FOCUSED SITE ASSESSMENT WORK PLAN

NORTHERN STATE HOSPITAL PROPERTY
SEDRO-WOOLLEY, WASHINGTON

Prepared for

PORT OF SKAGIT COUNTY

SEDRO-WOOLLEY, WASHINGTON

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Prepared by

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The material and data in this work plan were prepared under the supervision and direction of the undersigned.

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ACRONYMS AND ABBREVIATIONS

AST	aboveground storage tank
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
COI	chemical of interest
CRA	Cultural Resource Assessment report
CSM	conceptual site model
CUL	cleanup level
Department of Enterprise Services	Washington State Department of Enterprise Services
Ecology	Washington State Department of Ecology
EDR	Environmental Data Resources, Inc.
LUST	leaking underground storage tank
MFA	Maul Foster & Alongi, Inc.
MTCA	Model Toxics Control Act
NPDES	National Pollutant Discharge Elimination System
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
Port	Port of Skagit County, Washington
ppm	parts per million
Property	Northern State Hospital property
SAP	sampling and analysis plan
SIM	selective ion monitoring
TEE	terrestrial ecological evaluation
TPH-HCID	petroleum hydrocarbon identification
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound

1 INTRODUCTION

Maul Foster & Alongi, Inc. (MFA) has prepared this focused site assessment work plan for the Port of Skagit County, Washington (Port) for environmental site characterization activities at the Northern State Hospital property (the Property) located at 24909 Hub Drive in Sedro-Woolley, Washington (Figure 1). The Property historically was used as a self-sustaining treatment and residence facility for the mentally ill that included on-site patient and staff housing, a power house, maintenance shops, a laundry, and a fueling station. Activities associated with these and other historical uses may have resulted in the release of hazardous substances to environmental media at the Property. The Property is currently managed by the Washington State Department of Enterprise Services (Department of Enterprise Services), with buildings leased to multiple tenants, including Cascade Job Corps, for on-site housing and educational services; the Pioneer Center, for a drug and alcohol treatment facility; and the National Guard, for a vehicle storage, maintenance, and fueling facility.

1.1 Regulatory Framework

The Port received an Integrated Planning Grant from the Washington State Department of Ecology (Ecology) to support site assessment and redevelopment planning activities at the Property. This work plan has been developed to assess potential environmental impacts at the Property associated with selected features of concern. The focused site assessment will be conducted in general accordance with guidance put forth in the Model Toxics Control Act (MTCA) (Washington Administrative Code 173-340).

1.2 Purpose and Objectives

The purpose of the focused site assessment is to generate data to evaluate potential environmental contamination in selected areas of the Property in association with features of concern, to allow for risk screening, and to support an evaluation of potential cleanup actions (if needed). The activities outlined in this work plan are also intended to support the following specific project objectives:

- Conduct environmental due diligence activities including an in-depth file review to identify potential environmental concerns at the Property
- Develop a conceptual site model (CSM) and data quality objectives for site characterization
- Perform a limited investigation of hazardous substances in environmental media to identify potential sources of contamination and contaminant concentrations above MTCA cleanup levels (CULs)

- Evaluate potential risks to current and reasonably likely future human and ecological receptors
- Evaluate potential cleanup options for impacted environmental media on the Property

1.3 Work Plan Organization

This document is organized as follows:

- *Section 2* discusses background information and the physical setting of the Property.
- *Section 3* discusses the environmental due diligence research activities for the Property.
- *Section 4* discusses the potential features of concern at the Property.
- *Section 5* discusses the CSM.
- *Section 6* discusses the site assessment scope of work.
- *Section 7* describes the project management plan.

This work plan defines the environmental investigation approach for meeting the project purpose and objectives defined in Section 1.2. The investigation will include collection and analysis of soil and reconnaissance groundwater samples from temporary borehole locations at depths specific to historical site uses that may have resulted in release of hazardous substances.

Standard field operating procedures for collecting soil and reconnaissance groundwater samples, scheduling analyses, decontaminating equipment, and managing investigation-derived waste are described in the sampling and analysis plan (SAP) (Appendix A). The quality assurance project plan, included in the SAP, defines the laboratory and field analytical quality procedures and the quality assurance and quality control requirements for sampling and analysis.

2 BACKGROUND AND PHYSICAL SETTING

The background and physical setting information summarized below for the Property has been obtained from site visits, the environmental file review, and previous investigations at the Property.

2.1 Site Description

The Property is located in section 8 of township 35 north and range 5 east of the Willamette Meridian. The Property comprises four parcels: two rectangular-shaped parcels with the same parcel number and a combined area of 143.23 acres (parcel number 38607) to the north; a square-shaped, 39.37-acre tax parcel (parcel number 39356) to the south; and an irregularly shaped, 33.57-acre tax parcel (parcel number 100632) to the east (Figure 1). The Property is located on a small plateau with a slight downward topographic slope toward the east, south, and southwest toward Hansen Creek and Brickyard Creek.

The physical address for the Property is 24909 Hub Drive in Sedro-Woolley, Washington. The Property is bordered by Fruitdale Road to the west and the Northern State Recreation area to the north, south, and east. The Property is currently zoned urban reserve public open space and is outside the eastern edge of the Sedro-Woolley, Washington, city limits, but located within its urban growth area.

The Property currently comprises over 80 buildings and structures. Several buildings have been demolished on the Property, and the debris from a few of the buildings reportedly has been buried and/or disposed of on site, as determined through interviews of maintenance staff at the Property. The ground surface consists of grass and well established trees and shrubs, which are dispersed throughout the Property. The Property abuts the Northern State Recreation Area (owned by Skagit County), which contains more than 700 acres of vegetated open space.

2.2 Site History

The Property was developed in 1909 and operated as a treatment and residence facility and hospital for the mentally ill until its closure in 1973. The approximately 217-acre campus, which includes the former treatment and residence facility, hospital, and grounds, was designed to be self-sustaining and included on-site patient and staff housing, dedicated water supply reservoirs and an associated potable water treatment facility, a fueling station for on-site vehicles, maintenance and paint shops, and a laundry facility. Many of the buildings associated with the former facility, including the campus landscape as a whole, remain and are listed on the National Registry of Historic Places. After the facility's closure, the Property was transferred from the Department of Social and Health Services to the Department of Natural Resources and General Services Administration (known today as the Department of Enterprise Services). The Property is now partially occupied by the Cascade Job Corps, the Pioneer Center, and the National Guard, and many of the historical buildings are vacant.

Environmental impacts associated with former underground storage tanks (USTs) have been confirmed on the Property (see Section 3.2), but other potential environmental impacts associated with historical and current features of concern have not been assessed.

2.3 Geology and Hydrogeology

According to the Geologic Map of the Sedro-Woolley North and Lyman 7.5-minute quadrangles, the Property and vicinity are underlain by Quaternary glaciomarine drift (Dragovich et al., 1999). The glaciomarine deposits typically consist of "…poorly sorted, poorly compacted diamicton consisting of silty, sandy, gravelly clay to clayey gravel; moderately well- to well-sorted sandy silt, sandy clay, clayey silt, and clay…" (Dragovich et al, 1999). Environmental impacts, if found, in this type of geologic setting are not likely to migrate significant distances because conductive soil layers are probably not well interconnected or continuous, given the heterogeneities and cross-cutting layers typical of this type of geologic environment.

Previous investigations identified groundwater between 6 and 14 feet below ground surface (bgs) (Lone Rock Resources, 1993). MFA reviewed well logs from Ecology's online well log database for wells located within the nearest quarter sections adjacent to the Property tax parcels to better understand the local geology and identify potential water bearing zones that may be encountered at the Property. Several logs were located for geotechnical borings located on the Property. The exact location of these borings is unknown, but the logs indicate that the Property is underlain by approximately 25 feet of silt in some locations and approximately 15 feet of sand and gravel overlying silty sand in other locations. Depth to water was not identified on the geotechnical boring logs. Several logs were located for domestic wells in the general vicinity, which indicate shallow groundwater was encountered at depths from less than 20 feet bgs to greater than 80 feet bgs. These domestic well logs suggest that the local geology is variable and is generally composed of water-bearing zones of sand and gravel interspersed with layers of silt and clay. This type of variable geologic environment is consistent with MFA's understanding of the glaciomarine drift deposits present in the area.

The groundwater flow direction in the area of the Property has not been confirmed, but is inferred to flow toward the south, southwest, and southeast at the south end of the Property, in accordance with the local topography and as a result of discharge to Hansen and Brickyard Creeks (Figures 1 through 5). At the north end of the Property, groundwater likely flows generally north toward Hansen Creek.

3 ENVIRONMENTAL DUE DILIGENCE

MFA completed an environmental file review in order to identify features of potential environmental concern at the Property. The following records and historical documents were reviewed:

- State and federal agency database records as described in Section 3.1.
- A UST removal report (Lone Rock Resources, 1993) as discussed in Section 3.2.
- Aerial photographs of the Property as described in Section 3.3.1.
- Cultural resource assessment (CRA) (Artifacts Consulting, 2008) as described in Section 3.3.2.
- Building plans as described in Section 3.3.3.
- A utility map as described in Section 3.3.4.
- Sanborn Fire Insurance maps as described in Section 3.3.5.
- A book detailing the history of the facility, *Under the Red Roof* (McGoffin, 2011), as described in Section 3.3.6.
- Blueprint for the Northern State Multi-Service Center (from the Washington State Department of General Administration) as described below.

MFA conducted a site reconnaissance visit and interviewed a current maintenance worker to obtain site-specific information regarding the Property (see Section 3.4). MFA also interviewed a local government official for information about any emergency response actions or documented storage tank removal from the Property. This interview is discussed in detail in Section 3.5 of this work plan.

No information related to potential environmental impacts at the Property was found in the January 1992 Blueprint for the Northern State Multi-Service Center (provided by the Washington State Department of General Administration, Division of Property Development), the Sanborn Fire Insurance Map report, or the aerial photographs provided in the CRA and the Environmental Data Resources, Inc. (EDR) report (see Appendices C, D, and G).

3.1 Standard Environmental Record Sources

MFA contracted EDR to search state and federal agency databases for information regarding the Property and sites near the Property. All databases were searched using the standard search distances specified in ASTM E 1527-13. The sites identified by this database search are shown in Table 1. A list of "orphan" sites with inadequate address information for mapping was also researched; orphan sites found to be within the appropriate search radii are also included in Table 1. Only databases with hits for the sites on or near the Property are shown in Table 1. The EDR-generated radius map report is included in Appendix B.

The Property is identified on Ecology's Confirmed and Suspected Contaminated Sites List (Facility Site ID 65415931). Based on MFA's review of the report provided by EDR, the Property is documented to contain environmental impacts associated with petroleum products and benzene related to leaking underground storage tanks (LUSTs). One UST has been closed in place and four USTs are documented by Ecology as having been removed from the Property. The Ecology database listing for the LUSTs identified at FSID 65415931 notes that petroleum products have been confirmed and that benzene is suspected in the soil. The LUST listing confirms that petroleum products and benzene are suspected in the groundwater at the Property. The Property was listed as a Hazardous Waste Handler, although little is understood of the nature, use, and disposal of hazardous waste on the Property.

The remaining sites have no reported releases, have reported that cleanup is complete and/or have received No Further Action determinations from Ecology, and/or have little potential to impact the Property, based on their proximity and/or elevation in relation to the Property.

3.2 UST Removal Report

MFA requested any relevant documents from Ecology pertaining to contamination on the Property, including records pertaining to sampling, remedial actions, interim actions, violation notices, and environmental site assessments (Phase I/Phase II reports).

A UST removal summary report was provided by Ecology and reviewed by MFA. The report assessed the conditions of three former USTs and one remaining decommissioned UST on the Property and identified the presence or absence of petroleum impacts in the soil surrounding the USTs (Lone Rock Resources, 1993). Soil samples collected from nine locations near the

Maintenance, Douglas, and Denny buildings were analyzed for petroleum hydrocarbons and related constituents, using USEPA Method 8020 and Ecology methods WTPH-G, WTPH-D, and WTPH-418.1.

One former 250-gallon heating oil UST was removed and decommissioned near the Denny building (see Figure 2). During the investigation, the MTCA Method A soil CUL for diesel and heavy oil was 200 parts per million (ppm). The current MTCA Method A soil CUL for diesel and heavy oil is 2,000 ppm. No contamination above MTCA Method A CULs for diesel and heavy oils of 2,000 ppm was discovered during the sampling of the surrounding soil after the UST was removed.

Two former gasoline USTs, one 1,000-gallon and one 2,000-gallon, were decommissioned and removed at the former Maintenance building at the Property (Figure 2). The 2,000-gallon UST had been installed in 1987 as a replacement for a former UST that had shown signs of past leakage. Gasoline impacts, on the order of 100, 890, 1,300, 5,800, and 7,000 ppm, were detected in the soil surrounding both USTs. Benzene was not detected during the investigation (non-detect at 50 parts per billion), therefore the MTCA Method A soil CUL of 100 ppm for gasoline in soil was used. These concentrations exceed the MTCA Method A CUL of 100 ppm for gasoline in soil. Groundwater was confirmed to be in contact with the contaminated soil at 6 feet bgs, but this was not further investigated. A third UST was slated for removal near the Maintenance building; however, it was not found during the 1993 UST removal. No further remediation or assessment of the soil or groundwater impacts was determined to have taken place.

A former 300- to 500-gallon (varying amounts in report) No. 2 diesel fuel UST used to store fuel for an emergency generator was filled with inert material and decommissioned in place near the Douglas building (Figure 2). Diesel impacts, on the order of 460, 740, and 860 ppm, were detected in the soil surrounding the UST. This was above the MTCA Method A soil CUL of 200 ppm for diesel during the investigation. However, this is below the current MTCA Method A soil CUL of 2,000 ppm for diesel. Groundwater was found to be in contact with the bottom of the UST at approximately 14 feet bgs. Groundwater was not analyzed during the UST removal, and therefore the extent of impacts in groundwater is unknown. MFA found no documentation pertaining to further remediation or investigation activities for the surrounding soil or groundwater.

On March 4, 2013, Ecology sent an early notice letter to the current property owner requiring that additional work be done to assess the extent of environmental impacts associated with the former LUSTs (Ecology, 2013). Suspected soil and groundwater contamination related to benzene and petroleum products remains the primary concern. MFA found no documentation pertaining to further remediation or investigation activities.

3.3 Historical Use Information on Property

MFA reviewed the following information sources to obtain historical uses(s) information.

3.3.1 Historical Aerial Photographs Review

Aerial photographs of the Property from 1937, 1941, the mid-1940s1950, 1956, 1966, 1975, 1981, 1989, 1990, the mid-1990s, 1998, 2005, 2006, 2009, and 2011 were obtained from EDR (see

Appendix C) and the CRA (Artifacts Consulting, 2008). Reviewed aerial photographs from the CRA are included in Appendix D. These aerials were reviewed to identify historical changes to the Property and the Property's historical uses. Buildings mentioned below shown in Figures 2, 4 and 5.

1937 and 1940s—These aerials do not show enough detail to determine historical use and operations on the Property.

1941, 1950, and 1956—The aerials show the general layout of the structures on the campus; however, the number and size of the structures are indistinguishable because of the poor quality of the photographs.

1966—Some piles of debris can be observed in the open area to the east of the Power House and to the north of the Laundry building; however, no distinguishing features about the operation or contents of the piles can be observed because of the poor quality of the photograph.

1975—The Douglas building has been constructed. Because of the small scale of the Property on the photograph, no other distinguishing features or changes to the Property can be discerned.

1981, 1989, and 1990—The poor quality of the aerials make distinguishing specific structures and additional development of the Property difficult, but the campus and the surrounding area appear largely unchanged.

Mid-1990s—Several buildings have been removed from the Property. These buildings include the superintendent's residence; Ward D, E, F, and G; and the Rodgers, Elliot, and Horton buildings. Other development on the Property is not distinguishable because of the poor quality of the photograph.

1998—The National Guard Armory building has been built on the southwestern edge of the Property, although no distinguishing features to determine operations can be observed because of the poor quality of the photograph. The RSN building was added to the southeastern edge of the campus, although no distinguishing features can be discerned.

2005—No changes to the Property are visible.

2006—No changes to the Property are visible.

2009—No changes to the Property are visible.

2011—No changes to the Property are visible.

3.3.2 Cultural Resource Assessment Report

A CRA on the Property was reviewed to identify prior uses of buildings or operations at the former hospital that may have resulted in areas of concern (Artifacts Consulting, 2008). Areas of concern were selected from the list of buildings given in the CRA, based on the potential for waste or chemical handling and USTs or aboveground storage tanks (ASTs) associated with historical operations in the buildings. The CRA was also reviewed for evidence of historical use of pesticides (use, storage, and disposal) and areas where landscaping equipment had been serviced or washed; these features and uses were not identified in the report. The following are structures with historical uses that may have resulted in environmental impacts (see Figure 2):

- **Power House.** The Power House was built in 1919 and contained four boilers that used wood and later coal as a fuel source for the facility. Coal was brought to the building by rail on a track located to the north of the building. Coal was stored in a 90-foot-long by 18-foot-wide fuel bunker next to the rail trestle. A moveable coal hopper and an ash conveyor system aided in the functions of the building. Surplus coal was stored in piles around the outside of the Power House.

- **Laundry.** A laundry was constructed on the north end of the campus in 1947 to aid in the operations of the hospital. There is no clear evidence as to whether dry-cleaning operations were conducted in the building. However, because of the on-site residence of many doctors, nurses, and the superintendent, it is possible that dry-cleaning operations were performed at the facility. Dry-cleaning chemicals, if used, may have impacted the surrounding subsurface of the building.

- **Garage No. 2 (Maintenance Building).** A garage was built in 1921 and was mentioned as having had space for an oil room and a blacksmith shop. Petroleum products may have been handled and stored in and around the building, and metals contamination associated with blacksmithing may be present.

- **Paint, Planar, and Carpentry Shops.** This cluster of buildings to the north of the Power House provided the campus with paint, tin, blacksmith, plumbing, and carpentry shops. Built in the 1930s, the facilities allowed for on-site maintenance for the operations at the Property. The paint shop stored mixed paint products used on the stucco of the building's exterior and all wood elements on the Property. It is unclear what kind of activities related to handling, storage, and disposal of chemicals were conducted during the operations of the maintenance facilities.

- **Incinerator.** The CRA mentions that, during the operations of the hospital, refuse consisting of materials or items that could not be reused or repaired and food-waste-related products were burned in an incinerator located southeast of the Power House. The incinerator is no longer present on the Property. It is unclear if there were other landfills or incinerators located on the Property.

- **Chlorination Plant.** A chlorination plant was reported in the CRA to have been used to treat water from Reservoir No. 3, located in the northwest quadrant of the Property. It is unclear what kinds of chemicals were used to treat the water at the facility and whether chemicals were released to the subsurface soil and/or groundwater. The building is no longer present on the Property and the former building location on the Property is unknown.

- **Building Exteriors.** Buildings consisting of stucco exterior were painted with a mixture of linseed oil, turpentine, drier, and pigment. However, wood elements on the Property were painted with a blend containing lead.

- **Aeration and Filtration Buildings.** In 1947, wells were used to aid in the water supply for the operations at the hospital. Water was treated in the Aeration and Filtration buildings for sulfur and other impurities. Chlorinating equipment was stored and used in the Filtration building. It is unclear what kinds of chemicals were used to treat the water at the facility and whether chemicals were released to the subsurface soil and/or groundwater.

3.3.3 Building Plans

Building plans and blueprints of specific buildings on the Property were provided by the Department of Enterprise Services and were reviewed in order to locate buildings with the potential for USTs, ASTs, or identifying features associated with an environmental concern. Building plans are included in Appendix E. Not all buildings on the Property had blueprints available for review. The following blueprints were reviewed for any identifying features associated with a potential environmental impact (see Figure 2):

- **Power House.** Transformers were located in the northwest corner of the building in 1937. A proposed addition to the building in 1942 mentioned two storage tanks in the proposed eastern addition. The contents of these storage tanks are not described in the blueprint. A railroad track, mentioned in the CRA as being used for carrying coal to the Power House, extends behind the building to the north. The tracks end just past the northeastern side of the Power House. Abatement of asbestos in several pipes and in the insulation on the four boilers in the Power House was completed.
- **Laundry.** The Laundry contains extractor units, a drainage trench, and an abandoned steam trench. There is no description regarding what kind of extractor units were housed in the building. There were no clear indications concerning whether dry cleaning operations had been conducted in the building.
- **Denny Building.** The building plans provided no specific information associated with environmental concerns.
- **Douglas Building.** The building plans provided no specific information associated with environmental concerns. Polychlorinated biphenyl (PCB) abatement was proposed in the Douglas building with the removal of PCB-containing transformers.
- **National Guard Maintenance Building.** Building plans indicate that the facility contains fueling islands, wash pad, oil/water separator, and a 5,000-gallon diesel fuel tank near the building.

3.3.4 Utility Map

MFA reviewed a 1999 utility map from Skagit County Surveyors (Appendix F). Several piles were noted on the map to the east and northeast of the Power House; these may contain building demolition debris (see Figure 2).

3.3.5 Sanborn Fire Insurance Maps

Sanborn Fire Insurance maps were requested from EDR (see Appendix G). No records were found for the Property.

3.3.6 *Under the Red Roof* Book

MFA reviewed the book *Under the Red Roof* (McGoffin, 2011). No information related to environmental impacts on the Property was found.

3.4 Site Reconnaissance and Interview

On June 18, 2014, Ms. Heather Hirsch of MFA conducted a site reconnaissance visit and interviewed John Wiggins, a maintenance worker with the Department of Enterprise Services, in order to obtain information on the likelihood of environmental impacts in connection with the Property's former or current operations and to address data gaps identified in the historical file review.

Mr. Wiggins has been employed by the Department of Enterprise Services and working on the Property as a maintenance worker since 1994. Mr. Wiggins was employed after the decommissioning and/or removal of the four USTs mentioned in the UST removal summary report and had limited knowledge of UST locations on the Property (Lone Rock Resources, 1993). According to Mr. Wiggins, the historical operations around Power House may have resulted in environmental impacts in the subsurface.

3.4.1 Observations

Ms. Hirsch visually observed the Property and structures of concern on the Property. Site photographs taken during the site reconnaissance are included in Appendix H. Because of the limitations imposed by the Property's large size and access constraints, Ms. Hirsch was not able to observe the entire Property. Instead, Ms. Hirsch focused on areas identified during an initial screening process as being the most likely to contain environmental impacts (i.e., the areas identified through a review of historical documents).

3.4.2 Methodology

Ms. Hirsch visited and inspected the Property, including site structures, for indications of the presence of potential areas of concern, including USTs and ASTs, petroleum products, transformers containing PCBs, and use and storage of hazardous materials.

3.4.3 Limiting Conditions

The Property contains over 200 acres and more than 80 structures. Therefore, it was not feasible to observe every portion of the Property. Areas observed during the site reconnaissance were identified during a historical-records review of the Property. The following buildings and structures were observed for any potential areas of concern (see Figures 2, 3, and 4):

- Power House
- Maintenance Building
- Filtration Building
- Paint, Planar, and Carpentry Buildings
- Former Laundry Building
- Former Reservoir
- Former Winfield and Employee Garage Buildings
- Former Superintendent's Residence

The National Guard Armory was not included in our site reconnaissance activities or file review because of access constraints; the Armory is under a long-term lease and therefore is not likely to be included in the redevelopment and reuse plans for the Property (see Figure 5).

3.4.4 Hazardous Substances and Petroleum Products in Connection with Identified Uses

The following hazardous substances and petroleum products were identified as currently being in use at the Property:

Diesel. Two active, approximately 8,000-gallon No. 2 diesel ASTs were observed behind Power House. Mr. Wiggins noted that they are used as backup fuel for the boilers in the Power House and for fueling equipment on the campus. The two ASTs are inside a roofed enclosure with a gravel floor on the north side of the Power House.

Gasoline. One active, approximately 500-gallon unleaded gasoline AST was observed to the north of the Paint and Planar shops for equipment fueling on the campus.

Pesticides and Handheld Fuel Containers. Pesticides and handheld fuel containers are stored in locked metal storage enclosures off the north end of the Power House.

Caustic Chemicals. Caustic chemicals are stored and used in the basement of the Power House for treatment of water for hardness and pH before it is used in the boilers.

Maintenance Activities and Parts Cleaning. Waste generated in the Maintenance building is temporarily stored on site and then is transported off site by Clean Harbors for disposal.

Vocational Training Activities. The buildings located on the north end of the campus are used by the Cascade Job Corps for vocation trade training. These buildings were not observed during the site reconnaissance; however, it is likely that hazardous chemicals associated with masonry, carpentry, and electrical trade activities are used in these buildings.

3.4.5 Storage Tanks

All ASTs observed on the Property are discussed in Section 3.4.4, except for three former ASTs (approximately 10,000-gallon each) located in the Filtration building, which likely were used for the chlorination treatment of drinking water from the water supply wells. All of the ASTs in the former Filtration building are disconnected, empty, and suspected to be coated with lead paint (see Figure 2).

No active USTs were identified on the Property. According to Mr. Wiggins, the Cascade Job Corps maintenance building is likely the building referenced in the 1993 UST removal report (Lone Rock Resources, 1993). Vehicles and equipment were formerly fueled at this maintenance building from at least one UST located on either the south or the north end of the building. Mr. Wiggins indicated that it is possible that buildings constructed before the common use of natural gas, and not connected to the steam plant grid, had dedicated heating oil and diesel USTs associated with emergency generators and heating sources. The potential locations of these dedicated heating oil and diesel USTs on the Property are unknown.

3.4.6 Coal

Coal was shipped in by raised rail and deposited into a bin located below the north end of the Power House (see Figure 2). The coal was then burned in a smokestack attached to the Power House. Disposal location(s) for clunkers from coal burning and from the inside of the boilers is unknown, but they may have been disposed of in multiple locations across the Property (e.g., landfills or debris piles). Excess coal reportedly was also stored around the exterior of the Power Plant building (see Section 3.3.2), and residual coal material and/or coal-related impacts may remain.

3.4.7 PCBs

PCBs are a U.S. Environmental Protection Agency (USEPA)-regulated toxic substance. In 1980, PCBs above a concentration of 50 ppm were banned from commerce for most applications. PCBs are commonly found in electrical equipment manufactured before 1980, including pole- and pad-mounted, fluid-filled electrical transformers, capacitors, and ballasts associated with fluorescent light fixtures.

The electrical system at the Property was upgraded approximately ten years ago. Present-day transformers do not contain PCBs (Wiggins, 2014) and there are no known PCB-containing transformers currently on the Property. Several empty transformer vaults are noted on the campus, which likely formerly housed PCB-containing transformers. One transformer vault previously associated with the former superintendent's residence is now used as a power vault serving the adjacent cottages.

3.4.8 Building Debris

Building materials from older buildings are likely to contain asbestos and lead paint. Several demolished historical buildings have been buried or disposed of in debris piles on the campus. The former superintendent's residence was demolished and buried in place in 1994 (Figure 4). There is a noticeable topographic mound in the former mill pond area behind the Power House that may contain building debris (Figure 2). Debris piles potentially containing debris from the former Winfield and Employee Garage buildings are located in the former building footprints in the southeastern quadrants of parcel 38607 (Figure 3). There is a mound to the northeast of the Power House that may contain building demolition debris. The Property's former septic tanks are filled with demolished building debris and are buried on site.

3.4.9 Heating System

When the hospital was in operation, the campus was heated by a steam tunnel system extending throughout the Property. Staff Apartments Nos. 1 and 2 are not connected to the steam grid and may have had heating oil USTs; other buildings may not have been connected to the steam grid and had dedicated heating oil USTs, and larger buildings may have had supplemental heating provided by a fuel burning furnace with associated heating oil UST (Figure 5). The Kitchen and the Power House receive natural gas, but may also be connected to the steam grid (Figure 2).

3.4.10 Potable Water Supply/Sewage Disposal System

The Property has been connected to the public utility district since sometime before 1987. Prior to 1987, the water supply for the campus was a large (approximately 2 million gallons of storage capacity) reservoir (Reservoir No. 3) located at the top of Goat (Tyee) Hill in the northwest quadrant of parcel 38607 (Figure 3). The reservoir is still present, but is not currently in use. Water was pumped from Hansen Creek from a former pump house (Pump House No. 2, former location unknown) to the reservoir and the water was treated at the former chlorination plant (location unknown) prior to use.

Deep (300 feet or deeper) wells, located on the adjacent Skagit County owned parcels, supplied water to the campus after use of the Goat Hill reservoir was discontinued; the campus no longer receives water from these wells and they are now owned by Skagit County. The well water was treated in the Aeration and Filtration buildings for high sulfur content (Figure 2).

Water used for the boilers in the Power House is treated for hardness.

Historically, sewage was pumped to septic tanks located on the southeast section of parcel 39356. The septic tanks are no longer in use and were reportedly filled in with building demolition debris (Figure 5).

3.4.11 Waste Handling

Currently, all scrap metal and other solid wastes are stored on site in dumpsters prior to off-site disposal/recycling. Waste Management provides all solid waste services for the Property. Wastes generated in association with maintenance parts cleaning and vocation trade training activities are temporarily stored on site and then picked up by Clean Harbors for off-site disposal.

The Property formerly contained an incinerator that was used to burn kitchen refuse that could not be reused (Figure 2).

Wastes associated with historical activities on the Property (e.g., hospital services, landscaping and maintenance services, coal clunkers from the boilers and smokestack) may have been disposed of in landfills on the Property. No landfill locations have been confirmed on the Property; however, debris piles and topographic mounds indicative of potential debris/waste burial may contain wastes associated with these historical activities.

3.4.12 Stormwater

Two stormwater retention ponds were installed on the Property approximately six years ago. One is located to the north of the Power House and the other is located to the east of the National Guard Armory. Stormwater discharges to Hansen Creek, located along the northeast-east boundary of the campus (Figure 2 and 5).

3.5 Interview with Local Government Official

Ms. Carolyn Wise of MFA contacted Ms. Krista Salinas to discuss records involving UST removal and any spill response efforts at the Property that had been reported to the Department of Emergency Management. Ms. Salinas is the public records assistant for the Skagit County Department of Emergency Management. No records were found for the Property from 1981 to the present. A formal written response summarizing Ms. Salinas's research findings is included as Appendix I.

3.6 Other Interviews

Ms. Wise interviewed Nick Cockrell of the Department of Enterprise Services regarding any National Pollutant Discharge Elimination System (NPDES) stormwater or wastewater permits for the Property. Mr. Cockrell was not aware of any Hydraulic Project Approval or NPDES permits or violations associated with the Property. The Department of Enterprise Services pays stormwater fees to Skagit County. All of Hansen Creek is owned by Skagit County, except for a small section of the creek near the Power House.

3.7 Data Gaps

- **Unknown USTs.** Because of the age of the facility, there is the potential for additional, currently unknown USTs on the Property. Some of the larger buildings are known to have had heating oil and diesel fuel USTs associated with emergency generators and heating sources. Ecology removed a 250-gallon UST in 2001; however, its location on the Property is unknown. There may be additional buildings that have or had similar heating or generator fuel storage associated USTs that are unknown.

- **Aerial Photographs.** Aerial photographs showing the Property before it was first developed were not found. This data gap is not considered significant and does not impact the findings of this report.
- **Chlorination Activities.** There was a chlorination plant located on the Property for treatment of water for the facility. The exact location of the plant is unknown, as it is no longer present, but provided treatment of the water in Reservoir No. 3 in the northwest corner of parcel 38607. The Filtration Building formerly provided chlorination treatment to drinking water from former water supply wells. The exact chemicals and the duration of operation of the plant or the Filtration building are unknown.
- **Former PCB-containing Transformer Locations.** During the historical operation of the hospital, transformers containing PCBs were located on the Property. Currently there are no known PCB-containing transformers on the Property. However, any environmental impacts related to the operation of the previous transformers are unknown.
- **The National Guard Armory.** The National Guard Armory is known to have a fueling island, an oil/water separator, and an AST visible near the main building. Vehicle maintenance is reportedly conducted inside the main building. The number of tanks and their contents associated with the fueling island is unknown. Any spills associated with the tanks near the building are unknown.
- **Laundry Building.** There is no clear evidence regarding whether the laundry included dry-cleaning services.
- **Waste Management.** Because of the large size of the campus and number of residences at the Property during the operation of the hospital, there is potential for one or more landfills to be located on the campus. However, no clear records describing their locations were discovered.
- **Building Demolition Debris.** Several of the buildings on the campus have been buried on site. There is potential that, across the campus, the soil surrounding these buildings may consist of debris containing asbestos or heavy metals.
- **Hospital.** Medical-waste-handling procedures are unknown and waste may have been disposed of in a landfill(s) on the Property. Most of the medical equipment has been removed from the building.
- **Access Limitations.** The Property contains over 200 acres and 80 structures. Because of the limitations imposed by the Property's large size and access restraints, MFA was not able to inspect the entire Property. The site reconnaissance focused on structures or areas of concern identified during the historical-file review.

Some of these data gaps will be resolved during the environmental investigation (e.g., testing groundwater downgradient of the laundry for dry-cleaning chemicals); however, the remaining data gaps will not be addressed as part of this investigation. This investigation focuses on the highest-priority potential environmental impacts on the Property, in terms of locations, uses, and/or features that have the greatest likelihood of causing environmental contamination on a significant scale, and does not include a complete site characterization. There is the potential that additional environmental concerns exist at the Property that are not included in the investigation approach presented in this work plan.

4 FEATURES OF CONCERN

Historical or current features with the potential to have contributed, or to continue to contribute, to environmental impacts at the Property were selected as features of concern. The following features of concern were identified during an environmental due diligence investigation of the Property (see Figure 2):

- **Former gasoline USTs around the Maintenance building and associated soil and groundwater impacts.** The 1993 UST removal summary report confirmed the presence of gasoline in excess of the MTCA Method A soil CUL around the Maintenance building; however, the investigation did not define the lateral or vertical extent of contamination, including whether the underlying groundwater had been impacted. No further assessment is known to have been completed to determine the lateral and vertical extent of soil and/or groundwater impacts.
- **Footprint of the former Maintenance building.** Parts cleaning and maintenance activities have been observed in the building. No known investigations have been completed to determine any associated subsurface impacts within the building footprint.
- **Power House footprint and fuel storage.** Coal was stored on the north side of the Power House, and discarded clunkers may have been deposited around the building. Caustic chemicals are stored and used in the basement of the Power House for the treatment of water for pH and hardness prior to its use in the boilers. Two approximately 8,000-gallon No. 2 diesel ASTs are located behind the Power House to the north. Facility staff indicated that there likely were environmental impacts off the north side of the Power House (Wiggins, 2014).
- **Historical operation of the Paint, Planar, and Carpentry Shops.** Chemicals used to paint wood were previously stored in these buildings. An existing gasoline AST is located just to the north of the Paint and Planar shops. Potential impacts related to these activities have not been investigated.
- **Historical operation of the Laundry.** A laundry operated at the Property during the operation of the hospital and there has been no clear evidence regarding whether dry-cleaning operations were conducted in the facility at some point. There is potential for products associated with dry-cleaning operations to have impacted soil, surface water, and groundwater.
- **Building debris buried and deposited on the Property.** The former superintendent's residence, constructed in 1926, was demolished and buried in place in 1994. The former

Winfield and Employee Garage buildings, constructed in 1924 and 1937, respectively, have also been demolished near their former building footprints. Because of the age of the demolished buildings, it is likely that their building materials contained asbestos. There are several topographic mounds located to the east and northeast of the Power House that may contain building debris. These piles of debris may have impacted soil, surface water, and groundwater.

- **Waste Management.** An incinerator located to the east of the Power House was known to be used to manage waste during the operations of the hospital. There may be additional landfills and/or waste management areas on the Property; however, there are no clear records of other sites.

- **Building Exteriors.** A paint blend containing lead was used on wood surfaces on the building exteriors. Chipping or flaking of paint onto the ground surface surrounding the buildings may have resulted in lead impacts to shallow soil.

Because of the limited investigation of this work plan and the large size of the Property, areas of primary concern were selected based on primary potential impacts. Although there are several buildings buried on Property, only the areas with building debris buried near the primary areas of concern will be investigated under this limited work plan.

5 PRELIMINARY CONCEPTUAL SITE MODEL

A CSM describes potential chemical sources, release mechanisms, environmental transport processes, exposure routes, and receptors. The primary purpose of the CSM is to describe pathways by which human and ecological receptors could be exposed to site-related chemicals. A complete exposure pathway consists of four necessary elements: (1) a source and mechanism of chemical release to the environment, (2) an environmental transport medium for a released chemical, (3) a point of potential contact with the impacted medium (referred to as the exposure point), and (4) an exposure route (e.g., soil ingestion) at the exposure point. The potential release mechanisms and pathways are described below.

5.1 Potential Sources and Release Mechanisms

Based on documented historical uses, prior site characterizations, Ecology's observations of site conditions and activities, and information obtained during site reconnaissance activities, the features of concern discussed in Section 4 may have contributed to environmental contamination at the Property. Contaminants associated with those features of concern may have been released to surface and/or subsurface soil and groundwater.

5.2 Fate and Transport Processes

Contaminant releases to surface and subsurface soil have the potential to migrate laterally and vertically to the water table, resulting in impacts to subsurface soil and dissolved-phase impacts to shallow groundwater (if present) beneath the Property. Volatile contaminants in surface and subsurface soil or groundwater may also partition to the vapor phase, which could result in impacts to indoor or outdoor air quality.

Dissolved-phase contamination also has the potential to migrate via groundwater flow, potentially resulting in downgradient groundwater, vapor, or surface water and sediment impacts via discharge to Hansen and Brickyard Creeks.

5.3 Potential Receptors

The following current and future human and ecological receptors may potentially be exposed to chemicals originating from the Property:

- Occupational workers
- On-site residents
- Construction and trench workers
- Freshwater aquatic organisms
- Freshwater benthic organisms
- Terrestrial organisms (e.g., plants, soil biota, and wildlife)
- Recreational fishers

5.4 Potential Exposure Scenarios

Depending on the extent of impacts at the Property, the following are potentially current or future exposure pathways:

- Occupational workers, on-site residents, construction and trench workers, and terrestrial receptors could be exposed to contaminants in surface soil by incidental ingestion, or dermal contact; or to contaminants in surface or sub-surface soil by inhalation of windblown dust generated during excavation or trenching activities.

- Construction and trench workers could be exposed to contaminants in sub-surface soil or groundwater by incidental ingestion or dermal contact during excavation or trenching activities.

- Freshwater benthic organisms could be exposed to contaminants by ingestion of surface water or sediment.

- Recreational fishers, terrestrial receptors, and freshwater aquatic receptors could be exposed to contaminants by consumption of aquatic or benthic organisms that have bioaccumulated chemicals in their fatty tissue or by dermal contact with or ingestion of surface water.

- Occupational workers, on-site residents, construction and trench workers, and terrestrial receptors could be exposed to contaminants in outdoor air via inhalation of vapors that have emanated from soil and/or shallow groundwater.
- Occupational workers and on-site residents could be exposed to contaminants in indoor air vapors via inhalation of vapors that have emanated from soil and/or shallow groundwater and intruded into buildings.
- Occupational workers and on-site residents could be exposed to contaminants in groundwater via ingestion, dermal contact, and/or inhalation of chemicals in tap water obtained from future drinking water supply wells located on the Property.

These potential exposure pathways will be evaluated further upon completion of the site assessment.

6 SCOPE OF WORK

This section describes the objectives and scope of work for the site assessment. The field investigations will be conducted in general accordance with the methods and protocol described in the SAP (see Appendix A).

6.1 Site Assessment Objectives

Site assessment objectives as they relate to hazardous substances potentially present at the Property include the following:

- Identification and characterization of hazardous-substance source areas. Source areas will be characterized through a review of historical information and the results of previously conducted investigations, and by the collection of environmental samples for observation, field screening, and chemical analyses.
- Evaluation of contaminant migration pathways. Key elements relevant to contaminant migration include, but are not limited to, the direction of groundwater flow, preferential migration pathways, and volatilization of volatile organic compounds (VOCs).
- Further determination of the nature, extent, and distribution of hazardous substances in environmental media.
- Identification of current and reasonably likely future human and ecological receptors that may be exposed to hazardous substances. Relevant contaminant migration pathways and the nature, extent, and distribution of hazardous substances in affected media will be considered in this evaluation.
- Through the risk screening, evaluation of the risk to human health and the environment from releases of hazardous substances.

- Generation or use of data of sufficient quality for a preliminary, focused site characterization and risk screening.
- Development of the information necessary to conduct a preliminary evaluation and design of source control measures to address contaminant releases from the Property, if deemed necessary.

The proposed site assessment scope of work is intended to meet these objectives as they relate to the chemicals of interest (COIs) identified in Section 6.2.

6.2 Site Assessment Approach

Soil and reconnaissance groundwater samples will be collected from up to eight borings installed using direct-push drilling techniques in order to evaluate potential environmental impacts associated with the features of concern identified in Section 4 (see Figure 2).

A focused investigation approach has been developed that strategically targets the highest-priority, as determined by the greatest likelihood of the presence and magnitude of potential environmental impacts, features of concern (as discussed in Section 4). In general, this includes potential sources related to fuel storage, coal handling, dry-cleaning operations, building and waste debris, and chemical handling located on the northern end of the Property, in tax parcel 36807 (see Figure 2). Soil and groundwater samples will be collected from temporary boreholes in this portion of the Property. Proposed boring locations are presented in Figure 2. The features of concern, COIs, and analytical testing associated with each proposed boring location are summarized in Table 2.

Boring locations presented in Figure 2 are approximate and may be adjusted based on field conditions, presence of utilities, and/or other access constraints.

6.2.1 Utility Locate

A public utility locate will be requested. Prior to subsurface exploration, a private utility locate contractor will attempt to locate on-site utilities, including the orientation of any water and sewer mains or laterals. Sampling locations may be adjusted based on information obtained from the utility locates.

6.2.2 Soil

MFA will conduct a limited investigation for potential source-specific contaminants in proximity to the targeted potential sources. Soil cores will be advanced from the ground surface to approximately 15 feet bgs.

Soil cores will be screened using a photoionization detector or an organic vapor monitor, and visual and olfactory observations will be recorded. Soil samples will be collected from borings from one or more depth intervals between approximately 2 and 15 feet bgs from proposed borings GP1 to GP5 and GP7. Specific soil sample collection depths will be determined for each individual boring based on the historical and current uses, the suspected depth(s) of the potential release, and field observations. Samples will be collected in accordance with the methods discussed in the SAP (Appendix A). Soil samples will not be collected from boring locations GP6 and GP8 unless field observations indicate contamination is present and time and resources permit the collection and analysis of additional soil samples.

Soil samples will be analyzed for one or more of the following, according to the analytical schedule shown in Table 2.

- Petroleum hydrocarbons by the Northwest Method Total Petroleum Hydrocarbon (NWTPH) hydrocarbon identification (HCID) Method (NWTPH-HCID)
- Total metals (arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium, silver, and zinc) by USEPA Method 6010 or 6020
- Polycyclic aromatic hydrocarbons (PAHs) by USEPA Method 8270 selective ion monitoring (SIM)
- VOCs by USEPA Method 8260B
- PCBs and pesticides by USEPA Method 8082A
- Gasoline-range organics (GRO) by NWTPH-Gx
- Benzene, toluene, ethylbenzene, and xylenes (BTEX) by USEPA Method 8021B

If petroleum hydrocarbons are detected by the NWTPH-HCID method, the following follow up analyses will be requested, based on the product type detected:

- GRO by NWTPH-Gx
- Diesel-range organics (DRO) by NWTPH-Dx

Soil analytical results will be compared to MTCA Method A CULs for unrestricted land use. A simplified terrestrial ecological evaluation (TEE) will be conducted for the Property using the procedure put forth in MTCA Table 749-1. Based on the conclusions of the TEE, soil analytical results may be screened to CULs that are protective of terrestrial wildlife. In the event that detected chemicals are not included in the Method A list, or the site is determined to be complex (e.g., multiple chemicals of potential concern), then MTCA Method B soil CULs for unrestricted land use may also be used. Exposure pathways will be re-evaluated and CULs will be re-assessed following completion of the investigation.

6.2.3 Groundwater

If groundwater is encountered within the target boring depth of 15 feet bgs or shallower, MFA will collect reconnaissance groundwater samples from selected borings to evaluate the potential for groundwater COIs (see Table 2). Groundwater sampling will be conducted using the methods and protocol outlined in the SAP (Appendix A).

Reconnaissance groundwater samples collected from borings GP1, GP2, and GP8 will be analyzed for one or more of the following, according to schedule shown in Table 2:

- TPH-HCID by NWTPH-HCID
- VOCs by USEPA Method 8260B
- BTEX by USEPA Method 8021B
- Dissolved metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) by USEPA Methods 6010 and 6020
- PAHs by USEPA Method 8270 SIM

If petroleum hydrocarbons are detected by the NWTPH-HCID method, the following follow up analyses will be requested, based on the product type detected:

- GRO by NWTPH-Gx
- DRO by NWTPH-Dx

A reconnaissance groundwater sample will also be collected from boring GP6 near the Filtration building and will be monitored for field parameters only (pH, temperature, electrical conductivity, dissolved oxygen, oxygen reduction potential, and turbidity).

No groundwater samples are anticipated to be collected from borings GP3 through GP5 and GP7; however, boring locations and/or groundwater samples may be added based on field observations and if time and resources permit.

Groundwater analytical results will be compared to MTCA Method A groundwater CULs and surface water standards. In the event that chemicals detected are not included in the Method A list, or the site is determined to be complex (e.g., multiple chemicals of potential concern), then MTCA Method B groundwater CULs for unrestricted land use may be used. Exposure pathways will be re-evaluated and CULs will be re-assessed following completion of the investigation.

6.3 Risk Screening

MFA will assess the potential risk posed to human health and to ecological receptors by COIs that are detected in soil and/or groundwater by comparing detected concentrations to the preliminary CULs discussed above.

7 PROJECT MANAGEMENT PLAN

The following describes the roles of the key personnel on the project.

Marc Estvold will be the project manager for the Port. Mr. Estvold will be kept informed of the status of the project and of project activities. He will be provided with data, reports, and other project-related documents prepared by MFA before their submittal to Ecology. He will be responsible for communicating with the property owner, will participate in discussions with Ecology, and will coordinate on-site activities with the property owner and MFA.

Michael Stringer will be the project manager for MFA. Mr. Stringer will coordinate with project task leaders and will communicate with Mr. Estvold. He will be responsible for allocating the resources necessary to ensure that the objectives of the site assessment are met.

Justin Clary will be the principal engineer and will be responsible for managing the overall completion of the site assessment and for communication of project status to the project director and the Ecology project manager. Mr. Clary will review data, reports, and other project-related documents prepared by MFA before their submittal to the Port or to Ecology. Mr. Clary will also assist project staff with technical issues.

Heather Hirsch will be responsible for technical assistance to assigned staff, as appropriate; assist with resolution of technical or logistical challenges that may be encountered during the investigation; assist with field activities and write and review reports; and participate in discussions with Ecology at the request of the Port.

Carolyn Wise will assist with field activities and will write and review reports.

Madi Novak will review the baseline human health and ecological risk screening and will be involved with overall data management. Ms. Novak will participate in discussions with Ecology at the request of the Port.

7.1 Schedule

The following is the anticipated site assessment schedule:

Task	Start Date	Weeks to Complete
Complete work plan	Week of August 4, 2014	2
Ecology work plan/SAP review	Week of August 11, 2014	2 to 4
Fieldwork	After receipt of Ecology's comments and approval on the work plan. Time frame includes fieldwork and laboratory analyses and appropriate follow-up analyses.	10
Draft site assessment report	After completion of fieldwork and receipt of final data packages.	4
Final site assessment report	Receipt of Ecology comments on draft site assessment report.	2

The time frames for the work to be performed may change, based on changes to the scope of work and issues involving site access, and subject to subcontractor availability and Ecology approval.

LIMITATIONS

The services undertaken in completing this work plan were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This work plan is solely for the use and information of our client unless otherwise noted. Any reliance on this work plan by a third party is at such party's sole risk.

Opinions and recommendations contained in this work plan apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this work plan.

The purpose of an environmental assessment is to reasonably evaluate the potential for or actual impact of past practices on a given site area. In performing an environmental assessment, it is understood that a balance must be struck between a reasonable inquiry into the environmental issues and an exhaustive analysis of each conceivable issue of potential concern. The following paragraphs discuss the assumptions and parameters under which such an opinion is rendered.

No investigation is thorough enough to exclude the presence of hazardous materials at a given site. If hazardous conditions have not been identified during the assessment, such a finding should not, therefore, be construed as a guarantee of the absence of such materials on the site.

Environmental conditions that cannot be identified by visual observation may exist at the site. Where subsurface work was performed, our professional opinions are based in part on interpretation of data from discrete sampling locations that may not represent actual conditions at unsampled locations.

Except where there is express concern of our client, or where specific environmental contaminants have been previously reported by others, naturally occurring toxic substances, potential environmental contaminants inside buildings, or contaminant concentrations that are not of current environmental concern may not be reflected in this document.

REFERENCES

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Lone Rock Resources. 1993. Site characterization report for underground storage tank removal sites No. 3 and No. 4 Northern State Multi-Service Center. Prepared for Richmond Engineering. Lone Rock Resources Inc., Redmond, Washington. April 8.

McGoffin, M. J. 2011. Under the red roof—one hundred years at Northern State Hospital. Sedro-Woolley, Washington: Published by Mary J. McGoffin.

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TABLES

Table 1
EDR Radius Search Results Summary
Northern State Hospital Property
Sedro-Woolley, Washington

Databases Searched	Sites Listed	
	EDR Geocheck	Orphan
Approximate Minimum Search Distance: 1.0 Mile from Property Boundary		
Ecology Confirmed and Suspected Contaminated Sites List (CSCSL)	1	1
Approximate Minimum Search Distance: 0.5 Mile from Property Boundary		
Local lists of hazardous waste/contaminated sites (ALLSITES)	11	12
Ecology Independent Cleanup Reports (ICR)	1	1
Washington Solid Waste Information System (Landfills)	2	0
Ecology LUST Database	1	1
Approximate Minimum Search Distance: 0.25 Mile from Property Boundary		
Ecology UST Database	1	4
Approximate Minimum Search Distance: Property Only		
Ecology Underground Injection Control Program (UICP)	0	1
Additional Environmental Record Sources		
Facility Index System/Facility Registry System (FINDS)	0	7
Federal Insecticide, Fungicide, & Rodenticide Act/Toxic Substances Control Act (FIFRA/TSCA) (FTTS)	0	2
FIFRA/TSCA Tracking System Administrative Case Listing (Historical FTTS)	0	2
Integrated Compliance Information System (ICIS)	0	1
Resource Conservation and Recovery Act Non-Generator (RCRA Non Gen/NLR)	3	2
Washington Emissions Data System (AIRS)	0	1
Ecology Hazardous Waste Manifest Data (MANIFEST)	2	0

NOTES:

EDR = Environmental Data Resources, Inc.

FTTS = FIFRA/TSCA Tracking System

LUST = Leaking Underground Storage Tank

UST = Underground Storage Tank

Table 2
Proposed Sampling and Analysis Schedule
Northern State Hospital Property
Sedro-Woolley, Washington

Proposed Sample Location and Associated Feature(s) of Concern	Sample Identification	Sample Type	Soil Sample Collection Depth (feet bgs)	Number of Samples (Soil)	Number of Samples (GW)	Chemicals of Interest in Soil[a,b]	Chemicals of Interest in GW[a,b]
North of Maintenance Building: downgradient (inferred) of maintenance building and former 1,000- and 2,000-gallon gasoline USTs	GP1	Boring	2 to 15	1	1	NWTPH-HCID Total Metals	NWTPH-HCID VOCs
North of Power House: adjacent to and downgradient (inferred) of two existing 8,000-gallon (approximately) diesel ASTs with dispenser and former coal bin and smokestack	GP2	Boring	2 to 15	1	1	NWTPH-HCID Total Metals PAHs PCBs	NWTPH-HCID BTEX Dissolved Metals PAHs
East of Power House: former refuse incinerator and potential coal storage or disposal location	GP3	Boring	2 to 15	1	0	NWTPH-HCID Total Metals PAHs	N/A
East of Power House: buried debris pile with potential building demolition debris, landfill refuse, coal, and asphalt[c]	GP4	Boring	2 to 15	1	0	NWTPH-HCID Total Metals PAHs VOCs	N/A
Northeast of Power House: buried debris pile with potential building demolition debris, landfill refuse, coal, and asphalt[c]	GP5	Boring	2 to 15	1	0	NWTPH-HCID Total Metals PAHs VOCs	N/A
North of former Filtration Building: downgradient (inferred) of former filtration building where drinking water was formerly chlorinated	GP6	Boring	2 to 15	0	1	N/A	(field parameters only)

Table 2
Proposed Sampling and Analysis Schedule
Northern State Hospital Property
Sedro-Woolley, Washington

Proposed Sample Location and Associated Feature(s) of Concern	Sample Identification	Sample Type	Soil Sample Collection Depth (feet bgs)	Number of Samples (Soil)	Number of Samples (GW)	Chemicals of Interest in Soil[a,b]	Chemicals of Interest in GW[a,b]
North of gasoline AST: existing 500-gallon (approximately) unleaded gasoline AST	GP7	Boring	2 to 15	1	0	NWTPH-Gx BTEX	N/A
North of former Laundry Building: downgradient (inferred) of former laundry with potential dry cleaning solvent use	GP8	Boring	2 to 15	0	1	N/A	NWTPH-HCID VOCs

NOTES:

AST = aboveground storage tank.

bgs = below ground surface.

BTEX = benzene, toluene, ethylbenzene, and xylenes; analysis by USEPA Method 8021B.

GW = groundwater.

N/A = not applicable.

NWTPH-Gx = Northwest Total Petroleum Hydrocarbon method for analysis of gasoline-range organics.

NWTPH-HCID = Northwest Total Petroleum Hydrocarbons-Hydrocarbon Identification method.

PAHs = polycyclic aromatic hydrocarbons, analysis by USEPA Method 8270.

PCBs = polychlorinated biphenyls, analysis by USEPA Method 8082A.

Total Metals = arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium, silver, and zinc; analysis by USEPA Methods 6010 and 6020.

Dissolved Metals = arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver; analysis by USEPA Methods 6010 and 6020.

USEPA = U.S. Environmental Protection Agency.

UST = underground storage tank.

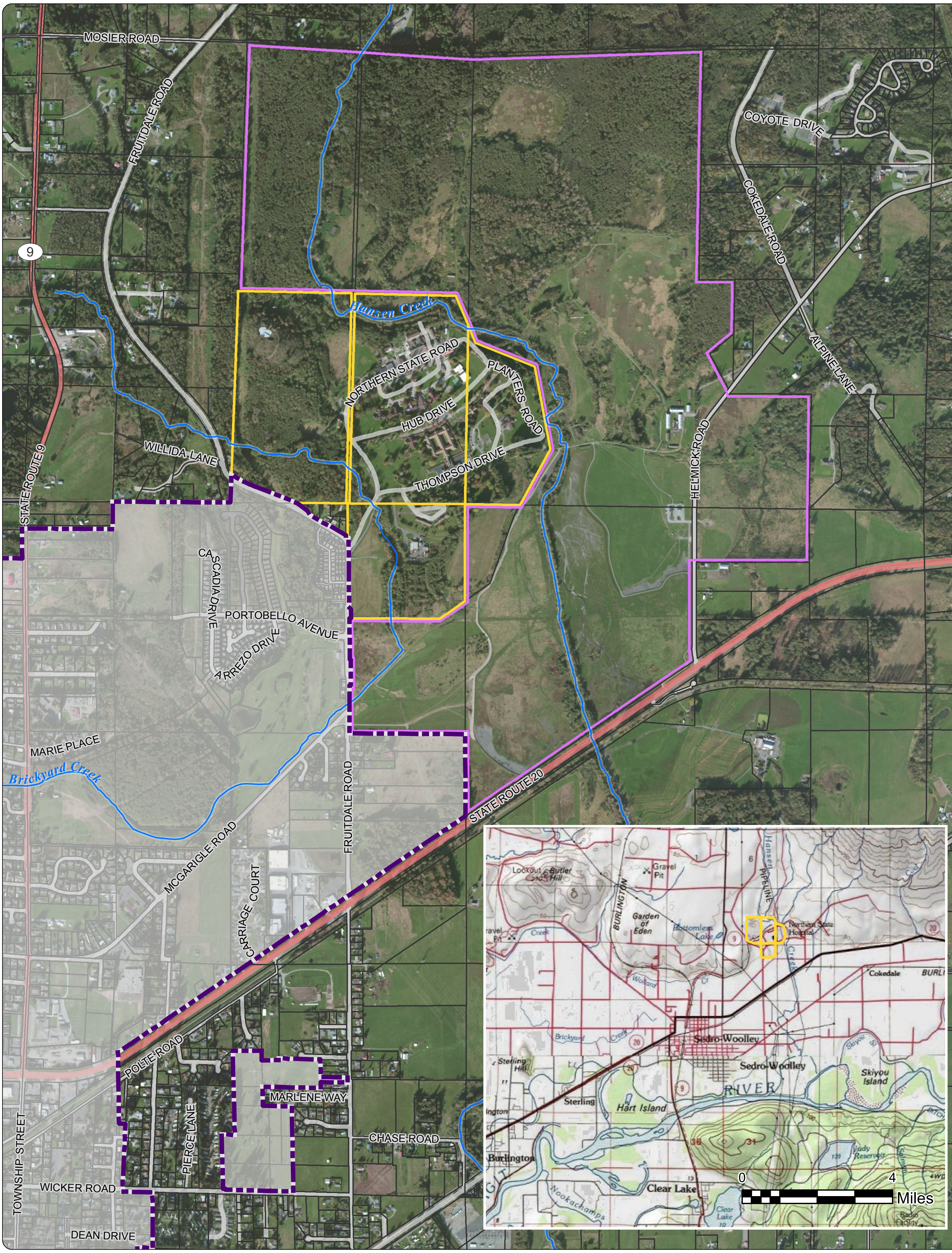
VOCs = volatile organic compound by USEPA Method 8260B.

[a]Soil samples to be analyzed by NWTPH-Gx and USEPA 8260B will be collected using the USEPA 5035 method.

[b]Additional samples may be collected and analyzed based on field observations, and additional followup analyses may be requested based on initial analytical results.

[c]If landfill/debris identified in the field, add analysis for PCBs and pesticides in soil.

FIGURES



Source: Aerial photograph obtained from Esri ArcGIS Online; parcels and roads obtained from Skagit County; city limits and UGA obtained from City of Sedro-Woolley.

Property address:
24909 Hub Drive
Sedro-Woolley, Washington

Notes:
City = City of Sedro-Woolley

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p. 971 544 2139 | www.maulfoster.com

Legend

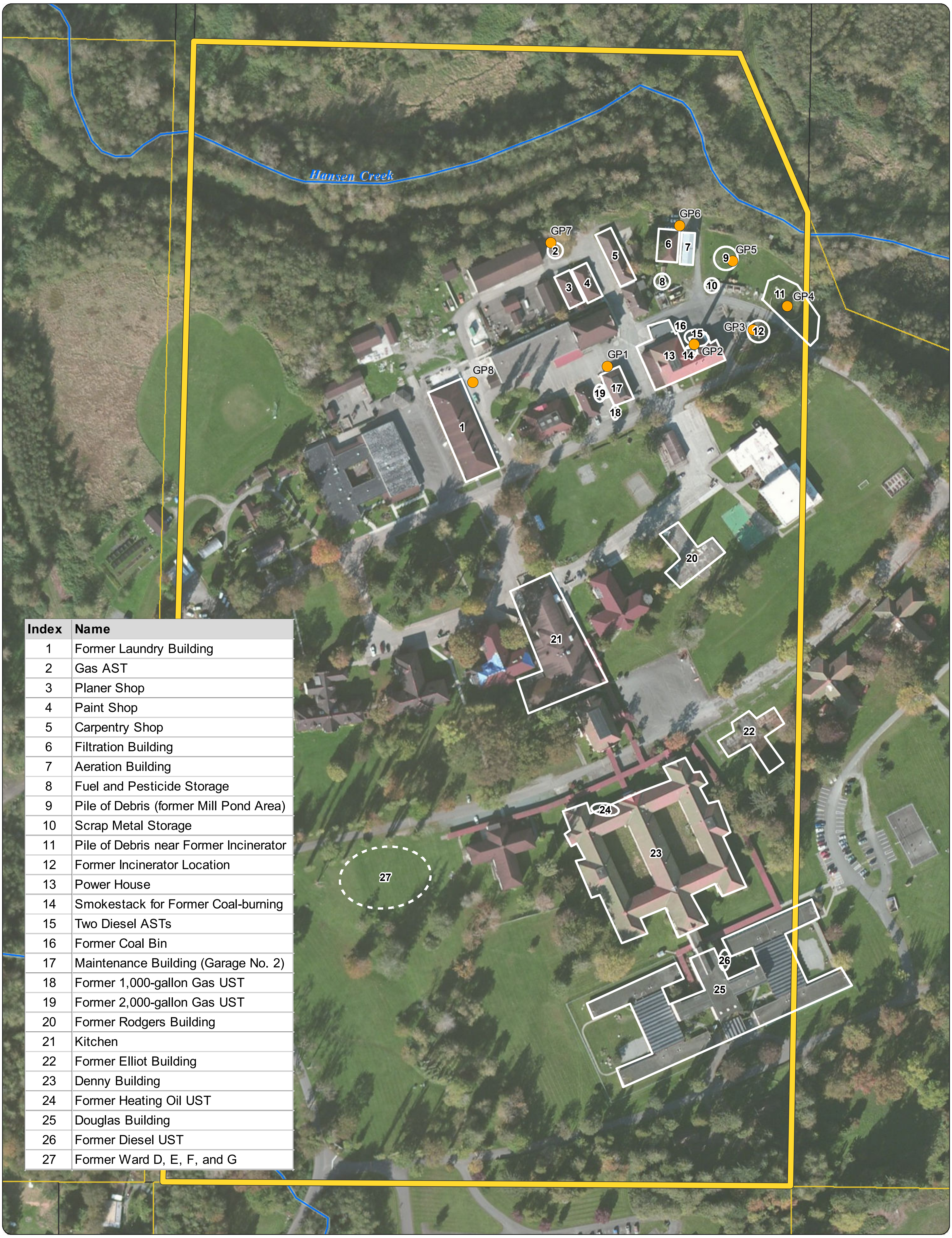
- Property Parcels
- Parcel Boundaries
- Northern State Recreational Area
- City Limits
- Streams

0 500 1,000
Feet

Figure 1
Property Location

Northern State
Hospital Property
Sedro-Woolley, Washington

Path: X:\0624.04 Port of Skagit\02_Adaptive Reuse Study\Projects\Fig 1_Site Location.mxd
Print Date: 8/15/2014
Approved By: mstinger
Produced By: gherbert
Project: 0624.04.01-01



Index	Name
1	Former Laundry Building
2	Gas AST
3	Planer Shop
4	Paint Shop
5	Carpentry Shop
6	Filtration Building
7	Aeration Building
8	Fuel and Pesticide Storage
9	Pile of Debris (former Mill Pond Area)
10	Scrap Metal Storage
11	Pile of Debris near Former Incinerator
12	Former Incinerator Location
13	Power House
14	Smokestack for Former Coal-burning
15	Two Diesel ASTs
16	Former Coal Bin
17	Maintenance Building (Garage No. 2)
18	Former 1,000-gallon Gas UST
19	Former 2,000-gallon Gas UST
20	Former Rodgers Building
21	Kitchen
22	Former Elliot Building
23	Denny Building
24	Former Heating Oil UST
25	Douglas Building
26	Former Diesel UST
27	Former Ward D, E, F, and G

Source: Aerial photograph obtained from Esri ArcGIS Online; parcels and roads obtained from Skagit County.

Notes: All property features are approximate.
AST = aboveground storage tank.
UST = underground storage tank.

Legend

- Parcel No. P38607
- Property Parcels
- Parcel Boundaries
- Proposed boring

Figure 2
Property Features and Proposed Sample Locations Parcel No. P38607 (1)

Northern State Hospital Property
Sedro-Woolley, Washington

0 100 200
Feet

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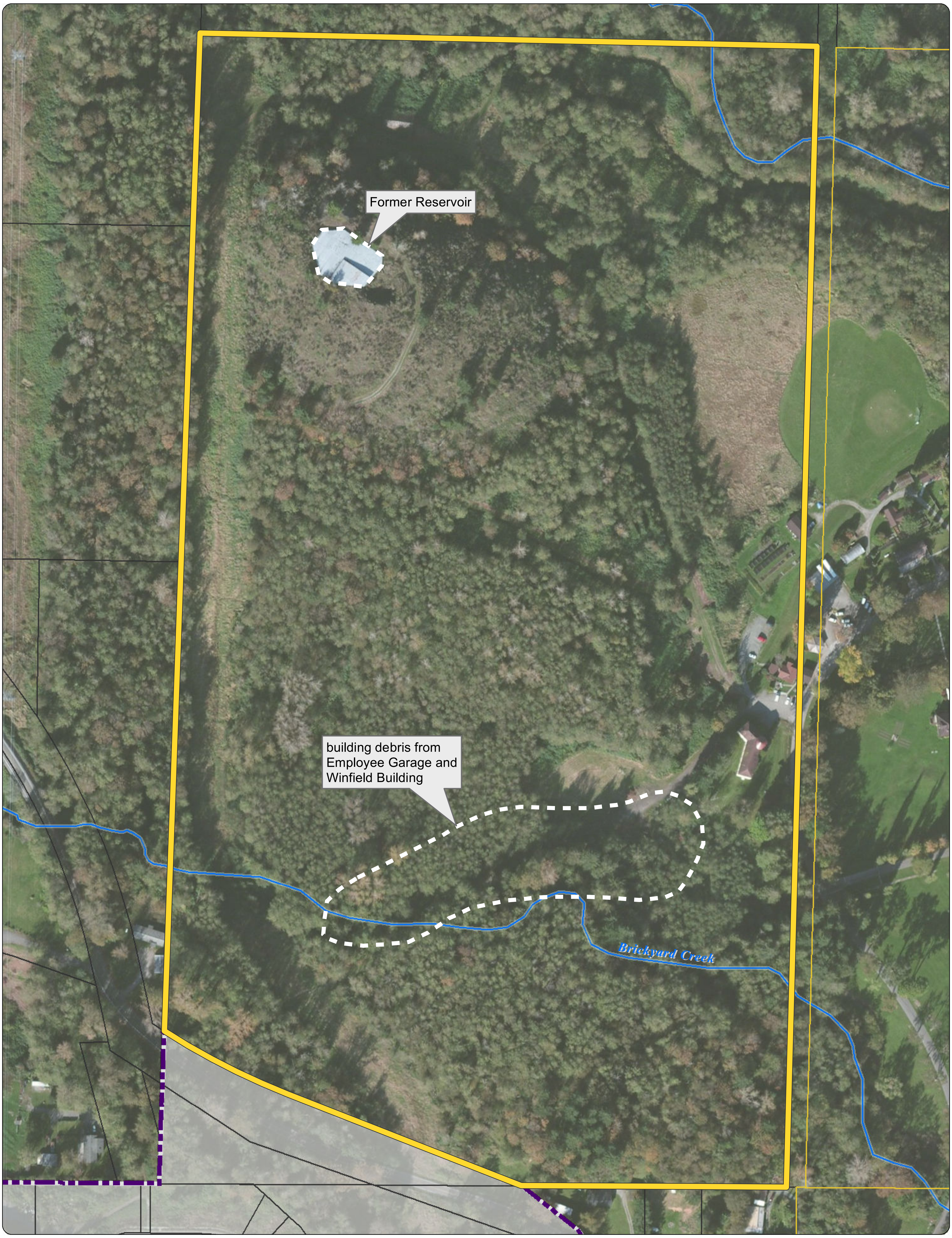
Print Date: 8/4/2014
Approved By: mstringer
Produced By: rcallihan
Project: 0624.04.01-01



Source: Aerial photograph obtained from Esri ArcGIS Online; parcels and roads obtained from Skagit County; city limits obtained from City of Sedro-Woolley.

Note: All property features are approximate.

Legend

- Parcel No. P38607
- Property Parcels
- Parcel Boundaries
- City Limits

0 100 200
Feet

Figure 3
Property Features
Parcel No. P38607 (2)

Northern State Hospital Property
Sedro-Woolley, Washington

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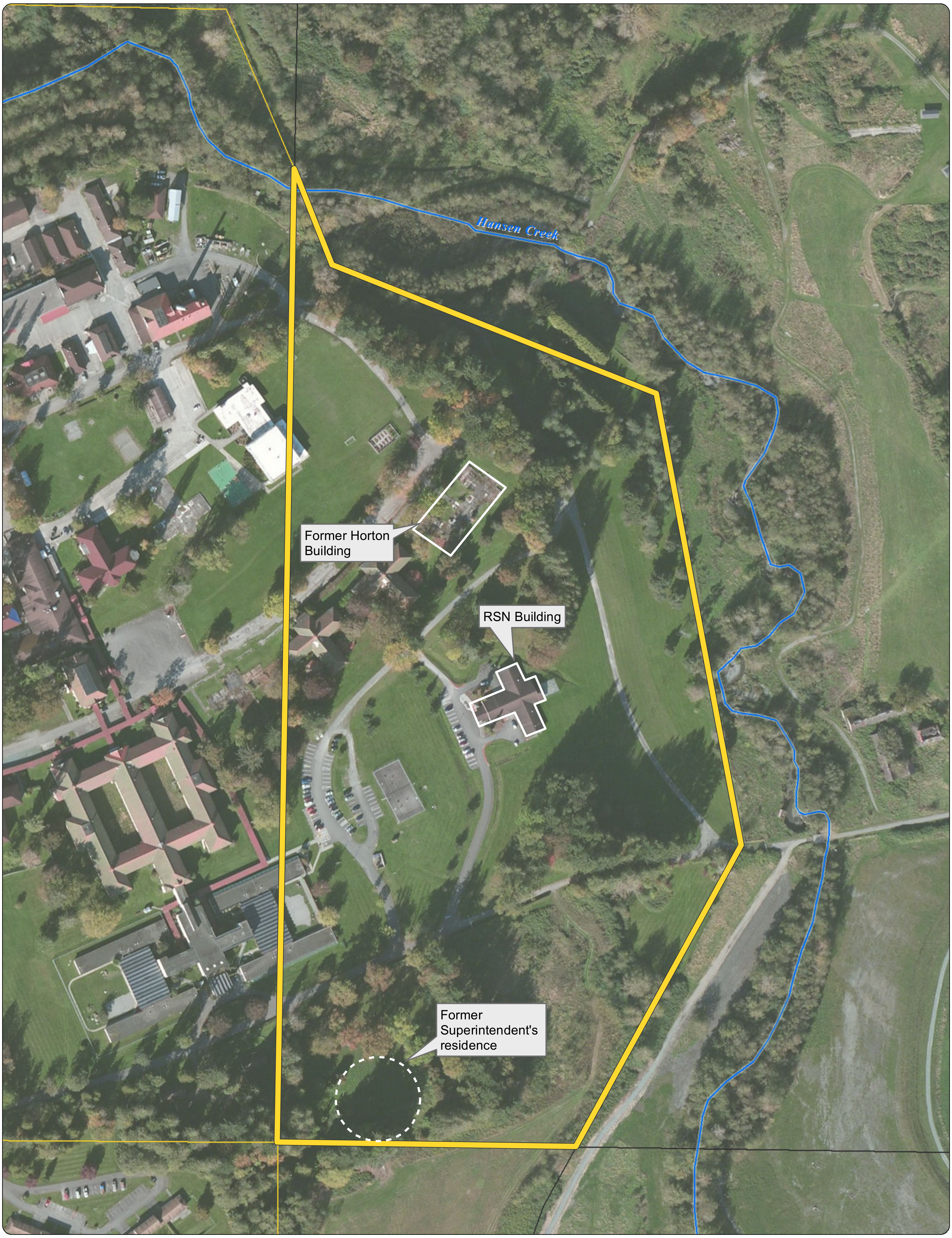
Project: 0624.04.01-01



Source: Aerial photograph obtained from Esri ArcGIS Online; parcels and roads obtained from Skagit County.

Note: All property features are approximate.

Legend

- Parcel No. P100632
- Property Parcels
- Parcel Boundaries

0 100 200
Feet

Figure 4
Property Features
Parcel No. P100632

Northern State Hospital Property
Sedro-Woolley, Washington

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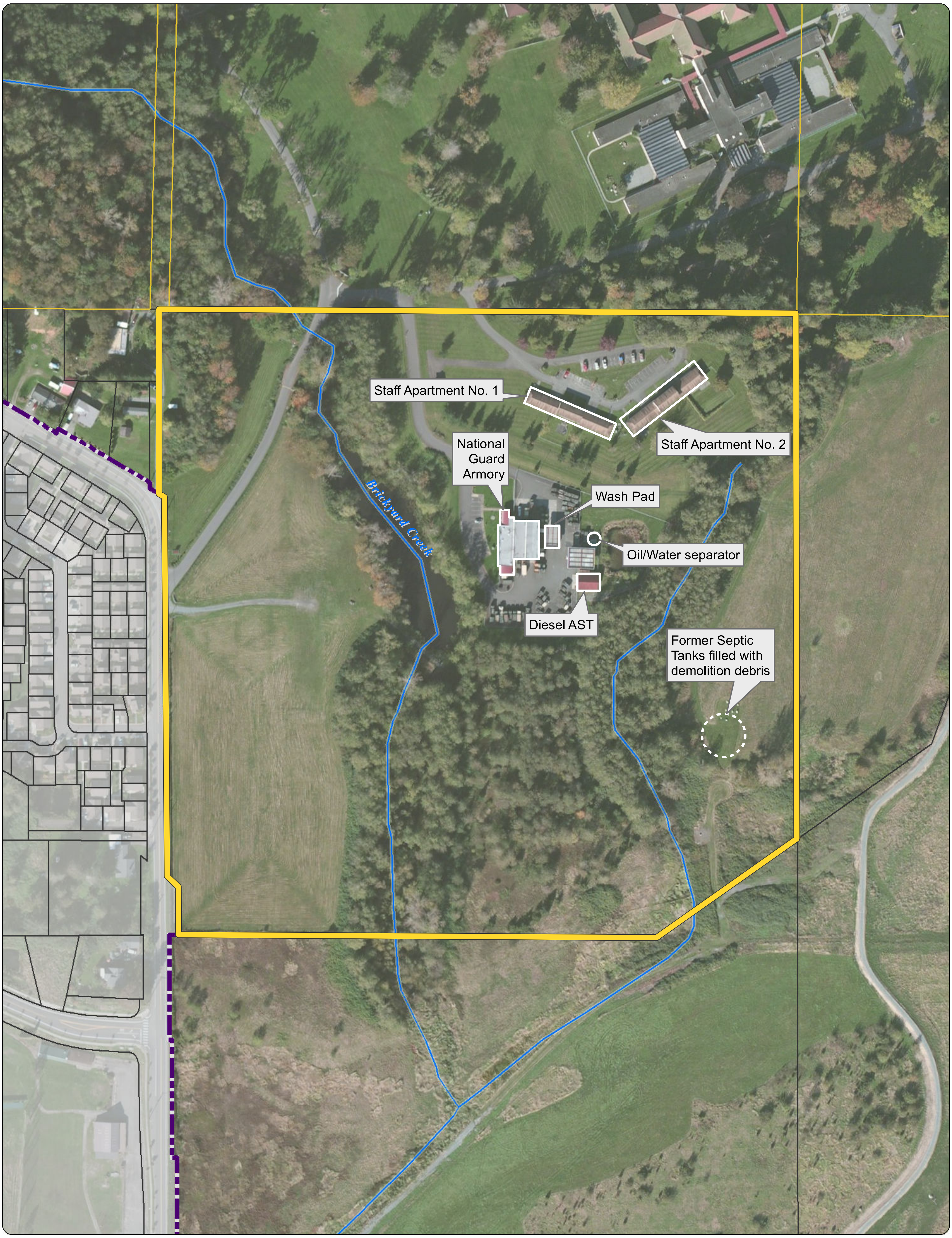
Print Date: 8/1/2014
Approved By: mstringer
Produced By: rcallihan
Project: 0624.04.01-01



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Print Date: 8/1/2014

Approved By: mstringer

Produced By: rcallihan

Project: 0624.04.01-01

Source: Aerial photograph obtained from Esri ArcGIS Online; parcels and roads obtained from Skagit County; city limits obtained from City of Sedro-Woolley.

Notes: All property features are approximate.
AST = aboveground storage tank.

Legend

- Parcel No. P39356
- Property Parcels
- Parcel Boundaries
- City Limits

Figure 5
Property Features
Parcel No. P39356

Northern State Hospital Property
Sedro-Woolley, Washington

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APPENDIX A

SAMPLING AND ANALYSIS PLAN

SAMPLING AND ANALYSIS PLAN

NORTHERN STATE HOSPITAL PROPERTY
SEDRO-WOOLLEY, WASHINGTON

Prepared for

PORT OF SKAGIT COUNTY

SEDRO-WOOLLEY, WASHINGTON

September 9, 2014

Project No. 0624.04.02

Prepared by

Maul Foster & Alongi, Inc.

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MAUL
FOSTER
ALONGI

SAMPLING AND ANALYSIS PLAN
NORTHERN STATE HOSPITAL PROPERTY
SEDRO-WOOLLEY, WASHINGTON

The material and data in this plan were prepared under the supervision and direction of the undersigned.

MAUL FOSTER & ALONGI, INC.

Heather R. Hirsch, LHG
Project Hydrogeologist

Michael Stringer, AICP
Project Manager

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TABLES AND ILLUSTRATIONS

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ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
COC	chain of custody
COI	chemical of interest
Ecology	Washington State Department of Ecology
FSDS	field sampling data sheet
GRO	gasoline-range organic
IDW	investigation-derived waste
IPG	Integrated Planning Grant
LCS	laboratory control sample
LDS	laboratory duplicate sample
MFA	Maul Foster & Alongi, Inc.
MS/MSD	matrix spike and matrix spike duplicate
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
pH	potential hydrogen
Port	Port of Skagit County, Washington
Property	Northern State Hospital property
PRT	post run tubing
QA	quality assurance
QC	quality control
SAP	sampling and analysis plan
SIM	selective ion monitoring
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
WAC	Washington Administrative Code

1 INTRODUCTION

Maul Foster & Alongi, Inc. (MFA) has prepared this sampling and analysis plan (SAP) consistent with the requirements of the Washington Administrative Code (WAC) 173-340-820 for the Port of Skagit, Washington (the Port) to guide the collection of samples during the focused site assessment investigation at the Northern State Hospital property (the Property) located at 24909 Hub Drive in Sedro-Woolley, Washington (see Figure 1 of the focused site assessment work plan [MFA, 2014]). Historically, the Property operated as a self-sustaining mental hospital that included on-site patient and staff housing, a laundry, maintenance shops, a power house, and a fueling station. The Property is now leased to multiple tenants, including the Cascade Job Corps, the Pioneer Center, and the National Guard, by the Washington State Department of Enterprise Services.

The work described in this SAP is being conducted by the Port under an Integrated Planning Grant (IPG) provided by the Washington State Department of Ecology (Ecology). The IPG funds will allow the Port to assess the environmental condition of the Property. The procedures described in this SAP will be used for various phases and tasks of the project. The goal of the sampling is to obtain reliable data about physical, environmental, and chemical conditions at the Property that will support the goals and objectives of the focused site assessment.

This SAP has been prepared consistent with the requirements of Ecology's Guidance on Sampling and Data Analysis Methods (Ecology, 1995), Guidance for Preparing Quality Assurance Project Plans for Environmental Studies (Ecology, 2004), Guidance for Evaluating Soil Vapor Intrusion in Washington State (Ecology, 2009), and the 1993 Model Toxics Control Act (WAC Chapter 173-340).

1.1 Investigation Objectives

The primary objective of the SAP is to establish procedures for the collection of data of sufficient quality to evaluate the nature and extent of impacted soil and groundwater at the Property. The focused site assessment work plan references the relevant procedures and protocols from this SAP and identifies specific media to be sampled and the locations, frequency, and types of field or laboratory analyses that will be conducted. The SAP is meant to ensure that reliable data are obtained in support of the development of remedial actions at the Property if such actions are necessary for the protection of human health and the environment. It provides a consistent set of procedures that will be used throughout the various work phases identified in the work plan (MFA, 2014).

Once the nature and extent of soil and groundwater impacts (if present) have been determined, further investigation, which may involve the collection of other media (e.g., soil gas, indoor or ambient air, subslab vapor), may be proposed. The procedures for collection of samples of other media are summarized in this SAP, in case these are necessary in future scopes of work.

If a phase of work or an otherwise unforeseen change in methodology requires modification to the SAP, an addendum may be prepared that describes the specific revision(s), or the alternative procedures used will be documented in the site assessment report. Procedures are provided that will be used to direct the investigation process so that the following conditions are met:

- Data collected are of high quality, representative, and verifiable.
- Use of resources is cost effective.
- Data can be used by the Port and Ecology to support selection and implementation of remedial actions, if necessary.

This SAP describes methods that will be used for sampling environmental media, decontaminating equipment, and managing investigation-derived waste (IDW). It also includes procedures for collecting, analyzing, evaluating, and reporting useful data. The SAP includes quality assurance (QA) procedures for field activities, quality control (QC) procedures, and data validation.

2 ACCESS AND SITE PREPARATION

2.1 Access

Signed agreements have been obtained from all the current tenants at the Property, granting access for MFA to conduct subsurface investigation under the IPG. MFA will coordinate activities directly with the Port, Ecology, and current tenants at the Property and will notify the Port and the Ecology project manager before beginning work at the Property.

2.2 Site Preparation and Coordination

Before subsurface field sampling programs begin at the Property, public and private utility-locating services will be used to check for underground utilities and pipelines near the proposed sample locations. MFA will coordinate fieldwork with the Port to define the locations of possible on-site utilities and piping or other subsurface obstructions. Ecology will be notified a minimum of 48 hours before field activities begin.

3 SOIL AND GROUNDWATER ASSESSMENT

The proposed locations of soil and reconnaissance groundwater borings are shown on Figure 2 of the site assessment work plan (MFA, 2014). Subsurface soil and reconnaissance samples will be collected using a direct-push drill rig (i.e., Geoprobe™) or using hand tools (e.g., hand auger, shovel).

Soil samples will be screened using a photoionization detector or an organic vapor monitor. Visual and olfactory observations will be noted. Soil and groundwater samples will be analyzed following the program outlined in Table 2 of the work plan (MFA, 2014). If there is evidence of impacts in the field, the sample depths may be altered in order to collect samples in and/or beneath the impacted areas. Additional analyses may be recommended based on field observations.

3.1 Borings

The borings will be advanced with the direct-push drill rig and industry-standard sampling techniques. In the event that refusal is met before the desired boring depth is reached (i.e., significant debris, cobbles, or bedrock are encountered), a different type of drilling technology may be considered.

Reconnaissance groundwater samples may be collected using a stainless steel (e.g., Geoprobe) water sampler. The water sampler will be advanced to the desired depth. The casing around the water sampler will be pulled back, exposing the screen. If water does not flow into the screen within 15 minutes, the sampler will be removed and a temporary well will be installed. This will consist of placing 0.010-inch machine slot screen with polyvinyl chloride riser into the boring and allowing the system to rest approximately 12 hours. If no water is in the well after the 12 hours, then the well will be abandoned.

If practicable, at least one casing volume of groundwater will be purged before sample collection, using new polyethylene tubing or a disposable bailer and following procedures summarized in Section 5.1. If there is enough water, some will be used to measure water quality field parameters, including pH, specific conductance, and temperature.

New disposable tubing will be used at each location to collect water samples. Non-disposable equipment used for water sample collection will be decontaminated both before its use at the facility and after each sample is collected in accordance with the procedures outlined in Section 3.7 of this plan.

Samples will be labeled, preserved, and shipped to the analytical laboratory under standard chain-of-custody (COC) procedures.

3.2 Documentation

A log of soil samples will be prepared by a geologist or hydrogeologist licensed by the State of Washington or by a person working under the direct supervision of a Washington State-licensed geologist or hydrogeologist. Boring logs will include information such as the project name and location, the name of the drilling contractor, the drilling method, the sampling method, sample depths, blow counts (if applicable), a description of soil encountered, and screened intervals. Soils will be described using American Society for Testing and Materials designation D2488-00, Standard Practice for Description and Identification of Soils (Visual-Manual Procedures). The information will be recorded on the MFA boring log form provided in Appendix A or in field notes.

3.3 Boring Decommissioning

When a boring is no longer needed, it will be decommissioned with bentonite chips or with bentonite grout in accordance with the WAC for Minimum Standards for Construction and Maintenance of Wells (WAC 173-160, 1998).

3.4 Monitoring Wells

Monitoring wells (if installed) will be constructed according to the Washington State well construction standards (Chapter 173-160 WAC) and as described below:

- Monitoring wells will be constructed with 2-inch-diameter polyvinyl chloride or stainless steel riser pipe and screened sections. The well screens will consist of 0.010-inch machine slots. The monitoring wells may be constructed with pre-packed well screen with 10 x 20 washed silica sand or by placing materials downhole, following the WAC regulation listed above.
- Additional filter pack may be placed around the pre-packed screen (if used). The additional filter pack will consist of graded 10 x 20 washed silica sand and will extend a maximum of 1 foot below the bottom of the screen and 3 feet above the top of the screen. A weighted line will be used to monitor the level of the filter pack during installation. The filter pack may be surged during installation.
- Bentonite grout or hydrated chips (e.g., 0.75-inch minus) will be used to seal the annulus above the filter pack. Potable water will be used. A weighted line will be used to measure the top of the bentonite chips as they are poured into place.
- At least 24 hours after installation of a well, the well will be developed by surging, bailing, or pumping to remove sediment that may have accumulated during installation and to improve the hydraulic connection with the water-bearing zone.
- Water quality field parameters such as specific conductance, pH, temperature, and turbidity will be measured during well development, as deemed appropriate. The wells will be developed until the turbidity measurements are 10 nephelometric turbidity units or less, or until there is no noticeable decrease in turbidity. To the extent practical, water quality field parameters will be considered stable when the specific conductance is within 10 percent of the previous reading, pH is within 0.1 standard unit of the previous reading, and temperature is within 0.1 degree Celsius of the previous reading.

3.5 Groundwater Elevations

Water level measurements to the nearest 0.01 foot will be taken, using an electronic water level indicator. If it is not known, the depth of the boring or the monitoring well will also be measured. The depth to water will be measured from the top of the casing (typically the polyvinyl chloride riser pipe) at the surveyed elevation point. This reference point will be marked so that readings are taken from the same reference point in future measurements. In addition, the well condition (including the condition of the lock, monument integrity, and legibility of well labels) will be recorded for each location. Gauging equipment will be decontaminated between wells in accordance with the procedures outlined in Section 3.7.

3.6 Surveying

The location of the borings, surface samples, and other features of interest will be surveyed using a global positioning unit (e.g., Trimble™) capable of sub-meter accuracy. If monitoring wells are installed, they will be surveyed by a licensed surveyor.

3.7 Equipment Cleaning and Decontamination

3.7.1 Drilling Equipment

The working area of the drill rig and downhole drilling equipment will be steam-cleaned or pressure-washed after arrival on the Property and after use in each borehole or monitoring well. Decontamination fluids will be transferred to drums approved by the Washington State Department of Transportation, and will be managed according to the procedures outlined in Section 3.8.

3.7.2 Sampling Equipment

Non-disposable sampling equipment and reusable materials that contact the soil or water will be decontaminated on site and before and after use at each sample and sampling location. Decontamination will consist of the following:

- Tap-water rinse (may consist of an equivalent high-pressure or hot-water rinse). Visible soil to be removed by scrubbing.
- Non-phosphate detergent wash, consisting of a dilute mixture of Liqui-Nox® (or equivalent) and tap water.
- Distilled-water rinse.
- Methanol solution rinse (1:1 solution of methanol with distilled water).
- Distilled-water rinse.

Decontamination fluids will be transferred to drums for management.

3.8 Management of Investigation-Derived Waste

IDW may include items such as soil cuttings, purged groundwater, decontamination fluids, sampling debris, and personal protective equipment. The IDW will be segregated into solids, liquids, and sampling debris (e.g., personal protective equipment, tubing, bailers). IDW will be stored in a designated area on the Property in drums approved by the Washington State Department of Transportation.

Drums will be labeled with their contents, the approximate volume of material, the date of collection, and the origin of the material. Pending characterization, the drums will be sealed, secured, and transferred to a designated area on the Property. Analytical data from the soil- and groundwater-sampling activities previously described may be used to characterize the soil cuttings, drilling fluids, purge water, and decontamination fluids generated during drilling and monitoring well sampling.

4 SOIL SAMPLING

Soil samples will be collected for lithologic description, field screening, and chemical analyses, as described below. The sampling intervals, depths, and initial sample analysis schedule are specified in the work plan (MFA, 2014).

4.1 Procedure

Samples will be prepared, handled, and documented as follows:

- Soil-sampling equipment will be decontaminated before it is used at each sampling location (see Section 3.7).
- Samples will be obtained by hand, using a new, uncontaminated glove; or with a decontaminated stainless steel spoon, trowel, or knife.
- Soil that will be analyzed for volatile organic compounds (VOCs) and gasoline-range organics (GROs) will be transferred directly from freshly exposed soil into laboratory-supplied containers, using the appropriate U.S. Environmental Protection Agency (USEPA) 5035A sampling procedures. The samples will be placed in 40-milliliter vials. Depending on the soil type, five milligrams of soil will be added to the prepared vials preserved with sodium bisulfate monohydrate or methanol. A soil sample will also be collected in an unpreserved glass jar to be analyzed for petroleum hydrocarbons, heavy metals, and other analytes specified in Table 2 of the work plan (MFA, 2014).
- Large particles (i.e., larger than 0.25 inch) may be removed before the sample is placed in a laboratory-supplied container.
- Soil samples will be transferred directly from the sampling device into laboratory-supplied glass jars by hand, using a new, uncontaminated glove; or with a decontaminated stainless steel spoon, trowel, or knife.
- Sample containers will be labeled, packed in iced shipping containers with COC documentation (see Section 9), and delivered or shipped to the laboratory.
- Sampling information will be recorded in a field notebook, on a field sampling data sheet (FSDS), and on the COC form.

- Generally, duplicate soil samples should be collected at the frequency of one duplicate sample for every 20 samples collected.

4.2 Nomenclature

Soil samples will be labeled with a prefix to describe the location identification number, an "S" to indicate a soil sample matrix, and the sample depth in feet. The depth interval should be specified as the middle of the sampling interval. For example, a soil sample collected from a boring at location 12 and at depth interval from 18 to 22 feet below ground surface (bgs) will have the sample nomenclature of GP12-S-20.0.

Duplicate soil samples will replace the location number with "DUP," and the sample will have the same sample time as the primary sample. A duplicate sample of the abovementioned sample would appear as GPDUP-S-20.0. To avoid confusion, duplicate samples should not be collected from multiple locations at the same depth on the same day and at the same time.

Relevant sample information will be documented on the exploratory boring log (see Appendix A) or an FSDS (see Appendix B).

4.3 Composite Soil Sampling

Should soil stockpiles be created on site in the future, characterization of each stockpile will be completed through collection of representative composite soil samples. A clean shovel or hand auger will be used to dig up to 1.5 feet into the pile from at least three subsample locations. Each of the subsamples will be collected by hand with clean, disposable gloves. Subsample locations will be selected to obtain representative material, based on visual inspection and best professional judgment. To the extent possible, subsamples should consist of fine-particle-sized material, with larger rocks and debris removed. Subsamples will be combined and homogenized. The composite sample of the material source will be transferred to a laboratory-supplied glass container(s).

5 GROUNDWATER SAMPLING

During drilling, reconnaissance groundwater samples may be collected for chemical analyses, as described below. Should monitoring wells be installed, groundwater samples may be collected following the procedure outlined below.

5.1 Reconnaissance Groundwater Sampling

Reconnaissance groundwater samples will be collected using conventional methods associated with the drilling method (e.g., inertia or peristaltic pump). Before groundwater sampling, the borehole will be purged to minimize solids and ensure that a representative sample is collected.

Groundwater will be transferred directly into laboratory-supplied containers specific to the analysis required, as outlined in Section 9. If there is enough water, water quality field parameters (e.g., temperature, specific conductance, pH, turbidity) will be measured.

5.2 Monitoring Well Groundwater Sampling

If monitoring wells are installed, a peristaltic pump will be used collect groundwater samples, using standard low-flow sampling techniques. If possible, groundwater samples should be collected from the middle of the screened interval or, if the water level is below the top of the screen, from the middle of the water column. New, disposable tubing will be used at each monitoring location.

Before collection of groundwater samples, the water level will be measured and the well will be purged. If a peristaltic pump is used, the well should be purged at a low flow rate (e.g., 0.1 to 0.5 liter per minute). A minimum of one well volume will be purged before sample collection, or purging will continue until selected water quality field parameters (e.g., temperature, specific conductance, pH, turbidity) have stabilized. If the well goes dry during purging, a sample can be collected once the well recharges enough water. During purging, the flow rates, water levels, and water quality parameters will be recorded on an appropriate field form or in the field notes. Groundwater will be transferred directly into laboratory-supplied containers specific to the analysis required.

5.3 Nomenclature

Groundwater samples will be labeled with a prefix to describe the sampling location identification number, a "W" to indicate a water sample matrix, and the midpoint of the screened or open area sample depth in feet. For example, a reconnaissance groundwater sample collected from a boring at location 4 and with a screen from 30 feet to 35 feet bgs will have the sample nomenclature of GP4-W- 32.5.

Duplicate reconnaissance groundwater samples will replace the location number with "DUP," and the sample will have the same sample time as the primary sample. To avoid confusion, avoid collecting more than one duplicate sample from the same depth on the same date and at the same time. A duplicate sample of the abovementioned sample would appear as GPDUP-W-32.5.

Relevant sample information will be documented on the exploratory boring log (see Appendix A) or an FSDS (see Appendix B); documentation may include items such as the screened interval or open space, equipment used, water quality field parameters, and the amount of water purged before sampling. The screened interval or open borehole will be recorded on the boring log.

6 SOIL VAPOR SAMPLING

If soil vapor sampling is performed, it should be conducted as described below.

6.1 Procedure

Soil borings for soil vapor sample collection will be advanced using direct-push technology (e.g., Geoprobe). A "post run tubing" (PRT) system will be used to reduce problems that are more likely to occur with sampling directly through the steel rods. The PRT system uses an adapter and tubing to isolate the soil gas sample from the drill rods, thereby reducing possible leaks of ambient air from the rod joints into the sample. A PRT point holder and expendable point are attached to the leading end of a sampling screen. The drill rods will be advanced to the desired sample depth. The PRT adapter attached to the sample tubing is threaded into the reverse thread fitting in the top of the point holder. The rods are then retracted to release the expendable point, exposing the screen and creating an opening where soil gas can enter the PRT system.

The upper end of the tubing will be connected to the purging/sampling system (Figure 1). A flow controller may be attached to the sample setup to regulate the flow of soil vapor into the sample container. The line will be purged for one minute or a period of time sufficient to achieve a purge volume that equals at least three volumes of the PRT system and sampling train, and then the sample will be collected using a laboratory-supplied stainless steel canister (e.g., Summa canister), or other appropriate container.

If a leak check is deemed necessary, helium will be contained around the sampling apparatus and sampling location, using a small, tent-like structure or shroud, to serve as a leak-check compound to verify the integrity of the sampling system before the sample is collected. See the attached Figure 1 for sample system configuration.

6.2 Nomenclature

Soil vapor samples will be labeled with a prefix to describe the sampling location identification number, "SV" to indicate the soil vapor sample matrix, and the midpoint of the screened or open area sample depth. For example, a soil vapor sample collected from a boring at location 4 and with an open screen from 5 feet to 7 feet bgs will have the sample number GP4-SV-6.0.

Duplicate soil vapor samples will replace the location number with "DUP," and the sample will have the same sample time as the primary sample. A duplicate sample of the abovementioned sample would appear as GPDUP-SV-6.0.

Relevant sample information will be documented on the exploratory boring log (see Appendix A) or an FSDS (see Appendix B); documentation should include the screened interval or open space, equipment used, and helium meter readings.

7 SUBSLAB SOIL VAPOR SAMPLING

If subslab soil vapor sampling is performed, it should be conducted as described below.

7.1 Procedure

Subslab soil vapor sampling may be performed to evaluate vapors that collect under a building's foundation. The following procedures may be followed to install subslab soil vapor sampling points.

Subslab utilities, such as water, sewer, and electrical, should be located and marked on the slab prior to drilling or cutting. If a building is determined to have a moisture barrier and/or a tension slab, special care should be taken when drilling or cutting through the concrete slab. Subslab samples will not be collected if the slab is in contact with, or potentially could come into contact with, groundwater.

After removal of the floor covering, a 1.0- to 1.25-inch-diameter hole will be drilled through the concrete slab (see Figure 2). A hammer drill can be used to drill the holes. The holes should be advanced 3 to 4 inches into the engineering fill below the slab. Drill cuttings should be removed from the borehole, using a vacuum.

Vapor probes will be constructed of 1/8-inch- or 1/4-inch-diameter stainless steel tubing (e.g., Swagelok®) with a permeable probe tip. A Teflon™ sealing disk should be placed, as needed, between the probe tip and the blank riser pipe to prevent the downward migration of materials into the sand pack.

Dry granular bentonite should be used to fill the borehole annular space to above the base of the concrete foundation. Hydrated bentonite should then be placed above the dry granular bentonite. The bentonite for this portion of probe construction should be hydrated to ensure proper sealing. Care should be used in placement of the bentonite to prevent post-emplacement expansion, which might compromise both the probe and the cement seal. The remainder of the hole should be filled with bentonite grout if the probe installation is permanent. Before the introduction of the bentonite grout or cement, the existing concrete surfaces in the borehole should be cleaned with a damp towel to increase the potential of a good seal. The vapor probe tip should be surrounded by a sand filter pack to ensure proper airflow to the probe tip.

Water used in the construction of the probe should be deionized, the bentonite grout should be contaminant-free and quick-drying, and the metal probe components should be stainless steel and should be cleaned to remove manufacturer-applied cutting oils.

Prior to sampling, at least two hours of time should elapse following installation of a probe to allow the construction materials to cure and the subsurface to equilibrate (USEPA, 2006).

The upper end of the tubing will be connected to the purging/sampling system (see Figure 3). A flow controller will be attached to the sample setup to regulate the flow of soil vapor into the sample container. Before sampling, the line will be purged for one minute or a period of time sufficient to achieve a purge volume that equals at least three volumes of the purging/sampling system prior to sampling. Relevant sampling information should be recorded, including items such as the sampling start and stop times, the initial and final canister vacuum readings, and weather conditions. If a stainless steel canister is used, the sample should be rejected or the data qualified if the initial canister pressure is not at least -28 inch of mercury or if the final canister pressure is greater than -5 inch of mercury.

Upon completion of the sampling events, the foundation probes will be decommissioned by overdrilling the probe tip, probe tubing, bentonite, and grout. The borehole will be filled with grout and concrete patch material.

7.2 Nomenclature

Subslab soil vapor samples will be labeled with a prefix to describe the sampling location identification number, "BV" to indicate the subslab soil vapor sample matrix, and the midpoint of the screened or open area sample depth. For example, a subslab soil vapor sample collected from location 4 and with an open screen from 5 feet to 7 feet bgs will have the sample number L04-BV-6.0.

Duplicate soil vapor samples will replace the location number with "DUP," and the sample will have the same sample time as the primary sample. A duplicate sample of the abovementioned sample would appear as LDUP-BV.

Samples will be documented in field notes and will include the equipment used and the screened interval or open space.

8 INDOOR/OUTDOOR AIR SAMPLING

If indoor or outdoor air sampling is performed, it should be conducted as described below.

8.1 Procedure

Indoor air samples should be collected from each level, if applicable, of each building included in the assessment. Indoor air samples will be collected approximately 3 to 5 feet above the floor. If outdoor ambient air samples are collected, they should be taken from locations upwind of the building around the same time as the indoor air sample collection.

A flow controller should be attached to the sample setup to regulate the flow of air into the sample container. If a 6-liter stainless steel canister is used, the valve will be opened to collect the sample over a 24-hour period. Field data will be recorded, including items such as a description of the sample location, sampling start and stop times, the initial and final canister vacuum readings, and weather conditions. The sample should be rejected or the data qualified if the initial canister pressure is not at least -28 inch of mercury or if the final canister pressure is greater than -5 inch of mercury.

8.2 Nomenclature

Indoor air samples will be labeled with a prefix to describe the sampling location identification number prefixed by L, "IA" to indicate the indoor air sample matrix, and a height above ground, in feet. Background air samples will be labeled with a prefix to describe the sampling location identification number prefixed by L, "BA" to indicate the background air sample matrix, and a height above ground, in feet. For example, an indoor air sample collected at location 4, 3 feet off the ground, will have the sample number L04-IA-3.0.

Duplicate air samples will replace the location number with "DUP," and the sample will have the same sample time as the primary sample. A duplicate sample of the abovementioned sample would appear as LDUP-IA-3.0.

Relevant sample information may be documented on an FSDS (see Attachment B) and should include items such as a description of the sample location, the screened interval or open space, and equipment used. Record field data before and after the sampling, including items such as the sampling start and stop times, the initial and final canister vacuum readings, temperature, relative humidity, and observations of conditions that may influence sampling results (e.g., presence or use of products that may contain chemicals of interest [COIs]; open windows/doors; ventilation systems).

9 ANALYTICAL METHODS

9.1 Chemicals of Interest

Gasoline-range and diesel-range petroleum hydrocarbons were detected in subsurface soil during a 1993 underground storage tank removal (Lone Rock Resources, 1993). In addition, the following chemicals may be associated with known or suspected former activities on the Property and have been identified as COIs: benzene, toluene, ethylbenzene, and xylenes (BTEX); metals; VOCs; polycyclic aromatic hydrocarbons (PAHs); polychlorinated biphenyls (PCBs); and pesticides. COIs will be analyzed as outlined in Table 2 of the work plan (MFA, 2014).

9.2 Laboratory Test Methods and Reporting Limits

9.2.1 Soil

In accordance with the QA/QC requirements set forth in this SAP, an accredited laboratory may perform the following analyses. Laboratory methods are summarized in Table 1.

- TPH-HCID by Northwest Method NWTPH-HCID
- GROs by Northwest Method NWTPH-Gx
- Total Metals by USEPA Method 6010 and 6020

- PAHs by USEPA Method 8270 selective ion monitoring (SIM)
- Pesticides/Herbicides by USEPA Method 8081, 8270, and/or 8151
- PCBs by USEPA Method 8082A
- VOCs/BTEX by USEPA Method 8260B/8021B

9.2.2 Groundwater

In accordance with the QA/QC requirements set forth in this SAP, an accredited laboratory may perform the following analyses. Laboratory methods are summarized in Table 2.

- TPH-HCID by Northwest Method NWTPH-HCID
- Total and Dissolved Metals by USEPA Method 6010 and 6020
- VOCs/BTEX by USEPA Method 8260B/8021B
- PAHs by USEPA Method 8270 selective ion monitoring (SIM)

Followup analyses will depend on the potential type of petroleum hydrocarbons identified and may include the following analytes:

- GROs by Northwest Method NWTPH-Gx
- Diesel-range and residual-range organics by Northwest Method NWTPH-Dx

9.2.3 Soil Vapor/Subslab Vapor Sampling

In the event that soil vapor/subslab vapor sampling at the Property is recommended, chemical analyses will be determined based on chemical impacts observed in soil and/or groundwater. For example, samples may be analyzed for selected compounds by Modified USEPA Method TO-15 SIM or USEPA Method TO-17. An accredited laboratory will provide a 1-liter, stainless steel canister (e.g., Summa canister) or sorbent tube for each sample to be analyzed for VOCs.

9.2.4 Indoor/Outdoor Air Sampling

In the event that indoor air/outdoor air sampling at the Property is recommended, chemical analyses will be determined based on chemical impacts observed in soil, groundwater, and/or vapor sampling. For example, samples may be analyzed for selected VOC compounds by Modified USEPA Method TO-15 SIM to achieve low reporting limits. An accredited laboratory may provide a 6-liter, stainless steel canister (e.g., Summa canister) or sorbent tube for each sample.

9.3 QA/QC Samples Generated in Field

To ensure that field samples and quantitative field measurements are representative of the media collected and conditions being measured, sample collection and measurement methods will follow procedures documented in Section 4.1. QC samples collected in the field include field equipment rinsate blanks, trip blanks, and field duplicates. Field QC samples will be identified on the FSDSs.

Field and trip blank results may indicate possible contamination introduced by field or laboratory procedures; field duplicates indicate precision in both field and laboratory procedures.

9.4 Laboratory Operations

In the laboratory, QC samples may include matrix spike and matrix spike duplicate (MS/MSD) samples, laboratory control samples (LCSs), surrogate spike samples, and method blanks, as well as other QC samples and procedures required by the individual methods.

9.5 Sample Containers, Preservations, and Handling

9.5.1 Preservation

Soil and water samples will be collected in laboratory-supplied containers, as generally specified; see the summary in Tables 1 and 2.

Soil samples for GRO and VOC analyses will be collected in 40-milliliter glass vials, using the USEPA 5035A method. Other soil samples will be collected in glass jars. The soil and groundwater samples will be stored in iced coolers at approximately 4 degrees Celsius. Sample containers will be supplied by the laboratory.

9.5.2 Sample Packaging and Shipping

Soil and groundwater samples will be stored in iced shipping containers or a refrigerator designated for samples, and then transported to the analytical laboratory in containers. Air samples will be transported to the analytical laboratory in shipping containers or boxes.

9.6 Sample Custody

Sample custody will be tracked from point of origin through analysis and disposal, using a COC form, which will be filled out with the appropriate sample and analytical information after samples are collected.

The following items will be recorded on the COC form:

- Project name
- Project number
- MFA project manager
- Sampler name(s)
- Sample number, date and time collected, media, number of bottles submitted
- Requested analyses for each sample
- Type of data package required

- Turnaround requirements
- Signature, printed name, and organization name of persons having custody of samples, and date and time of transfer
- Additional instructions or considerations that would affect analysis (nonaqueous layers, archiving, etc.)

Persons in possession of the samples will be required to sign and date the COC form whenever samples are transferred between individuals or organizations. The COC will be included in the shipping containers. The laboratory will implement its in-house custody procedures, which begin when sample custody is transferred to laboratory personnel.

If samples are shipped via air or ground transportation (by a third party), the following custody procedures will be followed. The COC will be signed and custody will be relinquished to the carrier. The signed COC(s) will be packed in shipping containers with the samples, and a custody seal will be placed on the container. The shipping documentation will be used by the carrier to document custody of the package while it is in transit to the laboratory.

At the analytical laboratory, a designated sample custodian will accept custody of the samples and will verify that the COC form matches the samples received. The shipping container or set of containers is given a laboratory identification number, and each sample is assigned a unique sequential identification number.

9.7 Instrumentation

9.7.1 Field Instrumentation

Field instruments will be used during the investigations. The following field equipment may require calibration before use and periodically during sampling activities:

- pH meter
- Conductivity meter
- Dissolved oxygen meter
- Oxygen/reduction potential meter
- Turbidity meter
- Thermometer
- Photoionization detector
- Electronic water-level probe

Field-instrument calibration and preventive maintenance will follow the manufacturers' guidelines, and deviations from the established guidelines will be documented.

9.7.1.1 Field Calibration

Generally, field instruments should be calibrated daily before work begins. Field personnel may decide to calibrate more than once a day if inconsistent or unusual readings occur, or if conditions warrant more frequent calibration. Calibration activities should be recorded in logbooks or field notebooks. To ensure that field instruments are properly calibrated and remain operational, the following procedures will be used, at a minimum:

- Operation, maintenance, and calibration will be performed in accordance with the instrument manufacturers' specifications.
- Standards used to calibrate field instruments will meet the minimum requirements for source and purity recommended in the equipment operation manual. Standards will be checked for expiration dates that may be printed on the bottle. Standards that have expired should not be used.
- Acceptable criteria for calibration will be based on the limits set in the operations manual.
- Users of the equipment should be trained in the proper calibration and operation of the instrument.
- Operation and maintenance manuals for each field instrument should be available to persons using the equipment.
- Field instruments will be inspected before they are taken to the site.
- Field instruments will be calibrated at the start of each workday. Meters will be recalibrated, as necessary, during the work period.
- Calibration procedures (including items such as time, standards used, and calibration results) should be recorded in a field notebook. The information should be available if problems are encountered.

9.7.1.2 Preventive Maintenance

Preventive maintenance of field instruments and equipment will follow the operations manuals. A schedule of preventive-maintenance activities should be followed to minimize downtime and ensure the accuracy of measurement systems. Maintenance will be documented in the field notebook.

9.7.2 Laboratory Instrumentation

Specific laboratory instrument calibration procedures, frequency of calibration, and preparation of calibration standards will be according to the method requirements as developed by the USEPA, following procedures presented in SW-846 (USEPA, 1986).

9.7.2.1 Laboratory Calibration and Preventive Maintenance

The laboratory calibration ranges specified in SW-846 (USEPA, 1986) will be followed.

Preventive maintenance of laboratory equipment will be the responsibility of the laboratory personnel and analysts. This maintenance includes routine care and cleaning of instruments and inspection and monitoring of carrier gases, solvents, and glassware used in analyses. The preventive-maintenance approach for specific equipment should follow the manufacturers' specifications, good laboratory practices, and industry standard techniques.

Precision and accuracy data will be examined for trends and excursions beyond control limits to determine evidence of instrument malfunction. Maintenance should be performed when an instrument begins to change, as indicated by the degradation of peak resolution, shift in calibration curves, decrease in sensitivity, or failure to meet any of the QC criteria.

9.8 Laboratory QA/QC Samples

The laboratory QC samples will be used to assess the accuracy and precision of the laboratory analysis. Each category of laboratory QA/QC will be performed by the laboratory as required by method-specific guidelines. The acceptance criteria presented in the guidelines will be adhered to and samples that do not meet the criteria will be reanalyzed or qualified, as appropriate.

9.8.1 Calibration Verification

Instruments will initially be calibrated at the start of the project or sample run, as required, and when any ongoing calibration does not meet control criteria. The number of points used in the initial calibration is defined in the analytical method. Calibration will be continued as specified in the analytical method to track instrument performance. If a continuing calibration does not meet control limits, analysis of project samples will be suspended until the source of the control failure is either eliminated or reduced to within control specifications.

9.8.2 Matrix Spike/Matrix Spike Duplicate

MS samples are analyzed to assess the matrix effects on the accuracy of analytical measurements. MS/MSD samples will be prepared by spiking investigative samples with known amounts of analytes before extraction and preparation and analysis. The recoveries for the MS/MSD samples will be used to assess the accuracy and precision in the analytical method by measuring how well the analytical method recovers the target compounds in the investigative matrices. For each matrix type, at least one set of MS/MSD samples will be analyzed for each batch of samples (consisting of 20 or fewer samples) received.

9.8.3 Method Blanks

Method blanks are prepared using analyte-free (reagent) water and are processed with the same methodology (e.g., extraction, digestion) as the associated investigative samples. Method blanks are used to document contamination resulting in the laboratory from the analytical process. A method blank shall be prepared and analyzed in every analytical batch. The method blank results are used to verify that reagents and preparation do not impart unacceptable bias to the investigative sample results. The presence of analytes in the method blank sample will be evaluated against method-specific thresholds. If analytes are present in the method blank above the method-specific threshold, corrective action will be taken to eliminate the source of contamination before proceeding with analysis. Investigative samples of an analytical batch associated with method blank results outside acceptance limits will be qualified, as appropriate, by the data validation contractor.

9.8.4 Laboratory Control Samples

LCSs are prepared by spiking laboratory-certified, reagent-grade water with the analytes of interest or a certified reference material that has been prepared and analyzed. The result for percent recovery of the LCS is a data quality indicator of the accuracy of the analytical method and laboratory performance.

9.8.5 Laboratory Duplicate Samples

Laboratory duplicate samples (LDSs) are prepared by the laboratory by splitting an investigative sample into two separate aliquots and performing separate sample preparation and analysis on each aliquot. The results for relative percent difference of the primary investigative sample and the respective LDSs are used to measure precision in the analytical method and laboratory performance. For nonaqueous matrices, sample heterogeneity may affect the measured precision for the LDSs.

9.9 Field QC

The following samples will be prepared by the sampling personnel in the field and submitted to the laboratory:

- **Equipment Rinsate Blanks—**To ensure that decontamination procedures are sufficient, an equipment rinsate blank will be collected when nondedicated, nondisposable equipment is used. At least one equipment rinsate blank will be collected for every 20 samples collected. If more than 20 samples are collected with the same equipment, or if high concentrations of contaminants are encountered, additional equipment rinsate blanks may be collected. Equipment rinsate blanks will be collected by passing laboratory deionized/distilled water through or over nondisposable sampling equipment.
- **Trip Blanks—**A trip blank monitors the potential for sample contamination during sample collection and transport. A trip blank consists of reagent-grade water in a new sample container, which is prepared at the same time as the sample containers. The trip blank will accompany the samples throughout collection, shipment, and storage. At least one trip blank should be included with each cooler in which samples for VOC analyses are stored.

- **Field Duplicates—**Field duplicates are collected to measure sampling and laboratory precision. At least one duplicate sample will be collected for every 20 samples.

9.10 Data Reduction, Validation, and Reporting

The analytical laboratory will submit analytical data packages that include laboratory QA/QC results to permit independent and conclusive determination of data quality. MFA will determine the data quality, using the data evaluation procedures described in this section. The results of the MFA evaluation will be used to determine if the project data quality objectives are met.

9.10.1 Field Data Reduction

Daily internal QC checks will be performed for field activities. Checks will consist of reviewing field notes and field activity memoranda to confirm that the specified measurements, calibrations, and procedures are being followed. The need for corrective action will be assessed on an ongoing basis, in consultation with the project manager.

9.10.2 Laboratory Evaluation

Initial data reduction, evaluation, and reporting at the analytical laboratory will be carried out as described in USEPA SW-846 manuals for analyses (USEPA, 1986), as appropriate. Additional laboratory data qualifiers may be defined and reported to further explain the laboratory's QC concerns about a particular sample result. Additional data qualifiers will be defined in the laboratory's case narrative reports.

9.10.3 Data Deliverables

Laboratory data deliverables are listed below. Electronic deliverables will contain the same data that are presented in the hard-copy report.

- Transmittal cover letter
- Case narrative
- Analytical results
- COC
- Surrogate recoveries
- Method blank results
- MS/MSD results
- Laboratory duplicate results

9.10.4 MFA Evaluation

9.10.4.1 Data QA/QC Review

MFA will evaluate the laboratory data for precision, completeness, accuracy, and compliance with the analytical method. MFA will review data according to applicable sections of USEPA organics and inorganic procedures (USEPA, 2008, 2010), as well as appropriate laboratory, method-specific guidelines (USEPA, 1986).

Data qualifiers, as defined by the USEPA, are used to classify sample data according to their conformance to QC requirements. Common qualifiers are listed below:

- J—Estimate, qualitatively correct but quantitatively suspect.
- R—Reject, data not suitable for any purpose.
- U—Not detected at a specified reporting limit.

Poor surrogate recovery, blank contamination, or calibration problems, among other things, can require qualification of the sample data. When sample data are qualified, the reasons for the qualification should be stated in the data evaluation report.

QC criteria not defined in the guidelines for evaluating analytical data are adopted, where appropriate, from the analytical method.

The following information will be reviewed during data evaluation, as applicable:

- Sampling locations and blind sample numbers
- Sampling dates
- Requested analysis
- COC documentation
- Sample preservation
- Holding times
- Method blanks
- Surrogate recoveries
- MS/MSD results
- Laboratory duplicates (if analyzed)
- Field duplicates
- Field blanks
- LCSs
- Method reporting limits above requested levels
- Additional comments or difficulties reported by the laboratory
- Overall assessment

The results of the data evaluation review will be summarized for each data package. Data qualifiers will be assigned to sample results on the basis of USEPA guidelines, as applicable.

9.10.4.2 Data Management and Reduction

MFA uses a database (e.g., EQuIS™) to manage laboratory data. The laboratory will provide the analytical results in electronic, EQuIS-compatible format. Following data evaluation, data qualifiers will be entered into the database.

Data may be reduced to summarize particular data sets and to aid interpretation of the results. Statistical analyses may also be applied to results. Data reduction QC checks will be performed on hand-entered data, calculations, and data graphically displayed. Data may be further reduced and managed using one or more of the following computer software applications:

- Microsoft Excel (spreadsheet)
- EQuIS (database)
- Microsoft Access (database)
- AutoCad and/or Arc GIS (graphics)
- USEPA ProUCL (statistical software)

10 REPORTING

After the data are received, MFA will generate a data report, which will summarize and screen the data against the applicable criteria.

LIMITATIONS

The services undertaken in completing this plan were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This plan is solely for the use and information of our client unless otherwise noted. Any reliance on this plan by a third party is at such party's sole risk.

Opinions and recommendations contained in this plan apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this plan.

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TABLES

Table 1
Soil Sample Summary
Northern State Hospital Property
Sedro-Woolley, Washington

Analyte	Method	Suggested Volume	Container	Number of Containers	Preservative	Storage Temperature	Holding Time from Collection
Total Petroleum Hydrocarbons-Hydrocarbon Identification	NWTPH-HCID	4 ounces	Glass Jar	1	none	4 degrees C	14 days
Total Petroleum Hydrocarbons—Gasoline	NWTPH-Gx	5035 Sample Kit	VOA/Glass Jar	1 5035 Sample Kit	5035 Sample Kit	4 degrees C	14 days
Total Metals	USEPA 6010 or 6020	4 ounces	Glass Jar	1	none	4 degrees C	six months
PAHs	USEPA 8270 SIM	4 ounces	Glass Jar	1	none	4 degrees C	14 days
Pesticides and/or Herbicides	USEPA 8081, 8270, and/or 8151	8 ounces	Glass Jar	1	none	4 degrees C	14 days
PCBs	USEPA 8082A	4 ounces	Glass Jar	1	none	4 degrees C	365 days
VOCs/BTEX	USEPA 8260B/8021B	5035 Sample Kit	VOA/Glass Jar	1 5035 Sample Kit	5035 Sample Kit	4 degrees C	14 days

NOTES:

5035 Sample Kit consists of two prepared 40-milliliter VOA with 5 milliliters of sodium bisulfate, two prepared 40-milliliter VOAs with 5 milliliters of methanol, and one 2-ounce jar for moisture content determination.

Total metals are arsenic, barium, cadmium, copper, chromium, lead, mercury, selenium, silver, and zinc.

BTEX = benzene, toluene, ethylbenzene, and xylenes.

C = Celsius.

NWTPH = Northwest Total Petroleum Hydrocarbons.

PAH = polycyclic aromatic hydrocarbon.

PCB = polychlorinated biphenyl.

SIM = selective ion monitoring.

USEPA = U.S. Environmental Protection Agency.

VOA = volatile organic analysis vial.

VOC = volatile organic compound.

Table 2
Groundwater Sampling Summary
Northern State Hospital Property
Sedro-Woolley, Washington

Analyte	Method	Suggested Volume	Container	Number of Containers	Preservative	Storage Temperature	Holding Time from Collection
Total Petroleum Hydrocarbons-Hydrocarbon Identification	NWTPH-HCID	1 liter	Amber Glass	1	HCL pH < 2	4 degrees C	14 days
Gasoline-range organics	NWTPH-Gx	40 milliliter	VOA	3	HCL pH < 2	4 degrees C	14 days
Diesel- and residual-range organics	NWTPH-Dx	1 liter	Amber Glass	1	HCL pH < 2	4 degrees C	14 days
Total Metals	USEPA 6010 or 6020	500 milliliter	Polyethylene	1	HNO_3 pH < 2	4 degrees C	six months
Dissolved Metals	USEPA 6010 or 6020	500 milliliter	Polyethylene	1	HNO_3 pH < 2	4 degrees C	six months
PAHs	USEPA 8270 SIM	1 liter	Amber Glass	2	none	4 degrees C	7 days
VOCs/BTEX	USEPA 8260B/8021B	40 milliliter	VOA	3	HCL pH < 2	4 degrees C	14 days

NOTES:

Total metals include arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium, silver, and zinc.

Dissolved metals include arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver.

BTEX = benzene, toluene, ethylbenzene, and xylenes.

C = Celsius.

HCL = hydrochloric acid.

HNO_3 = nitric acid.

NWTPH = Northwest Total Petroleum Hydrocarbons.

PAH = polycyclic aromatic hydrocarbon.

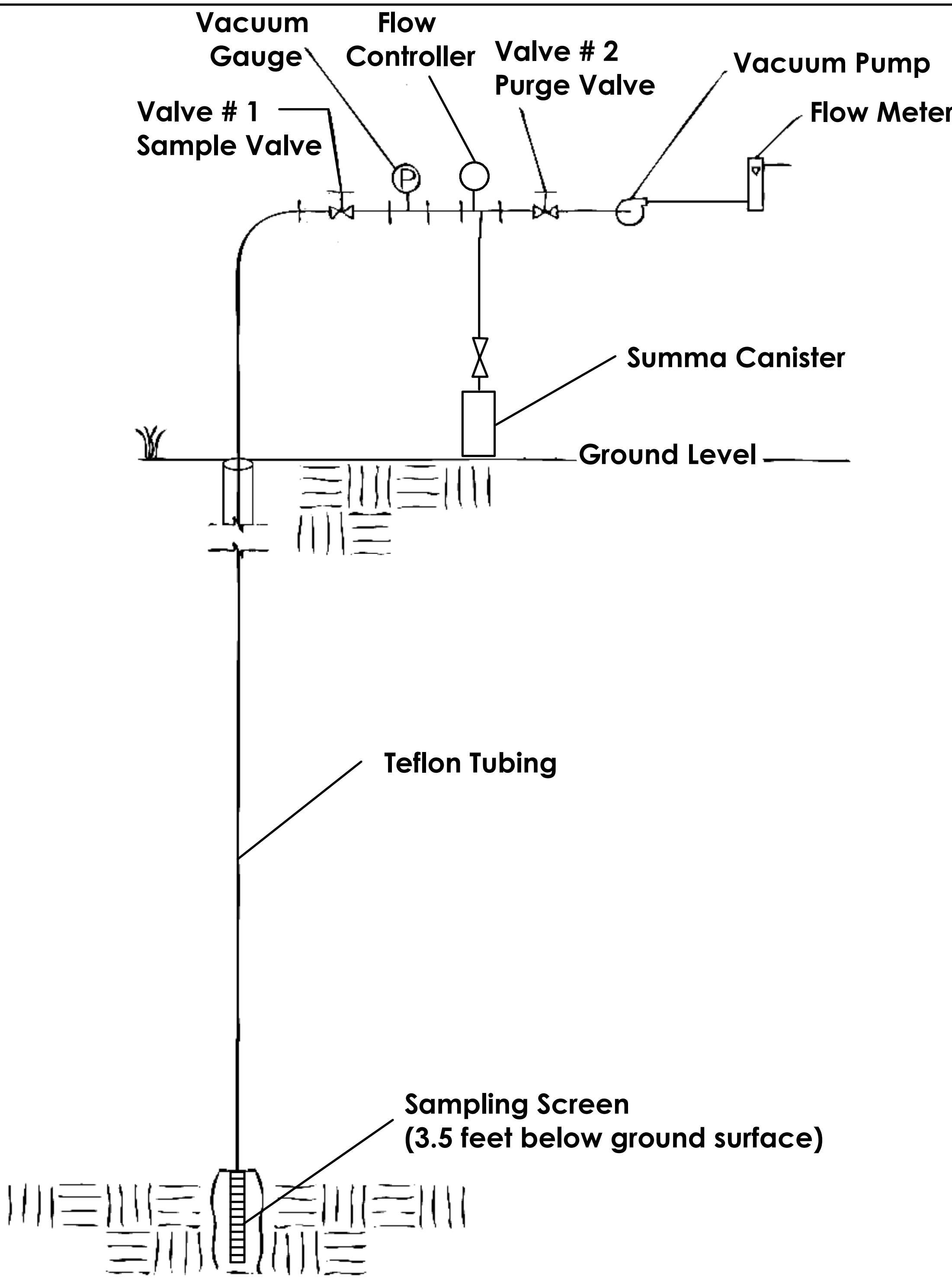
SIM = selective ion monitoring.

USEPA = U.S. Environmental Protection Agency.

VOA = volatile organic analysis vial.

VOC = volatile organic compound.

FIGURES



Source: CH2MHill, Corvallis Applied Sciences Laboratory

Figure 1
Soil Gas/ Evacuated Sampler System

Northern State Hospital Property
Sedro-Woolley, Washington

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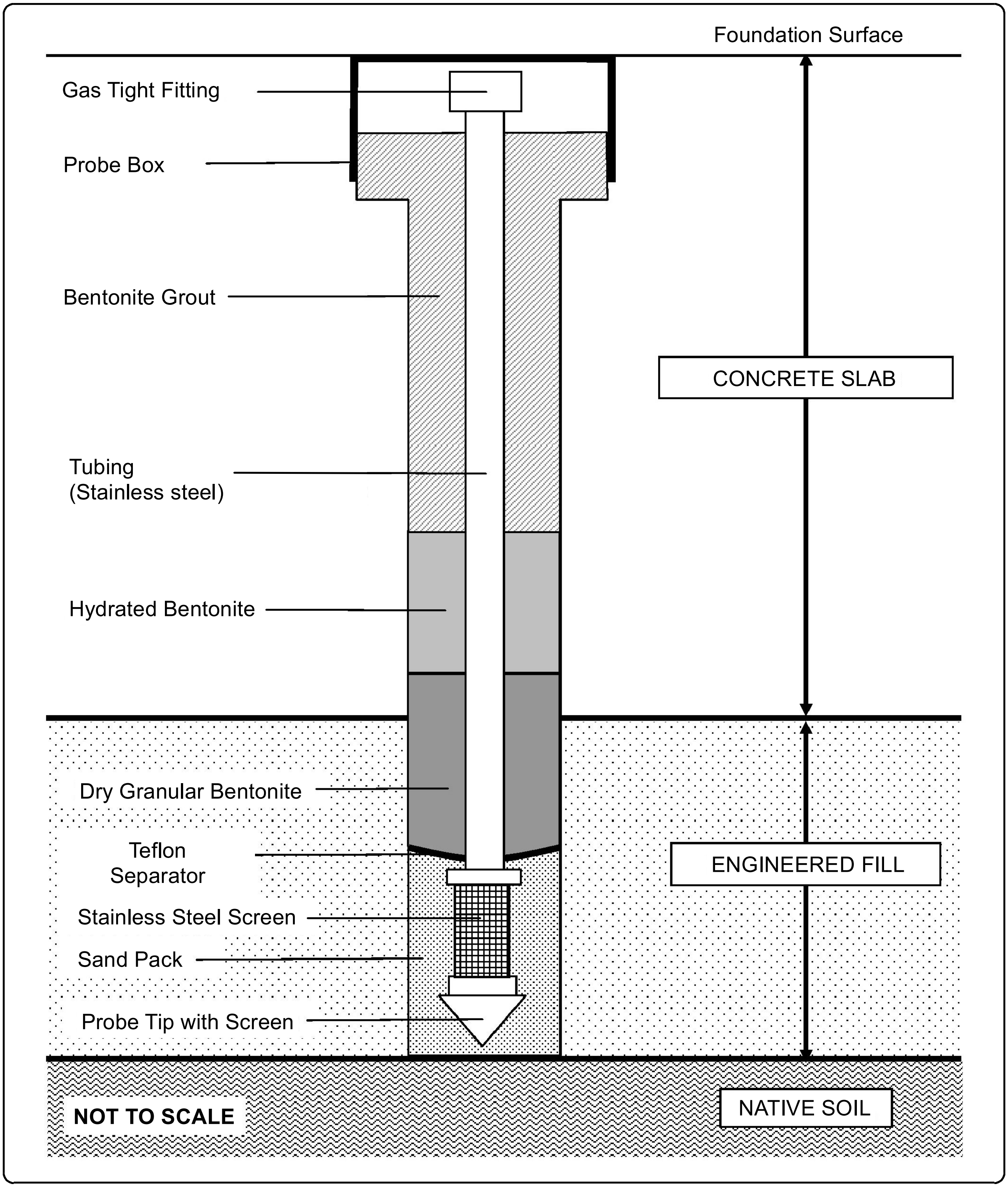
Project: 0624.04.02 Produced By: Rcallihan Approved By: C. Wise Print Date: 08-04-2014 File: X:\0624.04 Port of Skagit\02_Adaptive Reuse Study\Projects\Appendix Figures\Fig1_Soil Gas_Evacuated Sampler System.mxd



Source: State of California Vapor Intrusion Document October 2011 (DTSC - Cal/EPA).

Figure 2
Schematic Diagram of a Subslab Sampling Probe

Northern State Hospital Property
Sedro-Woolley, Washington

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Print Date: 8/4/2014
Approved By: C. Wise
Produced By: rcallihan
Project: 0624.04.02

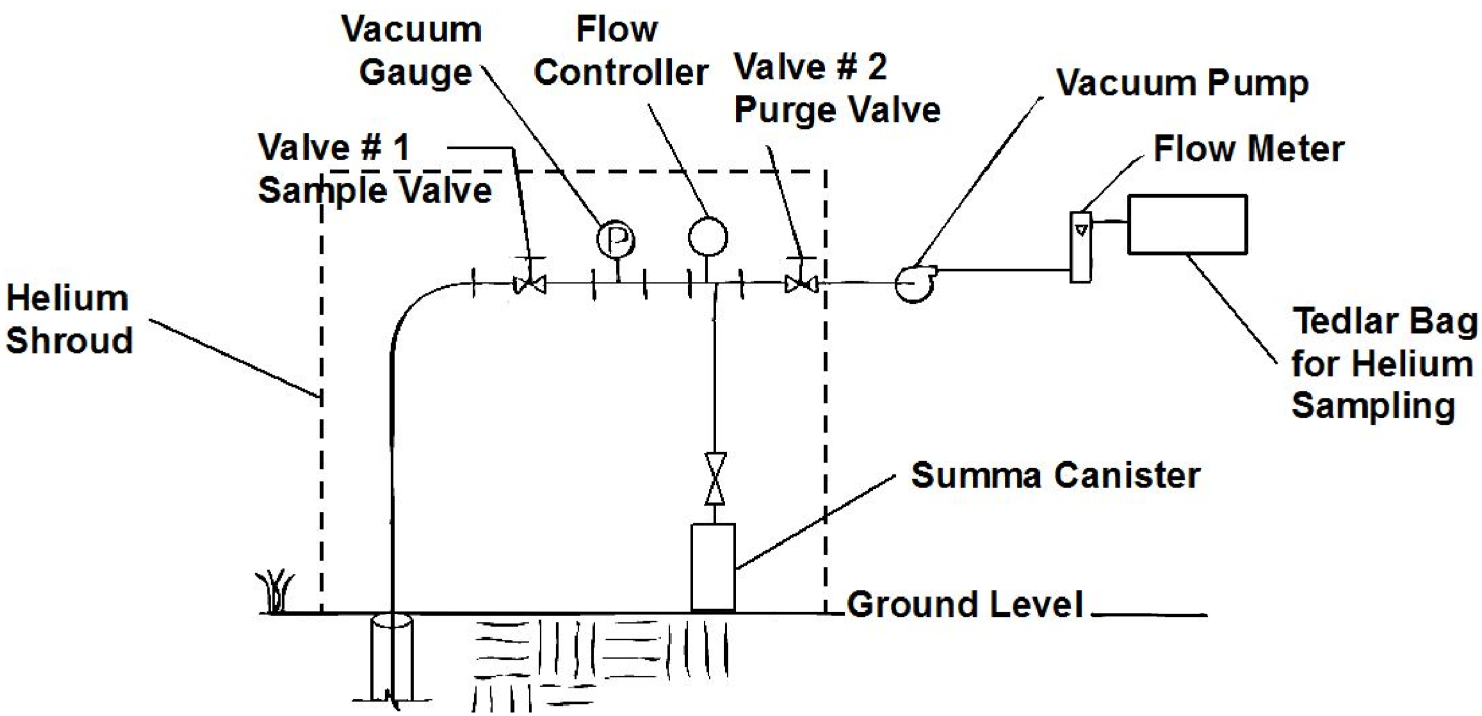

Figure 3
Subslab Soil Gas Evacuated Sampler System Ground Level

Northern State Hospital Property
Sedro-Woolley, Washington

Source: CH2MHill, Corvallis Applied Sciences Laboratory

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APPENDIX A
BORING LOG FORM

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Boring/Well No.: ____________

Site: ____________

Location: ____________

Project #: ____________

Boring Log Form

Drill Rig		MFA Staff:		Hole Dia:		Total Depth:	
Drilling Co.:				Water Level:		WLE Note:	
Start Date:		End Date:		Water Level:		WLE Note:	
Notes:							

Completion	Sample				Soil Type:				Color:	
	Top:		Time:	Depth:	Top:		Fines:		Moisture:	
	Length:				Bottom:		Sand:		PID:	
	Type:		Sample ID		Soil Class:		Gravel:		Line Type:	
	% Recov:				Trace:				Impacts:	
					Notes:					
	Top:		Time:	Depth:	Soil Type:				Color:	
	Length:				Top:		Fines:		Moisture:	
	Type:		Sample ID		Bottom:		Sand:		PID:	
	% Recov:				Soil Class:		Gravel:		Line Type:	
					Trace:				Impacts:	
					Notes:					
	Top:		Time:	Depth:	Soil Type:				Color:	
	Length:				Top:		Fines:		Moisture:	
	Type:		Sample ID		Bottom:		Sand:		PID:	
	% Recov:				Soil Class:		Gravel:		Line Type:	
					Trace:				Impacts:	
					Notes:					
	Top:		Time:	Depth:	Soil Type:				Color:	
	Length:				Top:		Fines:		Moisture:	
	Type:		Sample ID		Bottom:		Sand:		PID:	
	% Recov:				Soil Class:		Gravel:		Line Type:	
					Trace:				Impacts:	
					Notes:					
	Top:		Time:	Depth:	Soil Type:				Color:	
	Length:				Top:		Fines:		Moisture:	
	Type:		Sample ID		Bottom:		Sand:		PID:	
	% Recov:				Soil Class:		Gravel:		Line Type:	
					Trace:				Impacts:	
					Notes:					
	Top:		Time:	Depth:	Soil Type:				Color:	
	Length:				Top:		Fines:		Moisture:	
	Type:		Sample ID		Bottom:		Sand:		PID:	
	% Recov:				Soil Class:		Gravel:		Line Type:	
					Trace:				Impacts:	
					Notes:					
	Top:		Time:	Depth:	Soil Type:				Color:	
	Length:				Top:		Fines:		Moisture:	
	Type:		Sample ID		Bottom:		Sand:		PID:	
	% Recov:				Soil Class:		Gravel:		Line Type:	
					Trace:				Impacts:	
					Notes:					
Borehole Notes:										

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Boring/Well Completion Form

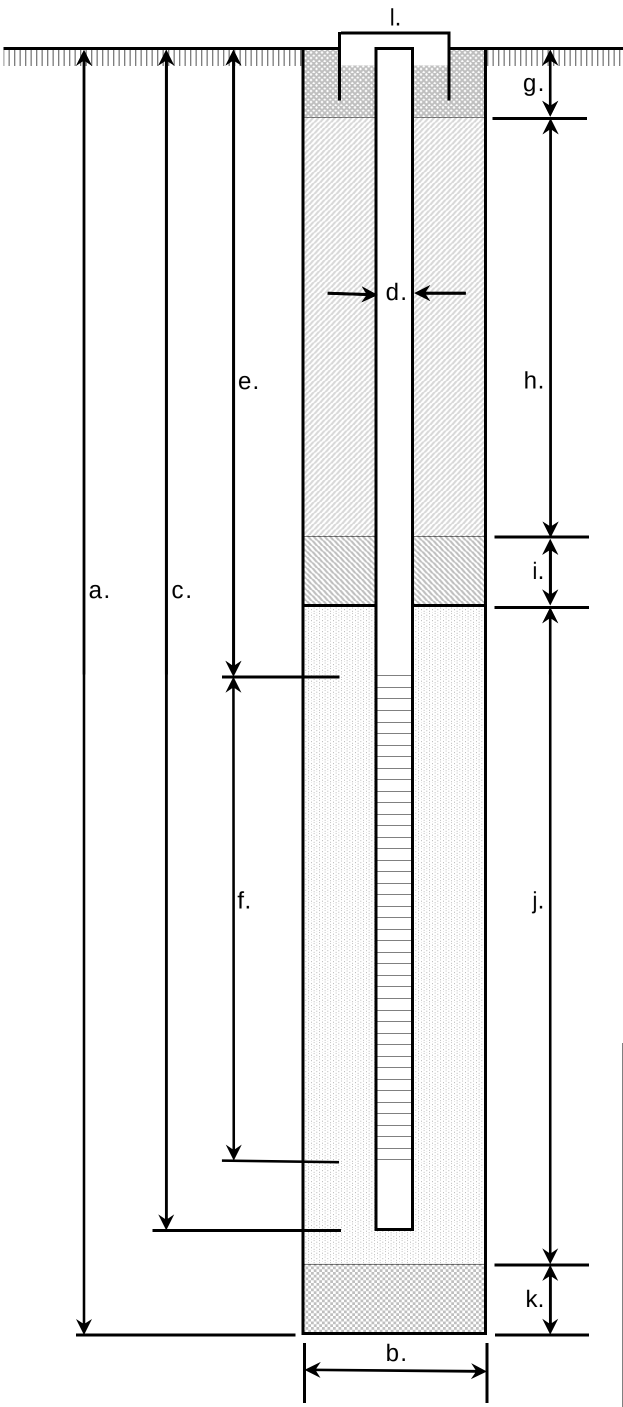
Boring/Well No.: ____________

Site: ____________

Location: ____________

Project #: ____________

Drilling Co.:		MFA Staff:		Start Date:		End Date:	
Drill Rig/ Method:				Well ID No.:		Start Card No.:	



Completion Details

a. Total Depth: ________ ft. bgs

b. Borehole diameter: ________ in.

c. Total Casing Length: ________ ft.

Material: ____________

d. Well diameter: ________ in.

e. Depth to top of screen: ________ ft. bgs

f Screen length: ________ ft.

screened interval: ________ ft. to ________ ft. bgs

Perforation type: ____________

Perforation size: ____________

g. Surface completion: ________ ft. bgs

completion material: ____________

Amount: ____________

h. Surface Seal: ________ ft. to ________ ft. bgs

Seal material: ____________

Amount: ____________

i. Secondary seal/pack: ________ ft. to ________ ft. bgs

Material: ____________

Amount: ____________

j. Filter Pack: ________ ft. to ________ ft. bgs

Material: ____________

Amount: ____________

Prepacked screen used: ____________ (Yes/No)

k. Seal or Slough: ________ ft. to ________ ft. bgs

Material: ____________

Amount: ____________

l. Type of well monument: ____________

Well height above/below ground surface: ________ ft. bgs

gINT Data			gINT Graphic Options*
Top	Bottom	gINT Graphic	Surface Completion - CMNT11 Borehole Seal - BENT11 Filter Pack - FILT11, FILT11-A Screen - SLOT11 Sump - PCAP11, PCAPBENT11 Backfill - BENTBOTT, FILTBOTT, SLUFFBOTT *more graphics available

Note:

APPENDIX B

FIELD SAMPLING DATA SHEET FORMS

Maul Foster & Alongi, Inc.

7223 NE Hazel Dell Avenue, Suite B, Vancouver, WA 98665 (360) 694-2691 Fax. (360) 906-1958

Water Field Sampling Data Sheet

Client Name		**Sample Location**	
Project #		**Sampler**	
Project Name		**Sampling Date**	
Sampling Event		**Sample Name**	
Sub Area		**Sample Depth**	
FSDS QA:			

Easting		**Northing**		**TOC**	

Hydrology/Level Measurements

Date	Time	DT-Bottom	DT-Product	DT-Water	(Product Thickness) DTP-DTW	(Water Column) DTB-DTW	(Gallons/ft x Water Column) Pore Volume

(0.75" = 0.023 gal/ft) (1" = 0.041 gal/ft) (1.5" = 0.092 gal/ft) (2" = 0.163 gal/ft) (3" = 0.367 gal/ft) (4" = 0.653 gal/ft) (6" = 1.469 gal/ft) (8" = 2.611 gal/ft)

Water Quality Data

Purge Method	Time	Purge Vol (gal)	Flowrate l/min	pH	Temp (C)	E Cond (uS/cm)	DO (mg/L) EH	Turbidity
Final Field Parameters								

Methods: (1) Submersible Pump (2) Peristaltic Pump (3) Disposable Bailer (4) Vacuum Pump (5) Dedicated Bailer (6) Inertia Pump (7) Other (specify)

Water Quality Observations:

Sample Information

Sampling Method	Sample Type	Sampling Time	Container Code/Preservative	#	Filtered
	Groundwater		VOA-Glass		
			Amber Glass		
			White Poly		
			Yellow Poly		
			Green Poly		
			Red Total Poly		
			Red Dissolved Poly		
			Total Bottles	0	

General Sampling Comments

Signature ______________________________