

## **17.0 BUILDINGS M0064 AND M0094 CARMACKS RCMP HOUSING**

### **17.1 Description of Existing Water Supply System**

Carmacks R.C.M.P. residences M0064 and M0094 share a common well that supplies the water supply systems for both homes. The well is located inside the basement of the M0064 residence. A site plan is provided as Figure M0064-A in Appendix A17. The coordinates of the wellhead, as measured by a hand held GPS device, were recorded as:

- UTM ZONE 8
- Northing: 6884798
- Easting: 432697

The well feeds directly into a 5000 L water storage tank, after which the system splits to service each respective residence. Both systems are treated with iron softeners that are located in each residence. Water quality results; however, show that the M0064 water softening system was not operational at the time of sampling. System schematics are shown for each respective residence by Figures M0064-B and M0094-B and are located in Appendix A17.

### **17.2 Description of Existing Wastewater Systems**

Both R.C.M.P. residences use a public sewage system provided by the Village of Carmacks. There is; however, a sewer service line that is located within 15 m of the wellhead. The sewage mains are located laterally and likely also upgradient from the well.

### **17.3 Water Quality Results**

#### **17.3.1 Water Quality Results from Previous Sampling**

##### *Bacteriological*

Bacteriological sampling of water from the point of use at each of the residences have been previously completed on a number of occasions by Property Management Agency representatives as part of a separate contract. EBA was provided access to the YTG database in order to review the results of these previous bacteriological sampling events. Twenty samples were collected from the M0064 system, and twenty-nine samples were collected from the M0094 system between October 2004 and March 2006, and were tested

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for total coliform and *E. coli* by Yukon Environmental Health Services using the presence/absence test method. Results are tabulated in Table M0064-1 in Appendix A17.

According to the YTG database, *E. coli* Bacteria was reported as absent in all samples from both residences for which results were provided. Total Coliform bacteria were reported as being present four times in samples from M0064. Total Coliform bacteria were reported as present in two samples from the M0094 residence.

### 17.3.2 Detailed Potability Analyses

Water samples had been previously collected from these water systems on October 5, 2004. A sample was collected from the kitchen tap in the M0064 residence and from the washroom tap in the M0094 residence. At the time of inspection in the M0064 residence, there was no functioning treatment system, and so the water sample is considered to be representative of raw groundwater quality. The samples were submitted to ETL EnviroTest in Surrey BC for detailed potability analyses. The results of these analyses are summarized in Table M0064-2 and are included in Appendix A17. EBA reviewed the analytical results to compare them with the CDWQG and to observe general water quality, identify and recommend additional sampling and analytical, and to identify potential indicators of contamination. Relevant results are provided below:

- The raw water quality for the sample obtained on October 5, 2004 indicated that the groundwater source is calcium bicarbonate type water with high hardness and pH of approximately 8. As expected, the water from the M0094 residence was significantly softer due to the presence of an operational water softener, and had higher levels of sodium and potassium.
- The water quality results indicated that all health based and aesthetic objectives were met for the parameters analyzed. The hardness (as CaCO<sub>3</sub>) was reported to be 214 mg/L in the M0064 residence, which is generally poor for aesthetic purposes, and 4 mg/L in the M0094 residence, which is considered to be very soft.

### 17.3.3 Identification of Additional Analytical Testing Required

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

- UV absorbance, to determine potential for UV treatment as a disinfection option was recommended for both residences.

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- Measurements in the field for total dissolved solids, conductivity, pH, and temperature were completed at the time of sampling.

#### *Additional Analytical Results*

A water sample was obtained during the water system assessment on May 10, 2005, and was submitted for analysis to ALS Environmental in Vancouver BC for UV absorbance for both residences. These results are summarized in Table M0064-2 and the laboratory reports are included in Appendix B.

#### 17.3.4 Indicators of Potential Contamination

Chloride, nitrate and nitrite concentrations can indicate impacts from surfacewater sources or septic waste. The chloride concentration for the sample obtained on October 5 2004 is low and can be considered to be within the normal background ranges for groundwater in the Carmacks area. Nitrate and nitrite concentrations for this sample are also low and within the normal background range for the Carmacks area.

### **17.4 Conceptual Hydrogeology**

Residents of the Central Village of Carmacks obtain their water supply from wells completed in a permeable unconfined sand and gravel aquifer in glaciofluvial and recent alluvial deposits. The regional groundwater flow direction in the vicinity of the Village core is northeast toward the Yukon River.

### **17.5 Potential Contaminant Sources**

Potential contaminant sources from observations during the site investigation are compiled in Table M0064-4 in Appendix A17. Photos of potential contaminant sources are provided in Appendix A17.

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

- Sewer main within 30 m,
- Sewer service lines within 15 m, and
- Two above ground fuel storage tank at 18 m.

### 17.5.1 Spills Records and Contaminated Sites Search Results

Investigation of available spills record information and contaminated sites search results did not identify any concerns for this site.

## 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 water system serving the M0064 and M0094 R.C.M.P. residences:

- The wellhead is located within 30 m of potential sources of contamination. There are two above ground fuel storage tanks located 18 m from the well;
- There is no surface sanitary seal (a 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;
- The hydrogeology of the area also indicates that there are no protective low permeability layers between the surface and the water table, and the well is likely less than 15 m deep and as thus would be considered a shallow well;
- Positive total coliform results;
- Poor surface completion of the wellhead below the basement.

### 17.6.2 Low Risk Deficiencies

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

## 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).

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### 17.7.1 Priority 1

Options to mitigate the deficiencies identified as high risk for the M0064 and M0094 Carmacks R.C.M.P. water systems are presented below.

- A treatment system should be installed such as a commercial inline filter at the point of entry before the water storage tank and two NSF/ANSI 55 certified UV disinfection systems at the point of use in each respective residence, after the existing water softeners. 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.
- There are existing water softeners in each residence; however it was found from the water quality results that the softener, as of October 2004, was not functional. It is possible that since that time the softener had been repaired, but it should nevertheless be ensured that both softeners are fully functional and adequate for use as pretreatment for the UV systems. Adjustment should be made to the existing softener to reduce sodium levels. Although sodium concentrations at 80 mg/L are below the CDWQG, they may be elevated for persons on sodium-reduced diets.
- Secondary containment should be provided for the two above ground fuel storage tanks that are approximately 18 m from the well. Alternatively, they could be replaced with double walled fuel storage tanks to mitigate any potential contamination of the well;

### 17.7.2 Priority 2

To address the remaining high-risk deficiencies, two options are presented below:

#### **Option 1:**

The first option involves upgrading the existing wellhead construction. In order to mitigate the remaining high-risk deficiencies identified in this report, the wellhead construction should be upgraded as follows:

- Raising the well casing to a minimum of 500 mm above ground level, installing a pitless adapter on the wellhead (the well casing and cap would protrude into the basement of the home);
- Due to the location of the wellhead, it would be difficult to retrofit a proper surface seal to 6 m depth, or even 3 m depth around the well casing without having to make significant renovations on the existing M0064 residence, and thus only a near surface seal could be installed. This would offer at least some protection to the

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water source from surfacewater contamination, and the treatment system if properly maintained would mitigate the remaining risk; and,

**Option 2:**

- It is likely that within the next two to five years that the Village of Carmacks will be developing a municipal water distribution system that will service all of the central village, and will likely include these residences. To save the cost of redeveloping the wellhead construction on a well that may only be used for another two years, the treatment system alone may be adequate until the community system is installed. An opinion for Environmental Health and Social Service should be solicited to see if they are in agreement with this approach;
- Once the community system is installed, it is possible that the treatment system may no longer be needed at the M0064 and M0094 Carmacks R.C.M.P. Residences, and they could be removed and re-installed at other YTG maintained systems.

## **17.8 Cost Estimates for Mitigative Options**

Engineering costs for pre-design and preparation of process diagrams and specifications for project tendering for water treatment systems are estimated to be 25% of construction costs. Engineering costs for other 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

Class D cost estimates for mitigative options to address the high-risk water system deficiencies for these residences are provided below:

- The cost for the treatment system would amount to a total installed cost of **\$7,500** assuming that the existing softening systems are adequate for pre-treatment for UV treatment.
- Replacing the existing above ground fuel storage tanks with double walled secondary containment tanks would likely cost approximately **\$2,600** for each tank. Secondary containment with a polyethylene trough would cost approximately **\$1000** per tank. This may be the better option for a short-term solution given that a piped distribution system is likely to happen in the near future.

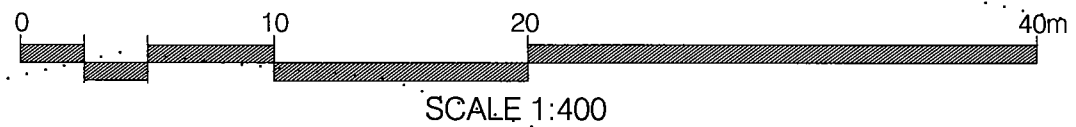
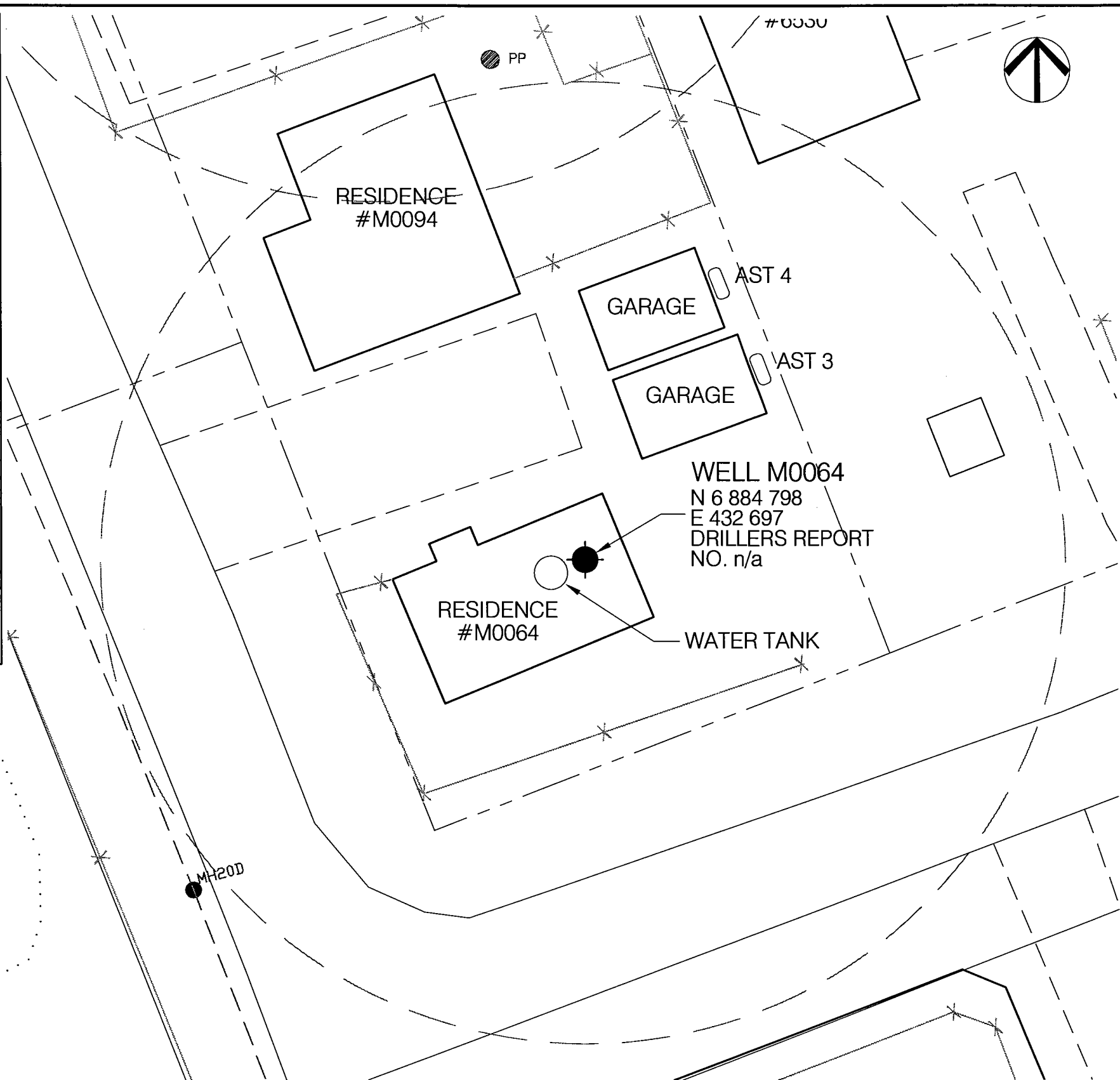
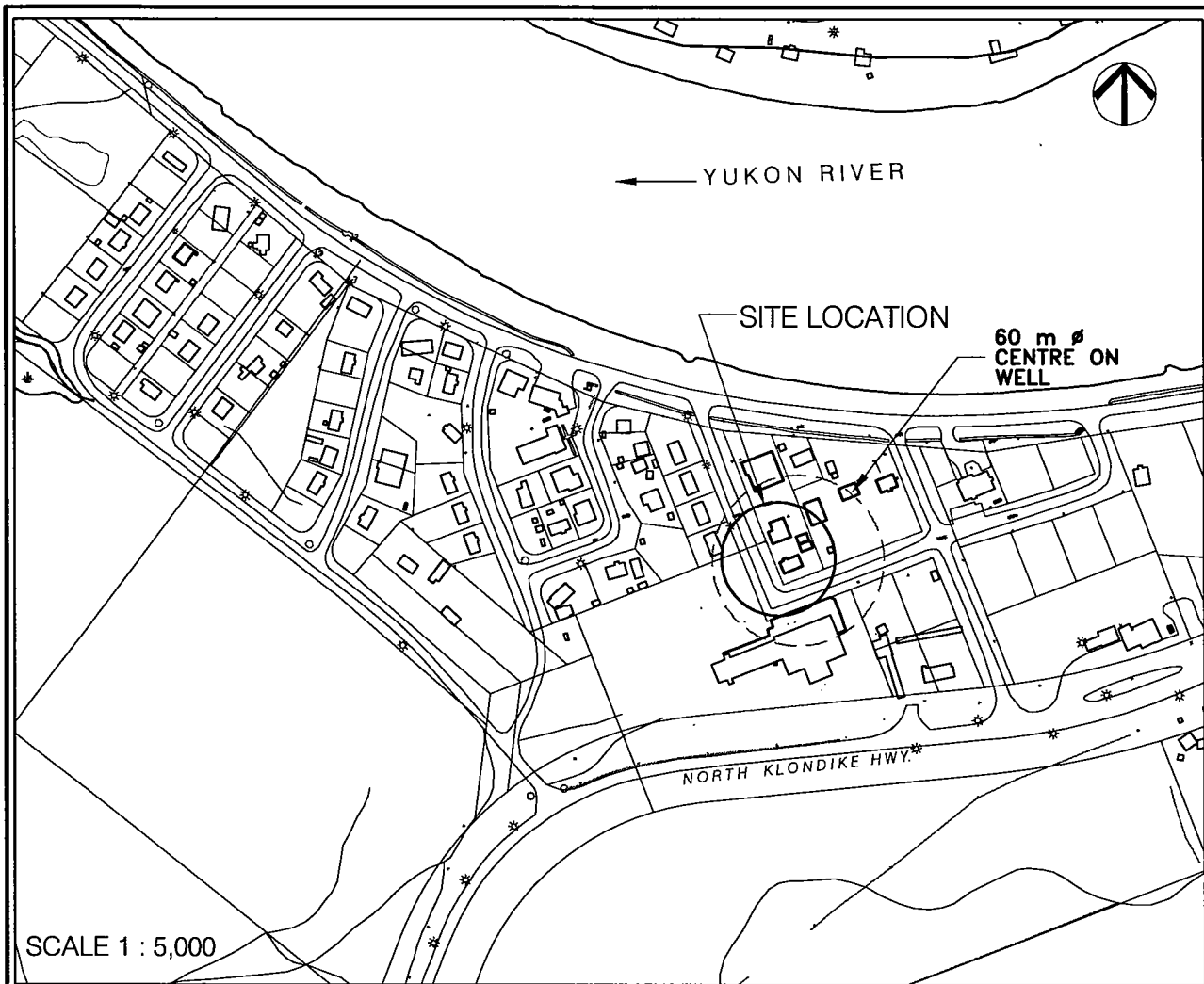
### 17.8.2 Priority 2

#### **Option 1:**

- The cost for the wellhead upgrades, would likely amount to approximately **\$1,200** for all materials and labour.

#### **Option 2:**

- The cost to connect with the planned community piped water distribution system would likely cost in the order of \$5000 for service connections.



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: JUNE 2005  
 SCALE: AS SHOWN  
 PROJECT No.: 1260002.001  
 ACAD FILENAME: 001-WHITEHORSE REGION

CLIENT: **Yukon**  
 Highways and Public Works  
 Property Management Branch

SMALL PUBLIC WATER SYSTEMS ASSESSMENT  
 WHITEHORSE REGION

GOVERNMENT OF YUKON  
 HIGHWAYS & PUBLIC WORKS

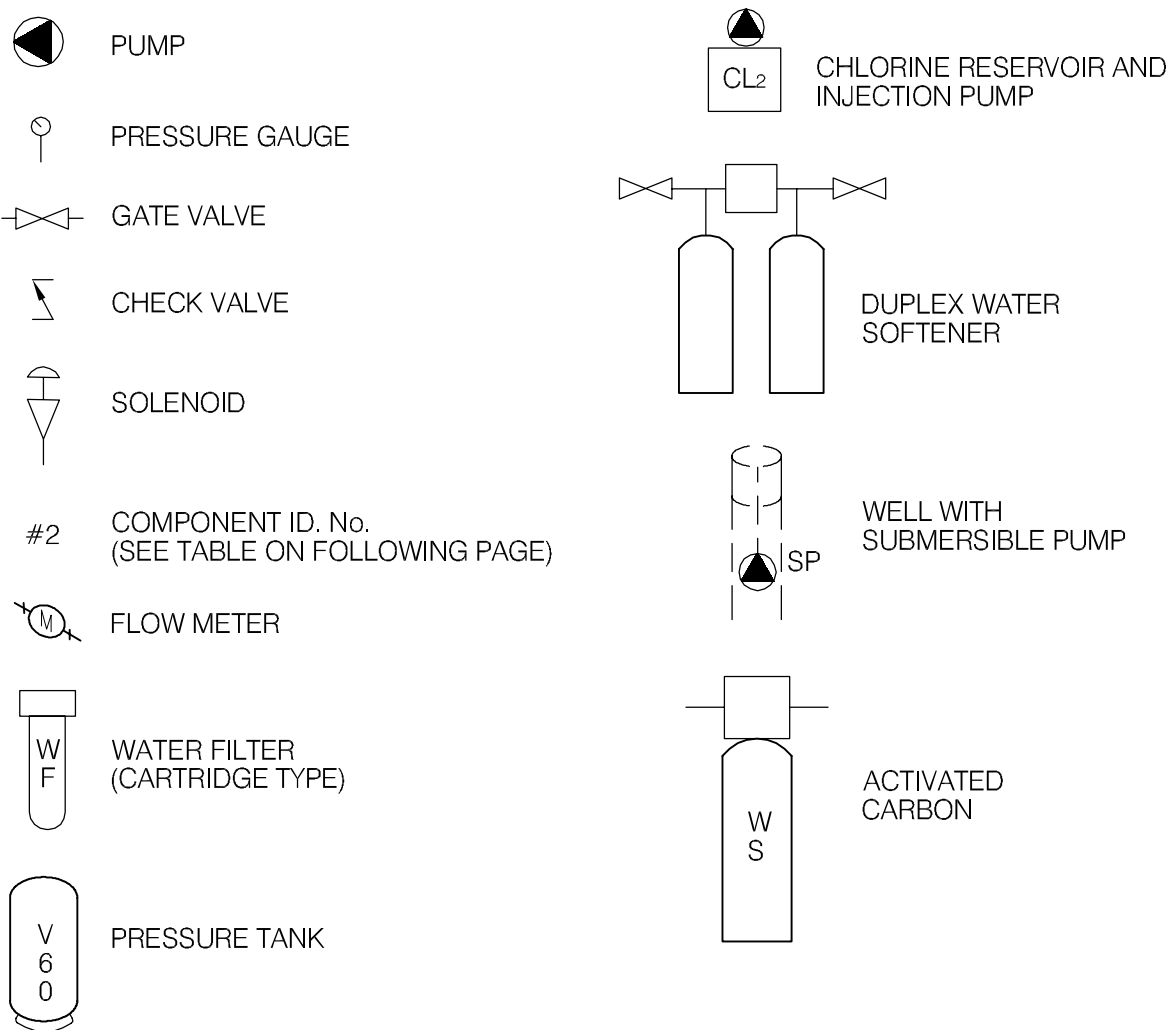
CARMACKS RCMP RESIDENCE  
 BUILDING M0064  
 LOCATION DIAGRAM  
 WELL ID: M0064A

REVISION ISSUE  
 0

DRAWING No.  
 FIGURE M0064A



# LEGEND



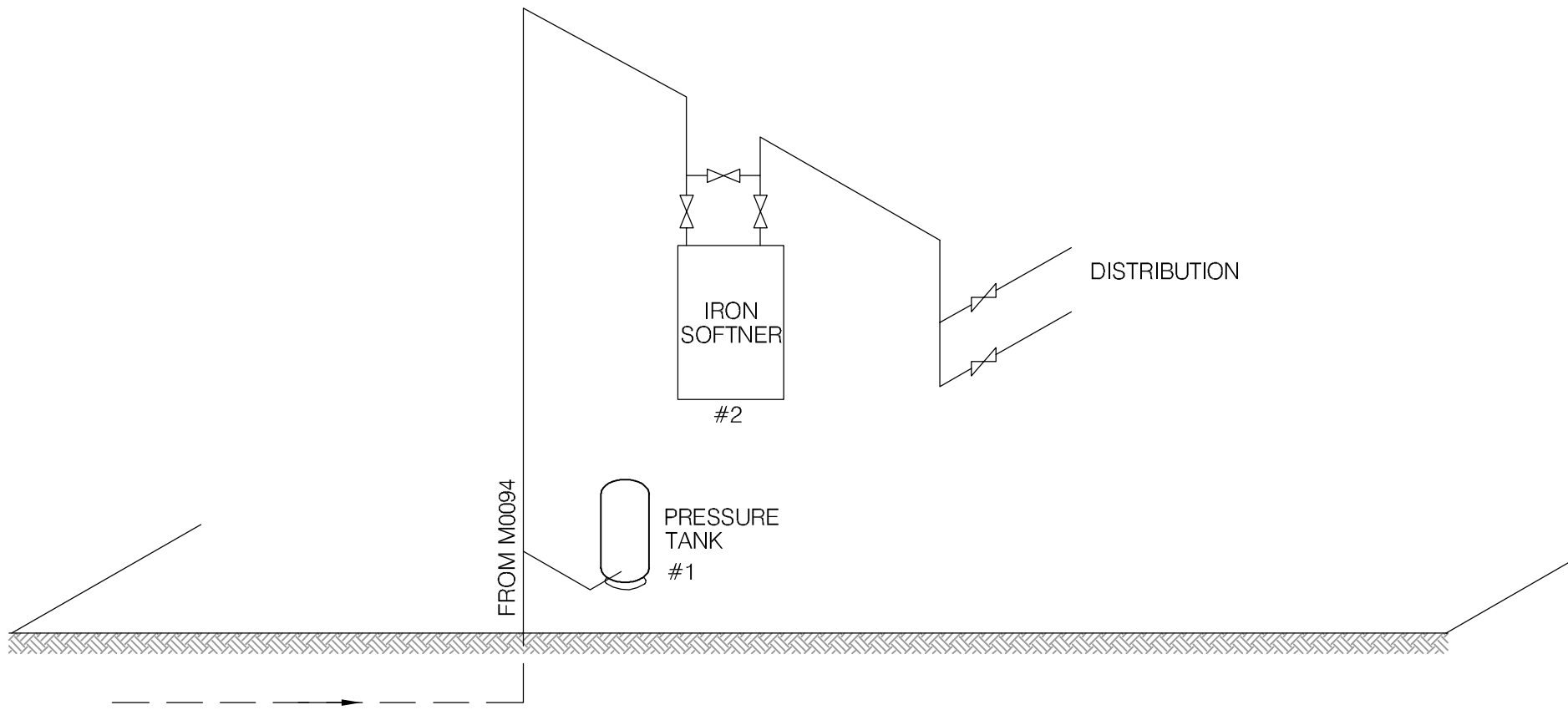
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|   |          |  |                  |
|---|----------|--|------------------|
|  <b>EBA Engineering Consultants Ltd.</b> |          | PROJECT SMALL PUBLIC WATER SYSTEMS ASSESSMENT<br>WHITEHORSE REGION |                  |
| CLIENT                                   |          | TITLE SCHEMATIC SYSTEM<br>LEGEND                                   |                  |
| DATE APRIL 2006   | DWN. JSB | CHKD. RMM  | FILE NO. 1260002 |
|   |          | DRWG.  | LEGEND           |



Whitehorse Region – R.C.M.P. Housing  
Building # MO064

DISTRIBUTION & TREATMENT SYSTEM DATA

| Item | Description         | Manufacturer | Model      | Part No. | Serial No. | Size         |
|------|---------------------|--------------|------------|----------|------------|--------------|
| 1    | 4" SUB. PUMP.       |              |            |          |            | 4" - 1/2 HD. |
| 2    | HOLDING TANK        |              | 1250 V.    |          |            | 1250 GALLONS |
| 3    | <del>JET</del> PUMP | DURO         | CONVEYABLE |          |            | 3/4 HD.      |
| 4    | PRESS TANK.         | AQUA FLO     | AF 2665    |          |            | 307 L        |
| 5    | WATER SOFTENER      | MYERS        | NISF30IN   |          | 1192       |              |
| 6    | PRESSURE SWITCH     | SO. D        | FSG-2      |          |            | 1/4" FIPT    |
| 7    |                     |              |            |          |            |              |
| 8    |                     |              |            |          |            |              |
| 9    |                     |              |            |          |            |              |
| 10   |                     |              |            |          |            |              |



SCHEMATIC PRODUCED BY BERT ALBISSER OF AQUA TECH SUPPLIES & SERVICES LTD.

|   |            |   |               |
|---|------------|---|---------------|
|  <b>EBA Engineering Consultants Ltd.</b> |            | PROJECT<br>SMALL PUBLIC WATER SYSTEMS ASSESSMENT<br>WHITEHORSE REGION                                   |               |
| CLIENT<br>                               |            | TITLE<br>WATER SYSTEM DISTRIBUTION/TREATMENT<br>SCHEMATIC SYSTEM ID.: M0094<br>CARMACKS RCMP DETACHMENT |               |
| DATE  | APRIL 2006 | DWN.  | JSB           |
| CHKD.   | FMM        | FILE NO.  | 1260002.001   |
|   |            | DWG.:   | FIGURE M0094B |

Whitehorse Region – R.C.M.P. Housing  
Building # ~~M0084~~ M0094

DISTRIBUTION & TREATMENT SYSTEM DATA

| Item | Description   | Manufacturer | Model    | Part No. | Serial No. | Size |
|------|---------------|--------------|----------|----------|------------|------|
| 1    | PRESSURE TANK | WELL RITE    | WR260-02 |          |            |      |
| 2    | IRON SOFTNER  | MYERS        | MISF30IN |          | 1192       |      |
| 3    |               |              |          |          |            |      |
| 4    |               |              |          |          |            |      |
| 5    |               |              |          |          |            |      |
| 6    |               |              |          |          |            |      |
| 7    |               |              |          |          |            |      |
| 8    |               |              |          |          |            |      |
| 9    |               |              |          |          |            |      |
| 10   |               |              |          |          |            |      |

**TABLE M0064 - 1: SUMMARY OF BACTERIOLOGICAL RESULTS**

| <b>Building #</b> | <b>Building Name</b> | <b>Number of Sampling Events</b> | <b>Time Period over which Sampling was Done</b> | <b>Any Positive Total Coliform Results? (yes or no)</b> | <b>Fraction of Positive Total Coliform Results vs. Total Sampling Events</b> | <b>Any positive E.Coli results? (yes or no)</b> | <b>Most Recent Sampling Event Available for EBA Review</b> | <b>Is Most Recent Result Positive?</b> |
|-------------------|----------------------|----------------------------------|---|---|--|---|--|--|
| M0064             | R.C.M.P Housing      | 9                                | Oct-04 to Mar-05                                | <b>yes</b>  | 3/9  | no  | 11-Mar-05  | no                                     |
| M0094             | R.C.M.P Housing      | 12                               | Sept-04 to Mar-05                               | <b>yes</b>  | 2/12   | no  | 11-Mar-05  | no                                     |



**Table M0064-2: Water Quality Results**

| SOURCE:                 | Building M0064 - R.C.M.P. Housing |                            | Building M0094 - R.C.M.P. Housing |                     | GCDWQ Criteria                                  |             |      |
|-------------------------|-----------------------------------|----------------------------|-----------------------------------|---------------------|---|-------------|------|
| Location/ Resident      | Carmacks                          |                            | Carmacks                          |                     |   |             |      |
| Address                 | Lot B-12                          |                            | Lot B-12                          |                     |   |             |      |
| Treatment               | No, Water Softener Only           |                            | No, Water Softener Only           |                     |   |             |      |
| Source of Water         | On-Site Well, Shares with         |                            | On-Site Well, Shares with         |                     |   |             |      |
| Purpose of Sampling     | Baseline                          | Additional Sampling        | Baseline                          | Additional Sampling |   |             |      |
| Sample Location         |                                   | Downstairs Laundry Tub Tap |                                   | Kitchen Tap         |   |             |      |
| Date Sampled            | 8-Oct-04                          | 12-May-05                  | 5-Oct-04                          | 12-May-05           | Lower Limit                                     | Upper Limit |      |
| Physical Tests (ALS)    |                                   |                            |                                   |                     | AO  | MAC         | AO   |
| Colour (CU)             | 5                                 |                            | 5                                 |                     |   |             | 15   |
| Conductivity (uS/cm)    | 373                               |                            | 481                               |                     |   |             |      |
| Total Dissolved Solids  | 231                               |                            | 284                               |                     |   |             | 500  |
| Hardness CaCO3          | 214                               |                            | 4                                 |                     | AO >200 = poor, > 500 unacceptable <sup>A</sup> |             |      |
| pH                      | 8.0                               |                            | 8.3                               |                     | 6.5   |             | 8.5  |
| Turbidity (NTU)         | 0.15                              |                            | 0.3                               |                     |   | 1           | 5    |
| UV Absorbance           |                                   | <0.0010                    |                                   | <0.0010             |   |             |      |
| Dissolved Anions (ALS)  |                                   |                            |                                   |                     |   |             |      |
| Alkalinity-Total CaCO3  | 201                               |                            | 215                               |                     |   |             |      |
| Chloride Cl             | 3                                 |                            | 3                                 |                     |   |             | 250  |
| Fluoride F              | 0.2                               |                            | 0.2                               |                     |   | 1.5         |      |
| Sulphate SO4            | 21.4                              |                            | 21.8                              |                     |   |             | 500  |
| Nitrate Nitrogen N      | 0.1                               |                            | 0.1                               |                     |   | 10          |      |
| Nitrite Nitrogen N      | <0.05                             |                            | <0.05                             |                     |   | 1           |      |
| Total Metals (ALS)      |                                   |                            |                                   |                     |   |             |      |
| Aluminum T-Al           | <0.02                             |                            |                                   |                     |   |             |      |
| Antimony T-Sb           | 0.0006                            |                            | <0.02                             |                     |   | 0.006       |      |
| Arsenic T-As            | <0.0004                           |                            | 0.0008                            |                     |   | 0.025       |      |
| Barium T-Ba             | 0.0643                            |                            | <0.0004                           |                     |   | 1           |      |
| Boron T-B               | <0.02                             |                            | 0.0009                            |                     |   | 5           |      |
| Cadmium T-Cd            | <0.0002                           |                            | <0.02                             |                     |   | 0.005       |      |
| Calcium T-Ca            | 63.9                              |                            | <0.0002                           |                     |   |             |      |
| Chromium T-Cr           | <0.0008                           |                            | 1.2                               |                     |   | 0.05        |      |
| Copper T-Cu             | 0.07                              | 0.0116                     | 0.0015                            |                     |   | 1           |      |
| Iron T-Fe               | 0.009                             |                            | 0.068                             |                     |   |             | 0.3  |
| Lead T-Pb               | 0.0005                            |                            | 0.031                             |                     |   | 0.01        |      |
| Magnesium T-Mg          | 13.4                              |                            | 0.0002                            |                     |   |             |      |
| Manganese T-Mn          | 0.001                             |                            | 0.1                               |                     |   |             | 0.05 |
| Mercury T-Hg            | <0.0002                           |                            | <0.001                            |                     |   | 0.001       |      |
| Potassium T-K           | 2.3                               |                            | <0.0002                           |                     |   |             |      |
| Selenium T-Se           | <0.0004                           |                            | 48.6                              |                     |   | 0.01        |      |
| Sodium T-Na             | 7                                 |                            | <0.0004                           |                     |   |             | 200  |
| Uranium T-U             | 0.0011                            |                            | 81                                |                     |   | 0.02        |      |
| Zinc T-Zn               | 0.007                             |                            | 0.0009                            |                     |   |             | 5    |
|                         |                                   |                            | 0.007                             |                     |   |             |      |
| Dissolved Metals        |                                   |                            |                                   |                     |   |             |      |
| Copper D-Cu             |                                   | 0.0078                     |                                   |                     |   |             | 1.0  |
| Field Chemistry (EBA)   |                                   |                            |                                   |                     |   |             |      |
| pH                      |                                   | 8.08                       |                                   | 8.10                | 6.5   |             | 8.5  |
| TDS                     |                                   | 194                        |                                   | 199                 |   |             | 500  |
| EC (uS/cm)              |                                   | 383                        |                                   | 392                 |   |             |      |
| Temperature             |                                   | 13.1                       |                                   | 15.0                |   |             |      |
| 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)



**Table M0064-3: Summary of Well Assessment Results  
SMALL PUBLIC DRINKING WATER SYSTEMS**

| <b>Well Identification and Location</b> |                      |                 |                                |                               |   |
|---|----------------------|-----------------|--------------------------------|-------------------------------|---|
| <b>Building #</b>                       | <b>Building Name</b> | <b>Location</b> | <b>Northing<br/>(+/- 10 m)</b> | <b>Easting<br/>(+/- 10 m)</b> | <b>Grade<br/>Elevation<br/>(+/- 10 m)</b> |
| M0064<br>M0094                          | R.C.M.P. Housing     | Carmacks        | 6884798                        | 432697                        | 526                                       |

| <b>Well Details</b>                      |                                |                  |                              |  |                                |  |   |
|--|--------------------------------|------------------|------------------------------|--|--------------------------------|--|---|
| <b>Well Casing<br/>Diameter<br/>(mm)</b> | <b>Year Well<br/>Installed</b> | <b>Well Log?</b> | <b>Well Depth<br/>(m bg)</b> | <b>Reported<br/>Low<br/>Permeability<br/>Protective<br/>Layer?</b> | <b>Pump Setting<br/>(m bg)</b> | <b>Well Capacity -<br/>Tested, or<br/>Reported by User</b>                                   | <b>Static Water<br/>Level Below<br/>Ground<br/>(m-btwc)</b> |
| 150                                      | ?                              | No               | ?                            | No, shallow<br>well  | ?                              | 1/2hp submersible<br>pump<br>(shared between 2<br>residences)<br>Size of pump meets<br>needs | ?   |

| <b>Well Construction Details</b>         |                  |                    |                         |                          |
|--|------------------|--------------------|-------------------------|--------------------------|
| <b>Wellhead<br/>Above ground<br/>(m)</b> | <b>Well Cap</b>  | <b>Well Screen</b> | <b>Surface<br/>Seal</b> | <b>Apron<br/>Grading</b> |
| ?  | Split Cap Gasket | ?                  | Unlikely                | Inside building          |

**Table M0064-4: Potential Contaminant Sources  
Building M0064 – RCMP Housing**

| Potential Contaminant Source                 | Potential Contaminants  | Distance from Water Source                          | Northing | Easting |
|--|---|---|----------|---------|
| Dump or Landfill                             | <i>Organic</i> and inorganic chemicals.   | 1250 m  |          |         |
| Cemetery                                     | <i>Biological</i> <sup>1</sup> , inorganic <sup>2</sup> and organic parameters. | 350 m   |          |         |
| Sewage lagoon                                | <i>Biological</i> , inorganic and organic parameters.                           | >300 m  |          |         |
| Sewage lines, tanks and lift stations        | <i>Biological</i> , inorganic and organic parameters.                           | <b>&lt;15 m to service lines and &lt;30 to main</b> |          |         |
| Septic fields                                | <i>Biological and Inorganic</i> parameters.                                     | >150 m  |          |         |
| Gas stations                                 | <i>Organic and Inorganic</i> parameters.  | 200 m   |          |         |
| Undergrounds Fuel Storage Tanks (USTs)       | <i>Organic</i> parameters.  | >>30 m  |          |         |
| Above ground storage tanks (ASTs)            | <i>Organic parameters.</i>  | <b>18 m</b>   | 6884810  | 432685  |
| Naturally occurring sources of contamination | <i>Radionuclides, Bacteria and Viruses from surfacewater sources.</i>           | >100 m  |          |         |

**Notes:** *Bold highlighting of distances indicates non-compliance with proposed guidelines*

1- Biological parameters include: bacteria, viruses, protozoa (parasitic organisms), helminthes (intestinal worms), and bio aerosols (inhalable moulds and fungi).

2 – Inorganic contaminants could include arsenic in embalming chemicals (prior to early 1900's), and heavy metals in caskets.

*Required Setback Distances Draft Guidelines for Part III – Small Public Drinking Water Systems:*

300 m (1,000 ft) from a sewage lagoon or pit and manure heaps

120 m (400 ft) from a solid waste dump or a cemetery

30 m (100 ft) from any other potential source of contamination



# 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 May 12, 2005

| WELL ID #                        | Owner       | Location Description |
|----------------------------------|-------------|----------------------|
| <u>M0094 + M0064</u><br>(1 well) | <u>RCMP</u> | <u>RCMP Housing</u>  |

#### 1. Well Location and Potential Contaminant Sources

a. General location of well: (Community, Subdivision, etc.)

Carmacks

b. Specific location: (Road or street, Building number, name of owner and/, legal description,

Carmacks RCMP Detachment Housing

c. GPS location: 432697 Easting 6884798 Northing 526m elev. ±14m

d. Is there electric power?  Yes  No

e. Does the well system have:

15 or more service connections to a piped distribution system? If so how many \_\_\_\_\_

Services 2 RCMP Housing Houses

5 or more delivery sites on a trucked distribution system? If so how many \_\_\_\_\_

f. Nearest building, specify \_\_\_\_\_

g. Distance from well to building \_\_\_\_\_

h. If there is an effluent disposal field, is its location known?  Yes  No

i. Distance from well to nearest point of known field: \_\_\_\_\_

j. Well location relative to field:  upslope  downslope  lateral

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k. 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

There is a sewer line 30 m away

l. Is the well located within 300 m from a sewage lagoon or pit?  Yes  No

There is a solid waste dump ~ 1 km away

m. Is the well located within 120 m from a solid waste site or dump, cemetery?  Yes  No

n. 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

o. Is well site subject to flooding?  Yes  No

p. Is the well site well drained?  Yes  No

q. 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 \_\_\_\_\_

r. 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 3 + 4; Distance from well to Potential Source 1: 18 m

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: \_\_\_\_\_

s. Are there other wells on this property?  Yes  No

How many? \_\_\_\_\_  in use  abandoned  require proper sealing

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## 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 \_\_\_\_\_ 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 unlikely
- 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,

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- 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 \_\_\_\_\_
- 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...) water softeners for both homes

### **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 \_\_\_\_\_

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\*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: \_\_\_\_\_

l. Comments on pump installation: \_\_\_\_\_  
\_\_\_\_\_

## **6. Conclusions**

a. Comments on overall installation:

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b. Recommendations: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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## PART B: EBA Site Inspection

Inspector: BERT ALBISSEN

Date MAY 12-05

| WELL ID #    | Owner      | Location Description                           |
|--------------|------------|--|
| <u>M0064</u> | <u>YTG</u> | <u>CARMACIES RAMP RES.</u><br><u>TAN HOUSE</u> |

### 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<sub>2</sub>S  Other \_\_\_\_\_

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- 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 *N/A*
- 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: *Pressure 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: \_\_\_\_\_

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## ***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



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## **8. Conclusions**

a. Comments on overall installation:

INSTALLATION IS OF GOOD QUALITY &  
WORKMANSHIP.  
WELL CASING IS PRONE TOO FLOODING.

b. Recommendations:

INSTALL PITLESS ADAPTER & EXTEND CASING  
18" ABOVE GRADE.

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## PART B: EBA Site Inspection

Inspector: BERT ALBISSER

Date May 12-05

| WELL ID # | Owner | Location Description |
|-----------|-------|----------------------|
| M009A     | YTG   | CARMACKS - RCMP      |

WHITE HOUSE

### 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<sub>2</sub>S  Other \_\_\_\_\_

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- d. Is there an unpleasant taste?  Yes  No  brackish  Other \_\_\_\_\_
- e. Is there a history of bad bacterial analyses?  Yes  No *N/A*
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## **TANK AND PIPING DETAILS**

### ***Tank Room***

Is there a water tank?  Yes  No Details: *Pressure TANK*

Where is it located?

Comments: *BASLMENT*

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: \_\_\_\_\_

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## ***Overall Tank***

What are the tank size and dimensions?

\_\_\_\_\_

What material is the tank constructed of? \_\_\_\_\_

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Comments: \_\_\_\_\_

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## **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

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## **8. Conclusions**

a. Comments on overall installation:

INSTALLATION IS OF GOOD QUALITY  
MATERIAL & WORKMANSHIP.

b. Recommendations:

ADD UV SYSTEM & FILTRATION



**Photo 0015:** M0064 Water System



**Photo 0147:** M0064 and M0094 Above Ground Heating Fuel Storage Tank



**Photo 0011:** M0094 Water Softener (left) and Pressure Tank (right)



**Photo 0012:** M0064 Water Softener