Swift Creek
Sediment Management Action Plan (SCSMAP)
And SCSMAP Phase 1 Project Plan
Draft Environmental Impact Statement

Appendix C

Swift Creek Draft EIS Technical Report on Geology, Soils, and Groundwater

Prepared by
Associated Earth Sciences, Inc.
January 2013
Associated Earth Sciences, Inc.
Serving the Pacific Northwest Since 1981

Technical Report on
Geology, Soils, and Ground Water

SWIFT CREEK
DRAFT ENVIRONMENTAL IMPACT STATEMENT
Whatcom County, Washington

Prepared for
Wheeler Consulting Group

Project No. EH110253A
January 29, 2013
TECHNICAL REPORT ON
GEOLOGY, SOILS, AND GROUND WATER

SWIFT CREEK
DRAFT ENVIRONMENTAL
IMPACT STATEMENT

Whatcom County, Washington

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Project No. EH110253A
January 29, 2013
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1.0 INTRODUCTION

1.1 Project Background and Scope

Associated Earth Sciences, Inc. (AESI) completed an evaluation of existing ground water quality conditions in the vicinity of the Swift Creek alluvial fan located in western Whatcom County near the towns of Nooksack and Everson, Washington. Our services also included providing geologic/hydrogeologic support for the preparation of a Draft Environmental Impact Statement (DEIS) regarding the potential implementation of the Swift Creek Sediment Management Action Plan (SCSMAP). The approximate location of the project area is shown on the “Vicinity Map,” Figure 1. Various physical features of the project area, including ground surface topography and the approximate locations of selected wells, are shown on the “Site Layout Map,” Figure 2.

Swift Creek has a history of landslide and debris movement and a very high level of sediment transport since at least the early 1900s. This has resulted in excessive channel sedimentation and an increased flood hazard affecting development and infrastructure on the creek alluvial fan and other downstream areas. The primary cause of the sedimentation problem in Swift Creek is a large, active, complex landslide in the upper watershed that occurred over 70 years ago. The landslide mass is estimated at 68 million cubic-yards (yd³) in volume, and it delivers an estimated 120,000 yd³ of sediment per year to the creek system (Kerr Wood Leidal Associates [KWL], 2008). On average, approximately 20% or 30,000 yd³ per year of this sediment deposits on the alluvial fan as bedload (KWL, 2008). Periodic debris flows and dam outbreak floods have resulted in much larger annual volumes of sediment deposition on the alluvial fan. This significant sediment deposition has caused continuing flood control problems for Whatcom County. The sedimentation problems in Swift Creek are exacerbated by the mineralogy of the creek sediment. The sediment contains naturally occurring asbestos and naturally elevated concentrations of certain metals, which have associated potential health concerns/risks.

Sediment management on the Swift Creek fan has been an ongoing issue since at least the 1950s. Since that time, flood conveyance on the lower reaches of Swift Creek has been maintained through channel excavation conducted by private individuals, as well as local and federal agencies. Dredging normally occurred on an annual basis (or as needed) with dredged material piled into high levees, which provide temporary storage, on private property, on both sides of the creek (Figure 2). In the past, most dredged sediment was removed from the site by the public and contractors for use as fill in construction projects. This provided an inexpensive method for removing dredged sediments from the area. This practice was later halted due to health concerns related to naturally occurring asbestos in Swift Creek sediments (Hart Crowser, 2008).
Whatcom County has proposed to manage the surface transport of the asbestos sediment through the adoption and implementation of the SCSMAP project and non-project sediment management strategies. The SCSMAP was prepared to address sedimentation and flooding that could result in damage to agricultural, residential, and public assets and have the potential to affect public health. The primary goals of the SCSMAP are to: (1) establish a program to minimize sediment, flooding, and health hazards within the Swift Creek watershed; (2) identify avenues for maximizing benefits to natural and human resources; and (3) provide a solid base for appropriate stewardship of economic resources. The SCSMAP is described in detail in the Swift Creek Sediment Management Action Plan prepared by Whatcom County Public Works Department dated 2012.

The SCSMAP includes a number of non-project actions such as the adoption of plans, policies, programs, or regulations that contain standards controlling the use of the environment and provides umbrella strategies to manage sediment-related issues in the Swift Creek watershed. Management strategies are included in the SCSMAP for flood hazard and floodplain management and planning; for sediment management and planning; for accomplishing necessary maintenance and repair; for managing the Swift Creek landslide; and for managing health risk and emergencies. The SCSMAP also includes project-related management actions that would result in immediate watershed-wide benefit, including the construction of large-scale sediment basins, a debris deflection levee, two setback levees, and grade control structures, which are described in detail in the DEIS and in a technical report prepared by Pacific Surveying and Engineering (PSE) dated March 30, 2011.

The primary purpose of our services was to evaluate potential impacts to ground water quality and quantity resulting from the sediment management options presented in the SCSMAP and to develop the supporting geologic/hydrogeologic and water quality information necessary for the DEIS. It is our understanding that the various non-project and/or no-action options will not result in the removal of a significant amount of asbestos sediment from the project area or significantly alter the sedimentation pattern that has existed on the alluvial fan for over 50 years. Therefore, it was assumed that the various non-project actions and no-action alternatives/options will result in similar potential ground water quality/quantity impacts (if any) as to those that may have been occurring in the project area for the past several decades. The construction of large-scale sediment basins on the alluvial fan area would significantly affect sediment depositional patterns and alter ground water recharge from what has been occurring in the project area. Consequently, the potential effect of this action on ground water quantity and quality has been evaluated as part of this project. A detailed description of our services is provided below.

1. Review available literature regarding the existing geologic/hydrogeologic and ground water quality conditions within the immediate vicinity of the Swift Creek alluvial fan. The information review included: (1) available consultant reports, (2) selected water well reports for domestic and public wells, and (3) pertinent technical reports and maps
available from Whatcom County, United States Environmental Protection Agency (EPA), U.S. Geological Survey (USGS), and other government agencies.

2. Recently the EPA retained Ecology and Environment, Inc. (E&E) to obtain ground water quality samples from seven monitoring and three domestic wells located in the Swift Creek alluvial fan area. Our services included preparing a Site Specific Sampling Plan (SSSP) for obtaining ground water samples from the same seven identified monitoring wells. The SSSP was patterned after and is generally consistent with the SSSP developed by E&E for their water sampling project, with the exception of the inclusion of well development protocol for the wells.

3. When appropriate, develop the monitoring wells using surge and pump methods with a Waterra Hydrolift Inertial pump.

4. Install dedicated sampling tubes in each monitoring well at the conclusion of well development activities.

5. Obtain water samples in accordance with the SSSP from each selected well approximately 1 week after well development activities have been completed. The wells were purged of at least three well volumes using a low-flow Waterra Hydrolift Inertial pump prior to obtaining the water samples.

6. Measure and record water quality parameters (temperature, conductivity, pH, turbidity, and oxidative-reductive potential) in the purge water removed from each well.

7. Submit the collected water samples to an approved analytical laboratory for analyses of the target analyte list (TAL) metals (dissolved and total) and asbestos as listed in the previously approved E&E SSSP.

8. Compile the new ground water analytical data with the water quality data previously collected from the monitoring and domestic wells.

9. Evaluate the water quality data with regard to applicable ground water and drinking water quality standards.

10. Assess the potential for contaminants to leach from the dredge soil stockpiles located on the alluvial fan area and affect underlying ground water. The analysis was based on the chemical analytical data for soil samples previously collected by Bennett Engineering, LLC (Bennett Engineering) and E&E.

11. Prepare a report that presents the results of our field activities and conclusions/recommendations regarding: (1) the geologic/hydrogeologic setting of the alluvial fan area, (2) conclusions regarding the current potential impact of the Swift Creek alluvial fan area, and (3) recommendations for future monitoring.
Creek slide debris and depositional patterns on ground water quality and quantity beneath the Swift Creek alluvial fan, and (3) potential impacts to ground water quality and quantity beneath the alluvial fan area from the contemplated construction of large-scale sediment basins on the alluvial fan.

1.2 Report Organization

This report summarizes the results of our literature review, data analysis, and ground water sampling activities completed between October and December 2012, and an analysis of probable significant impacts. The following sections of this report include: 1) a description of the physical setting of the project area; 2) relevant project background information; 3) descriptions of existing geologic and soil conditions; 4) a summary of existing ground water conditions; and 5) our analysis of potential significant environmental impacts and mitigation measures relative to ground water quality and quantity.

1.3 Data Review and Previous Studies

AESI reviewed available geologic, soil, and ground water data to gain an understanding of existing conditions in the project area. Information reviewed included the following:

- Previous consultant reports and maps prepared for the project area, including:
  - *Ground Water Investigation Report, Swift Creek Vicinity Between Goodwin Road and Oat Coles Road, Whatcom County, Washington* (Bennett Engineering, 2009).
  - *Whatcom County Health Department Solid Waste and Toxics Program Inspection Report, Swift Creek – Ecology Facility Site I.D. Number 5797429* (Whatcom County Health Department, 2009).
  - *Swift Creek Background and Management Alternatives* (KWL, 2008).
• Reports and maps published by Whatcom County, EPA, the USGS, and the Washington State Department of Natural Resources, Division of Geology and Earth Resources (DNR), including:
  - *SCSMAP Phase 1 Implementation Plan* (Whatcom County, 2012b).
  - *Geologic Map of the Bellingham 1:100,000 Quadrangle* (Lapen, 2000).
  - *Geologic Map of Western Whatcom County* (Easterbrook, 1976).
• Water quality data provided by E&E dated November 8, 2012 (E&E, 2012a).
• Water well reports obtained from the Washington State Department of Ecology (Ecology) online well log database.
• Soils maps obtained from the United States Department of Agriculture, Soil Conservation Service (USDA SCS, 1992).
• Aerial photographs of the project area.
• Maps provided by Wheeler Consulting Group and other members of the DEIS project team.

Complete citations for documents and communications referenced in this report are listed in Section 7, “References.”

1.4 Physical Setting

The project area is located east of the towns of Everson and Nooksack in Whatcom County and encompasses the Swift Creek drainage from its confluence with the Sumas River to its headwaters on Sumas Mountain (Figures 1 and 2). Swift Creek originates on the west flank of Sumas Mountain and flows westward across an alluvial fan complex and into the Sumas River drainage. The project area topography ranges from the relatively flat Sumas River floodplain to the rugged slopes of Sumas Mountain. Ground surface elevations in the project area range from roughly 100 feet near the Sumas River to over 3,000 feet on the western slope of Sumas Mountain (Figure 2). The western flanks of Sumas Mountain are dissected by high-gradient streams, including Swift Creek, that discharge into the Sumas River. The vegetation of the slopes of Sumas Mountain consists of second-growth Douglas fir, western hemlock and western red cedar mixed with red alder, willows, ferns, and berry bushes.
During most of the year, Swift Creek flows into the Sumas River, which in turn flows north to the Fraser River in British Columbia (Figure 1). However, during the late summer and early fall months, when surface flows are low, the stream typically infiltrates into the relatively permeable sediments that comprise the alluvial fan area and no surface water flow reaches the Sumas River.
2.0 FIELD METHODOLOGY

2.1 Field Investigations

AESI conducted well development and ground water quality sampling activities in the project area in October 2012. The seven existing ground water monitoring wells sampled during our field investigations included HMW-01 to HMW-03, installed by Bennett Engineering in 2009 and PMW-01 to PMW-04, installed by GeoEngineers, Inc. in 2010 (Bennett Engineering, 2009; GeoEngineers, 2010). Monitoring well locations are shown on Figure 2. Monitoring well logs are provided in Appendix 1. Table 1 provides a summary of monitoring well information, including the well identification numbers/names currently and previously used. The primary purpose of our field investigations was to collect ground water samples from the existing ground water monitoring wells in order to evaluate potential impacts to ground water quality within the project area.

2.2.1 Well Development Activities

On October 10, 2012, AESI developed monitoring wells PMW-01 to PMW-04 using surge and pump methods with a Waterra Hydrolift Inertial pump. The wells were purged at a pumping rate of approximately 0.6 to 1.9 gallons per minute (gpm). Each well was developed for 1½ to 2 hours. Monitoring wells PMW-01 to PMW-04 were also developed again by E&E in October 2012. Monitoring wells HMW-01 to HMW-03 were not developed by AESI because these wells had been previously developed by Bennett Engineering in 2009 and again by E&E in October 2012.

2.2.2 Ground Water Quality Sampling

On October 17, 2012, AESI obtained ground water samples from the seven monitoring wells. The ground water sampling protocol followed the SSSP prepared by AESI, which was modeled after the SSSP previously prepared for the Sumas Mountain Asbestos (Swift Creek) project by E&E, dated July 17, 2012 (E&E, 2012b). The SSSP prepared by AESI was intended to generally replicate the sampling methodologies employed by E&E during their prior sampling event (AESI, 2012).

During the October 2012 sampling event the weather conditions were mostly cloudy with an air temperature of approximately 50 degrees Fahrenheit (°F). Prior to sampling, the static water level was measured in each well to the nearest 0.01 feet using a decontaminated electric water level probe. Dedicated polyethylene sample tubing was installed in each monitoring well. The wells were purged with a Waterra Hydrolift Inertial pump at a rate of less than 0.2 gpm for 35 to 95 minutes prior to sample collection. Field parameters, including pH, temperature, conductivity, redox potential (ORP), and turbidity were measured periodically during purging. Field meters were calibrated by AESI the day of the sampling event. Ground water samples were collected following stabilization of the field parameters. Samples were...
obtained directly from the discharge stream of the inertial pump for analysis of total and dissolved TAL metals and asbestos. Total and dissolved TAL metals water samples were placed in a chilled cooler in the field and hand-delivered, using proper chain-of-custody (COC) procedures, to the Burlington office of Edge Analytical Laboratories (Edge Analytical) immediately following the sampling event. Asbestos water samples were placed in a chilled cooler in the field and shipped via FedEx, using proper COC procedures, to EMSL Analytical, Inc. (EMSL Analytical) in Cinnaminson, New Jersey immediately following the sampling event.
3.0 AFFECTED ENVIRONMENT: GEOLOGY AND SOILS

3.1 Regional Geology

The regional geologic conditions of the project area are described in detail in geologic maps/reports prepared by the USGS and the DNR and in consultant reports completed for the project area, including Converse Davis Dixon Associates (Converse, 1976), BGC Engineering, Inc. (BGC, 2005) and USGS Water Resources Investigation Report 98-4195 (Cox and Kahle, 1999). A summary of the regional geology compiled from geologic maps and consultant reports is provided below.

3.1.1 Bedrock Geology

The project area is located within the northern Puget Lowland region, between the Cascade Mountains and Puget Sound. The Puget Lowland is an elongated north-south topographic and structural depression generally characterized by low relief. With few exceptions, the Puget Lowland generally lies below elevation 500 feet. The North Cascades are characterized by steep mountains ranging in elevation from 4,000 feet to over 10,000 feet with the highest being Mount Baker at elevation 10,777 feet.

The oldest rocks found in the region are Paleozoic greywacke, limestone, chert, and shale, which have been complexly folded and faulted. Overlying these are pre-Tertiary greywacke, shale, serpentine, and peridotite. In late Mesozoic, the conglomerates and sandstones of the Chuckanut Formation, which are continental in origin and represent a former vast alluvial floodplain where the energy of the transporting water was relatively high, were deposited unconformably over the underlying pre-Tertiary rocks.

In early Tertiary, the Chuckanut Formation was folded, faulted, and uplifted. With the uplift, erosion was renewed and some of the previously formed structures were reduced by erosion. A return to an alluvial floodplain environment resulted in the deposition of the Tertiary continental sedimentary rocks, the Huntingdon Formation, which presently outcrops along the foothills and the south and east margins of the lowland.

In late Tertiary, uplift of the Cascade Range occurred causing deformation of the Huntingdon Formation and additional deformation of the Chuckanut and older formations.

3.1.2 Pleistocene Geology

The next period of deposition occurred during Pleistocene time. Geologic conditions within the project area are primarily the result of multiple periods of continental glaciation, during which vast ice sheets advanced south from British Columbia and covered much of the Puget Lowland during the last 1.6 million years. Each succeeding glacier reworked the previous deposits and buried them beneath younger deposits. In the northern Puget Lowland, the
Evidence of multiple glaciations lies buried beneath the deposits of the last glacial advance and retreat. Evidence of earlier glaciation is based on older glacial deposits exposed in the southern portion of the Puget Lowland.

During each glacial advance and retreat, rivers emanating from the ice sheet deposited thick sequences of coarse-grained material. The highest-energy deposits occurred near the ice sheet and included boulders, cobbles, and sandy gravel. The lower-energy deposits were deposited at a distance from the ice sheet in broad fluvial systems and consist primarily of sands. During each advance and retreat, the ice sheet disrupted drainage systems and caused rivers to back up and form large lakes. These lake (lacustrine) sediments consist of fine sands and silts.

During the time period between glaciations, the Puget Lowland was likely much like today, with primarily low-energy deposition occurring within floodplains, sedimentation in lakes, wetlands, bogs and streams, weathering of existing soils, and occasional large lahars or other volcanic events.

The last major phase of continental glaciation that invaded western Washington is referred to as the Fraser Glaciation. It began about 20,000 years ago and ended with its retreat from the area approximately 10,000 years ago. Most of the exposed glacial deposits in the northern Puget Lowland were deposited during this period which was comprised of three phases, each known as a “Stade.”

The oldest is the Vashon Stade which occurred 20,000 to 13,000 years ago. This comprises the time when the Vashon glacier occupied the northern Puget Lowland. At its maximum the glacier extended to a point approximately 15 miles south of Olympia, Washington and reached a maximum thickness in the Bellingham area on the order of 6,000 feet. The lower mountains, such as Sumas Mountain, were totally buried by glacial ice during at least its maximum stand. A portion of the sediments deposited during the period when the glacier occupied the area was glacial till. It was deposited as a blanket over most of the area and consists of a heterogeneous mixture of clay, silt, sand, and gravel. The weight of the overriding glacier resulted in over-consolidation of the till and underlying sediments. In its unweathered state, till is a very dense soil with high strength, low permeability, a concrete-like appearance and is commonly referred to as “hardpan.” In the low-lying areas, the glacial till is generally covered by younger deposits. It is best exposed along the flanks of the foothills and in pockets and discontinuous deposits on the lower mountains.

During the waning of the glacier, corresponding to the relative rise in sea level, the Everson Interstade began approximately 13,000 years ago. The glacial ice during this period had melted appreciably and is thought to have been only a few hundred feet thick and almost entirely floating in sea water. During this interstade, three major units were deposited. From oldest to youngest these consisted of the Kulshan glaciomarine drift, the Deming sand, and the Bellingham glaciomarine drift. Both units of the glaciomarine drift consist of heterogeneous mixtures similar to the glacial till from the Vashon Stade. However, because the ice was
floating, the sediments did not receive the overriding action of the ice and are thus markedly less compact. In addition, with the influx of the sea water, marine life was re-established and the glaciomarine drift contains fossils in the form of marine shells. The Deming sand was deposited during an intervening period when the sea level dropped to within 50 feet of its present level.

The last Stade is referred to as the Sumas Stade, which began approximately 11,000 years ago and lasted for approximately 1,000 years. During this period, the terminus of the glacier moved back and forth across the US/Canadian border in the northwestern portion of Whatcom County. In the northern portion of the area in the proximity of the glacier, these deposits consist primarily of gravel grading to sand in the southern portion. The meltwater flowing southward from the glacier created numerous channels and several of the channels have been preserved.

3.1.3 Holocene Geology

During the Holocene period, the Puget Lowland has undergone little change. What modifications have occurred have been confined to wave-cut erosion along the Puget Sound shoreline; some stream incision of the drift plain, primarily along the shoreline; some infilling of the depressions and abandoned meltwater channels with recent sediments and organic accumulation; and in some instances the building of small alluvial fans into Puget Sound or onto the regional floodplain in the vicinity of the foothills.

3.2 Project Geology

Our interpretation of the geologic conditions in the vicinity of the project area is based on a review of the Geologic Map of the Bellingham 1:100,000 Quadrangle, Washington (Lapen, 2000), exploration logs for monitoring wells completed within the project area (Bennett Engineering, 2009; GeoEngineers, 2010), area water well reports (Ecology, 2012), and other consultant reports (Converse, 1976; BGC, 2005; KWL, 2008). Figure 3 presents a surficial geologic map of the project area based on Lapen (2000). Two cross-sections illustrating surface and subsurface geology relative to site topography are presented as Figures 4 and 5. The locations of the cross-sections are shown on Figure 3. The geologic contacts presented on the maps and cross-sections are generally dashed, indicating that they are approximately located based on field data or have been interpreted based on regional information.

Seven stratigraphic units were identified and delineated on the geologic map prepared for this study. The following sections describe the stratigraphic units shown on the surficial geologic map and accompanying cross-sections, from youngest to oldest.
3.2.1 Geologic Units

_Qa – Alluvium (Holocene)_

Alluvium deposits generally occur in stream channels, modern deltas, and modern floodplains and typically consist of well-sorted and stratified cobbly gravel to silt and contain varying amounts of organic material. Within the project area, alluvium is mapped in the vicinity of HMW-02 and HMW-03 on the floodplain of the Sumas River (Figure 3). Field observations and laboratory tests indicate these deposits consist of medium dense to dense, poorly graded, brown to grey, sandy silt/silty sand grading to medium to coarse sand with trace silt (Bennett Engineering, 2009). The thickness of the alluvium in the project area is not known as none of the borings fully penetrated the alluvium; however, based on regional information, thicknesses range from a few feet to more than 200 feet (Lapen, 2000).

_Qaf – Alluvial Fan Deposits (Holocene to Latest Pleistocene)_

Alluvial fan deposits flank Sumas Mountain along the major east-west drainages. Within the project area, alluvial fan deposits are mapped in the vicinity of HMW-01 and PMW-01 to PMW-04, at the mouth of the Swift Creek drainage (Figure 3). Alluvial fan deposits typically consist of poorly sorted clayey silty sandy gravel and gravelly sandy silt. Clasts are generally angular to rounded and consist of detritus derived from local sources and reworked glacial deposits. Field observations and laboratory testing indicate the alluvial fan deposits encountered in PMW-01 to PMW-04 consisted of brown, loose to medium dense sand or gravel with silt, interbedded with silty sand or silt (GeoEngineers, 2010). The alluvial fan deposits encountered in HMW-01 consisted of brown to grey, medium dense to dense, silty fine to medium sand with trace gravel (Bennett Engineering, 2009). HMW-01 was completed in the alluvium. In PMW-02 to PMW-04, the unit extended to approximately 18 to 23 feet below the ground surface (bgs); in PMW-01, which is closest to the source, silty sand representative of alluvial fan materials extended to approximately 43 feet bgs.

_Qls - Landslide Deposits (Holocene to Late Pleistocene)_

Landslide deposits generally consist of unsorted to internally coherent surficial deposits transported downslope by gravity. The Swift Creek landslide is located in the upper Swift Creek watershed in the far eastern portion of the project area (Figure 3). The teardrop-shaped landslide complex is estimated at 68 million yd³ in volume (KWL, 2008) and is comprised of a heterogeneous mixture of serpentinite, till, and conglomeratic boulders, in a sheared, weak matrix of clay, glacial till, weathered serpentinite, rock flour, and fault gouge (Converse, 1976). The milky, colloidal suspension observed in Swift Creek runoff originates from these fine-grained materials. The landslide complex delivers an estimated 120,000 yd³ of sediment per year to the creek system.
Glacial outwash of the Sumas Stade is mapped within the project area (Figure 3). These outwash deposits typically consist of loose, moderately to well-sorted gravel with local boulders, sandy gravel, minor gravelly medium to coarse sand, and rare sand to silt. Clasts are generally subrounded to rounded and derived from the Coast Plutonic Complex in British Columbia and nearby sources (Lapen, 2000). Field observations and laboratory testing indicate the Sumas glacial outwash sediments encountered in PMW-01 to PMW-04 consisted of grey, dense, fine to coarse gravel with sand and sand with gravel (GeoEngineers, 2010). Silt content generally decreased with depth. The soils graded to medium dense to dense fine sand at depths of approximately 33 to 48 feet bgs in borings PMW-02, PMW-03, and PMW-04. Explorations PMW-01 to PMW-04 were terminated in this unit. It does not appear that Sumas glacial outwash sediments were encountered in explorations HMW-01 to HMW-03 (Bennett Engineering, 2009). The thickness of the Sumas outwash in the project area is not known as none of the borings fully penetrated the unit; however, based on regional information, thicknesses range from a few feet to more than 900 feet (Lapen, 2000). As shown on the geologic cross-sections (Figures 4 and 5), it is interpreted that Everson Interstade glaciomarine drift is present beneath the Sumas glacial outwash within the project area, based on regional information (Lapen, 2000; Cox and Kahle, 1999).

Undifferentiated glacial deposits are mapped within the project area on the lower flanks of Sumas Mountain (Figure 3). The unit symbol Qgd is used where detailed field and map data are lacking and/or differing interpretations of Quaternary glacial deposits are irreconcilable (Lapen, 2000). As described by Converse (1976), glacial till is the predominant glacial deposit encountered on the flanks of Sumas Mountain. The glacial till is a light bluish grey, massive, dense, hard, very heterogeneous mixture of gravel, cobbles, and boulders in a silty to clayey matrix. In the higher bedrock areas (elevation 2,000 feet), the till occurs in sporadic, discontinuous patches less than 30 feet thick. The average thickness in the lower elevations is approximately 50 to 75 feet.

The sedimentary rocks locally known as the Huntingdon Formation are mapped in the eastern portion of the project area on the lower flanks of Sumas Mountain (Figure 3). The Huntingdon Formation consists predominantly of thickly bedded to massive moderately to well-sorted conglomerate, sandstone, siltstone, shale, and clay that is locally unsorted (Lapen, 2000). The Huntingdon Formation in the vicinity of the project area is predominantly conglomerate, which contains rounded to angular volcanic, plutonic, gneissic, chert, argillite, serpentinite, and quartz clasts. This well to poorly cemented conglomerate is interbedded with coarse- to medium-grained sandstone lenses up to 3 feet thick. The conglomerate has a depositional contact with the serpentinite in the lower half of the landslide (Converse, 1976).
pTu – Ultramafic rocks (pre-Tertiary)

Serpentinite and partially serpentinized dunite and peridotite with minor lenses of chromite are mapped in the eastern portion of the project area (Figure 3). Outcrops are common on the northern end of Sumas Mountain, and the unit is locally referred to as the Sumas Mountain serpentinite. The original rock that has been altered to serpentinite is dense, very hard, fine-grained, dark green to greenish black peridotite and dunite. South of the Swift Creek landslide mass, the rock forms prominent blocky outcrops with minor serpentine and chlorite coating joint surfaces. Around the periphery and within the Swift Creek landslide mass, the bedrock is strongly serpentinized, which implies the rock is highly weathered with complete alteration to serpentine, chlorite, and clay.

The contact between the conglomerate and serpentinite is highly weathered and intensely oxidized, containing hematite and lateritic clay. The serpentinite contains natural chrysotile asbestos and trace metals (Ni, Cr, Mn, Mg, Co) in relatively high levels (KWL, 2008).

3.3 Surface Soils

Physical and chemical weathering of bedrock, surficial glacial deposits, and recent stream deposits have resulted in the formation of various types of surface soils in the project area. Surface soils data were obtained from the Soil Survey of Whatcom County Area, Washington (USDA SCS, 1992). Individual soil units have been mapped by the SCS on orthophotoquads of the site vicinity. Figure 6 presents a surface soils map for the project area based on the SCS mapping.

The five factors typically used to define the type, characteristics, and formation of specific soils are: (1) parent material; (2) climate; (3) topography; (4) organisms (biota); and (5) time. The 26 soil units identified within the project area are summarized in Table 2. The following section briefly describes the soil mapping units identified by the SCS in the project area.

3.3.1 Soil Units

In the eastern half of the project area, on the foothills and western slopes of Mount Sumas, the SCS generally describes the surficial soils as gravelly loam, including Andic Xerochrepts, (Soil Type #3 and 4), Barneston (#6 and 7), Blethen (#18), Oakes (#112), Seahome (#139), and Squalicum (#156, 157, and 158) gravelly loams (Figure 6; Table 2). All of these soil types are very deep, well-drained soils located on outwash terraces, foothills, mountainsides, and ridges within slopes ranging between 0 and 90%. There is no zone of ground water saturation within a depth of 6 feet in the Andic Xerochrepts, Barneston, and Blethen soils. The seasonal high water table is typically encountered in the Seahome and Squalicum soils at a depth of 2 to 4 feet from December through April.
As shown on Figure 6, the active Swift Creek landslide area is mapped as Rubble land (#133) (Table 2). This SCS describes this soil unit as being formed on talus slopes at the base of rock outcrops and consists of angular stones and boulders between 30 and 100% slopes.

In the central portion of the project area, between the foothill slopes and Goodwin Road, the SCS generally identifies the native soils along the Swift Creek drainage as Kline (#90) gravelly sandy loam (Figure 6; Table 2). The Kline soil is very deep, moderately well drained, and located on alluvial fans between 2 and 8% slopes. The seasonal high water table is typically encountered at a depth of 3 to 5 feet from January through March. Adjacent to the Kline soils are Clipper (#31) and Everson (#53) silt loams (Figure 6; Table 2). The Clipper and Everson soils are very deep, somewhat poorly drained soils formed in depressions on outwash terraces and outwash plains between 0 and 2% slopes. These soils are typically artificially drained by a system of deep ditches. The seasonal high water table is typically encountered at a depth of 2 to 4 feet from November through April.

In the western portion of the project area, west of Goodwin Road, the SCS generally identifies the surficial soils along the Swift Creek and Sumas River drainages as silt loam, including Briscot (#22), Hale (#62), Kickerville (#79), Oridia (#115), Puget (#123), Snohomish (#151), and Sumas (#162) silt loams (Figure 6; Table 2). All of these soil types are very deep, poorly drained soils located on floodplains within slopes between 0 and 2%. These soils are typically artificially drained by a system of deep ditches. The seasonal high water table is typically encountered in these soils at a depth of 1 to 3 feet from November through April. Mt. Vernon fine sandy loam (#107) is also mapped in the western portion of the project area, particularly adjacent to the Sumas River (Figure 6; Table 2). The Mt. Vernon soil is very deep, moderately well drained, and located on river terraces and floodplains. The seasonal high water table is typically encountered at a depth of 2 to 4 feet from November through April. Everett complex (#51) gravelly sandy loam, Pangborn muck (#116), and Shalcar muck (#143) are also identified in relatively small areas within the project area (Figure 6; Table 2).

As shown on Figure 6, Swift Creek is predominately mapped as Riverwash (#130) (Table 2). This map unit is on river bottom land that is frequently flooded. Slopes are 0 to 2%. The seasonal high water table is at or near the surface to a depth of 2 feet throughout the year.

3.3.2 Soil Quality and Sediment Leachability Results

In 2009, the Whatcom County Health Department (WCHD) collected six soil samples (SCS-01 to SCS-06) from the stockpiles located along the bank of Swift Creek to address a concern about the potential for metals to leach from Swift Creek sediment and discharge to ground water (WCHD, 2009). In 2012, E&E collected three soil samples (SC-01, SC-02, and DM-01) for a similar potential leaching analysis (E&E, 2012a). The approximate locations of the soil samples are shown on Figure 2. Sample results are presented in Tables 3 through 5. The results presented in Table 3 were compared to regional natural background metals concentrations for the Group “W” area and the Puget Sound Region, as described in the
Natural Background Soil Metals Concentrations in Washington State, Ecology publication #94-115 (Ecology, 1994), and the Washington State Model Toxics Control Act (MTCA) Method A Soil Cleanup Levels for Unrestricted Use, as described in the Model Toxics Control Act Cleanup Regulation, Washington Administrative Code (WAC) 173-340, Ecology publication #94-06 (Ecology, 2007). The results presented in Tables 4 and 5 were compared to the Washington State MTCA Method A Cleanup Levels for Ground Water (WAC 173-340), the EPA Maximum Contaminant Levels (MCLs), Secondary MCLs, or contaminant Action Levels for drinking water, as described in the National Primary Drinking Water Regulations Title 40 CFR, Part 141 (EPA, 2010), and the Washington State primary and secondary ground water quality standards (WAC 173-200). The analytical results bolded in the tables indicate a positive detection. The highlighted results in the tables exceeded one or more established soil/ground water standards.

The practical quantitation limit (PQL) is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions. In some cases, the PQL for a parameter is greater than the established soil/ground water standards (antimony, arsenic, cadmium, selenium, and thallium), therefore all non-detect results exceed the established soil/ground water standards for the parameter. Those results are also highlighted in the tables for reference.

The sediment total metals results are presented in Table 3. Chromium concentrations exceeded the 90th percentile natural background soil metals concentrations for either the Group “W” area or the Puget Sound Region in each of the samples collected by WCHD in June 2009 (WCHD, 2009). Cadmium, chromium, iron, and nickel exceeded natural background soil metals concentrations in each of the four samples collected by E&E in July 2012, and manganese exceeded natural background concentrations in samples SC-01 and SC-02 collected by E&E in July 2012 (E&E, 2012a). All other metals tested were either not detected or were detected at concentrations below their respective MTCA cleanup standards or below the 90th percentile natural background soil metals concentrations. No pollutant metals concentrations exceeded the MTCA cleanup standards (Table 3).

The Synthetic Precipitation Leaching Procedure (SPLP) results are presented in Table 4. All SPLP metals tested were either not detected or were detected at concentrations below their respective MTCA cleanup levels, EPA MCLs or Action Levels, or State ground water quality standards, with the exception of arsenic. Arsenic exceeded water quality criteria in samples SCS-5 and SCS-6 collected by WCHD in June 2009 (Table 4).

Sediment Deionized Water Leach Metals results for samples collected by E&E in 2012 are presented in Table 5. All Deionized Water Leach metals tested were either not detected or were detected at concentrations below their respective MTCA cleanup levels, EPA MCLs or Action Levels, or State ground water quality standards (Table 5).
4.0 AFFECTED ENVIRONMENT: GROUND WATER

4.1 Ground Water Occurrence and Distribution

Water is present in the pore spaces of soils and sediment. This “ground water” is part of the continuous hydrologic cycle which, in the natural state, begins with infiltration of precipitation and runoff (termed recharge) and ends with discharge to rivers, springs, streams, and wetlands. Under natural conditions, ground water recharge and discharge may shift with climatic cycles but remain in overall balance. Withdrawal of ground water by wells diverts a part of the ground water cycle, resulting in adjustments to natural recharge, discharge, or both.

Ground water under saturated conditions flows preferentially through materials with greater porosity and permeability, such as clean gravels and sands. Where geologic conditions limit discharge, ground water accumulates in permeable zones, which, if they can support production from wells, are termed “aquifers.” The sustainability of wells, or the long-term aquifer capacity, depends both on the extent of the aquifer, its rate of recharge and natural discharge, and the amount of withdrawal by producing wells.

Our review of available information and our experience indicate that the project area is underlain by a regionally extensive unconfined to semi-confined aquifer. The regional aquifer is located within the Sumas outwash (Qgos) and recent Nooksack and Sumas River alluvium (Qa), and locally includes alluvial fan deposits (Qaf) and coarse-grained portions of undifferentiated glacial deposits (Qgd) and is herein referred to as the regional aquifer. The sediments that comprise the regional aquifer are predominantly uncompacted and permeable and allow rapid infiltration. Lenses of fine-grained sediments are commonly found throughout the aquifer resulting in complex ground water flow paths.

Other aquifers may exist at deeper intervals in the glacial/nonglacial sediments, and possibly within fractured areas of the surrounding bedrock. However, the majority of water supply wells located in the project area appear to be completed within the regional aquifer and any potential ground water quantity/quality impacts from the implementation of the DEIS alternatives would likely be most obvious in the relatively shallow regional aquifer. Therefore the following sections of this report will focus on evaluating the pertinent characteristics of the regional aquifer with respect to the DEIS alternatives.

The “Surficial Geology Map” (Figure 3), geologic cross-sections (Figures 4 and 5), and the “Water Users and Ground Water Flow Map” (Figure 7) illustrate the geology and hydrogeology beneath the site.

4.1.1 Water Users

The Ecology online well log database was reviewed to obtain available water well reports for wells located within the project area (Ecology, 2012). The wells are approximately located on
the “Water Users and Ground Water Flow Map,” Figure 7. Copies of the well logs are included in Appendix 2. A summary of well construction details is included in Table 6. Note that the limited resolution provided by the well logs typically allows water users to be located only within the nearest quarter-quarter section; however, we were able to match most of the wells to a Whatcom County tax parcel based on information reported on the well log, as well as address and ownership records on file with the Whatcom County Assessor’s office. It should be noted that most of the well logs are prepared by non-geologists and standardized geologic descriptions are not commonly utilized. Therefore, interpretations from the well logs are considered to be rough approximations and are only used to obtain a general overview of regional conditions.

As shown on Figure 7 and summarized in Table 6, 47 water wells have been identified within the project area; including 41 domestic water supply wells, 2 irrigation wells, 1 industrial water supply well, and 3 wells which had no purpose indicated on the well logs. The majority of the wells appear to be located on the alluvial fan complex emanating from the Swift Creek drainage (Figure 7). The remaining wells appear to be located on the lower flanks of Sumas Mountain or on the valley floor near the Sumas River. Only 6 of the 47 wells located within the project area appear to be located within 1,000 feet of Swift Creek.

Based on information presented on the well logs, 41 of the 47 wells appear to be completed in the regional aquifer (Table 6). The wells completed in the regional aquifer range between approximately 16 feet and 84 feet in depth. Static water levels range between roughly 1 and 58 feet bgs, corresponding to ground water elevations ranging from approximately 75 feet to 290 feet. Well yields for the regional aquifer are highly variable ranging from roughly 1 gpm to 160 gpm.

Two wells appear to be completed in bedrock (Wells #12 and 13) (Figure 7; Table 6). The bedrock wells are reported as 85 feet and 220 feet deep, respectively. Static water levels in the bedrock wells were reported at 64 feet and 120 feet bgs, corresponding to ground water elevations of approximately 60 feet and 330 feet, respectively. According to the well logs, well yields from the two bedrock wells range from roughly 1 gpm to 2.5 gpm.

Well #4 is a dry well, drilled to a depth of 141 feet and completed in clay and gravel. Well completion details for Wells #11, 27, and 42 are unknown (Figure 7; Table 6).

4.2 Regional Aquifer Characteristics

The regional aquifer serves as the primary water supply for most of the wells in the project area. The aquifer appears to be locally extensive beneath the project area and can be more than 200 feet thick but appears to generally be 80 to 100 feet thick (Figure 4 and 5). All of the ground water monitoring wells evaluated for this study appear to be completed within the regional aquifer. The aquifer is largely unconfined; however, it becomes confined in places near the Sumas River valley where it is overlain by recent lacustrine silt and clay and along the
margins of the Sumas valley where it is overlain by fine-grained ice-contact deposits (Cox and Kahle, 1999). The aquifer is underlain by the extensive fine-grained Everson glaciomarine drift (Easterbrook, 1976; Lapen, 2000). The thickness of the saturated zone is influenced by relief on less-permeable areas of the underlying glaciomarine silt and clay and by horizontal and vertical variations in permeability. The aquifer is bounded on the east by relatively impermeable bedrock (Figures 3, 4, and 5).

The depths to ground water in the regional aquifer range from generally greater than 40 feet in the eastern portion of the Swift Creek alluvial fan to less than 10 feet in the vicinity of the Sumas River. Based on measured and estimated static water levels in wells completed in the regional aquifer, ground water elevations range from greater than 140 feet above mean sea level along the eastern margin of the Swift Creek alluvial fan to less than 100 feet in the Sumas River valley. Ground water beneath the alluvial fan portion of the project area appears to flow generally to the northwest, west, and southwest, radiating away from the base of Sumas Mountain toward the Sumas River (Figure 7). The upper surface of the regional aquifer across the Swift Creek alluvial fan has an average hydraulic gradient (slope) that is approximately 0.011 (58 feet per mile). The ground water flow direction in the regional aquifer transitions to a generally north direction in the Sumas River drainage and has an average hydraulic gradient of roughly 0.001 (5 feet per mile). The observed ground water flow directions are consistent with regional ground water flow patterns which typically flow toward the Nooksack and Sumas Rivers, which are the primary areas of ground water discharge (Cox and Kahle, 1999).

4.2.1 Aquifer Recharge and Discharge

As precipitation falls on the ground surfaces, a portion will infiltrate into the soil. The infiltrated water is held in the soil as soil moisture by capillary forces. The precipitation that does not infiltrate remains on the surface, filling small depressions and eventually running downslope as overland flow. A portion of the infiltrated water is used by plants as evapotranspiration. During periods of low precipitation, such as the months of May through September, not only is all of the infiltrated precipitation lost to evapotranspiration beneath vegetated areas, but the plants actually utilize the water stored in the upper soil column creating a soil moisture deficit situation. When the soil moisture content is high, such as what would generally occur during the winter and spring months of the year, water will migrate downward and eventually recharge the regional aquifer. Recharge to the regional aquifer in the project area is interpreted to be from the vertical infiltration of excess precipitation and from the infiltration of surface water from Swift Creek. As previously discussed, during late summer and early fall months, all of the surface water flow in Swift Creek infiltrates into the alluvial fan sediments and no surface water flow reaches the Sumas River.

The mean annual precipitation in the vicinity of the project area averages around approximately 50 inches. Most of this precipitation occurs during the months of November through April (Cox and Kahle, 1999). The USGS has derived regression relationships between mean annual precipitation and ground water recharge for various areas of Washington State that incorporate...
the effects of surface hydrogeology and tree canopy characteristics (Bidlake and Payne, 2001). Applying the USGS relationship to the soils and tree canopy characteristics of the project area results in an estimated ground water recharge of approximately 25 inches to the regional aquifer with the remaining approximately 25 inches of the precipitation likely being lost as evapotranspiration by vegetation and/or surface water runoff.

Most of the ground water flow through the aquifer beneath the project area likely discharges to the Sumas and Nooksack Rivers and other associated surface water bodies. To a much lesser extent, some of the ground water flow through the regional aquifer is captured by domestic wells located in the project area (Figure 7).

4.2.2 Aquifer Parameters

Hydraulic conductivity (K) is a measure of the rate at which water can move through an aquifer and, in unconsolidated sediments, is dependent on the size, shape, and arrangement of soil particles in the aquifer (Fetter, 2001). The USGS evaluated aquifer parameters for approximately 170 wells completed within the regional aquifer (Cox and Kahle, 1999). The USGS reported that the hydraulic conductivity of the regional aquifer ranged from 6.8 to 7,800 feet per day (ft/d) with a median value of 270 ft/d.

Aquifer specific yield (storativity) is a measure of the storage potential of an unconfined aquifer and is equal to the ratio of the volume of water the aquifer will yield by gravity drainage to the volume of the aquifer (Fetter, 2001). Aquifer specific yield generally ranges between 0.02 and 0.30. Aquifer transmissivity (T) is a measure of the amount of water that can be transmitted horizontally by the full saturated thickness of the aquifer under a hydraulic gradient of 1 and is related to hydraulic conductivity by the following equation:

\[ T = Kb \]

Where:
- K = Hydraulic Conductivity (ft/d)
- T = Transmissivity (ft²/d)
- b = Aquifer thickness (ft)

Assuming an average aquifer thickness of roughly 100 feet and a hydraulic conductivity of 270 ft/d (USGS median value for regional aquifer) results in a transmissivity value of 27,000 square feet per day (ft²/d) for the regional aquifer beneath the project area.

The average linear velocity (Vx) of ground water beneath the project area can be estimated using the equation below.
\[ Vx = \frac{1}{Ne(Ki)} \]

Where:
- \( Ne \) = Aquifer effective porosity (dimensionless)
- \( K \) = Aquifer hydraulic conductivity (ft/d)
- \( i \) = Aquifer hydraulic gradient (dimensionless)

As discussed previously, the USGS estimated a medium hydraulic conductivity value of 270 ft/d. The average linear ground water flow velocity for the regional aquifer beneath the Swift Creek alluvial fan was estimated at approximately 12 ft/d based on a hydraulic conductivity of 270 ft/d, a hydraulic gradient of 0.011, and an average effective porosity of 0.25.

### 4.3 Ground Water Quality

Ground water monitoring wells HMW-01, HMW-02, and HMW-03 have been sampled five times since April 2009 by Bennett Engineering, E&E, and AESI and monitoring wells PMW-01 to PMW-04 have been sampled three times since July 2012 by E&E and AESI (Bennett Engineering, 2009; E&E, 2012a). E&E also obtained ground water quality samples from three domestic wells (DW-01, DW-02, and DW-03) in July 2012. The water quality samples obtained from the wells during the sampling events were submitted to qualified analytical laboratories for analyses of the total and dissolved TAL metals. Water quality samples obtained from the monitoring wells were also submitted for analyses of asbestos fibers.

The water quality results from each of these sampling events have been compiled in Tables 7 through 16. The results presented in the tables were compared to the Washington State ground water quality standards presented in the Water Quality Standards for Ground Waters of the State of Washington (WAC 173-200) and the Washington State drinking water standards listed under Group A Public Water Systems (WAC 249-290). The bolded analytical results in the tables indicate a positive detection. The highlighted results in the tables exceeded one or more water quality standards. In some cases, the PQL for a parameter is greater than the established water quality standard (antimony, arsenic, selenium, and thallium), therefore all non-detect results exceed the water quality standard for the parameter. Those results are also highlighted in the tables for reference.

A summary/discussion of the water quality results is presented in the following sections of this report. Laboratory analytical data sheets from AESI’s October 2012 sampling event are provided in Appendix 3.
4.3.1 AESI Ground Water Sampling

As previously discussed, on October 17, 2012, AESI collected ground water samples from monitoring wells HMW-01 to HMW-03 and PMW-01 to PMW-04 to evaluate ground water conditions in the regional aquifer. The ground water sampling methodology followed the SSSP prepared by AESI, which was intended to generally replicate the sampling methodologies employed by E&E during their prior sampling events. Field parameters were measured at the time of sampling and the water samples were submitted to Edge Analytical and EMSL Analytical for chemical analysis of total and dissolved metals and asbestos. The following sections describe the laboratory quality control results and ground water quality results from AESI’s October sampling event.

Laboratory Quality Control Results

Edge Analytical attached quality control results to the total and dissolved metals analytical data for the October sampling event. The quality control program conducted by Edge Analytical included analysis of the following samples:

- Laboratory Fortified Blank (LFB) and Laboratory Reagent Blank (LRB)
- Method Blank (MB)
- Quality Control Sample (QCS)
- Duplicate (Dup), Matrix Spike (MS), and Matrix Spike Duplicate (MSD)

The Edge Analytical laboratory indicated that all samples were received intact, with no discrepancies in the paperwork. All samples were analyzed within appropriate hold times and the quality control data were within laboratory acceptance limits.

Laboratory documentation attached to the asbestos sample results provided by EMSL Analytical indicated that sample HMW-02 was damaged in transit to the laboratory and did not contain a sufficient volume of sample for analyses. Samples PMW-01 and PMW-02 were ozonated prior to analysis due to lab receipt time exceeding the 48-hour method hold time, and due to excessive particulate in the sample, the analytical sensitivity of 0.2 million fibers per liter (MFL) for fibers greater than 10 micrometers (µm) in length, as required by the method, was not reached in samples PMW-02, PMW-04, HMW-01, HMW-03, and the field duplicate.

Monitoring Well HMW-01

Total and dissolved TAL metals and asbestos were either not detected or detected at concentrations less than applicable regulatory levels in the water sample obtained from HMW-01 by AESI (Table 7).
Monitoring Well HMW-02

Total and dissolved TAL metals were either not detected or detected at concentrations less than applicable regulatory levels in the water sample obtained from HMW-02 by AESI, with the exception of total/dissolved arsenic, iron, and manganese. The sample obtained from HMW-02 by AESI was not analyzed for asbestos because the sample was damaged during transit to the laboratory (Table 8).

Monitoring Well HMW-03

Total and dissolved TAL metals and asbestos were either not detected or detected at concentrations less than applicable regulatory levels in the water sample obtained from HMW-03 by AESI, with the exception of total/dissolved arsenic, iron, and manganese (Table 9).

Monitoring Well PMW-01

Total and dissolved TAL metals and asbestos were either not detected or detected at concentrations less than applicable regulatory levels in the water sample obtained from PMW-01 by AESI (Table 10).

Monitoring Well PMW-02

Total and dissolved TAL metals and asbestos were either not detected or detected at concentrations less than applicable regulatory levels in the water sample obtained from PMW-02 by AESI (Table 11).

Monitoring Well PMW-03

Total and dissolved TAL metals and asbestos were either not detected or detected at concentrations less than applicable regulatory levels in the water sample obtained from PMW-03 by AESI (Table 12).

Monitoring Well PMW-04

Total and dissolved TAL metals and asbestos were either not detected or detected at concentrations less than applicable regulatory levels in the water sample obtained from PMW-04 by AESI, with the exception of total iron (Table 13).

4.3.2 E&E and Bennett Engineering Ground Water Sampling

Bennett Engineering obtained ground water samples from HMW-01, HMW-02, and HMW-03 in April and June 2009 for target metals and asbestos (Tables 7, 8, and 9) (Bennett
Engineering, 2009). E&E obtained ground water samples in July 2012 from seven ground water monitoring wells (HMW-01, HMW-02, HMW-03, PMW-01, PMW-02, PMW-03, and PMW-04) and three domestic wells (DW-01, DW-02, and DW-03) for analyses of various targeted metals (Tables 7 through 16) (E&E, 2012a). Water samples from the monitoring wells were also submitted to an analytical laboratory for analyses of asbestos fibers. E&E returned to the project area in October 2012 and obtained water samples from the seven monitoring wells for selected metals and asbestos fibers. The following is a summary of ground water quality results from the Bennett Engineering and E&E sampling events.

**Monitoring Well HMW-01**

Total and dissolved TAL metals and asbestos were either not detected or detected at concentrations less than applicable regulatory levels in the water samples obtained from HMW-01 by E&E and Bennett Engineering (Table 7).

**Monitoring Well HMW-02**

Total and dissolved TAL metals and asbestos were either not detected or detected at concentrations less than applicable regulatory levels in the water samples obtained from HMW-02 by E&E and Bennett Engineering, with the exception of total/dissolved arsenic, iron, and manganese (Table 8).

**Monitoring Well HMW-03**

Total and dissolved TAL metals and asbestos were either not detected or detected at concentrations less than applicable regulatory levels in the water samples obtained from HMW-03 by E&E and Bennett Engineering, with the exception of total/dissolved arsenic, iron, and manganese (Table 9).

**Monitoring Well PMW-01**

Total and dissolved TAL metals were either not detected or detected at concentrations less than applicable regulatory levels in the water samples obtained from PMW-01 by E&E with the exception of total aluminum, iron, manganese, and nickel (Table 10). Asbestos was also detected at a level greater than the applicable regulatory standard in the water sample obtained from PMW-01 by E&E in July 2012 (Table 10). It should be noted that asbestos and total aluminum, iron, manganese, and nickel were only detected at elevated concentrations in the water sample obtained from PMW-01 in July 2012 by E&E. The concentrations of asbestos and these metals were all less than regulatory standards in the following samples obtained from PMW-01 by E&E and AESI in October 2012, after the well was further developed and care was taken to collect water samples with relatively low turbidity levels (Table 10).
Monitoring Well PMW-02

Total and dissolved TAL metals and asbestos were either not detected or detected at concentrations less than applicable regulatory levels in the water samples obtained from PMW-02 by E&E with the exception of total aluminum, iron, and manganese (Table 11). It should be noted that total aluminum, iron, and manganese were only detected at elevated concentrations in the water sample obtained from PMW-02 by E&E in July 2012. The concentrations of these metals were all less than regulatory standards in the following samples obtained from PMW-02 by E&E and AESI in October 2012, after the well was further developed and care was taken to collect water samples with relatively low turbidity levels (Table 11).

Monitoring Well PMW-03

Total and dissolved TAL metal and asbestos were also either not detected or detected at concentrations less than applicable regulatory levels in the water samples obtained from PMW-03 by E&E with the exceptions of total aluminum, iron, and manganese (Table 12). It should be noted that total aluminum, iron, and manganese were only detected at elevated concentrations in the water samples obtained from PMW-03 by E&E in July 2012. Only total iron exceed the secondary MCL in the sample obtained by E&E in October 2012, after PMW-03 was further developed and care was taken to collect water samples with relatively low turbidity levels (Table 12).

Monitoring Well PMW-04

Total and dissolved TAL metals were either not detected or detected at concentrations less than applicable regulatory levels in the water samples obtained from PMW-04 by E&E with the exception of total aluminum and iron (Table 13). Asbestos was also detected at a level greater than the applicable regulatory standard in the water sample obtained from PMW-04 by E&E in July 2012 (Table 13). It should be noted that asbestos, total aluminum, and total iron were only detected at elevated concentrations in the water sample obtained from PMW-04 by E&E in July 2012. Only total iron exceeded the secondary MCL in the sample obtained from PMW-04 by AESI in October 2012, after PMW-04 was further developed and care was taken to collect water samples with relatively low turbidity (Table 13).

Domestic Well DW-01

Total and dissolved TAL metals were either not detected or detected at concentrations less than applicable regulatory levels in the water sample obtained from DW-01 by E&E in July 2012 (Table 14).
Domestic Well DW-02

Total and dissolved TAL metals were either not detected or detected at concentrations less than applicable regulatory levels in the water sample obtained from DW-02 by E&E in July 2012, with the exception of total/dissolved manganese (Table 15).

Domestic Well DW-03

Total and dissolved TAL metals were either not detected or detected at concentrations less than applicable regulatory levels in the water sample obtained from DW-03 by E&E in July 2012 (Table 16).

4.3.3 Water Quality Discussion

Monitoring wells HMW-01, PMW-01, PMW-02, PMW-03, and PMW-04 and domestic wells DW-01 and DW-02 are completed on the alluvial fan complex (Figure 2). Total and dissolved metals and asbestos were either not detected or detected at concentrations less than applicable regulatory levels in all of the samples obtained from HMW-01 and DW-01 (Tables 7 and 14). In the water samples obtained from monitoring wells PMW-01 through PMW-04 and domestic well DW-02 by E&E in July 2012, total and dissolved metals and asbestos were either not detected or detected at concentrations less than applicable regulatory levels, with a few exceptions, including total aluminum and iron (PMW-01 through PMW-04), total manganese (PMW-01 through PMW-03 and DW-02), dissolved manganese (DW-02), and total nickel (PMW-01) in the samples collected by E&E in July 2012 (Tables 7 through 16). Asbestos was also detected at a level greater than the applicable regulatory standard in the water samples obtained from PMW-01 and PMW-04 by E&E in July 2012.

In October 2012, E&E and AESI further developed and resampled monitoring wells PMW-01 through PMW-04 and care was taken to collect water samples with relatively low turbidity levels. Resampling results for water samples obtained from monitoring wells PMW-01 through PMW-04 by E&E and AESI in October 2012, after the wells were further developed, indicate that the concentrations of asbestos and total and dissolved metals were all less than regulatory standards, with the exception of total iron (PMW-03 and PMW-04) (Tables 10 through 13). Based on the resampling results, it appears that the ground water samples collected from monitoring wells PMW-01 through PMW-04 by E&E in July 2012 had elevated turbidity values because the wells had not been sufficiently developed prior to sampling, which resulted in anomalously high concentrations of asbestos and certain total metals in the July 2012 samples. Ground water samples collected from monitoring wells PMW-01 through PMW-04 by E&E and AESI in October 2012, after further development of the wells, and samples collected from HMW-01 and DW-01 are likely representative of actual ground water conditions beneath the alluvial fan complex.
Monitoring wells HMW-02 and HMW-03, and domestic well DW-03 are located in the western portion of the project area, within the Sumas River valley (Figure 2). Total and dissolved metals and asbestos were either not detected or detected at concentrations less than applicable regulatory levels in these wells, with the exception of total aluminum, total/dissolved arsenic, total/dissolved iron, and total/dissolved manganese in HMW-02 and HMW-03. However, HMW-03 is located upgradient of the Swift Creek alluvial fan complex and is considered to be representative of background ground water conditions, which suggests that these metals may be naturally elevated in the regional aquifer beneath the project area (Tables 8 and 9).
5.0 ENVIRONMENTAL IMPACTS: GROUND WATER

5.1 General

The evaluations included in this report are focused primarily on potential significant impacts to ground water quality and quantity in the regional aquifer that underlies the project area resulting from the non-project actions and the project actions, specifically the construction of sediment basins on the Swift Creek alluvial fan. The identified potential significant impacts to ground water quality/quantity included:

1. Ground water quality impacts due to the leaching of contaminants from the stockpiles of Swift Creek dredge sediments located in the project area.

2. Potential ground water transport of asbestos fibers.

3. Ground water quality impacts from the natural and/or induced infiltration of Swift Creek surface water into the alluvial fan.

4. Increased ground water levels due to induced infiltration of Swift Creek flow through the proposed sediment basins.

As previously discussed, the ground water quality samples collected by E&E from monitoring wells PMW-01 through PMW-04 in July 2012 appear to have had elevated turbidity values because the wells were not sufficiently developed prior to sampling. Elevated turbidity is generally indicative of increased sediment in the sample and can have a significant impact on general water quality results, specifically total metals and asbestos. The potential impact of elevated turbidity was significantly reduced when the wells were further developed in October 2012 by both E&E and AESI prior to their respective sampling events. Based on the water chemistry results for all of the ground water samples collected in the project area, it appears that the elevated turbidity levels in the July 2012 samples significantly compromised the total metals and asbestos results for PMW-01 through PMW-04 (Tables 7 through 10). Therefore, the analyses and conclusions presented in the following sections of this report are generally based on the uncompromised chemical analytical results obtained from the monitoring and domestic wells during the numerous sampling events discussed in this report.

5.2 Non-Project Actions Potential Impacts

The identified non-project related actions range from essentially no action to the adoption of plans, policies, programs, or regulations that contain standards for controlling the use of the environment and provide umbrella strategies to manage sediment-related issues in the Swift Creek watershed. The non-project actions do not include the removal or disturbance of the historically accumulated sediment in the project area, an alteration to the historic and current depositional patterns of sediment on the alluvial fan, and/or a change to ground water recharge.
in the project area. Therefore, there are no potential ground water quantity impacts associated with the various non-project actions and the potential ground water quality impacts can be evaluated directly based on the information available regarding current existing conditions, as discussed in the following section of this report.

5.2.1 Soil Leaching Potential

The soil stockpile testing results indicate that the sediments currently being deposited by Swift Creek contain concentrations of cadmium, chromium, iron, manganese, and nickel that exceed the 90th percentile natural background soil metals concentrations for either the Group “W” area or the Puget Sound Region. All other metals tested were either not detected or were detected at concentrations below their respective MTCA cleanup standards or below the 90th percentile natural background soil metals concentrations (Table 3).

The soil leachability test results reviewed for this project indicated that only arsenic has the potential to leach from the sediments at significant concentrations. All other metals tested were either not detected or were detected at concentrations below their respective MTCA cleanup levels, EPA MCLs or Action Levels, or State ground water quality standards (Tables 4 and 5). Arsenic was not detected in the soil stockpile samples at concentrations greater than natural background levels. Therefore, the potential for the Swift Creek sediments to leach arsenic into the ground water system at concentrations capable of affecting water quality is the same as other natural background conditions in the Puget Sound Region.

5.2.2 Total and Dissolved Metals Ground Water Chemistry

Five of the ground water monitoring wells (PMW-01, PMW-02, PMW-03, PMW-04, and HMW-01) and two of the domestic wells (DW-01 and DW-02) are located on the Swift Creek alluvial fan complex (Figure 2). These seven wells appear to be completed within geologic units that consist of relatively recent alluvial fan sediments and older glacial deposits. Six of these wells are located within 1,000 feet of the active channel of Swift Creek and DW-02 is located on the western margin of the alluvial fan complex, roughly 2,000 feet north of Swift Creek. As previously discussed, total and dissolved metals were either not detected or were detected at concentrations less than applicable ground water and drinking water standards in these wells, with only a few exceptions. The water quality exceptions include total iron in PMW-03 and PMW-04, and total and dissolved manganese in DW-02 (Tables 12, 13, and 15).

Ground water monitoring wells HMW-02 and HMW-03, and domestic well DW-03 are located in the western portion of the project area, within the Sumas River valley (Figure 2). These wells appear to be completed within relatively recent river alluvial deposits. Total and dissolved metals were either not detected or were detected at concentrations less than applicable ground water and drinking water standards in these wells, with the exception of iron and manganese in the two ground water monitoring wells. Total and dissolved arsenic was also detected in the ground water samples obtained from the two monitoring wells at
concentrations that exceeded the ground water quality standard but not the drinking water standard (Tables 8 and 9). HMW-03 is located hydraulically upgradient of the alluvial fan complex (Figure 2 and 7). Water quality in HMW-03 is likely representative of natural background conditions in the Sumas River valley and is likely not being influenced by the processes that historically have and currently are occurring on the Swift Creek alluvial fan.

Iron and manganese are naturally occurring ground water contaminants that commonly exceed the drinking water secondary MCL in ground water located in Whatcom County and the Puget Sound Region. Arsenic is also a naturally occurring ground water contaminant that is commonly detected in ground water at concentrations similar to those detected in HMW-02 and HMW-03. It should be noted that the concentrations of arsenic detected in HMW-02 and HMW-03 are less than the State of Washington primary drinking water standard (Tables 8 and 9), and as previously discussed, HMW-03 is located upgradient of the Swift Creek alluvial fan complex and is considered to be representative of background conditions. The relatively low levels of iron, manganese, and arsenic detected in the ground water monitoring and domestic wells discussed in this report are likely representative of natural background water quality conditions in the project area. The slight increase in the concentrations of total and dissolved arsenic, iron, and manganese detected in HMW-02, HMW-03, and DW-02 relative to the other wells is likely a natural ground water chemistry response to a change in local geology from one dominated by glacial and alluvial fan sediments to one more dominated by organic-rich river alluvium associated with the Sumas and Nooksack Rivers.

5.2.3 Ground Water Asbestos Transport

Monitoring wells HMW-01, HMW-02, and HMW-03 have been sampled five times since April 2009 for asbestos fibers. Monitoring wells PMW-01, PMW-03, and PMW-04 have been sampled three times and PMW-02 has been sampled twice for asbestos since July 2012. Five of the ground water monitoring wells (PMW-01 through PMW-04, and HMW-01) are located within a few hundred feet of the active channel of Swift Creek and are completed within the alluvial fan sediments. One ground water monitoring well (HMW-02) is located immediately downgradient of the Swift Creek sediment stockpiles and adjacent to Swift Creek. These six monitoring wells are located in excellent positions to monitor the potential transport of asbestos fibers by ground water beneath the alluvial fan complex. Asbestos fibers greater than 10 \( \mu \text{m} \) in length have not been detected in any of the water samples collected from ground water monitoring wells at concentrations greater than the drinking water standard of 7 MFL with the exception of the compromised water samples collected from PMW-01 and PMW-04 by E&E on July 19, 2012 (Tables 7 through 13).

In October 2012, PMW-01 and PMW-04 were re-sampled by both E&E and AESI after the wells were further developed. During the October 2012 sampling events, care was taken to collect low-turbidity (<15 nephelometric turbidity units [NTU]) water samples from the wells. Asbestos fibers were not detected in the samples collected from these wells in October 2012 at concentrations greater than the drinking water standard (Tables 10 and 13).
Ground water velocities as low as approximately 23,000 ft/d can keep 0.1 to 0.5 µm size particles in suspension (Newport, 1974). As previously discussed, ground water flow velocities in the project area are likely in the range of roughly 12 ft/d, which is significantly less than the velocities required to suspend and transport asbestos fibers with a length greater than 10 µm and transport the fibers through a sand and gravel medium typical of the Swift Creek alluvial fan deposits.

The water quality analytical data and the analyses provided above indicate that it is unlikely that asbestos is being actively transported by ground water at concentrations that are greater than applicable regulatory standards in the project area. It appears that the relatively low concentrations of asbestos fibers that have been detected in the monitoring wells are from asbestos-containing sediments located around the monitoring well screens that are disturbed and temporarily mobilized during sampling.

5.2.4 Summary of Potential Ground Water Quantity Impacts

The ground water quality and sediment leaching data reviewed does not indicate that either infiltrating surface water, ground water transport of asbestos, or recent leaching from sediments associated with the Swift Creek landslide complex is significantly affecting ground water quality in the project area. Therefore, because the proposed non-project actions will not significantly affect the historic or on-going physical processes in the project area, the proposed non-project options will not result in a significant impact to ground water quality or quantity in the project area.

5.3 Project Action Potential Impacts

The project option that has the potential to impact ground water quality and quantity in the project area is the construction of the sediment basins. Preliminary design drawings indicate that there will be at least two sediment basins located on the alluvial fan complex that will cover an area approximately 2,400 feet long and 1,200 feet wide (PSE, 2011). The preliminary project plans indicate that Swift Creek will be routed into the basins to where most of the sediment load will settle out and be deposited. Current ground water information and preliminary design data indicates that the regional aquifer will be located at depths ranging between roughly 15 and 50 feet beneath the proposed sediment basins.

Initially, it is likely that the stream will completely infiltrate into the relatively permeable near-surface sediments during most of the year and provide recharge to the underlying aquifer. However, over time it is assumed that the deposition of fine-grained sediments in the basins will seal off much of the infiltration area and the stream will ultimately flow out of the basins and after a short distance into the Sumas River in a manner similar to what is currently occurring in the project area. Therefore, a potential result of the construction and operation of the sediment basins will be at least a temporary increase in the volume of Swift Creek surface water infiltrating into the ground and providing recharge to the underlying aquifer.
5.3.1 Potential Ground Water Quality Impacts

The surface water flow observational and geologic/hydrogeologic data indicates Swift Creek becomes a losing stream as it flows across the alluvial fan complex and into the Sumas River valley. A losing stream is a watercourse that has a permeable reach through which surface water can be transmitted to ground water (Poehls and Smith, 2009). The surface water flow in Swift Creek completely infiltrates into the relatively permeable alluvial fan sediments during the late summer and early fall months of the year prior to reaching the Sumas River. Furthermore, this natural infiltration of high volumes of Swift Creek water that has been affected by the Swift Creek slide has been occurring since the slide occurred in the early 1900s.

Three ground water monitoring wells (HMW-01, HMW-02, and PMW-03) are located immediately adjacent to the active Swift Creek channel and are well located to monitor water quality impacts from the infiltration of the Swift Creek (Figure 2). As discussed in Section 5.2.4, “Summary of Potential Ground Water Quantity Impacts,” the extensive ground water quality data reviewed for this project does not indicate that the infiltration of surface water from Swift Creek over the past roughly 70 years has significantly affected ground water quality in the project area. Therefore, it is unlikely the anticipated temporary increase in the infiltration of surface water from the stream resulting from the construction and operation of the sediment basins will have a significant effect on ground water quality in the project area.

5.3.2 Potential Ground Water Quantity Impacts

It is possible that the infiltration of Swift Creek into a concentrated area like the proposed sediment basins will result in a mounding of ground water levels. A substantial ground water mound could affect the operation of the basins and impact slopes located near the basins. The size and extent of the ground water mound would depend specifically upon the volume and timing of water infiltrated; the size and configuration of the basins; the infiltration capacity of the soils exposed at the bottom of the basins; the depth to ground water beneath the basins; and the hydraulic conductivity and gradient of the aquifer that underlies the alluvial fan.

Although some of the required data is available or can be reasonably estimated to complete a preliminary evaluation, other critical data such as the volume and timing of the flows in Swift Creek and the infiltration capacity of the basin soils are not currently available. We recommend that a detailed ground water mounding analysis of the sediment basins be completed when all the data is available and when the final location and design of the basins is being completed.
6.0 LIMITATIONS

We have prepared this report for the Wheeler Consulting Group and Whatcom County in support of a Draft Environmental Impact Statement regarding the potential implementation of the Swift Creek Sediment Management Action Plan. The information presented in the report is based on the above-described research, field activities, and limited reconnaissance. Subsurface soil and aquifer characteristics at different locations at the site may vary.

Within the limitations of scope, schedule, and budget, AESI attempted to execute these services in accordance with generally accepted professional principles in the fields of geology and hydrogeology at the time this report was prepared. No warranty, express or implied, is made.

We have enjoyed working with you on this project and are confident that this report will aid in the preparation of the DEIS. If you should have any questions or require further assistance, please do not hesitate to call.

Sincerely,
ASSOCIATED EARTH SCIENCES, INC.
Everett, Washington

Bridget A. August, L.G.
Project Geologist

Charles S. Lindsay, L.G., L.E.G., L.Hg.
Senior Principal Geologist/Hydrogeologist
7.0 REFERENCES

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Whatcom County Public Works Department, 2012a, Swift Creek sediment management action plan: Draft 2012.

Whatcom County Public Works Department, 2012b, Swift Creek sediment management action plan (SCSMAP), phase 1 implementation plan: Draft, December 2012.
FIGURE 1

DATE 12/12

PROJ. NO. EH110253A

FEET

1500 3000

VICINITY MAP

SWIFT CREEK EIS

WHATCOM COUNTY, WASHINGTON

NOTE: BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION.
LEGEND

Qa - Alluvium
Qaf - Alluvial Fan Deposits
Qls - Landslide Deposits
Qgos - Glacial Outwash - Sumas Stade
Qgd - Glacial Deposits - Undifferentiated
Ech - Huntingdon Formation
pTu - Ultramafic Rocks (Sumas Mountain Serpentinite)

REFERENCE: USGS, LAPEN 2000

SURFICIAL GEOLOGY MAP
SWIFT CREEK EIS
WHATCOM COUNTY, WASHINGTON

NOTE: BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION.

SOILS MAP
SWIFT CREEK EIS
WHATCOM COUNTY, WASHINGTON

NOTE: BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION.
REFERENCE: USGS, WHATCOM COUNTY WATER USERS AND GROUND WATER FLOW MAP

NOTE: BLACK AND WHITE REPRODUCTION OF THIS COLOR ORIGINAL MAY REDUCE ITS EFFECTIVENESS AND LEAD TO INCORRECT INTERPRETATION.

WATER USERS AND GROUND WATER FLOW MAP
SWIFT CREEK EIS
WHATCOM COUNTY, WASHINGTON
Table 1 - Monitoring Well Summary

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<thead>
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<th>EPA</th>
<th>Ecology</th>
<th>Element Solutions</th>
<th>Bennett Engineering</th>
<th>GeoEngineers</th>
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<th>Longitude</th>
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Latitude and Longitude from E&E data tables dated November 8, 2012
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<th>Runoff Rate</th>
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<td>Medium</td>
<td>Severe</td>
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<td>Barneston very gravelly loam</td>
<td>Loess and volcanic ash over glacial outwash</td>
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<td>Everett complex</td>
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<td>Slight</td>
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<tr>
<td>115</td>
<td>Oridia silt loam, drained</td>
<td>Alluvium on flood plains; artificially drained</td>
<td>0-2</td>
<td>Moderate</td>
<td>Very slow</td>
<td>None</td>
</tr>
<tr>
<td>116</td>
<td>Pangborn muck, drained</td>
<td>Herbaceous and woody organic deposits; artificially drained</td>
<td>0-2</td>
<td>Moderate</td>
<td>Very slow</td>
<td>None</td>
</tr>
<tr>
<td>123</td>
<td>Puget silt loam, drained</td>
<td>Alluvium on flood plains; artificially drained</td>
<td>0-2</td>
<td>Moderately slow</td>
<td>Very slow</td>
<td>None</td>
</tr>
<tr>
<td>130</td>
<td>Riverwash</td>
<td>Riverbottom land that is frequently flooded</td>
<td>0-2</td>
<td>Very rapid</td>
<td>Very slow</td>
<td>Severe</td>
</tr>
<tr>
<td>133</td>
<td>Rubble land</td>
<td>Talus slopes at the base of rock outcrops</td>
<td>30-100</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
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<tr>
<td>139</td>
<td>Sehome loam</td>
<td>Volcanic ash and loess over glacial till</td>
<td>2-8</td>
<td>Moderate to very slow</td>
<td>Slow</td>
<td>Slight</td>
</tr>
<tr>
<td>143</td>
<td>Shalcar mulch, drained</td>
<td>Herbaceous and woody organic deposits overlying alluvium and glaciofluvial deposits; artificially drained</td>
<td>0-2</td>
<td>Moderate to very rapid</td>
<td>Very slow</td>
<td>None</td>
</tr>
<tr>
<td>151</td>
<td>Snohomish silt loam, drained</td>
<td>Alluvium underlain by organic material; artificially drained</td>
<td>0-2</td>
<td>Moderately slow</td>
<td>Very slow</td>
<td>None</td>
</tr>
<tr>
<td>156</td>
<td>Squalicum gravelly loam</td>
<td>Volcanic ash, loess, and slope alluvium over glacial till</td>
<td>5-15</td>
<td>Moderate to very slow</td>
<td>Slow</td>
<td>Slight</td>
</tr>
<tr>
<td>157</td>
<td>Squalicum gravelly loam</td>
<td>Volcanic ash, loess, and slope alluvium over glacial till</td>
<td>15-30</td>
<td>Moderate to very slow</td>
<td>Slow</td>
<td>Slight</td>
</tr>
<tr>
<td>158</td>
<td>Squalicum gravelly loam</td>
<td>Volcanic ash, loess, and slope alluvium over glacial till</td>
<td>30-60</td>
<td>Moderate to very slow</td>
<td>Medium</td>
<td>Moderate</td>
</tr>
<tr>
<td>162</td>
<td>Sumas silt loam, drained</td>
<td>Recent alluvium on flood plains; artificially drained</td>
<td>0-2</td>
<td>Moderately slow</td>
<td>Very slow</td>
<td>None</td>
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</table>

(1) SCS = USDA Soil Conservation Service.
NA = Not applicable.
Refer to Figure 6 for soils map.
# Table 3 - Sediment Total Metals Results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>MTCA Cleanup Level</th>
<th>Group 'W' Region</th>
<th>Puget Sound Region</th>
<th>Whatcom County Health Department</th>
<th>E&amp;E</th>
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<tr>
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<td>SCS-1</td>
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<td>SCS-3</td>
<td>SCS-4</td>
<td>SCS-5</td>
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<tr>
<td>Date</td>
<td>6/16/2009</td>
<td>7/18/2012</td>
<td>599 UJ</td>
<td>3,410 UJ</td>
<td>4,010 UJ</td>
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<tr>
<td>Total Metals (mg/Kg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td>--</td>
<td>62,905</td>
<td>32,581</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antimony</td>
<td>--</td>
<td>8.47</td>
<td>7.30</td>
<td>1.10 U</td>
<td>1.00 U</td>
</tr>
<tr>
<td>Arsenic</td>
<td>20</td>
<td>0.75</td>
<td>0.61</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Barium</td>
<td>--</td>
<td>0.10</td>
<td>0.77</td>
<td>1.10 U</td>
<td>1.00 U</td>
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<tr>
<td>Beryllium</td>
<td>--</td>
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<td>Calcium</td>
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<td>Chromium</td>
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<td>Lead</td>
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<td>0.07</td>
<td>0.01</td>
<td>0.01</td>
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<td>Potassium</td>
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<td>2</td>
<td>0.13</td>
<td>0.07</td>
<td>0.01</td>
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<tr>
<td>Selenium</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1.10 U</td>
<td>1.00 U</td>
</tr>
<tr>
<td>Silver</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1.10 U</td>
<td>1.00 U</td>
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<tr>
<td>Sodium</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1.10 U</td>
<td>1.00 U</td>
</tr>
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<td>Thallium</td>
<td>--</td>
<td>--</td>
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<td>--</td>
<td>--</td>
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<tr>
<td>Vanadium</td>
<td>--</td>
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<td>--</td>
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</tr>
<tr>
<td>Zinc</td>
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<td>85.56</td>
<td>85.06</td>
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</table>

**Notes:**

(1) = MTCA Method A Soil Clean Up Levels for Unrestricted Use (mg/Kg) (Ecology, 2007)

(2) = Washington State 90th percentile values for Group "W" area and Puget Sound Region background soil metals concentrations (mg/Kg) (Ecology, 1994)

(3) = Field duplicate sample

mg/Kg = Milligrams per Kilogram

-- = No water quality standard and/or parameter not measured

U = The analyte was analyzed for, but was not detected above the reported sample practical quantitation limit (PQL)

Shading indicates that the sample PQL is above the applicable water quality standard (i.e. arsenic)

JK = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias (E&E, 2012a)

UJL = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate with a low bias and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample (E&E, 2012a)

A BOLD result indicates a positive detection

A highlighted result indicates the parameter exceeded the applicable water quality standards
### Table 4 - Sediment SPLP Metals Results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Water Quality Standards</th>
<th>Whatcom County</th>
<th>E&amp;E</th>
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<tbody>
<tr>
<td></td>
<td>MTCA Cleanup Level²</td>
<td>EPA MCL or Action Level³</td>
<td>GW Standard WAC 173-200⁴</td>
</tr>
<tr>
<td>Sample Name</td>
<td></td>
<td></td>
<td>6/16/2009</td>
</tr>
<tr>
<td>Aluminum</td>
<td>--</td>
<td>0.006</td>
<td>0.0005</td>
</tr>
<tr>
<td>Antimony</td>
<td>0.005</td>
<td>0.010</td>
<td>0.010 U</td>
</tr>
<tr>
<td>Arsenic</td>
<td>0.005</td>
<td>0.010</td>
<td>0.0005</td>
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<tr>
<td>Barium</td>
<td>2</td>
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<tr>
<td>Beryllium</td>
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<td>0.004</td>
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<tr>
<td>Cadmium</td>
<td>0.005</td>
<td>0.005</td>
<td>0.01</td>
</tr>
<tr>
<td>Calcium</td>
<td>--</td>
<td>--</td>
<td>2</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.050</td>
<td>0.10</td>
<td>0.05</td>
</tr>
<tr>
<td>Cobalt</td>
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<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Copper</td>
<td>--</td>
<td>1.3 AL</td>
<td>1.0</td>
</tr>
<tr>
<td>Iron</td>
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<tr>
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<td>0.015 AL</td>
<td>0.05</td>
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<td>0.002</td>
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<td>Selenium</td>
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<tr>
<td>Zinc</td>
<td>--</td>
<td>5.0</td>
<td>--</td>
</tr>
</tbody>
</table>

**Notes:**

1. = Synthetic Precipitation Leaching Procedure
2. = MTCA Method A Clean Up Levels for Ground Water (mg/L) (Ecology 2007)
3. = EPA Drinking Water Maximum Contaminant Levels (MCL), Secondary MCLs, and Action Levels (AL) (EPA, 2010)
4. = Primary or Secondary Ground Water Quality Standard per Washinton Administrative Code (WAC) 173-200
5. = Field duplicate sample

---

**Parameters:**

- **SPLP Metals (mg/L):**
  - Aluminum
  - Antimony
  - Arsenic
  - Barium
  - Beryllium
  - Cadmium
  - Calcium
  - Chromium
  - Cobalt
  - Copper
  - Iron
  - Lead
  - Magnesium
  - Manganese
  - Mercury
  - Nickel
  - Potassium
  - Selenium
  - Silver
  - Sodium
  - Thallium
  - Vanadium
  - Zinc

**Water Quality Standards:**

- **MTCA Cleanup Level²**
- **EPA MCL or Action Level³**
- **GW Standard WAC 173-200⁴**

**Whatcom County Standards:**

- **SC-1**
- **SC-2**
- **SC-3**
- **SC-4**
- **SC-5**
- **SC-6**
- **SC-06⑤**

**E&E Standards:**

- **SC-01**
- **SC-02**
- **DM-01**
- **DM-01①**

---

**Notes:**

- **U:** The analyte was not detected above the reported sample practical quantitation limit (PQL).
- **UJL:** The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate with a low bias and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample (E&E, 2012).
- **R:** The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified (E&E, 2012).
- **A BOLD result indicates a positive detection.**
- **A highlighted result indicates the parameter exceeded the applicable water quality standards.**

---

**Table 4**

Associated Earth Sciences, Inc.  
Swift Creek EIS  
Project No: EH110253A  
January 2013
### Table 5 - Sediment Deionized Water Leach Metals Results

<table>
<thead>
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<td>SC-01</td>
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<td>Sample Name</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td></td>
</tr>
<tr>
<td>Total SPLP Metals (mg/L)</td>
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<tr>
<td>Aluminum</td>
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</tr>
<tr>
<td>Antimony</td>
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<td>Arsenic</td>
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<td>Beryllium</td>
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<td>Cadmium</td>
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<td>Calcium</td>
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<td>Chromium</td>
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<td>Cobalt</td>
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<td>Iron</td>
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<td>Lead</td>
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<td>Potassium</td>
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<td>Sodium</td>
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<td>Vanadium</td>
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</tr>
<tr>
<td>Zinc</td>
<td>--</td>
</tr>
</tbody>
</table>

Notes:

1. = Synthetic Precipitation Leaching Procedure
2. = MTCA Method A Clean Up Levels for Ground Water (mg/L) (Ecology, 2007)
3. = EPA Drinking Water MCLs, Secondary MCLs, and Action Levels (EPA, 2010)
4. = Primary Ground Water Quality Standard per Washington Administrative Code (WAC) 173-200
5. = Field duplicate sample
mg/L = Milligrams per liter
-- = No water quality standard and/or parameter not measured
NA = Not applicable
U = The analyte was analyzed for, but was not detected above the reported sample practical quantitation limit (PQL)
Shading indicates that the sample PQL is above the applicable water quality standard (i.e. arsenic)
PQL = Practical quantitation limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions
UIL = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate with a low bias and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample (E&E, 2012a)
R = The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria.
The presence or absence of the analyte cannot be verified (E&E, 2012a)
A **BOLD** result indicates a positive detection
A highlighted result indicates the parameter exceeded the applicable water quality standards
<table>
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<th>User's Name</th>
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**HMW-01 Water Quality Results Summary**

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Table 7

January 2013

Associated Earth Sciences, Inc.

Swift Creek EIS

Project No: EH110253
# Table 7
HMW-01 Water Quality Results Summary

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Notes:

(1) = Primary water quality standard unless otherwise noted
(2) = Depth to ground water measured from top of inner casing (TOIC), TOIC elevation HMW-1 = 129.50
(3) = Secondary water quality standard; aluminum water quality standard is EPA secondary MCL

ft = Feet
NTU = Nephelometric turbidity units
µS/cm = MicroSeimens per centimeter
ORP = Oxidation reduction potential
mV = Millivolts
DO = Dissolved oxygen
mg/L = Milligrams per liter
MFL ≥0.5 µm = Million fibers per liter; 0.5 to 10 micrometers
MFL >10 µm = Million fibers per liter; greater than 10 micrometers
TAL = Target analyte list
µg/L = Micrograms per liter
* = Indicates that the ground water and drinking water standards are for total metals
-- = No water quality standard and/or parameter not measured
ND = Not detected
U = The analyte was analyzed for, but was not detected above the reported sample practical quantitation limit (PQL)

Shading indicates that the sample PQL is above the applicable water quality standard

PQL = Practical quantitation limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions

(1) = Indicates an estimated value for concentrations below the PQL, but above the method detection limit

A BOLD result indicates a positive detection

Shading indicates that the parameter exceeded the applicable water quality standard
### Table 8: HMW-02 Water Quality Results Summary

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*Notes:
(1) Standard
(2) WAC 173-200
(3) WAC 246-290
(4) Asbestos Type: Chrysotile
(5) Analytical Sensitivity: 4.9 µg/L
(6) Asbestos (MFL >10 µm): 24 µg/L

Table 8
January 2013
Associated Earth Sciences, Inc.
Swift Creek EIS
Project No: EH110253
<table>
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<th>Parameter</th>
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Notes:

(1) = Primary water quality standard unless otherwise noted
(2) = Depth to ground water measured from top of inner casing (TOIC); TOIC elevation HMW-2 = 91.50
(3) = Secondary water quality standard; aluminum water quality standard is EPA secondary MCL
(4) = Sample was destroyed during transit to laboratory
(5) = Field duplicate sample collected for metals
ft = Feet
NTU = Nephelometric turbidity units
µS/cm = Microseimens per centimeter
ORP = Oxidation reduction potential
mV = Millivolts
DO = Dissolved oxygen
mg/L = Milligrams per liter
MFL ≥0.5 µm = Million fibers per liter; 0.5 to 10 micrometers
MFL >10 µm = Million fibers per liter; greater than 10 micrometers
TAL = Target analyte list
µg/L = Micrograms per liter
* = Indicates that the ground water and drinking water standards are for total metals
-- = No water quality standard and/or parameter not measured
ND = Not detected
U = The analyte was analyzed for, but was not detected above the reported sample practical quantitation limit (PQL)

Shading indicates that the sample PQL is above the applicable water quality standard
PQL = Practical quantitation limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions
(j) = Indicates an estimated value for concentrations below the PQL but above the method detection limit
A BOLD result indicates a positive detection

Shading indicates that the parameter exceeded the applicable water quality standard
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<thead>
<tr>
<th>Parameter</th>
<th>Water Quality Standard</th>
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<th>E&amp;E</th>
<th>AESI</th>
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Table 9
HMW-03 Water Quality Results Summary

January 2013
Associated Earth Sciences, Inc. Swift Creek EIS Project No: EH110253A
Table 9
HMW-03 Water Quality Results Summary

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<td>5 U</td>
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<td>Silver*</td>
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<td>5,000(1)</td>
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<td>50 U</td>
<td>50 U</td>
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</tbody>
</table>

Notes:
(1) = Primary water quality standard unless otherwise noted
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Shading indicates that the sample PQL is above the applicable water quality standard
PQL = Practical quantitation limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions
(J) = Indicates an estimated value for concentrations below the PQL but above the method detection limit
A BOLD result indicates a positive detection
Shading indicates that the parameter exceeded the applicable water quality standard

January 2013
Project No: EH110253A
### Table 10
PMW-01 Water Quality Results Summary

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<th>Parameter</th>
<th>Water Quality Standard</th>
<th>GW Standard WAC 173-200(^{(1)})</th>
<th>DW Standard WAC 246-290(^{(2)})</th>
<th>E&amp;E</th>
<th>AESI</th>
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### Total TAL Metals (µg/L)

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1. GW Standard WAC 173-200
2. DW Standard WAC 246-290
3. Water Quality Standards
4. Project No: EH110253A
# PMW-01 Water Quality Results Summary

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<thead>
<tr>
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<th>AESI</th>
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<td>0.5 U</td>
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<td>5 U</td>
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<td>10 U</td>
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<td>2 U</td>
<td>10 U</td>
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<td>5,000(3)</td>
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<td>2 U</td>
<td>20 U</td>
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**Notes:**

(1) = Primary water quality standard unless otherwise noted
(2) = Depth to ground water measured from top of inner casing (TOIC), TOIC elevation PMW-1 = 190.70
(3) = Secondary water quality standard; aluminum water quality standard is EPA secondary MCL
(4) = Well development site visit; well was not sampled for asbestos or metals
ft = Feet
NTU = Nephelometric turbidity units
µS/cm = MicroSeimens per centimeter
ORP = Oxidation reduction potential
mV = Millivolts
DO = Dissolved oxygen
mg/L = Milligrams per liter
MFL >0.5 µm = Million fibers per liter; 0.5 to 10 micrometers
MFL >10 µm = Million fibers per liter; greater than 10 micrometers
TAL = Target analyte list
µg/L = Micrograms per liter
* = Indicates that the ground water and drinking water standards are for total metals
-- = No water quality standard and/or parameter not measured
ND = Not detected
U = The analyte was analyzed for, but was not detected above the reported sample practical quantitation limit (PQL)
Shading indicates that the sample PQL is above the applicable water quality standard
PQL = Practical quantitation limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions
(J) = Indicates an estimated value for concentrations below the PQL but above the method detection limit
A **BOLD** result indicates a positive detection
Shading indicates that the parameter exceeded the applicable water quality standard
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<thead>
<tr>
<th>Parameter</th>
<th>Water Quality Standard</th>
<th>E&amp;E</th>
<th>AESI</th>
</tr>
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<tr>
<td>Ground Water Elevation (ft)</td>
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<tr>
<td>Starting Turbidity (NTU)</td>
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<tr>
<td>Final Turbidity (NTU)</td>
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<td>5,000&lt;sup&gt;(3)&lt;/sup&gt;</td>
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<sup>(1)</sup> GW Standard WAC 173-200<sup>(1)</sup>  WAC 246-290<sup>(1)</sup>
<sup>(2)</sup> Depth to Water (ft)  Ground Water Elevation (ft)
<sup>(3)</sup> Starting Turbidity (NTU)  Final Turbidity (NTU)
<sup>(4)</sup> pH
<sup>(5)</sup> Temperature  Conductivity (µS/cm)
<sup>(6)</sup> ORP (mV)
<sup>(7)</sup> DO (mg/L)
<sup>(8)</sup> Asbestos Type  Fibers Detected  Analytical Sensitivity
<sup>(9)</sup> Asbestos (MFL ≥0.5 µm)
<sup>(10)</sup> Total TAL Metals (µg/L)

Table 11  PMW-02 Water Quality Results Summary  January 2013  Project No: EH110253A
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Water Quality Standard</th>
<th>E&amp;E</th>
<th>AESI</th>
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Notes:

(1) = Primary water quality standard unless otherwise noted
(2) = Depth to ground water measured from top of inner casing (TOIC), TOIC elevation PMW-2 = 160.00
(3) = Secondary water quality standard; aluminum water quality standard is EPA secondary MCL
(4) = Well development site visit; well was not sampled for asbestos or metals
(5) = Field duplicate sample collected for asbestos and metals
ft = Feet
NTU = Nephelometric turbidity units
µS/cm = MicroSeimens per centimeter
ORP = Oxidation reduction potential
mV = Millivolts
DO = Dissolved oxygen
mg/L = Milligrams per liter
MFL = Million fibers per liter; 0.5 to 10 micrometers
MFL >10 µm = Million fibers per liter; greater than 10 micrometers
TAL = Target analyte list
µL = Microliters
* = Indicates that the ground water and drinking water standards are for total metals
-- = No water quality standard and/or parameter not measured
ND = Not detected
U = The analyte was analyzed for, but was not detected above the reported sample practical quantitation limit (PQL)

Shading indicates that the sample PQL is above the applicable water quality standard
PQL = Practical quantitation limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions
(1) = Indicates an estimated value for concentrations below the PQL but above the method detection limit
A BOLD result indicates a positive detection
Shading indicates that the parameter exceeded the applicable water quality standard

Table 11
PMW-02 Water Quality Results Summary
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<th>Parameter</th>
<th>GW Standard WAC 173-200(1)</th>
<th>DW Standard WAC 246-290(1)</th>
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<th>AESI</th>
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</table>

Table 12
PMW-03 Water Quality Results Summary

Associated Earth Sciences, Inc.
Swift Creek EIS
Project No: EH110253A

January 2013
### Table 12
PMW-03 Water Quality Results Summary

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<thead>
<tr>
<th>Parameter</th>
<th>GW Standard WAC 173-200(1)</th>
<th>DW Standard WAC 246-290(2)</th>
<th>E&amp;E</th>
<th>AESI</th>
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</table>

**Notes:**

(1) = Primary water quality standard unless otherwise noted
(2) = Depth to ground water measured from top of inner casing (TOIC), TOIC elevation PMW-3 = 139.80
(3) = Secondary water quality standard; aluminum water quality standard is EPA secondary MCL
(4) = Well development site visit; well was not sampled for asbestos or metals
ft = Feet
NTU = Nephelometric turbidity units
µS/cm = MicroSeimens per centimeter
ORP = Oxidation reduction potential
mV = Millivolts
DO = Dissolved oxygen
mg/L = Milligrams per liter
MFL ≥0.5 µm = Million fibers per liter; 0.5 to 10 micrometers
MFL >10 µm = Million fibers per liter; greater than 10 micrometers
TAL = Target analyte list
µg/L = Micrograms per liter
* = Indicates that the ground water and drinking water standards are for total metals
-- = No water quality standard and/or parameter not measured
ND = Not detected
U = The analyte was analyzed for, but was not detected above the reported sample practical quantitation limit (PQL)

Shading indicates that the sample PQL is above the applicable water quality standard

PQL = Practical quantitation limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions
(3) = Indicates an estimated value for concentrations below the PQL but above the method detection limit

A **BOLD** result indicates a positive detection

Shading indicates that the parameter exceeded the applicable water quality standard
<table>
<thead>
<tr>
<th>Parameter</th>
<th>GW Standard WAC 173-200(1)</th>
<th>DW Standard WAC 246-290(1)</th>
<th>E&amp;E</th>
<th>AESI</th>
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<td>10/9/2012</td>
<td>10/10/2012</td>
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<td>--</td>
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<tr>
<td>Zinc</td>
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## Table 13
PMW-4 Water Quality Results Summary

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<th>AESI</th>
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<td>Dissolved Metals (µg/L)</td>
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<tr>
<td>Aluminum</td>
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</tr>
<tr>
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</tr>
<tr>
<td>Arsenic*</td>
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</tr>
<tr>
<td>Barium*</td>
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<td>Beryllium*</td>
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<tr>
<td>Copper*</td>
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<td>Iron*</td>
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<td>Lead*</td>
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<tr>
<td>Zinc*</td>
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</tbody>
</table>

Notes:

1. = Primary water quality standard unless otherwise noted
2. = Depth to ground water measured from top of inner casing (TOIC); TOIC elevation PMW-4 = 163.10
3. = Secondary water quality standard; aluminum water quality standard is EPA secondary MCL
4. = Well development site visit; well was not sampled for asbestos or metals

ft = Feet
NTU = Nephelometric turbidity units
µS/cm = MicroSiemens per centimeter
ORP = Oxidation reduction potential
mV = Millivolts
DO = Dissolved oxygen
mg/L = Milligrams per liter
MFL ≥0.5 µm = Million fibers per liter; 0.5 to 10 micrometers
MFL >10 µm = Million fibers per liter; greater than 10 micrometers
TAL = Target analyte list
µg/L = Micrograms per liter
* = Indicates that the ground water and drinking water standards are for total metals
-- = No water quality standard and/or parameter not measured
ND = Not detected
U = The analyte was analyzed for, but was not detected above the reported sample practical quantitation limit (PQL)

Shading indicates that the sample PQL is above the applicable water quality standard

PQL = Practical quantitation limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions

(J) = Indicates an estimated value for concentrations below the PQL but above the method detection limit

A BOLD result indicates a positive detection

Shading indicates that the parameter exceeded the applicable water quality standard
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<tbody>
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<tr>
<td>Starting Turbidity (NTU)</td>
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</tr>
<tr>
<td>Final Turbidity (NTU)</td>
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<td>Conductivity (µS/cm)</td>
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<tr>
<td>DO (mg/L)</td>
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<td>Total TAL Metals (µg/L)</td>
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</tr>
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<td>Antimony</td>
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<td>--</td>
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<td>10 U</td>
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<tr>
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<td>Nickel</td>
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<tr>
<td>Potassium</td>
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### Table 14
**DW-01 Water Quality Results Summary**

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<td>GW Standard WAC 173-200(1)</td>
<td>DW Standard WAC 246-290(3)</td>
</tr>
</tbody>
</table>
| Date               | 7/19/2012
| **Dissolved Metals (µg/L)** | | |
| Aluminum           | -- | 50-200(3)| 3U |
| Antimony           | -- | 6 | 10 U |
| Arsenic*           | 0.05 | 10 | 10 U |
| Barium*            | 1,000 | 2,000 | 12.1 |
| Beryllium*         | -- | 4 | 0.4 U |
| Cadmium*           | 10 | 5 | 0.5 U |
| Calcium            | -- | -- | 15,800 |
| Chromium*          | 50 | 100 | 5.9 |
| Cobalt             | -- | -- | 1 U |
| Copper*            | 1,000(3) | 1,300 | 40.6 |
| Iron*              | 300(3) | 300(3) | 20 U |
| Lead*              | 50 | 15 | 10 U |
| Magnesium          | -- | -- | 52,300 |
| Manganese*         | 50(3) | 50(3) | 1.6 |
| Mercury*           | 2 | 2 | 0.2 U |
| Molybdenum         | -- | -- | -- |
| Nickel*            | -- | 100 | 2 U |
| Potassium          | -- | -- | -- |
| Selenium*          | 10 | 50 | 20 U |
| Silver*            | 50 | 100(3) | 2 U |
| Sodium             | -- | -- | 3,480 |
| Thallium*          | -- | 2 | 10 U |
| Vanadium           | -- | -- | 2 U |
| Zinc*              | 5,000(3) | 5,000(3) | 222 |

**Notes:**
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mV = Millivolts
DO = Dissolved oxygen
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MFL >10 µm = Million fibers per liter; greater than 10 micrometers
TAL = Target analyte list
µg/L = Micrograms per liter
* = Indicates that the ground water and drinking water standards are for total metals
-- = No water quality standard and/or parameter not measured
U = The analyte was analyzed for, but was not detected above the reported sample practical quantitation limit (PQL)
ND = Not detected

**Table 14**
January 2013

Associated Earth Sciences, Inc.  Swift Creek EIS
Project No: EH110253A
**Table 15**

**DW-02 Water Quality Results Summary**

<table>
<thead>
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<tr>
<td>Ground Water Elevation (ft)</td>
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<tr>
<td>Starting Turbidity (NTU)</td>
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<tr>
<td>pH</td>
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<td>Conductivity (µS/cm)</td>
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<td>DO (mg/L)</td>
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<td>Analytical Sensitivity</td>
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| Total TAL Metals (µg/L)   |                        |      |
| Aluminum                  | -- 50-200(2)           | 10.7 |
| Antimony                  | -- 6                   | 10 U |
| Arsenic                   | 0.05 10                | 10 U |
| Barium                    | 1,000 2,000            | 23.2 |
| Beryllium                 | -- 4                   | 0.4 U |
| Cadmium                   | 10 5                   | 0.5 U |
| Calcium                   | --                     | 17,400|
| Chromium                  | 50 100                 | 2 U  |
| Cobalt                    | --                     | 1 U  |
| Copper                    | 1,000(3) 1,300         | 4.7  |
| Iron                      | 300(3) 300(3)          | 214  |
| Lead                      | 50 15                  | 10 U |
| Magnesium                 | --                     | 47,600|
| Manganese                 | 50(3) 50(3)            | 118  |
| Mercury                   | 2 2                    | 0.2 U|
| Nickel                    | -- 100                 | 6.2  |
| Potassium                 | --                     | 1,060|
| Selenium                  | 10 50                  | 20 U |
| Silver                    | 50 100(3)              | 2 U  |
| Sodium                    | -- 2                   | 7,240|
| Thallium                  | -- 2                   | 10 U |
| Vanadium                  | --                     | 2 U  |
| Zinc                      | 5,000(4) 5,000(4)      | 56.5 |
### Table 15
**DW-02 Water Quality Results Summary**

<table>
<thead>
<tr>
<th>Parameter</th>
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<th>DW Standard WAC 246-290(1)</th>
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<tr>
<td>Dissolved Metals (µg/L)</td>
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<td></td>
</tr>
<tr>
<td>Aluminum</td>
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<td>50-200(3)</td>
<td>3U</td>
</tr>
<tr>
<td>Antimony</td>
<td>--</td>
<td>6</td>
<td>10 U</td>
</tr>
<tr>
<td>Arsenic*</td>
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<td>10</td>
<td>10 U</td>
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<tr>
<td>Barium*</td>
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<tr>
<td>Cadmium*</td>
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<td>0.5 U</td>
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<td>Chromium*</td>
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<tr>
<td>Cobalt</td>
<td>--</td>
<td>--</td>
<td>1 U</td>
</tr>
<tr>
<td>Copper*</td>
<td>1,000</td>
<td>1,300</td>
<td>2 U</td>
</tr>
<tr>
<td>Iron*</td>
<td>300(3)</td>
<td>300(3)</td>
<td>41.9</td>
</tr>
<tr>
<td>Lead*</td>
<td>50</td>
<td>15</td>
<td>10 U</td>
</tr>
<tr>
<td>Magnesium</td>
<td>--</td>
<td>--</td>
<td>48,000</td>
</tr>
<tr>
<td>Manganese*</td>
<td>50(3)</td>
<td>50(3)</td>
<td>120</td>
</tr>
<tr>
<td>Potassium</td>
<td>--</td>
<td>--</td>
<td>2.4</td>
</tr>
<tr>
<td>Selenium*</td>
<td>10</td>
<td>50</td>
<td>20 U</td>
</tr>
<tr>
<td>Silver*</td>
<td>50</td>
<td>100(3)</td>
<td>2 U</td>
</tr>
<tr>
<td>Sodium</td>
<td>--</td>
<td>--</td>
<td>7,310</td>
</tr>
<tr>
<td>Thallium*</td>
<td>--</td>
<td>2</td>
<td>10 U</td>
</tr>
<tr>
<td>Vanadium</td>
<td>--</td>
<td>--</td>
<td>2 U</td>
</tr>
<tr>
<td>Zinc*</td>
<td>5,000(3)</td>
<td>5,000(3)</td>
<td>37.6</td>
</tr>
</tbody>
</table>

**Notes:**

1. = Primary water quality standard unless otherwise noted
2. = Depth to ground water measured from top of inner casing (TOIC); TOIC elevation PMW-4 = 163.10
3. = Secondary water quality standard; aluminum water quality standard is EPA secondary MCL
4. = Well development site visit; well was not sampled for asbestos or metals

ft = Feet
NTU = Nephelometric turbidity units
µS/cm = MicroSiemens per centimeter
ORP = Oxidation reduction potential
mV = Millivolts
DO = Dissolved oxygen
mg/L = Milligrams per liter
MFL ≥0.5 µm = Million fibers per liter; 0.5 to 10 micrometers
MFL >10 µm = Million fibers per liter; greater than 10 micrometers
TAL = Target analyte list
µg/L = Micrograms per liter
* = Indicates that the ground water and drinking water standards are for total metals
-- = No water quality standard and/or parameter not measured
ND = Not detected
U = The analyte was analyzed for, but was not detected above the reported sample practical quantitation limit (PQL)
- = Indicating that the parameter exceeded the applicable water quality standard

**Table 15**
January 2013
Associated Earth Sciences, Inc. Swift Creek EIS
Project No: EH110253A
### Table 16

**DW-03 Water Quality Results Summary**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Water Quality Standard</th>
<th>E&amp;E</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>GW Standard</td>
<td>DW Standard</td>
</tr>
<tr>
<td></td>
<td>WAC 173-200(1)</td>
<td>WAC 246-290(2)</td>
</tr>
<tr>
<td>Date</td>
<td>7/19/2012</td>
<td></td>
</tr>
<tr>
<td><strong>Field Parameters</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth to Water (ft)(3)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Ground Water Elevation (ft)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Starting Turbidity (NTU)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Final Turbidity (NTU)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>pH</td>
<td>6.5-8.5(3)</td>
<td>--</td>
</tr>
<tr>
<td>Temperature</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Conductivity (µS/cm)</td>
<td>--</td>
<td>700(3)</td>
</tr>
<tr>
<td>ORP (mV)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>DO (mg/L)</td>
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<td>--</td>
</tr>
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#### Asbestos

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th>--</th>
<th>--</th>
<th>--</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asbestos Type</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Fibers Detected</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Analytical Sensitivity</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Asbestos (MFL ≥0.5 µm)</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>--</th>
<th>--</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asbestos Type</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Fibers Detected</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Analytical Sensitivity</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Asbestos (MFL &gt;10 µm)</td>
<td>--</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

#### Total TAL Metals (µg/L)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>GW Standard</th>
<th>DW Standard</th>
<th>E&amp;E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>50-200(3)</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>Antimony</td>
<td>6</td>
<td>10 U</td>
<td></td>
</tr>
<tr>
<td>Arsenic</td>
<td>0.05</td>
<td>10</td>
<td>10 U</td>
</tr>
<tr>
<td>Barium</td>
<td>1,000</td>
<td>2,000</td>
<td>21</td>
</tr>
<tr>
<td>Beryllium</td>
<td>4</td>
<td>0.4 U</td>
<td></td>
</tr>
<tr>
<td>Cadmium</td>
<td>10</td>
<td>5</td>
<td>0.5 U</td>
</tr>
<tr>
<td>Calcium</td>
<td>--</td>
<td>--</td>
<td>42,200</td>
</tr>
<tr>
<td>Chromium</td>
<td>50</td>
<td>2 U</td>
<td></td>
</tr>
<tr>
<td>Cobalt</td>
<td>--</td>
<td>1 U</td>
<td></td>
</tr>
<tr>
<td>Copper</td>
<td>1,000(3)</td>
<td>1,300</td>
<td>4.6</td>
</tr>
<tr>
<td>Iron</td>
<td>300(3)</td>
<td>300(3)</td>
<td>20 U</td>
</tr>
<tr>
<td>Lead</td>
<td>50</td>
<td>15</td>
<td>10 U</td>
</tr>
<tr>
<td>Magnesium</td>
<td>--</td>
<td>--</td>
<td>9,330</td>
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<tr>
<td>Manganese</td>
<td>50(3)</td>
<td>50(3)</td>
<td>5.7</td>
</tr>
<tr>
<td>Mercury</td>
<td>2</td>
<td>2</td>
<td>0.2 U</td>
</tr>
<tr>
<td>Nickel</td>
<td>--</td>
<td>100</td>
<td>2 U</td>
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<tr>
<td>Potassium</td>
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<td>2,010</td>
</tr>
<tr>
<td>Selenium</td>
<td>10</td>
<td>50</td>
<td>20 U</td>
</tr>
<tr>
<td>Silver</td>
<td>50</td>
<td>100(3)</td>
<td>2 U</td>
</tr>
<tr>
<td>Sodium</td>
<td>--</td>
<td>--</td>
<td>6,100</td>
</tr>
<tr>
<td>Thallium</td>
<td>--</td>
<td>2</td>
<td>10 U</td>
</tr>
<tr>
<td>Vanadium</td>
<td>--</td>
<td>--</td>
<td>2 U</td>
</tr>
<tr>
<td>Zinc</td>
<td>5,000(3)</td>
<td>5,000(3)</td>
<td>7.6</td>
</tr>
<tr>
<td>Parameter</td>
<td>Water Quality Standard</td>
<td>E&amp;I</td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
<td>------------------------</td>
<td>-----</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GW Standard WAC 173-200(1)</td>
<td>DW Standard WAC 246-290(1)</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>7/19/2012</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dissolved Metals (µg/L)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td>--</td>
<td>50-200(3)</td>
<td></td>
</tr>
<tr>
<td>Antimony</td>
<td>--</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Arsenic*</td>
<td>0.05</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Barium*</td>
<td>1,000</td>
<td>2,000</td>
<td></td>
</tr>
<tr>
<td>Beryllium*</td>
<td>--</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Cadmium*</td>
<td>10</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Chromium*</td>
<td>50</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>Cobalt</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Copper*</td>
<td>1,000</td>
<td>1,300</td>
<td></td>
</tr>
<tr>
<td>Iron*</td>
<td>300(3)</td>
<td>300(3)</td>
<td></td>
</tr>
<tr>
<td>Lead*</td>
<td>50</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Magnesium</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Manganese*</td>
<td>50(3)</td>
<td>50(3)</td>
<td></td>
</tr>
<tr>
<td>Mercury*</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Nickel*</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Potassium</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Selenium*</td>
<td>10</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Silver*</td>
<td>50</td>
<td>100(3)</td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Thallium*</td>
<td>--</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Vanadium</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Zinc*</td>
<td>5,000(3)</td>
<td>5,000(3)</td>
<td></td>
</tr>
</tbody>
</table>

Notes:

(1) = Primary water quality standard unless otherwise noted
(2) = Depth to ground water measured from top of inner casing (TOIC); TOIC elevation PMW-4 = 163.10 ft
(3) = Secondary water quality standard; aluminum water quality standard is EPA secondary MCL
(4) = Well development site visit; well was not sampled for asbestos or metals
ft = Feet
NTU = Nephelometric turbidity units
µS/cm = MicroSeimens per centimeter
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mg/L = Milligrams per liter
MFL ≥0.5 µm = Million fibers per liter; 0.5 to 10 micrometers
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* = Indicates that the ground water and drinking water standards are for total metals
-- = No water quality standard and/or parameter not measured
ND = Not detected
U = The analyte was analyzed for, but was not detected above the reported sample practical quantitation limit (PQL)
Shading indicates that the sample PQL is above the applicable water quality standard
PQL = Practical quantitation limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions
[j] = Indicates an estimated value for concentrations below the PQL but above the method detection limit
A BOLD result indicates a positive detection
Shading indicates that the parameter exceeded the applicable water quality standard
APPENDIX 1

Monitoring Well Logs
SOIL DESCRIPTION

ROAD SHOULDER (CRUSHED ROCK)
S.W. CORNER OF OAT COLES ROAD
& HASSEY ROAD)

GW ELEVATION = 96.6' (3.37' B.G.S.)
(MEASURED 6-9-09)

GRAY BROWN FINE TO MEDIUM SAND W/ TRACE TO
SOME GRAVEL, SATURATED, MEDIUM DENSE

GRAY SANDY SILT TO FINE SILTY SAND W/ PEAT,
SATURATED, SOFT

GRAY FINE TO MEDIUM SAND W/ TRACE SILT,
SATURATED, MEDIUM DENSE TO DENSE

GRAY, MEDIUM TO COARSE SAND W/ TRACE SILT,
SATURATED, MEDIUM DENSE TO DENSE

DRILLING TERMINATED @ 21.5' & BACK FILLED W.
SAND TO 20'

WELL INSTALLED TO 20'

BENTONITE CHIPS
2.0' - 3.0' B.G.S

SAND PACK
8.0' - 21.5' B.G.S

2' WELL SCREEN
8.0' - 20.0' B.G.S

21.5' B.G.S

CONCRETE
SURFACE SEAL

WRAP MOUNT MONUMENT

SOILS CLASSIFIED USING THE UNIFIED SOILS CLASSIFICATION SYSTEM
Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

A "P" indicates sampler pushed using the weight of the drill rig.

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.
A 2 in. well was installed on 3/8/2010 to a depth of 61.5 ft.

**FIELD DATA**

<table>
<thead>
<tr>
<th>Interval</th>
<th>Sample Name</th>
<th>Group</th>
<th>Classification</th>
<th>Moisture Content, %</th>
<th>Dry Density (pcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>1a</td>
<td>GP</td>
<td>Light gray fine to coarse gravel with fine to coarse sand and trace silt (medium dense, moist) (road fill)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-10</td>
<td>1b</td>
<td>SM</td>
<td>Brown silty fine to medium sand with occasional gravel (medium dense, moist) (weathered soil horizon)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-15</td>
<td>2a</td>
<td>GW-GM</td>
<td>Brown fine to coarse gravel with sand and silt (loose, moist) (alluvial fan deposits)</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>15-20</td>
<td>2b</td>
<td>3Lp-SM</td>
<td>Brown fine sandy silt with occasional gravel and organic matter (soft, moist)</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>20-25</td>
<td>3</td>
<td>ML</td>
<td>Brown fine to coarse sand with gravel and silt (loose, moist)</td>
<td>-</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- becomes wet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-30</td>
<td>4a</td>
<td>ML</td>
<td>Brown sandy silt (soft, wet)</td>
<td>-</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30-35</td>
<td>4b</td>
<td>SM</td>
<td>Brown silty fine to coarse sand with occasional gravel and pockets of silt (loose, moist to wet)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**WELL LOG**

2-inch Schedule 20 PVC Well Casing

Light gray fine to coarse gravel with fine to coarse sand and trace silt (medium dense, moist) (road fill)

Brown silty fine to medium sand with occasional gravel (medium dense, moist) (weathered soil horizon)

Brown fine to coarse gravel with sand and silt (loose, moist) (alluvial fan deposits)

Brown fine sandy silt with occasional gravel and organic matter (soft, moist)

Brown fine to coarse sand with gravel and silt (loose, moist)

Brown sandy silt (soft, wet)

Brown silty fine to coarse sand with occasional gravel and pockets of silt (loose, moist to wet)

**Log of Boring B-1**

Project: Swift Creek Sediment Management

Project Location: Nooksack, Washington

Project Number: 00484-030-03
<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>Interval</th>
<th>Blows/foot</th>
<th>Collected Sample</th>
<th>Sample Name</th>
<th>Water Level</th>
<th>Group</th>
<th>Classification</th>
<th>Moisture Content, %</th>
<th>Dry Density, (pcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.6</td>
<td>25</td>
<td>18</td>
<td>7</td>
<td>5</td>
<td>- SA; %F=19</td>
<td></td>
<td>- coarseness increases, becomes medium dense</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.6</td>
<td>30</td>
<td>18</td>
<td>12</td>
<td>6</td>
<td>- clean sand seam encountered</td>
<td></td>
<td>Brown silty fine sand with occasional gravel (very loose, moist to wet)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.6</td>
<td>35</td>
<td>18</td>
<td>2</td>
<td>7</td>
<td>-</td>
<td></td>
<td>Gray fine to medium sand with gravel and silt (medium dense to dense, wet) (outwash)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.6</td>
<td>40</td>
<td>10</td>
<td>8a</td>
<td>8b</td>
<td>- SA; %F=8</td>
<td></td>
<td>Monterey #2/12 sand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.6</td>
<td>45</td>
<td>18</td>
<td>56</td>
<td>9</td>
<td></td>
<td></td>
<td>2-inch Schedule 20 PVC Screen, with 0.01-inch slot width</td>
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<td></td>
</tr>
</tbody>
</table>

Note: See Figure 5 for explanation of symbols.
Log of Boring B-1 (continued)

Project: Swift Creek Sediment Management
Project Location: Nooksack, Washington
Project Number: 00484-030-03

Note: See Figure 5 for explanation of symbols.
A 2 in. well was installed on 3/8/2010 to a depth of 23.2 ft.

**Notes:**
- SPT

### FIELD DATA

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<thead>
<tr>
<th>Elevation (feet)</th>
<th>Depth (feet)</th>
<th>Interval</th>
<th>Recovered (in)</th>
<th>Blown foot</th>
<th>Collected Sample</th>
<th>Sample Name</th>
<th>Water Level</th>
<th>Water Column</th>
<th>Graphic Log</th>
<th>Material Description</th>
</tr>
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<tbody>
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<td>10</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SP-SM Brown fine to coarse sand with gravel and silt (medium dense, moist) (weathered soil horizon)</td>
</tr>
<tr>
<td>13</td>
<td>10</td>
<td></td>
<td>8</td>
<td>19</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GW-GM Brown fine to coarse gravel with sand and silt (loose, moist) (alluvial fan deposits)</td>
</tr>
<tr>
<td>13</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SM Brown silty fine to medium sand (loose, moist)</td>
</tr>
<tr>
<td>16</td>
<td>15</td>
<td></td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SW-SM Gray-brown fine to coarse sand with gravel and silt (medium dense, moist)</td>
</tr>
<tr>
<td>25</td>
<td>20</td>
<td></td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>GW-GM Brown and gray fine to coarse gravel with sand and silt (dense, wet) (outwash)</td>
</tr>
</tbody>
</table>

**Log of Boring B-2**

Project: Swift Creek Sediment Management

Project Location: Nooksack, Washington

Project Number: 00484-030-03

Figure 7

Sheet 1 of 2
<table>
<thead>
<tr>
<th>Interval (feet)</th>
<th>Depth (feet)</th>
<th>Recovered (in)</th>
<th>Blows/foot</th>
<th>Collected Sample</th>
<th>Sample Name</th>
<th>Water Level</th>
<th>Group Classification</th>
<th>Moisture Content, %</th>
<th>Dry Density, (pcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td></td>
<td>18</td>
<td>56</td>
<td>5</td>
<td></td>
<td></td>
<td>- SA; %F=5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td>12</td>
<td>66</td>
<td>6</td>
<td></td>
<td></td>
<td>Gray fine to medium sand with gravel and trace silt (medium dense to dense, wet)</td>
<td>- SA; %F=3</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td></td>
<td>18</td>
<td>53</td>
<td>7</td>
<td></td>
<td></td>
<td>2-inch Schedule 20 PVC Screen, with 0.01-inch slot width</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
<td>18</td>
<td>26</td>
<td>8</td>
<td></td>
<td></td>
<td>Monterey #2/12 sand</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: See Figure 5 for explanation of symbols.
A 2 (in) well was installed on 3/9/2010 to a depth of 61 ft.

**FIELD DATA**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Interval Recovered (in)</th>
<th>Blow Count (blows/ft)</th>
<th>Collected Sample</th>
<th>Combination Sample</th>
<th>Water Level</th>
<th>Dry Density (pcf)</th>
<th>Moisture Content (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
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</tr>
<tr>
<td>10</td>
<td>10</td>
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<td>10</td>
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<td>15</td>
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<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
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<tr>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

**MATERIAL DESCRIPTION**

- **Gray fine to coarse sandy gravel with silt (dense, moist)** (road fill)
- **Brown fine to medium sandy silt (soft, moist)** (weathered soil horizon)
- **Brown fine to coarse sand with silt and occasional gravel (very loose, moist)** (alluvial fan deposits) - SA: %F=14
- **Dark brown clayey silt with organic matter (soft, moist)**
- **Light brown silt with fine sand (soft, moist)** - becomes wet
- **Brown fine to coarse gravel with sand and trace silt (dense, wet)** (outwash)
- **Gray fine to medium sand with gravel and silt (dense, wet)**

**WELL LOG**

- Steel Surface Monument
- Flush-mount Steel Monument
- Locking J-plug
- Bentonite seal
- 2-inch Schedule 20 PVC Well Casing

**Log of Boring B-3**

- **Project:** Swift Creek Sediment Management
- **Project Location:** Nooksack, Washington
- **Project Number:** 00484-030-03
Gray fine to coarse sand with silt and occasional gravel (medium dense, wet)

- SA; %F=5

- coarsness increases

- becomes medium dense

Gray fine sand (dense, wet)

- SA; %F=5

Log of Boring B-3 (continued)

Project: Swift Creek Sediment Management
Project Location: Nooksack, Washington
Project Number: 00484-030-03

Figure 8
Sheet 2 of 3
Note: See Figure 5 for explanation of symbols.

Log of Boring B-3 (continued)

Project: Swift Creek Sediment Management
Project Location: Nooksack, Washington
Project Number: 00484-030-03
Log of Boring B-4

Project: Swift Creek Sediment Management
Project Location: Nooksack, Washington
Project Number: 00484-030-03

Figure 9
Sheet 1 of 2
<table>
<thead>
<tr>
<th>Field Data</th>
<th>Well Log</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth (feet)</td>
<td>Moisture Content, %</td>
</tr>
<tr>
<td>25</td>
<td>18</td>
</tr>
<tr>
<td>28.0</td>
<td>30.0</td>
</tr>
<tr>
<td>30</td>
<td>18</td>
</tr>
<tr>
<td>30.0</td>
<td>33.0</td>
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<td>35</td>
<td>18</td>
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<td>33.0</td>
<td>35.0</td>
</tr>
<tr>
<td>40</td>
<td>18</td>
</tr>
<tr>
<td>40.0</td>
<td>41.5</td>
</tr>
</tbody>
</table>

- SA; %F>5
- becomes wet

Brown-gray fine sand (medium dense, wet)

Monterey #2/12 sand

2-inch Schedule 20 PVC Screen, with 0.01-inch slot width

Note: See Figure 5 for explanation of symbols.
APPENDIX 2

Water Users and Water Well Reports
**WATER WELL REPORT**

**Construction/Decommission:** ORIGINAL CONSTRUCTION Notice of Intent Number

**PROPOSED USE:**
- [x] Domestic
- [ ] Industrial
- [ ] Municipal
- [ ] Dr. Water
  - Irrigation
  - Test Well
  - Other.

**TYPE OF WORK:**
- [x] New Well
- [ ] Reconditioned
- [ ] Method: Cased
- [ ] Drilled
- [ ] Deeper
- [ ] Hole Drilled
- [ ] Rotary
- [ ] Jetted

**DIMENSIONS:**
- Diameter of well: 6 inches, drilled: 25.5 ft
- Depth of completed well: 25.5 ft

**CONSTRUCTION DETAILS**
- Casing (installed): Dam from _ to _ ft.
- Installed: Dam from _ to _ ft.
- Skirted: Dam from 1.5 to 25.5 ft.

**Perforations:**
- [x] Yes
- [ ] No

**Screen:**
- [x] Yes
- [ ] No
- K-Flex
- Manufacturer's Name: Westwood
- Model No: NA

**Diag 1:**
- Slot Size: 1/4 to 21/8 ft.
- Slot Size: 21/8 to 21/2 ft.

**Gravel/Filter packed:**
- [x] Yes
- [ ] No
- Size of gravel/sand: 10-20

**Materials placed from:**
- [x] 18 ft to 25.5 ft

**Surface Seal:**
- [x] Yes
- [ ] No
- Depth of strata: 18 ft

**Materials used in seal:**
- [x] Bentonite

**Method of scaling shaft:**
- [x] Yes
- [ ] No

**PUMP:**
- Manufacturer's Name: API
- Model: HP

**WATER LEVELS:**
- Land-surface elevation above mean sea level: 5 ft
- Date: 06/17/2003
- Artesian pressure: lbs per square inch
- Date: 06/17/2003
- Artesian water is controlled by (cap, valve, etc.): None

**WELL TESTS:**
- Drawdown is amount water level is lowered below static level
- Was a pump test made? [x] Yes
- [ ] No
- If yes, by whom? Arch
- Yield [ ] gal/min with [ ] ft drawdown after [ ] hrs
- [x] 20 gal/min with [ ] ft drawdown after [ ] hrs
- [ ] 20 gal/min with [ ] ft drawdown after [ ] hrs
- Recovery data (time taken as zero when pump turned off; water level measured from well top to water level)

**DATE OF TEST:**
- [x] 06/17/2003

**Driller or Trainee License No.:**
- 0085

**Driller/Engineer/Trainee Signature:**
- Bill Colleen

---

**RECEIVED:**
- DEPT OF ECOLOGY
  - Jun 17, 2003
  - Jul 07, 2003

**Drilling Company:**
- 18 + 5 Oil Drilling
  - 0997

**Address:**
- Belltown, WA
  - 0997

**City, State, Zip:**
- Belltown, WA
  - 0997

**Contractor's License No.:**
- 180100

**Registration Date:**
- 06/17/2003

**Temperature of water:**
- Was a chemical analysis made? [ ] Yes
- [x] No

---

**THE DEPARTMENT OF ECOLOGY does NOT WARRANT the Data and/or the Information on this Well Report.**

**Driller/Engineer/Trainee Name:** Bill Colleen

**Address:**
- Belltown, WA
  - 0997

**City, State, Zip:**
- Belltown, WA
  - 0997

**Contractor's License No.:**
- 180100

**Registration Date:**
- 06/17/2003

**The Department of Ecology is an Equal Opportunity Employer**
- ECO 050-1-20 (Rev 4/01)
WATER WELL REPORT

Construction/Decommission (\textit{x} in circle) 133580

- Domestic
- Industrial
- Municipal

- Drilled
- Irrigation
- Test Well
- Other

POPROSED USE:  

- New Well
- Recombined
- Method
- Dug
- Bored
- Driven

- Deepened
- Tappet
- Jetted

DIMSIZN: Diameter of well drilled 25.5

- Depth of completed well 25.5

CONSTRUCTION DETAILS

Casing: Welded 6 diam from 11.5 to 25.5

Installed: Liner installed 6 diam from 11.5 to 25.5

Perforations: No

Type of perforator used

-  

SIZE of perforations in ft to ft

Screening: Yes No K-Pac Location No

Manufacturer:  

Model No:  

Diam 6 Slot Size 9/16 from 18 to 24.5 ft

Diam 6 Slot Size 9/16 from 20.5 to 25.5 ft

Gravel/Filter packed: Yes No Size of gravel/sand 10-20

Materials placed from 18 ft to 25.5 ft

Surface Seal: Yes No To what depth 42 ft

Materials in seal  

Did any strata contain unusable water? Yes No

Type of water Depth of strata

Method of scaling strata off

PUMP: Manufacturer's Name

Type

WATER LEVELS: Land surface elevation above mean sea level

Statc level 5 ft below top of well Date 01/15/03

Artesian pressure 1000 per square inch Date

Artesian water is controlled by (cap, valve, etc)

WELL TESTS: Drawdown is amount water level is lowered below base level

Was a pump test made? Yes No if yes, by whom

- Yield gal/min with ft drawdown after hrs

- Yield gal/min with ft drawdown after hrs

- Yield gal/min with ft drawdown after hrs

- Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

- Time Water Level

- Time Water Level

- Time Water Level

Date of test

Bailer test gal/min with ft drawdown after hrs

Air test gal/min with stem set at ft for hrs

Artesian flow gpm Date

Temperature of water Was a chemical analysis made? Yes No

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and information reported above are true to my best knowledge and belief.

Driller  

Driller/Engineer/Traine Name (Print)

Driller or Trainee License No.

If trainee, licensed driller's Signature and License no.

CURRENT

Notice of Intent No. WE-01/103

Unique Ecology Well ID Tag No. WHP160

Water Right Permit No.

Property Owner Name

Well Street Address 3600 S. Pass

City Yakima County Yakima

Location SW 1/4 SE 1/4 Sec 39 T20 R4 EWM or WWM

Lat/Long: Lat Deg ______ Lat Min/Sec ______

Long Deg ______ Long Min/Sec ______

Tax Parcel No. 04042996280

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered (USE ADDITIONAL SHEETS IF NECESSARY)

MATERIAL FROM TO

- DSvl

- Peat

- Sand

- Clay Gravel 20.15.5

RECEIVED

JUN 1 0 2003

DEPT-OF ECOLOGY

Start Date 01/15/03 Completed Date 01/15/03

Drilling Company

City, State, Zip

ECO 500-20 (Rev 4/01)
8787
STATE OF WASHINGTON

WATER WELL REPORT 
Start Card No. W147736
AFT 045

(1) OWNER: Name SELLER, KERRY 
Address 31485 CROSSLEY CT. ABBOTSFORD, BC

(2) LOCATION OF WELL: County WHATCOM 
(2a) STREET ADDRESS OF WELL (or nearest address) SW 1/4 SE 1/4 Sec 28 T 40 N., R 4E W

(3) PROPOSED USE: DOMESTIC

(4) TYPE OF WORK: Owner's Number of well (if more than one) 1
NEW WELL

(5) DIMENSIONS: Diameter of well 6 inches 
Drilled 18 ft. Depth of completed well 18 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Dia. from 42 ft. to 16.5 ft.
WELDED " Dia. from ft. to ft.
" Dia. from ft. to ft.

Perforations: NO
Type of perforator used in. by in.
Size of perforations ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

screens: YES
Manufacturer's Name
Type PVC Diam. 6 Model No.
slot size 20 from 16.5 ft. to 18 ft.
Diam. slot size from ft. to ft.

Gravel packed: YES Size of gravel 10/20
Gravel placed from 15.5 ft. to 18 ft.

Surface seal: YES To what depth? 15.5 ft.
Material used in seal, BENTONITE
Did any strata contain unusable water? NO
Type of water? Depth of strata ft.
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 6 ft. below top of well Date 10/01/01
Artesian Pressure lbs. per square inch Date
Artesian water controlled by

(9) WELL TEST: Drawdown is amount water level is lowered below static level.
Was a pump test made? YES If yes, by whom? HAYES DRILLING
Yield: 1 gal./min with 8 ft. drawdown after 1 hrs.

Recovery data
Time Water Level Time Water Level

Date of test /
Wailor test gal/min. ft. drawdown after hrs.
Air test gal/min. w/ stem set at ft. for hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? NO

WELL CONSTRUCTION CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME HAYES DRILLING, INC.
(Person, firm, or corporation) (Type or print)

ADDRESS 5695 ERSHIG RD. BOW, WA
License No. T2542
Contractor's Registration No. HAYES81065S Date 10/16/01

7391
Mr. Tom Banta  
Project Manager  
Hayes Drilling, Inc.  
5696 Ershig Road  
Bow, WA 98232-9610

Dear Mr. Banta:

RE: Variance request to construct a water well to a depth of eighteen feet with a short surface seal of sixteen feet located at 3544 South Pass Road, Whatcom County, Washington. The property is owned by Kerry Scale.

I am writing in response to your request for a variance to the Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 Washington Administrative Code (WAC) and specifically with WAC 173-160-231. The formal variance request was received by the Department of Ecology on October 2, 2001. You are requesting to construct a water well with a short surface seal.

A variance is hereby granted in accordance with WAC 173-160-106 and WAC 173-160-231 to allow the construction of a water well to the depth of eighteen feet with a short surface seal of sixteen feet as submitted in your variance request. This variance is granted under the following conditions:

1. A "Notice of Intent to Construct a Water Well" (Start Card) must be submitted for the well to the Department (Olympia address) at least seventy-two (72) hours prior to starting the well construction.

2. A Well Report describing the construction for the well shall be submitted to the Department (Northwest Regional Office) within thirty (30) days after completing the work.
This variance may be appealed. Your appeal must be filed with the Pollution Control Hearings Board, P.O. Box 40903, Olympia, Washington 98504-0903 within thirty (30) days of the date this decision was mailed. At the same time, your appeal must also be sent to the Department of Ecology c/o The Water Resources Program, The Appeal Coordinator, P.O. Box 47600, Olympia, Washington 98504-7600. The appeal alone will not stay the effectiveness of this variance. Stay requests must be submitted in accordance with RCW 43.21B.320. These procedures are consistent with chapter 43.21B RCW.

Your attention to these laws and regulations, and cooperation with the Department of Ecology in this matter, is appreciated. Please telephone Ken White at (425) 649-7044 if you have any questions concerning this variance.


Sincerely,

\begin{center}
\textit{Daniel L. Swenson} \\
Section Supervisor \\
Water Resources Program
\end{center}

DLS:kw:jc

cc: Christopher Miller, Whatcom County Health & Human Services, P.O. Box 935, Bellingham, WA 98227-0935 
Ken White, NWRO WR

\begin{center}
"I certify that I mailed this letter or an identical copy thereof, postage prepaid, to the above addressee(s) this \textit{5th} day of \textit{October}, 2001."
\end{center}

\begin{center}
\textit{Daniel L. Swenson} (Signature)
\end{center}
WATER WELL REPORT
STATE OF WASHINGTON
Start Card No W117694
AFT1004

1. OWNER: Name SEAL, KERRY
Address 31635 CROSLEY COURT ABBOTSFORD, BC

2. LOCATION OF WELL: COUNTY WHATCOM
   STREET ADDRESS: 3544 SOUTH PASS ROAD

3. PROPOSED USE: DOMESTIC

4. TYPE OF WORK: NEW WELL
   Method: ROTARY

5. DIMENSIONS:
   Diameter of well: 6 inches
   Depth of completed well: 741 ft

6. CONSTRUCTION DETAILS:
   Casing installed: 6
   steel, Dia. from +28 ft to +37 ft
   Welded: "Dia. from — ft. to — ft.

   Perforations NO
   Type of perforator used
   Size of perforations
   in by
   perforations from ft to ft
   perforations from ft to ft
   perforations from ft to ft

   Screens NO
   Manufacturer's Name
   Type
   Dia. slot size ft. to ft
   Dia. slot size ft. to ft

   Gravel packed NO
   Size of gravel
   Gravel placed from ft to ft

   Surface seal: YES
   To what depth? 10 ft.
   Material used in seal: BENTONITE
   Did any strata contain unusable water? NO
   Type of water?
   Depth of strata
   Method of sealing strata off

7. PUMP: Manufacturer's Name
   Type
   H.P.

8. WATER LEVELS:
   Land-surface elevation
   above mean sea level
   ft.
   Static level: N/A
   ft. below top of well
   Date: 02/15/91
   Artesian pressure: N/A
   lbs per square inch
   Date:
   Artesian water controlled by

9. WELL TESTS: Drawdown is amount water level is lowered below
   static level
   Was a pump test made? NO
   If yes, by whom?
   Yield gal/min with ft. drawdown after hrs

   Recovery data
   Time Water Level Time Water Level Time Water Level
   Time Water Level

   Date of test:
   Boiler test: gal/min.
   ft. drawdown after hrs
   Air test: gal/min w/ stem set at ft for hrs
   Artesian rise: p.m.
   Date
   Temperature of water: Was a chemical analysis made? NO

RECEIVED
MAR 01 2001
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

Work started 02/12/91 — Completed 02/13/91

WELL CONSTRUCTION CERTIFICATION
I constructed and/or accept responsibility for con-
struction of this well, and its compliance with all
Washington well construction standards. Materials used
and the information reported above are true to my best
knowledge and belief.

NAME: HAYES DRILLING, INC
(Person, firm, or corporation) (Type or print)

ADDRESS: 54960 ENGLISH RD, RLS, WA
(SIGNED) [Signature]
License No. 2189
Contractor's Registration No. HAYES010805 Date 02/23/01

7216
WATER WELL REPORT

STATE OF WASHINGTON

(1) OWNER: Henry Schleigh
Address: 3676 South Jared Place

(2) LOCATION OF WELL: Waldon

(3) PROPOSED USE: Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ]

(4) TYPE OF WORK: New well [ ] Method: Drilled [ ] Bored [ ] Reconditioned [ ] Deepened [ ]
Cable [ ] Driven [ ] Rotary [ ] Jetted [ ] Other [ ]

(5) DIMENSIONS:
Drilled: 35 ft. Diameter of well: 6 inches.
Depth of completed well: 35 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6" Diam. from 0 ft. to 35 ft.
Threaded [ ] Welded [ ]

Perforations: Yes [ ] No [ ]
Type of perforator used: [ ]
SIZE of perforations: [ ] in. by [ ] in.
perforations from 0 ft. to 35 ft.

Screen: Yes [ ] No [ ]
Manufacturer's Name: [ ]
Type: [ ] Model No: [ ]
Diam. Slot size: [ ] ft. to [ ] ft.

Gravel packed: Yes [ ] No [ ]
Size of gravel: [ ] ft. to [ ] ft.
Gravel placed from [ ] ft. to [ ] ft.

Surface seal: Yes [ ] No [ ]
To what depth: [ ] ft. Material used in seal [ ]
Did any strata contain unusable water? Yes [ ] No [ ]
Type of water: [ ]
Depth of strata: [ ] ft.
Method of sealing strata off: [ ]

(7) PUMP: Manufacturer's Name: [ ]
Type: [ ] Capacity: [ ] H.P.

(8) WATER LEVELS:
Static level: [ ] ft. below top of well Date: [ ]
Artesian pressure: [ ] lbs. per square inch Date: [ ]
Artesian water is controlled by: [ ]
(Cap, valve, etc.)

(9) WELL TESTS:
Draught down is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [ ] If yes, by whom? [ ]
Yield: [ ] gal. per minute with [ ] ft. drawdown after [ ] hr.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)
Time Water Level Time Water Level Time Water Level

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topsoil</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Sand and clay</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Peat</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>Gray clay</td>
<td>20</td>
<td>32</td>
</tr>
<tr>
<td>Coarse gravel</td>
<td>32</td>
<td>33</td>
</tr>
</tbody>
</table>

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME: [ ] C. Wells Drilling Inc.
Address: [ ]
(Signed): [ ] (Well Driller)
License No: [ ] Date: [ ] 17

(USE ADDITIONAL SHEETS IF NECESSARY)
**Water Well Report**

Original - Ecology, 1st copy - owner, 2nd copy - driller

**Construction/Decommission**

ORIGINAL INSTALLATION Notice of Intent Number

**PROPOSED USE:**
- ☐ Domestic
- ☐ Irrigation
- ☐ Industrial
- ☐ Municipal

**TYPE OF WORK:**
- ☐ New well
- ☐ Reconditioned
- Method: ☐ Dog, ☐ Bored, ☐ Driven
- ☐ Deepened

**DIMENSIONS:**
- Diameter of well: 6" drilled and cased 3.7 ft.
- Depth of completed well: 21 ft.

**CONSTRUCTION DETAILS:**
- Casing: 6" SCH 40, installed from 18.0 ft. to 37 ft.
- Liner installed from 37 ft. to 37 ft.
- Drilled from 37 ft. to 37 ft.

**Perforation:**
- Yes ☐ No ☐

**SIZE of perforated:**
- Yes ☐ No ☐

**Screen:**
- Yes ☐ No ☐

**Manufacturer's Name:**
- [Blank]

**Gravel/Filter pack:**
- Yes ☐ No ☐

**Surface Seal:**
- Yes ☐ No ☐

**Well tests:**
- Yes ☐ No ☐

**WELL TESTS:**
- Drawdown test: Yes ☐ No ☐
- Water flow test: Yes ☐ No ☐
- Artesian flow test: Yes ☐ No ☐

**WATER LEVELS:**
- Land surface elevation above mean sea level:
- Static level: 10 ft. below top of well
- Date: 07/07/07
- Artesian pressure:
- Artesian water is controlled by:

**MATERIAL:**

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Clay</td>
<td>14</td>
<td>19</td>
</tr>
<tr>
<td>Brown Clay</td>
<td>19</td>
<td>32</td>
</tr>
<tr>
<td>Gravel Clay</td>
<td>32</td>
<td>34</td>
</tr>
<tr>
<td>Gravel</td>
<td>34</td>
<td>37</td>
</tr>
</tbody>
</table>

**RECEIVED**

NOV 01 2004

DEPT OF ECOLOGY

**WELL CONSTRUCTION CERTIFICATION:**

I, [(Name)]

Driller's License No.: 0083

Driller's Signature:

**Drilled/Engineer/Trainer Name:**

Drilled/Engineer/Trainer Signature:

**Drilling Company:**

**City, State, Zip:**

**Construction:**

ECology is an Equal Opportunity Employer.

BCY 900-1-30 (Rev 09/21)
WATER WELL REPORT
STATE OF WASHINGTON

(1) OWNER: Bill Atton
Address: 3750 South Pass

(2) LOCATION OF WELL: County Whitman

(2a) STREET ADDRESS OF WELL (or nearest address): Above

(3) PROPOSED USE: Domestic [X] Industrial [] Municipal []

(4) TYPE OF WORK: Owner's number of well: [ ]
Abandoned [ ] New well [X] Method: Dug [ ] Bored [ ]
Depaened [ ] Cable [ ] Driven [ ]
Reconditioned [X] Rotro[ ] Jetted [ ]

(5) DIMENSIONS: Diameter of well: 6 inches
Drilled: 33 feet. Depth of completed well: 32 feet

(6) CONSTRUCTION DETAILS:
Casing Installed: 6 ft. Drill. 15 ft. to 33 ft.
Welled: [X] Lined: [ ]
Perforations: Yes [X] No [ ]
Type of perforator used:

SIZE of perforations: in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screened: Yes [ ] No [X]
Manufacturer's Name:
Type: 
Model No: 

Diam: 
Slot size: from ft. to ft.
Diam: 
Slot size: from ft. to ft.

Gravel packed: Yes [X] No [ ] Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes [X] No [ ] To what depth? 18 ft.
Material used in seal:
Did any strata contain unusable water? Yes [ ] No [X]
Type of water? Depth of strata:
Method of sealing strata off:

(7) PUMP: Manufacturer's Name:
Type: H.P.

(8) WATER LEVELS:
Static level ft. below top of well Date
Areal pressure: per square inch Date
Areal water is controlled by (CIR, valve, etc.)

(9) WELL TESTS:
Was a pump test made? Yes [ ] No [X] If yes, by whom?
Yield: 20 gal./min. with 15 ft. drawdown after 1 hrs.

Recovery (Time taken as zero when pump turned off) [water level measured from well top to water level]
Time Water Level Time Water Level Time Water Level

Date of test: 

Dissolved gas test: [ ]

Date of test: 

Bakal test: [ ]

Date of test: 

Analysis time: g.p.m. Date

Temperature of water [ ]

(10) WELL LOG or ABANDONMENT PROCEDURE
Description:

FORMATION: (Describe by color, character, size of material and structure, and show thickness of aquifers, etc. and the kind and nature of the materials in each stratum penetrated, with at least one entry for each change of formation)

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 50.1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Silty Clay</td>
<td>2 18</td>
<td></td>
</tr>
<tr>
<td>Gravel</td>
<td>18 30</td>
<td></td>
</tr>
<tr>
<td>Gravel Sand</td>
<td>30 33</td>
<td></td>
</tr>
<tr>
<td>Clay</td>
<td>33 -</td>
<td></td>
</tr>
</tbody>
</table>

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OCT 26 1995
DEPT. OF ECOLOGY

WELL CONTRACTOR:
I (Signature) 
(Use additional sheets if necessary)

ECO 055-1 20 (92) * 1

The Department of Ecology does NOT guarantee the data and/or information on this Well Report.
**WATER WELL REPORT**

**STATE OF WASHINGTON**

**OWNER:** Name: **LEE & LOIS HANDY**
Address: 1744 So. Pass Rd.

**LOCATION OF WELL:** County: **WHATCOM**
County Sec. **37 + 40 N, R, 47 WM**

**STREET ADDRESS OF WELL (or nearest address):** 1744 So. Pass Rd., **Evershot WA**.

**PROPOSED USE:**
- Domestic
- Irrigation
- Municpal
- DeWater
- Test Well
- Other

**TYPE OF WORK:**
- Owner's number of well: **12944**
- New well
- Deepened
- Recomplied
- Drilled
- Cased
- Jetted

**DIMENSIONS:** Diameter of well: **6** inches.
Depth of completed well: **61 ft**.

**CONSTRUCTION DETAILS:**
- Casing Installed: **60 ft.**
- Diam. from **0 ft. to 60 ft.**
- Welded
- Line installed: **60 ft.**
- Diam. from **0 ft. to 60 ft.**
- Threaded
- Diam. from **0 ft. to 60 ft.**
- Perforations: Yes **No**
- Size of perforations: **in. by in.**
- Size of gravel: **in. by in.**
- Screen: Yes **No**
- Diam. Slot size: **in. by in.**
- Material used to seal: **Bars**
- Gravel: Yes **No**
- Size of gravel: **in. by in.**
- Gravel placed from **ft. to ft.**
- Surface seal: Yes **No**
- To what depth? **18 ft.**
- Did any strata contain unusable water? Yes **No**
- Type of water: **Depth of strata**
- Method of sealing strata off:

**PUMP:** Manufacture's Name: **Flair-Warding**
Type: **Submersible**

**WATER LEVELS:**
- Land surface elevation above mean sea level: **8 ft.**
- Date: **8-19-95**
- Artisanal water is controlled by **(Case, valve, etc.)**

**WELL TESTS:**
- Drawdown measured in ft. below top of well: **41 ft.**
- Static level: **8 ft.**
- YIELD: **75** gal./min.
- If yes, by whom? **DELLR**
- Drawdown after 60 hrs.: **44 ft.**

**RECOVERY DATA:**
- Time Water Level Time Water Level Time Water Level

**CONSTRUCTION CERTIFICATION:**
I, **WILBUR H. DRAGGER**, the person, firm or corporation responsible for the construction of this well, certify that it is in compliance with all Washington well construction standards. The information reported above is true to the best of my knowledge and belief.

**NAME:** WILBUR H. DRAGGER
**ADDRESS:** 900 Box 4769
**City:** No. Box 4769
**State:** WA
**ZIP CODE:** 98226

**LICENSE NO.:** 003
**SIGNED:** 1995
**DATE:** 8-30-95

**ECOSYS:** is an Equal Opportunity and Affirmative Action employer. For special accommodations, contact the Water Resources Program at (206) 407-6800. The TDD number is (206) 407-6095.
### WELL LOG

**State of Washington**
**Department of Conservation**
**Division of Water Resources**

**Record by:** Driller
**Source:** Well Report

**Location:** State of Washington
- **County:** Whatcom
- **Area:**
- **Map:** SW\(\frac{1}{4}\) SE\(\frac{1}{4}\) sec 27 T. 40 N. R. 5 W. Diagram of Section

**Drilling Co.:** Arl Hillard
**Address:** 2010 South Road, Bellingham, Wash.

**Method of Drilling:** Dug
**Date:** 1957

**Owner:** Floyd C. and Evelyn M. Allen
**Address:** 5744 South Pass Road, Evergreen

**Land surface datum:** Above

**SWL:** 9.5' Date: 1957
**Dims.:** 8' x 6' 6"

### CONSOLIDATION

<table>
<thead>
<tr>
<th>Material</th>
<th>From (feet)</th>
<th>To (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topsoil</td>
<td>0</td>
<td>5'</td>
</tr>
<tr>
<td>Gravel &amp; clay</td>
<td>5'</td>
<td>18'</td>
</tr>
<tr>
<td>Gravel, water-bearing</td>
<td>18'</td>
<td>24'</td>
</tr>
<tr>
<td>Blue, Clay</td>
<td>24'</td>
<td>53'</td>
</tr>
<tr>
<td>Gravel, water-bearing</td>
<td>53'</td>
<td>58'</td>
</tr>
</tbody>
</table>

**Well Tests:**
- **Pump:** 14 gpm @ 6' 20 @ 9' 6
- **Pump:** RH WHDE Jet 1 HP
- **Screen:** Cook 53' 58'
- **Casing:** 6" .0030

**Turn up Sheet... of... sheets**
WATER WELL REPORT
STATE OF WASHINGTON Start Card No. 075388
OWNER: James TAYLOR, A.B. Address: 5667 HIBBOUTE RD DERRY, WA 98244-

LOCATION OF WELL: County WHATCOM
(2a) STREET ADDRESS OF WELL (or nearest address) 7733 LEHRrant RD

PROPOSED USE: DOMESTIC

(4) TYPE OF WORK: Owner's Number of well
(10) HULL LOG

NEW WELL Method: ROTARY

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 40 ft. Depth of completed well 37.5 ft.

CONSTRUCTION DETAILS:
Casing installed: 6� Dia. from +2.5 ft. to 37.5 ft.
WELDED Dia. from ft. to ft.
Dia. from ft. to ft.

Perforations: NO Type of perforator used
SIE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: NO Manufacturer's Name
Type
Diam. slot size from ft. to ft.
Diam. slot size from ft. to ft.

Gravel packed: NO Size of gravel
Gravel placed from ft. to ft.

Surface seal: YES To what depth? 10 ft.
Material used in seal PUDGELLING CLAY
Did any strata contain unusable water? NO
Type of water? Depth of strata ft.

(7) PUMP: Manufacturer's Name
Type
H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 20 ft. below top of well Date 10/24/90
Artesian Pressure lbs. per square inch Date
Artesian water controlled by

(9) WELL TESTS: Drawdown is amount water level is lowered below
static level.
Was a pump test made? NO If yes, by whom?
Yield: gal./min with ft. drawdown after hrs.

Recovery data
Time Water Level Time Water Level Time Water Level

Data of test
Water test 10 gal/min. at 35 ft. for .5 hrs.
Air test 10 gal/min. w dome set at 35 ft. for .5 hrs.
Artesian flow g.p.m. Date
Temperature of water
Was a chemical analysis made? NO

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change in formation.

MATERIAL
FROM TO
BROWN CLAY 0 3
BROWN GRAVEL & SAND 3 15
BROWN SAND & GRAVEL 15 30
BROWN SAND GRAVEL & WATER 30

Work started 10/24/90 Completed 10/24/90

WELL CONSTRUCTOR CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME HAYES DRILLING, INC.
(Person, firm, or corporation) (Type or print)
ADDRESS 556 ERSHIG RD. 98244 WA
(SIGNED) License No. 1825
Contractor's Registration No. HAYES010625 Date 10/20/90

The Department of Ecology does NOT Warranty the Data and/or the information on this Well Report.
Water Well Report

Original - Ecology, 1st copy - owner, 2nd copy - driller

**PROJECT**

**Construction/Decommission**

- [ ] Construction
- [x] Decommission

**ORIGINAL INSTALLATION Notice of Intent Number**

**PROPOSED USE:**

- [ ] DeWater
- [ ] Irrigation
- [x] Domestic
- [ ] Industrial
- [ ] Municipal
- [ ] Test Well
- [ ] Other

**TYPE OF WORK:**

- [ ] New well
- [ ] Reconditioned
- [x] Installed
- [ ] Augmented
- [ ] Closed
- [ ] Drilled
- [ ] Reconditioned
- [ ] Other

**DIMENSIONS:**

- Diameter of well in inches, drilled.
- Depth of completed well in ft.

**CONSTRUCTION DETAILS**

- casing
  - [ ] Welded
  - [ ] Lined
  - [ ] Threaded
  - [x] Installed
  - [ ] Diam. from ft. to ft.
  - [ ] Diam. from ft. to ft.
  - [ ] Diam. from ft. to ft.

- perforations
  - [ ] Yes
  - [ ] No

- size of pipe in in. and no. of perforations from ft. to ft.

- screens
  - [ ] Yes
  - [ ] No
  - [x] K-Fac
  - [ ] Location

- Manufacturer's Name

- Diameter
  - [ ] ft.
  - [ ] ft.

- Diameter of gravel/sand material placed from ft. to ft.

- Surface Seal
  - [ ] Yes
  - [ ] No
  - [ ] To what depth ft.

- Water used in seal

- Did any strata contain unsuitable water?
  - [ ] Yes
  - [ ] No

**Type of water?**

- [ ] Depth of strata

- Method of sealing strata off

- PUMP
  - [ ] Manufacturer's Name
  - [ ] Model No.
  - [ ] Location

- Water Level:
  - [ ] Land surface elevation above mean sea level
  - [ ] ft. below top of well
  - [ ] ft. below base of well

- Artesian water is controlled by
  - (cap, valve, etc.)

- WELL TESTS:
  - Drawdown is amount water level is lowered below static level
  - Was a pump test made?
    - [ ] Yes
    - [ ] No
  - If yes, by whom?

- Yield:
  - [ ] gal/min. with
  - [ ] ft. draught after hrs.
  - [ ] gal/min. after
  - [ ] ft. draught after hrs.
  - [ ] ft. draught after hrs.

- Recovery time (time taken as zero when pump shut off) from well top to water level

- Temperature of water
  - [ ] Was a chemical analysis made?
  - [ ] Yes
  - [ ] No

**WELL CONSTRUCTION CERTIFICATION:** I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

- Driller/Engineer's Name (Print)
- Driller/Engineer's License No.
- Driller's Signature
- Drilling Company
- Address
- City, State, Zip

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- APR 11 2005

- DEPT OF ECOLOGY

- Start Date
- Completed Date

- Ecology is an Equal Opportunity Employer.
**WATER WELL REPORT**

**STATE OF WASHINGTON**

---

1. **OWNER:** Darryl Kautzen  
   Address: 7758 Sealand Rd. Everson  
   SW, SW Sec. 26, T. 40 N., R. 14E W.M.

2. **LOCATION OF WELL:** County: Whatcom  
   Street Address of Well (or nearest address): Same

3. **PROPOSED USE:**  
   - Domestic [ ]  
   - Irrigation [ ]  
   - Industrial [ ]  
   - Municipal [ ]  
   - Irrigation Well [ ]  
   - Other [ ]

4. **TYPE OF WORK:**  
   - Owner's number of well [ ]  
   - New well [ ]  
   - Bored [ ]  
   - Fractured [ ]  
   - Bored [ ]  
   - Fractured [ ]  
   - Rotated [ ]  
   - Jetted [ ]

5. **DIMENSIONS:**  
   - Diameter of well: 85 inches.  
   - Drilled: 85 feet. Depth of completed well: 85 ft.

6. **CONSTRUCTION DETAILS:**  
   - Casing installed: 6  
     Diameter from 12 to 76 ft.  
   - Waist: 3  
     Diameter from 65 to 85 ft.  
   - Liner installed: 3  
     Diameter from 65 to 85 ft.  
   - Perforations: Yes [ ]  
     Yes [ ]
   - Type of perforator used: Saw cut (41" PVC)  
   - Depth of perforations: 12 in.  
     from 70 to 85 ft.  
   - Screws: Yes [ ]  
   - Model No.

7. **PUMP:**  
   - Manufacturer's Name:  
   - Type:  
   - Model No:  
   - Diameter:  
   - Slot size:  
   - Gravel pack: Yes [ ]  
   - Screen:  
   - Size of gravel:  
   - Material used:  
   - Depth of strata:  
   - Depth of strata:  

8. **WATER LEVELS:**  
   - Land surface elevation above mean sea level: 330 ft.  
   - Static level: 69 ft. below top of well  
     Date: 9-9-93  
   - Artesian pressure:  
     psi. per square inch  
     Date:  
   - Artesian water is controlled by:  
     (Cap, valve, etc.)

9. **WELL TESTS:**  
   - Drawdown is more than water level is lowered below static level  
   - Was a pump test made? Yes [ ]  
     If yes, by whom?  
   - Yield:  
     gal./min.  
     time:  
   - Recovery date (time taken as zero when pump turned off) (water level measured from well top to water level)  
     Time:  
     Water Level:  
     Time:  
     Water Level:  
     Time:  
     Water Level:

---

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APR 26 1993  
DEPT. OF ECOLOGY

---

**WELL CONSTRUCTION CERTIFICATION:**

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

**NAME:** Bezona Wells Service  
**ADDRESS:** 7219 Vist Dr. Ferndale, WA 98245

---

**SIGNATURES:**

(Signed) Paul K. Dennis  
License No. 0895  
(MEWS DRILLER)

**REGISTRATION:**

No. 2061617PP1  
Date: 4-16-93

---

(USE ADDITIONAL SHEETS IF NECESSARY)
WATER WELL REPORT

Construction/Decommission ("x" in circle)

Decommission ORIGIONAL INSTALLATION

420247

NOTICE OF INTENT NUMBER

PROPOSED USE: □ Domestic □ Industrial □ Municipal
□ DeWater □ Irrigation □ Test Well □ Other

TYPE OF WORK: Owner's number of well (if more than one)
□ New well □ Reconditioned Method: □ Dog □ Bored □ Driven
□ Deepened □ Cable □ Rotary □ Jetted

DIMENSIONS: Diameter of well a) Inches, drilled 220 ft.
Depth of completion well 220 ft.

CONSTRUCTION DETAILS

Casing: □ Welded 6 ft Diam. from 120 ft. to 138 ft.
Installed: □ Liner installed 8 ft Diam. from 120 ft. to 138 ft.
□ Threaded 8 ft Diam. From 120 ft. to 138 ft.

Perforations: □ Yes □ No

Type of perforator used

SIZE OF PERFS in by in. and no. of perforations from to ft.

Screws: □ Yes □ No □ K-Pac Location

Manufacturer's Name

Type: ________ Model No.: ________

Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel/Filler packed: □ Yes □ No Size of gravel/sand

Materials placed from ft. to ft.

Surface Seal: □ Yes □ No To what depth 18 ft.

Material used in seal

Did any strata contain usable water? □ Yes □ No

Type of water: ________ Depth of strata

Method of sealing strata off

PUMP: Manufacturer's Name

Type: ________ HP

WATER LEVELS: Land surface elevation above mean sea level ________ ft.
Static level 120 ft. below top of well Date: 6/12/11
Artesian pressure lbs. per square inch Date: ________

Artesian water is controlled by (cap, valve, etc.

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? □ Yes □ No If yes, by whom:

Yield gal./min. with ft. drawdown after hrs.
Yield gal./min. with ft. drawdown after hrs.
Yield gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time Water Level Time Water Level Time Water Level

Date of test

Bore test gal./min. with ft. drawdown after hrs.
Artesian test gal./min. with test set at hrs.
Artesian flow gpm. Date

Was a chemical analysis made? □ Yes □ No

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for constructing this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Driller □ Engineer □ Trainer Name (print) BRYAN

VANWEERDUIZEN

Driller/Engineer/Trainer Signature

Driller or trainee License No.

IF TRAINEE: Driller's License No. 3029

Driller's Signature

Drilling Company: B & C WELL DRILLING

Address: 888 KELLY
City, State, Zip BELLINGHAM WA, 98226

Contractor's Registration No. BCWELD9437PS Date 6/12/11

Start Date 6/9/11 Completed Date 6/12/11

CURRNT

Notice of Intent No. W30662

Unique Ecology Well ID Tag No. BCB 430

Water Right Permit No. 

Property Owner Name COLETTE CLOUTHIER

City EVERSION County WHATCOM

Location NE1/4-1/4 NE1/4 Sec 34 Twn 40 R 4 
(s, t, r Still REQUIRED) 

Lat/Lon Lat Deg _______ Lat Min/Sec _______

Long Deg _______ Long Min/Sec _______

Tax Parcel No (Required) 460443464989

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USING ADDITIONAL SHEETS IF NECESSARY)

MATERIAL FROM TO

TOPSOIL 0 2
BROWN CLAY GRAVEL 2 15
GRAVEL SAND 15 30
BROWN CLAY 30 50
BROWN CLAY GRAVEL 50 75
GRAY CLAY GRAVEL 75 85
GRAY CLAY SAND 85 95
GRAY CLAY GRAVEL 95 135
LITTLE H2O

GRAY SANDSTONE 135 220

40-4E-34A

SEP 02 2011

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WATER WELL REPORT

Construction/Decommission ("X" in circle)
- Decommission

PROPOSED USE: □ Domestic □ Irrigation □ Test Well □ Other
- Domestic

TYPE OF WORK: Owner's well number (If more than one)
- New well

DIMENSIONS: Diameter of well: _____ inches, drilled: _____ ft.
- Diameter of well: 8 inches, drilled: 50 ft.

CONSTRUCTION DETAILS
- Casing: Welded 6" Diam. from 0 ft. to 52 ft.
- Installed:
  - Lintel installed: Diameter from 0 ft. to 50 ft.
  - Threaded: Diameter from 0 ft. to 50 ft.

Perforations: □ Yes □ No
- Yes

Type of perforator used:
- JOHNSON

Screens: □ Yes □ No □ K-Pac
- Yes

Gravel/Filter pack:
- Yes □ No
- Size of gravel/sand: 0.14 in. from 50 ft. to 57 ft.

Surface Seal: □ Yes □ No
- Yes

Material used in seal
- BENTONITE

Did any strata contain unusable water? □ Yes □ No
- Yes

Type of water:
- Depth of strata

Method of scaling strata off:

PUMP: Manufacturer's Name
- JOHNSON

WATER LEVELS:
- Level: 0 ft. below top of well
- Date: 6/14/11

Artesian water is controlled by
- (cap, valve, etc.)

WELL TESTS:
- Was a pump test made? □ Yes □ No
- If yes, by whom?
- Yield:
  - gpm: 0.14
  - Drawdown after hrs.:
- Storage data (flow taken as zero when pump turned off)

Date of test:
- gpm

Artesian flow:
- Date

Temperature of water:
- Was a chemical analysis made? □ Yes □ No
- Yes

WELL CONSTRUCTION CERTIFICATION: I declare that I conducted and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.
- Driller □ Engineer □ Trainee Name (last) BRYAN VANWEERDHUIZEN

Drilling Company: B & C WELL DRILLING
- Address: 888 KELLY RD
- City, State, Zip: BELLINGHAM, WA, 98226

Contractor's Registration No.: RCWELD94796
- Date: 6/20/11

ECY 050-1-20 (Rev 02/10) If you need this document in an alternate format, please call the Water Resources Program at 360-407-6872. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.
**ENTERED**

**STATE OF WASHINGTON**

**WELL REPORT**

**Start Card No.** M104223

**Water Right Permit No.** A59476

---

**OWNER:** NAME: BUNAKI, DEAN

**Address:** 3853 S PASE ROAD EVANSON, WA 98437

- NE 1/4 NW 1/4 Sec 34 T 40 N., R 4E WM

**LOCATION OF WELL:** County WHATCOM

**STREET ADDRESS OF WELL (or nearest address):** 3853 S PASE ROAD

**PROPOSED USE:** DOMESTIC

**TYPE OF WORK:** Owner's Number of well

**NEW WELL**

**DIMENSIONS:** Diameter of well 6 inches

- Drilled 60 ft.
- Depth of completed well 57.5 ft.

**CONSTRUCTION DETAILS:**

- Casing installed: 6 Dia. from ft. to ft. 53.9 ft.

- WELDED

- Dia. from ft. to ft.

- Dia. from ft. to ft.

**Perforations:** NO

**Type of perforator used**

<table>
<thead>
<tr>
<th>in. by in.</th>
<th>ft. to ft.</th>
<th>ft. to ft.</th>
<th>ft. to ft.</th>
</tr>
</thead>
</table>

**Screws:** YES

**Manufacturer's Name** COOK

**Type STAINLESS STEEL**

| Dia. & slot size | from 53.4 ft. to 57.4 ft. | Dia. slot size | from ft. to ft. |

**Gravel packed:** NO

**Size of gravel**

**Gravel placed from ft. to ft.**

**Surface seal:** YES

**To what depth?** 18 ft.

**Material used in seal BENTONITE**

**Did any strata contain unusable water?** NO

**Type of water?**

<table>
<thead>
<tr>
<th>Depth of strata ft.</th>
</tr>
</thead>
</table>

**Method of sealing strata off**

**PUMP:**

**Manufacturer's Name**

**Type**

**W.P.**

---

**WATER LEVELS:**

- Land-surface elevation above mean sea level ...

<table>
<thead>
<tr>
<th>ft.</th>
</tr>
</thead>
</table>

- Static level 45 ft. below top of well Date 09/03/98

- Artesian Pressure lbs. per square inch Date

- Artesian water controlled by

---

**WELL TESTS:**

- Drawdown is amount water level is lowered below static level.

- Was a pump test made? NO/YES If yes, by whom?

- Yield: gal./min with ft. drawdown after hrs.

**Recovery data**

<table>
<thead>
<tr>
<th>Time</th>
<th>Water Level</th>
<th>Time</th>
<th>Water Level</th>
<th>Time</th>
<th>Water Level</th>
</tr>
</thead>
</table>

- Date of test

- Boiler test 12 gal/min. .5 ft. drawdown after .5 hrs.

- Air test 15 gal/min. w/ stem set at 57 ft. for 1 hrs.

- Artesian flow S.D.M.

- Temperature of water

- Was a chemical analysis made? NO

**WELL LOG**

**Formation:** Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change in formation.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>BROWN SILT</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>BROWN SILT &amp; GRAVEL</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>BROWN GRAVEL &amp; SILT</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>BROWN SILT SAND &amp; CLAY</td>
<td>15</td>
<td>29</td>
</tr>
<tr>
<td>SERY GRAVEL &amp; SAND</td>
<td>29</td>
<td>47</td>
</tr>
<tr>
<td>BROWN GRAVEL SAND &amp; WATER</td>
<td>47</td>
<td></td>
</tr>
</tbody>
</table>

**WELL CONSTRUCTOR CERTIFICATION**

- I, [Contractor's Name], hereby certify that I have constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

**NAME:** HAYES DRILLING, INC.

**ADDRESS:** 312 WASHINGTON ST.

**License No.** 2189

**Contractor's Name:**

**Registration No.** HAYESD10625

**Date 09/23/98**

---

**RECEIVED**

**SEP 30 1998**

**NWRO-WR**

**DEP OF ECOLOGY**

6475
WATER WELL REPORT

STATE OF WASHINGTON

11544

(1) OWNER: Name BUEY, DAVE
Address 1440 WEST BADGER ROAD CUSTER, WA 98240

(2) LOCATION OF WELL: County WHATCOM
(2a) STREET ADDRESS OF WELL (or nearest address) 38XX S. PASS ROAD

(3) PROPOSED USE: DOMESTIC

(4) TYPE OF WORK: Owner's Number of well
(If more than one).

NEW WELL

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 80 ft. Depth of completed well 80 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6
* Dia. from 42 ft. to 77 ft.
WELDED
* Dia. from ft. to ft.
* Dia. from ft. to ft.

Perforations: NO
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: YES
Manufacturer's Name
Type STAINLESS STEEL
Model No.
Diam. 6
Net size 20
from 77 ft. to 80 ft.

Diam. slot size from ft. to ft.

Gravel packed: NO
Size of gravel
Gravel placed from ft. to ft.

Surface seal: YES
To what depth? 18 ft.
Material used in seal RENTONITE
Did any strata contain unusable water? NO

Type of water
Depth of strata ft.

(7) PUMP: Manufacturer's Name
Type H.P.

(8) WATER LEVELS:
Land-surface elevation above mean sea level...

Stat. level 32 ft. below top of well Date 06/01/05
Artesian Pressure lbs. per square inch Date
Artesian water controlled by

(9) WELL TESTS: Drawdown is amount water level is lowered below
static level.
Was a pump test made? NO
If yes, by whom?

Yield: gal./min with ft. drawdown after hrs.

Recovery data
Time Water Level Time Water Level Time Water Level

Date of test / / 
Riser test 10 gal/min. 1 ft. drawdown after 1 hrs.
Air test gal/min. w/ stem set at ft. for hrs.

Artesian flow g.p.m. Date
Temperature of water °F Was a chemical analysis made? NO

WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for con-
struction of this well, and its compliance with all
Washington well construction standards. Materials used
and the information reported above are true to my best
knowledge and belief.

NAME HAYES DRILLING, INC.
(Person, firm, or corporation) (Type or print)
ADDRESS 5806 TOSHIO RD. S.W., BOW, WA

(SIGNED) License No. 2146
Contractor's Registration No. HAYRED106615 Date 07/05/05

07961
WATER WELL REPORT

STATE OF WASHINGTON

OWNER: Name HOUSTON, KELLY
Address 2025 BROADWAY ST BELLINGHAM, WA 98225

LOCATION OF WELL: County WHATCOM
(2a) STREET ADDRESS OF WELL (or nearest address) 386 S. PASS ROAD

PROPOSED USE: DOMESTIC

TYPE OF WORK: Owner's Number of well 1

DIMENSIONS: Diameter of well 6 inches
Drilled 60 ft. Depth of completed well 60 ft.

CONSTRUCTION DETAILS:
Casing installed: 6 Dia. from to 57 ft.
WELLHEAD Dia. from ft. to ft.
Dia. from ft. to ft.

Perforations: NO

Screen: YES
Manufacturer's Name
Type: STAINLESS STEEL
Model No.
Diam. 6 slot size 15 from 55 ft. to 60 ft.
Diam. slot size from ft. to ft.

Gravel packed: NO
Size of gravel
Gravel placed from ft. to ft.

Surface seal: YES
To what depth? 18 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? NO
Type of water? Depth of strata ft.
Method of sealing strata off

PUMP: Manufacturer's Name FLINT & WALLING
Type SUBMERGIBLE H.P. 1.5

WATER LEVELS:

<table>
<thead>
<tr>
<th>Land-surface elevation</th>
<th>Above mean sea level</th>
<th>ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static level</td>
<td>33 ft. below top of well</td>
<td>6/08/05</td>
</tr>
<tr>
<td>Artesian Pressure</td>
<td>lbs. per square inch</td>
<td>Date</td>
</tr>
<tr>
<td>Artesian water controlled by</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

WELL TESTS: Drawdown is amount water level is lowered below static level.

Was a pump test made? YES If yes, by whom? HAYES DRILLING
Yield: 20 gal./min with 9 ft. drawdown after 1 hrs.

Recovery data
Time Water Level Time Water Level Time Water Level

Date of test

Air test: gal/min. 1 ft. drawdown after 1 hrs.
Artesian flow: g.p.m. Date
Temperature of water

WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME HAYES DRILLING, INC.
(Person, firm, or corporation) (Type or print)
ADDRESS 5696 NASHING KD. RON, WA.

[Signature] License No. 2146

Contractor's Registration No. HAYES10629 Date 06/16/05

07944
**WATER WELL REPORT**

**Notice of Intent No. WE1040**

**Unitec Ecology Well ID Tag No. APF 226**

**Water Right Permit No.**

**Property Owner Name**

**Well Street Address**

**City**

**County**

**Location**

**LONG**

**Lat/Long**

**Tax Parcel No. (Required)**

**Brown salt & gravel**

**Brown gravel & sand**

**Brown gravel, sand & water**

**Brown sand & gravel**

**CONSTRUCTION DETAILS**

**Diameter of well**

**Depth of completed well**

**Perforations**

**Type of perforator used**

**Number of perfs**

**Material used in seal**

**Material used in slotted section**

**Type of well water**

**Method of sealing used**

**PUMP**

**Manufacturer's Name**

**WATER LEVELS**

**Static level**

**Date of measurement**

**Date of test**

**Date of test**

**WELL TESTS**

**Was a pump test made?**

**Yield of water**

**Temperature of water**

**Was a chemical analysis made?**

**WELL CONSTRUCTION CERTIFICATION**

**Driller/Engineer**

**Driller or trainee License No.**

**IF TRAINEE, Driller's License No.**

**Driller's Signature**

**ECY 050-1-20 (Rev 02/10)**

If you need this document in an alternate format, please call the Water Resources Program at 360-767-6972.

Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 711-777-6341.
WATER WELL REPORT
STATE OF WASHINGTON

(1) OWNER: Name: Neal Broad
Address: 1392 Central Rd.

(2) LOCATION OF WELL: County: Whatcom
Township: N 37 T 4 S, Range: W 3 E
Section: 34

(3) PROPOSED USE: Domestic [ ] Industrial [ ] Municipal [ ]
Irrigation [ ] Test Well [ ] Other [ ]

(4) TYPE OF WORK: Owner's number of well
(if more than one) [ ]
New well [ ] Method: by [ ] Bored [ ]
Dredged [ ] Cable [ ] Driven [ ]
Reconditioned [ ] Rotary [ ] Jetted [ ]

(5) DIMENSIONS: Diameter of well: 36 inches
Drilled: 54 ft. Depth of completed well: 53 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 36 ft. Diam. from 31 ft. to 54 ft.
Threaded [ ] Diam. from [ ] ft. to [ ] ft.
Welded [ ] Diam. from [ ] ft. to [ ] ft.

Perforations: Yes [ ] No [ ] Type of perforator used

Size of perforations: In. [ ] ft. [ ] in. [ ]
perforations from [ ] ft. to [ ] ft.
from [ ] ft. to [ ] ft.
from [ ] ft. to [ ] ft.
from [ ] ft. to [ ] ft.

Screen(s): Yes [ ] No [ ]
Manufacturer's Name
Type [ ] Slot size [ ] from [ ] ft. to [ ] ft.
Diam. [ ] Slot size [ ] from [ ] ft. to [ ] ft.
Gravel packed: Yes [ ] No [ ] Size of gravel: 3/8
Gravel placed from [ ] ft. to [ ] ft.

Surface seal: Yes [ ] No [ ] To what depth? 18 ft.
Material used in seal: [ ]
Did any strata contain unusable water? Yes [ ] No [ ]
Type of water: [ ]
Depth of strata [ ]
Method of sealing strata: [ ]

(7) PUMP: Manufacturer's Name:
Type [ ] HP [ ]

(8) WATER LEVELS:
Static level: 42 ft. below top of well Date: April 13
Artesian pressure: lbs. per square inch Date: [ ]
Artesian water is controlled by [ ] (Cap, valve, etc.)

(9) WELL TESTS:
Drawdown is amount water level is lowered below static level.
Was a pump test made? Yes [ ] No [ ] If yes, by whom? [ ]
Yield: 2.0 gal/min. with 3 ft. drawdown after 1 hr.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)
Time Water Level Time Water Level Time Water Level

Date of test [ ]
Batter test: gal/min. with [ ] ft. drawdown after [ ] hrs.
Artesian flow: g.p.m. Date [ ]
Temperature of water: [ ] Was a chemical analysis made? Yes [ ] No [ ]

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME: [ ] American Water Wells
(Person, firm, or corporation) (Type of print)
Address: PO Box 507 Ferndale WA

(Signed) [ ] (Well Driller)
License No. 0946 Date: April 17, 1929

(USE ADDITIONAL SHEETS IF NECESSARY)
**WATER WELL REPORT**

**State of Washington**

**File Original and First Copy to**

**Department of Ecology**

**Second Copy - Owner's Copy**

**Third Copy - Driller's Copy**

---

(1) **OWNER:** Name: **O. E. Community Club** 4211 S. Pass Rd., Everett, WA. 98247

(2) **LOCATION OF WELL:** County: **Whatcom**

(3) **STREET ADDRESS OF WELL (or nearest address):** 4211 S. Pass Rd., Everett, WA. 98247

(4) **PROPOSED USE:**
- Domestic
- Irrigation
- Wells Test
- Other

(5) **DIMENSIONS:**
- Diameter of well: 30 inches
- Depth of completed well: 30 ft.

(6) **CONSTRUCTION DETAILS:**
- Perforations: Yes [ ] No [X]
- Type of perforator used
- Size of perforations: in. by in.
- Screen: Yes [X] No [ ]
- Manufacturer's Name: **Howard Smith**
- Screen material: **Stainless Steel**
- Type: **Drill Well**
- H.P. [ ] W.L.

(7) **WATER LEVELS:**
- Static level: 30 ft. below top of well
- Artesian pressure: lbs. per square inch
- Artesian water is controlled by: (Cap, valve, etc.)

(8) **WELL TESTS:**
- Recovery data (time taken as zero when pump turned off): water level measured from well top to water level
- Initial yield: 19 gal./min., with __ h. drawdown after __ h.

---

(10) **WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION**

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface sand gravel</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Sand, gravel, rusty sand</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Sand, gravel, water</td>
<td>14</td>
<td>30</td>
</tr>
</tbody>
</table>

---

**RECEIVED**

**SEP 13 1994**

**DNR 4-17983**

---

**WELL CONSTRUCTOR CERTIFICATION:**

I, [Name], [Address], declare that the well was constructed in accordance with all Washington well construction standards. The material used and the information reported above is true to the best of my knowledge and belief.

**NAME:** [Name]

**ADDRESS:** [Address]

---

**SIGNATURE AND LICENSE NUMBER:**

[Signature] 0823

---

**USE ADDITIONAL SHEETS IF NECESSARY**
(21) WATER WELL REPORT
STATE OF WASHINGTON
UNIQUE WELL I.D. #: AES 603

(1) OWNER: Name Chuck & Teresa Getwiks
Address P.O. Box One, Everson, WA 98247

(2) LOCATION OF WELL:
County whatcom
(2a) STREET ADDRESS OF WELL (or nearest address) Southpass Rd

(3) PROPOSED USE: ☑ Domestic ☐ Industrial ☐ Test Well ☐ Municipal ☐ DeWater

(4) TYPE OF WORK:
Owner's number of well (if more than one) 1
Method ☑ New Well ☐ Deepened ☐ Reconditioned ☐ Decommissioning

(5) DIMENSIONS: Diameter of well 6 ft. inches
Drilled 40 ft. Depth of completed well 38 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: ☑ Welded ☐ Liner installed ☐ Threaded
Perforations: ☑ Yes ☐ No
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: ☑ Yes ☐ No ☐ X-No Location
Manufacturer's Name Johnson
Type S.S. ☑ Model No.
Diam. Slot size 20 from 33 ft. to 38 ft.
Diam. Slot size from 3 ft. to 6 ft.
Gravel/Filter packed: ☑ Yes ☐ No ☐ Size of gravel/sand
Material placed from ft. to ft.
Material used in seal Bentonite
Did any strata contain unusable water? ☑ Yes ☐ No
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP:
Manufacturer's Name
Type: H.P.

(8) WATER LEVELS:
Static level 8 ft. below top of well Date 9/1/99
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS:
Was a pump test made? ☑ Yes ☐ No If yes, by whom? Aquatech
Yield: 35 gal/min. with 8 ft. drawdown after 1 hr.
Yield: 25 gal/min. with 8 ft. drawdown after 1 hr.
Yield: 15 gal/min. with 8 ft. drawdown after 1 hr.
Recovery data (true taken as zero when pump turned off) (water level measured from well top to water level)
Time Water Level Time Water Level Time Water Level

Date of test 9/7/99
Balance test 40 gal/min. with 5 ft. drawdown after 1 hr.
Artesian 40 gal/min. with artesian at 38 ft. for 1.5 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☑ Yes ☐ No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION:
Formation: Describe by color, character, size of material and size, and the land and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>topsoil</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>brown clay &amp; peat</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>gray silty sand</td>
<td>16</td>
<td>24</td>
</tr>
<tr>
<td>brown sand gravel &amp; water</td>
<td>24</td>
<td>29</td>
</tr>
<tr>
<td>brown clay</td>
<td>28</td>
<td>32</td>
</tr>
<tr>
<td>brown sand gravel &amp; water</td>
<td>32</td>
<td></td>
</tr>
</tbody>
</table>

Job # 90992

SEP 2-0-1999

WELL CONSTRUCTION CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Type or Print Name Brannon Hopkins License No. 1825
(Licensed Driller/Engineer)
Trainee Name
Drilling Company Aquatech Well Drilling & Pump Inc.
(Signed) (Licensed Driller/Engineer) License No. 1825
Address 2722 Butler Crk Rd Sedro Woolley Wa 98284
Contractor's Registration No.

(AQUATWD040K4) Date 9/8/99

(USE ADDITIONAL SHEETS IF NECESSARY)
Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-8500. The TDD number is (360) 407-6386.
WELL LOG CHANGE FORM

Instructions: Record any change made to the well log record on this form. Then always append this form to the well log image. File with the original.

WCL Log ID (Required) 190475 Well Log ID 70394

Regional Office: ☐ CRO ☐ ERO ☐ NWRO ☐ SWRO

Type of Well: ☐ Water ☐ Resource Notice of Intent: W10001 Ecology Well ID Tag No. 56404

Property (Well) Owner's Name Gelwick

Well Street Address

City __________________________ County __________ Zip Code __________

Location: __1/4-1/4__ Sec __________ Twn _______ R _____ E or W (Circle One)

Lat./Long: (Required) Lat. Deg. _______ Lat. Min/Sec __________

Long. Deg. _______ Long. Min/Sec __________

Horizontal Collection Method Code __________

Tax Parcel No __________________________

Type of Work: ☐ New Well ☐ Reconditioned ☐ Deepened

Well Log Received Date ___/___/___

Well Diameter ___ (in inches) Well Depth ___ (in feet) Well Completed Date ___/___/___

Driller's Ecology License No. __________

Trainee's Ecology License No. __________

Reason/Source of Change (Required) Well tag # connected over the phone by Dana from Aquatex

Signature of Well Log Tracker (Required) __________ Date __/___/___

ECY-WR-WLCF Rev 10/02/02
WATER WELL REPORT
STATE OF WASHINGTON

(1) OWNER: Name ____________________________ Address __________________________

(2) LOCATION OF WELL: County ____________________________ Address __________________________

(3) PROPOSED USE: Domestic □ Industrial □ Municipal □ Irrigation □ Test Well □ Other □

(4) TYPE OF WORK: Owner's number of well _________ Number of wells (if more than one) _________

- New well □
- Method: Dug □ Bored □ Drilled □
- Deepened □
- Reconditioned □
- Rotary □ Jetted □

(5) DIMENSIONS:

- Diameter of well _______ inches
- Drilled _______ ft. Depth of completed well _______ ft.

(6) CONSTRUCTION DETAILS:

- Casing installed: _______ Diam. from _______ ft. to _______ ft.
- Threaded □ Diam. from _______ ft. to _______ ft.
- Welded □ Diam. from _______ ft. to _______ ft.
- Perforations: Yes □ No □
- Type of perforator used __________________________
- SIZE of perforations _______ in. by _______ in.
- perforations from _______ ft. to _______ ft.
- perforations from _______ ft. to _______ ft.
- perforations from _______ ft. to _______ ft.

- Screens: Yes □ No □
- Manufacturer's Name __________________________
- Type: __________________________
- Diam. _______ ft. Slot size _______ ft. from _______ ft. to _______ ft.
- Diam. Slot size _______ ft. from _______ ft. to _______ ft.
- Gravel packed: Yes □ No □ Size of gravel: _______ ft. from _______ ft. to _______ ft.
- Gravel placed from _______ ft. to _______ ft.
- Surface seal: Yes □ No □
- To what depth? _______ ft.
- Material used in seal: __________________________
- Did any strata contain unusable water? Yes □ No □
- Type of water? __________________________
- Depth of strata __________________________
- Method of sealing strata off __________________________

(7) PUMP: Manufacturer's Name __________________________
- Type: __________________________
- H.P. __________________________

(8) WATER LEVELS:

- Land-surface elevation above mean sea level: _______ ft.
- Date: _______ ft. below top of well: _______ ft.
- Date: _______ ft. 
- Artisan pressure: _______ lbs. per square inch Date: _______
- Artisan water is controlled by: __________________________
- (Cap, valve, etc.) __________________________

(9) WELL TESTS:

- Drawdown is amount water level is lowered below static level
- Was a pump test made? Yes □ No □ If yes, by whom? __________________________
- YIELD: _______ gal/min. with _______ ft. drawdown after _______ hrs.

- Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

<table>
<thead>
<tr>
<th>Time (hrs)</th>
<th>Water Level (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>_______</td>
<td>_______</td>
</tr>
</tbody>
</table>

- Date of test __________________________
- Boiler test _______ gal/min. with _______ ft. drawdown after _______ hrs.
- Artesian flow _______ g.p.m. Date: _______
- Temperature of water _______ Was a chemical analysis made? Yes □ No □

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME: ____________________________  Address: ____________________________  Type of Print: ____________________________

(Signed): ____________________________  (Well Driller): ____________________________

License No. _______ Date: _______

(USE ADDITIONAL SHEETS IF NECESSARY)
WATER WELL REPORT
STATE OF WASHINGTON

(1) OWNER: Name: Lawrence Nelson Address: South Pass Rd. Long Beach
(2) LOCATION OF WELL: County: Whatcom

(3) PROPOSED USE: Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ]

(4) TYPE OF WORK: Owner's number of well (if more than one)...

New well [ ] Method: Dug [ ] Bored [ ] Deepened [ ] Cable [ ] Driven [ ] Reconditioned [ ] Rotary [ ] Jetted [ ]

(5) DIMENSIONS: Diameter of well: 6 inches Depth of completed well: 47 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: Threaded [ ] Diameter from: ft. to: ft.

Perforations: Yes [ ] No [ ]
Type of perforator used: 
SIZE of perforations: in. by: in.
perforations from: ft. to: ft.
perforations from: ft. to: ft.
perforations from: ft. to: ft.

Screens: Yes [ ] No [ ]
Manufacturer's Name: 
Type: 
Diam. Slot size: from: ft. to: ft.
Diam. Slot size: from: ft. to: ft.

Gravel packed: Yes [ ] No [ ]
Size of gravel: 
Gravel placed from: ft. to: ft.

Surface seal: Yes [ ] No [ ] To what depth: 26 ft.
Material used in seal: 
Did any strata contain usable water? Yes [ ] No [ ]
Type of water: 
Depth of strata: 
Method of sealing strata off: 
(7) PUMP: Manufacturer's Name: 
Type: 
HP: 

(8) WATER LEVELS:
Land-surface elevation above mean sea level:...
ft.
Static level:...
ft. below top of well Date: 
Artesian pressure:...
Lbs. per square inch Date: 
Artesian water is controlled by...
(Cap, valve, etc.)

(9) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [ ] If yes, by whom?...
Yield: gal/min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)
Time Water Level Time Water Level Time Water Level

Date of test:
Ball test: 30 gal/min. with 20 ft. drawdown after 4 hrs.
Artesian flow:...
Date: 
Temperature of water...

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>black top soil</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>muselage water</td>
<td>9</td>
<td>33</td>
</tr>
<tr>
<td>green clay</td>
<td>33</td>
<td>36</td>
</tr>
<tr>
<td>fine gravel</td>
<td>36</td>
<td>46</td>
</tr>
<tr>
<td>coarse gravel water</td>
<td>46</td>
<td>47</td>
</tr>
<tr>
<td>grey clay</td>
<td>47</td>
<td></td>
</tr>
</tbody>
</table>

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME: O C Well Drilling Inc.
(Person, firm, or corporation) Type or print)
Address: 586 East Wall St. Bbl

[Signed] Herman Smith
(Well Driller)

License No. 0026 Date: Dec. 8, 1926

[USE ADDITIONAL SHEETS IF NECESSARY]
WATER WELL REPORT
STATE OF WASHINGTON

OWNER: Felix Vando-Allen
Address: 3801 South Pass

LOCATION OF WELL: NE 1/4 SW 1/4 Sec 36 T 34 N R 62 WM

STREET ADDRESS OF WELL: NE 1/4 SW 1/4 Sec 36 T 34 N R 62 WM

PROPOSED USE: Domestic

TYPE OF WORK: New well

DIMENSIONS: Diameter of well 6 inches

CONSTRUCTION DETAILS:
Type of perforator used: Yes

Gravel packed: Yes

Gravel placed from: ft. to ft.

Screen: Yes

Manufacturer's Name: 

Type: 

Model No. 

Diam. from ft. to ft.

Diam. from ft. to ft.

Material used in seal: 

Depth of strata 

Type of water: 

Method of sealing strata:

WATER LEVELS:

Static level 

Artesian pressure 

Artesian water is controlled by: 

(CEP, valve, etc.)

WELL TESTS:

Drawdown is amount water level is lowered below static level

Was a pump test made? Yes

Yield: gal/min.

Bail test: 

Rate of water level 

Artesian flow: 

Date of test:

Recovery date (time taken as zero when pump turned off) (water level measured from well top to water level)

Time 

Water Level 

Time 

Water Level 

Time 

Water Level 

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials and information reported above are true to my best knowledge and belief.

NAME: B+ C Well Drilling

Address: B+ C Well Drilling

License No. 028

Contractor's Name:

B+ C Well Drilling

License No. 028

(USE ADDITIONAL SHEETS IF NECESSARY)
WATER WELL REPORT
STATE OF WASHINGTON

(1) OWNER: Name: Charles Ludwig Address: 3911 5 Pass RC
(2) LOCATION OF WELL: County: Whatcom
(2a) STREET ADDRESS OF WELL (or nearest address): 58 80th St, 27, 40 N, R. 4 E

(3) PROPOSED USE: Domestic [X] Irrigation [ ] Industrial [ ] Municipal [ ] Other [ ]

(4) TYPE OF WORK: Owner's number of well (if more than one)
- Abandoned [ ] New well [X]
- Deepened [ ] Recycled [ ]
- Rotated [ ]

(5) DIMENSIONS:
- Diameter of well: 6 inches
- Drilled: 84 ft., Depth of completed well: 84 ft.

(6) CONSTRUCTION DETAILS:
- Casing installed: 6 in. Diam. from 81 ft. to 79 ft.
- Welded [ ]
- Liner installed [ ]

- Perforations: Yes [X] No [ ]
- Type of perforator used:
- Size of perforations:

- Surface seal: Yes [X] No [ ] To what depth? 12 ft.
- Material used in seal:

- Did any strata contain unusable water? Yes [ ] No [X]
- Depth of strata:

(7) PUMP: Manufacturer's Name:
- Type:

(8) WATER LEVELS:
- Land-surface elevation above mean sea level:
- Static level:
- Head of water:
- Areal pressure:
- Artesian water is controlled by (Cap, valve, etc.): (Cap, valve, etc.)

(9) WELL TESTS:
- Drawdown is equal water level lowered below static level
- Was a pump test made? Yes [X] No [ ]
- Yield: _______ gal/min. with _______ ft. drawdown after _______ hrs.

- Recovery data (Time taken as zero when pump turned off) (water level measured from well top to water level)

- Water Level: _______

- Time: _______

- Water Level: _______

- Time: _______

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION
- Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravel</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Brown Clay Gravel</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>Gray Clay Gravel</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>Gravel Clay</td>
<td>60</td>
<td>68</td>
</tr>
<tr>
<td>Gray Clay</td>
<td>68</td>
<td>70</td>
</tr>
<tr>
<td>Gravel Clay/ Mud Sand</td>
<td>79</td>
<td>83</td>
</tr>
<tr>
<td>Gravel Clay</td>
<td>83</td>
<td>84</td>
</tr>
</tbody>
</table>

RECEIVED
OCT 14 1992
DEPT. OF ECOLOGY

WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME: B & C WELL DRILLING

ADDRESS: 908 Selly LN

LICENSE NO: 2085

CONTRACTOR'S REGISTRATION NO: 9305

DATE: 9/30/92

(USE ADDITIONAL SHEETS IF NECESSARY)
WATER WELL REPORT
STATE OF WASHINGTON

(1) OWNER: Name: A. H. COLIER Address: ZEL92 KENDEL RD.
County: WHATCOM

(2) LOCATION OF WELL: Bearing and distance from section or subdivision corner:

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)... 2
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS:
Diameter of well _____ Inches.
Drilled... 20 ft. Depth of completed well... 20 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: "Diam. from... ft. to... ft."
Threaded ☐ "Diam. from... ft. to... ft."
Welded ☒ "Diam. from... 0 ft. to... 3 ft."

Perforations:
Type of perforator used...
SIZE of perforations... In. by...
perforations from...
perforations from...
perforations from...

Screens:
Yes ☒ No ☐ Manufacturer's Name:
Type...
Model No...
Diam. Slot size...
Diam. Slot size...

Gravel packed:
Yes ☒ No ☐ Size of gravel...
Gravel placed from...

Surface seal:
Yes ☒ No ☐ To what depth?... 18 ft.
Material used in seal...

Did any strata contain unsuitable water? Yes ☐ No ☒
Type of water...
Depth of strata...
Method of sealing strata off...

(7) PUMP:
Manufacturer's Name:
Type:
HP:

(8) WATER LEVELS:
Land-surface elevation above mean sea level...
Static level...
Artesian pressure...
Artesian water is controlled by...

(9) WELL TESTS:
Drawdown is amount water level is lowered below static level.
Was a pump test made? Yes ☒ No ☐ If yes, by whom?...
Yield: gal/min. with... ft. drawdown after... hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level):
Time Water Level Time Water Level Time Water Level

Date of test...
Bailer test... gal/min. with... ft. drawdown after... hrs.
Artesian flow...
gpm. Date...

Temperature of water...

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL FROM TO
GRavel 0 20
COMPACT SAND & GRAVEL 20 30
WATER AT 22
COARSE GRAVEL (1/2) 22 30

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME: WELCOME DRILLING CO.
(Person, firm, or corporation) (Type or print)
Address: 5985 MOSQUITO LK R.D. DEMING WA
(Signed) [ ] [ ]
[ ] [ ]
[ ] [ ]
(Well Driller)
License No...
Date... 12-24-79

(USE ADDITIONAL SHEETS IF NECESSARY)
WATER WELL REPORT

STATE OF WASHINGTON

(1) OWNER: Fatty Hooper
Address: 3801 S Pass

(2) LOCATION OF WELL: County Whidbey
NE 1/4, NW 1/4 Sec 34 T 40 N R 7 W

(3) TAX PARCEL NO:

(4) TYPE OF WORK:
Owner's number of well (if more than one):
- New Well
- Deepened
- Reconditioned
- Decommission
- Jettied
- Other

(5) DIMENSIONS:
- Diameter of well, 3.6 inches
- Depth of completed well, 48 ft

(6) CONSTRUCTION DETAILS:
- Casing Installed: Welded, 36 ft, Diameter from 10 ft to 48 ft
- Screened: Yes
- Material placed from
- Gravel/Filter packed: Yes
- Material used in seal: 80 ft
- Riser:
- Surface seal:
- Perforations: Unknown
- 2 perforations from 4 ft to 6 ft

(7) PUMP:
- Manufacturer's Name:
- Type: HP

(8) WATER LEVELS:
- Land-surface elevation above mean sea level:
  Statlev, 42 ft below top of well, Date 2/13/01
- Artesian pressure:
  lbs per square inch, Date

(9) WELL TESTS:
- Drawdown is amount water level is lowered below base level
- Was a pump test made? Yes No
- Yield:
  gpm with gpm, drawdown after 1 hr
  gpm with gpm, drawdown after 1 hr
  gpm with gpm, drawdown after 1 hr
- Recovery data: time taken as zero when pump turned off (water level measured from well top to water level)
  Time Water Level Time Water Level Time Water Level
  Date
- Date of test
- Bailer test:
  gpm, drawdown after hrs.
- Artest:
  gpm, drawdown after hrs.
- Artesian flow, gpm, Date

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION:
- Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change in formation. Indicate all water encountered:
  MATERIAL FROM TO

WELL CONSTRUCTION CERTIFICATION:
- I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.
- Type of Print Name: Cotel
- License No: 6053
- (Licensed Driller/Engineer)
- Trammel Name: Kelly Rollison
- License No: 6085
- (Licensed Driller/Engineer)
- Address: 3801 S Pass
- Contractor's Registration No: 116077K
- Date: 2/13/01

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (360) 407-6600. The TDD number is (360) 407-6006.
WATER WELL PERMIT
STATE OF WASHINGTON
WA 054026

Owner: St. Innocent Church
Address: PO Box 2031, Ferndale, WA 98248

Location of Well: County: Whatcom
Street Address: Goodwin Rd

Proposed Use: Domestic

Type of Work: New Well

Method: ROTARY

Diameter: 6 inches
Depth of completed well: 57 ft.

Construction Details:
Casing installed: 6 ft. from 42 ft. to 33 ft.

WELDED: Dia. from ft. to ft.
Dia. from ft. to ft.
Dia. from ft. to ft.

Perforations: NO
Type of perforator used

Size of perforations: in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screen: YES
Manufacturer's Name: Johnson
Type of Stainless Steel: Model No.
Dia. 6 slot size 20 from 32 ft. to 37 ft.
Dia. slot size from ft. to ft.

Gravel packed: NO
Size of gravel packed:
Gravel placed from ft. to ft.

Surface Seal: YES
To what depth? 18 ft.
Material used in seal: Bentonite
Did strata contain unusable water? NO
Type of Water: Depth of strata: ft.
Method of sealing strata off

Pump: Manufacturer's Name: Arendt
Type Submersible: H.P. 3/4

Water Levels:
Land-surface elevation:
Static level: 13.85 ft. below top of well
Artesian Pressure: lbs. per square inch
Artesian water controlled by

Test: Drawdown is amount water level is lowered below
Static level

Was a pump test made? YES If yes, by whom: Barrett Purcell
Yield: 31 gal./min with 1.1 ft. drawdown after 4 hrs.

Recovery Data:
Time Water Level Time Water Level Time Water Level
10 14.00 .20 13.11 .30 13.11

Date of test: Bailer test 20 gal./min 2 ft. drawdown after 1 hrs.
Air test gal./min. w' stem set at ft. for hrs.
Artesian flow g.p.m.
Temperature of water: °F

Chemical Analysis: YES

Well Log:

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MAR 2 1 1995
REC'D FOR EVALUAT

APR 1 2 1995
DEPT. OF ECOLOGY

WELL CONSTRUCTION CERTIFICATION:
I, [Name], accept responsibility for construction of this well and its compliance with all
Washington well construction standards. Materials used and statements made in this report are true to my
knowledge and belief.

Name: Hayes Drilling, Inc.
Address: 555 E. Skagit Rd., Bellingham, WA

SIGNED: [Signature]
License No: 1825

Contractor's Registration No: HAYESDI06105
Date: 07/03/95

4312
WATER WELL REPORT
STATE OF WASHINGTON

(1) OWNER: Everett Gimmaka
Address: 7431 Goodwin Rd., Everson

(2) LOCATION OF WELL: County: Whatcom
Sec. 33, T. 46 N., R. 4 E., W.M.

(3) PROPOSED USE: Domestic [ ] Industrial [ ] Municipal [ ]
Irrigation [ ] Test Well [ ] Other [ ]

(4) TYPE OF WORK: Owner's number of well
(if more than one) ____________________
New well [ ] Method: Drilled [ ] Bored [ ]
Deepened [ ] from __ ft. to __ ft.
Reconditioned [ ] Rotary [ ] Jetted [ ]

(5) DIMENSIONS:
Diameter of well __ ft. Depth of completed well __ ft.
Drilled __ ft.

(6) CONSTRUCTION DETAILS:
Casing installed: __ ft. from __ ft. to __ ft.
Threaded [ ] __ ft.
Welded [ ] __ ft.

Perforations: Yes [ ] No [ ]
Type of perforator used ____________________
Size of perforations __ in.
Perforations from __ ft. to __ ft.
Perforations from __ ft. to __ ft.
Perforations from __ ft. to __ ft.

Screens: Yes [ ] No [ ]
Manufacturer's Name: Johnson
Type: Stainless Steel Model No. __
Diam. __ ft. Slot size __ ft. from __ ft. to __ ft.
Diam. __ ft. Slot size __ ft. from __ ft. to __ ft.

Gravel packed: Yes [ ] No [ ]
Size of gravel __ ft.
Gravel placed from __ ft. to __ ft.

Surface seal: Yes [ ] No [ ]
To what depth __ ft.
Material used in seal: Puddling Clay
Did any strata contain unsuitable water? Yes [ ] No [ ]
Type of water: __
Depth of strata: __
Method of sealing strata off: __

(7) PUMP: Manufacturer's Name: __
Type: __

(8) WATER LEVELS:
Static level __ ft. below top of well Date: __
Artesian level __ ft. per square inch Date: __
Artesian water is controlled by: __

(Cap, valve, etc.)

(9) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [ ] No [ ]
If yes, by whom? ____________________
Yield: gal/min. with __ ft. drawdown after __ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

<table>
<thead>
<tr>
<th>Time</th>
<th>Water Level</th>
<th>Water Level</th>
<th>Time</th>
<th>Water Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Date of test: __
Butter test __ gal/min. with __ ft. drawdown after __ hrs.
Artesian flow: __ g.p.m. Date: __
Temperature of water: __
Was a chemical analysis made? Yes [ ] No [ ]

(USE ADDITIONAL SHEETS IF NECESSARY)

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME: Hayes Well Drilling & Pumps, Inc.
Address: 1413 Colony Rd., Bow

(Signed) ____________________
(Well Driller)

License No.: 762 Date: 5/20, 1987
WATER WELL REPORT
STATE OF WASHINGTON

(1) OWNER: Mr. Jack Dowling
Address: 7369 Goodwin Rd., Everson

(2) LOCATION OF WELL: Whatcom

(3) PROPOSED USE: Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ]

(4) TYPE OF WORK: New well [X] Method: Drilled [ ] Bored [ ]

(5) DIMENSIONS: Diameter of well: 6 inches.
Depth of completed well: 62 feet.

(6) CONSTRUCTION DETAILS:
Casing installed: 6" Dia. from top to 57" ft.
Threaded [ ] Welded [X] Dia. from to ft.

Perforations:
Type of perforator used: [ ] No.

Screws: Yes [X] No [ ] Manufacturer's Name: Johnson
Type: Stainless Steel Model No: Dia: 5 ft. Slot size: 20 ft. from to ft.

Gravel packed: Yes [X] No [ ] Size of gravel: [ ]

Screened: Yes [X] No [ ] To what depth: 18 ft.
Material used in well: Bentonite clay

Did any strata contain unusable water? Yes [X] No [ ]

Type of water: [ ] Depth of strata: [ ]

Method of sealing strata off: [ ]

(7) PUMP: Manufacturer's Name: Goulds
Type: Submersible HP: 1/2

(8) WATER LEVELS:
Static level: 23'-3" ft. below top of well Date: 4/23/66
Artesian pressure: [ ] lbs. per square inch Date: [ ]

Artesian water is controlled by: [ ]
(Cap, valve, etc.)

(9) WELL TESTS:
Drawdown at amount water level is lowered below static level
Was a pump test made? Yes [X] No [ ] If yes, by whom? Driller
Yield: 19 gal/min with [ ] 8 ft. drawdown after 3 hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)
Time Water Level Time Water Level Time Water Level

Date of test: 9/2/66

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME: Livermore & Son, Inc.
Address: 6053 Portalway Ferndale

[ ]
(Signed) [ ] (Well Driller)

License No.: 272 Date: 9/2/66

(USE ADDITIONAL SHEETS IF NECESSARY)
WATER WELL REPORT
STATE OF WASHINGTON

(1) OWNER: Mt. Baker Mushroom Farm
Address: Coodvin Rd.
Evenson

(2) LOCATION OF WELL: County Whatcom
Township: NW 1/4 SW 1/4 Sec. 34
Range: T. 40N, R. 6E, W. M.

(3) PROPOSED USE: Domestic ☐ Industrial ☒ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one). New well ☐ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well: 6 inches
Drilled: 57 ft. Depth of completed well: 57 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6' Diam. from +3 ft. to 52.5 ft.
Threaded ☐ Diam. from ☐ ft. to ☐ ft.
Welded ☒ Diam. from ☐ ft. to ☐ ft.

Perforations: Yes ☒ No ☐
Type of perforator used: ☐
Size of perforations: ☐ in. by ☐ in.
perforations from ☐ ft. to ☐ ft.
perforations from ☐ ft. to ☐ ft.
perforations from ☐ ft. to ☐ ft.

Screens: Yes ☒ No ☐
Johnson Stainless Steel
Manufacturer's Name: ☐
Type: 6' Diam. Slot size: 3/8' from 52 ft. to 57 ft.
Diam. Slot size: ☐ from ☐ ft. to ☐ ft.

Gravel packed: Yes ☒ No ☐
Size of gravel: ☐
Gravel placed from ☐ ft. to ☐ ft.

Surface seal: Yes ☒ No ☐
To what depth: ☐ ft.
Material used in seal: ☐
Method: ☐
Did any strata contain unusable water? Yes ☐ No ☒
Type of water: ☐
Depth of strata: ☐
Method of sealing strata off: ☐

(7) PUMP: Manufacturer's Name: ☐
Type: ☐
H.P.: ☐

(8) WATER LEVELS: Land-surface elevation above mean sea level: 29.5 ft.
Static level: 29.5 ft. below top of well Date 7/24/86.
Artesian pressure: lbs. per square inch Date ☐
Artesian water is controlled by: (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐
If yes, by whom? S. Gilbert
Yield: 10 gal./min. with 2 ft. drawdown after ½ hr.

Recovery data (time taken as zero when pump turned off) (water level measured from top to water level)
Time Water Level Time Water Level Time Water Level

Date of test: ☐
Water sent: ☐ gal./min. with ☐ ft. drawdown after ☐ hrs.
Artesian flow: ☐ g.p.m. Date: ☐
Temperature of water: ☐ Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and shape thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topsoil</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Brown clay</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Dry sand &amp; gravel</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>Sand, gravel, &amp; seepage</td>
<td>22</td>
<td>27</td>
</tr>
<tr>
<td>Brown clay &amp; gravel</td>
<td>27</td>
<td>32</td>
</tr>
<tr>
<td>Brown sand &amp; clay</td>
<td>27</td>
<td>32</td>
</tr>
<tr>
<td>Sand, gravel, &amp; water</td>
<td>32</td>
<td>32</td>
</tr>
</tbody>
</table>

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME: Hayes Well Drilling & Pumps, Inc.
(Person, firm, or corporation) (Type or print)
Address: 1413 Colony Rd.
Bow
(Signed) Steve Gilbert (Well Driller)
License No. 762 Date XX 6/15 1987

(USE ADDITIONAL SHEETS IF NECESSARY)
WATER WELL REPORT

STATE OF WASHINGTON

OWNER: MR. BAKERS MUSHROOM FARM
Address: GOODWIN RD

LOCATION OF WELL: County: WHATCOM
SW 1/4 NW 1/4 Sec 24 T 34 N, R 56 E, W.M.

STREET ADDRESS OF WELL (or nearest address):

PROPOSED USE: Domestic [ ]  Irrigation [ ]  Industrial [ ]  Municipal [ ]

TYPE OF WORK: Owner's number of well [ ]  New well [ ]
Abandoned [ ]  DeWater [ ]  Method: Dug [ ]  Cable [ ]  Bored [ ]
Reconditioned [ ]  Driven [ ]  Rotary [ ]  Jetted [ ]

DIMENSIONS: Diameter of well: 6 inches.
Drilled: _______ feet. Depth of completed well: _______ ft.

CONSTRUCTION DETAILS:

Casing Installed: 6 ft. Diam. from _______ ft. to _______ ft.
Welded: _______ ft. Diam. from _______ ft. to _______ ft.
Liner Installed: _______ ft. Diam. from _______ ft. to _______ ft.
Pervatorations: Yes [ ]  No [ ]
Type of perforator used: __________
SIZE of perforations: _______ in. by _______ in.
Perforations from _______ ft. to _______ ft.
Perforations from _______ ft. to _______ ft.
Perforations from _______ ft. to _______ ft.
Screen: Yes [ ]  No [ ]
Manufacturer's Name: __________
Type: __________  Model No: __________
Diam. _______ Slot size: _______ ft. to _______ ft.
Diam. _______ Slot size: _______ ft. to _______ ft.
Gravel packed: Yes [ ]  No [ ]  Size of gravel: _______
Gravel placed from _______ ft. to _______ ft.
Surface seal: Yes [ ]  No [ ]  To what depth? _______ ft.
Material used in seal: __________
Did any strata contain unsafe water? Yes [ ]  No [ ]
Type of water? _______ Depth of strata: _______
Method of sealing strata off: __________

PUMP: Manufacturer's Name: __________
Type: __________  H.P. _______

WATER LEVELS:

Land-surface elevation: _______ ft. above mean sea level: _______ ft.
Static level: _______ ft. below top of well: _______ ft.
Artesian pressure: _______ lbs. per square inch: _______
Artesian water is controlled by: __________

WELL TESTS:

Pump test made? Yes [ ]  No [ ]  If yes, by whom?
Yield: _______ gal./min. with _______ ft. drawdown after _______ hrs.
Recovery date (time taken as zero when pump turned off) (water level measured from well top to water level)
Time: _______ Water Level: _______ Time: _______ Water Level: _______
Time: _______ Water Level: _______ Time: _______ Water Level: _______

Date of test: __________
Beiler test: _______ gal./min. with _______ ft. drawdown after _______ hrs.
Air test: _______ gal./min. with _______ ft. for _______ hrs.
Artesian flow: _______ g.p.m. Date: _______
Temperature of water: _______
Was a chemical analysis made? Yes [ ]  No [ ]

RECEIVED
MAY 10, 1981
DEPT. OF ECOLOGY

WELL CONSTRUCTOR CERTIFICATION:

I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME: (PERSON, FIRM, OR CORPORATION) __________
Address: __________  Belling WA 98226
(Sign) __________  License No: 0085
Contractor's Reg. No. __________  Date: _______

(USE ADDITIONAL SHEETS IF NECESSARY)
WATER WELL REPORT

Construction/Decommission ("x" in circle)

Notice of Intent Number

PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐
DeWater ☐ Irrigation ☐ Test Well ☐ Other ☐

TYPE OF WORK: Owner's number of well (if more than one) ☐
New well ☐ Reconditioned ☐ Method: ☐ Deg ☐ Bored ☐ Driven ☐
Depressed ☐ Cased ☐ Rotary ☐ Jetted ☐

DIMENSIONS: Diameter of well: ☐ 6" Drilled: ☐ 62 ft. 
Depth of completed well: ☐ 666 ft.

CONSTRUCTION DETAILS

Casing: ☐ 6" Diameter: 6" Diem. from 62 ft. to 67 ft.
Installed: ☐ Liner installed: "Diam. from ___ ft. to ___ ft.
☐ Threaded: "Diam. from ___ ft. to ___ ft.

Perforations: ☐ Yes ☐ No

Type of perforation used: __________

Size of perforations: in. by in. and num. of perforations per ft. from ___ ft. to ___ ft.

Screen: ☐ Yes ☐ No ☐ K-Vac Location: SS

Manufacturer's Name: JOHNSON

Type: SS ☐ Model No. __________

Diam. 6½ in. 60 ft. from 67 ft. to 62 ft.

Gravel/Filter packed: ☐ Yes ☐ No Size of gravel/sand: __________

Materials placed from ___ ft. to ___ ft.

Surface Seal: ☐ Yes ☐ No To what depth? 16 ft.

Material used in seal: BENTONITE

Did any strain cause unsuitable water? ☐ Yes ☐ No

Type of water: __________

Depth of strain: __________

Method of sealing strain off: __________

PUMP: Manufacturer's Name: __________

Type: __________

WATER LEVELS: Land-surface elevation above mean sea level: __________

Static level: __________ below top of well: __________ Date: __________

Artesian pressure: __________ lbs. per square inch. Date: __________

Artesian water is controlled by: __________ (capi, valve, etc.)

WELL TESTS: Drawdowns is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☐ No If yes, by whom? __________

Yield: __________ gph/min. with __________ ft. drawdown after __________ hrs.

Yield: __________ gph/min. with __________ ft. drawdown after __________ hrs.

Yield: __________ gph/min. with __________ ft. drawdown after __________ hrs.

Recovery date (time taken as zero when pump turned off) (water level measured from well top to water level)

Time | Water Level
-----|------------
     |            |
     |            |
     |            |
     |            |
     |            |

Date of test: __________

Dissolved test: __________ gph/min. with __________ ft. drawdown after __________ hrs.

Airnet: __________ gph/min. with __________ ft. drawdown after __________ hrs.

Artesian flow: __________ p.m. Date: __________

Temperature of water: __________ Was a chemical analysis made? ☐ Yes ☐ No

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Driller ☐ Engineer ☐ Trainee Name (w/s) BRYAN VAN WEERDUIZEN

Driller/Engineer/Trainee Signature __________

Driller or trainee License No. 3029

If TRAINEE: Driller's License No. __________

Driller's Signature: __________

Drilling Company: B&C WELL DRILLING AND PUMP SERVICES, INC.

Address: 883 KELLY RD.
City, State, Zip: BELLINGHAM, WA, 98226
Contractor's Registration No.: B&CWLDP4765 Date: 07/12/2012

SCS 050-120 (Rev 06/10) If you need this document in an alternate format please call the Water Resources Program at 360-407-5672.
Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.
WATER WELL REPORT
STATE OF WASHINGTON

(1) OWNER: Name: Scott Smith  Address: 5508 NE, 4th Ave, Evanston

(2) LOCATION OF WELL: County: Whatcom  NE, Sec. 3, T. 39 N., R. 46 E.

(3) PROPOSED USE: Domestic O  Industrial O  Municipal O  Irrigation O  Test Well O  Other O

(4) TYPE OF WORK: Owner's number of well (if more than one)...

New well O  Method: Drilled O  Bored O
Deepened O  Cable O  Driven O
Reconditioned O  Rotary O  Jetted O

(5) DIMENSIONS: Diameter of well... inches.  Drilled... ft. Depth of completed well... ft.

(6) CONSTRUCTION DETAILS:
Casing installed:  " Diameter from... ft. to... ft.
Threaded O  " Diameter from... ft. to... ft.
Welded O  " Diameter from... ft. to... ft.

Perforations: Yes O  No O
Type of perforator used
SIZE of perforations... in. by... in.
perforations from... ft. to... ft.
perforations from... ft. to... ft.
perforations from... ft. to... ft.

Screen:  Yes O  No O
Manufacturer's Name...
Type...
Model No...
Diam. Slot size from... ft. to... ft.
Diam. Slot size from... ft. to... ft.

Gravel packed: Yes O  No O  Size of gravel...
Gravel placed from... ft. to... ft.

Surface seal: Yes O  No O  To what depth... ft.
Material used in seal:
Did any strata contain unusable water? Yes O  No O
Type of water...
Depth of strata...
Method of sealing strata off...

(7) PUMP: Manufacturer's Name...
Type...
HP...

(8) WATER LEVELS: Land-surface elevation above mean sea level...
ft.
Artesian pressure...
In. per square inch
Date...
Artesian water is controlled by...
(Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes O  No O  If yes, by whom?
Yield...
gal/min. with... ft. drawdown after... hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time...
Water Level...
Time...
Water Level...

Date of test...
Bailier test...
gal/min. with... ft. drawdown after... hrs.
Artesian flow...
gpm. Date...
Temperature of water...
Was a chemical analysis made? Yes O  No O

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and phone thickness of cements and the kind and nature of the material in each strata penetrated, with at least one entry for each change of formation.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown Clay Washed</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>Blue Clay Washed</td>
<td>40</td>
<td>65</td>
</tr>
<tr>
<td>Gravel Washed</td>
<td>65</td>
<td>67</td>
</tr>
</tbody>
</table>

AUG 1, 1980

Work started... 1-14  Completed... 1-18  1980

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME: B. C. WELL DRILLING INC.
(Person, firm, or corporation) (Type or print)
Address: 588 8 E 114th St, Bellingham
(Signed) Brian Shawfield (Well Driller)
License No. 938 Date... 1-18  1980

(USE ADDITIONAL SHEETS IF NECESSARY)
WATER WELL REPORT
STATE OF WASHINGTON

(1) OWNER: Dan Kien
Address: 8780 Gilmore

(2) LOCATION OF WELL: County: Whatcom
Well No: NE 1/4 Sec 3, T. 39 N., R. 4 E.

(2a) STREET ADDRESS OF WELL (or nearest address):

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)
Abandoned ☐ New well ☐ Method: Dig ☐ Bored ☐ Drilled ☐ Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well: 8 inches Dredged: 75 feet
Depth of completed well: 75 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed: Yes ☐ No ☐ Diameter from: 2 ft. to 75 ft.
Welded: Yes ☐ No ☐ Depth: 6 in.
Liner Installed: Yes ☐ No ☐ Type of liner:
Threaded: Yes ☐ No ☐ Size of liner:
Perforations: Yes ☐ No ☐ Depth of liner:
Type of perforator used:
SIZE of perforations:
perforations from:
Perforations from:
Perforations from:

Screens: Yes ☐ No ☐
Manufacturer's Name:
Type:
Model No.:
Diam.:
Slot size:
from:
to:
Diam.:
Slot size:
from:
to:

Gravel packed: Yes ☐ No ☐ Size of gravel:
Gravel placed from:
to:

Surface seal: Yes ☐ No ☐ To what depth?:
Material used:
Did any strata contain unusable water?: Yes ☐ No ☐
Type of water:
Depth of strata:
Method of sealing strata off:

(7) PUMP: Manufacturer's Name:
Type:
H.P.:

(8) WATER LEVELS: Land surface elevation above mean sea level:
Static level:
Areal pressure:
Artesian water is controlled by:

(9) WELL TESTS: Drawdown is amount water level is lowered below static level:
Was a pump test made?: Yes ☐ No ☐ If yes, by whom:
Yield:
gal./min. with ft. drawn down after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level):
Time:
Water Level:
Time:
Water Level:
Time:
Water Level:

Date of test:
Boiler test:
gal./min. with ft. drawn down after hrs.
Airtest:
gal./min. with stem set at ft. for hrs.
Artesian flow:
g.p.m. Date
Temperature of water:

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION:
Formation: Describe by color, character, size of material and structure, and show thicknesses of aquifers and the kind and nature of the materials in each stratum penetrated, with at least one entry for each change of information.
MATERIAL:
From:
To:

RECEIVED
SEP 20 1993
DEPT. OF ECOLOGY

The Department of Ecology does NOT WARRANT the Data and/or the Information on this Well Report.

WELL CONSTRUCTOR CERTIFICATION:
I, ____________________________, do hereby certify that I have constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to the best knowledge and belief.

NAME: ____________________________
Address: ____________________________
(Signed) ____________________________
(WELL READER) License No. 0095

(USE ADDITIONAL SHEETS IF NECESSARY)
WATER WELL REPORT

Proposed Use: ☑ Domestic ☐ Industrial ☐ Municipal
☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other

Type of Work: Owner's number of well (if more than one)
☐ New Well ☑ Reconditioned
Method: ☑ Drilled ☐ Bored ☐ Rotary Jettied
Depth: ☑ Casing ☐ Liner installed
Perforations: ☑ Yes ☐ No
Type of perforation used:

Size of perforations: □ Yes ☐ No
□ by □ No. of perf. from ft. to ft.

Screens: □ Yes ☐ No
☑ K-Fac Location:
Manufacturer's Name:
Type: Model No.:
Diam. Slot Size from ft. to ft.
Diam. Slot Size from ft. to ft.

Gravel/Filter pack: □ Yes ☐ No
□ Size of gravel/sand from ft. to ft.

Materials placed from ft. to ft.

Surface Seal: □ Yes ☐ No
□ To what depth? ft.

Materials used in seal

Did any strata contain unsalable water? □ Yes ☐ No

Type of water? □ Depth of strata

Method of sealing strata off:

Pump: Manufacturer's Name:
Type: H.P.:

Water Levels: Land-surface elevation above mean sea level ft.
Static level ft. below top of well Date: 3/24/03
Artesian pressure lbs. per square inch Date:
Artesian water is controlled by:

Cap, valve, etc.

Well Tests: Drawdown is amount water level is lowered below static level.

Was a pump test made? □ Yes ☐ No
□ If yes, by whom?

Yield gal/min. with ft. drawdown after hrs.

Yield gal/min. with ft. drawdown after hrs.

Yield gal/min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time Water Level Time Water Level Time Water Level

Date of test:

Water test: gal/min. with ft. drawdown after hrs.

Artesian flow gpm. Date:

Temperature of water Was a chemical analysis made? □ Yes ☐ No

Received:

APR 04 2003

DEPT OF ECOLOGY

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to the best knowledge and belief.

Driller ☑ Engineer ☑ Trainee Name (Corp):
Driller/Engineer/Trainee Signature:
Driller or Trainee License No.:

If trainee, licensed driller's
Signature and License no.

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

CURRENT
Notice of Intent No. 39-4E 3D
Unique Ecology Well ID Tag No. AHP 135
Water Right Permit No.

Property Owner Name:
Bob Ruhl

Well Street Address:
3815 6th Ave

City:_adapter naïf: County: Adapter naïf Location:
Mead 14 Sec 14 WWM

Lat/Long:
Lat Deg ——— Lat Min/Sec
Long Deg ——— Long Min/Sec

Tax Parcel No.: 390403185380

CONSTRUCTION OR DECOMMISSION PROCEDURE:
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

(USE ADDITIONAL SHEETS IF NECESSARY.)

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topsoil</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Brown Clay</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Gray Clay</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>Gray Sand</td>
<td>20</td>
<td>23</td>
</tr>
<tr>
<td>Gray Clay</td>
<td>23</td>
<td>32</td>
</tr>
<tr>
<td>Gray Clay</td>
<td>32</td>
<td>36</td>
</tr>
<tr>
<td>Gray Clay</td>
<td>36</td>
<td>42</td>
</tr>
</tbody>
</table>

RECEIVED

APR 04 2003

DEPT OF ECOLOGY

Drilling Company:

Address:

City, State, Zip:

Contractor's Registration:

Ecology is an Equal Opportunity Employer. ECO 350-1-20 (Rev 4.01)
**WATER WELL REPORT**

**Construction/Decommission (X in circle)** 134069

**Proposed Use:**
- [ ] Domestic
- [X] Industrial
- [ ] Municipal
- [ ] DeWater
- [ ] Irrigation
- [ ] Test Well
- [ ] Other

**Type of Work:**
- [ ] New Well
- [ ] Reconditioned
- [ ] Method
- [ ] Drilled
- [ ] Bored
- [ ] Driven
- [ ] Reamed
- [ ] Deepened
- [ ] Cased
- [ ] Rotary
- [ ] Jetted

**Dimensions:**
- Diameter of well: 6 inches drilled: 38 ft
- Depth of completed well: 24 ft

**Construction Details:**
- Casing: [ ] Welded
- Diameter: 6 in
- Length: 11.5 ft
- Installed: [ ] Lined
- Diameter: 6 in
- Length: 11.5 ft
- Perforations: [ ] Yes
- No

**Size of perforation (in mm) x (in m) x (in ft):**

**Screen:**
- [ ] Yes
- [X] No
- K-Type: 10.5
- Location: 18.5

**Manufacturer's Name:**
- Cook

**Type:** 5

**Slot Size:** 0.05

**Diameter from:** 14.5 ft to 24.5 ft

**Gravel/Filter packed:**
- [ ] Yes
- [X] No
- Size of gravel/sand:

**Materials placed from:** 14.5 ft to 24.5 ft

**Surface Seal:**
- [ ] Yes
- [X] No
- To what depth:

**Materials used in seal:**

**Did any strata contain unusable water?**
- [ ] Yes
- [X] No

**Type of water:**

**Method of sealing strata off:**

**PUMP:**
- Manufacturer's Name:
- Type:
- HP:

**Water Levels:**
- Land-surface elevation above mean sea level: 17 ft
- Date: 7/28/03
- Artesian pressure, lbs per square inch:
- Date:
- Artesian water is controlled by:

**Well Tests:**
- Drawdown is amount water level is lowered below state level
- Was a pump test made? [ ] Yes
- [X] No
- If yes, by whom?
- Yield gal/min with ft. drawdown after hrs
- Yield gal/min with ft. drawdown after hrs
- Yield gal/min with ft. drawdown after hrs
- Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

**Date of Test:**
- Date:
- Time
- Water Level
- Time
- Water Level
- Time
- Water Level

**Driller or Trusee License No.:** 0005

**Receiving Date:**
- AUG 1 2003

**Receipt DEPT OF ECOLOGY**

**WELL CONSTRUCTION CERTIFICATION:** I have constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to the best of my knowledge and belief.

Driller [ ] Engineer [ ] Trusee Name (Print):

Driller/Engineer/Trusee Address:

Driller or Trusee License No.:

Signature and License No.:

**Drilling Company:**

Address:

City, State, Zip:

Contraction:

Registration Date:

Ecology is an Equal Opportunity Employer ECO 050-1-20 (Rev 4/01)
**WATER WELL REPORT**

**STATE OF WASHINGTON**

**39-4-3D**

**OWNER:** Barry Zwiers  
**Address:** Goodman Rd. Everson, WA

**COUNTY:** Whatcom  
**Location:** NW, NW, 1/4 Sec 3 T 39 N R 4E W

**STREET ADDRESS OF WELL:**  
**Proposed Use:** Domestic  
**Irrigation**

**TYPE OF WORK:**  
**Abandoned**

**DIMENSIONS:**  
**Diameter of Well:** 6 inches  
**Depth of Completed Well:** 48 feet

**CONSTRUCTION DETAILS:**  
**Casing Installed:**  
**Welded**

**PERFORATIONS:**  
**Type of Perforation used:**

**Screened:**  
**No**

**Gravel packed:**

**Surface Seal:**

**Material used in seal:**

**Did any strata contain unusable water:**

**Type of water:**

**Method of sealing strata off:**

**PUMP:**

**WATER LEVELS:**  
**Static Level:** 37 ft below top of well  
**Artesian Pressure:**

**ARTESIAN WATER IS CONTROLLED BY:**

**WELL TESTS:**  
**Drawdown in amount:**

**Recovery data:**

**Date of Test:**

**WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION:**

**MATERIAL**

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>RED CLAY</td>
<td>0</td>
</tr>
<tr>
<td>FINE RED SAND</td>
<td>16</td>
</tr>
<tr>
<td>CLAY &amp; SAND</td>
<td>19</td>
</tr>
<tr>
<td>GREY SAND</td>
<td>44</td>
</tr>
</tbody>
</table>

**RECEIVED**

**MAY 28, 1996**

**DEPT OF ECOLOGY**

**WELL CONSTRUCTOR CERTIFICATION:**

I, Star Drilling Service, hereby acknowledge the construction of this well and its compliance with all Washington well construction standards. Materials used and the information reported above are true to the best of my knowledge and belief.

**NAME:** Star Drilling Service  
**Address:** 3930 Cliffs Side Dr. B  
**License No.** 0760  
**Contractor's Registration No.:**  
**Date:** 5-25-96

*USE ADDITIONAL SHEETS IF NECESSARY*

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-8600. The TDD number is (206) 407-8606.
**WATER WELL REPORT**

**Notice of Intent No.** WE01213

**Unique Ecology Well ID Tag No.** AHP 190

**Property Owner Name** Paul Capurro

**Well Street Address** 3470 Gilmore

**City** Evans

**County** Alamosa

**Location** W1/4 NW1/4 Sec 3 T39 R4 WWM 1/4

**Tax Parcel No.** 3904030764271

**CONSTRUCTION OR DECOMMISSION PROCEDURE**

**Formation** Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. Indicate all water encountered.

**USE ADDITIONAL SHEETS IF NECESSARY**

**RECEIVED**

**Aug 25 2003**

**DEPT OF ECOLOGY**

---

**MATERIAL**

**FROM** 0 1

**TO** 0 1

---

**Drilling Company** B&C Well Drilling

**Address** 888 Koll

**City, State, Zip** Pueblo, CO 81004

**Registration No.** 895

**Date** 8/4/03

EcoTech is an Equal Opportunity Employer. ECO 050-1-20 (Rev 4/01)
WATER WELL REPORT
STATE OF WASHINGTON

(1) OWNER: Mr. Gary Beaud
Address: 7304 Goodwin Rd., Everett

(2) LOCATION OF WELL: County Whatcom

(3) PROPOSED USE: Domestic [X] Industrial [ ] Municipal [ ]
Irrigation [ ] Test Well [ ] Other [ ]

(4) TYPE OF WORK: New well [X] Method: Dug [ ] Bored [ ]
Deepened [ ] Cable [ ] Driven [ ]
Reconditioned [ ] Rotary [ ] Jetted [ ]

(5) DIMENSIONS: Diameter of well 6" 68 ft. Depth of completed well 68 ft. 59 ft.
Drilled... ft. 62 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 ft. Diam. from ft. to ft.
Threaded [ ] Diam. from ft. to ft.
Welded [X] Diam. from ft. to ft.

Perforations: Yes [ ] No [X]
Type of perforator used [ ]
SIZE of perforations in. by in.
Perforations from ft. to ft.
Perforations from ft. to ft.
Perforations from ft. to ft.

Screen: Yes [X] No [ ]
Manufacturer's Name: Johnson
Type: Stainless Steel
Model No: [ ]
Diam. 2" Slot size 20 ft. 24 ft. 59 ft.
Diam. 2" Slot size 20 ft. 24 ft. 59 ft.

Gravel packed: Yes [X] No [ ]
Size of gravel: [ ]
Gravel placed from ft. to ft.

Surface seal: Yes [X] No [ ]
To what depth: 18 ft.
Material used in seal: Bentonite clay
Did any strata contain unusable water? Yes [ ] No [X]
Type of water: [ ]
Depth of strata: [ ]
Method of sealing strata off: [ ]

(7) PUMP: Manufacturer's Name: Goulds
Type: Submersible HP: 1/2

(8) WATER LEVELS:
Land-surface elevation above mean sea level: 17' 9" ft. below top of well: Date 5/5/86
Artesian pressure: lbs. per square inch Date [ ]
Artesian water is controlled by: [Cap, valve, etc.]

(9) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made Yes [ ] No [ ] By whom: Driller
Yield: gal./min. with ft. 3 ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)
Time Water Level Time Water Level Time Water Level

Date of test [ ]
Boiler test: gal./min. with ft. drawdown after hrs.
Artesian flow: g.p.m. Date [ ]
Temperature of water: °F. Was a chemical analysis made? Yes [ ] No [ ]

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of strata and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top soil</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Hard pan sand &amp; gravel</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Sandy loam</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Sand &amp; gravel</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Sand very fine &amp; muddy</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>Sand fine &amp; WATER</td>
<td>16</td>
<td>59</td>
</tr>
<tr>
<td>Blue clay</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RECEIVED

DEPARTMENT OF ECOLOGY
NORTHWEST REGION

Work started: 6/2/86, Completed 6/5/86, 19

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME: Livermore & Son, Inc.
(Person, firm, or corporation) [ ]
Address: 6053 Porta lever, Ferndale

(Signed) [ ]
(Well Driller)

License No: 272 Date: 6/16/86, 19

(USE ADDITIONAL SHEETS IF NECESSARY)
WATER WELL REPORT
STATE OF WASHINGTON

(1) OWNER: Name: John Holder
Address: 605 E. Main Everson WA 98247

(2) LOCATION OF WELL: County: Whatcom
Township: Sec 34 T 40N R 16E W 2N

(3) PROPOSED USE: Domestic ☐ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner’s number of well
New well ☐ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS:
Diameter of well: 6" inches
Drilled: 61 1/2 ft. Depth of completed well: 61 1/2 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 10" Diam. from 0 ft. to 61 1/2 ft.
Threaded ☐ Welded ☐

Perforations: Yes ☐ No ☐
Type of perforator used: Trench cut
Size of perforations: in. by in.
Perforations from 0 ft. to 10 ft.
Perforations from 10 ft. to 61 1/2 ft.

Screens: Yes ☐ No ☐
Manufacturer’s Name:
Type: Model No:
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☐
Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☐ No ☐
To what depth? 61 1/2 ft.
Material used in seal: MATERIAL FROM: Wellsite
Did any strata contain unusable water? Yes ☐ No ☐
Type of strata:
Depth of strata:
Method of sealing strata off:

(7) PUMP: Manufacturer’s Name:
Type:

(8) WATER LEVELS:
Land-surface elevation: ft. below mean sea level
Static level: 25.8 ft. below top of well Date: 1/17/77
Artesian pressure: lbs. per square inch Date:
Artesian water is: controlled by:
(Cap, valve, etc.)

(9) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Date of test:
Bailer test: gal./min. with ft. drawdown after hrs.
Artesian flow: gpm. Date:
Temperature of water: Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifer or the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandy Clay</td>
<td>25&quot;</td>
<td>61&quot;</td>
</tr>
<tr>
<td>Sandy Clay and Gravel</td>
<td>30&quot;</td>
<td>55&quot;</td>
</tr>
<tr>
<td>Sand and Gravel Waxy Sand</td>
<td>35&quot;</td>
<td>61&quot;</td>
</tr>
<tr>
<td>Sand and Gravel of Water</td>
<td>40&quot;</td>
<td>61&quot;</td>
</tr>
</tbody>
</table>

Work started: 1/13/77 Completed: 1/17/77

WELL DRILLER’S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME: Ralph Medley
Address: 417 N. 87th Seward, WA 98103
(Signed): Ralph Medley
(Well Driller)
License No.: Date: 5/10/77

(USE ADDITIONAL SHEETS IF NECESSARY)
WATER WELL REPORT
STATE OF WASHINGTON

(1) OWNER: Name: Steven Clark
Address: 3675 Massey Rd

(2) LOCATION OF WELL: County: Whatcom

(2a) STREET ADDRESS OF WELL: Same

(3) PROPOSED USE: Domestic

(4) TYPE OF WORK: Owner's number of well

Abandoned □ New well □ Method: Drilled □ Bored □
Deepened □ Reconditioned □ Rotary □ Piled □
Reused □ Jetted □

(5) DIMENSIONS: Diameter of well: 40 inches
Depth of completed well: 40 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 ft. Dia. from 1" 40 ft.

Welded □ Threaded □

Perforations: Yes □ No □
Type of perforator used

(7) PUMP:
Manufacturer's Name
Type

(8) WATER LEVELS:
Static level: 75 ft. below top of well Date: 10-28-98
Artesian pressure: lbs. per square inch

Artesian water is controlled by:

(9) WELL TESTS:

Was a pump test made? Yes □ No □
Yield: 8 gal./min. with 10.5 ft. drawdown after 1 hr.

Recovery date (time taken as zero when pump turned off) (water level measured from well top to water level)

Date of test

Bailer test gal./min with ______ ft. drawdown after ______ hr.

Airtest gal./min. with stem set at ______ ft. for ______ hr.

Aeration flow ______ gpm Date

Temperature of water: ______ Was a chemical analysis made? Yes □ No □

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each strata penetrated, with at least one entry for each change of information.

MATERIAL
FROM
TO

Well Drilled Around 1960
Well Construction Looks

RECEIVED
OCT 28 1998
DEPT OF ECOLOGY

WELL CONSTRUCTOR CERTIFICATION:
I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

NAME: B&D well Drilling & Pump Serv
Address: 888 Kelly Rd

License No: 1357

Contractor's Registration No: BCWEDP094K Date: 10-13-98

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 650-1-20 (9/95) * 11

The Department of Ecology does NOT warrant the Data and/or the Information on this Well Report.
WATER WELL REPORT
STATE OF WASHINGTON

(1) OWNER: Name: H. Bowers
Address: Mary Rd.

(2) LOCATION OF WELL: County: Whidbey
Township: NE ¼ N.E. ¼ Sec. 14
Range: T. 27 N., R. 66 W.M.

(3) PROPOSED USE: Domestic [ ] Industrial [x] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ]

(4) TYPE OF WORK: Owner's number of well
New well [x] Method: Dug [ ] Bored [ ]
Deepened [ ] Cable [ ] Driven [ ]
Reconditioned [ ] Rotary [ ] Jetted [ ]

(5) DIMENSIONS:
Drilled: 44' ft. Depth of completed well: 49' ft.

(6) CONSTRUCTION DETAILS:
Casing installed: Diam. from 4 ft. to 13 ft.
Threaded [ ] Diam. from 8 ft. to 16 ft.
Welded [x] Diam. from 8 ft. to 16 ft.
Perforations: Yes [x] No [ ]
Type of perforator used:
SIZE OF perforations: in. by in.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes [x] No [ ]
Manufacturer: Johnson
Type: [ ]
Model: [ ]
Diam.: Slot size: from ft. to ft.
Diam.: Slot size: from ft. to ft.
Gravel packed: Yes [x] No [ ]
Size of gravel: ft. to ft.
Gravel placed from ft. to ft.
Surface seal: Yes [x] No [ ]
Depth of stratum:
Material used in seal:
Did any stratum contain usable water? Yes [x] No [ ]
Type of water: [ ]
Depth of stratum:
Method of sealing stratum off:

(7) PUMP: Manufacturer:
Type:
HP.

(8) WATER LEVELS:
Static Level: 10 ft. below top of well
Artesian pressure: lbs. per square inch
Artesian water controlled by:
(Cap, valve, etc.)

(9) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? Yes [x] No [ ]
If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)
Time: Water Level: Time: Water Level: Time: Water Level:

Date of test:
Bailer test: gal./min. with ft. drawdown after hrs.
Artesian flow: P.M.
Temperature of water: Was a chemical analysis made? Yes [x] No [ ]

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of strata and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top soil &amp; clay</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Brown, sandy gravel</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sand &amp; gravel</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Blue Clay</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Sandy blue Clay</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>Brown Clay</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>Fine blue sand</td>
<td>17</td>
<td>19</td>
</tr>
<tr>
<td>Terraced gravel</td>
<td>19</td>
<td>21</td>
</tr>
<tr>
<td>Baddey Clay</td>
<td>21</td>
<td>24</td>
</tr>
<tr>
<td>Water &amp; sand gravel</td>
<td>24</td>
<td>42</td>
</tr>
</tbody>
</table>

Work started: 5-20 1980 Completed: 5-21 1980

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Name: W. C. KELLING
Address: 655 KELLY RD, BELLINGHAM
(Signed) P. C. KELLING
License No. 1087 Date: 5-25-1980

(USE ADDITIONAL SHEETS IF NECESSARY)
**WATER WELL REPORT**

**STATE OF WASHINGTON**

**OWNER:** Name: DALE FULLNER  
Address: END OF MAP RD.

**LOCATION OF WELL:** County: WHATCOM

**PROPOSED ADDRESS OF WELL:** SW 1/4 SW 1/4 Sec. 33  
T 60 N., R. 96 W.T.

**STREET ADDRESS OF WELL:**

**TYPE OF WORK:**
- Owner's number of well (if more than one):___________
- New well ___________
- Method: Drill ___________
- Bored ___________
- Deepened ___________
- Conditional ___________
- Dug ___________
- Ponds ___________
- Other ___________

**DIMENSIONS:**
- Diameter of well: 6 inches
- Drilled: 80 feet. Depth of completed well: 76 ft.

**CONSTRUCTION DETAILS:**
- Casing installed: 6 ft. Diameter: 0 ft. to 72 ft.
- Wedge: ___________
- Liner inserted: ___________
- Perforations: Yes ___________
- Type of perforator used: ___________
- SIZE of perforations: ___________
- perfections from ___________ in. to ___________ in.
- perfections from ___________ in. to ___________ in.
- perfections from ___________ in. to ___________ in.
- Screws: Yes ___________
- Manufacturer's Name: COOK
- Type: STEEL STAINLESS STL
- Model No.:
- Diameter: ___________
- Slot size: ___________
- Diameter: ___________
- Slot size: ___________
- Gravel packed: Yes ___________
- Size of gravel: ___________
- Gravel placed from ___________
- Surface seal: Yes ___________
- To what depth? ___________
- Material used: ___________
- Did any strata contain unusable water? Yes ___________
- Type of water: ___________
- Method of sealing strata off: ___________

**PUMP:**
- Manufacturer's Name: ___________
- Type: ___________
- H.P. ___________

**WATER LEVELS:**
- Land surface elevation above mean: ___________
- Water level: ___________
- Artesian pressure: ___________
- Date: ___________
- Artesian water is controlled by: ___________

**WELL TESTS:**
- Drawdown is amount water level is lowered below static level
- Was a pump test made? Yes ___________
- If so, by whom? ___________
- Yield: ___________
- gal./min. with: ___________
- ft. drawdown after: ___________
- Recovery date: time taken as zero when pump turned off
- Time: ___________
- Water Level: ___________
- Time: ___________
- Water Level: ___________

**RECEIVED:**
- FEB 2 1999
- DEPT OF ECOLOGY

**WELL CONSTRUCTOR CERTIFICATION:**
- I do hereby certify that I constructed and/or accept responsibility for construction of the well and its compliance with all Washington well construction standards. Materials used and the information reported are true to my best knowledge and belief.
- NAME: STAR DRILLING SERVICE
- Address: 3730 CLIFFSIDE DR BLHM
- License No: 92-60
- WELL DRILLER: (SIGNED)
- Date: FEB 1-1999

**USE ADDITIONAL SHEETS IF NECESSARY**

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.
WATER WELL REPORT

(1) OWNER: Name: Joe Strunk
Address: 2302 S. 61st Rd., Hesston

(2) LOCATION OF WELL: County: Wichita
Bearing and distance from section or subdivision corner:

(3) PROPOSED USE: Domestic □ Industrial □ Municipal □
Irrigation □ Test Well □ Other □

(4) TYPE OF WORK: Owner’s number of well 1
New well □ Method: Dug □ Bored □ Deepened □ Cased □ Driven □ Reconditioned □ Rotary □ Jetted □

(5) DIMENSIONS:
Diameter of well 6 inches.
Drilled 38 ft. Depth of completed well 37 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: _______ Diam. from _______ ft. to _______ ft.
Threaded □ Welded □ Diam. from _______ ft. to _______ ft.

Perforations: Yes □ No □
Type of perforator used:
SIZE of perforations _______ in. by _______ in.
perforations from _______ ft. to _______ ft.
perforations from _______ ft. to _______ ft.
perforations from _______ ft. to _______ ft.

Screens: Yes □ No □
Manufacturer’s Name: Johnston
Type: Slotted Model No.
Diam. _______ ft. Slot size _______ ft. from _______ ft. to _______ ft.
Diam. _______ ft. Slot size _______ ft. from _______ ft. to _______ ft.

Gravel packed: Yes □ No □ Size of gravel:
Gravel placed from _______ ft. to _______ ft.

Surface seal: Yes □ No □ To what depth: _______ ft.
Material used in seal: Bentonite
Did any strata contain unusable water? Yes □ No □
Type of water: _______ Depth of strata: _______ ft.
Method of sealing strata off:

(7) PUMP: Manufacturer’s Name: Lowell
Type: Jet B.P. 19

(8) WATER LEVELS:
Land-surface elevation above mean sea level: _______ ft.
Static level _______ ft. below top of well Date: 8-12-74
Artesian pressure _______ lbs. per square inch Date: _______ Artesian water is controlled by: _______ (Cap, valve, etc.)

(9) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? Yes □ No □ If yes, by whom:
Yield: _______ gal. min. with _______ ft. drawdown after _______ hr.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)
Time Water Level Time Water Level Time Water Level

Date of test: _______ gal./min. with _______ ft. drawdown after _______ hrs.
Artesian flow: _______ g.p.m. Date: _______
Temperature of water: _______ Was a chemical analysis made? Yes □ No □

(10) WELL LOG:
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>FROM</th>
<th>TO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Cemented gravel</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>Red clay &amp; sand</td>
<td>19</td>
<td>35</td>
</tr>
<tr>
<td>Loose fine gravel</td>
<td>35</td>
<td>58</td>
</tr>
</tbody>
</table>

Work started: July 18, 1974. Completed: July 20, 1974

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME: B & C WELL DRILLING, INC.
(Person, firm, or corporation) Type or print)
Address: 1210 E. Kelly Rd., Abilene
(Signed) Kleinman
(Well Driller)
License No.: 0076 Date: Aug. 13, 1974

USE ADDITIONAL SHEETS IF NECESSARY
**STATE OF WASHINGTON**

**DEPARTMENT OF CONSERVATION AND DEVELOPMENT**

**WELL LOG**

<table>
<thead>
<tr>
<th>Date</th>
<th>7-27-59</th>
<th>Number</th>
<th>Appli. #4858</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record by</td>
<td>well driller</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Source</td>
<td>driller's record</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>State of WASHINGTON</td>
<td></td>
<td></td>
</tr>
<tr>
<td>County</td>
<td>Whatcom</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Map</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W/S E</td>
<td>1/4 NW 1/4 sec. 33 T 40 N R 4 E</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Drilling Co.** Don Mulka

**Address** Sumas, Wash.

**Method of Drilling** dug hydraulic

**Date** 5-13, 1959

**Owner** Lewis Jenkins

**Address** Everson, Wash.

**Land surface datum** above

<table>
<thead>
<tr>
<th>Correlation</th>
<th>Material</th>
<th>Thickness (feet)</th>
<th>Depth (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Clay loam</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Fine sand</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>3&quot; rocks</td>
<td>9</td>
<td>16</td>
</tr>
</tbody>
</table>

**PUMP TEST:**

- Dim. 16"x36"
- SWL: 3 ft.
- DD: 3 ft.
- Yield: 160 g.p.m.
- Water Temp. 49°
- Type & size of pump: 5" air pump
  - " " " engine: 50 h.p. gas

**Casing:**

- 36" diam. concrete pipe from top to 8 ft.
- 36" " wooden screen from 8 to 16 ft.

**Perforations:** 250 3/8"x1" from 8 to 16 ft.

*Turn up Sheet... of... sheets*
<table>
<thead>
<tr>
<th>Tuning</th>
<th>Perforations in Johnson Screen Amoco Iron (over)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield</td>
<td>30 g.p.m.</td>
</tr>
<tr>
<td>CASER:</td>
<td>12' x 27'</td>
</tr>
<tr>
<td>DRAIL:</td>
<td>Soft blue clay</td>
</tr>
<tr>
<td>PUMP TEST:</td>
<td></td>
</tr>
<tr>
<td>SAND &amp; GRIT:</td>
<td>5</td>
</tr>
<tr>
<td>FINE SAND &amp; MUDY WATER:</td>
<td>1</td>
</tr>
<tr>
<td>HARDENED SAND &amp; GRAVEL WATER BEARING:</td>
<td>2</td>
</tr>
<tr>
<td>27'</td>
<td></td>
</tr>
<tr>
<td>12'</td>
<td></td>
</tr>
</tbody>
</table>

The data on the screen is not warranted by the Department of Ecology.
WELL LOG.—Continued

<table>
<thead>
<tr>
<th>Correlation</th>
<th>Material</th>
<th>Thickness (ft)</th>
<th>Depth (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depth forward</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80 slot from 21'6&quot; to 27 ft</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Test Report: Determination of Asbestos Structures ≥ 0.5 µm & > 10µm in Drinking Water Performed by the 100.2 Method (EPA 600/R-94/134)

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Sample ID Filtration Date/Time</th>
<th>Original Sample Vol. Filtered (ml)</th>
<th>Effective Filter Area (mm²)</th>
<th>Area Analyzed (mm²)</th>
<th>Asbestos Types</th>
<th>Fibers Detected</th>
<th>Analytical Sensitivity</th>
<th>Concentration MFL (million fibers per liter)</th>
<th>Confidence Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMW-01</td>
<td>041227476-0001</td>
<td>10/22/2012 10:15 AM</td>
<td>100</td>
<td>1282</td>
<td>≥ 0.5 µm</td>
<td>Chrysotile</td>
<td>49</td>
<td>0.19</td>
<td>9.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&gt; 10 µm only</td>
<td>None Detected</td>
<td>ND</td>
<td>0.19</td>
<td>&lt;0.19</td>
</tr>
<tr>
<td>PMW-02</td>
<td>041227476-0002</td>
<td>10/22/2012 10:15 AM</td>
<td>25</td>
<td>1282</td>
<td>≥ 0.5 µm</td>
<td>Chrysotile</td>
<td>115</td>
<td>1.90</td>
<td>220.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&gt; 10 µm only</td>
<td>Chrysotile</td>
<td>1</td>
<td>0.19</td>
<td>0.19</td>
</tr>
<tr>
<td>PMW-03</td>
<td>041227476-0003</td>
<td>10/19/2012 04:15 PM</td>
<td>25</td>
<td>1282</td>
<td>≥ 0.5 µm</td>
<td>Chrysotile</td>
<td>12</td>
<td>0.19</td>
<td>2.30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&gt; 10 µm only</td>
<td>None Detected</td>
<td>ND</td>
<td>0.19</td>
<td>&lt;0.19</td>
</tr>
<tr>
<td>PMW-04</td>
<td>041227476-0004</td>
<td>10/19/2012 04:15 PM</td>
<td>25</td>
<td>1282</td>
<td>≥ 0.5 µm</td>
<td>Chrysotile</td>
<td>120</td>
<td>1.30</td>
<td>160.00</td>
</tr>
</tbody>
</table>

Analyst(s)
Debbie Little  (6)
Steig Breloff  (4)
Wayne Froehlich (1)

Any questions please contact Steve Siegel.

Sample collection and containers provided by the client, acceptable bottle blank level is defined as ≤0.01MFL>10µm, ND=None Detected. This report may not be reproduced, except in full, without written permission by EMSL Analytical, Inc. The test results contained within this report meet the requirements of NELAC unless otherwise noted. This report relates only to the samples reported above. Samples received in good condition unless otherwise noted.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NELAC NYS ELAP 10872, NJ DEP 03036, FL DOH E87975
## Test Report: Determination of Asbestos Structures ≥ 0.5 µm & > 10µm in Drinking Water

Performed by the 100.2 Method (EPA 600/R-94/134)

<table>
<thead>
<tr>
<th>Sample ID / EMSL</th>
<th>Sample Filteration Date/Time</th>
<th>Original Sample Vol. Filtered (ml)</th>
<th>Effective Filter Area (mm²)</th>
<th>Area Analyzed (mm²)</th>
<th>Asbestos Types</th>
<th>Fibers Detected</th>
<th>Analytical Sensitivity</th>
<th>Concentration</th>
<th>Confidence Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMW-04 041227476-0004A</td>
<td>10/19/2012 04:15 PM</td>
<td>25</td>
<td>1282</td>
<td>0.2640</td>
<td>Chrysotile</td>
<td>&gt; 10 µm only</td>
<td>5</td>
<td>0.19</td>
<td>0.97</td>
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<td>0.78</td>
<td>95.00</td>
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<td>0.2640</td>
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<tr>
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<td>9.70</td>
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<td>&lt;9.70</td>
<td>0.00 - 36.00</td>
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</tbody>
</table>

**Analyst(s)**

Debbie Little (6)
Steig Breloff (4)
Wayne Froehlich (1)

Any questions please contact Steve Siegel.

Initial report from: 11/02/2012 14:39:33
Attn: Michael August  
Associate Earth Sciences, Inc.  
911 Fifth Avenue  
Suite 100  
Kirkland, WA  98033

Proj: EH110253A

Test Report: Determination of Asbestos Structures \( \geq 0.5 \mu m \) & \( > 10 \mu m \) in Drinking Water  
Performed by the 100.2 Method (EPA 600/R-94/134)

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Sample Filtration Date/Time</th>
<th>Original Sample Vol. Filtered (ml)</th>
<th>Effective Filter Area (mm²)</th>
<th>Area Analyzed (mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duplicate</td>
<td>10/19/2012 04:15 PM</td>
<td>25</td>
<td>1282</td>
<td>0.2640</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Asbestos Types</th>
<th>Fibers Detected</th>
<th>Analytical Sensitivity</th>
<th>Concentration</th>
<th>Confidence Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \geq 0.5 \mu m )</td>
<td>None Detected</td>
<td>ND</td>
<td>0.19</td>
<td>&lt;0.19</td>
</tr>
<tr>
<td>( &gt; 10 \mu m ) only</td>
<td>None Detected</td>
<td>ND</td>
<td>0.19</td>
<td>&lt;0.19</td>
</tr>
</tbody>
</table>

Samples PMW01 and PMW02 Sample ozonated prior to analysis due to lab receipt time exceeding 48hr method hold time.  
Due to excessive particulate the analytical sensitivity of 0.2 MFL as required by the method was not reached.

Analyst(s)  
Debbie Little (6)  
Steig Breloff (4)  
Wayne Froehlich (1)  

Any questions please contact Steve Siegel.

Initial report from: 11/02/2012 14:39:33
**Asbestos Lab Services Chain of Custody**

**EMSL Order Number** (Lab Use Only):

**Company:** Associated Earth Sciences, Inc.  
**Address:** 911 Fifth Ave Ste 100  
**City/State/Zip:** Kirkland, WA 98033  
**Report To (Name):** Michael August  
**Telephone:** 425-766-8525  
**Email Address:** maugust@asegeo.com  
**Project Name/Number:** EH110253A

**Turnaround Time (TAT) Options** — Please Check:

- 3 Hour
- 6 Hour
- 24 Hour
- 48 Hour
- 72 Hour
- 96 Hour
- 1 Week
- 2 Week

*For TEM Air 3 hr through 6 hr, please call ahead to schedule. There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL’s Terms and Conditions listed in the Analytical Price Guide.*

**PCM - Air**
- NIOSH 7400
- w/ OSHA 8hr. TWA

**PLM - Bulk (reporting limit)**
- PLM EPA 600/R-83/116 (<1%)
- PLM EPA NOB (<1%)
  - Point Count
    - 400 (<0.25%) 1000 (<0.1%)
    - Point Count w/Gravimetric
      - 400 (<0.25%) 1000 (<0.1%)
  - NYS 198.1 (fibrous in NY)
  - NYS 198.6 NOB (non-fibrous in NY)
  - NIOSH 6002 (fibrous in NY)

**TEM - Air**
- AHERA 40 CFR, Part 763
- NIOSH 7402
- EPA Level II
- ISO 10312

**TEM - Bulk**
- TEM EPA NOB
- NYS NOB 198.4 (non-fibrous NY)
- Chaffield SOP
- TEM Mass Analysis-EPA 600 sec. 2.5

**TEM - Water**
- EPA 100.2
- Fibers >10µm Waste Drinking Water
- All Fiber Sizes Waste Drinking

**Check For Positive Stop — Clearly Identify Homogenous Group**

**Filter Pore Size (Air Samples):**
- 0.8µm
- 0.45µm

**Sample #**

<table>
<thead>
<tr>
<th>Sample #</th>
<th>Sample Description</th>
<th>Volume/Area (Air)</th>
<th>Date/Time Sampled</th>
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<td>Crown water samples</td>
<td></td>
<td>10-17-12 1000</td>
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<td>PMW-02</td>
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<td></td>
<td></td>
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<tr>
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<tr>
<td>PMW-03</td>
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</table>

**Client Sample # (s):**

**Total # of Samples:**

**Reinlquished (Client):**

**Received (Lab):**

**Comments/Special Instructions:** Swift Creek Asbestos.

**Attention:** Michael August  
**Phone:** 425-427-7701  
**Email:** maugust@asegeo.com  
**Purchase Order:** EH110253A
**Data Report**

Client Name: Associated Earth Sciences, Inc.
911 Fifth Avenue Ste. 100
Kirkland, WA 98033

**Sample Description:** PMW-01 - Swift Creek

<table>
<thead>
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<th>Parameter</th>
<th>Result</th>
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<th>DF</th>
<th>Method</th>
<th>Analyzed</th>
<th>Analyst</th>
<th>Batch</th>
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<td>10/26/12</td>
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<td>0.0012</td>
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<td>200.7/FILTER</td>
<td>10/26/12</td>
<td>BJ</td>
<td>200.7-121026A</td>
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<td>10/30/12</td>
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<td>7.30E-05</td>
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<td>11/1/12</td>
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<td>11/1/12</td>
<td>MVP</td>
<td>200.8-121101</td>
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</tr>
</tbody>
</table>

**Notes:**

ND = Not detected above the listed practical quantitation limit (PQL) or not above the Method Detection Limit (MDL), if requested.
PQL = Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions.
D.F. = Dilution Factor

If you have any questions concerning this report contact Lawrence Henderson at the above phone number.
## Data Report

Sample Description: PMW-02 - Swift Creek  
Lab Number: 41673  
Sample Date: 10/17/12  
Collected By: M. August

<table>
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<th>Parameter</th>
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<th>MRL</th>
<th>MDL</th>
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<th>Analyst</th>
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**Notes:**
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- D.F. = Dilution Factor
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**Sample Description:** PMW-03 - Swift Creek

**Lab Number:** 41674

**Sample Date:** 10/17/12

**Collected By:** M. August
### Data Report

**Sample Description:** PMW-04 - Swift Creek  
**Lab Number:** 41675  
**Sample Date:** 10/17/12  
**Collected By:** M. August

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- **D.F.** = Dilution Factor

**Reference Number:** 12-18173  
**Report Date:** 11/6/12
Data Report

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Sample Description: HMW-01 - Swift Creek
Lab Number: 41676

Sample Date: 10/17/12
Collected By: M. August

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**Notes:**
- ND = Not detected above the listed practical quantitation limit (PQL) or not above the Method Detection Limit (MDL), if requested.
- PQL = Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions.
- D.F. = Dilution Factor

Sample Description: HMW-02 - Swift Creek
Lab Number: 41677

Sample Date: 10/17/12
Collected By: M. August
### Data Report

#### Sample Description: HMW-03 - Swift Creek

**Lab Number:** 41678  
**Sample Date:** 10/17/12  
**Collected By:** M. August

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**Notes:**

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- PQL = Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions.
- D.F. - Dilution Factor

**Reference Number:** 12-18173  
**Report Date:** 11/6/12
## Data Report

### CAS ID#s
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- 7439-96-5
- 7439-96-6
- 7440-10-9
- 7440-23-5
- 7440-62-2
- 7440-66-6
- 7440-66-0
- 7440-36-0
- 7440-36-0
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- 7440-38-2
- 7440-39-3
- 7440-39-3
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- 7440-87-3
- 7440-47-3
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- 7440-92-1
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- 7440-42-2
- 7440-22-4
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- 7440-66-6
- 7440-97-6
- 7440-97-6

### Sample Description:
- Lab Number: 41679
- Sample Date: 10/17/12
- Sample Description: Duplicate - Swift Creek

### ALUMINUM
- CAS ID#: 7439-95-4
- Result: 20.4
- MRL: 0.010
- MDL: 0.005
- Units: mg/L
- DF: 1.00
- Method: 200.7/FILTER
- Analyzed: 10/26/12
- Analyst: BJ
- Batch: 200.7-121026A

### Notes:
- **PQL**: Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions.
- **ND**: Not detected above the listed practical quantitation limit (PQL) or not above the Method Detection Limit (MDL), if requested.
- **D.F.**: Dilution Factor
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### Notes:

- **ND** = Not detected above the listed practical quantitation limit (PQL) or not above the Method Detection Limit (MDL), if requested.
- **PQL** = Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions.
- **D.F.** = Dilution Factor

Reference Number: Report Date: 11/6/12
### SAMPLE INDEPENDENT

#### QUALITY CONTROL REPORT

Laboratory Fortified Blank

**Reference Number:** 12-18173  
**Report Date:** 11/06/12

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*Notation:

%-Recovery = (Result of Analysis)/(True Value) * 100

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FORM: QC Independent
SAMPLE INDEPENDENT
QUALITY CONTROL REPORT

Laboratory Reagent Blank

Reference Number: 12-18173
Report Date: 11/06/12

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FORM: QC Independent
# QUALITY CONTROL REPORT

**Laboratory Reagent Blank**

Report Date: 11/06/12

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*Notation:

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FORM: QC Independent
## QUALITY CONTROL REPORT

### Method Blank

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FORM: QC Independent
**SAMPLE INDEPENDENT QUALITY CONTROL REPORT**

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FORM: QC Independent
### QUALITY CONTROL REPORT

**Reference Number:** 12-18173  
**Report Date:** 11/06/12

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FORM: QC Independent
## QUALITY CONTROL REPORT

**Duplicate, Matrix Spike/Matrix Spike Duplicate and Confirmation Result Report**

**Reference Number:** 12-18173  
**Report Date:** 11/6/2012

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**%RPD = Relative Percent Difference**  
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%RPD = Relative Percent Difference
NA = Indicates %RPD could not be calculated

Matrix Spike (MS)/Matrix Spike Duplicate (MSD) analyses are used to determine the accuracy (MS) and precision (MSD) of a method in a given matrix. Therefore, the usefulness of this report is limited to samples of similar matrices analyzed in the same analytical batch. Only Duplicate sample with detections are listed in this report.

Limits are intended for water matrices only. These criteria are for guidance only when reported with soils/solids.

FORM: cLFMD.rpt
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Limits are intended for water matrices only. These criteria are for guidance only when reported with soils/solids.

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%RPD = Relative Percent Difference
NA = Indicates %RPD could not be calculated

FORM: cLFMD.rpt
Matrix Spike

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245.1_121019

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245.1_121026

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%RPD = Relative Percent Difference
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Matrix Spike (MS)/Matrix Spike Duplicate (MSD) analyses are used to determine the accuracy (MS) and precision (MSD) of a analytical method in a given sample matrix. Therefore, the usefulness of this report is limited to samples of similar matrices analyzed in the same analytical batch.

Only Duplicate sample with detections are listed in this report

Limits are intended for water matrices only. These criteria are for guidance only when reported with soils/solids.
Matrix Spike

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FORM: cLFMD.rpt
## Qualifier Definitions

<table>
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<th>Qualifier</th>
<th>Definition</th>
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<td>Matrix induced bias assumed</td>
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<td>IS</td>
<td>The ratio of the spike concentration to sample background was too low to meet performance criteria</td>
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</table>

Note: Some qualifier definitions found on this page may pertain to results or QC data which are not printed with this report.
Chain of Custody / Analysis Request  
(Please complete all applicable shaded sections)

Report to:  Associated Earth Sciences, Inc.  
Ship Address:  911 Fifth Avenue Ste. 100  
City:  Kirkland  
Attn.:  Michael August  
Phone:  425.827-7701  
Email:  michaela@aesgeo.com  
Project:  Well Tests

Instructions
1. Use one line per sample Location.
2. Be specific in analysis requests.
3. List each metal individually
4. Check off analyses to be performed for each sample Location.
5. Enter number of containers.

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Turn Around Time Required
- Standard
- Half-time (50% surcharge) Phone Call Req.
- Quickest (100% surcharge) Phone Call Req.
- Emergency (Phone Call Req.)

Diss Metals

Analyses Requested

Sample Receipt Request (Must include FAX or Email)  
Sample temp 9 C satisfactory  
Samples received intact  
Chain of custody & labels agree

Sampled by:  Michael August  
Phone:  425.827-7701  
Fax:  825-5424  
Email:  michaela@aesgeo.com  

Relinquished by:  
Date:  10/18  
Time:  3:30  
Received by:  
Date:  10/18  
Time:  3:30

Custody seals intact

Special Instructions
Conditions on Receipt

Total Containers

* W - water  
SW - surface water  
WW - waste water  
OL - oil  
DW - drinking water  
GW - Ground water  
S - soil  
Other

FORM COC 01-06-2009