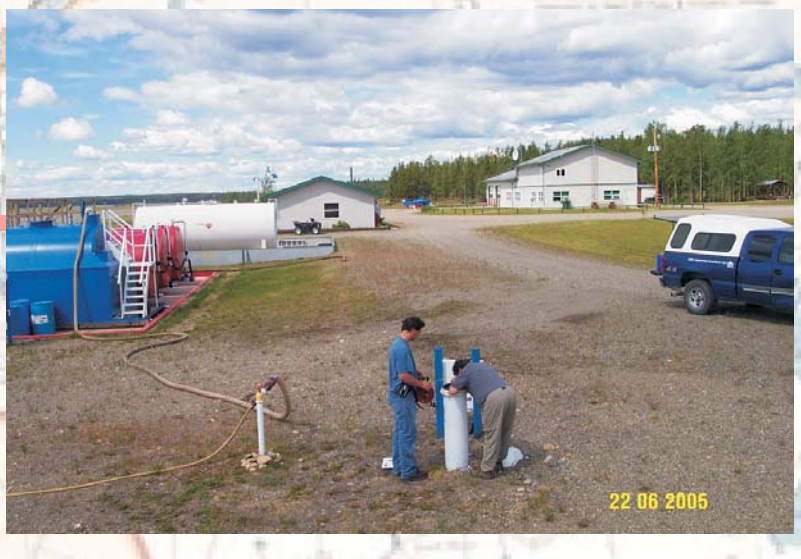
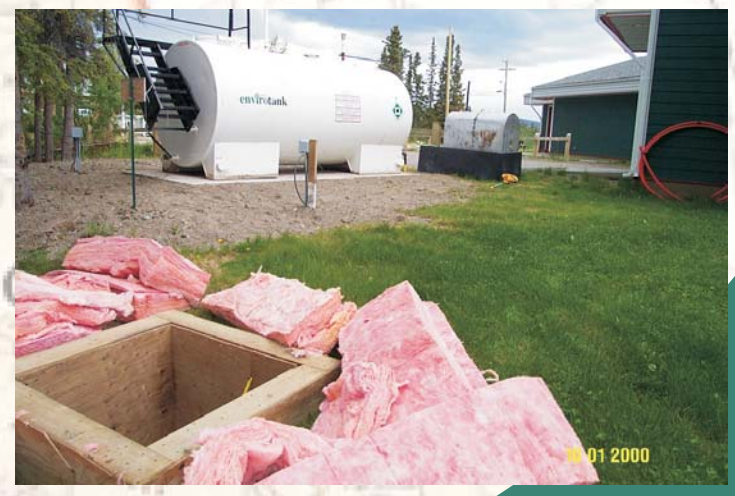
EBA ENGINEERING CONSULTANTS LTD.



SMALL PUBLIC WATER SYSTEM ASSESSMENT

Eastern Region





"CREATING AND DELIVERING BETTER SOLUTIONS"

eba

Small Public Water System Assessment
Yukon Government Maintained Buildings

EASTERN REGION

Project No. 1260002.002

March 2006

Small Public Water System Assessment
Yukon Government Maintained Buildings
EASTERN REGION

Submitted To:

Property Management Agency
Government of Yukon

Prepared by:

EBA ENGINEERING CONSULTANTS LTD.
WHITEHORSE, YUKON TERRITORY

Project No. 1260002.002

March 2006

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1.0 INTRODUCTION

1.1 Scope of Work and Terms of Reference

The scope of work for this project was to conduct professional assessments of the wells, water systems and water sources for Government of Yukon maintained buildings in the "Eastern Region" as defined in the Request for Proposal (RFP) "Small Public Water Drinking Water System Assessment – Yukon Government Maintained Buildings – 2005". The RFP, and the EBA project team's proposal (EBA, February 2005) formed the Terms of Reference (TOR) for this study. In accordance with the TOR, the assessments were comprehensive and the reporting includes information, observations, comments, recommendations and plans/sketches for the water sources, infrastructure and distribution systems. The recommendations include Class D cost estimates to upgrade water systems to meet the new draft regulations - ***Draft Guidelines for Part III – Small Public Drinking Water Systems***. Comparison of well construction with the ***Canadian Groundwater Association Guidelines for Water Well Construction,*** and comparison of water quality results with the ***Guidelines for Canadian Drinking Water Quality*** are included for each system. This report provides a summary of the assessment results and recommendations and costs for the Eastern Region.

1.2 Authorization

The project team consisting of EBA Engineering Consultants Ltd. (EBA), Dayton and Knight Ltd. (D&K) and Aqua Tech Service and Supply (ATSS) was authorized to complete the work program in accordance with the TOR. EBA, as the consulting team representative, signed a contract (GN04556521-40319) with the Property Management Agency (PMA) of the Government of Yukon (YTG) on March 8th 2005 to provide consulting services to conduct the Small Public Drinking Water Assessments as per the submitted proposal, fees and disbursements.

1.3 Public Drinking Water System Regulations and Guidelines

Since the tragedy of the Walkerton water supply contamination issue, jurisdictions across Canada have adopted the "Source to Tap, Multi-barrier" approach in assessing, planning and designing water systems. The Yukon has followed in step with the rest of Canada in the development of several key guidelines that are

intended to become regulation. The following two draft drinking water guidelines for regulation to be enacted under the ***Public Health and Safety Act*** (Yukon), were released in April 2004:

- ***Public Drinking Water Systems Regulations***; and,
- ***Bulk Delivery of Drinking Water Regulations***.

As well, the Yukon Government has recently developed ***Draft Guidelines for Part 3 – Small Public Drinking Water Systems***, which are referenced in this report. We understand that these draft guidelines are still under review.

Each of these draft regulations specify requirements in the areas of source protection, training, permitting, engineering assessments, equipment, disinfection and treatment, operation and maintenance, sampling and analysis, record-keeping, and emergency planning. All remedial measures and feasibility assessments completed in this study are consistent with the requirements of Yukon legislation.

The ***Canadian Drinking Water Quality Guidelines*** (CDWQG) are referenced to in our analysis of water quality data. These guidelines are amended periodically, and the most recent version (April 2004) was used for this study.

1.4 Methodology

The following sections describe the methodology used for completing the scope of work in accordance with the Terms of Reference.

1.4.1 Meeting #1: Project Kick-off

A project "Kick-Off" meeting was held on March 16th, 2005 following award of the contract to introduce the project team members and discuss the Terms of Reference. EBA representatives Ryan Martin and Matt Pye, ATSS representative Bert Albisser, and YTG representatives Tom Renwick and Nick Barnett attended the meeting. The civil/mechanical engineering representatives of the team (D&K) attended by teleconference. Project team introductions, access to background information (water quality results, well records), proposed mapping, schedule and billing was discussed.

1.4.2 Information Collection and Review

The assessment began with the compilation and review of all relevant information including previous reports, site plans, air photos, well logs, pump testing results and water quality data.

An evaluation of all existing water quality information available from a previous study (***Collection of Water Samples for Bacteriological Testing, Chemical and Physical Parameter Testing – Various Locations, Yukon – YTG Contract 2004)*** was undertaken prior to the field program. The purpose of this review was to identify wells that may be impacted by various potential sources of contamination in order to determine the additional water quality parameters necessary to evaluate treatment/disinfection options. The available water quality information was assessed for compliance with the ***Guidelines for Canadian Drinking Water Quality criteria***. EBA prepared a letter dated April 7th, 2005 for YTG Property Management Agency titled ***Recommendations for Additional Analytical – Small Public Drinking Water System Assessments – Government of Yukon Maintained Buildings – 2005***. The letter provided recommendations and estimated costs for additional sampling, field chemistry and laboratory analyses.

1.4.3 Meeting #2: Pre-Assessment

Following the collection and review of available information pertaining to the subject water systems, a meeting was held in Whitehorse with YTG, EBA and ATSS representatives on May 5, 2005. Each of the YTG regional managers attended.

The findings of the analytical review were discussed, with particular attention given to the recommendations for additional water quality sampling. Laboratory and courier cost estimates for the additional analyses were presented at the meeting, along with contact information for personnel involved in the project.

Specific aspects of the field program were discussed including site access and the standardized reporting format for each system. Also, the sequence of regions to be evaluated was determined based on priority of expected high-risk deficiency

upgrades and level of risk. It was decided that the first region to be assessed would be the Whitehorse Region, followed by the Eastern Region, Western Region and the Northern Region.

1.4.4 Assessment Team

For system assessment, a project field team consisting of an EBA hydrogeologist (Ryan Martin, P.Eng.), an EBA Field Technician (Luke Lebel) and one senior Aqua Tech personnel (Bert Albisser) was utilized. The primary responsibility of EBA personnel during the field assessments was the evaluation of well construction and location. All potential sources of contamination within 150 m of subject wells with specific attention to the 30 m surrounding the well were identified during the system assessments.

The primary responsibility of Aqua Tech personnel (Bert Albisser) during the field assessments was the accurate documentation of the distribution and treatment/disinfection systems, including general condition and maintenance requirements. Aqua Tech personnel provided a preliminary evaluation of the system to EBA and D&K and assisted with detailed evaluation and development of recommendations.

D&K personnel provided technical advice by correspondence, as needed during the water system assessments, and were not required to visit the sites.

1.4.5 Wellhead Inspections and Water Supply Source Evaluations

For each of the subject wells, the field investigation began with a site reconnaissance to assess general site conditions, topography, surface drainage patterns and exposed sediments. The major focus of the reconnaissance was identification of potential sources of contamination that may not have been previously identified through research prior to the field assessment. Separation distances were measured to all potential sources of contamination within 150 m of the well, including septic fields, sewage lagoons, cemeteries, landfills, buildings, roads, fuel storage tanks and other sources of potential contamination. This information is presented in the individual sections for each water system on digital,

scaled site plans developed for the subject sites. Groundwater flow directions are inferred where possible within the report based on topography and proximity to surface water bodies, as well as previous work.

Following the site reconnaissance, a detailed inspection of the water system was undertaken. Where possible, the following information was obtained for each well:

- Wellhead construction, enclosure, piping, cleanliness and the buildings served;
- GPS coordinates at each wellhead;
- GPS coordinates for septic fields or other potential contaminant sources within 150 m of each wellhead;
- Digital photographs of wellheads and any potential contaminant sources;
- Surface completion details relevant to the security and operation of the well;
- Assessment of all well enclosures;
- Completion of wellhead check lists for each well incorporating the following items:
  - Compliance with the ***Canadian Groundwater Association Guidelines for Water Well Construction***, including existence of casing seals (if possible) and height of casing above ground surface;
  - Casing type and diameter;
  - Type and condition of well cap;
  - Potential for ponding of surface drainage at wellhead;
  - Qualitative description of water quality concerns if possible (e.g. staining, odours);
  - Description of system deficiencies and digital photographs illustrating deficiencies;
  - Wellhead accessibility for rehabilitation, pump removal, inspections, etc.;
  - Site sketch illustrating location of well in relation to buildings and nearby potential contaminant sources within 150 m (as described above, information will be transferred to a digital site plan modified from an air photo base plan); and,
  - Water level measurements, and the depth of the well measured where possible.

During the well inspections, water quality samples were collected as required, to augment existing water quality information available for the subject systems.

1.4.6 Distribution and Treatment System Evaluations

Aqua Tech personnel documented the existing water supply distribution and treatment/disinfection systems. Where possible, the following information was collected for each system:

- Type and condition of pump, including make and model;
- Type and condition of controls;
- Type and condition of distribution piping, fittings and connections;
- Type and condition of water treatment systems, including make and model;
- Type and condition of disinfection systems, including make and model;
- Type and condition of freeze protection; and,
- Digital photographs illustrating piping, controls and treatment/disinfection systems, including deficiencies and general layout.

This information is presented on system schematics of the complete water systems, along with supporting tables that include all pertinent information related to the water supply source, well, distribution and treatment/disinfection systems. This information is presented in an individual appendix assigned for each site.

In addition to the above information, on-site water testing was performed for systems with operational chlorine disinfection systems. This was done using a chlorine test kit capable of reading in the range of 0.0-to 3.5 mg/L free chlorine. Chlorinated systems were assessed for compliance with the ***Draft Guidelines for Part III – Small Public Drinking Water Systems***, which requires a free chlorine residual of 0.4 mg/L for bulk water delivery, and a minimum of 0.2 mg/L for piped water distribution systems servicing five or more connections. Field parameters such as pH, electrical conductivity (EC), Total Dissolved Solids (TDS) and temperature were also obtained at all sites.

1.4.7 Report Format and Cost Estimates for Eastern Region

This report includes the assessment results and recommendations for upgrades to address deficiencies in a prioritized manner as requested in the Terms of Reference. Deficiencies are identified with respect to the requirements stipulated in the ***Canadian Groundwater Association Guidelines for Water Well Construction*** and the ***Draft Guidelines for Part III – Small Public Drinking Water Systems***. Upgrades are recommended to address these deficiencies, in addition to other improvements that may be warranted. Where appropriate, alternative upgrade

options are provided. All recommendations include Class D cost estimates, and are classified according to the following three categories:

- Priority 1: Recommended upgrades and estimated costs to address potential immediate risk deficiencies (high hazards);
- Priority 2: Recommended upgrades and estimated costs to address remaining potential medium and high risk deficiencies (medium and high hazards); and,
- Priority 3: Recommended upgrades for typically low risk issues (low hazards), or recommended mechanical and functional upgrades and estimated costs.

The water system deficiencies identified during this study are typically hazard conditions, where risk could exist if there is exposure. For simplicity within the document, a "high risk", implies that there is a high hazard condition (e.g. no cap on casing) that could pose a high risk if there was an exposure event (e.g. surface water or vermin entering casing). Likewise, other levels of risk and exposure are also referred to in the same manor.

The Draft Report for the Eastern Region Assessments was submitted to PMA in July 2005. This final report has been updated to make it relevant to the revised draft SPDWSR, to include some additional assessment work that has been completed since the draft reports were submitted, and editorial and formatting changes where required. In accordance with the TOR, two copies of this final report have been prepared for PMA. One copy is also maintained at the EBA Whitehorse office. PDF copies of the report in its entirety have also been provided on compact disk to PMA.

1.4.8 Nomenclature and Report Format

This study involved collecting, compiling and reviewing a large amount of data. In labeling the data, EBA used the YTG building numbering classification for system, well and sample names. Where a well served more than one building, the sample name consisted of the both building numbers that the well serves.

Originally there were to be 25 water systems to be assessed in the Eastern Region. The Eastern Region includes the communities on the Alaska Highway east of Whitehorse (Teslin, Swift River, Watson Lake) and YTG maintained buildings

along the Robert Campbell Highway (Tutchitua, Ross Rover and Drury Creek). During the work program, six additional systems (Watson Lake RCMP Detachment and 5 residences) were added. The Fire Lookout was not accessible at the time of the assessment, and was removed from the program. Two other sites on the Canol highway (Twin Creeks grader station on the North Canol Hwy, and Quiet Lake Grader Station on the South Canol Hwy) were added after the eastern region assessment program, and were originally reported within the Northern Region Draft report. This final report includes 32 water systems that were assessed in the Eastern Region and are reported upon in 26 sections.

The Property Management Agency has a number of individual clients, and therefore, the report was structured so that individual reports could be extracted and compiled for each client to maintain privacy and efficiency. The systems assessed included fire halls, schools, grader stations, administrative offices, various living quarters for YTG employees, and an RCMP detachment. The report is structured such that there is a separate section for each system. Supporting assessment data was tabulated and provided in a separate appendix for each system. Appendix numbers correspond to the section of the report for each of the systems (e.g. Section 4 has supporting data provided in Appendix A4). Supporting tables were named after the system for which they provide data. Each summary table has the building number followed by the table number and each figure has the building number followed by the figure number. The report is also provided as PDF digital files for each site including the report section and appendix for each system.

2.0 DISCUSSION OF PROPOSED AND EXISTING GUIDELINES

The proposed ***Guidelines for Part III – Small Public Drinking Water Systems*** are currently under development by YTG Environmental Health and Social Services (EHSS). In accordance with the Terms of Reference, these proposed guidelines (November 23, 2004) were used to determine compliance issues with respect to the systems assessed under this program. Since the completion of the draft reports for each Region, these guidelines were amended to a draft dated December 22nd, 2005. Accordingly, the final reports were also amended to reflect the latest draft of these guidelines. The most relevant sections of these draft Guidelines (December 22nd, 2005) as well as the Canadian Groundwater Association Guidelines for Water Well Construction pertaining to this study are summarized below:

- "Small public drinking water system" means a drinking water system which has:
    a) less than 15 direct service connections to a piped distribution system; or
    b) less than 5 delivery sites on a trucked distribution system.

- GUDI is an acronym for well water or groundwater under the direct influence of surface water.

- Well water under the direct influence of surface water means the water source for a well has been determined to be GUDI, using the Yukon's Assessment for Well Water or Groundwater under the Direct Influence of Surface Water (GUDI), published by Queen's Printer (Draft, December 22nd, 2005).

- According to Draft guidelines initial screening protocol, if a water source does not meet any one of the below criteria, the source shall be either identified as GUDI, or as potentially GUDI with further confirmatory assessment to be carried out:
- Vulnerable location or type – the water system shall not be:
    a) A spring, infiltration gallery, shallow collector system or artificial recharge system;
    b) A well with a production zone less than 15m below the ground surface;
    c) A well in an unconfined aquifer; or
    d) A well completed in fractured or karst bedrock exposed at or near the land surface.
- Proximity to surface water – the water source shall not be located within 60 m of any permanent, or intermittent or seasonal surface water body, including

ponds, slough, lakes, rivers, streams, canals, lagoons, or any other surface water feature.

- Well Construction – At a minimum, the well shall meet the requirements of the most recent version of the *Guidelines for Water Well Construction*, published by the Canadian Ground Water Association.
- Water quality – The raw water from the source shall not exhibit evidence of contamination by or from surface water (i.e., significant occurrence of insects, insect parts, microorganisms such as *E. coli*, algae, *Giardia*, *Cryptosporidium*, or viruses; or significant and rapid shifts in water characteristics such as turbidity, temperature, conductivity, temperature, conductivity, pH or chemistry that closely correlate to weather or surface water conditions).

- An owner is responsible for the supply and delivery of safe drinking water to the users.

- The owner is responsible for the maintenance and upgrade of the small public drinking water system, as necessary, for the purpose of providing safe drinking water to its users.

- An owner of a small water system that obtains drinking water from a groundwater source shall:
    a) Unless otherwise determined based on results of a comprehensive hydrogeological study, ensure that the drinking water well is located a minimum distance of:
        i. 15 metres from a septic tank, sewage holding tank or contained privy;
        ii. 30 metres from a soil absorption system, pit privy, or other potential sources of pollution that may pose a health and safety risk;
        iii. 120 metres from a solid waste site, dump, or cemetery; and,
        iv. 300 metres from a sewage lagoon or pit.
    b) Use a well, located and constructed in accordance with criteria that meets or exceeds those outlined in the Canadian Groundwater Association Guidelines for Water Well Construction.

- The owner of a small public water system that obtains water from a surface water source, or uses a well under the direct influence of surface water, shall ensure provision of treatment consisting of filtration and disinfection, or other treatment capable of producing a safe drinking water.

- An owner upon selecting a drinking water source shall consider a source that is:
    a) most likely to produce drinking water of a quality that meets the Guidelines for Canadian Drinking Water Quality, and

b) is least likely to be subject to municipal, industrial and agricultural contamination, and/or other types of contamination resulting from human activities within the watershed.

- If Chlorine disinfection of the small public drinking water system is required, the owner shall ensure that the free chlorine residual concentration throughout the plumbing or piped distribution system is no less than 0.2 mg/L.

- An owner of a small public water system shall ensure that the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant is designed and secured so as to prevent the unauthorized access by humans or entrance of animals.

- Particularly relevant requirements of the Canadian Groundwater Association Guidelines for Water Well Construction are provided below:
  a) Section 3.7: The casing of any drilled well shall project not less than 500 mm above the established ground surface; and,
  b) Section 4.1 and 4.2: The Guidelines for Water Well Construction consider that properly installed water tight casing must have a 50 mm (2") thick bentonite, or bentonite grout seal to effectively prevent the entrance of surface water into an aquifer, and to prevent the intermixing of formation water.

There are many other pertinent requirements involving permitting, application, system operators, seasonal facility start up procedures, well decommissioning, water holding tank cleaning, bulk water delivery, approvals to construct or modify etc. with the draft ***Part 3 – Small Public Drinking Water Systems Regulations (SPDWSR)***. PMA should ensure that all water systems serving YTG maintained buildings that fall under this regulation are in compliance with the final version in it's entirety.

A meeting to discuss the implications of the draft regulations on the assessment of these systems was arranged between Ryan Martin, and an Environmental Health Officer from YTG Environmental Health and Social Services (EHSS) on Thursday June 9th. Key points discussed in the meeting are provided below:

1) It is the intent of the draft SPDWSR that all wells that do not have a surface casing complete with a sanitary surface seal (grout or bentonite seal) and intact casing to 6 m may be under the direct influence of surface water, which would necessitate further assessment (as per the GUDI guidelines) or adequate disinfection.

2) The maximum acceptable concentration (MAC) for arsenic within the Canadian Drinking Water Quality Guidelines is currently under review by Health Canada. The proposed guideline is low (0.005 mg/L) compared with the existing MAC (0.025 mg/L). The EHSS health officer felt that there was a very high probability of the lower guideline being passed at any time in the near future. She indicated that there would likely be a grace period of at least one year for systems to come into compliance. This will have an impact on the treatment requirements for many water systems in the Yukon.

3.0 APPROACH TO WATER TREATMENT/ DISINFECTION

Drinking Water Officers in some jurisdictions in BC are adopting the "4,3,2,1,0, Dual Treatment" approach. This "multi-barrier" approach for water treatment requires 4-log (99.99%) removal of bacteria and viruses, 3-log (99.9%) removal/inactivation of *Giardia*, 2-log (99%) removal/inactivation of *Cryptosporidium*, turbidity less than 1 NTU, no total and fecal coliform and dual treatment (filtration and disinfection for example). This is the approach that the project team recommends for treatment system design for upgrades to the Yukon Small Water Systems. We understand that there is insufficient budget to implement all suggested upgrades immediately. Consequently, we recommend that a phased approach to treatment should also be implemented, by mitigating the highest risk with the best value as described below.

According to Dayton and Knight, Health Authorities in BC understand the realities of limited financial resources faced by small water systems. In such cases, the Health Authorities in BC may accept a multi-phase treatment approach starting with some type of primary disinfection initially, followed by additional upgrades as funds become available until full treatment (if required) is achieved. This report has been prepared with the assumption that YTG Environmental Health and Social Service would be amenable to this phased approach. For example, where a water system requires wellhead upgrades and disinfection treatment, and the recommended disinfection is filtration followed by UV (based on water quality and system characteristics), we have typically recommended a phased approach with an assigned level of priority as described previously. For this example, the Priority 1 upgrades may include superchlorination (disinfection) of the well and water system, installing a properly sealed well cap and installing a NSF/ANSI 55-certified UV system. These UV systems (with appropriate raw water quality that in some cases may require pretreatment) are certified to provide 4-log (99.99%) inactivation of *E. coli*, and 2-log (99%) inactivation of cryptosporidium and *Giardia*. This interim Priority 1 upgrade measure would mitigate most risk, however, would not provide 3-log inactivation of *Giardia*, nor dual treatment. During subsequent Priority 2 upgrades for the example system above (which would happen at a later date as funds become available), the filtration system (to 1 micron - absolute) would be installed in advance of the filter, and the wellhead would be upgraded (e.g., casing extension, surface seal installation). This is a practical approach to mitigate the highest risks with the funding available on a priority basis.

Input from drinking water authorities in the Yukon regarding this proposed approach is recommended. For example, on a case-by-case basis, drinking water authorities may agree to treatment without the requirement for filtration to 1 micron (absolute), which would enable 3-log inactivation of *Giardia*. For comparison, the City of Whitehorse does not currently provide filtration to the 3-log level, even though it obtains water from a surface water source.

The installation of water treatment systems are not entirely regulated in Canada and the last word relies with the Health authorities. Health Canada recommends that water treatment systems be NSF certified. The NSF designation for UV systems is ANSI/NSF-55, while filtration is ANSI/NSF 61, and RO systems conform to NSF/ANSI 58. It was not within the scope of this project to design water treatment systems, but rather to identify deficiencies, and to provide class level cost estimates for upgrade alternatives. Where treatments system suggestions are provided herein, they are conceptual based on preliminary information available at this time, and to be used for estimating cost of upgrade alternatives. For all treatment system upgrades, it would be prudent to involve a water treatment engineer in system component selection, and to consult with the local health authorities in the process of system design. For all upgrade options, it has been recommended to budget for a 20% engineering cost for final system design.

4.0 BUILDINGS M0107, M0108, AND M0109 – TESLIN RCMP DETACHMENT AND RESIDENCES

4.1 Description of Existing Water system

Water well M0107 serves three RCMP buildings including the Teslin RCMP Detachment (Building M0107) and two Teslin RCMP Residences (Buildings M0108 and M0109). The well is located approximately 5 m from the RCMP Detachment, as shown on Figure M0107-A in Appendix A4, and is completed with a pitless connection. However, the wellhead is located in a pit below grade and the well casing does not extend above ground level. All three buildings are equipped with a water softener, but at the time of inspection only the softener in Building M0108 appeared to be functional. Each of the residences (M0108 and M0109) are equipped with reverse osmosis (RO) systems to provide drinking water to dedicated point of use taps in each of the kitchens. Schematics detailing the water systems are given by Figure M0107-B, and M0109-B in Appendix A4.

There is also an abandoned well that is located in a below grade add-on from the basement of the M0109 RCMP Residence. The well is equipped with a proper cap, but it has yet to be properly decommissioned. The well was reported in the drillers log to be 143 m deep, but when measured during the site inspection was only 37 m deep, indicating that the well had been inundated with sediment and/or debris since it was abandoned. This well would require extensive rehabilitation if it were to be re-commissioned.

4.2 Description of Existing Wastewater Systems

All three RCMP buildings (M0107, M0108 and M0109) are connected to the community sewage collection system with the sewer main located along Johnson Street. The well is located approximately 40 m east of the sewer main.

4.3 Water Quality Results

4.3.1 Water Quality Results from Previous Sampling

A total of twenty bacteriological samples were taken from the three buildings served by this water system between September 2004 and March 2005. The test results did not indicate any positive coliform or *E. coli* results for samples collected from any of these systems. A summary of historical bacteriological results is presented in Table M0107-1 in Appendix A4.

Detailed potability analyses were performed on samples collected from the three RCMP buildings on September 9, 2004. The results are presented in Table M0107-2 in Appendix A4, and summarized in the following:

- The groundwater supplied by well M0107 is very hard and highly mineralized;
- The TDS concentration exceeded the CDWQG aesthetic objective (AO) of 500 mg/L in all three buildings;
- The hardness was observed to be approximately 440 mg/L in buildings M0107 and M0108, but only 1.7 mg/L in M0109. These extremely high hardness concentrations indicate the need for properly operating water-softening systems. Based on water quality results, the water softening systems for M0107 and M0108 did not appear to be functioning properly, however, the softener for M0109 did appear operational. Problems associated the softeners might be resolved by replacing the regenerant but may require further assessment.
- The sodium concentration from the M0109 water system was reported as 166 mg/L. Although the sodium concentration is below the CDWQG aesthetic objective of 200 mg/L, it should be noted that there might be some health effects for some people associated with elevated sodium in their diet. Potassium chloride would be a regenerant alternative to reduce sodium levels.
- The total and dissolved arsenic concentrations were below the current CDWQG MAC of 0.025 mg/L, but were greater than the proposed MAC of 0.005 mg/L for samples collected from all three buildings;
- The total and dissolved manganese concentrations exceeded the CDWQG AO of 0.05 mg/L for samples collected from RCMP buildings M0107 and M0108. The total manganese concentrations were below the CDWQG AO for samples collected from building M0109;

- All other parameters analyzed were below the applicable CDWQG criteria for the sample(s) submitted.

4.3.2 Identification of Additional Analytical Required

Additional parameters requiring analysis were identified prior to and/or during the site inspection and included UV absorbance, silicate, ammonia, phosphate, vanadium and confirmation of manganese and arsenic concentrations. These parameters were analyzed to confirm previous results and will be used in future disinfection system selection.

Samples for additional analytical testing were obtained by EBA during the water system assessment on June 16, 2005. Analytical results are presented in Table M0107-2 in Appendix A4, and laboratory reports are summarized in Appendix B. Results are summarized below:

- Arsenic concentrations, although not above the current CDWQG MAC of 0.025 mg/L, were observed to be above the proposed MAC of 0.005 mg/L. The concentrations of dissolved arsenic with respect to total arsenic indicated that the arsenic concentration in this well water could be almost entirely attributed to dissolved particles;
- Manganese concentrations were above the CDWQG aesthetic objective of 0.05 mg/L at each of the buildings; and,
- Measurements in the field indicated that pH at the M0107 RCMP detachment and the M0109 residence (8.66 and 8.72), were above the CDWQG aesthetic objective of 8.5. Laboratory results, however, reported the pH below 8.5 and the field pH values may be within the error of the instrument.

4.3.3 Indicators of Potential Contamination

The chloride concentrations in samples collected from taps supplied by well M0107 were observed to be greater than 20 mg/L. This may be associated with the use of water softener, but appears to be more likely representative of the aquifer chloride concentrations. Chloride concentrations in this range may occur naturally in groundwater, but may also be an indication of impacts from surface sources of contamination such as road salting, septic disposal, and/or other human activities.

4.4 Conceptual Hydrogeology

The site is located near the center of a small peninsula extending into Teslin Lake. In general, there are two primary aquifer zones identified by previous EBA studies in the Teslin area. These zones may be generalized as shallow unconfined aquifer(s) and deeper confined aquifer(s). Based on topography and proximity to surface water, the groundwater flow direction in the vicinity of the site is inferred to be southerly, but may possibly range from westerly to easterly.

4.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are compiled in field notes provided in Appendix A4. Photos of potential contaminant sources are also provided at the end of this appendix.

Potential contaminant sources within 30 m of wellhead M0107 (the well currently servicing the three buildings) included:

- Three above ground fuel storage tanks (ASTs).

Potential contaminant sources within 30 m of wellhead M0109 (the abandoned well) included:

- Three above ground fuel storage tanks (ASTs).

In addition, the community sewer main is located within about 40 m of well M0107 and approximately 55 m from well M0109.

4.5.1 Spills Records and Contaminated Sites Search Results

The Environment Canada Environmental Protection Branch did not identify any contaminated sites issues for this site or neighboring sites. Spill records for nighbouring sites were identified.

On four separate occations raw sewage was spilled at lift station 2 on Jackson Avenue, approximately 175 m from the active well on this site. It is unlikely that these spills impacted on groundwater quality at this site.

4.6 Identified Water System Deficiencies and Associated Risk

4.6.1 High and Medium-Risk Deficiencies;

- Wellhead M0107 is below grade in a well pit.
- From observations made during the field investigation, and given general well construction techniques employed at the time that this well was drilled, it is considered very unlikely that a surface sanitary seal was installed as required by the Canadian Groundwater Association Guidelines for Water Well Construction.
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because it is a vulnerable type (unconfined aquifer) and does not meet the requirements of the Guidelines for Water Well Construction.
- Lack of disinfection for the water system from well M0107.
- Non-functional water softening systems.
- Proximity of well to three ASTs.
- Abandoned well M0109 not properly decommissioned.

4.6.2 Low Risk Deficiencies

- Arsenic concentrations in exceedence of proposed MAC.
- Total dissolved solids and manganese in exceedence of CDWQG AO.
- pH in exceedence of CDWQG AO for M0107 and M0109 from field chemistry.

4.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

4.7.1 Priority 1

The Priority 1 upgrades recommended for this site to immediately mitigate high or medium risk deficiencies consist of:

- The water system should be superchlorinated;

- The existing softener systems should be brought back into service and maintained as necessary so that UV disinfection systems will function properly. Sodium levels should be monitored and residents advised when they are higher than 20 mg/L, so they can contact their physicians and get instructions regarding water intake; and,
- UV disinfection systems should be installed following each pretreatment softener system.

4.7.2 Priority 2

- The wellhead at M0107 should be extended to a minimum of 500 mm above the surrounding grade, and the well pit should be backfilled with a low-permeability material to provide a surface seal around the well casing;
- A NSF-61 certified filtration system (to 1 micron absolute) should be installed in the RCMP detachment to serve that building, and another filtration system should also be installed in the M0109 residence to serve both RCMP residences;
- Well M0109 should be decommissioned in accordance with Guidelines for Water Well Construction; and,
- The above ground fuel storage tank located near the RCMP garage should be moved to a suitable location greater than 30 m from the well and preferably downgradient. Alternatively, secondary containment could be installed at the AST.

4.7.3 Priority 3

- A reverse osmosis treatment system should be installed in the RCMP detachment to provide point of use drinking water; and,
- Improve operation and/or replace water-softening systems. The water softener for the M0109 RCMP residence can likely be replumbed to serve both residences.

The recommendations pertaining to water system upgrades provided above are considered conceptual based on the information available and are intended for planning and budgeting purposes. Engineering input will be required for final treatment system design.

4.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

4.8.1 Priority 1

- Supply and installation of UV disinfection systems would cost in the order of **$4,400** for both systems, and,
- Required maintenance to reactivate the softener systems and system superchlorination would cost approximately **$400**.

4.8.2 Priority 2

- Standard wellhead upgrades would cost in the order of **$3,000** for materials and labour;
- NSF 61 certified filtration systems would cost approximately **$1,500** each;
- Properly decommissioning the existing well in the M0109 residence would cost in the order of **$1,000**; and,
- To move the AST servicing the RCMP garage to a location greater than 30 m from the well, or to install secondary containment would cost in the order of **$1,000**.

4.8.3 Priority 3

- Installing a reverse osmosis system in the RCMP detachment building would cost in the order of **$600**.
- Repairing the water softeners would be covered by normal operation and maintenance costs.

5.0 BUILDING M0181 – TESLIN RCMP RESIDENCE

5.1 Description of Existing Water system

Building M0181, the Teslin RCMP Residence on Sawmill Road, is served by a truck delivered water supply that sources water from a community well operated by the Village of Teslin. The domestic system at M0181 is equipped with a 6,000 L cylindrical water storage tank. A schematic detailing the water system is provided as Figure M0181-B in Appendix A5. The coordinates of the water intake measured by a hand held GPS device, were recorded as:

- UTM ZONE 8
- Northing: 6673483
- Easting: 627320

5.2 Water Quality Results

5.2.1 Water Quality Results from Previous Sampling

Regular bacteriological sampling carried out between September 2004 and March 2005 did not indicate any positive coliform or *E. coli* testing results. A summary of historical bacteriological results is presented in Table M0181-1 in Appendix A5.

Detailed potability analyses were performed on samples collected from the RCMP building M0181 on September 9, 2004. The results are given in Table M0181-2 in Appendix A5, and summarized in the following:

- The water supplied by delivery appears to be hard and highly mineralized;
- The hardness concentration was observed to be 263 mg/L, which exceeds the CDWQG aesthetic objective of 200 mg/L;
- The total and dissolved arsenic concentrations were below the current CDWQG MAC of 0.025 mg/L, but were greater than the proposed MAC of 0.005 mg/L; and,
- All other parameters analyzed were below the applicable CDWQG criteria for the sample submitted.

5.2.2 Identification of Additional Analytical Required

Additional parameters requiring analysis were identified prior to and/or during the site inspection and included UV absorbance, silicate, phosphate, vanadium and

confirmation of arsenic concentrations. These parameters were chosen to confirm previous results and to assist in treatment system selection. Results from additional analytical sampling are presented in Table M0181-2 in Appendix A5, and laboratory results are provided in Appendix B. The analytical results are summarized below:

- At 0.0211 mg/L, the arsenic concentration was reported to be greater than the proposed guideline of 0.005 mg/L, but lower than the current MAC of 0.025 mg/L.
- Field chemistry reported that the residual chlorine concentration was only 0.05 mg/L, below the recommended 0.2 mg/L for all points of service for a water delivery system.

5.2.3 Indicators of Potential Contamination

No elevated concentrations of indicator parameters were observed in the sample results reviewed.

5.3 Conceptual Hydrogeology

The RCMP building M0181 is supplied by water delivery and there are no wells on the property included in this study, therefore, very limited subsurface information was readily available and an assessment of the hydrogeology in the vicinity of this building was not required.

Jacobsen (2003) examined water source, treatment, storage, pumping, and water distribution facilities as well as operations and maintenance procedures for the Village of Teslin Community well. The well is very deep, and has several confining low permeability units above it. As such, the aquifer from which this well obtains water is not likely under the direct influence of surface water, however, the well is approximately 60 m from Teslin Lake and may warrant further investigation.

5.4 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are compiled in field notes in Appendix A5. Photos of potential contaminant sources are also provided at the end of this appendix.

The sewer lift stations sporadically spill raw sewage as documented in spills reports and a previous study prepared for the Teslin Tlingit Council near the Village of Teslin community well. Lift Station #4, which is close to the Village of Teslin community well, is particularly disconcerting because the tank or eduction system have frequently spilled or leaked. Based on a conceptual understanding of the hydrogeological regime for the area, the Village of Teslin community well is 34 m cross-gradient to lift station #4. Government spills reports confirm that large spills routinely occur at Lift Station #4. The depth to the aquifer (84 m) and thick confining layers provide reasonable protection for the Village of Teslin community well from surficial sources of contamination.

5.5 Identified Water System Deficiencies and Associated Risk

5.5.1 High or Medium Risk Deficiencies

- Low free available chlorine concentration; and,
- Lack of regular water holding tank cleaning and residual chlorine monitoring.

5.5.2 Low Risk Deficiencies

- Piping is constructed of ABS and is not suitable for drinking water.

5.6 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

5.6.1 Priority 1

- Undertake immediate cleaning of holding tank including superchlorination of the tank and piping.
- Institute a regular FAC monitoring program and if residual chlorine concentrations continue to be low, consult with the Village of Teslin to ensure that concentrations upon delivery are above 4 mg/L as required by regulation.
- Implement a regular water storage tank cleaning program every 6 months.

5.6.2 Priority 2

- There were no Priority 2 mitigative options identified.

5.6.3 Priority 3

- Replace ABS piping with PVC piping.

5.7 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

5.7.1 Priority 1

- Initiating a water storage tank cleaning schedule and monitoring regularly for residual chlorine should fall under normal operations and maintenance costs.

5.7.2 Priority 3

- Replacing the ABS fill pipe with PVC would cost in the order of **$200** for materials and labour.

6.0 BUILDING 4762 – TESLIN SCHOOL

6.1 Description of Existing Water system

The Teslin School, Building 4762 is supplied from a 40 m deep well located in a pit approximately 4 m from the school. The well location and other details about the surrounding area are provided in Figure 4762-A in Appendix A6. The coordinates of the wellhead measured by a hand held GPS device were:

- UTM ZONE 8
- Northing: 6671906
- Easting: 626139

Water entering the school system is treated through several processes prior to entering the distribution piping. Existing treatment consists of the following:

- Chlorine injection system, however, it was not functioning at the time of the assessment;
- Duplex cartridge filters;
- Duplex activated carbon vessels; and,
- Duplex water softener.

A schematic detailing the water system is provided as Figure 4762-B in Appendix A6.

6.2 Description of Existing Wastewater Systems

Teslin school wastewater is discharged to the community piped sewage collection system.

6.3 Water Quality Results

6.3.1 Water Quality Results from Previous Sampling

Regular bacteriological sampling carried out between September 2004 and March 2005 did not indicate any positive coliform or *E. coli* testing results. A summary of historical bacteriological results is presented in Table 4762-1 in Appendix A6.

Detailed potability analyses were preformed on samples collected from the Teslin School on September 9, 2004. The results are presented in Table 4762-2 in Appendix A6, and summarized in the following:

- The TDS concentration was observed to be 550 mg/L, which exceeds the CDWQG AO of 500 mg/L;
- The total and dissolved arsenic concentrations were below the current CDWQG MAC of 0.025 mg/L, but were greater than the proposed MAC of 0.005 mg/L; and,
- All other parameters analyzed were below the applicable CDWQG criteria for the sample(s) submitted.

6.3.2 Identification of Additional Analytical Required

Additional parameters requiring analysis that were identified to included silicate, phosphate, vanadium and arsenic. These parameters were selected to confirm previous results and to assist with future treatment system selection. Results are summarized in Table 4762-2 in Appendix A6, and are outlined below:

- The total and dissolved arsenic concentrations, though were not above the current MAC, were above the proposed new MAC of 0.005 mg/L.

6.3.3 Indicators of Potential Contamination

No elevated concentrations of indicator parameters were observed in the sample results reviewed.

6.4 Conceptual Hydrogeology

In general, there are two primary aquifer zones identified by previous EBA studies in the Teslin area. These zones may be generalized as shallow unconfined aquifer(s) and deeper confined aquifer(s). Based on topography and proximity to surface water, the inferred groundwater flow direction is west to south towards Teslin Lake.

6.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are compiled in field notes provided in Appendix A6. Photos of potential contaminant sources are also provided at the end of this appendix.

6.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any contaminated sites isues for this site or neighboring sites. Spill records for nighbouring sites were identified.

On four separate occations raw sewage was spilled at lift station 2 on Jackson Avenue, approximately 300 m east of this well. It is unlikely that these spills impacted on groundwater quality at this site.

6.6 Identified Water System Deficiencies and Associated Risk

6.6.1 High and Medium Risk Deficiencies

- Poor wellhead completion below ground in a well pit with an improperly sized cap and evidence of surface water ponding above the well casing;
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because it does not meet the requirements of the Guidelines for Water Well Construction; and
- Piping is not in compliance with the Canadian Plumbing Code and water treatment system is in very poor condition. The chlorine injection pump was inoperative and retention time may not be adequate when the chlorination system is operational. In addition, the charcoal filters are located before the distribution system and would remove the residual chlorine before it enters the system.

6.6.2 Low Risk Deficiencies

- The arsenic concentration was above the proposed CDWQG MAC.

6.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical). These are conceptual design recommendation based on the information available, and are intended to be used for planning and budgeting purposes. Engineering input will be required for final system specifications or design.

Further assessment of the existing water system would be necessary to provide final design recommendations. Dayton and Knight have indicated that the current configuration may be intended for iron and manganese removal by pre-oxidation followed by Activated Carbon filtration. The issue with the current configuration, however, is that this does not allow for any residual chlorine within the distribution system.

6.7.1 Priority 1

- The well and water system should be superchlorinated and a proper well cap must be installed;
- The piping and treatment/distribution system should be repaired and upgraded to meet the Canadian Plumbing Code and provide the required level of disinfection; and,
- A daily monitoring program for residual chlorine in the water system should be initiated.

6.7.2 Priority 2

- The well casing should be extended to a minimum of 0.5 m above surrounding grade and an adequate surface seal installed around the casing. The well should be properly capped, and surface grading should promote drainage away from the wellhead;
- A NSF-61 certified filtration system (to 1 micron absolute) should be installed; and,
- In order to prevent access by children, a fence should be installed around the wellhead.

6.7.3 Priority 3

- A point of entry (POE) arsenic removal system should be installed.

6.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

6.8.1 Priority 1

- Shock chlorinating the well and water system, and installation of a proper well cap would incur minimal cost;
- To reconfigure and repair the plumbing would cost approximately **$3,700** for materials and labour;
- To replace the AC filtration with multimedia filtration would cost approximately **$900**; and,
- The cost associated with upgrading the current chlorination system would be in the order of **$1,900**.

6.8.2 Priority 2

- Standard wellhead upgrades, including retrofitting a surface seal to at least 3 m in depth and installing a commercial pitless unit would cost in the order of **$5,000** for all materials and labour.
- Assuming a 1.8 m high 2.5 m by 2.5 m square chain-link fence, the cost to install a fence around the wellhead would be in the order of **$2,000** for materials and labour.
- If necessary, a commercial duplex filtration system (to 1 micron absolute) would cost in the order of **$2,200**.

6.8.3 Priority 3

- A POE arsenic removal system would cost in the order of **$4,000** installed.

7.0 BULDING 4951 – TESLIN HEALTH CENTRE

7.1 Description of Existing Water system

Building 4951, the Teslin Health Centre, is served by a water system that delivers water from a well in a pit approximately 4 m from the Health Centre. The well location and other details about the surrounding area are provided as Figure 4971-A in Appendix A7. The coordinates of the wellhead, as measured by a GPS device, were recorded as:

- UTM ZONE 8
- Northing: 6671784
- Easting: 626739

The Teslin Health Centre water treatment system consists of a sand filter and a water softener. A schematic detailing the current water system is provided as Figure 4951-B in Appendix A7.

7.2 Description of Existing Wastewater Systems

The Teslin Health Centre wastewater is discharged to the community piped sewage collection system.

7.3 Water Quality Results

7.3.1 Water Quality Results from Previous Sampling

Regular bacteriological sampling carried out between September 2004 and March 2005 did not indicate any positive coliform or *E. coli* testing results. A summary of historical bacteriological results is presented in Table 4951-1 in Appendix A7.

Detailed potability analyses were performed on samples collected from the Teslin Health Centre on September 9, 2004. The results are presented in Table 4951-2 in Appendix A7, and are summarized in the following:

- The TDS concentration was 865 mg/L, which exceeds the CDWQG AO of 500 mg/L;
- The total arsenic concentration, although below the current CDWQG MAC of 0.025 mg/L, was greater than the proposed MAC of 0.005 mg/L;

- The pH was reported at 8.51, slightly above the CDWQG aesthetic objective of 8.5;
- All other parameters analyzed were below the applicable CDWQG criteria for the sample(s) submitted.

7.3.2 Identification of Additional Analytical Required

UV absorbance, silicate, phosphate, vanadium and arsenic were selected to confirm previous results and to provide necessary information for future treatment system design. Results from additional analytical sampling are summarized in Table 4951-2 in Appendix A7 and are outlined below:

- The total and dissolved arsenic concentrations were below the current CDWQG MAC of 0.025 mg/L, but were greater than the proposed MAC of 0.005 mg/L;
- Field chemistry reported the pH to be 8.57, above the CDWQG aesthetic objective of 8.5.

7.3.3 Indicators of Potential Contamination

No elevated concentrations of indicator parameters were observed in the sample results reviewed.

7.4 Conceptual Hydrogeology

This site is located near the southeast corner of a small peninsula extending into Teslin Lake, as shown on Figure 4951-A in Appendix A7. In general, there are two primary aquifer zones identified by previous EBA studies in the Teslin area. These zones may be generalized as shallow unconfined aquifer(s) and deeper confined aquifer(s). Based on topography and proximity to surface water, the groundwater flow direction in the vicinity of the site is inferred to range from easterly to southerly.

7.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are compiled in field notes in Appendix A7. Photos of potential contaminant sources are also provided at the end of this appendix.

Nearby potential sources of contamination relevant to the Teslin Health Centre well include:

- The community sewer main located about 30 m from the well; and,
- Two ASTs located about 5 m and 9 m away from the well.

7.5.1 Spills Records and Contaminated Sites Search Results

The Environment Canada Environmental Protection Branch did not identify any contaminated sites isues for this property or neighbouring properties. Spill records on adjacent sites were identified however. According to spill repots, on four separate occations raw sewage was spilled at lift station 2 on Jackson Avenue, approximately 200 m northeast from the well on this site. It is unlikely that these spills impacted on groundwater quality at this site.

7.6 Identified Water System Deficiencies and Associated Risk

7.6.1 High and Medium Risk Deficiencies

- There is no disinfection system on this water system.
- The well is located in a pit below grade and is not equipped with a surface sanitary seal (grout or bentonite) to at least 6 m in depth.
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because it does not meet the requirements of the Guidelines for Water Well Construction.

7.6.2 Low Risk Deficiencies

- There are above ground fuel storage tanks within 30 m of the well. They are, however, both equipped with secondary containment. One tank

appeared to be a temporary installation and will likely be removed in the near future; and,
- The arsenic concentration, although not above the current CDWQG MAC, is above the proposed new MAC.

7.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

7.7.1 Priority 1

- A NSF-61 certified filtration system (to 1 micron absolute) should be installed; and,
- An NSF/ANSI 55 certified UV disinfection system should be installed.

These are conceptual design recommendation based on the information available, and are intended to be used for planning and budgeting purposes. Engineering input will be required for final system specifications or design.

7.7.2 Priority 2

- The wellhead completion should be improved by extending the casing to a minimum of 0.5 m above ground and installing an adequate surface seal around the well casing.

7.7.3 Priority 3

- A point of entry arsenic removal system should be installed to ensure that the water meets the proposed CDWQG maximum acceptable concentration of 0.005 mg/L; and,
- The ASTs should be moved to suitable location greater than 15 m from the well and preferably downgradient.

7.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for

materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

7.8.1 Priority 1

- The cost for the proposed treatment should be in the order of **$3,700** for all materials and labour.

7.8.2 Priority 2

- Standard wellhead upgrades would cost in the order of **$5,000** for all materials and labour.

7.8.3 Priority 3

- The cost associated with moving the existing ASTs away from the wellhead would cost in the order of **$1,000**; and,
- To install a point of entry arsenic removal system would cost in the order of **$4,000**.

8.0 BUILDING 4782 – TESLIN WATER RESERVOIR

8.1 Description of Existing Water system

Building 4782, the Teslin Water Reservoir, is located within the Teslin Grader Station compound. The water reservoir building is equipped with transfer pumps to provide water to the adjacent grader station building, and on demand for truck fill for non-potable use such as vehicle cleaning and road watering. The water reservoir contains a large below grade concrete cistern that receives delivered water from the Village of Teslin community well. Until recently, however, water was piped 2 km from Teslin Lake and the infrastructure for the former piped system remains in place. The location of the reservoir, as well as other details about the surrounding area is provided as Figure 4782-A in Appendix A8. There is no treatment on the water system; however, the delivered water is chlorinated at the source. A schematic detailing the water system is provided as Figure 4782-B in Appendix A8. The coordinates of the wellhead measured by a hand held GPS device were:

- UTM ZONE 8
- Northing: 6673038
- Easting: 625969

8.2 Description of Existing Wastewater Systems

Wastewater is discharged to a septic field located behind the southwest corner of the grader station building greater than 60 m from the cistern.

8.3 Water Quality Results

8.3.1 Water Quality Results from Previous Sampling

There were no previous bacteriological or detailed potability sampling results available for review.

8.3.2 Identification of Additional Analytical Required

A sample was collected during the field program on July 16, 2005 for detailed potability analysis. The results are presented in Table 4782-2, and are summarized below:

- The water supplied by delivery to the cistern appears to be hard and highly mineralized;
- The turbidity was observed to be 2.49 NTU, which exceeds the CDWQG MAC of 1 NTU;
- The total and dissolved arsenic concentrations were below the current CDWQG MAC of 0.025 mg/L, but were greater than the proposed MAC of 0.005 mg/L;
- Field chemistry reported the pH to be 8.63, which is above the CDWQG aesthetic objective of 8.5; and,
- All other parameters analyzed were below the applicable CDWQG criteria for the sample(s) submitted.

8.3.3 Indicators of Potential Contamination

No elevated concentrations of indicator parameters were observed in the sample results reviewed.

8.4 Conceptual Hydrogeology

The Teslin Water Reservoir is supplied by water delivery and there are no wells on the property that were included in this study, therefore, very limited subsurface information was readily available and an assessment of the hydrogeology in the vicinity of this building was not required.

Jacobsen (2003) examined water source, treatment, storage, pumping, and water distribution facilities as well as operations and maintenance procedures for the Village of Teslin community well. The well is very deep, and has several confining low permeability units above it. As such, the aquifer from which this well obtains water is not likely under the direct influence of surface water, however, the well is approximately 60 m from Teslin Lake and may warrant further investigation.

8.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are compiled in field notes provided in Appendix A8. Photos of potential contaminant sources are also provided at the end of this appendix.

Nearby potential sources of contamination relevant were identified as follows:

- An AST is located within 4 m of the cistern;
- Salt storage is located within 8 m of the cistern;
- A salt hopper is located within 40 m of the cistern;
- A used oil tank is located within 50 m of the cistern;
- A rock pit is located within 45 m of the cistern; and,
- A cold mix asphalt pile is located more than 60 m from the cistern.

It is unlikely that any of these potential contaminant source would impact on cistern water quality.

8.5.1 Spills Records and Contaminated Sites Search Results

The sewer lift stations sporadically spill raw sewage as documented in spills reports and a previous study prepared for the Teslin Tlingit Council near the Village of Teslin community well. Lift Station #4, which is close to the Village of Teslin community well, is particularly disconcerting because the tank or eduction system have frequently spilled or leaked. Based on a conceptual understanding of the hydrogeological regime for this area, the Village of Teslin community well is 34 m cross-gradient to lift station #4. Government spills reports confirm that large spills routinely occur at Lift Station #4. The depth to the aquifer (84 m) and thick confining layers provides reasonable protection for the Village of Teslin community well.

8.6 Identified Water System Deficiencies and Associated Risk

8.6.1 High and Medium Risk Deficiencies

- Both the truck fill and cistern fill lines do not have proper caps;
- There is no drain at the lower level of the reservoir;
- There is no regular cistern cleaning schedule;

- This concrete cistern is not suitable for drinking water storage;
- There is no water disinfection system;
- There are no bacteriological results available for review.

In consideration of the condition of the cistern, and the difficulty to rehabilitate it to make it suitable for storage of a drinking water supply, it is advisable to find an alternate source of drinking water for the grader station building.

8.6.2 Low Risk Deficiencies

- The arsenic concentration was above the proposed CDWQG MAC of 0.005 mg/L.

8.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

8.7.1 Priority 1

- Install a suitably designed water storage tank in the grader station and use water delivery for the potable water supply;
- A regular cleaning schedule should be initiated and the residual chlorine should be frequently monitored;
- Disconnect the cistern from domestic supply and use for truck-fill only;
- Regular bacteriological testing should be completed.

8.7.2 Priority 2

There are no Priority 2 mitigative options identified for this site.

8.7.3 Priority 3

If in the future it is considered unfeasible to continue supplying grader station with water from a delivered source, it is possible that a well could be drilled on the property. The new well should be constructed considering the following:

- The well should be equipped with a surface seal to at least 6 m and the casing should be extended above grade (500 mm) within a lockable enclosure that is inaccessible to animals and unauthorized personnel;
- The well must be located at a distance greater than 30 m from any potential source of contamination, including the above ground storage tank and all parts of the septic system; and,
- The water from the new well must meet all CDWQG health based guidelines. If there are any exceedences in the CDWQG health-based guidelines then a treatment system must be designed and installed as necessary. A disinfection system would likely also be recommended.

8.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

8.8.1 Priority 1

- The cost associated with installing a water storage tank in the grader station maintenance building and disconnecting the domestic supply from the cistern would cost in the order of **$10,000**; and,
- Conducting regular bacteriological testing should be conducted under normal operation and maintenance budget.

8.8.2 Priority 3

- The cost associated with drilling a new well, assuming 40 m of overburden, including drilling, testing, and connecting the new well, would cost in the order of **$35,000**.

9.0 BUILDING 4793: SWIFT RIVER GRADER STATION

9.1 Description of Existing Water system

Building 4793, the Swift River Grader Station, is provided water from a 7 m deep dug well located in the maintenance garage of the grader station. The well location and other details about the surrounding area are provided in Figure 4793-A in Appendix A9. The coordinates of the wellhead, as measured by a GPS device, were recorded as:

- UTM ZONE 9
- Northing: 6653783
- Easting: 377966

Water passes through a sediment filter and then is stored in a 1000 L water storage tank prior to entering the domestic plumbing system. A schematic detailing the water system is provided as Figure 4793-B in Appendix A9. There is a sign posted in the grader station kitchen stating that the water is not for human consumption. Bottled water is provided for drinking.

9.2 Description of Existing Wastewater Systems

The septic field for the Swift River Grader Station is located on the southwest corner of the property approximately 38 m from the well. A site plan showing the location of the septic system is given by Figure 4793-A in Appendix A9.

9.3 Water Quality Results

9.3.1 Water Quality Results from Previous Sampling

Bacteriological

Six samples were collected from the Swift River Grader Station water system between September 2004 and March 2005 and were tested for total coliform and *E. coli* by Yukon Environmental Health Services using the presence/absence test method. Results are tabulated in Table 4793-1 in Appendix A9. Coliform bacteria and *E. coli* were reported as absent in each of the six samples for which results are provided.

Potability

YTG representatives collected a water sample from the Swift River Grader Station water system on October 13, 2004. The sample was submitted to Northwest Labs in Surrey, BC for detailed potability analyses. The results of these analyses are summarized in Table 4793-2 in Appendix A9. EBA reviewed the analytical results to compare them with the CDWQG, to observe general water quality, identify and recommend additional sampling and analytical, and to identify potential indicators of contamination.

- At 2.9 NTU, turbidity exceeded CDWQG health based upper limit of 1.0 NTU;
- At 0.40 mg/L, the iron concentration exceeded the CDWQG aesthetic objective of 0.30 mg/L;
- The water quality results indicated that all other health based and aesthetic objectives were met for the parameters analyzed. The total dissolved solids concentration of 53 mg/L and is considered to be very fresh.
- The hardness (as $CaCO_3$) was 25.9 mg/L, and is considered very soft.

9.3.2 Identification of Additional Analytical Testing Required

Additional analytical that was identified to be included during the water system assessments is detailed below:

- UV absorbance, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- As turbidity had previously been in exceedence of CDWQG MAC, a sample was taken to analyze for turbidity;
- As total iron had previously exceeded the CDWQG aesthetic objectives, samples were taken to determine total and dissolved iron content;
- Total Organic Carbon to assist with treatment system selection; and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample obtained by EBA during the field program on June 20, 2005, was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 4793-2 in Appendix A9 and the laboratory reports are included in Appendix B.

- At 0.92 NTU, turbidity was below the CDWQG MAC;
- At 0.277 mg/L, the iron content was reported below the CDWQG aesthetic objective.

9.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surface water sources or septic waste. Variability in water quality, particularly turbidity, can indicate that there is a surface water pathway and the groundwater is subject to direct surface water infiltration. Chloride concentrations were low and are considered to be within the normal background ranges for groundwater in the region. Nitrate and nitrite concentrations for this sample were low and are within the normal background range for the region. However, as there were major changes in groundwater quality between the sampling events, and because the well has a production zone less than 15 m below grade, by definition of the Draft Yukon GUDI Assessment Guideline, the well is considered to be under the direct influence of surface water.

9.4 Conceptual Hydrogeology

No log was available for this well, or any other wells in the Swift River area. This well appears to be a dug water table well with a static water depth of 5.12 m. The relatively shallow depth (7.0 m) and shallow static water level of this well indicate that there is likely no significant confining layer present. The direction of groundwater flow as inferred from topography and air photos is east towards Seagull Creek or south towards Swift River. The aquifer would be considered vulnerable to surface sources of contamination.

9.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are provided in field notes in Appendix A9. Photos of potential contaminant sources are also provided.

A summary of potential contaminant sources within 30 m of the well is provided below:

- Used oil tank at 16 m;
- Active industrial activity within 30 m.

9.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch identified two spill events for sites neighbouring the Swift River Grader Station, and they are outlined below. No contaminated sites issues, however, were reported for this property or neighbouring properties.

On March 1, 1993, it was identified that approximately 250 L of calcium chloride solution had been accidentally dumped at the Swift River Lodge during a de-icing, but there had been no effort made to collect the solution. The runoff had reportedly travelled towards Swift River, downgradient from this well and would not likely have posed a risk to this water system.

On February 1, 1999, it was identified that approximately 10 L of diesel fuel was spilled at the Yukon Electric Company facility when an EnviroTank was overfilled. The contaminated snow was reportedly removed and this spill likely poses a minimal risk to this water system. This spill location is likely greater than 60 m cross-gradient from this well.

9.6 Identified Water System Deficiencies and Associated Risk

9.6.1 High and Medium Risk Deficiencies

Because there is a sign posted warning that the water is not to be used for human consumption and drinking water is provided for grader station staff, all deficiencies associated with this water system are considered either medium or low risk.

The following deficiencies were identified as medium-risk for the Swift River Grader Station:

- Poor surface completion of the well (located in maintenance garage, only 80 mm above grade);
- The well is not equipped with a surface sanitary seal, (grout or bentonite as required by the Canadian Groundwater Association's Well Construction Guidelines);
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because it is a vulnerable type (unconfined aquifer), has a production zone less than 15 m below grade, and does not meet the requirements of the Guidelines for Water Well Construction);
- The turbidity has previously been in exceedence of CDWQG MAC. Additionally, seasonal variations in turbidity suggest that the groundwater supplying the well might be subject to surface water infiltration;
- There is no disinfection for this system; and,
- The well is located within 30 m of potential sources of contamination, including a used oil tank at 16 m and an underground fuel storage tank nest at approximately 12 m. The used oil tank is double-walled with secondary containment (EnviroTank). There are also industrial activities occurring within 30 m of the well that could potentially pose a risk to this water system.

9.6.2 Low Risk Deficiencies

The following deficiencies were identified as low-risk for the Swift River Grader Station:

- The iron concentration of the water has been previously reported in exceedence of CDWQG aesthetic objectives;
- The capacity of the well is reportedly inadequate for the grader station (as per conversation with grader station staff).

9.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical). Deficiencies are categorized as they are assuming that the Government of Yukon Environmental Health and Social Services agrees with the current posted advisory wording "Not for Human Consumption". The Property Management Agency should confirm that this wording is appropriate.

9.7.1 Priority 1

There are no Priority 1 mitigative options for this site, as long as the water is not being used as a source for drinking water.

9.7.2 Priority 2

Because the well is likely under the influence of surface water, and in consideration of the proximity of the well to potential sources of contamination and the other deficiencies associated with this well, it is recommended that water from the current well not be used for human consumption. Three options have been considered to provide a water supply for the Swift River Grader Station:

Option 1:

The water system supplying the grader station may be considered adequate as long as the water is not used for potable purposes. For this option bottled water should continue to be supplied for drinking water. It is recommended, however, that standard wellhead upgrades be done in order to protect the aquifer.

Option 2:

The second option involves abandoning the current well and obtaining potable water from the existing well at the Swift River Living Complex. During the water system assessment it appeared that this well had the least deficiencies and had superior water quality to the other YTG maintained wells in Swift River. This option would involve the following:

- Further study would have to be done on the living complex well in order to determine that this well is suitable to serve the other YTG maintained buildings at Swift River. This would involve obtaining the well log in order to determine the depth, and other wellhead construction details that were unavailable during this assessment. Sustainable well yield would also need to be verified by pumping tests;
- The wellhead at the living quarters requires improvement. Upgrades would involve installing a surface sanitary seal (grout or bentonite) to a depth of at least 3 m, and extending the well casing at least 500 mm above grade;
- A underground piped water distribution line should be installed, and should be properly freeze-protected through heat-trace and insulation; and,
- An NSF/ANSI 55 certified UV disinfection system complete with NSF-61 certified pre-filtration to 1 micron absolute should be installed near the point of entry in the Swift River Living complex.

These are conceptual design recommendation based on the information available, and are intended to be used for planning and budgeting purposes. Engineering input will be required for final system specifications or design.

Option 3:

The third option considered involves construction of a new well. A new well could potentially be used to supply all the YTG maintained buildings in Swift River, including the grader station, living complex, and foreman's residence. The new well should be constructed in consideration of the following recommendations:

- The well should be equipped with a surface seal to at least 6 m and the casing should be extended above grade (500 mm) within a lockable enclosure that is inaccessible to animals and unauthorized personnel;

- The well should be located upgradient from the current well and must be greater than 30 m from any potential source of contamination;
- The water from the new well must meet all CDWQG health based guidelines. If there are any exceedences in the CDWQG health-based guidelines then a treatment system must be designed and installed as necessary; and
- An NSF/ANSI certified UV disinfection system should be installed at a centralized location complete with adequate NSF approved pre-filtration.

These are conceptual design recommendations based on the information available, and are intended to be used for planning and budgeting purposes. Engineering input will be required for final system specifications or design.

9.7.3 Priority 3

Low-risk deficiencies would be mitigated through high-risk upgrades.

9.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

9.8.1 Priority 2

Class D cost estimates for mitigative options to address the well deficiencies for this site are outlined below.

Option 1:

- Extending the steel culvert around the wellhead to at least 500 mm above the maintenance garage floor, as well as other standard upgrades to protect the aquifer, would cost in the order of **$500**.

Option 2:

- Obtaining the well log (if possible), and completion of additional system assessment, would likely cost in the order of **$2,000**. Since this well would

serve three sites, the cost to the grader station building would be approximately **$700**;

- The cost associated with improving the living quarters well would cost in the order of **$5,000**. Since this well would serve three sites, the cost to the grader station would be approximately **$1,700**;
- Approximately 70 m of water distribution line, installed shallow with adequate freeze protection, assuming $120 per metre installed, would cost about **$8,400**;
- Filtration and UV disinfection system would cost in the order of **$3,700** installed. Since this proposed treatment/disinfection system would be located in a centralized location that would serve all three sites the cost to the grader station could be considered as **$1200**, and,
- The existing well should be properly decommissioned in accordance with the Guidelines for Water Well Construction. This would cost approximately **$500**.

Option 3:

- It is recommended that **$30,000** be budgeted for materials and labour to drill, test, and complete the well. Since this well would serve three sites, the cost to the grader station would be approximately **$10,000**;
- Approximately 200 m of water distribution line would be required to serve all three buildings, and assuming $120 per metre, this would amount to a total installed cost of **$24,000**. Note that for this option, heat trace would need to be extended from each building, to the middle of the distribution pipe. Since this well would serve three sites, the cost to the grader station would be in the order of **$8,000**;
- An adequate disinfection system would cost in the order of **$1200** assuming costs are split between the three systems that would be served by this well;
- If the new well is successful, the old well should be decommissioned in accordance with Guidelines for Water Well Construction. It is estimated that this would cost approximately **$500**.

10.0 BUILDING 4797: SWIFT RIVER UTILITY BUILDING

10.1 Description of Existing Water system

The water system for the Swift River Utility Building is supplied by a 23 m deep well located inside the pumphouse room of the utility building. The well location and other details about the surrounding area are provided in Figure 4797-A in Appendix A10. The coordinates of the wellhead were recorded as:

- UTM ZONE 9
- Northing: 6653544
- Easting: 377959

There is no treatment system present, and the water is stored in a 5800 L galvanized steel tank to serve the maintenance truck fill, and also serves the foreman's residence. A schematic detailing the water system is provided as Figure 4797-B in Appendix A10.

10.2 Description of Existing Wastewater Systems

A septic field that serves both the Swift River Living Complex and the foreman's residence is located approximately 60 m to the northeast of the utility building. A site plan showing the location of the septic system is given by Figure 4797-A in Appendix A10.

10.3 Water Quality Results

10.3.1 Water Quality Results from Previous Sampling

Bacteriological

Six samples were collected by YTG representatives from the Swift River Utility Building water system between September 2004 and March 2005 and were tested for total coliform and *E. coli* by Yukon Environmental Health Services using the presence/absence test method. Results are tabulated in Table 4797-1 in Appendix A10. *E. coli* bacteria were reported as absent in each of the six samples for which results were provided. One sample, however, taken November 9, 2004, tested positive for Total Coliform bacteria.

Potability

A water sample was collected by YTG representatives from the Swift River Utility Building water system on September 13, 2004 was submitted to Northwest Labs for detailed potability analyses. Additional analyses results were provided by YTG for a sample collected on June 22, 2005 from this system. The results of these analyses are summarized in Table 4797-2 in Appendix 10. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling, and to identify potential indicators of contamination.

- At 4.6 and 3.32 NTU, turbidity exceeded the CDWQG health based upper limit of 1.0 NTU;
- The water quality results indicated that all other health based and aesthetic objectives were met for the parameters analyzed. The total dissolved solids concentration was approximately 40 mg/L and is considered to be very fresh.
- The hardness (as $CaCO_3$) was approximately 34 mg/L, and is considered very soft.

10.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Swift River Utility Building that was identified to be included during the water system assessments is detailed below:

- UV absorbance, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- As turbidity had previously been in exceedence of CDWQG MAC, a subsequent sample was obtained;
- Total organic carbon (TOC), to assist in disinfection system selection; and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample obtained by EBA during the field program on June 20, 2005 was submitted to ALS Environmental in Vancouver, BC for analysis of the previously mentioned additional parameters. These results are summarized in Table 4797-2 in Appendix A10 and the laboratory reports are included in Appendix B.

- At 2.69 NTU, turbidity was similar to the previous sample results, and above the CDWQG MAC; and,
- Field chemistry indicated that the temperature of the water at the point of consumption in the foreman's residence was 40.6 ^{o}C.

10.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surface water sources or septic waste. Chloride concentrations were low and are considered to be within the normal background ranges for groundwater in the region.

No elevated concentrations of indicator parameters were observed in the sample results reviewed.

10.4 Conceptual Hydrogeology

No log was available for this well, or any other wells in the Swift River area. This well is reported to be 23.0 m deep with a static water level of 4.41 m below ground. The direction of groundwater flow as inferred from topography and air photos is south towards the Swift River (40 m away).

10.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are provided in field notes in Appendix A10. Photos of potential contaminant sources are provided in Appendix A10.

A summary of potential contaminant sources within 30 m of the well is provided below:

- An oil heater at 3 m inside the same building;
- An above ground fuel storage tank at 4 m; and,
- An abandoned diesel tank at 10 m.

10.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch identified three spill events for sites neighbouring the Swift River Utility Building, and they are outlined below.

On August 17, 2000, 1 L of gasoline was reportedly spilled at the Swift River Lodge. This, however, likely poses a minimal risk to this water system.

On March 1, 1993, it was identified that approximately 250 L of calcium chloride solution had been accidentally dumped at the Swift River Lodge during a de-icing, but there had been no effort made to collect the solution. The runoff had reportedly travelled towards Swift River, downgradient from this well and would not likely have posed a risk to this water system.

On February 1, 1999, it was identified that approximately 10 L of diesel fuel was spilled at the Yukon Electric Company facility when an EnviroTank was overfilled. The contaminated snow was reportedly removed and this spill likely poses a minimal risk to this water system. This spill location is likely greater than 60 m cross-gradient from this well.

10.6 Identified Water System Deficiencies and Associated Risk

10.6.1 High and Medium Risk Deficiencies

The following deficiencies were identified as high or medium risk for the Swift River Utility Building:

- Poor surface completion of the well (well casing is completed at grade and without a well cap);
- The well is not equipped with a surface sanitary seal as required by the Canadian Groundwater Association's Well Construction Guidelines;
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because it is a vulnerable type (unconfined aquifer), and does not meet the requirements of the Guidelines for Water Well Construction;
- The turbidity has been in exceedence of CDWQG MAC;
- A positive total coliform count has been reported;
- There is no treatment or disinfection system present;
- The well is located within 30 m of potential sources of contamination, including an oil heater, an above ground fuel storage tank, and an abandoned diesel tank;
- The pressure tank is of galvanized steel construction, which, is not suitable for drinking water storage; and,
- There are several other open holes in the concrete slab floor of the utility building (potentially abandoned wells) that could act as conduits for contamination to enter the subsurface.

10.6.2 Low Risk Deficiencies

The following deficiencies were identified as low-risk for the Swift River Utility Building:

- The heat trace on the piping to the foreman's residence is left on at all times of the year. If the water is stagnant in the piping for any period of time then the water at the point of consumption is very hot. Aside from this being non-aesthetically pleasing and uneconomical, it likely also leads to accelerated encrustation and biofouling.

10.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

10.7.1 Priority 1

The existing water system at the Swift River Utility Building should not be used for potable water due to poor construction and proximity to potential contaminant sources. It is recommended that the foreman's residence be disconnected from this system. The well at the utility building should only be used as a source of non potable water such as road watering and vehicle cleaning. Wellhead upgrades for should be completed, however, in order to protect the aquifer. There are two options being presented to provide the foreman's residence with a water supply.

Option 1:

The existing well at the Swift River Living Complex has better water quality and is considered less vulnerable to contamination. This option proposes that the living complex well be used to supply the foreman's residence. During the water system assessment it appeared that the Complex well had the least deficiencies and had superior water quality to the other YTG maintained wells in Swift River. This option would involve the following:

- Further study would have to be done on the living complex well in order to determine that the Complex well is suitable to serve the other YTG maintained buildings at Swift River. This would involve obtaining the well log in order to determine the depth, and other wellhead construction details that were unavailable during this assessment. Sustainable well yield would also need to be verified by pumping tests;
- The wellhead at the living quarters requires improvement. Upgrades would involve installing a surface sanitary seal (grout or bentonite) to a depth of at least 3 m, and extending the well casing at least 500 mm above grade;
- A underground piped water distribution line should be installed, and should be properly freeze-protected through heat-trace and insulation; and,
- An NSF/ANSI 55 certified UV disinfection system complete with NSF-61 certified pre-filtration to 1 micron absolute should be installed near the point of entry in the Swift River Living complex.

Option 2:

The second option considered involves construction of a new well. A new well could potentially be used to supply all the YTG maintained buildings in Swift River, including the grader station, living complex, and foreman's residence. The new well should be constructed in consideration of the following recommendations:

- The well should be equipped with a surface seal to at least 6 m and the casing should be extended above grade (500 mm) within a lockable enclosure that is inaccessible to animals and unauthorized personnel;
- The well should be located upgradient from the current well and must be greater than 30 m from any potential source of contamination;
- The water from the new well must meet all CDWQG health based guidelines. If there are any exceedences in the CDWQG health-based guidelines then a treatment system must be designed and installed as necessary; and
- An NSF/ANSI certified UV disinfection system should be installed at a centralized location complete with adequate NSF approved pre-filtration.

10.7.2 Priority 2

There are no Priority 2 recommendations for this site, assuming that Priority 1 recommendations are carried implemented.

10.7.3 Priority 3 – Low Risk

Low-risk deficiencies would also be mitigated when Priority 1 mitigative options are carried out. There are no Priority 3 recommendations.

10.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

10.8.1 Priority 1

The estimated cost to upgrade the wellhead in the utility building to protect the aquifer, and to disconnect the Foreman's residence from this water system would

cost about **$1,000**. Class D cost estimates for all other upgrade options are outlined below.

Option 1:

Some of the costs associated with this option depend on whether or not the Swift River Grader Station will also be supplied by the living complex well (costs to this system that can be distributed among multiple sites are reported as the average of the cost with two systems and the cost with three systems).

- Obtaining the well log, an additional site inspection, and additional water system assessment, would cost in the order of **$2,000**. This cost could be divided equally among the buildings proposed to be supplied by the living complex well, and would be approximately **$800**;
- The cost associated with improving the living quarters well would be in the order of **$5,000**. This cost could be divided equally among the buildings supplied by the living complex well, and would be approximately **$2,100**;
- Approximately 90 m of water distribution line, assuming $120 per metre (installed in shallow trench with required frost protection) would cost about **$10,800**;
- The proposed disinfection system to serve this water system would cost approximately **$1500**.

Option 2:

- It is recommended that **$30,000** be budgeted for materials and labour to drill, test, and complete the well. Since this well would serve three sites, the cost to this system would be approximately **$10,000**;
- Approximately 200 m of water distribution line would be required to serve all three buildings, and assuming $120 per metre, this would cost approximately **$24,000**. Since this well would serve three sites, the cost to this system would be approximately **$8,000**;
- The proposed disinfection system to serve this water system would cost approximately **$1500**.

11.0 BUILDING 4799: SWIFT RIVER LIVING COMPLEX

11.1 Description of Existing Water system

Building 4799, the Swift River Living Complex, is a five-unit complex that houses highway maintenance workers and is served by a well located in a pit approximately 1 m from the living complex. The well location and other details about the surrounding area are provided in Figure 4799-A in Appendix A11. The coordinates of the wellhead were recorded as:

- UTM ZONE 9
- Northing: 6653783
- Easting: 377966

At the time of the assessment, there was no treatment in place for this system. A schematic detailing the water system is provided as Figure 4799-B in Appendix A11.

11.2 Description of Existing Wastewater Systems

A septic field that serves both the Swift River Living Complex and the foreman's residence is located greater than 60 m from this well. A sewer line of wood stave construction runs approximately 25 m west of the well, and could potentially be leaking. A site plan showing the location of the sewer line is given by Figure 4799-A in Appendix A11. The grader station septic field is approximately 60 m northwest from this well.

11.3 Water Quality Results

11.3.1 Water Quality Results from Previous Sampling

Bacteriological

Six samples were collected from the Swift River Living Complex water system between September 2004 and March 2005 and were tested for total coliform and *E. coli* by Yukon Environmental Health Services using the presence/absence test method. Results are tabulated in Table 4799-1 in Appendix A11. Coliform bacteria

and *E. coli* were reported as absent in each of the six samples for which results are provided.

Potability

A water sample was collected by YTG representatives from the Swift River Living Complex water system on September 13, 2004. The sample was submitted to Northwest Labs for detailed potability analyses. Additional baseline results were provided by YTG for a sample collected on June 22, 2005. The results of these analyses are summarized in Table 4799-2 in Appendix 11. EBA reviewed the analytical results to compare them with the CDWQG to observe general water quality, to identify and recommend additional sampling and analytical, and to identify potential indicators of contamination.

- At 2.34 mg/L, the copper concentration exceeded the CDWQG MAC of 1 mg/L on September 13, 2004, however routine sampling on June 22, 2005 indicated the total copper concentration below 1 mg/L;
- On June 22, 2005, turbidity at 2.64 NTU was detected above the CDWQG MAC of 1 NTU;
- All other health based and aesthetic objectives were met for the parameters analyzed;
- The total dissolved solids concentration of 40 mg/L indicated that the water is very fresh; and,
- The hardness (as $CaCO_3$) of approximately 25 mg/L is considered very soft.

11.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Swift River Living Complex that was identified to be included during the water system assessments is detailed below:

- UV absorbance, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Analysis to determine total and dissolved copper, iron and manganese content;
- Total Organic Carbon to assist with treatment system selection; and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained by EBA during the field program on June 20, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis of the parameters indicated above. Results are summarized in Table 4799-2 in Appendix A11 and the laboratory reports are included in Appendix B.

11.3.3 Indicators of Potential Contamination

Additional analytical sampling for copper on June 20 and 22, 2005 found that it was below the CDWQG maximum acceptable concentration. One hypothesis is that the reported total copper concentration from the first baseline-sampling event was elevated because the water had been sitting stagnant in the piping and was not thoroughly purged before samples were taken.

No elevated concentrations of indicator parameters were observed in the sample results reviewed.

11.4 Conceptual Hydrogeology

No log was available for this well, or any other wells in the Swift River area. No information is available on the well depth or static water level. The direction of groundwater flow in this area as inferred from topography and air photos is easterly to southeasterly towards Seagull Creek or Swift River as the well is equidistant between the two surface water bodies.

11.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are provided in field notes in Appendix A11. Photos of potential contaminant sources are also provided.

A summary of potential contaminant sources within 30 m of the well is provided below:

- Wood stave sewage line at 25 m; and,
- Fuel drums at 8 m.

11.5.1 Spills Records and Contaminated Sites Search Results

No documented contaminated sites were reported for this property or neighbouring property. However, the Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch identified two spill events for sites neighbouring the Swift River Living Complex, and they are outlined below.

On August 17, 2000, 1 L of gasoline was reportedly spilled at the Swift River Lodge. This, however, likely poses a minimal risk to this water system.

On March 1, 1993, it was identified that approximately 250 L of calcium chloride solution had been dumped at the Swift River Lodge while a de-icing operation had been conducted, but there had been no effort made to collect the solution. The runoff had reportedly travelled towards Swift River, downgradient from this well and would not have likely posed a risk to this water system.

On February 1, 1999, it was identified that approximately 10 L of diesel fuel was spilled at the Yukon Electric Company facility when an EnviroTank was overfilled. The contaminated snow was reportedly recovered and this spill likely poses a minimal risk to this water system.

11.6 Identified Water System Deficiencies and Associated Risk

11.6.1 High and Medium Risk Deficiencies

The following deficiencies were identified as high-risk for the Swift River Living Complex:

- The well is located within 30 m of potential sources of contamination, including a wood stave septic line and fuel drums;
- Poor surface completion of the well (located in a pit below grade);

- The well is not equipped with a surface sanitary seal as required by the Canadian Groundwater Association's Well Construction Guidelines;
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because it is likely completed within a vulnerable type (unconfined aquifer), and does not meet the requirements of the Guidelines for Water Well Construction;
- The copper concentration has been previously reported to be in exceedence of CDWQG MAC. The most recent water sampling results, however, were below the CDWQG MAC; and,
- There is no treatment or disinfection system present.

11.6.2 Low Risk Deficiencies

There were no low-risk deficiencies identified at this site, all deficiencies are either high or medium risk.

11.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

11.7.1 Priority 1

It was identified during the water system assessment program that two other YTG facilities in Swift River had high-risk deficiencies that are not easily mitigated, and finding a new drinking water source for these buildings was recommended. One potential option is to utilize the living complex well to supply water to the grader station and foreman's residence, while another option considered is a new well to provide water to each of the three buildings, including the living complex. These options are presented below:

Option 1:

To utilize the well at the living complex, the following would be required:

- Further assessment is required to determine the suitability of this well to serve the complex and other YTG maintained buildings at Swift River. This would involve obtaining the well log in order to determine the depth, and

other wellhead construction details that were unavailable during this assessment. Sustainable well yield would also need to be verified by pumping tests;

- If the well is deemed suitable to supply all three buildings, it will require physical upgrades including installation of a surface sanitary seal (grout or bentonite) to a depth of at least 3 m, and extending the well casing at least 500 mm above grade;
- A underground piped water distribution line should be installed, and should be properly freeze-protected through heat-trace and insulation; and,
- An NSF/ANSI 55 certified UV disinfection system complete with NSF-61 certified pre-filtration to 1 micron absolute should be installed near the point of entry in the Swift River Living complex.

These are conceptual design recommendations based on the information available, and are intended to be used for planning and budgeting purposes. Engineering input will be required for final system specifications or design.

Option 2:

The second option considered involves construction of a new well. A new well could potentially be used to supply all the YTG maintained buildings in Swift River, including the grader station, living complex, and foreman's residence. The new well should be constructed in consideration of the following recommendations:

- The well should be equipped with a surface seal to at least 6 m and the casing should be extended above grade (500 mm) within a lockable enclosure that is inaccessible to animals and unauthorized personnel;
- The well should be located upgradient from the current well and must be greater than 30 m from any potential source of contamination;
- The water from the new well must meet all CDWQG health based guidelines. If there are any exceedences in the CDWQG health-based guidelines then a treatment system must be designed and installed as necessary; and
- An NSF/ANSI certified UV disinfection system should be installed at a centralized location complete with adequate NSF approved pre-filtration.

11.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

11.8.1 Priority 1

Class D cost estimates for Priority 1 mitigative options to address the well deficiencies for this site are outlined below.

Option 1:

Some of the costs associated with this option depend on whether or not the Swift River Grader Station will also be supplied by this well (costs to this proposed system are reported as the average of the cost with two systems and the cost with three systems).

- Obtaining the well log, an additional site inspection, short-term pump test to verify well yield, would likely cost in the order of **$2,000**. This cost could be divided equally among the buildings supplied by this well, and would be approximately **$800** for this site;
- If deemed suitable, the cost associated with improving the living quarters well would be in the order of **$5,000**. This cost could be divided equally among the buildings supplied by this well, and would be approximately **$1,700**;
- The proposed filtration and UV disinfection system would cost approximately **$5,000**. This cost could be divided equally among the buildings supplied by this well, and would be approximately **$1,700**;

Option 2:

- Assuming that the well would be drilled in overburden to a depth of approximately 30 m, it is recommended that **$30,000** be budgeted for materials and labour to drill, test, and complete the well. Since this well would serve three sites, the cost to this system would be approximately **$10,000**;
- Approximately 200 m of water distribution line would be required to serve all three buildings, and assuming $120 per metre, this would likely amount to a total installed cost of **$24,000**. Since this well would serve three sites, the cost to this system would be approximately **$8,000**;
- The proposed filtration and UV disinfection system would cost approximately **$5,000**. This cost could be divided equally among the buildings supplied by this well, and would be approximately **$1,700**;
- The cost associated with decommissioning the existing living complex well in accordance with the Guidelines for Water Well Construction would likely amount to **$1000**.

12.0 BUILDING M0086: WATSON LAKE RCMP RESIDENCE

12.1 Description of Existing Water system

Building M0086, a Watson Lake RCMP Residence at 111 Stubenburg, is supplied water from a 14.3 m deep well. The well is located in a concrete enclosure adjacent to the basement. At the time of inspection the well was open. The well location and other site details are provided on Figure M0086-A in Appendix A12. The coordinates of the wellhead measured by a GPS device were:

- UTM ZONE 9
- Northing: 6657739
- Easting: 518261

There is no treatment present on the water system from this well and it serves the M0086 RCMP Residence only. A schematic detailing the water system is provided as Figure M0086-B in Appendix A12.

12.2 Description of Existing Wastewater Systems

There is a communal in ground septic disposal system that is used for this residence as well as the M0087 and M0088 RCMP Residences. This field is located approximately 20 m east of the M0086 well. Figure M0086-A, provided in Appendix A12, shows the location of the septic system.

12.3 Water Quality Results

12.3.1 Results from Water Quality Sampling

Bacteriological

Two samples were collected from the M0086 Watson Lake RCMP Residence water system between May and June 2005 and were tested for total coliform and *E. coli* by Yukon Environmental Health Services using the presence/absence test method. Results are tabulated in Table M0086-1 in Appendix A12. Coliform bacteria and *E. coli* were reported as absent in both samples for which results were provided.

Potability

This site was only recently added as a one of the YTG maintained facility and as such a baseline water quality had not previously been collected and was not available for review prior to the assessment. The first YTG routine sampling event was completed on June 22, 2005. The sample was submitted to ALS for detailed potability analyses. The results of these analyses are summarized in Table M0086-2 in Appendix 12. Results of interest are summarized below:

- The hardness concentration of 273 mg/L (as CaCO3) indicates that the water is very hard and the softener was not functioning properly at the time of sampling.
- The total dissolved solids concentration was 314 mg/L and is considered to be relatively fresh.
- All other health based and aesthetic objectives were met for the parameters analyzed.
- Water quality results indicate that the groundwater supplying this system is calcium-bicarbonate type water with very high hardness.

Additional sample was obtained by EBA during the water system assessments in order to determine parameters relevant to the predesign of a potential treatment system. These included:

- UV absorbance, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system; and,
- Total Organic Carbon to assist with treatment system selection.

Additionally, measurements in the field for total dissolved solids, conductivity, pH, and temperature. Results of the baseline and additional analytical sampling are summarized in Table M0086-2 in Appendix A12, and the laboratory results are included in Appendix B.

12.3.2 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surface water sources or septic waste. Chloride concentrations, although were not high, are likely above the normal background ranges for groundwater in the area. Nitrate and nitrite concentrations for this sample are low and would also likely be within the normal background ranges for groundwater in the area. Considering that many of the wells

in the area have elevated chloride and nitrate, and also considering the shallow depth of this well, it is possible that the aquifer is under the influence of surface water sources or septic effluent wastes.

12.4 Conceptual Hydrogeology

No log was available for review for this well. Most wells in the area are completed at depths of less than 30 m within surficial moranic and colluvial deposits. These deposits are described as gravel, sand and silt, with occurrences of silty till sediments. This well is 14.3 m deep with a static water level of 9.5 m below grade. This well is situated on the north side of a groundwater flow divide near an area of groundwater discharge. The interpreted groundwater flow direction is likely northeasterly towards an unnamed lake.

12.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are provided in field notes in Appendix A12. Photos of potential contaminant sources are also provided at the end of this appendix.

A summary of potential contaminant sources within 30 m of the well is provided below:

- Septic field apprioximately 25 m from well;
- Fuel storage tank located in the basement of residence at 15 m (approx.).

12.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any recorded spill events or contaminated sites issues for this property or neighbouring properties. However, the corner lot across from Stubenburg road at Adela Trail appears to have groundwater monitoring wells on the site, and may be a former service station.

12.6 Identified Water System Deficiencies and Associated Risk

12.6.1 High or Medium Risk Deficiencies

- The well is located within 30 m of potential sources of contamination, including the communal septic system;
- Poor surface completion of the well (located below grade in an enclosure off from basement, wellhead had no cap at time of inspection);
- The well is not equipped with a surface sanitary seal as required by the Canadian Groundwater Association's Well Construction Guidelines;
- At 14.3 m in depth, this well is considered a shallow well;
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because it has a production zone less than 15 m below grade, and does not meet the requirements of the Guidelines for Water Well Construction; and,
- There is no disinfection system present, and the only treatment present is a water softener.

12.6.2 Low Risk Deficiencies

- There is a fuel storage tank located inside the basement of the residence. This is not a high-risk deficiency because the resident would likely notice fuel leak or spill before well contamination could occur.
- The pressure tank, jet pump and plumbing are in disrepair.

12.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

Considering that some of the wells in the RCMP complex in Watson Lake may show signs of potential impact from anthropogenic sources such as septic waste, it is proposed that a communal water distribution system be installed to serve all RCMP buildings in the complex with the source from the existing detachment well.

12.7.1 Priority 1

The following recommendations are provided in order to mitigate deficiencies that are of immediate concern for the M0086 Watson Lake RCMP Residence:

- If not already completed, the well should be superchlorinated and a cap should be installed on the well casing; and,
- A point of use NSF-55 certified disinfection system with adequate pre-treatment should be installed.

12.7.2 Priority 2

- The existing detachment well should be improved, including extending the well to at least 500 mm above grade and installing a commercial pitless unit. A surface sanitary seal (grout or bentonite) to at least 3 m below grade should be retrofitted around the well and ground surface immediately around the wellhead should be graded to promote surface drainage away from the wellhead;
- Additional assessment, including a pump test, should be done on the detachment well to determine its yield capacity and other construction details; and,
- A centralized treatment system should be installed in the basement of the RCMP detachment. This treatment system could consist of either a chlorine disinfection system with suitable retention, a UV disinfection (NSF/ANSI 55 certified) system, or a combination of both. These are conceptual design recommendations based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications;
- A piped water distribution line should be installed to service each RCMP building. Service lines should be run to M0086, to one of M0087 or M0088 and existing piping can be used to connect to the other, to one of M0126 or M0127 and existing piping can be used to connect to the other, and existing piping between the detachment and the RCMP gym can be used to serve the gym.

Once a central treatment system is installed, the POE system at M0086 could be removed and installed at another YTG maintained building.

12.7.3 Priority 3

- Existing well should be properly decommissioned.

12.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

12.8.1 Priority 1

- The cost associated with shock chlorinating the water system (including the well) and installing a UV disinfection system would cost in the order of **$2,700** for all materials and labour. Pretreatment may be required for proper operation of the UV.

12.8.2 Priority 2

- The estimated total cost to install the distribution system would be in the order of **$25,000**, including all materials and labour. Since the distribution system would serve five residences the cost to this system would be approximately **$5,000**.

12.8.3 Priority 3

- It would cost in the order of **$1,000** to properly decommission the well.

13.0 BUILDINGS M0087 AND M0088: WATSON LAKE RCMP RESIDENCES

13.1 Description of Existing Water system

Buildings M0087 and M0088, the Watson Lake RCMP Residences located at 2 and 3 Adela Trail, are served by a water system supplied from a 13.0 m deep well. The wellhead is located in a concrete enclosure off from the basement of the M0088 residence. At the time of inspection the well was open and was not fitted with a proper cap on the well casing. The casing also appeared to be broken, and there was a disconnected length of casing that extended above grade above the existing casing. The well location, and other site details are provided as Figure M0088-A in Appendix A13. The coordinates of the wellhead using a hand held GPS device were:

- UTM ZONE 9
- Northing: 6657683
- Easting: 518271

The water system is equipped with a water softener, but not disinfection. A schematic detailing the water system is provided as Figure M0088-B in Appendix A13.

13.2 Description of Existing Wastewater Systems

A shared septic tank and effluent field that is used for these two residences as well as the M0086 RCMP Residence is located approximately 20 m northwest of the M0088 well. Figure M0088-A, provided in Appendix A13, shows the location of the septic system.

13.3 Water Quality Results

13.3.1 Results from Water Quality Analysis

Bacteriological

Two samples were collected from the M0087 Watson Lake RCMP Residence water system between May and June 2005, and one was collected from the M0088 RCMP Residence in June of 2005 and was tested for total coliform and *E. coli* by Yukon Environmental Health Services using the presence/absence test method. Results are tabulated in Table M0088-1 in Appendix A13. Coliform bacteria and *E. coli* were reported as absent in each of the three samples for which results were provided.

Potability

This site was only recently added as one of the YTG maintained facilities and as such baseline water quality was taken at approximately the same time as the water system assessments. A YTG consultant obtained samples for baseline water quality on June 22, 2005.

- All health-based and aesthetic objectives were met for the parameters analyzed; and,
- The softener appears to be functioning properly.

Some samples were taken during the water system assessments in order to determine parameters relative to the predesign of a potential treatment system, and are summarized below:

- UV absorbance, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system; and,
- Total Organic Carbon to assist with treatment system selection.

Additionally, Measurements in the field for total dissolved solids, conductivity, pH, and temperature. Results of the baseline and additional analytical sampling are summarized in Table M0088-2 in Appendix 13 and the laboratory results are included in Appendix B.

13.3.2 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surface water sources or septic waste. Chloride concentrations were above the normal background ranges for groundwater in the area. Nitrate and nitrite concentrations for this sample were elevated above the background concentration for groundwater in the area. It is possible that the aquifer from which the groundwater is obtained for the M0087 and M0088 Watson Lake RCMP Residences well system is being impacted by surface water sources or septic wastes.

13.4 Conceptual Hydrogeology

No log was available for this well. Most wells in the area are completed at depths of less than 30 m within surficial morainic and colluvial deposits. These deposits are described as gravel, sand and silt, with occurrences of silty till sediments. This well is completed at 13.0 m depth with a static water level of 9.54 m below grade. This well is situated on the

north side of a groundwater flow divide near an area of groundwater discharge. The interpreted groundwater flow direction is likely northeasterly towards an unnamed lake.

13.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are provided in field notes in Appendix A13. Photos of potential contaminant sources are also provided at the end of this appendix.

A summary of potential contaminant sources within 30 m of the well is provided below:

- Septic field at 20 m;
- Fuel storage tank located in the basement of residence at 15 m (approx.).

13.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any recorded spill events or contaminated sites issues for this property or neighbouring properties.

13.6 Identified Water System Deficiencies and Associated Risk

13.6.1 High and Medium Risk Deficiencies

- The well is located within 30 m of potential sources of contamination, including the community septic system;
- Poor surface completion of the well (located below grade in an enclosure off basement, well had no cap);
- The well is not equipped with a surface sanitary seal as required by the Canadian Groundwater Association's Well Construction Guidelines;
- At 13.0 m in depth, this well is considered a shallow well;
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because it is a vulnerable type (unconfined aquifer), has a production zone less than 15 m below grade, and does not meet the requirements of the Guidelines for Water Well Construction; and,
- There is no disinfection system present.

13.6.2 Low Risk Deficiencies

- There is a fuel storage tank located inside the basement of the residence. This is not a high-risk deficiency because the resident would likely notice fuel leak or spill before well contamination could occur; and,

13.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

Considering that this well and other wells in the RCMP complex show indications of potential impact from anthropogenic sources, it is proposed that a community water distribution system be installed to serve the entire RCMP complex with water supplied from the existing detachment well.

13.7.1 Priority 1

The following recommendations are provided in order to mitigate deficiencies that are of immediate concern for the M0087 and M0088 Watson Lake RCMP Residences:

- The well should be superchlorinated and a cap should be installed on the well casing; and,
- A NSF-55 certified UV system with pre-filter should be installed at the point of entry to the building. Pre-treatment may be required.

13.7.2 Priority 2

- A centralized treatment system should be installed in the basement of the RCMP detachment. This treatment system could consist of either a chlorine disinfection system with suitable retention or a UV disinfection (NSF/ANSI 55 certified) system. This is a conceptual design recommendation based on the information available, and is intended to be used for planning and budgeting purposes. Engineering input will be required for final system specifications or design.
- The wellhead construction of the existing detachment well should be improved, including extending the well to at least 500 mm above grade and installing a commercial pitless unit. A surface sanitary seal (grout or bentonite) to at least 3 m

below grade should be retrofitted around the well and then the ground be graded to promote surface drainage away from the wellhead;
- Additional assessment, including pumping tests, should be completed to determine the detachment wells yield and construction details, and,
- A low-flow/low pressure water distribution line should be installed to service each building. Service lines should be run to M0086, to one of M0087 or M0088 and existing piping can be used to connect to the other, to one of M0126 or M0127 and existing piping can be used to connect to the other, and existing piping between the detachment and the RCMP gym can be used to serve the gym.

13.7.3 Priority 3

- Decommission well in accordance with regulation.

13.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

13.8.1 Priority 1

- The cost associated with superchlorinating the water system (including the well) and installing a well cap, and then installing a point of entry UV disinfection system with pre-filter would cost in the order of **$2,500** for all materials and labour.

13.8.2 Priority 2

- The estimated total cost to install the distribution system would be in the order of **$25,000**, including all materials and labour. Since the distribution system would serve five residences the cost to these systems would be approximately **$10,000**.

13.8.3 Priority 3

- It would cost in the order of **$1,000** to properly decommission the well.

14.0 BUILDINGS M0092: WATSON LAKE RCMP DETACHMENT

14.1 Description of Existing Water system

Building M0092, the Watson Lake RCMP Detachment, is served by a water system that delivers water from a 15.9 m deep well located in a pit approximately 2 m from the rear of the detachment. There is also an abandoned well located in a concrete enclosure off from the basement of the detachment building. The location of the wells and other details about the surrounding area are provided as Figure M0092-A in Appendix A14. The coordinates of the wellhead measured using a hand held GPS device were:

- UTM ZONE 9
- Northing: 6657662
- Easting: 518256

There is no treatment or disinfection system present on the water system. In addition to serving the detachment, this well also serves the RCMP Gym (building M0084). A schematic detailing the water system is provided as Figure M0092-B in Appendix A14.

14.2 Description of Existing Wastewater Systems

There is a septic field that is used commonly by both the RCMP detachment and the RCMP gym. This field is located approximately 35 m east of the main well. Figure M0092-A, provided in Appendix A14, shows the location of the septic system.

14.3 Water Quality Results

14.3.1 Results from Water Quality Analysis

Bacteriological

Two samples were collected from the M0092 Watson Lake RCMP Detachment water system between May and June 2005 and were tested for total coliform and *E. coli* by Yukon Environmental Health Services using the presence/absence test method. Results are tabulated in Table M0092-1 in Appendix A14. Coliform bacteria and *E. coli* were reported as absent in both samples for which results were provided.

Potability

This site was only recently added as one of the YTG maintained facilities and as such baseline water quality had not been obtained prior to the assessment. A sample was taken by a YTG representative at approximately the time as the water system assessments.

Measurements in the field for total dissolved solids, conductivity, pH, and temperature were taken at the time of the assessment. Results of the baseline and additional analytical sampling are summarized in Table M0092-2 in Appendix 14 and the laboratory results are included in Appendix B.

- Water quality results indicate that the groundwater supplying this system is calcium-bicarbonate type with high hardness.
- All health-based and aesthetic objectives were met for the parameters analyzed.

14.3.2 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surface water sources or septic waste. Chloride concentrations, although were not high, are likely above the normal background ranges for groundwater in the area. Nitrate and nitrite concentrations for this sample are low and would likely be within the normal background ranges for groundwater in the Watson Lake area.

14.4 Conceptual Hydrogeology

The log for M0092A indicates that the well is completed at a depth of 15.9 m in an unconfined sand aquifer with no significant confining material, the static water level measured at 9.16 m below grade. The log for M0092A is consistent with the lithology of most wells in the area, which are completed at depths of less than 30 m within surficial morainic and colluvial deposits. These deposits are described as gravel, sand and silt, with occurrences of silty till sediments. This well is located on the north side of a groundwater flow divide near an area of groundwater discharge. The interpreted flow direction is likely northeasterly towards an unnamed lake.

14.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are described in field notes in Appendix A14. Photos of potential contaminant sources are provided in Appendix A14.

A summary of potential contaminant sources within 30 m of the main RCMP detachment well is provided below:

- An adjacent abandonned well at approximately 1 m;
- Underground fuel storage tank at approximately 17 m; and,
- Two above ground fuel storage tanks at approximately 17 m and 27 m.

14.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any recorded spill events or contaminated sites issues for this property or neighbouring properties.

14.6 Identified Water System Deficiencies and Associated Risk

14.6.1 High and Medium Risk Deficiencies

- The well is located within 30 m of potential sources of contamination, including an abandoned well that has not been properly decommissioned and is not equipped with a proper cap;
- The well is located 17 m from an underground fuel storage tank, as well as 17 m and 27 m from two above ground fuel storage tanks;
- Poor surface completion of the well (located in a pit below grade);
- The well is not equipped with a surface sanitary seal as required by the Canadian Groundwater Association's Well Construction Guidelines;
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because it is a vulnerable type (unconfined aquifer), and does not meet the requirements of the Guidelines for Water Well Construction; and,
- There is no treatment or disinfection system present.

14.6.2 Low Risk Deficiencies

There were no low-risk deficiencies identified for this site. All deficiencies are considered high-risk.

14.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

Considering that some of the wells in the RCMP complex in Watson Lake may show signs of potential impacts from surface water or septic sources, it is proposed that a community water distribution system be installed to serve the entire RCMP complex, and would obtain its water from the existing well at this site.

14.7.1 Priority 1

The following recommendations are provided in order to mitigate deficiencies that are of immediate concern for the M0088 Watson Lake RCMP Detachment:

- The well should be superchlorinated;
- Additional assessment, including a pumping test, should be done on the detachment well to determine its yield and other construction details. Although this is not considered a high risk issue, this information will be necessary to determine the course of action for other Priority 1 upgrades (e.g. to determine sizing for disinfection system);
- There are two options available for the type of disinfection system to be installed for the proposed water distribution system, and are outlined below:

  Option 1:

  - An NSF/ANSI 55 certified UV disinfection system (preceded by NSF-61 certified filtration to 1 micron absolute) should be installed at a centralized location on the water system in the basement on the RCMP detachment; or,

  Option 2:

  - A chlorine disinfection system with suitable retention should be installed at a centralized location on the water system in the basement on the RCMP detachment.
- The abandoned well in the basement of the detachment should be properly decommissioned in accordance with Guidelines on Water Well Construction; and,

- The existing underground fuel storage tank should be removed and all contaminated soil (if any) should be removed and properly disposed of.

These are conceptual design recommendations based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications.

14.7.2 Priority 2

- The wellhead construction should be improved, including extending the well to at least 500 mm above grade and installing a commercial pitless unit. A surface sanitary seal (grout or bentonite) to at least 3 m below grade should be retrofitted around the well and the ground surface should be graded to promote surface drainage away from the wellhead;
- If the well is deemed suitable to meet the requirements of all buildings in the complex, a low-flow/ low pressure water distribution line should be installed to service each building. Service lines should be run to M0086, to one of M0087 or M0088 (existing piping can be used to connect to the other), to one of M0126 or M0127 (existing piping can be used to connect to the other), and existing piping between the detachment and the RCMP gym can be used to serve the gym; and,
- The existing above ground fuel storage tanks should be removed and replaced with double walled EnviroTanks with secondary containment.

14.7.3 Priority 3

There are no Priority 3 recommendations for this site.

14.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

14.8.1 Priority 1

- The required additional well assessment, including a short-term pump test, would cost in the order of **$2,000**; and,
- Shock chlorinating the well would cost in the order of **$100**;

- An adequate treatment system, sized to meet the future demands of all buildings at the site would likely cost in the order of **$8,000**;
- To properly decommission the abandoned well would cost in the order of **$1,000**; and,
- To remove the underground fuel storage tank should cost approximately **$3,000**.

14.8.2 Priority 2

- Standard wellhead upgrades would cost approximately **$5,000**;
- New double walled EnviroTanks would cost approximately **$2,600** each.

15.0 BUILDINGS M0126 AND M0127: WATSON LAKE RCMP RESIDENCE

15.1 Description of Existing Water system

Buildings M0126 and M0127, the Watson Lake RCMP Residences located at 4 and 5 Adela Trail, are served by a water system that delivers water from a 16.7 m deep well. The wellhead is located in a wooden enclosure off from the basement of the M0127 residence. The well location, and other site details are provided as Figure M0127-A in Appendix A15. The coordinates of the wellhead measured using a handheld GPS device were:

- UTM ZONE 9
- Northing: 6657683
- Easting: 518271

The water system is equipped with a water softener, but no disinfection. A schematic detailing the water system is provided as Figure M0127-B in Appendix A15.

15.2 Description of Existing Wastewater Systems

There is a community septic field that is used communally by these two residences located approximately 35 m north of the M0127 well. Figure M0127-A, provided in Appendix A15, shows the location of the septic system.

15.3 Water Quality Results

15.3.1 Results from Water Quality Analysis

Bacteriological

Two samples collected from each building between May and June 2005 and were tested for total coliform and *E. coli* by Yukon Environmental Health Services using the presence/absence test method. Results are tabulated in Table M0127-1 in Appendix A15. Coliform bacteria and *E. coli* were reported as absent in each of the four samples for which results were provided.

Potability

This site was only recently added as one of the YTG maintained facilities and as such baseline water quality was taken at the same time as the water system assessments. A YTG contractor took samples for baseline water quality.

Some additional samples were taken during the water system assessments in order to determine parameters relative to the predesign of a potential treatment system, and are summarized below:

- UV absorbance, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system; and,
- TOC in order to determine the total organic carbon concentration to assist with treatment system selection.

Additionally, Measurements in the field for total dissolved solids, conductivity, pH, and temperature. Results of the baseline and additional analytical sampling are summarized in Table M0127-2 in Appendix 15 and the laboratory results are included in Appendix B.

- Water quality results indicate that the groundwater supplying this system is a calcium-bicarbonate type water with very high hardness; and,
- All health-based and aesthetic objectives were met for the additional parameters analyzed.

15.3.2 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surface water sources or septic waste. Chloride, nitrate and nitrite concentrations in the sample obtained from this well were above the normal background ranges for groundwater in the Watson Lake Area area. It is possible that the aquifer from which the groundwater is obtained for the M0126 and M0127 Watson Lake RCMP Residences well system is under the influence of surface water sources or septic wastes.

15.4 Conceptual Hydrogeology

No log was available for this well. Most wells in the area are completed at depths of less than 30 m within surficial morainic and colluvial deposits. These deposits are described as gravel, sand and silt, with occurrences of silty till sediments. This well is completed at a depth of 16.71 m with a static water level of 8.6 m below grade. This well is situated on the north side of a groundwater flow divide near an area of groundwater discharge. The interpreted groundwater flow direction is likely northeasterly towards an unnamed lake.

15.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are provided in field notes in Appendix A15. Photos of potential contaminant sources are provided in Appendix A15.

A summary of potential contaminant sources within 30 m of the well is provided below:

- Fuel storage tank located in the basement of residence at 10 m (approx.).

15.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any recorded spill events or contaminated sites issues for this property or neighbouring properties.

15.6 Identified Water System Deficiencies and Associated Risk

15.6.1 High and Medium Risk Deficiencies

- Poor surface completion of the well (located below grade in an enclosure off from basement);
- The well is not equipped with a surface sanitary seal as required by the Canadian Groundwater Association's Well Construction Guidelines;
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because it is a vulnerable type (unconfined aquifer), has a production zone less than 15 m below grade, and does not meet the requirements of the Guidelines for Water Well Construction;

- There is no disinfection system present;
- The well shows signs of elevated chloride and nitrate and may be under the influence of surface water or septic sources.

15.6.2 Low Risk Deficiencies

- The well is located approximately 35 m from communal septic system;
- There is a fuel storage tank located inside the basement of the residence. This is not a high-risk deficiency because the residents should notice any fuel leak or spill before well contamination could occur.

15.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

Considering that this well and other wells in the RCMP complex in Watson Lake may show signs of potential contamination from surface water or septic sources, it is proposed that a treated community water distribution system be installed to serve the entire RCMP complex, with its source from the existing detachment well.

15.7.1 Priority 1

The following recommendations are provided in order to mitigate deficiencies that are of immediate concern for the M0086 Watson Lake RCMP Residence:

- The well and distribution system should be superchlorinated; and,
- An NSF approved UV disinfection system with pre filtration should be installed at the point of entry to disinfect water to be provided to both buildings.

15.7.2 Priority 2

- A centralized treatment system should be installed in the basement of the RCMP detachment. This treatment system could consist of either a chlorine disinfection system with suitable retention or a UV disinfection (NSF/ANSI 55 certified) system. This is a conceptual design recommendation based on the information

available, and is intended to be used for planning and budgeting purposes. Engineering input will be required for final system specifications or design.

- The wellhead construction of the existing detachment well should be improved, including extending the well to at least 500 mm above grade and installing a commercial pitless unit. A surface sanitary seal (grout or bentonite) to at least 3 m below grade should be retrofitted around the well and then the ground be graded to promote surface drainage away from the wellhead;
- Additional assessment, including pumping tests, should be completed to determine the detachment wells yield and construction details, and,
- A low-flow/low pressure water distribution line should be installed to service each building. Service lines should be run to M0086, to one of M0087 or M0088 and existing piping can be used to connect to the other, to one of M0126 or M0127 and existing piping can be used to connect to the other, and existing piping between the detachment and the RCMP gym can be used to serve the gym.

15.7.3 Priority 3

- Decommission well in accordance with regulation.

15.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

15.8.1 Priority 1

- The cost associated with superchlorinating the water system (including the well) and installing a well cap, and then installing a point of entry UV disinfection system with pre-filter would cost in the order of **$2,500** for all materials and labour.

15.8.2 Priority 2

- The estimated total cost to install the distribution system would be in the order of **$25,000**, including all materials and labour. Since the distribution system would serve five residences the cost to these systems would be approximately **$10,000**.

15.8.3 Priority 3

- It would cost in the order of **$1,000** to properly decommission the well.

16.0 BUILDING 4821: WATSON LAKE WEIGH SCALES

16.1 Description of Existing Water system

Building 4821, the Watson Lake Weigh Scales, is served by a water system that delivers water from a 28.8 m deep well. The well is equipped with a pitless adapter and is located in the parking lot approximately 30 m west of the weigh scales office building. At the time of inspection it was observed that because of damage to the casing the cap could no longer fit properly to seal the well. The well location, and other site details are provided in Figure 4821-A in Appendix A16. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 9
- Northing: 6657029
- Easting: 519309

A schematic detailing the water system is provided as Figure 4821-B in Appendix A16.

16.2 Description of Existing Wastewater Systems

The septic tank is located north of the weigh scales office approximately 52 m east from the wellhead. The septic tank discharges effluent to a field located north of the tank. A site plan showing the septic system is given by Figure 4821-A in Appendix A16.

16.3 Water Quality Results

16.3.1 Water Quality Results from Previous Sampling

Bacteriological

Four samples were collected from the water system by YTG representatives between September 2004 and March 2005 and were tested for total coliform and *E. coli* by Yukon Environmental Health Services using the presence/absence test method. Results are tabulated in Table 4821-1. Coliform bacteria and *E. coli* were reported as absent in each of the four samples for which results were provided.

Potability

A water sample was collected by YTG representatives from the Watson Lake Weigh Scales water system on November 9, 2004. The sample was submitted to Northwest Labs in Surrey, BC for detailed potability analyses. The results of these analyses are summarized in Table 4821-2 in Appendix A16. Additional baseline results were also provided by YTG for a sample collected on June 21, 2005. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify potential indicators of contamination.

- At 8.6 and 5.29 NTU, the baseline and routine sampling turbidity results exceeded both the CDWQG health based upper limit of 1.0 NTU and aesthetic objective of 5.0 NTU;
- At 27 and 17.9 CU, the colour exceeded the CDWQG aesthetic objective of 15 CU.
- At 0.0078 and 0.00717 mg/L, the arsenic concentrations, though not in excess of the current MAC of 0.025 mg/L, did exceed the proposed new MAC of 0.005 mg/L;
- At 0.079 and 0.0551 mg/L, the manganese concentrations exceeded the CDWQG aesthetic objective of 0.05 mg/L;
- At 0.601 mg/L during the June 21, 2005 sampling event, the total iron concentration exceeded the CDWQG aesthetic objective of 0.3 mg/L; and
- All other health based and aesthetic objectives were met for the parameters analyzed.
- The hardness (as $CaCO_3$) of approximately 140 mg/L is considered moderately hard.

16.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Watson Lake Weigh Scales that was identified to be included during the water system assessments is detailed below:

- UV absorbance, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- As turbidity had previously been in exceedence of CDWQG MAC, a sample was obtained to analyze for this parameter;
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained by EBA during the field program on June 21, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 4821-2 in Appendix A16 and the laboratory reports are included in Appendix B.

- At 2.1 NTU, turbidity was above the CDWQG health based upper limit; and,
- Field chemistry completed at the time of inspection found the pH to be at 8.56, above the CDWQG aesthetic objective of 8.5, but within the margin of error of the instrument.

16.3.3 Indicators of Potential Contamination

No elevated concentrations of indicator parameters were observed in the sample results reviewed.

16.4 Conceptual Hydrogeology

The log for 4821 indicates that the well is completed at a depth of 28.8 m within a confined clayey gravel aquifer. The static water depth is 3.3 m below grade. The lithology indicates material ranging from clay to gravel, with some permafrost at approximately 15 m below ground. This is consistent with the lithology of most wells in the area, which are completed at depths of less than 30 m within surficial morainic and colluvial deposits. These deposits are described as gravel, sand and silt, with occurrences of silty till sediments. The presence of fine-grained silt and clay from 10.1 to 23.5 m provides a reasonable confining layer and hence some protection from surficial sources of contamination. This well is located on the north side of a groundwater divide nearby a low-lying area of groundwater discharge. The inferred direction of groundwater flow is northeast towards an unnamed creek and low-lying area.

16.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are presented in field notes in Appendix A16. Photos of potential contaminant sources are also provided in Appendix A16. A drainage feature runs directly around the well and during rainy periods surface water flows within 1 m of the wellhead. The drillers log indicates that this is an item of concern and that the sanitary surface seal is not sufficient to protect the aquifer from this surface water feature.

16.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environment Branch did not identify any recorded spill events or contaminated sites issues for this site or neighbouring properties.

16.6 Identified Water System Deficiencies and Associated Risk

16.6.1 High and Medium Risk Deficiencies

The following deficiencies were identified as high-risk for the Watson Lake Weigh Scales:

- Poor location of the well in the weigh scales parking lot. There is a drainage feature that runs directly around the wellhead. The wellhead is susceptible to damage from vehicle impact. A truck has reportedly already hit the well casing, and the damage prevents the cap from being properly fastened to the top of the casing;
- Surface seal is not sufficient to protect the aquifer from this surface water feature,
- The drillers log indicates that the surface sanitary seal may not be constructed according to standards set by the Canadian Groundwater Association's Well Construction Guidelines;
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water (because it does not meet the requirements of the Guidelines for Water Well Construction; and,
- The turbidity has been in exceedence of CDWQG MAC; and
- There is no treatment or disinfection system present.

16.6.2 Low Risk Deficiencies

The following deficiencies were identified as low-risk for the Watson Lake Weigh Scales:

- The arsenic concentration, though is not in exceedence of the CDWQG MAC at the present time, is in exceedence of the proposed MAC; and,

- Colour, iron and manganese concentrations are in exceedence of CDWQG aesthetic objectives.

16.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical). With respect to water treatmetn system recommendations, these are conceptual recommendations based on the information available. Engineering input will be requited for final system desing or selection.

16.7.1 Priority 1

The following Priority 1 mitigative options should be carried out to address deficiencies associated with this water system.

Option 1:

This option involves upgrading the existing well for interim use until such time as a new well is constructed, and would involve the following well rehabilitation and treatment:

- The well and water system should be superchlorinated and the well casing should be repaired. The casing should extend at least 500 mm above grade and be equipped with a proper locking and vented cap;
- A surface-seal to at least 3 m below grade should be installed;
- The ground surface around the wellhead should be graded to promote surface drainage away from the well;
- A proper reinforced barricade and chain-link fence should be placed around the wellhead to prevent damage by vehicles; and,
- An NSF-61 certified filtration system (to 1 micron absolute) followed by a UV disinfection system (or equivalent) should be installed. Pretreatment consisting of a softener may be required to ensure that the UV system operates properly.

Option 2:

In the event that an adequate sanitary surface seal cannot be installed, the second option involves abandoning the existing well and drilling a new well immediately. The new well should be constructed in consideration of the following:

- The well should be equipped with a surface seal to at least 6 m and a pitless unit should be installed with the casing raised above grade (500 mm);
- The well must be located at a distance greater than 30 m and upgradient from any potential source of contamination; and,
- The water from the new well must meet all CDWQG health based guidelines. If there are any exceedences in the CDWQG health-based guidelines then a treatment

system must be designed and installed as necessary. A treatment/disinfection system would consist of a NSF-61 certified filtration system (to 1 micron absolute) followed by a UV disinfection system (or equivalent). Pretreatment would likely be required.

16.7.2 Priority 2

- There are no Priority 2 recommendations for this site.

16.7.3 Priority 3

- A point of use reverse osmosis treatment system should be installed to provide drinking water with arsenic concentrations below the proposed MAC.

16.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

16.8.1 Priority 1

Option 1:

- Superchlorination of the well and casing repair would cost in the order of **$1,000** for materials and labour;
- Standard wellhead upgrades and regrading around the wellhead to promote surface drainage and rerouting the drainage system to a distance of 10 m north of the wellhead would cost in the order of **$3,000**;
- Installing a chain-link fence around the wellhead, assuming a 1.8 m high, 2.5 m by 2.5 m square fence, would cost **$2,500** for all materials and labour. Installing a concrete barricade would cost in the order of **$500**;
- A suitable treatment/disinfection system would cost in the order of **$5,200**, assuming **$1,500** for the duplex filtration system, **$2,200** for the UV disinfection, and **$1,500** for a residential size water softener.

Option 2:

- A new well, assuming approximately 30 m of overburden, would cost in the order of **$32,700** to drill, test, and connect; and,

- A suitable treatment/disinfection system would cost in the order of **$5,200**, assuming **$1,500** for the duplex filtration system, **$2,200** for the UV disinfection, and **$1,500** for a residential size water softener.

16.8.2 Priority 3

- The installed cost for a reverse osmosis treatment system would be in the order of **$600**.

17.0 BUILDING 4836: WATSON LAKE GRADER STORAGE BUILDING

17.1 Description of Existing Water system

Building 4836, the Watson Lake Grader Storage Building, is served by a water system that delivers water from a 17.8 m deep well located in an addition off from the garage of the grader storage building. The well location and other details about the surrounding area are provided in Figure 4836-A in Appendix A17. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 9
- Northing: 6658289
- Easting: 515871

The grader storage building is equipped with water softening treatment system. The well also serves the grader station maintenance garage and the Property Management Agency Office in Watson Lake. A schematic detailing the water system is provided as Figure 4836-B in Appendix A17.

17.2 Description of Existing Wastewater Systems

The grader storage building is served by a piped sewer collection system provided by the Town of Watson Lake. There are service lines, and potentially sewer mains within 30 m the well.

17.3 Water Quality Results

17.3.1 Water Quality Results from Previous Sampling

Bacteriological

No test results were provided to EBA for review. Bacteriological sampling of water from the Watson Lake Grader Storage Building water system may not have been previously completed.

Potability

A water sample was collected by YTG representatives from the Watson Lake Grader Storage Building water system on September 13, 2004. The sample was submitted to Northwest Labs in Surrey, BC for potability analyses. The results of these analyses are

summarized in Table 4836-2 in Appendix A17. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify potential indicators of contamination. Note that the water quality results presented below are from a sample obtained prior to the recent treatment system upgrades (softener system).

- The water quality for the water sample obtained from previous sampling indicated that the water is a calcium bicarbonate type water with very high hardness;
- At 79.6 NTU, turbidity exceeded both CDWQG health based upper limit of 1.0 NTU and aesthetic objective of 5.0 NTU;
- At a level of greater than 60 CU, the colour exceeded the CDWQG aesthetic objective of 15 CU;
- At 1.14 mg/L, the barium concentration exceeded the CDWQG health based upper limit of 1.0 mg/L;
- At 5.35 mg/L, the iron concentration exceeded the CDWQG aesthetic objective of 0.3 mg/L;
- At 1.18 mg/L, the manganese concentration exceeded the CDWQG aesthetic objective of 0.05 mg/L;
- The water quality results indicated that all other health based and aesthetic objectives were met for the parameters analyzed; and,
- The hardness (as $CaCO_3$) was 422 mg/L, and is considered very hard.

17.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Watson Lake Grader Storage Building that was identified to be included during the water system assessments is detailed below:

- A sample for potability analysis including physical parameters of the water, as well as dissolved anions, nutrients, and total metals;
- Ammonia to provide a more detailed assessment of nutrient concentrations in order to determine if the water is under the direct influence of septic sources;
- The total organic carbon concentration (TOC); and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained by EBA during the field program on June 21, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are

summarized in Table 4836-2 in Appendix A17 and the laboratory reports are included in Appendix B.

It was observed during the site inspection that the water system at this site is equipped with a new water softener. Results from previous sampling show that there was no functioning water softening system at the time when baseline water quality analysis was taken. Additional analytical results show a significant improvement of the water quality:

- At 0.60 NTU, turbidity was below both the CDWQG health based upper limit and aesthetic objective;
- The colour had been reduced from greater than 60 CU to less than 5.0 CU, and was below the CDWQG aesthetic objective;
- The barium concentration had been reduced from 1.14 mg/L to 0.043 mg/L, and below the CDWQG health based upper limit;
- The iron concentration had been reduced from 5.35 mg/L to 0.062 mg/L, and below the CDWQG aesthetic objective;
- Manganese was in exceedence of the CDWQG aesthetic objective; and,
- As expected, the hardness had been lowered from 422 mg/L to 53.5 mg/L (as $CaCO_3$).
- Additionally, it was observed that at 749 mg/L, the total dissolved solids concentration is in exceedence of the CDWQG AO of 500 mg/L, and is considered highly mineralized.

17.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surface water sources or septic waste. Chloride concentrations reported from baseline and additional analytical water quality results were found to be high, reported at 190 mg/L and 184 mg/L. Nitrate, nitrite, and ammonia concentrations reported from baseline and additional analytical water quality results were found to be low and were within the normal background range for the Watson Lake area. The Watson Lake Grader Storage Building is located downgradient from the Town of Watson Lake's sewage lagoon, and this is likely the cause of the reported high chloride concentrations. Surrounding wells show similar evidence in water quality and it is therefore likely that the aquifer from which the Watson Lake Grader Storage Building obtains its water supply is being impacted by leachate from the sewage lagoon.

It should be noted that wells in the surrounding area also show signs of elevated barium. It is possible that a barite plant located upgradient from the grader storage building is causing the elevated barium observed in groundwater in the region. It is recommended that

additional hydrogeological assessment be completed to determine if the barite plant and the sewage lagoon are contaminating the aquifer in this region of Watson Lake.

17.4 Conceptual Hydrogeology

The log for this well indicates that the well is completed at a depth of 17.8 m with a static water level of 11.1 m below grade. The well is completed within a semi-confined sand aquifer from 17.0 to 17.8 m depth. The lithology indicates the presence of fine-grained silty sediments from 2.5 to 6.4 m and from 12.9 to 15.0 m depth. This is consistent with the lithology of most wells in the area, which are completed at depths of less than 30 m within surficial morainic and colluvial deposits. These deposits are described as gravel, sand and silt, with occurrences of silty till sediments. Given the heterogeneity in the lithology and the intermittent distribution of the silty sediments it is unlikely that they provide any significant amount of protection from surficial sources of contamination in the vicinity. The well is located on the north side of a groundwater divide and groundwater flow in this area is likely north to northeasterly towards Wye Lake.

17.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are provided in field notes in Appendix A17. Photos of potential contaminant sources are provided in Appendix A17.

A summary of potential contaminant sources within 30 m of the well is provided below:

- Waste oil burner at 16 m; and,
- Above ground fuel storage tank at 11 m.

Additionally, there is a barite plant and a sewage lagoon that are both likely upgradient from the well.

17.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any contaminated site issues for this site or neibouring sites. There was, however, one spill record identified. Details from the spill

record and discussion with a representative from the YTG Highways Departement is outlined below.

On October 2, 2000, a transformer had reportedly been struck by a maintenance vehicle and the resultant damage had caused approximately 90 L of transformer oil to spill on the northeast corner of the property. This transformer oil contained a concentraion of greater than 50 ppm of PCBs. The spill had, however, reportedly been properly cleaned up to remove all contamination, and the water system at this site had been regularly tested with no reported traces of PCBs in the time after the spill occurred (personal comm, Rick Harder). Based upon conceptual hydrogeology, the spill area is likely downgradient from the well.

17.6 Identified Water System Deficiencies and Associated Risk

17.6.1 High and Medium Risk Deficiencies

The following deficiencies were identified as high-risk for the Watson Lake Grader Storage Building:

- Water quality results for this water system and surrounding well water systems indicate that the aquifer from which groundwater for this well is obtained is likely being impacted by leachate from the sewage lagoon and the barite plant located upgradient;
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Well Construction Guidelines);
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water (because it does not meet the requirements of the Guidelines for Water Well Construction;
- There is no disinfection system;
- Poor surface completion of the wellhead (located in an attachment to the garage, the wellhead is only 100 mm above grade).
- Previous water quality results indicated exceedences in CDWQG health based parameters of turbidity and barium, as well as CDWQG of colour, iron, and manganese. Although there is a water softening system that has been installed that has significantly reduced these parameters, should it malfunction, concentrations of these parameters would likely again be in exceedence of these standards.
- There were no bacteriological results for this site available for review.

17.6.2 Low Risk Deficiencies

The following deficiencies were identified as low-risk for the Watson Lake Grader Storage Building:

- The wellhead is located within 30 m of potential sources of contamination, including sewer service lines within 30 m and a waste oil burner at 16 m;
- There is an above ground fuel storage tank located 16 m from the well;
- The manganese concentration in the water is in exceedence of CDWQG aesthetic objectives;
- There is and above ground fuel storage tank located 7 m from the well, but it is a double-walled EnviroTank with secondary containment;
- A transformer oil spill at the site, and,
- Total dissolved solids, however, continue to be high post-treatment;

17.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

17.7.1 Priority 1

The following mitigative options should be carried out to address the high-risk deficiencies associated with the water system at the Watson Lake Grader Storage Building:

- The well and water system should be superchlorinated;
- Reverse osmosis systems should be installed in both the grader station maintenance garage and the Property Management Agency office building. Grader station staff should be informed to not use the facilities in the grader storage building for drinking water. Signs should be posted;
- The water softener should be regularly monitored and maintained;
- It is recommended that NSF-61 certified filtration system (to 1 micron absolute) followed by a UV disinfection system be installed at the point of entry. This is a conceptual design recommendation based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications; and,
- Samples for bacteriological analysis should be taken on a regular basis.

17.7.2 Priority 2

- The wellhead completion should be improved. This would involve, among other things, raising the well casing to a minimum of 500 mm above ground level; and,
- A detailed hydrogeological study and water quality assessment should be performed in the area to determine the cause of the elevated barium and chloride concentrations.

17.7.3 Priority 3

- A surface sanitary seal (grout or bentonite) to a depth of at least 3 m below grade should be installed. The ground surface in the vicinity of the wellhead should then be graded to promote surface drainage away from the well.

17.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

17.8.1 Priority 1

- The cost for a suitable disinfection system such as filtration and UV treatment/disinfection system would cost approximately **$3,700**;
- To install point of use reverse osmosis systems in the maintenance garage and the Property Management Agency office would cost approximately **$1,200** for both systems;
- The cost associated with maintaining the softening system would fall under normal operation and maintenance costs; and,
- The cost to perform regular bacteriological tests would fall under the normal operation and maintenance budget.

17.8.2 Priority 2

Class D cost estimates for medium-risk mitigative options to address the well deficiencies for this site are as follows:

- The cost for the wellhead upgrades would cost in the order of **$2,000**; and,

- Conducting a detailed hydrogeological study, including drilling a series of monitoring wells, to determine if the sewage lagoon and barite plant are contaminating the local aquifer, would cost in the order of **$20,000**. The cost to this system would be one-third of this amount, in the order of **$6,700**;

17.8.3 Priority 3

- The cost to install a surface sanitary seal, considering that the enclosure around the wellhead must be demolished and a new addition be built, would be approximately **$8,000**.

18.0 BUILDING 4841: WATSON LAKE VISITOR RECEPTION CENTRE

18.1 Description of Existing Water system

Building 4841, the Watson Lake Visitor Reception Centre, is served by the community piped water distribution system operated by the Town of Watson Lake. The piped system reportedly occasionally malfunctions and freezes if it is used during the colder months of the year. Since the visitor reception centre is only open seasonally during the summer, this is rarely a problem; however there is a 10.7 m deep well located in the basement of the reception centre in the case that the community system fails. This well was not equipped with a proper cap at the time of the assessment. The visitor reception centre has no treatment or disinfection. A schematic detailing the well water system is provided as Figure 4841-B in Appendix A18.

18.2 Description of Existing Wastewater Systems

The visitor reception centre is served by a piped sewer collection system provided by the Town of Watson Lake. There are service lines, and potentially sewer mains within 30 m the well.

18.3 Water Quality Results

Because the well was not in service at the time of inspection, there are no water quality or bacteriological results available to review. Since the system is on a piped distribution system from the Town of Watson Lake, it can be assumed that the water quality is under their responsibility and is treated and monitored in order to ensure the safety of the entire community water supply, including this site.

18.4 Conceptual Hydrogeology

There is no log available for this well. The depth of the well is 10.69 m with a static water level 6.235 m below grade. The log for the adjacent Grader Storage Building (4836) indicates alternating coarse and fine deposits to 17.8 m depth. This is consistent with the lithology of most wells in the area, which are completed at depths of less than 30 m within surficial morainic and colluvial deposits. These deposits are described as gravel, sand and silt, with occurrences of silty till sediments. This well is located on the north side of a groundwater flow divide and the expected direction of groundwater flow is northeasterly towards Wye Lake.

18.5 Potential Contaminant Sources

18.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any recorded spill events or contaminated sites issues for this property or neighbouring properties.

18.6 Identified Water System Deficiencies and Associated Risk

18.6.1 High and Medium Risk Deficiencies

- There are not high risk deficiencies associated with this site assuming that the piped community system is utilized.

18.6.2 Low Risk Deficiencies

The following deficiencies were identified as low-risk for the Watson Lake Visitor Reception Centre are with respect to the existing well that is not in use:

- The wellhead is located in the basement of the visitor reception centre and is not equipped with a proper cap on the casing and is open.
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Well Construction Guidelines);
- At 10.7 m deep, the well is considered to be a shallow well. The well, therefore, would be considered to be at high-risk of contamination from surface sources;
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because it is a vulnerable type (unconfined aquifer with a production zone that is less than 15 m below grade and does not meet the requirements of the Guidelines for Water Well Construction; and,
- There is no treatment or disinfection system present.

Additionally, it has been reported that if the piped distribution system from the community is running during the late fall, winter, or early spring months, it has the tendency to freeze and become inoperable. It is for this reason that the well has not been decommissioned; it is used as a back-up system in case the visitor reception centre needs to be open at a time in the year when the piped distribution system may fail.

18.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority.

18.7.1 Priority 2

- In order to project the aquifer, it would be prudent superchlorinate and install a well cap or welded cover.

18.7.2 Priority 3

- In order to mitigate the deficiencies associated with the existing well at the Watson Lake Visitor Reception Centre, the piped distribution system from the Town of Watson Lake should be repaired as so to prevent freezing, and the existing well should be properly decommissioned in accordance with the Guidelines for Water Well Construction.

18.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

18.8.1 Priority 2

Shock chlorination and installation of a well cap would cost approximately **$250**

18.8.2 Priority 3

Class D cost estimates for mitigative option to address the well deficiencies for this site are as follows:

- The cost to repair the existing piped distribution system to ensure that it is protected against freezing cannot be estimated at this time**.**

- The estimated cost to properly decommission the well would be in the order of **$1000**.

19.0 BUILDING 4842: CASSIAR WEIGH SCALES

19.1 Description of Existing Water system

Building 4842, the Cassiar Weigh Scales, is served by a water system that delivers water from an approximately 27.7 m deep well. The well is located in a pit approximately 4.5 m from the weigh scales office building. The well location, and other site details are provided by Figure 4842-A in Appendix A19. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 9
- Northing: 6654368
- Easting: 496710

There is no treatment or disinfection for the water obtained from the well. In addition to the well, there is also an approximately 800 L water storage tank located directly outside the office building that serves the cold water tap in the kitchen. It is likely that this tank receives treated water from delivery for consumption, and the well supply is intended for non-potable use only; however, there were no signs present at the weigh scales that indicated such. The water storage tank was empty during the water system assessment and the only water that was available for sampling was obtained from a bathroom tap served by the well. A schematic detailing the well water system is provided as Figure 4842-B in Appendix A19.

19.2 Description of Existing Wastewater Systems

The septic tank for the Cassiar Weigh Scales is located south of the weigh scales office on the opposite side of the well approximately 13 m away. Whether the septic tank is routinely pumped out, or discharges effluent to an inground sewage disposal field is unknown at this time. A site plan showing the septic system is given by Figure 4842-A in Appendix A19.

19.3 Water Quality Results

19.3.1 Water Quality Results from Previous Sampling

Bacteriological

Two samples were collected from the Cassiar Weigh Scales water system between September 2004 and March 2005 and were tested for total coliform and *E. coli* by Yukon

Environmental Health Services using the presence/absence test method. Results are summarized in Table 4842-1. Coliform bacteria and *E. coli* were reported as absent in each of the two samples for which results were provided.

Potability

A water sample was collected by YTG representatives from the Cassiar Weigh Scales water system on October 13, 2004. The sample was submitted to Northwest Labs in Surrey, BC for detailed potability analyses. The results of these analyses are summarized in Table 4842-2 in Appendix A19. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify potential indicators of contamination.

- At 0.43 mg/L, the iron concentration exceeded the CDWQG aesthetic objective of 0.3 mg/L;
- All other health based and aesthetic objectives were met for the parameters analyzed.
- The hardness (as $CaCO_3$) was 194 mg/L, and is considered very hard.

19.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Cassiar Weigh Scales that was identified to be included during the water system assessments is detailed below:

- UV absorbance, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Analysis for total and dissolved iron and manganese to determine the amount of each associated with suspended compared to dissolved particles;
- Total Organic Carbon to assist with treatment system selection; and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained by EBA during the field program on June 22, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis of parameters indicated

above. These results are summarized in Table 4842-2 in Appendix A19 and the laboratory reports are included in Appendix B.

- The concentration of total iron in the water was reported to have been 2.26 mg/L, while the reported concentration of dissolved iron was less than the detection limit of 0.030 mg/L. The significance is that iron content in the water can be attributed mainly to suspended solids in the water and as such, filtration methods and/or well rehabilitation measures to decrease turbidity would likely significantly reduce the iron content in the water; and
- The concentration of total manganese in the water was reported to have been 0.0612 mg/L and the reported concentration of dissolved manganese was 0.0618 mg/L. In both cases the manganese concentrations are higher than the CDWQG aesthetic objectives of 0.05 mg/L. The significance of this is that manganese content in the water can be attributed entirely to dissolved particles in the water and as such filtration methods and well rehabilitation measures to decrease turbidity would unlikely reduce the manganese content in the water.

19.3.3 Indicators of Potential Contamination

No elevated concentrations of indicator parameters were observed in the sample results reviewed.

19.4 Conceptual Hydrogeology

There is no log available for this well. The depth of the well is greater than 27.72 m and the static water level is 20.71 m below grade. There are no well logs available for review for wells in the vicinity of the site. The well is located on the south side of a groundwater flow divide. Groundwater in this area most likely flows in a southerly to southeasterly direction towards Albert Creek.

19.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are provided in field notes in Appendix A19. Photos of potential contaminant sources are provided in Appendix A19. A summary of potential contaminant sources within 30 m of the well is provided below:

- Septic tank 13 m from the well (effluent field potentially within 30 m, however, this requires verification);
- Above ground fuel storage tank 1 m from the well, and;
- A drainage feature runs within 1 m of the well during wet periods, which may result in surface water infiltration to the well.

19.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any recorded spill events or contaminated sites issues for this property or neighbouring properties.

19.6 Identified Water System Deficiencies and Associated Risk

19.6.1 High and Medium Risk Deficiencies

The following deficiencies were identified as high-risk for the Cassiar Weigh Scales:

- Potential sources of contamination within 30 m of the well, including the septic tank, and potentially septic field (if present), a drainage stream that runs within 1 m the wellhead, and an above ground fuel storage tank located 1 m from the well;
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Well Construction Guidelines);
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water (because it does not meet the requirements of the Guidelines for Water Well Construction;
- There is no treatment disinfection system present;
- Poor surface completion of the wellhead (located in a pit below grade);
- The water intended for drinking water is delivered and stored in a water tank outside of the building. There is no enclosure of any kind around the storage tank, nor is there any insulation to prevent freezing;
- There are no signs stating that drinking water is only delivered to the kitchen cold water faucet; and,
- There was no water in the delivered water storage tank at the time of inspection, and as such there was no drinking water available at that time.

19.6.2 Low Risk Deficiencies

The following deficiencies were identified as low-risk for the Cassiar Weigh Scales:

- The total iron concentration of the water is in exceedence of CDWQG aesthetic objectives; and,

- Both the total and dissolved manganese concentrations are in exceedence of CDWQG aesthetic objectives.

19.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

There are two available options to address the deficiencies associated with this site. The options are outlined below:

Option 1:
The first option involves improving and upgrading the bulk water delivery system.

Option 2:
This option recognizes that water delivery is expensive and the current water delivery system is not up to standards. This option proposes installing treatment and using the well as the exclusive water supply source.

19.7.1 Priority 1

It should be noted that it was unclear whether there was a septic field at this site, or whether it was only a holding tank. An investigation should be carried out in order to determine if there is an actual effluent disposal field on the property and its proximity with respect to the well.

Option 1:

- An enclosure should be built around the wellhead in order to prevent freezing or overheating, and to prevent unauthorized human or animal access;
- Signs should be posted in the building at all point of use locations that drinking water should be obtained the cold water faucet in the kitchen only; and,
- It should be ensured that water is properly disinfected at the source.

Option 2:

- The well and water system should be superchlorinated and a NSF-61 certified filtration system (to 1 micron absolute) followed by a residential size water softener should be installed;

- A NSF-55 certified UV system should be installed after the softener to provide disinfection of drinking water;
- The water storage tank for delivered water should be removed once the treatment system is installed, and the well be used as the main source of drinking water; and,
- Secondary containment should be installed around the existing above ground fuel storage tank.

These are conceptual design recommendations based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications.

19.7.2 Priority 2

Option 1:

- Residual chlorine testing should be regularly conducted in order to ensure a minimum FAC concentration of 0.2 mg/L at the point of use.

Option 2:

- The wellhead completion should be improved. This would involve raising the well casing to a minimum of 500 mm above ground level and retrofitting a proper surface-seal to 3 m below grade; and,
- The ground surface around the wellhead should be graded to promote surface drainage away from the well by rerouting the existing drainage feature further away from the well.

19.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

19.8.1 Priority 1

Class D cost estimates for high-risk mitigative options to address the well deficiencies for this site are as follows:

Option 1:

- To build a secure enclosure around the water storage tank would likely cost in the order of **$1,000**.

Option 2:

- Superchlorination of the well and water system would cost approximately **$200**,
- The cost for the proposed filtration and softening system would amount to a total installed cost of approximately **$3,000**;
- To supply and install an UV system would cost approximately **$2,200**;
- Disconnecting and removing the existing water storage tank would likely incur minimal cost; and,
- To install secondary containment on the AST would likely cost in the order of **$1,000**.

19.8.2 Priority 2

Option 1:

- Routinely checking FAC would fall under normal operation and maintenance costs.

Option 2:

- The cost for the wellhead upgrades, including raising the wellhead, installing a surface seal to 3 m below grade, and installing a 150 mm pitless adapter would cost in the order of **$5,000**;

20.0 BUILDING 4840: WATSON LAKE ENVIRONMENTAL OFFICE

20.1 Description of Existing Water system

Building 4840, the Watson Lake Environmental Office, is served by a water system that delivers water from a 44.8 m deep well. The well is located in a wooden enclosure approximately 2 m from the storage building. The well location, as well as other site details, is shown in Figure 4840-A in Appendix A20. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 9
- Northing: 6658241
- Easting: 515629

The water system is equipped with a sediment filter and a water softener, and there is also a reverse osmosis treatment system that supplies water to one tap in the office kitchen. A schematic detailing the well water system is available as Figure 4840-B in Appendix A20.

20.2 Description of Existing Wastewater Systems

The environmental office is served by a septic system located on the northwest side of the office building opposite from the well. The septic tank is approximately 30 m west of the well and likely discharges effluent to the west of the tank. There was, however, no evidence of clean-out pipes and it is possible that the system is on sewage eduction.

20.3 Water Quality Results

20.3.1 Water Quality Results from Previous Sampling

Bacteriological

Seven samples were collected from the Watson Lake Environmental Office water system between September 2004 and March 2005 and were tested for total coliform and *E. coli* by Yukon Environmental Health Services using the presence/absence test method. Results are tabulated in Table 4840-1 in Appendix 20. Coliform bacteria and *E. coli* were reported as absent in each of the seven samples for which results were provided.

Potability

A water sample was collected by YTG representatives from the Watson Lake Environment Office water system on September 13, 2004. The sample was submitted to Northwest Labs in Surrey, BC for detailed potability analyses. The results of these analyses are summarized in Table 4840-2 in Appendix A20. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, to identify and recommend additional sampling and analytical, and to identify potential indicators of contamination.

- The groundwater is a calcium bicarbonate type water with very high hardness;
- At 16.7 NTU, turbidity exceeded both CDWQG health based upper limit of 1.0 NTU and aesthetic objective of 5.0 NTU;
- At a level of greater than 60 CU, the colour exceeded the CDWQG aesthetic objective of 15 CU.
- At 1.82 mg/L, the iron concentration exceeded the CDWQG aesthetic objective of 0.3 mg/L;
- At 0.303 mg/L, the manganese concentration exceeded the CDWQG aesthetic objective of 0.05 mg/L; and,
- All other health based and aesthetic objectives were met for the parameters analyzed.

20.3.2 Identification of Additional Analytical Testing Required

Samples were taken from both the regular treated water at bathroom fixtures, as well as the reverse osmosis treated water at the point of use. Additional analytical for the Watson Lake Environmental Office that was included in the water system assessments is detailed below:

- The suite of parameters included in the ASL Environmental drinking water package in order to analyze for the physical parameters of the water, as well as for dissolved anions, nutrients, and total metals. The drinking water package was obtained from both the regular treated water, and the reverse osmosis treated water;
- Dissolved metals to provide the full suite of metals dissolved in the water from the treated water;

- Ammonia to give a more detailed assessment of nutrient concentrations in order to determine if the water is under the direct influence of septic sources. This was taken from the regular treated water;
- TOC in order to determine the total organic carbon concentration in the regular treated water; and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature were completed at the time of sampling from both sample locations.

Additional Analytical Results

A water sample was obtained by EBA during the field program on June 21, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 4840-2 in Appendix A20 and the laboratory reports are included in Appendix B.

It was observed during the water system assessment that the treatment systems at this site had been recently installed. Results from previous sampling show that there was likely no treatment system at the time when baseline water quality analysis was taken, and this previous water sample likely represented raw water quality. Additional analytical results show a significant improvement of the water quality, as described below:

- At 0.44 NTU from the regular treated water and 0.18 NTU from the water subjected to reverse osmosis, turbidity had been lowered below both the CDWQG health based upper limit and aesthetic objective from the 16.7 NTU reported previously;
- The colour had been reduced from greater than 60 CU to less than 5.0 CU for both sample locations, and was below the CDWQG aesthetic objective;
- Both total and dissolved iron was reported at less than the detection limit of 0.030 mg/L for both sample locations;
- Although the total manganese concentration had lowered from 0.303 mg/L to 0.262 mg/L in the regular treated water, this water was still in exceedence of the CDWQG aesthetic objective. Additionally, the dissolved manganese content was reportedly 0.263 mg/L, signifying that the manganese content can be entirely attributed to dissolved particles. The reported manganese concentration from water subjected to reverse osmosis, however, was 0.0125 mg/L, which is lower than the CDWQG aesthetic objective; and,
- The hardness in the treated water at 212 mg/L (as $CaCO_3$), signifying that the water softener may not be functioning properly. The hardness in the water subjected to reverse osmosis had been reduced to 34.4 mg/L (as $CaCO_3$).

20.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surface water sources or septic waste. Chloride concentrations reported from baseline and additional analytical water quality results were found to be high relative to background (approximately 49 mg/L). Nitrate, nitrite, and ammonia concentrations reported from baseline and additional analytical water quality results were found to be low and were within the normal background range for the Watson Lake area. The Town of Watson Lake sewage lagoon is approximately 270 m upgradient from the Environmental Office, and it is considered probable this that is causing the high chlorides reported in this water system. Other wells in the area downgradient from the sewage lagoon also have elevated chloride concentrations.

Concentrations of total barium reported from baseline and additional analytical water quality results were found to be at 0.355 mg/L and 0.299 mg/L, respectively. Although these concentrations do not exceed the CDWQG MAC, they are considered to be elevated. It is possible that a barite plant located across the street from the environmental office causes the elevated barium in the region. It should be noted that other wells in the surrounding area also have elevated barium.

Considering the proximity of this well and surrounding wells to both a barite plant and a sewage lagoon, additional hydrogeological assessment and water quality analysis is recommended.

20.4 Conceptual Hydrogeology

There is no log available for this well. It is reported to be completed at a depth of 44.8 m; the depth to static water level is unknown. Lithology is available for the nearby grader station well, and indicates alternating fine and coarse material to 17.8 m depth. This well is deeper than most wells in the area, which are generally less than 30 m and completed within the surficial morainic and colluvial deposits. These deposits are described as gravel, sand and silt, with occurrences of silty till

sediments. The well is located on the north side of a groundwater divide. Groundwater flow direction in this vicinity is most likely northeasterly to easterly towards Wye Lake.

20.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are provided in field notes in Appendix A20. Photos of potential contaminant sources are provided in Appendix A20.

A summary of potential contaminant sources within 30 m of the well is provided below:

- Fuel drums 13 m.

Additionally, there is a barite plant located across the street from the environmental office and a sewage lagoon located approximately 270 m from the environmental office, and both are likely upgradient.

20.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any recorded spill events or contaminated sites issues for this property or neighbouring properties. There was, however, absorb-all observed on the ground approximately 30 m from the well, adjacent to the building, that could potentially mark the location of a former fuel spill.

20.6 Identified Water System Deficiencies and Associated Risk

20.6.1 High and Medium Risk Deficiencies

The following deficiencies were identified as high or medium risk for the Watson Lake Environmental Office:

- The wellhead is located within 30 m of potential sources of contamination, including fuel drums at 13 m;
- The wellhead is located approximately 270 m downgradient (inferred) from a sewage lagoon, which is likely causing the high chlorides reported from water quality analysis. The chloride concentrations, however, were not in exceedence of CDWQG aesthetic objectives. As a conservative parameter, it may be indicative that other chemicals emanating from this same source could be impacting the drinking water supplied from this well;
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Well Construction Guidelines);
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water (because it does not meet the requirements of the Guidelines for Water Well Construction;
- Poor surface completion of the wellhead (located in a wooden enclosure, the wellhead is only 0.25 m above grade);
- There is no disinfection system;
- The well is located downgradient from a barite plant, and high barium concentrations have been observed in water quality. The barium concentration, however, has not been found to be in exceedence of CDWQG MAC; and,
- Absorb-all was found on the ground at approximately 30 m from the well and may indicate a hydrocarbon spill.

20.6.2 Low Risk Deficiencies

The following deficiencies were identified as low-risk for the Watson Lake Environmental Office:

- Manganese concentrations in the water are reported in exceedence of CDWQG aesthetic objectives and may impact on RO system longevity;
- Previous water quality results indicated exceedences in CDWQG health based parameters for turbidity, as well as CDWQG aesthetic objectives of colour and iron. It is likely that the raw ground water quality is very poor.

20.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

20.7.1 Priority 1

- Confirm UV transmissivity post softening system.
- It is recommended that a NSF-61 certified filtration system (to 1 micron absolute) be installed, and a UV disinfection system be installed after other treatment. This is a conceptual design recommendation based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications;
- Environment office staff should be informed to use the reverse osmosis tap as the main source of drinking water;
- Regular maintenance and upkeep should be done to ensure that the water treatment system is working; and,
- The purpose of the absorbol on the ground behind the building should be verified.

20.7.2 Priority 2

- The wellhead completion should be improved. This would involve raising the well casing to a minimum of 500 mm above ground level and retrofitting a proper surface-seal to at least 3 m below grade; and,
- A detailed hydrogeological and water quality assessment should be carried out in the region to determine the cause of the elevated chloride and barium.

20.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

20.8.1 Priority 1

- Confirmation UV transmissivity post softening system would cost approximately **$100;**
- The cost for the proposed disinfection/treatment system would amount to a total installed cost of about **$3,700**;
- Posting a sign indicating that environment office staff must obtain drinking water from the reverse osmosis tap would incur minimal cost: and,
- Investigating the potential spill would incur minimal cost.

20.8.2 Priority 2

Class D cost estimates for medium-risk mitigative options to address the well deficiencies for this site are as follows:

- The cost for the wellhead upgrades, including raising the wellhead, installing a surface seal to at least 3 m below grade, and installing a 150 mm commercial pitless unit would likely cost in the order of **$5,000**.
- Conducting a detailed hydrogeological assessment and water quality study, including drilling a series of monitoring wells would cost in the order of **$20,000.** Since there are three YTG maintained buildings that show elevated chloride and barium in this region, the cost to this site would be approximately **$6,700** (one third of the total amount).

21.0 BUILDING 4851: WATSON LAKE AIRPORT PUMPHOUSE

21.1 Description of Existing Water system

The Watson Lake Airport Terminal Building, Maintenance Garage, and Camping Area are supplied water from a 33.4 m deep well located the Pumphouse Building 4851. Although the well casing is below grade, the building is equipped with a sump, sump pump, float controls, and alarm system to prevent flooding. The well location and other site details are provided in Figure 4851-A, provided in Appendix A21. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 9
- Northing: 6664005
- Easting: 509800

Currently there is no treatment system present on this water supply. In addition to servicing the two airport buildings, the well also supplies an underground water reservoir for emergency fire fighting use. A schematic detailing the water system is provided as Figure 4851-B in Appendix A21.

21.2 Description of Existing Wastewater Systems

The septic tank for both the Watson Lake Airport Terminal Building and Maintenance Garage is located approximately 35 m from the pumphouse. A site plan is included as Figure 4851-A in Appendix A21, and gives details on the location of the sewage system. The septic tank discharges effluent to a field located east of the tank. Effluent is discharged approximately 130 m east of the pumphouse well. The sewer discharge pipe that runs to the septic is located approximately 20 m from the well.

21.3 Water Quality Results

21.3.1 Water Quality Results from Previous Sampling

Bacteriological

Seven samples were collected from the Watson Lake Airport Pumphouse water system between September 2004 and March 2005 and were tested for total coliform and *E. coli* by Yukon Environmental Health Services using the presence/absence test method. Results are tabulated in Table 4851-1 in Appendix A21. Coliform bacteria and *E. coli* were reported as absent in four of the seven samples for which results were provided, and the remaining three were rejected due to high turbidity.

Potability

A water sample was collected by YTG representatives from the Watson Lake Airport Pumphouse water system on September 13, 2004. The sample was submitted to Northwest Labs in Surrey, BC for detailed potability analyses. Additional baseline sampling results were provided by YTG for a sample collected on June 22, 2005. The results of these analyses are summarized in Table 4851-2 in Appendix A21. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify potential indicators of contamination.

- At 142 and 30.8 NTU, turbidity greatly exceeded both CDWQG health based upper limit of 1.0 NTU and aesthetic objective of 5.0 NTU;
- At a level of greater than 60 CU, the colour exceeded the CDWQG aesthetic objective of 15 CU on September 13, 2005.
- At 1.28 mg/L and 3.14 mg/L, the iron concentrations exceeded the CDWQG aesthetic objective of 0.3 mg/L;
- At 1.84 and 2.26 mg/L, the manganese concentrations greatly exceeded the CDWQG aesthetic objective of 0.05 mg/L; and,
- All other health based and aesthetic objectives were met for the parameters analyzed. The hardness (as $CaCO_3$) was 112 and 114 mg/L, and is considered moderately hard.

21.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Watson Lake Airport Pumphouse that was included in the water system assessments is detailed below:

- UV absorbance, as well as tannins and lignin, to determine potential for UV treatment as a disinfection;
- Previous sampling had shown very high turbidity, and as such a sample was again taken in order to retest for turbidity;
- Analysis for total and dissolved iron and manganese to determine the amount of each associated with suspended or dissolved particles;
- Total organic carbon (TOC) to assist with treatment system selection;
- Analysis for EPH and PAH to determine if the water supply shows signs of hydrocarbon contamination; and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained by EBA during the field program on June 20, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 4851-2 in Appendix A21 and the laboratory reports are included in Appendix B. Results from the additional analytical are summarized below:

- At 23.2 NTU, turbidity exceeded the CDWQG MAC of 1.0 NTU;
- The total iron concentration was 2.69 mg/L. Additionally, the dissolved iron concentration was reportedly 1.25 mg/L, showing that the iron content can be attributed to both suspended solids and dissolved particles;
- The total manganese concentration was 2.69 mg/L, while the dissolved manganese concentration was reported at 2.65 mg/L, signifying that the manganese content can be mainly attributed to dissolved particles; and,
- EPH and PAH parameters were below analytical detection and CDWQG for each parameter tested.

21.3.3 Indicators of Potential Contamination

No elevated concentrations of indicator parameters were observed in the sample results reviewed.

21.4 Conceptual Hydrogeology

The log for this well indicates that the well is completed at a depth of 33.4 m in a sand and gravel aquifer. The lithology for this well indicates a silt and sandy silt layer existing from 17.8 to 21.1 m depth. The static water level in this well at the time of drilling was reported to be 5.4 m below grade. The presence of a 3.3 m layer of fine grained material above the aquifer zone provides a minimal degree of protection from surficial contamination sources. This well is located approximately 120 m north of Watson Lake. Groundwater flow in the vicinity is southerly towards Watson Lake.

21.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are provided in field notes in Appendix A21. Photos of potential contaminant sources are provided at the end of this appendix.

A summary of potential contaminant sources within 30 m of the well is provided below:

- Sewer service lines at approximately 20 m; and,
- Reported hydrocarbon contaminants in soil and groundwater as close as 5 m from the well.

21.5.1 Spills Records and Contaminated Sites Search Results

Based on a review of environmental reports for the Watson Lake Airport, it has been identified that hydrocarbon contaminated soil and groundwater exist to the northwest of the Airport pumphouse (Well 4851). The contamination is thought to be a result of leaks from a former diesel generating station. The inferred extent of soil contamination is indicated on Figure 4851-A in Appendix A21. EBA completed some assessment of soil and groundwater hydrocarbon concentrations on behalf of Public Works and Government Services Canada in 2004. Concentrations of benzo(a)pyrene in groundwater in excess of the Government of Yukon Contaminated Sites Regulations (CSR) Drinking Water (DW) standards, and the CDWQG, were identified at two monitoring wells within 20 m of Well 4851. The

groundwater contaminant plume defined with respect to the DW standards has not been delineated to the southwest, nor has it been delineated vertically.

Based on the log for Well 4851, the well obtains groundwater from a confined or semi-confined aquifer. The 3 m thick low permeability silt from 18 to 21 m below grade may provide some protection from hydrocarbon contamination observed in the upper aquifer. There is, however, some risk of contamination of this lower aquifer from the contaminant source identified in the upper unconfined aquifer and induced vertical gradients from the pumping of the well from the lower aquifer.

EBA reviewed water quality results from two previous sampling events for hydrocarbon parameters within the water supply. The water samples collected from the Air Terminal Building were below detection and met with CSR drinking water standards and CDWQG at the time of sampling for the parameters analyzed.

We understand that PWGSC and Transport Canada intend to excavate contaminated soil from this area in 2006 and that the excavated soil will be remediated at an on-site land treatment unit that is over 500 m from the well. Following remediation of as much of the contaminant source area as is practical, groundwater contamination would likely remain. EBA recommends installation of an activated carbon filtration system to remove hydrocarbons from the drinking water supply in the event that groundwater from the upper aquifer migrates into the lower aquifer, which supplies water to this well. This hydrocarbon removal measure is recommended along with routine monitoring (every 3 months) of raw water and treated water to ensure safe drinking water.

21.6 Identified Water System Deficiencies and Associated Risk

21.6.1 High and Medium Risk Deficiencies

The following deficiencies were identified as high-risk for the Watson Lake Airport Pumphouse water system:

- There is a hydrocarbon contaminant plume located upgradient of the pumphouse;
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Well Construction Guidelines);

- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water (because does not meet the requirements of the Guidelines for Water Well Construction;
- There has been a history of high turbidity reported for this system. The most recent water quality analysis reported turbidity to be 30.8 NTU, significantly above the CDWQG MAC. Turbidity has been as high as 142 NTU. Because of the high turbidity, three out of the seven bacteriological samples were rejected; and.
- This water system is not equipped with disinfection treatment.

21.6.2 Low Risk Deficiencies

The following deficiencies were identified as low-risk for the Watson Lake Airport Pumphouse:

- The total and dissolved iron concentrations in the water are in exceedence of CDWQG aesthetic objectives;
- The total and dissolved manganese concentrations in the water are in exceedence of CDWQG aesthetic objectives;
- Water quality results indicated exceedences in CDWQG aesthetic objectives for colour.

21.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

21.7.1 Priority 1

Treatment should be installed on the water for domestic use and is outlined below:

- A NSF-61 certified filtration system (to 1 micron absolute) should be installed (it is likely that a series of filters will be required such as 10 micron, 5 micron and then 1 micron);
- A potassium permanganate green sand filtration system, as well as an activated carbon filtration system should be installed in order to reduce the high concentrations of iron, manganese and turbidity and to remove any potential hydrocarbon contamination;
- Backflow prevention should be installed on both the waterline leading to the domestic water system and the fire protection system; and

- Frequent monitoring of extractable petroleum hydrocarbons, polycyclic aromatic hydrocarbons, and volatile organic carbon should be completed to ensure that the hydrocarbon plume has not migrated into the aquifer from which this system obtains its groundwater supply.

These are conceptual design recommendations based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications.

There are two proposed options available for disinfection systems, and are outlined below:

Option 1:

- This option would involve installation of an NSF/ANSI 55 certified UV disinfection system for the domestic water supply (not fire protection). This is a conceptual design recommendation based on the information available, and is intended to be used for planning and budgeting purposes. Engineering input will be required for final system specifications or design.

Option 2:

- This option would involve the installation of a chlorine disinfection system with suitable retention for the domestic water supply (not fire protection).

Unfortunately it would be too difficult to install a proper surface sanitary seal to a depth of 6 m. With a proper treatment and disinfection system and regular water quality monitoring, however, this deficiency and the deficiencies associated with proximity to potential contaminant sources would likely be mitigated.

21.7.2 Priority 2

There are no Priority 2 recommendations for this site.

21.7.3 Priority 3

There are no Priority 3 recommendations for this site.

21.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

21.8.1 Priority 1

- The cost for a potassium permanganate green sand filter would be in the order of **$4,000**;
- An activated carbon filter system would cost approximately **$7,000**;
- To install a backflow preventer would cost approximately **$700** for materials and labour; and,
- Routine monitoring of EPH, PAH, and VOC should fall under normal operations and maintenance costs (estimated at **$1,000** per year).

Option 1:

- The proposed UV disinfection with 1-micron absolute prefiltration would cost in the order of **$5,000**.

Option 2:

- The proposed chlorine disinfection with 5 micron prefiltration would cost in the order of **$9,000**.

22.0 BUILDING 4873: TUCHITUA PUMPHOUSE

22.1 Description of Existing Water system

The Tutchitua Grader Station is served by a 13.8 m deep well located inside building 4873, the Tutchitua Pumphouse. At the time of inspection the well was not equipped with a cap. The well location and other site details are provided in Figure 4873-A, provided in Appendix A22. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 9
- Northing: 6754733
- Easting: 488237

Currently there is no treatment present for this water system. A schematic detailing the water system is provided as Figure 4873-B in Appendix A22.

22.2 Description of Existing Wastewater Systems

There are two active and one abandoned septic system at the Tutchitua Grader Station. The leach pit system serving the maintenance garage is located on the northeast corner the building and is approximately 50 m south of the pumphouse. The septic tank servicing the living complex is located on the eastern side of the building approximately 80 m south of the pumphouse, and effluent is likely discharged in a leach pit to the west of the tank. There is also an abandoned septic tank and leach pit approximately 60 m southeast of the pumphouse. The site plan included in Appendix A22 provides details on the location of the sewage systems.

22.3 Water Quality Results

22.3.1 Water Quality Results from Previous Sampling

Bacteriological

Eight samples were collected from the Tutchitua Pumphouse water system between September 2004 and March 2005 and were tested for total coliform and *E. coli* by Yukon Environmental Health Services using the presence/absence test method. Results are tabulated in Table 4873-1 in Appendix 22. *E. coli* bacteria were

reported as absent in each of the eight samples for which results were provided. One sample from September 14, 2004, however, tested positive for Total Coliforms.

Potability

A water sample was collected by YTG representatives from the Tutchitua Pumphouse water system on September 13, 2004. The sample was submitted to Northwest Labs in Surrey, BC for detailed potability analyses. The results of these analyses are summarized in Table 4873-2 in Appendix A22. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify potential indicators of contamination.

- The water quality results indicated that all health based and aesthetic objectives were met for the parameters analyzed; and,
- The hardness (as $CaCO_3$) was 197 mg/L, and is considered very hard.

22.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Tutchitua Pumphouse that was included in the water system assessment is detailed below:

- UV absorbance, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Total Organic Carbon to provide necessary information for future treatment system selection;
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained by EBA during the field program on June 23, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 4873-2 in Appendix A22 and the laboratory reports are included in Appendix B.

22.3.3 Indicators of Potential Contamination

No elevated concentrations of indicator parameters were observed in the sample results reviewed.

22.4 Conceptual Hydrogeology

The log for this well indicates that the well is completed at a depth of 13.8 m in an unconfined sand aquifer. The lithology encountered consists of alternating sand, gravel and cobbles with no significant confining layer. The static water level is approximately 2.0 m below grade. The well location is approximately 4 m south of the Tutchitua River bank. The groundwater flow gradient may reverse during periods of rapid water level rise in the river, however the final discharge point for groundwater in the vicinity is expected to be the river. The expected direction of groundwater flow direction is north to northeast towards the Tutchitua River.

22.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are provided in field notes in Appendix A22. Photos of potential contaminant sources are also provided at the back of this appendix.

A summary of potential contaminant sources within 30 m of the well is provided below:

- Tutchitua River is located 4 m from the well;
- There are full and discarded fuel, paint, and kerosene drums within 30 m.

22.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch identified one recorded spill events for this site.

According to the spill report, on April 4 1977, 7560 L of diesel was spilled at the waterhouse at Tutchitua Maintenance Camp. According to the Environment Canada spill record, however, the oil was absorbed into snow only and the snow was removed to a gravel pit a signifant distance from the camp. The site was then cleaned up and reportedly there was little chance of contamination. This has not been verfied.

22.6 Identified Water System Deficiencies and Associated Risk

22.6.1 High or Medium Risk Deficiencies

- The wellhead is located within 30 m of potential sources of contamination, including the Tutchitua River (4 m from the well), and fuel, paint, and kerosene drums;
- The well is likely downgradient from leach pit septic systems serving the maintenance garage and living complex;
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Well Construction Guidelines);
- Poor surface completion of the wellhead (there was no cap on the well casing);
- The wellhead is only 70 mm above grade and is at risk of potential flooding;
- The production zone of the well is from 8.9 m to 10.4 m according to the well log.
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because it is a vulnerable type (unconfined aquifer with a production zone that is less than 15 m below grade), in close proximity to a surface water body and does not meet the requirements of the Guidelines for Water Well Construction;
- A bacteriological sample from September 14, 2004 tested positive for Total Coliforms;
- This water system is not equipped with a treatment or disinfection system; and,
- The plumbing from the well was found during the site inspection to be in disrepair. The pressure tank is very old, and it as well as much of the piping was leaking.

22.6.2 Low Risk Deficiencies

The following deficiencies were identified as low-risk for the Tutchitua Pumphouse:

- In 1977, a diesel fuel spill occurred near the pumphouse; however, the spilled fuel had reportedly been removed and according to the spill report there was little chance of contamination.

22.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

The septic systems present at this grader station are poorly constructed and likely upgradient from the well. Even though they are greater than 30 m from the well, because of their construction, the aquifer characteristics, and the well construction, these septic systems have the potential to pose significant risk to the water system. The well is also in very close proximity to surface water and has a very shallow depth. Considering these deficiencies it is proposed that a new well be drilled upgradient from any potential source of contamination.

22.7.1 Priority 1

The following Priority 1 options are those that are of immediate concern in order to provide short-term mitigative options that reduce the most risk for this water system:

- The well and water system should be immediately superchlorinated and a cap be installed to seal the well from the surface;
- The casing should be raised to a minimum of 500 mm above grade;
- All fuel, paint, and kerosene drums that are within 30 m of the pumphouse should be relocated. Fuel or chemicals are not to be stored within 30 m of the pumphouse; and,
- An NSF/ANSI 55 certified UV disinfection system with pre-filter should be installed. This is a conceptual design recommendation based on the information available, and is intended to be used for planning and budgeting purposes. Engineering input will be required for final system specifications or design.

Priority 2

A new well should be drilled and the current well be decommissioned. It is recommended that a new well be installed to meet the following conditions:

- The well should be equipped with a surface seal to at least 6 m and the casing should be extended above grade (500 mm) within a lockable enclosure that is not inaccessible to animals and unauthorized personnel;
- The well must be located at a distance greater than 30 m from any potential source of contamination, and at least 60 m from the Tutchitua River, and be upgradient from all parts of the existing septic systems;
- The water from the new well must meet all CDWQG health based guidelines. If there are any exceedences in the CDWQG health-based guidelines then a treatment system must be designed and installed as necessary. The treatment/disinfection system can be removed from the pumphouse and installed on the water system from the new well.

22.7.2 Priority 3

- There are no Priority 3 mitigative option recommended for this site.

22.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

22.8.1 Priority 1

- The estimated cost to raise the casing, superchlorinate the well, and install a proper cap would be in the order of **$200**;
- Relocating the fuel, paint, and kerosene would incur minimal costs; and,
- The cost for the proposed disinfection/treatment system would amount to a total installed cost of about **$2,500**.
- Approximately **$4,000** should be allocated as a contingency for additional water treatment if necessary.

22.8.2 Priority 2

- If a new well is to be installed with a proper surface seal and wellhead enclosure, in overburden to a depth of 30 m, and considering the probable distance for distribution piping, it is recommended that **$50,000** be budgeted for materials and labour to drill, test, complete and hook-up the well with properly insulated and heat-traced underground waterlines.
- If the new well is successful, the old well should be properly decommissioned in accordance with the Guidelines for Water Well Construction. It is estimated that this would cost approximately **$1,000**.

23.0 BUILDING 4962: LIARD FIRE HALL

23.1 Description of Existing Water system

Building 4962, the Liard Fire Hall, is supplied water from a well located inside the fire hall washroom. The well location and other site details are provided in Figure 4962-A, provided in Appendix A23. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 9
- Northing: 6656947
- Easting: 504733

There is no treatment system present on this water system. The water services both the domestic water supply for the fire hall as well as a 4300 L steel water storage tank for fire fighting use. A schematic detailing the water system is provided as Figure 4962-B in Appendix A23.

23.2 Description of Existing Wastewater Systems

The septic tank for the Liard Fire Hall is located west of the fire hall, approximately 8 m from the wellhead. A site plan that shows the position of the septic system relative to the well is given by Figure 4962-A in Appendix A23. During the site inspection it appeared that the septic system was not constructed in accordance with regulation. It is likely that the tank discharges effluent to a field located east of the tank and less than 30 m from the well; however, this should be confirmed.

23.3 Water Quality Results

23.3.1 Water Quality Results from Previous Sampling

Bacteriological

Six samples collected from the Liard Fire Hall water system between September 2004 and March 2005 were tested for total coliform and *E. coli* by Yukon Environmental Health Services using the presence/absence test method. According to the YTG database, *E. coli* and Total Coliform bacteria and *E. coli* were reported as absent in each of the six samples for which results were provided.

Potability

A water sample was collected by YTG representatives from the Liard Fire Hall water system on September 13, 2004. The sample was submitted to Northwest Labs for detailed potability analyses. Additional analytic results were also provided by YTG for a sample collected on June 22, 2005. The results of these analyses are summarized in Table 4962-2 and included in Appendix A23. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, to identify and recommend additional sampling and analytical, and to identify potential indicators of contamination.

- Turbidity results of 3.0 and 16.4 NTU, were in exceedence of the CDWQG MAC of 1.0 NTU;
- The total iron was reported at 1.4 mg/L on June 22, 2005 which is above the CDWQG aesthetic objective of 0.30 mg/L;
- At 0.118 and 0.0537 mg/L, the manganese concentration was reportedly in exceedence of the CDWQG aesthetic objective of 0.05 mg/L;
- The water quality results indicated that all other health based and aesthetic objectives were met for the parameters analyzed; and,
- The hardness of approximately 220 mg/L is considered poor for aesthetic purposes.

23.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Liard Fire Hall that was identified to be included during the water system assessments is detailed below:

- UV absorbance, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option;
- As turbidity was previously in exceedence of CDWQG MAC, a sample was taken to retest for this parameter,
- As total manganese had previously exceeded CDWQG aesthetic objectives, samples were taken to analyze for total and dissolved manganese;
- Total organic carbon concentration to assist with treatment system selection; and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained by EBA during the field program on June 22, 2005, and was submitted for analysis to ALS Environmental in Vancouver, BC. These results are summarized in Table 4862-2 and the laboratory reports are included in Appendix B.

- The turbidity was 49.9 NTU, above the CDWQG MAC of 1.0 NTU, and significantly higher than the previously reported turbidity of 3.0 NTU;
- The total manganese concentration had reportedly decreased to 0.0589 mg/L from the 0.118 mg/L reported during previous sampling, but is above CDWQG aesthetic objectives of 0.05 mg/L. Additionally, the dissolved manganese content was reportedly 0.0573 mg/L, signifying that the manganese content can be almost entirely attributed to dissolved particles.

23.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surface water sources or septic waste. Variations in turbidity can also indicate seasonal fluctuations in water quality caused by infiltration pathways of surface water. Nitrate, nitrite, and chloride concentrations for this site are low and were within the normal background range for the Watson Lake area. The severe increase in turbidity between September and June, however, does indicate that the aquifer from which the Liard Fire Hall receives its water supply may be subject to seasonal fluctuations in water quality and as such may be under the direct influence of surface water.

23.4 Conceptual Hydrogeology

There is no log available for this well. Examination of other well logs in the Upper Liard area indicate alternating sand and gravel sediments with occasional silt and peat. Most wells in the area are completed at depths of 10 m to 16.5 m within a sand and gravel aquifer, with no significant fine grained material or confining layer. The depth and static water level of this well are unknown. The well is located approximately 500 m west of the Liard River and 200 m south of Albert Creek. The direction of groundwater flow is likely east to north towards the Liard River and Albert Creek.

23.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are provided in field notes in Appendix A23. Photos of potential contaminant sources are also provided at the end of the appendix.

A summary of potential contaminant sources within 30 m of the well is provided below:

- Septic tank 8 m from well (required to be 15 m by regulation);
- Septic field (if present) is less than 30 m from well; and,
- Well is located in fire hall washroom.

23.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any contaminant issues for this property or neighbouring properties. One spill record was identified for the Upper Liard area. On May 9, 1996, it was reported that a fuel tank near the Upper Liard Wash House tipped over, spilling approximately 113 L of fuel oil. The spill occurred a significant distance from the fire hall and there is no risk associated with this water system.

23.6 Identified Water System Deficiencies and Associated Risk

23.6.1 High and Medium Risk Deficiencies

Site investigations and system inspections of the Liard Fire Hall water system found the following high and medium risk deficiencies:

- The well is located within 30 m of potential contaminant sources, including the fire hall septic system;
- The fire hall septic system did not appear to be constructed in compliance with existing regulations;
- Turbidity levels are consistently above the CDWQG MAC and are variable, which may indicate that the well is under direct influence surface water;
- The water system is not equipped with a disinfection or treatment system;

- Poor surface completion of the well (the well is located in the fire hall washroom and the casing does not extend above grade);
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Well Construction Guidelines);
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water (because there is no information on the completion depth and because it does not meet the requirements of the Guidelines for Water Well Construction; and,
- There is no backflow preventer on the waterline to the water storage tank, and water could potentially flow back to the domestic system and well.

23.6.2 Low Risk Deficiencies

- The manganese concentration exceeded the CDWQG aesthetic objective of 0.05 mg/L.

23.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

23.7.1 Priority 1

Evidence from the water quality samples for this well show that it may be under the direct influence of surface water, and considering all of the known deficiencies with the current well, it is recommended that a new well should be drilled and the current well be decommissioned. The following recommendations should be carried out as a temporary, interim measure until the new well can be drilled:

- The well and water system should be superchlorinated and the casing should be raised to a minimum of 500 mm above grade;
- A softener system, cartridge filtration and an NSF/ANSI 55 certified UV disinfection system should be installed. This is a conceptual design recommendation based on the information available, and is intended to be used for planning and budgeting purposes. Engineering input will be required for final system specifications or design.

- An investigation should be done in order to determine if the existing septic system is properly installed and up to current standards; and,
- A backflow preventer should be installed on the waterline to the fire storage tank in order to prevent water from siphoning back down from the tank into the domestic system or the well.

23.7.2 Priority 2

It is recommended that a new well be constructed in consideration of the following:

- The well should be equipped with a surface seal to at least 6 m and the casing should be extended above grade (500 mm) within a lockable enclosure that is inaccessible to animals and unauthorized personnel;
- The well must be located at a distance greater than 30 m and upgradient from any potential source of contamination, including the above ground storage tank and all parts of the septic system;
- The water from the new well must meet all CDWQG health based guidelines. If there are any exceedences in the CDWQG health-based guidelines then a treatment system must be designed and installed as necessary. The treatment/disinfection system installed for Priority 1 mitigative options can be used for this new water system; and,
- Pending results from the assessment on the septic system, if it is malfunctioning or not up to standards then a new septic system should be installed that is at least 30 m downgradient from the new well.

23.7.3 Priority 3

- If the new well continues to have high manganese, then a reverse osmosis system should be considered to provide water to a dedicated drinking water tap.

23.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

23.8.1 Priority 1

- To superchlorinate the well and water system and extend the casing would cost approximately **$500**;
- The proposed treatment/disinfection system would cost in the order of **$7,000**;
- Additional assessment on the existing septic system should incur minimal cost; and,
- To install a backflow preventer would cost approximately **$400** for materials and labour.

23.8.2 Priority 2

- Assuming the well would be drilled in overburden to a depth of approximately 30 m, it is recommended that **$30,000** be budgeted for materials and labour to drill, test, complete and hook-up the well.
- If the new well is successful, the old well should be properly decommissioned in accordance with the Guidelines for Water Well Construction. It is estimated that this would cost approximately **$1,000**.

23.8.3 Priority 3

- **$600** should be allocated to install a reverse osmosis system.

24.0 BUILDING 4976: WATSON LAKE AMBULANCE BUILDING

24.1 Description of Existing Water system

Building 4976, the Watson Lake Ambulance Building, has water from a 5.3 m dug well located in a pit approximately 3 m from the ambulance building. The well location and other site details are provided in Figure 4976-A, provided in Appendix A24. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 9
- Northing: 6650232
- Easting: 516892

There is no treatment system present on this water system. A schematic detailing the water system is provided as Figure 4976-B in Appendix A24.

24.2 Description of Existing Wastewater Systems

There is a holding tank near the northeast corner of the Watson Lake Ambulance Building approximately 10 m north of the well. A site plan that shows the position of the septic system relative to the well is given by Figure 4976-A in Appendix A24.

24.3 Water Quality Results

24.3.1 Water Quality Results from Previous Sampling

Bacteriological

No test results were provided to EBA for review. Bacteriological sampling of water from the Watson Lake Ambulance Building water system may not have been previously completed.

Potability

A water sample was collected by YTG representatives from the Watson Lake Ambulance Building water system on September 13, 2004. The sample was submitted to Northwest Labs in Surrey, BC for detailed potability analyses.

Additional results were also provided by YTG for a sample collected on June 22, 2005. The results of these analyses are summarized in Table 4976-2 and included in Appendix A24. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify potential indicators of contamination.

- Turbidity was reported as 1.2 NTU in September 2004, which is in exceedence of the CDWQG MAC of 1.0 NTU, follow-up results from June 2005 indicate turbidity below the MAC;
- At 2.5 and 2.3 mg/L, the reported nitrate concentration, although not in exceedence of the CDWQG MAC of 10 mg/L, is considered high relative to normal background concentrations in the region;
- At 35.8 and 60.4 mg/L, the reported chloride concentration, although not in exceedence of the CDWQG aesthetic objective of 250 mg/L, is considered high;
- The water quality results indicated that all other health based and aesthetic objectives were met for the parameters analyzed; and,
- The hardness (as $CaCO_3$), is 286 and 247 mg/L, and is considered as poor for aesthetic purposes.

24.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Watson Lake Ambulance Building that was identified to be included during the water system assessments is detailed below:

- UV absorbance, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option;
- As turbidity was in exceedence of CDWQG MAC, a sample was taken to retest for turbidity;
- As nitrates and chlorides were found to be high, a sample was taken for analysis of nitrates, nitrites, and chlorides, as well as ammonia, in order to determine if the water shows signs impact from surface water or septic wastes;
- Total Organic Carbon (TOC) to assist with treatment system selection; and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature were completed during the system assessment.

Additional Analytical Results

A water sample was obtained by EBA during the field program on June 23, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 4876-2 and the laboratory reports are included in Appendix B. Although there were no reported exceedences in CDWQG, it was found that there was a certain degree of variability in the parameters relative to previous sampling results.

24.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surface water sources or septic waste. Variations in water quality, including turbidity, can also indicate seasonal fluctuations in water quality caused by infiltration pathways of surface water. The chloride concentrations were reported as being 57.7 mg/L during the most recent sampling event, which was above the concentration of 35.3 mg/L that was reported previously. Nitrate concentrations were reported at 2.33 mg/L. In addition, turbidity had decreased from 1.2 NTU from previous sampling to 0.23 and 0.35 NTU in the additional analytical sampling. Therefore, these water quality results suggest that the aquifer from which the groundwater is obtained for the Watson Lake Ambulance Building may be under the influence of surface water sources and/or septic wastes.

24.4 Conceptual Hydrogeology

There is no log available for this dug well. This shallow water table well is completed at a depth of 5.3 m with a static water level of 3.0 m below grade. The well location is on the north side of a groundwater divide; groundwater flow in the area is likely northerly to northwesterly to Wye Lake. It is unlikely that there is protection of this aquifer from surface water or septic effluent contamination, as such this aquifer is considered to be highly vulnerable.

24.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are provided in field notes in Appendix A24. Photos of potential contaminant sources are provided in Appendix A24.

A summary of potential contaminant sources within 30 m of the well is provided below:

- Septic holding tank 10 m from well (not consistent with regulation); and,
- Horse corrals beginning at 1.5 m from the well.

24.5.1 Spills Records and Contaminated Sites Search Results

The Environment Canada Environmental Protection Agency did not identify any recorded spill events or contaminant issues for this site or neighbouring. There were spill records identified for neighbouring sites, and they are outlined below.

On April 28, 1994, it was reported that the spring melt was carrying waste oil from contaminated soils into ditches behind KPA Northern. The discharge was reported to have occurred near the corner of 3rd Street and Wye Drive, and the contaminated snow melt was traveling towards 2nd Wye Lake.

On April 7, 1997, it was reported that there were various industrial products found in a roadside ditch near the corner of 3rd Street and Adela Trail. The products included oil, diesel, and ethylene glycol.

On May 20, 1997, and again on April 14, 1998, it was reported that there was industrial product in the roadside ditch near the corner of 3rd Street and Adela Trail.

There is no record of clean-up of these reported spills. The exact proximity of these spills to the well is not known, however given the high vulnerability of this shallow aquifer and the documented frequency of these spill events in this area of commercial operations, this well should be considered at risk.

24.6 Identified Water System Deficiencies and Associated Risk

24.6.1 High and Medium Risk Deficiencies

Site investigations and system inspections of the Watson Lake Ambulance Building water system found the following high-risk deficiencies:

- The well is only 5.23 m deep, and it is very unlikely that there are any low permeability layers to prevent to prevent surface water infiltration;
- The well is located within 30 m of potential contaminant sources, including a septic holding tank and horse corrals;
- Turbidity levels, in addition to being above CDWQG MAC in previous sampling events, are variable. Chloride and nitrate concentrations were also found to be high and variable. Water quality results suggest that the aquifer from which the ambulance building receives its groundwater supply is under the direct influence of surface water sources and/or septic wastes;
- There are no available records of bacteriological testing, and it is unknown if bacteriological testing has been completed for this water system;
- The water system is not equipped with a disinfection or treatment system;
- Poor surface completion of the well (the well is located in a pit below grade, the wellhead is not equipped with a proper cap and is open);
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Well Construction Guidelines). The well is shallower than the 6 m required for a proper surface sanitary seal; and
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because it is a vulnerable type (unconfined aquifer with a production zone that is less than 15 m below grade) and does not meet the requirements of the Guidelines for Water Well Construction.

24.6.2 Low Risk Deficiencies

There were no low-risk deficiencies identified. All deficiencies are considered high-risk.

24.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

This well is not suitable for a potable water supply and use should be discontinued immediately.

24.7.1 Priority 1

Considering all of the known deficiencies with the current well, it is recommended that it be abandoned and decommissioned. Given the size of the property, existing land use, and distances to potential contaminant sources, it is unlikely that a new well could be safely located on the site. It is recommended that the water system be converted to bulk water delivery. The new water system should meet the following conditions:

- A water storage tank of adequate size should be installed. An addition to house the tank and pump may be required;
- A regular storage tank-cleaning schedule should be initiated and it should be ensured that the free available chlorine at the time of delivery is 0.4 mg/L and 0.2 mg/L at the point of consumption.

Additionally, until the new tank is installed and water is available from delivery, a sign should be posted stating that the water should not be used as a drinking water source. Bottled water should be provided. Consultation with YTG Environmental Health and Social Services is recommended.

24.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

24.8.1 Priority 1

- A 2000 L water storage tank, and sufficiently sized jet pump, assuming that an addition to the ambulance building will not have to be built, would cost approximately **$3,000** including installation in order to convert this system to water delivery. A contingency of **$5,000** is suggested to cover the cost of an add-on if required.

- The existing well should be properly decommissioned in accordance with the Guidelines for Water Well Construction. It is estimated that this would cost approximately **$1,000**.

25.0 BUILDING 4981: WATSON LAKE ENERGY, MINES, AND RESOURCES OFFICE

25.1 Description of Existing Water system

Building 4981, the Watson Lake Energy, Mines, and Resources Office, is supplied water from a 22.7 m deep well located in a pit approximately 2 m from the building. The well location and other site details are provided by Figure 4981-A in Appendix A25. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 9
- Northing: 6658342
- Easting: 515715

The water system is equipped with an AMG filter and a water softening system, and there is also a reverse osmosis treatment system that supplies water to one tap in the office kitchen. A schematic detailing the well water system is provided as Figure 4981-B in Appendix A25.

25.2 Description of Existing Wastewater Systems

The Watson Lake Energy, Mines, and Resources Office is served by a septic system located on the southwest side of the office building. The septic tank is approximately 13 m west of the well and likely discharges effluent to the west of the tank. Additionally, there is a septic field serving one of the neighboring buildings that is approximately 45 m northeast of the well, and a sinkhole that likely marks the location of an abandoned septic tank approximately 32 m north of the well.

25.3 Water Quality Results

25.3.1 Water Quality Results from Previous Sampling

Bacteriological

Eight samples were collected from the Watson Lake Energy, Mines, and Resources Office water system between September 2004 and March 2005 and were tested for total coliform and *E. coli* by Yukon Environmental Health Services using the

presence/absence test method. Results are tabulated in Table 4981-1 in Appendix 25. Coliform bacteria and *E. coli* were reported as absent in each of the eight samples for which results were provided.

Potability

A water sample was collected by YTG representatives from the Watson Lake Energy, Mines, and Resources Office water system on October 13, 2004. The sample was submitted to Northwest Labs in Surrey, BC for potability analyses. The results of these analyses are summarized in Table 4981-2 in Appendix A25. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify potential indicators of contamination.

- At 36.1 NTU, turbidity significantly exceeded both the CDWQG MAC of 1.0 NTU and aesthetic objective of 5.0 NTU;
- At 1.39 mg/L, the barium concentration exceeded the CDWQG MAC of 1.0 mg/L;
- At a level of greater than 60 CU, the colour exceeded the CDWQG aesthetic objective of 15 CU.
- At 0.0053 mg/L, the arsenic concentration exceeded the new proposed CDWQG MAC of 0.005 mg/L;
- At 289 mg/L, the chloride concentration was above the CDWQG aesthetic objective of 250 mg/L;
- At 2.85 mg/L, the iron concentration exceeded the CDWQG aesthetic objective of 0.3 mg/L;
- At 0.576 mg/L, the manganese concentration exceeded the CDWQG aesthetic objective of 0.05 mg/L;
- At 628 mg/L, the total dissolved solids exceeded the CDWQG aesthetic objective of 500 mg/L; and,
- All other health based and aesthetic objectives were met for the parameters analyzed. The hardness (as $CaCO_3$) was 541 mg/L, and is considered unacceptably hard.

25.3.2 Identification of Additional Analytical Testing Required

From the raw, untreated water, the following samples were taken:

- Detailed potability; and,

- Analysis for EPH and PAH to determine if the water supply shows signs of hydrocarbon contamination.

From softened water, the following samples were taken:

- Detailed potability;
- Dissolved metals to compare with total metals concentrations;
- Ammonia;
- Total organic carbon concentration; and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Samples of the RO treated water (post softener and RO at the dedicated drinking water tap in the kitchen) included:

- Detailed potability;
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained by EBA during the field program on June 21, 2005, and was submitted to ALS Environmental in Vancouver, BC for the analyses indicated above. These results are summarized in Table 4981-2 in Appendix A25 and the laboratory reports are included in Appendix B.

Results from previous sampling show that there was likely no treatment system at the time when baseline water quality analysis was taken, and this water likely shows raw water quality.

Raw water results are summarized below:

- Groundwater was calcium chloride type water with very high hardness;
- At 15.9 NTU, was well above the CDWQG MAC of 1.0 NTU;
- At 0.794 mg/L, the barium concentration was considered to be very high for groundwater in the Watson Lake area;
- The total dissolved solids concentration at 1240 mg/L indicated that the water was brackish;
- At 298 mg/L the chloride concentration was very high relative to background water quality;
- The total iron concentration of 1.28 mg/L was above the CDWQG aesthetic objective;

- The total manganese concentration of 1.01 mg/L, was above the CDWQG aesthetic objective.
- Analytical results for EPH and PAH indicated that concentrations for every parameter tested were less than detection limits and CDWQG.

It was observed during the site inspection that the softener system at this site had been recently installed. Results from additional analytical sampling show that there was an improvement of the water quality from the raw water samples:

- At 0.28 NTU, turbidity had been lowered below both the CDWQG MAC and AO;
- The barium concentration had been reduced to below the detection limit of 0.20 mg/L;
- The total dissolved solids had been reduced from 1240 mg/L to 996 mg/L, but was above CDWQG aesthetic objective and is considered brackish;
- At 299 mg/L the chloride concentration had not changed and remained above the CDWQG aesthetic objective;
- The total iron concentration had been reduced to less than the detection limit of 0.030 mg/L, and,
- The total manganese concentration had been reduced to less than the detection limit of 0.020 mg/L.

Results from the sample collected post reverse osmosis treatment showed further improvement as indicated below:

- The total dissolved solids had been significantly reduced to 48 mg/L; and,
- At 20.3 mg/L the chloride concentration had been reduced to below the CDWQG aesthetic objective;

Follow up baseline sample results were provided by YTG for a sample collected on June 22, 2005. These results are summarized in Table 4981-2 in Appendix A25. The results indicate that the sample was likely collected from the softened water, but not the RO treated water. The analytic results for this sample are consistent with previous results, which indicate chloride concentrations above the CDWQG aesthetic objective.

25.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surface water sources or septic waste. Chloride concentrations reported from baseline and additional analytical water quality results were very high (between 272 mg/L and 299 mg/L). Nitrate, nitrite, and ammonia concentrations reported from baseline and

additional analytical water quality results, however, were found to be low and were within the normal background range for the Watson Lake area.

The Town of Watson Lake sewage lagoon is likely upgradient from the well and it is considered probable this that is causing the high chlorides reported in this water system. Other wells in the area downgradient from the sewage lagoon also have elevated chloride concentrations.

Concentrations of total barium reported from baseline and additional analytical water quality results were observed to be 1.39 mg/L and 0.794 mg/L, respectively and are considered to be elevated above background groundwater concentrations. It is possible that a barite plant located upgradient of the site is the cause of the elevated barium observed in the region.

Considering the proximity of this well and surrounding wells to both a barite plant and a sewage lagoon, additional hydrogeological assessment and water quality analysis is recommended.

25.4 Conceptual Hydrogeology

The log for this well indicates that the well is completed at a depth of 22.9 m in a sand a gravel aquifer. The lithology consists of 15.2 m of silty sand overlying 7.7 m and permeable sand and gravel. No static water level information is available. The lithology is consistent with that of the nearby grader station well, which indicates alternating fine and coarse material to a depth of 17.8 m. The well is located on the north side of a groundwater divide, the direction of groundwater flow is inferred to be easterly to northeasterly towards Wye Lake.

25.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are provided in field notes in Appendix A25. Photos of potential contaminant sources are also provided in this appendix.

A summary of potential contaminant sources within 30 m of the well is provided below:

- Septic tank at 13 m (in contravention of regulation);
- Above ground fuel storage tank at 13 m;
- An industrial junkyard at 20 m; and,
- Scrap metal parts at 20 m.

Additionally, there is a barite plant and a sewage lagoon that are inferred to be located upgradient from the well.

25.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environment Branch did not identify any recorded spill events or contaminated sites issues for this property or neighbouring properties.

25.6 Identified Water System Deficiencies and Associated Risk

25.6.1 High and Medium Risk Deficiencies

- The wellhead is located within 30 m of potential sources of contamination, including the septic tank, an industrial junkyard, and scrap metal parts;
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Well Construction Guidelines);
- Poor surface completion of the wellhead (located in a pit, the wellhead was open with no cap on the casing);
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because it does not meet the requirements of the Guidelines for Water Well Construction;
- There is no disinfection system. There is, however, a treatment system consisting of an AMG filter, a water softener, and a reverse osmosis device. This treatment system was not functioning properly at the time of inspection and had to repaired by one of the inspection team members;
- Water quality data indicates that the raw groundwater quality is very poor, and could pose a risk if the treatment system ceases to function properly. There were historical exceedences of CDWQG MAC for turbidity and barium in untreated water;

- The well is located downgradient from a barite plant; the high barium concentrations observed in raw water would be a high-risk if the treatment system were ever to malfunction;
- The well is located approximately 390 m from the Town of Watson Lake sewage lagoon, and the lagoon is likely upgradient from the well. Water quality analyses indicate elevated chlorides in exceedence of CDWQG aesthetic objectives, providing evidence that this aquifer may be being impacted from the sewage lagoon; and,
- The softener system and RO filter drains are not properly installed and may be subject to cross contamination.

25.6.2 Low Risk Deficiencies

- The arsenic concentration reported for baseline raw water sampling event was slightly in exceedence of the proposed CDWQG MAC; and,
- The total and dissolved manganese concentrations in the raw water are in exceedence of CDWQG aesthetic objectives.

25.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

25.7.1 Priority 1

The following Priority 1 mitigative options should be carried out to address the deficiencies associated with the water system at the Watson Lake Energy, Mines, and Resources Office:

- The well and water system should be superchlorinated and a cap be installed on the wellhead;
- It is recommended that an NSF/ANSI 55 certified UV disinfection system be installed. This is a conceptual design recommendations based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications;
- Regular monitoring, maintenance should be completed on a daily basis to ensure the water treatment system is always functioning properly;

- Signs should be posted at all points of use on this water system to inform building users that only water from the dedicated drinking water tap in the kitchen area is suitable for drinking; and,
- The reverse osmosis and softener drains should be re-plumbed in order to provide air gaps.

25.7.2 Priority 2

The following mitigative options should be carried out to address the medium-risk deficiencies associated with the water system at the Watson Lake Energy, Mines, and Resources Office:

- The wellhead completion should be improved. This would involve raising the well casing to a minimum of 500 mm above ground level and retrofitting a proper surface-seal to 3 m below grade;
- The ground surface around the wellhead should be graded to promote surface drainage away from the well;
- An additional assessment should be done in order to determine the location of the start of the effluent field; and,
- A detailed hydrogeological assessment should be carried out in order to determine if the sewage lagoon and the barite plant are contaminating the aquifer that provides groundwater to this facility.

25.7.3 Priority 3

- There are no Priority 3 mitigative options recommended for this site.

25.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

25.8.1 Priority 1

- To superchlorinate the well and water system, and install a proper cap would likely cost in the order of **$250**;
- The cost for a UV disinfection system would be approximately **$2,200**;
- Approximately **$250** should be allocated to replumb the reverse osmosis and softener drains;
- Ensuring that the water treatment system is in proper working order should be completed under normal operations and maintenance costs; and,
- Posting a signs would incur minimal cost.

25.8.2 Priority 2

- The cost for the wellhead upgrades, including raising the casing, installing a surface seal to 3 m below grade, and installing a 150 mm commercial pitless unit would cost in the order of **$5,000**;
- Determining the location of the start of the effluent field should incur minimal cost; and,
- Conducting a detailed hydrogeological study, including drilling a series of monitoring wells, to determine if the barite plant is the cause of elevated barium in the area, would cost in the order of **$20,000**. Since there are two other YTG maintained facilities in the area whose wells show similar signs of contamination, the cost for this site would be approximately **$6,700**.

26.0 BUILDINGS 4993 AND 4994: WATSON LAKE EMR FIRE CONTROL CENTRE AND TANKER BASE

26.1 Description of Existing Water system

The Watson Lake EMR Fire Control Centre (Buildings 4993) and the EMR Tanker Base (Building 4994) are supplied water from a well that is located approximately 53 m from the tanker base (building 4994). The well is connected with a commercial pitless unit. The well location and other site details are provided in Figure 4994-A, provided in Appendix A26. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 9
- Northing: 6664425
- Easting: 510654

There is no treatment system present on this water system. In addition to servicing the two EMR buildings, the well also supplies a water storage tank and three fire retardant tanks to supply aircraft for forest fire fighting. A schematic detailing the water system is provided as Figure 4994-B in Appendix A26.

26.2 Description of Existing Wastewater Systems

The septic system for both the Watson Lake EMR Fire Control Centre and Tanker Base is located at a distance greater than 60 m west of the well.

26.3 Water Quality Results

26.3.1 Water Quality Results from Previous Sampling

Bacteriological

Four samples were collected from the EMR Fire Control Centre water system between November 2004 and March 2005, and two samples were also collected from the EMR Tanker Base between May and June 2005 and were tested for total coliform and *E. coli* by Yukon Environmental Health Services using the presence/absence test method. Results are tabulated in Table 4994-1 in

Appendix A26. Coliform bacteria and *E. coli* were reported as absent in each of the four samples for which results were provided for the EMR Fire Control Centre. One sample from the EMR Tanker Base, however, tested positive for Total Coliform bacteria.

Potability

A water sample was collected from the Watson Lake EMR Fire Control Centre and Tanker Base water system on November 9, 2004. The sample was submitted to Northwest Labs in Surrey, BC for detailed potability analyses. Additional analytic results were also provided by YTG for baseline samples collected on June 22, 2005. The results of these analyses are summarized in Table 4994-2 in Appendix 26. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality, identify and recommend additional sampling and analytical, and to identify potential indicators of contamination.

- At 9.2 and 11.2 NTU, turbidity exceeded both the CDWQG health based upper limit of 1.0 NTU and aesthetic objective of 5.0 NTU;
- At a level of greater than 60 CU, the colour exceeded the CDWQG aesthetic objective of 15 CU;
- At 0.58 and 2.78 mg/L, iron concentrations exceeded the CDWQG aesthetic objective of 0.3 mg/L;
- At 0.158 and 0.164 mg/L, manganese concentrations exceeded the CDWQG aesthetic objective of 0.05 mg/L; and,
- All other health based and aesthetic objectives were met for the parameters analyzed.
- The hardness (as $CaCO_3$) was approximately 120 mg/L and is considered moderately hard.

26.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Watson Lake EMR Fire Control Centre and Tanker Base that was included in the water system assessments is detailed below:

- UV absorbance, as well as tannins and lignin, to determine potential for UV treatment as a disinfection option for this water system;

- Previous sampling had shown very high turbidity, and as such, a sample was obtained to retest for turbidity;
- Analysis for total and dissolved iron and manganese to determine the amount of each associated with suspended compared to dissolved particles;
- Total Organic Carbon, to assist with selection of a treatment system;
- Analysis for EPH and PAH to determine if the water supply shows signs of hydrocarbon contamination;
- Analysis for OCP to determine if the water supply shows signs of contamination by DDT or other organochlorine pesticides; and,
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained by EBA during the field program on June 23, 2005, and was submitted to ALS Environmental in Vancouver, BC for analysis. These results are summarized in Table 4994-2 in Appendix A26 and the laboratory reports are included in Appendix B. Results from the additional analytical are summarized below:

- At 13.8 NTU, turbidity was above the CDWQG MAC of 1.0 NTU;
- The total iron concentration, at 2.94 mg/L was higher that the 0.58 mg/L reported during previous sampling. The dissolved iron content was reportedly less than the detection limit of 0.030 mg/L, showing that the iron content can be almost entirely attributed to suspended solids;
- The total manganese concentration was 0.192 mg/L and the dissolved manganese content was reportedly 0.189 mg/L, signifying that the manganese content can be almost entirely attributed to dissolved particles;
- Results for EPH and PAH indicated that every parameter tested was below the analytical detection limit; and,
- Results for OCP reported every parameter tested w as below the laboratory detection limit.

26.3.3 Indicators of Potential Contamination

No elevated concentrations of indicator parameters were observed in the sample results reviewed.

26.4 Conceptual Hydrogeology

No log was available for this well. Lithology from the nearby Watson Lake Airport well (4851) indicates alternating fine and coarse material to a depth of 33.4m. The depth of this well is unknown; the static water level was measured to be 4.395 m below grade. This well is located approximately 700 m north of Watson Lake. The groundwater flow direction is southerly to southeasterly towards Watson Lake.

26.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are provided in field notes in Appendix A26. Photos of potential contaminant sources are provided in this appendix.

A summary of potential contaminant sources within 30 m of the well is provided below:

- Fire retartant tanks from 15 m to 25 m;
- Above ground aviation fuel storage tank at 30 m; and,
- Evaporation lagoon at 10 m.

26.5.1 Spills Records and Contaminated Sites Search Results

EBA has completed environmental site assessments for the Watson Lake Airport as a part of a separate contract between 2001 and 2004. The results of these investigations indicated that there is a former U.S. Military dump site dating from World War II located approximately 350 m upgradient from this well. Analytical testing for hydrocarbon parameters and metals concentrations in groundwater in the vicinity of the dump during the previous investigation did not indicate any parameters above the contaminated site regulations (CSR). Additional extractable petrolem hydrocarbons, polycyclic aromatic hydrocarbons, and organochlorine pesticide testing duiring the additional assessment did not identify any parameter above detection limits. It is unlikely, therefore, that this water source is being

impacted from leachate deriving from this former military dump site at the time of sampling.

26.6 Identified Water System Deficiencies and Associated Risk

26.6.1 High and Medium Risk Deficiencies

The following deficiencies were identified as high-risk for the Watson Lake EMR Fire Control Centre and Tanker Base water system:

- The wellhead is located within 30 m of potential sources of contamination, including an evaporation lagoon 10 m from the well;
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Well Construction Guidelines);
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because the well completion depth is unknown and the well construction and does not meet the requirements of the Guidelines for Water Well Construction;
- There has been a consistent history of high turbidity reported at this water system. The most recent water quality analysis reported turbidity to be 13.8 NTU, well above the CDWQG MAC. Turbidity was previously reported as 9.2 and 11.2 NTU;
- There has been a positive total coliform count reported; and,
- This water system is not equipped with a treatment or disinfection system.

The water is used to supply fire retardant tanks in addition to supplying the EMR fire control centre and tanker base domestic systems. Although it is not a health-based deficiency for the water system, an additional high-risk deficiency with this water system is that the yield is reportedly too low to meet the peak firefighting water demand. Additionally, there is no backup well. This tanker base supplies planes that combat forest fires in the Southeast Yukon and Northern British Columbia, and the consequences of an undersized water supply could be great if a major fire threatens a community in these regions.

26.6.2 Low Risk Deficiencies

The following deficiencies were identified as low-risk for the Watson Lake EMR Fire Control Centre and Tanker Base water system:

- The total iron concentration was in exceedence of the CDWQG aesthetic objective;

- The total and dissolved manganese concentrations in the water were in exceedence of CDWQG aesthetic objectives;
- Previous water quality results indicated exceedences of CDWQG aesthetic objectives for colour.
- There are fire retardant tanks located between 15 m and 25 m from the well. They are, however, all double-walled Enviro Tanks equipped with secondary containment; and,
- There an above ground aviation fuel storage tank located approximately 30 m from the well. It is, however, a double-walled EnviroTank equipped with secondary containment.

26.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by identified level of priority (with Priority 1 being the most urgent).

26.7.1 Priority 1

- It is recommended that NSF-61 certified filtration and a NSF/ANSI 55 certified UV disinfection system be installed in the tanker base. A duplex water softener would also be required for pretreatment. These are conceptual design recommendations based on the information available for planning and budgeting purposes. Engineering input will be required for final system specifications;
- A short-term constant rate high yield pump test should be conducted in order to determine the yield of this well; and,
- An investigation into the adequacy of the existing pump relative to the results of the pumping test, and the adequacy of the pump controls and electrical for the pump should be completed at the time of the pump test.

For the interim, it should not be necessary to install disinfection and treatment in both buildings. The treatment/disinfection system should be installed in the tanker base because it serves as a living quarters for staff. A sign should be posted in the fire control centre, however, that the water should not be used for potable purposes and drinking water be obtained from the tanker base.

26.7.2 Priority 2

Due to the importance of a large water supply to meet peek demand for this facility, it is recommended that a new well be drilled and the current well be used as a backup well. This new well, pending water quality results, could then be used as the main source for the EMR fire control centre and tanker base. It is recommended that a new well be installed to meet the following conditions:

- The well should be equipped with a surface seal to at least 6 m and the casing should be extended above grade (500 mm) within a lockable enclosure that is inaccessible to animals and unauthorized personnel;
- The well must be located at a distance greater than 30 m from any potential source of contamination, including the above ground storage tanks, all parts of any septic system, and the evaporation lagoon; and,
- NSF/ANSI 55 certified UV disinfection system should be installed in the fire control centre, with a residential sized water softener for pretreatment. These are conceptual design recommendation based on the information available, and are intended to be used for planning and budgeting purposes. Engineering input will be required for final system specifications or design.

The existing well should then be properly disconnected from supplying the EMR fire control centre and tanker base's domestic water system, and be used exclusively as an auxiliary water supply source for forest fire fighting.

26.7.3 Priority 3

- There are no Priority 3 recommendations for this site.

26.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

26.8.1 Priority 1

- The proposed treatment/disinfection system would cost in the order of **$6,700**;

- A short term, high yield pump test, and inspection of the existing pump and controls would cost approximately **$2,500**; and,
- A contingency in the amount of **$6,000** should be budgeted in the event that a new pump is required.

26.8.2 Priority 2

- The new well is to be installed with a proper surface seal and wellhead enclosure, assuming overburden to a depth of approximately 30 m, it is recommended that **$25,000** be budgeted for materials and labour to drill, test, complete and hook-up the well; and,
- The proposed treatment/disinfection system for the fire control centre would cost approximately **$4,500**.

27.0 BUILDING 6746: ROSS RIVER HALL

27.1 Description of Existing Water system

Building 6746, the Ross River Fire Hall, is served by a water system that delivers water from a 110 m deep well located in a locked pit approximately 1 m from the fire hall. The well location and other site details are provided in Figure 6746-A in Appendix A27. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 8
- Northing: 6874869
- Easting: 633545

This water system is equipped with a chlorination system. The water services both the domestic water supply for the fire hall as well as an approximately 10,000 L water storage tank. In addition to serving the fire hall, this well also serves a water delivery fill station obtains water from the same water storage tank. This water delivery service is used as the main source of water for the community of Ross River, and is maintained by the Government of Yukon Community Services Department.

27.2 Description of Existing Wastewater Systems

There is septic holding tank approximately 17 m to the east of the well. A site diagram showing the location of the septic system is provided as Figure 6746-1 in Appendix A27. Additionally, there is a septic disposal field for the nearby TND Hotel that is located approximately 30 m south of the well, which reportedly, may not be constructed properly (Jacobsen, 2002).

27.3 Water Quality Results

27.3.1 Identification of Additional Analytical Testing Required

Bacteriological

Five samples were collected from the Ross River Fire Hall water system between September 2004 and March 2005 and were tested for total coliform and *E. coli* by

Yukon Environmental Health Services using the presence/absence test method. Results are tabulated in Table 6746-1 in Appendix A27. Coliform bacteria and *E. coli* were reported as absent in each of the seven samples for which results were provided.

Potability

A water sample was collected by a YTG representative from the Ross River Fire Hall water system on October 26, 2000. The sample was submitted to ASL Analytical Service Laboratories for detailed potability analyses. The results of these analyses are summarized in Table 6746-2 and are included in Appendix A27.

- The water quality analysis indicated that the groundwater source is calcium bicarbonate type water with very high hardness (277 mg/L as $CaCO_3$);
- At 0.0171 mg/L, the arsenic concentration, though it does not exceed the current MAC of 0.025 mg/L exceeds the proposed CDWQG MAC of 0.005 mg/L. The dissolved arsenic concentration was 0.0163 mg/L, and therefore the arsenic content can be attributed almost entirely to dissolved particles;
- At 0.078 mg/L, the manganese concentration exceeds the CDWQG aesthetic objective of 0.05 mg/L. The dissolved manganese concentration was 0.076 mg/L, and therefore the manganese content can be almost entirely attributed to dissolved particles;
- All other health based and aesthetic objectives were met for the parameters analyzed.
- The elevated hardness is considered to be generally poor for aesthetic purposes.

27.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Ross River Fire Hall that was identified for inclusion during the water system assessments is detailed below:

- Trihalomethane parameters (THM) were analyzed, as there is an existing chlorine disinfection system. These include (bromodichloromethane, bromoform, chloroform, dibromochloromethane). THMs and other disinfection by-products are formed when chlorine disinfectants react with naturally occurring organic matter in the source water. Some studies have linked THMs to increased risk of cancer.

- Haloacetic Acid (HAA) analysis has been included as well due to the presence of the chlorination system. Similar to THMs, HAA can be present in chlorinated drinking water as a disinfectant byproduct formed when the chlorine reacts with natural organic matter in raw water supplies.
- Samples were obtained for the full suite of both total and dissolved metals for comparison. The analysis included vanadium for use in future arsenic treatment system design;
- Samples were also obtained for silicate and phosphate in order to determine the effectiveness of an arsenic removal system;
- Measurements in the field for free available chlorine.

Additional Analytical Results

A water sample was collected by EBA during the field program on June 23, 2005, and was submitted for analysis to ALS Environmental in Vancouver, BC. The results are summarized in Table 6746-2 in Appendix A27 and the laboratory reports are included in Appendix B.

- At 0.0150 mg/L, the arsenic concentration, though it does not exceed the current MAC of 0.025 mg/L exceeds the proposed CDWQG MAC of 0.005 mg/L; and,
- At 0.0851 mg/L, the manganese concentration exceeds the CDWQG aesthetic objective of 0.05 mg/L.
- The residual chlorine concentration at the time of the assessment was 0.01 mg/L which is significantly less than the required FAC of 0.2 mg/L at the point of consumption.

27.3.3 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surface water sources or septic waste. No elevated concentrations of indicator parameters were observed in the sample results reviewed.

27.4 Conceptual Hydrogeology

The log for this well indicates that the well is completed at a depth of 110 m within a highly confined sand and gravel aquifer. Permafrost was encountered during drilling from 8.2 to 18.6 m below grade. The presence of silt and clay sediments from 0 to 101.5 m provides protection from surficial sources of contamination. The static water level is 7.7 m below grade. The well is located approximately 500m

southwest of the Pelly River. The direction of groundwater flow is likely northeast towards the Pelly River.

27.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation can be found in field notes in Appendix A27, and are summarized below:

- Fire hall septic tank is approximately 14 m;
- TND Hotel septic system is approximately 28 m;
- Underground storage tank at fire hall is approximately 13 m;
- Former Service station on adjacent property (66 m to tank nest); and,
- Above ground fuel storage tank is approximately 30 m from well.

27.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any contaminated site issues with the Ross River Fire Hall. There were several spill records for the region, however, it seems that none of the identified spills were within 300 m of the site.

27.6 Identified Water System Deficiencies and Associated Risk

27.6.1 High or Medium risk Deficiencies

Several high and medium risk deficiencies were identified for the Ross River Fire Hall water system including:

- Potential contaminant sources within 30 m of the well, including the fire hall septic tank and the septic system from the nearby TND Hotel;
- An underground fuel storage tank is located only 13 m from the well, and an above ground fuel storage tank 29 m from the well;
- Poor surface completion of the well (located in a pit below grade)
- There is no surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Well Construction Guidelines);
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because it does not meet the requirements of the Guidelines for Water Well Construction;

- Low residual chlorine concentration at the point of consumption;
- At the time of the inspection, a flow switch controlled the Grundfos digital dosing meter chlorine injection pump. Apparently, the switch had been "sticking". We understand that Community Development had ordered a flow meter to install with the DME system to ensure proportional feed of chlorine to the system.
- The arsenic concentration, although it is not in exceedence of the current MAC, is in exceedence of the proposed CDWQG MAC of 0.005 mg/L; and,
- There is an abandoned service station approximately 66 m from the site that potentially has hydrocarbon impacted soil and groundwater.

27.6.2 Low Risk Deficiencies

The following deficiencies were identified as being low-risk for the Ross River Fire Hall:

- Manganese concentrations are in exceedence of the CDWQG aesthetic objective of 0.05 mg/L;

27.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

27.7.1 Priority 1

- Initiate a residual chlorine-monitoring program and adjust chlorination system as required to maintain residual chlorine concentration above 0.2 mg/L at the point of consumption within the fire hall. If not already completed, the existing flow switch should be replaced with a pulse water meter to effect proportional chlorine feed;
- At least once every 6 months, all internal areas of the water tank shall be cleaned and disinfected;
- It is recommended that Environmental Health Services proceed with action to have the existing non-conforming in-ground sewage systems at the TND Hotel (former Welcome Inn) removed from service. This may result in the installation of sewage holding tanks that conform to the required setback distances; and,
- The underground fuel storage tank should be removed and replaced with an above ground double-walled EnviroTank fuel storage tank with secondary

containment. Due to size constraints of the property and the location of the well with respect to the building it is unlikely that the fuel tank could be placed at a distance greater than 30 m from the well, but it should be placed on the side of the fire hall opposite from the well at least 15 m from the well.

27.7.2 Priority 2

- The wellhead completion should be improved. This would involve raising the well casing to a minimum of 500 mm above ground level in a lockable enclosure, and retrofitting a proper surface-seal to at least 3 m below grade;
- The ground surface around the wellhead should be graded to promote surface drainage away from the well;
- The fire hall's septic holding tank should be removed and relocated to a distance greater than 30 m from the well. Since this well is the source for a community system, the new septic system can only be a holding tank and cannot discharge effluent as long as it is within 60 m of the well; and,
- A point of entry (POE) treatment system for arsenic removal should be installed. It is recommended that a suitable POE system be designed through pilot testing. It is suggested that this site could be the initial pilot site to investigate the feasibility of such a system to be applied at other sites in the Yukon. Arsenic removal to below the proposed CDWQG guideline will ultimately be necessary to utilize this water source as a drinking water supply; and,
- It is recommended that the owner investigate the potential vulnerability of the community well from hydrocarbon contamination that may be present in soils at the nearby abandoned service station.

27.7.3 Priority 3

- Consideration should be given to installing a point of use RO system for manganese removal in the fire hall. This would also ensure a redundant arsenic removal in the event that the POE system failed.

27.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

27.8.1 Priority 1

- The cost to initiate and conduct a residual chlorine-monitoring program would fall under normal operation and maintenance costs. We understand that Community Services is currently in the process of ordering and arranging for the installation of the flow meter to initiate proportional feed.
- It is anticipated that the cost to inspect, remove and replace the septic system(s) at the TND hotel would be covered by others.
- The cost to remove the existing underground storage tank, and to install a new 5000 L above ground EnviroTank would be in the order of **$10,000** depending on the amount of hydrocarbon impacted soil (if any) requires removal and treatment.

27.8.2 Priority 2

Class D cost estimates for Priority 2 upgrades for this site are as follows:

- The cost to upgrade the wellhead completion is estimated to be about **$5,000**.
- Relocating the fire hall septic holding tank would cost in the order of **$5,000**.
- A point of entry (POE) treatment system for arsenic removal is anticipated to cost in the order of **$4,500** for materials and labour.
- An investigation to determine whether hydrocarbon contamination resulting from the former service station on the property adjacent to the site is impacting on the subsurface conditions on this site, would cost in the order of **$10,000**. It is envisioned that this environmental assessment would involve drilling of two or three monitoring wells just inside the fire hall property line.

27.8.3 Priority 3

- Installing a point of use RO system would cost in the order of **$600**.

28.0 BUILDING 6591: DRURY CREEK PUMPHOUSE

28.1 Description of Existing Water system

The Drury Creek Grader Station maintenance garage and living complex are served by a water system that delivers water from a 6.5 m deep dug well completed with a perforated 1.8 m diameter galvanized culvert. The well is located in building 6591, the Drury Creek Pumphouse. The well location and other details about the surrounding area are provided in Figure 6591-A in Appendix A28. The coordinates of the wellhead, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 8
- Northing: 6896764
- Easting: 531777

The dug well serves both the living complex and the maintenance garage. Each side of the system has a jet pump and control box and there is a submersible pump within the well. The maintenance garage has an inline cartridge filter, however, there is no other treatment or disinfection associated with this water system. A schematic detailing the water system is provided as Figure 6591-B in Appendix A28. Photos of the well and water system are also included at the back of this appendix.

28.2 Description of Existing Wastewater Systems

Septic effluent from the maintenance garage is discharged to a septic field located on the northwest side of the building approximately 32 m south and likely cross gradient from the well. The living complex wastewater is discharged to a septic system south of the complex and the field is located greater than 60 m southwest of the well. Septic system locations are indicated on Figure 6591-A.

28.3 Water Quality Results

28.3.1 Water Quality Results from Previous Sampling

Bacteriological

Six samples were collected from the Drury Creek Pumphouse water system between September 2004 and March 2005 and were tested for total coliform and *E.*

coli by Yukon Environmental Health Services using the presence/absence test method. Results are tabulated in Table 6591-1 in Appendix A24. Coliform bacteria and *E. coli* were reported as absent in each of the six samples for which results were provided.

Potability

Water samples were collected from the Drury Creek Pumphouse water system on September 8, 2004 and June 22, 2005. The samples were submitted to Northwest Labs and ALS Environmental for potability analyses. The results of these analyses are summarized in Table 6591-2 in Appendix A28. EBA reviewed the analytical results to compare them with the Canadian Drinking Water Quality Guidelines (CDWQG) to observe general water quality; identify and recommend additional sampling and analytical; and, to identify potential indicators of contamination. The following observations were made:

- The water quality results for the sample collected on September 8, 2004 indicated that all health based and Aesthetic Objectives (AOs) were met for the parameters analyzed;
- For the sample collected on June 21, 2005 turbidity at 1.08 NTU, was slightly above the CDWQG maximum acceptable concentration (MAC) of 1.0 NTU;
- The water quality results from June 21, 2005 indicated iron at 0.127 mg/L to be above the AO of 0.03 mg/L;
- The water quality results indicate that the groundwater is calcium-bicarbonate type; and,
- The hardness (as $CaCO_3$) at approximately 165 mg/L is considered hard.

28.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Drury Creek Pumphouse that was identified to be included during the water system assessments is detailed below:

- UV absorbance and UV transmissivity, as well as tannin and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Total organic carbon (TOC), to assist with treatment system selection;
- Extractable Petroleum Hydrocarbons (EPH) to determine if there are indications of hydrocarbon impact to the well; and,

- Measurements in the field for total dissolved solids (TDS), conductivity, pH, and temperature.

Additional Analytical Results

A water sample was obtained by EBA during the field program on August 8, 2005, and was submitted to ALS Environmental for analysis. These results are summarized in Table 6591-2 in Appendix A24 and the laboratory reports are included in Appendix B. Significant observations are detailed below:

- EPH concentrations were below the laboratory detection limits; and,
- Field chemistry results indicated that physical parameters at the point of use are within the CDWQG aesthetic objectives (AO) for those parameters.

28.3.3 Indicators of Potential Contamination

No elevated concentrations of indicator parameters were observed in the sample results reviewed.

28.4 Conceptual Hydrogeology

This is a dug well completed at a depth of 6.55 m below grade with a static water level of 4.45 m below grade. The log for the abandoned drilled well located on the property indicates silty sand, gravel and boulders from surface to 3.35 m with till below. The shallow depth of this well combined with the absence of a confining layer leaves this aquifer vulnerable to surficial sources of contamination. The direction of groundwater flow in the vicinity of the site is likely east to southeast towards Drury Creek.

28.5 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are compiled in field notes in Appendix A24. Photos of potential contaminant sources are also provided at the end of this appendix.

Potential contaminant sources within 30 m of the wellhead are:

- Industrial activities;
- Two above ground fuel storage tanks (ASTs) and a fueling area at 15 m; and,
- An underground fuel storage tank (UST) at approximately 30 m, however, it appeared that the UST was in the process of being removed.

There is also an abandoned dug well, and an abandoned drilled well (with a welded cap) located on the Living Complex site.

28.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not identify any recorded spill events or contaminated sites issues for this property or neighbouring properties.

The Environment Canada Environmental Protection Branch provided spill reports for recorded spill events on or nearby this site (Appendix 24); which are summarized below:

- On October 15, 1986, it was reported that a fuel truck overturned spilling approximately 1134 L of diesel in to a ditch approximately 400 m west of Drury Creek on the Robert Campbell Highway.
- On November 24, 1986, it was reported that an ore truck overturned spilling approximately 13.4 tonnes of lead concentrate ore about 20 m from Drury Creek. The ore was reportedly removed and the area decontaminated.
- On November 21, 1995, an ore truck reportedly spun out near Little Salmon Lake spilling approximately 27 tonnes of zinc sulphide ore in to the ditch. Most of the ore was reportedly removed from the area.

Each of these spills occurred a significant distance away in the direction inferred to be downgradient from the well, therefore, it is unlikely that there would be any negative impact to this water supply.

28.6 Identified Water System Deficiencies and Associated Risk

28.6.1 High and Medium Risk Deficiencies

High and medium risk deficiencies for this water system that were identified during this study include:

- The shallow dug well is drawing water from an unconfined aquifer that is likely susceptible to surficial sources of contamination and may be under the direct influence of surface water;
- The well construction does not allow for a surface sanitary seal (grout or bentonite seal as required by the Canadian Groundwater Association's Guidelines for Water Well Construction);
- By definition of the Draft Yukon GUDI Assessment Guideline, the well is potentially under the direct influence of surface water because it is a vulnerable type (unconfined aquifer with a production zone that is less than 15 m below grade) and does not meet the requirements of the Guidelines for Water Well Construction;
- The well is within 30 m of potential sources of contamination including two EnviroTank AST's and a fueling area; and,
- There is no treatment or disinfection on the water system.

28.6.2 Low Risk Deficiencies

- At 1.08 NTU, the turbidity had previously exceeded the CDWQG MAC of 1.0 NTU.
- There is an abandoned drilled well (unsuccessful) and an abandoned dug well on the Living Complex property.

28.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

28.7.1 Priority 1

Recommended upgrades to remedy observed deficiencies that are potentially high or immediate health risks are detailed below:

- It would be prudent to install an adequate disinfection system due to the vulnerability of this aquifer to surficial contamination and the fact that the well does not have a bentonite/grout sanitary seal. Since the well serves two buildings, and there is a significant amount of buried distribution piping between the well enclosure building and the living complex, it is recommended that a NSF-61 certified filtration system (to 1 micron absolute) followed by a proportional feed chlorination system with necessary appurtenances (digital dosing proportional feed pump, chlorine

reservoir with secondary containment tray, retention tanks) be installed to provide residual disinfection. It is anticipated that this system could be installed on a partially raised platform within the building; however, some modifications to the heating and electrical systems would be necessary. These are conceptual design recommendation based on the information available, and are intended to be used for planning and budgeting purposes. Engineering input will be required for final system specifications or design.

- The well and water system should be superchlorinated.
- The ASTs and fueling area should be relocated to an area of the site that is at least 30 m and preferably downgradient (inferred to be southeast) of the well. All commercial/industrial activities on the site should be restricted to areas that are at least 30 m and preferably on the downgradient half (southeast) of the well.

28.7.2 Priority 2

To mitigate the remaining observed health risks to this water system, decommissioning of the abandoned well in the building enclosure on the Living Complex Site is recommended. Consideration should be given to completing this work at the same time as Priority 1 upgrades to save on mobilization/demobilization costs.

28.7.3 Priority 3

No low risk deficiencies were identified for this site.

28.8 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

28.8.1 Priority 1

Class D estimated costs for Priority 1 recommended upgrades are detailed below:

- The recommended filtration system and chlorination system with appurtenances (chlorine reservoir, flow meter, piping, chlorine drip tray) would cost approximately **$11,300** for materials, labour and mobilization/demobilization.
- Superchlorination of the well and water system could be completed for approximately **$800** for material and labour.
- Relocating the bulk fuel ASTs to an area at least 30 m from the well could be completed with the equipment available at the site as part of regular site maintenance by the staff of this grader station. Therefore, a cost has not been included.

28.9 Priority 2

Decommissioning of the abandoned wells would cost approximately **$2,500** including materials and labour. Consideration should be given to completing this at the same time as the Priority 1 upgrades to save on mobilization/demobilization costs.

28.9.1 Priority 3

- There are no Priority 3 upgrades recommended at this time

29.0 BUILDING 6711: QUIET LAKE GRADER STATION

29.1 Description of Existing Water system

Building 6711, Quiet Lake Grader Station, is served by a water system that delivers water directly from Quiet Lake. The water intake is located south of the grader station near the Quiet Lake Recreation Area. Exact details of the intake construction are not known. The coordinates of the water intake, as measured by a handheld GPS device, were recorded as:

- UTM ZONE 8
- Northing: 6780998
- Easting: 603201

The system is equipped with a submersible pump installed within the surface water intake. Treatment consists of inline canister filtration (currently to 30 micron) that is followed by a proportional feed LMI chlorine disinfection system. The treatment system is located in the maintenance garage and the system is equipped with a 5625 L retention tank. A jet pump complete with a pressure tank delivers water from the tank to the Grader Station and Living Complex.

Field chemistry results at the time of the assessment found the free available chlorine concentration to be 0.02 mg/L, which is below the required 0.2 mg/L within the proposed regulation. Staff interviewed at the site during the assessment provided the following relevant points:

- The water system is dismantled and drained each winter; and,
- There is inadequate training or instruction for employees at the site to operate the system.

It was observed during the water system assessment that the chlorine disinfection system had not been properly reinstalled in the spring and the injection system was not functioning properly, likely resulting in the low free available chlorine concentration observed. A schematic detailing the water system is provided as Figure 6711-B in Appendix A29. Photos of the well and water system are also included at the back of this appendix.

29.2 Description of Existing Wastewater Systems

Wastewater from the maintenance garage is discharged to a leach pit located near the south corner of the building. The living complex septic system is also served by leach pit, which is located off from the north corner of the living complex. A site plan showing the septic system locations, as well as other site details, is given by Figure 6711-A in Appendix 29.

29.3 Water Quality Results

29.3.1 Water Quality Results from Previous Sampling

No bacteriological or water quality results were available for this site.

29.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Quiet Lake Grader Station that was identified to be included during the water system assessments is detailed below:

- As no previous water quality results were available for review, a potability analysis was completed;
- As no previous bacteriological results were available for review, a sample was taken to analyze for the presence of *E. coli* and total coliform;
- UV absorbance and UV transmissivity, as well as tannin and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Total organic carbon (TOC) to assist with treatment system selection; and,
- Measurements in the field for total dissolved solids, conductivity, pH, temperature, and Free Available Chlorine (FAC).

29.3.3 Additional Analytical Results

Bacteriological

A sample was collected from the Quiet Lake Grader Station water system during the water system assessment in August 2005 and was tested for total coliform and *E. coli* by Yukon Environmental Health Services using the presence/absence test

method. Results are tabulated in Table 6711-1 in Appendix A29. The analysis reported a positive result for the presence of total coliform in the water system.

Potability

A water sample was collected by EBA during the field program on August 9, 2005, and was submitted to ALS Environmental for potability testing and analysis for other parameters as indicated above. These results are summarized in Table 6711-2 in Appendix A29 and the laboratory reports are included in Appendix B. The following points are of note:

- The water quality results indicated that all CDWQG health based and aesthetic objectives (AO) were met for the parameters analyzed; and,
- Analytic results indicate that the water is a very fresh calcium bicarbonate type water.

29.3.4 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surface water sources or septic waste. The chloride concentration was low and likely within the normal background ranges for surface water in the area. Nitrate and nitrite concentrations for this sample were below detection limits.

These water quality results do not suggest that the surface water has been impacted by anthropogenic sources of contamination.

29.4 Conceptual Hydrogeology

The water for this system is obtained directly from a surface water source at Quiet Lake. Groundwater in the vicnity of the Quiet Lake Grader Station is inferred to flow in a southeasterly direction towards the discharge area at Quiet Lake. Potential contaminants entering the groundwater table would likely eventually enter Quiet Lake.

29.5 Potential Contaminant Sources

Potential contaminant sources within the grader station compound observed during the site investigation are compiled in field notes in Appendix A29. Photos of potential contaminant sources on the grader station compound are also provided in Appendix A29.

There were no potential contaminant sources observed within 30 m of the water intake. Assessment of all anthropogenic or natural potential sources of contamination to Quiet Lake or any of its tributaries is beyond the scope of this investigation and unknown at this time, however, surface water sources are generally considered to be highly vulnerable to contamination. There is very limited development of the land surrounding the lake, and therefore, contamination from anthropogenic souces is considered unlikely. Naturally occuring sources of biological contamination (viruses, bacteria and protozoa) are commonly found in surface water and are considered a greater risk to his system.

29.5.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not provide any records of spill events or contaminated sites issues for this property or neighbouring properties.

29.6 Identified Water System Deficiencies and Associated Risk

29.6.1 High and Medium Risk Deficiencies

High and medium risk deficiencies for this water system that were identified during this study include:

- The system is supplied directly from a surface water source which is considered vulnerable to naturally occurring contamination; particularly bacteria, viruses and protozoa;
- It was reported that total coliform was present in the water sample for bacteriological testing taken during the water system assessment;
- There was no regular testing program for bacteriological or water quality analysis at the time of the assessment;

- There was no chlorine testing program in place at the time of the assessment;
- The free available chlorine concentration at the time of sampling was found to be 0.02 mg/L, below the required 0.2 mg/L at a point of use; and,
- There is no regular water storage tank-cleaning program at this site.

EBA immediately notified YTG PMA of the positive total coliform result, and brought to their attention the fact that the chlorination system was not functioning properly. EBA recommended that system maintenance be performed to ensure an adequate free available chlorine concentration, and that an immediate re-test be completed. YTG Environmental Health and Social Services also recommended re-testing for total coliform and *E. coli* bacteria. Since this is a surface water source, and potentially susceptible to protozoa, it was recommended by the project team that filtration to 1 micron absolute be installed. It is understood that Aqua Tech Supplies and Services was retained to return to the site and perform maintenance to the system to ensure that the free available chlorine concentration was within the proper range (between 0.2 mg/L and 0.4 mg/L) and to re-test for total coliform bacteria. EBA was not provided the results of the re-test or of routine monitoring of chlorine residual following the maintenance.

29.6.2 Low Risk Deficiencies

There were no low risk deficiencies observed during the assessment.

29.7 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

29.7.1 Priority 1

The following recommendations are made to mitigate immediate risk to the water system:

- Install primary disinfection consisting of duplex NSF-61 certified filtration system capable of filtering particles to 1 micron absolute should be installed in advance of the existing chlorination system;
- Ensure that residual chlorine concentration is maintained within the proper range through routine maintenance and monitoring by trained personnel;
- Implement a regular water storage tank cleaning program every 6 months; and,
- Initiate a routine bacteriological testing program.

29.7.2 Priority 2

There were no Priority 2 mitigative options identified.

29.7.3 Priority 3

There were no Priority 3 mitigative options identified.

29.8 Cost Estimates for Mitigative Options

29.8.1 Priority 1

Estimated costs for materials and labour for recommended Priority 1 upgrades are provided below. An additional contingency allowance of 20% is suggested for budgetary purposes.

- To install filtration as recommended would cost approximately **$1000** including materials, labour and mobilization/demobilization; and,
- Initiating a routine water storage tank cleaning program and free available chlorine monitoring and chlorine system maintenance should fall under normal operations and maintenance costs.

30.0 BUILDING 6751: TWIN CREEKS GRADER STATION

30.1 Description of Existing Water system

The Twin Creeks Grader Station (Building 6751) is served by a water system that delivers water directly from a surface water source (Twin Creek no.1). The water intake is located south of the grader station near the North Canol Highway. A site plan showing the location of the water intake and site details is provided as Figure 6751-A in Appendix A30. The coordinates of the water intake measured with a handheld GPS device were:

- UTM ZONE 9
- Northing: 6945749
- Easting: 383027

Water is delivered from the creek through 25 mm diameter polyethylene pipe to a 5625 L water storage tank with pressure provided from a gas-powered pump. There is a "tee" in the 25 mm pipe that provides water to the Grader Station. It appears that water is pumped to the storage tank as needed (it is not automated by a pressure tank or level switch). There is no treatment or disinfection system present, however, some empty chlorine bleach containers near the storage tank indicate that the water in the storage tank may be batch chlorinated. A schematic detailing the water system is provided as Figure 6751-B in Appendix A30. Photos of the well and water system are also included at the back of this appendix.

30.2 Description of Existing Wastewater Systems

Wastewater from the maintenance garage and living complex is discharged to leach pits for in-ground disposal. Exact details of septic system piping are not known. There are several leach pits on the northwest end of the site that appear to be set up for temporary trailer or RV connections. Locations of leach pits observed during the site visit are indicated on Figure 6751-A in Appendix A30.

30.3 Water Quality Results

30.3.1 Water Quality Results from Previous Sampling

No historical water quality results for bacteriological or potability parameters were available for this site.

30.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Twin Creeks Grader Station that was identified to be included during the water system assessments is detailed below:

- As no previous water quality results were available for review, a sample was collected for potability analyses;
- UV absorbance and UV transmissivity, as well as tannin and lignin, to determine potential for UV treatment as a disinfection option for this water system;
- Total organic carbon (TOC) to assist with treatment system selection; and,
- Measurements in the field for total dissolved solids (TDS), conductivity, pH, and temperature.

30.3.3 Additional Analytical Results

A water sample was obtained by EBA during the field program on August 9, 2005 and was submitted to ALS Environmental for analysis of the parameters indicated above. Results are summarized in Table 6751-2 in Appendix A30 and laboratory reports are included in Appendix B. Relevant findings are summarized below:

- Turbidity at 23.1 NTU is in exceedence of the CDWQG Maximum Acceptable Concentration (MAC) of 1.0 NTU and aesthetic objective (AO) of 5 NTU;
- Iron at 0.978 mg/L is above the CDWQG AO of 0.3 mg/L; and
- All other parameters analyzed met CDWQG MACs for health based and AOs.

It would not have been possible to get a sample back to Whitehorse within 24 hours at the time of the assessment; therefore, testing for total coliform and *E. coli* could not be completed.

30.3.4 Indicators of Potential Contamination

No elevated concentrations of indicator parameters were observed in the sample results reviewed.

30.4 Potential Contaminant Sources

Potential contaminant sources observed during the site investigation are compiled in field notes in Appendix A30. Photos are also provided in Appendix A30. There were no potential contaminant sources observed within 30 m of the water intake.

Identification of anthropogenic or naturally occuring sources of contamination to Twin Creek no.1 or any of its tributaries is beyond the scope of this investigation and unknown at this time, but since Twin Creek no.1 is a surface water source, it is highly vulnerable to contamination; particularly from naturally occuring bacteria, viruses and protozoa.

30.4.1 Spills Records and Contaminated Sites Search Results

The Government of Yukon Environmental Programs Branch and Environment Canada Environmental Protection Branch did not have any record of spill events or contaminated sites issues for this site.

30.5 Identified Water System Deficiencies and Associated Risk

30.5.1 High and Medium Risk Deficiencies

High and medium risk deficiencies for this water system that were identified during this study include:

- The system is supplied by a surface water source with no treatment or disinfection;
- Potential sources of contamination to Twin Creek no.1 or its tributaries is unknown;
- There is no regular testing program for bacteriological or water quality analysis; and,

- There is no regular water storage tank-cleaning program at this site, and significant biofouling of the water storage tank was observed during the water system assessment.

The water system in its current state is not suitable for potable water.

30.5.2 Low Risk Deficiencies

- There no low-risk deficiencies identified for this site, all deficiencies are considered either high or medium risk.

30.6 Mitigative Options for Deficiencies

Mitigative options were developed to address the deficiencies identified in the previous section. Deficiencies are categorized by recommended level of priority (with Priority 1 being most critical).

The existing water system is not considered suitable for a drinking water source based on the system configuration, water quality, and susceptibility to bacteria, viruses and protozoa. The options of major treatment system upgrades, or installation of a drilled well are presented below for comparision.

30.6.1 Priority 1

Regardless of which option is ultimately chosen, water from this system should not be used for human consumption until Priority 1 upgrades are completed. In the interim, until one of the options presented below is selected and implemented, YTG should provide bottled water and post suitable advisories.

Option 1:

The first option proposed would involve construction and installation of a water treatment system. Because the use of this maintenance camp is seasonal, it is recommended that the system be constructed within a skid-mounted enclosure. A suitable treatment system would consist of NSF-61 certified filtration to reduce turbidity and to ensure removal of

particulates that are greater in size than 1 micron, an iron removal filter, and a proportional feed chlorine injection system. A qualified water resource engineer should inspect the water intake to provide recommendations regarding its construction.

Due to the vulnerability of surface water sources, this option is considered to be higher risk than water supplied by a properly constructed drilled well (Option 2).

Option 2:

The second option presented involves drilling a well that would be located and constructed in consideration of the following:

- The well should be equipped with a surface seal to at least 6 m and a pitless unit should be installed with the casing raised above grade (500 mm);
- The well must be located at a distance greater than 30 m and upgradient from any potential source of contamination;
- The well should be at least 15 m in depth; and,
- The water from the new well must meet all CDWQG health based guidelines. If there are any exceedences in the CDWQG health-based guidelines then a treatment system must be designed and installed as necessary. A treatment/disinfection system would likely consist of a NSF-61 certified filtration system (to 1 micron absolute) followed by a proportional feed chlorine disinfection system.

30.6.2 Priority 2 and 3

There are no Priority 2 or 3 mitigative upgrades recommended at this time.

30.7 Cost Estimates for Mitigative Options

Engineering costs for mitigative options are estimated to be 20% of construction costs, and would include inspection and completion reporting. The costs for materials and labour (not including engineering) are provided in the sections below. An additional contingency allowance of 20% is suggested for budgetary purposes.

30.7.1 Priority 1

Option 1:

- The materials and labour costs for a suitable treatment/disinfection system would cost in the order of **$15,000**; assuming **$600** for the duplex filtration system, $**8000** for a proportional feed chlorination system, **$5000** for a prefabricated enclosure, and **$1400** for contractor mobilization/demobilization.

The total estimated cost for a portable water treatment system is $**15,000**.

Option 2:

- A new well, assuming a completion depth of approximately 30 m, would likely cost in the order of **$30,000** to drill, test, and hook up (including pump, drop pipe, freeze protected underground piping etc.); and,
- The materials and labour costs for a suitable treatment/disinfection system would cost in the order of **$15,000**; assuming **$600** for the duplex filtration system, and $**8000** for a proportional feed chlorination system, **$5000** for a prefabricated enclosure, and **$1400** for contractor mobilization/demobilization.

The total cost for a water well option would be in the order of $**45,000**.

31.0 SUMMARY

The project team assessed the small public drinking water systems for 29 Government of Yukon maintained buildings in the Eastern Region in June 2005 in general accordance with the Terms of Reference and the project team's proposal. Three additional sites (Twin Creek, Quiet Lake and Drury Creek) were assessed in early August 2005, and were included in this final version of this report. Key findings of this study are discussed below.

Based on water quality results provided from previous studies or collected during this study, most wells assessed in the Eastern Region did not have exceedences of health-based parameters, or indicators of anthropogenic sources of contamination.

In total, thirteen water systems had turbidity higher than the CDWQG maximum acceptable concentration (MAC) of 1 NTU. Nine systems had turbidity greater than 1 NTU during the most recent sampling events. Turbidity should be as low as possible, and consistently be below 1 NTU; however, it can exceed this level occasionally. Follow up analytic results provided by YTG for five of these systems confirmed turbidity concentrations above CDWQG MACs. Follow up sampling is recommended for the four other systems where turbidity was above 1 NTU during the most recent sampling events.

Based on the information provided to EBA from past bacteriological sampling events, *E. coli* bacteria (a type of faecal coliform) have not been identified in any of these water systems on the dates sampled.

The presence of total coliform bacteria can be a potential indicator of bacterial and/or viral contamination. In the Eastern Region, three of the water systems have at some time in the past six months had total coliform bacteria present in the samples collected. Total coliform bacteria are an indicator of possible contamination from surface waters, but do not necessarily indicate water contamination by faecal waste. However, the presence or absence of these bacteria in drinking water is often used to determine whether water disinfection is working properly, or whether treatment is required. We understand that YTG has commissioned monthly sampling at most water systems to detect the presence of total coliform and *E. coli* bacteria. Water systems where total coliform were detected in the past year should be utilized with caution. We recommend that these systems be re-sampled for the presence of bacteriological parameters in

the near future. Systems that are not regularly used should be sampled monthly when the buildings are in use.

Water sources from six wells serving nine YTG maintained buildings in the Eastern Region that are currently utilized for drinking water have concentrations of arsenic that exceed the proposed guideline and will require treatment or use of an alternate source of drinking water when these proposed guidelines come into effect.

In general, well construction for the wells serving the small public drinking water systems for YTG maintained buildings does not meet the current construction standards or the requirements of the proposed guidelines. Most wells have not been completed with surface sanitary seals (bentonite or bentonite grout) between the well casing and the formation within at least the top 6 m of the well completion. Additionally, many wells are located in pits below grade, which makes them potentially susceptible to flooding. The proposed guidelines require that all water supplied by wells that are not properly constructed, or wells without grout seals within the top 6 m would either require treatment consisting of both filtration and disinfection, or further GUDI assessment (Phase 2 and/or 3) to ensure that these systems are not at risk. Most of the water systems assessed do not have filtration or disinfection and as such, this has been identified as a high-risk deficiency. In addition, many wells assessed have potential sources of contamination located within 30 m of the wells.

Class D cost estimates to mitigate identified deficiencies are provided in each section, and are summarized in Table 4.

The multi-barrier approach to safe drinking water includes the protection of drinking water at its source, adequate treatment, a clean distribution system operated by competent personnel, and comprehensive testing of water quality. During this study, the project team evaluated the well construction and potential contaminant sources in the vicinity of wells to assess the level of protection of the drinking water at its source, as well as the condition and adequacy of the treatment and distribution systems. It was not within the scope of work to evaluate the operations, maintenance and testing programs for these systems; however, these are key to the multi-barrier approach, and will be required by the proposed small public drinking water system regulations. It was obvious from this assessment that operator training and routine maintenance of the existing water systems needs improvement. Table 5 provides a summary of the level of

risk assessed to each water system in consideration of the identified risk and existing barriers of protection (a "multi-barrier" approach). Risk factors included:

- Any parameter above a CDWQG maximum acceptable concentration (not including elevated turbidity or coliform presence);
- Poor water quality indicators such as elevated turbidity, presence of coliform, or elevated chloride, nitrate or nitrite;
- Potential sources of bacteriological and/or viral contaminants within 30 m of the wellhead; and,
- The level of risk due to public accessibility of the well (public buildings, schools, residences, etc.).

Risk mitigating factors that were considered included:

- Favorable hydrogeological conditions;
- Good well construction;
- Disinfection treatment (primary –i.e. filtration to less than1 micron etc.); and,
- Disinfection treatment (secondary – i.e. chlorination or UV treatment).

Priority was assessed based on the level of public accessibility to the buildings and their water systems. Systems that provide drinking water to publicly accessible buildings and employee residences were assessed as an overall Priority level of 1 (highest priority), while systems that are not publicly accessible were assigned a Priority level of 2 or 3 depending on the amount of use of the building and water system. The priority assessment presented in Table 5 can be used as a tool to assist PMA in prioritizing system upgrades. This prioritization system is illustrated in the following matrix:

Matrix 1: Illustration of "Priority 1 – High Risk Systems"

Overall risk based on multi-barrier approach	Priority Level based on public accessibility		
	Priority 1	**Priority 2**	**Priority 3**
High	**Priority 1 – High Risk**	Priority 2 – High risk	Priority 3 – High risk
Medium	Priority 1 – Medium Risk	Priority 2 – Medium risk	Priority 3 – Medium risk
Low	Priority 1 – Low Risk	Priority 2 – Low risk	Priority 3 – Low risk

As indicated in the matrix provided above, those buildings with water systems that were identified as having an overall high-risk, and serve public buildings or employee residences (Priority 1) should be addressed first from a cost benefit perspective. These systems we refer to as "Priority 1 – High Risk". All deficiencies (with the exception of some Priority 3 upgrades which are purely mechanical/operational and do not pose a health risk) for each system should ultimately be addressed in order to mitigate health risk. It is suggested that all Priority 1 upgrades for all systems be completed as soon as possible. In general, we recommend that the best approach to mitigate risk would be to install the recommended disinfection treatment systems (Priority 1), and to carry out well improvements as soon as possible thereafter (Priority 2).

The Priority 1, High-risk Sites for the Eastern Region include:

- 4762: Teslin School;
- 4797: Swift River Utility Building/ Superintendent Residence;
- 4799: Swift River Living Complex;
- M0086: Watson Lake RCMP Housing;
- M0087 and M0088: Watson Lake RCMP Housing;
- M0126 and M0127: Watson Lake RCMP Detachment;
- 4821: Watson Lake Weigh Scales;
- 4851: Watson Lake Airport Pumphouse;
- 4873: Tutchitua Pumphouse;
- 4962: Liard Fire Hall;
- 4976: Watson Lake Ambulance Building;
- 4993 and 4994: Watson Lake EMR Fire Control Centre and Tanker Base;
- 6591: Drury Creek Grader Station; and,
- 6751: Twin Creek Grader Station.

Installation of treatment systems will result in increased operation and maintenance costs for these systems. YTG should consider for budgetary purposes that the equivalent of a full time water system operator for the Eastern Region, with adequate training, would be required to coordinate the operation, maintenance and routine testing of these systems. Requirements of the proposed Guidelines for Small Public Drinking Water Systems, and any other applicable guideline or regulation should be implemented diligently within the "multi-barrier" approach.

A general recommendation for operation and maintenance for systems where upgrades are not immediately implemented that would mitigate significant risk is to inspect and disinfect

(superchlorinate with 200 mg/L chlorine solution) every water well, tank and distribution system on a bi-annual basis (every 6 months).

32.0 RECOMMENDATIONS AND CONCLUSIONS

The recommended upgrade options presented within this report should be evaluated by YTG with regard to risk, preference and cost. Priority 1 upgrades should be completed as soon as possible. All Priority 2 upgrades should also be completed as soon as budget and scheduling permits in the future. Priority 3 conditions should be monitored to check if and when they may worsen to a Priority 2 or 1 situation. In consideration of building priority, YTG PMA should start by commissioning the implementation of Priority 1 upgrades recommended for systems that are identified as "Priority 1-High-risk". Addressing Priority 1 deficiencies at other systems with an overall "lower risk" should follow based on level of risk until all Priority 1 upgrades are complete.

Five in-use wells were found to be without well caps, or lacked properly fitting caps, and are therefore, very vulnerable to the entrance of vermin and insects and other foreign objects. This could put them at risk of potential exposure to bacteria, viruses and/or protozoa. This was brought to the attention of PMA in August, following the assessments. We understand that well caps were installed at some of these sites by Aqua Tech in February 2005. If not already completed, PMA should ensure the remaining wells have properly fitted caps installed as soon as possible. The wells without properly fitting caps at the time of the well assessments include:

- W-4762: Teslin School Well (cap not properly sized);
- 4797: Swift River Utility Building/ Superintendent Residence;
- W-4981: Watson Lake Energy Mines and Resources Office;
- W-M0086: Watson Lake RCMP house;
- W-M0088: Serves Watson Lake RCMP houses; and,
- W- 4821: Watson Lake Weigh Scales.

It is recommended that interim alternate sources of drinking water be provided for the following buildings, until such time as the Priority 1 upgrades were implemented:

- 4976: Watson Lake Ambulance Building;
- Swift River Superintendent's Residence (supplied by W-4797);
- Teslin Grader Station (served by Reservoir 4782 – and have bottled water provided, however do not have advisories posted);
- 4793: Swift River Grader Station (already have signs posted and bottled water provided);

- 4962: Liard Fire Hall;
- 4851: Watson Lake Airport (bottled water is provided to CARS and YTG staff, however, there are no advisories posted); and,
- 4873: Tutchitua Grader Station and Living Complex.
- 6751: Twin Creeks Grader Station.

For these systems, it is recommended that YTG PMA consult with YTG EHSS to determine the best approach to issuing advisories and implementing interim measures (boiled water advisories or provision of bottled water).

It is recommended that additional assessment be completed for some systems as soon as possible. This would include:

- Attempt to locate the well log for the well serving the Swift River Living Complex (W-4799) and complete additional inspection and pumping tests to determine it's suitability to serve the Grader Station and Superintendent's residence.
- Free available chlorine concentrations should be re-tested at Teslin RCMP M0181.
- Confirm whether there is an in ground septic disposal system serving 4842, the Cassiar Weigh Scales.
- Determine the reason for absorbol on the ground at rear of the Watson Lake Environment Office (4840).
- Complete further assessment to determine if Liard Fire Hall (4962) septic field is properly constructed.
- Repeat sampling for turbidity to confirm results at the four remaining systems where results had previously exceeded 1 NTU. (4782 Teslin Water Reservoir, 4793 Swift River Grader Station, 6591 Drury Creek Pumphouse, and 6751 Twin Creek Grader Station).
- Follow-up sampling for chlorine residual concentrations in systems where the residual chlorine concentrations were less than 0.2 mg/L at the time of sampling during this assessment (Teslin School, M0181 Teslin RCMP Residence, Ross River Fire Hall).
- Complete 12 hour pumping test, pump and pump control inspection at the EMR Tanker Base (4994).

33.0 LIMITATIONS

Conclusions and recommendations presented in this report are based on the wellhead inspections, water supply source evaluations and distribution and treatment system evaluations as described in the previous sections. The project team attempted to identify all water system deficiencies in the amount of time allocated for each assessment, while working within the constraints of the scope, budget and accessibility. It is possible that some deficiencies or risks have not been identified within the level of effort this project afforded. EBA bears no responsibility for undiscovered deficiencies due to project limitations on level of effort. This report has been prepared for the exclusive use of the Government of Yukon. This report has been prepared in accordance with generally accepted hydrogeological and environmental engineering practices. For further limitations regarding the use of this report, reference should be made to the EBA Environmental Report - General Conditions attached, which form a part of this report.

34.0 CLOSURE

EBA trusts this report meets your present requirements. If you have questions or concerns, please do not hesitate to call the undersigned.

Respectfully submitted;
EBA Consultants Ltd.

Prepared by:

Ryan Martin, M.Eng., P.Eng.
Project Engineer, Hydrogeologist
(Phone: (867) 668-3068)
(e-mail: rmartin@eba.ca)

Reviewed by:

Richard Trimble, M.Sc(Eng), P.Eng.
Project Director, Yukon Region
(Phone: (867) 668-3068)
(e-mail: rtrimble@eba.ca)

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TABLES

TABLE 1: SUMMARY OF HISTORICAL BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
Teslin								
M0107	R.C.M.P Detachment	7	Sept-04 to Mar-05	no	0/7	no	1-Mar-05	no
M0108	R.C.M.P. Housing	7	Sept-04 to Mar-05	no	0/7	no	1-Mar-05	no
M0109	R.C.M.P Housing	6	Sept-04 to Mar-05	no	0/6	no	1-Mar-05	no
M0181	R.C.M.P Housing	7	Sept-04 to Mar-05	no	0/7	no	1-Mar-05	no
4762	Teslin School	7	Sept-05 to Mar-05	no	0/7	no	1-Mar-05	no
4951	Health Centre	7	Sept-05 to Mar-05	no	0/7	no	1-Mar-05	no
4782	Water Reservoir	NO BACTERIOLOGICAL RESULTS ARE AVAILABLE FOR THIS SITE						
Swift River								
4793	Swift River Grader Station	6	Sept-04 to Mar-05	no	0/6	no	9-Mar-05	no
4797	Swift River Utility Building	6	Sept-04 to Mar-05	**yes**	1/6	no	9-Mar-05	no
4799	Swift River Living Complex	6	Sept-04 to Mar-05	no	0/6	no	9-Mar-05	no
Watson Lake and Surrounding Area								
M0086	R.C.M.P. Housing	2	May -05 to Jun-05	no	0/2	no	23-Jun-05	no
M0087	R.C.M.P. Housing	2	May -05 to Jun-05	no	0/2	no	23-Jun-05	no
M0088	R.C.M.P. Housing	1	23-Jun-05	no	0/1	no	23-Jun-05	no
M0092	R.C.M.P Detachment	2	May -05 to Jun-05	no	0/2	no	23-Jun-05	no
M0126	R.C.M.P. Housing	2	May -05 to Jun-05	no	0/2	no	23-Jun-05	no
M0127	R.C.M.P. Housing	2	May -05 to Jun-05	no	0/2	no	23-Jun-05	no
4821	New Weigh Scale	4	Sept-04 to Mar-05	no	0/4	no	9-Mar-05	no
4836	Grader Storage Building	NO BACTERIOLOGICAL RESULTS ARE AVAILABLE FOR THIS SITE						
4841	Visitor Reception Centre	2	May -05 to Jun-05	no	0/2	no	23-Jun-05	no
4842	Cassiar Weigh Scales	2	Sept-04 to Mar-05	no	0/2	no	13-Oct-04	no
4840	Environmental Office	7	Sept-04 to Mar-05	no	0/7	no	9-Mar-05	no
4851	Airport Pumphouse	7	Sept-04 to Mar-05	no	0/7 *	no	8-Mar-05	no
4873	Tuchitua Pumphouse	8	Sept-04 to Mar-05	**yes**	1/8	no	Mar-05	no
4962	Liard Fire Hall	6	Sept-04 to Mar-05	no	0/6	no	9-Mar-05	no
4976	Ambulance Building	NO BACTERIOLOGICAL RESULTS ARE AVAILABLE FOR THIS SITE						
4981	Energy, Mines, and Resources Office	8	Sept-04 to Mar-05	no	0/8	no	9-Mar-05	no
4993	EMR Fire Control Centre	4	Nov-04 to Mar-05	no	0/4	no	Mar-05	no
4994	EMR Tanker Base	2	May -05 to Jun-05	**yes**	1/2	no	Jun-05	no
Ross River								
6746	Ross River Fire Hall	5	Sept-04 to Mar-05	no	0/5	no	3-Mar-05	no
Drury Creek								
6591	Drury Creek Grader Station	8	Sept-04 to Jun-05	no	0/8	no	22-Jun-05	no
Quiet Lake								
6711	Quiet Lake Grader Station	NO BACTERIOLOGICAL RESULTS ARE AVAILABLE FOR THIS SITE						
Twin Creeks								
6751	Twin Creeks Grader Station	NO BACTERIOLOGICAL RESULTS ARE AVAILABLE FOR THIS SITE						

* Three out of seven samples were rejected due to high turbidity

Table 2: Water Quality Results

SOURCE:	Building M0107 - R.C.M.P. Detachment		Building M0108 - R.C.M.P. Housing		Building M0109 - R.C.M.P. Housing		Building M0181 - R.C.M.P. Housing		Building 4762 - Teslin School		Building 4951- Teslin Health Centre		Building 4782- Water Reservoir	GCDWQ Criteria		
Location/ Resident	Teslin		Teslin		Teslin		Teslin		Teslin		Teslin		Teslin			
Address	Block 11		Block 12		Block 13		Block 26									
Treatment	Water Softener (not in use)		Water Softener (not in use), RO		Water Softener,Filter, RO		Water Softener		Softner, Filtration, Iron Manganese Removal		Iron, Mangnese Removal, Hardness Removal, Filtration		No			
Disinfection	No		No		No		No		Chlorination		No		No			
Source of Water	M0107 Well		M0107 Well		M0107 Well		Water Delivery		On-Site Well		On-site Well		Water Delivery			
Purpose of Sampling	Baseline	Additional Sampling	Baseline	Additional Sampling	Baseline	Additional Sampling	Baseline	Additional Sampling	Baseline	Additional Sampling	Baseline	Additional Assessment	Additional Sampling			
Sampled By	YTG	EBA	YTG	EBA	YTG	EBA	YTG	EBA	YTG	EBA	YTG	EBA	EBA			
Sample Location		Downstairs Laundry Tub Tap		Kitchen Sink		Kitchen Tap	Kitchen Tap	Downstairs Laundry Tub Tap	Home Ec. Room				Washroom Tap			
Date Sampled	9-Sep-04	16-Jun-05	9-Sep-04	16-Jun-05	9-Sep-04	16-Jun-05	9-Sep-04	16-Jun-05	9-Sep-04	16-Jun-05	9-Sep-04	16-Jun-05	16-Jun-05	**Lower Limit**	**Upper Limit**	
Physical Tests *(ALS)*														**AO**	**MAC**	**AO**
Colour (CU)	<5.0		<5.0		<5.0		5		<5		<5.0		6.1			15
Conductivity (uS/cm)													582			
Total Dissolved Solids	**502**		**506**		**617**		345		**550**		**865**		362			500
Hardness CaCO3	442		440		1.7		262		17.4		30.6		251	AO >200 = poor, > 500 unacceptable[A]		
pH	8.29		8.29		8.47		8.37		**8.53**		**8.51**		8.31	6.5		8.5
Turbidity (NTU)	0.7		0.8		0.4		0.4		0.3		0.3		**2.49**		1	5
UV Absorbance		0.0260		0.0280		0.0260		0.030				0.023				
% UV Transmittance		94.2		93.8		94.2		93.3				94.8				
Dissolved Anions *(ALS)*																
Alkalinity-Total CaCO3	229		229		227		223		294		271		238			
Chloride Cl	20.7		21.2		22.1		4.0		3.3		2.6		4.61			250
Fluoride F	0.18		0.18		0.18		0.14		0.16		0.17		0.17		1.5	
Silicate SiO4		13.5		14.4		14.3		9.4		15.5		14.9				
Sulphate SO4	189		194		194		88.0		82.9		264		105			500
Nitrate Nitrogen N	<0.1		<0.1		<0.1		<0.1		<0.1		<0.1		<0.10		10	
Nitrite Nitrogen N	<0.05		<0.05		<0.05		<0.05		<0.05		<0.05		<0.10		1	
Ammonia Nitrogen N		0.293											0.036			
Total Phosphate PO4		0.0576		0.0593		0.0686		0.0616		0.0435		0.0702				
Total Metals *(ALS)*																
Aluminum T-Al	<0.005		<0.005		<0.005		<0.005		<0.005		<0.005		<0.010		0.1	
Antimony T-Sb	<0.0002		<0.0002		<0.0002		<0.0002		<0.0002		<0.0002		<0.00050		0.006	
Arsenic T-As	*0.0067*	*0.0085*	*0.0083*	*0.0086*	*0.0074*	*0.0074*	*0.0193*	*0.0211*	*0.0070*	*0.0074*	*0.0083*	*0.0070*	*0.0162*		0.025	
Barium T-Ba	0.052		0.049		<0.001		0.03		0.003		0.002		0.03		1	
Boron T-B	0.03		0.028		0.026		0.033		0.027		0.032		<0.10		5	
Cadmium T-Cd	<0.00001		<0.00001		<0.00001		<0.00001		<0.00001		0.00002		<0.00020		0.005	
Calcium T-Ca													41.7			
Chromium T-Cr	0.0007		0.0010		0.0012		0.0006		0.001		0.0008		<0.0020		0.05	
Copper T-Cu	<0.001		<0.001		<0.001		0.017		0.098		0.002		0.0218		1	
Iron T-Fe	0.05		0.14		<0.01		0.17		0.01		<0.01		0.295			0.3
Lead T-Pb	0.0006		<0.0001		<0.0001		0.0002		0.001		0.0001		<0.0010		0.01	
Magnesium T-Mg													35.8			
Manganese T-Mn	**0.077**	**0.0891**	**0.079**	**0.0915**	<0.005		0.029		0.005		<0.005		0.013			0.05
Mercury T-Hg													<0.00020		0.001	
Potassium T-K													1.8			
Selenium T-Se													<0.0010		0.01	
Sodium T-Na	23.7		23.3		166		37.3		12.8		1.5		39.1			200
Uranium T-U	<0.0005		<0.0005		<0.0005		<0.0005		<0.0005		<0.0005		0.00017		0.02	
Vanadium T-V		0.033		<0.030		<0.030		<0.030		<0.030		<0.030				
Zinc T-Zn	0.003		0.002		0.003		0.008		0.001		0.004		0.065			5
Dissolved Metals																
Aluminum D-Al															0.1	
Antimony D-Sb															0.006	
Arsenic D-As		*0.00798*		*0.00811*		*0.00773*		*0.0158*		*0.00696*		*0.0073*			0.025	
Barium D-Ba															1.0	
Boron D-B															5	
Cadmium D-Cd															0.005	
Calcium D-Ca																
Chromium D-Cr															0.05	
Copper D-Cu																1.0
Iron D-Fe																0.3
Lead D-Pb															0.01	
Magnesium D-Mg																
Manganese D-Mn		**0.0897**		**0.0905**												0.05
Mercury D-Hg															0.001	
Potasium D-K																
Selenium D-Se															0.01	
Sodium D-Na																200
Uranium D-U															0.02	
Vanadium D-V																
Zinc D-Zn																5.0
Trihalomethanes																
Bromodichloromethane										<0.0010						
Bromoform										<0.0010						
Chloroform										0.0018						
Dibromochloromethane										<0.0010						
Total Trihalomethanes										<0.0040						
Organic Parameters																
Tannin and Lignin		0.56		0.68		<0.10		0.14				<0.050				
Total Organic Carbon C		2.78		1.71		1.87		2.14		2.59		1.57	2.19			
Haloacetic Acids																
Bromoacetic Acid										<0.0020						
Bromochloroacetic Acid										<0.0020						
Chloroacetic Acid										<0.020						
Dibromoacetic Acid										<0.0020						
Dichloroacetic Acid										<0.0020						
Trichloroacetic Acid (TCA)										<0.0020						
Polycyclic Aromatic Hydrocarbons																
Acenaphthene																
Acenaphthylene																
Acridine																
Anthracene																
Benz(a)anthracene																
Benzo(a)pyrene															0.00001	
Benzo(b)fluoranthene																
Benzo(g,h,i)perylene																
Benzo(k)fluoranthene																
Chrysene																
Dibenz(a,h)anthracene																
Fluoranthene																
Fluorene																
Indeno(1,2,3-c,d)pyrene																
Naphthalene																
Phenanthrene																
Pyrene																
Quinoline																
Extractable Hydrocarbons																
EPH10-19																
EPH19-32																
LEPH																
HEPH																
Field Chemistry (EBA)																
pH		8.66		8.35		8.72		8.45		8.36		8.57	8.63	6.5		8.5
TDS (ppm)		405		406		480		287		312		650	291			500
EC (uS/cm)		810		815		958		573		626		1300	586			
Temperature (^{o}C)		10						14		10.0			7.1			
Free Available Chlorine								0.05		0.01						

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting .

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU), Conductivity (umhos/cm),Temperature (^{o}C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

- = not tested

Table 2: Water Quality Results

SOURCE:	Building 4793- Swift River Grader Station		Building 4797 - Swift River Utility Building			Building 4799 - Swift River Living Complex			Building M0086 - Watson Lake RCMP Housing		Buildings M0087 and M0088 - Watson Lake RCMP Housing		Building M0092- Watson Lake RCMP Detachment		Building M0126 - Watson Lake RCMP Housing	Building M0127 - Watson Lake RCMP Housing	GCDWQ Criteria		
Location/ Resident	Swift River		Swift River			Swift River			Watson Lake		Watson Lake		Watson Lake		Watson Lake	Watson Lake			
Address	km 1181 Alaska		km 1181 Alaska Highway			km 1181 Alaska Highway			111 Stubenburg		2 & 3 Adela Trail				4 Adela Trail	5 Adela Trail			
Treatment	Sediment Filter		No			No			Softener		Water Softener		No		Softener	Softener			
Disinfection	No		No			No			No		No		No		No	No			
Source of Water	On-Site Well		On-Site Well			On-Site Well			On-Site Well		Well at M0088		On-site Well		M0127 Well	On-Site Well			
Purpose of Sampling	Baseline	Additional Sampling	Baseline	Additional Sampling	Baseline	Baseline	Additional Sampling	Baseline	Baseline	Additional Sampling	Baseline	Additional Sampling	Baseline	Additional Sampling	Baseline	Additional Sampling			
Sampled By	YTG	EBA	YTG	EBA	YTG	YTG	EBA	YTG	YTG	EBA	YTG	EBA	YTG	EBA	YTG	EBA			
Sample Location		Kitchen Tap		Foreman's Residence Kitchen Tap			Kitchen Tap	Kitchen Tap			M0087	M0088		Kitchen Tap	M0126	M0127			
Date Sampled	13-0ct-04	20-Jun-05	13-Sep-04	20-Jun-05	22-Jun-05	13-Sep-04	20-Jun-05	22-Jun-05	22-Jun-05	23-Jun-05	22-Jun-05		22-Jun-05	21-Jun-05	22-Jun-05	22-Jun-05	**Lower Limit**	**Upper Limit**	
Physical Tests *(ALS)*																	**AO**	**MAC**	**AO**
Colour (CU)	10		7		<5	<5		<5	<5.0		<5.0		<5.0		<5.0				15
Conductivity (uS/cm)					72.3			65.3	537		581		386		590				
Total Dissolved Solids	53		40		43	39		40	314		362		228		350				500
Hardness CaCO3	25.9		32.6		34	31.8		19.3	273		<0.66		187		312		AO >200 = poor, > 500 unacceptable[A]		
pH	7.29		7.3		7.03	7.26		6.77	7.87		7.93		7.94		7.95		6.5		8.5
Turbidity (NTU)	**2.9**	0.92	**4.6**	**2.69**	**3.32**	0.3	0.41	**2.64**	0.54		0.25		0.37		0.43			1	5
UV Absorbance		0.011		0.027			0.035			0.0190		0.0240				0.0120			
% UV Transmittance		97.5		94.0			92.3			95.7		94.6				97.3			
Dissolved Anions *(ALS)*																			
Alkalinity-Total CaCO3	35		37		42.6	34		22	274		288		206		319				
Chloride Cl	8.2		<0.5		0.76	0.5		4.7	19.0		23.1		14.2		16.3				250
Fluoride F	0.74		0.72		0.692	0.71		0.818	0.025		0.024		0.022		0.031			1.5	
Silicate SiO4																			500
Sulphate SO4	4.66		3.56		3.32	3.65		3.41	7.49		8.18		3.21		5.07				
Nitrate Nitrogen N	0.06		<0.1		<0.10	<0.1		<0.10	<0.10		1.57		0.19		1.01			10	
Nitrite Nitrogen N	<0.005		<0.05		<0.10	<0.05		<0.10	<0.10		<0.10		<0.10		<0.10			1	
Ammonia Nitrogen N																			
Total Phosphate PO4																			
Total Metals *(ALS)*																			
Aluminum T-Al	0.022		0.007		<0.010	<0.005		0.03	<0.010		<0.010		<0.010		<0.010				
Antimony T-Sb	<0.0002		<0.0002		<0.0005	<0.0002		<0.0005	<0.00050		<0.00050		<0.00050		<0.00050			0.006	
Arsenic T-As	<0.0002		<0.0002		0.00014	<0.0002		0.00046	0.00040		0.00066		0.00040		0.00062			0.025	
Barium T-Ba	0.016		0.012		0.020	0.012		<0.020	0.333		<0.020		0.194		0.417			1	
Boron T-B	0.004		0.011		<0.010	0.005		<0.10	<0.10		<0.10		<0.10		<0.10			5	
Cadmium T-Cd	0.00002		<0.00001		<0.00020	0.00001		<0.00020	<0.00020		<0.00020		<0.00020		<0.00020			0.005	
Calcium T-Ca					11.0			6.31	87.7		0.22		63.7		99.8				
Chromium T-Cr	<0.0005		<0.0005		<0.0020	<0.0005		<0.0020	<0.0020		<0.0020		<0.0020		<0.0020			0.05	
Copper T-Cu	0.574		0.023		0.0392	**2.34**	0.147	0.174	0.0136		0.0095		0.0386		0.116			1	
Iron T-Fe	**0.40**	0.277	0.25		0.253	0.01	0.04	0.116	0.037		<0.030		<0.030		<0.030				0.3
Lead T-Pb	0.0043		0.0011		0.0044	0.0007		0.0047	<0.0010		<0.0010		<0.0010		0.0014			0.01	
Magnesium T-Mg					1.56			0.85	13.1		<0.10		6.70		15.3				
Manganese T-Mn	0.012		0.021		0.0148	0.009	0.003	0.0064	0.0064		0.0101		<0.0020		0.0031				0.05
Mercury T-Hg					<0.00020			<0.0002	<0.00020		<0.00020		<0.00020		<0.00020			0.001	
Potassium T-K					0.32			0.27	1.00		0.48		1.25		1.26				
Selenium T-Se					<0.0010			<0.0010	<0.0010		<0.0010		<0.0010		<0.0010			0.01	
Sodium T-Na	8.8		1.8		<2.0	1.8		4.5	6.5		143		9.4		7.0				200
Uranium T-U	0.0005		<0.0005		0.00038	<0.0005		0.00085	0.00050		0.00030		0.00026		0.00052			0.02	
Vanadium T-V																			
Zinc T-Zn	0.189		0.073		0.096	0.07		0.083	<0.050		<0.050		<0.050		<0.050				5
Dissolved Metals																			
Aluminum D-Al																			
Antimony D-Sb																			
Arsenic D-As																			
Barium D-Ba																			
Boron D-B																			
Cadmium D-Cd																			
Calcium D-Ca																			
Chromium D-Cr																			
Copper D-Cu							0.154												
Iron D-Fe		<0.030					<0.030												
Lead D-Pb																			
Magnesium D-Mg																			
Manganese D-Mn							0.0022												
Mercury D-Hg																			
Potasium D-K																			
Selenium D-Se																			
Sodium D-Na																			
Uranium D-U																			
Vanadium D-V																			
Zinc D-Zn																			
Trihalomethanes																			
Bromodichloromethane																			
Bromoform																			
Chloroform																			
Dibromochloromethane																			
Total Trihalomethanes																			
Organic Parameters																			
Tannin and Lignin		0.1		<0.10			0.24			0.21		<0.10				0.16			
Total Organic Carbon C		0.72		0.70			1.21			1.37		1.86				0.93			
Haloacetic Acids																			
Bromoacetic Acid																			
Bromochloroacetic Acid																			
Chloroacetic Acid																			
Dibromoacetic Acid																			
Dichloroacetic Acid																			
Trichloroacetic Acid (TCA)																			
Polycyclic Aromatic Hydrocarbons																			
Acenaphthene																			
Acenaphthylene																			
Acridine																			
Anthracene																			
Benz(a)anthracene																			
Benzo(a)pyrene																			
Benzo(b)fluoranthene																			
Benzo(g,h,i)perylene																			
Benzo(k)fluoranthene																			
Chrysene																			
Dibenz(a,h)anthracene																			
Fluoranthene																			
Fluorene																			
Indeno(1,2,3-c,d)pyrene																			
Naphthalene																			
Phenanthrene																		0.1	
Pyrene																			
Quinoline																			
Extractable Hydrocarbons																			
EPH10-19																			
EPH19-32																			
LEPH																			
HEPH																			
Field Chemistry (EBA)																			
pH		8.25		7.43			7.93			7.83				7.88		7.69	6.5		8.5
TDS (ppm)		108		41			29			263				192		292			500
EC (uS/cm)		218		82			59			550				384		585			
Temperature (°C)		15.7		40.6			10.0			8.0				7.0		6.4			
Free Available Chlorine																			

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU), Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

- = not tested

Table 2: Water Quality Results

SOURCE:	Building 4821 - Watson Lake Scales			Building 4836 - Grader Storage Building		Building 4842 - Cassiar Weigh Scales		Building 4840 - Environmental Office			Building 4851 - Airport Pumphouse			GCDWQ Criteria		
Location/ Resident	Watson Lake			Watson Lake		Watson Lake		Watson Lake			Watson Lake					
Address								2 Adela Trail								
Treatment	No			Water Softener		No		Sediment Filter, Water Softener								
Disinfection	No			No		No		No			No					
Source of Water	On-Site Well			On-Site Well		On-Site Well		On-Site Well			On-Site Well					
Purpose of Sampling	Baseline	Baseline	Additional Sampling	Baseline	Additional Sampling	Baseline	Additional Sampling	Baseline	Additional Sampling	Additional Sampling	Baseline	Additional Sampling	Baseline			
Sampled By	YTG	YTG	EBA	YTG	EBA	YTG	EBA	YTG	EBA	YTG	YTG	EBA	YTG			
Sample Location					Laundry Sink		Washroom Tap		Kitchen Tap	Kitchen RO Tap		Terminal Washroom Tap				
Date Sampled	9-Nov-04	22-Jun-05	21-Jun-05	13-Sep-04	21-Jun-05	13-Oct-04	22-Jun-05	13-Sep-04	21-Jun-05	21-Jun-05	13-Sep-04	20-Jun-05	22-Jun-05	**Lower Limit**	**Upper Limit**	
Physical Tests *(ALS)*														**AO**	**MAC**	**AO**
Colour (CU)	**27**	**17.9**		**>60**	<5.0	8		**>60**	<5.0	<5.0	**>60**		<5			15
Conductivity (uS/cm)		316			1150				439	132			228			
Total Dissolved Solids	187	200		492	**749**	204		242	342	76	124		133			500
Hardness CaCO3	155	131		422	53.5	194		228	212	34.4	112		114	AO >200 = poor, > 500 unacceptable [A]		
pH	8.20	8.25		7.86	8.05	8.20		8.03	8.00	7.13	7.39		7.41	6.5		8.5
Turbidity (NTU)	**8.6**	**5.29**	**2.1**	**79.6**	0.60	0.6		**16.7**	0.44	0.18	**142**	**23.4**	**30.8**		1	5
UV Absorbance			0.149				0.0300					0.031				
% UV Transmittance			71.0				93.3					93.1				
Dissolved Anions *(ALS)*																
Alkalinity-Total CaCO3	179	190		212	222	190		168	157	47.8	126		141			
Chloride Cl	0.7	<0.50		190	184	4.2		48.9	49.8	19.4	1.0		0.60			250
Fluoride F	0.21	0.253		<0.05	<0.20	0.05		0.06	0.056	<0.020	<0.05		<0.040		1.5	
Silicate SiO4																
Sulphate SO4	7.28	6.04		4.13	<5.0	13.3		5.69	5.27	0.65	3.25		3.39			500
Nitrate Nitrogen N	<0.01	<0.10		<0.1	<1.0	0.39		<0.1	<0.10	<0.10	0.2		<0.10		10	
Nitrite Nitrogen N	<0.005	<0.10		<0.05	<1.0	<0.005		<0.05	<0.10	<0.10	<0.05		<0.10		1	
Ammonia Nitrogen N					<0.020				0.022							
Total Phosphate PO4																
Total Metals *(ALS)*																
Aluminum T-Al	0.054	<0.010		<0.005	<0.010	<0.005		<0.005	<0.010	<0.010	<0.005		<0.010			
Antimony T-Sb	<0.0002	<0.0005		<0.0002	<0.00050	<0.0002		<0.0002	<0.00050	0.00119	<0.0002		<0.0005		0.006	
Arsenic T-As	*0.0078*	*0.00717*		0.0018	0.00049	0.0004		<0.0002	0.00025	0.0005	0.0017		0.00142		0.025	
Barium T-Ba	0.094	0.072		**1.14**	0.043	0.166		0.355	0.299	0.052	0.378		0.328		1	
Boron T-B	0.011	<0.10		0.007	<0.10	0.009		0.006	<0.10	<0.10	0.009		<0.10		5	
Cadmium T-Cd	<0.00001	<0.0002		<0.00001	<0.00020	<0.00001		<0.00001	<0.00020	<0.00020	0.00007		<0.0002		0.005	
Calcium T-Ca		33.4			15.8				64.6	9.17			35.4			
Chromium T-Cr	0.0012	<0.0020		0.0012	<0.0040	0.0012		0.0006	<0.0020	<0.0020	<0.0005		<0.0020		0.05	
Copper T-Cu	0.08	0.0187		0.003	0.0174	0.01		0.002	0.0014	0.0018	0.002		0.0037		1	
Iron T-Fe	0.15	**0.601**		**5.35**	0.062	**0.43**	**2.26**	**1.82**	<0.030	<0.030	**1.28**	**3.01**	**3.14**			0.3
Lead T-Pb	0.0072	0.0017		0.0003	0.0012	0.0001		0.0018	<0.0010	<0.0010	0.0047		0.00016		0.01	
Magnesium T-Mg		11.6			3.37				12.4	2.78			6.14			
Manganese T-Mn	**0.079**	**0.0551**		**1.18**	**0.39**	0.03	**0.0612**	**0.303**	**0.262**	0.0125	**1.84**	**2.69**	**2.26**			0.05
Mercury T-Hg		<0.0002			<0.00020				<0.00020	<0.00020			<0.0002		0.001	
Potassium T-K		1.75			350				1.33	1.12			0.84			
Selenium T-Se		<0.0010			<0.0010				<0.0010	<0.0010			<0.0010		0.01	
Sodium T-Na	17.5	19.2		17.5	<2.0	3.6		2.7	2.6	15	2.5		2.6			200
Uranium T-U	<0.0005	<0.00010		<0.0005	0.00019	0.0005		<0.0005	0.00045	<0.00010	<0.0005		<0.00010		0.02	
Vanadium T-V																
Zinc T-Zn	0.05	<0.050		0.11	0.244	0.004		0.328	0.11	<0.050	0.15		<0.050			5
Dissolved Metals *(ALS)*																
Aluminum D-Al									<0.010						0.1	
Antimony D-Sb									<0.00050						0.006	
Arsenic D-As									0.0003						0.025	
Barium D-Ba									0.306						1.0	
Boron D-B									<0.10						5	
Cadmium D-Cd									<0.00020						0.005	
Calcium D-Ca									64.3							
Chromium D-Cr									<0.0020						0.05	
Copper D-Cu									0.0016							1.0
Iron D-Fe							<0.030		<0.030			**1.25**				0.3
Lead D-Pb									<0.0010						0.01	
Magnesium D-Mg									12.5							
Manganese D-Mn							**0.0618**		**0.263**			**2.65**				0.05
Mercury D-Hg									<0.00020						0.001	
Potasium D-K									1.24							
Selenium D-Se									<0.0010						0.01	
Sodium D-Na									2.7							200
Uranium D-U									0.00044						0.02	
Vanadium D-V																
Zinc D-Zn									0.104							5.0
Trihalomethanes																
Bromodichloromethane																
Bromoform																
Chloroform																
Dibromochloromethane																
Total Trihalomethanes															0.1	
Organic Parameters																
Tannin and Lignin			0.71				0.21					0.38				
Total Organic Carbon C					1.75		2.00		<0.50			1.62				
Haloacetic Acids																
Bromoacetic Acid																
Bromochloroacetic Acid																
Chloroacetic Acid																
Dibromoacetic Acid																
Dichloroacetic Acid																
Trichloroacetic Acid (TCA)																
Polycyclic Aromatic Hydrocarbons																
Acenaphthene												<0.000050				
Acenaphthylene												<0.000050				
Acridine												<0.000050				
Anthracene												<0.000050				
Benz(a)anthracene												<0.000050				
Benzo(a)pyrene												<0.000010			0.00001	
Benzo(b)fluoranthene												<0.000050				
Benzo(g,h,i)perylene												<0.000050				
Benzo(k)fluoranthene												<0.000050				
Chrysene												<0.000050				
Dibenz(a,h)anthracene												<0.000050				
Fluoranthene												<0.000050				
Fluorene												<0.000050				
Indeno(1,2,3-c,d)pyrene												<0.000050				
Naphthalene												<0.000050				
Phenanthrene												<0.000050				
Pyrene												<0.000050				
Quinoline												<0.000050				
Extractable Hydrocarbons																
EPH10-19												<0.30				
EPH19-32												<1.0				
LEPH												<0.30				
HEPH												<1.0				
Field Chemistry (EBA)																
pH			**8.56**		8.02		7.60		7.71	7.89		7.48				8.5
TDS (ppm)			156		**559**		312		217	86		118				500
EC (uS/cm)			312		1115		624		431	171		235				
Temperature (°C)			9.7		9.4		12.3		21.4	16.1		10.6				
Free Available Chlorine																

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU), Conductivity (umhos/cm),Temperature(°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

- = not tested

Table 2: Water Quality Results

SOURCE:	Building 4873 - Tutchitua Pumphouse		Building 4962 - Liard Fire Hall			Building 4976 - Ambulance Building			Building 4981 - Energy, Mines and Resources Office					Buildings 4993 and 4994 - EMR Fire Control and Tanker Base			Building 6746 - Ross River Fire Hall		Building 6591 - Drury Creek Pumphouse			Building 6711 - Quiet Lake Grader Station	Building 6751- Twin Creek Grader Station	GCDWQ Criteria		
Location/ Resident	Campbell Highway		Upper Liard			Watson Lake			Watson Lake					Watson Lake Airport			Ross River		Drury Creek			Quiet Lake	Twin Creek			
Address																										
Treatment	No		No			No				None	Filter and Softener	RO		No			No		Activated Carbon Filter			Filtration	No			
Disinfection	No		No			No			No					No			Chlorination		No			Chlorination	No			
Source of Water	On-Site Well		On-Site Well			On-Site Well			On-Site Well					On-Site Well 4994			On-site Well		On-Site Well			Intake on Lake	Inake on Creek			
Purpose of Sampling	Baseline	Additional Sampling	Baseline	Baseline	Additional Sampling	Baseline	Additional Sampling	Baseline	Baseline	Baseline	Baseline	Additional	Baseline	Baseline	Baseline	Additional Assesment			Baseline	Baseline	Additional Sampling	Baseline	Baseline			
Sample Location					Bathroom Sink		Sink in Ambulance Bay			Washroom Sink	Washroom Sink	Kitchen RO Tap														
Date Sampled			13-Sep-04	22-Jun-05	22-Jun-05	13-Sep-04	23-Jun-05	22-Jun-05	13-Oct-04	21-Jun-05	21-Jun-05	21-Jun-05	22-Jun-05	14-Sep-05	22-Jun-05	23-Jun-05	26-Oct-00	23-Jun-05	14-Sep-04	22-Jun-05	10-Aug-05	8-Aug-05	10-Aug-05	**Lower Limit**	**Upper Limit**	
Physical Tests *(ALS)*																								**AO**	**MAC**	**AO**
Colour (CU)	<5		8	<5		<5		<5	**>60**	<5.0	<5.0	<5.0	<5	>60	<5		<5		<5	<5		<5.0	14.9			15
Conductivity (uS/cm)				411				567		1250	1550	90	1460		225		596			330		224	212			
Total Dissolved Solids	199		224	230		312		370	**628**	**1240**	**996**	48	913	123	136		395		164	203		59	156			500
Hardness CaCO3	197		222	219		286		247	541	531	<6.6	6.59	1.56	118	120		277	305	158	168		41.8	106	AO >200 = poor, > 500 unacceptable[A]		
pH	8.10		7.93	8.03		7.60		7.8	7.86	7.96	8.14	6.54	8.09	7.83	7.86		8.09		7.98	8.03		7.98	8.11	6.5		8.5
Turbidity (NTU)	0.7		**3.0**	**16.4**	**49.9**	**1.2**	0.23	0.35	**36.1**	**15.9**	0.28	0.72	0.39	**9.2**	**11.2**	**13.8**	0.4		0.40	**1.08**		0.22	**23.1**		1	5
UV Absorbance		0.0200			0.017		0.026									0.048					0.0110	0.0580	0.1590			
% UV Transmittance		95.5			96.2		94.2									89.5					97.5	87.5	69.3			
Dissolved Anions *(ALS)*																										
Alkalinity-Total CaCO3	199		230	237		232		197	188	194	207	7.6	201	126	135		223		156	168		44.3	95			
Chloride Cl	1.3		1.6	1.24		35.8	57.7	60.4	**285**	**298**	**299**	20.3	**272**	<0.5	<0.50		1.2		1	<0.50		2.29	1.53			250
Fluoride F	<0.05		0.07	0.071		<0.05		<0.020	<0.2	<0.20	<0.20	<0.020	0.2	<0.05	0.056		0.36		<0.05	0.077		0.038	0.084		1.5	
Silicate SiO4																		18.2								
Sulphate SO4	5.16		4.3	3.06		16.7		13.7	7.34	<5.0	<5.0	<0.50	<5.0	1.95	1.16		118		11	16.4		23.6	17.4			500
Nitrate Nitrogen N	<0.1		<0.1	<0.10		2.5	2.33	2.3	<0.05	<1.0	<1.0	<0.10	<1.0	<0.01	<0.10		<0.1		<0.1	<0.1		<0.10	<0.10		10	
Nitrite Nitrogen N	<0.05		<0.05	<0.10		<0.05	<0.0010	<0.10	<0.02	<1.0	<1.0	<0.10	<1.0	<0.005	<0.10		<0.1		<0.05	<0.1		<0.10	<0.10		1	
Ammonia Nitrogen N							0.037				<0.020															
Total Phosphate PO4																		0.0499								
Total Metals *(ALS)*																										
Aluminum T-Al	<0.05		<0.005	<0.010		<0.005		<0.010	<0.005	<0.020	<0.10	<0.010	<0.010	<0.005	<0.010		<0.005	<0.010	<0.005	<0.010		<0.010	0.724			
Antimony T-Sb	<0.0002		<0.0002	<0.0005		<0.0002		<0.010	<0.0002	<0.0010	<0.0050	<0.00050	<0.0005	<0.0002	<0.0005			<0.00050	<0.0002	<0.0005		<0.00050	<0.00050		0.006	
Arsenic T-As	0.0003		0.0004	0.00025		0.0005		0.00045	*0.0053*	0.00418	0.0023	0.00068	*0.003*	0.0004	0.00042		*0.0171*	*0.015*	<0.0002	0.00013		0.0002	0.00072		0.025	
Barium T-Ba	0.177		0.282	0.243		0.316		0.245	**1.39**	0.794	<0.20	<0.020	<0.020	0.109	0.1		0.040	0.041	0.099	0.075		0.024	0.095		1	
Boron T-B	0.004		0.003	<0.10		0.008		<0.10	0.016	<0.20	<1.0	<0.10	<0.10	0.002	<0.10		<0.05	<0.10	0.002	0.1		<0.10	<0.10		5	
Cadmium T-Cd	0.00003		<0.00001	<0.0002		0.00003		<0.0002	<0.00001	<0.00040	<0.0020	<0.00020	<0.0002	<0.00001	<0.0002		<0.0002	<0.00020	<0.00001	0.0002		<0.00020	<0.00020		0.005	
Calcium T-Ca				61.6				80.2		170	2.3	2.14	0.63		38.3		58.8	62.3		47.6		11.4	26.6			
Chromium T-Cr	<0.005		0.0007	<0.0020		0.0013		<0.0020	0.0053	<0.0040	<0.020	<0.0020	<0.0020	0.0008	<0.0020		<0.002	<0.0020	0.001	<0.0020		<0.0020	<0.0020		0.05	
Copper T-Cu	0.008		0.001	0.013		0.313		0.0392	0.001	0.0159	<0.010	<0.0010	0.0091	<0.001	0.0014		0.001	0.0372	0.061	0.0248		0.0244	0.0189		1	
Iron T-Fe	0.11		0.16	**1.4**		0.02		0.253	**2.85**	**1.28**	<0.030	<0.030	<0.030	**0.58**	**2.78**	**2.94**	0.05	0.082	<0.01	**0.127**		<0.030	**0.978**			0.3
Lead T-Pb	0.0004		0.0002	<0.0010		0.0008		0.0044	<0.0001	<0.0020	<0.010	<0.0010	<0.0010	0.0005	<0.0010		<0.001	<0.0010	0.0002	<0.0010		0.0016	0.0012		0.01	
Magnesium T-Mg				15.9				1.56		26	<1.0	0.3	<0.10		5.82		33.3	36.7		11.8		3.25	9.67			
Manganese T-Mn	<0.005		**0.118**	**0.0537**	**0.0589**	<0.005		0.0148	**0.576**	**1.01**	<0.020	0.0187	0.0071	**0.158**	**0.164**	**0.192**	**0.078**	**0.0851**	<0.005	0.0027		<0.0020	0.0164			0.05
Mercury T-Hg				<0.0002				<0.00020		<0.00020	<0.00020	<0.00020	<0.0002		<0.0002		<0.00005	<0.00020		<0.0002		<0.00020	<0.00020		0.001	
Potassium T-K				0.93				0.32		2.12	515	17	480		0.53		3.34	3.71		0.76		0.54	0.89			
Selenium T-Se				<0.0010				<0.0010		<0.0020	<0.010	<0.0010	<0.0010		<0.0010		<0.001	<0.0010		<0.0010		<0.0010	<0.0010		0.01	
Sodium T-Na	2		2.2	2.3		12.8		<2.0	21.8	25.2	<2.0	2.2	<2.0	1.7	<2.0		17.0	17.2	2.5	2.5		<2.0	5.1			200
Uranium T-U	<0.0007		0.0009	0.00118		0.0008		0.00038	<0.0005	0.00029	<0.0010	<0.00010	0.00039	<0.0005	<0.0001		0.00393	0.00384	0.0016	0.00169		0.00099	0.00025		0.02	
Vanadium T-V																		<0.030								
Zinc T-Zn	0.188		0.008	<0.050		0.102		0.096	0.004	<0.10	<0.50	<0.050	<0.050	0.281	0.197		<0.005	<0.050	0.006	0.092		<0.050	0.114			5
Dissolved Metals *(ALS)*																										
Aluminum D-Al											<0.10						<0.005	<0.010							0.1	
Antimony D-Sb											<0.0050							<0.00050							0.006	
Arsenic D-As											0.0021						*0.0163*	*0.0134*							0.025	
Barium D-Ba											<0.20						0.039	0.041							1.0	
Boron D-B											<1.0						<0.05	<0.10							5	
Cadmium D-Cd											<0.0020						<0.0002	<0.00020							0.005	
Calcium D-Ca											1.9						58.8	62.3								
Chromium D-Cr											<0.020						<0.002	<0.0020							0.05	
Copper D-Cu											<0.010						0.001	0.0372								1.0
Iron D-Fe											<0.030						<0.030	0.05	0.082							0.3
Lead D-Pb											<0.010							<0.001	<0.0010						0.01	
Magnesium D-Mg											<1.0							33.3	36.7							
Manganese D-Mn					**0.0573**						<0.020					**0.189**	**0.078**	**0.0851**								0.05
Mercury D-Hg											<0.00020						<0.00005	<0.00020							0.001	
Potasium D-K											504						3.34	3.71								
Selenium D-Se											<0.010						<0.001	<0.0010							0.01	
Sodium D-Na											<2.0						17.0	17.2								200
Uranium D-U											<0.0010						0.00393	0.00384							0.02	
Vanadium D-V																		<0.030								
Zinc D-Zn											<0.50						<0.005	<0.050								5.0
Trihalomethanes																										
Bromodichloromethane																		<0.0010								
Bromoform																		<0.0010								
Chloroform																		<0.0010								
Dibromochloromethane																		<0.0010								
Total Trihalomethanes																		<0.0040							0.1	
Organic Parameters																										
Tannin and Lignin		<0.10			0.36		0.18									0.29					<0.10	0.14	0.53			
Total Organic Carbon C		1.82			1.22		1.50				1.78					2.31					1.15	2.77	6.04			
Haloacetic Acids																										
Bromoacetic Acid																		<0.0020								
Bromochloroacetic Acid																		<0.0020								
Chloroacetic Acid																		<0.020								
Dibromoacetic Acid																		<0.0020								
Dichloroacetic Acid																		<0.0020								
Trichloroacetic Acid (TCA)																		<0.0020								
Polycyclic Aromatic Hydrocarbons																										
Acenaphthene										<0.000050						<0.000050										
Acenaphthylene										<0.000050						<0.000050										
Acridine										<0.000050						<0.000050										
Anthracene										<0.000050						<0.000050										
Benz(a)anthracene										<0.000050						<0.000050										
Benzo(a)pyrene										<0.000010						<0.000010									0.00001	
Benzo(b)fluoranthene										<0.000050						<0.000050										
Benzo(g,h,i)perylene										<0.000050						<0.000050										
Benzo(k)fluoranthene										<0.000050						<0.000050										
Chrysene										<0.000050						<0.000050										
Dibenz(a,h)anthracene										<0.000050						<0.000050										
Fluoranthene										<0.000050						<0.000050										
Fluorene										<0.000050						<0.000050										
Indeno(1,2,3-c,d)pyrene										<0.000050						<0.000050										
Naphthalene										<0.000050						<0.000050										
Phenanthrene										<0.000050						<0.000050										
Pyrene										<0.000050						<0.000050										
Quinoline										<0.000050						<0.000050										
Extractable Hydrocarbons																										
EPH10-19										<0.30						<0.30					<0.30					
EPH19-32										<1.0						<1.0					<1.0					
LEPH										<0.30						<0.30										
HEPH										<1.0						<1.0										
Organochlorine Pesticides																										
Aldrin																<0.000050										8.5
alpha-BHC																<0.000050										500
beta-BHC																<0.00010										
delta-BHC																<0.000050										
cis-Chlordane (alpha)																<0.000050										
trans-Chlordane (gamma)																<0.000050										
2,4'-DDD																<0.00010										
4,4'-DDD																<0.000050										
2,4'-DDE																<0.00010										
4,4'-DDE																<0.000050										
2,4'-DDT																<0.00010										
4,4'-DDT																<0.00010										
Dieldrin																<0.000050										
Endosulfan I																<0.000050										
Endosulfan II																<0.000050										
Endosulfan Sulfate																<0.000050										
Endrin																<0.00020										
Heptachlor																<0.00010										
Heptachlor Epoxide																<0.000050										
Lindane (gamma - BHC)																<0.000050										
Methoxychlor																<0.00020										
Mirex																<0.000050										
cis-Nonachlor																<0.000050										
trans-Nonachlor																<0.000050										
Oxychlordane																<0.000050										
Field Chemistry (EBA)																										
pH		8.17			7.84		7.89				8.20	7.76				8.07					8.07	8.39	8.64			8.5
TDS (ppm)		132			207		274				**750**	76				158					158	40	53			500
EC (uS/cm)		263			416		550				1517	153				315					315	86	109			
Temperature (°C)		9.1			4.9		6.1				8.0	17.3				9.4					9.4	16.7	10.8			
Free Available Chlorine																						0.02				

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting .

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU), Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

- = not tested

Table 3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates			Well Details								Potential Contaminant Sources						Well Construction Details					
Building #	Building Name	Location	Northing (+/- 10 m)	Easting (+/- 10 m)	Grade Elevation (+/- 10 m)	Well Casing Diameter (mm)	Year Well Installed	Well Log?	Well Depth (m bg)	Reported Low Permeabilty Protective Layer?	Pump Setting (m bg)	Well Capacity - Tested, or Reported by User	Static Water Level Below Ground (m-btwc)	Distance from well to nearest point of septic field (m)	Distance from well to nearest building (m)	Distance to surface water body (m)	AST present on property?	Distance from well to AST (m)	Other potential sources of contamination observed on property, and distance to well.	Wellhead Above ground (m)	Well Cap	Well Screen	Surface Seal	Apron Grading	Comments
M0107	R.C.M.P. Detachment	Teslin				150		no		Clay confining layer starting at approximately 15 m		1 hp submersible pump, services detachment and 2 residences		Community Piped sewage Collection	5 m	Greater than 100 m	AST 1 AST 2 AST 3	9 16 17		2.3 m below ground	Yes, pitless unit		Unlikely	Yes	Services Teslin RCMP Detachment (M0107) as well as two Teslin RCMP Residences (M0108 and M0109)
M0109	R.C.M.P. Housing	Teslin				150	1970	Yes	37 (143 at time of drilling)	Clay confining layer starting at 13.8 m	No pump	N/A	8.47	Community Piped sewage Collection	Located inside basement	Greater than 100 m	AST 1 AST 2 AST 3	28 21 2		No, approximately 1 m below grade	Split seal gasket cap		Unlikely	No, ground slopes towards wellhead enclosure	Well is no longer in use
M0181	R.C.M.P. Housing	Teslin	6673483	627320	721	No well, system is on water delivery								15 from residence		Less than 100 m to teslin community well				N/A	N/A	N/A	N/A	N/A	This system uses water delivery
4762	Teslin School	Teslin	6671906	626139	705	125	1973	Yes	40.14 (may be pump)	Clay from 1.2 - 19.8 m			14.41 m below grade	Community Piped sewage Collection	4	Greater than 100 m	No			No, 1.7 m below grade	150 mm split seal gasket cap - does not fit on casing	From 44.0 m to 45.7 m below grade	No	No	
4951	Health Centre	Teslin	6671784	626304	697	150	2000	No						Community Piped sewage Collection	9	Greater than 100 m	AST 1 AST 2	5 9		No, 0.75 m below grade	Split Seal Gasket Cap		Unlikely	No, but site is well drained	
4782	Water Reservoir	Teslin	6673038	625969	704	No well, system is on water delivery								Greater than 60 m	Inside water resevoir building	Greater than 100 m	AST 1 AST 2	4 50	Salt Storage at 8 m Salt Hopper at 40 m Used Oil Tank at 50 m Rock Pit at 45 m Asphalt Pile at over 60 m	N/A	N/A	N/A	N/A	N/A	The system is on water delivery and uses a large concrete cistern in the resevoir building as a storage tank. Until recently water was piped approximately 2 km
4793	Grader Station	Swift River	6653783	377966	888	100 mm pvc pipe		No	6.96 (may be pump)	Unlikely		Well has very low yield	5.20	38	Inside maintenance garage	Approximately 60 m to Seagull Creek			Used Oil Tank at 16 m	0.08 m above grade	No		No	No	This well is likely a dug well
4797	Utility Building	Swift River	6643544	377959	884	150		No	23.0	Unknown	10.11		4.41	60	Inside utility building	40 m to Swift River	AST Abandonned Diesel Tank	4 10	Oil Heater at 10 m	Wellhead is at grade	No			Concrete floor around well is not sloped	Well services a highway maintenace truck fill and the forman's residence. The heat trace to the residence had been left on at the time of inspection so
4799	Living Complex	Swift River	6653710	377999	892	150		No		Unknown		Able to service 5 unit living complex		Approximately 60 m, 25 m to wood stave sewage line	1	75 m to Seagull Creek			Fuel Drums at 8 m	0.65 m below grade	Split seal gasket cap		Unlikely	Yes	Well services the 5 units and 1 common room in the Swift River Living Complex.
M0086	R.C.M.P. Housing	Watson Lake	6657739	518261	695	150		No	14.3 m below grade	Unknown	Jet pump		9.5 m below grade	M0086, M0087, M0088 septic field at 25 m M0092 septic field at 110 m M0126 and M00127 septic at 90 m	Located inside basement	Greater than 100 m	Basement AST's AST 1 AST 2	15 m 70 m 100 m	UST at 105 m 4 other wells on property at approximately 60 m, 85 m, 85m (abandonned), and 100 m	1.6 below grade	No		Unlikely	Ground above wellhead enclosure is relatively flat	
M0088	R.C.M.P. Housing	Watson Lake	6657683	518271	700	150		No	13.0	Unknown	Jet pump		9.54 m below grade	M0086, M0087, M0088 septic field at 35 m M0092 septic field at 45 m M0126 and M00127 septic at 55 m	Located inside basement	Greater than 100 m	Basement AST's AST 1 AST 2	15 m 45 m 45 m	UST at 55 m 4 other wells on property at approximately 60 m, 25 m, 25m (abandonned), and 60 m	1.45 below grade	No		Unlikely	Ground above wellhead enclosure is relatively flat	Well services both M0087 and M0088 RCMP residences
M0092-A	R.C.M.P. Detachment	Watson Lake	665766	518256	694	150	1992	Yes	15.9	None reported		25 gpm at time of drilling	8.0 m below grade at time of drilling	M0086, M0087, M0088 septic field at 40 m M0092 septic field at 35 m M0126 and M00127 septic at 55 m	2	Greater than 100 m	AST 1 AST 2	27 m 17 m	UST at 25 m 4 other wells on property at approximately 85 m, 25 m, 1m (abandonned), and 70 m	1.15 below grade	Split seal gasket cap		Unlikely	Slight slope away from well	Well services both the M0092 RCMP detachment and the M0084 RCMP gym
M0092-B	R.C.M.P. Detachment	Watson Lake	6657662	518253	693	100		No		Unlikely		Well no longer in use	9.160	M0086, M0087, M0088 septic field at 40 m M0092 septic field at 35 m M0126 and M00127 septic at 55 m	Located inside basement	Greater than 100 m	AST 1 AST 2	27 m 17 m	UST at 25 m 4 other wells on property at approximately 85 m, 25 m, 1m (abandonned), and 70 m	Approximately 1.6 m below grade	No		Unlikely	Slight slope away from well	Well is no longer in use
M0127	R.C.M.P. Housing	Watson Lake	6657664	518327	714	150	2001	No	16.71	Unlikely	11.04		6.895	M0086, M0087, M0088 septic field at 65 m M0092 septic field at 45 m M0126 and M00127 septic at 35 m	Located inside basement	Greater than 100 m	Basement AST's AST 1 AST 2	10 m 95 m 65 m	UST at 60 m 4 other wells on property at approximately 100 m, 70 m, 70m (abandonned), and 60 m	1.75 below grade	Split seal gasket cap		Unlikely	Ground above wellhead enclosure is relatively flat	Well services both M0127 and M0126 RCMP residences
YTG - Small Public Drinking Water Systems							-	-	N/A	-	-	-	-	> 30 m from any part of a sweage disposal system	-	-	-	>30 from any potential sources of polution	>30 from any potential sources of polution >120 m from solid waste site, dump, or cemetary >300 m from sewage lagoon or pit	-	-	-	-	-	eba

Well Identification			GPS Coordinates			Well Details								Potential Contaminant Sources						Well Construction Details					
Building #	Building Name	Location	Northing (+/- 10 m)	Easting (+/- 10 m)	Grade Elevation (+/- 10 m)	Well Casing Diameter (mm)	Year Well Installed	Well Log?	Well Depth (m bg)	Reported Low Permeabilty Protective Layer?	Pump Setting (m bg)	Well Capacity - Tested, or Reported by User	Static Water Level Below Ground (m-btwc)	Distance from well to nearest point of septic field (m)	Distance from well to nearest building (m)	Distance to surface water body (m)	AST present on property?	Distance from well to AST (m)	Other potential sources of contamination observed on property, and distance to well.	Wellhead Above ground (m)	Well Cap	Well Screen	Surface Seal	Apron Grading	Comments
4821	Watson Lake Scales	Watson Lake	6557029	519309	690	150	2004	Yes	28.8	Clay from 13.7 to 15.9 m, some permafrost at approximately 15m	13.2	17 gpm from log	2.765	52	30	Greater than 100 m	AST	38 m	Water drainage from surrounding area runs directly around well	0.55	Pitless unit, cap not on due to damage	20 slot screen from 19.2 m to 21.6 m	Yes, but may not properly constructed	No. Well is located in a low point between the parking lot and the forested area behind the weigh scales and water streams directly past the wellheac	The well casing had previously been hit by a truck and was samaged. Due to the damage, the cap can no longer be sealed on to the casing and the well is open.
4836	Watson Lake Grader Storage Building	Watson Lake	6658289	515871	715	150	1986	Yes	17.8	Silt and Till from 2.5 m to 12.8 m		20 gpm from log	11.0	Community Piped sewage Collection	Located off from maintenance garage	Greater than 100 m	AST 1 AST 2	7 16	Waste Oil Burner at 16 m UST greater than 30 m away, and likely downgradient	0.1 m above grade	Split seal gasket cap	20 slot screen from 17.0 m to 17.8 m	No	Ground above wellhead enclosure is relatively flat	The well services the grader storage building and the maintenance garage, as well as the Property Management Agency Watson Lake office. It is likely downgradient from a barite plant and sewage lagoon.
4841	Watson Lake Visitor Reception Centre	Watson Lake	6658536	515881	707	90 mm (thin walled)		No	10.69			Well is no longer in use	4.735	Community Piped Sewage Collection system	Located inside basement	Greater than 100 m				Approximately 1.5 m below grade	None present		Unlikely	No	Well is not presently in use. The Visitor Reception Centre is supplied by a piped community distribution system. The well is only used as a back-up system in case the community system freezes
4842	Cassiar Weigh Scales	Watson Lake Area	6554368	496710	730	150		No	27.72 (may be pump)				19.5	13 m to tank, not sure if there is a field.	4.5	Greater than 100 m	AST	1	Nearby service station: 75 m to pumps	1.25 m below grade	Split seal gasket cap		Unlikely	No, there is a drainage stream that runs within 1 m of the wellhead enclosure	
4840	Watson Lake Environmental Office	Watson Lake	6658241	515629	712	150		No	44.8					32	2	Greater than 100 m	AST 1 AST 2	35 40	Hydrocarbon spill area at 30 m Fuel Drums at 13 m	0.23 m above grade	Split seal gasket cap		Unlikely	Yes	The well is likely downgradient from a barite plant area and sewage lagoon.
4851	Watson Lake Airport Pumphouse	Watson Lake Airport	6664005	509800	690	200	1991	Yes	33.4	Silt from 17.8 m to 21.2 m		150 gpm	5.4 m below grade at time of drilling	130 (35 to tank and 20 to sewage line)	Located inside basement of pumphouse	10 m	AST	Greater than 80 m	Contaminated site starting at 5 m from the well	2.75 m below grade	Split seal gasket cap	80 slot from 29.8 m to 31.3 m and 100 slot from 31.3 m to 32.8 m	Unlikely	Yes	The well services the airport terminal as well as the airport maintenance garage.
4873	Tuchitua Pumphouse	Campbell Highway	6754733	488237	730	150	1974	Yes	13.8	No, sand and gravel only	12.7 m		Approximately 2 m (pump was on at time of inspection)	Approximately 50 m and 80 m to leach pits.	Located inside pumphouse	4	AST 1 AST 2	40 50	Fuel and paint drums between 15 m and 30 m from the well	0.07 m above grade	None present	Perforated piping from 8.9 m to 10.4 m	No	No, but site is well drained	The well services the living complex, the maintenance garage and the electric generating station. The bottom of the well is closed and the casing is perforated from 8.9 m to 10.4 m
4962	Liard Fire Hall	Upper Liard	6656947	504733	627	150		No						7.5 m to tank, not sure of field location	Located inside fire hall washroom	Greater than 100 m	No	N/A		Wellhead is at grade	Split seal gasket cap		Unlikely	No	
4976	Watson Lake Ambulance Building	Watson Lake	6658232	516892	696	200 mm pvc pipe		No	5.3	Unlikely	Jet pump		3.0 m below grade	10 m to septic tank.	3	Greater than 60 m	No	N/A	Horse corrals at 1.5 m from the well	0.6 m below grade	None present		No	No, well is at a low point on the property	This well is likely a dug well
4981	Watson Lake Energy, Mines, and Resources Office	Watson Lake	6658342	515715	707	150	1975	Yes	23.0	Silt from surface to 15.3 m				13 m to tank, field likely less than 30 m	2	Greater than 100 m	AST	12	Industrial Junkyard at approximately 20 m Scrap meatal at approximately 20 m Sink hole that may have been an old septic tank at 32 m	2.5 m below grade	Split seal gasket cap, but was not in place - well is open	Perforated piping from 20.9 m to 22.4 m	No	No, but site is well drained	The well is down slope and downgradient from a barite plant and sewage lagoon.
4993 and 4994	Watson Lake EMR Fire Control Centre and Tanker Base	Watson Lake Airport	6664425	510654	688	Unknown, likely 150 mm or 200 mmm. Surface casing is 250 mm		No					5.3	Greater than 60 m	53 m	12 m	Av gas AST	30 m	Fire retardant tanks from 15 m to 25 m Chemical storage at 40 m Evaporation lagoon that likely contains fire retardant and other run-off from the tarmac at 10 m	0.95 m above grade (top of surface casing on pitless unit), piping from pitless unit at 3.25 m below grade	Pitless unit with proper cap - gasket in cap is missing		No	No, well is at a low point on the property	The well services the EMR Fire Control Centre and Tanker Base. The well is located outside and the wellhead is a commercial pitless unit
6746	Ross River Fire Hall	Ross River	6874869	633545	699	200	1986	Yes	110 m	Till from grade to 101.5 m, permafrost was encountered at 8.23 m		167 gpm	6.57	17 m to tank, no field	1	Greater than 100 m	AST	29	UST at 13 m UST nest at 40 m Former service station (likely contaminated site) at 66 m	1.2 m below grade	Likely split seal gasket cap	25 slot from 105 m to 110 m	Unlikely	No	The well not only services the fire hall, but also services the community water delivery system
6591	Drury Creek Pumphouse	Drury Creek	6896764	531777	627	180		No	6.55	Silt and clay from grade to 13.5 m, bedrock from 13.5 m to depth	4.5		4.45	32 m	Located inside pit in pumphouse	Approximately 120 m to Drury Creek	AST 1 and 2	15 m	Industrial activiites, fueling area and possibly an abandoned UST 30 m from the well. Abondoned well at 30 and 50 m.	Wellhead is greater than 2 m below grade	No	No	No	Yes	The well services the grader station and likely also the living complex.
6711	Quiet Lake Grader Station	Quiet Lake	6780998	603201	793	No well, water supply is surface water intake on Quiet Lake.								Greater than 60m	n/a	Surface water intake on Quiet Lake	No	n/a		N/A	N/A	N/A	N/A	N/A	Water supply is surface water intake on Quiet Lake.
6751	Twin Creeks Grader Station	Twin Creeks	6945749	383027	889	No well, water supply is surface water intake on Twin Creek #1.								Greater than 60 m	n/a	Surface water intake on Twin Creek #1	AST 1,2,3	Greater than 60 m		N/A	N/A	N/A	N/A	N/A	Water supply is surface water intake on Twin Creek #1
YTG - Small Public Drinking Water Systems							-	-	N/A	-	-	-	-	> 30 m from any part of a sweage disposal system	-	-	-	>30 from any potential sources of polution	>30 from any potential sources of polution >120 m from solid waste site, dump, or cemetary >300 m from sewage lagoon or pit	-	-	-	-	-	

TABLE 4: SUMMARY OF OBSERVED DEFICIENCIES AND ESTIMATED COSTS

Building #	Building Name	HIGH AND MEDIUM RISK DEFICIENCIES	RECOMMENDED PRIORITY 1 MITIGATION	PRIORITY 1 ADDITIONAL ASSESSMENT	PRIORITY 1 COSTS				RECOMMENDED PRIORITY 2 - MITIGATION	PRIORITY 2 - ADDITIONAL ASSESSMENT	PRIORITY 2 - COSTS				LOW RISK DEFICIENCIES	RECOMMENDED PRIORITY 3 - MITIGATION	PRIORITY 3 - COSTS				
					Labour and Materials	Engineering	Contingency	Subtotal			Labour and Materials	Engineering	Contingency	Subtotal			Labour and Materials	Engineering	Contingency	Subtotal	Total
M0107/ 108/109	Teslin RCMP Detachment, Residences M0108 and M0109	Well construction, No disinfection, Proximity to ASTs	Bring all softeners back into service. Install UV disinfection/treatment systems.		$4,800	$980	$980	$6,760	Wellhead upgrades with pitless unit. Install filtration to 1 micron absolute. Decommission M0109 well. Move garage AST to greater than 30m.	Test arsenic concentration post RO	$8,000	$1,600	$1,600	$11,200	Elevated arsenic. High TDS, manganese, and pH.	Install RO in RCMP detachment.	$600	$120	$120	$800	$18,800
M0181	Teslin RCMP Residence	Lack of regular water holding tank cleaning and residual chlorine monitoring.	None	Test FAC routinely. If consistently below 0.2 at POU, consider other options.	$0	$0	$0	$0	No priority 2 mitigation recommended.		$0	$0	$0	$0	ABS piping. Poor piping layout.	Change ABS for PVC, and re-plumb.	$200	$40	$40	$300	$300
4762	Teslin School	Poor wellhead completion below grade, and improperly sized well cap. Piping is not in compliance with plumbing code and treatment system is in very poor condition. Retention tanks not required, however, install 20 GPM flow restrictor.	Shock chlorinate well and install a proper cap. Reconfigure piping and upgrade the chlorination system.	Additional assessment likely required for final design.	$6,500	$1,300	$1,300	$9,100	Standard wellhead upgrades with Pitless Unit, and fenced enclosure. Install filtration to 1 micron absolute.		$9,200	$1,800	$1,800	$12,800	Arsenic above proposed MAC.	Install POE arsenic removal system in future.	$4,000	$800	$800	$5,600	$27,500
4951	Teslin Health Centre	No disinfection.	Install NSF 55 UV disinfection and filtration post softener and ensure that softener is operating properly.		$3,700	$740	$740	$5,200	Standard wellhead upgrades.		$5,000	$1,000	$1,000	$7,000	Arsenic above proposed MAC.	Install POE arsenic removal system in future. Move ASTs.	$5,000	$1,000	$1,000	$7,000	$19,200
4782	Teslin Water Reservoir	Cistern is not suitable for drinking water. There is no treatment or disinfection system. No bacteriological results are available.	Install a water storage tank in the grader station and use water delivery for the potable water supply. Disconnect cistern from domestic supply and use for truck-fill only	Conduct regular bacteriological testing.	$10,000	$2,000	$2,000	$14,000	No priority 2 mitigation recommended.		$0	$0	$0	$0	Arsenic above proposed MAC.	If water delivery is too expensive in the future, then a new well may be drilled. Must be properly constructed and greater than 30 m from potential sources of contamination. Install treatment system if required, pending water quality.	$35,000	$7,000	$7,000	$49,000	$63,000
4793	Swift River Grader Station	Well has no surface seal, is shallow and vulnerable to contamination, and has industrial/commercial activities in close proximity to well. UST tank nest is approximately 12 m from well. Existing well should not (and currently is not) be used for drinking water source.	No Priority 1 Mitigation recommended. Ensure that EHSS agrees with signage advisory stating "Not for human consumption"		$0	$0	$0	$0	Option 1: Status Quo (advisories) with upgrades to protect aquifer.		$500	$100	$100	$700	Well capacity is reportedly inadequate.	None	$0	$0	$0	$0	$700
									Option 2: Improve well at Living Quarters, and connect well to serve grader Station. Upgrades to existing well to protect aquifer.	Obtain well log and determine well construction and well depth of Living Quarters well.	$12,600	$2,500	$2,500	$17,600							$17,600
									Option 3: Drill new well to serve all 3 Swift River Buildings.		$19,700	$3,900	$3,900	$27,500							$27,500
4797	Swift River Utility Building	Well has no surface seal and wellhead completion is very poor. Turbidity in exceedence of CDWQG MAC and a positive total coliform count has been reported. Oil heater, AST, abandoned diesel tank, and sewer lines within 30m. Pressure tank is made of galvanized steel and not suitable for drinking water. Existing well should not be used for a drinking water source.	Option 1: Disconnect foreman's residence from current well. Improve well at Living Quarters (including disinfection treatment), and connect well to serve foreman's residence. Upgrades to existing well to protect aquifer.	Obtain well log and determine well construction and well depth of Living Quarters well.	$15,200	$3,000	$3,000	$21,200	No priority 2 mitigation recommended.		$0	$0	$0	$0	Heat trace is left on year-round	See high-risk	$0	$0	$0	$0	$21,200
			Option 2: Disconnect foreman's residence from current well. Drill new well to serve all 3 Swift River Buildings.		$19,500	$3,900	$3,900	$27,300													$27,300
4799	Swift River Living Complex	Well has no surface seal. Copper previously in exceedence of CDWQG MAC. Sewer lines and fuel drums within 30m.	Option 1: Improve and upgrade well. Install disinfection treatment. Use to serve other YTG facilities at Swift River. Monitor copper in plumbing.	Obtain well log and determine well construction and well depth of Living Quarters well.	$4,000	$800	$800	$5,600	No priority 2 mitigation recommended.		$0	$0	$0	$0	None.	Decommission well.	$0	$0	$0	$0	$0
			Option 2: Drill new well to serve all 3 Swift River Buildings.		$20,700	$4,100	$4,100	$28,900													
M0086	Watson Lake RCMP Residence	Well has no cap. Well has no surface seal. Shallow well. Within 30 m of septic system. No disinfection.	Shock chlorinate well, install well cap, install POE UV system		$2,700	$500	$500	$3,700	Cluster distribution system using existing detachment well, including distribution and service lines.		$5,000	$1,000	$1,000	$7,000		Decommission well.	$1,000	$200	$200	$1,400	$12,100
M0087/ M0088	Watson Lake RCMP Residences	Well has no cap. Well has no surface seal. Shallow well. Within 30 m of septic system. Signs of impact from septic sources. No disinfection.	Shock chlorinate well, install well cap, install disinfection such as UV and pretreatment at POE.		$2,500	$500	$500	$3,500	Cluster distribution system using existing detachment well, including distribution and service lines.		$10,000	$2,000	$2,000	$14,000		Decommission well.	$1,000	$200	$200	$1,400	$18,900
M0092	RCMP Detachment and Gym	Abandoned well that has not been properly decommissioned nearby, 17 m from UST, 17 m and 27 m from AST, well is in pit, no grout seal, relatively shallow well, no treatment or disinfection.	Shock chlorinate well. Install RO in detachment and gym. Decommission well in basement of detachment. Remove UST.		14100	2800	2800	19700	Install UV disinfection system or chlorination for community system. Replace ASTs with double walled enviro tanks, standard wellhead upgrades.	Pump test well - $2000	$7,600	$1,500	$1,500	$10,600			$0	$0	$0	$0	$30,300

Building #	Building Name	HIGH AND MEDIUM RISK DEFICIENCIES	RECOMMENDED PRIORITY 1 MITIGATION	PRIORITY 1 ADDITIONAL ASSESSMENT	PRIORITY 1 COSTS				RECOMMENDED PRIORITY 2 - MITIGATION	PRIORITY 2 - ADDITIONAL ASSESSMENT	PRIORITY 2 - COSTS				LOW RISK DEFICIENCIES	RECOMMENDED PRIORITY 3 - MITIGATION	PRIORITY 3 - COSTS				
					Labour and Materials	Engineering	Contingency	Subtotal			Labour and Materials	Engineering	Contingency	Subtotal			Labour and Materials	Engineering	Contingency	Subtotal	Total
M0126/ M0127	Watson Lake RCMP Residences	Well has no surface seal. Well is below grade. Potential signs of impact from septic sources. No disinfection.	Shock chlorinate well, install RO in each residence for drinking water.		$2,500	$500	$500	$3,500	Community distribution system using existing detachment well, including distribution and service lines.		$10,000	$2,000	$2,000	$14,000			$1,000	$200	$200	$1,400	$18,900
4821	Watson Lake Weigh Scales (New Scales)	Casing is damaged, No cap, Poor location of well in parking lot, Drainage nearby well, Turbidity elevated, No disinfection.	Option 1: Improve and Upgrade Well. Shock Chlorinate. Repair casing, replace cap with locking cap, re-install surface seal, regrade, put fence around wellhead, install filtration and disinfection system.		$12,200	$2,400	$2,400	$17,000	No priority 2 mitigation recommended.		$0	$0	$0	$0	Arsenic above proposed MAC.	Install RO for drinking water.	$600	$120	$120	$840	$17,800
			Option 2: Drill and commission a new well.		$32,700	$6,500	$6,500	$45,700			$0	$0	$0	$0		Install RO for drinking water, if arsenic is still above MAC.	$600	$120	$120	$840	$46,500
4836	Watson Lake Grader Station Storage Building	Potential contamination from sewage lagoon and/or barite plant. No disinfection. No surface seal. Casing is too low. No bacteriological results reported.	Shock chlorinate well. Install RO systems in Grader Station and PMA building. Ensure softener is operational to keep barium below standard. Install filtration and UV.	Routine Bacteriological Testing (O&M)	$4,900	$1,000	$1,000	$6,900	Extend casing 500 mm above grade.	Hydrogeological and Water Quality Assessment to determine impact of barite plant and sewage lagoon on wells downgradient	$8,700	$1,700	$1,700	$12,100	Located within 30 m of potential contaminant sources.	Install surface seal.	$8,000	$1,600	$1,600	$11,200	$30,200
4841	Watson Lake Visitor Reception Centre	No cap on existing well, however, not in use as potable water source provided by piped distribution - Village of Watson Lake.	None	None.	$0	$0	$0	$0	Shock chlorinate well and install cap.		$250	$100	$100	$500	Existing well within 30 m of sewage lines. No cap on well. No surface seal. Well is shallow.	Ensure adequate freeze protection on community piped distribution. Properly decommission well.	$1,000	$200	$200	$1,400	$1,900
4842	Cassiar Weigh Scales	Potential sources of contamination within 30 m of well (including septic field??), AST 1 m from well, no surface seal, no treatment or disinfection of well source. Water tank for potable water in summer is accessible to tampering.	Option 1: Build enclosure around water tank complete with proper fill and vent, and put signage in bathroom instructing not to drink water. Ensure that water source for delivered water is disinfected at source.	Confirm whether there is a septic field.	$1,000	$200	$200	$1,400	Ensure Free Available Chlorine concentration is within acceptable range.		O&M cost	$0	$0	$0	High iron and manganese.	None	$0	$0	$0	$0	$1,400
			Option 2: Remove water tank. Shock chlorinate well, install treatment including pre-treatment, filtration and RO. Install secondary containment on AST.		$6,400	$1,300	$1,300	$9,000	Complete standard well upgrades (surface seal, casing extension, regrading).		$5,000	$1,000	$1,000	$7,000		None	$0	$0	$0	$0	$16,000
4840	Watson Lake Environmental Office	Well is located within 30 m of potential contaminant sources. Well is 230 m (likely downgradient) from sewage lagoon. There is no surface seal on well and well does not have sufficient stick-up. No disinfection. Likely downgradient of barite plant (barium concentrations elevated above background). Absorbol on ground may indicate that there had been a previous hydrocarbon spill.	Install filtration and disinfection system. Ensure softener is operational.	Determine why absorbol is on ground at rear of house.	$3,700	$700	$700	$5,100	Standard wellhead upgrades.	Hydrogeological and Water Quality Assessment to determine impact of barite plant and sewage lagoon on wells downgradient?	$11,700	$2,300	$2,300	$16,300	Elevated manganese above AO (post softener, but not post RO).		$0	$0	$0	$0	$0
4851	Watson Lake Airport Pumphouse	Well proximity to hydrocarbon contaminant plume. No surface seal. Elevated turbidity. No treatment/disinfection system.	Potassium permanganate greensand filter, 5 micron filtration, UV disinfection, activated carbon filtration. Backflow preventer.	Routine monitoring of PAH and VOC parameters in drinking water (every six months). Data must be reviewed on a yearly basis for 3 years, and at the end of 3 years, a decision should be made on the next phase of work if needed.	$16,700	$3,300	$3,300	$23,300	No priority 2 mitigation recommended.		$0	$0	$0	$0			$0	$0	$0	$0	$23,300
			Potassium permanganate greensand filter, 5 micron filtration, chlorination, activated carbon filtration. Backflow preventer.		$20,700	$4,100	$4,100	$28,900	No priority 2 mitigation recommended.		$0	$0	$0	$0	High iron, manganese and colour.	None	$0	$0	$0	$0	$28,900
4873	Tutchitua Pumphouse	Well is within 30 m of potential contaminant sources. No surface seal. At risk of flooding. Poor surface completion (no well cap and only 7 cm above floor). Very shallow well. Under direct influence of surface water. 1/8 tests positive for total coliform. No disinfection. Leach pits located likely upgradient from the well.	Install well cap and shock chlorinate the well. Raise casing. Install NSF 55 UV disinfection.		$2,700	$500	$500	$3,700	Drill new well upgradient from leach pits and other potential contaminant sources. Install waterline in trench below grade with proper insulation and heat trace.		$51,000	$10,200	$14,200	$75,400	Diesel fuel spill in 1977, however spill record indicates that it was cleaned up and considered that there was low potential for contamination. Pressure tank is very old and leaking.		$0	$0	$0	$0	$79,100

Building #	Building Name	HIGH AND MEDIUM RISK DEFICIENCIES	RECOMMENDED PRIORITY 1 MITIGATION	PRIORITY 1 ADDITIONAL ASSESSMENT	PRIORITY 1 COSTS				RECOMMENDED PRIORITY 2 - MITIGATION	PRIORITY 2 - ADDITIONAL ASSESSMENT	PRIORITY 2 - COSTS				LOW RISK DEFICIENCIES	RECOMMENDED PRIORITY 3 - MITIGATION	PRIORITY 3 - COSTS				
					Labour and Materials	Engineering	Contingency	Subtotal			Labour and Materials	Engineering	Contingency	Subtotal			Labour and Materials	Engineering	Contingency	Subtotal	Total
4962	Liard Fire Hall	Wellhead is in bathroom. Well is too close to septic system. Septic system does not appear to be up to standards. Turbidity is variable and extremely high. No surface seal. No disinfection. No backflow prevention from Fire storage tank.	Raise casing and shock chlorinate the system. Install NSF 55 Certified UV disinfection with 5 micron prefiltration. Install backflow preventer.	Further investigation to ensure that septic system is properly constructed.	$7,900	$1,600	$1,600	$11,100	Drill new well at safe location with respect to potential contaminant sources. Well should be at least 30 m southwest of septic system. Properly decommission existing well. Upgrade septic system pending results of additional assessment. Included as contingency. No other priority 2 mitigation recommended assuming new well with disinfection installed.		$31,000	$6,200	$6,200	$43,400	High manganese (above AO).	RO pending water quality results.	$600	$120	$120	$840	$55,300
4972	Watson Lake Ambulance Building	Shallow dug well. No surface seal. In pit below grade. Within 30 m of potential contaminants (horse corrals, septic holding tank). Well casing has no cap. Turbidity is above MAC and variable. Chloride and nitrate are high (above background) and variable. Well should be considered to be under the direct influence of surface water. No bacteriological testing has been reported to EBA. No disinfection or treatment.	Decommission well. Obtain alternate water supply through bulk water delivery. It is not considered feasible to install a safe well in the vicinity of this site. In the meantime, should consider posting signs (discuss with EHSS), and remove outside hose bib.	None.	$4,000	$800	$800	$5,600	None		$0	$0	$0	$0	None.		$0	$0	$0	$0	$5,600
4981	Energy Mines and Resources Building	Within 30 m of potential sources of contamination, including the septic system, an industrial junkyard, and scrap metal parts. No surface seal. Poor wellhead completion (well in pit below grade and is without a cap). MAC exceedences of turbidity and barium, and AO exceedence of chloride. Likely downgradient of sewage lagoon and barite plant - shows signs of impact from these sources. Filter drain and RO drain subject to cross contamination (No air gaps).	Post signs at all POUs that the only water to be used for drinking is from RO tap in kitchen. Install cap on wellhead and shock chlorinate well. Install UV disinfection system. Re-plumb RO and Softener drains with air gaps.	Ensure water treatment system is properly maintained. Adequate monitoring program must be instituted. Daily check of UV system to ensure working adequately.	$2,700	$500	$500	$3,700	Standard wellhead upgrades.	Hydrogeological and water quality assessment to determine impact of barite plant and sewage lagoon on wells downgradient. Standard wellhead upgrades. Confirm location of start of field.	$11,700	$2,300	$2,300	$16,300	High iron, manganese, TDS, previously high color (above AO). Previously elevated arsenic (above PMAC).		$0	$0	$0	$0	$20,000
4993/ 4994	EMR Fire Control Centre and Tanker Base	Within 30 m of potential sources of contamination, including an evaporation lagoon. No surface seal. MAC exceedences of turbidity. Positive total coliform result. No treatment or disinfection. Pump likely inadequate to supply peak demand for tanker fill and no backup well.	Install UV disinfection system in Tanker Base building. Assume require pre-treatment. Install new high-yield pump in existing well.	Increase bacteriological sampling. Complete 12 hour pump test to assess long term sustainability of well at same time as installation.	$8,700	$1,700	$7,700	$18,100	Drill new well at safe location with respect to potential contaminant sources. Well should have high capacity for tanker plane fill. Existing well should be used as backup and a new pump should be installed. Existing well should be disconnected from domestic system.		$29,500	$5,900	$5,900	$41,300	High iron, manganese and colour. Fire retardant and aviation fuel tanks within 30m, but are double walled Enivro tanks.	None	$0	$0	$0	$0	$59,400
6749	Ross River Fire Hall	Potential contaminant sources within 30 m including TND septic field, Fire Hall septic tank, UST, AST. Well in pit below grade. No surface seal. Residual chlorine low. Arsenic above PMAC.	Initiate residual chlorine monitoring program. Environmental Health Services should require TND hotel to remove and relocate its septic system to at least 60 m from the well. Remove UST and replace with double walled EnviroTank AST on opposite side of building.		$10,000	$2,000	$2,000	$14,000	Standard wellhead upgrades. Remove septic holding tank and replace at least 30 m from well - there cannot be effluent discharge from this septic system. POE arsenic removal system.		$24,500	$4,900	$4,900	$34,300	High manganese (above AO). Potential contaminated site at abandoned service station. Install POE arsenic removal system.	Install water softener. Investigate soils at abandoned service station for hydrocarbon contamination.	$600	$120	$120	$840	$49,100
6591	Drury Creek Grader Station	Shallow well drawing from unconfined aquifer susceptible to surficial contamination. Well construction does not allow for surface sanitary seal. Well within 30 m of potential sources of contamination including two AST's and a fuelling area. No treatment or disinfection.	Superchlorinate well and water system. Install filtration to 1 micron absolute and proportional feed chlorination system with necessary appurtenances. Will require power and heat to well enclosure building (assumes building is insulated). Relocate ASTs and Fuelling area.	None Identified	$12,100	$2,420	$2,420	**$16,940**	Decommission abandoned dug well on Living Complex Site.	None Identified	$2,000	$400	$400	**$2,800**	Turbidity previously exceeded CDWQG MAC.	Monitor turbidity.	$0	$0	$0	$0	$19,700

Building #	Building Name	HIGH AND MEDIUM RISK DEFICIENCIES	RECOMMENDED PRIORITY 1 MITIGATION	PRIORITY 1 ADDITIONAL ASSESSMENT	PRIORITY 1 COSTS				RECOMMENDED PRIORITY 2 - MITIGATION	PRIORITY 2 - ADDITIONAL ASSESSMENT	PRIORITY 2 - COSTS				LOW RISK DEFICIENCIES	RECOMMENDED PRIORITY 3 - MITIGATION	PRIORITY 3 - COSTS				
					Labour and Materials	Engineering	Contingency	Subtotal			Labour and Materials	Engineering	Contingency	Subtotal			Labour and Materials	Engineering	Contingency	Subtotal	Total
6711	Quiet Lake Grader Station	System directly supplied by surface water source. Potential sources of contamination to Quiet Lake or its tributaries unknown, but likely vulnerable to natural or anthropogenic sources of potential contamination. Total coliform present in water sample for bacteriological testing. No regular testing program for bacteriological or water quality analysis. No residual chlorine testing program. FAC below required 0.2 mg/L at point of use. Chlorine disinfection system not functioning properly.	Install filtration to 1 micron absolute.	Ensure routine sampling for bacteria and daily check of free available chlorine concentrations.	$600	$120	$120	**$840**		None Identified	$0	$0	$0	**$0**	No regular water storage tank-cleaning program at this site.		$0	$0	$0	**$0**	**$800**
6751	Twin Creeks	System supplied by surface water source with no treatment or disinfection. Potential sources of contamination to Twin Creek no.1 or its tributaries unknown. No regular testing program for bacteriological or water quality analysis. No treatment or disinfection system. No regular water storage tank-cleaning program. Significant biofouling of water storage tank observed during assessment.	Do not use for potable water until Priority 1 upgrades are completed. Option 1: Install treatment system similar to Dawson Grader Station (filtration, softener, UV, RO). Recommend skid mounted enclosed trailer.	Follow up sampling. Attempt to move intake to see if this affects water quality. Retain Civil water treatment engineer to make recommendations.	$15,000	$4,500	$3,000	**$22,500**		None Identified	$0	$0	$0	**$0**	No low-risk deficiencies identified for this site.	None Identified	$0	$0	$0	**$0**	**$22,500**
			Do not use for potable water until Priority 1 upgrades are completed. Option 2: Obtain new water source: Drill well. Required treatment unknown. A cost of $15000 has been carried to cover treatment.	None Identified	$45,000	$9,000	$9,000	**$63,000**		None Identified	$0	$0	$0	**$0**	No low-risk deficiencies identified for this site.	None Identified	$0	$0	$0	**$0**	**$63,000**

TABLE 5: OVERALL ASSESSED LEVEL OF RISK TO EXISTING WATER SUPPLY SYSTEMS USING MULTI-BARRIER APPROACH

		RISK INDICATORS					RISK MITIGATORS				OVERALL RISK AND PRIORITY		
Well System ID #	**Building Name**	**Exceedence of MAC other than total coliform or turbidty**	**Poor Quality Indicators (turbidity, coliform, nutrients)**	**Potential Bacteriological Contaminants (fields within 30 m, or tanks within 15 m)**	**Water source from shallow well? (less than 15 m)**	**Public Accessibility or Residence**	**Favourable Hydrogeological Conditions**	**Well Construction (surface casing, driven casing in tight formation etc..)**	**Disinfection Treatment (primary)**	**Disinfection Treatment (secondary)**	**Overall Risk**	**Rationale**	**Priority 1, 2 or 3**
M0107	Tesling R.C.M.P. Detachment/ Housing	No	Elevated chloride	No	Unlikely	Detachment and Residences (2)	Yes - clay	No	No	No	Moderate	Log and/ or well head upgrades may assist in mitigating risk.	1
M0109 (Abandonded Well)	Teslin R.C.M.P. Housing	n/a	Elevated chloride	n/a	No	No	Yes - clay	No- well seal or cap, Yes- driven in tight formation	n/a	n/a	Moderate	Well is no longer in use. Adequate decomissioning required to protect aquifer.	3
M0181	Teslin R.C.M.P. Housing	No	Elevated chloride	No	No	Residence	n/a	n/a	No	No	Moderate	Delivered water, treated at source.	1
4762	Teslin School	No	No	No	No	Yes	Yes - clay	No- well seal or cap, Yes- driven in tight formation	Yes- chlorination	No	High (as long as no well cap)	Proper well cap required.Surface seal required to comply with well construction guidelines.	1
4951	Teslin Health Centre	No	No	No	Unknown	Yes	? - no log	No	No	No	Moderate	Well head improvements required to mitigate risk.	1
4782	Teslin Water Reservoir	No	turbidity	No	No	No	n/a	n/a	No	No	High	Turbidity in exceedance of CDWQG.	2
4793	Swift River Grader Station	No	turbidity	No	Yes	No	? - no log	No	No	No	Moderate	Poor well construction, no well cap, most likely dug well. Risk is not high because there is a sign posted and drinking water provided.	3
4797	Swift River Utility Building/ Residence	No	turbidity, 1/6 total coliform	No	No	Residence	? - no log	No	No	No	High	No well cap, poor well comstruction, no risk mitigation.	1
4799	Swift River Living Complex	No	No	Yes- poor condition wood stave sewage line at 25m	?	Residence	? - no log	No	No	No	High	Risk exists, but no barriers.	1
M0086	Watson Lake R.C.M.P. Housing	No	elevated chloride	Yes	Yes	Residence	? - no log	No	No	No	High	Risk exists, but no barriers.	1
M0087 and M0088	Watson Lake R.C.M.P. Housing	No	elevated chloride	No	Yes	Residence	? - no log	No	No	No	High	Risk exists, but no barriers.	1

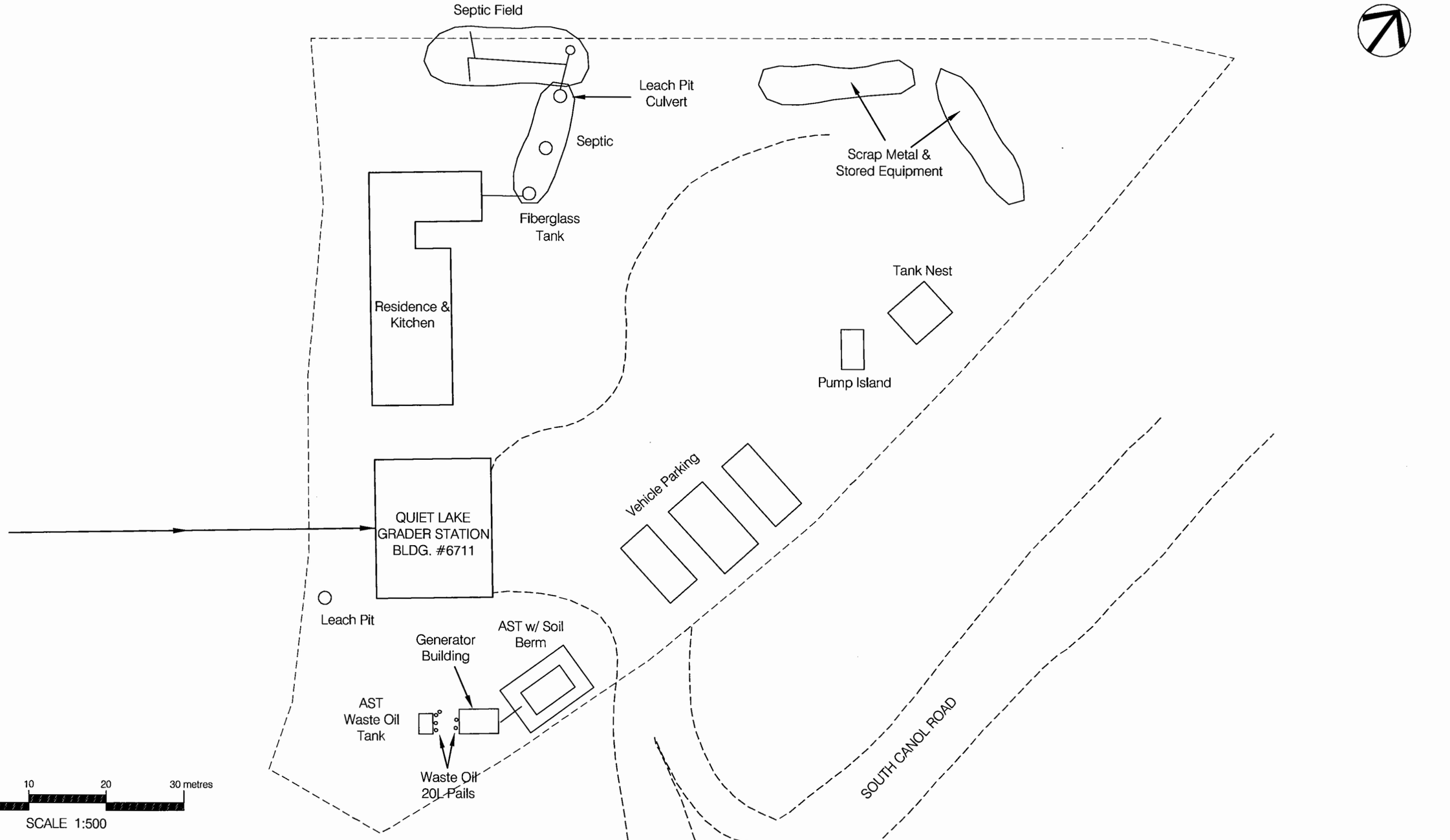
TABLE 5: OVERALL ASSESSED LEVEL OF RISK TO EXISTING WATER SUPPLY SYSTEMS USING MULTI-BARRIER APPROACH

		RISK INDICATORS					RISK MITIGATORS				OVERALL RISK AND PRIORITY		
Well System ID #	**Building Name**	**Exceedence of MAC other than total coliform or turbidty**	**Poor Quality Indicators (turbidity, coliform, nutrients)**	**Potential Bacteriological Contaminants (fields within 30 m, or tanks within 15 m)**	**Water source from shallow well? (less than 15 m)**	**Public Accessibility or Residence**	**Favourable Hydrogeological Conditions**	**Well Construction (surface casing, driven casing in tight formation etc..)**	**Disinfection Treatment (primary)**	**Disinfection Treatment (secondary)**	**Overall Risk**	**Rationale**	**Priority 1, 2 or 3**
M0092-A	Watson Lake R.C.M.P. Detachment	No	elevated chloride	No	No	Yes	No	No	No	No	Moderate	Risk exists, but no barriers.	1
M0092-B (Abandoned Well)	Watson Lake R.C.M.P. Detachment	No	?	No	?	No	? - no log	No	abandoned well	abandoned well	Moderate	Well is no longer in use. Adaquate decomissioning required to protect aquifer.	3
M0126 and M0127	Watson Lake R.C.M.P. Housing	No	elevated chloride	No	No	Residence	? - no log	No	No	No	High	Risk exists, but no barriers.	1
4821	Watson Lake Weigh Scales	No	turbidity	No	No	Yes	Yes - clay	Drillers log indicates inadequate well seal, casing not driven.	No	No	High (as long as no well cap)	Well head damaged, no cap or surface seal. Risk could be downgraded to medium if wellhead repaired.	1
4836	Watson Lake Grader Storage Building	No - barium (previously, but now below)	turbidity, elevated chloride (prior to treatment)	No	No	Yes - PMA offices	Yes - some silt and clay	No- well seal, Yes- driven in tight formation	No	No	Moderate	Barium and turbidity in exceedence of CDWQG prior to treatment system being installed. New results show Barium and turbidity below CDWQG.	1
4841	Watson Lake Visitor Reception Centre	n/a	No	No	Yes	No	? - no log	No	n/a	n/a	Low	Well is only used as backup. Wellhead upgrades required if well is to be used.	3
4842	Cassiar Weigh Scales	No	No	Yes - not sure if there is a septic field	No	Yes	? - no log	Unlikely	No	No	Moderate	No risk mitigation.	1
4840	Watson Lake Environmental Office	No	turbidity, elevated chloride	No	No	Yes	? - no log	No- well seal, Yes- driven in tight formation	No	Yes- Reverse Osmosis	Moderate	Turbidity in exceedance of CDWQG. Some risk is mitigated since RO provided. Staff should be instructed to drink RO water only.	1
4851	Watson Lake Airport Pumphouse	No	turbidity	No	No	Yes	Yes - silt	No- well seal, Yes- driven in tight formation	No	No	High	Risk exists, minimal barriers	1
4873	Tuchitua Pumphouse	No	1/8 total coliform	No	Yes	Residence	No	No	No	No	High	No risk mitigation.	1
4962	Liard Fire Hall	No	turbidity	Yes	?	Yes	? - no log	Unlikely	No	No	High	Turbidity in exceedance of CDWQG, likely under influence of surfacewater	1

TABLE 5: OVERALL ASSESSED LEVEL OF RISK TO EXISTING WATER SUPPLY SYSTEMS USING MULTI-BARRIER APPROACH

		RISK INDICATORS					RISK MITIGATORS				OVERALL RISK AND PRIORITY		
Well System ID #	**Building Name**	**Exceedence of MAC other than total coliform or turbidty**	**Poor Quality Indicators (turbidity, coliform, nutrients)**	**Potential Bacteriological Contaminants (fields within 30 m, or tanks within 15 m)**	**Water source from shallow well? (less than 15 m)**	**Public Accessibility or Residence**	**Favourable Hydrogeological Conditions**	**Well Construction (surface casing, driven casing in tight formation etc..)**	**Disinfection Treatment (primary)**	**Disinfection Treatment (secondary)**	**Overall Risk**	**Rationale**	**Priority 1, 2 or 3**
4976	Watson Lake Ambulance Building	No	turbidity, elevated chloride and nitrate	Yes	Yes	Yes	? - no log	No	No	No	High	Turbidity in exceedance of CDWQG, likely under influence of surfacewater	1
4981	Watson Lake Energy, Mines, and Resources Office	No, but barium (prevoiously)	turbidity, chloride (previously)	Yes	No	Yes	Yes - silt	No	No	Yes- Reverse Osmosis	Moderate	Barium, chloride and turbidity in exceedance of CDWQG. Some risk is mitigated since RO provided. Staff should be instructed to drink RO water only.	1
4993 and 4994	EMR Fire Control Centre and Tanker Base	No	turbidity and 1/6 total coliform	No	?	Yes	? - no log	No- well seal, Yes- driven in tight formation	No	No	High	Turbidity in exceedance of CDWQG.	1
6746	Ross River Fire Hall	No	No	No		Yes	Yes - clay and till	No- well seal, Yes- driven in tight formation	Yes	Yes	Low	Well construction and treatment mitigate most risk.	1
6591	Drury Creek Grader Station	No	turbidiity	No	Yes	Yes	No	No	No	No	High	Shallow dug well.	1
6711	Quiet Lake Grader Station	No	No	No	Surface Water Source	Yes	n/a	n/a	Yes	No	Moderate	Surface water source.	1
6751	Twin Creeks Grader Station	No	turbidity	No	No	Yes	n/a	n/a	No	No	High	Surface water source.	1

APPENDIX A



NOTES:

1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	SEPT. 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.004
ACAD FILENAME:	004-NORTHERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
NORTHERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

QUIET LAKE GRADER STATION
BUILDING # 6711
SITE LOCATION DIAGRAM
WELL ID: 6711

REVISION ISSUE: 0

FIGURE No.: FIGURE 6711-A

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LEGEND



PUMP



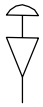
PRESSURE GAUGE



GATE VALVE



CHECK VALVE



SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



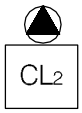
FLOW METER



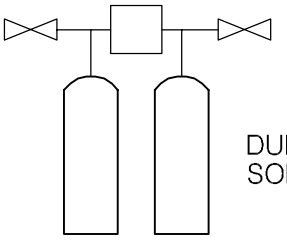
WATER FILTER
(CARTRIDGE TYPE)



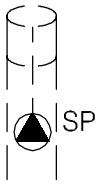
PRESSURE TANK



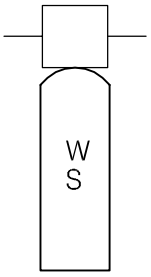
CHLORINE RESERVOIR AND
INJECTION PUMP



DUPLEX WATER
SOFTENER



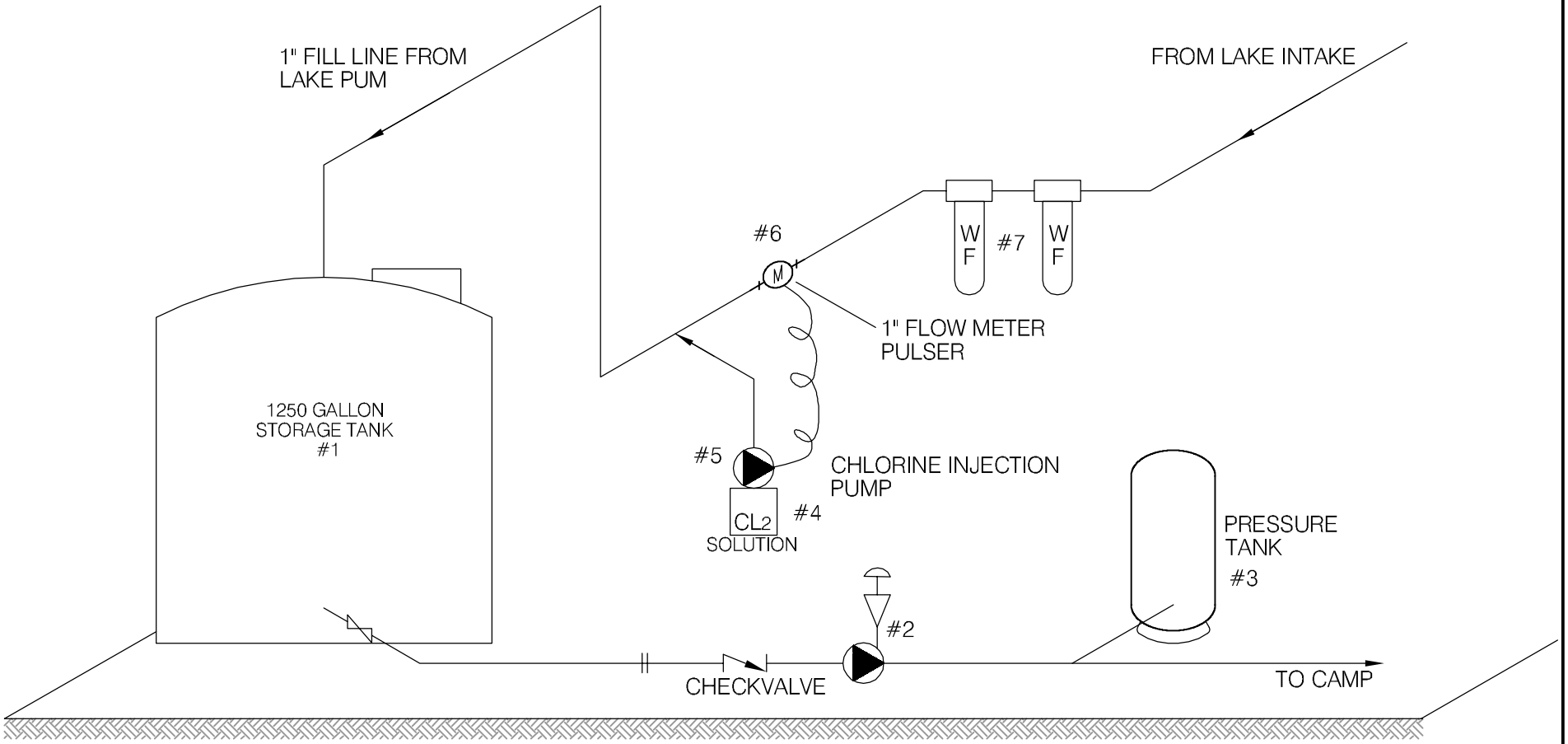
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

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SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	ADDITIONAL ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 6711 QUIET LAKE GRADER STATION	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002.005		DWG.: FIGURE 6711-B

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Eastern Region – Quiet Lake Grader Station
Building # 6711

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	Water Tank	N/A				1250 Gallon
2	Jet Pump	Grundfos				½ hp
3	Pressure Tank		PC366			
4	Chlorine Solution Tank					30 Gallon
5	Injection Pump		LMI A751-392T1			
6	Flowmeter Pulser					1” RFP-10
7	Filter	Duplex Big Blue				10”
8						
9						
10						

Table 6711-2: Water Quality Results

SOURCE:	Building 6711-Quiet Lake Grader Station	GCDWQ Criteria		
Location/ Resident	Quiet Lake			
Address				
Treatment	Filtration			
Disinfection	Chlorination			
Source of Water	Intake on Lake			
Purpose of Sampling	Baseline			
Sample Location				
Date Sampled	8-Aug-05	**Lower Limit**	**Upper Limit**	
Physical Tests *(ALS)*		**AO**	**MAC**	**AO**
Colour (CU)	<5.0			15
Conductivity (uS/cm)	224			
Total Dissolved Solids	59			500
Hardness CaCO3	41.8	AO >200 = poor, > 500 unacceptable[A]		
pH	7.98	6.5		8.5
Turbidity (NTU)	0.22		1	5
UV Absorbance	0.0580			
% Transmittance	87.5			
Dissolved Anions *(ALS)*				
Alkalinity-Total CaCO3	44.3			
Chloride Cl	2.29			250
Fluoride F	0.038		1.5	
Silicate SiO4				
Sulphate SO4	23.6			500
Nitrate Nitrogen N	<0.10		10	
Nitrite Nitrogen N	<0.10		1	
Ammonia Nitrogen N				
Total Phosphate PO4				
Total Metals *(ALS)*				
Aluminum T-Al	<0.010			
Antimony T-Sb	<0.00050		0.006	
Arsenic T-As	0.0002		0.025	
Barium T-Ba	0.024		1	
Boron T-B	<0.10		5	
Cadmium T-Cd	<0.00020		0.005	
Calcium T-Ca	11.4			
Chromium T-Cr	<0.0020		0.05	
Copper T-Cu	0.0244		1	
Iron T-Fe	<0.030			0.3
Lead T-Pb	0.0016		0.01	
Magnesium T-Mg	3.25			
Manganese T-Mn	<0.0020			0.05
Mercury T-Hg	<0.00020		0.001	
Potassium T-K	0.54			
Selenium T-Se	<0.0010		0.01	
Sodium T-Na	<2.0			200
Uranium T-U	0.00099		0.02	
Vanadium T-V				
Zinc T-Zn	<0.050			5
Dissolved Metals *(ALS)*				
Organic Parameters				
Tannin and Lignin	0.14			
Total Organic Carbon C	2.77			
Polycyclic Aromatic Hydrocarbons				
Field Chemistry (EBA)				
pH	8.39	6.5		8.5
TDS (ppm)	40			500
EC (uS/cm)	86			
Temperature (°C)	16.7			
Free Available Chlorine	0.02			

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU), Conductivity (umhos/cm), Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

eba

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date August 9, 2005

WELL ID #	Owner	Location Description
6717	YTG	Quiet Lake Grader Station

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
South Canol Highway

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Quiet Lake

c. GPS location: N 6780 998 E603201 elv 793m ± 8m UTM zone 8

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Maintenance garage and living complex
☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify n/a - surface water source from Quiet Lake

h. Distance from well to building _____

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: leach pit septic systems (likely)

k. Well location relative to field: ☐ upslope ☐ downslope ☐ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☐ Yes ☐ No

---

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☐ Yes ☒ No Entrance by animals? ☐ Yes ☒ No
Pump located outside complex in lake near a public recreation area

p. Is well site subject to flooding? ☐ Yes ☐ No n/a

q. Is the well site well drained? ☐ Yes ☐ No n/a

r. Is there a buried fuel tank on the property? ☐ Yes ☐ No

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe Various contaminant sources on property, but likely >30m from water intake

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1:_____; Distance from well to Potential Source 1:_____

Potential Source 2:_____; Distance from well to Potential Source 2:_____

Potential Source 3:_____; Distance from well to Potential Source 3:_____

Potential Source 4:_____; Distance from well to Potential Source 4:_____

t. Are there other wells on this property? ☒ Yes ☐ No

How many?_____ ☐ in use ☒ abandoned ☐ require proper sealing
dug well near current water intake.

2. Well and Wellhead information:

a. When was well installed? Year n/a Month _____

b. Type: ☐ drilled ☐ dug ☐ sand point ☒ other surface water source

c. Is there a drillers log for the well: ☐ Yes ☐ No n/a

d. Is there a surface seal to 6 m ☐ Yes ☐ No ☐ unknown ☐ unlikely n/a

e. Surface casing: ☐ Yes Diameter n/a ☐ No

f. Well casing: Diameter n/a Material: ☐ steel ☐ plastic ☐ concrete

g. Depth of well: n/a ☐ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: n/a

☐ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☐ unknown other n/a

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length n/a slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No n/a

m. Is the well head: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☐ in a building

☐ in a wooden enclosure other, describe surface water source from Quiet Lake

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail n/a

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☐ No n/a

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☐ No n/a

iv. Any evidence of rodents? Specify n/a

v. Does the well casing have a proper seal cap? ☐ Yes ☐ No

If no, describe condition n/a

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.
Direct surfacewater source

If yes is there treatment or disinfection ☒ Yes ☐ No

Explain (filtration, disinfection etc...) filtration, chlorination

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☐ granular sediment ☒ unknown
surfacewater

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☐ No n/a

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☒ electric submersible ☐ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☒ plastic from maintenance garage to lake

g. Pump delivers water to: ☒ pressure tank ☒ elevated tank ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☒ No

j. Is there a water meter on the system? ☐ Yes ☒ No

k. Is the pump and piping protected from freezing? ☐ Yes ☒ No

If yes, describe: Seasonal facility

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

Water for this system is supplied directly from Quiet Lake. There is an electric submersible pump that pumps water from the lake to the maintenance garage. There is an abandoned dug well near the current water intake. Both are located near the Quiet Lake Recreation Area downhill from the grader station.

b. Recommendations: _____

PART B: EBA Site Inspection
Inspector: MARK ROBINSON - AQUA TECH Date AUG 9/05

WELL ID #	Owner	Location Description
6711		QUIET LAKE GRADER STATION

6. Water Treatment

a. Is well water treated? ☒ Yes ☐ No; Type of treatment:

☒ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☒ Yes ☐ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☑ Yes ☐ No 0.02 mg/L reading.

Tested at KITCHEN TAP (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☒ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No PUMPED FROM LAKE TO TANK IN THE SHOP

7. Water Quality (observations):

a. Does the water stain plumbing? ☒ yes ☐ No ☒ slight ☐ severe

Type of stain: ☐ brown ☐ red ☐ black

b. Does the water contain sediment? ☐ Yes ☐ No ☐ occasional ☒ constant

c. Is there an unpleasant odour? ☐ Yes ☒ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☒ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No ?

f. Is there a chemical analysis? ☐ Yes ☒ No ☐ adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☐ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☒ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☐ No ☒ (unknown)

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☒ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? (Yes) No Details:

Where is it located?
Comments: IN THE MAIN SHOP AREA

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
(YES) NO
Comments: LOCATED IN CORNER OF LARGE HEATED SHOP

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES (NO)
Comments: THERE ARE WINDOWS IN THE SHOP, BUT NOT DIRECT IN THE TANK AREA

Are there other heat sources near the tank? YES (NO)
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES (NO)
Comments: LARGE CONCRETE FLOOR IN SHOP - NO SUMP

Overall Tank

What are the tank size and dimensions?
7' Round 6' High

What material is the tank constructed of? Poly

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? (YES) NO
Comments: PVC 1¼-1" Poly 160PSI From Lake & PVC Pipe For Suction To Pump Copper There After

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? (YES) NO 15"

Does the lid have a tight seal and is it watertight when closed? (YES) NO

Does the tank have an (overflow) or ~~high level whistle~~? (YES) NO

Is the water tank drain accessible? (YES) NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? (YES) NO
Comments: Some Staining - But Not Bad For Time In Service

Is there any sediment or scum in bottom of tank? (YES) NO
Comments: Very Little Seoiment

Is there any odour associated with the water or tank? YES (NO)

Have there been any bacteriological analyses conducted previously? YES NO Do Not Know

Does the tank appear that it has been cleaned recently? YES (NO) Neaver

Are the tanks easily assessed for the purpose of cleaning and disinfection? (YES) NO

8. Conclusions

a. Comments on overall installation:

WATER IS PUMPED FROM THE LAKE WITH A SUBM. PUMP THROUGH A 1" & 1¼" POLY LINE INTO THE SHOP THROUGH BB FILTERS 30MIC & 5MIC AND THEN CHLORINATED BEFORE ENTERING 1250 GAL STORAGE TANK. TANK IS CLEAN BUT HAS ONLY BEEN IN SERVICE FOR 3 SEASONS & HAS NEVER BEEN CLEANED.

b. Recommendations:



Photo 029: 6711 Grader station.



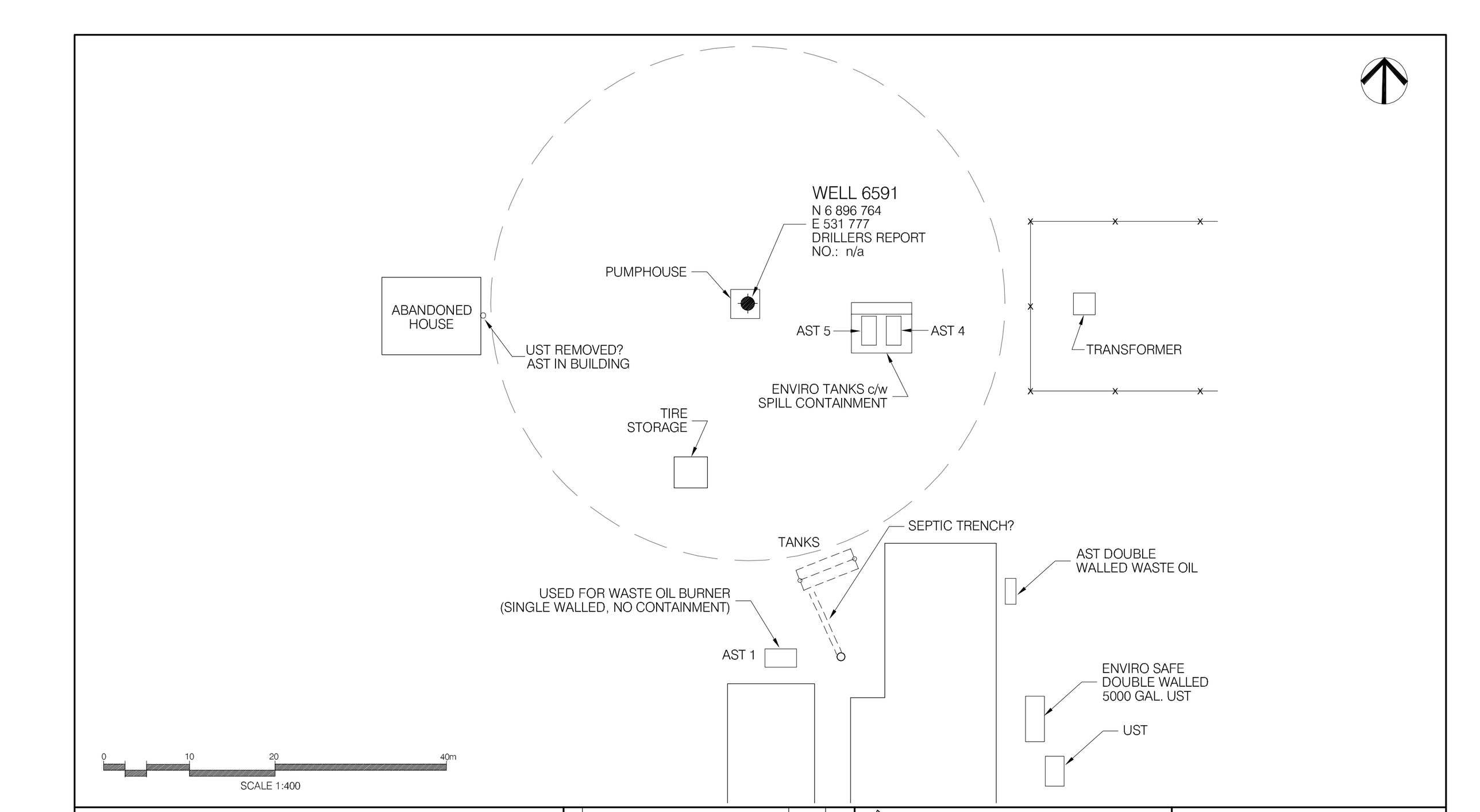
Photo 127: 6711 Surface water intake in Quiet Lake.



Photo 131: 6711 Water storage tank and LMI chlorination system.



Photo 028: 6711 AST with containment berm.



NOTES:

1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

DRURY CREEK GRADER STATION & PUMP HOUSE BUILDING # 6591
SITE LOCATION DIAGRAM
WELL ID: 6591

REVISION ISSUE 0

FIGURE No. FIGURE 6591-A

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\drury creek\1260002 Drury Crk Site Plan_6591A.dwg, 9/20/2005 11:03:36 AM, Adobe PDF

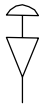
LEGEND


PUMP


PRESSURE GAUGE


GATE VALVE


CHECK VALVE


SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



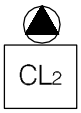
FLOW METER



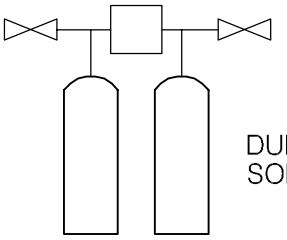
WATER FILTER
(CARTRIDGE TYPE)

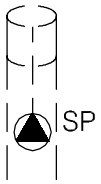


PRESSURE TANK

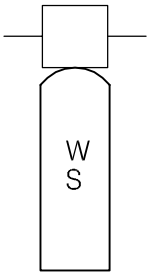


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER



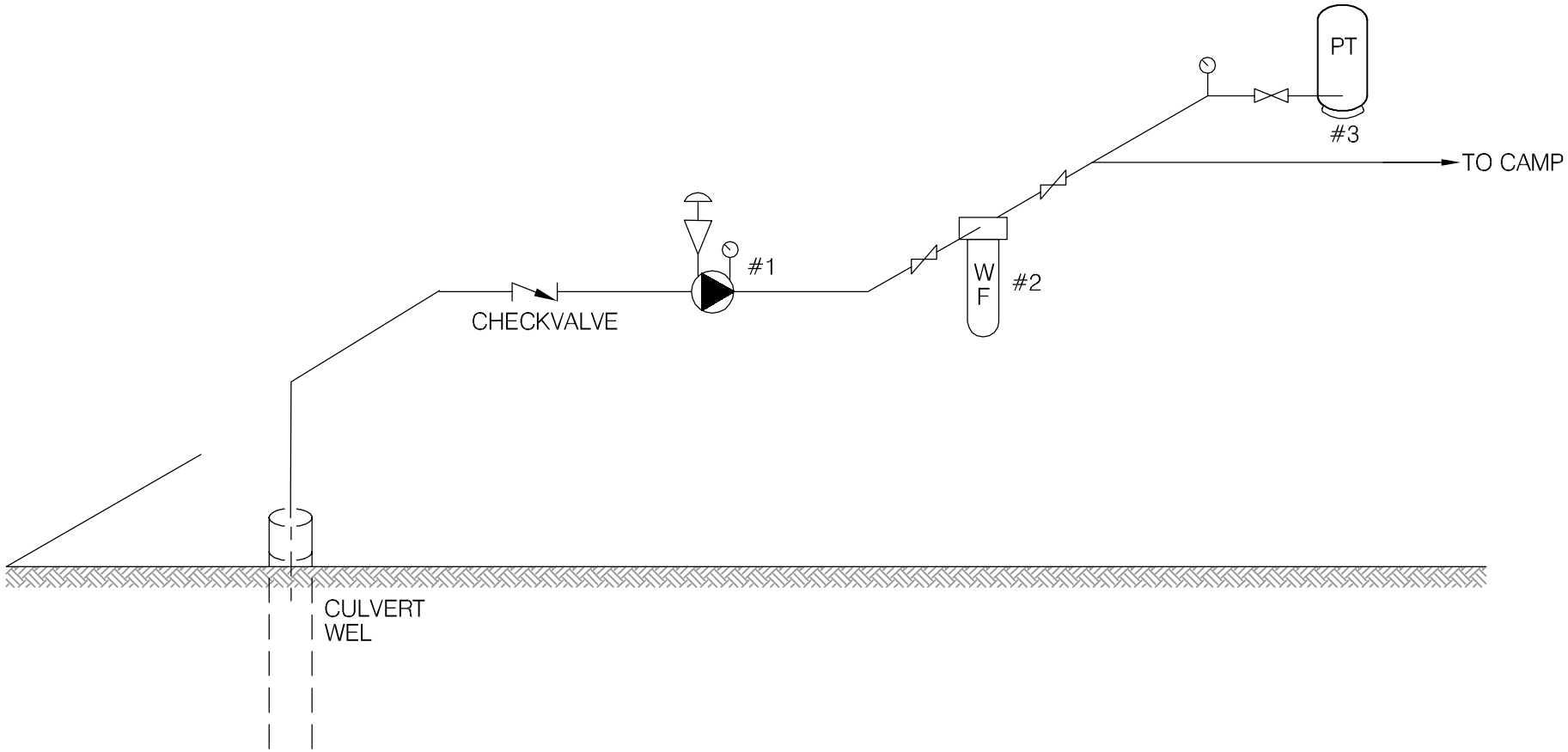
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\1260002003 Eastern Schematic_LEGEND.dwg, 4/11/2006 10:31:08 AM, Adobe PDF, jbuyck



SCHEMATIC PRODUCED BY BERT ALBIS$ER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	ADDITIONAL ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 6591 DRURY CREEK PUMPHOUSE	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002.005		DWG.: FIGURE 6591-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\drury creek\1260002 Drury Crk Pumphouse Schematic_6591B.dwg, 4/5/2006 1:25:24 PM, Adobe PDF, jbuyck

Eastern Region – Drury Creek Pumphouse
Building # 6591

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	Jet Pump	Monarch	JKS-1	1/3 Hp, 115 V	2594	¼" suction ¾" discharge
2	Cartridge Filter	US Filter	Activated Carbon			3" x 9.5" with 1" discharge
3	Pressure Tank	Jet-Rite	JR 25			8.5 US gal
	Submersible Pump	DID NOT GET ACCESS TO BUILDING WHERE EQUIPMENT IS HOUSED, CAMP FOREMAN NOT ON SITE				
	Pressure Tank					

TABLE 6591- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
6591	Dury Creek Pumphouse	8	Sept-04 to Jun-05	no	0/8	no	22-Jun-05	no

Table 6591-2: Water Quality Results

SOURCE:	Buiding 6591- Drury Creek Pumphouse			GCDWQ Criteria		
Location/ Resident	Drury Creek					
Address						
Treatment	Activated Carbon					
Disinfection	None					
Source of Water	Building 6591					
Purpose of Sampling	Baseline	Baseline	Additional Sampling			
Sample Location						
Date Sampled	14-Sep-04	22-Jun-05	9-Aug-05	**Lower Limit**	**Upper Limit**	
Physical Tests *(ALS)*				**AO**	**MAC**	**AO**
Colour (CU)	<5	<5				15
Conductivity (uS/cm)		330				
Total Dissolved Solids	164	203				500
Hardness CaCO3	158	168		AO >200 = poor, > 500 unacceptable[A]		
pH	7.98	8.03		6.5		8.5
Turbidity (NTU)	0.4	**1.08**			1	5
UV Absorbance	-	-	0.0110			
% UV Transmittance	-	-	97.5			
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	156	168				
Chloride Cl	1	<0.50				250
Fluoride F	<0.05	0.077			1.5	
Sulphate SO4	11	16.4				500
Nitrate Nitrogen N	<0.1	<0.10			10	
Nitrite Nitrogen N	<0.05	<0.10			3.2	
Ammonia Nitrogen N						
Total Phosphate PO4						
Total Metals *(ALS)*						
Aluminum T-Al	<0.005	<0.010				
Antimony T-Sb	<.0002	<0.00050			0.006	
Arsenic T-As	<0.0002	0.00013			0.025	
Barium T-Ba	0.099	0.075			1	
Boron T-B	0.002	<0.10			5	
Cadmium T-Cd	<0.00001	<0.00020			0.005	
Calcium T-Ca		47.6				
Chromium T-Cr	0.001	<0.0020			0.05	
Copper T-Cu	0.061	0.0248			1	
Iron T-Fe	<0.01	0.127				0.3
Lead T-Pb	0.0002	<0.0010			0.01	
Magnesium T-Mg		11.8				
Manganese T-Mn	<0.005	0.0027				0.05
Mercury T-Hg		<0.00020			0.001	
Potassium T-K		0.76				
Selenium T-Se		<0.0010			0.01	
Sodium T-Na	2.5	2.5				200
Uranium T-U	0.0016	0.00169			0.02	
Vanadium T-V						
Zinc T-Zn	0.006	0.092				5
Organic Parameters						
Tannin and Ligin	-	-	<0.10			
Total Organic Carbon	-	-	1.2			
Extractable Hydrocarbons						
EPH10-19			<0.30			
EPH19-32			<1.0			
Field Chemistry (EBA)						
pH	-	-	8.07	6.5		8.5
TDS	-	-	158			500
EC (uS/cm)	-	-	315			
Temperature	-	-	9.4			
Free Available Chlorine	-	-	-			250

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Shading indicates exceedence of Proposed MAC guideline (arsenic).

Bold Underline with Yellow shading indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU), Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

EBA Engineering Consultants Ltd.
Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date June 23, 2005, August 8, 2005

WELL ID #	Owner	Location Description
6591	YTG	Drury Creek Grader Station

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Drury Creek,

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
470 Campbell Hwy

c. GPS location: N 6896764 E 53[illegible] elv 6[illegible]m ± 7m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Grader Station + Living Complex

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Located inside pumphouse

h. Distance from well to building _____

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No N6896734 E531789

j. Distance from well to nearest point of known field: ~32m

k. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☐ Yes ☒ No

---

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☒ Yes ☐ No Located inside lockable building
Entrance by animals? ☒ Yes ☐ No Access unlikely

p. Is well site subject to flooding? ☐ Yes ☒ No

q. Is the well site well drained? ☒ Yes ☐ No

r. Is there a buried fuel tank on the property? ☒ Yes ☐ No

If yes, is it ☐ in use ☐ abandoned possible, may have been removed

Is the location known? ☒ Yes ☐ No
Distance from the well to known buried tank ~30m

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: Enviro tanks (2); Distance from well to Potential Source 1: ~15m
Potential Source 2: _____; Distance from well to Potential Source 2: _____
Potential Source 3: _____; Distance from well to Potential Source 3: _____
Potential Source 4: _____; Distance from well to Potential Source 4: _____

t. Are there other wells on this property? ☒ Yes ☒ No unlikely

How many? 1 ☐ in use ☒ abandoned ☐ require proper sealing

2. Well and Wellhead information:

a. When was well installed? Year _____ Month _____

b. Type: ☐ drilled ☒ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☐ Yes ☒ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☐ unlikely

e. Surface casing: ☒ Yes Diameter 180 cm ☐ No galvanized steel culvert

f. Well casing: Diameter None Material: ☐ steel ☐ plastic ☐ concrete

g. Depth of well: ~~24 ft~~ + 6.6m ☐ measured (if possible) ☐ reported ☒ from log

h. Static water level below ground: 4.45 m

☒ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☒ open end casing ☐ with a well screen

☐ with slotted pipe ☐ unknown other _____

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length n/a slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No

m. Is the well head: ☒ in pumphouse ☒ in pit ☐ pitless adaptor ☐ in a building
2m steel colvert in pumphouse
☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail n/a

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☐ No

iii. Is the wellhead enclosed by fiberglass insulations? ☒ Yes ☐ No

iv. Any evidence of rodents? Specify Access possible

v. Does the well casing have a proper seal cap? ☐ Yes ☒ No

If no, describe condition Dug well

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No (likely) ☐ farther investigation required.

If yes is there treatment ☐ Yes ☒ No

Explain (filtration, disinfection etc…)

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☒ bedrock ☐ granular sediment ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☐ electric submersible ☒ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☐ plastic
Unknown

g. Pump delivers water to: ☒ pressure tank ☐ elevated tank ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☒ No

j. Is there a water meter on the system? ☐ Yes ☒ No

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Heat trace, insulation, inside of building

l. Comments on pump installation: _____

_____

6. Conclusions

a. Comments on overall installation:

_____

_____

_____

_____

_____

_____

_____

b.Recommendations: _____

_____

_____

_____

_____

_____

_____

PART B: EBA Site Inspection

Inspector: RYAN MARTIN Date AUGUST 8TH, 2005

WELL ID #	Owner	Location Description
6591	YTG.	DRURY CREEK

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☒ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☐ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. **Water Quality (observations):**

a. Does the water stain plumbing? ☐ yes ☒ No ☐ slight ☐ severe

Type of stain: ☐ brown ☐ red ☐ black

b. Does the water contain sediment? ☐ Yes ☒ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☒ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐Yes ☒No ☐brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No

f. Is there a chemical analysis? ☒ Yes ☐ No ☐adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☐ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☐ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☐ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☐ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes (No) Details:

Where is it located?
Comments: _____

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES NO
Comments:_____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES NO

Comments: _____

Are there other heat sources near the tank? YES NO
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO
Comments: _____

Overall Tank

What are the tank size and dimensions?

_____

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO N/A

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments: _____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

GRADER STATION AND LIVING COMPLEX (4 UNITS) SERVED BY 180 cm DUG WELL (CULVERT) SUBMERSIBLE PUMP : CONTROLS TO COMPLEX, JET PUMP : PRESSURE TANK IN GRADER STATION. GAC INLINE FILTER IN GRADER STN.

b. Recommendations:

- UNDER DIRECT INFLUENCE OF SURFACEWATER ∴ SHOULD HAVE ADEQUATE TREATMENT FILTRATION + UV.
-

~~QUESTIONS:~~

- ~~WHERE IS ABANDONED WELL~~
- ~~SEARCH FOR COMPLEX #2~~
- DETAILS OF PUMP CONTROLS / PRESSURE TANK IN COMPLEX

DRURY CRK

MIDNIGHT SUN DRILLING CO. LTD.
WHITEHORSE Y.T.
PH. 633-3070
P.O. BOX 4391
WHITEHORSE, YUKON

Field Report

WELL NOT IN USE
LIKEL DRY HOLE

Started... Aug. 17 ....19.8.
Completed.. Aug. 18 ....19.8.

NAME AND ADDRESS OF CLIENT	DESCRIPTION OF WORK	LOCATION OF WORK
Y.T.G	w/l	Drury Crk. Gov. Camp

FORMATION LOG FROM	TO	FORMATION
0'	11'	SILTY SAND & GRAVEL - Boulders
11'	44'	Till
44'	75'	BEDROCK Creek (SOFT)
75'	245'	B.R.

DESCRIPTION OF WORK	TIME DATE	FROM	TO	HOURS
MOVE LOAD AT SHOP	Aug 17	8:00	12:00	
TRAVEL TO Drury Crk.	"	12:30	5:00	
EAT	"	5:00	5:30	
Move on	"	5:30	6:00	
SET UP	"	6:00	6:30	
silty sand, gravel, clay (some water)	"	6:30	8:30	
Pullout - Put on HAMMER	"			
Creek (SOFT)	"	8:30	9:00	
FIX LINE ON COMP.	"	9:00	10:00	
FIX LINE ON COMP.	"	10:00	10:30	9½
	Aug 16	8:00	9:30	
	"	9:30	2:30	
FLUSH HOLE PULL OUT - LOAD	"	2:30	4:30	
		4:30	9'	13

Rcrd. of Casing & Pipe Size	Type	Size	Type
Feet	Inch	Feet	Inch

Remarks:
49' - 219 WALL Casing
6" - Drive SHOE

Static Level		Total Rig Time	hrs.
Ground Level		Total Standby	hrs.
Top Of Casing		Drilling Mud	sacks

SIGNATURES

MIDNIGHT SUN... Jeff ..... CLIENT.....
TITLE..... BOSS ..... TITLE.....

Willow Printers

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	8611
Jurisdiction	Yukon
Community	
Address	
Highway	Robert Campbell Highway
Milepost	
Feature	Drury Creek
Location and Cause	1 M W of Drury Ck - tire blowout on tanker truck - tire delaminated - tread damaged valve on rear tank of truck
Latitude	62.199649
Longitude	-134.419242
Incident Date	10/15/1986 4:00:00 PM
Lead Agency	Environment Canada - Environmental Protection Service
Other Agency	
Company(s)	General Enterprises
Amount	1134
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Diesel
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	fuel in ditch - absorbed by soil - lake 1/4 M away - unlikely impact on area - co adv to remove soil if ditch receives any quantity of runoff water to lake

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	8613
Jurisdiction	Yukon
Community	
Address	
Highway	Robert Campbell Highway
Milepost	
Feature	Drury Creek
Location and Cause	truck overturn due to poor road conditions - 2nd trailer of b-train slid off road - one pot lost
Latitude	62.202295
Longitude	-134.387137
Incident Date	11/24/1986 7:40:00 PM
Lead Agency	Environment Canada - Environmental Protection Service
Other Agency	
Company(s)	Yukon Alaska Transport
Amount	13.4
Units	Tonnes (Metric)
Quantity	Actual
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Solid
Major Contaminant	Lead Concentrate
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	no sig dmg to env anticipated - contents of one pot lost - within 20 m of creek - to be cleaned-up by 11/26/86

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9558
Jurisdiction	Yukon
Community	
Address	
Highway	Robert Campbell Highway
Milepost	KM 469.6
Feature	Drury Creek
Location and Cause	truck spun out on hill and slid backward into ditch - contents of two rear containers spilled
Latitude	62.172703
Longitude	-134.157073
Incident Date	11/21/1995 5:40:00 PM
Lead Agency	Environment Canada - Environmental Protection Service
Other Agency	Yukon Government - Highways
Company(s)	Lomax
Amount	27000
Units	Kilograms
Quantity	Actual
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Solid
Major Contaminant	Zinc Sulphide
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	product contained in ditch of highway - 105m from Little Salmon Lake - truck and most of zinc concentrate removed from ditch



Photo 003: 6591 Drury Creek Pumphouse (centre) and ASTs (right).



Photo 005: 6591 On site UST.



Photo 006: 6591 Jet pump.



Photo 007: 6591 Pressure tank.



Photo 010: 6591 On site AST.



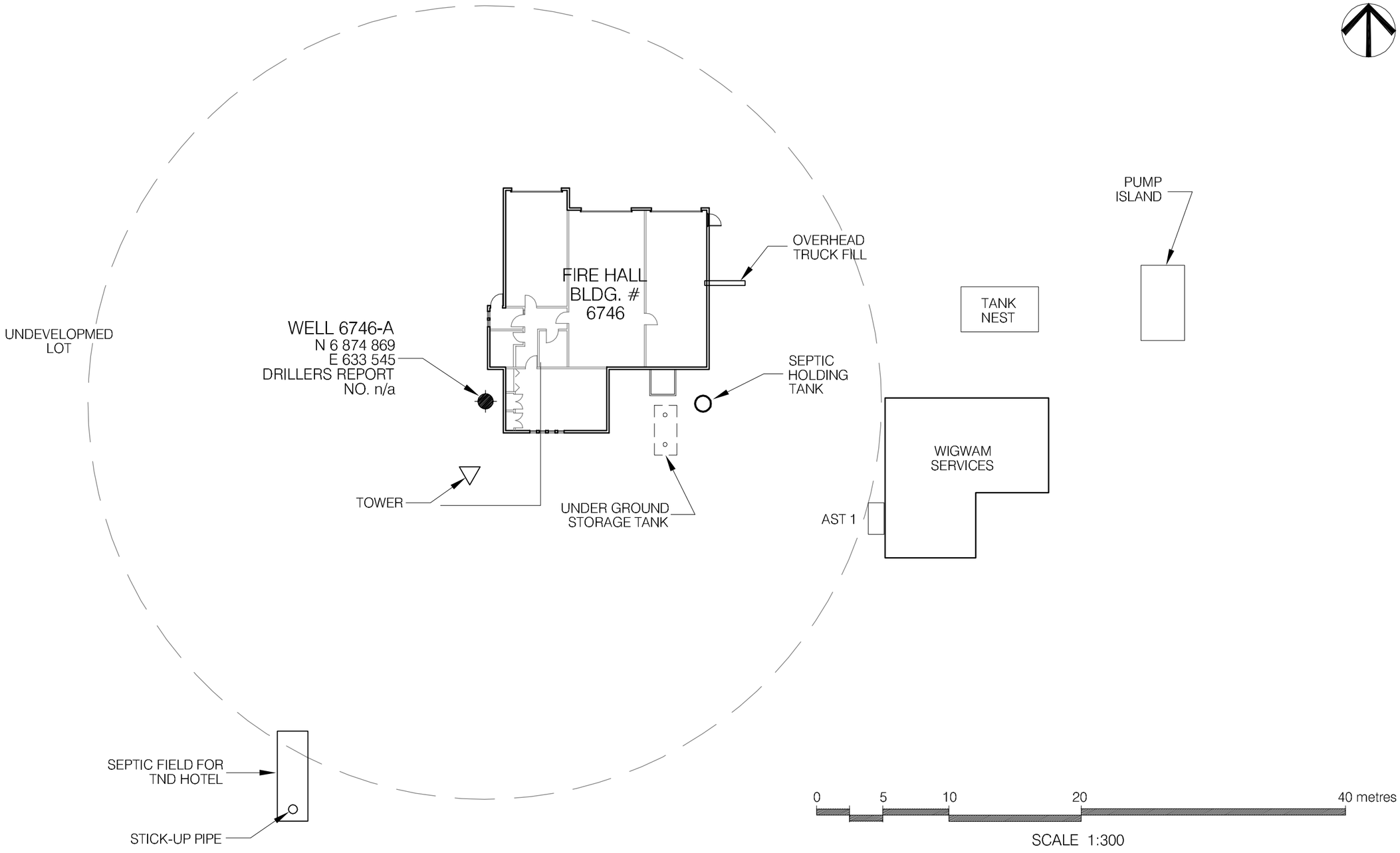
Photo 103: 6591 Well Culvert.



Photo 108: 6591 water storage tank.



Photo 014: 6591 Abandoned Well.



NOTES:

1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

ROSS RIVER FIRE HALL
BUILDING # 6746
SITE LOCATION DIAGRAM
WELL ID: 6746-A

REVISION ISSUE: 0

FIGURE No.: 6746-A

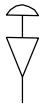
LEGEND


PUMP


PRESSURE GAUGE


GATE VALVE


CHECK VALVE


SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



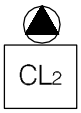
FLOW METER



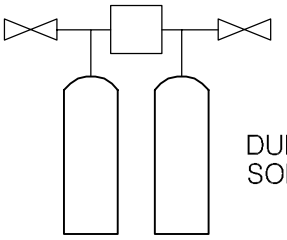
WATER FILTER
(CARTRIDGE TYPE)

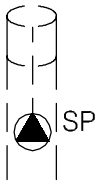


PRESSURE TANK

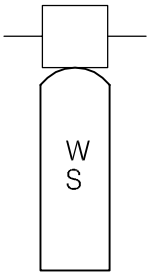


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER



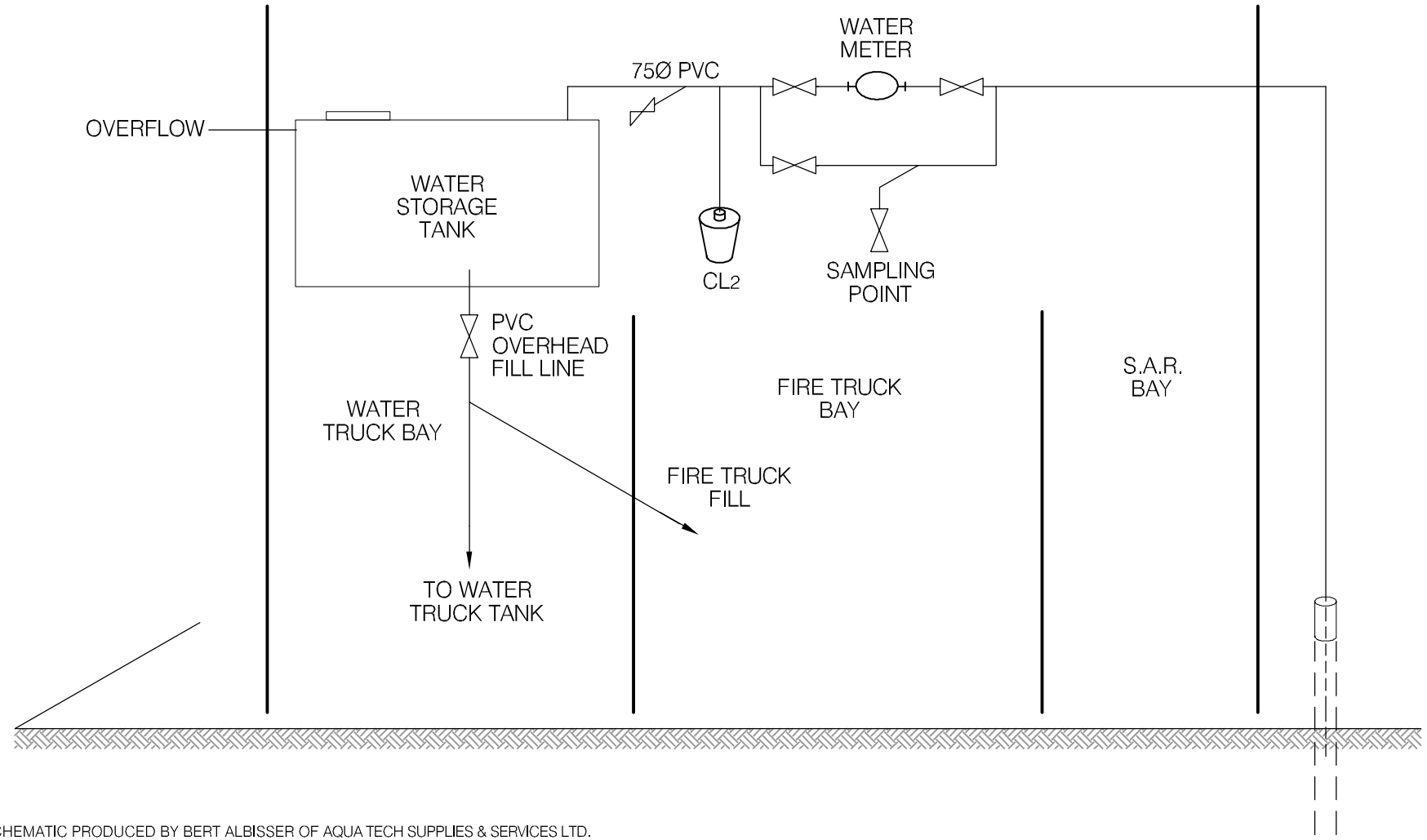
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\1260002003 Eastern Schematic_LEGEND.dwg, 4/11/2006 10:31:08 AM, Adobe PDF, jbuyck



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 6746 ROSS RIVER FIRE HALL	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE 6746-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\ross\6746B_Ross River Fire Hall Schematic.dwg, 7/26/2005 2:53:51 PM, Adobe PDF

Eastern Region – Ross River Firehall
Building # 6746

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	JET PUMP	MONARCH	MJC-50		2004	1/2 HP.
2	PRESSURE TANK	JET RITE	JR15			4.5 GAL
3	PRESSURE SWITCH	SQUARE D	FSG-2			2 HP 1/4" FIPT
4	PRESSURE GAUGE	MARSH	0-100			2" - 1/4" FIPT
5						
6						
7						
8						
9						
10						

TABLE 6746- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
6746	Ross River Fire Hall	5	Sept-04 to Mar-05	no	0/5	no	3-Mar-05	no

Table 6746-2: Water Quality Results

SOURCE:	Building 6746 - Ross River Fire Hall		GCDWQ Criteria		
Location/ Resident	Ross River				
Address					
Treatment	Softner, Filtration				
Disinfection	Chlorination				
Source of Water	On-Site Well				
Purpose of Sampling	Baseline	Additional Sampling			
Sample Location		Washroom Tap			
Date Sampled	26-Oct-00 (ASL)	23-Jun-05	Lower Limit	Upper Limit	
Physical Tests *(ALS)*			AO	MAC	AO
Colour (CU)	<5				15
Conductivity (uS/cm)	596				
Total Dissolved Solids	395				500
Hardness CaCO3	277	305	AO >200 = poor, > 500 unacceptable[A]		
pH	8.09		6.5		8.5
Turbidity (NTU)	0.4			1	5
Dissolved Anions *(ALS)*					
Alkalinity-Total CaCO3	223				
Chloride Cl	1.2				250
Fluoride F	0.36			1.5	
Silicate SiO4		18.2			
Sulphate SO4	118				500
Nitrate Nitrogen N	<0.1			10	
Nitrite Nitrogen N	<0.1			1	
Total Phosphate PO4		0.0499			
Total Metals *(ALS)*					
Aluminum T-Al	<0.005	<0.010			
Antimony T-Sb		<0.00050		0.006	
Arsenic T-As	*0.0171*	*0.015*		0.025	
Barium T-Ba	0.040	0.041		1	
Boron T-B	<0.05	<0.10		5	
Cadmium T-Cd	<0.0002	<0.00020		0.005	
Calcium T-Ca	58.8	62.3			
Chromium T-Cr	<0.002	<0.0020		0.05	
Copper T-Cu	0.001	0.0372		1	
Iron T-Fe	0.05	0.082			0.3
Lead T-Pb	<0.001	<0.0010		0.01	
Magnesium T-Mg	33.3	36.7			
Manganese T-Mn	**0.078**	**0.0851**			0.05
Mercury T-Hg	<0.00005	<0.00020		0.001	
Potassium T-K	3.34	3.71			
Selenium T-Se	<0.001	<0.0010		0.01	
Sodium T-Na	17.0	17.2			200
Uranium T-U	0.00393	0.00384		0.02	
Vanadium T-V		<0.030			
Zinc T-Zn	<0.005	<0.050			5
Dissolved Metals *(ALS)*					
Aluminum D-Al	<0.005	<0.010		0.1	
Antimony D-Sb		<0.00050		0.006	
Arsenic D-As	*0.0163*	*0.0134*		0.025	
Barium D-Ba	0.039	0.041		1.0	
Boron D-B	<0.05	<0.10		5	
Cadmium D-Cd	<0.0002	<0.00020		0.005	
Calcium D-Ca	57.7	61.9			
Chromium D-Cr	<0.002	<0.0020		0.05	
Copper D-Cu	0.003	0.0286			1.0
Iron D-Fe	0.05	<0.030			0.3
Lead D-Pb	<0.001	<0.0010		0.01	
Magnesium D-Mg	32.3	36.6			
Manganese D-Mn	**0.076**	**0.0763**			0.05
Mercury D-Hg	<0.00005	<0.00020		0.001	
Potassium D-K	3.30	3.86			
Selenium D-Se	<0.001	<0.0010		0.01	
Sodium D-Na	17.3	17.4			200
Uranium D-U	0.00391	0.00378		0.02	
Vanadium D-V		<0.030			
Zinc D-Zn	<0.005	<0.050			5.0
Trihalomethanes					
Bromodichloromethane		<0.0010			
Bromoform		<0.0010			
Chloroform		<0.0010			
Dibromochloromethane		<0.0010			
Total Trihalomethanes		<0.0040		0.1	
Haloacetic Acids					
Bromoacetic Acid		<0.0020			
Bromochloroacetic Acid		<0.0020			
Chloroacetic Acid		<0.020			
Dibromoacetic Acid		<0.0020			
Dichloroacetic Acid		<0.0020			
Trichloroacetic Acid (TCA)		<0.0020			
Field Chemistry (EBA)					
Free Available Chlorine		0.01			

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU), Conductivity (umhos/cm), Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

eba

Table 6746-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
6746	**Ross River Fire Hall**	**Ross River**	6874869	633545	699

Well Details							
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Well Capacity - Tested, or Reported by User**	**Static Water Level Below Ground (m-btwc)**
200	1986	Yes	110 m	Silt and clay from grade to 101.5 m, permafrost was encountered at 8.23 m		167 gpm	6.57

Potential Contaminant Sources					
Distance from well to nearest point of septic field (m)	**Distance from well to nearest building (m)**	**Distance to surface water body (m)**	**AST present on property?**	**Distance from well to AST (m)**	**Other potential sources of contamination observed on property, and distance to well**
17	1	Greater than 60 m	AST	29	UST at 13 m UST best at 40 m Former service station (likely contaminated site at 66 m)

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
1.2 m below grade	Likely split seal gasket cap	25 slot from 105 m to 110 m	Unlikely	No	The well not only services the fire hall, but also services the community water delivery system

EBA Engineering Consultants Ltd.
Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date June 23, 2005

WELL ID #	Owner	Location Description
6746	YTG	Ross River Fire Hall

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Ross River

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Ross River Fire Hall

c. GPS location: 6874869 633545 699m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many
Ross River Fire Hall and community trucking service

☐ 5 or more delivery sites on a trucked distribution system? If so how many

g. Nearest building, specify Ross River Fire Hall

h. Distance from well to building ~1m

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: 17m

k. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☐ Yes ☐ No
Septic from Fire Hall @17m, Septic from TND Hotel ~30m

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☒ Yes ☐ No lid above pit is locked
Entrance by animals? ☐ Yes ☐ No Access possible

p. Is well site subject to flooding? ☐ Yes ☐ No

q. Is the well site well drained? ☒ Yes ☐ No

r. Is there a buried fuel tank on the property? ☒ Yes ☐ No

If yes, is it ☒ in use ☐ abandoned

Is the location known? ☒ Yes ☐ No There is also a tank nest from a nearby service station @40m from well

Distance from the well to known buried tank 13m

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe There is a former gas station @ ~66m from the well. Site is likely contaminated.

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: AST1 ; Distance from well to Potential Source 1: 29m
Potential Source 2:_____; Distance from well to Potential Source 2:_____
Potential Source 3:_____; Distance from well to Potential Source 3:_____
Potential Source 4:_____; Distance from well to Potential Source 4:_____

t. Are there other wells on this property? ☐ Yes ☒ No

How many?_____ ☐ in use ☐ abandoned ☐ require proper sealing

2. Well and Wellhead information:

a. When was well installed? Year 1986 Month _____

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☒ Yes ☐ No
with previous report from Environmental Health Services (Niels Jacobson) -2003

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☒ unlikely

e. Surface casing: ☒ Yes Diameter 20cm ☐ No
to 32m, not proper surface casing (no grouting)

* permafrost was encountered at ~8m/18m

f. Well casing: Diameter 15cm Material: ☐ steel ☐ plastic ☐ concrete

g. Depth of well: 110m ☐ measured (if possible) ☒ reported ☐ from log

h. Static water level below ground: 6.57m

☐ measured (if possible) ☒ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☒ with a well screen

☐ with slotted pipe ☐ unknown other _____

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length 3.66m slot size(s) 25 thou slot
Location of screen: from 105m to 110m from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☒ in pit ☐ pitless adaptor ☐ in a building

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail 1.2m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by ~~fiberglass~~ Styrofoam insulations? ☒ Yes ☐ No

iv. Any evidence of rodents? Specify No, access is possible

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition _____

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☒ Yes ☐ No

Explain (filtration, disinfection etc...) Chlorination, filtration, softener

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment ☒ unknown
permafrost present

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No
unlikely

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☐ electric submersible ☒ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☒ plastic

g. Pump delivers water to: ☒ pressure tank (domestic) ☒ elevated tank (Fire use) ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☒ No

j. Is there a water meter on the system? ☐ Yes ☒ No

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Pump inside, piping in insulated enclosure

l. Comments on pump installation: _____

_____

6. Conclusions

a. Comments on overall installation:

_____

_____

_____

_____

_____

_____

_____

b.Recommendations: _____

_____

_____

_____

_____

_____

_____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JUNE 23, 2005

WELL ID #	Owner	Location Description
6746	YTG.	Ross River Fire Hall

6. Water Treatment

a. Is well water treated? ☑ Yes ☐ No; Type of treatment:

☑ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☐ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☑ Yes ☐ No 0.01 reading.

Tested at WASH ROOM TAP (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. Water Quality (observations):

a. Does the water stain plumbing? ☐ yes ☑ No ☐ slight ☐ severe

Type of stain: ☐ brown ☐ red ☐ black

b. Does the water contain sediment? ☐ Yes ☑ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☑ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☑ No

f. Is there a chemical analysis? ☐ Yes ☐ No ☑ adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☑ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☑ Yes ☐ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☑ Yes ☐ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☑ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes No Details:

Where is it located?
Comments: TRUCK FILL SIDE

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES NO
Comments: _____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES NO
Comments: _____

Are there other heat sources near the tank? YES NO
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO
Comments: _____

Overall Tank

What are the tank size and dimensions?

2000 GALLON

What material is the tank constructed of? FIBRE GLASS.

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? (YES) NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? (YES) NO

Does the lid have a tight seal and is it watertight when closed? YES (NO)

Does the tank have an overflow or high level whistle? (YES) NO

Is the water tank drain accessible? (YES) NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES (NO)
Comments: _____

Is there any sediment or scum in bottom of tank? YES NO
Comments: SLIGHT

Is there any odour associated with the water or tank? YES (NO)

Have there been any bacteriological analyses conducted previously? (YES) NO

Does the tank appear that it has been cleaned recently? YES (NO)

Are the tanks easily assessed for the purpose of cleaning and disinfection? (YES) NO

8. Conclusions

a. Comments on overall installation:

THIS IS AN ACCEPTABLE INSTALLATION
FLOW SWITCH IS SICKING - THIS
CONTROLS THE CHLORINE INJECTION PUMP.
THIS SYSTEM BELONG UNDER THE
JURISDICTION OF COMMUNITY OPERATIONS.

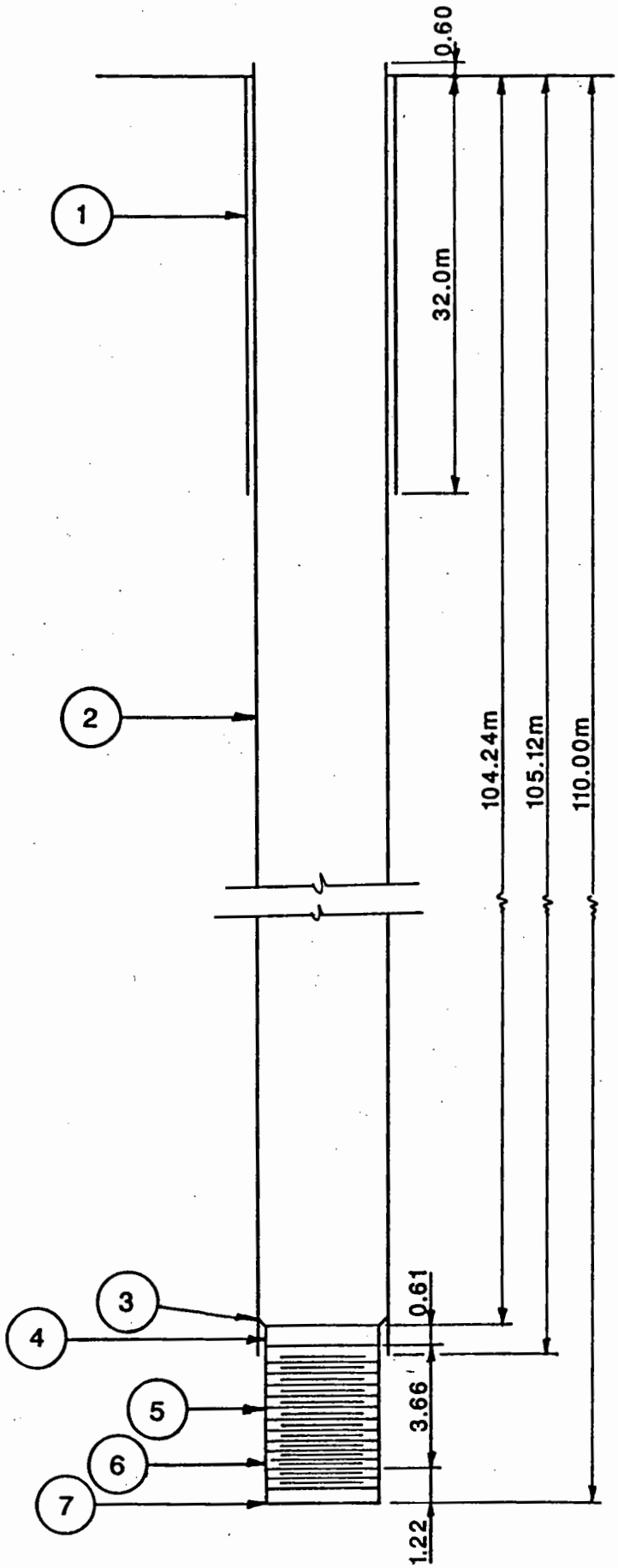
b. Recommendations:

REPLACE FLOW SWITCH WITH PULSE
WATER METER TO EFFECT PROPORTIONAL
CHLORINE FEED.

ROSS RIVER
LITHOLOGY

Depth (m)	Lithology	Comments
0 - 2.7	Till - sandy - silty, pebbles to 15 mm, gravel lens from 2.1 - 2.74 m (no noticable water)	
2.7 - 8.2	Till - dry, sandy to 4.57 m increase in moisture, dark grey, top of permafrost at approximately 8.23 m	Begin injecting water at 7.62 m
8.2 - 18.5	Till - sandy, silty, some bedrock	
18.5 - 60.0	Till - silty clay, some sand, black, continue injecting water	
60.0 - 101.5	Till - silty sandy, some clay, becomes saturated with depth	Sand is running and sloughing on each connection
101.5 - 110.0	Gravel to 25 mm size, round to sub-round, producing water in excess of 25 L/sec	

Stanley



KEYNOTES

1 203mm O.D. STEEL CASING

2 168mm O.D. X 0.280mm WALL STEEL CASING

3 JOHNSON LEAD PACKER

4 141mm O.D. STEEL RISER

5 143mm O.D. X 124mm I.D. STAINLESS STEEL WELL SCREEN SLOTTED 0.64mm

6 143mm O.D. X 124mm I.D. STAINLESS STEEL WELL SCREEN SLOTTED 0.76mm

7 END CAP

ROSS RIVER WATER WELL
COMPLETION DETAILS

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	0105
Jurisdiction	Yukon
Community	Ross River
Address	
Highway	
Milepost	
Feature	Ross River
Location and Cause	Lot 105 Group 905 Plan 55118 - Trailer #17 - broken feed line between tank and furnace
Latitude	61.98215567
Longitude	-132.44665694
Incident Date	1/29/2001 4:30:00 PM
Lead Agency	Environment Canada - Environmental Protection Service
Other Agency	
Company(s)	
Amount	400
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Diesel
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	spill to ground outside of residence - contaminated snow and ground - plan to excavate contaminated ground when conditions allow - nearest well at Band Office ~400m

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	0112
Jurisdiction	Yukon
Community	Ross River
Address	
Highway	
Milepost	
Feature	Ross River
Location and Cause	Lt 90-4 GR unit #873300 - rusty tank
Latitude	61.9807155
Longitude	-132.4455175
Incident Date	3/7/2001
Lead Agency	Yukon Government - Environmental Programs
Other Agency	
Company(s)	YHC
Amount	
Units	
Quantity	Unknown
Release Description	
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Furnace Oil
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	2m x 2m contaminated area of snow - snow was removed - hauled to dump - put "Gator" on ground - no call to spill line, fax only - no other info on file

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	8020
Jurisdiction	Yukon
Community	Ross River
Address	
Highway	
Milepost	
Feature	Ross River
Location and Cause	WPYR bulk plant - storage tank overfill - human error
Latitude	61.9826021
Longitude	-132.44942598
Incident Date	10/22/1980 9:00:00 AM
Lead Agency	Environment Canada - Environmental Protection Service
Other Agency	
Company(s)	White Pass & Yukon Route
Amount	1890
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Furnace Oil
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	contained and most soaked into ground within bermed area - damage to environment unknown but little expected - Pelly River 3/4 mile away

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	8717
Jurisdiction	Yukon
Community	Ross River
Address	
Highway	
Milepost	
Feature	Ross River
Location and Cause	WPYR tank farm - bulk tank overfill - attempt to transfer fuel to a full storage tank
Latitude	61.9826021
Longitude	-132.44942598
Incident Date	11/24/1987 9:30:00 AM
Lead Agency	Environment Canada - Environmental Protection Service
Other Agency	Department of Indian Affairs and Northern Development
Company(s)	White Pass Petroleum Division
Amount	4.9
Units	Tonnes (Metric)
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Furnace Oil
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	low environmental hazard if contained - potential risk to groundwater if not - no surface water in immediate area - cleaned-up

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

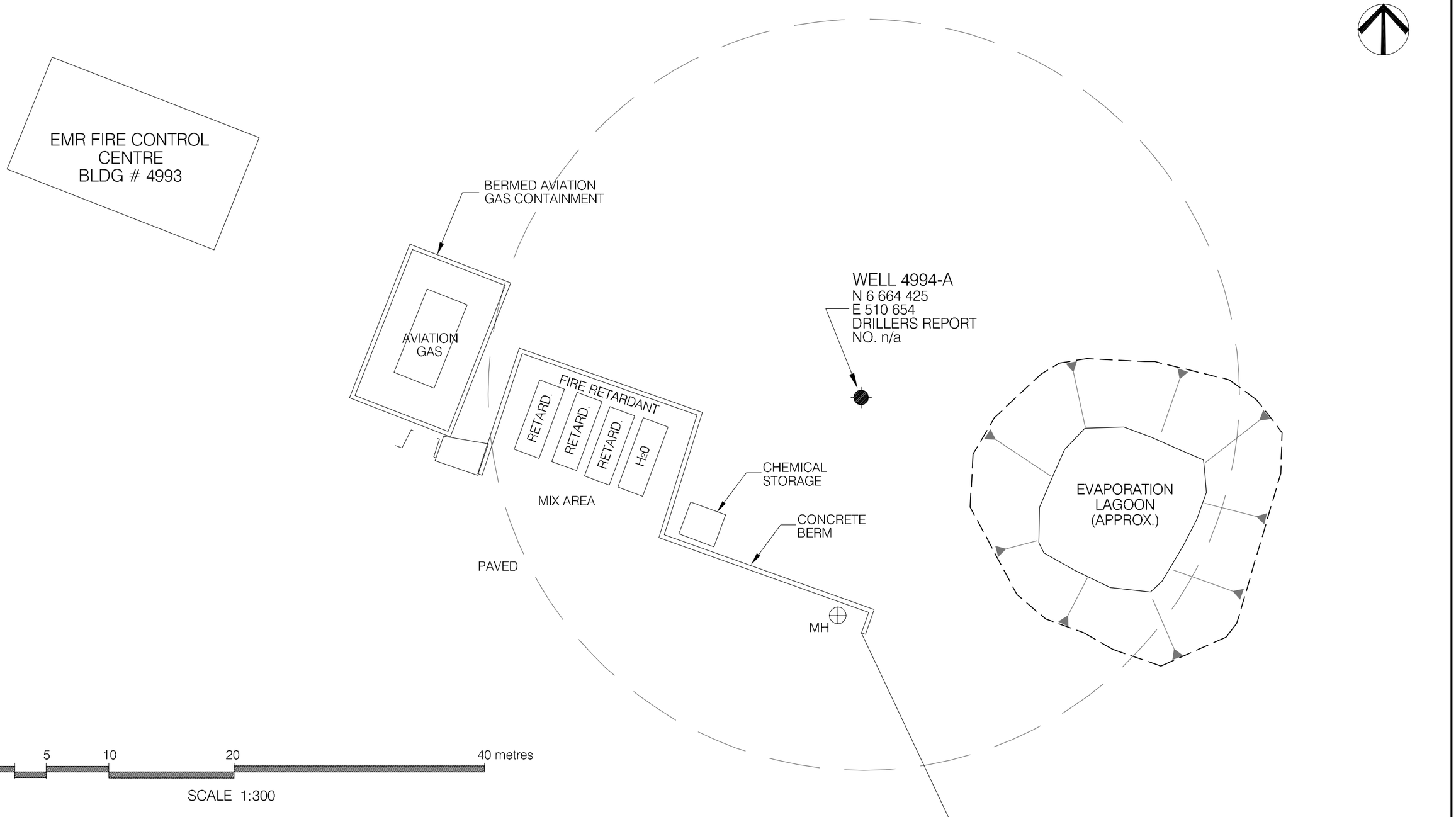
Spill #	9825
Jurisdiction	Yukon
Community	Ross River
Address	
Highway	
Milepost	
Feature	Ross River
Location and Cause	Land Claims Office
Latitude	61.984709
Longitude	-132.450185
Incident Date	6/3/1998 10:45:00 AM
Lead Agency	Municipality - identified in Community
Other Agency	
Company(s)	
Amount	
Units	
Quantity	Unknown
Release Description	
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Fuel Oil
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	250 ga tank not hooked up - fuel leaked overnight - looks like deliberate - fuel ran under another heating tank and soaked into ground - EC advised excavation of soil



Photo 0059: 6746 Jet pump and pressure tank



Photo 0060: 6746 Water storage tank



NOTES:

1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

WATSON LAKE EMR FIRE CONTROL CENTRE (4993) &
EMR TANKER BASE (4994)
SITE LOCATION DIAGRAM
WELL ID: 4994-A

REVISION ISSUE: 0

FIGURE No.: 4994-A

Z:\020\Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\1260002 EMR Tanker Base_4994.dwg, 7/25/2005 3:48:05 PM, Adobe PDF

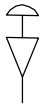
LEGEND


PUMP


PRESSURE GAUGE


GATE VALVE


CHECK VALVE


SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



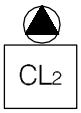
FLOW METER



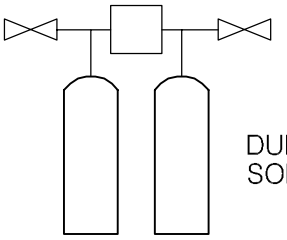
WATER FILTER
(CARTRIDGE TYPE)

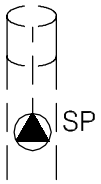


PRESSURE TANK

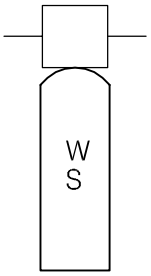


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER



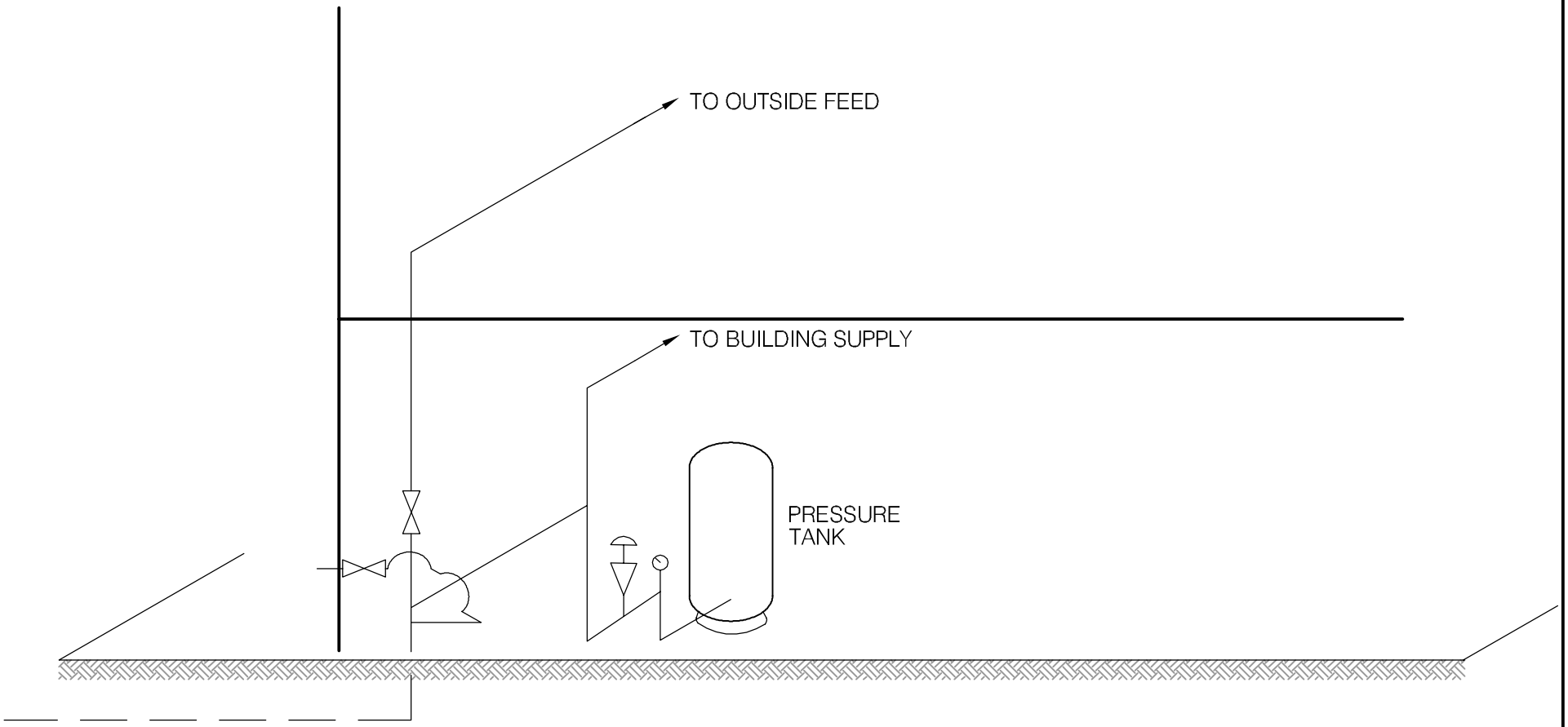
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\1260002003 Eastern Schematic_LEGEND.dwg, 4/11/2006 10:31:08 AM, Adobe PDF, jbuyck



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 4993 WATSON LAKE FIRE CONTROL	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE 4993-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\Schematics\1260002 Fire Control_4993 Schematic.dwg, 7/21/2005 4:39:08 PM, Adobe PDF

Eastern Region – EMR Fire Control Centre
Building # 4993

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB PUMP					NO INFO
2	PRESSURE TANK	PERMA TANK	PAD 119		090924472	
3	PRESSURE SWITCH	SQ. D	FSG-2			2HP - 1/4" FIPT
4	PRESSURE GAUGE	MARSH	0-100			2" - 1/4" FIPT
5						
6						
7						
8						
9						
10						

TABLE 4994- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
4993	EMR Fire Control Centre	4	Nov-04 to Mar-06	no	0/4	no	5-Mar-05	no
4994	EMR Tanker Base	2	May -05 to Jun-05	**yes**	1/2	no	5-Jun-05	no

Table 4994-2: Water Quality Results

SOURCE:	Buildings 4993 and 4994 - EMR Fire Control Centre and Tanker Base			GCDWQ Criteria		
Location/ Resident	Watson Lake Airport					
Address						
Treatment	No					
Disinfection	No					
Source of Water	On-Site Well 4994					
Purpose of Sampling	Baseline	Baseline	Additional Assesment			
Sample Location						
Date Sampled	14-Sep-05	22-Jun-05	23-Jun-05	**Lower**	**Upper Limit**	
Physical Tests *(ALS)*				**AO**	**MAC**	**AO**
Colour (CU)	>60	<5				15
Conductivity (uS/cm)		225				
Total Dissolved Solids	123	136				500
Hardness CaCO3	118	120		AO >200 = poor, > 500 unacceptable[A]		
pH	7.83	7.86		6.5		8.5
Turbidity (NTU)	**9.2**	**11.2**	**13.8**		1	5
UV Absorbance			0.048			
% Transmittance						
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	126	135				
Chloride Cl	<0.5	<0.50				250
Fluoride F	<0.05	0.056			1.5	
Silicate SiO4						
Sulphate SO4	1.95	1.16				500
Nitrate Nitrogen N	<0.01	<0.10			10	
Nitrite Nitrogen N	<0.005	<0.10			1	
Ammonia Nitrogen N						
Total Phosphate PO4						
Total Metals *(ALS)*						
Aluminum T-Al	<0.005	<0.010				
Antimony T-Sb	<0.0002	<0.0005			0.006	
Arsenic T-As	0.0004	0.00042			0.025	
Barium T-Ba	0.109	0.1			1	
Boron T-B	0.002	<0.10			5	
Cadmium T-Cd	<0.00001	<0.0002			0.005	
Calcium T-Ca		38.3				
Chromium T-Cr	0.0008	<0.0020			0.05	
Copper T-Cu	<0.001	0.0014			1	
Iron T-Fe	**0.58**	**2.78**	**2.94**			0.3
Lead T-Pb	0.0005	<0.0010			0.01	
Magnesium T-Mg		5.82				
Manganese T-Mn	**0.158**	**0.164**	**0.192**			0.05
Mercury T-Hg		<0.0002			0.001	
Potassium T-K		0.53				
Selenium T-Se		<0.0010			0.01	
Sodium T-Na	1.7	<2.0				200
Uranium T-U	<0.0005	<0.0001			0.02	
Vanadium T-V						
Zinc T-Zn	0.281	0.197				5
Dissolved Metals *(ALS)*						
Aluminum D-Al					0.1	
Antimony D-Sb					0.006	
Arsenic D-As					0.025	
Barium D-Ba					1.0	
Boron D-B					5	
Cadmium D-Cd					0.005	
Calcium D-Ca						
Chromium D-Cr					0.05	
Copper D-Cu						1.0
Iron D-Fe			<0.030			0.3
Lead D-Pb					0.01	
Magnesium D-Mg						
Manganese D-Mn			**0.189**			0.05
Mercury D-Hg					0.001	
Potasium D-K						
Selenium D-Se					0.01	
Sodium D-Na						200
Uranium D-U					0.02	
Vanadium D-V						
Zinc D-Zn						5.0
Trihalomethanes						
Bromodichloromethane						
Bromoform						
Chloroform						
Dibromochloromethane						
Total Trihalomethanes					0.1	
Organic Parameters						
Tannin and Lignin						
Total Organic Carbon C			0.29			
			2.31			
Haloacetic Acids						
Bromoacetic Acid						
Bromochloroacetic Acid						
Chloroacetic Acid						
Dibromoacetic Acid						
Dichloroacetic Acid						
Trichloroacetic Acid (TCA)						
Polycyclic Aromatic Hydrocarbons						
Acenaphthene			<0.000050			
Acenaphthylene			<0.000050			
Acridine			<0.000050			
Anthracene			<0.000050			
Benz(a)anthracene			<0.000050			
Benzo(a)pyrene			<0.000010		0.00001	
Benzo(b)fluoranthene			<0.000050			
Benzo(g,h,i)perylene			<0.000050			
Benzo(k)fluoranthene			<0.000050			
Chrysene			<0.000050			
Dibenz(a,h)anthracene			<0.000050			
Fluoranthene			<0.000050			
Fluorene			<0.000050			
Indeno(1,2,3-c,d)pyrene			<0.000050			
Naphthalene			<0.000050			
Phenanthrene			<0.000050			
Pyrene			<0.000050			
Quinoline			<0.000050			
Extractable Hydrocarbons						
EPH10-19			<0.30			
EPH19-32			<1.0			
LEPH			<0.30			
HEPH			<1.0			
Organochlorine Pesticides						
Aldrin			<0.000050			8.5
alpha-BHC			<0.000050			500
beta-BHC			<0.00010			
delta-BHC			<0.000050			
cis-Chlordane (alpha)			<0.000050			
trans-Chlordane (gamma)			<0.000050			
2,4'-DDD			<0.00010			
4,4'-DDD			<0.000050			
2,4'-DDE			<0.00010			
4,4'-DDE			<0.000050			
2,4'-DDT			<0.00010			
4,4'-DDT			<0.00010			
Dieldrin			<0.000050			
Endosulfan I			<0.000050			
Endosulfan II			<0.000050			
Endosulfan Sulfate			<0.000050			
Endrin			<0.00020			
Heptachlor			<0.00010			
Heptachlor Epoxide			<0.000050			
Lindane (gamma - BHC)			<0.000050			
Methoxychlor			<0.00020			
Mirex			<0.000050			
cis-Nonachlor			<0.000050			
trans-Nonachlor			<0.000050			
Oxychlordane			<0.000050			
Field Chemistry (EBA)						
pH			8.07			8.5
TDS (ppm)			158			500
EC (uS/cm)			315			
Temperature (°C)			9.4			
Free Available Chlorine						

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU), Conductivity (umhos/cm), Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

Table 4994-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
4993 and 4994	**Watson Lake EMR Fire Control and Tanker Base**	**Watson Lake Airport**	6664425	510654	688

Well Details							
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Well Capacity - Tested, or Reported by User**	**Static Water Level Below Ground (m-btwc)**
Unknown, likely 150 mm and 200 mm. Surface casing is 250 mm		No					5.3

Potential Contaminant Sources					
Distance from well to nearest point of septic field (m)	**Distance from well to nearest building (m)**	**Distance to surface water body (m)**	**AST present on property?**	**Distance from well to AST (m)**	**Other potential sources of contamination observed on property, and distance to well**
Greater than 60 m	53 m	Greater than 60 m	Av gas AST	30 m	Fire retardant tanks from 15 m to 25 m Chemical storage at 40 m Evaporation lagoon that likely contains fire retardant and other run-off from the tarmac at 10 m

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
0.95 m above grade (top of surface casing on pitless unit), piping from pitless unit at 3.25 m below grade	Pitless unit with proper cap - gasket in cap is missing		No	No, well is at a low point on the property	The well services the EMR Fire Control Centre and Tanker Base. The well is located outside and the wellhead is a commercial pitless unit.

EBA Engineering Consultants Ltd.

Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date June 23, 2005

WELL ID #	Owner	Location Description
4994	YTG	Watson Lake EMR Tanker Base

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Watson Lake

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Watson Lake Airport

c. GPS location: N 6664425 E 510654 elv 688m ± 6m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many
Tanker base (4994), Fire control centre (4993), fire retardant tanks and holding tanks

☐ 5 or more delivery sites on a trucked distribution system? If so how many

g. Nearest building, specify Tanker base

h. Distance from well to building 53m

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: >60m

k. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☒ Yes ☐ No
Run off from runway (w/retardant in it likely) goes into nearby evaporation lagoon

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☒ Yes ☐ No Entrance by animals? ☒ Yes ☐ No
commercial pitless unit

p. Is well site subject to flooding? ☐ Yes ☒ No

q. Is the well site well drained? ☐ Yes ☒ No
located at low point

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: Fire retard tanks Distance from well to Potential Source 1: ~15m-25m
Potential Source 2: Avgas ; Distance from well to Potential Source 2: ~30m
Potential Source 3: chem storage ; Distance from well to Potential Source 3: ~40m
Potential Source 4: evap lagoon ; Distance from well to Potential Source 4: ~10m

t. Are there other wells on this property? ☐ Yes ☐ No unknown

How many? _____ ☐ in use ☐ abandoned ☐ require proper sealing

2. Well and Wellhead information:

a. When was well installed? Year _____ Month _____

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☐ Yes ☐ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☐ unlikely

e. Surface casing: ☒ Yes Diameter 25 cm ☐ No
to pitless unit @ 4.17m bsc

f. Well casing: Diameter unknown Material: ☒ steel ☐ plastic ☐ concrete
likely

g. Depth of well: _____ ☐ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: 5.345 m bsc

☐ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☒ unknown other _____

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☐ in pit ☒ pitless adaptor ☐ in a building
commercial 25cm to 4.17m bsc

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail 0.95m above grade to top of surface casing

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No

iv. Any evidence of rodents? Specify No

v. Does the well casing have a proper seal cap? ☑ Yes ☐ No

If no, describe condition Missing Gasket on pitless unit lid

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☐ Yes ☐ No

Explain (filtration, disinfection etc…)_____

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment ☐ unknown likely

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☐ No unknown, facility is seasonal

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☒ electric submersible ☐ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☐ plastic unknown

g. Pump delivers water to: ☒ pressure tank (domestic) ☒ elevated tank (fire storage tanks) ☐ other (fire retardant)

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☒ No

j. Is there a water meter on the system? ☐ Yes ☒ No

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: pitless unit below frost line

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

Pump is apparently too small to meet demand - likely malfunctioning

b. Recommendations: _____

PART B: EBA Site Inspection

Inspector: BERT ALMOSEN. Date JUNE 23/05

WELL ID #	Owner	Location Description
4993	YTG.	FIRE CONTROL CENTER

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☑ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. **Water Quality (observations):**

a. Does the water stain plumbing? ☐ yes ☐ No ☐ slight ☑ severe

Type of stain: ☐ brown ☑ red ☐ black

b. Does the water contain sediment? ☐ Yes ☑ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☑ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐Yes ☑No ☐brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No ?

f. Is there a chemical analysis? ☐ Yes ☐ No ☐adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☑ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☑ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☑ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☑No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes No Details:

Where is it located?
Comments: _____

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES NO
Comments:_____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES NO

Comments: _____

Are there other heat sources near the tank? YES NO
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO
Comments: _____

Overall Tank

What are the tank size and dimensions?

_____

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments: _____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

THIS IS A PROFESSIONAL INSTALLATION. IT HAS NO TREATMENT AT ALL. THE WATER CAUSES SEVERE STAINING (RUST STAINS).

b. Recommendations:

INSTALL TREATMENT SYSTEM FOR WATER QUALITY AT POINT OF ENTRY INTO BUILDING, FOLLOWED BY CHLORINATION WITH APPROPRIATE RETENTION FACILITY.



Photo 0319: 4993/4994 Pitless unit (front centre), EMR Fire Control Centre (4993, back right), EMR Tanker Base (4994, back centre), above ground fuel storage and fire retardant tanks (left)



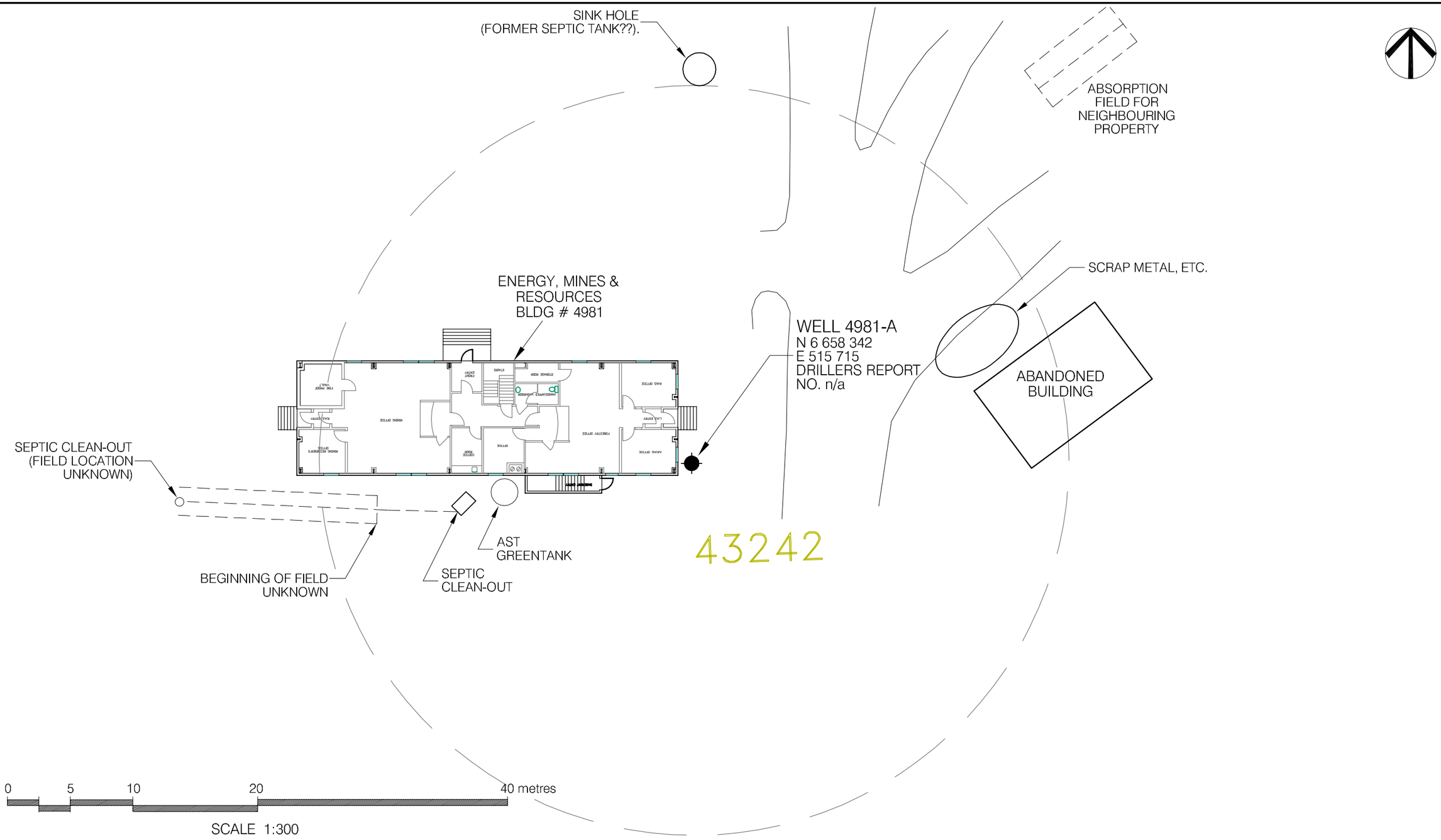
Photo 0318: 4993/4994 Pitless unit (front centre), above ground fuel storage tank (back right), fire retardant tanks (back right centre), chemical storage (back centre), and airport tarmac (behind)



Photo 0317: 4993/4994 Pitless unit (front right), evaporation lagoon (left)



Photo 0048: 4993 pressure tank



NOTES:

1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

WATSON LAKE ENERGY, MINES, & RESOURCES BUILDING # 4981
SITE LOCATION DIAGRAM
WELL ID: 4981-A

REVISION ISSUE: 0

FIGURE No.: 4981-A

LEGEND



PUMP



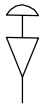
PRESSURE GAUGE



GATE VALVE



CHECK VALVE



SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



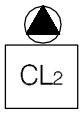
FLOW METER



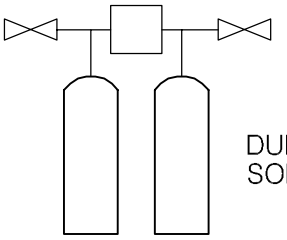
WATER FILTER
(CARTRIDGE TYPE)



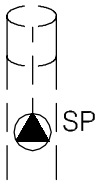
PRESSURE TANK



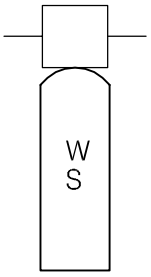
CHLORINE RESERVOIR AND
INJECTION PUMP



DUPLEX WATER
SOFTENER



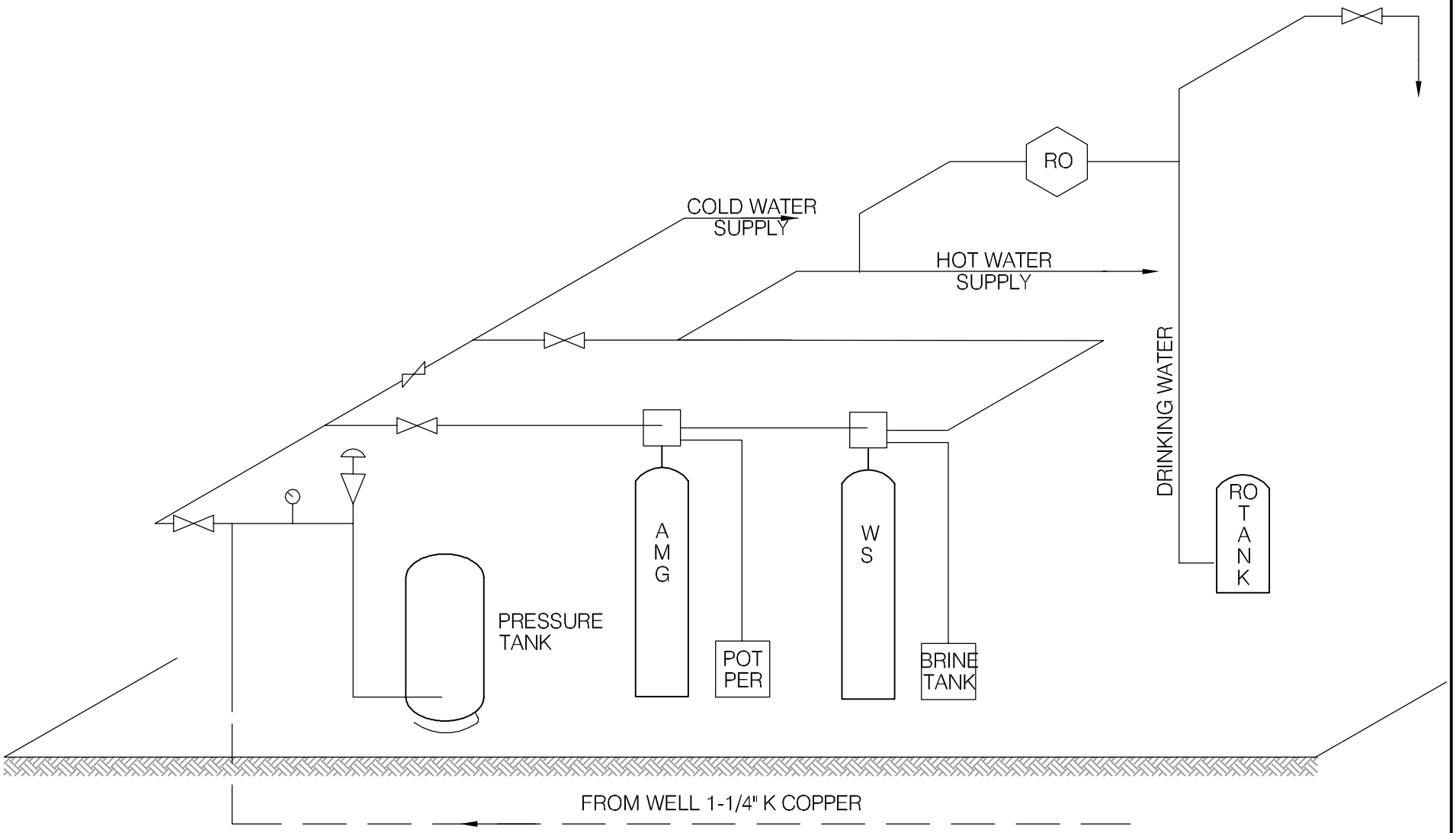
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\1260002003 Eastern Schematic_LEGEND.dwg, 4/11/2006 10:31:08 AM, Adobe PDF, jbuyck



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 4981 WATSON LAKE ENERGY, MINES, & RESOURCES OFFICE	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE 4981-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\Schematics\1260002 EMR Office_4981 Schematic.dwg, 7/21/2005 4:26:59 PM, Adobe PDF

Eastern Region – Energy/Mines Office
Building # 4981

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	MG FILTER	PETWA	02-2002-22		25210	12 x 52
2	SOFTENER	PETWA	01-150063		25209	10" x 54"
3	REVERSE OSMOSIS	USFILTER	E75TFC-3SF		75807	75GPD
4	RO TANK	WELL MATE	WM0075		02506371	75L
5	PRESSURE TANK	WELL RITE	WR200-02			
6	PRESSURE SWITCH	SQ. D	FSG-2			
7	PRESSURE GAUGE	MARSH	0-100			2 11
8	SUB. PUMP.	MONARCH	SK.			4" - 1/2 HP.
9						
10						

TABLE 4981- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
4981	Energy, Mines, and Resources Office	8	Sept-04 to Mar-05	no	0/8	no	9-Mar-05	no

Table 4981-2: Water Quality Results

SOURCE:	Building 4981 - Energy, Mines and Resources Office				GCDWQ Criteria		
Location/ Resident	Watson Lake						
Address							
Treatment		None	Filter and Water Softener	Reverse Osmosis			
Disinfection	No						
Source of Water	On-Site Well						
Purpose of Sampling	Baseline	Additional Sampling	Additional Sampling	Additional Sampling			
Sample Location		Washroom Sink	Washroom Sink	Kitchen RO Tap			
Date Sampled	13-Oct-04	21-Jun-05	21-Jun-05	21-Jun-05	Lower	Upper Limit	
Physical Tests *(ALS)*					AO	MAC	AO
Colour (CU)	>60	<5.0	<5.0	<5.0			15
Conductivity (uS/cm)		1250	1550	90.1			
Total Dissolved Solids	628	1240	996	48			500
Hardness CaCO3	541	531	<6.6	6.59	AO >200 = poor, > 500 unacceptable[A]		
pH	7.86	7.96	8.14	6.54	6.5		8.5
Turbidity (NTU)	36.1	15.9	0.28	0.720		1	5
Dissolved Anions *(ALS)*							
Alkalinity-Total CaCO3	188	194	207	7.6			
Chloride Cl	285	298	299	20.3			250
Fluoride F	<0.2	<0.20	<0.20	<0.020		1.5	
Sulphate SO4	7.34	<5.0	<5.0	<0.50			500
Nitrate Nitrogen N	<0.05	<1.0	<1.0	<0.10		10	
Nitrite Nitrogen N	<0.02	<1.0	<1.0	<0.10		1	
Ammonia Nitrogen N			<0.020				
Total Metals *(ALS)*							
Aluminum T-Al	<0.005	<0.020	<0.10	<0.010			
Antimony T-Sb	<0.0002	<0.0010	<0.0050	<0.00050		0.006	
Arsenic T-As	*0.0053*	0.00418	0.0023	0.00068		0.025	
Barium T-Ba	1.39	0.794	<0.20	<0.020		1	
Boron T-B	0.016	<0.20	<1.0	<0.10		5	
Cadmium T-Cd	<0.00001	<0.00040	<0.0020	<0.00020		0.005	
Calcium T-Ca		170	2.3	2.14			
Chromium T-Cr	0.0053	<0.0040	<0.020	<0.0020		0.05	
Copper T-Cu	0.001	0.0159	<0.010	<0.0010		1	
Iron T-Fe	2.85	1.28	<0.030	<0.030			0.3
Lead T-Pb	<0.0001	<0.0020	<0.010	<0.0010		0.01	
Magnesium T-Mg		26	<1.0	0.3			
Manganese T-Mn	0.576	1.01	<0.020	0.0187			0.05
Mercury T-Hg		<0.00020	<0.00020	<0.00020		0.001	
Potassium T-K		2.12	515	17			
Selenium T-Se		<0.0020	<0.010	<0.0010		0.01	
Sodium T-Na	21.8	25.2	<2.0	2.2			200
Uranium T-U	<0.0005	0.00029	<0.0010	<0.00010		0.02	
Zinc T-Zn	0.004	<0.10	<0.50	<0.050			5
Dissolved Metals *(ALS)*							
Aluminum D-Al			<0.10			0.1	
Antimony D-Sb			<0.0050			0.006	
Arsenic D-As			0.0021			0.025	
Barium D-Ba			<0.20			1.0	
Boron D-B			<1.0			5	
Cadmium D-Cd			<0.0020			0.005	
Calcium D-Ca			1.9				
Chromium D-Cr			<0.020			0.05	
Copper D-Cu			<0.010				1.0
Iron D-Fe			<0.030				0.3
Lead D-Pb			<0.010			0.01	
Magnesium D-Mg			<1.0				
Manganese D-Mn			<0.020				0.05
Mercury D-Hg			<0.00020			0.001	
Potasium D-K			504				
Selenium D-Se			<0.010			0.01	
Sodium D-Na			<2.0				200
Uranium D-U			<0.0010			0.02	
Zinc D-Zn			<0.50				5.0
Organic Parameters							
Total Organic Carbon C			1.78				
Polycyclic Aromatic Hydrocarbons							
Acenaphthene		<0.000050					
Acenaphthylene		<0.000050					
Acridine		<0.000050					
Anthracene		<0.000050					
Benz(a)anthracene		<0.000050					
Benzo(a)pyrene		<0.000010				0.00001	
Benzo(b)fluoranthene		<0.000050					
Benzo(g,h,i)perylene		<0.000050					
Benzo(k)fluoranthene		<0.000050					
Chrysene		<0.000050					
Dibenz(a,h)anthracene		<0.000050					
Fluoranthene		<0.000050					
Fluorene		<0.000050					
Indeno(1,2,3-c,d)pyrene		<0.000050					
Naphthalene		<0.000050					
Phenanthrene		<0.000050					
Pyrene		<0.000050					
Quinoline		<0.000050					
Extractable Hydrocarbons							
EPH10-19		<0.30					
EPH19-32		<1.0					
LEPH		<0.30					
HEPH		<1.0					
Field Chemistry (EBA)							
pH			8.20	7.76	6.5		8.5
TDS (ppm)			750	76			500
EC (uS/cm)			1517	153			
Temperature (°C)			8	17.3			

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU), Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

Table 4981-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
4981	**Watson Lake Energy, Mines, and Resources Office**	**Watson Lake**	6658342	515715	707

Well Details							
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Well Capacity - Tested, or Reported by User**	**Static Water Level Below Ground (m-btwc)**
150	1975	Yes	23.0	Silt from surface to 15.3 m			

Potential Contaminant Sources					
Distance from well to nearest point of septic field (m)	**Distance from well to nearest building (m)**	**Distance to surface water body (m)**	**AST present on property?**	**Distance from well to AST (m)**	**Other potential sources of contamination observed on property, and distance to well**
13	2	Greater than 60 m	AST	12	Industrial Junkyard at approximately 20 m Scrap meatal at approximately 20 m Sink hole that may have been an old septic tank at 32 m

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
2.5 m below grade	Split seal gasket cap, but was not in place - well is open	Perforated piping from 20.9 m to 22.4 m.	No	No, but site is well drained	The well is down slope and down gradient from a barite plant and sewage lagoon.

EBA Engineering Consultants Ltd.

Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin
Lake Lebel

Date June 21, 2005

WELL ID #	Owner	Location Description
4981	YTG	Watson Lake Energy Mines and Resources office

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Watson Lake

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
1007 Alaska Hwy Watson Lake

c. GPS location: N6 6 5 8 3 4 2 E 5 1 5 7 1 5 elv 707 ±11m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Energy, Mines and Resources office

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Energy, Mines and Resources office building

h. Distance from well to building ~ 2m

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: 13m N 6658336 E 515694

k. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☒ Yes ☐ No

N 6658371
E 515717 Sink hole → could be old septic @~32m, septic field and service lines <30m, 2nd septic field @~45m

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☐ Yes ☒ No Entrance by animals? ☒ Yes ☐ No access possible, but unlikely.

p. Is well site subject to flooding? ☐ Yes ☒ No

q. Is the well site well drained? ☒ Yes ☐ No

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: AST ; Distance from well to Potential Source 1: ~12 m
Potential Source 2: Industrial Junkyard ; Distance from well to Potential Source 2: ~20m
Potential Source 3: Scrap Metal ; Distance from well to Potential Source 3: ~20m
Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

t. Are there other wells on this property? ☐ Yes ☐ No

How many? _____ ☐ in use ☐ abandoned ☐ require proper sealing

2. Well and Wellhead information:

a. When was well installed? Year 1975 Month November

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☒ Yes ☐ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☐ unlikely

e. Surface casing: ☐ Yes Diameter _____ ☒ No

f. Well casing: Diameter 15cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: 75 ft ☐ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: unknown

☐ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☐ unknown other perforated pipe - bottom closed

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length 5 ft slot size(s) perforated
Location of screen: from 68 ft to 73 ft (from log) reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☒ in pit ☐ pitless adaptor ☐ in a building
ø 110cm fibreglass culvert

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail 2.5m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☒ Yes ☐ No

iv. Any evidence of rodents? Specify No

v. Does the well casing have a proper seal cap? ☐ Yes ☒ No

If no, describe condition seal cap is not on well - has been removed well is open

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☒ Yes ☐ No

Explain (filtration, disinfection etc...) Softener, fitration, RO

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No unlikely

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☒ electric submersible ☐ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☒ plastic likely

g. Pump delivers water to: ☒ pressure tank ☐ elevated tank ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☒ No

j. Is there a water meter on the system? ☒ Yes ☐ No

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Insulation -> There may be heat trace

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

There was no salt in softener at time of inspection.
The wellhead has no cap on it and well is open.

b. Recommendations: _____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JUNE 21/05

WELL ID #	Owner	Location Description
4981	YTG	WATSON LAKE EWR-

6. **Water Treatment**

a. Is well water treated? ☑ Yes ☐ No; Type of treatment: AMG, WS, RO.

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☑ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____(location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. **Water Quality (observations):**

a. Does the water stain plumbing? ☐ yes ☑ No ☐ slight ☐ severe

Type of stain: ☐ brown ☐ red ☐ black

b. Does the water contain sediment? ☐ Yes ☑ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☑ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐Yes ☑No ☐brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No

f. Is there a chemical analysis? ☐ Yes ☐ No ☐adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☐ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☐ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☐ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☐ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes No Details:

Where is it located?
Comments: _____

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES NO
Comments:_____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES NO

Comments: _____

Are there other heat sources near the tank? YES NO
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO
Comments: _____

Overall Tank

What are the tank size and dimensions?

_____

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments: _____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

GOOD OVERALL INSTALLATION. HOWEVER AUTOMATIC FILTER DRAINS & RO DRAINS ARE SUBJECT TO CROSS CONTAMINATION.

b. Recommendations:

INSTALL AIR GAP TO SOFTNER & RO DRAINS.
INSTITUTE BI ANNUAL SUPER CHLORINATION OF WELL & PIPING SYSTEM. INSTALL ~~AN OR~~ APPROPRIATE UV SYSTEM AFTER SOFTENER.

MIDNIGHT SUN DRILLING CO. LTD.
PH: 668-2434
WHITEHORSE Y.T.
P.O. Box 4391

FIELD REPORT

Started. NOV. 12 ..... 19 75
Completed. NOV 15 ..... 19 75

NAME AND ADDRESS OF CLIENT	DESCRIPTION OF WORK	LOCATION OF WORK
INDIAN AFFAIRS	WATER WELL	WATSON LAKE Mining Recording Office

FORMATION LOG

FROM	TO	FORMATION
0	16	BROWN SY, SD
5	50	SY, SD
50	60	GR + SD
60	75	GR + SD

DESCRIPTION OF WORK

MOVE

DATE	TIME FROM	TIME TO	HOURS
NOV 12	~~8~~	8/930	12.5
NOV 13	~~8~~	8/9	12 X
NOV 14	~~8~~	8 7	11
NOV 15	~~8~~	8/7	11

HR.

Casing & Pipe

Type	Size	Type
Inch	Feet	Inch
2"		
6		
6"		
0		
8"		
0"		
8"		

Remarks:

BOTTOM CLOSED
PER 68' TO 73'

BAILED AT 5 GALS
10 HRS. BAILING

STATIC LEVEL		Total Rig Time	46.5 hrs.
Ground level		Total Standby	hrs.
Top of casing		Drilling Mud	4 sacks

SIGNATURES

MIDNIGHT SUN.. M. FRY ..... TULL .....
TITLE..... DRILLER .....

CLIENT.....
TITLE.....



Photo 0270: 4981 Wellhead enclosure (front), and EMR office (behind)



Photo 0269: 4981 Wellhead in pit



Photo 0272: 4981 Above ground fuel storage tank (right), EMR office (behind), and septic field (back left)

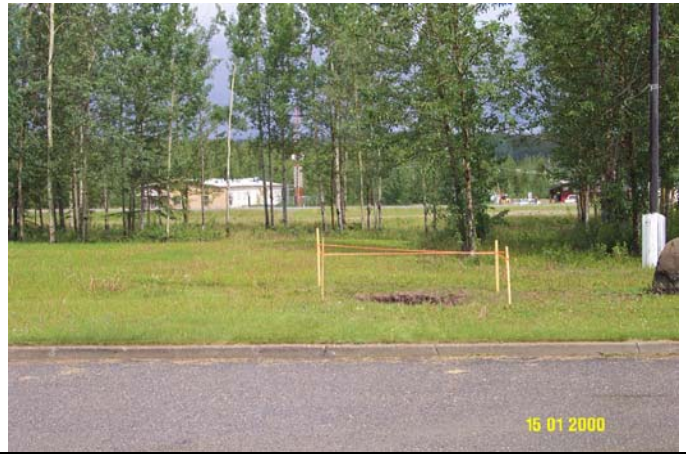


Photo 0267: 4981 Sinkhole – could be abandoned septic tank



Photo 0012: 4981 AMG filter



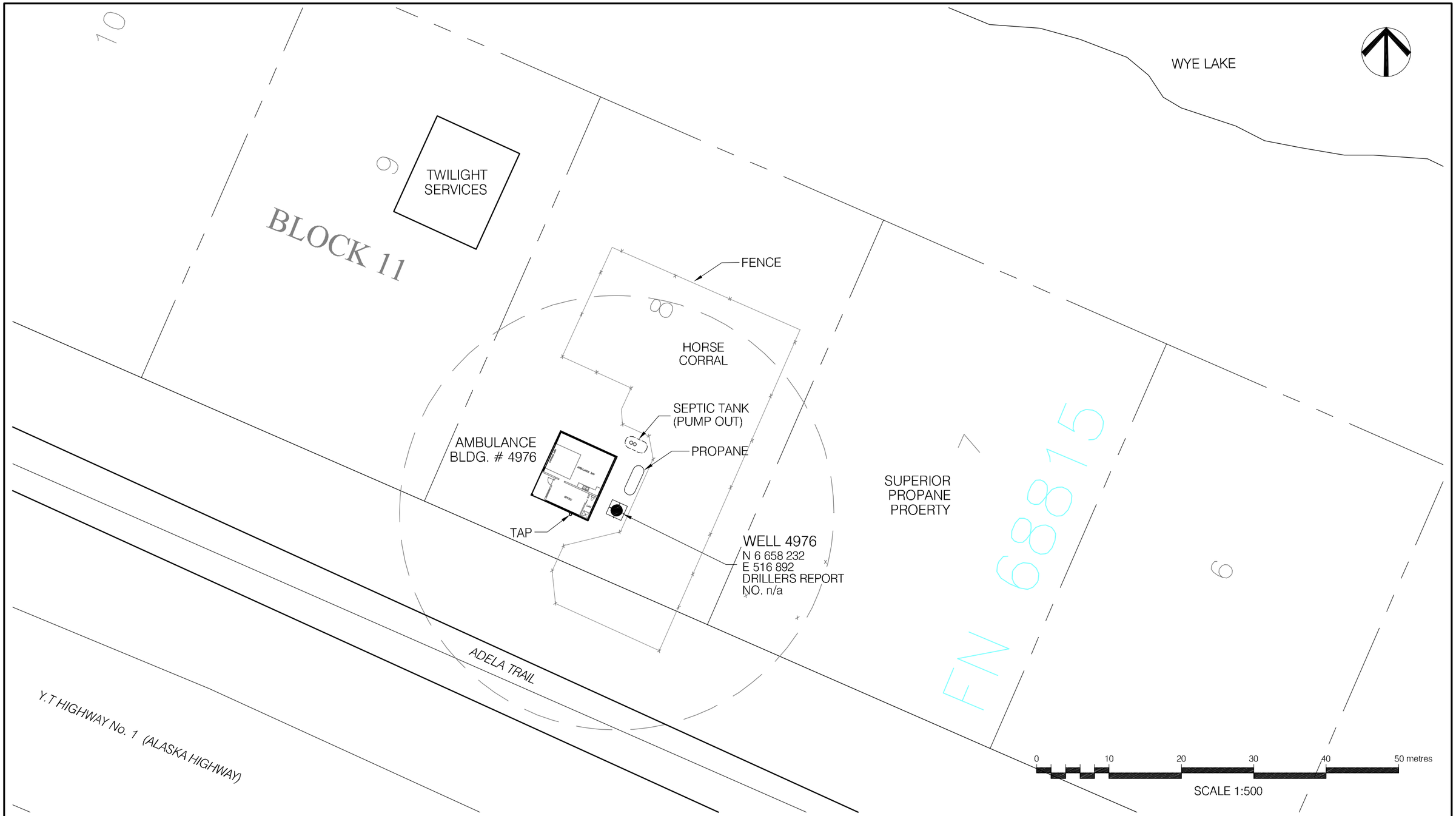
Photo 0013: 4981 Water softener



Photo 0011: 4981 Reverse osmosis system



Photo 0009: 4981 Pressure Tank



NOTES:

1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.
2. LOCATION OF BUILDINGS AND STRUCTURES ARE APPROXIMATE ONLY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon Highways and Public Works Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

WATSON LAKE AMBULANCE
BUILDING # 4976
SITE LOCATION DIAGRAM
WELL ID: 4976-A

REVISION ISSUE: 0

FIGURE No.: 4976-A

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\1260002 Ambulance Bldg_4976.dwg, 7/25/2005 3:44:04 PM, Adobe PDF

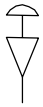
LEGEND


PUMP


PRESSURE GAUGE


GATE VALVE


CHECK VALVE


SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



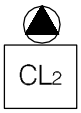
FLOW METER



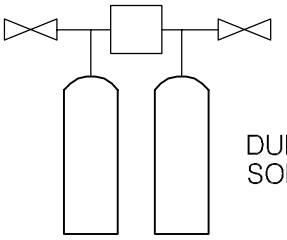
WATER FILTER
(CARTRIDGE TYPE)

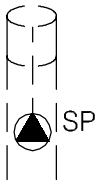


PRESSURE TANK

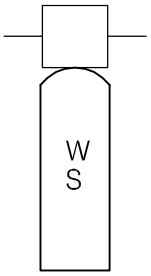


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER



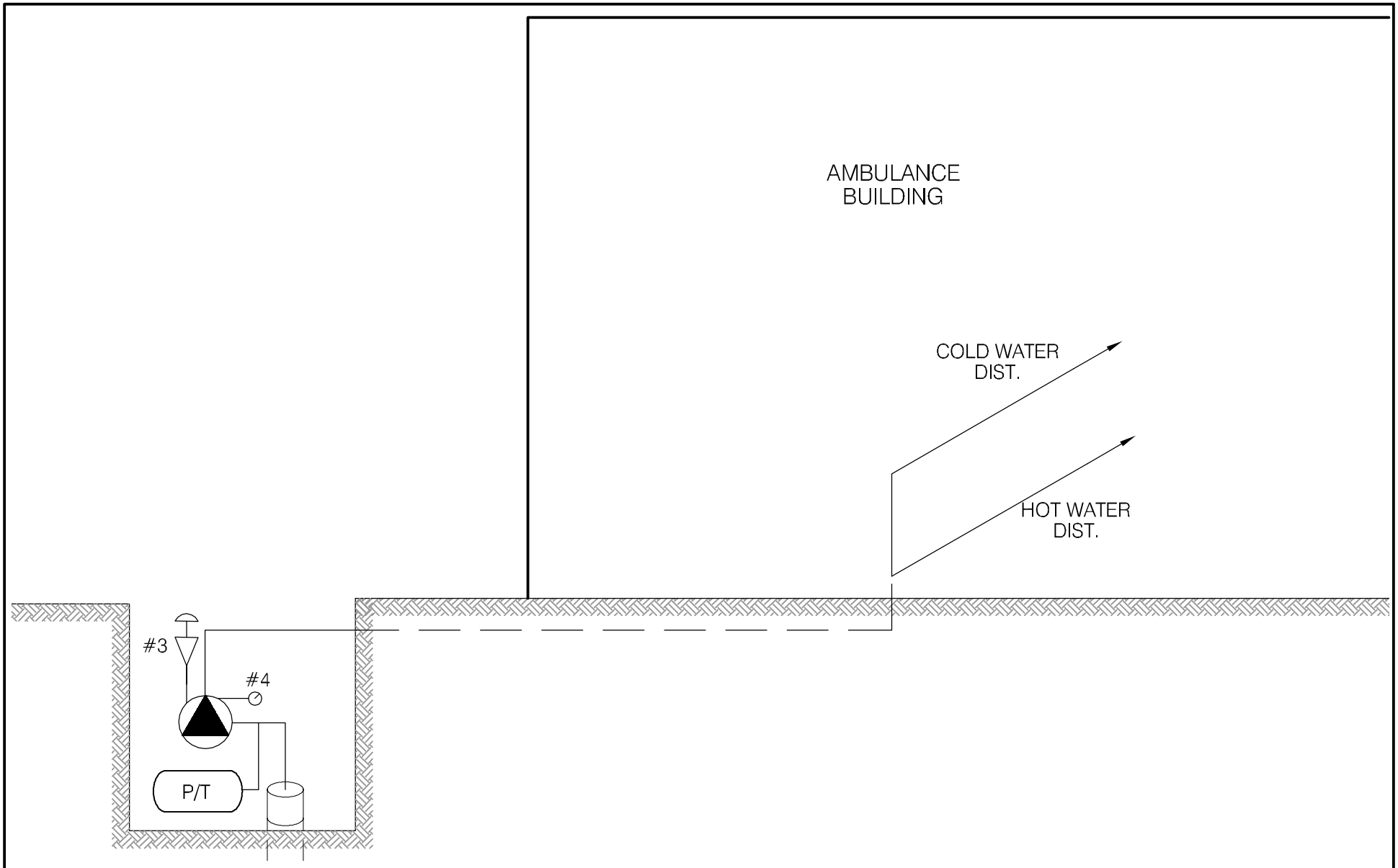
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

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SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 4976 WATSON LAKE AMBULANCE STATION	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE 4976-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\Schematics\1260002 Ambulance Station_4976 Schematic.dwg, 7/21/2005 2:42:58 PM, Adobe PDF

TABLE 4976- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
4976	Ambulance Building	NO BACTERIOLOGICAL RESULTS ARE AVAILABLE FOR THIS SITE						

Table 4976-2: Water Quality Results

SOURCE:	Building 4976 - Ambulance Building			GCDWQ Criteria		
Location/ Resident	Watson Lake					
Address						
Treatment	No					
Disinfection	No					
Source of Water	On-Site Well					
Purpose of Sampling	Baseline	Additional Sampling	Baseline			
Sample Location		Sink in Ambulance Bay				
Date Sampled	13-Sep-04	23-Jun-05	22-Jun-05	**Limit**	**Upper Limit**	
Physical Tests (*ALS*)				**AO**	**MAC**	**AO**
Colour (CU)	<5		<5			15
Conductivity (uS/cm)			567			
Total Dissolved Solids	312		370			500
Hardness CaCO3	286		247	AO >200 = poor, > 500 unacceptable[A]		
pH	7.60		7.8	6.5		8.5
Turbidity (NTU)	**1.2**	0.23	0.35		1	5
UV Absorbance		0.026				
% Transmittance						
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	232		197			
Chloride Cl	35.8	57.7	60.4			250
Fluoride F	<0.05		<0.020		1.5	
Silicate SiO4						
Sulphate SO4	16.7		13.7			500
Nitrate Nitrogen N	2.5	2.33	2.3		10	
Nitrite Nitrogen N	<0.05	<0.0010	<0.10		1	
Ammonia Nitrogen N		0.037				
Total Phosphate PO4						
Total Metals *(ALS)*						
Aluminum T-Al	<0.005		<0.010			
Antimony T-Sb	<0.0002		<0.010		0.006	
Arsenic T-As	0.0005		0.00045		0.025	
Barium T-Ba	0.316		0.245		1	
Boron T-B	0.008		<0.10		5	
Cadmium T-Cd	0.00003		<0.0002		0.005	
Calcium T-Ca			80.2			
Chromium T-Cr	0.0013		<0.0020		0.05	
Copper T-Cu	0.313		0.0392		1	
Iron T-Fe	0.02		0.253			0.3
Lead T-Pb	0.0008		0.0044		0.01	
Magnesium T-Mg			1.56			
Manganese T-Mn	<0.005		0.0148			0.05
Mercury T-Hg			<0.00020		0.001	
Potassium T-K			0.32			
Selenium T-Se			<0.0010		0.01	
Sodium T-Na	12.8		<2.0			200
Uranium T-U	0.0008		0.00038		0.02	
Vanadium T-V						
Zinc T-Zn	0.102		0.096			5
Dissolved Metals *(ALS)*						
Aluminum D-Al					0.1	
Antimony D-Sb					0.006	
Arsenic D-As					0.025	
Barium D-Ba					1.0	
Boron D-B					5	
Cadmium D-Cd					0.005	
Calcium D-Ca						
Chromium D-Cr					0.05	
Copper D-Cu						1.0
Iron D-Fe						0.3
Lead D-Pb					0.01	
Magnesium D-Mg						
Manganese D-Mn						0.05
Mercury D-Hg					0.001	
Potasium D-K						
Selenium D-Se					0.01	
Sodium D-Na						200
Uranium D-U					0.02	
Vanadium D-V						
Zinc D-Zn						5.0
Trihalomethanes						
Bromodichloromethane						
Bromoform						
Chloroform						
Dibromochloromethane						
Total Trihalomethanes					0.1	
Organic Parameters						
Tannin and Lignin		0.18				
Total Organic Carbon C		1.50				
Haloacetic Acids						
Bromoacetic Acid						
Bromochloroacetic Acid						
Chloroacetic Acid						
Dibromoacetic Acid						
Dichloroacetic Acid						
Trichloroacetic Acid (TCA)						
Polycyclic Aromatic Hydrocarbons						
Acenaphthene						
Acenaphthylene						
Acridine						
Anthracene						
Benz(a)anthracene						
Benzo(a)pyrene					0.00001	
Benzo(b)fluoranthene						
Benzo(g,h,i)perylene						
Benzo(k)fluoranthene						
Chrysene						
Dibenz(a,h)anthracene						
Fluoranthese						
Fluorene						
Indeno(1,2,3-c,d)pyrene						
Naphthalene						
Phenanthrene						
Pyrene						
Quinoline						
Extractable Hydrocarbons						
EPH10-19						
EPH19-32						
LEPH						
HEPH						
Organochlorine Pesticides						
Aldrin						8.5
alpha-BHC						500
beta-BHC						
delta-BHC						
cis-Chlordane (alpha)						
trans-Chlordane (gamma)						
2,4'-DDD						
4,4'-DDD						
2,4'-DDE						
4,4'-DDE						
2,4'-DDT						
4,4'-DDT						
Dieldrin						
Endosulfan I						
Endosulfan II						
Endosulfan Sulfate						
Endrin						
Heptachlor						
Heptachlor Epoxide						
Lindane (gamma - BHC)						
Methoxychlor						
Mirex						
cis-Nonachlor						
trans-Nonachlor						
Oxychlordane						
Field Chemistry (EBA)						
pH		7.89				8.5
TDS (ppm)		274				500
EC (uS/cm)		550				
Temperature (°C)		6.1				
Free Available Chlorine						

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU)

Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

Table 4976-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
4976	**Watson Lake Ambulance Building**	**Watson Lake**	6658232	516892	696

Well Details							
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Well Capacity - Tested, or Reported by User**	**Static Water Level Below Ground (m-btwc)**
200 mm pvc pipe		No	5.3	Unlikely	Jet pump		3.0 m below grade

Potential Contaminant Sources					
Distance from well to nearest point of septic field (m)	**Distance from well to nearest building (m)**	**Distance to surface water body (m)**	**AST present on property?**	**Distance from well to AST (m)**	**Other potential sources of contamination observed on property, and distance to well**
10	3	Greater than 60 m	No	N/A	Horse corrals at 1.5 m from the well

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
0.6 m below grade	None present		No	No, well is at a low point on the property	This well is likely a dug well

EBA Engineering Consultants Ltd.

Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date June 23, 2005

WELL ID #	Owner	Location Description
4976	YTG	Watson Lake Ambulance Building

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Watson Lake

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
500 Adela Trail

c. GPS location: N 6659232 E 516892 elv 696m ±14m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Ambulance building and horse corrals

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Ambulance building

h. Distance from well to building ~3m

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: Septic tank ~10 m from well

k. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☐ Yes ☐ No
Horse Corrals ~1.5m from well; Septic holding tank @ 10m

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☐ Yes ☒ No unfastened lid
Entrance by animals? ☐ Yes ☒ No signs of mice and insects

p. Is well site subject to flooding? ☒ Yes ☐ No some water standing

q. Is the well site well drained? ☐ Yes ☒ No low point on property

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1:_____; Distance from well to Potential Source 1:_____
Potential Source 2:_____; Distance from well to Potential Source 2:_____
Potential Source 3:_____; Distance from well to Potential Source 3:_____
Potential Source 4:_____; Distance from well to Potential Source 4:_____

t. Are there other wells on this property? ☐ Yes ☒ No

How many?_____ ☐ in use ☐ abandoned ☐ require proper sealing

2. Well and Wellhead information:

a. When was well installed? Year unknown Month _____

b. Type: ☐ drilled ☒ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☐ Yes ☒ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☐ unlikely

e. Surface casing: ☐ Yes Diameter _____ ☒ No

f. Well casing: Diameter 20cm Material: ☐ steel ☒ plastic PVC ☐ concrete

g. Depth of well: 5.32 m below grade ☒ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: 3.02 m below grade

☒ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☐ unknown other unlikely

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length _____ slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unlikely

m. Is the well head: ☐ in pumphouse ☒ in pit ☐ pitless adaptor ☐ in a building
pwf wooden - insulated - enclosure

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail top of casing ~ 60cm below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☒ Yes ☐ No some

iii. Is the wellhead enclosed by fiberglass insulations? ☒ Yes ☐ No in walls of enclosure

iv. Any evidence of rodents? Specify Yes

v. Does the well casing have a proper seal cap? ☐ Yes ☒ No

If no, describe condition None

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No shallow well ☐ farther investigation required.

If yes is there treatment ☐ Yes ☒ No

Explain (filtration, disinfection etc…)

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☐ No unknown

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☐ electric submersible ☒ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface n/a

f. Drop pipe for submersible pump: ☐ steel ☒ plastic

g. Pump delivers water to: ☒ pressure tank ☐ elevated tank ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☒ No

j. Is there a water meter on the system? ☐ Yes ☒ No

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Heat trace → enclosure is insulated

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

b. Recommendations:

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JUNE 23/05

WELL ID #	Owner	Location Description
4976	YTG	WATSON LAKE AMBULANCE BLDG.

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☑ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☑ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☑ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☑ No

7. **Water Quality (observations):**

a. Does the water stain plumbing? ☐ yes ☐ No ☑ slight ☐ severe

Type of stain: ☐ brown ☑ red ☐ black

b. Does the water contain sediment? ☐ Yes ☑ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☑ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No ?

f. Is there a chemical analysis? ☐ Yes ☐ No ☐ adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☑ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☑ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☑ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☑ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes No Details:

Where is it located?
Comments: _____

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES NO
Comments:_____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES NO

Comments: _____

Are there other heat sources near the tank? YES NO
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO
Comments: _____

Overall Tank

What are the tank size and dimensions?

_____

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments: _____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

THIS INSTALLATION IS TOTALLY INADEQUATE. THE WELL HEAD IS OPEN TO SEVERAL SOURCES OF CONTAMINATION. A HEAVY RAINFALL COULD FILL THE WELL PIT FROM SURROUNDING ANIMAL ENCLOSURES (HORSES) THERE IS EVIDENCE OF MICE LIVING IN THE WELL ENCLOSURE. THE WELL IS BASICALLY SURFACE WATER WITH NO FILTRATION OR TREATMENT.

b. Recommendations:

DRILL A PROPER WATER WELL OR HAVE A WATER DELIVERY SYSTEM INSTALLED. INSTALL PROPER TREATMENT IE FILTRATION, UV OR CHLORINATION.

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9417
Jurisdiction	Yukon
Community	Watson Lake
Address	3rd St N & Wye Dr
Highway	
Milepost	
Feature	Watson Lake
Location and Cause	spring melt carrying oil from contaminated soil into ditches - behind KPI Northern
Latitude	60.0602777777778
Longitude	-128.684444444444
Incident Date	4/28/1994
Lead Agency	Municipality - identified in Community
Other Agency	
Company(s)	
Amount	
Units	
Quantity	Unknown
Release Description	Chronic Discharge
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Waste Oil
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	oil sheen on water in ditches - ditches drain toward 2nd Wye Lake but dead end halfway - 100m from lake - no storm sewers nearby

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9724
Jurisdiction	Yukon
Community	Watson Lake
Address	Adela Trail & 3rd St N
Highway	
Milepost	
Feature	Watson Lake
Location and Cause	product in roadside ditch
Latitude	60.0596
Longitude	-128.6846
Incident Date	4/7/1997
Lead Agency	Yukon Government - Environmental Programs
Other Agency	
Company(s)	
Amount	
Units	
Quantity	Unknown
Release Description	
Additional Quanitit	oil, diesel, antifreeze mixture
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Oil
2nd Contaminant	Diesel
3rd Contaminant	Ethylene Glycol
4th Contaminant	
Outcome	suspect KPI Northern may be responsible as the business operates in the area - being investigated by the Watson Lake CO - no further information on file

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9731
Jurisdiction	Yukon
Community	Watson Lake
Address	3rd St N & Wye Drive
Highway	
Milepost	
Feature	Watson Lake
Location and Cause	product in roadside ditch - ditch is 1/2 full
Latitude	60.0605
Longitude	-128.6846
Incident Date	5/20/1997
Lead Agency	Yukon Government - Environmental Programs
Other Agency	
Company(s)	
Amount	
Units	
Quantity	Unknown
Release Description	Unknown
Additional Quanitit	yellow, dark, turpentine smell
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Unknown Substance
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	Bryan Levia inspected spill site - samples taken to see if it was a hazardous waste - no other informaiton on file

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9816
Jurisdiction	Yukon
Community	Watson Lake
Address	3rd St N & Wye Drive
Highway	
Milepost	
Feature	Watson Lake
Location and Cause	oil in ditch on corner - was reported last year - Spill No 9731
Latitude	60.0605
Longitude	-128.6846
Incident Date	4/14/1998
Lead Agency	Yukon Government - Environmental Programs
Other Agency	
Company(s)	KPI Northern
Amount	
Units	
Quantity	Unknown
Release Description	Unknown
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Oil
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	concern about waste getting into Second Wye Lake - CO in Watson Lake to investigate - no further information on file



Photo 0312: 4976 Watson Lake Ambulance Building



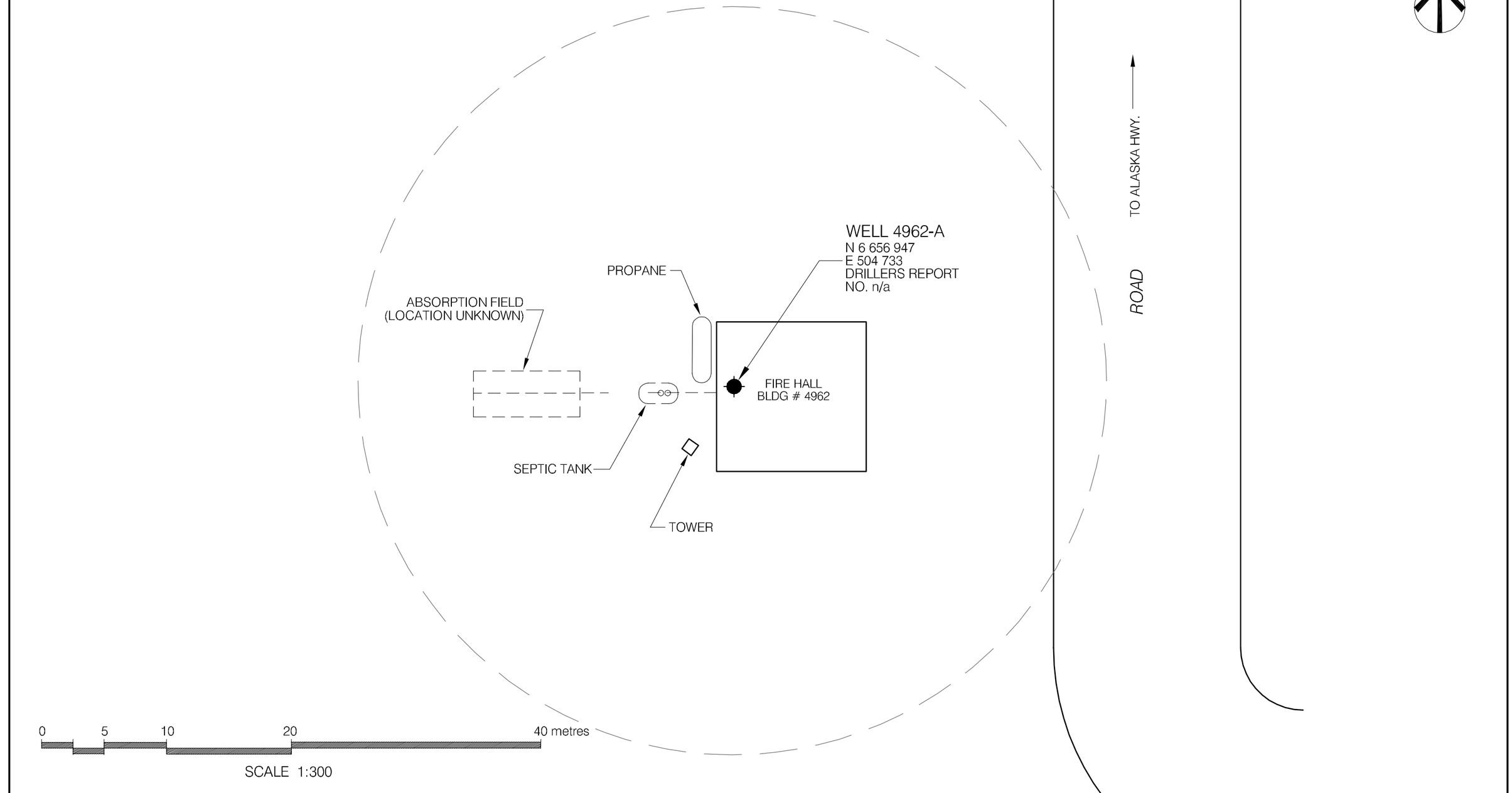
Photo 0310: 4976 Wellhead enclosure (centre), propane tank (behind), and horse corrals (back)



Photo 0308: 4976 Wellhead in pit (left), and jet pump (centre)



Photo 0311: 4976 Septic holding tank (front), and horse corrals (back)



NOTES:

1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon Highways and Public Works Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

LIARD FIRE HALL
BUILDING # 4962
SITE LOCATION DIAGRAM
WELL ID: 4962-A

REVISION ISSUE: 0

FIGURE No.: 4962-A

Z:\020\Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\1260002 Liard Fire Hall_4962.dwg, 7/21/2005 2:40:15 PM, Adobe PDF

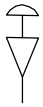
LEGEND


PUMP


PRESSURE GAUGE


GATE VALVE


CHECK VALVE


SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



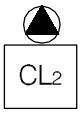
FLOW METER



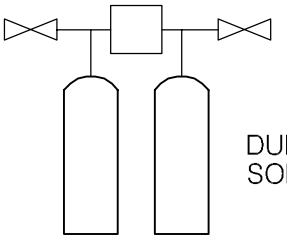
WATER FILTER
(CARTRIDGE TYPE)

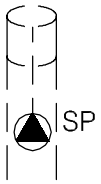


PRESSURE TANK

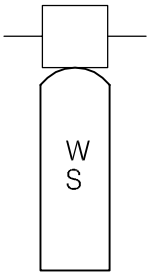


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER



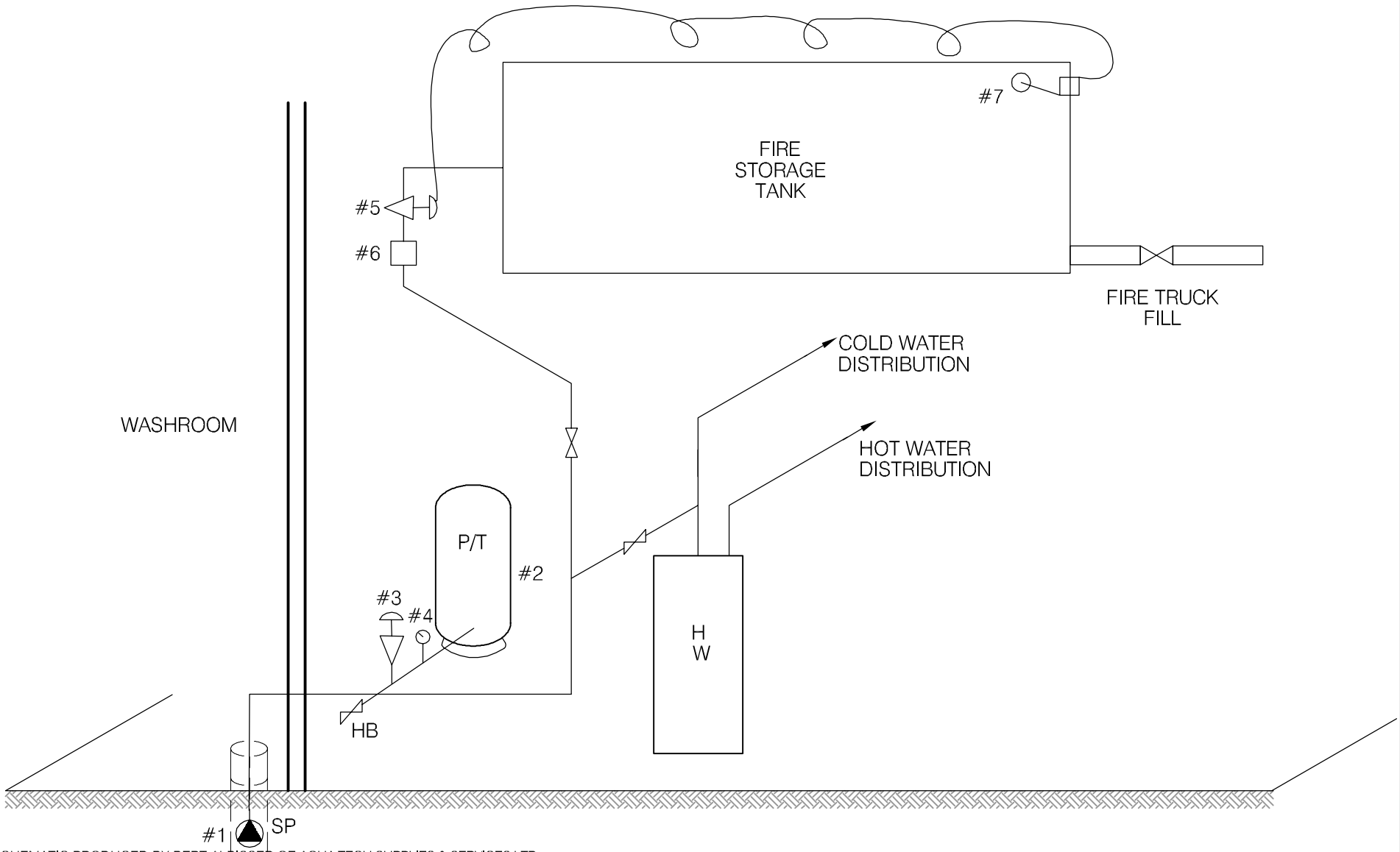
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\1260002003 Eastern Schematic_LEGEND.dwg, 4/11/2006 10:31:08 AM, Adobe PDF, jbuyck



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 4962 LIARD FIRE HALL	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE 4962-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\1260002 Liard Fire Hall_4962 Schematic.dwg, 7/21/2005 2:34:32 PM, Adobe PDF

Eastern Region – Liard Firehall
Building # 4962

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	Sub. Pump	Goulds	13EM0541Z		T047455	4" ½ HP.
2	Pressure Tank	A.O. Smith	V200		CK8615	
3	Pressure Switch.	Sq. D	FSG-2			2HP - ¼" FIPT
4	Pressure Gauge	Marsh	0-100			2" ¼" FIPT.
5	Solenoid Valve	Asco	1"			
6	In Line Y Strainer	Sarco	1"			
7	Tank Float Control	Mc Connell	1"			
8						
9						
10						

TABLE 4962- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
4962	Liard Fire Hall	6	Sept-04 to Mar-05	no	0/6	no	9-Mar-05	no

Table 4962-2: Water Quality Results

SOURCE:	Building 4962 - Liard Fire Hall			GCDWQ Criteria		
Location/ Resident	Upper Liard					
Address						
Treatment	No					
Disinfection	No					
Source of Water	On-Site Well					
Purpose of Sampling	Baseline	Baseline	Additional Sampling			
Sample Location			Bathroom Sink			
Date Sampled	13-Sep-04	22-Jun-05	22-Jun-05	**Lower**	**Upper Limit**	
Physical Tests *(ALS)*				**AO**	**MAC**	**AO**
Colour (CU)	8	<5				15
Total Dissolved Solids	224	230				500
Hardness CaCO3	222	219		AO >200 = poor, > 500 unacceptable[A]		
pH	7.93	8.03		6.5		8.5
Turbidity (NTU)	**3.0**	**16.4**	**49.9**		1	5
UV Absorbance			0.017			
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	230	237				
Chloride Cl	1.6	1.24				250
Fluoride F	0.07	0.071			1.5	
Sulphate SO4	4.3	3.06				500
Nitrate Nitrogen N	<0.1	<0.10			10	
Nitrite Nitrogen N	<0.05	<0.10			1	
Total Metals *(ALS)*						
Aluminum T-Al	<0.005	<0.010				
Antimony T-Sb	<0.0002	<0.0005			0.006	
Arsenic T-As	0.0004	0.00025			0.025	
Barium T-Ba	0.282	0.243			1	
Boron T-B	0.003	<0.10			5	
Cadmium T-Cd	<0.00001	<0.0002			0.005	
Calcium T-Ca		61.6				
Chromium T-Cr	0.0007	<0.0020			0.05	
Copper T-Cu	0.001	0.013			1	
Iron T-Fe	0.16	**1.4**				0.3
Lead T-Pb	0.0002	0.0014			0.01	
Magnesium T-Mg		15.9				
Manganese T-Mn	**0.118**	**0.0537**	**0.0589**			0.05
Mercury T-Hg		<0.0002				
Potassium T-K		0.93				
Selenium T-Se		<0.0010				
Sodium T-Na	2.2	2.3				200
Uranium T-U	0.0009	0.00118			0.02	
Vanadium T-V						
Zinc T-Zn	0.008	<0.050				5
Dissolved Metals *(ALS)*						
Manganese D-Mn			**0.0573**			0.05
Organic Parameters						
Tannin and Lignin			0.36			
Total Organic Carbon C			1.22			
Field Chemistry (EBA)						
pH			7.84	6.5		8.5
TDS (ppm)			207			500
EC (uS/cm)			416			
Temperature (^{o}C)			4.90			

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU) Conductivity (umhos/cm),Temperature (^{o}C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

Table 4962-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
4962	**Liard Fire Hall**	**Upper Liard**	6656947	504733	627

Well Details							
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Well Capacity - Tested, or Reported by User**	**Static Water Level Below Ground (m-btwc)**
150		No					

Potential Contaminant Sources					
Distance from well to nearest point of septic field (m)	**Distance from well to nearest building (m)**	**Distance to surface water body (m)**	**AST present on property?**	**Distance from well to AST (m)**	**Other potential sources of contamination observed on property, and distance to well**
8	Located inside fire hall washroom	Greater than 60 m	No	N/A	

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
Wellhead is at grade	Split seal gasket cap		Unlikely	No	

EBA Engineering Consultants Ltd.
Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Mardin, Luke Lebel Date June 22, 2005

WELL ID #	Owner	Location Description
4962	YTG	Liard Fire Hall

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Upper Liard

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Upper Liard Subdivision

c. GPS location: N 6656947 E 504733 elv 627m ±16m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☐ Yes ☒ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Liard Fire Hall

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Located in bathroom of Liard Fire Hall

h. Distance from well to building _____

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: ~17.5m
N6656953
E504721

k. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral
likely upgradient

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☐ Yes ☐ No
Unknown if it is a holding tank only - may or may not be an effluent field
There are no signs of cleanout or obvious digging

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☐ Yes ☐ No
Located inside building, but building was unlocked and unalarmed at the time of inspection

Entrance by animals? ☐ Yes ☒ No
Access possible. There are mouse traps in surrounding rooms.

p. Is well site subject to flooding? ☒ Yes ☐ No
If washroom sink or toilet overflowed, then the well could be flooded. The wellhead is exactly at the level of the washroom floor

q. Is the well site well drained? ☐ Yes ☒ No
There are no other drains in the washroom

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: Adjacent Septic ; Distance from well to Potential Source 1: >30m (Home is ~50m from well)

Potential Source 2:_____; Distance from well to Potential Source 2:_____

Potential Source 3:_____; Distance from well to Potential Source 3:_____

Potential Source 4:_____; Distance from well to Potential Source 4:_____

t. Are there other wells on this property? ☐ Yes ☒ No unlikely → There may be wells in surrounding properties (unknown)

How many?_____ ☐ in use ☐ abandoned ☐ require proper sealing

2. Well and Wellhead information:

a. When was well installed? Year unknown Month _____

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☐ Yes ☒ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☒ unlikely

e. Surface casing: ☐ Yes Diameter _____ ☒ No

f. Well casing: Diameter 15 cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: unknown ☐ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: unknown

☐ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☐ unknown other unknown

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☒ in a building
located in washroom of fire hall – The top of the well casing is exactly at the level of the concrete floor
☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail At grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No but inside insulated building

iv. Any evidence of rodents? Specify Mouse traps in surrounding rooms

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition split gasket cap

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☐ Yes ☒ No

Explain (filtration, disinfection etc…)_____

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment likely ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No unlikely

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☒ electric submersible ☐ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☒ plastic

g. Pump delivers water to: ☒ pressure tank (domestic) ☒ elevated tank (fire truck fill) ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☒ Yes ☐ No

j. Is there a water meter on the system? ☐ Yes ☒ No

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: located inside heated building

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

The wellhead is located in the fire hall washroom and is directly against the washroom floor - in one corner.

b. Recommendations: _____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JUNE 22/05

WELL ID #	Owner	Location Description
4962	YTG.	LIARD FIRE HALL

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☐ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. **Water Quality (observations):**

a. Does the water stain plumbing? ☐ yes ☐ No ☐ slight ☑ severe

Type of stain: ☐ brown ☑ red ☐ black

b. Does the water contain sediment? ☐ Yes ☑ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☑ Yes ☐ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☑ Yes ☐ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No ?

f. Is there a chemical analysis? ☐ Yes ☐ No ☐ adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☐ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☐ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☐ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☐ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes No Details: PRESSURE TANK. & FIRE STORAGE

Where is it located?
Comments: ON PLATFORM.

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES NO
Comments: _____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES NO

Comments: _____

Are there other heat sources near the tank? YES NO
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO
Comments: _____

Overall Tank

What are the tank size and dimensions?
4' Ø x 12' LONG

What material is the tank constructed of? STEEL

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES (NO)

Comments: NOT USED FOR DRINKING WATER.

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments:

Is there any sediment or scum in bottom of tank? YES NO
Comments:

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

THE WELL IS LOCATED IN THE WASHROOM WITH CASING CUT AT FLOOR LEVEL. TOILET OVERFLOW WOULD FLOW INTO THE WELL.
FIRE STORAGE TANK HAS NO BACKFLOW DEVICE.

b. Recommendations:

RAISE CASING AT LEAST 18" ABOVE FLOOR LEVEL, REPIPE AS NECESSARY. INSTALL FLOOR DRAIN TO ASSURE DRAINAGE IN CASE OF TOILET OVERFLOW. INSTALL SUITABLE WATER TREATMENT AND UV SYSTEM. INSTITUTE BI-ANNUAL TOTAL SYSTEM SHOCK CHLORINATION AND REGULAR MAINTENANCE PROGRAM FOR WATER TREATMENT.
INSTALL 1" DCA IN TANK FILL.

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9620
Jurisdiction	Yukon
Community	
Address	
Highway	
Milepost	
Feature	Upper Liard
Location and Cause	Upper Liard - wash house - fuel tank near building tipped over
Latitude	60.0491666666667
Longitude	-128.905
Incident Date	5/9/1996
Lead Agency	
Other Agency	
Company(s)	
Amount	113
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Fuel Oil
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	fuel spilled on ground - no threat to surface water given small quanitity - possible ground water contamination - clean-up difficult - Band Manager contacted - will do clean-up



Photo 0299: 4962 Liard Fire Hall



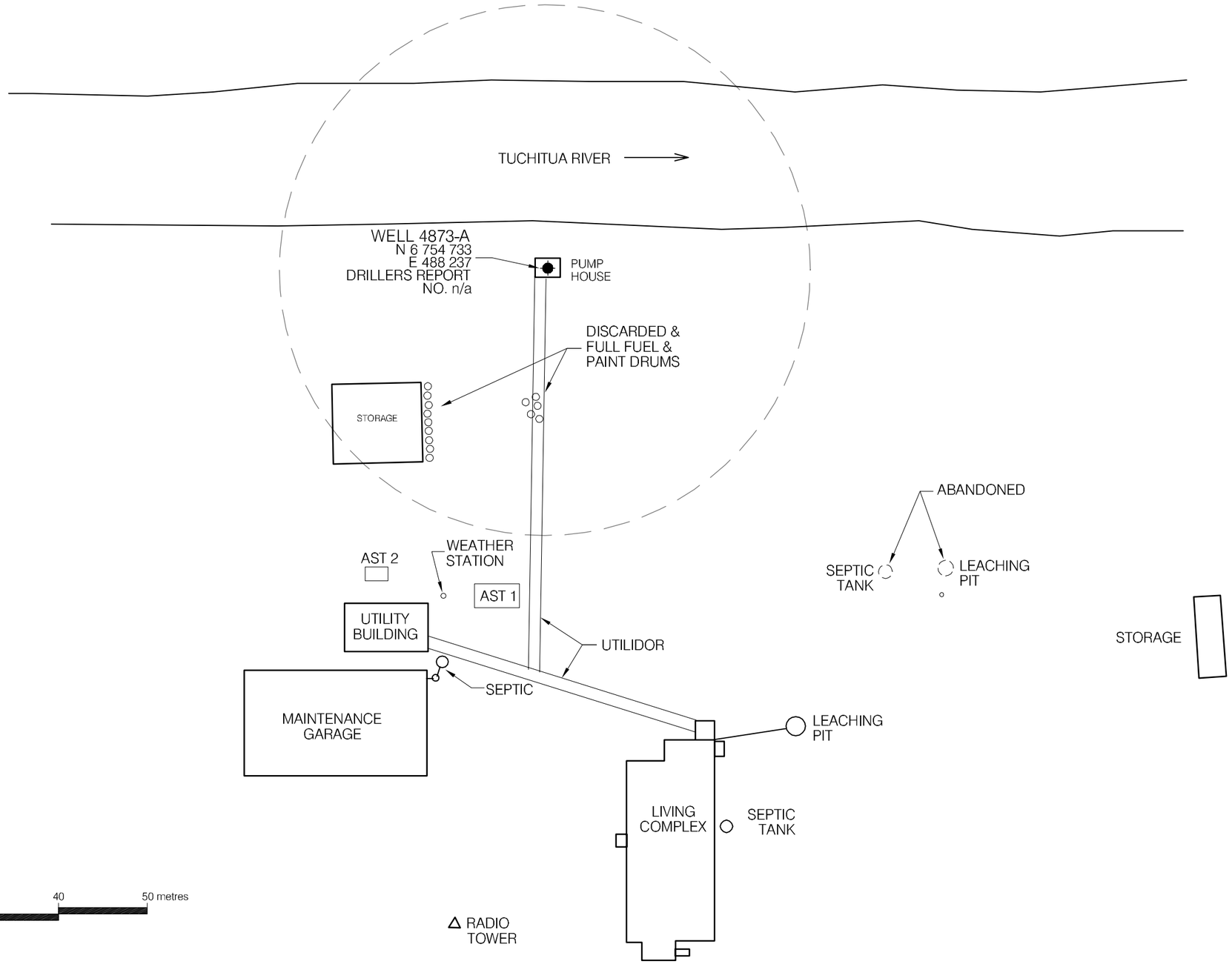
Photo 0300: 4962 Septic tank (front), propane tank and rear of fire hall (back)



Photo 0301: 4962 Wellhead (left) inside fire hall washroom



Photo 0026: 4962 Pressure tank



NOTES:

1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

TUCHITUA PUMPHOUSE
BUILDING # 4873
SITE LOCATION DIAGRAM
WELL ID: 4873-A

REVISION ISSUE: 0

FIGURE No.: 4873-A

Z:\020\Drawings\1260002 Water Assessment YTG\002 - Eastern Region\tuchitua\1260002 Tuchitua Pump House_4873.dwg, 7/27/2005 11:36:24 AM, Adobe PDF

LEGEND



PUMP



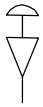
PRESSURE GAUGE



GATE VALVE



CHECK VALVE



SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



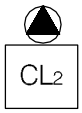
FLOW METER



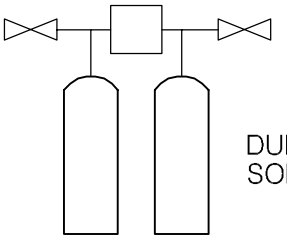
WATER FILTER
(CARTRIDGE TYPE)



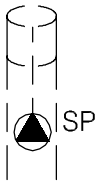
PRESSURE TANK



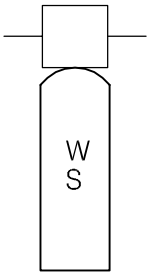
CHLORINE RESERVOIR AND
INJECTION PUMP



DUPLEX WATER
SOFTENER



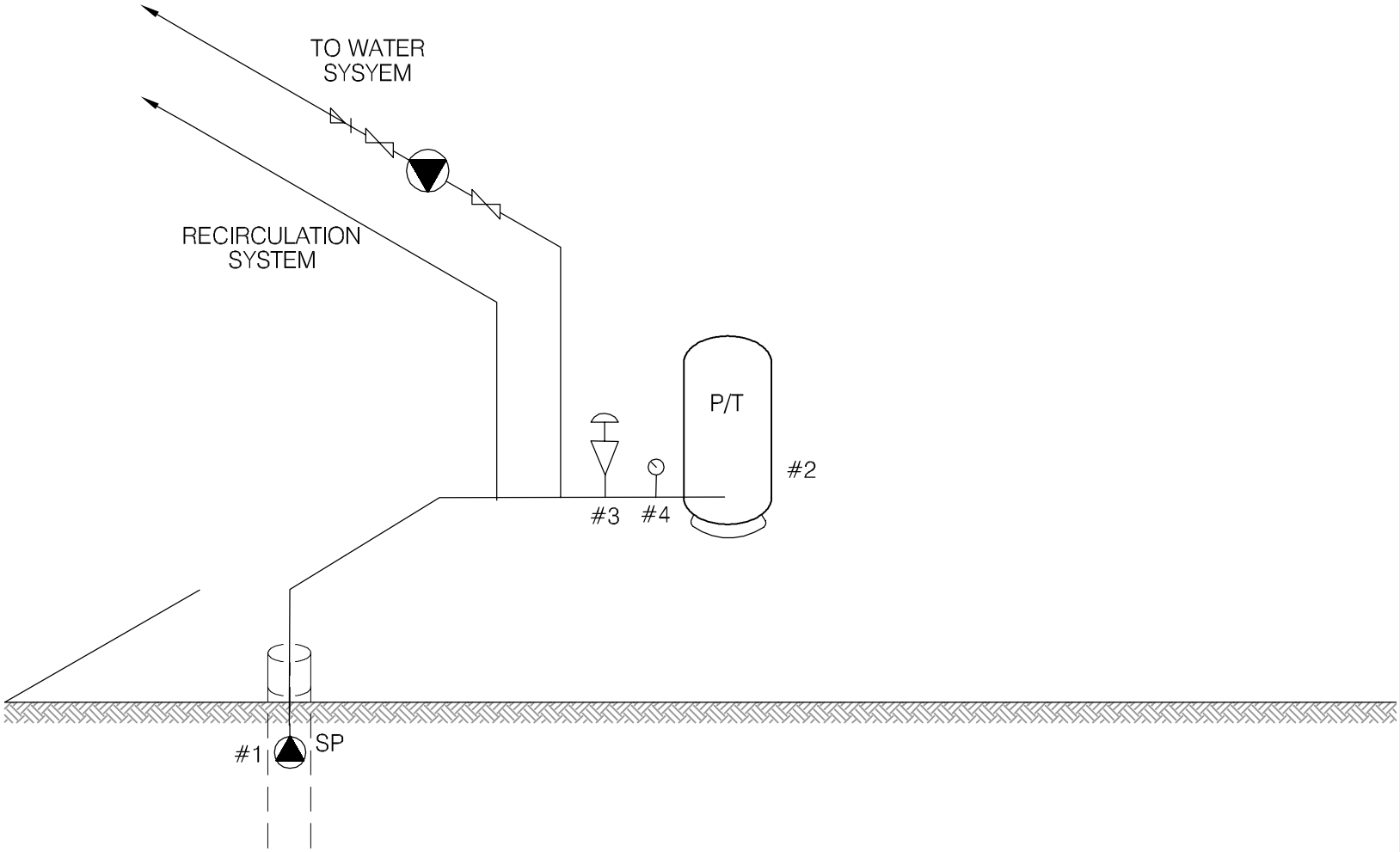
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

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SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIE$ & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 4873 TUCHITUA PUMPHOUSE	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE 4873-B

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Eastern Region – Tuchitua Pumphouse
Building # 4873

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB PUMP					4" - 1HP.
2	PRESSURE TANK	PLEXMA TANK	FG120			120 GALLON
3	PRESSURE SWITCH	SQ. D	9SG-2			5HP - 1/4" FIPT
4	PRESSURE GAUGE	MARSH	0-100			2 1/2" 1/4 FIPT
5	RECIRC PUM	ARMSTRONG.	N/A			
6						
7						
8						
9						
10						

TABLE 4873- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
4873	Tutchitua Pumphouse	8	Sept-04 to Mar-05	yes	1/8	no	Mar-05	no

Table 4873-2: Water Quality Results

SOURCE:	Building 4873 - Tutchitua Pumphouse		GCDWQ Criteria		
Location/ Resident	Campbell Highway				
Address	km 110.5 Campbell Highway				
Treatment	No				
Disinfection	No				
Source of Water	On-Site Well				
Purpose of Sampling	Baseline	Additional Sampling			
Sample Location		Kitchen Tap			
Date Sampled	13-Sep-04	23-Jun-05	**Lower**	**Upper Limit**	
Physical Tests *(ALS)*			**AO**	**MAC**	**AO**
Colour (CU)	<5				15
Total Dissolved Solids	199				500
Hardness CaCO3	197		AO >200 = poor, > 500 unacceptable[A]		
pH	8.10		6.5		8.5
Turbidity (NTU)	0.7			1	5
UV Absorbance		0.0200			
Dissolved Anions *(ALS)*					
Alkalinity-Total CaCO3	199				
Chloride Cl	1.3				250
Fluoride F	<0.05			1.5	
Sulphate SO4	5.16				500
Nitrate Nitrogen N	<0.1			10	
Nitrite Nitrogen N	<0.05			1	
Total Metals *(ALS)*					
Aluminum T-Al	<0.005				
Antimony T-Sb	<0.0002			0.006	
Arsenic T-As	0.0003			0.025	
Barium T-Ba	0.177			1	
Boron T-B	0.004			5	
Cadmium T-Cd	0.00003			0.005	
Chromium T-Cr	<0.0005			0.05	
Copper T-Cu	0.008			1	
Iron T-Fe	0.11				0.3
Lead T-Pb	0.0004			0.01	
Manganese T-Mn	<0.005				0.05
Sodium T-Na	2.0				200
Uranium T-U	0.0007			0.02	
Zinc T-Zn	0.188				5
Organic Parameters					
Tannin and Lignin		<0.10			
Total Organic Carbon C		1.82			
Field Chemistry (EBA)					
pH		8.17	6.5		8.5
TDS (ppm)		132			500
EC (uS/cm)		263			
Temperature (°C)		9.1			

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU)

Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

eba

Table 4873-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
4873	**Tuchitua Pumphouse**	**Campbell Highway**	6754733	488237	730

Well Details						
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Static Water Level Below Ground (m-btwc)**
150	1974	Yes	13.8	No, sand and gravel only	12.7 m	Approximately 2 m (pump was on at time of inspection)

Potential Contaminant Sources					
Distance from well to nearest point of septic field (m)	**Distance from well to nearest building (m)**	**Distance to surface water body (m)**	**AST present on property?**	**Distance from well to AST (m)**	**Other potential sources of contamination observed on property, and distance to well**
Approximately 80 m	Located inside pumphouse	4	AST 1	40	Fuel and paint drums between 15 m and 30 m from the well
			AST 2	50	

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
0.07 m above grade	None present	Perforated piping from 8.9 m to 10.4 m	No	No, but site is well drained	The well services the living complex, the maintenance garage, and the electric generating station. The bottom of the well is closed and the casing is perforated from 8.9 m to 10.4 m

EBA Engineering Consultants Ltd.
Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin Date June 23, 2005

WELL ID #	Owner	Location Description
4873	YTG	Tutchitua Pumphouse

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Campbell Hwy

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Km 110 Campbell Hwy

c. GPS location: N 6754733 E 488237 elv 730m ±9m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Grader Station, Electric Generating Station, Living Complex
☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify located inside pumphouse

h. Distance from well to building _____

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: >30m

k. Well location relative to field: ☒ upslope ☐ downslope ☐ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☐ Yes ☐ No
River + Discarded Fuel/Paint drums

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☒ Yes ☐ No
located inside lockable pumphouse

Entrance by animals? ☐ Yes ☒ No
Casing seal had been removed casing open - Access in building and in well possible

p. Is well site subject to flooding? ☒ Yes ☐ No
Nearby pressure tank is leaking (however, no signs directly around wellhead)

q. Is the well site well drained? ☒ Yes ☐ No

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: River ; Distance from well to Potential Source 1: 4 m
Potential Source 2: Fuel/Paint Drums; Distance from well to Potential Source 2: 15 m to 30m
Potential Source 3: AST 1 ; Distance from well to Potential Source 3: ~40 m
Potential Source 4: AST 2 ; Distance from well to Potential Source 4: ~50m

t. Are there other wells on this property? ☒ Yes ☐ No

How many? 1 ☐ in use ☒ abandoned ☐ require proper sealing
Abandonned / Filled dug well (likely)

2. Well and Wellhead information:

a. When was well installed? Year 1974 Month June

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☒ Yes ☐ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☐ unlikely

e. Surface casing: ☐ Yes Diameter _____ ☒ No

f. Well casing: Diameter 15cm Material: ☐ steel ☐ plastic ☐ concrete

g. Depth of well: ~2,690m ☒ measured (if possible) ☐ reported ☒ from log 45ft

h. Static water level below ground: ~2m (pump on)

☒ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☐ unknown other perforated piping - bottom is closed

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length 5 ft slot size(s) perforated piping
Location of screen: from 29 ft to 34 ft from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No

m. Is the well head: ☒ in pumphouse ☐ in pit ☐ pitless adaptor ☐ in a building

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail 7 cm above grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No
But nearby pressure tank is leaking

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No but likely in pumphouse walls

iv. Any evidence of rodents? Specify Yes – well casing is open

v. Does the well casing have a proper seal cap? ☐ Yes ☒ No

If no, describe condition has been removed – well is open

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☐ Yes ☒ No

Explain (filtration, disinfection etc…)_____

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☒ electric submersible ☐ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☒ plastic

g. Pump delivers water to: ☒ pressure tank ☐ elevated tank ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☒ No

j. Is there a water meter on the system? ☐ Yes ☒ No

k. Is the pump and piping protected from freezing? ☐ Yes ☐ No

If yes, describe: Inside heated, insulated building

l. Comments on pump installation: _____

_____

6. Conclusions

a. Comments on overall installation:

_____

_____

_____

_____

_____

_____

_____

b.Recommendations: _____

_____

_____

_____

_____

_____

_____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JUNE 23/05

WELL ID #	Owner	Location Description
4873	YTG.	TUCHITUA PUMPHOUSE.

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☑ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☑ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☑ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. **Water Quality (observations):**

a. Does the water stain plumbing? ☐ yes ☐ No ☑ slight ☐ severe

Type of stain: ☐ brown ☑ red ☐ black

b. Does the water contain sediment? ☐ Yes ☑ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☑ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No ?

f. Is there a chemical analysis? ☐ Yes ☐ No ☐ adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☑ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☑ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☑ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☑ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes No Details:

Where is it located?
Comments: _____

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES NO
Comments:_____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES NO

Comments: _____

Are there other heat sources near the tank? YES NO
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO
Comments: _____

Overall Tank

What are the tank size and dimensions?

_____

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments: _____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

INSTALLATION IS OLD - PRESSURE TANK HAS NO BLADDER - IS SUBJECT TO WATER LOGGING. WELL HEAD IS WIDE OPEN NO WELL SEAL.

b. Recommendations:

INSTALL TREATMENT SYSTEM AS PER ANALYSIS. INSTALL UV SYSTEM. SUPERCHLORINATE THE WELL & PIPING SYSTEM.

MIDNIGHT SUN DRILLING CO. LTD.
PH: 668-2434
WHITEHORSE Y.T.
P.O. Box 4391

FIELD REPORT

Started. JUNE 18.19.74
Completed. JUNE 19.19.74

NAME AND ADDRESS OF CLIENT	DESCRIPTION OF WORK	LOCATION OF WORK
YUKON TERR.	WATER WELL	MILE 69
GOVERMENT		CAMPBELL HWY
ATT. A.K CHRISTENSON		TUTHITUWA MAINTENANCE CAMP

FORMATION LOG

FROM	TO	FORMATION
0'	14'	SAND, GR. COBBLES
14'	29'	SAND GRAVEL
29'	45'	SAND

DESCRIPTION OF WORK

MOVE FROM WATSON LAKE

TIME

DATE	FROM	TO	HOURS
JUNE 18/74	08:00	22:00	14.0
19/74	08:30	14:00	5.5

Record of Casing & Pipe

Size	Type	Size	Type
5"	.258		
Feet	Inch	Feet	Inch
45'	0"		

Remarks:

BOTTOM CLOSED
PERFORATED FROM 29'-34'

STATIC LEVEL		Total Rig Time	19.5 hrs.
Ground level	6.5	Total Standby	— hrs.
Top of casing	7.0	Drilling Mud	8 sacks

SIGNATURES

MIDNIGHT SUN.....
TITLE..LES JORGENSON - DRILLER

CLIENT.....
TITLE.....

TUTHITUA

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	7701
Jurisdiction	Yukon
Community	
Address	
Highway	Robert Campbell Highway
Milepost	M 69
Feature	Tuchitua River
Location and Cause	Waterouse (Tuchitua) Maintenance Camp - frost cracked drain pipe of fuel storage tank
Latitude	60.932539
Longitude	-129.231391
Incident Date	4/4/1977 4:12:00 AM
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	Yukon Territorial Government - other
Company(s)	YTG
Amount	7560
Units	Litres
Quantity	Estimate
Release Description	Leaked
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Diesel
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	oil soaked snow moved to gravel pit some distance from camp - cleaned-up - little chance of contamination



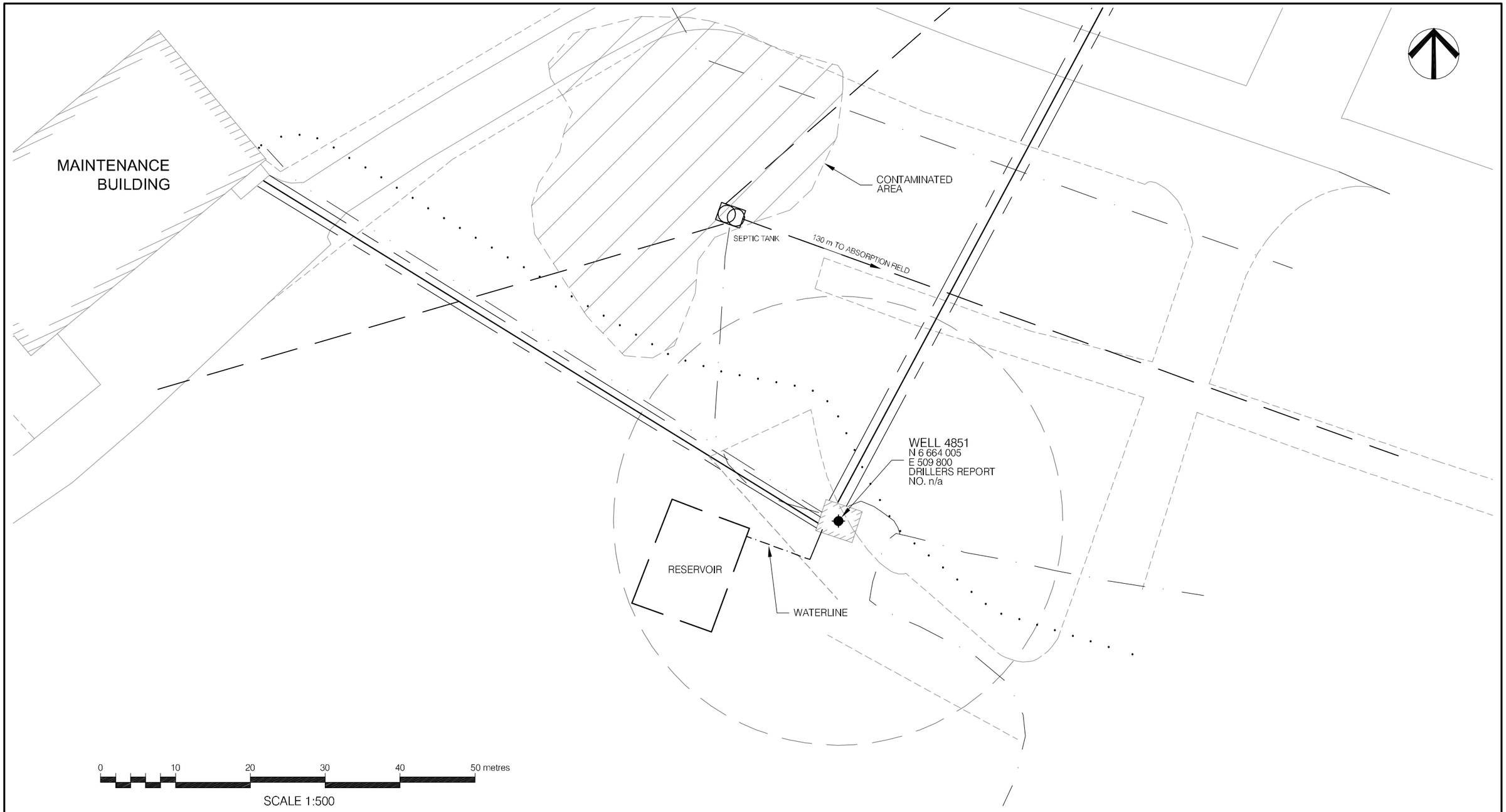
Photo 0053: 4873 Wellhead



Photo 0055: 4873 Leak in piping from pressure tank



Photo 0054: 4873 Pressure tank



NOTES:

1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon Highways and Public Works Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

WATSON LAKE AIRPORT MAIN PUMPHOUSE BUILDING # 4851 SITE LOCATION DIAGRAM WELL ID: 4851-A

REVISION ISSUE: 0

FIGURE No.: 4851-A

LEGEND



PUMP



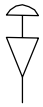
PRESSURE GAUGE



GATE VALVE



CHECK VALVE



SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



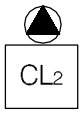
FLOW METER



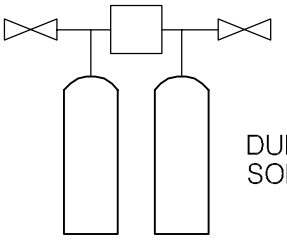
WATER FILTER
(CARTRIDGE TYPE)



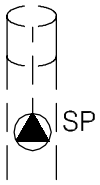
PRESSURE TANK



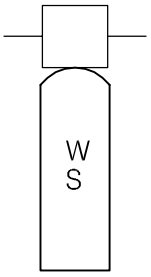
CHLORINE RESERVOIR AND
INJECTION PUMP



DUPLEX WATER
SOFTENER



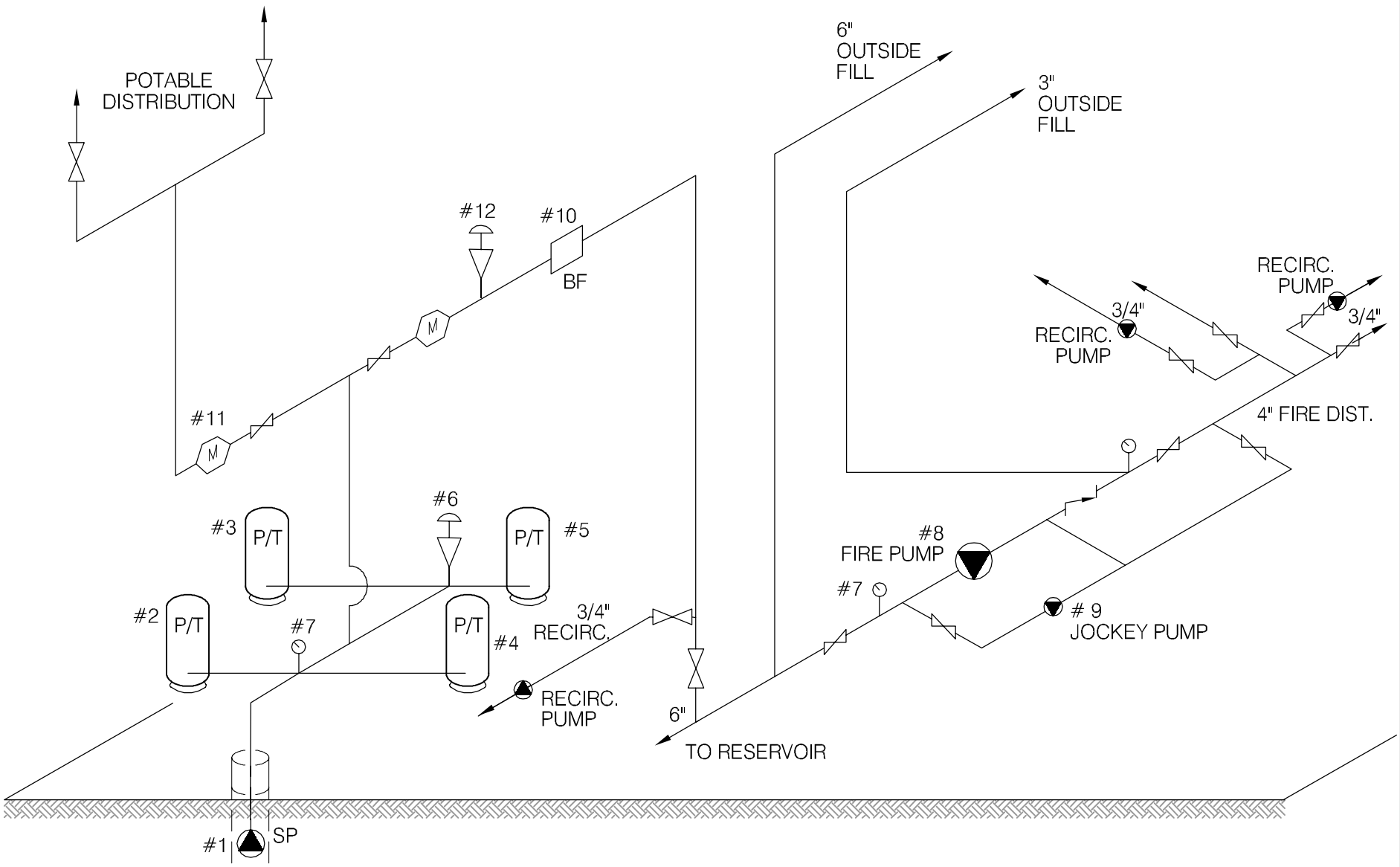
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\1260002003 Eastern Schematic_LEGEND.dwg, 4/11/2006 10:31:08 AM, Adobe PDF, jbuyck



SCHEMATIC PRODUCED BY BERT ALBI$SER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 4851 WATSON LAKE AIRPORT PUMP HOUSE	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE 4851-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\Schematics\1260002 Airport Pump House_4851 Schematic.dwg, 7/21/2005 1:50:46 PM, Adobe PDF

Eastern Region – Airport Pumphouse
Building # 4851

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB. PUMP	MYERS	CB5573		795	5HP.
2	PRESSURE TANK 1	FLEXCON	WR360R		02-21-98	
3	PRESSURE TANK 2	FLEX CON	WR360R		04-17 98	
4	PRESSURE TANK 3	FLEX CON	WR360R		04-17-98	
5	PRESSURE TANK 4	FLEX CON	WR360R		04 17 98R	
6	PRESSURE SWITCH	SQ. D	FSG-2			1/4 FIPT
7	PRESSURE GAUGE	WEKSLER	0-100			4 1/2" FACE
8	FIRE PUMP	ARMSTRONG.	43MF		C-9056	3x3x8
9	JOCKEY PUMP	WEBTROL	ES B/2-3PHN			1" x 1"
10	BACKFLOW DEVICE	WATTS	2" 007 DCA.			2"
11	WATER METER	NEPTUNE	2" HP DIRECT READ			
12	SOLENOID VALVE	ASCO	2" SOLENOID VALVE			

TABLE 4851- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
4851	Airport Pumphouse	7	Sept-04 to Mar-05	no	0/7 *	no	8-Mar-05	no

* Three out of seven samples were rejected due to high turbidity

eba

Table 4851-2: Water Quality Results

SOURCE:	Building 4851 Airport Pumphouse			GCDWQ Criteria		
Location/ Resident	Watson Lake					
Address						
Treatment	No					
Disinfection	No					
Source of Water	On-Site Well					
Purpose of Sampling	Baseline	Additional Sampling	Baseline			
Sample Location		Washroom				
Date Sampled	13-Sep-04	20-Jun-05	22-Jun-05	**Limit**	**Upper Limit**	
Physical Tests *(ALS)*				**AO**	**MAC**	**AO**
Colour (CU)	**>60**		<5			15
Conductivity (uS/cm)			228			
Total Dissolved Solids	124		133			500
Hardness CaCO3	112		114	AO >200 = poor, > 500 unacceptable[A]		
pH	7.39		7.41	6.5		8.5
Turbidity (NTU)	**142**	**23.4**	**30.8**		1	5
UV Absorbance		0.031				
% Transmittance						
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	126		141			
Chloride Cl	1.0		0.60			250
Fluoride F	<0.05		<0.040		1.5	
Silicate SiO4						
Sulphate SO4	3.25		3.39			500
Nitrate Nitrogen N	0.2		<0.10		10	
Nitrite Nitrogen N	<0.05		<0.10		1	
Ammonia Nitrogen N						
Total Phosphate PO4						
Total Metals *(ALS)*						
Aluminum T-Al	<0.005		<0.010			
Antimony T-Sb	<0.0002		<0.0005		0.006	
Arsenic T-As	0.0017		0.00142		0.025	
Barium T-Ba	0.378		0.328		1	
Boron T-B	0.009		<0.10		5	
Cadmium T-Cd	0.00007		<0.0002		0.005	
Calcium T-Ca			35.4			
Chromium T-Cr	<0.0005		<0.0020		0.05	
Copper T-Cu	0.002		0.0037		1	
Iron T-Fe	**1.28**	**3.01**	**3.14**			0.3
Lead T-Pb	0.0047		0.00016		0.01	
Magnesium T-Mg			6.14			
Manganese T-Mn	**1.84**	**2.69**	**2.26**			0.05
Mercury T-Hg			<0.0002		0.001	
Potassium T-K			0.84			
Selenium T-Se			<0.0010		0.01	
Sodium T-Na	2.5		2.6			200
Uranium T-U	<0.0005		<0.00010		0.02	
Vanadium T-V						
Zinc T-Zn	0.15		<0.050			5
Dissolved Metals *(ALS)*						
Aluminum D-Al					0.1	
Antimony D-Sb					0.006	
Arsenic D-As					0.025	
Barium D-Ba					1.0	
Boron D-B					5	
Cadmium D-Cd					0.005	
Calcium D-Ca						
Chromium D-Cr					0.05	
Copper D-Cu						1.0
Iron D-Fe		**1.25**				0.3
Lead D-Pb					0.01	
Magnesium D-Mg						
Manganese D-Mn		**2.65**				0.05
Mercury D-Hg					0.001	
Potasium D-K						
Selenium D-Se					0.01	
Sodium D-Na						200
Uranium D-U					0.02	
Vanadium D-V						
Zinc D-Zn						5.0
Trihalomethanes						
Bromodichloromethane						
Bromoform						
Chloroform						
Dibromochloromethane						
Total Trihalomethanes					0.1	
Organic Parameters						
Tannin and Lignin		0.38				
Total Organic Carbon C		1.62				
Haloacetic Acids						
Bromoacetic Acid						
Bromochloroacetic Acid						
Chloroacetic Acid						
Dibromoacetic Acid						
Dichloroacetic Acid						
Trichloroacetic Acid (TCA)						
Polycyclic Aromatic Hydrocarbons						
Acenaphthene		<0.000050				
Acenaphthylene		<0.000050				
Acridine		<0.000050				
Anthracene		<0.000050				
Benz(a)anthracene		<0.000050				
Benzo(a)pyrene		<0.000010			0.00001	
Benzo(b)fluoranthene		<0.000050				
Benzo(g,h,i)perylene		<0.000050				
Benzo(k)fluoranthene		<0.000050				
Chrysene		<0.000050				
Dibenz(a,h)anthracene		<0.000050				
Fluoranthene		<0.000050				
Fluorene		<0.000050				
Indeno(1,2,3-c,d)pyrene		<0.000050				
Naphthalene		<0.000050				
Phenanthrene		<0.000050				
Pyrene		<0.000050				
Quinoline		<0.000050				
Extractable Hydrocarbons						
EPH10-19		<0.30				
EPH19-32		<1.0				
LEPH		<0.30				
HEPH		<1.0				
Field Chemistry (EBA)						
pH		7.48				8.5
TDS (ppm)		118				500
EC (uS/cm)		235				
Temperature (°C)		10.6				
Free Available Chlorine						

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU)

Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

Table 4851-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
4851	**Watson Lake Airport Pumphouse**	**Watson Lake Airport**	6664005	509800	690

Well Details							
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Well Capacity - Tested, or Reported by User**	**Static Water Level Below Ground (m-btwc)**
200	1991	Yes	33.4	Silt from 17.8 m to 21.2 m		150 gpm	5.4 m below grade at time of drilling

Potential Contaminant Sources					
Distance from well to nearest point of septic field (m)	**Distance from well to nearest building (m)**	**Distance to surface water body (m)**	**AST present on property?**	**Distance from well to AST (m)**	**Other potential sources of contamination observed on property, and distance to well**
130 (35 to tank and 20 to sewage line)	Located inside basement of pumphouse	Approximately 175 m to Watson Lake	AST	Greater than 80 m	Contaminated site starting at 5 m from the well

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
2.75 m below grade	Split seal gasket cap	80 slot from 29.8 m to 31.3 m and 100 slot from 31.3 m to 32.8 m	Unlikely	Yes	The well services the airport terminal as well as the airport maintenance garage.

EBA Engineering Consultants Ltd.
Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date June 20, 2005

WELL ID #	Owner	Location Description
4851	YTG	Watson Lake Airport Pumphouse

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Watson Lake

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Watson Lake Airport

c. GPS location: N 6664005 E 509800 690m ±10m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☐ Yes ☒ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Maintenance Garage + Terminal building

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Pumphouse

h. Distance from well to building located inside basement

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: 130 m, 35m to tank, 20m to sewage line

k. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral
likely upgradient

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☐ Yes ☐ No

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☒ Yes ☐ No locked pumphouse
Entrance by animals? ☒ Yes ☐ No No signs - Access possible but unlikely

p. Is well site subject to flooding? ☐ Yes ☒ No

q. Is the well site well drained? ☒ Yes ☐ No Apron Grading around building

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unknown, but would be >80m

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

s. Are there any other known contaminant sources on the property?

☒ Yes ☐ No Describe Hydrocarbon contaminated site @ 5m and greater from well Monitoring wells in place.

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: Terminal A57 ; Distance from well to Potential Source 1: >80m
Potential Source 2: Watson Lake ; Distance from well to Potential Source 2: >80m
Potential Source 3: Contaminated Site ; Distance from well to Potential Source 3: 5m and greater
Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

t. Are there other wells on this property? ☒ Yes ☐ No

How many? _____ ☐ in use ☐ abandoned ☐ require proper sealing
Monitoring wells for contaminated site

2. Well and Wellhead information:

a. When was well installed? Year 1991 Month June

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☒ Yes ☐ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☒ unknown ☐ unlikely

e. Surface casing: ☐ Yes Diameter _____ ☒ No

f. Well casing: Diameter 20 cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: 109 ft ☐ measured (if possible) ☐ reported ☒ from log

h. Static water level below ground: 17.5 ft at time of drilling

☐ measured (if possible) ☐ reported ☒ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☒ with a well screen

☐ with slotted pipe ☐ unknown other _____

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic N/A

k. If there is a well screen: length 5ft, 5ft slot size(s) 80 slot, 100 slot
Location of screen: from 97ft to 102ft ~~to~~ 102ft to 107ft (from log) reported

l. Is there a sump below the screen? ☒ Yes ☐ No
Sump in the building to prevent flooding

m. Is the well head: ☒ in pumphouse ☐ in pit ☐ pitless adaptor ☒ in a building
basement of pumphouse

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail 2.75 m below apron grading

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☒ Yes ☐ No
Minor - some leakage from pipes above

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No

iv. Any evidence of rodents? Specify No

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition split gasket cap

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☐ Yes ☒ No

Explain (filtration, disinfection etc…)

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No
unlikely

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☒ electric submersible ☐ jet

☐ shallow well centrifugal ☐ other,

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☒ steel ☐ plastic
likely

g. Pump delivers water to: ☒ pressure tank ☐ elevated tank ☒ other
water resevoir for fire use

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☒ Yes ☐ No
Near floor

j. Is there a water meter on the system? ☒ Yes ☐ No

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Inside heated building

l. Comments on pump installation: _____

_____

6. Conclusions

a. Comments on overall installation:

_____

_____

_____

_____

_____

_____

_____

b.Recommendations: _____

_____

_____

_____

_____

_____

_____

_____

PART B: EBA Site Inspection

Inspector: BERT ALBASSER Date JUNE 20/05

WELL ID #	Owner	Location Description
4851	YTG.	WATSON LAKE AIRPORT PUMPHOUSE

6. Water Treatment

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☑ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. Water Quality (observations):

a. Does the water stain plumbing? ☐ yes ☐ No ☐ slight ☐ severe

Type of stain: ☐ brown ☐ red ☐ black

b. Does the water contain sediment? ☐ Yes ☐ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☐ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐Yes ☐No ☐brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No

f. Is there a chemical analysis? ☐ Yes ☐ No ☐adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☐ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☐ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☐ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☐ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes No Details: PRESSURE TANKS 4x WR360R

Where is it located?
Comments: LOWER LEVEL – PUMPHOUSE

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
(YES) NO
Comments: _____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES (NO)
Comments: _____

Are there other heat sources near the tank? YES (NO)
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? (YES) NO
Comments: _____

Overall Tank

What are the tank size and dimensions?

WR360R.

What material is the tank constructed of? STEEL POLYBUT BLADDER

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments: _____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

THIS IS A PROFESSIONAL INSTALLATION. THERE IS NO TREATMENT AT THE SOURCE A SILENT CHECK VALVE SHOULD BE INSTALLED TO PREVENT WATER HAMMER OBSERVED DURING INSPECTION

b. Recommendations:

INSTALL SILENT CHECK ON SUB. PUMP DISCHARGE. INSTALL CHLORINATION SYSTEM ON POTABLE WATER SUPPLY. SYSTEM MUST BE PROPORTIONAL FEED FOR PROPER RESIDUAL CONTROL. INSTITUTE CHLORINE RESIDUAL TESTING AT REGULAR INTERVALS.

Field Report

MIDNIGHT SUN DRILLING CO. LTD. WHITEHORSE Y.T.
PH. 633-3070 TELEX 036-8496
P.O. BOX 4391
WHITEHORSE, YUKON

Started June 13 19 91.

Completed June 18 19 91.

NAME AND ADDRESS OF CLIENT	DESCRIPTION OF WORK	LOCATION OF WORK
UMA	~~water well~~ 8" 91-10-10	B.C.T. Wit. Lk.

FORMATION LOG FROM	TO	FORMATION
0	29	Gr.
29	51	Gr.
51	58	Fine
58	69	silt
69	108	sand
108	109	fine

DESCRIPTION OF WORK	DATE	TIME FROM	TO	HOURS
MOVE				
Move set up	June 13	6:30	[illegible]	[illegible]
Sand	June 14	7:00	2:00	7
Sand some silt				
Sand silt				
Gr.				
Sand Gr sand.				
Travel to Whse	June 14	2:30	8:30	6.
Loading	June 15	9:00	12:00	3
Travel to Watson	June 17	6:00	12:00	6
set screens	"	1:00	4:00	3
Develop	"	4:00	8:00	4
Develop	June 18	7:30	5:30	10
Move off.	"	5:30	6:30	1

Casing & Pipe Size	Type	Size	Type
Feet	Inch	Feet	Inch
17'	6		

Remarks: 150 GPM
1-odex shoe
1-80 slot
1-100 slot
2" riser pipe.
K Packer
5 7/8" bit pin
107' screen bottom

Static Level		Total Rig Time	hrs.
Ground Level	17' 6"	Total Standby	hrs.
Top Of Casing		Drilling Mud	sacks

SIGNATURES

MIDNIGHT SUN..... CLIENT.....

TITLE..... TITLE.....

ow Printers

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	8519
Jurisdiction	Yukon
Community	Watson Lake
Address	
Highway	
Milepost	
Feature	Watson Lake
Location and Cause	Airport - hose burst at coupling while refueling
Latitude	60.1166666666667
Longitude	-128.833055555556
Incident Date	5/6/1985 3:27:00 PM
Lead Agency	
Other Agency	
Company(s)	Yukon Aviation
Amount	15
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Aviation Fuel (Jet A Or B)
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	happened on tarmac - absorbant laid down and later picked up

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9107
Jurisdiction	Yukon
Community	Watson Lake
Address	
Highway	
Milepost	
Feature	Watson Lake
Location and Cause	Airport - Fire Training Area - contents of storage tank leaked - valve not properly closed due to ice in fuel
Latitude	60.118888
Longitude	-128.828042
Incident Date	4/1/1991 8:00:00 AM
Lead Agency	Transport Canada
Other Agency	Environment Canada - Environmental Protection Service
Company(s)	Transport Canada
Amount	6800
Units	Litres
Quantity	Actual
Release Description	Leaked
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Gasoline
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	test pits excavated - plume determined - contaminated water pumped out - evaporation and sorbents used to clean - monitoring well dug



Photo 0255: 4851 Watson Lake Airport Pumphouse (right), airport terminal building (back), contaminated site (centre right)



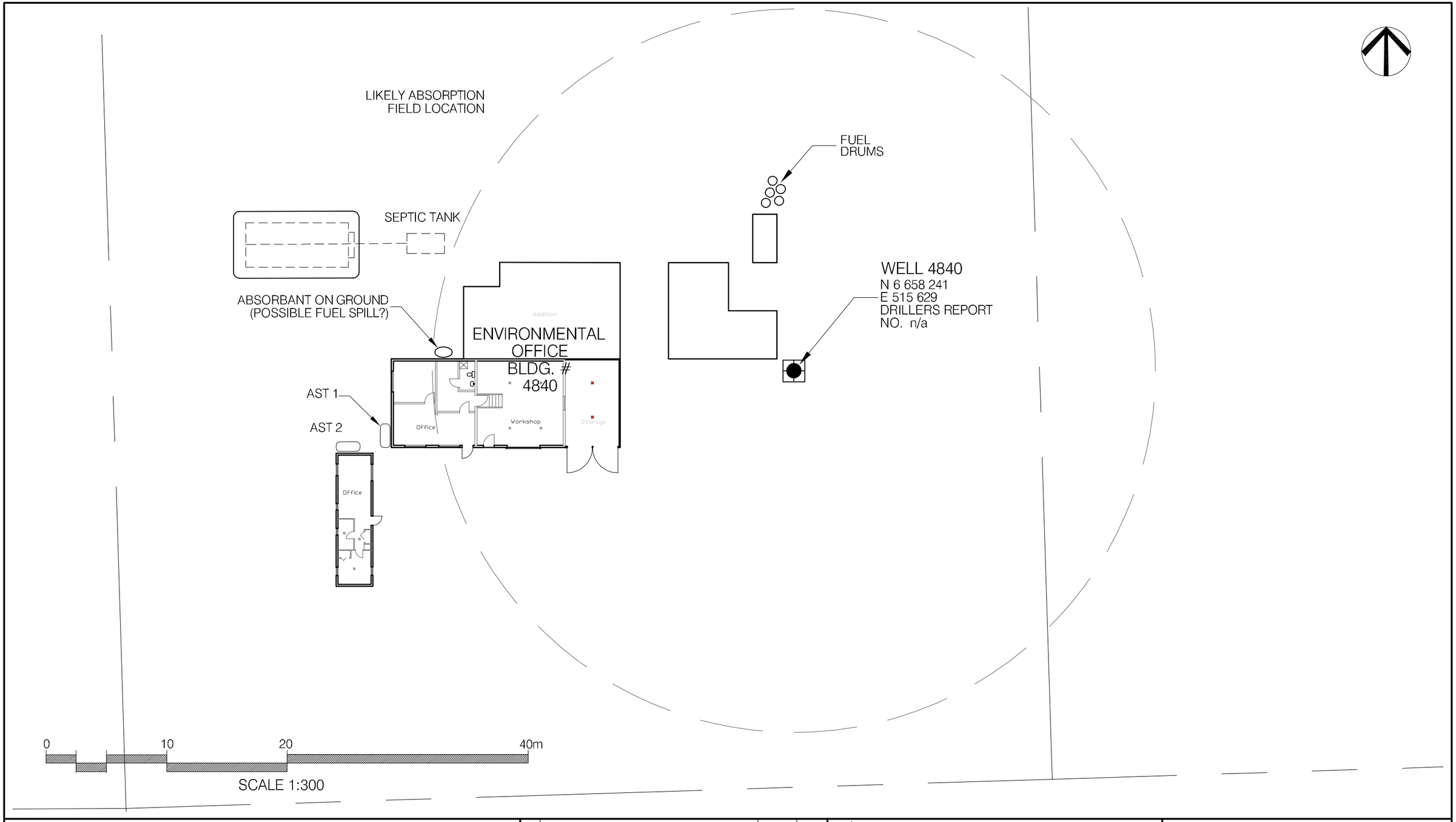
Photo 0250: 4851 Wellhead in pumphouse basement (centre) and pressure tanks (back)



Photo 0251: 4851 Fire pump (right) and pumphouse sump (left)



Photo 0254: 4851 Underground water reservoir for fire fighting



NOTES:

1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.
2. LOCATION OF BUILDINGS AND STRUCTURES ARE APPROXIMATE ONLY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

WATSON LAKE ENVIRONMENTAL
BUILDING # 4840
SITE LOCATION DIAGRAM
WELL ID: 4840-A

REVISION ISSUE: 0

FIGURE No.: 4840-A

LEGEND



PUMP



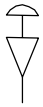
PRESSURE GAUGE



GATE VALVE



CHECK VALVE



SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



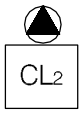
FLOW METER



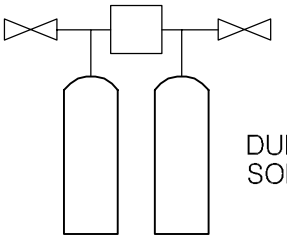
WATER FILTER
(CARTRIDGE TYPE)



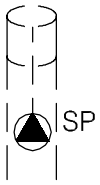
PRESSURE TANK



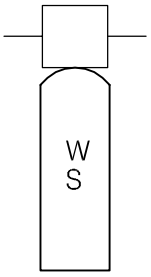
CHLORINE RESERVOIR AND
INJECTION PUMP



DUPLEX WATER
SOFTENER



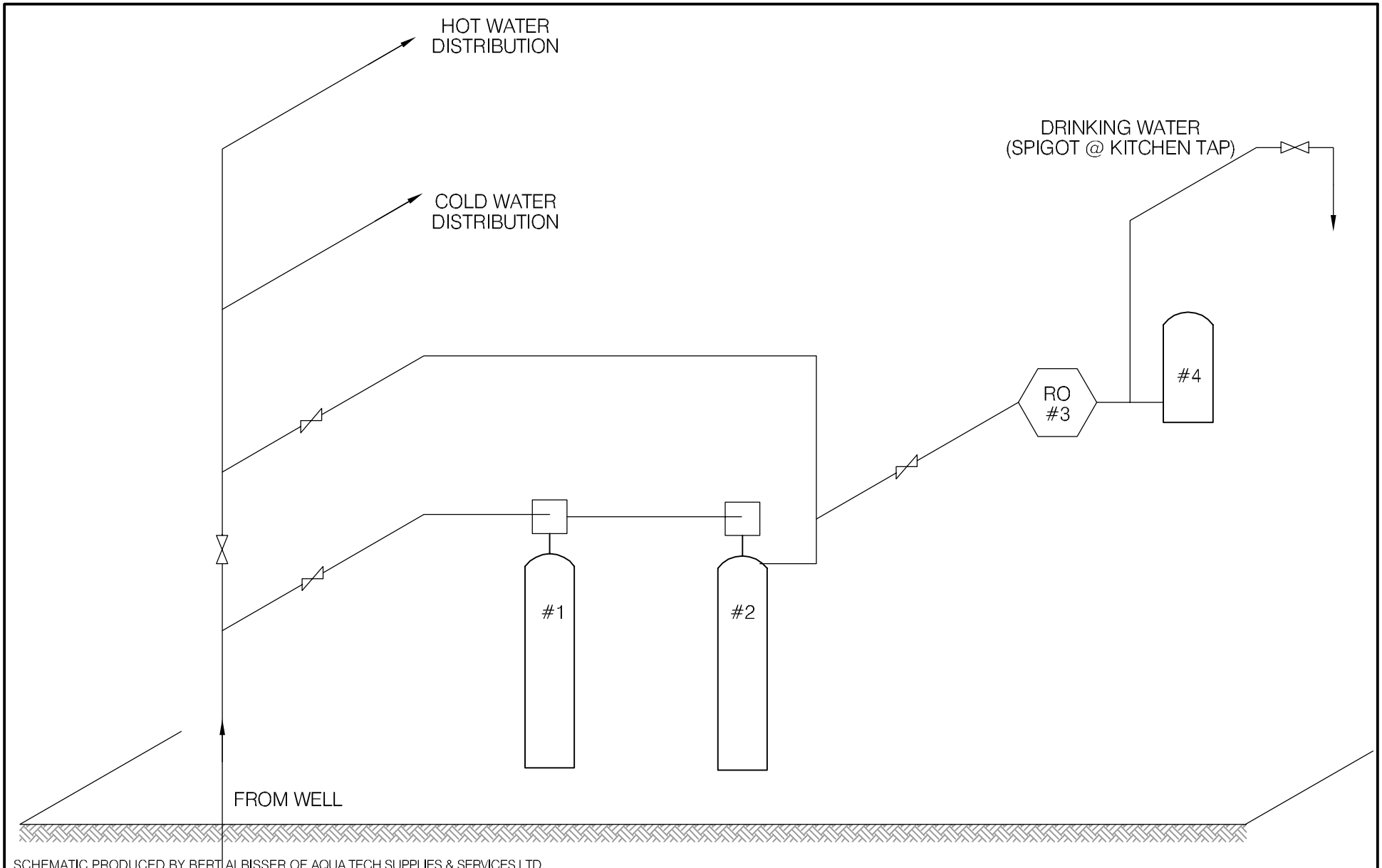
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\1260002003 Eastern Schematic_LEGEND.dwg, 4/11/2006 10:31:08 AM, Adobe PDF, jbuyck



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.

PROJECT: SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

TITLE: WATER SYSTEM DISTRIBUTION/TREATMENT
SCHEMATIC SYSTEM ID.: 4840
WATSON LAKE ENVIRONMENTAL OFFICE

DATE	JULY 2005	DWN.	JSB	CHKD.	RMM	FILE NO.	1260002.002	DWG.:	FIGURE 4840-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\Schematics\1260002 Environmental Office_4840 Schematic.dwg, 7/21/2005 10:42:43 AM, Adobe PDF

Eastern Region – Environmental Office
Building # 4840

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	~~5MM~~ MM FILTER	PETWA.	02-150132		25240	10"x54"
2	SOFTENER	PETWA.	01-150132		25239	10"x54"
3	REVERSE OSMOSIS	PETWA.	?			
4	R.O. TANK	WELMATE	0075		02505738.	75L
5						
6						
7						
8						
9						
10						

TABLE 4840- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
4840	Environmental Office	7	Sept-04 to Mar-05	no	0/7	no	9-Mar-05	no

Table 4840-2: Water Quality Results

SOURCE:	Building 4840 - Environmental Office			GCDWQ Criteria		
Location/ Resident	Watson Lake					
Address						
Treatment		Sediment Filter, Water Softener	Reverse Osmosis			
Disinfection	No					
Source of Water	On-Site Well					
Purpose of Sampling	Baseline	Additional Sampling	Additional Sampling			
Sample Location		Kitchen Tap	Tap			
Date Sampled	13-Sep-04	21-Jun-05	21-Jun-05	Lower	Upper Limit	
Physical Tests *(ALS)*				**AO**	**MAC**	**AO**
Colour (CU)	**>60**	<5.0	<5.0			15
Conductivity (uS/cm)		439	132			
Total Dissolved Solids	242	342	76			500
Hardness CaCO3	228	212	34.4	AO >200 = poor, > 500 unacceptable[A]		
pH	8.03	8.00	7.13	6.5		8.5
Turbidity (NTU)	**16.7**	0.44	0.18		1	5
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	168	157	47.8			
Chloride Cl	48.9	49.8	19.4			250
Fluoride F	0.06	0.056	<0.020		1.5	
Sulphate SO4	5.69	5.27	0.65			500
Nitrate Nitrogen N	<0.1	<0.10	<0.10		10	
Nitrite Nitrogen N	<0.05	<0.10	<0.10		1	
Ammonia Nitrogen N		0.022				
Total Metals *(ALS)*						
Aluminum T-Al	<0.005	<0.010	<0.010			
Antimony T-Sb	<0.0002	<0.00050	0.00119		0.006	
Arsenic T-As	<0.0002	0.00025	0.0005		0.025	
Barium T-Ba	0.355	0.299	0.052		1	
Boron T-B	0.006	<0.10	<0.10		5	
Cadmium T-Cd	<0.00001	<0.00020	<0.00020		0.005	
Calcium T-Ca		64.6	9.17			
Chromium T-Cr	0.0006	<0.0020	<0.0020		0.05	
Copper T-Cu	0.002	0.0014	0.0018		1	
Iron T-Fe	**1.82**	<0.030	<0.030			0.3
Lead T-Pb	0.0018	<0.0010	<0.0010		0.01	
Magnesium T-Mg		12.4	2.78			
Manganese T-Mn	**0.303**	**0.262**	0.0125			0.05
Mercury T-Hg		<0.00020	<0.00020		0.001	
Potassium T-K		1.33	1.12			
Selenium T-Se		<0.0010	<0.0010		0.01	
Sodium T-Na	2.7	2.6	15			200
Uranium T-U	<0.0005	0.00045	<0.00010		0.02	
Zinc T-Zn	0.328	0.11	<0.050			5
Dissolved Metals *(ALS)*						
Aluminum D-Al		<0.010			0.1	
Antimony D-Sb		<0.00050			0.006	
Arsenic D-As		0.0003			0.025	
Barium D-Ba		0.306			1.0	
Boron D-B		<0.10			5	
Cadmium D-Cd		<0.00020			0.005	
Calcium D-Ca		64.3				
Chromium D-Cr		<0.0020			0.05	
Copper D-Cu		0.0016				1.0
Iron D-Fe		<0.030				0.3
Lead D-Pb		<0.0010			0.01	
Magnesium D-Mg		12.5				
Manganese D-Mn		**0.263**				0.05
Mercury D-Hg		<0.00020			0.001	
Potasium D-K		1.24				
Selenium D-Se		<0.0010			0.01	
Sodium D-Na		2.7				200
Uranium D-U		0.00044			0.02	
Zinc D-Zn		0.104				5.0
Organic Parameters						
Total Organic Carbon C		<0.50				
Field Chemistry (EBA)						
pH		7.71	7.89	6.5		8.5
TDS (ppm)		217	86			500
EC (uS/cm)		431	171			
Temperature (°C)		21.4	16.1			

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU), Conductivity (umhos/cm),Temperature (oC) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

eba

Table 4840-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
4840	**Watson Lake Environmental Office**	**Watson Lake**	6658241	515629	712

Well Details							
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Well Capacity - Tested, or Reported by User**	**Static Water Level Below Ground (m-btwc)**
150		No	44.8				

Potential Contaminant Sources					
Distance from well to nearest point of septic field (m)	**Distance from well to nearest building (m)**	**Distance to surface water body (m)**	**AST present on property?**	**Distance from well to AST (m)**	**Other potential sources of contamination observed on property, and distance to well**
32	2	Greater than 60 m	AST 1	35	Hydrocarbon spill area at 30 m
			AST 2	40	Fuel Drums at 13 m

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
0.23 m above grade	Split seal gasket cap		Unlikely	Yes	The well is likely downgradient from a barite plant area and sewage lagoon.

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SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date June 21

WELL ID #	Owner	Location Description
4940	YTG	Watson Lake Environmental office

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Watson Lake

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Centenial Avenue

c. GPS location: N 6658241 E 515629 elv 712m ± 7m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No
unlikely accessable to public

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many
3 (or 2) buildings in environmental office complex

☐ 5 or more delivery sites on a trucked distribution system? If so how many

g. Nearest building, specify Environmental office storage building

h. Distance from well to building ~2m

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No
N 6658252
E 515597

j. Distance from well to nearest point of known field: ~32m

k. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☐ Yes ☐ No
Sewage lines likely begin @ 30m approximately

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☐ Yes ☒ No unlocked wooden enclosure
Entrance by animals? ☐ Yes ☒ No Access possible

p. Is well site subject to flooding? ☐ Yes ☒ No

q. Is the well site well drained? ☒ Yes ☐ No
Apron grading around enclosure

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

s. Are there any other known contaminant sources on the property?

☒ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: AST 1 ; Distance from well to Potential Source 1: 35 m
Potential Source 2: AST 2 ; Distance from well to Potential Source 2: 40 m
Potential Source 3: Spill area ; Distance from well to Potential Source 3: 30m
Potential Source 4: Fuel drums ; Distance from well to Potential Source 4: 13 m

t. Are there other wells on this property? ☐ Yes ☒ No unlikely

How many? _____ ☐ in use ☐ abandoned ☐ require proper sealing

2. Well and Wellhead information:

a. When was well installed? Year _____ Month _____

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☐ Yes ☒ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☒ unlikely

e. Surface casing: ☐ Yes Diameter _____ ☒ No

f. Well casing: Diameter 15cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: 146ft ☐ measured (if possible) ☒ reported ☐ from log

h. Static water level below ground: _____

☐ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☐ unknown other unknown

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☐ in a building

☒ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail No

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☒ Yes ☐ No In walls of enclosure, not directly

iv. Any evidence of rodents? Specify no signs, access is possible

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition split gasked cap - may not be making proper seal around the rope

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☒ Yes ☐ No

Explain (filtration, disinfection etc...) filtration and softening - one RO tap

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment likely ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☐ No possible - low yield well

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☒ electric submersible ☐ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☒ plastic likely

g. Pump delivers water to: ☒ pressure tank ☐ elevated tank ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☒ No

j. Is there a water meter on the system? ☐ Yes ☐ No unknown

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: heater inside insulated enclosure

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

wellhead is rusty and inaccessable for inspection

b.Recommendations: _____

PART B: EBA Site Inspection

Inspector: BERT [redacted] Date [redacted]

WELL ID #	Owner	Location Description
4840	YTG	[redacted] LAKE - ENVIRONMENT OFFICE

6. **Water Treatment**

a. Is well water treated? ☑ Yes ☐ No; Type of treatment: SEDIMENT FILTER + WATER SOFTENER

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☑ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. **Water Quality (observations):**

a. Does the water stain plumbing? ☐ yes ☑ No ☐ slight ☐ severe

Type of stain: ☐ brown ☐ red ☐ black

b. Does the water contain sediment? ☐ Yes ☑ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☑ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☑ No

f. Is there a chemical analysis? ☐ Yes ☐ No ☐ adequate ☐ incomplete ?

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☑ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☐ No ☑ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☐ No ☑ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☑ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? (Yes) No Details: PRESSURE TANK FOR R.O. WATER

Where is it located?
Comments: SHOP AREA

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES NO
Comments: _____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES NO

Comments: _____

Are there other heat sources near the tank? YES NO
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO
Comments: _____

Overall Tank

What are the tank size and dimensions?

_____

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments:_____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

THE EQUIPMENT IS OF GOOD QUALITY. THE INSTALLATION IS OF ACCEPTABLE QUALITY WORKMANSHIP WITH THE EXCEPTION OF THE AUTOMATIC FILTER DRAINS - THEY MUST HAVE A AIR GAP.

b. Recommendations:

INSTALL PROPER AIR GAP AND UV DISINFECTION AFTER SOFTENER SUPERCHLORINATE THE WELL BI ANNUALLY. SUPER CHLORINATE THE COMPLETE PIPING SYSTEM AFTER UV INSTALLATION AND RETURN TO SERVICE.



Photo 0261: 4840 Wellhead enclosure (centre), and storage building (back left)



Photo 0260: 4840 Wellhead (centre), and pressure tank (left) in enclosure



Photo 0263: 4840 Septic field



Photo 0262: 4799 Fuel drums (centre) around storage building



Photo 0264: 4840 Absorb-all on ground behind office building – likely site of hydrocarbon contamination



Photo 0265: 4840 Above ground fuel storage tanks



Photo 0266: Barite ore storage lot south and likely up gradient from 4840 well



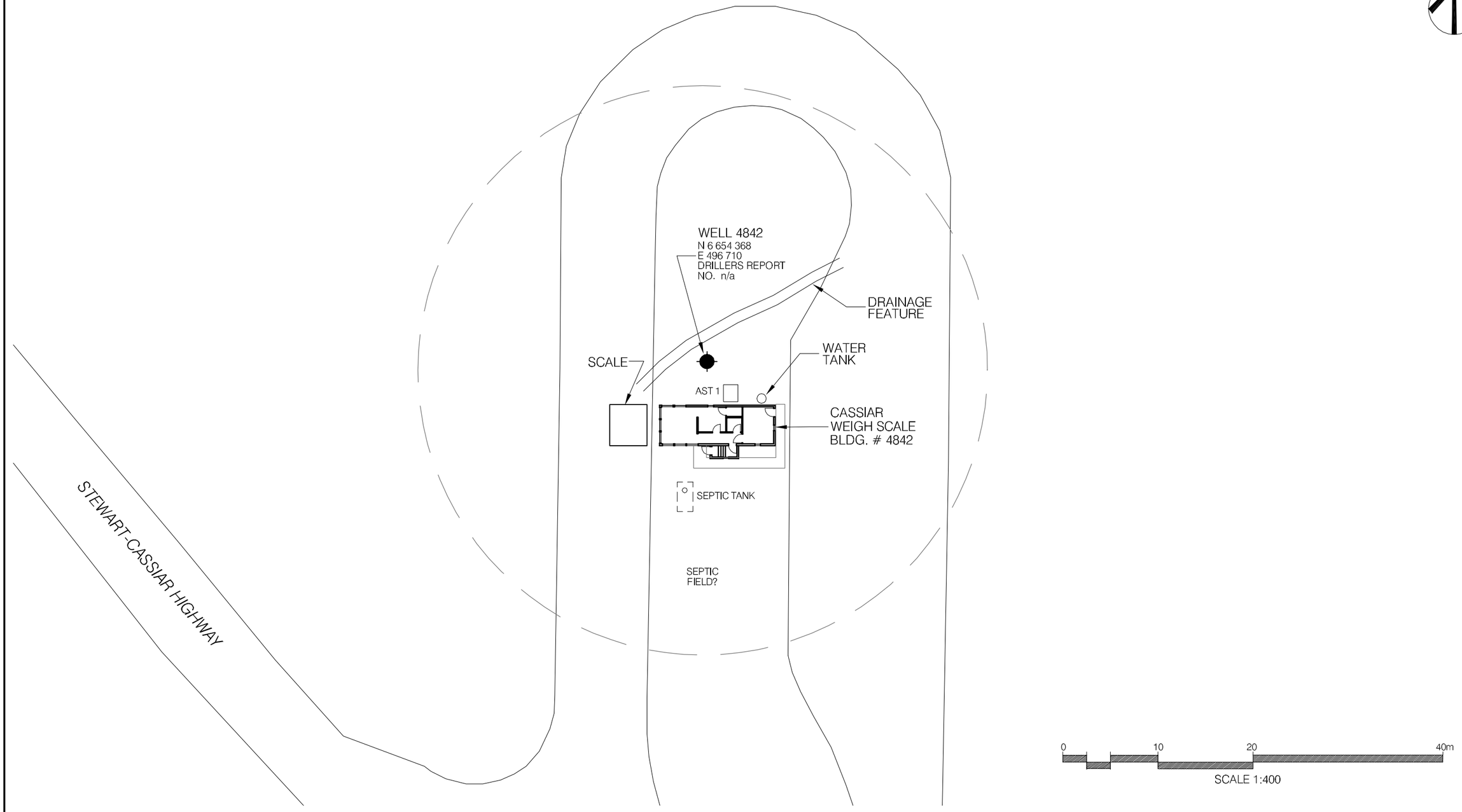
Photo 0003: 4840 Sediment filter (left) and water softener (right)



Photo 0004: 4840 Reverse osmosis system



Photo 0007: 4840 Reverse osmosis tap in kitchen



NOTES:

1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.
2. LOCATION OF BUILDINGS AND STRUCTURES ARE APPROXIMATE ONLY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

CASSIAR WEIGH SCALE
BUILDING # 4842
SITE LOCATION DIAGRAM
WELL ID: 4842-A

REVISION ISSUE: 0

FIGURE No.: 4842-A

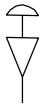
LEGEND


PUMP


PRESSURE GAUGE


GATE VALVE


CHECK VALVE


SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



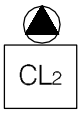
FLOW METER



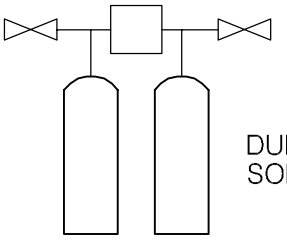
WATER FILTER
(CARTRIDGE TYPE)

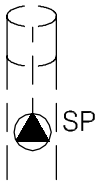


PRESSURE TANK

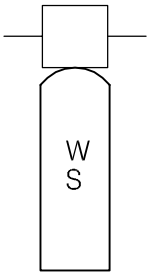


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER



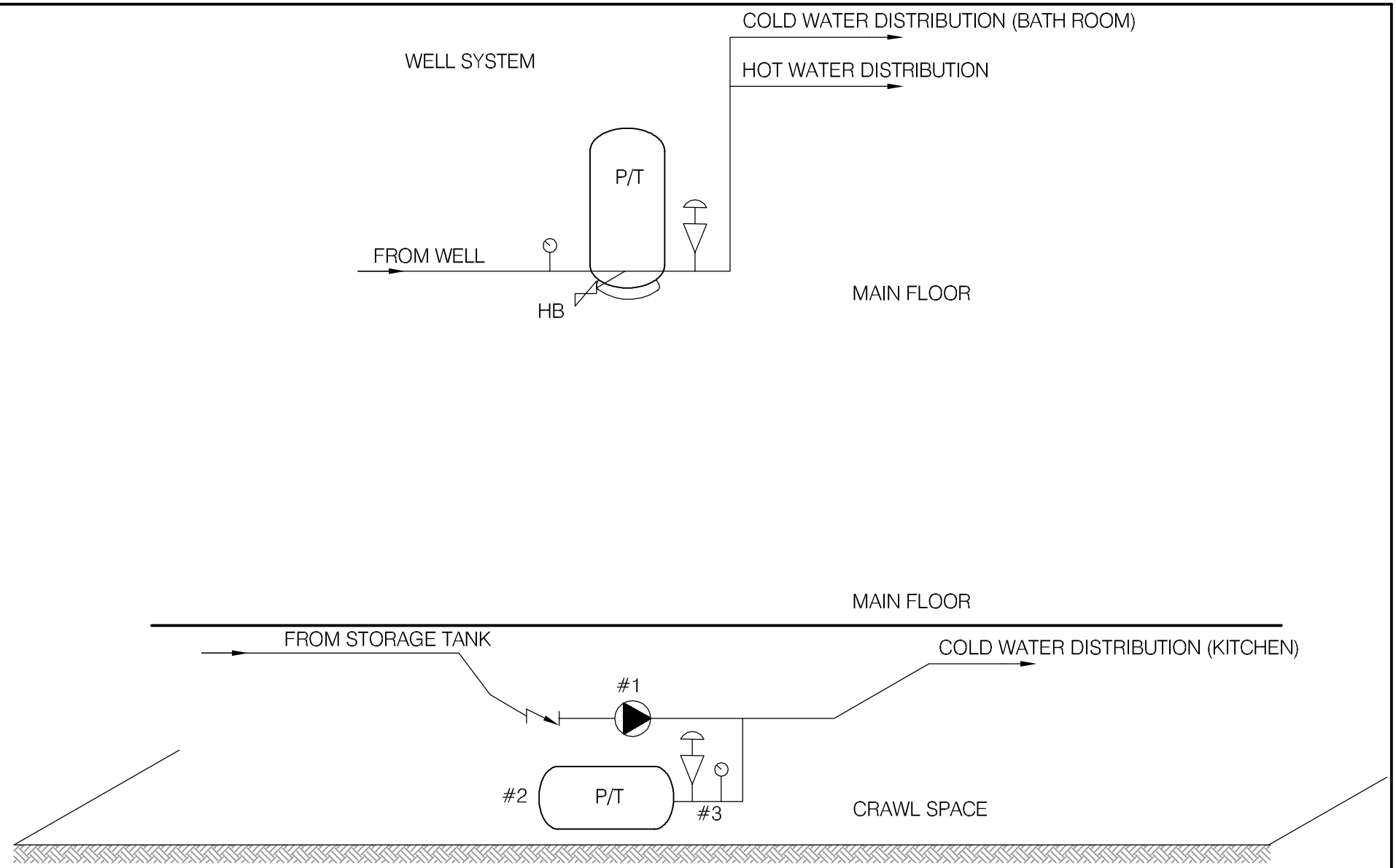
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\1260002003 Eastern Schematic_LEGEND.dwg, 4/11/2006 10:31:08 AM, Adobe PDF, jbuyck



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 4842 CASSIAR WEIGH SCALES	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE 4842-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\Schematics\1260002 Cassiar Weigh Scales_4842 Schematic.dwg, 7/21/2005 10:32:43 AM, Adobe PDF

Eastern Region – Cassier Weigh Scales
Building # 4842

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	JET PUMP	LEADER PUMPS	ECOMATIC	110	0799208665	
2	PRESSURE TANK	"	14L			
3	CONTROLS	"	PART OF PACKAGE			
4	SUB. PUMP					4" - 1/2 HP.
5	PRESSURE TANK	WELL X TROL	WX-202			30 GAL.
6	HEAT TRACE T/STAT	THERMON	HT STAT			2 @ FILLERY.
7						
8						
9						
10						

TABLE 4842- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
4842	Cassier Weigh Scales	2	Sept-04 to Mar-05	no	0/2	no	13-Oct-04	no

Table 4842-2: Water Quality Results

SOURCE:	Building 4842 - Cassiar Weigh Scales		GCDWQ Criteria		
Location/ Resident	Watson Lake				
Address					
Treatment	No				
Disinfection	No				
Source of Water	On-Site Well				
Purpose of Sampling	Baseline	Additional Sampling			
Sample Location		Washroom Tap			
Date Sampled	13-Oct-04	22-Jun-05	**Lower**	**Upper Limit**	
Physical Tests *(ALS)*			**AO**	**MAC**	**AO**
Colour (CU)	8				15
Total Dissolved Solids	204				500
Hardness CaCO3	194		AO >200 = poor, > 500 unacceptable[A]		
pH	8.20		6.5		8.5
Turbidity (NTU)	0.6			1	5
UV Absorbance		0.0300			
Dissolved Anions *(ALS)*					
Alkalinity-Total CaCO3	190				
Chloride Cl	4.2				250
Fluoride F	0.05			1.5	
Sulphate SO4	13.3				500
Nitrate Nitrogen N	0.39			10	
Nitrite Nitrogen N	<0.005			1	
Total Metals *(ALS)*					
Aluminum T-Al	<0.005				
Antimony T-Sb	<0.0002			0.006	
Arsenic T-As	0.0004			0.025	
Barium T-Ba	0.166			1	
Boron T-B	0.009			5	
Cadmium T-Cd	<0.00001			0.005	
Chromium T-Cr	0.0012			0.05	
Copper T-Cu	0.01			1	
Iron T-Fe	**0.43**	**2.26**			0.3
Lead T-Pb	0.0001			0.01	
Manganese T-Mn	0.03	**0.0612**			0.05
Sodium T-Na	3.6				200
Uranium T-U	0.0005			0.02	
Zinc T-Zn	0.004				5
Dissolved Metals *(ALS)*					
Iron D-Fe		<0.030			0.3
Manganese D-Mn		**0.0618**			0.05
Organic Parameters					
Tannin and Lignin		0.21			
Total Organic Carbon C		2.00			
Field Chemistry (EBA)					
pH		7.60	6.5		8.5
TDS (ppm)		312			500
EC (uS/cm)		624			
Temperature (°C)		12.3			

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU)

Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

eba

Table 4842-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
4842	**Cassiar Weigh Scales**	**Watson Lake**	6554368	496710	730

Well Details							
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Well Capacity - Tested, or Reported by User**	**Static Water Level Below Ground (m-btwc)**
150		No	27.72 (may be pump)				19.5

Potential Contaminant Sources					
Distance from well to nearest point of septic field (m)	**Distance from well to nearest building (m)**	**Distance to surface water body (m)**	**AST present on property?**	**Distance from well to AST (m)**	**Other potential sources of contamination observed on property, and distance to well**
13	4.5	Greater than 60 m	AST	1	Nearby service station: 75 m to pumps

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
1.25 m below grade	Split seal gasket cap		Unlikely	No, there is a drainage stream that runs within 1 m of the wellhead enclosure	

EBA Engineering Consultants Ltd.
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SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date June 22, 2005

WELL ID #	Owner	Location Description
4842	YTG	Cassiar weigh Scale

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Watson Lake

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Junction 39 - Cassiar Hwy / Alaska Hwy Junction

c. GPS location: N 6654368 E 496710 elv 736 m ±6m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☐ Yes ☒ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
weigh Scales office

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify weigh Scales office

h. Distance from well to building ~4.5m

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No N 6654360 E 496701

j. Distance from well to nearest point of known field: ~13m

k. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral
it may only be a holding tank

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☐ Yes ☐ No

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☐ Yes ☒ No Unlocked/ unfastened lid on top of wellhead enclosure

Entrance by animals? ☐ Yes ☒ No Access is possible

p. Is well site subject to flooding? ☒ Yes ☐ No Evidence of water staining on enclosure

q. Is the well site well drained? ☐ Yes ☐ No There is a small, natural drainage ditch ~13m from well head enclosure

r. Is there a buried fuel tank ~~on the property~~ near the well? ☒ Yes ☐ No

If yes, is it ☒ in use ☐ abandoned UST nest

Is the location known? ☒ Yes ☐ No

Distance from the well to known buried tank ~94m

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: AST 1 ; Distance from well to Potential Source 1: 1m

Potential Source 2: Alaska Hwy ; Distance from well to Potential Source 2: 65m

Potential Source 3: Junction 37 pumps; Distance from well to Potential Source 3: ~75m

Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

t. Are there other wells on this property? ☐ Yes ☒ No

How many? _____ ☐ in use ☐ abandoned ☐ require proper sealing

2. Well and Wellhead information:

a. When was well installed? Year unknown Month _____

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☐ Yes ☒ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☒ unlikely

e. Surface casing: ☐ Yes Diameter _____ ☒ No

f. Well casing: Diameter 15 cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: 727.72 (LD BOTTOM OR PUMP) ☑ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: 19.455

☐ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☐ unknown other unknown

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☒ in pit ☐ pitless adaptor ☐ in a building
wooden pwf pit - wellhead is ~2cm above the floor (sand) level of the pit
☒ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail 0.90 m below grade (is only 2cm above pit floor)

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☒ Yes ☐ No
Heavy where piping enters enclosure

iii. Is the wellhead enclosed by fiberglass insulations? ☒ Yes ☐ No

iv. Any evidence of rodents? Specify Access possible

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition split gasked cap

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☐ Yes ☒ No

Explain (filtration, disinfection etc…)

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment likely ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No
Unknown

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☒ electric submersible ☐ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: unknown By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☒ plastic

g. Pump delivers water to: ☒ pressure tank ☐ elevated tank ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☒ No

j. Is there a water meter on the system? ☐ Yes ☒ No

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Heat trace and fibreglass insulation

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

Water from well is for washroom sink, toilet, and hot water supply only. There is a water tank for delivered water that supplies the kitchen cold water tap - this is likely supposed to be the drinking water for the building.

b. Recommendations: _____

PART B: EBA Site Inspection

Inspector: BERT ALB Date _____

WELL ID #	Owner	Location Description
4842	YTG.	JUNCTION 37 WEIGH SCALES

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☐ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. **Water Quality (observations):**

a. Does the water stain plumbing? ☐ yes ☐ No ☑ slight ☐ severe

Type of stain: ☐ brown ☑ red ☐ black

b. Does the water contain sediment? ☐ Yes ☑ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☑ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐Yes ☐No ☐brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No

f. Is there a chemical analysis? ☐ Yes ☐ No ☐adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☐ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☐ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☐ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☐ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? (Yes) No Details:

Where is it located?
Comments: OUTSIDE

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES (NO)
Comments: _____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES NO
Comments: No ENCLOSURE

Are there other heat sources near the tank? YES (NO)
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES (NO)
Comments: _____

Overall Tank

What are the tank size and dimensions?
30" x 72" TALL

What material is the tank constructed of? POLYETHYLEN

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? (YES) NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES (NO)

Does the lid have a tight seal and is it watertight when closed? YES (NO)

Does the tank have an overflow or high level whistle? YES (NO)

Is the water tank drain accessible? YES (NO)

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments: NOT IN USE WHEN INSPECTED.

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

THIS JET PUMP INSTALLATION IS OF POOR QUALITY MATERIAL AND WORKMANSHIP. THE PUMP RUNS CONTINUALLY - IT WILL NOT BRING THE SYSTEM UP TO PRESSURE. THE SUCTION PIPE HAS NUMEROUS HOSE CLAMP JOINT AND IS THERE FOR SUBJECT TO AIR LEAKS.

b. Recommendations:

REPLACE PUMP SYSTEM WITH SUBMERSIBLE PUMP SYSTEM. INSTALL TREATMENT AS REQUIRED. SUPERCHLORINATE THE TOTAL SYSTEM AND INSTALL AN APPROPRIATE UV SYSTEM.



Photo 0238: 4842 Cassiar Weigh Scales (back), wellhead enclosure (centre), above ground fuel storage tank (left centre), water storage tank for kitchen cold water tap (left)



Photo 0237: 4842 Pressure tank (centre) and pump controls (right)

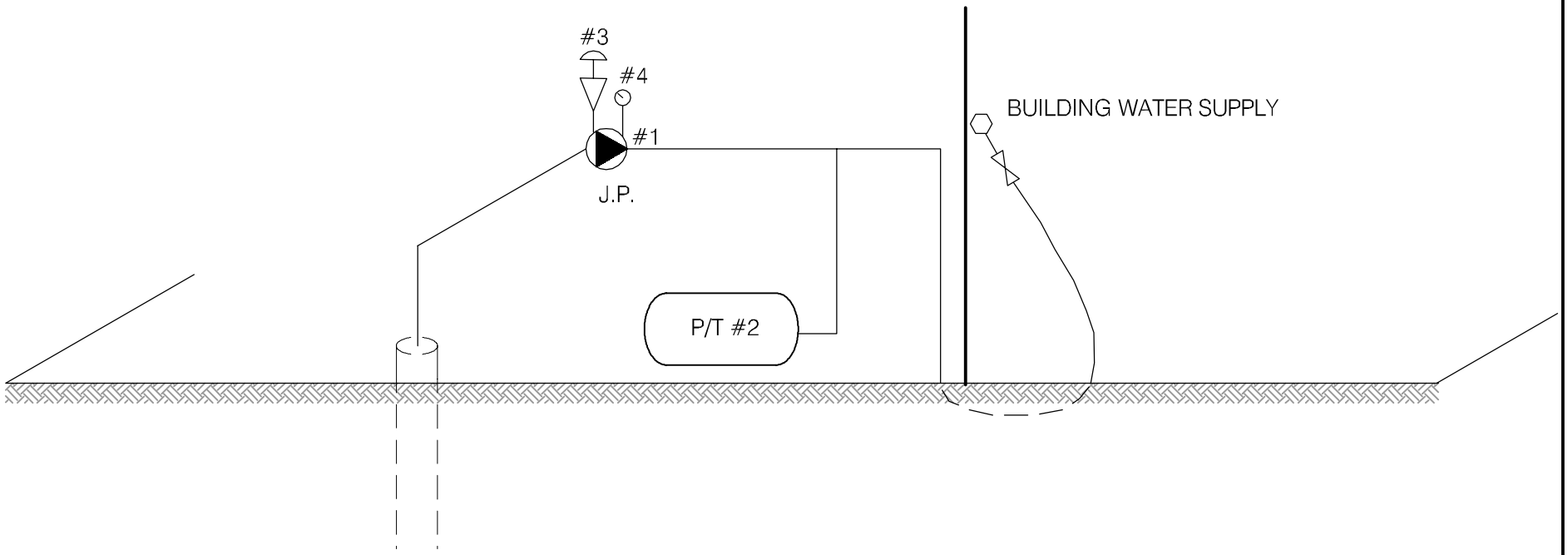


Photo 0240: 4842 Wellhead in pit



Photo 0239: 4842 Possible septic field

LOCATED IN BASEMENT STORAGE AREA



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 4841 WATSON LAKE VISITOR RECEPTION CENTRE	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE 4841-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\Schematics\1260002 Visitor Reception Centre_4841 Schematic.dwg, 7/21/2005 10:25:17 AM, Adobe PDF

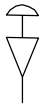
LEGEND


PUMP


PRESSURE GAUGE


GATE VALVE


CHECK VALVE


SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



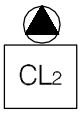
FLOW METER



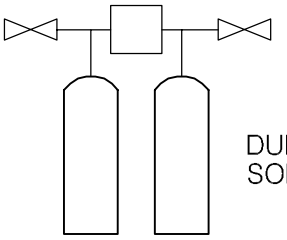
WATER FILTER
(CARTRIDGE TYPE)

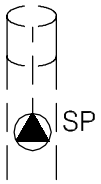


PRESSURE TANK

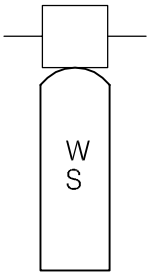


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER



WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\1260002003 Eastern Schematic_LEGEND.dwg, 4/11/2006 10:31:08 AM, Adobe PDF, jbuyck

Eastern Region – Watson Lake Visitor Reception Centre
Building # 4841

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	MONARCH JET Pump	MONARCH	MJC-50		3703	1/2 HP.
2	PRESSURE TANK	WELL RITE	TR25			8.5 GAL 3/4" MIPT
3	PRESSURE SWITCH	SQ. D	FSG-2			2 AR 1/4" FIPT
4	PRESSURE GAUGE	MARSH	0-100			2" - 1/4" FIPT.
5						
6						
7						
8						
9						
10						

EBA Engineering Consultants Ltd.
Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin
Luke Lebel

Date June 22, 2005

WELL ID #	Owner	Location Description
4841	YTG	Watson Lake Visitor Reception Centre

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Watson Lake

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Sign Post Forest – Alaska Hwy

c. GPS location: N 6658536 E 515881 elv 707m ±10m

d Is there electric power? ☐ Yes ☒ No well not currently in service

e Is there outside water access? ☒ Yes ☐ No
Town water

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
well not in service → only visitor reception centre when it is in service

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Inside basement of visitor reception centre

h. Distance from well to building _____

i. If there is an effluent disposal field, is its location known? ☐ Yes ☒ No building on piped sewage system

j. Distance from well to nearest point of known field: _____

k. Well location relative to field: ☐ upslope ☐ downslope ☐ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☒ Yes ☐ No
Sewage main or service lines likely <30m from well

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☒ Yes ☐ No In basement of visitor reception centre
Entrance by animals? ☐ Yes ☒ No There is no cap on the casing

p. Is well site subject to flooding? ☐ Yes ☒ No unlikely

q. Is the well site well drained? ☒ Yes ☐ No
There appears to be good drainage away from building

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1:_____; Distance from well to Potential Source 1:_____
Potential Source 2:_____; Distance from well to Potential Source 2:_____
Potential Source 3:_____; Distance from well to Potential Source 3:_____
Potential Source 4:_____; Distance from well to Potential Source 4:_____

t. Are there other wells on this property? ☐ Yes ☐ No

How many?_____ ☐ in use ☐ abandoned ☐ require proper sealing

2. Well and Wellhead information:

a. When was well installed? Year unknown Month _____

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☐ Yes ☒ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☒ unknown ☒ unlikely

e. Surface casing: ☐ Yes Diameter unknown ☐ No

f. Well casing: Diameter 9 cm unknown Material: ☒ steel ☐ plastic ☐ concrete Thin-walled

g. Depth of well: ~~unknown~~ 10.690 m ~~3.735 m~~ bc ☒ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: ~~unknown~~ 4.733m bc

☐ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☐ unknown other unknown

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☒ in a building
in basement of visitor reception centre
☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail ~1.5m bg

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No

iv. Any evidence of rodents? Specify No, access possible

v. Does the well casing have a proper seal cap? ☐ Yes ☒ No

If no, describe condition metal plate

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes (likely) ☐ No ☐ farther investigation required.

If yes is there treatment ☐ Yes ☒ No

Explain (filtration, disinfection etc…)

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment (likely) ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☐ electric submersible ☒ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface n/a

f. Drop pipe for submersible pump: ☐ steel ☒ plastic

g. Pump delivers water to: ☒ pressure tank ☐ elevated tank ☐ other
when in operation

h. Are there automatic pump controls: ☒ Yes ☐ No
likely when in operation

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☒ No

j. Is there a water meter on the system? ☐ Yes ☒ No unlikely

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No
If yes, describe: when in operation - it is used as a back-up if town water distribution system is frozen

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:
well is only used as a back-up system in the spring if the piped distribution system freezes. During the site inspection the wellhead was not located. The well has not been used in over three years

b.Recommendations: _____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JUNE 22/05

WELL ID #	Owner	Location Description
4841	YTG	WATSON LAKE RECEPTION CENTER.

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☐ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. **Water Quality (observations):** WELL NOT IN USE

a. Does the water stain plumbing? ☐ yes ☐ No ☐ slight ☐ severe

Type of stain: ☐ brown ☐ red ☐ black

b. Does the water contain sediment? ☐ Yes ☐ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☐ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐Yes ☐No ☐brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No

f. Is there a chemical analysis? ☐ Yes ☐ No ☐adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☐ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☐ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☐ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☐ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes No Details:

Where is it located?
Comments: _____

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES NO
Comments:_____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES NO

Comments: _____

Are there other heat sources near the tank? YES NO
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO
Comments: _____

Overall Tank

What are the tank size and dimensions?

_____

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments: _____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

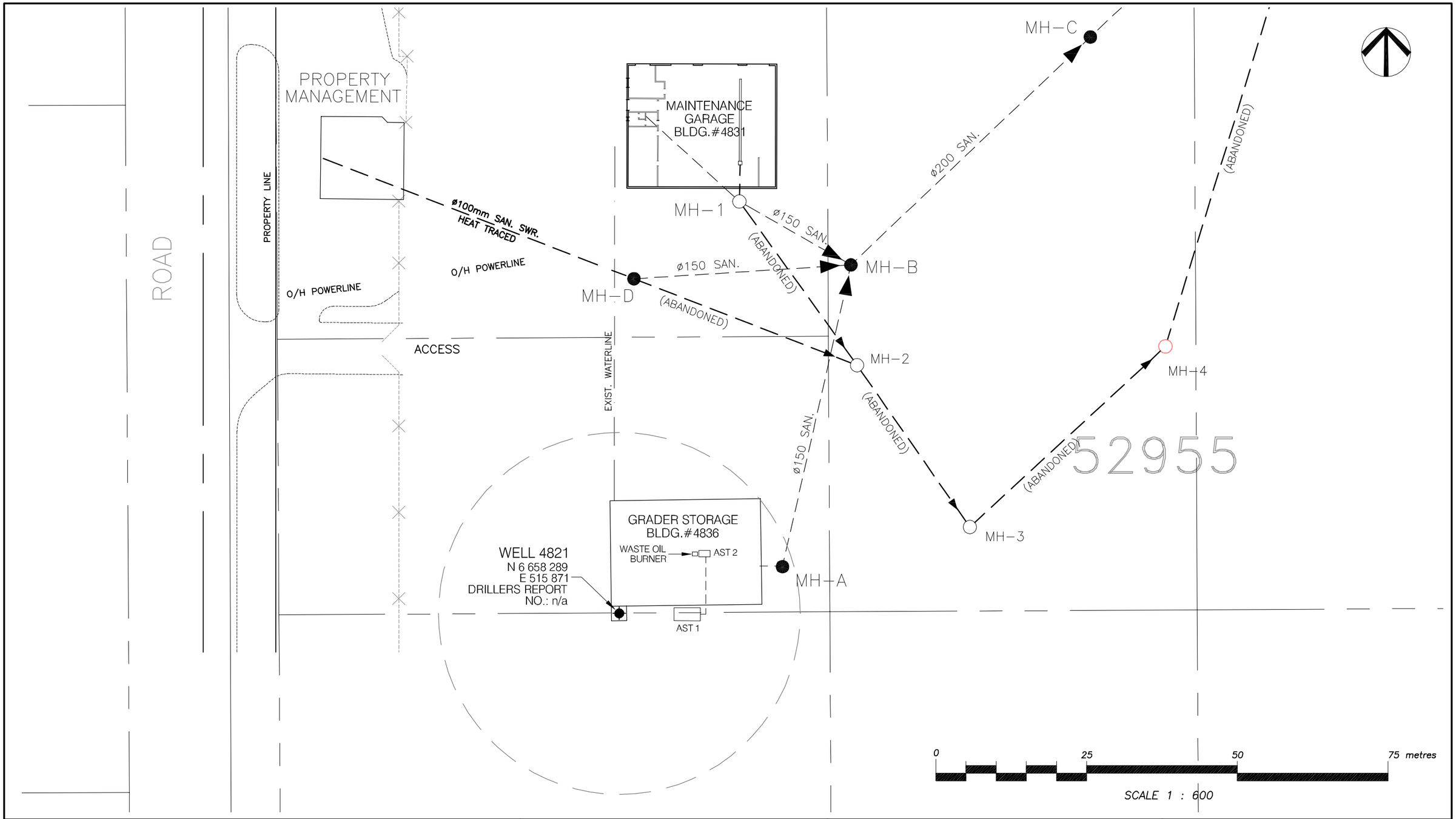
THE WELL IS FOR EMERGENCY USE ONLY.
THE CASING SHOULD BE EXTENDED TO A
SAFE HEIGHT TO PREVENT FLOODING.
PRIOR TO ANY USE THE WELL & ITS PIPING
SYSTEM MUST BE SHOCK CHLORINATED.

b. Recommendations:

AS ABOVE



Photo 0030: 4841 Well (centre), jet pump (behind well), and pressure tank (behind jet pump) in basement of Visitor Reception Centre – system not currently in use



NOTES:

1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002–EASTERN REGION

CLIENT: Yukon — Highways and Public Works, Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

WATSON LAKE GRADER WORKSHOP
BUILDING # 4836
SITE LOCATION DIAGRAM
WELL ID: 4836–A

REVISION ISSUE: 0

FIGURE No.: 4836–A

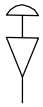
LEGEND


PUMP


PRESSURE GAUGE


GATE VALVE


CHECK VALVE


SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



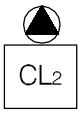
FLOW METER



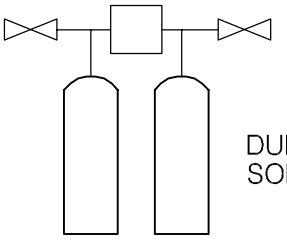
WATER FILTER
(CARTRIDGE TYPE)

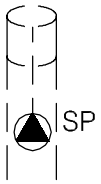


PRESSURE TANK

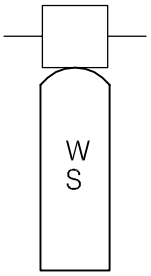


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER



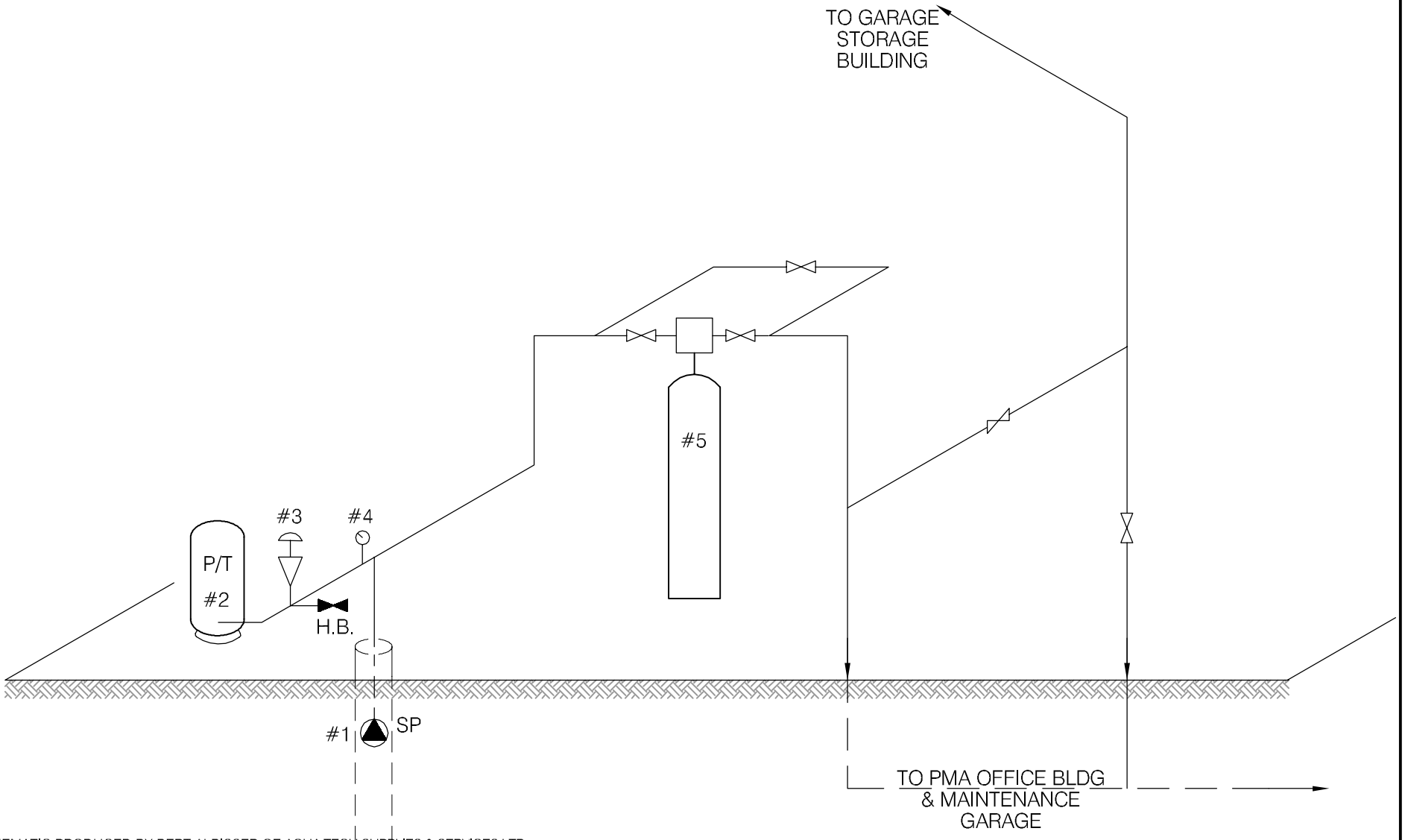
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\1260002003 Eastern Schematic_LEGEND.dwg, 4/11/2006 10:31:08 AM, Adobe PDF, jbuyck



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 4836 WATSON LAKE GRADER STORAGE BUILDING	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE 4836-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\Schematics\1260002 Grader Station_4836 Schematic.dwg, 7/21/2005 10:07:46 AM, Adobe PDF

W.L. GRADER STATION

Eastern Region – ~~Ambulance Building~~
Building # ~~4976~~ 4833

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB. PUMP.					4" - 3/4HP.
2	PRESSURE TANK	WEL-RITE	WR-260-03			
3	PRESSURE SWITCH	SQ. D	FSG-M4			2HP 1/4" FIPT
4	PRESSURE GAUGE	WINTERS	0-100			4" - 1/4" FIPT
5	SOFTENER	PETWA	01-400015-278-963		Z4813	16 x 65
6						
7						
8						
9						
10						

TABLE 4836- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
4836	Grader Storage Building	NO BACTERIOLOGICAL RESULTS ARE AVAILABLE FOR THIS SITE						

Table 4836-2: Water Quality Results

SOURCE:	Building 4836 - Grader Storage Building		GCDWQ Criteria		
Location/ Resident	Watson Lake				
Address					
Treatment	Water Softener				
Disinfection	No				
Source of Water	On-Site Well				
Purpose of Sampling	Baseline	Additional Sampling			
Sample Location		Laundry Sink			
Date Sampled	13-Sep-04	21-Jun-05	**Lower**	**Upper Limit**	
Physical Tests *(ALS)*			**AO**	**MAC**	**AO**
Colour (CU)	**>60**	<5.0			15
Conductivity (uS/cm)		1150			
Total Dissolved Solids	492	**749**			500
Hardness CaCO3	**422**	53.5	AO >200 = poor, > 500 unacceptable[A]		
pH	7.86	8.05	6.5		8.5
Turbidity (NTU)	**79.6**	0.60		1	5
Dissolved Anions *(ALS)*					
Alkalinity-Total CaCO3	212	222			
Chloride Cl	190	184			250
Fluoride F	<0.05	<0.20		1.5	
Sulphate SO4	4.13	<5.0			500
Nitrate Nitrogen N	<0.1	<1.0		10	
Nitrite Nitrogen N	<0.05	<1.0		1	
Ammonia Nitrogen N		<0.020			
Total Metals *(ALS)*					
Aluminum T-Al	<0.005	<0.010			
Antimony T-Sb	<0.0002	<0.00050		0.006	
Arsenic T-As	0.0018	0.00049		0.025	
Barium T-Ba	**1.14**	0.043		1	
Boron T-B	0.007	<0.10		5	
Cadmium T-Cd	<0.00001	<0.00020		0.005	
Calcium T-Ca		15.8			
Chromium T-Cr	0.0012	<0.0040		0.05	
Copper T-Cu	0.003	0.0174		1	
Iron T-Fe	**5.35**	0.062			0.3
Lead T-Pb	0.0003	0.0012		0.01	
Magnesium T-Mg		3.37			
Manganese T-Mn	**1.18**	**0.39**			0.05
Mercury T-Hg		<0.00020		0.001	
Potassium T-K		350			
Selenium T-Se		<0.0010		0.01	
Sodium T-Na	17.5	<2.0			200
Uranium T-U	<0.0005	0.00019		0.02	
Zinc T-Zn	0.11	0.244			5
Organic Parameters					
Total Organic Carbon C		1.75			
Field Chemistry (EBA)					
pH		8.02	6.5		8.5
TDS (ppm)		**559**			500
EC (uS/cm)		1115			
Temperature (°C)		9.4			

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU)

Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

eba

Table 4836-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
4836	**Watson Lake Grader Storage Building**	**Watson Lake**	6658289	515871	715

Well Details							
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Well Capacity - Tested, or Reported by User**	**Static Water Level Below Ground (m-btwc)**
150	1986	Yes	17.8	Silt from 2.5 m to 6.4 m and from 12.9 m to 15.0 m		20 gpm from log	11.0

Potential Contaminant Sources					
Distance from well to nearest point of septic field (m)	**Distance from well to nearest building (m)**	**Distance to surface water body (m)**	**AST present on property?**	**Distance from well to AST (m)**	**Other potential sources of contamination observed on property, and distance to well**
Community Sewage system	Located off from maintenance garage	Greater than 60 m	AST 1	7	Waste Oil Burner at 16 m
			AST 2	16	UST greater than 30 m away, and likely downgradient

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
0.1 m above grade	Split seal gasket cap	20 slot screen from 17.0 m to 17.8 m	No	Ground above wellhead enclosure is relatively flat	The well services the grader storage building and the maintenance garage, as well as the Property Management Agency Watson Lake office. It is likely downgradient from a barite plant and sewage lagoon.

EBA Engineering Consultants Ltd.
Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin
Luke Lebel

Date June 21, 2005

WELL ID #	Owner	Location Description
4836	YTG	Watson Lake Grader Storage Building

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Watson Lake

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Watson Lake Grader Station Complex

c. GPS location: N 6698289 E 515871 elv 715 m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☐ Yes ☐ No inaccessable to the public

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Grader Station, Storage Building, Property Management Agency office

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify located in alcove off of storage buildings

h. Distance from well to building n/a

i. If there is an effluent disposal field, is its location known? ☐ Yes ☒ No

j. Distance from well to nearest point of known field: _____

k. Well location relative to field: ☐ upslope ☐ downslope ☐ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☒ Yes ☐ No
wastewater system on community sewage system - sewer manhole and likely main sewer line ~26m from well

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☒ Yes ☐ No Inside building in grader station complex

Entrance by animals? ☐ Yes ☒ No Access possible - no protection

p. Is well site subject to flooding? ☒ Yes ☐ No Alcove off of storage building leaks during rainfall

q. Is the well site well drained? ☒ Yes ☐ No

r. Is there a buried fuel tank on the property? ☒ Yes ☐ No possibly

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank >30m down gradient (likely)

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe Garage sumps may drain into septic - unknown; there may be a rock pit whose location is unknown

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: AST 1 ; Distance from well to Potential Source 1: ~7m

Potential Source 2: AST 2 ; Distance from well to Potential Source 2: 16m

Potential Source 3: waste oil burner ; Distance from well to Potential Source 3: 16m

Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

t. Are there other wells on this property? ☐ Yes ☒ No

How many? _____ ☐ in use ☐ abandoned ☐ require proper sealing

2. Well and Wellhead information:

a. When was well installed? Year 1986 Month February

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☒ Yes ☐ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☐ unlikely

e. Surface casing: ☐ Yes Diameter _____ ☒ No

f. Well casing: Diameter 15cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: 58 ft ☐ measured (if possible) ☐ reported ☒ from log

h. Static water level below ground: _____

☐ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☒ with a well screen

☐ with slotted pipe ☐ unknown other _____

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length _____ slot size(s) 20 slot
Location of screen: from _____ to _____ (from log) reported

l. Is there a sump below the screen? ☐ Yes ☒ No

m. Is the well head: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☒ in a building
in an enclosure off from storage building

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail 10 cm above grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No not directly but inside heated/insulated building

iv. Any evidence of rodents? Specify no, but access is possible

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition split gasket cap

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☒ Yes ☐ No

Explain (filtration, disinfection etc…) softening system

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No unlikely

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☒ electric submersible ☐ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☒ steel ☐ plastic likely

g. Pump delivers water to: ☒ pressure tank ☐ elevated tank ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☒ Yes ☐ No
but tap is directly against floor

j. Is there a water meter on the system? ☐ Yes ☒ No

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: located inside heated building

l. Comments on pump installation: _____

_____

6. Conclusions

a. Comments on overall installation:

_____

_____

_____

_____

_____

_____

_____

b.Recommendations: _____

_____

_____

_____

_____

_____

_____

_____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JUNE 21 05

WELL ID #	Owner	Location Description
~~4976~~ 4836	YTG	WATSON LAKE GRADER ~~STATION~~ STORAGE BUILDING

6. Water Treatment

a. Is well water treated? ☑ Yes ☐ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☑ other WATER SOFTNER.

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☑ No If so how_____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☑ No _____reading.

Tested at _____(location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☑ No If yes how often?_____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. Water Quality (observations):

a. Does the water stain plumbing? ☐yes ☐ No ☐ slight ☑ severe

Type of stain: ☐ brown ☑ red ☐ black

b. Does the water contain sediment? ☐Yes ☑No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☑ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No ?

f. Is there a chemical analysis? ☐ Yes ☐ No ☑ adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☑ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☑ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☐ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☑ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes No Details: PRESSURE TANK.

Where is it located?
Comments: STORAGE BUILDING.

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES NO
Comments: _____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES NO

Comments: _____

Are there other heat sources near the tank? YES NO
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO
Comments: _____

Overall Tank

What are the tank size and dimensions?

_____

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments:_____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

INSTALLATION IS OF GOOD QUALITY & WORKMANSHIP THE SOFTNER DRAIN DOES NOT MEET PLUMBING CODE AND IS SUBJECT TO FREEZING. THIS WILL RENDER THE SOFTNER INOPERABLE.

b. Recommendations:

INSTALL PROPER DRAIN FACILITY FOR SOFTNER. SUPER CHLORINATE WELL & PIPING SYSTEM. INSTALL UV TREATMENT SYSTEM, AFTER WATER SOFTNER. INSTITUTE BI ANNUAL WELL SUPER CHLORINATION MAINTENANCE PROGRAM.

Field Report

MIDNIGHT SUN DRILLING CO. LTD.
WHITEHORSE Y.T.
PH. 633-3070
P.O. BOX 4391
WHITEHORSE, YUKON

Started Feb. 25 19 86
Completed Feb. 27 19 86

NAME AND ADDRESS OF CLIENT	DESCRIPTION OF WORK	LOCATION OF WORK
Y.T.G.	W/W	Grader station Watson Lake.

WATSON LK GRADER STATION

FORMATION LOG FROM	TO	FORMATION
0'	8'	Gr. sand.
8'	21	silt Gr.
21	26	sand Gr.
26	42	Till
42	49	sand Gr. some silt
49	58	Gr. sand.

DESCRIPTION OF WORK	TIME DATE	FROM	TO	HOURS
MOVE	~~Feb 25~~	~~8:00~~	~~4:00~~	~~8~~
loading	Feb. 25	8:00	4:00	8
Travel to Watson	Feb. 26	8:00	4:30	8.5
move on set up	"	4:30	5:30	1
	"	5:30	7:30	2
set screen	Feb 27	8:00	8:30	0.5
Develop	"	8:30	10:00	1.5
move off	"	10:00	10:30	0.5
travel to Whse	"	10:30	7:00	8.5

Rcrd. of Casing & Pipe

Size	Type	Size	Type
6			
Feet	Inch	Feet	Inch
55	6		

Remarks:
1 - drive shoe
2' riser lead pack.
20 slot
5 7/8" bit pin
20 GPM.

Static Level		Total Rig Time	hrs.
Ground Level	36'	Total Standby	hrs.
Top Of Casing		Drilling Mud	sacks

SIGNATURES

MIDNIGHT SUN..... CLIENT.....

TITLE..... TITLE.....

Widow Printers

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	0043
Jurisdiction	Yukon
Community	Watson Lake
Address	
Highway	
Milepost	
Feature	Watson Lake
Location and Cause	YTG Highways Compound/Complex - transfomer brought down by accident - transformer oil spilled from damaged equipment
Latitude	60.06230376
Longitude	-128.71344317
Incident Date	10/2/2000 2:05:00 PM
Lead Agency	Emergency Measures Organization
Other Agency	Yukon Government - Environmental Programs
Company(s)	YTG - Highways
Amount	90
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	>50 ppm PCB
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Transformer Oil
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	contaminated soil excavated and put in barrels - transformer repaired - oil tested - previous tests (late 80's) showed >50 ppm PCB - soil to be remediated - no further info



Photo 0273: 4836 Grader Storage Building and wellhead enclosure addition (back), above ground fuel storage tank (right)



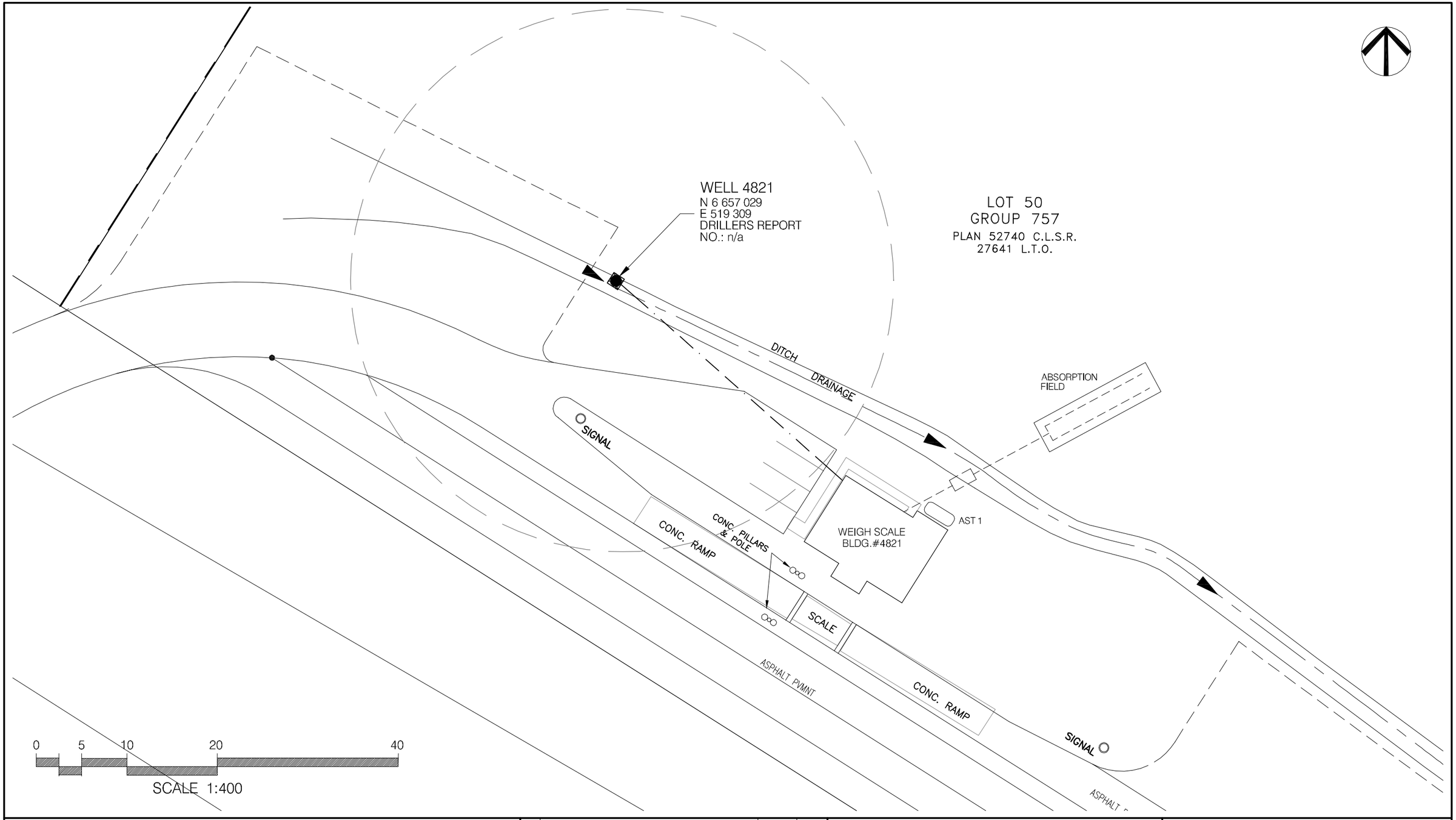
Photo 0275: 4836 Above ground fuel storage tank



Photo 0017: 4836 Wellhead (centre), pressure tank (left)



Photo 0018: 4836 Water softener and brine tank



NOTES:

1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

WATSON LAKE WEIGH SCALE
BUILDING # 4821
SITE LOCATION DIAGRAM
WELL ID: 4821-A

REVISION ISSUE: 0

FIGURE No.: 4821-A

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LEGEND



PUMP



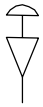
PRESSURE GAUGE



GATE VALVE



CHECK VALVE



SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



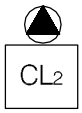
FLOW METER



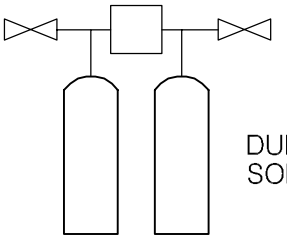
WATER FILTER
(CARTRIDGE TYPE)



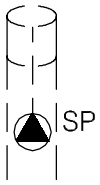
PRESSURE TANK



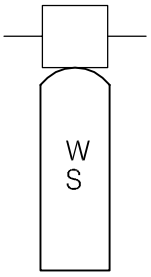
CHLORINE RESERVOIR AND
INJECTION PUMP



DUPLEX WATER
SOFTENER



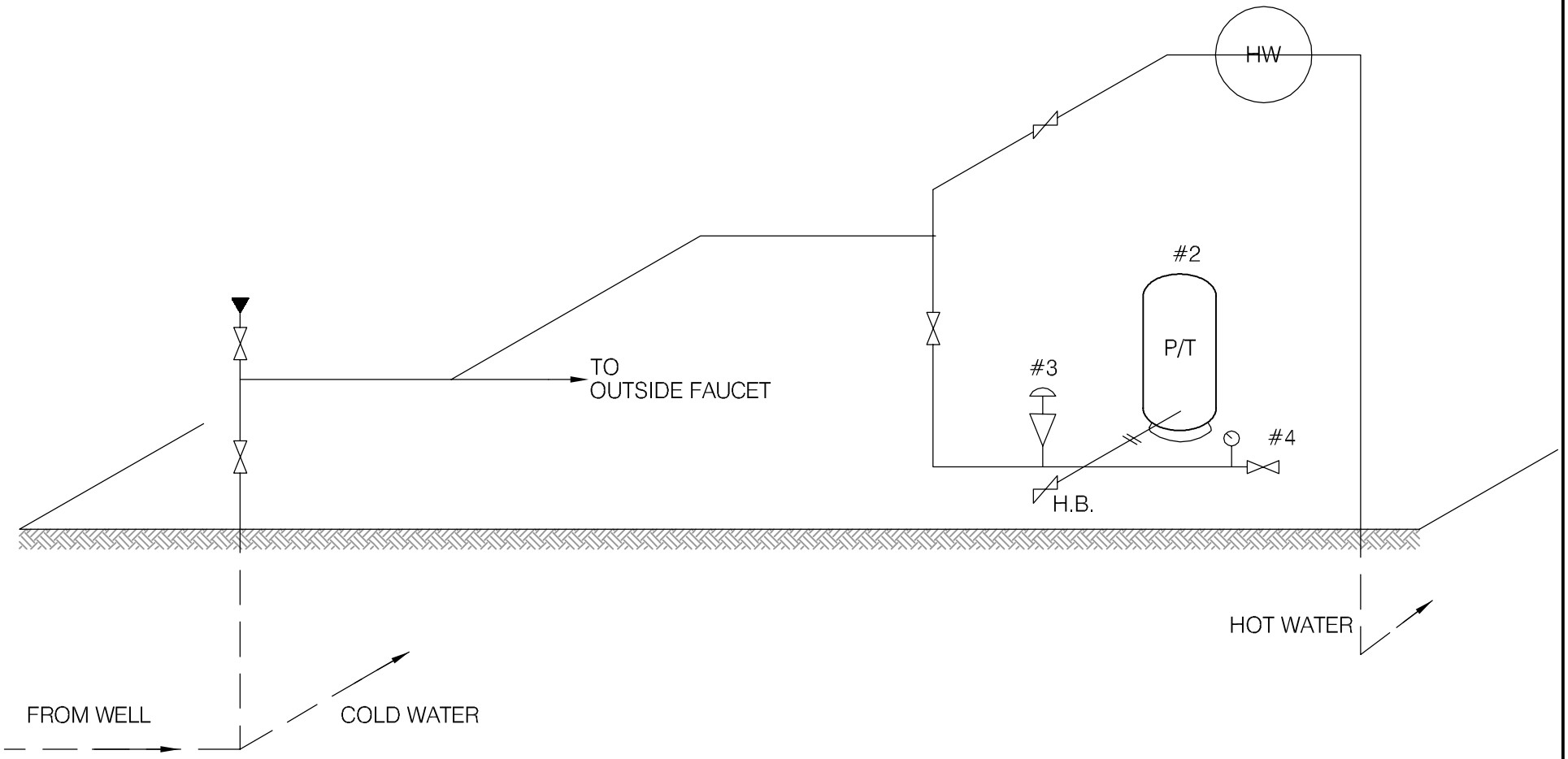
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\1260002003 Eastern Schematic_LEGEND.dwg, 4/11/2006 10:31:08 AM, Adobe PDF, jbuyck



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.		PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION
CLIENT	Yukon Highways and Public Works Property Management Branch	TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 4821 WATSON LAKE WEIGH SCALE
DATE JULY 2005	DWN. JSB / CHKD. RMM	FILE NO. 1260002.002	DWG.: FIGURE 4821-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\Schematics\1260002 Weigh Scale_4821 Schematic.dwg, 7/21/2005 9:29:02 AM, Adobe PDF

Eastern Region – Watson Lake New Weigh Scale
Building # 4821

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB. PUMP.	?				4" - 1/2 HP.
2	PRESSURE TANK	WELL-X-TROL	WX-203		12306104	
3	PRESSURE SWITCH	SQ. D	FSG-2			2HP 1/4" FIPT.
4	PRESSURE GAUGE	MARSH	0-100			2" - 1/4" FIPT.
5						
6						
7						
8						
9						
10						

TABLE 4821- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
4821	New Weigh Scale	4	Sept-04 to Mar-05	no	0/4	no	9-Mar-05	no

Table 4821-2: Water Quality Results

SOURCE:	Building 4821 - Watson Lake Scales		GCDWQ Criteria		
Location/ Resident	Watson Lake				
Address					
Treatment	No				
Disinfection	No				
Source of Water	On-Site Well				
Purpose of Sampling	Baseline	Additional Sampling			
Sample Location					
Date Sampled	9-Nov-04	21-Jun-05	**Lower**	**Upper Limit**	
Physical Tests *(ALS)*			**AO**	**MAC**	**AO**
Colour (CU)	**27**				15
Total Dissolved Solids	187				500
Hardness CaCO3	155		AO >200 = poor, > 500 unacceptable[A]		
pH	8.20		6.5		8.5
Turbidity (NTU)	**8.6**	**2.10**		1	5
UV Absorbance		0.149			
Dissolved Anions *(ALS)*					
Alkalinity-Total CaCO3	179				
Chloride Cl	0.7				250
Fluoride F	0.21			1.5	
Sulphate SO4	7.28				500
Nitrate Nitrogen N	<0.01			10	
Nitrite Nitrogen N	<0.005			1	
Total Metals *(ALS)*					
Aluminum T-Al	0.054				
Antimony T-Sb	<0.0002			0.006	
Arsenic T-As	*0.0078*			0.025	
Barium T-Ba	0.094			1	
Boron T-B	0.011			5	
Cadmium T-Cd	<0.00001			0.005	
Chromium T-Cr	0.0012			0.05	
Copper T-Cu	0.08			1	
Iron T-Fe	0.15				0.3
Lead T-Pb	0.0072			0.01	
Manganese T-Mn	**0.079**				0.05
Sodium T-Na	17.5				200
Uranium T-U	<0.0005			0.02	
Zinc T-Zn	0.05				5
Organic Parameters					
Tannin and Lignin		0.71			
Field Chemistry (EBA)					
pH		**8.56**	6.5		8.5
TDS (ppm)		156			500
EC (uS/cm)		312			
Temperature (°C)		9.70			

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU)

Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

Table 4821-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
4821	**Watson Lake Scales**	**Watson Lake**	6557029	519309	690

Well Details							
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Well Capacity - Tested, or Reported by User**	**Static Water Level Below Ground (m-btwc)**
150	2004	Yes	28.8	Clay and silt from 10.1 m to 28.8 m with some permafrost at approximately 15m	13.2	17 gpm from log	2.765

Potential Contaminant Sources					
Distance from well to nearest point of septic field (m)	**Distance from well to nearest building (m)**	**Distance to surface water body (m)**	**AST present on property?**	**Distance from well to AST (m)**	**Other potential sources of contamination observed on property, and distance to well**
52	30	Greater than 60 m	AST	38 m	Water drainage from surrounding area runs directly around well

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
0.55	Pitless unit, cap not on due to damage	20 slot screen from 19.2 to 21.6 m	Yes, but not properly constructed	No. Well is located in a low point between the parking lot and the forested area behind the weigh scales and water streams directly past the wellhead	The well casing had previously been hit by a truck and was samaged. Due to the damage, the cap can no longer be sealed on to the casing and the well is open.

EBA Engineering Consultants Ltd.
Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date June 21, 2005

WELL ID #	Owner	Location Description
4821	YTG	Watson Lake Weigh Scales

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Watson Lake

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Watson Lake, Alaska Hwy - East of town

c. GPS location: N 6657029 E 519309 elv. 690 m ± 7m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No
but locked

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Weigh scales building

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Weigh scales building

h. Distance from well to building 30 m

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No N 6657007 E 519363

j. Distance from well to nearest point of known field: 52m

k. Well location relative to field: ☐ upslope ☒ downslope slightly ☐ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☐ Yes ☐ No

---

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☐ Yes ☒ No Cap on top of casing is unfastened due to damage to well casing

Entrance by animals? ☐ Yes ☒ No cap on top of casing is unfastened Access is possible

p. Is well site subject to flooding? ☒ Yes ☐ No → The well is apparently built in a natural drainage flow ditch in parking lot. There is a small stream - with evidence of hydrocarbons in it - that runs around well

q. Is the well site well drained? ☒ Yes ☐ No →

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: AST ; Distance from well to Potential Source 1: 38m

Potential Source 2: parking ; Distance from well to Potential Source 2: 0 m → well was apparently hit and damaged by a truck

Potential Source 3: drainage ; Distance from well to Potential Source 3: 0 m

Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

t. Are there other wells on this property? ☐ Yes ☒ No unlikely

How many? _____ ☐ in use ☐ abandoned ☐ require proper sealing

2. Well and Wellhead information:

a. When was well installed? Year 2004 Month _____

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☒ Yes ☐ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☐ unlikely → Appears to be a pvc casing with grout in it, but it is warped,

e. Surface casing: ☐ Yes Diameter _____ ☒ No → and if it does go to 6m, it is not a proper seal

f. Well casing: Diameter 15 cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: 92ft ☐ measured (if possible) ☐ reported ☒ from log

h. Static water level below ground: 2.765m bc

☒ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☐ unknown other unknown

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☐ in pit ☒ pitless adaptor ☐ in a building
damaged

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail 0.55m above grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☒ Yes ☐ No
There is a stream (after rain) running around wellhead

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No

iv. Any evidence of rodents? Specify No

v. Does the well casing have a proper seal cap? ☐ Yes ☒ No

If no, describe condition damage prevents proper seal

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes likely ☐ No ☐ farther investigation required.

If yes is there treatment ☐ Yes ☒ No

Explain (filtration, disinfection etc…)

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No unlikely

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☒ electric submersible ☐ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: 2004 - likely By: _____

e. For submersible pump, depth of setting below surface 13.785 m bc

f. Drop pipe for submersible pump: ☐ steel ☒ plastic likely

g. Pump delivers water to: ☒ pressure tank ☐ elevated tank ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☒ No

j. Is there a water meter on the system? ☐ Yes ☒ No

k. Is the pump and piping protected from freezing? ☐ Yes ☒ No
but should be below frost line
If yes, describe: _____

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:
The wellhead was damaged - is currently open as the cap cannot properly seal the top of the casing

b. Recommendations: _____

PART B: EBA Site Inspection

Inspector: BART ALBISSER Date JUNE 21/05

WELL ID #	Owner	Location Description
4821	YTG	WATSON LAKE WEIGH SCALE

6. Water Treatment

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☐ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. Water Quality (observations):

a. Does the water stain plumbing? ☐ yes ☐ No ☐ slight ☑ severe

Type of stain: ☐ brown ☑ red ☐ black

b. Does the water contain sediment? ☐ Yes ☑ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☑ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☑ No

f. Is there a chemical analysis? ☐ Yes ☐ No ☐ adequate ☑ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☑ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☑ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☐ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☑ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes No Details:

Where is it located?
Comments: _____

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES NO
Comments:_____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES NO

Comments: _____

Are there other heat sources near the tank? YES NO
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO
Comments: _____

Overall Tank

What are the tank size and dimensions?

_____

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments: _____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

THE INSIDE INSTALLATION IS WELL DONE BOTH IN WORKMANSHIP & MATERIAL.

b. Recommendations:

INSTALL TREATMENT SYSTEM AS PER WATER QUALITY ANALYSIS. INSTALL UV BEYOND TREATMENT SYSTEM. INSTITUTE A BI-ANNUAL WELL & PIPING SYSTEM SHOCK CHLORINATION MAINTENANCE PROGRAM. MONITOR WATER QUALITY IN THE BUILDING ON A REGULAR BASIS.

NORTHWIND DRILLING AND PUMP SALES

BOX 284, WATSON LAKE, YUKON Y0A 1C0

PHONE/FAX: *867-536-2009*

E-MAIL: yknstone@yknet.yk.ca

Member of BCGWA & CGWA

Owner/operator; Shawn Stone

~ Commercial ~ Residential ~ Industrial ~ Well Recovery ~ Soil Sampling ~ Consultations~

Pump Test Log Sheet;

Saturday, August 21, 2004

Location; Watson lake weigh scale

Clients Name; Bergeron General Contracting

Job #; WL0402

Type and Model of pump used; 10So5-9 Grundfos

Pump depth for test: 49 feet

Start Time; 9:15 Am.

Static level at Start. 9 feet

Static Level Finish; 9 feet

Min. to recover to static; 5 min

Average GPM. Flow. 17 gallons per minute

Name of Pump Tester, Shawn Stone

Signature of pump Tester.

Draw Down Chart

Time	1 min.	2 min.	3 min.	4 min.	5 min.	6 min.	7 min.	8 min.	9 min.	10 min.	12 min.
WL ft.	11	13	22	25	26	28	31	32	35	35	37
Time	14 min.	16 min.	18 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.
WL ft.	38	38	38	38	38	38	38	38	38	38	38

Recovery Chart

Time	1 min.	2 min.	3 min.	4 min.	5 min.	6 min.	7 min.	8 min.	9 min.	10 min.	12 min.
WL ft.	39	32	30	29	22	18	16	14	12	11	9
Time	14 min.	16 min.	18 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.

Special notes, recommendations, or observations during test.

Water showed signs of surging and cloudy bursts effected flow rates. Water was cloudy and cleared enough for toilet usage. Recommend filter for system and no odour was present. Completed depth was recommended by contractor involved.

NORTHWIND DRILLING AND PUMP SALES

BOX 284, WATSON LAKE, YUKON Y0A 1C0

PHONE/FAX: *867-536-2009*

E-MAIL: yknstone@yknet.yk.ca

Member of BCGWA & CGWA

Owner/operator; Shawn Stone

~ Commercial ~ Residential ~ Industrial ~ Well Recovery ~ Soil Sampling ~ Consultations~

Friday, August 20, 2004

Scale well recommendation

Well is finished in an unstable state and could have an undetermined future. During the pull back process it was noted that the well conditions were changing and bottom measurements were inconsistent. At one point the material added was washed away overnight and changed the footage 9 feet overnight. I feel that there is a strong flow at 70 – 80 feet and this water is in motion causing erosion. When this layer was drilled into it was found to be a void of 6 feet and was assessed as being water bearing sand. This may cause problems in the future as it may erode into top surface layers with the assistance of a high static level. At this point Northwind would recommend that this well be sealed to prevent a development of a possible sinkhole. Relocation of the well would be viable as the surface water is still having an effect on the well head as it is still flowing to well head from the parking lot and I do not feel that the surface seal is at adequate depth to stop the contamination of the source. When the well head was landscaped it was noted during work that the water was running under the back fill and to well head. At present this well it is to be put on line. The well was tested at being 18 gallons per min with the drawdown depth of 32 feet. Water was cloudy and will require filtration to obtain adequate clarity to prevent damage to all auxiliaries. In closing the final recommendation would be to relocate well to a location that would have no influence from the parking lot (salts and road material that wash off trucks) and prepare a larger surface casing to continue through the unstable layers to prevent erosion or contamination of multiple layers of water bearing strata's. This well has had enough violation and is unable to provide accurate information.

Northwind Drilling And Pump Sales

Box 284 Watson Lake, Yukon Y0A 1C0

867-536-2009

BC Environment

Groundwater Section

Water Management Branch

IDENTIFICATION

Well I.D. No.: 401 **Plate #:**

Name: Bergeron (Last) Steve (First)

Address: 16 (Street No.) Alaska Hwy./ scale (Street Name)

Consultant Co.: Na

WELL LOCATION

BCGS:

Lot: 50 **Plan:** 27641 **District Lot:**

Location: Watson Lake, Yukon

Section: **Township:** **Range:**

PID: **Land Dist:** **Block:**

Legal Misc.:

GPS Lat: **GPS Long:**

Proposed Use: DOM **Type of Work:** NEW

Owner's Number of Well: 401 **Type of Rig:** CAB

DIMENSIONS

Diameter of Well 6 inches

Drilled: 92 ft. **Depth of completed well:** 92 ft.

Liner From: 0 ft. **To:** 0 ft. **Diameter:** in.

CASING DETAILS 1

Material: STL **Table Used:** SCHEDULE

Size: 6" **Diameter:** 6.625 **Wall:** 188

From: **To:** **Total Length:** 96

CASING DETAILS 2

Material: **Table Used:**

Size: **Diameter:** **Wall:**

From: **To:** **Total Length:**

PERFORATIONS

Perforations: ☐

Misc.:

SCREENS

Screens: ☐ **Material:** Stainless Steel

Manufacture: johnson

Type: **Wire:** V Wire

I.D.: inches **Slot Size 1:** 20 77 ft. to 81 ft.

I.D.: inches **Slot Size 2:** ft. to ft.

Total Length of Assembly Including Blanks and Riser: 4 ft.

GRAVEL PACKED

Gravel Packed: ☐ **Size of Gravel:**

Gravel placed from: ft. to ft.

SURFACE SEAL

Surface Seal: ☐ **Depth:**

Material Used in Seal: bentonite

Method of Sealing strata off: bentonite/

DATE

Started: 6/9/2004 **Completed:** 7/12/2004

Rig #: 01

Other Equipment: pump developement

DEPTH

Overburden: 92 ft.

Bedrock: ft.

Total: ft.

CREW

Driller: Don Stone

Helper: Shawn Stone

LITHOLOGY

Unit of Measurement: FT

FROM	TO	LITHOLOGY
0	27	surface gravels,sand,light grey
28	32	hard pan,gravels
33	44	grey sands,fine,silty
45	52	hardclays,sharp gravels,water bearing,perma frost,small flow, static of 9 feet
53	77	grey sands,silty water bearing,warm
78	82	clays,sharp gravels,wood, cold waterbearing with static of 26 feet
83	92	cemented gravels,clay,silts.

Development Total Hrs.: 16

Development Notes

All attempts at developement was found to have poor results.Grey silts cloudy.

GENERAL COMMENTS

Well was not completed to a producing status.

PRODUCTION DATA AT TIME OF DRILLING

Static Level: ft. **Tidal:** ☐

Rec'd Max. Pump Output: BAIL at at ft.

Rec'd Pump Setting: 86 ft. at 12 GPM from GrdLvl

Yield: 0.0 **Units:** DRY HOLE

DISCLAIMER: The Province disclaims all responsibility for the accuracy of this information. This information should not be used as a basis for making financial or any other commitments.

Northwind Drilling And Pump Sales

Box 284 Watson Lake, Yukon Y0A 1C0

867-536-2009

BC Environment

Groundwater Section

Water Management Branch

IDENTIFICATION

Well I.D. No.: 4012 **Plate #:**

Name: Bergeron (Last) Steve (First)

Address: 16 (Street No.) Alaska Hwy/scale (Street Name)

Consultant Co.: Na

WELL LOCATION

BCGS:

Lot: 50 **Plan:** 27641 **District Lot:**

Location: Watson Lake, Yukon

Section: **Township:** **Range:**

PID: **Land Dist:** **Block:**

Legal Misc.:

GPS Lat: n 60 03 00 **GPS Long:** w128.39.20

Proposed Use: DOM **Type of Work:** NEW

Owner's Number of Well: 401 **Type of Rig:** CAB

DIMENSIONS

Diameter of Well 6 inches

Drilled: 92 ft. **Depth of completed well:** 51 ft.

Liner From: ft. **To:** ft. **Diameter:** in.

CASING DETAILS 1

Material: STL **Table Used:** SCHEDULE

Size: 6" **Diameter:** 6.625 **Wall:**

From: 0 **To:** 51 **Total Length:** 51

CASING DETAILS 2

Material: **Table Used:**

Size: **Diameter:** **Wall:**

From: **To:** **Total Length:**

PERFORATIONS

Perforations: ☐

Misc.:

SCREENS

Screens: ☑ **Material:** Stainless Steel 19.2 - 21.6

Manufacture: Johnson

Type: continuos slot **Wire:** V Wire

I.D.: 5.5 inches **Slot Size 1:** 20 71 ft. to 67 ft.

I.D.: 5.5 inches **Slot Size 2:** 20 67 ft. to 63 ft.

Total Length of Assembly Including Blanks and Riser: 8 ft.

GRAVEL PACKED

Gravel Packed: ☐ **Size of Gravel:**

Gravel placed from: ft. to ft.

SURFACE SEAL

Surface Seal: ☑ **Depth:** 10

Material Used in Seal: Bentonite/

Method of Sealing strata off: oversized

DATE

Started: 8/5/2004 **Completed:** 8/10/2004

Rig #: 01

Other Equipment: pumping equipment

DEPTH

Overburden: 92 ft.

Bedrock: ft.

Total: 92 ft.

CREW

Driller: Shawn Stone

Helper: Roger

LITHOLOGY

Unit of Measurement: FT

FROM	TO	LITHOLOGY
0	32	hard pan clays,overburden.permafrost at 32 feet
33	51	shard gravels with some sand ending in clay silts with large water flow.

Development Total Hrs.: 16

Development Notes

Cloudy, warm flow intrusion.two destictive static levels.with permafrost.

GENERAL COMMENTS

this work was to find an adequit suppy in surface layer of water.

PRODUCTION DATA AT TIME OF DRILLING

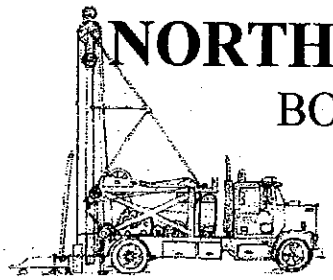
Static Level: 13 ft. **Tidal:** ☐

Rec'd Max. Pump Output: PUMP at 18 GPM at 45 ft.

Rec'd Pump Setting: 45 ft. at 18 GPM from Casing

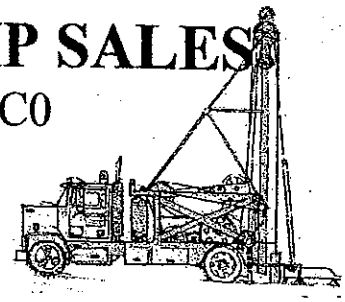
Yield: 4320.2 **Units:** Gallons per Minute (U.S./Imperial)

DISCLAIMER: The Province disclaims all responsibility for the accuracy of this information. This information should not be used as a basis for making financial or any other commitments.



NORTHWIND DRILLING AND PUMP SALES

BOX 284, WATSON LAKE, YUKON Y0A 1C0
PHONE/FAX: *867-536-2009*
E-MAIL: yknstone@yknet.yk.ca
Member of BCGWA & CGWA
Owner/operator; Shawn Stone



~ Commercial ~ Residential ~ Industrial ~ Well Recovery ~ Soil Sampling ~ Consultations~

Sunday, August 22, 2004

ESTIMATE FOR PUMP INSTALLATION AT SCALE #3

1	10SO5- 9 Grundfos ½ horse 230 volt pump		$808.16
1	Control Box		$105.00
1	Pitless adapter		$72.85
1	WX203 Tank and tee package		$689.00
1	Torque arrestor		$50.00
Per foot of horizontal line installation			$15.50
Per foot of vertical line			$8.50
Approximate backhoe time		7 hours	$500.00
Approximate pump labour		12 hours	$780.00

This is based on a line length of 150 feet horizontal and 40 feet vertical.

Sub total	$5670.00
G.S.T.	$396.90
Total estimate	$6066.91

Estimate valid for 30 days. Materials will be charged out as actual field footage. Electrician required to hook up to control box also required. Extra materials charged out at cost plus. Horizontal line cost includes Reychem heat trace, wire, service line, insulation, and poly wrap.

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	8720
Jurisdiction	Yukon
Community	Watson Lake
Address	
Highway	
Milepost	
Feature	Watson Lake
Location and Cause	weigh station - overfill of tank truck - tank leaked
Latitude	60.049775
Longitude	-128.648933
Incident Date	10/20/1987 11:05:00 AM
Lead Agency	Environment Canada - Environmental Protection Service
Other Agency	
Company(s)	Teslin Lake Motors (Walter Duncan)
Amount	9
Units	Litres
Quantity	Estimate
Release Description	Leaked
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Diesel
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	min hazard to health and env - no surface water affected - weigh stn well approx 50m away - advised to contain spill with absorbant and repair leak

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9627
Jurisdiction	Yukon
Community	Watson Lake
Address	
Highway	
Milepost	
Feature	Watson Lake
Location and Cause	200 ft W of Watson Lake Weight Station - product leaking from transport truck - truck carrying load of barrels
Latitude	60.050235
Longitude	-128.649861
Incident Date	5/27/1996 12:20:00 PM
Lead Agency	Yukon Government - Dangerous Goods
Other Agency	Municipality - identified in Community
Company(s)	Northern Industrial Carriers Ltd
Amount	115
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	7
Concentration Unit	%
Phase	Liquid
Major Contaminant	Methanol
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	product from one barrel spilt - soaked up with absorbant and recovered - clean-up complete



Photo 0291: 4821 Weigh scale office (back right, as seen from wellhead), drainage stream (centre), and septic field (back left)



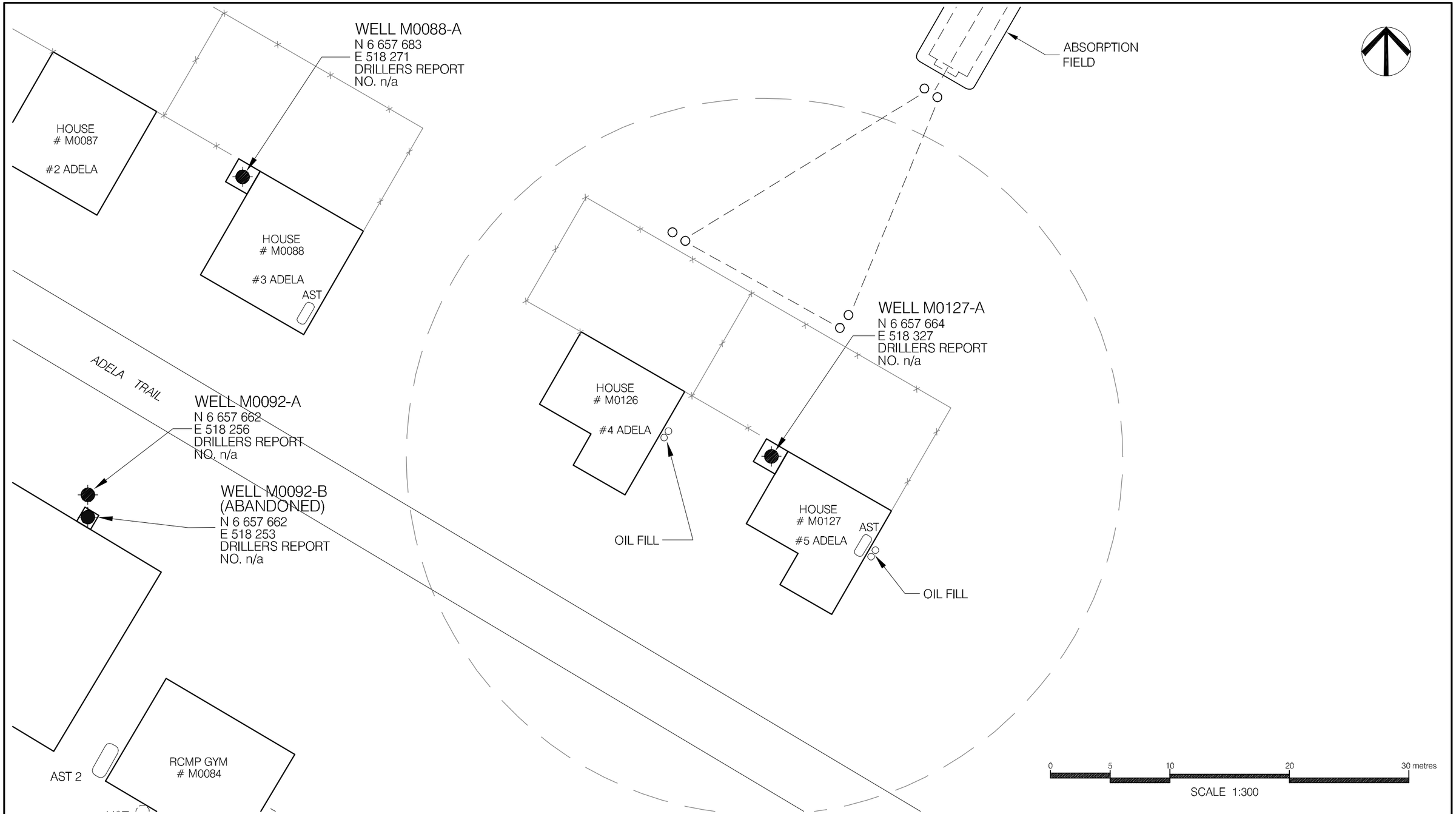
Photo 0290: 4821 Wellhead – pitless adapter



Photo 0288: 4821 Wellhead – notice damage due to impact with truck



Photo 0023: 4821 Pressure tank and controls



NOTES:

1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

WATSON LAKE RCMP HOUSE
BUILDING # M0127
SITE LOCATION DIAGRAM
WELL ID: M0127-A

REVISION ISSUE: 0

FIGURE No.: M0127-A

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LEGEND



PUMP



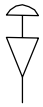
PRESSURE GAUGE



GATE VALVE



CHECK VALVE



SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



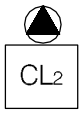
FLOW METER



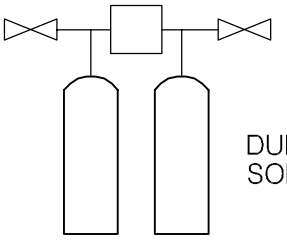
WATER FILTER
(CARTRIDGE TYPE)



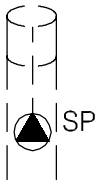
PRESSURE TANK



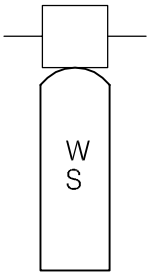
CHLORINE RESERVOIR AND
INJECTION PUMP



DUPLEX WATER
SOFTENER



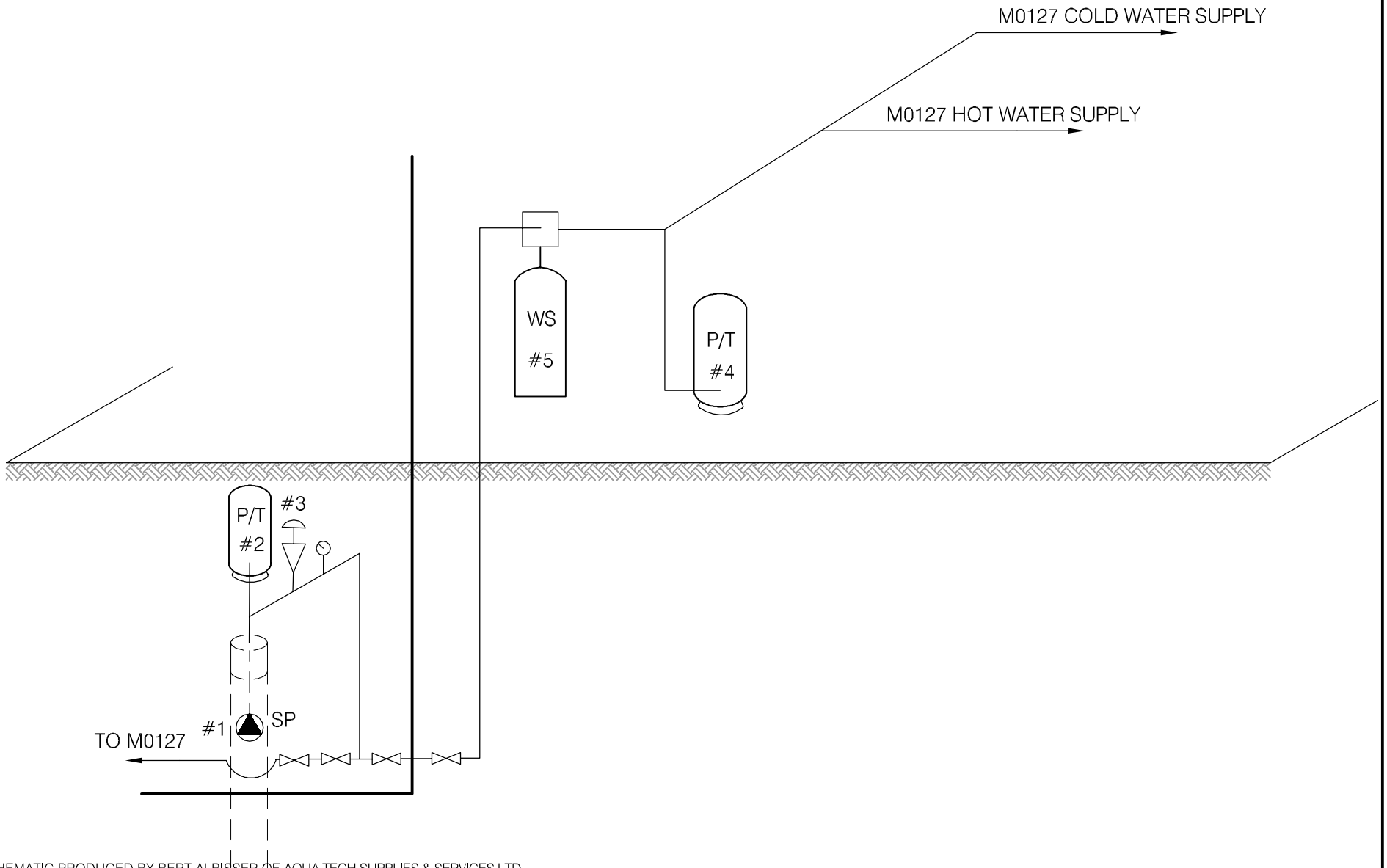
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

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SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: M0127 WATSON LAKE RCMP HOUSING	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE M0127-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\Schematics\1260002 RCMP_M0127 Schematic.dwg, 7/26/2005 1:49:00 PM, Adobe PDF

TABLE M0127- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
M0126	R.C.M.P. Housing	2	May -05 to Jun-05	no	0/2	no	23-Jun-05	no
M0127	R.C.M.P. Housing	2	May -05 to Jun-05	no	0/2	no	23-Jun-05	no

Table M0127-2: Water Quality Results

Location/ Resident	Watson Lake		GCDWQ Criteria		
Address	4 and 5 Adela Trail				
Treatment	Water Softener				
Disinfection	No				
Source of Water	On-Site Well				
Purpose of Sampling	Baseline	Additional Sampling			
Sample Location	M0126	M0127			
Date Sampled	22-Jun-05	22-Jun-05	**Lower Limit**	**Upper Limit**	
Physical Tests *(ALS)*			**AO**	**MAC**	**AO**
Colour (CU)	<5.0				15
Conductivity (uS/cm)	590				
Total Dissolved Solids	350				500
Hardness CaCO3	312		AO >200 = poor, > 500 unacceptable[A]		
pH	7.95		6.5		8.5
Turbidity (NTU)	0.43			1	5
UV Absorbance		0.0120			
Dissolved Anions *(ALS)*					
Alkalinity-Total CaCO3	319				
Chloride Cl	16.3				250
Fluoride F	0.031			1.5	
Sulphate SO4	5.07				
Nitrate Nitrogen N	1.01			10	
Nitrite Nitrogen N	<0.10			1	
Total Metals *(ALS)*					
Aluminum T-Al	<0.010				
Antimony T-Sb	<0.00050			0.006	
Arsenic T-As	0.00062			0.025	
Barium T-Ba	0.417			1	
Boron T-B	<0.10			5	
Cadmium T-Cd	<0.00020			0.005	
Calcium T-Ca	99.8				
Chromium T-Cr	<0.0020			0.05	
Copper T-Cu	0.116			1	
Iron T-Fe	<0.030				0.3
Lead T-Pb	0.0014			0.01	
Magnesium T-Mg	15.3				
Manganese T-Mn	0.0031				0.05
Mercury T-Hg	<0.00020			0.001	
Potassium T-K	1.26				
Selenium T-Se	<0.0010			0.01	
Sodium T-Na	7.0				200
Uranium T-U	0.00052			0.02	
Zinc T-Zn	<0.050				5
Organic Parameters					
Tannin and Lignin		0.16			
Total Organic Carbon C		0.93			
Field Chemistry (EBA)					
pH		7.69	6.5		8.5
TDS (ppm)		292			500
EC (uS/cm)		585			
Temperature (°C)		6.4			

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU) Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

Table M0127-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
M0127	**R.C.M.P. Housing**	**Watson Lake**	6657664	518327	714

Well Details							
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Well Capacity - Tested, or Reported by User**	**Static Water Level Below Ground (m-btwc)**
150	2001	No	16.7	Unlikely	11.0		6.895

Potential Contaminant Sources					
M0086, M0087, M0088 septic field at 65 m	Located inside basement	Greater than 60 m	Basement AST's	10 m	UST at 60 m
M0092 septic field at 45 m			AST 1	95 m	4 other wells on property at approximately 100 m, 70 m, 70m (abandoned), and 60 m
M0126 and M00127 septic at 35 m			AST 2	65 m	

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
1.75 below grade	Split seal gasket cap		Unlikely	Ground above wellhead enclosure is relatively flat	Well services both M0127 and M0126 RCMP residences.

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: ~~[illegible]~~ Ryan Martin, Luke Lebel Date JUNE 22/05

WELL ID #	Owner	Location Description
~~M0088~~ M0127	~~YTG~~ RCMP	RCMP WATSON LAKE RESIDENCE

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Watson Lake

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
RCMP complex - 5 Adela Trail

c. GPS location: N 6657664 E 518327 elv 714m ± 8m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
4+5 Adela trail

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Located inside enclosure off from basement of residence

h. Distance from well to building _____

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: ~20m

k. Well location relative to field: ☐ upslope ☒ downslope ☐ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☐ Yes ☐ No
All RCMP complex septic systems @ ~20m, ~45m, and ~65m

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☒ Yes ☐ No located off from basement of residence
Entrance by animals? ☐ Yes ☒ No Access is possible

p. Is well site subject to flooding? ☐ Yes ☒ No

q. Is the well site well drained? ☒ Yes ☐ No

r. Is there a buried fuel tank on the property? ☒ Yes ☐ No

If yes, is it ☒ in use ☐ abandoned

Is the location known? ☒ Yes ☐ No
Distance from the well to known buried tank ~60m

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe ASTs in basement @ ~10m

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: AST 1 ; Distance from well to Potential Source 1: ~95m
Potential Source 2: AST 2 ; Distance from well to Potential Source 2: ~65m
Potential Source 3: _____ ; Distance from well to Potential Source 3: _____
Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

t. Are there other wells on this property? ☒ Yes ☐ No

How many? 4 ☒ in use(3) ☒ abandoned(0) ☒ require proper sealing

2. Well and Wellhead information:

a. When was well installed? Year unknown Month _____

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☐ Yes ☒ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☒ unlikely

e. Surface casing: ☐ Yes Diameter _____ ☒ No

f. Well casing: Diameter 15cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: 14.960m likely bc ☒ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: 6.895m bc

☒ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☐ unknown other unknown

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☒ in pit ☐ pitless adaptor ☒ in a building
in below grade enclosure off from basement of residence

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail ~1.75m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No
Some rusting is present

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No
However, likely in walls of enclosure

iv. Any evidence of rodents? Specify No, but access is possible

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition split gasket cap

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☒ Yes ☐ No

Explain (filtration, disinfection etc...) Softener for both residences

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment ☐ unknown
likely

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No
unlikely

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☒ electric submersible ☐ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: 2001 By: _____

e. For submersible pump, depth of setting below surface n.o4o m bc -likely

f. Drop pipe for submersible pump: ☐ steel ☒ plastic

g. Pump delivers water to: ☒ pressure tank ☐ elevated tank ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☒ No

j. Is there a water meter on the system? ☐ Yes ☒ No

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: located off from heated basement - enclosure insulated

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

b. Recommendations: _____

PART B: EBA Site Inspection

Inspector: BART ALBISSER Date JUNE 22/05

WELL ID #	Owner	Location Description
M00127	~~YFG.~~ RCMP	RCMP WATSON LAKE

6. **Water Treatment**

a. Is well water treated? ☑ Yes ☐ No; Type of treatment: WATER SOFTNER.

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☑ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. **Water Quality (observations):**

a. Does the water stain plumbing? ☐ yes ☐ No ☑ slight ☐ severe

Type of stain: ☐ brown ☐ red ☐ black

b. Does the water contain sediment? ☐ Yes ☑ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☑ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No ?

f. Is there a chemical analysis? ☐ Yes ☐ No ☐ adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☑ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☐ No ☑ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☑ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☐ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes No Details: PRESSURE TANK

Where is it located?
Comments: BASEMENT

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES NO
Comments: _____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES NO

Comments: _____

Are there other heat sources near the tank? YES NO
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO
Comments: _____

Overall Tank

What are the tank size and dimensions?

_____

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments: _____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

WELL CASING TO BE EXTENDED AS REQUIRED. INSTALL PITLESS ADAPTER

THIS IS A GOOD INSTALLATION.

b. Recommendations:

WELL CASING TO BE EXTENDED TO PROPER HEIGHT ABOVE GROUND. INSTALL PITLESS ADAPTER. INSTITUTE A BI ANNUAL WELL MAINTENANCE PROGRAM OF STOCK CHLORINATION OF WELL & PIPING. INSTALL APPROPRIATE UV SYSTEM. WATER SOFTNER MUST BE PROPERLY MAINTAINED.



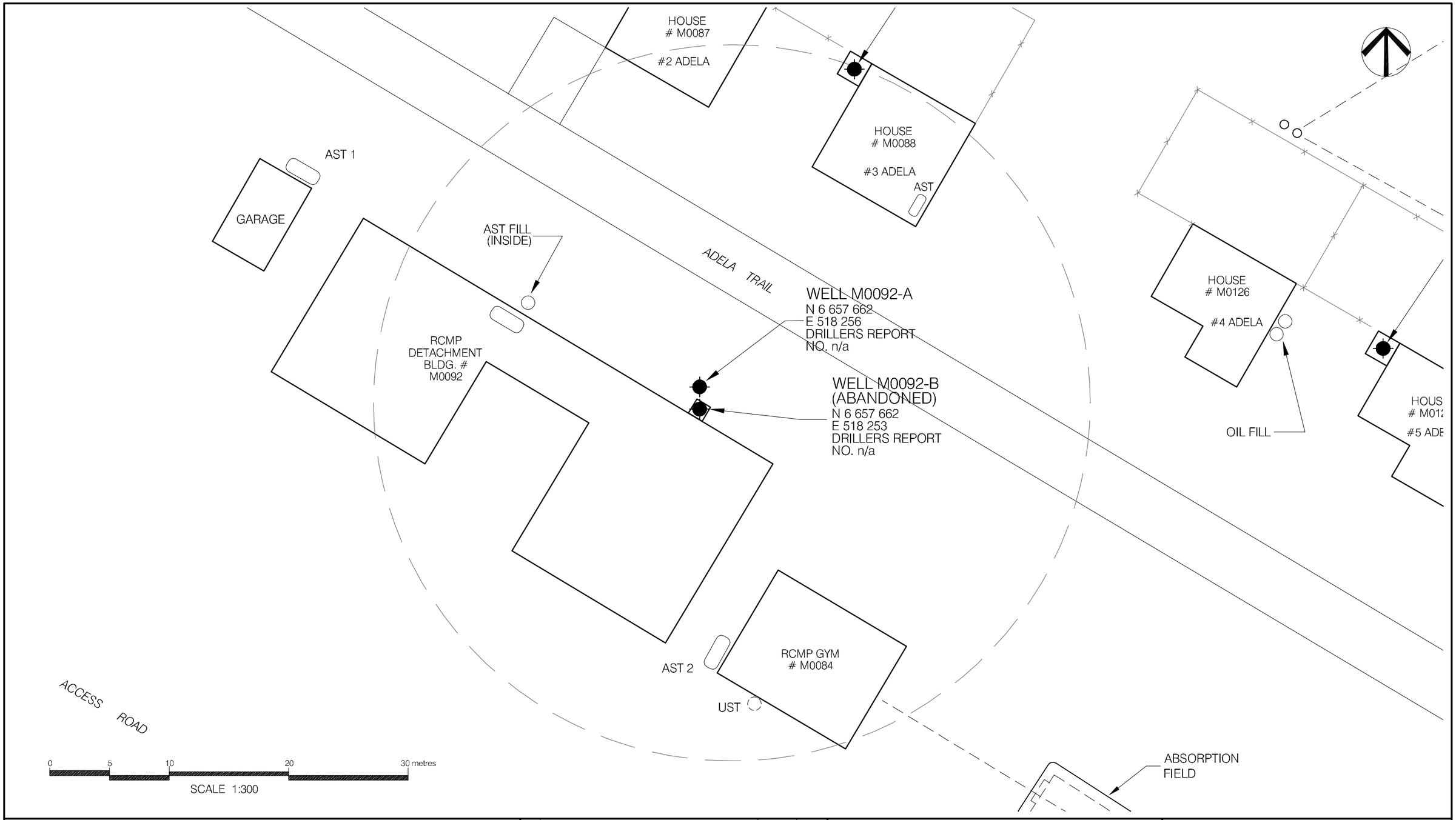
Photo 0040: M0127 Wellhead (right) in wellhead enclosure off from basement of residence, and pressure tank (left)



Photo 0038: M0127 Pressure tank



Photo 0039: M0127 Water softener



NOTES:

1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

WATSON LAKE RCMP HOUSE
BUILDING # M0092
SITE LOCATION DIAGRAM
WELL ID: M0092-A

REVISION ISSUE: 0

FIGURE No.: M0092-A

Z:\02\01Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\1260002 Watson Lake RCMP_M0092_M0088.dwg, 7/20/2005 5:36:30 PM, Adobe PDF

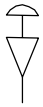
LEGEND


PUMP


PRESSURE GAUGE


GATE VALVE


CHECK VALVE


SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



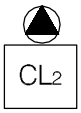
FLOW METER



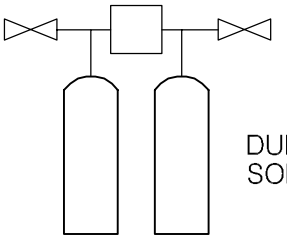
WATER FILTER
(CARTRIDGE TYPE)

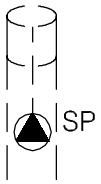


PRESSURE TANK

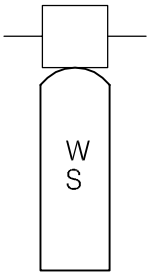


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER



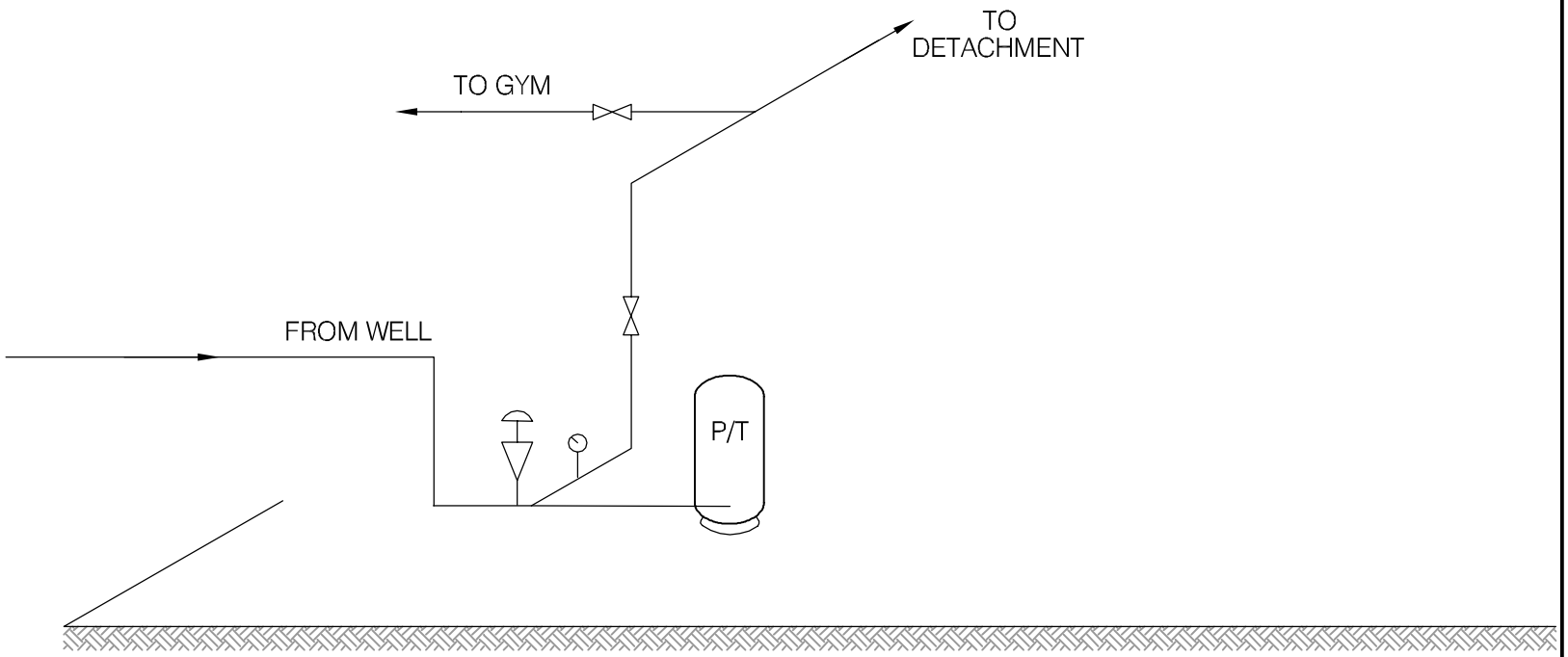
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\1260002003 Eastern Schematic_LEGEND.dwg, 4/11/2006 10:31:08 AM, Adobe PDF, jbuyck



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: M0092 WATSON LAKE RCMP DETACHMENT	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE M0092-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\Schematics\1260002 RCMP Detach_M0092 Schematic.dwg, 7/20/2005 5:28:47 PM, Adobe PDF

TABLE M0092- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
M0092	R.C.M.P Detachment	2	May -05 to Jun-05	no	0/2	no	23-Jun-05	no

Table M0092-2: Water Quality Results

Location/ Resident	Watson Lake		GCDWQ Criteria		
Address					
Treatment	Water Softener				
Disinfection	No				
Source of Water	On-Site Well				
Purpose of Sampling	Baseline	Additional Sampling			
Sample Location					
Date Sampled	21-Jun-05	21-Jun-05	**Lower Limit**	**Upper Limit**	
Physical Tests *(ALS)*			**AO**	**MAC**	**AO**
Colour (CU)	<5.0				15
Conductivity (uS/cm)	386				
Total Dissolved Solids	228				500
Hardness CaCO3	187		AO >200 = poor, > 500 unacceptable[A]		
pH	7.94		6.5		8.5
Turbidity (NTU)	0.37			1	5
Dissolved Anions *(ALS)*					
Alkalinity-Total CaCO3	206				
Chloride Cl	14.2				250
Fluoride F	0.022			1.5	
Sulphate SO4	3.21				
Nitrate Nitrogen N	0.19			10	
Nitrite Nitrogen N	<0.10			1	
Total Metals *(ALS)*					
Aluminum T-Al	<0.010				
Antimony T-Sb	<0.00050			0.006	
Arsenic T-As	0.00040			0.025	
Barium T-Ba	0.194			1	
Boron T-B	<0.10			5	
Cadmium T-Cd	<0.00020			0.005	
Calcium T-Ca	63.7				
Chromium T-Cr	<0.0020			0.05	
Copper T-Cu	0.0386			1	
Iron T-Fe	<0.030				0.3
Lead T-Pb	<0.0010			0.01	
Magnesium T-Mg	6.70				
Manganese T-Mn	<0.0020				0.05
Mercury T-Hg	<0.00020			0.001	
Potassium T-K	1.25				
Selenium T-Se	<0.0010			0.01	
Sodium T-Na	9.4				200
Uranium T-U	0.00026			0.02	
Zinc T-Zn	<0.050				5
Field Chemistry (EBA)					
pH		7.88	6.5		8.5
TDS (ppm)		192			500
EC (uS/cm)		384			
Temperature (°C)		7.0			

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU) Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

eba

Table M0092A-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
M0092-A	**R.C.M.P. Detachment**	**Watson Lake**	665766	518256	694

Well Details							
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Well Capacity - Tested, or Reported by User**	**Static Water Level Below Ground (m-btwc)**
150	1992	Yes	15.9	None reported		25 gpm at time of drilling	8.0 m below grade at time of drilling

Potential Contaminant Sources					
M0086, M0087, M0088 septic field	2	Greater than 60 m	AST 1	27 m	UST at 25 m
M0092 septic field at 35 m			AST 2	17 m	4 other wells on property at approximately 85 m, 25 m, 1m (abandonned), and 70 m
M0126 and M00127 septic at 55 m					

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
1.15 below grade	Split seal gasket cap		Unlikely	Slight slope away from well	Well services both the M0092 RCMP detachment and the M0084 RCMP gym

Table M0092B-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
M0092-B	**R.C.M.P. Detachment**	**Watson Lake**	6657662	518253	693

Well Details							
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Well Capacity - Tested, or Reported by User**	**Static Water Level Below Ground (m-btwc)**
100		No		Unlikely		Well no longer in use	9.16

Potential Contaminant Sources					
M0086, M0087, M0088 septic field at 40 m	Located inside basement	Greater than 60 m	AST 1	27 m	UST at 25 m
M0092 septic field at 35 m			AST 2	17 m	4 other wells on property at approximately 85 m, 25 m, 1m (abandonned), and 70 m
M0126 and M00127 septic at 55 m					

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
Approximately 1.6 m below grade	No		Unlikely	Slight slope away from well	Well is no longer in use.

EBA Engineering Consultants Ltd.

Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date June 21, 2005

WELL ID #	Owner	Location Description
M0092-A	RCMP	watson Lake RCMP Detachement

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
watson Lake

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
watson Lake RCMP Complex

c. GPS location: N 6657662 E 518256 elv 694 m ± 7m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☐ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many
Services detachement (M0092) and Gym (M0094)

☐ 5 or more delivery sites on a trucked distribution system? If so how many

g. Nearest building, specify RCMP Detachement

h. Distance from well to building ~2m

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: ~35m

k. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☒ Yes ☐ No
All RCMP complex septic systems @ ~35m, ~40m, and ~55m

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☐ Yes ☒ No Entrance by animals? ☒ Yes ☐ No
unfastened lid over pit

p. Is well site subject to flooding? ☐ Yes ☒ No

q. Is the well site well drained? ☒ Yes ☐ No

r. Is there a buried fuel tank on the property? ☐ Yes ☐ No

If yes, is it ☒ in use ☐ abandoned

Is the location known? ☒ Yes ☐ No
Distance from the well to known buried tank ~25m

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: AST 1 ; Distance from well to Potential Source 1: 27m
Potential Source 2: AST 2 ; Distance from well to Potential Source 2: 17m
Potential Source 3: _____ ; Distance from well to Potential Source 3: _____
Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

t. Are there other wells on this property? ☒ Yes ☐ No

How many? 4 ☒ in use (9) ☒ abandoned (1) ☒ require proper sealing N6657662 E518253

2. Well and Wellhead information:

a. When was well installed? Year 1992 Month June

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☒ Yes ☐ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☐ unlikely

e. Surface casing: ☐ Yes Diameter _____ ☒ No

f. Well casing: Diameter 15cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: 52ft ☐ measured (if possible) ☐ reported ☒ from log

h. Static water level below ground: 26ft -

☐ measured (if possible) ☐ reported ☒ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☒ with a well screen

☐ with slotted pipe ☐ unknown other _____

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length 5 ft slot size(s) 40 Thou slot
Location of screen: from 47 ft to 52 ft from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☒ in pit ☐ pitless adaptor ☐ in a building
@ 110 cm fibreglass culvert

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail 115cm below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☒ Yes ☐ No

iv. Any evidence of rodents? Specify no

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition split gasket cap

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☐ Yes ☒ No

Explain (filtration, disinfection etc…)

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☒ electric submersible ☐ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☒ plastic likely

g. Pump delivers water to: ☒ pressure tank ☐ elevated tank ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☒ No

j. Is there a water meter on the system? ☐ Yes ☒ No

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: _____

l. Comments on pump installation: _____

_____

6. Conclusions

a. Comments on overall installation:

_____

_____

_____

_____

_____

_____

_____

b.Recommendations: _____

_____

_____

_____

_____

_____

_____

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SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin Date June 21, 2005

WELL ID #	Owner	Location Description
M0092-B	RCMP	Watson Lake RCMP Detachment - Abandonned well

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Watson Lake

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Watson Lake RCMP Complex

c. GPS location: N6657662 E518253

d Is there electric power? ☐ Yes ☒ No

e Is there outside water access? ☐ Yes ☒ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Abandonned

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Located in basement of RCMP Detachment

h. Distance from well to building _____

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: ~35m

k. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☐ Yes ☐ No
An RCMP complex septic systems @ ~35m, ~40m, and ~55m

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☒ Yes ☐ No Entrance by animals? ☒ Yes ☐ No
inside RCMP detachment

p. Is well site subject to flooding? ☐ Yes ☒ No

q. Is the well site well drained? ☒ Yes ☐ No

r. Is there a buried fuel tank on the property? ☒ Yes ☐ No

If yes, is it ☒ in use ☐ abandoned

Is the location known? ☒ Yes ☐ No
Distance from the well to known buried tank ~25m

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: AST 1 ; Distance from well to Potential Source 1: 27m
Potential Source 2: AST 2 ; Distance from well to Potential Source 2: 17m
Potential Source 3: _____ ; Distance from well to Potential Source 3: _____
Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

t. Are there other wells on this property? ☒ Yes ☐ No

How many? M0092-A ☐ in use ☐ abandoned ☐ require proper sealing

N6657662
E518256

2. Well and Wellhead information:

a. When was well installed? Year unknown Month _____

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☐ Yes ☒ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☐ unlikely

e. Surface casing: ☐ Yes Diameter _____ ☒ No

f. Well casing: Diameter 10cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: unknown ☐ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: 9.160m

☒ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☐ unknown other unknown

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☒ in a building
off from basement of detachment

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail ~1.6 m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No

iv. Any evidence of rodents? Specify No

v. Does the well casing have a proper seal cap? ☐ Yes ☒ No

If no, describe condition No, no seal cap.

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☐ Yes ☒ No

Explain (filtration, disinfection etc…)

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment likely ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No

5. Pump Installation:

a. Is the well equipped with a pump? ☐ yes ☒ No

b. Type of pump: ☐ hand ☐ electric submersible ☐ jet n/a

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: n/a By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☒ plastic – disconnected

g. Pump delivers water to: ☐ pressure tank ☐ elevated tank ☐ other
n/a - Does not produce water

h. Are there automatic pump controls: ☐ Yes ☒ No
n/a

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☐ No
n/a

j. Is there a water meter on the system? ☐ Yes ☐ No
n/a

k. Is the pump and piping protected from freezing? ☐ Yes ☐ No
n/a

If yes, describe: _____

l. Comments on pump installation: well is abandonned

6. Conclusions

a. Comments on overall installation:

b.Recommendations:

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JUNE 21/05

WELL ID #	Owner	Location Description
M0092	~~YG~~ RCMP	RCMP DETACHMENT WATSON LAKE.

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☐ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____(location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. **Water Quality (observations):**

a. Does the water stain plumbing? ☐ yes ☑ No ☐ slight ☐ severe

Type of stain: ☐ brown ☐ red ☐ black

b. Does the water contain sediment? ☐ Yes ☑ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☑ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No ?

f. Is there a chemical analysis? ☐ Yes ☐ No ☐ adequate ☐ incomplete ?

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☑ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☑ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☑ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☑ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes No Details: PRESSURE TANK.

Where is it located?
Comments: _____

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES NO
Comments: _____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES NO

Comments: _____

Are there other heat sources near the tank? YES NO
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO
Comments: _____

Overall Tank

What are the tank size and dimensions?

_____

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments: _____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

REASONABLE INSTALLATION PIPING FROM WELL IS A BIT SLOPPY.
INTERIOR PIPING IS ACCORDING TO CODE.

b. Recommendations:

INSTALL TREATMENT IF NECESSARY TO SUIT UV INSTALLATION.
INSTITUTE BI-ANNUAL WATER WELL & PIPE SYSTEM SHOCK CHLORINATION.

Field Report 201020051

MIDNIGHT SUN DRILLING CO. LTD. WHITEHORSE Y.T.

13 MacDONALD ROAD
WHITEHORSE, YUKON
Y1A 4L1

PHONE (403) 633-3070
TELEX 036-8496

Started. June 6 19 92

Completed. June 9 19 92

NAME AND ADDRESS OF CLIENT	DESCRIPTION OF WORK	LOCATION OF WORK
Nason Contracting	W / W	RCMP Project
		Watson Lake.
	92-1A-15	

FORMATION LOG FROM	TO	FORMATION	DESCRIPTION OF WORK	TIME DATE	FROM	TO	HOURS
			MOVE				
			Loading	June 6	11:00	2:00	3
			Loading	June 8	8:00	9:00	1
			Travel	"	9:00	5:00	8
			move on set up	"	5:00	7:00	2
0	52	Gr.	sand odd cob. some silt	June 9	7:30	10:00	2.5
			set screen	"	10:00	10:30	0.5
			Develop	"	10:30	1:00	2.5
			Move off	"	1:00	2:00	1
			Travel to Whse	"	3:00	11:00	8

crd. of Casing & Pipe

Size	Type	Size	Type
6"			
Feet	Inch	Feet	Inch
51'		6'	
		21'	
		21'	

Remarks: 25 GPM
1- odex shoe
40 slot screen
2' riser Pipe
K Packer
5 3/8" bit Pin

Static Level		Total Rig Time	hrs.
Ground Level	26'	Total Standby	hrs.
Top Of Casing		Drilling Mud	sacks

SIGNATURES

MIDNIGHT SUN..... CLIENT LAURIE A NASON

TITLE..... TITLE PROJECT MANAGER

Stillow Printers

Midnight Sun Drilling Co. Ltd.

DATE Nov 2/92

PAGE NO

PROJECT

RCMP WELL WATSON LAKE

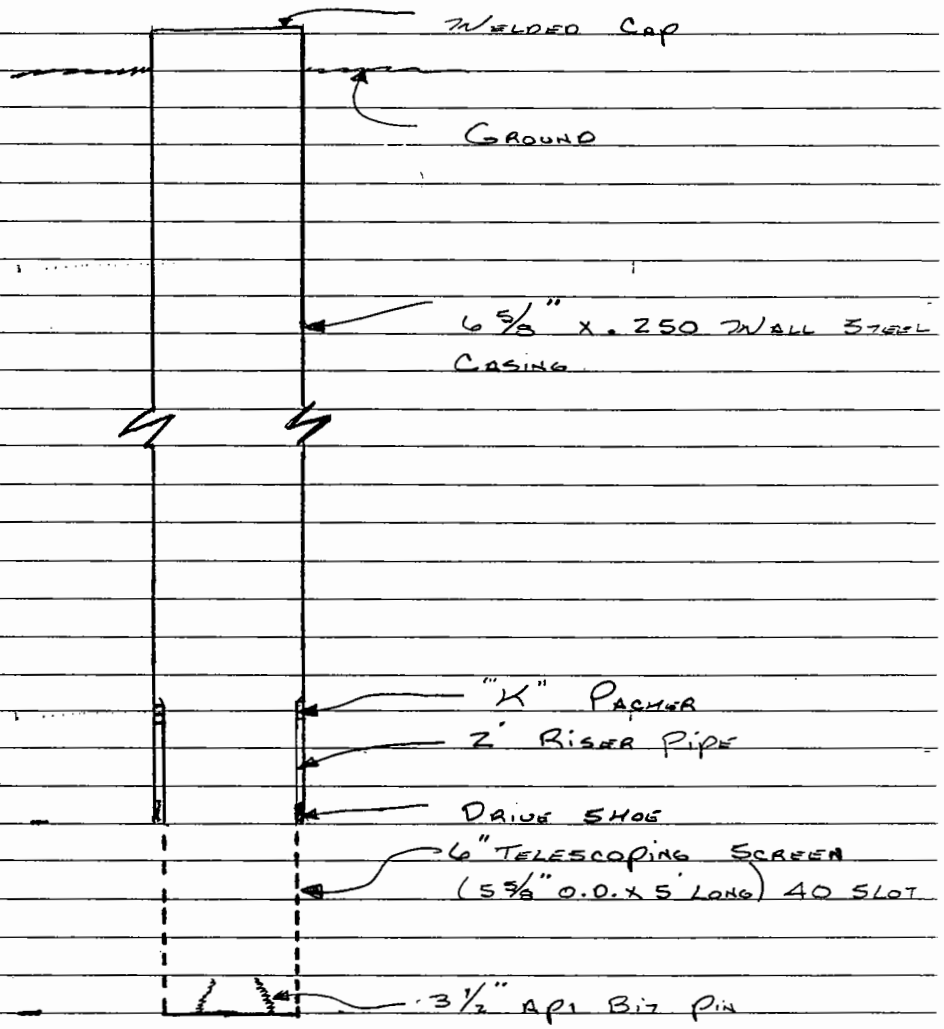




Photo 0281: M0092-A Wellhead in pit



Photo 0282: M0092 Above ground fuel storage tank



Photo 0285: M0084 (RCMP gym, left) Above ground fuel storage tank (centre)



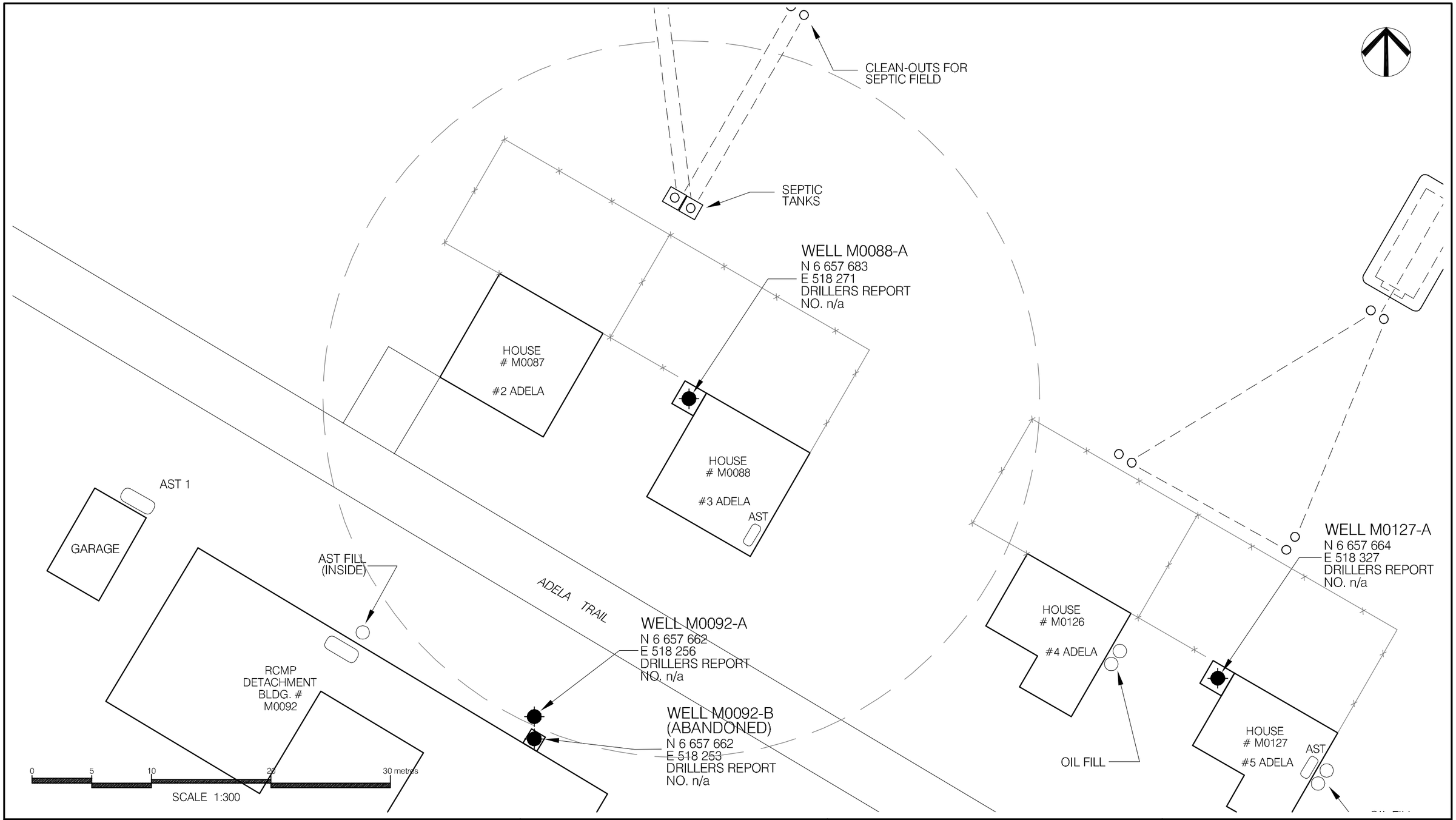
Photo 0283: M0092 Potential underground fuel storage tank (centre), RCMP detachment building (left)



Photo 0022: M0092 Pressure tank



Photo 0277: M0092-B Wellhead in enclosure off from basement of RCMP detachment



NOTES:
1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DD/MM/YY	APPROVED
0	ISSUED FOR CLIENT REVIEW	XXX	

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

WATSON LAKE RCMP HOUSE
BUILDING # M0088
SITE LOCATION DIAGRAM
WELL ID: M0088-A

REVISION ISSUE: 0

FIGURE No.: M0088-A

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\1260002 Watson Lake RCMP_M0092_M0088.dwg, 7/20/2005 5:37:17 PM, Adobe PDF

LEGEND



PUMP



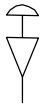
PRESSURE GAUGE



GATE VALVE



CHECK VALVE



SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



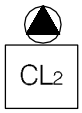
FLOW METER



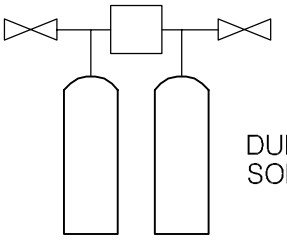
WATER FILTER
(CARTRIDGE TYPE)



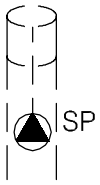
PRESSURE TANK



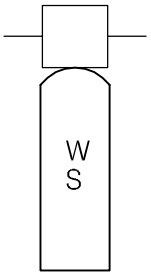
CHLORINE RESERVOIR AND
INJECTION PUMP



DUPLEX WATER
SOFTENER



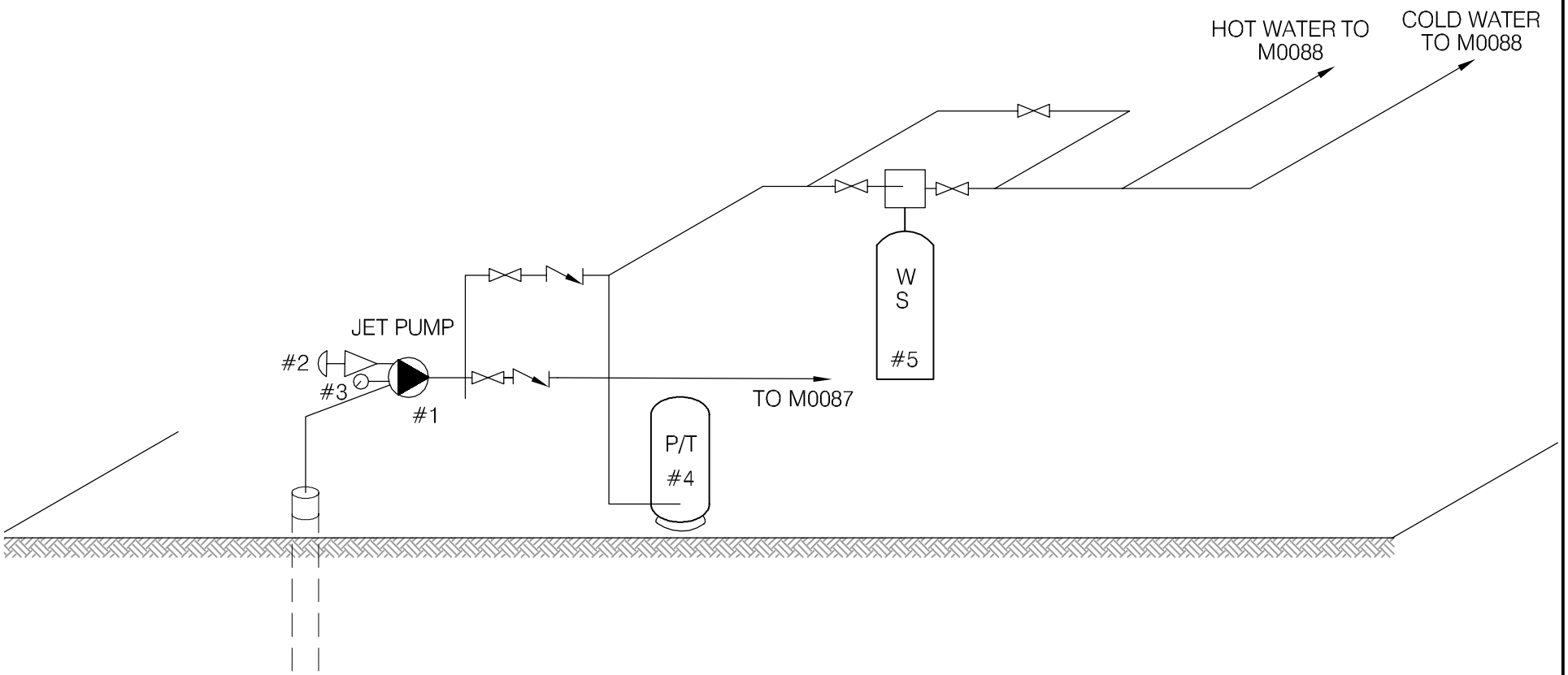
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

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SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: M0088 WATSON LAKE RCMP RESIDENCE	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE M0088-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\watson\Schematics\1260002 RCMP_M0088 Schematic.dwg, 7/20/2005 5:16:54 PM, Adobe PDF

TABLE M0088- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
M0087	R.C.M.P. Housing	2	May -05 to Jun-05	no	0/2	no	23-Jun-05	no
M0088	R.C.M.P. Housing	1	23-Jun-05	no	0/1	no	23-Jun-05	no

Table M0088-2: Water Quality Results

Location/ Resident	Watson Lake		GCDWQ Criteria		
Address	2 and 3 Adela Trail				
Treatment	Water Softener				
Disinfection	No				
Source of Water	On-Site Well				
Purpose of Sampling	Baseline	Additional Sampling			
Sample Location	M0087	M0088			
Date Sampled	22-Jun-05	22-Jun-05	**Lower Limit**	**Upper Limit**	
Physical Tests *(ALS)*			**AO**	**MAC**	**AO**
Colour (CU)	<5.0				15
Conductivity (uS/cm)	581				
Total Dissolved Solids	362				500
Hardness CaCO3	<0.66		AO >200 = poor, > 500 unacceptable[A]		
pH	7.93		6.5		8.5
Turbidity (NTU)	0.25			1	5
UV Absorbance		0.0240			
Dissolved Anions *(ALS)*					
Alkalinity-Total CaCO3	288				
Chloride Cl	23.1				250
Fluoride F	0.024			1.5	
Sulphate SO4	8.18				
Nitrate Nitrogen N	1.57			10	
Nitrite Nitrogen N	<0.10			1	
Total Metals *(ALS)*					
Aluminum T-Al	<0.010				
Antimony T-Sb	<0.00050			0.006	
Arsenic T-As	0.00066			0.025	
Barium T-Ba	<0.020			1	
Boron T-B	<0.10			5	
Cadmium T-Cd	<0.00020			0.005	
Calcium T-Ca	0.22				
Chromium T-Cr	<0.0020			0.05	
Copper T-Cu	0.0095			1	
Iron T-Fe	<0.030				0.3
Lead T-Pb	<0.0010			0.01	
Magnesium T-Mg	<0.10				
Manganese T-Mn	0.0101				0.05
Mercury T-Hg	<0.00020			0.001	
Potassium T-K	0.48				
Selenium T-Se	<0.0010			0.01	
Sodium T-Na	143				200
Uranium T-U	0.00030			0.02	
Zinc T-Zn	<0.050				5
Organic Parameters					
Tannin and Lignin		<0.10			
Total Organic Carbon C		1.86			
Field Chemistry (EBA)					
pH		7.94	6.5		8.5
TDS (ppm)		363			500
EC (uS/cm)		729			
Temperature (°C)		7.4			

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU) Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

eba

Table M0088-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
M0088	**R.C.M.P. Housing**	**Watson Lake**	6657683	518271	700

Well Details							
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Well Capacity - Tested, or Reported by User**	**Static Water Level Below Ground (m-btwc)**
150		No	13.0	Unknown	Jet pump		9.54 m below grade

Potential Contaminant Sources					
Distance from well to nearest point of septic field (m)	**Distance from well to nearest building (m)**	**Distance to surface water body (m)**	**AST present on property?**	**Distance from well to AST (m)**	**Other potential sources of contamination observed on property, and distance to well**
M0086, M0087, M0088 septic field	Located inside basement	Greater than 60 m	Basement AST's	15 m	UST at 55 m
M0092 septic field at 45 m			AST 1	45 m	4 other wells on property at approximately 60 m, 25 m, 25m (abandonned), and 60 m
M0126 and M00127 septic at 55 m			AST 2	45 m	

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
1.45 below grade	No		Unlikely	Ground above wellhead enclosure is relatively flat.	Well services both M0087 and M0088 RCMP residences

EBA Engineering Consultants Ltd.
Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Mardin
Luke Lebel

Date June 22, 2005

WELL ID #	Owner	Location Description
M0088	RCMP	RCMP Residence

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Watson Lake

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
3 Adela Trail

c. GPS location: N 6657683 E516271 elv 700 ± 11

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
#'s 2 and 3 Adela Trail

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Located inside residence

h. Distance from well to building _____

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: ~20m

k. Well location relative to field: ☐ upslope ☒ downslope ☐ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☒ Yes ☐ No
An RCMP complex septic systems @20m, ~45m, and ~55m

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☐ Yes ☒ No Entrance by animals? ☐ Yes ☒ No
Access possible → open casing

p. Is well site subject to flooding? ☐ Yes ☒ No

q. Is the well site well drained? ☒ Yes ☐ No

r. Is there a buried fuel tank on the property? ☒ Yes ☐ No

If yes, is it ☒ in use ☐ abandoned

Is the location known? ☒ Yes ☐ No
Distance from the well to known buried tank ~55m

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe ASTs in basement @ ~15m

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: AST 1 ; Distance from well to Potential Source 1: ~45m
Potential Source 2: AST 2 ; Distance from well to Potential Source 2: ~45m
Potential Source 3: _____ ; Distance from well to Potential Source 3: _____
Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

t. Are there other wells on this property? ☒ Yes ☐ No

How many? 4 ☒ in use (3) ☒ abandoned (1) ☒ require proper sealing

2. Well and Wellhead information:

a. When was well installed? Year _____ Month _____

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☐ Yes ☒ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☒ unlikely

e. Surface casing: ☐ Yes Diameter _____ ☒ No

f. Well casing: Diameter 15cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: 13.1 m below upper casing ☐ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: 9.64 m below upper casing

☐ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☐ unknown other unknown

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☒ in a building
enclosure off of residence basement - concrete

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail ~1.45 m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No

iv. Any evidence of rodents? Specify No, but access is possible

v. Does the well casing have a proper seal cap? ☐ Yes ☒ No

If no, describe condition No cap, casing is broken

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☒ Yes ☐ No

Explain (filtration, disinfection etc…) softener

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment ☐ unknown
likely

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No
unlikely

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☐ electric submersible ☒ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☒ plastic

g. Pump delivers water to: ☒ pressure tank ☐ elevated tank ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☒ Yes ☐ No

j. Is there a water meter on the system? ☐ Yes ☒ No

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Inside heated building

l. Comments on pump installation: _____

_____

6. Conclusions

a. Comments on overall installation:

_____

_____

_____

_____

_____

_____

_____

b.Recommendations: _____

_____

_____

_____

_____

_____

_____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JUNE 22/05

WELL ID #	Owner	Location Description
M0088	~~YES.~~ RCMP	RCMP WATSON LAKE

6. **Water Treatment**

a. Is well water treated? ☑ Yes ☐ No; Type of treatment: WATER SOFTNER

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☑ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. **Water Quality (observations):**

a. Does the water stain plumbing? ☐ yes ☑ No ☐ slight ☐ severe

Type of stain: ☐ brown ☐ red ☐ black

b. Does the water contain sediment? ☐ Yes ☑ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☑ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No ?

f. Is there a chemical analysis? ☐ Yes ☐ No ☐ adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☑ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☑ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☐ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☐ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes No Details:

Where is it located?
Comments: _____

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES NO
Comments: _____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES NO

Comments: _____

Are there other heat sources near the tank? YES NO
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO
Comments: _____

Overall Tank

What are the tank size and dimensions?

_____

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments: _____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

JET PUMP INSTALLATION IS UNSAFE.
THERE IS NO SANITARY SEAL ON WELLHEAD.
THE WELL IS WIDE OPEN TO CONTAMINATION
OF ALL SORTS.
THE INSTALLATION BEYOND THE JET PUMP
IS GOOD.

b. Recommendations:

AS THERE IS NO POSSIBILITY OF
PERFORMING ANY WELL MAINTENANCE,
A NEW WELL SHOULD BE DRILLED FOR
THE COMPLEX. PROPER TREATMENT
MUST BE PROVIDED. THIS WELL COULD
POSSIBLY SERVE THE WHOLE COMPLEX.



Photo 0033: M0088 Wellhead in concrete enclosure off from basement of residence



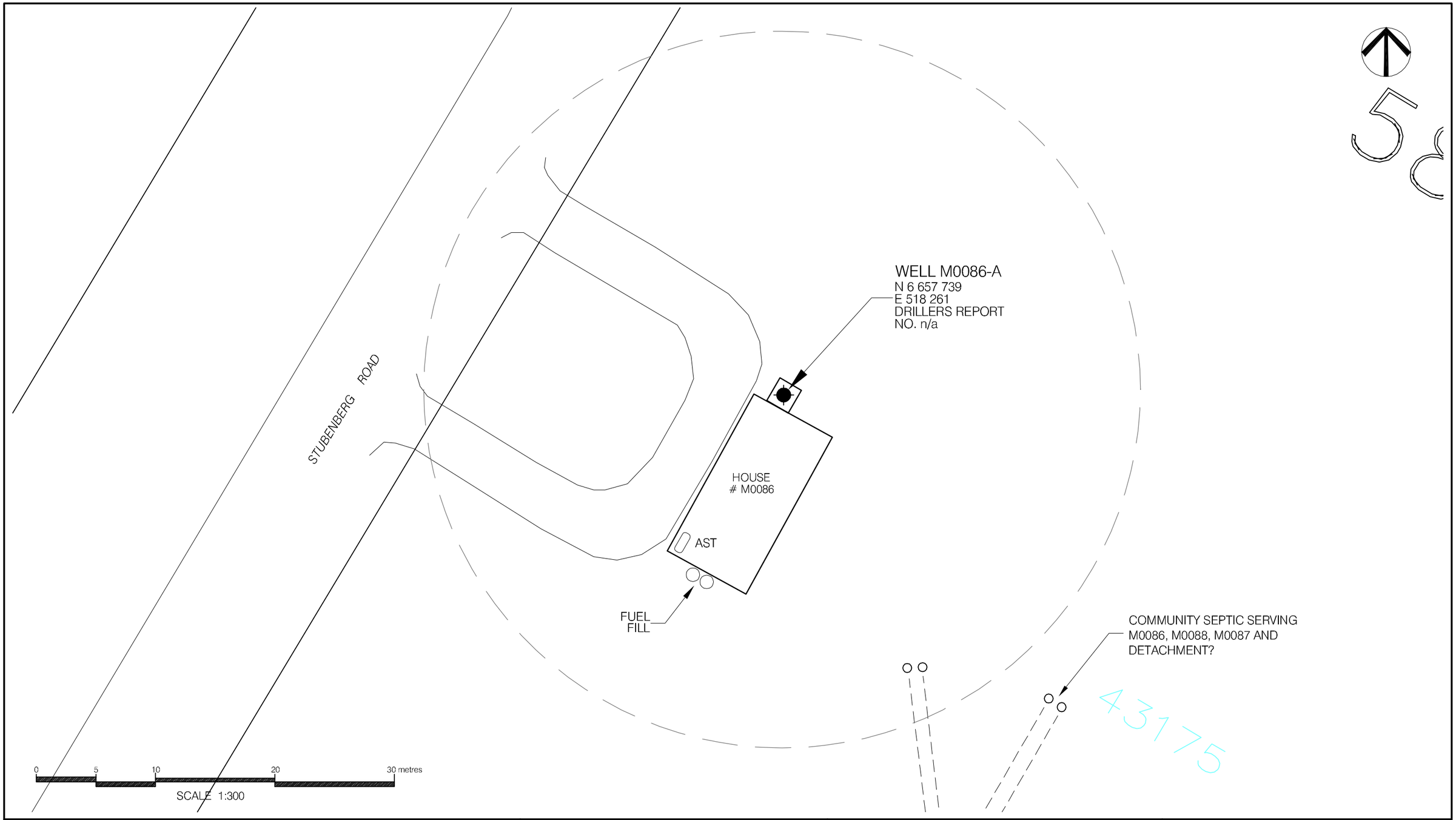
Photo 0037: M0088 Well casing extended above grade – not connected to casing below



Photo 0032: M0088 Jet pump and pressure tank



Photo 0034: M0088 Water softener (left), and pressure tank (behind)



NOTES:
1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

WATSON LAKE RCMP DETACHMENT
BUILDING # M0086
SITE LOCATION DIAGRAM
WELL ID: M0086-A

REVISION ISSUE: 0

FIGURE No.: M0086-A

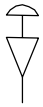
LEGEND


PUMP


PRESSURE GAUGE


GATE VALVE


CHECK VALVE


SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



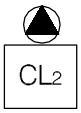
FLOW METER



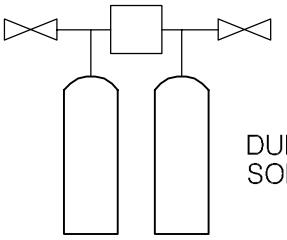
WATER FILTER
(CARTRIDGE TYPE)

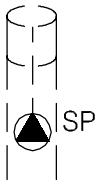


PRESSURE TANK

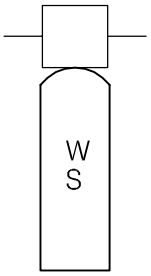


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER



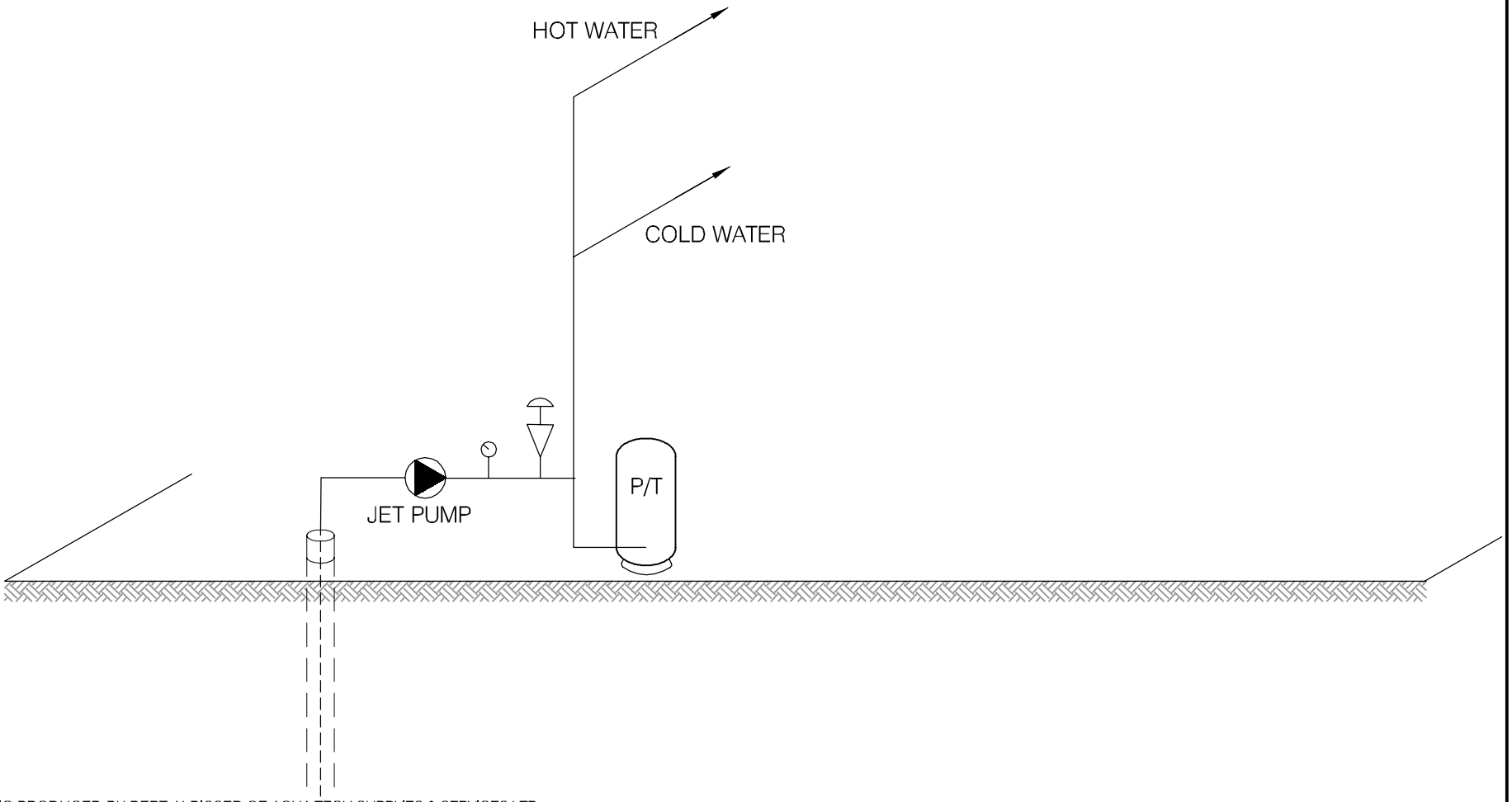
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

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SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: M0086 WATSON LAKE RCMP HOUSING	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE M0086-B

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TABLE M0086- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
M0086	R.C.M.P. Housing	2	May -05 to Jun-05	no	0/2	no	23-Jun-05	no

Table M0086-2: Water Quality Results

Location/ Resident	Watson Lake		GCDWQ Criteria		
Address	111 Stubenburg				
Treatment	Water Softener				
Disinfection	No				
Source of Water	On-Site Well				
Purpose of Sampling	Baseline	Additional Sampling			
Sample Location					
Date Sampled	22-Jun-05	23-Jun-05	**Lower Limit**	**Upper Limit**	
Physical Tests *(ALS)*			**AO**	**MAC**	**AO**
Colour (CU)	<5.0				15
Conductivity (uS/cm)	537				
Total Dissolved Solids	314				500
Hardness CaCO3	273		AO >200 = poor, > 500 unacceptable[A]		
pH	7.87		6.5		8.5
Turbidity (NTU)	0.54			1	5
UV Absorbance		0.0190			
Dissolved Anions *(ALS)*					
Alkalinity-Total CaCO3	274				
Chloride Cl	19.0				250
Fluoride F	0.025			1.5	
Sulphate SO4	7.49				
Nitrate Nitrogen N	<0.10			10	
Nitrite Nitrogen N	<0.10			1	
Total Metals *(ALS)*					
Aluminum T-Al	<0.010				
Antimony T-Sb	<0.00050			0.006	
Arsenic T-As	0.00040			0.025	
Barium T-Ba	0.333			1	
Boron T-B	<0.10			5	
Cadmium T-Cd	<0.00020			0.005	
Calcium T-Ca	87.7				
Chromium T-Cr	<0.0020			0.05	
Copper T-Cu	0.0136			1	
Iron T-Fe	0.037				0.3
Lead T-Pb	<0.0010			0.01	
Magnesium T-Mg	13.1				
Manganese T-Mn	0.0064				0.05
Mercury T-Hg	<0.00020			0.001	
Potassium T-K	1.00				
Selenium T-Se	<0.0010			0.01	
Sodium T-Na	6.5				200
Uranium T-U	0.00050			0.02	
Zinc T-Zn	<0.050				5
Organic Parameters					
Tannin and Lignin		0.21			
Total Organic Carbon C		1.37			
Field Chemistry (EBA)					
pH		7.83	6.5		8.5
TDS (ppm)		263			500
EC (uS/cm)		550			
Temperature (°C)		8.0			

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU) Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

eba

Table M0086-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
M0086	**R.C.M.P. Housing**	**Watson Lake**	6657739	518261	695

Well Details							
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Well Capacity - Tested, or Reported by User**	**Static Water Level Below Ground (m-btwc)**
150		No	14.3 m below grade	Unknown	Jet pump		9.5 m below grade

Potential Contaminant Sources					
Distance from well to nearest point of septic field (m)	**Distance from well to nearest building (m)**	**Distance to surface water body (m)**	**AST present on property?**	**Distance from well to AST (m)**	**Other potential sources of contamination observed on property, and distance to well**
M0086, M0087, M0088 septic field	Located inside basement	Greater than 60 m	Basement AST's	15 m	UST at 105 m
M0092 septic field at 110 m			AST 1	70 m	4 other wells on property at approximately 60 m, 85 m, 85m (abandonned), and 100 m
M0126 and M00127 septic at 90 m			AST 2	100 m	

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
1.6 below grade	No		Unlikely	Ground above wellhead enclosure is relatively flat.	

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date June 23, 2005

WELL ID #	Owner	Location Description
M0086	RCMP	RCMP Residence

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Watson Lake

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
111 Studenburg

c. GPS location: N 6657739 E 518261 elv 695 m ± 14

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
111 Studenburg

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Located in enclosure off from basement of residence

h. Distance from well to building _____

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No Communal Septic

j. Distance from well to nearest point of known field: ~20m

k. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☐ Yes ☐ No
Communal septic system for residences

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☒ Yes ☐ No
located in basement of residence, but may be accessable to children

Entrance by animals? ☐ Yes ☐ No
No seal cap - access into well directly is possible

p. Is well site subject to flooding? ☐ Yes ☒ No No large or serious water standing

q. Is the well site well drained? ☒ Yes ☐ No

r. Is there a buried fuel tank on the property? ☒ Yes ☐ No

If yes, is it ☒ in use ☐ abandoned

Is the location known? ☒ Yes ☐ No

Distance from the well to known buried tank ~105m

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe AST's in basement @ ~15m

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: AST 1 ; Distance from well to Potential Source 1: ~70m
Potential Source 2: AST 2 ; Distance from well to Potential Source 2: ~100m
Potential Source 3: _____ ; Distance from well to Potential Source 3: _____
Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

t. Are there other wells on this property? ☒ Yes ☐ No

How many? 4 ☒ in use (3) ☒ abandoned (1) ☒ require proper sealing

2. Well and Wellhead information:

a. When was well installed? Year unknown Month _____

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☐ Yes ☒ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☒ unlikely

e. Surface casing: ☐ Yes Diameter _____ ☒ No

f. Well casing: Diameter 15cm Material: ☐ steel ☐ plastic ☐ concrete

g. Depth of well: 14.3m below grade ☐ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: ~ 9.5 m below grade

☐ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☐ unknown other unknown

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☒ in a building
in enclosure off from basement of residence

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail ~1.6m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No
some in basement around pressure tank

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No
Styrofoam insulation

iv. Any evidence of rodents? Specify Access is possible

v. Does the well casing have a proper seal cap? ☐ Yes ☒ No

If no, describe condition No seal cap

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☒ Yes ☐ No

Explain (filtration, disinfection etc…) Softener

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment ☐ unknown
likely

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No
unlikely

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☐ electric submersible ☒ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☒ plastic

g. Pump delivers water to: ☒ pressure tank ☐ elevated tank ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☒ No

j. Is there a water meter on the system? ☐ Yes ☒ No

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: located inside heated building

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

b.Recommendations:

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JUNE 23/05

WELL ID #	Owner	Location Description
M0086	RCMP	RCMP WATSON LAKE HOUSE # 1

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☐ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. **Water Quality (observations):**

a. Does the water stain plumbing? ☐ yes ☐ No ☑ slight ☐ severe

Type of stain: ☐ brown ☑ red ☐ black

b. Does the water contain sediment? ☐ Yes ☑ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☑ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐Yes ☑No ☐brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No ?

f. Is there a chemical analysis? ☐ Yes ☐ No ☐adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☑ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☑ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☑ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☐ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes (No) Details:

Where is it located?
Comments: _____

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES NO
Comments:_____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES NO

Comments: _____

Are there other heat sources near the tank? YES NO
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO
Comments: _____

Overall Tank

What are the tank size and dimensions?

_____

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments: _____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

THIS IS A OLD (1989) TOTALLY INADEQUATE INSTALLATION. THE WELL HEAD IS WIDE OPEN, NO SEAL OF ANY KIND. THE PUMP & TANK ARE BOTH AT THE END OF THEIR LIFE CYCLE. PRESSURE TANK IS SHOWING SIGNS OF LEAKAGE AS THE BOTTOM IS NEARLY RUSTED OUT COMPLETELY.

b. Recommendations:

CLEAN THE WELL MECHANICALLY, AFTER EXTENDING THE WELL CASING TO THE REQUIRED HEIGHT ABOVE GRADE. INSTALL A NEW PUMP SYSTEM. INSTALL ON PITLESS ADAPTER.



Photo 0306: M0086 Watson Lake RCMP Residence – location of well off of basement



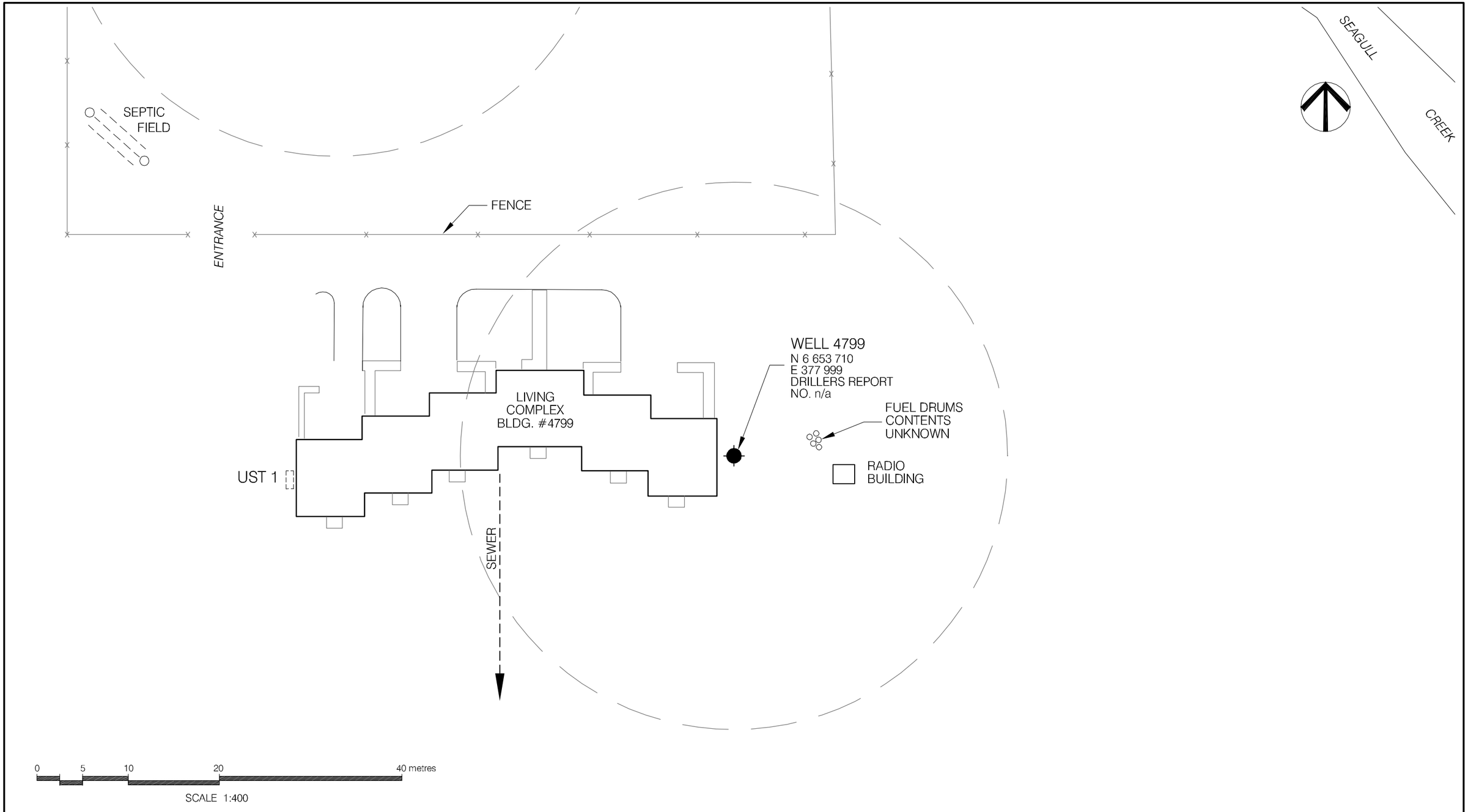
Photo 0304: M0086 Septic field



Photo 0043: M0086 Wellhead (back right), and jet pump (front centre)



Photo 0044: M0086 Pressure tank (left) and wellhead enclosure off of basement of residence



NOTES:

1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

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DESIGNED BY:	R. MARTIN
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CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

SWIFT RIVER LIVING COMPLEX
BUILDING # 4799
SITE LOCATION DIAGRAM
WELL ID: 4799

REVISION ISSUE: 0

FIGURE No.: 4799-A

Z:\02\01Drawings\1260002 Water Assessment YTG\002 - Eastern Region\swift\1260002 Swift River Grader Station_4793 Site Plan.dwg, 7/20/2005 4:34:56 PM, Adobe PDF

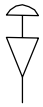
LEGEND


PUMP


PRESSURE GAUGE


GATE VALVE


CHECK VALVE


SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



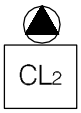
FLOW METER



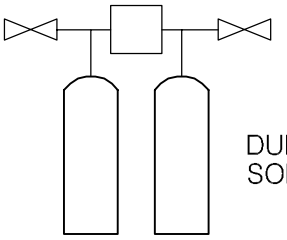
WATER FILTER
(CARTRIDGE TYPE)

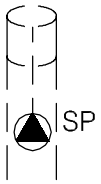


PRESSURE TANK

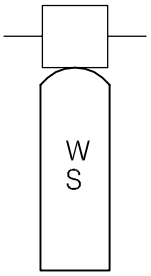


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER



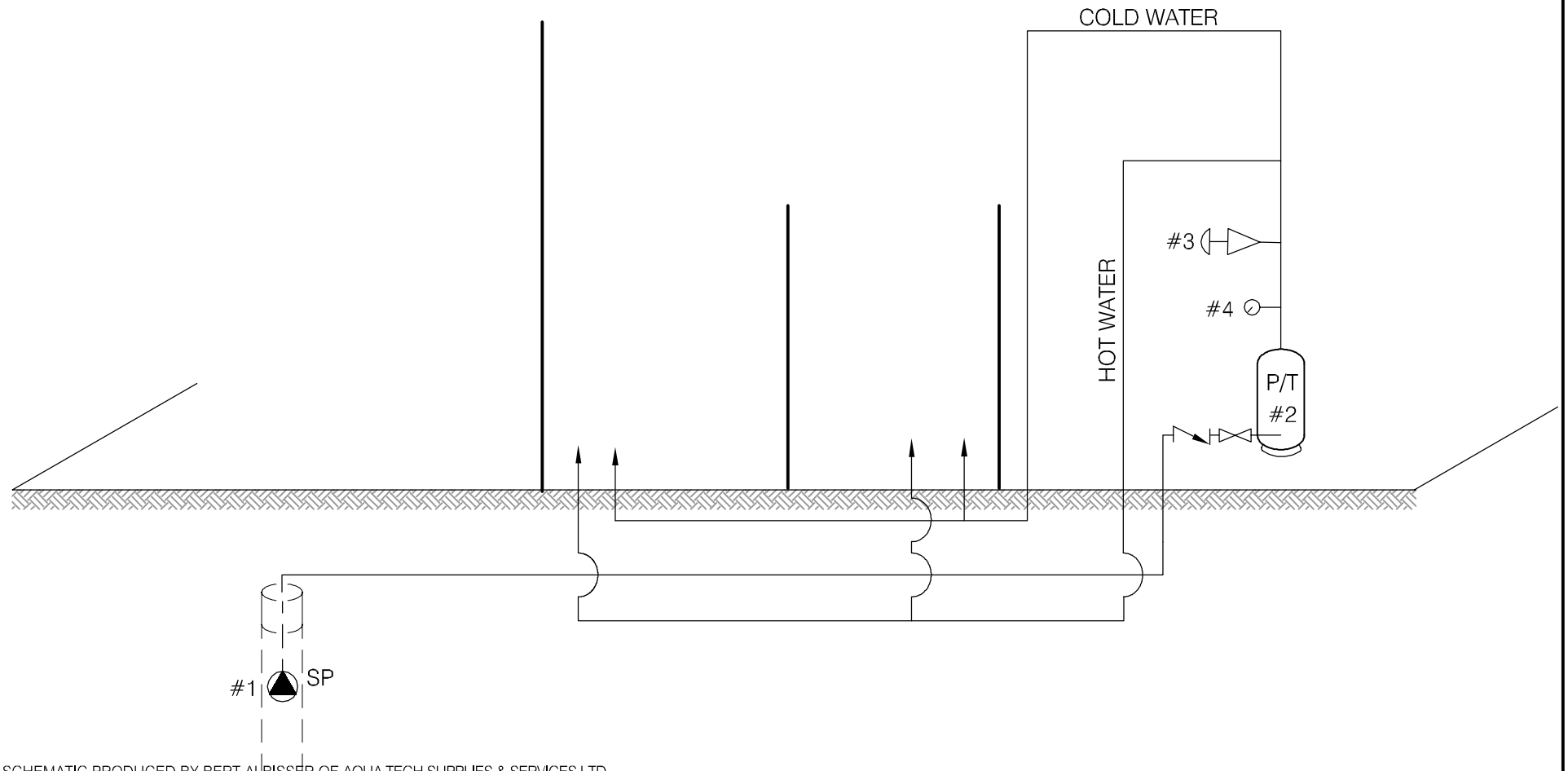
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
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SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT	Yukon Highways and Public Works Property Management Branch		TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 4799 SWIFT RIVER LIVING COMPLEX	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE 4799-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\swift\1260002 Swift River Living Complex_4799 Schematic.dwg, 7/20/2005 4:29:34 PM, Adobe PDF

Eastern Region – Swift River Living Complex
Building # 4799

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB. PUMP					4"
2	PRESSURE TANK	WELL X TROL	WX-302			
3	PRESSURE SWITCH	SQ. D	FSG-M4			
4	PRESSURE GAUGE	MARSH	0-100			2"
5						
6						
7						
8						
9						
10						

TABLE 4799- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
4799	Swift River Living Complex	6	Sept-04 to Mar-05	no	0/6	no	9-Mar-05	no

Table 4799-2: Water Quality Results

Location/ Resident	Swift River			**GCDWQ Criteria**		
Address	km 1181 Alaska Highway					
Treatment	No					
Disinfection	No					
Source of Water	On-Site Well					
Purpose of Sampling	Baseline	Additional Sampling	Baseline			
Sample Location		Kitchen Tap	Kitchen Tap			
Date Sampled	13-Sep-04	20-Jun-05	22-Jun-05	**Lower Limit**	**Upper Limit**	
Physical Tests *(ALS)*				**AO**	**MAC**	**AO**
Colour (CU)	<5		<5			15
Conductivity (uS/cm)			65.3			
Total Dissolved Solids	39		40			500
Hardness CaCO3	31.8		19.3	AO >200 = poor, > 500 unacceptable[A]		
pH	7.26		6.77	6.5		8.5
Turbidity (NTU)	0.3	0.41	***2.64***		1	5
UV Absorbance		0.035				
% Transmittance						
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	34		22			
Chloride Cl	0.5		4.7			250
Fluoride F	0.71		0.818		1.5	
Silicate SiO4						500
Sulphate SO4	3.65		3.41			
Nitrate Nitrogen N	<0.1		<0.10		10	
Nitrite Nitrogen N	<0.05		<0.10		1	
Ammonia Nitrogen N						
Total Phosphate PO4						
Total Metals *(ALS)*						
Aluminum T-Al	<0.005		0.03			
Antimony T-Sb	<0.0002		<0.0005		0.006	
Arsenic T-As	<0.0002		0.00046		0.025	
Barium T-Ba	0.012		<0.020		1	
Boron T-B	0.005		<0.10		5	
Cadmium T-Cd	0.00001		<0.00020		0.005	
Calcium T-Ca			6.31			
Chromium T-Cr	<0.0005		<0.0020		0.05	
Copper T-Cu	***2.34***	0.147	0.174		1	
Iron T-Fe	0.01	0.04	0.116			0.3
Lead T-Pb	0.0007		0.0047		0.01	
Magnesium T-Mg			0.85			
Manganese T-Mn	0.009	0.003	0.0064			0.05
Mercury T-Hg			<0.0002		0.001	
Potassium T-K			0.27			
Selenium T-Se			<0.0010		0.01	
Sodium T-Na	1.8		4.5			200
Uranium T-U	<0.0005		0.00085		0.02	
Vanadium T-V						
Zinc T-Zn	0.07		0.083			5
Dissolved Metals						
Aluminum D-Al						
Antimony D-Sb						
Arsenic D-As						
Barium D-Ba						
Boron D-B						
Cadmium D-Cd						
Calcium D-Ca						
Chromium D-Cr						
Copper D-Cu		0.154				
Iron D-Fe		<0.030				
Lead D-Pb						
Magnesium D-Mg						
Manganese D-Mn		0.0022				
Mercury D-Hg						
Potasium D-K						
Selenium D-Se						
Sodium D-Na						
Uranium D-U						
Vanadium D-V						
Zinc D-Zn						
Trihalomethanes						
Bromodichloromethane						
Bromoform						
Chloroform						
Dibromochloromethane						
Total Trihalomethanes						
Organic Parameters						
Tannin and Lignin		0.24				
Total Organic Carbon C		1.21				
Haloacetic Acids						
Bromoacetic Acid						
Bromochloroacetic Acid						
Chloroacetic Acid						
Dibromoacetic Acid						
Dichloroacetic Acid						
Trichloroacetic Acid (TCA)						
Polycyclic Aromatic Hydrocarbons						
Acenaphthene						
Acenaphthylene						
Acridine						
Anthracene						
Benz(a)anthracene						
Benzo(a)pyrene						
Benzo(b)fluoranthene						
Benzo(g,h,i)perylene						
Benzo(k)fluoranthene						
Chrysene						
Dibenz(a,h)anthracene						
Fluoranthene						
Fluorene						
Indeno(1,2,3-c,d)pyrene						
Naphthalene						
Phenanthrene					0.1	
Pyrene						
Quinoline						
Extractable Hydrocarbons						
EPH10-19						
EPH19-32						
LEPH						
HEPH						
Field Chemistry (EBA)						
pH		7.93		6.5		8.5
TDS (ppm)		29				500
EC (uS/cm)		59				
Temperature (°C)		10.0				
Free Available Chlorine						

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU) Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

Table 4799-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
4799	**Living Complex**	**Swift River**	6653710	377999	892

Well Details							
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Well Capacity - Tested, or Reported by User**	**Static Water Level Below Ground (m-btwc)**
150		No		Unknown		Able to service 5 unit living complex	

Potential Contaminant Sources					
Distance from well to nearest point of septic field (m)	**Distance from well to nearest building (m)**	**Distance to surface water body (m)**	**AST present on property?**	**Distance from well to AST (m)**	**Other potential sources of contamination observed on property, and distance to well**
Approximately 60 m, 25 m to sewage line	1	75 m to Seagull Creek			Fuel Drums at 8 m

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
0.65 m below grade	Split seal gasket cap		Unlikely	Yes	Well services the 5 units and 1 common room in the Swift River Living Complex.

EBA Engineering Consultants Ltd.

Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date June 20, 2005

WELL ID #	Owner	Location Description
4799	YTG	Swift River Living Complex

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Swift River

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Swift River, Alaska Hwy

c. GPS location: N: 6653710 E: 377999 elv. 892 m ± 13m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☐ Yes ☒ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
5 apartements in living complex

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Living complex

h. Distance from well to building ~1m

i. If there is an effluent disposal field, is its location known? ☐ Yes ☒ No

j. Distance from well to nearest point of known field: _____

k. Well location relative to field: ☐ upslope ☐ downslope ☐ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☒ Yes ☐ No
Sewer pipe @ 25m, septic field ~60m

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☐ Yes ☒ No
unlocked wooden enclosure

Entrance by animals? ☐ Yes ☒ No
Access possible - signs of rodents

p. Is well site subject to flooding? ☐ Yes ☒ No

q. Is the well site well drained? ☒ Yes ☐ No

r. Is there a buried fuel tank on the property? ☒ Yes ☐ No

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☒ Yes ☐ No
Distance from the well to known buried tank ~50m

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: Fuel drums ; Distance from well to Potential Source 1: 8m
Potential Source 2: Seagull Creek; Distance from well to Potential Source 2: 75m
Potential Source 3: Highway ; Distance from well to Potential Source 3: 90m
Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

t. Are there other wells on this property? ☐ Yes ☐ No

How many? _____ ☐ in use ☐ abandoned ☐ require proper sealing

2. Well and Wellhead information:

a. When was well installed? Year unknown Month _____

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☐ Yes ☒ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☒ unlikely

e. Surface casing: ☐ Yes Diameter _____ ☒ No

f. Well casing: Diameter 15cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: unknown ☐ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: unknown

☐ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☐ unknown other unknown

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☒ in pit ☐ pitless adaptor ☐ in a building
wooden (non-pwf) enclosed pit.

☒ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail Yes, 0.65 m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☒ Yes ☐ No

iv. Any evidence of rodents? Specify some evidence, access possible

v. Does the well casing have a proper seal cap? ☐ Yes ☐ No

If no, describe condition split gasket cap - does not appear to be properly fastened

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☐ Yes ☐ No

Explain (filtration, disinfection etc…)_____

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment ☐ unknown likely

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No unlikely

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☒ electric submersible ☐ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☐ plastic

g. Pump delivers water to: ☒ pressure tank ☐ elevated tank ☐ other

h. Are there automatic pump controls: ☐ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☐ No

j. Is there a water meter on the system? ☐ Yes ☐ No

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Insulation - no visible heat trace

l. Comments on pump installation: _____

_____

6. Conclusions

a. Comments on overall installation:

_____

_____

_____

_____

_____

_____

_____

b.Recommendations: _____

_____

_____

_____

_____

_____

_____

PART B: EBA Site Inspection

Inspector: BOB ARBUTHNOT Date JUNE 20/05

WELL ID #	Owner	Location Description
4799	YTG.	SWIFT RIVER LIVING COMPLEX

6. Water Treatment

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☐ No If so how_____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____reading.

Tested at _____(location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often?_____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. Water Quality (observations):

a. Does the water stain plumbing? ☐yes ☐ No ☐ slight ☐ severe

Type of stain: ☐ brown ☐ red ☐ black

b. Does the water contain sediment? ☐Yes ☐No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☐ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐Yes ☐No ☐brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No

f. Is there a chemical analysis? ☐ Yes ☐ No ☐adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☐ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☐ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☐ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☐ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes No Details: PRESSURE TANK

Where is it located?
Comments: BOILER ROOM

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
(YES) NO
Comments: _____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES (NO)
Comments: _____

Are there other heat sources near the tank? YES (NO)
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES (NO)
Comments: _____

Overall Tank

What are the tank size and dimensions?

WX-302

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? (YES) NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments: _____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

THE WATER SYSTEM FOR THIS COMPLEX NEEDS TO BE UPGRADED TO MEET NEW STANDARDS. TREATMENT WILL HAVE TO BE ADDED

b. Recommendations:

EXTEND WELL CASING TO PROPER HEIGHT. BUILD PROPER WELL HOUSE TO ACCOMODATE CHLORINATION SYSTEM.

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9321
Jurisdiction	Yukon
Community	
Address	
Highway	Alaska Highway
Milepost	M 733
Feature	Swift River
Location and Cause	Swift River Lodge - de-icing operation being conducted without collection of solution
Latitude	60.0080555555556
Longitude	-131.184166666667
Incident Date	3/1/1993
Lead Agency	Environment Canada - Environmental Protection Service
Other Agency	
Company(s)	Swift River Lodge
Amount	250
Units	Litres
Quantity	Estimate
Release Description	Dumped
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Calcium Chloride
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	de-icing solution not being contained - no runoff to river yet but potential - advised operation to be moved and solution contained - toxic to fish

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9902
Jurisdiction	Yukon
Community	Swift River
Address	
Highway	Alaska Highway
Milepost	M 733
Feature	Swift River
Location and Cause	YECL Envirotank overfilled - tanker truck driver unsure of storage tanks capacity
Latitude	60.004
Longitude	-131.1864
Incident Date	2/1/1999 11:50:00 AM
Lead Agency	Yukon Government - Environmental Programs
Other Agency	
Company(s)	Healey Enterprises (Fort Nelson, BC)
Amount	10
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Diesel
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	fuel ran down sides of tank into snow - contaminated snow to be recovered and free product soaked up - pump shut off as soon as fuel came out vent - no further information



Photo 0238: 4799 Wellhead enclosure



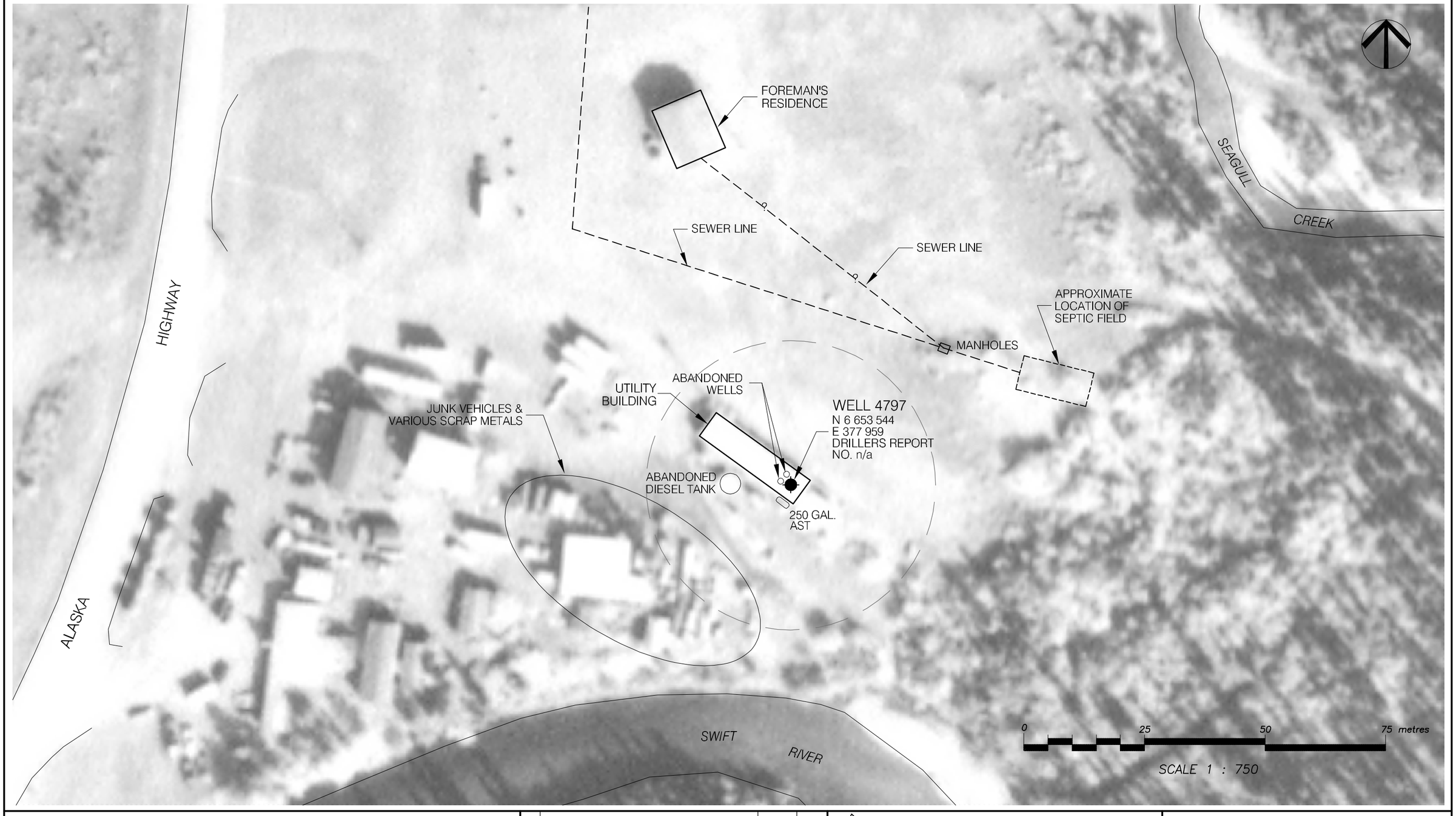
Photo 0237: 4799 Wellhead in pit



Photo 0240: 4799 Swift River Living Complex (back) and wellhead enclosure (in front)



Photo 0239: 4799 Fuel drums (centre), and radio building (right)



NOTES:

1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

SWIFT RIVER UTILITY
BUILDING # 4797
SITE LOCATION DIAGRAM
WELL ID: 4797

REVISION ISSUE: 0

FIGURE No.: 4797-A

Z:\020\Drawings\1260002 Water Assessment YTG\002 - Eastern Region\swift\1260002 Swift River Grader Station_4793 Site Plan.dwg, 7/20/2005 4:26:11 PM, Adobe PDF

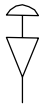
LEGEND


PUMP


PRESSURE GAUGE


GATE VALVE


CHECK VALVE


SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



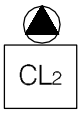
FLOW METER



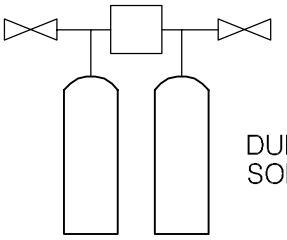
WATER FILTER
(CARTRIDGE TYPE)

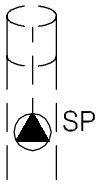


PRESSURE TANK

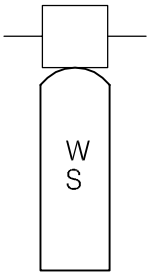


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER



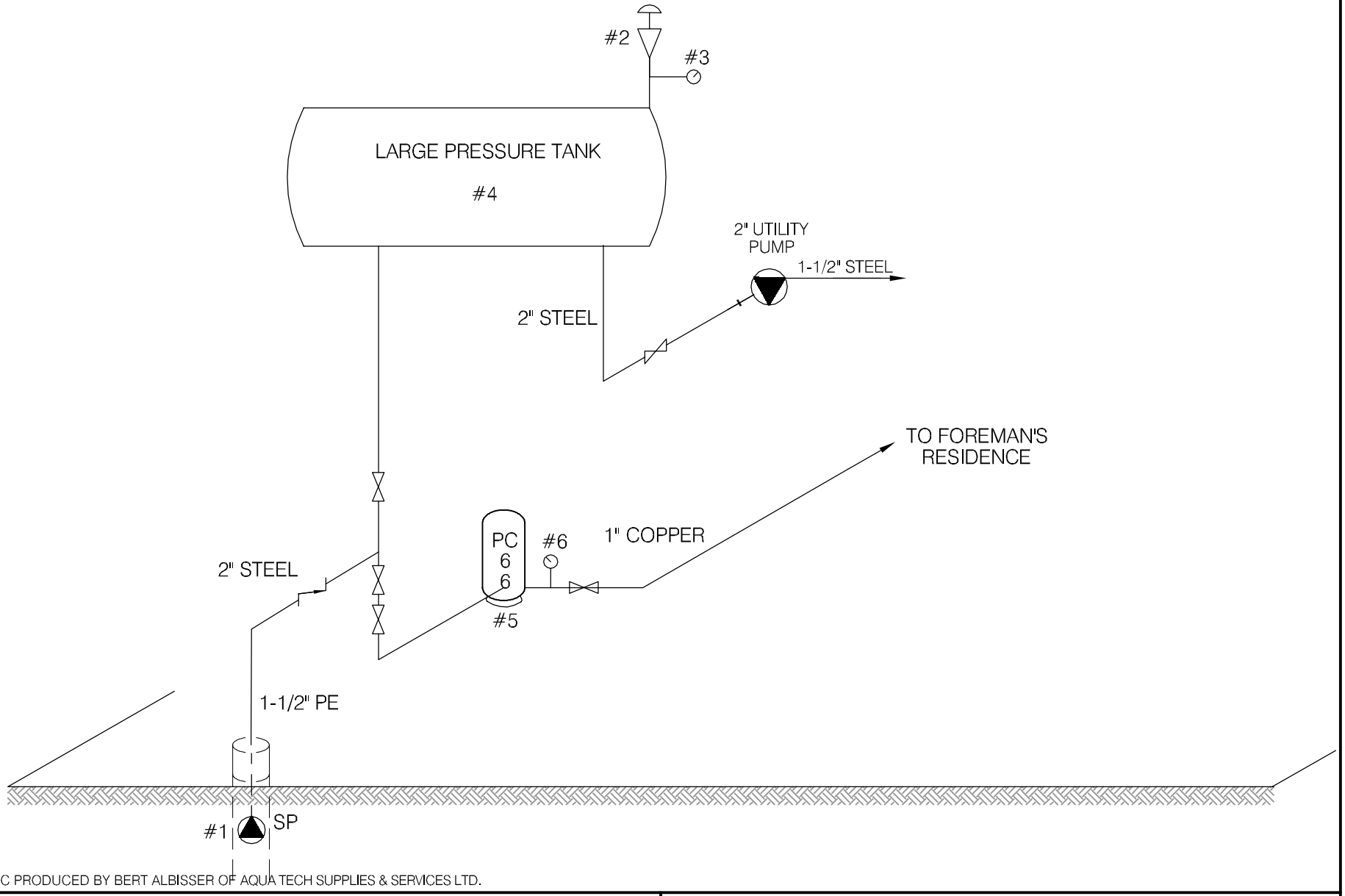
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\1260002003 Eastern Schematic_LEGEND.dwg, 4/11/2006 10:31:08 AM, Adobe PDF, jbuyck



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 4797 SWIFT RIVER UTILITY BUILDING	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE 4797-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\swift\1260002 Swift River Utility Bldg_4797 Schematic.dwg, 7/20/2005 4:15:27 PM, Adobe PDF

Eastern Region – Swift River Utility Building
Building # 4797

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB PUMP	MONARCH	SB11D15E		2892	4"
2	PRESSURE SWITCH	SQ. D	GSG-2	224330		
3	PRESSURE GAUGE	MARSH	0-100			2"
4	PRESSURE TANK	N/A.	LARGE			16' x 4'
5	PRESSURE TANK	CHALLENGER	PC 66			DOMESTIC
6	PRESSURE GAUGE	0-100	4" DIAL			"
7						
8						
9						
10						

TABLE 4797- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
4797	Swift River Utility Building	6	Sept-04 to Mar-05	yes	1/6	no	9-Mar-05	no

Table 4797-2: Water Quality Results

Location/ Resident	Swift River			GCDWQ Criteria		
Address	km 1181 Alaska Highway					
Treatment	No					
Disinfection	No					
Source of Water	On-Site Well					
Purpose of Sampling	Baseline	Additional Sampling	Baseline			
Sample Location		Foreman's Residence Kitchen Tap				
Date Sampled	13-Sep-04	20-Jun-05	22-Jun-05	**Lower Limit**	**Upper Limit**	
Physical Tests *(ALS)*				**AO**	**MAC**	**AO**
Colour (CU)	7		<5			15
Conductivity (uS/cm)			72.3			
Total Dissolved Solids	40		43			500
Hardness CaCO3	32.6		34	AO >200 = poor, > 500 unacceptable[A]		
pH	7.3		7.03	6.5		8.5
Turbidity (NTU)	**4.6**	**2.69**	**3.32**		1	5
UV Absorbance		0.027				
% Transmittance						
Dissolved Anions *(ALS)*						
Alkalinity-Total CaCO3	37		42.6			
Chloride Cl	<0.5		0.76			250
Fluoride F	0.72		0.692		1.5	
Silicate SiO4						500
Sulphate SO4	3.56		3.32			
Nitrate Nitrogen N	<0.1		<0.10		10	
Nitrite Nitrogen N	<0.05		<0.10		1	
Ammonia Nitrogen N						
Total Phosphate PO4						
Total Metals *(ALS)*						
Aluminum T-Al	0.007		<0.010			
Antimony T-Sb	<0.0002		<0.0005		0.006	
Arsenic T-As	<0.0002		0.00014		0.025	
Barium T-Ba	0.012		0.020		1	
Boron T-B	0.011		<0.010		5	
Cadmium T-Cd	<0.00001		<0.00020		0.005	
Calcium T-Ca			11.0			
Chromium T-Cr	<0.0005		<0.0020		0.05	
Copper T-Cu	0.023		0.0392		1	
Iron T-Fe	0.25		0.253			0.3
Lead T-Pb	0.0011		0.0044		0.01	
Magnesium T-Mg			1.56			
Manganese T-Mn	0.021		0.0148			0.05
Mercury T-Hg			<0.00020		0.001	
Potassium T-K			0.32			
Selenium T-Se			<0.0010		0.01	
Sodium T-Na	1.8		<2.0			200
Uranium T-U	<0.0005		0.00038		0.02	
Vanadium T-V						
Zinc T-Zn	0.073		0.096			5
Dissolved Metals						
Aluminum D-Al						
Antimony D-Sb						
Arsenic D-As						
Barium D-Ba						
Boron D-B						
Cadmium D-Cd						
Calcium D-Ca						
Chromium D-Cr						
Copper D-Cu						
Iron D-Fe						
Lead D-Pb						
Magnesium D-Mg						
Manganese D-Mn						
Mercury D-Hg						
Potasium D-K						
Selenium D-Se						
Sodium D-Na						
Uranium D-U						
Vanadium D-V						
Zinc D-Zn						
Trihalomethanes						
Bromodichloromethane						
Bromoform						
Chloroform						
Dibromochloromethane						
Total Trihalomethanes						
Organic Parameters						
Tannin and Lignin		<0.10				
Total Organic Carbon C		0.70				
Haloacetic Acids						
Bromoacetic Acid						
Bromochloroacetic Acid						
Chloroacetic Acid						
Dibromoacetic Acid						
Dichloroacetic Acid						
Trichloroacetic Acid (TCA)						
Polycyclic Aromatic Hydrocarbons						
Acenaphthene						
Acenaphthylene						
Acridine						
Anthracene						
Benz(a)anthracene						
Benzo(a)pyrene						
Benzo(b)fluoranthene						
Benzo(g,h,i)perylene						
Benzo(k)fluoranthene						
Chrysene						
Dibenz(a,h)anthracene						
Fluoranthene						
Fluorene						
Indeno(1,2,3-c,d)pyrene						
Naphthalene						
Phenanthrene					0.1	
Pyrene						
Quinoline						
Extractable Hydrocarbons						
EPH10-19						
EPH19-32						
LEPH						
HEPH						
Field Chemistry (EBA)						
pH		7.43		6.5		8.5
TDS (ppm)		41				500
EC (uS/cm)		82				
Temperature (°C)		40.6				
Free Available Chlorine						

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU)

Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

Table 4797-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
4797	**Utility Building**	**Swift River**	6643544	377959	884

Well Details							
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Well Capacity - Tested, or Reported by User**	**Static Water Level Below Ground (m-btwc)**
150		No	23	Unknown	10.11		4.41

Potential Contaminant Sources					
Distance from well to nearest point of septic field (m)	**Distance from well to nearest building (m)**	**Distance to surface water body (m)**	**AST present on property?**	**Distance from well to AST (m)**	**Other potential sources of contamination observed on property, and distance to well**
60	Inside utility building	40 m to Swift River	AST	4	Oil Heater at 10 m
			Abandoned Diesel Tank	10	

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
Wellhead is at grade	No			Concrete floor around well is not sloped	Well services a highway maintenace truck fill and the forman's residence. The heat trace to the residence had been left on at the time of inspection so all water was hot.

EBA Engineering Consultants Ltd.

Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin
Luke Lebel -

Date June 20, 2005

WELL ID #	Owner	Location Description
4797	YTG	Swift River Utility Building

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Swift River

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Swift River, Alaska Hwy

c. GPS location: N 6653544 E 377959 elv 884m ±6

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☐ Yes ☒ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Foreman's Residence + fill line

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify inside utility buildings

h. Distance from well to building _____

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from well to nearest point of known field: 60m

k. Well location relative to field: ☐ upslope ☒ downslope ☒ lateral
slightly downslope

N 6653545
E 377976

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☐ Yes ☐ No
lodge septic >50m, sewer pipe @ 35m

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☒ Yes ☐ No Inside locked building
Entrance by animals? ☐ Yes ☒ No Access possible

p. Is well site subject to flooding? ☐ Yes ☒ No no signs of ponding

q. Is the well site well drained? ☒ Yes ☐ No

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely <150m

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: Oil heater ; Distance from well to Potential Source 1: 3m
Potential Source 2: AST ; Distance from well to Potential Source 2: 4m
Potential Source 3: Diesel tank (abandonned) ; Distance from well to Potential Source 3: 10m
Potential Source 4: Swift River ; Distance from well to Potential Source 4: 40m

t. Are there other wells on this property? ☒ Yes ☐ No possible - There is piping coming from floor that may be abandonned wells

How many? _____ ☒ in use ☒ abandoned ☐ require proper sealing
living complex + grader stn wells >50m

2. Well and Wellhead information:

a. When was well installed? Year unknown Month _____

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____
likely

c. Is there a drillers log for the well: ☐ Yes ☒ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☒ unlikely

e. Surface casing: ☐ Yes Diameter _____ ☒ No

f. Well casing: Diameter 15 cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: 10.11 m could be pump 75ft likely ☒ measured (if possible) ☒ reported ☐ from log

h. Static water level below ground: 4.41m bg

☒ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☐ unknown other unknown

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☒ in a building

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail at grade approx.

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No

iv. Any evidence of rodents? Specify Access possible, but no evidence

v. Does the well casing have a proper seal cap? ☐ Yes ☒ No

If no, describe condition steel lid above casing

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☐ Yes ☒ No

Explain (filtration, disinfection etc…)_____

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☑ granular sediment ☐ unknown likely

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No unknown

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☒ electric submersible ☐ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☒ plastic

g. Pump delivers water to: ☒ pressure tank (domestic) ☒ elevated tank (truck fill) ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☒ No

j. Is there a water meter on the system? ☐ Yes ☒ No

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Heater - no insulation or heat trace

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

b.Recommendations:

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JUNE 20/05

WELL ID #	Owner	Location Description
4797	YTG	SWIFT RIVER UTILITY BLD.

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☐ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. **Water Quality (observations):**

a. Does the water stain plumbing? ☐ yes ☐ No ☐ slight ☐ severe

Type of stain: ☐ brown ☐ red ☐ black

b. Does the water contain sediment? ☐ Yes ☐ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☐ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐Yes ☐No ☐brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No

f. Is there a chemical analysis? ☐ Yes ☐ No ☐adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☐ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☐ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☐ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☐ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? (Yes) No Details: PRESSURE TANK

Where is it located?
Comments: UTILITY BLDG.

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
(YES) NO
Comments: _____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES (NO)
Comments: _____

Are there other heat sources near the tank? YES (NO)
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES (NO)
Comments: _____

Overall Tank

What are the tank size and dimensions?

16' L x 4' Ø

What material is the tank constructed of? GALV. STEEL

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES (NO)

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments: _____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

WELL IS AT FLOOR LEVEL. PRESSURE TANK NOT SUITABLE FOR DRINKING WATER. THERE IS NO TREATMENT IN PLACE NO SANITARY SEAL ON WELL HEAD

b. Recommendations:

EXTEND CASING TO PROPER HEIGHT. INSTALL SANITARY SEAL. SPLIT SYSTEM TO SEPARATE UTILITY WATER AND DOMESTIC SUPPLY. INSTALL APPROPRIATE TREATMENT.

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9321
Jurisdiction	Yukon
Community	
Address	
Highway	Alaska Highway
Milepost	M 733
Feature	Swift River
Location and Cause	Swift River Lodge - de-icing operation being conducted without collection of solution
Latitude	60.0080555555556
Longitude	-131.184166666667
Incident Date	3/1/1993
Lead Agency	Environment Canada - Environmental Protection Service
Other Agency	
Company(s)	Swift River Lodge
Amount	250
Units	Litres
Quantity	Estimate
Release Description	Dumped
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Calcium Chloride
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	de-icing solution not being contained - no runoff to river yet but potential - advised operation to be moved and solution contained - toxic to fish

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9902
Jurisdiction	Yukon
Community	Swift River
Address	
Highway	Alaska Highway
Milepost	M 733
Feature	Swift River
Location and Cause	YECL Envirotank overfilled - tanker truck driver unsure of storage tanks capacity
Latitude	60.004
Longitude	-131.1864
Incident Date	2/1/1999 11:50:00 AM
Lead Agency	Yukon Government - Environmental Programs
Other Agency	
Company(s)	Healey Enterprises (Fort Nelson, BC)
Amount	10
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Diesel
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	fuel ran down sides of tank into snow - contaminated snow to be recovered and free product soaked up - pump shut off as soon as fuel came out vent - no further information



Photo 0249: 4797 Utility building (back right), and foreman's residence (left)



Photo 0243: 4797 Wellhead



Photo 0247: 4797 Septic field



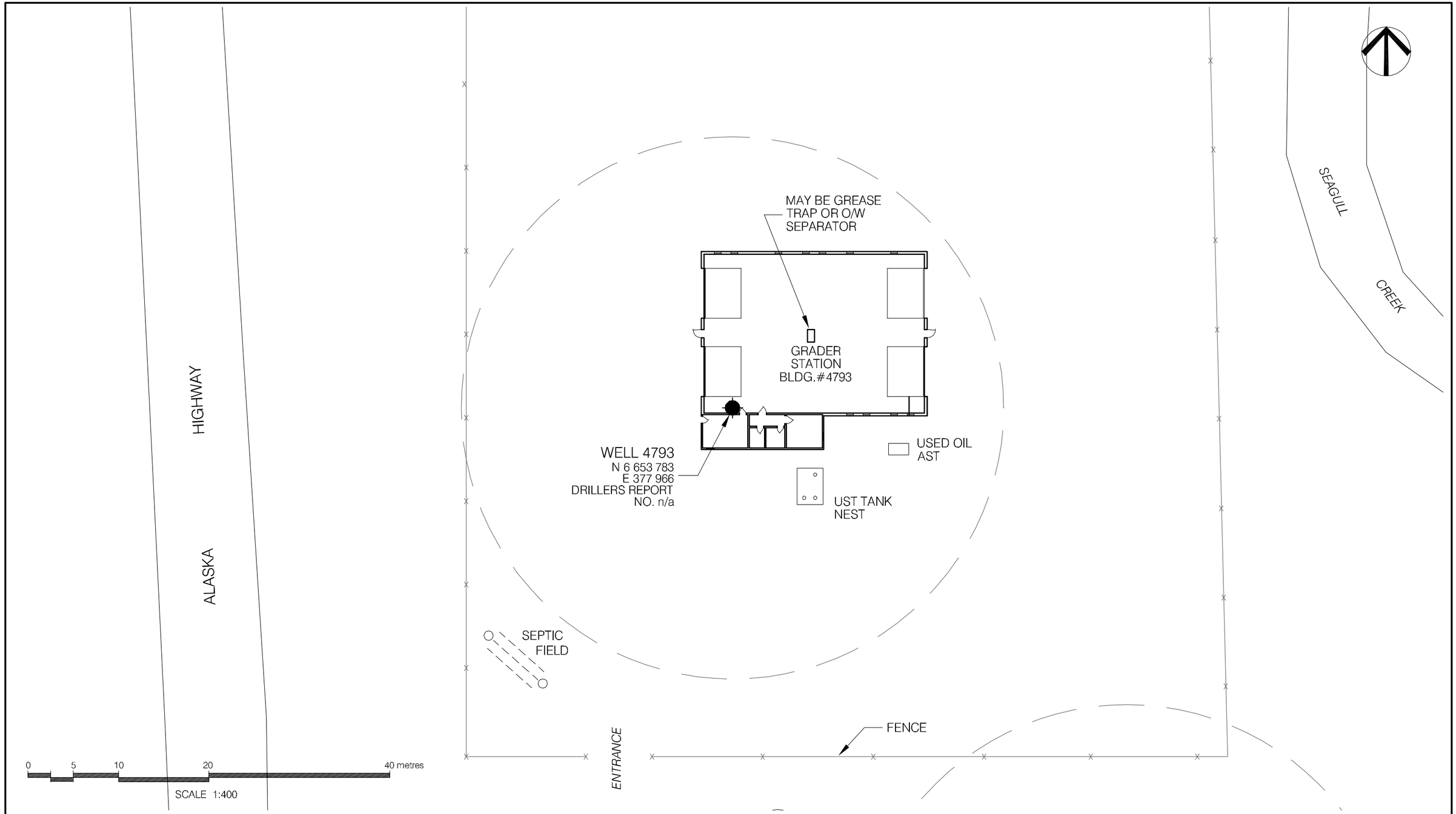
Photo 0246: 4797 Swift River (back), and utility building (right)



Photo 0248: 4797 Utility building (right), above ground storage tank (centre), and abandoned diesel tank (back left)

Photo 0244: 4797 Water storage tank





NOTES:
1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DD/MM/YY	APPROVED
0	ISSUED FOR CLIENT REVIEW	XXX	

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon Highways and Public Works Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

SWIFT RIVER GRADER STATION
BUILDING # 4793
SITE LOCATION DIAGRAM
WELL ID: 4793

REVISION ISSUE 0

FIGURE No. FIGURE 4793-A

LEGEND



PUMP



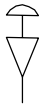
PRESSURE GAUGE



GATE VALVE



CHECK VALVE



SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



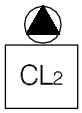
FLOW METER



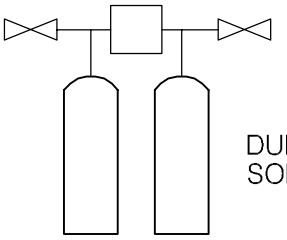
WATER FILTER
(CARTRIDGE TYPE)



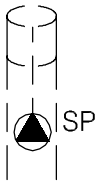
PRESSURE TANK



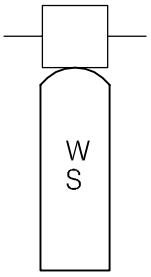
CHLORINE RESERVOIR AND
INJECTION PUMP



DUPLEX WATER
SOFTENER



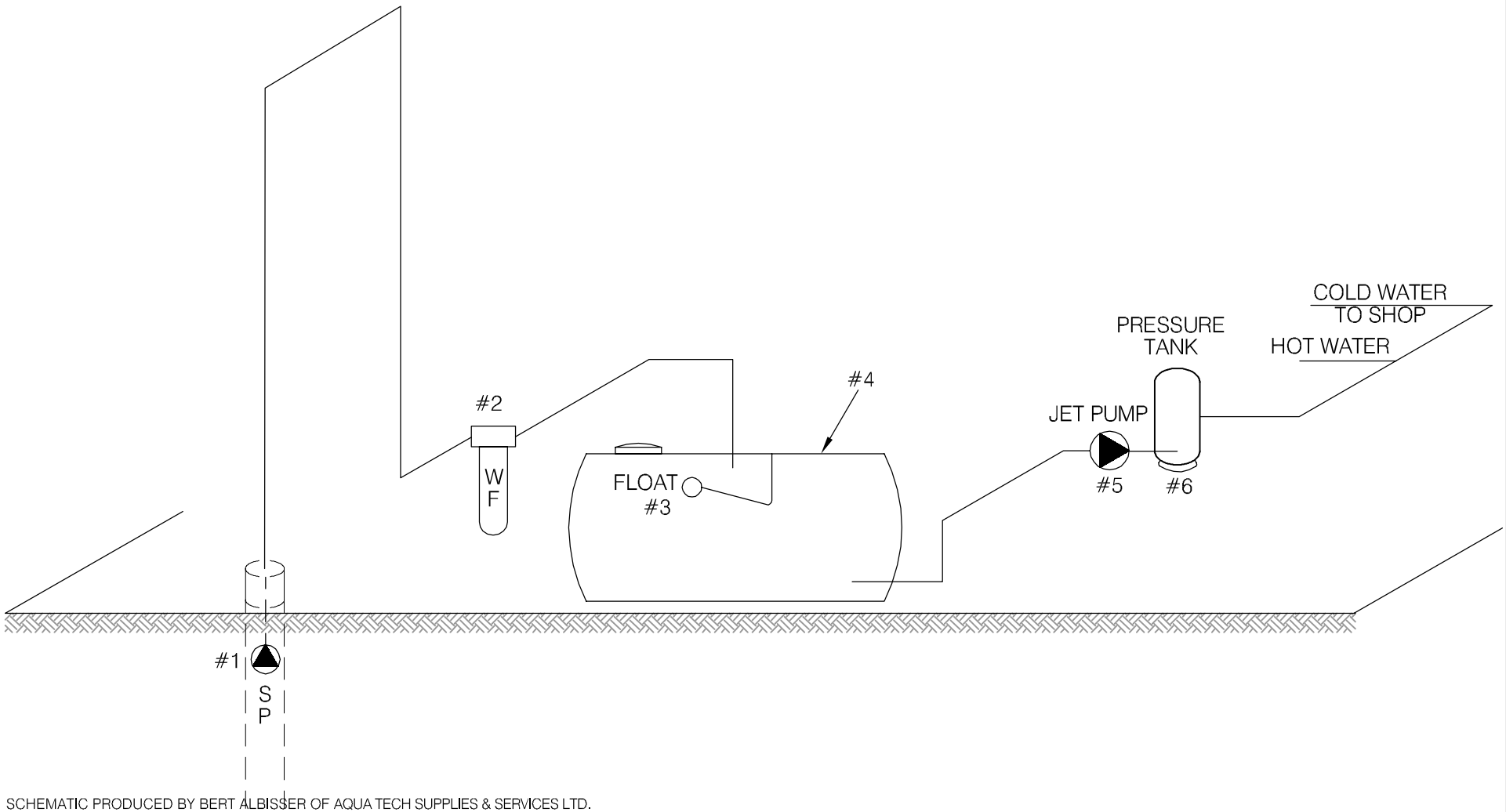
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\1260002003 Eastern Schematic_LEGEND.dwg, 4/11/2006 10:31:08 AM, Adobe PDF, jbuyck



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 4793 SWIFT RIVER GRADER STATION	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE 4793-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\swift\1260002 Swift River Grader Station_4793 Schematic.dwg, 7/20/2005 4:02:41 PM, Adobe PDF

Eastern Region – Swift River Grader Station
Building # 4793

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB. PUMP	GRUNDFOS	SQ			3" - 1"
2	IN LINE FILTER	AMETEK	10" BB			10" x 1"
3	FLOAT CONTROL	STE RHOMBUS	PUMPMASTER	-PUMP UP		
4	STORAGE TANK	MARMIT	HORIZONTAL	LEE TANK		250 GALLON
5	JET PUMP	MONARCH	MJC-60			1/2 HP.
6	PRESSURE TANK	CON AIRE	SCA42E			25 GALLON
7						
8						
9						
10						

TABLE 4793- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
4793	Swift River Grader Station	6	Sept-04 to Mar-05	no	0/6	no	9-Mar-05	no

Table 4793-2: Water Quality Results

Location/ Resident	Swift River		GCDWQ Criteria		
Address	km 1181 Alaska Highway				
Treatment	Sediment Filter				
Disinfection	No				
Source of Water	On-Site Well				
Purpose of Sampling	Baseline	Additional Sampling			
Sample Location		Kitchen Tap			
Date Sampled	13-0ct-04	20-Jun-05	**Lower Limit**	**Upper Limit**	
Physical Tests *(ALS)*			**AO**	**MAC**	**AO**
Colour (CU)	10				15
Total Dissolved Solids	53				500
Hardness CaCO3	25.9		AO >200 = poor, > 500 unacceptable[A]		
pH	7.29		6.5		8.5
Turbidity (NTU)	2.9	0.92		1	5
UV Absorbance		0.011			
Dissolved Anions *(ALS)*					
Alkalinity-Total CaCO3	35				
Chloride Cl	8.2				250
Fluoride F	0.74			1.5	
Sulphate SO4	4.66				
Nitrate Nitrogen N	0.06			10	
Nitrite Nitrogen N	<0.005			1	
Total Metals *(ALS)*					
Aluminum T-Al	0.022				
Antimony T-Sb	<0.0002			0.006	
Arsenic T-As	<0.0002			0.025	
Barium T-Ba	0.016			1	
Boron T-B	0.004			5	
Cadmium T-Cd	0.00002			0.005	
Chromium T-Cr	<0.0005			0.05	
Copper T-Cu	0.574			1	
Iron T-Fe	0.40	0.277			0.3
Lead T-Pb	0.0043			0.01	
Manganese T-Mn	0.012				0.05
Sodium T-Na	8.8				200
Uranium T-U	0.0005			0.02	
Zinc T-Zn	0.189				5
Dissolved Metals					
Iron D-Fe		<0.030			0.3
Organic Parameters					
Tannin and Lignin		0.10			
Total Organic Carbon C		0.72			
Field Chemistry (EBA)					
pH		8.25	6.5		8.5
TDS (ppm)		108			500
EC (uS/cm)		218			
Temperature (°C)		15.7			

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU)

Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

eba

Table 4793-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
4793	**Grader Station**	**Swift River**	6653783	377966	888

Well Details							
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Well Capacity - Tested, or Reported by User**	**Static Water Level Below Ground (m-btwc)**
100 mm pvc pipe		No	6.96 (may be pump)	Unlikely		Well has very low yield	5.2

Potential Contaminant Sources					
Distance from well to nearest point of septic field (m)	**Distance from well to nearest building (m)**	**Distance to surface water body (m)**	**AST present on property?**	**Distance from well to AST (m)**	**Other potential sources of contamination observed on property, and distance to well**
38	Inside maintenance garage	Approximately 60 m to Swift River			Used oil tank at 16 m

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
0.08 m above grade	No		No	No	This well is likely a dug well

EBA Engineering Consultants Ltd.
Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date June 20, 2005

WELL ID #	Owner	Location Description
4793	YTG	Swift River Grader Station

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Swift River

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Swift River, Alaska Hwy

c. GPS location: N 6653783 E377966 elv 888m ±11m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☐ Yes ☒ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Swift River Grader Station

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Swift River Grader Station

h. Distance from well to building located inside

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No N 6653771 E 377942

j. Distance from well to nearest point of known field: 38m

k. Well location relative to field: ☒ upslope slightly ☐ downslope ☒ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☒ Yes ☐ No
Located inside maintenace garage on floor

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☒ Yes ☐ No
located inside maintenance garage

Entrance by animals? ☐ Yes ☒ No
No signs of animals, access possible

p. Is well site subject to flooding? ☐ Yes ☒ No

q. Is the well site well drained? ☒ Yes ☐ No
floor slopes toward garage sump

r. Is there a buried fuel tank on the property? ☒ Yes ☐ No

If yes, is it ☒ in use ☐ abandoned

Is the location known? ☒ Yes ☐ No

Distance from the well to known buried tank ~12m

s. Are there any other known contaminant sources on the property?

☒ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: Used oil AST ; Distance from well to Potential Source 1: ~16m
Potential Source 2: Seagull Creek; Distance from well to Potential Source 2: ~40m
Potential Source 3: _____; Distance from well to Potential Source 3: _____
Potential Source 4: _____; Distance from well to Potential Source 4: _____

t. Are there other wells on this property? ☒ Yes ☐ No

How many? 2 ☒ in use ☐ abandoned ☐ require proper sealing
living complex + utility building wells

2. Well and Wellhead information:

a. When was well installed? Year unknown Month _____

b. Type: ☐ drilled ☒ dug likely ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☐ Yes ☒ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☐ unlikely

e. Surface casing: ☐ Yes Diameter _____ ☒ No
Rudementary; not fixed

f. Well casing: Diameter 10 cm Material: ☐ steel ☒ plastic ☐ concrete inside 30cm steel culvert

g. Depth of well: 6.96m bg could be pump ☒ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: 5.20m bg

☒ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☐ unknown other unknown

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic unknown

k. If there is a well screen: length unknown slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☒ in a building
Maintenance garage of grader station

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail_____

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No

iv. Any evidence of rodents? Specify No signs, access possible

v. Does the well casing have a proper seal cap? ☐ Yes ☒ No

If no, describe condition unfixed, Ø15cm lid over culvert + pvc pipe

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☐ Yes ☒ No

Explain (filtration, disinfection etc…)_____

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment likely ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☐ No
well very low yield

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☒ electric submersible ☐ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☒ plastic

g. Pump delivers water to: ☒ pressure tank ☒ ~~elevated~~ storage tank ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☒ No

j. Is there a water meter on the system? ☐ Yes ☒ No

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: located inside maintenance garage

l. Comments on pump installation: _____

_____

6. Conclusions

a. Comments on overall installation:

_____

_____

_____

_____

_____

_____

_____

b.Recommendations: _____

_____

_____

_____

_____

_____

_____

PART B: EBA Site Inspection

Inspector: BERT AUBISSEK Date JUNE 20/05

WELL ID #	Owner	Location Description
4793	VTG.	SWIFT RIVER GRAVEL STATION

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☑ other IN LINE SEDIMENT FILTER.

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☑ No If so how_____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____reading.

Tested at _____(location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often?_____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. **Water Quality (observations):**

a. Does the water stain plumbing? ☐yes ☐ No ☑ slight ☐ severe

Type of stain: ☐ brown ☐ red ☐ black

b. Does the water contain sediment? ☐Yes ☐No ☑ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☑ No ☐ H_2S ☐ Other _____

WATER NOT USED FOR DRINKING WATER

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No

f. Is there a chemical analysis? ☐ Yes ☐ No ☐ adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☑ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☑ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☑ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☑ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? (Yes) No Details:

Where is it located?
Comments: IN SHED AREA.

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
(YES) NO
Comments:

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES (NO)
Comments:

Are there other heat sources near the tank? YES (NO)
Comments:

Is there waterproof flooring with a sealed base to contain spills? (YES) NO
Comments:

Overall Tank

What are the tank size and dimensions?
30" Ø x 52" LONG.

What material is the tank constructed of? POLYETHELYNE

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? (YES) NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES (NO)

Does the lid have a tight seal and is it watertight when closed? YES (NO)

Does the tank have an overflow or high level whistle? YES (NO)

Is the water tank drain accessible? (YES) NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES (NO)
Comments: _____

Is there any sediment or scum in bottom of tank? YES (NO)
Comments: _____

Is there any odour associated with the water or tank? YES (NO)

Have there been any bacteriological analyses conducted previously? YES NO N/A.

Does the tank appear that it has been cleaned recently? YES (NO)

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES (NO)

8. Conclusions

a. Comments on overall installation:

THIS IS A SHALLOW WELL SYSTEM. THE WELL IS LOCATED IN THE SHED AREA AND DOES NOT HAVE A SANITARY SEAL. STORAGE TANK HAS TO BE REMOVED FROM THE SYSTEM TO ACCESS IT FOR CLEANING.

b. Recommendations:

DRILL A PROPER WATER WELL FOR THIS FACILITY.

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9321
Jurisdiction	Yukon
Community	
Address	
Highway	Alaska Highway
Milepost	M 733
Feature	Swift River
Location and Cause	Swift River Lodge - de-icing operation being conducted without collection of solution
Latitude	60.0080555555556
Longitude	-131.184166666667
Incident Date	3/1/1993
Lead Agency	Environment Canada - Environmental Protection Service
Other Agency	
Company(s)	Swift River Lodge
Amount	250
Units	Litres
Quantity	Estimate
Release Description	Dumped
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Calcium Chloride
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	de-icing solution not being contained - no runoff to river yet but potential - advised operation to be moved and solution contained - toxic to fish

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	9902
Jurisdiction	Yukon
Community	Swift River
Address	
Highway	Alaska Highway
Milepost	M 733
Feature	Swift River
Location and Cause	YECL Envirotank overfilled - tanker truck driver unsure of storage tanks capacity
Latitude	60.004
Longitude	-131.1864
Incident Date	2/1/1999 11:50:00 AM
Lead Agency	Yukon Government - Environmental Programs
Other Agency	
Company(s)	Healey Enterprises (Fort Nelson, BC)
Amount	10
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Diesel
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	fuel ran down sides of tank into snow - contaminated snow to be recovered and free product soaked up - pump shut off as soon as fuel came out vent - no further information



Photo 0232: 4793 Wellhead in maintenance garage



Photo 0229: 4793 Wellhead



Photo 0235: 4793 Septic field



Photo 0236: 4793 Underground fuel storage tank nest (front), used oil tank (back), maintenance garage (back left)



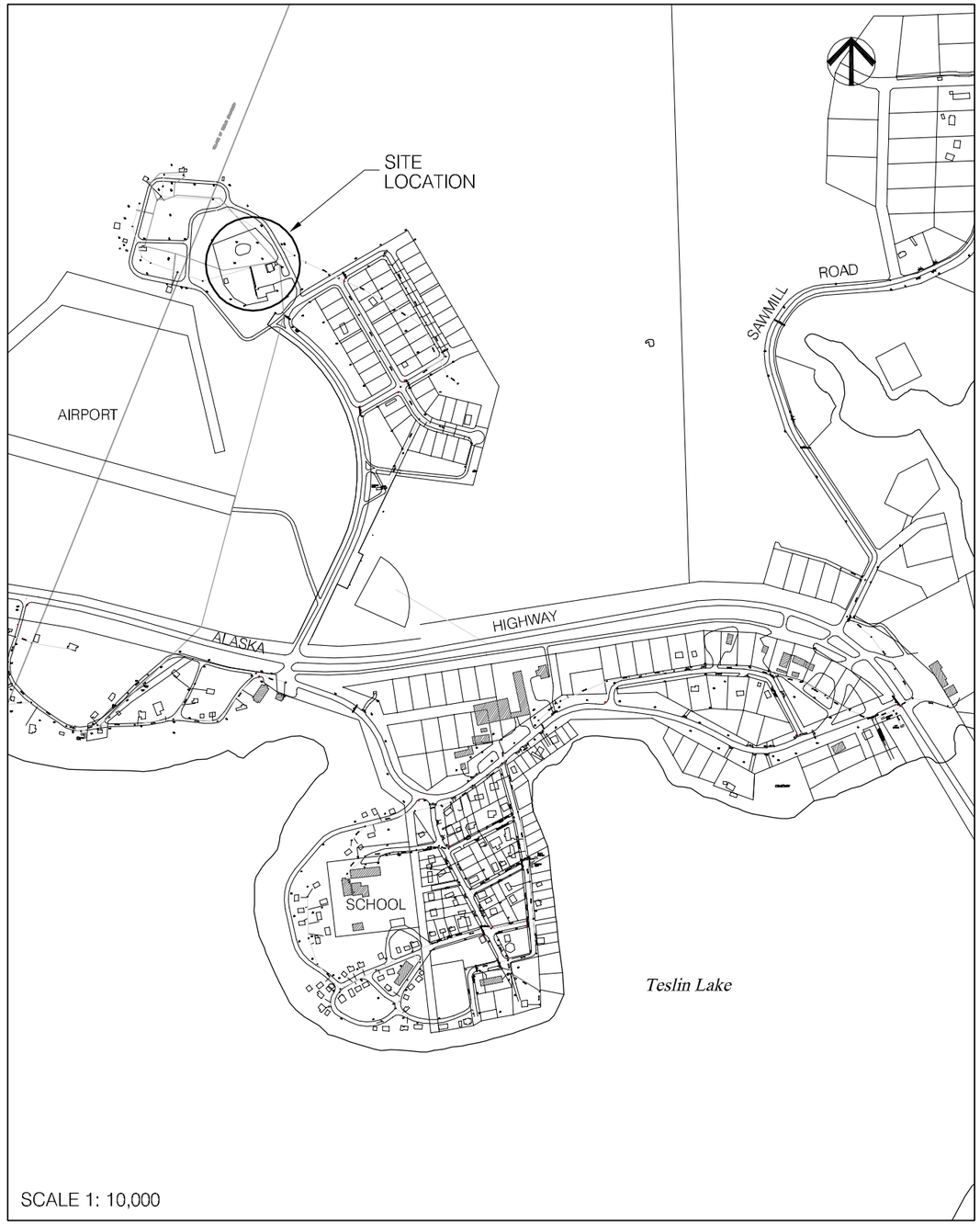
Photo 0230: 4793 Well

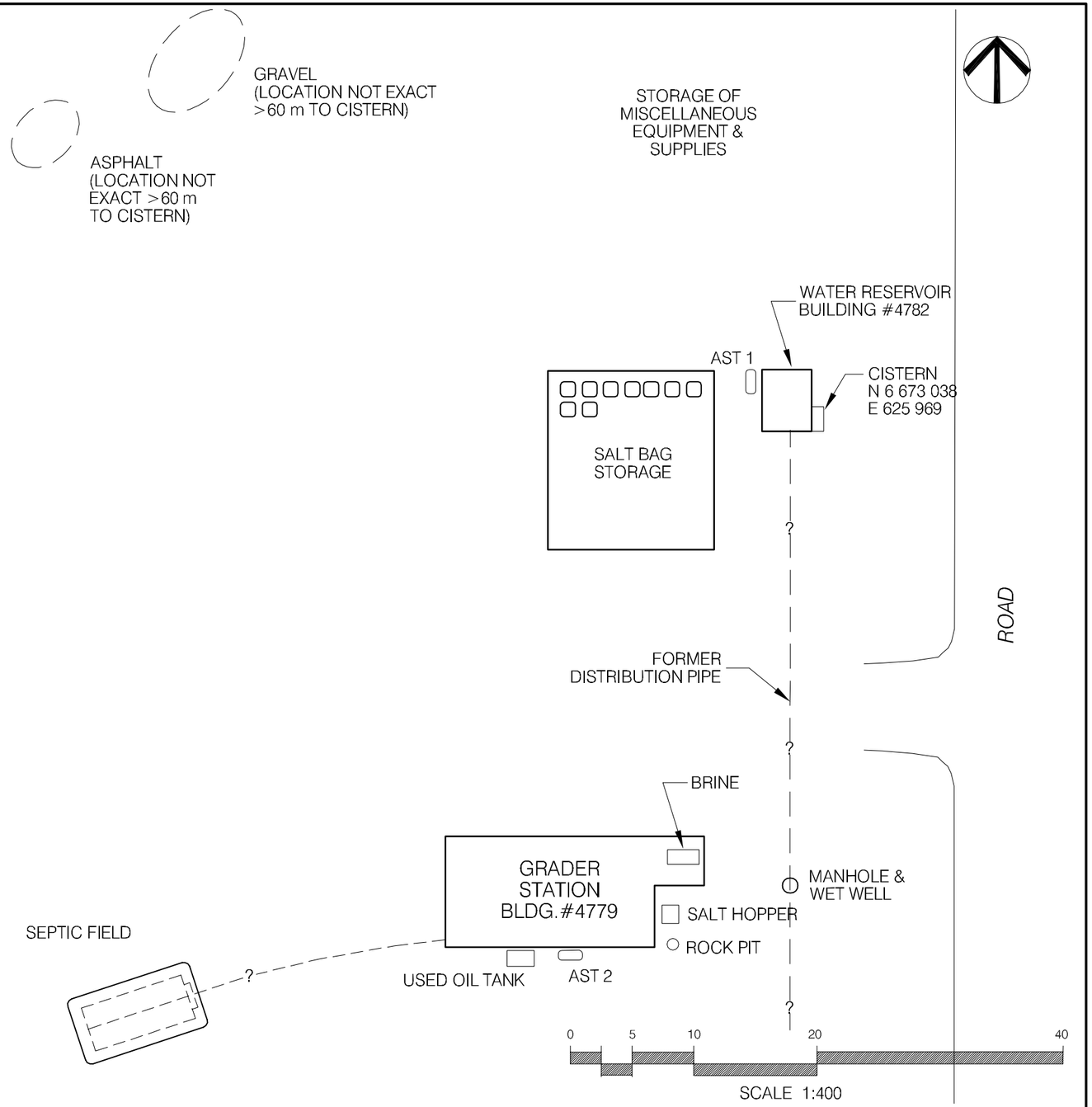


Photo 0231: 4793 Water storage tank



Photo 0228: 4793 Sign warning that water is not to be used as drinking water





NOTES:
1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

TESLIN WATER RESERVOIR
BUILDING # 4782
SITE LOCATION DIAGRAM
WELL ID: 4782

REVISION ISSUE 0

FIGURE No. FIGURE 4782-A

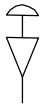
LEGEND


PUMP


PRESSURE GAUGE


GATE VALVE


CHECK VALVE


SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



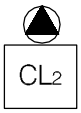
FLOW METER



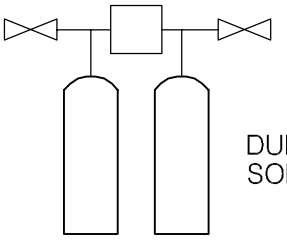
WATER FILTER
(CARTRIDGE TYPE)

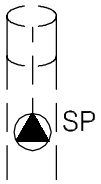


PRESSURE TANK

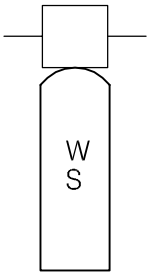


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER



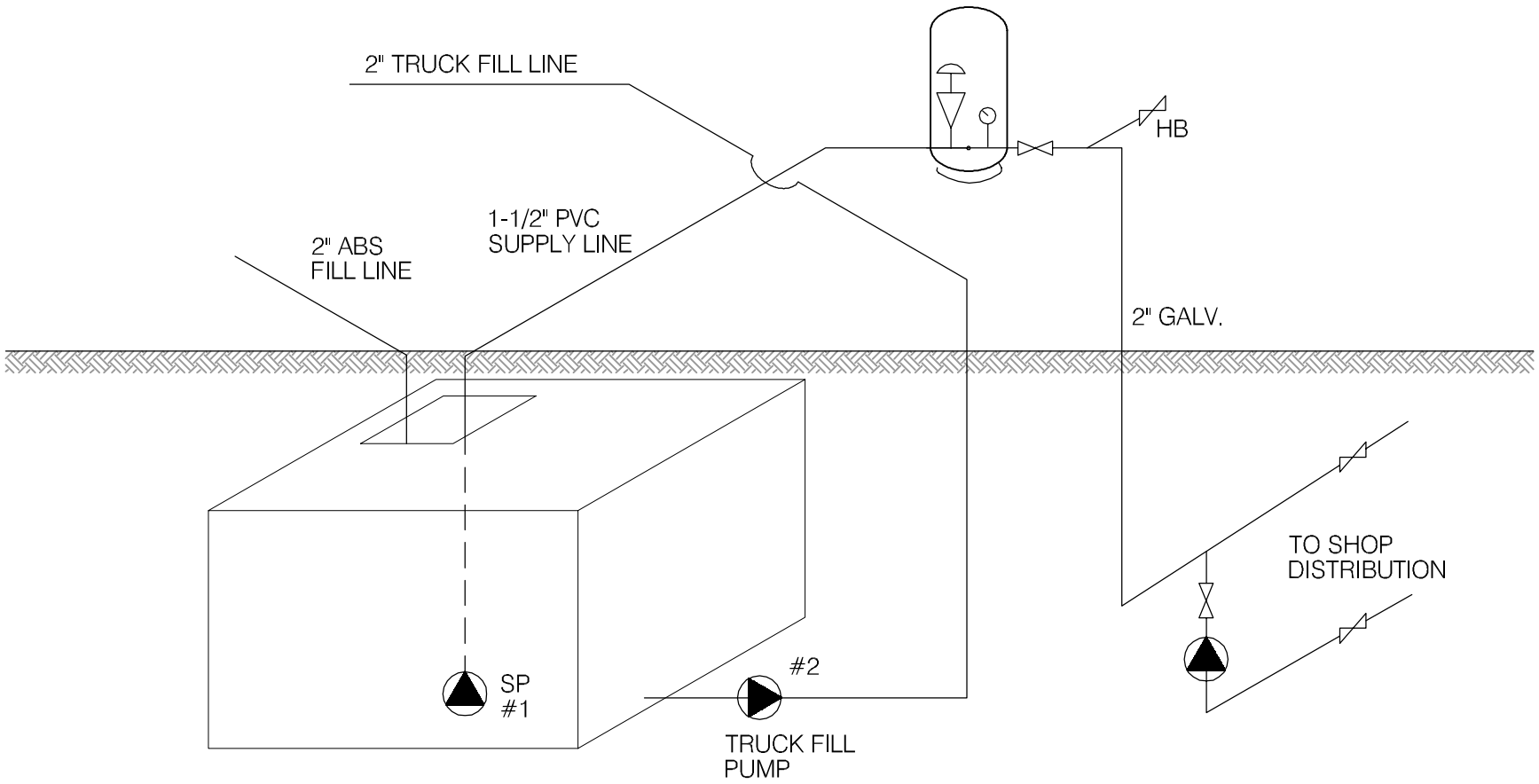
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\1260002003 Eastern Schematic_LEGEND.dwg, 4/11/2006 10:31:08 AM, Adobe PDF, jbuyck



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 4782 TESLIN GRADER STATION	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE 4782-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\teslin\Schematics\1260002 Teslin Grader Station 4782 Schematic.dwg, 7/20/2005 12:16:43 PM, Adobe PDF

Eastern Region – Water Reservoir
Building # 4782

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	Sub. Pump	N/A	N/A			4" - 1HP
2	Truck Fill Pump	Monarch	6MF-2		685	
3	Pressure Tank	Well Rite	WR240R			307 L
4	Pressure Switch	SQ. D	FSG-2			2" 1/4 Flat
5	Pressure Gauge	Marsh	0-100 PSI			2"
6						
7						
8						
9						
10						

TABLE 4782- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
4782	Water Reservoir	NO BACTERIOLOGICAL RESULTS ARE AVAILABLE FOR THIS SITE						

Table 4782-2: Water Quality Results

SOURCE:	Building 4782 - Water Reservoir		GCDWQ Criteria		
Location/ Resident	Teslin				
Address					
Treatment	No				
Disinfection	No				
Source of Water	Water Delivery				
Purpose of Sampling	Baseline	Additional Sampling			
Sample Location		Washroom Tap			
Date Sampled		16-Jun-05	**Lower**	**Upper Limit**	
Physical Tests *(ALS)*			**AO**	**MAC**	**AO**
Colour (CU)		6.1			15
Conductivity (uS/cm)		582			
Total Dissolved Solids		362			500
Hardness CaCO3		251	AO >200 = poor, > 500 unacceptable[A]		
pH		8.31	6.5		8.5
Turbidity (NTU)		**2.49**		1	5
Dissolved Anions *(ALS)*					
Alkalinity-Total CaCO3		238			
Chloride Cl		4.61			250
Fluoride F		0.17		1.5	
Sulphate SO4		105			500
Nitrate Nitrogen N		<0.10		10	
Nitrite Nitrogen N		<0.10		1	
Ammonia Nitrogen N		0.036			
Total Metals *(ALS)*					
Aluminum T-Al		<0.010		0.1	
Antimony T-Sb		<0.00050		0.006	
Arsenic T-As		*0.0162*		0.025	
Barium T-Ba		0.03		1	
Boron T-B		<0.10		5	
Cadmium T-Cd		<0.00020		0.005	
Calcium T-Ca		41.7			
Chromium T-Cr		<0.0020		0.05	
Copper T-Cu		0.0218		1	
Iron T-Fe		0.295			0.3
Lead T-Pb		<0.0010		0.01	
Magnesium T-Mg		35.8			
Manganese T-Mn		0.013			0.05
Mercury T-Hg		<0.00020		0.001	
Potassium T-K		1.8			
Selenium T-Se		<0.0010		0.01	
Sodium T-Na		39.1			200
Uranium T-U		0.00017		0.02	
Zinc T-Zn		0.065			5
Organic Parameters					
Total Organic Carbon C		2.19			
Field Chemistry (EBA)					
pH		**8.63**	6.5		8.5
TDS (ppm)		291			500
EC (uS/cm)		586			
Temperature (°C)		7.1			

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU), Conductivity (umhos/cm), Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

eba

Table 4782-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification			GPS Coordinates		
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
4782	**Water Reservoir**	**Teslin**	6673038	625969	704

Well Details							
Well Casing Diameter (mm)	**Year Well Installed**	**Well Log?**	**Well Depth (m bg)**	**Reported Low Permeabilty Protective Layer?**	**Pump Setting (m bg)**	**Well Capacity - Tested, or Reported by User**	**Static Water Level Below Ground (m-btwc)**
No well, system is on water delivery							

Potential Contaminant Sources					
Distance from well to nearest point of septic field (m)	**Distance from well to nearest building (m)**	**Distance to surface water body (m)**	**AST present on property?**	**Distance from well to AST (m)**	**Other potential sources of contamination observed on property, and distance to well**
Greater than 60 m	Inside water resevoir building	Greater than 60 m	AST 1	4	Salt storage at 8 m
					Salt Hopper at 40 m
					Used Oil Tank at 50 m
			AST2	50	Rock Pit at 45 m
					Asphalt Pile at over 60 m

Well Construction Details					
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**	**Comments**
N/A	N/A	N/A	N/A	N/A	

EBA Engineering Consultants Ltd.

Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date June 16, 2005

WELL ID #	Owner	Location Description
4782	YTG	Water Reservoir/Teslin Grader Station

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Teslin

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Teslin Grader Station

c. GPS location: N: 6673038 E: 625969 elev. 704m ± 8m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☐ Yes ☒ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Located inside the water reservoir building

h. Distance from well to building _____

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No

j. Distance from ~~well~~ reservoir to nearest point of known field: >60m

k. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☐ Yes ☒ No

---

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☒ Yes ☐ No Entrance by animals? ☒ Yes ☐ No
Inside building equiped w/ padlock on the door

p. Is well site subject to flooding? ☒ Yes ☐ No

q. Is the well site well drained? ☒ Yes ☐ No
The area around the enclosure is graded away from well

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely

If yes, is it ☐ in use ☐ abandoned _____

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe Proximity with respect to the water reservoir

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other
Asphalt pile >60m

2- N: 6672984 E: 625964 elv 710m ±8m →

Potential Source 1: AST1, 2 ; Distance from well to Potential Source 1: 4m

Potential Source 2: Salt Storage ; Distance from well to Potential Source 2: 8m

Potential Source 3: Salt Hopper ; Distance from well to Potential Source 3: _____

Potential Source 4: Used oil tank ; Distance from well to Potential Source 4: _____

Rock Pit → Possibly @ ~45m N:6672994 E:625978

t. Are there ~~other~~ wells on this property? ☐ Yes ☒ No unlikely

How many? _____ ☐ in use ☐ abandoned ☐ require proper sealing

2. Well and Wellhead information:

a. When was ~~well~~ reservoir installed? Year Unknown Month _____

b. Type: ☐ drilled ☐ dug ☐ sand point ☐ other N/A

c. Is there a drillers log for the well: ☐ Yes ☐ No N/A

d. Is there a surface seal to 6 m ☐ Yes ☐ No ☐ unknown ☐ unlikely N/A

e. Surface casing: ☐ Yes Diameter _____ ☐ No N/A

f. Well casing: Diameter _____ Material: ☐ steel ☐ plastic ☐ concrete N/A

g. Depth of well: _____ ☐ measured (if possible) ☐ reported ☐ from log N/A

h. Static water level below ground: _____

☐ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen N/A

☐ with slotted pipe ☐ unknown other _____

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic N/A

k. If there is a well screen: length _____ slot size(s) _____ N/A
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No N/A

m. Is the ~~well head~~ reservoir: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☒ in a building
The reservoir is made of concrete.
The enclosure is made of timbers, but is made of concrete ~40 cm
☐ in a wooden enclosure other, describe above grade and below

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail The water reservoir is made of concrete and installed below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☐ No
The basement of the buiding has been flooded: ~ 5cm of water

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☐ No

iv. Any evidence of rodents? Specify There was no evidence of rodents inside building

v. Does the well casing have a proper seal cap? ☐ Yes ☐ No
N/A

If no, describe condition _____

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☐ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☐ Yes ☐ No

Explain (filtration, disinfection etc…) _____

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☐ granular sediment ☐ unknown
N/A

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☐ No
N/A

5. Pump Installation:

a. Is the ~~well~~ reservoir equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☒ electric submersible ☐ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☐ plastic
N/A

g. Pump delivers water to: ☒ pressure tank ☐ elevated tank ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☒ Yes ☐ No

j. Is there a water meter on the system? ☐ Yes ☐ No
Unknown

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: There is a heater inside the reservoir building

l. Comments on pump installation: Pump is submersed in reservoir

6. Conclusions

a. Comments on overall installation:

This water system includes a concrete water reservoir 2.5m x 5m x 3m located inside water reservoir building. Water is from a delivered source, up until recently the water had been piped from Teslin Lake.

b.Recommendations: _____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JUNE 16/05

WELL ID #	Owner	Location Description
4782	YTG	TESLIN WATER RESERVOIR

6. Water Treatment

a. Is well water treated? ☐ Yes ☐ No; Type of treatment: DELIVERED WATER.

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☑ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☑ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☑ Yes ☐ No

7. Water Quality (observations):

a. Does the water stain plumbing? ☐ yes ☐ No ☐ slight ☐ severe

Type of stain: ☐ brown ☐ red ☐ black

b. Does the water contain sediment? ☐ Yes ☐ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☐ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☑ Yes ☐ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No N/A

f. Is there a chemical analysis? ☐ Yes ☐ No ☐ adequate ☐ incomplete ?

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☑ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☑ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☑ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☑ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes No Details:

Where is it located?
Comments: OUT BUILDING

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES NO
Comments: _____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES NO
Comments: _____

Are there other heat sources near the tank? YES NO
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO
Comments: _____

Overall Tank

What are the tank size and dimensions?
5' W x 16' L x 10' H 5000 GALLON APPROX

What material is the tank constructed of? CONCRETE

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? (YES) NO

Does the lid have a tight seal and is it watertight when closed? YES (NO)

Does the tank have an overflow or high level whistle? YES (NO)

Is the water tank drain accessible? YES (NO)

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments: IRON STAINING

Is there any sediment or scum in bottom of tank? (YES) NO
Comments: _____

Is there any odour associated with the water or tank? YES (NO)

Have there been any bacteriological analyses conducted previously? YES NO ?

Does the tank appear that it has been cleaned recently? YES (NO)

Are the tanks easily assessed for the purpose of cleaning and disinfection? (YES) NO

8. Conclusions

a. Comments on overall installation:

THIS INSTALLATION DOES NOT MEET DRINKING WATER SYSTEM STANDARDS. THE CYSTERN ACCESS IS NOT SECURED WITH A LID OF ANY KIND. THERE IS A STRONG DIESEL FUEL ODOUR IN THIS BUILDING. BOTH THE TRUCK FILL LINE AND THE CYSTERN FILL LINE ARE EXPOSED WITHOUT A PROPER CAP. THERE IS NO DRAIN OR SUMP PUMP AT THE LOWER LEVEL.

b. Recommendations:

CLEAN THE CONCRETE CYSTERN. INSTALL PROPERLY SEALED LID. REPIPE THE SUB. PUMP SYSTEM WITH PROPER SEALED WALL SLEEVES. INSTALL PROPERLY SEALED FILL LINE TO THE CYSTERN. SUPERCHLORINATE THE COMPLETE PIPING SYSTEM INSTITUTE PROPER CHLORINE RESIDUAL TESTING.



Photo 0218: 4782 Water Reservoir building



Photo 0220: 4782 Cistern inside Water Reservoir building



Photo 0222: 4782 Teslin Grader Station (back) and Water Reservoir building (right)



Photo 0221: 4782 Basement of Water Reservoir building. Water pump (centre), cistern behind left wall, note flooding on the floor.



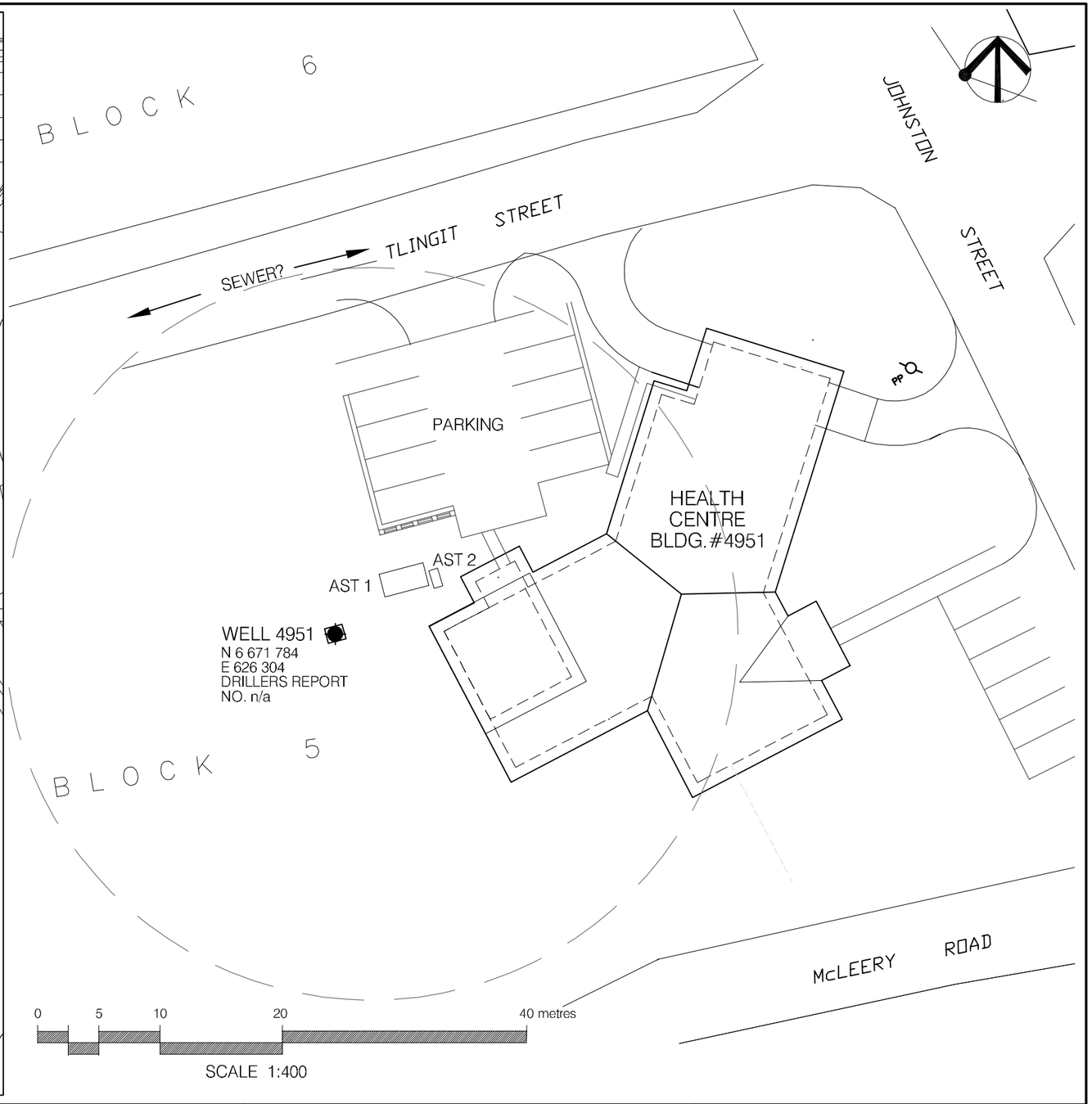
Photo 0009: 4782 Entrance to cistern



Photo 0009: 4782 Pressure tank



SCALE 1: 10,000



SCALE 1:400

NOTES:
1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon Highways and Public Works Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

TESLIN HEALTH CENTRE BUILDING # 4951 SITE LOCATION DIAGRAM WELL ID: 4951

REVISION ISSUE: 0

FIGURE No.: FIGURE 4951-A

LEGEND



PUMP



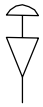
PRESSURE GAUGE



GATE VALVE



CHECK VALVE



SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



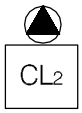
FLOW METER



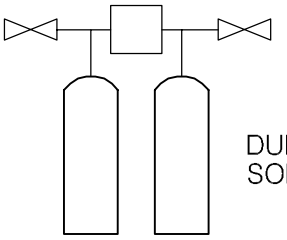
WATER FILTER
(CARTRIDGE TYPE)



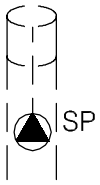
PRESSURE TANK



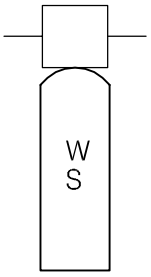
CHLORINE RESERVOIR AND
INJECTION PUMP



DUPLEX WATER
SOFTENER



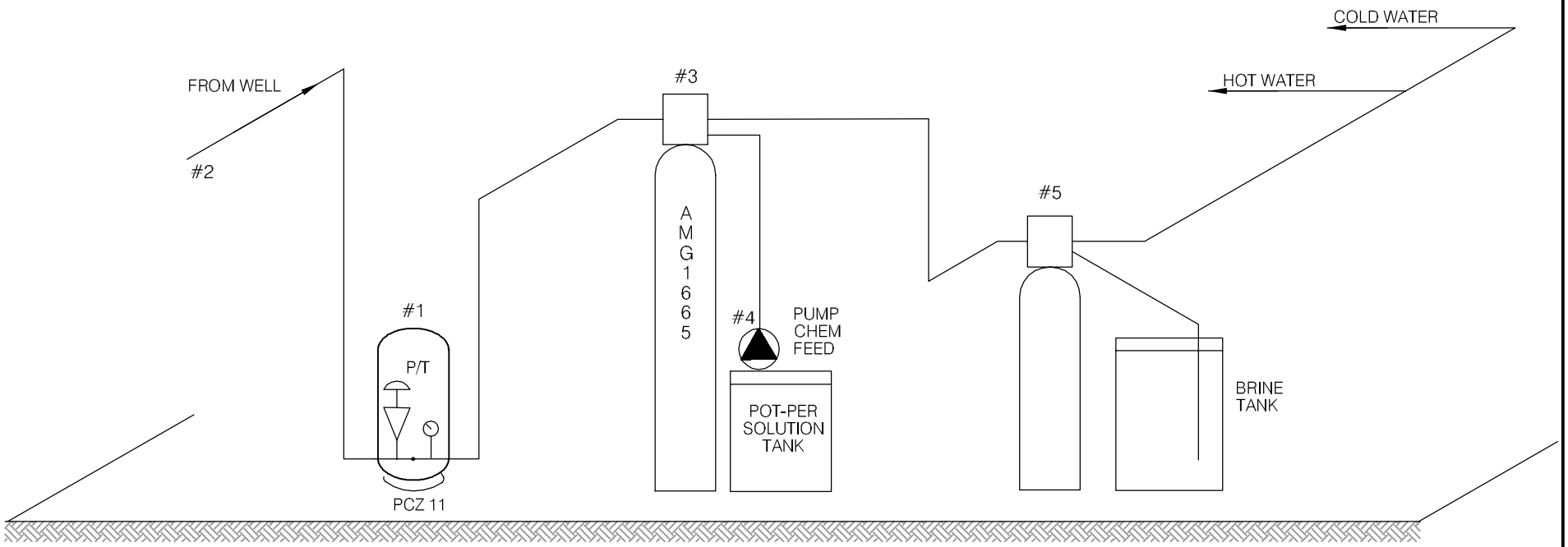
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\1260002003 Eastern Schematic_LEGEND.dwg, 4/11/2006 10:31:08 AM, Adobe PDF, jbuyck



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.				PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION
CLIENT	Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 4951 TESLIN HEALTH CENTRE
DATE JULY 2005	DWN. JSB	CHKD. RMM		FILE NO. 1260002.002	DWG.: FIGURE 4951-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\teslin\Schematics\1260002 Teslin Health Centre 4951 Schematic.dwg, 7/20/2005 3:46:21 PM, Adobe PDF

Eastern Region – Health Centre
Building # 4951

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	PRESSURE TANK	CHALLENGER	PC211		2110097	225L
2	SUB. PUMP					4"
3	GREENSAND FILTER	HYDROTECH	HMG-1665		162353	1665
4	CHEM FEED PUMP	PULSATRON	LC038A-	VTC1-XXX	000410462	
5	WATER SOFTENER	HYDROTECH	EIS 45-MI	7836-1	174642	10"x54
6						
7						
8						
9						
10						

TABLE 4951- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
4951	Health Centre	7	Sept-05 to Mar-05	no	0/7	no	1-Mar-05	no

Table 4951-2: Water Quality Results

SOURCE:	Building 4951 - Teslin Health Centre		GCDWQ Criteria		
Location/ Resident	Teslin				
Address					
Treatment	Iron Manganese Removal, Harness Removal, Filtration				
Disinfection	No				
Source of Water	On-Site Well				
Purpose of Sampling	Baseline	Additional Sampling			
Sample Location		Washroom Tap			
Date Sampled	9-Sep-04	16-Jun-05	**Lower**	**Upper Limit**	
Physical Tests *(ALS)*			**AO**	**MAC**	**AO**
Colour (CU)	<5.0				15
Total Dissolved Solids	**865**				500
Hardness CaCO3	30.6		AO >200 = poor, > 500 unacceptable[A]		
pH	**8.51**		6.5		8.5
Turbidity (NTU)	0.3			1	5
UV Absorbance		0.023			
Dissolved Anions *(ALS)*					
Alkalinity-Total CaCO3	271				
Chloride Cl	2.6				250
Fluoride F	0.17			1.5	
Silicate SiO4		14.9			
Sulphate SO4	264				500
Nitrate Nitrogen N	<0.1			10	
Nitrite Nitrogen N	<0.05			1	
Total Phosphate PO4		0.0702			
Total Metals *(ALS)*					
Aluminum T-Al	<0.005			0.1	
Antimony T-Sb	<0.0002			0.006	
Arsenic T-As	***0.0083***	***0.0070***		0.025	
Barium T-Ba	0.002			1	
Boron T-B	0.032			5	
Cadmium T-Cd	0.00002			0.005	
Chromium T-Cr	0.0008			0.05	
Copper T-Cu	0.002			1	
Iron T-Fe	<0.01				0.3
Lead T-Pb	0.0001			0.01	
Manganese T-Mn	<0.005				0.05
Sodium T-Na	1.5				200
Uranium T-U	<0.0005			0.02	
Vanadium T-V		<0.030			
Zinc T-Zn	0.004				5
Dissolved Metals					
Arsenic D-As		***0.0073***		0.025	
Organic Parameters					
Tannin and Lignin		<0.50			
Total Organic Carbon C		1.57			
Field Chemistry (EBA)					
pH		**8.57**	6.5		8.5
TDS (ppm)		**650**			500
EC (uS/cm)		1300			

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU)

Conductivity (umhos/cm), Temperature (^{o}C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

eba

EBA Engineering Consultants Ltd.

Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date June 16

WELL ID #	Owner	Location Description
4951	YTG	Teslin Health Centre

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Teslin

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Teslin Health Centre

c. GPS location: N 6671784 E 626304 ~~el.~~ el. 697m ±8m

d Is there electric power? ☐ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Health Centre only

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Teslin Health Centre Building

h. Distance from well to building 9m

i. If there is an effluent disposal field, is its location known? ☐ Yes ☒ No

j. Distance from well to nearest point of known field: _____

k. Well location relative to field: ☐ upslope ☐ downslope ☐ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☒ Yes ☐ No
Community sewage system

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☒ Yes ☐ No
Enclosed in locked pit

Entrance by animals? ☐ Yes ☒ No
no evidence, but access is possible

p. Is well site subject to flooding? ☐ Yes ☒ No

q. Is the well site well drained? ☒ Yes ☐ No

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: AST 1 ; Distance from well to Potential Source 1: 5m
Potential Source 2: AST 2 ; Distance from well to Potential Source 2: 9 m
Potential Source 3: _____ ; Distance from well to Potential Source 3: _____
Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

t. Are there other wells on this property? ☐ Yes ☒ No

How many? _____ ☐ in use ☐ abandoned ☐ require proper sealing

2. Well and Wellhead information:

* a. When was well installed? Year _____ Month _____

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☐ Yes ☒ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☒ unlikely

e. Surface casing: ☐ Yes Diameter _____ ☒ No

f. Well casing: Diameter 15 cm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: _____ ☐ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: _____

☐ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☐ unknown other _____

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length _____ slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No

m. Is the well head: ☐ in pumphouse ☒ in pit ☐ pitless adaptor ☐ in a building
PWF insulated pit

☒ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail 0.75 m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☒ Yes ☐ No

iv. Any evidence of rodents? Specify No evidence, access possible

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No
Split seal gasket
If no, describe condition _____

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☒ Yes ☐ No

Explain (filtration, disinfection etc...) Mn screen sand filtration and water softening

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☐ granular sediment ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No unlikely

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☒ electric submersible ☐ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☒ plastic likely

g. Pump delivers water to: ☒ pressure tank ☐ elevated tank ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☒ Yes ☐ No
But located up against floor

j. Is there a water meter on the system? ☐ Yes ☐ No unknown

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Heat trace and insulation

l. Comments on pump installation: _____

_____

6. Conclusions

a. Comments on overall installation:

_____

_____

_____

_____

_____

_____

_____

b.Recommendations: _____

_____

_____

_____

_____

_____

_____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JUNE 16/05

WELL ID #	Owner	Location Description
4951	YTG	TESLIN HEALTH CENTRE

6. **Water Treatment**

a. Is well water treated? ☑ Yes ☐ No; Type of treatment:

☐ chlorination ☑ iron and or manganese removal ☑ other HARDNESS REMOVAL

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☑ No If so how_____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____reading.

Tested at _____(location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often?_____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. **Water Quality (observations):**

a. Does the water stain plumbing? ☐ yes ☑ No ☐ slight ☐ severe

Type of stain: ☐ brown ☐ red ☐ black

b. Does the water contain sediment? ☐ Yes ☑ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☑ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☑ No

f. Is there a chemical analysis? ☐ Yes ☐ No ☑ adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☑ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☐ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☐ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☐ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? (Yes) No Details:

Where is it located?
Comments: PRESSURE TANK.

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
(YES) NO
Comments: _____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES (NO)
Comments: _____

Are there other heat sources near the tank? YES NO
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO
Comments: _____

Overall Tank

What are the tank size and dimensions?

_____

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments: _____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

THIS IS A GOOD QUALITY INSTALLATION IN EQUIPMENT AND WORKMANSHIP

b. Recommendations:

AS THIS WELL HAS NO SURFACE SEAL THE COMPLETE SYSTEM SHOULD BE SHOCK CHLORINATED AND AN APPROPRIATE UV SYSTEM SHOULD BE INSTALLED.

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	0104
Jurisdiction	Yukon
Community	Teslin
Address	Jackson Ave
Highway	
Milepost	
Feature	Teslin
Location and Cause	Teslin septic tank - mechanical failure of auto dialer alarm - sewage spill
Latitude	60.16491
Longitude	-132.72162
Incident Date	1/7/2001
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	
Company(s)	Village of Teslin
Amount	800
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	spill migrated to shoreline of Teslin Lake but was contained in snow and ice - contaminated snow removed and bleach used as disenfectant - clean-up was completed

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	0333
Jurisdiction	Yukon
Community	Teslin
Address	Jackson Ave
Highway	
Milepost	
Feature	Teslin
Location and Cause	spill at Lift Station #2 - due possibley to faulty truck guage - cause to be determined
Latitude	60.16491
Longitude	-132.72162
Incident Date	9/23/2003 11:00:00 AM
Lead Agency	
Other Agency	
Company(s)	Village of Teslin
Amount	100
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	contaminated soil removed and replaced with clean crush - industrial bleach applied to contaminated area - lead agency to be determined - no further info on file

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	0340
Jurisdiction	Yukon
Community	Teslin
Address	Jackson Ave
Highway	
Milepost	
Feature	Teslin
Location and Cause	Lift Station #2 (Jackson Ave) - spill due to non-secured coupling device
Latitude	60.16491
Longitude	-132.72162
Incident Date	11/27/2003 2:30:00 PM
Lead Agency	Yukon Government - Water Inspections
Other Agency	
Company(s)	Village of Teslin
Amount	80
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	driver of truck bleached area - contaminated area being cleaned up and material removed to landfill - copy of letter from Village of Teslin to YT Water Board on file

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	8706
Jurisdiction	Yukon
Community	Teslin
Address	Jackson Ave
Highway	
Milepost	
Feature	Teslin
Location and Cause	Jackson Ave pump station - truck overturned in avoiding oncoming traffic
Latitude	60.16491
Longitude	-132.72162
Incident Date	3/17/1987 2:10:00 PM
Lead Agency	Federal Government - other
Other Agency	Environment Canada - Environmental Protection Service
Company(s)	Walter Geddes
Amount	4500
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	no specific environmental concerns - possiblity of contamination of 1 or 2 near-by water wells - contained in snow berm - removed to sewage lagoon



Photo 0217: 4951 Wellhead enclosure (front), doubled walled envirotank above ground fuel storage tank (back left), existing above ground storage tank with secondary containment tub (back centre), and Teslin Health Centre (back right).



Photo 0216: 4951 Wellhead in pit



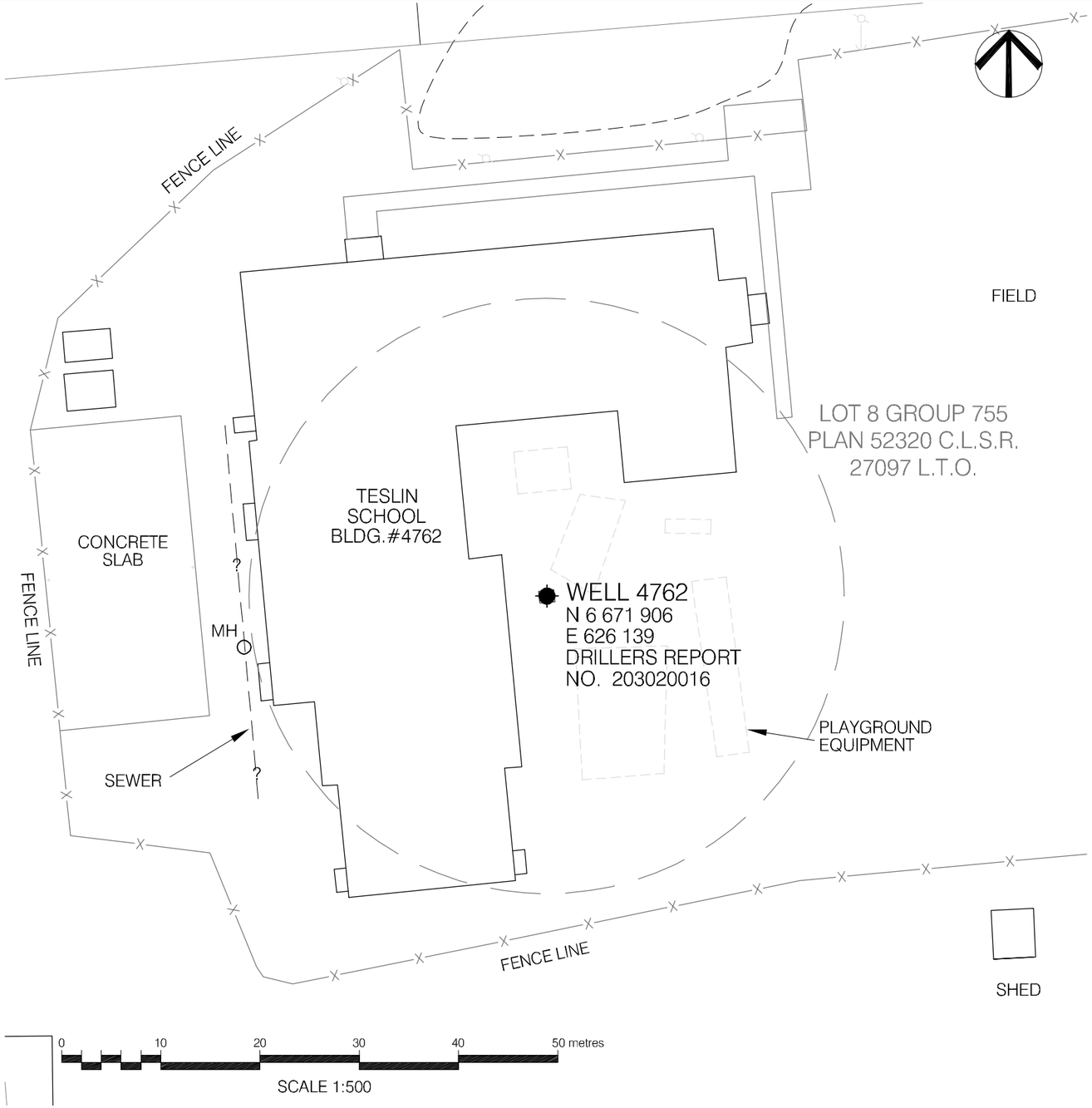
Photo 0026: 4951 Water softener (left), greensand filter (centre), and brine tank (right)



Photo 0028: 4951 Pressure tank



SCALE 1: 10,000



SCALE 1:500

NOTES:
1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

TESLIN SCHOOL BUILDING # 4762 SITE LOCATION DIAGRAM WELL ID: 4762

REVISION ISSUE 0

FIGURE No. FIGURE 4762-A

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\teslin\1260002 Teslin School 4762.dwg, 7/20/2005 3:42:42 PM, Adobe PDF

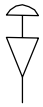
LEGEND


PUMP


PRESSURE GAUGE


GATE VALVE


CHECK VALVE


SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



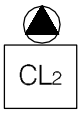
FLOW METER



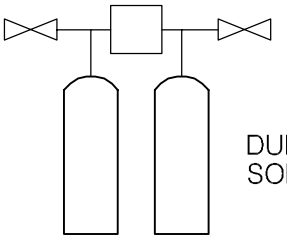
WATER FILTER
(CARTRIDGE TYPE)

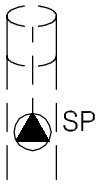


PRESSURE TANK

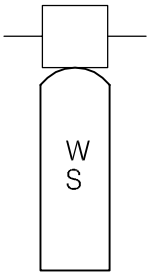


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER



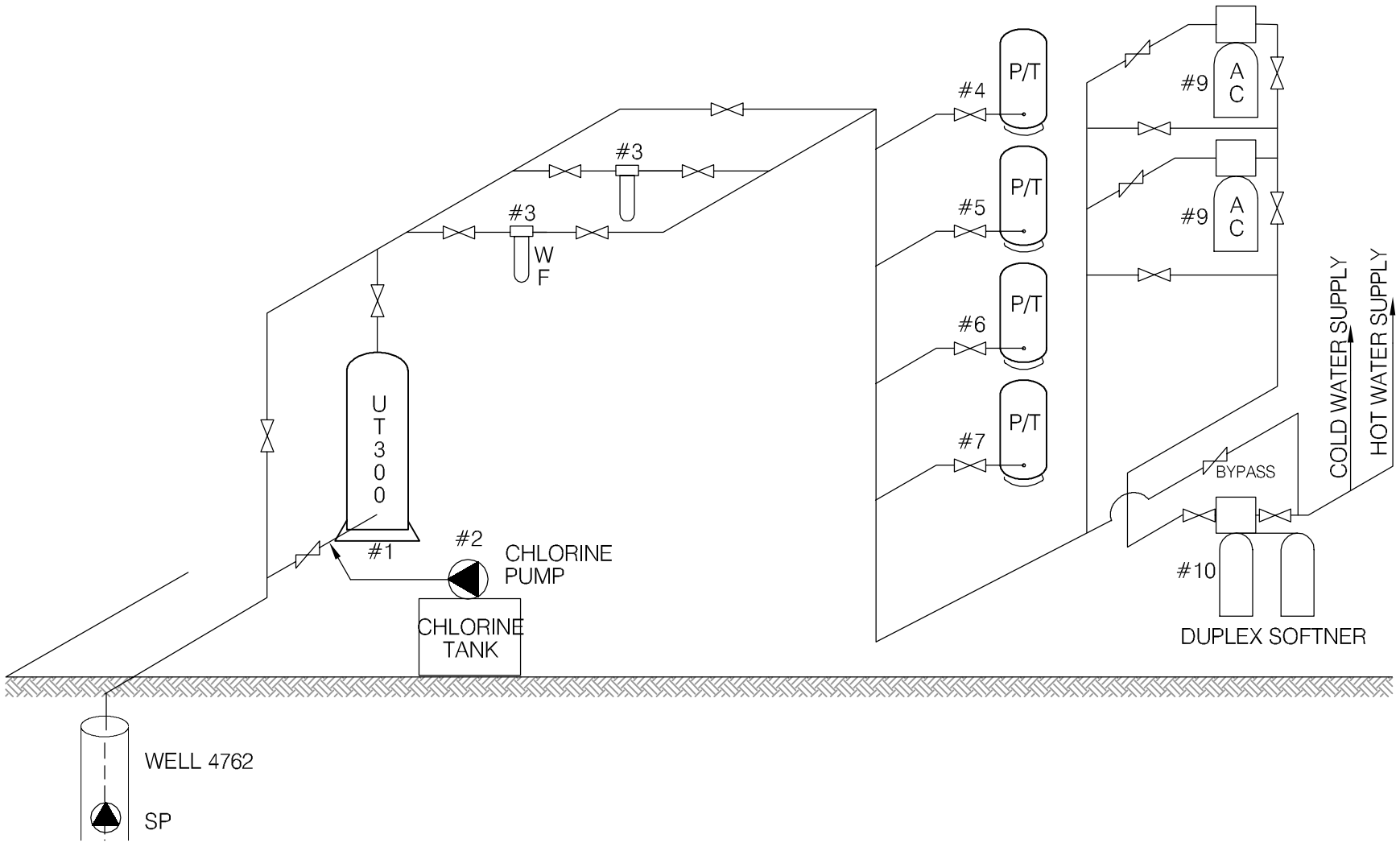
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\1260002003 Eastern Schematic_LEGEND.dwg, 4/11/2006 10:31:08 AM, Adobe PDF, jbuyck



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 4762 TESLIN SCHOOL	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE 4762-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\teslin\Schematics\1260002 Teslin School 4762 Schematic.dwg, 7/20/2005 3:27:17 PM, Adobe PDF

Eastern Region – Teslin School
Building # 4762

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	RETENTION TANK	WELL MATE	UT-300			
2	CHEM FEED PUMP	STENNER	45MP5		D13886-DF	50GPD
3	INLINE FILTER	AMIDEK	10BB DUPLEX			10" BB
4	PRESSURE TANKS	CHALLENGER	PC 144R			
5	PRESSURE TANK	"	"			
6	PRESSURE TANK	"	"			
7	PRESSURE TANK	RED LION	RL 44	60446		
8	WELL PUMP SUBMERSIBLE					4"
9	CHARCOAL FILTER	AQUA TECH	25600 CC AC 1.5			1.5 cu ft
10	DUPLEX SOFTENER	AQUA TECH	29000 MI 45K			45K.

TABLE 4762- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
4762	Teslin School	7	Sept-05 to Mar-05	no	0/7	no	1-Mar-05	no

Table 4762-2: Water Quality Results

SOURCE:	Building 4762-Teslin School		GCDWQ Criteria		
Location/ Resident	Teslin				
Address					
Treatment	Softner, Filtration, Iron Manganese Removal				
Disinfection	Chlorination (inefective)				
Source of Water	On-Site Well				
Purpose of Sampling	Baseline	Additional Sampling			
Sample Location	Home Ec. Room				
Date Sampled	9-Sep-05	16-Jun-05	Lower	Upper Limit	
Physical Tests *(ALS)*			**AO**	**MAC**	**AO**
Colour (CU)	<5				15
Total Dissolved Solids	**550**				500
Hardness CaCO3	17.4		AO >200 = poor, > 500 unacceptable[A]		
pH	**8.53**		6.5		8.5
Turbidity (NTU)	0.3			1	5
Dissolved Anions *(ALS)*					
Alkalinity-Total CaCO3	294				
Chloride Cl	3.3				250
Fluoride F	0.16			1.5	
Silicate SiO4		15.5			
Sulphate SO4	82.9				500
Nitrate Nitrogen N	<0.1			10	
Nitrite Nitrogen N	<0.05			1	
Total Phosphate PO4		0.0435			
Total Metals *(ALS)*					
Aluminum T-Al	<0.005			0.1	
Antimony T-Sb	<0.0002			0.006	
Arsenic T-As	*0.0070*	*0.0074*		0.025	
Barium T-Ba	0.003			1	
Boron T-B	0.027			5	
Cadmium T-Cd	<0.00001			0.005	
Chromium T-Cr	0.001			0.05	
Copper T-Cu	0.098			1	
Iron T-Fe	0.01				0.3
Lead T-Pb	0.001			0.01	
Manganese T-Mn	0.005				0.05
Sodium T-Na	12.8				200
Uranium T-U	<0.0005			0.02	
Vanadium T-V		<0.030			
Zinc T-Zn	0.001				5
Dissolved Metals					
Arsenic D-As		*0.00696*		0.025	
Trihalomethanes					
Bromodichloromethane		<0.0010			
Bromoform		<0.0010			
Chloroform		0.0018			
Dibromochloromethane		<0.0010			
Total Trihalomethanes		<0.0040			
Organic Parameters					
Total Organic Carbon C		2.59			
Haloacetic Acids					
Bromoacetic Acid		<0.0020			
Bromochloroacetic Acid		<0.0020			
Chloroacetic Acid		<0.020			
Dibromoacetic Acid		<0.0020			
Dichloroacetic Acid		<0.0020			
Trichloroacetic Acid (TCA)		<0.0020			
Field Chemistry (EBA)					
pH		8.36	6.5		8.5
TDS (ppm)		312			500
EC (uS/cm)		626			
Temperature (°C)		10.0			
Free Available Chlorine		*0.01*			

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU)

Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

eba

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date June 16, 2005

WELL ID #	Owner	Location Description
4762	YTG	Teslin School

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Teslin

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Teslin School

c. GPS location: N 6671906 E 626139 elv. 705 m ± 13m

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Teslin School

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Teslin School

h. Distance from well to building ~4 m

i. If there is an effluent disposal field, is its location known? ☐ Yes ☒ No

j. Distance from well to nearest point of known field: _____

k. Well location relative to field: ☐ upslope ☐ downslope ☐ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☒ Yes ☐ No
Community Sewage system and service lines may be <30m away.

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☐ Yes ☒ No
Unlocked enclosure, but w/ heavy concrete lid

Entrance by animals? ☒ Yes ☒ No
Heavy concrete lid, no evidence of animals

p. Is well site subject to flooding? ☒ Yes ☐ No
Bottom of pit flooded at time of inspection

q. Is the well site well drained? ☐ Yes ☒ No
level surface gradient, no apron grading around well

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1:_____; Distance from well to Potential Source 1:_____

Potential Source 2:_____; Distance from well to Potential Source 2:_____

Potential Source 3:_____; Distance from well to Potential Source 3:_____

Potential Source 4:_____; Distance from well to Potential Source 4:_____

t. Are there other wells on this property? ☐ Yes ☒ No unlikely

How many?_____ ☐ in use ☐ abandoned ☐ require proper sealing

2. Well and Wellhead information:

a. When was well installed? Year 1973 Month March

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☒ Yes ☐ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☐ unlikely

e. Surface casing: ☐ Yes Diameter _____ ☒ No

f. Well casing: Diameter 165 mm Material: ☒ steel ☐ plastic ☐ concrete

g. Depth of well: 40.14m bg (may be pump) ☒ measured (if possible) ☐ reported ☐ from log (180 ft from log)

h. Static water level below ground: 14.41 m below grade

☒ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☒ with a well screen

☐ with slotted pipe ☐ unknown other 7 slot from 143.5ft to 149ft

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic n/a

k. If there is a well screen: length 5.5 ft slot size(s) 7 slot
Location of screen: from 143.5 ft to 149 ft from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No unknown

m. Is the well head: ☐ in pumphouse ☒ in pit ☐ pitless adaptor ☐ in a building
concrete and pvc pit

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail 1.4 m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☒ Yes ☐ No
The bottom of the enclosure is flooded

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☒ No styrofoam in walls

iv. Any evidence of rodents? Specify no evidence

v. Does the well casing have a proper seal cap? ☐ Yes ☒ No
The cap was unfastened at the time of inspection. It was a
If no, describe condition 15 cm cap for a 12.5 cm casing

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☒ Yes ☐ No charcoal

Explain (filtration, disinfection etc…) chlorination and filtration but ineffective due to poor installation

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No unlikely

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☒ electric submersible ☐ jet

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☒ plastic

g. Pump delivers water to: ☐ pressure tank ☐ elevated tank ☐ other

h. Are there automatic pump controls: ☐ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☐ No

j. Is there a water meter on the system? ☐ Yes ☐ No

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: Heater in insulated pit, but no heat trace

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

- There was a 15 cm cap being used on a 12.5cm casing. The well is therefore open
- The water level within the pit was, observed from water staining likely 35 cm high. If the flood level were to be 35cm higher then the water would likely flood into the well

b. Recommendations: _____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JUNE 16/05

WELL ID #	Owner	Location Description
4762	YTG	TESLIN SCHOOL

6. Water Treatment

a. Is well water treated? ☑ Yes ☐ No; Type of treatment:

☑ chlorination ☑ iron and or manganese removal ☑ other CHARCOAL FILTERS

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☑ No If so how_____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☑ No _____reading.

Tested at _____(location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☑ No If yes how often?_____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☑ No

7. Water Quality (observations):

a. Does the water stain plumbing? ☐ yes ☑ No ☐ slight ☐ severe

Type of stain: ☐ brown ☐ red ☐ black

b. Does the water contain sediment? ☐ Yes ☑ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☑ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☑ No

f. Is there a chemical analysis? ☐ Yes ☐ No ☑ adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☑ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☐ No ☑ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☐ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☑ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? (Yes) No Details: RETENTION TANK + 4 PRESSURE TANKS

Where is it located?
Comments: CRAWL SPACE

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
(YES) NO
Comments: _____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES (NO)
Comments: _____

Are there other heat sources near the tank? YES (NO)
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES (NO)
Comments: _____

Overall Tank

What are the tank size and dimensions?

_____

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments: _____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

THE WATER SYSTEM IS IN A VERY BAD CONDITION. THE PIPING HAS BEEN REVAMPED AND DOES NOT MEET THE CANADIAN PLUMBING CODE. THE CHEMICAL FEED PUMP FOR CHLORINE INJECTION IS INOPERABLE AND LEAKING BADLY. THE RETENTION TANK IS NOT ADEQUATE TO PROVIDE THE PRESCRIBED 20 MINUTE RETENTION. THE PIPING CONFIGURATION HAS AC FILTERS THAT REMOVE ANY Cl_2 RESIDUAL BEFORE IT ENTERS THE DISTRIBUTION SYSTEM, THEREFOR PROVIDES NO PROTECTION AT ALL.

b. Recommendations:

REPAIR THE SYSTEM TO PROVIDE PROPER CHLORINATION WITH THE REQUIRED RETENTION TIME. REPIPE THE SYSTEM SO THAT THE CHARCOAL FILTERS WILL NOT REMOVE THE Cl_2 RESIDUAL. INSTITUTE A PROPER CHLORINE RESIDUAL TESTING PROGRAM.

KEY TO
FORMATION LOG

Clay - br cl
Clay - bl cl
d - sd
ndy Clay - sdy cl
oft Shale - s shl
ard Rock - hd rk
andstone - ss
ine Gravel - f gr
oulders - bdrs

nvoice No.....

FIELD REPORT

MIDNIGHT SUN

DRILLING CO. LTD.

Mailing Address:
P.O. Box 2106
Whitehorse, Yukon
Phone: 667-4795

Job (Month) (Day) (Year)
Started March 29 ....19.73..
Completed.....19.....

ME AND ADDRESS OF CLIENT	DESCRIPTION OF WORK	LOCATION OF WORK
Yukon Territorial Gov	Water Well	~~Sec. Twp. Rge. W.~~ Site of new school Teslin, Yukon

FORMATION LOG			DESCRIPTION OF WORK	TIME			
OM	TO	FORMATION		Date	From	To	Hours
),	4',	sand gravel	Move From Watson Lake (0)	29/3/73	07:00	12:00	4.5
	25	br. sandy clay	Set-up drill with 6¼" H.F. bit		12:30	19:00	6.5
			to 15' Drill with 6¼" S.F. bit	30/3/73	08:00	12:30	4.5
5	65	grey clay ~~with gravel~~	to 30'		13:00	19:30	6.5
5	72	gravel with cobbles	Return to 3' to drill rocks off.	5/4/73	09:00	21:00	12.0
			Reaming with 6¼" (180) to (150)	6/4/73	07:30	12:30	5.0
2	136	blue sand trace of clay with gravel.	Ran 145' casing 40' of sand	18/6/73	06:00	20:00	14.0
			in casing.	19/6/73	07:00	09:00	2.0
			Sample #1 at 74' fine blue grey				
36	155	fine grey sand ~~(H20)~~	sand trace of clay				
			Sample #2 at 115' Fine blue grey				
55	180	blue grey clay	sand, gravel with traces of clay				
			Sample #3 at 123' Blue sand				
			trace of clay with gravel				
			Sample #4 141.5' fine grey				
			sand, water bearing				

. of Casing & Pipe			
e	Type	Size	Type
"	¼"		
t	Inch	Feet	Inch
"	0"		
'	0"		
'	0"		
0'	0"		
'	0"		
'	0"		
'	0"		
'	0"		

Remarks: Capped bottom, welded one side to be pushed off with screen. Ran 5" I.D. casing to 145'. Installed 5" Ø telescoping Johnston well screen no. 7 slot from 143.5 to 149.0. bailed at 15 G.P.M.

Well Cased: Casing to ft. and	Total Big Time (above) hrs.
Casing from ft. to ft.	Total Standby (above) hrs.
STATIC LEVEL: from ground level from top of casing	Drilling Mud Used (above) 2 sacks

SIGNATURES

r Midnight Sun..... For Client.....

Driller - David Jamieson
Helper - John Gow

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	0104
Jurisdiction	Yukon
Community	Teslin
Address	Jackson Ave
Highway	
Milepost	
Feature	Teslin
Location and Cause	Teslin septic tank - mechanical failure of auto dialer alarm - sewage spill
Latitude	60.16491
Longitude	-132.72162
Incident Date	1/7/2001
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	
Company(s)	Village of Teslin
Amount	800
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	spill migrated to shoreline of Teslin Lake but was contained in snow and ice - contaminated snow removed and bleach used as disenfectant - clean-up was completed

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	0333
Jurisdiction	Yukon
Community	Teslin
Address	Jackson Ave
Highway	
Milepost	
Feature	Teslin
Location and Cause	spill at Lift Station #2 - due possibley to faulty truck guage - cause to be determined
Latitude	60.16491
Longitude	-132.72162
Incident Date	9/23/2003 11:00:00 AM
Lead Agency	
Other Agency	
Company(s)	Village of Teslin
Amount	100
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	contaminated soil removed and replaced with clean crush - industrial bleach applied to contaminated area - lead agency to be determined - no further info on file

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	0340
Jurisdiction	Yukon
Community	Teslin
Address	Jackson Ave
Highway	
Milepost	
Feature	Teslin
Location and Cause	Lift Station #2 (Jackson Ave) - spill due to non-secured coupling device
Latitude	60.16491
Longitude	-132.72162
Incident Date	11/27/2003 2:30:00 PM
Lead Agency	Yukon Government - Water Inspections
Other Agency	
Company(s)	Village of Teslin
Amount	80
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	driver of truck bleached area - contaminated area being cleaned up and material removed to landfill - copy of letter from Village of Teslin to YT Water Board on file

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	8706
Jurisdiction	Yukon
Community	Teslin
Address	Jackson Ave
Highway	
Milepost	
Feature	Teslin
Location and Cause	Jackson Ave pump station - truck overturned in avoiding oncoming traffic
Latitude	60.16491
Longitude	-132.72162
Incident Date	3/17/1987 2:10:00 PM
Lead Agency	Federal Government - other
Other Agency	Environment Canada - Environmental Protection Service
Company(s)	Walter Geddes
Amount	4500
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	no specific environmental concerns - possiblity of contamination of 1 or 2 near-by water wells - contained in snow berm - removed to sewage lagoon



Photo 0225: 4762 Wellhead in pit



Photo 0031: 4762 Chlorination system and retention tank



Photo 0223: 4762 Wellhead enclosure and Teslin School



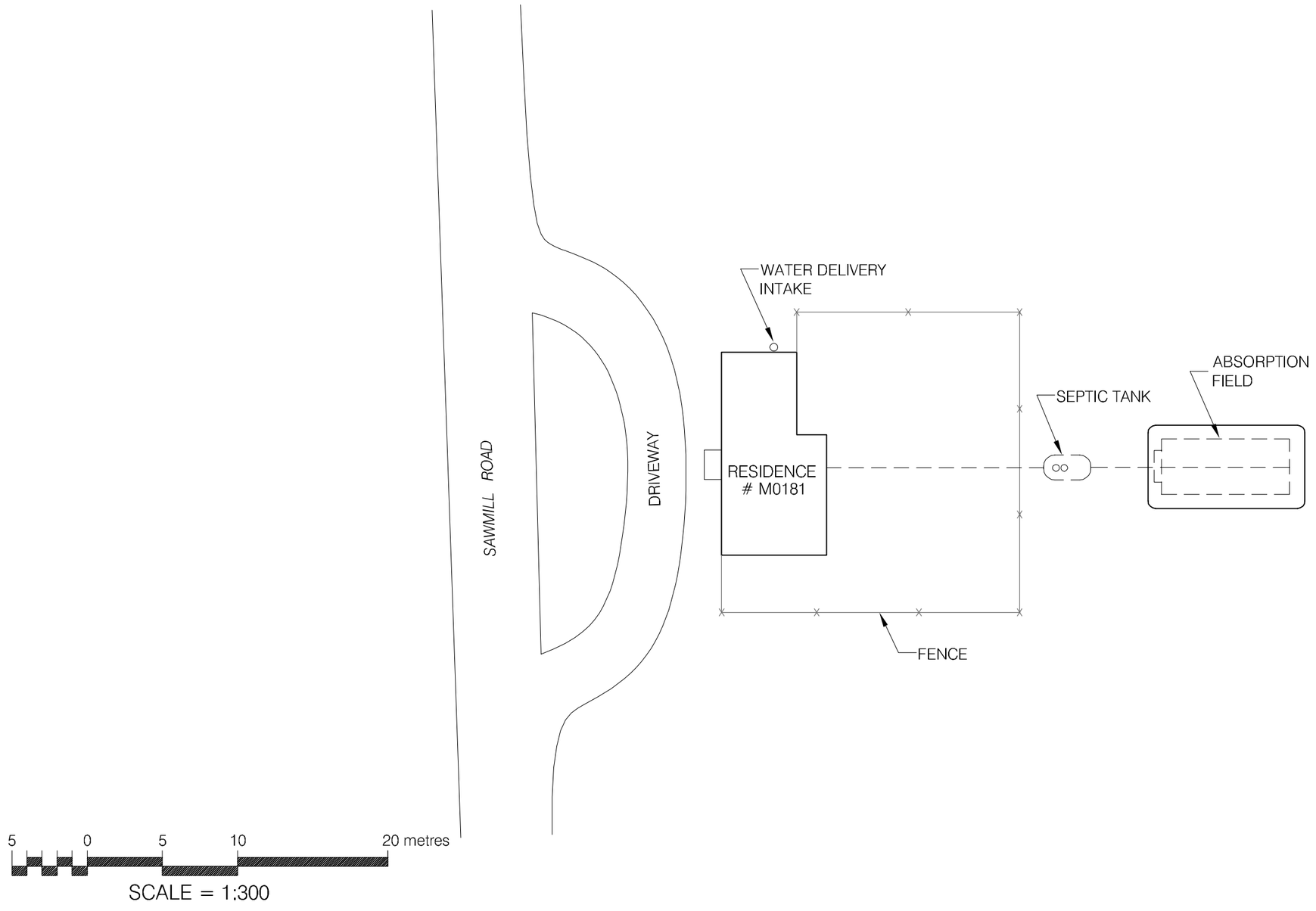
Photo 0033: 4762 Inline filters



Photo 0036: 4762 Charcoal filtration and water softening system

Photo 0037: 4762 Pressure tanks





NOTES:
1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

TESLIN RCMP RESIDENCE
M0181
SITE LOCATION DIAGRAM
WELL ID: N/A

REVISION ISSUE: 0

FIGURE No.: FIGURE M0181-A

Z:\02012Drawings\1260002 Water Assessment YTG\002 - Eastern Region\teslin\1260002 M0181 Site Plan.dwg, 7/20/2005 3:01:22 PM, Adobe PDF

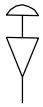
LEGEND


PUMP


PRESSURE GAUGE


GATE VALVE


CHECK VALVE


SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



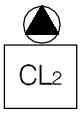
FLOW METER



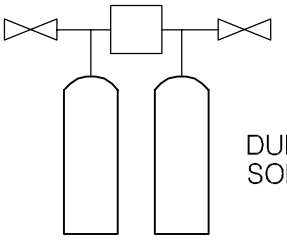
WATER FILTER
(CARTRIDGE TYPE)

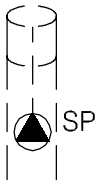


PRESSURE TANK

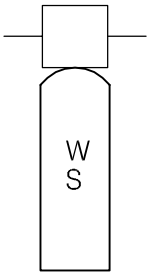


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER



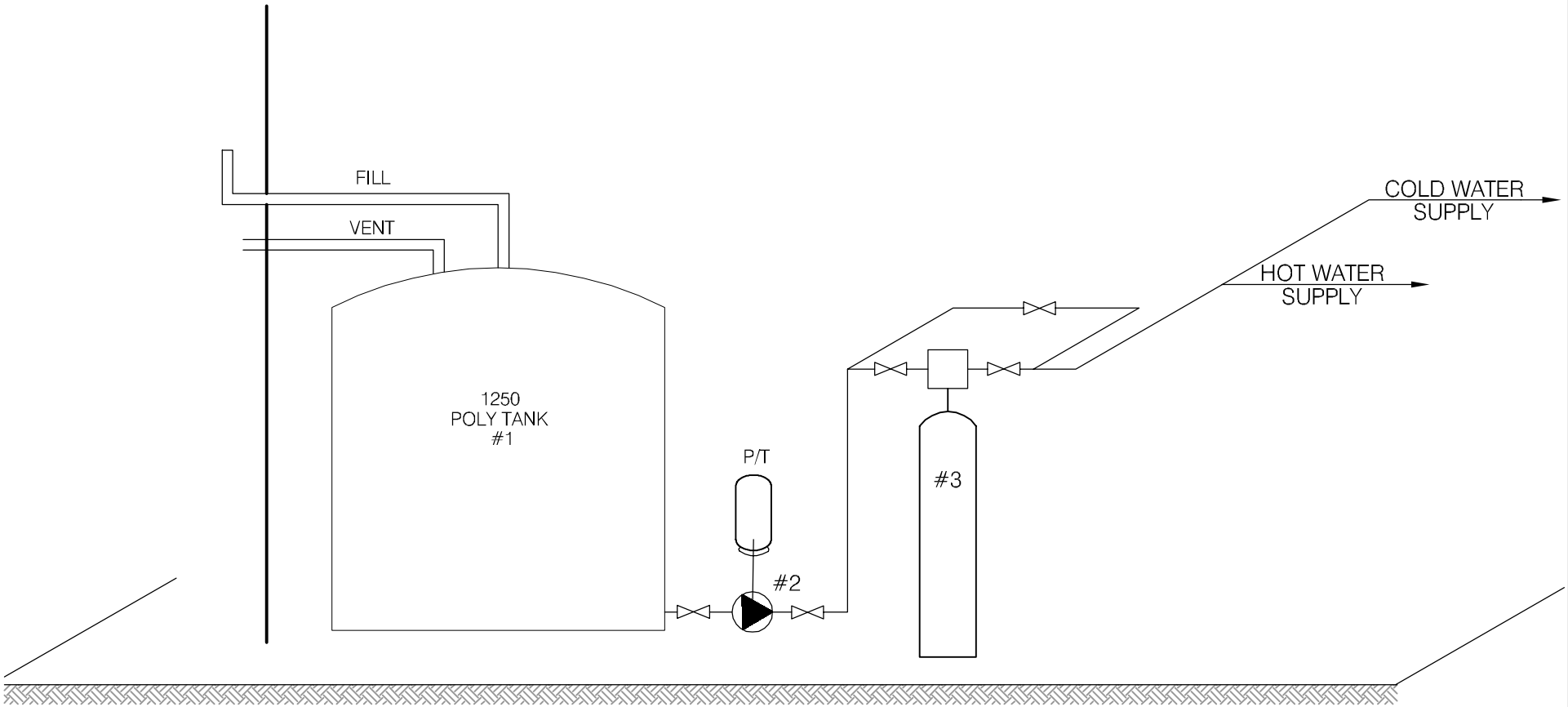
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\1260002003 Eastern Schematic_LEGEND.dwg, 4/11/2006 10:31:08 AM, Adobe PDF, jbuyck



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: M0181 TESLIN RCMP RESIDENCE	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE M0181-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\teslin\Schematics\1260002 RCMP Detach M0181 Schematic.dwg, 7/20/2005 2:33:48 PM, Adobe PDF

Eastern Region – R.C.M.P. Housing
Building # M0181

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	WATER TANK	N/A	1250 VERTICAL			1250 GALLON
2	JET PUMP	GRUNDFOS	JPF-3A			½ HP - 1"
3	WATER SOFTENER	AQUA TECH	L5600-30MI			30K
4						
5						
6						
7						
8						
9						
10						

TABLE M0181- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
M0181	R.C.M.P Housing	7	Sept-04 to Mar-05	no	0/7	no	1-Mar-05	no

Table M0181-2: Water Quality Results

SOURCE:	Building M0181 - R.C.M.P. Housing		GCDWQ Criteria		
Location/ Resident	Teslin				
Address	Block 26				
Treatment	Water Softener				
Disinfection	No				
Source of Water	Water Delivery				
Purpose of Sampling	Baseline	Additional Sampling			
Sample Location	Kitchen Tap	Downstairs Laundry Tub Tap			
Date Sampled	9-Sep-04	16-Jun-05	**Lower**	**Upper Limit**	
Physical Tests *(ALS)*			**AO**	**MAC**	**AO**
Colour (CU)	5				15
Total Dissolved Solids	345				500
Hardness CaCO3	262		AO >200 = poor, > 500 unacceptable[A]		
pH	8.37		6.5		8.5
Turbidity (NTU)	0.4			1	5
UV Absorbance		0.030			
Dissolved Anions *(ALS)*					
Alkalinity-Total CaCO3	223				
Chloride Cl	4.0				250
Fluoride F	0.14			1.5	
Silicate SiO4		9.4			
Sulphate SO4	88.0				500
Nitrate Nitrogen N	<0.1			10	
Nitrite Nitrogen N	<0.05			1	
Total Phosphate PO4		0.0616			
Total Metals *(ALS)*					
Aluminum T-Al	<0.005			0.1	
Antimony T-Sb	<0.0002			0.006	
Arsenic T-As	*0.0193*	*0.0211*		0.025	
Barium T-Ba	0.03			1	
Boron T-B	0.033			5	
Cadmium T-Cd	<0.00001			0.005	
Chromium T-Cr	0.0006			0.05	
Copper T-Cu	0.017			1	
Iron T-Fe	0.17				0.3
Lead T-Pb	0.0002			0.01	
Manganese T-Mn	0.029				0.05
Sodium T-Na	37.3				200
Uranium T-U	<0.0005			0.02	
Vanadium T-V		<0.030			
Zinc T-Zn	0.008				5
Dissolved Metals					
Arsenic D-As		*0.0158*		0.025	
Organic Parameters					
Tannin and Lignin		0.14			
Total Organic Carbon C		2.14			
Field Chemistry (EBA)					
pH		8.45	6.5		8.5
TDS (ppm)		287			500
EC (uS/cm)		573			
Temperature (°C)		14			
Free Available Chlorine		0.05			

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU), Conductivity (umhos/cm), Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

EBA Engineering Consultants Ltd.
Creating and Delivering Better Solutions

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date June 16, 2005

WELL ID #	Owner	Location Description
M0181	RCMP	Teslin RCMP Residence

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Teslin

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Sawmill Road

c. GPS location: N 6673493 E 627320 elev. 721m ± 12m

d Is there electric power? ☐ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No
Not accessable to Public

f. Does the well system have:
The system is for the residence only and is from delivery
☐ 15 or more service connections to a piped distribution system ? If so how many_____

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify N/A - Tank is located inside building

h. Distance from well to building N/A

i. If there is an effluent disposal field, is its location known? ☒ Yes ☐ No N 6673479

j. Distance from well to nearest point of known field: ~15m from residence E 627343

k. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral
from residence

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☐ Yes ☒ No
No part of the property, however, is greater than 30m from a septic source

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☐ No N/A

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☐ No N/A

o. Is the infrastructure protecting the ~~wellhead~~ tank, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☒ Yes ☐ No Entrance by animals? ☐ Yes ☐ No
located inside residence n/a

p. Is well site subject to flooding? ☐ Yes ☐ No N/A

q. Is the well site well drained? ☐ Yes ☐ No N/A

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1:_____; Distance from well to Potential Source 1:_____
Potential Source 2:_____; Distance from well to Potential Source 2:_____
Potential Source 3:_____; Distance from well to Potential Source 3:_____
Potential Source 4:_____; Distance from well to Potential Source 4:_____

t. Are there other wells on this property? ☐ Yes ☒ No

How many?_____ ☐ in use ☐ abandoned ☐ require proper sealing

2. Well and Wellhead information:

a. When was well installed? Year N/A Month _____

b. Type: ☐ drilled ☐ dug ☐ sand point ☐ other N/A

c. Is there a drillers log for the well: ☐ Yes ☐ No N/A

d. Is there a surface seal to 6 m ☐ Yes ☐ No ☐ unknown ☐ unlikely N/A

e. Surface casing: ☐ Yes Diameter N/A ☐ No

f. Well casing: Diameter N/A Material: ☐ steel ☐ plastic ☐ concrete

g. Depth of well: N/A ☐ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: N/A

☐ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen N/A

☐ with slotted pipe ☐ unknown other N/A

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic N/A

k. If there is a well screen: length N/A slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No N/A

m. Is the well head: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☐ in a building N/A

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail N/A

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☐ No
N/A

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☐ No
N/A

iv. Any evidence of rodents? Specify N/A

v. Does the well casing have a proper seal cap? ☐ Yes ☐ No

If no, describe condition N/A

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☐ Yes ☐ No ☐ farther investigation required.
N/A

If yes is there treatment ☐ Yes ☒ No

Explain (filtration, disinfection etc…)

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☐ granular sediment ☐ unknown
N/A

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☐ No
N/A

5. Pump Installation:

a. Is the well equipped with a pump? ☐ yes ☐ No N/A

b. Type of pump: ☐ hand ☐ electric submersible ☐ jet N/A

☐ shallow well centrifugal ☐ other, _____

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: N/A By: _____

e. For submersible pump, depth of setting below surface N/A

f. Drop pipe for submersible pump: ☐ steel ☐ plastic
N/A

g. Pump delivers water to: ☐ pressure tank ☐ elevated tank ☐ other
N/A

h. Are there automatic pump controls: ☐ Yes ☐ No
N/A

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☐ No
N/A

j. Is there a water meter on the system? ☐ Yes ☐ No
N/A

k. Is the pump and piping protected from freezing? ☐ Yes ☐ No
N/A

If yes, describe: _____

l. Comments on pump installation: _____

_____

6. Conclusions

a. Comments on overall installation:

_____

_____

_____

_____

_____

_____

_____

b.Recommendations: _____

_____

_____

_____

_____

_____

_____

PART B: EBA Site Inspection

Inspector: BERT HARRISON Date JUNE 16/05

WELL ID #	Owner	Location Description
M0181	YG.	TCHP RES TESLIN SAWMILL ROAD.

6. Water Treatment

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☐ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☑ Yes ☐ No

7. Water Quality (observations):

a. Does the water stain plumbing? ☐ yes ☑ No ☐ slight ☐ severe

Type of stain: ☐ brown ☐ red ☐ black

b. Does the water contain sediment? ☐ Yes ☑ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☑ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☑ No

f. Is there a chemical analysis? ☐ Yes ☐ No ☑ adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☐ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☑ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☑ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☑ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes No Details: 1250 VERTICAL PE TANK

Where is it located?
Comments: BASEMENT

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES NO
Comments: _____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES NO
Comments: _____

Are there other heat sources near the tank? YES NO
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO
Comments: _____

Overall Tank

What are the tank size and dimensions?
87" Ø x 65" H

What material is the tank constructed of? POLYETHYLENE

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? (YES) NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? (YES) NO

Does the lid have a tight seal and is it watertight when closed? YES (NO)

Does the tank have an overflow or high level whistle? YES (NO)

Is the water tank drain accessible? YES (NO)

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? (YES) NO
Comments: _____

Is there any sediment or scum in bottom of tank? (YES) NO
Comments: _____

Is there any odour associated with the water or tank? YES (NO)

Have there been any bacteriological analyses conducted previously? YES (NO)

Does the tank appear that it has been cleaned recently? YES (NO)

Are the tanks easily assessed for the purpose of cleaning and disinfection? (YES) NO

8. Conclusions

a. Comments on overall installation:

THIS IS A TYPICAL WATER DISTRIBUTION WATER SYSTEM. PIPING SYSTEM IS ADEQUATELY SUPPORTED

b. Recommendations:

CLEAN TANK, IMPLEMENT MAINTENANCE SYSTEM. TEST OPERATION RESIDUAL PERIODICALLY. REMOVE DEAD LINE WITH LOOP SERVICE. CLEAN TANK AS REQUIRED INTERVALS.



Photo 0215: M0181 delivery water fill



Photo 0022: M0181 5000 L water storage tank



Photo 0023: M0181 Pressure tank

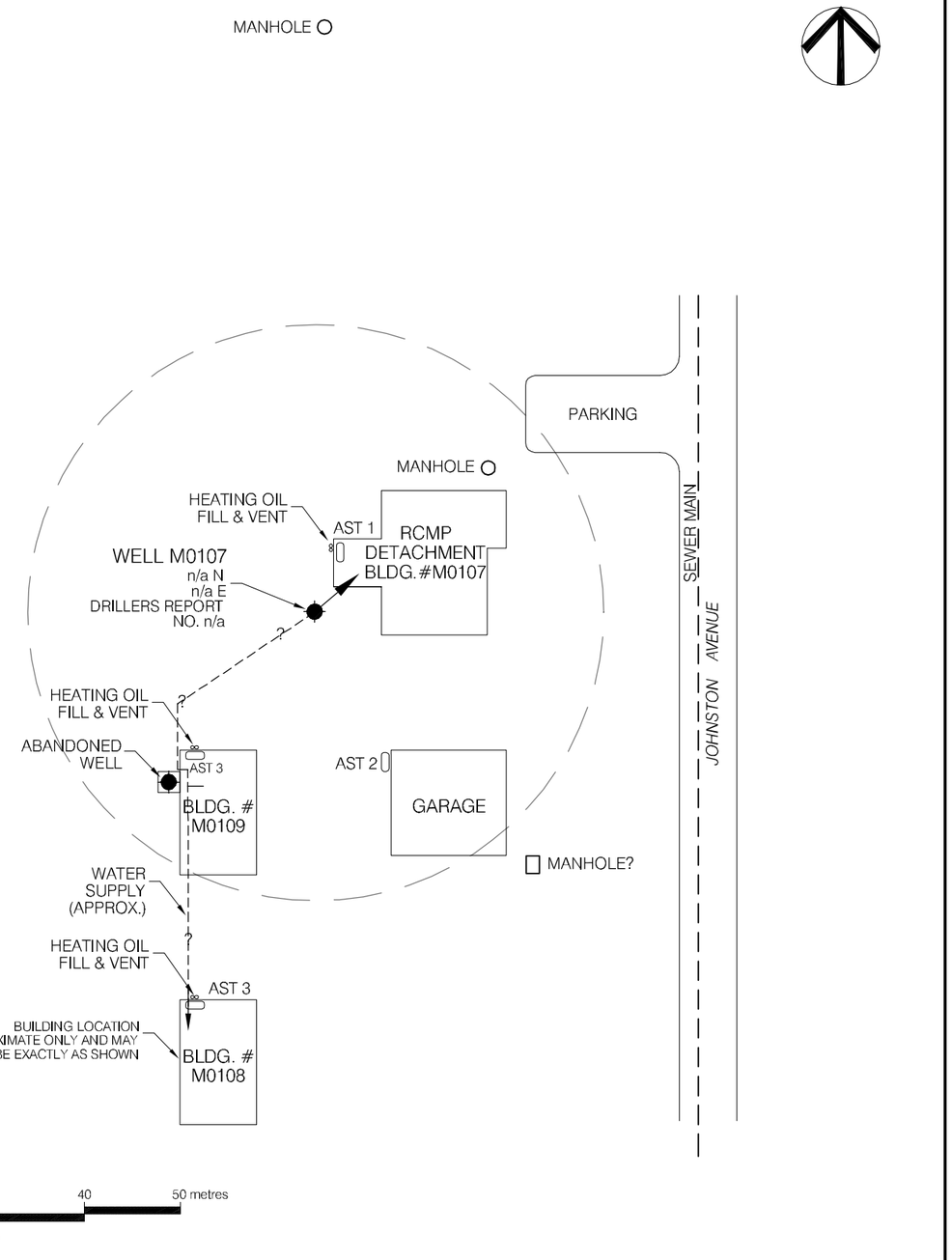


Photo 0025: M0181 Water softening system



SCALE 1: 10,000

SCHOOL



0 10 20 30 40 50 metres

SCALE 1:600

NOTES:
1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DD/MM/YY	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	JULY 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.002
ACAD FILENAME:	002-EASTERN REGION

CLIENT: Yukon Highways and Public Works Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
EASTERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

TESLIN RCMP BUILDINGS
M0107/M0108/M0109
SITE LOCATION DIAGRAM
WELL ID: M0107 & M0109

REVISION ISSUE 0

FIGURE No. FIGURE M0107-A

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\teslin\1260002 M0107_M0108_M0109 Site Plans.dwg, 7/26/2005 8:59:30 AM, Adobe PDF

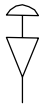
LEGEND


PUMP


PRESSURE GAUGE


GATE VALVE


CHECK VALVE


SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



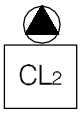
FLOW METER



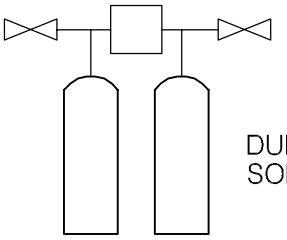
WATER FILTER
(CARTRIDGE TYPE)

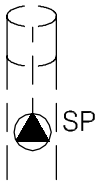


PRESSURE TANK

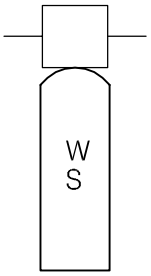


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER



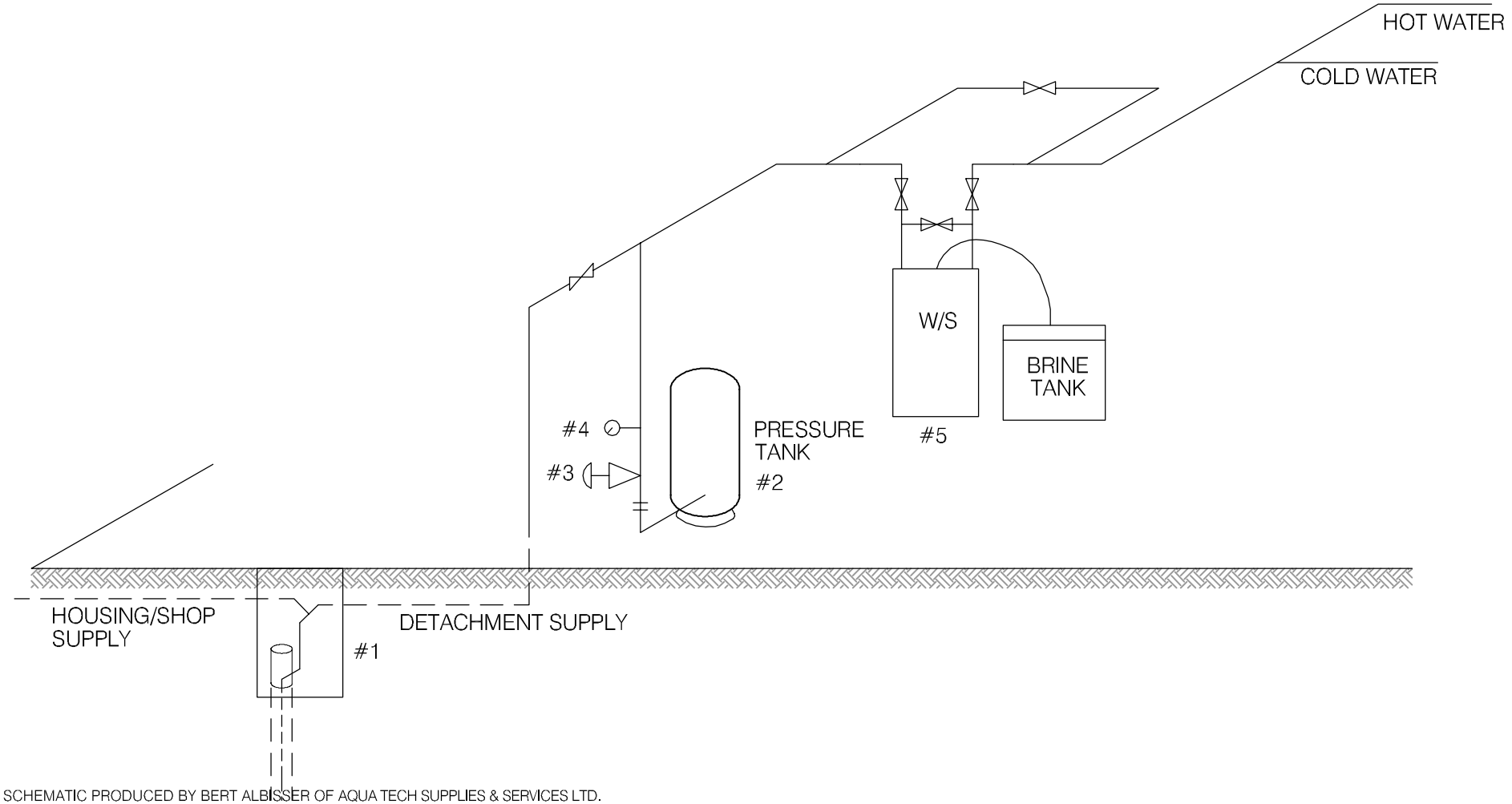
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

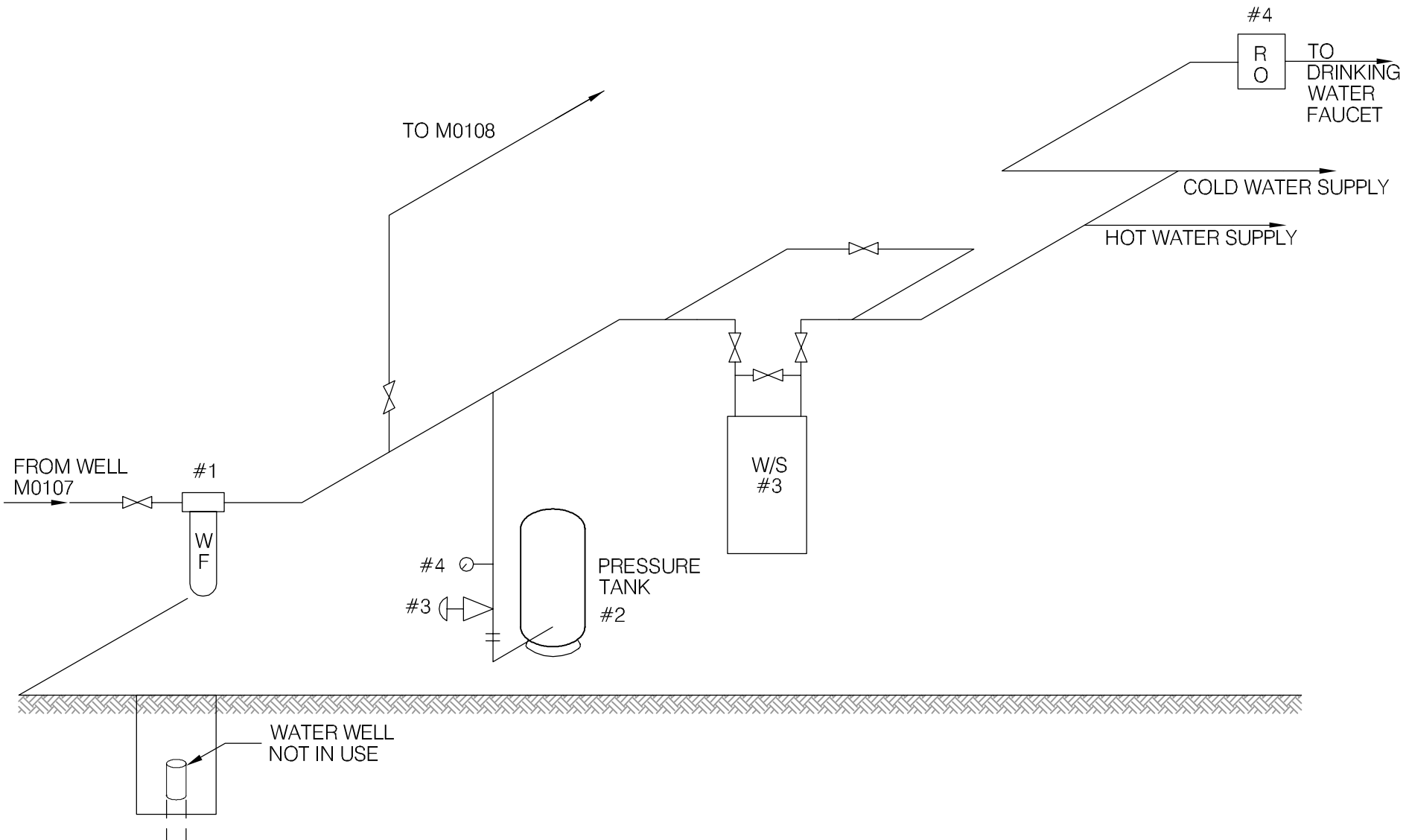
Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\1260002003 Eastern Schematic_LEGEND.dwg, 4/11/2006 10:31:08 AM, Adobe PDF, jbuyck



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: M0107 TESLIN RCMP DETACHMENT	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE M0107-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\teslin\Schematics\1260002 RCMP Detach M0107 Schematic.dwg, 7/22/2005 8:20:40 AM, Adobe PDF



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: M0109 TESLIN RCMP RESIDENCE	
DATE JULY 2005	DWN. JSB	CHKD. RMM	FILE NO. 1260002.002		DWG.: FIGURE M0109-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\teslin\Schematics\1260002 RCMP Residence M0109 Schematic.dwg, 7/20/2005 12:39:52 PM, Adobe PDF

Eastern Region – R.C.M.P. Detachment
Building # M0107

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	SUB PUMP	N/A	N/A			4" - 1 HP.
2	PRESSURE TANK	WELL RITE	WR 140			
3	PRESSURE SWITCH	SQ. D	FSG-2			2HP- 1/4" FIPT
4	PRESSURE GAUGE	MARSH	0-100			2" - 1/4" MIPT
5	WATER SOFTNER	NOVATEK	HTSOMI		206674	50K
6						
7						
8						
9						
10						

Eastern Region – R.C.M.P. Housing
Building # M0108

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1						
2	PRESSURE TANK	CHALLENGER	PC266			1¼" FIPT
3	WATER SOFTENER	NOVATEK	HT50MI		Z06675	50K
4	REVERSE OSMOSIS	HYDROTECH	ETFC-24			24GPD.
5						
6						
7						
8						
9						
10						

SOFTENER REMOVED FOR REPAIR

Eastern Region – R.C.M.P. Housing
Building # M0109

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	WATER FILTER	AMETEK	10" BB			1"/2 - 10"
2	PRESSURE TANK	CHALLENGER	PC266			1"/4" FIPT
3	WATER SOFTENER	NOVATEK	HT50MI		206675	50K
4	REVERSE OSMOSIS	HYDROTECH	ETFC-ZA			Z4GPD
5						
6						
7						
8						
9						
10						

TABLE M0107- 1: SUMMARY OF BACTERIOLOGICAL RESULTS

Building #	Building Name	Number of Sampling Events	Time Period over which Sampling was Done	Any Positive Total Coliform Results? (yes or no)	Fraction of Positive Total Coliform Results vs. Total Sampling Events	Any positive E.Coli results? (yes or no)	Most Recent Sampling Event Available for EBA Review	Is Most Recent Result Positive?
M0107	R.C.M.P Detachment	7	Sept-04 to Mar-05	no	0/7	no	1-Mar-05	no
M0108	R.C.M.P Housing	7	Sept-04 to Mar-05	no	0/7	no	1-Mar-05	no
M0109	R.C.M.P Housing	6	Sept-04 to Mar-05	no	0/6	no	1-Mar-05	no

Table M0107-2: Water Quality Results

SOURCE:	Building M0107 - R.C.M.P. Detachment		Building M0108 - R.C.M.P. Housing		Building M0109 - R.C.M.P. Housing		GCDWQ Criteria		
Location/ Resident	Teslin		Teslin		Teslin				
Address	Block 11		Block 12		Block 13				
Treatment	Water Softener (not in use)		Water Softener (not in use), RO		Water Softener, Filter, RO				
Disinfection	No		No		No				
Source of Water	M0107 Well		M0107 Well		M0107 Well				
Purpose of Sampling	Baseline	Additional Sampling	Baseline	Additional Sampling	Baseline	Additional Sampling			
Sample Location		Downstairs Laundry Tub Tap		Kitchen Sink		Kitchen Tap			
Date Sampled	9-Sep-04	16-Jun-05	9-Sep-04	16-Jun-05	9-Sep-04	16-Jun-05	**Lower Limit**	**Upper Limit**	
Physical Tests *(ALS)*							**AO**	**MAC**	**AO**
Colour (CU)	<5.0		<5.0		<5.0				15
Total Dissolved Solids	**502**		**506**		**617**				500
Hardness CaCO3	**442**		**440**		1.7		AO >200 = poor, > 500 unacceptable[A]		
pH	8.3		8.3		8.47		6.5		8.5
Turbidity (NTU)	0.7		0.8		0.4			1	5
UV Absorbance		0.0260		0.0280		0.0260			
Dissolved Anions *(ALS)*									
Alkalinity-Total CaCO3	229		229		227				
Chloride Cl	20.7		21.2		22.1				250
Fluoride F	0.18		0.18		0.18			1.5	
Silicate SiO4		13.5		14.4		14.3			
Sulphate SO4	189		194		194				500
Nitrate Nitrogen N	<0.1		<0.1		<0.1			10	
Nitrite Nitrogen N	<0.05		<0.05		<0.05			1	
Ammonia Nitrogen N		0.293							
Total Phosphate PO4		0.0576		0.0593		0.0686			
Total Metals *(ALS)*									
Aluminum T-Al	<0.005		<0.005		<0.005			0.1	
Antimony T-Sb	<0.0002		<0.0002		<0.0002			0.006	
Arsenic T-As	*0.0067*	*0.00849*	*0.0083*	*0.00861*	*0.0074*	*0.00736*		0.025	
Barium T-Ba	0.052		0.049		<0.001			1	
Boron T-B	0.03		0.028		0.026			5	
Cadmium T-Cd	<0.00001		<0.00001		<0.00001			0.005	
Chromium T-Cr	0.0007		0.0010		0.0012			0.05	
Copper T-Cu	<0.001		<0.001		<0.001			1	
Iron T-Fe	0.05		0.14		<0.01				0.3
Lead T-Pb	0.0006		<0.0001		<0.0001			0.01	
Manganese T-Mn	**0.077**	**0.0891**	**0.079**	**0.0915**	<0.005				0.05
Sodium T-Na	23.7		23.3		166				200
Uranium T-U	<0.0005		<0.0005		<0.0005			0.02	
Vanadium T-V		0.033		<0.030		<0.030			
Zinc T-Zn	0.003		0.002		0.003				5
Dissolved Metals									
Arsenic D-As		*0.00798*		*0.00811*		*0.00773*		0.025	
Manganese D-Mn		**0.0897**		**0.0905**					0.05
Organic Parameters									
Tannin and Lignin		0.56		0.68		<0.10			
Total Organic Carbon C		2.78		1.71		1.87			
Field Chemistry (EBA)									
pH		**8.66**		8.35		**8.72**	6.5		8.5
TDS		405		406		480			500
EC (uS/cm)		810		815		958			
Temperature (°C)		10							

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlighting.

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU), Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin
Luke Lebel

Date June 16, 2005

WELL ID #	Owner	Location Description
M0107	R.C.M.P	Teslin RCMP Detachment

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Teslin

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Johnson Avenue

c. GPS location: _____

d Is there electric power? ☒ Yes ☐ No

e Is there outside water access? ☒ Yes ☐ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
well services M0107 Detachment, and M0108 and M0109 Residences

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify Teslin RCMP Detachment

h. Distance from well to building ~5 m

i. If there is an effluent disposal field, is its location known? ☐ Yes ☒ No

j. Distance from well to nearest point of known field: _____

k. Well location relative to field: ☐ upslope ☐ downslope ☐ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☒ Yes ☐ No
Community sewage system

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☐ Yes ☒ No Wellhead is in unlocked pit
Entrance by animals? ☐ Yes ☒ No Access likely possible, but no evidence

p. Is well site subject to flooding? ☐ Yes ☒ No

q. Is the well site well drained? ☒ Yes ☐ No

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No
Distance from the well to known buried tank _____

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: AST 1 ; Distance from well to Potential Source 1: ~9m inside building
Potential Source 2: AST 2 ; Distance from well to Potential Source 2: ~16m
Potential Source 3: AST 3 ; Distance from well to Potential Source 3: ~17m inside building
Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

t. Are there other wells on this property? ☒ Yes ☐ No

How many? M0109 well ☐ in use ☒ abandoned ☐ require proper sealing

2. Well and Wellhead information:

✱ a. When was well installed? Year _____ Month _____

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☐ Yes ☒ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☒ unlikely

e. Surface casing: ☐ Yes Diameter _____ ☒ No

f. Well casing: Diameter 15 cm Material: ☒ steel ☐ plastic ☐ concrete

✱ g. Depth of well: _____ ☐ measured (if possible) ☐ reported ☐ from log

✱ h. Static water level below ground: _____

☐ measured (if possible) ☐ reported ☐ from log ☐ flowing

✱ i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☐ unknown other _____

✱ j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

✱ k. If there is a well screen: length _____ slot size(s) _____
Location of screen: from _____ to _____ from log reported

✱ l. Is there a sump below the screen? ☐ Yes ☐ No

m. Is the well head: ☐ in pumphouse ☒ in pit ☒ pitless adaptor ☐ in a building

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail piping 2.20m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☒ Yes ☐ No likely within enclosure wall

iv. Any evidence of rodents? Specify No

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No
Split seal gasket
If no, describe condition

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☐ Yes ☒ No

Explain (filtration, disinfection etc...) M0107 - softening, but non-functional
M0108 - softening, but non-functional
M0109 - softening

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☒ granular sediment likely ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☒ No unlikely

5. Pump Installation:

a. Is the well equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☒ electric submersible ☐ jet

☐ shallow well centrifugal ☐ other,

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☒ plastic likely

g. Pump delivers water to: ☒ pressure tank ☐ elevated tank ☐ other

h. Are there automatic pump controls: ☒ Yes ☐ No

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☒ No
none observed

j. Is there a water meter on the system? ☐ Yes ☐ No

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No
If yes, describe: Heat trace and insulation, + heater in pit

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:
The well supplies the 3 RCMP Buildings M0107, M0108, and M0109.

b. Recommendations: _____

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin
Luke Lebel

Date June 16, 2005

WELL ID #	Owner	Location Description
M0109	RCMP	Teslin RCMP Residence

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
Teslin

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Johnson Avenue

c. GPS location: _____

d Is there electric power? ☐ Yes ☒ No

e Is there outside water access? ☐ Yes ☒ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many N/A
Well is no longer in use

☐ 5 or more delivery sites on a trucked distribution system? If so how many _____

g. Nearest building, specify Located off of basement of M0109 Residence

h. Distance from well to building _____

i. If there is an effluent disposal field, is its location known? ☐ Yes ☒ No

j. Distance from well to nearest point of known field: _____

k. Well location relative to field: ☐ upslope ☐ downslope ☐ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☐ Yes ☐ No
Community Sewage system and service piping

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☒ Yes ☐ No
located inside locked residence

Entrance by animals? ☐ Yes ☒ No
Access possible, No evidence

p. Is well site subject to flooding? ☐ Yes ☒ No

q. Is the well site well drained? ☐ Yes ☒ No
wellhead enclosure faces upslope

r. Is there a buried fuel tank on the property? ☐ Yes ☒ No unlikely

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe _____

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1: AST1 ; Distance from well to Potential Source 1: ~28m in separate building

Potential Source 2: AST2 ; Distance from well to Potential Source 2: ~21m outside

Potential Source 3: AST3 ; Distance from well to Potential Source 3: ~2m in same building

Potential Source 4: _____ ; Distance from well to Potential Source 4: _____

t. Are there other wells on this property? ☒ Yes ☐ No

How many? M0107 well ☒ in use ☐ abandoned ☐ require proper sealing

2. Well and Wellhead information:

a. When was well installed? Year _____ Month _____

b. Type: ☒ drilled ☐ dug ☐ sand point ☐ other _____

c. Is there a drillers log for the well: ☐ Yes ☒ No

d. Is there a surface seal to 6 m ☐ Yes ☒ No ☐ unknown ☒ unlikely

e. Surface casing: ☐ Yes Diameter _____ ☒ No

f. Well casing: Diameter 15 cm Material: ☒ steel ☐ plastic ☐ concrete
split seal gasket w/ proper plugs

g. Depth of well: 36.175 m bc ☒ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: 8.470 m bc

☒ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☒ unknown other _____

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic

k. If there is a well screen: length n/a slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☒ No

m. Is the well head: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☒ in a building
Inside Molog Residence

☐ in a wooden enclosure other, describe _____

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail 1.70m below grade

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☒ No

iii. Is the wellhead enclosed by fiberglass insulations? ☒ Yes ☐ No likely inside walls

iv. Any evidence of rodents? Specify no observe evidence, access possible

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No

If no, describe condition split seal gasket w/ proper plugs

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☐ Yes ☐ No ☐ farther investigation required.

If yes is there treatment ☐ Yes ☐ No N/A

Explain (filtration, disinfection etc…)_____

---

4. Aquifer Supplying This Well:

a. The aquifer is: ☐ bedrock ☐ granular sediment ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? ☐ Yes ☐ No N/a

5. Pump Installation:

a. Is the well equipped with a pump? ☐ yes ☐ No N/A

b. Type of pump: ☐ hand ☐ electric submersible ☐ jet N/A

☐ shallow well centrifugal ☐ other, N/A

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: N/A By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☐ plastic N/A

g. Pump delivers water to: ☐ pressure tank ☐ elevated tank ☐ other N/A

h. Are there automatic pump controls: ☐ Yes ☐ No N/A

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☐ No N/A

j. Is there a water meter on the system? ☐ Yes ☐ No N/A

k. Is the pump and piping protected from freezing? ☒ Yes ☐ No

If yes, describe: _____

l. Comments on pump installation: _____

_____

6. Conclusions

a. Comments on overall installation:

_____

_____

_____

_____

_____

_____

_____

b.Recommendations: _____

_____

_____

_____

_____

_____

_____

_____

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JUNE 16 05

WELL ID #	Owner	Location Description
M0107	YTG.	RCMP DETACHMENT TESLIN

6. Water Treatment

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☑ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. Water Quality (observations):

a. Does the water stain plumbing? ☐ yes ☐ No ☑ slight ☐ severe

Type of stain: ☐ brown ☑ red ☐ black

b. Does the water contain sediment? ☐ Yes ☑ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☑ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐Yes ☑No ☐brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☑ No

f. Is there a chemical analysis? ☐ Yes ☐ No ☐adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☐ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☐ No ☑ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☐ No ☑ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☑ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes No Details:

Where is it located?
Comments: PRESSURE TANK - BASEMEN

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES NO
Comments:_____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES NO

Comments: _____

Are there other heat sources near the tank? YES NO
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO
Comments: _____

Overall Tank

What are the tank size and dimensions?

_____

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments:_____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

THE CASING IS APPROX. BELOW GRADE.
THE WATER SYSTEM. INSTALLATION IS GOOD
QUALITY MATERIAL AND WORKMANSHIP.
THE WATER SOFTENER IS BY PASSED. APPARENTLY
THE MINERAL TANK LEAKS.

b. Recommendations:

EXTEND WELL CASING TO APPROPRIATE
HEIGHT ABOVE GRADE. INSTALL SURFACE
SEAL. SUPERCHLORINATE WATER WELL AND
PIPING SYSTEM. INSTITUTE A PROPER
WATER WELL MAINTENANCE PROGRAM.
RECORD WELL MAINTENANCE

PART B: EBA Site Inspection

Inspector: BERT ALBISSER Date JUNE 16/05

WELL ID #	Owner	Location Description
M108	YTG.	TESLIN RCMP RESIDENCE

6. Water Treatment

a. Is well water treated? ☑ Yes ☐ No; Type of treatment:

☐ chlorination ☑ iron and or manganese removal ☑ other R.O. SYSTEM

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☑ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. Water Quality (observations):

a. Does the water stain plumbing? ☐ yes ☐ No ☑ slight ☐ severe

Type of stain: ☐ brown ☐ red ☐ black

b. Does the water contain sediment? ☐ Yes ☑ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☑ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐Yes ☐No ☐brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No

f. Is there a chemical analysis? ☐ Yes ☐ No ☐adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☐ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☐ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☐ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☐ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes No Details: PRESSURE TANK

Where is it located?
Comments: _____

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES NO
Comments:_____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES NO

Comments: _____

Are there other heat sources near the tank? YES NO
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES NO
Comments: _____

Overall Tank

What are the tank size and dimensions?

_____

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments:_____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

THIS UNIT IS FED FROM THE DETACHMENT WELL THE INSTALLATION IS PROFESSIONAL.

b. Recommendations:

INSTALL APPROPRIATE FILTRATION AND UV TREATMENT AS WELL HAS NO SURFACE SEAL.

PART B: EBA Site Inspection

Inspector: Bert Albisser Date June 16/05

WELL ID #	Owner	Location Description
M0109	YTG	RCMP Housing Teslin

6. Water Treatment

a. Is well water treated? ☐ Yes ☑ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☐ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. Water Quality (observations):

a. Does the water stain plumbing? ☐ yes ☐ No ☑ slight ☐ severe

Type of stain: ☐ brown ☑ red ☐ black

b. Does the water contain sediment? ☐ Yes ☑ No ☐ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☑ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☐ Yes ☑ No ☐ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☑ No

f. Is there a chemical analysis? ☐ Yes ☐ No ☐ adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☐ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☐ No ☐ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☐ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☐ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? (Yes) No Details: PRESSURE TANK PC266

Where is it located?
Comments: _____

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
(YES) NO
Comments: _____

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES (NO)
Comments: _____

Are there other heat sources near the tank? YES (NO)
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES (NO)
Comments: _____

Overall Tank

What are the tank size and dimensions?

_____

What material is the tank constructed of? _____

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? YES NO

Comments: _____

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? YES NO

Does the lid have a tight seal and is it watertight when closed? YES NO

Does the tank have an overflow or high level whistle? YES NO

Is the water tank drain accessible? YES NO

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? YES NO
Comments: _____

Is there any sediment or scum in bottom of tank? YES NO
Comments: _____

Is there any odour associated with the water or tank? YES NO

Have there been any bacteriological analyses conducted previously? YES NO

Does the tank appear that it has been cleaned recently? YES NO

Are the tanks easily assessed for the purpose of cleaning and disinfection? YES NO

8. Conclusions

a. Comments on overall installation:

THIS IS A GOOD INSTALLATION BOTH IN EQUIPMENT & WORKMANSHIP.
THE ABANDONED WELL CASING NEEDS TO BE PROCESSED OR EXTENDED ABOVE GRADE.

b. Recommendations:

ABANDON WATER WELL NOT IN USE ACCORDING TO REGULATION.

KEY TO FORMATION LOG

Brown Clay - br cl
Blue Clay - bl cl
Sand - sd
Sandy Clay - sdy cl
Soft Shale - s shl
Hard Rock - hd rk
Sandstone - ss
Fine Gravel - f gr
Boulders - bdrs

TYPE BID 20302 0013

FIELD REPORT

MIDNIGHT SUN DRILLING CO. LTD.

Mailing Address:
P.O. Box 2106
Whitehorse, Yukon
Phone: 667-4795

Job (Month) (Day) (Year)
Started....Nov..1..19..79.
Completed..Dec.7..19..79.

Invoice No.....

NAME AND ADDRESS OF CLIENT	DESCRIPTION OF WORK	LOCATION OF WORK
Department of Public Works Whitehorse Y.T.	Water Well	~~Sec.~~ ~~Twp.~~ ~~Rge.~~ ~~W.~~ R.C.M.P. Detachment Teslin Yukon

FORMATION LOG FROM	TO	FORMATION
0	1	Top Soil
1	11	Rock Cemented Gravel
11	26	Caving Sand
26	30	Pea Gravel
30	45	Gravel To 1"
45	50	Brown Cl. Sand
50	58	Pea Gravel
58	60	Hard Rock
60	69	Blue Clay Rock
69	72	Hard Rock
72	105	Bl. Clay Scattered Rk
105	118	Sand
118	119	Hard Rock
119	130	Rock With Blue Clay
130	155	Blue Clay Scattered Rock
155	157	Sand

DESCRIPTION OF WORK

Move
Set up Dug in Pit
Drill With 6" Bit to 50'
Water Bearing
Nov 3 13:30 - Nov 4 19:30
Nov 5 12:00 - Nov 6 21:30
Drill With 4½" to 465'
Waiting For Repairs 8, 9, 10
Nov 11 12:00 - Nov 11 - 15:30

Page #2

TIME Date	From	To	Hours
Nov 1	14:00	20:00	6
2	07:30	20:00	12½
3	08:00	19:00	11
4	08:00	20:00	12
5	08:00	21:00	13
6	08:00	20:00	12
7			
11	10:00	01:00	15

Casing & Pipe Size	Type	Size	Type
Feet	Inch	Feet	Inch

Remarks:

Well Cased: Casing from ft. to ft. and Casing from ft. to ft.

STATIC LEVEL: from ground level from top of casing

Total Big Time (above) hrs.

Total Standby (above) hrs.

Drilling Mud Used (above) sacks

SIGNATURES

For Midnight Sun.....

For Client.....

Well Moved (page 1 of 2)

KEY TO FORMATION LOG

rown Clay - br cl
lue Clay - bl cl
and - sd
andy Clay - sdy cl
oft Shale - s shl
ard Rock - hd rk
andstone - ss
ine Gravel - f gr
oulders - bdrs

nvoice No.....

FIELD REPORT

MIDNIGHT SUN

DRILLING CO. LTD.

Mailing Address:
P.O. Box 2106
Whitehorse, Yukon
Phone: 667-4795

Job (Month) (Day) (Year)
Started.....19.....
Completed.....19.....

ME AND ADDRESS OF CLIENT	DESCRIPTION OF WORK	LOCATION OF WORK
Page 2		Sec. Twp. Rge. W.

FORMATION LOG

OM	TO	FORMATION
57	169	Blue Clay Scattered Rock
69	172	Sand
72	184	Bl. Clay Rock
84	195	Hard Rock
95	215	Rock With Clay
15	227	Blue Clay With Rock
27	238	Blue Clay
38	248	Rock
48	371	Blue Clay With a occasionaly Rock
71	465	Blue Clay With a occasionaly Rock

DESCRIPTION OF WORK	TIME Date	From	To	Hours
Move				
	Nov 12	09:00	24:00	15
	15	10:00	03:00 Dec 8	17
	Dec 7	10:00	06:00	20
Dry				

d. of Casing & Pipe			
ie	Type	Size	Type
		Nil	
et	Inch	Feet	Inch

Remarks:

Well Cased: Casing to ft. and
Casing from ft. to ft.
STATIC LEVEL: from ground level from top of casing

Total Big Time (above) 135 hrs.
Total Standby (above) hrs.
Drilling Mud Used (above) 22 sacks

SIGNATURES

or Midnight Sun.. D. Jamieson Driller

For Client.....

well MC109 (page 2 of 2)

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	0104
Jurisdiction	Yukon
Community	Teslin
Address	Jackson Ave
Highway	
Milepost	
Feature	Teslin
Location and Cause	Teslin septic tank - mechanical failure of auto dialer alarm - sewage spill
Latitude	60.16491
Longitude	-132.72162
Incident Date	1/7/2001
Lead Agency	Department of Indian Affairs and Northern Development
Other Agency	
Company(s)	Village of Teslin
Amount	800
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	spill migrated to shoreline of Teslin Lake but was contained in snow and ice - contaminated snow removed and bleach used as disenfectant - clean-up was completed

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	0333
Jurisdiction	Yukon
Community	Teslin
Address	Jackson Ave
Highway	
Milepost	
Feature	Teslin
Location and Cause	spill at Lift Station #2 - due possibley to faulty truck guage - cause to be determined
Latitude	60.16491
Longitude	-132.72162
Incident Date	9/23/2003 11:00:00 AM
Lead Agency	
Other Agency	
Company(s)	Village of Teslin
Amount	100
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	contaminated soil removed and replaced with clean crush - industrial bleach applied to contaminated area - lead agency to be determined - no further info on file

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	0340
Jurisdiction	Yukon
Community	Teslin
Address	Jackson Ave
Highway	
Milepost	
Feature	Teslin
Location and Cause	Lift Station #2 (Jackson Ave) - spill due to non-secured coupling device
Latitude	60.16491
Longitude	-132.72162
Incident Date	11/27/2003 2:30:00 PM
Lead Agency	Yukon Government - Water Inspections
Other Agency	
Company(s)	Village of Teslin
Amount	80
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	driver of truck bleached area - contaminated area being cleaned up and material removed to landfill - copy of letter from Village of Teslin to YT Water Board on file

Environment Canada Environnement Canada

Enforcement and Emergencies Section
91782 Alaska Highway, Whitehorse, YT Y1A 5B7
PH: 867.667.3400 FAX: 867.667.7962

Spill Report Information

Spill #	8706
Jurisdiction	Yukon
Community	Teslin
Address	Jackson Ave
Highway	
Milepost	
Feature	Teslin
Location and Cause	Jackson Ave pump station - truck overturned in avoiding oncoming traffic
Latitude	60.16491
Longitude	-132.72162
Incident Date	3/17/1987 2:10:00 PM
Lead Agency	Federal Government - other
Other Agency	Environment Canada - Environmental Protection Service
Company(s)	Walter Geddes
Amount	4500
Units	Litres
Quantity	Estimate
Release Description	Spilled
Additional Quanitit	
Concentration	
Concentration Unit	
Phase	Liquid
Major Contaminant	Raw Sewage
2nd Contaminant	
3rd Contaminant	
4th Contaminant	
Outcome	no specific environmental concerns - possiblity of contamination of 1 or 2 near-by water wells - contained in snow berm - removed to sewage lagoon



Photo 0212: M0107 Wellhead enclosure (front), Teslin RCMP Detachment building M0107 (back)



Photo 0213: M0107 Wellhead enclosure (front), Teslin RCMP Residences M0109 (right) and M0108 (behind), and above ground fuel storage tank in front of RCMP garage (back left)



Photo 0211: M0107 Wellhead in pit (pitless adapter)



Photo 0013: M0107 Water softener (centre), pressure tank (left), and brine tank (right)



Photo 0016: M0109 Pressure tank



Photo 0211: M0109 Water softener (back), and brine tank (front)



Photo 0214: M0109 Wellhead adjacent to basement of M0109 residence (bottom, no longer in use), line from M0107 well (back) and inline filter (left)



Photo 0018: M0109 Reverse osmosis treatment system



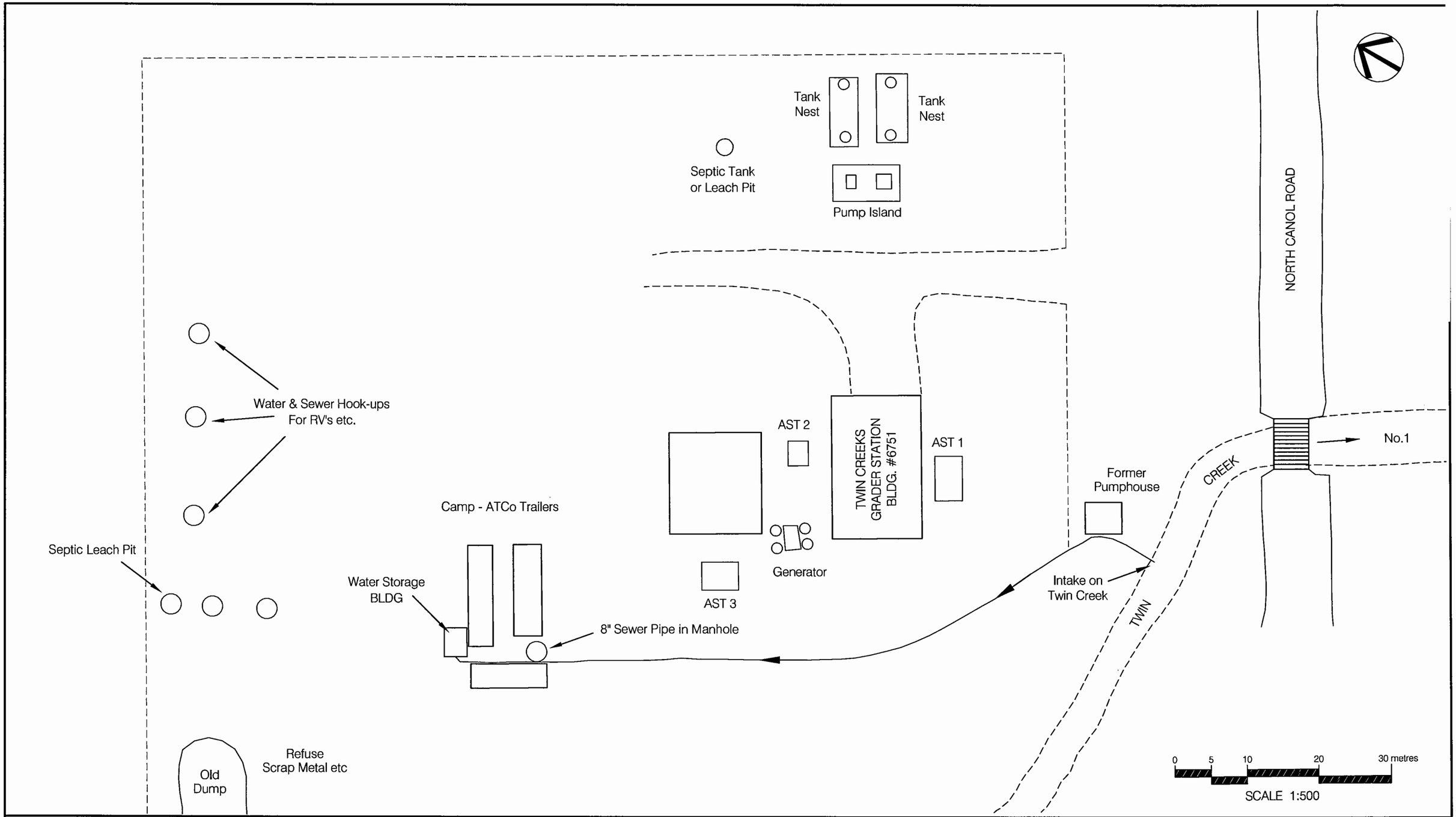
Photo 0019: M0109 Reverse osmosis tap in kitchen



Photo 0020: M0108 Reverse osmosis treatment system



Photo 0021: M0108 Reverse osmosis tap in kitchen



NOTES:
1. UTM COORDINATES OBTAINED WITH A HAND HELD GPS USING NAD83 SYSTEM AND ARE CONSIDERED TO BE ACCURATE TO 10.0 m, APPROXIMATELY.

30 m RADIUS FROM WATER WELL FOR CONSIDERATION OF PROXIMITY TO POTENTIAL CONTAMINANT SOURCES.

No.	DESCRIPTION	DATE	APPROVED
0	ISSUED FOR CLIENT REVIEW	DD/MM/YY	XXX

REVISION

EBA Engineering Consultants Ltd.

DESIGNED BY:	R. MARTIN
DRAWN BY:	J. BUYCK
DATE:	SEPT. 2005
SCALE:	AS SHOWN
PROJECT No.:	1260002.004
ACAD FILENAME:	004-NORTHERN REGION

CLIENT: Yukon
Highways and Public Works
Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT
NORTHERN REGION

GOVERNMENT OF YUKON
HIGHWAYS & PUBLIC WORKS

TWIN CREEKS GRADER STATION
BUILDING # 6751
SITE LOCATION DIAGRAM
WELL ID: 6751

REVISION ISSUE 0

FIGURE No. FIGURE 6751-A

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\Twin Creeks\1260002 Twin Creeks Grader Station Site Plan_6751A.dwg, 4/6/2006 10:58:16 AM, Adobe PDF, jbuyck

LEGEND



PUMP



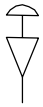
PRESSURE GAUGE



GATE VALVE



CHECK VALVE



SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)



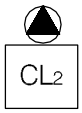
FLOW METER



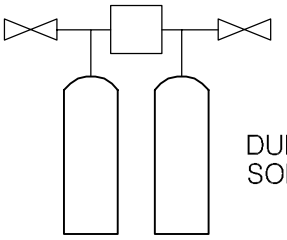
WATER FILTER
(CARTRIDGE TYPE)



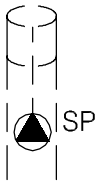
PRESSURE TANK



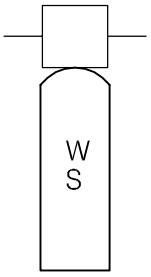
CHLORINE RESERVOIR AND
INJECTION PUMP



DUPLEX WATER
SOFTENER



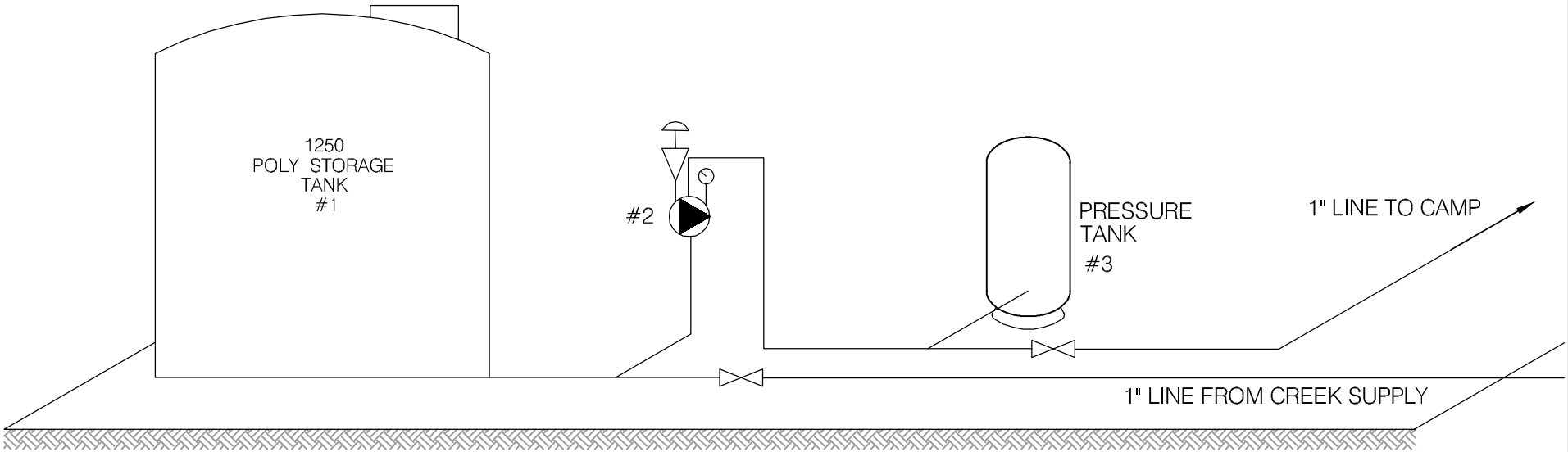
WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	SCHEMATIC SYSTEM LEGEND	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002		DRWG. LEGEND

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\1260002003 Eastern Schematic_LEGEND.dwg, 4/11/2006 10:31:08 AM, Adobe PDF, jbuyck



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

EBA Engineering Consultants Ltd.			PROJECT	ADDITIONAL ASSESSMENT EASTERN REGION	
CLIENT Yukon Highways and Public Works Property Management Branch			TITLE	WATER SYSTEM DISTRIBUTION/TREATMENT SCHEMATIC SYSTEM ID.: 6751 TWIN CREEK GRADER STATION	
DATE APRIL 2006	DWN. JSB	CHKD. RMM	FILE NO. 1260002.005		DWG.: FIGURE 6751-B

Z:\0201Drawings\1260002 Water Assessment YTG\002 - Eastern Region\Twin Creeks\1260002 Twin Creek Grader Station 6751B_Schematic.dwg, 4/5/2006 1:58:05 PM, Adobe PDF, jbuyck

Eastern Region – Twin Creeks Grader Station
Building # 6751

DISTRIBUTION & TREATMENT SYSTEM DATA

Item	Description	Manufacturer	Model	Part No.	Serial No.	Size
1	Polyethylene Storage Tank	Equinox Industries				1250 Imp. gallon
2	Jet Pump	Mastercraft	PN312223			¾ Hp. 230V
3	Pressure Tank	H2OW-TO	14623419			8.5 US. Gal.
4						
5						
6						
7						
8						
9						
10						

Table 6751- 2: Water Quality Results

SOURCE:	Building 6751- Twin Creek Grader Station		GCDWQ Criteria		
Location/ Resident	Twin Creek				
Address					
Treatment	No				
Disinfection	No				
Source of Water	Intake on Twin Creek #1				
Purpose of Sampling		Baseline			
Sample Location					
Date Sampled		10-Aug-05	**Lower Limit**	**Upper Limit**	
Physical Tests *(ALS)*			**AO**	**MAC**	**AO**
Colour (CU)	-	14.9			15
Conductivity (uS/cm)	-	212			
Total Dissolved Solids	-	156			500
Hardness CaCO3	-	106	AO >200 = poor, > 500 unacceptable[A]		
pH	-	8.11	6.5		8.5
Turbidity (NTU)	-	**23.1**		1	5
UV Absorbance	-	0.159			
% Transmittance	-	63.3			
Dissolved Anions *(ALS)*					
Alkalinity-Total CaCO3	-	95			
Chloride Cl	-	1.53			250
Fluoride F	-	0.084		1.5	
Silicate SiO4	-				
Sulphate SO4	-	17.4			500
Nitrate Nitrogen N	-	<0.10		10	
Nitrite Nitrogen N	-	<0.10		1	
Ammonia Nitrogen N	-				
Total Phosphate PO4	-				
Total Metals *(ALS)*					
Aluminum T-Al	-	**0.724**		0.1	
Antimony T-Sb	-	<0.00050		0.006	
Arsenic T-As	-	0.00072		0.025	
Barium T-Ba	-	0.095		1	
Boron T-B	-	<0.10		5	
Cadmium T-Cd	-	<0.00020		0.005	
Calcium T-Ca	-	26.6			
Chromium T-Cr	-	<0.0020		0.05	
Copper T-Cu	-	0.0189		1	
Iron T-Fe	-	**0.978**			0.3
Lead T-Pb	-	0.0012		0.01	
Magnesium T-Mg	-	9.67			
Manganese T-Mn	-	0.0164			0.05
Mercury T-Hg	-	<0.00020		0.001	
Potassium T-K	-	0.89			
Selenium T-Se	-	<0.0010		0.01	
Sodium T-Na	-	5.1			200
Uranium T-U	-	0.00025		0.02	
Vanadium T-V	-				
Zinc T-Zn	-	0.114			5
Field Chemistry (EBA)					
pH	-	8.64	6.5		8.5
TDS (ppm)	-	53			500
EC (uS/cm)	-	109			
Temperature (°C)	-	10.8			
Free Available Chlorine	-				

Notes:

A. Guidelines indicated for hardness are not CDWQG, rather they are general aesthetic guidelines - exceedences are indicated in yellow highlight

Italics and underline indicates exceedence of proposed MAC (ie. arsenic)

Bold with Yellow highlighting indicates exceedence of CDWQG Aesthetic Objective (AO)

Bold Underline with Yellow highlighting indicates exceedence of CDWQG MAC

Results are expressed as milligrams per litre except for pH and Colour (CU), Conductivity (umhos/cm),Temperature (°C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

- = not tested

eba

SMALL PUBLIC WATER SYSTEM ASSESSMENT

PART A: EBA Site Inspection

Inspector: Ryan Martin, Luke Lebel Date August 9, 2005

WELL ID #	Owner	Location Description
6751	YTG	Twin Creeks Grader Station

1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)
North Canol Highway

b. Specific location: (Road or street, Building number, name of owner and/, legal description,
Twin Creeks

c. GPS location: N 6945749 E 383027 elv 889m ±6m UTM zone 9

d Is there electric power? ☐ Yes ☒ No uses gas powered pump

e Is there outside water access? ☐ Yes ☒ No

f. Does the well system have:

☐ 15 or more service connections to a piped distribution system ? If so how many_____
Living complex

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

g. Nearest building, specify _____

h. Distance from well to building _____

i. If there is an effluent disposal field, is its location known? ☐ Yes ☐ No

j. Distance from well to nearest point of known field: _____

k. Well location relative to field: ☐ upslope ☐ downslope ☐ lateral

l. Is there any part of a sewage disposal system(s)or other potential sources of pollution that may pose a health and safety risk within 30 m? ☐ Yes ☒ No
This site uses leach pits for its septic system

m. Is the well located within 300 m from a sewage lagoon or pit? ☐ Yes ☒ No

n. Is the well located within 120 m from a solid waste site or dump, cemetery? ☐ Yes ☒ No

o. Is the infrastructure protecting the wellhead, pumphouse, storage tank and/or water treatment plant designed and secured to prevent:

Unauthorized access by humans? ☐ Yes ☒ No Entrance by animals? ☐ Yes ☒ No
outside in creek outside of compound.

p. Is well site subject to flooding? ☐ Yes ☐ No n/a

q. Is the well site well drained? ☐ Yes ☐ No n/a

r. Is there a buried fuel tank on the property? ☐ Yes ☐ No

If yes, is it ☐ in use ☐ abandoned

Is the location known? ☐ Yes ☐ No

Distance from the well to known buried tank _____

s. Are there any other known contaminant sources on the property?

☐ Yes ☐ No Describe There are various potential sources of hydrocarbon contamination of the site, but are all likely >30m from the creek intake

If yes, specify the source: ☐ dump ☐ sewage lagoon ☐ cemetery ☐ other

Potential Source 1:_____; Distance from well to Potential Source 1:_____

Potential Source 2:_____; Distance from well to Potential Source 2:_____

Potential Source 3:_____; Distance from well to Potential Source 3:_____

Potential Source 4:_____; Distance from well to Potential Source 4:_____

t. Are there other wells on this property? ☒ Yes ☐ No

How many?_____ ☐ in use ☒ abandoned ☐ require proper sealing
dug well near current surfacewater intake

2. Well and Wellhead information:

a. When was well installed? Year n/a Month _____

b. Type: ☐ drilled ☐ dug ☐ sand point ☒ other Surface water source from Twin Creek no. 1

c. Is there a drillers log for the well: ☐ Yes ☐ No n/a

d. Is there a surface seal to 6 m ☐ Yes ☐ No ☐ unknown ☐ unlikely n/a

e. Surface casing: ☐ Yes Diameter n/a ☐ No

f. Well casing: Diameter n/a Material: ☐ steel ☐ plastic ☐ concrete

g. Depth of well: n/a ☐ measured (if possible) ☐ reported ☐ from log

h. Static water level below ground: n/a

☐ measured (if possible) ☐ reported ☐ from log ☐ flowing

i. (If granular) Is the well completed: ☐ open end casing ☐ with a well screen

☐ with slotted pipe ☐ unknown other n/a

j. (If bedrock) Does the well have a liner? ☐ yes ☐ No ☐ steel ☐ plastic n/a

k. If there is a well screen: length n/a slot size(s) _____
Location of screen: from _____ to _____ from log reported

l. Is there a sump below the screen? ☐ Yes ☐ No n/a

m. Is the well head: ☐ in pumphouse ☐ in pit ☐ pitless adaptor ☐ in a building

☐ in a wooden enclosure other, describe n/a

n. If the well head is located in a wooden enclosure,

i. Is the well head below grade? describe in detail n/a

ii. Are there signs of ponding on the enclosure(e.g. water stains, etc.)? ☐ Yes ☐ No n/a

iii. Is the wellhead enclosed by fiberglass insulations? ☐ Yes ☐ No n/a

iv. Any evidence of rodents? Specify n/a

v. Does the well casing have a proper seal cap? ☐ Yes ☐ No

If no, describe condition n/a

3. Water Supplying This Well:

a. By definition is the water from a surface water source or under the direct influence of surface water?

☒ directly Yes ☐ No ☐ farther investigation required.

If yes is there treatment or disinfection ☐ Yes ☒ No

Explain (filtration, disinfection etc…)

---

4. Aquifer Supplying This Well:

a. The ~~aquifer~~ Source Twin Creek no. 1 is: ☐ bedrock ☐ granular sediment ☐ unknown

b. Does water level and/or well capacity show seasonal fluctuation? n/a ☐ Yes ☐ No

5. Pump Installation:

a. Is the ~~well~~ System equipped with a pump? ☒ yes ☐ No

b. Type of pump: ☐ hand ☐ electric submersible ☐ jet

☐ shallow well centrifugal ☒ other, gas powered pump to fill storage tank

c. Description: Manufacturer _____ Model _____

horsepower _____ capacity _____ voltage _____

d. Date installed: _____ By: _____

e. For submersible pump, depth of setting below surface _____

f. Drop pipe for submersible pump: ☐ steel ☐ plastic n/a

g. Pump delivers water to: ☐ pressure tank ☒ elevated tank ☐ other

h. Are there automatic pump controls: ☐ Yes ☒ No manually filled

i. Is there provision for taking water samples before water reaches storage? ☐ Yes ☒ No

j. Is there a water meter on the system? ☐ Yes ☒ No

k. Is the pump and piping protected from freezing? ☐ Yes ☒ No

If yes, describe: Seasonal camp

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

This system does not use a well but takes water directly from Twin Creek no. 1 and stores it in a water storage tank. There is an abandoned dug well located in a pumphouse near the current water intake.

b. Recommendations: _____

PART B: EBA Site Inspection
Inspector: MARK ROBINSON AQUA TECH Date AUG 9/05

WELL ID #	Owner	Location Description
#6751		TWIN CREEKS GRADER STATION

6. **Water Treatment**

a. Is well water treated? ☐ Yes ☒ No; Type of treatment:

☐ chlorination ☐ iron and or manganese removal ☐ other _____

b. Is water entering plumbing or piped distribution system treated with chlorine or another treatment that is as effective as chlorine used to achieve disinfection throughout the system?

☐ Yes ☒ No If so how _____

c. If treated with chlorine, is the free residual chlorine concentration less than 0.2 mg/L

☐ Yes ☐ No _____ reading.

Tested at _____ (location)

d. Is testing for chlorine residual concentration done at the tap (eg. Kitchen faucet) or from representative points in a piped distribution system, including a point from tap at the end line

☐ Yes ☐ No If yes how often? _____

e. If the drinking water is being transported by water delivery truck does it have a minimum chlorine free residual of 0.4 mg/L at the time of fill. ☐ Yes ☐ No

7. **Water Quality (observations):**

a. Does the water stain plumbing? ☒ yes ☐ No ☒ slight ☐ severe

Type of stain: ☐ brown ☒ red ☒ black

b. Does the water contain sediment? ☒ Yes ☐ No ☒ occasional ☐ constant

c. Is there an unpleasant odour? ☐ Yes ☒ No ☐ H_2S ☐ Other _____

d. Is there an unpleasant taste? ☒ Yes ☐ No ☒ brackish ☐ Other _____

e. Is there a history of bad bacterial analyses? ☐ Yes ☐ No

f. Is there a chemical analysis? ☐ Yes ☐ No ☐ adequate ☐ incomplete

g. Is there analysis of trihalomethanes (THMs) where the water source is a surface water supply or a well under the direct influence of surface water? ☐ Yes ☐ No

h. Is the drinking water tested daily with an accurate reading chlorine test kit capable of reading in the range 0 to 3.5 mg/L of free chlorine residual in increments of 0.1mg/L? ☐ Yes ☐ No ☒ unknown

i. If yes is the test performed in accordance with manufactures directions? ☐ Yes ☐ No ☐ unknown

j. Is a record of the date, time,name of person performing the test and results of the drinking water sample kept? ☐ Yes ☐ No

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? (Yes) No Details:

Where is it located?
Comments: ADD-ON BESIDE KITCHEN TRAILER

Is the room in which the water tank is located heated to maintain an optimum temperature of 4°C for stored water?
YES (NO)
Comments: NOT INSULATED

Are there windows in the add-on that may allow direct sunlight onto the water holding tank? YES (NO)
Comments: ENTRANCE DOOR ONLY

Are there other heat sources near the tank? YES (NO)
Comments: _____

Is there waterproof flooring with a sealed base to contain spills? YES (NO)
Comments: _____

Overall Tank

What are the tank size and dimensions?
9' LONG 5' WIDE ROUND TANK

What material is the tank constructed of? POLY

Is tank and associated piping constructed of safe materials (i.e. CSA approved and material that does not affect the taste of the water)? (YES) NO
Comments: 1¼" GALV. SUCTION TO PUMP 1" POLY TO CAMP

Tank Inlet, Outlet and Lid

Is there adequate access on the tank for cleaning (i.e. min 15" access lid)? (YES) NO 16" OPENING

Does the lid have a tight seal and is it watertight when closed? (YES) NO

Does the tank have an overflow or high level whistle? (YES) (NO)

Is the water tank drain accessible? (YES) NO REMOVE FILL LINE AT TANK (BOTTOM)

WATER TANK AND WATER QUALITY CONDITION

Are there signs of staining or biofouling? (YES) NO
Comments: TANK VERY DIRTY, BLACK STAINING

Is there any sediment or scum in bottom of tank? (YES) NO
Comments: BOTH SEDIMENT AND SCUM VERY DIRTY

Is there any odour associated with the water or tank? (YES) NO

Have there been any bacteriological analyses conducted previously? YES NO ?

Does the tank appear that it has been cleaned recently? YES (NO)

Are the tanks easily assessed for the purpose of cleaning and disinfection? (YES) NO

8. Conclusions

a. Comments on overall installation:

WATER IS PUMPED FROM TWIN CREEK #1 WITH A GAS POWERED PUMP THROUGH A 1" POLY LINE INTO THE BOTTOM PORT OF THE 1250 POLY WATER HOLDING TANK AS NEEDED. THERE ARE SOME OLD EMPTY HOUSE HOLD CHLORINE JUGS NEAR THE 1250 TANK. MAY BE CHLOIRINATED MANUALLY. WATER LINE FOR GRADED STATION GARAGE IS TEED OFF THE 1" POLY SUPPLY LINE FROM CREEK TO 1250 TANK.

b. Recommendations:



Photo 025: 6751 Water storage tank and jet pump.



Photo 025: 6751 Twin Creeks water source and abandoned pumphouse.



Photo 021: 6751 Grader station (left) AST (centre) shop (right)



Photo 018: 6751 Living quarters.