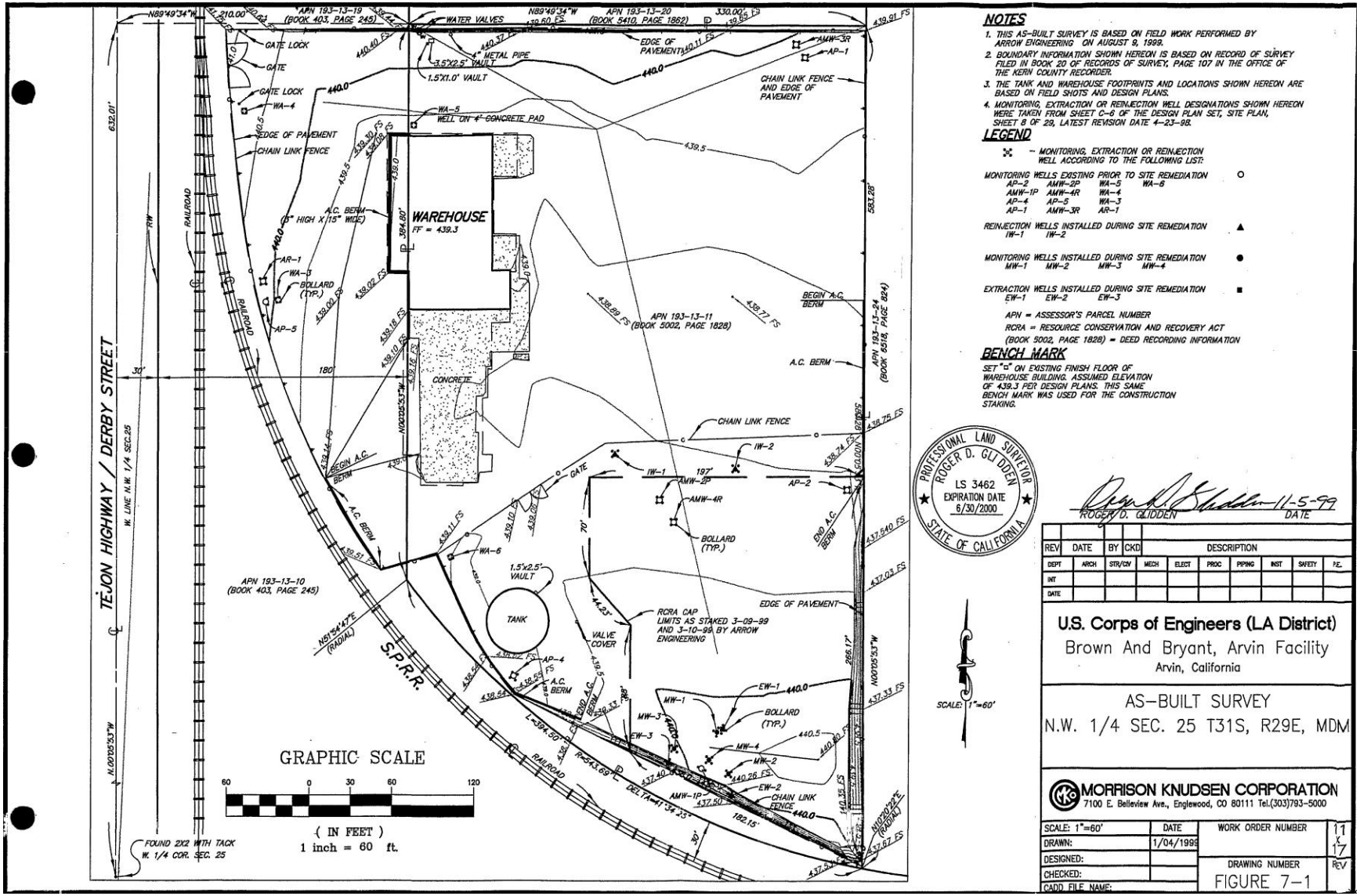
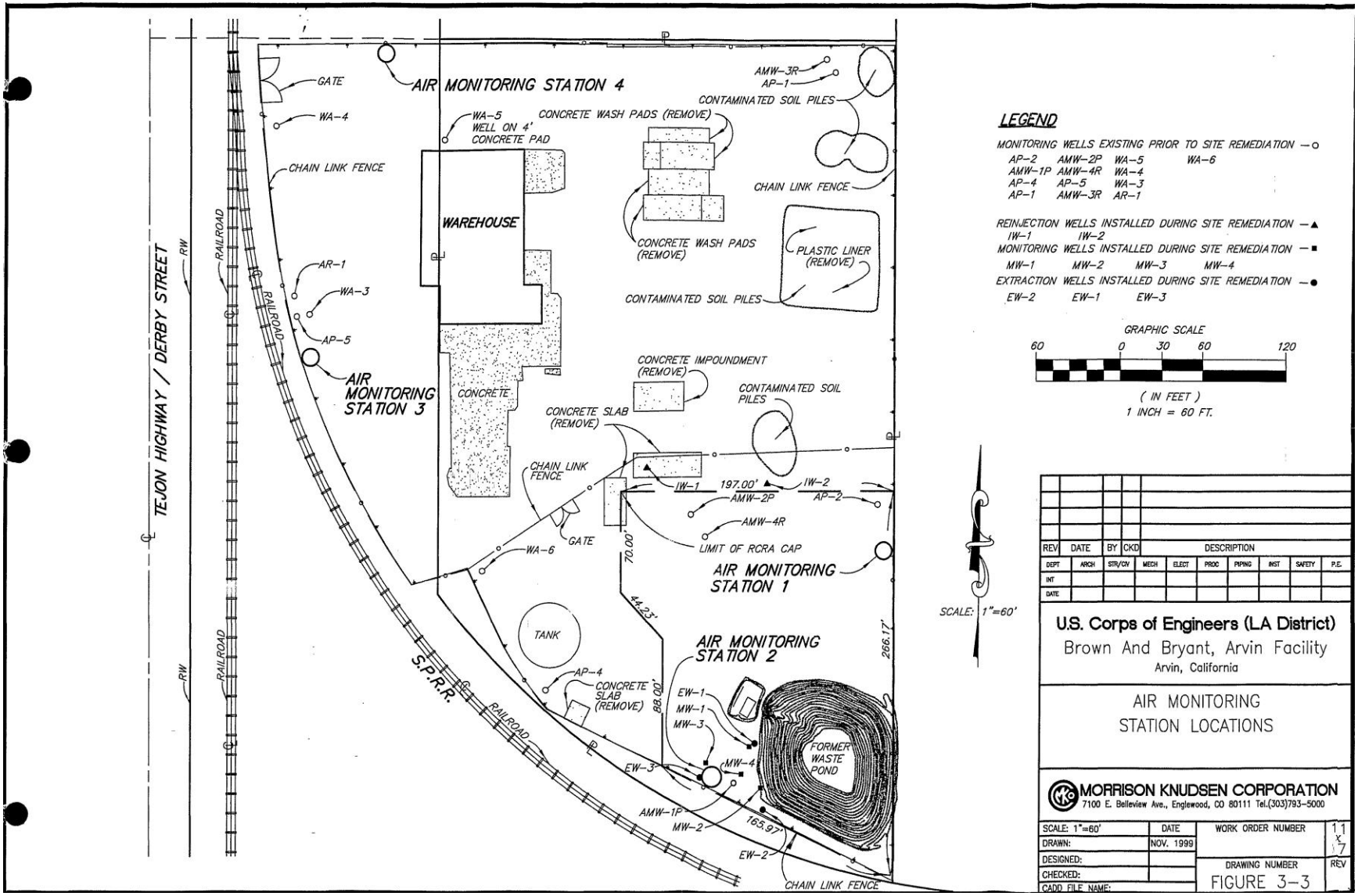
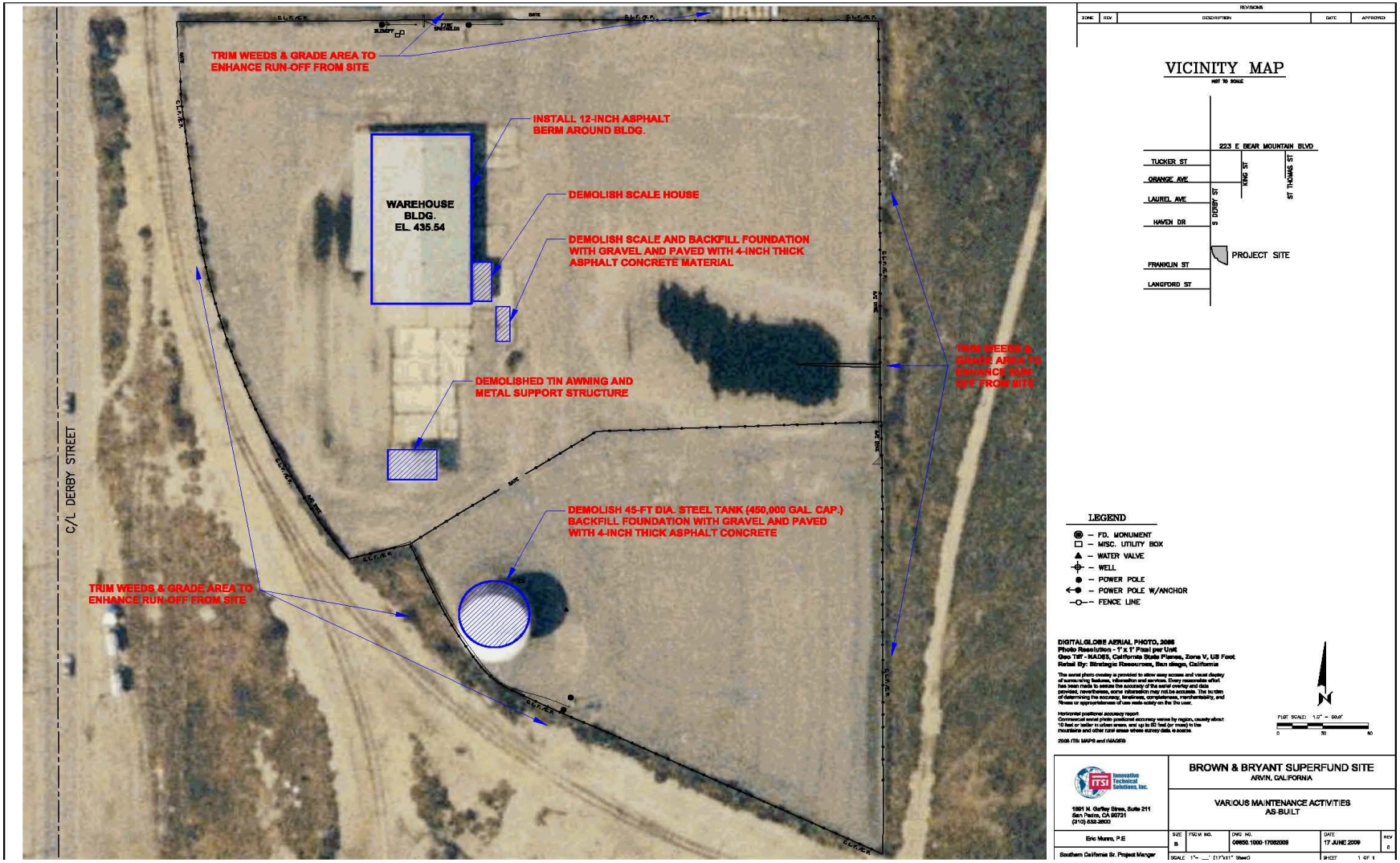


**Figure A-18: Air Monitoring Station Locations**



## Figure A-19: Various Maintenance Activities As-Build



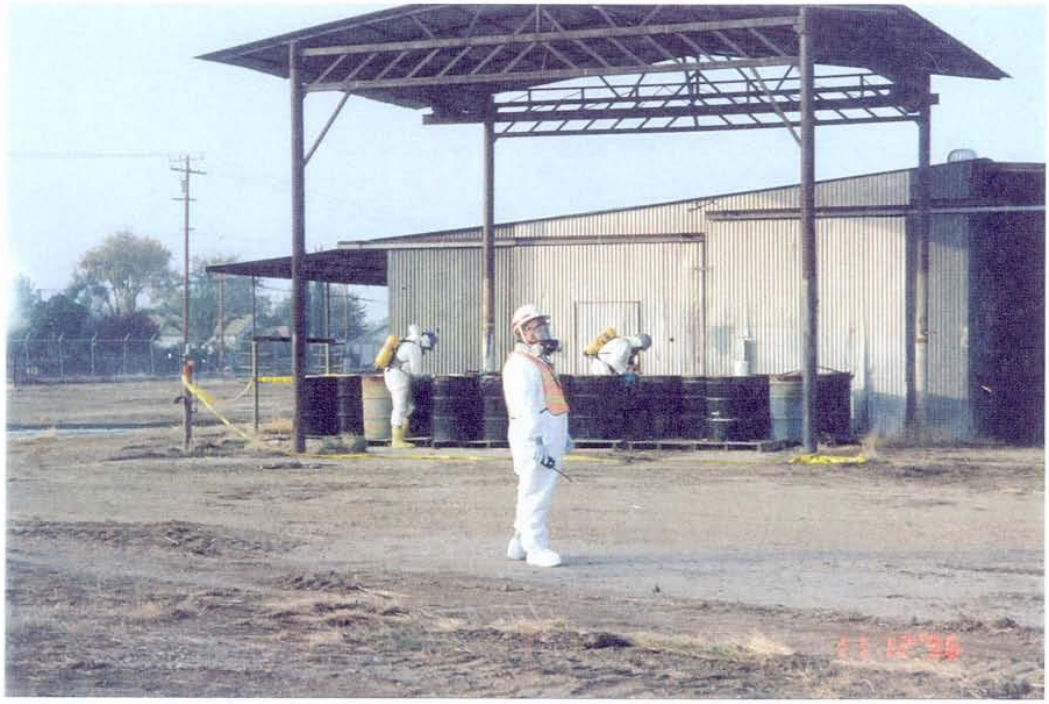
# APPENDIX B
# PHOTOGRAPHS

Brown & Bryant Arvin Facility
EPA Superfund Site
600 South Derby
Arvin, California 93230
EPA ID. Number CAD 052384021

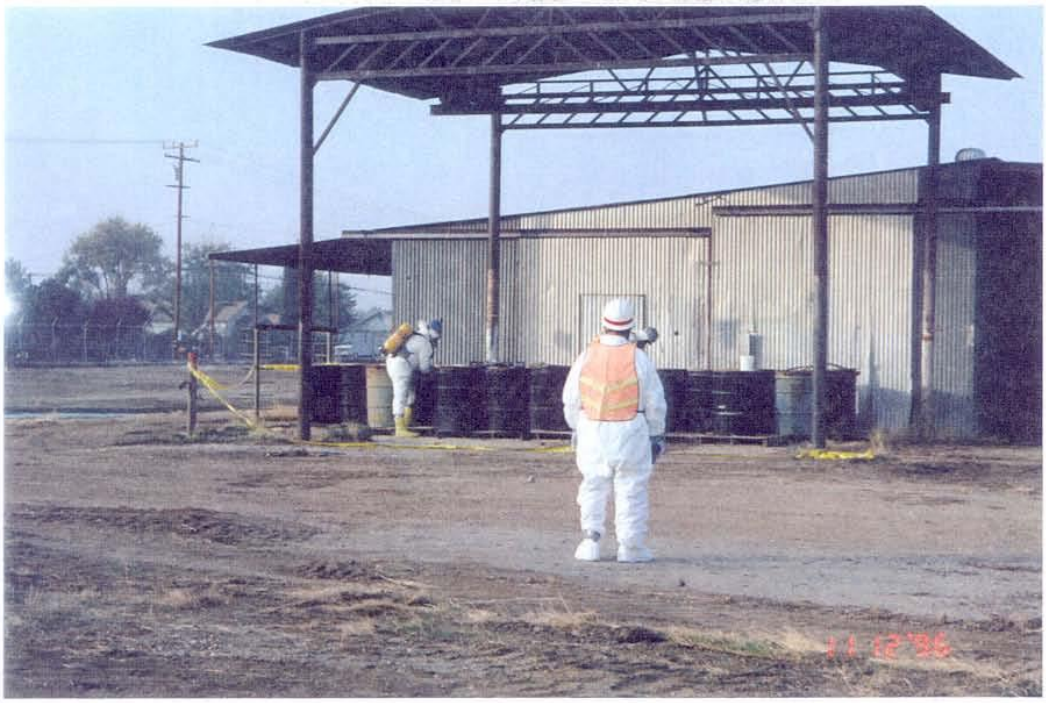
11-12-96 EPA Preparing to check drums.

-12-96 EPA personnel preparing to open drums.

**Brown & Bryant Arvin Facility**
**EPA Superfund Site**
**600 South Derby**
**Arvin, California 93230**
**EPA ID. Number CAD 052384021**



11-12-96 Safety observer for ones opening drums.



-12-96 Safety Observer for ones opening drums.

11-12-96 EPA opening unmarked drums.

11-12-96-EPA opening unmarked drums.

1-12-96 Pressure cleaning of material before removing off-site

11-12-96 Pressure cleaning of material before removing off-site.

11-12-96 Cleaning debris from waste POND

11-12-96 Cleaning debris from waste pond.

11-12-96 Demolition of Wooden Shed.

Demolition of Tank 3, rinsed, cut up + pressured washed before removal from site. 11-12-96

11-13-96 Glynn Alsop, USACE, securing drums after sampling. Preparing to label drums. "X" indicates ones sampled.

11-14-96 Condition of drums in warehouse. Caution tape identifys overpack is needed.

11-14-96 Condition of drums as cleanup of warehouse begins.

11-14-96 Condition of SW corner. Blue drums are set up by Ecology Env. to accomplish sampling.

11-14-96 Site condition in middle of warehouse as cleanup begins.

11-14-96 Drums requiring overpack before moving.

11-14-96 Condition of drums in warehouse. Contents need to be verified and drum overpacked before moving.

21 NOV 96 Pumping Tank 2

2 NOV 96 Pumping Tank 2

11-22-96 Drum storage in NW corner of warehouse

1-22-96 Drums, labeled + organized in NW corner of warehouse.

Last Day on site, looking southeast at Warehouse, from outside site fence.
11-26-96

Last day on site, looking southwest, from northeast corner of site.
11-26-96

**Brown & Bryant Railroad Spur Minor Soil Cleanup**

Site After Backfill With 3/8 Gravel - Red Flags are Locations of Samples (LtoR)
BB3597006 & BB3597004 Showing Above Gravel

Railroad Spur Minor Soil Clean-Up Drum Placement (center) in Warehouse
3/5/97 (6)

Some of the holes in cap prior to repair

Some of the holes in cap prior to repair

Some of the cracks on the cap surface

Some of the cracks on the cap surface

Sealed holes in cap

Sealed holes in cap

Sealed cracks

Sealed cracks on cap

Sealed cracks on cap

Slurry seal application on cap surface

Slurry seal application on cap surface

Cap surface following slurry seal application

Fence needing repair

Repaired fence

Storm water ponding on basic cap

Storm water ponding on basic cap

Innovative Technical Solutions, Inc.

## *Photographic Documentation*

**Project:** Various Maintenance Activities
**Location:** Brown and Bryant Superfund Site, Arvin, California
**Contract Number:** W912PL-06-D-0007

**Project Number:** 06850.1000
**Task Order Number:** 0008
**ITSI Project Number:** 06850.1000

**Photograph No. 01**

**Photo Credit:**
Jess Hall
ITSI Project Site Superintendent

Photo Taken:
9 March 2009

**Description:**
Specialized Environmental, Inc. (SEI) crew preparing essential equipment and safety support prior to tank demolition.

**Photograph No. 02**

**Photo Credit:**
Jess Hall
ITSI Project Site Superintendent

Photo Taken:
9 March 2009

**Description:**
Cutting an opening in the tank. A fire extinguisher is set nearby for fire safety measure.

Innovative Technical Solutions, Inc.

## *Photographic Documentation*

**Project:** Various Maintenance Activities
**Location:** Brown and Bryant Superfund Site, Arvin, California
**Contract Number:** W912PL-06-D-0007

**Project Number:** 06850.1000
**Task Order Number:** 0008
**ITSI Project Number:** 06850.1000

**Photograph No. 03**

**Photo Credit:**
Jess Hall
ITSI Project Site Superintendent

Photo Taken:
9 March 2009

**Description:**

Cut two access holes at the sides of the tank for easy entry and exit, and for positive air flow.

**Photograph No. 04**

**Photo Credit:**
Jess Hall
ITSI Project Site Superintendent

Photo Taken:
9 March 2009

**Description:**
Day one of tank demolition is completed. SEI cut large openings at the side and top of tank.

Innovative Technical Solutions, Inc.

## *Photographic Documentation*

**Project:** Various Maintenance Activities
**Location:** Brown and Bryant Superfund Site, Arvin, California
**Contract Number:** W912PL-06-D-0007

**Project Number:** 06850.1000
**Task Order Number:** 0008
**ITSI Project Number:** 06850.1000

**Photograph No. 05**

**Photo Credit:**
Jess Hall
ITSI Project Site Superintendent

Photo Taken:
10 March 2009

**Description:**
SEI crew shown cutting through steel wall from the inside of the tank. SEI used proper PPE. Bird droppings are widespread inside the tank.

**Photograph No. 06**

**Photo Credit:**
Jess Hall
ITSI Project Site Superintendent

Photo Taken:
10 March 2009

**Description:**
SEI crew using adequate PPE, respirators with face cover, hard hat and disposal overall. ITSI Superintendent provided additional entry supervision.

Innovative Technical Solutions, Inc.

## *Photographic Documentation*

**Project:** Various Maintenance Activities
**Location:** Brown and Bryant Superfund Site, Arvin, California
**Contract Number:** W912PL-06-D-0007

**Project Number:** 06850.1000
**Task Order Number:** 0008
**ITSI Project Number:** 06850.1000

**Photograph No. 07**

**Photo Credit:**
Jess Hall
ITSI Project Site Superintendent

Photo Taken:
10 March 2009

**Description:**
After cutting the sides of the tank, a backhoe with grabber extension pulled the structure down.

**Photograph No. 08**

**Photo Credit:**
Jess Hall
ITSI Project Site Superintendent

Photo Taken:
10 March 2009

**Description:**
Tank demolition is completed in the second day.

Innovative Technical Solutions, Inc.

## *Photographic Documentation*

**Project:** Various Maintenance Activities
**Location:** Brown and Bryant Superfund Site, Arvin, California
**Contract Number:** W912PL-06-D-0007

**Project Number:** 06850.1000
**Task Order Number:** 0008
**ITSI Project Number:** 06850.1000

**Photograph No. 09**

**Photo Credit:**
Jess Hall
ITSI Project Site Superintendent

Photo Taken:
11 March 2009

**Description:**
Dismantling the tank for recycling. Backhoe moves on plywood sheets to protect asphalt pavement from tract damage.

**Photograph No. 10**

**Photo Credit:**
Jess Hall
ITSI Project Site Superintendent

Photo Taken:
11 March 2009

**Description:**
SEI dismantling the tank for recycling. A warning sign is set near the demolition area. Also shown is the graded area to provide positive run-off from site.

Innovative Technical Solutions, Inc.

## *Photographic Documentation*

**Project:** Various Maintenance Activities
**Location:** Brown and Bryant Superfund Site, Arvin, California
**Contract Number:** W912PL-06-D-0007

**Project Number:** 06850.1000
**Task Order Number:** 0008
**ITSI Project Number:** 06850.1000

**Photograph No. 11**

**Photo Credit:**
Jess Hall
ITSI Project Site Superintendent

Photo Taken:
13 March 2009

**Description:**
Hauling off of scrap metals from the tank, awning and Scale House were completed 13 March 2009.

**Photograph No. 12**

**Photo Credit:**
Jess Hall
ITSI Project Site Superintendent

Photo Taken:
11 March 2009

**Description:**
Awning structure tin sheets ready for removal after the steel supports were taken out.

Innovative Technical Solutions, Inc.

## *Photographic Documentation*

**Project:** Various Maintenance Activities
**Location:** Brown and Bryant Superfund Site, Arvin, California
**Contract Number:** W912PL-06-D-0007

**Project Number:** 06850.1000
**Task Order Number:** 0008
**ITSI Project Number:** 06850.1000

**Photograph No. 13**

**Photograph No. 12**

**Photo Credit:**
Jess Hall
ITSI Project Site Superintendent

Photo Taken:
11 March 2009

**Description:**
Demolition work of the weighing scale concrete platform

**Photograph No. 14**

**Photo Credit:**
Jess Hall
ITSI Project Site Superintendent

Photo Taken:
11 March 2009

**Description:**
SEI crews cutting the weighing scale steel structure for recycling.

Innovative Technical Solutions, Inc.

## *Photographic Documentation*

**Project:** Various Maintenance Activities
**Location:** Brown and Bryant Superfund Site, Arvin, California
**Contract Number:** W912PL-06-D-0007

**Project Number:** 06850.1000
**Task Order Number:** 0008
**ITSI Project Number:** 06850.1000

**Photograph No. 15**

**Photo Credit:**
Jess Hall
ITSI Project Site Superintendent

Photo Taken:
11 March 2009

**Description:**
Vern Perry Asphalt Paving (VPAPI) completed the gravel backfill of the Scale House Bldg. Arrow Engineering Services confirmed compaction met subgrade preparation requirements.

**Photograph No. 16**

**Photo Credit:**
Jess Hall
ITSI Project Site Superintendent

Photo Taken:
11 March 2009

**Description:**
Vern Perry Asphalt Paving (VPAPI) completed the gravel backfill of the tank foundation footprint. Arrow Engineering Services confirmed compaction met subgrade preparation requirements.

Innovative Technical Solutions, Inc.

## *Photographic Documentation*

**Project:** Various Maintenance Activities
**Location:** Brown and Bryant Superfund Site, Arvin, California
**Contract Number:** W912PL-06-D-0007

**Project Number:** 06850.1000
**Task Order Number:** 0008
**ITSI Project Number:** 06850.1000

**Photograph No. 17**

**Photo Credit:**
Jess Hall
ITSI Project Site Superintendent

Photo Taken:
13 March 2009

**Description:**
Vern Perry Asphalt Paving (VPAPI) completed asphalt paving at the weigh scale and installed 12" asphalt berm around the warehouse building perimeter.

**Photograph No. 18**

**Photo Credit:**
Jess Hall
ITSI Project Site Superintendent

Photo Taken:
13 March 2009

**Description:**
Completed asphalt paving previously the tank footprint area.

All demolition and paving activities completed on 13 March 2009.

# APPENDIX C
# COST SUMMARY

## Table C-1: OU-1 RD-RA Construction Cost Details

| Cost Category | Cost Element | OU-1 ROD Estimate, 1993 | 1999 Adjusted Estimate(1) | Actual Cost 1999(2) | Difference |
|---|---|---|---|---|---|
| Remedial Design & Work Plans | Soil Removal & Consolidation | $1,500 | $1,791 | $1,961 | $170 |
| | RCRA Cap | $80,000 | $95,524 | $104,591 | $9,067 |
| | Non- RCRA Cap | $13,000 | $15,523 | $16,996 | $1,473 |
| | A-Zone Groundwater Extraction & Treatment System | $250,000 | $298,513 | $326,846 | $28,333 |
| | **Total** | **$334,500** | **$411,351** | **$450,394** | **$39,043** |
| RA Construction | Mobilization & Prep Work | $100,000 | $109,273 | $182,261 | $72,988 |
| | Clearing & Grubbing | $0 | $0 | $41,000 | $41,000 |
| | Miscellaneous Structure Demolition & Abandonment, Warehouse Cleanup & Organization | $0 | $0 | $285,521 | $285,521 |
| | Tank/Drum Removal | $0 | $0 | $56,411 | $56,411 |
| | Soil Removal & Consolidation, Earthwork, Filling & Grading | $802,000 | $957,630 | $685,933 | ($271,697) |
| | RCRA Cap | | | | |
| | Basic (Non-RCRA) Cap | $87,000 | $103,883 | $518,143 | $414,260 |
| | A-Zone Extraction Well | $1,500,000 | $1,791,078 | $597,643 | ($1,193,435) |
| | Injection Wells | | | | |
| | Monitoring Wells | | | | |
| | Aquifer Testing, Piping, Pumps, Tanks, etc for Extraction System | $154,000 | $183,884 | $96,565 | ($87,319) |
| | A-Zone Water Treatment & Injection System | $650,000 | $776,134 | $0 | ($776,134) |
| | Misc, Project Closeout Cost, etc. | $0 | $0 | $100,000 | $100,000 |
| | **Total** | **$3,293,000** | **$3,921,882** | **$2,563,477** | **($1,358,405)** |
| | **TOTAL** | **$3,637,500** | **$4,33,233** | **$3,013,871** | **($1,319,362)** |

Note (1): Inflated the 1993 ROD estimate to 1999 when spent at 3% annually
Note (2): Costs of bonds, indirect costs, field oversight and profit were rolled into individual items according to the item cost

## Table C-2: OU-1 O&M Cost Details

| Year | Cost Element | 1993 ROD Estimate | As Spent Year Estimate (1) | Actual Cost (As Spent) | Difference |
|---|---|---|---|---|---|
| 2000 | Repair, Maintenance & Groundwater Monitoring | $66,000 | $81,172 | $1,069,883 | $988,711 |
| 2001 | Repair, Maintenance & Groundwater Monitoring | $66,000 | $83,607 | $230,224 | $146,617 |
| 2002 | Repair, Maintenance & Groundwater Monitoring | $66,000 | $86,115 | $88,393 | $2,278 |
| 2003 | Repair, Maintenance & Groundwater Monitoring | $66,000 | $88,698 | $263,629 | $174,930 |
| 2004 | Repair, Maintenance & Groundwater Monitoring | $66,000 | $91,359 | $270,204 | $178,845 |
| 2005 | Repair, Maintenance & Groundwater Monitoring | $66,000 | $94,100 | $122,063 | $27,963 |
| 2006 | Repair, Maintenance & Groundwater Monitoring | $66,000 | $96,923 | $174,653 | $77,730 |
| 2007 | Repair, Maintenance & Groundwater Monitoring | $66,000 | $99,831 | $260,000 | $160,169 |
| 2008 | Repair, Maintenance & Groundwater Monitoring | $66,000 | $102,826 | $223,322 | $120,497 |
| | **Total through 2008** | **$594,000** | **$822,732** | **$2,702,371** | **$1,877,739** |
| 2009 to 2029(2) Projected | Repair, Maintenance & Groundwater Monitoring | $1,386,000 | $3,037,119 | $3,037,119 | $0 |
| **TOTAL** | | **$1,980,000** | **$3,861,751** | **$5,739,490** | **$1,877,739** |

Note (1): Inflated the 1993 ROD estimate to the year when spent 3% annually

# APPENDIX D
# OPERATIONAL AND FUNCTIONAL DETERMINATION

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**REGION IX**
**75 Hawthorne Street**
**San Francisco, CA 94105**

March 22, 2010

Steve Ross
Department of Toxic Substances Control
8800 Cal Center Drive
Sacramento, CA 95826-3200

RE: Brown and Bryant Superfund Site
Operational and Functional Determination

Dear Mr. Ross:

The purpose of this letter is to seek concurrence by the Department of Toxic Substances Control (DTSC) that the remedy at the Brown and Bryant Superfund Site, OU1, is operational and functional (O & F), as of July 1, 2010. EPA determines that a remedy is determined to be O & F either one year after construction of the remedy is complete, or when EPA and the State concur that the remedy is functioning properly and is performing as designed.

This concurrence applies to the RCRA and non-RCRA caps, and does not apply to the remedy for the A zone aquifer, specified in the 1993 OU1 Record of Decision (ROD). The remedy for the A zone aquifer was not implemented as it was technically infeasible. An amended remedy was incorporated into the 2007 OU2 Record of Decision, which is still in the design phase.

Mobilization for construction of the OU1 remedial action occurred in November, 1998. Construction activities included consolidation and compaction of contaminated soils in a lined RCRA cell; demolition and disposal/abandonment of concrete structures, berms, a rail spur, and utilities; removal of underground storage tank, warehouse drums/tanks, and asphalt; confirmatory sampling of soils; backfilling and re-grading of the northern portion of the Site; and construction of RCRA and non-RCRA caps. All construction work on the RCRA and non-RCRA caps was completed on August 12, 1999, in compliance with the Final Remedial Design Plan and specifications dated September 25, 1997. EPA and DTSC conducted a pre-final inspection of the Site on October 7, 1999.

The RCRA and non-RCRA caps have been in place for more than ten years and regular maintenance has been performed by EPA. This remedy is ready to move into the next phase, Operations & Maintenance (O & M). EPA and DTSC conducted an inspection on February 12, 2009 to review the condition of the caps in preparation for turning O & M activities over to the State. EPA plans to repair existing cracks on the cap and declare that the O & F is complete on July 1, 2010.

If DTSC concurs that the physical construction of the remedy is complete and that the system is functioning properly and operating as designed, then all parties can agree that this letter documents that the O & F determination has been achieved.

If you have any other questions, I can be reached at 415-972-3161.

Sincerely,

Travis L. Cain

Travis L. Cain, M.S.
Environmental Scientist