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**WELL HEAD PROTECTION STUDY
VILLAGE OF NEW DENVER**

Prepared For:
**Corporation of the Village of New Denver
New Denver, BC**

Prepared By:
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Kamloops, BC**

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1.0 INTRODUCTION

AGRA Earth & Environmental Limited (AEE), is pleased to present this well head protection study for the Village of New Denver's (Village) groundwater system. The study was prepared in accordance with AEE's proposal **PK97-53** dated April 30, 1997.

2.0 OBJECTIVES AND SCOPE OF WORK

The Village obtains its water from an unconfined to semi-confined aquifer at the mouth of Carpenter Creek. Unconfined aquifers can be very susceptible to contamination from surface sources such as underground storage tanks, landfills and septic systems. Accordingly, the Village is undertaking studies to determine potential sources of aquifer contamination and to develop planning guidelines to protect the community wells and the groundwater resource. A well head protection plan typically consists of six tasks:

- | | |
|--------|---|
| Task 1 | Forming a community planning team. |
| Task 2 | Delineating the capture zones for the Village wells. |
| Task 3 | Mapping potential sources of contamination in the capture zone area. |
| Task 4 | Managing the activities in the capture zone area to prevent pollution and minimize the risk of pollution. |
| Task 5 | Developing a contingency plan against contamination of the aquifer. |
| Task 6 | Monitoring, evaluating and revising the plan over time. |

AEE's scope of work was to complete Tasks 2 and 3 and provide recommendations to the Village for Tasks 4, 5 and 6. The Village would complete tasks 4, 5 and 6 using AEE's recommendations.

3.0 METHODOLOGY

The study consisted of two general phases. The first phase consisted of a review of available data and a field reconnaissance. The second phase of the study consisted of developing a hydrogeological model of the Village area with the acquired data, evaluating the risk presented by potential pollution sources and preparing a report that provided recommendations on managing the risk.

3.1 Contaminant Inventory

Kevin Bennett of AEE completed the field reconnaissance on April 8 and 9, 1998. The field visit was initiated with a meeting with Carol Gordon and Gordon Brookfield of the Village to discuss the Village history and general protection issues and obtain relevant information from the Village's files. Following the meeting, Kevin Bennett and Gordon Brookfield completed a walkthrough inspection of the Village area to view current land use, proposed land use, potential contaminant sources and interview the operators of these facilities. Kevin Bennett also toured the general area to view geological exposures (such as the fluvial glacial terraces above Carpenter Creek, bedrock exposed along the south bank of the creek), verify the geomorphology interpreted from aerial photos and inspect the three existing water wells (2 municipal, one private).



The Ministry of Environment, Lands & Parks (MELP) was requested to conduct a waste management search of the Village area. This search included a review of electronic and paper files related to contaminated sites, spills, permits, etc. AEE requested the review as a component of the inventory of potential contaminant sources within the Village.

Groundwater samples from the two municipal wells were analysed for gasoline and diesel indicator constituents to determine the present quality of the groundwater with respect to petroleum impacts. A water sample from Slocan Lake was analyzed for major ions and sewage indicator parameters to compare the groundwater and the lake water quality.

3.2 Groundwater Modelling

The acquired geological and groundwater data was used to develop a hydrogeological model of the aquifer as input to a finite difference modelling program – Visual MODFLOW. MODFLOW was developed by the United States Geological Survey. Visual MODFLOW is a windows operation of MODFLOW. The modelling results are used as a tool in evaluating the aquifer, however, the results are limited to existing available data. Visual MODFLOW was used to assess the capture zones around the two municipal wells. The modelling was completed for steady state conditions only.

Input to the hydrogeological model included stratigraphic information from four driller's logs, a terrain resource inventory base map (TRIM) aerial photo interpretation, water level and pumping test data from the original municipal well construction reports and the Village's chemistry data.

Pumping test data for the Arena Well and the Lake Well (November 1974) were analysed using the software AQTESOLV to estimate the transmissivity and specific yield of the aquifer.

Regression analysis was applied to chloride and nitrate data for the Arena Well and the Lake Well to determine if statistically significant increases in these parameters have occurred since sampling was started in 1978.

4.0 INVESTIGATION RESULTS

4.1 Village Setting and Infrastructure

The Village is located in the Slocan Valley on the east side of Slocan Lake. The Slocan Valley is in the Selkirk Mountains and the Village is bordered by Mount Carpenter to the northeast, Idaho Peak to the southeast, and Slocan Lake to the West. The Village proper is situated on an alluvial fan constructed by Carpenter Creek. The creek also bisects the Village. The head of the alluvial fan is at an elevation of approximately 576 m ASL and slopes towards Slocan Lake at an average gradient of approximately 4%. A topographical map of the Village is included as Figure 1. An Area Plan enlarged from a 1990 aerial photo is included as Figure 2.

The Village population is approximately 600. The entire Village and several adjacent properties are serviced by the two municipal wells. The adjacent community of New Denver Heights is serviced by a separate communal surface water system not operated by the Village. Sewage disposal in the Village and surrounding areas is by individual lot in-ground disposal. Disposal systems vary from cess pits to septic fields. There are no plans for a community sewer system at this time. Storm



water is directed into seven dry wells in the roadways around the Village, or into the adjacent lake and creek. The Village is serviced by BC Hydro, however, there is no communal (piped) natural gas or propane. Residences are heated by electricity, propane (tanks), heating oil and wood.

4.2 Climate

According to Koppen's classification system the climate of the New Denver area is designated by Dfc; a cold snow-forest climate. The meaning of the Koppen letter symbols are: "D" micro thermal climate; average temperature of coldest month below -3°C, average temperature of warmest month 10°C, f: no dry season; c: cool short summers, less than 4 months over 10°C. The mean annual total precipitation recorded at New Denver, was 812.2 mm for the period 1951 to 1980.

4.3 Water Well Records

A summary of relevant information from the two well construction reports and four water well records used in this assessment is presented in Table 1. The locations of these water wells are shown on Figure 2. Information presented in water well records is submitted on a voluntary basis by the drilling contractors and may not necessarily be representative of actual field conditions.

TABLE 1 - WELL SUMMARY

Well # (Date)	Location (Owner)	Depth (m)	SWL (m)	Stratigraphy (m)	Depth to Bedrock (m)	Est. Yield (US gpm)
Arena Well (Oct 1974)	Kootney St. (Village)	42.0	19.5	0 – 11.6 silty gravel, black 11.6 – 19.8 gravel, clay, silt 19.8 – 24.0 sand & gravel, silty, compact, black 24.0 – 32.3 gravel & sand @ 26.2 – 26.8 clay lenses 32.3 – 37.2 silty sand 37.2 – 42.1 sand, gravel 42.1 – 45.1 gravelly till, brown	UNK	175
2 (Lake Well) Nov 1974	Eldorado Ave (Village)	33.6	4.5	0 – 6.1 sand, gravel, cobbles, boulders 6.1 – 20.1 sand & gravel 20.1 – 20.4 clay lenses 20.4 – 34.1, sand & gravel, some cobbles 34.1 – 36.0 clay, gravel, sand (till?)	UNK	1,000
3 (Aug 1992)	South bank Carpenter Creek (McDonaugh)	24.7	18.2	0 – 6.4, sand, gravel, clay, boulders 6.4 – 9.1 sand & gravel, wet 9.1 – 17.1 clay & gravel 17.1 – 18.3 gravel & sand 18.3 – 22.3 clay, gravel, boulders 22.3 – 23.2 gravel, boulders, sand 23.2 – 24.7 bedrock	23.2	20
4 (Aug 1992)	South bank Carpenter Creek (McDonaugh)	12.2	UNK	0 – 5.8 boulders, gravel 5.8 – 10.1 sand gravel, boulders clay, wet 10.1 – 12.2 bedrock – shale	10.0	0

UNK – unknown

4.4 Geology

Geological cross-sections looking north and east through the study area are presented on Figure 3 and Figure 4 respectively. The locations of the geological cross-sections are illustrated on Figure 2. The cross-sections were prepared from the water well records and topographical information from the Village's files. Stratigraphic contacts between wells are estimated.

The lower/western portion of the Village is situated on post glacial alluvium deposited by Carpenter Creek. This alluvium consists of sand, gravel and boulders extending to a depth of approximately 34 m below surface, adjacent to Slocan Lake (Lake Well). The sand and gravel below 34 m is described as cemented; AEE suspects that this deposit is till.

Moving eastward, towards the Arena Well the deposits grade into materials deposited by glacial meltwaters. These bedded deposits range from very low energy deposition silts and clays to high energy deposition gravel and cobbles. These deposits are very stratified producing semi confined aquifers in the area. A confined aquifer can be permeable sand and gravel overlain by low permeable silts and clays. The clay and silt layers retard the vertical migration of groundwater (and contaminants) into the underlying sand and gravel aquifer. The silt and clay layers are not present at the Lake Well and are therefore discontinuous. The aquifer at the Arena Well is considered semi confined due to the discontinuous nature of the overlying low permeable (confining) layers of silt and clay. The sand and gravel aquifer at the Arena Well is underlain by till. AEE's interpretation of the discontinuous nature of the low permeable layers is illustrated on the geological cross sections.

The static water level in the Arena Well is approximately 19.5 m below grade at an elevation of approximately 538.5 m ASL. The base of Carpenter Creek in the vicinity of Arena Well, is at an elevation of approximately 544 m ASL, or 5.5 m above the static water level in Arena Well. Similar conditions are present in Well #3 where a clayey layer is present and the static water level in the well is approximately 12.2 m below the base of Carpenter Creek. The difference in the creek elevation and the static water levels in the Arena Well and Well #3 are further evidence that the low permeable layers are restricting the downward migration of groundwater.

A monitoring well installed to the base of the uppermost silty gravel unit at the Arena Well i.e. 12.2 m below surface, may encounter an unconfined aquifer. This aquifer would be the most susceptible to contamination originating at the surface or near surface. Monitoring groundwater quality in the unconfined aquifer would provide an early warning mechanism for potential contamination of the lower semi confined aquifer.

The Geological Survey of Canada map 1090A indicates that the bedrock in the area is comprised of metamorphic and sedimentary rock of the Triassic Period. This Slocan Group includes slate, argillite, quartzite, limestone and conglomerate. There are no faults mapped in the study area. A driller's log for a dry hole (Well #4) located on the south side of Carpenter Creek describes the intercepted bedrock as shale.

4.5 Aquifer Modelling

The modelling objective for the well-head protection study for the Village of New Denver was to estimate the capture zones of the two municipal wells. The capture zone analysis was accomplished through the following tasks:

- evaluating the available hydrogeological data,
- developing a conceptual model from the hydrogeological data,
- constructing a numerical groundwater flow model based on the conceptual model,
- calibrating the model to steady state non-pumping conditions,
- extending the calibration to pumping conditions, and
- evaluating the capture zones of different pumping scenarios using particle tracking methods.

4.5.1 Hydrogeological Conceptual Model

The hydrogeological conceptual model was developed based on the available geologic and hydrogeologic data. The New Denver aquifer model has been developed using the following assumptions:

- The aquifer is of a uniform thickness of 30 m;
- The aquifer consists of two hydrostratigraphic units defined as Unit 1 and Unit 2. Unit 1 has been assigned a hydraulic conductivity (K) = 1×10^{-2} m/s, and Unit 2 has been assigned a hydraulic conductivity (K) = 6×10^{-4} m/s estimated from pumping test analyses;
- The recharge associated with Unit 1 and Unit 2 are defined as Unit 1 having recharge equal to 10% of the annual precipitation (80 mm/year) and Unit 2 having a recharge equal to 1% of the annual precipitation (8 mm/year). The associated recharge values are a function of the variation in hydraulic conductivity values, where the higher the hydraulic conductivity the greater the amount of recharge is allowed to infiltrate the aquifer;
- The areal distribution of Unit 1 and Unit 2 is shown in Figure 5;
- Based on measured static water levels in the Lake Well and Arena Well, the hydraulic gradient is very flat and directed toward Slocan Lake. Direct connection between Slocan Lake and the New Denver Aquifer is assumed based on measured water levels in the Lake Well and Slocan Lake;
- No direct connection is believed to exist between Carpenter Creek and the aquifer, based on measured water levels. The water levels in Carpenter Creek are above the groundwater table, therefore the creek is assumed to not be directly connected to the underlying aquifer;
- The aquifer lateral boundaries are defined by bedrock and are assumed to be impermeable, based on water level data in Well #4.

A summary of the hydrogeological parameters both measured and derived from the conceptual model is listed in Table 2.

Table 2
Hydrogeological Parameters in Model

	Lake Well /Unit 1	Arena Well/Unit 2	Well #3	Well #4
Transmissivity	0.3 m ² /sec	0.018 m ² /sec	N/A	N/A
Aquifer Thickness	30 m	30 m	N/A	N/A
Recharge	80 mm/year	8 mm/year	N/A	N/A
Static Water Levels	538 m ASL	538.5 m ASL		dry
Pumping Rates	1000 US gpm	175 US gpm	0	0
Pumping Water Levels	537.5 m ASL	532 m ASL	N/A	N/A

4.5.2 Model Grid and Boundary Conditions

The numerical model was constructed based on the conceptual model and the hydrostratigraphic data shown in Table 2. The model boundaries and grid are shown in Figure 5.

- The model was set as a 1600 m X 1700 m grid with a uniform grid spacing of 10 m. The model consists of a one layer aquifer thirty (30) m thick. The lateral extent of the aquifer is defined by the exposed bedrock
- Carpenter Creek is not treated explicitly in the model due to the assumption that it is not directly connected to the aquifer
- A constant head boundary condition was set along the lake boundary with a value of 538 m ASL which is equal to the static (non-pumping) water levels measured in the Lake Well. It is assumed that a direct connection between Slocan Lake and the Lake Well exists
- A constant head boundary condition was set along the inflow boundary equal to 538.6 m ASL.
- Two wells were installed to simulate the Lake Well and the Arena Well at pumping rates of 1000 US gpm and 175 US gpm respectively.
- The hydraulic head distribution is based on a steady state simulation which does not account for fluctuations in Slocan Lake

4.5.3 Groundwater Flow Simulations

Before evaluating the capture zones, the steady state groundwater flow was assessed under non pumping conditions. The model was calibrated initially by comparing field measured hydraulic head values to simulated hydraulic heads under non-pumping conditions. The simulated equipotential surface is shown in Figure 6. Table 3 shows the measured water levels versus the simulated water levels for non-pumping and pumping conditions.

TABLE 3
MEASURED VERSUS SIMULATED WATER LEVELS

Non- Pumping	Measured	Simulated	Difference
Lake Well	538 m ASL	538 m ASL	0 m
Arena Well	538.5 m ASL	538.16 m ASL	0.34 m
Pumping			
Lake Well	537.5 m ASL	537.88 m ASL	0.38 m
Arena Well	532 m ASL	537.6 m ASL	5.6 m

The difference between the measured and simulated values for non-pumping conditions was less than one metre. The differences between the measured and simulated water levels under pumping conditions were not as close as for non-pumping conditions. The measured water levels in the wells will be lower than simulated estimates due to well bore losses. MODFLOW assumes that the pumping well is 100% efficient, but in reality there will be head loss due to inefficiencies in the well.

4.5.4 Prediction of Steady State Capture Zones

Particle tracking is a numerical method where the flow paths to water supply wells are visualized through the release of simulated contaminants to the aquifer. The capture zone is defined as the area which if particles were introduced would intercept the water supply well and subsequently pose a threat to the drinking water supply. The areal extent of capture zones are sensitive to recharge, pumping rate, and vertical hydraulic conductivity.

To evaluate the capture zones from the Lake Well and the Arena Well, particles were released to both wells. Figure 7 shows the estimated flow paths and capture zones under steady state pumping conditions with both wells operating. Figure 8 illustrates the flow path and capture zone with only the Lake Well operating. The estimated capture zone boundary of both wells is also outlined on Figure 2.

The modeling results show that most of the flow intercepting the Lake Well is being diverted from the lake. The capture zone is relatively small because it is adjacent to a large water source, providing a constant recharge to the well. The capture zone delineation may be redistributed as the pumping rates change. For example when the Arena Well is not pumping (Figure 8), the capture zone for the Lake Well is then redistributed and includes groundwater flow originating up slope (east) of the Arena Well, south to Carpenter Creek and north to the school.

The capture zone from the Arena Well is located primarily upgradient from the Lake Well, but also extends approximately 200 m down slope (west of the well head). The approximate northern and southern capture zone limits for the Arena Well are the school and the bedrock bluffs along Carpenter Creek respectively.

4.6 Inventory of Potential Contaminants

The Contaminant Inventory – Table 4 - provides a summary of the inventory of potential sources of groundwater contamination. The location of these sources are marked on the Area Plan (Figure 2). The locations are numbered on the Area Plan according to the numbering in Contaminant Inventory. The inventory is based on the site visit and the record review completed by MELP. MELP's response letter is included in Appendix D.

The inventory also indicates if the specific site is within the estimated capture zone of one or both municipal wells. A risk potential is also assigned to each site based on the type of underlying aquifer, its position in relation to the capture zones, the type of contaminant and the method of contaminant uses.

4.7 Groundwater & Slocan Lake Water Quality

4.7.1 Sewage Indicators

Chloride, nitrate and coliforms are standard indicators for sewage impacts. Regression analysis was used to determine if there was a significant time – trend correlation in the chloride and nitrate data for the Arena Well and the Lake Well. A correlation coefficient of $r^2=0.36$ or greater was considered to be significant providing the slope of the line was not equal to zero (Yevdjovich 1994).

The results of the regression analyses of the Lake Well chloride and nitrate concentrations are plotted on Figure 7. Both chloride and nitrate concentrations have demonstrated an increasing trend considered significant with correlation coefficients of $r^2 = 0.52$ and $r^2 = 0.93$ respectively. The chloride and nitrate concentrations in the Arena Well did not exhibit a significant correlation ($r^2 = 0.23$ and 0.0 respectively).

The significant increase in chloride and nitrate concentrations in the Lake Well suggest that the well is being impacted by in-ground sewage disposal. However, nitrate concentrations in the Lake Well have not exceeded 1 mg/L and are well below the drinking water standards of 10 mg/L.

Nitrate, ammonia and phosphate concentrations in the water sample from Slocan Lake (collected September 1998) were below the analytical detection limits. The nitrate concentration in Slocan Lake was approximately 250 times lower than the nitrate concentration in the Lake Well. The lake sample did not reflect an impact by sewage with respect to inorganic parameters.

4.7.2 Volatile Organics and Hydrocarbons

Groundwater samples from the two Village wells were collected by Village personnel and forwarded to ASL in Vancouver, BC for analyses of volatile organic carbons (VOCs) and extractable hydrocarbons. These analyses include constituents in gasoline, diesel, oil and solvents. The analyses were completed to investigate the impact of neighbouring service stations, auto repair and disposal of chemicals via septic fields. The samples were collected on June 16, 1998. Monocyclic aromatic (gasoline) and extractable hydrocarbon (diesel, heating oil) analyses are summarised in

Table 5. Chlorinated hydrocarbon concentrations are summarized in the laboratory analysis report in Appendix C; concentrations were below the analytical detection limit.

Groundwater contamination levels for hydrocarbons are referenced to the BC Ministry of Environment, Lands and Parks (MELP) standards set forth in the April 1997 *Contaminated Site Regulations* (CSR). The document provides generic standards for drinking water. The standards where defined, are included in Table 5.

TABLE 5
HYDROCARBON CONCENTRATIONS IN GROUNDWATER
Units: ug/L (ppb)

Location	Benzene	Toluene	Ethyl-Benzene	Total Xylenes	Extractable Hydrocarbon (C10 – 18)	Extractable Hydrocarbon (C19 – C31)
Arena Well	<0.5	<0.5	<0.5	<0.5	<500	<1,000
Lake Well	<0.5	<0.5	<0.5	<0.5	<500	<1,000
CSR –Drinking Water	5	24	2.4	300	NS	NS

CSR - Contaminated Sites Regulation - BC Reg 375/96, effective April 1, 1997

BOLD - Exceeds the CSR Drinking Water Standards

NS - No Standard

5.0 CONCLUSIONS

AEE's conclusions from the well head protection study are presented below. These comments are based on a review of available information, a site visit, and numerical groundwater modelling. It should be noted that the geological database for the Village area is limited. The accuracy of computer modelling is directly dependent on how accurately the area hydrogeology can be defined. AEE has assumed a conservative modelling approach in assessing the capture zones of the two community water wells due to the lack of hydrogeological information.

- The Lake Well capture zone is connected primarily to Slocan Lake and quality of the lake water will impact the quality of the groundwater in the Lake Well. Nitrate concentrations in the groundwater sample from the Lake well were approximately 250 times higher than the nitrate concentration in the Slocan Lake water sample. As the lake recharges the aquifer around the Lake Well, it is likely diluting nitrate concentrations in the groundwater withdrawn by the well.
- The Arena Well intercepts some groundwater flow that would otherwise be intercepted by the Lake Well.



- Changing the pumping rate of the wells will impact the shape and distribution of the capture zones.
- Sewage disposal and hazardous material storage is occurring within the capture zones of the Arena Well and the Lake Well.
- Storm water disposal via dry wells is occurring within the capture zone of the Lake Well. The dry wells are potential conduits for chemical spills and contaminated runoff to enter the aquifer.
- The aquifer supplying the Village with groundwater is vulnerable to surface sources of contamination. The aquifer at the Lake Well is more vulnerable than at the Arena Well due to the absence of the overlying low permeable layer. A chemical spill occurring near the Lake Well would enter the aquifer very quickly whereas the low permeable zone at the Arena Well would retard the migration of contaminant into the underlying aquifer.
- Nitrate and chloride concentrations in groundwater from the Arena Well have not demonstrated a significant increase since 1974. Nitrates and chlorides are indicators of sewage impacts. VOCs and extractable hydrocarbon concentrations in a groundwater sample from the well were below the analytical detection limit.
- Nitrate and chloride concentrations in groundwater from the Lake Well have demonstrated a significant increase since 1974. Although increasing, the nitrate concentration is presently well below CDWG. The increase in nitrate concentrations is consistent with the hydrogeological and numerical modelling. The model indicates that in-ground sewage disposal is occurring within the capture zone of the unconfined Lake Well aquifer and that the aquifer is sensitive to surface sources of contamination. VOCs and extractable hydrocarbon concentrations in a groundwater sample from the Lake Well were below the analytical detection limit.
- At present there is no emergency alternative water system.

6.0 RECOMMENDATIONS

AEE's recommendations for the Well Head Protection Plan are stated below. The recommendations include addressing the data gaps in the hydrogeological model and refining the computer model.

- Current sewage disposal practices in the Village present a moderate to high risk to the aquifer depending on the location of the disposal i.e. Arena Well or Lake Well area. Additional development within the capture zone will increase the risk. AEE understands that there are no plans or finances to construct a communal sewage disposal system in the near future. The primary tool in monitoring this risk will be to implement a routine groundwater quality monitoring program including installing PVC monitoring wells in the uppermost layer of the unconfined aquifer. Monitoring wells should be positioned near and midway between the two supply wells.

- After installing the additional monitoring wells pumping test should be completed with the two municipal wells to collect field data on drawdown cones, the gradient of the unconfined aquifer and re-evaluate the aquifer characteristics (transmissivity, storativity). The existing computer model should be updated with this data to refine the estimation of the well head capture zones and aquifer recharge rates.
- Alternative methods of storm water disposal should be reviewed. These methods could include infiltrating the storm water into the aquifer outside the capture zone or discharging the runoff into a wetland complex that would provide primary treatment. Discharging the runoff directly into the lake may locally impact the lake quality. As the main source of recharge to the Lake Well is Slocan Lake, the quality of the lake water may influence the quality of groundwater at this location.
- Preferably the existing service stations would be re-located outside the capture zones of the Lake Well and Arena Well. If this is impractical then a monitoring well should be installed to the groundwater table beneath each site and an annual fitness test conducted on the fuel storage and dispensing systems.
- The three USTs at the Village office should be removed.
- An inventory should be made on the use of heating oil tanks in the Village. Abandoned heating oil tanks (above and below ground) should be removed. The Village should consider assisting with the removal of these tanks.
- The Village residents should be educated on the connection between the quality of their drinking water supply and land use, chemical use and disposal, and sewage disposal. This education could include brochures, seminars, hazardous waste collection days etc.
- A spill response plan should be formulated. The plan should include methods of containing the spill, evaluating the extent of the impact, advising residents, monitoring groundwater quality, providing an alternative water source if the wells are required to be shut off and remediating the groundwater.
- The Village should consider implementing additional well head protection tools through zoning, bylaws and public participation including:
 - Prohibition of various land uses and hazardous material storage within the capture zones
 - Large lot zoning within the capture zones
 - Limited development within the capture zones
 - Septic cleaner bans
 - Septic system upgrades
 - Hazardous waste collection and recycling

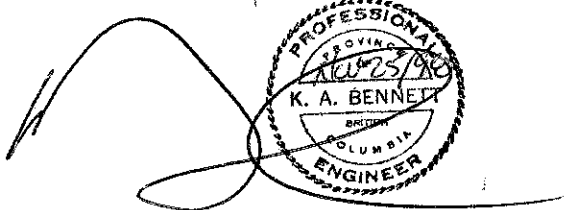
- The Village should also consider acquiring property that would be suitable for either a sewage disposal system or to develop a third water supply well. There are many issues to resolve to within the current well head protection area, therefore, the easiest method of ensuring a safe drinking water supply may be to develop a groundwater supply that will not be impacted by the existing development. One location that may be suitable for either option is in the area of Lot 78 and 79 at the south end of Vancouver Street. A zone of restricted or non-development would be implemented in this area.

7.0 CLOSURE

We appreciate the opportunity to be of service and trust that this study will meet your requirements. If there are any questions, please contact Kevin Bennett at (250) 374-1347 in Kamloops.

Sincerely,

AGRA Earth & Environmental Limited



Kevin A. Bennett, P.Eng.
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KAB/ja

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References: Yedjevich, V.M. 1964 Regression and Correlation Analysis in Handbook of Applied Hydrogeology, Ven Te Chow, Editor in Chief pp 8.43 - 8.68

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TABLE 4
Contaminant Inventory - Village of New Denver

Site No.	Location	Description	Contaminant Type	Distance to Arena Well (m)	Distance to Lake Well (m)	Within Arena Well Capture Zone	Within Lake Well Capture Zone	Risk Potential	Comments
1	621 Union St.	Thrifty Gas	Hydrocarbons	160	450	Yes	Yes	H	Constructed early 1960s, enviro investigation April 1988 but groundwater quality not addressed
2	722 Union St	Petro Canada	Hydrocarbons	120	500	Yes	Yes	H	Constructed in 1968, original USTs removed 1990, replaced with 3 fiberglass 25,000 L USTs
3	219 - 6th Ave	Former service station	Hydrocarbons	400	200	No	Yes	M	Burnt down in 1961, current Post Office, 2,270 L heating oil UST removed Nov 1995. Environmental assessment indicates site meets MELP commercial land use standards
4	805 Union St	Former Esso Station	Hydrocarbons	180	450	Yes	Yes	M	3 USTs removed Nov 1994, Melp issued "letter of comfort" Environmental Assessment
5	416 - 8th Ave	Former Service Station	Hydrocarbons	350	550	No	No	L	Indicated soils not contaminated. Groundwater quality not addressed.
6	805 Union St	R&L Motors	solvents, antifreeze	180	450	Yes	Yes	L	Decommissioned in early 1960s
7	Ltd 1 Plan17712	Former dump	leachate, various	950	1400	No	No	L	Former Esso
8	Various	Storm sewer dry wells (?)	variously surface spills	250 - 450	160 - 750	Yes	Yes	H - VH	Operated 1962 to 1983, residential and commercial. No intrusive environmental investigation
9	Entire Village	Septic fields and cess pits	nitrites, pathogens, misc.	>40	>100	Yes	Yes	M - H	No communal sewage system
10	Slocan Ave	Public works yard	Hydrocarbons, misc.	500	150	No	Yes	VH	3 USTs (1 abandoned heating oil UST), former highways yard, no enviro investigation.
11	DL 550, P91456	Former Esso Bulk Plant	hydrocarbons	950	1500	No	No	L	Decommissioned early 1980s, adjacent to rail line
12	DL 550, P6084	VSA Maintenance yard	hydrocarbons, solvents, misc.	950	1500	No	No	L	Owned by BCB, fuel storage in ASTs and drums.
13	7th & 8th Ave	School		200	550	Yes	Yes	M	Heated by propane, sewage disposal by septic field
14	Vancouver St	Cemetery		600	1000	No	No	L	3 adjoining properties & 2 reserved sites, former crematorium
15	Kildare St	Old Hospital Site		250	400	No	Yes	L	Decommissioned approx. 1975, presently senior citizens lodge
16	403 - 6th Ave	New Denver Coin Laundry		230	380	No	Yes	M	Septic field disposal
17	706 Union St	Vahalla Motel & Laundry		40	500	Yes	Yes	M	Motel, Restaurant, Pub and Laundromat on septic field
18	Centennial Park	RV semi-dump	nitrites, pathogens, misc.	550	400	No	No	L	
19	Lot 1, Plan 4193	Hospital	nitrites, pathogens, misc.	800	850	No	No	L	MELP permit for inground sewage disposal. Biomedical wastes shipped to Nelson, BC
20	214 - 6th Ave	Slocan Lake Hardware	paints, solvents, fertilizer, mis	400	230	No	Yes	L	All chemicals etc are prepackaged and stored inside, not licensed for pesticides or herbicides
21	513 Slocan Ave	Welding Shop		50	550	Yes	Yes	M	
22	Vancouver St	Reitmeier Logging	hydrocarbons, solvents, misc.	500	1000	Yes	Yes	L	
23	Entire Village	Heating Oil ASTs	hydrocarbons	<50	150	Yes	Yes	M - H	no natural gas, heating by oil, wood, propane and electricity

L - Low Risk

M - Moderate Risk

H - High Risk

VH - Very High Risk

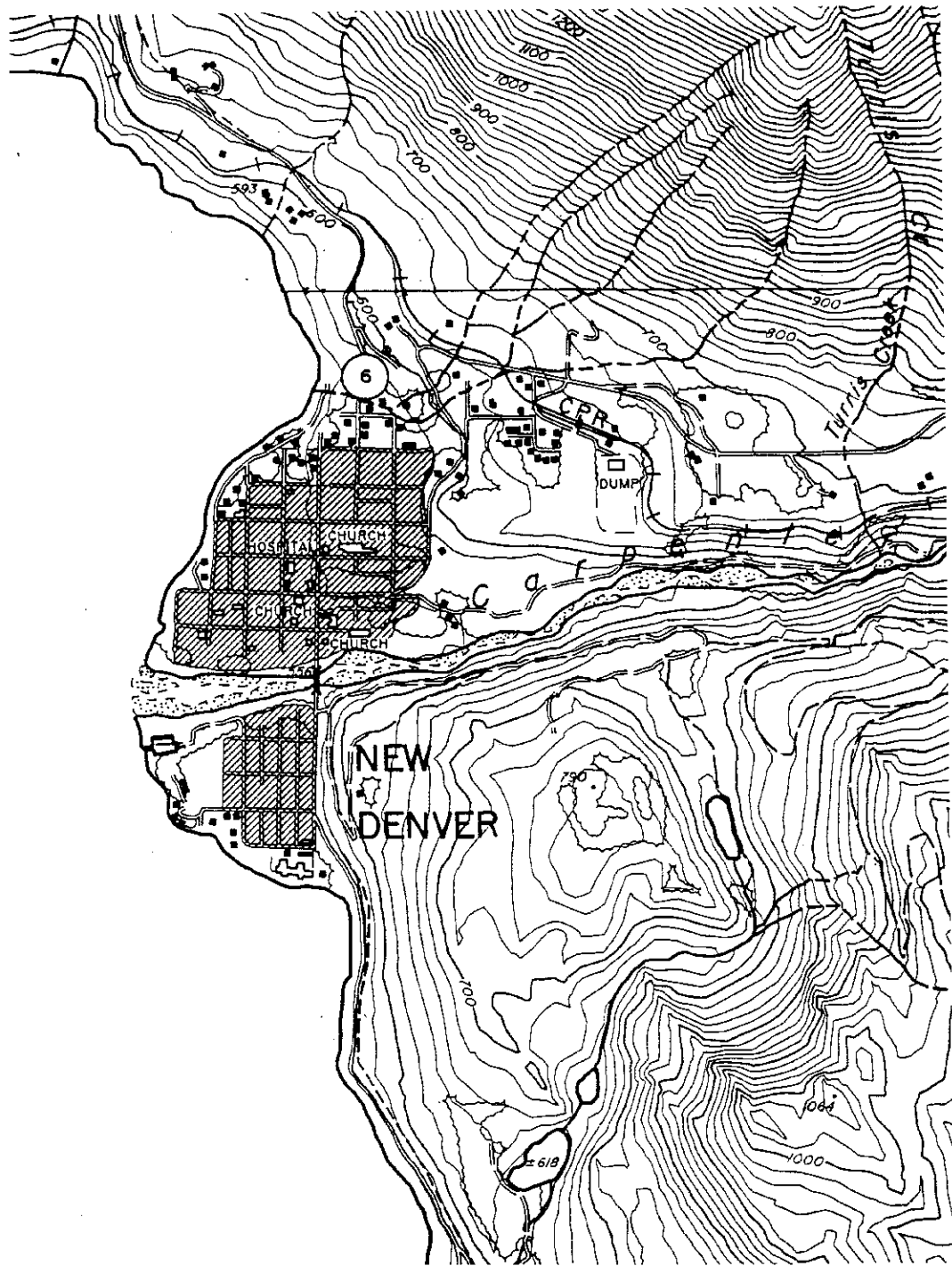
AST - above ground storage tank

UST - underground storage tank

Appendix A

SITE
LOCATION

SLOCAN
LAKE



AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

NEW DENVER AREA TOPOGRAPHIC SITE PLAN

CLIENT: VILLAGE OF NEW DENVER
REFERENCE: WELL HEAD PROTECTION STUDY

Scale
1:20,000

Date
9/10/05

Drawn by
BMD

Project #
KXI2005

FIGURE I

CAD FILE: KXI2005\I2005FIG1.DWG



SLOCAN
LAKE

LEGEND

▲ DRY WELL

① SITE # CORRESPONDING TO
CONTAMINANT INVENTORY
(SEE TABLE 2)

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

AREA PLAN

CLIENT: VILLAGE OF NEW DENVER
REFERENCE WELL HEAD PROTECTION STUDY

Scale
1" = 500'

Date
09/10/05

Drawn by
BMD

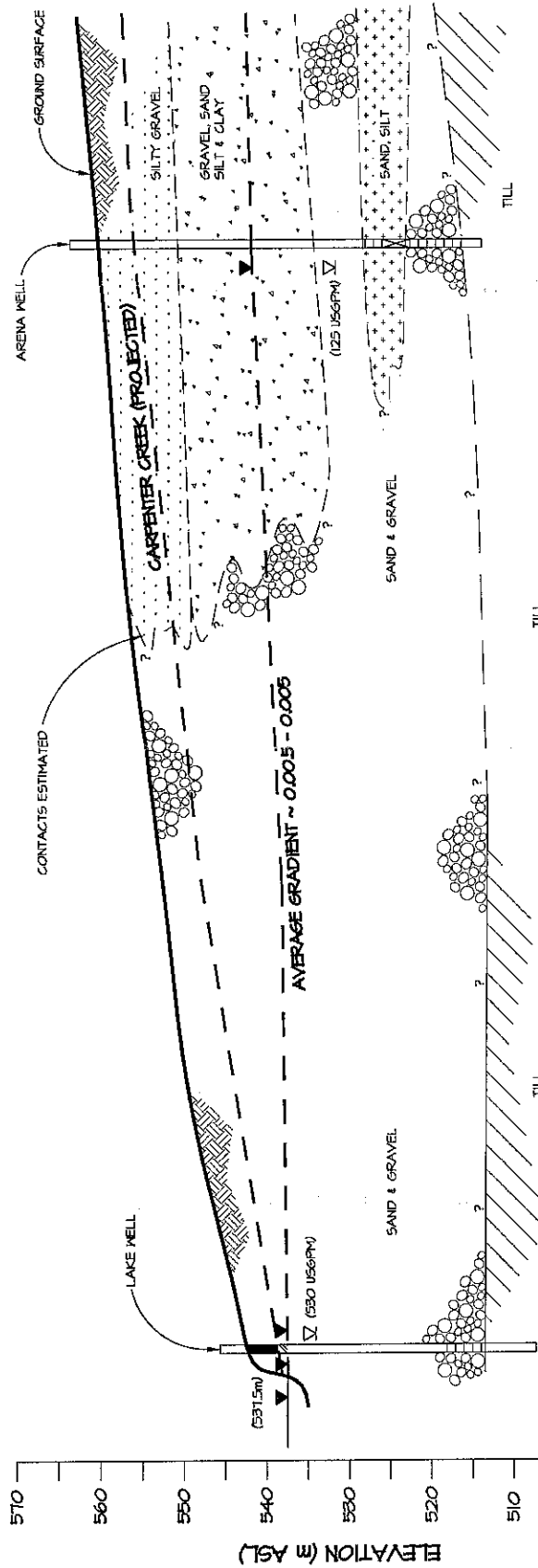
Project #
K12005

FIGURE 2

CAD FILE: K12005\K12005\F162.DWG

RELATIVE HORIZONTAL DISTANCE (m)

0 100 200 300 400 500 600 700 800

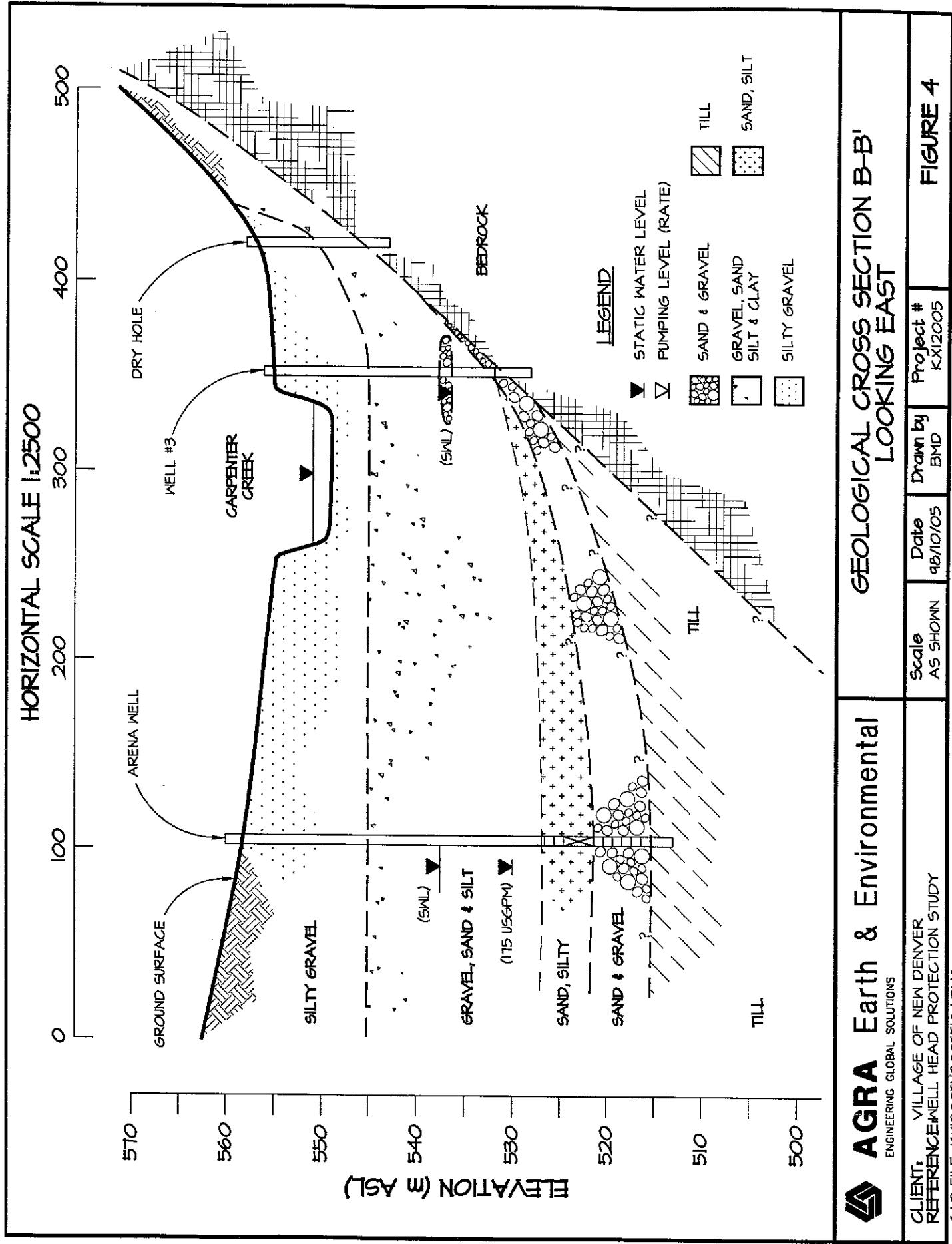


LEGEND

- ▼ STATIC WATER LEVEL
- ▽ PUMPING LEVEL (RATE)
- [Pattern] SAND & GRAVEL
- [Pattern] GRAVEL SAND & SILT & CLAY
- [Pattern] SILTY GRAVEL
- [Pattern] TILL
- [Pattern] SAND, SILT

AGRA Earth & Environmental <small>ENGINEERING GLOBAL SOLUTIONS</small>	GEOLOGICAL CROSS SECTION A-A' LOOKING NORTH		
	CLIENT: VILLAGE OF NEW DENVER REFERENCE: WELL HEAD PROTECTION STUDY	Scale: AS SHOWN Date: 9/10/05 Drawn by: BMD Project #: KX12005	FIGURE 3

CAD FILE: KX12005A2005FIG3.DWG

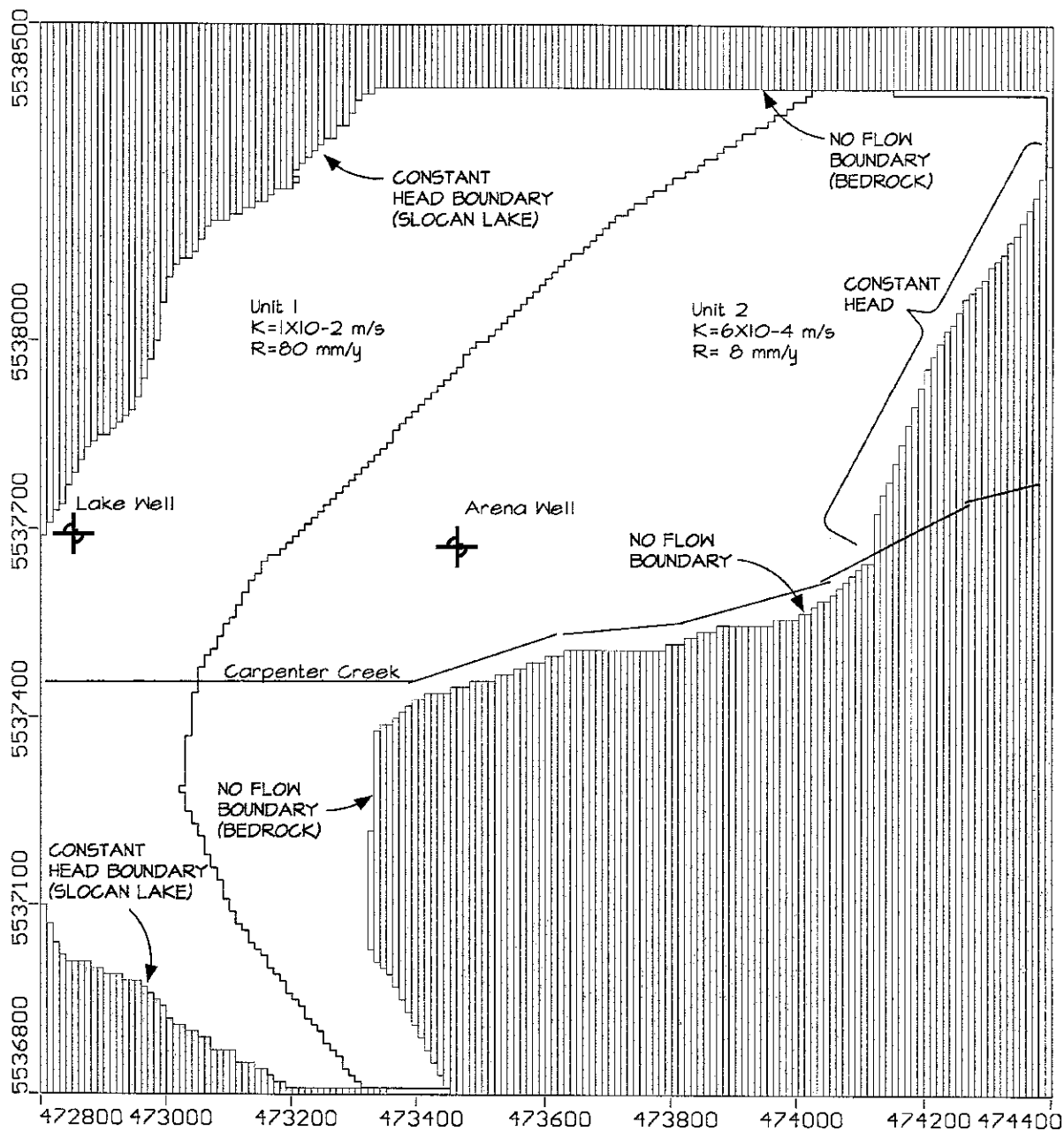


AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

GEOLOGICAL CROSS SECTION B-B'
LOOKING EAST

CLIENT: VILLAGE OF NEW DENVER
REFERENCE: WELL HEAD PROTECTION STUDY

CAD FILE: KX12005\2005FIG4.DWG



AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

MODEL BOUNDARIES

CLIENT: VILLAGE OF NEW DENVER
REFERENCE: WELL HEAD PROTECTION STUDY

Scale
AS SHOWN

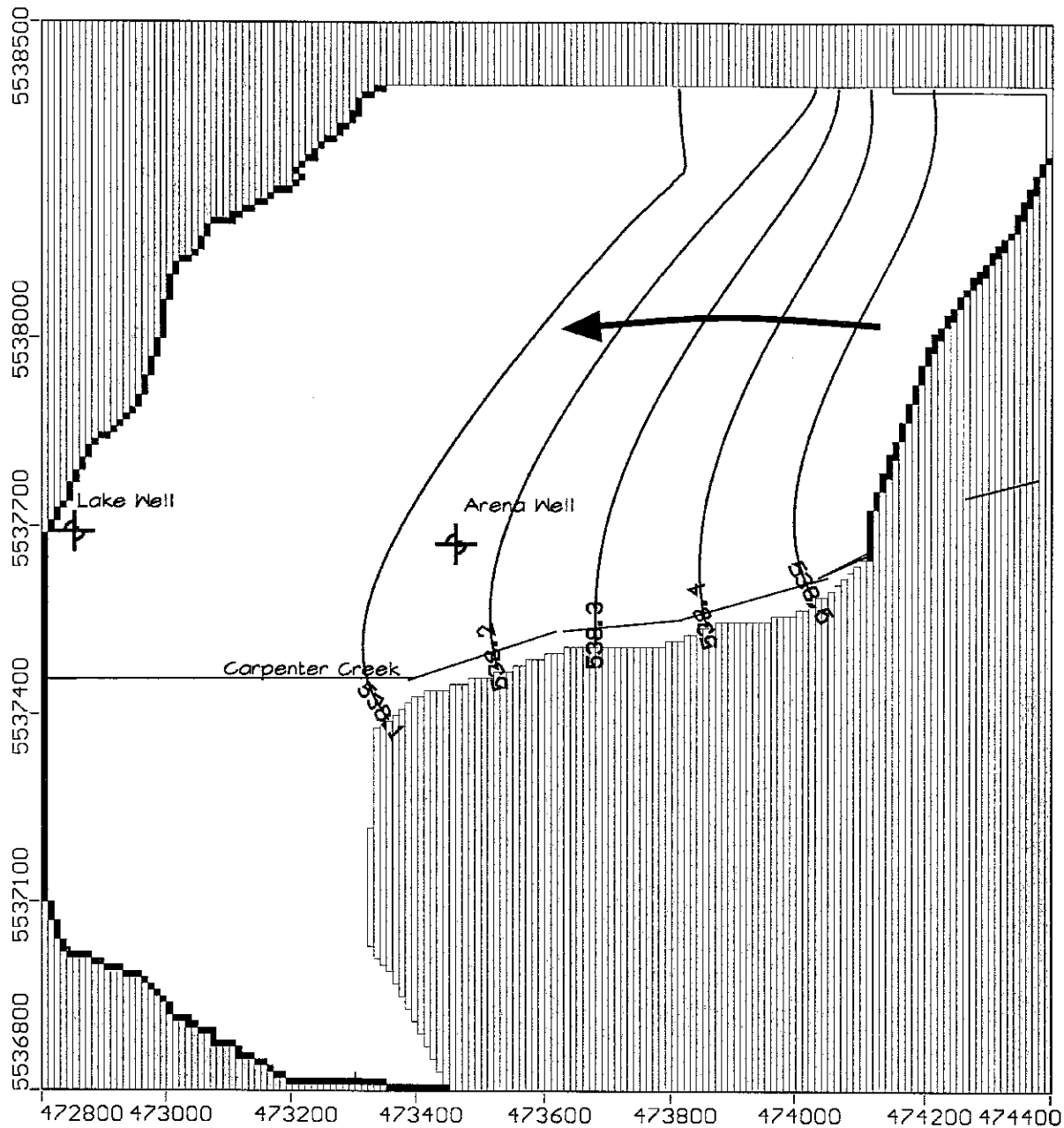
Date
9/8/10/07

Drawn by
BMD

Project #
KX12005

FIGURE 5

CAD FILE: KX12005\12005FIG5.DWG



← DIRECTION OF GROUNDWATER FLOW



AGRA Earth & Environmental

ENGINEERING GLOBAL SOLUTIONS

PEZIOMETRIC SURFACE

CLIENT: VILLAGE OF NEW DENVER
REFERENCE: WELL HEAD PROTECTION STUDY

Scale
AS SHOWN

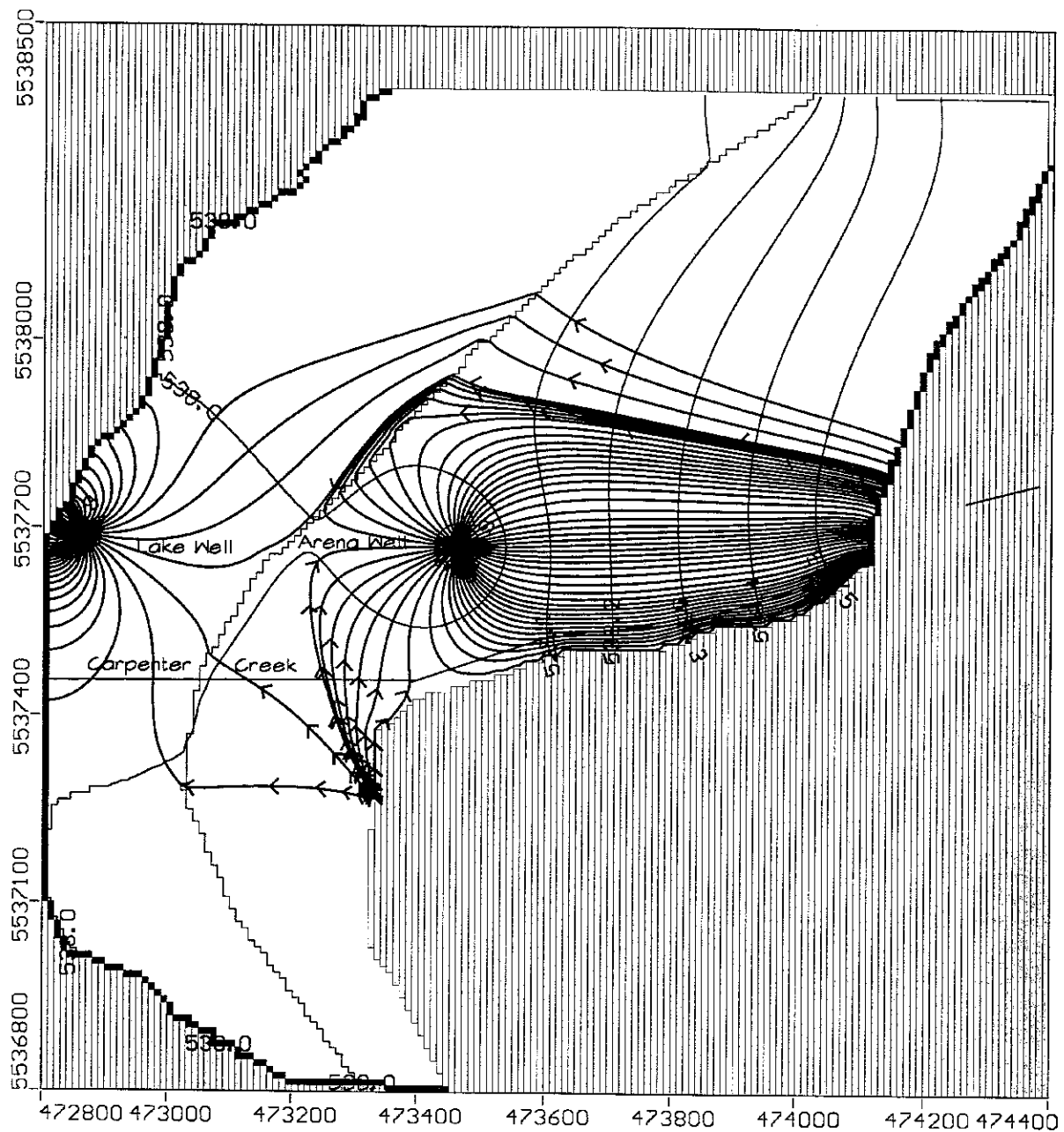
Date
9/10/07

Drawn by
BMD

Project #
KX12005

FIGURE 6

CAD FILE: KX12005\12005FIG6.DWG



← DIRECTION OF GROUNDWATER FLOW



AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

STEADY STATE CAPTURE ZONE OF BOTH WELLS

CLIENT: VILLAGE OF NEW DENVER
REFERENCE: WELL HEAD PROTECTION STUDY

Scale
AS SHOWN

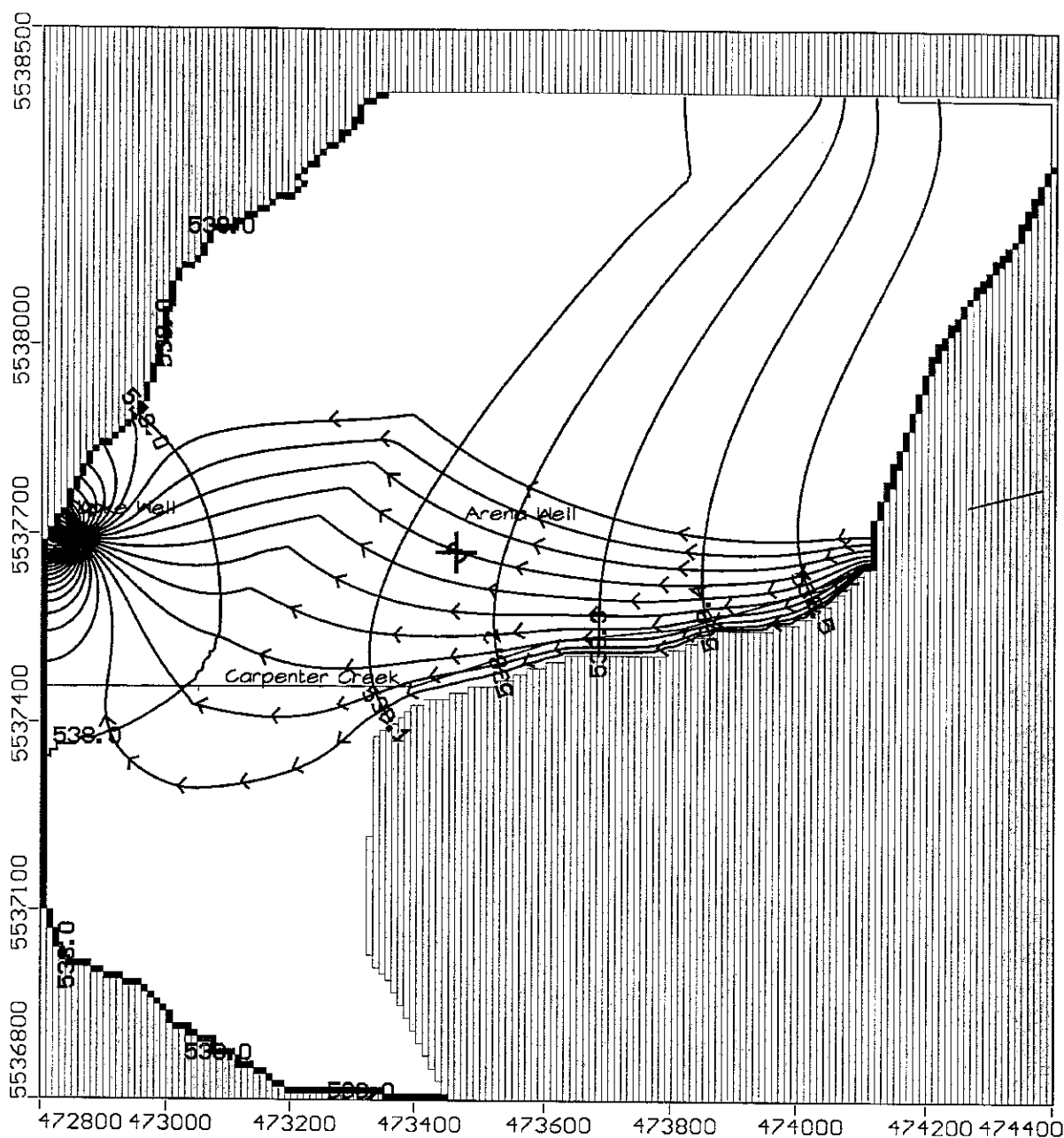
Date
98/10/07

Drawn by
BMD

Project #
KX12005

FIGURE 7

CAD FILE: KX12005\12005F167.DWG



← DIRECTION OF GROUNDWATER FLOW

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

STEADY STATE CAPTURE ZONE LAKE WELLS

CLIENT: VILLAGE OF NEW DENVER
REFERENCE: WELL HEAD PROTECTION STUDY

Scale
AS SHOWN

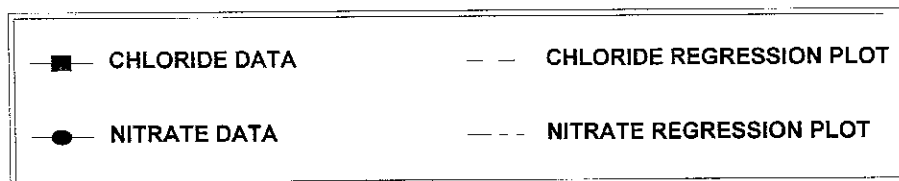
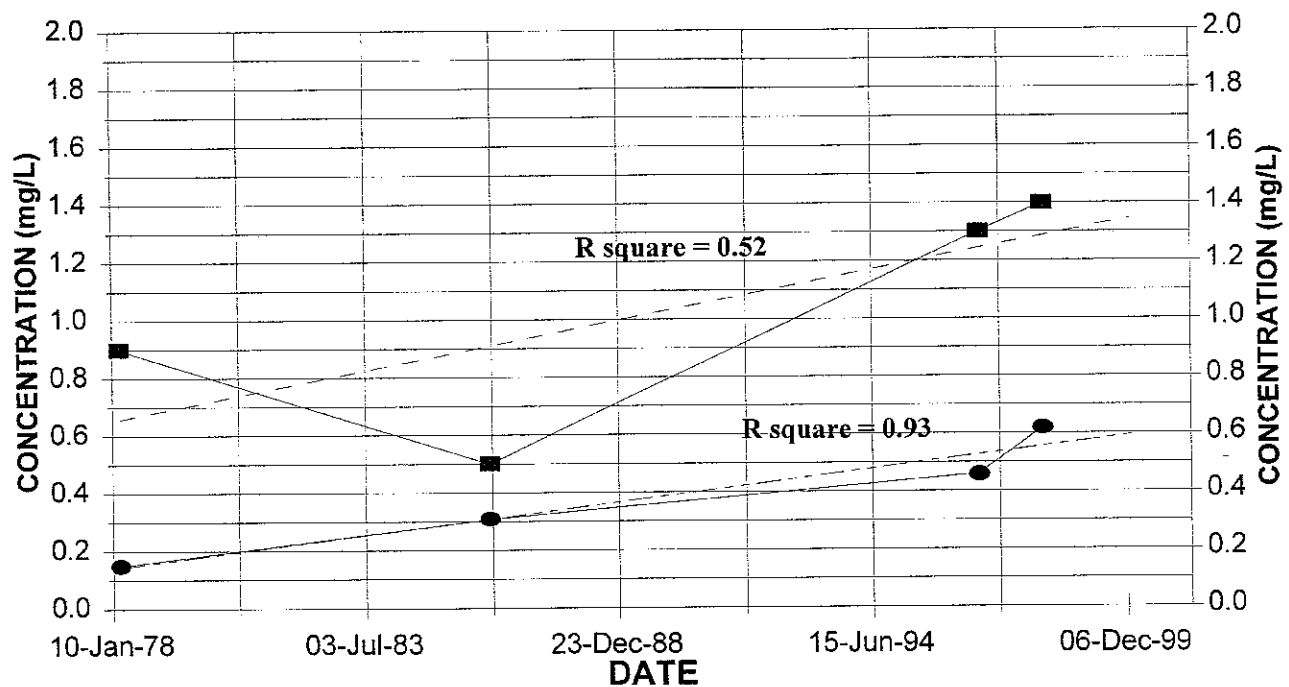
Date
9/8/10/07

Drawn by
BMD

Project #
KXI2005

FIGURE 8

CAD FILE: KXI2005\I2005FIG8.DWG



AGRA Earth & Environmental
Engineering and Environmental Services

**NITRATE & CHLORIDE
CONCENTRATIONS VS TIME**

CLIENT: CORPORATION OF THE VILLAGE OF NEW DENVER
REFERENCE: WELL HEAD PROTECTION STUDY

Scale
NTS

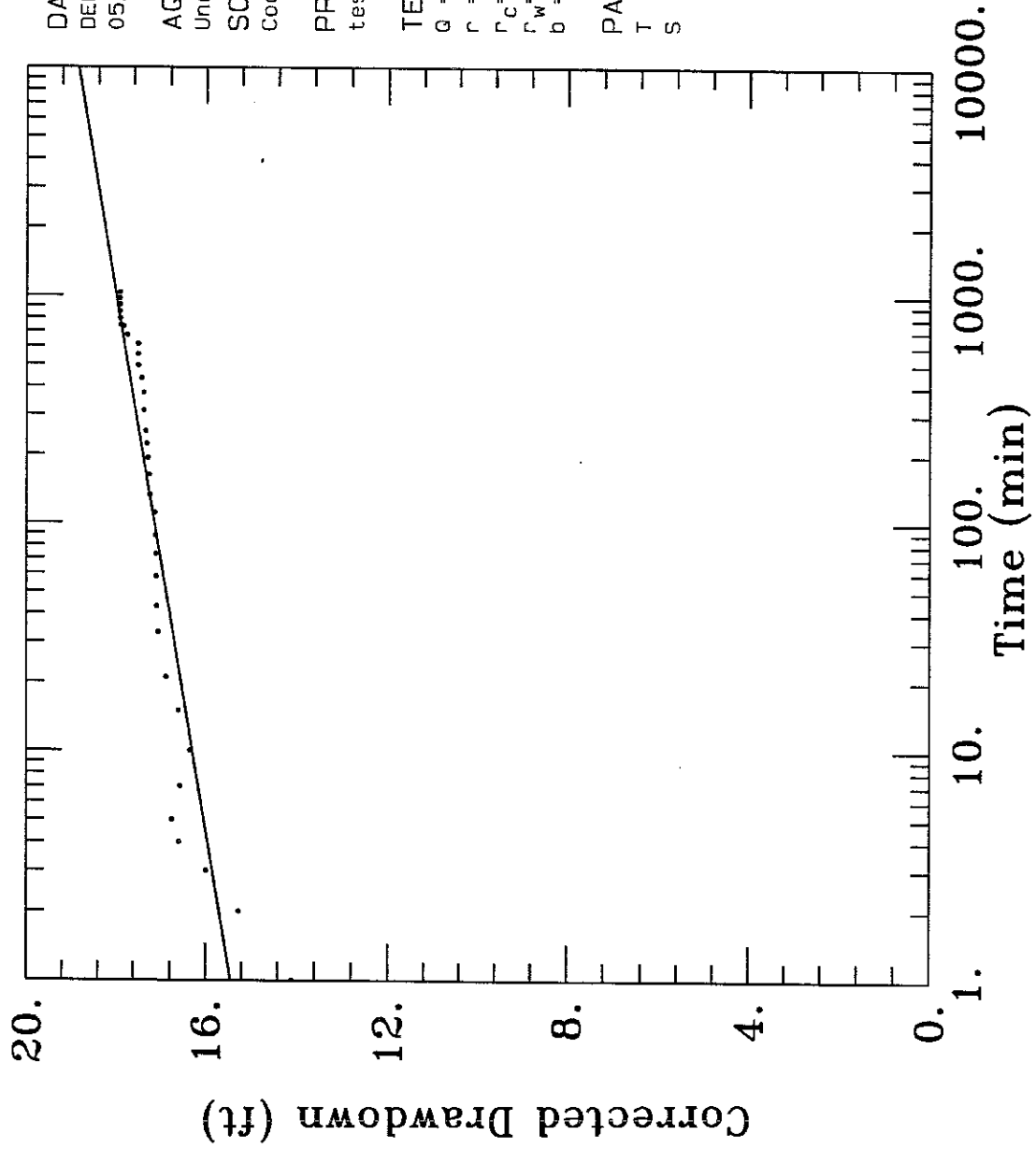
Date
06/10/98

Drawn By
KB

Project #
KX12005

FIGURE 9

Appendix B



DATA SET:
DENVER1.DAT
05/14/98

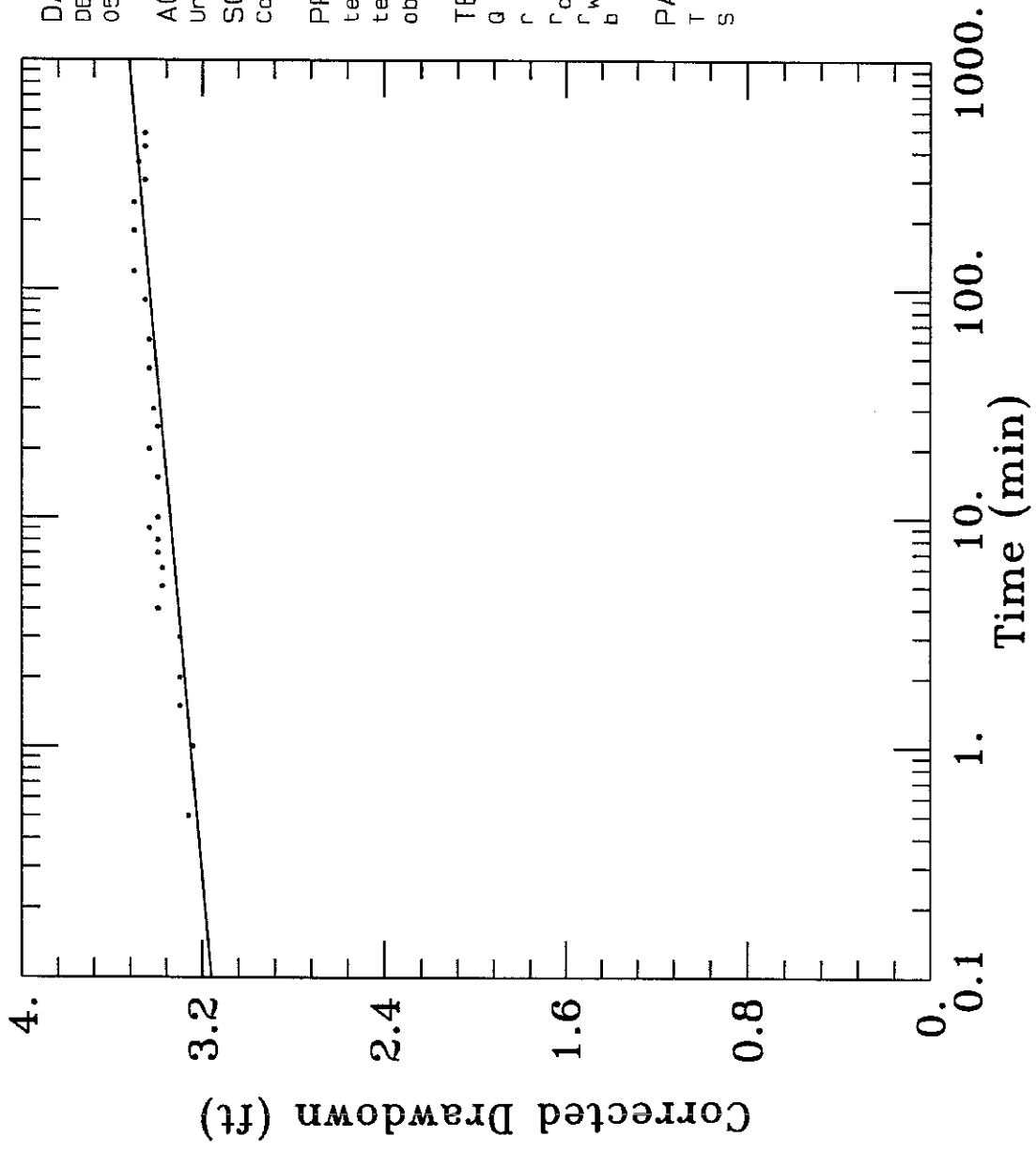
AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Cooper-Jacob

PROJECT DATA:
test date: November 22, 1974

TEST DATA:
 $Q = 164$ gal/min
 $r = 0.4709$ ft
 $r_c = 0.333$ ft
 $r_w = 0.333$ ft
 $b = 76$ ft

PARAMETER ESTIMATES:
 $T = 4.72$ ft²/min
 $S = 3.414E-17$



DATA SET:
DENVER2.DAT
05/14/98

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Cooper-Jacob

PROJECT DATA:
test date: December 5, 1974
test well: Lake
obs. well: Lake

TEST DATA:
Q = 900. gal/min
r = 0.4709 ft
r_c = 0.33 ft
r_w = 0.33 ft
b = 95. ft

PARAMETER ESTIMATES:
T = 241.9 ft²/min
S = 5.098E-33




CHEMICAL ANALYSIS REPORT

Date: June 23, 1998
ASL File No. J6003
Report On: Well Head Protection Study
Water Analysis
Report To: **AGRA Earth & Environmental Ltd.**
913 Laval Crescent
Kamloops, BC
V2C 5P4
Attention: **Mr. Kevin A. Bennett**, Environmental/Groundwater Eng.
Received: June 17, 1998

ASL ANALYTICAL SERVICE LABORATORIES LTD.

per:


Heather A. Ross, B.Sc.
Project Chemist


Miles Gropen, B.Sc.
Project Chemist

cc: Ms. Carol Gordon -
Village of New Denver

**RESULTS OF ANALYSIS - Water**

File No. J6003

	Well #1	Well #2
	98 06 16 10:05	98 06 16 09:55
<hr/>		
<u>Halogenated Volatiles</u>		
Bromodichloromethane	<0.001	<0.001
Bromoform	<0.001	<0.001
Carbon Tetrachloride	<0.001	<0.001
Chlorobenzene	<0.001	<0.001
Chloroethane	<0.001	<0.001
Chloroform	<0.001	<0.001
Chloromethane	<0.001	<0.001
Dibromochloromethane	<0.001	<0.001
1,2-Dichlorobenzene	<0.001	<0.001
1,3-Dichlorobenzene	<0.001	<0.001
1,4-Dichlorobenzene	<0.001	<0.001
1,1-Dichloroethane	<0.001	<0.001
1,2-Dichloroethane	<0.001	<0.001
cis-1,2-Dichloroethylene	<0.001	<0.001
trans-1,2-Dichloroethylene	<0.001	<0.001
1,1-Dichloroethylene	<0.001	<0.001
Dichloromethane	<0.005	<0.005
1,2-Dichloropropane	<0.001	<0.001
cis-1,3-Dichloropropylene	<0.001	<0.001
trans-1,3-Dichloropropylene	<0.001	<0.001
1,1,1,2-Tetrachloroethane	<0.001	<0.001
1,1,2,2-Tetrachloroethane	<0.001	<0.001
Tetrachloroethylene	<0.001	<0.001
1,1,1-Trichloroethane	<0.001	<0.001
1,1,2-Trichloroethane	<0.001	<0.001
Trichloroethylene	<0.001	<0.001
Trichlorofluoromethane	<0.001	<0.001
Vinyl Chloride	<0.001	<0.001
<u>Non-halogenated Volatiles</u>		
Benzene	<0.0005	<0.0005
Ethylbenzene	<0.0005	<0.0005
Styrene	<0.0005	<0.0005
Toluene	<0.0005	<0.0005
meta- & para-Xylene	<0.0005	<0.0005
ortho-Xylene	<0.0005	<0.0005

Results are expressed as milligrams per litre.

< = Less than the detection limit indicated.

EPH = Extractable Petroleum Hydrocarbons.



RESULTS OF ANALYSIS - Water

File No. J6003

Well #1

Well #2

98 06 16
10:05

98 06 16
09:55

Extractables

EPH (C10-18)
EPH (C19-31)

<0.5
<1

<0.5
<1

Results are expressed as milligrams per litre.
< = Less than the detection limit indicated.
EPH = Extractable Petroleum Hydrocarbons.

Appendix C



METHODOLOGY

File No. J6003

Outlines of the methodologies utilized for the analysis of the samples submitted are as follows:

Volatile Organic Priority Pollutants in Water

This analysis is carried out in accordance with U.S. EPA Method 624/524 and 5030/8240. These procedures involve purge and trap extraction of the sample and subsequent analysis of the volatile components by capillary column gas chromatography with mass spectrometric detection.

Extractable Hydrocarbons in Water

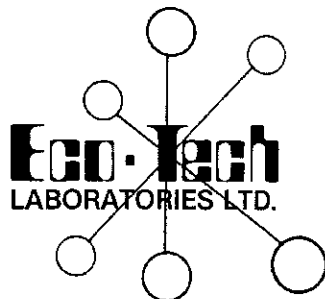
This analysis is carried out using procedures adapted from U.S. EPA Methods 3510/8015 (Publ. #SW-846, 3rd ed., Washington, DC 20460) and British Columbia Ministry of Environment, Lands and Parks Method for "Extractable Petroleum Hydrocarbons in Water by GC/FID" (January 1996). The procedure involves a methylene chloride solvent extraction followed by analysis of the extract by capillary column gas chromatography with flame ionization detection. Results are not corrected for Polycyclic Aromatic Hydrocarbons (PAHs) for Extractable Petroleum Hydrocarbon (LEPH/HEPH) purposes.

End of Report



APPENDIX

CHAIN OF CUSTODY FORMS



KX12005
ASSAYING
GEOCHEMISTRY
ANALYTICAL CHEMISTRY
ENVIRONMENTAL TESTING

10041 E. Trans Canada Hwy., R.R. #2, Kamloops, B.C. V2C 6T4
Phone (250) 573-5700 Fax (250) 573-4557
email: ecotech@mail.wkpowerlink.com

CHEMICAL ANALYSIS REPORT

Date: 7-Oct-98

Et. File No. E1553

Report On: Water Analysis

Report To: AGRA EARTH & ENVIRONMENTAL LTD.
#26-913 Laval Crescent

KAMLOOPS, BC
V2C 5P4

Attention: Kevin Bennett

Project Name: Village of New Denver
Project No: Not given

Received: 24-Sep-98
Sample Dated: not given

ECO-TECH LABORATORIES LTD.
per:

K. Mathieu
Kathy Mathieu
Environmental Lab Manager

KM/dm
Fax @: 374-2944

AGRA EARTH & ENVIRONMENTAL LTD.
Project Name: Village of New Denver
Project No: Not given

7-Oct-98
Et. No. E1553

RESULTS OF ANALYSIS - WATER

Sample Dated: Not given

PARAMETERS	Slocan Lake @ New Denver
pH (units)	7.94
Sulphate (as SO ₄)	5
Total Phosphate (as P)	<0.003
Nitrate (as N)	<0.003
Nitrite (as N)	<0.003
Ammonia (as N)	<0.005
Alkalinity (as CaCO ₃)	38.4
Chloride	<0.5
Calcium	12.9
Magnesium	2.00
Sodium	0.88
Pottasium	<0.9

Results expressed in mg/L unless otherwise indicated.

AGRA EARTH & ENVIRONMENTAL LTD.

Project Name: Village of New Denver

Project No: Not given

7-Oct-98

Et. No.

E1553

RESULTS OF ANALYSIS - WATER

Sample Dated: Not given

QUALITY CONTROL DATA

Methods used are based upon those found in "Standard Methods for the Examination of Water and Wastewater" 19th Edition, published by the American Public Health Association, or on US EPA methods from "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW846) third Edition. Any other procedures are based on methods accepted by the B.C. Ministry of Environment.

1. QC SOLUTION RUNS:

Parameter	Method	Expected (mg/L)	Observed (mg/L)	%Deviation
Total Phosphate	Technicon	0.131	0.129	-1.5
Chloride	Titrimetric	55.0	55.2	+0.3
Nitrite	Technicon	0.304	0.303	-0.33
Nitrate	Technicon	0.227	0.218	-3.96
Alkalinity	Titrimetric	1000	1010	+1
Ammonia	Technicon	0.393	0.368	-6.36
Sulfate	Turbidimetric	20	18	-10

2. DUPLICATE RUNS:

Parameter	Method	Sample ID	Run 1 (mg/L)	Run 2 (mg/L)	Deviation

3. Blank Runs:

All blanks for each parameter were found to be less than its detection limit.

NOTE:

The control criteria for reagent blank are that the observed value for each analyte to be determined is less than its detection limit. If this is not achieved during analysis, the process will be terminated and will not be continued until the problem is solved.



June 2, 1998

Your File: KX12005

Our File: 26100-20/Inquiries

AGRA Earth & Environmental
913 Laval Crescent
Kamloops BC V2C 5P4

Attention: Kevin A. Bennett, P.Eng.

Dear Kevin A. Bennett:

Re: Request for Non-Site Specific Information Pertaining to the Village of New Denver, BC.

This will confirm receipt of \$321.00 and your April 27, 1998 request that a file search be conducted for the Village of New Denver.

A waste management search based on your submitted information was conducted for the Village of New Denver. Information searches include review of electronic databases (SITE and SWIS) and paper files related to contaminated sites, special waste issues, spills, waste management approvals and permits, and pollution abatement and/or prevention orders.

Following review of our files, our records indicate that three sites have been noted on the SITE Registry database which is available to the public via BC Online. This database includes a summary of all recorded site assessment and remediation information that BC Environment has on file. The following sites were noted:

<u>SITE ID</u>	<u>Name</u>
2676	New Denver Esso - New Denver
3164	New Denver Surplus Highways
3242	Canada Post Corporation

Enclosed with this letter are current Manager's Site Registry Reports for all above files which details all BC Environment information currently available to the public via BC Online. Most reports listed may be obtained from BC Environment for a photocopy charge of 25 cents per page. Some limitations on access may apply.

In the Village of New Denver, Canada Post Corporation removed a 2270 L fuel oil underground storage tank (UST) November 30, 1995 from its location at 219-6th Avenue, New Denver. Environmental assessment did not identify any evidence of petroleum hydrocarbon contamination exceeding commercial standards set out in the Contaminated Sites Regulations.

The New Denver Surplus Highway Site is bounded by Highway 31A, Denver Siding Street, and Atlantic Street. This site is located approximately 0.7 km northeast of Slocan lake and 0.5 km north of Carpenter Creek. Historic land uses on this site are suspected to include use as an Asphalt Storage Area and a decommissioned municipal landfill. The site has also been used as a utility-pole dump. There was a report commissioned by BC Buildings Corporation (BCBC) 05-June-1992 entitled: "Real Estate Environmental Audit: Lot 1, District Lot 550, Plan 17712 New Denver, B.C. - Final Report". This report is held in BC Environment's Victoria Office.

The New Denver Esso Station located on Highway 6 at the corner of Union Street, New Denver, was issued a Letter of Comfort by BC Environment on January 31, 1995, indicating that the soil conditions at the subject site appeared to meet the required remedial criterion of BC at that time. Remediation of the site to those criteria occurred during decommissioning of three underground petroleum storage tanks on November 12, 1994, ceasing operation as a petroleum dispensing operation. An environmental assessment was conducted determining that no soils contamination existed within the tank nest area.

The Slocan Community Hospital and Health Care Society has a permit (PE-6034) to discharge effluent from a hospital located at New Denver, BC, to the ground. This permit was issued September 14, 1982. The maximum amount of effluent allowed to be discharged is 29 m³ per day. The authorized works consist of an existing extended aeration treatment plant, ground disposal fields consisting of 230 lineal metres of disposal pipe and related appurtenances. The legal description of the land from which the effluent originates is Block L, Plan 4177 and Lot 1, Plan 4193, Lot 549, Kootenay District. The tile field lies parallel to a small creek which runs into Slocan Lake. The high water level is approximately 2 m below the top of the treatment tanks.

Review of our special waste databases and files indicates that Slocan Community Hospital and Health Care Centre located at 401 Galena Avenue, New Denver, BC has two generator registrations. One registration documents that infectious waste substances are regularly generated in quantities as high as 850 Litres per month. These wastes are routinely removed for off-site disposal by BFI Medical Waste

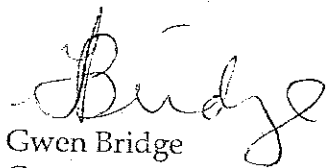
Systems. The other generator registration was to document asbestos removal conducted in 1994. The asbestos was associated with thermal system insulation.

BC Environment's searches are limited to information since approximately 1989. The existence or absence of information provides no assurance that a site is or is not contaminated.

The foregoing comments are based on the most recent information provided to BC Environment with respect to the indicated sites. BC Environment, however, makes no representation or warranty as to the accuracy or completeness of this information.

If we can be of further assistance, please do not hesitate to contact our office at 250 354-6355.

Yours truly,

A handwritten signature in cursive script, appearing to read "Gwen Bridge".

Gwen Bridge
Contaminated Sites Technician

GB/mh

Enclosure

Site Id : 3242
Common Name : CANADA POST CORP. - NEW DENVER P.O.

'PENDING STATUS' DATA

LOCATION

Site Address : 219 6TH AVENUE
Victoria File :
Regional File : 26250-20/3242
Longitude : 117 : 22 : 31.3
Latitude : 049 : 59 : 28.6

City : NEW DENVER
Province : BC
Postal Code :

Initial Approval Date :
Last Approval Date :
Pending Date : 1997-11-25

STATUS

Status : INACTIVE - NO FURTHER ACTION
Category : UNRANKED

LOCATION DESCRIPTION

NOTATIONS

Initiated	Notation	Participant	Role	Notes	Required Actions
-----------	----------	-------------	------	-------	------------------

PARCEL DESCRIPTIONS

Land Title # (PID)	Crown Land # (PIN)	Land File #	Date Noted	Legal/Land Descriptions
013771736			1996-11-25	LOT 1 BLOCK 12 DISTRICT LOT 432 KOOTENAY DISTRICT PLAN 9501
013771752			1996-11-25	LOT 2 BLOCK 12 DISTRICT LOT 432 KOOTENAY DISTRICT PLAN 9501

Date Printed: 1998-05-29

BC Environment

Manager's Site Registry Report

SELECTION CRITERIA

Destination Type:	File
Destination Name:	/tmp/gbridge_SISR0095.lis
Site Id:	3242
Content:	A

report version v.2.3

Site Id : 3164
Common Name : NEW DENVER SURPLUS HIGHWAY SITE

'PENDING STATUS' DATA LOCATION

Site Address	: HIGHWAY 31A (DENVER SIDING ST AND ATLANTIC ST)	Victoria File	: 26250-20/3164
		Regional File	: 26250-20/3164
		Longitude	: 117 : 21 : 32.4
		Latitude	: 049 : 59 : 47.4
City	: NEW DENVER		
Province	: BC		
Postal Code	:		

Initial Approval Date : 1998-02-16
Last Approval Date :
Pending Date : 1998-04-06

STATUS

Status : ACTIVE - UNDER ASSESSMENT
Category : UNRANKED

LOCATION DESCRIPTION

BOUNDED BY HIGHWAY 31A, DENVER SIDING STREET, AND ATLANTIC STREET. LAT/LONG DERIVED BY BC ENVIRONMENT
REFERENCING TRIM DATA (1:20,000).

NOTATIONS

Initiated	Notation	Participant	Role	Notes	Required Actions
1992-06-05	SITE INVESTIGATION REPORT SUBMITTED	BC BUILDINGS CORPORATION (KAMLOOPS)	REQUESTED BY	PRELIMINARY SITE INVESTIGATION COMPLETED	
		JMB RESEARCH LTD. (BURNABY, B.C.)	SUBMITTED BY		
		MCLENNAN, ROBERT E.	Ministry Contact		

MANAGER'S SITE REGISTRY REPORT ALL PROPOSED SITE REGISTRY INFORMATION: 1998-05-29

SITE PARTICIPANTS

Participant	Start Date	End Date	Role	Note
BC BUILDINGS CORPORATION (KAMLOOPS)	1978-05-04	1997-09-29	FORMER OPERATOR	BECAUSE PROPERTY OWNER 01/29/98
CORPORATION OF THE VILLAGE OF NEW DENVER	1997-09-29		PROPERTY OWNER	
JMB RESEARCH LTD. (BURNABY, B.C.)	1992-06-05		ENVIRONMENTAL CONSULTANT/CONTRACTOR	
MCLENNAN, ROBERT E.	1992-06-05		MAIN BC ENVIRONMENT CONTACT	
WINGERT, WILLIAM C. AND JEAN	1987-02-11	1988-01-29	PROPERTY OWNER	
WRIGHT, CHARLES A.	1923-10-28	1978-05-04	FORMER PROPERTY OWNER	
WRIGHT, GUSTAVUS J.	1923-10-28	1978-05-04	FORMER PROPERTY OWNER	

DOCUMENTS

Title	Document Date	Received Date	Participant	Role	Notes
REAL ESTATE ENVIRONMENTAL AUDIT: LOT 1 DISTRICT LOT 560 KOOTENAY DISTRICT PLAN 17712 NEW DENVER, B.C.: FINAL REPORT	1992-06-05	1992-06-05	BC BUILDINGS CORPORATION (KAMLOOPS)	COMMISSIONER	
			JMB RESEARCH LTD. (BURNABY, B.C.)	AUTHOR	
			MCLENNAN, ROBERT E.	RECIPIENT	

SUSPECT LAND USE

Description	Note
ASPHALT TAP ROOFING MANUFACTURE/WHOLESALE STORAGE/DISTRIBUTE	ASPHALT STORAGE AREA
LANDFILL - GENERAL USE	
TREATED WOOD STORAGE AT THE SITE OF TREATMENT	HYDRO-POLE DUMP

PARCEL DESCRIPTIONS

Land Title # (PID)	Crown Land # (PIN)	Land File #	Date Noted	Legal/Land Descriptions
009360859			1996-11-18	LOT 1 DISTRICT LOT 560 KOOTENAY DISTRICT PLAN 17712

Date Printed: 1998-05-29

BC Environment

Manager's Site Registry Report

SELECTION CRITERIA

Destination Type:	File
Destination Name:	/tmp/gbridge_SISR0095.lis
Site Id:	3164
Content:	A

report version v.2.3

Site Id : 2676
Common Name : NEW DENVER ESSO STATION

'PENDING STATUS' DATA
LOCATION

Site Address	: HIGHWAY 6 (UNION AND 6TH AVENUE)	Victoria File	:
		Regional File	: 26250-20/2676
City	: NEW DENVER	Longitude	: 117 : 22 : 20.9
Province	: BC	Latitude	: 049 : 59 : 30.1
Postal Code	: V0G 1S0		

Initial Approval Date : 1997-10-08
Last Approval Date :
Pending Date :

STATUS

Status : INACTIVE -- REMEDIATION COMPLETE
Category : UNRANKED

LOCATION DESCRIPTION

LOCATED ON CORNER OF HIGHWAY 6 (UNION STREET) AND 6TH AVENUE. LAT/LONG DERIVED BY BC ENVIRONMENT
 REFERENCEING THE TRANSPORTATION CENTERLINE NETWORK (TCN), NAD 83.

NOTATIONS

Initiated	Notation	Participant	Role	Notes	Required Actions
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NOTATIONS

Initiated	Notation	Participant	Role	Notes	Required Actions
1995-01-31	CONCENTRATION CRITERIA APPROACH USED	STOCKERL, ED	Ministry Contact		
	LETTER OF COMFORT ISSUED	CASLEY, ERNIE STOCKERL, ED	REQUESTED BY ISSUED BY Ministry Contact	BASED ON THE REVIEW OF LIMITED SITE SPECIFIC INFORMATION PROVIDED TO THIS OFFICE, THE SOIL CONCENTRATION AT THE SUBSTATION APPEARS TO MEET THE REMEDIAL CRITERIA AND STANDARDS PRESENTLY IN EFFECT IN B.C.	
	REMEDIATED TO COMMERCIAL/INDUSTRIAL LEVELS (DRAFT CMCS 2/17/89)	STOCKERL, ED	Ministry Contact		
1995-01-25	REMEDIATION COMPLETION REPORT SUBMITTED	CASLEY, ERNIE SEACOR ENVIRONMENTAL ENGINEERING INC. (NELSON, B.C.) STOCKERL, ED	REQUESTED BY SUBMITTED BY Ministry Contact RECEIVED BY	ENVIRONMENTAL ASSESSMENT REPORT ADDRESSES THE REMOVAL OF 3 UNDERGROUND PETROLEUM STORAGE TANKS AND PROVIDES AN ENVIRONMENTAL RISK ASSESSMENT. IT CONCLUDES THAT NO SOIL CONTAMINATION EXISTS AROUND THE TANK NEST AREA.	BC ENVIRONMENT TO REVIEW AND ISSUE A LETTER OF COMFORT IF ACCEPTABLE

SITE PARTICIPANTS

Participant	Start Date	End Date	Role	Note
ANALYTICAL SERVICE LABORATORIES LTD. (VANCOUVER, B.C.)	1994-11-25		ANALYTICAL LAB	
CASLEY, ERNIE	1994-11-12	1996-09-28	FORMER OPERATOR FORMER PROPERTY OWNER	PETROLEUM DISPENSING OPERATIONS WERE DECOMMISSIONED NOVEMBER 12, 1994 WITH THE REMOVAL OF 3 USTS
SEACOR ENVIRONMENTAL ENGINEERING INC. (NELSON, B.C.)	1994-11-12		ENVIRONMENTAL CONSULTANT/CONTRACTOR	
STOCKERL, ED	1995-01-25		MAIN BC ENVIRONMENT CONTACT	
VAN DER VELDEN, PETER	1996-09-28		PROPERTY OWNER	

DOCUMENTS

Title	Document Date	Received Date	Participant	Role	Notes
UNDERGROUND STORAGE TANK REMOVAL NEW DENVER ESSO STATION NEW DENVER BC	1994-11-25	1995-01-25	CASLEY, ERNIE SEACOR ENVIRONMENTAL ENGINEERING INC. (NELSON, B.C.) STOCKERL, ED	COMMISSIONER AUTHOR REVIEWER	

SUSPECT LAND USE

Description	Note
PETRO. PROD. DISPENSE FACILITY, INC. SERVICE STATION/CARDLOT PETRONATURAL GAS/PRODUCE WATER STRG ABOVEGROUND/UNDERGROUND TANK	SITE DECOMMISSIONED AS A PETROLEUM DISPENSING OPERATION WITH REMOVAL OF USTS 3 USTS REMOVED NOVEMBER 12, 1994.

MANAGER'S SITE REGISTRY REPORT
ALL PROPOSED SITE REGISTRY INFORMATION: 1998-05-29

PARCEL DESCRIPTIONS

Land Title # (PID)	Crown Land # (PIN)	Land File #	Date Noted	Legal/Land Descriptions
006279619			1996-09-26	LOT 15 BLOCK 36 DISTRICT LOT 549 KOOTENAY DISTRICT PLAN 557
006279643			1996-09-26	LOT 16 BLOCK 36 DISTRICT LOT 549 KOOTENAY DISTRICT PLAN 557
006279660			1996-09-26	LOT 17 BLOCK 36 DISTRICT LOT 549 KOOTENAY DISTRICT PLAN 557
006279775			1996-09-26	LOT 18 BLOCK 36 DISTRICT LOT 549 KOOTENAY DISTRICT PLAN 557
006279791			1996-09-26	LOT 19 BLOCK 36 DISTRICT LOT 549 KOOTENAY DISTRICT PLAN 557

Date Printed: 1998-05-29

BC Environment

Manager's Site Registry Report

SELECTION CRITERIA

Destination Type:	File
Destination Name:	/tmp/gbridge_SISR0095.lis
Site Id:	2676
Content:	A
report version v.2.3	

Appendix D



June 2, 1998

Your File: KX12005

Our File: 26100-20/Inquiries

AGRA Earth & Environmental
913 Laval Crescent
Kamloops BC V2C 5P4

Attention: Kevin A. Bennett, P.Eng.

Dear Kevin A. Bennett:

Re: Request for Non-Site Specific Information Pertaining to the Village of New Denver, BC.

This will confirm receipt of \$321.00 and your April 27, 1998 request that a file search be conducted for the Village of New Denver.

A waste management search based on your submitted information was conducted for the Village of New Denver. Information searches include review of electronic databases (SITE and SWIS) and paper files related to contaminated sites, special waste issues, spills, waste management approvals and permits, and pollution abatement and/or prevention orders.

Following review of our files, our records indicate that three sites have been noted on the SITE Registry database which is available to the public via BC Online. This database includes a summary of all recorded site assessment and remediation information that BC Environment has on file. The following sites were noted:

<u>SITE ID</u>	<u>Name</u>
2676	New Denver Esso - New Denver
3164	New Denver Surplus Highways
3242	Canada Post Corporation

Enclosed with this letter are current Manager's Site Registry Reports for all above files which details all BC Environment information currently available to the public via BC Online. Most reports listed may be obtained from BC Environment for a photocopy charge of 25 cents per page. Some limitations on access may apply.

In the Village of New Denver, Canada Post Corporation removed a 2270 L fuel oil underground storage tank (UST) November 30, 1995 from its location at 219-6th Avenue, New Denver. Environmental assessment did not identify any evidence of petroleum hydrocarbon contamination exceeding commercial standards set out in the Contaminated Sites Regulations.

The New Denver Surplus Highway Site is bounded by Highway 31A, Denver Siding Street, and Atlantic Street. This site is located approximately 0.7 km northeast of Slocan lake and 0.5 km north of Carpenter Creek. Historic land uses on this site are suspected to include use as an Asphalt Storage Area and a decommissioned municipal landfill. The site has also been used as a utility-pole dump. There was a report commissioned by BC Buildings Corporation (BCBC) 05-June-1992 entitled: "Real Estate Environmental Audit: Lot 1, District Lot 550, Plan 17712 New Denver, B.C. - Final Report". This report is held in BC Environment's Victoria Office.

The New Denver Esso Station located on Highway 6 at the corner of Union Street, New Denver, was issued a Letter of Comfort by BC Environment on January 31, 1995, indicating that the soil conditions at the subject site appeared to meet the required remedial criterion of BC at that time. Remediation of the site to those criteria occurred during decommissioning of three underground petroleum storage tanks on November 12, 1994, ceasing operation as a petroleum dispensing operation. An environmental assessment was conducted determining that no soils contamination existed within the tank nest area.

The Slocan Community Hospital and Health Care Society has a permit (PE-6034) to discharge effluent from a hospital located at New Denver, BC, to the ground. This permit was issued September 14, 1982. The maximum amount of effluent allowed to be discharged is 29 m³ per day. The authorized works consist of an existing extended aeration treatment plant, ground disposal fields consisting of 230 lineal metres of disposal pipe and related appurtenances. The legal description of the land from which the effluent originates is Block L, Plan 4177 and Lot 1, Plan 4193, Lot 549, Kootenay District. The tile field lies parallel to a small creek which runs into Slocan Lake. The high water level is approximately 2 m below the top of the treatment tanks.

Review of our special waste databases and files indicates that Slocan Community Hospital and Health Care Centre located at 401 Galena Avenue, New Denver, BC has two generator registrations. One registration documents that infectious waste substances are regularly generated in quantities as high as 850 Litres per month. These wastes are routinely removed for off-site disposal by BFI Medical Waste

Systems. The other generator registration was to document asbestos removal conducted in 1994. The asbestos was associated with thermal system insulation.

BC Environment's searches are limited to information since approximately 1989. The existence or absence of information provides no assurance that a site is or is not contaminated.

The foregoing comments are based on the most recent information provided to BC Environment with respect to the indicated sites. BC Environment, however, makes no representation or warranty as to the accuracy or completeness of this information.

If we can be of further assistance, please do not hesitate to contact our office at 250 354-6355.

Yours truly,

A handwritten signature in cursive script, appearing to read "Bridge".

Gwen Bridge
Contaminated Sites Technician

GB/mh

Enclosure

Site Id : 3242
Common Name : CANADA POST CORP. - NEW DENVER P.O.

PENDING STATUS DATA
LOCATION

Site Address : 219 6TH AVENUE
City : NEW DENVER
Province : BC
Postal Code :
Initial Approval Date :
Last Approval Date :
Pending Date : 1997-11-25
Victoria File :
Regional File : 26250-20/3242
Longitude : 117 : 22 : 31.3
Latitude : 049 : 59 : 28.6

STATUS

Status : INACTIVE - NO FURTHER ACTION
Category : UNRANKED

LOCATION DESCRIPTION

NOTATIONS

Initiated Notation

Participant

Role

Notes

Required Actions

PARCEL DESCRIPTIONS

Land Title # (PID)	Crown Land # (PIN)	Land File #	Date Noted	Legal/Land Descriptions
013771736			1996-11-25	LOT 1 BLOCK 12 DISTRICT LOT 432 KOOTENAY DISTRICT PLAN 9501
013771752			1998-11-25	LOT 2 BLOCK 12 DISTRICT LOT 432 KOOTENAY DISTRICT PLAN 9501

Date Printed: 1998-05-29

BC Environment

Manager's Site Registry Report

SELECTION CRITERIA

Destination Type:	File
Destination Name:	/tmp/gbridge_SISR0095.lis
Site Id:	3242
Content:	A
report version v.2.3	

Site Id : 3164
Common Name : NEW DENVER SURPLUS HIGHWAY SITE

'PENDING STATUS' DATA
LOCATION

Site Address : HIGHWAY 31A (DENVER SIDING ST AND ATLANTIC ST)
City : NEW DENVER
Province : BC
Postal Code :
Victoria File : 26250-20/3164
Regional File : 26250-20/3164
Longitude : 117 : 21 : 32.4
Latitude : 049 : 59 : 47.4

Initial Approval Date : 1998-02-16
Last Approval Date :
Pending Date : 1998-04-06

STATUS

Status : ACTIVE - UNDER ASSESSMENT
Category : UNRANKED

LOCATION DESCRIPTION

BOUNDED BY HIGHWAY 31A, DENVER SIDING STREET, AND ATLANTIC STREET. LAT/LONG DERIVED BY BC ENVIRONMENT
REFERENCING TRIM DATA (1:20,000).

NOTATIONS

Initiated	Notation	Participant	Role	Notes	Required Actions
1992-06-05	SITE INVESTIGATION REPORT SUBMITTED	BC BUILDINGS CORPORATION (KAMLOOPS)	REQUESTED BY	PRELIMINARY SITE INVESTIGATION COMPLETED	
		JMB RESEARCH LTD. (BURNABY, B.C.)	SUBMITTED BY		
		MOLLENEHAN, ROBERT E.	Ministry Contact		

MANAGER'S SITE REGISTRY REPORT

ALL PROPOSED SITE REGISTRY INFORMATION: 1998-05-29

SITE PARTICIPANTS

Participant	Start Date	End Date	Role	Note
BC BUILDINGS CORPORATION (KAMLOOPS)	1978-05-04	1997-09-29	FORMER OPERATOR	BECAME PROPERTY OWNER 01/29/98
CORPORATION OF THE VILLAGE OF NEW DENVER	1997-09-29		PROPERTY OWNER	
JMB RESEARCH LTD. (BURNABY, B.C.)	1992-06-06		ENVIRONMENTAL CONSULTANT/CONTRACTOR	
MCLENNAN, ROBERT E.	1992-08-05		MAIN BC ENVIRONMENT CONTACT	
WINGERT, WILLIAM C. AND JEAN	1987-02-11	1988-01-29	PROPERTY OWNER	
WRIGHT, CHARLES A.	1923-10-28	1978-05-04	FORMER PROPERTY OWNER	
WRIGHT, GUSTAVUS J.	1923-10-28	1978-05-04	FORMER PROPERTY OWNER	

DOCUMENTS

Title	Document Date	Received Date	Participant	Role	Notes
REAL ESTATE ENVIRONMENTAL AUDIT: LOT 1, D.L. 550, PLAN 17712 NEW DENVER, B.C. - FINAL REPORT	1992-06-06	1992-06-05	BC BUILDINGS CORPORATION (KAMLOOPS)	COMMISSIONER	
			JMB RESEARCH LTD. (BURNABY, B.C.)	AUTHOR	
			MCLENNAN, ROBERT E.	RECIPIENT	

SUSPECT LAND USE

Description	Note
ASPHALT TAR ROOFING MANUFACTURE/WHOLESALE STORAGE/DISTRIBUTE	ASPHALT STORAGE AREA
LANDFILL - GENERAL USE	
TREATED WOOD STORAGE AT THE SITE OF TREATMENT	HYDRO-POLE DUMP

PARCEL DESCRIPTIONS

Land Title # (PID)	Crown Land # (PIN)	Land File #	Date Noted	Legal/Land Descriptions
009360059			1998-11-18	LOT 1 DISTRICT LOT 550 KOOTENAY DISTRICT PLAN 17712

Date Printed: 1998-05-29

BC Environment

Manager's Site Registry Report

SELECTION CRITERIA

Destination Type:	File
Destination Name:	/tmp/gbridge_SISR0095.ils
Site Id:	3164
Content:	A
report version v.2.3	

Site Id : 2676
Common Name : NEW DENVER ESSO STATION

PENDING STATUS' DATA
LOCATION

Site Address : HIGHWAY 6 (UNION AND 6TH AVENUE)

Victoria File :
Regional File : 26250-20/2676
Longitude : 117 : 22 : 20.9
Latitude : 049 : 59 : 30.1

City : NEW DENVER
Province : BC
Postal Code : V0G 1S0

Initial Approval Date : 1997-10-08
Last Approval Date :
Pending Date :

STATUS

Status : INACTIVE - REMEDIATION COMPLETE
Category : UNRANKED

LOCATION DESCRIPTION

LOCATED ON CORNER OF HIGHWAY 6 (UNION STREET) AND 6TH AVENUE. LAT/LONG DERIVED BY BC ENVIRONMENT
REFERENCING THE TRANSPORTATION CENTERLINE NETWORK (TCN). NAD 83.

NOTATIONS

Initiated	Notation	Participant	Role	Notes	Required Actions
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NOTATIONS

Initiated	Notation	Participant	Role	Notes	Required Actions
1985-01-31	CONCENTRATION CRITERIA APPROACH USED	STOCKERL, ED	Ministry Contact		
	LETTER OF COMFORT ISSUED	CASLEY, ERNIE STOCKERL, ED	REQUESTED BY ISSUED BY Ministry Contact	BASED ON THE REVIEW OF LIMITED SITE SPECIFIC INFORMATION PROVIDED TO THIS OFFICE, THE SOIL CONDITIONS AT THE SELECTED SITE APPEAR TO MEET THE HEADN CRITERIA AND STANDARDS PRESENTLY IN EFFECT IN B.C.	
	REMEDIATED TO COMMERCIAL/INDUSTRIAL LEVELS (DRAFT COMS 2/11/89)	STOCKERL, ED	Ministry Contact		
1995-01-25	REMEDIATION COMPLETION REPORT SUBMITTED	CASLEY, ERNIE SEACOR ENVIRONMENTAL ENGINEERING INC. (NELSON, B.C.) STOCKERL, ED	REQUESTED BY SUBMITTED BY Ministry Contact RECEIVED BY	ENVIRONMENTAL REPORT ASSESSMENT OF THE REMOVAL OF 3 UNDERGROUND PETROLEUM STORAGE TANKS AND PROVIDES AN ENVIRONMENTAL REVIEW. CONCLUDES THAT NO SOILS CONTAMINATION EXISTS AROUND THE TANK NEST AREA.	BC ENVIRONMENT TO REVIEW AND ISSUE A LETTER OF COMFORT IF ACCEPTABLE.

SITE PARTICIPANTS

Participant	Start Date	End Date	Role	Note
ANALYTICAL SERVICE LABORATORIES LTD. (VANCOUVER, B.C.)	1994-11-25		ANALYTICAL LAB	
CASLEY, ERNIE	1994-11-12	1996-09-26	FORMER OPERATOR FORMER PROPERTY OWNER	PETROLEUM DISPENSING OPERATIONS WERE DECOMMISSIONED NOVEMBER 12, 1994 WITH THE REMOVAL OF 3 UST'S
SEACOR ENVIRONMENTAL ENGINEERING INC. (NELSON, B.C.)	1994-11-12		ENVIRONMENTAL CONSULTANT/CONTRACTOR	
STOCKERL, ED	1995-01-25		MAIN BC ENVIRONMENT CONTACT	
VAN DER VELDEN, PETER	1996-09-26		PROPERTY OWNER	

DOCUMENTS

Title	Document Date	Received Date	Participant	Role	Notes
UNDERGROUND STORAGE TANK UNDERGROUND STORAGE TANK NEW DENVER BC	1994-11-25	1995-01-25	CASLEY, ERNIE SEACOR ENVIRONMENTAL ENGINEERING INC. (NELSON, B.C.) STOCKERL, ED	COMMISSIONER AUTHOR REVIEWER	

SUSPECT LAND USE

Description	Note
PETRO. PROD. DISPENSE FACILITY, INC. SERVICE STATION/CARLOT PETRONATURAL GAS/PRODUCE WATER STRG ABOVEGROUND/UNDERGRND TANK	SITE DECOMMISSIONED AS A PETROLEUM DISPENSING OPERATION WITH REMOVAL OF UST'S 3 UST'S REMOVED NOVEMBER 12, 1994.

MANAGER'S SITE REGISTRY REPORT
ALL PROPOSED SITE REGISTRY INFORMATION: 1998-05-29

PARCEL DESCRIPTIONS

Land Title # (PID)	Crown Land # (PIN)	Land File #	Date Noted	Legal/Land Descriptions
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006279660			1996-09-26	LOT 17 BLOCK 36 DISTRICT LOT 549 KOOTENAY DISTRICT PLAN 557
006279775			1996-09-26	LOT 18 BLOCK 36 DISTRICT LOT 549 KOOTENAY DISTRICT PLAN 557
006279791			1996-09-26	LOT 19 BLOCK 36 DISTRICT LOT 549 KOOTENAY DISTRICT PLAN 557

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BC Environment

Manager's Site Registry Report

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report version v.2.3