Revised
Geology and Ground Water Report
Reserve Silica Mine
Ravensdale Washington

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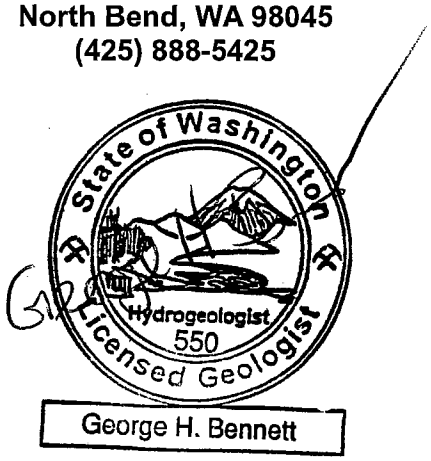

June 28, 2006
Project No. 2003-23

INTRODUCTION AND PROJECT SUMMARY

This revised report has been prepared as part of an environmental checklist for the revised permit and periodic review of the Reserve Silica Corporation's Ravensdale project. The purpose of this report is to discuss the existing geology and ground water conditions at the site, the effect of the current operation on these conditions, and the anticipated impact of the expanded mine on existing conditions. The Reserve project consists of a surface sandstone mine and a wash plant located on 403 acres of land immediately southwest of the Town of Ravensdale, King County, Washington (Figure 1).

The surface mine is located south of the Black-Diamond Ravensdale Road where silica-bearing sandstone is excavated from three of seven seams that occur on the property. The sandstone is mined from open cuts on seams up to 200 feet wide. The useful sandstone is hauled to the wash plant located north of the Black Diamond-Ravensdale Road. Waste rock is hauled to surface dumps or placed as backfill in mined out areas. Approximately 81 acres have been disturbed to date from sandstone mining as well as historic coal production of which 28 acres have been reclaimed. Under the proposal that is the subject of this report, the current active pit will be expanded to the west and deepened and improvements will be made to storm water management. Reclamation of depleted pits will continue as previously where mine waste, dewatered wash plant tailings and ultimately imported fill soil from construction projects are used together as backfill. In the end the mined out areas will be completely backfilled to approximately pre-development contours

The mill and the wash plant, located immediately north of the Black-Diamond Ravensdale road includes an office/maintenance building, sand washing plant, dryers, stockpiles, clay settling ponds and a small gravel pit. Approximately 35 acres of the process area is devoted to clay ponds and road access, 6 acres to a small gravel pit and 6 acres to the process area, maintenance shops, offices and stockpiles. The process plant produces high quality silica sand by disaggregating the sandstone, separating the fines from the sand by washing, drying, and discharging the fines contained in process water to settling ponds. The products made at the site are used predominantly for glass manufacturing and also for golf coarse sand, cement production, landscaping, and cinder block manufacturing. With the proposed permit revision, the wash plant will continue operating at its historical rate of production with improvements made to process water re-circulation, storm water management, and clay tailings disposal. In particular, clay tailings will no longer be discharged to a settling pond. Rather a belt press/dewatering facility will be used to dewater the tailings after which they will be trucked back to the mine area for in-pit backfilling.

In addition to the mining and sand washing, the site is also the subject of a solid waste-monitoring program under a Seattle-King County Health Department permit, and the Washington State Department of Ecology. Two solid waste disposal sites are located on the property, which consist of backfilled mine workings were that were backfilled with high pH cement kiln dust (CKD) and capped with clay. The sites consist of an upper eastern pit that was mined for coal, referred to as the Dale Strip Pit (DSP), and a lower western pit that was mined for silica sand known as the Lower Disposal Area (LDA). The monitoring program is under a different regulatory agency than the proposed mine expansion and is the responsibility of the Holcim Cement Company of Michigan rather than Reserve Silica. However, because the CKD sites are on the subject property and are related to past mining activity, they were a topic for analysis during the 5-year periodic

review. Thus logs for the monitoring wells constructed to monitor ground water around the CKD sites were included with this study and the relationship of the CKD backfill areas to the underlying site geology and groundwater are also described in this report.

DATA SOURCES FOR REVISED REPORT

The data used in this report revision consists of 206 rotary percussion drill holes completed in 2003 as part of an exploration program for additional silica sand, seven hollow stem augur drill holes completed as monitor wells around the LDA, with one hole completed as a test boring, four rotary drill holes/monitor wells completed adjacent to the Dale Strip pit, and 25 logs from water wells completed in the surrounding vicinity obtained from the Department of Ecology (DOE) database. In addition to the drill logs, geochemical analyses of ground water samples taken from the monitor wells were included to this revised study. Logs for the drill holes and the ground water chemistry study are included as attachments to this report.

The locations of offsite water wells from the DOE database, as well as the local geology underlying the project site are displayed on Figure 2. It should be noted that on our previous submittal a number of wells were included on Figure 2 that were incorrectly plotted in the DOE database. A careful review of street address, in addition to the section corners, indicated that about a third of the wells in the database were plotted in the wrong township, and these incorrectly plotted wells have been removed from the map. A number of additional wells, located down gradient of the site in Sections 3 and 34 have been added to Figure 2 and are discussed in this revised report.

As part of this report revision a search for municipal water wells down gradient of the project site was conducted. Within the DOE database two up-gradient public supply wells were identified, but none were identified down gradient of the site within a 2-mile search radius. As summary of the water wells displayed on Figure 2 is contained in Table 1. The up-gradient public supply wells are identified as 36A1 and 36A2 on Table 1 and these are high-yield wells completed in the shallow recessional outwash aquifer, discussed below under ground water conditions.

Figure 3 displays the locations of the onsite rotary percussion drill holes, the hollow-stem augur dill holes, and the monitor wells completed adjacent to the DSP. Geologic cross sections constructed through the site using this drill data are displayed on Figures 4 to 8. The drill used to explore the onsite bedrock was a track mounted, rotary percussion hammer drill, equipped with a compressed air cyclone for sample recovery. Nick Ferris and Jim Melfi of Reserve supervised the drilling and kept the limited drill logs attached to this report. The drill had an 82-foot depth capability, however in many instances the drill holes were terminated before this capacity was reached. No record of ground water encounters were kept, however, when water is encountered with the air percussion drill, samples would no longer be retrievable, and the hole would be terminated. Thus if a hole reaches an 82-foot depth, one can be fairly certain that it was dry its entire length. With a hole less than 82-feet in depth nothing can be said about ground water, as holes were terminated prematurely for a host of reasons, not just the presence of ground water. In speaking with Jim Melfi, he indicated that there was little ground water in the bedrock units, however they did locally encounter ground water within the glacial units. The logs for the Arcadis monitoring wells were also somewhat limited for geologic interpretations, as the wells were constructed principally to monitor the chemistry of CKD

seepage and as such they were properly completed. Their use in geologic interpretation is limited because the sample interval was every five feet and no attempt was made to distinguish between fill and native soil in the logs, even though the site has been extensively modified over the past 100 years. In addition no attempt was made to compensate for the fact that the wells completed in the infiltration pond area were drilled into cobble-rich gravel, which is difficult to sample and evaluate with a split-spoon sampler. The possible presence of bedrock claystone at the bottom of MW-1A was also not noted, as no attempt was made to interpret geology in the soil description while the holes were being drilled and no samples were kept.

One exploration hole EH-1, was drilled with the hollow stem auger drill after it completed the wells for Arcadis. The Arcadis geologist was unavailable to log the hole as it was drilled, however the driller did collect split spoon samples at five-foot intervals and did note when ground water was encountered. Subsequent to the drilling the samples were logged and the log is attached to this report.

The interpretations made on the geologic cross sections for the Arcadis wells relied on the geologist's sample description, a knowledge of the type of drill used, and personal experience gained during the coarse of completing several backhoe pits in the area of the infiltration pond. The existing open pits in the current mining operation also provided direct visual observations of the onsite geologic conditions.

In addition to the drill log data, Arcadis has been collecting and analyzing ground water samples from their six monitor wells since July 2005. The data from this monitoring program are attached to this report, and discussed further in the ground water section of this study.

GEOLOGY AND GROUND WATER CONDITIONS

The location of the project site and its relationship to underlying geologic units and nearby surface water features is displayed on Figure 2. Three geologic units have been identified at the site, as well as artificial fill soil. These consist of the Eocene age (45 million year ago) Renton Formation (Tr- bedrock), Vashon age (10-15,000 years ago) lodgement till (Qvt) and recessional outwash gravel (Qvr). The Vashon recessional outwash underlies the northwestern portions of the property, and it forms an important local aquifer that is hydrologically connected to several surface water features in the local area. Much of the surface water in the northern portion of the property drains toward this shallow aquifer. Based on subsurface data from DOE water wells and the USGS Southwestern King County ground water study (Woodward, 1995), Vashon advance outwash (Qva) and pre-Frazer (Qpfu) non-glacial sediments (>15,000 years ago) were encountered in down-gradient water wells to the west of the site. While the Vashon advance outwash and pre-Frazier sediments form an important regional aquifer to the west of the site, they are absent beneath the site, as discussed further below.

The following sections describe the geologic characteristics of bedrock and glacial units underlying the local region and their relationship to the proposed mine expansion.

Renton Formation (Tr)

The Renton Formation forms the bedrock core of the northwest trending ridge that underlies the mine property south of the Ravensdale – Black Diamond Road. The bedrock consists of alternating arkosic sandstone, siltstone, carbonaceous shale and coal beds that were deposited in a meandering stream/floodplain environment during middle Eocene time. Since deposition these units have been uplifted and tilted by tectonic activity so that within the site boundary the bedrock layers strike (trend) about N25W and dip (slope) down to the southwest at an angle of between 50 and 60 degrees. With the exception of the coal beds, ground water flow within the Renton formation is extremely restricted due to high clay content. In the previous USGS ground water studies, a hydraulic conductivity was not measured for the Renton formation, however it has been described as a bedrock-confining unit. Water wells completed within this unit are typically low yield and unreliable with ground water flow and recharge achieved principally through bedrock fractures.

Within the site boundaries the coal beds have been extensively mined in the past, principally by underground means but also through an open surface cut on the east side of the property known as the Dale Strip Pit (DSP). The coal has been classified as subbituminous and is low in sulfur (0.5-0.6%, Vine, 1969). Since about 1967, high silica sand units within the Renton Formation have been mined in open cuts for industrial silica. The silica sand typically contains 20-30% clay, principally kaolinite, 15% feldspar, and some carbonate mostly in the form of siderite. As a result of past and current mining the topography of the bedrock areas is characterized by a series of long, linear, northwest trending cuts that have been partially or completely backfilled. In the easternmost cut, the DSP, and the westernmost cut, the (LDA), CKD was placed as part of the backfill material. In the other cuts, the backfill material is principally waste rock and excavated soils from construction projects in the local area.

In the mine cuts that have not been completely backfilled the low permeability of the Renton Formation is evident as these cuts hold surface water year-round and must be pumped out when access is needed. However in areas where the open cuts are connected to underground workings, such as the DSP, water is readily conveyed through via the old workings and coal beds to the north end of the mine area where water is discharged year-round to the surface through an old mine portal (Figure 3). Thus while on a regional scale the Renton Formation acts as a basement confining unit, within the project area, ground water is able to flow from south to north through the bedrock via the old mine workings.

Vashon Advance Outwash (Qva) and pre-Frasier non-Glacial Sediments (Qpfu)

The Vashon Advance unit consists of moderately well sorted sand and gravel sediments that were deposited by braided meltwater streams emanating from the advancing Vashon glacial ice sheet (Vashon Stade of the Fraser Glaciation). This unit has been identified in subsurface well logs about one mile to the west of the project site and represents an important aquifer to these down gradient areas. Typically the Qva lies within 100 feet of the land surface at an altitude from about 500 to 550 feet above sea level. This unit can be up to 200 feet thick with a high degree of grain size variability as a result of its deposition from migrating streams along the front of the advancing Puget Lobe ice sheet. The Qva pinches out near the project site where bedrock is at or near

the land surface and is typically absent in major river valleys where it has been eroded away. Similarly the Qva can be unusually thick in areas where it fills in pre-existing topographic lows. Because the Qva is overlain by an aquitard (Qvt – described below) it is not directly connected hydrologically to surface water emanating from the project site. It should be noted that in our previous submittal erroneously plotted water well logs suggested that Qva underlay the project site. Since it was determined that these wells were incorrectly plotted, and with the addition of new subsurface data from the onsite drill holes, the data now indicate that the Qva is absent beneath the mine property.

Underlying the Qva, a few wells about a mile west of the project area encountered non-glacial sediments that predate the Frasier (Vashon) glaciation. These non-glacial units (Qpfu) indicated on Table 1 can also form an important regional aquifer. They are distinguished from the glacial units by the presence of wood or other organic material, abundance of fine-grained beds, lower static water levels and deeper water-yielding horizons. For the purposes of this study this aquifer unit should be even less affected by the proposed mine activities than the overlying glacial units as it is deeper and further removed from surface water emanating from the project site.

Ground water flow within the Qva/Qpfu aquifers is generally from east to west, following the general dip (slope) of these units. Hydraulic conductivity is in the 2-4 x 10^{-2} cm/sec range and typically the aquifer is confined by the overlying Qvt (Vashon till) aquitard unit.

Vashon Lodgement Till (Qvt)

Vashon lodgement till consists of an unsorted mixture of cobbles, and pebbles densely compacted in a matrix of sand, silt and clay. The till was deposited at the sole of the advancing Vashon glacier, which reached a thickness of over 3,000 feet in this area. The till material was literally 'smeared" along the ground by the tremendous pressure produced by the weight of the ice and formed a basal deposit beneath the ice that capped the topography over which the ice sheet advanced. Lodgement till is commonly rather hard and difficult to excavated with all but the largest excavation machinery.

The till occurs at the land surface over most of the project area displayed on Figure 3. Regionally the till thickens toward the west, toward the Puget Lowland. It is rarely over 60 feet thick, although like the Qva it locally can fill topographic depressions and reach a greater thickness. Within the project site the till is absent over the bedrock highs, and is more than 60-feet thick in a local area south of the currently active mine where it was encountered by exploration drill holes. Till principally functions as a confining unit, however, local dug wells have been developed in the past in this unit within sand and gravel lenses in the upper less-compact part of the till. The typical hydraulic conductivity of the till has been measured in the 10^{-5} to 10^{-6} cm/sec range. The relatively low permeability of the till within the project site is evidence by Wetland B (discussed below), which has developed atop the till in the southwestern portion of the project area.

Vashon Recessional Outwash (Qvrg)

About 10,000 years ago as the glacier receded, enormous meltwater channels formed along the edge of the continental ice sheet. These channels contained ice-dammed lakes that filled with gravel and repeatedly ruptured as the ice containment broke away.

Within the project area the meltwater streams deposited extensive sheets of sand and gravel, with occasional beds of boulders that probably represent outburst flood events. As displayed on Figure 2, the portion of the project site to the north of the Ravensdale-Black Diamond lies along a large outwash channel that developed between two bedrock/till upland areas. Ravensdale lake and other wetlands that lie along this paleo channel probably represent glacial kettles, or areas where large blocks of ice became isolated along the channel, leaving a depression in the topography when the ice melted away.

The recessional outwash in this area is typically sandy, cobbly gravel to gravelly cobbles, with low silt content and is thus rather permeable to ground water flow. The Qvrg represents the coarser fraction of the recessional outwash deposits. This unit is rather extensive in the vicinity of the project site and where saturated it is considered an aquifer. Ground water flow within this unit is typically from east to west and hydraulic conductivity in this unit within the project area is in the 10^{-1} to 10^{-2} cm/sec range.

Within the large channel areas the Qvrg unit averages about 40 feet thick, with local kame terraces up to 150 feet thick. Recessional outwash typically overlies lodgement till. However in areas where till was never deposited or was eroded away, the Qvrg may lie directly on bedrock or on the Qva/Qpfu, such as near Lake Sawyer, about 2-miles down gradient of the site. In the case where Qvrg lies directly atop Qva/Qpfu, the confining layer is absent allowing ground water to flow directly into the Qva aquifer from the Qvrg.

Fill Soil

Fill soil (soil artificially placed) is widespread across the project site as a result of more than 100 years of mining and grading activity. It typically has the composition of lodgement till with added organic matter and has iron oxide mottling as a result of ground water migration. Fill soil was recognized in drill hole EH-1 (Figure 6) and is interpreted to be present in holes DH 03-215 (Figure 4) and well MW-3A (Figure 8). The upper ground water encountered in EH-1 and MW-3A is interpreted as shallow perched ground water that accumulated within the fill atop the less permeable underlying lodgement till.

The old mine excavations have also been backfilled with a variety of material, principally construction fill soil, waste rock, and in the case of the LDA and DSP, they have been backfilled with CKD. The composition of the fill in these areas was outside the scope of this study.

SURFACE WATER

The entire project area lies within the Lake Sawyer drainage basin with a local surface water divide that bisects the site along the BPA power transmission lines near the center of the property. Drainage features to the north of this divide, including Ravensdale Lake, receive most of their recharge via ground water in the Qvrg unit. Ravensdale Lake according to local residents is fed by springs and it in turn drains into Ravensdale Creek, which flows directly into Lake Sawyer. Presumably Wetland A (Figure 2) also receives recharge via ground water like Ravensdale Lake, and it is interpreted to have developed

atop a silt lens that lies within coarse cobbly sediments that are permeable to surface and ground water.

Drainage features to the south of the power line divide are recharged principally by surface water that flows atop the relatively impermeable lodgement till and bedrock. Wetland B lies to the west and south of the mine area (Figure 3), and has developed where surface water runoff has perched atop relatively impermeable lodgement till. The perched nature of this surface water feature is displayed on Figure 6, where bedrock exploration drill holes to the east of Wetland B were dry well below the elevation of Wetland B. In this area the relatively impermeable lodgement till is underlain by even less permeable bedrock siltstone, which forms an aquitard between the wetland and proposed mine expansion area.

A more in-depth discussion of surface water at the site is contained in the Technical Information Report (TIR) attached as Appendix B to the environmental checklist submitted for this project.

LOCAL WATER SUPPLY

The domestic water wells within about a one-mile up-gradient and two-miles down-gradient distance from project site are displayed on Figure 2, and summarized in Table 1. Driller's logs for these wells are attached to this report, which were obtained from the Washington DOE database. DOE locates their wells to within the nearest ¼ smile and most of the well locations displayed on Figure 2 are shown as they appear in the DOE database, unless more was known about their location. As discussed above, many wells included in our previous submittal were located in the wrong Township, when their street address was crosschecked with the listed location in the DOE database. All of the wells displayed on Figure 2 have been crosschecked and the misplotted wells removed. For the purposes of this study the well locations shown on Figure 2 are sufficiently accurate to characterize ground water conditions in the local region surrounding the project site.

The summary of the local water supply wells presented on Table1 indicates that three aquifers are present near and down gradient of the project area. These include a bedrock aquifer, a Qva/Qpfu aquifer, and a Qvrg aquifer. As stated above the bedrock is low-yield aquifer and generally an unreliable source for a domestic water supply. With the exception of the underground mine workings ground water flow and recharge is limited to factures in the bedrock. Where the bedrock is tight, dry wells are encountered. Within the project area the bedrock wells had a yield that ranged from 0.25 gallons per minute (gpm) with a drawdown of 7 feet, to 3.5 gpm with a drawdown of 155 feet.

The Qva/Qpfu aquifer lies atop the bedrock and beneath the Qvt confining layer, and has been identified in water wells within about ½ mile northwest of the project site (Figure 2). According to regional ground water studies (USGS Water Resources Investigations Report 92-4098) the project site lies at the eastern margin of this aquifer unit, which in this area is typically a moderate yield aquifer with well production ranging from 6 gpm with 60 feet of draw-down up to 125 gpm with 55 feet of draw-down. For the purposes of this report both the Qva and Qpfu aquifers are grouped as a single unit, although commonly they can each form distinct aquifers. The onsite drill data indicates that neither of these units underlies the project site, and where these units have been

encountered in offsite wells they have occurred beneath the confining Qvt layer. Thus they have no direct hydrologic connection to the project area and should be little affected by the project.
The Qvrg unit lies atop the Qvt confining bed or bedrock and forms an unconfined aquifer within the glacial outwash deposits that cover much of the area down gradient to the north and west of the project site as displayed on Figure 2. Near the project area this aquifer has moderate to high yields that range from 25 gpm with 6 feet of drawdown to 1,850 gpm with 2 feet of drawdown. The static water levels in this aquifer suggest that it has a direct hydrologic connection with surface water features in the area, including Ravensdale Lake, Ravensdale Creek, and presumably Wetland A. Surface water runoff from north of the power line drainage divide, as well as the ground water that empties from the old mine portal and seepages from the LDA CKD site all eventually infiltrate into the Qvrg aquifer. Excess process water has also been discharged into the Qvrg aquifer since the late 1960's.

The two public water supply wells identified in this study (36A1 and 36A2) are located up gradient of the project site and therefore should not be affected by activities originating from within the project site.

MINING RELATED IMPACTS ON LOCAL WATER SUPPLY

Wash Plant

Silica washing operations began in 1967 and the process water that has been discharged into the Qvrg aquifer contained suspended clay resulting from the washing of the silica sandstone. Since that time the effect of discharging the clay-bearing water into the coarse gravel of the Qvrg has served to gradually "blind off" the gravel to further infiltration. With the permeability of the gravel reduced the excess process water perched atop the Qvrg rather than infiltrate into it. A review of aerial photographs (displayed in the Wetland Appendix of the Environmental Checklist) shows that as the Qvrg was blinded off the infiltration area was moved progressively to the west. Currently discharge to the Qvrg occurs at the western end of the property with most process water re-circulated back through the wash plant. There have been no reported down gradient impacts to the Qvrg aquifer in the more than 35 years that the wash plant has operated. Most likely the suspended clay in the process water discharge drops out of the ground water within a few feet of the ground surface.

In addition to clay particles, the discharged process water contains both anionic and cationic flocculants such as Magnafloc, which is used to cause the clay particles precipitate out of suspension. The water clarifying materials used are approved by the Washington State Department of Ecology (WDOE) for discharge to ground water, and the process water is monitored weekly per the WDOE National Pollution Discharge Elimination System (NDPSE) permit. With the expanded permit the use of the clay tailings pond will be phased out and the tailings hauled back to the mine excavation and backfilled. As part of the tailings dewatering procedure, the re-circulation and re-use of process water will be greatly increased, which should nearly eliminate process water discharges to the Qvrg aquifer.

Surface Mine

Runoff from the mine area to the north of the powerline divide ultimately discharges to the Qvrg aquifer. To the north of the mine portal, runoff flows down the access road into the County road ditch and via a culvert onto the plant site property. Here the runoff enters a closed depression where it infiltrates into the Qvrg aquifer. South of the mine portal, but north of the powerline divide, storm water gets routed into an infiltration pond into the Qvrg aquifer at the northwestern end of the mine property (Figure 3). Presumably, over the years, the sediment contained in this runoff has had the effect of blinding off the infiltration capacity of the Qvrg, although storm water still infiltrates into the ground in these areas. With the proposed expansion, all runoff north of the powerline divide will be collected and directed toward approved infiltration ponds with an upstream treatment pond to settle out fines prior to discharge

To the south of the power transmission lines storm water has little opportunity to enter the ground water regime. Storm water in this area is collected in the open mine workings and road ditches and either flows or is pumped into a detention pond about 150 feet to the east of Wetland B. Overflow from the pond then enters Wetland B. As stated previously, Wetland B is perched atop relatively impermeable lodgement till (Qvt) well above the regional water table. Thus runoff from the southern portion of the mine area remains as surface water in Wetland B, which eventually drains into Sonia Lake and finally into Ginder Lake. Based on a visual reconnaissance along the perimeter of Wetland B, completed with a wetland biologist from Ecological Land Services, no visible impacts were encountered as a result of runoff from the mine area entering the wetland (see Appendix C of the ECL).

Historic Underground Mines and DSP

Mixed with the mine area storm water is the discharge from the mine portal, as well as seepages emanating from the lower CKD disposal area (LDA). The mine portal discharges water at a rate of about 10-15 gallons per minute during winter months, and the discharge is clear with a relatively neutral pH of 6.8 to 7.6 and low metal values that meet the Federal drinking water standards for As (0.005 mg/l), Cd (0.005 mg/l) and Pb (0.015 mg/l - see attached monitoring data). These analyses suggest that there is no measurable impact of the mine portal water entering the Qvrg.

Because the mine portal drains the area underlying the Dale Strip pit, where CKD was placed, the neutral pH suggests that the CKD in the upper pit is contained, with no measurable effect on the mine water. Some of the ground water samples from the monitor wells that were completed around the Dale Strip pit (RMW-1D, MW-1D, RMW-1S, and MW-4D) however slightly exceed the Federal drinking water standards for As, (See attached monitoring data). These data could be the result of elevated As in the bedrock or possibly slight leakage from the DSP. Regardless of the source by the time this ground water discharges at the mine portal, Federal drinking water standards are met. Monthly testing of the mine portal water is a requirement by the State Department of Ecology (DOE) as part of the mines NPDES permit and will continue with the expanded permit.

LDA

The discharge from the LDA is presently under investigation by Arcadis who are in the process of monitoring the ground water in this area and developing a mitigation plan under the direction of Seattle-King County Public Health. As part of the monitoring plan six wells were completed downslope of the LDA. These are plotted on Figures 3 through 8 with the logs and ground water sampling results attached in the appendix to this report. The data that are available from the Arcadis wells suggest the following interpretations:

- Upland Wells MW-3A and 4A encountered shallow ground water between 4 and 6 feet that most like represents perched ground water at the interface between fill soil and lodgement till. This ground water probably flows in the shallow subsurface closely following surface topography with little vertical migration through the till.
- Wells MW1A, 2A, 5A and 6A, completed in the infiltration pond area most likely penetrated the Ravensdale (Qvrg) aquifer that has developed within recessional outwash. Ground water elevations indicate that flow within this aquifer is from northeast to southwest, from the public supply well in Ravensdale, to Ravensdale Lake, to the Arcadis monitoring wells, down gradient toward Lake Sawyer.
- Seepage from the LDA area most likely flows in the shallow subsurface along or near the till/fill interface as shown on Figure 4. It then flows near the surface atop the till and ultimately discharges toward the Ravensdale aquifer,
- Well MW-1A possibly encountered bedrock clay at its base, directly beneath the recessional outwash, indicating that lodgement till and advance outwash have been eroded away from this area or were never deposited.

The seepage emanating from the LDA flows at a rate of about 1 gpm and has a high pH of between 10 and 12.5. As shown on Figure 5, a likely reason for the leakage from the LDA is likely due to ground water emanating from the north pit, through the CKD area and beneath the fill of the haul road. Many of the surface water samples taken from the Still Well, Weir, Infiltration #1, and South Pond which are downslope of the CKC seepage area (Figure 3), exceeded Federal drinking water standards for As and a few samples from the South Pond and Weir exceeded standards for Pb. Elevated As levels were also detected in the ground water monitoring wells (MW-1A, 3A, 5A and 6A) downslope of the surface water samples, although the concentrations were significantly lower (Refer to attached monitoring data). Given the low rate of seepage from the LDA, and the ample opportunity for dilution, the effect of the CKD seepage on the Qvrg aquifer is most likely limited to a local area.

Understanding and mitigation the effects of the CKD seepages from the LDA will be completed under the existing Seattle - King County Public Health permit in conjunction with the DOE. Mitigation of the CKD seepage is responsibility of Holcim Cement Company of Michigan and not the applicant for the mine expansion. However the impact of the CKD seepage was a topic of discussion for the 5-Year periodic review for the mine's grading permit review and expansion.

IMPACTS OF PROPOSED EXPANSION

Wash Plant

Under the expansion proposal the rate of mining and processing will remain the same as in the past, however improvements to the wash plant will be completed to increase the level of process water re-circulation and reduce discharge to the Qvrg. The fact that the tailings disposal will no longer be in the settling ponds, but rather dewatered tailings will be hauled back to the mine area should greatly reduce the amount of process water discharged to the ground. The ponds instead will be used to control storm water runoff within the plant area as well as and any excess process water from the tailings dewatering system. Since the quantity of water discharged to the ground will be reduced by up to 90 percent the likelihood of further blinding off the Qvrg and other aspects of the proposal should be less than the existing operation.

Mine Area

In the mine area to the north of the power transmission lines, storm water will continue to be infiltrated into the Qvrg. However, an engineered infiltration pond with upstream sediment pond will be constructed per King County SWDM, which will allow the treatment of storm water prior to infiltration. In addition, storm water that presently flows off the mine property onto the plant parcel will be intercepted and routed into the engineered sediment and infiltration pond. The pond facilities have also been sized to handle the discharge from the mine portal and the relatively minor seepage quantities emanating from the LDA site. As discussed previously, mitigation of the CKD seepage will be regulated under a different permit than the one that was the focus for this study.

Under the proposed continuation of the project, backfilling of the north pit (Figure 3) will continue until a stable reclamation slope of 2H:1V or less has been achieved. Once backfilled there will no longer be standing water in the pit to exert a hydrostatic pressure on the upslope side of the LDA. Without this added hydrostatic force we anticipate that seepage activity will be diminished. Since the fill material used for backfill is typically fine-grained soil (chiefly lodgement till and siltstone), once the pits are backfilled, storm water will flow off of the site, rather than recharging ground water into the CKD. This should reduce recharge to the CKD seepages.

To the south of the power transmission lines storm water runoff will be controlled via an engineered detention pond designed per King County SWDM. Discharge will continue to be toward Wetland B however treatment will occur in an upstream sediment pond prior to entering the detention pond. This should have the effect of improving surface water discharge over existing conditions.

Under the proposal the existing pit will be extended to the west and excavated down to the 600-foot elevation (Figure 6). Concerns have been raised that this excavation will be below the elevation of Wetland B and the CKD backfill in the LDA. We believe that there is little likelihood that the deepened excavation will pose a problem to either of these features based on the lithologies and ground water occurrences encountered. The air-rotary and auger drill holes completed at the site suggest the following interpretations:

- The shallow ground water encountered at the site is perched atop the relatively impermeable Vashon lodgment till (Qvt). Perched surface and ground water atop till also led to the formation of Wetland B.
- Drill results indicate that Vashon advance outwash (Qva) is absent near the project site.
- Some bedrock ground water was encountered both in EH-1 and some of the rotary percussion holes. This ground water is believed to be fracture related as saturated zones were localized with unsaturated rock encountered below the ground water.
- The bedrock in this area principally an aquitard principally due to its high clay content, even in coarse sandstone units, and will this limit ground water migration toward the proposed pit.

Based on these interpretations Wetland B is perched atop relatively impermeable lodgment till that was deposited directly atop bedrock, which has been classified as a ground water confining unit. The deeper portions of the excavation that will be below the elevation of surface water in Wetland B will be separated from the surface water not only by the lodgement till, but also by a rather thick, impermeable siltstone unit that should block any ground water migration (Figures 6 –7).

Similarly the proposed excavation will be separated from the LDA by more than 200 feet of clay-rich sandstone. As discussed previously the LDA seepages have developed along the contact of the bedrock and road fill with small flow rates. Thus the likelihood of the seepages migrating through clay-rich sandstone is considered remote.
Rotary percussion drill holes completed between the LDA and proposed excavation were dry (Figure 5, Section B-B') suggesting that there is minimal ground water flow in the bedrock between the LDA and proposed excavation. In addition the area of existing leachate seepage is on the north side of the LDA, to the north of the power line divide, which separates the LDA from the mine expansion area. Communications with Arcadis personnel and discussion with Jerry Veenhuizen, the original mine manager of the site, indicate that the LDA pit was developed by bulldozing sand from south to north with drainage to the north. Upon backfilling, the seepages that developed in the LDA continued to follow the original surface drainage by flowing from the south to the north.

CONCLUSION

Overall impacts to ground water should be less with the expanded mine operation than under existing conditions, as storm water management will be brought up to date per KCSWDM and improvements will be made to the wash plant. Discharge conditions to the Qvrg should be greatly improved, with the elimination of tailings disposal in the settling ponds, and with storm water treatment via sediment ponds done prior to infiltration.

Similarly, south of the power transmission lines water treatment will be done prior to discharge to surface water. The expanded and deepened pit will likely encounter ground water seepage that is typical for this clay-rich sandstone, however we anticipate that the volume of ground water will be relatively minor in comparison to seasonal surface water flows that currently enter the pit. Because the bedrock is tight we believe that there is little likelihood of the deepened pit affecting either Wetland B of the LDA.

Finally, backfilling the old workings should reduce recharge to the LDA ground water and diminish the seepage activity emanating from the LDA. As mentioned previously the final mitigation for the CKD seepage is under a different permit and is the responsibility of others not associated with the applicants for this study. Thus it should be considered on its own merits aside from the mine expansion proposal.

REFERENCES

Arcadis, G & M Inc, 2005, *Monitor Well Installation Program, Lower Disposal Area, Reserve Silica Site, Ravensdale, WA, private report prepared for Holcim Cement Co*

Jones, M. A. , 1999, *Geologic Framework for the Puget Sound Aquifer System, Washington and British Columbia*" U.S.G.S. Professional Paper 1424-C,

Robinson and Noble, 1985, Inc., *Hydrologic Testing of Piezometers at the Dale #4 Strip Pit, private report prepared for Ideal Basic Industries, Seattle*

Vine, J.D. 1969, *Geology and Coal Resources of the Cumberland, Hobart, and Maple Valley Quadrangles, King County, WA, USGS Prof Paper 624*

Woodward, D. G. et al, 1995, *Occurrence and Quality of Ground Water in Southwestern King County, Washington*" U.S.G.S. Water-Resource Investigations Report 92-4098

Attachment A

Water Well Logs

Table 1
Summary of Water Wells Near and Down Gradient of Site
Reserve Silica Project, Ravensdale, WA

Well ID and Owner	Well Location	Street Address	Distance From Project (feet)	Aquifer	Well Depth	SWL	Yield and Drawdown*
3C William Ruth	NE NW Sec 3	28800 237th Pl. SE	9,000	Qva	97	53	15 gpm
34A-1 Dave Svedarsky	NE NE Sec 34	Maple Valley Highway	6,000	Qpfu	155	119	12gpm/22 ft
34A-2 Carson Cox	NE NE Sec 34	SE 276 St & 240 Ave SE	6,000	Qva	80	25	125gpm/55 ft
34B William Ourada	NW NE Sec 34	27320 SE 236th St	7,000	Qpfu	138	62	6 gpm/60 ft
34G William Ruth	SE NE Sec 34	SE 280th & 239 Ave SE	6,500	Qva	57	28	30 gpm/22 ft
34H Greg Moore	SE NE Sec 34	27626 240th Ave SE	5,500	Qva	80	28	125 gpm/52 ft
34J-1 Don Olson	NE SE Sec 34	28420 Maple Valley Hwy	4,500	Qpfu	137	103	30 gpm/34 ft
34J-2 Glacier Valley Prop	NE SE Sec 34	236th Ave SE & SE 284th	4,500	Qva	70	30	30 gpm/31 ft
34J-3 William Ruth	NE SE Sec 34	224th Ave SE & 213th St	4,500	Qva	120	47	30 gpm/63 ft
34Q Shoppe	SW SE Sec 34	23804 SE 288th	5,500	Qva	80	48	30 gpm/14 ft
34R1 Del Drillevich	SE SE Sec 34	28930 Maple Valley Hwy	4,500	Qva	65	30	15 gpm/20 ft
34R2 Stuth Company	SE SE Sec 34	28620 Maple Valley Hwy	4,500	Qva	70	30	25 gpm/20ft
35E Maple Ridge Highlands	SW NW Sec 35	SE 276th St	4,000	Qva	74	62	30 gpm/6 ft
35F Maple Ridge Highlands	SE NW Sec 35	SE 276th St	3,000	Qpfu	134	82	42 gpm/33 ft
35G1 Maple Ridge Highlands	SW NE Sec 35	SE 276th St	2,000	bedrock	181	70	3.5 gpm/155 ft
35G2 Maple Ridge Highlands	SW NE Sec 35	SE 276th St	2,000	Qva	124	90	51 gpm/2.7 ft
35G3 Maple Ridge Highlands	SW NE Sec 35	SE 276th St	2,000	bedrock	209	70	0.5 gpm/149 ft.
35H? Maple Ridge Highlands	SE NE? Sec 35	SE 276th St	500	Qpfu	156	110	42 gpm/8 ft
35R1 C.J. Construction	SE SE Sec 35	28750 Black D. Rd SE	500	bedrock	260	50	0.25gpm/7 ft
36A1 Fire District No. 42	NE NE Sec 36	27401 Kent Kangley Rd	5,000	Qvr	40	10	50 gpm/15 ft
36A2 King Co Water Dist. 105	NE NE Sec 36	Black Diamond Rd SE	5,000	Qvr	43	22	1850 gpm/2 ft
36F1 Ralph W. Barnett	SE NW Sec 36	26726 SE Ravensdale	2,000	Qvr	37	23	25 gpm/4 ft
36F2 Ray C. Bennett	SE NW Sec 36	26733 SE Ravensdale Pl	2,000	Qvr	36	22	25 gpm/4 ft
36F3 Evar Morgan	SE NW Sec 36	26707 SE Ravensdale Pl	2,000	Qvr	37	-	25 gpm/6 ft
36N L-Bar Products, Inc.	SW SW Sec 36	26000 Black D Rd	on site	Qvr	36	27	2.5 gpm/4 ft

118847

Que 21-6E 3C

WATER WELL REPORT

ECOLOGY Original & 1st copy Ecology 2nd copy owner 3rd copy driller

Construction/Decommission (x in circle)
- (X) Construction
- ( ) Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number*_____

CURRENT
Notice of Intent No WI37572

Unique Ecology Well ID Tag No AGP 466

Water Right Permit No N/A

Property Owner Name William E Ruth

Well Street Address 28300 237TH PL SE

City Maple Valley County King

Location NE 1/4 1/4 NW 1/4 Sec 3 Twn 21N R 6E EWM (circle one) WWM

Lat/Long (s t r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No 1531000010

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* ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS Diameter of well 6 inches drilled 97 ft
Depth of completed well 94 ft

CONSTRUCTION DETAILS
Casing Installed ☒ Welded 6 Diam from +3 ft to 0 ft
☐ Liner installed _____ Diam from 0 ft to 94 ft
☐ Threaded _____ Diam from _____ ft to _____ ft

Perforations ☐ Yes ☒ No
Type of perforator used_____
SIZE of perfs_____ in by_____ in and no of perfs_____ from _____ ft to _____ ft

Screens ☐ 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/Filter packed ☐ Yes ☒ No ☐ Size of gravel/sand_____
Materials placed from_____ ft to_____ ft

Surface Seal ☒ Yes ☐ No To what depth? 19 ft
Materials used in seal Bentonite
Did any strata contain unusable 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 53 ft below top of well Date 5-8-02
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_____
Bailer test_____ gal /min with _____ ft drawdown after_____ hrs
Airtest 12-15 gal /min with stem set at 92 ft for 1 hrs
Artesian flow_____ g p m Date_____
Temperature of water_____ Was a chemical analysis made? ☐ Yes ☐ No

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
DK Brn silty sand Grvl	0	3
LT Brn silty sand Grvl moist	3	7
med grey Brn Till Dense dry	7	43
Grey sand grvl some silt water Bearing	43	93
LT Brn Silt Snd Grvl Dense	93	97

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AUG 2 2002
DEPT OF ECOLOGY

Start Date 5-8-02 Completed Date 5-8-02

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 (Print) Thomas Craney

Driller/Engineer/Trainee Signature Thomas W Craney

Driller or Trainee License No 2409

Drilling Company Holt Drilling

Address 10621 Todd Rd E

City State Zip Puyallup 98372

Contractor s Registration No HOLTDI*136G Date 5-9-02

If trainee, licensed driller s Signature and License no _____

Ecology is an Equal Opportunity Employer ECY 050 1 20 (Rev 4/01)

Qpf

22/06-34A-1

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. .....

Permit No. .....

(1) OWNER: Name DAVE SVEDARSKY Address 17863 W. Spring Lake Drive S.E., Renton, WA

(2) LOCATION OF WELL: County KING NE¼ NE¼ Sec. 34 T. 22 N., R. 6 W.M.

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) .....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 155 ft. Depth of completed well 155 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 Diam. from 0 ft. to 155 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 ... 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? 18 ft.
Material used in seal bentonite & cement
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.
Static level 119 ft. below top of well Date 1/4/80
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 12 22 1
Bailer 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.

MATERIAL	FROM	TO
brown till	0	32
blue till & cobbles	32	125
blue sand & gravel	125	147
water bearing sand & gravel	147	155

Work started 1/3/80 19... Completed 1/4/80 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 NORTHWEST PUMP & DRILLING COMPANY
(Person, firm, or corporation) (Type or print)

Address 3245 Auburn Way South, Auburn, WA

[Signed] R. B. DeTurner III
(Well Driller)

License No. 0097 Date 1/14/80, 19...

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

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B

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. 044279
Water Right Permit No.

(1) OWNER: Name COX, CARSON Address 25523 212 SE MAPLE VALLEY, WA 98038-

(2) LOCATION OF WELL: County KING - NE 1/4 NE 1/4 Sec 34 T 22 N., R 6 WM
(2a) STREET ADDRESS OF WELL (or nearest address) SE 276 & 240 SE

(3) PROPOSED USE: DOMESTIC

(4) TYPE OF WORK: Owner's Number of well (If more than one)
NEW WELL Method: ROTARY

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

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Dia. from 0 ft. to 80 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: NO
Manufacturer's Name
Type Model No.
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? 18 ft.
Material used in seal BENTONITE CLAY
Did any strata contain unusable water? NO
Type of water? Depth of strata ft.
Method of sealing strata off N/A

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

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 25 ft. below top of well Date 06/26/91
Artesian Pressure lbs. per square inch Date
Artesian water controlled by N/A

(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 / /
Bailer test gal/min. ft. drawdown after hrs.
Air test 125 gal/min. w/ stem set at 80 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? NO

(10) WELL LOG 27/6E/34 A-2

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 CEMENTED SAND & GRAVEL	0	32
BLUE GLACIAL TILL	32	33
BROWN GLACIAL TILL	33	67
WATER BEARING SAND & GRAVEL	67	80

Work started 06/26/91 Completed 06/26/91

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 NORTHWEST PUMP & DRILLING
(Person, firm, or corporation) (Type or print)

ADDRESS 3245 AUBURN WAY SOUTH

[SIGNED] R B DeLemos License No. 0097

Contractor's Registration No. NORTHPD137PQ Date 06/27/91

RECEIVED
JUL 26 1991
DEPT. OF ECOLOGY

Qpfu

22/06-34B

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. .....

Permit No. .....

(1) OWNER: Name William Ouradnik Address 27320 SE 236th Maple Valley

(2) LOCATION OF WELL: County King NW¼ NE¼ Sec. 34 T. 22 N., R. 6 W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic [X] 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 [X] Cable [ ] Driven [ ]
Reconditioned [ ] Rotary [ ] Jetted [ ]

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 138 ft. Depth of completed well 138 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from 0 ft. to 138 ft.
Threaded [ ] " Diam. from ... ft. to ... ft.
Welded [X] " Diam. from ... ft. to ... ft.

Perforations: Yes [X] No [ ] Mills Knife
Type of perforator used
SIZE of perforations 1/4 in. by 3 in.
12 perforations from 93 ft. to 97 ft.
12 perforations from 113 ft. to 117 ft.
... perforations from ... ft. to ... ft.

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

Surface seal: Yes [X] No [ ] To what depth? 18 ft.
Material used in seal puddling 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
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level .... ft.
Static level 62 ft. below top of well Date 4/2/81
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 [X] 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
Baller test 6 gal./min. with 60 ft. drawdown after 24 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes [ ] No [X]

(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
Brown hardpan gravel, rocks	43	55
Brown gravel - seepage	55	67
Gray clay	67	72
Brown hardpacked gravel, seepage	72	99
Brown hardpan	99	112
Brown gravel, rocks - seepage	112	138
Brown hardpan	138	—
Deepened 43' well drilled in December, 1980		

Work started 3/30, 19 81 Completed 4/2, 19 81

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 Johnson Drilling Co. Inc. (Person, firm, or corporation) (Type or print) 98057

Address 19415 108th Ave SE Renton

[Signed] Brad Johnson (Well Driller)

License No. 0233 Date 4/2, 19 81

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

Qve

22-6E-34 W
6

WATER WELL REPORT

ECOLOGY Original & 1st copy Ecology, 2nd copy owner, 3rd copy driller

Construction/Decommission (x in circle)
- ⊗ Construction
- ○ Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number* 129494

CURRENT Notice of Intent No. W137618

Unique Ecology Well ID Tag No AGP 452

Water Right Permit No N/A

Property Owner Name William E Rutt

Well Street Address CRN OF SR 280 & ST + 239TH AVE SE

City Kent County King

Location SE 1/4- 1/4 NE 1/4 Sec 34 Twn 22N R 6E (E/W/M) circle one WWM

Lat/Long (s,t,r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No 3422069003

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* ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ⊗ Rotary ☐ Jetted

DIMENSIONS Diameter of well 6 inches drilled 58 ft
Depth of completed well 57 ft

CONSTRUCTION DETAILS
Casing Installed: ⊗ Welded 6 Diam from +3 ft to 15 ft
☐ Liner installed _____ Diam from 0 ft to 57 ft
☐ Threaded _____ Diam from _____ ft to _____ ft

Perforations ☐ Yes ⊗ No
Type of perforator used _____
SIZE of perfs ____ in by ____ in and no of perfs ____ from ____ ft to ____ ft

Screens ☐ 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/Filter packed ☐ Yes ⊗ No ☐ Size of gravel/sand _____
Materials placed from _____ ft to _____ ft

Surface Seal ⊗ Yes ☐ No To what depth? 19 ft
Materials used in seal Bentonite
Did any strata contain unusable 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 28 ft below top of well Date 7-26-02
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 _____
Bailer test ____ gal/min with ____ ft drawdown after ____ hrs
Airtest 300 gal/min with stem set at 50 ft for 1 hrs
Artesian flow _____ g p m Date _____
Temperature of water ____ Was a chemical analysis made? ☐ Yes ☐ No

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
Topsoil	0	4
DK Brn silty grvl cobbles w/ organics	4	17
LT Brn Till w Dense dry med Brn sand grvl	17	35
WATER Bearing LT Brn silty grvl	35	57
	57	58

RECEIVED
APR 01 2003
DEPT OF ECOLOGY

Start Date 7-26-02 Completed Date 7-26-02

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 (Print) Thomas Cranney
Driller/Engineer/Trainee Signature Thomas W. Cranney
Driller or Trainee License No 2409

Drilling Company Holt Drilling
Address 10621 Todd Rd E
City, State, Zip Puyallup WA 98372
Contractor's Registration No HOLTDRK1360 Date 7-29-02

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

Ecology is an Equal Opportunity Employer ECY 050 1 20 (Rev 4/01)

ENTERED

Qva

22/c/34 H

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W 41454
Unique Well I.D. #
Water Right Permit No.

(1) OWNER: Name MOORE, GREG Address 27626 240 AVE SE MAPLE VALLEY, WA 98038-

(2) LOCATION OF WELL: County KING - SE 1/4 NE 1/4 Sec 34 T 22 N., R 6 WM
(2a) STREET ADDRESS OF WELL (or nearest address) 27626 240 AVE SE, MAPLE VALLEY

(3) PROPOSED USE: DOMESTIC

(4) TYPE OF WORK: Owner's Number of well (If more than one)
NEW WELL Method: ROTARY

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

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Dia. from 0 ft. to 80 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: NO
Manufacturer's Name
Type Model No.
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? 18 ft.
Material used in seal BENTONITE CLAY
Did any strata contain unusable water? NO
Type of water? Depth of strata ft.
Method of sealing strata off N/A

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

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 28 ft. below top of well Date 10/25/94
Artesian Pressure lbs. per square inch Date
Artesian water controlled by N/A

(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 / /
Bailer test gal./min. ft. drawdown after hrs.
Air test 125 gal./min. w/ stem set at 80 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? 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 in formation.

MATERIAL	FROM	TO
BROWN CEMENTED SAND & GRAVEL	0	23
BLUE GLACIAL TILL	23	29
BROWN GLACIAL TILL	29	62
WATER BEARING SAND & GRAVEL	62	80

RECEIVED
NOV 22 1994
DEPT. OF ECOLOGY

Work started 10/19/94 Completed 10/25/94

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 NORTHWEST PUMP & DRILLING
(Person, firm, or corporation) (Type or print)

ADDRESS 3245 AUBURN WAY SOUTH

[SIGNED] License No. 0097

Contractor's Registration No. NORTHPD137PO Date 10/31/94

22/6/31J-1

B

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. [redacted]
Water Right Permit No.

(1) OWNER: Name OLSON, DON Address P O BOX 123 RAVENSDALE, WA 98051-

(2) LOCATION OF WELL: County KING - NE 1/4 SE 1/4 Sec 34 T 22 N., R 6 WM
(2a) STREET ADDRESS OF WELL (or nearest address) 28420 MAPLE VALLEY HWY SE

(3) PROPOSED USE: DOMESTIC

(4) TYPE OF WORK: Owner's Number of well (If more than one)
NEW WELL Method: ROTARY

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 137 ft. Depth of completed well 137 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Dia. from 0 ft. to 137 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: NO
Manufacturer's Name
Type Model No.
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? 20 ft.
Material used in seal BENTONITE CLAY
Did any strata contain unusable water? NO
Type of water? Depth of strata ft.
Method of sealing strata off N/A

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

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 103 ft. below top of well Date 06/11/92
Artesian Pressure lbs. per square inch Date
Artesian water controlled by N/A

(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 / /
Bailer test gal/min. ft. drawdown after hrs.
Air test 30 gal/min. w/ stem set at 137 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? 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 in formation.

MATERIAL	FROM	TO
BROWN SAND & GRAVEL W/ COBBLES	0	90
BROWN CEMENTED SAND & GRAVEL	90	130
BROWN WATER BEARING SAND & GRAVEL	130	137

RECEIVED
JUN 24 1992
DEPT. OF ECOLOGY

Work started 06/08/92 Completed 06/11/92

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 NORTHWEST PUMP & DRILLING
(Person, firm, or corporation) (Type or print)

ADDRESS 3245 AUBURN WAY SOUTH

[SIGNED] [signature] License No. 1913

Contractor's Registration No. NORTHPD137PQ Date 06/16/92

WATER WELL REPORT

ECOLOGY Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Q1/4 Q1/4 22-6E 345-2

Construction/Decommission ("x" in circle)
(●) Construction
( ) Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number* 151946

CURRENT Notice of Intent No. W159087

Unique Ecology Well ID Tag No. AKF-913

Water Right Permit No. _____

Property Owner Name Glacier Valley Properties LLC

Well Street Address North end of 236th Ave SE, & 284th SE

City Maple Valley County: King

Location NE 1/4- 1/4 SE 1/4 Sec 34 Twn 22 R 6 (EWM) or WWM *circle one*

Lat/Long: (s,t,r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. 342206-LLC

PROPOSED USE: ☐ Domestic ☐ Industrial ☐ Municipal less than 5,000 gal per day ☐ DeWater ☒ Irrigation ☐ Test Well ☐ Other

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

DIMENSIONS: Diameter of well 6 inches, drilled 70 ft.
Depth of completed well 66 ft.

CONSTRUCTION DETAILS
Casing Installed: ☒ Welded 6 " Diam. from +1 ft. to 65 ft.
☐ Liner installed _____ " Diam. from _____ ft. to _____ ft.
☐ Threaded _____ " Diam. from _____ ft. to _____ ft.

Perforations: ☐ Yes ☒ No
Type of perforator used _____
SIZE of perfs _____ in. by _____ in. and no. of perfs _____ from _____ ft. to _____ ft.

Screens: ☐ 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/Filter packed: ☐ Yes ☒ No ☐ Size of gravel/sand _____
Materials placed from _____ ft. to _____ ft.

Surface Seal: ☒ Yes ☐ No To what depth? 18 ft
Materials used in seal bentonite
Did any strata contain unusable 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 30 ft. below top of well Date 6-16-04
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 _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest 30 gal./min. with stem set at 61 ft. for 1 hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? ☐ Yes ☒ No

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
Surface	0	3
Sand-gravel-brown	3	9
Hardpan brown	9	50
Sand-gravel water gray	50	65
Hardpan-gray	65	70

RECEIVED
JUL 06 2004
DEPT OF ECOLOGY

Start Date 6-15-04 Completed Date 6-16-04

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 (Print) Brad Johnson
Driller/Engineer/Trainee Signature _____
Driller or Trainee License No. 0233

Drilling Company Johnson Drilling Co., LLC
Address 19415 108th Ave SE
City, State, Zip Renton, WA 98055
Contractor's Registration No. JOHNSOC207QM Date 6-16-04

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

Ecology is an Equal Opportunity Employer. ECY 050-1-20 (Rev 4/01)

118845 QV9

22-6E-34J-3

WATER WELL REPORT

ECOLOGY Original & 1st copy Ecology 2nd copy owner 3rd copy driller

Construction/Decommission (x in circle)
- (X) Construction
- ( ) Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number*_____

CURRENT Notice of Intent No W137617

Unique Ecology Well ID Tag No AGP 453

Water Right Permit No N/A

Property Owner Name WILLIAM E RUTH

Well Street Address CRN OF 224TH AVE SE & SR 312TH

City MAPLE VALLEY County KING

Location NE 1/4 1/4 SE 1/4 Sec 34 Twn 22N R 6E (EWM) or WWM (circle one)

Lat/Long (s t r still REQUIRED) Lat Deg _____ Lat Min/Sec _____

Long Deg _____ Long Min/Sec _____

Tax Parcel No 0922069034

PROPOSED USE (X) Domestic ( ) Industrial ( ) Municipal ( ) DeWater (X) Irrigation ( ) Test Well ( ) Other_____

TYPE OF WORK Owner's number of well (if more than one) LOT 35-34

(X) New Well ( ) Reconditioned *Method* ( ) Dug ( ) Bored ( ) Driven ( ) Deepened ( ) Cable (X) Rotary ( ) Jetted

DIMENSIONS Diameter of well 6 inches drilled 117 ft

Depth of completed well 114 ft

CONSTRUCTION DETAILS

Casing Installed (X) Welded 6 Diam from 43 ft to 80 ft

( ) Liner installed _____ Diam from 0 ft to 117 ft

( ) Threaded _____ Diam from _____ ft to _____ ft

Perforations ( ) Yes (X) No

Type of perforator used_____

SIZE of perfs_____ in by_____ in and no of perfs_____ from_____ ft to_____ ft

Screens ( ) Yes (X) 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/Filter packed ( ) Yes (X) No ( ) Size of gravel/sand_____

Materials placed from_____ ft to_____ ft

Surface Seal (X) Yes ( ) No To what depth? 18 ft

Materials used in seal Bentonite

Did any strata contain unusable water? ( ) Yes (X) 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 47 ft below top of well Date 7-25-02

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_____

Bailer test_____ gal/min with _____ ft drawdown after _____ hrs

Airtest 30+ gal/min with stem set at 110 ft for 1 hrs

Artesian flow_____ g p m Date_____

Temperature of water_____ Was a chemical analysis made? ( ) Yes ( ) No

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
LT BRN SAND GRVL SOME COMPACT	0	43
LT GREY & LT BRN GRVL V. DENSE	43	70
DK BRN COURSE SAND MOIST	70	72
MED BRN SILT BRN GRVL COBBLES V. DENSE DRY	72	82
DK GREY SILTY SAND GRVL COBBLES WET	82	95
LT GREY SAND GRVL WATER BEARING	95	120

RECEIVED
AUG 6 2002
DEPT OF ECOLOGY

Start Date 7-25-02 Completed Date 7-25-02

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

(X) Driller ( ) Engineer ( ) Trainee Name (Print) Thomas Craney

Driller/Engineer/Trainee Signature Thomas W. Craney

Driller or Trainee License No 2409

Drilling Company Holt Drilling

Address 10621 Todd Rd E

City State Zip Puyallup WA 98372

Contractor's Registration No HOLTDEK136CG Date 7-29-02

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

Ecology is an Equal Opportunity Employer ECY 050-1-20 (Rev 4/01)

QV9

22/06-34Q

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. .....

Permit No. .....

(1) OWNER: Name Shoppe [redacted] Address 23804 SE 288th Kent Wa

(2) LOCATION OF WELL: County King NW¼ SE¼ ¼ Sec 34 T. 22 N., R. 6E W.M.

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) .....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

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

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Diam. from 0 ft. to 80 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 ..... 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? 18 ft.
Material used in seal puddling clay
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.
Static level 18 ft. below top of well Date 3/14/79
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 .....
Bailer test 30 gal./min. with 14 ft. drawdown after 4 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.

MATERIAL	FROM	TO
Surface	0	2
Brown hardpan gravel	2	14
Gray hardpan gravel	14	65
Gray water gravel	65	80

Work started 3/12 19 79 Completed 3/14 19 79

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 Johnson Drilling Co., Inc. (Person, firm, or corporation) (Type or print) [illegible]

Address 19415 108th Ave SE Renton 98055

[Signed] [illegible] (Well Driller)

License No. 0233 Date 3/14, 19 79

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7356—OS—(Rev. 4-71).

Qva

22/6-34/R-1

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. .....

Permit No. .....

(1) OWNER: Name Del Drillevich Address 23830 Maple Valley Black Diamond Rd SE

(2) LOCATION OF WELL: County King SE¼ SE¼ Sec. 34 T. 22 N., R. 6 E. W.M.

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) .....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 65 ft. Depth of completed well 65 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6" Diam. from 0 ft. to 65 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 ... 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? 18 ft.
Material used in seal Puddling Clay
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.
Static level 30 ft. below top of well Date 6/9/83
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: 15 gal./min. with 20 ft. drawdown after 3 hrs.
" AIR JET " "

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 ... 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.

MATERIAL	FROM	TO
Surface	0	3
Brown hardpan	3	60
Gray water gravel	60	65
Gray hardpan	65	—

Work started 6/9 19 83 Completed 6/9 19 83

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 Johnson Drilling Co., Inc.
(Person, firm, or corporation) (Type or print)

Address 19415 108th Ave SE Renton 98055

[Signed] Brad Johnson
(Well Driller)

License No. 0233 Date 6/9 19 83

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

Qva

22/06/34 R 2

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. .....

Permit No. .....

(1) OWNER: Name Stoth Company, Inc. Address 28620 Maple Valley Rd SE, Maple Valley

(2) LOCATION OF WELL: County King — SE ¼ SE ¼ Sec. 34 T. 22 N., R. 6 E W.M.

Bearing and distance from section or subdivision corner See attached

(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 70 ft. Depth of completed well 70 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6" Diam. from 0 ft. to 70 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 ... 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? 18 ft.
Material used in seal puddling clay
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.
Static level 30 ft. below top of well Date 4-29-86
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? ...
Yield: gal./min. with ... ft. drawdown after ... hrs.
" 25 " 20 " 2 1/2 "
" " " AIR JET "

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 ... 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.

MATERIAL	FROM	TO
Brown sand-gravel-rocks	0	23
Gray hardpan-gravel	23	56
Gray water sand & gravel	56	70

RECEIVED
MAY 5 1986
DEPARTMENT OF ECOLOGY
NORTHWEST REGION

Work started 4-28 19 86 Completed 4-29 19 86

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 Johnson Drilling Co., Inc.
(Person, firm, or corporation) (Type or print)

Address 19415 108th Ave SE Renton 98055

[Signed] Brad Johnson
(Well Driller)

License No. 0233 Date 4-29, 19 86

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

102789 Qva 22-6E-35E

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. W147718
AGH 092

9199

(1) OWNER: Name MAPLE RIDGE HIGHLANDS Address MAPLE VALLEY, WA POLYGON NW

(2) LOCATION OF WELL: County KING - SW 1/4 NW 1/4 Sec 35 T 22 N., R 6E WM
(2a) STREET ADDRESS OF WELL (or nearest address) SE 276TH & MAPLE VALLEY

(3) PROPOSED USE: IRRIGATION

(4) TYPE OF WORK: Owner's Number of well (If more than one) E 12
NEW WELL Method: ROTARY

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 91 ft. Depth of completed well 91 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Dia. from +3 ft. to 82 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 COOK
Type STAINLESS STEEL Model No.
Diam. 6 slot size 030 from 81 ft. to 91 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

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

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 62 ft. below top of well Date 08/06/01
Artesian Pressure lbs. per square inch Date
Artesian water controlled by

(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 in formation.

MATERIAL	FROM	TO
BROWN SILT SAND & GRAVEL COBBLES	0	15
GRAY TILL	15	24
BROWN GRAVEL SAND & CLAY	24	33
BROWN CLAY & GRAVEL	33	34
GRAY CLAY & GRAVEL	34	56
BROWN GRAVEL SAND & CLAY	56	70
BROWN GRAVEL SAND & WATER	70	73
BROWN-CLAY	73	74
BROWN GRAVEL SAND & WATER	74	

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NOV 0 2 2001
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

Work started 08/05/01 Completed 08/06/01

(9) 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: 30 gal./min with 5.7 ft. drawdown after 2.5 hrs.

Recovery data
Time Water Level Time Water Level Time Water Level

Date of test / /
Bailer test gal/min. ft. drawdown after hrs.
Air test 30 gal/min. w/ stem set at 80 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? NO

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 5896 ERSHIG RD. BOW, WA

[SIGNED] _____ License No. 1149

Contractor's
Registration No. HAYESDI106J5 Date 10/29/01

7404

T22 R6E Sec35 E_Well Log ID: 314661

22-6E-35F

102791

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. W147714

9199 . AGH 089

(1) OWNER: Name MAPLE RIDGE HIGHLANDS Address MAPLE VALLEY, WA POLYGON NW

(2) LOCATION OF WELL: County KING - SE 1/4 NW 1/4 Sec 35 T 22 N., R 6E WM

(2a) STREET ADDRESS OF WELL (or nearest address) SE 276TH & MAPLE VALLEY

(3) PROPOSED USE: IRRIGATION

(4) TYPE OF WORK: Owner's Number of well (If more than one) D-3

NEW WELL Method: ROTARY

(5) DIMENSIONS: Diameter of well 6 inches

Drilled 138 ft. Depth of completed well 138 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Dia. from +3 ft. to 134 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 COOK

Type STAINLESS STEEL Model No.

Diam. 6 slot size 030 from 133 ft. to 138 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

(7) PUMP: Manufacturer's Name

Type H.P.

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

Static level 82 ft. below top of well Date 08/28/01

Artesian Pressure lbs. per square inch Date

Artesian water controlled by

(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 in formation.

MATERIAL	FROM	TO
BROWN SILT SAND & GRAVEL COBBLES	0	14
GRAY GRAVEL SILT & SAND COBBLES	14	53
GRAY AND BROWN GRAVEL COBBLES	53	62
CLAY	53	62
GRAY CLAY SAND & GRAVEL	62	97
GRAY CLAY SAND & SILT & WATER	97	101
GRAY CLAY SAND & GRAVEL	101	114
GRAY SAND & SILT & WOOD	114	133
& COAL	114	133
GRAY SAND & WOOD & WATER	133	134
GRAY SAND & WATER	134	

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NOV 0 2 2001

DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

Work started 08/25/01 Completed 08/28/01

(9) 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: 42 gal./min with 33 ft. drawdown after 2 hrs.

Recovery data

Time	Water Level	Time	Water Level	Time	Water Level

Date of test

Bailer test gal/min. ft. drawdown after hrs.

Air test 35 gal/min. w/ stem set at 130 ft. for 1 hrs.

Artesian flow g.p.m. Date

Temperature of water Was a chemical analysis made? NO

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 ERSHIG RD. BOW, WA

[SIGNED] [signature] License No. 1149

Contractor's Registration No. HAYESDI106J5 Date 10/26/01

7400

T22 R6E Sec35 F_Well Log ID: 314659

RR

22-6E-35G-1

162780

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. W147713
AGH 088

9199

1) OWNER: Name MAPLE RIDGE HIGHLANDS Address MAPLE VALLEY, WA POLYGON NW

(2) LOCATION OF WELL: County KING - SW 1/4 NE 1/4 Sec 35 T 22 N., R 6E WM
(2a) STREET ADDRESS OF WELL (or nearest address) 276TH & MAPLE VALLEY ROAD

(3) PROPOSED USE: IRRIGATION

(4) TYPE OF WORK: Owner's Number of well (If more than one) D 2
NEW WELL Method: ROTARY

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 220 ft. Depth of completed well 221 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Dia. from +3 ft. to 37 ft.
WELDED 4 " Dia. from -11 ft. to 211 ft.
liner installed " Dia. from ft. to ft.
threaded

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 MONOFLEX
Type PVC Model No.
Diam. 4 slot size 010 from 211 ft. to 221 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

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

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 70 ft. below top of well Date 08/22/01
Artesian Pressure lbs. per square inch Date
Artesian water controlled by

(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 in formation.

MATERIAL	FROM	TO
BROWN SILT & SAND & GRAVEL	0	14
GRAY AND BROWN SILT & SAND & GRAVEL	14	26
COBBLES	14	26
BROWN SILT SANDSTONE	26	34
TAN SILT SANDSTONE CLAY	34	50
TAN GRAY SANDSTONE	50	53
GRAY SANDSTONE	53	56
BROWN TAN SANDSTONE	56	65
BROWN SILTSTONE	65	75
BLACK BROWN COAL	75	90
BLACK COAL	90	95
BLACK BROWN COAL	95	102
& SILTSTONE	95	102
BLACK BROWN COAL	102	105
LIGHT BROWN SILTSTONE	105	125
TAN SILTSTONE	125	129
BLACK BROWN COAL	129	139
BROWN SILTSTONE	129	139
TAN SILTSTONE & WATER	139	181
TAN GRAY SANDSTONE	181	

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DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

Work started 08/22/01 Completed 08/22/01

(9) 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: 3.5 gal./min with 155 ft. drawdown after 2 hrs.

Recovery data
Time Water Level Time Water Level Time Water Level

Date of test
Bailer test gal/min. ft. drawdown after hrs.
Air test 4 gal/min. w/ stem set at 219 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? NO

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 ERSHIG RD. BOW, WA

[SIGNED] [signature] License No. 1149

Contractor's
Registration No. HAYESDI106J5 Date 10/26/01

7399

T22 R6E Sec35 G_Well Log ID: 314660

Qva 22-6E-35G-2

102794

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. W147716
AGH 091

9199

1) OWNER: Name MAPLE RIDGE HIGHLANDS Address MAPLE VALLEY, WA POLYGON NW

(2) LOCATION OF WELL: County KING - SW 1/4 NE 1/4 Sec 35 T 22 N., R 6E WM
(2a) STREET ADDRESS OF WELL (or nearest address) SE 276TH & MAPLE VALLEY

(3) PROPOSED USE: IRRIGATION

(4) TYPE OF WORK: Owner's Number of well (If more than one) D 6
NEW WELL Method: ROTARY

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 138 ft. Depth of completed well 138 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Dia. from +3 ft. to 134 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 COOK
Type STAINLESS STEEL Model No.
Diam. 6 slot size 050 from 133 ft. to 138 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

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

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 90.5 ft. below top of well Date 09/04/01
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? YES If yes, by whom? HAYES DRILLING
Yield: 51 gal./min with 2.7 ft. drawdown after 2 hrs.

Recovery data
Time Water Level Time Water Level Time Water Level

Date of test
Bailer test gal/min. ft. drawdown after hrs.
Air test 60+ gal/min. w/ stem set at 130 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? 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 in formation.

MATERIAL	FROM	TO
BROWN TOPSOIL	0	7
BROWN SAND & GRAVEL	7	16
GRAY TILL COBBLES	16	124
BROWN GRAVEL & SAND COBBLES & WATER	124	

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NOV 0 2 2001
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

Work started 08/31/01 Completed 09/04/01

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 ERSHIG RD. BOW, WA

[SIGNED] _____ License No. 1149

Contractor's
Registration No. HAYESDI106J5 Date 10/26/01

7402

T22 R6E Sec35 G_Well Log ID: 314664

102792 BR 22-6E-35G-3

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. W147715
AGH 090

9199

1) OWNER: Name MAPLE RIDGE HIGHLANDS Address MAPLE VALLEY, WA POLYGON NW

(2) LOCATION OF WELL: County KING - SW 1/4 NE 1/4 Sec 35 T 22 N., R 6E WM
(2a) STREET ADDRESS OF WELL (or nearest address) SE 276TH & MAPLE VALLEY

(3) PROPOSED USE: IRRIGATION

(4) TYPE OF WORK: Owner's Number of well (If more than one) D5
NEW WELL Method: ROTARY

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 220 ft. Depth of completed well 220 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Dia. from +3 ft. to 116 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: NO
Manufacturer's Name
Type Model No.
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? 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

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

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 70 ft. below top of well Date 08/30/01
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 / /
Bailer test gal/min. ft. drawdown after hrs.
Air test .5 gal/min. w/ stem set at 219 ft. for 2 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? 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 in formation.

MATERIAL	FROM	TO
BROWN TILL COBBLES	0	14
GRAY TILL COBBLES	14	22
BROWN TILL COBBLES	22	26
GRAY TILL COBBLES	26	30
BROWN TILL COBBLES	30	37
GRAY TILL COBBLES	37	68
BROWN SAND & GRAVEL SILT & CLAY	68	82
BROWN GRAVEL SILT & SAND	82	102
GRAY GRAVEL SILT & SAND	102	112
BROWN SANDSTONE pink	112	113
REDISH-BROWN SANDSTONE	113	116
COAL	116	131
TAN SANDSTONE	131	186
BROWN SILTSTONE	186	209
COAL	209	

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DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

Work started 08/29/01 Completed 08/30/01

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 ERSHIG RD. BOW, WA

[SIGNED] _____ License No. 1149

Contractor's
Registration No. HAYESDI106J5 Date 10/26/01

7403

T22 R6E Sec35 G_Well Log ID: 314666

22-6E-35R-2

162793

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. W147717
ABO 378

9199

) OWNER: Name MAPLE RIDGE HIGHLANDS Address MAPLE VALLEY, WA POLYGON NW

(2) LOCATION OF WELL: County KING - SE 1/4 SE 1/4 Sec 35 T 22 N., R 6E WM
(2a) STREET ADDRESS OF WELL (or nearest address) SE 276TH & MAPLE VALLEY

(3) PROPOSED USE: IRRIGATION

(4) TYPE OF WORK: NEW WELL
Owner's Number of well (If more than one) D 5
Method: ROTARY

(5) DIMENSIONS:
Drilled 161 ft.
Diameter of well 6 inches
Depth of completed well 161 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Dia. from +2 ft. to 149 ft.
WELDED " Dia. from ft. to ft.
" Dia. from ft. to ft.

Perforations: YES
Type of perforator used STAR
SIZE of perforations 1 in. by .25 in.
150 perforations from 138 ft. to 148 ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: NO
Manufacturer's Name
Type Model No.
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? 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

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

(8) WATER LEVELS:
Land-surface elevation above mean sea level ... ft.
Static level 110 ft. below top of well Date 09/26/01
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? YES If yes, by whom? HAYES DRILLING
Yield: 42 gal./min with 8 ft. drawdown after 2 hrs.

Recovery data
Time Water Level Time Water Level Time Water Level

Date of test
Bailer test gal/min. ft. drawdown after hrs.
Air test 30 gal/min. w/ stem set at 148 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? 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 in formation.

MATERIAL	FROM	TO
BROWN SILT SAND & GRAVEL COBBLES	0	30
GRAY COBBLES GRAVEL & SAND	30	34
GRAY GRAVEL SILT & SAND	34	74
GRAY CLAY SILT & SAND CLAY	74	80
GRAY AND BROWN SILT & SAND GRAVEL	80	104
BASALT BOULDERS	104	106
BROWN GRAVEL COBBLES & SAND	106	138
SAND & GRAVEL & WATER	138	148
TAN SANDSTONE	148	156
COAL	156	

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NOV 0 2 2001
DEPARTMENT OF ECOLOGY
WELL DRILLING UNIT

Work started 09/24/01 Completed 09/26/01

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 ERSHIG RD. BOW, WA

[SIGNED] _____ License No. 1149

Contractor's Registration No. HAYESDI106J5 Date 10/26/01

7401

T22 R6E Sec35 R_Well Log ID: 314665

22-6E-35R-1

WATER WELL REPORT

ECOLOGY Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Construction/Decommission ("x" in circle) 138518
-) Construction
-) Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number*_____

CURRENT Notice of Intent No. W127779

Unique Ecology Well ID Tag No. ABO-584

Water Right Permit No. _____

Property Owner Name C. J. Construction

Well Street Address 28750 BL. Diamond Ridge Rd SE

City Ravensdale County: King

Location SE 1/4- 1/4 SE 1/4 Sec 35 Twn 22 R 6E (WWM) circle one or WWM

Lat/Long: (s,t,r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. 3522069046

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* ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ☒ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 260 ft. Depth of completed well 57 ft.

CONSTRUCTION DETAILS

Casing Installed: ☒ Welded 6" Diam from 0 ft to 57 ft

☐ Liner installed _____" Diam from _____ ft to _____ ft

☐ Threaded _____" Diam from _____ ft to _____ ft

Perforations: ☐ Yes ☒ No

Type of perforator used_____

SIZE of perfs_____in by_____in and no of perfs_____ from _____ft to _____ft

Screens: ☐ 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/Filter packed: ☐ Yes ☒ No ☐ Size of gravel/sand_____

Materials placed from_____ ft to_____ ft

Surface Seal: ☒ Yes ☐ No To what depth? 18 ft

Materials used in seal bentonite

Did any strata contain unusable 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 50 ft below top of well Date 9-11-03

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_____

Bailer test 1/4 gal./min with 7 ft drawdown after 3 1/2 hrs

Airtest _____ gal./min with stem set at _____ ft for _____ hrs

Artesian flow_____ g p m Date_____

Temperature of water_____ Was a chemical analysis made? ☐ Yes ☒ No

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
Surface	0	3
Sand-gravel-brown	3	7
Hardpan-brown	7	53
Sand-gravel-Seepage brown	53	57
Sandstone-gray	57	85
Coal	85	90
Sandstone-gray	90	230
Decayed rock-coal	230	260
Bentonite placed from 75'-26'		

RECEIVED
SEP 17 2003
DEPT OF ECOLOGY

Start Date 9-5-03 Completed Date 9-11-03

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 (Print) Brad Johnson Drilling Company Johnson Drilling Co, LLC

Driller/Engineer/Trainee Signature Brad Johnson Address 19415 108th Ave SE

Driller or Trainee License No. 0233 City, State, Zip Renton, WA 98055

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

Contractor's Registration No. JOHNSDC207QM Date 9-11-03

Ecology is an Equal Opportunity Employer ECY 050-1-20 (Rev 4/01)

T22 R6E Sec35 R_Well Log ID: 368486

Qvr

22/06-36A-1

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No. .....

Permit No. .....

OWNER: Name Fire District No. 43 Address 27401 SE Kent Kangley Rd., Maple Valley 98038

(2) LOCATION OF WELL: County King NE ¼ NE ¼ Sec. 36 T. 22 N., R. 6 E. W.M.

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) .....
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

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

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from 0 ft. to 40 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 ..... 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? 18 ft.
Material used in seal puddling clay
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.
Static level 10 ft. below top of well Date 2/16/82
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 .....
Bailer test 60 gal./min. with 15 ft. drawdown after 2 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.

MATERIAL	FROM	TO
Surface	0	2
Brown hardpan	2	18
Brown water gravel	18	40

Work started 2/15, 19 82 Completed 2/15, 19 82

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 Johnson Drilling Co., Inc. (Person, firm, or corporation) (Type or print)

Address 19415 105th Ave SE Renton 98055

[Signed] Ronald Johnson (Well Driller)

License No. 0233 Date 2/15, 19 82

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

QVY

22/06-36A-2
Application No.

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON 22/6-36A
Permit No.

(1) OWNER: Name KING COUNTY WATER DIST. 105 Address 30033 188th Ave. S.E., KENT 98031

(2) LOCATION OF WELL: County KING NE ¼ NE ¼ Sec. 36 T. 22 N., R. 6 E W.M.

Bearing and distance from section or subdivision corner APPROX 150' S. AND 300' E OF N.E. COR. OF SEC. 36

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

(4) TYPE OF WORK: Owner's number of well (if more than one) RAVENSDALE P.D. #43
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☒ Driven ☐
Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 16 inches.
Drilled 43 ft. Depth of completed well 40.8 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 16" Diam. from +2.0 ft. to 28.6 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 JOHNSON — WATERMARK
Type STAINLESS Model No.
Diam. 14 P.S. Slot size 100 from 31.3 ft. to 38.3 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? 18 ft.
Material used in seal CONCRETE
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

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

(8) WATER LEVELS: Land-surface elevation above mean sea level ~620 ft.
Static level 22.21 ft. below top of well Date 7/12/84
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 ROBINSON & NOBLE
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: 1850 gal./min. with 2.26 ft. drawdown after 24 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
0	24.47	75	22.76		
1½	22.94	150	22.72		
9½	22.88				

Date of test 7/12-13/84
test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water 48 °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 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
BROWN SILTY SAND AND GRAVEL, BOULDER SIZE GRAVEL COMMON	0	14
BROWN SILTY SAND AND GRAVEL	14	21
BROWN LARGE GRAVEL, UP TO COBBLE SIZE, WITH SOME SAND. LARGE BOULDER AT 23'	21	40
BROWN SAND AND GRAVEL WITH SOME BROWN CLAY	40	43

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NORTHWEST REGION

PREPARED BY:
ROBINSON & NOBLE, INC.
MBS

Work started JULY 1, 1984 Completed JULY 13, 1984

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 Holt Drilling and Pump Systems (Person, firm, or corporation) (Type or print)
Address 2405 41st Ave NE
[Signed] Randy Holt (Well Driller)
License No. 1099 Date 7-14, 1984

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

Qvr

22/06-36F-1

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Application No

Permit No.

(1) **OWNER:** Name Ralph U. Barnett Address 2726 SE Renton-Issaquah Hwy, Renton

LOCATION OF WELL: County King por of - SE ¼ NW ¼ Sec. 36 T. 22 N., R. 6 W.M.

Bearing and distance from section or subdivision corner See attached

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

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

(5) **DIMENSIONS:** Diameter of well 6 inches.
Drilled 37 ft. Depth of completed well 37 ft.

(6) **CONSTRUCTION DETAILS:**

Casing installed: 6" Diam. from 0 ft. to 37 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.

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

Surface seal: Yes [X] No [ ] To what depth? 18 ft.
Material used in seal puddling 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
Type: H.P.

(8) **WATER LEVELS:** Land-surface elevation above mean sea level ft.
Static level 23 ft. below top of well Date 8-30-84
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: 25 gal./min. with 4 ft. drawdown after 2 hrs.
" " " " "
" " Bailer " "

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
r test 24 gal./min. with 4 ft. drawdown after 2 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes [ ] No [ ]

(10) **WELL LOG:**

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DEPARTMENT OF ECOLOGY
NORTHWEST REGION

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
Surface	0	4
Brown hardpan gravel	4	33
Brown water sand gravel	33	33
Brown hardpacked gravel	33	37

Work started 8-28, 19 84 Completed 8-30, 19 84

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 Johnson Drilling Co., Inc.
(Person, firm, or corporation) (Type or print)

Address 19415 108th Ave SE Renton 98055

[Signed] Brad Johnson
(Well Driller)

License No. 0233 Date 8-30, 19 84

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

T22 R6E Sec36 F_Well Log ID: 286542

QVr 22/06-36F_2

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Application No. ...
Permit No. ...

OWNER: Name Ray C. Bennett Address 26733 SE Ravendale Pl., Kovasdale

(2) LOCATION OF WELL: County King PO R of OF SE ¼ NW ¼ Sec 36 T 22 N, R 6 E W.M.

Bearing and distance from section or subdivision corner

RECEIVED
SEP 04 1984
DEPARTMENT OF ECOLOGY
NORTHWEST REGION

(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 36 ft. Depth of completed well 36 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from 0 ft. to 36 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 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? 18 ft.
Material used in seal. puddling Clay
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

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

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 22 ft. below top of well Date 8-22-84
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: 25 gal./min. with 4 ft. drawdown after 2 hrs.
" " " AIR JET "

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
ler 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.

MATERIAL	FROM	TO
Surface	0	1
Tan sand & gravel	2	5
Brown hardpan gravel	5	22
Brown water sand & gravel	22	36
Brown solid rock	36	

Work started 8-27, 19 84 Completed 8-27, 19 84

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 Johnson Drilling Co., Inc (Person, firm, or corporation) (Type or print)

Address 19415 108th Ave SE Renton 98055

[Signed] Brad Johnson (Well Driller)

License No. 0233 Date 8-27, 19 84

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

T22 R6E Sec36 F_Well Log ID: 286551

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON 22/6-36F 3

Application No.
Permit No.

OWNER: Name Evor O. Morgan Address 26703 SE Ravensdale Pl, Ravensdale 98051

(2) LOCATION OF WELL: County King POR OF - SE¼ NW¼ Sec. 36 T. 22N., R. 6 W.M.

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)
New well ☒ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 37 ft. Depth of completed well 37 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from 0 ft. to 37 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 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? 18 ft.
Material used in seal puckering clay
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.
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: 25 gal./min. with 6 ft. drawdown after 3 hrs.
" " " AIR JET "

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 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.

MATERIAL	FROM	TO
Surface	0	2
Brown hardpan gravel	2	22
Brown water sand&gravel	22	37
Brown solid rock	37	—

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[redacted]

Work started 8-24, 19 84 Completed 8-27, 19 84

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 Johnson Drilling Co, Inc. (Person, firm, or corporation) (Type or print)
Address 19415 108th Ave SE Renton 980
[Signed] Ronald Johnson (Well Driller)
License No. 0233 Date 8-27, 19 84

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

T22 R6E Sec36 F_Well Log ID: 91241

24/06+36N

File Original and First Copy with Department of Ecology
Second Copy—Owner's Copy
Third Copy—Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 014581

Water Right Permit No. _____

(1) OWNER: Name L-Bar Products Incorporated Address 26000 Ravensdale Black Diamond Rd

(2) LOCATION OF WELL: County King SW ¼ SW ¼ Sec 36 T 22 N., R 6 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) _____

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

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

Abandoned ☐ New well ☒ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 36 feet. Depth of completed well 36 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6" Diam. from 0 ft. to 36 ft.
Welded ☒ _____" Diam. from _____ ft. to _____ ft.
Liner installed ☐
Threaded ☐ _____" 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 _____ 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? 18 ft.
Material used in seal puddling clay
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.
Static level 27 ft. below top of well Date 1-11-88
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 _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest 2-3 gal./min. with stem set at 23 ft. for 2 1/2 hrs.
Artesian flow _____ g.p.m. 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 stratum penetrated, with at least one entry for each change of information.

MATERIAL	FROM	TO
Brown gravel & sand	0	9
Tan gravel & sand-clay	9	20
Brown gravel-sand-clay	20	25
Gray clay gravel-sand	25	30
Gray gravel & sand-water some clay	30	36
Gray clay-gravel	36	—

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JAN 25 1988
DEPARTMENT OF ECOLOGY
NORTHWEST REGION

Work started 1-11 19. Completed 1-11 19 88

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 Johnson Drilling Co., Inc (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 19415 108th Ave SE Renton 98055

(Signed) Burl Johnson (WELL DRILLER) License No. 0233

Contractor's Registration No. JOHNSDC203M Date 1-12 19 88

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329-

T22 R6E Sec36 N_Well Log ID: 94317

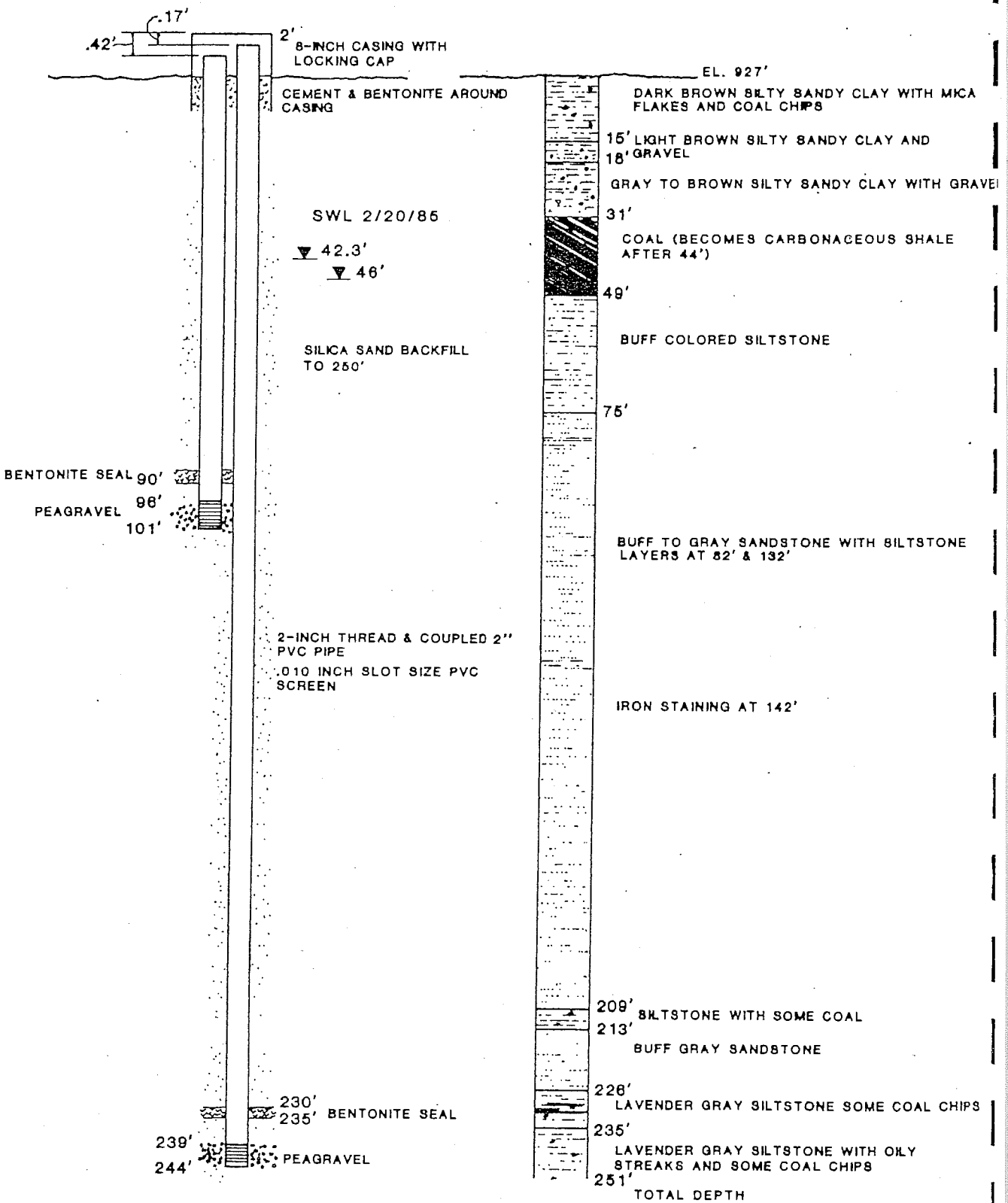
Attachment B

DSP Monitor Well Logs

Test Well 1

INDUSTRIAL MINERAL PROJECTS

RAVENSDALE



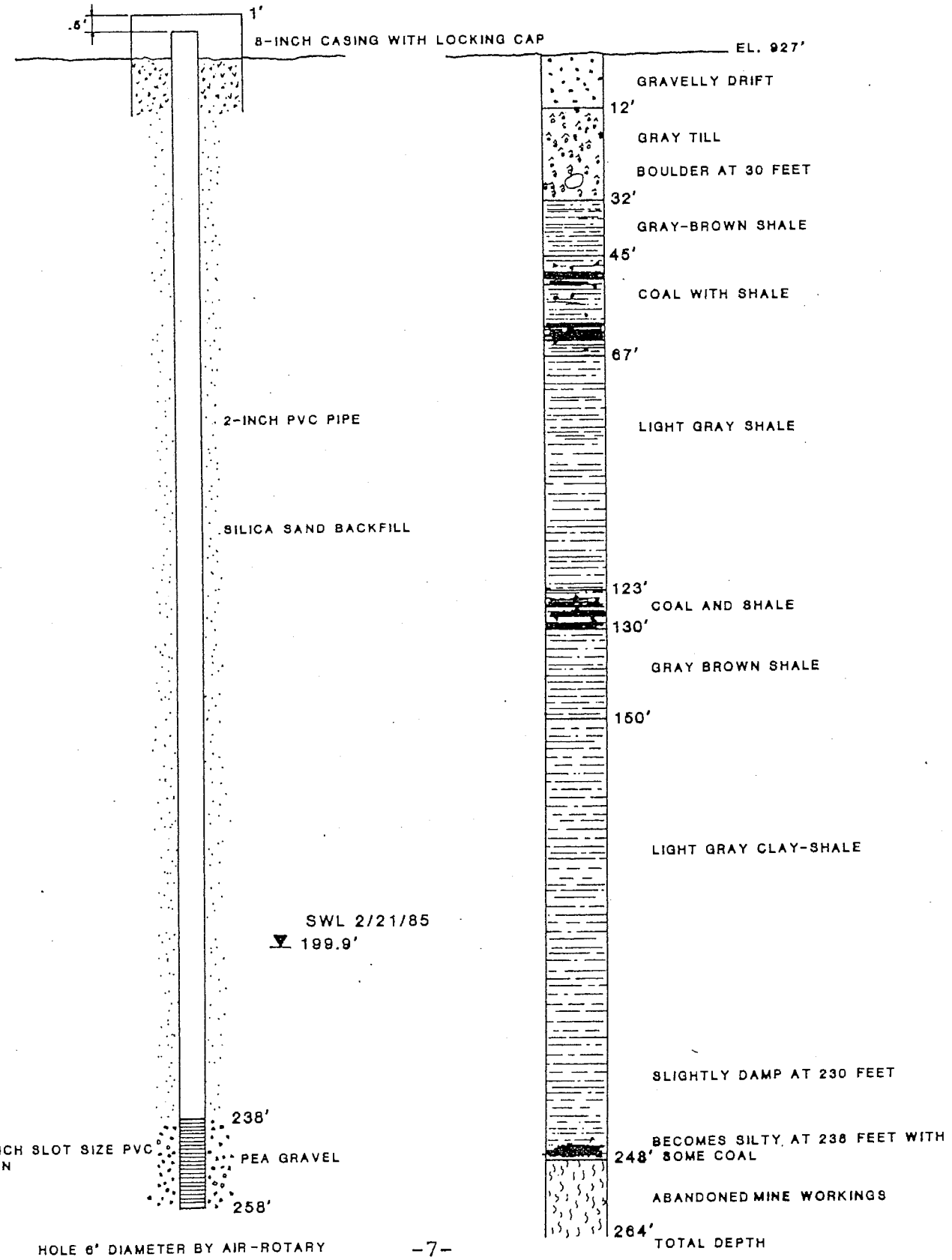
HOLE 6" DIAMETER BY AIR ROTARY

NOTE: ALL BEDS HAVE STEEP WESTERLY DIP

Test Well 2

INDUSTRIAL MINERAL PRODUCTS

RAVENSDALE



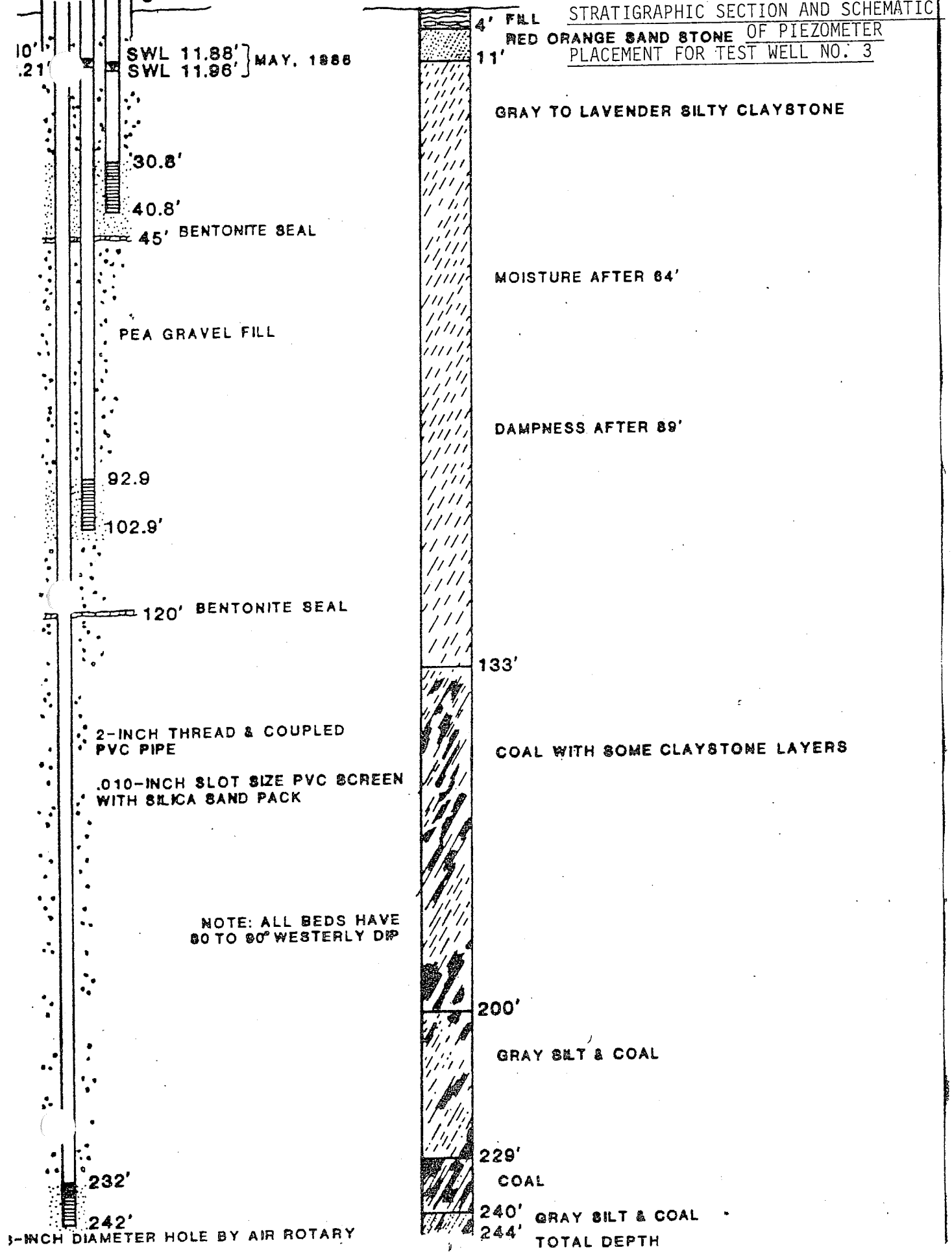
HOLE 6" DIAMETER BY AIR-ROTARY

NOTE: ALL BEDS HAVE STEEP WESTERLY DIP

ATTACHMENT 25

FIGURE 2

STRATIGRAPHIC SECTION AND SCHEMATIC OF PIEZOMETER PLACEMENT FOR TEST WELL NO. 3



RAVENSDALE

ATTACHMENT 25

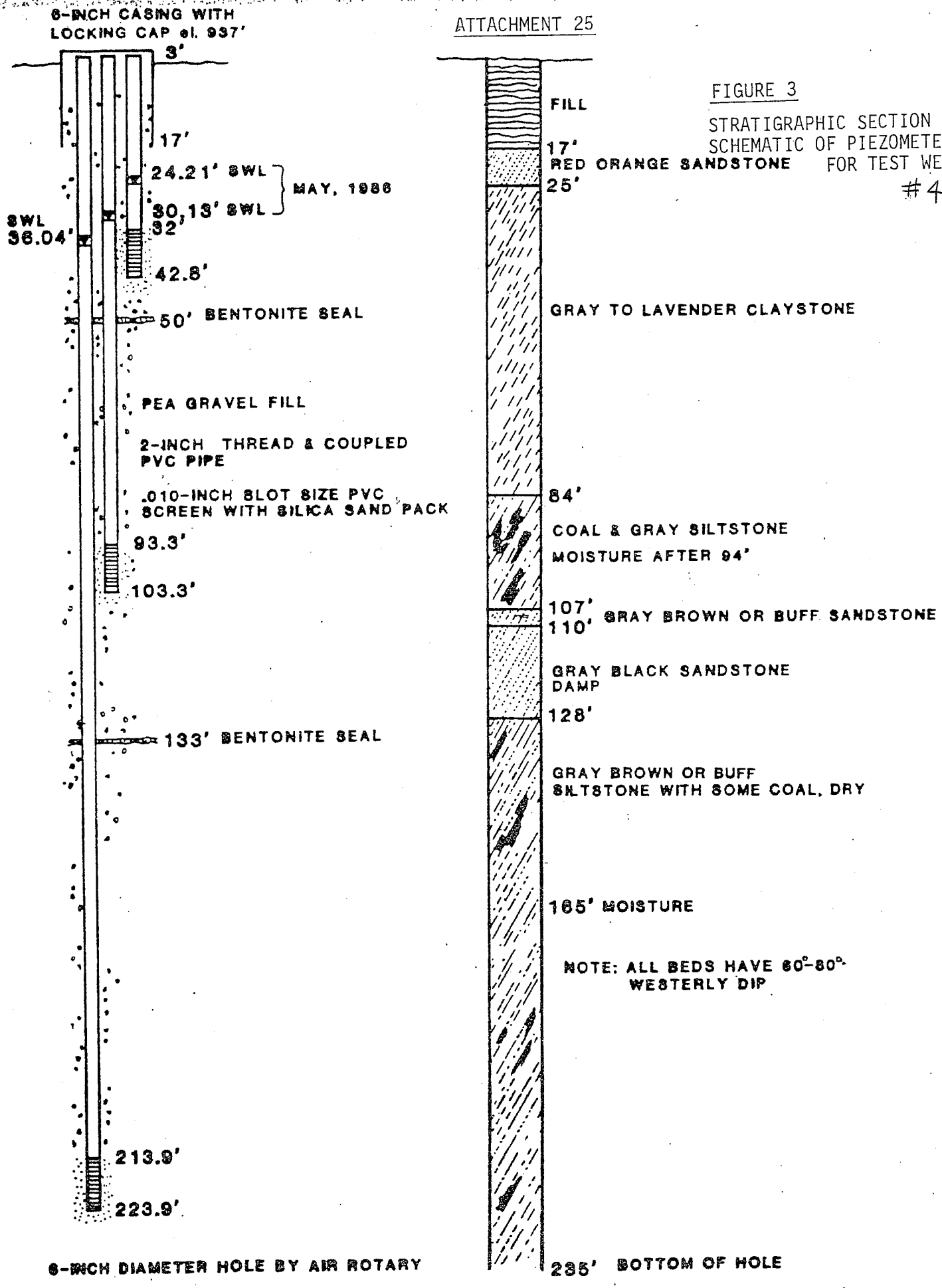


FIGURE 3

STRATIGRAPHIC SECTION AND SCHEMATIC OF PIEZOMETER P FOR TEST WELL #4

CADIS GERAGHTY & MILLER

Sample/Core Log (Cont.d)

Boring/Well RMW-1S

Page 1 of 2

Prepared by Wayne Harmon

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 Inches	Sample/Core Description
0'	5'			Reddish-Brown clay PH 8.1 with pieces of Coal
5'	10'			Reddish-Brown silty clay with coal Fragments
10'	15'			Dark Grey silty clay with coal Fragments & Gravel pieces
15'	20'			Grey silty clay with coal Fragments & Gravel pieces
20'	21'			Layer of 3/4" minus Gravel
21'	21'10"			Grey Brown silty Sand Coal pieces and shale Flakes
22'	27'			Grey silty sand with shale pieces
27'	32'			Grey sandy silty Clay with Gravel pieces
32'	37'			Grey Brown Sandy silt with Gravel pieces
37	42'			Grey Brown Sandy Silt
	41'			Coal
41	47			Coal
47	52			Coal
52	57			Coal
57	62			Coal
62	67			Coal
67	71			Coal
	71			Grey Sandy Siltstone
72	77			~~Grey Sandy Silt~~ Grey Silty Sandstone
77	87			~~Grey Silty Sand~~ Buff colored silt stone
87	97			Brown-Grey silt stone
97	107			Brown-Grey Silty Sandstone
107	117			Grey-Tan Silty Sandstone
117'	27'			Grey-Tan Silty Sandstone
127'	137'			Grey-Tan Silty Sandstone (AT 137' we stopped Drilling FOR 45 min. No water was produced
37	147'			Grey Tan Silty Sandstone
147	155			Grey-Tan Silty Sandstone
	155			Hit water

ARCADIS GERAGHTY & MILLER

Sample/Core Log (Cont.d)

Boring/Well RMW 1-S

Prepared by Wayne HARMON

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 Inches	Sample/Core Description
155'	165'			GREY Sandstone

CADIS GERAGHTY & MILLER

Sample/Core Log (Cont.d)

Boring/Well RMW-1D

Page 1 of 2

Prepared by Wayne Harmon

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 Inches	Sample/Core Description
0'	5'			Reddish Brown clay with pieces of coal
5'	10'			Reddish Brown silty clay with coal fragments
10'	15'			Dark Grey silty clay with coal fragments & Gravel pieces
15'	19'			Grey silty clay with coal fragments & Gravel pieces
19'	20'			Gravel Layer 3/4 minus small amount of sandy fines
20'	25			Light Grey/Brown silty sand coal pieces & shale flakes
25'	30'			Grey to Brown sandy silty clay with Gravel pieces
30'	35'			Grey to Brown sandy silty clay with Gravel pieces
35'	37'6"			Grey to Brown sandy silty clay with Gravel pieces
40	42'			Grey to Brown silty clay
42'	47'			Buff colored silt stone
47'	52'			Buff colored silt stone
	55'			1.7 Coal Layer
55'	57'			Coal
57'	62'			Coal
62	67'			Coal
67	72'			Coal
72	77'			Coal
77'	82'			Coal
	82'			Buff colored silt stone
82'	87'			Buff colored silt stone
87	97			Buff colored silt stone
97	107			Buff Colored silt stone
107	117			Buff to Grey sandstone
117	127'			~~wet~~ Buff silt stone
127'	137'			wet silty sandstone
137	147'			wet silty sandstone
147	157			wet silty sandstone

ARCADIS GERAGHTY & MILLER

Sample/Core Log (Cont.d)

Boring/Well RMW-1D

Prepared by WAyne Hartman

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 Inches	Sample/Core Description
157'	167'			~~Buff~~ Grey Colored silty Sandstone
167'	177'			~~Buff~~ Grey Colored silty Sandstone
177'	187'			Grey silty sandstone with some Coal
187'	197'			Grey Colored sandstone
197'	207'			Grey Colored Sandstone
207'	217'			Grey Colored Sandstone
217'	227'			Grey Colored Sandstone with some Coal
227'	237'			Grey Colored Sandstone
237'	247			Grey Colored Sandstone
	247'			Lavender - Grey Sandstone with some Coal
247'	257'			Lavender - Grey Sandstone with some Coal
257'	270'			Lavender - Grey Sandstone with some Coal

Attachment C

Augur Bore Hole Logs

Bore Hole Log

SubTerra, Inc.
PO Box 520
218 East North Bend Way
North Bend, WA 98045
Phone: (425) 888-5425
Fax: (425) 888-2725

Contractor: Cascade Drilling
Drilling Method: Hollow Stem Auger
Sampling Method: Split Spoon
Elevation:

Hole No: EH-1
Project Name: Reserve Silica
Project Number: 2003-23
Hole Diam: 8 1/4"

Depth	Graphic	Geologic Description	Sample Interval	Standard Penetration (▲ Blows/foot (140lbs hammer/30"drop); N/A - Samples logged later; 10 20 30 40 50)	Ground Water
		Fill			
5		Fill, dark brown with rusty mottling, black organics moist to wet, gravelly sandy silt	X		
10		Fill, brownish gray with rusty mottling, woody debris saturated, sandy silt	X		▼
15		Lodgement Till, light brown gray with rusty mottling wet, gravelly silty sand	X		
		Lodgement Till			
20		Lodgement Till, gray, some mottling, wet gravelly silty sand - contact at 21'	X		
25		Siltstone, gray, dry to damp	X		
30		Siltstone, gray, dry to damp	X		
		Siltstone Bedrock			
35		Siltstone, gray, dry to damp	X		
40		Siltstone, gray, dry to damp, pour recovery	X		
5		Siltstone, gray, dry to damp, limited recovery	X		

Bore Hole Log

SubTerra, Inc.

Hole No: EH-1

Depth	Graphic	Geologic Description	Sample Interval	Standard Penetration (▲ Blows/foot (140lbs hammer/30"drop); N/A - Samples logged later; 10 20 30 40 50)	Ground Water
50		Sandstone, gray, damp, fine grained, arkosic, some mica	☒		
55		Sandstone, light gray, damp, fine grained, arkosic, some mica	☒		
60		Sandstone, light gray, damp, fine to medium grained, arkosic, some mica	☒		
65		Sandstone, light gray, moist, medium grained, arkosic, some mica	☒		
70		Sandstone, light gray, moist, medium grained, arkosic, some mica	☒		
		Sandstone Bedrock			
75		Sandstone, light gray, wet, medium grained, arkosic, some mica	☒		
80		Sandstone, light gray, some rusty orange mottling; saturated, medium to course grained	☒		▼
85		Sandstone, light gray, moist, medium grained	☒		
90		Sandstone, light gray, moist, medium grained	☒		
95		Sandstone, light gray, moist, medium grained, trace coal fragments	☒		
		TD 95'			
100					

BOREHOLE LOG

WELL NO. MW-1A

ARCADIS 11411 NE 124th Street, Suite 270, Kirkland, WA 98034 Tel: 425 821-2100 Fax: 425 821-2111

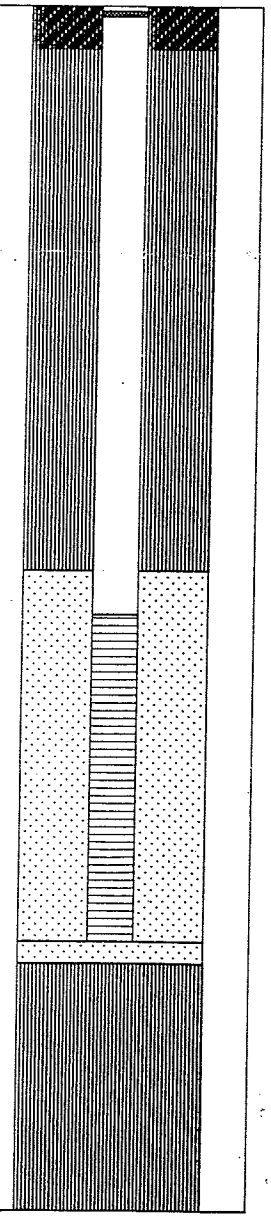
PROJECT NUMBER: WA000712.0003.00002
PROJECT NAME: Reserve Silica Site
LOCATION: Ravensdale, WA
LOGGED BY: Brett Bardsley
DRILLING CO: Cascade Drilling Inc.
DRILLER: Andy Flagan
DRILLING METHOD: Hollow Stem Auger
DATE BEGUN: 07/11/05
DATE COMPLETED: 07/11/05
SURVEYED ELEVATION: 609.83 FT
DTW / (DATE): 35.43 (08/18/05)

WELL COMPLETION DETAILS:

	TYPES	DEPTH (FT BLS)
SURFACE CASING GROUT TYPE:	Concrete	0-2
SEAL TYPE:	Bentonite chips	2-26
WELL SCREEN:	15', 2" PVC screen, 0.010" slots	28-43
SAND PACK:	2 X 12 grade sand	26-44
BACKFILL:	Bentonite chips	44-55.5
TOTAL DEPTH DRILLED:		55.5

DEPTH	MOISTURE	U. S. C. S. CLASS	CORE RECOVERY	DENSITY BLOWS/6"	LITHOLOGY	DESCRIPTION
0	moist	ML				SILT : olive gray; fine to coarse rounded gravel.
-5	moist	ML	1.5'	3,5,5		SILT : olive gray; trace amounts of fine to medium grained sand; loose.
-10	moist	ML	1.5'	3,5,5		SILT : yellowish orange; trace amounts of fine to medium grained sand; wood debris; loose.
-15	moist	SP	0.5'	50 for 6"		GRAVELLY SAND : light brown; medium to coarse grained sand; coarse rounded gravel; cobbles; very dense.
-20	moist	ML	0.5'	50 for 6"		SANDY SILT WITH GRAVEL: grayish brown; fine to medium grained sand; fine rounded gravel; hard.
-25	moist	ML	0.4'	50 for 4"		SILT WITH GRAVEL : light gray; fine rounded gravel; hard.
-30	moist	SP	0.5'	50 for 6"		GRAVELLY SAND : light gray; coarse grained sand; fine rounded gravel; very dense.
-35	wet	SP	0.5'	50 for 6"		GRAVELLY SAND : light gray; trace silt; medium to coarse grained sand; fine rounded gravel; very dense. Note: Groundwater was encountered at approximately 33 feet below land surface (BLS).
-40	wet	ML	0.4'	50 for 4"		SILT WITH SAND : light gray; fine to medium grained sand; trace amounts of fine rounded gravel; very dense.
-45	wet	ML	0.5'	50 for 6"		SILT WITH SAND : light gray; fine to medium grained sand; trace amounts of fine rounded gravel; very dense.
-50	wet	CL	0.5'	50 for 6"		LEAN CLAY : light gray; low to medium plasticity; hard.
-55	wet	CL	0.5'	50 for 6"		LEAN CLAY : light gray; low to medium plasticity; hard.

WELL INSTALLATION



BOREHOLE LOG

WELL NO. MW-2A

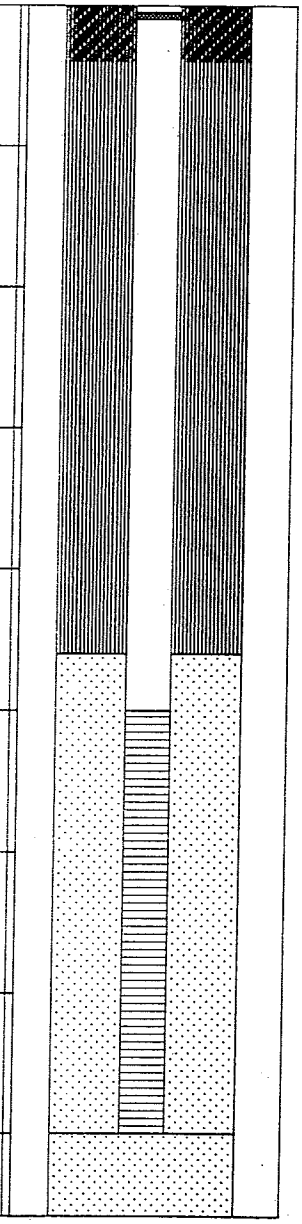
ARCADIS 11411 NE 124th Street, Suite 270, Kirkland, WA 98034 Tel: 425 821-2100 Fax: 425 821-2111

PROJECT NUMBER: WA000712.0003.00002
PROJECT NAME: Reserve Silica Site
SITE LOCATION: Ravensdale, WA
LOGGED BY: Brett Bardsley
DRILLING CO: Cascade Drilling Inc.
DRILLER: Andy Flagan
DRILLING METHOD: Hollow Stem Auger
DATE BEGUN: 07/12/05
DATE COMPLETED: 07/15/05
SURVEYED ELEVATION: 603.61 FT
DTW / (DATE): 29.18 (08/18/05)

WELL COMPLETION DETAILS:

	TYPES	DEPTH (FT BLS)
SURFACE CASING GROUT TYPE:	Concrete	0-2
SEAL TYPE:	Bentonite chips	2-23
WELL SCREEN:	15', 2" PVC screen, 0.010" slots	25-40
SAND PACK:	2 X 12 grade sand	23-40
TOTAL DEPTH DRILLED:		43

DEPTH	MOISTURE	U. S. C. S. CLASS	CORE RECOVERY	DENSITY BLOWS/6"	LITHOLOGY	DESCRIPTION	WELL INSTALLATION
0						There was no recovery.	
-5			0	NR		There was no recovery.	
-10	dry	ML	0.5'	50 for 6"		SILT WITH GRAVEL : grayish brown; fine rounded gravel; hard.	
-15			0	50 for 2"		There was no recovery.	
-20			0	15,25,50 for 1"		There was no recovery.	
-25			0	50 for 6"		There was no recovery.	
-30			0	50 for 1"		There was no recovery.	
-35	wet	SP	1'	5,50 for 5"		GRAVELLY SAND : dark brown; medium to coarse grained sand; fine rounded gravel; very dense.	
-40	wet	ML	1.5'	5,10,25		SANDY SILT WITH GRAVEL : dark brown; fine to medium grained sand; fine rounded gravel; hard.	



BOREHOLE LOG

WELL NO. MW-3A

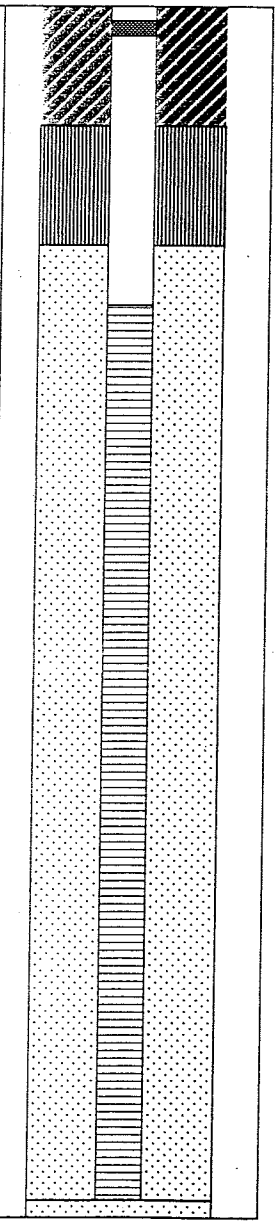
ARCADIS 11411 NE 124th Street, Suite 270, Kirkland, WA 98034 Tel: 425 821-2100 Fax: 425 821-2111

PROJECT NUMBER: WA000712.0003.00002
IECT NAME: Reserve Silica Site
LOCATION: Ravensdale, WA
LOGGED BY: Brett Bardsley
DRILLING CO: Cascade Drilling Inc.
DRILLER: Andy Flagan
DRILLING METHOD: Hollow Stem Auger
DATE BEGUN: 07/12/05
DATE COMPLETED: 07/12/05
SURVEYED ELEVATION: 685.51 FT
DTW / (DATE): 6.09 (07/15/05)

WELL COMPLETION DETAILS:

	TYPES	DEPTH (FT BLS)
SURFACE CASING GROUT TYPE:	Concrete	0-2
SEAL TYPE:	Bentonite chips	2-4
WELL SCREEN:	15', 2" PVC screen, 0.010" slots	4-20
SAND PACK:	2 X 12 grade sand	5-20
TOTAL DEPTH DRILLED:		20.3

DEPTH	MOISTURE	U. S. C. S. CLASS	CORE RECOVERY	DENSITY BLOWS/6"	LITHOLOGY	DESCRIPTION	WELL INSTALLATION
0	dry	SM				SILTY SAND WITH GRAVEL: grayish brown; coarse grained sand; fine rounded gravel.	
-5	wet	SM	1.0'	12, 50 for 6"		SILTY SAND WITH GRAVEL: grayish brown; coarse grained sand; fine rounded gravel; very dense.	
-10	wet	SM	0.4'	50 for 4"		SILTY SAND WITH GRAVEL: grayish brown; fine rounded gravel; hard.	
-15	wet	ML	0.5'	50 for 6"		SILT WITH GRAVEL : light gray; fine rounded gravel; hard.	
-20	moist	ML	0.3'	50 for 3"		SILT WITH GRAVEL : light gray; fine rounded gravel; hard.	



BOREHOLE LOG

WELL NO. MW-4A

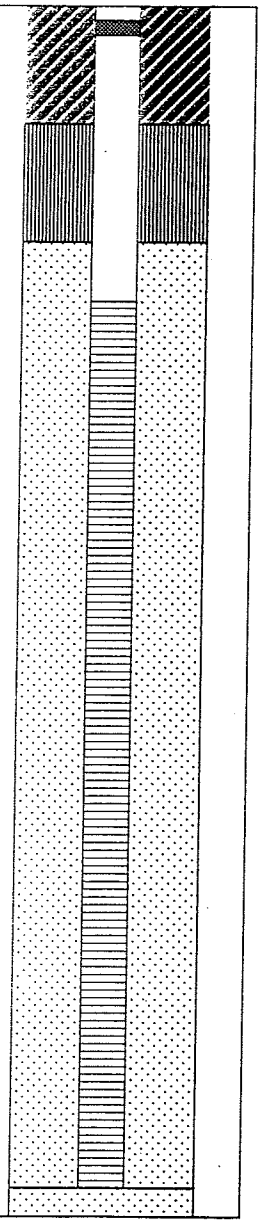
ARCADIS 11411 NE 124th Street, Suite 270, Kirkland, WA 98034 Tel: 425 821-2100 Fax: 425 821-2111

PROJECT NUMBER: WA000712.0003.00002
PROJECT NAME: Reserve Silica Site
LOCATION: Ravensdale, WA
LOGGED BY: Brett Bardsley
DRILLING CO: Cascade Drilling Inc.
DRILLER: Andy Flagan
DRILLING METHOD: Hollow Stem Auger
DATE BEGUN: 07/13/05
DATE COMPLETED: 07/13/05
SURVEYED ELEVATION: 701.85 FT
DTW / (DATE): 4.60 (07/15/05)

WELL COMPLETION DETAILS:

	TYPES	DEPTH (FT BLS)
SURFACE CASING GROUT TYPE:	Concrete	0-2
SEAL TYPE:	Bentonite chips	2-4
WELL SCREEN:	15', 2" PVC screen, 0.010" slots	5-20
SAND PACK:	2 X 12 grade sand	4-20
TOTAL DEPTH DRILLED:		20.5

DEPTH	MOISTURE	U. S. C. S. CLASS	CORE RECOVERY	DENSITY BLOWS/6"	LITHOLOGY	DESCRIPTION	WELL INSTALLATION
0	moist	ML				SILT WITH GRAVEL : light brown; trace amounts of fine grained sand; fine rounded gravel.	
-5	moist	ML	0.5'	50 for 6"		SILT WITH GRAVEL : light brown; trace amounts of fine grained sand; fine rounded gravel; hard.	
-10	wet	SM	0.5'	50 for 6"		SILTY SAND WITH GRAVEL: grayish brown; coarse grained sand; fine rounded gravel; very dense.	
-15	wet	SM	0.5'	50 for 6"		SILTY SAND WITH GRAVEL: grayish brown; coarse grained sand; fine rounded gravel; very dense.	
-20	wet	ML	0.5'	50 for 6"		SILT WITH GRAVEL : light gray; fine rounded gravel; hard.	



BOREHOLE LOG

WELL NO. MW-5A

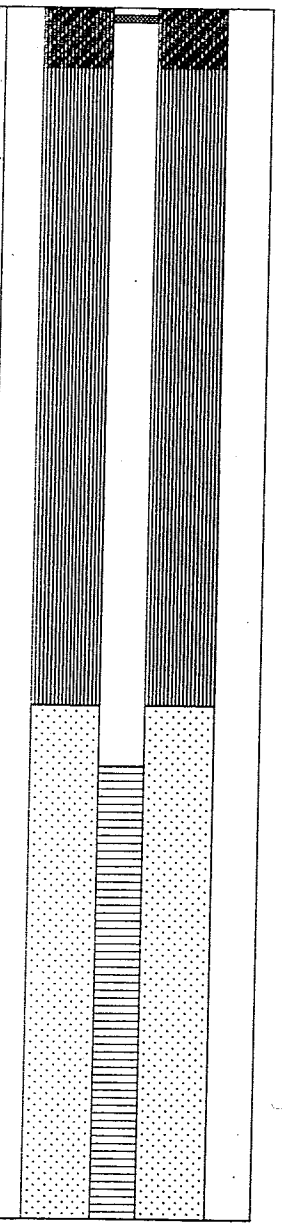
ARCADIS 11411 NE 124th Street, Suite 270, Kirkland, WA 98034 Tel: 425 821-2100 Fax: 425 821-2111

PROJECT NUMBER:	WA000712.0003.00002
PROJECT NAME:	Reserve Silica Site
LOCATION:	Ravensdale, WA
LOGGED BY:	Brett Bardsley
DRILLING CO:	Cascade Drilling Inc.
DRILLER:	Andy Flagan
DRILLING METHOD:	Hollow Stem Auger
DATE BEGUN:	07/13/05
DATE COMPLETED:	07/13/05
SURVEYED ELEVATION:	607.61 FT
DTW / (DATE):	33.33 (08/18/05)

WELL COMPLETION DETAILS:

	TYPES	DEPTH (FT BLS)
SURFACE CASING GROUT TYPE:	Concrete	0-2
SEAL TYPE:	Bentonite chips	2-23
WELL SCREEN:	15', 2" PVC screen, 0.010" slots	25-40
SAND PACK:	2 X 12 grade sand	23-40
TOTAL DEPTH DRILLED:		40

DEPTH	MOISTURE	U. S. C. S. CLASS	CORE RECOVERY	DENSITY BLOWS/6"	LITHOLOGY	DESCRIPTION	WELL INSTALLATION
0	moist	ML				SILT : dark brown; trace amounts of coarse rounded gravel; cobbles.	
-5	moist	ML	1.5'	5,8,12		SILT : dark brown; trace amounts of coarse rounded gravel; cobbles; very stiff.	
-10	moist	ML	1.5'	41,20,50 for 5"		GRAVELLY SILT: light gray; fine rounded gravel; hard.	
-15	moist	SP	1.0'	15,50 for 6"		POORLY GRADED SAND WITH GRAVEL AND COBBLES: grayish brown; trace amounts of silt; medium to coarse grained sand; fine rounded gravel; very dense.	
-20	moist	ML	0.3'	50 for 3"		SILT WITH GRAVEL : brown; fine rounded gravel; hard.	
-25	moist	ML	1.0'	22,50 for 6"		GRAVELLY SILT: grayish brown; fine to coarse rounded gravel; cobbles; very dense.	
-30	moist	SP	0.5'	50 for 6"		GRAVELLY SAND : grayish brown; some silt; coarse grained sand; fine rounded gravel; very dense.	
-3	wet	SP	0.5'	50 for 6"		POORLY GRADED SAND WITH GRAVEL AND COBBLES: grayish brown; coarse grained sand; fine rounded gravel; very dense.	
-40							



BOREHOLE LOG

WELL NO. MW-6A

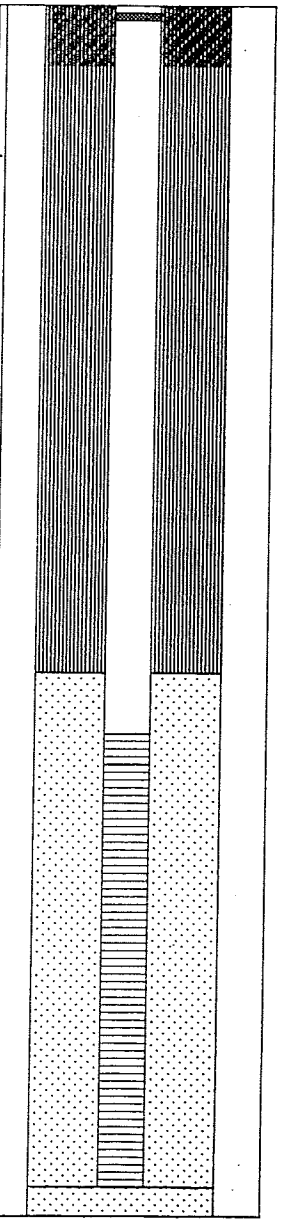
ARCADIS 11411 NE 124th Street, Suite 270, Kirkland, WA 98034 Tel: 425 821-2100 Fax: 425 821-2111

PROJECT NUMBER: WA000712.0003.00002
JECT NAME: Reserve Silica Site
E LOCATION: Ravensdale, WA
LOGGED BY: Brett Bardsley
DRILLING CO: Cascade Drilling Inc.
DRILLER: Andy Flagan
DRILLING METHOD: Hollow Stem Auger
DATE BEGUN: 07/14/05
DATE COMPLETED: 07/14/05
SURVEYED ELEVATION: 605.35 FT
DTW / (DATE): 30.89 (08/18/05)

WELL COMPLETION DETAILS:

	TYPES	DEPTH (FT BLS)
SURFACE CASING GROUT TYPE:	Concrete	0-2
SEAL TYPE:	Bentonite chips	2-22
WELL SCREEN:	15', 2" PVC screen, 0.010" slots	24-39
SAND PACK:	2 X 12 grade sand	22-39
TOTAL DEPTH DRILLED:		40.0

DEPTH	MOISTURE	U. S. C. S. CLASS	CORE RECOVERY	DENSITY BLOWS/6"	LITHOLOGY	DESCRIPTION	WELL INSTALLATION
0	dry	ML				SILT WITH GRAVEL AND COBBLES: brown; fine to coarse rounded gravel; cobbles.	
-5	dry	ML	1.0'	28.50 for 6"		SILT WITH GRAVEL AND COBBLES: brown; fine to coarse rounded gravel; cobbles; hard.	
-10	dry	ML	0.5'	50 for 6"		SILT : brown; fine to coarse rounded gravel; cobbles; hard.	
-15	moist	ML	0.5'	50 for 6"		GRAVELLY SILT: grayish brown; fine to coarse rounded gravel; hard.	
-20			0	50 for 6"		There was no recovery.	
-25	moist	ML	0.5'	50 for 6"		GRAVELLY SILT: light gray; fine to coarse rounded gravel: hard.	
-30			0.5'	50 for 6"		There was no recovery.	
-3			0			There was no recovery.	
-40							



Attachment D

Rotary Percussion Drill Hole Logs

RAVENSDALE SAND MINE 2003 DRILL HOLE DATA

Drill Hole No.	Cover Depth	Bed Rock Depths
03-1	~70'	Ss ~ 70' to 90' TD.
03-2	>80'	Water at 30', abandoned at 80'.
03-3	22'	Vvf ss with mud splits, prob. "sltstn" in mine. 60' carb slt grading to coal at 71'. 72'-82' f ss, TD.
03-4	8'	Ss tan and gray, 8' - 58' TD.
03-5	12'	Vvf ss 12' - 36' TD.
03-6	10'	slt and ms interbedded.
03-7	4'	Vvf ss, thin ms splits 4'-22' TD
03-8	~9'	Vvf ss grading to slt with mud splits TD at 46'
03-9	10'	Slty ss10'-18'; f ss 22'-30' TD; water, hole abandoned.
03-10	10'	Vvvf ss to slt, minor sh splits, 10'-58' TD.
03-11	11'	Slt, sh, 11'-22' TD.
03-12	11'	Ss 11'-58' TD.
03-13	15'	Slty sh 15'-34' TD.
03-14	>30'	Abandoned at 30' because of water.
03-15	>58'	Abandoned at 58' because of mud.
03-16	36'	Sh 36'-58' TD.
03-17	20'	Vf ss 20'-82' TD.
03-18	28'	Slt/sh 28'-34', TD.
03-19	28'	Shaly slt 28'-33' TD.
03-20	21'	F ss 21'-46' TD.
03-21	16'	Ss 16'-46' TD.
03-22	16'	Ss 16'-34' TD.
03-23	33'	Ss 33'-34'; coal, c-sh 34'-42'; ms 42'-46' TD.
03-24	13'	Vvvf ss, minor sh splits, 13'-22' TD.
03-25	14'	Vvf ss 14'-22' TD.
03-26	7'	Slt/sh splits 7'-34' TD.
03-27	8'	Slt/sh splits 8'-34' TD.
03-28	5'	Slt/sh splits 5'-7', vvf ss/clay splits 7'-22' TD.
03-29	8'	Ms 8'-22' TD.
03-30	8'	Clyst 8'-9', ms/slt 9'- 34' TD.
03-31	1'	Fss 1'-58' TD.
03-32	32'	Sh 32'-46' TD.
03-33	7'	Ss 7'-34' TD.
03-34	16'	Ss 16'-34' TD.
03-35	16'	Slt, sh 16'-34' TD.
03-36	7'	Coal 7'-43';vf ss 43'-58' TD.
03-37	6'	Coal, c-sh 6'-52'; c-sh 52'-58' TD.
03-38	8'	C-sh 8'-19'; c-sh 19'-34' TD.
03-39	13'	C-sh, coal 13'-22' TD.
03-40	12'	Fss 12'-34' TD.
03-41	8'	Ss 8'-65' TD.
03-42	18'	Fss 18'-34' TD
03-43	1'	Ss 1'-36'; coal 36'-49'; c-sh, sh 49'53', sh 53'-82' TD.
03-44	15'	Ss 15'-50'; coal, slt 50'-58'; ss (tan) 58'-81' TD.
03-45	no hole	
03-46	15'	Vvf ss, slt 15'-34' TD.
03-47	no hole	
03-48	no hole	

03-49	0'	Clst, slt; coal at 73' TD.
03-50	34'	Coal 34'-43'; sh grading to slt 43'-70' TD.
03-51	28'	Vf ss 28'-46' TD.
03-52	41'	Sh 41'-46'; coal, c-sh 46'-67'; slty ss with clay splits 67'-74'; thin coal in fss 74'-82' TD.
03-53	28'	fss 28'-46' TD.
03-54	32'	Vvf ss 32'-40'; sh 40'-41'; vvf ss 41'-46' TD.
03-55	29'	F ss 29'-46' TD, coarser than in 03-54.
03-56	>34'	Abandoned in glacial material.
03-57	38'	Sh 38'-58' TD.
03-58	30'	F ss 30'-46' TD.
03-59	38'	Sh, slt 38'-46' TD.
03-60	16'	Ss 16'-82' TD.
03-61	20'	Coal +c-sh 20'-32'; vvvf ss 32'- 34'; slt+cly 34'-46'; cly+ slt 46'-76' TD.
03-62	18'	vf ss 18'-82' TD.
03-63	19'	Vvf ss 19'-29'; c-sh 29'-32'; coal 32'-52' TD. Bottom of coal at 52' on white sh/slt chips. Dip based on bottom coal in 03-61and 03-63 is 65 degreesNE.
03-64	19'	Cly and slt 19'-46'.
03-65	20'	Vf ss+sh splits 20'-58' TD.
03-66	20'	Vf ss 20'-80' TD.
03-67	18'	Vf ss 18'-46' TD. Some sh splits.
03-68	26'	Green ss 26'-44' TD.
03-69	30'	Coal 30'-46'; cltst 46'-58' TD, grading to slt with cly splits.
03-70	30'	Clystn/sh 30'-34' TD.
03-71	28'	F ss 28'-46' TD.
03-72	18'	F ss 18'-46' TD.
03-73	15'	Ss 15'-34'; f ss 34-58'; sh 58'-67' with thin coal at 65'; coal 67'-82' TD.
03-74	14'	Coal 14'-16'; slt 16'-46' TD.
03-75	18'	Coal 18'-48'; slt 48'-58' TD.
03-76	15'	F ss 15'-82' TD.
03-77	7'	F ss 7'- ?
03-78	15'	Ss 15'- 50' TD.
03-79	15'	Ss 15' 32'; finer ss changing to slt at 46'; clyst 46'-50' TD.
03-80	15'	Slt 15'-22' TD.
03-81	7'	Coal 7'-9'; thin c-sh; coal to 24'; slt/cly 24'-39'; coal, c-sh 39'-54'; sh 54'- 58' TD.
03-82	21'	Coal 21'-34' TD.
03-84	25'	F ss to vvf ss 25'-46' TD.
03-85	27'	F ss 27'-44' TD.
03-86	15'	Ss 15' 34' TD.
03-87	29'	Slt 29'-47'; f ss 47'-58' TD.
03-88	54' till+dump	Ss 54'-70' TD.
03-89	7'	Vf ss 7'-18'; white slt 18'-22'; vf ss 22'-34' TD.
03-90	7'	Sandy slt 7'-8'; coal 8'-15'; c-sh 15'-22' TD.
03-91	8'	Vvf ss/slt/clst 8'-22' TD.
03-92	9'	Clay+vvf ss 9'-22' TD.
03-93	9'	C-sh 9'-22' TD.
03-94	8'	Vvvf clayey ss 8'-10; f ss 14'-34' TD.
03-95	4'	Vf ss 4'-22'; f ss 22'-34' TD.

03-96	5'	Vf ss 5'-10'; ss 10'-65' TD.
03-97	9'	Sh, vvvss 9'-22'; sh 22'-43'; sh and c-sh 43'-77'; sh 77'-82' TD.
03-98	4'	Ss 4'-18' TD (Twisted off at 18'.)
03-99	9' or >34'	F brown ss 9'-22'; ? 22'-34' abandoned in dark ss with sh frags. Could all be glacial.
03-100	9'	Vvf ss 9'-22' TD.
03-101	36'	Fss 36'-58' TD.
03-102	37'	Vvf ss (slt) 37'-46' TD.
03-103	31'	Orange ss in main mine road. Old lower sand.
03-104	25'	slty vvf ss 25'-35' TD.
03-105	32'	Sh 32'-40' TD.
03-106	32'	Vvvf ss 32'-47'; c-sh 47'-50' TD.
03-107	24'	Ss 24'-40'; vf ss, clayey 40'-50' TD.
03-108	25'	Vf ss 25'-40'; vvf ss 40'-50' TD.
03-109	25'	F ss 25'-50' TD. Some clay-rich layers.
03-110	25'	Slty clyst grading to slt 25'-40' TD.
03-111	29'	C-sh ~29'-37' TD. Bit plugged.
03-112	34'	Vvvf ss with clay 34'-44' TD. Bit plugged.
03-113	30'	slt 30'-35'; sh/slt 35'-50' TD.
03-114	25'	C-sh 25'-30' TD. Several drill problems. Moved drill.
03-115	7'	Ss 7'-30' TD.
03-116	27'	Ss 27'-40'
03-117	25'	Ss 25'-49'; coal 49'-62' TD.
03-118	36'	Ss 36'-52' TD. Lost hole to water, plugged bit.
03-119	34'	Ss 34'-50'; f ss 50'-60' TD, more clay.
03-120	25'	Ss 245'-40' TD.
03-121	15'	Ss 15-30' TD.
03-122	6'	F ss 6'-22' TD. More clay in ss at bottom.
03-123	4'	Slty clay 4'-20' TD.;
03-124	5'	Slty clay5'-17'; c-sh 17'-20' TD.
03-125	no hole	
03-126	4'	Silty clay 4'-6', f ss '-8'; vvvf ss 8'-14'; vf ss 14'-30'; f ss 30'-40' TD.
03-127	15'	F ss 15'-40' TD.
03-128	10'	Clay/sh 10'-20' TD.
03-129	12'	Slt 12'-20' TD.
03-130	15'	Sh 15'-20' TD.
03-131	6'	F to vf ss 6'-20' TD.
03-132	24'	Sh 24'-62'; c-sh 62'-70'; sh 70'-80' TD.
03-133	54'	C-sh 54'-60'; sh 70'-100' TD.
03-134	54'	Ss 54'-60'; clstn 60'- 80' TD.
03-135	>54'	Abandoned.
03-136	>45'	Abandoned. Plugged rods.
03-137	24'	Sh 24'-50' TD.
03-138	24'	Ss to f ss 24'-50' TD.
03-139	36'	F ss 36'-50' TD.
03-140	~45'	F ss 45'-60' TD.
03-141	24'	F ss 24'- 40' TD.
03-142	6'	Ss 6'-20' TD.
03-143	4'	Ss becoming clay rich, 4'-24' TD.
03-144	>45'	Abandoned; shoe on drill broke, welded, hole muddy.
03-145	>35'	Abandoned. Plugged rods. Wasting time.

03-146	16'	Sh 16'-20' TD.
03-147	18'	Coal 18'-35'; Clystn 35'-70' TD.
03-148	15'	F ss 15'-40' TD. Lost two rods in hole.
03-149	11'	Ss, f ss 11'-40' TD.
03-150	8'	F ss 8'-15'; sh 15'-20' TD.
03-151		10' from 03-147, part of dip test on coal. No coal to 30'.
03-152		5' closer to 03-147. Coal at 13' to 25'. Dip 70 degrees NW.
03-191	34'	Sas orange to white 34-44', ss to 58' TD.
03-192	31'	Coal to 37', c-sh, then sh 39-58' TD.
03-193	16'	Gray atypical ss grading to vfgss, slty ss, and sh at 34' TD.
03-194	28'	Ss, orange turning cream, then orange by 34' TD
03-201	22'	Ss 22-28' yellow; 22-34' slt.
03-202	24'	Ss tan-yellow, orange at 28'. Lt gray slt at 33'; fss at 40'.
03-202a	30'	Fss, orange, gray at 37', coal 63-73', sh, c-sh to 82' TD.
03-203	20'	Ss 24', orange at 27' to orange fss at 82' TD.
03-204	26'	Tan ss, orange at 29' to 46' TD.
03-205	5'	Sh 5-22', TD.
03-206	5'	Sh 5-22', TD.
03-207	18'*	60* angle into fm dip at N75*E. Red ss 18', tan to 34', gray to 39', coal 39-44', c-sh to 46' TD.
03-208	24'	Greenish tan ss 24-29, then tan orange ss to gray at 33'; coal 34'-43'; sh to 46'TD.
03-209	22'	Orange ss 22-44; turns gray at 50' to 82' TD.
03-210	17'	Orange ss 17-30', then white hard ss 30-44', then gray ss to 82' TD.
03-211	39'	Gray-tan ss at 39', then wet, clayey fss 46-65' TD.
03-212	27'	Tan ss 27' becoming clay rich by 70'; gray 78-82' TD.
03-213	12'	Tan ss 12-27', reddish clayey ss 27-74' TD.
03-214	19'	Orange-yellow ss 19-30', then lt green gray, 36-70' red to orange ss.
03-215	>45'	Hundreds of feet north on west side of road. Not at Old Lower Sand.
03-216	18'	Ss, tan, 19-44', then sh/slt 44-70'TD except for coal 58-60'.
03-217	18'	Tan ss finer grained with depth.Tan to 82' TD but greenish at 65'.
03-218	22'	Sh 22-71', some c-sh below 50'. Gray ss 71-82' TD.
03-219	19'	Ss, tan 19-22', gray to 46' TD.
03-220	25'	Coal 25-41'; sh and coal to 55', slty ss 55-62', fss 62-75', ss 75-82'TD.
03-221	18'	Tan vfss grading to gray. TD 34' in gray fss.
03-222	30'	Tan-brn fss; TD 58' in red-tan vfgss.
03-223	29'	Vfss gray grading to fss by 32'. TD 46'.
03-224	34'*	45* angle hole into dip. Slt 34-46' grading to gray fssby 58'. TD 63'.
03-225	12'	12-15' tan ss; coal, c-sh and sh alternating to 46'; coal 50-60', sh to 70', then vvvfss coarsening to fss at 74'; TD 82' in gray fss.
03-226	23'	Lt gray ss 23-82' TD.
03-227	13'	Orange ss changing to gray 13-48'. White mud from sh 48-58' TD.
03-181	>82'	No drilling problem. Had only 82' of drill pipe.
03-182	20' (?)	Slt 20-46'; sh at 46'. "slt" could be glacial, seds beginning at 46' sh.
03-183	22' (?)	Slt 22-60', hard slt to 79', then coal 79-82' TD. Coal may be first sed.
03-184	55'	Gray slt or vvfss 55' grading to sh at 60'. Slty sh 60 to 82' TD.
03-185	15'	Slt and sg 15-28'; coal and c-sh 28-34' TD.
03-186	30'	Yellow ss 30-33', coal to 36', slt to 46' TD.
03-187	38'	Slt 38-48', c-sh 48-58', coal and c-sh 58-70' TD.
03-188	>82	Much water from 60' on down.
03-189	70'	Possible sltstn mixed with glacial pebbles by drill; to TD at 82'.

03-190	48'	Gray ss at 48-58' TD.
03-301	9'	Gray fss 9-82' TD.
03-302	10'	Ss 10-11', 11-63' slt. TD 63', hit mine workings.
03-303	13'	Tan ss turning white at 18'; mised tan and white to TD 82'.
03-304	16'	Fss, cream, at 16', variable yellow to brn to 63', brn sh, c-sh to 82' TD.
03-305	16'	16-82' TD alternating sh, c-sh, minor coal.
03-306	18'	sh to 26', then slt+sh to 34, slt to 46, slt+sh to 62; sh to 82' TD incl. coal 70-73'
03-401	17'	17-38 mudst., 38-46 gray ss, ms 46-62', coal 62-76', c-sh to TD 82'.
03-402	27'	White sandy slt 27-40', brn sh 40-53' TD because of mine workings.
03-403	25	25-58' variable yellow to orange ss, mostly white ss 58-82' TD.
03-404	22'	Slt 22-39'; gray vfss at 39' coarsening at 70' TD 82' in fss.
03-405	19'	C-sh 19-23', coal and c-sh 23-65'. Slt 65-70'; grading to vfss 70-82' TD.
03-406	21'	Gray fss 21-43', gray sh, brn sh, c-sh, to 80', then coal 80-82' TD.

Attachment E

Arcadis Monitor Well Geochemistry

Subject: RE: [Fwd: Data Tables]Reserve Silica
From: "Tony Burgess" <tony@abcenviro.com>
Date: Wed, 31 May 2006 14:07:48 -0700
To: "'George Bennett'" <gbennett@subterra.us>

George

There are standards for As (0.005 mg.l), Cd (0.005 mg/l), and Pb (0.015 mg/l) as dissolved metals in groundwater (WA MTCA Method A). There is also a Federal drinking water standard (MCL) for Ba (2 mg/l). There are no standards for Zn. I am assuming that only groundwater standards are appropriate since the samples are either from wells or the surface water is infiltrated. In any case, surface water standards are much higher and are likely to be met by all analytes.

The following samples exceed the Method A for As

- RMW-1S, all samples
- RMW-1D, 2002, 2003
- MW-4D, 2003, 2004, 2005
- MW-1A, 7/15/05
- MW-3A, 11/10/05, 2/15/06
- MW-5A, 11/10/05, 2/15/06
- MW-6A, 2/15/06
- Still Well, all samples except 6/7/05 and 3/15/06
- Infiltration #1, all samples
- Weir, all samples
- South Pond, all samples

The following samples exceed the Method A for Pb

- Weir, 9/14/05
- South Pond, all samples except 4/5/05, 12/09/05 and 1/19/06

Tony

-----Original Message-----
From: George Bennett [mailto:gbennett@subterra.us]
Sent: Tuesday, May 30, 2006 10:29 AM
To: Tony Burgess
Subject: [Fwd: Data Tables]Reserve Silica

Tony,
Could you have a look at these and let me know if the dissolved metals are a concern
Thanks
George

-------- Original Message --------
Subject: Data Tables
Date: Fri, 26 May 2006 13:58:00 -0600
From: Kleven, Melissa <MKleven@ARCADIS-US.com>
To: George Bennett <gbennett@subterra.us>
CC: <rsilica@seanet.com>

Hi George

I hope the submittal is going well and that you enjoy the weekend. Here are the data tables. If you need any explanation just call me to discuss. You can reach me anytime on my cell at 425.785.6638. If you

Summary of DSP Bedrock Groundwater Sampling Results
Lower Disposal Area
Reserve Silica, Ravensdale, Washington

	2002				2003				2004				2005				2006
	First Mar-02	Second Jun-02	Third Sep-02	Fourth Dec-02	First Mar-03	Second May-03	Third Aug-03	Fourth Nov-03	First Feb-04	Second May-04	Third Aug-04	Fourth Nov-04	First Feb-05	Second May-05	Third Aug-05	Fourth Nov-05	First Feb-06
MW-4D																	
Depth to Groundwater (feet bmp)	-	34.34	34.34	36.30	26.93	28.90	34.99	30.02	27.42	31.53	33.25	31.74	26.75	27.57	32.05	33.16	26.19
pH (s.u.)	7.22	7.1	6.8	6.95	7.06	7.03	7.05	7.05	6.87	6.96	6.85	6.81	6.96	6.89	6.58	6.82	6.95
Temperature (°C)	NA	15	12	11.8	11.7	11.7	13.6	10.8	11.89	13.27	14.35	10.93	10.76	11.95	13.39	12.13	9.66
Conductance (µmhos/cm)	694	840	780	774	705	647	777	427	560	552	367	694	749	780	779	722	689
Dissolved Oxygen (mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.86
Oxidation Reduction Potential (mv)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	***
Turbidity (NTU)	-	-	-	-	-	84.00	18.50	7.65	0.93	29.70	56.70	10.10	9.77	77.30	26.90	86.00	11.6
Dissolved Calcium (mg/L)	130	105	113	82.2	90	87.1	87.4	79.8	92.3	86	83.5	89.8	94.8	89.1	92.1	93.8	91.5
Dissolved Magnesium (mg/L)	250	52	59	36.5	40	40	39.5	36.8	41.8	38.9	38.1	40.6	43.5	40.2	40.1	41.0	42.9
Dissolved Sodium (mg/L)	22	15	18	11	12.7	13.1	13.2	13.4	13.3	13.3	13.3	15.1	16.8	12.4	14.1	12.4	14.3
Bicarbonate as Calcium Carbonate (mg/L)	464	390	376	370	390	400	390	367	400	378	355	367	395	406	376	347	394
Chloride (mg/L)	2	4	2	1.35	1.48	1.54	1.28	1.47	1.61	1.39	1.41	1.22	1.25	1.49	2.15	1.74	2.30 J
Total Dissolved Solids (mg/L)	615	465	444	410	420	500	430	460	500	443	427	472	467	446	484	470	450 J
Dissolved Arsenic (mg/L)	-	-	-	0.0034	-	-	-	0.00638	-	-	-	0.00542	-	-	-	0.00568	-
Dissolved Barium (mg/L)	-	-	-	0.121	-	-	-	0.112	-	-	-	0.129	-	-	-	0.123	-
Dissolved Cadmium (mg/L)	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	<0.001	-
Dissolved Lead (mg/L)	-	-	-	<0.0005	-	-	-	0.00108	-	-	-	<0.001	-	-	-	<0.001	-
Dissolved Zinc (mg/L)	-	-	-	0.00192	-	-	-	0.00615	-	-	-	0.0108	-	-	-	<0.01	-
Portal																	
pH (s.u.)	7.29	7.2	7.1	7.03	7.09	6.94	7.17	7.53	6.85	7.12	7.11	6.94	7.41	7.31	7.23	7.61	6.78
Temperature (°C)	NA	12	11	9.1	10.1	11.2	12.78	10.2	9.31	10.93	12.10	10.20	10.52	13.08	11.08	9.53	9.23
Conductance (µmhos/cm)	653	920	920	900	873	981	1,030	569	568	952	835	941	889	953	988	958	669
Dissolved Oxygen (mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.88
Oxidation Reduction Potential (mv)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	***
Turbidity (NTU)	-	-	-	-	-	10.00	13.00	4.65	5.41	5.98	6.29	6.58	8.72	8.15	7.40	8.58	7.93
Dissolved Calcium (mg/L)	78	80	88	70.8	66.3	70.1	80.1	72	70.4	81.7	74.2	86.1	71.2	64.7	75.8	77.8	61.7
Dissolved Magnesium (mg/L)	53	51	62	40.2	38.1	41.8	46	41.6	42.6	46.6	42.8	48.4	42.2	37.8	42.9	43.5	38.2
Dissolved Sodium (mg/L)	45	46	62	32.1	38.3	40.5	50.6	42.5	33.3	49.9	51.7	66.1	55.4	37.8	47.9	45.8	26.1
Bicarbonate as Calcium Carbonate (mg/L)	280	330	296	330	320	340	370	322	340	341	335	345	341	354	362	382	314
Chloride (mg/L)	8	10	11	9.21	8.18	7.96	10	9.99	6.84	9.9	10.6	9.68	7.05	8.46	10.1	9.23	5.28 J
Total Dissolved Solids (mg/L)	586	583	651	570	530	590	630	592	560	615	601	656	541	548	644	640	450 J
Dissolved Arsenic (mg/L)	-	-	-	0.00444	-	-	-	0.00333	-	-	-	0.00341	-	-	-	0.00315	-
Dissolved Barium (mg/L)	-	-	-	0.0666	-	-	-	0.0621	-	-	-	0.078	-	-	-	0.0712	-
Dissolved Cadmium (mg/L)	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	<0.001	-
Dissolved Lead (mg/L)	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	<0.001	-	-	-	<0.001	-
Dissolved Zinc (mg/L)	-	-	-	0.0018	-	-	-	0.00435	-	-	-	0.00517	-	-	-	<0.01	-

Notes:
Higher result between primary and duplicate sample shown beginning with June 2002 data.
Calcium, magnesium and sodium results prior to May 2003 may be representative of total rather than the dissolved fraction.
Data validation codes shown beginning with 2006 data.

bmp Below measuring point.
°C Degrees Centigrade.
J Data validation code. Estimated value.
µmhos/cm Micromhos per centimeter.
mg/L Milligrams per liter.
NA Not available.
s.u. Standard units.
- Not analyzed or not measured.
* Wells MW-1S and MW-1D decommissioned/abandoned and replaced with RMW-1S and RMW-1D in December 2002.
** Water level probe inoperable. Utilized past data to determine purge volumes.
*** Measurement invalid and not shown.
< Constituent not detected at the reporting limit shown.

Summary of LDA Shallow Groundwater Sampling Results
Lower Disposal Area
Reserve Silica, Ravensdale, Washington

		Field Parameters									General Wet Chemistry (mg/L)			Total Metals (mg/L)				Dissolved Metals (mg/L)							
MONITOR WELL ID	DATE SAMPLED	TOC ELEVATION (feet msl)	DEPTH TO WATER (feet bmp)	GROUNDWATER ELEVATION (feet msl)	TEMPERATURE (°C)	CONDUCTIVITY (µmhos/cm)	DISSOLVED OXYGEN (mg/L)	OXIDATION-REDUCTION POTENTIAL (mV)	TURBIDITY (NTU)	pH (standard units)	BICARBONATE AS CALCIUM CARBONATE	CHLORIDE	TOTAL DISSOLVED SOLIDS	ARSENIC	IRON	LEAD	MANGANESE	ARSENIC	BARIUM	CALCIUM	IRON	LEAD	MAGNESIUM	MANGANESE	SODIUM
MW-1A	07/15/05	609.83	35.43*	574.40	15.17	883	-	-	358	7.03	245	65.8	664	0.0107	8.93	<0.005	0.786	0.00847	0.0748	48.5	<0.1	<0.002	24.9	0.602	72.2
	11/09/05		31.83	578.00	10.77	1,037	-	-	22.2	6.89	474	12.9	680	0.0041	1.12	0.00168	0.0635	0.00345	0.122	61.0	<0.15	<0.001	29.8	0.0286	84.4
	02/15/06		23.91	585.92	9.14	623	1.53	497.4	6.76	7.26	279	4.48 J	470 J	0.00357	0.243	<0.001	<0.01	0.00325	0.0489	30.3	<0.15	<0.001	12.4	<0.01	64.2
MW-2A	07/15/05	603.61	29.18*	574.43	13.78	853	-	-	28.3	7.70	330	12	606	<0.005	1.53	<0.005	0.253	<0.002	0.0473	43.6	<0.1	<0.002	26.9	0.209	56.3
	11/09/05		25.64	577.97	10.95	860	-	-	3.82	7.43	335	5.93	550	0.00142	<0.15	<0.001	0.425	0.00131	0.0546	50.8	<0.15	<0.001	32.6	0.449	46.9
	02/15/06		17.64	585.97	7.81	709	0.82	467.7	3.96	7.86	327	6.02 J	520 J	0.00127	<0.15	<0.001	0.179	0.00106	0.0336	38.4	<0.15	<0.001	23.6	0.134	49.6
MW-3A	07/15/05	685.51	6.09	679.42	13.80	1,124	-	-	30.3	6.96	545	111	922	<0.005	1.21	<0.005	0.657	0.00241	0.0431	99.4	<0.1	<0.002	39.8	0.628	170
	11/10/05		5.50	680.01	10.80	1,518	-	-	2.32	6.88	790	15.5	960	0.0113	4.48	<0.001	3.15	0.0105	0.0537	138	4.80	<0.001	49.8	3.60	155
	02/15/06		5.31	680.20	9.52	1,357	0.46	217.4	58.2	6.33	742	17.0 J	930 J	0.00829	5.54	<0.001	2.94	0.00666	0.0490	110	4.29	<0.001	39.3	2.85	156
MW-4A	07/15/05	701.85	4.60	697.25	12.43	629	-	-	6.07	6.45	224	55.7	490	<0.005	0.53	<0.005	0.403	<0.002	0.0224	68.8	<0.1	<0.002	21.6	0.426	49
	11/10/05		3.70	698.15	11.98	441	-	-	7.40	6.22	184	2.96	290	<0.001	<0.15	<0.001	0.0919	<0.001	<0.01	57.1	<0.15	<0.001	19.2	0.0991	13.9
	01/19/06		3.56	698.29	8.29	319	0.42	-	1.46	6.53	178	2.90	290 J	<0.001	<0.15	<0.001	0.0649	<0.001	<0.01	43.8	<0.15	<0.001	15.3	0.0908	10.6
	02/15/06		3.82	698.03	8.32	326	0.62	99.7	3.50	7.39	128	2.45 J	220 J	<0.001	<0.15	<0.001	0.0313	<0.001	<0.01	37.0	<0.15	<0.001	12.5	0.0341	10.7
	03/15/06		3.79	698.06	7.58	254	0.87	201.9	0.82	6.65	133	2.84 J	210 J	<0.001	<0.15	<0.001	0.0707	<0.001	<0.01	37.9	<0.15	<0.001	12.9	0.0650	10.6
MW-5A	07/15/05	607.61	33.33*	574.28	12.02	956	-	-	496	7.34	386	9.32	600	0.06	142	0.0489	4.67	0.00201	0.0881	35.2	<0.1	<0.002	16.7	1.13	52.2
	11/10/05		29.62	577.99	11.24	1,212	-	-	27.6	7.32	536	5.41	800	0.00998	1.04	0.00213	0.0306	0.0084	0.146	36.5	<0.15	<0.001	22.0	0.0183	78.7
	02/15/06		21.70	585.91	6.45	665	2.59	280.3	11.1	7.86	282	3.71 J	520 J	0.0245	0.850	0.00132	0.0215	0.0223	0.0325	11.8	0.256	<0.001	6.77	0.0169	58.1
MW-6A	07/15/05	605.35	30.89*	574.46	15.26	735	-	-	303	7.60	262	32.7	612	<0.005	5.39	<0.005	0.617	<0.002	0.0499	28.9	<0.1	<0.002	15.9	0.349	64.2
	11/10/05		27.25	578.10	11.79	700	-	-	13.7	7.51	262	6.19	460	0.00224	0.249	<0.001	0.42	0.00216	0.0445	51.1	<0.15	<0.001	28.3	0.451	30.8
	02/15/06		19.42	585.93	6.17	759	2.00	162.9	9.42	8.27	245	7.09 J	550 J	0.00782	0.460	<0.001	0.687	0.00754	0.0589	36.9	<0.15	<0.001	18.1	0.616	53.3

Note: Higher result between primary and duplicate sample shown. Data validation codes shown beginning with 2006 data.

- Not measured.
* Depth to water measurements for Wells MW-1A, MW-2A, MW-5A and MW-6A recorded on 8/18/05.
°C Degrees Centigrade.
feet bmp Feet below measuring point.
feet msl Feet above mean sea level.
J Data validation code. Estimated value.
µmhos/cm Micromhos per centimeter.
NTU Nephelometric Turbidity Unit.
mg/L Milligrams per liter.
mV Millivolts.
TOC Top of casing.
< Analyte not detected above the reporting limit shown.

Summary of LDA Flow Groundwater Sampling Results
Lower Disposal
Reserve Silica, Ravensdale, Washington

MONITOR WELL ID	DATE SAMPLED	Field Parameters									General Wet Chemistry (mg/L)			Total Metals (mg/L)				Dissolved Metals (mg/L)							
		TOC ELEVATION (feet msl)	DEPTH TO WATER (feet bmp)	GROUNDWATER ELEVATION (feet msl)	TEMPERATURE (°C)	CONDUCTIVITY (µmhos/cm)	DISSOLVED OXYGEN (mg/L)	OXIDATION-REDUCTION POTENTIAL (mV)	TURBIDITY (NTU)	pH (standard units)	BICARBONATE AS CALCIUM CARBONATE	CHLORIDE	TOTAL DISSOLVED SOLIDS	ARSENIC	IRON	LEAD	MANGANESE	ARSENIC	BARIUM	CALCIUM	IRON	LEAD	MAGNESIUM	MANGANESE	SODIUM
MW-1A	07/15/05	609.83	35.43*	574.40	15.17	883	-	-	358	7.03	245	65.8	664	0.0107	8.93	<0.005	0.786	0.00847	0.0748	48.5	<0.1	<0.002	24.9	0.602	72.2
	11/09/05		31.83	578.00	10.77	1,037	-	-	22.2	6.89	474	12.9	680	0.0041	1.12	0.00168	0.0635	0.00345	0.122	61.0	<0.15	<0.001	29.8	0.0286	84.4
	02/15/06		23.91	585.92	9.14	623	1.53	497.4	6.76	7.26	279	4.48 J	470 J	0.00357	0.243	<0.001	<0.01	0.00325	0.0489	30.3	<0.15	<0.001	12.4	<0.01	64.2
MW-2A	07/15/05	603.61	29.18*	574.43	13.78	853	-	-	28.3	7.70	330	12	606	<0.005	1.53	<0.005	0.253	<0.002	0.0473	43.6	<0.1	<0.002	26.9	0.209	56.3
	11/09/05		25.64	577.97	10.95	860	-	-	3.82	7.43	335	5.93	550	0.00142	<0.15	<0.001	0.425	0.00131	0.0546	50.8	<0.15	<0.001	32.6	0.449	46.9
	02/15/06		17.64	585.97	7.81	709	0.82	467.7	3.96	7.86	327	6.02 J	520 J	0.00127	<0.15	<0.001	0.179	0.00106	0.0336	38.4	<0.15	<0.001	23.6	0.134	49.6
MW-3A	07/15/05	685.51	6.09	679.42	13.80	1,124	-	-	30.3	6.96	545	111	922	<0.005	1.21	<0.005	0.657	0.00241	0.0431	99.4	<0.1	<0.002	39.8	0.628	170
	11/10/05		5.50	680.01	10.80	1,518	-	-	2.32	6.88	790	15.5	960	0.0113	4.48	<0.001	3.15	0.0105	0.0537	138	4.80	<0.001	49.8	3.60	155
	02/15/06		5.31	680.20	9.52	1,357	0.46	217.4	58.2	6.33	742	17.0 J	930 J	0.00829	5.54	<0.001	2.94	0.00666	0.0490	110	4.29	<0.001	39.3	2.85	156
MW-4A	07/15/05	701.85	4.60	697.25	12.43	629	-	-	6.07	6.45	224	55.7	490	<0.005	0.53	<0.005	0.403	<0.002	0.0224	68.8	<0.1	<0.002	21.6	0.426	49
	11/10/05		3.70	698.15	11.98	441	-	-	7.40	6.22	184	2.96	290	<0.001	<0.15	<0.001	0.0919	<0.001	<0.01	57.1	<0.15	<0.001	19.2	0.0991	13.9
	01/19/06		3.56	698.29	8.29	319	0.42	-	1.46	6.53	178	2.90	290 J	<0.001	<0.15	<0.001	0.0649	<0.001	<0.01	43.8	<0.15	<0.001	15.3	0.0908	10.6
	02/15/06		3.82	698.03	8.32	326	0.62	99.7	3.50	7.39	128	2.45 J	220 J	<0.001	<0.15	<0.001	0.0313	<0.001	<0.01	37.0	<0.15	<0.001	12.5	0.0341	10.7
	03/15/06		3.79	698.06	7.58	254	0.87	201.9	0.82	6.65	133	2.84 J	210 J	<0.001	<0.15	<0.001	0.0707	<0.001	<0.01	37.9	<0.15	<0.001	12.9	0.0650	10.6
MW-5A	07/15/05	607.61	33.33*	574.28	12.02	956	-	-	496	7.34	386	9.32	600	0.06	142	0.0489	4.67	0.00201	0.0881	35.2	<0.1	<0.002	16.7	1.13	52.2
	11/10/05		29.62	577.99	11.24	1,212	-	-	27.6	7.32	536	5.41	800	0.00998	1.04	0.00213	0.0306	0.0084	0.146	36.5	<0.15	<0.001	22.0	0.0183	78.7
	02/15/06		21.70	585.91	6.45	665	2.59	280.3	11.1	7.86	282	3.71 J	520 J	0.0245	0.850	0.00132	0.0215	0.0223	0.0325	11.8	0.256	<0.001	6.77	0.0169	58.1
MW-6A	07/15/05	605.35	30.89*	574.46	15.26	735	-	-	303	7.60	262	32.7	612	<0.005	5.39	<0.005	0.617	<0.002	0.0499	28.9	<0.1	<0.002	15.9	0.349	64.2
	11/10/05		27.25	578.10	11.79	700	-	-	13.7	7.51	262	6.19	460	0.00224	0.249	<0.001	0.42	0.00216	0.0445	51.1	<0.15	<0.001	28.3	0.451	30.8
	02/15/06		19.42	585.93	6.17	759	2.00	162.9	9.42	8.27	245	7.09 J	550 J	0.00782	0.460	<0.001	0.687	0.00754	0.0589	36.9	<0.15	<0.001	18.1	0.616	53.3

Note: Higher result between primary and duplicate sample shown. Data validation codes shown beginning with 2006 data.

-	Not measured.
*	Depth to water measurements for Wells MW-1A, MW-2A, MW-5A and MW-6A recorded on 8/18/05.
°C	Degrees Centigrade.
feet bmp	Feet below measuring point.
feet msl	Feet above mean sea level.
J	Data validation code. Estimated value.
µmhos/cm	Micromhos per centimeter.
NTU	Nephelometric Turbidity Unit.
mg/L	Milligrams per liter.
mV	Millivolts.
TOC	Top of casing.
<	Analyte not detected above the reporting limit shown.

Su / of DSP Bedrock Groundwater Sampling Results
Lower Disposal Area
Reserve Silica, Ravensdale, Washington

	2002				2003				2004				2005				2006
	First Mar-02	Second Jun-02	Third Sep-02	Fourth Dec-02	First Mar-03	Second May-03	Third Aug-03	Fourth Nov-03	First Feb-04	Second May-04	Third Aug-04	Fourth Nov-04	First Feb-05	Second May-05	Third Aug-05	Fourth Nov-05	First Feb-06
MW-1S*																	
Depth to Groundwater (feet bmp)	-	42.32	48.83	*	*	*	*	*	*	*	*	*	*	*	*	*	*
pH (s.u.)	7.18	7.3	6.9	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Temperature (°C)	NA	15	15	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Conductance (µmhos/cm)	1,124	1,270	1,290	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Dissolved Calcium (mg/L)	244	195	212	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Dissolved Magnesium (mg/L)	100	106	114	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Dissolved Sodium (mg/L)	29	53	61	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Bicarbonate as Calcium Carbonate (mg/L)	480	534	526	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Chloride (mg/L)	11	13	10	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Total Dissolved Solids (mg/L)	1,300	1,210	1,060	*	*	*	*	*	*	*	*	*	*	*	*	*	*
RMW-1S*																	
Depth to Groundwater (feet bmp)				69.87	36.83	34.88	52.02	53.61	32.75	42.50	49.26	42.81	33.62	34.88	43.80	52.80	42.70
pH (s.u.)				7.29	7.15	7.09	7.01	7.19	6.78	7.23	6.98	6.92	7.01	6.85	6.80	6.64	7.08
Temperature (°C)				9.5	11.5	12.8	19.19	11.60	11.52	14.87	13.72	11.88	13.06	12.91	10.40	10.40	10.40
Conductance (µmhos/cm)				1,690	1,260	1,520	1,460	915	1,033	1,126	1,234	1,429	1,615	1,459	1,472	1,458	1,343
Dissolved Oxygen (mg/L)				-	-	-	-	-	-	-	-	-	-	-	-	-	1.10
Oxidation Reduction Potential (mv)				-	-	-	-	-	-	-	-	-	-	-	-	-	48.3
Turbidity (NTU)				-	24.10	38.00	11.40	8.97	7.36	7.53	8.07	9.06	7.11	6.54	10.40	6.02	11.1
Dissolved Calcium (mg/L)				125	139	148	165	166	183	173	165	183	188	159	188	200	190
Dissolved Magnesium (mg/L)				56.2	61.8	66.3	71.1	74.7	82.1	75.5	72.4	79.8	82.7	70.9	79.6	83.3	82.9
Dissolved Sodium (mg/L)				86.2	71.4	58.1	50.8	44.3	39.2	43.2	42.9	42.5	48.9	30.2	34.4	31.9	32.8
Bicarbonate as Calcium Carbonate (mg/L)				450	450	480	510	507	530	517	499	517	511	521	529	536	537
Chloride (mg/L)				61.2	35.6	25.9	20.3	18.2	17.4	15.7	16.8	14.4	13.9	14.2	15.3	12.7	15.8 J
Total Dissolved Solids (mg/L)				910	860	950	990	1,010	1,060	1,020	981	1,060	1,020	1,000	1,090	1,100	1,100 J
Dissolved Arsenic (mg/L)				0.0466	0.00973	-	-	0.00858	-	-	-	0.01	-	-	-	0.0103	-
Dissolved Barium (mg/L)				0.165	-	-	-	0.0848	-	-	-	0.0894	-	-	-	0.0734	-
Dissolved Cadmium (mg/L)				<0.0005	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	<0.001	-
Dissolved Lead (mg/L)				0.00268	-	-	-	0.000695	-	-	-	<0.001	-	-	-	<0.001	-
Dissolved Zinc (mg/L)				0.127	-	-	-	0.0272	-	-	-	0.0194	-	-	-	<0.01	-
MW-1D*																	
Depth to Groundwater (feet bmp)	-	95.42	95.43	*	*	*	*	*	*	*	*	*	*	*	*	*	*
pH (s.u.)	7.22	7.2	6.9	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Temperature (°C)	NA	15	13	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Conductance (µmhos/cm)	1,263	1,320	1,370	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Dissolved Calcium (mg/L)	220	189	190	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Dissolved Magnesium (mg/L)	111	101	98	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Dissolved Sodium (mg/L)	58	55	71	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Bicarbonate as Calcium Carbonate (mg/L)	456	487	492	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Chloride (mg/L)	19	20	20	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Total Dissolved Solids (mg/L)	1,350	1,250	1,360	*	*	*	*	*	*	*	*	*	*	*	*	*	*

Summary of DSP Bedrock Groundwater Sampling Results
Lower Disposal Area
Reserve Silica, Ravensdale, Washington

	2002				2003				2004				2005				2006
	First Mar-02	Second Jun-02	Third Sep-02	Fourth Dec-02	First Mar-03	Second May-03	Third Aug-03	Fourth Nov-03	First Feb-04	Second May-04	Third Aug-04	Fourth Nov-04	First Feb-05	Second May-05	Third Aug-05	Fourth Nov-05	First Feb-06
RMW-1D*																	
Depth to Groundwater (feet bmp)				87.28	48.63	47.12	64.60	66.14	46.55	55.82	61.89	56.83	47.31	48.60	56.80	66.85	47.88
pH (s.u.)				7.72	7.48	7.54	7.36	8.10	7.15	7.58	7.47	7.22	7.35	7.25	6.99	7.11	7.53
Temperature (°C)				11.1	12.0	12.1	23.23	11.0	10.68	13.61	13.15	10.94	12.80	12.86	14.17	10.20	10.11
Conductance (µmhos/cm)				557	623	548	675	400	455	508	585	655	778	743	746	702	648
Dissolved Oxygen (mg/L)				-	-	-	-	-	-	-	-	-	-	-	-	-	0.71
Oxidation Reduction Potential (mv)				-	-	-	-	-	-	-	-	-	-	-	-	-	109.4
Turbidity (NTU)				-	24.00	264.00	195.00	15.50	8.70	12.40	15.70	9.40	8.39	4.22	3.10	5.36	2.72
Dissolved Calcium (mg/L)				90.3	66.3	72.2	72.1	70.9	68.7	72.1	78.3	78.5	76.6	76.6	82.3	84.8	80.8
Dissolved Magnesium (mg/L)				42	28.7	32.7	31.5	31.4	30.7	31.4	34.1	34.6	34.1	34.4	34.9	39.4	35.8
Dissolved Sodium (mg/L)				27	21.8	19.6	19.8	17.6	18.7	19.8	20	22.1	25.8	18	21.2	24.2	21.5
Bicarbonate as Calcium Carbonate (mg/L)				330	260	270	270	251	270	258	253	262	273	297	267	270	248
Chloride (mg/L)				22.8	9.43	9.18	7.9	8.13	8.64	8.12	8.48	8.11	8.47	8.89	10.7	9.23	13.7 J
Total Dissolved Solids (mg/L)				540	370	440	450	437	440	429	399	477	451	432	518	470	450 J
Dissolved Arsenic (mg/L)				0.0327	0.00708	-	-	0.00603	-	-	-	0.00308	-	-	-	0.0036	-
Dissolved Barium (mg/L)				0.108	-	-	-	0.081	-	-	-	0.134	-	-	-	0.15	-
Dissolved Cadmium (mg/L)				<0.0005	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	<0.001	-
Dissolved Lead (mg/L)				<0.0005	-	-	-	<0.0005	-	-	-	<0.001	-	-	-	<0.001	-
Dissolved Zinc (mg/L)				1.72	-	-	-	0.208	-	-	-	0.0069	-	-	-	<0.01	-
MW-2																	
Depth to Groundwater (feet bmp)	-	197.34	199.29	200.09	190.21	191.78	199.82	199.97	188.78	198.45	199.17	197.92	186.36	**	196.10	196.78	193.93
pH (s.u.)	7.22	7.1	6.9	6.89	6.98	6.98	6.92	7.04	6.68	6.80	6.71	6.75	6.94	6.89	6.44	6.66	6.82
Temperature (°C)	NA	12	14	10.8	11.9	12.3	16.5	11.6	11.96	13.69	14.38	11.62	11.64	12.87	15.01	9.91	8.10
Conductance (µmhos/cm)	542	750	660	675	763	730	848	559	608	614	731	785	806	790	603	549	641
Dissolved Oxygen (mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.11
Oxidation Reduction Potential (mv)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	269.2
Turbidity (NTU)	-	-	-	-	-	233.00	17.00	9.20	4.86	6.17	5.48	12.30	1.47	15.80	45.70	13.30	35.7
Dissolved Calcium (mg/L)	132	100	108	92.9	94.6	100	102	95.9	101	96.5	97.1	95.2	101	78.8	69.1	66.7	82.3
Dissolved Magnesium (mg/L)	44	52	58	41.3	41.9	46.2	46	44.5	45.2	43.6	43.8	43	45.8	35	27.1	24.5	35.1
Dissolved Sodium (mg/L)	22	17	19	13.5	16.6	17.4	18	18.2	17.3	18.3	18.7	21.4	22.9	14.8	18.7	14.6	16.8
Bicarbonate as Calcium Carbonate (mg/L)	372	427	458	440	430	470	460	435	450	417	418	425	442	344	305	361	378
Chloride (mg/L)	3	4	2	1.75	1.84	1.92	1.55	1.87	1.98	1.73	1.9	1.61	1.61	1.61	2.6	2.91	2.78 J
Total Dissolved Solids (mg/L)	467	459	499	440	450	550	520	522	560	478	460	512	487	338	388	350	400 J
Dissolved Arsenic (mg/L)		-	-	<0.001	-	-	-	0.00098	-	-	-	<0.001	-	-	-	<0.001	-
Dissolved Barium (mg/L)	-	-	-	0.178	-	-	-	0.19	-	-	-	0.173	-	-	-	0.0751	-
Dissolved Cadmium (mg/L)	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	<0.001	-
Dissolved Lead (mg/L)	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	<0.001	-	-	-	<0.001	-
Dissolved Zinc (mg/L)	-	-	-	0.00344	-	-	-	0.00905	-	-	-	0.0101	-	-	-	0.0144	-

S[illegible]ry of DSP Bedrock Groundwater Sampling Results
Lower Disposal Area
Reserve Silica, Ravensdale, Washington

	2002				2003				2004				2005				2006
	First Mar-02	Second Jun-02	Third Sep-02	Fourth Dec-02	First Mar-03	Second May-03	Third Aug-03	Fourth Nov-03	First Feb-04	Second May-04	Third Aug-04	Fourth Nov-04	First Feb-05	Second May-05	Third Aug-05	Fourth Nov-05	First Feb-06
MW-4D																	
Depth to Groundwater (feet bmp)	-	34.34	34.34	36.30	26.93	28.90	34.99	30.02	27.42	31.53	33.25	31.74	26.75	27.57	32.05	33.16	26.19
pH (s.u.)	7.22	7.1	6.8	6.95	7.06	7.03	7.05	7.05	6.87	6.96	6.85	6.81	6.96	6.89	6.58	6.82	6.95
Temperature (°C)	NA	15	12	11.8	11.7	11.7	13.6	10.8	11.89	13.27	14.35	10.93	10.76	11.95	13.39	12.13	9.66
Conductance (µmhos/cm)	694	840	780	774	705	647	777	427	560	552	367	694	749	780	779	722	689
Dissolved Oxygen (mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.86
Oxidation Reduction Potential (mv)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	***
Turbidity (NTU)	-	-	-	-	-	84.00	18.50	7.65	0.93	29.70	56.70	10.10	9.77	77.30	26.90	86.00	11.6
Dissolved Calcium (mg/L)	130	105	113	82.2	90	87.1	87.4	79.8	92.3	86	83.5	89.8	94.8	89.1	92.1	93.8	91.5
Dissolved Magnesium (mg/L)	250	52	59	36.5	40	40	39.5	36.8	41.8	38.9	38.1	40.6	43.5	40.2	40.1	41.0	42.9
Dissolved Sodium (mg/L)	22	15	18	11	12.7	13.1	13.2	13.4	13.3	13.3	13.3	15.1	16.8	12.4	14.1	12.4	14.3
Bicarbonate as Calcium Carbonate (mg/L)	464	390	376	370	390	400	390	367	400	378	355	367	395	406	376	347	394
Chloride (mg/L)	2	4	2	1.35	1.48	1.54	1.28	1.47	1.61	1.39	1.41	1.22	1.25	1.49	2.15	1.74	2.30 J
Total Dissolved Solids (mg/L)	615	465	444	410	420	500	430	460	500	443	427	472	467	446	484	470	450 J
Dissolved Arsenic (mg/L)	-	-	-	0.0034	-	-	-	0.00638	-	-	-	0.00542	-	-	-	0.00568	-
Dissolved Barium (mg/L)	-	-	-	0.121	-	-	-	0.112	-	-	-	0.129	-	-	-	0.123	-
Dissolved Cadmium (mg/L)	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	<0.001	-
Dissolved Lead (mg/L)	-	-	-	<0.0005	-	-	-	0.00108	-	-	-	<0.001	-	-	-	<0.001	-
Dissolved Zinc (mg/L)	-	-	-	0.00192	-	-	-	0.00615	-	-	-	0.0108	-	-	-	<0.01	-
Portal																	
pH (s.u.)	7.29	7.2	7.1	7.03	7.09	6.94	7.17	7.53	6.85	7.12	7.11	6.94	7.41	7.31	7.23	7.61	6.78
Temperature (°C)	NA	12	11	9.1	10.1	11.2	12.78	10.2	9.31	10.93	12.10	10.20	10.52	13.08	11.08	9.53	9.23
Conductance (µmhos/cm)	653	920	920	900	873	981	1,030	569	568	952	835	941	889	953	988	958	669
Dissolved Oxygen (mg/L)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.88
Oxidation Reduction Potential (mv)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	***
Turbidity (NTU)	-	-	-	-	-	10.00	13.00	4.65	5.41	5.98	6.29	6.58	8.72	8.15	7.40	8.58	7.93
Dissolved Calcium (mg/L)	78	80	88	70.8	66.3	70.1	80.1	72	70.4	81.7	74.2	86.1	71.2	64.7	75.8	77.8	61.7
Dissolved Magnesium (mg/L)	53	51	62	40.2	38.1	41.8	46	41.6	42.6	46.6	42.8	48.4	42.2	37.8	42.9	43.5	38.2
Dissolved Sodium (mg/L)	45	46	62	32.1	38.3	40.5	50.6	42.5	33.3	49.9	51.7	66.1	55.4	37.8	47.9	45.8	26.1
Bicarbonate as Calcium Carbonate (mg/L)	280	330	296	330	320	340	370	322	340	341	335	345	341	354	362	382	314
Chloride (mg/L)	8	10	11	9.21	8.18	7.96	10	9.99	6.84	9.9	10.6	9.68	7.05	8.46	10.1	9.23	5.28 J
Total Dissolved Solids (mg/L)	586	583	651	570	530	590	630	592	560	615	601	656	541	548	644	640	450 J
Dissolved Arsenic (mg/L)	-	-	-	0.00444	-	-	-	0.00333	-	-	-	0.00341	-	-	-	0.00315	-
Dissolved Barium (mg/L)	-	-	-	0.0666	-	-	-	0.0621	-	-	-	0.078	-	-	-	0.0712	-
Dissolved Cadmium (mg/L)	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	<0.001	-
Dissolved Lead (mg/L)	-	-	-	<0.0005	-	-	-	<0.0005	-	-	-	<0.001	-	-	-	<0.001	-
Dissolved Zinc (mg/L)	-	-	-	0.0018	-	-	-	0.00435	-	-	-	0.00517	-	-	-	<0.01	-

Notes:
Higher result between primary and duplicate sample shown beginning with June 2002 data.
Calcium, magnesium and sodium results prior to May 2003 may be representative of total rather than the dissolved fraction.
Data validation codes shown beginning with 2006 data.

bmp	Below measuring point.
°C	Degrees Centigrade.
J	Data validation code. Estimated value.
µmhos/cm	Micromhos per centimeter.
mg/L	Milligrams per liter.
NA	Not available.
s.u.	Standard units.
-	Not analyzed or not measured.
*	Wells MW-1S and MW-1D decommissioned/abandoned and replaced with RMW-1S and RMW-1D in December 2002.
**	Water level probe inoperable. Utilized past data to determine purge volumes.
***	Measurement invalid and not shown.
<	Constituent not detected at the reporting limit shown.

Summary of LDA Surface Water Sampling Results
Lower Disposal Area
Reserve Silica, Ravensdale, Washington

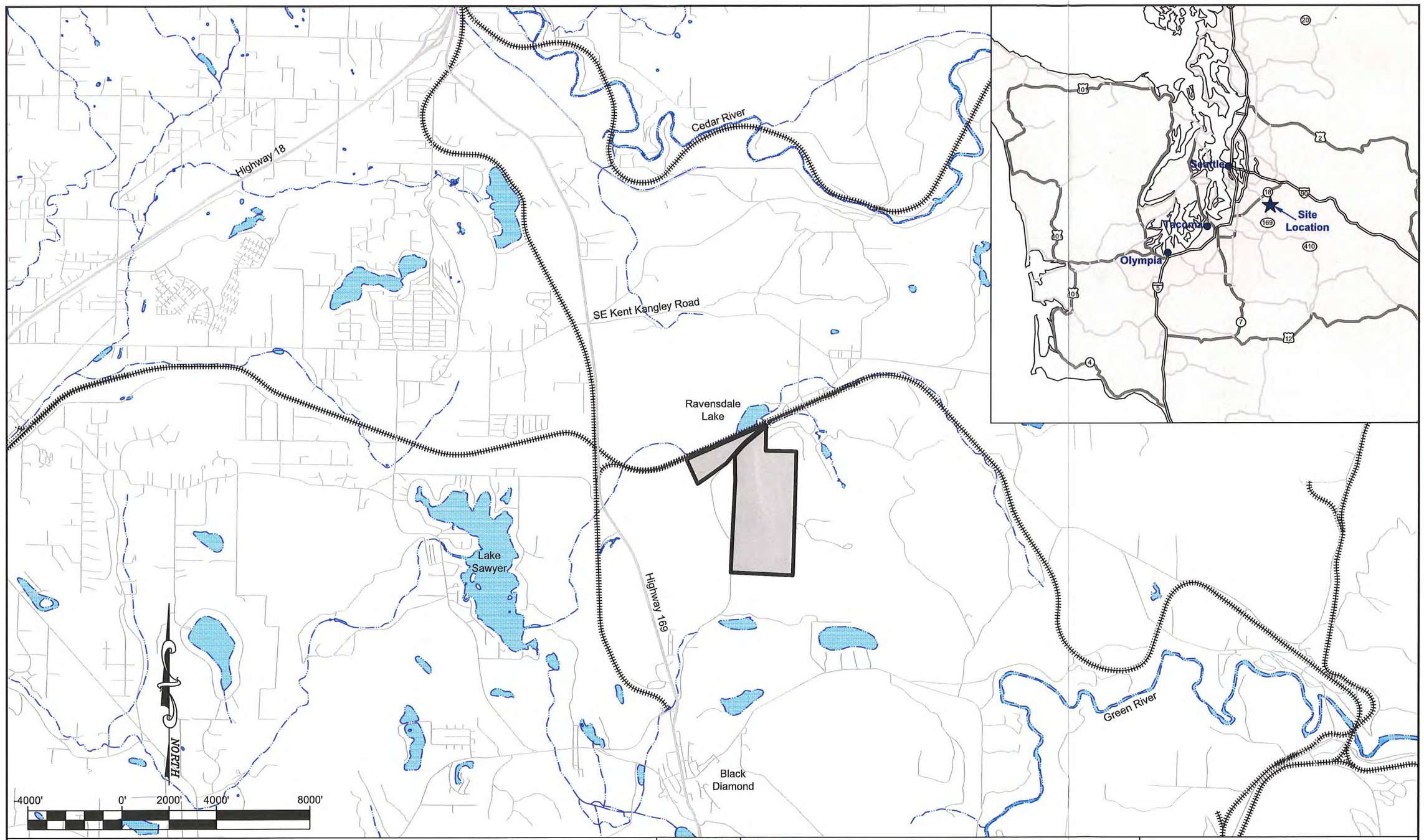
	Units	Analytical Method	2-1-05	3-9-05	4-5-05	5-10-05	6-7-05	7-15-05[a]	7-15-05[b]	8-9-05[a]	8-9-05[b]	9-14-05[a]	9-14-05[b]	10-5-05	11-9-05	12-09-05	1-19-06	2-16-06	3-15-06
Still Well																			
General Wet Chemistry																			
Bicarbonate as Calcium Carbonate	mg/L	EPA 310.1 or SM 2320B	0	-	-	0	-	-	-	<5	0	-	-	-	<5	-	-	<5	-
Total Dissolved Solids	mg/L	EPA 160.1	2,860	2,860	2,900	2,810	2,490	3,800	2,540	3,500	2,820	3,600	2,830	3,020	3,400	2,800	1,900 J	3,200 J	3,300 J
pH	standard units	EPA 150.1	12.58	12.53	12.32	12.57	12.51	12.6	12.61	12.6	12.46	12.5	12.61	12.60	12.6	12.6	12.6 J	12.6	12.6
Chloride	mg/L	EPA 300.0	11	-	-	11.4	-	-	-	13.6	15.6	-	-	-	16.0	-	-	9.54 J	-
Total Metals																			
Iron	mg/L	EPA 6010	0.266	1.92	0.143	0.43	0.17	0.51	0.458	0.962	1.49	13.5	8.96	2.13	0.898	0.603	0.922	1.41 J	0.188
Manganese	mg/L	EPA 6010	<0.01	0.0377	<0.02	<0.02	<0.02	0.015	<0.02	0.0272	0.032	1.92	0.204	0.0577	0.0195	0.0135	0.0195	0.0282 J	<0.01
Arsenic	mg/L	EPA 6020	0.051	0.101	0.0596	0.0549	0.015	0.0773	0.0786	0.0958	0.113	0.455	0.105	0.135	0.0692	0.0596	0.0696	0.0710	0.0694
Barium	mg/L	EPA 6020	-	0.321	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	mg/L	EPA 6020	0.00727	0.0246	0.0145	0.0157	0.00753	0.0143	0.0148	0.0134	0.0191	0.798	0.0726	0.112	0.0299	0.0376	0.0388	0.0459	0.0233
Dissolved Metals																			
Calcium	mg/L	EPA 6010	186	-	-	223	-	-	-	52.7	93.8	-	-	-	155	-	-	216	-
Iron	mg/L	EPA 6010	<0.1	0.228	<0.1	<0.1	<0.1	<0.15	<0.1	0.288	<0.1	<0.75	0.363	<0.1	<0.15	<0.15	<0.15	<0.15	<0.15
Magnesium	mg/L	EPA 6010	<1	-	-	0.0427	-	-	-	<0.5	<1	-	<1	<1	4.09	-	-	<0.5	-
Manganese	mg/L	EPA 6010	<0.01	<0.01	<0.02	<0.02	<0.02	<0.01	<0.02	0.0101	<0.02	<0.05	-	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	mg/L	EPA 6010	548	-	-	467	-	-	-	360	398	-	-	-	490	-	-	285	-
Arsenic	mg/L	EPA 6020	0.0499	0.115	0.0556	0.0554	<0.005	0.00272	0.0398	0.12	0.0915	0.118	0.115	0.0852	0.074	0.0145	0.0152 J	0.0134 J	0.00236
Barium	mg/L	EPA 6020	-	0.112	-	0.404	-	-	-	0.169	0.272	-	-	-	0.342	-	-	0.343	-
Lead	mg/L	EPA 6020	0.00552	0.0147	0.0116	0.0125	<0.005	0.00607	0.00757	0.0109	0.00953	0.0112	0.0144	0.0119	<0.01	0.00107	<0.001	0.00189	0.00250 J
Field Parameters																			
pH	standard units	Field Meter	12.87	12.51	12.44	12.53	12.54	12.50		11.78		12.36		12.47	12.34	12.82	13.06	12.27	12.60
Temperature	°C	Field Meter	8.10	13.23	9.5	13.99	13.83	18.21		21.45		17.38		13.31	9.58	6.18	8.66	8.13	7.98
Conductivity	µmhos/cm	Field Meter	10,658	7,393	11,310	11,871	10,888	11,331		12,087		9,507		11,481	14,417	7,138	8,265	9,019	9,033
Dissolved Oxygen	mg/L	Field Meter	-	-	-	-	-	-		-		-		-	-	-	1.74	2.81	0.79
Oxidation-Reduction Potential	mV	Field Meter	-	-	-	-	-	-		-		-		-	-	-	-	195.6	114.8
Turbidity	NTU	Field Meter	6.59	7.42	10.9	3.60	22.6	14.8		17.9		14.0		62.7	11.0	12.5	11.8	6.16	8.93
Infiltration #1																			
General Wet Chemistry																			
Bicarbonate as Calcium Carbonate	mg/L	EPA 310.1 or SM 2320B	133	-	-	185	-	-	-	493	442	-	-	-	422	-	-	255	-
Total Dissolved Solids	mg/L	EPA 160.1	874	960	800	844	804	1,100	874	1,000	1,030	790	806	736	970	980	470 J	530 J	530 J
pH	standard units	EPA 150.1	9.75	9.46	9.49	9.79	9.53	9.54	9.45	9.22	9.05	9.04	9.03	8.73	9.28	9.54	9.77	8.99	9.19
Chloride	mg/L	EPA 300.0	5.51	-	-	4.32	-	-	-	6.96	6.74	-	-	-	6.92	-	-	5.31 J	-
Total Metals																			
Iron	mg/L	EPA 6010	1.84	1.54	1.48	7.8	6.06	3.85	3.28	2.56	2.35	6.00	4.81	1.93	5.39	1.37	2.84	2.30	1.18
Manganese	mg/L	EPA 6010	0.0974	0.0551	0.0522	0.227	0.162	0.116	0.109	0.102	0.103	0.220	0.208	0.119	0.135	0.05	0.0914	0.194	0.101
Arsenic	mg/L	EPA 6020	0.172	0.0982	0.0682	0.1	0.0991	0.104	0.108	0.147	0.146	0.122	0.12	0.0758	0.0571	0.0741	0.0458	0.0170	0.0258
Barium	mg/L	EPA 6020	-	0.0369	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	mg/L	EPA 6020	0.0148	0.00691	0.00796	0.0317	0.0225	0.0155	0.0147	0.0138	0.0129	0.0182	0.0181	0.00871	0.0107	0.00575	0.00786	0.00347	0.00324
Dissolved Metals																			
Calcium	mg/L	EPA 6010	9.33	-	-	10.2	-	-	-	11.9	9.02	-	-	-	12.3	-	-	50.6	-
Iron	mg/L	EPA 6010	0.234	0.47	0.574	0.79	0.722	<0.3	0.533	0.792	0.339	<0.75	0.877	0.329	0.194	0.179	0.181	<0.15	0.167
Magnesium	mg/L	EPA 6010	4.15	-	-	3.74	-	-	-	4.59	3.57	-	4.21	4.98	5.41	-	-	31.7	-
Manganese	mg/L	EPA 6010	0.0249	0.0321	<0.02	0.0462	0.0327	0.0534	<0.02	0.0499	0.0308	<0.05	-	0.0263	0.0295	0.0399	0.0402	0.119	0.0791
Sodium	mg/L	EPA 6010	147	-	-	108	-	-	-	119	117	-	-	-	110	-	-	42.1	-
Arsenic	mg/L	EPA 6020	0.0849	0.0962	0.0623	0.0765	0.0843	0.0925	0.0999	0.123	0.14	0.11	0.118	0.0893	0.046	0.0646	0.0407	0.0133	0.0225
Barium	mg/L	EPA 6020	-	0.0288	-	0.027	-	-	-	0.0293	0.0355	-	-	-	<0.1	-	-	0.0534	
Lead	mg/L	EPA 6020	0.00499	0.00392	0.00321	<0.005	<0.005	0.00414	0.00382	0.0051	0.00612	0.00354	0.00518	0.00283	<0.01	0.00311	0.00229	<0.001	<0.001
Field Parameters																			
pH	standard units	Field Meter	9.95	9.59	9.8	9.83	9.61	9.30		9.44		8.97		8.98	8.83	9.71	10.13	8.54	9.22
Temperature	°C	Field Meter	8.17	14.04	11.0	14.91	15.11	23.56		19.05		13.59		14.82	8.43	2.12	6.66	2.63	7.16
Conductivity	µmhos/cm	Field Meter	1,315	1,183	1,115	1,275	1,140	1,276		1,744		1,154		970	1,285	1,361	728	624	639
Dissolved Oxygen	mg/L	Field Meter	-	-	-	-	-	-		-		-		-	-	-	7.96	9.75	11.61
Oxidation-Reduction Potential	mV	Field Meter	-	-	-	-	-	-		-		-		-	-	-	-	30.3	236.8
Turbidity	NTU	Field Meter	8.13	23.0	43.7	564	239	94.4		57.2		99.8		82.7	135	14.2	64.7	25.2	23.1

Summary of LDA Surface Water Sampling Results
Lower Disposal Area
Reserve Silica, Ravensdale, Washington

	Units	Analytical Method	2-1-05	3-9-05	4-5-05	5-10-05	6-7-05	7-15-05[a]	7-15-05[b]	8-9-05[a]	8-9-05[b]	9-14-05[a]	9-14-05[b]	10-5-05	11-9-05	12-09-05	1-19-06	2-16-06	3-15-06
Weir																			
General Wet Chemistry																			
Bicarbonate as Calcium Carbonate	mg/L	EPA 310.1 or SM 2320B	142	-	-	335	-	-	-	dry		-	-	-	448	-	-	65.7	-
Total Dissolved Solids	mg/L	EPA 160.1	1,440	1,630	1,420	1,210	1,570	3,200	1,990	dry		2,800	2,730	2,150	1,900	1,700	1,000 J	1,400 J	1,300 J
pH	standard units	EPA 150.1	10.37	10.11	10.18	9.85	10.18	10.3	10.44	dry		10.0	10.16	9.97	9.88	10.4	10.4	10.8	10.7
Chloride	mg/L	EPA 300.0	8.28	-	-	6.8	-	-	-	dry		-	-	-	11.2	-	-	8.05 J	-
Total Metals																			
Iron	mg/L	EPA 6010	1.04	1.89	1.24	45.1	2.23	2.38	2.09	dry		2.19	2.83	1.97	1.76	1.58	1.39	1.70	1.63
Manganese	mg/L	EPA 6010	0.049	0.117	0.0772	2.25	0.173	0.211	0.21	dry		0.102	0.119	0.246	0.0999	0.0827	0.114	0.101	0.0841
Arsenic	mg/L	EPA 6020	0.103	0.208	0.139	0.31	0.14	0.172	0.189	dry		0.254	0.209	0.153	0.0882	0.154	0.0906	0.110	0.147
Barium	mg/L	EPA 6020	-	0.039	-	-	-	-	-	dry		-	-	-	-	-	-	-	-
Lead	mg/L	EPA 6020	0.00702	0.0171	0.012	0.499	0.0129	0.0141	0.0139	dry		0.105	0.084	0.0151	0.0118	0.0109	0.0107	0.00868	0.0125
Dissolved Metals																			
Calcium	mg/L	EPA 6010	8.22	-	-	8.99	-	-	-	dry		-	-	-	11.0	-	-	11.4	-
Iron	mg/L	EPA 6010	0.323	0.526	1.15	1.46	1.47	0.367	1.46	dry		1.25	1.07	1.43	0.167	0.189	0.449	0.343	0.204
Magnesium	mg/L	EPA 6010	2.8	-	-	3.48	-	-	-	dry		-	1.72	7.56	<5	-	-	3.77	-
Manganese	mg/L	EPA 6010	0.0569	0.0938	0.054	0.0818	0.117	0.206	0.164	dry		0.1	-	0.225	0.0835	0.0857	0.104	0.0817	0.0750
Sodium	mg/L	EPA 6010	265	-	-	176	-	-	-	dry		-	-	-	234	-	-	155	-
Arsenic	mg/L	EPA 6020	0.149	0.2	0.129	0.105	0.138	0.192	0.189	dry		0.208	0.223	0.17	0.0782	0.130	0.0895	0.105	0.128
Barium	mg/L	EPA 6020	-	0.0298	-	0.027	-	-	-	dry		-	-	-	<0.1	-	-	0.0203	-
Lead	mg/L	EPA 6020	0.0107	0.0119	0.00861	0.00763	0.0101	0.00998	0.0108	dry		0.0578	0.0733	0.0125	<0.01	0.00612	0.00481	0.00546	0.00638
Field Parameters																			
pH	standard units	Field Meter	10.23	10.15	10.42	9.87	10.03	10.36		dry		9.92		9.89	9.64	10.43	10.61	10.78	10.63
Temperature	°C	Field Meter	8.47	11.38	7.7	14.10	15.74	20.38		dry		15.60		12.96	8.40	3.34	7.37	3.74	7.21
Conductivity	µmhos/cm	Field Meter	2,205	2,054	2,169	1,912	2,588	3,184		dry		3,792		3,237	2,545	1,377	1,424	1,680	1,634
Dissolved Oxygen	mg/L	Field Meter	-	-	-	-	-	-		-		-		-	-	-	7.92	12.19	12.61
Oxidation-Reduction Potential	mV	Field Meter	-	-	-	-	-	-		-		-		-	-	-	-	*	194.4
Turbidity	NTU	Field Meter	6.24	7.80	7.99	562	11.6	8.91		dry		14.5		4.99	13.8	8.03	12.2	14.6	7.44
Flow Rate	gpm	Field Measurement	-	2.64	10.00	25.00	6.82	0.94		dry		0.07		0.32	7.50	5.00	7.50	7.50	5.28
South Pond																			
General Wet Chemistry																			
Bicarbonate as Calcium Carbonate	mg/L	EPA 310.1 or SM 2320B	0	-	-	0	-	-	-	844	620	-	-	-	<5	-	-	<5	-
Total Dissolved Solids	mg/L	EPA 160.1	4,080	4,640	3,830	3,270	3,780	5,000	4,260	6,600	5,580	5,100	4,750	3,090	2,600	3,900	2,000 J	4,100 J	5,100 J
pH	standard units	EPA 150.1	12.61	12.57	12.31	12.40	12.32	11.6	11.80	10.3	10.35	11.1	11.78	10.15	11.5	12.3	12.3 J	12.6	12.7
Chloride	mg/L	EPA 300.0	21.8	-	-	18.5	-	-	-	31.7	33.5	-	-	-	13.7	-	-	17.7 J	-
Total Metals																			
Iron	mg/L	EPA 6010	2.57	2.97	2.03	1.65	2.19	2.95	2.73	9.75	8.31	1.69	5.31	2.42	3.36	5.32	2.42	2.43	0.735
Manganese	mg/L	EPA 6010	0.0988	0.0979	0.123	0.06	0.0763	0.075	0.0777	0.197	0.178	0.122	0.162	0.0908	0.0982	0.143	0.0750	0.0976	0.0160
Arsenic	mg/L	EPA 6020	0.199	0.247	0.141	0.104	0.121	0.210	0.221	0.346	0.354	0.267	0.262	0.115	0.129	0.156	0.0470	0.0436	0.0513
Barium	mg/L	EPA 6020	-	0.055	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	mg/L	EPA 6020	0.0313	0.0469	0.0108	0.046	0.0327	0.0381	0.037	0.0676	0.0608	0.0363	0.0386	0.0361	0.0363	0.0158	0.0379	0.0481	0.137
Dissolved Metals																			
Calcium	mg/L	EPA 6010	12.4	-	-	17.5	-	-	-	18.3	15.7	-	-	-	8.77	-	-	38.5	-
Iron	mg/L	EPA 6010	1.14	0.988	2.52	0.866	1.54	1.26	0.286	8.36	0.648	1.86	2.27	0.947	0.504	5.72	0.556	1.48	<0.15
Magnesium	mg/L	EPA 6010	<1	-	-	0.069	-	-	-	<0.5	<1	-	<1	<1	<0.5	-	-	<0.5	-
Manganese	mg/L	EPA 6010	0.0694	0.0853	0.128	0.0339	0.0526	0.0922	<0.02	0.148	0.0828	0.155	-	0.0638	0.0802	0.149	0.0355	0.0548	<0.01
Sodium	mg/L	EPA 6010	817	-	-	531	-	-	-	609	670	-	-	-	286	-	-	475	-
Arsenic	mg/L	EPA 6020	0.174	0.24	0.133	0.0929	0.132	0.281	0.237	0.322	0.34	0.235	0.268	0.13	0.121	0.175	0.0203	0.0430	0.0386
Barium	mg/L	EPA 6020	-	0.047	-	0.0285	-	-	-	0.0762	0.0771	-	-	-	<0.1	-	-	0.0675	-
Lead	mg/L	EPA 6020	0.0243	0.0421	0.00985	0.0255	0.0247	0.0318	0.0342	0.0445	0.0371	0.0193	0.0342	0.0265	0.0217	0.0141	0.00324	0.0256	0.0418
Field Parameters																			
pH	standard units	Field Meter	13.02	12.52	11.99	12.14	12.19	11.69		10.26		10.51		9.80	11.12	12.85	12.52	12.30	12.60
Temperature	°C	Field Meter	7.13	14.28	9.9	15.10	14.49	18.34		23.53		18.55		12.14	6.78	3.22	7.73	3.96	8.72
Conductivity	µmhos/cm	Field Meter	9,580	9,979	10,820	6,091	8,257	6,937		7,654		6,730		4,323	3,784	8,745	5,215	9,342	12,910
Dissolved Oxygen	mg/L	Field Meter	-	-	-	-	-	-		-		-		-	-	-	5.43	8.97	9.59
Oxidation-Reduction Potential	mV	Field Meter	-	-	-	-	-	-		-		-		-	-	-	-	231.2	222.1
Turbidity	NTU	Field Meter	4.19	6.79	43.5	45.6	24.2	6.89		17.1		10.0		17.6	11.8	12.9	13.3	9.08	7.64

Note: Higher result between primary and duplicate sample shown. Data validation codes shown beginning with 2006 data.

- Not analyzed or not measured.
* Measurement invalid and not shown.
< Analyte not detected above the reporting limit shown.
°C Degrees Centigrade.
gpm Gallons per minute.
J Data validation code. Estimated value.
µmhos/cm Micromhos per centimeter.
mg/L Milligrams per liter.
mV Millivolts.
NTU Nephelometric Turbidity Unit.
a North Creek Analytical, Inc.
b Severn Trent Laboratories.



HORIZONTAL SCALE	1"=4000'
VERTICAL SCALE	Same
DESIGNED	
DATE	BY
12-01-04	GHB
DRAWN	
DATE	BY
12-01-04	JLL

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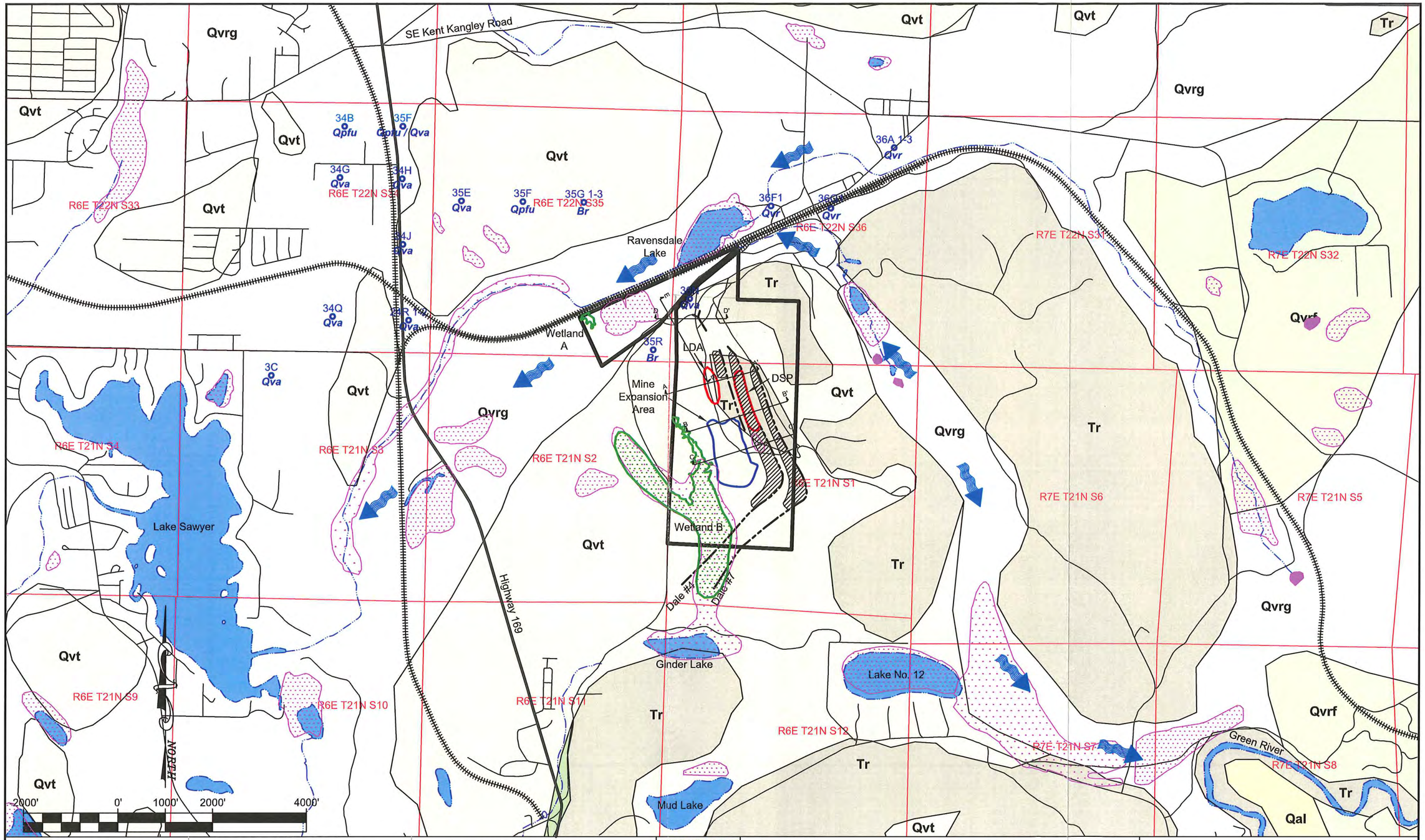
Figure 1
Reserve Silica
Ravensdale Project
Site Vicinity Map

Z:\Active Projects\2003_Projects\2003-23 Reserve Silica Corporation - Reserve Silica\AutoCAD Drawings\Geology Report 12-01-04\Fig1 Vicinity Large.dwg 12/01/2004 10:04:18 AM PDT



= Property Boundary
= Streams / Rivers
= Lakes
= Mine Portal

Qvrg = Vashon Recessional Outwash Gravel (Aquifer)
Qvt = Vashon Lodgement Till (Aquitard)
Tr = Renton Formation (Basement Confining Unit)
Qal = Recent Alluvium

Qvrf = Vashon Recessional Outwash, Fine Sand
= Coal Seam/Mine Workings
2F Qva = Water Well & Aquifer Contact
= Mine Expansion Area
= CKD Backfill Site

HORIZONTAL SCALE 1"=2000'
VERTICAL SCALE Same

DESIGNED	
DATE	BY
12-01-04	GHB
DRAWN	
DATE	BY
12-01-04	JLL

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= Shallow Aquifer Generalized Groundwater Flow

Source: USGS Professional Paper 1424-C

Figure 2
Reserve Silica
Ravensdale Project
Local Geology Map

Z:\Active Projects\2003_Projects\2003-23 Reserve Silica Corporation - Reserve Silica\AutoCAD Drawings\Geology & Groundwater Report 03-30-06\Fig2 Local Geology.dwg 3/30/2006 8:57:31 AM PST

Dale Strip Pit

Lower Disposal Area(L.D.A.)

Monitor Well #1 (RMW-1S & RMW-1D)

Monitor Well #2

Monitor Well #3 (Abandoned)

Monitor Well #4

W.L. 811.1

W.L. 700.3

EH-1

Still Well

Leachate Seepage Aera

Weir

Mine Portal

WM-3A

WM-4A

MW-1A

MW-2A

MW-5A

MW-6A

#1 Pond

South Pond

Pond 1

175' Wetland Buffer

WETLAND B

K.C. Class 1
37.4 Acres

Wetland B Continues Off-site

Wetland B Continues

A

A'

B

B'

C

C'

D

D'

E

E'

Legend:

MW-3A = Hollowstem - Auger Drill Hole

DH03-227 = Rotary Percussion Drill Hole

= Monitoring Well

HORIZONTAL SCALE	1"=200'
VERTICAL SCALE	Same
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04-05-2006	GHB
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DATE	BY
04-05-2006	SGJ

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Figure 3
Reserve Silica
Ravensdale Project
Drill Hole and Section Layout

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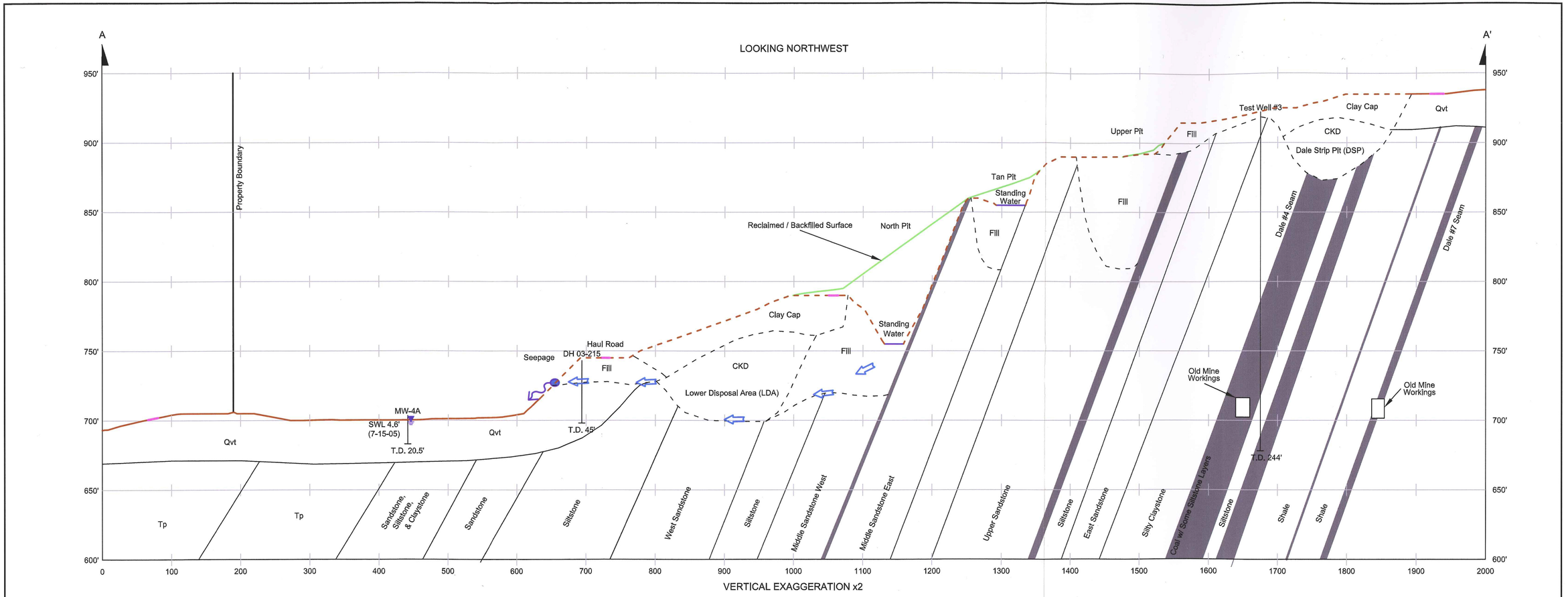

Geologic Interpretation Based on:
Robinson & Noble, Inc. June 1986
Arcadis Geraghty & Miller July 2005
Reserve Silica Staff November 2003 & July 2005
USGS Water Resources Investigation Report 92-4098

Qva = Vashon Advance Outwash
Qvt = Vashon Lodgement Till
Tp = Puget Group Sediments
= Direction of Ground Water Flow
CKD = Cement Kiln Dust Backfill Material

= Existing Natural Surface
= Existing Modified Surface
= Natural Geologic Contact
= Modified Geologic Contact
= Coal

HORIZONTAL SCALE 1"=100'
VERTICAL SCALE 1"=50'
DESIGNED DATE 11-22-05 BY GHB
DRAWN DATE 11-22-05 BY JLL

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Figure 4
Reserve Silica
Ravensdale Project
Cross Section A-A'

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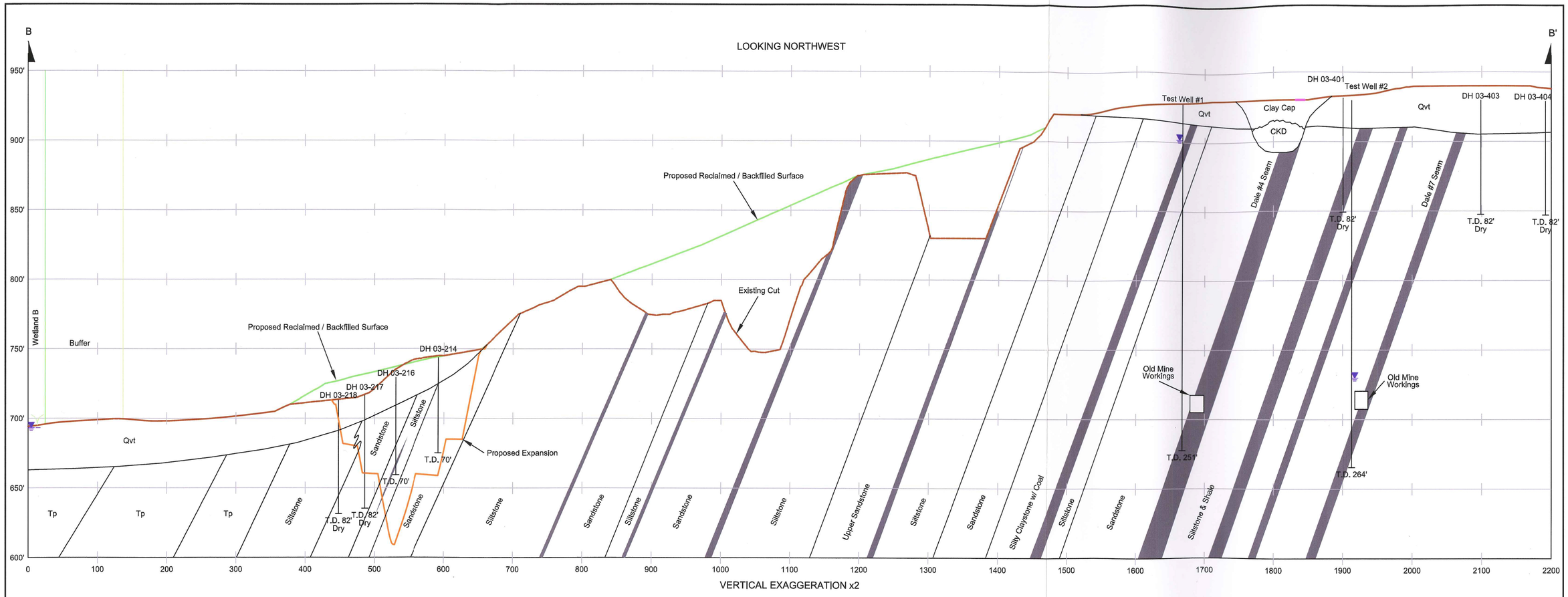

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VERTICAL SCALE 1"=50'
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Figure 5
Reserve Silica
Ravensdale Project
Cross Section B-B'

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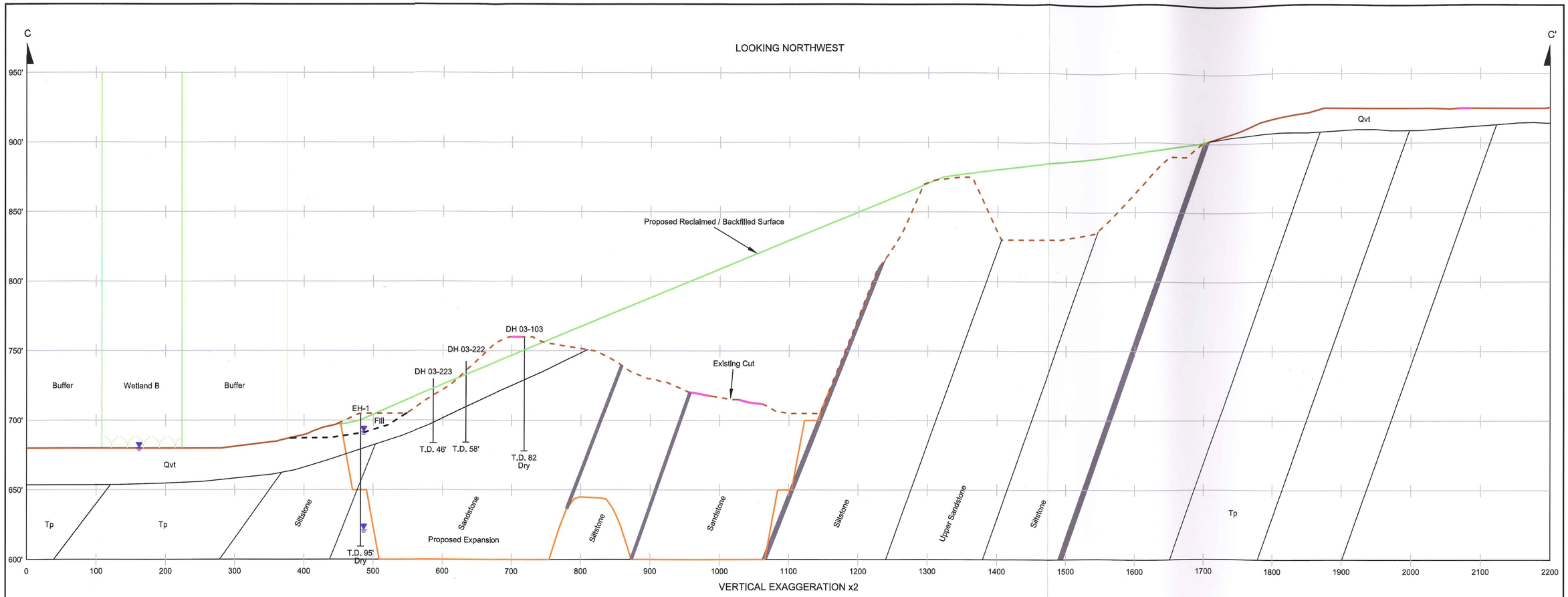

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= Natural Geologic Contact
= Modified Geologic Contact
= Coal

HORIZONTAL SCALE	1"=100'
VERTICAL SCALE	1"=50'
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DATE 11-22-05	BY JLL

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Figure 6
Reserve Silica
Ravensdale Project
Cross Section C-C'

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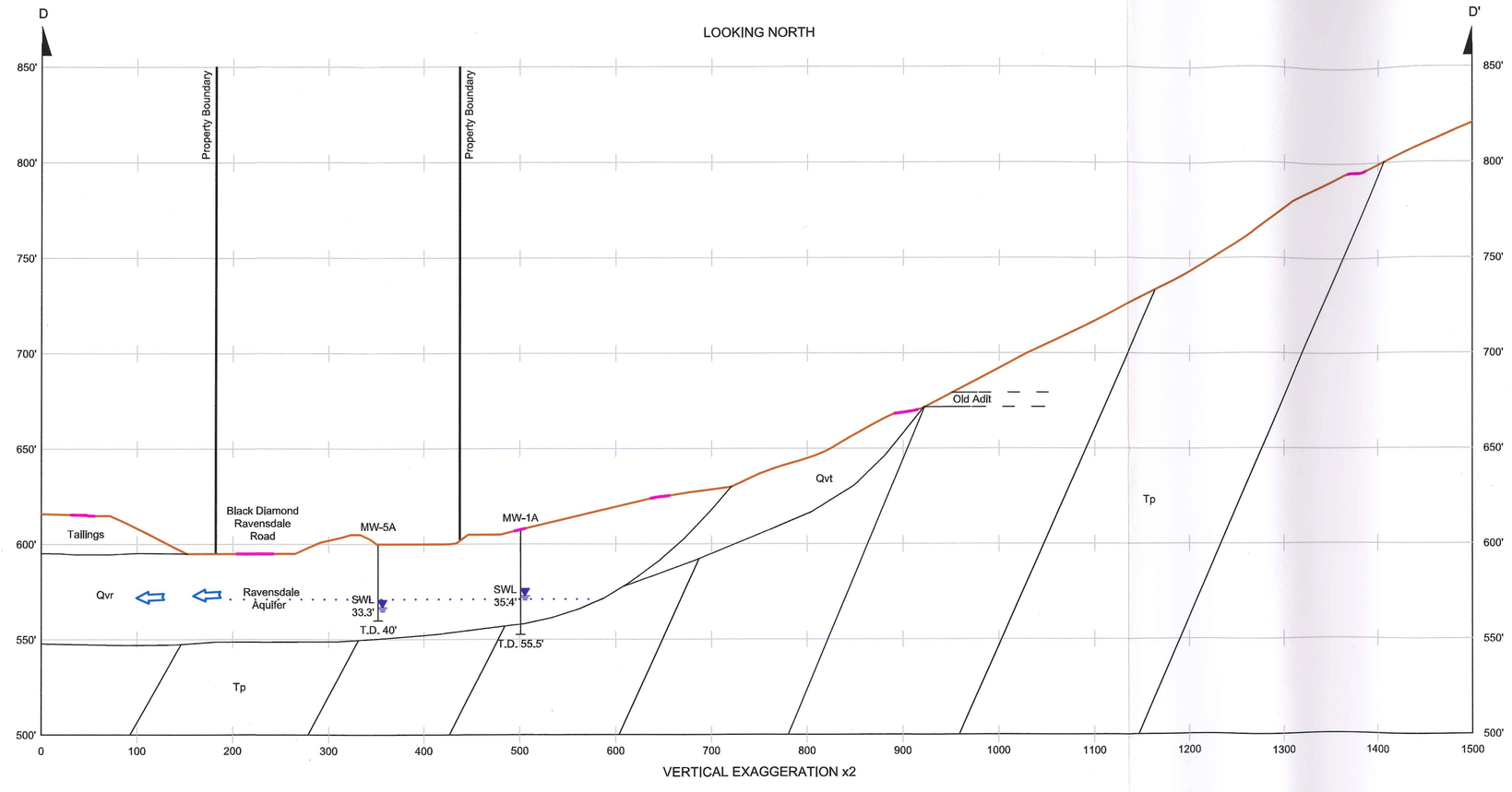

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= Modified Geologic Contact
= Coal

HORIZONTAL SCALE	1"=100'
VERTICAL SCALE	1"=50'
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Figure 7
Reserve Silica
Ravensdale Project
Cross Section D-D'

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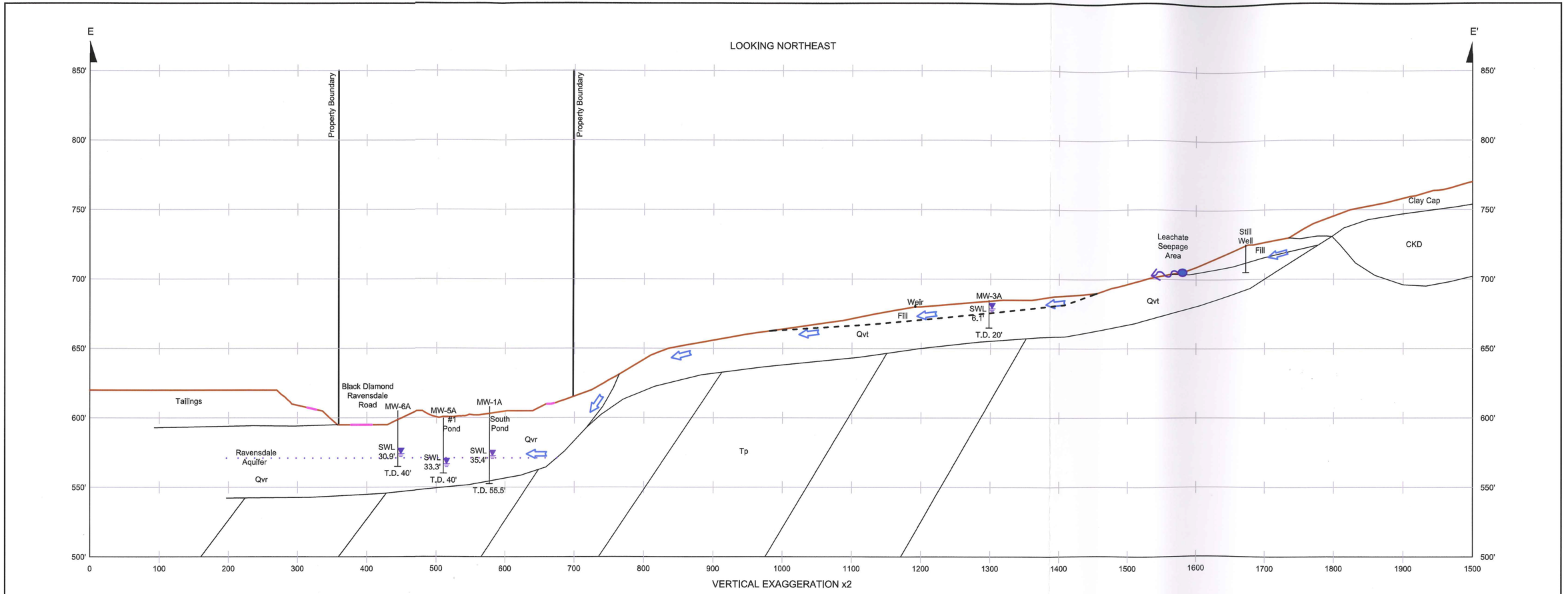

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Reserve Silica Staff November 2003 & July 2005
USGS Water Resources Investigation Report 92-4098

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= Existing Modified Surface
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= Modified Geologic Contact
= Coal

HORIZONTAL SCALE	1"=100'
VERTICAL SCALE	1"=50'
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DATE	BY
11-22-05	GHB
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DATE	BY
11-22-05	JLL

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Figure 8
Reserve Silica
Ravensdale Project
Cross Section E-E'

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