STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
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March 11, 2003

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BP America, Inc.
801 Warrenville Road, Suite 800
Lisle, IL 60532

Mr. Jerry Sedgewick
Chevron Environmental Management Co.
6001 Bollinger Canyon Road K2090
San Ramon, California 94583

Re: Final Remedial Investigation/Feasibility Study Work Plan Approval Letter, Bee Jay Scales, Sunnyside, Washington

Dear Sirs:

The Washington State Department of Ecology (Ecology) Toxics Cleanup Program has completed its review of the above referenced report submitted to Ecology for the Bee Jay Scales Site located in Sunnyside, Washington. Based on our review, we are pleased to inform you that Ecology finds the report to be in compliance with the requirements of Section IV paragraph 1 of the Agreed Order and WAC 173-340-350(7). Accordingly, the report is hereby approved, subject to fulfillment of the following conditions:

> Should data obtained from the field work conducted under this Work Plan show contamination emanating from this site extends beyond the study area, additional investigative measures will be required by Ecology.

This approval does not relieve the Potential Liable Parties of their obligations to comply with all other federal, state, and local requirements. If you have any questions, feel free to call me at (509) 454-7836.

Sincerely,

Brian T Deeken

Brian T. Deeken
Site Manager
Toxics Cleanup Program

# Bee-Jay Scales Site
# Sunnyside, WA
# Remedial Investigation/ Feasibility Study Work Plan

Prepared for
**Chevron Environmental Management Company**

and
**Group Environmental Management Company**
**A BP-Affiliated Company**

February 2003

Prepared by
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The hydrogeologic information in this report was prepared under the supervision of a licensed Hydrogeologist.

February 11, 2003

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# Acronyms

| | |
|---|---|
| ARAR | applicable or relevant and appropriate requirements |
| AST | aboveground storage tank |
| ASTM | American Society for Testing and Materials |
| b-BHC | beta benzenehexachloride |
| bgs | below ground surface |
| BTEX | benzene, ethylbenzene, toluene, and xylene |
| °C | degrees Celsius |
| Ca | potential occupational carcinogen |
| CAS | Chemical Abstracts Service |
| CLP | Contract Laboratory Program |
| cm/sec | centimeters per second |
| COC | chain of custody |
| COPC | contaminant of potential concern |
| CRBG | Columbia River Basalt Group |
| CRDL | contract-required detection limit |
| CUL | clean-up level |
| CWM | clear, wide-mouth |
| 2,4-D | dichlorophenoxyacetic acid |
| DDD | dichlorodiphenyldichloroethane |
| DDE | dichlorodiphenyltrichloroethene |
| DDT | dichlorodiphenyltrichloroethane |
| DO | dissolved oxygen |
| DQO | data quality objective |
| DTW | depth to water |
| Ecology | Washington State Department of Ecology |
| EPA | United States Environmental Protection Agency |
| ESA | environmental site assessment |

| | |
|---|---|
| °F | degrees Fahrenheit |
| F | Prespecified confidence factor |
| FA-CPR | first aid-cardiopulmonary resuscitation |
| FS | feasibility study |
| ft/yr | feet per year or foot per year |
| $ft^2$ | square feet or square foot |
| g-BHC | gamma-benzenehexachloride |
| gal/ft | gallon per foot |
| GFCI | ground fault circuit interrupter |
| GPC | Glacier Park Company |
| gpm | gallons per minute |
| Hazwoper | hazardous waste operations and emergency response |
| HCID | hydrocarbon identification |
| HSM | Health and Safety Manager |
| HSP | Health and Safety Plan |
| ID | identification or inside diameter |
| IDLH | immediately dangerous to life and health |
| IDW | investigation-derived waste |
| IRF | incident report form |
| LCS | laboratory control sample |
| LDR | Land Disposal Restriction |
| LUST | leaking underground storage tank |
| Ma | million years |
| MCL | maximum contaminant level |
| MDL | method detection limit |
| µg/kg | microgram per kilogram |
| µg/L | microgram per liter |
| µmhos | micromhos |
| mg/kg | milligram per kilogram |
| mg/L | milligram per liter |

| | |
|---|---|
| mg/m$^3$ | milligram per cubic meter |
| mL | milliliter |
| MS/MSD | matrix spike/matrix spike duplicate |
| MSDS | material safety data sheet |
| MTCA | Model Toxics Control Act |
| NFA | no further action |
| NGVD | National Geodetic Vertical Datum |
| NSC | National Safety Council |
| NTU | nephelometric turbidity unit |
| OD | outside diameter |
| OSHA | Occupational Safety and Health Administration |
| PCB | polychlorinated biphenyl |
| PID | photoionization detector |
| PIP | photoionization potential |
| PPE | personal protective equipment |
| ppm | part per million |
| PVC | polyvinyl chloride |
| QA | quality assurance |
| QAPP | Quality Assurance Project Plan |
| QC | quality control |
| RAO | remedial action objective |
| RCRA | Resource Conservation and Recovery Act |
| RCW | Revised Code of Washington |
| RI | remedial investigation |
| RL | reporting limit |
| RMSF | Rocky Mountain Spotted Fever |
| RPD | relative percent difference |
| RSD | relative standard deviation |
| RT | retention time |
| SAP | Sampling and Analysis Plan |

| | |
|---|---|
| SCS | Soil Conservation Service |
| SOP | standard operating procedure |
| SOW | Statement of Work |
| SPT | standard penetration test |
| SRM | standard reference material |
| SSC | Site Safety Coordinator |
| SVOC | semivolatile organic compound |
| TCL | target compound list |
| TCLP | toxicity characteristic leaching procedure |
| TD | total depth |
| TDS | total dissolved solids |
| TIC | tentatively identified compound |
| TOC | total organic carbon |
| 2,4,5-TP | 2,4,5-trichlorophenol |
| TPH | total petroleum hydrocarbons |
| TSDF | treatment, storage, and disposal facility |
| TSS | total suspended solids |
| USDA | United States Department of Agriculture |
| USDOT | United States Department of Transportation |
| USGS | United States Geological Service |
| UST | underground storage tank |
| VOC | volatile organic compound |
| WAC | Washington Administrative Code |
| WMP | Waste Management Plan |
| WSDOT | Washington State Department of Transportation |
| WTPH | Washington Total Petroleum Hydrocarbon Analytical Method |
| $yd^3$ | cubic yard |

SECTION 1

# Introduction

Chevron Chemical Company and Amoco Oil Company are conducting a Remedial Investigation (RI) and Feasibility Study (FS) under the Washington Model Toxics Control Act (MTCA) and in accordance with Revised Code of Washington (RCW) 70.105D; the MTCA Clean-Up Regulations; Washington Administrative Code (WAC) 173-340; and Agreed Order No. DE 02TCPCR-3932. The purpose of the RI/FS is to collect sufficient information about the nature and extent of contamination at the Bee-Jay Scales Site in order to develop, evaluate, and select a preferred clean-up action. The Bee-Jay Scales Site is located at, and in the immediate vicinity of, 301 Warehouse Avenue and 116 North 1st Street in Sunnyside, Washington.

## 1.1 Purpose of the Work Plan

The RI/FS Work Plan is a public document that specifies the work that is required by MTCA to take the site through the required RI and FS steps. This Work Plan includes the following:

- What we currently know about the site
- What clean-up alternatives are considered for the site, preliminarily
- What additional data are needed and why
- The activities needed to collect the additional data
- The methodologies that will be implemented to collect the additional data
- The general process to develop and evaluate clean-up alternatives
- The overall RI/FS schedule

If, during the course of the RI, additional data needs are identified to support selecting a clean-up alternative, the Work Plan will be amended to include the additional work.

## 1.2 Work Plan Organization

The Work Plan is divided into ten sections. The following paragraphs list the nine sections that follow this section (Section 1, Introduction) and briefly describe each section's contents:

- **Section 2, Site History,** summarizes site conditions, historical operations at the site, previous investigations, and existing data.
- **Section 3, Screening of Clean-Up Action Alternatives,** summarizes the contaminants of potential concern (COPCs) identified from existing data, general

response actions, an initial screening of remedial technologies, and data needs to assist evaluation.

- **Section 4, Data Quality Objectives (DQOs),** specifies the quality (such as detection limit) of the data to be collected during the RI such that the data can be used to answer questions about applicable, relevant, or appropriate regulations (ARARs).
- **Section 5, RI Approach,** presents the what, where, and general how of the activities for the RI.
- **Section 6, FS,** develops and evaluates clean-up alternatives.
- **Section 7, Deliverables and Schedule,** includes the RI/FS deliverables and schedule.
- **Section 8, Sampling and Analysis Plan (SAP),** specifies how the field work will be conducted and the methodologies to be followed.
- **Section 9, Quality Assurance Project Plan (QAPP),** specifies the analytical procedures and the evaluation of laboratory data to assure data of known quality are generated during the RI/FS.
- **Section 10, Health and Safety Plan (HSP),** specifies the health and safety requirements and procedures to be followed during field work at the site.
- **Section 11, References,** lists the references cited for this study.

SECTION 2

# Site History

## 2.1 Purpose of Site History Review

In accordance with Condition 1 and Attachment A specified in the MTCA Agreed Order No. DE 02TCPCR-3932, this site history section describes the known history of the Bee-Jay Scales Site located in Sunnyside, Washington. The Bee-Jay Scales Site is located at, and in the immediate vicinity of, 301 Warehouse Avenue and 116 North 1st Street in Sunnyside. The site history review compiles known and available site operational information and hazardous material release history. These findings are then used to assess the current degree and extent of contamination of hazardous materials so that an RI/FS can be planned and conducted. Certain site history information required by Attachment A of the Agreed Order (e.g., topographic map with 1-foot contours) were not included in the current site history review but will be incorporated into the RI/FS effort as required (Sedgwick, 2002).

## 2.2 Site Description

The site is composed of two property parcels: Parcels No. 22102522014 and 22102522015 as recorded by the Yakima County Department of Assessment. Parcel No. 22102522014 is located at 116 North 1st Street, Sunnyside, Washington, and is owned by Bee-Jay Scales, Inc. and may be referred to individually as the "Bee-Jay property." Parcel No. 22102522015 is located at 301 Warehouse Avenue, Sunnyside, Washington, is owned by Hickenbottom & Sons, Inc., and may be referred to individually as the "Hickenbottom property." Collectively, these two parcels are herein referred to as the Bee-Jay Scales Site or the "site." Hickenbottom & Sons owns additional, contiguous property on which their business is located, and it is herein referred to as "adjacent Hickenbottom property." Figure 2-1 shows the locations of the two parcels as well as adjacent parcels and property owners and structures located there as of 1990.

## 2.3 Site Setting

### 2.3.1 Topography

The site is located within the Yakima River Valley, at about 750 feet elevation National Geodetic Vertical Datum (NGVD) as shown on Figure 2-2. The site is flat. About 1.5 miles southwest of the site is Snipes Mountain (elevation of about 1,300 feet NGVD). Rattlesnake Ridge is located approximately 5 miles north of the site, and the Yakima River is located approximately 4.5 miles southwest of the site. A series of irrigation canals divert surface water from the Yakima River to serve agricultural and municipal water needs.

## 2.3.2 Land Use

### 2.3.2.1 Regional Land Uses

The site is located within Yakima County, an important agricultural region of Washington. Major agricultural products that come from the greater Sunnyside area include wine grapes, apples, pears, asparagus, mint, hops, corn, and wheat. Cattle and dairy ranching are also represented within the region. Land use in the immediate vicinity of the site, within the City of Sunnyside, is primarily industrial and commercial and support the region's larger agricultural interests. Typical service industries include food processing, agricultural product storage and transfer, pipe manufacturing, warehousing, tank-cleaning services, trucking, and storage.

### 2.3.2.2 Current Site Land Uses

The Bee-Jay Scales Site is located within the city limits of Sunnyside. Both property parcels, Parcels No. 22102522014 and 22102522015 , are located within the designated Urban Growth Area Plan prepared by Yakima County (Yakima County, 2000).

Three businesses currently operate at the Bee-Jay Scales property: Sandy Farms, a local trucking company; Sanleco, Inc., an interstate trucking company with an on-site tractor-trailer repair garage; and Bee-Jay Scales, a commercial scale operation.

Hickenbottom & Sons, Inc. is a food-processing and distribution company. Most of Hickenbottom & Sons' current operation consists of a refrigeration warehouse. The Hickenbottom property that makes up a portion of the site is currently leased to the Johnson Fruit Company and is used to store produce bins, pallets, tractor-trailer rigs, and other miscellaneous equipment. The remainder of the Hickenbottom & Sons property is used for tractor-trailer storage and produce storage and transportation.

## 2.3.3 Climate and Air Quality

The Sunnyside, Washington area has an arid climate with cold winters and warm summers. Mean monthly air temperatures range from 31 to 72 degrees Fahrenheit (°F) with an average annual temperature of 52°F (Molenaar, 1985; City of Sunnyside, 2002). Mean annual precipitation for the area is approximately 7 inches (City of Sunnyside, 2002).

An air quality monitoring site, maintained by the Yakima Regional Clean Air Authority, is located at the Harris Middle School in Sunnyside, approximately three-quarter mile southeast of the Bee-Jay Scales Site. The primary source of air pollution in Yakima County is motor vehicles. Air quality is poorest during the winter when weather patterns sometimes create an inversion layer that traps air. Wood smoke, car exhaust, road dust, and other emissions can collect in this trapped layer until weather conditions change (Yakima County, 1998).

## 2.3.4 Geology and Soils

### 2.3.4.1 Soils

Two soil surveys have been conducted for Yakima County by the United States Department of Agriculture's (USDA's) Soil Conservation Service (SCS). The older survey (1958) provides only general information, but the more recent survey (1985) provides more detailed information about the soil characteristics. The more recent soil survey assigned a different soil series name to site soils than the older survey.

The older survey identifies site soils as Esquatzel fine sandy loam with 0 to 2 percent slopes (USDA, 1958, sheet 6). The soil is neutral to mildly alkaline, generally noncalcareous, moderately to rapidly permeable, and has moderate water-holding capacity.

The more detailed, recent survey reclassified site soils as Cleman very fine sandy loam, 0 to 2 percent slopes (USDA, 1985, sheet 73). The soil series description indicates that Cleman soils includes areas of Esquatzel soils, which is the name assigned by the 1958 survey. Cleman is a well-drained soil formed in alluvium. Native vegetation on the soil is mainly grasses, forbs, and shrubs. The surface layer is brown very fine sandy loam about 10 inches thick. Physical characteristics of the soil include moderate permeability, slow runoff, rare flooding, slight erosion hazard, but high soil blowing hazard. Cutbanks in the soil are not stable and are subject to caving.

### 2.3.4.2 Geology

**Regional Geologic Setting**

The Bee-Jay Scales Site is located in the Columbia Basin, an intermontane basin located between the Cascade and Rocky Mountains, and within the Yakima Fold Belt, a structural subprovince characterized by dominantly east-west trending anticlinal ridges and synclinal valleys (Reidel *et al*, 1994). Snipes Mountain, located just west of Sunnyside, is an anticlinal ridge measuring approximately 8 miles in length and 1 mile in width. Cenozoic age volcanic rocks from the Columbia River Basalt Group (CRBG) and sediments fill the basin. Underlying the CRBG are Tertiary and Quaternary fluvial and glaciofluvial deposits on top of Tertiary age continental sedimentary rocks.

The Yakima Fold Belt is underlain by up to 7,000 feet of continental and volcaniclastic sediments, deposited in a basin separated from the adjacent crystalline basement by a suture zone. Beginning about 17.5 million years (Ma), the CRBG erupted, filling the Yakima Fold Belt basin with up to 4,000 feet of tholeiitic flood basalt. Eruption continued until about 6 Ma. The Ellensburg Formation, a series of epiclastic and volcaniclastic sedimentary rocks, are interlayered with and overlie the CRBG. North-south compression that caused the formation of the Yakima Fold Belt primarily occurred since about 10.5 Ma.

Once the CRBG eruptions ceased, folding continued in the Yakima Fold Belt and the Columbia River system controlled rock formation until the Pleistocene, resulting in deposition of the Ellensburg Formation. Sand and gravel were deposited in fluvial channels and alluvial fans. Finer-grained sediments were deposited in broad floodplain-overbank areas within the Columbia River system. The locations of Yakima Fold Belt anticlines controlled the river flow and morphology. The Snipes Mountain conglomerate was deposited early in the period when the Columbia River flowed south and then southwest through the Sunnyside Gap. The river channel shifted eastward and sediment deposition occurred in alluvial fans and smaller stream channels, resulting in finer-grained sand deposits. By about 5 Ma, deposition became even finer-grained and occurred in a lacustrine environment.

Pleistocene geology in northern North America was dominated by the advance and retreat of continental glacier systems. Glaciers affected the Columbia Basin predominantly by the damming and flooding of the Columbia River system. Ice dams from advancing glaciers formed at a bottleneck in the river valley and the backed up water created a huge lake in Montana called Lake Missoula. Evidence indicates that the ice dam broke suddenly, resulting in catastrophic flooding downstream. Huge volumes of water traveling at high velocities scoured volcanic bedrock in central Washington, forming the Scablands, carried extremely coarse-grained bedloads that were deposited in the channels and side channels of the river system, and further flooded side channel systems with backwater that deposited large volumes of finer-grained sediments. Geologic evidence also indicates that the damming and flooding happened multiple times (O'Connor *et al*, 1995).

Finer-grained Missoula flood sediments were deposited in the valleys near Sunnyside. Depositions of loess, fine-grained flood sediments reworked and redeposited by wind, also are common on the slopes and upland areas in the site vicinity (Busacca and McDonald, 1994; Schuster *et al*, 1997).

Surficial geology at the city of Sunnyside, including the subject site area, is Quaternary alluvium (Campbell, 1979). Harrison Hill and Snipes Mountain, prominent hills just west of Sunnyside, are anticlinal ridges of Columbia River Basalt. The Ellensburg Formation is exposed about 2.5 miles north of Sunnyside and extends west along the flanks of Rattlesnake Ridge (Kinnison and Sceva, 1963).

Geologic processes currently active in eastern Washington include ongoing erosion of the mountains by streams and glaciers and the associated deposition of sediments along stream channels and flood plains and active mountain building through faulting, folding, and volcanic activity such as the 1980 eruption of Mt. Saint Helens that resulted in deposition of ash over large parts of eastern Washington, including Sunnyside.

### Site Geology

Three geologic units have been identified in the vicinity of the site based on subsurface information derived from well-drilling logs. They are, from youngest to oldest, Quaternary Alluvium, the Ellensberg Formation, and Columbia River Basalts.

The Quaternary Alluvium consists of sandy silt and extends to a depth of at least 24.5 feet below the site (Hart Crowser, 1990). Bentley *et al* (1993) further divide the alluvium and indicate that the site is underlain by silt, sand, and gravel deposited by tributaries of the Yakima River and that materials are dominantly of basaltic composition. The Ellensberg Formation, interbedded silt, sand, gravel, and clay, underlies the alluvium and extends to a depth of approximately 450 feet below the ground surface (bgs), based on logs for nearby City of Sunnyside water wells. The Ellensberg Formation is underlain by CRBG rocks to an unknown depth.

### 2.3.5 Surface Water

There are no natural water bodies identified on the site.

Two lakes are located southeast of Sunnyside between the town itself and the Yakima River. The reach of the Yakima River located south of Sunnyside is subject to overbank flooding during large flood events. The town elevation (about 750 feet NGVD) is approximately 70 feet higher than the river banks.

The Yakima River valley is developed with a complex system of stream flow diversion canals, return-flow drains, and waterways. Most water is diverted for irrigation, but some water is used for municipal and industrial water supply and electric-power generation (Molenaar, 1985). The Sunnyside Canal, an irrigation diversion canal from the Yakima River that flows parallel to the river along the northern edge of the valley, was completed in 1900 as part of the United States Bureau of Reclamation Yakima Federal Reclamation Project. The Snipes Mountain Lateral of the Sunnyside Canal, located approximately one-third mile southwest of the site, is the closest surface water body to the site. Flow in the Sunnyside Canal averaged 441.7 acre-feet between 1960 and 1977 (Molenaar, 1985). The Yakima River is located approximately 4.5 miles southwest of the site.

The quality of regional surface water is altered significantly as it flows from its mountainous upper reach source areas to the lower Yakima River basin. Agricultural activities, including cultivation, crop fertilization, and pesticide application, affect physical, chemical, and biological surface water quality, according to data gathered by the United States Geological Survey (USGS) and others (Molenaar, 1985). Concentrations of pesticides in samples obtained in the mid-1970s from a return flow drainage canal at Sunnyside exceeded water quality criteria for dichlorodiphenyltrichloroethane (DDT) and lindane.

### 2.3.6 Groundwater

#### 2.3.6.1 Regional Groundwater

Information in this section is summarized from Molenaar (1985) unless otherwise noted.

Groundwater in the region around the site generally occurs in each of the three major geologic units: unconsolidated Quaternary alluvium, partially consolidated Ellensburg Formation, and the CRBG. The Ellensburg Formation and the basalt aquifer are more productive than the alluvium aquifer. The regional geologic structures (anticlines, synclines, faults, and sedimentary contacts) control the direction and rate of groundwater flow. In general, groundwater flows from the margins of the valleys (structural basins) toward the center and then down the valley axis toward the Yakima River.

The Quaternary alluvium is composed of unconsolidated sand, gravel, and cobbles with minor silt and clay deposited by streams and rivers along their channels and in their flood plains. The thickness of this unit ranges from a few feet to approximately 150 feet. Groundwater occurs under unconfined conditions and generally is at or near the level of water in nearby surface water bodies.

The Ellensburg Formation is composed of partly consolidated sand and gravel, sandstone and siltstone, and minor conglomerate and claystone. The Ellensburg Formation occurs at depths of 100 feet or more in the centers of the valleys and gradually rises to the surface near the ridges. The thickness of the Ellensburg Formation is greatest in the valley middles, ranging up to 1,000 feet. The top of the formation is not well defined and may be gradational with the overlying Quaternary alluvium, which is comprised of similar materials and deposited by similar processes. Water-bearing units in the Ellensburg Formation may be as shallow as 50 feet bgs. The shallower units generally occur on the margins of valleys and are unconfined. Deeper zones that are generally beneath the central portions of valleys may be confined.

Sedimentary Ellensburg Formation rocks interlayered with volcanic rocks of the CRBG compose the basalt aquifer, a deep, regional, and highly productive aquifer system. Groundwater occurs in fractures within the rock, rubble zones at the top and base of individual lava flows, pore spaces within the volcanic rock (vesicles and scoria), and in Ellensburg sand and gravel layers between lava flow units. Water-bearing zones may be large or small, ranging from a few feet to more than 50 feet thick with great variations in lateral continuity. Groundwater in the basalt aquifer is generally either confined or may be under artesian pressure because of the morphology of the structural basins formed in the basalts.

Sunnyside is located near the axis of the Wapato syncline, a regional structure that controls groundwater flow. Groundwater in the immediate Sunnyside area is present in the Prosser subbasin of the Lower Yakima Basin (Kennison and Sceva, 1963). Regional groundwater generally flows south-southwest off Rattlesnake Ridge toward the axis of the synclinal valley (Molenaar, 1985) and then continues to flow south-southeast toward the Yakima River (Kennison and Sceva, 1963).

Water levels in local wells show seasonal fluctuations related to precipitation, with the levels highest in the late winter and spring and declining summer through fall. Water wells in the Rattlesnake Slope subarea, a groundwater basin extending from the crest of the Rattlesnake Hills to the Yakima River between Union Gap and Prosser, are used primarily for household water supply. Approximately one-third are used for irrigation.

#### 2.3.6.2 Site Groundwater

Site groundwater was investigated by a previous property owner, Glacier Park Company (GPC), in 1990 (Hart Crowser, 1990). Four monitoring wells were installed, three on the Bee-Jay Scales portion of the site and one on the Hickenbottom & Sons property. Well logs for the monitoring wells indicate that light-brown silt and sandy silt is present from the surface to a depth of at least 24.5 feet bgs. Groundwater was encountered in the borings at depths between 9 and 13 feet bgs. Eight test pits also were completed at the time the monitoring wells were installed. Groundwater was encountered in the base of the test pits at depths ranging from 9.5 to 11 feet bgs. Groundwater elevations ranged from 740.52 to 741.87 feet NGVD. Hydraulic conductivity was estimated by conducting a bail-down test in one well. The shallowest aquifer beneath the site was found to have relatively low permeability, approximately $10^{-4}$ centimeters per second (cm/sec), and a flow rate of approximately 1 foot per year (ft/yr).

#### 2.3.6.3 Well Inventory (1-Mile Radius)

Water well records were obtained from the Washington State Department of Ecology (Ecology) for a 1-mile area around the site. Figure 2-3 shows the locations of the wells based on data available in the records. Locations were not field checked. Copies of the well records are included in Appendix A.

Well records are plotted on Figure 2-3 showing well depth and aquifer information based on information provided in the log. City of Sunnyside water supply well locations (marked "COS") also are shown in Figure 2-3. Location information was derived from the City's website (www.city.sunnyside.wa.us). Some of the City of Sunnyside well logs were included in records obtained from Ecology. Notably, a log for the most recently drilled well, Well 8 (located just west of the site), was not present in Ecology's records.

Wells located south of the site are assumed to be downgradient of the site. Generally, the shallowest wells located within the City Center east and southeast of the site are resource protection or monitoring wells, presumably drilled at other sites with suspected groundwater contamination. Water supply wells located south of the site include two City of Sunnyside wells and one well owned by Mountain Valley Products. All three are completed in the alluvium aquifer at depths of 200 feet or greater. Generally, wells located north of the site also are completed deep within the alluvium aquifer. Only two basalt aquifer wells are located within 1 mile of the site.

## 2.4 Site Information and Background

### 2.4.1 Property Title History Review

Property title reports for the Bee-Jay Scales Site were obtained from Ecology's files (First American Title Insurance Company, January 2002a, 2002b) that document the chain-of-title for the site. These title reports record ownership history, but they do not document site uses or possible leases. These documents are on record at Ecology for the site and are not provided in this document. A summary of ownership for the site was prepared by the ChevronTexaco Company and is tabulated in Appendix B. This summary is not a legal interpretation of the title reports but rather is a simplified summary to assist with the understanding of the property transactions that have occurred.

As is shown in Appendix B, portions of the site were owned by the Northern Pacific Railroad Company from 1906 until 1989 when purchased by the GPC. The western 125-foot portion of Lot 10 was purchased by the Chevron Chemical Company in 1981 and sold to Bee-Jay Scales, Inc., in 1987. Hickenbottom & Sons leased a portion of the site from the Northern Pacific Railroad Company beginning in 1961 and purchased portions of Lots 10 and 11 in 1992. Bee-Jay Scales purchased additional portions of Lots 10 and 11 in 1995 and 1996. These portions of Lots 10 and 11 purchased by Bee-Jay Scales, Inc. and Hickenbottom & Sons are assumed to correspond to Parcels No. 22102522014 and 22102522015, as recorded by the Yakima County Department of Assessment and identified as the site in Agreed Order No. DE 02TCPCR-3932.

### 2.4.2 Aerial Photography Review

Seven historical aerial photographs of the site were reviewed to document physical changes at the site and in the regional vicinity. The photographs were obtained from the Washington State Department of Transportation (WSDOT). The first five photographs are black and white (1966, 1973, 1979, 1982, and 1991) while the last two (1998 and 2001) are in color.

Copies of the aerial photographs are included in Appendix C along with narrative interpretations. The aerial photographs show the site to be located in a developed urban area surrounded by industrial or commercial buildings and warehouses. The aerial photographs were used to corroborate and augment the site history information addressed in Section 2.4.4.

### 2.4.3 Previous Investigations

The following environmental investigations have been conducted previously at the Bee-Jay Scales Site:

- Phase I and Phase II environmental site assessments (ESAs) conducted by Hart Crowser (1990a, 1990b) for the GPC
- Phase II ESA conducted by White Shield (1991) for Hickenbottom & Sons
- Environmental media sampling conducted by Ecology in 1997

In addition, a leaking underground storage tank (LUST) assessment and clean-up was performed by PLSA Engineering & Surveying (1992) for Hickenbottom & Sons. The following sections summarize these previous investigations. Data from these investigations are included in the Bee-Jay Scales Site files at Ecology. These historical site data are compiled in Section 2.5.

#### 2.4.3.1 Hart Crowser Phase I and II Environmental Site Assessments

In 1990, Hart Crowser, Inc., performed two studies of GPC property:

- Preliminary ESA, GPC Property, Property Sequence No. 3833, Sunnyside, Washington (March 1990)
- Subsurface exploration and testing, GPC Property, Property Sequence Nos. 145-2 and 3833 Sunnyside, Washington (July 1990)

These assessments address environmental conditions at properties owned by the GPC at that time, including what is currently called the Bee-Jay Scales Site and adjacent properties. Figure 2-4 shows the location of these parcels.

**Preliminary Environmental Site Assessment (Hart Crowser, March 1990)**
A limited Phase I ESA of the GPC Property Sequence No. 3833 was performed in 1990. The GPC Property Sequence No. 3833, which includes the Bee-Jay Scales Site, is located between 1st and 9th Streets on the west and east, respectively, and Warehouse and Blaine Avenues on the north and south, respectively. The Property Sequence No. 3833 encompasses approximately 13 acres and consists of four parcels (Parcels 1 through 4). Figure 2-4 shows the location of these parcels. The Bee-Jay Scales Site includes most of the GPC Parcel 1 and is approximately 4 acres in size.

The Phase I ESA included a site history profile, a regulatory agency list review, and a site reconnaissance. The site history profile was developed using Sanborn Fire Insurance Maps from 1908 to 1944 and from information provided by GPC. Copies of the GPC information or a complete list of sources were not provided in the report copy. Hart Crowser summarized the site history profile for all four parcels as follows:

> *According to the map review and GPC information, the site has been the location of agricultural warehouse, lumber yards, coal storage bins, and BNRR trackage since 1908. In 1928 bulk oil facilities were operated by Texas Oil and Union Oil companies on the adjacent property just north of the BNRR tracks west and east on Ninth Street, respectively. The Texas Oil facility is no longer present. In 1944, a lumber yard was operated by Potlach Yards, Inc. just north of the BNRR tracks on the GPC property near Warehouse Avenue and Sixth Street. The lumber yard is no longer present. Currently the site contains agricultural product distributors, fruit warehouses, and retail stores.*

The site reconnaissance for Parcel 1, which includes both the Bee-Jay Scales property and the Hickenbottom property as identified in Figure 2-4, identified the occupants as Sandy Farms (Buildings 1, 2, and 3) and Hickenbottom & Sons Fruit Company (Building 4). The Phase I ESA did not identify records of spills or releases. Based on visual observations and historical activities identified, the areas of potential concern identified for Parcel 1 include the following:

- The chemical lagoon (Building 3) on the Sandy Farms property was suspected of leakage. Leakage of agricultural chemicals was suspected before lining of the lagoon and possibly through the liner at the time of the assessment.
- Soils around the washdown area north of the chemical lagoon were suspected to be contaminated. The area was used to wash agricultural chemical applicator vehicles.
- Four aboveground storage tanks (ASTs) located west of the chemical lagoon that historically contained chemical fertilizers were identified.
- An underground storage tank (UST), UST-1, was identified in the Sandy Farm yard. UST-1 was formerly used to store leaded gasoline.
- Exterior drum storage areas, one of which was unpaved, were observed during the reconnaissance in or adjacent to Building 1 (Sandy Farms) and Building 4 (Hickenbottom & Sons). Some of the drums were observed to be corroded. Storage of batteries in an exterior area in the northeast corner of the parcel was also observed.
- The concrete floor of Building 2, occupied by Sandy Farms, was observed to be pitted. The report presumed that the pitting resulted from spills of agricultural chemicals previously stored in the building. A release of agricultural chemicals through the deteriorated flooring may have resulted in contamination of soil and groundwater.
- Green to yellow soil staining was observed in an area approximately 1,500 square feet ($ft^2$) in size located in the center of the Sandy Farms yard. This staining was suspected by one of the Sandy Farms representatives to be a result of "dinitro or other herbicides." It was not clear if this staining was the result of possible application of herbicides or of a possible release of herbicides.
- In addition, two USTs, UST-2 and UST-3, were identified near Building 4 on the Hickenbottom & Sons property located adjacent to the Bee-Jay Scales Site. UST-2 is a 12,000-gallon tank formerly used to store diesel, and UST-3 is a 1,000-gallon tank formerly used to store leaded gasoline.

### Subsurface Exploration and Testing GPC Property (Hart Crowser, July 1990)

A Phase II ESA was conducted by Hart Crowser for GPC to collect soil and groundwater samples from areas of potential concern identified in the Phase I report. The Phase II report, *Subsurface Exploration and Testing Glacier Park Company Property* (Hart Crowser, July 1990), summarizes the findings. The purpose of the Phase II work was to accomplish two goals: (1) assess whether the historical activities identified in the Phase I report resulted in significant subsurface contamination, and (2) estimate potential clean-up costs based on the scope of work. Areas on the Bee-Jay Scales Site that were addressed in this report include the following:

- Drum storage west of Building 1
- Agricultural chemical truck washdown area and rinse water collection lagoon (Building 3)
- Three liquid fertilizer ASTs
- Areas of green and yellow soil staining

UST-1, UST-2, and UST-3, located on the Hickenbottom & Sons property immediately adjacent to the Bee-Jay Scales Site, were also addressed.

Exploration work at Parcel 1, which encompasses the Bee-Jay Scales Site, included excavating test pits, performing hand-auger borings, drilling soil borings, and installing four monitoring wells. Soil samples from the hand-auger borings were analyzed for nitrates, organochlorine pesticides, chlorinated herbicides, polychlorinated biphenyls (PCBs), and total metals. Selected soil and groundwater samples were analyzed for nitrates, organochlorine pesticides, chlorinated herbicides, PCBs, and petroleum hydrocarbons. Analytical methods used include nonstandard screening methods performed at the Hart Crowser FAST laboratory as well as United States Environmental Protection Agency (EPA) methods performed at ATI Laboratories. The Hart Crowser sample locations are shown on Figure 2-5. Section 2.5 summarizes these data and discusses data usability.

Groundwater was encountered at a depth of approximately 10 feet bgs with apparent flow direction toward the south. Hart Crowser reported that the groundwater was encountered within a relatively low permeability silt horizon that may be in hydraulic contact with underlying water-producing horizons used for local domestic water supplies. The report recommends additional data collection to better define site aquifer characteristics.

Remediation costs presented in the report address UST removal, drum removal, and surplus fertilizer product recycling.

### 2.4.3.2 White Shield Phase II Environmental Site Assessment

A Phase II ESA of a portion of the lease site located at 301 Warehouse Avenue in Sunnyside, Washington was performed by White Shield, Inc. (September 1991) for Hickenbottom & Sons. The investigation was initiated after the Hart Crowser (July 1990) report indicated pesticides, herbicides, and fertilizer residues existed on the Hickenbottom & Sons lease area near the washdown area and in the rinse water lagoon on the adjacent Sandy Farms lease area. The study area was limited to the lease area between the Sandy Farms washdown and rinsate lagoon and the Hickenbottom & Sons cold storage building and loading dock.

Following this investigation a portion of the property was replatted and ownership transferred to Hickenbottom & Sons.

Soil and groundwater samples were collected from soil borings at nine locations within the study area. These locations are shown on Figure 2-5. In general, two soil samples were collected from hand-auger borings at approximate depths of 3 feet and 7 feet and composited by the laboratory. Soils were analyzed for organochlorine pesticides and PCBs, chlorinated herbicides, ammonia nitrogen, nitrate + nitrite, and total phosphates. Monitoring wells were not installed; groundwater samples were collected from eight of the borings using either a stainless-steel bailer or a soil probe. Groundwater was not collected from Boring SB-2. Where sufficient quantity of groundwater allowed, samples were analyzed for organochlorine pesticides and PCBs, chlorinated herbicides, total petroleum hydrocarbons (TPHs), nitrate + nitrite, total phosphorous, and specific conductance. Section 2.5 summarizes the White Shield data and discusses data usability.

#### 2.4.3.3 Leaking Underground Storage Tank Environmental Site Assessment and Intermediate Clean-Up

A LUST assessment and intermediate clean-up was performed at the Hickenbottom & Sons lease site by PLSA Engineering & Surveying (PLSA, February 1992). A 12,000-gallon steel UST that formerly contained diesel and a 1,000-gallon steel UST that formerly contained gasoline were removed from the Hickenbottom & Sons property.

Both tanks were reported by PLSA to be located in a common tank basin north of the site building and truck scales. This area is adjacent and to the west of the Bee-Jay Scales Site.

During the removal of the USTs, petroleum contamination was observed in the surrounding soils. Water was observed by PLSA to be seeping into the bottom of the excavation at an approximate depth of 13 feet bgs. PLSA stated that "free groundwater" was not encountered. PSLA staff monitored the removal of the USTs and the petroleum-contaminated soils. Approximately 2,500 cubic yards (yd$^3$)of petroleum-contaminated soils were excavated and placed on site for remediation by land farming. A letter from PLSA to Mr. Jerry Hickenbottom, dated April 16, 1992, states that samples collected from the landfarmed soils in April 1992 did not have concentrations of gasoline or diesel above the method detection limits (MDLs). According to Ecology records (Ecology LUST, 2002a), this site has not received a letter of no further action (NFA) from Ecology.

#### 2.4.3.4 Ecology Sampling

In 1997 Ecology conducted limited sampling and analysis of groundwater, soils, and lagoon sediment at the Bee-Jay Scales Site (Ecology, 1997). Ecology records include the laboratory reports only. Groundwater was sampled from two of the monitoring wells installed during the Hart Crowser Phase II ESA (1990b): MW-3 and MW-4. An additional water sample, identified as UNK, is included in the general chemistry sample results. The location of the sample and source of the water could not be determined from available records. The precise locations of the soil sample (AST 1) and the location of the lagoon sediment sample (LAG 01) are also not identified, but they are assumed to have been collected from surface soils in the vicinity of the former ASTs and within the lagoon containment. Section 2.5 summarizes the Ecology data and discusses data usability.

### 2.4.4 Summary of Operational History

Based on information obtained from the chain-of-title history, historical aerial photographs, previous investigations, Ecology correspondence files, site reconnaissance and interviews, a summary of the operational history of the Bee-Jay Scales Site based on these sources has been prepared. Interviews conducted with the following individuals contribute to this summary:

- Mr. Arno Johnson, President-Owner, Bee-Jay Scales and Sandy Farms, September 19, 2002
- Mr. Bob Bolden, Manager, Sandy Farms, September 9, 2002
- Mr. Jerry Hickenbottom, President, Hickenbottom & Sons, and Mr. Robert Hickenbottom, Past President, Hickenbottom & Sons, September 9, 2002

There is some conflicting site ownership information presented in the following paragraphs. As was discussed in Section 2.4.1, the title report summarizes occupants of the property. The conflicting information may be related to sources attributing land ownership to facility operators. The accuracy of the information provided by the individuals interviewed for this work plan and previous investigations has not been verified.

Industrial uses on or adjacent to the site began near the turn of the century. Early uses included agricultural warehouses, lumber yards, coal storage, and railroad transportation activities (Hart Crowser, 1990a, Sanborn, 1908 to1960). According to the Sanborn Fire Insurance Maps prepared for Sunnyside, Washington, there was not a fertilizer plant located on the site prior to 1960. However, there is a liquid fertilizer plant identified southeast of the site that contained ten liquid fertilizer ASTs. The approximate location of this second fertilizer plant is 5th Street and the Northern Pacific Railroad Company right-of-way (Sanborn, 1960).

An agricultural chemical distribution facility operated at the site from the 1960s through at least 1986. At least two separate companies operated the facility: Laneger Agricultural Services and Valley Agriculture Inc.. The 1966 aerial photograph shows the presence of buildings and ASTs on the property that indicate the presence of the fertilizer distribution facility.

A letter from the American Oil Company to the Chevron Chemical Company dated July 14, 1972 (Henkens, 1972) was located in the Ecology files for the Bee-Jay Scales Site. The letter includes information on the Sunnyside Farm Service Center fertilizer facility, as the facility was called at that time, and a list of equipment and a site plan. A copy of this information is included in Appendix D. The Sunnyside Farm Service Center consisted of a dry fertilizer plant, liquid fertilizer plant, and a "L.P. gas and anhydrous ammonia plant." According to Mr. Johnson, the L.P. probably referred to liquid pressurized anhydrous ammonia gas. Mr. Johnson indicated that propane was not sold at the site and that he was not aware of any use for propane related to site activities or operations. The dry fertilizer blending plant, located in the southwestern area of the site, was housed inside a 60-foot by 40-foot warehouse and shop addition and included a weigh hopper, 2-ton mixer, bagging machine, holding hopper, railroad car unloader, and other amenities such as electrical equipment, sewer, and water. The liquid fertilizer plant, located in the southeastern area of the site, included two 20,000-gallon vertical tanks, two 10,000-gallon vertical tanks, one 5,000-gallon vertical tank, three 2,000-gallon vertical tanks, concrete tank pads, aqua converter, chemical pumps, mixer, heater house, loading dock, and amenities such as electrical equipment and piping. The L.P. gas and anhydrous ammonia plant, located in the southeastern area of the site, included one 30,000-gallon L.P. tank, compressor, pump, tank car unloading riser, tank and truck loading riser, 20-ton truck scale with wood dock, 6-foot pit, sump pump, piping, and electrical.

According to the historical aerial photographs (Appendix C), the L.P. tank was removed and a lagoon structure was constructed in the vicinity between 1982 and 1991. This is supported by an invitation-to-bid document, located in the Ecology correspondence files, to refurbish the liquid tank farm and install a holding pond. This bid document is from the Chevron Chemical Company and is dated March 1984. The document specifies removal of a 28-foot by 68-foot concrete pad, construction of a 25-foot by 60-foot, 8-foot-deep holding pond, line holding pond with Chevron Industrial Membrane, attach membrane to drain line, construct a catch basin to connect to the wash rack gutter and drain line to connect to the holding pond. According to an interview with a Sandy Farms representative, Mr. Arno Johnson, conducted by Hart Crowser in 1990 (Hart Crowser, 1990a), the previous owner of the facility, Valley Agriculture Inc., constructed the lagoon in the early 1980s to collect water from the washdown of farm chemical applicator vehicles. The title report indicates that the Chevron Chemical Company owned the property from 1981 to 1987. Mr. Johnson reported that lagoon water was allowed to evaporate; prior to the construction of the lagoon, the water was washed into the public sewer system. In the September 2002 interview, Mr. Johnson indicated that the washdown area was unpaved and unlined before the lagoon was constructed. He also indicated that an earlier washdown area was located on the western portion of the site adjacent the current shop portion of the office/shop building.

The fertilizer facility was not operating at the time of the Hart Crowser study in 1990. The aerial photographs show that the vertical storage tanks in the former liquid fertilizer plant were removed in the late 1990s. Mr. Johnson indicated that the tanks were purchased in 1987 by another agricultural chemical company, NaChur, located across 1st Avenue from the site, and are still in use today.

After Valley Agriculture Inc. ceased operations in 1986, Mr. Arno Johnson purchased only the office/shop building portion of the site. He installed a scale and operated a commercial truck weighing operation, Bee-Jay Scales, with Mr. Neils Brown, a former employee of Valley Agriculture Inc.. In 1987, Mr. Johnson also moved the operations of a dairy and livestock feed business, Sandy Farms, to the site. The feed business was operated inside the warehouse that formerly contained the dry fertilizer plant. Mr. Johnson indicated that in order to meet rigorous USDA standards for storing feed in the warehouse (referred to now as the commodity building), it was thoroughly cleaned by scrubbing, vacuuming, and a final rinse, vacuuming all rinsate. The building was inspected regularly during the feed business tenure. Feed products stored in the commodity building by Sandy Farms included soybean meal, corn distillers, beet pellets, whole grain corn, mill run (wheat hulls), and rapeseed pellets. Sandy Farms ceased operating a livestock feed business in December 1996. Current Sandy Farms operations are limited to activities related to a local trucking company.

Adjacent property upgradient of the site that could have resulted in migration of contaminants to the site include gas stations formerly present on the west side of 1st Avenue both north and south of Warehouse Avenue and large stock yards (such as Munson Feed Lot) that could have contributed nitrate-related contaminants to the groundwater.

According to Robert Hickenbottom, the Hickenbottom property has been used for food packing, storage, and a transportation business since 1961. Prior to use of the property by Hickenbottom & Sons, the Hickenbottom property was pastureland.

## 2.4.5 Current Site Conditions

A site visit was conducted by CH2M HILL on September 9, 2002, to observe and document current site features and apparent conditions.

### 2.4.5.1 Bee-Jay Scales Property

According to Mr. Bob Bolden, manager of Sandy Farms, three businesses currently operate at the Bee-Jay Scales property:

- Sandy Farms, a local trucking company
- Sanleco, Inc., an interstate trucking company with on-site tractor trailer repair
- Bee-Jay Scales, a commercial scale operation

The current Bee-Jay Scales property includes four buildings of various sizes and a pole building (an open-sided, roof-only storage structure). The four buildings include the office/shop, the commodity building, and two small outbuildings. Three buildings were numbered in the Hart Crowser report, and all building locations are shown in Figure 2-5. The property is fenced and most of it is unpaved with gravel cover. Paved areas are limited to concrete curtains surrounding the office/shop building and a small area of the southeast quarter of the site. Equipment, tires, and vehicles, including cars, trucks, and trailers, and debris, are stored over the entire site. In general, housekeeping at the site is poor, although no hazardous substances were definitively identified at the site other than a waste solvent storage bin inside the shop building. Mr. Johnson indicated that waste oil and waste solvents generated by the truck servicing business are collected and stored together in a tank outside the shop building. A waste oil service company regularly disposes of the tank contents. Portions of the site are vegetated with sparse shrubs and groundcover, and one tree was observed on the eastern portion of the site.

The office/shop building is located on the west portion of the property and is a steel-frame structure on a concrete slab. It has offices in the front, facing First Avenue, and two large shop bays in the rear; the northern shop bay extends the entire width of the building. The commodity building is located on the southern site boundary adjacent the railroad tracks The commodity building appears to comprise two buildings and is a wood-frame structure on a concrete slab. The building interiors are divided into open bays currently used to store various vehicle parts, equipment, and tires. The western building has four bays while the eastern building has nine bays. The floor in one of the bays in the western building is stained with oil. Two elevators used for transferring bulk, granular materials are still attached to the building: one on the north side and one on the south side. A second, former elevator previously located on the south side has collapsed. The materials remain adjacent to the building's south side.

Two small outbuildings are also wood-frame structures with concrete slabs. Building 3 is a small structure located near the center of the property. The building had two small rooms and currently is used to store vehicle parts such as engine blocks and transmission parts. A fourth, small building located just east of the commodity building contains several large electrical control panels, but otherwise appears to be unused.

East of the fourth building in the location of the former liquid fertilizer plant is a fenced enclosure. Within the enclosure is a smaller fenced enclosure surrounding a lined pond. At the time of the site visit, a small amount of sediment and water (less than 1 foot thick or deep) sat in the pond; bright green algae appeared to be growing in the water. Two thick concrete stem walls on concrete pads with large lag bolts are located just west of the pond. Piles of gravelly soil and concrete debris, as well as truck parts and debris, are stored within the fenced enclosure. Just north of the fence is a three-sided concrete block wall with a concrete base, reportedly a former washout area. Just west of the washout area is a small roof structure with piping, valves, and bollards. An 8-inch diameter polyvinyl chloride (PVC) pipe that extends approximately 3 feet into the ground is located in this area.

Electric power appears to be supplied via overhead lines. According to site personnel, other utilities, including water and sewer, are provided by the City of Sunnyside.

### 2.4.5.2 Hickenbottom & Sons Property

Hickenbottom & Sons, a food processing and distribution company, operates on the Hickenbottom property of the site and contiguous, adjacent property. The majority of Hickenbottom & Sons' operation consists of a refrigeration warehouse. The Hickenbottom property that makes up a portion of the site is currently leased to the Johnson Fruit Company, which uses it to store produce bins, pallets, tractor-trailer rigs, and other miscellaneous equipment. The remainder of the Hickenbottom & Sons property is used to store tractor-trailers and produce and to transport produce to market. Former operations at Hickenbottom & Sons included fresh fruit and vegetable packing in preparation for transportation to market.

The Hickenbottom & Sons' portion of the site is part of a larger, contiguous property owned by Hickenbottom & Sons and used for their food processing and distribution business. The entire Hickenbottom property is fenced, and most of the property is covered with asphaltic concrete paving. Unpaved areas include a strip approximately 12 feet wide adjacent to the Bee-Jay Scales property and an area just west of the warehouse building on the southern portion of the property. The property line between the Hickenbottom property of the site and adjacent, contiguous Hickenbottom property transects the gravel paved area.

According to Jerry Hickenbottom, the site (and the warehouse portion of his property) is currently leased to Johnson Fruit company who uses it for storage. The northern portion is used to store tractor trailers, and the southern portion was being used to store fruit boxes, pallets, and miscellaneous equipment and materials at the time of our site visit. An L.P. tank is located on the eastern site boundary, adjacent to the warehouse. Utilities located on site include City of Sunnyside sanitary and storm sewer lines, municipal water, and electrical service. Hickenbottom has installed electrical outlets along the western site boundary to provide electricity for truck engine heaters in the winter.

## 2.5 Nature and Extent of Contamination

Ecology has included a table of hazardous substances detected in soil and groundwater at the site in the MTCA Agreed Order No. DE 02TCPCR-3932. These included 2,4-dichlorophenoxyacetic acid (2,4-D), dinoseb, heptachlor, lindane, ammonia, nitrate + nitrite, and benzene. Other hazardous substances were also identified in either soil or groundwater. Results from studies conducted by Hart Crowser (June 1990), White Shield (1991), and Ecology (1997) have been compiled to provide a preliminary summary of the nature and extent of contamination. The following sections address the historical data and their usability, contaminants detected in soils, and contaminants detected in groundwater.

### 2.5.1 Historical Data Quality

The DQOs for previous investigations were not identical; therefore, different sample collection and analytical methods, including screening methods, were used. Soil samples include composite samples made over different intervals, from 4 feet to more than 20 feet, and included composite samples for organic compound analysis. Groundwater samples were collected from monitoring wells as well as directly from hand-augered soil borings using a bailer. Groundwater collected directly from hand-augered borings may not represent actual groundwater quality. Screening analytical methods, while excellent tools to efficiently collect information at a site, may not best represent actual soil and groundwater quality or compare to regulatory criteria.

The data from the previous investigations at the Bee-Jay Scales Site have been summarized in Tables 2-1 and 2-2. The tables indicate sample type and whether analytical screening methods were used. MTCA Method B clean-up levels and maximum contaminant levels (MCLs) are provided in the tables for informational purposes only.

In addition, the historical data have been combined and displayed on site maps and are discussed by environmental media and chemical group in the following sections. The historical data will be used to guide sampling and analysis for the RI.

### 2.5.2 Soil

Contaminant concentrations detected in soil samples and lagoon sediment samples from the Hart Crowser (June 1990) and White Shield (1991) studies are summarized in Table 2-2 and shown on Figures 2-6, 2-7, and 2-8. Ecology (1997) collected a single soil sample from the area of the ASTs on the Bee-Jay Scales Site and a sediment sample from the lagoon. However, because sample locations were not found in the Ecology records, they are not shown on these figures.

#### 2.5.2.1 Conventional Parameters

Soils samples were analyzed for general parameters including nitrate (as nitrogen) and ammonia in the Hart Crowser study, ammonia, nitrate + nitrite, and total phosphorous in the White Shield study, and total organic carbon (TOC) in the Ecology lagoon sediment sample. Nitrate concentrations ranged from less than MDLs to 1,100 milligrams per kilogram (mg/kg) (SF-5, 0.5 to 6.0 feet bgs) in soils and up to 12,000 mg/kg in the lagoon sediment. Nitrite + nitrate concentrations ranged from less than MDLs to 8,200 mg/kg (SB-2, 3 feet bgs). Ammonia concentrations ranged from 1.6 mg/kg (MW-2, composite 3.0 to 24.5 feet) to 15,000 mg/kg (SB-2) in soil and 5,200 mg/kg in the lagoon sediment. The MTCA Method B clean-up levels for unrestricted land use soils for nitrate and nitrite is 8,000 mg/kg (Ecology CLARC, 2001). There is no MTCA clean-up level for ammonia in soils. The nitrate + nitrite and ammonia concentrations in soils are shown on Figure 2-6. The contamination concentrations are reported from shallow soils collected from hand-auger borings as well as soils collected from borings for MW-3 and MW-4 to a depth of 19.5 feet.

Total phosphorous concentrations ranged from less than MDLs to 2,900 mg/kg (SB-3, 3.0 to 7.0 feet bgs). TOC ranged from 0.9 percent dry weight in the Ecology soil sample to 11.3 percent dry weight in the Ecology lagoon sediment sample. The MTCA Method B clean-up level for unrestricted land use soils for phosphorous is 1.6 mg/kg. There is no MTCA clean-up level for TOC in soils.

#### 2.5.2.2 Volatile Organic Compounds and Petroleum

Soil samples collected from the vicinity of USTs were analyzed for TPH in the Hart Crowser study and the White Shield study. TPH concentrations ranged from less than MDLs to 950 mg/kg (SB-9, 3.0 to 7.0 feet bgs). The data cannot be readily compared to current MTCA Method A clean-up levels for unrestricted land use due to differences in analytical methods. Method A clean-up levels range from 30 mg/kg to 4,000 mg/kg, depending on the type of hydrocarbon organics present. TPH concentrations are shown on Figure 2-7.

Soil samples were analyzed for petroleum-related volatile organic compounds (VOCs), benzene, toluene, ethylbenzene, and xylenes (BTEX), in the Hart Crowser study in the vicinity of the former Hickenbottom & Sons USTs as shown on Figure 2-7. Concentrations detected are below current MTCA Method B clean-up levels for unrestricted land use. MTCA Method B clean-up levels are 18.2 mg/kg for benzene, 8,000 mg/kg for ethylbenzene, 16,000 mg/kg for toluene, and 160,000 mg/kg for xylenes.

The soil sample AST-1 collected by Ecology was analyzed for VOCs. The soil sample had estimated concentrations of chloroform at 0.59 micrograms per kilogram (µg/kg) and xylenes at 0.57 µg/kg. These concentrations are below MTCA Method B clean-up levels.

#### 2.5.2.3 Pesticides and Polychlorinated Biphenyls

Soil samples were analyzed for organochlorine pesticides and PCBs in the Hart Crowser and White Shield studies. Lindane concentrations ranged from less than MDLs to 0.099 mg/kg (SF-7, 0.5 to 6.0 feet bgs), heptachlor concentrations ranged from less than MDLs to 0.005 mg/kg (SF-8, 0.5 to 6.0 feet bgs), and gamma-benzenehexachloride (g-BHC) concentrations ranged from less than MDLs to 1.8 mg/kg (SB-4, 3-7 feet bgs). MTCA Method B clean-up levels for unrestricted land use for these contaminants are lindane 0.769 mg/kg and heptachlor 0.222 mg/kg. This compound, g-BHC, is also categorized as lindane. Soil concentrations did not exceed these clean-up levels. 4,4′-Dichlorodiphenyltrichloroethene (4,4′-DDE), 4,4′-DDT, endosulfan II, and endrin aldehyde were detected in a lagoon sediment sample using nonstandard methods. These compounds were not detected using EPA methods. No PCBs were detected. Figure 2-8 shows the location of the lindane detection.

Ecology tested a single soil sample and lagoon sediment for chlorinated pesticides and PCBs (EPA 1618), nitrogen-containing pesticides (EPA 1618), organophosphorous pesticides (EPA 1618), and carbamate pesticides (SW 8318). Aldicarb sulfone, a carbamate pesticide, was detected at 0.17 mg/kg in the lagoon sediment sample. The MTCA Method B clean-up level is 80 mg/kg. No other pesticides or PCBs were detected in the Ecology samples.

#### 2.5.2.4 Herbicides

Soil samples were analyzed for chlorinated herbicides in the Hart Crowser and White Shield studies. 2,4-D concentrations ranged from less than MDLs to 0.35 mg/kg (MW-3, 3.0 to 19.5 feet bgs), dinoseb concentrations ranged from less than MDLs to 8 mg/kg (SF-7, 0.5 to 6.0 feet bgs). MTCA Method B clean-up levels for unrestricted land use for these contaminants are 2,4-D, 80 mg/kg, and dinoseb, 80 mg/kg. Figure 2-8 shows the locations of 2,4-D and dinoseb detections.

Ecology analyzed one soil sample (AST-1) and one lagoon sediment sample for chlorinated herbicides; no chlorinated herbicides were detected.

### 2.5.3 Groundwater

#### 2.5.3.1 Conventional Parameters

Groundwater samples from monitoring wells were analyzed for nitrate, nitrite, ammonia, total phosphate, and conductivity in the Hart Crowser study. The White Shield study analyzed groundwater collected from soil borings for nitrate + nitrite, ammonia, and total phosphate. Groundwater was collected from soil borings in the White Shield study using a bailer or a soil probe. This collection technique may result in a sample with a high total suspended solids (TSS) content and may not be an accurate representation of groundwater quality. Nitrate ranged from 4 milligrams per liter (mg/L) in the upgradient monitoring well (MW-1) to 2,800 mg/L (MW-3). Nitrite ranged from 0.02 mg/L (MW-1) to 250 mg/L (MW-3). Ammonia in the monitoring wells ranged from 0.08 mg/L (MW-1) to 5,100 mg/L (MW-3). Nitrate + nitrite ranged from less than MDLs to 4,400 mg/L (SB-1). Total phosphate ranged from 1.4 mg/L (MW-1) to 2.6 mg/L (MW-3). Total phosphate was detected up to 420 mg/L from groundwater collected from soil borings (SB-4). Total phosphorous is reported in results for groundwater collected from borings SB-8 and SB-9 (this may be a typographical error). The White Shield study states that total phosphates were analyzed. Conductivity in the upgradient monitoring well (MW-1) was measured at 4,000 micromhos (µmhos) and at 220,000 µmhos in MW-3. MTCA Method B clean-up levels for potable groundwater for nitrate and nitrite is 1.6 mg/L for phosphorous is 0.00032. Conventional parameter data from these studies are shown on Figure 2-9. Groundwater was collected from two of the existing monitoring wells (MW-3 and MW-4) for the 1997 Ecology study. Conventional parameters analyzed were TOC, nitrite + nitrate, ammonia, chloride, sulfate, and conductivity. The Ecology data are shown on Figure 2-10. The highest concentrations of nitrite + nitrate and ammonia were detected in MW-4 at 4,090 mg/L and 1,650 mg/L, respectively.

#### 2.5.3.2 Petroleum and Volatile Organic Compounds

The Hart Crowser study did not detect concentrations of petroleum hydrocarbons as gasoline or diesel. TPHs in groundwater, collected from soil borings in the White Shield study, were not detected above MDLs. Groundwater collected for the Ecology study was analyzed for VOCs. Detected compounds are shown in Figure 2-11. Compounds detected at concentrations above MTCA Method B clean-up levels for potable groundwater include benzene (1.3 micrograms per liter, or µg/L), 1,2-dichloroethane (2.2 µg/L), 1,2-dichloropropane (459 µg/L), 1,3-dichloropropane (17 µg/L), chlorobenzene (3.1 µg/L), and 1,2,3 trichloropropane (155 µg/L). Clean-up levels for these compounds are 0.8 µg/L (benzene), 0.481 µg/L (1,2-dichloroethane), 0.642 µg/L (1,2-dichloropropane), 0.643 µg/L (1,3-dichloropropane), 0.324 µg/L (chlorobenzene), and 0.00625 (1,2,3 trichloropropane).

### 2.5.3.3 Pesticides and Polychlorinated Biphenyls

Organochlorine pesticides and PCBs were analyzed in groundwater collected in the Hart Crowser and White Shield studies. Pesticides were detected by Hart Crowser in MW-3 and MW-4 using nonstandard analytical methods. A sample collected from MW-4 and analyzed using EPA Method 8080 did not confirm these results and did not indicate pesticides or PCB concentrations at or above MDLs. Groundwater was collected from soil borings in the White Shield study using a bailer or a soil probe. This collection technique may result in a sample with a high TSS content and may not accurately represent groundwater quality. The samples had detected concentrations of beta-benzenehexachloride (b-BHC) that ranged from less than detection limits to 3.2 µg/L (SB-2), g-BHC from less than MDLs to 69 µg/L (SB-2), lindane from less than MDLs to 1.8 µg/L (SB-4), heptachlor from less than MDLs to 1.4 µg/L (SB-2), and heptachlor epoxide from less than MDLs to 3.6 µg/L (SB-3). All detected pesticides are from groundwater samples collected directly from soil borings, with the exception of a single lindane detection in MW-2 detected in a screening analysis. MTCA Method B clean-up levels for potable groundwater for b-BHC (lindane), g-BHC (lindane), and lindane is 0.0673 µg/L, for heptachlor is 0.0194 µg/L, and for heptachlor epoxide is 0.0096 µg/L. Figure 2-12 shows locations of detected pesticides.

The Ecology groundwater samples collected in 1997 were analyzed for pesticides using EPA Methods 531.1 and 8318. The samples did not have concentrations of organochlorine pesticides at or above MDLs. Detected pesticide compounds are shown on Figure 2-13. The detected pesticide compounds are less than MTCA Method B clean-up levels for potable groundwater.

### 2.5.3.4 Herbicides and Semivolatile Organic Compounds

The Hart Crowser study analyzed groundwater for chlorinated herbicides and semivolatile organic compounds (SVOCs). The results reported 2,4-D concentrations ranging from less than MDLs to 2.3 mg/L or 2,300 µg/L (MW-3). Dinoseb concentrations ranged from less than MDLs to 7 mg/L or 7,000 µg/L (MW-3). SVOCs were analyzed in a sample from MW-4 only. Detected compounds included 2,4-dichlorophenol (19 µg/L); tentatively identified compounds (TICs) included dichloropropene (280 µg/L) , dichloronitrophenol (48 µg/L), and trichloroethane (50 µg/L). Groundwater was collected from soil borings in the White Shield study using a bailer or a soil probe. This collection technique may result in a sample with a high TSS content and may not accurately represent groundwater quality. The White Shield study reported dinoseb concentrations ranging from less than MDLs to 280 µg/L (SB-1) and 2,4-5-TP concentrations ranging from less than MDLs to 4.0 µg/L (SB-4). MTCA Method B clean-up levels for potable groundwater for 2,4-D, dinoseb, 2,4-5-TP, and 2,4-

dichlorophenol are 160 µg/L, 16 µg/L, 128 µg/L, and 48 µg/L, respectively. Dinoseb and 2,4-D concentrations are shown on Figure 2-12.

The groundwater samples collected by Ecology were analyzed for chlorinated herbicides. The detected concentrations are shown on Figure 2-14. Concentrations detected that exceeded MTCA Method B clean-up levels for potable groundwater included 2,4-D at 290 µg/L (MW-4), dinoseb at 1100 µg/L (MW-4), and pentachlorophenol at 2.1 µg/L (MW-4). The clean-up level for pentachlorophenol is 0.729 µg/L.

#### 2.5.3.5 Metals

The 1997 Ecology sampling event collected groundwater from MW-3 and MW-4 and analyzed samples for metals. Information in the files does not indicated whether these samples were filtered in the field and represent dissolved metals. For purposes of this report, it is assumed that the data are presented as total metal concentrations. The data are shown on Figure 2-15. Lead concentrations of 22 µg/L and 28 µg/L exceed the MTCA Method A clean-up level and MCL (15 µg/L). The maximum manganese value (2,810 µg/L) exceeds the MTCA Method B clean-up level for potable groundwater of 2,240 µg/L.

### 2.5.4 Summary

A preliminary list of COPCs has been assembled based on available information on past practices and on the available analytical and field screening results summarized above. COPCs identified for soils include nitrate, nitrite, ammonia, phosphorous, TPHs, lindane, 2,4-D, dinoseb, and arsenic. Nitrate and arsenic are the only contaminants in soils that have been identified at concentrations above MTCA Method B clean-up levels for unrestricted land use. Clean-up levels for the site have not been established at this time.

The extent of soil contamination is not well defined in particular with respect to depth of contaminants in soils. The previous investigations include soil samples that were composited over large depth intervals with few vertically discrete soil samples. Lateral limits of soil contamination also are not well-defined, with the exception of the eastern extent of the nitrate-contaminated soil plume on the Hickenbottom property.

COPCs identified for groundwater include the conventional parameters (nitrate, nitrite, ammonia, phosphate, sulfate, chloride, and conductivity), VOCs, SVOCs, pesticides, herbicides, and metals. Nitrate, nitrite, sulfate, chloride, benzene, dichloroethane, 1,2-dichloropropane, 1,2,3-trichloropropane, 2,4-dichlorophenol, pentachlorophenol, lindane, heptachlor, heptachlor epoxide, 2,4-D, dinoseb, 2,4,5-trichlorophenol (2,4,5-TP), lead, and manganese are compounds identified that exceeded MTCA Method B clean-up levels for potable groundwater. Clean-up levels have not been established for the site.

The extent of groundwater contamination is not well defined, in particular with respect to possible off-site contamination. In the 1990 Hart Crowser investigation, the highest concentrations of COPCs were observed in MW-3 located southeast of the truck washdown area. Based on the sample results from the 1997 Ecology sampling event, the highest concentrations of COPCs were identified in MW-4, located further south near the Bee-Jay Scales Site property boundary.

## TABLE 2-1

Summary of Historical Soil Data: Detected Compounds

*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| **Boring or Test Pit ID**<br>**Composite or Discrete**<br>**Depth Interval (in feet)**<br>**Source/Date** | WA State Cleanup Level MTCA Method B Unrestr. Land Use (ingest. path only) CLARC 11/2001 | **HB-1**<br>**composite**<br>**1.5-11**<br>**HC 1990** | **HB-1**<br>**discrete**<br>**10.0-11**<br>**HC 1990** | **HB-2**<br>**composite**<br>**1.5-11**<br>**HC 1990** | **HB-2**<br>**discrete**<br>**10.0-11**<br>**HC 1990** | **SB-1/ HIC-0291-1&2**<br>**composite**<br>**3.0-7.0**<br>**WS 1991** | **SB-2/HIC-0291-4**<br>**discrete**<br>**3**<br>**WS 1991** | **SB-3/ HIC-0291-5&6**<br>**composite**<br>**3.0-7.0**<br>**WS 1991** | **SB-4/ HIC-0291-8&9**<br>**composite**<br>**3.0-7.0**<br>**WS 1991** | **SB-5/ HIC-0291-11 &12**<br>**composite**<br>**3.0-7.0**<br>**WS 1991** | **SB-5/ HIC-0291-13**<br>**discrete**<br>**13**<br>**WS 1991** | **SB-7/ HIC-0291-15&16**<br>**composite**<br>**3.0-7.0**<br>**WS 1991** | **SB-6/ HIC-0291-17&18**<br>**composite**<br>**3.0-7.0**<br>**WS 1991** | **SB-9/ HIC-0291-20&21**<br>**composite**<br>**3:0-7.0**<br>**WS 1991** | **SB-9/ HIC-0291-23**<br>**discrete**<br>**3**<br>**WS 1991** | **AST-1**<br>**ECY 1997** | **Lagoon Sed**<br>**ECY 1997** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Compound** | | | | | | | | | | | | | | | | | |
| Conventional Parameters (mg/Kg) | | | | | | | | | | | | | | | | | |
| Nitrate | 8000 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 18 | 3 | NA | NA |
| Nitrite | 8000 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | ND | ND | NA | NA |
| Nitrate + Nitrite | NC | NA | NA | NA | NA | 48 | NA | 80 | 34 | NA | NA | NA | 8.5 | NA | NA | NA | NA |
| Ammonia | NC | NA | NA | NA | NA | 0.6 | NA | ND | ND | ND | NA | NA | 1.2 | ND | ND | NA | NA |
| Phosphate (Total) | NC | NA | NA | NA | NA | 270 | NA | 2900 | 2500 | NA | NA | NA | NA | 550 | 930 | NA | NA |
| Total Organic Carbon (% dry wt.) | NC | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 0.9 | 11.3 |
| Petroleum Hydrocarbons (mg/Kg) | | | | | | | | | | | | | | | | | |
| TPH | NC | NA | 56 | *ND** | *ND** | NA | NA | NA | NA | NA | ND | NA | 13 | 14 | 950 | NA | NA |
| TPH-gasoline | 100 (MTCA A no benz) | NA | 13 | *ND** | *ND** | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-diesel | 2000 (MTCA A) | NA | 43 | 140* | *ND** | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-motor oil | 2000 (MTCA A) | NA | ND | *ND** | *ND** | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Volatile Organic Compounds (mg/Kg) | | | | | | | | | | | | | | | | | |
| Benzene | 18.2 | NA | 0.057 | NA | 0.018* | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | ND | ND |
| Ethylbenzene | 8000 | NA | 0.24 | NA | 0.046* | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | ND | ND |
| Toluene | 16000 | NA | 0.17 | NA | 0.037* | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | ND | ND |
| Xylenes | 160000 | NA | 0.74 | NA | 0.190* | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 0.00057 J | ND |
| Chloroform | 164 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 0.00059 J | ND |
| Pesticides and PCBs (mg/Kg) | | | | | | | | | | | | | | | | | |
| ***Chlorinated Pesticides/PCBs*** | | | | | | | | | | | | | | | | | |
| Lindane (g-BHC) | 0.769 | *ND** | NA | NA | NA | ND | 0.06 | ND | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| 4,4'-DDE | 2.94 | NA | NA | NA | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| 4,4'-DDT | 2.94 | NA | NA | NA | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| Endosulfan II | 480 | NA | NA | NA | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| Endrin Aldehyde | NC | NA | NA | NA | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| Heptachlor | 0.22 | NA | NA | NA | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| PCBs | NC | *ND** | NA | NA | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| ***Carbamate Pesticides*** | | | | | | | | | | | | | | | | | |
| Aldicarb sulfone | 80 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | ND | 0.17 |

Notes:

1. HC 1990=Hart Crowser (1990b). Screening analyses used for petroleum hydrocarbons and chlorinated pesticides/PCBs as noted by astrisk (*). Methods for other analyses include: nitrate EPA 353.1, nitrite EPA 354.1, total phosphate EPA 365.1, TPH EPA 8015 modified, BETX EPA 8020, chlorinated pesticides/PCBs EPA 8080, chlorinated herbicides EPA 8150, arsenic EPA 7060, cadmium EPA 7130, copper EPA 7210.

2. WS 1991=White Shield (1991). Analytical methods include: nitrate+nitrite, nitrate, nitrite, ammonia, total phosphate, total phosphorous, and specific conductance (methods not specified), TPH EPA 418.1, chlorinated pesticides/PCBs EPA 8080, chlorinated herbicides EPA 8150. Soil samples were composited by the laboratory.

3. ECY 1997=Ecology (1997). Analytical methods include nitrite-nitrete EPA 353.2, ammonia EPA 350.1, sulfate EPA 300, chloride EPA 300, TOC EPA 415.1, conductivity EPA 120.1, VOCs EPA 8260, chlorinated pesticides and nitrogen-containing pesticides EPA 1618, carbamate pesticides EPA 531.1, chlorinated herbicides EPA 8150, metals EPA 200.7.

4. CLARC 11/2001=Ecology (2001), Cleanup Levels and Risk Calculations under the MTCA Cleanup regulation.

5. Data Qualifiers:
* = field screening method
B = detected in blank
NA = not analyzed
J = compound detected estimated concentration value
ND = not detected at or above method detection limits
^ = laboratory report not identified, results presented in report text
E = concentration exceeds known calibration range
100 = bold values indicate exceeds regulatory values presented in the table
NC = not published in CLARC

**TABLE 2-1**

Summary of Historical Soil Data: Detected Compounds

*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| **Boring or Test Pit ID**<br>**Composite or Discrete**<br>**Depth Interval (in feet)**<br>**Source/Date** | WA State Cleanup Level MTCA Method B Unrestr. Land Use (ingest. path only) CLARC 11/2001 | **HB-1**<br>**composite**<br>**1.5-11**<br>**HC 1990** | **HB-1**<br>**discrete**<br>**10.0-11**<br>**HC 1990** | **HB-2**<br>**composite**<br>**1.5-11**<br>**HC 1990** | **HB-2**<br>**discrete**<br>**10.0-11**<br>**HC 1990** | **SB-1/ HIC-0291-1&2**<br>**composite**<br>**3.0-7.0**<br>**WS 1991** | **SB-2/HIC-0291-4**<br>**discrete**<br>**3**<br>**WS 1991** | **SB-3/ HIC-0291-5&6**<br>**composite**<br>**3.0-7.0**<br>**WS 1991** | **SB-4/ HIC-0291-8&9**<br>**composite**<br>**3.0-7.0**<br>**WS 1991** | **SB-5/ HIC-0291-11 &12**<br>**composite**<br>**3.0-7.0**<br>**WS 1991** | **SB-5/ HIC-0291-13**<br>**discrete**<br>**13**<br>**WS 1991** | **SB-7/ HIC-0291-15&16**<br>**composite**<br>**3.0-7.0**<br>**WS 1991** | **SB-6/ HIC-0291-17&18**<br>**composite**<br>**3.0-7.0**<br>**WS 1991** | **SB-9/ HIC-0291-20&21**<br>**composite**<br>**3.0-7.0**<br>**WS 1991** | **SB-9/ HIC-0291-23**<br>**discrete**<br>**3**<br>**WS 1991** | **AST-1**<br>**ECY 1997** | **Lagoon Sed**<br>**ECY 1997** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Compound** | | | | | | | | | | | | | | | | | |
| Herbicides (mg/Kg) | | | | | | | | | | | | | | | | | |
| 2,4-D | 800 | NA | NA | NA | NA | ND | NA | ND | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| Dinoseb | 80 | NA | NA | NA | NA | 0.12 | NA | ND | ND | ND | NA | ND | ND | ND | ND | ND | ND |
| | | | | | | | | | | | | | | | | | |
| Metals (mg/Kg) | | | | | | | | | | | | | | | | | |
| Arsenic | 0.667 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Cadmium | 80 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 21.9 | 4.24 |
| Chromium | 120000 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 57.2 | 33.5 |
| Copper | 2960 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 49.4 | 73.6 |
| Iron | NC | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 19200 | 31900 |
| Lead | 250 (MTCA A) | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 94.3 J | 115 J |
| Manganese | 11200 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 188 | 562 |
| Nickel | NC | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 13.2 | 31.5 |
| Zinc | 24000 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | 1010 | 694 |

Notes:

1. HC 1990=Hart Crowser (1990b). Screening analyses used for petroleum hydrocarbons and chlorinated pesticides/PCBs as noted by astrisk (*). Methods for other analyses include: nitrate EPA 353.1, nitrite EPA 354.1, total phosphate EPA 365.1, TPH EPA 8015 modified, BETX EPA 8020, chlorinated pesticides/PCBs EPA 8080, chlorinated herbicides EPA 8150, arsenic EPA 7060, cadmium EPA 7130, copper EPA 7210.
2. WS 1991=White Shield (1991). Analytical methods include: nitrate+nitrite, nitrate, nitrite, ammonia, total phosphate, total phosphorous, and specific conductance (methods not specified), TPH EPA 418.1, chlorinated pesticides/PCBs EPA 8080, chlorinated herbicides EPA 8150. Soil samples were composited by the laboratory.
3. ECY 1997=Ecology (1997). Analytical methods include nitrite-nitrete EPA 353.2, ammonia EPA 350.1, sulfate EPA 300, chloride EPA 300, TOC EPA 415.1, conductivity EPA 120.1, VOCs EPA 8260, chlorinated pesticides and nitrogen-containing pesticides EPA 1618, carbamate pesticides EPA 531.1, chlorinated herbicides EPA 8150, metals EPA 200.7.
4. CLARC 11/2001=Ecology (2001), Cleanup Levels and Risk Calculations under the MTCA Cleanup regulation.
5. Data Qualifiers:

| | | |
|---|---|---|
| * = field screening method | J = compound detected estimated concentration value | E = concentration exceeds known calibration range |
| B = detected in blank | ND = not detected at or above method detection limits | 100 = bold values indicate exceeds regulatory values presented in the table |
| NA = not analyzed | ^ = laboratory report not identified, results presented in report text | NC = not published in CLARC |

**TABLE 2-2**
Summary of Historical Groundwater Data: Detected Compounds
*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| **Monitoring Well or Boring<br>Screen Interval (in feet)<br>Depth to Water (in feet)<br>Source/Date** | WA State Cleanup Level MTCA Method B Potable GW CLARC 11/2001 | EPA Water MCL Drinking Water CLARC 11/2001 | EPA Water MCL Secondary Drinking Water CLARC 11/2001 | **MW-1<br>13.5-23.5<br>13.21<br>HC 1990** | **MW-2<br>11.5-21.5<br>9.72<br>HC 1990** | **MW-3<br>10.0-20.0<br>8.9<br>HC 1990** | **MW-4<br>8.0-18.0<br>10.44<br>HC 1990** | **MW-3<br>10.0-20.0<br>NA<br>ECY 1997** | **MW-4<br>8.0-18.0<br>NA<br>ECY 1997** | **SB-1/ HIC-0291-3 boring sample@14'<br>WS 1991** | **SB-3/ HIC-0291-7 boring sample@14'<br>WS 1991** | **SB-4/ HIC-0291-10 boring sample@12'<br>WS 1991** | **SB-5/ HIC-0291-13 boring sample@13'<br>WS 1991** | **SB-6/HIC-0291-14 boring sample@15'<br>WS 1991** | **SB-7/ HIC-0291-19 boring sample@13'<br>WS 1991** | **SB-8/ HIC-0291-22 boring sample@13'<br>WS 1991** | **SB-9/ HIC-0291-24 boring sample@19'<br>WS 1991** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Compound** | | | | | | | | | | | | | | | | | |
| Conventional Parameters (mg/L) | | | | | | | | | | | | | | | | | |
| Nitrate | NC | 10 | NC | 4 | **100** | **2,800** | **1,400** | NA | NA | NA | NA | NA | 5.5 | NA | NA | **31** | 5.4 |
| Nitrite | 1.6 | 1 | NC | 0.02 | 0.06 | **250** | **25** | NA | NA | NA | NA | NA | 0.03 | NA | NA | ND | ND |
| Nitrate + Nitrite | NC | NC | NC | NA | NA | NA | NA | 0.955 | 4090 J | 4,400 | 11 | 43 | NA | 240 | 4.7 | NA | NA |
| Ammonia | NC | NC | NC | 0.08 | 0.25 | 5,100 | 220 | 434 | 1650 | 0.53 | 17 | 0.04 | NA | 1.4 | 0.06 | NA | NA |
| Phosphates (total) | NC | NC | NC | 1.4 | 2 | 2.6 | 2.4 | NA | NA | 8.7 | 54 | 420 | 57 | 370 | NA | NA | NA |
| Phosphorous (total) | 0.00032 | NC | NC | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Chloride | NC | NC | 250 | NA | NA | NA | NA | 12.2 | **443** | NA | NA | NA | NA | NA | NA | **48** | **0.23** |
| Total organic carbon | NC | NC | NC | NA | NA | NA | NA | 36.1 J | 22.4 J | NA | NA | NA | NA | NA | NA | NA | NA |
| Conductivity (in umhos) | NC | NC | NC | 4,000 | 10,500 | 220,000 | 8,200 | 1040 | 14700 | 7,400 | 2,100 | 960 | 680 | 620 | 640 | 660 | 650 |
| Petroleum Hydrocarbons (ug/L) | | | | | | | | | | | | | | | | | |
| TPH | NC | NC | NC | NA | NA | NA | NA | NA | NA | ND | ND | ND | ND | ND | NA | NA | NA |
| TPH-Gasoline | 800 (MTCA A+benz) | NC | NC | *ND** | *ND** | *ND** | *ND** | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-Diesel | 500 (MTCA A) | NC | NC | *ND** | *ND** | *ND** | *ND** | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| TPH-Unknown | NC | NC | NC | *ND** | *ND** | 230* | 21* | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Volatile Organic Compounds (ug/L) | | | | | | | | | | | | | | | | | |
| enzene | 0.795 | 5 | NC | NA | NA | NA | NA | ND | **1.3 B** | NA | NA | NA | NA | NA | NA | ND | ND |
| Toluene | 1000 | 1000 | NC | NA | NA | NA | NA | ND | ND | NA | NA | NA | NA | NA | NA | NA | NA |
| Xylenes | 16000 | 10000 | NC | NA | NA | NA | NA | ND | 0.53 B | NA | NA | NA | NA | NA | NA | NA | NA |
| 2-Butanone | 4800 | NC | NC | NA | NA | NA | NA | 36 | ND | NA | NA | NA | NA | NA | NA | NA | NA |
| 1,2-Dichloroethane | 0.48 | 5 | NC | NA | NA | NA | NA | ND | **2.2** | NA | NA | NA | NA | NA | NA | NA | NA |
| 1,2-Dichloropropane | 0.643 | 5 | NC | NA | NA | NA | NA | **0.71 J** | **459 E** | NA | NA | NA | NA | NA | NA | NA | NA |
| 4-Methyl 2-Pentanone | 640 | NC | NC | NA | NA | NA | NA | 0.55 J | ND | NA | NA | NA | NA | NA | NA | NA | NA |
| 1,1,2-Trichloroethane | 0.768 | 5 | NC | NA | NA | NA | NA | ND | 0.22 J | NA | NA | NA | NA | NA | NA | NA | NA |
| 1,3-Dichloropropane | 0.643 | NC | NC | NA | NA | NA | NA | ND | **17** | NA | NA | NA | NA | NA | NA | NA | NA |
| Chlorobenzene | 0.324 | 100 | NC | NA | NA | NA | NA | ND | **3.1** | NA | NA | NA | NA | NA | NA | NA | NA |

Notes:

1. HC 1990=Hart Crowser (1990b). Screening analyses used for petroleum hydrocarbons and chlorinated pesticides/PCBs as noted by astrisk (*). Methods for other analyses include: nitrate EPA 353.1, nitrite EPA 354.1, total phosphate EPA 365.1, TPH EPA 8015 modified, BETX EPA 8020, chlorinated pesticides/PCBs EPA 8080, chlorinated herbicides EPA 8150, arsenic EPA 7060, cadmium EPA 7130, copper EPA 7210.
2. WS 1991=White Shield (1991). Analytical methods include: nitrate+nitrite, nitrate, nitrite, ammonia, total phosphate, total phosphorous, and specific conductance (methods not specified), TPH EPA 418.1, chlorinated pesticides/PCBs EPA 8080, chlorinated herbicides EPA 8150. Soil samples were composited by the laboratory.
3. ECY 1997=Ecology (1997). Analytical methods include nitrite-nitrete EPA 353.2, ammonia EPA 350.1, sulfate EPA 300, chloride EPA 300, TOC EPA 415.1, conductivity EPA 120.1, VOCs EPA 8260, chlorinated pesticides and nitrogen-containing pesticides EPA 1618, carbamate pesticides EPA 531.1, chlorinated herbicides EPA 8150, metals EPA 200.7.
4. CLARC 11/2001=Ecology (2001), Cleanup Levels and Risk Calculations under the MTCA Cleanup regulation.
5. Data Qualifiers:

| | | | |
|---|---|---|---|
| * = field screening method | J = compound detected estimated concentration value | E = concentration exceeds known calibration range | NC = not published in CLARC |
| B = detected in blank | ND = not detected at or above method detection limits | 100 = bold values indicate exceeds regulatory values presented in the table | |

**TABLE 2-2**

Summary of Historical Groundwater Data: Detected Compounds

*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| Monitoring Well or Boring<br>Screen Interval (in feet)<br>Depth to Water (in feet)<br>Source/Date | WA State Cleanup Level MTCA Method B Potable GW CLARC 11/2001 | EPA Water MCL Drinking Water CLARC 11/2001 | EPA Water MCL Secondary Drinking Water CLARC 11/2001 | MW-1<br>13.5-23.5<br>13.21<br>HC 1990 | MW-2<br>11.5-21.5<br>9.72<br>HC 1990 | MW-3<br>10.0-20.0<br>8.9<br>HC 1990 | MW-4<br>8.0-18.0<br>10.44<br>HC 1990 | MW-3<br>10.0-20.0<br>NA<br>ECY 1997 | MW-4<br>8.0-18.0<br>NA<br>ECY 1997 | SB-1/ HIC-0291-3 boring sample@14' WS 1991 | SB-3/ HIC-0291-7 boring sample@14' WS 1991 | SB-4/ HIC-0291-10 boring sample@12' WS 1991 | SB-5/ HIC-0291-13 boring sample@13' WS 1991 | SB-6/HIC-0291-14 boring sample@15' WS 1991 | SB-7/ HIC-0291-19 boring sample@13' WS 1991 | SB-8/ HIC-0291-22 boring sample@13' WS 1991 | SB-9/ HIC-0291-24 boring sample@19' WS 1991 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Compound** | | | | | | | | | | | | | | | | | |
| Semivolatile Organics (ug/L) | | | | | | | | | | | | | | | | | |
| 2,4-Dichlorophenol | 48 | | | NA | NA | NA | 19 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dichloropropene (TIC) | NC | | | NA | NA | NA | 280 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Dichloronitrophenol (TIC) | NC | | | NA | NA | NA | 48 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Trichloroethane (TIC) | NC | | | NA | NA | NA | 50 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Metals (ug/L) | | | | | | | | | | | | | | | | | |
| Chromium | 24000 | | | NA | NA | NA | NA | 27 | 18 | NA | NA | NA | NA | NA | NA | NA | NA |
| Copper | 592 | | 1000 | NA | NA | NA | NA | 57.4 | 40 | NA | NA | NA | NA | NA | NA | NA | NA |
| Iron | NC | | 300 | NA | NA | NA | NA | **19900** | **16600** | NA | NA | NA | NA | NA | NA | NA | NA |
| Lead | 15 (MTCA A) | | | NA | NA | NA | NA | **28** | **22** | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | 2240 | | 50 | NA | NA | NA | NA | **502** | **2810** | NA | NA | NA | NA | NA | NA | NA | NA |
| Nickel | NC | | | NA | NA | NA | NA | 24 | 56 | NA | NA | NA | NA | NA | NA | NA | NA |
| Zinc | 4800 | | 5000 | NA | NA | NA | NA | 1000 | 78.2 | NA | NA | NA | NA | NA | NA | NA | NA |

Notes:

8020, chlorinated pesticides/PCBs EPA 8080, chlorinated herbicides EPA 8150, arsenic EPA 7060, cadmium EPA 7130, copper EPA 7210.

2. WS 1991=White Shield (1991). Analytical methods include: nitrate+nitrite, nitrate, nitrite, ammonia, total phosphate, total phosphorous, and specific conductance (methods not specified), TPH EPA 418.1, chlorinated pesticides/PCBs EPA 8080, chlorinated herbicides EPA 8150. Soil samples were composited by the laboratory.

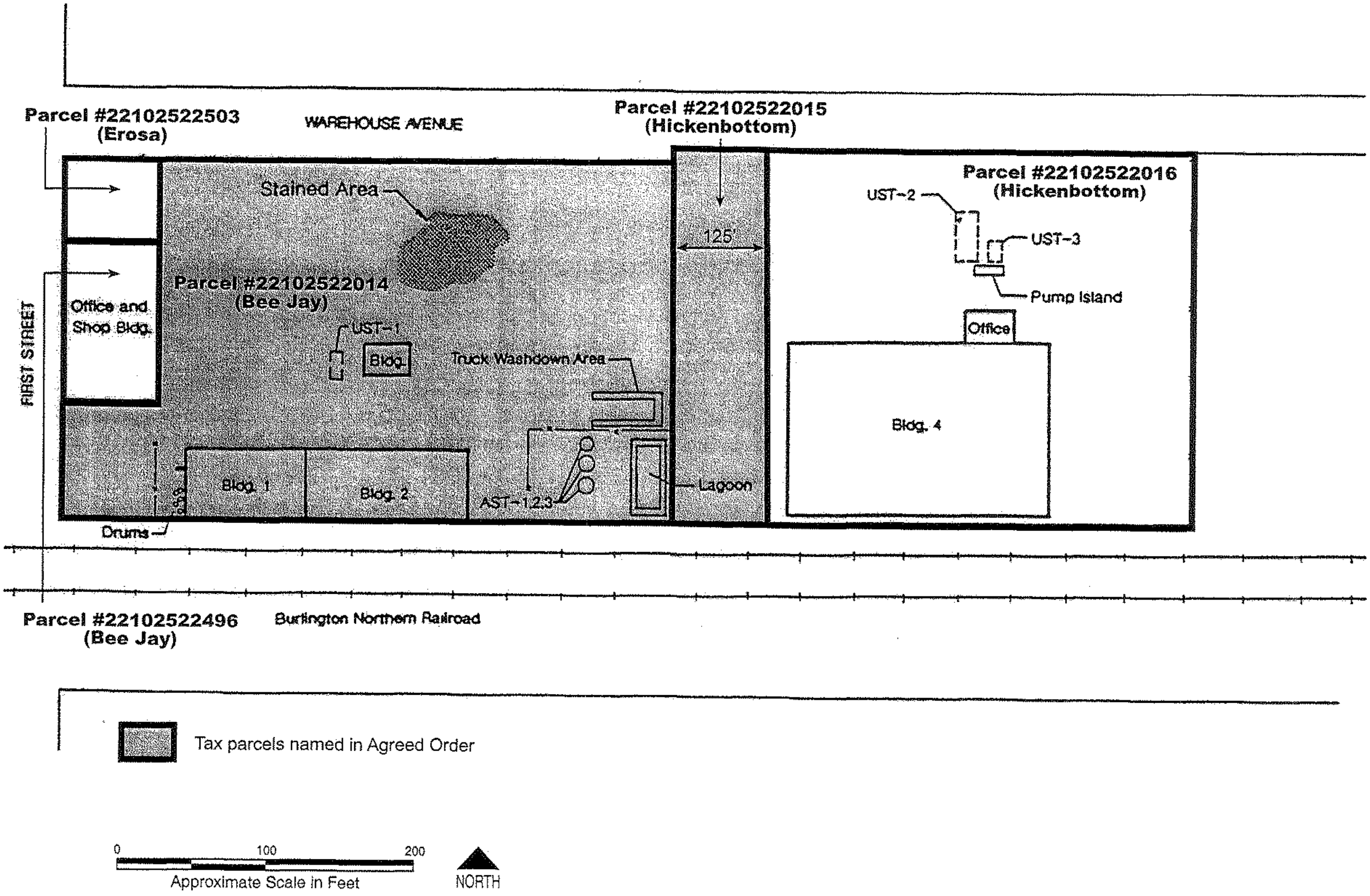
3. ECY 1997=Ecology (1997). Analytical methods include nitrite-nitrete EPA 353.2, ammonia EPA 350.1, sulfate EPA 300, chloride EPA 300, TOC EPA 415.1, conductivity EPA 120.1, VOCs EPA 8260, chlorinated pesticides and nitrogen-containing pesticides EPA 1618, carbamate esticides EPA 531.1, chlorinated herbicides EPA 8150, metals EPA 200.7.

4. CLARC 11/2001=Ecology (2001), Cleanup Levels and Risk Calculations under the MTCA Cleanup regulation.

5. Data Qualifiers:

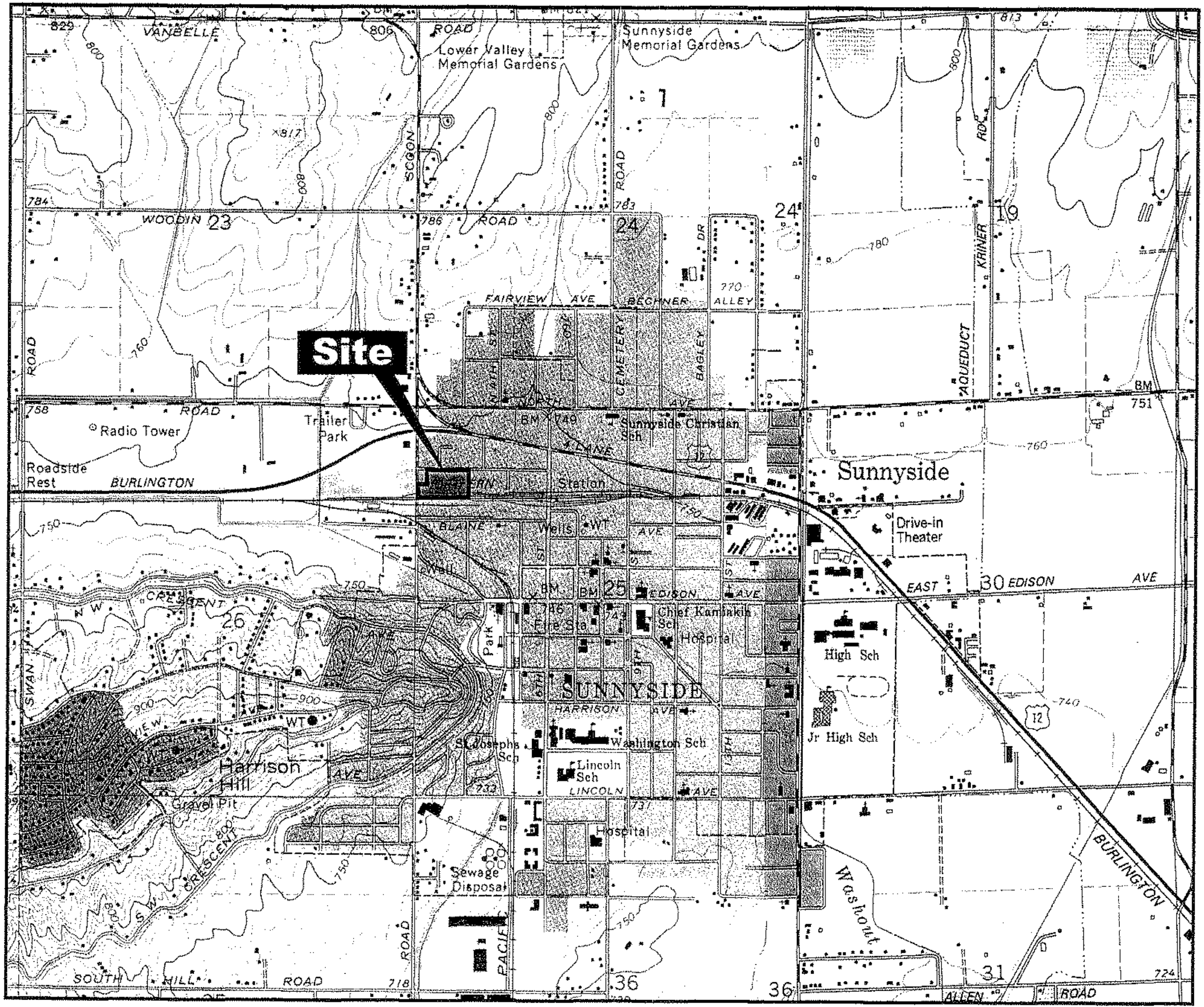
| | | |
|---|---|---|
| * = field screening method | J = compound detected estimated concentration value | E = concentration exceeds known calibration range |
| B = detected in blank | ND = not detected at or above method detection limits | 100 = bold values indicate exceeds regulatory values presented in the table |
| NA = not analyzed | ^ = laboratory report not identified, results presented in report text | NC = not published in CLARC |

174175.A1.02_E072002012SEA / Bee-Jay Scales / RI/FS Work Plan / Fig 2-1 SiteParcelsAndAdjacentOwners / 10-20-02 / LW



Source: Hart Crowser, June 1990; Yakima County Tax Assessor, 2002.

Figure 2-1
**Site Parcels and Adjacent Owners**
Bee-Jay Scales
RI/FS Work Plan

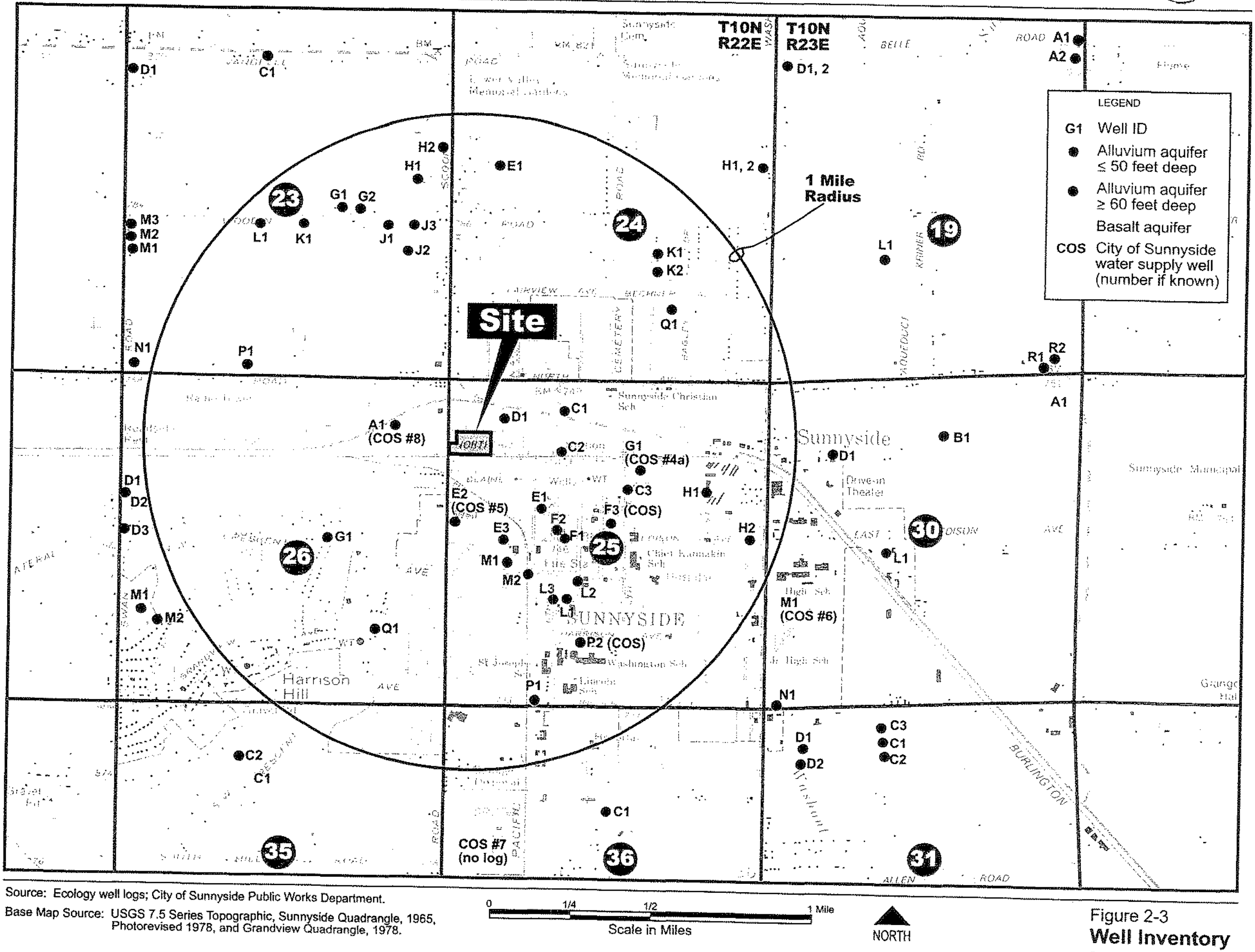


Source: USGS 7.5 Series Topographic, Sunnyside Quadrangle, 1965, Photorevised 1978, and Grandview Quadrangle, 1978.

0 1000 2000
Scale in Feet

NORTH

Figure 2-2
**Site Location and Topographic Map**
Bee-Jay Scales
RI/FS Work Plan

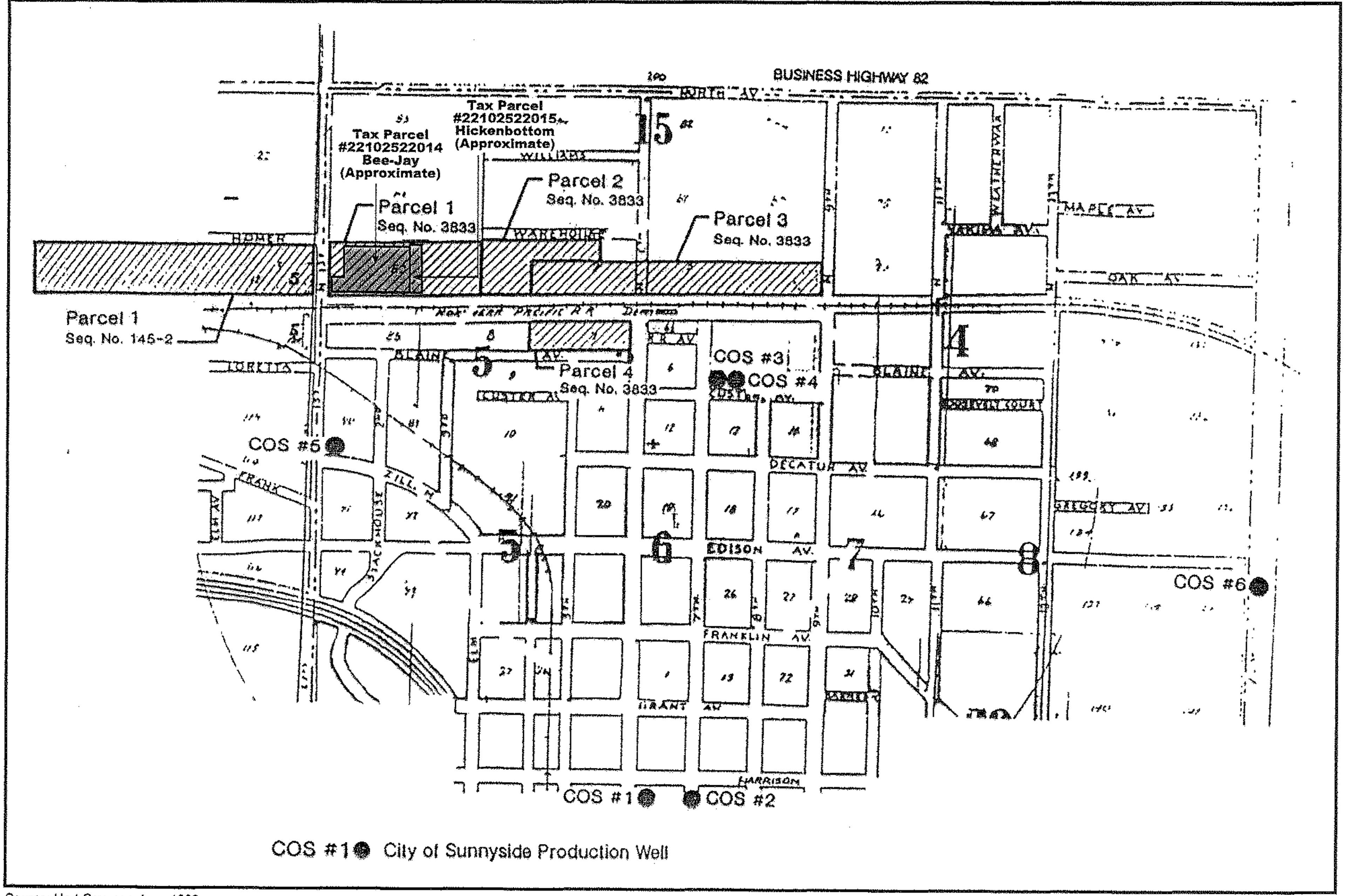


Source: Ecology well logs; City of Sunnyside Public Works Department.

Base Map Source: USGS 7.5 Series Topographic, Sunnyside Quadrangle, 1965, Photorevised 1978, and Grandview Quadrangle, 1978.

Figure 2-3
**Well Inventory**
Bee-Jay Scales
RI/FS Work Plan

174175.A1.02_E072002012SEA / Bee-Jay Scales / RI/FS Work Plan / Fig 2-4 Parcel Location Map / 11-4-02 / LW



Source: Hart Crowser, June 1990.

0 600 1200
Approximate Scale in Feet

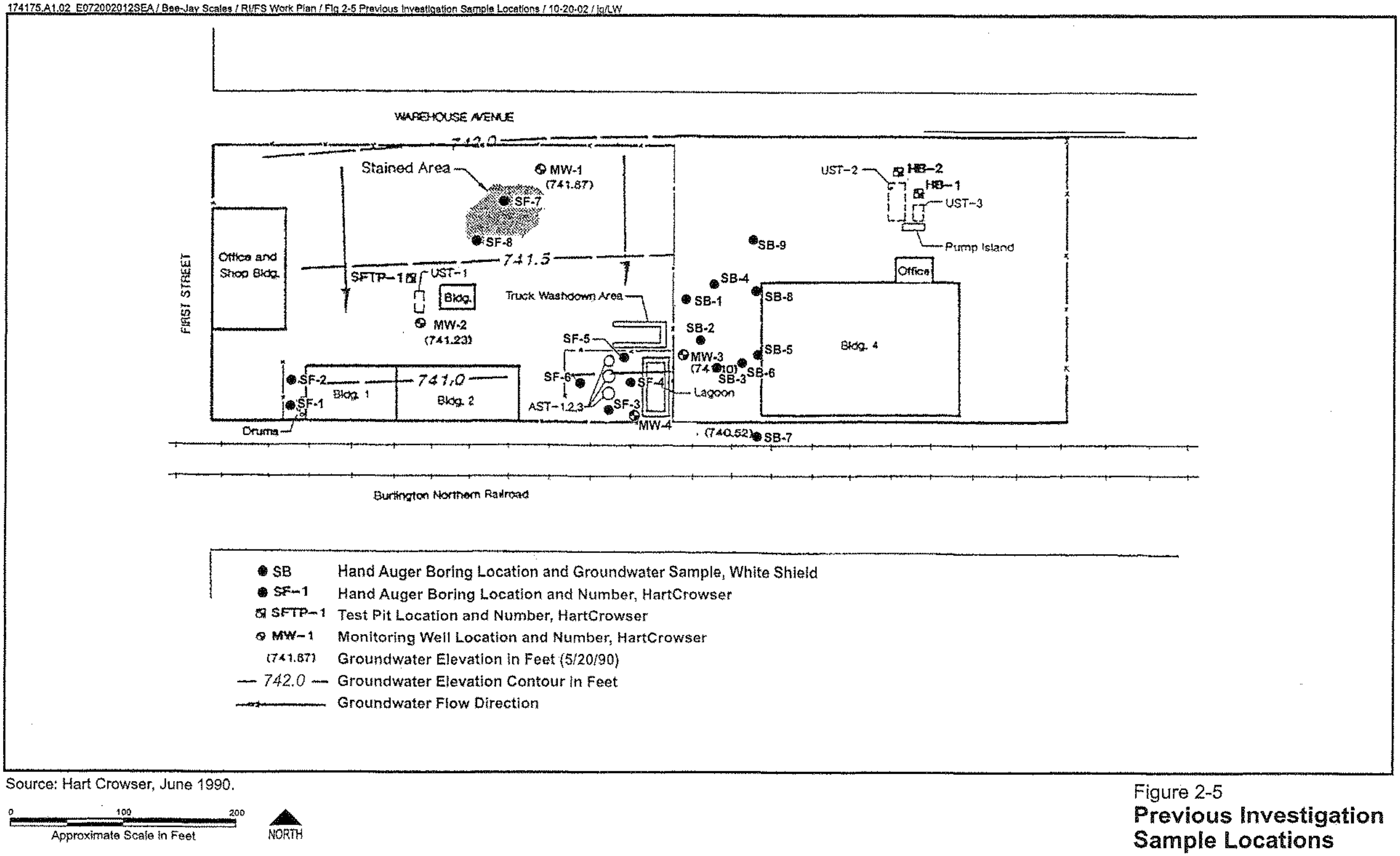
NORTH

Figure 2-4

**Hart Crowser Report**
**Parcel Location Map**

Bee-Jay Scales
RI/FS Work Plan

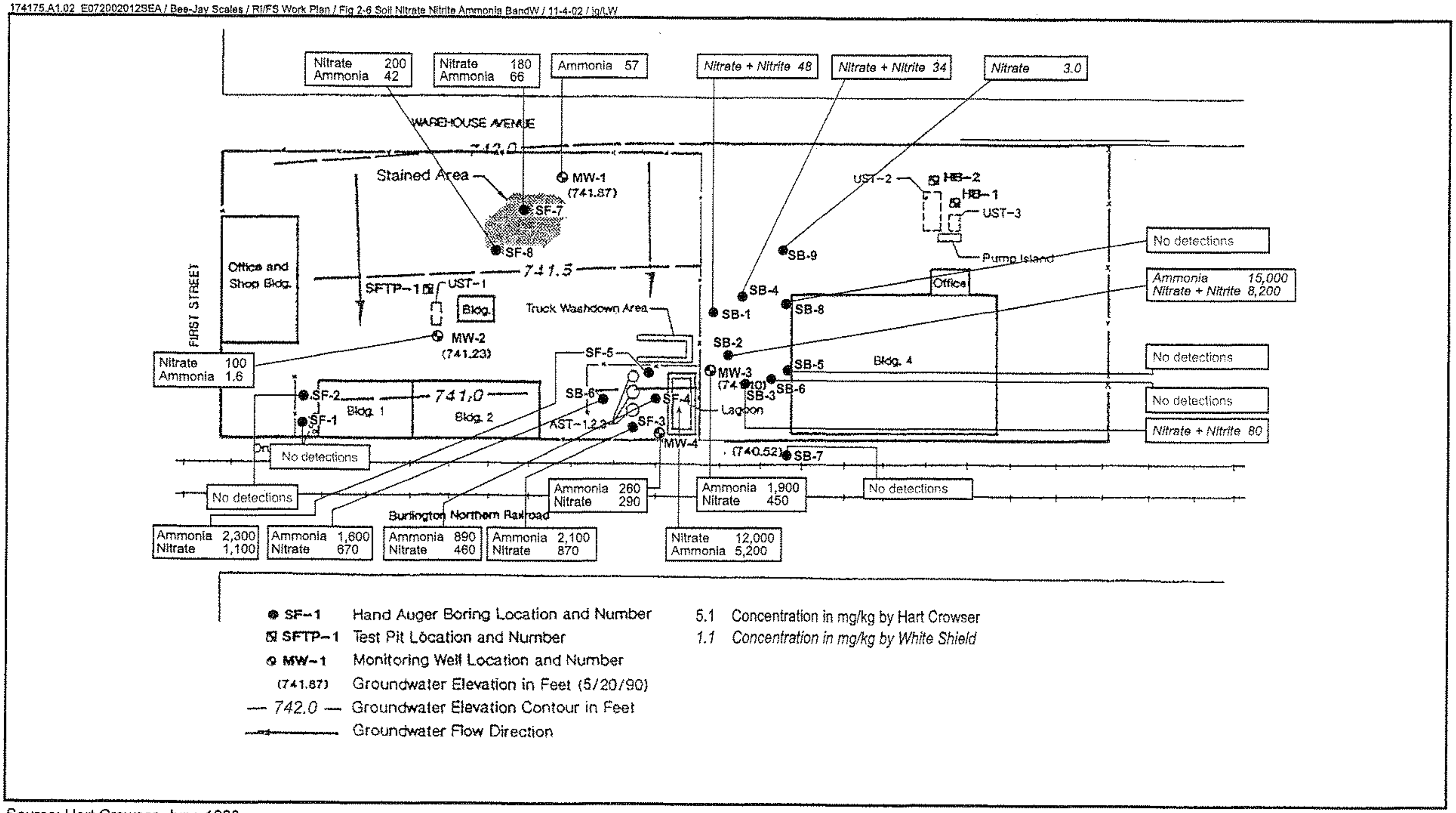
174175.A1.02 E072002012SEA / Bee-Jay Scales / RI/FS Work Plan / Fig 2-5 Previous Investigation Sample Locations / 10-20-02 / lg/LW



Source: Hart Crowser, June 1990.

Figure 2-5
**Previous Investigation Sample Locations**
Bee-Jay Scales
RI/FS Work Plan

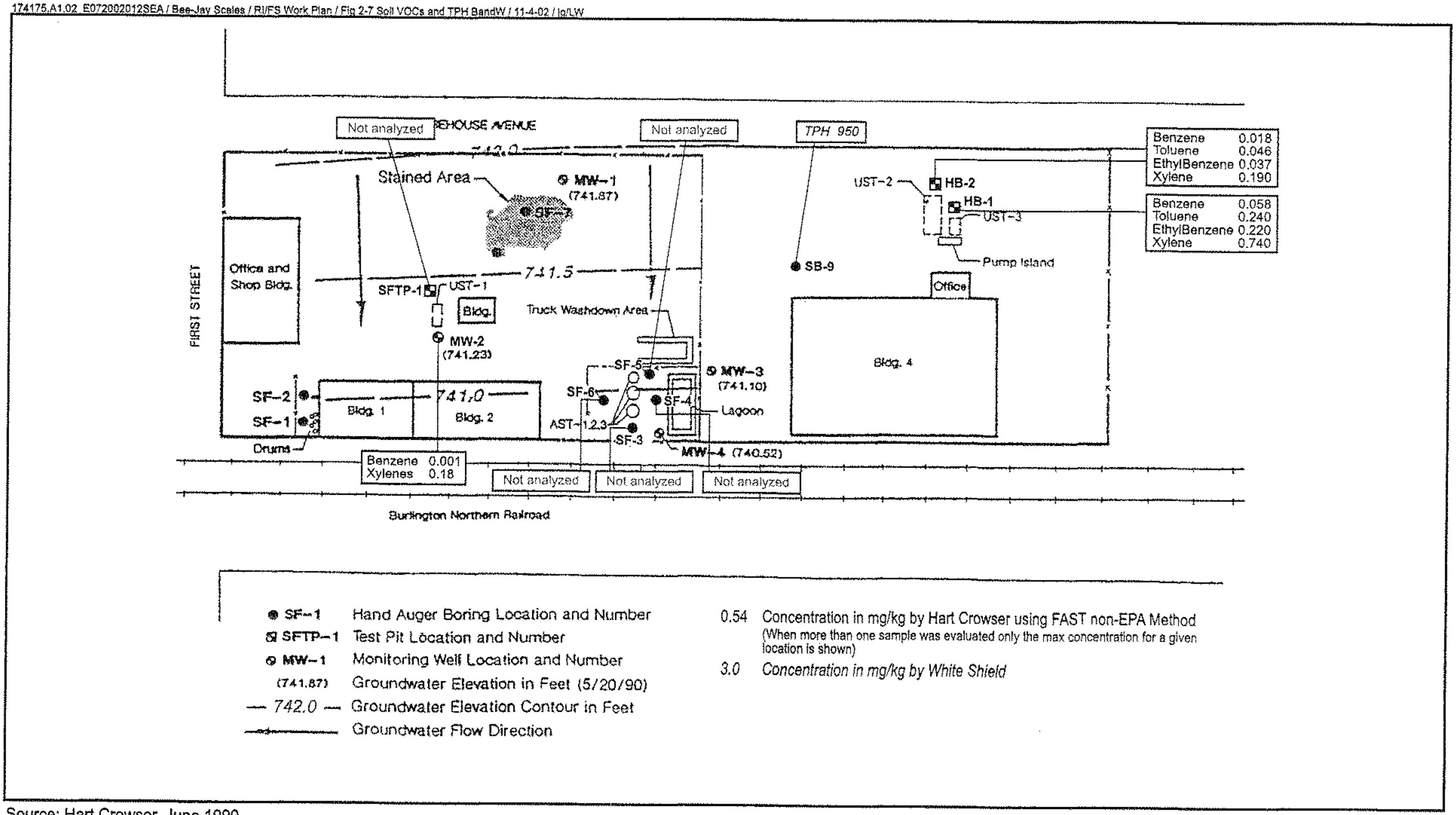
174175.A1.02 E072002012SEA / Bee-Jay Scales / RI/FS Work Plan / Fig 2-6 Soil Nitrate Nitrite Ammonia BandW / 11-4-02 / ig/LW



Source: Hart Crowser, June 1990.

Figure 2-6
Site and Exploration Plan
Hickenbottom & Sons Fruit Company
Soil: Nitrate, Nitrite, and Ammonia
Bee-Jay Scales
RI/FS Work Plan

174175.A1.02 E072002012SEA / Bee-Jay Scales / RI/FS Work Plan / Fig 2-7 Soil VOCs and TPH BandW / 11-4-02 / lg/LW



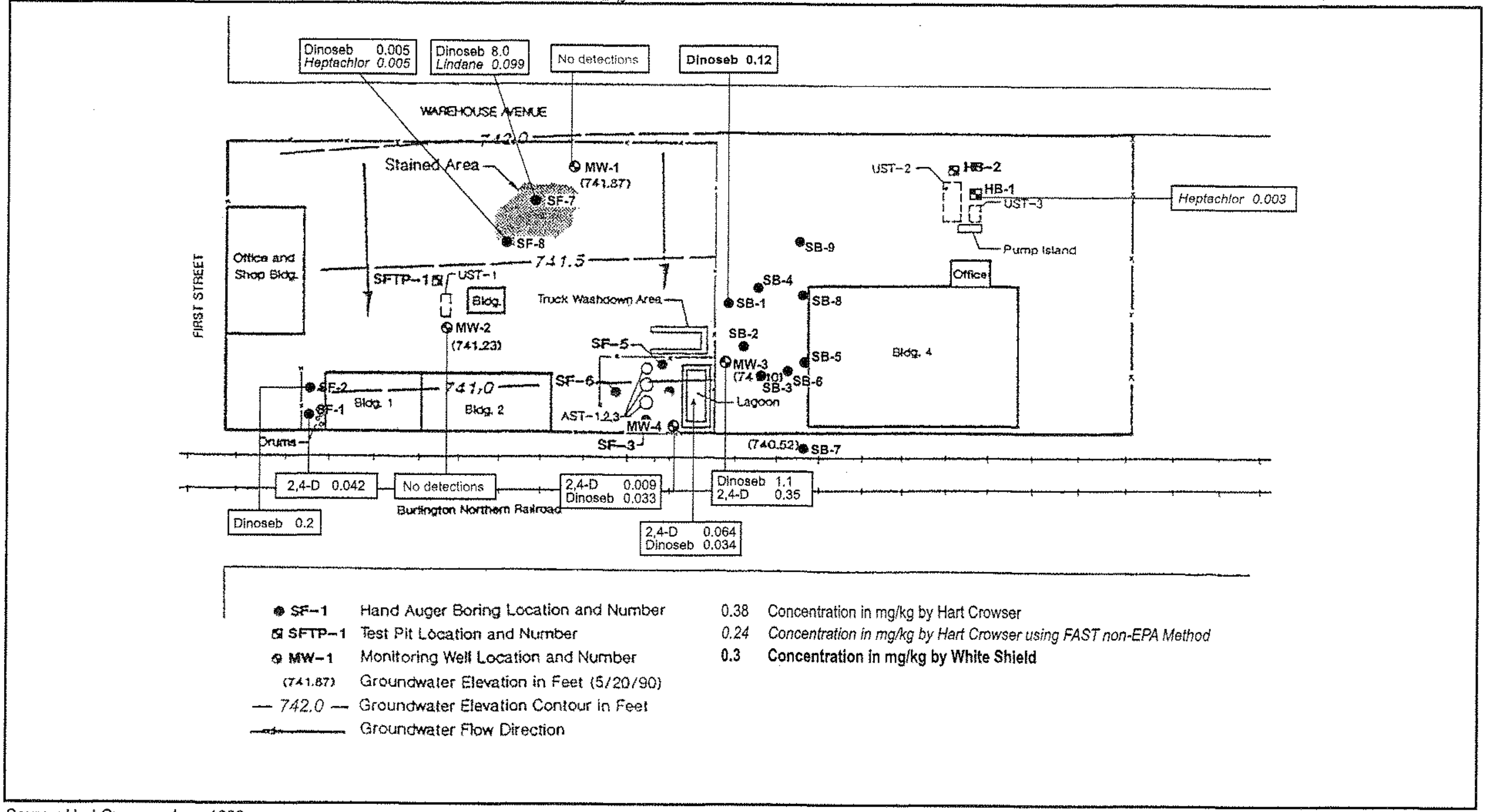
Source: Hart Crowser, June 1990.

Figure 2-7

## Site and Exploration Plan
## Hickenbottom & Sons Fruit Company
## Soil: VOCs and TPH

Bee-Jay Scales
RI/FS Work Plan

174175.A1.02_E072002012SEA / Bee-Jay Scales / RI/FS Work Plan / Fig 2-8 Soil Herbicides and Pesticides BandW / 11-4-02 / jg/LW



Source: Hart Crowser, June 1990.

0 100 200
Approximate Scale in Feet

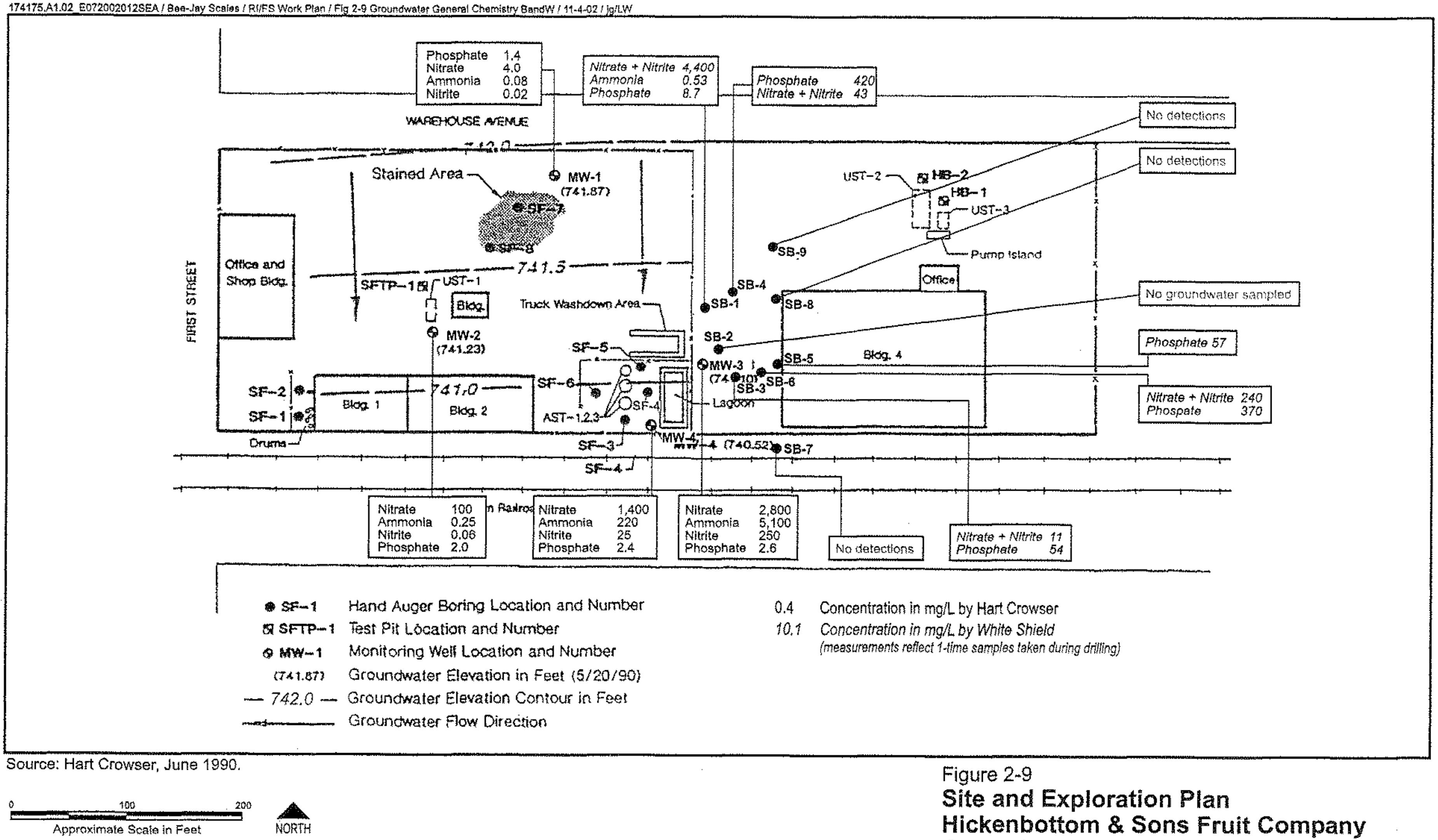
NORTH

Figure 2-8

## Site and Exploration Plan Hickenbottom & Sons Fruit Company Soil: Herbicides and Pesticides

Bee-Jay Scales
RI/FS Work Plan

174175.A1.02_E072002012SEA / Bee-Jay Scales / RI/FS Work Plan / Fig 2-9 Groundwater General Chemistry BandW / 11-4-02 / jg/LW



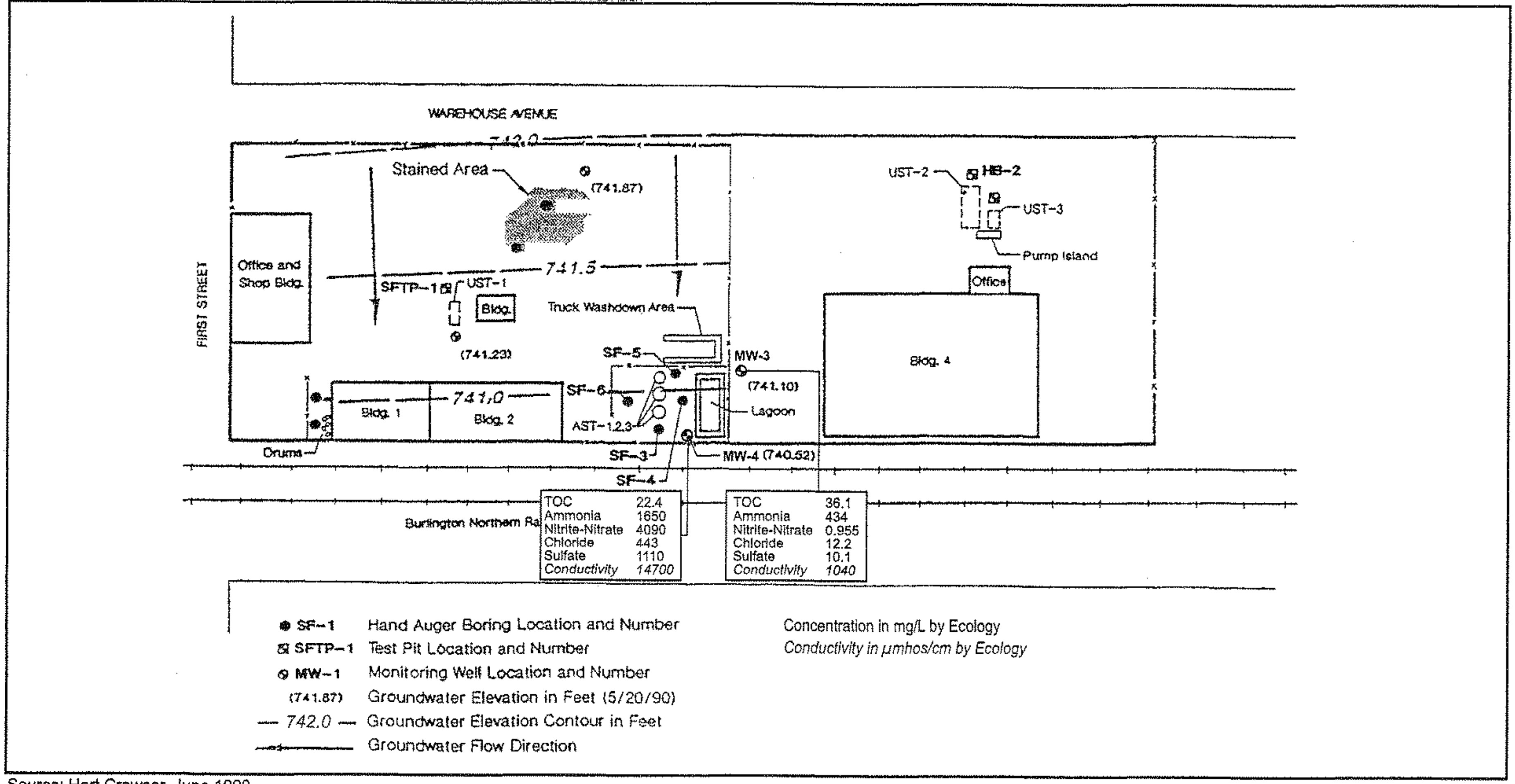
Source: Hart Crowser, June 1990.

Figure 2-9

**Site and Exploration Plan**
**Hickenbottom & Sons Fruit Company**
**Groundwater: General Chemistry**
**(Phosphate, Nitrite, Nitrate, and Ammonia)**

Bee-Jay Scales
RI/FS Work Plan

174175.A1.02 E072002012SEA / Bee-Jay Scales / RI/FS Work Plan / Fig 2-10 Groundwater 1997 - Nitrite BandW / 11-4-02 / lg/LW



| | |
|---|---|
| TOC | 22.4 |
| Ammonia | 1650 |
| Nitrite-Nitrate | 4090 |
| Chloride | 443 |
| Sulfate | 1110 |
| *Conductivity* | *14700* |

| | |
|---|---|
| TOC | 36.1 |
| Ammonia | 434 |
| Nitrite-Nitrate | 0.955 |
| Chloride | 12.2 |
| Sulfate | 10.1 |
| *Conductivity* | *1040* |

Source: Hart Crowser, June 1990.

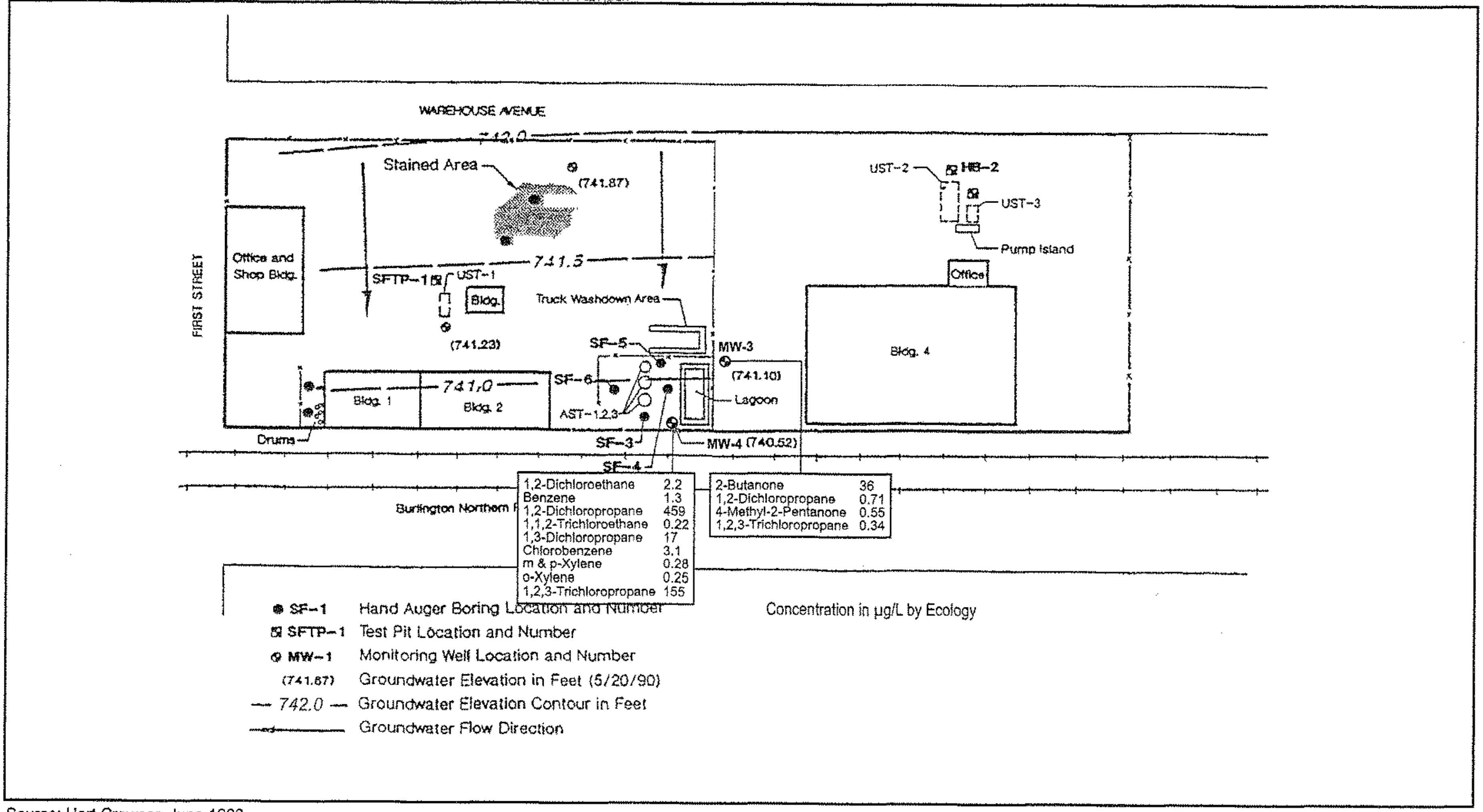
0 100 200
Approximate Scale in Feet
NORTH

Figure 2-10

**Site and Exploration Plan**
**Hickenbottom & Sons Fruit Company**
**Groundwater 1997: Nitrite, Nitrate, Ammonia, Sulfate, TDC, Chloride, and Conductivity**

Bee-Jay Scales
RI/FS Work Plan

174175.A1.02 E072002012SEA / Bee-Jay Scales / RI/FS Work Plan / Fig 2-11 Groundwater 1997 - VOCs BandW / 11-4-02 / jg/LW



| | |
|---|---|
| 1,2-Dichloroethane | 2.2 |
| Benzene | 1.3 |
| 1,2-Dichloropropane | 459 |
| 1,1,2-Trichloroethane | 0.22 |
| 1,3-Dichloropropane | 17 |
| Chlorobenzene | 3.1 |
| m & p-Xylene | 0.28 |
| o-Xylene | 0.25 |
| 1,2,3-Trichloropropane | 155 |

| | |
|---|---|
| 2-Butanone | 36 |
| 1,2-Dichloropropane | 0.71 |
| 4-Methyl-2-Pentanone | 0.55 |
| 1,2,3-Trichloropropane | 0.34 |

Source: Hart Crowser, June 1990.

0 100 200
Approximate Scale in Feet

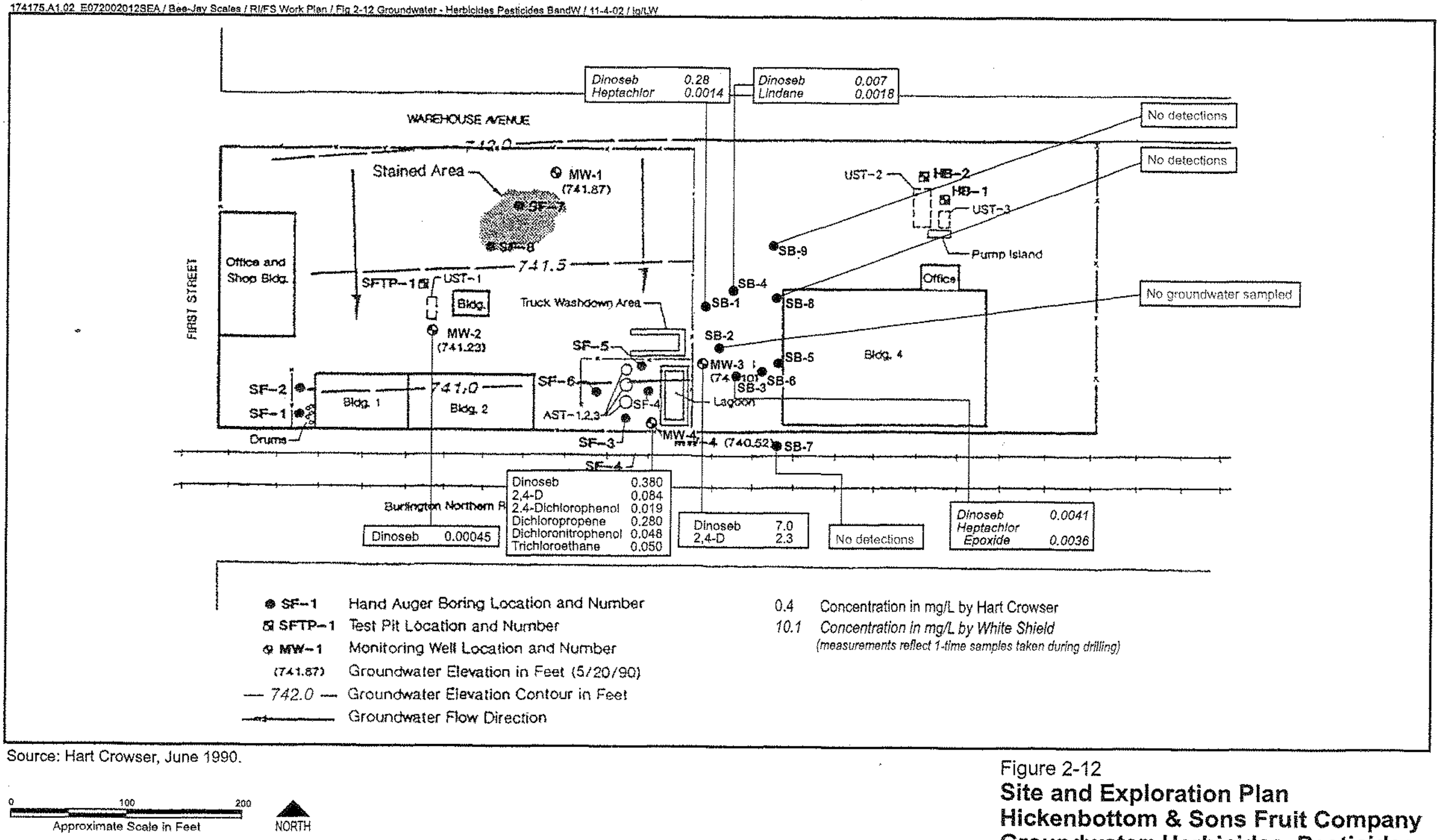
NORTH

Figure 2-11

## Site and Exploration Plan
## Hickenbottom & Sons Fruit Company
## Groundwater 1997: VOCs

Bee-Jay Scales
RI/FS Work Plan

174175.A1.02 E072002012SEA / Bee-Jay Scales / RI/FS Work Plan / Fig 2-12 Groundwater - Herbicides Pesticides BandW / 11-4-02 / lg/LW



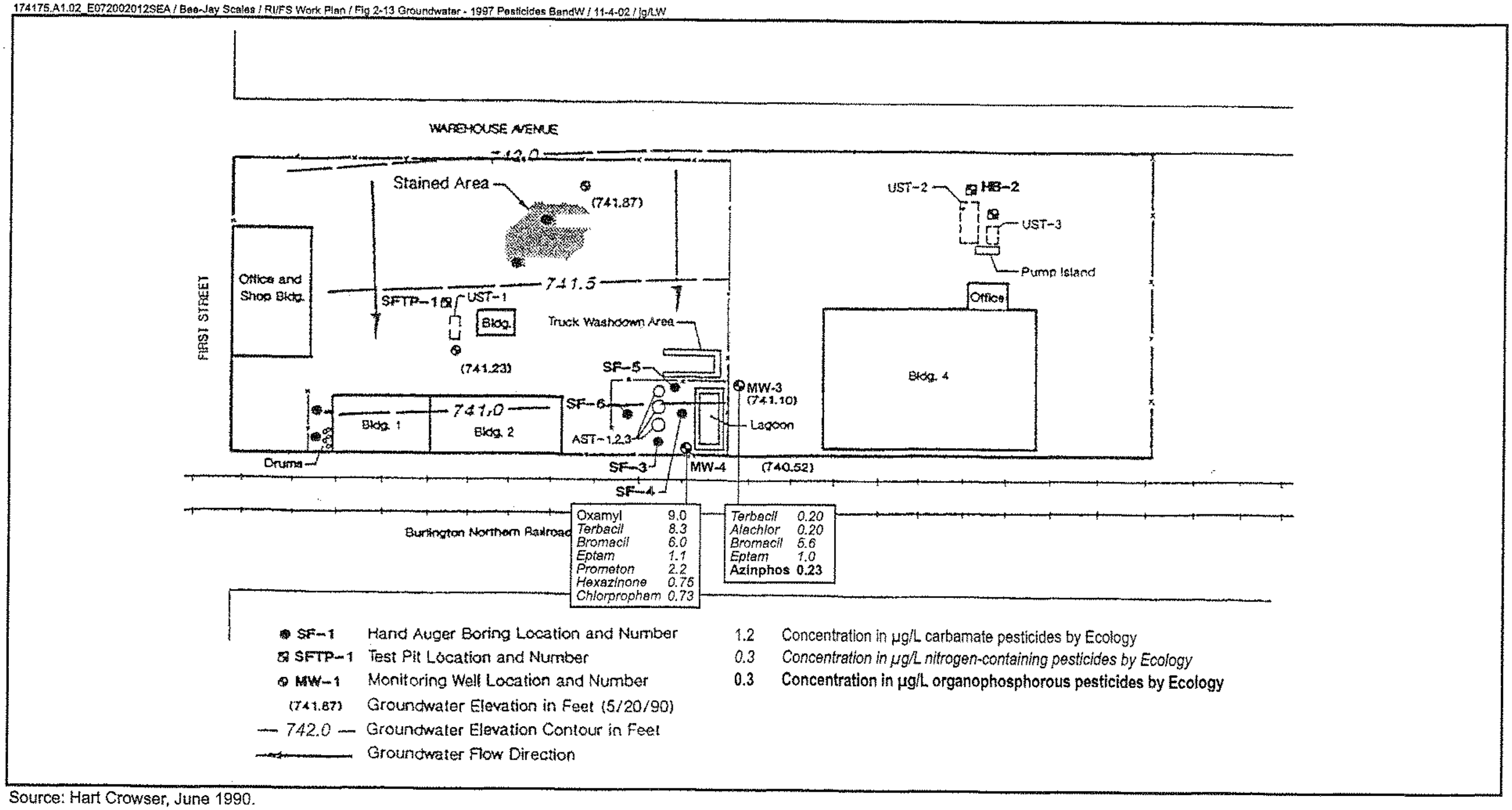
Source: Hart Crowser, June 1990.

Figure 2-12

**Site and Exploration Plan Hickenbottom & Sons Fruit Company Groundwater: Herbicides, Pesticides, and SVOCs**

Bee-Jay Scales
RI/FS Work Plan

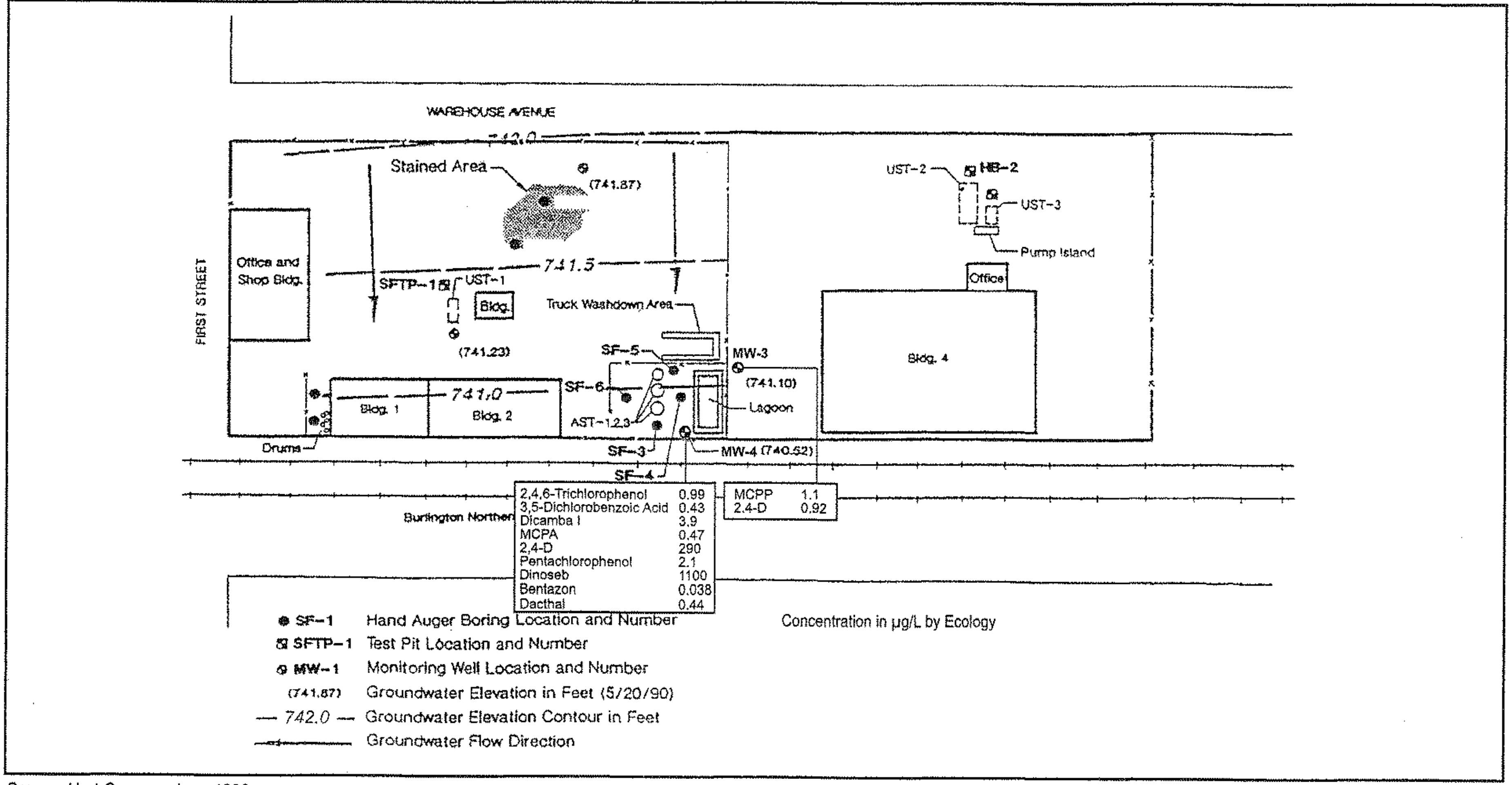
174175.A1.02_E072002012SEA / Bee-Jay Scales / RI/FS Work Plan / Fig 2-13 Groundwater - 1997 Pesticides BandW / 11-4-02 / jg/LW



Source: Hart Crowser, June 1990.

Figure 2-13
**Site and Exploration Plan**
**Hickenbottom & Sons Fruit Company**
**Groundwater 1997: Pesticides**
Bee-Jay Scales
RI/FS Work Plan

174175.A1.02_E072002012SEA / Bee-Jay Scales / RI/FS Work Plan / Fig 2-14 Groundwater 1997 Herbicides BandW / 11-4-02 / jg/LW



| | |
|---|---|
| 2,4,6-Trichlorophenol | 0.99 |
| 3,5-Dichlorobenzoic Acid | 0.43 |
| Dicamba I | 3.9 |
| MCPA | 0.47 |
| 2,4-D | 290 |
| Pentachlorophenol | 2.1 |
| Dinoseb | 1100 |
| Bentazon | 0.038 |
| Dacthal | 0.44 |

| | |
|---|---|
| MCPP | 1.1 |
| 2,4-D | 0.92 |

Source: Hart Crowser, June 1990.

0 100 200
Approximate Scale in Feet

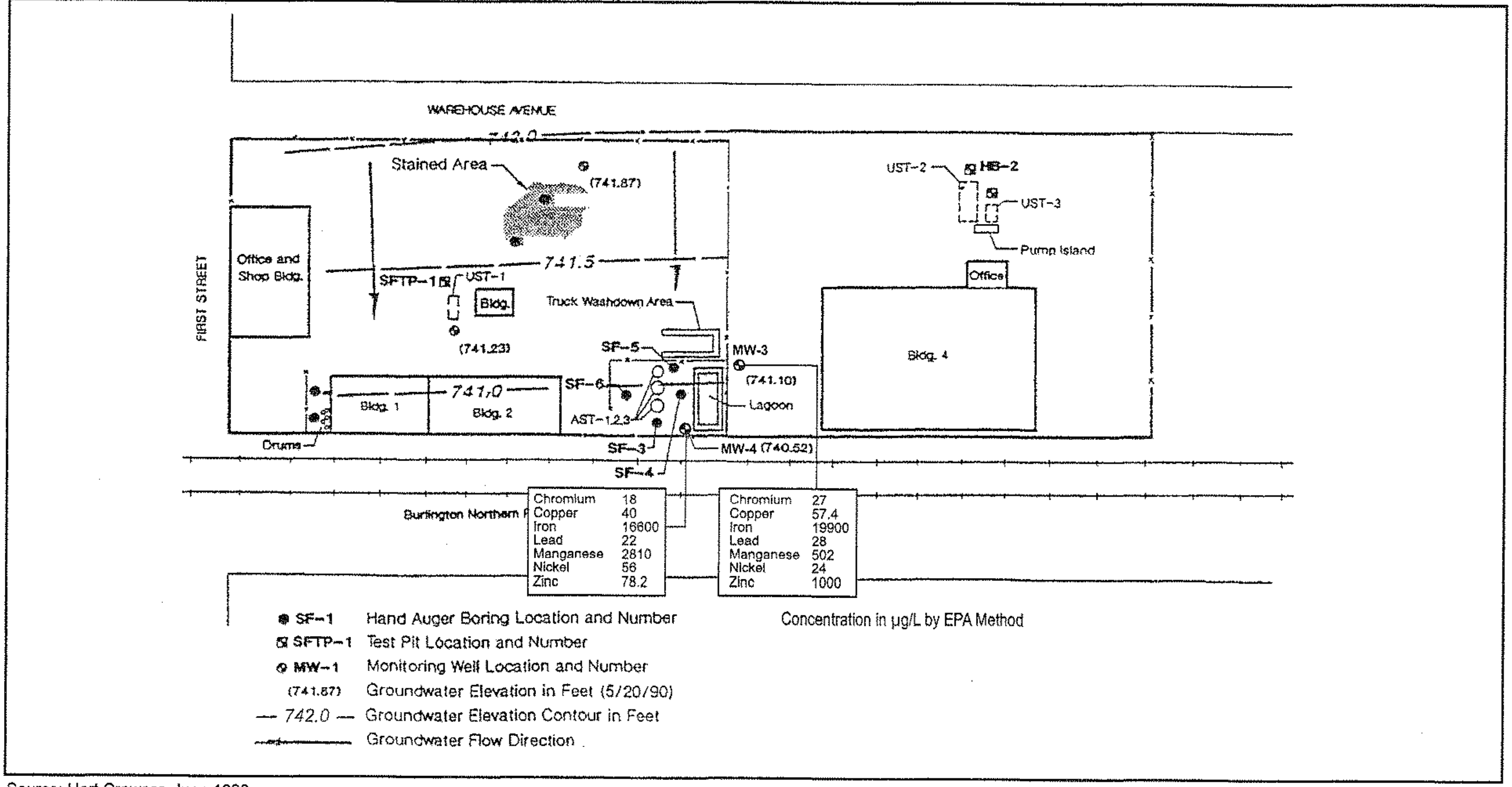
NORTH

Figure 2-14

## Site and Exploration Plan
## Hickenbottom & Sons Fruit Company
## Groundwater 1997: Herbicides

Bee-Jay Scales
RI/FS Work Plan

174175.A1.02_E072002012SEA / Bee-Jay Scales / RI/FS Work Plan / Fig 2-15 Groundwater 1997 Metals BandW / 11-4-02 / jg/LW



| | |
|---|---|
| Chromium | 18 |
| Copper | 40 |
| Iron | 16600 |
| Lead | 22 |
| Manganese | 2810 |
| Nickel | 56 |
| Zinc | 78.2 |

| | |
|---|---|
| Chromium | 27 |
| Copper | 57.4 |
| Iron | 19900 |
| Lead | 28 |
| Manganese | 502 |
| Nickel | 24 |
| Zinc | 1000 |

Source: Hart Crowser, June 1990.

0 100 200
Approximate Scale in Feet

NORTH

Figure 2-15

## Site and Exploration Plan Hickenbottom & Sons Fruit Company Groundwater 1997: Metals

Bee-Jay Scales
RI/FS Work Plan

SECTION 3

# Screening of Clean-Up Action Alternatives Evaluation

## 3.1 Purpose

The purpose of the Screening of Clean-Up Action Alternatives Evaluation is to develop a preliminary list of clean-up actions and technologies that are potentially feasible for conditions at the Bee-Jay Scales Site based on existing current knowledge of the site. The evaluation will also be used to guide the collection of RI data that will ultimately support the FS. This preliminary list does not represent any commitment to implementing these clean-up technologies at the Bee-Jay Scales Site. The findings of the Screening of Clean-Up Action Alternatives Evaluation as presented in this section also do not preclude adding other clean-up technologies in the FS based on RI results.

This section summarizes the COPCs identified in site media based on historical data obtained from the Ecology files (Section 3.2), identifies general response actions (Section 3.3), and provides a preliminary evaluation of feasible clean-up actions and technologies for the site and data needs to assist the evaluation of these technologies in the FS (Section 3.4). Further evaluation of clean-up alternatives, in accordance with WAC 173-340-360, will be completed as part of the FS to be conducted after the completion of the RI.

## 3.2 Contaminants of Potential Concern

A preliminary list of COPCs has been assembled based on available information of past practices and on the available analytical and field screening results. The COPC list is expected to become more precise following the completion of the RI. At this time, COPCs identified for soils include nitrate, nitrite, ammonia, phosphorous, TPHs, lindane, 2,4-D, dinoseb, and arsenic. Nitrate and arsenic are the only contaminants in soils that have been identified at concentrations that appear to be above MTCA Method B clean-up levels for unrestricted land use. However, clean-up levels for the site have not been identified at this time and will depend upon the results of the RI and FS.

COPCs identified for groundwater include nitrate, nitrite, ammonia, phosphate, sulfate, chloride, conductivity, VOCs, SVOCs, pesticides, herbicides , and metals (arsenic and manganese). Nitrate, nitrite, sulfate, chloride, benzene, dichloroethane, 1,2-dichloropropane, 1,2,3-trichloropropane, 2,4-dichlorophenol, pentachlorophenol, lindane, heptachlor, heptachlor epoxide, 2,4-D, dinoseb, 2,4,5-TP, lead, and manganese are compounds that appear to exceed corresponding MTCA Method B clean-up levels for potable groundwater. Again, clean-up levels have not been identified for the site.

The predominant COPCs, those with multiple detections reported in soil and groundwater, are the nutrients and the herbicides 2,4-, and dinoseb reported to be associated with the former fertilizer plant operations at the site. For this reason, identifying potential clean-up alternatives was focused on addressing these compounds. Remaining COPCs are not dismissed and are carried forward in this screening of alternative actions and will be addressed by the RI.

## 3.3 General Response Actions

To select and screen treatment options that may be appropriate for this site, it is helpful to consider what general response actions are available. General response actions represent a group of actions or a broad category of responses that are designed to meet remedial action objectives (RAOs). Identifying general response actions is typically the first step in the alternatives evaluation process. For the Bee-Jay Scales Site, general response actions need to address contaminants in soil and groundwater. Proposed actions may include treatment, volume reduction, reuse, recycling, containment, removal, disposal, or any combination of these. In addition, institutional controls can be considered on a location-specific or sitewide basis to manage or prevent access to areas having chemical constituents at concentrations that exceed clean-up levels. An NFA response is provided as a baseline option for consideration and comparison.

The following possible general response actions were identified to address the clean-up of soil and groundwater contaminants at the Bee-Jay Scales Site:

- NFA
- Institutional controls and monitoring
- Excavation
- Collection and removal
- Treatment
- Disposal and reuse

These general response actions are summarized in Table 3-1.

## 3.4 Screening of Remedial Technologies

The purpose of this section is to refine the general response actions identified in Section 3.3 into more specific remediation technologies organized by site media to undertake a preliminary screening of clean-up action alternatives. This section also identifies data needs to assist further evaluation in the FS. This preliminary screening is not an effort to complete MTCA evaluation (per WAC 173-340-360(3)(f)) wherein specific criteria are used to determine if a clean-up action is permanent. Instead this screening focuses on the effectiveness of possible treatment remedies using available, but general information. The remedial technologies identified below were selected because they are associated with like contaminants and have some track record regarding efficacy in terms of cost, time frame, and overall protectiveness. Table 3-2 summarizes the technologies included in the preliminary screening.

### 3.4.1 Soil

General clean-up alternative technology categories selected for soil remediation include *in situ* biological treatment, *ex situ* biological treatment, and *ex situ* physical treatment and containment. *Ex situ* actions assume excavation of soils that exceed established criteria. Table 3-2 summarizes the technologies included in the preliminary screening and additional data needs.

### 3.4.2 Groundwater

General clean-up alternative technology categories selected for groundwater remediation include *in situ* biological treatment, *ex situ* biological treatment, and *ex situ* physical and chemical treatment. At this time, *ex situ* clean-up actions assume groundwater collection, containment, and discharge or reuse of treated water. Table 3-2 summarizes the technologies included in the preliminary screening and additional data needs. Maintenance costs assume groundwater monitoring will be required for each of the technologies presented. Evaluation of technical and administrative requires collecting additional data and might depend on issues related to possible permit requirements, if authorized, of water extraction and discharge.

**TABLE 3-1**
General Response Actions
*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| Action | Description |
|---|---|
| **Soil** | |
| NFA | Serves as baseline comparison option, and assumes that the site would continue to be operated under current conditions. |
| Institutional controls and monitoring | Reduces the potential for human contact with soil through deed restrictions, signage, and/or fencing, and provides for routine, possibly long-term, maintenance of these controls. |
| Excavation, disposal, and containment | Excavation of accessible soil and disposal at an approved facility (containment) to prevent direct contact and remove any continuing source to groundwater. |
| **Groundwater** | |
| NFA | Serves as baseline comparison option, and assumes that the site would continue to be operated under current conditions. |
| Institutional controls and monitoring | Reduces the potential for direct contact with alluvial groundwater through deed restrictions, signage, and/or fencing, and provides for routine maintenance of these controls and might require long-term groundwater monitoring. |
| Collection, removal, and reuse | Removes groundwater by pumping, and may require pretreatment and permitting prior to discharge. |
| Treatment | Provides treatment of groundwater using conventional engineered treatment systems. |
| Disposal and reuse | Provides for disposal of treated groundwater through discharge, reinjection, off-site reuse, or off-site disposal. |

**TABLE 3-2**
Cleanup Alternatives Technologies Screening Matrix
*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| Codes: See key in footnotes for rating codes. | Effectiveness-Herbicides, Pesticides, SVOCs | Effectiveness - TPH, VOCs | Effectiveness - Nitrate, Nitrite, Ammonia | Effectiveness - Phosphate | Effectiveness - Pb, Mn | Cleanup Time Frame | Protectiveness | Permanence | Technical and Administrative Implementability | Capital Cost | Maintenance Cost | Data Collection: Nature & Extent | Data Collection: Physical/ Chemical Properties |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Soil** | | | | | | | | | | | | | |
| **In Situ Biological Treatment** | | | | | | | | | | | | | |
| **Phytoremediation** | p | o | + | + | n/a | - | o | + | ? | $ | $ | COPCs, organic contaminants and nutrients along x,y, and z axes to groundwater | Organic matter, phosphorus (weak bray and NaHCO3), extractable cations (Ca, Mg, Na, K), pH, SMP buffer pH, CEC, NH4-N, NO3-N, DTPA-available Fe, Mn, Zn, Cu, sulfate-sulfur, conductivity of the saturation extract (ECe), and Ca, Mg, Na, and Cl in the saturation extract.<br>Soil texture (silt, sand clay) |
| **Enhanced Bioremediation** | o/- | + | +/o | o/- | n/a | - | o | + | ? | $ | $ | same as above | same as above |
| **Ex Situ Biological Treatment (assumes excavation)** | | | | | | | | | | | | | |
| **Composting** | p | + | + | + | n/a | + | + | + | ? | $$ | $ | COPCs | TOC, %moisture, porosity, density, void ration, ash content |
| **Ex Situ Physical Treatment/Containment (assumes excavation)** | | | | | | | | | | | | | |
| **Disposal at approved landfill** | + | + | + | + | n/a | + | + | + | + | $$$ | $ | COPCs | TCLP, paint filter test, other - depends on disposal site |
| **Groundwater** | | | | | | | | | | | | | |
| **In Situ Biological Treatment** | | | | | | | | | | | | | |
| **Natural Attenuation** | p | o | - | - | p | - | p | o | ? | $ | $ | COPCs | Dissolved oxygen, Eh, pH, nitrate, sulfate, ferrous iron, alkalinity, electrical conductance, temperature, porosity, hydraulic conductivity, velocity, depth to groundwater, depth to confining layer |
| **Enhanced Biodegredation** | p | o | p | - | p | o | p | o | ? | $$ | $ | COPCs, organic contaminants and | porosity, hydraulic conductivity, velocity, depth to groundwater, depth to confining |
| **Phytoremediation** | p | o | + | + | o | - | p | o | ? | $ | $ | organic contaminants and nutrients along x, y, and z axes to groundwater, including total P, soluble P, NO3, NO2, NH3/NH4, pH, and a complete characterization organic | EC, TDS, SAR (Ca, Mg, Na), NO3, NO2, NH3/NH4, pH, porosity, hydraulic conductivity, velocity, depth to groundwater, depth to confining layer |
| **Ex Situ Biological Treatment** | | | | | | | | | | | | | |

**TABLE 3-2**
Cleanup Alternatives Technologies Screening Matrix
*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| **Codes:**<br>See key in footnotes for rating codes. | Effectiveness-Herbicides, Pesticides, SVOC | Effectiveness - TPH, VOCs | Effectiveness - Nitrate, Nitrite, Ammonia | Effectiveness - Phosphate | Effectiveness - Pb, Mn | Cleanup Time Frame | Protectiveness | Permanence | Technical and Administrative Implementability | Capital Cost | Maintenance Cost | Data Collection: Nature & Extent | Data Collection: Physical/ Chemical Properties |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Nitrification/Anaerobic Denitrifi** | p | p | + | + | - | o | p | + | ? | $$$ | $$ | COPCs | alkalinity, pH, long term contaminant concentration estimate, porosity, permeability, hydraulic conductivity, velocity, depth to groundwater, depth to confining layer |
| **Agricultural Application** | + | + | + | + | - | - | o | + | ?<br>water rights issues | $ | $ | organic contaminants and nutrients along x, y, and z axes to groundwater, including total P, soluble P, NO3, NO2, NH3/NH4, pH, and a complete characterization organic compounds. | EC, TDS, SAR (Ca, Mg, Na), NO3, NO2, NH3/NH4, pH, porosity, hydraulic conductivity, velocity, depth to groundwater, depth to confining layer |
| **Ex Situ Physical/Chemical Treatment** | | | | | | | | | | | | | |
| **Reverse Osmosis** | + | + | + | + | o | o | + | + | ?<br>need to treat regeneration stream or use for agricultural application | $$$ | $$$ | COPCs | Si, Ba, Sr, Ca, Mg, Fe, Mn, F, P, temperature, permeability, hydraulic conductivity, velocity, depth to groundwater, depth to confining layer |
| **Ion Exchange** | p | p | + | + | o | o | p | + | ?<br>need to treat regeneration stream or use for | $$ | $$ | COPCs | same as above |
| **Carbon Filtration** | + | + | - | - | - | o | + | +, p | + | $$ | $$ | COPCs | same as above |

Notes:
Rating codes: + = Better, o = Average, - = Worse, p = partial, n/a = not applicable, ? = additional information needed
Cost Codes: $$$ = Higher, $$ = Intermediate, $ = Lower

SECTION 4

# Data Quality Objectives

The RI activities at the site should provide data of sufficient quality and quantity to satisfy the overall project DQOs as follows:

- Determine the contaminant concentrations in soils and groundwater for comparison to applicable criteria
- Determine the general extent of contamination from each of the potential sources to support the selection of a clean-up alternative if the source proves to be a threat to public health and the environment
- Evaluate compliance with MTCA and other ARARs
- Support the evaluation of potential clean-up alternatives

The overall DQO for analytical data generated during the RI is to ensure that data collected are of known and acceptable quality. The project DQOs presented above represent the end uses of the RI data. The specific DQOs for analytical data are presented in Section 9, QAPP.

SECTION 5

# Remedial Investigation Approach

This RI approach has been developed to address data gaps identified at the Bee-Jay Scales Site based on the site history (Section 2) as well as data needs identified in the screening of clean-up action alternatives (Section 3). The specifics of how data will be collected in the field are presented in the SAP (Section 8). Details on analytical methodologies are presented in the QAPP (Section 9).

## 5.1 Introduction

The results of the RI will be presented in the RI report. The RI report will combine the current information with the new data collected during the RI. Together this information will be used to characterize the site and support development and selection of a clean-up alternative.

Because data needs are sometimes contingent on the results of proposed field work, additional RI data collection may be required to support selection of a clean-up alternative. In this case, this Work Plan will be amended to include additional work.

The following sections outline the investigation areas, identify data gaps, and discuss the purpose and description of specific RI tasks.

### 5.1.1 Investigation Areas

Six investigation areas, described below, have been identified for the Bee-Jay Scales Site based on historical operations:

- **Area 1, Former Liquid Fertilizer Plant and Truck Wash Area,** includes the former liquid fertilizer plant, former anhydrous ammonia plant, former truck washdown area, and former washdown evaporation pond.

- **Area 2, Former Dry Fertilizer Plant Area,** includes Buildings 1 and 2 of the former dry fertilizer plant and surrounding loading areas.

- **Area 3, Drum Storage Area,** includes the former empty pesticide drum storage identified in 1990.

- **Area 4, Suspected Historical Washdown Area,** is located east of the current Sandy Farms/Sanleco, Inc. trucking company office and maintenance shop and is suspected to be the location of historical agricultural truck washdown operations, similar to that identified in Area 1.

- **Area 5, North Area,** includes the historical stained soils area identified in 1990 and the former gasoline UST. Area 5 overlaps the northern portion of Area 6.

- **Area 6, Hickenbottom Area,** includes Parcel No. 22102522015 owned by Hickenbottom & Sons. The northern portion of Area 6 overlaps with Area 5. The southern portion of

Area 6 is adjacent to Area 1 and may have been impacted by former washdown operations.

Figure 5-1 shows the investigation areas; the boundaries shown on this figure are based on the current understanding of site history and operations.

### 5.1.2 Data Gaps

Additional data are needed to better define the nature and extent of contamination and to allow evaluation of appropriate clean-up alternatives. Table 5-1 lists these data gaps by investigation area.

## 5.2 Mapping Investigation

### 5.2.1 Purpose of Investigation

The purpose of the mapping investigation is to prepare a site base map showing surveyed site boundaries, topography, monitoring well locations, soil boring locations, and other site features.

### 5.2.2 Task Description

A property survey of the site will be conducted to delineate the site boundaries and existing structures. Control for the survey will be tied to standard, legal controls such as state plane coordinates or USGS benchmarks. A site topographic map with 1-foot contours (NGVD) will be prepared. Property boundaries and relevant key features will be included on the topographic base map. Sample locations, including monitoring wells and soil samples, will be surveyed using both horizontal and vertical control and included as overlays to the base map. Results of the mapping investigation will be used to develop base maps for presenting RI results.

## 5.3 Well Inventory

### 5.3.1 Purpose of Investigation

The following are the purposes of the well inventory:

- Supplement the well inventory information compiled for the site history to meet conditions of the Agreed Order
- Obtain additional hydrogeologic information (geology, hydrostratigraphy, and groundwater elevations) for the vicinity immediately surrounding the site

### 5.3.2 Task Description

An initial well inventory was performed for the site history (Section 2). Figure 2-3 shows well locations identified within a 1-mile radius of the site. The Agreed Order included a requirement to conduct interviews with possible well owners. The City of Sunnyside Public Works Division and the Yakima County Health Department will be contacted to obtain additional information on the city water supply wells. Interviews with possible well owners will be developed following confirmation of groundwater flow (Sedgewick, 2002). Results of the well inventory investigation will be presented in the RI report.

# 5.4 Soil Investigation

## 5.4.1 Purpose of Investigation

The following are purposes of the soil characterization:

- Confirm screening method results from previous investigations
- Help determine the nature and extent of soil contamination
- Help characterize the site geology and hydrogeology

## 5.4.2 Task Description

The soil investigation will include collecting soil data from the six investigation areas at the Bee-Jay Scales Site. The task descriptions for each area are discussed in the following subsections. Detailed sampling and analysis procedures are presented in the SAP (Section 8). Also presented in Section 8.0 are guidelines for discretionary sampling for unexpected conditions encountered in the field.

### 5.4.2.1 Area 1: Former Liquid Fertilizer Plant and Truck Wash Area

Soil borings will be installed in nine locations, including the former washdown area, below the evaporation pond, and in the vicinity of the former liquid fertilizer and anhydrous ammonia tanks and piping, as shown in Figure 5-2. Sample locations were selected to target areas of potential contamination not previously sampled (i.e., truck washdown bay below evaporation pond) and to confirm contamination identified previously in composite soil samples and in screening analytical results.

During drilling, soil samples will be obtained continuously from the surface to the water table. Samples will be examined following standard visual field classification procedures of soils. Discrete samples will be obtained at three depth intervals: shallow (0.5 to 1.5 feet bgs), intermediate (4.5 to 6 feet bgs), and directly above the water table (approximately 9.5 to 11 feet bgs)and submitted for chemical analysis of the following chemical groups:

- Conventional parameters, including nutrients
- VOCs
- SVOCs
- Pesticides
- Herbicides
- Metals

Table 5-2 lists the laboratory analytes for Area 1 soil depth intervals. No soil samples will be collected below the water tables for chemical analysis.

#### 5.4.2.2 Area 2: Former Dry Fertilizer Plant Area

Soil borings will be installed in seven locations, including adjacent to loading bays north and east of the former dry fertilizer plant, adjacent to the oily stained area identified in the southwest corner of Building 1, near the property boundary east of Building 2, and in the BNSF right-of-way below the former eastern overhead loading structure. Two of the six borings will be converted to monitoring wells as part of the groundwater investigation (Section 5.5). Soil samples are not targeted below Buildings 1 and 2 because the fertilizer products previously processed and stored were dry. These dry materials are not expected to have migrated through incidental cracks in the concrete floor. Figure 5-2 shows the soil boring locations.

During drilling, soil samples will be obtained continuously from the surface to the water table. Samples will be examined following standard visual field classification procedures of soils. Discrete samples will be obtained at three depth intervals: shallow (0.5 to 1.5 feet bgs), intermediate (4.5 to 6 feet bgs), and directly above the water table (approximately 9.5 to 11 feet bgs). The soil boring located in the BNSF will be sampled, using a hand auger, at two depth intervals: shallow (0.5 to 1.5 feet bgs) and intermediate (4.5 to 6 feet bgs) or until refusal. These samples will be submitted for chemical analysis of the following chemical groups:

- Conventional parameters, including nutrients
- Pesticides
- Herbicides
- Metals

Table 5-2 lists the laboratory analytes for Area 2 soil depth intervals. No soil samples will be collected below the water tables for chemical analysis.

#### 5.4.2.3 Area 3: Drum Storage Area

Soil borings will be installed in two locations to confirm previous results from composite samples and analytical screening methods. The boring locations are shown in Figure 5-2.

During drilling, soil samples will be obtained continuously from the surface to the water table. Samples will be examined following standard visual field classification procedures of soils. Discrete samples will be obtained at three depth intervals: shallow (0.5 to 1.5 feet bgs), intermediate (4.5 to 6 feet bgs), and directly above the water table (approximately 9.5 to 11 feet bgs); these will be submitted for chemical analysis of the following chemical groups:

- Conventional parameters, including nutrients
- VOCs
- SVOCs
- TPH
- Pesticides

- Metals

Table 5-2 lists the laboratory analytes for Area 3 soil depth intervals. No soil samples will be collected below the water tables for chemical analysis.

#### 5.4.2.4 Area 4: Suspected Historical Washdown Area

A historical washdown area is suspected to have been located in Area 4 based on interviews with site operators. The exact physical location is not known, but it is believed to be close to an exterior water supply and hose bib located at the shop building. Additional interviews with persons knowledgeable of historical site activities may reveal better information about the location of the historical washdown area. However, based on the current information about this potential source of soil contamination, a statistically-based sampling method will be applied to identify possible "hot spots." Using the "hot spot" sampling method, samples are obtained from nodes on a grid. Grid spacing is determined based on the suspected radius of the hot spot and the level of confidence desired in discovering a hot spot of that size.

A grid space size for hot spot coverage is established as follows (Gilbert, 1987):

$$G = R/F$$

where:

G = Grid spacing of a specific size

R = Hot spot radius

F = Prespecified confidence factor

A confidence level of 90 percent has been selected, resulting in a 45-foot grid spacing. The grid start point and grid orientation are randomized, and sampling will occur at all nodes. More detailed instructions on how to randomize start points and grid orientation is included in Section 5.4.2.7. One additional sample will be colocated to measure field variability. Soil borings will be installed in six grid node locations; Figure 5-2 shows general locations.

During drilling, soil samples will be obtained continuously from the surface to the water table. Samples will be examined following standard visual field classification procedures of soils. Discrete samples will be obtained at three depth intervals: shallow (0.5 to 1.5 feet bgs), intermediate (4.5 to 6 feet bgs), and directly above the water table (approximately 9.5 to 11 feet bgs); these will be submitted for chemical analysis of the following chemical groups:

- Conventional parameters, including nutrients
- TPH
- VOCs
- SVOCs
- Pesticides
- Herbicides

- Metals

Table 5-2 lists the laboratory analytes for Area 4 soil depth intervals. No soil samples will be collected below the water tables for chemical analysis.

#### 5.4.2.5 Area 5: North Area

Area 5 includes the northern area of the site, including the former UST (UST-1). Previous investigations reported an area of yellow-stained soils in the North Area. Analytical results did not indicate concentrations of contaminants in the stained area above MTCA clean-up levels. Additional gravel appears to have been placed over the area, and no yellow staining is currently observed. The UST is recorded as closed in place and TPH and BTEXs were not identified at or above regulatory criteria (Ecology, 2002b). No specific operations related to the former fertilizer plant have been identified in this area, and no sources of contamination, such as equipment washdown or material storage, have been identified in the records or observed during the recent site reconnaissance. The area is currently used to park trucks. Because there are no identified sources of contamination, a nonparametric statistical sampling method will be used.

Also, because there are no identified sources of contamination in the North Area, and because it is located upgradient of known potential contamination sources, an additional soil boring is planned to obtain physical information about the site subsurface geology. The boring will be drilled near the north property boundary to a depth of approximately 50 feet or 15 feet into a silt/clay layer, whichever is shallower. Samples will be obtained every 5 feet for visual soil classification purposes only. If an aquitard layer is encountered that is of sufficient thickness to obtain a relatively undisturbed sample, one will be obtained for testing of vertical permeability (by method American Society for Testing and Materials, or ASTM, D5084). After the total depth for the soil boring is reached, the boring will be backfilled to a shallower depth and a monitoring well will be installed. The well depth will be similar to the depth of other site monitoring wells. The purpose of the monitoring well is to characterize groundwater quality entering the site. Monitoring well installation approach and rationale are further discussed in Section 5.5.

The statistical sampling method is based on randomized collection of samples within defined areas of relatively homogeneous contamination. The number of samples within any homogeneous area is independent of the size of the area and has been based upon a nonparametric (distribution-free) statistical method that calculates the size of a sample (N) required to estimate a prespecified tolerance interval of the sampled population with a prespecified level of confidence (*Practical Nonparametric Statistics*, W.J. Conover. John Wiley, 1980).

Nonparametric specification of sample size makes no assumptions about the underlying distribution of the chemical or compound. It does require specification of both a desired level of confidence and a desired upper bound on the quantile (of the sampled population) being estimated. The level of confidence reflects the probability that the maximum concentration from a sample of a given size will not exceed the prespecified upper quantile and is preselected. The "Q" (the quantile of the population being sampled) is defined as the value (concentration) at which the probability that members of the population will exceed that value is "Q," where Q ranges between 0 and 1. For example, half of the population is greater and half of the distribution is less than the .5 quantile, the population median value. The upper and lower quartiles of the distribution, the .75 and .25 quantiles, respectively, are the concentration levels at which 25 and 75 percent of the population are greater. A prespecified confidence level of 5 percent and prespecified .5 quantile means that the maximum concentration from the sample of size "N" will not be less than the median (due to chance alone) more than 5 times out of 100. "N" increases as either the preselected quantile (upper tolerance limit) or preselected level of confidence increases. The effect of raising the quantile of interest dominates the increase in required sample size. For example, to be 90 percent certain that the maximum concentration from a sample exceeds the median of the population being sampled requires a sample size of 4; to be 95 percent certain requires a sample size of 5—a comparatively negligible increase in sample size. To be 90 percent confident that the maximum sample concentration is greater than the .95 quantile requires a sample size of 45; to be 95 percent confident requires an N of 59.

Table 5-4 summarizes sample sizes required to meet a range of prespecified coverages and a range of prespecified confidence levels.

Five samples will be collected to obtain a 95 percent confidence level that sample collection represents the median of the population. One additional sample will be colocated to measure the short-range variability. The sample locations are located on a grid with a random start point (x, y coordinates) and a random degree of rotation. More detailed instructions on how to randomize start points and grid orientation is included in Section 5.4.2.7. The six shallow soil samples will be collected as shown in Figure 5-2.

Discrete shallow soil samples (0.5 to 1.5 feet bgs) will be obtained using hand tools or using the drill rig used to obtain other soil samples. Samples will be examined following standard visual field classification procedures of soils and submitted for chemical analysis of the following chemical groups:

- Conventional parameters, including nutrients
- TPH
- Pesticides
- Herbicides
- Metals

Table 5-2 shows the laboratory analytes for Area 5 soils.

#### 5.4.2.6 Area 6: Hickenbottom Area

Area 6 is divided into north and south subareas. The northern subarea overlaps with Area 5 where no definitive sources of contamination have been identified. For that reason, the sampling method for Area 5 will include the northern portion of Area 6. The southern subarea is located east of Area 1, the former truck washdown area and liquid fertilizer plant. Soil sample locations have been selected to target the perimeter of Area 1 and confirm results from previous soil composite samples collected. Soil borings will be installed in five locations as shown in Figure 5-2.

During drilling, soil samples will be obtained continuously from the surface to the water table. Samples will be examined following standard visual field classification procedures of soils. Discrete samples will be obtained at three depth intervals: shallow (0.5 to 1.5 feet bgs), intermediate (4.5 to 6 feet bgs), and directly above the water table (approximately 9.5 to 11 feet bgs); the samples will be submitted for chemical analysis of the following chemical groups:

- Conventional parameters, including nutrients
- VOCs
- TPH
- Pesticides
- Herbicides
- Metals

Table 5-2 shows laboratory analytes for Area 6 soil depth intervals. No soil samples will be collected below the water tables for chemical analysis.

### 5.4.2.7 Sample Location Method

The hot spot and nonparametric sampling methods require sampling grids with random starting points. The point of using random number generation for sampling grid location is to avoid any visual bias in selecting sample sites. This grid sampling is intended to give an overall understanding of the contamination of each area.

A randomly located grid will be constructed to allow systematic location of samples. The grid spacing is determined based on the size of the sampling area:

$$grid\ size = \sqrt{\frac{area}{number\ of\ samples}}$$

A total of 5 samples will be collected for Area 5 (approximately 40,300 ft$^2$) so the grid size is calculated as follows:

$$grid\,size = \sqrt{\frac{40{,}300\,ft2}{5}}$$

$$grid\ size = 90\,feet$$

The grids must be located with a randomly selected orientation and starting point. The orientation is easily selected by multiplying a randomly selected number between 0 and 1 (as given by most calculators or random number table) by 360 degrees. Rotate the grid that angle from north. The starting point should be selected in the same manner by selecting two random numbers between 0 and 1 and multiplying the first number by the width of the area and the second number by the length of the area to give a random x and y. Measure from the northern most corner of the area, along the edges of the area, to find that point and situate one of the grid intersections there. The sampling grid for the hot spot area sampling should be set up in a similar manner using the grid spacing established for the hot spot coverage. The approximate limits of the hot spot area should be estimated for each specific area based on knowledge of past activities for each area.

## 5.5 Groundwater Investigation

### 5.5.1 Purpose of Investigation

The following are the purposes of the groundwater investigation:

- Characterize site hydrogeology, including groundwater elevations, groundwater flow direction, hydraulic conductivity, and seasonal variations
- Help determine the nature and extent of groundwater contamination
- Help determine the quality of groundwater entering the site
- Help determine the quality of groundwater beneath the site downgradient of where releases of contaminants occurred or may have occurred

### 5.5.2 Task Description

The groundwater investigation will include evaluating the condition of existing monitoring wells, constructing additional monitoring wells at site perimeter locations, conducting aquifer testing, and sampling and analyzing groundwater. The task descriptions are discussed in the following subsections. Detailed sampling and analysis procedures are presented in the SAP (Section 8).

#### 5.5.2.1 Evaluation of Existing Monitoring Wells and New Monitoring Well Construction

Four monitoring wells were constructed at the site in 1990. The condition of these wells is uncertain; however, MW-2 is reported to have been damaged by a snow plow. The monument and the upper portion of the casing were separated from the well. The remaining casing from MW-2 will be located and abandoned in accordance with state well standards (WAC 173-160). The remaining wells, MW-1, MW-3, and MW-4, will be inspected and redeveloped. If redevelopment indicates that one or more of the wells is not functional, the wells will be abandoned. Possible replacement of these wells will be discussed with Ecology, if necessary.

Three new monitoring wells will be constructed near the perimeter of the site. These wells will be completed near the top of the aquifer. Two wells, MW-5 and MW-6, will be located near the southern perimeter of the site. Based on limited groundwater flow data, it is assumed that these wells are located downgradient of current and historical site activities that may have impacted groundwater. MW-7 will be located near the northern perimeter of the site. Based on limited groundwater flow data, it is assumed that this well is located upgradient of current and historical site activities. Well locations are shown in Figure 5-2.

During hollow-stem drilling, soil samples will be collected to identify stratigraphy and aquifer and aquitard characteristics. The following sampling increments and tests will be conducted:

- 2.5-foot increments for standard penetration tests (SPTs)

- 2.5-foot increments for visual field soil classification
- One sample from the screened area for particle-size distribution and laboratory soil classification
- One per borehole for laboratory vertical permeability of aquifer and aquitard material

Each monitoring well will meet the following criteria:

- Drilled to 30 feet bgs and backfilled for well-screen installation intersecting the top of the water table
- 10-foot long well screen
- Constructed with 2-inch diameter Schedule 40 PVC casing and screen
- Slug tested and analyzed for horizontal permeability
- Surveyed for horizontal location (+/- 1 foot) and land surface and top-of-casing elevation (+/- 0.01 foot)

Detailed monitoring well construction instructions are located in the SAP (Section 8).

#### 5.5.2.2 Groundwater Level Monitoring

The purpose of groundwater level monitoring is to establish the elevation of the potentiometric surface below the site, evaluate the direction of groundwater flow, and determine whether groundwater levels show seasonal, diurnal, or other variations such as effects from nearby pumping of water supply wells. Groundwater levels will be measured in each monitoring well during the initiation of the RI field work (i.e. during drilling and well development/redevelopment) and then during four quarters of groundwater monitoring over a one year period. In addition, continuous groundwater monitoring will be conducted during the RI field work. Transducers and data loggers will be installed in at least one of the existing monitoring wells after it has been redeveloped. The data loggers will collect water level data continuously over the period of RI field work associated with the soil and groundwater investigations (expected to be 2 to 4 weeks duration). The continuous water level data will be evaluated to determine whether levels show short-term fluctuations, particularly whether site groundwater levels are affected by groundwater pumping at nearby city wells.

#### 5.5.2.3 Groundwater Sampling and Analysis

Groundwater from each monitoring well will be sampled and tested during four quarters of groundwater sampling. During the first two quarters, groundwater samples will be tested for the following analytes:

- Conventional parameters, including nutrients
- TPH
- VOCs
- SVOCs

- Pesticides
- Herbicides
- Metals

Following the second round of sampling, the analytical parameters will be reevaluated to determine if all organic parameters (TPH, VOCs, SVOCs, pesticides, and herbicides) will be monitored in all wells for the third and fourth quarters of monitoring.

Water levels will be measured in the site monitoring wells during each monitoring event to establish groundwater gradients and flow direction. Additional water elevation data may be required to determine variability in groundwater flow direction, such as effects from pumping schedules at nearby water supply wells.

## 5.6 Other Media

### 5.6.1 Air

Based on existing information of contaminant concentrations at the site, contaminants in air are not expected to be of concern. No additional work is included in this Work Plan to address air contaminants. However, if data collected during the course of the RI suggest that this determination is not valid, additional work may be included as an addendum to this Work Plan.

### 5.6.2 Surface Water

Surface water bodies are not identified on the site and are not identified within one half-mile radius of the site. As such, a surface water investigation is not included in this Work Plan.

### 5.6.3 Sediment

Sediment is defined in WAC 173-204-200 as the following:

> *"Settled particulate matter located in the predominant biologically active aquatic zone, or exposed to the water column. Sediment(s) also includes settled particulate matter exposed by human activity (e.g., dredging) to the biologically active aquatic zone or to the water column."*

Surface water bodies are not identified on the site and are not identified within one half-mile radius of the site. As such, sediment is not identified as an environmental media at the Bee-Jay Scales Site. Sediment accumulated in the evaporation pond will be included in the Soils Investigation (Section 5.4). A sediment investigation is not included in this Work Plan.

### 5.6.4 Ecological Risk Assessment

As part of developing the RI approach, the criteria for determining that no further terrestrial ecological risk evaluation is required were reviewed (WAC 173-340-7491). A simplified terrestrial ecological evaluation (WAC 173-7492 (2)(a)(ii), Table 749-1) was completed and is included in Table 5-5. The score identified from the evaluation indicates that no further evaluation of terrestrial ecological risk is required for the RI.

## 5.7 Off-Site Groundwater Investigation

After the results of the tasks described in Sections 5.4 and 5.5 are obtained, the data will be evaluated to determine whether sufficient information has been gathered to define the nature and extent of contamination or whether additional data are required. Based on the results of previous investigations, it is anticipated that additional information will be required to define the downgradient extent of impacted groundwater. It is likely that at least one additional groundwater monitoring well will be installed off site during a second phase of RI field work. The area requiring downgradient investigation will be determined after the integrity of the existing, on-site monitoring wells has been evaluated, new monitoring wells have been installed, groundwater level data have been evaluated, and at least one round of groundwater samples has been analyzed and interpreted. An addendum to this Work Plan will be prepared and submitted to Ecology for review outlining the downgradient exploration area. Methods for the second phase of exploration will follow those outlined in the SAP (Section 8) or will be included in the Work Plan addendum.

**TABLE 5-1**
Data Gaps
*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| Investigation Area | Data Gaps |
|---|---|
| Sitewide conditions | *Site Map*<br>• Develop site topographic map with sample locations<br>*Soil*<br>• Subsurface geology<br>*Groundwater*<br>• Groundwater flow direction (existing information indicates flow to south, but based on limited data), horizontal and vertical hydraulic conductivity, and groundwater velocity<br>• Seasonal variations |
| Area 1: Former Liquid Fertilizer Plant and Truck Wash Area | *Soil*<br>• Confirm contaminant concentrations from previous investigations using EPA analytical methods at discrete depth intervals<br>• Confirm characterization of sediment in evaporation pond<br>• Soil chemical/physical properties<br>*Groundwater*<br>• Monitoring well condition, MW-4<br>• Current contaminant concentrations, southern property boundary<br>• Groundwater chemical/physical properties |
| Area 2: Former Dry Fertilizer Plant Area | *Soil*<br>• Initial characterization<br>• Contaminant concentrations of discrete depth intervals<br>• Soil chemical/physical properties<br>*Groundwater*<br>• Contaminant concentrations, southern property boundary<br>• Groundwater chemical/physical properties |
| Area 3: Drum Storage Area | *Soil*<br>• Confirm contaminant concentrations from previous investigations using EPA analytical methods at discrete depth intervals<br>*Groundwater*<br>• Contaminant concentrations, southern property boundary<br>• Groundwater chemical/physical properties |
| Area 4: Suspected Historical Washdown Area | *Soil*<br>• Initial characterization<br>• Contaminant concentrations of discrete depth intervals<br>• Soil chemical/physical properties<br>*Groundwater*<br>• Contaminant concentrations<br>• Groundwater chemical/physical properties |

| **Investigation Area** | **Data Gaps** |
|---|---|
| Area 5: North Area | *Soil*<br>• Area-wide contaminant concentrations of shallow soils<br>• Soil chemical/physical properties<br>*Groundwater*<br>• Monitoring well condition (MW-1)<br>• Contaminant concentrations at north property boundary (assumed to be upgradient of site activities)<br>• Groundwater chemical/physical properties |
| Area 6: Hickenbottom Area | *Soil*<br>• Confirm contaminant concentrations from previous investigations using EPA analytical methods at discrete depth intervals - east of the former washdown area<br>• Soil chemical/physical properties<br>*Groundwater*<br>• Monitoring well condition (MW-3)<br>• Contaminant concentrations of representative groundwater<br>• Groundwater chemical/physical properties |
| Off-Site Conditions | *Well Inventory*<br>*Soil*<br>• Background concentrations of metals<br>• Subsurface geology<br>*Groundwater*<br>• Upgradient contribution of contaminants to the site<br>• Groundwater quality downgradient of site<br>• Groundwater chemical/physical properties |

**TABLE 5-2**
Soil Sampling Matrix
*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| Area | Sample ID | Soil Sample Depth (feet bgs) | Analytical Parameter Groups[1] |
|---|---|---|---|
| ***Area 1: Former Liquid Fertilizer Plant and Truck Wash*** | | | |
| 1 | Soil boring: shallow | 0.5 to 1.5 | Conventional parameters[2], VOCs, SVOCs[3], organochlorine pesticides, herbicides, metals |
| 1 | Soil boring: intermediate | 4.5 to 6.0 | Conventional parameters[2], organochlorine pesticides, herbicides |
| 1 | Soil boring: above groundwater | 9.5 to 11 | Conventional parameters[2], VOCs, SVOCs[3] |
| ***Area 2: Former Dry Fertilizer Plant*** | | | |
| 2 | Soil boring: shallow | 0.5 to 1.5 | Conventional parameters, organochlorine pesticides, herbicides, metals |
| 2 | Soil boring: intermediate | 4.5 to 6.0 | Conventional parameters, |
| 2 | Soil boring: above groundwater | 9.5 to 11 | Conventional parameters, |
| ***Area 3: Drum Storage*** | | | |
| 3 | Soil boring: shallow | 0.5 to 1.5 | Conventional parameters, TPH, VOCs, SVOCs[3], organochlorine pesticides, metals |
| 3 | Soil boring: intermediate | 4.5 to 6.0 | Conventional parameters, metals |
| 3 | Soil boring: above groundwater | 9.5 to 11 | Conventional parameters, TPH, VOCs, SVOCs[3], metals |
| ***Area 4: Suspected Former Washdown*** | | | |
| 4 | Soil boring: shallow | 0.5 to 1.5 | Conventional parameters, TPH, VOCs, SVOCs[3], organochlorine pesticides, herbicides, metals |
| 4 | Soil boring: intermediate | 4.5 to 6.0 | Conventional parameters, organochlorine pesticides, herbicides |
| 4 | Soil boring: above groundwater | 9.5 to 11 | Conventional parameters, TPH, VOCs, SVOCs[3] , organochlorine pesticides, herbicides |
| ***Area 5: North Area*** | | | |
| 5 | Soil boring: shallow | 0.5 to 1.5 | Conventional parameters, TPH, organochlorine pesticides, herbicides, metals |
| ***Area 6: Hickenbottom Property*** | | | |
| 6 | Soil boring: shallow | 0.5 to 1.5 | Conventional parameters, TPH, VOCs (A6-SB-001 only), organochlorine pesticides, herbicides |
| 6 | Soil boring: intermediate | 4.5 to 6.0 | Conventional parameters, TPH, organochlorine pesticides, herbicides |
| 6 | Soil boring: above groundwater | 9.5 to 11 | Conventional parameters, TPH, VOCs (A6-SB-001 only), organochlorine pesticides, herbicides |

Notes:

[1] Conventional parameters and methods may include ammonia (EPA 350.1), nitrite (EPA 353.2), nitrate (EPA 353.2), phosphate (EPA 300), sulfate (EPA 375.2), chloride (EPA 325.2), TOC (EPA 415), and pH (EPA 150.1). See SAP for detailed information.

[2] Conventional parameters will include agronomic analyses in Area 1 for purposes of the FS. These parameters include extractable cations (S-5.10, S-2.50), NaHCO3 (S-4.10), CEC (S-10.10), DTPA-available Fe, Mn, B, Cu (S-6.12), Ece (S-1.20), Ca-Mg-Na-Cl in saturation extract (S-1,60, S-1.40),, void ratio (2.1-2/30, 2.1/20); Agronomic methods ("S" methods) from Miller, R.O., J. Kotuby-Amacher, and J.B. Rodriquez. 1998. Western States Laboratory Proficiency Testing Program, Soil and Plant Analytical Methods, Version 4.10 (2/10/98). Western States Program, Colorado State University, Fort Collins, CO.

[3] VOCs, SVOCs are analyzed in a subset of the soil boring samples. See SAP for detailed information.

**TABLE 5-3**
Hot Spot Grid Spacing
*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| Confidence | F | Grid Spacing[1] |
|---|---|---|
| 0.95 | 0.59 | 42 |
| 0.90 | 0.55 | 45 |
| 0.85 | 0.53 | 47 |
| 0.75 | 0.48 | 52 |
| 0.50 | 0.39 | 64 |

[1] Grid spacing base on area of contamination with a radius of 25 feet (refer to earlier footnote).

**TABLE 5-4**
Nonparametric Sample Sizes
*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| Estimated Quantile | 85 Percent Confidence | 90 Percent Confidence | 95 Percent Confidence |
|---|---|---|---|
| 50th [Median] | 3 | 4 | 5 |
| 75th [Upper Quartile] | 7 | 9 | 11 |
| 85th | 12 | 15 | 19 |
| 90th | 19 | 22 | 29 |
| 95th | 37 | 45 | 59 |

## TABLE 5-5

Simplified Terrestrial Ecological Evaluation: Exposure Analysis Procedure under WAC 173-340-7492(2)(a)(ii), Table 749-1

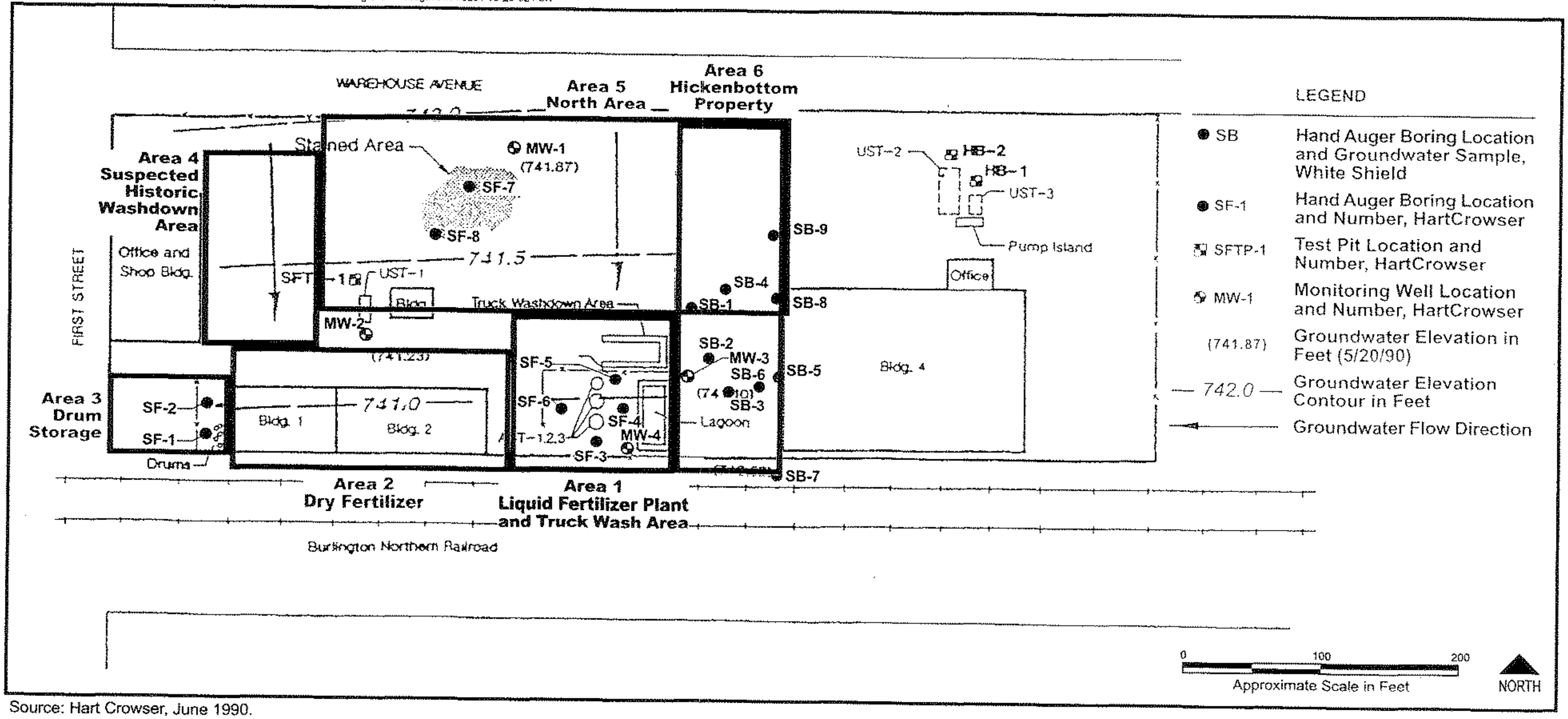
*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| | Exposure Analysis Criteria | Score |
|---|---|---|
| 1. | Estimate the area of contiguous (connected) undeveloped land on the site or within 500 feet of any area of the site to the nearest half-acre and select the appropriate points.<br>*Area (acres):*<br>0.25 or less = 4 points<br>0.5 = 5 points<br>1.0 = 6 points<br>1.5 = 7 points<br>2.0 = 8 points<br>2.5 = 9 points<br>3.0 = 10 points<br>3.5 =11 points<br>4.0 or more = 12 points | 4 |
| 2. | Is this an industrial or commercial property? If yes, enter a score of 3. If no, enter a score of 1. | 3 |
| 3. | Enter a score for the habitat quality of the site, using the rating system:<br>High = 1 point<br>Intermediate = 2 points<br>Low = 3 points | 3 |
| 4. | Is the undeveloped land likely to attract wildlife? If yes, enter a score of 1. If no, enter a score of 2. | 2 |
| 5. | Are any of the following soil contaminants present: chlorinated dioxins and/or furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, benzene, hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, pentachlorobenzene? If yes, enter a score of 1. If no, enter a score of 4. | 1 |
| 6. | Add the numbers in the boxes on lines (2) through (5) and enter this number. If this number is larger than the number in the box on line (1), the simplified terrestrial ecological evaluation may be ended under WAC 173-340-7492(2)(a)(ii). | 9 |

Notes:

1. It is expected that this habitat evaluation will be undertaken by an experienced field biologist. If this is not the case, enter a conservative score (1) for questions 3 and 4.
2. Line (1). "Undeveloped land: means land that is not covered by existing buildings, roads, paved areas, or other barriers that will prevent wildlife from feeding on plants, earthworms, insects, or other food in or on the soil.
3. Line (3). Habitat rating system. Rate the quality of the habitat as high, intermediate, or low based on your professional judgement as a field biologist. The following are suggested factors to consider in making the evaluation:
   - **Low:** Early successional vegetative stands; vegetation predominantly noxious, nonnative, exotic plant species or weeds. Area severely disturbed by human activity, including intensely cultivated croplands. Areas isolated from other habitat used by wildlife.
   - **High:** Area is ecologically significant for one of more of the following reasons: late-successional native plant communities present; relatively high species diversity; used by an uncommon or rare species; priority habitat part of a later area of habitat where size of fragmentation may be important for the retention of some species.
   - **Intermediate:** area does not rate as either high or low.
4. Line (4). Indicate "yes" if the area attracts wildlife or is likely to do so. Examples: birds frequently visit the area to feed; evidence of high use by mammals; habitat "island" in an industrial area; unusual features of an area that make it important for feeding animals; heavy use during seasonal migration.

174175.A1.02_E072002012SEA / Bee Jay Scales / RI/FS Work Plan / Fig 5-1 Investigation Areas / 10-20-02 / LW



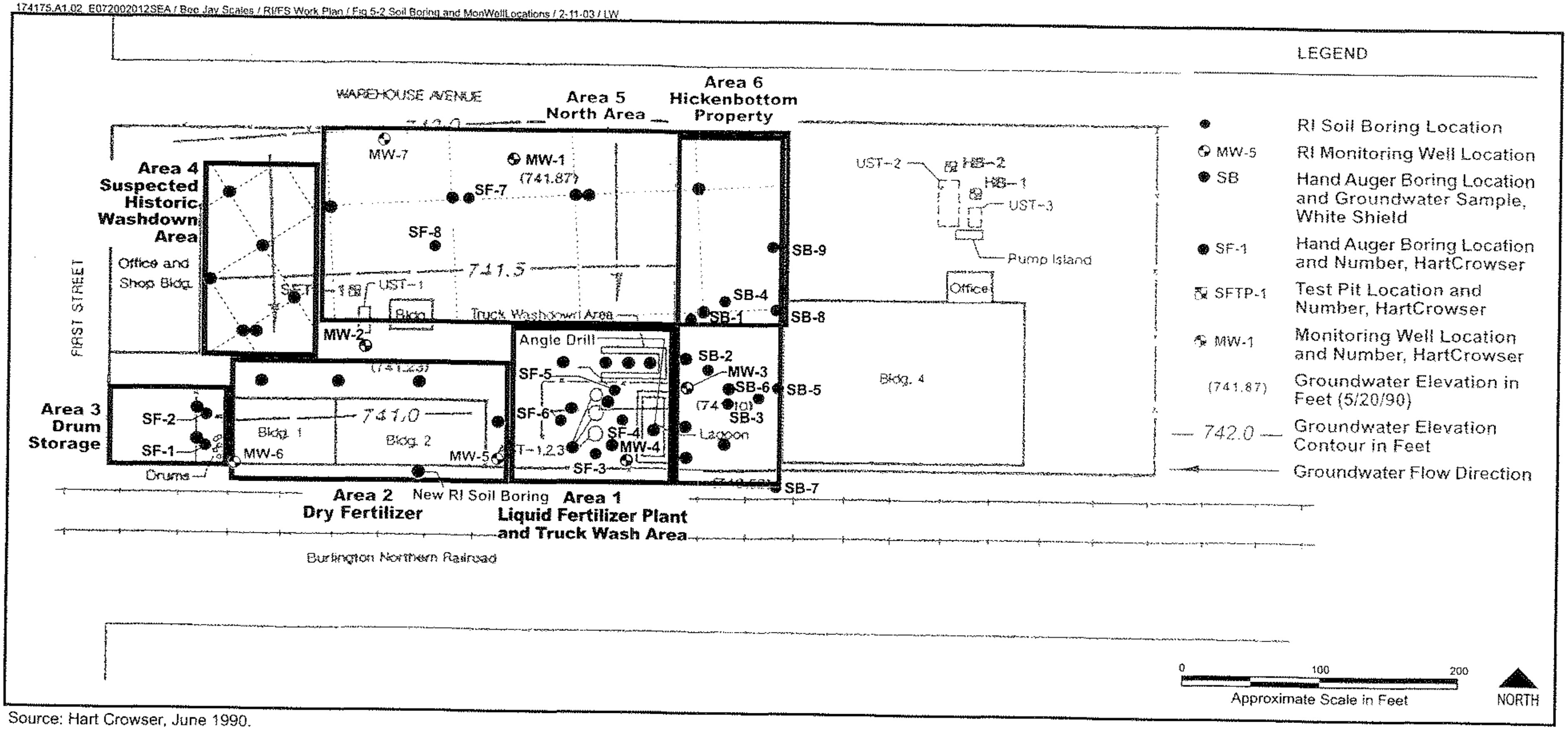
Source: Hart Crowser, June 1990.

Figure 5-1

**Investigation Areas**

Bee-Jay Scales
RI/FS Work Plan

174175.A1.02 E072002012SEA / Bee Jay Scales / RI/FS Work Plan / Fig 5-2 Soil Boring and MonWellLocations / 2-11-03 / LW



Source: Hart Crowser, June 1990.

Figure 5-2

**Soil Boring and Monitoring Well Locations**

Bee-Jay Scales
RI/FS Work Plan

SECTION 6

# Feasibility Study

The FS will be conducted in accordance with WAC Chapter 173-340-350. Clean-up action alternatives will be evaluated in accordance with requirements of WAC Chapter 173-340-360.

An initial screening of alternative actions has been conducted and is presented in Section 3 of this Work Plan. Final screening of alternatives will consider proposed clean-up standards, ARARs, and the results of the RI. The results of the FS will be presented in an FS report and will include selection of a preferred clean-up alternative.

## SECTION 7

# Deliverables and Schedule

The Agreed Order identifies an overall RI/FS project master planning schedule. The schedule is based on a number of assumptions developed before the RI/FS work planning process. The schedule will be refined as work proceeds. At present, the current schedule identifies the following milestones:

| | |
|---|---|
| November 7, 2002 | Submittal of draft RI/FS Work Plan to Ecology |
| December 18, 2002 | Ecology approval of RI/FS Work Plan |
| January 3, 2003 to October 9, 2003 | RI field work, data analysis, risk assessment, and draft RI report |
| February 6, 2004 | Ecology approval of RI report |
| March 26 to July 4, 2004 | Treatability studies |
| September 1, 2004 | Draft FS report |

SECTION 8

# Sampling and Analysis Plan

This SAP was developed to provide direction for field sampling activities associated with the Bee-Jay Scales Site RI activities. The approach and rationale for RI field activities are presented in Section 5, RI Approach. Details on analytical methodologies are presented in the Section 9, QAPP. An HSP covering training, safety monitoring requirements, and site control procedures is presented in Section 10. Attachments to this SAP include examples of commonly used field sampling forms such as boring logs, chain-of-custody forms, and sample data sheets (Attachment 1 in Appendix E). A Waste Management Plan (WMP) that describes handling procedures for investigation-derived waste (IDW) in accordance with state and federal requirements also is attached to this SAP (Attachment 2 in Appendix E).

## 8.1 Introduction

This SAP is intended to be used by field staff conducting RI sampling work. Other methodologies may be incorporated in the form of addenda to the SAP, depending on site-specific conditions and requirements. The following is information contained in this SAP:

- Overall scope and objective
- Sampling methods
- Sample handling
- Chain-of-custody (COC) and shipping
- Decontamination procedures
- Project staff organization
- Data management

Work plans developed in the future to address specific project data needs will reference this SAP and the QAPP (Section 9).

## 8.2 Sampling Operations

This section presents the objectives behind the sampling to be performed at the Bee-Jay Scales Site, and it details the sampling procedures that will be employed to satisfy these objectives.

### 8.2.1 Sampling Objectives

The purposes of the sampling program are to acquire site-specific data needed to locate potential sources of contaminants and determine the level of risk posed by contaminants at the site. For each sample that is collected, the analytical data provided by that sample will be used to satisfy one or more of the following specific objectives:

- Define the nature and extent of the constituents present
- Evaluate risks posed by constituents present at the site
- Characterize material for waste management purposes, such as separation or disposal
- Make field decisions regarding work progress, additional needs, or investigation completion
- Assess contaminant migration

Table 8-1 lists the different sampling activities that will be performed at the Bee-Jay Scales Site, as well as the objective(s) that they satisfy.

#### 8.2.1.1 Sample Types

Soil and groundwater samples will be collected. At this time, it is not expected that samples will be collected from other media such as surface water, sediment, or waste sources. The types of soil and water samples to be collected will be determined based on area-specific goals and objectives. In general, sample types will be either discrete or composite.

##### *Discrete Sampling*

A discrete sample is a spatially and temporally distinct sample and includes the following examples:

- A surface soil sample collected from a point located on a sampling grid
- A soil bore sample from one depthlimited continuum
- A groundwater sample from a specific monitoring well

Discrete sampling provides specific profiling information and is useful where the detailed pattern of constituent distribution is necessary. Groundwater samples will always be discrete.

##### *Composite Sampling*

A composite sample is collected by combining two or more discrete samples and includes the following examples:

- A mixture of two or more sampling depth intervals in a soil borehole or test pit
- A sample composed of multiple samples collected from a stream at fixed time intervals
- A mixture of several grab samples from surface soil or a stockpile

Composite samples reflect the general characteristics over an area or depth or over a period of time. Soil and sediment composite samples are collected by mixing equal portions of discrete samples. Surface water composite samples are collected as time composite samples (equal discrete volumes at constant time intervals), area composite samples (equal discrete volumes over a defined area), or flow-proportional composite samples (volume of discrete sample proportional to stream flow). Composite sampling is a cost-effective way of determining the general characteristics of an area or discharge, and it is useful in evaluating characteristics for waste disposal.

### 8.2.2 Soil Sampling Methods

Both surface and subsurface soil samples will be obtained. Surface samples will be obtained using hand tools. Subsurface samples will be obtained from soil borings drilled using hollow-stem auger drilling methods. The site has been divided into six soil sampling areas based on historical site activities believed to have occurred in each area (see Section 5). Surface and shallow subsurface soil sampling will be conducted in Area 5, the North Area, using hand tools. Subsurface soil sampling from soil borings will be conducted in the remaining five areas. Figure 8-1 shows the sample locations, Table 8-2 summarizes the sampling information, and Table 8-3 summarizes analytical methods.

#### 8.2.2.1 Drilling Methods and Procedures

The soil borings will be drilled with a truck-mounted drilling rig using a minimum 4-inch inside diameter (ID) hollow-stem auger. The auger will be advanced from the surface to a depth of approximately 25 to 30 feet bgs. All drilling and sampling equipment will be decontaminated by steam cleaning and/or the procedures described in Section 8.3 both before and after drilling. Once the boring is completed, the borehole will be decommissioned consistent with WAC 173-160.

#### 8.2.2.2 Soil Sampling Procedures

Samples for geologic logging will be collected continuously in advance of each drilling interval (starting from the ground surface), using either an 18-inch-long by 1 3/8-inch ID by 2-inch outside diameter (OD) split-spoon sampler or a 24-inch-long by 2-1/2-inch ID California liner split-spoon sampler. Split-spoon sampling will be performed in general accordance with the standard method for penetration sampling and split-barrel sampling of soils (ASTM, D1586) or equivalent. The samples will be visually classified according to the Unified Soil Classification System (ASTM D2488).

SPTs will be conducted to obtain a measure of the resistance of the soil to penetration while recovering a soil sample. The split spoon will be driven 18 inches into the soil ahead of the auger to obtain the sample. SPT procedures assume that each blow represents a 140-pound guided hammer dropping 30 inches. The number of blows to advance the sampler through each 6-inch interval will be recorded in the geologic log. The sampler will be extracted, and the auger will then be advanced. As a precaution to prevent damage to the split-spoon sampler, the blow count for an interval will not be allowed to exceed 50. If the blow count reaches 50, the test will be stopped; the total driven distance will be recorded in the field log and the sample will be retrieved.

The split spoon will be slowly and carefully removed from the boring so that heaving will not be induced. After the sampler has been removed from the boring, it will be placed on a clean surface, opened, and split lengthwise with a decontaminated stainless-steel knife. Any soil samples for chemical analysis will be obtained immediately, and then the sample will be screened using a photoionization detector (PID).

Soil sample depth intervals are specified in Table 8-2. However, if unexpected conditions are detected in a soil boring that suggest sampling at other depth intervals is needed, the field team leader will determine if supplemental sampling is appropriate. Unexpected conditions may include free product detection, unusual soil coloration, or groundwater depths significantly different from those expected. The field team leader will determine if additional depth intervals should be sampled or if sample depth intervals should be modified. All deviations from the work plan will be documented in the field sampling notes.

The vertical depth of a sample drilled at an angle will determined by the following equation:

$$D = H \cos A$$

Where:

D = Vertical depth of the sample

H = Drill length

A = Angle by which the drill stem deviates from vertical

For example, if the drill stem has advanced 15 feet drilling at an angle of 30 degrees from vertical, the depth of the sample below the ground surface is as follows:

$$\begin{aligned} D &= 15 \cos 30 \\ &= 15 (.891) \\ &= 13.3 \text{ feet} \end{aligned}$$

### 8.2.2.3 Surface Soil Sampling Methods and Procedures

Surface soil sample locations in Area 5 have been located by generating a square grid with a known spacing tilt/rotation and randomly determined starting point. The starting point will be located in the field using the drawing in Figure 8-1. Because a detailed site survey is not available, the starting point location will determined using best professional judgement and any variations from the grid location shown in this plan will be noted in the field notebook. A site map will be prepared and include surveyed sampling locations. Therefore, the starting point and all surface sampling locations will be marked clearly by field personnel using a survey stake.

Surface soil samples will be obtained using hand tools (shovel, trowel, pick, and/or hand auger). Prior to sampling, the gravel paving material and/or vegetation covering the soil will be scraped away. Clean sampling tools will then be used to obtain the upper 6 to 12 inches of soil for a chemical sample. Soil will be placed in a decontaminated stainless-steel bowl and mixed thoroughly prior to transferring to laboratory-prepared sample jars. Excess soil will be placed back in the hole, hand compacted, and recovered with the gravel or surface material.

### 8.2.2.4 Soil Sampling Procedures for Chemical Analysis

Soil samples to be submitted for chemical analysis will be obtained from the split barrel in the borings at the following sample depth intervals: 0.5 to 2 feet; 5 to 6.5 feet; and just above the water table, expected to be encountered at a depth of between 9.5 and 13 feet bgs. Other intervals may be substituted for the samples at the discretion of the field investigator based on sample recovery or other factors. No samples will be obtained below the water table.

Sample containers selected may be either laboratory-prepared glass jars with Teflon-lined caps or for the split-barrel, stainless-steel liners with Teflon caps. The preferred sample container will be chosen based on drilling and sample recovery conditions. Procedures for using each sample container type are described below.

#### *Sample Jars*

Immediately after the split barrel is opened, a decontaminated stainless-steel knife is used to split the soil sample in half lengthwise. The knife is then used to transfer soil from the lower one-foot segment of the split barrel into the jar. The jar(s) should be completely filled with soil in approximately equal aliquots from the length of the 1-foot segment. The jar will then be sealed, placed in a plastic bag, and transferred to the sample cooler. Field screening with the PID and geologic logging of the sample will proceed after the above procedure is complete.

#### *Liners*

Stainless-steel rather than brass liners will be used because samples will be analyzed for metals. After the split-barrel sampler has been decontaminated, the liners will be placed in the barrel. The entire length of the split barrel will be filled with liners. Liners are available in lengths of 3, 4, and 6 inches. The 6-inch liners will be used to provide the analytical laboratory with maximum matrix. The sampler then will be assembled.

When the sample is obtained, immediately after the split barrel is opened, a decontaminated stainless-steel knife will be used to separate the ends of the liners. The deepest liner, nearest the drive end or shoe, will be selected for chemical analysis. A piece of Teflon tape that is larger than the liner will be placed over both ends of the liners. Tight-fitting Teflon caps will be placed over the tape. The sample label will then be affixed to one of the Teflon caps, and the sample will be placed in a plastic bag and transferred to the sample cooler. Field screening with the PID and geologic logging of the sample will proceed after the above procedure is complete.

### 8.2.2.5 Soil Chemical Analyses

Table 8-2 summarizes the soil sampling matrix, and Table 8-3 presents soil chemical analytical requirements. Section 8.5 includes information on field quality assurance/quality control (QA/QC), and Section 8.7 includes information on sample handling procedures.

## 8.2.3 Groundwater Sampling Methods

### 8.2.3.1 Monitoring Well Construction

At least three new monitoring wells will be installed in boreholes drilled for soil sampling. A minimum 8-inch-diameter boring will be drilled to accommodate the 2-inch monitoring well.

Drilling and sampling will continue until the groundwater table is encountered. At that time, drilling will be stopped and water level measurements will be taken at 10-minute intervals until the water level is stabilized. When the water level stabilizes, drilling will resume, and the well will be drilled to a final depth of approximately 10 to 15 feet below the static water level or 5 feet into an aquitard, whichever is shallower.

The monitoring wells will be constructed of 2-inch Schedule 40 PVC well screen and casing. Schematic diagrams of typical monitoring well construction and completion are shown in Attachment 1 of Appendix E.

The monitoring well casing will consist of a 2-foot sump, 10 feet of 0.010-inch slotted screen, and the remaining length blank Schedule 40 PVC 2-inch casing. The monitoring well casing will be positioned centrally in the borehole and held in place by centralizers placed on the sump and above the screen. The monitoring well casings will be fitted with vented PVC slip caps. A filter pack of Colorado 10/20 graded sand will be used.

The completion depths of the monitoring wells will be determined in the field, based on the conditions encountered and the judgment of the field geologist. They will be installed in accordance with WAC 173-160, Minimum Standards for Construction and Maintenance of Wells. The monitoring well filter pack will extend at least 3 feet above the top of the monitoring well screen, and a 2-foot seal of hydrated bentonite will be installed on top of the sand pack. The remaining distance from the bentonite seal to the surface may be filled with bentonite or a bentonite-grout mixture. Flush-mounted well monuments encased in a concrete pad will complete the well.

Monitoring well completion details to be determined in the field include the following:

- Placement of the well screen
- Placement and length of the gas probe screen
- Total length of filter packs and seal between the monitoring well and gas probe filter packs
- Total well and probe depth
- Well development time

The well screen slot size and grade of sand used for the filter pack may be changed based on field conditions if significant thicknesses of fine-grained units are encountered.

#### 8.2.3.2 Monitoring Well Development

The three existing monitoring wells that are believed to remain intact (MW1, MW3, and MW4) will be opened, inspected by depth sounding and comparison to well completion diagrams, and redeveloped by surging and bailing or pumping. If the wells are determined to be suitable for use, they will be included in the quarterly monitoring program. If one or more wells is determined to be fouled or in poor quality, it will be abandoned in accordance with procedures outlined in Chapter 173-160 WAC, and a new monitoring well will be drilled to replace it.

Once the monitoring wells are completed, each well will be developed by surging with a surge block or similar development tool to remove fines from around the monitoring well. Water and fines will be removed by bailing and/or pumping. The development time will be at the discretion of the field hydrogeologist.

### 8.2.3.3 Well Abandonment

Monitoring well MW2 was reportedly damaged, and proper abandonment of the remaining well casing is required. The well will be abandoned by overdrilling in accordance with procedures in Chapter 173-160 WAC.

### 8.2.3.4 Aquifer Testing

The purpose of the aquifer testing is to estimate the aquifer's horizontal permeability and/or hydraulic conductivity. Each well will be slug tested for horizontal permeability. Procedures for slug testing will be in accordance with ASTM D4044/D4104 or equivalent. Testing and analysis procedures may be modified to fit the site and test conditions based on the judgment of the project hydrogeologist.

A slug test will be performed on each monitoring well. The water in the well will be displaced with a sealed and weighted, 8-foot-long, 1 3/8-inch OD solid acrylic pipe or "slug rod." An electronic pressure transducer will be installed in the well before the slug test is begun. The initial water level will be recorded. The slug rod will be lowered instantaneously into the well, and recovery of the water level will be monitored over time using the pressure transducer and a datalogger. When the water level recovers to the pretest static water level, the slug rod will be removed instantaneously and the rising head portion of the test will be monitored. All equipment will be decontaminated prior to being lowered into the well.

### 8.2.3.5 Quarterly Groundwater Monitoring

Groundwater sampling procedures can be separated into five main activities:

- Static water level measurement
- Field instrument calibration
- Calculation of the volume to be evacuated
- Well evacuation and measurement of field water quality parameters
- Sample collection

The first round of samples will be obtained using minimal drawdown procedures using nondedicated equipment. After the first round, sampling procedures will be reviewed to evaluate the best technique for site conditions. If conditions are favorable, minimal drawdown techniques will continue to be used and acquisition of dedicated equipment will be considered. Sampling techniques will be modified only if required by site conditions. Each procedure is described in detail below.

#### *Static Water Level Measurement*

The depth to the static water level (DTW) is the distance between a reference point (a marked point on the top edge of the PVC well casing) and the static water level. The measurement is performed using a SINCO Model 51453 water level indicator or equivalent. The probe is lowered into the well until it enters the water. At this point the sounder will buzz and (if present) a red light on the sounder will come on, indicating the probe is at the water surface. The probe will be raised and lowered in slight increments until it is exactly at the water surface and will be held in that position. The position on the sounding line that is even with the reference point is then marked using a finger (this is the DTW spot on the graduated line). The line is then pulled partially out of the well casing and the DTW read to the nearest 0.01 foot.

The water level indicator sounding line will be thoroughly decontaminated after the measurements are performed and prior to coiling the line back onto the spool.

Continuous water level measurements will be obtained using a pressure transducer and datalogger. The pressure transducer should be vented to compensate for atmospheric pressure changes. A 10 psi transducer will be used. The transducer will be placed at least 4 feet below the static water level in the well and at least 1 foot above the base of the well. The water level should be checked manually using a water level indicator at the start, finish, and periodically during the period of continuous water level monitoring to calibrate the datalogger. Decontamination of pressure transducers will be the same as for water level indicator equipment. Datalogger and pressure transducer equipment suitable to complete this work is manufactured by Geokon, Aquastar, and Hermit.

### Calculation of Well Evacuation Volume

The volume of water to be evacuated from each well prior to sampling is calculated in the field. The DTW measured just prior to sampling is subtracted from the total depth (TD) of each well to compute the volume of water to be evacuated. The total evacuation volume is calculated using the following equation for a 2-inch ID well:

$$V = (TD-DTW) \times 0.5$$

where:

V = Volume of water to be evacuated from the well, in gallons; this number equals three times the volume of water contained within the well casing (three casing volumes)

TD = Total depth of well, in feet

DTW = Depth to water, in feet

0.5 = Constant in gallons per foot (gal/ft) that equals 0.16 gal/ft (for a 2-inch-diameter casing) multiplied by three casing volumes (0.16 ga/ft x 3 = 0.5 gal./ft)

The TD of each well will be sounded and recorded annually, at a minimum, to monitor the volume of accumulated silt and verify that no obstructions exist.

### Well Evacuation Methods and Procedures

Stagnant water in the well casing will be removed by purging each well prior to sampling. Minimal drawdown procedures are preferred for purging and sampling. Procedures for purging using a bailer are included as well. The first round of samples will be obtained using minimal drawdown procedures using nondedicated equipment. After the first round, sampling procedures will be reviewed to evaluate the best technique for site conditions. If conditions are favorable, minimal drawdown techniques will continue to be used and acquiring dedicated equipment will be considered. Sampling techniques will be modified only if required by site conditions.

### Bailer Procedures

Either dedicated stainless-steel bailers or disposable polyethylene bailers will be used. Purge water will be temporarily stored in 55-gallon drums pending receipt and review of chemical analytical results. Purge water handling and disposal procedures are described in further detail in the WMP (Attachment 2 in Appendix E).

Monofilament fishing line (80- to 100-pound test) should be used for the bailer line. Woven fiber will not be used. When sampling with a bailer, it is important that the bailer line not touch the ground. A cord-wheel is recommended for wells where the depth to groundwater is less than 30 feet. A downrigger is recommended, although not essential, for deeper wells where the depth to groundwater is greater than 30 feet.

Dedicated bailers will be stored in cases constructed of PVC pipe. PVC slip caps will be attached to the ends of the casing, and one end will be secured with stainless-steel screws. The well number should be etched on the dedicated bailer and written on the case. The project name and number also will be written on the case.

### Cordwheel and Bailer Operation

One end of the monofilament line will be attached to the bailer using a fisherman's knot. Distilled water will be poured over and through the bailer and over the gloved hands of the sampling personnel. The bailer will be lowered to the bottom of the well. The line will be cut and the free end will be attached to a cordwheel with a fisherman's knot.

The bailer will be lowered and raised so as to minimize disturbance of the water in the well. The well will be evacuated from the top of the water column by lowering the bailer until it is just submerged; then the bailer will be raised and emptied. Purge water will be collected in a calibrated bucket to record total purge volume. Field water quality parameters will be measured during evacuation, as described in the following section.

Evacuated well casing water will be put into graduated buckets and measured within +5 percent of the computed well casing volume. After the last aliquot of sample is collected, the bailer line should be discarded and the cordwheel will be decontaminated.

### Downrigger Operation

The downrigger assembly will be set up over the monitoring well using the following procedure. The downrigger reel will be attached to the tripod by sliding it into the bracket attached to the tripod head and securing the downrigger to the tripod by tightening the knob located at the base of the downrigger reel. The tripod will be rotated to level it about the monitoring well so that the downrigger arm is located directly above the well opening. The monofilament line (80- to 100-pound test) will be attached to the bailer. Distilled water will be poured over and through the bailer and over the gloved hands of the sampling personnel. The bailer will be lowered to the bottom of the well, allowing for an extra 5 feet, before the line is cut. The monofilament line will be attached to the downrigger reel by threading it through the line guide and pulley attached to the downrigger arm in the direction the line would travel as it leaves the well. The monofilament line will be passed through the eyelet on the line reservoir reel and double-knotted at the end so that it cannot slip back through.

### Minimal Drawdown Purging Procedures

A 2-inch diameter Grundfos Redi-F1o2 stainless-steel sampling pump with Teflon-lined polyethylene discharge hose will be used for minimal drawdown purging and sampling. Either portable pumps may be used (following decontamination procedures between each well) or dedicated pumps may be installed in each groundwater monitoring well.

When dedicated pumps are used, ppurge water will be removed from each well using a dedicated Grundfos Redi-Flo2 submersible pump. Discharge hose will be 1/2-inch diameter Teflon-lined polyethylene. The pump intake will be set near the midpoint of the well screen.

DTW will be measured in the well and recorded prior to turning the pump on. During purging, water levels will be monitored along with water quality parameters. The wells will be purged at between 0.25 and 1 gallons per minute (gpm) until the remaining field water quality parameters stabilize. The purge rate will not exceed 1 gpm. Purging at these rates should prevent discharge temperature increases of more than 2 degrees Celsius (°C) over the starting temperature.

### Measurement of Field Water Quality Parameters

Evacuated well casing water will be put into graduated buckets or other measuring devices such as a graduated PVC beaker. Field water quality parameter measurements will be used to determine when purging is complete. In addition to temperature, pH, and conductivity, one or more of the following parameters also will be measured during purging:

- Temperature
- pH
- Conductivity
- Redox potential
- Turbidity
- DO

Water quality parameters will be measured continuously during purging when using minimal drawdown purging procedures using either an open topped flow-through cell or equivalent means. Well evacuation will be considered to be complete when three successive readings of the water quality parameters stabilize to within the following tolerances (after Puls and Barcelona, 1995):

- +/-0.1 for pH
- +/- 3 percent for conductivity
- +/- 10 millivolts for redox potential
- +/-10 percent for DO
- and +/- 10 percent for turbidity or until readings are less than 10 nephelometric turbidity unit (NTUs)

For all other purging techniques, besides minimal drawdown, three well volumes will be removed and the field water quality parameters will be recorded.

Purge water will be temporarily stored in 55-gallon drums pending receipt and review of chemical analytical results. Purge water handling and disposal procedures are described in further detail in the WMP (Attachment 2 in Appendix E).

#### 8.2.3.6 Groundwater Chemical Analyses

Table 8-4 presents groundwater chemical analytical requirements, Section 8.5 presents field QA/QC sample information, and Section 8.7 presents information on sample handling procedures.

## 8.3 Decontamination Procedures

This section describes the decontamination procedures to be followed in preparing field sampling equipment for use at the site. Decontamination is used to minimize the potential for transfer of potentially contaminated materials to uncontaminated areas, to minimize the exposure of personnel to hazardous substances, and to reduce the possibility of cross-contamination between samples.

Decontamination procedures for personal protective equipment (PPE) are included in the HSP (Section 10).

Whenever possible, dedicated field equipment will be used. Nondedicated field equipment decontamination procedures are based on the known or suspected contaminants present as well as the analytical data objectives. The following are decontamination objectives:

- Prevent contaminants from being introduced into samples from sampling equipment or other samples
- Prevent contamination from leaving the sampling site by way of sampling equipment, personnel, or construction materials
- Prevent exposure of field personnel to contaminated materials

This section outlines procedures that will be followed to meet decontamination objectives. Any nondedicated sampling equipment, including split-spoon soil samplers, hand augers, and bailers, that comes in contact with soil, sediment, surface water, or groundwater will be decontaminated before and after each use. Decontamination procedures for sampling equipment are presented in detail below. Contractors' heavy equipment also should be decontaminated before use at each sample area and before leaving the site. Equipment probes that come in contact with sample water should be cleaned by thoroughly rinsing with distilled water.

A decontamination station for contractors' heavy equipment should be set up in a level area where the decontamination water can be contained for analysis and disposal. The equipment decontamination station will be outside any of the six field investigation areas. All heavy equipment should be decontaminated using a steam cleaner. The water used to decontaminate heavy equipment will be collected and transferred to 55-gallon drums for storage pending analysis and disposal.

A boot wash area for field personnel may also be set up at the heavy equipment decontamination area. Either the steam cleaner may be used to wash boots, or two large tubs may be set up. One tub will contain a detergent and water solution. A brush will be provided in the boot wash tub. The second tub will contain rinse water. The tubs will be set up so that a person wearing the boots may step directly from the wash tub into the rinse tub and from the rinse tub directly outside the decontamination area.

Recommended procedures for decontamination of sampling equipment are presented below. Step 1 (setup of the decontamination station) will take place at the beginning of each workday that decontamination of sampling equipment will be required.

1. Set up a decontamination station using two wash basins containing the wash water used to decontaminate equipment. It may be useful to set up a small table to make it easier to handle the equipment once it has been cleaned.
2. The first wash basin should be half filled with a detergent and water solution. A half-cup of Liquinox or Alconox should be used per 10 gallons of potable water. The second basin should be filled with potable water only.
3. The sampling equipment should be decontaminated by disassembling and washing each part thoroughly in the detergent solution.
4. Rinse equipment thoroughly in the potable tap water basin.
5. Rinse using distilled or deionized water.
6. Rinse with spectra-grade isopropyl alcohol.
7. Final spray rinse with distilled or deionized water.
8. Air-dry, if possible, then completely wrap equipment in unused aluminum foil (shiny side out) for the next use.

## 8.4 Field Measurements

Field measurements of groundwater and surface water may include pH, conductivity, DO, turbidity, oxidation-reduction potential, and water levels. Field equipment usage, calibration, and maintenance will follow the instrument-specific operation manuals. Table 8-5 presents the frequency of calibration for field equipment.

More detailed instructions concerning the field measurements (according to the instrument-specific operations manuals) appear in Attachment 3 of Appendix E.

## 8.5 Field Quality Assurance/Quality Control Samples

Samples for QA/QC purposes will be collected in the field in conjunction with all sampling events (unless otherwise specified in a task-specific work plan). The types of QA/QC samples that must be collected, the rationale behind collection of these samples, and the frequency of QA/QC sample collection are described in the QAPP (Section 9).

Four types of field samples will be analyzed as part of the QA program: trip blanks, rinseate blanks, duplicates, and colocates. These QA samples are described in the following sections.

### 8.5.1 Trip Blanks

Trip blank samples will be analyzed to evaluate cross-contamination of VOCs in groundwater and soil samples. Trip blank samples will be prepared by the laboratory and will accompany the sample bottles throughout the sampling event, including shipping to and from the laboratory. It is not necessary that the trip blank be blind to the laboratory. Trip blanks will be analyzed for VOCs only.

### 8.5.2 Equipment Blanks

Equipment blanks will be analyzed to evaluate the integrity of decontamination procedures for nondedicated sampling equipment. Equipment blanks are obtained by completing the decontamination procedure as usual and then pouring additional deionized water over the equipment and collecting the water in sample containers. Equipment blanks will be collected at a frequency of one per type of sampling equipment used per day. Equipment blanks will be analyzed for parameters scheduled for those samples collected up to the point the equipment blank is obtained. For example, if drilling and soil sampling are conducted on day 1, an equipment blank will be collected that day on the decontaminated split spoons and sample liners.

### 8.5.3 Duplicates

Analysis of duplicate samples is used to monitor laboratory precision and reproducibility of the data with respect to site-specific matrix parameters. Duplicate soil samples will be obtained at a frequency of approximately 10 percent. One duplicate sample will be collected from one of the downgradient monitoring wells during each quarterly sampling event.

Duplicate soil samples will be obtained by filling laboratory-prepared sample jars side by side from the same soil matrix. If soil boring samples are obtained using split-spoon liners, duplicates will not be obtained from subsurface samples.

### 8.5.4 Colocates

A colocated soil sample is one located very close to the original sample in order to check variability over a short lateral distance. Colocated samples have the same depth interval as the original sample. Two colocated samples are planned for the nonparametric sample areas in Areas 4 and 5.

After the original soil boring has been drilled and abandoned, the field representative will locate a second boring as close as practically possible to the original boring. The auger will be advanced to the top of the shallowest sample interval, 0.5 feet, and a single sample will be driven to 2-foot depth. Only the shallowest soil sample interval will be obtained for a colocated chemical analytical sample. A colocated soil sample will have a unique sample identification and sequential boring number.

# 8.6 Sample Identification Scheme

## 8.6.1 Soil Sample Identification

Each sample will be identified by a unique alphanumeric identifier (sample number). The sample number is composed of four components that indicate the following:

- Area of investigation
- Sample media and location sequence
- Depth (soil and sediment) or date (groundwater and surface water)
- QA/QC type

For soil samples, the following is the sample identification (ID) format:

**AA-MMnnn-dddd-q**

where:

AA = The area of investigation code as indicated in Table 8-6

MM = Sample media and method as indicated in Table 8-7

nnn = The location sequence within the area of investigation

dddd = The depth of the sample in tenths of feet; for soil borings and composites, this will be at the top of the sampling interval

q = The sample type code, as indicated by:

0 Normal environmental sample

1 Field duplicate

2 Field equipment rinsate blank

3 Field trip blank, which is always associated with the last sample of the day if samples are collected for VOC analysis

4 Composite sample

5 Physical test sample

The location sequences from previous sampling efforts will not be repeated. RI/FS sample identifiers will begin with the next incremental location sequence within each area of investigation sampled in both phases.

Inclusion of areas of investigation and sample media and/or types in Tables 8-6 and 8-7 does not indicate that a particular sampling will occur. These codes are included to cover the realm of possibilities of sampling locations and methods at the facility.

Example sample numbers for soil and sediment are as follows:

- A1-SB007-0050-0: A soil boring sample, taken from 5.0 to 6.5 feet at the seventh location in Area 1.
- A3-SB003-0005-2: A rinsate blank taken after a soil boring sample collected at 0.5 foot, from the third location in Area 3
- A5-SS001-0001-0: A surface soil sample taken at 0.1 foot at the first location in the Area 5.

### 8.6.2 Groundwater Sample Identification

Groundwater samples will be identified by the well identifier, sample or well depth, and the sampling date, such as the following:

**MWXX-DDMMYY-***

where:

XX = two-digit well number, for example, MW08

DD = day of the month

MM = month

YY = Last two digits of current year

* = 0 for normal environmental sample

* = 1 for field duplicate sample

* = 2 for a rinsate blank

* = 3 for a field trip blank, which is associated with the last VOC sample taken in the cooler to be shipped

The following are examples using this groundwater ID:

- MW03-050496-1: Field duplicate sample collected from monitoring well 3 at 625 feet bgs on April 5, 1996
- MW02-010596-0: Normal sample collected from monitoring well location 2, on May 1, 1996

### 8.6.3 Other Sample Types

At the Bee-Jay Scales Site, other sample types may be collected that do not lend themselves to categorization in the matrices covered above. Sample ID schemes are shown in Table 8-8 for some of these types of samples that can be anticipated. For sample locations or types not covered here or in the previous subsections, the data manager will be consulted, during planning for the sampling event, regarding a sample ID scheme.

## = Incrementally assigned numerical code for each sample location

ddmmyy = The sampling day-month-year format

ffff = Sampling depth in tenths of feet; for borings and composites, this number will represent the depth to the top of the sampling interval

q = Sample type code; see Section 8.6.1

ccc = Unique location alphabetic and/or numeric code for each sample location; the data manager will be consulted before a new sequence of IDs is assigned, to ensure that IDs are not duplicated at different sample locations

## 8.7 Sample Handling and Custody

### 8.7.1 Sampling Containers, Preservation Methods, and Holding Times

The sampling container, preservation, and holding time requirements are listed in Tables 5-1 (soil) and 5-2 (groundwater). Precleaned containers, laboratory-prepared with preservative, will be procured from the analytical laboratory. Soil from drilled soil borings will be collected in stainless-steel sleeves placed inside the split spoon prior to driving the sampler. All samples will be held at 4° C in a cooler until delivery to the laboratory. Coordination with the laboratory can often reduce the total number of sample containers required below the numbers specified in Tables 8-3 and 8-4 (see Section 8.2).

### 8.7.2 Sample Labeling

Sample ID numbers must be obtained from the data manager before sampling is performed. Before a particular sample is collected, all containers needed for the different parameters to be determined should be properly labeled. The sample label should be attached directly to the sample container, either by means of the glued back surface or—for containers where the label will not adhere directly to the sample container—by means of a tag with twist wire attachments.

The information that should be included on the sample label includes the following:

- Project name (Bee-Jay Scales and location)
- Sample ID (unique ID for each sample location; see Section 8.6)
- Date sampled
- Time sampled (in military time)
- Initials of sampler(s)
- Parameter for which the particular container is intended
- Preservative in the sample container, if any

### 8.7.3 Chain-of-Custody Record

The COC form is a vital document for all samples collected and must be properly completed. It serves as a record of sample collection information, analysis requests, and sample tracking. It is a crucial record from the time of sample collection to final reporting and decision-making. An example COC record is included in Attachment 1 of Appendix E. COC forms will be obtained along with sample containers from the contracted analytical laboratory. Information that must be recorded on the COC record at the time of sample collection includes the following:

- Project name (Bee-Jay Scales Site)
- Project number
- Project manager's name
- Sample date
- Sample time
- Sample ID (unique for each sample)
- Number of containers for each sample
- Parameters to be determined for each sample
- Special analytical requests (for example, fast turnaround requirement)
- Sampler's name
- Laboratory name

The COC record will be referenced in the following sections regarding its use as a sample custody document.

### 8.7.4 Sample Custody

Sample possession will be traceable from the time a sample is collected until it is received at the analytical laboratory. Sample possession will be documented according to the COC procedures outlined below.

#### 8.7.4.1 Field Custody

Samples will be in the custody of the field sampler from the time they are collected until the samples are transferred to the proper dispatcher. Samples will be packed in coolers with inert packing material (for example, bubble wrap or plastic netting) to prevent breakage. At the end of the sampling effort each day, the Field Team Leader will inventory the samples in each cooler against the COC form.

#### 8.7.4.2 Sample Transfer of Custody and Shipment

Generally, a laboratory representative will be given advance notification of the scheduled sampling event. Samples will be delivered to the analytical laboratory by hand or shipped by a member of the field sampling team.

Upon transferring custody of the samples, the individuals relinquishing and receiving them will sign, date, and note the time of transfer on the COC record(s). The method of shipment, courier name, and other pertinent information will be entered in the remarks section of the COC record. Once the record is completed, the carbon copies will be separated. The field member who relinquished the samples will retain a copy, and the original will accompany the coolers to the laboratory. The field copy will be delivered to the project data manager and stored in the project files.

Before any cooler leaves the site by means other than laboratory courier or field personnel, the COC record will be placed in a sealed plastic bag, and taped to the inside of the cooler. The cooler will then be sealed with fiber tape, and a custody seal will be signed and dated by the relinquishing party and placed on the cooler so that the cooler cannot be opened without the custody seal being broken. The carbon copy will be delivered within 24 hours to the project data manager. A COC record will be maintained in the project management files.

Within 24 hours of sample receipt, the laboratory will send a letter acknowledging sample receipt to the project data manager. In the acknowledgment letter, the laboratory will list the samples received, the associated laboratory IDs that were assigned, and any problems that were encountered at sample receipt.

Any changes to the analyses that are requested on the COC record should be noted, initialed, and dated on the COCs copies possessed by both the laboratory and the project data manager. Upon completion of analysis, the analytical laboratory will send copies of the appropriate COC record for each sample to the project data manager.

## 8.8 Project Documentation

During the course of investigation activities at the Bee-Jay Scales Site, all field activities will be documented using one or more of the following methods:

- Project notebooks
- Photographs
- Custody forms
- Sample labels
- Soil boring logs (see Attachment 1 in Appendix E)
- Well construction and completion diagrams (see Attachment 1 in Appendix E)

### 8.8.1 Project Notebook

Field personnel will use a project notebook to record any pertinent information and to describe sampling procedures. After sampling activities are completed, the field notebooks will be in the custody of the project coordinator. Each notebook will be identified by the project-specific document number, and each page will be numbered. Personnel will update the project notebooks daily during field activities. In addition to the investigation data, the following site activity records will be recorded in the project notebooks:

- Time of arrival and departure from the site
- Project personnel and subcontractor personnel on site
- Equipment calibration records
- Health and safety monitoring records

### 8.8.2 Documentation Forms and Procedures

Sample documentation forms are included in Attachment 1 of Appendix E . Specific procedures regarding use of these forms are discussed elsewhere in this SAP in association with activities that require use of the particular form.

Individual forms and the sections in which they are discussed are listed below:

- Sample labels (Section 8.7.2)
- COC record (Section 8.7.3)
- Custody seal (Section 8.7.4)
- Soil boring log (Section 8.2)
- Well construction diagram (Section 8.2.4)

## 8.9 Surveying

To facilitate data visualization and evaluation, sampling locations (stations) will be surveyed. A site map will be prepared as part of the RI. Sampling stations will be included in the development of the site map. Both soil and groundwater (monitoring wells) sampling stations will be surveyed horizontally and vertically. Monitoring wells will include vertical control of the groundwater elevation measuring point, usually the top of the casing rim.

## 8.10 Investigation-Derived Waste Handling Procedures

IDWs will be generated during the RI/FS field work. Procedures for handling and management of investigation-derived waste are described in the WMP (Attachment 2 of Appendix E). Chemical analytical results from discrete soil and groundwater samples obtained during the RI will be used for characterization of IDW. For example, soil sample results from soil boring samples will be used to characterize IDW generated during drilling (to include drill cuttings, PPE, and equipment decontamination water). Groundwater samples will be used to characterize purge-water IDW and decontamination water for groundwater sampling equipment. If additional characterization is required for IDW from a different waste stream, then a sampling plan will be developed.

**TABLE 8-1**
Sampling Objectives and Associated Sampling Procedures
*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| Sampling Activities | Sampling Program Objectives | | | | | |
|---|---|---|---|---|---|---|
| | **Nature and Extent** | **Risk Assessment** | **Waste Management** | **Field Decision-making** | **Migration Assessment** | **Compliance Verification** |
| Subsurface soil sampling | X | X | X | X | X | X |
| Surface soil sampling | X | X | X | X | X | X |
| Groundwater sampling | X | X | X | X | X | X |
| IDW sampling | | | X | X | | X |

**TABLE 8-2**
Soil Sampling Summary Matrix
*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| Area | Sample Identification | Soil Sample Depth (feet,bgs) | General Sample Locations | Number of Samples per Parameter Group | Analytical Parameter Groups[1] | US EPA Methods[1] |
|---|---|---|---|---|---|---|
| **Area 1: Liquid Fertilizer Plant and Truck Wash, 9 Borings** | | | | | | |
| 1 | Soil boring: shallow | 0.5-1.5 | all borings | 9 | Conventional A[1], Conventional C[3], organochlorine pesticides, herbicides, metals | 8081, 8151, 6000/7000 |
| | Soil boring: shallow | 0.5-1.5 | any 3 | 3 | Conventional B[2] | see notes |
| | Soil boring: shallow | 0.5-1.5 | center of truck wash area | 2 | SVOCs, VOCs | 8270, 8260B |
| 1 | Soil boring: intermediate | 4.5-6.0 | all borings | 9 | Conventional A[1], Conventional C[3], organochlorine pesticides, herbicides | 8080/CLP, 8151 |
| | Soil boring: intermediate | 4.5-6.0 | any 3 | 3 | Conventional B | see notes |
| 1 | Soil boring: above groundwater | 9.5-11 | all borings | 9 | Conventional A[1], Conventional C[3], organochlorine pesticides, herbicides | 8081, 8151 |
| | Soil boring: above groundwater | 9.5-11 | any 3 | 3 | Conventional B | see notes |
| | Soil boring: above groundwater | 9.5-11 | center of truck wash area | 2 | SVOCs, VOCs | 8270, 8260B |
| **Area 2: Former Dry Fertilizer Plant, 7 Borings** | | | | | | |
| 2 | Soil boring: shallow | 0.5-1.5 | all borings | 7 | Conventional A, organochlorine pesticides, herbicides, metals | 8081, 8151, 6000/7000 |
| | Soil boring: shallow | 0.5-1.5 | any 2 | 2 | Conventional B | see notes |
| 2 | Soil boring: intermediate | 4.5-6.0 | all borings | 7 | Conventional A | see notes |
| | Soil boring: intermediate | 4.5-6.0 | any 2 | 2 | Conventional B | see notes |
| 2 | Soil boring: above groundwater | 9.5-11 | all borings | 6 | Conventional A | see notes |
| | Soil boring: above groundwater | 9.5-11 | any 2 | 2 | Conventional B | see notes |
| **Area 3: Drum Storage, 2 Borings** | | | | | | |
| 3 | Soil boring: shallow | 0.5-1.5 | all borings | 2 | Conventional A, WTPH-GX, WTPH-DX, VOCs, SVOCs, organochlorine pesticides, metals | NWTPH, 8260/8270, 8080, 6000/7000 |

| Area | Sample Identification | Soil Sample Depth (feet,bgs) | General Sample Locations | Number of Samples per Parameter Group | Analytical Parameter Groups[1] | US EPA Methods[1] |
|---|---|---|---|---|---|---|
| | Soil boring: shallow | 0.5-1.5 | either boring | 1 | Conventional B | see notes |
| 3 | Soil boring: intermediate | 4.5-6.0 | all borings | 2 | Conventional A, metals | 6000/7000 |
| | Soil boring: intermediate | 4.5-6.0 | either boring | 1 | Conventional B | 6000/7000 |
| 3 | Soil boring: above groundwater | 9.5-11 | all borings | 2 | Conventional A, WTPH-GX, WTPH-DX, VOCs, SVOCs, metals | NWTPH, 8260/8270, 6000/7000 |
| | Soil boring: above groundwater | 9.5-11 | either boring | 1 | Conventional B, metals | 6000/7000/CLP |
| **Area 4: Suspected Historic Washdown Area, 5 Borings** | | | | | **Note: plus one additional shallow, colocated boring with one additional sample** | |
| 4 | Soil boring: shallow | 0.5-1.5 | all borings plus colocate | 6 | Conventional A, WTPH-G/BTEX, WTPH-DX, organochlorine pesticides, herbicides, metals | NWTPH, 8081, 8151, 6000/7000 |
| | Soil boring: shallow | 0.5-1.5 | any two | 2 | Conventional B, SVOCs | |
| 4 | Soil boring: intermediate | 4.5-6.0 | all borings | 5 | Conventional A, organochlorine pesticides, herbicides | 8081, 8151 |
| | Soil boring: intermediate | 4.5-6.0 | any one | 1 | Conventional B | see notes |
| 4 | Soil boring: above groundwater | 9.5-11 | all borings | 5 | Conventional A, WTPH-G/BTEX, WTPH-DX, organochlorine pesticides, herbicides | NWTPH, 8081, 8151 |
| 4 | Soil boring: above groundwater | 9.5-11 | any two | 2 | Conventional B, VOCs, SVOCs | 8260B, 8270 |
| **Area 5: North Area, Surface Samples only** | | | | | **Note: Includes one colocated sample** | |
| 5 | Shallow | 0.5-1.5 | all locations plus one colocate | 6 | Conventional A, WTPH-HCID, organochlorine pesticides, herbicides, metals | NWTPH, 8081, 8151, 6000/7000 |
| | Shallow | 0.5-1.5 | any 2 | 2 | Conventional B | |
| **Area 6: Hickenbottom Property, 5 Borings** | | | | | | |
| 6 | Soil boring: shallow | 0.5-1.5 | all borings | 5 | Conventional A, Parameters, WTPH-HCID, organochlorine pesticides, herbicides | HCID, 8081, 8151 |
| | Soil boring: shallow | 0.5-1.5 | A6-SB-001 | 1 | VOCs | 8260 |
| | Soil boring: shallow | 0.5-1.5 | any location | 1 | Conventional B | see notes |
| 6 | Soil boring: intermediate | 4.5-6.0 | all borings | 5 | Conventional A, Parameters, WTPH-HCID, organochlorine pesticides, herbicides | HCID, 8081, 8151 |
| | Soil boring: intermediate | 4.5-6.0 | any location | 1 | Conventional B | See notes |

| Area | Sample Identification | Soil Sample Depth (feet,bgs) | General Sample Locations | Number of Samples per Parameter Group | Analytical Parameter Groups[1] | US EPA Methods[1] |
|---|---|---|---|---|---|---|
| 6 | Soil boring: above groundwater | 9.5-11 | all borings | 5 | Conventional A, Parameters, WTPH-HCID, organochlorine pesticides, herbicides | HCID, 8081, 8151 |
| 6 | Soil boring: above groundwater | 9.5-11 | any location | 1 | Conventional B | see notes |
| Total | | | | 88 | | |

Notes:

*Area 5, North Area includes two samples that are physically located in Area 6.

1. Conventional A parameters and methods include: Ammonia (EPA 350.1), Nitrite (EPA 353.2), Nitrate (EPA 353.2), Phosphate (EPA 300), Sulfate (EPA 375.2), Chloride (EPA 325.2), pH (EPA 150.1), moisture content.

2. Conventional B parameters will include total organic carbon (415), grain size distribution (ASTM), and void ratio/porosity.

3. Conventional C parameters will include agronomic analyses in Area 1 for purposes of the FS. These parameters include: Extractable Cations (S-5.10, S-2.50), NaHCO3 (S-4.10), CEC (S-10.10), DTPA-available Fe,Mn, An, Cu (S-6.10), Ece (S-1.20), Ca-Mg-Na-Cl in saturation extract (S-1,60, S-1.40), void ratio. Agronomic methods ("S" methods) from Miller, R.O., J. Kotuby-Amacher, and J.B. Rodriquez. 1998. Western States Laboratory Proficiency Testing Program, Soil and Plant Analytical Methods, Version 4.10 (2/10/98). Western States Program, Colorado State University, Fort Collins, CO.

**TABLE 8-3**
Soil Analytical Parameters and Methods
*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| Analyte(s) | Method | Sample Container | Preservative | Holding Time |
|---|---|---|---|---|
| **Nutrients and conventional parameters** | | | | |
| Chloride | EPA 325.2 | 4 oz. CWM | Keep cool at 4° C | 48 hours |
| Nitrite | EPA 353.2 | | | |
| Nitrate | EPA 353.2 | | | |
| Sulfate | EPA 375.2 | | | |
| pH | EPA 150.1 | | | |
| Ammonia | EPA 350.1 | | | |
| TOC | EPA 415 | 4 oz. CWM | Keep cool at 4° C | 6 months |
| Phosphate | EPA 365.1 | 4 oz. CWM | | |
| Extraction cations Ca, Mg, Na, K | S-5.10 | 2-16 oz. CWM | Keep cool at 4° C | 6 months |
| SMP Buffer pH | S-2.50 | | | |
| NaHCO3 | S-4.10 | | | |
| CEC | S-10.10 | | | |
| Ece | S-1.20 | | | |
| DPTA-available Fe, S, Mn, Zn, B, Cu | S-6.12 | | | |
| Grain size | ASTM D422-63 | 4 oz. CWM | | |
| Void ratio/porosity | 21-2, 30-2.1 and 29-3.2 | Per laboratory | Per laboratory | 6 months |
| Percent moisture | ASTM D2216 | 4 oz. CWM | Keep cool at 4° C | 14 days |
| **VOCs** | | | | |
| VOCs | 8260B | 4 oz. CWM septum | Keep cool at 4° C | 14 days |
| **TPH** | | | | |
| TPH | NWTPH-HCID | 8 oz. CWM | Keep cool at 4° C | 14 days |
| TPH-gasoline extended/BETX | NWTPH-Gx/BETX | | | |
| TPH-diesel extended | NWTPH-Dx | | | |
| **SVOCs** | | | | |
| SVOCs | 8270 | 8 oz. CWM | Keep cool at 4° C | 7 days |
| **Metals** | | | | |
| Metals- PP list + Fe, Mn | 6010/7000 | 8 oz. CWM | none | 6 months |
| **Pesticides** | | | | |
| Pesticides | 8081 | 8 oz. CWM | Keep cool at 4° C | 7 days |
| **Herbicides** | | | | |
| Herbicides | 8151A | 8 oz. CWM | Keep cool at 4° C | 7 days |

**TABLE 8-4**

Groundwater Analytical Parameters and Methods

*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| Analyte(s) | Method | Sample Container | Preservative | Holding Time |
|---|---|---|---|---|
| **Nutrients and conventional parameters** | | | | |
| Chloride | EPA 325.2 | 1-500 mL HDPE bottle | keep cool[1] | 28 days |
| Nitrite-N | EPA 353.2 | | | |
| Nitrate-N | EPA 353.2 | | | |
| Sulfate | EPA 375.2 | | | |
| Ammonia | EPA 350.1 | 1-500 mL HDPE bottle | keep cool[1], $H_2SO_4$ | 28 days |
| Phosphate | EPA 365.1 | | | |
| TOC | EPA 415.1 | 1-250 mL amber bottle | keep cool[1], $H_2SO_4$ | 28 days |
| TSS | EPA 160.1 | 1-1L HDPE bottle | keep cool[1] | 28 days |
| TDS | EPA 160.2 | 1-1L HDPE bottle | keep cool[1] | 28 days |
| Hardness | EPA 310.1 | 1-500 mL HDPE bottle | keep cool[1] | 14 days |
| Alkalinity | EPA 310.1 | | | |
| Temperature | Field | none | | |
| Electrical conductivity | Field | none | | |
| PH | Field | none | | |
| DO | Field | none | | |
| **VOCs** | | | | |
| VOCs | 8260B | 3-40 mL glass vials | keep cool[1], HCl | 14 days |
| **TPH** | | | | |
| TPH | NWTPH-HCID | 1-1 L amber bottle | keep cool[1] | 14 days |
| TPH-gasoline extended | NWTPH-G | 1-1 L amber bottle | keep cool[1] | 14 days |
| TPH-diesel extended | NWTPH-D | 1-1 L amber bottle | keep cool[1] | 14 days |
| **SVOCs** | | | | |
| SVOCs | 8270 | 1-1 L amber bottle | keep cool[1] | 7 days |
| Pentachlorophenol | SIM | 1-1 L amber bottle | Keep cool[1] | 7 days |
| **Metals** | | | | |
| Metals (total) | 6010/7000 | 1- 1L HDPE bottle | $HN0_3$ to pH below 2 (lab) | 6 months |
| **Pesticides** | | | | |
| Pesticides/PCBs | 8081 with Manchester extraction | 1-1 L amber bottle | keep cool[1] | 7 days |
| **Herbicides** | | | | |
| Herbicides | 8151 | 1-1 L amber bottle | keep cool[1] | 7 days |

Notes:

[1] Keep cool at 4° C

**TABLE 8-5**
Frequency of Calibration for Field Equipment
*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| Equipment | Calibration Frequency |
|---|---|
| pH meter[1] | Daily before use |
| Specific conductivity meter | Daily before use |
| DO meter | Daily before use |
| Turbidity meter | Daily before use |

Notes:
[1] Check at midday in the midrange buffer.

**TABLE 8-6**
Area Codes for Soil Samples
*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| Area of Investigation | Sample Number Code (AA) |
|---|---|
| Area 1: Former Liquid Fertilizer Plant and Truck Wash | A1 |
| Area 2: Former Dry Fertilizer Plant | A2 |
| Area 3: Drum Storage Area | A3 |
| Area 4: Suspected Historical Washdown | A4 |
| Area 5: North Area | A5 |
| Area 6: Hickenbottom Area | A6 |

**TABLE 8-7**
Codes for Sample Media Type or Method
*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

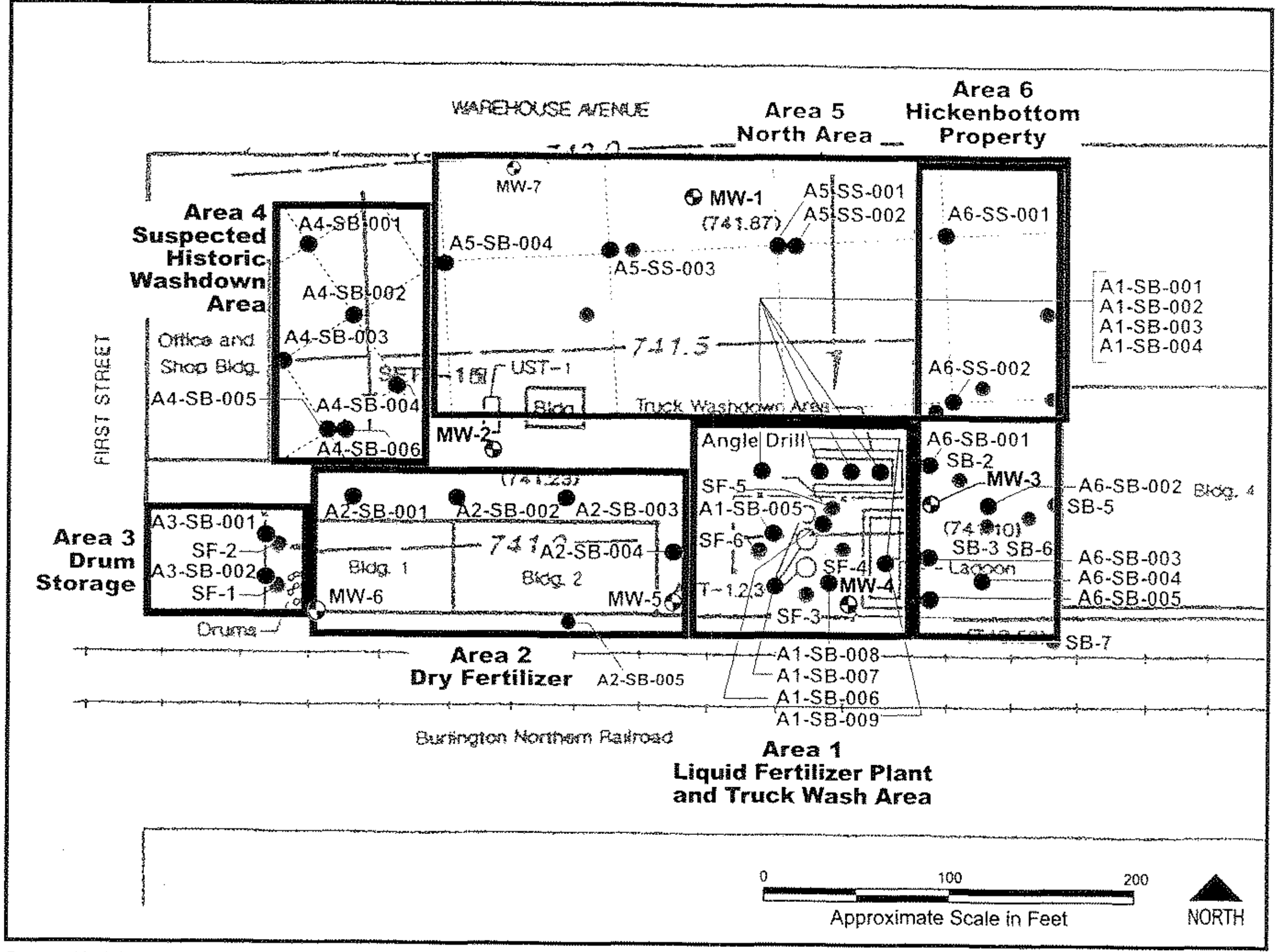
| Sample Media Type or Method | Media Code (MM) |
|---|---|
| Soil boring | SB |
| Surface soil | SS |

**TABLE 8-8**
Sample Identification Schemes
*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| Sample Location/Matrix | ID Format |
|---|---|
| Surface water | ▨-SW##-ddmmyy-q |
| Sediment | ▨-SD##-ffff-q |
| Waste source 1 | ▨-W1CCC-dddyy-q |
| Waste source 2 | ▨-W2CCC-dddyy-q |

▨

174175.A1.02_E072002012SEA / Bee Jay Scales / RI/FS Work Plan / Fig 8-1 CroppedSoil and Groundwater Sample Locations / 2-11-03 / LW



LEGEND

| | |
|---|---|
| A1-SB-001 | Sample Location |
| ● | RI Soil Boring Location |
| MW-5 | RI Monitoring Well Location |
| ● SB | Hand Auger Boring Location and Groundwater Sample, White Shield |
| ● SF-1 | Hand Auger Boring Location and Number, HartCrowser |
| SFTP-1 | Test Pit Location and Number, HartCrowser |
| MW-1 | Monitoring Well Location and Number, HartCrowser |
| (741.87) | Groundwater Elevation in Feet (5/20/90) |
| — 742.0 — | Groundwater Elevation Contour in Feet |
| ← | Groundwater Flow Direction |

Figure 8-1
**Soil and Groundwater Sample Locations**
Bee-Jay Scales
RI/FS Work Plan

Source: Hart Crowser, June 1990.

SECTION 9

# Quality Assurance Project Plan

## 9.1 Approvals

Approved by:

| | |
|---|---|
| ______________________________ | ______________ |
| CH2M HILL Project Manager | Date |
| ______________________________ | ______________ |
| CH2M HILL QA Manager | Date |
| ______________________________ | ______________ |
| Laboratory QA Manager | Date |
| ______________________________ | ______________ |
| Chevron Environmental Manager | Date |
| ______________________________ | ______________ |
| BP Environmental Manager | Date |
| ______________________________ | ______________ |
| Washington State Department of Ecology QA Coordinator | Date |

## 9.2 Distribution List

______________________ Washington State Department of Ecology Site Manager

______________________ CH2M HILL Project Manager

______________________ CH2M HILL Task Manager

______________________ CH2M HILL Field Team Leader

______________________ CH2M HILL Quality Assurance Manager

______________________ Laboratory Quality Assurance Manager

______________________ Chevron Environmental Manager

______________________ BP Environmental Manager

## 9.3 Introduction

The purpose of this QAPP is to specify the policies, organization, objectives, functional activities, and specific QA and QC activities associated with collecting and analyzing environmental samples for the Bee-Jay Scales Site RI/FS. This work is being conducted in accordance with the requirements of Agreed Order No. DE 02TCPCR between Chevron Chemical Company, Amoco Oil Company, and Ecology. A separate document, the SAP, has been prepared to provide a detailed description of the field sampling program for the RI. The SAP includes a description of the QA/QC activities associated with collecting, packaging, and shipping environmental samples from the RI. An HSP has also been prepared that describes potential hazards and personal protective and monitoring equipment that will be needed for the RI. Where appropriate, existing QA/QC guidelines, policies, and programs and relevant information in the SAP and HSP are incorporated by reference.

This QAPP follows Ecology guidelines contained in *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* (Ecology, 2001) and the EPA's *Guidance for Quality Assurance Project Plans* (EPA, 1998).

## 9.4 Project Organization and Schedule

The project organization and lines of authority for the RI are illustrated in Figure 9-1.

The Project Manager will have the overall responsibility for implementing the project. The Project Manager will be responsible for defining work scopes, project schedule, and financial status; administering staff; and providing overall quality review of project deliverables.

Independent analytical QA review will be provided by the QA Manager who will be included with the technical support staff. An independent technical review will be provided by the senior reviewers for project deliverables. When QA problems or deficiencies requiring special action are identified, the QA Manager will identify the appropriate corrective action to be initiated by the Project Manager.

The Health and Safety Manager will be responsible for the health and safety planning and work practices for the project. The Health and Safety Manager will coordinate directly with the RI Field Team Leader.

The RI Field Team Leader will be responsible for staffing, scheduling subcontract work, and maintaining the quality of all activities conducted in the field. The RI Field Team Leader will work closely with the Health and Safety Manager to ensure a quality working environment is maintained under all conditions at the site.

Soil boring, sampling, and analysis are expected to be carried out in 2003 preceding a subsequent remedial alternatives FS. The schedule, as included in the Agreed Order, is in Section 7.

## 9.5 Background and Problem Statement

### 9.5.1 Background

Ecology entered into an Agreed Order with the Chevron Chemical Company and Amoco Oil Company in June 2002 to conduct an RI/FS at the Bee-Jay Scales Site. As such, the Agreed Order and MTCA regulations are the primary regulatory requirements for this project. In the Agreed Order, Ecology included in the statement of facts that the hazardous substances 2,4-D, dinoseb, heptachlor, lindane, ammonia, nitrate/nitrite, and benzene, were identified in soil and groundwater and that the lateral and vertical extent of these contaminants is not fully defined.

The site history is summarized in Section 2 of this Work Plan. In summary, a fertilizer plant was previously operated on the site from the early 1960s to 1986. Operations included storing and distributing dry and liquid fertilizers. The liquid fertilizer plant included ASTs and an aboveground anhydrous ammonia tank. A truck-washing facility was located immediately north of the liquid fertilizer storage area (liquid fertilizer plant). A second truck-washing area is suspected to have been located north of the dry fertilizer warehouse (dry fertilizer plant). No manufacture of pesticides or herbicides was positively identified in the site history. It is suspected that pesticides, herbicides, and other organic contaminants detected may be a result of washing vehicles and equipment that previously contained these materials.

Based on analysis of previous investigations of the site, a preliminary list of COPCs has been assembled. COPCs identified for soils include nitrate, nitrite, ammonia, phosphorous, TPH, lindane, 2,4-D, dinoseb, and arsenic. The extent of soil contamination is not well defined, in particular with respect to depth of contaminants in soils. The previous investigations include soil samples that were composited over large depth intervals with few vertically discrete soil samples. Lateral limits of soil contamination also are not well defined, with the exception of the eastern extent of the nitrate-contaminated soil plume on the Hickenbottom property.

COPCs identified for groundwater include conventional parameters (nitrate, nitrite, ammonia, phosphate, sulfate, chloride, and conductivity), VOCs, SVOCs, pesticides, herbicides , and metals. The extent of groundwater contamination is not well defined, in particular with respect to possible downgradient contamination.

Logistical problems and constraints identified include access to and establishing safe working conditions in the railroad right-of-way immediately south of the site and potentially downgradient of identified contaminated soil and groundwater.

### 9.5.2 Problem Statement

The RI approach (Section 5) describes the six investigation areas of the site and identifies data gaps and purposes of the investigations. The purposes of the investigations are restated here to establish a problem statement for the QAPP:

- Determine the subsurface geology and hydrogeology of the site.

- Confirm contaminant concentrations from previous investigations where samples were extensively composited and/or where analytical screening methods were used (Areas 1, 3, 5, and 6).
- Determine the nature and extent of contaminants in soils at the site where previous investigations have not been conducted (Areas 2 and 4).
- Confirm contaminant concentrations in groundwater reported in previous investigations.
- Determine contaminant concentrations upgradient of contaminated site areas.
- Determine contaminant concentrations downgradient of contaminated site areas.
- Determine physical and geochemical parameters of soil and groundwater to support evaluation of clean-up alternatives.

## 9.6 Project Description

### 9.6.1 Goals and Decision Statement

The goals for the Bee-Jay Scales RI are stated in the following decision statements:

- Determine whether concentrations of contaminants in soils at the site pose an unacceptable health risk to site workers.
- Determine whether concentrations of metals in soils are above regional background levels.
- Determine whether concentrations of contaminants in soils and soil conditions will cause contamination of groundwater at levels that exceed appropriate risk-based clean-up levels for groundwater.
- Determine whether concentrations of contaminants in groundwater at the site pose an unacceptable risk to human health.
- Determine whether concentrations of contaminants in groundwater upgradient of the site contribute to site groundwater contamination.
- Determine whether concentrations of contaminants in groundwater downgradient of the site pose an unacceptable risk to human health and require further investigation off site, including additional investigation regarding possible existence of drinking water wells not recorded in agency files.
- Determine whether the physical and geochemical parameters of soil and groundwater are amenable to clean-up alternative technologies.

### 9.6.2 Objectives

The following are the objectives of the RI:

- Determine the contaminant concentrations in soils and groundwater for comparison to applicable risk-based criteria.
- Determine the general extent of contamination from each of the potential sources to support the selection of a clean-up alternative if the source proves to be a threat to human health and the environment.
- Evaluate compliance with MTCA and other ARARs.
- Support the evaluation of potential clean-up alternatives.

Existing data from previous investigations have been used to guide investigations at the site. However, much of the data are not of sufficient quality to meet the objectives stated above. A discussion of usability of data from previous investigations is included in Section 2 of this Work Plan.

Data required to meet these objectives include physical, chemical and agronomic data for soil and groundwater samples collected at the site. Chemical data will be compared to existing data, for confirmation purposes, and to MTCA clean-up levels for soil and groundwater. In addition, groundwater data will be compared to primary and secondary MCLs. Agronomic data will be used to support the evaluation of potential clean-up alternatives. Data will be summarized by analytical parameter to present total number of samples, number of parameter detects, maximum and minimum concentrations, and mean concentration values. Soils samples will be collected at discrete depth intervals as stated in the SAP. Groundwater samples will be collected for four continuous quarters (one year). Samples will be collected within the site boundaries, however, as stated above in Section 9.6.1, additional off-site groundwater samples may be collected.

The following decision rules are established for the RI:

- For the detected contaminants in soil, a comparison will be made to MTCA Level C clean-up levels. If these levels are exceeded, then clean-up actions will be considered. If the levels are not exceeded, then these compounds will be eliminated as contaminants of concern.
- For the detected contaminants in groundwater, a comparison will be made to MTCA Level B and MCLs . If these levels are exceeded, then clean-up actions will be considered. If the levels are not exceeded, then these compounds will be eliminated as contaminants of concern.
- If contaminants are found to exceed clean-up levels as stated above, then physical and geochemical parameters in soil and groundwater will be evaluated to the technical implementability of clean-up technologies.

Practical constraints identified, as included in Section 9.5.1, include restricted access to the railroad right-of-way south of the site boundary.

# 9.7 Data Quality Objectives and Criteria for Measurement Data

## 9.7.1 Project Data Quality Objectives

Specific DQOs were considered independently through the DQO process (*EPA Guidance for the Data Quality Objective Process*, EPA Q4/G-4, 1994) to meet the data user's needs for each activity. The DQO decision-making process for the field activities is presented above in Section 9.6 and in Section 4 of this Work Plan.

## 9.7.2 Measurement Performance Criteria

The QA objective of this plan is to develop implementation procedures that will provide data of known and appropriate quality for the needs identified in the project quality objectives. Data quality is assessed by representativeness, comparability, accuracy, precision, and completeness. Definitions of these terms, the applicable procedures, and level of effort are described below. The applicable QC procedures, quantitative target limits, and level of effort for assessing data quality are dictated by the intended use of the data and the nature of the analytical methods. Chemical parameters, analytical methods, applicable detection levels, analytical precision, accuracy, and completeness in alignment with needs identified in Section 9.7.1 are presented in Table 9-1. Agronomic and physical parameters and corresponding methods and applicable detection levels are presented in Table 9-2. Since the measurement performance criteria are developed primarily for chemical analysis, they are not applicable to agronomic and physical parameters and therefore are not included in Table 9-2.

As seen in Tables 9-3 and 9-4, the detection levels for the selected analytical methods are generally below the regulatory criteria. Where detection levels for the selected methods do not achieve MTCA Level B clean-up levels for COPCs (identified in Section 2 of this Work Plan), the laboratory to be contracted will be requested to provide lower detection levels where achievable.

Representativeness is a measure of how closely the results reflect the actual concentration or distribution of the chemical compounds in the water and sediment sampled. Sampling plan design, sampling techniques, and sample handling protocols (e.g., storage, preservation, and transportation) have been developed and are presented in the SAP. Documentation procedures described in the SAP will demonstrate that protocols were followed and sample ID and integrity were assured. Equipment blanks and trip blanks will be used to assess field and transport contamination and method variation. Laboratory sample retrieval, storage, and handling procedures have also been developed and are discussed in subsequent sections of this plan. Laboratory method blanks will be run at the minimum frequency of 5 percent or one-per-set to assess laboratory contamination.

Comparability of the data will be maintained by using standard EPA-defined procedures where available. If EPA procedures are not available, the proposed procedures are defined or referenced in this document. Data comparability will be maintained through the use of consistent methods, consistent units, and well-defined detection limits. The analytical methods are listed in Table 9-1 and the detection limits are provided in Tables 9-3 and 9-4. Section 9.10 of this plan further describes the analytical and QC procedures. MDLs are established using pure standards. During measurement of an actual sample, detection limits may be elevated because of interference from other components in the matrix. Matrix interferences cannot be predicted ahead of time but will be reported if they occur.

Accuracy is an assessment of the closeness of the measured value to the true value. The accuracy of chemical test results is assessed by spiking samples with known standards and establishing the average recovery. In general, two types of recoveries are measured for VOCs: matrix spike recoveries and surrogate spike recoveries. For a matrix spike, known amounts of standard compounds identical to the compounds present in the sample of interest are added to the sample. For a surrogate spike, the standards are chemically similar but not identical to the compounds in the fraction being analyzed. The purpose of the surrogate spike is to provide QC on every sample by constantly monitoring for unusual matrix effects and gross sample processing errors. For inorganics, generally only matrix spikes are measured. A quantitative definition of average recovery is given in Section 9.15. Accuracy measurements will be conducted in the laboratory at a minimum frequency of 1 in 20 samples. Table 9-1 lists the target quantitative accuracy objectives that will apply to each parameter or parameter group.

Precision is a measure of the spread of the data when more than one measurement is taken on the same sample. For duplicate measurements, precision can be expressed as the relative percent difference (RPD). A quantitative definition of RPD is given in Section 9.15. Precision measurements will be conducted in the laboratory at a minimum frequency of 1 in 20 samples. Target quantitative precision objectives are listed as applicable in Table 9-1.

Completeness is a measure of the amount of valid data obtained from the analytical measurement system. The quantitative definition of completeness is given below in Section 9.15. The target completeness objective will be 90 percent; the actual completeness may vary depending on the intrinsic nature of the samples. The completeness of the data will be assessed during QC reviews.

## 9.8 Sampling Design

The sampling design has been described in Section 5.4, Soil Investigation, and Section 5.5, Groundwater Investigation of this Work Plan.

## 9.9 Field Procedures

The sample collection procedures are described for each medium in the SAP.

## 9.10 Laboratory Procedures

Project analytes and methods have been listed Tables 9-1 and 9-2. All samples will be analyzed per standard EPA methodology listed in Table 9-1. As shown in Table 9-1, where applicable QC procedures for methods will be per EPA Contract Laboratory Program (CLP) protocol or equivalent. For methods not covered by CLP, method standard operating procedures or data quality indicators are provided in Attachment 1 in Appendix F. Agronomic analyses will be performed using referenced methods and laboratory-specific standard operating procedures.

# 9.11 Quality Control Procedures

## 9.11.1 Field Quality Control Procedures

Field QC procedures will include collecting trip blanks, field duplicates, and equipment blanks. Specific requirements are discussed in the SAP.

## 9.11.2 Laboratory Quality Control Procedures

Laboratory QC procedures will include the following:

- Analytical methodology according to specific methods listed in Tables 9-1 and 9-2 and Attachment 1 in Appendix F
- Instrument calibrations and standards as defined in specific methods in Attachment 1 in Appendix F or in accordance with minimum level of effort of CLP where applicable
- Laboratory blank measurements at a minimum 5-percent or 1-per-batch frequency
- Accuracy and precision measurements at a minimum of 1 in 20, 1 per set
- Data reduction and reporting according to specific methods listed in Table 9-1
- Laboratory documentation equivalent to minimum level of effort as per CLP statement of work (SOW).

# 9.12 Data Management Procedures

All data for all parameters will undergo two levels of review and validation: (1) at the laboratory and (2) outside the laboratory as described in Section 9.14. Following receipt of validated data, the data will be input into the databases (as described further below) to facilitate database inquires and report preparation.

Data management can be defined as comprising the functions of creating and accessing stored data, enforcing data storage conventions, and regulating data input and output. The stored data will include parameters measured in soils at the site.

For this project, data management will involve the use of a computerized data management system. The system will provide a centralized, secure location for data of known quality that can be shared and used for multiple purposes. The data management system will assist in the information flow for the project by providing a means of cataloging, organizing, archiving, and accessing information.

The data management system will include three main elements:

1. **The database:** An organized and structured storehouse of data used for multiple purposes. Initially a spreadsheet program will be used, and if justified by project needs, a relational database will be used later.
2. **Data management procedures:** The steps involved in the data management process.

3. **Personnel:** The project staff who develop, implement, and administer the database and procedures.

These elements are briefly described in the following subsections.

### 9.12.1 Database

A spreadsheet will be created to store data collected as part of this effort. The software being used in support of the spreadsheet is Microsoft Excel or Access as the relational database.

### 9.12.2 Data Management Procedures

Data management procedures are a crucial part of the data management system. Established procedures are necessary to ensure consistency among data sets, internal database integrity, and a verified, usable data set. The tasks and procedures that will be performed for all project data before they are entered include the following:

- **Data mapping.** The process by which the collected environmental data are selected, marked, and correctly named for entry into the database.
- **Electronic data interchange.** To facilitate data interchange between the analytical laboratory and the data user. Detailed specifications will be developed for both receipt and delivery of electronic data, including data importing and data exporting.
- **Data entry and verification.** The process by which data are correctly entered into the database, including data preparation, data import and entry, and data verification.
- **Data presentation and analysis.** Data from the database may be presented in two types of reports: appendix-style reports (tabular listings sorted by station and sample ID) and summary statistics (e.g., frequency of detection, mean, minimum values, maximum values, standard deviation, and variance) sorted by station, depth, and parameter.
- **Data administration.** Effective administration of the data management system will reduce the likelihood of errors and ensure the integrity of the database. Data administration tasks include data redundancy control, operation and maintenance of the database, documentation of the data management process, and closing out the data management task in both interim and final stages of completion.

### 9.12.3 Personnel

Successful implementation of a data management system requires a clear definition of responsibilities. The Project Data Coordinator and Database Technician will carry out the data management system. The Project Data Coordinator has an overall view of the project. Responsibilities includes database integrity, redundancy control, data sharing and version control, performance, security, and back-up. The Database Technician has a comprehensive understanding of the database structure, software, and associated analysis tools. Responsibilities include data logging and tracking, data preparation, data entry and verification, data archiving, data requests, and report generation.

## 9.13 Audits and Reports

### 9.13.1 Audits

The Project Manager and the review team will monitor and audit the performance of the QA procedures. When necessary, the review team will conduct field audits. Audits may be scheduled to evaluate the execution of sample ID, sample control, COC procedures, field notebooks, sampling procedures, and field measurements.

The laboratories will be audited as necessary. If necessary, the external on-site laboratory audits will be carried out to cover analytical methodology QC procedures.

Verification of computer models and software will be conducted periodically by the entry of known data sets or programs by a computer expert not assigned to the project. Electronic and paper-based data sets will be verified by double entry, cross checking, and range checking against the known programs and models to check for correctness, reasonableness, and user competence. Verification of model and software performance will be documented in the QA/QC portion of the specific reports.

If QC audits result in detection of unacceptable conditions or data, the Project Manager will be responsible for initiating corrective action. The Ecology Project Manager will be notified if nonconformance is of program significance or requires special expertise not normally available to the project team. Corrective actions may include the following:

- Reanalyzing samples if holding-time criteria permit
- Resampling and analyzing
- Evaluating and amending sampling and analytical procedures
- Accepting data while acknowledging level of uncertainty

### 9.13.2 Reporting

Technical status reports are prepared monthly to update Ecology on progress made, problems encountered and corrected during the past month, and report problems, anticipated progress, and planned future activities. These reports may include the following information:

- Results of performance audits
- Results of systems audits
- Significant QA problems and recommended solutions

Following completion of data collection and analysis for the project, a final summary report will be prepared assessing overall measurement data accuracy, precision, and completeness.

## 9.14 Data Review, Verification, and Validation

Data reviews will be performed at two levels: at the laboratory and outside the laboratory by independent chemists. Outside the laboratory, 100 percent of the data will be reviewed for all QC data; a percentage of the data will be checked for raw data as further described below.

Data reviews outside the laboratory will be in accordance with EPA CLP *National Functional Guidelines for Data Review* (EPA, 1999) and with the specifications in Attachment 1 in Appendix F of this QAPP. One hundred percent of the data will be reviewed for all QC summary data presented on CLP forms, and as described in Attachment 1 in Appendix F; a percentage of data will be reviewed for raw data (algorithm, calculation, and transcription checks) on a task-specific basis.

## 9.15 Data Quality Assessment

Following validation, the data will be assessed by the project team. The assessment will include incorporation of the data validation findings into the database by entry of data qualifiers. The assessment will also include reviewing quantitative DQOs (accuracy, precision, completeness, and detection limits) and preparing a summary report to present the data results. The final report will include an evaluation of the overall adequacy of the total measurement systems with regard to the DQO of the data generated. These quantitative DQOs are defined below.

### 9.15.1 Precision

If calculated from duplicate measurements, the RPD can be defined as follows: (1)

$$RPD = \frac{(C_1 - C_2) \times 100}{(C_1 + C_2)/2}$$

where:

RPD = relative percent difference
$C_1$ = larger of the two observed values
$C_2$ = smaller of the two observed values

If calculated from three or more replicates, use relative standard deviation (RSD) rather than RPD: (2)

$$RSD = (s/\bar{y}) \times 100$$

where:

RSD = relative standard deviation
s = standard deviation
$\bar{y}$ = mean of replicate analyses

Standard deviation, s, is defined as follows: (3)

$$s = \sqrt{\sum_{i-1}^{n} \frac{(y_i - \bar{y})^2}{n-1}}$$

where:

s = standard deviation
$y_i$ = measured value of the ith replicate
$\bar{y}$ = mean of replicated measurements
n = number of replicates

### 9.15.2 Accuracy

For measurements where matrix spikes are used, percent recovery can be calculated using the following formula: (4)

$$\% R = 100x \left[ \frac{S - U}{C_{SA}} \right]$$

where:

%R = percent recovery
S = measured concentration in spiked aliquot
U = measured concentration in unspiked aliquot
$C_{SA}$ = actual concentration of spike added

For situations where a standard reference material (SRM) is used instead of or in addition to matrix spikes, the following formula is used: (5)

$$\% R = 100x \left[ \frac{C_m}{C_{SRM}} \right]$$

where:

%R = percent recovery
$C_M$ = measured concentration of SRM
$C_{SRM}$= actual concentration of SRM

### 9.15.3 Completeness

Completeness is defined as follows for all measurements: (6)

$$\% C = 100x \left[ \frac{V}{T} \right]$$

where:

%C = percent completeness
V = number of measurements judged valid
T = total number of measurements

### 9.15.4 Detection Limit

The MDL is defined as follows for nonradionuclide measurements:

$$MDL = t_{(n-1,l-a=0.99)} \times S \tag{7}$$

where:

MDL = method detection limit
S = standard deviation of the replicated analyses
$t_{(n-1,\ 1-a=0.99)}$ = students' t-level and a standard deviation estimate with n-1 degree of freedom

**TABLE 9-1**
*Measurement Performance Criteria for Soil and Groundwater Chemical Parameters*
Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan

| Parameter | Method[a] | Target Detection Limit[b] | Analytical Accuracy (% Recovery) | Analytical Precision (Relative % Deviation) | Overall Completeness (%) |
|---|---|---|---|---|---|
| **Soil** | | | | | |
| TCL VOCs[c] | CLP/8260 | (b) | CLP | CLP | 90 |
| TCL SVOCs[c] | CLP/8270 | (b) | CLP | CLP | 90 |
| Metals (priority pollutants plus Fe and Mn)[c] | CLP/6010/7000 | (b) | CLP | CLP | 90 |
| TCL organochlorine pesticides[c] | CLP/8080 | (b) | CLP | CLP | 90 |
| Chlorinated herbicides | 8151A | (b) | (f) | (f) | 90 |
| TPH | NWTPH-HCID[d] | (e) | 75-125 | ±25 | 90 |
| TPH-gasoline with BETX[g] | NWTPH-Gx with BETX | 5 | 75-125 | ±25 | 90 |
| TPH-diesel[g] | NWTPH-Dx | 25 | 75-125 | ±25 | 90 |
| Ammonia | EPA 350.1 | 10 mg/Kg | 75-125 | ±25 | 90 |
| Chloride | EPA 325.2 | 3 mg/Kg | 75-125 | ±25 | 90 |
| Nitrite-N | EPA 353.2 | 0.3 mg/Kg | 75-125 | ±25 | 90 |
| Nitrate-N | EPA 353.2 | 0.3 mg/Kg | 75-125 | ±25 | 90 |
| Total phosphate | EPA 365.1 | 0.6 mg/Kg | 75-125 | ±25 | 90 |
| Total sulfate | EPA 375. 2 | 0.3 mg/Kg | 75-125 | ±25 | 90 |
| TOC | EPA 415.1 | 100 mg/Kg | 75-125 | ±25 | 90 |
| **Groundwater** | | | | | |
| TCL VOCs[c] | CLP/8260 | (b) | CLP | CLP | 90 |
| TCL SVOCs[c] | CLP/8270 | (b) | CLP | CLP | 90 |
| Metals (priority pollutants plus Fe and Mn)[c] | CLP/6010/7000 | (b) | CLP | CLP | 90 |
| TCL organochlorine pesticides[c] | CLP/8080 | (b) | CLP | CLP | 90 |
| Chlorinated herbicides | 8151A | (b) | (f) | (f) | 90 |
| TPH | NWTPH-HCID[d] | (e) | 75-125 | ±25 | 90 |
| TPH-gasoline with BETX[g] | NWTPH-Gx with BETX | 0.25 | 75-125 | ±25 | 90 |
| TPH-diesel[g] | NWTPH-Dx | 0.25 | 75-125 | ±25 | 90 |
| TSS | 160.2 | 10.0 mg/L | 75-125 | ±25 | 90 |
| TDS | 160.1 | 1.0 mg/L | 75-125 | ±25 | 90 |
| Hardness | EPA 130 | 0.1 mg/L | 75-125 | ±25 | 90 |
| Alkalinity | EPA 310.1 | 5 mg/L | 75-125 | ±25 | 90 |
| Ammonia | EPA 350.1 | 0.04 mg/L | 75-125 | ±25 | 90 |
| Chloride | EPA 325.2 | 0.3 mg/L | 75-125 | ±25 | 90 |
| Nitrite-N | EPA 353.2 | 0.03 mg/L | 75-125 | ±25 | 90 |

| Parameter | Method[a] | Target Detection Limit[b] | Analytical Accuracy (% Recovery) | Analytical Precision (Relative % Deviation) | Overall Completeness (%) |
|---|---|---|---|---|---|
| Nitrate-N | EPA 353.2 | 0.03 mg/L | 75-125 | ±25 | 90 |
| Total phosphate | EPA 365.1 | 0.06 mg/L | 75-125 | ±25 | 90 |
| Total sulfate | EPA 375. 2 | 0.3 mg/L | 75-125 | ±25 | 90 |
| TOC | EPA 415.1 | 0.5 mg/L | 75-125 | ±25 | 90 |

[a] CLP indicates that quality control will be performed in accordance with minimum level of effort of the CLP protocols, latest version in effect; U.S. EPA; *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, revised March 1983; *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846*, 3rd Edition, March 1986 and revisions, U.S. EPA.

[b] As shown in Tables 9-3 and 9-4.

[c] TCLfor VOCs, SVOCs, organochlorine pesticides, and priority pollutant metals plus Fe and Mn as shown in Tables 9-3 and 9-4.

[d] *Analytical Methods for Petroleum Hydrocarbons*, June 1997, Ecology.

[e] Target detection limits for soil are gasoline-range 20 mg/Kg, diesel-range 50 mg/Kg, motor oil-range 100 mg/Kg and for groundwater are gasoline-range 0.1 mg/L, diesel-range 0.25 mg/L, motor oil-range 0.5 mg/L.

[f] See Attachment A.

[g] Perform if detected using NWTPH-HCID.

**TABLE 9-2**
Method and Target Detection Limit for Physical and Agronomic Parameters
*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| Parameter | Method[a] | Target Detection Limit[b] |
|---|---|---|
| Extraction Cations, Ca, Mg, Na, K | S-5.10 | Ca 0.21 meq/100g; Mg 0.12 meq/100g; Na 0.20 meq/100g; K 10.9 mg/kg |
| SMP Buffer pH | S-2.50 | NA |
| NaHCO3 | S-4.10 | 6.3 mg/kg |
| Cation Exchange Capacity | S-10.10 | 0.80 meq/100g |
| Saturated Paste EC | S-1.10/S-1.20 | 0.1 mmohs/cm |
| Saturated Paste Sol. Cations | S-1.10/S-1.60 | Ca 1.0 meq/L; Mg 0. 2 meq/L; Na 0.9 meq/L |
| Saturated Paste Chlorides (by titration) | S-1.10/S-1.40 | 3.0 mg/L |
| DPTA-Sorbitol Extract | S-6.12 | Zn 0.10 mg/kg; Mn 0.68 mg/kg; Cu 0.15 mg/kg; Fe 6.8 mg/kg; S 1.7 mg/kg; B 0.05 mg/kg |
| Total Porosity | 21-2, 30-2.1 and 29-3.2[c] | NA |
| Grain Size | ASTM D422-63[d] | NA |
| Moisture | ASTM D2216[d] | NA |

[a] Agronomic methods ("S" methods) from Miller, R.O., J. Kotuby-Amacher, and J.B. Rodriquez. 1998. Western States Laboratory Proficiency Testing Program, Soil and Plant Analytical Methods, Version 4.10 (2/10/98). Western States Program, Colorado State University, Fort Collins, CO.

[b] Target detection limits provided by Soiltest Farm Consultants, Inc. and may be different if a lab other than Soiltest is selected. Detection limits presented are method detection limits.

[c] Methods of Soil Analysis, Physical and Mineralogical Properties, Agronomy No. 9, C.A. Black Ed, p. 300.

[d] ASTM method.

**TABLE 9-3**
Detection Limit Comparisons for Soil
*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| Parameter | CAS Number | Method[a] | Laboratory Reporting Limit (RL)[b] | MTCA Method B CUL[c] | MTCA Method C CUL[c] | RL > MTCA Method C CUL |
|---|---|---|---|---|---|---|
| **VOCs (μg/kg)** | | | | | | |
| Dichlorodifluoromethane | 75-71-8 | 8260 | 10 | 1.60E+07 | 7.00E+08 | |
| Trichlorofluoromethane | 75-69-4 | 8260 | 10 | 2.40E+07 | 1.05E+09 | |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 76-13-1 | 8260 | 10 | 2.40E+09 | 1.05E+11 | |
| Methyl Acetate | 79-20-9 | 8260 | 10 | 8.00E+07 | 3.50E+09 | |
| Trans-1,2-Dichloroethene | 156-60-5 | 8260 | 10 | 1.60E+06 | 7.00E+07 | |
| Methyl tert-Butyl Ether | 1634-04-4 | 8260 | 10 | | | |
| Cis-1,2-Dichlorothene | 156-59-2 | 8260 | 10 | 800,000 | 3.50E+07 | |
| Cyclohexane | 110-82-7 | 8260 | 10 | | | |
| Methylcyclohexane | 108-87-2 | 8260 | 10 | | | |
| 1,2-Dibromoethane | 106-93-4 | 8260 | 10 | 12 | 1,544 | |
| Isopropylbenzene | 98-82-8 | 8260 | 10 | 8.00E+06 | 3.50E+08 | |
| 1,2,4-Trichlorobenzene | 120-82-1 | 8260 | 10 | 800,000 | 3.50E+07 | |
| 1,2-Dichlorobenzene | 95-50-1 | 8260 | 10 | 7.20E+06 | 3.15E+08 | |
| 1,3-Dichlorobenzene | 541-73-1 | 8260 | 10 | 7.12E+06 | | |
| 1,4-Dichlorobenzene | 106-46-7 | 8260 | 10 | 41,667 | 5.47E+06 | |
| 1,2-Dibromo-3-chloropropane | 96-12-8 | 8260 | 10 | 714 | 93,750 | |
| 1,1,1-Trichloroethane | 71-55-6 | 8260 | 10 | 7.20E+07 | 3.15E+09 | |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 8260 | 10 | 5,000 | 656,250 | |
| 1,1,2-Trichloroethane | 79-00-5 | 8260 | 10 | 17,544 | 2.30E+06 | |
| 1,1-Dichloroethane | 75-34-3 | 8260 | 10 | 8.00E+06 | 3.50E+08 | |
| 1,1-Dichloroethene | 75-35-4 | 8260 | 10 | 1,667 | 218,750 | |
| 1,2-Dichloroethane | 107-06-2 | 8260 | 10 | 10,989 | 1.44E+06 | |
| 1,2-Dichloropropane | 78-87-5 | 8260 | 10 | 14,706 | 1.93E+06 | |
| 1,2,3-Trichloropropane | 96-18-4 | 8260 | 10 | 1.43E-01 | 1.88E+01 | |
| 2-Butanone | 78-93-3 | 8260 | 10 | 4.80E+07 | 2.10E+09 | |
| 2-Hexanone | 591-78-6 | 8260 | 10 | | | |
| 4-Methyl-2-pentanone | 108-10-1 | 8260 | 10 | 6.40E+06 | 2.80E+08 | |
| Acetone | 67-64-1 | 8260 | 10 | 8.00E+06 | 3.50E+08 | |
| Benzene | 71-43-2 | 8260 | 10 | 18,182 | 2.39E+06 | |
| Bromodichloromethane | 75-27-4 | 8260 | 10 | 16,129 | 2.12E+06 | |
| Bromoform | 75-25-2 | 8260 | 10 | 126,582 | 1.66E+07 | |
| Bromomethane | 74-83-9 | 8260 | 10 | 112,000 | 4.90E+06 | |
| Carbon Disulfide | 75-15-0 | 8260 | 10 | 8.00E+06 | 3.50E+08 | |
| Carbon Tetrachloride | 56-23-5 | 8260 | 10 | 7,692 | 1.01E+06 | |
| Chlorobenzene | 108-90-7 | 8260 | 10 | 1.60E+06 | 7.00E+07 | |
| Chloroethane | 75-00-3 | 8260 | 10 | | | |
| Chloroform | 67-66-3 | 8260 | 10 | 163,934 | 2.15E+07 | |
| Chloromethane | 74-87-3 | 8260 | 10 | 76,923 | 1.01E+07 | |
| Cis-1,3-Dichloropropene | 10061-01-5 | 8260 | 10 | | | |
| Dibromochloromethane | 124-48-1 | 8260 | 10 | 11,905 | 1.56E+06 | |
| Ethyl Benzene | 100-41-4 | 8260 | 10 | 8.00E+06 | 3.50E+08 | |
| Methylene Chloride | 75-09-2 | 8260 | 10 | 133,333 | 1.75E+07 | |
| Styrene | 100-42-5 | 8260 | 10 | 33,333 | 4.38E+06 | |
| Tetrachloroethene | 127-18-4 | 8260 | 10 | 19,608 | 2.57E+06 | |
| Toluene | 108-88-3 | 8260 | 10 | 1.60E+07 | 7.00E+08 | |
| Trans-1,3-Dichloropropene | 10061-02-6 | 8260 | 10 | | | |
| Trichloroethene | 79-01-6 | 8260 | 10 | 90,909 | 1.19E+07 | |
| Vinyl Chloride | 75-01-4 | 8260 | 10 | 667 | 87,500 | |
| Xylenes (total) | 1330-20-7 | 8260 | 10 | 1.60E+08 | 7.00E+09 | |

| Parameter | CAS Number | Method[a] | Laboratory Reporting Limit (RL)[b] | MTCA Method B CUL[c] | MTCA Method C CUL[c] | RL > MTCA Method C CUL |
|---|---|---|---|---|---|---|
| **SVOCs (μg/kg)** | | | | | | |
| Benzaldehyde | 100-52-7 | 8270 | 330 | 8.00E+06 | 3.50E+08 | |
| Acetophenone | 98-86-2 | 8270 | 330 | 8.00E+06 | 3.50E+08 | |
| Caprolactam | 105-60-2 | 8270 | 330 | 4.00E+07 | 1.75E+09 | |
| 1,1'-Biphenyl | 92-52-4 | 8270 | 330 | 4.00E+06 | 1.75E+08 | |
| Atrazine | 1912-24-9 | 8270 | 330 | 4,545 | 596,591 | |
| 2,2'-oxybis (1-Chloropropane) | 108-60-1 | 8270 | 330 | 14,286 | 1.88E+06 | |
| 2,4,5-Trichlorophenol | 95-95-4 | 8270 | 830 | 8.00E+06 | 3.50E+08 | |
| 2,4,6-Trichlorophenol | 88-06-2 | 8270 | 330 | 90,909 | 1.19E+07 | |
| 2,4-Dichlorophenol | 120-83-2 | 8270 | 330 | 240,000 | 1.05E+07 | |
| 2,4-Dimethylphenol | 105-67-9 | 8270 | 330 | 1.60E+06 | 7.00E+07 | |
| 2,4-Dinitrophenol | 51-28-5 | 8270 | 830 | 160,000 | 7.00E+06 | |
| 2,4-Dinitrotoluene | 121-14-2 | 8270 | 330 | 160,000 | 7.00E+06 | |
| 2,6-Dinitrotoluene | 606-20-2 | 8270 | 330 | 80,000 | 3.50E+06 | |
| 2-Chloroaphthalene | 91-58-7 | 8270 | 330 | 6.40E+06 | 2.80E+08 | |
| 2-Chlorophenol | 95-57-8 | 8270 | 330 | 400,000 | 1.75E+07 | |
| 2-Methylnaphthalene | 91-57-6 | 8270 | 330 | | | |
| 2-Methylphenol | 95-48-7 | 8270 | 330 | 4.00E+06 | 1.75E+08 | |
| 2-Nitroaniline | 88-74-4 | 8270 | 830 | | | |
| 2-Nitrophenol | 88-75-5 | 8270 | 330 | | | |
| 3,3'-Dichlorobenzidine | 91-94-1 | 8270 | 330 | 2,222 | 291,667 | |
| 3-Nitroaniline | 99-09-2 | 8270 | 830 | | | |
| 4,6-Dinitro-2-methylphenol | 534-52-1 | 8270 | 830 | | | |
| 4-Bromophenyl-phenylether | 101-55-3 | 8270 | 330 | | | |
| 4-Chloro-3-methylphenol | 59-50-7 | 8270 | 330 | | | |
| 4-Chloroaniline | 106-47-8 | 8270 | 330 | 320,000 | 1.40E+07 | |
| 4-Chlorophenyl-phenyl ether | 7005-72-3 | 8270 | 330 | | | |
| 4-Methylphenol | 106-44-5 | 8270 | 330 | 400,000 | 1.75E+07 | |
| 4-Nitroaniline | 100-01-6 | 8270 | 830 | | | |
| 4-Nitrophenol | 100-02-7 | 8270 | 830 | 640,000 | | |
| Acenaphthene | 83-32-9 | 8270 | 330 | 4.80E+06 | 2.10E+08 | |
| Acenaphthylene | 208-96-8 | 8270 | 330 | | | |
| Anthracene | 120-12-7 | 8270 | 330 | 2.40E+07 | 1.05E+09 | |
| Benzo(a)anthracene | 56-55-3 | 8270 | 330 | 137 | 17,979 | |
| Benzo(a)pyrene | 50-32-8 | 8270 | 330 | 137 | 17,979 | |
| Benzo(b)fluoranthene | 205-99-2 | 8270 | 330 | 137 | 17,979 | |
| Benzo(g,h,i)perylene | 191-24-2 | 8270 | 330 | | | |
| Benzo(k)fluoranthene | 207-08-9 | 8270 | 330 | 137 | 17,979 | |
| Bis(2-Chloroethoxy)methane | 111-91-1 | 8270 | 330 | | | |
| Bis(2-Chloroethyl) ether | 111-44-4 | 8270 | 330 | 909 | 119,318 | |
| Bis(2-Ethylhexyl)phthalate | 117-81-7 | 8270 | 330 | 71,429 | 9.38E+06 | |
| Butylbenzylphthalate | 85-68-7 | 8270 | 330 | 1.60E+07 | 7.00E+08 | |
| Carbazole | 86-74-8 | 8270 | 330 | 50,000 | 6.56E+06 | |
| Chrysene | 218-01-9 | 8270 | 330 | 137 | 17,979 | |
| Di-n-butylphthalate | 84-74-2 | 8270 | 330 | 8.00E+06 | 3.50E+08 | |
| Di-n-octylphthalate | 117-84-0 | 8270 | 330 | 1.60E+06 | 7.00E+07 | |
| Dibenz(a,h)anthracene | 53-70-3 | 8270 | 330 | 137 | 17,979 | |
| Dibenzofuran | 132-64-9 | 8270 | 330 | | | |
| Diethylphthalate | 84-66-2 | 8270 | 330 | 6.40E+07 | 2.80E+09 | |
| Dimethylphthalate | 131-11-3 | 8270 | 330 | 8.00E+07 | 3.50E+09 | |
| Fluoranthene | 206-44-0 | 8270 | 330 | 3.20E+06 | 1.40E+08 | |
| Fluorene | 86-73-7 | 8270 | 330 | 3.20E+06 | 1.40E+08 | |
| Hexachlorobenzene | 118-74-1 | 8270 | 330 | 625 | 82,031 | |
| Hexachlorobutadiene | 87-68-3 | 8270 | 330 | 12,821 | 700,000 | |

| Parameter | CAS Number | Method[a] | Laboratory Reporting Limit (RL)[b] | MTCA Method B CUL[c] | MTCA Method C CUL[c] | RL > MTCA Method C CUL |
|---|---|---|---|---|---|---|
| Hexachlorocyclopentadi | 77-47-4 | 8270 | 330 | 480,000 | 2.10E+07 | |
| Hexachloroethane | 67-72-1 | 8270 | 330 | 71,429 | 3.50E+06 | |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | 8270 | 330 | 137 | 17,979 | |
| Isophorone | 78-59-1 | 8270 | 330 | 1.05E+06 | 1.38E+08 | |
| N-Nitrosodi-n-propylamine | 621-64-7 | 8270 | 330 | 143 | 18,750 | |
| N-nitrosodiphenylamine | 86-30-6 | 8270 | 330 | 204,082 | 2.68E+07 | |
| Naphthalene | 91-20-3 | 8270 | 330 | 1.60E+06 | 7.00E+07 | |
| Nitrobenzene | 98-95-3 | 8270 | 330 | 40,000 | 1.75E+06 | |
| Pentachlorophenol | 87-86-5 | 8270 | 830 | 8,333 | 1.09E+06 | |
| Phenanthrene | 85-01-8 | 8270 | 330 | | | |
| Phenol | 108-95-2 | 8270 | 330 | 4.80E+07 | 2.10E+09 | |
| Pyrene | 129-00-0 | 8270 | 330 | 2.40E+06 | 1.05E+08 | |
| **Pesticides (μg/kg)** | | | | | | |
| 4,4'-DDD | 72-54-8 | 8081 | 0.1 | 4,167 | 546,875 | |
| 4,4'-DDE | 72-55-9 | 8081 | 0.1 | 2,941 | 386,029 | |
| 4,4'-DDT | 50-29-3 | 8081 | 0.1 | 2,941 | 386,029 | |
| Aldrin | 309-00-2 | 8081 | 0.05 | 59 | 7,721 | |
| Alpha-BHC | 319-84-6 | 8081 | 0.05 | 159 | 20,833 | |
| Alpha-Chlordane | 5103-71-9 | 8081 | 0.05 | | | |
| Beta-BHC | 319-85-7 | 8081 | 0.05 | 556 | 72,917 | |
| Delta-BHC | 319-86-8 | 8081 | 0.05 | | | |
| Dieldrin | 60-57-1 | 8081 | 0.1 | 63 | 8,203 | |
| Endosulfan I | 959-98-8 | 8081 | 0.05 | | | |
| Endosulfan II | 33213-65-9 | 8081 | 0.1 | | | |
| Endosulfan sulfate | 1031-07-8 | 8081 | 0.1 | | | |
| Endrin | 72-20-8 | 8081 | 0.1 | 24,000 | 1.05E+06 | |
| Endrin aldehyde | 7421-93-4 | 8081 | 0.1 | | | |
| Endrin ketone | 53494-70-5 | 8081 | 0.1 | | | |
| Gamma-BHC (Lindane) | 58-89-9 | 8081 | 0.05 | 769 | 100,962 | |
| Gamma-Chlordane | 5103-74-2 | 8081 | 0.05 | | | |
| Heptachlor | 76-44-8 | 8081 | 0.05 | 222 | 29,167 | |
| Heptachlor expoxide | 1024-57-3 | 8081 | 0.05 | 110 | 14,423 | |
| Methoxychlor | 72-43-5 | 8081 | 0.5 | 400,000 | 1.75E+07 | |
| Toxaphene | 8001-35-2 | 8081 | 0.05 | 909 | 119,318 | |
| **Chlorinated Herbicides (μg/kg)** | | | | | | |
| 2,4-DB | 94-82-6 | 8151A | 17 | 640,000 | 2.80E+07 | |
| Dalapon | 75-99-0 | 8151A | 17 | 2.40E+06 | 1.05E+08 | |
| Dicamba | 1918-00-9 | 8151A | 17 | 2.40E+06 | 1.05E+08 | |
| 2,4-D | 94-75-7 | 8151A | 17 | 800,000 | 3.50E+07 | |
| Dichlorprop | 120-36-5 | 8151A | 17 | | | |
| Dinoseb | 88-85-1 | 8151A | 8.3 | 80,000 | 3.50E+06 | |
| MCPA | 94-74-6 | 8151A | 25 | 40,000 | 1.75E+06 | |
| MCPP | 93-65-2 | 8151A | 17 | 80,000 | 3.50E+06 | |
| 2,4,5-T | 93-76-5 | 8151A | 8.3 | 800,000 | 3.50E+07 | |
| 2,4,5-TP | 93-72-1 | 8151A | 17 | 640,000 | 2.80E+07 | |
| **Metals (mg/kg)** | | | | | | |
| Antimony | 7440-36-0 | 6010/7000 | 60 | 32 | 1,400 | |
| Arsenic | 7440-38-2 | 6010/6020 | 1 | 0.667 | 87.5 | |
| Beryllium | 7440-41-7 | 6010/7000 | 5 | 160 | 7,000 | |
| Cadmium | 7440-43-9 | 6010/7000 | 5 | 40 | 1,750 | |
| Chromium[d] | 7440-47-3 | 6010/7000 | 10 | 240 | 10500 | |
| Copper | 7440-50-8 | 6010/7000 | 25 | 2960 | 129,500 | |
| Iron | 7439-89-6 | 6010/7000 | 100 | | | |
| Lead | 7439-92-1 | 6010/7000 | 3 | 250[e] | 1000[e] | |

| Parameter | CAS Number | Method[a] | Laboratory Reporting Limit (RL)[b] | MTCA Method B CUL[c] | MTCA Method C CUL[c] | RL > MTCA Method C CUL |
|---|---|---|---|---|---|---|
| Manganese | 7439-96-5 | 6010/7000 | 15 | 11200 | 490,000 | |
| Mercury | 7439-97-6 | 6010/7000 | 0.2 | 24 | 1,050 | |
| Nickel | 7440-02-0 | 6010/7000 | 40 | 1600 | 70,000 | |
| Selenium | 7782-49-2 | 6010/7000 | 5 | 400 | 17,500 | |
| Silver | 7440-22-4 | 6010/7000 | 10 | 400 | 17,500 | |
| Thallium | 7440-28-0 | 6010/7000 | 10 | 5.6 | 245 | |
| Zinc | 7440-66-6 | 6010/7000 | 20 | 24000 | 1.05E+06 | |
| **TPH (mg/kg)** | | **NWTPH-HCID[fg]** | | | | |
| TPH, gasoline and BETX | NA | NWTPH-GX[f] | 20.00 | 30[e] | | |
| TPH, diesel range | NA | NWTPH-DX[f] | 50 | 2000[e] | | |
| TPH, mineral oils | NA | NWTPH-DX[f] | 100 | 4000[e] | | |
| **Conventional Analysis (mg/kg)** | | | | | | |
| Ammonia | 7664-41-7 | EPA 350.1 | 10 | | | |
| Chloride | 16887-00-6 | EPA 325.2 | 3 | | | |
| Nitrate-N | 14797-55-8 | EPA 353.2 | 0.30 | 8,000 | 350,000 | |
| Nitrite-N | 14797-65-0 | EPA 353.2 | 0.30 | 8,000 | 350,000 | |
| Total Phosphate | 14265-44-2 | EPA 365.1 | 0.6 | | | |
| Total Sulfate | NA | EPA 375.2 | 0.3 | | | |
| Total Organic Carbon | NA | EPA 415.1 | 100 | | | |

Notes:

[a] Contract Laboratory Program (CLP) equivalent QC will be performed in accordance with minimum level of effort of CLP protocols, latest version in effect, U.S. EPA; Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, revised March 1983; Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition, March 1986 and revisions, U.S. EPA.

[b] For CLP parameters, Contract Required Quantitation Limits (CRQL) or Contract Required Detection Limits (CRDL) are provided in place of RLs. CRQL and CRDL values presented are from the current CLP versions in effect, OLC03.22 and ILM04.1.

[c] MTCA Methods B and C cleanup levels (CULs) for soil in accordance with WAC 173-340, CLARC Version 3.1, updated November 2001.

[d] RL for chromium is based on total chromium. CUL listed is based on hexavalent chromium.

[e] MTCA Method A CUL for soil.

[f] Analytical Methods for Petroleum Hydrocarbons, June 1997, Ecology. As per method, NWTPH-Gx and NWTPH-Dx performed if target analyte detected using NWTPH-HCID.

[g] Target detection limits for soil are gasoline-range 20 mg/Kg, diesel-range 50 mg/Kg, motor oil-range 100 mg/ kg.

*Indicates compounds with Reporting Limits greater than the regulatory limits.

**TABLE 9-4**
Detection Limit Comparisons for Groundwater
*Bee-Jay Scales Site Remedial Investigation/Feasibility Study Work Plan*

| Parameter | CAS Number | Method[a] | Laboratory Reporting Limit (RL)[b] | MTCA GW Method B CUL[c] | MCL[d] | RL > MTCA Method B CUL |
|---|---|---|---|---|---|---|
| **VOCs (µg/L)** | | | | | | |
| Dichlorodifluoromethane | 75-71-8 | 8260B | 1 | 1,600 | | |
| Trichlorofluoromethane | 75-69-4 | 8260B | 1 | 2,400 | | |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 76-13-1 | 8260B | 1 | 480,000 | | |
| Methyl Acetate | 79-20-9 | 8260B | 1 | 8,000 | | |
| trans-1,2-Dichloroethene | 156-60-5 | 8260B | 1 | 160 | 100 | |
| Methyl tert-Butyl Ether | 1634-04-4 | 8260B | 1 | | | |
| cis-1,2-Dichlorothene | 156-59-2 | 8260 B | 1 | 80 | 70 | |
| Cyclohexane | 110-82-7 | 8260 B | 1 | | | |
| Methylcyclohexane | 108-87-2 | 8260 B | 1 | | | |
| 1,2-Dibromoethane | 106-93-4 | 8260 B | 1 | 5.15E-04 | 0.050 | * |
| Isopropylbenzene | 98-82-8 | 8260 B | 1 | 1,600 | | |
| 1,2,4-Trichlorobenzene | 120-82-1 | 8260 B | 1 | 80 | 70 | |
| 1,2-Dichlorobenzene | 95-50-1 | 8260 B | 1 | 720 | 10 | |
| 1,3-Dichlorobenzene | 541-73-1 | 8260 B | 1 | | | |
| 1,4-Dichlorobenzene | 106-46-7 | 8260 B | 1 | 1.8 | 75 | |
| 1,2-Dibromo-3-chloropropane | 96-12-8 | 8260 B | 5 | 0.031 | 0.20 | * |
| 1,1,1-Trichloroethane | 71-55-6 | 8260 B | 1 | 7,200 | 200 | |
| 1,1,2,2-Tetrachloroethane | 79-34-5 | 8260 B | 1 | 0.22 | | * |
| 1,1,2-Trichloroethane | 79-00-5 | 8260 B | 1 | 0.77 | 5.0 | |
| 1,1-Dichloroethane | 75-34-3 | 8260 B | 1 | 800 | | |
| 1,1-Dichloroethene | 75-35-4 | 8260 B | 1 | 0.073 | 7.0 | * |
| 1,2-Dichloroethane | 107-06-2 | 8260 B | 1 | 0.48 | 5.0 | |
| 1,2-Dichloropropane | 78-87-5 | 8260 B | 0.5 | 0.64 | 5.0 | |
| 1,2,3-Trichloropropane | 98-18-4 | 8260 B | 0.5 | 6.23E-03 | 4 | * |
| 2-Butanone | 78-93-3 | 8260 B | 10 | 4,800 | | |
| 2-Hexanone | 591-78-6 | 8260 B | 10 | | | |
| 4-Methyl-2-pentanone | 108-10-1 | 8260 B | 10 | 640 | | |
| Acetone | 67-64-1 | 8260 B | 10 | 800 | | |
| Benzene | 71-43-2 | 8260 B | 1 | 0.80 | 5.0 | |
| Bromodichloromethane | 75-27-4 | 8260 B | 1 | 0.71 | 100 | |
| Bromoform | 75-25-2 | 8260 B | 1 | 5.5 | 100 | |
| Bromomethane | 74-83-9 | 8260 B | 2 | 11 | | |
| Carbon Disulfide | 75-15-0 | 8260 B | 1 | 800 | | |
| Carbon Tetrachloride | 56-23-5 | 8260 B | 1 | 0.34 | 5.0 | * |
| Chlorobenzene | 108-90-7 | 8260 B | 1 | 160 | 100 | |
| Chloroethane | 75-00-3 | 8260 B | 1 | | | |
| Chloroform | 67-66-3 | 8260 B | 1 | 7.2 | 100 | |
| Chloromethane | 74-87-3 | 8260 B | 1 | 3.4 | | |
| cis-1,3-Dichloropropene | 10061-01-5 | 8260 B | 1 | | | |
| Dibromochloromethane | 124-48-1 | 8260 B | 1 | 0.52 | 100 | |
| Ethyl Benzene | 100-41-4 | 8260 B | 1 | 800 | 700 | |
| Methylene Chloride | 75-09-2 | 8260 B | 1 | 5.8 | | |
| Styrene | 100-42-5 | 8260 B | 1 | 1.5 | 100 | |
| Tetrachloroethene | 127-18-4 | 8260 B | 1 | 0.86 | 5.0 | |
| Toluene | 108-88-3 | 8260 B | 1 | 1,600 | 1,000 | |
| trans-1,3-Dichloropropene | 10061-02-6 | 8260 B | 1 | | | |
| Trichloroethene | 79-01-6 | 8260 B | 1 | 4.0 | 5.0 | |
| Vinyl Chloride | 75-01-4 | 8260 B | 1 | 0.029 | 2.0 | * |
| Xylenes (total) | 1330-20-7 | 8260 B | 2 | 16,000 | 10,000 | |
| **SVOCs (µg/L)** | | | | | | |
| Benzaldehyde | 100-52-7 | 8270 | 10 | 1,600 | | |
| Acetophenone | 98-86-2 | 8270 | 10 | 1,600 | | |
| Caprolactam | 105-60-2 | 8270 | 10 | 8,000 | | |
| 1,1'-Biphenyl | 92-52-4 | 8270 | 10 | 800 | | |
| Atrazine | 1912-24-9 | 8270 | 10 | 0.40 | 3.0 | * |
| 2,2'-oxybis (1-Chloropropane) | 108-60-1 | 8270 | 10 | 1.3 | | * |
| 2,4,5-Trichlorophenol | 95-95-4 | 8270 | 10 | 1,600 | | |
| 2,4,6-Trichlorophenol | 88-06-2 | 8270 | 10 | 8.0 | | |
| 2,4-Dichlorophenol | 120-83-2 | 8270 | 10 | 48 | | |
| 2,4-Dimethylphenol | 105-67-9 | 8270 | 10 | 320 | | |

| Parameter | CAS Number | Method[a] | Laboratory Reporting Limit (RL)[b] | MTCA GW Method B CUL[c] | MCL[d] | RL > MTCA Method B CUL |
|---|---|---|---|---|---|---|
| 2,4-Dinitrophenol | 51-28-5 | 8270 | 20 | 32 | | |
| 2,4-Dinitrotoluene | 121-14-2 | 8270 | 10 | 32 | | |
| 2,6-Dinitrotoluene | 606-20-2 | 8270 | 10 | 16 | | |
| 2-Chloroaphthalene | 91-58-7 | 8270 | 10 | 1,280 | | |
| 2-Chlorophenol | 95-57-8 | 8270 | 10 | 80 | | |
| 2-Methylnaphthalene | 91-57-6 | 8270 | 10 | | | |
| 2-Methylphenol | 95-48-7 | 8270 | 10 | 800 | | |
| 2-Nitroaniline | 88-74-4 | 8270 | 10 | | | |
| 2-Nitrophenol | 88-75-5 | 8270 | 10 | | | |
| 3,3'-Dichlorobenzidine | 91-94-1 | 8270 | 10 | 0.19 | | * |
| 3-Nitroaniline | 99-09-2 | 8270 | 10 | | | |
| 4,6-Dinitro-2-methylphenol | 534-52-1 | 8270 | 10 | | | |
| 4-Bromophenyl-phenylether | 101-55-3 | 8270 | 10 | | | |
| 4-Chloro-3-methylphenol | 59-50-7 | 8270 | 10 | | | |
| 4-Chloroaniline | 106-47-8 | 8270 | 10 | 64 | | |
| 4-Chlorophenyl-phenyl ether | 7005-72-3 | 8270 | 10 | | | |
| 4-Methylphenol | 106-44-5 | 8270 | 10 | 80 | | |
| 4-Nitroaniline | 100-01-6 | 8270 | 10 | | | |
| 4-Nitrophenol | 100-02-7 | 8270 | 10 | | | |
| Acenaphthene | 83-32-9 | 8270 | 10 | 960 | | |
| Acenaphthylene | 208-96-8 | 8270 | 10 | | | |
| Anthracene | 120-12-7 | 8270 | 10 | 2,400 | | |
| Benzo(a)anthracene | 56-55-3 | 8270 | 10 | 0.012 | | * |
| Benzo(a)pyrene | 50-32-8 | 8270 | 10 | 0.012 | | * |
| Benzo(b)fluoranthene | 205-99-2 | 8270 | 10 | 0.012 | 0.20 | * |
| Benzo(g,h,i)perylene | 191-24-2 | 8270 | 10 | | | |
| Benzo(k)fluoranthene | 207-08-9 | 8270 | 10 | 0.012 | | * |
| bis(2-Chloroethoxy)methane | 111-91-1 | 8270 | 10 | | | |
| bis(2-Chloroethyl) ether | 111-44-4 | 8270 | 10 | 0.040 | | * |
| bis(2-Ethylhexyl)phthalate | 117-81-7 | 8270 | 5 | 6.3 | 6.0 | |
| Butylbenzylphthalate | 85-68-7 | 8270 | 10 | 3,200 | | |
| Carbazole | 86-74-8 | 8270 | 10 | 4.4 | | * |
| Chrysene | 218-01-9 | 8270 | 10 | 0.012 | | * |
| Di-n-butylphthalate | 84-74-2 | 8270 | 10 | 1,600 | | |
| Di-n-octylphthalate | 117-84-0 | 8270 | 10 | 320 | | |
| Dibenz(a,h)anthracene | 53-70-3 | 8270 | 10 | 0.012 | | * |
| Dibenzofuran | 132-64-9 | 8270 | 10 | | | |
| Diethylphthalate | 84-66-2 | 8270 | 10 | 12,800 | | |
| Dimethylphthalate | 131-11-3 | 8270 | 10 | 16,000 | | |
| Fluoranthene | 206-44-0 | 8270 | 10 | 640 | | |
| Fluorene | 86-73-7 | 8270 | 10 | 640 | | |
| Hexachlorobenzene | 118-74-1 | 8270 | 10 | 0.055 | 1.0 | * |
| Hexachlorobutadiene | 87-68-3 | 8270 | 10 | 0.56 | | * |
| Hexachlorocyclopentadi | 77-47-4 | 8270 | 10 | 96 | 50 | |
| Hexachloroethane | 67-72-1 | 8270 | 5 | 6.3 | | |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | 8270 | 10 | 0.012 | | * |
| Isophorone | 78-59-1 | 8270 | 10 | 92 | | |
| N-Nitrosodi-n-propylamine | 621-64-7 | 8270 | 10 | 0.013 | | * |
| N-nitrosodiphenylamine | 86-30-6 | 8270 | 10 | 18 | | |
| Naphthalene | 91-20-3 | 8270 | 10 | 160 | | |
| Nitrobenzene | 98-95-3 | 8270 | 5 | 8.0 | | |
| Pentachlorophenol | 87-86-5 | 8270 | 10 | 0.73 | 1.0 | * |
| Phenanthrene | 85-01-8 | 8270 | 10 | | | |
| Phenol | 108-95-2 | 8270 | 10 | 9,600 | | |
| Pyrene | 129-00-0 | 8270 | 10 | 480 | | |
| **Pesticides (ng/L)** | | | | | | |
| | | 8081 Manchester extraction | | | | |
| 4,4'-DDD | 72-54-8 | 8081 Manchester extraction | 2 | 360 | | |
| 4,4'-DDE | 72-55-9 | 8081 Manchester extraction | 2 | 260 | | |
| 4,4'-DDT | 50-29-3 | 8081 Manchester extraction | 2 | 260 | | |
| Aldrin | 309-00-2 | 8081 Manchester extraction | 1 | 5.1 | | |

| Parameter | CAS Number | Method[a] | Laboratory Reporting Limit (RL)[b] | MTCA GW Method B CUL[c] | MCL[d] | RL > MTCA Method B CUL |
|---|---|---|---|---|---|---|
| alpha-BHC | 319-84-6 | 8081 Manchester extraction | 1 | 14 | | |
| alpha-Chlordane | 5103-71-9 | 8081 Manchester extraction | 1 | | | |
| beta-BHC | 319-85-7 | 8081 Manchester extraction | 1 | 49 | | |
| delta-BHC | 319-86-8 | 8081 Manchester extraction | 1 | | | |
| Dieldrin | 60-57-1 | 8081 Manchester extraction | 2 | 5.5 | | |
| Endosulfan I | 959-98-8 | 8081 Manchester extraction | 1 | | | |
| Endosulfan II | 33213-65-9 | 8081 Manchester extraction | 2 | | | |
| Endosulfan sulfate | 1031-07-8 | 8081 Manchester extraction | 2 | | | |
| Endrin | 72-20-8 | 8081 Manchester extraction | 2 | 48,000 | 20,000 | |
| Endrin aldehyde | 7421-93-4 | 8081 Manchester extraction | 2 | | | |
| Endrin ketone | 53494-70-5 | 8081 Manchester extraction | 2 | | | |
| gamma-BHC (Lindane) | 58-89-9 | 8081 Manchester extraction | 1 | 67 | 200 | |
| gamma-Chlordane | 5103-74-2 | 8081 Manchester extraction | 1 | | | |
| Heptachlor | 76-44-8 | 8081 Manchester extraction | 1 | 19 | 400 | |
| Heptachlor expoxide | 1024-57-3 | 8081 Manchester extraction | 1 | 9.6 | 200 | |
| Methoxychlor | 72-43-5 | 8081 Manchester extraction | 15 | 80,000 | 40,000 | |
| Hexachlorobenzene | 118-74-1 | 8081 Manchester extraction | 2 | 5 | 1,000 | |
| Hexachlorobutedrene | 87-68-3 | 8081 Manchester extraction | 2 | 560 | | |
| Toxaphene | 8001-35-2 | | 100 | 80 | 3,000 | * |
| **Chlorinated Herbicides (μg/L)** | | | | | | |
| 2,4-DB | 94-82-6 | 8151A | 4 | 128 | | |
| Dalapon | 75-99-0 | 8151A | 10 | 480 | 200 | |
| Dicamba | 1918-00-9 | 8151A | 1 | 480 | | |
| 2,4-D | 94-75-7 | 8151A | 1 | 160 | 70 | |
| Dichlorprop | 120-36-5 | 8151A | 1 | | | |
| Dinoseb | 88-85-1 | 8151A | 2 | 16 | | |
| MCPA | 94-74-6 | 8151A | 5 | 8.0 | | |
| MCPP | 93-65-2 | 8151A | 10 | 16 | | |
| 2,4,5-T | 93-76-5 | 8151A | 1 | 160 | | |
| 2,4,5-TP | 93-72-1 | 8151A | 1 | 128 | 50 | |
| Pentachlorophenol | 87-86-5 | 8151A | 0.5 | 0.73 | 1.0 | |
| **Metals, Dissolved (μg/L)** | | | | | | |
| Antimony | 7440-36-0 | 6010/7005/6020 | 50 | 6.4 | 6.0 | * |
| Arsenic | 7440-38-2 | 6020 | 1 | 0.058 | 50 | * |
| Beryllium | 7440-41-7 | 6010/7000 | 5 | 32 | 4.0 | |
| Cadmium | 7440-43-9 | 6010/7000 | 5 | 8.0 | 5.0 | |
| Chromium[e] | 7440-47-3 | 6010/7000 | 10 | 48 | | |
| Copper | 7440-50-8 | 6010/7000 | 25 | 592 | 1,000 | |
| Iron | 7439-89-6 | 6010/7000 | 100 | | 300 | |
| Lead | 7439-92-1 | 6010/7000 | 3 | 15[f] | 15 | |
| Manganese | 7439-96-5 | 6010/7000 | 15 | 2,240 | 50 | |
| Mercury | 7439-97-6 | 6010/7000 | 0.2 | 4.8 | 2.0 | |
| Nickel | 7440-02-0 | 6010/7000 | 40 | 320 | 100 | |
| Selenium | 7782-49-2 | 6010/7000 | 5 | 80 | 50 | |
| Silver | 7440-22-4 | 6010/7000 | 10 | 80 | 100 | |
| Thallium | 7440-28-0 | 6010/7000 | 10 | 1.1 | 2.0 | * |
| Zinc | 7440-66-6 | 6010/7000 | 20 | 4,800 | 5,000 | |

| Parameter | CAS Number | Method[a] | Laboratory Reporting Limit (RL)[b] | MTCA GW Method B CUL[c] | MCL[d] | RL > MTCA Method B CUL |
|---|---|---|---|---|---|---|
| **TPH (mg/L)** | | **NWTPH-HCID[g,h]** | | | | |
| TPH, gasoline and BETX | NA | NWTPH-Dx and BETX[g] | 0.1 | 800[f] | | |
| TPH, diesel range | NA | NWTPH-Dx[g] | 0.25 | 500[f] | | |
| TPH, mineral oils | NA | NWTPH-Dx[g] | 1 | 1000[f] | | |
| **Conventional Analyses (mg/L except as noted)** | | | | | | |
| Alkalinity/Biocarbonate | NA | EPA 310.1 | 5 | | | |
| Ammonia | 7664-41-7 | EPA 350.1 | 0.04 | | | |
| Chloride | 16887-00-6 | EPA 325.2 | 0.03 | | 250 | |
| Hardness | NA | EPA 130 | 0.1 | | | |
| Nitrate-N | 14797-55-8 | EPA 353.2 | 0.03 | 1.6 | 10 | |
| Nitrite-N | 14797-65-0 | EPA 353.2 | 0.03 | 1.6 | 1 | |
| Total Phosphate | 14265-44-2 | EPA 365.1 | 0.06 | | | |
| Total Sulfate | NA | EPA 375.2 | 0.5 | | 250 | |
| TSS | NA | EPA 160.2 | 0.1 | | | |
| TDS | NA | EPA 160.1 | 10 | | 500 | |
| TOC | NA | EPA 415.1 | 0.5 | | | |

Notes:

[a] Contract Laboratory Program (CLP) equivalent QC will be performed in accordance with minimum level of effort of CLP protocols, latest version in effect, U.S. EPA; Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, revised March 1983; Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition, March 1986 and revisions, U.S. EPA.

[b] For CLP parameters, Contract Required Quantitation Limits (CRQL) or Contract Required Detection Limits (CRDL) are provided inplace of RLs. CRQL and CRDL values presented are from the current CLP versions in effect, OLC03.22 and ILM04.1.

[c] MTCA Method B cleanup levels (CULs) for groundwater in accordance with WAC 173-340, CLARC Version 3.1, updated November 2001.

[d] Federal and Washington State Primary and Secondary Maximum Contaminant Levels (MCLs).

[e] RL for chromium is based on total chromium. CUL listed is based on hexavalent chromium.

[f] MTCA Method A groundwater CUL.

[g] Analytical Methods for Petroleum Hydrocarbons, June 1997, Ecology. As per method, NWTPH-Gx and NWTPH-Dx performed if target analyte detected using NWTPH-HCID.

[h] Target detection limits for groundwater are gasoline-range 0.1 mg/L, diesel-range 0.25 mg/L, and motor oil-range 0.5 mg/L.

*Indicates compounds with Reporting Limits greater than the regulatory limits.

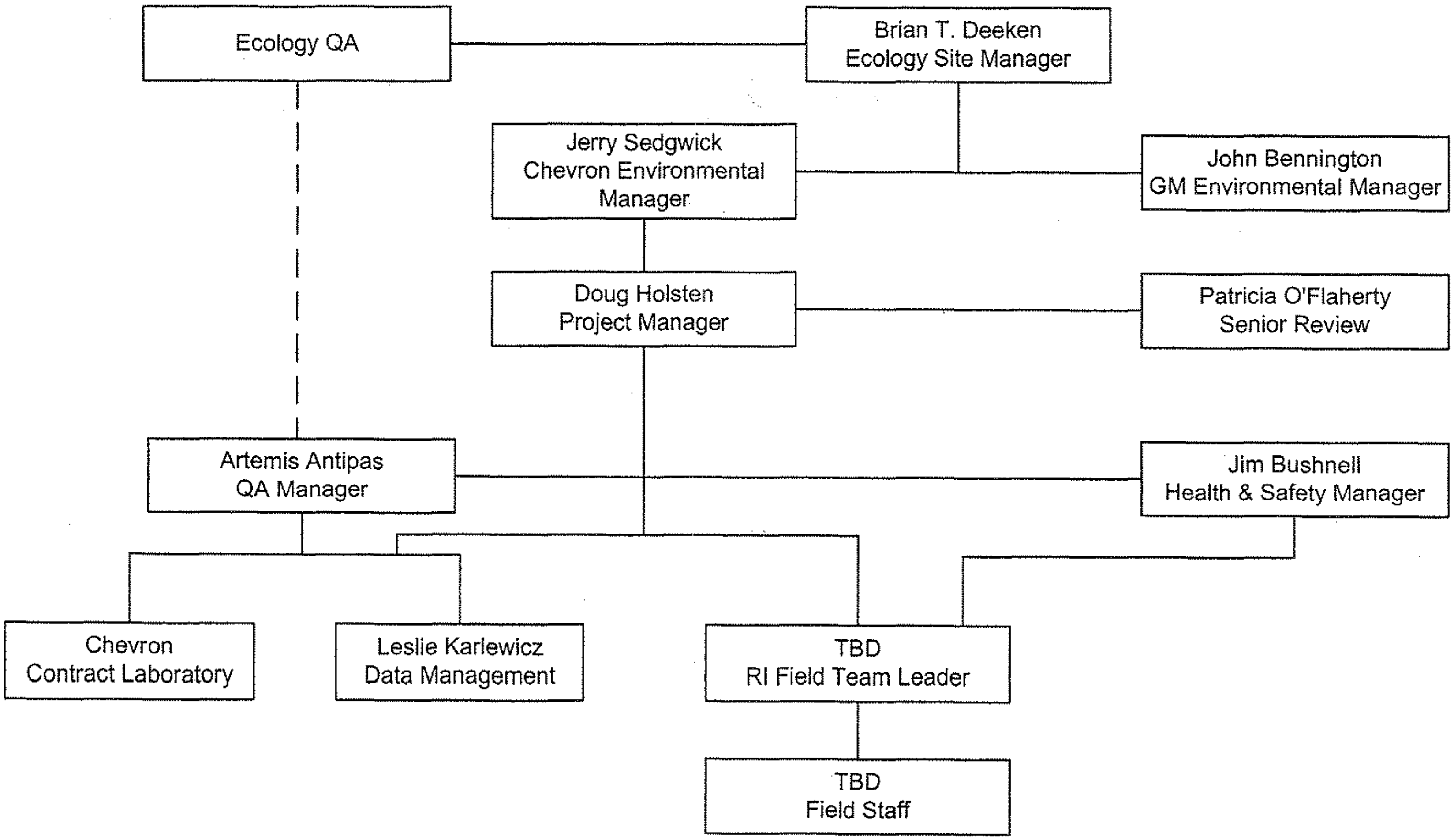


Figure 9-1
Project Organization
Bee-Jay Scales RI/FS

## SECTION 10

# Health and Safety Plan

This Health and Safety Plan (HSP) will be kept on the site during field activities and will be reviewed as necessary. The plan will be amended or revised as project activities or conditions change or when supplemental information becomes available. The plan adopts, by reference, the Standards of Practice (SOPs) in the CH2M HILL *Corporate Health and Safety Program, Program and Training Manual*, as appropriate. In addition, this plan adopts procedures in the project Work Plan. The Site Safety Coordinator (SSC) is to be familiar with these SOPs and the contents of this plan. CH2M HILL's personnel and subcontractors must sign Attachment 1 (in Appendix G).

# Project Information and Description

**PROJECT NO:** 174175

**CLIENT:** Chevron Environmental Management Company/Group Environmental Management Company

**PROJECT/SITE NAME:** Bee-Jay Scales

**SITE ADDRESS:** 116 Warehouse Avenue, Sunnyside, Washington

**CH2M HILL PROJECT MANAGER:** Doug Holsten/SEA

**CH2M HILL OFFICE:** Bellevue, Washington Office

**DATE HEALTH AND SAFETY PLAN PREPARED:** October 2002

**DATE(S) OF SITE WORK:** October 2002 through December 2004

**SITE ACCESS**: Contact owner; fenced

**SITE SIZE:** 3 acres

**SITE TOPOGRAPHY**: flat

**PREVAILING WEATHER**: warm dry summers, cold winters

**SITE DESCRIPTION AND HISTORY**: Site incorporated an agricultural chemical distribution facility since the 1960s. Fertilizers, herbicides, and pesticides were stored and blended on site. Soil and groundwater contamination allegedly comes from the regular practice of washing out trucks and equipment that contained chemicals. Primary contaminants are nutrients (nitrates).

**DESCRIPTION OF SPECIFIC TASKS TO BE PERFORMED**: Sampling and investigation related to RI/FS. Soil sampling using drill rig tools, hand tools. Groundwater sampling using pumps, hand tools.

# Site Map

This page is reserved for a Site Map.

Note locations of Support, Decontamination, and Exclusion Zones; site telephone; first aid station; evacuation routes; and assembly areas.

# 10.1 Tasks to be Performed Under this Plan

## 10.1.1 Description of Tasks

(Reference Field Project Start-up Form)

Refer to project documents (i.e., Work Plan) for detailed task information. A health and safety risk analysis (Section 10.1.2) has been performed for each task and is incorporated in this plan through task-specific hazard controls and requirements for monitoring and protection. Tasks other than those listed below require an approved amendment or revision to this plan before tasks begin. Refer to Section 10.8.2 for procedures related to "clean" tasks that do not involve hazardous waste operations and emergency response (Hazwoper).

### 10.1.1.1 Hazwoper-Regulated Tasks

- Drilling
- Well Installation
- Groundwater sampling
- Soil sampling

### 10.1.1.2 Non-Hazwoper-Regulated Tasks

Under specific circumstances, the training and medical monitoring requirements of federal or state Hazwoper regulations are not applicable. It must be demonstrated that the tasks can be performed without the possibility of exposure in order to use non-Hazwoper-trained personnel. **Prior approval from the Health and Safety Manager (HSM) is required before these tasks are conducted on regulated hazardous waste sites.**

| TASKS | CONTROLS |
|---|---|
| • Surveying | • Brief on hazards, limits of access, and emergency procedures<br>• Post contaminant areas as appropriate (refer to Section 10.8.2 for details)<br>• Sample and monitor as appropriate (refer to Section 10.5)<br>• Use PPE as outlined in Section 10.4 |

### 10.1.2 Task Hazard Analysis

(Refer to Section 10.2 for hazard controls)

| POTENTIAL HAZARDS | TASKS | | |
|---|---|---|---|
| | Drilling and Well Installation | Groundwater Sampling and Soil Sampling | Surveying |
| Flying debris/objects | X | | |
| Noise > 85dBA | X | | |
| Electrical | X | X | |
| Suspended loads | X | | |
| Buried utilities, drums, tanks | X | | |
| Slip, trip, fall | X | X | X |
| Back injury | X | X | |
| Visible lightning | X | X | X |
| Fires | X | | |
| Entanglement | X | | |
| Drilling | X | | |
| Heavy equipment | X | | |

## 10.2 Hazard Controls

This section provides safe work practices and control measures used to reduce or eliminate potential hazards. These practices and controls are to be implemented by the party in control of either the site or the particular hazard. CH2M HILL employees and subcontractors must remain aware of the hazards affecting them regardless of who is responsible for controlling the hazards. CH2M HILL employees and subcontractors who do not understand any of these provisions should contact the SSC for clarification. In addition to the controls specified in this section, Project-Activity Self-Assessment Checklists are contained in Attachment 5 in Appendix G. These checklists are to be used to assess the adequacy of CH2M HILL and subcontractor site-specific safety requirements. The objective of the self-assessment process is to identify gaps in project safety performance, and prompt for corrective actions in addressing these gaps. Self-assessment checklists should be completed early in the project, when tasks or conditions change, or when otherwise specified by the HSM. The self-assessment checklists, including documented corrective actions, should be made part of the permanent project records, and be promptly submitted to the HSM.

Project-specific frequency for completing self-assessments: **weekly**

### 10.2.1 Project-Specific Hazards

#### 10.2.1.1 Drilling

(Reference CH2M HILL SOP HS-35, Drilling)

- Only authorized personnel are permitted to operate drill rigs.
- Stay clear of areas surrounding drill rigs during every startup.
- Stay clear of the rotating augers and other rotating components of drill rigs.
- Stay as clear as possible of all hoisting operations. Loads shall not be hoisted overhead of personnel.
- Do not wear loose-fitting clothing or other items such as rings or watches that could get caught in moving parts. Long hair should be restrained.
- If equipment becomes electrically energized, personnel shall be instructed not to touch any part of the equipment or attempt to touch any person who may be in contact with the electrical current. The utility company or appropriate party shall be contacted to have line de-energized prior to approaching the equipment.
- Smoking around drilling operations is prohibited.

### 10.2.1.2 Exposure to Public Vehicular Traffic

The following precautions must be taken when working around traffic, and in or near an area where traffic controls have been established by a contractor.

- Exercise caution when exiting traveled way or parking along street – avoid sudden stops, use flashers, etc.
- Park in a manner that will allow for safe exit from vehicle, and where practicable, park vehicle so that it can serve as a barrier.
- All staff working adjacent to traveled way or within work area must wear reflective/high-visibility safety vests.
- Eye protection should be worn to protect from flying debris.
- Remain aware of factors that influence traffic related hazards and required controls – sun glare, rain, wind, flash flooding, limited sight-distance, hills, curves, guardrails, width of shoulder (i.e., breakdown lane), etc.
- Always remain aware of an escape route -- behind an established barrier, parked vehicle, guardrail, etc.
- Always pay attention to moving traffic – never assume drivers are looking out for you
- Work as far from traveled way as possible to avoid creating confusion for drivers.
- When workers must face away from traffic, a "buddy system" should be used, where one worker is looking towards traffic.
- When working on highway projects, obtain a copy of the contractor's traffic control plan.
- Work area should be protected by a physical barrier – such as a K-rail or Jersey barrier.
- Review traffic control devices to ensure that they are adequate to protect your work area. Traffic control devices should: 1) convey a clear meaning, 2) command respect of road users, and 3) give adequate time for proper traffic response. The adequacy of these devices are dependent on limited sight distance, proximity to ramps or intersections, restrictive width, duration of job, and traffic volume, speed, and proximity.

## 10.2.2 General Hazards

### 10.2.2.1 General Practices and Housekeeping

(Reference CH2M HILL SOP HS-20, General Practices)

- Site work should be performed during daylight hours whenever possible. Work conducted during hours of darkness require enough illumination intensity to read a newspaper without difficulty.
- Good housekeeping must be maintained at all times in all project work areas.
- Common paths of travel should be established and kept free from the accumulation of materials.
- Keep access to aisles, exits, ladders, stairways, scaffolding, and emergency equipment free from obstructions.
- Provide slip-resistant surfaces, ropes, and/or other devices to be used.
- Specific areas should be designated for the proper storage of materials.
- Tools, equipment, materials, and supplies shall be stored in an orderly manner.
- As work progresses, scrap and unessential materials must be neatly stored or removed from the work area.
- Containers should be provided for collecting trash and other debris and shall be removed at regular intervals.
- All spills shall be quickly cleaned up. Oil and grease shall be cleaned from walking and working surfaces.

### 10.2.2.2 Hazard Communication

(Reference CH2M HILL SOP HS-05, Hazard Communication)

The SSC is to perform the following:

- Complete an inventory of chemicals brought on site by CH2M HILL using Attachment 2 in Appendix G.
- Confirm that an inventory of chemicals brought on site by CH2M HILL subcontractors is available.
- Request or confirm locations of Material Safety Data Sheets (MSDSs) from the client, contractors, and subcontractors for chemicals to which CH2M HILL employees potentially are exposed.
- Before or as the chemicals arrive on site, obtain an MSDS for each hazardous chemical.

- Label chemical containers with the identity of the chemical and with hazard warnings, and store properly.
- Give employees required chemical-specific HAZCOM training using Attachment 3 in Appendix G.
- Store all materials properly, giving consideration to compatibility, quantity limits, secondary containment, fire prevention, and environmental conditions.

#### 10.2.2.3 Shipping and Transportation of Chemical Products

(Reference CH2M HILL's Procedures for Shipping and Transporting Dangerous Goods)

Chemicals brought to the site might be defined as hazardous materials by the U.S. Department of Transportation (DOT). All staff who ship the materials or transport them by road must receive CH2M HILL training in shipping dangerous goods. All hazardous materials that are shipped (e.g., via Federal Express) or are transported by road must be properly identified, labeled, packed, and documented by trained staff. Contact the HSM or the Equipment Coordinator for additional information.

#### 10.2.2.4 Lifting

(Reference CH2M HILL SOP HS-29, Lifting)

- Proper lifting techniques must be used when lifting any object.
  - Plan storage and staging to minimize lifting or carrying distances.
  - Split heavy loads into smaller loads.
  - Use mechanical lifting aids whenever possible.
  - Have someone assist with the lift -- especially for heavy or awkward loads.
  - Make sure the path of travel is clear prior to the lift.

#### 10.2.2.5 Fire Prevention

(Reference CH2M HILL SOP HS-22, Fire Prevention)

- Fire extinguishers shall be readily identified and located and provided so that the travel distance from any work area to the nearest extinguisher is less than 100 feet. When 5 gallons or more of a flammable or combustible liquid is being used, an extinguisher must be within 50 feet. Extinguishers must:
  - be maintained in a fully charged and operable condition,
  - be visually inspected each month, and
  - undergo a maintenance check each year.
- The area in front of extinguishers must be kept clear.
- Combustible materials stored outside should be at least 10 feet from any building.
- Solvent waste and oily rags must be kept in a fire resistant, covered container until removed from the site.
- Flammable/combustible liquids must be kept in approved containers, and must be stored in an approved storage cabinet.

#### 10.2.2.6 Electrical

(Reference CH2M HILL SOP HS-23, Electrical)

- Do not tamper with electrical wiring and equipment unless qualified to do so. All electrical wiring and equipment must be considered energized until lockout/tagout procedures are implemented.
- Inspect electrical equipment, power tools, and extension cords for damage prior to use. Do not use defective electrical equipment, remove from service.
- All temporary wiring, including extension cords and electrical power tools, must have ground fault circuit interrupters (GFCIs) installed.
- Extension cords must be:
  - equipped with third-wire grounding.
  - covered, elevated, or protected from damage when passing through work areas.
  - protected from pinching if routed through doorways.
  - not fastened with staples, hung from nails, or suspended with wire.
- Electrical power tools and equipment must be effectively grounded or double-insulated UL approved.

- Operate and maintain electric power tools and equipment according to manufacturers' instructions.
- Maintain safe clearance distances between overhead power lines and any electrical conducting material unless the power lines have been de-energized and grounded, or where insulating barriers have been installed to prevent physical contact. Maintain at least 10 feet from overhead power lines for voltages of 50 kV or less, and 10 feet plus ½ inch for every 1 kV over 50 kV.
- Protect all electrical equipment, tools, switches, and outlets from environmental elements.

### 10.2.2.7 Cold Stress

(Reference CH2M HILL SOP HS-09, Heat and Cold Stress)

- Be aware of the symptoms of cold-related disorders, and wear proper, layered clothing for the anticipated fieldwork. Appropriate rain gear is a must in cool weather.
- Consider monitoring the work conditions and adjusting the work schedule using guidelines developed by the U.S. Army (wind-chill index) and the National Safety Council (NSC).
- Wind-Chill Index is used to estimate the combined effect of wind and low air temperatures on exposed skin. The wind-chill index does not take into account the body part that is exposed, the level of activity, or the amount or type of clothing worn. For those reasons, it should only be used as a guideline to warn workers when they are in a situation that can cause cold-related illnesses.
- NSC Guidelines for Work and Warm-Up Schedules can be used with the wind-chill index to estimate work and warm-up schedules for fieldwork. The guidelines are not absolute; workers should be monitored for symptoms of cold-related illnesses. If symptoms are not observed, the work duration can be increased.
- Persons who experience initial signs of immersion foot, frostbite, hypothermia should consult the SSC/DSC to avoid progression of cold-related illness.
- Observe one another for initial signs of cold-related disorders.
- Obtain and review weather forecast – be aware of predicted weather systems along with sudden drops in temperature, increase in winds, and precipitation.

**SYMPTOMS AND TREATMENT OF COLD STRESS**

| | **Immersion (Trench) Foot** | **Frostbite** | **Hypothermia** |
|---|---|---|---|
| Signs and Symptoms | Feet discolored and painful; infection and swelling present. | Blanched, white, waxy skin, but tissue resilient; tissue cold and pale. | Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration. |
| Treatment | Seek medical treatment immediately. | Remove victim to a warm place. Re-warm area quickly in warm–but **not** hot–water. Have victim drink warm fluids, but **not** coffee or alcohol. Do not break blisters. Elevate the injured area, and get medical attention. | Remove victim to a warm place. Have victim drink warm fluids, but **not** coffee or alcohol. Get medical attention. |

### 10.2.2.8 Procedures for Locating Buried Utilities

**Local Utility Mark-Out Service**
Name: Utilities Underground
Phone: 800/424-5555

- Where available, obtain utility diagrams for the facility.
- Review locations of sanitary and storm sewers, electrical conduits, water supply lines, natural gas lines, and fuel tanks and lines.
- Review proposed locations of intrusive work with facility personnel knowledgeable of locations of utilities. Check locations against information from utility mark-out service.
- Where necessary (e.g., uncertainty about utility locations), excavation or drilling of the upper depth interval should be performed manually
- Monitor for signs of utilities during advancement of intrusive work (e.g., sudden change n advancement of auger or split spoon).
- When the client or other onsite party is responsible for determining the presence and locations of buried utilities, the SSC should confirm that arrangement.

## 10.2.3 Biological Hazards and Controls

### 10.2.3.1 Snakes

Snakes typically are found in underbrush and tall grassy areas. If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately. **DO NOT** apply ice, cut the wound, or apply a tourniquet. Try to identify the type of snake: note color, size, patterns, and markings.

### 10.2.3.2 Poison Ivy and Poison Sumac

Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas. Become familiar with the identity of these plants. Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.

### 10.2.3.3 Ticks

Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch in size. Wear tightly woven light-colored clothing with long sleeves and pant legs tucked into boots; spray **only outside** of clothing with permethrin or permanone and spray skin with only DEET; and check yourself frequently for ticks.

If bitten by a tick, grasp it at the point of attachment and carefully remove it. After removing the tick, wash your hands and disinfect and press the bite areas. Save the removed tick. Report the bite to human resources. Look for symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF). Lyme: a rash might appear that looks like a bullseye with a small welt in the center. RMSF: a rash of red spots under the skin 3 to 10 days after the tick bite. In both cases, chills, fever, headache, fatigue, stiff neck, and bone pain may develop. If symptoms appear, seek medical attention.

### 10.2.3.4 Bees and Other Stinging Insects

Bee and other stinging insects may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic. Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past, and inform the SSC and/or buddy. If a stinger is present, remove it carefully with tweezers. Wash and disinfect the wound, cover it, and apply ice. Watch for allergic reaction; seek medical attention if a reaction develops.

### 10.2.3.5 Bloodborne Pathogens

(Reference CH2M HILL SOP HS-36, Bloodborne Pathogens)

Exposure to bloodborne pathogens may occur when rendering first aid or CPR, or when coming into contact with landfill waste or waste streams containing potentially infectious material. Exposure controls and personal protective equipment (PPE) are required as specified in CH2M HILL SOP HS-36, *Bloodborne Pathogens.* Hepatitis B vaccination must be offered before the person participates in a task where exposure is a possibility.

## 10.2.4 Radiological Hazards and Controls

Refer to CH2M HILL's *Corporate Health and Safety Program, Program and Training Manual,* and *Corporate Health and Safety Program, Radiation Protection Program Manual,* for standards of practice in contaminated areas.

| Hazards | Controls |
|---|---|
| None Known | None Required |

## 10.2.5 Contaminants of Concern

(Refer to Project Files for more detailed contaminant information)

| Contaminant | Location and Maximum[a] Concentration (ppm) | Exposure Limit[b] | IDLH[c] | Symptoms and Effects of Exposure | PIP[d] (eV) |
|---|---|---|---|---|---|
| Aldrin | Potential | .25 mg/m$^3$ | 100 Ca | Headache; dizziness; nausea; vomit; malaise; sweating; limb jerks; convulsions | NA |
| Dieldrin | Potential | .25 mg/m$^3$ | 450 Ca | Headache; dizziness; nausea; vomit; malaise; sweating; limb jerks; convulsions | NA |
| 4,4 DDD | Potential | NL | NL | No information found in reference material | UK |
| 4,4 DDE | Potential | NL | NL | No information found in reference material | UK |
| DDT | Potential | 0. 5 mg/m$^3$ | 500 Ca | Paresthesia of tongue, lips, hand, and face; tremors; dizziness; confusion; headache; fatigue; convulsions; eye and skin irritation; vomiting | UK |
| Endosulfan | Potential | 0.1 mg/m$^3$ | NL | Irritated skin, nausea, confusion, agitation, flushing, dry mouth, tremor, convulsion, headache | UK |
| Endrin Total | Potential | 0.1 mg/m$^3$ | 2 | Headache; dizziness; nausea; vomit; malaise; sweating; limb jerks; convulsions | |
| Heptachlor | Potential | .5 mg/m$^3$ | 700 Ca | Carcinogen; liver damage | NA |
| Heptachlor epoxide | Potential | NL | NL | No information found in reference materials | UK |
| Lindane | Potential | .5 mg/m$^3$ | 50 | Irritated eyes, skin, nose, throat; Headache; dizziness; nausea; vomit; malaise; sweating; limb jerks; convulsions | UK |
| Methoxychlor | Potential | 15 mg/m$^3$ | 5000 Ca | Trembling; convulsions; liver/kidney damage | UK |
| alpha-BHc | Potential | .5 mg/m$^3$ | NL<br>Ca | Confirmed carcinogen; poison by ingestion; convulsions; cyanosis | UK |
| beta-BHC | Potential | .5 mg/m$^3$ | NL<br>Ca | Confirmed carcinogen; poison by ingestion; convulsions; cyanosis | UK |
| delta-BHC | Potential | .5 mg/m$^3$ | NL Ca | Confirmed carcinogen; poison by ingestion; convulsions; cyanosis | UK |

| Contaminant | Location and Maximum[a] Concentration (ppm) | Exposure Limit[b] | IDLH[c] | Symptoms and Effects of Exposure | PIP[d] (eV) |
|---|---|---|---|---|---|
| gamma-BHC | Potential | .5 mg/m$^3$ | NL<br>Ca | Confirmed carcinogen; poison by ingestion; convulsions; cyanosis | UK |

Footnotes:

[a] Specify sample-designation and media: SB (Soil Boring), A (Air), D (Drums), GW (Groundwater), L (Lagoon), TK (Tank), S (Surface Soil), SL (Sludge), SW (Surface Water).

[b] Appropriate value of PEL, REL, or TLV listed.

[c] IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant); NL = No limit found in reference materials; CA = Potential occupational carcinogen.

[d] PIP = photoionization potential; NA = Not applicable; UK = Unknown.

## 10.2.6 Potential Routes of Exposure

| | | |
|---|---|---|
| **Dermal:** Contact with contaminated media. This route of exposure is minimized through proper use of PPE, as specified in Section 10.4. | **Inhalation:** Vapors and contaminated particulates. This route of exposure is minimized through proper respiratory protection and monitoring, as specified in Sections 10.4 and 10.5, respectively. | **Other:** Inadvertent ingestion of contaminated media. This route should not present a concern if good hygiene practices are followed (e.g., wash hands and face before drinking or smoking). |

# 10.3 Project Organization and Personnel

## 10.3.1 CH2M HILL Employee Medical Surveillance and Training

(Reference CH2M HILL SOPs HS-01, Medical Surveillance, and HS-02, Health and Safety Training)

The employees listed below are enrolled in the CH2M HILL Comprehensive Health and Safety Program and meet state and federal hazardous waste operations requirements for 40-hour initial training, 3-day on-the-job experience, and 8-hour annual refresher training. Employees designated "SSC" have completed a 12-hour site safety coordinator course, and have documented requisite field experience. An SSC with a level designation (D, C, B) equal to or greater than the level of protection being used must be present during all tasks performed in exclusion or decontamination zones. Employees designated "FA-CPR" are currently certified by the American Red Cross, or equivalent, in first aid and CPR. At least one FA-CPR designated employee must be present during all tasks performed in exclusion or decontamination zones. The employees listed below are currently active in a medical surveillance program that meets state and federal regulatory requirements for hazardous waste operations. Certain tasks (e.g., confined-space entry) and contaminants (e.g., lead) may require additional training and medical monitoring.

Pregnant employees are to be informed of and are to follow the procedures in CH2M HILL's SOP HS-04, *Reproduction Protection*, including obtaining a physician's statement of the employee's ability to perform hazardous activities before being assigned fieldwork.

| Employee Name | Office | Responsibility | SSC/FA-CPR |
|---|---|---|---|
| TBD | SEA | Field Team Leader/SSC | Level C SSC; FA-CPR |
| | SEA | Field Team Member/ Alt SSC | Level C SSC; FA-CPR |
| | SEA | Field Team Member/ Alt SSC | Level C SSC; FA-CPR |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

## 10.3.2 Field Team Chain of Command and Communication Procedures

### 10.3.2.1 Client

Contact Name: Jerry Sedgwick/Chevron Environmental Management Company
Phone: 925/842-1813
Onsite Contact: Arno Johnson/Bee-Jay Scales Inc.
Phone: 509/837-8280

### 10.3.2.2 CH2M HILL

Project Manager: Doug Holsten/SEA
Health and Safety Manager: John Culley/SEA
Field Team Leader/SSC: **TBD**

The SSC is responsible for contacting the Field Team Leader and Project Manager. In general, the Project Manager will contact the client. The Health and Safety Manager should be contacted as appropriate.

### 10.3.2.3 CH2M HILL Subcontractors

(Reference CH2M HILL SOP HS-55, *Subcontractor, Contractor, and Owner*)

Subcontractor: **TBD**
Subcontractor Contact Name:
Telephone:
Subcontractor Task(s): Drilling and well installation

The subcontractors listed above are covered by this HSP and must be provided a copy of this plan. However, this plan does not address hazards associated with the tasks and equipment that the subcontractor has expertise in (e.g., drilling, excavation work, electrical). Subcontractors are responsible for the health and safety procedures specific to their work, and are required to submit these procedures to CH2M HILL for review before the start of field work. Subcontractors must comply with the established health and safety plan(s). The CH2M HILL SSC should verify that subcontractor employee training, medical clearance, and fit test records are current and must monitor and enforce compliance with the established plan(s). CH2M HILL's oversight does not relieve subcontractors of their responsibility for effective implementation and compliance with the established plan(s).

CH2M HILL should continuously endeavor to observe subcontractors' safety performance. This endeavor should be reasonable, and include observing for hazards or unsafe practices that are both readily observable and occur in common work areas. CH2M HILL is not responsible for exhaustive observation for hazards and unsafe practices. In addition to this level of observation, the SSC is responsible for confirming CH2M HILL subcontractor performance against both the subcontractor's safety plan and applicable self-assessment checklists. Self-assessment checklists contained in Attachment 5 in Appendix G are to be used by the SSC to review subcontractor performance.

Health and safety related communications with CH2M HILL subcontractors should be conducted as follows:

- Brief subcontractors on the provisions of this plan, and require them to sign the Employee Signoff Form included in Attachment 1 in Appendix G.
- Request subcontractor(s) to brief the project team on the hazards and precautions related to their work.
- When apparent non-compliance/unsafe conditions or practices are observed, notify the subcontractor safety representative and require corrective action – the subcontractor is responsible for determining and implementing necessary controls and corrective actions.
- When repeat non-compliance/unsafe conditions are observed, notify the subcontractor safety representative and stop affected work until adequate corrective measures are implemented.
- When an apparent imminent danger exists, immediately remove all affected CH2M HILL employees and subcontractors, notify subcontractor safety representative, and stop affected work until adequate corrective measures are implemented. Notify the Project Manager and HSM as appropriate.
- Document all oral health and safety related communications in project field logbook, daily reports, or other records.

## 10.4 Personal Protective Equipment (PPE)

(Reference CH2M HILL SOP HS-07, Personal Protective Equipment, HS-08, Respiratory Protection)

**PPE Specifications** [a]

| Task | Level | Body | Head | Respirator [b] |
|---|---|---|---|---|
| • General site entry<br>• Surveying | NA | Work clothes; steel-toe, leather work boots; work glove. | Hardhat [c]<br>Safety glasses<br>Ear protection [d] | None required |
| • Drilling<br>• Well Installation<br>• Groundwater sampling<br>• Soil sampling | Modified D | **Coveralls:** Cotton coveralls, or uncoated Tyvek® if cotton cannot be kept clean<br>**Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots<br>**Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves. | Hardhat [c]<br>Splash shield [c]<br>Safety glasses<br>Ear protection [d] | None required. |

**Reasons for Upgrading or Downgrading Level of Protection**

| Upgrade[e] | Downgrade |
|---|---|
| • Request from individual performing tasks.<br>• Change in work tasks that will increase contact or potential contact with hazardous materials.<br>• Occurrence or likely occurrence of gas or vapor emission.<br>• Known or suspected presence of dermal hazards.<br>• Instrument action levels (Section 10.5) exceeded. | • New information indicating that situation is less hazardous than originally thought.<br>• Change in site conditions that decreases the hazard.<br>• Change in work task that will reduce contact with hazardous materials. |

[a] Modifications are as indicated. CH2M HILL will provide PPE only to CH2M HILL employees.

[b] No facial hair that would interfere with respirator fit is permitted.

[c] Hardhat and splash-shield areas are to be determined by the SSC.

[d] Ear protection should be worn when conversations cannot be held at distances of 3 feet or less without shouting.

[e] Performing a task that requires an upgrade to a higher level of protection (e.g., Level D to Level C) is permitted only when the PPE requirements have been approved by the HSM, and an SSC qualified at that level is present.

## 10.5 Air Monitoring/Sampling

(Reference CH2M HILL SOP HS-06, Air Monitoring)

### 10.5.1 Air Monitoring Specifications

| Instrument | Tasks | Action Levels[a] | | Frequency [b] | Calibration |
|---|---|---|---|---|---|
| **PID:** OVM, MiniRAE, MultiRAE with 10.6eV lamp or equivalent | • Drilling<br>• Well installation<br>• Groundwater sampling<br>• Soil sampling | <1 ppm →<br>≥1 ppm → | Level D<br>Stop work; notify HSM | Initially and periodically during task | Daily |
| **Visual Dust Monitor** | All Tasks | No Visual Dust<br>Visual Dust | → Level D<br>→ Implement dust control measures | Initially and periodically during tasks | NA |

[a] Action levels apply to **sustained** breathing-zone measurements above background **for more than 5 minutes**.

[b] The exact frequency of monitoring depends on field conditions and is to be determined by the SSC; generally, every 5 to 15 minutes if acceptable; more frequently may be appropriate. Monitoring results should be recorded. Documentation should include instrument and calibration information, time, measurement results, personnel monitored, and place/location where measurement is taken (e.g., "Breathing Zone/MW-3", "at surface/SB-2", etc.).

[c] If the measured percent of $O_2$ is less than 10, an accurate LEL reading will not be obtained. Percent LEL and percent $O_2$ action levels apply only to ambient working atmospheres, and not to confined-space entry. More-stringent percent LEL and $O_2$ action levels are required for confined-space entry (refer to Section 10.2).

### 10.5.2 Calibration Specifications

(Refer to the respective manufacturer's instructions for proper instrument-maintenance procedures)

| Instrument | Gas | Span | Reading | Method |
|---|---|---|---|---|
| **PID:** OVM, 10.6 or 11.8 eV bulb | 100 ppm isobutylene | RF = 1.0 | 100 ppm | 1.5 lpm reg T-tubing |
| **PID:** MiniRAE, 10.6 eV bulb | 100 ppm isobutylene | CF = 100 | 100 ppm | 1.5 lpm reg T-tubing |
| **PID:** MultiRAE | 100 ppm isobutylene | Per Manufacturer's Specifications | | |

### 10.5.3 Air Sampling

Sampling, in addition to real-time monitoring, may be required by other OSHA regulations where there may be exposure to certain contaminants. Air sampling typically is required when site contaminants include lead, cadmium, arsenic, asbestos, and certain volatile organic compounds. Contact the HSM immediately if these contaminants are encountered.

**Method Description**

Not required at this time

## 10.6 Decontamination

(Reference CH2M HILL SOP HS-13, Decontamination)

The SSC must establish and monitor the decontamination procedures and their effectiveness. Decontamination procedures found to be ineffective will be modified by the SSC. The SSC must ensure that procedures are established for disposing of materials generated on the site.

### 10.6.1 Decontamination Specifications

| Personnel | Sample Equipment | Heavy Equipment |
|---|---|---|
| • Boot wash/rinse<br>• Glove wash/rinse<br>• Outer-glove removal<br>• Body-suit removal<br>• Inner-glove removal<br>• Respirator removal<br>• Hand wash/rinse<br>• Face wash/rinse<br>• Shower ASAP<br>• Dispose of PPE in municipal trash, or contain for disposal<br>• Dispose of personnel rinse water to facility or sanitary sewer, or contain for offsite disposal | • Wash/rinse equipment<br>• Solvent-rinse equipment<br>• Contain solvent waste for offsite disposal | • Power wash<br>• Steam clean<br>• Dispose of equipment rinse water to facility or sanitary sewer, or contain for offsite disposal |

### 10.6.2 Diagram of Personnel-Decontamination Line

No eating, drinking, or smoking is permitted in contaminated areas and in exclusion or decontamination zones. The SSC should establish areas for eating, drinking, and smoking. Contact lenses are not permitted in exclusion or decontamination zones.

Figure 10-1 illustrates a conceptual establishment of work zones, including the decontamination line. Work zones are to be modified by the SSC to accommodate task-specific requirements.

## 10.7 Spill-Containment Procedures

Sorbent material will be maintained in the support zone. Incidental spills will be contained with sorbent and disposed of properly.

Notes:

**1.** This figure can be used as a guide to establish a decontamination line when used PPE will either be disposed of or re-used, and can be applied to any level of protection.

**2.** The stations illustrated below may be removed when not applicable (e.g., no respirator station if not wearing Level C).

**3.** The SSC may modify the decontamination sequence based on site-specific conditions.

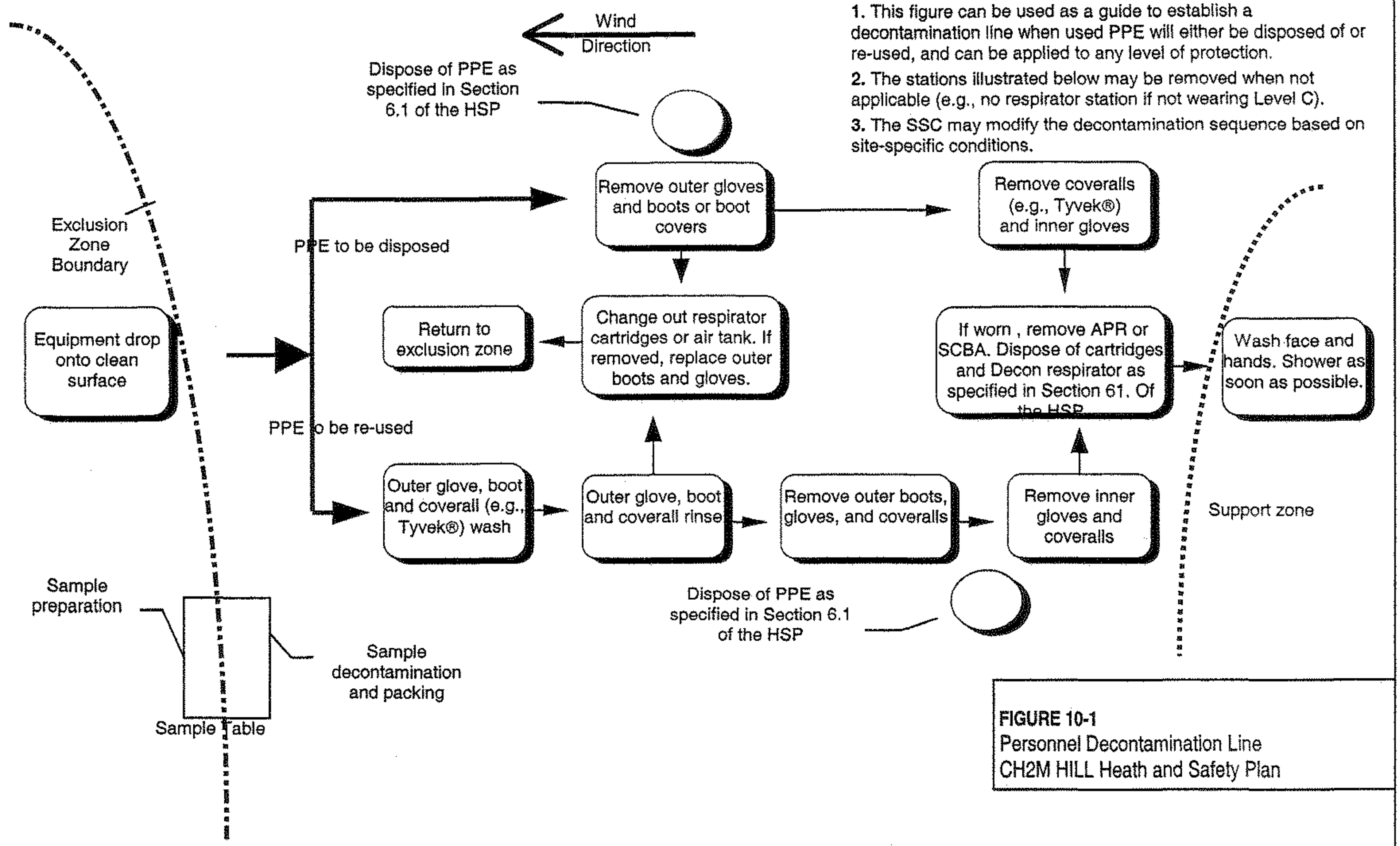


**FIGURE 10-1**
Personnel Decontamination Line
CH2M HILL Heath and Safety Plan

## 10.8 Site-Control Plan

### 10.8.1 Site-Control Procedures

(Reference CH2M HILL SOP HS-11, Site Control)

- The SSC will conduct a site safety briefing (see below) before starting field activities or as tasks and site conditions change.
- Topics for briefing on site safety: general discussion of Health and Safety Plan, site-specific hazards, locations of work zones, PPE requirements, equipment, special procedures, emergencies.
- The SSC records attendance at safety briefings in a logbook and documents the topics discussed.
- Establish support, decontamination, and exclusion zones. Delineate with flags or cones as appropriate. Support zone should be upwind of the site. Use access control at entry and exit from each work zone.
- Establish onsite communication consisting of the following:
  - Line-of-sight and hand signals
  - Air horn
  - Two-way radio or cellular telephone if available
- Establish offsite communication.
- Establish and maintain the "buddy system."
- Initial air monitoring is conducted by the SSC in appropriate level of protection.
- The SCC is to conduct periodic inspections of work practices to determine the effectiveness of this plan – refer to Sections 2 and 3. Deficiencies are to be noted, reported to the HSM, and corrected.

### 10.8.2 Hazwoper Compliance Plan

(Reference CH2M HILL SOP HS-19, Site-Specific Written Safety Plans)

Certain parts of the site work are covered by state or federal Hazwoper standards and therefore require training and medical monitoring. Anticipated Hazwoper tasks (Section 1.1.1) might occur consecutively or concurrently with respect to non-Hazwoper tasks. This section outlines procedures to be followed when approved activities specified in Section 1.1.2 do not require 24- or 40-hour training. Non-Hazwoper-trained personnel also must be trained in accordance with all other state and federal OSHA requirements.

- In many cases, air sampling, in addition to real-time monitoring, must confirm that there is no exposure to gases or vapors before non-Hazwoper-trained personnel are allowed on the site, or while non-Hazwoper-trained staff are working in proximity to Hazwoper activities. Other data (e.g., soil) also must document that there is no potential for exposure. The HSM must approve the interpretation of these data. Refer to subsections 2.5 and 5.3 for contaminant data and air sampling requirements, respectively.
- When non-Hazwoper-trained personnel are at risk of exposure, the SSC must post the exclusion zone and inform non-Hazwoper-trained personnel of the:
  - nature of the existing contamination and its locations
  - limitations of their access
  - emergency action plan for the site
- Periodic air monitoring with direct-reading instruments conducted during regulated tasks also should be used to ensure that non-Hazwoper-trained personnel (e.g., in an adjacent area) are not exposed to airborne contaminants.
- When exposure is possible, non-Hazwoper-trained personnel must be removed from the site until it can be demonstrated that there is no longer a potential for exposure to health and safety hazards.
- Remediation treatment system start-ups: Once a treatment system begins to pump and treat contaminated media, the site is, for the purposes of applying the Hazwoper standard, considered a treatment, storage, and disposal facility (TSDF). Therefore, once the system begins operation, only Hazwoper-trained personnel (minimum of 24 hour of training) will be permitted to enter the site. All non-Hazwoper-trained personnel must not enter the TSDF area of the site.

## 10.9 Emergency Response Plan

(Reference CH2M HILL, SOP HS-12, Emergency Response)

### 10.9.1 Pre-Emergency Planning

The SSC performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with CH2M HILL onsite parties, the facility, and local emergency-service providers as appropriate.

- Review the facility emergency and contingency plans where applicable.
- Determine what onsite communication equipment is available (e.g., two-way radio, air horn).
- Determine what offsite communication equipment is needed (e.g., nearest telephone, cell phone).
- Confirm and post emergency telephone numbers, evacuation routes, assembly areas, and route to hospital; communicate the information to onsite personnel.
- Review changed site conditions, onsite operations, and personnel availability in relation to emergency response procedures.
- Where appropriate and acceptable to the client, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies.
- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
- Inventory and check site emergency equipment, supplies, and potable water.
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, and releases.
- Rehearse the emergency response plan before site activities begin, including driving route to hospital.
- Brief new workers on the emergency response plan.

The SSC will evaluate emergency response actions and initiate appropriate follow-up actions.

### 10.9.2 Emergency Equipment and Supplies

The SSC should mark the locations of emergency equipment on the site map and post the map.

| Emergency Equipment and Supplies | Location |
|---|---|
| 20 LB (or two 10-lb) fire extinguisher (A, B, and C classes) | Required w/ drill rig |
| First aid kit | Support Zone/Field Vehicle |
| Bloodborne-pathogen kit | Support Zone/Field Vehicle |
| Cellular phone | Support Zone/Field Vehicle |

### 10.9.3 Incident Response

In fires, explosions, or chemical releases, actions to be taken include the following:

- Shut down CH2M HILL operations and evacuate the immediate work area.
- Notify appropriate response personnel.
- Account for personnel at the designated assembly area(s).
- Assess the need for site evacuation, and evacuate the site as warranted.

Instead of implementing a work-area evacuation, note that small fires or spills posing minimal safety or health hazards may be controlled.

## 10.9.4 Emergency Medical Treatment

The procedures listed below may also be applied to non-emergency incidents. Injuries and illnesses (including overexposure to contaminants) must be reported to Human Resources. If there is doubt about whether medical treatment is necessary, or if the injured person is reluctant to accept medical treatment, contact the CH2M HILL medical consultant. During non-emergencies, follow these procedures as appropriate.

- Notify appropriate emergency response authorities listed in Section 9.8 (e.g., 911).
- The SCC will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room.
- Prevent further injury.
- Initiate first aid and CPR where feasible.
- Get medical attention immediately.
- Perform decontamination where feasible; lifesaving and first aid or medical treatment take priority.
- Make certain that the injured person is accompanied to the emergency room.
- When contacting the medical consultant, state that the situation is a CH2M HILL matter, and give your name and telephone number, the name of the injured person, the extent of the injury or exposure, and the name and location of the medical facility where the injured person was taken.
- Report incident as outlined in Section 9.7.

## 10.9.5 Evacuation

- Evacuation routes and assembly areas (and alternative routes and assembly areas) are specified on the site map.
- Evacuation route(s) and assembly area(s) will be designated by the SSC before work begins.
- Personnel will assemble at the assembly area(s) upon hearing the emergency signal for evacuation.
- The SSC and a "buddy" will remain on the site after the site has been evacuated (if safe) to assist local responders and advise them of the nature and location of the incident.
- The SSC will account for all personnel in the onsite assembly area.
- A designated person will account for personnel at alternate assembly area(s).
- The SSC will write up the incident as soon as possible after it occurs and submit a report to the Corporate Director of Health and Safety.

## 10.9.6 Evacuation Signals

| Signal | Meaning |
|---|---|
| Grasping throat with hand | Emergency-help me. |
| Thumbs up | OK; understood. |
| Grasping buddy's wrist | Leave area now. |
| Continuous sounding of horn | Emergency; leave site now. |

## 10.9.7 Incident Notification and Reporting

- Upon any project incident (fire, spill, injury, near miss, death, etc.), immediately notify the PM and HSM. Call emergency beeper number if HSM is unavailable.
- For CH2M HILL work-related injuries or illnesses, contact and help Human Resources administrator complete an Incident Report Form (IRF). IRF must be completed within 24 hours of incident.
- For CH2M HILL subcontractor incidents, complete the Subcontractor Accident/Illness Report Form and submit to the HSM.
- Notify and submit reports to client as required in contract.

## 10.10 Approval

This site-specific Health and Safety Plan has been written for use by CH2M HILL only. CH2M HILL claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if those conditions change.

### 10.10.1 Original Plan

**Written By:** Judi Radloff/SEA **Date:** October 2002

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**Approved By:** Culley **Date: October 10, 2002**

**John Culley/SEA**

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### 10.10.2 Revisions

**Revisions Made By:** **Date:**

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**Revisions to Plan:**

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**Revisions Approved By:** **Date:**

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## 10.11 Attachments (in Appendix G)

**Attachment 1:** Employee Signoff Form – Field Safety Instructions

**Attachment 2:** Project-Specific Chemical Product Hazard Communication Form

**Attachment 3:** Chemical-Specific Training Form

**Attachment 4:** Emergency Contacts

**Attachment 5:** Project Activity Self-Assessment Checklists

SECTION 11

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APPENDIX A

# Well Logs

Submitted on a CD.

APPENDIX B

# Summary of Ownership

**Legal description of property: The western portion of Lots 10 and 11, "Block B" of GEORGE E. SHAW'S ACRE TRACTS ADDITION TO SUNNYSIDE, Washington, according to the official plat thereof recorded in Volume "A" of Plats, page 74, records of Yakima County, Washington, lying northerly of the Northern Pacific Right of Way.**

| | | | | |
|---|---|---|---|---|
| 10/4/1991 | Glacier Park Company | Gordon Laird | Quit Claim Deed | All portion of Lot 10 and 11 Blk "B" lying westerly of a line drawn parallel with and distant 634 ft Easterly of West line except West 125 ft width lying Northerly of line drawn parallel with and distant 150 ft northerly |
| 10/10/1991 | Glacier Park Company | Trillium Corporation | Special Warranty Deed | All portion of Lot 10 and 11 Blk "B" except West 125 ft width lying Northerly of a line drawn parallel with and distance 150 ft northerly |
| 1/21/1992 | Trillium Corporation | Hickenbottom & Sons, Inc. | Quit Claim Deed | All portion of Lot 10 and 11 Blk "B" except all portion of Lots 10 & 11 lying Westerly of line drawn parallel with and distant 634 ft Easterly of West line |
| 8/2/1995 | Gordon Laird | Bee-Jay Scales Inc. | Real Estate Contract | All portion of Lot 10 and 11 Blk "B" except West 125 ft width lying Northerly of line drawn parallel with and distant 150 ft northerly |

This preliminary title report is not an abstract of title or a title policy., nor is it a written representation as to the condition of title and may not list all liens, defects, and rances affecting title to the land. It is offered solely as a summary to assist in u nding the chain of title at the parcel described above.

**Legal description of property: The western portion of Lots 10 and 11, "Block B" of G[illegible]RGE E. SHAW'S ACRE TRACTS ADDITIO[illegible] SUNNYSIDE, Washington, according to the official plat thereof recorded in Volume "A" of Plats, page 74, records of Yakima County, Washington, lying northerly of the Northern Pacific Right of Way.**

| Date of Recordation | Grantor | Grantee | Type of recording instrument | Notes |
|---|---|---|---|---|
| | | | | and southerly of Warehouse Ave. |
| 9/28/1976 | Gladys P. Mitchell | Donald W. Langenegger | Warranty Deed | West 125 ft portion of Lot 10 Blk "B" lying Northerly of NP r/w |
| 1/25/1977 | Nancy L. Langenegger | Donald W. Langenegger | Quit claim Deed | West 125 ft portion of Lot 10 Blk "B" lying Northerly of NP r/w |
| 7/13/1981 | Donald L. Langenegger | Chevron Chemical Company | Warranty Deed | West 125 ft of Lot 10 Blk "B" lying Northerly of NP r/w |
| 9/23/1987 | Chevron Chemical Company | Bee-Jay Scales, Inc. | Statutory Warranty Deed | West 125 ft of Lot 10 Blk "B" lying northerly of NP r/w except minerals, geothermal, and drilling rights below 500 ft below surface |
| 6/15/89 | Burlington Northern Railroad Company (formerly named Burlington Northern Inc.) | Glacier Park Company | Quit claim Deed | All portion Lot 10 & 11, Blk "B" except West 125 ft width of Lot 11 |
| 10/12/1989 | Burlington Northern Railroad Company (formerly named Burlington Northern Inc.) | Glacier Park Company | Correction Quit claim Deed | All portion Lot 10 & 11 Blk "B" except West 125 ft width of Lots 10 & 11 |
| 4/20/90 | Burlington Northern Railroad Company (formerly named Burlington Northern Inc.) | Glacier Park Company | Correction Quit Claim Deed | All portions of Lot 10 and 11 Blk "B" except West 125 ft width lying Northerly of line drawn parallel with and distant 150 ft northerly |

**Legal description of property: The western portion of Lots 10 and 11, "Block B" of GEORGE E. SHAW'S ACRE TRACTS ADDITION TO SUNNYSIDE, Washington, according to the official plat thereof recorded in Volume "A" of Plats, page 74, records of Yakima County, Washington, lying northerly of the Northern Pacific Right of Way.**

| Date of Recordation | Grantor | Grantee | Type of recording instrument | Notes |
|---|---|---|---|---|
| 9/6/1944 | F. W. Grending & Ethel W. Grending | L. D. Blair | Deed | Portion of Lot 10 Blk "B" ly N of the NPR Co. r/w subject to Randolph lease |
| 9/6/1944 | L. D. Blair | The Old National Bank of Spokane | Mortgage | |
| 4/11/1946 | L. D. Blair | Northern Pacific Railway Company | Deed | Portion of Lot 10 Blk "B" lying northerly of NPR Co's r/w as described by deed recorded 9/7/1906 **except West 125 ft** |
| 4/11/1946 | Old National Bank of Spokane | L. D. Blair | Satisfaction of Mortgage | |
| 3/2/1949 | L. D. Blair | Vernon Mitchell & Gladys P. Mitchell | Deed | West 125 Ft portion of Lot 10 Blk "B" ly Northerly of NP r/w |
| 5/22/1961 | Northern Pacific Railway Company | Elmer A. Hickenbottom and Robert R. Hickenbottom DBA as Elmer Hickenbottom and Son | Term Lease | No. 89753<br>Portion of Lots 10 and 11 Blk "B" lying northerly of the above described premises, easterly of a northerly production of the westerly line of Lot 13 and southerly of Warehouse Ave. |
| 5/22/1961 | Northern Pacific Railway Company | Elmer A. Hickenbottom and Robert R. Hickenbottom | Extension of Lease | No. 89753<br>Portion of Lots 10 and 11 Blk "B" lying northerly of the above described premises, easterly of a northerly production of the westerly line of Lot 13 |

**Legal description of property: The western portion of Lots 10 and 11, "Block B" of GEORGE E. SHAW'S ACRE TRACTS ADDITION TO SUNNYSIDE, Washington, according to the official plat thereof recorded in Volume "A" of Plats, page 74, records of Yakima County, Washington, lying northerly of the Northern Pacific Right of Way.**

| Date of Recordation | Grantor | Grantee | Type of recording instrument | Notes |
|---|---|---|---|---|
| 3/24/1902 | George E. Shaw & Frances A. Shaw | S. J. Harrison | Deed | Lot 10-11 & 12 Blk "B" |
| 8/2/1902 | S. J. Harrison & Loretta R. Harrison | Naaman Woodin | Deed | Lot 10-11 & 12 Blk "B" |
| 7/24/1903 | Naaman Woodin & Lottie W. Woodin | Thomas C. Williams | Q. C. Deed | Lot 10-11 & 12 Blk "B" |
| 5/4/1905 | T. C. Williams and Margaret C. Williams | N. P. Ry Co. | Lease ??? | Lot 10-11 & 12 Blk "B" |
| 6/18/1906 | Stephen J. Harrison & Loretta R. Harrison | Thomas C. Williams | Q. C. D. | Lot 10-11 & 12 Blk "B" |
| 8/10/1906 | Thomas C. Williams & Margaret C. Williams | N. P. Ry Co. | Contract for Deed for R. of W. | Lot 10 Blk "B" 250ft width being 150 on N. side & 100 ft on S. side of center line of said RR as surveyed and staked out on the ground desc as follows ... |
| 9/7/1906 | Thomas C. Williams & Margaret C. Williams | N. P. Ry Co. | Warranty Deed | Lot 10 Blk "B" 250ft width being 150 on N. side & 100 ft on S. side of center line of said RR as surveyed and staked out on the ground desc as follows ... |
| 1/20/1925 | L. C. Luce Sheriff of Yakina County Washington | The Oregon Mortgage Company Limited | Sheriff's Deed | Lots 10, 11 and 12 in Blk "B" of George E. Shaw's Acre Tracts except right of way of the N. P. Rlway Co. |
| 1/31/1936 | Oregon Mortgage Company | F. W. Grending & Ethel W. Grending | Deed | Lot 10 Blk "B" lying North of Northern Pacific R/W |
| 1/31/1036 | F. W. Grending & Ethel W. Grending | Home Owners' Loan Corporation | Mortgage | |
| | Grending | Randolph | | Unrecorded lease may have been executed |
| 6/16/1943 | F. W. Grending & Ethel W. Grending | L. D. Blair | Land Contract | |

This preliminary title report is not an abstract of title or a title policy., nor is it a written representation as to the condition of title and may not list all liens, defects, and er hrances affecting title to the land. It is offered solely as a summary to assist in und tanding the chain of title at the parcel described above.

**L description of property: The western portio Lots 10 and 11, "Block B" of GEORGE E. SHAW'S ACRE TRACTS ADDITION TO SUNNYSIDE, Washington, according to the official plat thereof recorded in Volume "A" of Plats, page 74, records of Yakima County, Washington, lying northerly of the Northern Pacific Right of Way.**

| | | | | |
|---|---|---|---|---|
| 2/20/1996 | Gordon Laird | Bee-Jay Scales, Inc. | Statutory Warranty Deed | All portion of Lot 10 and 11 Blk "B" except West 125 ft width lying Northerly of line drawn parallel with and distant 150 ft northerly and except West 490 ft |
| 2/20/1996 | Bee-Jay Scales, Inc. | Hickenbottom & Sons, Inc. | Statutory Warranty Deed | All portions of Lot 10 and 11 Blk "B" except West 125 ft width lying Northerly of line drawn parallel with and distant 150 ft northerly and except West 490 ft |
| Title currently vested as | Bee-Jay Scales, Inc. as to Parcel A and Gordon Laird on date of acquiring title as to Parcel B | | | Parcel A: West 125 ft of Lot 10 Blk "B" lying northerly of Northern Pacific r/w<br>Parcel B: West 490 ft of portion of Lots 10 & 11 except west 125 ft width of Lots 10 & 11 lying northerly of a line drawn parallel with and distant 150 ft northerly |

APPENDIX C

# Aerial Photographs

## Narrative Descriptions of Aerial Photographs, 1966 to 2001

Photograph interpretation of the site is reported in two sections per photograph:

1. Bee-Jay Scales/Sandy Farms
2. Hickenbottom & Sons, Inc.

The scale of all seven photographs is 1:4800.

### 1966 Aerial Photograph

#### Bee-Jay Scales/Sandy Farms

In the 1966 photograph, the northwest section of the Sandy Farms property is occupied by what looks like a residential house and yard. The north property line is bordered by trees. The northeast property section appears to be a dirt or gravel surface with some vehicles or tanks present. The southeast corner of the property appears to be used as aboveground storage space for tanks, drums or vehicles. Vertical storage tanks are observed (shadows and a horizontal tank that looks like possibly a liquid propane (L.P.) tank. At the center of the south property line there is a large building (labeled "Building 2" in the 1990 preliminary Hart Crowser environmental assessment report) with a smaller building located just to the northeast. The southwest portion of the site is grass-covered and has what appears to be four white aboveground storage tanks (ASTs).

#### Hickenbottom & Sons Fruit Company

The property show little sign of development and appears to be grass-covered with a few scattered trees to the south.

### 1973 Aerial Photograph

#### Bee-Jay Scales/Sandy Farms

Since 1966, an addition (Building 1, per Hart Crowser) was added along the south property line to Building 2. The southwest section of the property has been cleared of grass and appears to be a dirt or gravel surface. The four white features in this area have become more visible.

#### Hickenbottom & Sons Fruit Company

A few trees have been cut but the property does not show signs of other activity.

## 1979 Aerial Photograph

### Bee-Jay Scales/Sandy Farms

Trees along the north property line have been cut (except for the residential area in the northwest corner). A large, square building (Building 4, per Hart Crowser, 1990) now lies along western property edge. The four white, tank-like features in the southwest area of the property have been removed.

### Hickenbottom & Sons Fruit Company

Some type of activity has occurred in the northern half of the property with the appearance of stacks of material. The southern half of the property has been cleared, and it appears that footpaths have been cut through this area.

## 1982 Aerial Photograph

### Bee-Jay Scales/Sandy Farms

Trees in the northwest corner of the property have been cut but the residential house remains. In the northeast property corner there has appeared a series of white rectangular features (possibly drums, trucks, or storage tanks). A new building has been erected just north of Buildings 1 and 2.

### Hickenbottom & Sons Fruit Company

Since 1979, a building has been added to the northern part of the property. All grass has been cleared from the south part of the property.

## 1991 Aerial Photograph

### Bee-Jay Scales/Sandy Farms

Two buildings have been constructed in the northwest property corner. A rectangular building has replaced the residential house on the northwest corner of the property, and a smaller building was added just to the right and between this new rectangular building and Building 4. The white drums, trucks, or tanks along the north boundary have been replaced by what appears to be vehicles. On the eastern half of the property, a circular dirt drive has appeared that arcs around a central island of cars or drums. In the southeast corner, the L.P. tank is gone and a low-relief, rectangular feature can be seen, which correlates to the description of a lagoon provided in the 1990 Hart Crowser report.

### Hickenbottom & Sons Fruit Company

Since 1982, the building on the north part of the property has been divided into two smaller buildings. It appears that a portion of the northern half of the property has been paved. A wide access road entering from the east has been added to the center of the property. The southern half of the property has been developed with what appears to be two small buildings. Two large stacks of material have also been added adjacent to the south property line.

## 1998 Aerial Photograph

### Bee-Jay Scales/Sandy Farms

Since 1991, the north border and central island areas have become more densely filled with multicolored cars or crates and are now intergrown with shrubs. The ASTs observed in this area have been removed. The rectangular feature (lagoon) that was visible in the southeast corner in 1991 now shows a bright green color in this photograph.

### Hickenbottom & Sons Fruit Company

The buildings in the northern half have been removed. What appears to be two tractor-trailers and multiple vehicles are parked on the paved region where painted parking spaces can be clearly seen. There appears to be piles or stacks of material along the western edge and southwest corner of the property. The two small buildings on the southern half of the property have been removed.

## 2001 Aerial Photograph

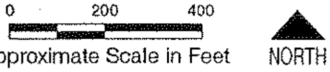
### Bee-Jay Scales/Sandy Farms

The central island of vehicles or tanks remain in the center of the property. The green rectangular structure can still be found in the southeast corner of the property.

### Hickenbottom & Sons Fruit Company

Piles of material from the western property border have been removed. On the southern half of the property, it appears that a small building has been erected.

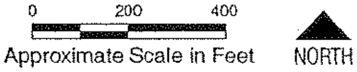
Source: WSDOT



**1966 Aerial Photo**

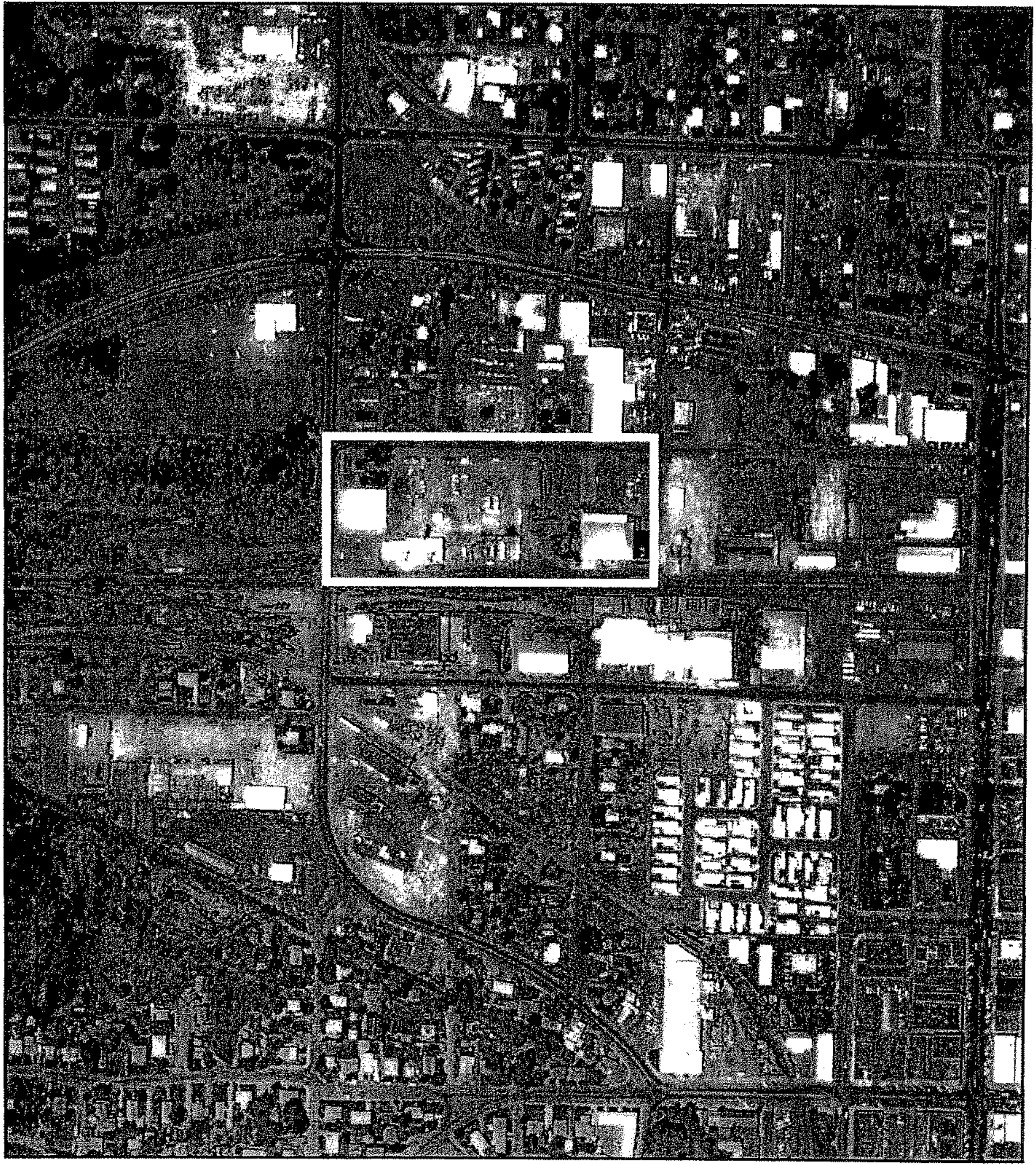
Bee Jay Scales
Site History Report

Source: WSDOT



# 1973 Aerial Photo

Bee Jay Scales
Site History Report



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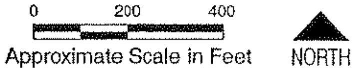
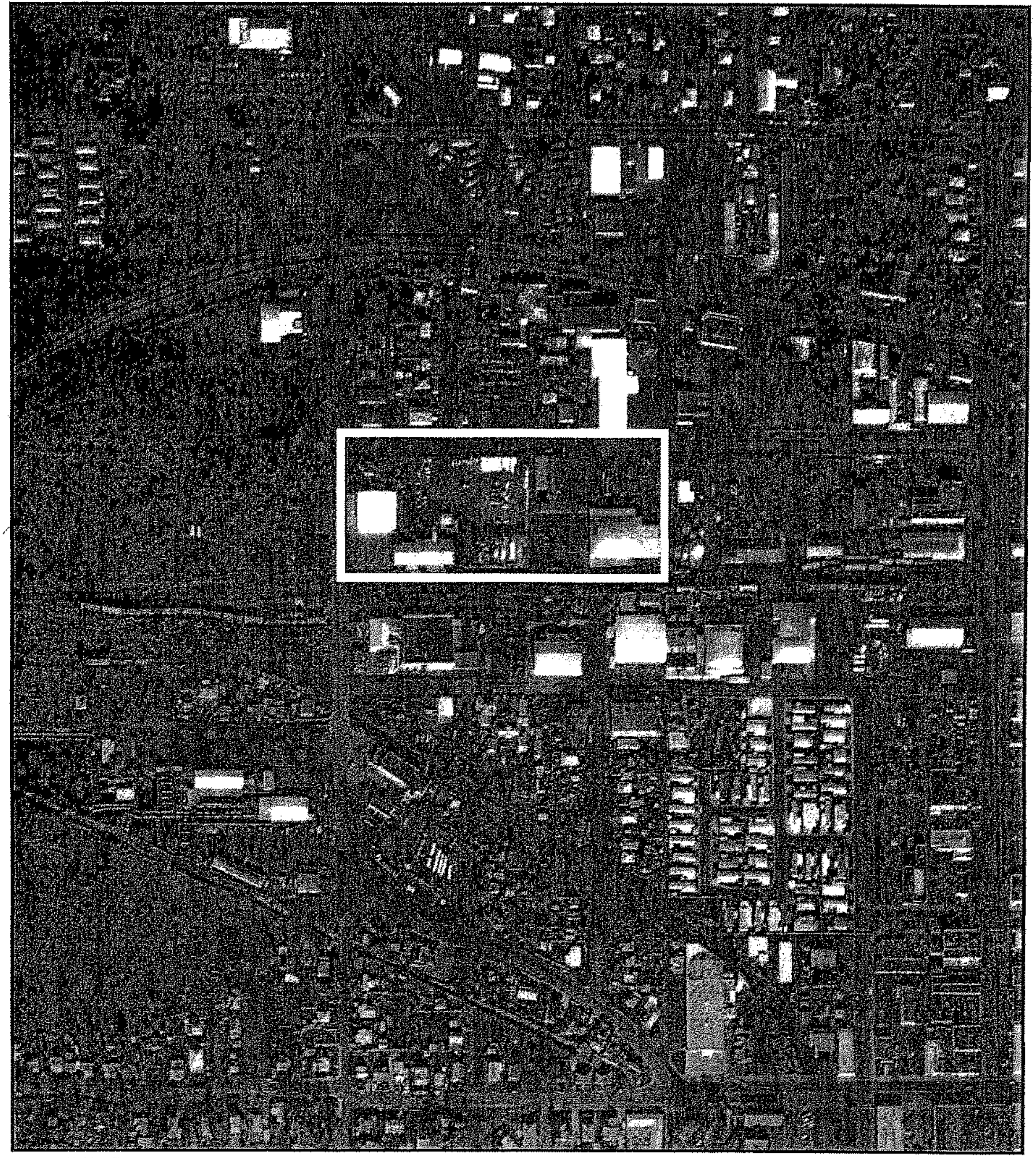


## 1979 Aerial Photo

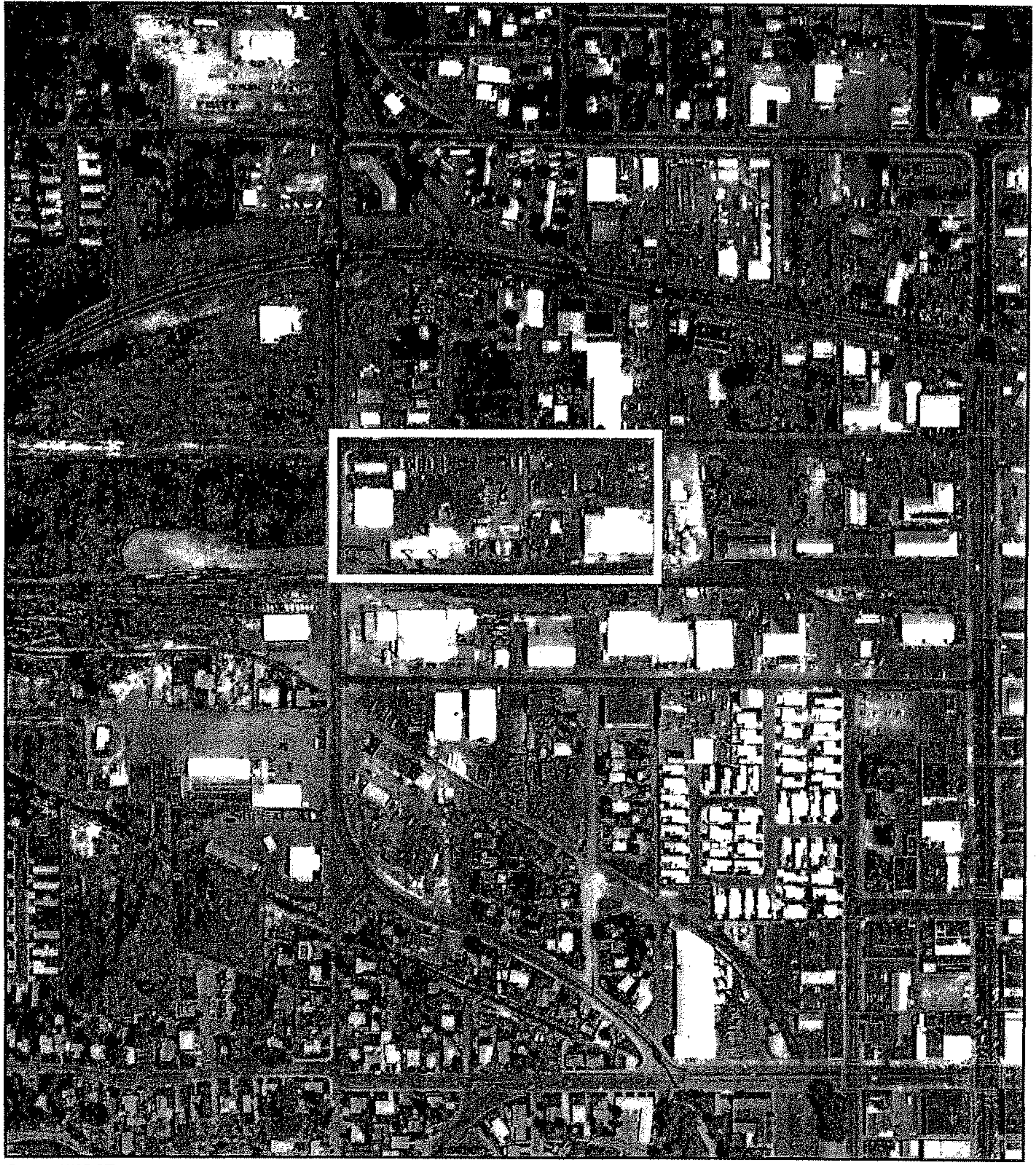
Bee Jay Scales
Site History Report



Source: WSDOT

## 1982 Aerial Photo

Bee Jay Scales
Site History Report



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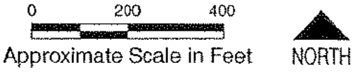
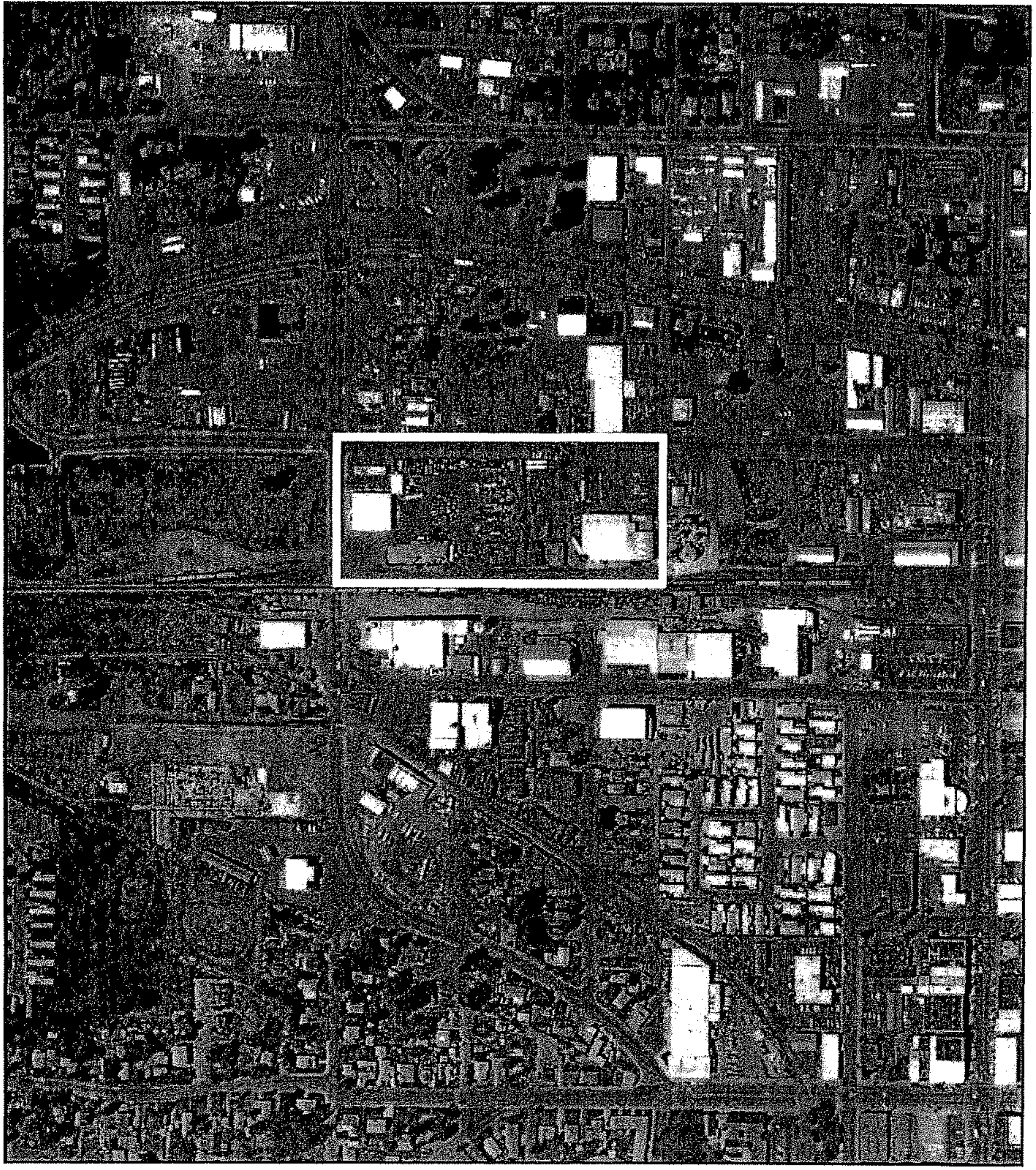


## 1991 Aerial Photo

Bee Jay Scales
Site History Report



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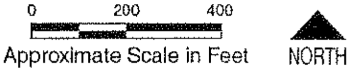


## 1998 Aerial Photo

Bee Jay Scales
Site History Report

APPENDIX D

# Historical Site Plan and Information

APPENDIX B

R. M. SCANLON

JUL 17 1972

AMOCO

**American Oil Company**
Western Region
114 East Armour Boulevard
Kansas City, Missouri 64111
816-561-4140

OF ECOLOGY
ived
JUL 05 2001
CENTRAL REGION OFFICE

cc D.L. Bartin
R.B. Price
Jack
info.
RM
7/

July 14, 1972

Mr. Clarence S. Anderson
Supervisor, Dealer Development
Chevron Chemical Company
200 Bush Street
San Francisco, California 94104 [redacted]

$ 90,000

Quik

see 8-23-72
CSA/RMS - KDH

Dear Mr. Anderson:

SUNNYSIDE, WASHINGTON
FERTILIZER FACILITY

Confirming our telephone conversation of July 14, attached is the following information concerning our Sunnyside, Washington fertilizer facility:

1. A facility layout.
2. A list of fixed improvements including dry fertilizer, liquid fertilizer and anhydrous ammonia facilities.
3. A list of rolling stock including vehicles and application equipment.

Property on which these facilities are located is leased from the Northern Pacific Railroad. The lease is assignable. Our lease with the Northern Pacific Railroad expires on March 31, 1980. This lease provides for an annual rental of $1,050 per year through March 31, 1975. Although the lease does not expire until 1980, the rental arrangement must be negotiated in 1975.

see paid 1975.
50' TRACK LEASE.

Mr. W. E. Hope will arrive in Yakima, Washington at 3:30 p.m. on Tuesday, July 25, and plans to arrive at the Red Lion Motel in Pasco at approximately 5:30 p.m.

If I can be of any additional assistance, please feel free to call upon me.

Yours truly,

K. D. Henkens

K. D. Henkens
Manager - Consumer Sales Develop.

ENCLOSURE IN
ENVELOPE BEHIND
FILE B-65183

KDH:sr
Attachments

cc: W. E. Hope
cc: J. C. Dorian

Wallace

see 7-1-72
Yakima Farm Center Fleet

see 7-6-72
CSA - KDH

see 3-23-71
Sunnyside Farm Center Fleet

see 12-29-71
RBP - HHC

see 10-20-69
Yakima Farm Center Fert Equip

see 12-22-71
HJO-RBP

ATTACHMENT NO. 2

## SUNNYSIDE FARM SERVICE CENTER
## SUNNYSIDE, WASHINGTON

### Dry Fertilizer Blending Plant:

Asphalt approach - 10,600 sq. ft.
Asphalt course - 5,840 sq. ft. Acquired
Gravel driveways - 25,375 sq. ft.
Gravel driveways - 25,375 sq. ft.
Grading and fill
Concrete loading slab: Concrete curb 110' X 3' X 6"
110' X 12' X 10"
Fencing: 320 L.F.
Gates: 2 - Pass gates
1 - 12' gate

Sewer Line
Water Line - 1" line
60' X 96' wooden fertilizer building
Office
Electrical work in the building
Heating, 2 L.P. Unit heaters
Painting

Weigh hopper
2 Ton Mixer
Elevator - 38'
3 H.P. air compressor
Junior Force Flow bagging machine
Holding Hopper
Railroad Car Unloader
Front End loader & bucket & pallet forks
Wiring and equipment assembly
30' Utility belt
60' X 40' Warehouse and Shop Addition

### Liquid Fertilizer Plant:

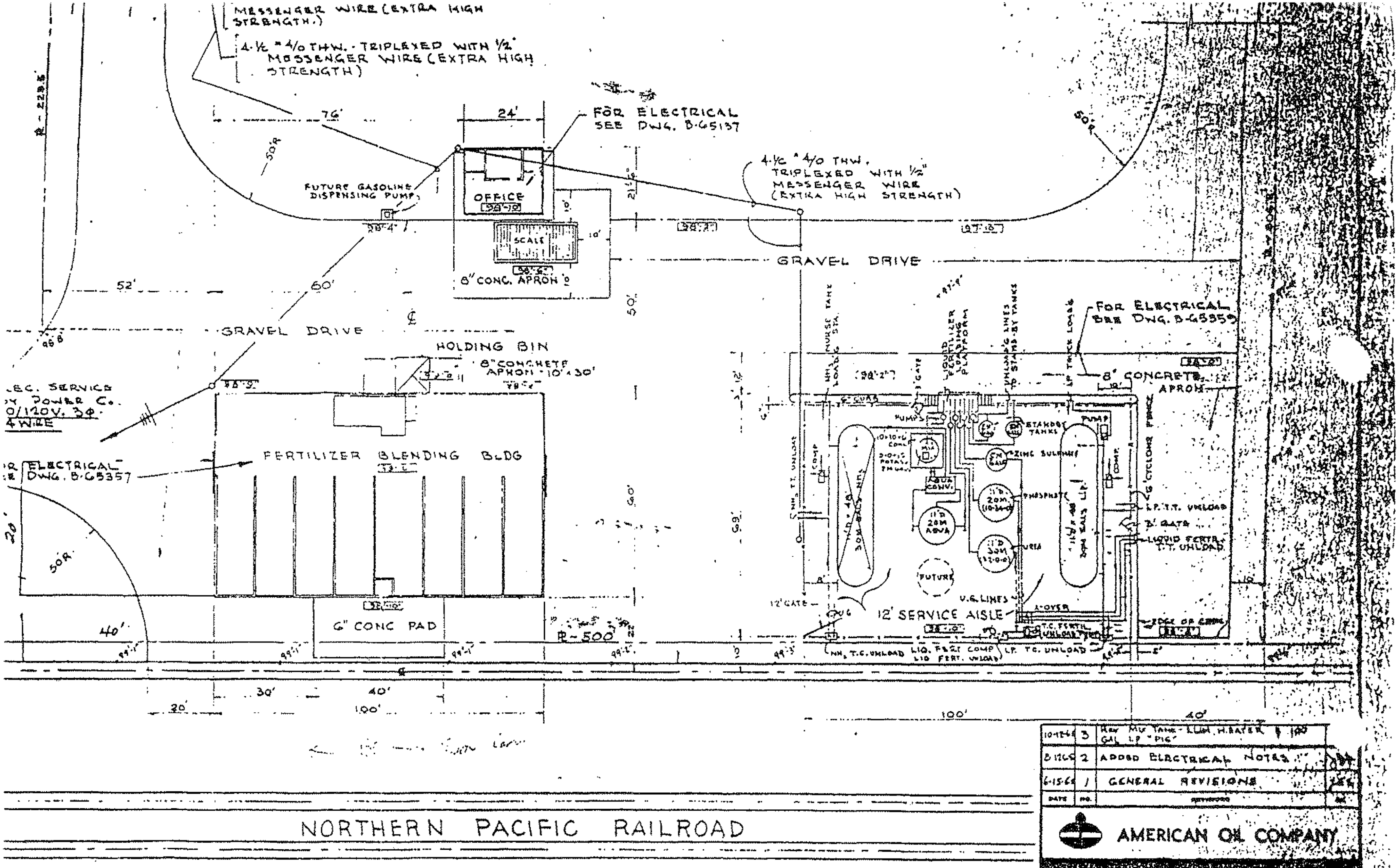
Aqua converter
2 - 20,000 gal. tanks, vertical, manhole, ladder, gauge
2 - 10,000 gal. tanks, " " " "
1 - 5,000 gal. tanks, " " " "
1 - 2,000 gal. tanks, " with steam coil
2 - 2,000 gal. tanks, " " " "
1 - Heater house
1 - A.O. Smith Hot water heater
3 - Chemical pumps 200 rpm w/motor
2 - " " 100 rpm w/motor
9 - Concrete tank pads

Liquid Fertilizer Plant (Cont'd.):

Pipe, valves and fittings
1 - Loading dock
Electrical work
3/4 H.P. Mixer
1 - Potash tank ladder

L.P. Gas and Anhydrous Ammonia Plant:

1 - 30,000 gallon L.P. tanks, 11' X 68'
Install tank, including steel saddles and piers
1 - 5 H.P. Corkin compressors
1 - 7-1/2 H.P. pump
Tank car unloading riser
Transport unloading riser
Tank and truck loading riser
Pipes and fittings
Electrical work
Painting
20 Ton truck scale w/wood dock, 6' pit, sump pump type register beam and approaches



| | | | |
|---|---|---|---|
| 10-12-66 | 3 | REV MIX TANK - LUM. HEATER & 100 GAL LP "PIG" | |
| 8-12-66 | 2 | ADDED ELECTRICAL NOTES | |
| 6-15-66 | 1 | GENERAL REVISIONS | |
| DATE | NO. | REVISIONS | |

AMERICAN OIL COMPANY

LAYOUT
LIQUID & DRY FERTILIZERS
AMMONIA & L.P. GAS
BULK PLANT COMPLEX

LOCATION
FIRST ST. & WAREHOUSE
SUNNYSIDE, WASHINGTON

SCALE 1" = 20'
DRAWN BY
CHECKED BY

LEGEND

EXISTING GRADES: ×99.10

FINISHED GRADES: [99.10]

—o— SERVICE POLE WITH LIGHT FIXTURES FURNISHED, WIRED & INSTALLED BY POWER CO.

24' Bly 40
PA
File Shop

GLACIER PARK COMPANY
*Land Management for Increased Opportunities.*

(206) 467-7215

January 6, 1992

JAN 7 1992

Robert D. Swackhammer
Washington Department of Ecology
Toxics Cleanup Program
106 South 6th Avenue
Yakima, WA 98902-3387

RE: Site Hazard Assessment- Bee Jay Scales
Sunnyside, Washington, Formerly GPC SEQ. 3833

Dear Mr. Swackhammer:

Thank you for your letter of December 23, 1991, regarding the above referenced site. As I believe you are aware from prior correspondence, Glacier Park sold this property last Fall to Mr. Gordon Laird of Bellingham, WA. It is my understanding that the property has since been sold to Mr. Tom McGerr of Bellingham, WA. In the spirit of cooperation, GPC is enclosing the information you have requested. In your letter you requested any environmental assessment reports or laboratory analysis, other than the Phase II report entitled "Subsurface Exploration and Testing, Glacier Park Company Property, Property Sequence No. 3833, Sunnyside, Washington." Enclosed herein is the only other assessment report we have for the Sunnyside property. It is a Preliminary Environmental Assessment conducted by Hart Crowser, Inc. dated March 16, 1990. We do not have any additional laboratory analysis work.

I have also enclosed a diagram of the holding pond which was constructed by Chevron. This diagram was provided to Glacier Park by Chevron.

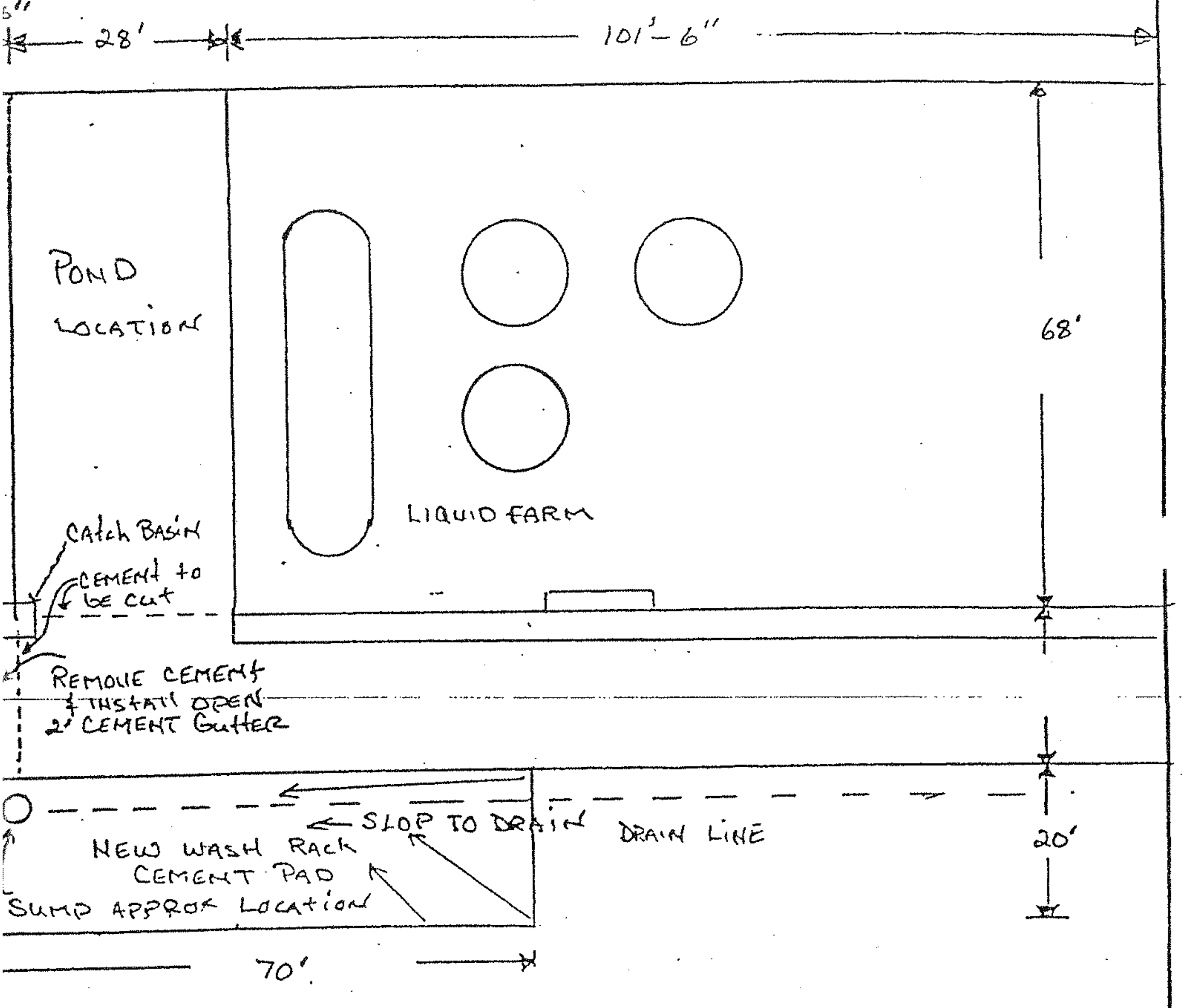
Please feel free to contact me at the direct dial number above if you have any questions.

Best regards,

Katherine Kramer Laird
Contract Project Manager

KKL/kl
cc: Martha Anamosa (w/o encl.)
Mr. Tom McGerr (w/ encl.)

1011 Western Avenue, Suite 700 • Seattle, Washington 98104 • 206-467-5500
*A Subsidiary of Burlington Resources Inc.*

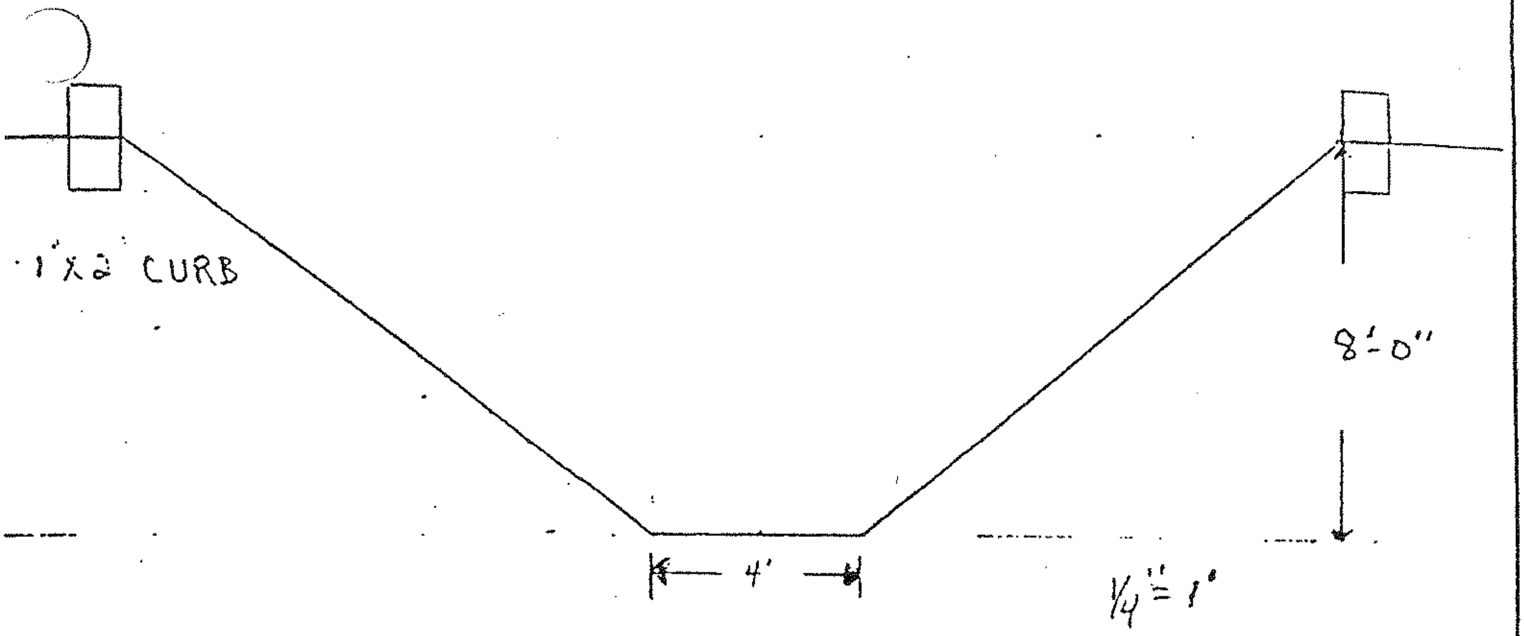


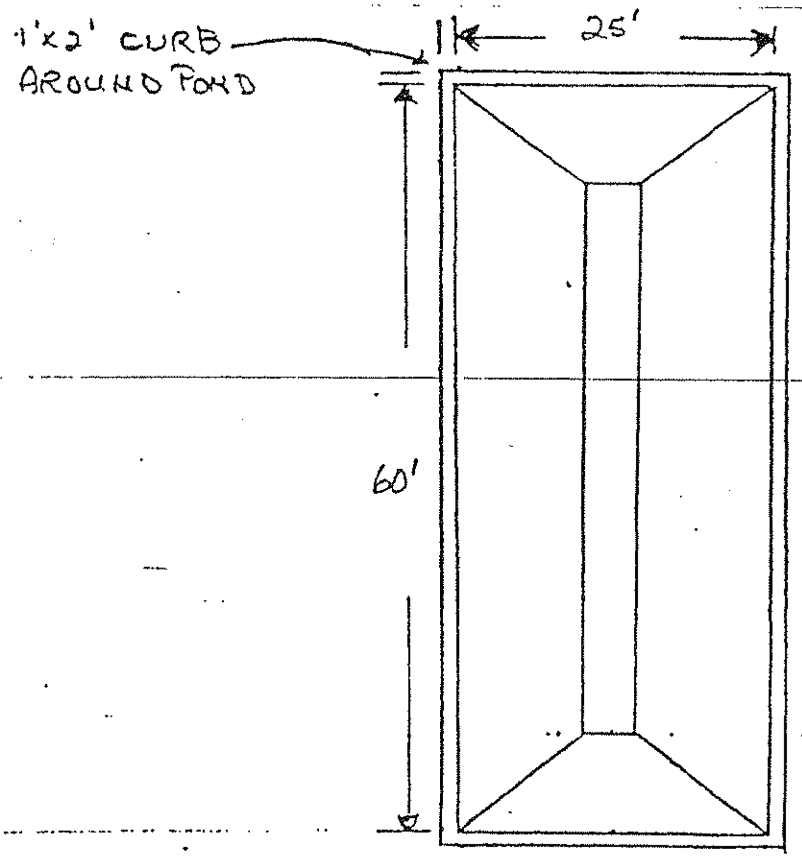
**ORTHO** Chevron Chemical Company

SCALE 1/16"=20' DATE 3-20-84
DR. CK. DR. APPR.
ENG.
OPER. SUNNYSIDE

LOCATION PLAN

A 01



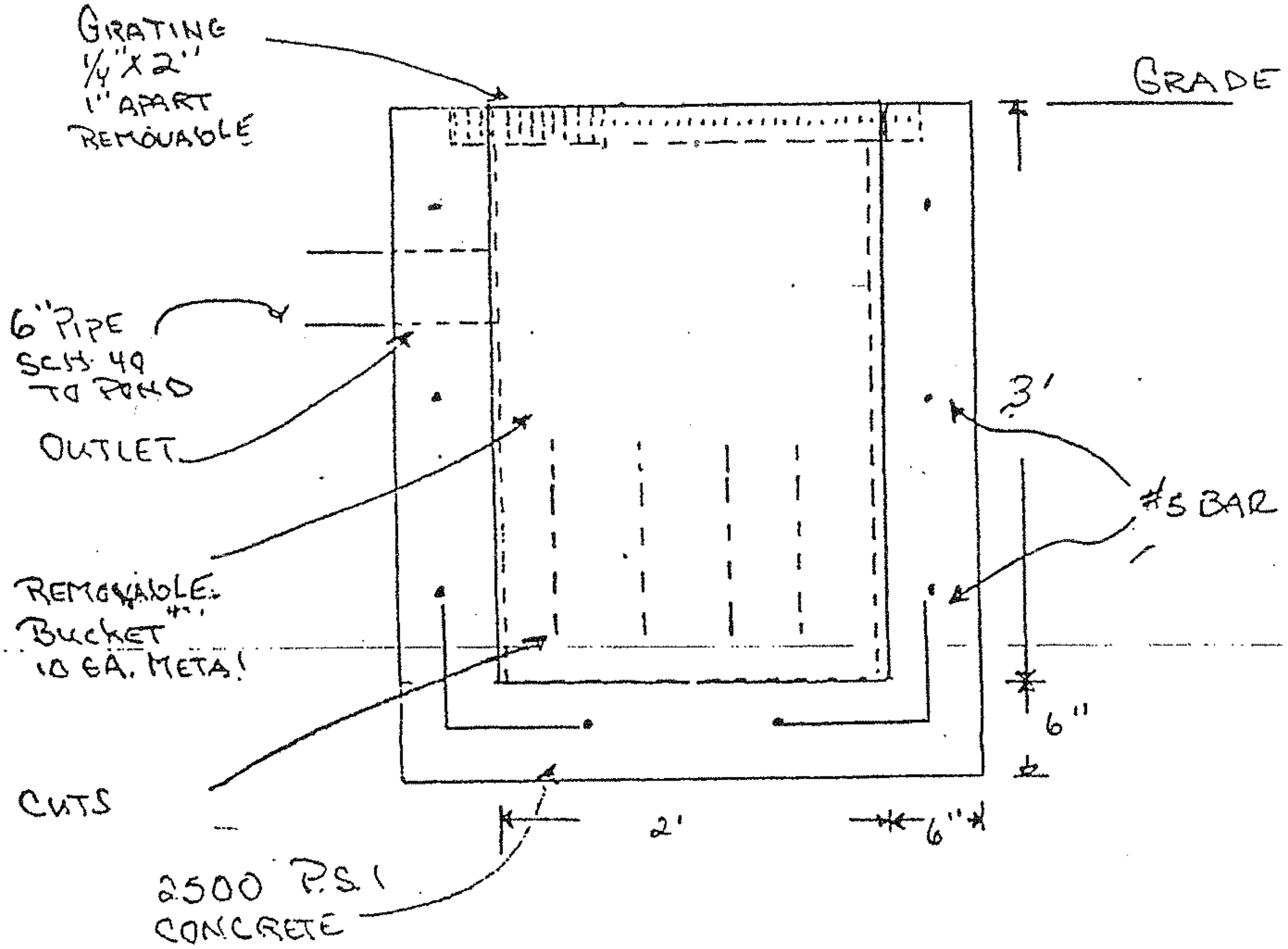


ORTHO Chevron Chemical Company

SCALE ABOVE DATE 3-20-84
DR. CK. DR. APPR.
ENG.
OPER. SUNNYSIDE

POND

A



**ORTHO** Chevron Chemical Company

SCALE 1" = 1' DATE 3-20-84
DR. CK. – DR. APPR.
ENG. N A
OPER. SUNNYSIDE

CATCH BASIN

A-03

## HOLDING POND

1. Construct 25'x60', 8' deep holding pond. Field verify size. See drawings for location.

2. Remove cement concrete pad approximately 28'x68'. Separate cement pad by cement cutter. Contractor to dispose of concrete.

3. Dig pond approximately 25'x60', 8' deep. Contractor to dispose of earth.

4. Install 1'x2' deep cement curb around pond. See attached cement specifications #ECG-140, Portland Cement.

5. Line holding pond with Chevron Industrial Membrane per the following.

   Contact E. F. "Ed" Cook, Special Asphalt Product, Inc., P.O. Box 03305, Portland, OR 97203.

6. Attach membrane to cement curb.

7. Install 6" drain line from catch basin to holding pond. Attach membrane to drain line.

## CATCH BASIN

1. Construct 3'6" deep x 3' square catch basin. Pour 6" walls and bottom with the attached cement specification #ECG-140.
2. Construct 10-gauge 2' square, 3' deep removable bucket with handles and cuts. Prime and paint.
3. Construct removable grating 1/4"x2", 1" part.
4. Hook up catch basin from wash rack gutter.
5. Install 6" PVC Sch 40 drain line to pond. Seal drain line to membrane material.
6. See attached drawings for detail and location.

Cement 6 packs

APPENDIX E

# Sampling and Analysis Plan Attachments

Attachment 1: Sample Forms

Attachment 2: Waste Management Plan

Attachment 3: Instructions for Instrument Calibration and Field Measurements

# Attachment 1: Sample Forms

Example Chain-of-Custody Record

Example Soil Boring Log

Example Well Construction Diagram

Example Well Completion Diagram

**CH2MI** **Applied Sciences Lab**

CHAIN OF CUSTODY RECORD
AND AGREEMENT TO PERFORM SERVICES

CVO 2300 NW Walnut Boulevard
Corvallis, OR 97330-3538
(541) 752-4271 FAX (541) 752-0276

COC # ____

Project #

Purchase Order #

Project Name

Company Name

Report to:

Phone No:

Requested Completion Date:

Sample Disposal:
Dispose ☐ Return ☐

THIS AREA FOR LAB USE ONLY

Lab #

Page

of

Requested Analytical Method #

Preservative

EPA Tier QC Level

1 (Screening) 2 3 4

| Sampling |  | Type |  | Matrix |  |  |  | CLIENT SAMPLE ID (8 CHARACTERS) | LAB QC | TOTAL # OF CONTAINERS | Requested Analytical Method # / Preservative | Alternate Description | Lab ID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | COMP | GRAB | WATER | SOIL | AIR | Other |  |  |  |  |  |  |

Relinquished By — Date/Time

Received By — Date/Time

Sampled By and Title (Please sign and print name) — Date/Time

Relinquished By (Please sign and print name) — Date/Time

Received By (Please sign and print name) — Date/Time

Relinquished By (Please sign and print name) — Date/Time

Received By (Please sign and print name) — Date/Time

Shipped Via
UPS Fed-Ex Other ____

Shipping #

Special Instructions:

*Instructions and Agreement Provisions on Reverse Side*

*DISTRIBUTION: Original - LAB, Yellow - LAB, Pink - Client*

**CH2MHILL**

# SOIL BORING LOG

**PROJECT NUMBER**

**BORING NUMBER**

SHEET OF

**LOCATION OF BORING**

○
North Arrow

PROJECT :
LOCATION:
SURFACE CONDITIONS:
DRILLING CONTRACTOR:
DRILLING METHOD AND EQUIPMENT:
SAMPLING METHOD AND EQUIPMENT:
START DATE:
END DATE:
ELEVATION:
LOGGER:

| SAMPLING | | | | | | | | SOIL DESCRIPTION | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|
| DEPTH BELOW SURFACE (FT) | INTERVAL (FT) | DRIVEN/RECOVERED (IN) | SAMPLE ID | TIME | SPT RESULTS 6"-6"-6" | USCS GROUP | SOIL GRAPH | SOIL NAME, COLOR, GRAIN SIZE, MOISTURE CONTENT<br>RELATIVE DENSITY OR CONSISTENCY,<br>SOIL STRUCTURE, MINERALOGY, ORGANIC CONTENT | CASING DEPTH, TESTS, INSTRUMENT READINGS |
| 1 | | | | | | | | | |
| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
| 6 | | | | | | | | | |
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| 8 | | | | | | | | | |
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| 2 | | | | | | | | | |
| 3 | | | | | | | | | |
| 4 | | | | | | | | | |
| 5 | | | | | | | | | |
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| 7 | | | | | | | | | |
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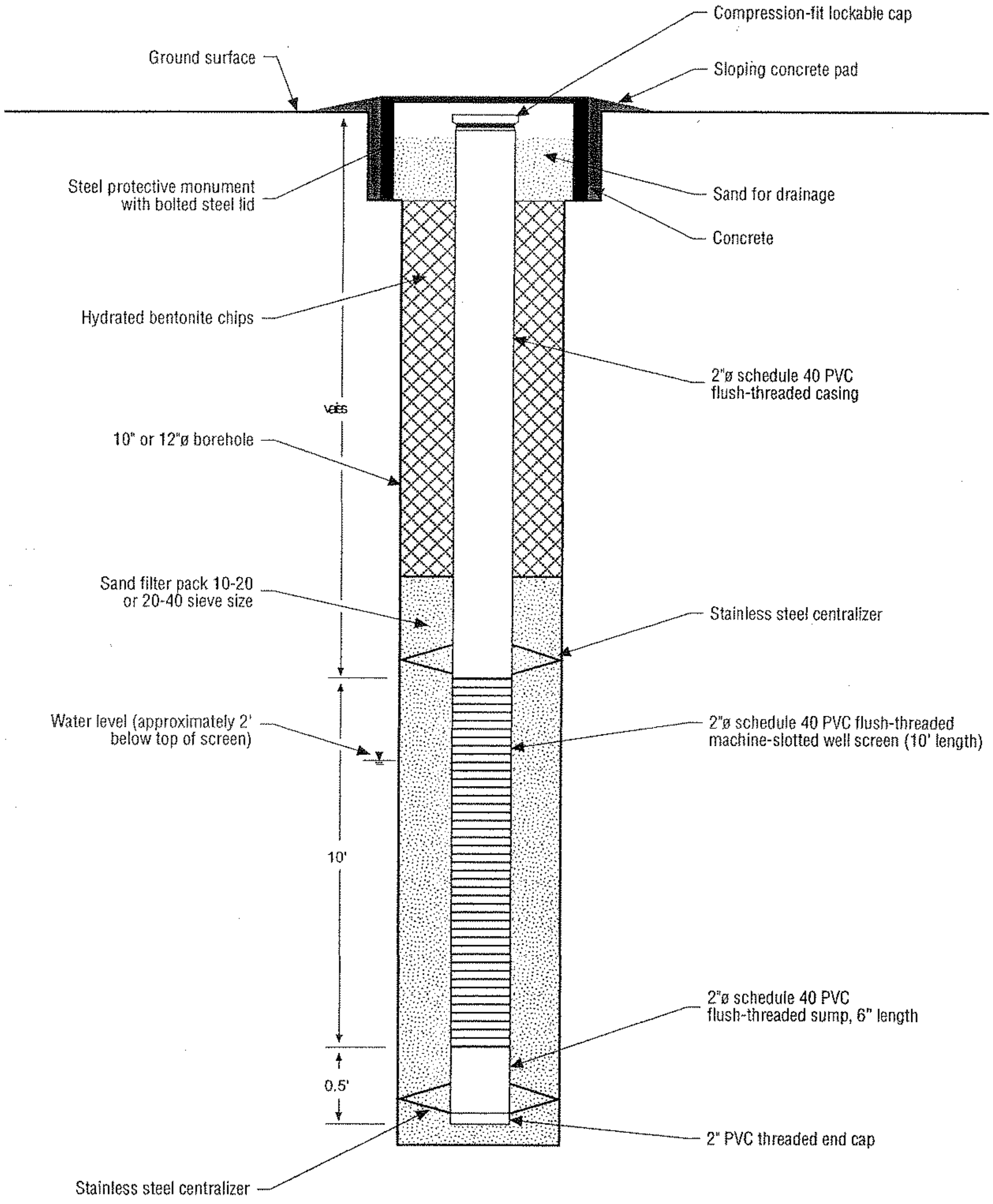
# Generalized Construction Design for Monitoring Wells



NOTE: Not to scale

CH2MHILL

PROJECT NUMBER

BORING NUMBER

SHEET 1 OF 1

# WELL COMPLETION DIAGRAM

PROJECT :

LOCATION :

ELEVATION :

DRILLING CONTRACTOR :

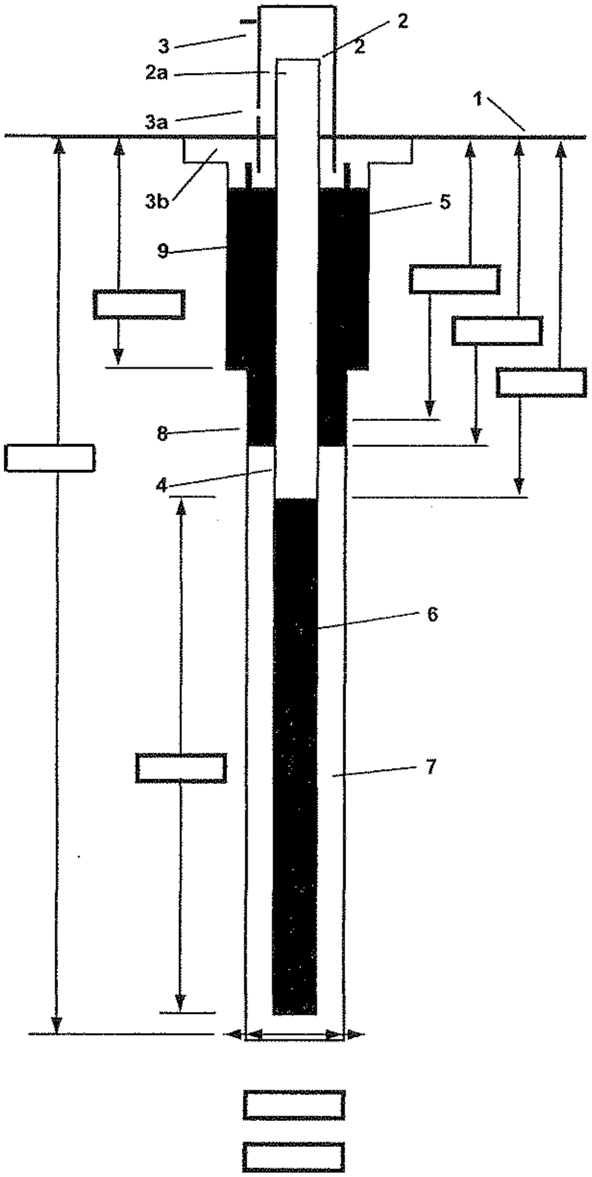
DRILLING METHOD AND EQUIPMENT USED :

WATER LEVELS :

START :

END :

LOGGER :



1- Ground elevation at well

2- Top of casing elevation
   a) vent hole?

3- Wellhead protection cover type
   a) weep hole?
   b) concrete pad dimensions

4- Diameter/type of well casing

5- Diameter/type of surface casing

6- Type/slot size of screen

7- Type screen filter
   a) Quantity used

8- Type of seal
   a) Quantity used

9- Grout
   a) Grout mix used
   b) Method of placement
   c) Quantity of well casing grout

Development method

Development time

Estimated purge volume

Comments

# Attachment 2: Waste Management Plan

## Waste Streams

This Waste Management Plan (WMP) is an attachment to the Sampling and Analysis Plan (SAP) for the Bee-Jay Scales Site Remedial Investigation/Feasibility Study (RI/FS) Work Plan. This plan describes the waste management requirements and procedures for RI field activities including obtaining soil samples from drilled soil borings, installing monitoring wells, and conducting groundwater sampling. The RI field work at the Bee-Jay Scales Site is being conducted under the Model Toxics Control Act (MTCA) and is subject to the requirements of the Washington Dangerous Waste Regulations and the Resource Conservation and Recovery Act (RCRA). Wastes generated from these activities shall be managed and disposed in accordance with State of Washington and federal hazardous and solid waste regulations.

The waste streams associated with this scope of work may include the following:

- Personal protective equipment (PPE)
- Uncontaminated general construction debris (such as caution tapes, barricades, signs, and packing materials)
- Generated contact water, decontamination water, and monitoring well purge water
- Generated soil from drill cuttings for soil borings and monitoring well installation
- Residue from equipment decontamination

## Waste Characterization

The SAP details information on the waste sampling requirements. However, in some cases, off-site facilities may require additional analyses to evaluate the waste stream prior to acceptance. All wastes will be classified per the Code of Federal Regulations (CFR) 40 CFR 261 to determine if they are hazardous using generator knowledge of the materials and sample results. Based on existing knowledge of the site and historical site activities, listed wastes are not anticipated to be encountered or contained in any environmental media.

Typically, uncontaminated wastes, such as general construction debris, shall be characterized using process knowledge and generally will be classified as municipal solid waste. Waste characterization information for wastes shall be documented on a waste profile form provided by the off-site treatment or disposal facility as part of the waste acceptance process. An approved copy of the waste profile shall be received prior to off-site transportation of the material. ChevronTexaco and/or BPAmoco personnel shall provide generator certification and/or signature, if required.

The profile typically requires the following information:

- Generator information, including name, address, contact, and phone number
- Site name including physical and mailing address

- Activity generating waste (e.g., RI)
- Source of contamination (e.g., demolition of facility)
- Historical chemical use for area
- Physical state of waste (solid or liquid, for example)

## Waste Management

### Waste Storage Time Limit

It is CH2M HILL policy that hazardous wastes be removed from any facility within 45 days from the date of generation. Hazardous wastes shall be removed within 90 days from generation, and other wastes shall be removed from the site as soon as possible (or sooner if mandated by regulation; for example, certain polychlorinated biphenyl [PCB] wastes have only a 30-day storage limit). The date of generation is the day that a waste is first placed in a container or tank.

### Labels

The labeling of waste containers will be in accordance with 49 CFR 172, 173 and 178. Labels will include the type of waste, location from which the waste was generated, and accumulation start date. In specific, containers, roll-off boxes, and tanks used to store and accumulate waste (including soil and groundwater) shall include one of the following labels:

- **Analysis Pending**: Temporary or handwritten label until analytical results are received and reviewed; this label shall include the accumulation start date
- **Hazardous Waste**: Preprinted hazardous waste labels with the following information:
    - Accumulation start date
    - Generator name: ChevronTexaco/BPAmoco
    - Site name
    - United States Environmental Protection Agency (EPA) Identification (ID) Number
    - Waste codes
    - For containers of less than 110 gallons, the manifest number must be on the label before transporting.
- **Nonhazardous Waste:** Preprinted labels with the following information:
    - Accumulation start date
    - Generator name: ChevronTexaco/BPAmoco
    - EPA ID Number
    - Waste-specific information (e.g., contaminated soil)

Where applicable, the major hazards on the label (e.g., flammable, oxidizer, and carcinogen) shall be included on the label.

## General Waste Management Requirements

Hazardous wastes shall be segregated from nonhazardous wastes. Additionally, incompatible wastes (e.g., flammable and corrosive wastes) shall be segregated. Wastes of the same matrix, contamination, and the same source may be aggregated to facilitate storage and disposal. Hazardous wastes shall only be aggregated if from the same source and if carrying the same hazardous waste codes. In any case, hazardous wastes shall not be diluted (note exceptions, as applicable from Phase II Land Disposal Restriction [LDR] Rule).

### *Waste Storage Areas*

Hazardous wastes containers shall be stored in a temporary accumulation area designated by ChevronTexaco. If ChevronTexaco has not designated an accumulation area, hazardous wastes will be temporarily stored in a secure area.

Hazardous waste storage areas shall contain emergency equipment sufficient to respond to the hazard posed by waste. Typical items in a hazardous waste storage area include fire extinguishers, decontamination equipment, and an alarm system. Spill control equipment (e.g., sorbent pads) shall be available in the waste storage areas and where liquids are transferred from one vessel to another.

Bee-Jay Scales RI wastes shall be stored in one of the following settings and according to the following requirements:

#### Drums and Small Containers

- Drums and small containers of hazardous waste will be transported to the temporary accumulation areas on wood pallets and will be secured together with non-metallic bonding.
- Drums shall be inspected and inventoried upon arrival on site for signs of contamination and/or deterioration.
- Adequate aisle space (e.g., 30 inches) shall be provided for containers such as 55-gallon drums to allow the unobstructed movement of personnel and equipment; a row of drums should be no more than two drums wide.
- Each drum shall be provided with its own label.
- Drums shall remain covered except when removing or adding waste to the drum, and covers shall be properly secured at the end of each workday.
- Drums shall be disposed of with the contents; if the contents are removed from the drums for off-site transportation and treatment or disposal, the drums shall be decontaminated prior to re-use or before leaving the site.
- Secondary containment shall be provided for drums of liquid hazardous waste or hazardous wastes that are incompatible with other wastes or materials stored nearby.

In the unlikely event that extremely hazardous waste are encountered, container storage areas will be bermed and lined with a polyethylene liner.

### Stockpiles

It is not anticipated that the soils will contain a hazardous waste (and therefore must be managed as a hazardous waste); it also is not anticipated that soils will be stockpiles. The following procedures shall be followed when stockpiling soils that do not contain hazardous waste:

- Stockpiles shall be placed on plastic sheeting near the excavation areas.
- Stockpiles shall be provided with liner, cover, and perimeter berm to prevent rupture and release or infiltration of liquids.
  - Minimum 6-mil polyethylene sheeting shall be used for liners and covers.
  - The perimeter berm, typically hay bales placed beneath the liner, shall be constructed to allow for collection of any free liquids draining from the stockpile.
  - Accumulated free liquids shall be pumped (or otherwise removed) to a container.
- Covers and perimeter berms shall be secured in-place when not in use, at the end of each workday, or as necessary to prevent wind dispersion or run-off from major precipitation events.
- Construction materials for the stockpiles that contact waste shall be disposed of as contaminated debris.
- A log documenting accumulation dates shall be maintained for soils and other waste stored on site in stockpiles.

### Roll-Off Boxes

- Roll-off boxes shall be inspected upon arrival on site; any roll-off containers arriving with contents shall be rejected.
- Roll-off boxes for hazardous soils shall be provided with covers and disposable liners; liners shall be disposed of as contaminated debris.
- When not in use, securely fastened covers shall be installed on all roll-off boxes.
- Old labels shall be removed.
- Roll-off containers shall be inspected by the transporter after the liner is removed and decontaminated in the event of evidence of liner failure.

## Transportation

Each transportation vehicle and load of waste shall be inspected before leaving the site. The quantities of waste leaving the site shall be recorded. A contractor licensed for commercial transportation shall transport non-hazardous wastes. In the event that wastes are hazardous, the transporter shall be licensed in accordance with 49 CFR 171-179. A copy of the documentation indicating that the selected transporter has appropriate licenses shall be received prior to transport of any waste material.

### Manifests and Shipping Documentation

Each load of waste material shall be manifested prior to leaving the site. At a minimum, the manifest form shall include the following information:

- Transporter information, including name, address, contact, and phone number
- Generator information, including name, address, contact, and phone number
- Site name including physical and mailing address
- Description of waste (hazardous waste or liquid, for example)
- Type of container
- Quantity of waste (volumetric estimate)
- Additionally, each shipment of waste shall also have a waste profile, a LDR Notification/Certification for hazardous wastes, and a haul ticket.

If the signed hazardous waste manifest from the designated off-site facility is not received within 35 days, CH2M HILL shall contact the transporter or the designated facility to determine the status of the waste. If the signed hazardous waste manifest has not been received within 45 days, CH2M HILL shall prepare an exception report for ChevronTexaco to submit to the State of Washington, as required under 40 CFR 262.42.

### Transporter Responsibilities

The transporter shall be responsible for weighing loads at a certified scale. For each load of material, weight measurements shall be obtained for each full and empty container, dump truck, or tanker truck. Disposal quantities shall be based on the difference of weight measurements between the full and empty container, dump truck, or tanker truck. Weights shall be recorded on the waste manifest. The transporter shall provide copies of weight tickets with the final manifest to CH2M HILL.

The transporter shall observe the following practices when hauling and transporting wastes off site:

- Minimize impacts to general public traffic.
- Repair road damage caused by construction and/or hauling traffic.
- Clean-up material spilled in transit.
- Line and cover trucks or trailers used for hauling contaminated materials to prevent releases and contamination.
- Decontaminate vehicles prior to re-use, other than hauling contaminated material.
- All personnel involved in off-site disposal activities shall follow safety and spill response procedures outlined in the Health and Safety Plan (HSP).

- No materials from other projects shall be combined with materials from CH2M HILL.
- Seal trucks transporting liquids.

### Transportation and Disposal Log

Transportation of wastes shall be inventoried the day of transportation from the site using the transportation and disposal log. A carbon copy of the initial manifest form for each load shall be retained on-site and attached to the daily production report. All required transportation manifests shall be prepared by CH2M HILL and signed by a field representative.

## Disposal of Waste Streams

Off-site treatment or disposal facilities will use the waste profile and supporting documentation (e.g., analytical data) to determine if they will accept a waste. Hazardous wastes shall be sent to the appropriate RCRA Subtitle C treatment, storage, or disposal (TSD) facility. Nonhazardous wastes shall be disposed at a Subtitle D facility or a municipal landfill, as appropriate. The TSD facility shall be responsible for providing a copy of the final waste manifest and for a certificate of treatment or disposal for each load of waste received. Section 3.4.1 describes the required actions if the signed manifest is not received within 35 days.

## Training

Training requirements for on-site personnel, including subcontractors, is provided in the site-specific HSP.

## Records and Reporting

The following records and documents shall be maintained:

- Transportation and off-site disposal records:
  - Profiles and associated characterization data
  - Manifests, LDR notifications and certifications, bills of lading, and other shipping records
  - Off-site facility waste receipts, certificates of disposal and destruction
- Training records
- Inspection records

CH2M HILL shall maintain Material Data Safety Sheets (MSDS) for chemicals and/or hazardous materials brought onsite, including the MSDS for chemicals brought onsite by subcontractors.

# Attachment 3: Instructions for Instrument Calibration and Field Measurements

Numerous commercially available meters exist for measuring field water quality parameters (pH, temperature, dissolved oxygen [DO], and specific conductance). Each type of meter is listed below along with various recommended types and models. Calibration of soil screening instruments is described in Section 10, Health and Safety Plan (HSP).

Recommended meters include the following:

- **pH meter**: Horiba, Chemtrix, Orion, Beckman, or equivalent
- **Water-level sounder**: SJNCO Model 51453 or equivalent
- **Temperature meter:** Hand-held thermometer, temperature mode on pH meter, or SCT meter
- **DO meter:** Horiba, YSI Model SiB or equivalent
- **Conductivity meter**: Horiba, YSI Model 33 S-C-T meter, or equivalent; a temperature-compensating meter is preferred (if meter does not compensate for temperature, water temperature should be noted so that values corrected to 25 degrees Celsius (°C) can be computed).

The pH meter may require periodic calibration after initial calibration if drift becomes a problem. If recalibration is required, it should be performed to manufacturer's specifications and should be recorded in the field notebook.

Some conductivity meters cannot be calibrated in the field (such as the YSI Model 33 SCT meter). These meters should be field checked to evaluate their accuracy. Field-checking is done by recording readings on standard solutions in the expected concentration range of the samples. Fresh standard solutions must be used for each monthly and quarterly sampling event. Calibration check results should be recorded in the field notes at the beginning of each day at a minimum. Additional periodic calibration checks are recommended during sampling or throughout the day to check that each meter is operating as required and to help evaluate instrument drift.

Field measurement equipment that is out of calibration and cannot be calibrated or that malfunctions during use should be removed from service and repaired by a qualified technician.

The field meters and water-level sounder are powered by batteries that should be checked routinely for integrity. Some meters with rechargeable batteries have a battery check function for convenient determination of charge level. New batteries should be included with meters that use disposable batteries.

Calibration of field instruments should be documented in either the field notebook or on sample data sheets. Data to be recorded include make, model, and serial number of equipment; calibration medium; meter readings (both actual and expected); and any anomalies in the calibration.

APPENDIX F

# Quality Assurance Project Plan Attachments

Attachment 1: Laboratory Quality Control Procedures, Non-Contract Laboratory Program

# Attachment 1: Laboratory Quality Control Procedures, Non-Contract Laboratory Program

The following summarizes laboratory quality control (QC) procedures for analytical methods that are not covered by the Contract Laboratory Program (CLP). The laboratory QC procedures for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), organochlorine pesticides, and metals will be those specified by CLP.

**TABLE A-1**
Summary of Calibration and QC Procedures for Method 8151

| Method | Applicable Parameter | QC Check | Minimum Frequency | Acceptance Criteria | Corrective Action[a] |
|---|---|---|---|---|---|
| 8151 | Chlorinated herbicides | Five-point initial calibration for all analytes | Initial calibration prior to sample analysis | linear - mean RSD of average CF of all analytes ≤20 percent and average CF of individual analyte <30 percent<br>or<br>mean RSD for all analytes ≤20 percent with no individual analyte RSD > 30 percent<br>linear – least squares regression r > 0.995<br>nonlinear – COD ≥ 0.990<br>(6 points shall be used for second order, 7 points shall be used for third order) | Correct problem then repeat initial calibration |
| | | Second-source calibration verification | Once per five-point initial calibration | All analytes within ±15 percent of expected value | Correct problem then repeat initial calibration |
| | | Retention time window calculated for each analyte | Each initial calibration and calibration verifications | ± 3 times standard deviation for each analyte retention time from 72-hour study | Correct problem then reanalyze all samples analyzed since the last retention time check |
| | | Initial calibration verification | Daily, before sample analysis | All analytes within ±15 percent of expected value | Correct problem then repeat initial calibration |
| | | Calibration verification | After every 10 samples and at the end of the analysis sequence | All analytes within ±15 percent of expected value | Correct problem then repeat initial calibration verification and reanalyze all samples since last successful calibration verification |

| Method | Applicable Parameter | QC Check | Minimum Frequency | Acceptance Criteria | Corrective Action[a] |
|---|---|---|---|---|---|
| | | Method blank | One per analytical batch | No analytes detected ≥ RL | Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank |
| | | LCS for all analytes | One LCS per analytical batch | QC acceptance criteria, per attached table | Correct problem then reprep and analyze the LCS and all samples in the affected analytical batch |
| | | Surrogate spike | Every sample, spiked sample, standard, and method blank | QC acceptance criteria, per attached table | Correct problem then reextract and analyze sample |
| | | MS/MSD | One MS/MSD per every 20 project samples per matrix | QC acceptance criteria,per attached table | none |
| | | Confirmation[a] | 100 percent for all positive results | Same as for initial or primary analysis | Same as for initial or primary analysis |
| | | MDL study | Once per 12 month period | Detection limits established shall be ≤ RLs | none |
| | | Results reported between MDL and RL | none | none | None |

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[a] Use a second column or different detector

**TABLE A-2**

QC Acceptance Criteria for Method SW8151A

| Method | Analyte | Accuracy Water (%R) | Precision Water (%RPD) | Accuracy Soil (%R) | Precision Soil (%RPD) |
|---|---|---|---|---|---|
| SW8151A | 2,4-D | 39–120 | ≤ 30 | 32–131 | ≤ 50 |
| | 2,4-DB | 44–120 | ≤ 30 | 42–145 | ≤ 50 |
| | 2,4,5-T | 44–122 | ≤ 30 | 43–139 | ≤ 50 |
| | 2,4,5-TP | 49–126 | ≤ 30 | 46–128 | ≤ 50 |
| | Dalapon | 40–120 | ≤ 30 | 22–125 | ≤ 50 |
| | Dicamba | 60–120 | ≤ 30 | 56–120 | ≤ 50 |
| | Dichlrprop | 68–122 | ≤ 30 | 72–142 | ≤ 50 |
| | Dinoseb | 28–115 | ≤ 30 | 20–131 | ≤ 50 |
| | MCPA | 62–144 | ≤ 30 | 65–120 | ≤ 50 |
| | MCPP | 60–133 | ≤ 30 | 60–118 | ≤ 50 |
| | *Surrogate:* | | | | |
| | 2,4-D | 50-130 | | 45-140 | |

**TABLE A-3**
Summary of Calibration and QC Procedures for Inorganics*

| Method | Applicable Parameter | QC Check | Minimum Frequency | Acceptance Criteria | Corrective Action |
|---|---|---|---|---|---|
| Inorganics | Inorganics | Multipoint calibration for all analytes (minimum 3 standards and one calibration blank) | Initial calibration prior to sample analysis | Correlation coefficient ≥0.995 for linear regression | Correct problem then repeat initial calibration |
| | | Second-source calibration verification | Once per multipoint calibration | All analytes within ±10 percent of expected value | Correct problem then repeat initial calibration |
| | | Retention time window calculated for each analyte | Each initial calibration and calibration verifications | ± 3 times standard deviation for each analyte retention time over 8 hour period | Correct problem then reanalyze all samples analyzed since the last retention time check |
| | | Initial calibration verification | Daily, before sample analysis or when elutent is changed | All analytes within ±10 percent of expected value | Correct problem then repeat initial calibration |
| | | Calibration verification | After every 10 samples and at the end of the analysis sequence | Instrument response within ±5 percent of expected response | Correct problem then repeat initial calibration verification and reanalyze all samples since last successful calibration verification |
| | | Method blank | One per analytical batch | No analytes detected ≥ RL | Correct problem then reprep and analyze method blank and all samples processed with the contaminated blank |
| Inorganics | Inorganics | LCS for all analytes | One LCS per analytical batch | QC acceptance criteria, 75 to 125 percent | Correct problem then reprep and analyze the LCS and all samples in the affected analytical batch |
| | | Duplicate | One per every 10 samples | Percent difference ≤25 | |
| | | MS/MSD | One MS/MSD per every 20 project samples per matrix | QC acceptance criteria, 75 to 125 percent | None |

| Method | Applicable Parameter | QC Check | Minimum Frequency | Acceptance Criteria | Corrective Action |
|---|---|---|---|---|---|
| | | MDL study | Once per 12 month period | Detection limits established shall be ≤ RLs | None |
| | | Results reported between MDL and RL | none | none | None |

*These are minimum requirements where applicable. Some of the QC checks may not apply to the specific method, for example TOC calibrations may be automatically dictated by the instrument and some of the methods are not amenable to MS/MSD checks.

APPENDIX G

# Health and Safety Plan Attachments

Attachment 1: Employee Signoff Form

Attachment 2: Project-Specific Chemical Product Hazard Communication Form

Attachment 3: Chemical-Specific Training Form

Attachment 4: Emergency Contacts

Attachment 5: Project Activity Self-Assessment Checklists

CH2MHILL

# EMPLOYEE SIGNOFF FORM

## Health and Safety Plan

The CH2M HILL project employees and subcontractors listed below have been provided with a copy of this HSP, have read and understood it, and agree to abide by its provisions.

**Project Name:** **Project Number:**

| EMPLOYEE NAME (Please print) | EMPLOYEE SIGNATURE | COMPANY | DATE |
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CH2MHILL

# Project-Specific Chemical Product Hazard Communication Form

This form must be completed prior to performing activities that expose personnel to hazardous chemicals products. Upon completion of this form, the SSC shall verify that training is provided on the hazards associated with these chemicals and the control measures to be used to prevent exposure to CH2M HILL and subcontractor personnel. Labeling and MSDS systems will also be explained.

**Project Name:** **Project Number:**

**MSDSs will be maintained at the following location(s):**

## Hazardous Chemical Products Inventory

| Chemical | Quantity | Location | MSDS Available | Container labels | |
|---|---|---|---|---|---|
| | | | | Identity | Hazard |
| Isobutylene | 1 liter, compressed | Support Zone | | | |
| Hydrochloric acid | < 500 ml | Support Zone / sample bottles | | | |
| Alconox/Liquinox | < 1liter | Support/Decon Zones | | | |
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Refer to SOP HS-05 *Hazard Communication* for more detailed information.

**CH2MHILL**

# CHEMICAL-SPECIFIC TRAINING FORM

Location: Project # :

HCC: Trainer:

**TRAINING PARTICIPANTS:**

| NAME | SIGNATURE | NAME | SIGNATURE |
|---|---|---|---|
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**REGULATED PRODUCTS/TASKS COVERED BY THIS TRAINING:**

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The HCC shall use the product MSDS to provide the following information concerning each of the products listed above.

☐ Physical and health hazards

☐ Control measures that can be used to provide protection (including appropriate work practices, emergency procedures, and personal protective equipment to be used)

☐ Methods and observations used to detect the presence or release of the regulated product in the workplace (including periodic monitoring, continuous monitoring devices, visual appearance or odor of regulated product when being released, etc.)

Training participants shall have the opportunity to ask questions concerning these products and, upon completion of this training, will understand the product hazards and appropriate control measures available for their protection.

Copies of MSDSs, chemical inventories, and CH2M HILL's written hazard communication program shall be made available for employee review in the facility/project hazard communication file.

## Emergency Contacts

## 24-hour CH2M HILL Emergency Beeper – 888/444-1226

**Medical Emergency – 911**
Facility Medical Response #:
Local Ambulance #:

**CH2M HILL Medical Consultant**
Dr. Peter Greaney
GMG WorkCare, Orange, CA
800/455-6155
(After hours calls will be returned within 20 minutes)

**Fire/Spill Emergency -- 911**
Facility Fire Response #:
Local Fire Dept #:

**Local Occupational Physician**

**Security & Police – 911**
Facility Security #:
Local Police #:

**Corporate Director Health and Safety**
Name: Mollie Netherland/SEA
Phone: 425/453-5000
**24-hour emergency beeper: 888-444-1226**

**Utilities Emergency**
Water:
Gas:
Electric:

**Health and Safety Manager (HSM)**
Name: John Culley/SEA
Phone: 425/453-5000

**Designated Safety Coordinator (DSC)**
Name:
Phone: 425/453-5000

**Regional Human Resources Department**
Name:
Phone:

**Project Manager**
Name: Doug Holsten/SEA
Phone: 425/453-5000

**Corporate Human Resources Department**
Name: John Monark/COR
Phone: 303/771-0900

**Federal Express Dangerous Goods Shipping**
Phone: 800/238-5355
**CH2M HILL Emergency Number for Shipping Dangerous Goods**
Phone: 800/255-3924

**Worker's Compensation and Auto Claims**
Sterling Administration Services
Phone: 800/420-8926 After hours: 800/497-4566

Report fatalities AND report vehicular accidents involving pedestrians, motorcycles, or more than two cars.

Contact the Project Manager. Generally, the Project Manager will contact relevant government agencies.

**Facility Alarms:**

**Evacuation Assembly Area(s):**

**Facility/Site Evacuation Route(s):**

**Hospital Name/Address:** Sunnyside Community Hospital
10th and Tacoma, Sunnyside, WA

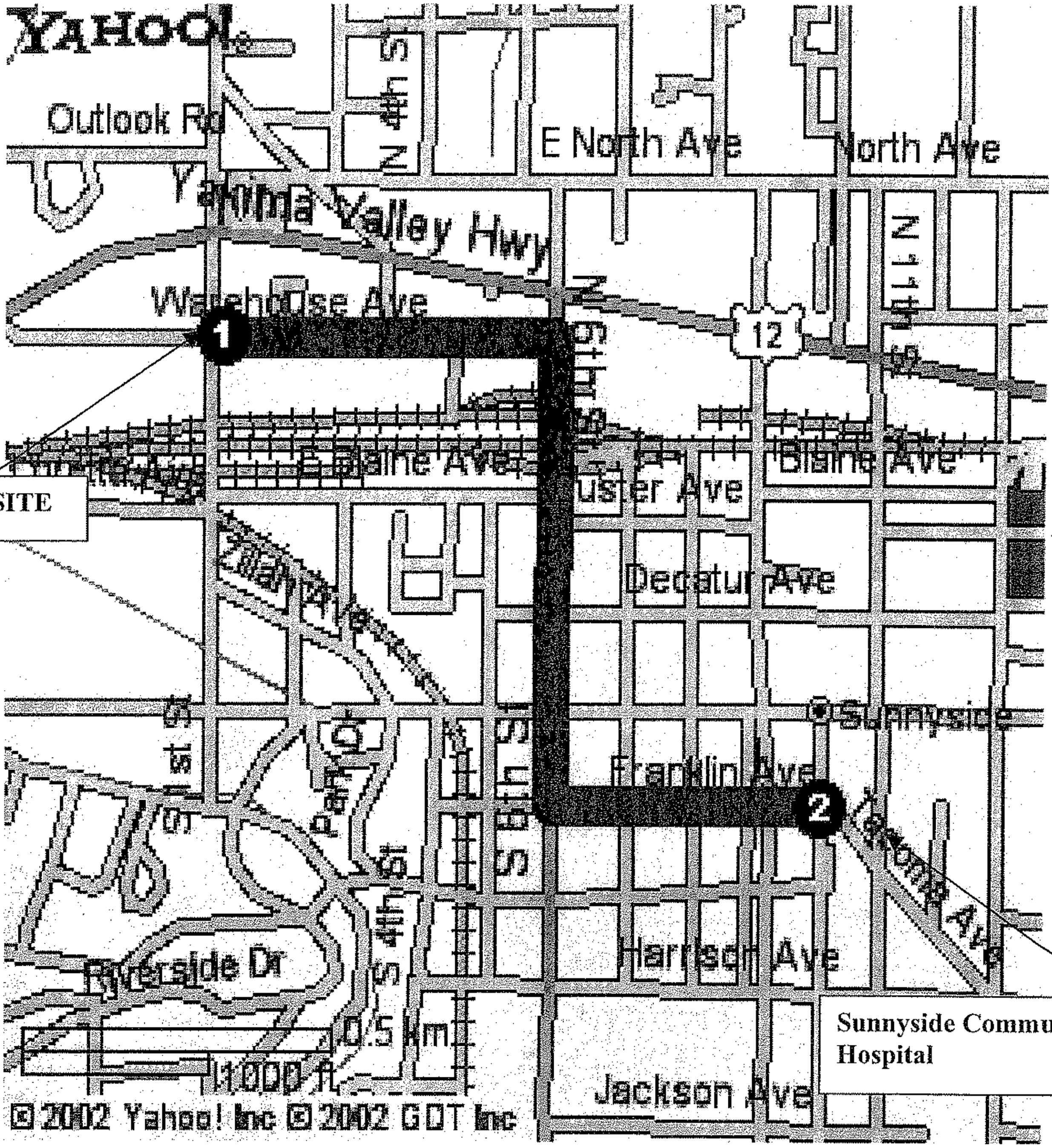
**Hospital Phone #:** (509) 837-4070

[redacted]

**Directions Miles**

1. Start on E WAREHOUSE AVE 0.3
2. Turn Right on N 6TH ST 0.1
3. Continue on S 6TH ST 0.3
4. Turn Left on E FRANKLIN AVE/FRANKLIN AVE 0.3

**See maps next page**



SITE

Sunnyside Community Hospital

**CH2MHILL**

# H&S Self-Assessment Checklist – DRILLING

## Page 1 of 3

This checklist shall be used by CH2M HILL personnel only and shall be completed at the frequency specified in the project's HSP/FSI.

This checklist is to be used at locations where: 1) CH2M HILL employees are potentially exposed to hazards associated with drilling operations (complete Sections 1 and 3), and/or 2) CH2M HILL oversight of a drilling subcontractor is required (complete entire checklist).

SSC/DSC may consult with drilling subcontractors when completing this checklist, but shall not direct the means and methods of drilling operations nor direct the details of corrective actions. Drilling subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Completed checklists shall be sent to the health and safety manager for review.

Project Name: ______________________________ Project No.: ______________

Location: ______________________________ PM: ______________

Auditor: ______________________ Title: ______________ Date: ________

This specific checklist has been completed to:

☐ Evaluate CH2M HILL employee exposures to drilling hazards
☐ Evaluate a CH2M HILL subcontractor's compliance with drilling H&S requirements
Subcontractors Name: ______________________________

- Check "Yes" if an assessment item is complete/correct.
- Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the drilling subcontractor. Section 3 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HS-35.

| SECTION 1 | Yes | No | N/A | N/O |
|---|---|---|---|---|
| **PERSONNEL SAFE WORK PRACTICES (3.1)** | | | | |
| 1. Only authorized personnel operating drill rig | ☐ | ☐ | ☐ | ☐ |
| 2. Personnel cleared during rig startup | ☐ | ☐ | ☐ | ☐ |
| 3. Personnel clear of rotating parts | ☐ | ☐ | ☐ | ☐ |
| 4. Personnel not positioned under hoisted loads | ☐ | ☐ | ☐ | ☐ |
| 5. Loose clothing and jewelry removed | ☐ | ☐ | ☐ | ☐ |
| 6. Personnel instructed not to approach equipment that has become electrically energized | ☐ | ☐ | ☐ | ☐ |
| 7. Smoking is prohibited around drilling operation | ☐ | ☐ | ☐ | ☐ |
| 8. Personnel wearing appropriate PPE, per HSP/FSI | ☐ | ☐ | ☐ | ☐ |

Rev.0

**CH2MHILL**

# H&S Self-Assessment Checklist – DRILLING

Page 2 of 3

| SECTION 2 | Yes | No | N/A | N/O |
|---|---|---|---|---|
| **GENERAL (3.2.1)** | | | | |
| 9. Daily safety briefing/meeting conducted with crew | ☐ | ☐ | ☐ | ☐ |
| 10. Daily inspection of drill rig and equipment conducted before use | ☐ | ☐ | ☐ | ☐ |
| **DRILL RIG PLACEMENT (3.2.2)** | | | | |
| 11. Location of underground utilities identified | ☐ | ☐ | ☐ | ☐ |
| 12. Safe clearance distance maintained from overhead powerlines | ☐ | ☐ | ☐ | ☐ |
| 13. Drilling pad established, when necessary | ☐ | ☐ | ☐ | ☐ |
| 14. Drill rig leveled and stabilized | ☐ | ☐ | ☐ | ☐ |
| **DRILL RIG TRAVEL (3.2.3)** | | | | |
| 15. Rig shut down and mast lowered and secured prior to rig movement | ☐ | ☐ | ☐ | ☐ |
| 16. Tools and equipment secured prior to rig movement | ☐ | ☐ | ☐ | ☐ |
| 17. Only personnel seated in cab are riding on rig during movement | ☐ | ☐ | ☐ | ☐ |
| 18. Safe clearance distance maintained while traveling under overhead powerlines | ☐ | ☐ | ☐ | ☐ |
| 19. Backup alarm or spotter used when backing rig | ☐ | ☐ | ☐ | ☐ |
| **DRILL RIG OPERATION (3.2.4)** | | | | |
| 20. Kill switch clearly identified and operational | ☐ | ☐ | ☐ | ☐ |
| 21. All machine guards are in place | ☐ | ☐ | ☐ | ☐ |
| 22. Rig ropes not wrapped around body parts | ☐ | ☐ | ☐ | ☐ |
| 23. Pressurized lines and hoses secured from whipping hazards | ☐ | ☐ | ☐ | ☐ |
| 24. Drill operation stopped during inclement weather | ☐ | ☐ | ☐ | ☐ |
| 25. Air monitoring conducted per HSP/FSI for hazardous atmospheres | ☐ | ☐ | ☐ | ☐ |
| 26. Rig placed in neutral when operator not at controls | ☐ | ☐ | ☐ | ☐ |
| **DRILL RIG MAINTENANCE (3.2.5)** | | | | |
| 27. Defective components repaired immediately | ☐ | ☐ | ☐ | ☐ |
| 28. Lockout/tagout procedures used prior to maintenance | ☐ | ☐ | ☐ | ☐ |
| 29. Cathead in clean, sound condition | ☐ | ☐ | ☐ | ☐ |
| 30. Drill rig ropes in clean, sound condition | ☐ | ☐ | ☐ | ☐ |
| 31. Fall protection used for fall exposures of 6 feet or greater | ☐ | ☐ | ☐ | ☐ |
| 32. Rig in neutral and augers stopped rotating before cleaning | ☐ | ☐ | ☐ | ☐ |
| 33. Good housekeeping maintained on and around rig | ☐ | ☐ | ☐ | ☐ |
| **DRILLING AT HAZARDOUS WASTE SITES (3.2.6)** | | | | |
| 34. Waste disposed of according to HSP | ☐ | ☐ | ☐ | ☐ |
| 35. Appropriate decontamination procedures being followed, per HSP | ☐ | ☐ | ☐ | ☐ |

Rev.0

# H&S Self-Assessment Checklist – DRILLING

## Page 3 of 3

### SECTION 3

Complete this section for all items checked "No" in Sections 1 or 2. Deficient items must be corrected in a timely manner.

| Item # | Corrective Action Planned/Taken | Date Corrected |
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