Appendix 5.3.6A
Stage 1 – Environmental Impact Study: Rapid Filtration Basin Wastewater Disposal for the New Gold Inc. Blackwater Mine Construction Camp near Vanderhoof, BC

western water ASSOCIATES LTD
Consultants in Hydrogeology and Water Resources Management

Stage 1 - Environmental Impact Study: Rapid Infiltration Basin Wastewater Disposal for the New Gold Inc. Blackwater Mine Construction Camp near Vanderhoof, B.C.

Prepared for:

New Gold Inc.
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December 2013

Project: 13-019-02, Ver 1

Prepared by:

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December 12, 2013

New Gold Inc.
ATTN: Nigel Fisher M.Sc., PMP, Environmental Permitting Specialist
Two Bentall Centre
Suite 1800 - 555 Burrard Street, Vancouver
British Columbia, Canada, V7X 1M9

Via email: Nigel.Fisher@newgold.com

Dear Mr. Fisher:

Re: FINAL REPORT – Stage 1 Environmental Impact Study in Support of Wastewater Disposal via Rapid Infiltration Basin for the proposed Backwater Mining Construction Camp Expansion

Western Water Associates Ltd. (WWAL) is pleased to provide this report on our Stage 1 Environmental Impact Study (EIS) in support of the New Gold Blackwater Mining Camp expansion. The work has been completed within the context of, and meets the requirements of, the B.C. Municipal Wastewater Regulation and its companion guidance document for completing an EIS. This report is suitable for submission to the Ministry of Environment and other approval agencies.

The results of our Stage 1 EIS indicate that disposal of Class C effluent from the proposed 1,200 person construction camp, with a future 400 permanent operations camp, to-ground via rapid infiltration basin (RIB) is feasible and should not adversely affect the receiving environment. Baseline water quality at the site was assessed and indicates that the shallow groundwater regime in the area is not currently showing anthropogenic impact. The Class C effluent proposed for discharge in connection with wastewater treatment is a better alternative to regular septic effluent and on-going monitoring will ensure that the groundwater and surface water down gradient of the proposed RIB meets the appropriate water quality guidelines.

We trust that the professional opinions and advice presented in this document are sufficient for your current requirements. Should you have any questions, or if we can be of further assistance in this matter, please contact the undersigned.

WESTERN WATER ASSOCIATES LTD.

Reviewed by:

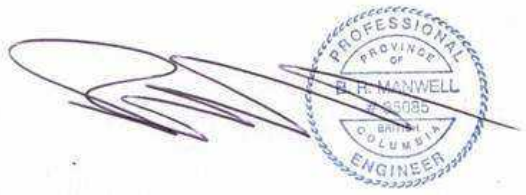

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TABLE OF CONTENTS

List of Photos

List of Figures (Following Text)

List of Tables

List of Appendices

1. INTRODUCTION

At the request of New Gold Inc., Western Water Associates Ltd. (WWAL) has completed a Stage 1 Environmental Impact Study (EIS), a requirement under the Municipal Wastewater Regulation (MWR - 2012), for the planned wastewater system being designed to support the planned 1,200 man construction camp which will be reduced to a 400 man operations camp, at the Blackwater Mine. The Mine is located approximately 100 km south of Vanderhoof, B.C. and 150 km west of Quesnel, B.C (Figure 1). This report is based on the guidelines for completing environmental impact studies as described in the Municipal Sewage Regulation (MSR) companion document (MoE 2000). This Stage 1 EIS supports a new MWR registration and is considered separate to the existing registration (# 105882), which currently serves a 200 man exploration camp located to the west of the proposed new construction camp location.

New Gold is planning to construct a community wastewater treatment and dispersal system with a maximum daily flow of approximately 300 m^3/day, which would be treated to Class C effluent quality (max BOD_5 45 mg/l and TSS 45 mg/l) supplemented with U.V. disinfection and infiltrated to ground with Rapid Infiltration Basins (RIB). The 300 m^3/day design flow is based on a 1,200 person construction camp and future 400 person permanent camp requiring a treatment and dispersal system capacity of 250 litres per day per person. The plan is to utilize an area south of the proposed construction camp location that has been identified to have suitable soil and site characteristics for RIB disposal.

This report presents the findings of our hydrogeological investigations and Stage 1 EIS, and is intended to provide the information required to support registration of the new wastewater system under the MWR. Operation of the system at full design capacity (300 m^3/day) is expected to last only a few years before the construction camp is replaced by the long term (17 year expected mine life) 400 man operations camp. Construction of the proposed new wastewater system is not scheduled to occur until the first quarter for 2015.

For a separate feasibility level study, WWAL completed installation and testing of four test water supply wells after the Stage 1 EIS was completed in the summer of 2013. Three of these test wells are located within the vicinity of the proposed RIB area (Figure 3). The purpose of the test wells were to provide New Gold with an indication of where water supply wells could be located to supply water for the proposed construction camp. Section 6.3 of this report addresses the potential impact to these wells, if they become supply wells for the camp.

Note that the some information in the current report is taken from the EIS written by WWAL for the MSR registration # 105882 for the existing 200 person camp (WWAL 2011). The existing camp and wastewater disposal system are located west of both the proposed construction camp and RIB area.

1.1 Project Location and Description

The New Gold Blackwater Mine is located in the northwestern part of the Cariboo Regional District in a relatively remote area, about 100 km south of Vanderhoof and about 150 km west of Quesnel (Figure 1). The site occupies unsurveyed Crown land and the approximate coordinates of the proposed RIB site are

10U 378,340 E and 5,894,537 N. The entire area surrounding the Blackwater Mine area is undeveloped, except for access, forestry, and exploration roads, the existing camp, and drill pads and other minor land disturbances. The nearest inhabited community appears to be the Kluskus First Nation village located in a remote area west of Quesnel, at Kluskus Lake. This is about 25 kilometres southeast of the site and reachable at times during the year by a road from Nazko. The Kluskus First Nation village is also the location of a reported water well (See Section 2.4).

The approximate location of the Blackwater Mine site is depicted on Figure 1. Figure 2 shows the layout of the site showing pertinent existing and planned onsite features such as the existing camp location, the planned construction camp location and the location of the proposed RIB area. Figure 3 shows the location of the proposed RIB area together with the locations of nearby test water supply wells, test pits and nearby surface water bodies.

1.2 Project Objectives and Scope of Services

The objective of this assessment was to complete a Stage 1 Environmental Impact Study (EIS) in the context of the 2012 Municipal Wastewater Regulation (MWR) and to provide the information required by regulatory authorities to make an informed decision on permitting of the system. The proposed maximum effluent design flow is 300 m^3/day, and the level of effort for this study generally corresponds with the level of effort suggested in the guidance document for greater risk flow >200 m^3/day.

WWAL provided the following services to New Gold Inc., as outlined in our proposal dated April 30, 2013.

1. Attended a pre-registration with the B.C. Ministry of Environment. Confirmed Ministry expectations regarding the Stage 1 EIS and system registration.
2. Reviewed previous reports for investigations completed at the site, as well as available surficial and bedrock mapping, orthophoto coverage, aquifer mapping and well logs at the site.
3. Completed field work July 7th to July 21st, 2013 to conduct the field investigations in support of the EIS. This included the following:
    a. Excavation of 14 test pits which helped delineate the sand and gravel deposit within the proposed RIB disposal area;
    b. Drilling of five boreholes using a sonic drilling rig within the proposed RIB area to further characterize the subsurface;
    c. Constructed a trial infiltration basin, installed a temporary monitoring well next to the basin, and performed a 72 hour Pilot RIB loading test at the proposed RIB area;
    d. Installed four permanent monitoring wells; one upgradient, one cross gradient and two down gradient of the proposed RIB area;
    e. Sampled pre-discharge groundwater and surface water quality at the newly installed monitoring wells and two surface water locations;
4. Analyzed the data collected to develop a conceptual model of groundwater flow beneath the site, calculated travel times in the saturated and unsaturated zone and determined the likely fate of effluent disposed to RIB at the site;

5. Evaluated the potential for groundwater to mound beneath and adjacent to the future infiltration basins;
6. Identified possible down-gradient receptors and evaluated impacts to the receiving environment; and
7. Prepared this report documenting the methods and results of our Stage 1 Environmental Impact Study.

1.3 Project Contributors

This report was prepared by Bryer Manwell, M.Sc., P.Eng. of Western Water Associates Ltd. (WWAL). Information pertaining to the new water supply wells installed with WWAL oversight and historic camp water supply wells was provided by Knight Piésold. Subsurface investigations in 2013, within the vicinity of the proposed construction camp area, were completed by Opus DaytonKnight and reviewed by WWAL. Sections 2.1 and 2.6 include information that was provided to WWAL by AMEC, environmental consultants for New Gold Inc.

2. SITE DESCRIPTION, GEOLOGIC AND HYDROGEOLOGIC SETTING

The following sections summarize available physiographic and geologic information available for the mine site. Much of this information is regional in scale, and Section 3 of this report provides a description of proposed RIB area-specific conditions.

2.1 Physiography, Vegetation and Wildlife

The Blackwater Camp is located in B.C.'s Central Interior Plateau, at an elevation of approximately 1,450 m asl. This part of the Cariboo-Chilcotin region is characterized by a rolling upland with the land elevation mostly above 1,200 m, which is bisected by east-draining creeks and rivers and a number of elongate lake systems, oriented in mostly east-west or northwest-southwest valleys, with the lakes lying at elevations of approximately 900 to 1,000 m asl. The nearest high point is Mount Davidson, west-southwest of the existing camp, which reaches approximately 1,825 m asl.

The Blackwater Camp is situated in the Engelmann Spruce – Subalpine Fir Moist Very Cold Nechako (ESSFmv) variant. Detailed ecosystem mapping for the project area has not been completed. Based on aerial photo interpretation and plot data from representative sites a general description of the area is given. The area immediately surrounding the camp waste system is characterized by forests, wetlands and riparian areas. The forested area to the north of the camp waste system site appears to be dominated by zonal forests. Zonal forests are typical sites that represent the variant and are characterized by subalpine fir (*Abies lasiocarpa*), hybrid white spruce (*Picea engelmannii var. x glauca*), and lodgepole pine (*Pinus contorta*) in the tree layer. The understory is composed of black huckleberry (*Vaccinium membranaceum*), white-flowered rhododendron (*Rhododendron albiflorum*), five-leaved bramble (*Rubus pedatus*), one-sided wintergreen (*Orthilia secunda*), twinflower (*Linnaea borealis*) and feathermosses (*Pleurozium schreberi*, *Ptilium crista-castrensis* and *Dicranum spp.*).

Several creeks within the Creek 661 watershed flow past both on the east and west sides of the proposed RIB area. The creek located 410 m to the west of the proposed RIB location is tributary to Creek 661 but referred to as Creek 661 within this report. Auro Creek is located approximately 260 m east of the

RIB area. The creeks follow surface topography and flow, generally, from south to north. The riparian areas associated with the creeks area comprise a complex of forest and shrub communities. Forested riparian areas in the ESSFmv are dominated by hybrid white spruce with minor components of subalpine fir and lodgepole pine. The understory is characterized by Indian hellebore (*Veratrum viride*), sitka valerian (*Valeriana sitchensis*), three-leaved foamflower (*Tiarella trifoliata*) and horsetails (*Equisetum spp*.). Shrub riparian areas are dominated by a variety of willow species (*Salix spp*), twinberry (*Lonicera involucrata*), black gooseberry (*Ribes lacustre*), arrow-leaved groundsel (*Senecio triangularis*), tall larkspur (*Delphinium glaucum*) and indian paintbrush (*Castellija miniata*).

The wetland located approximately 600 m to the north of the site is a complex of wet forest, willow shrub, scrub birch (*Betula nana*) and aquatic sedges (*Carex spp*.). Riparian and wetland areas are considered sensitive ecosystems and care must be taken to reduce any impact to these ecosystems. This area lies topographically below the dispersal field and is considered the nearest down gradient environmental receptor.

Species of conservation concern (i.e., red, blue-listed), from surveys of the property, show that the mine site is immediately adjacent to a high elevation ungulate winter range (UWR) polygon for northern caribou (Mgt Unit: U-7-012). This herd belongs to the west-central metapopulation, which is part of the declining Southern Mountain population of woodland caribou. They have been blue-listed provincially and designated as threatened nationally. The wintering area for the Tweedsmuir-Entiako caribou herd (see attached mapping for assistance) is west of the camp; opposite of the cleared area. Special measures such as fencing of any open water area (if applicable) and minimizing winter access snow clearing (if feasible) or push-outs to allow animals off the roads if they are open, should be considered.

The wetland area, located 600 m to the north of the proposed RIB area, has the potential for containing the federal COSEWIC listed threatened and provincially blue-listed olive-sided flycatcher, as well as the federally listed Special Concern and provincially blue-listed Western toad.

At this time it is recommended that Best Management Practices for the protection of amphibians and reptiles and of wetlands in the area (i.e., road use etc.) are implemented to prevent runoff and the discharge of any deleterious substances to the adjacent wetland. In addition, a buffer (recommended 15 m) should be retained around that wetland or any future wetlands encountered as part of land clearing activities and that no clearing should occur during the bird breeding period (approx. May to August) prior to a nest search, as active nests of migratory birds such as the olive-sided flycatcher are protected under the Migratory Birds Convention Act.
(http://www.env.gov.bc.ca/wld/documents/bmp/HerptileBMP_complete.pdf)

2.2 Surficial and Bedrock Geology

A review of geological mapping on the B.C. Water Resources Atlas (BCMoE 2013) indicates most areas on-site are covered by undifferentiated Quaternary deposits, which are likely composed of a mixture of glacial deposits, including morainal deposits, ice-contact sand and gravel, and compact glacial till, with colluvium of varying thickness and re-worked materials of glacial origin along present-day stream courses.

Where the veneer of glacial deposits and colluvium is thin or absent, sporadic outcrops of bedrock occur, but these outcrops are relatively subdued.

Bedrock at the site includes the Middle Jurassic Hazelton Group, including Naglico volcanics, and the Eocene to Oligocene Nechako Plateau Group volcanics. The gold deposits are hosted in volcanic rocks that are described by New Gold's geologists (unpublished information) as northwest dipping felsic and intermediate volcanic pile overlying cretaceous sediments overprinted by silica-sericite-pyrite alteration and unique manganese garnets. The rocks reportedly exhibit highly chaotic stratigraphy and structure.

In regards to understanding the local site hydrogeology and implications for effluent dispersal, the most important aspects of site geology are the nature, extent, thickness and hydraulic properties of the unconsolidated surficial deposits. These site features were characterized during the field investigation described later in this report.

2.3 Hydrogeology

WWAL conducted a search of the B.C. Ministry of Environment Water Resource Atlas (MoE 2013) to find information on aquifer mapping and reported water wells in the area. There are no mapped aquifers or registered wells at the site except the two wells drilled in 2012 by Cariboo Drilling under the direction of WWAL (Bryer Manwell). One of these wells is currently being used for the existing mine camp water supply. Four more, feasibility level, test water supply wells were drilled in August 2013 and three of these wells are located in the vicinity of the proposed RIB area; furthermore, several boreholes and monitoring wells were drilled in the current investigation. Subsurface conditions at these locations will be used to assess groundwater flow beneath the proposed RIB area. Historic test pitting completed by Knight Piésold and Opus DaytonKnight at the Blackwater site and further test pitting completed by WWAL near the RIB area show that groundwater seeps and low permeability soils (glacial till) are present on much of the Blackwater site.

The location chosen for the proposed RIB area (Figures 2 and 3) was unique at the site as no groundwater seeps were observed and the soils were found to be primarily well-drained sand and gravels with trace silt. Note, to the south of the proposed RIB area thin groundwater seeps (windows) were observed during test pitting; however, no seeps were identified in the pits beneath the proposed RIB area. The surficial geology in the vicinity of the field was likely formed as an ice contact and is considered a glacial moraine.

Groundwater flow through the saturated morainal surficial till deposits underlying the proposed RIB area is likely occurring as a subdued replica of topography (Haitjema and Mitchell-Bruker 2005). However, at the Blackwater site we have seen that perched groundwater flow through 'windows' of higher permeability soils is common in the vadose (unsaturated zone). These windows of perched groundwater are dependent on the extent of the compact silt lens which forms laterally discontinuous confining layers. Further discussion on the conceptual model of groundwater flow and effluent fate is provided in Section 6.1 below.

The proposed RIB area is located at the crest between the drainage of two creeks within the Creek 661 basin and as such, groundwater flow in the saturated zone is likely to occur beneath the proposed RIB area from south to north or northeast discharging to Auro Creek (east), or into the wetlands located over 600 m to the north, or recharging the bedrock aquifers below. During site investigations by WWAL a permanent groundwater table was not encountered beneath the RIB area during test pitting or borehole

drilling to 30 m (99 ft) below ground surface (bgs). Within test pits located to the south of the proposed RIB area thin discontinuous windows of groundwater flow were observed; however, these seeps were not considered the groundwater table (i.e., continuously flowing aquifers), as dry sediment was observed below the seepage windows (Photo 1).

At MW13-02, located directly north and down gradient of the proposed RIB area, a groundwater table was encountered and a relatively thick unconfined or semi-confined aquifer was identified. MW13-03 was installed in a shallow, creek associated, unconfined aquifer and MW13-04 was installed in a shallow, thin perched aquifer (groundwater flow window) at the down gradient wetlands area.

During the feasibility test water supply well drilling program completed in August 2013 three aquifers were identified in the vicinity of the proposed RIB area. The three aquifers identified during the test well drilling program were as follows:

1. A semi-confined to confined aquifer was located approximately 775 m to the northwest of the proposed RIB area at TW13-01;
2. A confined aquifer was located at TW13-02 1,500 m to the north of the proposed RIB area; and,
3. A bedrock aquifer was located 800 m to the south of the proposed RIB area at TW13-04.

Refer to Figure 2 for well locations.

Photo 1: Thin groundwater seepage window at 3-4 ft bgs in excavation pit (Test Pit 9), July 8, 2013.

2.4 Groundwater Use Near the Proposed RIB Area

The existing Blackwater mining camp is serviced by a well completed in a bedrock aquifer. The well is located at Kilometer 15 on the current mine access road; this well is over 3.5 km directly west of the proposed RIB system, a distance well beyond the minimum 90 meter setback required in the MSR for wells completed in bedrock aquifers.

As mentioned above, three test wells have recently been drilled in the vicinity of the proposed RIB area. The purpose of drilling the wells was to identify the feasibility of sourcing groundwater for the construction camp potable water supply. Potable water for the construction camp will likely be sourced from the confined aquifer located 1,500 m directly north of the RIB area. This area is far beyond the 90 m setback required in the MWR for wells completed in confined aquifers.

Table 2.1 summarizes the basic construction information for the three nearest test water supply wells along with the existing camp supply well. There are two off-site wells reported in the B.C. Water Resources Atlas (BCMoE 2011) that are also shown in Table 2.1. One of these wells reportedly supplies the Kluskus First Nation village at Kluskus Lake and the other appears to be owned by a forestry company. Both off-site wells are more than 20 km from the proposed RIB area. Well logs for the nearby wells are provided in Appendix A.

Table 2.1 Water Well Inventory for Blackwater Mine and Beyond

Well Name and Well Tag or Well Plate Number	Date Drilled	Reported Yield (US gpm)	Total Depth m (ft)	Static Water Level m (ft)	Location relative to RIB	Aquifer Type
TW13-01	July 31, 2013	70	27.4 m (90 ft)	2.5 m (8.3ft)	750 m NE	Surficial Semi-confined to confined
TW13-02	Aug 2, 2013	30	54.8 m (180 ft)	Flowing Artesian	750 m N	Surficial Confided
TW13-04	July 28, 2013	4	121.9 m (400 ft)	4.8 m (15.7 ft)	665 m S	Bedrock
Km 15 Well (Well No 3, 12C) WPN 31679	March 2012	5	76.5 m (251 ft)	18.99 (61.2 ft)	3.4 km W	Bedrock
Km 14 Well (Well No 4, 12D) WPN 31680	March 2012	6	43.9 m (144 ft)	21 m (69 ft)	3.7 km W	Bedrock

Well Name and Well Tag or Well Plate Number	Date Drilled	Reported Yield (US gpm)	Total Depth m (ft)	Static Water Level m (ft)	Location relative to RIB	Aquifer Type
WW11-01 WPN - 31656	June 24, 2011	1.5 (Knight Piésold 2011a)	121.9 m (400 ft)	6.1 m (20 ft)	2.5 km W	Bedrock
WW10-01 WPN 31634	September 4, 2010	8	109.7 m (360 ft)	18.3 m (60 ft)	2.6 km W	Bedrock
Kluskus well WTN 98647	2009	100	20.7 m (68 ft)	3.6 m (12 ft)	~25 km SE	Surficial
TTM Resources WTN 95966	2008	8	64.9 m (213 ft)	57.9 m (190 ft)	~20 km NE	Surficial

2.5 Climate

Climate in the project area is characterized by warm summers and cold winters, with precipitation fairly well distributed throughout the year. Given these conditions, we would expect recharge to the shallow aquifer system would occur in all but the coldest months of winter when the ground is likely frozen and frost penetration is at a maximum. Climate normals for the Environment Canada climate station in Vanderhoof are provided in Table 2.2, below. Note that the Vanderhoof climate station is 600-700 m lower in elevation than the camp site. Thus we would expect the climate at the camp to be markedly cooler than Vanderhoof, with more precipitation, and with a higher proportion of the annual precipitation falling as snow. Table 2.3 provides a summary of site specific precipitation data from Knight Piésold (2013).

Table 2.2 Climate Normals from Environment Canada Station No. 1098D90 (Vanderhoof; Elevation 638 m)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Daily Average (°C)	-9.5	-5.7	0	5.5	10.7	14.2	16.3	15.8	11.1	5.1	-2.6	-8.6	4.4
Rainfall (mm)	5.8	6.4	7.3	21.4	35.2	58	47.3	44.5	40.9	41.6	17.2	5	330.6
Snowfall (mm)	41.5	23.1	15.3	4.2	0.3	0.3	0	0	0.3	7	30.4	43	165.3
Precipitation (mm)	47.3	29.5	22.7	25.6	35.5	58.3	47.3	44.5	41.1	48.6	47.6	48	495.9

Data Source: Environment Canada 2013

Table 2.3 Regional and Blackwater Precipitation Summary (from KP)

Station Name	Period of Record	Elevation (m asl)	Distance from Mine Site (km)		Units
Vanderhoof	1970 - 2012	674	112	**488**	Mm
				100%	% annual
				64%	Mm
				36%	% annual
Tatelkuz	1970 - 1977	914	17	**483**	Mm
				100%	% annual
				55%	Mm
				45%	% annual
Blackwater Low Climate Station[1,2]	2011	1051	15	120.2	Mm
				-	% annual
	2012			405.8	Mm
					% annual

Data from Knight Piésold, 2013.

2.6 Surface Water Receptor Description

As noted above, there are two creeks in the vicinity of the RIB, one located to the east and one to the west (Figure 3). Both creeks are within the Creek 661 watershed and are tributaries to Creek 661 (BC Watershed Atlas Code 100-567134-610692-671007-505659-146920). The creek to the east is referred to locally as Auro Creek, the creek to the west is unnamed. The creeks both flow into Creek 661, which subsequently flows east into Chedakuz Creek, and then northeast into Tatelkuz Lake, which is located about 15 km from the camp. Both streams have stream class orders of S3 (AMEC 2013a), as outlined in the Forest Practices Code "Fish-stream Identification Guidebook." The unnamed stream to the west was assessed during summer of 2011 and had a mean wetted width of 3.55 m and a depth of 0.47 m with a mean stream gradient of 0.75%. During WWAL's field investigation in July 2013, the creek to the west was 2.1 m in width and 0.3 m in depth. Auro Creek, to the east, sampled at the bridge crossing south of the proposed RIB area was 0.9 m in width and 0.2 m depth.

Creek 661 is documented as a fish-bearing stream containing rainbow trout. There have been no red- or blue-listed species documented in this stream. Based on the presence of these streams in proximity to the proposed RIB area, and the presence of groundwater wells nearby, Aquatic Life Guidelines and the federal and provincial drinking water guidelines are the appropriate guidelines to apply with regard to the EIS and the proposed post-discharge monitoring program.

WWAL reviewed the baseline (historic) water quality database provided by AMEC (2013b). No indication of septic related impact was observed in the surface water sampled on the unnamed tributary down gradient of the effluent dispersal field.

3. FIELD INVESTIGATION AND RIB AREA CHARACTERIZATION

The following section provides an overview of the field investigation and site characterization performed at the proposed RIB area in July 2013. The site investigation involved test pitting, borehole drilling, monitoring well drilling, a pilot scale infiltration test and water quality sampling.

3.1 RIB Area Location, Topography and Surface Drainage

The proposed RIB area is located approximately 3.4 km west of the existing mine camp. The entire Blackwater site is known to have generally poor surface drainage; however, the proposed RIB area was selected as a potential RIB site to investigate due to the lack of standing surface water present after extend precipitation events. The RIB area is situated on a relatively flat knob, at 1400 m asl, which forms a small drainage divide separating two streams, both within the Creek 661 watershed drainage. There is approximately 1.5 hectares (3.6 acres) of relatively flat area, which showed acceptable soils for RIB disposal. The proposed RIB area is bordered by steeper slopes of approximately 10% grade to the north, west and east (Figure 3 and 4).

3.2 Surficial Deposits and Stratigraphy

WWAL oversaw the digging of 14 test pits within the vicinity of the proposed RIB area from July 7th to July 9th, 2013. From this initial test pitting program an area approximately 1.5 hectares (3.6 acres) was delineated as exhibiting potentially suitable subsurface conditions for effluent disposal via RIB's. The area appropriate for RIB disposal of effluent is located on the flat terrace, at an elevation of about 1400 m asl, primarily on the north site of the L-Trail (Figure 3 and 4). Table 3.1 summarizes relevant data observed during test pit logging and includes the following:

- test pit name and depth;
- the predominant soil type observed at the test pits;
- the suitability of the test pit area for effluent disposal via rapid infiltration;
- if groundwater seepage was observed within the test pit and at what depth; and,
- the location of the pit relative to the location of the pilot scale RIB loading test.

For a more complete description of the test pits including UTM coordinates, refer to Appendix B. The locations of the test pits relative to the pilot test basin area are provided in Figure 4.

Shallow stratigraphy at the site is glacial outwash and as such is heterogeneous. However, the predominant deposits present are medium to fine sand occurring with a varying amount of silt and gravel. In the proposed RIB area (Figure 4) a silt layer, from 0 to 1.5 m bgs, is present; below this silt layer are sand and gravels with trace silt suitable for RIB disposal.

Table 3.1 Proposed RIB Area Test Pit Summary

Test Pit No.	Total Depth (m)	Predominant soil type below	Suitable for rapid infiltration.	Groundwater seepage observations	Location relative to RIB
TP13-01	5.7	Coarse sand and gravel with trace fines and boulders.	YES	Moist	30 m S
TP13-02	7.01	Coarse sand and gravel with trace silt.	YES	Dry	90 m SSW
TP13-03	7.31	Coarse sand and gravel with trace fines and boulders.	NO	Seepage from 3-4 m	100 m S
TP13-04	6.4	Silt with sand and gravel.	NO	Dry	130 m SSW
TP13-05	1.22	Silty gravel with some sand.	NO	Moist	170 m SW
TP13-06	7.01	Sand and gravel with trace silt.	NO	Dry	140 m SW
TP13-07	7.01	Sand and gravel with silt.	NO	Seepage at 4.2 m	160 m SW
TP13-08	6.4	Sand and gravel with silt.	NO	Dry	165 m SW
TP13-09	6.4	Fine sand and silt.	NO	Seepage from 3-4 m	90 m SW
TP13-10	6.1	Sandy gravel with trace silt.	YES	Wet	90 m WSW
TP13-11	6.1	Gravel with sand with trace silt.	YES	DRY	60 m WSW
TP13-12	4.6	Sand and gravel.	YES	Dry	25 m N
TP13-13	6.4	Sand and gravel with some fines.	YES	Dry	100 m W
TP13-14	5.8	Sand and gravel.	YES	Dry	30 m N

3.3 Boreholes and Monitoring Well Installations

The following section describes the subsurface characterization derived from the drilled boreholes and hand installed monitoring wells. During the July 2013 field investigation nine boreholes were drilled to depths ranging between 15 m (49 ft) and 38 m (126 ft). Monitoring wells were installed at three of the boreholes (RIB BH13-03/ TMW-03, MW13-01 and MW13-02). Two additional monitoring wells were installed, by hand, and with the use of an excavator (MW13-03 and MW13-04). The location of the boreholes and monitoring wells are provided on Figure 3. Subsurface details and monitoring wells information is summarized in Table 3.2. See Appendix B for the full borehole and monitoring well logs.

From logs of the boreholes it is evident that the surficial deposits in the vicinity of the RIB area are heterogeneous as is expected of glacial till. However, we see larger to continuous zones of sand and gravel with trace silt in the area delineated as the proposed RIB area (RIB BH13-03, 04 and 05) compared to the area to the south (RIB BH13-01 and 02 and MW13-01), refer to borehole logs in Appendix B.

Table 3.2 Borehole and Monitoring Well Summary

Monitoring Well/ Borehole ID	Elevation (masl)	Total Depth m (ft)	Static Water Level m (ft)	General Lithology with potential confining layer depth mentioned	Distance from RIB
MW13-01	1408	19.8 m (65 t)	Dry	Silt and gravel. At 20 m silt, hard compact	353 m SW of RIB (Up gradient)
MW13-02	1330	37.5 m (123 ft)	26.8 m (88 ft)	Fine sand with some silt. At 27-29m Brown silt. Dense	448 m N of RIB (Down gradient)
MW13-03	1310	4.28 m (14 ft)	2.7 m (8.8 ft)	Sand and gravel with some silt	720 m NW of RIB (Down Slope /Cross gradient)
MW13-04	1279	4.2 m (13.6 ft)	1.5 m (5.1 ft)	Sand and silt with some gravel. At 1.5 m, wet sand layer with flow.	900 m N of RIB (Down gradient)
RIB-BH01	1405	30.1 m (99 ft)	n/a	Silt with sand and gravel. At 23 m a dense silt lens.	68 m, SW of RIB
RIB-BH02	1401	15.2 m (50 ft)	n/a	Sand and gravel with some silt.	64 m S of RIB
RIB-BH03	1402	13.7 m (45 ft)	n/a	Sand and gravel with some silt.	3 m N of RIB

Monitoring Well/ Borehole ID	Elevation (masl)	Total Depth m (ft)	Static Water Level m (ft)	General Lithology with potential confining layer depth metioned	Distance from RIB
RIB-BH04	1397	`14.9 M (49 ft)	n/a	Medium to coarse sand with some silt. At 6-7m dense sand and silt.	46 m, W of RIB
RIB-BH05	1400	14.9 m (49 ft)	n/a	Sandy silt with some layers of sand.	74 m, W of RIB

3.4 Groundwater Occurrence and Flow

As mentioned above, a permanent groundwater table was not encountered within 30 m (99 ft) of ground surface at any of the borings drilled at the upper elevations (Figure 3). However, a permanent groundwater table was encountered at the lower elevation wells MW13-02, MW13-03 and MW13-04. These observations hold true with the conceptual model that the upper elevation area (1400 m asl), where the proposed RIB is located, is a groundwater recharge area, whereas the lower elevations, north and east of the proposed RIB area, are groundwater discharge zones.

The heterogeneous nature of the glacial deposits at the Blackwater site represents a complex geological environment, thereby creating complex saturated and unsaturated flow conditions and dynamics. We have seen from test pitting and borehole logs that discontinuous saturated lenses ("windows" of groundwater flow|) exist within the unsaturated (vadose) zone. The presence and movement of these discontinuous saturated lenses is influenced by several factors including lithology, topography, air temperature, precipitation and evapotranspiration. In general there will be greater recharge to the permanent water table occurring after snow melt and after high precipitation events. Groundwater flow in the saturated zone, as mentioned in Section 2.3, will typically occur as a subdued replica of topography. With this is mind, we expect groundwater to move generally from south to north with some divergent (fanning) flow both east and west based on the topography of the site (Figure 3).

3.5 Loading Test on Pilot (Trial) Rapid Infiltration Basin

To evaluate the suitability of the proposed RIB area for effluent infiltration, a 72 hour (three day) loading test on a pilot (trial) basin was completed between July 17th and July 20th, 2013. The trial basin was dug using a Volvo EC 310 excavator, and had dimensions of 7.6 m (25 ft) by 7.6 m (25 ft) to a depth of 1.5 m (5 ft). During excavation the rig remained outside the basin to reduce any soil compaction. The basin was excavated to a depth of 1.5 m (5 ft) to access the sand and gravel formation located below the surface silt layer. Temporary 10 slot, 2" schedule 40 PVC, pipe was used to distribute the water within the test basin

(Photo 1, below). A temporary monitoring well (RIB BH13-03/TMW-03) was installed at a distance of 3 m (10 ft) from the northern edge of the pilot basin to monitor the presence of and/or potential rise in water level during the loading test. The monitoring well was completed at a depth of 7.9 m (26 ft), due to the presence of a layer of dense silt layer at 7.9 m (26 ft). The dense silt layer was taken to be a potential confining layer which could create perched mounding of the loading test water. However, the monitoring well remained dry throughout the entire three day loading test.

The trial basin was loaded continuously at a rate of 93 m^3/day (17 US gpm), or approximately one-third the design flow of the full-scale RIB system. This is equivalent to a loading rate of approximately 1,600L/m^2/day. A total of 279 m^3 (73,700 US gal) of water was infiltrated in the test basin over the 72 hour pilot test.

Water was supplied to the pilot basin from a 5,000 gallon water truck, which in turn received water delivered by a second water truck making runs for water throughout the three day continuous loading test. The second water truck obtained water from an on-site flowing artesian well. The water trucks were operated by a crew from Grandview Water Hauling, based out of Prince George.

The trial basin exhibited adequate hydraulic capacity to infiltrate the water during the test, with minimal pooling of water on the basin floor by the end of the test. As mentioned above, there was no mounded water observed in the adjacent temporary monitoring well (RIB-BH13-03/TMW-03), which was completed just above a possible discontinuous confining layer. Further, the slope, down gradient, east and north of the pilot RIB area, was periodically monitored during the loading test to check for daylighting (surfacing of pilot basin test water) and none was observed. Overall, the results of the trial loading test indicate that wastewater disposal through rapid infiltration basins is feasible at the site.

Photo 2: RIB Pilot Loading Test after two days of loading at 93 m^3/day (17 US gpm), July 19, 2013.

3.6 Soil Permeability and Hydraulic Conductivity

Soil permeability and hydraulic conductivity dictate the fate of effluent as it migrates through the subsurface. An accurate assignment of hydraulic conductivity values for calculating groundwater velocity and travel time to potential receptors within the receiving environment is important.

3.6.1 Vadose (Unsaturated) Zone

To assess flow through the vadose (unsaturated) zone the 72 hour pilot basin test was conducted. From the test we know the subsurface at the pilot test location can be loaded at a rate of 1,655 L/m^2/day this rate is equivalent to 1.44 m/day (1.7X10^{-5} m/s), with porosity assumed to be 0.3; we estimate the unsaturated hydraulic conductivity to be 5.3X10^{-5} m/s.

3.6.2 Saturated Zone

To evaluate hydraulic conductivity in the saturated zone hydraulic testing was carried out at MW13-02, MW13-03 and MW13-04. Further, the hydraulic conductivity values, derived from the 72 hour pumping tests performed on the newly installed water supply test wells were considered. Note, WWAL staff are in the process of reporting for the test wells and data is not available for inclusion in this report. Table 3.3 summarizes the saturated hydraulic conductivity values for the test supply wells and monitoring wells. Appendix C provides details on the solution methods, inputs and outputs for calculation of hydraulic conductivity at the RIB monitoring wells. The saturated hydraulic conductivity values range from 3.0E-5 m/s at TW13-01 to 9.5E-7 m/s at TW13-02. These values are reasonable when compared to literature values for silty (dirty) sand and gravel surficial deposits (Freeze and Cherry 1979).

Table 3.3 Summary of Hydraulic Conductivities for the Surficial Aquifer

Monitoring Well ID	Aquifer Thickness (m)	K (m/s)	Analytical Solution Used
MW13-02	12	1.0E-6	Cooper-Jacob (Aqtesolv)
MW13-03	1.524	1.6E-6	Bouwer-Rice Slug Test
MW13-04	3	8.3E-6	Bouwer-Rice Slug Test
TW13-01	4	3.0E-5	Cooper-Jacob
TW13-02	22.7	9.5E-7	Cooper-Jacob

4. REVIEW OF WASTEWATER SYSTEM DESIGN

Opus DaytonKnight is providing engineering services for the Blackwater permanent and construction camps, with a total capacity of 1,200 people. Opus provided WWAL with information on the proposed wastewater collection, treatment, and conveyance and disposal system. Details are provided in the following sections.

Currently in the preliminary design phase, the proposed system will be designed to accept 300 m^3/day of Class C septic effluent from both camps. The strategy includes allowances for gravity collection to aeration lagoons, with pressurized conveyance to in ground disposal via Rapid Infiltration Basins (RIB). A

level of redundancy will be incorporated into both the treatment and disposal portions of the system for regular maintenance and/or troubleshooting.

4.1 Design Flows

When designing the proposed wastewater system, resources are available to quantify the average per capita wastewater flow from the camps. Generally a value of 227 L/cap/day is used as a design basis. In the case of the Blackwater site, accurate wastewater flow records are available from the existing 250 person camp to compare with. Accordingly, a value of 250 L/cap/day is being used as a design flow for the 1,200 person system.

With a per capita sewage generation of 250 L/cap/day, the average daily wastewater flow from the 1,200 person camps will be 300 m^3. The pumping and disposal systems will convey and receive the daily flows, with buffering of hourly peak flows (up to 10 times the daily flow) occurring in the treatment systems located prior to the pump station.

4.2 Treatment Systems and Effluent Quality

The system will be operated in two distinct phases depending on camp population numbers: Phase 1: 1,200 person (300 m^3/day) during construction years -2 to 0, and Phase 2: 400 person (100 m^3/day) during mine operation years 0 to 17. Effluent quality is expected to be similar throughout the project life. Specifics of the treatment systems and phasing is outlined below.

Aerated lagoons generally have high reliability characteristics, when sized correctly, aerated lagoons can produce effluent quality equivalent to MWR Class C. Each lagoon is expected to have a treatment volume of 4,900 m^3, and a minimum residence time of approximately 32 days.

According to MWR Class C effluent characteristics, the effluent from the aerated lagoons will have the following operating parameters:

- Total flow capacity, 500 m^3/day (4 x 125 m^3/day)
- Influent BOD_5, 400 mg/L
- Influent TSS, 350 mg/L
- Effluent BOD_5, <45 mg/L
- Effluent TSS, <45 mg/L

4.3 Treated Effluent Lift Station and RIB Disposal

Following treatment via the combined aerated lagoons/packaged treatment plants, the effluent will be pressurized with vertical turbine pumps and conveyed through a 1900 m long forcemain. The location of the RIB is such that a static head of approximately 150 m (213 psi) exists at the lift station. As such, special considerations are required with regard to pump capacity and design, as well as forcemain material and pressure class. The forcemain will discharge at the RIB location into a distribution manifold which will route the flow to the appropriate RIB basin.

4.4 Potential Impact from Wastewater Treatment System Construction

The following section discusses the potential impacts from the construction of the collection, treatment and disposal system. Treated water effluent quality of BOD_5 of less than 45 mg/l and TSS of less than 45 mg/l meet and are expected to exceed the requirements of MSR Class C (max 45/45). The lagoons, considered a permanent system, will be constructed prior to camp construction.

The lagoons and treatment units are proposed to be installed greater than 100 metres from the temporary camp, and 750 metres from the permanent camp, down gradient from the immediate camp site, and outside of the normal zone of day to day camp activities such that we do not expect the treatment system to be a substantial nuisance with respect to issues such as noise, odour, etc. The system is expected to be Reliability Category III. As per MWR Part 3, Division 1, Table 1, the proposed treatment system is expected to meet the Component and Reliability Requirements for Wastewater Facilities. The treatment system will be designed with a level of redundancy such that should any one of the treatment trains be out of service, the system still retains 100% treatment capacity overall.

4.5 RIB Location and Area Requirements

Based on the results of the pilot basin testing, some guidance on the sizing of rapid infiltration basins can be provided. The trial basin was loaded at a rate 64 L/min (17 US gpm), equivalent to 93 m^3/day. The trial basin was approximately 58 m^2, which equates to a loading rate of 1,655 L/m^2/day or 1.7 m^3/day/m^2. Further, from the testing it has been shown that 1.44 m/day or 526 m/year can be infiltrated at the pilot basin based on the results from the loading test.

Annual precipitation is taken into account when sizing the basin area. Using a conservative estimate of 500 mm/year of precipitation at the site (refer to the climate data in Section 2.5), this would amount to a 5 m/ year increased load to the basins.

Using a maximum design flow, for 1,200 persons of 300 m^3/day and dividing by the tested infiltration rate (93 m^3/day), less the infiltration of precipitation, shows that an area of approximately 200 m^2 would be required to infiltrate the full design flow rate. The anticipated number of basins required for operation of the RIB system is four in order to maximize nitrate reduction by employing an alternating wetting and drying cycle. Therefore, at least 200 m^2 X 4 = 960 m^2 or approximately 800 m^2 (0.08 hectare) will be required for the footprint of the four basins.

The MWR requires that rapid infiltration basins receive an effluent that is Class C or better. For this project, an infiltration of a Class C effluent will result in some bio-fouling of soils at and below the infiltrative surface that will decrease the infiltration capacity over time. Further, winter operation has been shown to decrease the infiltrative capacity of soils. Routine maintenance such as mechanical scarification of the soils in basins will help restore infiltration capacity and winter modifications for operation will be employed; however, a safety factor should be built into hydraulic loading rate and basin area.

We recommend a safety factor of 6 X basin sizing, which would result in a total RIB disposal area foot print of approximately 4,800 m^2 (0.48 hectares) including basin sloping, outside embankments or distance between each basin. As mentioned earlier, from the subsurface investigation, approximately 1.5 hectares (3.7 acres) exhibited adequate soils for RIB disposal at the area investigated. Therefore, based on the

investigation to-date there appears to be sufficient room within the potential RIB area to meet the requirement of the projected design flow for a 1,200 man construction camp.

5. BASELINE WATER QUALITY ASSESSMENT

Baseline, pre-MWR registered discharge water quality was sampled during the July 2013 field program. The following sections detail the findings from the current water quality assessment.

5.1 Water Sampling Methods

Five water quality samples were collected; three from groundwater and two from surface water during the July 2013 field program. Sampling occurred in accordance with provincial standards (MoE 2003) with the exception of samples for dissolved metals (for MW13-03 and MW13-04) which were not field filtered prior to shipping to the lab as the samples were highly turbid. Therefore, filtering for dissolved metals occurred at the laboratory. Samples were directed into clean, new bottles supplied by the laboratory while wearing nitrile gloves. The samples were stored on ice in coolers and shipped to Caro Analytical in Kelowna, B.C. This discrepancy in sampling protocol is not considered to affect water quality interpretation related to potential impact from sewage. The following parameters were sampled and analyzed:

- Temperature (field)
- Oxidation Reduction Potential (ORP) (field)
- Dissolved metals
- Alkalinity
- Chloride
- Fluoride
- Orthophosphate
- Sulfate
- Nitrate
- Nitrite
- True Colour
- Conductivity
- Ammonia-N
- pH
- phosphorous, total dissolved
- TDS
- UV transmittance
- Turbidity
- Fecal coliform
- Total coliform
- *E. Coli*
- BOD, 5-day

5.2 Discussion of Water Quality Guidelines

The Environmental Impact Study Guideline (MoE 2000) indicates that the applicable water quality guidelines to be met at the property boundary must be assessed. We note that there are no property

boundaries as this is all Crown land. However, the water quality guidelines with which to compare groundwater at a site depend on the potential down gradient receptors. The nearby down gradient receptors identified are the test water supply wells and two creeks, as discussed earlier in this report. Therefore, for discussion purposes, baseline water quality results were compared to the BC Approved Water Quality Guidelines for freshwater aquatic life and the Guidelines for Canadian Drinking Water Quality.

5.3 Water Quality Results and Interpretation

The results of the baseline water quality testing are summarized in Table 5.1 below and the water quality database table and complete laboratory reports are provided in Appendix E. Further, exceedances in the water quality guidelines are summarized in Table 5.2. Groundwater down gradient of the RIB is characterized as being fresh with low electrical conductivity, neutral pH and low hardness. Concentrations of dissolved metals are extremely high due to the hydrothermally altered volcanic overburden deposits the shallow creek-associated groundwater is flowing though. Some aquatic life guidelines are exceeded with respect to the presence of dissolved metals (see Table 5.2); however, these exceedances are considered baseline and not associated with anthropogenic influence.

In summary, baseline groundwater quality at the Blackwater Camp down gradient of the proposed RIBs is good, particularly with respect to parameters associated with effluent disposal to ground. We will recommend ongoing groundwater monitoring be performed during the operating life of the wastewater treatment plant to ensure the operation of the system does not adversely impact the potential receptors.

Table 5.1 Baseline Water Quality Summary

Analyte	Guideline		RIB MW13-02	RIB MW13-03	RIB MW13-04	RIB SW-01	RIB SW-02
	BCAWQG AL	GCDWQ MAC/AO					
pH	N [1.16]	NG/6.5 - 8.5	7.87	6.83	7.1	7.06	7.46
Conductivity uS.cm	NG	NG	118	72	163	25	272
Alkalinity (total, as CaCO3)	NG	NG	54	36	38	8	22
Ammonia (total, as N)	Calc [1.25]	NG	0.037	0.7	0.329	<0.02	0.02
Nitrate (as N)	32.8 [1.26]	10/NG	0.07	0.03	<0.010	0.017	<0.014
Nitrite (as N)	Calc [1.28]	1/NG	<0.01	<0.01	<0.010	<0.01	<0.01
Orthophosphate (dissolved, as P)	NG	NG	<0.01	0.04	<0.01	<0.01	<0.01
Phosphorus (total)	N [1.30]	NG	<0.2	0.2	0.6	<0.2	<0.2
Chloride	600 [1.13]	NG/250	0.39	0.63	0.71	<0.10	.64
Sulphate	Calc [1.17]	NG/500[3.3]	4	1.7	33.8	<1.0	1.7
E. coli MPN/100 mL	N [1.22]	0 [2.4]/NG	<1	<1	<3.0	<1	<1
Fecal coliforms MPN/100 mL or CFU/100 ml	N [1.24]	0 [2.6]/NG	<1	<1	<3.0	<1	<1
Total coliforms MPN/100 mL or CFU/100 ml	NG	0 [2.8]/NG	>63	2400	46000	370	190
Aluminum (dissolved)	Calc [1.1]	NG/N[3.1]	0.08	5.83	12	0.11	0.12
Arsenic (dissolved)	0.005 [1.2]	0.01/NG	<0.005	0.006	0.009	<0.005	<0.005
Calcium (dissolved)	NG	NG	14	9	22	3	5
Iron (dissolved)	0.35	NG/0.3	<0.1	3	8.6	0.2	<0.1
Magnesium (dissolved)	NG	NG	3.3	2.6	6.9	0.7	1.3
Sodium (dissolved)	NG	NG/200[3.2]	4.2	3.5	4.6	1.3	2.9

Notes:

1) BCAWQG AL - BC Approved Water Quality Guidelines for freshwater aquatic life
2) BCWWQG AL - Working Water Quality Guidelines for British Columbia for freshwater aquatic life
3) All units are mg/l unless otherwise stated.
4) Cal – Calculated Guideline. The guideline is dependent on the value of one or more other analytes, and is calculated.
5) NG – no guideline
6) N - Narrative type of guideline.

Table 5.2 Summary of Water Quality Exceedances.

Sampling Location	Guideline	Exceedances
RIB MW13-02	GCDWQ MAC	Total coliforms (counts)
	GCDWQ AO	Manganese (dissolved)
RIB MW13-03	BCAWQG AL	Aluminum (dissolved), Arsenic (dissolved), Iron (dissolved), Zinc (dissolved)
	GCDWQ MAC	Total coliforms (counts)
	GCDWQ AO	Colour, Iron (dissolved), Manganese (dissolved),
RIB MW13-04	BCAWQG AL	Aluminum (dissolved), Arsenic (dissolved), Copper (dissolved), Iron (dissolved), Zinc (dissolved)
	GCDWQ MAC	Total coliforms (MPN / PA)
	GCDWQ AO	Colour, Iron (dissolved), Manganese (dissolved)
RIB SW-01	BCAWQG AL	Aluminum (dissolved)
	GCDWQ MAC	Total coliforms (counts)
	GCDWQ AO	Colour
RIB SW-02	BCAWQG AL	Aluminum (dissolved)
	GCDWQ MAC	Total coliforms (counts)
	GCDWQ AO	Colour

6. ENVIRONMENTAL IMPACT ASSESSMENT

This section of the report assesses how wastewater treatment and treated effluent dispersal for the proposed Blackwater mine construction camp could potentially impact the receiving environment. The migration of effluent from the infiltration area to potential down gradientreceptors is identified. Calculations to assess the effects of mounding are not considered in this feasibility level EIS. Mounding was not confirmed in this report because, during the loading test, there was no mounding observed at the temporary monitoring well installed 3 m (10 ft) north of the RIB (see borehole log for RIB BH13-03/TMW-03). Further, we observed no definite and continuous confining layer or groundwater table within 30 m (99ft) of ground surface, below the proposed RIB area, so mounding potential is much lower here than at other sites with shallow bedrock or a high water table.

6.1 Conceptual Model of Effluent Flow

As discussed previously, Class C effluent will be discharged into dug basins and will flow up to a maximum flow rate of 300 m^3/day. The total basin area will be roughly 4,000 m^2 or less in total basin area or 1000 m^2 per basin. Effluent will migrate through the vadose zone on, likely, a three day wetting cycle followed by an approximately 9 day drying cycle. The effluent will renovate as it migrates through the vadose zone and eventually becomes part of the permanent water table and flows in the saturated zone unit

groundwater discharges to the wetlands several hundred metres north of the RIB area, to a creek or potentially recharges bedrock below. Figure 5 depicts our conceptual model for groundwater flow and effluent fate down gradient of the proposed RIB area.

6.2 Groundwater Flow Velocity and Travel Times

Given the above model for groundwater and effluent flow, we used the following procedure to estimate groundwater flow velocity and travel time:

1. We used a representative, yet conservative, value of k (hydraulic conductivity) based on the stratigraphy observed in test pits and borehole logs and the results from hydraulic testing at the down gradient wells (Table 3.3).
2. We applied Darcy's Law to estimate Darcy velocity and travel time.

For this analysis, we applied a form of Darcy's Law as follows:

Equation 1…….. $V = k * i / n$

Where
V = groundwater flow velocity in m/day
k = hydraulic conductivity in m/day
i = hydraulic gradient in m/m
n = estimated soil effective porosity (0.30, Fetter 2001)

The travel time between the base of the dispersal fields and the unnamed tributary south of the dispersal field is the sum of:

1. The vertical travel time in the unsaturated zone between the bottom of the basin and the water table; and
2. The horizontal travel time in the unsaturated zone along the prevailing hydraulic gradient.

The vertical travel time in the unsaturated zone will be on the order of 1.4 m/day. A potential confining layer was observed at RIB BH13-01 at 20 m (65 ft) bgs and the bottom of the RIB was 1.5 m (5 ft) bgs. Distance divided by velocity (18.5 m/4.8 m/day) yields a vertical travel time of at about 4 days. Once the effluent reaches the water table (in this case it is a perched water table), horizontal flow can be calculated using Equation 1 and the following inputs:

- $k = 3 \times 10^{-5}$ m/s (0.4 m/day) [the highest, most conservative, k value is taken from hydraulic testing of down gradient wells, as it will yield the fastest Darcy velocity];
- i = 0.10 (determined assuming the water table is a subdued replica of topography); and
- n = effective porosity estimated at 0.30.

The results of the equation yields a horizontal groundwater velocity of between 0.9 and 1.4 m/day (Table 6.1). Table 6.1 summarizes the horizontal travel times, and shows that effluent subsurface travel times are considerably greater than the 10-day minimum required in the regulation.

Table 6.1 Effluent travel Time Summary

Down gradient receptor	I	n	Saturated k (m/s) 1	V (m/s)	V (m/day)	Distance from the proposed RIB location to Receptor (m)	Travel Time Estimate (days)
Auro Creek (east)	0.2	0.3	3.0E-05	1.6E-05	1.4	262	194
Creek 661 (west)	0.1	0.3	3.0E-05	1.3E-05	1.1	476	437
Water Supply Well TW13-01	0.1	0.3	3.0E-05	1.1E-05	1	770	781
Water Supply Well TW13-02	0.1	0.3	3.0E-05	1.0E-05	0.9	1500	1725

Note (1) saturated hydraulic conductivity was assessed at MW13-02, MW13-03, MW13-04, TW113-01 and TW13-02. 3.0E-05 m/s was taken as the most conservative estimate.

6.3 Potential Down Gradient Receptors

Potential downgradient receptors were identified based on a review of mapping for the area and land use in the area downgradient of the proposed RIB area. Potential down gradient receptors identified include discharge to the two creeks, Creek 661 (west) and Auro Creek (east) and associated aquatic ecosystems. Along with the two test water supply wells, which were installed in August, are the nearest groundwater source wells.

Discharge to Surface Water Groundwater and effluent migrating beneath the proposed RIB area will potentially discharge into Creek 661 or Auro Creek. The streams both flow into Creek 661, which subsequently flows east into Chedakuz Creek, and then northeast into Tatelkuz Lake, located about 15 km from the camp. Assuming groundwater and effluent remain in the ground until discharge into the creeks, the travel time from potential RIB area to the creeks is on the order of 200 to 400 days, during which significant renovation of wastewater will occur. Wastewater from the Blackwater construction camp site will likely have little to no effect on water quality in Tatelkuz Lake.

Potential Discharge to Water Wells The two newly installed water wells are located outside the predicted effluent flow paths. TW13-01 and TW13-02 are over 700 m and 1,500 m away from the RIB, respectively. The predicted subsurface travel time from the RIB to test wells TW13-01 and TW13-02 are 780 days and 1,700 days, respectively. Further, TW13-01 is completed within a semi-confined to confined aquifer and TW13-02 is completed in a confined aquifer.

6.4 Setback Requirements

The MWR stipulates certain setbacks that must be maintained between in-ground disposal areas and certain features. Table 6.2 summarizes relevant setback requirements from the MWR, all of which are thought to be met for the proposed RIB area.

Table 6.2 Minimum Setback Requirements

Feature	Minimum Setback Distance (flow > 37m3/day)	Comments
Property boundary	6 m	The northern property boundary is several kilometers away.
Building drain	10 m	There are no plans to build in the vicinity of the RIB area
Surface water	30 m	Creek 661 and Auro Creek are located at least 30 m from the proposed RIB area
Water wells	300 m (unconfined) 90 m (confined or bedrock)	The two test water supply wells are located at least 700 m from the proposed RIB area.

6.5 Maximum Infiltration Capacity

The Maximum Infiltration Capacity (MIC) is an empirical method typically used to check the reasonableness of infiltration design. The MIC is calculated using the following equation which is based on Darcy's Law:

Equation 2…… $MIC = A * k * CF$

Where: A = infiltration area, 1,250 m^2 recommended area for each basin
k = unsaturated vertical hydraulic conductivity (1.44 m/day)
CF = clogging factor, assumed 0.5

Based on Equation 2, the MIC for each of the RIB's is approximately 875 m^3/day, almost three times the design flow of 300 m^3/day of effluent. This calculation suggests the proposed sizing of the rapid infiltration basins is adequate and the design flow is moderate relative to the soil hydraulic capacity.

6.6 Natural Discharge Capacity

The Natural Discharge Capacity (NDC) is the maximum volume of treated effluent that can seep away from the dispersal area to the area of natural discharge. The NDC depends upon the hydraulic conductivity and thickness of the soil through which seepage will occur, the hydraulic gradient and the width of the seepage zone. NDC is calculated using the following empirical equation, also based on Darcy's Law:

Equation 3…… $NDC = W * T * k * i$

Where: W = width of seepage zone
T = thickness of seepage zone
k = saturated hydraulic conductivity (k = 1 $X10^{-5}$ m/s (2.6 m/day)
i = hydraulic gradient immediately down gradient, estimated at 0.17

For the purposes of this calculation, the width of the seepage zone is 60 m (estimated length of each RIB). The unsaturated thickness of seepage zone is taken to be 90 m (300 ft) based on the elevation of the water table at MW13-02. The results indicate an NDC of about 800 m^3/day; which is over two times the design flow.

6.7 Assessment of the Potential for Mounding

The MWR requires an assessment of mounding be made if mounding is considered to be a potential risk. Schedule 4 of the old MSR requires demonstration that infiltration will not result in a mound being generated that could cause effluent or the groundwater table to surface within 30 m of the infiltration site.

As there was no indication of mounding during the July 2013 pilot RIB loading test at the monitoring well RIB BH03/TMW-03, installed at a depth of 7.9 m (26 ft), located approximately 3 m to the north of the pilot test basin (Figure 4).

The potential groundwater mound height above the static water table can be estimated by applying the mounding model in AQTESLOV. AQTESOLV uses the Hantush method (1967) to compute the transient water-table rise (groundwater mounding) beneath a rectangle. The detailed design phase of the EIS will address the potential for mounding about 30 m down gradient to assess the risk of daylighting (renovated effluent surfacing). Based on the presence of a thick unsaturated zone, we do not foresee issues with mounding at the proposed RIB location.

7. CONCLUSIONS

WWAL has completed a feasibility level, Stage 1 Environmental Impact Study to support design and registration of a wastewater treatment system for the Blackwater Mine construction camp. The design flow for the camp is approximately 300 m^3/day. Effluent will be treated to Class C effluent (max BOD_5 45 mg/l and TSS 45 mg/l) supplemented with U.V. disinfection with aerated lagoons, and disposed to ground via RIB. Field investigations were completed to assess soil and groundwater conditions at the site. Based on the results of our Stage 1 Environmental Impact Study, we provide the following conclusions:

C1 Soils at the dispersal field site are heterogeneous and primarily consist of medium sand with gravel and silt.

C2 14 test pits were dug in the vicinity of the proposed RIB area and nine boreholes were drilled or excavated. Four dedicated (permanent) monitoring wells were installed; one up gradient ad three down slope. The up gradient well was dry after installation.

C3 No permanent groundwater table was encountered beneath or adjacent to the RIB area during the field investigation (to a depth of 30 m (99 ft)). However, a water table was identified at MW13-02, located at an elevation of approximately 1310 m asl.

C4 Groundwater flows from south to north and is thought to fan out towards the east and west, down gradient of the proposed RIB area with a gradient of 0.1. Estimates of effluent travel time between proposed RIBs and receptors meet MWR requirements for Class C effluent (> 10 days).

C5 Groundwater flow velocity through the unsaturated (vadose) zone was estimated based on the results of a pilot loading test, infiltration rates is on the order of 4 m/day.

C6 The RIB meets the MWR setback requirements.

C7 Baseline Water Quality at the site was assessed and found to be of good quality.

C8 Two creeks, located to the west and east of the proposed RIB area along with two potential test water supply wells were identified as the down gradient receptors.

C9 Class C effluent disposed at the proposed RIB area is not likely to adversely impact the receptors. Further, wastewater from the Blackwater construction camp site will have little to no effect on water quality in down gradient Tatelkuz Lake.

C10 From the Stage 1 EIS evaluation we have assigned the proposed treatment to be a Reliability Category III.

C11 Further investigation for the Stage 2 EIS phase of the mine construction camp wastewater system will involve gaining a better understanding of the full build-out basin configuration, and settling on an appropriate design hydraulic loading rate for each basin in consultation with the design engineer. Further investigation of the lower terrace, located directly north of the proposed RIB, will also be considered in the Stage 2 EIS. This lower terrace could be used as a potential RIB reserve area. Further, this lower terrace may be appealing as its location relative to the proposed construction camp could reduce the pumping head requirement; thereby, reducing operating costs of the wastewater system.

C12 Two additional wells are proposed for installation during the Stage 2 EIS, these wells will act at century wells to the down gradient receptors. Specifically, one will be installed between the proposed RIB area and TW13-01, a potential potable supply well for the construction camp and a second well will be installed between the proposed RIB and Auro Creek.

8. POST DISCHARGE GROUNDWATER QUALITY MONITORING

The following section details the proposed groundwater quality monitoring that should be implemented during operation of the wastewater system.

8.1 Recommendations for Post-discharge Groundwater Quality Monitoring

The MWR requires ongoing monitoring of the receiving environment, in this case groundwater and surface water, to confirm the effectiveness of water treatment and to ensure that the appropriate water quality guidelines are being met at the property boundary to protect down-gradient receptors.

Based on guidance in the MWR we recommend the following monitoring program:

Tri-annual sampling of the monitoring network at freshet (May-June), during water level recession (September or October) and baseflow (November) of groundwater for the following parameters:

- Field parameters (pH, temperature, ORP and electrical conductivity)
- Alkalinity
- Total nitrate, nitrite and ammonia
- Total and dissolved phosphorous
- Ortho-phosphorous
- Chloride
- Dissolved Metals
- BOD^5 and TSS
- Total coliform, fecal coliform and *E. coli.*

Sampling should be completed by qualified personnel knowledgeable in monitoring well purging and sampling procedures. As a general best practice, we recommend groundwater water levels be measured at each sampling event to assess seasonal changes in the direction of groundwater flow. A qualified hydrogeologist should oversee and review this program annually.

For QA/QC we recommend one triplicate be taken during the annual monitoring program to assess the standard error for each measurable parameter.

We recommend this proposed monitoring network be used for the first full year of monitoring and then re-evaluated by a qualified professional hired by New Gold once the groundwater flow direction is better understood based from the collection of water level data. The final configuration of the monitoring array should be in place by the end of the second year of MWR registered effluent dispersal and monitoring.

A report evaluating the results of the ongoing groundwater monitoring should be submitted to annually the B.C. MoE Regional Officer within 120 days of the end of each calendar year. After two years (i.e. 6 sample events plus the pre-discharge sampling documented in this EIS), the monitoring program should be reviewed and the number of parameters and frequency of monitoring should be reassessed and potentially reduced to annual sampling. This review should be conducted by a qualified professional hired by New Gold. The recommendations should be submitted to the Ministry Regional Officer for approval.

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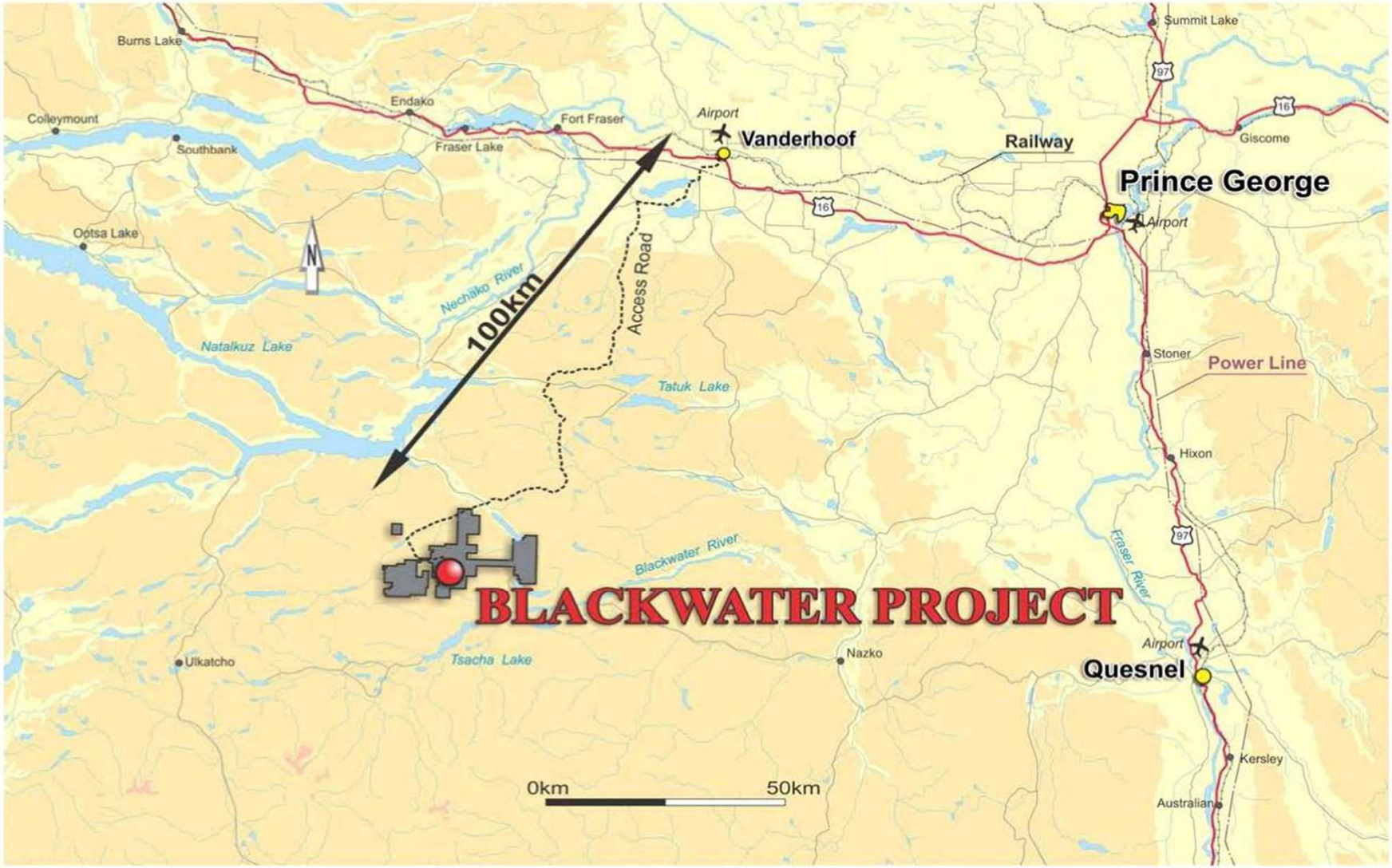
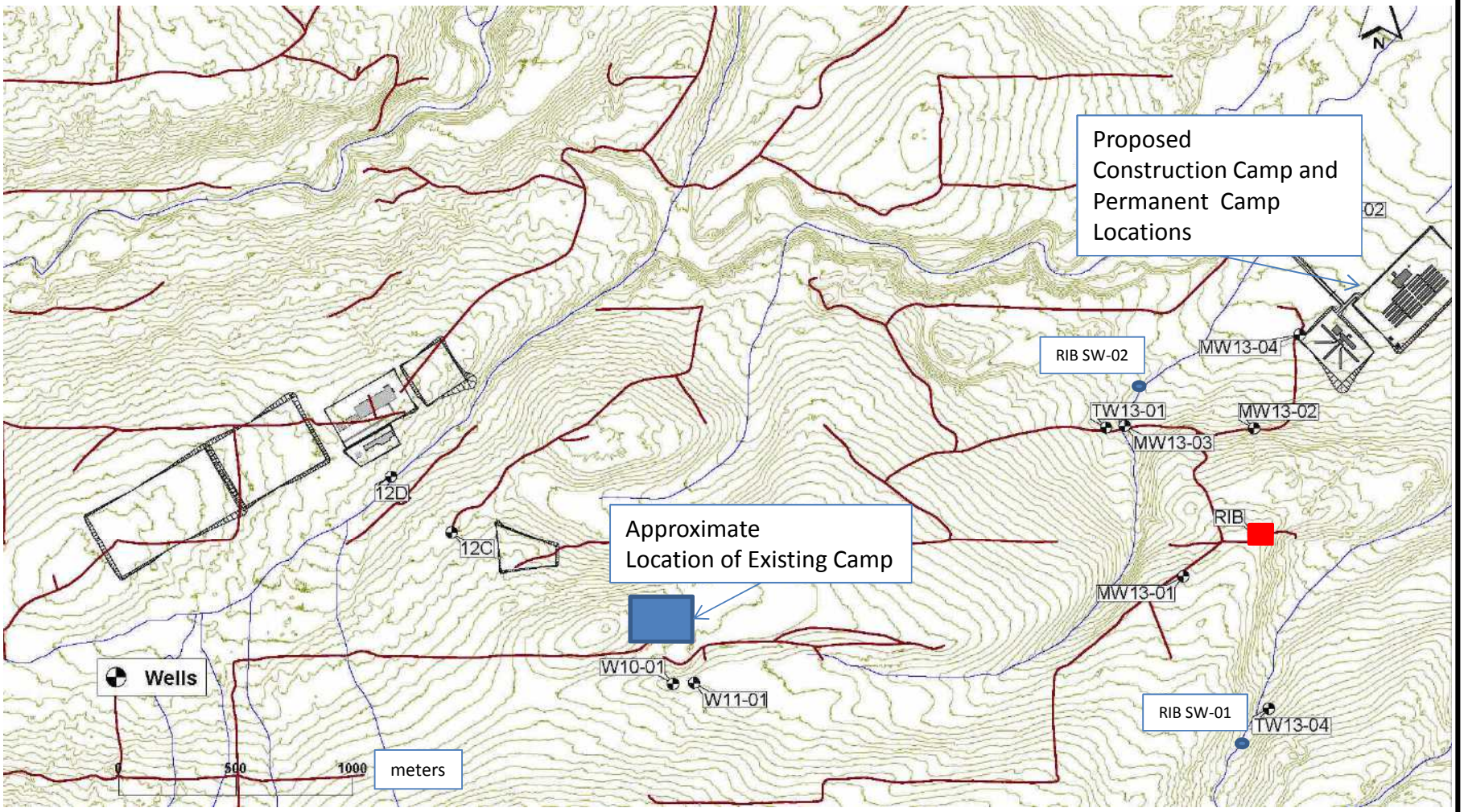
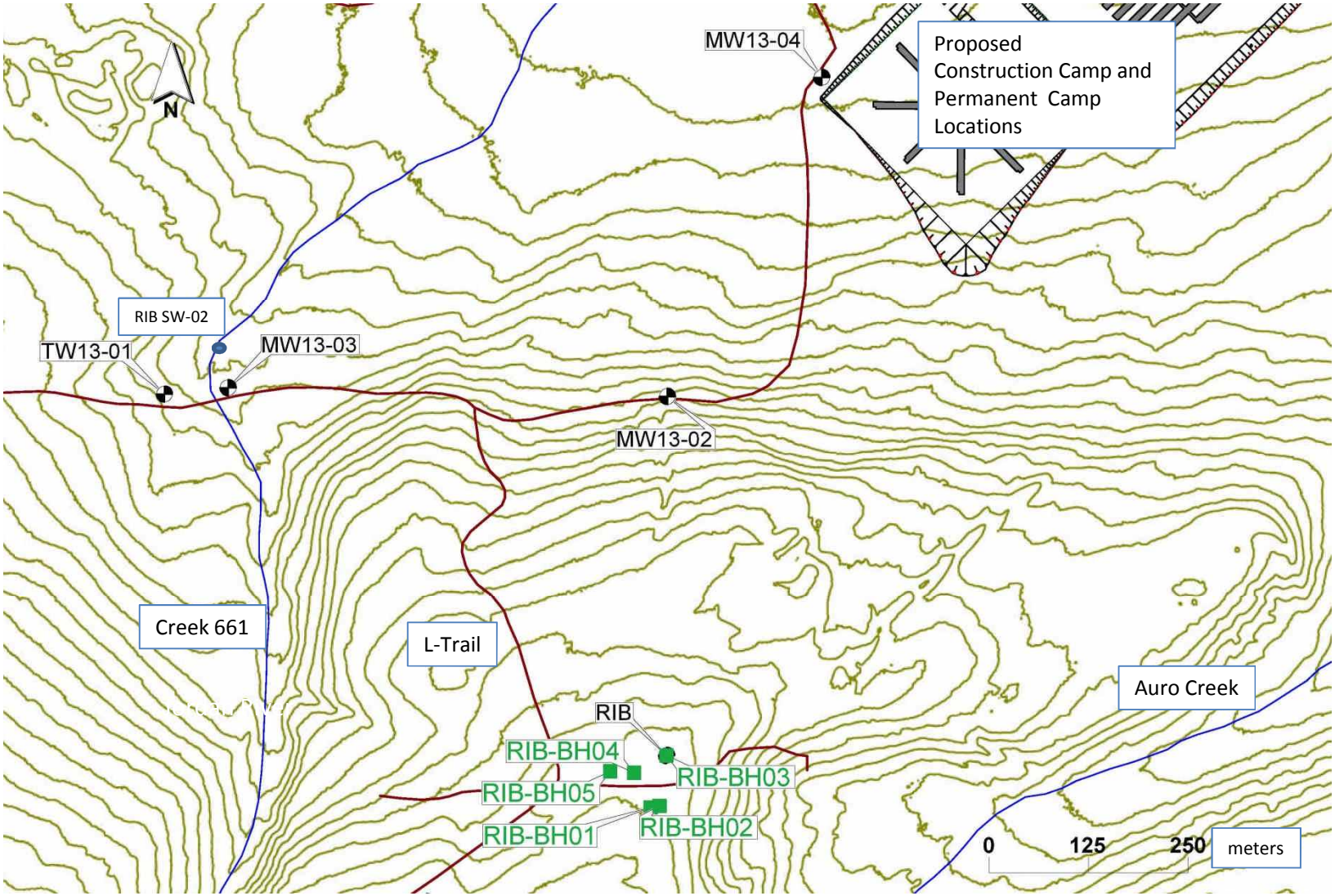


New Gold – Blackwater Construction Camp MWR - EIS	TITLE **Figure 1:** Site Location Map			
western water ASSOCIATES LTD	DRAWN BRM	DATE July 2013	PROJECT NO. 13-019-02	
	CHECKED	SCALE See figure	DWG. NO. na	
	REVIEWED	FILE NO.	FIGURE VERSION NO. 1	



New Gold – Blackwater Construction Camp MWR - EIS	TITLE **Figure 2:** Blackwater Site Map – Including planned mine infrastructure along with existing well locations, the proposed RIB area, surface water bodies, surface water sample sites, 5 m contours and existing trails.			
western water ASSOCIATES LTD	DRAWN BRM	DATE July 2013	PROJECT NO. 13-019-02	
	CHECKED	SCALE See figure	DWG. NO. na	
	REVIEWED	FILE NO.	FIGURE VERSION NO. 1	

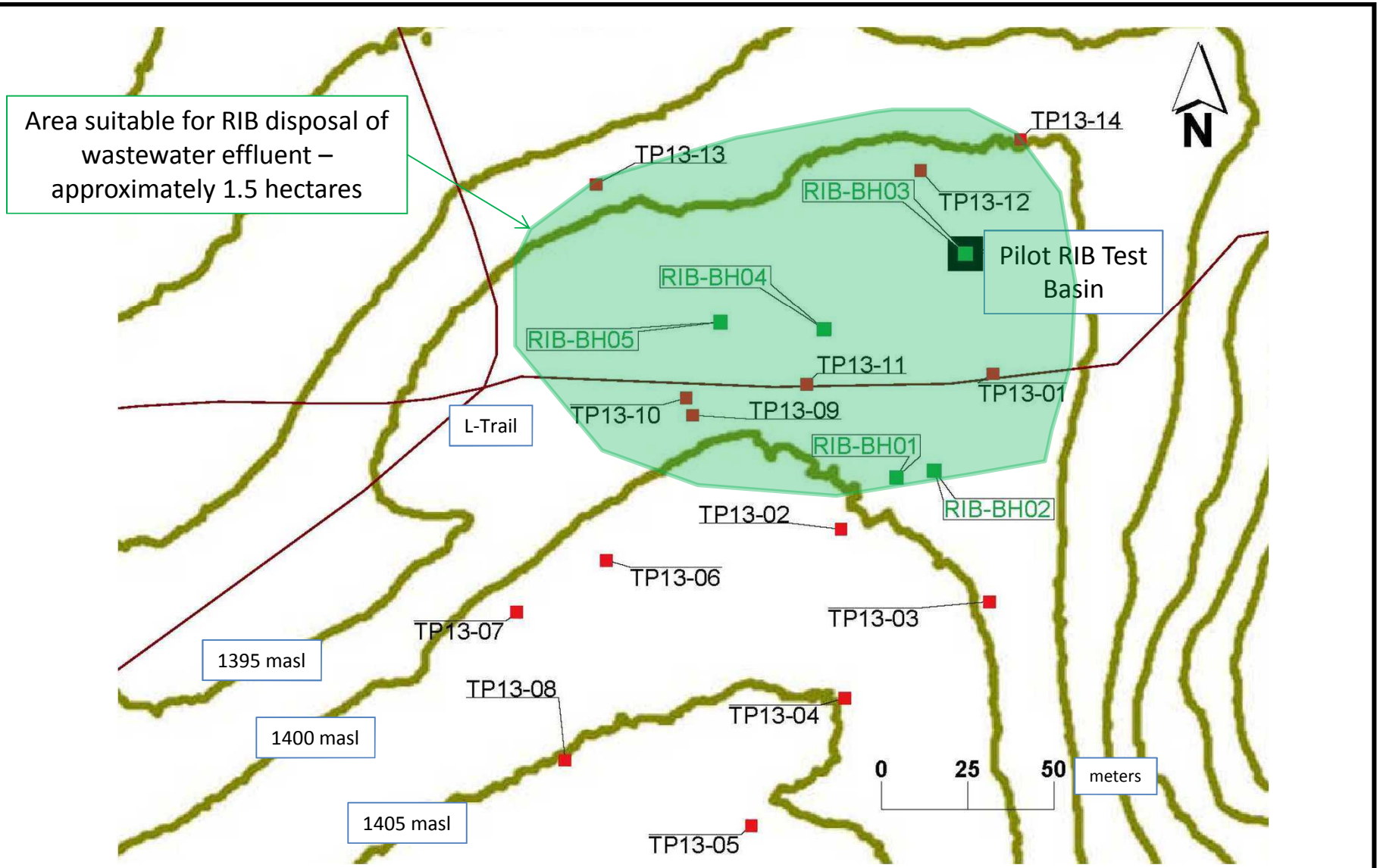


New Gold – Blackwater Construction Camp MWR - EIS

TITLE **Figure 3:** Proposed RIB Area with Boreholes, Monitoring Wells and Test Supply Well Locations. Contours are 5 m

western water ASSOCIATES LTD

DRAWN	BRM	DATE	July 2013	PROJECT NO.	13-019-02
CHECKED		SCALE	See figure	DWG. NO.	na
REVIEWED		FILE NO.		FIGURE VERSION NO.	1



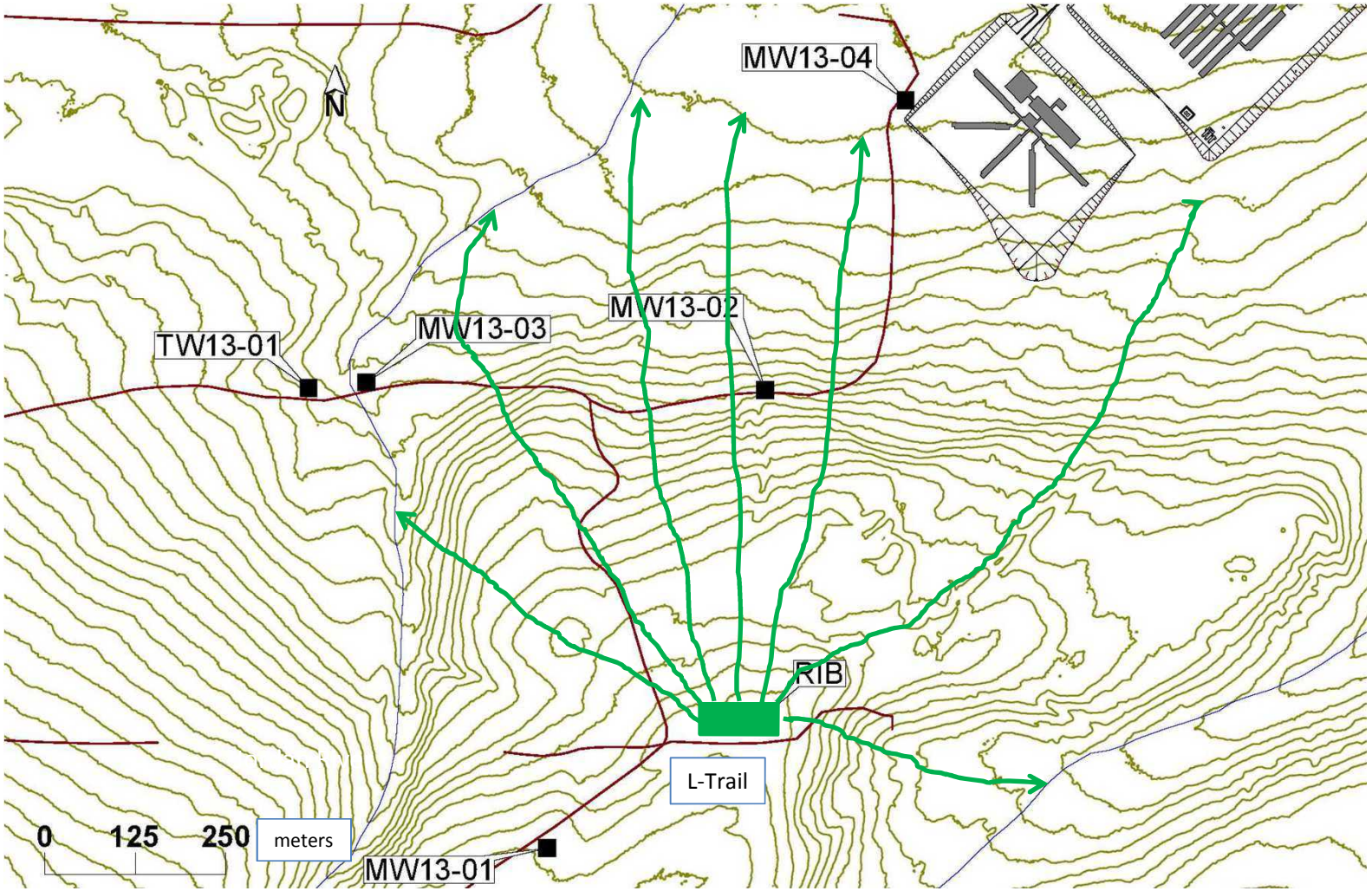
New Gold – Blackwater Construction Camp MWR - EIS

TITLE

Figure 4: Proposed RIB Area with Test Pit and Borehole Locations. Contours are 5 m and green shaded area is the Area suitable for RIB disposal of wastewater effluent – approximately 1.5 hectares

western water ASSOCIATES LTD

DRAWN	BRM	DATE	July 2013	PROJECT NO.	13-019-02
CHECKED		SCALE	See figure	DWG. NO.	na
REVIEWED		FILE NO.		FIGURE VERSION NO.	1



New Gold – Blackwater Construction Camp MWR - EIS	TITLE	**Figure 5:** Conceptual Model for RIB Effluent Fate. Green lines represent the predicted flow path of the RIB infiltrated effluent based on topographic gradient.		
western water ASSOCIATES LTD	DRAWN BRM	DATE July 2013	PROJECT NO. 13-019-02	
	CHECKED	SCALE See figure	DWG. NO. na	
	REVIEWED	FILE NO.	FIGURE VERSION NO. 1	

Appendix A

Water Well Logs

Legend for Lithology Symbols **Client: NewGold - Blackwater**

Project: Feasibility-Waste Water **Project Number: 13-019-02**

western water ASSOCIATES LTD

Depth ft/m	Lithological Symbol	Symbol Description
		Sand.
5		Silty sand.
10		Sandy silt.
15 — 5		Sand and clay.
20		Sand and gravel.
25		Gravel and some boulders.
30		Well sorted silt.
35 — 10		Silt with clay.
40		Clay with some silt.
45		Sand with silt and clay.
50 — 15		Sand, silt and gravel.
55		Silt with gravel.
60		Silt with clay and gravel.
65 — 20		Topsoil, often with organic material.
70		Engineered filter pack (10/20 sand size).
75		Bentonite.
80 — 25		Backfill material. Either clean sand or natural material.
85		Backfill material. Either clean sand or natural material.
90		
95		
100 — 30		

Drawn By: Anthony Friesen **Checked By: Bryer Manwell**

Well Number: TW13-01 (WPN 28413) **Client: NewGold - Blackwater**
Project: Feasibility-Water Supply **Project Number: 13-019-01**
Location: On the L Trail, near removed bridge.

western water ASSOCIATES LTD

Depth Below Ground Surface	Symbol	Lithology	Well Construction	Well Completion Details

ft / m

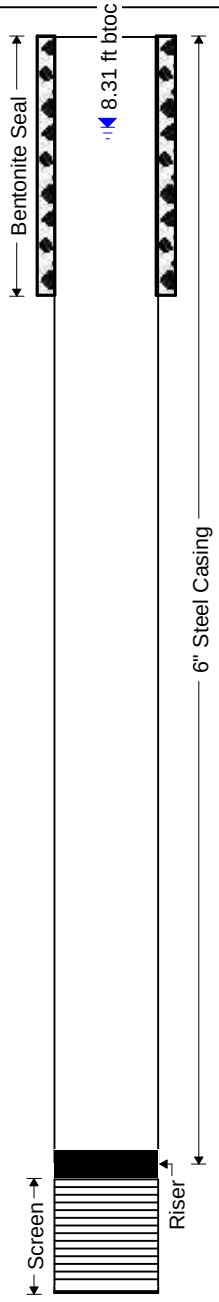
Ground Surface

Brown sand and gravel with boulders.
Dry
(GM)

Brown sandy clay with boulders.
Moist.
(GC)

Brown silty sand.
Wet.
(SM)

Brown medium to coarse sand with cobbles.
Wet.
(GM)



Casing Stick-up:
2.5 ft (0.75 m)

Surface Seal:
Hydrated Bentonite to
18 ft (5.5 m)

Static Water Level:
8.3 ft (2.5 m) btoc

6" Steel Casing:
0-78 ft (0-24 m)

Riser:
76.5 ft (23.3m) to 78.5ft (24m)
with K-Packer at 76.5ft (23.3m)

Well Screen:
4 ft of stainless steel 25 slot
screen from 78.5-82.5 ft (24-25.1 m)
4 ft of stainless steel 30 slot
screen from 82.5-86.5 ft
(25.1-26.4 m)

End Of Hole:
90 ft (27.4m)

Coordinates: E 377709 **N 5894991**
Yield: 67.6 USgpm
Elevation: 1312 masl
Logged By: Ryan Rhodes
Drawn By: Anthony Friesen **Checked By: Bryer Manwell**

Drilling Contractor: Cariboo Drilling
Drilling Method: Air Rotary
Date of Completion: July 31, 2013

Well Number: TW13-02 (WPN 28414) **Client: NewGold-Blackwater**
Project: Backwater Supply Wells **Project Number: 13-019-01**
Location: Northwest of TW13-01 (near future camp)

western water ASSOCIATES LTD

Depth Below Ground Surface	Symbol	Lithology	Well Construction	Well Completion Details

ft / m

0 / 0 — Ground Surface

Grey clay with sand silt and cobbles.
Dry.
(GM)

10 / 10 — Brown silt with sand and gravel.
(Less gravel then above)
Dry.
(GM)

20 / 20 — Black thin layers of possible organic material.
Dry.
(OH)

Grey/brown till.
Wet (70 feet).
(GM)

Brown till. Dense/cemented layer.
Dry.
(GC)

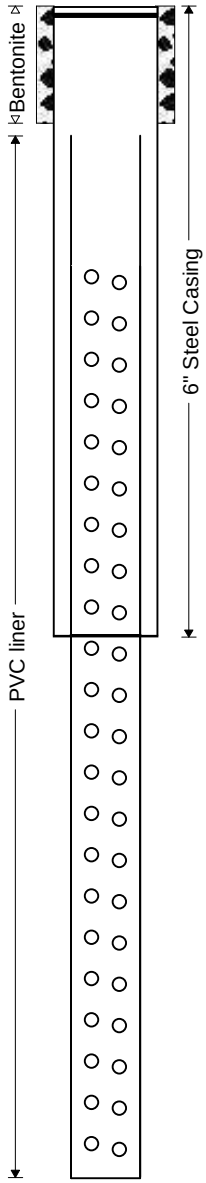
30 / 30 — Brown sand and silt.
Dry.
((SM)

Brown,sand silt and gravel.
Increasing Clay from 160-180 ft.
Cemented.
Water throughout with main producing zone from 140-160 ft.

40 / 40

50 / 50

60 / 60



Casing Stick-up:
2.5 ft (0.75m)

Static Water Level:
Flowing Artesian conditions.
(9.8 lbs of pressure at start of test pumping)

Surface Seal:
Hydrated Bentonite to 18ft (5.5m) below ground suface

6" Steel Casing
To 97 ft (29.6m)

4.5" PVC Liner:
Solid from 20-40 ft (6-12m) below ground surface.
From 40-140 ft (12-42.7m)
3/4" holes drilled on 2 sides 1' apart.
From 140-180 ft (42.7-54.8m)
3/16" holes drilled on 4 sides 8" apart

End of Hole:
180 ft (54.8m)

Coordinates: E 378640 N 5895993
Yield: 30 USgpm
Elevation: 1249 masl
Logged By: Ryan Rhodes
Drawn By: Anthony Friesen Checked By: Bryer Manwell

Drilling Contractor: Cariboo Drillling
Drilling Method: Air Rotary
Date of Completion: August 02, 2013

Well Number: TW13-03 (WPN 28415) **Client: NewGold - Blackwater**
Project: Feasibility-Water Supply **Project Number: 13-019-01**
Location: 5km east off the C Trail at the 6.5 km mark.

western water ASSOCIATES LTD

Depth Below Ground Surface	Symbol	Lithology	Well Construction	Well Completion Details

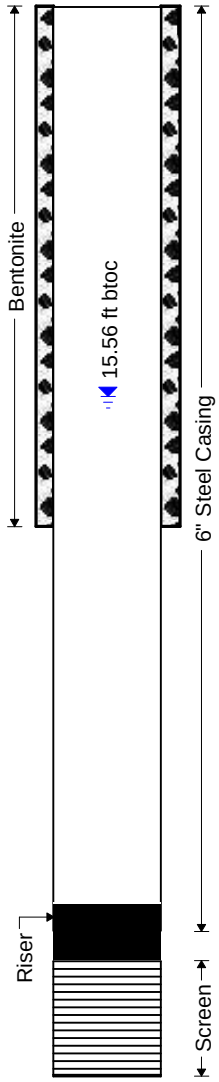
ft m
0 0
1
2
3
1
4
5
6
2
7
8
9
3
10
11
12
4
13
14
15
16
17
18
19
5
20
21
22
23
24
25
26
6
27
28
29
30
7
31
32
33
34
8
35
36
37
38
39
9
40
41
42
43
44
45
10
11
12
13

Ground Surface

Brown sand and gravels.
Uncolsolidated.
Dry.
(SP)

Brown sand and gravels.
Unconsolitated.
Wet.
(SP)

Black silty Clay.
Consolidated.
Moist.
(ML)



Casing Stick-up:
2.5 ft (0.75m) above ground surface

Static Water Level:
15.56 ft (4.7m) btoc

Surface Seal:
Hydrated Bentonite to 18 ft (5.5m)

6" Steel Casing:
0-32 ft (0-9.75 m)

Riser:
31-33 ft (9.44-10 m) with K-Packer at top of riser

Well Screen:
4 ft of stainless steel 25 slot screen from 33-37 ft (10-11.27 m)

End of Hole:
Hole Drilled to 45 ft (13.7 m)

Coordinates: E 378492 N 5900405
Yield: 70 USgpm
Elevation: 1134 masl
Logged By: Ryan Rhodes
Drawn By: Anthony Friesen Checked By: Bryer Manwell

Drilling Contractor: Cariboo Drilling
Drilling Method: Air Rotary
Date of Completion: August 2, 2013

Well Number: TW13-04 (WPN 28412) **Client: NewGold - Blackwater**
Project: Feasibilty-Water Supply **Project Number: 13-019-01**
Location: East of Auro Creek bridge.

western water ASSOCIATES LTD

Depth Below Ground Surface	Symbol	Lithology	Well Construction	Well Completion Details

ft / m

0 / 0 — Ground Surface

0 / 0 — Brown glacial till.
Dry.
(GM)

40 — Red Regolith
(broken bedrock).
Dry.
(BR)

60 / 20 — Red bedrock
(Andesite).
Hard.
Dry.
(BR)

100 — Black/Grey bedrock.
Hard.
Wet.
(BR)

120 / 40

160 — Red bedrock
(Andesite).
Hard.
Wet.
(BR)

180 / 60

200 — Maroon bedrock.
Soft.
Wet.
(BR)

220

240 — Black bedrock.
Hard.

260 / 80

280 — Red bedrock
(Andesite).
Hard.
Wet.
(BR)

300

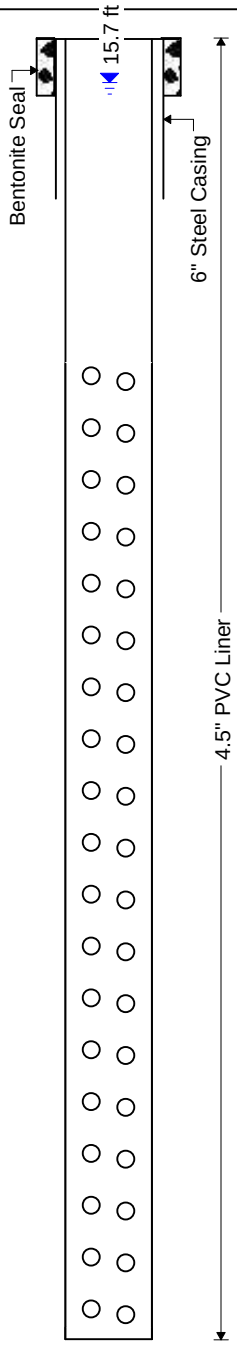
320 / 100 — Black bedrock.
Hard.
Wet.
(BR)

340

360

380

400 / 120



Casing Stick-up:
2.5 ft (0.75m)

Surface Seal:
Hydrated Bentonite to
18 ft (5.5m) below ground
surface

Static Water Level:
15.7 ft (4.78m) btoc

6" Steel Casing:
2.5 ft (0.75m) above ground
surface to 50 ft (15.24m) btoc

4.5" PVC Liner:
Solid from 0-50 ft (0-15.2m)

From 50-400 ft (15.2-122m)
3/4" holes drilled in 2 sides 1'
apart

End of Hole:
400 ft (122m)

Coordinates: E 378404 N 5893792
Yield: 4 USgpm
Elevation: 1398 masl
Logged By: Ryan Rhodes
Drawn By: Anthony Friesen Checked By: Bryer Manwell

Drilling Contractor: Cariboo Drilling
Drilling Method: Air Rotary
Date of Completion: July 28, 2013

Borehole / Well Completion Log

western water ASSOCIATES LTD
Consultants in Hydrogeology and Water Resources Management

Client Allnorth/NewGold **Well ID** Well 3 (TW-12C, WPN 31679)

Project Blackwater Camp Water Supply **Project No.** 12-015-03

Drilling

Drilling Company	*Cariboo Water Wells Ltd.*	Completion Date	*3/13/2012*	Northing	5894847
Drilled by	*Kurt (Doug)*	Drilling Fluid	*None*	Easting	374628
Logged By	*BRM*	Borehole Depth		Surface Elev. (m)	1454
Drill Rig	-	Corehole Dia. (in)		TOC Elev. (m)	1454
Drilling Method	*Air Rotary*	Borehole Dia. (in)	*150 mm (6")*	Stick-up/down	*71.1 cm (28")*

Samples

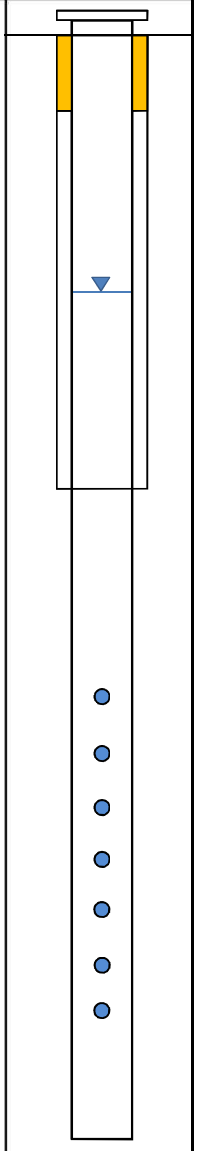
Sample Method	*Air Lift*	Sample Interval		DTB (mbtoc)	**76.5 m (251 ft)**
				DTW (mbtoc)	**17.7 m (58 ft)**
				* DTB & DTW measured after well development	

Well

Well Depth (bgs)		Backfill Interval		Notes:	
Casing Type	*Carbon Steel*	Filter Material	*N/A*		
Casing Joints		Filter Interval			
Casing Dia. (in)	5" (liner)	Seal Material	*Bentonite*		
Screen Type	*40 Slot*	Seal Interval			
Slot Size (in)		Surface Seal			
Screen Interval	*No screen*	Development	*Air Lift (10 hours)*		
Backfill Material	*None*				

DEPTH (m)	SYMBOL	SOIL / ROCK DESCRIPTION	WELL COMPLETION DETAILS
0		Dark brown, LOAM, loose, moist	3 ft bentonite surface seal
5		Brown, SILT, with fine sand and loam, moist.	6 inch casing to 33.5 m (110 ft)
10		trace fines, trace subrounded gravel	5 inch steel liner from ground to 76.5 m (25' ft)
15		Brown, SAND, with gravel and silt, loose, moist	
20		Brown, CLAY, with gravel, compact, Wet (approx. 0.5 GPM)	Water level at 17.7 m (58 ft)
25		Brown, SAND, fine sand some gravel, loose, wet.	
30			
35		Brown, green and pink, BEDROCK, soft, volcanic in origin	
40			
45			**5" liner perforated between 46.0 m and 70.4 (151 – 231 ft)**
50			
55		Dominant water bearing fractures encountered between 51.8 and 53.4 m (170 - 175 ft)	
60			
65			
70			
75			

Well Constr.



Borehole / Well Completion Log

western water ASSOCIATES LTD
Consultants in Hydrogeology and Water Resources Management

Client Allnorth/New Gold **Well ID** Well 4 (TW-12D, WPN 31680)

Project Blackwater Camp Water Supply **Project No.** 12-015-03

Drilling

Drilling Company	Cariboo Water Wells Ltd.	Completion Date	3/14/2012	Northing	5895448
Drilled by	Kurt (Doug)	Drilling Fluid	None	Easting	374457
Logged By	BRM	Borehole Depth	43.9 m (144 ft)	Surface Elev. (m)	1433
Drill Rig	-	Corehole Dia. (in)		TOC Elev. (m)	1433
Drilling Method	Air Rotary	Borehole Dia. (in)	150 mm (6")	Stick-up/down	92.7 cm (36.5")

Samples

Sample Method	Air Lift	Sample Interval	3 m (10 ft)	DTB (mbtoc)	43.9 m (144 ft)
				DTW (mbtoc)	20.1 m (66 ft)

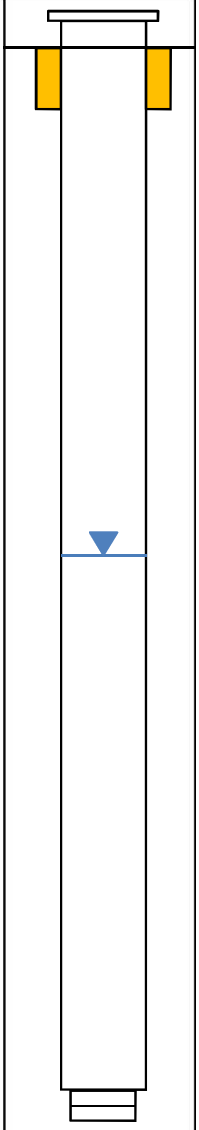
* DTB & DTW measured after well development

Well

Well Depth (bgs)		Backfill Interval		Notes:	
Casing Type	Carbon Steel	Filter Material	N/A		
Casing Joints		Filter Interval			
Casing Dia. (in)	6"	Seal Material	Bentonite		
Screen Type	40 Slot	Seal Interval			
Slot Size (in)		Surface Seal			
Screen Interval	140.5' -144'	Development	Air Lift (4 hours)		
Backfill Material	None				

DEPTH (m)	SYMBOL	SOIL / ROCK DESCRIPTION	WELL COMPLETION DETAILS
0		Brown, SAND, with well-rounded gravel, loose,	6" carbon steel casing that extends from ground surface to 42.1 m (138 ft)
5			6.1 m (20 ft) bentonite surface seal
10		Brown, TILL, with silt and fine sand, loose, dry	
15			
20			Depth to water 20.1 m (66 ft)
25		Same as above but moist	
30			
35			4" K packer between 42.2 m (135.2 ft) and 44.2 m (138.5 ft)
40		Some gravel with silt	2 ft blank between 42.2 m (138.2 ft) and 42.8 m (140.5 ft)
45		Bedrock encountered	4 ft Johnson 40 slot stainless steel screen between 42.8 m (140.5 ft) and 43.9 m (144 ft). Note: only 3.5 ft of screen is exposed.

Well Constr.



Report 1 - Detailed Well Record

```
Well Tag Number: 95996

Owner: TTM RESOURCES

Address: KLUSKUS FSR ROAD

Area: VANDERHOOF

WELL LOCATION:
 Land District
District Lot:  Plan:  Lot:
Township:  Section:  Range:
Indian Reserve:  Meridian:  Block:
Quarter:
Island:
BCGS Number (NAD 27): 093F037243 Well:

Class of Well: Water supply
Subclass of Well: Domestic
Orientation of Well: Vertical
Status of Well: New
Well Use: Water Supply System
Observation Well Number:
Observation Well Status:
Construction Method:
Diameter:  inches
Casing drive shoe:  Y
Well Depth: 213 feet
Elevation: 3570  feet (ASL)
Final Casing Stick Up: 30 inches
Well Cap Type: WELDED
Bedrock Depth:  feet
Lithology Info Flag: Y
File Info Flag: N
Sieve Info Flag: N
Screen Info Flag: N

Site Info Details:
Other Info Flag:
Other Info Details:
```

```
Construction Date: 2008-09-22 00:00:00.0

Driller: Cariboo Water Wells
Well Identification Plate Number: 27624
Plate Attached By: DOUG LEMAL
Where Plate Attached: SIDE

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield:     8 (Driller's Estimate) U.S. Gallons per Minute
Development Method: Air lifting
Pump Test Info Flag: N
Artesian Flow:
Artesian Pressure (ft):
Static Level: 190 feet

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag: N
Field Chemistry Info Flag:
Site Info (SEAM):

Water Utility:
Water Supply System Name:
Water Supply System Well Name:

SURFACE SEAL:
Flag: Y
Material: Bentonite clay
Method: Poured
Depth (ft): 18 feet
Thickness (in):
Liner from       To:       feet

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:
```

Screen from	to feet	Type	Slot Size

Casing from	to feet	Diameter	Material	Drive Shoe
0	213	6	Steel	Y

```
GENERAL REMARKS:
 WELL INSPECTION REPORT AVAILABLE FROM PRINCE GEORGE REGIONAL OFFICE.

LITHOLOGY INFORMATION:
From     0 to     6 Ft.  Hard    DRY grey  till
From     6 to    30 Ft.   SAND WITH GRAVEL   DRY grey
From    30 to   200 Ft.  Hard SAND WITH GRAVEL   DRY brown
From   200 to   213 Ft.  Dense SAND WITH GRAVEL   HIGH PRODUCTION grey
```


- Return to Main
- Return to Search Options
- Return to Search Criteria

Report 1 - Detailed Well Record

Well Tag Number: 98647

Owner: KLUSKUS FIRST NATION

Address:

Area:

WELL LOCATION:
COAST RANGE 4 Land District
District Lot: Plan: Lot:
Township: Section: Range: 4
Indian Reserve: Meridian: Block:
Quarter:
Island:
BCGS Number (NAD 27): 093F008431 Well:

Class of Well: Water supply
Subclass of Well: Domestic
Orientation of Well: Vertical
Status of Well: New
Well Use: Water Supply System
Observation Well Number:
Observation Well Status:
Construction Method:
Diameter: inches
Casing drive shoe: N Y
Well Depth: 68 feet
Elevation: 3183 feet (ASL)
Final Casing Stick Up: 12 inches
Well Cap Type: ALUMINUM
Bedrock Depth: feet
Lithology Info Flag: Y
File Info Flag: N
Sieve Info Flag: N
Screen Info Flag: Y

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 2008-10-23 00:00:00.0

Driller: J. R. Drilling Central Ltd. Partnership
Well Identification Plate Number: 29594
Plate Attached By: KELLY PELLETIER
Where Plate Attached: CASING

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield: 100 (Driller's Estimate) U.S. Gallons per Minute
Development Method:
Pump Test Info Flag: N
Artesian Flow:
Artesian Pressure (ft):
Static Level: 12 feet

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag: N
Field Chemistry Info Flag:
Site Info (SEAM):

Water Utility:
Water Supply System Name:
Water Supply System Well Name:

SURFACE SEAL:
Flag: Y
Material: Bentonite clay
Method: Poured
Depth (ft): 20 feet
Thickness (in):
Liner from To: feet

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

Screen from	to feet	Type	Slot Size
56	64		40

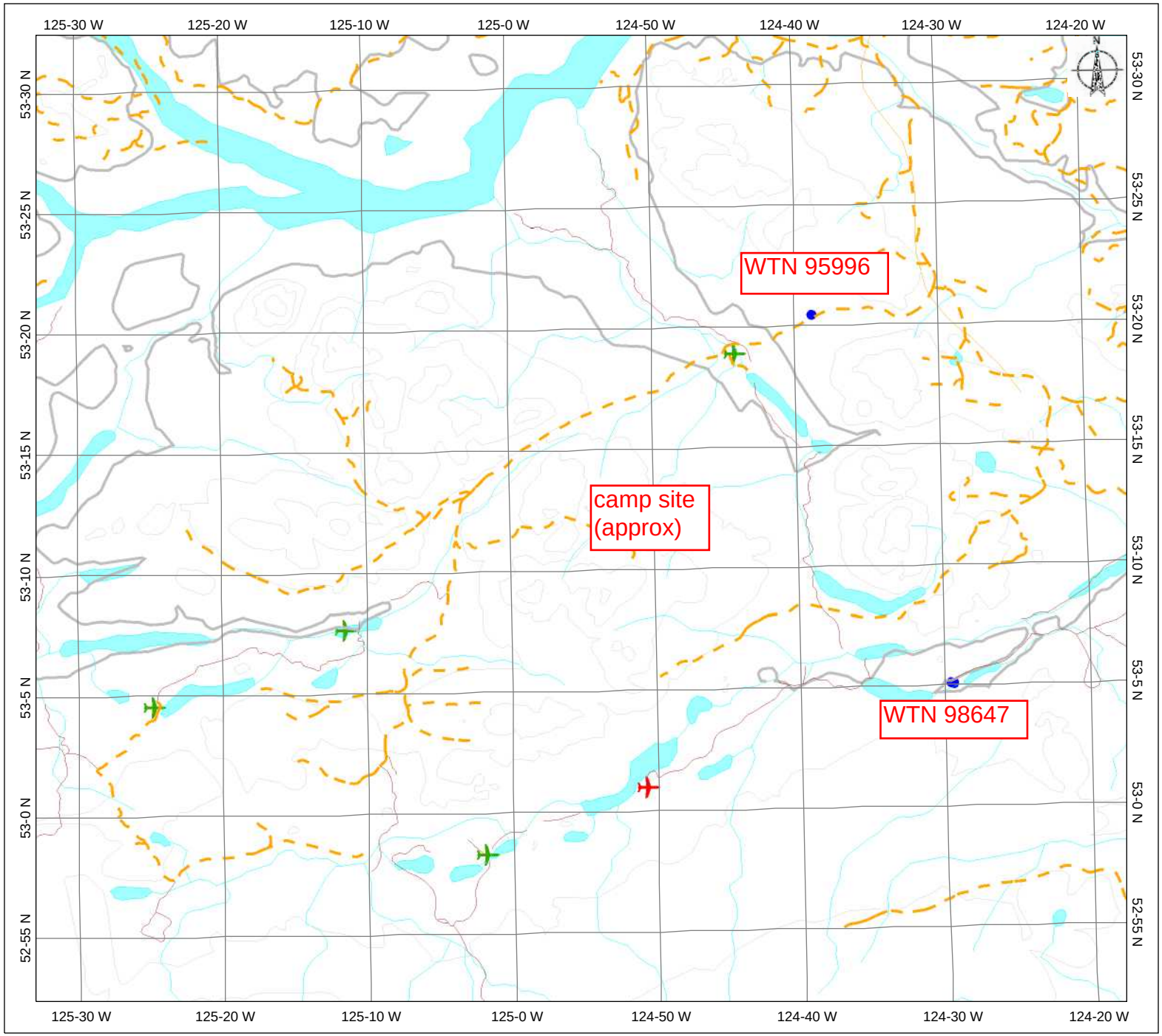
Casing from	to feet	Diameter	Material	Drive Shoe
0	70	8	Steel	Y
0	20	12	Steel	N

GENERAL REMARKS:
 DRIVE SHOE BARBER. WELL LOCATIONS & CONSTRUCTION SUPERVISED BY KALA GROUND WATER.

LITHOLOGY INFORMATION:

From	0 to	17 Ft.	Dense SAND WITH GRAVEL	MOIST AT 12 FEET grey
From	17 to	39 Ft.	Dense SAND WITH GRAVEL	WET grey
From	39 to	60 Ft.	SAND WITH COARSE GRAVEL	HIGH PRODUCTION grey
From	60 to	70 Ft.	SAND WITH COARSE GRAVEL	HIGH PRODUCTION grey

- Return to Main
- Return to Search Options
- Return to Search Criteria



BRITISH COLUMBIA

Blackwater Map

Legend

Transportation - Roads, Railroads, etc. (1:250,000)

- Road - Paved lanes 2 or More Divided
- Ferry Route
- Aerial Cableway
- Road (Gravel Undivided) - 1 Lane
- Road (Gravel Undivided) - 3 Lanes
- Road (Paved Undivided) - Not Elevated - 1 Lane
- Road (Paved Undivided) - Not Elevated - 2 Lanes
- Road - Paved lanes 3 or More Undivided
- Road (Unimproved)
- Road - Loose access Dry Weather
- Road (Winter Road)
- Road - Paved lanes 2 Undivided
- Road - Paved lanes 2 Undivided U C
- Road - Paved Divided access Non Standard
- Track - Cart or Tractor
- Causeway (Railway)
- Cut (Roadway)
- Trail
- Tunnel
- Bridge
- Rail Line - Narrow Gauge - Single Track
- Rail Line (Multiple Track)
- Rail Line (Single Track)
- Rail Line - Abandoned Track
- Cable - Telephone
- Line (Transmission) - Electrical
- Line (Transmission) - Electrical - Primary

0 6 12 km.

Scale: 1:430,603

Datum/Projection: NAD83, Albers Equal Area Conic

Key Map of British Columbia

Appendix B

Test Pit, Borehole and Monitoring Well Logs

Test Pit ID: TP13-01 **Client: NewGold - Blackwater**

Project: Feasibility-Waste Water **Project Number: 13-019-02**

Location: On the L Trail, 30 m south of RIB

western water ASSOCIATES LTD

Depth Below Ground Surface	Depth (ft)	Symbol	Lithology
ft / m			Ground Surface
0 – 2 ft / 0 – 1 m	0-2'		Brown loam with sand and gravel (SP)
2 – 19 ft / 1 – 5.8 m	2-19'		Brown, coarse sand and gravel, trace fines and some boulders. Unconsolidated and poorly sorted. Moist. (SW)
19 – 25 ft / 5.8 – 7 m			

Coordinates: E 378348 **N 5894502**

Depth: 19 ft (5.8 m)

Elevation: 1396 masl

Logged By: Bryer Manwell

Drawn By: Anthony Friesen **Checked By: Bryer Manwell**

Excavator Contractor: NewGold

Excavation Method: Volvo EC 310

Date of Completion: July 8, 2013

Test Pit ID: TP13-02 **Client: NewGold - Blackwater**

Project: Feasibility-Waste Water **Project Number: 13-019-02**

Location: On the L Trail, 90 m south southwest of RIB

western water ASSOCIATES LTD

Depth Below Ground Surface	Depth (ft)	Symbol	Lithology
ft / m			Ground Surface
0 / 0			
1	0-1.5'		Brown Loam
2			
3 / 1			
4			
5			
6 / 2			
7			
8			
9			Brown, lose sand and gravel. Trace silt; banding-alternating layers of pure clean sand and dirty sand. (SP)
10 / 3			
11	1.5-23'		
12			
13 / 4			
14			
15			
16 / 5			
17			
18			
19			
20 / 6			
21			
22			
23 / 7			
24			
25			

Coordinates: E 378304 **N 5894457** **Excavator Contractor: NewGold**

Depth: 23 ft (7 m) **Excavation Method: Volvo EC 310**

Elevation: 1396 masl **Date of Completion: July 8, 2013**

Logged By: Bryer Manwell

Drawn By: Anthony Friesen **Checked By: Bryer Manwell**

Test Pit ID: TP13-03 **Client: NewGold - Blackwater**

Project: Feasibility-Waste Water **Project Number: 13-019-02**

Location: On the L Trail, 100 m south of RIB

western water ASSOCIATES LTD

Depth Below Ground Surface	Depth (ft)	Symbol	Lithology
ft / m			Ground Surface
0–2 ft / 0–1 m	0-2'		Loam silt, roots, brown loose (OL)
2–12 ft / 1–3 m	2-12'		Brown sand and gravel, somes fines with occassional boulder. Poorly sorted. (SW)
10 ft / 3 m			Decent water flow at 11.5 ft (3.5 m) , 2 gal/min).
12–15 ft / 4 m	12-15'		Brown, silt seem. Moist. (ML)
15–24 ft / 5–7 m	15-24'		Sand and gravel with boulders and some fines (GM)

Coordinates: E 378347 **N 5894436**

Depth: 24 ft (7.3 m)

Elevation: 1401 masl

Logged By: Bryer Manwell

Drawn By: Anthony Friesen **Checked By: Bryer Manwell**

Excavator Contractor: NewGold

Excavation Method: Volvo EC 310

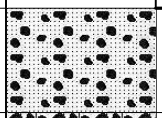
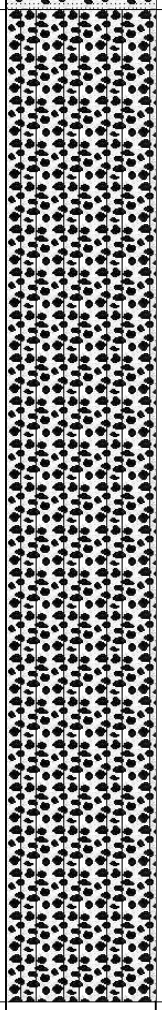
Date of Completion: July 8, 2013

Test Pit ID: TP13-04 **Client: NewGold - Blackwater**

Project: Feasibility-Waste Water **Project Number: 13-019-02**

Location: On the L Trail, 130 m south southwest of RIB

western water ASSOCIATES LTD

Depth Below Ground Surface	Depth (ft)	Symbol	Lithology
ft / m			Ground Surface
0–2 ft / 0–1 m	0-2'		Brown sand and gravel. Loose and dry. (SW)
2–21 ft / 1–6 m	2-21'		Brown silt with sand and gravel; homogenous. (SW)
21–25 ft / 6–7 m			

Coordinates: E 378305 **N 5894408**

Depth: 21 ft (6.4 m)

Elevation: 1404 masl

Logged By: Bryer Manwell

Drawn By: Anthony Friesen **Checked By: Bryer Manwell**

Excavator Contractor: NewGold

Excavation Method: Volvo EC 310

Date of Completion: July 8, 2013

Test Pit ID: TW13-05 **Client: NewGold - Blackwater**

Project: Feasibility-Waste Water **Project Number: 13-019-02**

Location: On the L Trail, 170 m southwest of RIB

western water ASSOCIATES LTD

Depth Below Ground Surface	Depth (ft)	Symbol	Lithology
ft / m			Ground Surface
0 / 0	0-1.5'		Loam with roots. (SM)
1			
2	1.5-4'		Gravel, boulders, silt and sand. (GM)
3 / 1			
4	4-5'		Silty gravel with some sand; loose and moist. (GM)
5			

Coordinates: E 378278 **N 5894371** **Excavator Contractor: NewGold**

Depth: 4 ft (1.2 m) **Excavation Method: Volvo EC 310**

Elevation: 1408 masl **Date of Completion: July 8, 2013**

Logged By: Bryer Manwell

Drawn By: Anthony Friesen **Checked By: Bryer Manwell**

Test Pit ID: TP13-06 **Client: NewGold - Blackwater**

Project: Feasibility-Waste Water **Project Number: 13-019-02**

Location: On the L Trail, 140 m southwest of RIB

western water ASSOCIATES LTD

Depth Below Ground Surface	Depth (ft)	Symbol	Lithology
ft / m			Ground Surface
0 / 0	0-1.5'		Reddy Brown loam. Topsoil, with roots. (OL)
2 / 1	1.5-4'		Brown gravel with sand and silty loam. (GM)
4	4-6'		Silty
6 / 2	6-17'		Sand and gravel with some silt (SM)
17 / 5	17-18'		Silt layer (ML)
18 / 6	18-23'		Brown Sand and gravel silt Loose with the silt being more dense. (SM)
23 / 7			
25			

Coordinates: E 378236 **N 5894448** **Excavator Contractor: NewGold**

Depth: 23 ft (7 m) **Excavation Method: Volvo EC 310**

Elevation: 1406 masl **Date of Completion: July 8, 2013**

Logged By: Bryer Manwell

Drawn By: Anthony Friesen **Checked By: Bryer Manwell**

Test Pit ID: TP13-07 **Client: NewGold - Blackwater**

Project: Feasibility-Waste Water **Project Number: 13-019-02**

Location: On the L Trail, 160 m southwest of RIB

western water ASSOCIATES LTD

Depth Below Ground Surface (ft / m)	Depth (ft)	Symbol	Lithology
0 / 0			Ground Surface
0–1	0-1.5'		Brown loam with roots. (Topsoil) (OL)
2–3 / 1	1.5-3.5'		Brown and red silt. (ML)
4–13 / 1–4	3.5-14'		Sand and gravel with silt.
14–16 / 4–5	14-17'		Brown silt. Dense. (ML)
17–23 / 5–7	17-23'		Sand and gravel with silt. (GM)
23–25 / 7			

Coordinates: E 378210 **N 5894433**

Depth: 23 ft (7 m)

Elevation: 1407 masl

Logged By: Bryer Manwell

Drawn By: Anthony Friesen **Checked By: Bryer Manwell**

Excavator Contractor: NewGold

Excavation Method: Volvo EC 310

Date of Completion: July 8, 2013

Test Pit ID: TP13-08 **Client: NewGold - Blackwater**

Project: Feasibility-Waste Water **Project Number: 13-019-02**

Location: On the L Trail, 165 m southwest of RIB

western water ASSOCIATES LTD

Depth Below Ground Surface	Depth (ft)	Symbol	Lithology
ft / m			Ground Surface
0			Topsoil
1	0.5-1.5'		Grey white (illuvosol)
2	1.5-3.5'		Grey to Brown silt with sand and gravel (dense) (GM)
3			
4	3.5-13'		Sand and gravel with silt. Loose. (SM)
5			
6			
7			
8			
9			
10			
11			
12			
13	13-14'		Brown and grey silt. Dense. (ML)
14	14-21'		Silt with sand and gravel, All dry. (SM)
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

Coordinates: E 378224 **N 5894390**

Depth: 21 ft (6.4 m)

Elevation: 1404 masl

Logged By: Bryer Manwell

Drawn By: Anthony Friesen **Checked By: Bryer Manwell**

Excavator Contractor: NewGold

Excavation Method: Volvo EC 310

Date of Completion: July 8, 2013

Test Pit ID: TP13-09 **Client: NewGold - Blackwater**

Project: Feasibility-Waste Water **Project Number: 13-019-02**

Location: On the L Trail, 165 m southwest of RIB

western water ASSOCIATES LTD

Depth Below Ground Surface	Depth (ft)	Symbol	Lithology
ft / m			Ground Surface
0 – 0	0-0.75'		Mauve Topsoil.
1	0.75-1.5'		Reddy brown loam with fine sand. (ML)
2 – 1	1.5-9'		Brown fine sand with some silt. Dense and moist. (SM)
9 – 3	9-12'		Ground water seep.
12 – 4	12-18'		Silt with fine sand. (ML)
18 – 6	18-21'		fine sand with silt. (SM)
21 – 7			
25			

Coordinates: E 378261 **N 5894490** **Excavator Contractor: NewGold**

Depth: 21 ft (6.4 m) **Excavation Method: Volvo EC 310**

Elevation: 1401 masl **Date of Completion: July 8, 2013**

Logged By: Bryer Manwell

Drawn By: Anthony Friesen **Checked By: Bryer Manwell**

Test Pit ID: TP13-10 **Client: NewGold - Blackwater**

Project: Feasibility-Waste Water **Project Number: 13-019-02**

Location: On the L Trail, 90 m southwest of RIB

western water ASSOCIATES LTD

Depth Below Ground Surface	Depth (ft)	Symbol	Lithology
ft / m			Ground Surface
0 / 0	0-0.75'		Brown and grey topsoil with roots. Loose and dry. (OL)
1 / 2 / 3 / 4 / 5 / 6 / 1 / 2	0.75-7'		Sand and gravel and silt (GM)
7 / 8 / 9 / 10 / 11 / 12 / 3	7-13'		Sandy gravel with trace silt. Dry. (SP)
13 / 14 / 15 / 16 / 17 / 18 / 4 / 5	13-18'		Silt. Largely dense and wet. (MH)
19 / 20 / 6	18.5-20'		Gravel with coarse sand (GW)
21 / 22 / 23 / 24 / 25 / 7			

Coordinates: E 378261 **N 5894495**

Depth: 20 ft (6.1 m)

Elevation: 1399 masl

Logged By: Bryer Manwell

Drawn By: Anthony Friesen **Checked By: Bryer Manwell**

Excavator Contractor: NewGold

Excavation Method: Volvo EC 310

Date of Completion: July 8, 2013

Test Pit ID: TP13-11 **Client: NewGold - Blackwater**

Project: Feasibility-Waste Water **Project Number: 13-019-02**

Location: On the L Trail, 60 m west southwest of RIB

western water ASSOCIATES LTD

Depth Below Ground Surface	Depth (ft)	Symbol	Lithology
ft / m			Ground Surface
0 / 0	0-1'		Red topsoil with roots (dry)
1			
2			
3 / 1	1-5.5'		Gravel with sand. (GP)
4			
5			
6 / 2			Sand and gravel with trace silt (SW)
7			
8			
9			
10 / 3	5.5-20'		
11			
12			
13 / 4			
14			
15			
16 / 5			
17			
18			
19			
20 / 6			
21			
22			
23 / 7			
24			
25			

Coordinates: E 378294 **N 5894499** **Excavator Contractor: NewGold**

Depth: 20 ft (6.1 m) **Excavation Method: Volvo EC 310**

Elevation: 1406 masl **Date of Completion: July 8, 2013**

Logged By: Bryer Manwell

Drawn By: Anthony Friesen **Checked By: Bryer Manwell**

Test Pit ID: TP13-12 **Client: NewGold - Blackwater**

Project: Feasibility-Waste Water **Project Number: 13-019-02**

Location: On the L Trail, 25 m of RIB

western water ASSOCIATES LTD

Depth Below Ground Surface	Depth (ft)	Symbol	Lithology
ft / m			Ground Surface
0 / 0	0-0.5'		Mauve, Thin Topsoil, with roots (OL)
1	0.5-1.5'		Reddy brown loam with fine sand. (ML)
2	1.5-5'		Fine sand with gravel. Loose and dry. (SP)
3 / 1			
4			
5	5-7'		Sand and Gravel. (SW)
6 / 2			
7	7-8'		Fine sand (SP)
8	8-15'		Fine Sand and Gravel. Loose and dry. (SW)
9			
10 / 3			
11			
12			
13 / 4			
14			
15			

Coordinates: E 378327 **N 5894561**

Depth: 15 ft (4.6 m)

Elevation: 1399 masl

Logged By: Bryer Manwell

Drawn By: Anthony Friesen **Checked By: Bryer Manwell**

Excavator Contractor: NewGold

Excavation Method: Volvo EC 310

Date of Completion: July 8, 2013

Test Pit ID: TP13-13 **Client: NewGold - Blackwater**

Project: Feasibility-Waste Water **Project Number: 13-019-02**

Location: On the L Trail, 100 m west of RIB

western water ASSOCIATES LTD

Depth Below Ground Surface	Depth (ft)	Symbol	Lithology
ft / m			Ground Surface
0 / 0	0-0.75'		Red, Brown loam with roots. (OL)
1	0.75-1.5'		Silt with sand and gravel. (SM)
2	1.5-9'		Sand and gravel with some fines. Loose and dry. (SP)
3 / 1			
4			
5			
6			
7 / 2			
8			
9	9-21'		Coarse to fine sand with trace silt. (SM)
10 / 3			
11			
12			
13 / 4			
14			
15			

Coordinates: E 378233 **N 5894557**

Depth: 21 ft (6.4 m)

Elevation: 1395 masl

Logged By: Bryer Manwell

Drawn By: Anthony Friesen **Checked By: Bryer Manwell**

Excavator Contractor: NewGold

Excavation Method: Volvo EC 310

Date of Completion: July 8, 2013

Test Pit ID: TP13-14 **Client: NewGold - Blackwater**

Project: Feasibility-Waste Water **Project Number: 13-019-02**

Location: On the L Trail, 30 m north of RIB

western water ASSOCIATES LTD

Depth Below Ground Surface	Depth (ft)	Symbol	Lithology
ft / m			Ground Surface
0 / 0	0-0.75'		Red, Brown loam with roots (OL)
1			Sand and gravel (clean). (GW)
2			
3 / 1			
4			
5			
6 / 2			
7			
8	0.75-19'		
9			
10 / 3			
11			
12			
13 / 4			
14			
15			
16 / 5			
17			
18			
19 / 6			
20			
21			
22			
23 / 7			
24			
25			

Coordinates: E 378356 **N 5894570**

Depth: 19 ft (5.8 m)

Elevation: 1398 masl

Logged By: Bryer Manwell

Drawn By: Anthony Friesen **Checked By: Bryer Manwell**

Excavator Contractor: NewGold

Excavation Method: Volvo EC 310

Date of Completion: July 8, 2013

Bore Hole ID: RIB-BH01 **Client: NewGold-Blackwater**

Project: Feasibility-Waste Water **Project Number: 13-019-02**

Location: East on the L Trail, 68 m southwest of RIB.

western water ASSOCIATES LTD

Depth Below Ground Surface (ft)	Depth Below Ground Surface (m)	Depth (ft)	Symbol	Lithology
0	0			Ground Surface
0–2		0-2'		Brown coarse sand and gravel with some fines. Loose. Moist. (SW)
2–4				Brown silt with gravel and some sand. Compact and dense. Moist. (GM)
4–20	2–6	3.75-21'		Grey silt with some gravel and sand. Loose. Dry. (GM)
20–30	6–8	21-29.5'		Brown coarse to medium sand and gravel with some boulders and trace fines. Loose. Moist. (GW)
30–32	8–10	29.5-32'		Brown sand and gravel with silt. Compact and dense. Moist. (SW)
32–40	10–12	32-39'		Brown sand and gravel with silt.Loose. Dry. (SW)
40–42	12	40-43.5'		Brown coarse sand with gravel lense. Dry. (SW)
42–44				Brown sand silt and gravel. Loose. Wet. (SW)
44–46	14	45-49'		Brown silt with gravel and sand. Dense. Moist. (MH)
46–50		49-53'		Brown sand and gravel with silt (dirty). Loose. Moist. (GW)
50–52	16			Brown course sand with trace fines and gravel. Loose. Moist. (SW)
52–64	16–18	53-64'		Brown silt to clay with medium to fine sand and some gravel. Dense. Moist. (ML)
64–66	20	64.5-73.5'		Brown silt. Compact confining unit. (ML)
66–72				Fine to medium sand with some silt, gravel and cobbles. Loose. Dry. (SW)
72–74	22			
74–76		74-77'		Brown silt lense. Compact. Dry. (ML)
76–78				Brown silt lense. Compact. Dry. (ML)
78–84	24	77-83'		Brown fine silt with sand and gravel. Loose. (ML)
84–86	26	83-86'		Grey Brown coarse sand and silt. Dense. (SM)
86–88				Grey silt with some fine sand and clay. Dense. Wet. (ML)
88–90		88-92'		Grey coarse sand with trace fines and gravel. Wet. (SM)
90–92	28			
92–94		92-96'		Grey silt with sand and gravel. Loose. Wet. (ML)
94–96				
96–98		96-98'		Grey Brown silt and clay. Very dense. Moist. (ML)
98–100	30			Fine sand and silt with gravel. Dry. (SM)
100–104	32			

Coordinates: E 378320 **N 5894472**

Depth: 99 ft (30.2 m)

Elevation: 1405 masl

Logged By: Bryer Manwell

Drawn By: Anthony Friesen **Checked By: Bryer Manwell**

Drilling Contractor: Mudbay (Stephen McAllister)

Drilling Method: DB320-01 (Sonic Drilling)

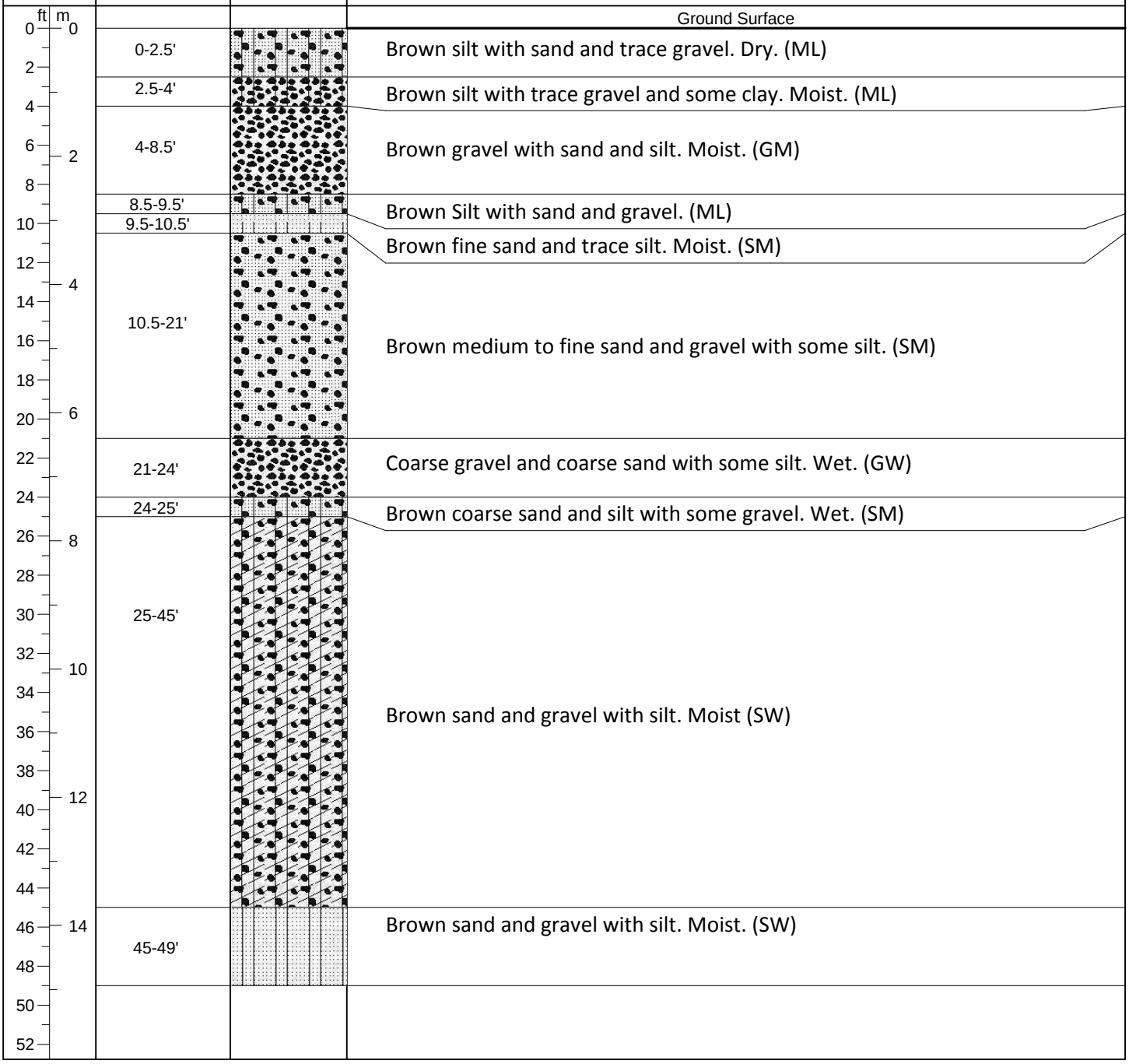
Date of Completion: July 16, 2013

Bore Hole ID: RIB-BH02 **Client: NewGold - Blackwater**

Project: Feasibility-Waste Water **Project Number: 13-019-02**

Location: East On the L Trail, 64 m South of RIB

western water ASSOCIATES LTD



Coordinates: E 378331 **N 5894474**

Depth: 50 ft (15.2 m)

Elevation: 1401 masl

Logged By: Bryer Manwell

Drawn By: Anthony Friesen **Checked By: Bryer Manwell**

Drilling Contractor: Mudbay (Stephen McAllister)

Drilling Method: DB 320-01 (Sonic drilling)

Date of Completion: July 16, 2013

Bore Hole ID: RIB-BH13-03/ Temporary TMW-03

Project: Feasibility-Waste Water **Client: NewGold - Blackwater**

Location: On L Trail, 3 m North of RIB **Project Number: 13-019-02**

western water ASSOCIATES LTD

Depth Below Ground Surface	Symbol	Lithology	Well Construction	Well Completion Details
ft / m		Ground Surface		
0 – 2 ft		Brown, red silt with gravel. Loose. Moist. (MH)		**Casing stick-up:** 2.62 ft (0.80 m)
2 – 6 ft		Brown sand and trace silt. Moist. (SM)		**Static water level:** Dry thoughout.
6 – 8 ft (2 m)		Brown fine to medium sand with trace fines. (SM)		**10/20 Sand pack:** 0-27 ft (0-8.2 m)
8 – 26 ft (4 – 8 m)		Brown sand and gravel with some silt. Increased silt from 15-19'. Loose. Dry between 15-19'. (SP)	10/20 Sand Pack; Screen	**2' Schedule 40 PVC blank:** 0-21ft (0-6.4 m)
21 – 26 ft (6.4 – 7.9 m)			Screen	**10 Slot screen:** 21-26 ft (6.4-7.9 m)
26 – 28 ft (8 m)		Brown silt with some sand and gravel. Loose. Wet. (ML)	Bentonite	**Bentonite seal:** 27-28 ft (8.2-8.5 m)
28 – 44 ft (8 – 13.5 m)		Brown sand and gravel with some silt. Loose. Moist. (SM)	Backfill	**Backfill:** 28-45 ft (8.5-13.7 m) With clean sand or natural material.
44 – 45 ft (13.5 – 14 m)		Brown sand and gravel with silt. Dry to Moist. (SM)		**End of Hole:** Hole drilling to 45 ft (13.7 m)

Coordinates: E 378340 N 5894537

Static Water Level: Dry

Elevation: 1402 masl

Depth: 45 ft (13.7 m)

Drawn By: Anthony Friesen Checked By: Bryer Manwell

Drilling Contractor: MudBay (Stephen McAllister)

Drilling Method: DB320-01 (Sonic Drilling)

Date of Completion: July 17, 2013

Logged By: Bryer Manwell

Bore Hole ID: RIB-BH04 **Client: NewGold - Blackwater**

Project: Feasibility-Waste Water **Project Number: 13-019-02**

Location: On the L Trail, 46 m west of RIB

western water ASSOCIATES LTD

Depth Below Ground Surface (ft / m)	Depth (ft)	Symbol	Lithology
0 / 0			Ground Surface
0 – 6 / 0 – 2	0-6'		Brown silt with sand and gravel. Dense. Moist. (ML)
6 – 10 / 2 – 4	6-10'		Brown medium sand. Clean. Moist. (SP)
10 – 12 / 4	10-12'		Brown silt sand and gravel. Moist. (ML)
12 – 20 / 4 – 6	12-20'		Brown medium to coarse sand. Clean. Loose. Moist. (SP)
20 – 23 / 6 – 8	20-23'		Brown fine sand and silt. Dense. Moist. (SM)
23 – 25 / 8	23-25'		Brown medium to coarse sand. Clean. Loose. Moist. (SP)
25 – 29 / 8 – 10	25-29'		Grey silt sand and gravel. Loose. Dry. (ML)
29 – 34 / 10	29-34'		Brown sand and gravel with some silt. Moist. (GM)
34 / 10			Boulder
35 – 39 / 10 – 12	35-39'		Grey silt with sand and gravel. Boulder. Loose. Dry. (ML)
39 – 49 / 12 – 14	39-49'		Grey boulders with gravel silt and sand. (GW)
50 – 52 / 14			

Coordinates: E 378299 **N 5894515**

Depth: 49 ft (14.9 m)

Elevation: 1397 masl

Logged By: Bryer Manwell

Drawn By: Anthony Friesen **Checked By: Bryer Manwell**

Drilling Contractor: Mudbay (Stephen McAllister)

Drilling Method: DB 320-01 (Sonic Drilling)

Date of Completion: July 18, 2013

Bore Hole ID: RIB-BH05 **Client: NewGold - Blackwater**

Project: Feasibility-Waste Water **Project Number: 13-019-02**

Location: On the L Trail, 74 m west of RIB

western water ASSOCIATES LTD

Depth Below Ground Surface	Depth (ft)	Symbol	Lithology
ft / m			Ground Surface
0–10 ft / 0–2 m	0-10'		Brown silt, sand and gravel. Compact. Moist. (ML)
10–15 ft / 2–4 m	10-15'		Brown coarse sand and gravel with fines. Loose. Moist. (SM)
15–18 ft / 4–6 m	15-18'		Grey silt and sand. Layers of compact and layers of loose. (ML)
18–22 ft / 6–6 m	18-22'		Grey silt and sand.Compact. Dry (ML)
22 ft			Red boulder
22.5–27 ft / 6–8 m	22.5-27'		Brown coarse sand and gravel with trace silt. Loose. Moist. (SW)
27–31 ft / 8–10 m	27-31'		Grey silt with trace sand and gravel. Compact. Dry. (ML)
31–37 ft / 10–12 m	31-37'		Brown medium to coarse sand with fines and gravel. Loose. Moist. (SM)
37–40 ft / 12–12 m	37-40'		Gray silt with trace sand and gravel. Dry. (ML)
40–45 ft / 12–14 m	40-45'		Grey silt with sand and gravel. Moist. (ML)
45–49 ft / 14–14 m	45-49'		Grey sand silt and gravel. (SW)
49–52 ft / 14–16 m			

Coordinates: E 378269 **N 5894517**

Depth: 49 ft (14.9 m)

Elevation: 1400 masl

Logged By: Bryer Manwell

Drawn By: Anthony Friesen **Checked By: Bryer Manwell**

Drilling Contractor: Mudbay (Stephen McAllister)

Drilling Method: DB320-01 (Sonic Drilling)

Date of Completion: July 18, 2013

Monitoring Well ID: MW13-01 **Client: NewGold - Blackwater**
Project: Feasibility-Waste Water **Project Number: 13-019-02**
Location: On the L Trail, 353 m southwest, up gradient of RIB.

western water ASSOCIATES LTD

Depth Below Ground Surface	Symbol	Lithology	Well Construction	Well Completion Details

ft / m

Ground Surface

Grey/brown silt with fine sand. Moist. (MH)

Brown silt with clay. Extremely compact. Moist. (CL)

Brown sand, silt and gravel. Loose. Moist. (SW)

Brown silt with trace sand and gravel. Loose. Dry. (SM)

Brown to grey sand and gravel with some sand. Moist. (SW)

Brown to grey silt. Hard compact. (ML)

Brown silt sand and gravel coarsing downward. Alternating moist and dry. (GW)

Brown to grey silt. Hard compact. (ML)

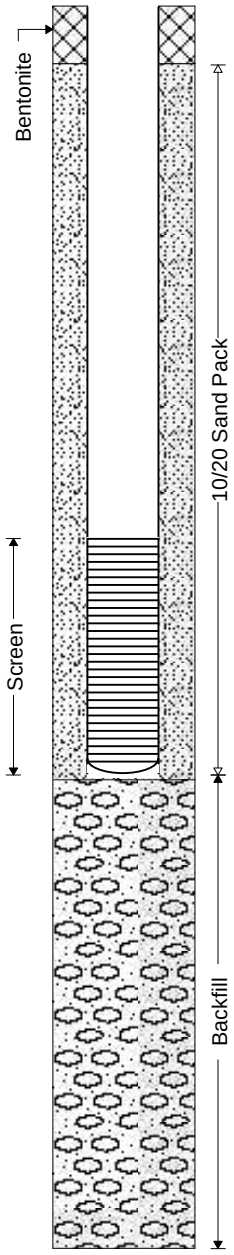
Brown sand silt and gravel. (GW)

Brown silt with sand and some gravel. (ML)

Brown sand, gravel and silt. Slightly cleaner. Moist. (SW)

Brown silt with sand and some gravel. (ML)

Brown silt sand and gravel. Loose. Dry. (SW)



Casing Stick-up:
0.83 ft (0.25 m)

Static Water Level:
Dry throughout

Surface Seal:
Hydrated Bentonite to 5 ft (1.5 m)

2' Schedule 40 PVC blank:
0-45 ft (0-13.7 m)

10 Slot Screen:
45-65 ft (13.7-19.8 m)

10/20 Sand pack:
0-65 ft (0-19.8 m)

Backfill:
backfilled from 65-105 ft (19.8-32 m)
Clean sand and natural material.

End of Hole:
Hole drilling to 105 ft (32 m)

Coordinates: E 378036 N 5894360
Static Water Level: Dry
Elevation: 1408 masl
Depth: 65 ft (19.8 m)
Drawn By: Anthony Friesen Checked By: Bryer Manwell

Drilling Contractor: Mudbay (Stephen McAllister)
Drilling Method: DB320-01 (Sonic Drilling)
Date of Completion: July 17, 2013
Logged By: Bryer Manwell

Monitoring Well ID: MW13-02 **Client: NewGold - Blackwater**
Project: Feasibility-Waste Water **Project Number: 13-019-02**
Location: On L Trail, 448 m north and down gradient of RIB

western water ASSOCIATES LTD

Depth Below Ground Surface	Symbol	Lithology	Well Construction	Well Completion Details

ft / m

Ground Surface

0 – 0 — Brown silt with sand and some gravel. Dense. Moist. (ML)

5 – 5 — Brown silt. Very Dense. (ML)

10 – 10 — Brown sand with some silt and trace gravel. Loose. Moist. (SW)

40 — Brown Silt . Dense. (ML)

45 – 15 — Brown silt, sand and gravel. Loose. Moist. (ML)

50 — Brown sand, silt and gravel. Loose. Moist. (SW)

65 – 20

70 — Brown sand with silt. Dense. Moist. (SM)

75 — Brown sand with some silt and trace gravel. Loose. Moist. (SW)

80 – 25

90 — Brown silt. Dense. (ML)

95 — Brown fine sand with some silt. Wet. (SW)

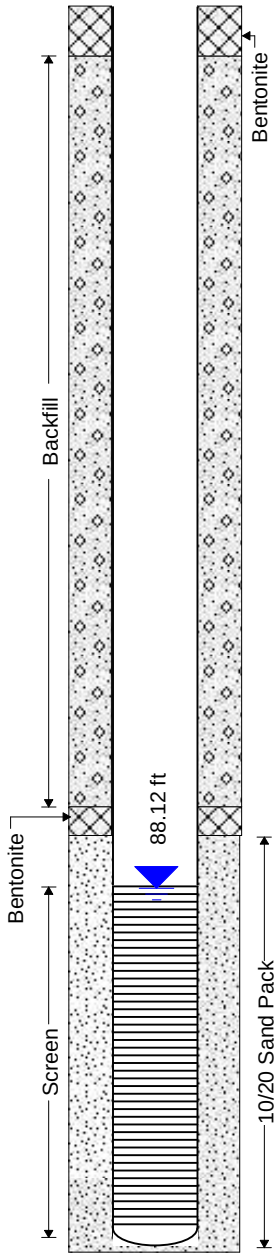
100 – 30

115 – 35

120

125

130



Casing Stick-up:
2.3 ft (0.7 m)

Surface Seal:
Hydrated Bentonite to 5 ft (1.5 m)

Static Water Level:
88.1ft (26.8 m)

Backfill:
Backfilled from 5-80 ft (1.5-24.3 m)
Clean sand and natural material.

2" PVC Blank Liner:
0-88 ft (0-26.8 m)

2" 10 Slot PVC Screen:
88-123 ft (26.8-37.5 m)

Bentonite Seal:
80-83 ft (24.3-25.3 m)

10/20 Sand pack:
83-123 ft (25.3-37.5 m)

End of Hole:
Hole drilling to 123 ft (37.5 m)

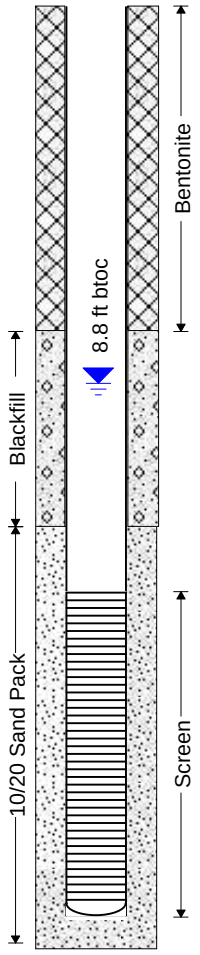
Coordinates: E 378375 N 5894701
Static Water Level: 88.1 ft (26.8 m) btoc
Elevation: 1330 masl
Depth: 123 ft (37.5 m)
Drawn By: Anthony Friesen Checked By: Bryer Manwell

Drilling Contractor: Mudbay (Stephen McAllister)
Drilling Method: DB320-01 (Sonic Drilling)
Date of Completion: July 19, 2013
Logged By: Bryer Manwell

Monitoring Well ID: MW13-03 **Client: NewGold - Blackwater**
Project: Feasibility-Waste Water **Project Number: 13-019-02**
Location: On L Trail, 720 m northwest downslope/cross gradient of RIB

western water ASSOCIATES LTD

Depth Below Ground Surface	Symbol	Lithology	Well Construction	Well Completion Details
ft / m		Ground Surface		
0 – 14 ft (0 – 4.3 m)		Brown sand and gravel with some silt and boulders. Wet. (GW)		



Casing Stick-up:
2.62 ft (0.80 m)

Surface Seal:
Hydrated Bentonite to
5 ft (1.52 m)

Static Water Level:
8.8 ft (2.7 m) btoc

Backfill:
5-8 ft (1.5-2.4 m)
With clean sand or natural material.

2' Schedule 40 PVC Blank:
0-9 ft (0-2.7 m)

10 Slot Screen:
9-14 ft (2.7-4.2 m)

10/20 Sand pack:
8-14 ft (2.4-4.3 m)

End of Hole:
Hole drilling to 14 ft (4.3 m)

Coordinates: E 377789 N 5894999
Static Water Level: 8.8 ft (2.7 m) btoc
Elevation: 1311 masl
Depth: 14 ft (4.3 m)
Drawn By: Anthony Friesen Checked By: Bryer Manwell

Drilling Contractor: Mudbay (Stephen McAllister)
Drilling Method: DB320-01 (Sonic Drilling)
Date of Completion: July 21, 2013
Logged By: Bryer Manwell

Monitoring Well ID: MW13-04 **Client: NewGold - Blackwater**
Project: Feasibility-Waste Water **Project Number: 13-019-02**
Location: On L Trail, in wetlands 900 m north, down gradient of RIB

western water ASSOCIATES LTD

Depth Below Ground Surface	Symbol	Lithology	Well Construction	Well Completion Details

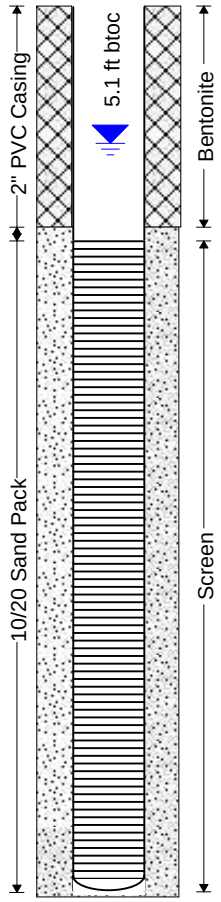
ft / m

Ground Surface

Brown sandy silt with some gravel. Loose. Wet. (GW)

Brown sand lense. Wet, ground water flow. (SP)

Brown sandy silt with some gravel. Loose. Wet. (GW)



Casing Stick-up:
2.72 ft (0.83 m)

Static Water Level:
5.1 ft (1.6 m) btoc

Surface Seal:
Hydrated Bentonite to
3 ft (1.0 m)

2' Schedule 40 PVC blank:
0-3.6 ft (0-1.1 m)

10 Slot screen:
3.6-13.6 ft (1.1-4.1 m)

10/20 Sand pack:
3-13.6 ft (1-4.1 m)

End of hole:
Hole drilling to 13.6 ft (4.1 m)

Coordinates: E 378535 N 5895406
Static Water Level: 5.11 ft (1.6 m) btoc
Elevation: 1279 masl
Depth: 13.6 ft (4.1 m)
Drawn By: Anthony Friesen Checked By: Bryer Manwell

Drilling Contractor: Mudbay (Stephen McAllister)
Drilling Method: DB320-01 (Sonic Drilling)
Date of Completion: July 20, 2013
Logged By: Bryer Manwell

Appendix C

Calculation of Hydraulic Conductivity

Data Set: E:\MW13-02 Final K values.aqt
Date: 08/29/13
Time: 07:42:54

PROJECT INFORMATION

Company: WWAL
Client: NewGold
Project: 13-019-02
Location: Blackwater
Test Date: 21-July-13
Test Well: MW13-02 pumping test

AQUIFER DATA

Saturated Thickness: 12. m
Anisotropy Ratio (Kz/Kr): 1.

PUMPING WELL DATA

No. of pumping wells: 1

Pumping Well No. 1: MW13-02

X Location: 0. m
Y Location: 0. m

Casing Radius: 0.025 m
Well Radius: 0.025 m

Fully Penetrating Well

No. of pumping periods: 261

Pumping Period Data

Time (min)	Rate (gal/min)	Time (min)	Rate (gal/min)
1.	0.3521	132.	0.
2.	0.3521	133.	0.
3.	0.3521	134.	0.
4.	0.3521	135.	0.
5.	0.3521	136.	0.
6.	0.3521	137.	0.
7.	0.3521	138.	0.
8.	0.3521	139.	0.
9.	0.3521	140.	0.
10.	0.3521	141.	0.
11.	0.3521	142.	0.
12.	0.3521	143.	0.
13.	0.3521	144.	0.
14.	0.3521	145.	0.
15.	0.3521	146.	0.
16.	0.3521	147.	0.
17.	0.3521	148.	0.
18.	0.3521	149.	0.

Time (min)	Rate (gal/min)	Time (min)	Rate (gal/min)
19.	0.3521	150.	0.
20.	0.3521	151.	0.
21.	0.3521	152.	0.
22.	0.3521	153.	0.
23.	0.3521	154.	0.
24.	0.3521	155.	0.
25.	0.3521	156.	0.
26.	0.3521	157.	0.
27.	0.3521	158.	0.
28.	0.3521	159.	0.
29.	0.3521	160.	0.
30.	0.3521	161.	0.
31.	0.3521	162.	0.
32.	0.3521	163.	0.
33.	0.3521	164.	0.
34.	0.3521	165.	0.
35.	0.3521	166.	0.
36.	0.3521	167.	0.
37.	0.3521	168.	0.
38.	0.3521	169.	0.
39.	0.3521	170.	0.
40.	0.3521	171.	0.
41.	0.3521	172.	0.
42.	0.3521	173.	0.
43.	0.3521	174.	0.
44.	0.3521	175.	0.
45.	0.3521	176.	0.
46.	0.3521	177.	0.
47.	0.3521	178.	0.
48.	0.3521	179.	0.
49.	0.3521	180.	0.
50.	0.3521	181.	0.
51.	0.3521	182.	0.
52.	0.3521	183.	0.
53.	0.3521	184.	0.
54.	0.3521	185.	0.
55.	0.3521	186.	0.
56.	0.3521	187.	0.
57.	0.3521	188.	0.
58.	0.3521	189.	0.
59.	0.3521	190.	0.
60.	0.3521	191.	0.
61.	0.3521	192.	0.
62.	0.3521	193.	0.
63.	0.3521	194.	0.
64.	0.3521	195.	0.
65.	0.3521	196.	0.
66.	0.3521	197.	0.
67.	0.3521	198.	0.
68.	0.3521	199.	0.
69.	0.3521	200.	0.
70.	0.3521	201.	0.
71.	0.3521	202.	0.

Time (min)	Rate (gal/min)	Time (min)	Rate (gal/min)
72.	0.3521	203.	0.
73.	0.3521	204.	0.
74.	0.3521	205.	0.
75.	0.3521	206.	0.
76.	0.3521	207.	0.
77.	0.3521	208.	0.
78.	0.3521	209.	0.
79.	0.3521	210.	0.
80.	0.3521	211.	0.
81.	0.3521	212.	0.
82.	0.3521	213.	0.
83.	0.3521	214.	0.
84.	0.3521	215.	0.
85.	0.3521	216.	0.
86.	0.3521	217.	0.
87.	0.3521	218.	0.
88.	0.	219.	0.
89.	0.	220.	0.
90.	0.	221.	0.
91.	0.	222.	0.
92.	0.	223.	0.
93.	0.	224.	0.
94.	0.	225.	0.
95.	0.	226.	0.
96.	0.	227.	0.
97.	0.	228.	0.
98.	0.	229.	0.
99.	0.	230.	0.
100.	0.	231.	0.
101.	0.	232.	0.
102.	0.	233.	0.
103.	0.	234.	0.
104.	0.	235.	0.
105.	0.	236.	0.
106.	0.	237.	0.
107.	0.	238.	0.
108.	0.	239.	0.
109.	0.	240.	0.
110.	0.	241.	0.
111.	0.	242.	0.
112.	0.	243.	0.
113.	0.	244.	0.
114.	0.	245.	0.
115.	0.	246.	0.
116.	0.	247.	0.
117.	0.	248.	0.
118.	0.	249.	0.
119.	0.	250.	0.
120.	0.	251.	0.
121.	0.	252.	0.
122.	0.	253.	0.
123.	0.	254.	0.
124.	0.	255.	0.

Time (min)	Rate (gal/min)	Time (min)	Rate (gal/min)
125.	0.	256.	0.
126.	0.	257.	0.
127.	0.	258.	0.
128.	0.	259.	0.
129.	0.	260.	0.
130.	0.	261.	0.
131.	0.		

OBSERVATION WELL DATA

No. of observation wells: 1

Observation Well No. 1: MW13-02

X Location: 0. m
Y Location: 0. m

Radial distance from MW13-02: 0. m

Piezometer
Piezometer Depth: 0. m

No. of Observations: 261

Observation Data

Time (min)	Displacement (m)	Time (min)	Displacement (m)
1.	0.	132.	0.094
2.	0.016	133.	0.093
3.	0.041	134.	0.092
4.	0.056	135.	0.092
5.	0.071	136.	0.091
6.	0.084	137.	0.089
7.	0.097	138.	0.09
8.	0.11	139.	0.089
9.	0.123	140.	0.088
10.	0.137	141.	0.088
11.	0.151	142.	0.088
12.	0.166	143.	0.086
13.	0.18	144.	0.085
14.	0.193	145.	0.085
15.	0.207	146.	0.085
16.	0.22	147.	0.084
17.	0.233	148.	0.083
18.	0.197	149.	0.083
19.	0.211	150.	0.083
20.	0.209	151.	0.083
21.	0.225	152.	0.082
22.	0.243	153.	0.082
23.	0.261	154.	0.081
24.	0.275	155.	0.081
25.	0.29	156.	0.081
26.	0.304	157.	0.08
27.	0.318	158.	0.08

Time (min)	Displacement (m)	Time (min)	Displacement (m)
28.	0.333	159.	0.08
29.	0.347	160.	0.079
30.	0.361	161.	0.079
31.	0.373	162.	0.079
32.	0.383	163.	0.079
33.	0.391	164.	0.078
34.	0.397	165.	0.079
35.	0.406	166.	0.078
36.	0.411	167.	0.078
37.	0.417	168.	0.078
38.	0.422	169.	0.078
39.	0.428	170.	0.077
40.	0.433	171.	0.077
41.	0.437	172.	0.076
42.	0.442	173.	0.076
43.	0.445	174.	0.076
44.	0.448	175.	0.076
45.	0.45	176.	0.075
46.	0.453	177.	0.076
47.	0.457	178.	0.075
48.	0.461	179.	0.075
49.	0.462	180.	0.075
50.	0.466	181.	0.075
51.	0.471	182.	0.075
52.	0.474	183.	0.074
53.	0.481	184.	0.073
54.	0.484	185.	0.074
55.	0.487	186.	0.074
56.	0.491	187.	0.074
57.	0.495	188.	0.074
58.	0.5	189.	0.073
59.	0.505	190.	0.074
60.	0.508	191.	0.074
61.	0.512	192.	0.073
62.	0.516	193.	0.073
63.	0.518	194.	0.073
64.	0.521	195.	0.073
65.	0.523	196.	0.072
66.	0.526	197.	0.073
67.	0.53	198.	0.073
68.	0.533	199.	0.072
69.	0.534	200.	0.072
70.	0.536	201.	0.073
71.	0.539	202.	0.073
72.	0.542	203.	0.074
73.	0.545	204.	0.072
74.	0.547	205.	0.073
75.	0.547	206.	0.072
76.	0.548	207.	0.072
77.	0.551	208.	0.072
78.	0.552	209.	0.072
79.	0.554	210.	0.072
80.	0.554	211.	0.071

Time (min)	Displacement (m)	Time (min)	Displacement (m)
81.	0.558	212.	0.071
82.	0.563	213.	0.071
83.	0.566	214.	0.071
84.	0.566	215.	0.07
85.	0.569	216.	0.071
86.	0.572	217.	0.07
87.	0.573	218.	0.07
88.	0.477	219.	0.07
89.	0.413	220.	0.069
90.	0.371	221.	0.07
91.	0.336	222.	0.071
92.	0.305	223.	0.072
93.	0.282	224.	0.071
94.	0.262	225.	0.07
95.	0.245	226.	0.07
96.	0.231	227.	0.071
97.	0.218	228.	0.071
98.	0.207	229.	0.071
99.	0.197	230.	0.07
100.	0.188	231.	0.07
101.	0.18	232.	0.07
102.	0.172	233.	0.07
103.	0.166	234.	0.07
104.	0.16	235.	0.07
105.	0.156	236.	0.07
106.	0.152	237.	0.07
107.	0.147	238.	0.071
108.	0.142	239.	0.07
109.	0.138	240.	0.071
110.	0.135	241.	0.07
111.	0.132	242.	0.071
112.	0.129	243.	0.071
113.	0.126	244.	0.071
114.	0.123	245.	0.071
115.	0.121	246.	0.071
116.	0.119	247.	0.071
117.	0.116	248.	0.07
118.	0.114	249.	0.07
119.	0.112	250.	0.07
120.	0.109	251.	0.07
121.	0.108	252.	0.07
122.	0.107	253.	0.069
123.	0.104	254.	0.07
124.	0.103	255.	0.07
125.	0.102	256.	0.07
126.	0.101	257.	0.07
127.	0.099	258.	0.069
128.	0.099	259.	0.069
129.	0.098	260.	0.069
130.	0.096	261.	0.069
131.	0.095		

SOLUTION

Pumping Test
Aquifer Model: Unconfined
Solution Method: Cooper-Jacob

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	0.1221	cm^2/sec
S	8.117E-5	

K = T/b = 0.0001018 cm/sec
Ss = S/b = 6.764E-6 1/m

MW13-03 K-Value calculations using Bouwer Rice Slug-Test Method

Equation Used $K=(r^2((\ln R_e/R)/2L_e)*(1/t)*(\ln(H_o/H_t))$

All of these variable are the same for all tests	r=radius of well casing (m)
	R=radius of the sreen
	Re=effective radius of the of which the head is dissipated (m)
	Le= length of screen (m)
	t= time in seconds of measurement of Ht
	Ho=initial draw down (m)
	Ht=drawdraw at t (m)

Common Variables	
rc	0.025
Re	0.5
R	0.025
Le	1.524
1/t	0.2
Slug-Test 1	
Ho	2.966
Ht	2.929
K (m/sec)	1.50E-06
Slug Test 2	
Ho	2.961
Ht	2.922
K (m/sec)	1.60E-06
Test 3	
Ho	2.954
Ht	2.915
K (m/sec)	1.60E-06

Bower Rice slug-Test Excel Calculations

Variables	Values	Answer
rc	0.025	1.63E-06 m/sec
Re	0.5	
R	0.025	
Le	1.524	
Ho	2.954	
Ht	2.915	
1/t	0.2	

MW13-03/MW13-04 K-Value calculations using Bouwer Rice Slug-Test Method

Equation Used $K=(r^2((\ln R_e/R)/2L_e)*(1/t)*(\ln(H_o/H_t))$

All of these variable are the same for all MW13-03	r=radius of well casing (m)
	R=radius of the sreen
	Re=effective radius of the of which the head is dissipated (m)
	Le= length of screen (m)
	t= time in seconds of measurement of Ht
	Ho=initial draw down (m)
	Ht=drawdraw at t (m)

Common Variables for test 1-3	
rc	0.025
Re	0.5
R	0.025
Le	1.524
1/t	0.2
Slug-Test 1	
Ho	2.966
Ht	2.929
K (m/sec)	**1.50E-06**
Slug Test 2	
Ho	2.961
Ht	2.922
K (m/sec)	**1.60E-06**
Test 3	
Ho	2.954
Ht	2.915
K (m/sec)	**1.60E-06**

Variables for MW13-04	
rc	0.025
Re	0.5
R	0.025
Le	3
1/t	0.0057471
Ho	2.01
Ht	1.69
K (m/sec)	**8.30E-06**

slug-Test Excel Calculation

Variables	Values
rc	0.025
Re	0.5
R	0.05
Le	3
Ho	2.01
Ht	1.69
1/t	0.0057471

Answer
8.32E-06 m/sec

Appendix D

Site Plan Drawings (to come from ODK)

Appendix E

Water Quality Reports

Blackwater
Water Quality Results

Analyte	Unit	Guideline			Sampling Location	RIB MW13-02	RIB MW13-03	RIB MW13-04	RIB SW-01	RIB SW-02
					Date Sampled	21-Jul-13	21-Jul-13	21-Jul-13	21-Jul-13	21-Jul-13
					Lab ID	3071518-01	3071518-02	3071518-03	3071518-04	3071518-05
					Sample Type					
		BCAWQG AL	GCDWQ MAC	GCDWQ AO						
Lab Results										
General										
Alkalinity (total, as CaCO3)	mg/L	NG	NG	NG		54	36	38	8	22
Biochemical oxygen demand	mg/L	NG	NG	NG		<10	<10	<10	<10	<10
Chloride	mg/L	600 [1.13]	NG	250		0.39	0.63	0.71	<0.10	0.64
Colour	CU	N [1.14]	NG	15		<5	**48**	**150**	**54**	**42**
Conductivity	µS/cm	NG	NG	NG		118	72	163	25	51
Cyanide (total)	mg/L	NG	0.2 [2.1]	NG						
Fluoride	mg/L	Calc [1.15]	1.5	NG		0.16	<0.10	<0.10	<0.10	<0.10
Hardness, total (dissolved as CaCO3)	mg/L	NG	NG	NG		48.9	32.2	82.4	9.3	18.7
Hardness, Total (total as CaCO3)	mg/L	NG	NG	NG		51.2	37.6	123	8.6	18
pH		N [1.16]	NG	6.5 - 8.5		7.87	6.83	7.1	7.06	7.46
Sulphate	mg/L	Calc [1.17]	NG	500 [3.3]		4	1.7	33.8	<1.0	1.7
Total dissolved solids	mg/L	NG	NG	500		160	220	142	27	42
Total organic carbon	mg/L	N [1.18]	NG	NG		<0.5	14.9	26.2	15.3	10.8
Total suspended solids	mg/L	N [1.19]	NG	NG		46	3820	101	<1	<1
Turbidity	NTU	N [1.20]	N [2.2]	NG		21.7	>4000	287	0.7	0.9
UV transmittance at 254 nm	%	NG	NG	NG		98.3	69.4	25.7	43.5	53.3
Microbiological										
Background Bacteria	CFU/100 mL	NG	NG	NG		>200	>200		>200	>200
E. coli (counts)	CFU/100 mL	N [1.21]	0 [2.3]	NG		<1	<1		<1	<1
E. coli (MPN / PA)	MPN/100 mL	N [1.22]	0 [2.4]	NG				<3.0		
Fecal coliforms (counts)	CFU/100 mL	N [1.23]	0 [2.5]	NG		<1	<1		<1	<1
Fecal coliforms (MPN / PA)	MPN/100 mL	N [1.24]	0 [2.6]	NG				<3.0		
Total coliforms (counts)	CFU/100 mL	NG	0 [2.7]	NG		**>63**	**2400**		**370**	**190**
Total coliforms (MPN / PA)	MPN/100 mL	NG	0 [2.8]	NG				**46000**		
Nutrients										
Ammonia (total, as N)	mg/L	Calc [1.25]	NG	NG		0.037	0.7	0.329	<0.020	0.02
Nitrate (as N)	mg/L	32.8 [1.26]	10	NG		0.07	0.03	<0.010	0.017	<0.010
Nitrate + Nitrite (as N) (calculated)	mg/L	32.8 [1.27]	10 [2.9]	NG		0.07	0.03	<0.014	0.017	<0.014
Nitrite (as N)	mg/L	Calc [1.28]	1	NG		<0.010	<0.010	<0.010	<0.010	<0.010
Orthophosphate (dissolved, as P)	mg/L	NG	NG	NG		<0.01	0.04	<0.01	<0.01	<0.01
Phosphorus (dissolved, by ICPMS/ICPOES)	mg/L	N [1.29]	NG	NG		<0.2	<0.2	<0.2	<0.2	<0.2
Phosphorus (total, by ICPMS/ICPOES)	mg/L	N [1.30]	NG	NG		<0.2	0.2	0.6	<0.2	<0.2
Phosphorus (dissolved, APHA 4500-P)	mg/L	N [1.31]	NG	NG		<0.01	0.07	0.08	0.03	0.03
Potassium (dissolved)	mg/L	NG	NG	NG		0.6	1.8	2.7	<0.2	<0.2
Potassium (total)	mg/L	NG	NG	NG		0.8	1.6	3.3	<0.2	<0.2
Dissolved Metals										
Aluminum (dissolved)	mg/L	Calc [1.1]	NG	N [3.1]		0.08	5.83	12	0.11	0.12
Antimony (dissolved)	mg/L	NG	0.006	NG		0.001	0.001	0.001	<0.001	<0.001
Arsenic (dissolved)	mg/L	0.005 [1.2]	0.01	NG		<0.005	0.006	0.009	<0.005	<0.005
Barium (dissolved)	mg/L	NG	1	NG		<0.05	<0.05	0.13	<0.05	<0.05
Beryllium (dissolved)	mg/L	NG	NG	NG		<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth (dissolved)	mg/L	NG	NG	NG		<0.001	<0.001	<0.001	<0.001	<0.001
Boron (dissolved)	mg/L	1.2 [1.3]	5	NG		<0.04	<0.04	<0.04	<0.04	<0.04
Cadmium (dissolved)	mg/L	NG	0.005	NG		<0.0001	<0.0001	0.0002	<0.0001	<0.0001
Calcium (dissolved)	mg/L	NG	NG	NG		14	9	22	3	5
Chromium (dissolved)	mg/L	NG	0.05	NG		<0.005	0.005	0.009	<0.005	<0.005
Cobalt (dissolved)	mg/L	0.110 [1.4]	NG	NG		<0.0005	0.0012	0.0066	<0.0005	<0.0005
Copper (dissolved)	mg/L	Calc [1.5]	NG	1		<0.002	0.002	0.01	<0.002	<0.002
Iron (dissolved)	mg/L	0.35	NG	0.3		<0.1	**3**	**8.6**	0.2	<0.1
Lead (dissolved)	mg/L	Calc [1.6]	0.01	NG		<0.001	0.005	0.006	<0.001	<0.001
Lithium (dissolved)	mg/L	NG	NG	NG		<0.001	0.002	0.004	<0.001	<0.001
Magnesium (dissolved)	mg/L	NG	NG	NG		3.3	2.6	6.9	0.7	1.3
Manganese (dissolved)	mg/L	Calc [1.7]	NG	0.05		**0.076**	**0.113**	**0.678**	0.007	0.003
Mercury (dissolved)	mg/L	0.000020 [1.8]	0.001	NG		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum (dissolved)	mg/L	2 [1.9]	NG	NG		0.002	<0.001	<0.001	<0.001	<0.001
Nickel (dissolved)	mg/L	NG	NG	NG		<0.002	0.004	0.018	<0.002	<0.002
Selenium (dissolved)	mg/L	0.0020 [1.10]	0.01	NG		<0.005	<0.005	<0.005	<0.005	<0.005
Silicon (dissolved, as Si)	mg/L	NG	NG	NG		6	16	28	<5	5
Silver (dissolved)	mg/L	Calc [1.11]	NG	NG		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Sodium (dissolved)	mg/L	NG	NG	200 [3.2]		4.2	3.5	4.6	1.3	2.9
Strontium (dissolved)	mg/L	NG	NG	NG		0.06	0.07	0.11	0.02	0.04
Sulphur (dissolved)	mg/L	NG	NG	NG		<10	<10	<10	<10	<10
Tellurium (dissolved)	mg/L	NG	NG	NG		<0.002	<0.002	<0.002	<0.002	<0.002
Thallium (dissolved)	mg/L	NG	NG	NG		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thorium (dissolved)	mg/L	NG	NG	NG		<0.001	<0.001	<0.001	<0.001	<0.001
Tin (dissolved)	mg/L	NG	NG	NG		<0.002	<0.002	<0.002	<0.002	<0.002
Titanium (dissolved)	mg/L	NG	NG	NG		<0.05	0.19	0.45	<0.05	<0.05
Uranium (dissolved)	mg/L	NG	0.02	NG		0.0003	0.0016	0.0012	<0.0002	<0.0002
Vanadium (dissolved)	mg/L	NG	NG	NG		<0.01	<0.01	0.02	<0.01	<0.01
Zinc (dissolved)	mg/L	Calc [1.12]	NG	5		<0.04	0.05	0.04	<0.04	<0.04
Zirconium (dissolved)	mg/L	NG	NG	NG		<0.001	0.006	0.018	<0.001	<0.001

Legend for Reports for Blackwater Water Quality Results

<	Less than reported detection limit
>	Greater than reported upper detection limit
A	Absent
BCAWQG AL	BC Approved Water Quality Guidelines for freshwater aquatic life
Calc	Calculated guideline or standard. The guideline or standard is dependent on the value of one or more other analytes, and is calculated from a formula or table.
GCDWQ AO	Guidelines for Canadian Drinking Water Quality - Aesthetic Objectives
GCDWQ MAC	Guidelines for Canadian Drinking Water Quality - Maximum Acceptable Concentrations
L	Laboratory reading type (Lab result)
m asl	metres above sea level
N	Narrative type of guideline or standard, or Result Note.
ND	Non-detect. Result is less than lower detection limit.
NG	No Guideline
NR	No Result
NS	No Standard
NT	Not Tested
OG	Overgrown
P	Present
PR	Presumptive
TK	Test kit reading type (Field result)
TNTC	Too numerous to count
	Highlighted value has a reported detection limit that is greater than the guideline or standard maximum.
BCAWQG AL	Highlighted value exceeds BCAWQG AL
GCDWQ AO	Highlighted value exceeds GCDWQ AO
GCDWQ MAC	Highlighted value exceeds GCDWQ MAC

Guideline Notes for Reports for Blackwater Water Quality Results

1. Notes for BC Approved Water Quality Guidelines for freshwater aquatic life (BCAWQG AL)
General Notes:
The Water Quality Guidelines (Criteria) Reports by BC Ministry of Environment were used as references for the guidelines. (Internet address: http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html). Overview Reports (BC MOE) were used as the references for the guidelines unless the note for specific analyte indicates that the Technical Appendix (BC MOE) was used. / For some parameters, guidelines are specified as two values: the maximum value or the acute criterion, and the 30-day average value or the chronic criterion. The maximum value was used in this report for parameters that have both guideline values.
Note 1.1 for Aluminum (dissolved):
The maximum concentration of dissolved aluminum at any time should not exceed:
1. 0.10 mg/L when the pH is greater than or equal to 6.5
2. The value (in mg/L) determined by the following relationship if pH less than 6.5
Dissolved Aluminum = e (1.209-2.426 (pH) + 0.286 $(pH)^2$)
The 30-day average concentration of dissolved aluminum (based on a minimum of 5 approximately weekly samples) should not exceed:
1. 0.05 mg/L when the median pH over 30 days is greater than or equal to 6.5
2. the value determined by the following relationship at median pH less than 6.5
Dissolved Aluminum = e (1.6-3.327 (median pH) + 0.402 (median $pH)^2$)
Note 1.2 for Arsenic (dissolved):
The recommended guideline is for total arsenic.
Note 1.3 for Boron (dissolved):
The recommended guideline is for total boron.
Note 1.4 for Cobalt (dissolved):
The interim maximum concentration for total cobalt is 110 µg/L to protect aquatic life in the freshwater environment from acute effects of cobalt.
The interim 30-day average concentration for total cobalt (based on five weekly samples) is 4 µg/L to protect aquatic life from chronic effects of cobalt.
Note 1.5 for Copper (dissolved):
The maximum concentration of total copper should not exceed at any time the numerical value (in µg/L) given by the formula "0.094(hardness)+2", where water hardness is reported as mg/L CaCO3.
The 30-day average concentration of total copper (based on a minimum of 5 approximately weekly samples) should not exceed 2 µg/L when average water hardness over the same period (expressed as mg/L CaCO3) is less than 50 mg/L. When average water hardness is greater than 50 mg/L the 30-day average concentration should not exceed the numerical value (in µg/L) given by the formula "0.04(average hardness)", where water hardness is reported as mg/L CaCO3.
Note 1.6 for Lead (dissolved):
The maximum guideline for total lead in water, at a water hardness less than or equal to 8 mg/L as CaCO3 is set at 3.0 µg/L. When water hardness exceeds 8.0 mg/L CaCO3 the maximum guideline for lead at any time is given by the following equation:
Maximum Criteria (µg/L) = exp (1.273 ln(hardness) - 1.460).
The 30-day average guideline for total lead in water, when water hardness exceeds 8 mg/L as CaCO3, is as follows:
30-Day Average (µg/L) is less than or equal to 3.31 + exp (1.273 ln (mean hardness) - 4.704).
For hardness less than or equal to 8.0 mg/L there is no 30-day average guideline; hence the maximum concentration of 3.0 µg/L is used.
Note 1.7 for Manganese (dissolved):
The maximum concentration of total manganese in mg/L at any time should not exceed the value as determined by the following relationship:
0.01102 hardness + 0.54
where water hardness is reported as mg/L of CaCO3.
The 30-day mean concentration of total manganese in mg/L should be less than or equal to the value as determined by the following relationship:
0.0044 hardness + 0.605
where water hardness is reported as mg/L of CaCO3.
Note 1.8 for Mercury (dissolved):
The average concentration of total mercury in water as measured over a 30-day period (based on five weekly samples) should not exceed 0.02 µg/L when the methyl mercury (MeHg) constitutes less than or equal to 0.5% of the total mercury concentration. When the proportion of MeHg is greater than 0.5%, the guideline should be adjusted as indicated in the Table 1 and Table 4 of the BC MOE Overview Report - First Update, February 2001.
There is no guideline maximum for total mercury in water, for freshwater aquatic life.
Note 1.9 for Molybdenum (dissolved):

The maximum concentration for total molybdenum is 2 mg/L.
The 30-day average concentration for total molybdenum (based on at least five weekly samples in a period of 30 days) is less than or equal to 1 mg/L.

Note 1.10 for Selenium (dissolved):
To protect freshwater aquatic life from adverse effects, the mean concentration of total selenium should not exceed 2 µg/L. The mean concentration in the water column is calculated based on at least 5 weekly samples taken over a 30-day period.

Note 1.11 for Silver (dissolved):
The guideline maximum for total silver is:
0.1 µg/L maximum if hardness less than or equal to 100 mg/L
3.0 µg/L maximum if hardness greater than 100 mg/L.
The guideline 30-day average for total silver is:
0.05 µg/L as 30-day mean if hardness less than or equal to 100 mg/L
1.5 µg/L as 30-day mean if hardness greater than 100 mg/L.

Note 1.12 for Zinc (dissolved):
The maximum concentration of total zinc (µg/L) at any time should not exceed 33 µg/L when water hardness is less than or equal to 90 mg/L as CaCO3.
When water hardness exceeds 90 mg/L CaCO3, the guideline maximum in µg/L for total zinc is the value determined by the following relationship:
33 + 0.75 * (hardness - 90)
where water hardness is reported as mg/L of CaCO3.
The 30-day average concentration of total zinc (µg/L) at any time should not exceed 7.5 µg/L when water hardness is less than or equal to 90 mg/L as CaCO3.
When water hardness exceeds 90 mg/L CaCO3, the guideline maximum in µg/L for total zinc is the value determined by the following relationship:
7.5 + 0.75 * (hardness - 90)
where water hardness is reported as mg/L of CaCO3.

Note 1.13 for Chloride:
To protect freshwater aquatic life from acute and lethal effects, the maximum concentration of chloride (mg/L as NaCl) at any time should not exceed 600 mg/L.
To protect freshwater aquatic life from chronic effects, the average (arithmetic mean computed from five weekly samples collected over a 30-day period) concentration of chloride (mg/L as NaCl) should not exceed 150 mg/L.

Note 1.14 for Colour:
30-day average true colour of filtered water samples shall not exceed background levels by more than 5 colour units in clearwater systems or 20% in coloured systems. See BC MOE Overview Report for additional details.

Note 1.15 for Fluoride:
Correction by BC MOE Sept. 2011: The criteria for Fluoride (total) in mg/L is 0.4 as a maximum where the water hardness (as CaCO3) is less than or equal to 10 mg/L. Otherwise use the equation:
LC50 fluoride = -51.73 + 92.57 log10 (Hardness) and multiply by 0.01.
Hardness is as CaCO3 in units mg/L.

Note 1.16 for pH:
pH less than 6.5: No statistically significant decrease in pH from background.
pH from 6.5 to 9.0: Unrestricted change permitted within this range.
pH over 9.0: No statistically significant increase in pH from background.
See BC MOE Overview Report for additional details.

Note 1.17 for Sulphate:
The approved 30-day average (minimum of 5 evenly-spaced samples collected in 30 days) water quality guidelines to protect aquatic life in BC for sulphate are:
128 mg/L at hardness of 0 to 30 mg/L as CaCO3
218 mg/L at hardness of 31 to 75 mg/L as CaCO3
309 mg/L at hardness of 76 to 180mg/L as CaCO3
429 mg/L at hardness 181 to 250 mg/L as CaCO3
Need to determine guideline based on site water for hardness greater than 250 mg/L as CaCO3.
For screening purposes in this report, exceedance were flagged for sulphate greater than 429 mg/L at hardness greater than 250 mg/L as CaCO3.

Note 1.18 for Total organic carbon:
Recommended guideline for total organic carbon (TOC) is 30-day median ± 20% of the median background concentration.

Note 1.19 for Total suspended solids:

Maximum Induced Suspended Sediments - mg/L or % of background:
- 25 mg/L in 24 hours when background is less than or equal to 25;
- Mean of 5 mg/L in 30 days when background is less than or equal to 25;
- 25 mg/L when background is between 25 and 250;
- 10% when background is greater than or equal to 250.

Note 1.20 for Turbidity:
When background is less than or equal to 8 NTU:
- Maximum Induced Turbidity of 8 NTU in 24 hours.
- For sediment inputs that last between 24 hours and 30 days (daily sampling preferred) the mean turbidity should not exceed background by more than 2 NTU.

Maximum Induced Turbidity of 5 NTU when background is between 8 and 50 NTU.
Maximum Induced Turbidity of 10% when background is greater than 50 NTU.

Note 1.21 for E. coli (counts):
The escherichia coli density in fresh and marine waters used for the growing and harvesting of shellfish for human consumption should not exceed a median MPN of 14/100 mL over 30 days, and at least 90% of the samples in a 30-day period should not exceed 43/100 mL.

Note 1.22 for E. coli (MPN / PA):
The escherichia coli density in fresh and marine waters used for the growing and harvesting of shellfish for human consumption should not exceed a median MPN of 14/100 mL over 30 days, and at least 90% of the samples in a 30-day period should not exceed 43/100 mL.

Note 1.23 for Fecal coliforms (counts):
The guideline for fecal coliforms is as follows: “The fecal coliform density in fresh and marine waters used for the growing and harvesting of shellfish for human consumption should not exceed a median MPN of 14/100 mL over 30 days, and at least 90% of the samples in a 30-day period should not exceed 43/100 mL.”

Note 1.24 for Fecal coliforms (MPN / PA):
The guideline for fecal coliforms is as follows: “The fecal coliform density in fresh and marine waters used for the growing and harvesting of shellfish for human consumption should not exceed a median MPN of 14/100 mL over 30 days, and at least 90% of the samples in a 30-day period should not exceed 43/100 mL.”

Note 1.25 for Ammonia (total, as N):
The maximum guideline for ammonia varies as a function of pH and temperature. See Table 3 in Overview Report Update September 2009.
The 30-day average guideline for ammonia varies as a function of pH and temperature. See Table 4 in Overview Report Update September 2009. / The lab pH and field temperature results were used for determining the maximum ammonia for this report. If a lab pH result was not available then the field pH result was used.

Note 1.26 for Nitrate (as N):
The guideline maximum for nitrate (as N) is 32.8 mg/l.
The 30-day average guideline for nitrate (as N) is 3.0 mg /L. The 30-day average (chronic) concentration is based on 5 weekly samples collected within a 30-day period.
Where nitrate and nitrite are present, the total nitrate+nitrite nitrogen should not exceed these values.

Note 1.27 for Nitrate + Nitrite (as N) (calculated):
The guideline maximum for nitrate (as N) is 32.8 mg/l.
The 30-day average guideline for nitrate (as N) is 3.0 mg /L. The 30-day average (chronic) concentration is based on 5 weekly samples collected within a 30-day period.
Where nitrate and nitrite are present, the total nitrate+nitrite nitrogen should not exceed these values.

Note 1.28 for Nitrite (as N):
The guideline maximum for nitrite as N is:
0.06 mg/L if chloride less than 2 mg/L
0.12 mg/L if chloride is 2 to 4 mg/L
0.18 mg/L if chloride is 4 to 6 mg/L
0.24 mg/L if chloride is 6 to 8 mg/L
0.30 mg/L if chloride is 8 to 10 mg/L
0.60 mg/L if chloride is greater than 10 mg/L.
The guideline 30-day average for nitrite as N is:
0.02 mg/L if chloride less than 2 mg/L
0.04 mg/L if chloride is 2 to 4 mg/L
0.06 mg/L if chloride is 4 to 6 mg/L
0.08 mg/L if chloride is 6 to 8 mg/L
0.10 mg/L if chloride is 8 to 10 mg/L
0.20 mg/L if chloride is greater than 10 mg/L.

Note 1.29 for Phosphorus (dissolved, by ICPMS/ICPOES):

Streams: None proposed for streams.
Lakes: It is not possible to specify a single phosphorous concentration to achieve protection of aquatic life in lakes. A range of total phosphorous concentrations (5-15 µg/L) is suggested as the criterion which can be used as the basis for site specific water quality objectives.

Note 1.30 for Phosphorus (total, by ICPMS/ICPOES):
Streams: None proposed for streams.
Lakes: It is not possible to specify a single phosphorous concentration to achieve protection of aquatic life in lakes. A range of total phosphorous concentrations (5-15 µg/L) is suggested as the criterion which can be used as the basis for site specific water quality objectives.

Note 1.31 for Phosphorus (dissolved, APHA 4500-P):
Streams: None proposed for streams.
Lakes: It is not possible to specify a single phosphorous concentration to achieve protection of aquatic life in lakes. A range of total phosphorous concentrations (5-15 µg/L) is suggested as the criterion which can be used as the basis for site specific water quality objectives.

Note 1.32 for Cobalt (total):
The interim maximum concentration for total cobalt is 110 µg/L to protect aquatic life in the freshwater environment from acute effects of cobalt.
The interim 30-day average concentration for total cobalt (based on five weekly samples) is 4 µg/L to protect aquatic life from chronic effects of cobalt.

Note 1.33 for Copper (total):
The maximum concentration of total copper should not exceed at any time the numerical value (in µg/L) given by the formula "0.094(hardness)+2", where water hardness is reported as mg/L CaCO3.
The 30-day average concentration of total copper (based on a minimum of 5 approximately weekly samples) should not exceed 2 µg/L when average water hardness over the same period (expressed as mg/L CaCO3) is less than 50 mg/L. When average water hardness is greater than 50 mg/L the 30-day average concentration should not exceed the numerical value (in µg/L) given by the formula "0.04(average hardness)", where water hardness is reported as mg/L CaCO3.

Note 1.34 for Lead (total):
The maximum guideline for total lead in water, at a water hardness less than or equal to 8 mg/L as CaCO3 is set at 3.0 µg/L. When water hardness exceeds 8.0 mg/L CaCO3 the maximum guideline for lead at any time is given by the following equation:
Maximum Criteria (µg/L) = exp (1.273 ln(hardness) - 1.460).
The 30-day average guideline for total lead in water, when water hardness exceeds 8 mg/L as CaCO3, is as follows:
30-Day Average (µg/L) is less than or equal to 3.31 + exp (1.273 ln (mean hardness) - 4.704).
For hardness less than or equal to 8.0 mg/L there is no 30-day average guideline; hence the maximum concentration of 3.0 µg/L is used.

Note 1.35 for Manganese (total):
The maximum concentration of total manganese in mg/L at any time should not exceed the value as determined by the following relationship:
0.01102 hardness + 0.54
where water hardness is reported as mg/L of CaCO3.
The 30-day mean concentration of total manganese in mg/L should be less than or equal to the value as determined by the following relationship:
0.0044 hardness + 0.605
where water hardness is reported as mg/L of CaCO3.

Note 1.36 for Mercury (total):
The average concentration of total mercury in water as measured over a 30-day period (based on five weekly samples) should not exceed 0.02 µg/L when the methyl mercury (MeHg) constitutes less than or equal to 0.5% of the total mercury concentration. When the proportion of MeHg is greater than 0.5%, the guideline should be adjusted as indicated in the Table 1 and Table 4 of the BC MOE Overview Report - First Update, February 2001.
There is no guideline maximum for total mercury in water, for freshwater aquatic life.

Note 1.37 for Molybdenum (total):
The maximum concentration for total molybdenum is 2 mg/L.
The 30-day average concentration for total molybdenum (based on at least five weekly samples in a period of 30 days) is less than or equal to 1 mg/L.

Note 1.38 for Selenium (total):
To protect freshwater aquatic life from adverse effects, the mean concentration of total selenium should not exceed 2 µg/L. The mean concentration in the water column is calculated based on at least 5 weekly samples taken over a 30-day period.

Note 1.39 for Silver (total):

The guideline maximum for total silver is:
0.1 µg/L maximum if hardness less than or equal to 100 mg/L
3.0 µg/L maximum if hardness greater than 100 mg/L.
The guideline 30-day average for total silver is:
0.05 µg/L as 30-day mean if hardness less than or equal to 100 mg/L
1.5 µg/L as 30-day mean if hardness greater than 100 mg/L.

Note 1.40 for Zinc (total):
The maximum concentration of total zinc (µg/L) at any time should not exceed 33 µg/L when water hardness is less than or equal to 90 mg/L as CaCO3.
When water hardness exceeds 90 mg/L CaCO3, the guideline maximum in µg/L for total zinc is the value determined by the following relationship:
33 + 0.75 * (hardness - 90)
where water hardness is reported as mg/L of CaCO3.
The 30-day average concentration of total zinc (µg/L) at any time should not exceed 7.5 µg/L when water hardness is less than or equal to 90 mg/L as CaCO3.
When water hardness exceeds 90 mg/L CaCO3, the guideline maximum in µg/L for total zinc is the value determined by the following relationship:
7.5 + 0.75 * (hardness - 90)
where water hardness is reported as mg/L of CaCO3.

2. Notes for Guidelines for Canadian Drinking Water Quality - Maximum Acceptable Concentrations (GCDWQ MAC)

Note 2.1 for Cyanide (total):
The GCDWQ MAC for Cyanide (free) is 0.2 mg/L. A maximum of 0.2 mg/L was used, in this report, to identify exceedances for Cyanide (total) as a means for determining the potential for exceeding the Cyanide (free) guideline.

Note 2.2 for Turbidity:
Waterworks systems that use a surface water source or a groundwater source under the direct influence of surface water should filter the source water to meet health-based turbidity limits, as defined for specific treatment technologies. Where possible, filtration systems should be designed and operated to reduce turbidity levels as low as possible, with a treated water turbidity target of less than 0.1 NTU at all times. Where this is not achievable, the treated water turbidity levels from individual filters should meet the requirements described in GCDWQ. The health-based turbidity guideline does not apply to secure groundwater sources, i.e., those not under the direct influence of surface water. However, for effective operation of the distribution system, it is good practice to ensure that water entering the distribution system has low turbidity levels of around 1.0 NTU.

Note 2.3 for E. coli (counts):
MAC is none detectable per 100 mL

Note 2.4 for E. coli (MPN / PA):
MAC is none detectable per 100 mL

Note 2.5 for Fecal coliforms (counts):
The GCDWQ does not have a guideline for fecal coliforms. The GCDWQ were revised in 2006 when the guideline for fecal coliforms was deleted, and a guideline for E. coli was added. However the GCDWQ has a guideline for total coliforms that includes the following statement: “The MAC of total coliforms in water leaving a treatment plant in a public system and throughout semi-public and private supply systems is none detectable per 100 mL.” Therefore a guideline of none detectable per 100 mL was used for fecal coliforms for this report.
Note that the Drinking Water Protection Regulation (2003), under the BC Drinking Water Protection Act, has a water quality standard for potable water for fecal coliforms of “No detectable fecal coliform bacteria per 100 ml”.

Note 2.6 for Fecal coliforms (MPN / PA):
The GCDWQ does not have a guideline for fecal coliforms. The GCDWQ were revised in 2006 when the guideline for fecal coliforms was deleted, and a guideline for E. coli was added. However the GCDWQ has a guideline for total coliforms that includes the following statement: “The MAC of total coliforms in water leaving a treatment plant in a public system and throughout semi-public and private supply systems is none detectable per 100 mL.” Therefore a guideline of none detectable per 100 mL was used for fecal coliforms for this report.
Note that the Drinking Water Protection Regulation (2003), under the BC Drinking Water Protection Act, has a water quality standard for potable water for fecal coliforms of “No detectable fecal coliform bacteria per 100 ml”.

Note 2.7 for Total coliforms (counts):
The maximum acceptable concentration (MAC) of total coliforms in water leaving a treatment plant and in non-disinfected groundwater leaving the well is none detectable per 100 mL.
Total coliforms should be monitored in the distribution system because they are used to indicate changes in water quality. Detection of total coliforms from consecutive samples from the same site or from more than 10% of the samples collected in a given sampling period should be investigated.

Note 2.8 for Total coliforms (MPN / PA):

The maximum acceptable concentration (MAC) of total coliforms in water leaving a treatment plant and in non-disinfected groundwater leaving the well is none detectable per 100 mL.
Total coliforms should be monitored in the distribution system because they are used to indicate changes in water quality. Detection of total coliforms from consecutive samples from the same site or from more than 10% of the samples collected in a given sampling period should be investigated.

Note 2.9 for Nitrate + Nitrite (as N) (calculated):
The MAC for Nitrate (as N) is 10 mg/L

3. Notes for Guidelines for Canadian Drinking Water Quality - Aesthetic Objectives (GCDWQ AO)

Note 3.1 for Aluminum (dissolved):
This is an operational guidance value, designed to apply only to drinking water treatment plants using aluminum-based coagulants. The operational guidance value of 0.1 mg/L applies to conventional treatment plants, and 0.2 mg/L applies to other types of treatment systems.

Note 3.2 for Sodium (dissolved):
It is recommended that sodium be included in routine monitoring programmes, as levels may be of intrested to authorities who wish to prescribe sodium-restricted diets for their patients.

Note 3.3 for Sulphate:
There may be a laxative effect in some individuals when sulphate levels exceed 500 mg/L

Note 3.4 for Aluminum (total):
This is an operational guidance value, designed to apply only to drinking water treatment plants using aluminum-based coagulants. The operational guidance value of 0.1 mg/L applies to conventional treatment plants, and 0.2 mg/L applies to other types of treatment systems.

Note 3.5 for Sodium (total):
It is recommended that sodium be included in routine monitoring programmes, as levels may be of intrested to authorities who wish to prescribe sodium-restricted diets for their patients.

CERTIFICATE OF ANALYSIS

REPORTED TO Western Water Associates Ltd
106 - 5145 26th Street
Vernon, BC V1T 8G4

TEL (250) 541-1030
FAX (250) 575-4764

ATTENTION	Bryer Manwell	**WORK ORDER**	3071518
PO NUMBER		**RECEIVED / TEMP**	Jul-24-13 09:10 / 15.0 °C
PROJECT	Blackwater WW	**REPORTED**	Jul-31-13
PROJECT INFO	13-019-02	**COC NUMBER**	14034

General Comments:

CARO Analytical Services employs methods which are conducted according to procedures accepted by appropriate regulatory agencies, and/or are conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts, except where otherwise agreed to by the client.

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Issued By: **Sara Gulenchyn For Jennifer Shanko, AScT**
Administration Coordinator, Kelowna

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ANALYSIS INFORMATION

REPORTED TO	Western Water Associates Ltd	**WORK ORDER**	3071518
PROJECT	Blackwater WW	**REPORTED**	Jul-31-13

Analysis Description	Method Reference (* = modified from) Preparation	Analysis	Location
Alkalinity, total	N/A	APHA 2320 B	Kelowna
Ammonia-N, total colorimetric	N/A	APHA 4500-NH3 G	Kelowna
BOD, 5-day	N/A	APHA 5210 B	Kelowna
Carbon, Total Organic in Water	N/A	APHA 5310 B	Kelowna
Chloride in Water by IC	N/A	APHA 4110 B	Kelowna
Colour, True at 410 nm	N/A	APHA 2120 C *	Kelowna
Conductivity in Water	N/A	APHA 2510 B	Kelowna
Dissolved Metals	APHA 3030 B	APHA 3125 B	Richmond
E. Coli (MPN)	N/A	APHA 9221	Kelowna
E. coli (Partition Method)	N/A	APHA 9222 G	Kelowna
Fecal Coliforms (MF)	N/A	APHA 9222 D	Kelowna
Fecal Coliforms (MPN)	N/A	APHA 9221 E	Kelowna
Fluoride in Water by IC	N/A	APHA 4110 B	Kelowna
Hardness as CaCO3 (CALC)	N/A	APHA 2340 B	Richmond
Nitrate-N in Water by IC	N/A	APHA 4110 B	Kelowna
Nitrite-N in Water by IC	N/A	APHA 4110 B	Kelowna
Orthophosphate as P by IC	N/A	APHA 4110 B	Kelowna
pH in Water	N/A	APHA 4500-H+ B	Kelowna
Phosphorus, Total Dissolved Kjeldahl	N/A	EPA 365.4 (1974) *	Kelowna
Sulfate in Water by IC	N/A	APHA 4110 B	Kelowna
Total Coliforms (by Endo)	N/A	APHA 9222 B	Kelowna
Total Coliforms (MPN)	N/A	APHA 9221 B	Kelowna
Total Dissolved Solids	N/A	APHA 2540 C	Kelowna
Total Recoverable Metals	APHA 3030E *	APHA 3125 B	Richmond
Total Suspended Solids	N/A	APHA 2540 D	Kelowna
Transmissivity at 254nm	N/A	APHA 5910 B	Kelowna
Turbidity	N/A	APHA 2130 B	Kelowna

Note: The numbers in brackets represent the year that the method was published/approved

Method Reference Descriptions:

APHA	Standard Methods for the Examination of Water and Wastewater, American Public Health Association
EPA	United States Environmental Protection Agency Test Methods

Glossary of Terms:

MRL	Method Reporting Limit
<	Less than the Reported Detection Limit (RDL) - the RDL may be higher than the MRL due to various factors such as dilutions, limited sample volume, high moisture, or interferences
%	Percent W/W
CFU/100mL	Colony Forming Units per 100 mL
Color Unit	Colour referenced against a platinum cobalt standard
mg/L	Milligrams per litre
MPN/100mL	Most Probable Number per 100 mL
NTU	Nephelometric Turbidity Units
pH units	pH < 7 = acidic, ph > 7 = basic
uS/cm	Microsiemens per centimeter

SAMPLE ANALYTICAL DATA

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result / *Recovery*	MRL / *Limit*	Units	Prepared	Analyzed	Notes
Sample ID: RIB MW13-02 (3071518-01) [Water] Sampled: Jul-21-13						CT4
Anions						
Alkalinity, Total as CaCO3	**54**	1	mg/L	N/A	Jul-24-13	
Chloride	**0.39**	0.10	mg/L	N/A	Jul-24-13	
Fluoride	**0.16**	0.10	mg/L	N/A	Jul-24-13	
Nitrogen, Nitrate as N	**0.070**	0.010	mg/L	N/A	Jul-24-13	
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L	N/A	Jul-24-13	
Phosphate, Ortho as P	< 0.01	0.01	mg/L	N/A	Jul-24-13	
Sulfate	**4.0**	1.0	mg/L	N/A	Jul-24-13	
General Parameters						
BOD, 5-day	< 10	10	mg/L	Jul-24-13	Jul-29-13	
Carbon, Total Organic	< 0.5	0.5	mg/L	N/A	Jul-24-13	
Colour, True	< 5	5	Color Unit	N/A	Jul-25-13	HT
Conductivity (EC)	**118**	2	uS/cm	N/A	Jul-24-13	
Nitrogen, Ammonia as N, Total	**0.037**	0.020	mg/L	N/A	Jul-25-13	HT
pH	**7.87**	0.01	pH units	N/A	Jul-24-13	
Phosphorus, Total Kjeldahl Dissolved	< 0.01	0.01	mg/L	N/A	Jul-24-13	
Solids, Total Dissolved	**160**	5	mg/L	N/A	Jul-24-13	
Solids, Total Suspended	**46**	1	mg/L	N/A	Jul-25-13	
Turbidity	**21.7**	0.1	NTU	N/A	Jul-25-13	HT
UV Transmittance @ 254nm	**98.3**	0.1	%	Jul-25-13	Jul-25-13	
Calculated Parameters						
Hardness, Total (Total as CaCO3)	**51.2**	5.0	mg/L	N/A	N/A	
Hardness, Total (Diss. as CaCO3)	**48.9**	5.0	mg/L	N/A	N/A	
Dissolved Metals						
Aluminum, dissolved	**0.08**	0.05	mg/L	N/A	Jul-26-13	
Antimony, dissolved	**0.001**	0.001	mg/L	N/A	Jul-26-13	
Arsenic, dissolved	< 0.005	0.005	mg/L	N/A	Jul-26-13	
Barium, dissolved	< 0.05	0.05	mg/L	N/A	Jul-26-13	
Beryllium, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Bismuth, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Boron, dissolved	< 0.04	0.04	mg/L	N/A	Jul-26-13	
Cadmium, dissolved	< 0.0001	0.0001	mg/L	N/A	Jul-26-13	
Calcium, dissolved	**14**	2	mg/L	N/A	Jul-26-13	
Chromium, dissolved	< 0.005	0.005	mg/L	N/A	Jul-26-13	
Cobalt, dissolved	< 0.0005	0.0005	mg/L	N/A	Jul-26-13	
Copper, dissolved	< 0.002	0.002	mg/L	N/A	Jul-26-13	
Iron, dissolved	< 0.1	0.1	mg/L	N/A	Jul-26-13	
Lead, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Lithium, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Magnesium, dissolved	**3.3**	0.1	mg/L	N/A	Jul-26-13	
Manganese, dissolved	**0.076**	0.002	mg/L	N/A	Jul-26-13	
Mercury, dissolved	< 0.0002	0.0002	mg/L	N/A	Jul-26-13	
Molybdenum, dissolved	**0.002**	0.001	mg/L	N/A	Jul-26-13	
Nickel, dissolved	< 0.002	0.002	mg/L	N/A	Jul-26-13	
Phosphorus, dissolved	< 0.2	0.2	mg/L	N/A	Jul-26-13	

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result / *Recovery*	MRL / *Limit*	Units	Prepared	Analyzed	Notes
Sample ID: RIB MW13-02 (3071518-01) [Water] Sampled: Jul-21-13, Continued						CT4
Dissolved Metals, Continued						
Potassium, dissolved	**0.6**	0.2	mg/L	N/A	Jul-26-13	
Selenium, dissolved	< 0.005	0.005	mg/L	N/A	Jul-26-13	
Silicon, dissolved	**6**	5	mg/L	N/A	Jul-26-13	
Silver, dissolved	< 0.0005	0.0005	mg/L	N/A	Jul-26-13	
Sodium, dissolved	**4.2**	0.2	mg/L	N/A	Jul-26-13	
Strontium, dissolved	**0.06**	0.01	mg/L	N/A	Jul-26-13	
Sulfur, dissolved	< 10	10	mg/L	N/A	Jul-26-13	
Tellurium, dissolved	< 0.002	0.002	mg/L	N/A	Jul-26-13	
Thallium, dissolved	< 0.0002	0.0002	mg/L	N/A	Jul-26-13	
Thorium, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Tin, dissolved	< 0.002	0.002	mg/L	N/A	Jul-26-13	
Titanium, dissolved	< 0.05	0.05	mg/L	N/A	Jul-26-13	
Uranium, dissolved	**0.0003**	0.0002	mg/L	N/A	Jul-26-13	
Vanadium, dissolved	< 0.01	0.01	mg/L	N/A	Jul-26-13	
Zinc, dissolved	< 0.04	0.04	mg/L	N/A	Jul-26-13	
Zirconium, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Total Recoverable Metals						
Aluminum, total	**0.79**	0.05	mg/L	Jul-25-13	Jul-26-13	
Antimony, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Arsenic, total	< 0.005	0.005	mg/L	Jul-25-13	Jul-26-13	
Barium, total	< 0.05	0.05	mg/L	Jul-25-13	Jul-26-13	
Beryllium, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Bismuth, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Boron, total	< 0.04	0.04	mg/L	Jul-25-13	Jul-26-13	
Cadmium, total	< 0.0001	0.0001	mg/L	Jul-25-13	Jul-26-13	
Calcium, total	**15**	2	mg/L	Jul-25-13	Jul-26-13	
Chromium, total	< 0.005	0.005	mg/L	Jul-25-13	Jul-26-13	
Cobalt, total	**0.0008**	0.0005	mg/L	Jul-25-13	Jul-26-13	
Copper, total	< 0.002	0.002	mg/L	Jul-25-13	Jul-26-13	
Iron, total	**1.0**	0.1	mg/L	Jul-25-13	Jul-26-13	
Lead, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Lithium, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Magnesium, total	**3.5**	0.1	mg/L	Jul-25-13	Jul-26-13	
Manganese, total	**0.113**	0.002	mg/L	Jul-25-13	Jul-26-13	
Mercury, total	< 0.0002	0.0002	mg/L	Jul-25-13	Jul-26-13	
Molybdenum, total	**0.002**	0.001	mg/L	Jul-25-13	Jul-26-13	
Nickel, total	< 0.002	0.002	mg/L	Jul-25-13	Jul-26-13	
Phosphorus, total	< 0.2	0.2	mg/L	Jul-25-13	Jul-26-13	
Potassium, total	**0.8**	0.2	mg/L	Jul-25-13	Jul-26-13	
Selenium, total	< 0.005	0.005	mg/L	Jul-25-13	Jul-26-13	
Silicon, total	**7**	5	mg/L	Jul-25-13	Jul-26-13	
Silver, total	< 0.0005	0.0005	mg/L	Jul-25-13	Jul-26-13	
Sodium, total	**4.5**	0.2	mg/L	Jul-25-13	Jul-26-13	
Strontium, total	**0.07**	0.01	mg/L	Jul-25-13	Jul-26-13	
Sulfur, total	< 10	10	mg/L	Jul-25-13	Jul-26-13	

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result / *Recovery*	MRL / *Limit*	Units	Prepared	Analyzed	Notes
Sample ID: RIB MW13-02 (3071518-01) [Water] Sampled: Jul-21-13, Continued						CT4
Total Recoverable Metals, Continued						
Tellurium, total	< 0.002	0.002	mg/L	Jul-25-13	Jul-26-13	
Thallium, total	< 0.0002	0.0002	mg/L	Jul-25-13	Jul-26-13	
Thorium, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Tin, total	< 0.002	0.002	mg/L	Jul-25-13	Jul-26-13	
Titanium, total	< 0.05	0.05	mg/L	Jul-25-13	Jul-26-13	
Uranium, total	**0.0003**	0.0002	mg/L	Jul-25-13	Jul-26-13	
Vanadium, total	< 0.01	0.01	mg/L	Jul-25-13	Jul-26-13	
Zinc, total	< 0.04	0.04	mg/L	Jul-25-13	Jul-26-13	
Zirconium, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Microbiological Parameters						
Coliforms, Total	**≥ 63**	1		Jul-24-13	Jul-25-13	
Background Colonies	**> 200**	200	CFU/100mL	Jul-24-13	Jul-25-13	
Coliforms, Fecal	< 1	1	CFU/100mL	Jul-24-13	Jul-25-13	
E. coli	< 1	1	CFU/100mL	Jul-24-13	Jul-25-13	

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result / *Recovery*	MRL / *Limit*	Units	Prepared	Analyzed	Notes
Sample ID: RIB MW13-03 (3071518-02) [Water] Sampled: Jul-21-13						CT4, F1
Anions						
Alkalinity, Total as CaCO3	**36**	1	mg/L	N/A	Jul-24-13	
Chloride	**0.63**	0.10	mg/L	N/A	Jul-24-13	
Fluoride	< 0.10	0.10	mg/L	N/A	Jul-24-13	
Nitrogen, Nitrate as N	**0.030**	0.010	mg/L	N/A	Jul-24-13	
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L	N/A	Jul-24-13	
Phosphate, Ortho as P	**0.04**	0.01	mg/L	N/A	Jul-24-13	
Sulfate	**1.7**	1.0	mg/L	N/A	Jul-24-13	
General Parameters						
BOD, 5-day	< 10	10	mg/L	Jul-24-13	Jul-29-13	
Carbon, Total Organic	**14.9**	0.5	mg/L	N/A	Jul-24-13	
Colour, True	**48**	5	Color Unit	N/A	Jul-25-13	HT
Conductivity (EC)	**72**	2	uS/cm	N/A	Jul-24-13	
Nitrogen, Ammonia as N, Total	**0.700**	0.020	mg/L	N/A	Jul-25-13	HT
pH	**6.83**	0.01	pH units	N/A	Jul-24-13	
Phosphorus, Total Kjeldahl Dissolved	**0.07**	0.01	mg/L	N/A	Jul-24-13	
Solids, Total Dissolved	**220**	5	mg/L	N/A	Jul-24-13	
Solids, Total Suspended	**3820**	1	mg/L	N/A	Jul-25-13	
Turbidity	**> 4000**	0.1	NTU	N/A	Jul-25-13	HT
UV Transmittance @ 254nm	**69.4**	0.1	%	Jul-25-13	Jul-25-13	
Calculated Parameters						
Hardness, Total (Total as CaCO3)	**37.6**	5.0	mg/L	N/A	N/A	
Hardness, Total (Diss. as CaCO3)	**32.2**	5.0	mg/L	N/A	N/A	
Dissolved Metals						
Aluminum, dissolved	**5.83**	0.05	mg/L	N/A	Jul-26-13	
Antimony, dissolved	**0.001**	0.001	mg/L	N/A	Jul-26-13	
Arsenic, dissolved	**0.006**	0.005	mg/L	N/A	Jul-26-13	
Barium, dissolved	< 0.05	0.05	mg/L	N/A	Jul-26-13	
Beryllium, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Bismuth, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Boron, dissolved	< 0.04	0.04	mg/L	N/A	Jul-26-13	
Cadmium, dissolved	< 0.0001	0.0001	mg/L	N/A	Jul-26-13	
Calcium, dissolved	**9**	2	mg/L	N/A	Jul-26-13	
Chromium, dissolved	**0.005**	0.005	mg/L	N/A	Jul-26-13	
Cobalt, dissolved	**0.0012**	0.0005	mg/L	N/A	Jul-26-13	
Copper, dissolved	**0.002**	0.002	mg/L	N/A	Jul-26-13	
Iron, dissolved	**3.0**	0.1	mg/L	N/A	Jul-26-13	
Lead, dissolved	**0.005**	0.001	mg/L	N/A	Jul-26-13	
Lithium, dissolved	**0.002**	0.001	mg/L	N/A	Jul-26-13	
Magnesium, dissolved	**2.6**	0.1	mg/L	N/A	Jul-26-13	
Manganese, dissolved	**0.113**	0.002	mg/L	N/A	Jul-26-13	
Mercury, dissolved	< 0.0002	0.0002	mg/L	N/A	Jul-26-13	
Molybdenum, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Nickel, dissolved	**0.004**	0.002	mg/L	N/A	Jul-26-13	
Phosphorus, dissolved	< 0.2	0.2	mg/L	N/A	Jul-26-13	

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result / *Recovery*	MRL / *Limit*	Units	Prepared	Analyzed	Notes
Sample ID: RIB MW13-03 (3071518-02) [Water] Sampled: Jul-21-13, Continued						CT4, F1
Dissolved Metals, Continued						
Potassium, dissolved	**1.8**	0.2	mg/L	N/A	Jul-26-13	
Selenium, dissolved	< 0.005	0.005	mg/L	N/A	Jul-26-13	
Silicon, dissolved	**16**	5	mg/L	N/A	Jul-26-13	
Silver, dissolved	< 0.0005	0.0005	mg/L	N/A	Jul-26-13	
Sodium, dissolved	**3.5**	0.2	mg/L	N/A	Jul-26-13	
Strontium, dissolved	**0.07**	0.01	mg/L	N/A	Jul-26-13	
Sulfur, dissolved	< 10	10	mg/L	N/A	Jul-26-13	
Tellurium, dissolved	< 0.002	0.002	mg/L	N/A	Jul-26-13	
Thallium, dissolved	< 0.0002	0.0002	mg/L	N/A	Jul-26-13	
Thorium, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Tin, dissolved	< 0.002	0.002	mg/L	N/A	Jul-26-13	
Titanium, dissolved	**0.19**	0.05	mg/L	N/A	Jul-26-13	
Uranium, dissolved	**0.0016**	0.0002	mg/L	N/A	Jul-26-13	
Vanadium, dissolved	< 0.01	0.01	mg/L	N/A	Jul-26-13	
Zinc, dissolved	**0.05**	0.04	mg/L	N/A	Jul-26-13	
Zirconium, dissolved	**0.006**	0.001	mg/L	N/A	Jul-26-13	
Total Recoverable Metals						
Aluminum, total	**10.8**	0.05	mg/L	Jul-25-13	Jul-26-13	
Antimony, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Arsenic, total	**0.012**	0.005	mg/L	Jul-25-13	Jul-26-13	
Barium, total	**0.09**	0.05	mg/L	Jul-25-13	Jul-26-13	
Beryllium, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Bismuth, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Boron, total	< 0.04	0.04	mg/L	Jul-25-13	Jul-26-13	
Cadmium, total	**0.0002**	0.0001	mg/L	Jul-25-13	Jul-26-13	
Calcium, total	**10**	2	mg/L	Jul-25-13	Jul-26-13	
Chromium, total	**0.015**	0.005	mg/L	Jul-25-13	Jul-26-13	
Cobalt, total	**0.0026**	0.0005	mg/L	Jul-25-13	Jul-26-13	
Copper, total	**0.005**	0.002	mg/L	Jul-25-13	Jul-26-13	
Iron, total	**7.6**	0.1	mg/L	Jul-25-13	Jul-26-13	
Lead, total	**0.011**	0.001	mg/L	Jul-25-13	Jul-26-13	
Lithium, total	**0.004**	0.001	mg/L	Jul-25-13	Jul-26-13	
Magnesium, total	**3.3**	0.1	mg/L	Jul-25-13	Jul-26-13	
Manganese, total	**0.260**	0.002	mg/L	Jul-25-13	Jul-26-13	
Mercury, total	< 0.0002	0.0002	mg/L	Jul-25-13	Jul-26-13	
Molybdenum, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Nickel, total	**0.005**	0.002	mg/L	Jul-25-13	Jul-26-13	
Phosphorus, total	**0.2**	0.2	mg/L	Jul-25-13	Jul-26-13	
Potassium, total	**1.6**	0.2	mg/L	Jul-25-13	Jul-26-13	
Selenium, total	< 0.005	0.005	mg/L	Jul-25-13	Jul-26-13	
Silicon, total	**20**	5	mg/L	Jul-25-13	Jul-26-13	
Silver, total	< 0.0005	0.0005	mg/L	Jul-25-13	Jul-26-13	
Sodium, total	**3.5**	0.2	mg/L	Jul-25-13	Jul-26-13	
Strontium, total	**0.07**	0.01	mg/L	Jul-25-13	Jul-26-13	
Sulfur, total	< 10	10	mg/L	Jul-25-13	Jul-26-13	

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result / *Recovery*	MRL / *Limit*	Units	Prepared	Analyzed	Notes
Sample ID: RIB MW13-03 (3071518-02) [Water] Sampled: Jul-21-13, Continued						CT4, F1
Total Recoverable Metals, Continued						
Tellurium, total	< 0.002	0.002	mg/L	Jul-25-13	Jul-26-13	
Thallium, total	< 0.0002	0.0002	mg/L	Jul-25-13	Jul-26-13	
Thorium, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Tin, total	< 0.002	0.002	mg/L	Jul-25-13	Jul-26-13	
Titanium, total	**0.29**	0.05	mg/L	Jul-25-13	Jul-26-13	
Uranium, total	**0.0022**	0.0002	mg/L	Jul-25-13	Jul-26-13	
Vanadium, total	**0.02**	0.01	mg/L	Jul-25-13	Jul-26-13	
Zinc, total	**0.14**	0.04	mg/L	Jul-25-13	Jul-26-13	
Zirconium, total	**0.005**	0.001	mg/L	Jul-25-13	Jul-26-13	
Microbiological Parameters						
Coliforms, Total	**2400**	1	CFU/100mL	Jul-24-13	Jul-25-13	
Background Colonies	**> 200**	200	CFU/100mL	Jul-24-13	Jul-25-13	
Coliforms, Fecal	< 1	1	CFU/100mL	Jul-24-13	Jul-25-13	
E. coli	< 1	1	CFU/100mL	Jul-24-13	Jul-25-13	

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result / *Recovery*	MRL / *Limit*	Units	Prepared	Analyzed	Notes
Sample ID: RIB MW13-04 (3071518-03) [Water] Sampled: Jul-21-13						CT4, F1
Anions						
Alkalinity, Total as CaCO3	**38**	1	mg/L	N/A	Jul-24-13	
Chloride	**0.71**	0.10	mg/L	N/A	Jul-24-13	
Fluoride	< 0.10	0.10	mg/L	N/A	Jul-24-13	
Nitrogen, Nitrate as N	< 0.010	0.010	mg/L	N/A	Jul-24-13	
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L	N/A	Jul-24-13	
Phosphate, Ortho as P	< 0.01	0.01	mg/L	N/A	Jul-24-13	
Sulfate	**33.8**	1.0	mg/L	N/A	Jul-24-13	
General Parameters						
BOD, 5-day	< 10	10	mg/L	Jul-24-13	Jul-29-13	
Carbon, Total Organic	**26.2**	0.5	mg/L	N/A	Jul-24-13	
Colour, True	**150**	5	Color Unit	N/A	Jul-25-13	HT
Conductivity (EC)	**163**	2	uS/cm	N/A	Jul-24-13	
Nitrogen, Ammonia as N, Total	**0.329**	0.020	mg/L	N/A	Jul-25-13	HT
pH	**7.10**	0.01	pH units	N/A	Jul-24-13	
Phosphorus, Total Kjeldahl Dissolved	**0.08**	0.01	mg/L	N/A	Jul-24-13	
Solids, Total Dissolved	**142**	5	mg/L	N/A	Jul-24-13	
Solids, Total Suspended	**101**	1	mg/L	N/A	Jul-25-13	
Turbidity	**287**	0.1	NTU	N/A	Jul-25-13	HT
UV Transmittance @ 254nm	**25.7**	0.1	%	Jul-25-13	Jul-25-13	
Calculated Parameters						
Hardness, Total (Total as CaCO3)	**123**	5.0	mg/L	N/A	N/A	
Hardness, Total (Diss. as CaCO3)	**82.4**	5.0	mg/L	N/A	N/A	
Dissolved Metals						
Aluminum, dissolved	**12.0**	0.05	mg/L	N/A	Jul-26-13	
Antimony, dissolved	**0.001**	0.001	mg/L	N/A	Jul-26-13	
Arsenic, dissolved	**0.009**	0.005	mg/L	N/A	Jul-26-13	
Barium, dissolved	**0.13**	0.05	mg/L	N/A	Jul-26-13	
Beryllium, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Bismuth, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Boron, dissolved	< 0.04	0.04	mg/L	N/A	Jul-26-13	
Cadmium, dissolved	**0.0002**	0.0001	mg/L	N/A	Jul-26-13	
Calcium, dissolved	**22**	2	mg/L	N/A	Jul-26-13	
Chromium, dissolved	**0.009**	0.005	mg/L	N/A	Jul-26-13	
Cobalt, dissolved	**0.0066**	0.0005	mg/L	N/A	Jul-26-13	
Copper, dissolved	**0.010**	0.002	mg/L	N/A	Jul-26-13	
Iron, dissolved	**8.6**	0.1	mg/L	N/A	Jul-26-13	
Lead, dissolved	**0.006**	0.001	mg/L	N/A	Jul-26-13	
Lithium, dissolved	**0.004**	0.001	mg/L	N/A	Jul-26-13	
Magnesium, dissolved	**6.9**	0.1	mg/L	N/A	Jul-26-13	
Manganese, dissolved	**0.678**	0.002	mg/L	N/A	Jul-26-13	
Mercury, dissolved	< 0.0002	0.0002	mg/L	N/A	Jul-26-13	
Molybdenum, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Nickel, dissolved	**0.018**	0.002	mg/L	N/A	Jul-26-13	
Phosphorus, dissolved	< 0.2	0.2	mg/L	N/A	Jul-26-13	

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result / *Recovery*	MRL / *Limit*	Units	Prepared	Analyzed	Notes
Sample ID: RIB MW13-04 (3071518-03) [Water] Sampled: Jul-21-13, Continued						CT4, F1
Dissolved Metals, Continued						
Potassium, dissolved	**2.7**	0.2	mg/L	N/A	Jul-26-13	
Selenium, dissolved	< 0.005	0.005	mg/L	N/A	Jul-26-13	
Silicon, dissolved	**28**	5	mg/L	N/A	Jul-26-13	
Silver, dissolved	< 0.0005	0.0005	mg/L	N/A	Jul-26-13	
Sodium, dissolved	**4.6**	0.2	mg/L	N/A	Jul-26-13	
Strontium, dissolved	**0.11**	0.01	mg/L	N/A	Jul-26-13	
Sulfur, dissolved	< 10	10	mg/L	N/A	Jul-26-13	
Tellurium, dissolved	< 0.002	0.002	mg/L	N/A	Jul-26-13	
Thallium, dissolved	< 0.0002	0.0002	mg/L	N/A	Jul-26-13	
Thorium, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Tin, dissolved	< 0.002	0.002	mg/L	N/A	Jul-26-13	
Titanium, dissolved	**0.45**	0.05	mg/L	N/A	Jul-26-13	
Uranium, dissolved	**0.0012**	0.0002	mg/L	N/A	Jul-26-13	
Vanadium, dissolved	**0.02**	0.01	mg/L	N/A	Jul-26-13	
Zinc, dissolved	**0.04**	0.04	mg/L	N/A	Jul-26-13	
Zirconium, dissolved	**0.018**	0.001	mg/L	N/A	Jul-26-13	
Total Recoverable Metals						
Aluminum, total	**26.1**	0.05	mg/L	Jul-25-13	Jul-26-13	
Antimony, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Arsenic, total	**0.019**	0.005	mg/L	Jul-25-13	Jul-26-13	
Barium, total	**0.25**	0.05	mg/L	Jul-25-13	Jul-26-13	
Beryllium, total	**0.001**	0.001	mg/L	Jul-25-13	Jul-26-13	
Bismuth, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Boron, total	< 0.04	0.04	mg/L	Jul-25-13	Jul-26-13	
Cadmium, total	**0.0005**	0.0001	mg/L	Jul-25-13	Jul-26-13	
Calcium, total	**30**	2	mg/L	Jul-25-13	Jul-26-13	
Chromium, total	**0.026**	0.005	mg/L	Jul-25-13	Jul-26-13	
Cobalt, total	**0.0151**	0.0005	mg/L	Jul-25-13	Jul-26-13	
Copper, total	**0.029**	0.002	mg/L	Jul-25-13	Jul-26-13	
Iron, total	**28.1**	0.1	mg/L	Jul-25-13	Jul-26-13	
Lead, total	**0.027**	0.001	mg/L	Jul-25-13	Jul-26-13	
Lithium, total	**0.014**	0.001	mg/L	Jul-25-13	Jul-26-13	
Magnesium, total	**11.5**	0.1	mg/L	Jul-25-13	Jul-26-13	
Manganese, total	**1.32**	0.002	mg/L	Jul-25-13	Jul-26-13	
Mercury, total	< 0.0002	0.0002	mg/L	Jul-25-13	Jul-26-13	
Molybdenum, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Nickel, total	**0.035**	0.002	mg/L	Jul-25-13	Jul-26-13	
Phosphorus, total	**0.6**	0.2	mg/L	Jul-25-13	Jul-26-13	
Potassium, total	**3.3**	0.2	mg/L	Jul-25-13	Jul-26-13	
Selenium, total	< 0.005	0.005	mg/L	Jul-25-13	Jul-26-13	
Silicon, total	**42**	5	mg/L	Jul-25-13	Jul-26-13	
Silver, total	< 0.0005	0.0005	mg/L	Jul-25-13	Jul-26-13	
Sodium, total	**5.0**	0.2	mg/L	Jul-25-13	Jul-26-13	
Strontium, total	**0.15**	0.01	mg/L	Jul-25-13	Jul-26-13	
Sulfur, total	< 10	10	mg/L	Jul-25-13	Jul-26-13	

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result / *Recovery*	MRL / *Limit*	Units	Prepared	Analyzed	Notes
Sample ID: RIB MW13-04 (3071518-03) [Water] Sampled: Jul-21-13, Continued						CT4, F1
Total Recoverable Metals, Continued						
Tellurium, total	< 0.002	0.002	mg/L	Jul-25-13	Jul-26-13	
Thallium, total	**0.0002**	0.0002	mg/L	Jul-25-13	Jul-26-13	
Thorium, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Tin, total	< 0.002	0.002	mg/L	Jul-25-13	Jul-26-13	
Titanium, total	**0.71**	0.05	mg/L	Jul-25-13	Jul-26-13	
Uranium, total	**0.0025**	0.0002	mg/L	Jul-25-13	Jul-26-13	
Vanadium, total	**0.05**	0.01	mg/L	Jul-25-13	Jul-26-13	
Zinc, total	**0.14**	0.04	mg/L	Jul-25-13	Jul-26-13	
Zirconium, total	**0.008**	0.001	mg/L	Jul-25-13	Jul-26-13	
Microbiological Parameters						
Coliforms, Total (MPN)	**46000**	3.0	MPN/100mL	Jul-24-13	Jul-25-13	HT
Coliforms, Fecal (MPN)	< 3.0	3.0	MPN/100mL	Jul-24-13	Jul-25-13	HT
E. coli (MPN)	< 3.0	3.0	MPN/100mL	Jul-24-13	Jul-25-13	HT

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result / *Recovery*	MRL / *Limit*	Units	Prepared	Analyzed	Notes
Sample ID: RIB SW 13-01 (3071518-04) [Water] Sampled: Jul-21-13						CT4, F1
Anions						
Alkalinity, Total as CaCO3	**8**	1	mg/L	N/A	Jul-24-13	
Chloride	< 0.10	0.10	mg/L	N/A	Jul-24-13	
Fluoride	< 0.10	0.10	mg/L	N/A	Jul-24-13	
Nitrogen, Nitrate as N	**0.017**	0.010	mg/L	N/A	Jul-24-13	
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L	N/A	Jul-24-13	
Phosphate, Ortho as P	< 0.01	0.01	mg/L	N/A	Jul-24-13	
Sulfate	< 1.0	1.0	mg/L	N/A	Jul-24-13	
General Parameters						
BOD, 5-day	< 10	10	mg/L	Jul-24-13	Jul-29-13	
Carbon, Total Organic	**15.3**	0.5	mg/L	N/A	Jul-24-13	
Colour, True	**54**	5	Color Unit	N/A	Jul-25-13	HT
Conductivity (EC)	**25**	2	uS/cm	N/A	Jul-24-13	
Nitrogen, Ammonia as N, Total	< 0.020	0.020	mg/L	N/A	Jul-25-13	HT
pH	**7.06**	0.01	pH units	N/A	Jul-24-13	
Phosphorus, Total Kjeldahl Dissolved	**0.03**	0.01	mg/L	N/A	Jul-24-13	
Solids, Total Dissolved	**27**	5	mg/L	N/A	Jul-24-13	
Solids, Total Suspended	< 1	1	mg/L	N/A	Jul-25-13	
Turbidity	**0.7**	0.1	NTU	N/A	Jul-25-13	HT
UV Transmittance @ 254nm	**43.5**	0.1	%	Jul-25-13	Jul-25-13	
Calculated Parameters						
Hardness, Total (Total as CaCO3)	**8.6**	5.0	mg/L	N/A	N/A	
Hardness, Total (Diss. as CaCO3)	**9.3**	5.0	mg/L	N/A	N/A	
Dissolved Metals						
Aluminum, dissolved	**0.11**	0.05	mg/L	N/A	Jul-26-13	
Antimony, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Arsenic, dissolved	< 0.005	0.005	mg/L	N/A	Jul-26-13	
Barium, dissolved	< 0.05	0.05	mg/L	N/A	Jul-26-13	
Beryllium, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Bismuth, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Boron, dissolved	< 0.04	0.04	mg/L	N/A	Jul-26-13	
Cadmium, dissolved	< 0.0001	0.0001	mg/L	N/A	Jul-26-13	
Calcium, dissolved	**3**	2	mg/L	N/A	Jul-26-13	
Chromium, dissolved	< 0.005	0.005	mg/L	N/A	Jul-26-13	
Cobalt, dissolved	< 0.0005	0.0005	mg/L	N/A	Jul-26-13	
Copper, dissolved	< 0.002	0.002	mg/L	N/A	Jul-26-13	
Iron, dissolved	**0.2**	0.1	mg/L	N/A	Jul-26-13	
Lead, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Lithium, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Magnesium, dissolved	**0.7**	0.1	mg/L	N/A	Jul-26-13	
Manganese, dissolved	**0.007**	0.002	mg/L	N/A	Jul-26-13	
Mercury, dissolved	< 0.0002	0.0002	mg/L	N/A	Jul-26-13	
Molybdenum, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Nickel, dissolved	< 0.002	0.002	mg/L	N/A	Jul-26-13	
Phosphorus, dissolved	< 0.2	0.2	mg/L	N/A	Jul-26-13	

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result / *Recovery*	MRL / *Limit*	Units	Prepared	Analyzed	Notes
Sample ID: RIB SW 13-01 (3071518-04) [Water] Sampled: Jul-21-13, Continued						CT4, F1
Dissolved Metals, Continued						
Potassium, dissolved	< 0.2	0.2	mg/L	N/A	Jul-26-13	
Selenium, dissolved	< 0.005	0.005	mg/L	N/A	Jul-26-13	
Silicon, dissolved	< 5	5	mg/L	N/A	Jul-26-13	
Silver, dissolved	< 0.0005	0.0005	mg/L	N/A	Jul-26-13	
Sodium, dissolved	**1.3**	0.2	mg/L	N/A	Jul-26-13	
Strontium, dissolved	**0.02**	0.01	mg/L	N/A	Jul-26-13	
Sulfur, dissolved	< 10	10	mg/L	N/A	Jul-26-13	
Tellurium, dissolved	< 0.002	0.002	mg/L	N/A	Jul-26-13	
Thallium, dissolved	< 0.0002	0.0002	mg/L	N/A	Jul-26-13	
Thorium, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Tin, dissolved	< 0.002	0.002	mg/L	N/A	Jul-26-13	
Titanium, dissolved	< 0.05	0.05	mg/L	N/A	Jul-26-13	
Uranium, dissolved	< 0.0002	0.0002	mg/L	N/A	Jul-26-13	
Vanadium, dissolved	< 0.01	0.01	mg/L	N/A	Jul-26-13	
Zinc, dissolved	< 0.04	0.04	mg/L	N/A	Jul-26-13	
Zirconium, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Total Recoverable Metals						
Aluminum, total	**0.13**	0.05	mg/L	Jul-25-13	Jul-26-13	
Antimony, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Arsenic, total	< 0.005	0.005	mg/L	Jul-25-13	Jul-26-13	
Barium, total	< 0.05	0.05	mg/L	Jul-25-13	Jul-26-13	
Beryllium, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Bismuth, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Boron, total	< 0.04	0.04	mg/L	Jul-25-13	Jul-26-13	
Cadmium, total	< 0.0001	0.0001	mg/L	Jul-25-13	Jul-26-13	
Calcium, total	**2**	2	mg/L	Jul-25-13	Jul-26-13	
Chromium, total	< 0.005	0.005	mg/L	Jul-25-13	Jul-26-13	
Cobalt, total	< 0.0005	0.0005	mg/L	Jul-25-13	Jul-26-13	
Copper, total	< 0.002	0.002	mg/L	Jul-25-13	Jul-26-13	
Iron, total	**0.2**	0.1	mg/L	Jul-25-13	Jul-26-13	
Lead, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Lithium, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Magnesium, total	**0.7**	0.1	mg/L	Jul-25-13	Jul-26-13	
Manganese, total	**0.018**	0.002	mg/L	Jul-25-13	Jul-26-13	
Mercury, total	< 0.0002	0.0002	mg/L	Jul-25-13	Jul-26-13	
Molybdenum, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Nickel, total	< 0.002	0.002	mg/L	Jul-25-13	Jul-26-13	
Phosphorus, total	< 0.2	0.2	mg/L	Jul-25-13	Jul-26-13	
Potassium, total	< 0.2	0.2	mg/L	Jul-25-13	Jul-26-13	
Selenium, total	< 0.005	0.005	mg/L	Jul-25-13	Jul-26-13	
Silicon, total	< 5	5	mg/L	Jul-25-13	Jul-26-13	
Silver, total	< 0.0005	0.0005	mg/L	Jul-25-13	Jul-26-13	
Sodium, total	**1.3**	0.2	mg/L	Jul-25-13	Jul-26-13	
Strontium, total	**0.02**	0.01	mg/L	Jul-25-13	Jul-26-13	
Sulfur, total	< 10	10	mg/L	Jul-25-13	Jul-26-13	

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result / *Recovery*	MRL / *Limit*	Units	Prepared	Analyzed	Notes
Sample ID: RIB SW 13-01 (3071518-04) [Water] Sampled: Jul-21-13, Continued						CT4, F1
Total Recoverable Metals, Continued						
Tellurium, total	< 0.002	0.002	mg/L	Jul-25-13	Jul-26-13	
Thallium, total	< 0.0002	0.0002	mg/L	Jul-25-13	Jul-26-13	
Thorium, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Tin, total	< 0.002	0.002	mg/L	Jul-25-13	Jul-26-13	
Titanium, total	< 0.05	0.05	mg/L	Jul-25-13	Jul-26-13	
Uranium, total	< 0.0002	0.0002	mg/L	Jul-25-13	Jul-26-13	
Vanadium, total	< 0.01	0.01	mg/L	Jul-25-13	Jul-26-13	
Zinc, total	< 0.04	0.04	mg/L	Jul-25-13	Jul-26-13	
Zirconium, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Microbiological Parameters						
Coliforms, Total	**370**	1	CFU/100mL	Jul-24-13	Jul-25-13	
Background Colonies	**> 200**	200	CFU/100mL	Jul-24-13	Jul-25-13	
Coliforms, Fecal	< 1	1	CFU/100mL	Jul-24-13	Jul-25-13	
E. coli	< 1	1	CFU/100mL	Jul-24-13	Jul-25-13	

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result / *Recovery*	MRL / *Limit*	Units	Prepared	Analyzed	Notes
Sample ID: RIB SW 13-02 (3071518-05) [Water] Sampled: Jul-21-13						CT4
Anions						
Alkalinity, Total as CaCO3	**22**	1	mg/L	N/A	Jul-24-13	
Chloride	**0.64**	0.10	mg/L	N/A	Jul-24-13	
Fluoride	< 0.10	0.10	mg/L	N/A	Jul-24-13	
Nitrogen, Nitrate as N	< 0.010	0.010	mg/L	N/A	Jul-24-13	
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L	N/A	Jul-24-13	
Phosphate, Ortho as P	< 0.01	0.01	mg/L	N/A	Jul-24-13	
Sulfate	**1.7**	1.0	mg/L	N/A	Jul-24-13	
General Parameters						
BOD, 5-day	< 10	10	mg/L	Jul-24-13	Jul-29-13	
Carbon, Total Organic	**10.8**	0.5	mg/L	N/A	Jul-24-13	
Colour, True	**42**	5	Color Unit	N/A	Jul-25-13	HT
Conductivity (EC)	**51**	2	uS/cm	N/A	Jul-24-13	
Nitrogen, Ammonia as N, Total	**0.020**	0.020	mg/L	N/A	Jul-25-13	HT
pH	**7.46**	0.01	pH units	N/A	Jul-24-13	
Phosphorus, Total Kjeldahl Dissolved	**0.03**	0.01	mg/L	N/A	Jul-24-13	
Solids, Total Dissolved	**42**	5	mg/L	N/A	Jul-24-13	
Solids, Total Suspended	< 1	1	mg/L	N/A	Jul-25-13	
Turbidity	**0.9**	0.1	NTU	N/A	Jul-25-13	HT
UV Transmittance @ 254nm	**53.3**	0.1	%	Jul-25-13	Jul-25-13	
Calculated Parameters						
Hardness, Total (Total as CaCO3)	**18.0**	5.0	mg/L	N/A	N/A	
Hardness, Total (Diss. as CaCO3)	**18.7**	5.0	mg/L	N/A	N/A	
Dissolved Metals						
Aluminum, dissolved	**0.12**	0.05	mg/L	N/A	Jul-26-13	
Antimony, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Arsenic, dissolved	< 0.005	0.005	mg/L	N/A	Jul-26-13	
Barium, dissolved	< 0.05	0.05	mg/L	N/A	Jul-26-13	
Beryllium, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Bismuth, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Boron, dissolved	< 0.04	0.04	mg/L	N/A	Jul-26-13	
Cadmium, dissolved	< 0.0001	0.0001	mg/L	N/A	Jul-26-13	
Calcium, dissolved	**5**	2	mg/L	N/A	Jul-26-13	
Chromium, dissolved	< 0.005	0.005	mg/L	N/A	Jul-26-13	
Cobalt, dissolved	< 0.0005	0.0005	mg/L	N/A	Jul-26-13	
Copper, dissolved	< 0.002	0.002	mg/L	N/A	Jul-26-13	
Iron, dissolved	< 0.1	0.1	mg/L	N/A	Jul-26-13	
Lead, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Lithium, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Magnesium, dissolved	**1.3**	0.1	mg/L	N/A	Jul-26-13	
Manganese, dissolved	**0.003**	0.002	mg/L	N/A	Jul-26-13	
Mercury, dissolved	< 0.0002	0.0002	mg/L	N/A	Jul-26-13	
Molybdenum, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Nickel, dissolved	< 0.002	0.002	mg/L	N/A	Jul-26-13	
Phosphorus, dissolved	< 0.2	0.2	mg/L	N/A	Jul-26-13	

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result / *Recovery*	MRL / *Limit*	Units	Prepared	Analyzed	Notes
Sample ID: RIB SW 13-02 (3071518-05) [Water] Sampled: Jul-21-13, Continued						CT4
Dissolved Metals, Continued						
Potassium, dissolved	< 0.2	0.2	mg/L	N/A	Jul-26-13	
Selenium, dissolved	< 0.005	0.005	mg/L	N/A	Jul-26-13	
Silicon, dissolved	**5**	5	mg/L	N/A	Jul-26-13	
Silver, dissolved	< 0.0005	0.0005	mg/L	N/A	Jul-26-13	
Sodium, dissolved	**2.9**	0.2	mg/L	N/A	Jul-26-13	
Strontium, dissolved	**0.04**	0.01	mg/L	N/A	Jul-26-13	
Sulfur, dissolved	< 10	10	mg/L	N/A	Jul-26-13	
Tellurium, dissolved	< 0.002	0.002	mg/L	N/A	Jul-26-13	
Thallium, dissolved	< 0.0002	0.0002	mg/L	N/A	Jul-26-13	
Thorium, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Tin, dissolved	< 0.002	0.002	mg/L	N/A	Jul-26-13	
Titanium, dissolved	< 0.05	0.05	mg/L	N/A	Jul-26-13	
Uranium, dissolved	< 0.0002	0.0002	mg/L	N/A	Jul-26-13	
Vanadium, dissolved	< 0.01	0.01	mg/L	N/A	Jul-26-13	
Zinc, dissolved	< 0.04	0.04	mg/L	N/A	Jul-26-13	
Zirconium, dissolved	< 0.001	0.001	mg/L	N/A	Jul-26-13	
Total Recoverable Metals						
Aluminum, total	**0.17**	0.05	mg/L	Jul-25-13	Jul-26-13	
Antimony, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Arsenic, total	< 0.005	0.005	mg/L	Jul-25-13	Jul-26-13	
Barium, total	< 0.05	0.05	mg/L	Jul-25-13	Jul-26-13	
Beryllium, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Bismuth, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Boron, total	< 0.04	0.04	mg/L	Jul-25-13	Jul-26-13	
Cadmium, total	< 0.0001	0.0001	mg/L	Jul-25-13	Jul-26-13	
Calcium, total	**5**	2	mg/L	Jul-25-13	Jul-26-13	
Chromium, total	< 0.005	0.005	mg/L	Jul-25-13	Jul-26-13	
Cobalt, total	< 0.0005	0.0005	mg/L	Jul-25-13	Jul-26-13	
Copper, total	< 0.002	0.002	mg/L	Jul-25-13	Jul-26-13	
Iron, total	**0.1**	0.1	mg/L	Jul-25-13	Jul-26-13	
Lead, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Lithium, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Magnesium, total	**1.2**	0.1	mg/L	Jul-25-13	Jul-26-13	
Manganese, total	**0.004**	0.002	mg/L	Jul-25-13	Jul-26-13	
Mercury, total	< 0.0002	0.0002	mg/L	Jul-25-13	Jul-26-13	
Molybdenum, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Nickel, total	< 0.002	0.002	mg/L	Jul-25-13	Jul-26-13	
Phosphorus, total	< 0.2	0.2	mg/L	Jul-25-13	Jul-26-13	
Potassium, total	< 0.2	0.2	mg/L	Jul-25-13	Jul-26-13	
Selenium, total	< 0.005	0.005	mg/L	Jul-25-13	Jul-26-13	
Silicon, total	< 5	5	mg/L	Jul-25-13	Jul-26-13	
Silver, total	< 0.0005	0.0005	mg/L	Jul-25-13	Jul-26-13	
Sodium, total	**2.7**	0.2	mg/L	Jul-25-13	Jul-26-13	
Strontium, total	**0.04**	0.01	mg/L	Jul-25-13	Jul-26-13	
Sulfur, total	< 10	10	mg/L	Jul-25-13	Jul-26-13	

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result / *Recovery*	MRL / *Limit*	Units	Prepared	Analyzed	Notes
Sample ID: RIB SW 13-02 (3071518-05) [Water] Sampled: Jul-21-13, Continued						CT4
Total Recoverable Metals, Continued						
Tellurium, total	< 0.002	0.002	mg/L	Jul-25-13	Jul-26-13	
Thallium, total	< 0.0002	0.0002	mg/L	Jul-25-13	Jul-26-13	
Thorium, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Tin, total	< 0.002	0.002	mg/L	Jul-25-13	Jul-26-13	
Titanium, total	< 0.05	0.05	mg/L	Jul-25-13	Jul-26-13	
Uranium, total	< 0.0002	0.0002	mg/L	Jul-25-13	Jul-26-13	
Vanadium, total	< 0.01	0.01	mg/L	Jul-25-13	Jul-26-13	
Zinc, total	< 0.04	0.04	mg/L	Jul-25-13	Jul-26-13	
Zirconium, total	< 0.001	0.001	mg/L	Jul-25-13	Jul-26-13	
Microbiological Parameters						
Coliforms, Total	**190**	1	CFU/100mL	Jul-24-13	Jul-25-13	
Background Colonies	**> 200**	200	CFU/100mL	Jul-24-13	Jul-25-13	
Coliforms, Fecal	< 1	1	CFU/100mL	Jul-24-13	Jul-25-13	
E. coli	< 1	1	CFU/100mL	Jul-24-13	Jul-25-13	

Sample / Analysis Qualifiers:

CT4	Client requested bact analysis be run from decanted sample
F1	The sample was not field-filtered and was therefore filtered through a 0.45 um membrane in the laboratory and preserved with HNO3 prior to analysis for dissolved metals.
HT	Sample prepared / analyzed outside of the recommended holding time.

REPORTED TO	Western Water Associates Ltd	**WORK ORDER**	3071518
PROJECT	Blackwater WW	**REPORTED**	Jul-31-13

The following section displays the quality control (QC) data that is associated with your sample data. Groups of samples are prepared in "batches" and analyzed in conjunction with QC samples that ensure your data is of the highest quality. Common QC types include:

- **Method Blank (Blk)**: Laboratory reagent water is carried through sample preparation and analysis steps. Method Blanks indicate that results are free from contamination, i.e. not biased high from sources such as the sample container or the laboratory environment
- **Duplicate (Dup)**: Preparation and analysis of a replicate aliquot of a sample. Duplicates provide a measure of the analytical method's precision, i.e. how reproducible a result is. Duplicates are only reported if they are associated with your sample data.
- **Blank Spike (BS)**: A known amount of standard is carried through sample preparation and analysis steps. Blank Spikes, also known as laboratory control samples (LCS), are prepared from a different source of standard than used for the calibration. They ensure that the calibration is acceptable (i.e. not biased high or low) and also provide a measure of the analytical method's accuracy (i.e. closeness of the result to a target value).
- **Standard Reference Material (SRM)**: A material of similar matrix to the samples, externally certified for the parameter(s) listed. Standard Reference Materials ensure that the preparation steps in the method are adequate to achieve acceptable recoveries of the parameter(s) tested.

Each QC type is analyzed at a 5-10% frequency, i.e. one blank/duplicate/spike for every 10 samples. For all types of QC, the specified recovery (% Rec) and relative percent difference (RPD) limits are derived from long-term method performance averages and/or prescribed by the reference method.

Analyte	Result	MRL	Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
Anions, Batch B3G1047										
Blank (B3G1047-BLK1)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Alkalinity, Total as CaCO3	< 1	1	mg/L							
Blank (B3G1047-BLK2)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Alkalinity, Total as CaCO3	< 1	1	mg/L							
Blank (B3G1047-BLK3)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Alkalinity, Total as CaCO3	< 1	1	mg/L							
Blank (B3G1047-BLK4)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Alkalinity, Total as CaCO3	< 1	1	mg/L							
LCS (B3G1047-BS1)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Alkalinity, Total as CaCO3	98	1	mg/L	100		98	96-108			
LCS (B3G1047-BS2)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Alkalinity, Total as CaCO3	97	1	mg/L	100		97	96-108			
LCS (B3G1047-BS3)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Alkalinity, Total as CaCO3	97	1	mg/L	100		97	96-108			
LCS (B3G1047-BS4)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Alkalinity, Total as CaCO3	99	1	mg/L	100		99	96-108			
Anions, Batch B3G1051										
Blank (B3G1051-BLK1)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Chloride	< 0.10	0.10	mg/L							
Fluoride	< 0.10	0.10	mg/L							
Nitrogen, Nitrate as N	< 0.010	0.010	mg/L							
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L							
Phosphate, Ortho as P	< 0.01	0.01	mg/L							
Sulfate	< 1.0	1.0	mg/L							

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result	MRL	Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
Anions, Batch B3G1051, Continued										
Blank (B3G1051-BLK2)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Chloride	< 0.10	0.10	mg/L							
Fluoride	< 0.10	0.10	mg/L							
Nitrogen, Nitrate as N	< 0.010	0.010	mg/L							
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L							
Phosphate, Ortho as P	< 0.01	0.01	mg/L							
Sulfate	< 1.0	1.0	mg/L							
Blank (B3G1051-BLK3)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Chloride	< 0.10	0.10	mg/L							
Fluoride	< 0.10	0.10	mg/L							
Nitrogen, Nitrate as N	< 0.010	0.010	mg/L							
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L							
Phosphate, Ortho as P	< 0.01	0.01	mg/L							
Sulfate	< 1.0	1.0	mg/L							
Blank (B3G1051-BLK4)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Chloride	< 0.10	0.10	mg/L							
Fluoride	< 0.10	0.10	mg/L							
Nitrogen, Nitrate as N	< 0.010	0.010	mg/L							
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L							
Phosphate, Ortho as P	< 0.01	0.01	mg/L							
Sulfate	< 1.0	1.0	mg/L							
LCS (B3G1051-BS1)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Chloride	15.9	0.10	mg/L	16.0		99	85-115			
Fluoride	4.01	0.10	mg/L	4.00		100	85-115			
Nitrogen, Nitrate as N	3.96	0.010	mg/L	4.00		99	85-115			
Nitrogen, Nitrite as N	1.87	0.010	mg/L	2.00		93	85-115			
Phosphate, Ortho as P	2.12	0.01	mg/L	2.00		106	85-115			
Sulfate	16.1	1.0	mg/L	16.0		100	85-115			
LCS (B3G1051-BS2)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Chloride	15.9	0.10	mg/L	16.0		99	85-115			
Fluoride	4.06	0.10	mg/L	4.00		102	85-115			
Nitrogen, Nitrate as N	3.90	0.010	mg/L	4.00		98	85-115			
Nitrogen, Nitrite as N	2.01	0.010	mg/L	2.00		101	85-115			
Phosphate, Ortho as P	2.00	0.01	mg/L	2.00		100	85-115			
Sulfate	16.2	1.0	mg/L	16.0		101	85-115			
LCS (B3G1051-BS3)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Chloride	15.8	0.10	mg/L	16.0		99	85-115			
Fluoride	4.00	0.10	mg/L	4.00		100	85-115			
Nitrogen, Nitrate as N	3.94	0.010	mg/L	4.00		99	85-115			
Nitrogen, Nitrite as N	1.98	0.010	mg/L	2.00		99	85-115			
Phosphate, Ortho as P	1.96	0.01	mg/L	2.00		98	85-115			
Sulfate	16.1	1.0	mg/L	16.0		101	85-115			
LCS (B3G1051-BS4)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Chloride	15.7	0.10	mg/L	16.0		98	85-115			
Fluoride	4.05	0.10	mg/L	4.00		101	85-115			
Nitrogen, Nitrate as N	3.94	0.010	mg/L	4.00		98	85-115			
Nitrogen, Nitrite as N	2.08	0.010	mg/L	2.00		104	85-115			
Phosphate, Ortho as P	1.91	0.01	mg/L	2.00		95	85-115			
Sulfate	16.1	1.0	mg/L	16.0		101	85-115			
Duplicate (B3G1051-DUP4)		**Source: 3071518-03**		Prepared: Jul-25-13, Analyzed: Jul-25-13						
Chloride	0.71	0.10	mg/L		0.71			< 1	10	

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result	MRL	Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
Anions, Batch B3G1051, Continued										
Duplicate (B3G1051-DUP4), Continued		**Source: 3071518-03**		Prepared: Jul-25-13, Analyzed: Jul-25-13						
Fluoride	< 0.10	0.10	mg/L		< 0.10				10	
Nitrogen, Nitrate as N	< 0.010	0.010	mg/L		< 0.010				10	
Nitrogen, Nitrite as N	< 0.010	0.010	mg/L		< 0.010				10	
Phosphate, Ortho as P	< 0.01	0.01	mg/L		< 0.01				20	
Sulfate	33.4	1.0	mg/L		33.8			1	10	
Dissolved Metals, Batch B3G1099										
Blank (B3G1099-BLK1)				Prepared: Jul-26-13, Analyzed: Jul-26-13						
Aluminum, dissolved	< 0.05	0.05	mg/L							
Antimony, dissolved	< 0.001	0.001	mg/L							
Arsenic, dissolved	< 0.005	0.005	mg/L							
Barium, dissolved	< 0.05	0.05	mg/L							
Beryllium, dissolved	< 0.001	0.001	mg/L							
Bismuth, dissolved	< 0.001	0.001	mg/L							
Boron, dissolved	< 0.04	0.04	mg/L							
Cadmium, dissolved	< 0.0001	0.0001	mg/L							
Calcium, dissolved	< 2	2	mg/L							
Chromium, dissolved	< 0.005	0.005	mg/L							
Cobalt, dissolved	< 0.0005	0.0005	mg/L							
Copper, dissolved	< 0.002	0.002	mg/L							
Iron, dissolved	< 0.1	0.1	mg/L							
Lead, dissolved	< 0.001	0.001	mg/L							
Lithium, dissolved	< 0.001	0.001	mg/L							
Magnesium, dissolved	< 0.1	0.1	mg/L							
Manganese, dissolved	< 0.002	0.002	mg/L							
Mercury, dissolved	< 0.0002	0.0002	mg/L							
Molybdenum, dissolved	< 0.001	0.001	mg/L							
Nickel, dissolved	< 0.002	0.002	mg/L							
Phosphorus, dissolved	< 0.2	0.2	mg/L							
Potassium, dissolved	< 0.2	0.2	mg/L							
Selenium, dissolved	< 0.005	0.005	mg/L							
Silicon, dissolved	< 5	5	mg/L							
Silver, dissolved	< 0.0005	0.0005	mg/L							
Sodium, dissolved	< 0.2	0.2	mg/L							
Strontium, dissolved	< 0.01	0.01	mg/L							
Sulfur, dissolved	< 10	10	mg/L							
Tellurium, dissolved	< 0.002	0.002	mg/L							
Thallium, dissolved	< 0.0002	0.0002	mg/L							
Thorium, dissolved	< 0.001	0.001	mg/L							
Tin, dissolved	< 0.002	0.002	mg/L							
Titanium, dissolved	< 0.05	0.05	mg/L							
Uranium, dissolved	< 0.0002	0.0002	mg/L							
Vanadium, dissolved	< 0.01	0.01	mg/L							
Zinc, dissolved	< 0.04	0.04	mg/L							
Zirconium, dissolved	< 0.001	0.001	mg/L							
Duplicate (B3G1099-DUP1)		**Source: 3071518-02**		Prepared: Jul-26-13, Analyzed: Jul-26-13						
Aluminum, dissolved	5.27	0.05	mg/L		5.83			10	16	
Antimony, dissolved	< 0.001	0.001	mg/L		0.001				21	
Arsenic, dissolved	0.005	0.005	mg/L		0.006				10	
Barium, dissolved	< 0.05	0.05	mg/L		0.05				6	
Beryllium, dissolved	< 0.001	0.001	mg/L		< 0.001				20	
Bismuth, dissolved	< 0.001	0.001	mg/L		< 0.001				20	
Boron, dissolved	< 0.04	0.04	mg/L		< 0.04				13	
Cadmium, dissolved	0.0001	0.0001	mg/L		< 0.0001				24	

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result	MRL	Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
Dissolved Metals, Batch B3G1099, Continued										
Duplicate (B3G1099-DUP1), Continued		**Source: 3071518-02**		Prepared: Jul-26-13, Analyzed: Jul-26-13						
Calcium, dissolved	8	2	mg/L		9				10	
Chromium, dissolved	0.005	0.005	mg/L		0.005				7	
Cobalt, dissolved	0.0011	0.0005	mg/L		0.0012				12	
Copper, dissolved	0.002	0.002	mg/L		0.002				20	
Iron, dissolved	3.1	0.1	mg/L		3.0			3	10	
Lead, dissolved	0.005	0.001	mg/L		0.005			< 1	14	
Lithium, dissolved	0.002	0.001	mg/L		0.002				15	
Magnesium, dissolved	2.5	0.1	mg/L		2.6			5	9	
Manganese, dissolved	0.107	0.002	mg/L		0.113			5	10	
Mercury, dissolved	< 0.0002	0.0002	mg/L		< 0.0002				20	
Molybdenum, dissolved	< 0.001	0.001	mg/L		< 0.001				16	
Nickel, dissolved	0.002	0.002	mg/L		0.004				14	
Phosphorus, dissolved	< 0.2	0.2	mg/L		< 0.2				23	
Potassium, dissolved	1.5	0.2	mg/L		1.8			14	17	
Selenium, dissolved	< 0.005	0.005	mg/L		< 0.005				23	
Silicon, dissolved	15	5	mg/L		16				10	
Silver, dissolved	< 0.0005	0.0005	mg/L		< 0.0005				20	
Sodium, dissolved	3.3	0.2	mg/L		3.5			5	9	
Strontium, dissolved	0.07	0.01	mg/L		0.07			4	9	
Sulfur, dissolved	< 10	10	mg/L		< 10				27	
Tellurium, dissolved	< 0.002	0.002	mg/L		< 0.002				20	
Thallium, dissolved	< 0.0002	0.0002	mg/L		< 0.0002				12	
Thorium, dissolved	< 0.001	0.001	mg/L		< 0.001				20	
Tin, dissolved	< 0.002	0.002	mg/L		< 0.002				20	
Titanium, dissolved	0.16	0.05	mg/L		0.19				20	
Uranium, dissolved	0.0011	0.0002	mg/L		0.0016			37	11	
Vanadium, dissolved	< 0.01	0.01	mg/L		0.01				14	
Zinc, dissolved	0.05	0.04	mg/L		0.05				11	
Zirconium, dissolved	0.006	0.001	mg/L		0.006			4	20	
Matrix Spike (B3G1099-MS1)		**Source: 3071518-03**		Prepared: Jul-26-13, Analyzed: Jul-26-13						
Antimony, dissolved	0.353	0.001	mg/L	0.400	0.001	88	71-112			
Arsenic, dissolved	0.179	0.005	mg/L	0.200	0.009	85	82-112			
Barium, dissolved	0.94	0.05	mg/L	1.00	0.13	81	80-109			
Beryllium, dissolved	0.094	0.001	mg/L	0.100	< 0.001	94	75-111			
Cadmium, dissolved	0.0950	0.0001	mg/L	0.100	0.0002	95	84-109			
Chromium, dissolved	0.384	0.005	mg/L	0.400	0.009	94	87-115			
Cobalt, dissolved	0.388	0.0005	mg/L	0.400	0.0066	95	85-118			
Copper, dissolved	0.393	0.002	mg/L	0.400	0.010	96	84-121			
Iron, dissolved	2.2	0.1	mg/L	2.00	8.6	NR	71-129			SPK1
Lead, dissolved	0.198	0.001	mg/L	0.200	0.006	96	81-111			
Manganese, dissolved	0.386	0.002	mg/L	0.400	0.678	NR	66-125			SPK1
Nickel, dissolved	0.382	0.002	mg/L	0.400	0.018	91	85-115			
Selenium, dissolved	0.090	0.005	mg/L	0.100	< 0.005	90	77-113			
Silver, dissolved	0.0977	0.0005	mg/L	0.100	< 0.0005	98	52-131			
Thallium, dissolved	0.0996	0.0002	mg/L	0.100	< 0.0002	100	82-111			
Vanadium, dissolved	0.38	0.01	mg/L	0.400	0.02	89	85-111			
Zinc, dissolved	0.94	0.04	mg/L	1.00	0.04	89	85-115			
Reference (B3G1099-SRM1)				Prepared: Jul-26-13, Analyzed: Jul-26-13						
Aluminum, dissolved	0.24	0.05	mg/L	0.233		101	58-142			
Antimony, dissolved	0.054	0.001	mg/L	0.0430		125	75-125			
Arsenic, dissolved	0.417	0.005	mg/L	0.438		95	81-119			
Barium, dissolved	3.33	0.05	mg/L	3.35		99	83-117			
Beryllium, dissolved	0.207	0.001	mg/L	0.213		97	80-120			
Boron, dissolved	1.61	0.04	mg/L	1.74		93	74-117			
Cadmium, dissolved	0.221	0.0001	mg/L	0.224		99	83-117			

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result	MRL	Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
Dissolved Metals, Batch B3G1099, Continued										
Reference (B3G1099-SRM1), Continued				Prepared: Jul-26-13, Analyzed: Jul-26-13						
Calcium, dissolved	7	2	mg/L	7.69		96	76-124			
Chromium, dissolved	0.439	0.005	mg/L	0.437		100	81-119			
Cobalt, dissolved	0.133	0.0005	mg/L	0.128		104	76-124			
Copper, dissolved	0.886	0.002	mg/L	0.844		105	84-116			
Iron, dissolved	1.3	0.1	mg/L	1.29		102	74-126			
Lead, dissolved	0.114	0.001	mg/L	0.112		102	72-128			
Lithium, dissolved	0.106	0.001	mg/L	0.104		102	60-140			
Magnesium, dissolved	7.1	0.1	mg/L	6.92		102	81-119			
Manganese, dissolved	0.352	0.002	mg/L	0.345		102	84-116			
Molybdenum, dissolved	0.410	0.001	mg/L	0.426		96	83-117			
Nickel, dissolved	0.856	0.002	mg/L	0.840		102	74-126			
Phosphorus, dissolved	0.6	0.2	mg/L	0.495		113	68-132			
Potassium, dissolved	2.9	0.2	mg/L	3.19		90	74-126			
Selenium, dissolved	0.028	0.005	mg/L	0.0331		85	70-130			
Sodium, dissolved	18.9	0.2	mg/L	19.1		99	72-128			
Strontium, dissolved	0.92	0.01	mg/L	0.916		101	84-113			
Thallium, dissolved	0.0398	0.0002	mg/L	0.0393		101	57-143			
Uranium, dissolved	0.264	0.0002	mg/L	0.266		99	85-115			
Vanadium, dissolved	0.85	0.01	mg/L	0.869		98	87-113			
Zinc, dissolved	0.86	0.04	mg/L	0.881		97	72-128			
General Parameters, Batch B3G0996										
Blank (B3G0996-BLK1)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Carbon, Total Organic	< 0.5	0.5	mg/L							
Blank (B3G0996-BLK2)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Carbon, Total Organic	< 0.5	0.5	mg/L							
LCS (B3G0996-BS1)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Carbon, Total Organic	9.2	0.5	mg/L	10.0		92	80-120			
LCS (B3G0996-BS2)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Carbon, Total Organic	9.9	0.5	mg/L	10.0		99	80-120			
General Parameters, Batch B3G1023										
Blank (B3G1023-BLK1)				Prepared: Jul-24-13, Analyzed: Jul-29-13						
BOD, 5-day	< 10	10	mg/L							
Blank (B3G1023-BLK2)				Prepared: Jul-24-13, Analyzed: Jul-29-13						
BOD, 5-day	< 10	10	mg/L							
LCS (B3G1023-BS1)				Prepared: Jul-24-13, Analyzed: Jul-29-13						
BOD, 5-day	214	10	mg/L	198		108	85-115			
LCS (B3G1023-BS2)				Prepared: Jul-24-13, Analyzed: Jul-29-13						
BOD, 5-day	218	10	mg/L	198		110	85-115			
General Parameters, Batch B3G1029										
Blank (B3G1029-BLK1)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Solids, Total Suspended	< 1	1	mg/L							
Blank (B3G1029-BLK2)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Solids, Total Suspended	< 1	1	mg/L							

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result	MRL	Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
General Parameters, Batch B3G1029, Continued										
Blank (B3G1029-BLK3)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Solids, Total Suspended	< 1	1	mg/L							
LCS (B3G1029-BS1)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Solids, Total Suspended	50	1	mg/L	50.0		100	85-110			
LCS (B3G1029-BS2)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Solids, Total Suspended	49	1	mg/L	50.0		98	85-110			
LCS (B3G1029-BS3)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Solids, Total Suspended	49	1	mg/L	50.0		98	85-110			
Reference (B3G1029-SRM1)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Solids, Total Suspended	150	1	mg/L	159		94	80-120			
General Parameters, Batch B3G1030										
Blank (B3G1030-BLK1)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Solids, Total Dissolved	< 5	5	mg/L							
Blank (B3G1030-BLK2)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Solids, Total Dissolved	< 5	5	mg/L							
Reference (B3G1030-SRM1)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Solids, Total Dissolved	233	5	mg/L	240		97	85-115			
Reference (B3G1030-SRM2)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Solids, Total Dissolved	236	5	mg/L	240		98	85-115			
General Parameters, Batch B3G1047										
Blank (B3G1047-BLK1)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Conductivity (EC)	< 2	2	uS/cm							
Blank (B3G1047-BLK2)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Conductivity (EC)	< 2	2	uS/cm							
Blank (B3G1047-BLK3)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Conductivity (EC)	< 2	2	uS/cm							
Blank (B3G1047-BLK4)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Conductivity (EC)	< 2	2	uS/cm							
LCS (B3G1047-BS5)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Conductivity (EC)	1420	2	uS/cm	1410		100	93-104			
LCS (B3G1047-BS6)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Conductivity (EC)	1420	2	uS/cm	1410		101	93-104			
LCS (B3G1047-BS7)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Conductivity (EC)	1430	2	uS/cm	1410		101	93-104			
LCS (B3G1047-BS8)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
Conductivity (EC)	1430	2	uS/cm	1410		101	93-104			
Reference (B3G1047-SRM1)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
pH	6.99	0.01	pH units	7.00		100	98-102			

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result	MRL	Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
General Parameters, Batch B3G1047, Continued										
Reference (B3G1047-SRM2)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
pH	7.00	0.01	pH units	7.00		100	98-102			
Reference (B3G1047-SRM3)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
pH	6.99	0.01	pH units	7.00		100	98-102			
Reference (B3G1047-SRM4)				Prepared: Jul-24-13, Analyzed: Jul-24-13						
pH	6.99	0.01	pH units	7.00		100	98-102			
General Parameters, Batch B3G1069										
Blank (B3G1069-BLK1)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Nitrogen, Ammonia as N, Total	< 0.020	0.020	mg/L							
LCS (B3G1069-BS1)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Nitrogen, Ammonia as N, Total	10.1	0.020	mg/L	10.0		101	86-111			
General Parameters, Batch B3G1072										
Blank (B3G1072-BLK1)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Turbidity	< 0.1	0.1	NTU							
Blank (B3G1072-BLK2)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Turbidity	< 0.1	0.1	NTU							
Blank (B3G1072-BLK3)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Turbidity	< 0.1	0.1	NTU							
Blank (B3G1072-BLK4)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Turbidity	< 0.1	0.1	NTU							
LCS (B3G1072-BS1)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Turbidity	39.5	0.1	NTU	40.0		99	85-115			
LCS (B3G1072-BS2)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Turbidity	39.5	0.1	NTU	40.0		99	85-115			
LCS (B3G1072-BS3)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Turbidity	40.0	0.1	NTU	40.0		100	85-115			
LCS (B3G1072-BS4)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Turbidity	39.9	0.1	NTU	40.0		100	85-115			
Duplicate (B3G1072-DUP1)		**Source: 3071518-01**		Prepared: Jul-25-13, Analyzed: Jul-25-13						
Turbidity	24.0	0.1	NTU		21.7			10	15	
General Parameters, Batch B3G1075										
Blank (B3G1075-BLK1)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Colour, True	< 5	5	Color Unit							
Blank (B3G1075-BLK2)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Colour, True	< 5	5	Color Unit							
Blank (B3G1075-BLK3)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Colour, True	< 5	5	Color Unit							

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result	MRL	Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
General Parameters, Batch B3G1075, Continued										
LCS (B3G1075-BS1)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Colour, True	9	5	Color Unit	10.0		92	81-118			
LCS (B3G1075-BS2)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Colour, True	9	5	Color Unit	10.0		92	81-118			
LCS (B3G1075-BS3)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Colour, True	9	5	Color Unit	10.0		92	81-118			
Duplicate (B3G1075-DUP2)		**Source: 3071518-01**		Prepared: Jul-25-13, Analyzed: Jul-25-13						
Colour, True	< 5	5	Color Unit		< 5				5	
General Parameters, Batch B3G1114										
Blank (B3G1114-BLK1)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
UV Transmittance @ 254nm	< 0.1	0.1	%							
Blank (B3G1114-BLK2)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
UV Transmittance @ 254nm	< 0.1	0.1	%							
Blank (B3G1114-BLK3)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
UV Transmittance @ 254nm	< 0.1	0.1	%							
Blank (B3G1114-BLK4)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
UV Transmittance @ 254nm	< 0.1	0.1	%							
Blank (B3G1114-BLK5)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
UV Transmittance @ 254nm	< 0.1	0.1	%							
Duplicate (B3G1114-DUP4)		**Source: 3071518-01**		Prepared: Jul-25-13, Analyzed: Jul-25-13						
UV Transmittance @ 254nm	98.3	0.1	%		98.3			< 1	15	
Reference (B3G1114-SRM1)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
UV Transmittance @ 254nm	81.3	0.1	%	79.8		102	90-110			
Reference (B3G1114-SRM2)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
UV Transmittance @ 254nm	81.2	0.1	%	79.8		102	90-110			
Reference (B3G1114-SRM3)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
UV Transmittance @ 254nm	81.0	0.1	%	79.8		101	90-110			
Reference (B3G1114-SRM4)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
UV Transmittance @ 254nm	81.2	0.1	%	79.8		102	90-110			
Reference (B3G1114-SRM5)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
UV Transmittance @ 254nm	81.1	0.1	%	79.8		102	90-110			
General Parameters, Batch B3G1116										
Blank (B3G1116-BLK1)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Phosphorus, Total Kjeldahl Dissolved	< 0.01	0.01	mg/L							
LCS (B3G1116-BS1)				Prepared: Jul-25-13, Analyzed: Jul-25-13						
Phosphorus, Total Kjeldahl Dissolved	0.56	0.01	mg/L	0.500		112	80-120			
Microbiological Parameters, Batch B3G1001										

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result	MRL	Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
Microbiological Parameters, Batch B3G1001, Continued										
Blank (B3G1001-BLK1)				Prepared: Jul-24-13, Analyzed: Jul-25-13						
Coliforms, Total	< 1	1	CFU/100mL							
Coliforms, Fecal	< 1	1	CFU/100mL							
E. coli	< 1	1	CFU/100mL							
Blank (B3G1001-BLK2)				Prepared: Jul-24-13, Analyzed: Jul-25-13						
Coliforms, Total	< 1	1	CFU/100mL							
Coliforms, Fecal	< 1	1	CFU/100mL							
E. coli	< 1	1	CFU/100mL							
Blank (B3G1001-BLK3)				Prepared: Jul-24-13, Analyzed: Jul-25-13						
Coliforms, Total	< 1	1	CFU/100mL							
Coliforms, Fecal	< 1	1	CFU/100mL							
E. coli	< 1	1	CFU/100mL							
Blank (B3G1001-BLK4)				Prepared: Jul-24-13, Analyzed: Jul-25-13						
Coliforms, Total	< 1	1	CFU/100mL							
Coliforms, Fecal	< 1	1	CFU/100mL							
E. coli	< 1	1	CFU/100mL							
Microbiological Parameters, Batch B3G1019										
Blank (B3G1019-BLK1)				Prepared: Jul-24-13, Analyzed: Jul-25-13						
Coliforms, Total (MPN)	< 3.0	3.0	MPN/100mL							
Coliforms, Fecal (MPN)	< 3.0	3.0	MPN/100mL							
E. coli (MPN)	< 3.0	3.0	MPN/100mL							
Blank (B3G1019-BLK2)				Prepared: Jul-24-13, Analyzed: Jul-25-13						
Coliforms, Total (MPN)	< 2.2	3.0	MPN/100mL							
Coliforms, Fecal (MPN)	< 2.2	3.0	MPN/100mL							
E. coli (MPN)	< 2.2	3.0	MPN/100mL							
Total Recoverable Metals, Batch B3G1097										
Blank (B3G1097-BLK1)				Prepared: Jul-25-13, Analyzed: Jul-26-13						
Aluminum, total	< 0.05	0.05	mg/L							
Antimony, total	< 0.001	0.001	mg/L							
Arsenic, total	< 0.005	0.005	mg/L							
Barium, total	< 0.05	0.05	mg/L							
Beryllium, total	< 0.001	0.001	mg/L							
Bismuth, total	< 0.001	0.001	mg/L							
Boron, total	< 0.04	0.04	mg/L							
Cadmium, total	< 0.0001	0.0001	mg/L							
Calcium, total	< 2	2	mg/L							
Chromium, total	< 0.005	0.005	mg/L							
Cobalt, total	< 0.0005	0.0005	mg/L							
Copper, total	< 0.002	0.002	mg/L							
Iron, total	< 0.1	0.1	mg/L							
Lead, total	< 0.001	0.001	mg/L							
Lithium, total	< 0.001	0.001	mg/L							
Magnesium, total	< 0.1	0.1	mg/L							
Manganese, total	< 0.002	0.002	mg/L							
Mercury, total	< 0.0002	0.0002	mg/L							
Molybdenum, total	< 0.001	0.001	mg/L							
Nickel, total	< 0.002	0.002	mg/L							
Phosphorus, total	< 0.2	0.2	mg/L							
Potassium, total	< 0.2	0.2	mg/L							

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PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result	MRL	Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
Total Recoverable Metals, Batch B3G1097, Continued										
Blank (B3G1097-BLK1), Continued				Prepared: Jul-25-13, Analyzed: Jul-26-13						
Selenium, total	< 0.005	0.005	mg/L							
Silicon, total	< 5	5	mg/L							
Silver, total	< 0.0005	0.0005	mg/L							
Sodium, total	< 0.2	0.2	mg/L							
Strontium, total	< 0.01	0.01	mg/L							
Sulfur, total	< 10	10	mg/L							
Tellurium, total	< 0.002	0.002	mg/L							
Thallium, total	< 0.0002	0.0002	mg/L							
Thorium, total	< 0.001	0.001	mg/L							
Tin, total	< 0.002	0.002	mg/L							
Titanium, total	< 0.05	0.05	mg/L							
Uranium, total	< 0.0002	0.0002	mg/L							
Vanadium, total	< 0.01	0.01	mg/L							
Zinc, total	< 0.04	0.04	mg/L							
Zirconium, total	< 0.001	0.001	mg/L							
Duplicate (B3G1097-DUP1)		**Source: 3071518-03**		Prepared: Jul-25-13, Analyzed: Jul-26-13						
Aluminum, total	27.4	0.05	mg/L		26.1			5	27	
Antimony, total	< 0.001	0.001	mg/L		< 0.001				24	
Arsenic, total	0.020	0.005	mg/L		0.019				14	
Barium, total	0.26	0.05	mg/L		0.25			5	16	
Beryllium, total	0.001	0.001	mg/L		0.001				20	
Bismuth, total	< 0.001	0.001	mg/L		< 0.001				20	
Boron, total	< 0.04	0.04	mg/L		< 0.04				15	
Cadmium, total	0.0007	0.0001	mg/L		0.0005			25	40	
Calcium, total	31	2	mg/L		30			1	14	
Chromium, total	0.028	0.005	mg/L		0.026			7	17	
Cobalt, total	0.0159	0.0005	mg/L		0.0151			5	17	
Copper, total	0.031	0.002	mg/L		0.029			6	30	
Iron, total	30.7	0.1	mg/L		28.1			9	28	
Lead, total	0.027	0.001	mg/L		0.027			< 1	19	
Lithium, total	0.014	0.001	mg/L		0.014			2	18	
Magnesium, total	12.4	0.1	mg/L		11.5			7	13	
Manganese, total	1.40	0.002	mg/L		1.32			6	19	
Mercury, total	< 0.0002	0.0002	mg/L		< 0.0002				40	
Molybdenum, total	< 0.001	0.001	mg/L		< 0.001				24	
Nickel, total	0.038	0.002	mg/L		0.035			7	33	
Phosphorus, total	0.8	0.2	mg/L		0.6				24	
Potassium, total	3.7	0.2	mg/L		3.3			11	22	
Selenium, total	< 0.005	0.005	mg/L		< 0.005				21	
Silicon, total	45	5	mg/L		42			5	25	
Silver, total	< 0.0005	0.0005	mg/L		< 0.0005				23	
Sodium, total	5.4	0.2	mg/L		5.0			8	17	
Strontium, total	0.16	0.01	mg/L		0.15			6	11	
Sulfur, total	< 10	10	mg/L		< 10				41	
Tellurium, total	< 0.002	0.002	mg/L		< 0.002				31	
Thallium, total	0.0002	0.0002	mg/L		0.0002				21	
Thorium, total	< 0.001	0.001	mg/L		< 0.001				46	
Tin, total	< 0.002	0.002	mg/L		< 0.002				30	
Titanium, total	0.80	0.05	mg/L		0.71			11	60	
Uranium, total	0.0025	0.0002	mg/L		0.0025			< 1	17	
Vanadium, total	0.06	0.01	mg/L		0.05			6	27	
Zinc, total	0.14	0.04	mg/L		0.14				26	
Zirconium, total	0.006	0.001	mg/L		0.008			38	60	
Matrix Spike (B3G1097-MS1)		**Source: 3071518-04**		Prepared: Jul-25-13, Analyzed: Jul-26-13						
Antimony, total	0.394	0.001	mg/L	0.400	< 0.001	99	81-122			

REPORTED TO Western Water Associates Ltd
PROJECT Blackwater WW

WORK ORDER 3071518
REPORTED Jul-31-13

Analyte	Result	MRL	Units	Spike Level	Source Result	% REC	REC Limit	RPD	RPD Limit	Notes
Total Recoverable Metals, Batch B3G1097, Continued										
Matrix Spike (B3G1097-MS1), Continued		**Source: 3071518-04**		Prepared: Jul-25-13, Analyzed: Jul-26-13						
Arsenic, total	0.182	0.005	mg/L	0.200	< 0.005	91	81-119			
Barium, total	0.94	0.05	mg/L	1.00	< 0.05	94	84-113			
Beryllium, total	0.095	0.001	mg/L	0.100	< 0.001	95	77-117			
Cadmium, total	0.0935	0.0001	mg/L	0.100	< 0.0001	93	87-112			
Chromium, total	0.387	0.005	mg/L	0.400	< 0.005	97	88-119			
Cobalt, total	0.395	0.0005	mg/L	0.400	< 0.0005	99	88-118			
Copper, total	0.396	0.002	mg/L	0.400	< 0.002	99	86-126			
Iron, total	2.3	0.1	mg/L	2.00	0.2	100	70-138			
Lead, total	0.197	0.001	mg/L	0.200	< 0.001	98	82-119			
Manganese, total	0.407	0.002	mg/L	0.400	0.018	97	81-125			
Nickel, total	0.390	0.002	mg/L	0.400	< 0.002	97	85-121			
Selenium, total	0.089	0.005	mg/L	0.100	< 0.005	89	73-121			
Silver, total	0.0979	0.0005	mg/L	0.100	< 0.0005	98	83-118			
Thallium, total	0.0984	0.0002	mg/L	0.100	< 0.0002	98	85-115			
Vanadium, total	0.38	0.01	mg/L	0.400	< 0.01	95	86-116			
Zinc, total	0.94	0.04	mg/L	1.00	< 0.04	94	83-123			
Reference (B3G1097-SRM1)				Prepared: Jul-25-13, Analyzed: Jul-26-13						
Aluminum, total	0.30	0.05	mg/L	0.296		102	81-129			
Antimony, total	0.050	0.001	mg/L	0.0505		99	88-114			
Arsenic, total	0.112	0.005	mg/L	0.122		92	88-114			
Barium, total	0.71	0.05	mg/L	0.777		92	72-104			
Beryllium, total	0.045	0.001	mg/L	0.0488		92	76-131			
Boron, total	3.27	0.04	mg/L	3.40		96	75-121			
Cadmium, total	0.0460	0.0001	mg/L	0.0490		94	89-111			
Calcium, total	10	2	mg/L	10.2		97	86-121			
Chromium, total	0.232	0.005	mg/L	0.242		96	89-114			
Cobalt, total	0.0375	0.0005	mg/L	0.0366		103	91-113			
Copper, total	0.488	0.002	mg/L	0.487		100	91-115			
Iron, total	0.5	0.1	mg/L	0.469		100	77-124			
Lead, total	0.188	0.001	mg/L	0.193		97	92-113			
Lithium, total	0.382	0.001	mg/L	0.390		98	85-115			
Magnesium, total	3.3	0.1	mg/L	3.31		100	78-120			
Manganese, total	0.106	0.002	mg/L	0.109		97	90-114			
Mercury, total	0.0045	0.0002	mg/L	0.00456		99	50-150			
Molybdenum, total	0.181	0.001	mg/L	0.197		92	90-111			
Nickel, total	0.234	0.002	mg/L	0.242		97	90-111			
Phosphorus, total	0.3	0.2	mg/L	0.233		112	85-115			
Potassium, total	5.7	0.2	mg/L	5.93		96	84-113			
Selenium, total	0.106	0.005	mg/L	0.115		92	85-115			
Sodium, total	7.7	0.2	mg/L	7.64		100	82-123			
Strontium, total	0.36	0.01	mg/L	0.363		99	88-112			
Thallium, total	0.0764	0.0002	mg/L	0.0794		96	91-114			
Uranium, total	0.0180	0.0002	mg/L	0.0192		94	85-120			
Vanadium, total	0.35	0.01	mg/L	0.376		94	86-111			
Zinc, total	2.26	0.04	mg/L	2.42		93	85-111			

QC Qualifiers:

SPK1 The recovery of this analyte was outside of established control limits. The data was accepted based on performance of other batch QC.

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