21.0 BUILDING 6512: CARMACKS GRADER STATION

21.1 Description of Existing Water Supply System

Water to Building 6512, the Carmacks Grader Station, is supplied by a 55 m deep well located in an addition to the main shop. A site plan showing the location of the wellhead and site details is provided as Figure 6512-A in Appendix A21. The coordinates of the wellhead, as measured by a hand held GPS device were recorded as:

- UTM ZONE 8
- Northing: 6884956
- Easting: 433308

The water is filtered with an inline cartridge type filter. The submersible pump system is controlled by a pressure tank and pump controls. A system schematic is provided as Figure 6512-2 located in Appendix A21.

21.2 Description of Existing Wastewater Systems

The septic tank for the Carmacks Grader Station is located 20 m southeast of the well. The septic tank discharges effluent to a field located southeast of the tank. The in ground sewage disposal system also handles wastewater from the garage sumps located in the maintenance garage.

21.3 Water Quality Results

21.3.1 Water Quality Results from Previous Sampling

Bacteriological

No test results were provided to EBA for review. Bacteriological sampling of water from the Carmacks Grader Station water system may not have been previously completed because reportedly it is not used for drinking water.

Detailed Potability Analyses

A water sample was previously collected from the Carmacks Grader Station water system on October 5, 2004. The sample was submitted to ETL EnviroTest in Surrey BC for analysis and included detailed potability analyses. The results from this analysis are

summarized in Table 6512-2 and are included 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.

- The water quality for the sample obtained on October 5, 2004 indicated that the groundwater source was calcium-bicarbonate type water with very high hardness and a pH of 8.
- At 0.067 mg/L, the manganese concentration exceeds 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. The hardness (as $CaCO_3$) was reported to be 261 mg/L, and is generally poor for aesthetic purposes.

21.3.2 Identification of Additional Analytical Testing Required

Additional analytical for the Carmacks Grader Station that was identified to be included during the investigation is detailed below:

- Since the total manganese concentration had previously exceeded the CDWQG aesthetic objectives, an analysis for dissolved iron and manganese was recommended in order to assist in determining potential treatment or rehabilitation measures.
- UV absorbance to determine potential for UV treatment as a disinfection option.
- Measurements in the field for total dissolved solids, conductivity, pH, and temperature were completed at the time of sampling.
- Since there were no previous bacteriological results for the water system, a sample was taken to YTG Health services for analysis for *E. coli* and Total Coliform.

It was observed during the site inspection that there are potential sources of hydrocarbon contamination within 30 m of the well. Extractable Petroleum Hydrocarbons (EPH) and Polycyclic Aromatic Hydrocarbons (PAH) were included as potential indicators of contamination of the water supply from hydrocarbon sources.

Additional Analytical Results

A water sample was obtained during the water system assessment on May 25, 2005, and was submitted to ALS Environmental in Vancouver BC for analysis of dissolved iron and manganese, UV absorbance, EPH and PAH. These results are summarized in Table 6512-2 in Appendix A21 and the laboratory reports are included in Appendix B.

- EPH and PAH were found to be below analytical detection, and thus there was no evidence to suggest that the water system was being impacted by hydrocarbons at the time of sampling.
- Bacteriological results for the water sample collected on May 25, 2005 reported both *E. coli* and Total Coliform as absent.

21.3.3 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 was reported to be low and can be considered to be within the normal background ranges for groundwater in the Carmacks area. Nitrate and nitrite concentrations from this sample were also low and within the normal background range for the Carmacks area.

21.4 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 Village centre is northeast toward the Yukon River.

21.5 Potential Contaminant Sources

Potential contaminant sources from observations during the site investigation are compiled in Table 6512-4 in Appendix A21. Photos of potential contaminant sources are provided in Appendix A21.

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

- Septic field/rock pit at 20 m,
- Used oil tank at 28 m,
- Waste solvent drum at 30 m,
- Waste antifreeze drum at 30 m, and
- Two above ground fuel storage tanks at 25 m.

21.5.1 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.

21.6 Identified Water System Deficiencies and Associated Risk

21.6.1 High and Medium Risk Deficiencies

The following deficiencies were identified as being high-risk for the Carmacks Grader Station:

- The wellhead is located within 30 m of potential sources of contamination. There are two above ground fuel storage tanks located 25 m from the well. There is a used oil tank, as well as a used solvent drum and a used antifreeze drum located approximately 30 m from the well. The septic system including the filed is within 30 m of the well. Additionally, the septic system also acts as a rock pit and may receive some hydrocarbon wastes from the garage sumps along with the domestic effluent into the septic system;
- 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 an attachment to the maintenance garage, concrete floor is cracked around 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.
- The hydrogeology of the area indicates that there are no protective low permeability layers between the surface and the water table; and,
- There is no bacteriological testing program at this site.

21.6.2 Low Risk Deficiencies

- Iron above CDWQG aesthetic objective.

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

It is likely that the cost associated with redeveloping the current well and removing to a safe distance any potential source of contamination, including the current septic and garage sump disposal system would likely be greater than the cost to drill a new well located properly with respect to potential contaminant sources, and constructed to meet the existing guidelines rather than to relocate the potential contaminant sources and upgrade the well. This would also result is a safer water supply source. There are two options available to mitigate the deficiencies associated with the water system at the Carmacks Grader Station.

Option 1:

The first option involves replacing the existing well and drilling the new well so that it satisfies the following conditions:

- The well must be located at least 30 m away from any potential source of contamination, preferably in an upgradient direction;
- 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 accessible to animals and unauthorized persons;
- 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;
- If the new well is successful, the old well should be properly decommissioned in accordance with the Guidelines for Water Well Construction and the existing wellhead enclosure should be removed; and,
- Regular bacteriological testing should be implemented.

Option 2:

An alternative to overhauling the existing wellhead construction is available:

- 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, with routine monitoring may be adequate until the

community system is installed. An opinion from 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 and it could be removed and re-installed at other YTG maintained systems. Alternatively, a bottled water station could be provided.
- The old well should be properly decommissioned once the grader station connects to the community water supply in accordance with the Guidelines for Water Well Construction and the existing wellhead enclosure should be removed.
- Until the well deficiencies have been mitigated and while the well is still being used as a source of potable water, regular bacteriological testing should take place.

21.7.2 Priority 2

All identified risks are considered to be Priority 1.

21.7.3 Priority 3

All identified risks are considered to be Priority 1.

21.8 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.

21.8.1 Priority 1

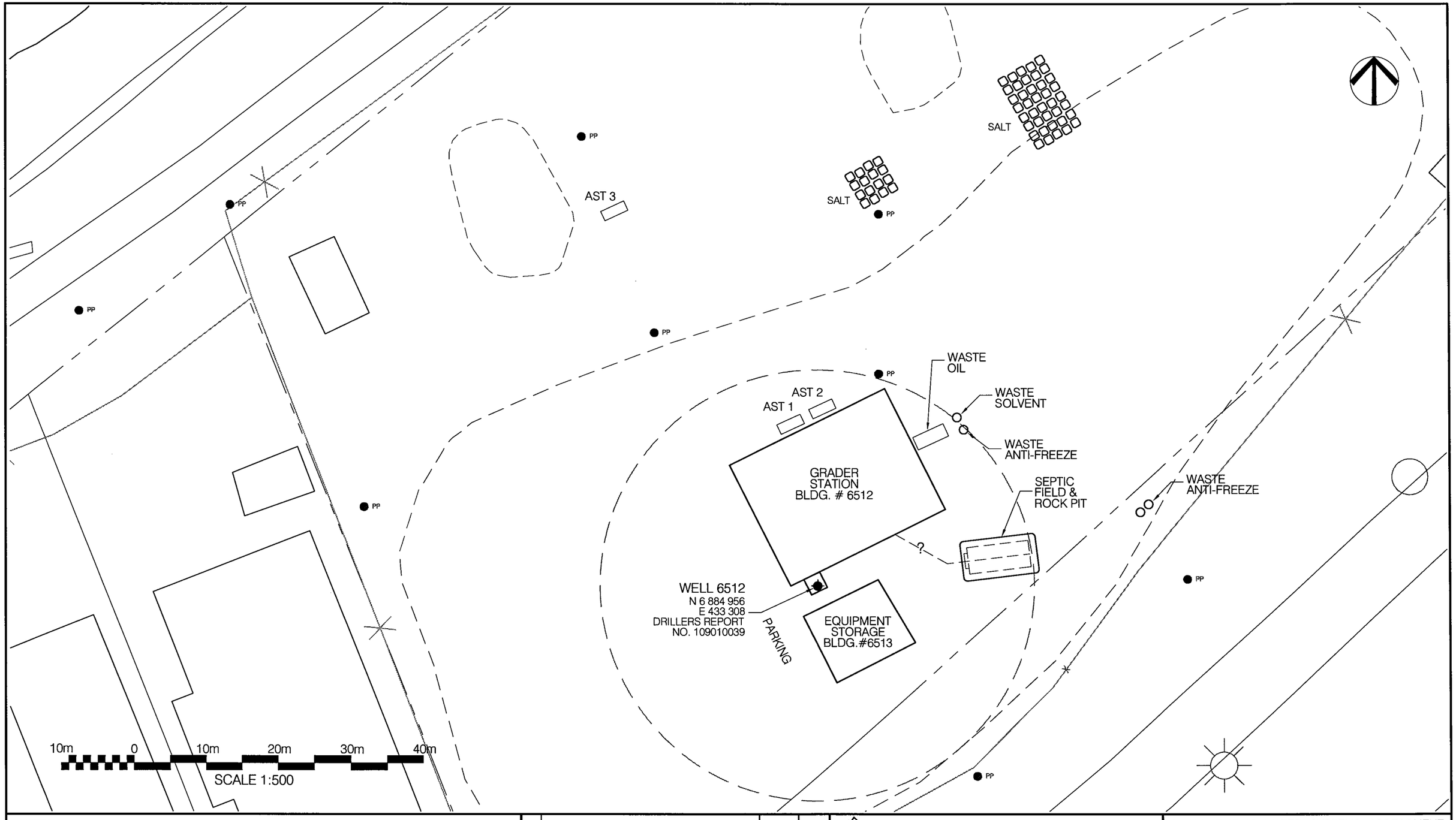
Option 1:

- It is recommended that **$35,000** be budgeted for materials and labour to drill, test, complete and hook-up the well;
- It would cost approximately **$1,500** to decommission the existing water well and wellhead enclosure;
- A minimum of **$9,000** should be allocated for adequate water treatment and disinfection; and,

- Regular bacteriological testing for the Carmacks Grader Station would fall under normal Operation and Maintenance costs for the Property Management Agency.

Option 2:

- The costs to connect with the planned community distribution system would likely be paid for by others and recovered through taxation.
- The cost for providing bottled water would likely be about **$500** initially and **$100** per month in the interim until the community system is installed;
- The existing well should be properly decommissioned in accordance with the Guidelines for Water Well Construction and to remove the existing wellhead enclosure. It is estimated that this would cost approximately **$1,500**.
- Regular bacteriological testing for the Carmacks Grader Station would fall under Operation and Maintenance costs.



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:	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 GRADER STATION
BUILDING 6912
SITE LOCATION DIAGRAM
WELL ID: 6912

REVISION ISSUE: 0

DRAWING No.: FIGURE 6512A

Z:\0201Drawings\1260002 Water Assessment YTG\001 - Whitehorse Region\carmacks\1260002 Carmacks Overall Plan.dwg, 6/13/2005 10:11:31 AM, \\whi-eb-dc001\WHI201COMMON

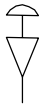
LEGEND


PUMP


PRESSURE GAUGE


GATE VALVE


CHECK VALVE

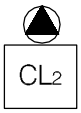

SOLENOID

#2 COMPONENT ID. No.
(SEE TABLE ON FOLLOWING PAGE)

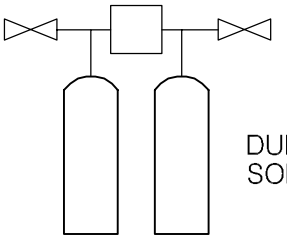
FLOW METER

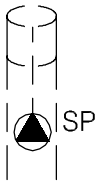
WATER FILTER
(CARTRIDGE TYPE)

PRESSURE TANK

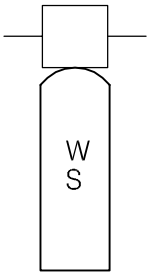


CHLORINE RESERVOIR AND
INJECTION PUMP


DUPLEX WATER
SOFTENER

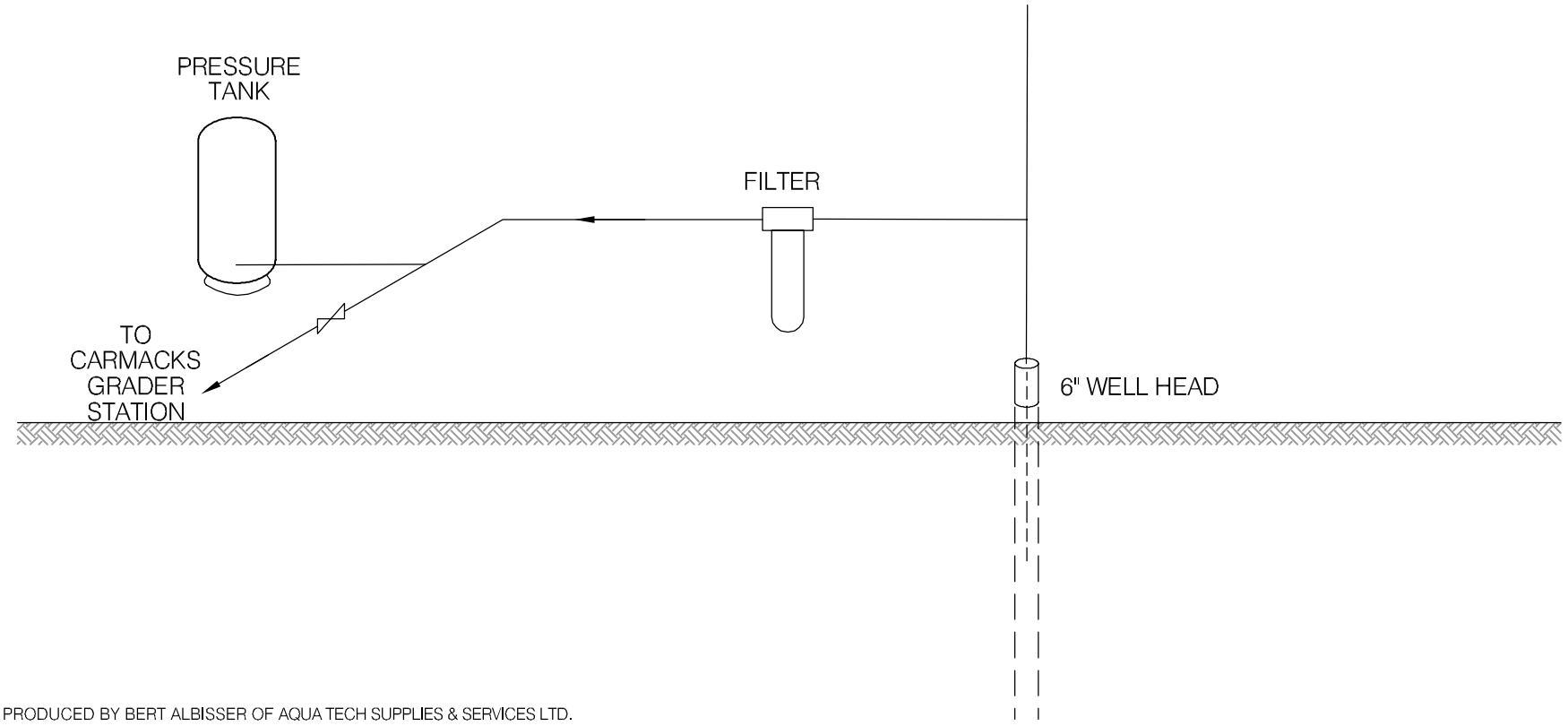


WELL WITH
SUBMERSIBLE PUMP



ACTIVATED
CARBON

EBA Engineering Consultants Ltd.			PROJECT	SMALL PUBLIC WATER SYSTEMS ASSESSMENT WHITEHORSE 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



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

EBA Engineering Consultants Ltd.

PROJECT: SMALL PUBLIC WATER SYSTEMS ASSESSMENT
WHITEHORSE REGION

CLIENT: Yukon Highways and Public Works Property Management Branch

TITLE: WATER SYSTEM DISTRIBUTION/TREATMENT
SCHEMATIC SYSTEM ID.: 6512
CARMACKS GRADER STATION

DATE	DWN.	CHKD.	FILE NO.	DWG.:
APRIL 2006	JSB	RMM	1260002.001	FIGURE 6512B

Z:\0201Drawings\1260002 Water Assessment YTG\001 - Whitehorse Region\carmacks\Schematics\1260002 Grader Station 6512 Schematic.dwg, 4/6/2006 10:32:14 AM, Adobe PDF, jbuyck

TABLE 6512 - 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?
6512	Grader Station	1	May 05	no	0/1	no	25-May-05	no

Table 6512-2: Water Quality Results

SOURCE:	Building 6512 - Carmacks Grader Station		GCDWQ Criteria		
Location/ Resident	Carmacks				
Address	Lot 10 Group 10				
Treatment	Filtration				
Source of Water	On-Site Well				
Purpose of Sampling	Baseline	Additional Sampling			
Sample Location		Washroom Tap			
Date Sampled	5-Oct-04	25-May-05	**Lower Limit**	**Upper Limit**	
Physical Tests *(ALS)*			**AO**	**MAC**	**AO**
Colour (CU)	5				15
Conductivity (uS/cm)	381				
Total Dissolved Solids	286				500
Hardness CaCO3	261		AO >200 = poor, > 500 unacceptable[A]		
pH	8.0		6.5		8.5
Turbidity (NTU)	**1.0**			1	5
UV Absorbance		<0.0010			
Dissolved Anions *(ALS)*					
Alkalinity-Total CaCO3	244				
Chloride Cl	5				250
Fluoride F	0.21			1.5	
Sulphate SO4	32.6				500
Nitrate Nitrogen N	<0.1			10	
Nitrite Nitrogen N	<0.05			1	
Ammonia Nitrogen N					
Total Metals *(ALS)*					
Aluminum T-Al	<0.02			0.1	
Antimony T-Sb	0.0007			0.006	
Arsenic T-As	0.0034			0.025	
Barium T-Ba	0.0655			1	
Boron T-B	<0.02			5	
Cadmium T-Cd	<0.0002			0.005	
Calcium T-Ca	72.4				
Chromium T-Cr	0.0018			0.05	
Copper T-Cu	0.003			1	
Iron T-Fe	0.25				0.3
Lead T-Pb	0.0002			0.01	
Magnesium T-Mg	19				
Manganese T-Mn	**0.067**				0.05
Mercury T-Hg	<0.0002			0.001	
Potassium T-K	2.8				
Selenium T-Se	<0.0004			0.01	
Sodium T-Na	7				200
Uranium T-U	0.0017			0.02	
Zinc T-Zn	0.008				5
Dissolved Metals					
Iron D-Fe		<0.030			0.3
Manganese D-Mn		**0.0649**			0.05
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			
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		8.06	6.5		8.5
TDS		225			500
EC (uS/cm)		450			
Temperature		13.0			
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 (^{o}C) and Turbidity (NTU)

< = Less than the detection limit indicated.

AO = Aesthetic Objective

MAC = Maximum Acceptable Concentration (Health Based)

Table 6512-3: Summary of Well Assessment Results
SMALL PUBLIC DRINKING WATER SYSTEMS

Well Identification and Location					
Building #	**Building Name**	**Location**	**Northing (+/- 10 m)**	**Easting (+/- 10 m)**	**Grade Elevation (+/- 10 m)**
6512	**Carmacks Grader Station**	**Carmacks**	6884956	433308	532

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	?	Yes	54.86	No, sand and gravel	13.420 (may be wires, uncertain)	3/4hp submersible pump Size of pump meets needs	5.800

Well Construction Details				
Wellhead Above ground (m)	**Well Cap**	**Well Screen**	**Surface Seal**	**Apron Grading**
0.3	Split Cap Gasket	?	No	Inside building

Table 6512-4: Potential Contaminant Sources
Building 6512 – Carmacks Grader Station

Potential Contaminant Source	Potential Contaminants	Distance from Water Source	Northing	Easting
Dump or Landfill	***Organic*** and inorganic chemicals.	1600 m		
Cemetery	***Biological***[1]***,*** inorganic[2] and organic parameters.	1000 m		
Sewage lagoon	***Biological,*** inorganic and organic parameters.	>300 m		
Sewage lines, tanks and lift stations	***Biological,*** inorganic and organic parameters.	**Approx. 15 m**		
Septic fields	***Biological, Organic, and Inorganic*** parameters.	**20 m**	6884950	433333
Gas stations	***Organic and Inorganic*** parameters.	150 m		
Undergrounds Fuel Storage Tanks (USTs)	***Organic*** parameters.	>>30 m		
Above ground storage tanks (ASTs)	***Organic*** *parameters****.***	**2 at 25 m and 1 at 60 m**		
Used Oil Tank	***Organic*** *parameters****.***	30 m		
Used Solvent Drum	***Organic*** *parameters****.***	30 m		
Used Antifreeze Drums	***Inorganic*** parameters.	30 m and 70 m		
Salt Storage	***Inorganic*** parameters.	80 m		
Asphalt pile	***Organic and Inorganic*** parameters.	70 m		
Naturally occurring sources of contamination	***Radionuclides, Bacteria and Viruses from surfacewater sources.***	>150 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: Luke Lebel Date May 25, 2005

WELL ID #	Owner	Location Description
6512	YTG	Carmacks Grader Station

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,
Freegold road, Carmacks

c. GPS location: 433308 Easting, 6884956 Northing 532m elevation ±7m

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_____
Carmacks Grader Station

☐ 5 or more delivery sites on a trucked distribution system? If so how many_____

f. Nearest building, specify Located inside small addition to the Grader Station

g. Distance from well to building ~2m

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

i. Distance from well to nearest point of known field: ~20m

j. Well location relative to field: ☐ upslope ☐ downslope ☒ lateral

5.800M - S.L. OF WATER
13.420M - SOMETHING; MAYBE TOP OF PUMP

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
All waste from grader station, effluent and floor grease, flows into the septic tank/rock pit that is ~20m away

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

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
located inside locked building

Entrance by animals? ☐ Yes ☒ No
some evidence of mouse droppings. Entrance can be easily gained by animals. There are spaces between the walls of the wellhouse and ditch and the grader station, as well as cracks in the cement floor

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/unknown

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 1+2 ; Distance from well to Potential Source 1: ~25m

Potential Source 2: AST 3 ; Distance from well to Potential Source 2: ~60m

Potential Source 3: waste oil/solvent/antifreeze ; Distance from well to Potential Source 3: ~30m

Potential Source 4: Salt storage ; Distance from well to Potential Source 4: ~80m
Asphault pile ~40m; parking ~5m

s. 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: 54.86m -possibly ☐ measured (if possible) ☐ reported ☒ from log

h. Static water level below ground: 5.800 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 _____ 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 addition off from the 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 No ~0.3 m 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
The well is inside an insulated addition, there are however, major cracks in concrete floor and spaces between addition and grade on walls

iv. Any evidence of rodents? Specify Access is possible, some morse dropping

v. Does the well casing have a proper seal cap? ☒ Yes ☐ No
split seal cap

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...) filtration only

---

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 13.40 m - something, may be top of pump

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
tap on line after filter but before pressure tank

j. Is there a water meter on the system? ☐ Yes ☒ No

k. Is the pump and piping protected from freezing? ☐ Yes ☐ No
Well head is located inside building. There is no door between heated grader station and wellhouse addition. No heat trace, large void spaces
If yes, describe: between walls of addition and exterior grader stn walls.

l. Comments on pump installation: _____

6. Conclusions

a. Comments on overall installation:

The effluent field 20m away does not only take in domestic waste from the grader station, but also hydrocarbon/solvent waste from the drainage inside the garage. The effluent field therefore doubles as a rock pit as all of the waste coming directly from the grader station drains into it.

b. Recommendations: See report

Carmacks Grader Station

Driller's Report 109010039

Location: YTG Grader Station Well Lot 10 Group 10 CRMK

NAD 83 **Zone** 8 **Easting** 433293.45 **Northing** 6884939.6 **Elevation ASL** 1 m.

Location Accuracy: **Horizontal** 30-100 (topo) **Vertical** unknown or unreliable

Purpose of well: Commercial - not fabrication or manufacturing

Permafrost encountered? No

LOG OF OVERBURDEN AND BEDROCK MATERIALS

Layer	From	To		General Colour	Most Common Material	Secondary Material	General Description
1	0	3.05	m.		SAND, fine		
2	3.05	5.49	m.		GRAVEL		
3	5.49	7.32	m.		GRAVEL till		
4	7.32	9.14	m.		SAND		
5	9.14	14.94	m.		fine SAND		
6	14.94	16.15	m.		GRAVEL		
7	16.15	54.86	m.		fine SAND		

WELL CONSTRUCTION

Well No. 1090100391 **Completion date** **Drilling method** **Well type**

Casing: **OS Diameter** mm. **Material** **Wall thickness** mm. **Depth to** m.

Comments

Surface/Env'l seal: **Material** **Diameter** mm. **Depth from** to m. **Volume** cu. m.

Gravel Pack ? ☐ **Material** **Diameter** mm. **Depth from** to

Well Screen Information

OS Diameter	Material	Screen Type	Comments

Screen Sections

Section	From	to	Slot size/ perforation diameter
1			

WELL DEVELOPMENT AND STATUS

Well ID	Developed by	Wellhead completion	Adapter depth	Static water level	Yield Estimate	Estimate method
1090100391			m.	m.	Lps	

Final Status New, in use for intended purpose

No

GROUNDWATER QUALITY

Well No. 1090100391 **Field Measurement Date** 10-Dec-02

Electrical Conductivity	485	µS
pH	7.56	
Temperature	3.9	°C
Groundwater Type		
Turbidity/sand content		

Well disinfection

Was the well disinfected on completion of pump installation? ☐

Bacterial testing done? ☐ **Lab** **Date**

Chemical testing done? ☐ **Lab** **Date**

EBA Engineering Consultants Ltd.

Creating and Delivering Better Solutions

PART B: EBA Site Inspection

Inspector: MARK ROBINSON / AQUATECH. 3/4 H.P. 230V SUBM. PUMP ON 1 1/4" POLY PIPE Date MAY 25/05

WELL ID #	Owner	Location Description
6512 6512	YTG	Carmacks

6. Water Treatment

a. Is well water treated? ☐ Yes ☒ No; Type of treatment: ALL TAPED UP. DID NOT OPEN

☐ chlorination ☐ iron and or manganese removal ☐ other 1½ BIG BLUE FILTER AT WELL HEAD BEFORE PRESSURE TANK.

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 ROTTEN EGGS

d. Is there an unpleasant taste? ☒ Yes ☐ No ☐ brackish ☐ Other Do Not Drink, Haul H2O from Home in 20L Jug.

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 Not Daily - Testing Done By Property Mangement (Monthly?)

TANK AND PIPING DETAILS

Tank Room

Is there a water tank? Yes (No) Details:

Where is it located?
Comments: Well 6" Casing inside a 8'x8'x10' Room Added To Side of Garage

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: Door Removed From Well House To Shop. Floor Raised From Garage (6"

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: Concrete Cracked Around Well Casing, Filled With Cold Mix (Pavement)

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:

b. Recommendations:

(1) Repair cracks in concrete floor in well house.
(2) Raise casing - casing is only 7" above well house floor and is app. 13" above floor of shop.
(3) To clean well (redevelop) you would have to remove roof ~~on~~ or remove the whole add on well room building, in order to get equipment over hole.

Carmacks Grader Station

Driller's Report 109010039

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WELL CONSTRUCTION

Well No. 1090100391 Completion date | Drilling method | Well type

Casing: OS Diameter mm. Material | Wall thickness mm. Depth to m.

Comments

Surface/Env'l seal: Material | Diameter mm. Depth from to m. Volume cu. m.

Gravel Pack? ☐ Material | Diameter mm. Depth from to

Well Screen Information

OS Diameter	Material	Screen Type	Comments

Screen Sections

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Well No. 1090100391 Field Measurement Date: 10-Dec-02

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pH: 7.56

Temperature: 3.9 °C

Groundwater Type:

Turbidity/sand content:

Well disinfection

Was the well disinfected on completion of pump installation? ☐

Bacterial testing done? ☐ Lab | Date

Chemical testing done? ☐ Lab | Date

Photo 0196: 6512 Carmacks Grader Station and Well house Addition (back), Parking (front)

Photo 0197: 6512 Wellhead (center) and Filter (left)

Photo 0205: 6512 Septic Field and Rock Pit (left), Carmacks Grader Station (back right)

Photo 0202: 6512 Above Ground Fuel Storage Tanks (2) and Carmacks Grader Station (behind)

Photo 0204: 6512 Used Oil Tank, Used Antifreeze Drum and Used Solvent Drum, Carmacks Grader Station (behind)

Photo 0203: 6512 Salt Storage

Photo 0200: 6512 Ash Fault Pile

Photo 0198: 6512 Pressure Tank