DEPARTMENT OF ECOLOGY
State of Washington

SITE HAZARD ASSESSMENT
Worksheet 1: Summary Score Sheet

SITE NAME: Weyerhaeuser Snoqualmie Mill **Rank: 1**

Cleanup Site ID: 10346

Facility/Site ID: 73953138

Completed on 8/20/2021 for inclusion on the August 2021 Hazardous Sites List.

LOCATION OF SITE

38800 SE Mill Pond Rd

Snoqualmie, King County, WA 98065

Township 24N, Range 8E, Section 29

Latitude, Longitude: 47.53765, -121.81141

Tax Parcel ID: 2924089009 and 3024089004 (uplands);2924089011, 2924089013, 2924089015, 2924089018, and 3224089006 (Borst Lake)

SITE DESCRIPTION

Within Currently Defined Site Boundaries

The Weyerhaeuser Snoqualmie Mill site (Site) includes multiple existing areas of contamination related to the operation of a sawmill on the property for many years, under the Snoqualmie Falls Lumber Company and Weyerhaeuser names.

Based on the information currently available in the Ecology site file, the Site includes both upland areas and Borst Lake, which was used as a log pond during mill operations. A number of wetland areas have been identified within the former mill property, though none are within the currently defined areas of contamination.

The tax parcels included in the list above include the areas of documented contamination discussed in more detail in the Site Characterization and Remediation section. This list may be updated as the Site continues through the MTCA cleanup process and more information becomes available about areas of the former mill property that have not been included in previous investigations.

SUMMARY OF MILL OPERATIONS

The Snoqualmie Falls Lumber Company, a partnership between Weyerhaeuser and Grandin Coast Lumber Company, was formed in 1914. The Snoqualmie Falls Lumber Company became a branch of Weyerhaeuser Timber Company in 1948. Construction of the mill and company town began in June 1916. The mill was the second all-electric mill in operation in the United States. The first log was cut at the mill in November 1917. Additional buildings were constructed throughout the mill's lifetime to allow for the production of different products (for example, the Silvacel plant added in 1951 and plywood plant in 1959). The locations of buildings and notable equipment used as part of operations during the lifetime of the mill area are shown on Figure 2.

The primary function of the mill was to process large logs from old growth timber. Production gradually decreased after World War II as supply of old growth timber declined. Operations in the plywood mill ended in 1989 after a fire burned down the building. The main sawmill operated until 1992. The last mill operations, including the wood finishing plant and dry kilns, ended in May 1993. Some of the mill structures have been removed. Buildings remaining on the Site include the Power Plant, a designated King County Landmark.

The company town of Snoqualmie Falls thrived during early years of mill operation. Most of the residential areas were located outside of the mill property, to the east and north of the mill. Residential occupancy of these areas ended in 1958. The last remaining homes were relocated across the Snoqualmie River at this time. The residential area occupied by the Japanese community of employees and their families was located on the southeastern portion of the mill property (see Figure 1). Residential use of this area ended in 1942 after the forced internment of the Japanese residents.

Borst Lake is located south of the upland portion of the mill property. It is located in an oxbow of the Snoqualmie River and was excavated and enlarged for use in mill operations. Discharges from the upland mill operations area into Borst Lake were covered by a National Pollution Discharge Elimination System (NPDES) permit from approximately 1992 to 2004. Water exits Borst Lake at the southeast, where it flows through an overflow channel and a culvert under Mill Pond Road before discharging to the Snoqualmie River. Historically, water level in Borst Lake was controlled by a weir located in the overflow channel. Recent reports have documented erosion near the weir, allowing water to flow around the weir. This new flow pathway results in a water level lower than what the weir would control. Snoqualmie Falls waterfall is located approximately one mile downstream of the discharge point into the Snoqualmie River.

CURRENT USE OF THE PROPERTY

Current uses of the former mill property vary. The northeastern portion of the property is utilized by multiple companies (Hos Brothers Construction, Merrill & Ring, North Folk, Flatiron, Guard Well Boat & RV Storage). Uses vary by company, but generally include staging of supplies and equipment. DirtFish, a rally car driving school, utilizes many of the roadways throughout the remaining area of the property and buildings in the southeastern portion of the property as part of their operations. The northwestern portion of the property is vacant land, and is not used consistently as part of current activities on the property. Borst Lake is not included in any of the current commercial uses of the property.

There is a redevelopment proposed for the upland areas of the mill property. The redevelopment would occur in phases, with phase 1 located in the northwest portion of the property. Commercial, residential, and light industrial areas are included in the plans for the development. As of the time of this Site Hazard Assessment (SHA), the Planned Commercial/Industrial Plan for the project is undergoing environmental review under the State Environmental Policy Act (SEPA) process. A draft Environmental Impact Statement for public and agency comment was published in April 2020. The final Environmental Impact Statement had not been published at the time this SHA was completed.

SITE IDENTIFYING INFORMATION

Multiple Ecology programs have worked with the Site during and since mill operations, and that is reflected in multiple Facility/Site ID (FSID) numbers in Ecology’s files (2274, 73953138, 1786557, 23262, 26568). As of the start of the SHA, two of these FSIDs were connected to contamination and interactions with the Toxics Cleanup Program - 2274 and 73953138.

The Weyerhaeuser Snoqualmie cleanup site (FSID 73953138, CSID 10346), was created based on contamination reported to Ecology in 1989. This contamination was related to leaking underground storage tanks in the former fueling area. The Weyerhaeuser Snoqualmie Mill cleanup site (FSID 2274, CSID 2049), was created in 1991 at the time of the report of a petroleum release in the Morbark chipper area. All reports of contamination related to mill operations since 1991 were included in the Weyerhaeuser Snoqualmie Mill cleanup site file.

Following a review of available information as part of the SHA, Ecology determined that all contamination related to the mill facility is best managed as one cleanup site, and the two existing sites were combined. All cleanup-related information is now included in one Weyerhaeuser Snoqualmie Mill site. The identifying information presented at the start of this SHA reflects the combined site. Information on impacted media and contaminants in Ecology's cleanup site database has been updated as part of the site merge. This update only impacts the cleanup site files, and does not change the identifying information used by other Ecology programs.

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Historical Owners and Operators

From	To	Owner/Operator	Site Uses
1914	2010	Snoqualmie Falls Lumber Company, Weyerhaeuser Company	sawmill; last mill-related operations in 1993; ownership transferred to Weyerhaeuser Real Estate Development Company in 2008
2010	present	Weyerhaeuser Real Estate Development Company	continued ownership of Borst Lake/log pond parcels (2924089011, 2924089013, 2924089015, 2924089018, 3224089006)
2010	present	Snoqualmie Mill Ventures, LLC	ownership of upland parcels (2924089006, 2924089009, 3024089001, 3024089004, 3024089069, 3024089070); some commercial activities continue on Site, as described in the section above
2015	present	King County - Natural Resources & Parks	ownership of parcels (292408-9002, -9003, -9022, -9023, -9028) on eastern edge of former mill property not included in current definition of Site; current use includes office building and parking associated with DirtFish

Area Surrounding the Site

The Site is located north of downtown Snoqualmie, on the north side of the Snoqualmie River. The area immediately surrounding the Site is primarily undeveloped land. North of the Site is the CalPortland Snoqualmie Ready Mix and Aggregate Plant, a sand and gravel quarry. The Snoqualmie Water Reclamation Facility, where waste water is treated for reuse in non-drinking water applications, and Girard Resources & Recycling, a landscaping supply company, are located west of the Site.

King County Parks and Recreation has identified parcels that are within or adjacent to the former mill property as potential acquisitions, as part of their plan to complete the existing Snoqualmie Valley Trail and create a new open space (Figure 3). The Snoqualmie Valley Trail is a 31.5-mile regional trail that runs from Duvall to Rattlesnake Lake. The entire length of the trail corridor has been completed, with the exception of the 0.5-mile section near the Site. Currently, trail users use existing roadways to travel through this area.

The Snoqualmie Water System uses groundwater wells as the source of drinking water. These wells are primarily located in two wellfields, located north and south of the Site. The south wellfield is located south of the Snoqualmie River. The Site is in the modeled 5-year time of travel zone for the water system wells. The drinking water wells are located at depths of 558 feet below ground surface (bgs) or deeper. The Special Considerations section below contains additional information on how drinking water wells in the area were considered as part of the SHA scoring.

SITE CHARACTERIZATION AND/OR REMEDIATION

Areas of identified contamination are generally referred to in site reports and in this SHA by names indicating their use during mill operations. The locations of most of these areas can be determined by using the mill structure names on Figure 2. Final cleanup levels have not been established for the Site at this point. Cleanup levels mentioned in the text below are included to provide context to the selection of excavation areas or as screening levels that, when compared to data, indicate further investigation and possible remedial action is warranted. In some petroleum-contaminated areas, site reports include site-specific cleanup levels. Ecology has not reviewed these values, and their mention should not be interpreted as a determination that they are appropriate for use at the Site.

Site reports related to petroleum contamination often separate the petroleum into three categories: gasoline-, diesel-, and oil-range petroleum hydrocarbons. The distinctions are generally based on the carbon chain lengths of the components of the mixtures. This SHA uses the abbreviations TPH-G for gasoline-range petroleum hydrocarbons and TPH-Dx for the sum of diesel- and oil-range petroleum hydrocarbons, which are the categories for which there are established cleanup levels. Any references to TPH with no suffix refer to the total TPH concentration, either because an older analytical method was used that could not separate the total into TPH-G and TPH-Dx or because the value is being compared to a calculated site-specific total TPH value.

Groundwater sampling, unless otherwise specified in the text, refers to samples collected in the perched layer (also called the interflow network). Additional details on groundwater aquifers can be found below in the Special Considerations section.

AREAS WITH LIMITED INFORMATION
HDR Engineering investigated the press pit area of the plywood plant in July 1989. The press pit was a hydraulically operated piece of machinery. Soil in this area was contaminated with TPH above the cleanup level at the time of the investigation (200 mg/kg). Groundwater conditions were not evaluated. Contaminated soil was excavated in July 1989. TPH concentrations in confirmation samples in the press pit area and near an adjacent diesel UST were reportedly below the cleanup level. Additional details of this excavation and sampling are not available in the Ecology site file.

Sampling was conducted near Transformer 18 as part of the 2004 Delta Level II Environmental Site Assessment (ESA), after oil staining was noted on gravel and concrete near the transformer. This transformer was located on the east side of the common lumber shed. At the time of the initial sampling, the transformer was active. Additional soil and groundwater sampling was done in this area as part of the Level III ESA. Sampling results indicated TPH-Dx contamination was limited to shallow soil.

The former vehicle wash pad area was identified during the 2004 Delta Level II ESA as a potentially contaminated area, based on visual observations of soil staining in the area. At the time of this investigation, the wash pad concrete was degraded and partially covered with soil. During operation, wash water collected on the pad, flowed to a sump that functioned as an oil-water separator, and then flowed to a drainage ditch. A soil sample collected from a visibly stained area on top of the degraded concrete contained TPH-Dx above the Method A cleanup level. Additional soil and groundwater samples were collected in this area as part of the Level III ESA. TPH-Dx in these soil samples was below Method A cleanup levels, but the groundwater samples were contaminated with TPH-Dx above the Method A cleanup level.

The chip truck hydraulic lift area was also sampled during the 2004 Level II ESA after surface staining was noted. At the time of the sampling, the area consisted of layers of degraded concrete and asphalt with wood debris present. A soil sample was collected at a depth of 1 foot bgs near the hydraulic unit. The TPH-Dx concentration in the soil sample was 1720 mg/kg.

Woody debris is noted intermittently in shallow soils in reports from various areas of the Site. The only identified large deposition area for woody debris is a fill pile located in an area north of the former plywood plant. The only chemical evaluation of the debris pile was done on one soil sample collected during the 2004 Delta Level II ESA. The sample was collected from a depth of 3 feet bgs and analyzed for TPH-Dx. The TPH-Dx concentration was 75 mg/kg, well below the current 2000 mg/kg Method A cleanup level.

BOILER ASH FILL AREA
Samples were collected from the area west of the former sawmill as part of the 2004 Level II ESA conducted by Delta. This area was identified as a potential area of boiler ash fill. Previous reports had indicated that boiler ash had primarily been disposed of off-property. Samples indicated elevated concentrations of arsenic and carcinogenic polycyclic aromatic hydrocarbons (cPAHs) in boiler ash fill. The Level III ESA estimated the area potentially impacted by boiler ash fill as 1.4 acres, or 6000 cubic yards of boiler ash fill when accounting for the fill depth (6 inches to 3 feet). Currently, the powerhouse and area to the west are fenced off to limit exposures of humans or wildlife to any remaining boiler ash fill (Figure 15e).

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BORST LAKE/LOG POND

Borst Lake was used as a log pond during some periods of mill operation. Runoff from upland areas and plant outflows discharged to Borst Lake at multiple points, and the discharge was regulated under NPDES Permit No. WA-000173-2. The NPDES permit was active from approximately 1992 to 2004. Ecology conducted a Class II Inspection of the facility in February 1993 as part of the NPDES permit, which included sampling of soil, sediment, and surface water. The majority of the water samples were collected from ditches or discharge points before water entered Borst Lake. Three sediment samples were collected within Borst Lake. Two were collected on the north side, near the outfalls from the mill, and the third was collected on the south side near the outlet to the overflow channel. Testing of the samples included both chemical analysis and bioassays. Bioassays with Hyallela azteca showed significantly lower organism survival for samples SED-1 and SED-3 as compared to the control. Chemical analyses found considerable oil and grease in all three sediment samples. SED-2 had the highest concentration of volatile chemicals, specifically toluene at a concentration of 9800 ug/kg. Polycyclic aromatic hydrocarbons (PAHs) and phenols were also detected in all three sediment samples, with the highest concentrations in SED-1. Phenols are produced when wood waste degrades in sediment. The description of the sediment samples in the inspection report is brief, but specifically mentions the presence of sawdust/wood waste in SED-1 and SED-2.

PES Environmental collected soil and sediment samples from the Borst Lake parcels in June 2020. Soil samples were collected from the former railroad alignment north and east of Borst Lake. Samples were collected from 11 locations (B-1 through B-11, Figure 4) along the former rail line at depths of 0-1 and 1-2 ft bgs. Five samples collected in the 0-1 ft bgs depth range were analyzed for TPH-Dx, semivolatile organic compounds (including PAHs), and polychlorinated biphenyls (PCBs). TPH-Dx and PAHs were detected in multiple samples at concentrations below the screening levels included in the PES report.

Sediment samples (S-1 through S-3, Figure 4) were collected in approximately the same locations as the 1993 Ecology samples with a similar numbering pattern (S-1 was collected near original location SED-1). Samples were taken from the top 6 inches of the sediment core and analyzed for TPH-Dx, volatile organic compounds, semivolatile organic compounds, and PCBs. At the time of sampling, the sediment in the sampled areas was 1-4 ft below the water surface. The report notes abundant root organics and pieces of wood present in the sampled sediment. Overall, the chemicals detected in the 2020 samples were similar to the 1993 samples. Concentrations of the detected chemicals tended to be lower in the 2020 samples. TPH-Dx and PAH concentrations in the 2020 samples were below the applicable Sediment Management Standard chemical criteria based on protection of the benthic community (SMS criteria). Benzene, toluene, ethylbenzene, and xylenes (BTEX), a group of volatile organic compounds commonly associated with petroleum, were detected in all of the 2020 samples. SMS criteria have not been established for these chemicals. Phenols, specifically 3&4 methylphenol, were present above SMS criteria in one sample.

DIP TANK 1 AREA

Delta first investigated two areas where pentachlorophenol dip tanks were located during the 2004 Level III ESA. Two soil borings were completed in each former tank area (Dip Tank Area 1 and Dip Tank Area 2; see Figure 2), and two samples were collected from each boring. Samples were analyzed for pentachlorophenol, total tetrachlorophenols, and 2,4,5-trichlorophenol. No chlorophenols were present above laboratory reporting limits in the samples from Dip Tank Area 2. Both boring locations in Dip Tank Area 1 had detectable concentrations of chlorophenols. The highest concentrations were in the sample collected at 10 feet bgs in location S7.1-2. This was the deepest sample collected at this location, so contamination may extend to deeper soils. The concentration of pentachlorophenol in this sample was 6.5 mg/kg. The current Method B cleanup level based on human direct contact with soil is 2.5 mg/kg.

Groundwater samples in Dip Tank Area 1 were collected by Delta as part of a 2005 Supplemental ESA. Pentachlorophenol and 2,3,4,6-tetrachlorophenol were only detected in the sample collected from location SB1-4 (Figure 5). Groundwater in this location was 2 feet bgs at the time of sampling.

LUMBER STRAPPING AREA

The lumber strapping area was located on the west side of the shipping building, in the northern portion of the mill. Strapping is the step in the packaging process where lumber is bundled together prior to shipping. The source of contamination in this area is likely a hydraulic oil leak from the strapping equipment. A soil sample collected from this area during the 2004 Level II ESA confirmed contamination with TPH-Dx. Additional soil and groundwater sampling in this area was done as part of the Level III ESA. Soil contamination above cleanup levels was confirmed in these samples, as was groundwater contamination with TPH-Dx. Additional soil and groundwater samples were collected as part of a 2005 Supplemental ESA to delineate the area of soil requiring remediation (Figure 6).

MORBARK CHIPPER AREA
Log chipping operations began in this area of the Site in the late 1960s. The Morbark chipping machinery included a conveyer that fed logs into a debarker and chipper. The machinery was originally powered by diesel engines, but was converted to electric power in 1976. A new debarker was installed in 1993. Chipping operations at the Site ended in September 1997, and the chipping machinery was removed in 1998. There were multiple features of normal operations of the machinery that may have contributed to contamination in this area, including a leak of hydraulic oil from the original debarker before its replacement in 1993, lubrication of chains by pouring 5 gallon buckets of oil directly on them, and washing of spilled oil off of the asphalt pad onto the ground to the south and southwest of the chipper machinery.

Petroleum contamination in the chipper area was reported to Ecology in 1991, following a contamination investigation by GeoEngineers. Test pits around the chipper area indicated soil contamination with TPH-Dx. Additional sampling to determine the extent of contamination in the chipper area was done by Emcon in 1997. The results of this sampling are summarized in the 1998 Emcon Remedial Action Report. The 1997 sampling event confirmed contamination with TPH-Dx in soil and groundwater in the chipper area.

Remediation was done by Emcon in 1998, after removal of the machinery. This included removal of the concrete foundation and asphalt pad that the machinery had been located on. The area of soil to be excavated was determined using a site-specific total TPH action level of 4400 mg/kg. Approximately 1386 tons of contaminated soil was removed from two areas (Figure 7) near the former machinery. The western excavation, near the infeed conveyor, extended to a depth of 6 feet bgs. No groundwater was encountered in this excavation, and post-excavation confirmation samples were collected from the sidewalls and base of the excavation. The excavation in the debarker and chipper area extended to approximately 5 feet bgs, the depth at which groundwater was encountered. Due to the presence of groundwater, no base of excavation confirmation sample was collected. Following the initial excavations, only sample SW-5 contained TPH above the action level. Two additional excavations occurred in this area. Excavations stopped when they reached the adjacent storage bin building. The confirmation sample collected after the final excavation, sample SW-5-2, contained TPH above the action level.

Emcon installed five groundwater monitoring wells in September 1998, the week after soil excavations were completed. Groundwater was encountered between 3 and 7 feet bgs, above a silt layer that began at approximately 8 feet bgs. Groundwater TPH-Dx concentrations exceeded the Method A cleanup level at the time of the report in wells A-1 and A-5. The Method A cleanup level has since been lowered. TPH-Dx concentrations in A-2 and A-4 are also above the current cleanup level. Delta collected two soil samples from the northeastern edge of the 1998 excavation area as part of the 2005 Level III ESA, to evaluate conditions near original sampling location SW-5. Concentrations of TPH-Dx in these samples were below the current Method A cleanup level. This report also references additional groundwater sampling in the area that documented concentrations of TPH-Dx below the Method A cleanup level; this data could not be found in Ecology's site file.

PLYWOOD MILL TRANSFORMERS
A fire on February 5, 1989 destroyed the plywood plant. During the fire, falling debris damaged two transformers (Transformer 12 and Transformer 17; see Figure 8). Both transformers were filled with PCB-containing askarel fluid, which leaked into the surrounding soil as a result of the damage sustained during the fire. Investigations into the extent of PCB contamination in soil and groundwater were conducted in February-April 1989 by HDR Engineering and Weyerhaeuser. Excavation of contaminated soil was done in June 1989.

Excavation in the Transformer 17 area (T-17), in what was the central portion of the plywood plant, began with the construction of a trench surrounding the contaminated area. The trench was 6 feet deep, which is the depth at which the clay layer was reached, and was lined with a neoprene liner. Approximately 3000 gallons of water were pumped out of the trench area during construction. Soil was excavated to a depth of 2 feet bgs across the entire T-17 area, and remedial excavation proceeded in the northern portion of T-17 to a depth of approximately 6 feet bgs. The northern portion is where PCBs had been identified in earlier sampling events. Confirmation samples were taken from the floor of the excavation. After an overexcavation and re-sampling in one area, the excavation was filled with clean soil. All confirmation samples had a PCB concentration below 25 mg/kg, the cleanup goal for the excavation based on the US Environmental Protection Agency (EPA) PCB Cleanup Policy (Figure 8).

Soil characterization in the Transformer 12 area (T-12) showed evidence of a spill from the transformer during the fire and an earlier spill. Since the areas of contamination were co-located, remedial activities addressed both releases. The first soil excavation in T-12 was done in June 1989. Confirmation sampling indicated high concentrations of PCBs and co-located chlorinated benzenes, another component of the askarel, present in a small area of the excavation (approximately 5 feet by 5 feet). Due to concerns that deeper excavation could allow for transport of contaminants through the clay layer into deeper groundwater (Snoqualmie River Shallow Aquifer, or Shallow Aquifer; see Special Considerations section for additional details on this aquifer), the excavation was stopped. A tarp was placed in the bottom of the excavation, the hole was filled with clean soil, and the excavation area was covered with plastic sheeting to limit rainwater infiltration. An additional subsurface investigation was done in September 1989 to evaluate conditions below the clay layer. Based on the results, additional excavation in T-12 was done in October 1989. The excavation extended to a depth of 13 feet bgs, above the base of the clay layer (approximately 15 feet bgs). Results from samples collected at the base of the excavation confirmed that PCBs and chlorinated benzenes are present at elevated concentrations in the remaining soil in the clay layer.

Information on the PCB releases, investigation, and remedial actions were submitted to the EPA, who has regulatory authority over PCB releases under the Toxic Substances Control Act (TSCA). Ecology and Environment, Inc. used this information to complete a Preliminary Assessment and Hazard Ranking Score for the Site in February 1991. The Assessment and Score were based only on contamination in the PCB area, and not on any other documented contaminant releases on the mill property. After considering the results of the Assessment and Score, EPA did not recommend further action at the Site under the Comprehensive Environmental Response, Compensation, and Liability Act/Superfund Amendments and Reauthorization Act (CERCLA/SARA). An assessment of groundwater conditions in the Shallow Aquifer in the T-12 area was started by GeoEngineers, who installed four monitoring wells in August 1991, and was continued by Dalton, Olmsted, & Fuglevand, who installed four additional monitoring wells in May 1992. The wells were screened at depths between approximately 15 and 28 feet bgs. MW-1 through -4 were sampled in August 1991. MW-1, -3, -4, -5, -6, -7, and -8 were sampled in May, August, and November 1992. Contamination was primarily present in the MW-2 sample, which had elevated concentrations of PCBs (430 ug/L) and chlorinated benzenes (200 ug/L tetrachlorobenzene, 22,000 ug/L trichlorobenzene, and 29,800 ug/L total dichlorobenzenes).

The 1992 Dalton, Olmstead, & Fuglevand investigation also included sampling of surface soils (up to 6 inches bgs) in the area around the T-12 excavation. A geotextile and soil cover had been installed in this area in October 1991 (Figure 9), to decrease the chance that humans or wildlife would come in contact with PCB-contaminated soils. Sampling results indicate remaining areas of surface soil contaminated with PCBs above the current MTCA Method A cleanup level (1 mg/kg) in areas both beneath and outside of the geotextile/soil cover (Figure 10).

SAWMILL AREA

The sawmill was built in 1916, and manufactured lumber from large cedar and fir logs until it was closed and demolished in 1989. After demolition, investigations of the areas where lubricant and hydraulic oils were used in the mill machinery identified two areas of petroleum contamination: the sash gang area and the log haul area. Approximately 1000 cubic yards of petroleum contaminated soil was excavated from these areas in January 1990. Additional 1990 investigations in the mill area refined the understanding of the extent of petroleum contaminated soil and added a third area of identified petroleum contamination, the powerhouse area. Contamination in the powerhouse area is related to the presence of an electrical transformer (T-7). These additional investigations also confirmed groundwater contamination with TPH.

Delta investigated the extent of contamination in the sawmill area as part of the 2005 Level III ESA. Based on a change in the Method A TPH cleanup levels between the 1990 and 2005 investigations, the only area identified as having petroleum contaminated soil in need of additional remediation was the log haul area (Figure 11). Groundwater wells in this area were removed after sampling was done as part of the Level III ESA.

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UNDERGROUND AND ABOVEGROUND STORAGE TANK AREA
Ten underground storage tanks (USTs) were removed from the Site in January 1989, in the area referred to as the former UST area or Area 1. The USTs held gasoline, diesel fuel, and lubricating oils. During removal of the USTs, 300 cubic yards of petroleum-saturated soils were removed. A follow-up investigation in August 1989, involving soil sampling in 11 test pits, confirmed remaining soil contamination with TPH and BTEX.

Olympus Environmental and HDR Engineering conducted the first remedial actions in the UST area in November 1989. This included the collection of additional soil and groundwater samples to get a better understanding of the extent of petroleum contaminated soil, as well as the excavation of approximately 700 cubic yards of contaminated soil. Contamination above the Method A cleanup levels at the time was left in place near the southeastern edge of the excavation, where a roadway limited the accessible area for excavation. Following excavation, soil was transported to a different Weyerhaeuser property for storage in lined containment cells. The excavated soils were treated using bioremediation in a land treatment unit. Treatment occurred from June 1990 to 1993, at which time the soil was evaluated, determined to be a Class 3 soil, and stockpiled for future use as road fill.

During the November 1989 investigation, samples were also collected in the area of an above-ground storage tank (AST) southeast of the UST area. This area is referred to as the AST area or Area 2 in site reports. The AST held road oil. Sampling indicated petroleum contaminated soil was also present in the AST area, and HDR excavated soil in this area in November 1989. Approximately 600 cubic yards of contaminated soil were removed, transferred to lined containment cells, and treated in the same manner as soils from the UST area. Excavation of soil was limited by multiple structures in the area, and the excavation did not include the full area of contamination.

Groundwater conditions in the UST and AST areas were investigated beginning in March 1990. A total of 11 monitoring wells were installed by the end of 1990. Wells were sampled twice a year from 1991 to 1993 by Shannon & Wilson. TPH and BTEX were elevated in some wells in the UST area. TPH was elevated in some wells in the AST area. Lead was present above the Method A cleanup level at the time of sampling in wells from both the UST and AST areas.

Emcon conducted sampling to investigate the extent of remaining contamination in the UST and AST areas in 1997. These were the first samples in the UST and AST areas analyzed using the WATPH analytical methods, giving results as TPH-G and TPH-Dx instead of the total TPH value from earlier sampling events. TPH-G contaminated soils were identified south of the former UST area. TPH-Dx contaminated soils were identified on the west and south sides of the previous excavation in the AST area. Groundwater results were similar to previous sampling events, with TPH-G, TPH-Dx, BTEX, and lead present in samples from some wells in the UST area and TPH-Dx and lead present in samples from some wells in the AST area. In 1998, Emcon oversaw the removal of existing monitoring wells and installation of 8 new monitoring wells. The original monitoring wells were mostly located in the Shallow Aquifer at a depth of approximately 12 feet bgs. Based on results indicating that groundwater contamination in this area was primarily located in the perched layer, at approximately 6-8 feet bgs, the new wells were installed in the perched groundwater layer. Samples of the new wells indicated conditions consistent with previous sampling events, with elevated benzene, TPH-G, and TPH-Dx in the UST area and elevated TPH-Dx in the AST area.

Groundwater monitoring continued at least twice a year from 1998 through 2003. Results of this ongoing monitoring are included in the 2004 Groundwater Monitoring Report prepared by Shaw Environmental. By the end of 2003, concentrations of TPH-G, TPH-Dx, and BTEX were consistently below the Method A cleanup levels with the exception of benzene in well A1-9. In an attempt to decrease the remaining benzene, oxygen releasing compound-filled socks were inserted into well A1-9. These socks were changed quarterly, in conjunction with groundwater monitoring in this well to monitor the effectiveness of the socks. Benzene concentrations in A1-9 remained above the Method A cleanup level at the end of 2004, and the socks were discontinued as a remediation strategy since they had been ineffective at decreasing the benzene concentration.

Delta Environmental conducted additional soil and groundwater sampling in the UST area in 2005, with the goal of identifying the area of soil with elevated concentrations of TPH-G or benzene that was contributing to the ongoing contamination in groundwater in well A1-9. The area of proposed soil excavation based on the results of this investigation is shown below in Figure 12.

Delta also conducted additional sampling in the AST area as part of the 2004 Level III ESA. Soil samples were collected from near the previous AST excavation area, as well as around the adjacent fuel oil storage building. Soil concentrations of TPH-Dx were elevated in an area extending south of the previous excavation (Figure 13). Free product was observed in some borings. A groundwater sample collected from boring S-3.1 contained TPH-Dx above the Method A cleanup level.

2005 PETROLEUM CONTAMINATED SOIL EXCAVATIONS
Additional remediation of petroleum contaminated soils from multiple areas discussed above – the sawmill, AST, lumber strapping, Morbark chipper, and UST areas – was done in 2005. Soil from these areas was excavated and stockpiled in the former planer mill and lumber sheds. Stockpiles underwent landfarming, a remediation technique that encourages bioremediation to lower petroleum concentration in the soils.

The excavation in the sawmill area removed approximately 13 cubic yards of soil and extended to a maximum depth of 10 feet bgs. In the AST area, the excavation removed approximately 6787 cubic yards of soil and extended to a maximum depth of 13 feet bgs. The lumber strapping area excavation extended to a maximum depth of 5 feet bgs and removed approximately 751 cubic yards of soil. In the Morbark chipper area, approximately 1500 cubic yards of soil were removed from the excavation, which extended to a maximum depth of 5 feet bgs. The UST area excavation removed approximately 6787 cubic yards of soil and extended to a maximum depth of 13 feet bgs.

Site specific Method B cleanup levels, proposed for each individual area in the report, were used to determine which landfarmed soils were in compliance and could be reused on the property. Landfarming was ended in December 2006, at which time 10,136 cubic yards of soil (89% of the total excavated volume) was deemed suitable for reuse. Soil resistant to treatment with landfarming had come from the Lumber Strapping area. Soil unsuitable for reuse was disposed of off-site at a landfill.

The only detailed information in the Ecology site file on this remedial action is included in a report submitted as part of the King County grading permit for the work. Since the report was prepared for that purpose and not for submission to Ecology, it is missing some of the information normally included in cleanup reports (analytical results from soil samples, figures showing excavation boundaries, details on derivation of site specific TPH concentrations used to determine which soils were acceptable for reuse, etc.). With these information gaps, it is unclear how much petroleum contaminated soil remains in these areas.

ADDITIONAL INFORMATION COLLECTED BY THE SITE HAZARD ASSESSOR

The Assessor visited the Site on April 7, 2021. The visit focused on previously identified areas of contamination in the upland portion of the Site. The owners of this part of the Site and their environmental consultant were present for the visit. Generally, no visual evidence of contaminated areas was present on the ground surface, as would be expected from the subsurface location of the previously identified contamination. The areas are generally covered in vegetation (areas not currently used for commercial operations) or gravel (areas used for commercial operations). Two areas are fenced to limit contact of humans and wildlife with shallow soil contamination - one near T-12 and the other in the boiler ash fill area. These areas are visible in photos taken during the visit (see Figure 15).

SPECIAL CONSIDERATIONS

Checked boxes indicate routes applicable for Washington Ranking Method (WARM) scoring

☑ **Surface Water**

Contamination has been documented in sediment in Borst Lake.

☐ **Air**

Contamination is located in the subsurface, and vapor intrusion is unlikely based on distance between areas of contamination and enclosed structures.

☑ **Groundwater**

Documented groundwater and/or soil contamination in multiple areas.

GROUNDWATER AQUIFERS ON AND NEAR THE SITE
While there is limited information on groundwater in the site reports focused on contamination, additional information is available on the groundwater aquifers on and near the Site, as summarized in the Associated Earth Sciences, Inc. (AESI) Soil, Geology, Groundwater and Geologic Hazards Report. The following are the aquifers of interest, from shallowest to deepest, identified on or near the Site in this report.

The interflow network is shallow groundwater located generally in the uppermost fill soils. This is also referred to as perched groundwater in some of the reports about contamination investigations. Groundwater in this layer is discontinuous and will not support production wells so is not considered an aquifer in the AESI report. Most of the groundwater analyzed for contamination on the Site to date comes from this layer.

The Snoqualmie River Shallow Aquifer (Shallow Aquifer) is also fairly shallow (less than 50 feet bgs) and discontinuous. There is a groundwater divide that crosses the Site – north of this line, groundwater in this aquifer flows to the north and connects with the Tokul Creek Delta Aquifer in the subsurface. South of the divide, groundwater flows generally to the south toward Borst Lake and the Snoqualmie River. This is the deepest groundwater with existing data for the Site, including the "deep" aquifer samples in the T-12 area and some wells in the UST/AST area. Contaminated groundwater was identified in the Shallow Aquifer samples. During slug testing conducted by AESI, the aquifer behaved as a confined system. Modeling suggests the aquifer may behave as an unconfined system depending on seasonal water levels.

The Tokul Creek River Aquifer is located on the north end of the former mill property and further north. It is connected to the Shallow Aquifer, but testing shows limited connection to the deeper aquifers. Groundwater flows to the northwest, where it discharges to Tokul Creek via springs.

The Pre-Fraser Aquifer is separated from the aquifers above and below it by fairly thick low permeability soil layers. In the southern area of the mill, approximately 160 feet of low permeability clay separates the Snoqualmie River Shallow Aquifer from the Pre-Fraser Aquifer (Figure 14). The low permeability layer between the Pre-Fraser and Deep Aquifers is estimated at 50-100 feet, though based on connectivity between these two aquifers that layer is likely discontinuous. There are not enough wells in this aquifer to confirm groundwater flow direction, but is likely to the northwest.

The Deep Aquifer is the primary aquifer of concern for possible groundwater target scoring, based on the location of many Group A and B wells in this aquifer. This includes the City of Snoqualmie Water System wells, which are located at least 550 feet bgs. Only 5-10% of the water in the aquifer comes from recharge within the 10-year time of travel area, with the rest coming from farther upgradient. The groundwater flow in this aquifer is to the northwest.

While the low permeability layers mentioned above are identified based on water movement, the clay and silt present in these layers would also slow contaminant migration, as organic contaminants are more likely to sorb to clay and silt than they are to sand and gravel in the higher permeability layers.

GROUNDWATER SCORING GUIDANCE
The WARM Scoring Manual indicates that the assumption for scoring is that all groundwater aquifers are connected, unless "site documentation clearly indicates otherwise". The AESI report provides more information on aquifer connectivity than is available for many sites at the time of WARM Ranking. The Assessor, in consultation with an Ecology hydrogeologist, considered multiple lines of evidence from the information in the AESI report when determining how to score the groundwater target questions. Lines of evidence included:

a) Depth and thickness of low permeability layers between aquifers.
b) Limited connectivity between the Shallow Aquifer and any other aquifer, outside of area north of Site where it is connected to the Tokul River Delta Aquifer.

SITE HAZARD ASSESSMENT
Worksheet 1: Summary Score Sheet

c) Shallow Aquifer flow direction on Site toward surface water (Borst Lake and Snoqualmie River), combined with information on aquifer connectivity to surface water and surface water proximity.
d) Low percentage of Deep Aquifer recharge attributable to the entire area covered by the 10-year time-of-travel zone, indicating limited connectivity to other aquifers in the area of the Site.

The sum of this evidence was sufficient to demonstrate that groundwater target scoring should be based on conditions in the Shallow Aquifer. Note that including wells in the deeper aquifers in scoring would not change the overall site rank. This groundwater evaluation only pertains to SHA scoring, and does not eliminate the need for further sampling and investigation to evaluate current groundwater conditions in order to assess compliance with MTCA groundwater cleanup levels.

ROUTE SCORES

Surface Water/ Human Health: 35.7

Surface Water/ Environment: 34.9

Air/ Human Health:

Air/ Environment:

Groundwater/ Human Health: 49.4

Overall Rank: 1

SITE HAZARD ASSESSMENT
Worksheet 1: Summary Score Sheet

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SITE HAZARD ASSESSMENT
Worksheet 2: Route Documentation

SITE NAME: Weyerhaeuser Snoqualmie Mill

Cleanup Site ID: 10346

Facility/Site ID: 73953138

1. SURFACE WATER ROUTE

List those substances to be considered for scoring:

BTEX, TPH-Dx (as naphthalene), PAHs (as benzo(a)pyrene), phenol, 3&4-methylphenol

Explain the basis for choice of substances to be used in scoring:

Substances considered for scoring were present at elevated concentrations in at least one sampling event. The substances selected for scoring were toluene, phenol, and 3-methylphenol. Toluene was the BTEX substance present in the highest concentration in the 2020 samples, and was selected to represent that group of substances. Based on the decrease in concentration between the 1993 and 2020 sampling events, TPH-Dx and PAHs were eliminated from the short list of substances used for scoring. 3&4-methylphenol were present above SMS criteria in 2020 samples, and 3-methylphenol was selected as the substance for scoring. Phenol concentrations were high in 1993 samples, but below detection limits in 2020 samples. 2020 detection limits were above the SMS criteria, however, so these results do not definitively confirm that phenol is present below the applicable criteria. Phenol was, therefore, conservatively retained on the list of substances for scoring.

List those management units to be considered for scoring:

sediment

Explain basis for choice of unit to be used in scoring:

Borst Lake sediments were used for scoring, based on contact with surface water and lack of any documented remedial actions since the sampling confirmed sediments were contaminated.

2. AIR ROUTE

List those substances to be considered for scoring:

not scored

Explain the basis for choice of substances to be used in scoring:

List those management units to be considered for scoring:

Explain basis for choice of unit to be used in scoring:

3. GROUNDWATER ROUTE

List those substances to be considered for scoring:

TPH-G (as benzene), TPH-Dx (as naphthalene), arsenic, pentachlorophenol, tetrachlorophenol, PCBs, tetrachlorobenzene, trichlorobenzene, dichlorobenzene

Explain the basis for choice of substances to be used in scoring:

Substances considered for scoring in each management unit were those documented to be present above screening levels (MTCA Method A or B cleanup levels for unrestricted land use). The management unit used for scoring was selected using Worksheet 3. Substances used for scoring are those present in the selected management unit.

List those management units to be considered for scoring:

Sawmill, UST/AST, Plywood Mill, Lumber Sheds, Morbark Chipper, and Dip Tank. See Worksheet 3 for more details on areas of contamination included in each unit.

Explain basis for choice of unit to be used in scoring:

The Sawmill was selected as the unit used in scoring. Since the Sawmill and Plywood Mill areas received the same subscore on Worksheet 3, the maximum mobility value for each area was used to make a final selection (3 for Sawmill, 2 for Plywood Mill). The short list of contaminants from the Sawmill was used to score toxicity, mobility, and containment. An estimate of total contaminated soil in all considered units was used to score substance quantity.

Worksheet 3
Substance Characteristics Worksheet For Multiple Unit/Substance Sites

Site Name: Weyerhaeuser Snoqualmie Mill
CSID: 10346

1. Surface Water Route: Only one unit (Borst Lake sediment) was considered for this route.

2. Air Route: Route not scored.

3. Groundwater Route:

Unit Considered for Scoring:	Sawmill	UST/AST	Plywood Mill	Lumber Sheds	Morbark Chipper	Dip Tank
Areas described in Worksheet 1 - Site Characterization and Remediation included in the unit:	sawmill petroleum areas, boiler ash area	UST area, AST area	T-12, T-17, press pit	lumber strapping, T-18	Morbark chipper	dip tank area 1
Substance(s):	TPH-Dx, PAHs, arsenic	TPH-G, TPH-Dx, benzene	PCBs, tetrachlorobenzene, trichlorobenzene, dichlorobenzene	TPH-Dx	TPH-Dx	pentachlorophenol, tetrachlorophenol
Human Toxicity Value:	12	8	12	5	5	10
Containment Value:	10	10	10	10	10	10
Rationale:	all units have documented soil and/or groundwater contamination, resulting in a maximum containment score (10)					
Groundwater Subscore	165	121	165	88	88	143

Based on the highest scoring toxicity/containment combinations, the following management units will be used for route scoring:

Surface Water: Borst Lake/log pond
Air: not scored
Groundwater: Sawmill. See Worksheet 2 for explanation of final selection.

Worksheet 4
Surface Water Route

CSID:10346

Site: Weyerhaeuser Snoqualmie Mill

1.0 SUBSTANCE CHARACTERISTICS

1.1 Human Toxicity

	Drink. Wat. Stnd.		Acute Toxicity		Chronic Toxicity		Carcinogenicity	
Substance	Value (µg/L)	Score	Value (mg/kg)	Score	Value (mg/kg/day)	Score	Adj. CPFo (risk/mg/kg-day)	Score
toluene	1.0E+03	4	5.0E+03	3	8.0E-02	1	--	X
3-methylphenol	--	X	2.4E+02	5	5.0E-02	1	--	X
phenol	4.0E+03	2	1.0E+01	10	3.0E-01	1	--	X

Maximum score: 10

Bonus points:

Human Toxicity Score: 10

Source: WARM Toxicity Database

Range: 1-12

1.2 Environmental Toxicity

Freshwater: X

Marine:

	Acute Water Quality Criterion	
Substance	Value (µg/L)	Score
toluene	1.75E+04	2
3-methylphenol	--	X
phenol	--	X

Maximum score: 2

Environmental Toxicity Score: 2

Source: WARM Toxicity Database

Range: 2-10

1.3 Substance Quantity

Amount: 60 acres

Basis: approximate area of sediment in Borst Lake

Source: site reports, King County iMap

Substance Quantity Score: 10

Range: 1-10

2.1 Containment

Description:	substances in sediment in direct contact with surface water		
Source:	site reports	Containment Score:	10
		Range: 0-10	

SUBSTANCE PARAMETER CALCULATIONS

Human Health Pathway

SUBh (Human Toxicity + 3) x (Containment + 1) + Substance Quantity **153.0**

Environmental Pathway

SUBe (Environ. Toxicity + 3) x (Containment + 1) + Substance Quantity **65.0**

2.0 MIGRATION POTENTIAL

2.2 Surface Soil Permeability

Description:	sediment in contact with surface water		
Source:	site reports	Soil Permeability Score:	7
		Range: 1-7	

2.3 Total Annual Precipitation

Amount (in.):	61.5	Annual Precipitation Score:	4
Source:	NOAA NCEI	Range: 1-5	

2.4 Maximum Two-Year/24-Hour Precipitation

Amount (in.):	3.3	24-Hour Precipitation Score:	3
Source:	NOAA Atlas 2	Range: 1-5	

2.5 Flood Plain

Classification:	in 100 year floodplain	Floodplain Score:	2
Source:	iMap	Range: 0-2	

2.6 Terrain Slope

Degree of slope:	sediment in contact with surface water - max score		
Source:	site reports	Terrain Slope Score:	5
		Range: 1-5	

MIGRATION PARAMETER CALCULATION

MIG =Soil Permability + Annual Precip. + 24-Hour Precip. + Floodplain + Slope **21.0**

3.0 TARGETS

3.1 Distance to Surface Water

Name:	sediment in contact with surface water		
Distance (ft):	0	Distance to Surface Water Score:	10
Source:	site reports	Range: 0-10	

3.2 Population Served within 2 Miles

Population:	0	Population Served Score:	0
Source:	DOH SWAP Map, WRTS	Range: 0-75	

3.3 Area Irrigated within 2 Miles

Basis:	closest active irrigation water rights from Snoqualmie River are approximately 2.2 miles downstream		
Area (acres):	0	Area Irrigated Score:	0
Source:	WRTS	Range: 0-30	

3.4 Distance to Nearest Fishery Resource

Name:	Snoqualmie River		
Distance (ft):	1200 (approximate length from Lake outlet to River via the water)	Distance to Fishery Score:	9
Source:	iMap	Range: 0-12	

3.5 Distance to Nearest Sensitive Environment

Name:	contamination within wetland area (Borst Lake)		
Distance (ft):	0	Distance to Sensitive Environment Score:	12
Source:	site reports, National Wetland Inventory	Range: 0-12	

TARGET PARAMETER CALCULATIONS

Human Health Pathway

TARh Dist. to Surface Water + Population Served + Area Irrigated **10.0**

Environmental Pathway

TARe Dist. to Surface Water + Dist. to Fishery + Dist. to Sensit. Environ. **31.0**

4.0 RELEASE

Evidence of release?	The 1993 investigation report did not find any individual chemicals out of compliance with the NPDES permit in the effluent samples. Per the WARM Scoring Manual, discharges in accordance with an NPDES Permit are not scored as releases. There is no surface water data in the site file collected after the NPDES permit became inactive.		
Source:	site reports	Release Score (REL):	0.0
		Range: 0 or 5	

SURFACE WATER ROUTE CALCULATIONS

Human Health Pathway

SWh =(SUBh x 40/175) x [(MIG x 25/24)) + REL + (TARh x 30/115)] / 24 **35.7**

Environmental Pathway

SWe =(SUBe x 40/153) x {(MIG x 25/24)) + REL + (TARe x 30/34)} / 24 **34.9**

Range: 0-100

Worksheet 5
Air Route

CSID:10346

Site: Weyerhaeuser Snoqualmie Mill

Not scored.

Worksheet 6
Groundwater Route

CSID: **10346**

Site: **Weyerhaeuser Snoqualmie Mill**

1.0 SUBSTANCE CHARACTERISTICS

1.1 Human toxicity

Substance	Drink. Wat. Stnd Value (µg/L)	Score	Acute Toxicity Value (mg/kg)	Score	Chronic Toxicity Value (mg/kg/day)	Score	Carcinogenicity Adj. CPFo (risk/mg/kg-day)	Score
TPH-Dx (naphthalene)	--	X	4.9E+02	5	2.0E-02	1	--	X
PAHs (benzo(a)pyrene)	2.0E-01	10	5.0E+01	10	3.0E-04	5	8.0E-01	5
arsenic	1.0E+01	8	7.6E+02	5	3.0E-04	5	1.5E+00	7

Maximum score: 10

Bonus points: 2 — Human Toxicity Score: 12

Source: WARM Toxicity Database — Range: 1-12

1.2 Mobility

Substance	Solubility Value (mg/L)	Score
TPH-Dx (naphthalene)	3.1E+01	1
PAHs (benzo(a)pyrene)	1.6E-03	0
arsenic	K >1	3

Maximum value: 3 — Mobility Score: 3

Source: WARM Toxicity Database — Range: 1-3

1.3 Substance quantity

Quantity: approximately 30,000 yd^3

Basis: Estimate of area of contaminated soil on site, based on the best available information in the site files. Based on the large amount of uncertainty in the available data for the 2005 TPH excavations, in these areas estimated volume of contaminated soil was based on pre-2005 information, giving a conservative estimate of remaining contaminated soil in these areas.

Source: site reports — Substance Quantity Score: 5

Range: 1-10

2.1 Containment

Description: documented contamination in soil and groundwater

Source: site reports — Containment Score: 10

Range: 0-10

SUBSTANCE PARAMETER CALCULATION

SUB =(Human Toxicity + Mobility + 3) x (Containment + 1) + Substance Quantity **203.0**

2.0 MIGRATION POTENTIAL

2.2 Net precipitation

Amount (in.):	41.5	Net Precipitation Score:	5
Source:	NOAA NCEI, ESRI	Range: 0-5	

2.3 Subsurface Hydraulic Conductivity

Description:	soil above shallowest groundwater is primarily sand/gravel fill		
Source:	site reports	Hydraulic Conductivity Score:	4
		Range: 1-4	

2.4 Vertical Depth to Aquifer

Depth (ft):	documented contamination in groundwater	Depth to Aquifer Score:	8
Source:	site reports	Range: 1-8	

MIGRATION PARAMETER CALCULATION

MIG =Depth to Aquifer + Net Precipitation + Hydraulic Conductivity **17.0**

3.0 TARGETS

3.1 Aquifer Usage

Description:	Not used, but usable. (reflects Shallow Aquifer conditions - see Special Considerations for details on Groundwater Target Scoring)		
Source:	site reports, DOH Find Water System/SWAP Map	Aquifer Use Score:	2
		Range: 1-10	

3.2 Distance to Nearest Drinking Water Well

Distance (ft):	No wells in aquifer. (reflects Shallow Aquifer conditions - see Special Considerations for details on Groundwater Target Scoring)		
Source:	site reports, DOH Find Water System/SWAP Map	Well Distance Score:	0
		Range: 0-5	

3.3 Population Served by Drinking Water Wells within Two Miles

		Population Served Score:	0.0
No. of people:	0	Range: 0-100	
Source:	site reports, DOH Find Water System/SWAP Map		

3.4 Area Irrigated by Wells within Two Miles

		Area Irrigated Score:	0.0
Area (acres):	0	Range: 0-50	
Source:	site reports, DOH Find Water System/SWAP Map		

TARGET PARAMETER CALCULATION

2.0

TAR =Aquifer Use + Well Distance + Population Served + Area Irrigated

4.0 RELEASE

Evid. of release?	documented contaminated groundwater	Release Score (REL):	5.0
Source:	site reports	Range: 0 or 5	

GROUND WATER ROUTE CALCULATION

49.4

GW = (SUB x 40/208) x {(MIG x 25/17) + REL + (TAR x 30/165)} / 24

Range: 0-100

Washington Ranking Method
Route Scoring Summary and Ranking Calculation

CSID: **10346**
Site: **Weyerhaeuser Snoqualmie Mill**

Human Health Route Scores

Pathway	Score	Quintile
Surface water	35.7	5
Air	0.0	
Groundwater	49.4	4

Human Health Pathway Quintiles - based off February 2021 HSL

Quintile	Surface Water		Air		Groundwater	
1	<=	7.3	<=	8.6	<=	24.1
2	7.4	14.7	8.7	16.4	24.2	33.2
3	14.8	21.1	16.5	25.8	33.3	40.4
4	21.1	29.7	25.9	40.2	40.5	49.7
5	>=	29.8	>=	40.3	>=	49.8

Quintile	Value
High (H)	5
Middle (M)	4
Low (L)	

$(H^2 + 2M + L) / 8$

Human Health Priority Bin Score: 4.1

Environmental Route Scores

Pathway	Score	Quintile
Surface water	34.9	4
Air	0.0	

Environmental Pathway Quintiles - based off Febrauary 2021 HSL

Quintile	Surface Water		Air	
1	<=	11.3	<=	1.2
2	11.4	24.1	1.3	1.5
3	24.2	32.5	1.6	13.8
4	32.6	49.6	13.9	26.5
5	>=	49.7	>=	26.6

Quintile	Value
High (H)	4
Low (L)	

$(H^2 + 2L) / 7$

Environmental Priority Bin Score: 2.3

FINAL MATRIX RANKING

Human Health Priority	Environmental Priority 5	4	3	2	1	n/a
5	1	1	1	1	1	1
4	1	2	2	2	3	2
3	1	2	3	4	4	3
2	2	3	4	4	5	3
1	2	3	4	5	5	5
n/a	3	4	5	5	5	NFA

n/a - not applicable

NFA - no further action

Site Rank: 1

TEXT SUMMARY OF WORKSHEETS 3 THROUGH 6

The following is a summary of Washington Ranking Method (WARM) scoring for the site. To request the full details of scoring in an accessible format, please contact Ecology. Additional information on WARM, including the scoring options for individual questions and the equations used to convert individual question scores to route scores and then to an overall site rank, is available in the WARM Scoring Manual[1].

Worksheet 3 – Substance Characteristics for Multiple Unit/Substance Sites

Worksheet 3 was used to select a unit for scoring the groundwater pathway. The equation to determine the subscore for a unit considers human toxicity and containment of contamination. The sawmill and plywood mill areas tied for the highest subscore, followed by the dip tank, UST/AST, lumber shed, and Morbark chipper areas. The mobility of contaminants in each area was used to determine which of the highest scoring areas would be used in scoring. The sawmill area had contaminants with higher mobility, and was selected as the area used in groundwater route scoring.

Worksheet 4 – Surface Water Route

The substances selected for scoring the surface water route were toluene, phenol, and 3-methylphenol. These substances earned a score of 10 out of 12 for human toxicity and 2 out of 10 for environmental toxicity. Substance quantity scored the maximum, based on the estimated area of sediment in Borst Lake. The maximum value was given for substance containment, since contaminated sediment is in direct contact with surface water.

Scoring of the migration potential of contamination into surface water includes questions on soil permeability, total annual precipitation, maximum precipitation, location of the Site within a flood plain, and slope of the terrain between contamination and surface water. The migration potential subscore was 21 out of a possible 24.

The Site scored the maximum possible points for distance from contamination to surface water and distance to nearest sensitive environment based on contamination detected in sediment within the Lake. It scored 9 out of a possible 12 points for distance to the nearest fisheries resource, the Snoqualmie River. There were no identified uses of surface water for drinking or irrigation within 2 miles of the Site, so the score for those questions was 0. Because the only available information from Lake Borst was collected while the Site was covered by an active National Pollutant Discharge Elimination System (NPDES) permit, and no violations of the permit for surface water were noted, a score of 0 was given for a release based on the WARM Scoring Guidance.

There are two final scores for the surface water route, one for human health and one for environmental health. The human health score was 35.7 and the environmental health score was 34.9, both out of a possible 100.

[1] https://apps.ecology.wa.gov/publications/documents/90014.pdf

Worksheet 5 – Air Route

The air route was not scored.

Worksheet 6 – Groundwater Route

The substances selected for scoring the groundwater route were naphthalene (representing diesel range petroleum hydrocarbons), benzo(a)pyrene (representing polycyclic aromatic hydrocarbons), and arsenic. These were selected based on the results of Worksheet 3. These substances earned the maximum scores for toxicity and mobility. Substance quantity scored 5 out of 10, based on estimated volume of contaminated soil. Since groundwater is confirmed to be contaminated, the maximum score was given for substance containment.

Migration potential was scored using net precipitation, hydraulic conductivity, and distance between contamination and the aquifer. Maximum scores were given for all of these parameters based on an annual net precipitation of 41.5 inches, sand and gravel soil above the shallowest groundwater, and contamination having already reached groundwater.

Groundwater target questions were answered based on conditions in the Shallow Aquifer. A detailed explanation of the selection of that aquifer for scoring can be found in the Special Considerations section of Worksheet 1. Aquifer usage was considered not used but usable, scoring 2 out of 10. Based on an absence of water wells in this aquifer, scores of 0 were given to questions relating to usage for drinking water and irrigation. The maximum score was given for release, based on documentation of groundwater contamination on Site.

Groundwater scoring does not include an environmental score, so only an overall score for human health was calculated. The human health score was of 44.6 out of a possible 100.

Route Scoring Summary and Ranking

Route scores were converted to quintile values using the quintiles calculated after the publication of the February 2021 Hazardous Sites List. Quintile values were then entered into the WARM ranking equations to establish human health and environmental priority bin scores. Priority bin scores were rounded up to the nearest whole number, per the WARM ranking manual, and converted to a final rank using the final ranking matrix.

For human health, the surface water route received a quintile score of 5 and the groundwater route received a quintile score of 4. The priority bin score was 4.1, which rounded up to 5. For environmental health, the surface water route received a quintile score of 4. The priority bin score was 2.3, which rounded up to 3. Entering the bin scores of 5 and 3 into the ranking matrix resulted in an overall site rank of 1. Site ranks range from 1 to 5, with a rank of 1 indicating the highest risk relative to other ranked sites in Washington state.

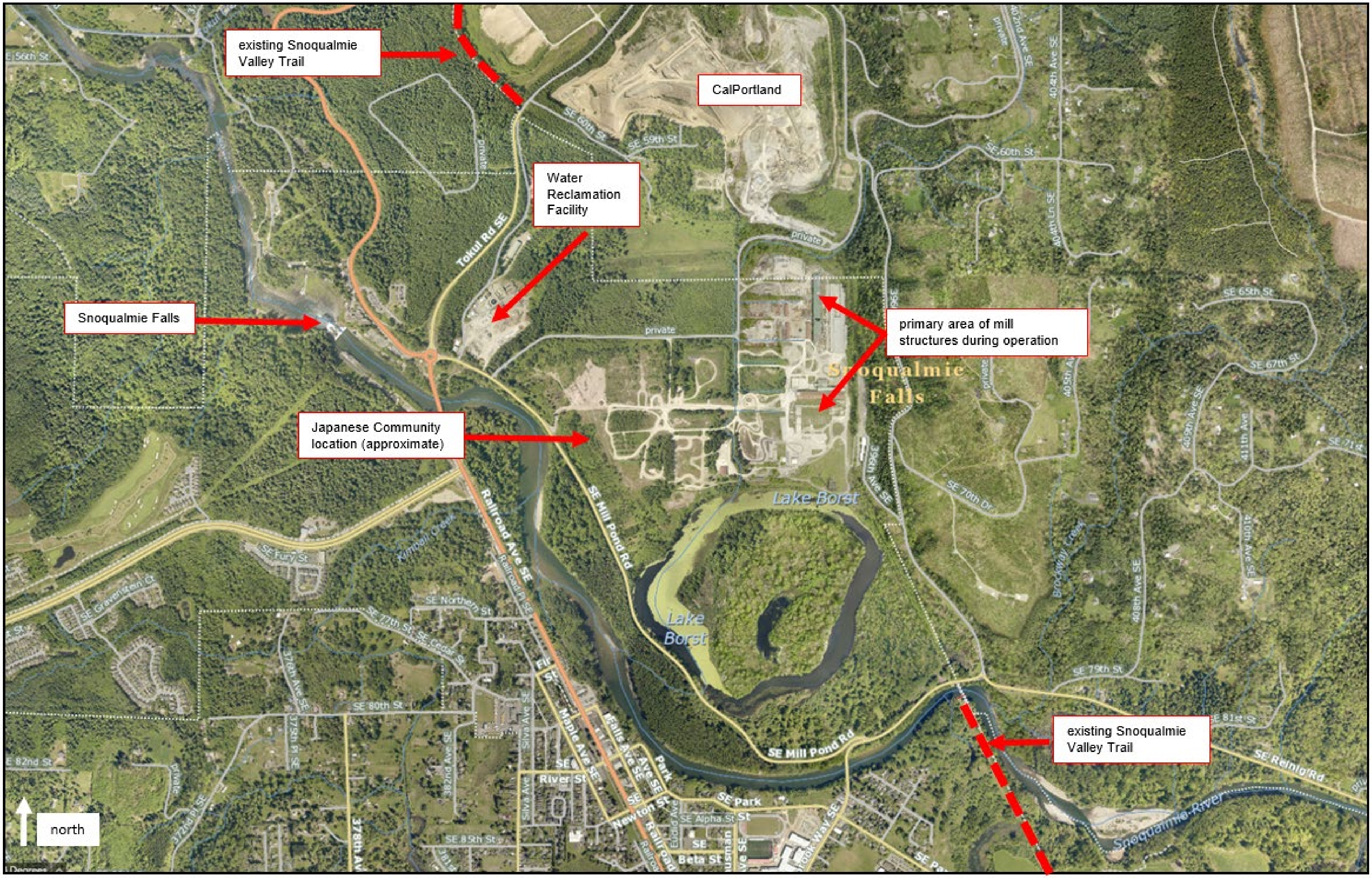


FIGURE 1. Site and surrounding area. Base figure is 2019 aerial basemap from King County iMap.

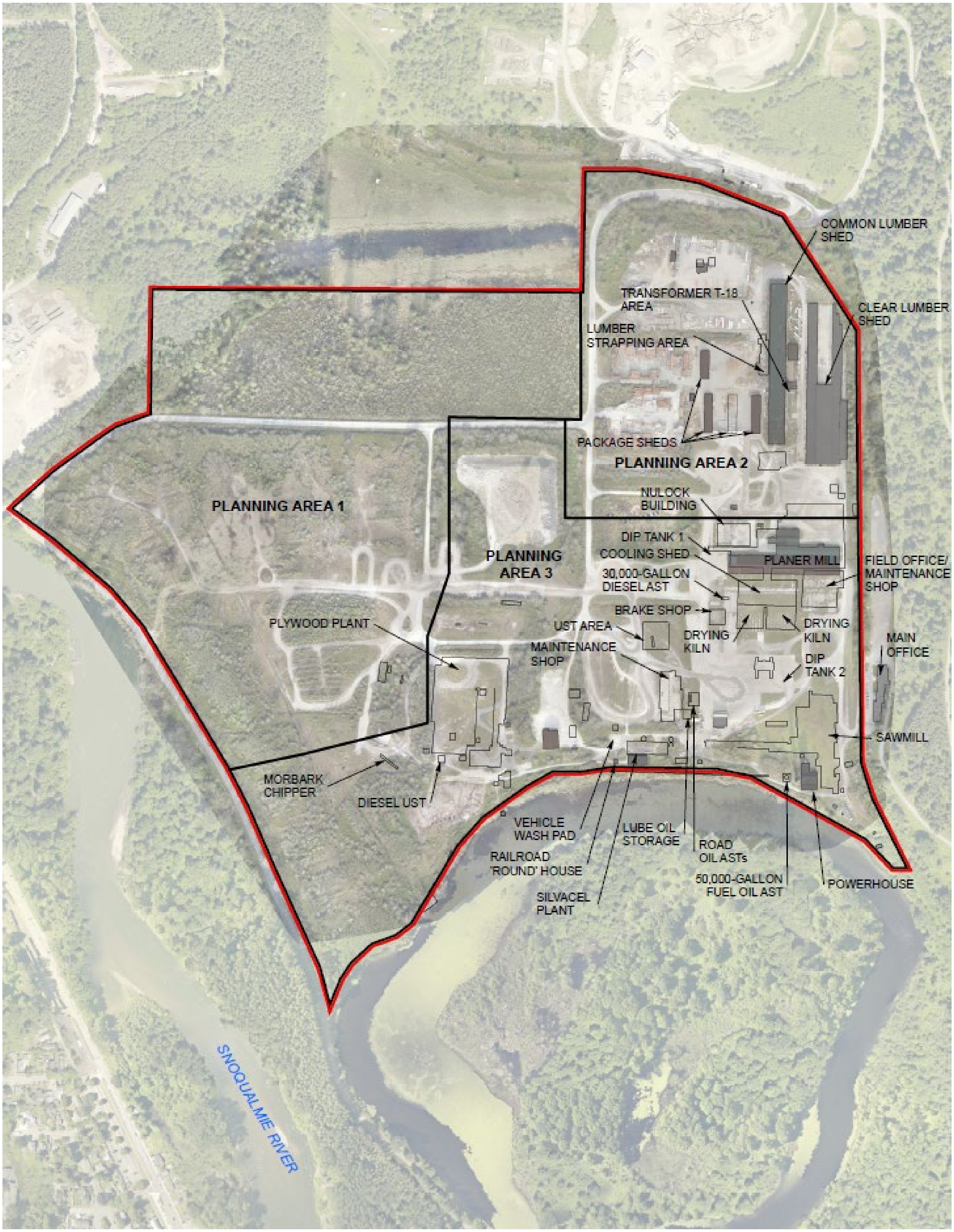


FIGURE 2. Location of mill structures during operations. Only commercial structures are shown, residential areas are not identified on the figure. Planning Area designations are related to the potential redevelopment. Figure from Farallon (2019) Summary of Environmental Investigations and Cleanup Activities.

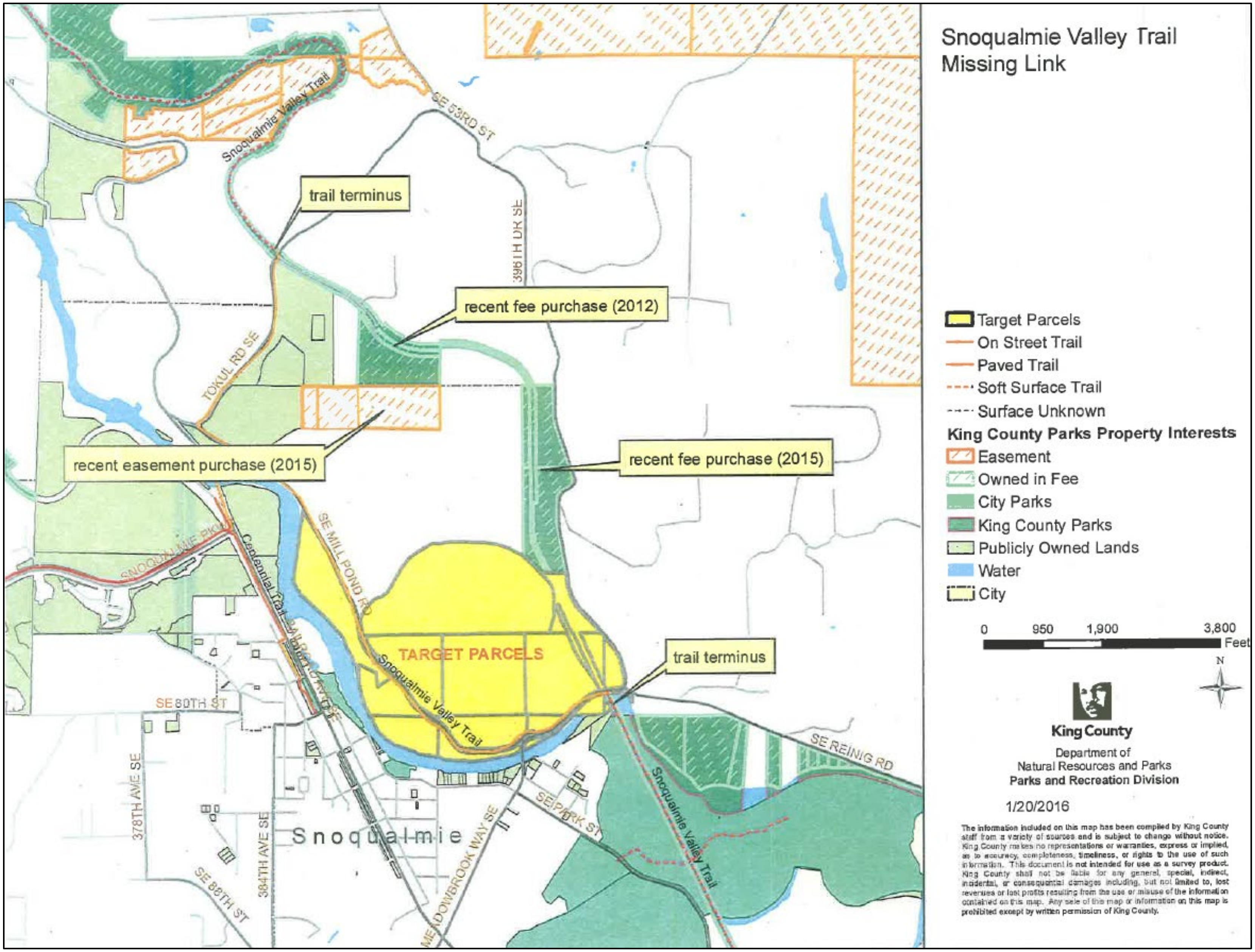


FIGURE 3. Potential areas targeted by King County Parks for the completion of the Snoqualmie Valley Trail and the creation of an open space in the area including Borst Lake.

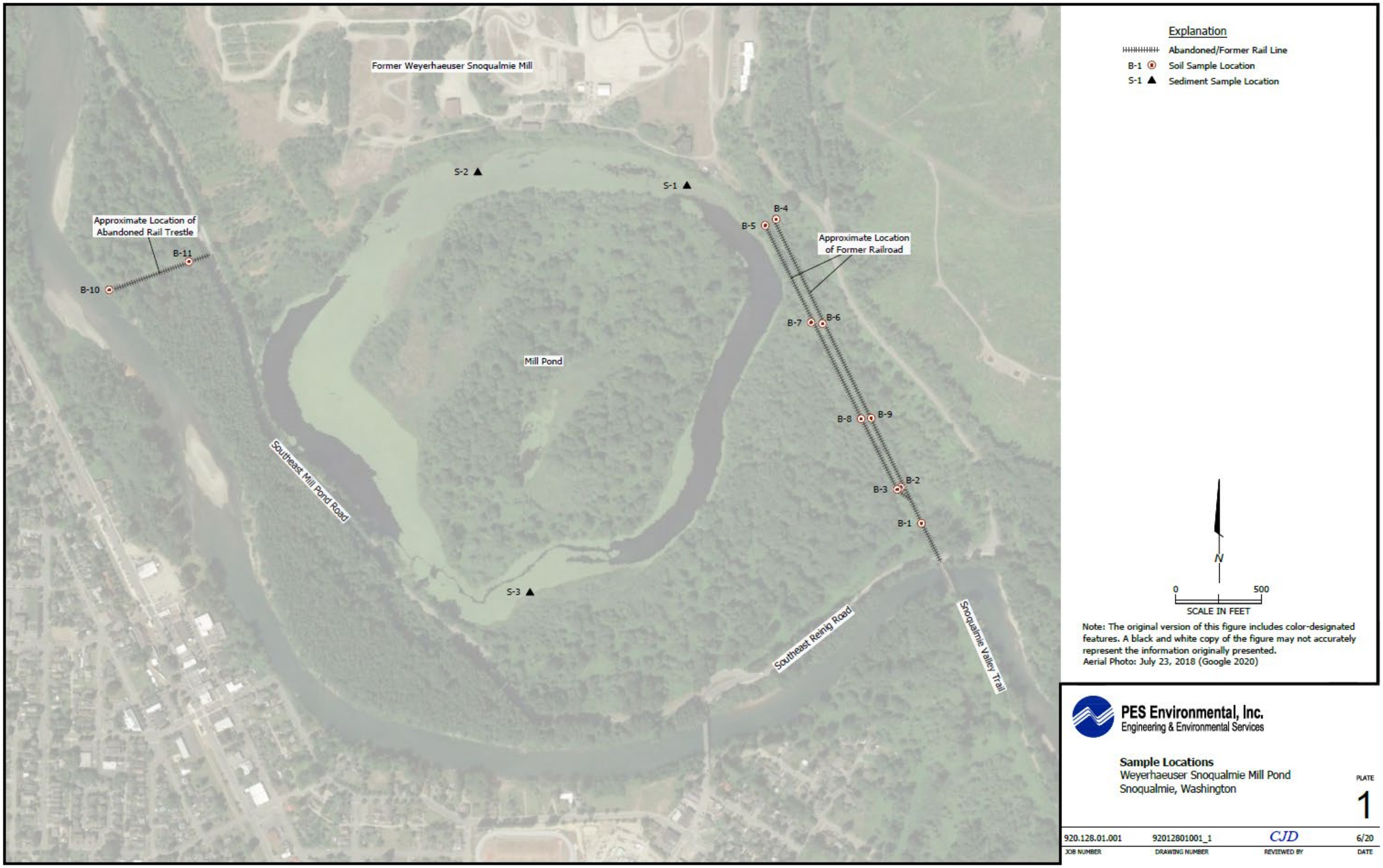


FIGURE 4. Sediment and soil sampling locations. Sediment locations are approximately the same as where Ecology collected samples in 1993. Figure from PES Environmental (2020) Sediment and Soil Sampling Summary.

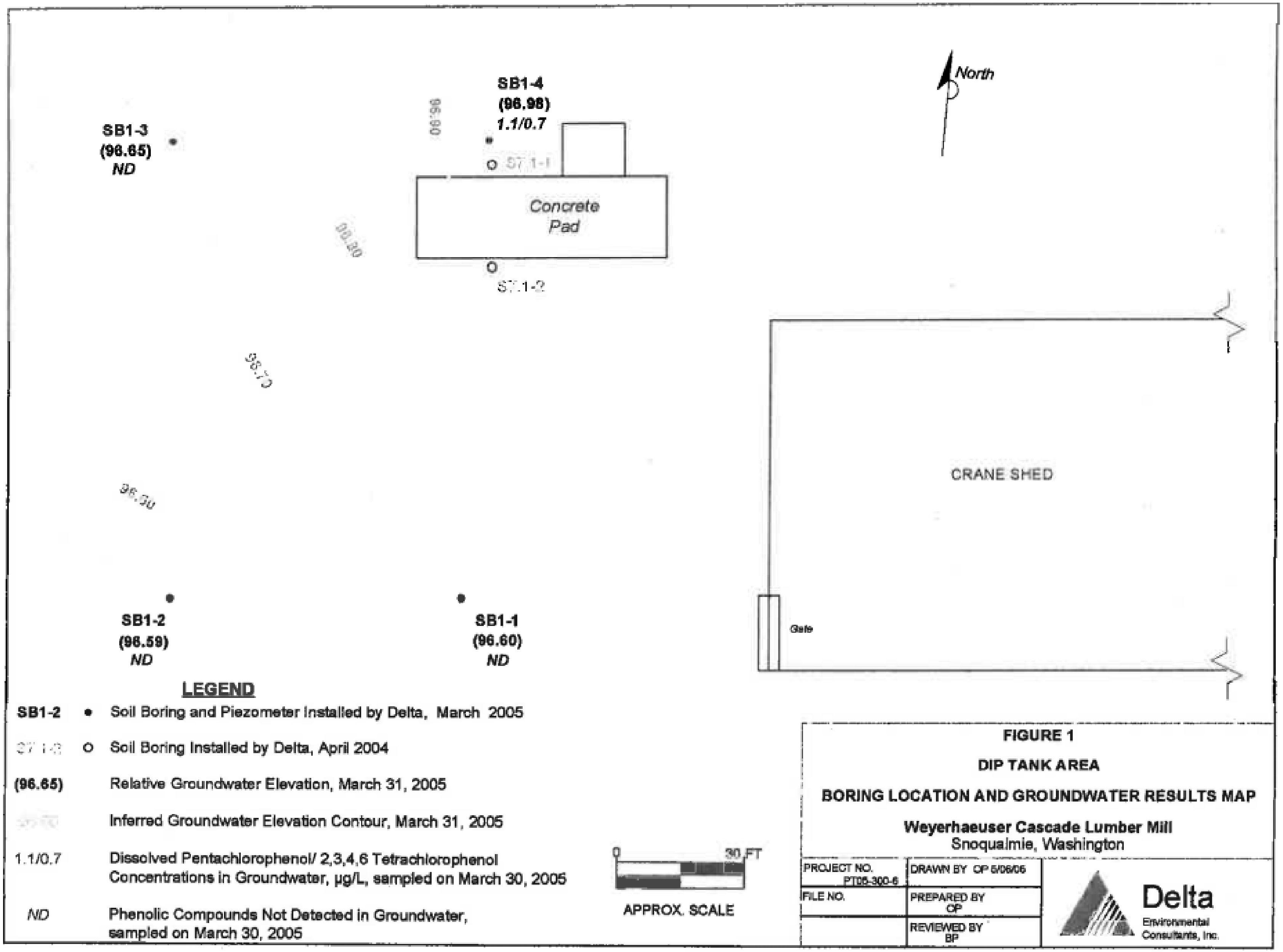


FIGURE 5. Sampling locations in Dip Tank Area 1. Figure from Delta (2005) Supplemental ESA for Former Lumber Strapping Area and Former Dip Tank Area.

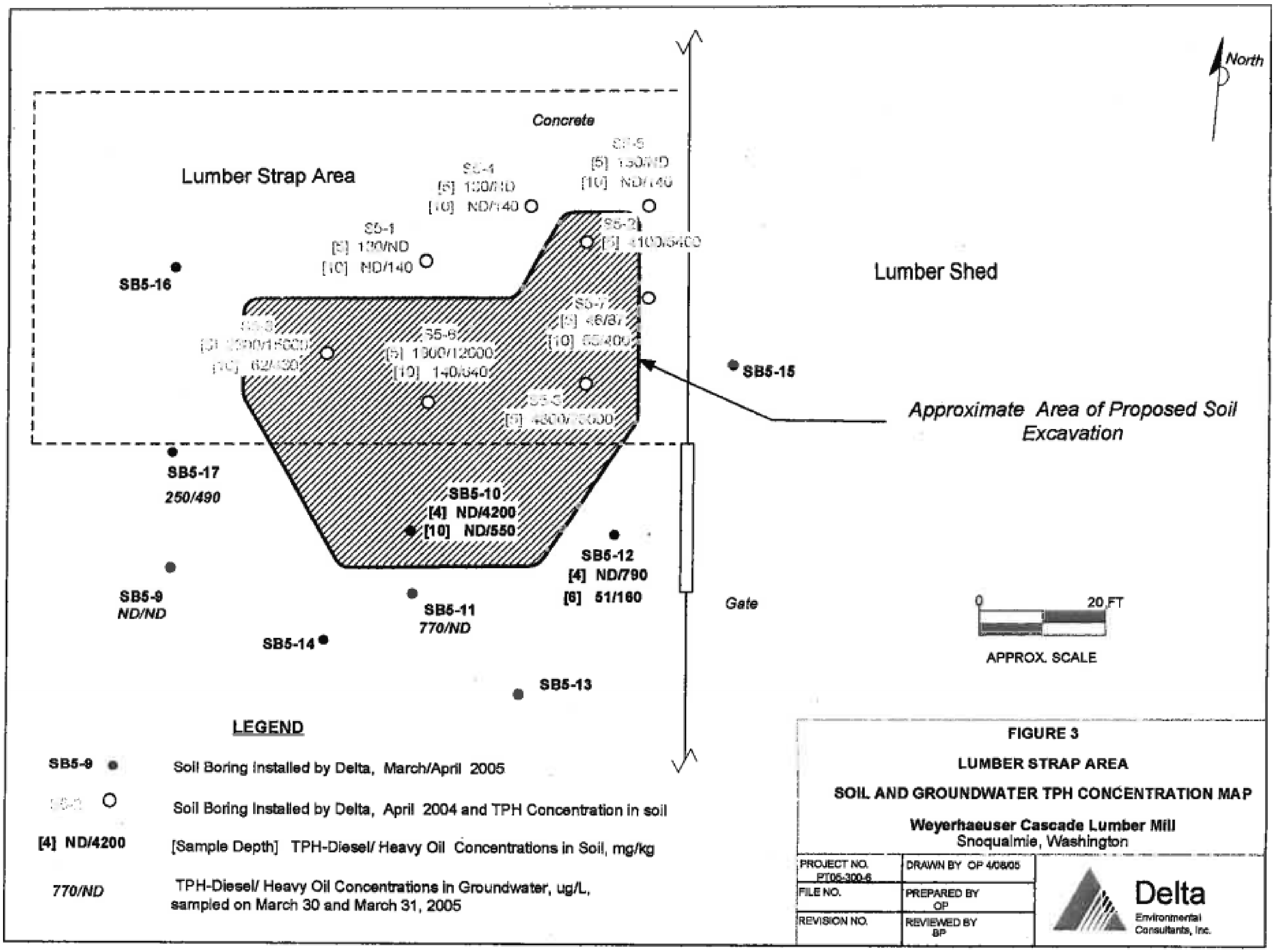


FIGURE 6. Identified extent of contaminated soil in the Lumber Strapping Area prior to the 2005 excavation. Figure from Delta (2005) Supplemental ESA for Former Lumber Strapping Area and Former Dip Tank Area.

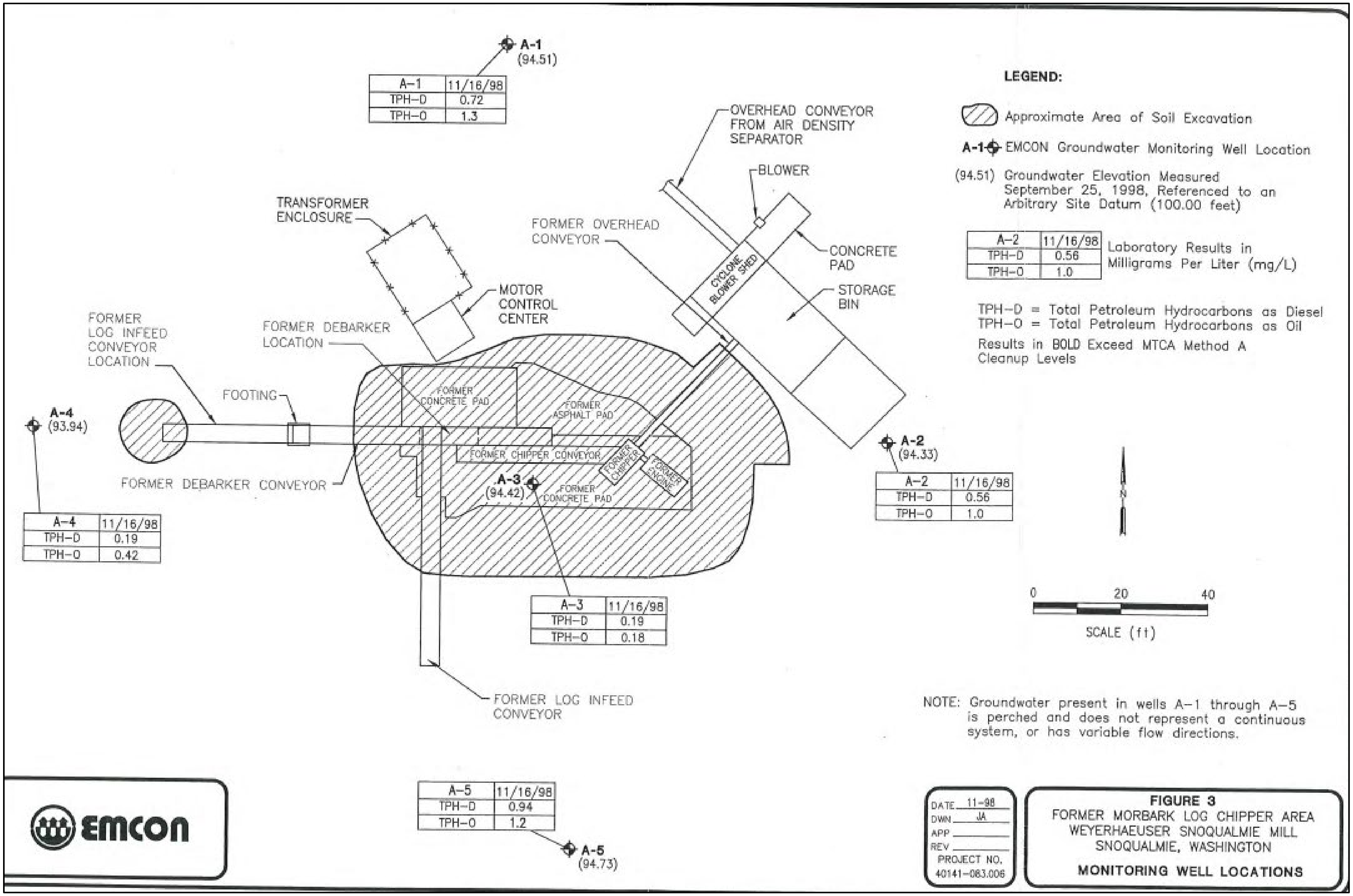


FIGURE 7. Morbark Chipper area, showing groundwater concentrations of TPH-Dx and areas of 1998 soil excavation. Additional soil removal in this area was done as part of the 2005 excavations, but based on available information in the site file, the location of that excavation is unknown. Note: the sum of TPH-D and TPH-O should be used for comparison to the cleanup level (current Method A is 0.5 mg/L). Figure from Emcon (1998) Remedial Action Report, Former Morbark Chipper Area.

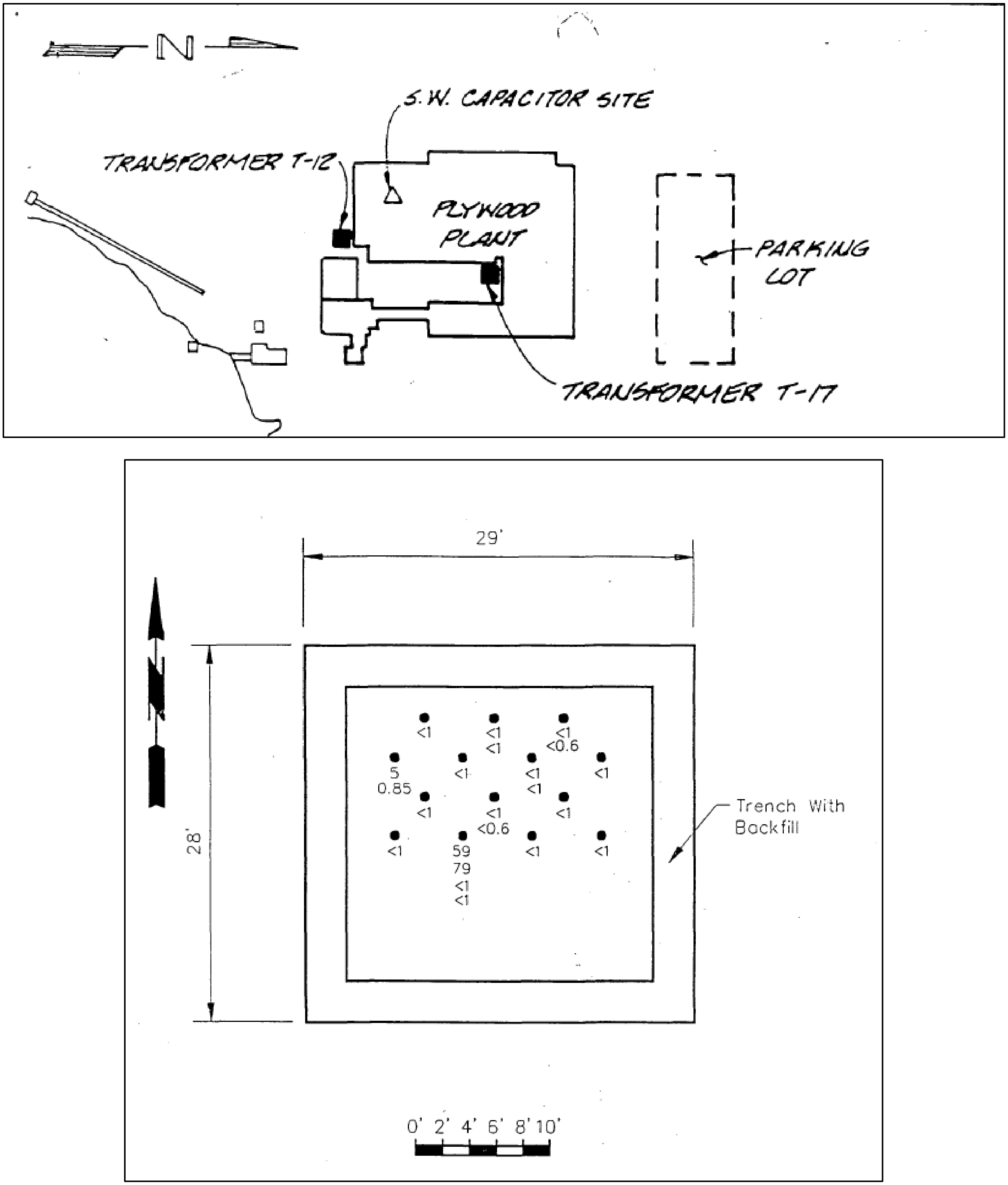


FIGURE 8. Location of transformers T-17 and T-12 within the plywood plant (top). Soil concentrations of PCBs in the T-17 excavation area following remedial actions (bottom). Locations with 2 concentrations indicate locations where duplicate samples were collected. The location with 4 values indicates a sample and duplicate with concentrations above the above the target PCB concentration; an additional 6 inches of soil was excavated in this area, and then another excavation base sample and duplicate were collected in this location. Figures from HDR Engineering (1990) Plywood Plant Fire Site…Cleanup Summaries, Risk Assessment, and Site Hazard Ranking Report.

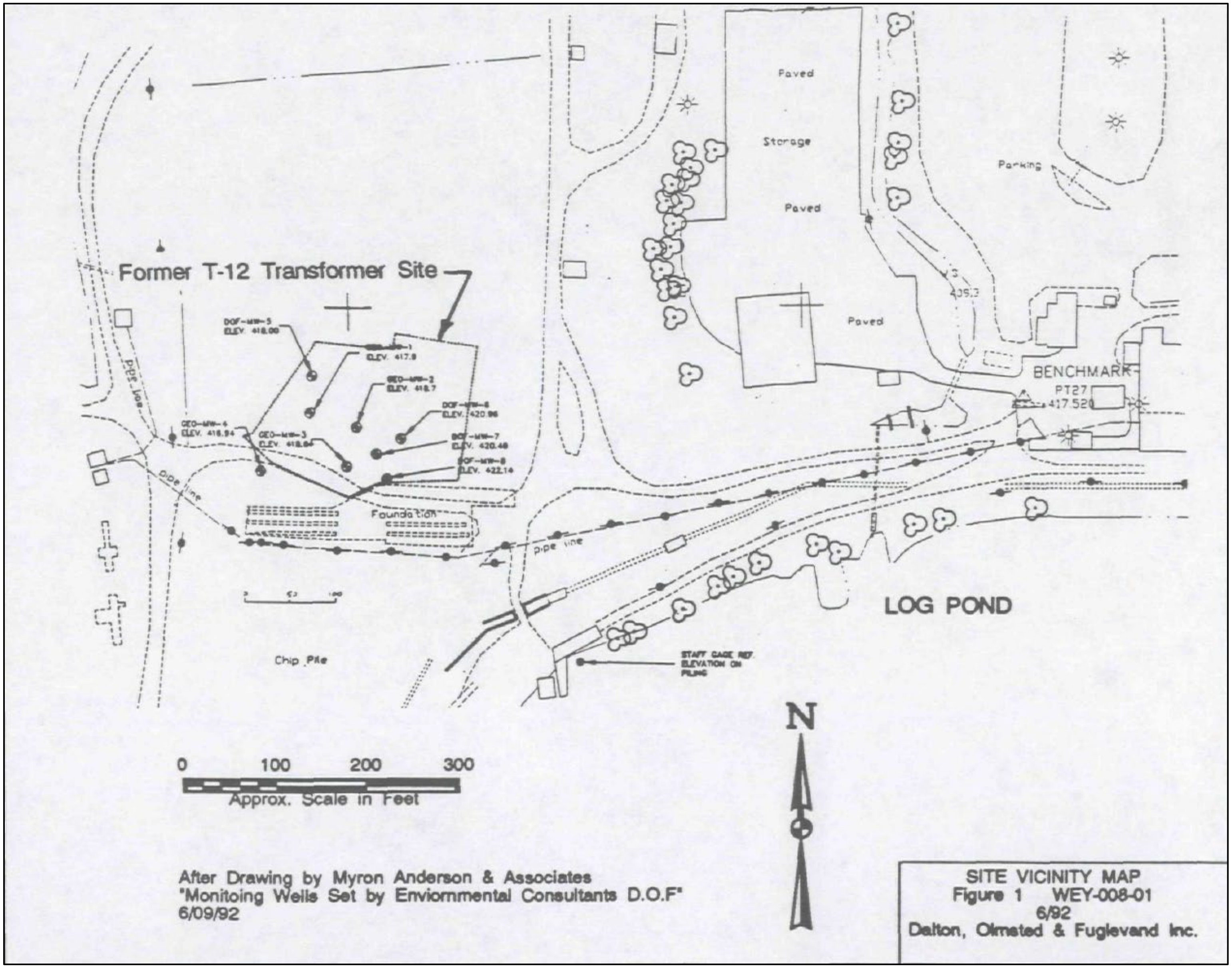


FIGURE 9. Approximate area of geotextile liner installed around T-12 indicated by Former T-12 Transformer Site boundary. The T-12 soil excavation was a smaller area around location MW-2 on the figure. Figure from Dalton, Olmsted, & Fuglevand (1994) Additional Assessment of PCB Contamination, T-12 Area.

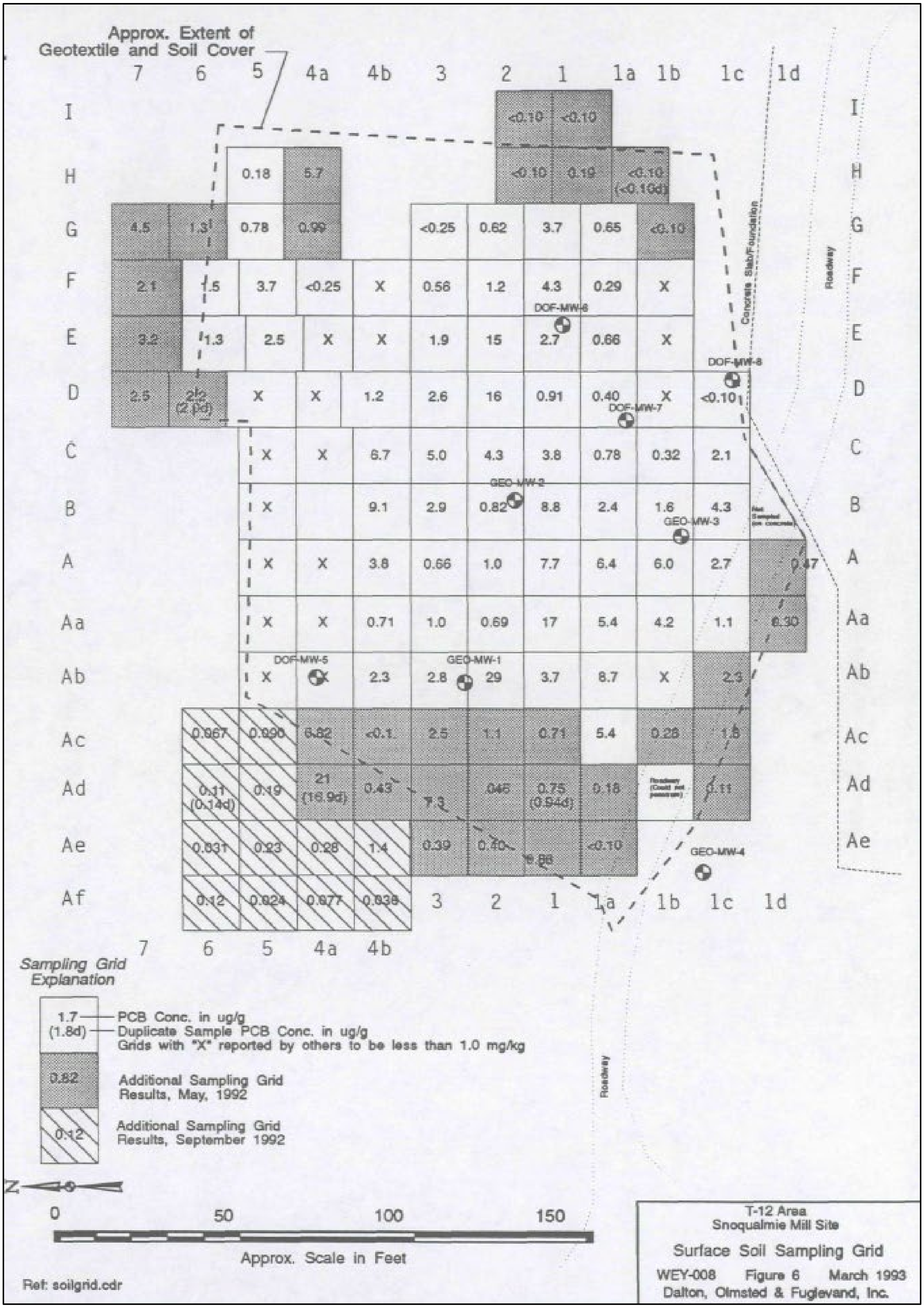


FIGURE 10. PCB concentrations in near-surface soil under and near the geotextile barrier near T-12. Figure from Dalton, Olmsted, & Fuglevand (1994) Additional Assessment of PCB Contamination, T-12 Area.

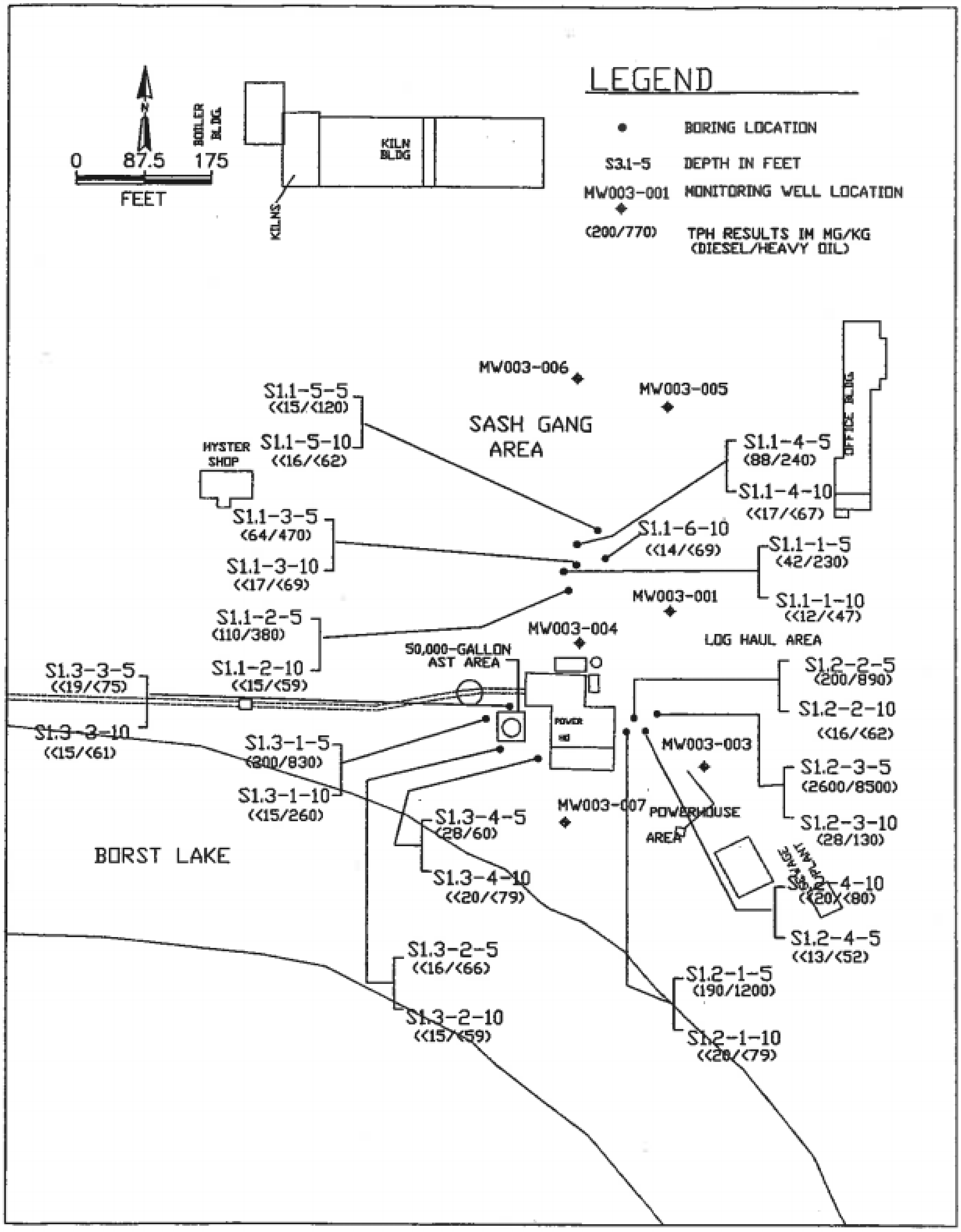


FIGURE 11. Soil sampling results in the Sawmill Area. Soil was removed from this area during the 2005 excavations, but the location of the excavation cannot be determined from the information available in the site file. Figure from Delta (2004) Level III ESA.

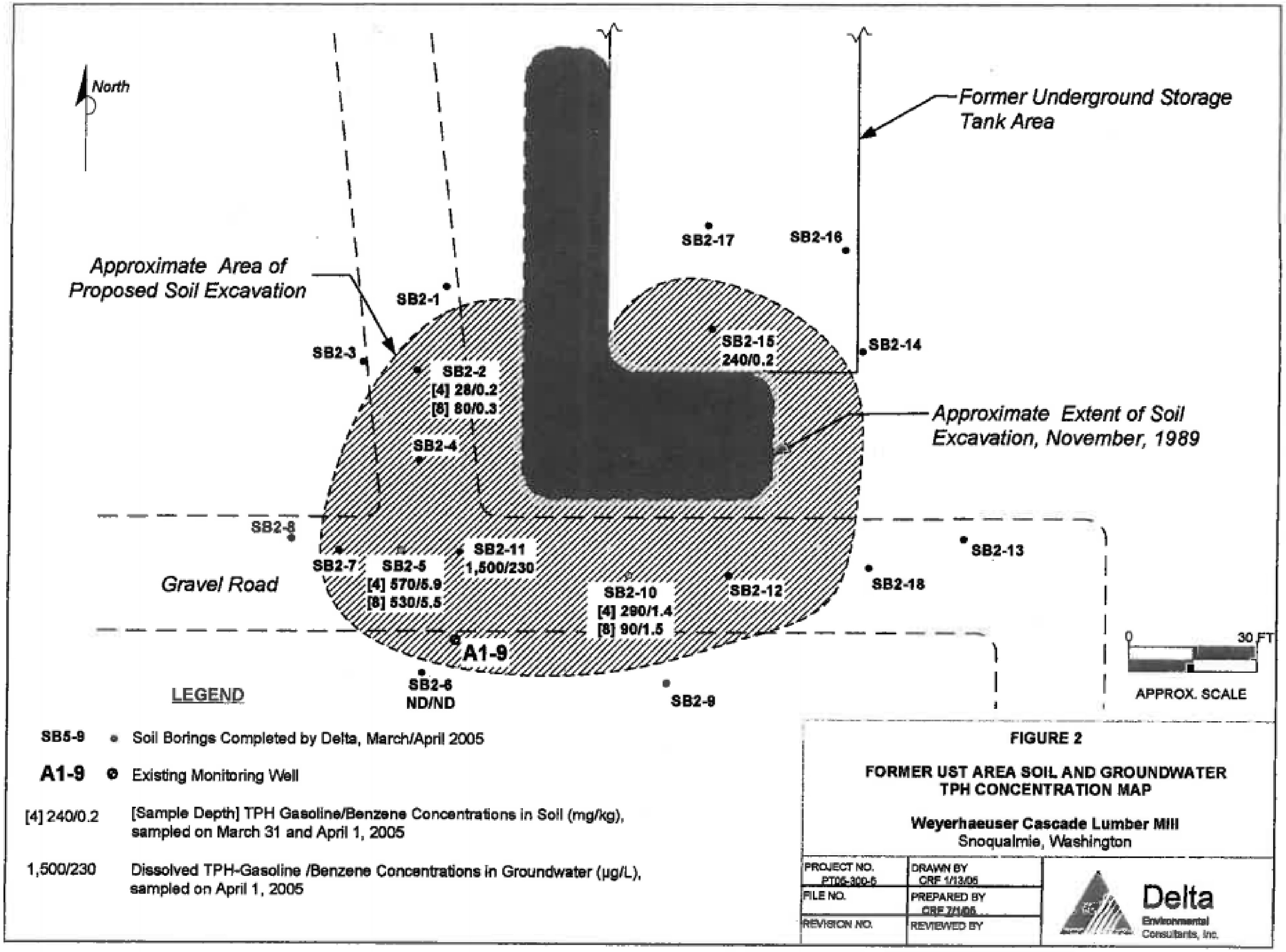


FIGURE 12. Area of remaining contaminated soil in the UST Area as of 2005. Additional soil removal was done in this area as part of the 2005 excavations, but the extent of that excavation cannot be determined from the available information in the site file. Figure from Delta (2005) Supplemental ESA for Former UST/AST Area.

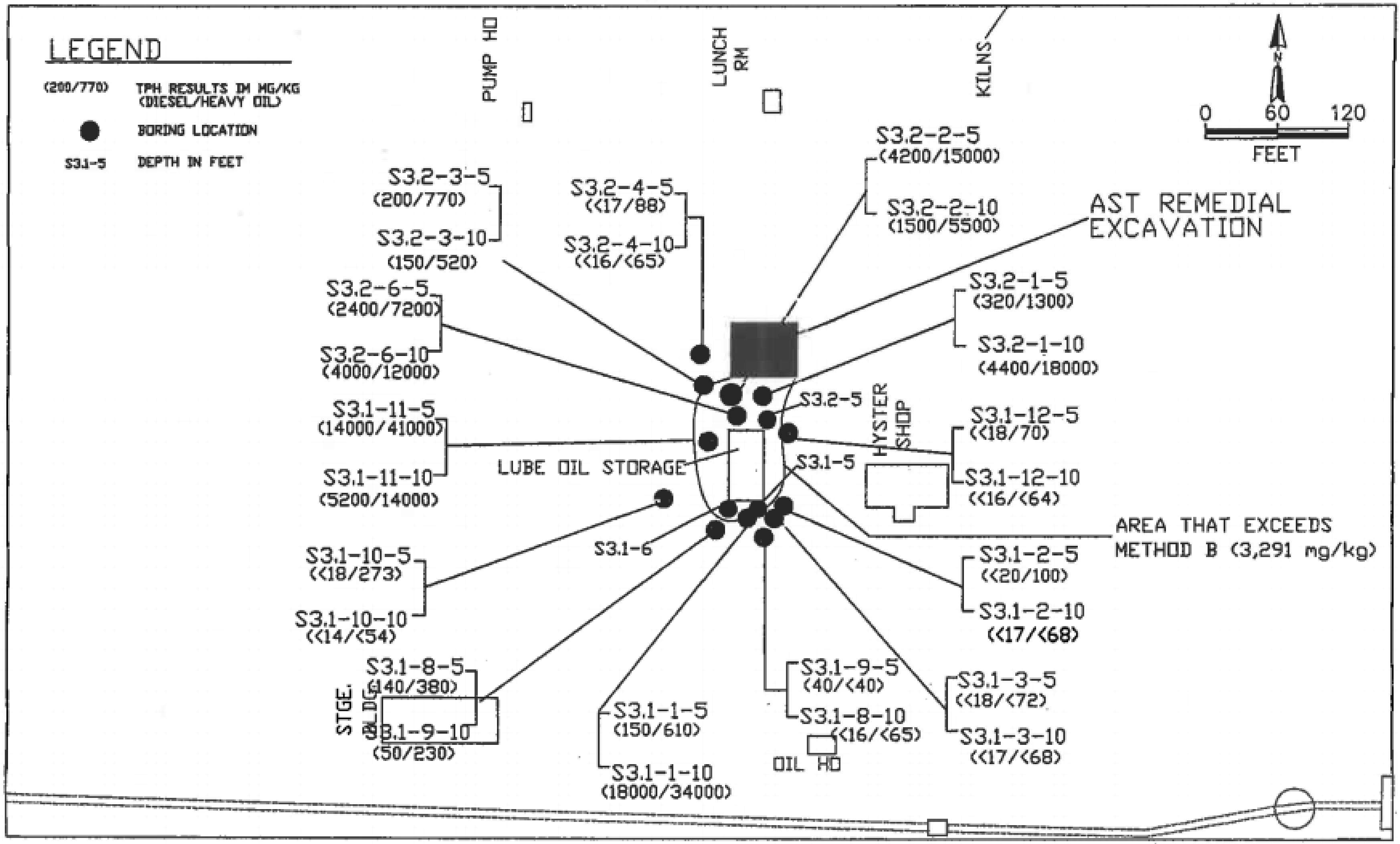
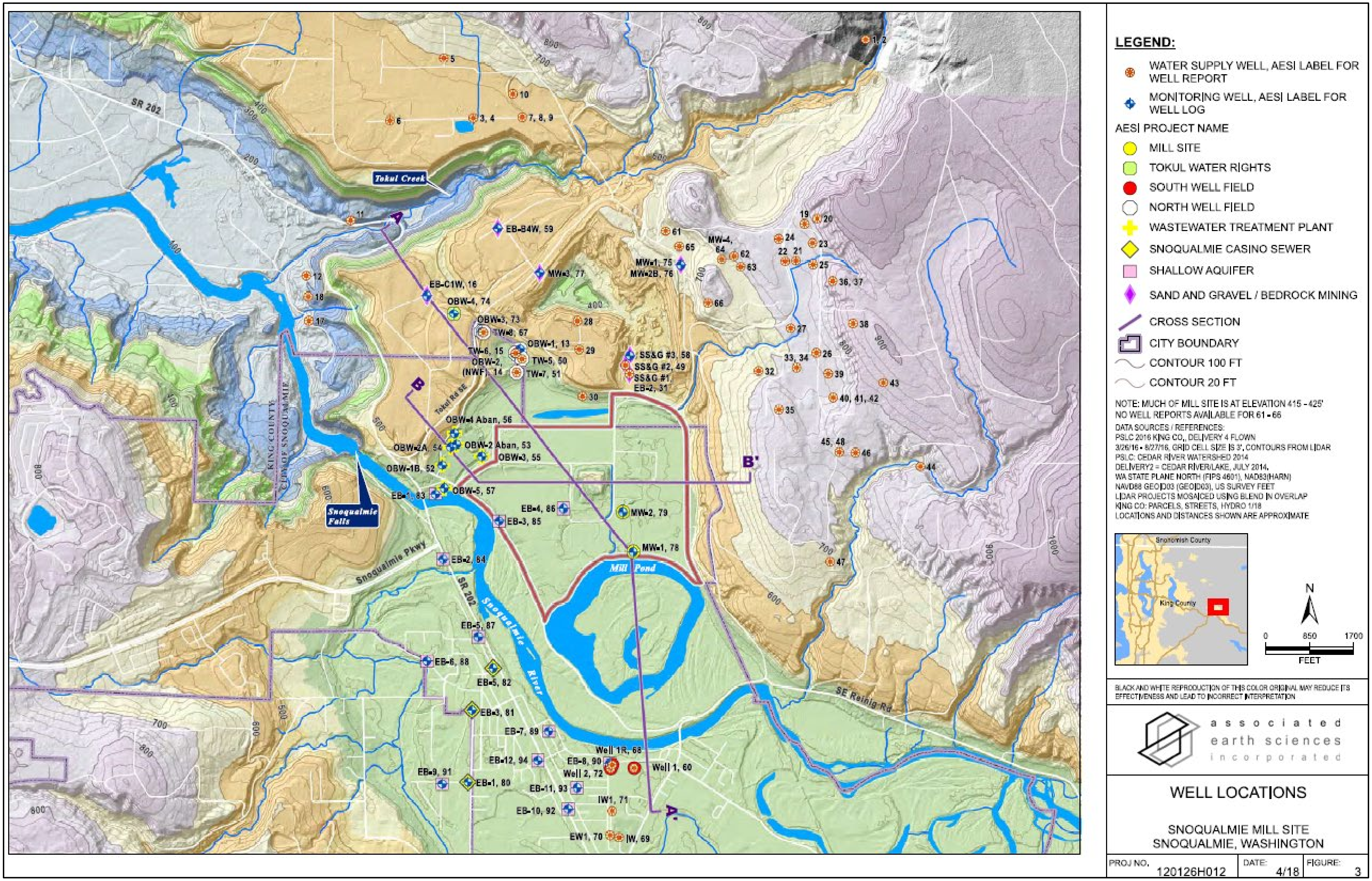


FIGURE 13. Soil concentrations of TPH-Dx in the AST Area. Indicated Remedial Excavation boundaries are for the 1989 soil excavation. Additional soil excavation in this area was done as part of the 2005 excavations, but the area of excavation cannot be determined from the information available in the site file. Figure from Delta (2004) Level III ESA.

a)


LEGEND:
WATER SUPPLY WELL, AESI LABEL FOR WELL REPORT
MONITORING WELL, AESI LABEL FOR WELL LOG
AESI PROJECT NAME
MILL SITE
TOKUL WATER RIGHTS
SOUTH WELL FIELD
NORTH WELL FIELD
WASTEWATER TREATMENT PLANT
SNOQUALMIE CASINO SEWER
SHALLOW AQUIFER
SAND AND GRAVEL / BEDROCK MINING
CROSS SECTION
CITY BOUNDARY
CONTOUR 100 FT
CONTOUR 20 FT
NOTE: MUCH OF MILL SITE IS AT ELEVATION 415 - 425'
NO WELL REPORTS AVAILABLE FOR 61 - 66
DATA SOURCES / REFERENCES:
PSLC 2016 KING CO., DELIVERY 4 FLOWN
3/26/16 - 8/27/16, GRID CELL SIZE IS 3', CONTOURS FROM LIDAR
PSLC: CEDAR RIVER WATERSHED 2014
DELIVERY2 = CEDAR RIVER/LAKE, JULY 2014.
WA STATE PLANE NORTH (FIPS 4601), NAD83(HARN)
NAVD88 GEOID03 (GEOID03), US SURVEY FEET
LIDAR PROJECTS MOSAICED USING BLEND IN OVERLAP
KING CO: PARCELS, STREETS, HYDRO 1/18
LOCATIONS AND DISTANCES SHOWN ARE APPROXIMATE
Snohomish County
King County
N
0 850 1700
FEET
BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION
associated earth sciences incorporated
WELL LOCATIONS
SNOQUALMIE MILL SITE
SNOQUALMIE, WASHINGTON
PROJ NO. 120126H012
DATE: 4/18
FIGURE: 3
SR 202
Tokul Creek
Snoqualmie Falls
Snoqualmie Pkwy
Snoqualmie River
Mill Pond
SE Reinig Rd
Tokul Rd SE
KING COUNTY
CITY OF SNOQUALMIE
A
A'
B
B'
EB-B4W, 59
EB-C1W, 16
OBW-4, 74
OBW-3, 73
TW-8, 67
OBW-1, 13
TW-6, 15
OBW-2, (NWF), 14
TW-5, 50
TW-7, 51
MW-3, 77
MW-1, 75
MW-2B, 76
MW-4, 64
SS&G #3, 58
SS&G #2, 49
SS&G #1, EB-2, 31
OBW-4 Aban, 56
OBW-2A, 54
OBW-2 Aban, 53
OBW-3, 55
OBW-1B, 52
OBW-5, 57
EB-1, 83
EB-4, 86
EB-3, 85
MW-2, 79
MW-1, 78
EB-2, 84
EB-5, 87
EB-6, 88
EB-5, 82
EB-3, 81
EB-7, 89
EB-12, 94
EB-8, 90
Well 1R, 68
Well 1, 60
Well 2, 72
EB-9, 91
EB-1, 80
EB-11, 93
IW1, 71
EB-10, 92
EW1, 70
IW, 69

b)

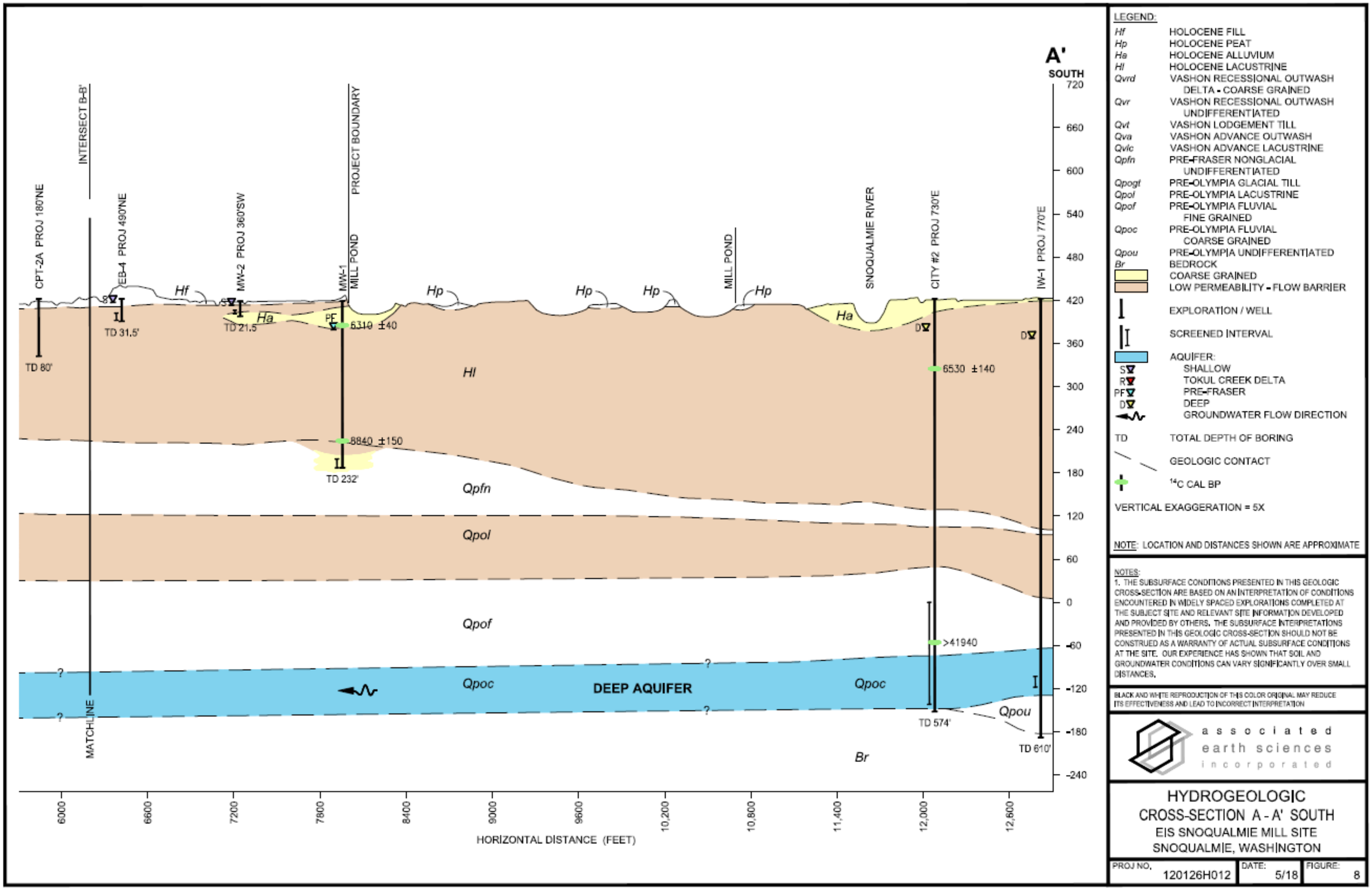


FIGURE 14. a) Location of cross-section and b) portion of cross-section A-A' that covers the south end of the former mill, where groundwater contamination has been previously documented on Site. The deepest documented groundwater contamination on Site is in the Shallow aquifer. MW-1, completed in the Pre-Fraser aquifer on the south end of the mill property, provides information on the extent of low permeability soil separating the two aquifers. Figures from Associated Earth Sciences (2020) Soil, Geology, Groundwater and Geologic Hazards Report.

a) Morbark Chipper area, facing south.

b) AST area, facing east. Vehicles and office building associated with DirtFish are visible in the background.

c) UST area, facing northeast. The planer mill building is visible in the background on the right.

d) North end of the fenced-off PCB area around T-12, facing northwest.

e) East end of the fenced-off Boiler Ash Fill Area, including the powerhouse building.

f) South portion of the Lumber Strapping Area, facing southeast. The area was being used for log storage as part of commercial operations at the time of the site visit.

FIGURE 15. Photos taken by the Assessor during the April 2021 site visit. Many of the areas of contamination are currently open vegetated spaces, including the a) Morbark Chipper, b) AST Area, and c) UST Area. Fencing is in place to limit access to the d) T-12 Area and e) Boiler Ash Fill Area. The f) Lumber Strapping Area is within the portion of the site currently used for commercial activities, specifically the area used by Merrill & Ring lumber company.