BGC ENGINEERING INC.
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This report has been superseded by the report included in the SIR submitted May 2012

VICTORIA GOLD CORPORATION

EAGLE GOLD PROJECT
DUBLIN GULCH, YUKON

2011 GEOTECHNICAL INVESTIGATION FOR MINE SITE INFRASTRUCTURE FACTUAL DATA REPORT

DRAFT

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BGC Project Memorandum

To:	**Victoria Gold**	**Doc. no:**	**0792-006-M1-2011**
Attention:	**Mike Padula**	**cc:**	**Marten Regan, Wardrop**
From:	**Pete Quinn**	**Date:**	**October 14 2011**
Subject:	**Eagle Gold – Mine Site Infrastructure, General Earthworks Guidance**		
Project no:	**0792-006**		

1.0 INTRODUCTION

1.1. General

BGC Engineering Inc. (BGC) has been retained by Victoria Gold Corp. (VIT) to complete geotechnical investigations for the open pit and mine site infrastructure for the Eagle Gold project at Dublin Gulch, Yukon.

Ore will be extracted from an open pit located on the ridge line above Dublin Gulch to the south, and between the headwaters of Eagle Pup and Platinum Gulch. Gold is to be extracted from the ore by heap leaching using a valley fill heap located in a small valley drained by Ann Gulch, spanning over and partially filling the middle reach of Dublin Gulch.

The project will involve a number of other important facilities, including: two primary waste rock storage areas (WRSAs), in Eagle Pup, and at the top of Platinum Gulch; a water diversion system to carry surface water from the upper reach of Dublin Gulch around the heap leach pad; process water ponds for management of heap solution; a process plant; crushers, conveyors and stockpiles; borrow pits; truck shop; offices and warehouse space; fuel and water tanks; power and water transmission facilities; and explosives management facilities.

Preliminary geotechnical recommendations for mine site infrastructure were provided in a series of draft memos issued by BGC between March and May, 2011. Recommendations for the various mine site infrastructure components will subsequently be updated on the basis of 2011 field investigations pending approvals from VIT and finalization of infrastructure layouts and mine production scheduling by Wardrop Engineering Inc. (Wardrop). This memorandum presents high level geotechnical recommendations for general earthworks associated with development proposed mine facilities to allow Wardrop to complete Feasibility Study planning.

1.2. Proposed Facilities and Functional Areas

The most recent General Arrangement for the proposed mine development was provided by Wardrop on 7 October 2011.

The proposed mine will include a number of major infrastructure components. For the purpose of this report, the site has been subdivided into a number of distinct functional areas, to aid in evaluating the available subsurface data in a meaningful way, relevant for the planned major earthworks. These functional areas are illustrated in Drawing 1, which also shows the proposed general arrangement, and the distribution of locations with subsurface data. The following functional areas have been considered in the report, listed in alphabetical order:

- 100 day storage pad;
- Camp site;
- Conveyors from crushers to heap;
- Crushers;
- Dublin Gulch diversion;
- Dublin Gulch pond;
- Eagle Pup waste rock storage area (WRSA) pond;
- Eagle Pup WRSA;
- Heap leach events ponds;
- Explosives storage area;
- Heap leach embankment;
- Heap leach pad main footprint;
- Laydown area;
- Main site water management pond;
- Main truck road from truck shop to open pit;
- Plant site;
- Platinum Gulch WRSA pond;
- Platinum Gulch WRSA;
- Secondary roads from truck shop area to crushers area; and
- Truck shop pad area.

1.3. Scope and Limitations

The commentary included in this memorandum is intended to assist with the development of bulk earthworks quantities to support cost estimating for the feasibility study (FS), in advance review of all field and lab data, and prior to initiation of the final foundation report. The recommendations included in the final foundation report may vary from the preliminary guidance provided herein.

This memorandum includes commentary on the following:

- Presence and general thickness of deleterious materials such as loose fill, ice rich permafrost, or organic soils;
- Presence of materials requiring additional effort for excavation, such as frozen ground or rock; and
- Potential for re-use of excavated materials.

This memorandum does not provide recommendations for cut slope angles or allowable bearing pressures for foundations, or for other general geotechnical considerations. Those considerationss have been addressed in prior reports, and updated recommendations will be provided at a later date in the foundation design report. This report also does not take site-specific groundwater conditions into consideration. The need to consider subsurface drainage, or to plan for dewatering during construction, should be addressed during more detailed examination of specific sites and facilities.

2.0 SITE CONDITIONS

2.1. Background Reports and 2011 Data

Site conditions at the Eagle Gold site have been described in several prior reports, including:

- Report on 1995 Geotechnical Investigations for Four Potential Heap Leach Facility Site Alternatives, First Dynasty Mines, Dublin Gulch Property. (Knight Piesold, 1996a).
- Report on Feasibility Design of the Mine Waste Rock Storage Area, First Dynasty Mines, Dublin Gulch Property. (Knight Piesold, 1996b).
- Field Investigation Data Report, Dublin Gulch Project, New Millennium Mining. (Sitka Corp, 1996).
- Hydrogeological Characterization and Assessment, Dublin Gulch Project, New Millennium Mining. (GeoEnviro Engineering, 1996).
- Site Facilities Geotechnical Investigation Factual Data Report. Eagle Gold Project, Victoria Gold Corporation. (BGC Engineering Inc. 2009).
- Project Proposal for Executive Committee Review. Pursuant to the Yukon Environmental and Socio-Economic Assessment Act. Eagle Gold Project, Victoria Gold Corporation. (Stantec. 2010).
- 2010 Geotechnical Investigation for Mine Site Infrastructure, Factual Data Report. Eagle Gold Project, Victoria Gold Corporation. (BGC Engineering Inc. 2011).

General overviews of regional geology, physiography, drainage, climate, seismicity and other general site conditions are also described in these reports, and the Project Proposal prepared by Stantec (2010).

Additional subsurface investigations were undertaken by BGC in summer, 2011, including 46 boreholes, 96 test pits, 59 mapped outcrops, and a variety of specialized geotechnical in-situ and laboratory tests. The results of that work have not yet been published, but preliminary data from that work have been considered in this memorandum.

2.2. Generalized Site Conditions in the Mine Site Area

2.2.1. General Site Conditions

Subsurface data from BGC geotechnical investigations, and relevant data from prior investigations by others, have been compiled for review in support of this work. The locations of available data are shown on Drawing 1 and Figure 1.

Figure 2 shows the distribution of overburden thickness, where it is known from test holes that explored its full thickness. The overburden contains a variety of different geological units including organics, colluvium and completely weathered bedrock, overlying highly weathered bedrock. The transition from “overburden” to “bedrock” is interpreted at the interface between completely weathered bedrock, which can be expected to have “soil-like” behaviour, and highly weathered bedrock, whose behaviour will be somewhat more “rock-like.” Other overburden units are locally present, and have been identified as fill, till, alluvial deposits, and debris flow deposits.

Figure 3 shows the distribution of fill thickness, where known. This unit is most commonly found in the Dublin Gulch and Haggart Creek valley bottoms, and consists of placer tailings.

Figure 4 shows the distribution of frozen ground, where encountered, which can generally be inferred to be permafrost. Frozen ground is more difficult to excavate than unfrozen ground, and can be expected to require ripping.

Figure 5 shows the distribution of ice rich permafrost, which for the purposes of this report, is defined as frozen soils that become very wet and soft when thawed. Ice-rich permafrost soils are unstable as a foundation for an engineering structure when thawed.

Figure 6 shows the distribution of "Type 3" rock. This is the first "rock-like" material underlying the overburden materials, and is defined as being rock that is highly or less weathered, and has intact strength greater than R0 (i.e. minimum UCS strength 1 MPa). Type 3 rock can be excavated with normal excavating equipment.

Figure 7 shows the distribution of "Type 2" rock. This material is defined as rock with Geological Strength Index (GSI, Hoek and Marinos, 2000) or Rock Mass Rating (RMR, Bieniawski, 1976) of 30 or greater, and core recovery during drilling of 50 % or greater. Alternatively, where GSI and RMR data are unavailable, average Rock Quality Designation (RQD) of 10 or greater serves as an equivalent criterion. It is expected that Type 2 rock will require ripping.

Figure 8 shows the distribution of "Type 1" rock. This material is defined as having GSI, RMR or average RQD exceeding 40. It is expected that Type 1 rock will require blasting.

Note that some areas of the site do not show observations for some of the above-noted criteria. For example, overburden thickness and depth to the three rock types is not shown in the camp site area. Where no data are shown, it is because no relevant data are available.

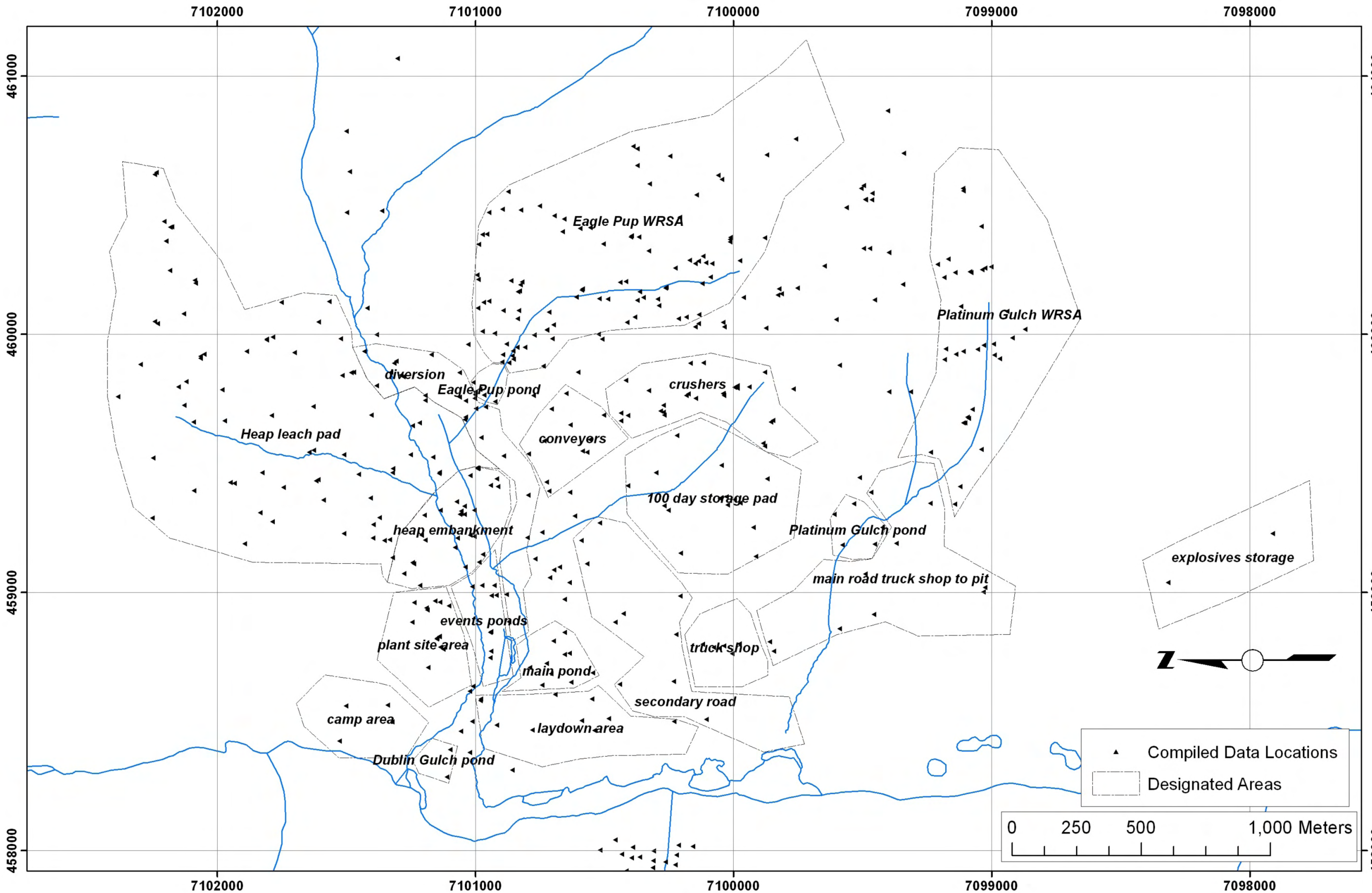

Figure 1. Distribution of Subsurface Observations Considered in this Report

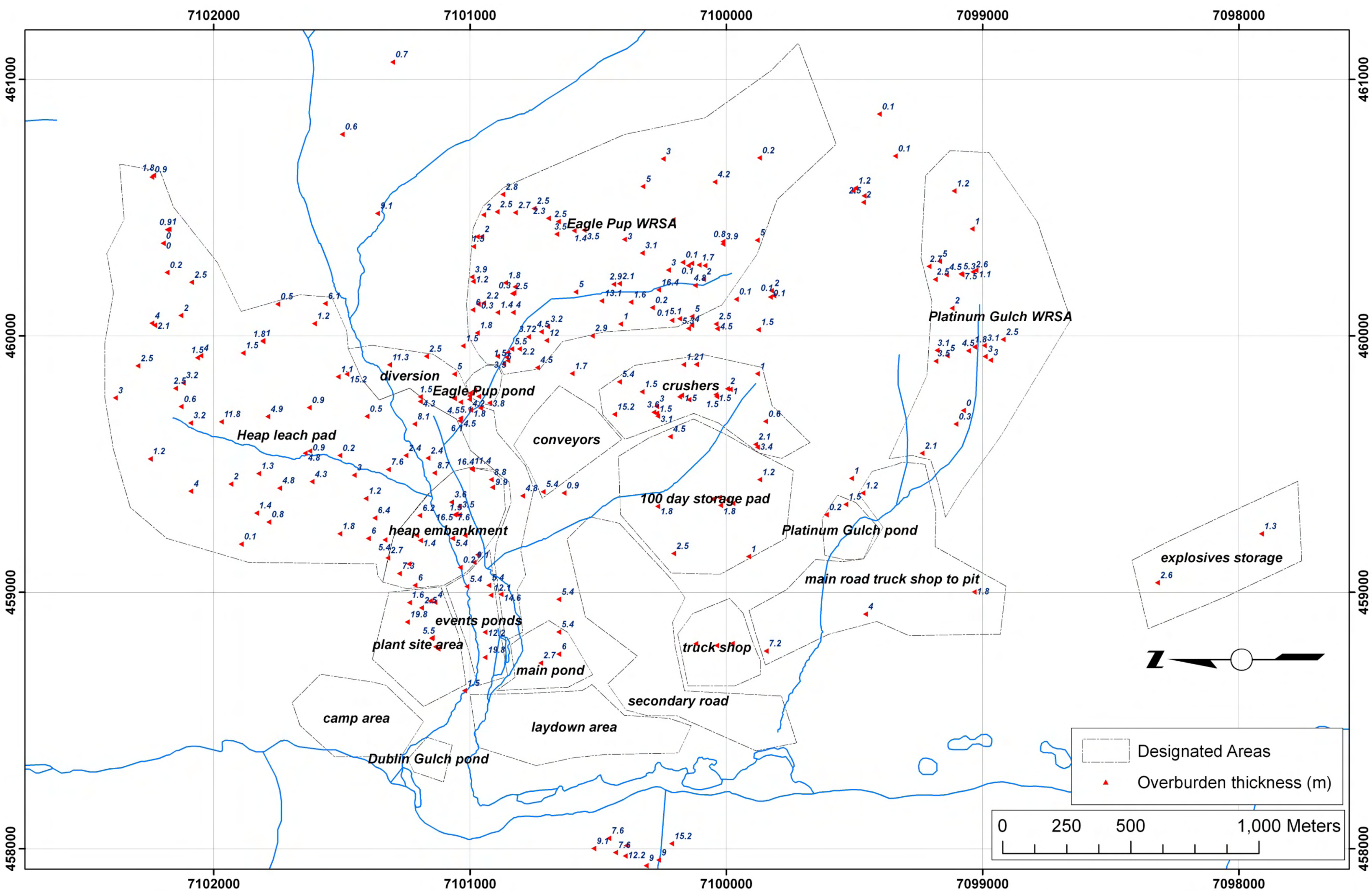

Figure 2. Observed Overburden Thickness (where known)

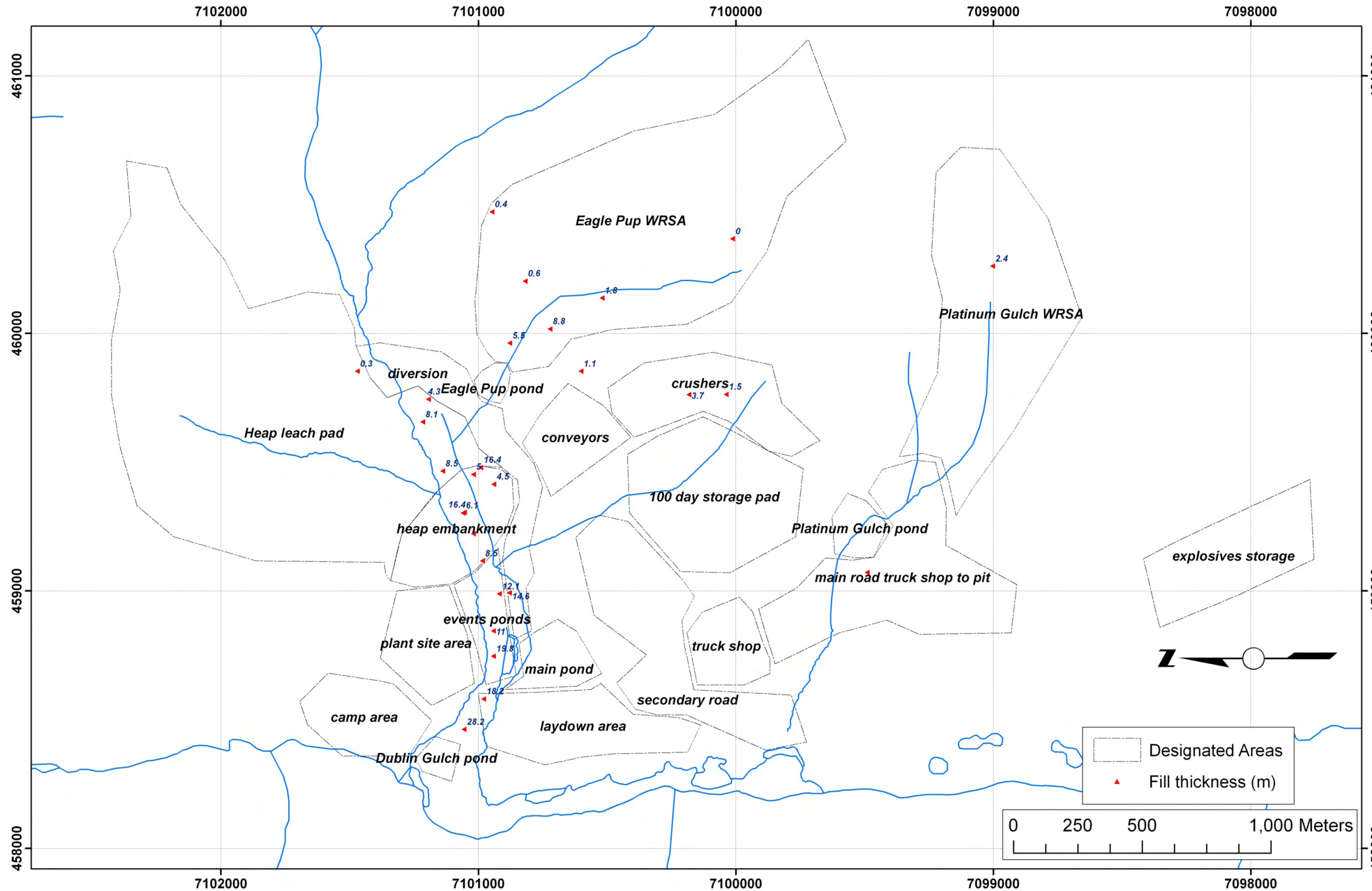

Figure 3. Observed Fill Thickness (where encountered)

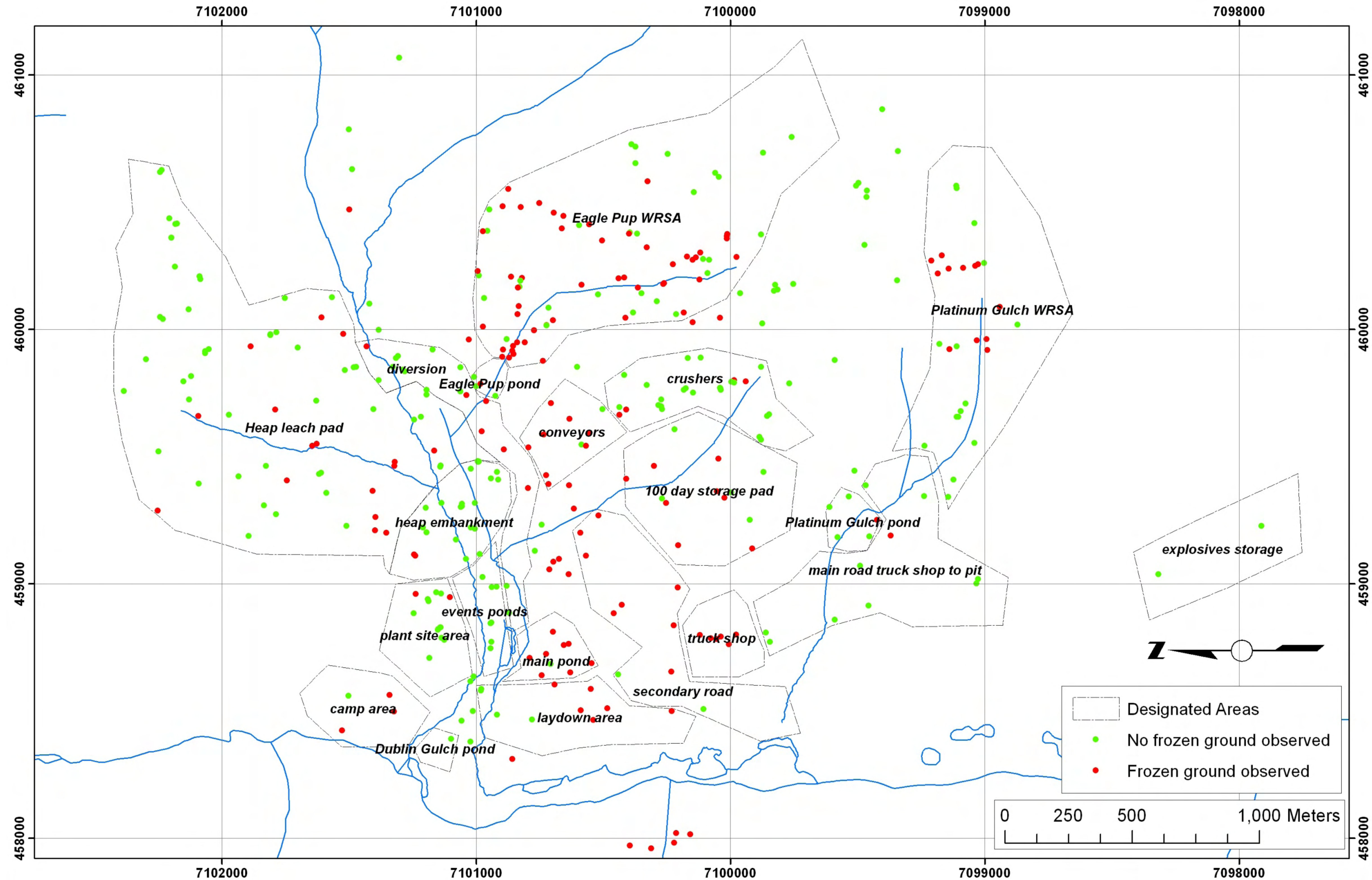

Figure 4. Observed Presence of Frozen Ground

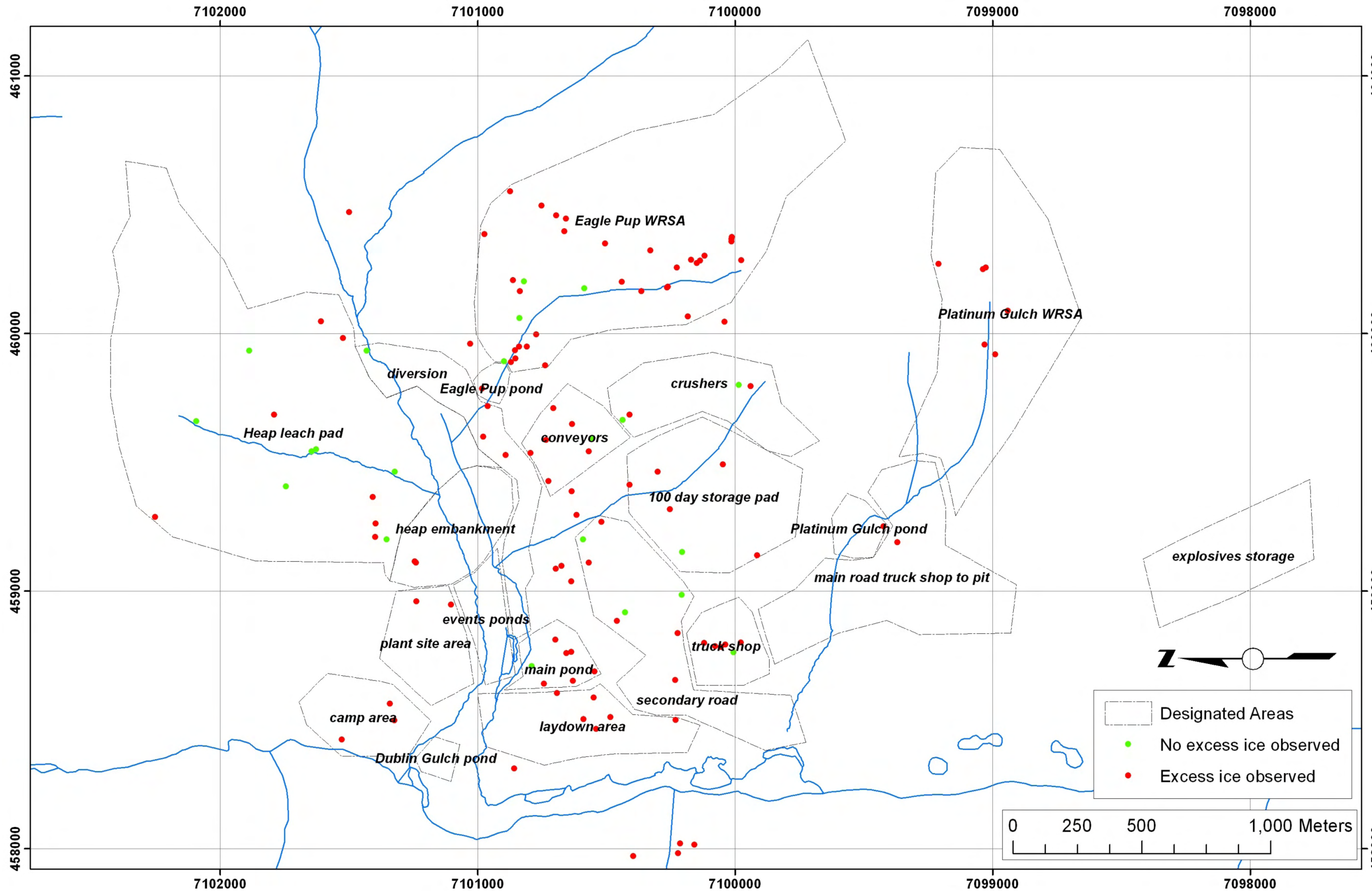

Figure 5. Observed Presence of Excess Ice

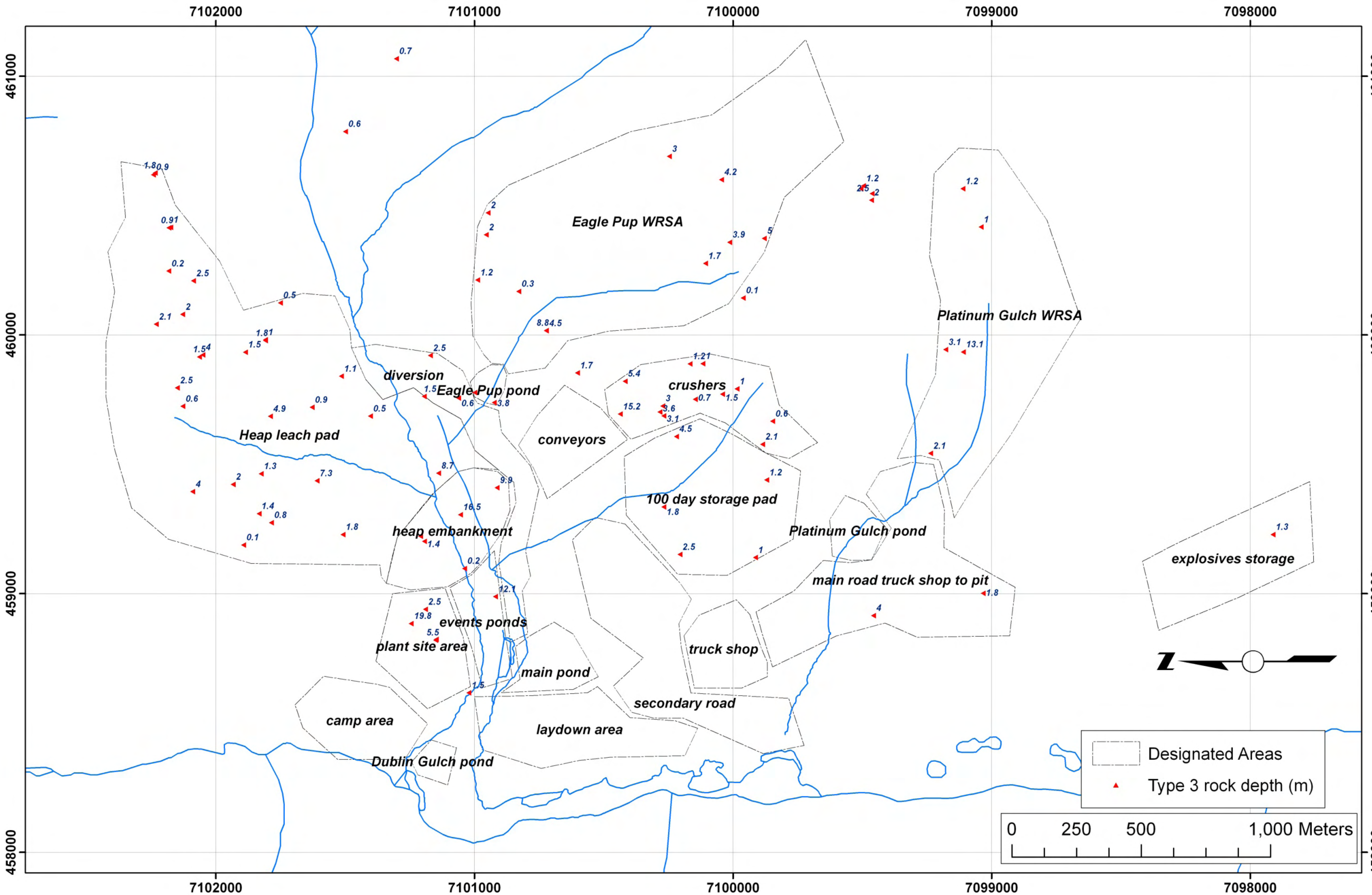

Figure 6. Observed Depth to Type 3 Rock from Ground Surface (where encountered)

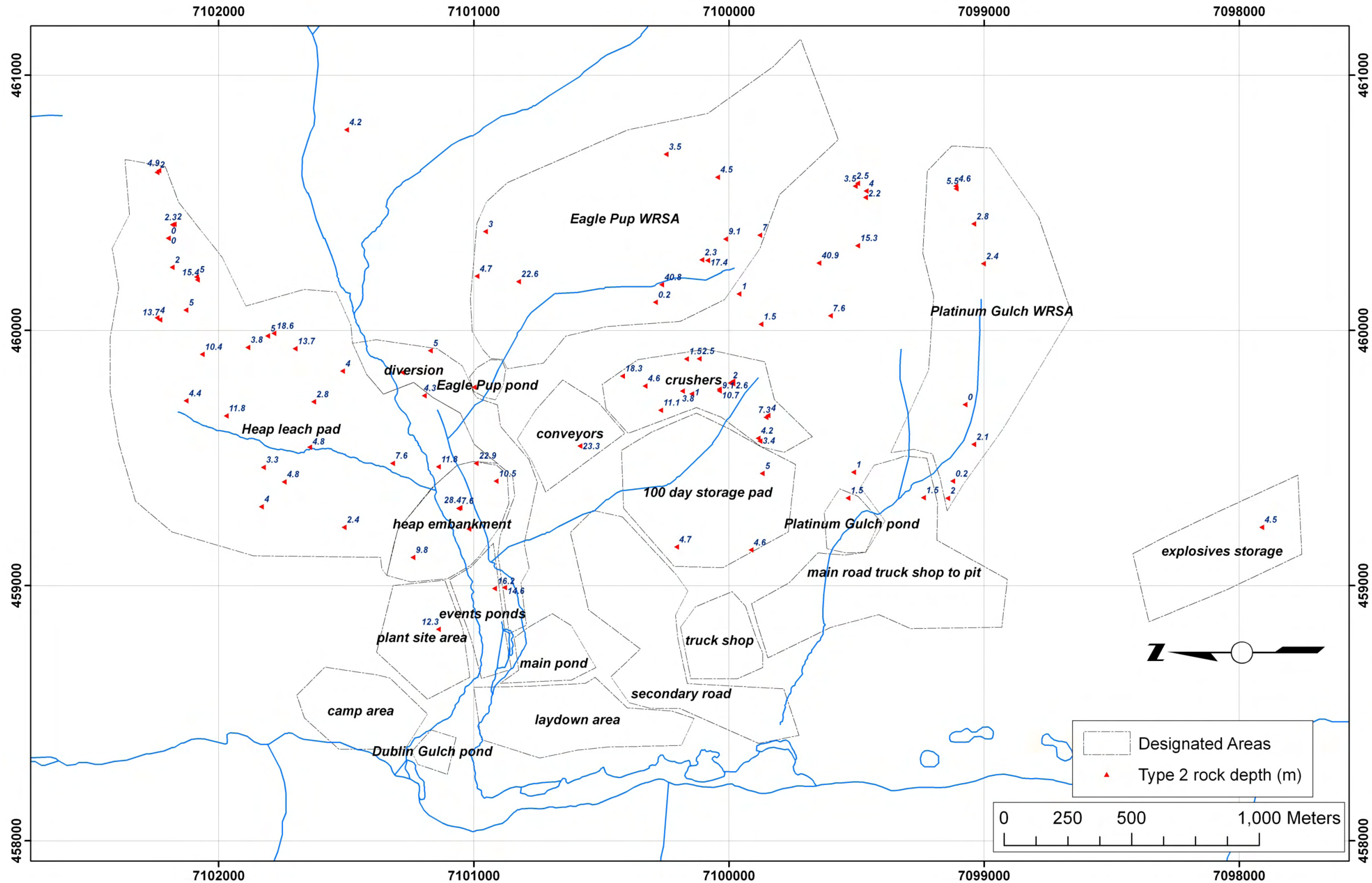

Figure 7. Observed Depth to Type 2 Rock from Ground Surface (where encountered)

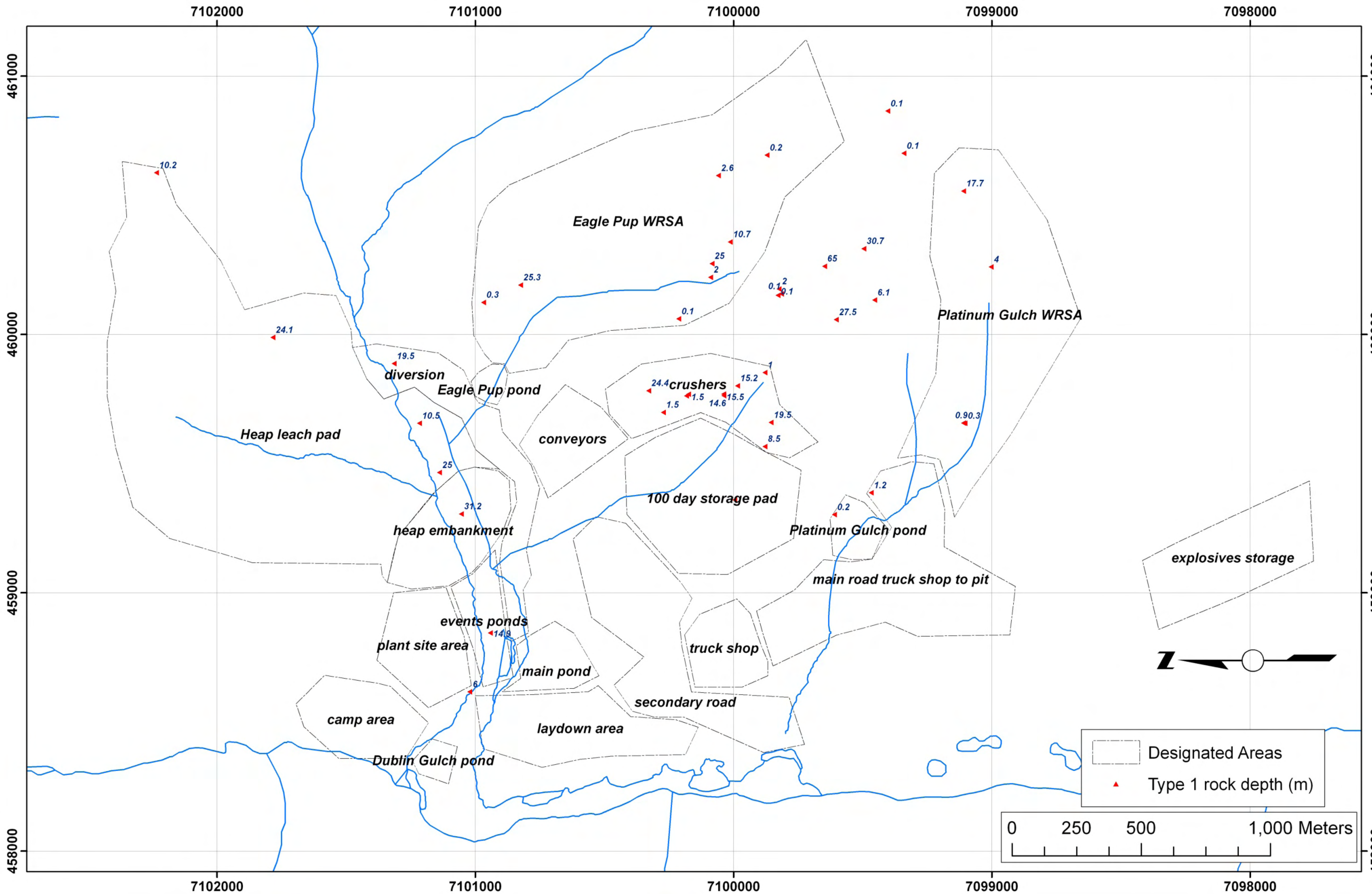

Figure 8. Observed Depth to Type 1 Rock from Ground Surface (where encountered)

2.3. Area-Specific Ground Conditions and Earthworks Commentary

2.3.1. General

Summary observations for each functional area are presented in Table 1. This table provides an overview of the general conditions within each area, including the observed thickness of overburden, presence or absence of frozen ground and excess ice, and depth, where encountered, to Types 1, 2 or 3 bedrock. Excess ice is present where the pore spaces in the soil have a volume of ice that exceeds the normal pore space volume, such that, on thawing, there is a loss of soil volume and release of excess pore fluid.

The presence of fill is an issue primarily in the Dublin Gulch valley bottom, and will affect the heap leach pad, heap embankment, a portion of the Dublin Gulch diversion, and ponds or other facilities constructed in this area. The observed thickness of placer tailings at 16 test holes had a mean value of about 10 m, with a range between 0.3 m and 19.8 m.

There is typically a thin cover of organic soils overlying the other overburden units. The observed thickness of this unit varies across the site, ranging between 0 m and 1.5 m, with an average thickness of 0.25 m, and standard deviation of 0.2 m from 299 observations. All organic materials are unsuitable for re-use as engineering fill materials, but should be suitable for reuse as cover materials for reclamation and should be segregated and separately stockpiled.

The following sub-sections present commentary related to earthworks construction in each functional area, based on the summary observations just presented. The need to remove surficial organic materials is not repeated in these sections. These general comments are intended to be interpreted in relation to gross earthworks within each identified functional area, and may not apply precisely for specific sites or facilities.

2.3.2. Area-Specific Commentary

The following subsections provide area-specific earthworks commentary. Where bedrock is encountered, it can generally be assumed that common excavation, ripping and blasting may be expected in Types 3, 2, and 1 rock, respectively. Excavated rock can generally be expected to be suitable for reuse as general fill, and potentially suitable for use as silty structural fill with due care in selection, placement and compaction control. Excavated rock used as structural fill will not be suitable for use in applications where a free-draining material is required, such as at shallow depths below buildings, or behind retaining walls.

Frozen ground will be most efficiently excavated by ripping where it contains excess ice or is otherwise well-bonded, and for planning purposes, all frozen ground may be assumed to require ripping. Excavated frozen ground will generally be unsuitable for reuse without substantial effort to dry and thaw, and may remain unsuitable upon drying due to high fines content. It will be necessary to plan for temporary or permanent stockpiling of the wasted frozen ground. These materials will be unstable and won’t stand at steep angles or significant height, so a large footprint may be required to store relatively low volumes.

Table 1. Summary Observations

Area	Overburden Thickness (m)				Observations of Frozen Ground			Depth to Rock where Encountered (m)					
	Known Thickness[1]		Minimum Thickness[2]		N[3]	Frozen Ground[4], N_f	Excess Ice[5], N_{ei}	Type 3		Type 2		Type 1	
	Typical Range	N[3]	Typical Range	N[3]				Typical Range	N[3]	Typical Range	N[3]	Typical Range	N[3]
100 Day Storage	1 to 3.5	6	N/A	N/A	12	8	5	1 to 3.5	5	4.5 to 5	3	N/A	N/A
Camp Site	N/A[6]	N/A	2.5 to 7	4	4	3	3	N/A	N/A	N/A	N/A	N/A	N/A
Conveyors	18	1	1.5 to 5.5	9	10	8	6	18	1	N/A	N/A	N/A	N/A
Crushers	0 to 7.5	18	N/A	N/A	26	4	2	0 to 7	12	1 to 11	16	9 to 21	7
Diversion	2 to 13	9	N/A	N/A	17	6	3	0.5 to 2.5	2	4.5 to 14.5	3	19.5	1
Dublin Gulch pond	N/A	N/A	19	1	1	0	0	N/A	N/A	N/A	N/A	N/A	N/A
Eagle Pup WRSA pond	3 to 12	4	N/A	N/A	4	1	1	2.5 to 4	2	4.3	1	N/A	N/A
Eagle Pup WRSA	0 to 10	30	N/A	N/A	81	51	31	1 to 5	11	0 to 23	11	0 to 19	8
Events Ponds	10 to 20	3	N/A	N/A	7	0	0	12.1	1	16.2	1	14.9	1
Explosive Storage	1.3	1	4.5	1	2	0	0	1.3	1	4.5	1	N/A	N/A
Heap Embankment	4 to 14	12	N/A	N/A	22	2	2	0 to 14	5	8 to 24	6	31.2	1
Heap Pad	0 to 9	45	N/A	N/A	66	16	8	0 to 4	30	6	29	10 to 26	4
Laydown Area	N/A	N/A	1.5 to 13	10	10	6	6	N/A	N/A	N/A	N/A	N/A	N/A
Main Pond	N/A	N/A	2 to 18	10	9	8	6	N/A	N/A	N/A	N/A	N/A	N/A
Main truck road	1.5 to 7	3	N/A	N/A	7	1	1	1.5 to 4.5	2	N/A	N/A	N/A	N/A
Plant site	2 to 15	10	N/A	N/A	14	2	2	1.5 to 17	4	12.3	1	N/A	N/A
Platinum Gulch WRSA pond	N/A	N/A	0 to 6	5	3	1	1	N/A	N/A	N/A	N/A	0.2	1
Platinum Gulch WRSA	0 to 6.5	16	N/A	N/A	22	12	6	0 to 9	5	1 to 5	5	0 to 16	3
Secondary road	N/A	N/A	0 to 10	10	10	8	5	N/A	N/A	N/A	N/A	N/A	N/A
Truck Shop	7 to 8	3	N/A	N/A	6	6	5	6.5 to 8.5	3	N/A	N/A	N/A	N/A

Notes:
1. Known thickness of overburden implies the full depth is known because bedrock was encountered within the limits of exploration.
2. Minimum thickness of overburden represents observations where the overburden is known to be at least a given thickness, equal to the depth of exploration, but total thickness is not known, since bedrock was not encountered. These data are only provided where the full thickness of overburden has not been explored, to provide a lower bound for mean thickness, or where there are limited data.
3. “N” is the number of observations taken into consideration.
4. N_f is the number of observation locations where frozen ground was noted.
5. N_{ei} is the number of observation locations where excess ice was observed in the frozen ground.
6. “N/A” implies no data available in that area.

2.3.2.1. 100 Day Storage Pad

Overburden is relatively thin, and is commonly frozen, with excess ice encountered in nearly half the test holes where frozen ground observations were made. Excavated overburden materials will not generally be suitable for re-use as a construction material. The shallow bedrock will be relatively easy to excavate to depths of 5-10 m below grade, and will be suitable for re-use as general fill. Excavations deeper than about 10 m, if required, may require ripping or blasting.

2.3.2.2. Camp Site

Very little information is available in this area, as the four test pits met refusal in frozen ground at relatively shallow depth, with excess ice observed at three of four test holes. It should be assumed that all excavated materials will be unsuitable for re-use, and that ground will be frozen and difficult to excavate to at about 5-10 m depth below grade.

2.3.2.3. Conveyors

This area contains thick, frozen overburden, typically containing excess ice. Excavation of frozen ground will likely require ripping, and excavated materials will be unsuitable for re-use. Rock excavation is not anticipated in this area.

2.3.2.4. Crushers

This area contains relatively little frozen ground, and moderately thick (typically 0 to 7.5 m) overburden, most of which consists of weathered rock. It should be assumed that about half of the overburden may be re-used as general fill. Shallow bedrock to approximately 5-10 m below grade will be Type 3. Deeper rock at 10-15 m or > 15 m depth can be expected to be Type 2 and Type 1, respectively. All excavated rock is expected to be suitable for re-use as general fill.

2.3.2.5. Dublin Gulch Diversion

Selected parts of this area (i.e. the Eagle Pup valley and west) have widespread frozen ground with excess ice which may require ripping to excavate and will be unsuitable for re-use. Thickness of ice-rich permafrost, where present, is unknown but may be up to about 5 m. Depth to rock is highly variable along the length of this area. For planning purposes, it may be assumed that Types 3, 2 and 1 rock will be encountered at approximately 5 m, 10 m and 15 m below grade respectively, however this will vary considerably and material take offs should consider the detailed subsurface data.

2.3.2.6. Dublin Gulch Pond

Very little information is available in this area. It should be assumed that loose, variable fill materials (placer tailings) will be present, including wet silty materials that will likely be unsuitable for reuse.

2.3.2.7. Eagle Pup WRSA Pond

Overburden is relatively thick (typically 3 to 12 m), with locally shallower Type 3 or Type 2 bedrock. Ice-rich frozen ground is locally present (observed in one of four observation locations). An estimated half of excavated overburden materials may be suitable for re-use as general fill. Bedrock, where encountered, can be excavated but may require local ripping. Excavated bedrock will be suitable for re-use as general fill.

2.3.2.8. Eagle Pup WRSA

Overburden is moderately thick (0 to 10 m), but highly variable. Frozen ground is widespread (51 of 81 observations) and frequently contains excess ice (31 of 81 observations). Stripping of ice-rich materials, where required for WRSA foundation preparation, will require ripping, and excavated materials will not be suitable for re-use. Excavation of rock is not expected to be necessary for foundation preparation in the WRSA.

2.3.2.9. Heap Leach Events Ponds

Overburden is thick (typically 10 m to 20 m) and comprised of placer tailings, which are expected to be generally suitable for reuse as general fill without processing, or for use as select fill (structural fill, and potentially concrete aggregate or heap overliner) with crushing and screening. Excavation of rock is not expected to be necessary in this area, unless pond grades approach bedrock elevations.

2.3.2.10. Explosives Storage

Overburden is relatively thin (typically 2-3 m), and the underlying bedrock is Type 3 near the ground surface. Some ice-rich frozen ground should be anticipated. It may be assumed that roughly half of excavated overburden will be suitable for re-use as general fill. Bedrock to about 5 m depth can be expected to be Type 3, and deeper rock will be Type 2 and will require ripping. If excavations deeper than about 10 m are required, blasting of Type 1 rock should be anticipated.

2.3.2.11. Heap Leach Embankment

Overburden is thick (typically 4 to 14 m) and comprised of placer tailings, which are expected to be generally suitable for reuse as general fill without processing, or for use as select fill (structural fill, and potentially concrete aggregate or heap overliner) with crushing and screening. No rock excavation is expected to be necessary in this area.

Overburden materials are more complex and variable at the north and south ends of this area, where the abutments will be constructed. No general commentary can be provided for those areas in this report. Design of foundation preparation for the heap embankment and abutments is being undertaken by Tetra Tech, and should consider the detailed subsurface data in those areas.

2.3.2.12. Heap Leach Pad

The overburden is typically of moderate thickness (0 to 9 m), but highly variable. Frozen ground is locally present (16 of 66 observations) and contains excess ice in isolated areas (8 of 66 observations). Non-frozen overburden will generally be granular colluvium that is expected easily excavated and generally suitable for reuse as grading fill for heap subgrade. Bedrock depth is variable, and shallow bedrock to 5 m depth tends to be Type 3. Type 2 rock can be expected at depths below 5 m, and Type 1 rock may be encountered at depths greater than about 10 m, but is locally shallower in the upper part of the heap.

2.3.2.13. Laydown Area

This area includes the area intended to be developed for silt borrow for pond liner material, as well as the proposed construction laydown area.

The proposed laydown area straddles thick (estimated to be 10 to 20 m, no data available) placer tailings in the Dublin Gulch valley bottom, and thick (up to 25 m thick), ice rich permafrost in the undisturbed landscape further south.

The ice rich permafrost will require ripping to excavate, and the silt removed for liner material will need to be thawed and dried before use.

The placer tailings in this area have been recently re-worked to construct a pad for the 100-man exploration camp. The materials in this pad are highly variable and typically very silty sand and gravel. These materials are suitable for use as general fill in applications where long term settlements are of limited concern.

2.3.2.14. Main Site Water Management Pond

The proposed pond area straddles thick (estimated to be 10 m or greater, no data available) placer tailings in the Dublin Gulch valley bottom, and thick (up to 25 m thick), ice rich permafrost in the undisturbed landscape further south.

The placer tailings in this area are expected to be generally suitable for reuse as general fill. Ripping will be required to excavate frozen ice rich overburden in the undisturbed part of this area, which comprises roughly the southern three quarters. No rock excavation is expected to be necessary in this area.

2.3.2.15. Main Truck Road

The overburden in this area is of moderate thickness (typically 1.5 to 7 m), with limited presence of frozen ground (1 of 7 observations). Most of the unfrozen excavated overburden is expected to be suitable for re-use as road grading fill. Excavations deeper than about 5 m may encounter Type 3 rock. Excavations deeper than 10 m and 15 m should be expected to encounter Type 2 and Type 1 rock, respectively.

2.3.2.16. Plant Site

This area has thick overburden, most of which is either till or completely weathered rock. Perhaps two thirds of the excavated overburden materials in this area will be suitable for re-use as general fill, assuming a deep cut for the plant site pad. It is expected that excavations in this area can be completed with normal excavation equipment to at least 30 m depth. The Type 3 rock encountered below about 10 m depth may be suitable for re-use as structural fill with due care in quality control of material selection, placement and compaction control.

2.3.2.17. Platinum Gulch WRSA Pond

There is very little information available for this area, however the distribution of permafrost may be limited, and bedrock may be locally shallow (i.e. 0 to 6 m). Type 1 rock should be anticipated for excavations deeper than about 5 m.

2.3.2.18. Platinum Gulch WRSA

Overburden is moderately thick (typically 0 to 6 m), but highly variable. Frozen ground is locally present and occasionally contains excess ice. Stripping of ice-rich materials, where required for WRSA foundation preparation, will require ripping, and excavated materials will not be suitable for re-use. Rock excavation is not expected to be necessary for foundation preparation in the WRSA.

2.3.2.19. Secondary Roads

Limited information suggests that overburden is thick and commonly frozen and ice rich in this area. Ripping may be required for excavation of frozen overburden for road grade preparation. It should be expected that excavated spoil materials will not be suitable for immediate re-use as road grading fill, but may become suitable given adequate time to thaw and drain (perhaps after a minimum of one full summer, but will depend on seasonal weather).

2.3.2.20. Truck Shop

Overburden is moderately thick (typically 7 to 8 m) and consists of frozen silty colluvium with excess ice in the upper 2 to 4 m. The underlying bedrock is Type 3. The shallow frozen overburden will require ripping. The frozen colluvium and bedrock below about 4 to 5 m depth can be excavated with normal excavating equipment. Excavated overburden materials will not be suitable for immediate reuse, but excavated bedrock will be suitable for use as general fill, or for use as structural fill with due care in quality control of material selection, placement and compaction control.

2.3.3. Additional Commentary

Excavation of frozen ground, particularly ice rich permafrost, requires additional effort and care. Well-bonded, ice-rich frozen ground will be difficult to excavate, and as discussed previously, may be excavated most efficiently by ripping. Further consideration needs to be given to the thaw behavior of this material, and allowances made for adequate drainage and associated erosion control, as well as additional time and effort for the work. Exposure of ice-rich permafrost and the associated thaw can result in wet, muddy, soft ground, and poor trafficability, along with local slumping and other nuisance effects.

3.0 CLOSURE

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Yours sincerely,

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Senior Geotechnical Engineer

APEY Permit to Practice Number PP092

Reviewed by:

Thomas G. Harper P.E.
Senior Civil Engineer

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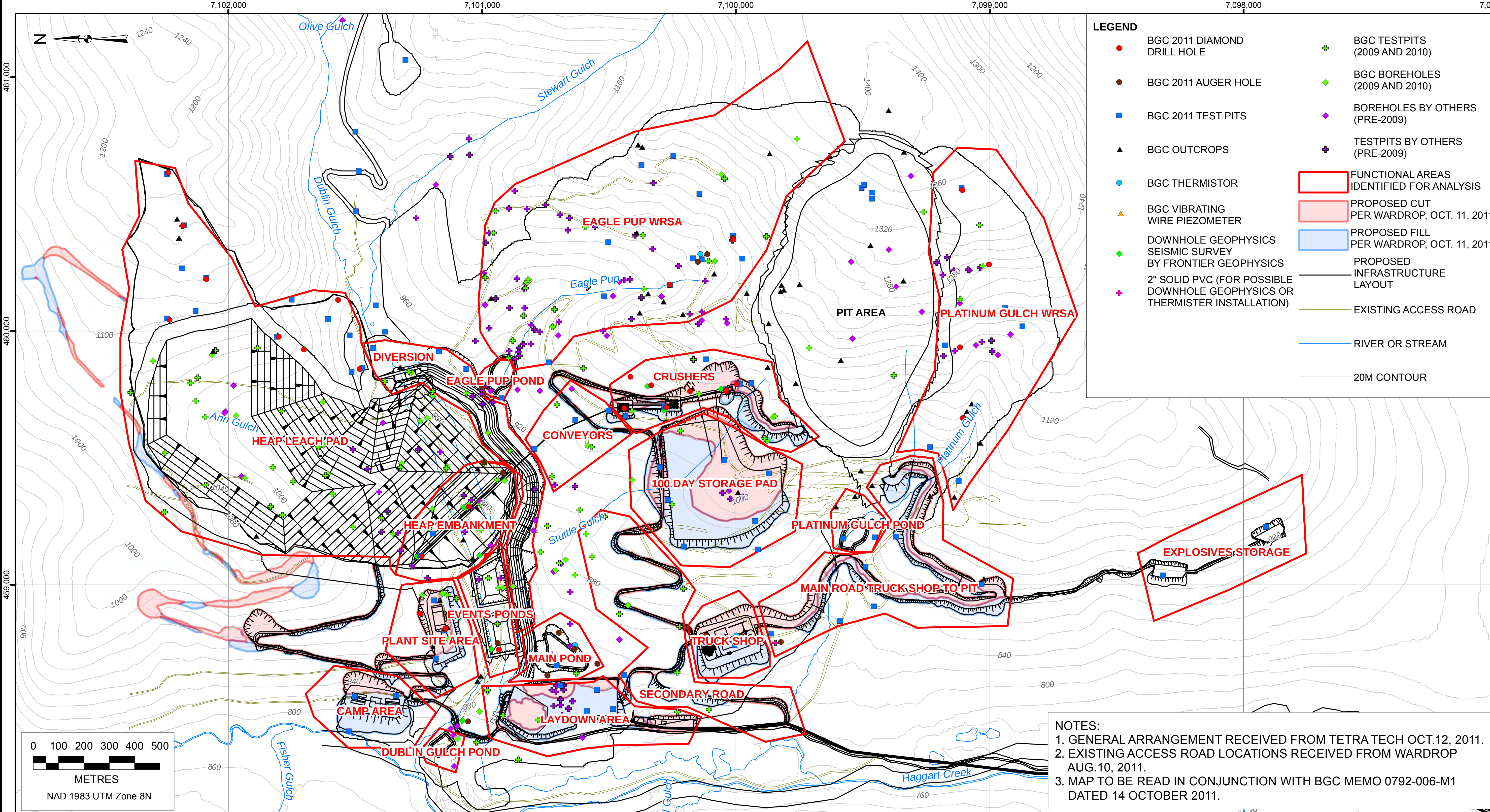
DRAWINGS



REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.
0	10/14/2011	ISSUED TO VICTORIA GOLD AND WARDROP FOR COMMENTS	LL	DW	PQ

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DATE:	OCT 2011
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DESIGNED:	LT
CHECKED:	DW
APPROVED:	PQ

PROFESSIONAL SEAL:

DRAFT

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT:
VICTORIA GOLD CORPORATION

PROJECT:
EAGLE GOLD - MINE SITE INFRASTRUCTURE, GENERAL EARTHWORKS GUIDANCE

TITLE:
GENERAL ARRANGEMENT, AVAILABLE SUBSURFACE DATA AND FUNCTIONAL AREAS

PROJECT No.:	DWG No.:	REV.:
0792-006-M1	01	0

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DWG TO BE READ WITH BGC MEMO TITLED "EAGLE GOLD - MINE SITE INFRASTRUCTURE, GENERAL EARTHWORKS GUIDANCE" DATED OCTOBER 2011

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BGC Project Memorandum

To:	**Victoria Gold**	**Doc. no:**	**0792-004-M5-2011**
Attention:	**Mike Padula**	**cc:**	**Marten Regan, Wardrop** **Glen Barr, Stantec**
From:	**Pete Quinn**	**Date:**	**21 April 2011**
Subject:	**Eagle Gold – Heap Leach Pad, Water Diversion and Process Management Ponds DRAFT Foundation Report**		
Project no:	**0792-004**		

1.0 INTRODUCTION

1.1. General

BGC Engineering has been retained by Victoria Gold Corp. (Victoria) to complete geotechnical investigations for the open pit and mine site infrastructure for the Eagle Gold project at Dublin Gulch, Yukon.

Ore will be extracted from an open pit located on the ridge line above Dublin Gulch to the south, and between the headwaters of Eagle Pup and Platinum Gulch. Gold is to be extracted from the ore by heap leaching using a valley fill heap located in a small valley drained by Ann Gulch, spanning over and partially filling the middle reach of Dublin Gulch.

The project will involve a number of other important facilities, including: two primary waste rock storage areas (one in Eagle Pup, and one at the top of Platinum Gulch); a water diversion system to carry surface water from the upper reach of Dublin Gulch around the heap leach pad; process water ponds for management of heap solution; a process plant; crushers, conveyors and stockpiles; borrow pits; temporary spoil stockpiles; and miscellaneous other facilities, including truck shop, offices, warehouse space, fuel and water tanks, power and water transmission facilities; and explosives management facilities.

The Heap Leach Facility (HLF), the subject of this memo, comprises several major components, including:

- Heap leach pad, including a large containment dike;

- Dublin Gulch water diversion, including a rock fill diversion dike, diversion channel and energy dissipation structure; and,
- Process management ponds.

An initial design for the HLF was presented in the prefeasibility study (PFS) by Scott Wilson RPA (SWRPA, 2010). The Feasibility Study (FS), currently in progress by Wardrop Engineering Inc. (WEI), includes a proposed expansion of the HLF towards the east, as described in WEI Memo No. 1154860100-MEM-R0002-00 dated April 14, 2011. This amendment to the PFS design will result in changes to the proposed location of some of the HLF structures, specifically the diversion system and sediment control pond, and the eastern and northern extent of the heap leach pad. The HLF facilities are being designed by WEI and/or Tetra Tech.

This memorandum presents geotechnical recommendations for use in the FS planning and design of the HLF, including: the heap leach pad, water diversion facilities and process management ponds.

1.2. Proposed Facilities and Foundation Requirements

1.2.1. General

The most recent General Arrangement provided by Wardrop on 14 March 2011 shows the following primary components considered in this report:

- Heap leach pad to be constructed in Ann Gulch and across part of the valley bottom of Dublin Gulch (Drawing M5-01). The heap leach pad will have the following components:
    - Rockfill containment dike, consisting of an embankment approximately 50 m high spanning Dublin Gulch and forming one side of the in-heap pond;
    - In-heap pond for collection of pregnant solution, and associated solution removal wells;
    - Engineered liners, leachate detection and recovery systems. A triple liner system is proposed below the in-heap pond, and a double liner system is proposed elsewhere above the pond;
    - Stacked ore, reaching a final elevation of approximately 1080 m above sea level; and
        - o Cover for closure.
- Dublin Gulch water diversion (Drawing M5-02), consisting of:
    - Rockfill diversion berm and energy dissipater pond;
    - Diversion channel and energy dissipater / drop structure; and
    - Sediment control pond(s).

- Process management ponds (Drawing M5-03), to be located west of the proposed heap leach pad.

The proposed layouts are illustrated in plan view in Drawings M5-01, M5-02 and M5-03. It is noted that these layouts are preliminary and are expected to change as the FS evolves. For example the diversion layout does not consider planned the heap leach pad expansion. The present report makes assumptions about proposed layouts based on the PFS drawings and preliminary input from WEI. These assumptions should be treated as conceptual only, subject to review upon further development of layouts.

2.0 SITE CONDITIONS

2.1. Background Reports

Site conditions at the Eagle Gold site are described in several reports:

- Report on 1995 Geotechnical Investigations for Four Potential Heap Leach Facility Site Alternatives, First Dynasty Mines, and Dublin Gulch Property. (Knight Piesold, 1996a).
- Report on Feasibility Design of the Mine Waste Rock Storage Area, First Dynasty Mines, and Dublin Gulch Property. (Knight Piesold, 1996b).
- Field Investigation Data Report, Dublin Gulch Project, New Millennium Mining. (Sitka Corp., 1996.).
- Hydrogeological Characterization and Assessment, Dublin Gulch Project, New Millennium Mining. (GeoEnviro Engineering, 1996).
- BGC Engineering Inc. 2009. Site Facilities Geotechnical Investigation Factual Data Report. Eagle Gold Project, Victoria Gold Corporation.
- Stantec. 2010. Project Proposal for Executive Committee Review. Pursuant to the Yukon Environmental and Socio-Economic Assessment Act. Eagle Gold Project, Victoria Gold Corporation.
- BGC Engineering Inc. 2011a. 2010 Geotechnical Investigation for Mine Site Infrastructure, Factual Data Report. Eagle Gold Project, Victoria Gold Corporation.

General overviews of regional geology, physiography, drainage, climate, seismicity and other general site conditions are also described in these reports. The Project Proposal (Stantec 2010) also includes air-photo based terrain mapping, and an evaluation of geological hazards affecting the project area.

2.2. Generalized Site Conditions in the Heap Leach and Process Management Ponds

2.2.1. General Site Conditions

The site topography involves moderate to high relief, with ground elevation varying from approximately 800 to 1400 masl.

Ground conditions are highly variable across the site. Further, due to poor drill recovery and the evolution of the general arrangement, there is limited information and significant uncertainty in the subsurface conditions at many areas of the site.

Groundwater was observed at varying depths across the site, generally close to the elevation of streams in the valley bottoms (i.e. less than 2 to 3 m below grade), and often below the depth of test pit excavation (i.e. often 5 to 6 m depth) on the hillsides.

Permafrost is present in the area, and is warm (i.e. typically 0 to -1 degrees Celsius), discontinuous and occasionally contains excess ground ice. Although not specifically controlled by slope aspect, permafrost is found more frequently in the north and west-facing lower slopes above Dublin Gulch (Drawing M5-04).

Seismic design parameters (i.e. uniform hazard spectra) applicable for buildings were presented in BGC (2009). Additional commentary on the selection of seismic design parameters for earthworks structures was provided by BGC (2011b). It is understood that a site specific seismic hazard assessment is being completed by Tetra Tech to support the finalization of seismic design parameters.

2.2.2. Typical Subsurface Conditions

Overburden soils encountered on the sloping ground at the mine site typically consist of a veneer of organic soils overlying a blanket of colluvium, which overlies weathered bedrock. Glacial till is generally only encountered on the lower flanks of the north and west-facing slopes located north and west of the proposed open pit, above Dublin Gulch and Haggart Creek. The till is often overlain by colluvium. Placer tailings (fill) cover most of the valley bottom of Dublin Gulch and Haggart Creek. Alluvial soils are occasionally encountered along undisturbed valley-bottom areas.

The bedrock encountered in the mine site area is generally classified as metamorphosed sedimentary rock, with a variably deep weathering profile. The intact rock strength of the encountered rock types is highly variable, with strength ranging between R0 class (i.e. corresponding to < 1 MPa Unconfined Compressive Strength, UCS) and R4 (50-100 MPa UCS). The average intact strength is estimated to be approximately R2 (5-25 MPa) in the metasedimentary rock, depending upon the degree of weathering, but with significant variability across the site.

Rock Mass Rating (RMR, Bieniawski, 1976) values calculated from retrieved rock core generally range between 20 to 40 in the metasedimentary rock. These values compare reasonably well with Geological Strength Index (GSI, Hoek, 2007; Hoek and Marinos, 2000) values estimated from the recovered core and surface or near surface field mapping observations. The estimated GSI ranges approximately between 30 and 40 in the metasedimentary rocks.

The inferred rockmass quality (as quantified by GSI) can be used to derive estimated stiffness and Hoek-Brown strength parameters for stability analysis of slopes, and for bearing capacity and settlement calculations of the proposed foundations.

Bedrock at the mine site has been subdivided into three broad categories – Type 1, Type 2 and Type 3 – on the basis of rockmass quality and inferred engineering behavior, with Type 1 being the highest quality, and Type 3 being the lowest quality. Typical characteristics of these three bedrock types are categorized in accordance with indices noted above. Further background on rock classification is provided in the Canadian Foundation Engineering Manual (CGS 2006). The typical characteristics of the three rock types are summarized in Table 1.

Table 1. Rock Type Typical Characteristics.

Parameter	Type 1	Type 2	Type 3
Unconfined Compressive Strength	> 25 MPa	5 to 25 MPa	1 to 5 MPa
Geological Strength Index	> 20	15 to 25	15 to 25
Weathering Grade	Slightly to Moderately Weathered	Moderately to Highly Weathered	Highly Weathered

Type 3 bedrock, the lowest quality rockmass considered to behave as rock (rather than as a soil), can be recognized in the field by a qualified geotechnical engineer/geologist on the basis of evident preserved fabric of the parent rock within the highly weathered rockmass, and the requirement for moderate effort to excavate with heavy excavators. Types 1 and 2 bedrock are of generally better rockmass quality. The transition from Type 3 to Type 2 can be inferred where it becomes necessary to rip the rock. Type 1 bedrock will require the use of hydraulic hammers and/or drilling and blasting to excavate.

2.3. Subsurface Conditions at the Proposed Heap Leach Pad, Water Diversion and Process Management Ponds

2.3.1. Heap Leach Pad

2.3.1.1. General

Drawing M5-01 shows the distribution of test holes located in the vicinity of the proposed heap leach pad. Detailed test pit and borehole logs are available in the source documents listed in sub-section 2.1, and are not included in this report. The data suggest that this area can be divided into three zones with distinct overburden conditions: Heap Leach Upland, Heap Leach Valley Bottom, and Heap Leach Southern Edge above Valley Bottom. The test hole observations from these three zones are summarized in Tables 2a, 2b, and 2c, respectively.

Table 2a. Summary Subsurface Observations in Proposed Heap Leach Pad Area - Upland

Test Hole ID	Approx. Elev[1]. (m)	Overburden thickness (m)				Depth to Completely-Highly Weathered Rock (m)	Depth to Moderately-Slightly Weathered Rock (m)	Total Depth (m)	Frozen Ground (depth in m where noted)
		Organics	Colluvium	Till	Fill				
TP-BGC09-A1	884	0.2	1.1	0.9	-	-	-	2.2	0.5 - >2.2
TP-BGC09-HL6-1	1038	0.1	2.4	-	-	2.5	-	6.5	-
TP-BGC09-HL6-2	1024	0.1	0.6	-	-	0.7	-	4.4	-
TP-BGC09-HL6-3	1010	0.2	3.0	-	-	3.2	-	6.2	-
TP-BGC09-HL6-4	981	0.2	3.8	-	-	4.0	-	4.8	2.8
TP-BGC09-HL6-5	1022	0.1	0.6	-	-	0.7	-	4.0	-
TP-BGC09-HL6-6	1062	0.2	1.5	-	-	1.7	-	5.5	-
TP-BGC09-HL6-7	1072	0.2	2.3	-	-	2.5	-	5.4	-
TP-BGC09-HL6-8	920	0.4	> 2.2	-	-	-	-	2.6	1.2 – 2.0
TP-BGC09-HL6-9	1042	0.2	0.6	-	-	0.8	-	3.8	1.2 - 1.5
TP-BGC09-HL6-10	939	0.2	1.0	-	-	1.2	-	4.8	2.0
TP-BGC09-HL6-11	976	0.2	0.5	-	-	0.7	-	2.8	-
TP-BGC09-HL6-12	957	0.1	> 5.9	-	-	-	-	6.0	-
TP-BGC09-HL6-13	959	0.1	1.5	-	-	1.6	-	2.4	-
TP-BGC09-HL6-14	870	0.2	5.6	-	-	6.0	-	6.2	-
TP-BGC09-HL6-15	979	0.2	4.7	-	-	4.9	-	5.3	0.2 - 1.4

Test Hole ID	Approx. Elev[1]. (m)	Overburden thickness (m)				Depth to Completely-Highly Weathered Rock (m)	Depth to Moderately-Slightly Weathered Rock (m)	Total Depth (m)	Frozen Ground (depth in m where noted)
		Organics	Colluvium	Till	Fill				
TP-BGC09-HL6-16	999	0.1	-	-	-	0.1	-	5.3	-
TP-BGC09-HL6-17	984	0.2	1.1	-	-	1.3	-	3.3	-
TP-BGC10-26	1023	0.1	1.6	-	-	1.7	-	5.3	-
TP-BGC10-27	1045	0.2	1.5	-	-	1.7	4.5	5.3	-
TP-BGC10-28	1027	0.3	> 0.2	-	-	-	-	0.5	0.4 - >0.5
TP-BGC10-29	1049	0.2	1.0	-	-	1.2	-	3.0	-
TP-BGC10-30	1060	0.2	3.8	-	-	4.0	-	5.5	-
TP-BGC10-31	1048	0.2	3.0	-	-	3.2	-	5.3	-
TP-BGC10-35	880	0.4	2.0	-	-	-	2.5	5.5	-
TP-BGC10-41	942	0.2	4.0	-	-	4.3	-	6.1	-
TP-BGC10-42	917	0.3	> 3.2	-	-	-	-	3.5	0.7 - >3.5
DH-BGC09-AG3	884	1.2	6.4	-	-	-	7.6	13.7	-
BH-BGC10-1	1057	NR				-	1.8	20.4	-
BH-BGC10-2	949	NR				7.3	-	20.4	-
MW10-AG3	997	0.2	4.5	-	-	4.7	-	11.8	-
MW10-AG5	934	0.2	0.9	-	-	1.1	-	16.1	-
MW10-AG6	906	0.3	4.1	-	-	4.4	9.0	17.7	-
TP95-51	912	-	> 5.5	-	-	-	-	5.5	-

Test Hole ID	Approx. Elev[1]. (m)	Overburden thickness (m)				Depth to Completely-Highly Weathered Rock (m)	Depth to Moderately-Slightly Weathered Rock (m)	Total Depth (m)	Frozen Ground (depth in m where noted)
		Organics	Colluvium	Till	Fill				
TP95-52	899	0.2	-	-	-	0.2	3.0	3.0	-
TP95-53	917	0.4	> 1.2	-	-	-	-	1.6	0.4 - 1.2
TP95-54	911	-	6.4	-	-	6.4	-	7.3	-
TP95-55	904	0.2	> 5.2	-	-	-	-	5.5	-
TP95-56	920	-	> 6.0	-	-	-	-	6.1	-
TP95-57	902	2.7	-	-	-	2.7	5.5	5.5	-
TP95-58	889	1.8	5.5	-	-	-	-	7.3	6.7 - 7.0
TP95-59	871	1.2	4.9	-	-	-	-	6.1	-

Notes:

(1) Approximate ground elevation is inferred from available digital elevation model based on assumed approximate horizontal position.
(2) "NR" = no recovery
(3) – not observed or not applicable
(4) Frozen ground observations from older test pits (TP95-XX or TP96-XX) may not reflect current conditions
(5) Stantec monitoring wells MW09-AG1 and MW09-AG2 have been excluded from the table since they do not provide any soil information.

Table 2b. Summary Subsurface Observations in Proposed Heap Leach Pad Area – Valley Bottom

Test Hole ID	Approx. Elev.[1] (m)	Overburden thickness (m)				Depth to Completely-Highly Weathered Rock (m)	Depth to Moderately-Slightly Weathered Rock (m)	Total Depth (m)	Frozen Ground (depth in m where noted)
		Organics	Colluvium	Till	Fill				
TP-BGC09-DG1	923	-	-	-	> 2.5	-	-	2.5	-
TP-BGC10-17[4]	873	0.1		>1.5	4.4	-	-	6.0	-
TP-BGC10-18[4]	877	0.2	0.3	>7.0	-	-	-	7.5	-
TP-BGC10-21[3]	895	0.1	-	-	>6.4	-	-	6.5	-
TP-BGC10-22[4]	884	0.1	0.8	-	-	0.9	1.5	5.3	-

Test Hole ID	Approx. Elev.[1] (m)	Overburden thickness (m)				Depth to Completely-Highly Weathered Rock (m)	Depth to Moderately-Slightly Weathered Rock (m)	Total Depth (m)	Frozen Ground (depth in m where noted)
		Organics	Colluvium	Till	Fill				
TP-BGC10-23[4]	880	-	-	-	> 5.0	-	-	5.0	-
TP-BGC10-24	858	0.1	-	-	>2.9	-	-	3.0	-
TP-BGC10-32[4]	902	0.1	-	-	7.9	-	-	8.0	-
TP-BGC10-36	837	-	-	-	>4.5	-	-	4.5	-
DH-BGC09-DG1	923	-	-	-	6.1	6.1	7.6	12.8	-
BH-BGC10-3	878	-	0.9	-	7.2	-	8.1	50.7	-
BH-BGC10-4	858	-	-	-	8.7	-	8.7	31.0	-
BH-BGC10-5[4]	884	-	-	-	4.3	-	4.3	21.0	-
BH-BGC10-6[4]	876	-	-	16.4	-	-	16.4	28.9	-
BH-BGC10-15[4]	893	NR				-	8.8	21.0	-
BH-BGC10-16[4]	878	NR				8.4	9.9	28.0	-
BH-BGC10-17	836	-	-	-	7.3	-	7.3	37.3	-
BH-BGC10-23	849	-	-	-	>6.0	-	-	6.0	-
TP95-45	838	-	-	-	5.5	-	-	5.5	-
TP95-46	867	-	-	-	2.5	2.5	-	3.1	-
TP95-50	872	-	-	-	2.5	3.7	-	3.7	-
TP96-230	845	-	-	-	>1.5	-	-	1.5	-
TP96-231	843	-	-	-	>3.5	-	-	3.5	-
TP96-232	851	-	-	-	>3.7	-	-	3.7	-

Notes:

(1) Approximate ground elevation is inferred from available digital elevation model based on assumed approximate horizontal position.

(2) "NR" = no recovery
(3) – not observed or not applicable
(4) Also considered in the proposed velocity reduction pond and rockfill diversion structures analysis
(5) Frozen ground observations from older test pits (TP95-XX or TP96-XX) may not reflect current conditions
(6) Stantec monitoring wells MW09-DG1 has been excluded from the table since it did not provide any soil information.

Table 2c. Summary Subsurface Observations in Proposed Heap Leach Pad Area – Southern Edge of Proposed Heap above Valley Bottom

Test Hole ID	Approx. Elev.[1] (m)	Overburden thickness (m)				Depth to Completely-Highly Weathered Rock (m)	Depth to Moderately-Slightly Weathered Rock (m)	Total Depth (m)	Frozen Ground (depth in m where noted)
		Organics	Colluvium	Till	Fill				
TP-BGC10-17[5]	873	0.1		>1.5	4.4	-	-	6.0	-
TP-BGC10-18[5]	877	0.2	0.3	>7.0	-	-	-	7.5	-
BH-BGC10-6[5]	876	-	-	16.4	-	-	16.4	28.9	-
BH-BGC10-16[5]	878	NR				8.4	9.9	28.0	-

Notes:

(1) Approximate ground elevation is inferred from available digital elevation model based on assumed approximate horizontal position.
(2) "NR" = no recovery
(3) – not observed or not applicable
(4) Frozen ground observations from older test pits (TP95-XX or TP96-XX) may not reflect current conditions
(5) Also considered in the proposed velocity reduction pond and rockfill diversion structures analysis

It should be noted that the current plan in the evolving FS designs is to expand the footprint of the HLF to the east. No subsurface data have been collected within this proposed expanded footprint, therefore, further investigations will be required to support design of this proposed expansion.

2.3.1.2. Overburden

Overburden soil conditions are distinctly different in the Dublin Gulch valley bottom from those encountered above the valley bottom in Ann Gulch and south of Dublin Gulch along the southern edge of the proposed heap.

In the Uplands above the valley bottom, the upper soil unit consists of a thin horizon of organic soil, rootlets, woody debris and plant matter ranging from 0.1 to 2.8 m thickness and averaging approximately 0.4 m (Table 2a). The organic cover above the valley bottom overlies colluvium ranging in thickness from 0.2 to 6.4 m, and averaging approximately 2.9 m (Table 2a). The colluvium consists of loose to compact angular gravel with occasional cobbles in a silt and sand matrix, derived from transported weathered metasedimentary bedrock. The colluvium may also include variable amounts of organics, which are often observed in distinct layers within the colluvium.

The overburden soils in the valley bottom have been reworked by historical placer mining activities. Placer tailings (fill) are observed from the ground surface to bedrock, with thicknesses ranging between 1.5 m and 8.7 m, and an average thickness of approximately 4.9 m (Table 2b). The material encountered is generally a well graded, loose to dense, silty sand and gravel, ranging to sand and gravel with some silt and occasional cobbles and boulders. Loose and moist zones have been encountered within the placer tailings. There is little to no vegetative cover on the placer tailings.

The placer tailings in the valley bottom have highly variable particle size distribution and density, and are generally saturated. Recorded Standard Penetrometer (SPT) blowcounts, N, are summarized in section 2.3.3.2, Table 7 for the placer tailings within the footprint of the proposed process management ponds. No blowcount data are available within the footprint of the heap leach pad, but the placer tailings (fill) materials are expected to have a similar extreme variability in penetration resistance and associated strength and stiffness.

The overburden at the southern edge of the proposed HLF includes 4.4 m of placer tailings at TP-BGC10-17, and a variable thickness of till ranging between 1.5 m to 16.4 m (Table 2c). The till is a compact to dense sandy silt to silty sand with some gravel. It must be noted that in borehole BH-BGC10-16 there was no soil recovery, so the contact between fill and undisturbed till has only been inferred from observations in the adjacent test pit TP-BGC10-17.

2.3.1.3. Bedrock

Drawing M5-01 shows the plan view of the Heap Leach Pad and includes all the existing test holes in the area. Bedrock was observed in the uplands above Dublin Gulch immediately below colluvium at depths ranging between 0.1 and 7.6 m below existing grade (average depth to bedrock at 2.5 m where observed). It is noted that borehole BH-BGC10-2 was excluded from the above-mentioned range since there was no recovery for the top 7.3 m depth.

Bedrock was observed in the valley bottom at depths ranging between 2.5 and 8.7 m below existing grade, with an average depth to bedrock at 5.8 m where observed. Borehole BH-BGC10-15 was excluded from the above-mentioned range since there was no recovery of overburden soil, thus the depth to bedrock is uncertain.

The very limited amount of data at the southern edge of the HLF suggests that bedrock is relatively deep (i.e. greater than 8 m).

Observed bedrock consisted of highly to completely weathered metasedimentary rock (i.e. Type 3 rock) or moderately to highly weathered rock (i.e. Type 2 rock). The metasediments in general are observed as strongly foliated yellowish brown to dark grey phyllites interbedded with quartzites. The quartzites are variably gritty, micaceous, and massive. Phyllitic metasediments are composed of muscovite-sericite and chlorite.

The rock mass quality and characteristics have been inferred from observations in boreholes BH-BGC10-01, -03, -04, -05, -06, -15, -16, -17, MW10AG3, and -AG5, which were drilled within the heap leach pad footprint. Rock Mass Rating (RMR, Bienawski, 1976) values of 20 to 30 were determined from the observed rock core to about 10 m depth, then increased to about 45 to 50 at most locations.

Geological mapping of structural features was carried out along road cuts, valley cuts and outcrops within and around the heap leach pad footprint by Victoria Gold field geologists during 2009 and 2010. The foliation/lineation/fault features are presented below in stereonets showing structures encountered in the upper portion of the HLF, between Tin Dome and the eastern edge of the heap leach pad, and in the valley bottom, between the proposed rock fill diversion berm and velocity reduction pond to the east, and the proposed process management ponds to the west. These data are plotted in Figures 01 to 03, and the spatial distribution of the field observation locations is shown in Drawing M5-05.

In the upper part of the HLF the structural mapping included 27 data points and shows two sets of structures plus random discontinuities. The first set ranges from east to south-east with an average strike/dip of 114° / 51°, while the second set ranges from north to north-east with an average strike/dip of 013° / 71° (see Figure 01 and Stereonet A in Drawing M5-05). In the valley bottom, 18 data points in the vicinity of the Dublin Gulch diversion berm and velocity reduction pond are divided in two sets, one trending south to south-west with an average strike/dip of 193° / 78°, and the other one trending north-east to east with an average strike/dip of 074° / 67° (see Figure 02 and Stereonet B in Drawing M5-05). For the west part of the valley bottom, between the heap containment embankment and the process management ponds, 51 data points are distributed in two sets, one trending north to north-west with an average strike/dip of 171° / 22°, and the other one trending north-east to east with an average strike/dip of 066° / 86° (Figure 03 and Stereonet C in Drawing M5-05).

Observations from test pits and road cuts indicate that the bedrock structure is highly variable at the local scale due to folding and local undulations of the foliation. However, in general at a larger scale, two major structural sets are identified, one trending NNE – SSW dipping to either E or W and compatible with the regional features sub parallel to Ann Gulch, and the other one trending ENE – ESE dipping to the S, compatible with the regional structure running parallel to Dublin Gulch.

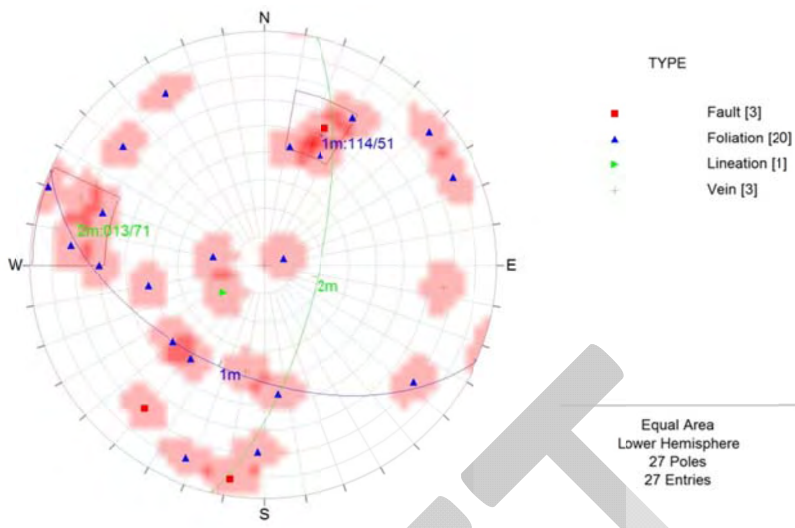

Figure 1. Structural data (interpreted with inclusion of field mapping data provided by Victoria Gold) near the proposed Heap Leach Facility, Upland.

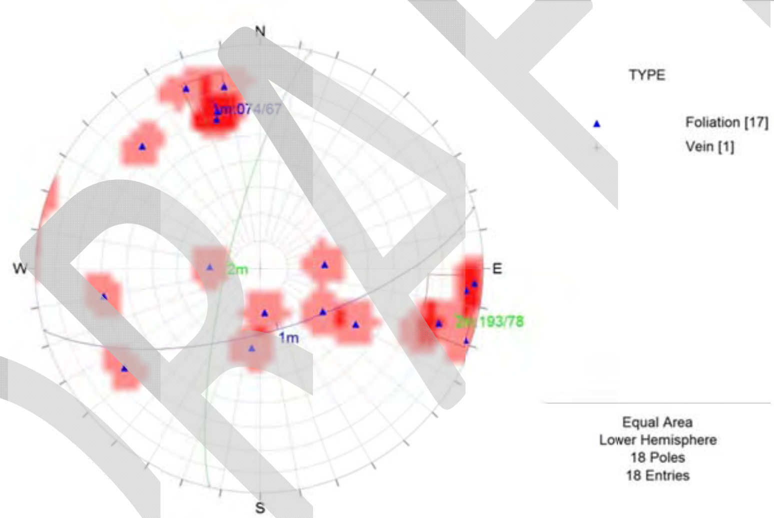

Figure 2. Structural data (interpreted with inclusion of field mapping data provided by Victoria Gold) near the proposed Heap Leach Facility, Valley Bottom East.

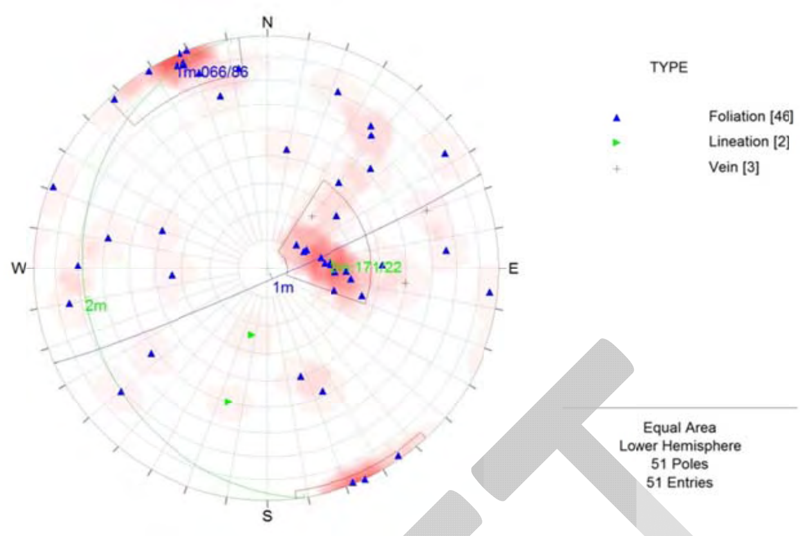

Figure 3. Structural data (interpreted with inclusion of field mapping data provided by Victoria Gold) near the proposed Heap Leach Facility, Valley Bottom West.

2.3.1.4. Groundwater

Groundwater seepage was noted at approximately 2.6 m below ground surface in test pit TP-BGC09-HL6-8, located within the footprint of the proposed heap containment dike. Within the valley bottom, a number of test pits (TP-BGC09-DG1, TP-BGC10-21, -22, TP95-45, -46, -50, TP96-230, -231, -232) encountered groundwater seepage at depths below ground surface varying between 1.5 and 5.0 m. A number of groundwater wells have been installed across the project site, as documented by Stantec (2010), and as illustrated in Drawings M5-01, M5-02 and M5-03. Typical groundwater observations for the area around the HLF are compiled in Table 3.

Table 3 Groundwater Observations in the General Area of the Proposed Heap Leach Pad (data compiled from Stantec 2010)

Location	Well ID	Typical Groundwater Depth (m below ground surface)
Upland	MW09-AG1[1]	14.4
	MW09-AG2[1]	15.5
	MW10-AG3a[2]	9.9
	MW10-AG5[2]	6.7
	MW10-AG6[2]	12.4
Valley Bottom	MW09-DG1[1]	2.6
	MW09-DG2[1]	2.5

Notes:
(1) Groundwater level measured in October 2009
(2) Groundwater level measured in May 2010

The observed groundwater depths on the open slopes in the upper Ann Gulch valley range from 6.7 m below grade close to the middle of Ann Gulch to 15.5 m in the headwaters of Ann Gulch. Water levels are typically about 2.5 m below ground surface in the Dublin Gulch valley bottom, but can be expected to be closer to ground surface near streams and deeper below piles of tailings. It is anticipated that these levels will vary seasonally.

For preliminary design, it may be assumed that the natural groundwater table will be encountered at approximately 10-15 m depth below grade in the uplands, and at close to the elevation of existing drainage courses in the valley bottom. However, groundwater can be expected to be encountered locally at shallower depths, specifically when approaching the main drainages. This variability should be considered in planning, design and construction.

2.3.1.5. Permafrost

Frozen ground was encountered in the upper part of the HLF footprint (i.e. Upland area) in test pits TP-BGC09-A1, TP-BGC09-HL6-04, -09, -10, -15, TP-BGC10-28, -42, TP95-53 and -58. When observed in a plan view, many of the test pits are located on the eastern slope of Ann Gulch, and all except for TP-BGC10-28 align in a NE trend, covering the entire HLF footprint, from its most eastern edge to its western end at the heap leach containment dike. The reason for this connection between the frozen ground observations is unknown and might simply correspond to sporadic disconnected patches; nevertheless the continuity of the linear feature may deserve to be studied in more detail and accounted for during site preparation and construction. Frozen ground was typically encountered within colluvial gravels and gravels and sands with depths varying between 0.6 m to 2.8 m, and occasionally included excess ice. Test pit TP95-58 describes visible ice encountered between 6.7 m to 7.3 m depth.

Frozen ground was not encountered in the valley bottom nor on the southern edge of the proposed heap leach pad, but localized pockets of frozen ground may be present in these areas.

2.3.1.6. Geological Hazards

Around the HLF, geological hazards as determined by Stantec (2010) mainly include permafrost processes in the west-facing slopes at the upper part of the valley and surface seepage at the bottom of the valley between the rockfill diversion berm and rockfill embankment (Drawing M5-04). Some of the south-facing lower and steeper slopes above Dublin Gulch are affected by rockfall and rockslide hazards (Drawing M5-04). If the HLF is to be extended to the east as proposed, these hazards will need to be accounted for in planning, designing and constructing grades for the pad in that area.

2.3.2. Water Diversion Structure

2.3.2.1. General

The water diversion system consists of a rockfill diversion dike and velocity reduction pond which will divert water coming from Dublin Gulch into the first segment of a diversion channel. Approximately half way down the diversion channel at Stuttle Gulch is an energy dissipater/drop structure which will then divert water down toward a second, lower, segment of the diversion channel. The second segment carries water adjacent to the process management ponds down Dublin Gulch into sediment control ponds before discharging into Haggart Creek.

Overburden conditions encountered along the proposed diversion channel alignment before the energy dissipater/drop structure, east of Stuttle Gulch, are generally different than those encountered further west in the valley bottom. The first segment is located at a higher elevation containing primarily colluvium and till; whereas, the second segment is underlain by placer tailings (fill) (see Drawing M5-03). The ground conditions for the second (lower) segment of the diversion channel and sediment ponds are discussed in section 2.3.3 Process Management Ponds.

Ground conditions at the proposed Dublin Gulch diversion berm and velocity reduction pond are similar to that encountered at the valley bottom component of the heap leach pad.

Subsurface conditions in the area of the proposed Dublin Gulch diversion to the Stuttle Gulch energy dissipation structure are summarized below in Table 4.

Table 4 Summary Subsurface Observations in Proposed Dublin Gulch Diversion Area

Test Hole ID	Approx. Elev.[1] (m)	Overburden thickness (m)				Depth to Completely-Highly Weathered Rock (m)	Depth to Moderately-Slightly Weathered Rock (m)	Total Depth (m)	Frozen Ground (depth in m where noted)
		Organics	Colluvium	Till	Fill				
TP-BGC09-HL4-2[5]	910	0.30	2.00	-	-	-	-	2.3	0.3 - >2.3
TP-BGC09-HL4-3[5]	913	0.20	-	4.80	-	-	-	5.0	0.5 - >5.0
TP-BGC09-HL4-7[5,6]	894	0.25	2.50	-	-	-	-	2.8	0.8 - >2.8
TP-BGC09-HL4-14[5]	910	0.30	1.60	-	-	-	-	1.9	0.2 - >1.9
TP-BGC10-17[5]	873	0.05	-	1.55	4.45	-	-	6.1	-
TP-BGC10-18[5]	877	0.20	0.30	7.00	-	-	-	7.5	-
TP-BGC10-19[5]	899	0.15	7.35	-	-	-	-	7.5	1.8 - >7.5
TP-BGC10-20[5]	905	0.20	0.40	-	-	-	0.60	3.2	-
TP-BGC10-21[4]	895	0.10	-	-	6.40	-	-	6.5	-

Test Hole ID	Approx. Elev.[1] (m)	Overburden thickness (m)				Depth to Completely-Highly Weathered Rock (m)	Depth to Moderately-Slightly Weathered Rock (m)	Total Depth (m)	Frozen Ground (depth in m where noted)
		Organics	Colluvium	Till	Fill				
TP-BGC10-22[5]	884	0.10	0.80	-	-	0.90	1.50	5.3	-
TP-BGC10-32[4]	902	0.1	-	-	7.9	-	-	8.0	-
TP-BGC10-43[6]	861	0.1	0.3	6.1	-	-	-	6.5	-
TP-BGC10-44[6]	892	0.3	5.7	-	-	-	-	6.0	3.0 - >6.0
TP-BGC10-45[6]	867	0.1	6.7	-	-	-	-	6.7	-
BH-BGC10-5[5]	884	-	-	-	4.3	-	4.3	21.0	-
BH-BGC10-6[5]	876	-	-	16.4	-	-	16.4	28.9	-
BH-BGC10-15[4]	893	-	-	-	-	-	8.8	21.0	-
BH-BGC10-16[5]	878	NR				8.38	9.9	28.0	-
TP96-129[5]	904	0.2	-	-	4.9	-	-	5.1	1.2 - 5.1
TP96-130[5]	893	-	-	-	1.4	-	1.4	1.8	-
TP95-47[5]	897	0.2	5.3	-	-	-	-	5.5	-
TP95-48[5]	903	0.2	0.7	-	-	-	-	0.9	0.6 - >0.9
TP95-49[5]	886	-	4.9	-	-	-	-	4.9	4.3 - 4.9
DH95-152[6]	865	-				-	12.2	30.2	-

Notes:

(1) Approximate ground elevation is inferred from available digital elevation model based on assumed approximate horizontal position.
(2) "NR" = no recovery
(3) – not observed or not applicable
(4) Test holes relevant to the proposed velocity reduction pond and rockfill diversion structure
(5) Test holes relevant to the proposed first segment of the diversion channel
(6) Test holes relevant to the proposed energy dissipation structure
(7) Frozen ground observations from older test pits (TP95-XX or TP96-XX) may not reflect current conditions

(8) Stantec monitoring wells MW09-STU2, MW09-STU3, MW09-STU4 have been excluded from the table since they do not provide any soil information.

2.3.2.2. Overburden

The current diversion dike arrangement, as shown in Drawing M5-02 and proposed in the PFS report, is located entirely within the approximate extent of placer tailings. There is a thin organic layer approximately 0.1 m thick underlain by placer tailings with thickness varying between 6.4 m to 7.9 m and an average of 7.2 m. The tailings are generally loose to compact silty sands and gravels and soft to firm sandy silts. Recorded Standard Penetrometer (SPT) blowcounts, N, are summarized in section 2.3.3.2, Table 7 for the placer tailings within the footprint of the proposed process management ponds.

Note that the proposed heap expansion may require a relocation of the diversion berm to the east into an area where no subsurface data are currently available.

The first segment of the diversion channel runs along the north facing slope, south of Dublin Gulch, at an elevation of approximately 900 m, and is generally outside the extent of placer tailings. The overburden consists of a thin horizon of organic soil ranging from 0.05 to 0.30 m thick and averaging approximately 0.20 m. The organic cover is underlain by colluvium ranging in thickness from 0.3 m to 7.4 m, with an average thickness of approximately 2.6 m. Colluvium is described as a loose to compact gravelly sand with some silt to gravelly silt with some sand. Glacial till is observed locally close to the western end of the upper segment of the diversion channel. The observed thickness of the till unit varied between 1.6 m to 16.4 m, with an average thickness of at least 7.4 m. In this area till is described as being a firm to stiff (or compact to dense) silt and sand with some gravel.

The overburden at the energy dissipater structure consists of a thin layer of organic soil from 0.05 to 0.3 m thick with an average of 0.18 m. The organic cover is underlain by colluvium with a thickness ranging from 0.3 m to 6.7 m and an average of approximately 3.8 m. Colluvium is described as loose to compact silty sand with some gravel, ranging to sandy silt. Test pit TP-BGC10-43 encountered 6.1 m of till underlying the colluvium, described as compact silty sand with some gravel and cobbles.

2.3.2.3. Bedrock

The bedrock near the diversion berm was observed at a maximum depth of 8.8 m in borehole BH-BGC10-15 (no recovery for the first 8.8 m). The rock is described as slightly to moderately weathered metasedimentary rock (W2 – W3), weak to medium strong (R2 – R3), and with very closely spaced discontinuities. The rock mass rating (RMR '76) ranges from 13 to 50 with an average rating of about 40. For the mapped geological structures in this area refer to Figure 2 and Drawing M5-05.

Close to the east end of the proposed diversion channel, bedrock was encountered within the first 1.5 m below ground surface, where test pits met refusal on bedrock in test pits TP-BGC10-20, -22 and TP96-130. However, boreholes drilled approximately 100 m to the north of the proposed diversion channel (BH-BGC10-05, -06 and -16) showed a depth to weathered bedrock between 4.3 m and 16.4 m. Rock Mass Rating (RMR, Bienawski, 1976) values of 20 to 30 were determined from the observed rock core to about 10 m depth and then increased to about 30 to 50.

At the proposed energy dissipation structure, bedrock was not encountered in test pits, which met refusal on frozen ground. One borehole drilled by Knight Piesold, DH95-152, encountered moderately weathered bedrock (W2-W3) at 12.2 m.

2.3.2.4. Groundwater

Groundwater has been observed in several test pits along the water diversion alignment (TP-BGC09-HL4-14, TP-BGC10-19, -21, -22 and TP96-130), where seepage caused sloughing of some test pit walls. Depths of groundwater seepage below ground surface varied between 1.5 and 3.0 m.

Table 5 shows a summary of water levels for two boreholes within the energy dissipater structure area.

Table 5 Groundwater Observations within the Proposed Energy Dissipation Structure Area (data compiled from Stantec 2010)

Well ID	Typical Groundwater Depth (mbgs)
DH95-152[1]	4.61
DH95-152[2]	4.19
DH95-152[3]	4.42
DH95-152[4]	4.58
DH95-152[5]	4.53
MW09-STU2[5]	0.65

Notes:
(1) Groundwater level measured in Sept 1995
(2) Groundwater level measured in Nov 1995
(3) Groundwater level measured in Jul 2009
(4) Groundwater level measured in Aug 2009
(5) Groundwater level measured in Oct 2009

Groundwater levels at DH95-152 were observed at an average depth of 4.5 m in 1995 and 2009. Data from monitoring well MW09-STU2, located proximal to Stuttle Gulch, showed an average value out of three readings of 0.65 m below ground surface.

It may be assumed for preliminary design that the groundwater table will be encountered near the energy dissipater area at up to approximately 4 m depth below grade, although there may be areas along the diversion where groundwater will be encountered at shallower depths.

2.3.2.5. Permafrost

Frozen ground was encountered in two test pits TP-BGC10-19 and TP-BGC09-HL4-2, located the valley bottom to the south of the proposed diversion channel. The depth to frozen ground ranged 0.3 m to > 2.3 m (refusal on frozen ground). Excess ice was observed in both test pits.

2.3.2.6. Geological Hazards

As shown in Drawing M5-04, the geological hazards identified by Stantec (2010) that might affect the construction of the diversion berm and part of the energy dissipater include surface seepage within the footprint of the placer tailings. Due to the sandy, and in numerous cases, moist and loose nature of these materials, liquefaction might be an issue under a seismic loading scenario.

For the upper segment of the diversion channel, the presence of permafrost may affect construction and operation, while surface seepage in creek crossings will need to be accounted for as well.

2.3.3. Process Management Ponds

2.3.3.1. General

The proposed process management ponds are located immediately downstream (west) of the heap leach pad and below (south of) the process plant (Drawing M5-03), and are to be constructed in the Dublin Gulch valley bottom, between Stuttle Gulch in the east and Haggart Creek to the west. The ponds are distributed in a linear series, as follows (higher to lower elevation):

- Events ponds to accommodate excess solution and rainfall/snowmelt when hydrological events exceed the storage capacity of the heap. These will operate on an infrequent basis.
- Polishing ponds to provide detention and precipitation of suspended solids coming from the effluent treatment plant. After polishing, water will be pumped to the sedimentation pond below before discharge.
- Sediment control pond to prevent runoff loaded with sediments generated during construction of the facilities and during mine operations from impacting the environment.

The overburden soil encountered in the vicinity of the proposed process management ponds area mainly comprises placer tailings and occasional colluvium or till. Subsurface conditions in the area are summarized below in Table 4.

Table 6 Summary Subsurface Observations in Proposed Process Management Ponds Area

Test Hole ID	Approx. Elev.[1] (m)	Overburden thickness (m)				Depth to Completely-Highly Weathered Rock (m)	Depth to Moderately-Slightly Weathered Rock (m)	Total Depth (m)	Frozen Ground (depth in m where noted)
		Organics	Colluvium	Till	Fill				
BH-BGC10-13	824	-	1.1	-	11.0	-	12.1	19.5	-
BH-BGC10-14	808	-	-	-	20.7	-	-	20.7	-
BH-BGC10-22	793	-	-	-	18.9	-	-	-	-
BH-BGC10-24	800	-	-	-	16.2	-	-	16.2	-
DH-BGC09-DG2	828	-	-	-	14.6	-	14.6	16.3	-
DH-BGC09-DG3	844	-	-	-	12.1	12.1	16.2	20.7	-
TP-BGC09-A2	823	-	-	4.5	-	-	-	4.5	2.0 – 2.5
TP-BGC09-DG3	837	-	-	-	5.0	-	-	5.0	-
TP-BGC10-37	930	-	-	3.5	5.5	-	-	9.0	-
TP-BGC10-38	830	-	-	-	4.8	-	-	4.8	-
TP-BGC10-39	825	-	-	-	5.5	-	-	5.5	-
TP-BGC10-40	816	-	-	-	5.5	-	-	5.5	-
TP-BGC10-46	795	-	-	-	6.7	-	-	6.7	-
TP-BGC10-47	806	-	-	-	5.3	-	-	5.3	-
TP-BGC10-48	793	-	-	-	3.5	-	-	3.5	-
TP-BGC10-49	808	-	-	-	5.5	-	-	5.5	-

Test Hole ID	Approx. Elev.[1] (m)	Overburden thickness (m)				Depth to Completely-Highly Weathered Rock (m)	Depth to Moderately-Slightly Weathered Rock (m)	Total Depth (m)	Frozen Ground (depth in m where noted)
		Organics	Colluvium	Till	Fill				
MW10-DG7	795	-	-	-	35.0	-	-	35.0	-
MW10-OBS1	796	-	-	-	15.2	-	-	15.2	-
MW10-OBS2	793	-	-	-	15.2	-	-	15.2	-
TP95-43	822				5.5	-	-	5.5	-
TP95-44	828	-	-	-	5.5	-	-	5.5	-

Notes:

(1) Approximate ground elevation is inferred from available digital elevation model based on assumed approximate horizontal position.
(2) "NR" = no recovery
(3) – not observed or not applicable
(4) Test holes relevant to the proposed velocity reduction pond and rockfill diversion structure
(5) Test holes relevant to the proposed first segment of the diversion channel
(6) Test holes relevant to the proposed energy dissipation structure
(7) Frozen ground observations from older test pits (TP95-XX or TP96-XX) may not reflect current conditions
(8) Stantec monitoring wells MW09-DG2, MW09-DG3, MW09-DG4 have been excluded from the table since they do not provide any soil information.

2.3.3.2. Overburden

The placer tailings within the footprint of the proposed process management ponds and lower segment of the proposed diversion channel, above Dublin Gulch, generally vary in thickness from 3.5 to 20 m with an average thickness of 10.9 m. Note that 35 m of overburden was encountered at one hole, Stantec monitoring well MW10-DG7. Till was observed in two test holes, TP-BGC10-37 and TP-BGC09-A2. The till was observed to be compact silty sand to sandy silt with varying proportions of gravel.

The placer tailings encountered within the footprint of the event ponds are generally a well graded, loose to compact, sand and gravel with some fines and some cobbles. Further downstream, below the footprint of the polishing ponds and up to the sediment pond, the placer tailings are finer grained, consisting of loose to compact silt and sand, gravelly to some gravel, and ranging to a soft to firm sandy silt with some gravel. Moist to wet fine-grained soils are frequently encountered in this area.

The high degree of variability of particle size distribution and density of the placer tailings within the ponds area is illustrated by the associated variability in Standard Penetration Test (SPT) N-values. Table 7 below summarizes the available SPT N-value for the boreholes within the area of the proposed process management ponds. Detailed records of recorded N values can be found on the borehole logs in BGC's 2010 site investigation data report (BGC 2011a).

Table 7 Summary of Standard Penetration Test N-values for the placer tailings within the Process Management Ponds Footprint

Borehole ID	Depth Interval tested (m)	USCS	Number of Tests Meeting Refusal	N-value (raw blowcount, blows / 300 mm)	
				Average	Standard Deviation
BH-BGC10-13	0.8 – 5.0	GW, trace SW	1	30	8
BH-BGC10-14	1.5 – 20.7	SW/SM – GW/GM	4	32	20
BH-BGC10-14B	1.5 – 5.7	SW - GP	1	4	4
BH-BGC10-22	1.5 – 18.8	SW/SM – ML, trace GW	1	27	28

The overall average N-value for tests performed on placer tailings within the process management ponds footprint is 23 ± 15. For these calculations, even though refused SPTs are considered valid tests, they were not included based on the influence the gravelly soils, which include cobbles and boulders, would have in the results. SPT results in cobbles and boulders cannot be relied on for indicators of density.

2.3.3.3. Bedrock

Bedrock was encountered underlying the placer tailings within the footprints of the proposed events ponds in boreholes BH-BGC09-DG2, -DG3, and BH-BGC10-13 (Drawing M5-03). Depth to bedrock ranged between 12.1 and 14.6 m below existing grade, averaging 13.0 m.

Observed bedrock consisted of moderately to highly weathered metasedimentary rock (i.e. Type 2 rock as described in Table 1) or slightly to moderately weathered rock (i.e. Type 1 rock). The metasediments are moderately to strongly foliated and fractured due to folding. Structures are oriented subparallel to foliation. Structural information relevant to the proposed process management ponds can be obtained from Figure 3 and Drawing M5-05.

2.3.3.4. Groundwater

Groundwater was observed in most of the testpits within the valley bottom (TP-BGC09-DG3, TP-BGC10-40, -48, and -49), where seepage caused sloughing of some test pit walls. Recorded depths to groundwater seepage vary between 2.0 and 5.5 m. Table 8 shows a summary of water levels for the boreholes within the proposed process management ponds. Groundwater levels at these three monitoring well locations were observed to be 2 to 3 m deeper in October 2010 than in May 2010.

Table 8 Groundwater Observations within the Proposed Process Management Ponds (data compiled from Stantec 2010)

Well ID	Elevation (m above sea level)	Groundwater Depth (m below ground surface)
MW09-DG2[1]	824	2.71
MW09-DG2[3]		2.55
MW09-DG2[4]		2.49
MW10-DG7[1]	795	10.27
MW10-DG7[2]		7.30
MW10-OBS1[1]	796	10.69
MW10-OBS1[2]		8.36
MW10-OBS2[1]	793	8.13
MW10-OBS2[2]		6.06

Notes:
(1) Groundwater level measured in Oct 2010
(2) Groundwater level measured in May 2010
(3) Groundwater level measured in Aug 2009
(4) Groundwater level measured in Oct 2009

Groundwater levels at MW09-DG2, located adjacent to the footprint of the proposed lower segment of the diversion channel, were observed at an average depth of 2.6 m between October 2009 and October 2010. Groundwater levels for MW10-DG7 for the period between May and October 2010 averaged 8.8 m below ground surface, while MW10-OBS1 averaged 9.5 m below grade and for MW-OBS2 the average was 7.1 m.

It may be assumed for preliminary design that the groundwater table will be at shallow depths near the event ponds at approximately 2 to 3 m depth below current grade, and that for the sediment control ponds the water level will be at about 7 to 9 m below current grade.

2.3.3.5. Permafrost

Only test pit TP-BGC09-A2 encountered frozen ground within a sandy silt glacial till between 2.0 and 2.5 m below grade. While frozen ground was not often observed within the placer tailings in the valley bottom, isolated patches of permafrost may be encountered.

2.3.3.6. Geological Hazards

The geological hazards identified by Stantec (2010) that might affect the construction of the process management ponds are limited to surface seepage within the footprint of the placer tailings (Drawing M5-04). Due to the sandy, and in numerous cases, moist and loose nature of these materials, liquefaction may be an issue under a seismic loading scenario. Faults have been identified in the project area, as illustrated in Drawing M5-05; however, there is no indication these are active.

3.0 RECOMMENDATIONS

3.1. General

There are a number of significant ground-related challenges to construction of earthworks and buildings at the overall mine site. These are discussed in greater detail in other engineering memos, but include, generally:

- Presence of discontinuous permafrost, including some areas with excess ground ice;
- Relatively short "traditional" (i.e. spring/summer/fall) construction season, with specific challenges and limitations during other parts of the year (e.g. poor trafficability and material workability on hillsides before mid-summer; and long, harsh winter);
- Uncertain quality and quantity of required borrow materials;
- Presence of significant quantities of existing random fill (placer tailings);
- Presence of steep slopes and associated geological hazards; and
- Limitations of data quality or completeness from prior field investigations, resulting in some uncertainties in the interpretation of subsurface conditions.

The uncertainties may be reduced through further field investigation, and to some degree the costs risks can be managed through use of contracts that allow for changing site conditions. Adequate contingencies should be carried in cost estimates to cover the uncertainty and variability, specifically if the HLF will be extended to the east where to date no subsurface information is available.

The following sub-sections contain a number of general recommendations for earthworks construction, to assist Tetra Tech with geotechnical design. These recommendations are provided to be consistent with recommendations provided for development at other areas of the site. More specific recommendations for particular facilities can be provided on request.

3.2. Site Preparation

The shallow overburden materials, including fill, organic soils and colluvium, should be removed to expose the undisturbed weathered bedrock as a subgrade for all settlement sensitive facilities. Organic soils should be removed and stockpiled for reuse in reclamation work. Unfrozen colluvium free of organics may be considered for use as subgrade fill for areas in the heap where some differential settlements can be tolerated without damaging the liner system or without incurring excessive distortion of the leachate detection/collection or internal drainage systems. Where colluvial soils are exposed as heap subgrade, they should be proof-rolled to identify soft or weak zones for removal and replacement.

In the uplands above the Dublin Gulch valley bottom, the overburden soils contain a significant percentage of silt, clay, and fine sand such that their consistency may be sensitive to moisture and freezing temperatures. Care should be taken in working with these materials, particularly during wet periods and spring melt.

Stripped materials should be segregated under the direction of an experienced geotechnical engineer. The excavated colluvium materials may be suitable for re-use as general grading fill (General Fill), provided that they do not contain deleterious materials, such as organic inclusions or significant quantities of excess ice. Materials containing excess ice may become usable if they are stripped frozen, stockpiled and thawed and allowed to drain before use.

Selected poor quality colluvial soils may need to be wasted, at the discretion of the geotechnical engineer. These soils may also degrade to slurry-like consistency when subjected to construction traffic or otherwise disturbed in wet conditions. It is recommended that defined construction roads be used for repetitive construction traffic to minimize disturbance at prepared areas. Trafficability will be poor on recently thawed ground, particularly where excess ice is encountered.

Discontinuous permafrost is present in patches in the area, and soils that seasonally thaw may remain frozen late into the summer. Some of these materials will contain excess ice and will therefore become wet when thawed. Care should be taken to segregate and safely stockpile frozen materials removed during site grading activities. Frozen materials containing excess should be removed from the proposed HLF subgrade and replaced as necessary with a material of equivalent stiffness to the surrounding subgrade.

Construction activities may be conducted during periods of cold weather, where soils may be subjected to freezing conditions. Fill should not be placed upon frozen material, snow or ice. Fill placement should be temporarily suspended if freezing conditions exist. It is recommended that if the ambient air temperature is less than zero degrees Celsius for more than four (4) hours over the preceding twenty-four (24) hours, the temperature of the fill should be measured to determine if the fill is frozen. If frozen, Structural Fill should be removed and replaced. To help protect the fill surface from freezing during periods of shutdown it is recommended that placed fills be covered with a loose (sacrificial) fill, or blankets, to help insulate the fill from freezing temperatures.

The placer tailings in the Dublin Gulch valley bottom have variable gradation and density, and are expected to be prone to excessive settlements under load, and may be locally susceptible to seismic or static liquefaction. The placer tailings are therefore considered to be unsuitable in their current state to support heavy structures such as the heap containment dike and stacked ore, the Dublin Gulch diversion dike, and process management ponds that will contain solution. It is recommended that all placer tailings be removed from all foundation subgrades to expose a subgrade of Type 3 (or better) rock or intact till, which can be built up to required grades by placement of Structural Fill or Rock Fill. Excavation of the tailings is discussed in Sections 3.3.7 and 3.3.9.

3.3. Site Grading and Fill Materials

3.3.1. General

Site grading, as described in this section, includes all major excavations and fills necessary to bring the site to the proposed design elevations.

It is expected that the surficial organic soils, colluvium, placer tailings and shallow Type 3 bedrock (i.e. highly to completely weathered bedrock) can be excavated with conventional earth moving construction equipment. If excavations extend into the stronger weathered bedrock (i.e. Types 1 or 2, expected at approximately 3 to 4 m depth below grade in the valley slopes, and 7 to 8 m depth below grade in the valley bottom), excavation will likely require ripping. Use of hydraulic breakers, and potentially localized blasting, may be required deeper in the weathered bedrock.

3.3.2. Structural Fill

Structural fill is defined as engineered fill used for the support of facilities requiring low foundation settlements under load. It may be considered for use in components of the heap containment dike or Dublin Gulch diversion dike.

Structural fill should consist of well graded sand and gravel (maximum particle size of 75 mm) with durable particles and containing less than 8 % fines (% passing the No. 200 sieve by weight), and less than 30 % by weight larger than 19 mm. The Structural Fill should be placed and compacted to at least 100% of Standard Proctor Maximum Dry Density (SPMDD, ASTM D-698) in maximum of 200 mm lifts with equipment suitable to achieve the required density.

Structural fill should not be placed upon frozen material, snow or ice. The placed fill should also be free of frozen materials and protected from the weather during freezing conditions. A layer of insulating fill or insulated blankets may be required when working in freezing or near-freezing conditions.

3.3.3. Rock Fill

Material containing more than 30 percent of particles above 19 mm (3/4 inch) size (Rock Fill) may be considered for use as fill in areas for select applications where frost susceptibility and drainage are less important. It is understood that the heap containment dike and the Dublin Gulch diversion dike are planned be constructed of Rock Fill.

It will likely be necessary to use relatively weak, non-durable rock for construction of rock fill. Rock Fill derived from weak rock will have high fines content, and therefore will not be suitable in applications where subsurface drainage is important, or where frost susceptibility is a concern. The construction of a Rock Fill developed with weak source rock will require careful quality control. Further advice can be provided as required.

The construction of a Rock Fill using locally derived metasediments will require the use of heavy vibratory rollers, use of thin lifts (i.e. 300 mm loose lifts) and application of water, similar to construction of an earth fill. Compaction control requirements for a Rock Fill may be determined based on the results of a test fill. The test fill should be constructed and monitored in accordance with the U. S. Army Corps of Engineers' (USACE) guidelines for test fill construction (USACE EM 1110-2-2301). In the event a source of higher quality rock is located capable of producing hard, durable rock particles, as expected from some of the waste rock derived from the open pit, the Rock Fill can be constructed in 1 m lifts and compacted by heavy construction traffic. Additional information regarding construction of Rock Fill using either high or poor quality source rock is provided by Cooke (1990).

3.3.4. General Fill

General fill is defined as a fill material used for general purposes where differential movements due to settlement of fills or frost heaving are of limited concern. General fill is intended as bulk grading fill in laydown or parking areas, as road grading fill below sub base, or for similar applications. General fill may be compacted by compaction equipment or by heavy construction traffic to a minimum of 95 % SPMDD, or to an acceptable level as determined by proof-rolling with a heavily loaded dump truck.

General fill should consist of unfrozen mineral soil with no deleterious materials such as organic or frozen inclusions. General fill should not contain particles exceeding 200 mm, and should contain less than 20 % fines by weight. Materials with oversize or excess fines may be considered for specific applications upon review by a qualified geotechnical engineer.

3.3.5. Permanent Cut Slopes

The PFS drawings (SWRPA 2010) show that the diversion channel involves a permanent cut of up to approximately 15 m height, with a 5 m buffer zone at the toe of the slope adjacent to the diversion channel. The proposed cut will be made through overburden materials and bedrock, which may be Type 3 or Type 2 rock, and can be expected to vary in depth and quality along the length of the diversion. Similar cuts may be required along the sides of the energy dissipater. The eastern expansion of the heap leach pad is expected to require a significant excavation of unknown depth into the adjacent bedrock to achieve acceptable grades.

Cuts in the colluvium and organic overburden above weathered rock can be made at slope angles of 2.5H:1V (22 degrees), provided adequate drainage is provided to keep the overburden drained. Preliminary analysis suggests that cuts of up to 15-20 m height in bedrock (overall cut face height) and with an overall slope angle in the rock of 1.5H:1V from crest to toe will have an adequate factor of safety against overall deep-seated slope failure (including seismic loading). It can be expected that this cut slope will ravel over time, with some accumulation of debris in the 5 m wide buffer.

Frozen ground will be encountered in places near the existing ground surface along the cut slope face to variable depths within the overburden and bedrock. Where excess ice is observed in the overburden materials above bedrock, local overexcavation may be required to reduce the occurrence of thaw-related slumping of the overburden.

The side slopes alongside the energy dissipater should be made at 3H:1V or flatter, as required for adequate erosion protection design.

The excavation for the eastern heap expansion will require additional detail to support design. For preliminary design, it may be assumed that this cut may be made safely with an overall slope angle of 3H:1V or flatter. Consideration of steeper grades will require additional drilling data at the FS stage, prior to initiation of detailed design.

3.3.6. Engineered Fill Slopes

Engineered slopes constructed of Structural Fill may be made at 2H:1V or flatter. Buildings constructed near the proposed earthworks facilities, if required, should be set back a minimum of 10 m from the crest of fill slopes.

Where a structural fill is to be constructed adjacent to an existing natural slope, the fill should be keyed into the natural slope by excavating steps into the slope at the edge of successive lifts of structural fill.

3.3.7. Temporary Excavations

3.3.7.1. General

Construction may require temporary excavations into native soil and weathered bedrock. Safe, stable construction slopes should be made the responsibility of the contractor and will depend on the groundwater and soil and rock conditions encountered at the time of construction.

A review of the PFS designs suggests the following temporary excavations will be required: excavation, removal and recompaction of the placer tailings for foundation preparation for the process management ponds; excavation for foundation preparation at the heap containment dike and rockfill diversion berm, including excavations for preparation of the abutments; and, excavation and removal of unsuitable foundation materials elsewhere within the footprint of the HLF components.

BGC can provide further advice on temporary cut slopes at the Detailed Design stage; however, it is recommended that the design of temporary slopes be left with the Contractor.

3.3.8. Subgrade Preparation

Care should be taken to avoid disturbing subgrade materials that will remain in place. Areas of weathered rock, colluvium or till subgrade that become softened or loosened during construction should be removed and replaced with compacted engineered fill (Structural Fill or Rock Fill). The base of all excavations should be dry and free of loose soils at the time of placement of liner materials or other construction components. Exposed frozen soil with excess ice should be removed to provide a thaw stable subgrade.

3.3.9. Water Control and Construction Dewatering

It will likely be necessary to remove and/or replace most of the existing placer tailings in the valley bottom, and these are largely below the groundwater table. It will be necessary to dewater the excavations. It may be most effective to dam the valley above and pump water around the HLF construction footprint, with additional sumps and pumps as required within the main construction area. The excavation of placer tailings will require careful consideration of scheduling, dewatering, stockpiling and processing of the placer tailings. Dewatering on the scale required will require a plan to avoid or mitigate impacting water in Haggart Creek and Eagle Creek where there are existing fisheries. This will be a major activity requiring further discussion and consideration of construction methods and schedule.

Construction dewatering should be made the responsibility of the contractor. BGC can provide further advice if specifically required.

3.4. Recommendations for Further Investigation

The cut slope designs are based on certain assumptions regarding bedrock quality and structure. These design assumptions may be confirmed through additional site investigation including test pit/trench excavations, mapping, and monitoring of the exposed cut faces, and borehole drilling along proposed cut slopes. Alternatively, the construction contracts may be structured to account for the anticipated variability in subsurface conditions.

There is presently no subsurface information within the footprint of the expanded heap, east of the area identified in the PFS (SWRPA 2010) for the HLF. It is imperative to obtain additional test pit and borehole data to support Detailed Design. If steeper grades are required in this area than recommended in this memorandom, additional subsurface data will be required to support the FS.

3.5. Review of Design and Construction

Details of the design and specifications related to geotechnical aspects of the construction should be reviewed by a qualified geotechnical engineer prior to construction.

All recommendations presented in this memorandum are made with the implicit assumption that an adequate level of monitoring (i.e. full-time monitoring, inspection and testing by suitably qualified persons) will be provided during construction, and that all construction will be carried out by suitably qualified contractors, experienced in earthworks and foundation construction in the north.

3.6. Work to Support Detailed Design

The information and recommendations provided in this report have been prepared to support the development of designs at the FS level. In some cases, sufficient data do not exist to support the development of FS level designs to a normal degree of certainty, due either to observed material variability, or due to the lack of subsurface information. Adequate cost contingencies should be carried in the FS design to address these uncertainties, and consideration should be given to obtaining additional data where warranted.

BGC can provide further geotechnical advice at the Detailed Design stage, if requested. Additional field data will be necessary to support the development of Detailed Design. Tetra Tech should identify geotechnical data gaps that require further investigation either as part of FS development or to support Detailed Design. BGC can assist in this effort if requested.

4.0 CLOSURE

BGC Engineering Inc. (BGC) prepared this document for the account of Victoria Gold Corp. The material in it reflects the judgment of BGC staff in light of the information available to BGC at the time of document preparation. Any use which a third party makes of this document or any reliance on decisions to be based on it is the responsibility of such third parties. BGC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this document.

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Yours sincerely,

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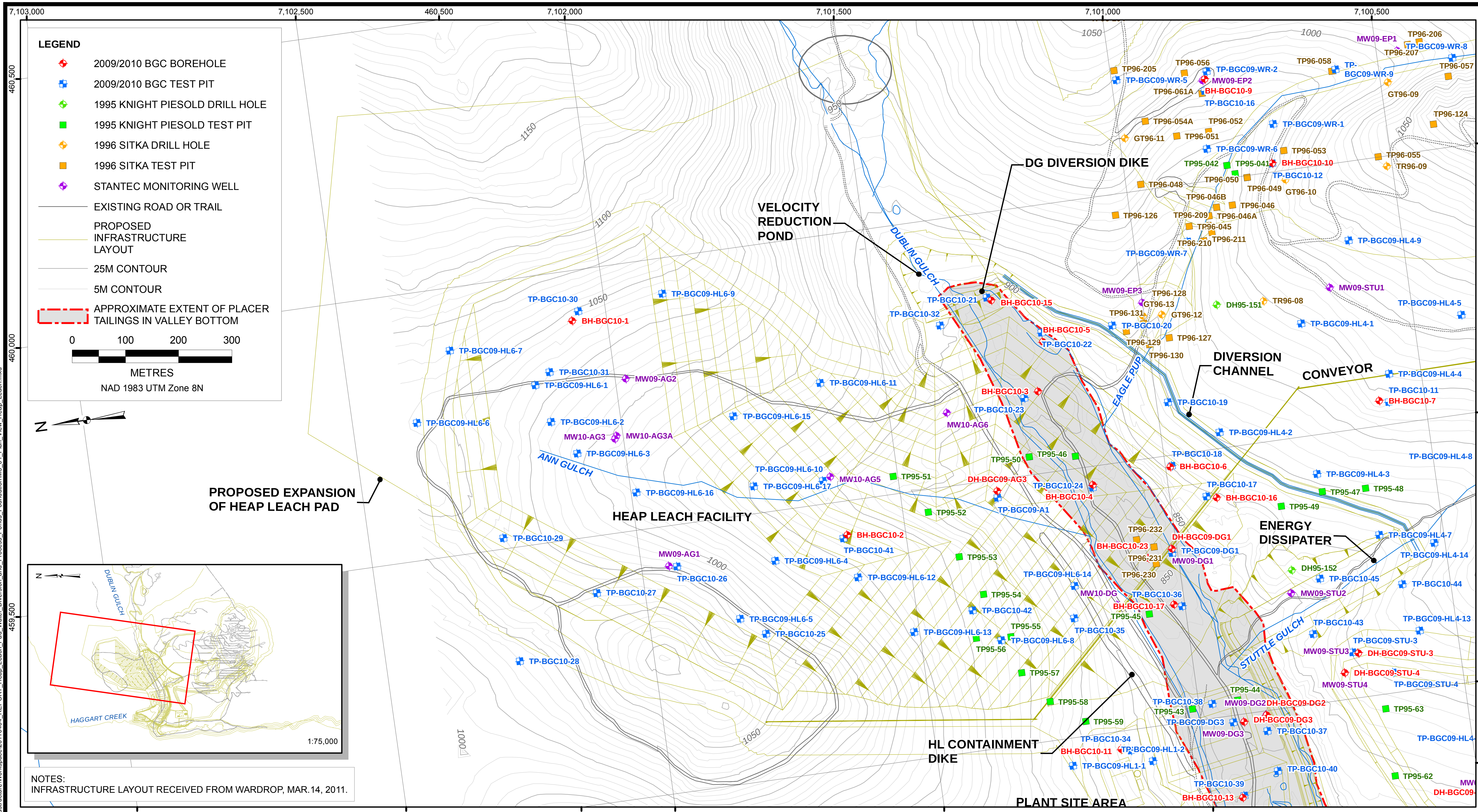
DRAWINGS



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APPROVED:	PQ

PROFESSIONAL SEAL:

DRAFT

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT:
VICTORIA GOLD CORPORATION

PROJECT:
EAGLE GOLD – HEAP LEACH PAD, WATER DIVERSION AND PROCESS PONDS FOUNDATION REPORT

TITLE:
PLAN VIEW - HEAP LEACH

PROJECT No.:	DWG No.:	REV.:
0792-004	M5 - 01	A

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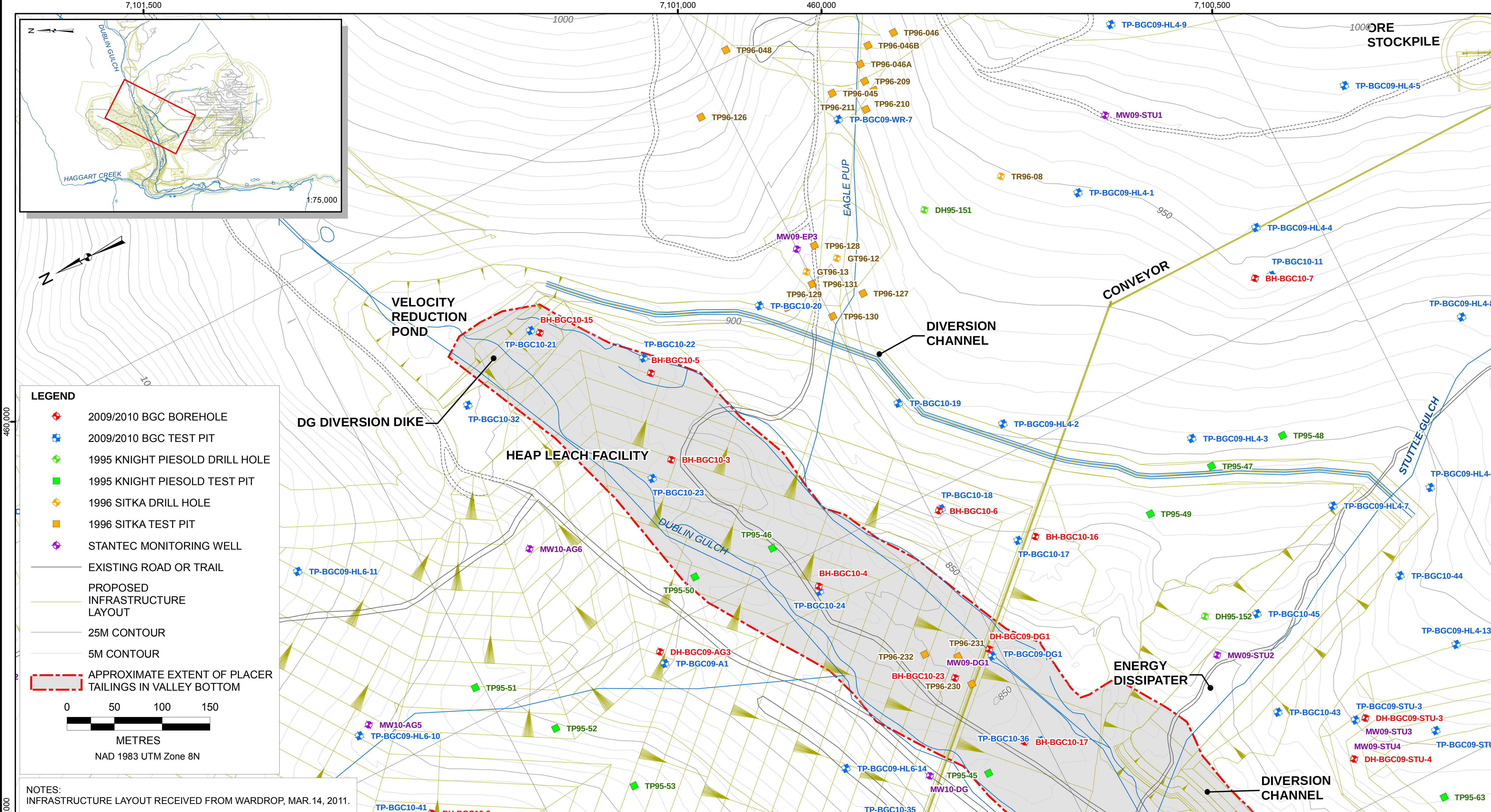

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CLIENT:
VICTORIA GOLD CORPORATION

PROJECT:
EAGLE GOLD – HEAP LEACH PAD, WATER DIVERSION AND PROCESS PONDS FOUNDATION REPORT

TITLE:
PLAN VIEW - DIVERSION CHANNEL

PROJECT No.: 0792-004
DWG No.: M5 - 02
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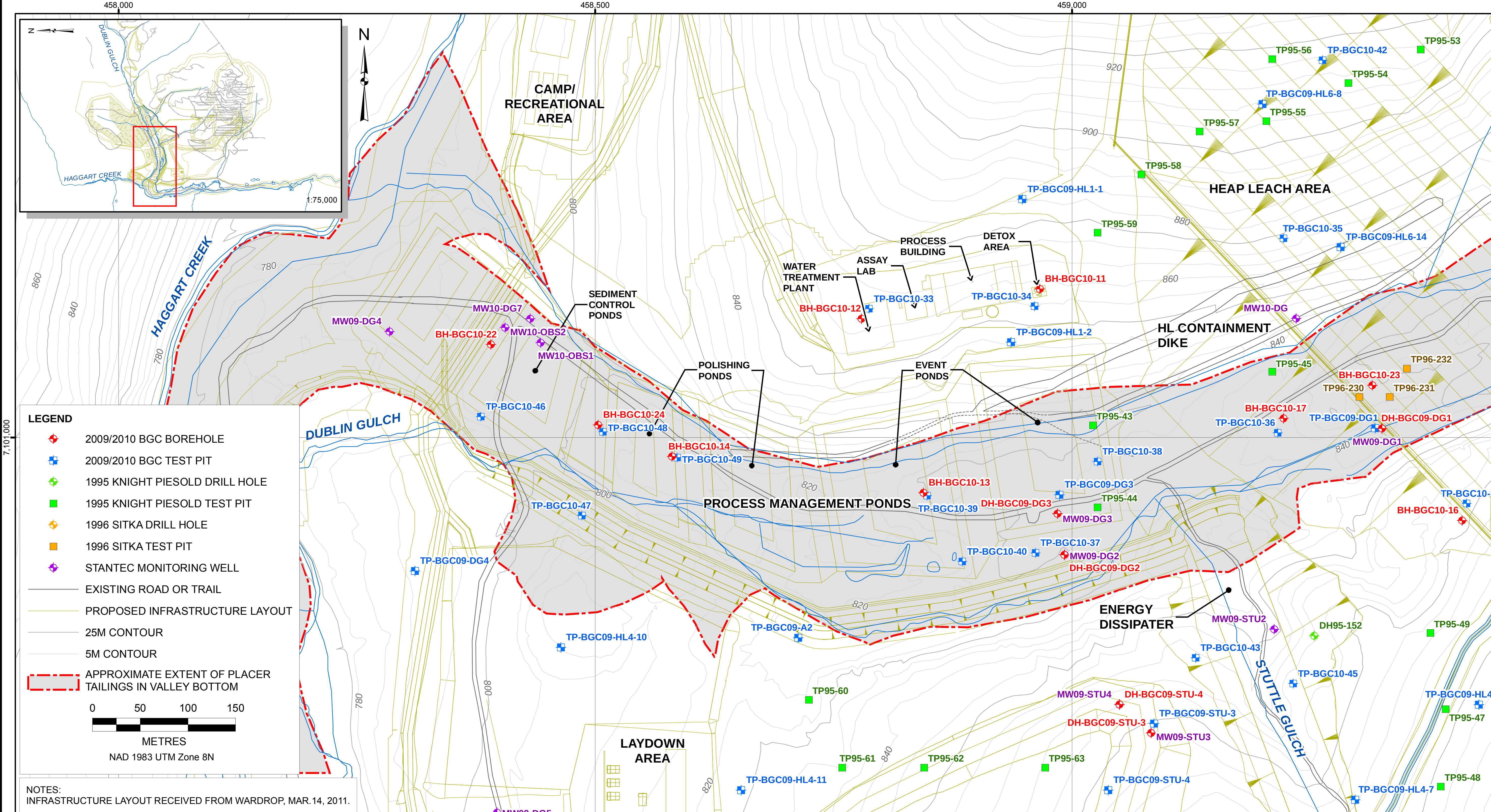

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VICTORIA GOLD CORPORATION

PROJECT:
EAGLE GOLD – HEAP LEACH PAD, WATER DIVERSION AND PROCESS PONDS FOUNDATION REPORT

TITLE:
PLAN VIEW - PROCESS MANAGEMENT PONDS

PROJECT No.: 0792-004
DWG No.: M5 - 03
REV.: A

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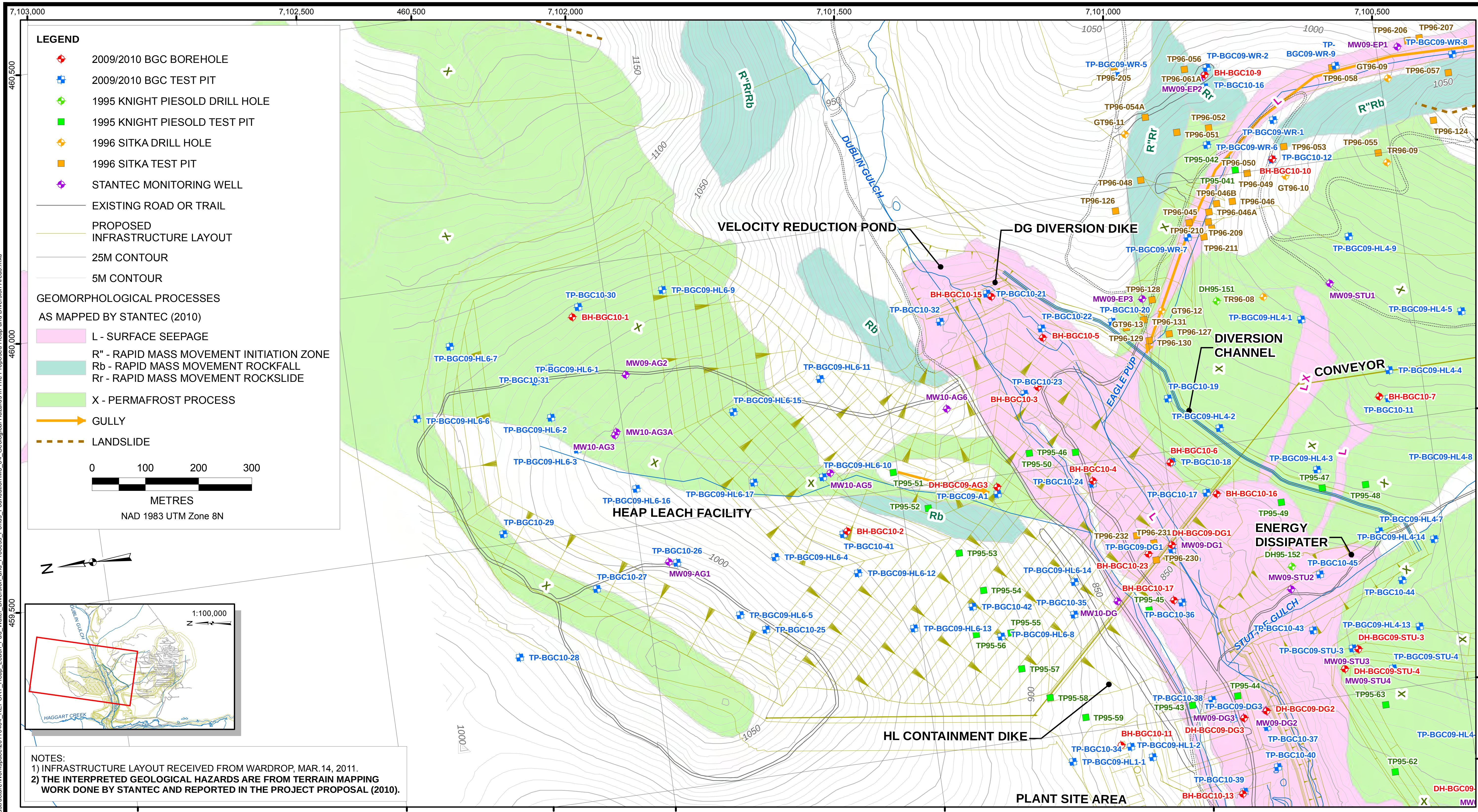

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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT:
VICTORIA GOLD CORPORATION

PROJECT:
EAGLE GOLD – HEAP LEACH PAD, WATER DIVERSION AND PROCESS PONDS FOUNDATION REPORT

TITLE:
GEOLOGICAL HAZARDS IN THE PROPOSED HEAP AND DIVERSION AREAS (FROM STANTEC TERRAIN ANALYSIS)

PROJECT No.: 0792-004
DWG No.: M5 - 04
REV.: A

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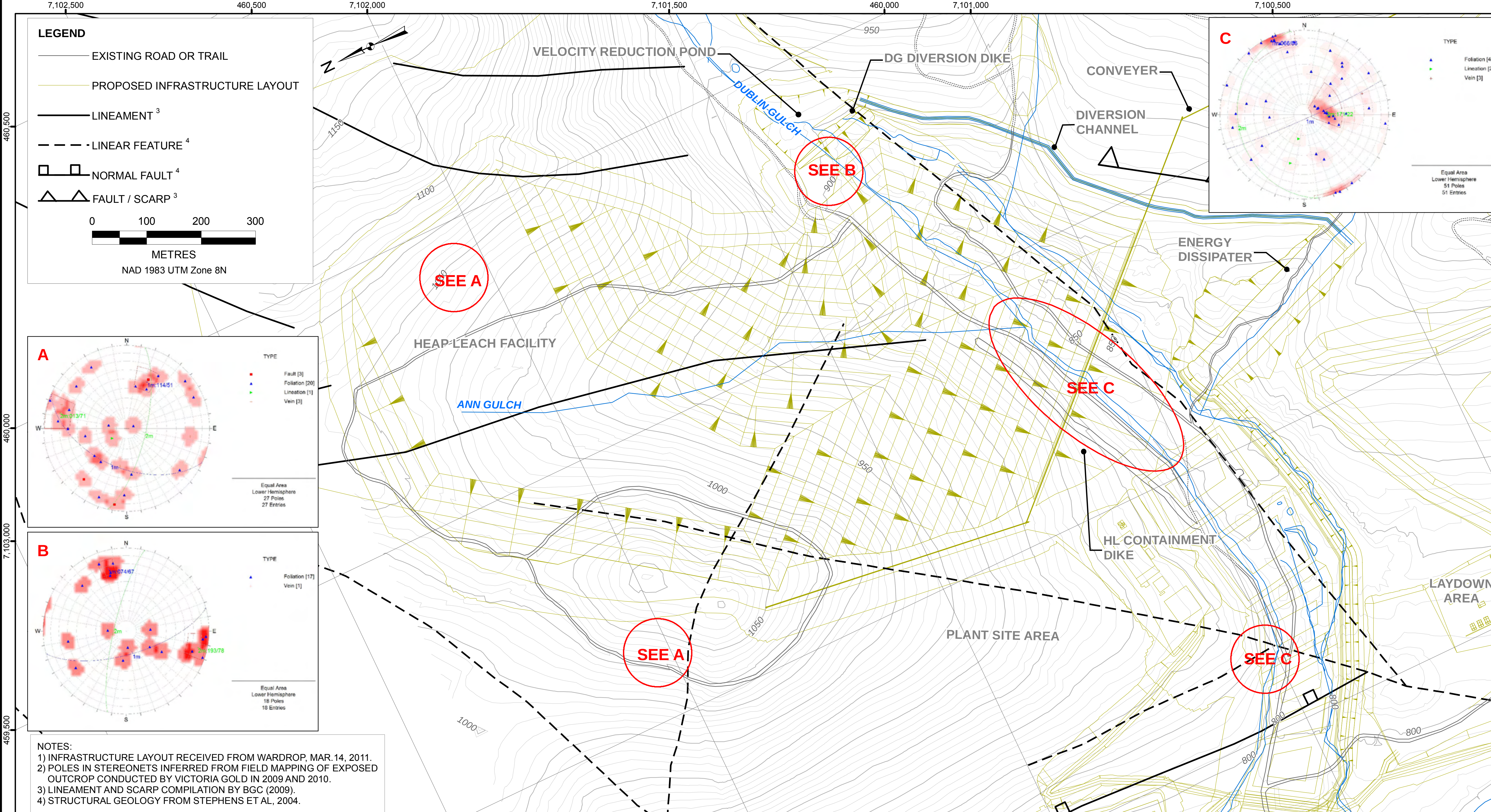

NOTES:
1) INFRASTRUCTURE LAYOUT RECEIVED FROM WARDROP, MAR.14, 2011.
2) POLES IN STEREONETS INFERRED FROM FIELD MAPPING OF EXPOSED OUTCROP CONDUCTED BY VICTORIA GOLD IN 2009 AND 2010.
3) LINEAMENT AND SCARP COMPILATION BY BGC (2009).
4) STRUCTURAL GEOLOGY FROM STEPHENS ET AL, 2004.

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VICTORIA GOLD CORPORATION

PROJECT:
EAGLE GOLD – HEAP LEACH PAD, WATER DIVERSION AND PROCESS PONDS FOUNDATION REPORT

TITLE:
STRUCTURAL GEOLOGY MAP

PROJECT No.:	DWG No.:	REV.:
0792-004	M5 - 05	A

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BGC Project Memorandum

To:	**Victoria Gold**	**Doc. no:**	**0792-004-M6.1-2011**
Attention:	**Mike Padula**	**cc:**	**Marten Regan, Wardrop Glen Barr, Stantec**
From:	**Pete Quinn**	**Date:**	**April 21, 2011**
Subject:	**Eagle Gold – Borrow Evaluation Report**		
Project no:	**0792-004**		

1.0 INTRODUCTION

BGC Engineering Inc. (BGC) has been retained by Victoria Gold Corp. (Victoria) to complete geotechnical investigations for the open pit and mine site infrastructure for the Eagle Gold project at Dublin Gulch, Yukon.

Ore will be extracted from an open pit located on the ridge line above Dublin Gulch to the south, and between the headwaters of Eagle Pup and Platinum Gulch. Gold is to be extracted from the ore by heap leaching using a valley fill heap located in a small valley drained by Ann Gulch, spanning over and partially filling the middle reach of Dublin Gulch.

The project will involve a number of other important facilities, including: two primary waste rock storage areas (one in Eagle Pup, and one at the top of Platinum Gulch); a water diversion system to carry surface water from the upper reach of Dublin Gulch around the heap leach pad; process water ponds for management of heap solution; a process plant; crushers, conveyors and stockpiles; borrow pits; temporary spoil stockpiles; and miscellaneous other facilities, including truck shop, offices, warehouse space, fuel and water tanks, power and water transmission facilities; and explosives management facilities. Mine development also requires construction of upgrades to existing roads, and a power transmission line. The General Arrangement developed in the prefeasibility study (PFS) by Scott Wilson RPA (SWRPA, 2010) is illustrated in Drawing 01, which also illustrates the distribution of subsurface information.

It is understood that the existing one lane, unmaintained, Haggart Creek territorial road (HCR) will be upgraded as a radio-controlled single lane road. This upgrade involves the following components: alignment improvements at four specific sections totaling approximately 2.0 km; development of borrow sources; construction of pullouts along the roadway; and, reconstruction improvements at three crossings: Secret Creek, Haggart Creek and Snowshoe Creek. The extent of the HCR to be upgraded is illustrated in Drawing 02.

Granular borrow materials will be required for construction of various earthworks structures associated with mine site development and access road upgrades. This memorandum discusses the availability of borrow materials for the mine site and for the Haggart Creek Road upgrades.

2.0 SITE CONDITIONS

2.1. Background Reports

Site conditions at the Eagle Gold site are described in several reports:

- Report on 1995 Geotechnical Investigations for Four Potential Heap Leach Facility Site Alternatives, First Dynasty Mines, Dublin Gulch Property. (Knight Piesold, 1996a).
- Report on Feasibility Design of the Mine Waste Rock Storage Area, First Dynasty Mines, Dublin Gulch Property. (Knight Piesold, 1996b).
- Field Investigation Data Report, Dublin Gulch Project, New Millennium Mining. (Sitka Corp, 1996).
- Hydrogeological Characterization and Assessment, Dublin Gulch Project, New Millennium Mining. (GeoEnviro Engineering, 1996).
- Site Facilities Geotechnical Investigation Factual Data Report. Eagle Gold Project, Victoria Gold Corporation. (BGC Engineering Inc. 2009).
- Project Proposal for Executive Committee Review. Pursuant to the Yukon Environmental and Socio-Economic Assessment Act. Eagle Gold Project, Victoria Gold Corporation. (Stantec. 2010).
- 2010 Geotechnical Investigation for Mine Site Infrastructure, Factual Data Report. Eagle Gold Project, Victoria Gold Corporation. (BGC Engineering Inc. 2011).

Proposed upgrades to the HCR are outlined in the following:

- Eagle Gold Project: Access Road DRAFT, Victoria Gold Corporation. (Yukon Engineering Services, January 2010);
- Geotechnical Evaluation: Haggart Creek Road Upgrades, Section km 16 to km 38, Victoria Gold Property, Dublin Gulch, YT, Victoria Gold Corporation. (Yukon Engineering Services, February 2011).

2.2. Generalized Site Conditions in the Mine Site Area

The site topography involves moderate to high relief, with ground elevation varying from approximately 800 to 1400 m ASL.

Ground conditions are highly variable across the site. Further, due to limitations of the drilling equipment used and the evolution of the general arrangement, there is limited information and significant uncertainty in the subsurface conditions at many areas of the site.

Groundwater was observed at varying depths across the site, generally close to the elevation of streams in the valley bottoms, and often below the depth of test pit excavation on the hillsides.

Overburden soils encountered on the sloping ground at the mine site typically consist of a veneer of organic soils overlying a blanket of colluvium, which overlies weathered bedrock. Glacial till is generally encountered on the lower flanks of the north- and west-facing slopes north and west of the proposed open pit, above Dublin Gulch and Haggart Creek. Placer tailings (fill) cover most of the valley bottom of Dublin Gulch and Haggart Creek. Alluvial soils are occasionally encountered along the undisturbed valley-bottom areas.

The bedrock encountered at the mine site is classified as either intrusive (i.e. granodiorite, typically in the uplands) or metamorphosed sedimentary rock, with a variably deep weathering profile. The intact rock strength of the encountered rock types is highly variable, with strength ranging between R0 class (i.e. corresponding to 0-1 MPa Unconfined Compressive Strength, UCS) and R4 (50-100 MPa). The average intact strength is estimated to be approximately R2 (5-25 MPa) in the metasedimentary rock and R3 (25-50) in the granodiorite rock, depending upon the degree of weathering.

Rock Mass Rating (RMR), (Bieniawski, 1976) values calculated from retrieved rock core generally range between 20 to 40 in the metasedimentary rock and >40 in the granodiorite rock, where sufficient core was retrieved to for determination. These values compare reasonably well with Geological Strength Index (GSI), (Hoek, 2007; Hoek and Marinos, 2000) values estimated from the recovered core and near surface observations. The estimated GSI ranged between approximately 30-40 in the metasedimentary rocks and > 40 in the granodiorite.

The inferred rockmass quality (as quantified by GSI) can be used to derive estimated stiffness and Hoek-Brown strength parameters for stability analysis of slopes, and for bearing capacity and settlement calculations of the proposed foundations.

Bedrock at the mine site has been subdivided into three broad categories – Type 1, Type 2 and Type 3 – on the basis of rockmass quality and inferred engineering behaviour, with Type 1 being the highest quality, and Type 3 being the lowest quality. Typical characteristics of these three bedrock types are categorized in accordance with the indices noted above. Further background on rock classification is provided in the Canadian Foundation Engineering Manual (CGS 2006). The typical characteristics of the three rock types are summarized in Table 1.

3.2. Haggart Creek Road

Yukon Engineering Services (2011) identifies the following specific requirements for granular borrow for the HCR upgrades:

- 10,000 m3 of road base material;
- 10,000 m3 of base material for pull outs;
- 16,000 m3 of road surfacing material; and
- 1,000 m3 of culvert bedding material.

3.3. Suggested Borrow Material Classifications

Silt/Clay Liners

These are engineered low permeability soil liners used as a barrier for chemical and physical migration of fluids. The PFS report (SWRPA 2010) suggests a target hydraulic conductivity for compacted fine grained liner materials of no more than 1 x 10-5 cm/s, or 1 x 10-6 cm/s in the absence of a leachate detection and removal system.

Silt and clay liners are typically placed and compacted to 95% of Standard Proctor Maximum Dry Density (SPMDD), and should contain a minimum of 35% passing the No. 200 sieve and be free of all deleterious materials including oversize of 75 mm or greater, frozen soils, and organics. This material should be placed with uniform moisture content, typically within 2% (above) optimum moisture content (ASTM D698) and a USCS classification of CL, ML, CH, MH.

Rock Fill

Rock fill can be classified as one of two types: that derived from strong rock, yielding durable rock fragments larger than gravel size and contains sand and gravel with less than 15% fines when excavated/blasted; and, that derived from weak, fissile rock, generating non-durable rock fragments. The first type may be placed and compacted as a rock fill in 1 m lifts, whereas the second type may be placed and compacted as a rock fill in thinner lifts similar to an earth fill embankment.

Additional detail on construction of rock fills derived from strong rock or weaker rock may be found in Cooke (1990) and US Army Corps of Engineers (1994).

Structural Fill

Structural Fill is an engineered soil material placed and compacted for use beneath lightly to moderately loaded structures to provide a uniform bearing surface with tolerable movements under load through the life of the structure.

Structural Fill should consist of well graded sand and gravel having a maximum size of 75 mm and less than 8% fines (materials passing the No. 200 sieve) and be free of all deleterious materials including oversize of 75 mm or greater, frozen soils, and organics. All structural fill should be placed and compacted to 100% Standard Proctor Maximum Dry

Type 3 bedrock, the lowest quality rockmass, is considered to act as bedrock (rather than as a soil), can be recognized in the field by a qualified geotechnical engineer/geologist on the basis of evident preserved fabric of the parent rock within the highly weathered rockmass, and the requirement for moderate effort to excavate with heavy excavators. Types 1 and 2 bedrock are of generally better rockmass quality. The transition from Type 3 to Type 2 can be considered to have been observed if it becomes necessary to use more aggressive equipment to rip the rock, such as a Caterpillar D8 dozer with ripper teeth. Type 1 bedrock will require the use of hydraulic hammers and/or some blasting to excavate.

Table 2-1. Rock Type Typical Characteristics.

Parameter	Type 1	Type 2	Type 3
Unconfined Compressive Strength	> 25 MPa	5 to 25 MPa	1 to 5 MPa
Geological Strength Index	> 20	15 to 25	15 to 25
Weathering Grade	Slightly to Moderately Weathered	Moderately to Highly Weathered	Highly Weathered

Permafrost is present in the area, and is warm (i.e. typically 0 to -1 degrees Celsius), discontinuous and occasionally contains excess ground ice. Although not specifically controlled by slope aspect, permafrost is found more frequently in the north-facing lower slopes above the south side of Dublin Gulch.

3.0 BORROW REQUIREMENTS

3.1. Mine Site Area

The PFS report by SWRPA (2010) describes various types of granular borrow required for construction of the mine site facilities, and quantities have been extracted or estimated from the PFS capital cost estimates including:

- 564,000 m^3 of silt/fines for heap leach pad liner construction;
- 2,240,000 m^3 of rock fill for heap containment dyke and diversion embankment, selected from durable waste rock from mining ;
- 330,000 m^3 of fine gravel/coarse sand for leachate detection and recovery system;
- 883,000 m^3 of general fill and/or structural fill for various earthworks structures, including pond berms, building pads and similar structural applications;
- 65,000 m^3 of transition zone gravel;
- 49,000 m^3 of Type 2 drainage system material (described as silty colluvium);
- 26,000 m^3 of rip rap;
- 4,000 m^3 of coarse concrete aggregate; and
- 2,000 m^3 of fine concrete aggregate.

Concrete Aggregate

Concrete aggregate includes fine and coarse aggregate meeting CSA A23.1 specifications for designing and proportioning concrete mix. Aggregates can be derived from crushed durable rock or gravel.

Road Base

This is an engineered material, consisting of a well graded, hard, durable, very clean (less than 5% fines), screened and crushed sand and gravel or rock, with a maximum particle size of 38 mm. Material should be free of flat and elongated pieces and have a minimum of 50 % fractured particle faces. Road base gravel should also have less than 25% loss by Micro-Deval. Road base materials should be placed and compacted to a minimum of 100% SPMDD.

Road Surfacing Material

Road surfacing material should consist of as a well graded hard, durable, angular screened and crushed sand and gravel or rock with less than 15% fines, and maximum particle size of 25 mm. Granular material should have a less than 25% loss by Micro-Deval and greater than 50% fractured faces. Fines should have a plasticity index of less than 8%.

Culvert Bedding Material

Culvert bedding material should consist of a clean (less than 8 % fines), well graded sand and gravel, compacted to 95% SPMDD in lifts not exceeding 150 mm consisting of material meeting road base classification.

4.0 AVAILABLE BORROW MATERIALS

4.1. General

Several sources of borrow material were identified in the mine site area as part of the PFS design (SWRPA 2010). This includes: two potential silt borrow pits near the proposed laydown area and near the confluence of Platinum Gulch and Haggart Creek; the existing placer tailings in the Dublin Gulch valley bottom; and proposed platform cuts into bedrock along sloping ground. These identified borrow areas are illustrated in Drawing 03. Potential additional borrow areas identified by BGC in discussion with Wardrop are also illustrated in Drawing 03.

EBA Engineering (in Yukon Engineering Services 2011) identified three potential sources of granular borrow (i.e. Borrow Areas 1, 2 and 3) along the HCR upgrade section, as illustrated in Drawing 02. The map also shows the location of placer tailings at Secret Creek near Haggart Creek, also indicated as potentially suitable borrow by EBA.

Density (SPMDD). Placement and compaction should be performed in lifts less than 300 mm in loose thickness with equipment suitable to obtain the specified density.

General Fill

General Fill is a non-organic soil material used for general site grading, frost cover and/or protection of pipes, or similar applications. Materials should be limited to maximum 200 mm particle size, and contain no more than 20% fines. General Fill must be compacted to a minimum of 95% SPMDD. General Fill should not be used for support of settlement sensitive structures.

Grading Fill

This is a soil material used as an intermediate layer between in-situ soil or rock subgrade and higher quality engineering materials above, such as road base, for example. Any granular material that can be placed and compacted to 95 % SPMDD to provide a uniform bearing surface may be suitable for this purpose. Selected materials should have a maximum particle size of 150 mm. Oversize materials may be screened out, or can be removed from the surface of placed materials by hand. Suitable materials would include and materials identified as suitable for structural fill or general fill, and may include local colluvium materials provided maximum size requirements are met.

Riprap

Rip rap consists of varying sized rock fragments and/or boulders, typically angular or subangular as derived from blasting or crushing, used as a protective barrier from erosion and scour due to water currents and/or ice. Material should consist of hard, durable rock fragments free from splits, seams or defects that could impair its soundness. Thicknesses of rip-rap layers typically vary from 1.0 to 1.5 times the maximum rock size. Riprap gradation requirements, including mean and/or maximum particle size, depend on the specific application.

Drainage Material

An open or gap-graded granular material intended for allowing free drainage of fluids to pipes and/or collection systems. Drainage material should consist of crushed or uncrushed screened rock or gravel free of flat, elongated particles. Grain size requirements depend on the specific drainage application. Drainage materials should be placed and compacted to a minimum of 85% relative density.

Filter Material

Filters are a transition zone material used for preventing soil migration due to fluid flow between granular materials, and/or between rock fill and finer silt and clay layers. Filter material gradations are generally designed based on the specific material gradations that they will transition. Filter materials can be derived from rock excavations or gravel borrow areas, and will require crushing, screening and washing to attain the necessary gradations.

from TP95-21, TP95-24-1 and TP95-24-2 compacted to 95 % of Modified Proctor maximum dry density (MPMDD). This testing yielded permeabilities ranging between 3 x 10^{-7}, and 8 x 10^{-7} cm/s. It is anticipated that select colluvium materials can be used as grading fill for various facilities provided that any oversize materials are screened and removed.

4.2.3. Rock Excavations

Rock excavations will be required at various locations during construction of the project. As described previously, the rock at the site is divided into 3 categories: Type 1, Type 2 and Type 3, with Type 1 being the highest quality rockmass, and Type 3 being the lowest quality, most highly weathered and weakest rockmass.

It is anticipated that shallow excavations into rock will typically encounter Type 2 and Type 3 rock at most locations, with Type 1 rock not being encountered until deeper excavations have occurred into the pit, or at specific very deep cuts. Type 3 rock, when excavated, will be generally be suitable for reuse as General Fill only. Type 2 rock, when excavated, will be suitable for use as a compacted rock fill. Excavated Type 2 rock may be suitable for use as filter material with adequate screening and washing.

Excavated rock for use in mass fills for embankments and dykes can be broadly divided into those that are constructed from durable rock, and those constructed from weaker, non-durable rock (Cooke 1990). Either type of rock can be used to provide a satisfactorily performing rock fill, provided appropriate construction methods are used, and appropriate assumptions are made for compacted material properties (i.e. strength, stiffness and hydraulic conductivity).

Any material identified by a qualified geotechnical engineer as bedrock, including highly weathered but intact bedrock, may be used as a source of fill. This is expected to be derived primarily from highly weathered metasedimentary rock. This material, when excavated, will yield non-durable clasts that will break apart upon placement and compaction. Large fills constructed of these materials should be constructed in a similar fashion to an earth fill, using small lifts (e.g. 300 mm loose lifts), standard vibratory compaction equipment, and application of water. A fill constructed in this manner will have similar strength and stiffness properties to that of a structure built of compacted earth fill, and will not be free draining.

Some durable rock will become available during mine development (i.e during excavation of Type 1 rock). The granodiorite stock that crosses the ridge tops on the south of the property, including much of the footprint of the proposed open pit, will yield some more durable rock, particularly as the pit excavation advances more deeply into less weathered rock. Similarly, some of the metasediments near the granodiorite stock consist of quartzite, which is stronger and more durable than the schists and phyllites observed across much of the rest of the site. A rock fill constructed of selected durable quartzite or granodiorite may be constructed as a rock fill with placement in thicker lifts (e.g. 1 m) and compaction by haul vehicle traffic and possibly vibratory compactors. A rock fill constructed of durable rock will have higher shear strength and be significantly more permeable than a compacted rock fill constructed from lower quality bedrock.

4.2. Mine Site Area

4.2.1. Silt Borrow Pits

SWRPA (2010) identified two potential borrow sources for silt materials, as outlined in Drawing 03. These are understood to have been selected based on field reconnaissance and review of aerial photographs. BGC also expects that the area between these two proposed pits will contain silt, based on inferences of similar landforms in available aerial photos, and inferences of subsurface conditions from test holes within or near the proposed borrow areas. Note that further investigation is required to confirm the thickness and spatial extent of exploitable silt, and to better estimate the volume of seasonally unfrozen materials potentially available for immediate use.

A compacted sample of brown silt obtained from till materials in the vicinity of the proposed silt borrow area 1 at TP95-63 yielded a permeability of 4.3×10^{-7} cm/s at 95 % MPMDD.

Subsurface conditions in the general area of the proposed silt borrow areas east of Haggart Creek are summarized in Table A-1. The associated laboratory test results are summarized in Table A-2.

Sitka Corp (1996) identified an additional potential source of silt borrow at the confluence of Gill Gulch and Haggart Creek, as shown on Drawing 03. Subsurface conditions in the general area of the proposed silt borrow area at Gill Gulch are summarized in Table A-3. An analysis of available data and terrain analysis suggests a potential unfrozen silt volume from the four identified silt sources of approximately 900,000 to 1,400,000 m^3, with a similar volume expected to be frozen, as detailed in Table 1. Approximately half of the unfrozen materials, with a best estimate of 500,000 m^3, are available on the east side of Haggart Creek, close to the mine site. The remainder is available at Gill Gulch.

It should be noted that scattered permafrost is present in the proposed silt borrow areas. Some silt will be unfrozen and available for immediate use, but quantities of material will require careful construction planning by stockpiling so that these materials can be thawed and dried before use. The estimated volumes of unfrozen material may therefore represent an unconservatively high estimate, as some unfrozen materials will not be easily exploitable depending on the distribution of frozen ground. It may be assumed that up to about 400,000 m^3 of silty materials may be obtained from the silt borrows on the east side of Haggart Creek in the first year of borrow operation, and additional materials will require thawing.

Some further processing of fine materials may be required to remove oversize particles.

4.2.2. Colluvium Excavations

It is anticipated that quantities of colluvium will be excavated during stripping for many of the site facilities. The colluvium is frozen in places, and is variable in thickness, gradation, and moisture content. Generally the colluvium is found to have fines content ranging between 15 and 40 % and may contain up to 50% gravel sizes. Knight Piesold conducted modified Proctor testing and falling head permeability testing on several overburden samples obtained from test pits (outside the current footprint). Three samples of silty colluvium were obtained

4.2.4. Placer Tailings

The placer tailings are found within the valley bottom and consist of reworked materials from historical placer mining operations.

Table A-4 shows the range in stratigraphic sequence at various test hole locations distributed across the placer tailings area. Table A-5 presents a compilation of laboratory test data for samples obtained from test holes or from surface grab samples in the placer tailings.

The distribution of materials within the placer tailings was examined by field reconnaissance, and the spatial distribution of typical material types is illustrated in Drawing 04. The approximate thickness of placer tailings above bedrock is illustrated in Drawing 05. This drawing also identifies areas with exploitable materials.

Examination of the surface topography of the tailings and the approximate bedrock surface, as inferred from test hole locations, suggests that approximately 5-6 million cubic metres of fill materials are present above bedrock and potentially exploitable for use elsewhere as an engineering material. Note that if all of these materials are exploited to expose bedrock, it will be necessary to replace a significant quantity of material to restore grades in the pond development area to a level above the existing valley bottom drainage system. The net quantity of potentially available exploitable materials is roughly 2-2.5 million cubic metres.

Most of the required engineering materials can be produced from the placer tailings through careful selection combined with crushing, screening and/or washing, with the exception of liner materials and coarse concrete aggregate.

Limited aggregate testing indicates the placer tailings are likely not suitable for use as concrete aggregate, thus requiring this material to be developed from excavation of competent bedrock, or imported from off site. Based on the aggregate testing conducted in the placer tailings, the physical quality of the sample is influenced by the presence of many particles judged to be of poor to moderate engineering quality. A petrographic analysis revealed a petrographic number of 167, which is considered in excess of the minimum petrographic number required as set out by CSA A23.1 of 140. However, a petrographic number of 167 is considered acceptable for use as select granular material such as structural or general fill. Based on the limited durability testing conducted to date, including LA Abrasion, MicroDeval and Soundness by Magnesium Sulphate, the placer tailings are marginally acceptable for concrete aggregate. In addition, the results of gradation analysis indicate that crushing and washing would be required for use of the placer tailings as concrete aggregate. Further testing may identify a quantity of tailings with suitable properties for use as concrete aggregate. The silt materials in the placer tailings are too wet to be of practical use in construction.

Removal of placer tailings down to bedrock, which may be necessary to provide an adequate foundation subgrade, will require significant efforts for dewatering.

4.3. Haggart Creek Road Upgrade

EBA Engineering has identified three sources of undisturbed native borrow, and one source of re-worked placer tailings borrow, as outlined in Drawing 02.

The identified borrow areas appear to contain more than sufficient materials for the identified road upgrades. Note that some processing (i.e. crushing, screening and/or washing) may be necessary to produce the required materials. Note also that further investigation (i.e. test pits) is required to confirm the spatial extent of available borrow.

4.4. Summary of Material Availability

Estimated volumes of potentially available borrow materials are summarized in Table 2, below. It should be noted that there are significant uncertainties associated with each volume estimate, and these uncertainties have been represented by expressing approximate ranges of available volumes.

Table 2. Summary of Borrow Material Availability.

Borrow Source	Material Types	Estimated Volumes (in situ volumes, except where noted)	Comments
Silt / Fines for Heap Liner and other Low Permeability Applications:			
Mine Site Silt Source 1	Silt / fines	Up to 100,000 m^3 non-frozen 250-300,000 m^3 frozen	Silt sources are locally frozen and may contain excess ice. It will be necessary to select unfrozen materials for immediate use, and thaw and possibly dry the frozen materials for later use. Selection and segregation of un-frozen silt for immediate use will require supervision by a qualified geotechnical engineer.
Mine Site Silt Source 2		Up to 100,000 m^3 non-frozen 250-300,000 m^3 frozen	
Landform between Sources 1 and 2		200-400,000 m^3 non-frozen 200-400,000 m^3 frozen	
Gill Creek at Haggart Creek		500-700,000 m^3 non-frozen 200-250,000 m^3 frozen	
Rockfill Sources:			
Plant Site platform cut	Rock Fill	140-160,000 m^3 non-durable rock fill	Rock fill will be derived from weathered bedrock, consisting of granodiorite or metasediments (quartzite, schist and/or phyllite) in the open pit, and generally only metasediments (typically schist and/or phyllite) elsewhere. Assessment for ARD or other environmental issues is not addressed in this memo, but is considered elsewhere by others. Rock fill derived from the open pit may be segregated at source to yield durable rock (typically unweathered granodiorite or quartzite). The remaining rock fill will consist of non-durable rock, susceptible to break down in placement and compaction. Durable and non-durable rock fill materials require different construction and quality control approaches, with the non-durable rock fill being treated much like an earth fill. Stripping prior to rock excavation will yield quantities of colluvium that may be suitable for use as grading fill.
HPGR and Ore Stockpile platform cut		30-35,000 m^3 non-durable rock fill	
Crushers cut		30-35,000 m^3 non-durable rock fill	
Open pit (waste rock)		Potentially up to 33 million loose cubic metres, including both durable and non-durable rock fill	
Additional rock fill quarry east of heap leach pad		This area can be exploited to yield several million cubic metres of rock fill.	
Placer Tailings:			
Dublin Gulch valley bottom identified as extent of exploitable placer tailings	Various engineering materials, including: • Structural fill • General fill • Riprap • Coarse sand and fine gravel • Other manufactured materials	Total estimated volume of exploitable placer tailings is: 5-6 million m^3 Estimated ***NET*** available tailings after loose materials are removed and replaced as foundation materials for ponds or heap is approximately: 2-2.5 million m^3	Production of engineering materials will require crushing, screening, washing. Exploitation of all useable tailings will require dewatering of the valley bottom during removal activities.
Haggart Creek Road Upgrade:			
Borrow 1	Sand and gravel	Up to approximately 250-500,000 m^3 (estimate based on 2 m thick exploitable zone over full area of borrow identified by EBA)	Screening may be required to produce select materials for road base or road surfacing material. Quantity estimates are highly uncertain and require verification through further test pit exploration.
Borrow 2	Sand and gravel	Not confirmed, but potentially up to 100-300,000 m^3 (estimate obtained in same manner as above)	
Borrow 3	Sand and gravel	No estimate available	
Secret Creek placer tailings	Sand and gravel, but including variable quantity of low durability particles	No field estimate available, but from satellite imagery, it would appear that between 100-300,000 m^3 may be available.	Only suitable for use as roadway subgrade fill. Not suitable for use in applications requiring durable materials.

4.5. Recommendations for Further Investigation

The following additional investigation is recommended to confirm borrow availability in support of the feasibility study:

- Test pit exploration to confirm the spatial extent and quantity of suitable borrow at HCR upgrade borrow areas 1, 2 and 3 (Drawing 02);
- Test pit and auger drill exploration to confirm the quantity and quality of silt, and the extent of permafrost within the footprint of proposed silt borrow areas on the east side of Haggart Creek. Laboratory testing of silt samples to determine engineering properties for design;
- Additional sampling and testing of the placer tailings to look for possible sources of concrete aggregate; and
- Borehole drilling of the proposed rock quarry east of the heap leach pad to determine rockmass quality.

5.0 CLOSURE

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Yours sincerely,

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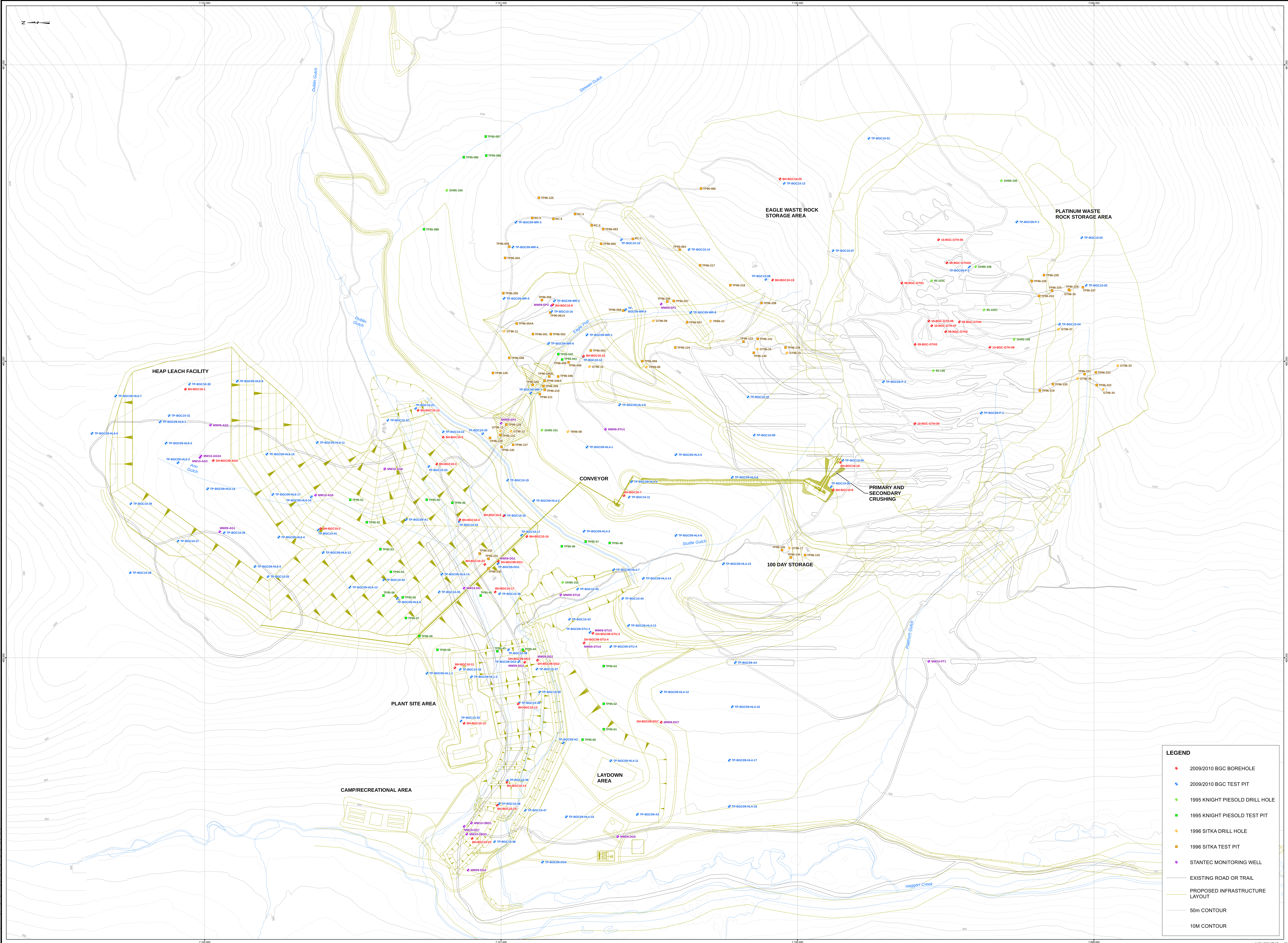
DRAWINGS



NOTES:
PRE-FEASIBILITY INFRASTRUCTURE LAYOUT RECEIVED FROM SCOTT WILSON, FEB.23, 2011.

REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:4,000
DATE:	APR 2011
DRAWN:	LL
DESIGNED:	LGT
CHECKED:	AKU
APPROVED:	PQ

PROFESSIONAL SEAL:
DRAFT

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT:
VICTORIA GOLD CORPORATION

PROJECT:
EAGLE GOLD – BORROW EVALUATION REPORT

TITLE:
PROPOSED GENERAL ARRANGEMENT FOR MINE SITE INFRASTRUCTURES

PROJECT No.:	DWG No.:	REV.:
0792-004	01	

DWG TO BE READ WITH BGC REPORT TITLED "EAGLE GOLD – BORROW EVALUATION REPORT" DATED APR 2011

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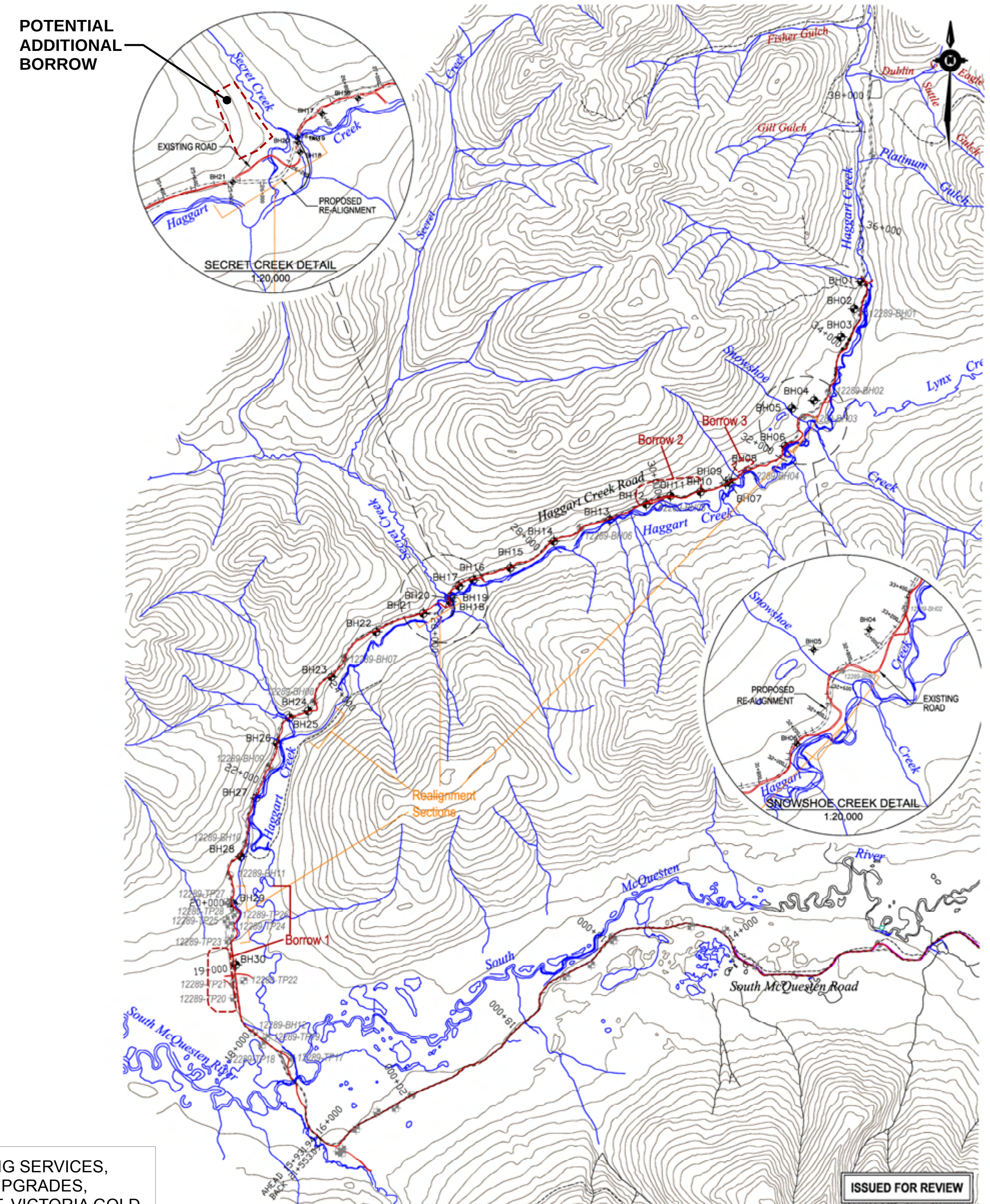

LEGEND

- BH01 BOREHOLE LOCATION (DEC.2010)
- PREVIOUS TEST PIT LOCATION (OCT.1996)
- PREVIOUS BOREHOLE LOCATION (OCT.1996)
- EXISTING ROAD
- PROPOSED RE-ALIGNMENT
- EXISTING TRAIL
- POTENTIAL BORROW AREAS

1,000 0 1,000 2,000 3,000

METRES

NAD 1983 UTM Zone 8N

THIS MAP HAS BEEN REPRODUCED DIRECTLY FROM YUKON ENGINEERING SERVICES, FEBRUARY 2011. GEOTECHNICAL EVALUATION: HAGGART CREEK ROAD UPGRADES, SECTION KM 16 TO KM 38, VICTORIA GOLD PROPERTY, DUBLIN GULCH, YT, VICTORIA GOLD CORPORATION, AND IS INCLUDED HERE FOR GENERAL INFORMATION ONLY.

REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:90,000
DATE:	APR 2011
DRAWN:	LL
DESIGNED:	LGT
CHECKED:	AKU
APPROVED:	PQ

PROFESSIONAL SEAL:

DRAFT

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT:
VICTORIA GOLD CORPORATION

PROJECT:
EAGLE GOLD – BORROW EVALUATION REPORT

TITLE:
HAGGART CREEK ROAD BORROW SOURCES LOCATION MAP

PROJECT No.:	DWG No.:	REV.:
0792-004	02	

DWG TO BE READ WITH BGC REPORT TITLED "EAGLE GOLD – BORROW EVALUATION REPORT" DATED APR 2011

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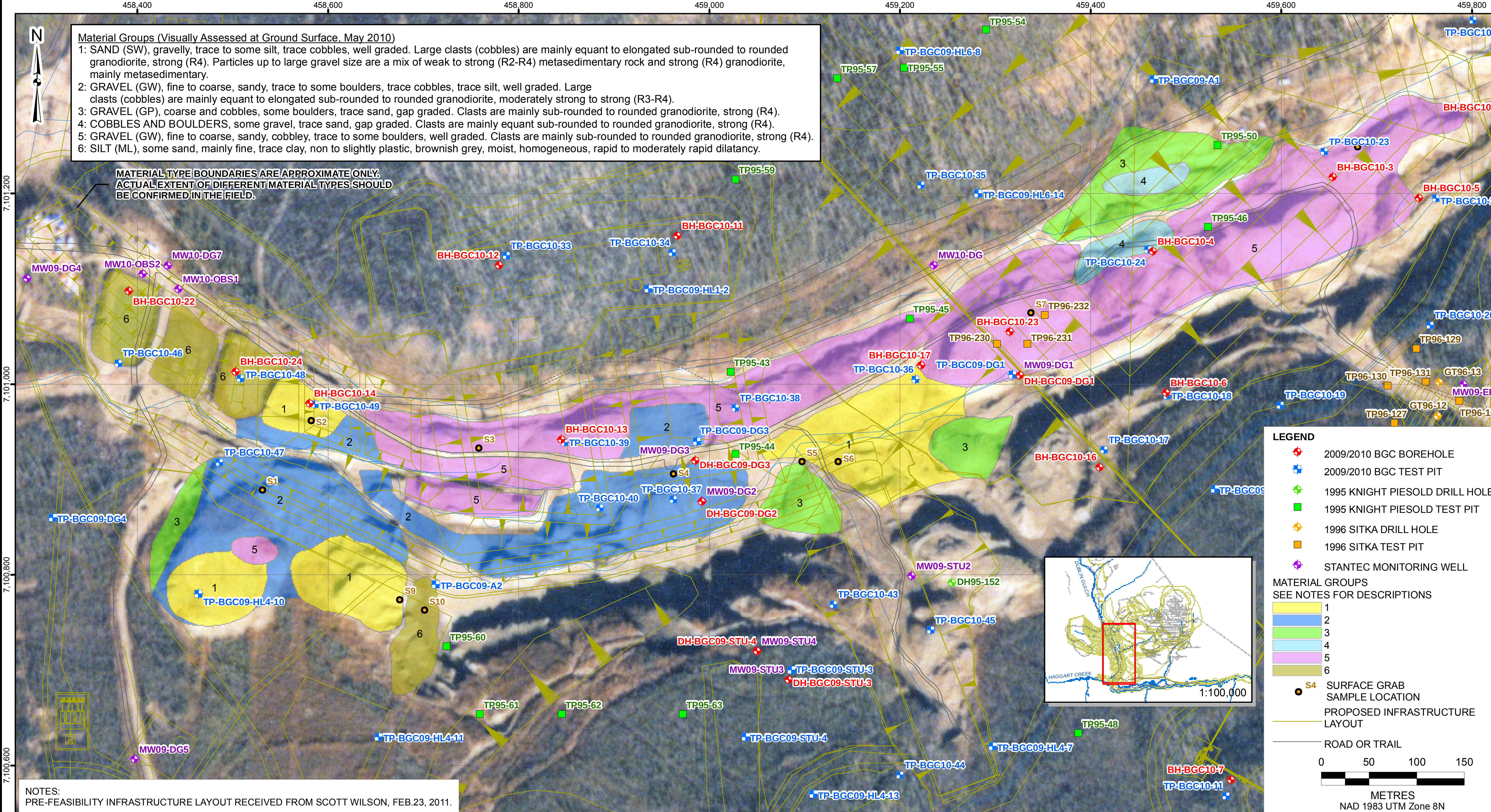


Material Groups (Visually Assessed at Ground Surface, May 2010)

1: SAND (SW), gravelly, trace to some silt, trace cobbles, well graded. Large clasts (cobbles) are mainly equant to elongated sub-rounded to rounded granodiorite, strong (R4). Particles up to large gravel size are a mix of weak to strong (R2-R4) metasedimentary rock and strong (R4) granodiorite, mainly metasedimentary.
2: GRAVEL (GW), fine to coarse, sandy, trace to some boulders, trace cobbles, trace silt, well graded. Large clasts (cobbles) are mainly equant to elongated sub-rounded to rounded granodiorite, moderately strong to strong (R3-R4).
3: GRAVEL (GP), coarse and cobbles, some boulders, trace sand, gap graded. Clasts are mainly equant sub-rounded to rounded granodiorite, strong (R4).
4: COBBLES AND BOULDERS, some gravel, trace sand, gap graded. Clasts are mainly equant sub-rounded to rounded granodiorite, strong (R4).
5: GRAVEL (GW), fine to coarse, sandy, cobbley, trace to some boulders, well graded. Clasts are mainly sub-rounded to rounded granodiorite, strong (R4).
6: SILT (ML), some sand, mainly fine, trace clay, non to slightly plastic, brownish grey, moist, homogeneous, rapid to moderately rapid dilatancy.

LEGEND

- 2009/2010 BGC BOREHOLE
- 2009/2010 BGC TEST PIT
- 1995 KNIGHT PIESOLD DRILL HOLE
- 1995 KNIGHT PIESOLD TEST PIT
- 1996 SITKA DRILL HOLE
- 1996 SITKA TEST PIT
- STANTEC MONITORING WELL

MATERIAL GROUPS
SEE NOTES FOR DESCRIPTIONS
1
2
3
4
5
6

S4 SURFACE GRAB SAMPLE LOCATION

PROPOSED INFRASTRUCTURE LAYOUT

ROAD OR TRAIL

0 50 100 150
METRES
NAD 1983 UTM Zone 8N

NOTES:
PRE-FEASIBILITY INFRASTRUCTURE LAYOUT RECEIVED FROM SCOTT WILSON, FEB.23, 2011.

REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:4,000
DATE:	APR 2011
DRAWN:	LL
DESIGNED:	LGT
CHECKED:	AKU
APPROVED:	PQ

PROFESSIONAL SEAL:

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: VICTORIA GOLD CORPORATION

PROJECT: EAGLE GOLD – BORROW EVALUATION REPORT

TITLE: MATERIAL CHARACTERIZATION IN THE PLACER TAILINGS

PROJECT No.:	DWG No.:	REV.:
0792-004	04	

X:\Projects\0792 Victoria Gold\004_EG_FS_Infrastructure\Workspace\20110404_REPORT_Borrow_Evaluation_Report\04_Material_Characterization_in_the_Placer_tailings.mxd

DWG TO BE READ WITH BGC REPORT TITLED "EAGLE GOLD – BORROW EVALUATION REPORT" DATED APR 2011

0 100 200 300 400 500
METRES
NAD 1983 UTM Zone 8N

NOTES:
PRE-FEASIBILITY INFRASTRUCTURE LAYOUT RECEIVED FROM SCOTT WILSON, FEB.23, 2011.

REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:5,000
DATE:	APR 2011
DRAWN:	LL
DESIGNED:	LGT
CHECKED:	AKU
APPROVED:	PQ

PROFESSIONAL SEAL:

DRAFT

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

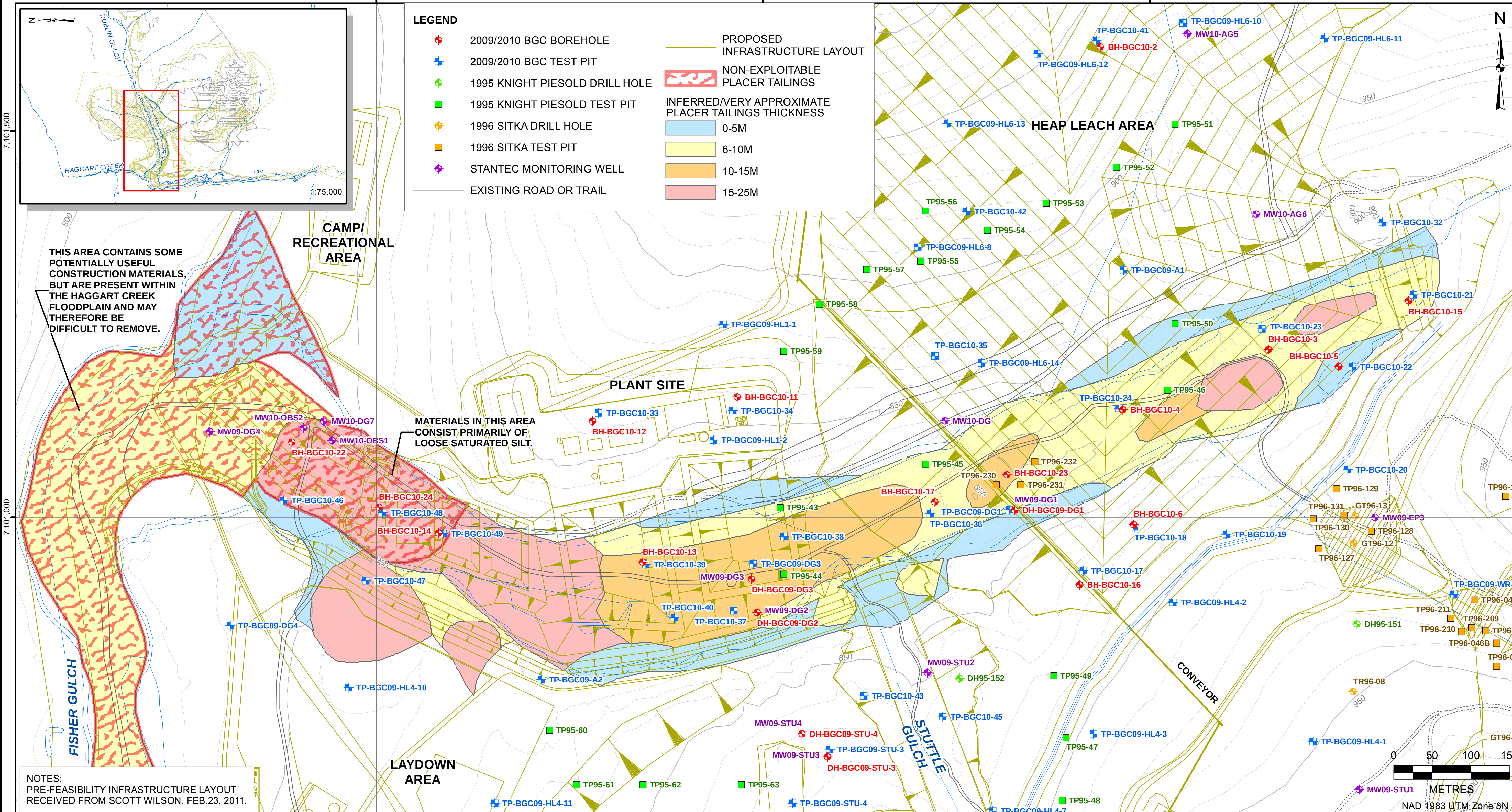
CLIENT: VICTORIA GOLD CORPORATION

PROJECT: EAGLE GOLD – BORROW EVALUATION REPORT

TITLE: LOCATION OF BORROW SOURCES AROUND THE EAGLE GOLD MINE SITE

PROJECT No.:	DWG No.:	REV.:
0792-004	03	

DWG TO BE READ WITH BGC REPORT TITLED "EAGLE GOLD – BORROW EVALUATION REPORT" DATED APR 2011



REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:5,000
DATE:	APR 2011
DRAWN:	LL
DESIGNED:	LGT
CHECKED:	AKU
APPROVED:	PQ

PROFESSIONAL SEAL:

DRAFT

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT:
VICTORIA GOLD CORPORATION

PROJECT:
EAGLE GOLD – BORROW EVALUATION REPORT

TITLE:
ASSESSMENT OF THICKNESSES AND EXPLOITABILITY OF MATERIAL IN THE PLACER TAILINGS

PROJECT No.:	DWG No.:	REV.:
0792-004	05	

X:\Projects\0792 Victoria Gold\004_EG_FS_Infrastructure\Workspace\20110404_REPORT_Borrow_Evaluation_Report\05_Assessment of Thickness_and_Exploitability_of_Materials_in_the_Placer_Tailings.mxd

DWG TO BE READ WITH BGC REPORT TITLED "EAGLE GOLD – BORROW EVALUATION REPORT" DATED APR 2011

APPENDIX A
TABLES

Table A-1. Stratigraphic Summary in the Silt Borrow Areas.

			Strata						
Test Hole	**Completed By (Year)**	**Approx. Ground Elevation (m ASL)**	**Organics Thickness**	**Colluvium Thickness**	**Alluvium Thickness**	***Till Thickness**	**Total Depth**	**Groundwater Observation**	**Frozen Ground**
			(m)	(m)	(m)	(m)	(m)		(m)
TP-BGC09-A2	BGC (2009)	823	0.00	0.50	-	>4.00	4.50	No	2.0 to 2.5
TP-BGC09-A3	BGC (2009)	804	0.10	-	-	>5.40	5.50	No	0.9 to 1.3
TP-BGC09-HL4-11	BGC (2010)	831	0.40	>1.10	-	-	1.50	No	0.2 to 1.5
TP-BGC09-HL4-18	BGC (2009)	790	0.20	2.80	-	>1.70	4.70	No	3.0 to 4.7
TP-95-60	KP (1995)	-	0.2	-	-	>2.55	2.75	No	2.6 to 2.75
TP-95-61	KP (1995)	-	0.25	3.6	-	>2.40	6.00	Yes	3.6 to 6.0
TP-95-62	KP (1995)	-	-	-	>5.5	-	5.50	No	No

Table A-2. Summary of Laboratory Testing Data in Silt Borrow Areas.

Test Hole	Average Sample Depth (m)	Moisture Content (%)	Atterberg Limits		
			LL (%)	PL (%)	PI (%)
TP-BGC09-HL4-11	0.50	57.8	-	-	-
TP-BGC09-HL4-11	1.00	11.8	-	-	-
TP-BGC09-HL4-18	0.35	9.6	-	-	-
TP-BGC09-HL4-18	1.15	6.1	-	-	-
TP-BGC09-HL4-18	1.70	6.4	-	-	-
TP-BGC09-HL4-18	2.20	8.6	-	-	-
TP-BGC09-HL4-18	3.75	64.3	-	-	-
TP-95-60	-	26.0	22.3	20.0	2.3

Table A-3. Stratigraphic Summary in Gill Gulch.

Test Hole	Completed By (Year)	Approx. Ground Elevation (m ASL)	Strata					Total Depth	Groundwater Observation	Frozen Ground
			Organics Thickness (m)	Colluvium Thickness (m)	Fill Thickness (m)	*Till Thickness (m)	Depth to Completely - Highly Weathered Rock (m)	(m)	(m BGL)	(m)
GT96-38	SC (1996)	791	-	-	-	>15.2	-	15.2	No	9.1 to 15.1
GT96-41	SC (1996)	810	-	-	-	>4.6	-	4.6	No	No
GT96-42	SC (1996)	807	-	-	-	>4.6	-	4.6	No	No
GT96-43	SC (1996)	802	-	-	-	7.6	7.6	7.6	No	No
GT96-44	SC (1996)	795	-	-	4.5	>1.6	-	6.1	No	No
GT96-45	SC (1996)	787	-	-	3.0	6.1	9.1	9.1	7.6 (Saturated)	No
GT96-46	SC (1996)	790	-	-	3.0	9.2	12.2	12.2	10.6 (wet)	No
GT96-47	SC (1996)	792	-	-	3.0	6.1	9.1	9.1	6.1 (wet)	No
GT96-48	SC (1996)	799	-	-	-	>12.2	-	12.2	7.6 (wet)	No
GT96-49	SC (1996)	795	1.5	-	-	>9.2	-	10.7	4.6 (wet)	No
GT96-50	SC (1996)	790	1.5	-	-	13.7	15.2	15.2	No	7.6 to 15.2
GT96-51	SC (1996)	791	1.5	-	-	>7.6	-	9.1	No	No
TH/TR96-01	SC (1996)	794	-	-	-	>13.7	-	13.7	No	No
TH/TR96-02	SC (1996)	797	-	-	1.5	6.1	-	7.6	No	3.0 to 6.1
TH/TR96-03	SC (1996)	796	-	-	-	>9.1	-	9.1	No	1.5 to 9.0
TH/TR96-04	SC (1996)	789	-	-	-	>7.6	-	7.6	No	No
TH/TR96-05	SC (1996)	798	-	-	-	>12.2	-	12.2	-	6.1 to 12.2

Table A-4. Stratigraphic Summary in the Placer Tailings.

Testhole	Completed By (Year)	Approx. Ground Elevation (m ASL)	Strata						Total Depth	Groundwater Observation	Frozen Ground
			Organics Thicknes s (m)	Colluvium Thickness (m)	Fill Thickness (m)	*Till Thickness (m)	Depth to Completely - Highly Weathered Rock (m)	Depth to Moderate-Slightly Weathered Rock (m)	(m)		
TP-BGC09-DG1	BGC (2009)	923	-	-	>2.5	-	-	-	2.5	Yes	No
TP-BGC09-DG3	BGC (2009)	837	-	-	5.0	-	-	-	5.0	No	No
TP-BGC10-21	BGC (2010)	895	0.10	-	>6.4	-	-	-	6.5	Yes	No
TP-BGC10-22	BGC (2010)	884	0.10	0.80	-	-	0.90	1.50	5.3	Yes	No
TP-BGC10-23	BGC (2010)	880	-	-	>5.0	-	-	-	5.0	No	No
TP-BGC10-24	BGC (2010)	858	0.05	-	>2.95	-	-	-	3.0	No	No
TP-BGC10-36	BGC (2010)	837	-	-	>4.5	-	-	-	4.5	No	No
TP-BGC10-37	BGC (2010)	930	-	-	5.5	3.5	-	-	9.0	No	No
TP-BGC10-38	BGC (2010)	830	-	-	4.8	-	-	-	4.8	No	No
TP-BGC10-39	BGC (2010)	825	-	-	5.5	-	-	-	5.5	No	No
TP-BGC10-40	BGC (2010)	816	-	-	5.5	-	-	-	5.5	No	No
TP-BGC10-46	BGC (2010)	795	-	-	6.7	-	-	-	6.7	No	No
TP-BGC10-47	BGC (2010)	806	-	-	5.3	-	-	-	5.3	No	No
TP-BGC10-48	BGC (2010)	793	-	-	3.5	-	-	-	3.5	Yes	No
TP-BGC10-49	BGC (2010)	808	-	-	5.5	-	-	-	5.5	Yes	No
BH-BGC09-DG1	BGC (2009)	923	-	-	6.1	-	6.1	7.6	12.8	No	No
BH-BGC09-DG2	BGC (2009)	828	-	-	14.6	-		14.6	16.3	4.9m	No
BH-BGC09-DG3	BGC (2009)	844	-	-	12.1	-	12.1	16.2	12.1	Yes	No
BH-BGC10-4	BGC (2010)	858	-	-	8.7	-	-	8.7	31.0	No	No

Testhole	Completed By (Year)	Approx. Ground Elevation (m ASL)	Strata						Total Depth	Groundwater Observation	Frozen Ground
			Organics Thicknes s (m)	Colluvium Thickness (m)	Fill Thickness (m)	*Till Thickness (m)	Depth to Completely - Highly Weathered Rock (m)	Depth to Moderate-Slightly Weathered Rock (m)	(m)		
BH-BGC10-3	BGC (2010)	878	-	0.9	7.2	-		8.1	50.7	No	No
BH-BGC10-5	BGC (2010)	884	-	-	4.3	-		4.3	21.0	No	No
BH-BGC10-13	BGC (2010)	824	-	1.25	11.0	-		12.25	19.5	No	No
BH-BGC10-14	BGC (2010)	808	-	-	20.7	-	-	-	20.7	No	No
BH-BGC10-15	BGC (2010)	893	-		**	-		8.8	21.0	No	No
BH-BGC10-17	BGC (2010)	836	-	-	7.3	-	-	7.3	37.3	No	No
BH-BGC10-22	BGC (2010)	793	-	-	>19.0	-	-	-	-	No	No
BH-BGC10-23	BGC (2009)	849	-	-	>6.0	-	-	-	6.0	No	No
BH-BGC10-24	BGC (2010)	800	-	-	>16.2	-	-	-	16.2	No	No
TP95-43	KP (1995)	822	-	-	>5.45	-	-	-	5.45	No	No
TP95-44	KP (1995)	828	-	-	>5.45	-	-	-	5.45	Yes	No
TP95-45	KP (1995)	834	-	-	>5.45	-	-	-	5.45	Yes	No
TP95-46	KP (1995)	867	-	-	2.45	-	2.45	-	3.05	Yes	No
TP95-50	KP (1995)	872	-	-	2.45	-	2.45	-	3.65	Yes	-
TP96-230	SC (1996)	845	-	-	>1.5	-	-	-	1.5	Yes	No
TP96-231	SC (1996)	843	-	-	>3.5	-	-	-	3.5	Yes	No
TP96-232	SC (1996)	851	-	-	>3.7	-	-	-	3.7	Yes	No

Table A-5. Summary of Laboratory Testing Data in the Placer Tailings.

Test Location	Sample ID	Depth (m)	ASTM D2216 Moisture Content	ASTM D422 ***Grain Size Analysis Oversize (%)	ASTM D422 ***Grain Size Analysis Gravel (%)	ASTM D422 ***Grain Size Analysis Sand (%)	ASTM D422 ***Grain Size Analysis Fines Silt (%)	ASTM D422 ***Grain Size Analysis Fines Clay (%)	ASTM D4781 ****Atterberg Limits LL (%)	ASTM D4781 ****Atterberg Limits PL (%)	ASTM D4781 ****Atterberg Limits PI (%)	ASTM D1557 Modified Proctor Max. Dry Density (kg/m3)	ASTM D1557 Modified Proctor Optimum Moisture Content (%)	Falling Head Permeability (cm/s)	CSA A23.2 - 10A Bulk Density (kg/m3)	ASTM C127 Specific Gravity Coarse	ASTM D854 Specific Gravity Fine	CSA A23.2 -12A (SSD) Relative Density Coarse	CSA A23.2-6A (SSD) Relative Density Fine	CSA A23.2-12A Absorption Coarse (%)	CSA A23.2-6A Absorption Fine (%)	CSA A23.2-15A Petrographic Number	CSA A23.2-9A, ASTM C88 MgSO4 Soundness Coarse (%Loss)	CSA A23.2-9A, ASTM C88 MgSO4 Soundness Fine (% Loss)	CSA A23.2-29A Micro Deval, % Loss Coarse (%Loss)	CSA A23.2-23A Micro Deval, % Loss Fine (%Loss)	CSA A23.2-16A LA Abrasion (%Loss)	CSA A23.2 - 4A Low Density Granular Material (%)	CSA A23.2-24A Freeze Thaw (% Weighted Loss)	ASTM D2974, CSA A23.2 - 7A Organic Impurities (Color Plate Value or %)	CSA A23.2 - 3A Clay Lumps (%)	CSA A223.2-25A AMBT AAR Expansivity (14 Days)	CSA A23.2-3B Water Soluble Sulphate (Total) Ion in Soil (%)
BH-BGC10-13	SPT1	1.0	5.2																														
BH-BGC10-13	SPT2	1.7	4.5																														
BH-BGC10-13	SPT3	2.5	2.5																														
BH-BGC10-13	SPT4	3.2	4.4																														
BH-BGC10-13	SPT5	4.0	2.3																														
BH-BGC10-13	SPT6	4.7	5.0																														
BH-BGC10-14	G2	2.4	24.8						35	28	17						2.81																
BH-BGC10-14	G6	5.2	31.2						35	27	8						2.73																
BH-BGC10-14	G7	6.7	34.8						37	27	10																						
BH-BGC10-14	SPT6	9.7	7.4																														
BH-BGC10-15	G2	13.3	26.0						30	25	5																						
BH-BGC10-22	G2	1.0	26.6						33	27	6																						
BH-BGC10-22	G11	9.1	20.1						25	20	5																						
BH-BGC10-22	SPT8	9.3	21.6						28	22	6																						
BH-BGC10-22	G13	11.2	10.8						17	16	1																						
BH-BGC10-22	G16	15.5	19.3						31	20	11																						
BH-BGC10-24	SPT3	4.7	25.4																														
BH-BGC10-24	G2	7.0	26.0						28	22	6																						
BH-BGC10-24	G6	12.7	15.4																														
BH-BGC10-24	G9	15.9	13.4														2.72																

			ASTM D2216	ASTM D422					ASTM D4781			ASTM D1557			CSA A23.2 - 10A	ASTM C127	ASTM D854	CSA A23.2 -12A	CSA A23.2-6A	CSA A23.2-12A	CSA A23.2-6A	CSA A23.2-15A	CSA A23.2-9A, ASTM C88		CSA A23.2-29A	CSA A23.2-23A	CSA A23.2-16A	CSA A23.2 - 4A	CSA A23.2-24A	ASTM D2974, CSA A23.2 - 7A	CSA A23.2 - 3A	CSA A223.2-25A	CSA A23.2-3B
Test Location	Sample ID	Depth (m)		***Grain Size Analysis					****Atterberg Limits			Modified Proctor		Falling Head		Specific Gravity		(SSD) Relative Density		Absorption			MgSO4 Soundness		Micro Deval, % Loss								
							Fines																										
			Moisture Content	Oversize (%)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	LL (%)	PL (%)	PI (%)	Max. Dry Density (kg/m3)	Optimum Moisture Content (%)	Permeability (cm/s)	Bulk Density (kg/m3)	Coarse	Fine	Coarse	Fine	Coarse (%)	Fine (%)	Petrographic Number	Coarse (%Loss)	Fine (% Loss)	Coarse (%Loss)	Fine (%Loss)	LA Abrasion (%Loss)	Low Density Granular Material (%)	Freeze Thaw (% Weighted Loss)	Organic Impurities (Color Plate Value or %)	Clay Lumps (%)	AMBT AAR Expansivity (14 Days)	Water Soluble Sulphate (Total) Ion in Soil (%)
CFA-01	95 KP	-	5.3		40	53	7	-																									
CFA-02	95 KP	-	3.1		20	75	5	-																									
CFA-03	95 KP	-	4.2		49	47	2	-																									
PSL-1	95 KP	-	27.4		0	0	72	28	39	26	13	1828	14.5	2.0E-07			2.7																
PSL-2	95 KP	-	9.1		22	29	38	11	24	16	8	2258	7.4	9.0E-08																			
Tailings Group 1	S2	0.0	3.1														2.73																
Tailings Group 1	S6	0.0	4.0													2.71	2.75			1.78													
Tailings Group 1	S9	0.0	6.7													2.65	2.76			1.17													
Tailings Group 2	S1	0.0	23.1														2.75																
Tailings Group 2	S4	0.0	-	7	33	32	28									2.62	2.70	2.65		1.10			10.5	8.2						1.40%			
Tailings Group 3	S5	0.0	0.4													2.65				1.16													
Tailings Group 5	S3	0.0	-	15	43	37	4									2.61	2.68	2.64		1.27			8.6	13.0						0.80%			
Tailings Group 5	S7	0.0	1.2													2.73	2.72			1.46													
Tailings Group 5	S8	0.0	-	49	24	25	2									2.60	2.65	2.63		1.39			11.1	20.0						0.70%			
TP95-43	S1	1.4	5.4		46	47	7	-																									
TP95-43	S2	4.8	38.0		0	1	86	13	33	28	5																						
TP-BGC09-DG1	S1	4.6	12.7																														
TP-BGC09-DG3	S1	1.5	25.4																														
TP-BGC09-DG3	S2	6.1	14.1																														
TP-BGC10-21	M1	5.0	20.0						28	24	4						2.73																
TP-BGC10-21	M2	6.0	12.8																														

Test Location	Sample ID	Depth (m)	ASTM D2216	ASTM D422					ASTM D4781			ASTM D1557			CSA A23.2 - 10A	ASTM C127	ASTM D854	CSA A23.2 -12A	CSA A23.2-6A	CSA A23.2-12A	CSA A23.2-6A	CSA A23.2-15A	CSA A23.2-9A, ASTM C88		CSA A23.2-29A	CSA A23.2-23A	CSA A23.2-16A	CSA A23.2 - 4A	CSA A23.2-24A	ASTM D2974, CSA A23.2 - 7A	CSA A23.2 - 3A	CSA A223.2-25A	CSA A23.2-3B
				***Grain Size Analysis					****Atterberg Limits			Modified Proctor		Falling Head		Specific Gravity		(SSD) Relative Density		Absorption			MgSO4 Soundness		Micro Deval, % Loss								
							Fines																										
			Moisture Content	Oversize (%)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	LL (%)	PL (%)	PI (%)	Max. Dry Density (kg/m3)	Optimum Moisture Content (%)	Permeability (cm/s)	Bulk Density (kg/m3)	Coarse	Fine	Coarse	Fine	Coarse (%)	Fine (%)	Petrographic Number	Coarse (%Loss)	Fine (% Loss)	Coarse (%Loss)	Fine (%Loss)	LA Abrasion (%Loss)	Low Density Granular Material (%)	Freeze Thaw (% Weighted Loss)	Organic Impurities (Color Plate Value or %)	Clay Lumps (%)	AMBT AAR Expansivity (14 Days)	Water Soluble Sulphate (Total) Ion in Soil (%)
TP-BGC10-37	M2	6.0	7.9																														
TP-BGC10-38	M1	1.5	3.4	9		49	5					2094	8.2			2.60	2.51	2.63	2.58	1.23	2.99												
TP-BGC10-46	M1	2.0		4		43	11								2091	2.60	2.45	2.62	2.53	1.18	3.28	167	5.5	9.6	17.5	19.6	28.9	0.0	3.6	2 CPV	0.0	0.311	0.02
TP-BGC10-48	M2	3.0	45.3		1	6	75	19	51	40	11						2.70																
TP-BGC10-49	M1	2.5	32.6		2	4	95																										

Notes:
* Often described as silt and interpreted as till
** No overburden recovered
*** Gran Size Analysis
Oversize – particles in excess of 75 mm size
Gravel – particles between 75 mm and 4.75 size.
Sand – particles between 4.75 mm and 0.075 mm size.
Silt – particles between 0.075 mm and 0.002 mm size.
Clay – particles less than 0.002 mm size.
**** Atterberg Limits
LL – Liquid Limit
PL – Plastic Limit
PI – Plastic Index
m ASL – metres Above Sea Level
BGC – BGC Engineering Inc.
KP – Knight Piesold
SC – Sitka Corp.

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BGC Project Memorandum

To:	**Victoria Gold**	**Doc. no:**	**0792-004-M6.2-2011**
Attention:	**Mike Padula**	**cc:**	**Marten Regan, Wardrop** **Glen Barr, Stantec**
From:	**Pete Quinn**	**Date:**	**May 11, 2011**
Subject:	**Eagle Gold – Geotechnical Design Basis for Mine Site Infrastructure in the Project Proposal**		
Project no:	**0792-004**		

1.0 INTRODUCTION

1.1. General

BGC Engineering Inc. (BGC) has been retained by Victoria Gold Corp. (Victoria) to complete geotechnical investigations for the open pit and mine site infrastructure for the Eagle Gold project at Dublin Gulch, Yukon to support prefeasibility study (PFS) and feasibility study (FS) level designs.

BGC undertook subsurface investigations for the open pit and mine site infrastructure at the PFS level in 2009, and provided geotechnical recommendations for the pit walls and pit depressurization. The geotechnical basis for mine site infrastructure, including the heap leach pad and associated facilities, waste rock storage areas, crushing and conveying facilities, roads, buildings and other related facilities, was developed by Scott Wilson RPA (SWRPA). Their geotechnical design basis was supported by investigation work completed by BGC in 2009, and also relied on prior geotechnical work conducted by Knight Piesold and Sitka Corp. in 1995 and 1996.

Ore will be extracted from an open pit located on the ridge line above Dublin Gulch to the south, and between the headwaters of Eagle Pup and Platinum Gulch. Gold is to be extracted from the ore by heap leaching using a valley fill heap located in a small valley drained by Ann Gulch, spanning over and partially filling the middle reach of Dublin Gulch.

The project will involve a number of other major facilities, including: two primary waste rock storage areas (one in Eagle Pup, and one in Platinum Gulch); a water diversion system to carry surface water from the upper reach of Dublin Gulch around the heap leach pad;

process water ponds for management of heap solution; a process plant; crushers, conveyors and stockpiles; borrow pits; temporary spoil stockpiles; and miscellaneous other facilities, including truck shop, offices, warehouse space, fuel and water tanks, power and water transmission facilities; and explosives management facilities. The General Arrangement (GA) developed in the prefeasibility study (PFS) design by Scott Wilson RPA (SWRPA, 2010) is illustrated in Drawing 01, which also illustrates the distribution of available subsurface information.

The PFS engineering designs prepared by SWRPA (2010) were described at a relatively high level in the Project Proposal (Stantec 2010). Significantly more detail regarding engineering assumptions is provided in the PFS report (SWRPA 2010). This memo presents and summarizes the geotechnical design basis developed by SWRPA, as presented in the PFS report. This memo does not present any engineering work done by BGC.

2.0 SITE CONDITIONS

2.1. Background Reports

Site investigations have been completed at the project site over several years by different geotechnical firms working for different mining companies. Subsurface data are available in most areas of proposed development, and have been obtained by a variety of intrusive techniques. Geotechnical site conditions at the Eagle Gold site are described in several reports:

- Report on 1995 Geotechnical Investigations for Four Potential Heap Leach Facility Site Alternatives, First Dynasty Mines, and Dublin Gulch Property. (Knight Piesold, 1996a).
- Report on Feasibility Design of the Mine Waste Rock Storage Area, First Dynasty Mines, and Dublin Gulch Property. (Knight Piesold, 1996b).
- Field Investigation Data Report, Dublin Gulch Project, New Millennium Mining. (Sitka Corp, 1996).
- Hydrogeological Characterization and Assessment, Dublin Gulch Project, New Millennium Mining. (GeoEnviro Engineering, 1996).
- Site Facilities Geotechnical Investigation Factual Data Report. Eagle Gold Project, Victoria Gold Corporation. (BGC Engineering Inc. 2009).
- Project Proposal for Executive Committee Review. Pursuant to the Yukon Environmental and Socio-Economic Assessment Act. Eagle Gold Project, Victoria Gold Corporation. (Stantec. 2010).
- 2010 Geotechnical Investigation for Mine Site Infrastructure, Factual Data Report. Eagle Gold Project, Victoria Gold Corporation. (BGC Engineering Inc. 2011).

2.2. Generalized Site Conditions in the Mine Site Area

The site topography involves moderate to high relief, with ground elevation varying from approximately 800 to 1400 m ASL.

Ground conditions are highly variable across the site. Further, due to limitations of the drilling equipment used and the evolution of the general arrangement, there is limited information and significant uncertainty in the subsurface conditions at many areas of the site.

Groundwater was observed at varying depths across the site, generally close to the elevation of streams in the valley bottoms. On the hillsides the water table was often below the depth of test pit excavation and therefore was not encountered.

Overburden soils encountered on the sloping ground at the mine site typically consist of a veneer of organic soils overlying a blanket of colluvium, which overlies weathered bedrock. Glacial till is generally encountered on the lower flanks of the north- and west-facing slopes north and west of the proposed open pit, above Dublin Gulch and Haggart Creek. Placer tailings (fill) cover most of the valley bottom of Dublin Gulch and Haggart Creek. Alluvial soils are occasionally encountered along the undisturbed valley-bottom areas.

The bedrock encountered at the mine site is classified as either intrusive (i.e. granodiorite, typically in the uplands) or metamorphosed sedimentary rock, with a variably deep weathering profile. The intact rock strength of the encountered rock types is highly variable, with observed strength typically ranging between R0 class (i.e. corresponding to < 1 MPa Unconfined Compressive Strength, UCS) and R4 (50-100 MPa).

Permafrost is present in the area, and is warm (i.e. typically 0 to -1 degrees Celsius), discontinuous and occasionally contains excess ground ice. Although not specifically controlled by slope aspect, permafrost is found more frequently in the north-facing lower slopes above the south side of Dublin Gulch.

The terrain involves moderate relief, including some steep slopes. A number of geological hazards have been identified across the mine site area, as identified by Stantec (2010). These are illustrated in Drawing 02.

3.0 GEOTECHNICAL DESIGN BASIS FOR MINE SITE INFRASTRUCTURE

3.1. General

The engineering for mine development evolves through several stages of planning and design, from preliminary scoping assessments, through prefeasibility (PFS) and feasibility (FS) design, to basic engineering and/or detailed design, and finally to construction and operation. The project described in the Project Proposal reflects the PFS level of design. It should be pointed out that BGC did not develop the geotechnical design basis for the PFS. However, BGC is currently working with Victoria Gold's design team on the FS level of design, which will represent a refinement of the PFS design. Thus, this memo summarizes the work of others.

The proposed General Arrangement for the mine site infrastructure is illustrated in Drawing 01, which also shows the distribution of all subsurface data (i.e. boreholes and test pits). Drawing 02 shows the location of geological hazards identified by Stantec (2010).

3.2. Heap Leach Pad, Water Diversion and Impoundment Structures

3.2.1. General

The complete design basis for the facilities associated with heap leaching, as developed and reported by SWRPA (2010), is presented in Appendix A, and summarized in more concise form by SWRPA in Appendix B. Issues of relevance to the geotechnical design are summarized here in point form, following the same outline as used by SWRPA in the PFS report. Interested readers may refer directly to Appendices A and B if further detail is required to understand the context associated with specific issues.

The proposed Heap Leach Facility (HLF) is located approximately 1.2 km north of the Eagle Zone orebody. The majority of the HLF is in the Ann Gulch catchment, with its base in the valley floor of Dublin Gulch at an elevation of 840 m above sea level (m ASL), extending up Ann Gulch to an elevation of 1080 m ASL.

The HLF comprises a number of elements, including: a rock-filled embankment to provide stability; a lined storage area for the ore to be leached; an in-heap storage pond to contain the pregnant solution; pumping wells for extraction of the solution; ponds to contain excess solution in extreme events; diversions; sediment control ponds (SCPs); and leak detection, recovery and monitoring systems.

3.2.2. Site Selection

Site selection for the HLF was based on a two stage assessment of the suitability of six potential locations. The first stage involved an engineering assessment, weighing the options against engineering, geotechnical and closure considerations. This first stage resulted in the six options being grouped into two sets of options: three higher scoring Group 1 options; and, three lower scoring Group 2 options.

The second stage of assessment involved a project-wide assessment of impacts from the various HLF site options. This stage considered a variety of factors with an impact on mining operations, other infrastructure layouts, mineral resources and the environment. The results of both stages of assessment are tabulated in Appendix A.

The results of the project-wide review of the three leading Group 1 sites established a clear preference for Option 6 – Ann Gulch. This alternative was therefore carried forward for prefeasibility engineering.

3.2.3. Site Characteristics

The topography and geology are described for the HLF in Appendix C, including a discussion of observations from subsurface investigation. Basic hydrology and hydrogeology characteristics are presented. The HLF components are affected by discontinuous permafrost, which may contain excess ice. Areas of permafrost with excess ice require treatment by stripping to encourage thawing and drainage, or excavation and removal to expose thaw stable soils before covering with waste rock. Seismic design parameters are presented as peak ground accelerations for the Design Basis Earthquake (0.078 g) and Maximum Design Earthquake (0.10 g).

3.2.4. Heap Leach Facility Design

The design basis for the HLF is summarized in Appendix B, which includes standards, objectives and operating parameters used for the PFS design. The general arrangement for the HLF facilities is illustrated in Figures included in Appendix A, and includes the following primary components:

- Heap Leach Pad;
- Sediment Control Ponds and Surface Runoff Diversions;
- Events Ponds;
- Confining Embankment;
- Lining System; and
- In-heap Pond.

3.2.5. Liner System Design

The heap leach pad, in-heap pond and other solution control ponds will be provided with an engineered lining system to prevent loss of solution and contamination of groundwater. The lining system will cover approximately 87 ha, and consist of a multiple composite polyvinyl chloride (PVC) liner system with dual leak detection.

The liner system has been designed to achieve compliance with Nevada State guidelines, as these were used as the basis for design and permitting of the Brewery Creek HLF, which is understood to be the only HLF permitted in Yukon. Estimated liner leakage rates are based on the assumption of “one [puncture] hole per acre’’ with an effective area of 10 mm^2 for a liner placed with a high level of quality control.

The HLF liner system design provides: a double composite liner in the upslope area of the HLF pad (above the in-heap pond); and, a triple liner in the in-heap storage pond. The liner system in the heap leach pad upslope area includes, from top to bottom: 1 m thick ore cushion, with leachate collection and removal system (LCRS) pipework; primary composite liner with 1 mm PVC geomembrane and 300 mm compacted silt; geotextile separator; primary leak detection and recovery system (LDRS) comprising 300 mm thick fine gravel to coarse sand with pipes, or geonet on steep slopes; and, secondary composite liner with 0.75 mm PVC geomembrane and 300 mm compacted silt.

The in-heap storage pond area liner design includes an additional liner element above the primary composite liner, comprising an upper 0.75 mm PVC geomembrane over an upper LDRS gravel layer.

The event ponds will be double-lined and will incorporate a geonet separation layer. The liner system includes: primary 2 mm thick high density polyethylene (HDPE) geomembrane liner; primary LDRS geonet layer; secondary 1 mm thick HDPE geomembrane; and, 300 mm compacted silt.

The cushion layer is a load-bearing drainage layer at the bottom of the ore, above the composite liner system, in which the LCRS pipework can be installed. It will be formed from coarse sand or fine gravel sized durable ore.

PVC geomembrane has been selected for the liner systems due to its good cold weather performance, high interface strength and chemical resistance. All exposed areas of PVC need to be covered soon after installation to protect from ultraviolet radiation. HDPE geomembrane has been selected for the events ponds due to good long term ultraviolet resistance, chemical resistance and performance as an exposed pond liner. A thicker liner (2 mm) has been selected due to increased exposure to potential wear and the elements.

The LDRS layers will comprise free draining fine gravel to coarse sand, with typically 90 % finer than 5 mm particle size, and less than 10 % finer than 1 mm. Where the liners are placed on steeper slopes, such as along events ponds side slopes, a geonet will be used as a drainage layer in place of coarse sand or fine gravel.

The compacted silt layers will be prepared to form a competent low permeability base to receive the PVC geomembrane liners to form a composite liner system. The compacted silt will have a minimum thickness of 300 mm, and a target permeability of 1×10^{-7} m/s, consistent with Nevada guidelines for composite liner systems.

A layer of non-woven geotextile is included at the interface between the compacted silt and underlying fine gravel to coarse sand LDRS layer to provide separation and prevent particle migration.

3.2.6. Leak Detection and Recovery Systems Design

Separate LRDS systems will be installed below each liner, and all collected solution returned to the heap. The LDRS will consist of a series of 100 mm pipes within a 300 mm thick layer of gravel, feeding to a 200 mm collector pipe. Leakage will be collected in sumps and pumped back to the heap.

The in-heap liner will have a second LDRS beneath the upper liner, with more pipes to account for potentially higher flow. The proposed design calls for down-hole pumps on the embankment slope. Three pipes have been provided for pumping to provide redundancy in the event of blockage.

The quality and quantity of solution returned in the LDRSs will be monitored in relation to the location of the heap being irrigated at the time. Monitoring boreholes downstream of the heap leach facility and events ponds will be sampled regularly as backup for LDRS monitoring.

3.2.7. Dublin Gulch Relocation Design

The relocation of the Dublin Gulch streambed is designed to convey streamflow safely past the HLF. The diversion will include: an upstream inlet structure; a 900 m long diversion channel; channelization of the Stuttle Gulch flow with additional energy dissipation; an enlarged and re-routed channel diversion (the “lower diversion”) around the Event Ponds and Finishing Ponds; and, a reconnection of the flow into the existing course of Dublin Gulch.

The diversion is designed for the Probable Maximum Flow (PMF) of 105 m^3/s, since it remains post-closure. The inlet includes a 12 m high diversion structure, constructed of rock fill with upstream filter zone and HDPE liner on the upstream face, constructed on bedrock after removing placer tailings and alluvial soils from the foundation. The 900 m long diversion structure will run nearly parallel to slope contours at 1:100 grade to Stuttle Gulch. Up-slope cut surfaces will be provided with erosion protection measures, and flow from disturbed surfaces will be channeled through a sediment control pond (SCP).

The following design aspects require further development in the feasibility study: selection of backfill material; further design of Stuttle Gulch erosion protection measures; further geotechnical data along the proposed diversion; and, design of the lower Dublin Gulch diversion with regard to providing suitable fish habitat.

3.2.8. Stability Design

The HLF is designed against failure of the ore and/or the foundations, considering operational design events and post closure extreme events, of seismic loading under Operational Design Event and Maximum Design Event (ODE and MDE), Probable Maximum Flood (PMF) and Probable Maximum Precipitation (PMP). The following aspects were considered: ore material properties particularly strength; geometry and loading cases (static and seismic); shear strength of soil/liner and ore/liner interfaces; location of phreatic surfaces; deformation strength changes; and normal loading changes in geosynthetic strength properties.

The following stability issues require further assessment at the feasibility study stage: permanent displacement assessments to address post seismic deformation strengths; and, shear testing of the compacted soil/geosynthetic liner interface.

Failure modes considered at the PFS stage include: circular and non-circular failures contained within the ore; wedge failures through the ore along the ore/liner interface; circular and non-circular failures through the ore and into the foundation materials; and, liquefaction of the ore.

Stability analysis adopted the following approach: identification of critical stability sections; selection of methods and appropriate material types and geotechnical parameters; identification of boundary conditions and loading cases; and, evaluation of stability against design criteria.

A deterministic limit equilibrium approach was selected for stability analysis, applying the following Factors of Safety: 1.5 for static loading of impounding structures; 1.3 for static stability of non-impounding structures; and, 1.15 for seismic loading. A pseudo-static approach was used to simulate earthquake loading. More detailed analysis, including deformation analysis, will be required for the feasibility study.

Piezometric water levels were assumed at 5 m above the liner. Further work is required at the feasibility study to conduct geotechnical testing of the ore, seepage analysis and further stability analysis.

Geotechnical material parameters used for stability analysis are summarized in SWRPA's Table 9-4, which is presented as Figure 1.

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TABLE 9-4 GEOTECHNICAL PARAMETERS

Victoria Gold Corp. – Eagle Gold Project

Material Type	Unit Weight (kN/m^3)	Cohesion (kN/m^2)	Friction Angle (°)	Material Description	Ref
Ore	18	0	32	In the absence of laboratory testing, based on previous slope stability analysis parameter	4
Placer Tailings	20	0	37	Sand and Gravel (SP); based on EBA Particle Size Analysis: generally, < 10% fines, 20 - 60% sand and 30 to 70% gravel.	1
Colluvium (Type 1)	14	38	28	Gravelly Silt (ML). Generally, consists of > 30 - 50% fines (silt and clay) content.	1
Colluvium (Type 2)	22	0	36	Sand and Gravel (SW, SM, GW, GM); with occasional silt, medium compacted, unsaturated. Generally, consists of 30 - 50% fines (silt and clay) content.	1, 4
Weathered Bedrock	22	0	38	Weathered Granodiorite, described as sand (SP) with occasional boulders and cobbles. Strength = S2 (approximately 25 MPa), Weathering Grade 4 -5.	
Bedrock	26	Based on shear strength vrs normal strength envelope		Based on field estimation and observations, bottom of DG option 6; in the absence of laboratory strength properties; .RocLab used. UCS = 45 MPa, GSI =60, m_i = 9, D = 0, based on similar materials	2
Waste Rock	26	Based on shear strength vrs normal strength envelope		In the absence of laboratory rock strength, based on UCS = 45 MPa with Barton and Kjærnsli (1981) strength model	3
Compacted Sand and Gravel	24	0	40	In the absence of laboratory testing, based on dense Colluvium type 2 and previous slope stability	4

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2 SRK. 2008. NI 43-101 Preliminary Assessment Dublin Gulch Property – Mar-Tungsten Zone Mayo District, Yukon Territory, Canada (Table 17.2.2.2.)

3. Barton, N., and Kjærnsli, B., 1981. Shear strength of rockfill. J. of the Geotech. Eng. Div., Proc. of ASCE, Vol. 107:GT7: 873-891. Proc. Paper 16374, July.

4. Rescan. 1996. Dublin Gulch Prefeasibility Study - Volume 2. (Table 7.9.1)

Figure 1 Assumed Geotechnical Parameters from PFS Report (SWRPA 2010)

3.2.9. Confining Embankment Design

Design of the HLF confining embankment assumes a slope of 3H:1V to allow for use of a variety of earth and mine waste rock or rock fill materials to be used. Toe- and side-drains will be provided to intercept water from the abutments. Groundwater drainage will be used beneath the embankment and at the inlets to the Dublin Gulch diversion and along the route of the diversion.

The main source of earth/rock fill for embankment construction will be overburden and waste rock generated during mine development. Characteristics and availability require confirmation. The embankment requires a transition zone on the upstream face where particle size reduces from boulder size in the rock fill to silt in the lower liner. Two filter zones have been assumed, and this will need to be reviewed at feasibility and detailed design, and confirmed during construction.

Foundation preparation will consist of removing loose sand and gravel from the valley floor, potentially to bedrock, at a depth of 2 t 10 m. Topsoil will be removed from the abutments to expose competent material.

3.3. Waste Rock Storage Areas

The complete design basis for the Waste Rock Storage Areas (WRSAs) is presented in Appendix C. Issues of relevance to the geotechnical design are summarized here following the same outline as used by SWRPA in the PFS report (SWRPA 2010). Interested readers may refer directly to Appendix C if further detail is required to understand the context associated with specific issues.

General

Four sites were considered by SWRPA: Eagle Pup, Platinum Gulch, Stuttle Gulch and Stewart Gulch, and compared based on capacity, location and geology. Stewart Gulch is the farthest from the proposed open pit and therefore the least economically attractive waste rock storage area. Placing waste rock in Stuttle Gulch would interfere with crushing and conveying operations. Based on these considerations, the Eagle Pup and Platinum Gulch sites were selected for waste rock storage.

The WRSA planned at Eagle Pup will store approximately 55 Mt of waste rock, with capacity for additional waste rock. The WRSA at Platinum Gulch has been designed to store approximately 11 Mt of waste rock. Platinum Gulch WRSA will be developed first, followed by Eagle Pup WRSA. Waste rock will be deposited year-round at roughly 10,000 m^3/day. The dumps will be constructed in lifts with maximum height of 100 m, with benches between successive lifts to provide overall slopes of 2.5H:1V.

Site Characteristics

The topography and geology are described for both WRSAs in Appendix C, including a discussion of observations from subsurface investigation. Basic hydrology and hydrogeology characteristics are presented. Both WRSAs are affected by discontinuous permafrost, which may contain excess ice. Areas of permafrost with excess ice require treatment by stripping to encourage thawing and drainage, or excavation and removal to expose thaw stable soils before covering with waste rock. Seismic design parameters are presented as peak ground accelerations for the Design Basis Earthquake (0.078 g) and Maximum Design Earthquake (0.10 g).

Design Basis

This section of the PFS report presents assumed design criteria and operational parameters. Those pertinent to the geotechnical design basis include:

- Facilities to be developed in stages over time;
- Drainage below the WRSAs to be collected and conveyed effectively;
- Presence of permafrost to be addressed, and appropriate foundation drainage requirements to satisfy stability criteria;
- All aspects to be monitored to ensure design objectives are met;
- Several operational assumptions guide the design:
    - Waste rock production schedule depends on outputs from design and operation of the open pit;
    - Total waste rock production estimated as 65 Mt, with average production of 8 Mt per annum;
    - Hauling and placement of waste rock will occur 365 days/year;
    - Placement of waste materials in benches up to 100 m, primarily by end-dumping from the surface of the advancing lift; and
    - Waste materials will be comprised of variable grain sizes and rock types (granodiorite and metasediments) up to boulder size.

WRSA Design

Design considerations relevant to the geotechnical design included in the pre-feasibility study by SWRPA (2010) are outlined in Table 1 below. Additional details, including conceptual drawings, are available in Appendix C.

Table 1 Summary of Geotechnical Design Considerations as extracted from SWRPA PFS (2010)

Design Component	Notes
General Arrangement	WRSAs include the following elements: rock dump and foundation drainage; starter embankments; sediment control pond; surface runoff diversion channels; and, closure works. The Eagle Pup WRSA is contained within the lower catchment area of Eagle Pup, with plans for 60 Mt at a density of 1.9 t/m^3, and phased construction behind a starter embankment traversing the valley. The Platinum Gulch WRSA is located within the upper catchment of Platinum Gulch.
Rock Dump and Foundations	To be constructed through a hybrid of ascending lifts waste rock terraces and in some areas descending platforms and wrap-arounds. This approach is expected to mitigate against rapid ground pressure build-up, thaw-instability beneath the waste rock, and uncontrolled segregation which would have implications for drainage.
Stability Considerations	The WRSAs are designed against failure of the waste rock and/or foundations. The design considers the operational design events and post closure extreme events, of seismic loading under and Operational and Maximum Design Earthquake (ODE and MDE) and Probable Maximum Precipitation (PMP). The following items have been identified as being key in determining stability: waste rock material properties, particularly strength properties; geometry and loading cases (static and seismic); location of phreatic surfaces; pore pressures and thaw instability in the foundations; mechanisms of failure; and, deformation strength changes.
Stability Analysis – Material Properties	Waste rock is expected to contain coarse, angular fragments of metasedimentary and intrusive rock up to 1 m in diameter. Other than the fine-grained metasediments, the waste rock is assumed to be primarily clean, durable and free of significant fines content. Assumed material properties are summarized in Figure 2. The assumptions regarding friction angle and thickness of superficial soils are assessed to be the most critical to WRSA stability. Previous studies had adopted a friction angle of 30^o for surficial soils and 40^o for the underlying bedrock.
Piezometric Surfaces	A rock drain is proposed along the valley floors to preclude the presence of a piezometric surface within the waste rock.
Pore Pressure Development from Thawing	Analyses have accounted for development of pore pressures in the early years from thawing of an assumed extensive seasonal frost zone of up to three meters depth.
Analysis	Stability analysis for static and pseudo-static (earthquake) conditions were conducted in previous studies for a variety of operational and post closure configurations. These analyses conclude a 2H:1V overall slope achieves the minimum factors of safety against slope stability under static and pseudo-static events. The most marginal stability cases involve the early static loading as the WRSA is developed through the valley area and encounters thaw instability and/or weaker foundation materials. Satisfactory stability is achieved only by ascending terraces, with gradual loading of foundations, removal of organic material and unsuitable alluvial deposits, and controlled deposition over seasonal permafrost.
Rock Drain	The Eagle Pup lower catchment will be progressively stripped of organic

Design Component	Notes
	material and enhanced with selected durable granular waste rock.
Starter Embankment	An 18 m high starter embankment, consisting of durable and clean waste rock of selected particle size range will be designed to ensure good toe drainage and provide a stable toe for the operational and rehabilitated (post closure) WRSA.
Monitoring	The performance of the WRSA will be monitored during construction through both survey and geotechnical inspection. Observations will be made to record pore pressure changes, strains and settlements in the WRSAs as possible precursors to major instability.

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TABLE 6-15 WASTE ROCK MATERIAL PARAMETERS COMPARISON (MIN – MEAN – MAX)
Victoria Gold Corp. – Eagle Gold Project

Parameter		BGC (2009)	Sitka Corp (1996)	Knight Piésold (1996)	Reference
Base angle of friction, (°)	Metasediments	32	-	-	1a
	Intrusives	28	-	-	1a
Peak angle of friction, (°)	Metasediments	40	40	42.3	1a, 2, 3b
	Intrusives	40	-	42.3	1a, 2, 3b
Residual angle of friction (°)	Metasediments	35	37	-	1a, 3b
	Intrusives	38	-	-	1a, 3b
Joint Roughness Coefficient (JRC)	Bedrock	11 (55% of the dataset)	-	8 -12 (based on assessment from discontinuity logs)	1b
Uniaxial Compressive Strength, (MPa)	Metasediments	21 -77 -168	86	55 (2a) 55 - 100 -190 (2b)	1c, 2a, 2b, 3a
	Intrusives	3 - 134 - 224	127	63 (2a) 63 - 178 - 260 (2b)	1c, 2a, 2b, 3a
	Weathered Bedrock	-	-	4 - 34 - 93	2b

1a. BGC. 2009. Direct Shear Strength Testing Results.pdf and Direct Shear Results Summary.xls / Direct Shear Strength Testing Results.pdf

1b. BGC. 2009. Rock Mass and Discon Information.xls

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2a. Knight Piésold. 1996. Dublin Gulch Project - Report on the Feasibility of Heap Leach Pad and Associated Structures. (Report No. 1882/4)

2b. Knight Piésold. 1996. Dublin Gulch Project - Report on the Open Pit Slopes. (Report No. 1882/3)

3a. Sitka Corp. 1996. Pit Slope Re-Assessment- Design Memorandum. (Dated: 18/09/96)

3b.Sitka Corp. 1996. Dublin Gulch Project - IEE Addendum Section 8.0, Eagle Pup MWRSA). (Dated 17/10/96).

Figure 2 Assumed Waste Rock Material Properties from PFS Report (SWRPA 2010)

4.0 CONCLUSIONS

This memorandum has been prepared to summarize the geotechnical design basis for major earthworks structures to be developed as part of mine development at Eagle Gold. It is emphasized that the preceding overview of the geotechnical design basis for mine site infrastructure summarizes the work of others, specifically Scott Wilson RPA.

5.0 CLOSURE

At the request of Victoria Gold Inc., BGC has summarized the geotechnical design basis developed by others for the Pre-Feasibility Study (SWRPA, 2010) and this document does not necessarily reflect the views of BGC.

BGC Engineering Inc. (BGC) prepared this document for the account of Victoria Gold Corp. The material in it reflects the judgment of BGC staff in light of the information available to BGC at the time of document preparation. Any use which a third party makes of this document or any reliance on decisions to be based on it is the responsibility of such third parties. BGC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this document.

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Yours sincerely,

BGC ENGINEERING INC.
per:

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Anthony Urquhart, P.Eng.
Geotechnical Engineer

ORIGINAL SIGNED BY

Pete Quinn, Ph.D., P.Eng
Senior Geotechnical Engineer
APEY Permit to Practice Number PP092

Reviewed by:

ORIGINAL SIGNED BY

Thomas G. Harper P.E.
Senior Civil Engineer

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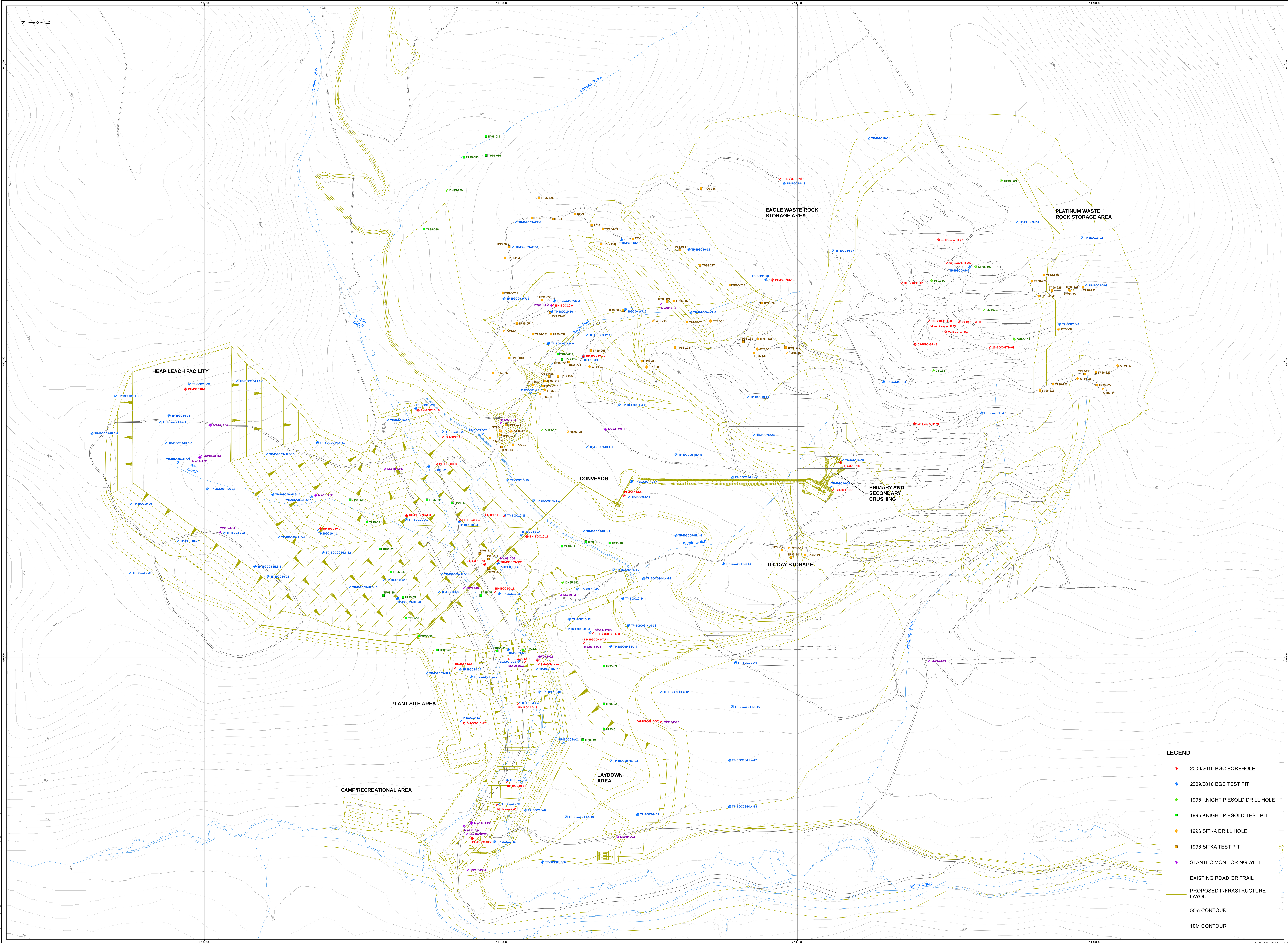
DRAWINGS



NOTES:
PRE-FEASIBILITY INFRASTRUCTURE LAYOUT RECEIVED FROM SCOTT WILSON, FEB.23, 2011.

REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:4,000
DATE:	APR 2011
DRAWN:	LL
DESIGNED:	LGT
CHECKED:	AKU
APPROVED:	PQ

PROFESSIONAL SEAL:

DRAFT

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

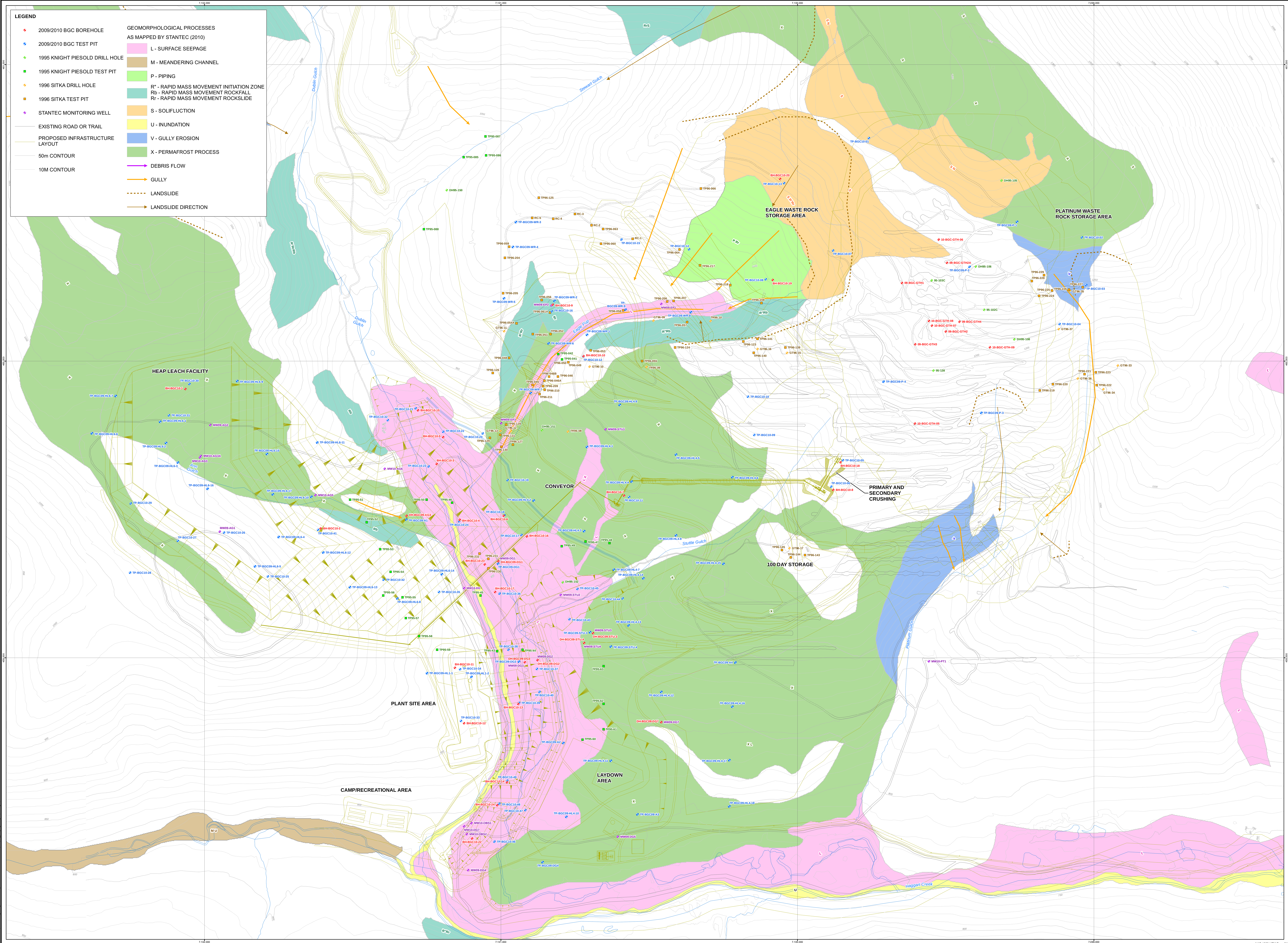
CLIENT: VICTORIA GOLD CORPORATION

PROJECT: EAGLE GOLD – GEOTECHNICAL DESIGN BASIS FROM SCOTT WILSON RPA PREFEASIBILITY STUDY

TITLE: PROPOSED GENERAL ARRANGEMENT OF MINE SITE INFRASTRUCTURE

PROJECT No.:	DWG No.:	REV.:
0792-004	01	

DWG TO BE READ WITH BGC MEMO TITLED "EAGLE GOLD – GEOTECHNICAL DESIGN BASIS FROM SCOTT WILSON RPA PREFEASIBILITY STUDY" DATED APR 2011



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METRES

NOTES:
1. PRE-FEASIBILITY INFRASTRUCTURE LAYOUT RECEIVED FROM SCOTT WILSON, FEB.23, 2011.
2. IDENTIFIED GEOLOGICAL HAZARDS ARE FROM TERRAIN MAPPING PRODUCED BY STANTEC (2010).

REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:4,000
DATE:	APR 2011
DRAWN:	LL
DESIGNED:	LGT
CHECKED:	AKU
APPROVED:	PQ

PROFESSIONAL SEAL:

DRAFT

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CLIENT: VICTORIA GOLD CORPORATION

PROJECT: EAGLE GOLD – GEOTECHNICAL DESIGN BASIS FROM SCOTT WILSON RPA PREFEASIBILITY STUDY

TITLE: GEOLOGICAL HAZARDS AS INTERPRETED BY STANTEC (2010)

PROJECT No.: 0792-004 | DWG No.: 02 | REV.:

DWG TO BE READ WITH BGC MEMO TITLED "EAGLE GOLD – GEOTECHNICAL DESIGN BASIS FROM SCOTT WILSON RPA PREFEASIBILITY STUDY" DATED APR 2011

APPENDIX A
SCOTT WILSON RPA PREFEASIBILITY STUDY SECTION FOR HEAP LEACH PAD AND ASSOCIATED FACILITIES

9 HEAP LEACHING

The proposed Heap Leach Facility (HLF) is located approximately 1.2 km north of the Eagle Zone orebody. The majority of the HLF is located in the Ann Gulch catchment, a tributary to Dublin Gulch. The base of the HLF is in the valley floor of Dublin Gulch at an elevation of 840 masl and at full height, the HLF extends up Ann Gulch to an elevation of 1,080 masl.

This section of the report presents the Scott Wilson HLF design, used to support the PFS cost estimates. Summaries of meteorology, hydrology, seismicity, geological, geotechnical, and hydrogeological conditions that were used as inputs to those designs are also presented. These summaries are taken from BGC and Stantec reports, found in the appendices to this report.

The HLF comprises a number of elements: a rock-filled embankment to provide stability to the HLF, a lined storage area for the ore to be leached, an in-heap storage pond to contain the pregnant solution, pumping wells for the extraction of solution, ponds to contain excess solution in extreme events, diversions, Sediment Control Ponds (SCP), and leak detection, recovery and monitoring systems to ensure the containment of solution. An associated structure is the relocated Dublin Gulch waterway (channelled to the south side of the valley).

Engineering of these components is discussed in the following sections and drawings are presented in Appendix F. Capital and operating costs have been prepared and are included in Sections 14 and 15.

PREVIOUS STUDIES

Previous studies undertaken include reports on the 1996 Feasibility design (Knight Piésold, 1996) and the Initial Environmental Evaluation (Sitka, 1996). Reports on investigations, laboratory testing and other information prepared in support of these reports have been reviewed but not referenced.

SITE SELECTION

Site selection for the HLF site was based on a two stage assessment of the suitability of potential locations:

- Stage 1 - an engineering assessment (see Appendix F), and
- Stage 2 - a Project-wide assessment of impacts from the various HLF site options.

POTENTIAL SITE OPTIONS

Following initial screening of a variety of potential heap leach sites in the wider Dublin Gulch catchment area, six sites were considered for taking forward (see Figure 9-1), with four of these selected for the geotechnical investigation, Options 1, 4, 5 and 6. The potential site options for the HLF include:

- Option 1 – Cross valley type HLF within Dublin Gulch (lower valley)
- Option 2 – Cross valley type HLF within Dublin Gulch (mid valley)
- Option 3 – Valley type HLF on Potato Hills within Bawn Boy headwaters
- Option 4 – Side valley type HLF on slopes below the Eagle Zone ore deposit
- Option 5 – Valley type HLF on granodiorite ridge within Olive Gulch headwaters
- Option 6 – Side valley type HLF in Ann Gulch headwaters.

ENGINEERING ASSESSMENT

The engineering assessment considered the factors that influence the suitability of the facility at each location, using a qualitative comparison of each site against a set of significant engineering (cost-related) criteria. These criteria are drawn from Scott Wilson's experience of the design, construction, and closure of heap leach facilities.

A variable degree of compliance was applied in regard to each criterion, with non-compliance scoring negatively (-5) and full compliance positively (+3). The approach aimed to identify favourable sites based on these engineering criteria, thus establishing options for further consideration. Quantitative data were scored on a basis of 1 point per US$1 million of differential cost between options.

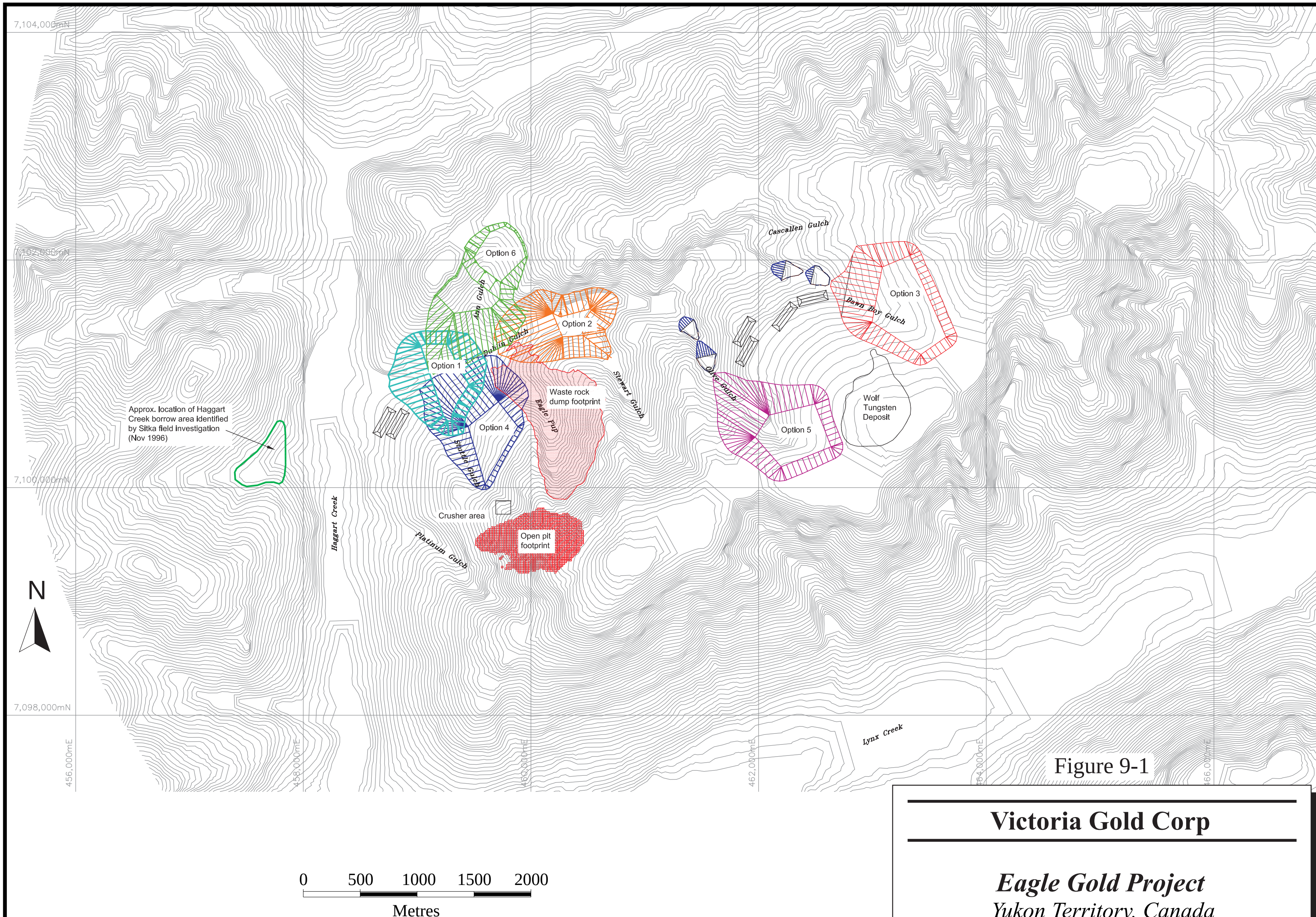


Figure 9-1

Victoria Gold Corp

Eagle Gold Project

Yukon Territory, Canada

Heap Leach Site Options

June 2010

Source: Scott Wilson, KCA, 2010.

The engineering assessment of alternatives is summarised in Table 9-1 and established a group of Options, numbers 3, 5 and 6 that score significantly higher than Options 1, 2 and 4. From an engineering and construction perspective of the heap leach pad, Option 3 - Potato Hills is the most favourable of the leading group and Options 1 and 2 the least favourable from the latter group.

TABLE 9-1 ENGINEERING SITE ASSESSMENT OF POTENTIAL HEAP LEACH SITE OPTIONS
Victoria Gold Corp. – Eagle Gold Project

Criteria		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Engineering	Land Surface Area	3	3	3	1	1	1
	Topography	1	-5	3	1	1	1
	Heap leach facility shape	1	1	1	1	1	1
	Materials handling access	3	3	1	3	1	3
Geotechnical	Preparatory Works	1	1	3	1	3	3
	Earthworks for starter embankment	3	1	3	1	1	3
	Other Geotechnical Concerns	-5	-5	3	-5	1	3
Closure		-5	-5	3	1	3	1
	TOTAL	**2**	**-6**	**20**	**4**	**12**	**16**

PROJECT WIDE ASSESSMENT

A Project-wide consideration of the options was undertaken in regard to impacts of the HLF site on:

- mining operations – particularly haulage and access
- other infrastructure layouts
- mineral resources - condemnation requirements, and
- environment – notably on surface and ground water, fauna (fisheries), flora, and visual as well as consideration for archaeological, air quality, sociology.

The scores, as assessed by the various project study leaders (environmental, mining etc.) for the HLF site options are presented in Table 9-2.

TABLE 9-2 HEAP LEACH SITE OPTIONS PROJECT ASSESSMENT SCORING TABLE

Victoria Gold Corp. – Eagle Gold Project

			Engineering			Mining				Environmental										
Option No.	**Name**	**Description**	**Heap Leach Engineering**	**Geotechnical - Ground Works**	**Closure**	**Operations**	**Resources**	**Infrastructure**	**Expandability**	**Fauna**	**Fisheries**	**Flora**	**Archaeological/ Heritage**	**Visual Impact**	**Climatic**	**Remediation Closure**	**Surface Water**	**Ground Water**	**Score**	**Ranking**
			Score	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**		
									Group 1											
3	Potato Hills	Valley	8	9	3	-24	-1	1	3	0	1	-1	0	0	0	3	1	-5	-2	3
5	Olive Gulch	Valley	4	5	3	-16	-2	1	-5	0	1	1	0	0	0	3	1	-5	-9	4
6	Ann Gulch	Side Valley	6	9	1	-2	0	3	1	0	0	1	0	0	0	1	-5	1	16	1
									Group 2											
1	Dublin Gulch	Cross Valley	8	-1	-5					Screened out at Engineering Assessment Stage										
2	Dublin/Eagle Pup	Cross valley	2	-3	-5					Screened out at Engineering Assessment Stage										
4	Eagle Zone	Side Valley	6	-3	1	0	-1	3	1	0	0	1	0	0	0	1	-5	1	5	2

CONCLUSIONS

The results of the Project-wide review of the leading three sites established a clear site location preference in Option 6 - Ann Gulch, with similar neutral scores as compared to other sites, but much lower impacts on (costs to) mining and infrastructure. Option 6 was taken forward for pre-feasibility engineering.

SITE CHARACTERISTICS

TOPOGRAPHY AND GEOLOGY

The site of Option 6 - Ann Gulch is located on the southern side of an east-west orientated ridge, on relatively shallow slopes (of largely less than 3H:1V). The slopes drain southwards via a shallow central valley (see Figure 9-2) and down into a confluence with the Dublin Gulch valley. The catchment is south-facing, and short in length (~ 2 km). The catchment ridge rises to an elevation of approximately 1,210 masl and the confluence is at an elevation of approximately 850 masl. On the western side, the valley slopes include isolated steeper sections and the catchment divide on the east side marks a rapid change in slope gradient to the neighbouring catchment.

The geology of the catchment was investigated in 2009 (BGC 2009) through a series of 15 test pits, a few boreholes in the Dublin Gulch valley (see Figure 9-3) and laboratory testing of samples. Bedrock conditions comprise a series of clastic rocks (metasediments comprising schists, phyllites and quartzites), overlain by a variable profile of overburden materials. These surficials include a distinctive weathered bedrock horizon of up to four metres thickness, beneath silty sands and gravels (colluvium) - up to 6.1 m thick, and a 0.3 m organic soil layer. Considerable variation occurs, however, depth to bedrock is typically no greater than 6.5 m in the proposed heap leach pad area. At the lower end of the HLF, the surficials in Dublin Gulch comprise placer tailings deposits (sand and gravel) and are up to 15 m in thickness.

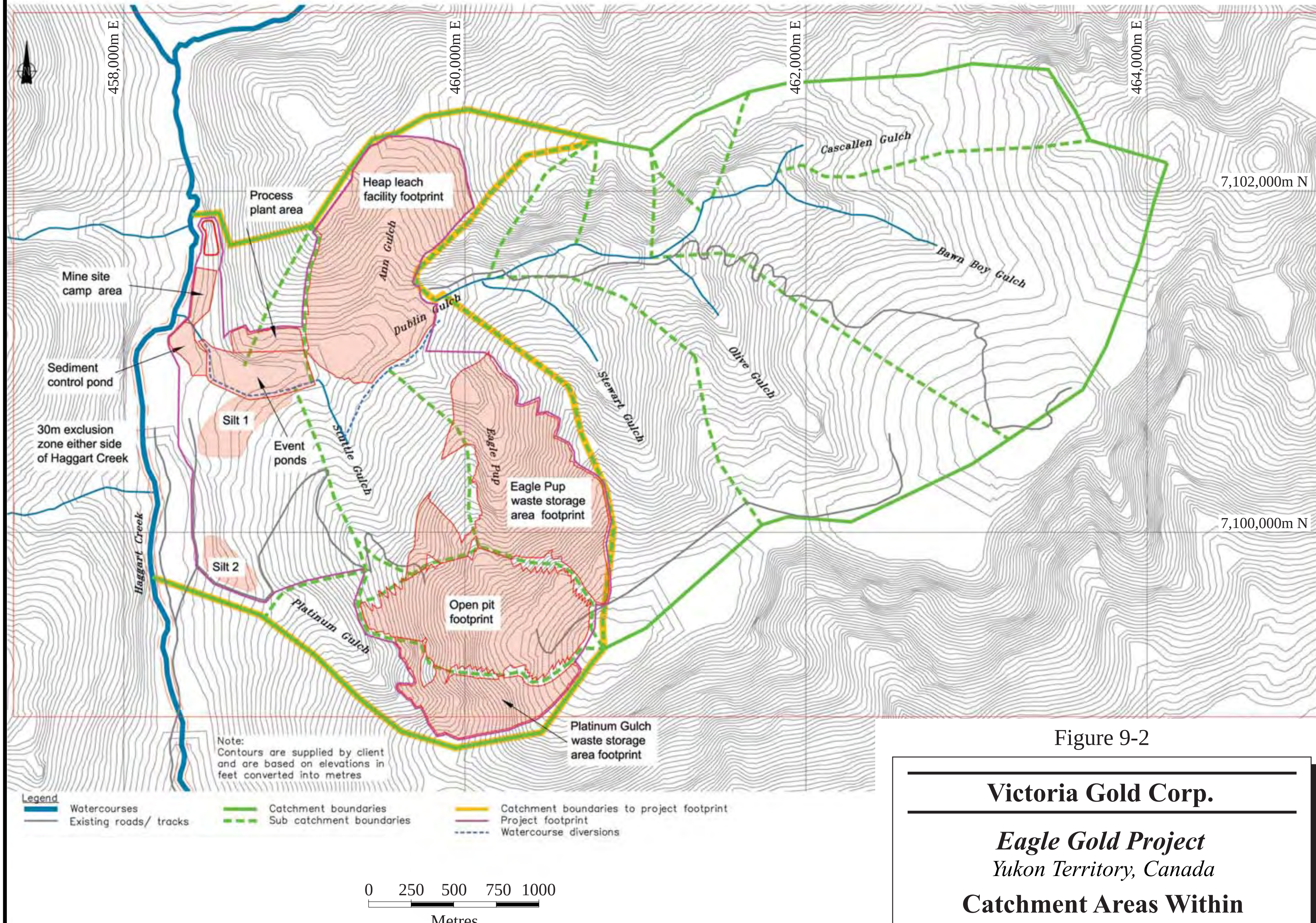


Figure 9-2

Victoria Gold Corp.

Eagle Gold Project

Yukon Territory, Canada

Catchment Areas Within Dublin Gulch Basin

June 2010

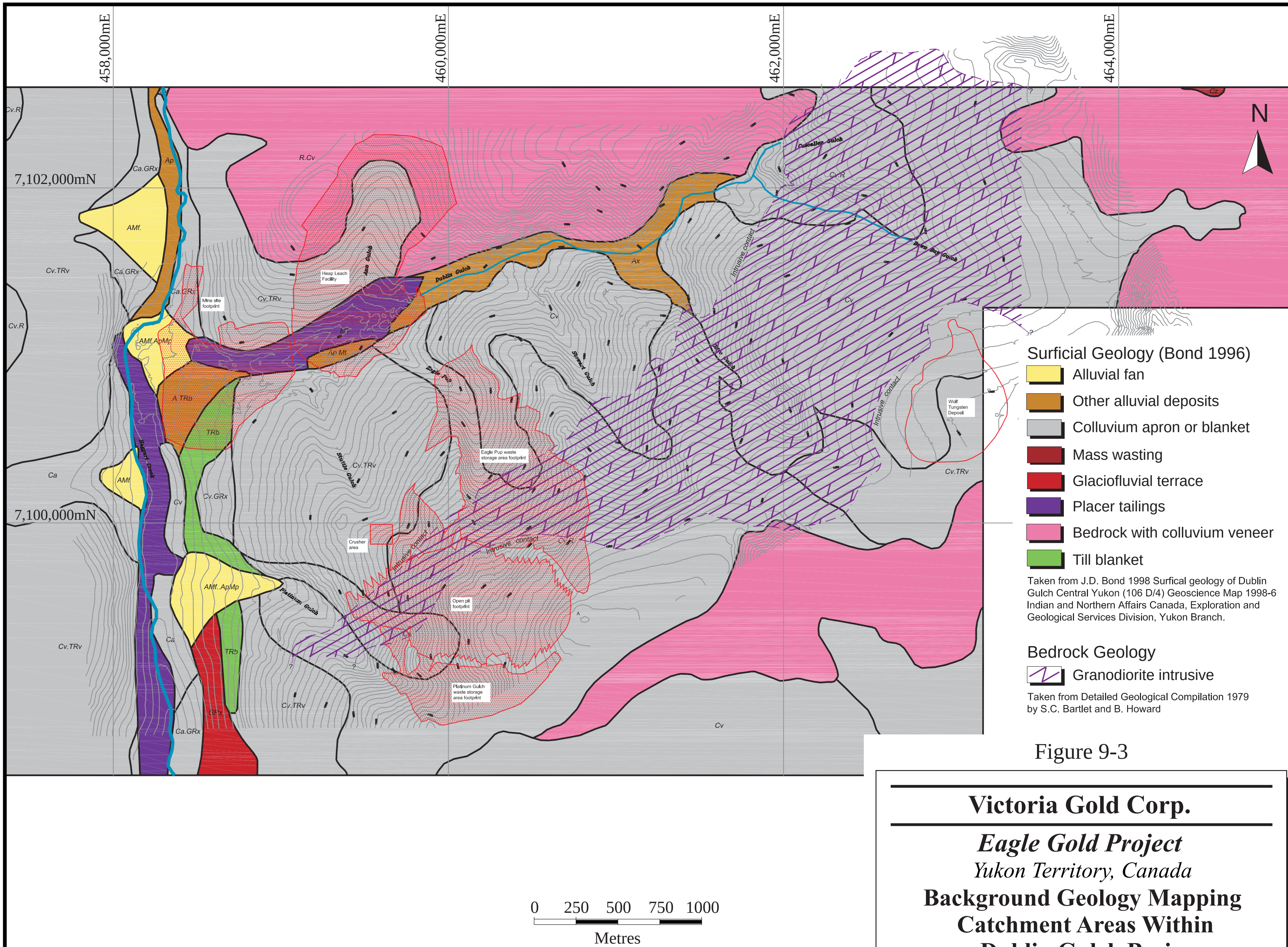


Figure 9-3

Victoria Gold Corp.

Eagle Gold Project

Yukon Territory, Canada

Background Geology Mapping Catchment Areas Within Dublin Gulch Basin

June 2010

www.scottwilson.com

HYDROLOGY

The hydrology of the Project area, including the HLF site, is presented in detail in Stantec's report and summarised in this report in Section 6. Of particular note for the HLF is that the peak stream flows occur in the spring in association with freshet events, (snow melt or rain-on-snow events) with flows gradually disappearing following the disappearance of the snow. Sizeable flood events may also occur in the late summer due to intense rainstorms and are particularly significant for small catchments. Ann Gulch is ephemeral, with zero discharges in mid winter when the small stream freezes.

The peak flows are pertinent to the design of the HLF foundation drains and surface runoff collection and diversion ditches and summarised in Table 9-3.

TABLE 9-3 SURFACE AND GROUNDWATER FLOW DESIGN ASSUMPTIONS
Victoria Gold Corp. – Eagle Gold Project

Structure	Return Period	Event Size	Peak Flow (m^3/s)
Surface diversion ditches around the HLF	1 in 200 year	24 hour event	0.5 to 1.2
Operational surface collection ditches on the HLF benches	1 in 10 year	24 hour storm event.	0.6
Foundation Drainage	1 in 200 year	24 hour storm event.	1.5

HYDROGEOLOGY

The hydrogeology of the project area including the HLF site is presented in detail by Stantec (2009) and summarised in this report in Section 6. Of particular note for the HLF is the unconfined flow system within the bedrock and the slow release of groundwater throughout the summer months. The resulting springs are ephemeral, and only where they coalesce in the lower catchment at approximately 950 masl, are surface flows observed in the summer months.

Measurements of groundwater levels in Ann Gulch catchment indicate water levels present within the superficials and weathered bedrock of a few metres below ground level, however, this is variable across the catchment, reflecting a subdued form of the topography, altered by thickness of superficials and weathered bedrock. Typical values of between 2 m and 7 m below grade level are anticipated, however, seasonal variations are not identified.

The hydraulic conductivity of the bedrock is relatively low and assumed to be 1.5×10^{-6} m/s (Knight Piésold 1996), and the foundation soils of sand and gravel with some silt beneath the HLF are of the order of 1.9×10^{-5} m/s in a thawed state.

PERMAFROST

Permafrost generates significant potential issues for the HLF design in two regards, the potential for thawing of:

- seasonal frost zones, and
- permafrost zones that include excess ice.

Only a scattering of permafrost is identified from the Ann Gulch investigations (BGC 2009) and the potential for the HLF catchment area as a whole is assessed to be as low as 5%.

SEISMICITY

A review of the seismicity records of the Project area, and the Knight Piésold 1996 and RESCAN 1996 reports, has confirmed the appropriateness of previous seismic design assumptions. A design Base Earthquake of 0.078 g for operational conditions is considered conservative as compared to a range of deterministic methods of calculation. The adoption of a 50% of a Maximum Critical Event for a Maximum Design Earthquake (MDE) located on the nearest significant fault is an appropriate methodology for the generated MDE of 0.10 g for post closure conditions.

In 2005, the National Building Code of Canada (NBCC) was revised with respect to seismic design parameters. Scott Wilson RPA notes that the NBCC applies to buildings, not to geotechnical structures (such as the heap embankment), however, reconciliation to the applicable standard (in consultation with regulators) should be settled prior to embarking on Feasibility-level design.

HEAP LEACH FACILITY DESIGN

DESIGN BASIS

A Scott Wilson technical note on the design basis (see Appendix F), presents the standards, objectives and operating parameters used for the PFS design, a summary of which is presented below.

Heap leach design standards adopted for the project include:

- regulatory requirements of Yukon and Canada;
- permitting requirements of the State of Nevada. These are not regulatory requirements in the Yukon, but are considered as standards for best practice, and
- guidelines from the International Finance Corporation.

Taking in to account the requirements of the various stakeholders, the principal objectives of the Eagle Gold Project HLF are to:

- ensure complete protection of the regional groundwater and surface water flows both during operations and in the long-term;
- to satisfy the environmental regulatory requirements of the Yukon territory and the Federal Government;
- provide permanent, secure storage and total confinement of the leach ore within a fully engineered facility;
- effectively collect and convey solutions for in-heap pregnant solution storage to ensure maximum recovery. In-heap storage of solution will be utilised to provide the necessary winter time storage of solution in an above freezing environment;
- minimise the quantity of surface water runoff entering the facility and coming into contact with the process solutions;
- provide additional external facilities (events ponds) to accommodate excess solution and rainfall/snowmelt when hydrological events exceed the storage capacity of the heap;
- develop the facility in stages, where possible, to minimize the environmental disturbance at any one time and to distribute capital expenditure over the life of the facility;
- monitor all aspects of the facility to ensure that the design objectives are met and that there are no adverse environmental impacts; and

- rehabilitate the facility to a condition compatible with the original land use and is stable under extreme precipitation events and seismic events.

In conjunction with these objectives are a series of input parameters and criteria developed for the PFS design of the HLF.

GENERAL ARRANGEMENT

The general arrangement of the HLF is presented in Figure 9-4 and consists of the following features.

HEAP LEACH PAD

The heap leach pad will be a 240 m high combination valley and side valley heap leach. The pad will be constructed from within Dublin Gulch and up Ann Gulch side valley. This will allow space for Dublin Gulch to be re-directed around the HLF, rather than underneath. The heap will be constructed in three phases:

- Phase 1 - all facilities to provide 2 years of operation, including (in order of construction):
    - sediment control ponds;
    - surface runoff diversions;
    - events pond No.1;
    - confining embankment;
    - lining system; and
    - in-heap pond.

- Phase 2 - Extension to the HLF (additional lined area), and
    - construction of events pond 2

- Phase 3 - Extension to the HLF (additional lined area)

SEDIMENT CONTROL PONDS AND SURFACE RUNOFF DIVERSIONS

Control of surface water runoff and sediment will be achieved with construction of runoff diversions around the HLF and sediment control features. A permanent SCP will be located at the downstream extent of the HLF and events ponds infrastructure as shown in Figure 9-6. The SCP will have a volume of 36,000 m^3 and is sized to accommodate run-off events during construction and operations. Temporary use will be made of one of the events ponds, providing 100,000 m^3 of storage for sediment control whilst constructing the Dublin Creek Diversion.

EVENTS PONDS

Two events ponds will be located downstream of the HLF and process plant to allow gravity drainage. The events ponds will have a total storage volume of 200,000 m^3 and cater for excess solution in storm events from the HLF and plant drain-downs. As the in-heap capacity is significant, an event pond is not anticipated to be required in Years 1 and 2, however, the first pond will be constructed at start-up, as a conservative measure. During construction, this pond will act as a temporary stormwater collection pond, and will provide water storage for start-up.

Cross sections are provided in Figure 9-5 and Figure 9-6.

CONFINING EMBANKMENT

In order to provide a satisfactory initial operational area to confine the heap leach pad and in-heap storage pond, an embankment will be constructed at the base of the facility in the Dublin Gulch valley. The embankment will be 50 m high, with an upstream width of 560 m and a total fill volume of 2.2 million m^3. It will be constructed from selected durable waste rock from the mining process, placed on a suitable foundation, with a filter zone on the upstream face to provide a transition to the sub-grade of the liner.

LINING SYSTEM

The heap leach pad will be provided with an engineered lining system to prevent loss of solution and contamination of groundwater. The final lining system will cover approximately 87 ha, and will consist of a multiple composite PVC liner system, with dual leak detection, and a leachate recovery and collection systems to convey solution to the extraction well.

IN-HEAP POND

Solution storage capacity for normal operations of 435,000 m^3 will be provided with an in-heap pond, which consists of storing the solution within the pore space of the ore. This will allow operation in the cold winter and spring climate conditions. As the heap is raised and the catchment area increases, additional storage (the event ponds) will be required for extreme rainfall events. Provision of external storage for this requirement is more economical than increasing the size of the in-heap pond.

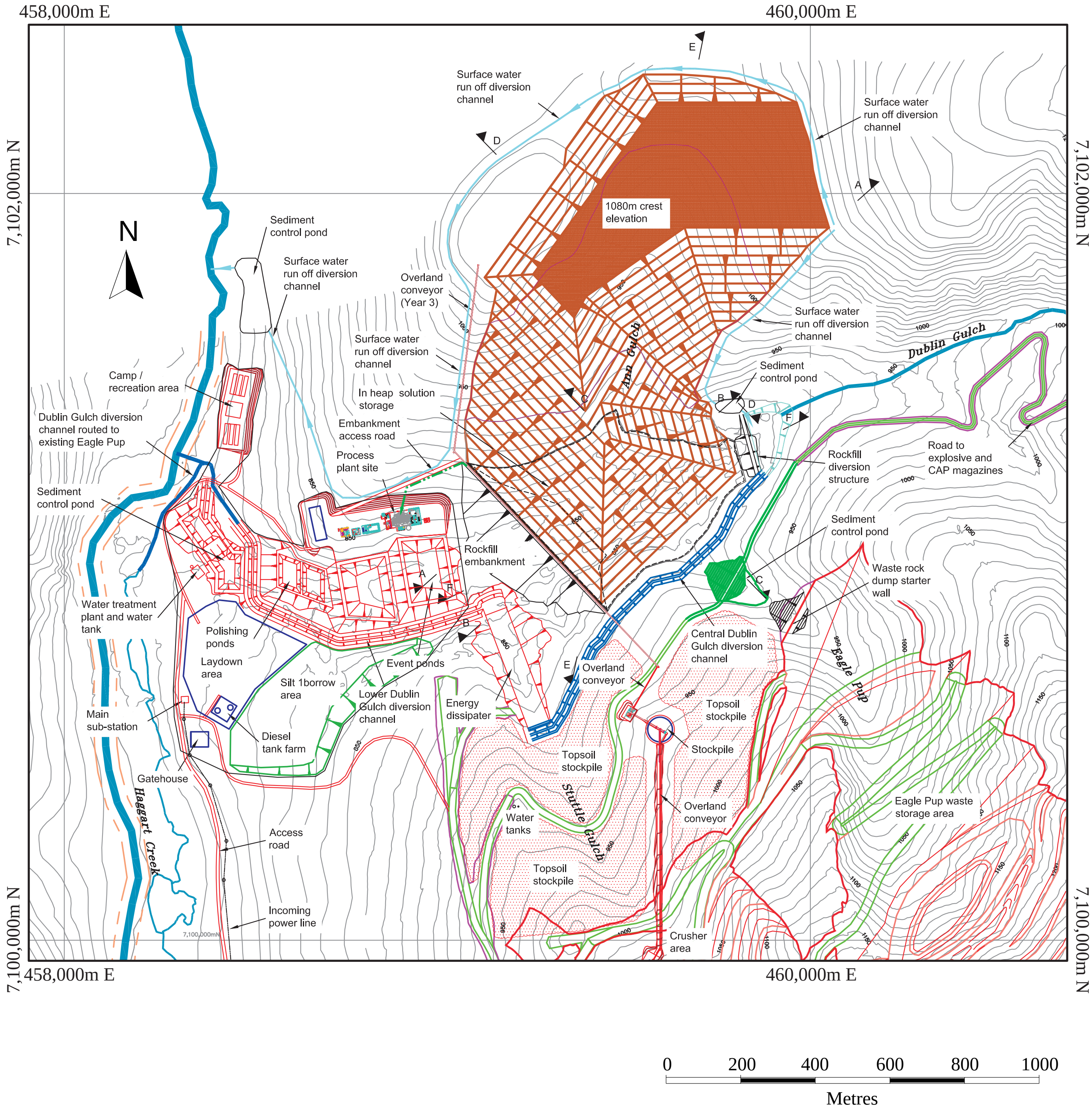


Figure 9-4

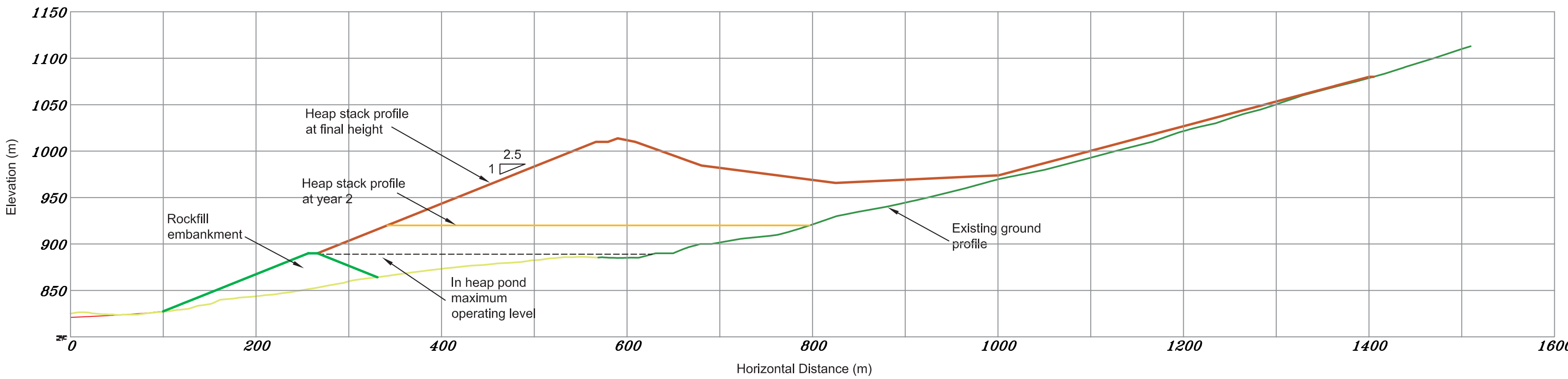
Victoria Gold Corp.

Eagle Gold Project

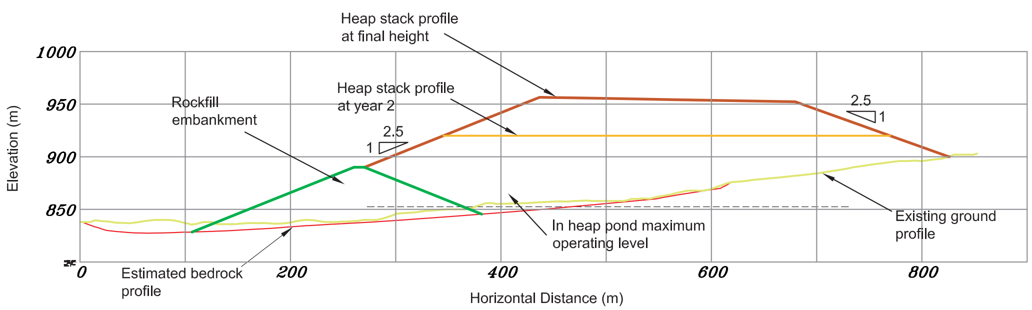
Yukon Territory, Canada

General Arrangement at Final Stack Height

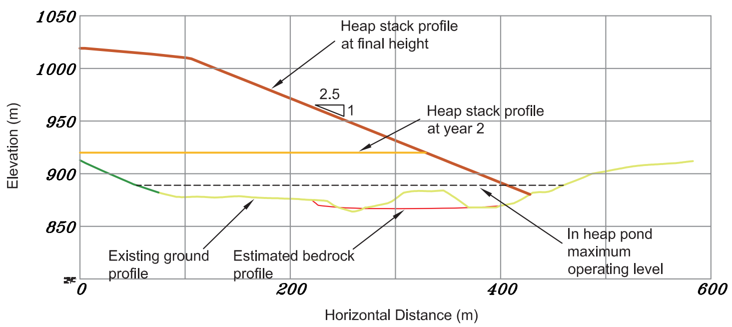
June 2010



Section A–A



Section B–B



Section C–C

Note
1. All dimensions are in millimetres and elevations in metres unless noted otherwise.
2. All sections are provisional, awaiting geological profile data.

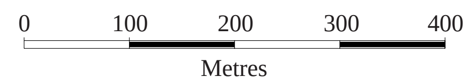


Figure 9-5

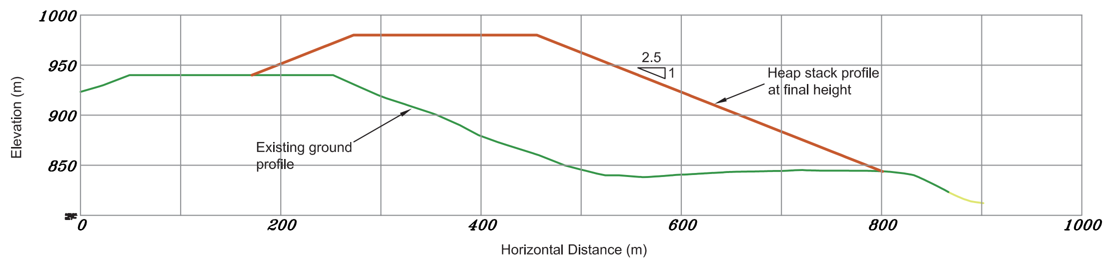
Victoria Gold Corp.

Eagle Gold Project

Yukon Territory, Canada

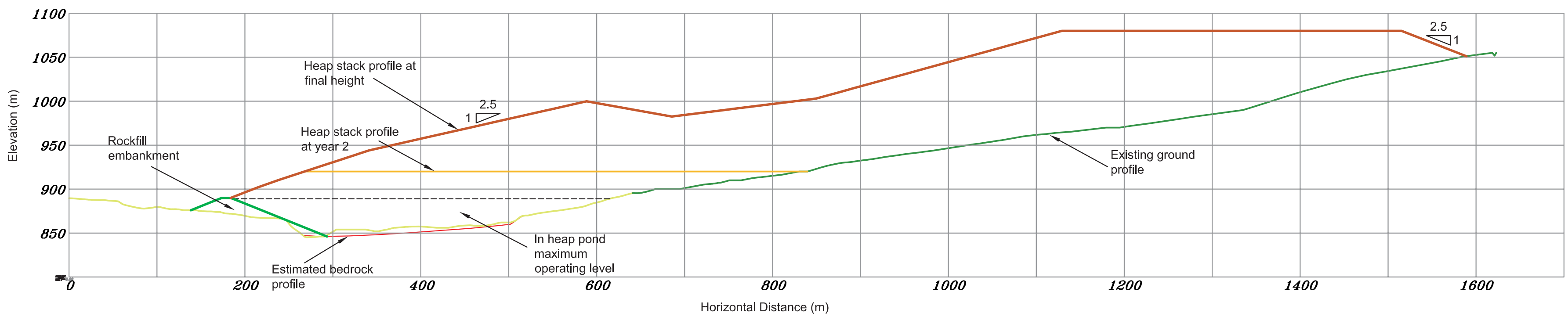
HLF Cross Sections Sheet 1

June 2010

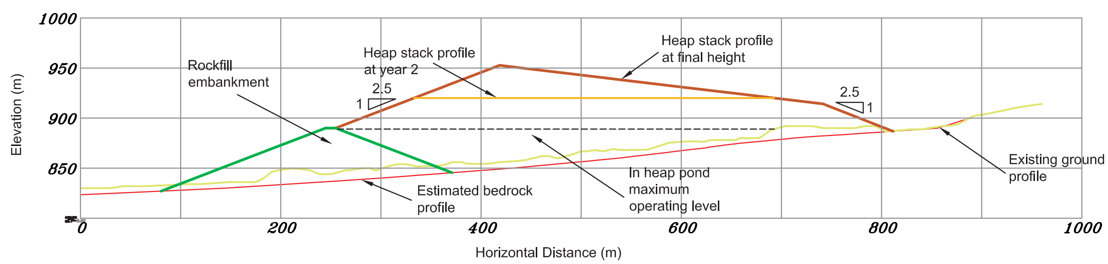


Section D–D

Note
1. All dimensions are in millimetres and elevations in metres unless noted otherwise.
2. All sections are provisional, awaiting geological profile data.



Section E–E



Section F–F

0 100 200 300 400
Metres

Figure 9-6

Victoria Gold Corp.

Eagle Gold Project

Yukon Territory, Canada

HLF Cross Sections Sheet 2

June 2010

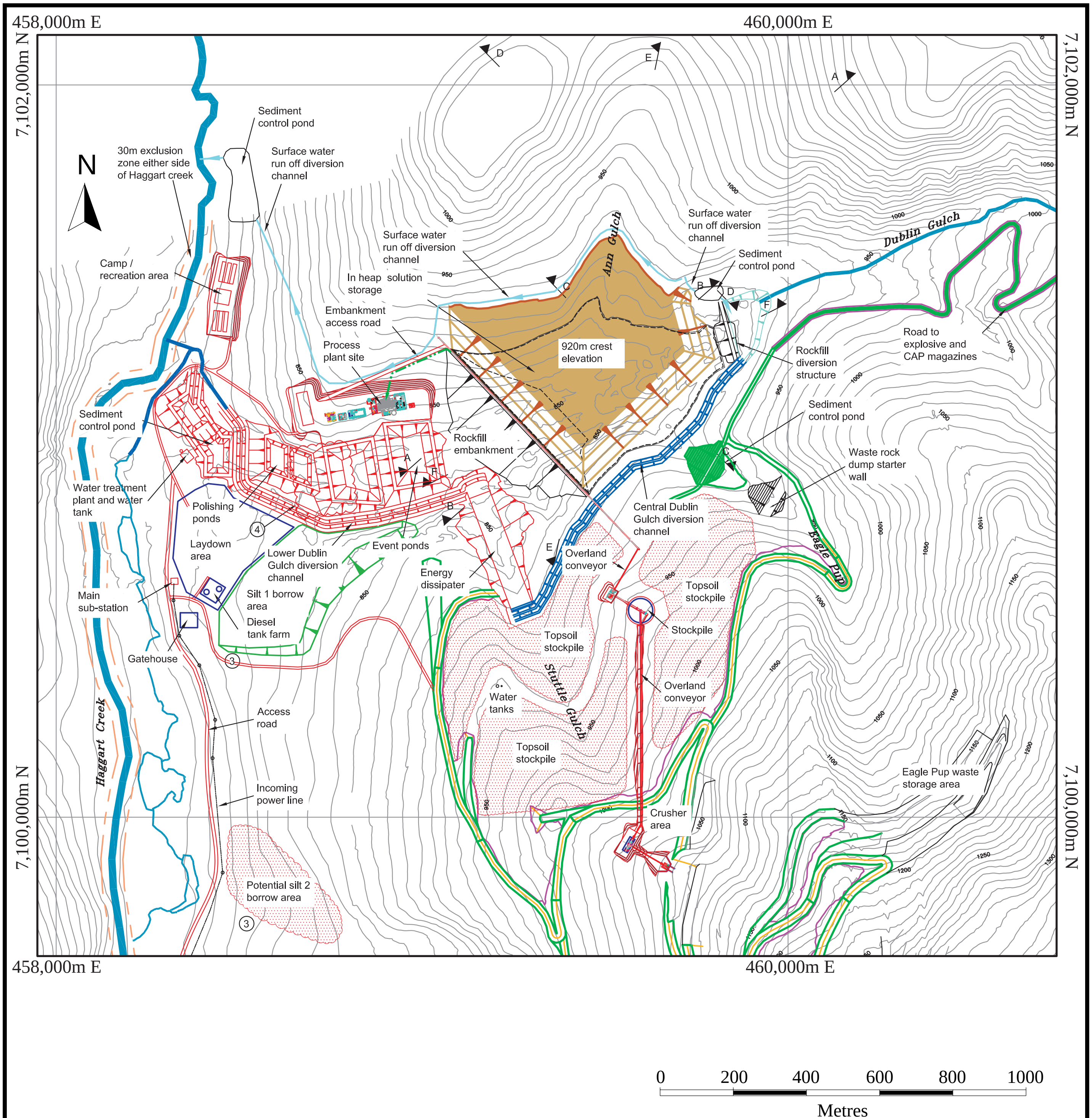


Figure 9-7

Victoria Gold Corp.

Eagle Gold Project

Yukon Territory, Canada

HLF Layout at Year 2

June 2010

LINER SYSTEM DESIGN

The heap leach pad and in-heap pond areas will be provided with an engineered lining system to prevent loss of solution and contamination of groundwater. The lining system will cover approximately 87 ha, and consist of a multiple composite PVC liner system, with dual leak detection.

DESIGN BASIS

The Yukon Territory does not have regulations specifically developed for heap leach facilities, but instead relies on regulations from other regions and precedence from other projects. It is understood that the only HLF that has been permitted in the Yukon is at Brewery Creek, the design and permitting of which, according to previous design work by Sitka Corporation (1996), was based on the Nevada State guidelines and associated permitting limitations. The liner system has been designed, therefore, to ultimately achieve compliance with these guidelines.

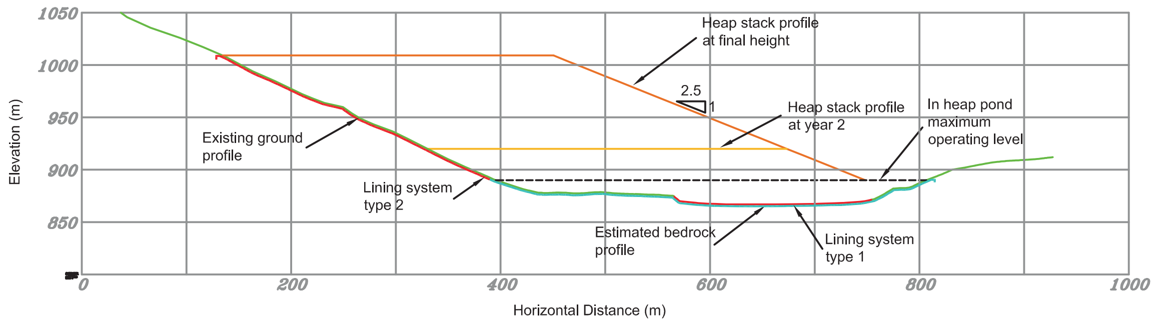
Based on the recommendations of Giroud and Bonaparte (1989), in general, it is expected that "one [puncture] hole per acre" (4,000 m^2) with an effective area of 10 mm^2 would have a reasonable potential to exist for a geomembrane liner placed with a high level of construction quality control. It is on this basis that potential leakage rates through the liner have been assessed to check compliance with the Nevada guidelines.

LINER SYSTEM DESIGN

The lining system elements are illustrated in Figure 9-8. The HLF liner system design provides:

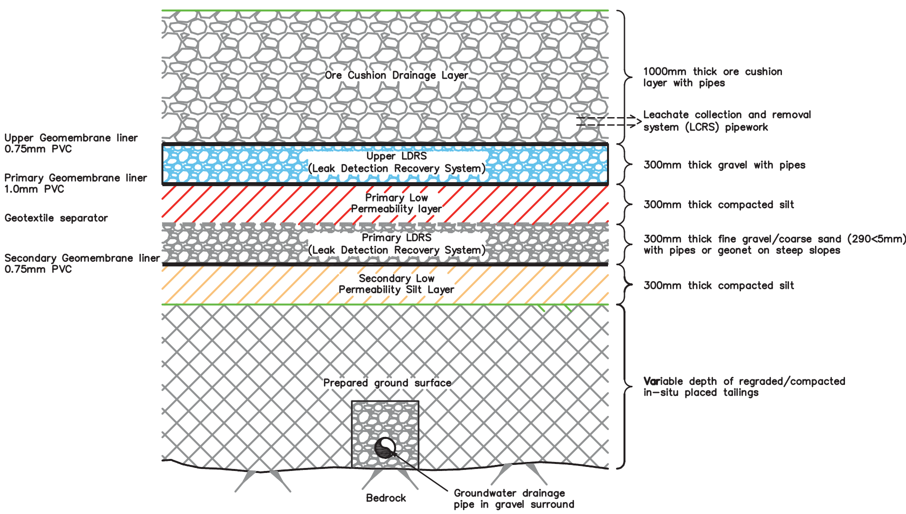
- a double composite liner in the upslope area of the pad (above the in-heap pond maximum operating level), and
- a triple liner in the in-heap storage pond area.

The events ponds will also be double-lined and incorporate a geonet separation layer.

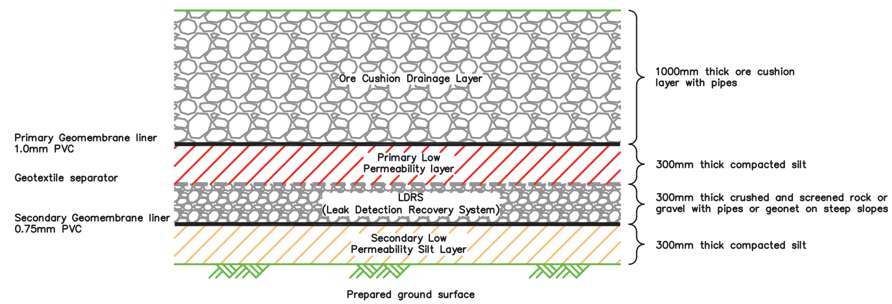


Typical Section Through Heap Leach Facility

Note
All sections are provisional, awaiting geological profile data



Lining System Type 1
In Heap Triple Liner Area
(Below in heap pond maximum operating level)



Lining System Type 2
Heap Pad Double Liner Area
(Above in heap pond maximum operating level)

Figure 9-8

Victoria Gold Corp.

Eagle Gold Project
Yukon Territory, Canada

Lining System Details

June 2010

HEAP LEACH PAD AREA

The liner system in the heap leach pad upslope area comprises the following elements from top to bottom:

- a cushion layer of 1 m thick ore, with Leachate Collection and Removal System (LCRS) pipework
- primary composite liner system comprising:
  - Primary 1.0 mm PVC geomembrane liner
  - 300 mm thick compacted silt
- geotextile separator
- primary Leak Detection and Recovery System (LDRS) comprising 300 mm thick fine gravel to coarse sand with pipes. On steep slopes, this is replaced with geonet
- secondary composite liner comprising:
  - secondary 0.75 mm PVC geomembrane liner
  - 300 mm thick compacted silt.

Potential leakage through the primary liner into the LDRS in the upslope pad area will be minimised by provision of a closely spaced network of leachate collection interceptor. These drains effectively reduce the hydraulic head over the liner.

IN-HEAP STORAGE POND AREA

In order to achieve compliance with the Nevada permitting guidelines with respect to liner leakage in the in-heap storage pond area, an additional liner element is required above the primary composite liner. This additional element comprises an upper 0.75 mm PVC geomembrane over an upper LDRS gravel layer. This upper liner serves to minimise the hydraulic head on the primary composite liner and therefore reduce the potential leakage rates into the primary LDRS. The liner system in the in-heap storage pond area comprises the following elements from top to bottom:

- a 1 m thick ore cushion layer with Leachate Collection and Removal System (LCRS) pipework
- Upper 0.75 mm PVC geomembrane liner
- Upper LDRS 300 mm thick gravel with pipes;
- Primary composite liner system
- Geotextile separator

- Primary LDRS 300 mm thick fine gravel to coarse sand with pipes, and
- Secondary composite liner system.

By using a double composite liner in the upslope section and triple liner in the storage section of the pad, leakage into the LDRS will be below the limiting rates stipulated in the Nevada guidelines, and any subsequent leakage out of the system into the ground will be negligible.

EVENT PONDS

The liner system to the events ponds comprises the following elements from top to bottom:

- Primary 2.0 mm thick HDPE geomembrane liner
- Primary LDRS geonet layer
- Secondary 1.0 mm thick HDPE geomembrane liner, and
- 300 mm thick compacted silt.

LINER COMPONENT SELECTION

CUSHION LAYER

The cushion layer is effectively a load-bearing drainage layer, in which the LCRS pipework can be installed. It will be formed from coarse sand/fine gravel-sized durable ore.

The cushion layer material is assumed to wholly comprise particle sizes less than 5 mm diameter, so that the underlying geomembrane liner will not require any additional protection from damage by large particles or sharp protrusions. If the ore contains particles of greater than 5 mm diameter, then it will be necessary to screen it before use as a cushion layer.

It is recommended that further testing of the puncture resistance of the PVC liner, when placed in combination with the selected cushion layer material, be carried out under the anticipated heap loads to confirm suitability at feasibility design stage.

GEOMEMBRANE LINERS

PVC geomembrane has been selected for the heap leach pad and in-heap storage pond areas due to good cold weather performance, high interface strength (frictional and tensile) characteristics and excellent chemical resistance to the anticipated solutions. It possesses a high degree of flexibility, which enhances its puncture resistance and has proven long-term performance under heaps with high normal loads.

Since the PVC has a relatively low long-term resistance to ultraviolet radiation, all exposed areas will need to be covered with cushion layer material soon after installation.

High Density Polyethylene (HDPE) has been selected for the event ponds, due to good long-term resistance to ultraviolet radiation, excellent chemical resistance and proven performance as an exposed pond liner. The event pond primary liner thickness of 2.0 mm (compared to 1.0 mm thickness for the heap leach secondary liner) has been selected due to its increased exposure to potential wear and to the elements.

LDRS GRAVEL AND GEONET

The primary and upper LDRS layers will comprise free-draining fine gravel to coarse sand material, with typically 90% finer than 5 mm particle size, with minimal fines (i.e., less than 10% finer than 1 mm). The grading of the material will be such that it is capable of transmitting any leakage through the liner system at a rate that ensures minimal head build up over the underlying PVC liner, and also prevents damage to the adjacent (either overlying or underlying) PVC liner associated with large particle protrusions.

It is recommended that, in addition to the cushion layer testing outlined above, testing of the puncture resistance of the PVC liner placed adjacent to the proposed LDRS gravel-sand material be carried out to confirm suitability at feasibility design stage.

The geomembrane liners to the events ponds will be separated by a geonet fluid transmission layer on the side slopes and a gravel layer on the base, which is capable of transmitting leaked fluids at a rate that ensures that excessive head will not develop on the secondary liner.

It is anticipated that the proposed geonet will be a high compressive strength HDPE type product; although further testing will be required during feasibility design to confirm fluid transmission capacities will be adequate for anticipated liner leakage.

COMPACTED SILT

The compacted silt material component of the lining system will be prepared to form a competent low permeability base to receive the PVC geomembrane liners to form a composite lining system. The compacted silt will be a minimum of 300 mm thick and will have a smooth surface, free of sharp protrusions and will be in direct contact with the PVC geomembrane.

It is important to achieve good contact conditions between the PVC geomembrane and compacted silt layer, as the effectiveness of the composite liners depends on the quality of contact between the two elements.

In order to comply with the Nevada guidelines for composite liner systems and permitted leakage rates into LDRS systems, the target permeability of the compacted silt is 1×10^{-7} m/s.

It is recommended that permeability testing under consolidated conditions, taking into account that this material will be significantly loaded by heap material above, be carried out to confirm that this permeability value can be realistically and consistently achieved.

GEOTEXTILE

A layer of non-woven geotextile has been included at the interface between the fine grained primary compacted silt layer and the underlying fine gravel to coarse sand LDRS layer. This geotextile is included to provide effective separation of the two materials and prevent any undesirable migration of fine particles and associated instability and settlement that could potentially occur as a result.

LEAK DETECTION AND RECOVERY SYSTEMS

The performance of the lining system, as measured in terms of preventing loss of solution into the ground, will be assessed by monitoring leak detection drains constructed below the liners. Separate LDRS will be installed below each liner, and all collected solution will be returned to the heap.

The LDRS will consist of a series of 100 mm diameter pipes within a 300 mm thick layer of 20 mm gravel, feeding to a 200 mm diameter collector pipe, also located within the gravel layer. Any leakage reporting to the drains will flow to a sump below the in-heap pond, from where it will be pumped back to the heap.

For the in-heap liner, there will be a second LDRS, beneath the upper liner. This is similar to the primary LDRS, except that there are more pipes to cater for the potentially higher flow and convey the solution with minimal pressure on the liner beneath. Any drainage collected will be conveyed to a separate sump below the in-heap pond, from where it will be pumped back to the heap.

The location of the leak detection and collection systems, between the liner layers, makes access for pumping difficult. The proposed design requires installation of down-hole pumps in pipes on the embankment slope, which is not ideal for pump operation. In the event of blockage, replacement of pipes would not be practicable and therefore three pipes for pumping have been provided. Consideration was given to constructing a pipe beneath the embankment, however, this is generally not considered good practice as it is a potential source of leaks. Typical details are shown on Figure 9-8.

The practicability of using borehole pumps to drain potential leaks should be confirmed.

HEAP LEACH PAD - MONITORING

Monitoring will consist of recording the quantity and occasionally quality of solution returned in the LDRS in relation to the location of the heap being irrigated at the time. In addition monitoring boreholes will be installed downstream of the heap leach facility and events ponds and will be sampled regularly for water quality as backup to the LDRS monitoring.

EVENT POND - LEAKAGE DETECTION

The events ponds are designed to work on an infrequent basis, to take the solution in the event of high rainfall events and plant shutdowns. The likelihood for leaks is reduced, together with reduced impact from a dilute solution. The leak detection system will discharge potential seepage to a collection sump, where it will be monitored on a regular basis, and any leakage returned back into the pond with a dewatering pump.

The events ponds will be constructed above the presumed groundwater level. The base of the events ponds is presumed to be free-draining alluvial material and consequently groundwater drainage is not included. This will be investigated further during detailed design.

The events ponds LDRS consists of 100 mm diameter slotted chlorinated polyethylene (CPE) drainage pipes in a 300 mm thick layer of 10 mm gravel feeding a sump in a constructed low point within the event pond. From the sump, two 150 mm diameter HDPE pipes are provided on the slope, connected to the 100 mm drainage pipes. A down-hole pump is installed in one of the pipes, together with an electronic depth sensor.

EVENT POND - MONITORING

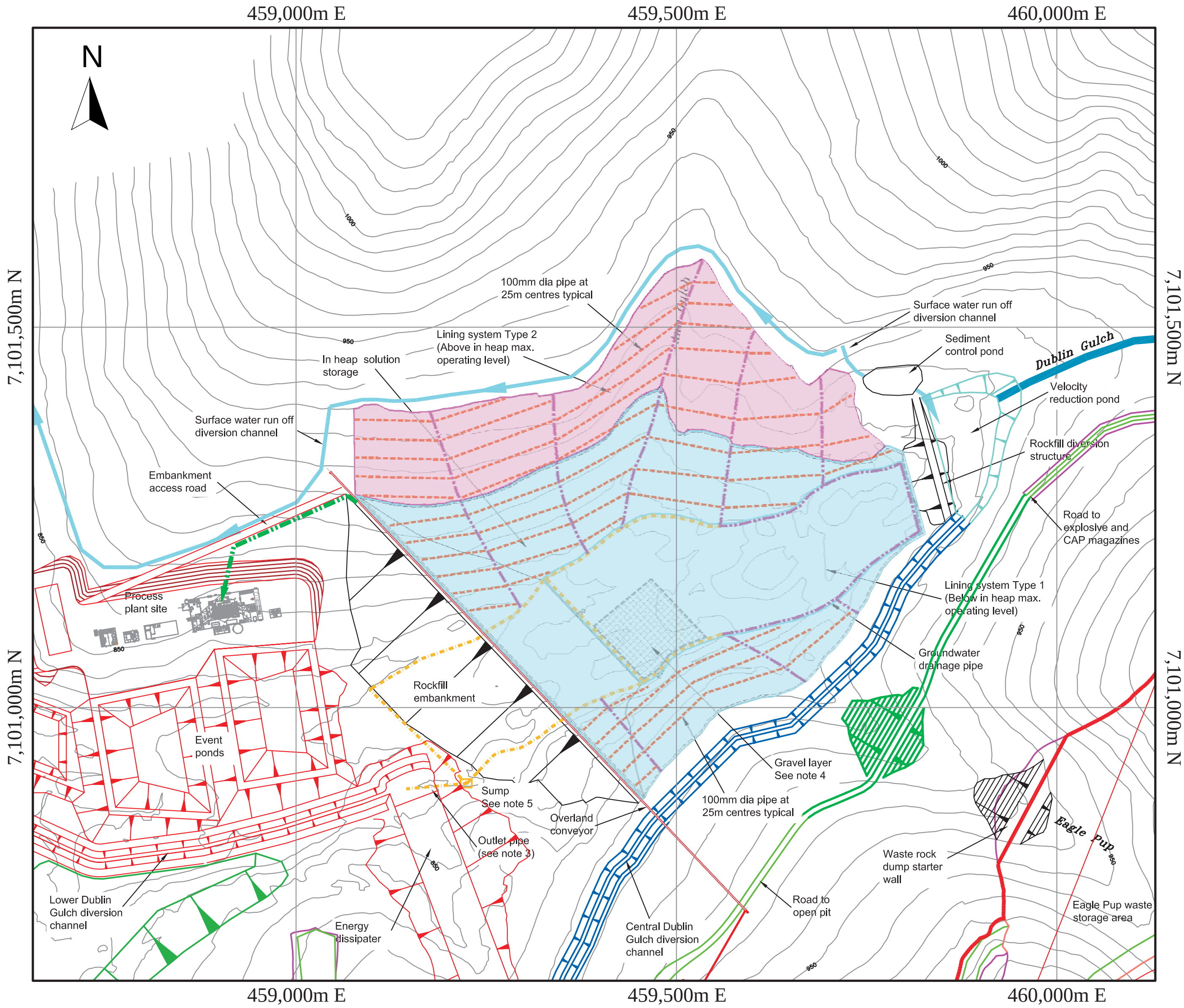
Monitoring will consist of recording water depth in the sump and recording the quantity returned to the event pond. Occasional sampling of the quality will also be undertaken. Monitoring boreholes downstream of the events pond will be provided as part of the HLF monitoring and will be sampled regularly for water quality.

GROUNDWATER DRAINAGE - DESCRIPTION OF WORKS

A groundwater drainage system will be installed beneath the lowest liner of the HLF to prevent uplift pressures developing beneath the liner (see Figure 9-9). The drainage system will be comprised of a network of pipes placed in gravel-filled trenches and wrapped in geotextile. The pipe network will be comprised of 100 mm diameter slotted corrugated polyethylene pipes (CPP) pipes in a 300 mm x 300 mm gravel-filled trench at a spacing of 25 m, feeding 200 mm diameter HDPE un-perforated collector pipes at 200 mm centres in 1,200 mm x 1,200 mm gravel-filled trench. In the base of the HLF, beneath the in-heap pond, the 200 mm pipes will feed into a 300 mm diameter HDPE pipe. The 300 m pipe will require a gravelled-filled trench with cross-sectional area of 12 m^2 to convey the post-closure flow from the heap.

GROUNDWATER DRAINAGE - MONITORING

Monitoring of flow and quality will be undertaken on a regular basis. Water that meets the effluent standards will be released via a pipeline to the SCP. If the water does not meet the required standards, it will be pumped to the events pond for treatment or recycling. For this purpose, a sump is provided at the embankment toe with valves to isolate flow.



Legend

300mm dia pipe

200mm dia pipe

100mm dia pipe

0 100 200 300 400 500

Metres

Figure 9-9

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Groundwater Drainage Pipework Layout at Year 2 Stack Height

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DUBLIN GULCH RELOCATION

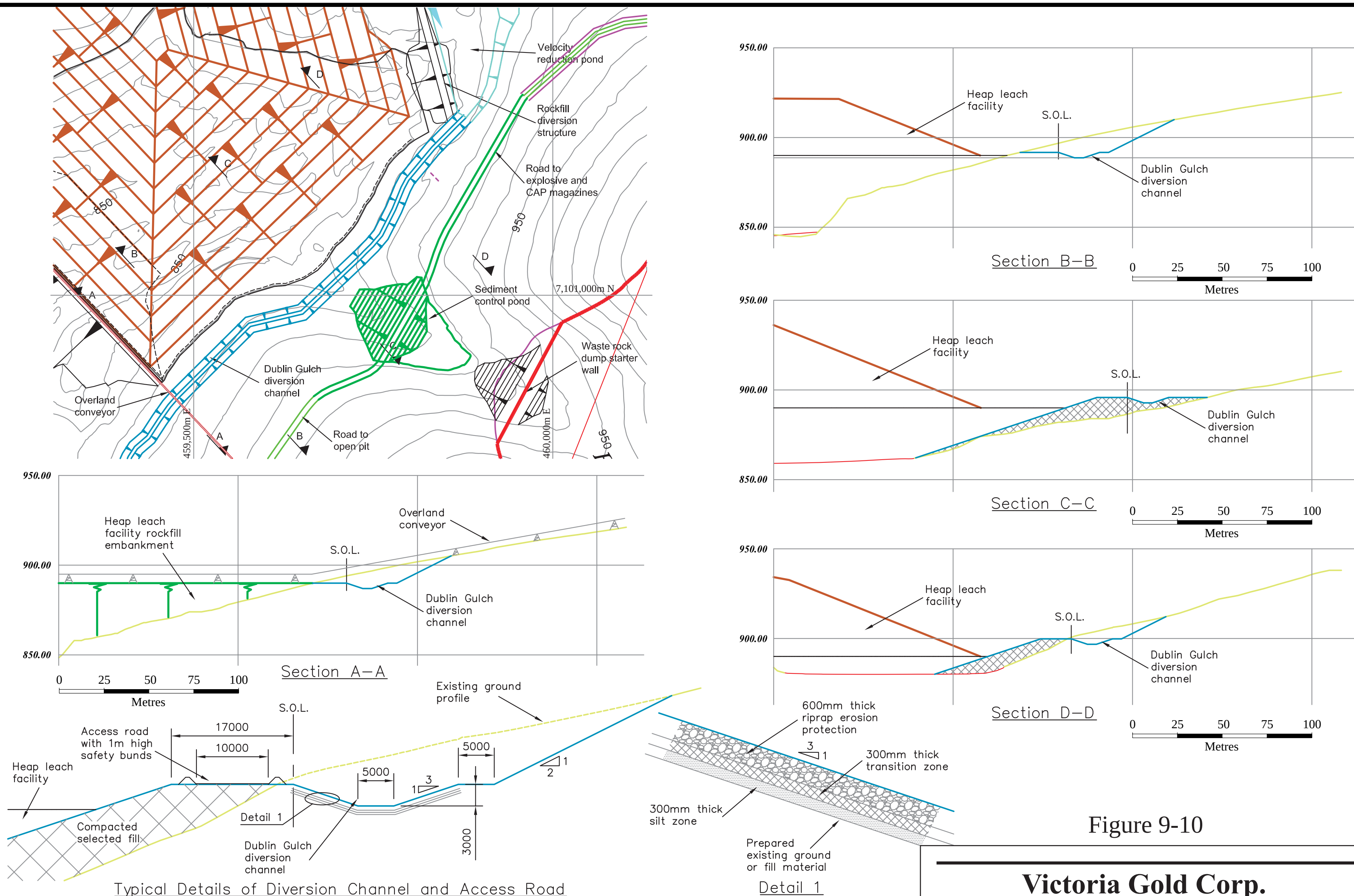
The relocation of the Dublin Gulch streambed is designed to convey streamflow safely past the HLF and return it back to the current course, approximately 1,500 m downstream of the diversion structure inlet. The diversion will be comprised of:

- an upstream inlet structure that intercepts all Dublin Gulch streamflow and directs flow into a diversion channel
- a 900 m long diversion channel (“the upper diversion”) 3 m deep with a slope of 1:100 leading to Stuttle Gulch
- channelization of the Stuttle Gulch flow with additional energy dissipation and erosion protection measures
- an enlarged and re-routed channel diversion (“the lower diversion”) around the Event Ponds and Polishing Ponds, and
- a reconnection of the flow into the current course of Dublin Gulch.

Guidelines for diversions require design for a 1 in 200 year storm event, however, the diversion remains post-closure and therefore a design to the Probable Maximum Flow (PMF) is appropriate. Consequently the diversion is designed for a peak flow based on the PMF of 105 m^3/s.

The inlet will consist of a 12 m high embankment, designed to intercept all surface flows and the majority of sub-surface flows. The embankment will consist of rock fill with a filter zone on the upstream face to provide a transition to the sub-grade of an HDPE liner. Placer tailings and alluvial material in the valley floor will be removed, and an impervious zone barrier created, to direct sub-surface flows into the diversion. The HDPE liner will be provided with damage protection measures grading from gravel back to rockfill.

From the upstream diversion structure, the 900 m long diversion will run nearly parallel to the contour at a 1:100 slope to Stuttle Gulch. The construction of the upper diversion will consist of earth-fill, HDPE liner and rock-fill erosion protection. The up-slope cut surfaces will be provided with erosion protection measures and flow from the disturbed surfaces will be channelled through a SCP until runoff meets the suspended solids requirements (see Figure 9-10).



Notes:
1. All dimensions are in millimetres and elevations in metres unless noted otherwise.

Figure 9-10

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Yukon Territory, Canada

Central Dublin Gulch Diversion Channel Details

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The flow from the upper diversion will then be directed into Stuttle Gulch, through energy dissipation and erosion protection measures to handle the PMF (see Figure 9-11). These measures will comprise large size rock-fill, placed on a gravel bed on a heavy duty geotextile. Stability of the slope, keying the structure into the slope and permafrost are issues to be reviewed further in the feasibility design.

The flow from the Stuttle Gulch energy dissipation channel will re-enter the lower diversion of the Dublin Gulch valley floor at a channel inlet, which is an enlarged section of the lower diversion, provided with erosion protection measures. The stream at this point is then designed to be part of the Dublin Gulch fish habitat and detailed design will need to take this into account. The invert of the channel is presumed to be on competent bedrock and will intercept and drain the groundwater beneath the events ponds. Lining is not considered necessary, however, erosion protection to the banks will be provided. Detailed investigations of the geotechnical and groundwater conditions along the route of the diversion will be undertaken as part of the detailed engineering.

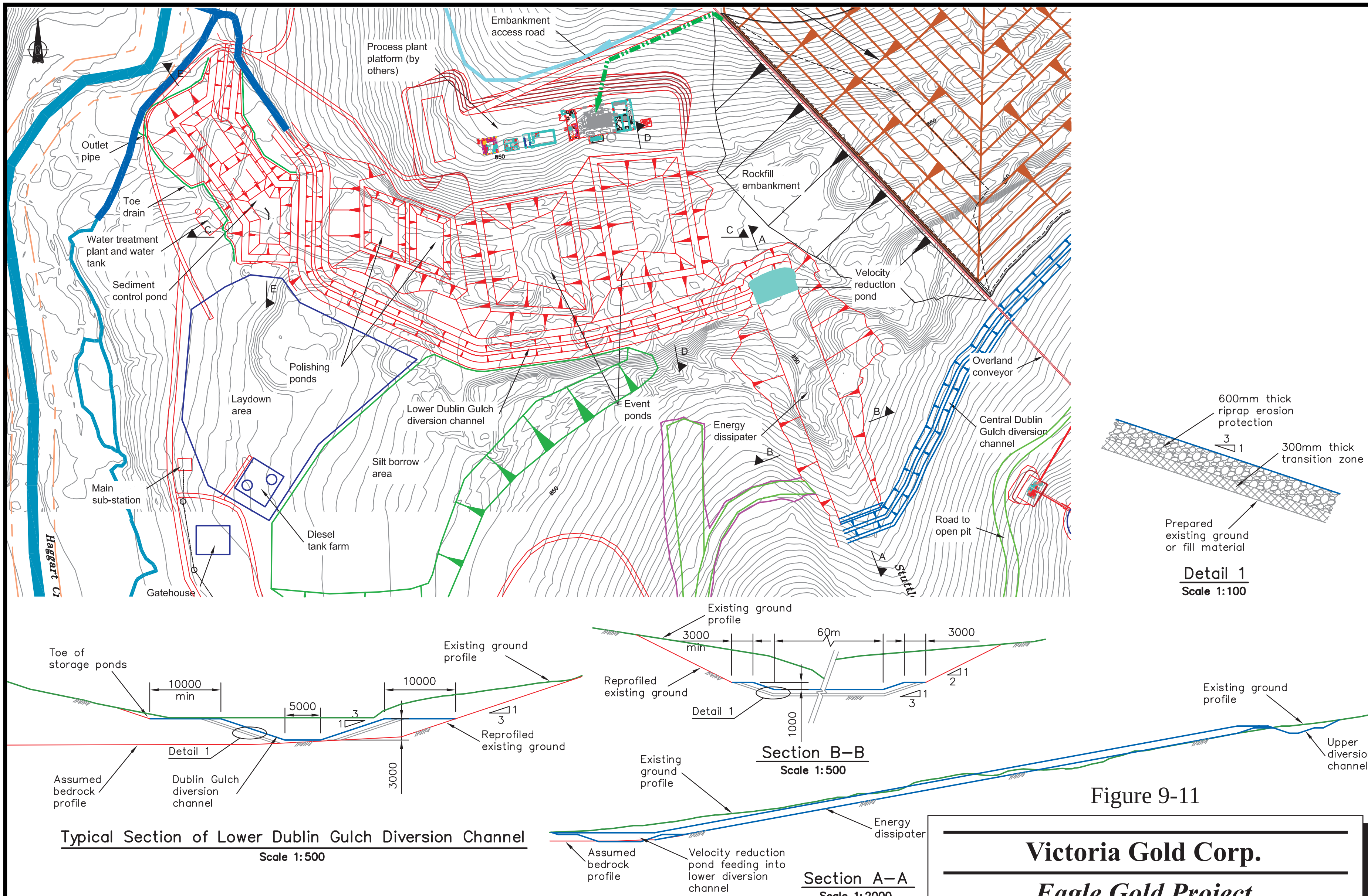

Figure 9-11

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Lower Dublin Gulch Diversion Channel Details and Energy Dissipater

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FURTHER WORK

In addition to a general progression of design, the following items are specifically noted for advancing in the feasibility study:

- selection of the backfill material, whether waste rock from the mine or locally excavated materials and ensuring availability i.e., matching waste rock production to use and undertaking borrow pit assessments to determine available suitable volumes
- further design of the Stuttle Gulch erosion protection measures
- further geotechnical data along the route of the proposed diversion, and
- design of the lower Dublin Gulch diversion with regard to providing suitable fish habitat.

STABILITY DESIGN

The physical stability of the HLF is critical to its short-term (operational) and long-term (post closure) performance. The HLF is designed against failure of the ore and/or the foundations that could overstress the liner system and thereby compromise the integrity of the containment system. The design therefore considers the operational design events and post closure extreme events, of seismic loading under an Operational and Maximum Design Events (ODE and MDE), Probable Maximum Flood (PMF) and Probable Maximum Precipitation (PMP).

Particular aspects that are key to determining stability:

- ore material properties particularly strength
- geometry and loading cases (static and seismic)
- shear strength of the:
    - soil/liner interface
    - ore/liner interface
- location of phreatic surfaces:
    - groundwater level beneath the soil/liner interface, and
    - hydraulic solution head above the liner.
- deformation strength changes, and
- normal loading changes in geo-synthetic strength properties.

Stability issues for further evaluation in feasibility studies include:

- permanent displacement assessments to address post seismic deformation strengths, which can be significantly lower and mobilised through only small deformation, and

- shear testing of the compacted soil/geosynthetic liner interface to assess the appropriate shear strength relationship to be adopted for analysis.

MECHANISMS OF FAILURE

Case studies and theory establish the modes of failure in HLFs can include both shallow and deep seated failures, the latter having the potential to damage the liner system. Failure modes considered at this PFS stage include:

- circular and non-circular failures contained within the ore

- wedge failures through the ore and along the ore/liner interface

- circular ad non-circular failures though the ore and into the foundation materials, and

- liquefaction of the ore (particularly as the heap develops above the in-heap pond).

ANALYSIS

METHOD

Stability analysis for the Eagle Project HLF adopted the following approach:

- identifying critical stability sections and developing representative cross sections (two dimensional)

- selecting a method of analysis and determining the appropriate material types and geotechnical parameters

- identifying boundary conditions and loading cases for each section, and

- performing evaluations of stability against design criteria for each loading case.

Figures 9-5 to 9-6 (above) present the locations of the critical cross sections. Other areas in the HLF have configurations that have higher factors of safety as compared to these sections and are therefore not considered.

A deterministic limit equilibrium approach was selected to consider the stability of the structure. In this approach shear stress is compared to the available shear strength. The ratio between the two is the Factor of Safety (FoS). Applicable FoS are presented in the Design Basis (see Appendix F).

To simulate earthquakes loading, a pseudo-static approach was used for the PFS stage. Seismic loading in this approach is simulated as a constant horizontal force, which is computed from an applied acceleration, based on assessments of the ODE and MDE events.

For the feasibility study, more detailed analyses will be required, to determine the amount of movement under earthquake loading. This will include deformation analyses, which are of particular importance as deformation in the liner needs to be assessed to ensure that the liner system can operate post deformation.

MATERIAL PROPERTIES

The selection of geotechnical material properties for stability design of a HLF is a significant part of the geotechnical process of design. The selection needs to attend to the requirements of the proposed analyses whilst the reflecting the ground model for the failure mechanism being considered. The introduction of synthetic materials which are typically of lower shear strength than the surrounding ore and soil materials need to be accounted for in the stability analysis. A summary of the material parameters used in the cross-sections are presented in Table 9-4.

PIEZOMETRIC SURFACES

Piezometric water levels in the ore can impact HLF stability, thus the permeability of the ore and drainage system are significant controls on head in the secondary liner system. For the PFS, stability has been assessed with water levels of up to five metres above the liner.

At the feasibility stage, geotechnical testing of the ore, seepage analyses and further stability analyses need to be undertaken.

TABLE 9-4 GEOTECHNICAL PARAMETERS

Victoria Gold Corp. – Eagle Gold Project

Material Type	Unit Weight (kN/m³)	Cohesion (kN/m²)	Friction Angle (°)	Material Description	Ref
Ore	18	0	32	In the absence of laboratory testing, based on previous slope stability analysis parameter	4
Placer Tailings	20	0	37	Sand and Gravel (SP); based on EBA Particle Size Analysis: generally, < 10% fines, 20 - 60% sand and 30 to 70% gravel.	1
Colluvium (Type 1)	14	38	28	Gravelly Silt (ML). Generally, consists of > 30 - 50% fines (silt and clay) content.	1
Colluvium (Type 2)	22	0	36	Sand and Gravel (SW, SM, GW, GM); with occasional silt, medium compacted, unsaturated. Generally, consists of 30 - 50% fines (silt and clay) content.	1, 4
Weathered Bedrock	22	0	38	Weathered Granodiorite, described as sand (SP) with occasional boulders and cobbles. Strength = S2 (approximately 25 MPa), Weathering Grade 4 -5.	
Bedrock	26	Based on shear strength vrs normal strength envelope		Based on field estimation and observations, bottom of DG option 6; in the absence of laboratory strength properties; .RocLab used. UCS = 45 MPa, GSI =60, m_i = 9, D = 0, based on similar materials	2
Waste Rock	26	Based on shear strength vrs normal strength envelope		In the absence of laboratory rock strength, based on UCS = 45 MPa with Barton and Kjærnsli (1981) strength model	3
Compacted Sand and Gravel	24	0	40	In the absence of laboratory testing, based on dense Colluvium type 2 and previous slope stability	4

References

1. Carter, M.; Bentley, S.P., 1991. Correlations of soil properties. Pentech Press. 1st Edition.

2 SRK. 2008. NI 43-101 Preliminary Assessment Dublin Gulch Property – Mar-Tungsten Zone Mayo District, Yukon Territory, Canada (Table 17.2.2.2.)

3. Barton, N., and Kjærnsli, B., 1981. Shear strength of rockfill. J. of the Geotech. Eng. Div., Proc. of ASCE, Vol. 107:GT7: 873-891. Proc. Paper 16374, July.

4. Rescan. 1996. Dublin Gulch Prefeasibility Study - Volume 2. (Table 7.9.1)

CONFINING EMBANKMENT DESIGN

Slope stability calculations were undertaken for the confining embankment with the heap in place up to the final elevation. A slope of 3H:1V was adopted for the embankment based on stability assessments, which allows for a variety of earth and mine waste-rock or rock-fill materials to be used. Unweathered waste rock can be built to a steeper slope, but with an embankment volume of 2,000,000 m^3 required, quantities of waste rock may not be available in the required timeframe.

Toe- and side-drains will be provided to intercept groundwater from the abutments. Drainage beneath the embankment will be provided by a groundwater drainage system, which is linked to that beneath the liner. There will also be groundwater drainage systems at the inlets to the Dublin Gulch diversion and along the route of the diversion, which intercept groundwater before it reaches the main embankment. The main source of water within the embankment will be from rainfall infiltration onto the embankment, which will not be sufficient to build up a significant phreatic surface.

There will be pipes passing beneath the embankment conveying groundwater from beneath the liner. They will not pass through a liner and will be in a gravel trench. Potential for “piping” (loss of material due to flow of water along a pipe through an embankment) will therefore be negligible. There will be no other features passing through the embankment.

The main source of the earth/rock-fill will be from overburden and waste rock generated during mine development. Characteristics and availability (co-ordination with mining schedule) requires confirmation.

The embankment requires a transition zone on the upstream face where particle size reduces from boulder size in the rockfill to silt beneath the lower liner. Specific filter relationships are required for the particle sizes of the zones in order to prevent washing away of materials into the coarser zone in the event of a leak through the liner. Two zones have been assumed at this stage and this will need to be reviewed during both feasibility and detailed design and confirmed during construction.

Foundation preparation beneath the embankment will consist of removing loose sand and gravel from the valley floor, potentially to bedrock at a depth of two to ten metres. For the abutments, topsoil will be removed and excavated down to competent material, to a depth of one to two metres, with isolated pockets of deeper loose material.

SOLUTION MANAGEMENT

Solution management of the HLF comprises the efficient management of the solution delivered to, permeating through, and reporting from under the stacked heap; and the secure containment of pregnant and barren leachate leading to optimum metal recovery.

The solution management objectives of the heap leach facility are:

- the system is to operate as a closed system with zero release of solution to the environment
- the solution ponds are to contain operational flows with run-off during normal operational and storm rainfall events, and
- in extremely wet seasons, excess solution is to be stored and treated until the quality of the water meets the required regulatory quality requirements for release.

Figure 9-12 presents a schematic of the solution flow and is described as follows:

- Barren and recycled solution will be applied to the heap through a series of buried dripper type and (summer only) sprinkler applicators.
- The solution will permeate through the heap, where it will be contained by the lining system and directed via collection pipes to the collection well.
- Pregnant solution will be pumped to the Adsorption/Desorption/Recovery (ADR) plant.
- A spillway will be provided at the top of the in-heap pond to discharge excess solution to the events pond via 450 mm dia. HDPE pipes.
- The event ponds will be zero release and all solution will be pumped to the ADR plant.
- After removal of gold in the ADR plant, barren solution will be pumped to the heap leach pad.
- In extremely wet seasons, the resulting excess barren solution in the ADR plant will be treated and released to the polishing pond before release via the SCP.

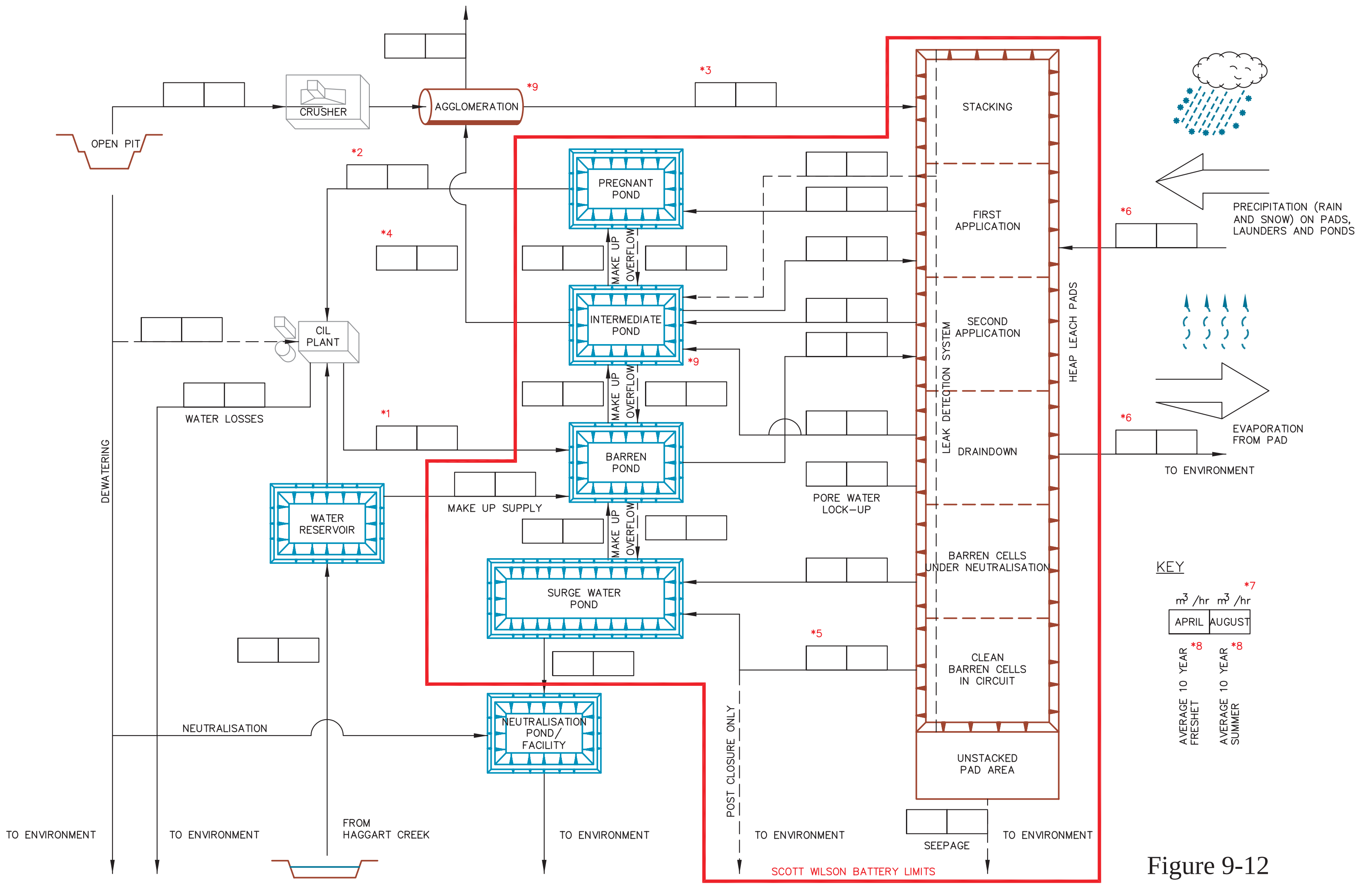

Figure 9-12

CASE	SUMMER 10 YEAR AVERAGE

NOTES
*1 KCA IRRIGATION RATE
*2 KCA CIL PLANT DEMAND
*3 KCA WATER IN ORE
*4 KCA AGGLOMERATION DEMAND
*5 KCA DETOXIFICATION TIME
*6 STANTEC DATA
*7 PROJECT UNITS
*8 PROJECT DESIGN BASIS
SNOW AND STORM IN MAY
*9 KCA REQUIREMENTS

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Yukon Territory, Canada

Process Water Balance

June 2010

The above process will be repeated until cessation of operations, when the heap will be rinsed and treated until the quality of the untreated rinse water meets the required regulatory requirements for release.

IN-HEAP POND SIZE SELECTION

The in-heap pond is designed to provide for the fluctuating water volumes in the system caused by precipitation events, operational parameters, dead storage and heap drain-down. The gross volume of the in-heap pond will be 3,247,000 m^3. The available volume is the difference between the saturated water content (22%) and the residual water content (8.6%), which results in a net volume of 435,000 m^3. A summary of the pond volume calculations and assumptions are summarised below:

- *Dead Storage.* Pumps require a minimum operating head, which results in a volume that cannot be pumped. The facility has been designed with a sump to minimise this volume and it is assumed to be negligible (less than 100 m^3).

- *Minimum Operational Volume.* Based on ensuring the supply of solution to the ADR plant for a period of 2 days at an abstraction rate of 1,300 m^3/hr, a minimum operational volume of 61,680 m^3 is required.

- *Maximum Operational Volume.* To provide the required storage for snow melt, the in-heap pond should be at minimum operational volume by the end of April. To achieve this for Phase 1, a maximum operational volume of 215,000 m^3 is required in October of each year to be able to accommodate the snowmelt.

- *Storm events.* The total rainfall in a 24-hour, 1 in 100 year storm event is 60 mm. For Phase 1, the heap leach area is 300,000 m^2, which results in a storm water volume of 18,000 m^3.

- *Heap Drain-down.* In the event of an operational power loss where pumping of the solution stops, the saturated heap will continue to drain-down. The worst case scenario is where drain-down occurs from the highest lift. The maximum volume of solution within the pore space that will be released from the heap for Phase 1 (30 m lift height) is assessed as 188,000 m^3 based on the difference between the leaching (13.5%) and residual moisture content (8.6%).

- *Freeboard.* If the in-heap pond reaches the spillway level, a further depth of 1 m is required for the overflow to reach the maximum capacity of the spillway pipe. An additional 500 mm freeboard is provided.

In normal operating conditions the in-heap pond can store freshet, storm and drain-down volumes. For Phase 1, the in-heap pond (435,000 m^3) can store the combined worst case scenario of maximum operational volume, storm event and drain-down (426,000 m^3). In Phases 2 and 3, this combination will result in the in-heap pond discharging via the spillway into the events ponds, which provides additional storage.

FURTHER WORK

Optimisation and improvements to the solution management will be undertaken during feasibility study and could include:

- confirming sources of winter make-up water to reduce the maximum operating volume
- consideration of inter-lift liners to reduce the heap drain-down volume
- verifying the residual, leaching and saturated moisture contents and the variability under the varying pressures within the heap
- assess viability for removal of snow from the HLF
- developing management criteria for solution volumes to address annual and seasonal variations, i.e., to establish rules for controlling pond levels (make-up water and treat and release) in advance of freshet and storm events and planned shut downs
- assess the events ponds for winter plant drain-downs, and
- review the potential for collector pipes on the side valley with separate collector pipes to direct the flow by gravity direct to the plant. It may be feasible to use these collectors to intercept the flow from specific heaps and thus manage the various solution grades.

LEACHATE COLLECTION SYSTEM

To provide the required flow to the leachate collection sump, a pipe network will be provided beneath the heap (Figure 9-13). Pipes will also be provided up the slope of the heap to reduce the phreatic surface and reduce the retention time of solution in the heap. The pipes will be located immediately above the liner, within the liner cushion layer and consist of:

- 100 mm diameter HDPE perforated pipes at 25 m centres placed in a 300 mm wide by 600 mm deep trench backfilled with clean gravel, connecting to
- 300 mm diameter HDPE un-perforated collector pipes placed in a 600 mm wide by 600 mm deep trench; backfilled with excavated material;

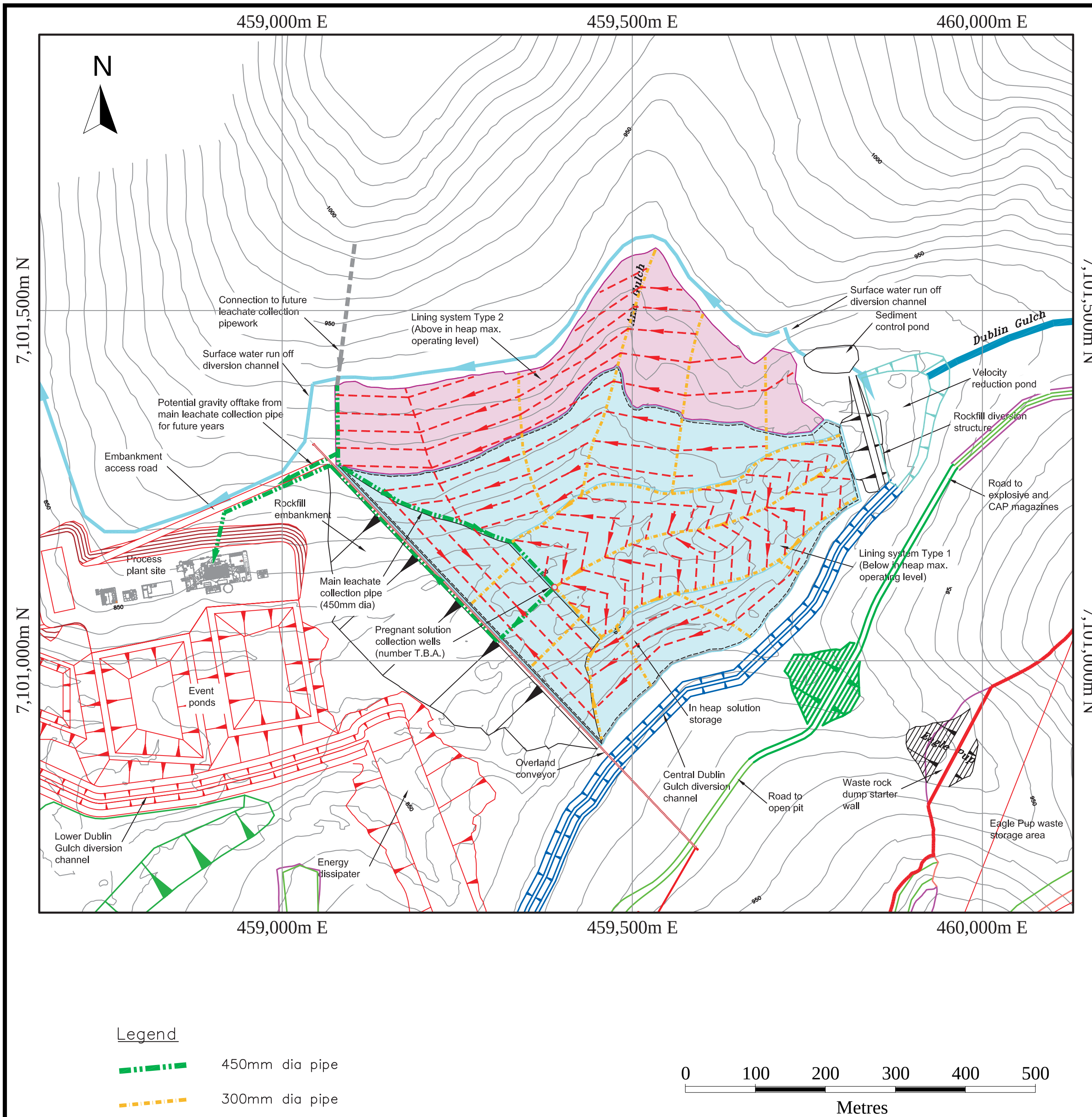

Figure 9-13

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Leachate Collection and Removal System Pipework Layout at 2014 Stack Height

June 2010

For the high earth pressure in the heap, creating a trench for the pipes is important to prevent crushing of the pipes, i.e., the cushion layer will be placed first and compacted, with the pipes placed in excavated trenches.

SEDIMENT CONTROL

Sediment control comprises two key elements

- runoff diversion and sediment control features, and
- infrastructure surface runoff collection and SCPs.

These structures will prevent sediment impacting the environment, and will be constructed at locations to prevent sediment from entering streams at source, or prior to runoff discharge into a natural water courses.

Sediment control works at site will include minimizing land clearing in advance of heap expansion, provision of silt fences, location of temporary diversions, stabilising diversion channels, temporary piping to the SCPs, etc. These works will be detailed as part of feasibility design.

Runoff from undisturbed areas above the catchment of the HLF and WRSAs is conveyed through channels, provided with erosion protection and routed through a SCP before release. When the facilities are raised, these same channels are used to intercept runoff from the disturbed catchments. The runoff diversions have not been detailed as part of this study and are shown only on the general arrangement drawings.

Runoff from the heap leach, although unlikely, will be prevented from discharging into the environment by constructing a minimum 1 m high bund wall around the toe of the HLF.

The highest potential for generating sediments is during construction of the facilities when topsoil is removed and the subsoil disturbed. Since the HLF and WRSAs will be constructed in phases throughout the mine life, interim stages require additional sediment control works. Sediment control works constructed at the start of the works are designed to take into account the phased construction.

There are two key SCPs;

- the HLF and plant site SCP, and
- the WRSAs and open pit SCP.

There will also be additional, smaller, SCPs or other appropriate sediment control measures for roads.

The volume required for the HLF and plant site SCP varies throughout the project. The largest capacity required is 130,000 m^3 for construction of the Dublin Gulch diversion. Throughout the remainder of the project, the capacity required is 30,000 m^3. Since the larger capacity is for a relatively short duration, it is proposed to make use of one of the events pond (capacity 100,000 m^3) and provide a permanent SCP for the remaining 30,000 m^3.

The start-up construction sequence ensures that sediment control is provided ahead of the main works. The main SCP will be constructed first, to enable works at the plant site and HLF to commence. Secondly, the Dublin Gulch diversion will be constructed. This will convey the drainage from the SCP at the toe of the Eagle Pup WRSA, which is to be constructed third. Runoff from the Platinum Gulch WRSA will be directed into a small SCP, and then directed down to the main SCP, along with water from the open pit.

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APPENDIX B
SCOTT WILSON RPA DESIGN BASIS FOR HEAP LEACH PAD AND ASSOCIATED FACILITIES

Design Basis
Eagle Gold Project - Heap Leach Facility

<table>
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<tr><td>Reference</td><td colspan="2">TN-DSNB</td></tr>
<tr><td>Originator</td><td>Reviewer</td><td>Revision</td><td>V2</td><td>V3</td><td>V4</td><td>V5</td><td rowspan="2">Template Version 02</td></tr>
<tr><td>SD</td><td>DJB/AMW</td><td>Date</td><td>21-09-09</td><td>23-09-09</td><td>29-10-09</td><td>18-11-09</td></tr>
</table>

INTRODUCTION

This document presents the assumed civil, hydrological and geotechnical engineering design parameters for the Eagle Gold Project Heap Leach Facility (HLF) and summarises applicable design standards and design criteria and defines the battery limits for the design scope.

The presented design parameters have been largely based on information supplied by other project parties and, where new data is not available, information contained in previous studies carried out for the project site.

DESIGN STANDARDS

There are currently no published international standards for the design and construction of dump and heap leach facilities; however there is significant reference material highlighting the pertinent design and operational issues.

Similarly, the Yukon Territory does not have regulations specifically for heap leach facilities, but instead relies on regulations from other regions and precedence from other projects. It is understood that the only HLF that has been permitted in the Yukon is at Brewery Creek, the design and permitting of which, according to previous design work by Sitka Corporation, was based on the Nevada State guidelines (Ref. 2). Also, the Walter Creek Valley Fill Heap Leach Facility, located at Fort Knox Mine near Fairbanks, Alaska (Ref 1) might be used as a reference facility. The design and operation of the Fort Knox HLF is likely to encounter similar obstacles to those present at the Dublin Gulch site.

Previous studies for a HLF at the project site have been published and therefore it has been assumed that the new pre-feasibility facility design will be required to meet the same standards.

Table 1 summarises the main technical and permitting requirements for the State of Nevada for the key elements of the HLF design.

Table 1: Heap Leach Pad Permitting Requirements (State of Nevada, USA)		
Heap Leap Feature	**Description**	**Reference**
Leach Pad Liner	System must have containment capability equal to or greater than that of a composite liner consisting of a synthetic liner over one foot of compacted soil at a permeability of 1 x 10^{-6} centimetre per second or 1 x 10^{-5} centimetre per second if a leak detection system is used beneath portions of the liner with the greatest potential for leakage	Ref 2
	Synthetic liners must be rated as having resistance to fluid passage equal to a permeability of less than or equal to 1 x 10^{-11} centimetre per second	Ref 2
	Allow a maximum quarterly average leakage rate of 300 litres per day per cell into the leak detection and recovery system and a maximum yearly average of 100 litres per day per cell.	Ref 3
Solution Ponds	System must have a primary synthetic liner and a secondary liner that meet the above-described liner specifications. The synthetic liners must be separated by a fluid transmission layer which is capable of transmitting leaked fluids at a rate that will ensure that excessive head will not develop on the secondary liner	Ref 2
Solution Management and Containment	Process components must be demonstrated to have the capacity to "withstand" the runoff from a 100-year, 24-hour precipitation event. In addition, facility fluid management systems must demonstrate the capability of remaining "fully functional and fully contain all process fluids including all accumulation resulting from a 25-year, 24 hour precipitation event. The foregoing standards are minimal and additional containment capacity may be required if surface water bodies or human populations are in close proximity to the facility, or if groundwater is shallow	Ref 2
Foundations	Consider static / dynamic loads and differential movement or shifting	Ref 2
Construction QA/QC	Regulations require that each applicant develop and carry out a quality assurance and quality control program for liner construction. A summary of the QA/QC program must be submitted with as-built drawings after construction has been completed	Ref 2
Neutralization/Detoxification of Spent Ore	Spent ore, whether it is to be left on pads or removed from a pad, must be rinsed until it can be demonstrated either the remaining solid material, when representatively sampled does not contain levels of contaminants that are likely to become mobile and degrade the waters of the state under the conditions that will exist at the site, or, the spent ore is stabilized in such a manner as to inhibit meteoric waters from migrating through the material and transporting contaminants that have the potential to degrade the waters of the state"	Ref 2

Compliance with the aforementioned permitting criteria in the most part also implies that more general requirements, such as the International Finance Corporation's (IFC) World Bank guidelines (Ref. 11) are also met. The IFC guidelines apply to mining operations in general with one section specific to HLF as follows:

"*Operators should design and operate surface heap leach processes with:*

- *Infiltration of toxic leach solutions should be prevented through the provision of appropriate liners and sub-drainage systems to collect or recycle solution for treatment, and minimize ground infiltration;*
- *Pipeline systems carrying pregnant solutions should be designed with secondary bunded containment;*
- *Leak detection equipment should be installed for pipeline and plant systems with appropriate leak response systems in place;*

- *Process solution storage ponds and other impoundments designed to hold non-fresh water or non-treated leach process effluents should be lined, and be equipped with sufficient wells to enable monitoring of water levels and quality."*

With reference to the last bullet point above, it would be appropriate to consider installing monitoring wells around the HLF to monitor water levels and quality.

The pre-feasibility (PFS) report is to include a table demonstrating compliance with these criteria and guidelines.

PRINCIPAL DESIGN OBJECTIVES

Taking in to account regulations, guidelines, best practice and experience, the principal objectives of the PFS design of the Eagle Gold Project HLF are to:

- Ensure complete protection of the regional groundwater and surface water flows both during operations and in the long-term.
- To satisfy the environmental regulatory requirements of the Yukon territory and the Department of Indian and Northern Development (DIAND)
- Provide permanent, secure storage and total confinement of the leach ore within a fully engineered facility.
- Effectively collect and convey solutions for in-heap pregnant solution storage to ensure maximum recovery. In-heap storage of solution will be utilised to provide the necessary winter time storage of solution in an above freezing environment.
- Minimise the quantity of surface water runoff entering the facility and coming into contact with the process solutions.
- Provide additional external facilities (events ponds) to accommodate excess solution and rainfall/snowmelt when hydrological events exceed the storage capacity of the heap.
- Stage develop the facility where possible to minimize the environmental disturbance at any one time and to distribute capital expenditure over the life of the facility.
- Monitor all aspects of the facility to ensure that the design objectives are met and that there are no adverse environmental impacts.
- Reclaim the facility to a condition compatible with the original land use and is stable under extreme precipitation events and seismic events.

PROJECT PARAMETERS AND CRITERIA

The parameters and criteria presented in Table 2 form the basis of design for the HLF. A number of parameters require to be confirmed (marked TBC) on completion of work by others. The owner of the presented parameters and criteria are also indicated. Where current data is not available applicable source references to previous studies are provided.

Table 2: Heap Leach Facility - Project Parameters and Criteria			
ITEM	**Quantity/Criteria**	**Owner**	**Reference**
Operations			
Mine Life	10 years TBC	Project	TBC
Life of mine (LOM) ore quantity to be stacked on heap leach pad	52 – 65 Mt TBC	Project	TBC
Crushing rate, stages	Delivery to primary crusher 24,000 t/d (6Mtpa) Primary Crusher Type Gyratory Secondary Crusher Type Open circuit Tertiary/Quaternary Crusher Type MP/HPGR	KCA	
Final ore crush size	5 mm TBC	Project	TBC
Ore geotechnical parameters	32 degrees, 0 Cohesion, unit weight 18kN/m^3	SWM	
Leach pad type	Permanent, multiple lift	Project	
Initial stacking capacity	Minimum of 2 years	Project	
Stacking schedule	250 days per year	Project	
Stacking Rate	1430 t/h	KCA	
Process flow diagram	TBC	KCA	TBC
Agglomeration	Belt Type, 2 – 3 kg/t cement, 1 kg/t lime.	KCA	
Stacking method	Conveyor-stacker	Project	
Stacked dry density of ore	Initial - 1.60 t/m^3	KCA	
Stack / lift height	10 m lifts, max heap height - TBC	Project	TBC
Overall slope angle of stacked ore	1h : 2.5 v (22 degrees)	SWM	Ref. 4
Coefficient of permeability of stacked ore	0.05 cm/s (typical). Initial permeability and post-leach permeability at confining pressures 10m to 100m TBC	KCA	Ref. 5
Ore solution storage	0.26 m^3 of solution per m^3 of ore TBC	KCA	TBC - Ref. 4
Ore moisture contents	Initial 3.0%, leaching 12.8%, residual 6.9% TBC	KCA	TBC - Ref. 7
Leach schedule	350 days per year	Project	
Solution application method	Drip emitters (buried during cold weather operations)	KCA	
Solution application rate	10 l/hr/m^2	KCA	
Irrigation area	160,000 m^2 TBC (Calculated based on the nominal solution application flow of 1600 m^3/hour and solution application rate of 10 l/hr/m^2)	KCA	TBC
Solution application flow	1,600 m^3/hour (nominal) 1,900 m^3/hour (design)	KCA	
Hydrology and Climate (1,000 m elevation)	**Quantity/Criteria**	**Owner**	**Reference**
Total annual precipitation	454 mm Superseded – see Stantec data	Stantec	Ref 6,8
Annual Rainfall (57% total annual precipitation)	259 mm Superseded – see Stantec data	Project	Ref 6,8
Annual Snowfall (43% total annual precipitation)	195 mm Superseded – see Stantec data	Project	Ref 6,8
Maximum Rainfall – one month, two month, three month	94 mm, 143 mm, 188 mm Superseded – see Stantec data	Project	Ref 6,8
Average extreme 24-Hour Rainfall	22.9 mm Superseded – see Stantec data	Project	Ref 6,8
100-yr 24-Hour Rainfall	43.7 mm Superseded – see Stantec data	Project	Ref 6,8

Maximum Snowpack (mm water)	164 mm Superseded – see Stantec data	Project	Ref 6,8
Annual Lake Evaporation (mm)	450 mm Superseded – see Stantec data	Project	Ref 6,8
Sublimation (% of snowfall)	13 % Superseded – see Stantec data	Project	Ref 6
Mean Annual Temperature	-3.7°C Superseded – see Stantec data	Project	Ref 6,8
Seismicity	**Quantity/Criteria**	**Owner**	**Reference**
Design Basis Earthquake (DBE)	0.078g (1 in 475 yr return period)	SWM	Ref 5
Maximum Design Earthquake (MDE)	0.10g (1 in 1000 yr return period)	SWM	Ref 5
Geotechnical Stability	**Quantity/Criteria**	**Owner**	**Reference**
Minimum embankment Factor of Safety	Static Loading - 1.5 (impounding), 1.3 (non-impounding), Seismic Loading - 1.15	SWM	Ref 4
Permafrost	Permafrost encountered in the pad or pond foundations, if thaw unstable, will be removed	SWM	Ref 4
Containment Dyke	**Quantity/Criteria**	**Owner**	**Reference**
General	To provide stable confinement of the ore and in-heap storage of solution.	SWM	Ref 4 Ref 10
Standards	Designed to Canadian Dam Safety Association (CDSA) standards	SWM	Ref 4
In-heap storage	To attenuate variation in flows into the heap to allow a constant flow to the process plant and minimise treatment and release. 1. Minimum storage volume (to ensure supply to process plant) equivalent to 48 hours supply. 2. Maximum storage volume to allow for 1:100 year, 24-hour storm event 3. Maximum storage volume to allow for draindown of water stored in voids above in-heap pond level.	SWM	Ref 5
Overflow spillway	Sized to pass 100 year return period peak flow assuming heap storage is at capacity at the start of the event.	SWM	Ref 4 (and Nevada)
Groundwater	**Quantity/Criteria**	**Owner**	**Reference**
General	A drainage system is required beneath the liner system to control groundwater pressures. The system is to collect groundwater in a controlled manner before discharge downslope of the containment embankment. Note, unforeseen seepage may be encountered during construction, for which additional measures may be required.	SWM	Ref 4
Pad Liner System	**Quantity/Criteria**	**Owner**	**Reference**
Ore cushion	To protect the lining system from damage by ore placement whilst not impacting the conveyance of solution to the recovery wells.	SWM	Ref 4
Geosynthetic liner	Suitable liner material to provide required puncture resistance, elastic strain range and resistance to solution attack together with good cold weather performance.	SWM	Ref 4
Soil liner	Compacted fine grained soil below the geosynthetic liner to provide a composite liner to minimise leakage. Objective maximum permeability 1×10^{-5} cm/s.	SWM	Ref2//Ref 4
Geotextile	To be used where filter relationships are not satisfactory between soil materials in the lining system.	SWM	Ref 4
Leak detection and recovery system (LDRS)	A system to collect leakage through the composite liner and convey it to monitoring points. The system to comprise drainage gravel and a network of drainage pipes to collect and convey any leaked solution.	SWM	Ref 4
LDRS monitoring	Monitoring of the flow into the LDRS to ensure that allowable rates (determined by permitting authorities) are not exceeded.	SWM	Ref 3/Ref4

	Mitigation procedures to be defined should rates be exceeded.		
Frost protection	Liner to be protected from seasonal frost penetration by maintaining a minimum of 3 m of dry ore above the cushion layer.	SWM	Ref 4
Solution Recovery Wells	**Quantity/Criteria**	**Owner**	**Reference**
General	Solution is to be recovered from the heap through vertical pumped wells installed in the in-heap solution storage area TBC	SWM	TBC - Ref 4
Event Pond(s)	**Quantity/Criteria**	**Owner**	**Reference**
General	Events pond(s) to be constructed downstream of the pad to store excess solution and natural inflow that cannot be stored in the in-heap storage.	SWM	Ref 4
Standards	Confining structure to be designed to same standards as the ore containment embankment	SWM	Ref 4
Overflow spillway (from HLF)	Sized for 100 year return period peak flow assuming heap storage is at capacity at the start of the event. No spillway to be provided in the events pond (all flows to be pumped).	SWM	Ref 4
Storage Capacity	Sized to store 48-hour draindown volume, the design hydrological inflow and the operating solution volume less the storage volume provided in-heap	SWM	Ref 4/Ref 5
Liner system	Lining to comprise a primary and secondary geosynthetic liner separated by a geonet drain (LDRS layer) and a compacted soil layer between the secondary liner and the subgrade.	SWM	Ref 4
Polishing Pond(s)	**Quantity/Criteria**	**Owner**	**Reference**
General	Effluent from the water treatment plant to be directed to the polishing pond for detention and precipitation of suspended solids. After polishing, water to be pumped to the sedimentation pond before discharge. TBC	KCA	TBC - Ref 4
Surface Water Diversion	**Quantity/Criteria**	**Owner**	**Reference**
General	Surface water diversions to be provided around the pad and ponds to divert natural run-off water away from the structures. Diversion channels to be designed to convey peak flows from a 100 year return period storm event with appropriate erosion protection measures.	SWM	Ref 4
Sediment Control	**Quantity/Criteria**	**Owner**	**Reference**
General	Sediment control to be provided for the pad, the events and polishing ponds, pit and waste rock areas using conventional settling ponds. Settling ponds to be sized to remove inflowing suspended sediment down to medium silt sizes for events up to a 10 year return period 24 hour duration storm. Emergency spillways to be provided for each pond with a capacity sufficient to convey the flow from a 100 year return period storm event. TBC	SWM	TBC - Ref 4
Construction Material Sources	**Quantity/Criteria**	**Owner**	**Reference**
General	All engineering fill materials shall be sourced locally where possible.	SWM	Ref 4
Topsoil stockpiles	Stockpile topsoil such that it is suitable for re-use at closure	Stantec	

DESIGN BATTERY LIMITS

Scott Wilson (Ashford) shall be responsible for the design, to pre-feasibility level, to the identified battery limits of the elements identified in Table 3.

Table 3: Heap Leach Facility – Design Battery Limits		
ITEM	**SW Ashford scope**	**Battery Limit**
Heap leach pad.	Liner, leak detection, recovery systems and in-heap solution storage pond.	Top of cushion layer (above liner)
In-heap pond spillway	Spillway and pipeline to events pond	None
Leachate collection and removal system (LCRS)	In-heap pipework and vertical solution pump well	Inlet at vertical solution well pump
Leak detection and recovery system (LDRS upper and lower)	LDRS layers and pipe network.	Inlet at inter-liner pumps
Confining embankment	Embankment	Access road surface
Events ponds	Embankments, liner and inflow pipeline from HLF	Inlet of outflow pump to plant and HLF
Surface water runoff diversions for pad and ponds	Channel to sediment control pond	None
Sediment control ponds	Embankments, liner, inflow channel or pipeline and outflow pipeline.	Inlet from plant, inlet from polishing pond and inlet from camp
Polishing ponds	KCA scope	-
Closure and site reclamation.	Closure of all SW (Ashford) designed items. Physical stability of re-contoured surfaces.	Top of re-contoured surface. Chemical stability

REFERENCES

1. Fairbanks Gold Mining Inc. 2006. Fort Knox Gold Mine, Alaska - Walter Creek Valley Fill Heap Leach Facility Project Description.

2. JBR Environmental Consultants for the Utah Department of Environmental Quality. 1996. Design and Construction Guidance Document for Precious Metals Heap Leach Extraction Facilities.

3. Sitka Corporation. 1996. Liner Evaluation design documentation.

4. Rescan. 1996. Dublin Gulch Feasibility Study – Volume 2.

5. Knight Piésold. 1996. Report on Feasibility Design of Heap Leach Pad and Associated Structures. Ref. No. 1882/4.

6. Clearwater Consultants Ltd. 1996. Site Hydrology Memo CCL-DG3

7. Clearwater Consultants Ltd. 1996. Heap Leach Facility Water Balance Design Memo CCL-DG4.

8. Hallam Knight Piésold. 1996. Dublin Gulch Initial Environmental Evaluation Vol II Environmental Setting.

9. Hallam Knight Piésold. 1996. Dublin Gulch Initial Environmental Evaluation - Vol III Environmental Mitigation & Impact Assessment.

10. Golder Associates. 2007. Memo 073-95057: Assumptions used for the development of Heap Leach Facility Conceptual Design and Capital Cost Estimate.

11. International Finance Corporation and World Bank Group. 2007. Environmental, Health and Safety Guidelines for Mining.

APPENDIX C
SCOTT WILSON RPA PREFEASIBILITY STUDY SECTION FOR WASTE ROCK STORAGE AREAS

WASTE ROCK STORAGE AREAS

The waste rock storage areas (WRSAs) are located on either side of the proposed open pit, largely downslope and within a kilometre of the pit edges. The Eagle Pup WRSA is located in the lower part of the Eagle Pup catchment area, covering approximately 80 ha of the 127.2 ha catchment area. The Platinum Gulch WRSA occupies 33 ha of the upper section of the Platinum Gulch catchment.

The Eagle Pup WRSA is designed to provide permanent storage for approximately 55 Mt of waste rock, with potential capacity for more. The Platinum Gulch WRSA is designed to provide permanent storage for approximately 11 Mt of waste rock. Waste rock will be deposited year-round, at a rate of approximately 8 million tonnes per year, or 10,000 m^3/day. The dumps will be constructed in lifts with a maximum height of 100 m, with benches between successive lifts to provide a final overall slope of 2.5H:1V.

A series of previous studies are relevant to the WRSA designs, including a feasibility design carried in the late 1990s of a facility on the Eagle Pup site, of comparable dimensions and location. Certain aspects of these studies, particularly stability and water balance are therefore directly applicable to the current Eagle Gold Project and are reviewed and adopted in the light of field observations and investigations and modifications to Project parameters.

SITE SELECTION

Four potential sites for the location of WRSAs were identified, including all the main catchments draining the proposed open pit area i.e., Platinum Gulch, Stuttle Gulch, Eagle Pup and Stewart Gulch.

Based on a comparison of capacity, location and geology, the preferred locations for waste rock disposal are the Platinum Gulch and Eagle Pup catchments. Although Stuttle Gulch is closer to the open pit than Eagle Pup, it would interfere with crushing and conveying infrastructure. Platinum Gulch is proposed for use in the initial years of operation, followed by Eagle Pup.

The design of the various elements of the Eagle Pup WRSA is developed in the following sections, together with supporting sections on water balance and stability assessment. These design elements were used to assess the Platinum Gulch WRSA, a late addition to the PFS, however, a separate detailed assessment is required for the feasibility design.

SITE CHARACTERISTICS

TOPOGRAPHY AND GEOLOGY

The Eagle Pup valley has narrow upper reaches at an elevation of approximately 1,500 masl, with relatively shallow slopes draining the ridge behind the open pit, but then the valley opens out with particularly steep slopes in its mid reaches. These slopes flatten in a downstream northerly direction in the central valley area (see Figure 6-9) to an elevation of approximately 900 masl at the confluence with the Dublin Gulch valley. On the western side, valley slopes include rock bluffs, below which the valley kinks north-west. The lower part of the valley is characterised by a narrowing valley outlet bordered by rounded catchment divides to Stewart and Stuttle Gulches.

The geology of the lower catchment bedrock conditions were investigated in the late 1990s (for the Rescan 1996 Feasibility Study) and also in 2009 (BGC, 2009), with a series of over 30 trial pits, three boreholes, laboratory testing of samples and in-situ geotechnical testing. Bedrock conditions comprise intrusive granodiorites, the outcrop of which strikes SW-NE and is located in a central section cutting through the Eagle Pup catchment. The intrusion occurred into a series of clastic rocks (metasediments comprising schists, phyllites, quartzites etc.).

The superficial materials of the lower catchment area comprise largely colluvium derived from bedrock weathering. Talus covered slopes are present on some of the steeper slopes below rock bluffs (north-west facing slopes between 970 masl and 1,320 masl, and to a lesser extent, the east facing slopes of the western ridge). In the centre of the kilometre long, 100 m wide valley floor, in the lower central part of the valley, some fluvial reworking of the colluvium sediments is present. The Sitka 1996 report also identified the presence of till. This surficial (potential overburden) material has been shown to vary considerably in thickness from 0.5 m to 14 m and is estimated as follows:

- upper catchment areas, shallow slopes less than 20 degrees – up to 7 m of weathered bedrock
- ridge lines – 0.5 m to 1.0 m of weathered bedrock
- valley side slopes > 20 degrees – rock outcrops or colluvium of between 1 m and 2 m, and
- creek bed and valley floor – colluvium up to 3 m and alluvium in the lower valley floor up to 6.5 m over weathered bedrock to >10 m.

Organic soils are widespread but are of limited thicknesses up to depths of 0.3 m.

The upper catchment area has not been investigated, however, comparable flat-topped ridge locations in the granodiorite and metasediments indicate a thin organic soil over a deep, up to 6.5 m, weathered bedrock profile.

The variable surficial thickness is an issue for the foundation conditions for defining depths to competent free draining soils or bedrock.

The specific local features of the Eagle Pup WRSA include a north-facing aspect and an elevation of between 900 masl and 1,150 masl.

HYDROLOGY

The hydrology of the Project area, including the WRSA sites, is presented in detail in Stantec's report (2009). Of particular note for the WRSAs is that the peak stream flows occur in the spring in association with freshet events, (snow melt or rain-on-snow events) with flows gradually disappearing following the disappearance of the snow. Sizeable flood events may also occur in the late summer due to intense rainstorms and are particularly significant for small catchments. The smallest discharges occur in mid winter, when streams such as Eagle Pup freeze entirely, reducing their winter flows to zero.

The peak flows are pertinent to the design of the WRSA foundation rock drains and surface runoff collection and diversion ditches. Knight Piésold (1996) provided a feasibility analysis of the flows for small catchments based on the Rational Method described in the MOE Manual of Operational Hydrology in B.C. and the Hathaway. The analysis for structures in a similar-sized catchment in the same location is presented in Table 6-14.

TABLE 6-14 GROUND AND SURFACE WATER PEAK FLOW DESIGN ASSUMPTIONS
Victoria Gold Corp. – Eagle Gold Project

WRSA Structure	Return Period	Event Size	Peak Flow (m^3/s)
Surface diversion ditches around the WRSA	1 in 200 year	24 hour event	0.5 to 1.2
Operational surface collection ditches on the WRSA benches	1 in 10 year	24 hour storm event.	0.6
Foundation Rock Drain	1 in 200 year	24 hour storm event.	1.5

HYDROGEOLOGY

The hydrogeology of the Project area, including the WRSA sites, is presented in detail in Stantec's report (2009). Of particular note for the WRSAs is the unconfined flow system within the bedrock. Groundwater is recharged at higher elevations in the thick weathered horizons of the upland areas (above the proposed open pit area) and slowly discharges throughout the year onto the steep slopes of the upper part of the catchment from a series of small springs. The resulting surface flows are intermittent and the flows sink back into the valley colluvium and alluvial materials, only to finally reappear lower down the catchment valley (observed at elevations of around 950 masl in late summer of 2009).

Measurements of groundwater levels in the Eagle pup catchment indicate water levels present within the superficials and weathered bedrock a few metres below ground level, however, this is variable across the catchment, reflecting a subdued form of the topography, but altered by thickness of superficials and weathered bedrock. Typical values of between two metres and seven metres below ground level are reported (Sitka 1996), however, seasonal variations were not identified.

The hydraulic conductivity of the bedrock is relatively low and assessed to be 1.5 x 10^{-6} m/s (Knight Piésold 1996), and the foundation soils of sand and gravel with some silt beneath the WRSA are of the order of 1.9 x 10^{-5} m/s in a thawed state and 10^{-11} m/s in a frozen state.

For the WRSA water balance the groundwater losses into the bedrock foundations have been estimated at 2% (Knight Piésold 1996).

PERMAFROST

Permafrost will generate issues for the WRSA design in two regards, the potential for thawing of:

- seasonal frost zones, and
- permafrost zones that include excess ice.

A zone of near surface seasonal frost is recorded in the test pitting and is very evident in frost heave soils and the frost-jacking (out of the ground) of the monitoring well KP 95-151 installed in 1995 (Knight Piésold 1996). Thermistor measurements indicate the marginal temperatures in this zone and thaw analysis by Knight Piésold support the observation of about three metres of seasonal thaw. With the stripping of the insulating organic layer, the seasonal frost zone can be expected to thaw earlier and more deeply, leading to excess pore water pressures. Thawing rates were investigated and assessed to generate limited excess pore pressures that would dissipate rapidly once thawing occurs (Knight Piésold 1996).

The permafrost of the Project area, including the WRSA sites, is assessed in BGC's report (BGC 2009). Of particular note for the WRSAs is the presence of a discontinuous permafrost zone within the valleys in both the superficials and in the near surface weathered bedrock. The permafrost depth is recorded as typically occurring from about three metres depth (Sitka 1996 and BGC 2009). Where bedrock or overburden is frozen without excess ice, the permafrost is unlikely to affect the WRSA stability. Test pits, however, have encountered zones of permafrost with excess ice, and these areas will require treatment by stripping to encourage thawing and drainage, or excavation to thaw stable soils or bedrock before being covered with waste rock, and if necessary monitoring and limited dump heights.

SEISMICITY

A review of the seismicity of the project area was undertaken for the Heap Leach Facility (HLF) and is presented in Section 9. The design Base Earthquake of 0.078 g for operational conditions and a Maximum Design Earthquake of 0.10 g for post closure conditions as developed for the HLF are also appropriate for the design of the WRSAs.

DESIGN BASIS

DESIGN CRITERIA

Taking in to account regulations, guidelines, best practice and experience, the following design criteria are established for WRSA facility design:

- **provide permanent, secure storage** and total confinement of mine waste rock within a fully engineered facility
- **minimize potential impacts** to the local groundwater system and surface water flows both during operations and post closure long-term
- **rehabilitate the facility** to a condition compatible with the original land use and is stable under extreme precipitation events and seismic events, and
- **satisfy the environmental regulatory requirements** of the Yukon territory and the Department of Indian and Northern Development (DIAND).

PROJECT OBJECTIVES

Taking in to account regulations, guidelines, best practice and design criteria, the principal project objectives of the PFS design of the WRSAs are to:

- develop the facilities in stages to minimize the environmental disturbances at one time during construction and operations and to distribute capital expenditures over the life of the facility

- minimize disturbance to catchment area(s)
- effectively collect and convey drainage beneath the WRSAs
- minimize the quantity of surface water runoff entering the facilities and coming into contact with the waste rock
- provide additional external facilities (sediment ponds) to accommodate drainage and rainfall/snowmelt when hydrological events generate discharges
- address the presence of permafrost and provide appropriate foundation drainage requirements to satisfy stability criteria
- monitor all aspects of the facilities to ensure that the design objectives are met and that there are no adverse environmental impacts, and
- reclaim the facilities to a condition compatible with the original land use and stable under extreme precipitation events and design seismic events.

OPERATIONAL PARAMETERS

The following operational assumptions have been made for the PFS design of the WRSAs:

- mine waste rock schedule is based on outputs from the design of the open pit mine
- a total waste rock production of 65 Mt
- annual waste rock production averaging 8 Mtpa
- hauling and placement of waste rock operations for 365 days/year
- placement of waste materials in benches up to 100 m, by end-dumping from the face of an advancing lift, and
- waste material comprises variable grain size up to boulders of granodiorite and meta-sedimentary rock types.

WRSA DESIGN

GENERAL ARRANGEMENT

The general arrangement of the WRSAs is presented in Figure 6-9 and includes the following elements:

- rock dump and foundation drainage
- starter embankments

- sediment control pond (SCP)
- surface runoff diversion channels, and
- closure works.

The Eagle Pup WRSA is contained within the Eagle Pup lower catchment area, between the elevations of 1,385 masl and 925 masl at the toe. The facility is based on 60 Mt at a density of 1.9 t/m^3, and a phased construction behind a starter embankment that traverses the valley from ridge line to ridge line.

The Platinum Gulch WRSA is located within the upper catchment area of Platinum Gulch, between the elevations of 1,380 masl and 1,000 masl at the toe.

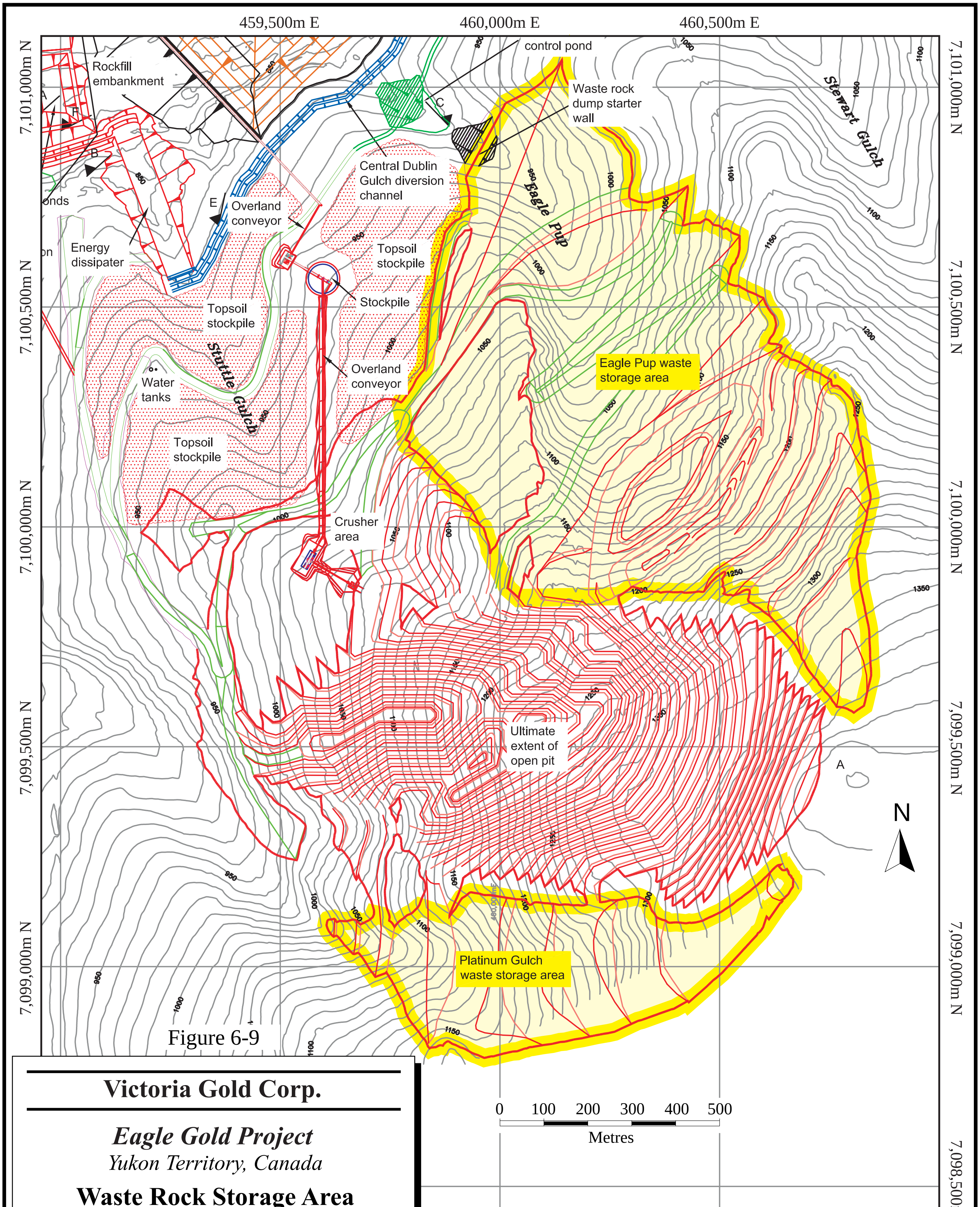


Figure 6-9

Victoria Gold Corp.

Eagle Gold Project

Yukon Territory, Canada

Waste Rock Storage Area General Arrangement

June 2010

ROCK DUMP AND FOUNDATIONS

The rock dump is constructed through a hybrid of ascending lifts waste-rock terraces and some areas of descending platforms and wrap-arounds. The hybrid approach addresses issues of heap stability, environmental impact and provides flexibility for the early mining operation. The approach also mitigates against various operational risks including:

- instability and Health and Safety impacts on operatives and downstream infrastructure from
  - excessive rates of advance on limited lengths of end-tip crests
  - boulder roll out
  - rapid ground pressure build-up
  - thaw-instability beneath the waste rock
- uncontrolled segregation with implications for drainage
- reducing sediment generation and the potential for contamination
- waste rock avalanches in winter.

The design also:

- allows for progressive stripping of topsoil where practical, and
- minimizes disturbance to the environment of one catchment.

The stripping of organic materials is limited to approximately 30 ha of the catchment that comprises continuous slopes of less than 20 degrees. The balance of the catchment is assessed as too steep to be accessed or comprises surficial materials with limited organic material that warrants stripping.

This overall approach to rock dump construction also addresses the availability of waste rock, the anticipated differences in waste rock quality differences, and the requirement for selected materials for drainage to be tipped in the lower terraces and thus provide adequate WRSA stability during operations and post closure.

STABILITY CONSIDERATIONS

The physical stability of the WRSA is critical to its short-term (operational) and long-term (post closure) performance. The WRSA is designed against failure of the waste rock and/or the foundations. The design therefore considers the operational design events and post closure extreme events, of seismic loading under an Operational and Maximum Design Earthquake (ODE and MDE) and Probable Maximum Precipitation (PMP).

Particular aspects that are key to determining stability include:

- waste rock material properties particularly strength characteristics with increased normal stress
- geometry and loading cases (static and seismic)
- location of phreatic surfaces
- pore pressures and thaw instability in the foundations
- mechanisms of failure, and
- deformation strength changes.

MECHANISMS OF FAILURE

Case studies and theory have established that modes of failure in waste rock slopes are dependent in-part on the method of construction. Where material is end-tipped at the crest, the slope remains at an the angle of repose for the waste rock and through a combination of factors not least segregation and height of slope, and failure is commonly along a parallel plane and consists commonly of a number of wedges or segments (Campbell 2000).

Where ascending terrace lifts are utilised, relative increases in strength characteristics are achieved through improved state of particle packing during construction, reduced segregation and reduced (bench) slope heights. Failure mechanisms are more likely to include toe failures, circular and non-circular failures contained within the waste rock and into the foundation materials.

Failure mechanisms post closure can be linked to long-term effects of chemical and physical weathering and moisture-softening mechanisms leading to progressive failure. Settlement can also be expected of between 2% and 7% of the waste rock (Williams 2000).

Given the proposed ascending construction method, the critical failure mechanisms for the WRSA are assessed to include circular and wedge failures through the variable foundation material identified in the catchment, particularly in early years where the WRSA is an isolated structure, with limited stabilising benefit from the side slopes.

STABILITY ANALYSIS - MATERIAL PROPERTIES

The selection of geotechnical material properties for stability design of a WRSA is a significant part of the geotechnical process of design.

The waste rock is expected to contain coarse, angular fragments of metasedimentary and intrusives (granodiorites) up to one metre in diameter. The absence of a significant weathering horizon in the vicinity of the open pit, and limited clay coatings on the intrusive, ensures that other than the fine-grained metasediments, the waste rock is primarily clean, durable and free of any significant fines content.

A comparison of shear strength material parameters considered for stability analyses are presented in Table 6-15.

TABLE 6-15 WASTE ROCK MATERIAL PARAMETERS COMPARISON (MIN – MEAN – MAX)

Victoria Gold Corp. – Eagle Gold Project

Parameter		BGC (2009)	Sitka Corp (1996)	Knight Piésold (1996)	Reference
Base angle of friction, (°)	Metasediments	32	-	-	1a
	Intrusives	28	-	-	1a
Peak angle of friction, (°)	Metasediments	40	40	42.3	1a, 2, 3b
	Intrusives	40	-	42.3	1a, 2, 3b
Residual angle of friction (°)	Metasediments	35	37	-	1a, 3b
	Intrusives	38	-	-	1a, 3b
Joint Roughness Coefficient (JRC)	Bedrock	11 (55% of the dataset)	-	8 -12 (based on assessment from discontinuity logs)	1b
Uniaxial Compressive Strength, (MPa)	Metasediments	21 -77 -168	86	55 (2a) 55 - 100 -190 (2b)	1c, 2a, 2b, 3a
	Intrusives	3 - 134 - 224	127	63 (2a) 63 - 178 - 260 (2b)	1c, 2a, 2b, 3a
	Weathered Bedrock	-	-	4 - 34 - 93	2b

1a. BGC. 2009. Direct Shear Strength Testing Results.pdf and
Direct Shear Results Summary.xls / Direct Shear Strength Testing Results.pdf

1b. BGC. 2009. Rock Mass and Discon Information.xls

1b. BGC. 2009. Point Load Testing Results.xls / Intact Strength.pdf

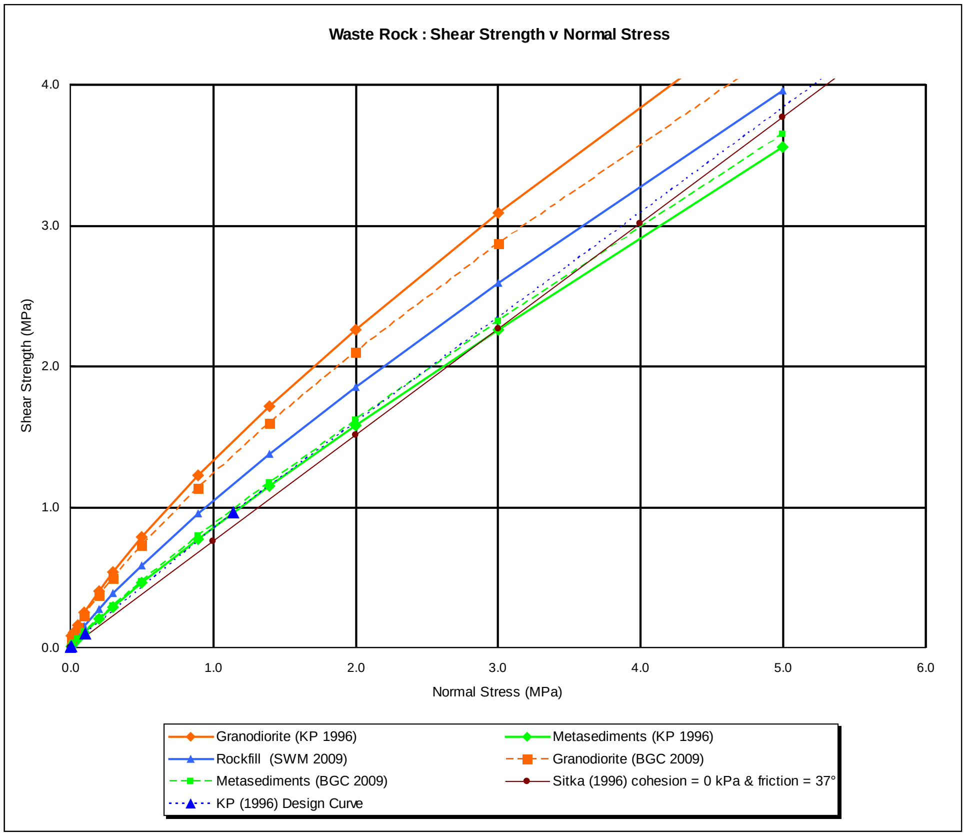
2a. Knight Piésold. 1996. Dublin Gulch Project - Report on the Feasibility of Heap Leach Pad and Associated Structures. (Report No. 1882/4)

2b. Knight Piésold. 1996. Dublin Gulch Project - Report on the Open Pit Slopes. (Report No. 1882/3)

3a. Sitka Corp. 1996. Pit Slope Re-Assessment- Design Memorandum. (Dated: 18/09/96)

3b.Sitka Corp. 1996. Dublin Gulch Project - IEE Addendum Section 8.0, Eagle Pup MWRSA). (Dated 17/10/96).

FIGURE 6-10 WASTE ROCK SHEAR STRENGTH



The core discontinuity data acquired by BGC (2009) has been assumed to reflect to a degree the waste rock surfaces for a consideration of rockfill shear strength based on an empirical relationship developed by Barton and Kjaerlski (1981). A comparison of these waste rock shear strengths with those used in previous analyses are presented in Figure 6-10, and indicate a similarity in the adopted material properties for waste rock.

For the foundation conditions, the assumption of a friction angle of 32º for a shear strength was adopted in previous studies (KP 1996), based on observations and design guidance for the surface stripped of organic material (the remaining superficials) over ‘bedrock’, whilst Sitka (1996) adopted a friction angle of 30º, based on silt shear testing for the organic material assumed to be left in situ, over weathered bedrock superficials with a friction angle of 40º. These assumptions regarding the friction angle and thickness of the superficials are assessed to be the most critical to potential WRSA failures.

PIEZOMETRIC SURFACES

Previous studies have assumed the absence of a piezometric surface in the WRSA due to the limited infiltration and the drainage characteristics of the rockfill. To ensure this condition a rock drain is proposed along the valley floor of Eagle Pup ensuring the continuity of foundation drainage and the removal of unsuitable organic material.

PORE PRESSURE DEVELOPMENT FROM THAWING

Analyses have also accounted for pore pressures developing in early years from thawing of an assumed extensive seasonal frost zone of up to three metres depth (KP 1996).

ANALYSIS

Stability analysis of the WRSA has been previously conducted for both static and pseudo-static (earthquake) conditions for a variety of both operational and post closure configurations (Refs. KP and Sitka 1996). These analyses are based on similar assumptions regarding groundwater and seismic loadings, and conclude a 1: V to 2 H overall slope in the WRSA achieves the minimum factors of safety against slope stability under static and pseudo-static design events.

However, the most marginal of cases is the early, static loading as the WRSA is developed through the valley area and encounters thaw instability and/or weaker foundation materials. Satisfactory stability is only achieved by ascending terraces, with gradual loading of foundations, the removal of organic material and unsuitable alluvial deposits, and controlled deposition over seasonal permafrost.

ROCK DRAIN

The Eagle Pup lower catchment will be progressively stripped of organic material and enhanced with selected and durable granular waste rock to ensure:

- the removal of organic material for stockpiling for closure and uncover for removal any unsuitable material in the foundations of the WRSA, and
- a piezometric surface does not build up significantly within the WRSA during:
    - operational design storm events by passing flows through a central drain designed to pass a 1 in 200 year 24 hour event with a peak flow estimated at 1.5 m^3/s, and
    - post closure PMP events by passing peak flows through the rockfill drain designed to pass a PMP event.

STARTER EMBANKMENT

An 18 m high starter embankment, consisting of durable and clean waste rock of selected particle size range is designed to:

- ensure good toe drainage in areas of highest flow gradients
- protect the outlet and drainage so as to not be damaged by waste rock disposal
- provide a buffer zone to protect the SCP and its liner from any boulder rollout, and
- provide post closure a physical and hydrological stable toe of the rehabilitated WRSA.

WATER BALANCE

A full water balance for a WRSA was conducted by Knight Piésold for a comparable Eagle Pup WRSA in location and size for the 1997 Rescan feasibility study. The 1996 evaluation assumed precipitation to range between 231 mm minimum to 527 mm maximum and averaging 374 mm, with runoff coefficients of 0.65 and 0.3 from the undisturbed area and WRSA respectively. Based on these parameters, and allowing for evaporation, losses to groundwater and lock-up in the Eagle Pup WRSA, the predicted inflows to the SCP are of the order of 33,400 m^3/month. Any interception and diversion of the observed springs and seeps in the upper catchment would typically reduce only this flow by about 1,400 m^3/month per spring.

RUNOFF CONTROL

Two specific WRSA runoff controls are designed to reduce inflows and minimise erosion. These controls include an interception and diversion ditch system of the upper-catchment springs and specific construction constraints on the WRSA benches.

A number of springs issue surface water throughout the year into the upper part of the catchment. The long-term impact of dewatering for the open pit is likely to impact on these, however, in early years of operation, these primary sources of water into the catchment will be redirected into the neighbouring catchment of Stewart Gulch. The steepness of the catchment slopes precludes practical diversion of any other surface runoff and therefore this will be allowed to infiltrate into the waste rock.

Rainfall onto the highly permeable WRSA in the operational period is unlikely to pond and generate surface runoff. Horizontal benches will mitigate against the concentration of runoff and potential for erosion.

All precipitation infiltrating the WRSA will report to the rock drain and finally as seepages from the toe of the waste rock and into the SCP.

SEDIMENT CONTROL POND DESIGN

The Eagle Pup SCP will be located in the narrow valley at the bottom of Eagle Pup. The design includes an embankment constructed from rockfill, an HDPE-lined pond and variable height decant. The SCP is designed to accommodate a 1:100 year event, with a volume of 25,000 m^3.

An SCP for the Platinum Gulch WRSA is shown on drawings and will be similar to that for the Eagle Pup SCP, but has not been assessed in detail for this study.

MONITORING

The performance of the WRSA will be monitored during construction through both survey and geotechnical inspection. This will include instrumentation to assist in the assessment of slope stability of the WRSA benches, the starter embankment in front of the WRSA, and the SCP, and enable comparisons of actual against forecast behaviour. Given the size of the facility, observations and measurements will be taken to detect pore pressure changes, strains and settlement in the WRSA, as possible precursors to major instability.

Monitoring of the SCP will include water levels, sediment volumes, flows and water quality. Boreholes downstream of the SCP will provide a final check on the groundwater quality emanating from the Eagle Pup catchment.

CONSTRUCTION

The construction of the WRSA follows the construction of the site sediment collection pond in the Dublin Gulch valley. The sequence comprises:

- WRSA SCP embankment construction with waste rock from mining operations
- lining of the SCP

- stripping of valley organics and placement of selected durable boulders
- starter embankment construction

This report was included in the SIR submitted May 2012
as Appendix 2H

BGC ENGINEERING INC.

REPORT ON

SEISMIC REFRACTION AND

DOWNHOLE SEISMIC INVESTIGATION

PROPOSED MINE SITE FACILITIES

EAGLE GOLD PROJECT

YUKON

by

Alex Smith, M.Sc.

Russell Hillman, P.Eng.

September, 2011 **PROJECT FGI-1216**

Frontier Geosciences Inc. 237 St. Georges Avenue, North Vancouver, B.C., Canada V7L 4T4
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VICTORIA GOLD CORPORATION

EAGLE GOLD PROJECT
DUBLIN GULCH, YUKON

SITE FACILITIES GEOTECHNICAL INVESTIGATION FACTUAL DATA REPORT

FINAL

PROJECT NO:	0792-002	DISTRIBUTION:	
DATE:	March 5, 2010	VICTORIA GOLD	3 copies
		BGC	2 copies

BGC ENGINEERING INC.
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March 5, 2010

Project No. 0792-002

Mike Padula

Victoria Gold Corporation

2550-1066 West Hastings

Vancouver, BC

Canada V6E 3X2

Dear Mr. Padula,

RE: EAGLE GOLD PROJECT SITE FACILITIES GEOTECHNICAL INVESTIGATION FACTUAL DATA REPORT

Please find attached a final version of the aforementioned report for your records. Should you have any questions or comments do not hesitate to contact the undersigned.

Yours sincerely,

BGC ENGINEERING INC.
per:

Pete Quinn, Ph.D., P.Eng.
Senior Geotechnical Engineer

EXECUTIVE SUMMARY

This report summarizes the findings of the geotechnical site investigation program conducted in July and August of 2009, at the Eagle Gold Project, located near Mayo, Yukon Territory. Several areas on site were explored as part of a pre-feasibility study for potential heap leach and waste rock containment facilities.

A total of 69 test pits and 7 auger/drill holes were completed in order to characterize the overburden material and shallow bedrock conditions. Laboratory testing was completed of most samples for moisture content, and representative samples were also tested for Atterberg limits and grain size analysis. Three permanent thermistor strings were installed to obtain ground temperature profiles in areas of suspected permafrost.

The data have been organized into terrain units that divide the overall project site into smaller segments for ease of visualization, and generally correspond to drainage basins or sub-basins within the larger Dublin Gulch catchment.

This report presents factual data only, and does not include any engineering interpretation of the data nor engineering recommendations in relation to the proposed mine facilities.

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LIMITATIONS OF REPORT

BGC Engineering Inc. (BGC) prepared this document for the account of Victoria Gold Corporation. The material in it reflects the judgment of BGC staff in light of the information available to BGC at the time of document preparation. Any use which a third party makes of this document or any reliance on decisions to be based on it are the responsibility of such third parties. BGC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this document.

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This report presents factual data only. BGC was not commissioned to provide engineering interpretations of the data contained herein in relation to the proposed development. Any such interpretation by others is solely their responsibility.

1.0 INTRODUCTION

1.1. General

Victoria Gold Corporation (VGC) is completing a prefeasibility study (PFS) for development of the proposed Eagle Gold mine at Dublin Gulch, Yukon Territory. BGC Engineering Inc. (BGC) was engaged by VGC to design the open pit and to complete geotechnical subsurface exploration work for the other mine facilities. This report presents factual data resulting from a geotechnical investigation of proposed locations for the heap leach and waste rock facilities. Studies related to the design of the open pit will be submitted in a separate report.

1.2. Project Description

The Eagle Gold property is located in the Yukon Territory approximately 40 km north of Mayo, and 15 km northwest of Elsa, as illustrated in Figure 1. The mine will comprise an open pit and heap leach ore processing facility, haul roads, waste rock storage area, crushers, process water ponds, drainage ditches, sediment control structures plus various ancillary facilities.

The arrangement of mine facilities has not been finalized. Three heap leach locations were initially proposed, labeled Options #1, #2 and #3 in Figure 2. Option #1 would be a valley fill at the outlet of the Dublin Gulch drainage basin. Option #2 would be a mid-valley fill further up Dublin Gulch, and Option #3 would be constructed at the height of land approximately 4 km east of the open pit at Bawn Boy Gulch. Each of these options was noted to have specific disadvantages, and during the 2009 site investigation program, additional Options #4 and #5 were proposed. Option #4 would be in the Stuttle Gulch drainage above Dublin Gulch, and Option #5 would be east of the open pit at Olive Gulch.

A sixth option in Ann Gulch was proposed late in the field program. This option and option #5 (Olive Gulch) have reportedly emerged as the preferred heap leach alternatives. Figure 3 shows the approximate layout of these two heap leach pads and their associated ponds, plus the waste rock dump in Eagle Pup, the open pit, and the camp site.

1.3. Previous Studies

Previous geotechnical site investigations were carried out at the Eagle Gold property in 1995 by Knight Piesold and in 1996 by Sitka Corporation. The purpose of those studies was to investigate potential heap leach and waste rock facility locations for feasibility design. The following are the key previous site investigation reports:

- Report on 1995 Geotechnical Investigations for Four Potential Heap Leach Facility Site Alternatives, First Dynasty Mines, Dublin Gulch Property. (Knight Piesold, 1996a)
- Report on Feasibility Design of the Mine Waste Rock Storage Area, First Dynasty Mines, Dublin Gulch Property. (Knight Piesold, 1996b)

- Field Investigation Data Report, Dublin Gulch Project, New Millennium Mining. (Sitka Corporation, 1996.)
- Hydrogeological Characterization and Assessment, Dublin Gulch Project, New Millennium Mining. (GeoEnviro Engineering, 1996)

Knight Piesold completed a feasibility level geotechnical study to evaluate the surficial materials and bedrock conditions at four potential heap leach pad locations, two potential waste rock areas, and the open pit. Groundwater wells and two thermistors were installed in selected drillholes. Test pitting and diamond drilling were completed from June to September 1995 at upper Bawn Bay Gulch, lower Dublin Gulch, the north side of Lynx Creek, and at the confluence of Haggart and Lynx Creeks.

In 1996, Sitka Corporation completed test pits and diamond drillholes in Bawn Bay Gulch, Eagle Pup, Stewart Gulch, and Platinum Gulch for preliminary design of the heap leach and waste rock facilities. Auger holes were drilled in Gill Gulch to evaluate it as a potential borrow source of silt material as a liner for the heap leach facility. Monitoring wells were installed in Bawn Bay Gulch and Eagle Pup. Eight thermistor strings were installed.

1.4. Scope of Work

BGC was engaged to gather factual data regarding subsurface conditions at the proposed heap leach and waste rock facilities. Engineering interpretation of these factual data for design of specific facilities is the responsibility of others. The work involved the excavation of 69 test pits and advancement of seven boreholes. Thermistor strings were installed in three boreholes to gather temperature measurements. Dynamic cone penetration profiles were obtained at two borehole locations to obtain information about material density. Dynamic cone soundings were attempted in two other holes. Groundwater monitoring wells were installed by Stantec in two of the seven boreholes. Stantec supervised the logging and installation of several other monitoring wells around the site.

2.0 SITE CONDITIONS

2.1. Climate

Available information for the nearest permanent weather station, at Mayo Airport, YT, suggests daily average temperatures ranging from -25.7^{o}C in January to 16.0^{o}C in July (Environment Canada Canadian Climate Normals 1971-2000), with a mean annual air temperature of -3.1 ^{o}C and mean annual precipitation of 313 mm, with 205 mm of rainfall and 147 cm of snowfall. According to Knight Piesold (1996b), the Dublin Gulch basin receives moderate precipitation and has extreme variations in temperature. Based on analysis of climate data collected intermittently from site during 1979-80, 1984-85, and 1993-95, combined with long-term regional values from Keno Hill and Mayo, Knight Piesold (1996b) estimated average annual precipitation of about 375 mm at the mouth of Dublin Gulch and about 600 mm at the headwaters in the uplands above the valley. Average monthly temperatures range from about -23^{o}C in January to about 13^{o}C in July, with recorded extreme temperatures ranging between -60^{o}C to 35^{o}C.

2.2. Physiography, Drainage and Vegetation

The project site is located within the Dublin Gulch drainage basin. Dublin Gulch drains the surrounding highlands to the west toward Haggart Creek, which flows from north to south. Several streams drain the surrounding highlands, forming a trellis drainage pattern of roughly perpendicular streams, as illustrated in Figure 4.

The project site is characterized by rugged hilly terrain, with ground elevations ranging between approximately 800 and 1500 m above sea level. Figure 5 shows the distribution of slope angles across the Dublin Gulch basin. Slope angles often exceed 20 degrees, particularly near the planned open pit, along the north valley wall above Dublin Gulch, and in much of the drainage basins for Eagle Pup, Stewart Gulch and Olive Gulch.

Most of the site is vegetated, with black spruce forests being relatively common. The lower reach of Dublin Gulch has been completely reworked by placer mining activities and is therefore largely devoid of vegetation.

2.3. Bedrock Geology

According to Knight Piesold (1996a and 1996b), the Eagle Gold project is located in the Selwyn Basin, a geological region characterized by chert, shale and schist. The Selwyn Basin comprises four main lithological units (Lower Schist, Keno Hill Quartzite, Upper Schist, and Hyland Group) and has several granite masses with nearby gold veins rich in silver, lead, zinc and quartz. The Lower Schist and Keno Hill Quartzite are of Mesozoic-age, the Upper Schist is of Paleozoic-age and the Hyland Group of Proterozoic to Lower Cambrian age. There are three principal thrust sheets in the Selwyn Basin, from east to west, the Dawson, Tombstone, and Robert Service. Four phases of deformation have been identified, of which only the first two resulted in the generation of prominent structures. Thrusting during the first phase resulted in the widespread development of foliation that was subsequently deformed by gentle, regional-scale folding during the second phase of deformation. Several east-trending, south-plunging anticlines in the Dublin Gulch area are attributed to this second deformational event. During the Cretaceous period, there were three events of granitoid intrusion associated with numerous mineral deposits including the Eagle Gold property.

A thin veneer of residual, heavily weathered and decomposed rock overlies much of the project area, varying in thickness from 1 to 2 m, grading down to coarser, heavily-fractured bedrock at relatively shallow depths. Bedrock is comprised of granodiorite and various metasediments. The Dublin Gulch deposit area is dominated by a northeast trending intrusive stock, roughly 2 km long by 500 m wide. This granodiorite stock intruded into the surrounding host sediments, which consist of strongly foliated quartzose and locally calcareous phyllites to quartz-biotite-andalusite schists. The granodiorite and metasediments have both been described as fresh, moderately strong to strong, and heavily jointed and fractured.

2.4. Surficial Geology

The surficial geology of the Eagle Gold property has been mapped by Bond (1998) and is illustrated in Figure 6. The valley bottom is dominated by alluvium and placer mining tailings. The uplands are dominated by an apron or blanket of colluvium over bedrock, with some areas of shallower bedrock with a thinner veneer of colluvium. The Haggart Creek Valley to the west of the project site is filled with a mix of alluvial deposits and placer tailings. A till blanket has been mapped along the east side of Haggart Creek, south of its confluence with Dublin Gulch.

2.5. Seismicity

Site specific seismic hazard information was obtained from Natural Resources Canada at www.EarthquakesCanada.ca. The National Building Code of Canada (NBCC) design ground motions, corresponding to a 2 % probability of exceedence in 50 years (0.000404 per annum) are detailed in Table 1 below.

Table 1. National Building Code of Canada Recommended Design Motions.

Sa(0.2)	Sa(0.5)	Sa(1.0)	Sa(2.0)	PGA (g)
0.513	0.312	0.155	0.086	0.245

It is noted that these design motions are significantly higher than reported in the Knight Piesold reports from 1996, as seismic design in Canada underwent a complete overhaul coincident with the introduction of the 2005 update of the National Building Code.

Ground motions for other return periods are provided in Table 2 below.

Table 2. Ground Motions for other Probabilities.

Probability of exceedence per annum	0.010	0.0021	0.001
Probability of exceedence in 50 years	**40 %**	**10 %**	**5 %**
Sa(0.2)	0.131	0.272	0.368
Sa(0.5)	0.076	0.160	0.219
Sa(1.0)	0.037	0.077	0.107
Sa(2.0)	0.020	0.043	0.059
PGA	0.072	0.139	0.182

The distribution of recorded seismic events in the vicinity of the project site, as obtained from Natural Resources Canada, is illustrated in Figure 7.

The seismic hazard described above can be re-stated in terms of a representative earthquake event. An earthquake of M5.65 located at a distance of 17 km from the site would yield ground motions similar to those reported above. This de-aggregation of the seismic hazard was provided by the Geological Survey of Canada (GSC) on the basis of site coordinates. They were requested to do the de-aggregation for peak ground acceleration, and using the return period/annual probability specified in the National Building Code (therefore applicable to buildings). Slightly different values may apply for other structures to which the NBCC does not apply, and for which other components of the hazard (specific spectral acceleration values, rather than PGA) may be more important. The information provided by GSC was accompanied by the following qualifying notes:

> *De-aggregations of the NBCC Robust seismic hazard generate a suite of files, one for each period, for each site.*
>
> *"Robust" hazard values are the ones used in the NBCC and are the higher of the H, R, C, and F model values at each site. Where any of the three other models give hazard values "sub-equal" to that from the highest model for any period, for that period the de-aggregations for those other models should also be considered for engineering purposes. This is because certain hazard and risk contributions of those other models may exceed those of the Robust model.*
>
> *A hazard example might be for liquefaction, where nearby, small-magnitude sources from the H model may give the Robust value of PGA (suitable for structural design of short-period buildings), but the liquefaction hazard may come from mid-distance large-magnitude earthquakes in the R model (because of the longer duration of ground motions from those sources).*
>
> *A risk example might be for structural damage, to the degree that it is influenced by duration effects not captured by the 5%-damped spectral values.*

"Sub-equal" can be generally taken as 70% or greater of the Robust value for any period, but there is no certainty that this is the correct value for all cases. The user needs to decide.

3.0 GEOTECHNICAL INVESTIGATIONS

3.1. General

The field work for this project was conducted in July and August, 2009, and included the following tasks:

- Initial reconnaissance to refine the test pit and borehole plans;
- Excavation of test pits to refusal or the limit of reach of a CAT 235B excavator;
- Visual classification and sampling of overburden materials;
- Ground ice classification, where encountered;
- Supervision of drilling using solid stem auger and triple tube coring;
- Supervision of dynamic cone penetration testing of overburden materials at selected boreholes, where possible;
- Visual classification of bedrock core; and
- Installation of instrumentation, including standpipe piezometers, monitoring wells (for others), and thermistor strings.

The test pit program was designed to develop an understanding of the engineering properties of the overburden materials. The borehole program was planned to penetrate bedrock where it was expected to be deep, and to characterize overburden and bedrock conditions at those locations.

Overburden materials were described according to the Unified Soil Classification System (USCS) (ASTM D24887) using Canadian Foundation Engineering Manual (CFEM 2006) grain size boundaries. Frozen soils were classified according to ASTM D4083.

The locations of all test pits and boreholes were estimated using a handheld GPS unit. Coordinates are expected to be accurate to within 5-20 m horizontally, depending on satellite coverage, and 5-20 m vertically.

Certain areas of the site were inaccessible due to steep slopes, heavy vegetation, or soft wet ground, necessitating the selection of alternate test pit locations.

3.2. Terrain Units for Data Presentation

The subsurface exploration program focused on probable heap leach pad and waste rock dump locations. However, as described in Section 1.2, prospective locations for facilities were added during the planning and execution of the field work. It is understood that the Ann Gulch and Olive Gulch heap leach options are currently considered the preferred options, but it is also understood that VGC may still wish to consider some of the earlier options.

The data in this report are presented in accordance with the specific area of the property that they were obtained. Therefore, for the purposes of data presentation, the site has been subdivided into a number of terrain units, as follows:

- Bawn Boy Gulch catchment;
- Olive Gulch catchment;
- Stewart Gulch catchment;
- Eagle Pup catchment;
- Stuttle Gulch catchment;
- East side of Haggart Creek between Dublin and Platinum Gulches;
- Ann Gulch Catchment;
- Lower reach of Dublin Gulch;
- Middle reach of Dublin Gulch; and
- Open pit area.

These terrain units are illustrated in Figure 8. The data have been so organized to allow VGC to consider facility alternatives without requiring BGC to reorganize and reinterpret the data.

3.3. Test Pitting

The testpitting program was carried out between 18 July and 8 August, 2009. A total of 69 test pits were excavated throughout the project area, using VGC's onsite Caterpillar 325B excavator, which has a maximum reach of about 6.5m to 7m. Test pit locations are illustrated in Figure 9. Test pit observations allowed for characterization of subsurface conditions and collection of disturbed soil samples for laboratory testing.

A summary of the overburden materials observed in the test pits is provided in Table 3, and test pit logs are provided in Appendix A. PVC casing with the bottom end capped was installed in ten backfilled test pits exhibiting frozen ground, used to allow for later insertion of a thermistor string for shallow ground temperature measurements. Two slotted groundwater monitoring standpipes were installed in test pits where notable seepage was observed.

Representative samples were collected from many test pits for laboratory index testing, including moisture content determination, and Atterberg limits and grain size analysis on selected representative samples. Bulk samples were also collected from several test pits and stored for later laboratory testing to assess their suitability as construction borrow materials. Laboratory test results to date are provided in Appendix B and summarized in Section 2.5.

Table 3. Test Pit Summary

Terrain Unit	TP ID#	Coordinates (NAD 83)		Depth of Frozen Ground		Excess Ice	End of Test Pit	
		Easting (m)	Northing (m)	Top (m)	Bottom (m)		Depth (m)	Reason
Ann Gulch	TP-BGC09-A-1	459466	7101320	0.5	0.0	N	1.3	frozen
Ann Gulch	TP-BGC09-HL1-1	458948	7101250	0.3	2.0	Y	6.5	bedrock
Ann Gulch	TP-BGC09-HL1-2	458936	7101100	0.3	4.5	N	6.2	limit of reach
Ann Gulch	TP-BGC09-HL6-1	459796	7102150	N/A	N/A	N	6.5	limit of reach
Ann Gulch	TP-BGC09-HL6-10	459543	7101640	2.0	3.0	N	4.8	bedrock
Ann Gulch	TP-BGC09-HL6-11	459726	7101620	N/A	N/A	N	2.8	bedrock
Ann Gulch	TP-BGC09-HL6-12	459355	7101600	N/A	N/A	N	5.8	sloughing
Ann Gulch	TP-BGC09-HL6-13	459238	7101510	N/A	N/A	N	3.3	bedrock
Ann Gulch	TP-BGC09-HL6-14	459282	7101200	N/A	N/A	N	6.2	bedrock
Ann Gulch	TP-BGC09-HL6-15	459687	7101790	0.2	0.8	Y	5.3	bedrock
Ann Gulch	TP-BGC09-HL6-16	459570	7101990	N/A	N/A	N	5.3	bedrock
Ann Gulch	TP-BGC09-HL6-17	459551	7101770	N/A	N/A	N	3.3	bedrock
Ann Gulch	TP-BGC09-HL6-2	459724	7102130	N/A	N/A	N	4.4	bedrock
Ann Gulch	TP-BGC09-HL6-3	459658	7102090	0.9	2.0	N	6.2	bedrock
Ann Gulch	TP-BGC09-HL6-4	459407	7101750	2.8	3.0	N	4.8	bedrock
Ann Gulch	TP-BGC09-HL6-5	459308	7101830	N/A	N/A	N	4.0	sloughing
Ann Gulch	TP-BGC09-HL6-6	459757	7102380	0.5	1.7	Y	5.5	bedrock
Ann Gulch	TP-BGC09-HL6-7	459883	7102300	N/A	N/A	N	5.4	bedrock
Ann Gulch	TP-BGC09-HL6-8	459200	7101350	1.2	N/A	N	2.6	sloughing
Ann Gulch	TP-BGC09-HL6-9	459933	7101890	1.2	1.5	N	3.8	bedrock
Eagle Pup	TP-BGC09-WR-1	460089	7100710	N/A	N/A	N	6.0	limit of reach
Eagle Pup	TP-BGC09-WR-2	460204	7100820	4.0	5.0	N	6.0	limit of reach
Eagle Pup	TP-BGC09-WR-3	460469	7100950	N/A	N/A	N	5.8	bedrock
Eagle Pup	TP-BGC09-WR-4	460385	7100960	N/A	N/A	N	3.0	bedrock
Eagle Pup	TP-BGC09-WR-5	460212	7100990	N/A	N/A	N	4.7	bedrock
Eagle Pup	TP-BGC09-WR-6	460060	7100840	1.5	N/A	Y	6.5	limit of reach
Eagle Pup	TP-BGC09-WR-7	459893	7100900	0.3	1.5	Y	2.5	seepage
Eagle Pup	TP-BGC09-WR-8	460165	7100360	0.4	0.5	Y	3.5	seepage
Eagle Pup	TP-BGC09-WR-9	460174	7100580	1.1	1.4	N	6.5	limit of reach
Lower Reach Dublin Gulch	TP-BGC09-A-2	458713	7100790	3.5	4.0	N	4.5	limit of reach
Lower Reach Dublin Gulch	TP-BGC09-DG-1	459318	7101010	N/A	N/A	N	0.0	seepage
Lower Reach Dublin Gulch	TP-BGC09-DG-3	458987	7100940	N/A	N/A	N	5.0	boulders
Lower Reach Dublin Gulch	TP-BGC09-DG-4	458311	7100860	1.0	N/A	Y	3.0	frozen
Lower Reach Dublin Gulch	TP-BGC09-HL4-10	458464	7100780	N/A	N/A	N	6.5	limit of reach
Olive Gulch	TP-BGC09-HL5-1	461916	7100360	N/A	N/A	N	4.4	bedrock
Olive Gulch	TP-BGC09-HL5-10	462461	7100370	N/A	N/A	N	2.8	seepage
Olive Gulch	TP-BGC09-HL5-2	461745	7100620	N/A	N/A	N	6.0	limit of reach
Olive Gulch	TP-BGC09-HL5-3	461696	7100760	0.2	N/A	Y	2.0	frozen
Olive Gulch	TP-BGC09-HL5-4	462119	7100180	N/A	N/A	N	5.5	limit of reach
Olive Gulch	TP-BGC09-HL5-5	462404	7100180	N/A	N/A	N	2.0	bedrock
Olive Gulch	TP-BGC09-HL5-6	462551	7100380	N/A	N/A	N	5.5	seepage
Olive Gulch	TP-BGC09-HL5-7	462478	7100680	N/A	N/A	N	4.8	bedrock

Table 3. Test Pit Summary

Olive Gulch	TP-BGC09-HL5-8	462283	7100690	N/A	N/A	N	0.9	bedrock
Olive Gulch	TP-BGC09-HL5-9	462139	7100720	N/A	N/A	N	1.4	bedrock
Stuttle Gulch	TP-BGC09-HL4-1	459711	7100710	0.3	N/A	Y	1.9	frozen
Stuttle Gulch	TP-BGC09-HL4-13	459109	7100570	0.2	N/A	Y	1.5	frozen
Stuttle Gulch	TP-BGC09-HL4-14	459268	7100520	0.3	N/A	Y	1.9	frozen
Stuttle Gulch	TP-BGC09-HL4-15	459317	7100250	0.2	N/A	Y	1.3	frozen
Stuttle Gulch	TP-BGC09-HL4-2	459530	7100890	0.3	N/A	Y	2.3	frozen
Stuttle Gulch	TP-BGC09-HL4-3	459427	7100720	0.6	N/A	Y	5.0	frozen
Stuttle Gulch	TP-BGC09-HL4-4	459594	7100560	0.5	N/A	N	2.2	frozen
Stuttle Gulch	TP-BGC09-HL4-5	459685	7100410	0.2	N/A	Y	6.5	limit of reach
Stuttle Gulch	TP-BGC09-HL4-6	459609	7100220	N/A	N/A	N	6.0	limit of reach
Stuttle Gulch	TP-BGC09-HL4-7	459297	7100620	0.3	N/A	Y	2.8	frozen
Stuttle Gulch	TP-BGC09-HL4-8	459413	7100410	0.5	N/A	Y	2.2	frozen
Stuttle Gulch	TP-BGC09-HL4-9	459853	7100600	N/A	N/A	N	5.7	sloughing
Stuttle Gulch	TP-BGC09-STU-3	459086	7100700	0.8	N/A	Y	1.9	frozen
Stuttle Gulch	TP-BGC09-STU-4	459038	7100630	0.3	N/A	Y	2.6	frozen
West Haggart Creek	TP-BGC09-A-3	458472	7100540	0.9	1.3	Y	5.5	limit of reach
West Haggart Creek	TP-BGC09-A-4	458984	7100210	1.1	N/A	Y	4.3	frozen
West Haggart Creek	TP-BGC09-HL4-11	458653	7100630	0.2	N/A	Y	1.5	frozen
West Haggart Creek	TP-BGC09-HL4-12	458885	7100460	0.8	N/A	Y	1.9	frozen
West Haggart Creek	TP-BGC09-HL4-16	458835	7100220	0.5	N/A	Y	2.0	frozen
West Haggart Creek	TP-BGC09-HL4-17	458655	7100230	0.6	N/A	Y	1.6	frozen
West Haggart Creek	TP-BGC09-HL4-18	458499	7100230	1.6	N/A	Y	4.7	frozen
Open Pit	TP-BGC09-P-1	460470	7099260	N/A	N/A	N	3.5	bedrock
Open Pit	TP-BGC09-P-2	460318	7099420	N/A	N/A	N	2.5	bedrock
Open Pit	TP-BGC09-P-3	459826	7099380	N/A	N/A	N	5.5	sloughing
Open Pit	TP-BGC09-P-4	459931	7099710	N/A	N/A	N	2.2	bedrock

3.4. Borehole Drilling

Boreholes were drilled by Top Rank Diamond Drilling, subcontracted to Aggressive Drilling of Kelowna, BC. Top Rank Diamond Drilling used a Pioneer 2 rubber tire mounted auger drill rig equipped with an HQ3 core barrel for rock coring and a 4.5" solid stem auger for overburden drilling and sampling. An AST bobcat was used to transport the drill rig around site.

BGC and Stantec shared the drill rig for geotechnical and hydrogeological investigations, respectively. A total of nineteen boreholes were drilled between August 10, 2009 and September 3, 2009, seven boreholes under the supervision of BGC to characterize the groundwater, overburden and near surface bedrock, and twelve under the supervision of Stantec for the installation of monitoring wells. For the BGC boreholes, a field engineer was with the drill rig at all times to observe drilling progress, log the soil for geotechnical and ground ice properties, take photographs, and conduct dynamic cone penetration testing.

Borehole locations were surveyed using a hand held GPS unit and are illustrated in Figure 10. Borehole completion details are summarized in Table 4. Detailed borehole logs are presented in Appendix C.

Table 4. Summary of Boreholes Supervised by BGC.

	HOLE ID	Northing (m)	Easting (m)	Final Depth (m)	Depth to Rock (m)	Depth to Water (m)	Excess Ice Observed? Yes/No	Installation Type
Ann Gulch	AG-3	459502	7101320	13.7	7.6	N/A	No	DCPT, Thermistor
Lower Reach Dublin Gulch	DG-2	458992	7100880	16.3	14.3	4.9	No	DCPT, Monitoring Well
Lower Reach Dublin Gulch	DG-3	458985	7100920	20.7	12.1	N/A	No	DCPT
Lower Reach Dublin Gulch	DG-1	459302	7101060	12.8	7.6	2.0	No	DCPT, Monitoring Well
Stuttle Gulch	STU-3	459083	7100690	31.1	N/A	N/A	Yes	Thermistor
Stuttle Gulch	STU-4	459050	7100720	18.3	N/A	N/A	Yes	DCPT, Thermistor
West side Haggart Creek	DG-7	458783	7100460	19.8	N/A	N/A	No	DCPT

Three thermistor strings were installed to 10 m depth in selected auger holes. Ground temperature profiles are provided in Appendix D.

Stantec supervised nine additional boreholes for the installation of monitoring wells, as outlined in Table 5. Well construction details for the BGC boreholes can be found on the borehole logs in Appendix C.

Table 5. Summary of Boreholes Supervised by Stantec.

	HOLE ID	Northing (m)	Easting (m)	Final Depth (m)	Depth to Rock (m)	Depth to Water[1] (m)	Installation Type
Ann Gulch	AG-1	459364	7101840	15.9	9.8	14.0	MW
Ann Gulch	AG-2	459732	7101880	15.9	12.8	14.9	MW
Lower Reach Dublin Gulch	DG-4	458318	7100870	16.8	N/A	6.0	MW
Olive Gulch	OG-1	461892	7100460	6.1	0.3	N/A	N/A[2]
Olive Gulch	OG-2	462246	7100680	15.9	0.3	6.6	MW
Olive Gulch	OG-3	461347	7101450	8.4	N/A	1.9	MW
Stuttle Gulch	STU-1	459647	7100430	14.3	9.0	14.0	MW
Stuttle Gulch	STU-2	459331	7100660	10.1	N/A	0.0	MW
West side Haggart Creek	DG-5	458448	7100430	13.7	N/A	13.2	MW

Notes: 1. Groundwater measurements made between 18 August and 2 September 2009 after development of wells.
2. No well installed by Stantec in this hole.

3.4.1. Auger Drilling

Solid stem auger drilling was advanced to the limits of drilling capability (i.e. length of auger) or to refusal, typically on boulders or bedrock. Select disturbed soil samples were sent for laboratory testing. Test results are provided in Appendix B and summarized in Section 3.5.

3.4.2. Rock Coring

The rock coring program comprised coring bedrock at four borehole locations (see Table 4 – rock was cored in the four boreholes where it was encountered). All coring was done using an HQ core barrel, which provided 61.2 mm diameter core. The recovered rock core was placed in core boxes, photographed, and transported to a core logging shack at camp. Rock core photographs are provided in Appendix E.

As part of the geotechnical diamond drill investigation, the following data were collected to allow the assessment of rock mass properties according to the Rock Mass Rating (RMR) Classification system proposed by Bieniawski (1976):

- top of run depth (m);
- bottom of run depth (m);

- lithology;
- core recovery length (m);
- Rock Quality Designation (RQD) length (m);
- number of discontinuities;
- hardness;
- alteration/weathering; and
- average and minimum joint condition.

These characteristics are noted in the borehole logs in Appendix C.

3.4.3. Dynamic Cone Penetration Testing

The drill rig was equipped with an automatic trip hammer for dynamic cone penetration testing of the overburden. Dynamic cone penetration testing (DCPT) is an in-situ test widely used in geotechnical engineering for assessing the in situ strength of soils. The dynamic cone was connected to the end of AWJ rods and pushed with the automatic trip hammer until practical refusal (100 blows/ft) or the cone was observed to bounce. Blow counts were measured in 0.3 m (1 ft) increments.

Table 6. Summary of Dynamic Cone Penetration Testing

Hole ID												
DH-BGC09-DG-3	Depth (m)	1.22	1.52	1.83	2.13	2.44	2.74	3.05	3.35	3.66	3.96	4.27
	Blows per foot	3	3	10	14	20	14	12	33	47	41	71
	Depth (m)	4.57	4.88	5.18	5.49	5.79	6.10					
	Blows per foot	48	39	20	21	46	100					
DH-BGC09-DG-2	Depth (m)	1.52	1.83	2.13	2.44	2.74	3.05	3.35	3.66	3.96	4.27	4.57
	Blows per foot	9	7	9	7	6	12	10	13	14	18	22
	Depth (m)	4.88	5.18	5.49	5.79	6.10	6.40	6.71	7.01	7.32	7.62	7.92
	Blows per foot	15	13	14	21	27	20	16	18	18	18	12
	Depth (m)	8.23	8.53	8.84	9.14	9.45						
	Blows per foot	19	28	22	18	50						
DH-BGC09-STU-3	Depth (m)	1.52	2.44	3.05								
	Blows per foot	No penetration, frozen ground										
DH-BGC09-STU-4	Depth (m)	1.52	3.1	6.1	1.06							
	Blows per foot	No penetration, boulders										
DH-BGC09-DG-7	Depth (m)	6.71	7.01	19.8								
	Blows per foot	1	100	100								
DH-BGC09-AG-3	Depth (m)	2.1	2.4	3.2								
	Blows per foot	7	100	100								

These results are also noted and/or illustrated graphically in the borehole logs in Appendix C.

3.4.4. Thermistor Installations

Thermistor strings were installed in three drilholes to measure ground temperatures up to 10.0 m depth at these locations. Thermistor strings were installed in 50 mm, schedule 80 PVC casing. Installation details are summarized in Table 7 below. The ground temperature cables were manufactured by EBA Engineering Consultants Ltd. During the 2009 site investigation, ground temperatures were periodically measured with a multi-meter and switch box. Tables summarizing the thermistor node depths, recorded temperatures, temperature profiles, and thermistor manufacturer calibration sheets are presented in Appendix D. The first set of temperature measurements were recorded two days after borehole completion. Ground temperature profiles are presented in Appendix D. The ground temperature measurements indicate warm permafrost (warmer than -0.5^{o}C) conditions at two locations (i.e. both boreholes in Stuttle Gulch), and an absence of permafrost at the third (i.e. in Ann

Gulch). Notably, frozen ground was observed to a depth of 19.7 m at BH-BGC09-STU-3 during drilling.

Table 7. Summary of 2009 Thermistor String Installations

Hole ID	Northing (m)	Easting (m)	Location
DH-BGC09-AG-3	459502	7101320	Ann Gulch
DH-BGC09-STU-3	459083	7100690	Stuttle Gulch
DH-BGC09-STU-4	459050	7100720	Stuttle Gulch

3.4.5. Monitoring Wells and Standpipe Piezometers

A total of 14 monitoring wells were installed by Stantec during the 2009 site investigation program. Monitoring wells were constructed using 50 mm diameter, Schedule 40, threaded PVC pipe with a screened section of slotted PVC at the bottom. A cap was placed at the bottom of each well assembly. The sand pack around the PVC consisted of silica sand (#10 - #20 U.S. standard sieve size), filled to approximately 0.6 m above the screen. Typically, bentonite seals of 0.6 m to 1.5 m thickness were placed above the sand pack.

3.5. Laboratory Testing

Representative grab samples were collected by BGC staff for laboratory index testing. Natural moisture content tests were conducted according to ASTM standard D2216. Grain size distributions were determined for selected samples using sieves only (i.e. no hydrometers), according to ASTM standard D422. The complete laboratory results are presented in Appendix B. Table 8 summarizes the laboratory test results.

Table 8. Summary of Laboratory Index Tests.

Terrain Unit	Test Hole ID#	Sample Depth (m)	Material Genesis	Descriptive Texture	Moisture Content (% dry weight)	Grain Size Distribution			
						% <2µm	% <75 µm	% <4.75mm	% <75mm
Ann Gulch	TP-BGC09-A-4	1.2	Colluvium	GRAVEL, sandy, trace to some silt.	19.5	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-1	0.5-0.6	Colluvium	Gravelly SAND, some silt, trace clay.	12.9	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-1	2.5-3.0	Weathered Bedrock	Highly to completely weathered Metasedimentary Bedrock.	15.2	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-1	5.0-5.5	Weathered Bedrock	Highly to completely weathered Metasedimentary Bedrock.	9.3	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-2	0.4-0.5	Colluvium	Silty SAND and GRAVEL, trace clay.	11.8	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-2	1.0-1.1	Weathered Bedrock	Highly to completely weathered Metasedimentary Bedrock.	7.9	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-3	0.4-0.5	Colluvium	Silty GRAVEL, some sand, trace clay.	11.7	5	33	29	33
Ann Gulch	TP-BGC09-HL6-3	1.0-1.2	Colluvium	Sandy SILT and GRAVEL.	7.9	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-3	2.0-2.5	not classified	SAND, trace gravel, trace silt.	9.8	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-3	5.0-5.5	Weathered Bedrock	Completely weathered Metasedimentary rock.	7.3	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-4	0.4-0.6	not classified	Sandy GRAVEL, trace silt.	3.9	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-4	0.8-1.0	not classified	Sandy GRAVEL, trace silt.	3.8	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-4	2.8	not classified	Sandy GRAVEL, trace silt.	11.2	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-4	4.0-4.4	Weathered Bedrock	Completely to highly weathered Metasedimentary Bedrock.	6.3		8	43	50
Ann Gulch	TP-BGC09-HL6-5	0.3-0.4	Colluvium	Silty GRAVEL, some sand.	12.1	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-5	0.9-1.0	Completely Weathered Bedrock	Sandy GRAVEL, some silt, trace clay.	7	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-5	3.5-4	Weathered Bedrock	Highly weathered Metasedimentary bedrock.	5.1	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-6	0.3-0.4	not classified	Gravelly SILT, some sand.	13.8	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-6	1.0-1.2	not classified	Gravelly SILT, some sand.	12.6		32	29	39
Ann Gulch	TP-BGC09-HL6-7	0.2-0.3	not classified	Sandy GRAVEL, some silt.	13.3	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-7	0.8-0.9	Colluvium	Gravelly SILT, some sand, trace clay.	11	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-7	2.0-2.5	Colluvium	Sandy GRAVEL, some silt.	8.6	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-8	0.3	Organics	SILT and ORGANICS.	246.4	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-8	1	Colluvium	Gravelly SILT, some sand, trace clay.	13.6	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-8	2.0-2.4	Colluvium	Gravelly SILT, some sand, trace clay.	13.4	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-9	0.3-0.4	Colluvium	Gravelly SILT, some sand.	13.2	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-9	0.9-1.1	not classified	Gravelly SILT, some sand, trace clay.	11.8	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-10	0.5-0.6	not classified	Gravelly SILT, some sand.	17.1	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-10	0.8-0.9	not classified	Gravelly SILT, some sand.	10.6	2	34	27	37
Ann Gulch	TP-BGC09-HL6-10	2.2-2.7	Weathered Bedrock	Completely weathered Metasedimentary Rock.	10.6	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-11	0.8	Weathered Bedrock	Highly weathered Mica Schist, some sand infill.	14 .0	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-12	1	Colluvium	SAND and GRAVEL, some clay.	10.0	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-12	4.3	not classified	Coarse GRAVEL, some sand.	9.9	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-13	1	not classified	SANDY GRAVEL, some silt, trace cobble.	8.2	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-14	1	Colluvium	SAND and GRAVEL, some silt, trace clay.	15.6	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-15	3	Colluvium	Gravelly SAND, trace cobbles.	13.2	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-16	0.45	not classified	SAND and GRAVEL, some silt.	10.5	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL6-17	1	Colluvium	SAND and GRAVEL, some cobble, trace silt.	4.8	N/A	N/A	N/A	N/A

Terrain Unit	Test Hole ID#	Sample Depth (m)	Material Genesis	Descriptive Texture	Moisture Content (% dry weight)	Grain Size Distribution			
						% <2µm	% <75 µm	% <4.75mm	% <75mm
Ann Gulch	TP-BGC09-HL1-1	1.5	not classified	Gravelly CLAY, trace sand.	10.1	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL1-2	1	not classified	Clayey SAND and GRAVEL.	11.5	N/A	N/A	N/A	N/A
Ann Gulch	TP-BGC09-HL1-2	5.8	not classified	Clayey SAND and GRAVEL, silty SAND lens from 5.5-5.8m	30.4	N/A	N/A	N/A	N/A
Ann Gulch	DH-BGC09-AG-3	4.57	not classified	Silty SAND, some gravel.	4.2	N/A	N/A	N/A	N/A
Eagle Pup	TP-BGC09-WR-1	0.6	Colluvium	Silty GRAVEL, some sand, trace clay.	10.2	N/A	N/A	N/A	N/A
Eagle Pup	TP-BGC09-WR-1	5	not classified	Sandy CLAY, some gravel.	8.2	N/A	N/A	N/A	N/A
Eagle Pup	TP-BGC09-WR-1	6	not classified	SAND, some gravel, trace silt.	12.5	N/A	N/A	N/A	N/A
Eagle Pup	TP-BGC09-WR-2	0.8-0.9	Colluvium	Sandy GRAVEL, some silt, trace clay, trace cobbles/boulders.	9.4	N/A	N/A	N/A	N/A
Eagle Pup	TP-BGC09-WR-2	4	not classified	Sandy GRAVEL, some clay, trace silt.	11	N/A	N/A	N/A	N/A
Eagle Pup	TP-BGC09-WR-3	2	Weathered Bedrock	Highly fractured Metasedimentary rock, trace fines.	17.7	N/A	N/A	N/A	N/A
Eagle Pup	TP-BGC09-WR-4	0.5	not classified	Gravelly SILT, some cobbles.	16.8	4	41	22	34
Eagle Pup	TP-BGC09-WR-4	0.9	not classified	Gravelly SAND, some cobbles.	16.9	N/A	N/A	N/A	N/A
Eagle Pup	TP-BGC09-WR-5	0.5	not classified	Silty GRAVEL, some sand.	9.7	N/A	N/A	N/A	N/A
Eagle Pup	TP-BGC09-WR-5	1	not classified	Silty GRAVEL, some sand.	4.8	N/A	N/A	N/A	N/A
Eagle Pup	TP-BGC09-WR-6	0.9-1.0	Colluvium	Gravelly SILT, some clay.	16.2	N/A	N/A	N/A	N/A
Eagle Pup	TP-BGC09-WR-6	1.0-1.2	Colluvium	Gravelly SILT, some clay.	10.2	N/A	N/A	N/A	N/A
Eagle Pup	TP-BGC09-WR-6	4	Colluvium	Gravelly SILT, some clay.	14.7	N/A	N/A	N/A	N/A
Eagle Pup	TP-BGC09-WR-7	0.9	Colluvium	Silty GRAVEL, trace sand.	17		19	43	38
Eagle Pup	TP-BGC09-WR-8	0.9-1.0	not classified	Silty SAND, some gravel.	11.8	N/A	N/A	N/A	N/A
Eagle Pup	TP-BGC09-WR-8	2	not classified	Silty SAND, some gravel.	8	N/A	N/A	N/A	N/A
Eagle Pup	TP-BGC09-WR-9	0.5-0.7	Colluvium	Silty SAND, some gravel.	19.3	N/A	N/A	N/A	N/A
Eagle Pup	TP-BGC09-WR-9	2.0-2.5	not classified	SAND, some gravel, trace silt.	9.7	N/A	16	25	60
Lower Reach Dublin Gulch	TP-BGC09-HL4-10	0.5-0.6	not classified	Gravelly SILT, some sand, trace clay.	12.8	N/A	N/A	N/A	N/A
Lower Reach Dublin Gulch	TP-BGC09-HL4-10	3.0-3.4	not classified	Silty SAND, some gravel.	12.6	7	15	63	15
Lower Reach Dublin Gulch	TP-BGC09-HL4-10	5.0-5.5	not classified	SILT, some sand, some gravel.	9.4	N/A	N/A	N/A	N/A
Lower Reach Dublin Gulch	TP-BGC09-HL4-10	6.5	not classified	SILT, some sand, some gravel.	14	N/A	N/A	N/A	N/A
Lower Reach Dublin Gulch	TP-BGC09-DG-1	0.5	not classified	SAND and GRAVEL, silty.	9.7	N/A	N/A	N/A	N/A
Lower Reach Dublin Gulch	TP-BGC09-DG-1	1.5	Possibly Fluvial	SAND and GRAVEL, some silt, some cobbles, trace boulders.	5.2	N/A	N/A	N/A	N/A
Lower Reach Dublin Gulch	TP-BGC09-DG-3	1	Placer Tailings	Clayey SILT.	38.7	N/A	N/A	N/A	N/A
Lower Reach Dublin Gulch	TP-BGC09-DG-3	3	not classified	SAND and GRAVEL, trace silt.	7.0	N/A	N/A	N/A	N/A
Lower Reach Dublin Gulch	TP-BGC09-DG-4	1	Till	SILT and COBBLES, some gravel.	31.5	N/A	N/A	N/A	N/A
Lower Reach Dublin Gulch	TP-BGC09-DG-4	1.8	not classified	Sandy SILT, trace clay.	27.5	N/A	N/A	N/A	N/A
Lower Reach Dublin Gulch	DH-BGC09-DG-1	4.57	not classified	Silty GRAVEL, some sand, some cobbles.	12.7	N/A	N/A	N/A	N/A
Lower Reach	DH-BGC09-DG-2	7.62	not classified	Sandy GRAVEL, some silt, cobbly.	11.9	N/A	N/A	N/A	N/A

Terrain Unit	Test Hole ID#	Sample Depth (m)	Material Genesis	Descriptive Texture	Moisture Content (% dry weight)	Grain Size Distribution			
						% <2µm	% <75 µm	% <4.75mm	% <75mm
Dublin Gulch									
Lower Reach Dublin Gulch	DH-BGC09-DG-2	1.52	not classified	Clayey GRAVEL, some sand, some silt.	16.8	N/A	N/A	N/A	N/A
Lower Reach Dublin Gulch	DH-BGC09-DG-3	1.52	Placer Tailings	Clayey SILT, some sand.	25.4	N/A	N/A	N/A	N/A
Lower Reach Dublin Gulch	DH-BGC09-DG-3	6.10	not classified	GRAVEL, COBBLES and BOULDERS, silty, some sand.	14.1	N/A	N/A	N/A	N/A
Olive Gulch	TP-BGC09-HL5-2	0.7	not classified	Granodiorite BOULDERS and COBBLES, silty sand infill.		N/A	N/A	N/A	N/A
Olive Gulch	TP-BGC09-HL5-3	1	not classified	Sandy GRAVEL, trace cobbles and boulders.	8.8	N/A	N/A	N/A	N/A
Olive Gulch	TP-BGC09-HL5-3	1.5	not classified	Sandy GRAVEL, trace cobbles and boulders.	1.5	N/A	N/A	N/A	N/A
Olive Gulch	TP-BGC09-HL5-3	1.8	not classified	Sandy GRAVEL, trace cobbles and boulders.	1.8	N/A	N/A	N/A	N/A
Olive Gulch	TP-BGC09-HL5-4	0.5-0.6	not classified	Gravelly SILT, some sand.	12		34	24	42
Olive Gulch	TP-BGC09-HL5-4	2.0-2.5	not classified	Gravelly SAND, some silt.	9.1	N/A	N/A	N/A	N/A
Olive Gulch	TP-BGC09-HL5-4	4.0-4.5	Weathered Granodiorite	Completely weathered granodiorite, SAND.	6	N/A	N/A	N/A	N/A
Olive Gulch	TP-BGC09-HL5-5	0.5-0.6	not classified	SILT, some sand.	17.8	N/A	N/A	N/A	N/A
Olive Gulch	TP-BGC09-HL5-6	0.6-0.7	Colluvium	SILT, some gravel, trace sand.	17.6	N/A	N/A	N/A	N/A
Olive Gulch	TP-BGC09-HL5-6	2.0-2.5	Weathered Granodiorite	Completely weathered granodiorite, SAND, trace silt, trace gravel.	13.9	N/A	N/A	N/A	N/A
Olive Gulch	TP-BGC09-HL5-6	5.0-5.5	not classified	SAND, some subrounded gravel.	11.9	N/A	N/A	N/A	N/A
Olive Gulch	TP-BGC09-HL5-7	0.4-0.5	not classified	SILT, some gravel.	17.9	N/A	N/A	N/A	N/A
Olive Gulch	TP-BGC09-HL5-7	0.8-0.9	Colluvium	Silty SAND, some gravel.	9.5	N/A	N/A	N/A	N/A
Olive Gulch	TP-BGC09-HL5-7	2.0-2.5	Colluvium	Gravelly SAND, some silt.	11.7	6	38	30	25
Olive Gulch	TP-BGC09-HL5-8	0.2-0.4	Colluvium	Sandy SILT, trace gravel.	10.6	N/A	N/A	N/A	N/A
Olive Gulch	TP-BGC09-HL5-8	1.5	Bedrock	Granodiorite Bedrock, fractured tabular boulders.	16.7	N/A	N/A	N/A	N/A
Olive Gulch	TP-BGC09-HL5-9	0.4-0.5	not classified	SILT, some sand, some gravel.	29	N/A	N/A	N/A	N/A
Olive Gulch	TP-BGC09-HL5-10	0.5	Colluvium	Silty GRAVEL, some sand.	23.8	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-1	0.5	not classified	SILT, some gravel, trace sand, trace clay.	29	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-1	1.8-1.9	not classified	SILT, some gravel, trace sand, trace clay.	18	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-2	0.2-0.4	not classified	SILT, some gravel, trace sand, trace clay.	35.9	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-2	06.-0.7	not classified	SILT, some gravel, trace sand, trace clay.	74.8	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-2	2.3	not classified	SILT, some gravel, trace sand, trace clay.	25.6	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-3	0.4-0.5	not classified	Silty SAND, some cobbles, some boulders.	18.6	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-3	2.5	not classified	Silty SAND, some gravel, trace clay.	8.8	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-3	4.5	not classified	CLAY, trace gravel, trace silt.	31.5	13	86	1	N/A
Stuttle Gulch	TP-BGC09-HL4-4	0.4-0.5	not classified	Sandy SILT, trace clay, trace gravel.	14.7	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-4	1.5	not classified	Gravelly SAND, trace silt.	10.7	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-5	0.4-0.5	Colluvium	Sandy SILT, some gravel, trace clay.	23.6	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-5	2.5-3.0	Colluvium	Sandy SILT, some gravel, trace clay.	10.4	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-5	5.5-6.0	Colluvium	Sandy GRAVEL, some silt.	7.8	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-6	0.6-0.7	Colluvium	Silty SAND and GRAVEL.	10.4	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-6	3.0-3.5	not classified	Sandy GRAVEL, some silt.	5.7		15	40	45
Stuttle Gulch	TP-BGC09-HL4-7	0.5-0.7	Colluvium	Sandy SILT, some gravel.	14.9	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-7	1.5-1.85	Colluvium	Gravelly SAND, some silt.	33.2	N/A	N/A	N/A	N/A

Terrain Unit	Test Hole ID#	Sample Depth (m)	Material Genesis	Descriptive Texture	Moisture Content (% dry weight)	Grain Size Distribution			
						% <2µm	% <75 µm	% <4.75mm	% <75mm
Stuttle Gulch	TP-BGC09-HL4-8	0.3-0.4	Organics	SILT, trace sand, trace gravel.	92.5	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-8	1.5	Colluvium	Sandy SILT and GRAVEL.	15.6	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-9	0.8-0.9	Fill	Gravelly SAND, some silt.	11.2	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-9	3.3-3.8	Weathered Bedrock	Highly weathered Metasedimentary rock.	5.6	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-13	0.4-0.5	not classified	SILT, some sand, some gravel.	13.2	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-13	0.9-1.0	not classified	SILT, some sand, some gravel.	83.2	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-13	1.3-1.5	not classified	Gravelly SAND, some silt.	14.8	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-14	0.7-0.8	Colluvium	Gravelly SILT, some sand.	25.7	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-14	1.5	Colluvium	Gravelly SILT, some sand.	33.5	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-14	1.9	Colluvium	Gravelly SILT, some sand.	25.9	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-15	0.2-0.3	Colluvium	SILT, some sand, some gravel.	12.3	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-HL4-15	0.9-1.0	Colluvium	SILT, some sand, some gravel.	13.2	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-STU-3	0.5	not classified	SAND and GRAVEL, some silt, trace cobble.	12.1	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-STU-3	1.5	not classified	SAND and GRAVEL, some silt, trace cobble.	17.1	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-STU-4	1	not classified	Sandy SILT, some gravel.	119.3	N/A	N/A	N/A	N/A
Stuttle Gulch	TP-BGC09-STU-4	1.8	not classified	Sandy SILT, some subrounded to subangular gravel.	21.1	N/A	N/A	N/A	N/A
Stuttle Gulch	DH-BGC09-STU-3	1.52	not classified	SAND and GRAVEL, some silt, trace cobble.	21.2	N/A	N/A	N/A	N/A
Stuttle Gulch	DH-BGC09-STU-3	7.62	not classified	SILTY SAND and GRAVEL, some clay.	14.3	N/A	N/A	N/A	N/A
Stuttle Gulch	DH-BGC09-STU-3	9.14	not classified	SILTY SAND and GRAVEL, some clay.	MISSING	N/A	N/A	N/A	N/A
Stuttle Gulch	DH-BGC09-STU-3	13.72	not classified	SILT and GRAVEL, sandy, trace clay.	13.2	N/A	N/A	N/A	N/A
Stuttle Gulch	DH-BGC09-STU-3	18.29	not classified	SILT and CLAY, some sand, trace gravel.	14.6	N/A	N/A	N/A	N/A
Stuttle Gulch	DH-BGC09-STU-4	15.24	Till	Gravelly CLAY, some sand, some silt, boulders.	12.6	N/A	N/A	N/A	N/A
Stuttle Gulch	DH-BGC09-STU-4	1.52	Colluvium	Silty SAND and GRAVEL, some clay.	27.0	N/A	N/A	N/A	N/A
Stuttle Gulch	DH-BGC09-STU-4	7.62	Till	Gravelly CLAY, some sand, some silt, boulders.	15.2	N/A	N/A	N/A	N/A
West Haggart Creek	TP-BGC09-HL4-11	0.4-0.6	not classified	SILT, trace clay, trace sand.	57.8	N/A	N/A	N/A	N/A
West Haggart Creek	TP-BGC09-HL4-11	0.9-1.1	not classified	Sandy GRAVEL, some silt.	11.8	N/A	N/A	N/A	N/A
West Haggart Creek	TP-BGC09-HL4-12	0.3-0.4	not classified	SILT, some gravel, some sand.	18.5	N/A	N/A	N/A	N/A
West Haggart Creek	TP-BGC09-HL4-12	1.0-1.1	not classified	SILT, some gravel, some sand.	53.1	N/A	N/A	N/A	N/A
West Haggart Creek	TP-BGC09-HL4-12	1.3-1.4	not classified	Sandy GRAVEL, some silt.	51.4	3	30	35	33
West Haggart Creek	TP-BGC09-HL4-16	0.4-0.5	not classified	Silty SAND and GRAVEL.	13.2	N/A	N/A	N/A	N/A
West Haggart Creek	TP-BGC09-HL4-16	0.9-1.0	not classified	Silty SAND and GRAVEL.	13.4	N/A	N/A	N/A	N/A
West Haggart Creek	TP-BGC09-HL4-16	1.8-2.0	not classified	Silty SAND, some gravel.	15.6	3	48	19	29
West Haggart Creek	TP-BGC09-HL4-17	0.3-0.5	not classified	SILT, trace clay, trace gravel.	80.4	N/A	N/A	N/A	N/A
West Haggart Creek	TP-BGC09-HL4-17	0.7-0.8	not classified	Silty SAND and GRAVEL.	20.3	N/A	N/A	N/A	N/A
West Haggart Creek	TP-BGC09-HL4-17	0.7-0.8	not classified	Silty SAND and GRAVEL.	16.9	N/A	N/A	N/A	N/A

Terrain Unit	Test Hole ID#	Sample Depth (m)	Material Genesis	Descriptive Texture	Moisture Content (% dry weight)	Grain Size Distribution			
						% <2µm	% <75 µm	% <4.75mm	% <75mm
West Haggart Creek	TP-BGC09-HL4-18	0.3-0.4	not classified	Silty SAND and GRAVEL.	9.6	N/A	N/A	N/A	N/A
West Haggart Creek	TP-BGC09-HL4-18	1.1-1.2	not classified	Silty SAND and GRAVEL.	6.1	N/A	N/A	N/A	N/A
West Haggart Creek	TP-BGC09-HL4-18	1.6-1.8	not classified	Silty SAND and GRAVEL.	6.4	N/A	N/A	N/A	N/A
West Haggart Creek	TP-BGC09-HL4-18	2.0-2.4	not classified	Silty SAND and GRAVEL.	8.6	N/A	N/A	N/A	N/A
West Haggart Creek	TP-BGC09-HL4-18	3.5-4.0	not classified	SILT, some clay, trace gravel, trace sand.	64.3	N/A	N/A	N/A	N/A
West Haggart Creek	DH-BGC09-DG-7	15.24	not classified	Sandy CLAY, some silt, some fine gravel.	13.9	N/A	N/A	N/A	N/A
West Haggart Creek	DH-BGC09-DG-7	6.10	Colluvium	Silty SAND and GRAVEL, cobbly.	21.8	N/A	N/A	N/A	N/A
West Haggart Creek	DH-BGC09-DG-7	18.29	Till	Sandy CLAY, some gravel.	17.8	N/A	N/A	N/A	N/A
West Haggart Creek	DH-BGC09-DG-7	12.19	not classified	Clayey GRAVEL, cobbly.	17.1	N/A	N/A	N/A	N/A
West Haggart Creek	DH-BGC09-DG-7	3.05	not classified	Silty GRAVEL, some sand, some clay.	16.1	N/A	N/A	N/A	N/A
						N/A	N/A	N/A	N/A
Open Pit	TP-BGC09-P1	0.7-0.8	Weathered Bedrock	SAND and BOULDERS, some silt, some gravel, some cobbles.	10.5	N/A	N/A	N/A	N/A
Open Pit	TP-BGC09-P1	2.7-3.2	Weathered Bedrock	SAND and BOULDERS, some silt, some gravel, some cobbles.	5.2	N/A	N/A	N/A	N/A
Open Pit	TP-BGC09-P2	0.3-0.4	Colluvium	SAND and GRAVEL, some silt, trace clay.	8.4	N/A	N/A	N/A	N/A
Open Pit	TP-BGC09-P2	1-1.1	not classified	SAND and GRAVEL, some silt, trace clay, trace cobbles.	6.2	N/A	N/A	N/A	N/A
Open Pit	TP-BGC09-P3	0.6-0.7	Colluvium	Sandy GRAVEL, some silt, trace clay.	8.6	N/A	N/A	N/A	N/A
Open Pit	TP-BGC09-P4	0.9-1.0	Colluvium	SAND, some silt, some gravel and cobbles.	6.8	N/A	N/A	N/A	N/A
Open Pit	TP-BGC09-P4	1.8-2	Completely Weathered Bedrock	Sandy GRAVEL, some strong granodiorite clasts.	6.8	N/A	N/A	N/A	N/A

3.6. Bulk Samples

Representative bulk samples were collected from 60 test pits, at depths varying from 0.2 m to 5.5 m, for future use by VGC in determining potential construction borrow materials. No laboratory testing has yet been conducted on these samples - they are currently being stored in the core shack on the Eagle Gold Project site (Photograph 1). A complete inventory of bulk samples is shown in Table 9.

Photograph 1 Storage of Bulk Samples under logging racks in the core shack.

Table 9. Bulk Samples.

Terrain Unit	Test ID#	Depth (m)	Genesis	Texture
Ann Gulch	TP-BGC09-HL1-1	2	Weathered rock	Completely weathered QUARTZITE, to gravelly SAND.
Ann Gulch	TP-BGC09-HL6-1	2.5-3.0	Weathered Bedrock	Highly to completely weathered Metasedimentary Bedrock.
Ann Gulch	TP-BGC09-HL6-2	0.2-0.6	Colluvium	Silty SAND and GRAVEL, trace clay.
Ann Gulch	TP-BGC09-HL6-3	2.0-2.5	not classified	SAND, trace gravel, trace silt.
Ann Gulch	TP-BGC09-HL6-4	4.0-4.5	Weathered Bedrock	Completely to highly weathered Metasedimentary Bedrock.
Ann Gulch	TP-BGC09-HL6-5	0.9	Completely Weathered Bedrock	Sandy GRAVEL, some silt, trace clay.
Ann Gulch	TP-BGC09-HL6-6	2.8-3.2	not classified	Gravelly SILT, some sand.
Ann Gulch	TP-BGC09-HL6-7	2.0-2.5	Colluvium	Sandy GRAVEL, some silt.
Ann Gulch	TP-BGC09-HL6-8	2.0-2.4	Colluvium	Gravelly SILT, some sand, trace clay.
Ann Gulch	TP-BGC09-HL6-9	1.5-2.0	Weathered Bedrock	Completely weathered Metasedimentary Rock.
Ann Gulch	TP-BGC09-HL6-10	0.6-1.0	not classified	Gravelly SILT, some sand.
Ann Gulch	TP-BGC09-HL6-10	2.2-2.7	Weathered Bedrock	Completely weathered Metasedimentary Rock.
Ann Gulch	TP-BGC09-HL6-11	1.5	Weathered Bedrock	Highly weathered Metasedimentary bedrock, trace sand infill.
Ann Gulch	TP-BGC09-HL6-12	2	not classified	Coarse GRAVEL, some sand.
Ann Gulch	TP-BGC09-HL6-13	2.2	Weathered Bedrock	Highly weathered Metasedimentary bedrock, sand and gravel infill.
Ann Gulch	TP-BGC09-HL6-15	2	Colluvium	Gravelly SAND, trace cobbles.
Ann Gulch	TP-BGC09-HL6-16	2	Completely Weathered Bedrock	Sandy GRAVEL, trace silt.
Ann Gulch	TP-BGC09-HL6-17	2.3	Weathered Bedrock	Highly weathered Metasedimentary bedrock, gravelly sand and cobbles.
Eagle Pup	TP-BGC09-WR-4	2	Weathered Bedrock	Highly fractured metasedimentary rock.
Eagle Pup	TP-BGC09-WR-5	0.5-0.7	not classified	Silty GRAVEL, some sand.
Eagle Pup	TP-BGC09-WR-6	1	Colluvium	Gravelly SILT, some clay.
Eagle Pup	TP-BGC09-WR-6	4.0-4.5	Colluvium	Gravelly SILT, some clay.
Eagle Pup	TP-BGC09-WR-8	2	not classified	Silty SAND, some gravel.
Eagle Pup	TP-BGC09-WR-9	2.0-2.5	not classified	SAND, some gravel, trace silt.
Lower Reach Dublin Gulch	TP-BGC09-HL4-10	3.0-3.4	not classified	Silty SAND, some gravel.
Lower Reach Dublin Gulch	TP-BGC09-DG-1	2	not classified	Gravelly cobbles and boulders.
Lower Reach Dublin Gulch	TP-BGC09-DG-3	2	not classified	SAND and GRAVEL, trace silt.
Lower Reach Dublin Gulch	TP-BGC09-DG-4	1.5	Till	SILT and COBBLES, some gravel.
Olive Gulch	TP-BGC09-HL5-4	2.0-2.5	not classified	Gravelly SAND, some silt.
Olive Gulch	TP-BGC09-HL5-4	4.0-4.5	Weathered Granodiorite	Completely weathered granodiorite, SAND.
Olive Gulch	TP-BGC09-HL5-6	2.0-2.5	Weathered Granodiorite	Completely weathered granodiorite, SAND, trace silt, trace gravel.
Olive Gulch	TP-BGC09-HL5-6	5.0-5.5	not classified	SAND, some subrounded gravel.
Olive Gulch	TP-BGC09-HL5-7	2-2.5	Colluvium	Gravelly SAND, some silt.
Olive Gulch	TP-BGC09-HL5-8	0.2-0.5	Colluvium	Sandy SILT, trace gravel.
Olive Gulch	TP-BGC09-HL5-9	3.3-3.8	Bedrock	Fresh tabular Granodiorite Rock.
Olive Gulch	TP-BGC09-HL5-10	0.5	Colluvium	Silty GRAVEL, some sand.
Stuttle Gulch	TP-BGC09-HL4-1	1.8-1.9	not classified	SILT, some gravel, trace sand, trace clay.
Stuttle Gulch	TP-BGC09-HL4-2	1.5-2	not classified	SILT, some gravel, trace sand, trace clay.
Stuttle Gulch	TP-BGC09-HL4-3	2.0-2.5	not classified	Silty SAND, some gravel, trace clay.
Stuttle Gulch	TP-BGC09-HL4-3	4.0-5.0	not classified	CLAY, trace gravel, trace silt.
Stuttle Gulch	TP-BGC09-HL4-4	1.5	not classified	Gravelly SAND, trace silt.
Stuttle Gulch	TP-BGC09-HL4-5	2.5-3.0	Colluvium	Sandy SILT, some gravel, trace clay.
Stuttle Gulch	TP-BGC09-HL4-6	3.0-3.5	not classified	Sandy GRAVEL, some silt.
Stuttle Gulch	TP-BGC09-HL4-7	1.5-1.8	Colluvium	Gravelly SAND, some silt.

Terrain Unit	Test ID#	Depth (m)	Genesis	Texture
Stuttle Gulch	TP-BGC09-HL4-8	1.5	Colluvium	Sandy SILT and GRAVEL.
Stuttle Gulch	TP-BGC09-HL4-9	3.3-3.8	Weathered Bedrock	Highly weathered Metasedimentary rock.
Stuttle Gulch	TP-BGC09-HL4-13	1.3-1.5	not classified	Gravelly SAND, some silt.
Stuttle Gulch	TP-BGC09-HL4-14	1.5	Colluvium	Gravelly SILT, some sand.
Stuttle Gulch	TP-BGC09-HL4-15	1.3	Colluvium	SILT, some sand, some gravel.
Stuttle Gulch	TP-BGC09-STU-4	1.5	not classified	Sandy SILT, some subrounded to subangular gravel.
Stuttle Gulch	TP-BGC09-STU-3	1.5	not classified	SAND and GRAVEL, some silt, trace cobble.
West Haggart Creek	TP-BGC09-HL4-11	0.5-0.8	not classified	SILT, trace clay, trace sand.
West Haggart Creek	TP-BGC09-HL4-12	1.3-1.4	not classified	Sandy GRAVEL, some silt.
West Haggart Creek	TP-BGC09-HL4-16	1.5-1.7	not classified	Silty SAND, some gravel, trace clay.
West Haggart Creek	TP-BGC09-HL4-17	1.6	not classified	Silty SAND and GRAVEL.
West Haggart Creek	TP-BGC09-HL4-18	2.0-2.4	not classified	Silty SAND and GRAVEL.
Open Pit	TP-BGC09-P1	2.7-3.2	Weathered Bedrock	SAND and BOULDERS, some silt, some gravel, some cobbles.
Open Pit	TP-BGC09-P2	1.7-2.2	Bedrock	Biotite Schist.
Open Pit	TP-BGC09-P3	1.3-1.7	Weathered Bedrock	Moderately weathered Metasedimentary bedrock, some silty sand infill.
Open Pit	TP-BGC09-P4	2-2.3	Completely Weathered Bedrock	Sandy GRAVEL, some strong granodiorite clasts.

4.0 RESULTS

4.1. Observed Overburden Soil Conditions

Overburden in the Eagle Gold project area is most commonly a thin cover of organic soils underlain by colluvium, followed by either a metasedimentary or granodiorite weathered rock profile. The overburden thickness and consistency varies spatially throughout the project area and any generalizations or conclusions drawn are naturally biased by the investigation of predetermined potential site facility locations. Ground conditions may vary considerably between test holes.

4.1.1. Organic Soils

Organic cover is widespread across the project site, and consists of predominantly peat and silt in varying proportions. The distribution of organic thickness is illustrated in Figure 11. Organic cover averaged 0.2 m thickness. Previously-disturbed areas, such as old drill pads, road construction or placer mining, had no organic cover. The thickness of organic cover was greater, up to 0.5m, in the valley bottoms and shallow slopes. All organic layers were penetrated by roots, with varying compositions of moss or needle mats.

4.1.2. Colluvium

The nature and distribution of colluvium layer(s) varied across site, ranging from 0.2 m to 6.3 m thickness, where observed. The distribution of thickness of colluvium is illustrated in Figure 12. The colluvium was generally gravelly silt or gravelly sand. The clasts comprised of metasedimentary rock or granodiorite and clasts ranged from angular to subangular/ subrounded. In areas of steeper exposed rock faces, more recent and active rockfall accounted for thicker colluvium layers.

Occasionally colluvial deposits were observed to be separated by fluvial deposits, in the test pits adjacent to gulches and streams.

The moisture content of the colluvial materials ranged between 6.8 % and 33.5 % and averaged 4.6 %.

4.1.3. Till

Till was encountered in drillholes BH-BGC09-STU-3 and BH-BGC09-DG-7 at 15.0 m and 15.6 m depths, respectively. These boreholes were drilled along the lower flanks of the hillside above Dublin Gulch, west of Stuttle Gulch, above the exposed bluffs adjacent to the placer tailings at the valley bottom. Till was also encountered at 0.1 m depth in test pit TP-BGC09-A-3, located east of the main access road beside Haggart Creek.

The till was generally a silty or sandy clay matrix with some proportion of larger clasts up to cobble size. A typical core sample of unfrozen till is shown in Photograph 2 below.

The till was observed to be hard in the two boreholes, and compact to dense in the test pit.

Photograph 2. Till core from 25 m depth at DH-BGC09-STU-3.

The south side slopes of lower Dublin Gulch have been stripped of vegetation (Photograph 3), exposing a fine grained matrix with randomly distributed gravel and cobble sized clasts. The exposed materials are weathered and cemented, so the genesis isn't certain, but these exposed banks appear to be till, with a thin veneer of glaciofluvial, glaciolacustrine and aeolian materials at the top.

Photograph 3. Exposed banks south of Dublin Gulch, west of Stuttle Gulch, looking south.

4.1.4. Weathered Rock

There are two main rock types found on site: metasediments and granodiorite. Consequently two weathering profiles were observed where in situ weathering occurred. Decomposed granodiorite was observed in the Olive Gulch zone, having been completely weathered to coarse sand with friable, relict corestones in places. Metasedimentary weathering profiles were most apparent in Ann Gulch, where in situ soils also contained easily friable pieces of remnant mica schist. Weathered rock was most often observed directly below colluvium, and above more intact rock. The observed thickness of weathered rock across the site is illustrated in Figure 13.

It should be noted that the distinction between colluvium and weathered rock was often subtle, as the two materials are similar in character. Consequently, the transition depths noted in the test hole logs are approximate.

4.1.5. Placer Tailings

The surficial materials in the lower reaches of Dublin Gulch have been reworked by placer mining operations for several decades. Large stockpiles of washed sands and gravels and fine grained tailings settling ponds are present. Photograph 4 illustrates the topography in the tailings deposits, and gives a sense of the variability of texture.

Three drillholes and two test pits were completed in the reworked Dublin Gulch placer tailings area. In general, the placer tailings are compact to dense well graded sands and gravels with cobbles and trace boulders. Placer tailings typically comprise subrounded metasedimentary and granodiorite clasts. Drillhole DH-BGC09-DG-2 was drilled in an abandoned placer tailings settling pond where sediments comprised wet compact clayey silt overlying silty sand and gravel. Boulders were observed in gravel tailings above bedrock from 5.4 m to 12.2 m depth at DG-3.

Dynamic cone penetration tests were completed at DG-2 and DG-3, and showed that the material strength is highly variable, ranging from loose to very dense. Surface observations, combined with test hole observations, suggest that the texture and density of the placer tailings is highly variable both horizontally and with depth.

Photograph 4. Placer tailings in Dublin Gulch valley bottom.

4.2. Frozen Ground and Permafrost

Frozen ground was encountered in approximately half of the test pits, as detailed in Table 3. Frozen ground was also encountered in two of the three boreholes on the north facing slopes above the Dublin Gulch valley bottom (DH-BGC09-STU-3 and STU-4). The placer tailings in the valley bottom were not frozen at the three borehole locations. Frozen ground was also not observed at boreholes DH-BGC09-DG-7 and DH-BGC09-AG-3.

Frozen soil, when observed, was generally encountered immediately below the organic cover, although frozen organics were also encountered on north facing slopes and under a dense spruce forest canopy. Three thermistor strings were installed, as shown in Figure 14. At boreholes DH-BGC09-STU-3 and STU-4, thermistor strings were installed with multiple temperature-measuring beads to 10 m depth. At DH-BGC09-AG-3, a single temperature-measuring bead was installed at 10 m depth.

The distribution of observed frozen ground from the test pit locations is illustrated in Figure 15. This figure includes observations from BGC's current work, as well as compiled observations from the Knight Piesold and Sitka work in 1995 and 1996. The distribution of frozen ground is highly variable across the site, with frozen ground being present within a few metres of other test pits that were unfrozen. Similar variability was observed within individual test pits, where part of a side wall was observed to be frozen at shallow depth, whereas the opposite wall, or a different section of the wall, was unfrozen.

The term frozen ground is used, rather than permafrost, since the observations were made in July and August, prior to the maximum extent of thaw, which is expected by September. Permafrost was confirmed with temperature measurements in 1996 at one of ten thermistors installed by Knight Piesold and Sitka (GT96-33). Their other nine thermistors showed an absence of permafrost. Two of BGC's thermistors from 2009 (STU-3 and STU-4) confirmed permafrost at those locations. In all three cases of confirmed permafrost, ground temperatures showed the permafrost to be warm, at close to 0^{o}C.

Excess ice was noted in the frozen ground at several test pit locations. The distribution of observations of excess ice is illustrated in Figure 16.

4.3. Bedrock

Bedrock was encountered at shallow depth in many test pits. The observed depth to bedrock in test pits is illustrated in Figure 17. Bedrock was also observed in four of the seven drilled boreholes supervised by BGC.

Metasedimentary bedrock was penetrated between 7.6 m and 14.3 m depth in the three drillholes advanced through the placer tailings in the Dublin Gulch valley bottom (DH-BGC09-DG-1, DG-2, and DG-3). At drillhole DH-BGC09-DG-3, a brecciated fault gouge was present from 12.1 m to 19.0 m. Metasedimentary bedrock was also encountered at DH-BGC09-AG-3, which was advanced in the lower part of Ann Gulch, close to its confluence with Dublin Gulch.

Bedrock was not encountered at DH-BGC09-STU-3, DH-BGC09-STU-4 and DH-BGC09-DG-7, which were terminated at 31.1 m, 18.3 m and 19.8 m. These holes were drilled on the lower flanks of the hills above Dublin Gulch to the south, west of Stuttle Gulch.

Where rock was encountered, it was generally very poor quality, with RQD values typically ranging from 0 to 20. Metasedimentary bedrock ranged from extremely weak to medium strong.

4.4. Groundwater Conditions

Groundwater was observed in nine of 69 test pits, and in two of the seven boreholes supervised by BGC. In all other test pits, the permanent water table appeared to be lower than the limits of excavation. Groundwater observations made by BGC are summarized in Table 10 below. Table 11 summarizes data supplied from Stantec's groundwater monitoring, including older wells from previous site investigation programs.

Observations of groundwater seepage are illustrated in Figure 18. Observed depth to groundwater is illustrated in Figure 19.

Table 10. Summary of Groundwater Observations

Test Pit/Borehole ID	Depth (m)	Seepage*	GW Pipe**	Comments
TP-BGC09-HL4-14	0-1.9	L	N	Excavation left open for 25 minutes, weepy walls from ice melting.
TP-BGC09-HL4-17	0-0.5	L-M	N	Seepage likely rain from showers in area, released from disturbed moss covering.
TP-BGC09-HL5-6	5.5	M-H	Y	
TP-BGC09-HL5-10	0-2.8	H	N	Ponded water on surface, boggy area.
TP-BGC09-HL6-8	0-2.6	M-H	N	Ponded water on surface in day old excavator tracks.
TP-BGC09-WR-7	0-2.5	M-H	N	Test pit located adjacent to Eagle Pup.
TP-BGC09-WR-8	3.5	H	Y	Inflow from Eagle Pup.
DH-BGC09-DG-1	2	M-H	Y	Groundwater table encountered at 2.0m.
DH-BGC09-DG-2	4.9	M-H	Y	Groundwater table encountered at 4.9m.
TP-BGC09-DG-1	2	H	N	Seepage filled testpit then sloughed in.
TP-BGC09-DG-3	2.9	M	N	

*L=light, M=moderate, H=heavy
**Slotted 2" PVC for groundwater monitoring installed

Table 11. Summary of Depth to Groundwater Table.

Monitoring Well ID	Date	Easting	Northing	Depth to Groundwater (m bgs)
GT96-26	24-Jul-09	462585.133	7101834.681	4.21
	27-Aug-09			4.22
MW96-8	24-Jul-09	463252.365	7101258.356	1.36
	27-Aug-09			1.53
MW96-9a/b	24-Jul-09	463074.143	7101059.862	7.16
	27-Aug-09			7.61
MW96-13a/b	25-Jul-09	460176.627	7100649.791	16.52
	27-Aug-09			17.85
MW96-15a	25-Jul-09	459996.865	7100730.109	7.68
	27-Aug-09			7.88
MW96-15b	25-Jul-09	459996.865	7100730.109	8.66
MW95-152	25-Jul-09	459146.957	7100752.290	3.48
	27-Aug-09			3.71
MW96-1	21-Aug-09	463759.664	7100773.192	26.10
	27-Aug-09			23.97
MW96-18	25-Jul-09	460521.066	7099296.894	18.56
	27-Aug-09			21.25
MW96-10b	24-Jul-09	462935.908	7100938.914	2.54
MW96-2	24-Jul-09	463672.639	7100852.218	10.57
MW96-3	24-Jul-09	463595.519	7100942.276	3.33
DH95-147	24-Jul-09	463443.952	7100932.907	5.00
MW96-4	24-Jul-09	463503.748	7101032.507	6.53
MW96-5	24-Jul-09	463426.376	7101100.282	3.35
DH95-144	24-Jul-09	463670.673	7101520.915	3.49
MW96-7b	24-Jul-09	463592.005	7101477.256	1.26
MW96-19	23-Aug-09	460536.011	7099318.994	27.73
MW96-17b	23-Aug-09	460487.700	7099364.185	44.70
MW96-17a	23-Aug-09	460487.700	7099364.185	dry
MW96-25	23-Aug-09	459182.590	7099369.868	dry
MW06-24	23-Aug-09	459685.139	7099296.455	dry
MW96-23	27-Aug-09	459584.496	7099074.864	9.64
MW09-DG2	27-Aug-09	458989.746	7100687.488	1.71
MW09-DG1	27-Aug-09	459318.818	7100816.909	2.19
MW09-Stu2	27-Aug-09	458953.530	7100164.159	-0.18
MW09-Stu1	27-Aug-09	459768.539	7100454.432	14.79

Monitoring Well ID	Date	Easting	Northing	Depth to Groundwater (m bgs)
MW09-AG2	4-Sep-09	459775.905	7101780.566	14.02
MW09-AG1	26-Aug-09	459418.958	7101751.765	13.97
MW09-OG3	3-Sep-09	461221.378	7101361.009	2.75
MW09-OG2	4-Sep-09	462216.068	7100401.481	5.50
MW09-DG4	4-Sep-09	458279.458	7100919.823	6.02
MW09-DG5	4-Sep-09	458394.885	7100416.760	14.24

4.5. Slope Instability

Explicit consideration of slope stability was not included in BGC's scope, and terrain mapping is being completed by others. However, BGC brought aerial photographs into the field to aid in planning of the work, and air photo observations during field reconnaissance suggested the possibility of a large ancient landslide on the hillside above Dublin Gulch (see Figure 20). If an old landslide exists, this would need to be considered in the planning, design and construction of mine infrastructure in the area. Loading the top, or excavating the toe, of such a landslide could potentially lead to reactivation. Additional study of this feature is recommended for any facilities alternative that it may affect.

There are numerous smaller instability features across the project area. For example, steep rock slopes in Olive Gulch are subject to rockfall. Similarly, a near vertical rock face along the west valley wall of Eagle Pup is also subject to rockfall. Other types of slope failure, including probable creep features, are evident in the other creek basins. Each should be considered in relation to planning and design once facilities locations and layouts have been finalized.

5.0 OBSERVATIONS IN SPECIFIC TERRAIN UNITS

Section 4 presented the detailed observations resulting from the field investigation. These findings have been compiled in summary form in Table 12 to provide a general overview of conditions in each terrain unit outlined in Figure 8. This Table also presents a snapshot of the more significant geotechnical issues that would be encountered in specific terrain units. These comments are intended to be very general in nature, as facility locations have not been finalized, and within each terrain unit, there is spatial heterogeneity, particularly between the steep and relatively level areas. Areas with steep slopes have been denoted where slope angles are steeper than about 20 degrees. The detailed data should be consulted to develop a more complete understanding of these issues. Issues that are common across all terrain units, such as encountering scattered permafrost, potentially including ice rich soil, are not specifically mentioned.

Table 12. Observations in specific terrain units.

Terrain Unit Name	Associated Facility	General Description of Terrain	Number of Test Holes	Typical Soil Conditions	Bedrock Depth	Groundwater Conditions	Frozen Ground and Permafrost	Significant Issues
Ann Gulch	Heap Leach Option #6	Ann Gulch is a relatively short valley draining toward Dublin Gulch. It was dry during the field work, and likely only carries surface water during spring runoff or significant rainfall. Slope angles are relatively gentle, typically less than 20 degrees, with isolated steeper areas.	20 test pits 1 borehole	Organics over colluvium over weathered rock over intact bedrock.	Typically shallow, ranging from 2.8 m to 6.5 m where observed, and relatively few holes where rock was not encountered.	Test holes were all dry, except one test pit where groundwater seepage was observed at 2.6 m depth.	Less frozen ground than typically observed elsewhere in the project area. Very little excess ice where frozen ground was observed.	
Bawn Boy Gulch	Heap Leach Option #3	This unit is predominantly very gently sloping, with some steep slopes to the north, where the creek has carved a relatively deep channel.	No work done by BGC in 2009. Numerous test pits and boreholes completed by Knight Piesold and Sitka in 1995 and 1996.	Organics over colluvium over weathered rock over intact bedrock.	From Knight Piesold and Sitka reports, bedrock is relatively shallow, generally.	From Knight Piesold and Sitka reports, test pits were generally dry.	From Knight Piesold and Sitka reports, frozen ground observed randomly. No information available regarding excess ice.	
Eagle Pup	Waste Rock Dump	This drainage basin is dominated by steep slopes along both valley walls, being typically steeper along the east-facing wall. This basin may be affected by a potential existing large landslide.	9 test pits	Organics over colluvium over weathered rock over intact bedrock.	Bedrock was only encountered in 3 of 9 holes, suggesting it is relatively deep.	Test holes were all dry, except two test pits where groundwater seepage was observed at 2.5 m and 3.5 m depth.	Frozen ground observed randomly. Some observations of excess ice.	Steep slopes. Thick frozen ground. Thick colluvium. Potential large instability.
Lower Reach of Dublin Gulch	Heap Leach Option #1	This area has been completely reshaped by anthropogenic influence. The valley floor is covered by large mounds of reworked placer tailings. Relatively low, steep banks exist to the south.	5 test pits 3 boreholes	Placer tailings over bedrock.	Bedrock depth below placer tailings can be expected to vary considerably, but was observed at 7.6 to 14.3 m depth in three boreholes.	Relatively shallow groundwater is observed near streams.	Some frozen ground. No observations of excess ice in the placer tailings. Ice-rich permafrost in till and colluvium on southern valley bluffs.	Thick, variable surficial soils. Exccess ice in till and colluvium on southern valley bluffs.
Middle Reach of Dublin Gulch	Heap Leach Option #2	The middle part of the Dublin Gulch valley is relatively wide at the bottom, with very steep exposed rock faces to the north.	No work done by BGC in 2009. Option #2 was set aside from further consideration.	No data.	No data.	No data.	No data.	Steep rock slopes.
Olive Gulch	Heap Leach	The upper part of this terrain	10 test pits	Organics over colluvium	Bedrock depth tends to be		Frozen ground	Rockfall along steep

Terrain Unit Name	Associated Facility	General Description of Terrain	Number of Test Holes	Typical Soil Conditions	Bedrock Depth	Groundwater Conditions	Frozen Ground and Permafrost	Significant Issues
	Option #5	unit consists of gently sloping terrain, which is bisected by a deep channel with steep rock slope sides. The valley bottom is covered with a blanket of boulders. The lower part of the valley has steep sides.		over weathered rock over intact bedrock.	shallow, and was encountered at 5 of 9 test pits at depths between 0.9 m and 4.8 m.		observed randomly. Excess ice observed rarely.	valley sides. Steep slopes in lower part of the valley.
Stewart Gulch	Nil	This small drainage basin is dominated by steep slopes throughout.	None.	No data.	No data.	No data.	No data.	Steep slopes. Unknown subsurface conditions.
Stuttle Gulch	Heap Leach Option #4	The drainage basin has relatively gentle slopes in its lower half, becoming gradually steeper with increased elevation. This basin may be affected by a potential existing large landslide.	15 test pits 2 boreholes	Organics over thick colluvium over thick hard till (till present at lower flanks only).	Bedrock was not encountered in any test holes, including two boreholes to 18.3 m and 31.1 m, suggesting that it is relatively thick.	Test holes were all dry, except two test pits where groundwater seepage was observed at 2.8 m and 5.5 m depth.	Frozen ground very common. Excess ice very common.	Thick colluvium. Thick frozen ground with excess ice. Potential large instability.
West Haggart Creek	Heap Leach Option #4	This unit contains primarily west facing slopes, and is outside the Dublin Gulch drainage basin. Slopes are relatively gentle on the lower flanks, and increase with elevation. This terrain unit may be affected by a potential existing large landslide.	7 test pits 1 borehole	Organics over thick colluvium over thick hard till (till present at lower flanks only).	Bedrock was not encountered in any test holes, including one borehole to 19.8 m depth, suggesting that it is relatively thick.	Test holes were all dry, except one test pit where groundwater seepage was observed at 0.5 m depth.	Frozen ground very common. Excess ice very common.	Thick colluvium. Thick frozen ground with excess ice. Steep slopes near open pit. Potential large instability.

6.0 RECOMMENDATIONS FOR FURTHER STUDY

The intent of this work was to gather sufficient geotechnical data to support prefeasibility level designs for the proposed mine development. Additional subsurface data will be required at subsequent stages to support the more detailed levels of design once the facilities locations and grades have been finalized.

Some evidence emerged during the field work suggesting the potential existence of a large instability feature on the south facing slopes above Dublin Gulch in the Stuttle Gulch and Eagle Pup drainage basins. If such a feature exists, it could have a material impact on the development of facilities downslope, particularly activities that would undermine the toe of the slope, load the crest, or result in additional groundwater infiltration. Therefore, if facilities are planned in this area, further study is recommended to either rule out the interpreted instability, or to determine how to modify design and construction to avoid problems should the feature exist.

7.0 CLOSURE

We trust the above satisfies your requirements at this time. Should you have any questions or comments, please do not hesitate to contact us.

Yours sincerely,

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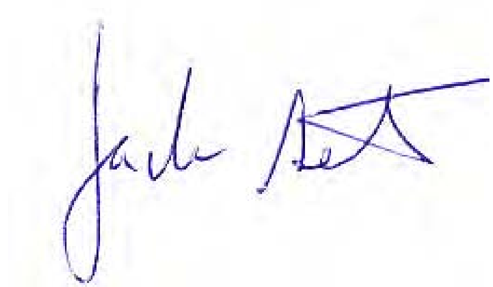

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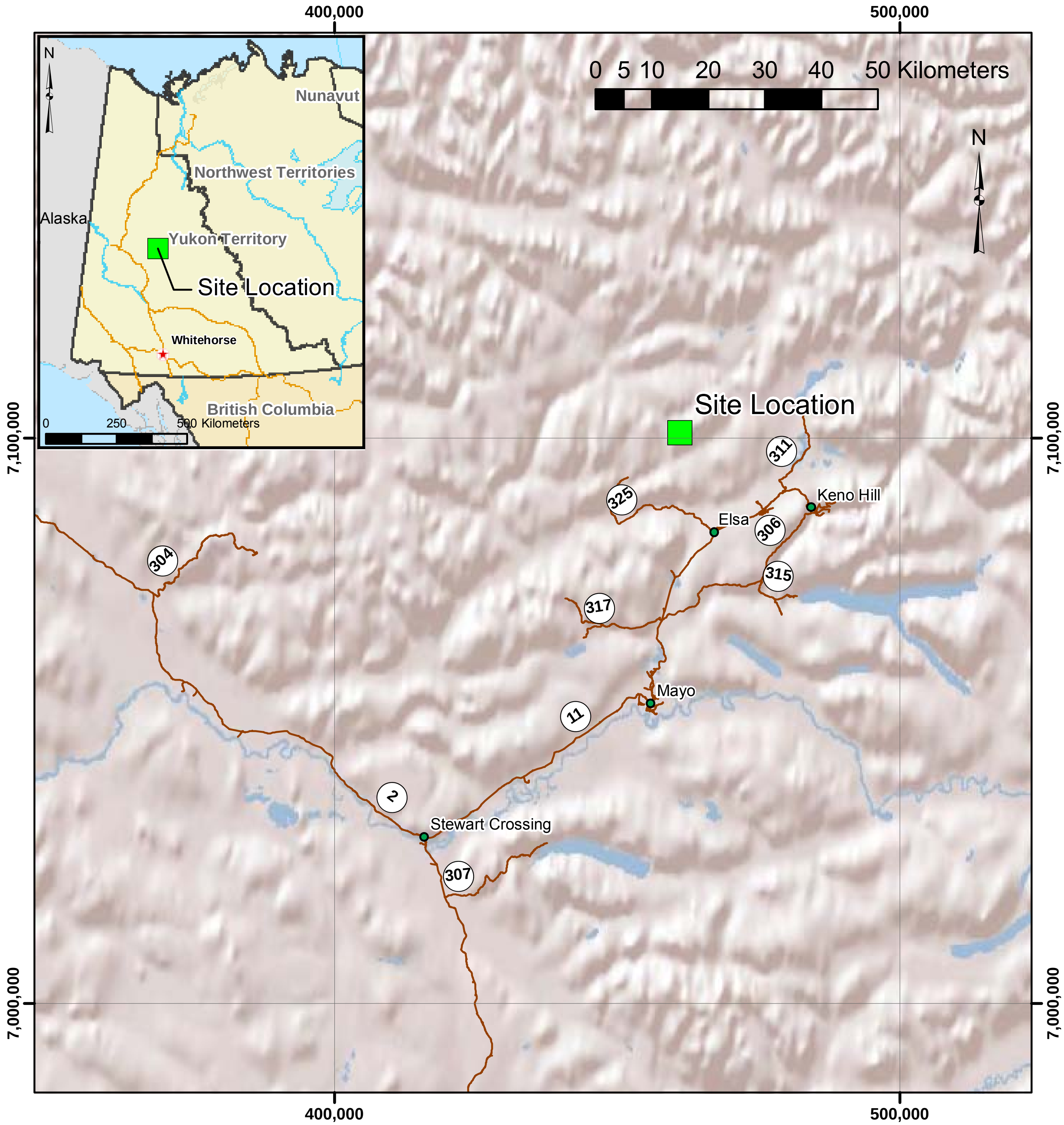
FIGURES



NAD 1983 UTM Zone 8N

SCALE:	1:1,000,000	DESIGNED:	PQ
DATE:	MAR 2010	CHECKED:	PQ
DRAWN:	GLT	APPROVED:	JTCS

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT:

VICTORIA GOLD CORP.

PROJECT:

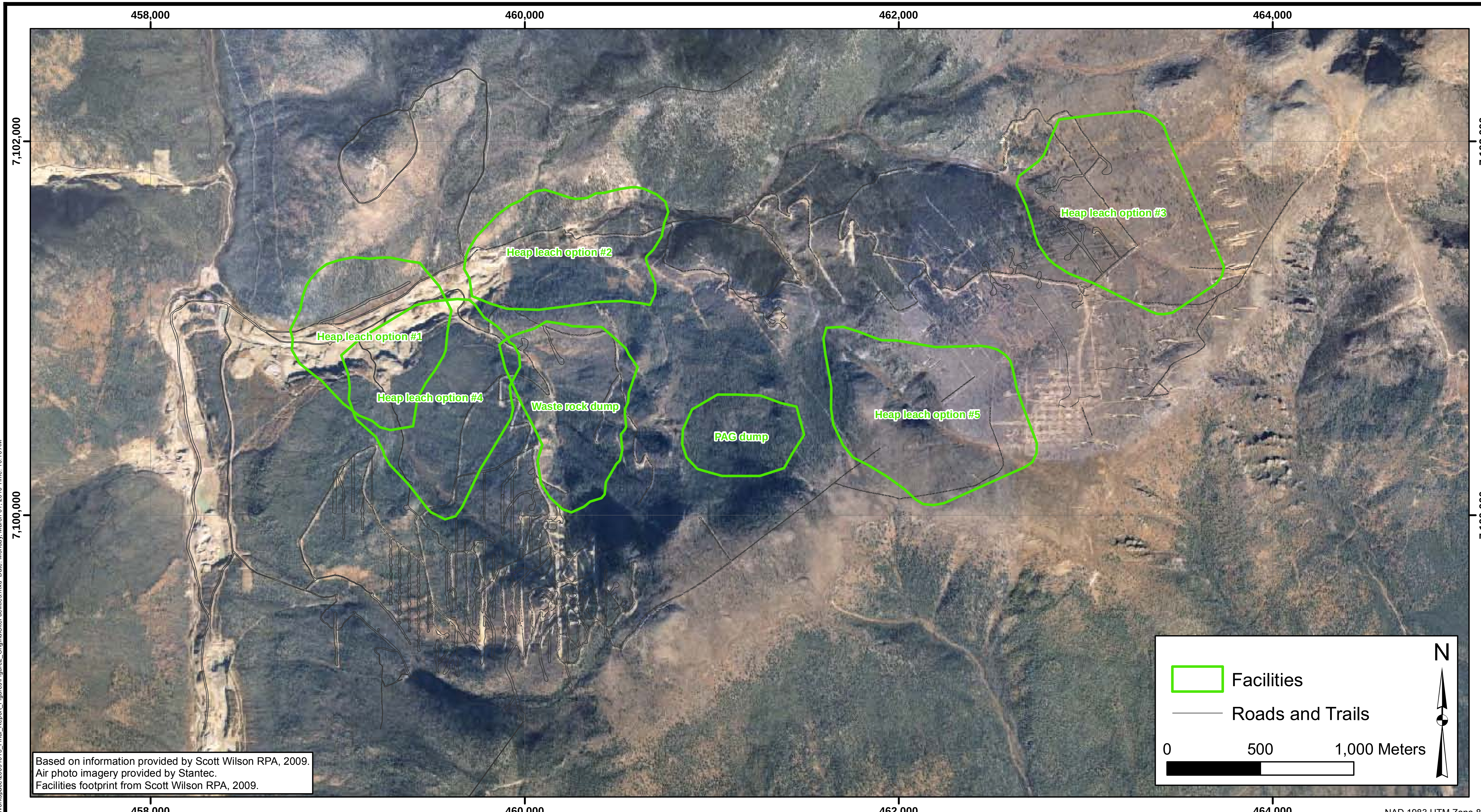
EAGLE GOLD PROJECT
PRE-FEASIBILITY OPEN PIT DEPRESSURIZATION

TITLE:

GENERAL SITE LOCATION

PROJECT No.:	FIG No.:	REV.:
0792-002	1	

X:\Projects\0792 Victoria Gold\002 Eagle Creek\Workspace\20091015_Final_Report_Figures\Figure1_GeneralSiteLocation.mxd Date: Wednesday, March 03, 2010 Time: 10:04 AM



REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:20,000
DATE:	MAR 2010
DRAWN:	GLT
DESIGNED:	PQ
CHECKED:	PQ
APPROVED:	JTCS

PROFESSIONAL SEAL:

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

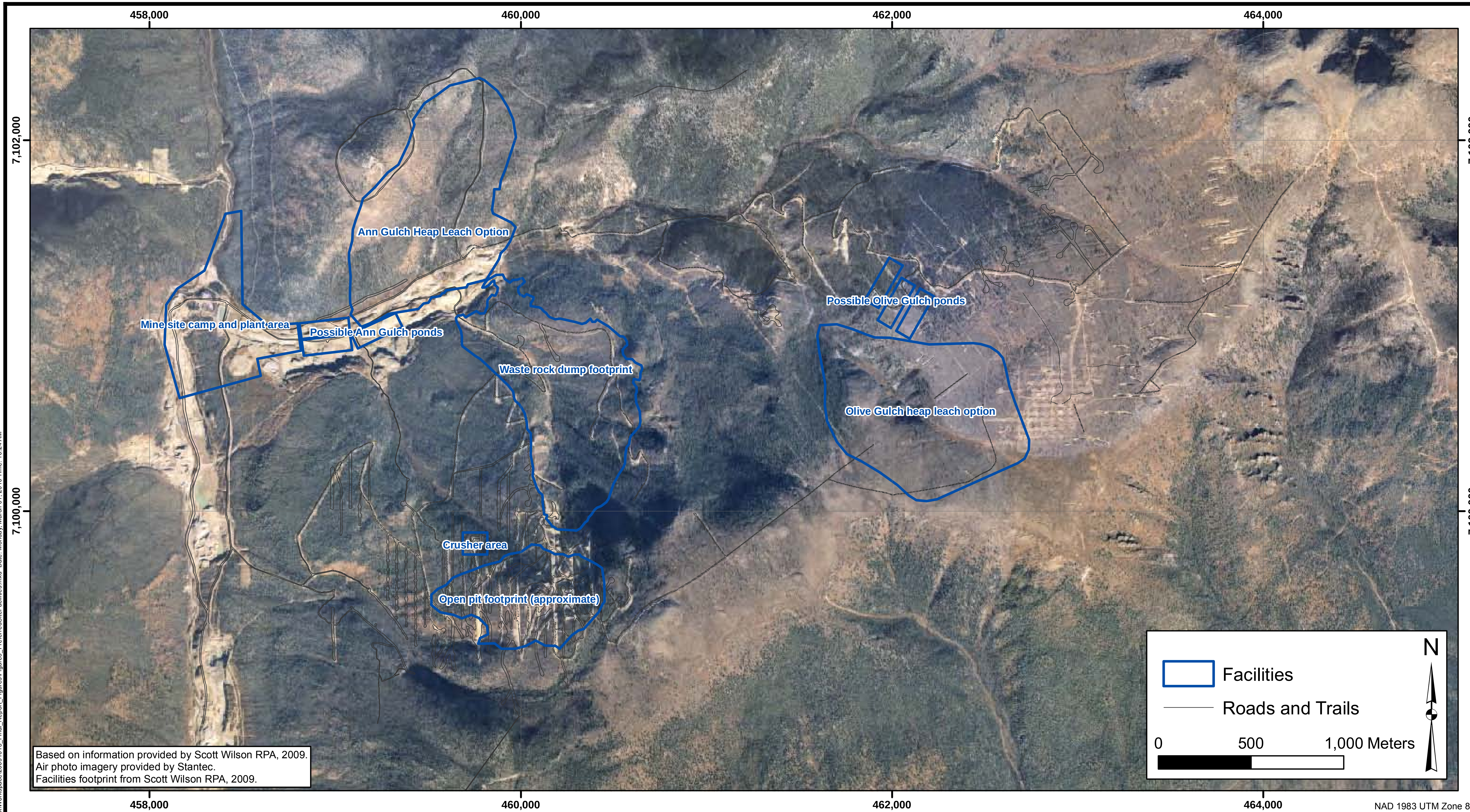
CLIENT:
VICTORIA GOLD

PROJECT:
EAGLE GOLD PROJECT
SITE FACILITIES GEOTECHNICAL ASSESSMENT

TITLE:
SITE FACILITIES – ORIGINAL HEAP
LEACH OPTIONS AND WASTE ROCK DUMPS

PROJECT No.:	FIG No.:	REV.:
0792-002	2	

X:\Projects\0792 Victoria Gold\002 Eagle Creek\Workspace\20091015_Final_Report_Figures\Figure2_OriginalSiteFacilities.mxd Date: Monday, March 01, 2010 Time: 10:16 AM



REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:20,000
DATE:	MAR 2010
DRAWN:	GLT
DESIGNED:	PQ
CHECKED:	PQ
APPROVED:	JTCS

PROFESSIONAL SEAL:

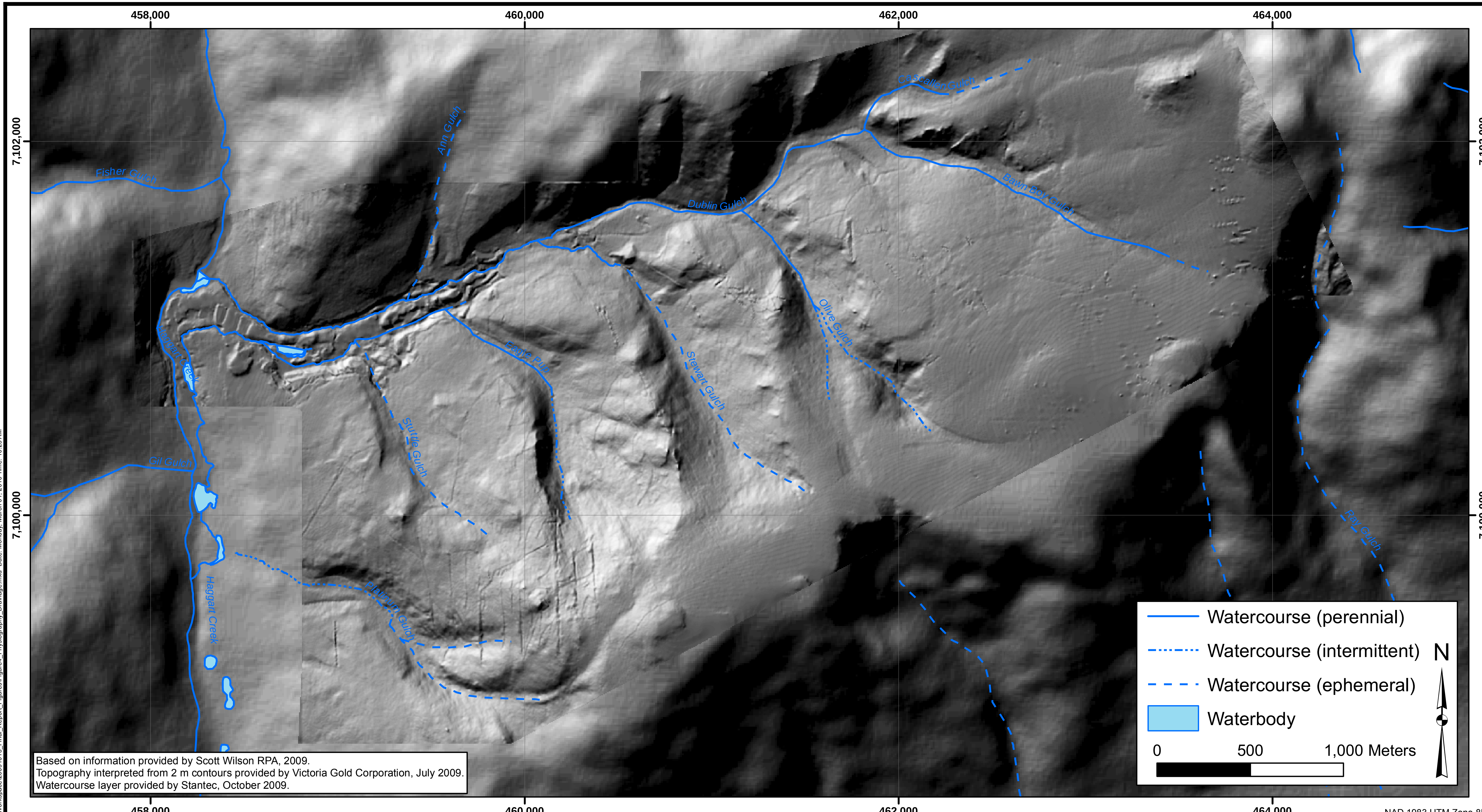
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT:
VICTORIA GOLD

PROJECT:
EAGLE GOLD PROJECT
SITE FACILITIES GEOTECHNICAL ASSESSMENT

TITLE:
SITE FACILITIES – PREFERRED HEAP LEACH OPTIONS AND WASTE ROCK DUMP

PROJECT No.:	FIG No.:	REV.:
0792-002	3	



REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:20,000
DATE:	MAR 2010
DRAWN:	GLT
DESIGNED:	PQ
CHECKED:	PQ
APPROVED:	JTCS

PROFESSIONAL SEAL:

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

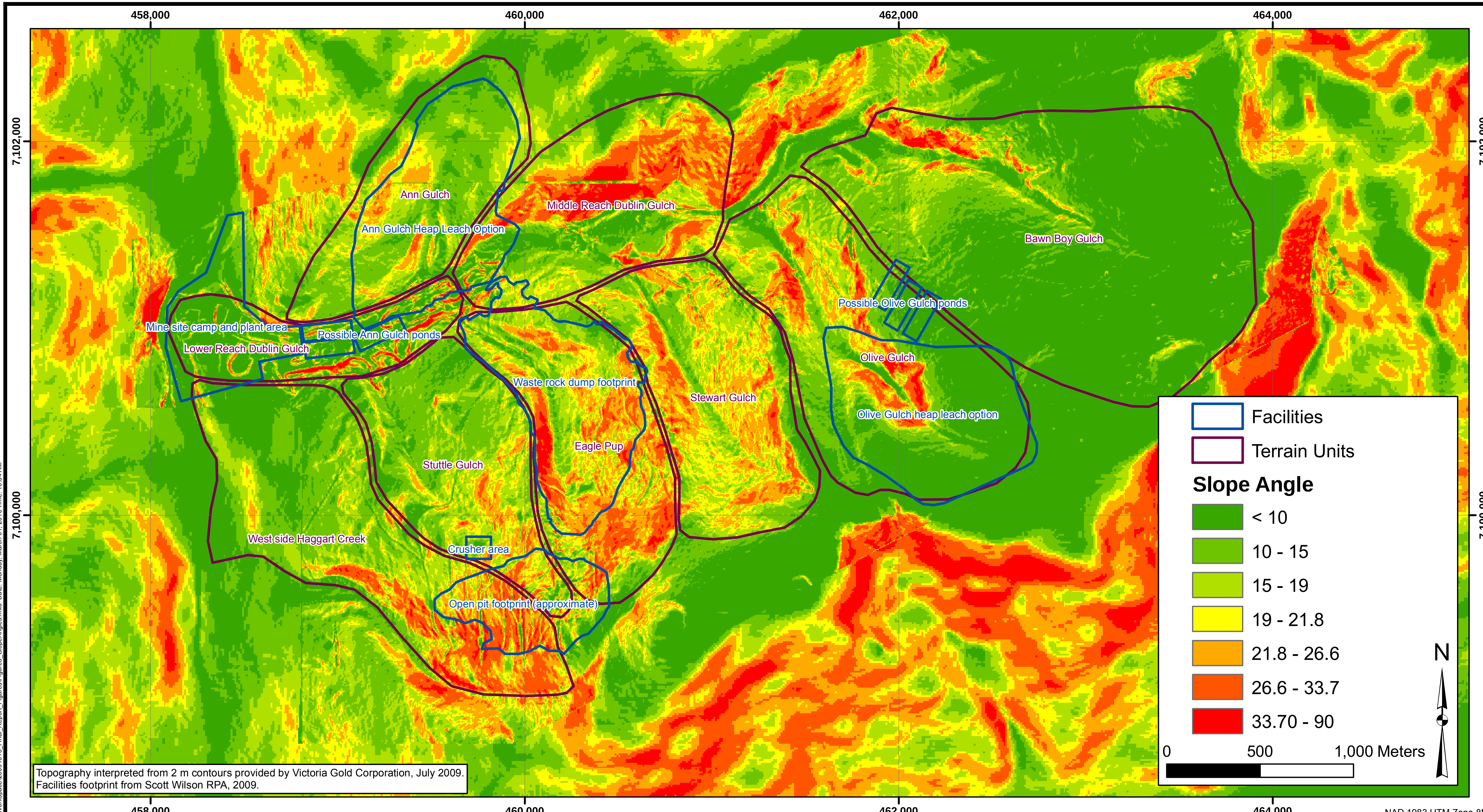
CLIENT: VICTORIA GOLD

PROJECT: EAGLE GOLD PROJECT
SITE FACILITIES GEOTECHNICAL ASSESSMENT

TITLE: PHYSIOGRAPHY AND DRAINAGE

PROJECT No.:	FIG No.:	REV.:
0792-002	4	

X:\Projects\0792 Victoria Gold\002 Eagle Creek\Workspace\20091015_Final_Report_Figures\Figure4_Physiography_Drainage.mxd Date: Monday, March 01, 2010 Time: 10:25 AM



X:\Projects\0792 Victoria Gold\002 Eagle Creek\Workspace\20091015_Final_Report_Figures\Figure5_SlopeAngles.mxd Date: Monday, March 01, 2010 Time: 10:34 AM

REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:20,000
DATE:	MAR 2010
DRAWN:	GLT
DESIGNED:	PQ
CHECKED:	PQ
APPROVED:	JTCS

PROFESSIONAL SEAL:

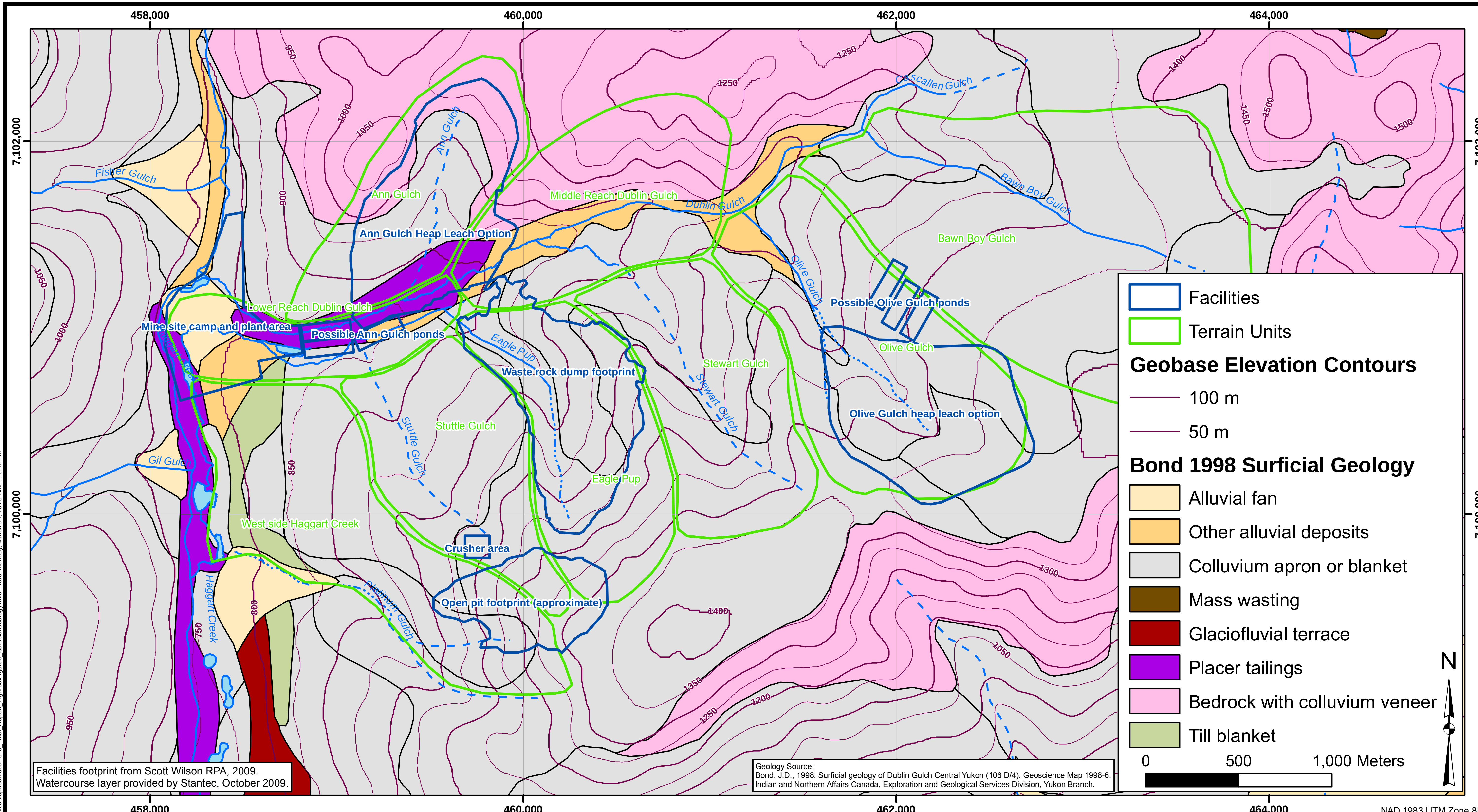
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: VICTORIA GOLD

PROJECT: EAGLE GOLD PROJECT
SITE FACILITIES GEOTECHNICAL ASSESSMENT

TITLE: SLOPE ANGLES

PROJECT No.:	FIG No.:	REV.:
0792-002	5	



X:\Projects\0792 Victoria Gold\002 Eagle Creek\Workspace\20091015_Final_Report_Figures\Figure6_SurficialGeology.mxd Date: Monday, March 01, 2010 Time: 10:42 AM

REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:20,000
DATE:	MAR 2010
DRAWN:	GLT
DESIGNED:	PQ
CHECKED:	PQ
APPROVED:	JTCS

PROFESSIONAL SEAL:

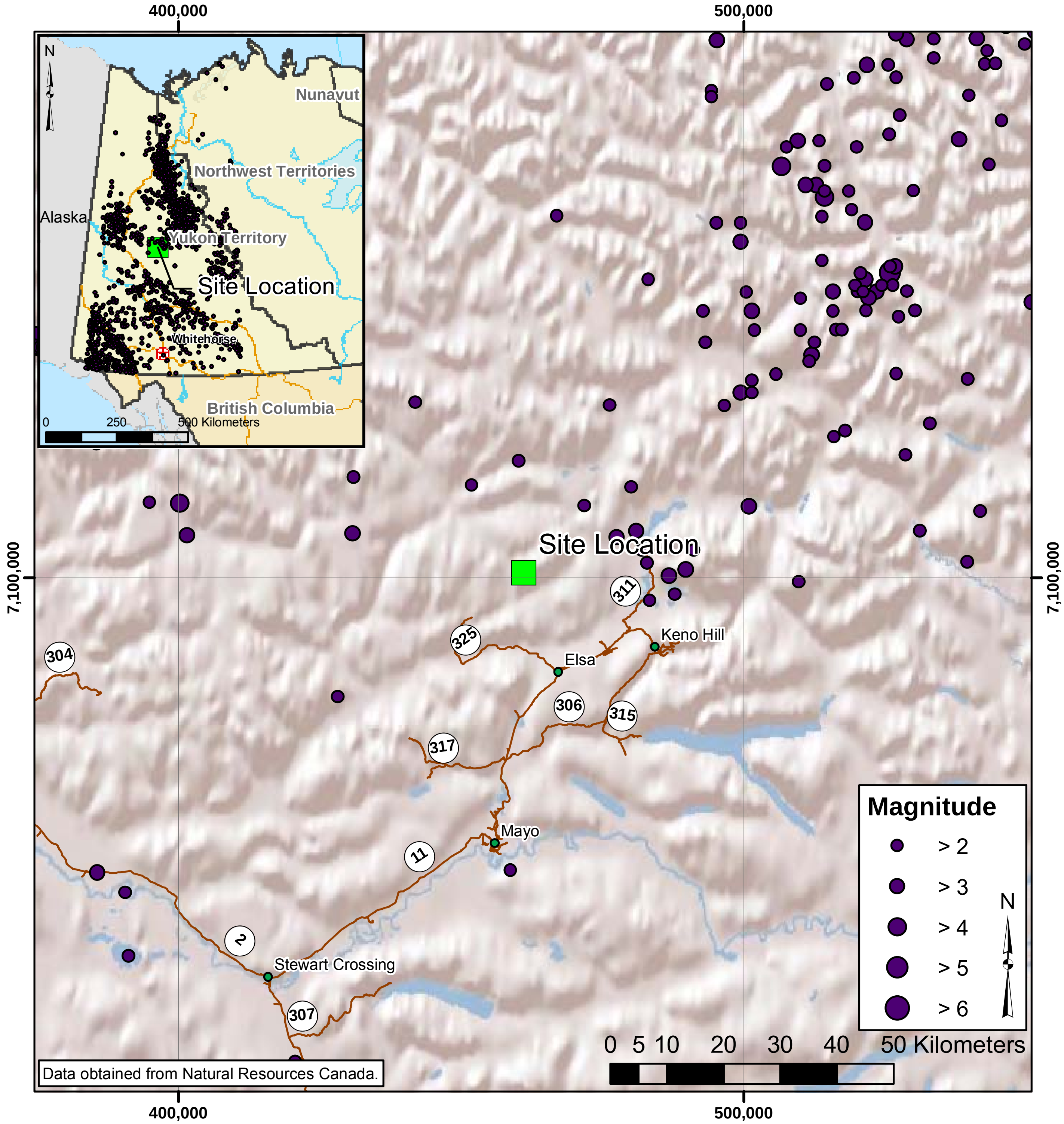
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT:
VICTORIA GOLD

PROJECT:
EAGLE GOLD PROJECT
SITE FACILITIES GEOTECHNICAL ASSESSMENT

TITLE:
SURFICIAL GEOLOGY MAP

PROJECT No.:	FIG No.:	REV.:
0792-002	6	



NAD 1983 UTM Zone 8N

SCALE:	1:1,000,000	DESIGNED:	PQ
DATE:	MAR 2010	CHECKED:	PQ
DRAWN:	GLT	APPROVED:	JTCS

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

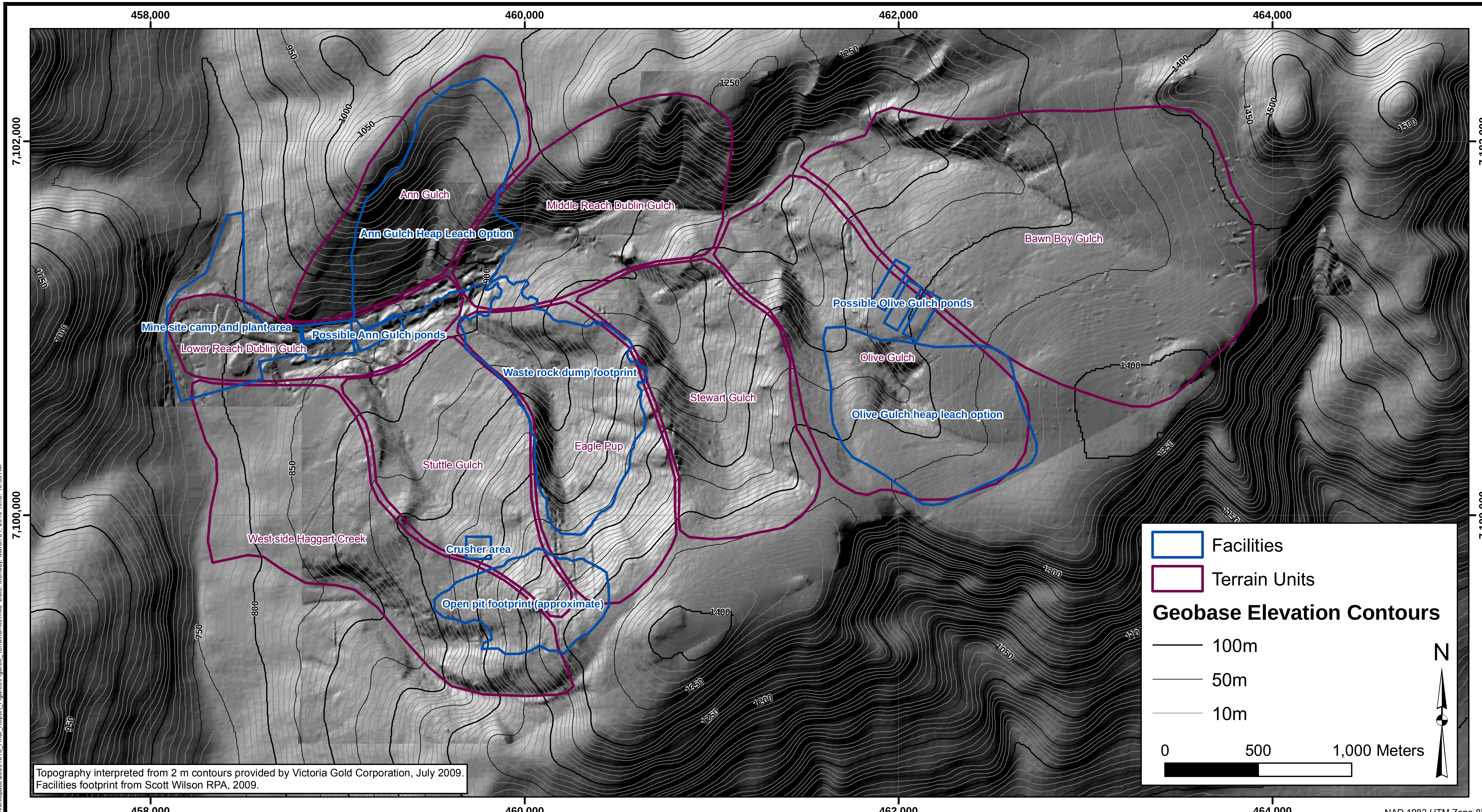
PROJECT:
EAGLE GOLD PROJECT
SITE FACILITIES GEOTECHNICAL ASSESSMENT

TITLE:
DISTRIBUTION OF RECORDED SEISMIC EVENTS

CLIENT:
VICTORIA GOLD

PROJECT No.:	FIG No.:	REV.:
0792-002	7	

X:\Projects\0792 Victoria Gold\002 Eagle Creek\Workspace\20091015_Final_Report_Figures\Figure7_Seismic.mxd Date: Monday, March 01, 2010 Time: 10:50 AM



X:\Projects\0792 Victoria Gold\002 Eagle Creek\Workspace\20091015_Final_Report_Figures\Figure8_TerrainUnits.mxd Date: Monday, March 01, 2010 Time: 10:59 AM

REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:20,000
DATE:	MAR 2010
DRAWN:	GLT
DESIGNED:	PQ
CHECKED:	PQ
APPROVED:	JTCS

PROFESSIONAL SEAL:

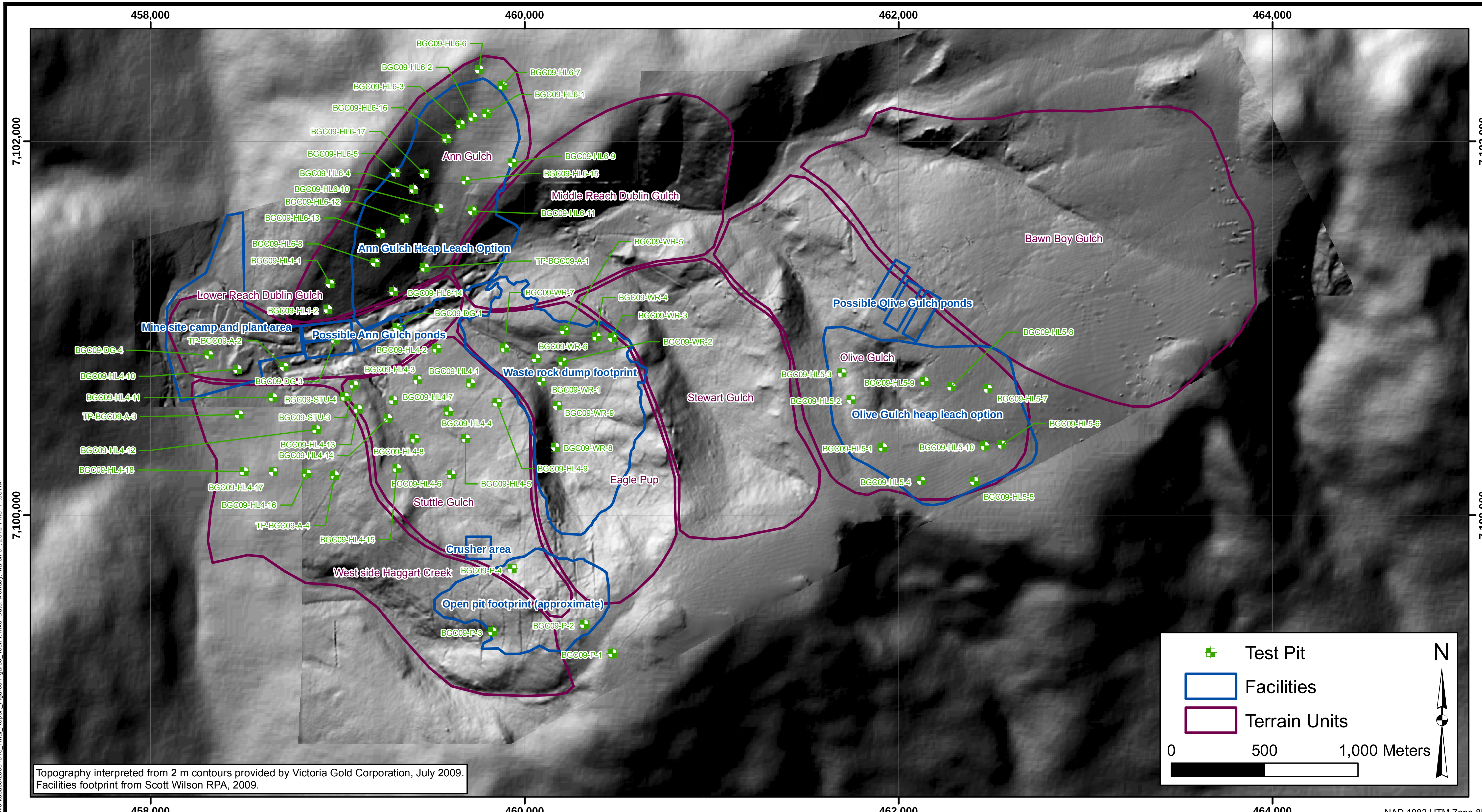
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT:
VICTORIA GOLD

PROJECT:
EAGLE GOLD PROJECT
SITE FACILITIES GEOTECHNICAL ASSESSMENT

TITLE:
TERRAIN UNITS SELECTED FOR DATA ORGANIZATION

PROJECT No.:	FIG No.:	REV.:
0792-002	8	



X:\Projects\0792 Victoria Gold\002 Eagle Creek\Workspace\20091015_Final_Report_Figures\Figure9_TestPit.mxd Date: Monday, March 01, 2010 Time: 11:05 AM

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SCALE:	1:20,000
DATE:	MAR 2010
DRAWN:	GLT
DESIGNED:	PQ
CHECKED:	PQ
APPROVED:	JTCS

PROFESSIONAL SEAL:

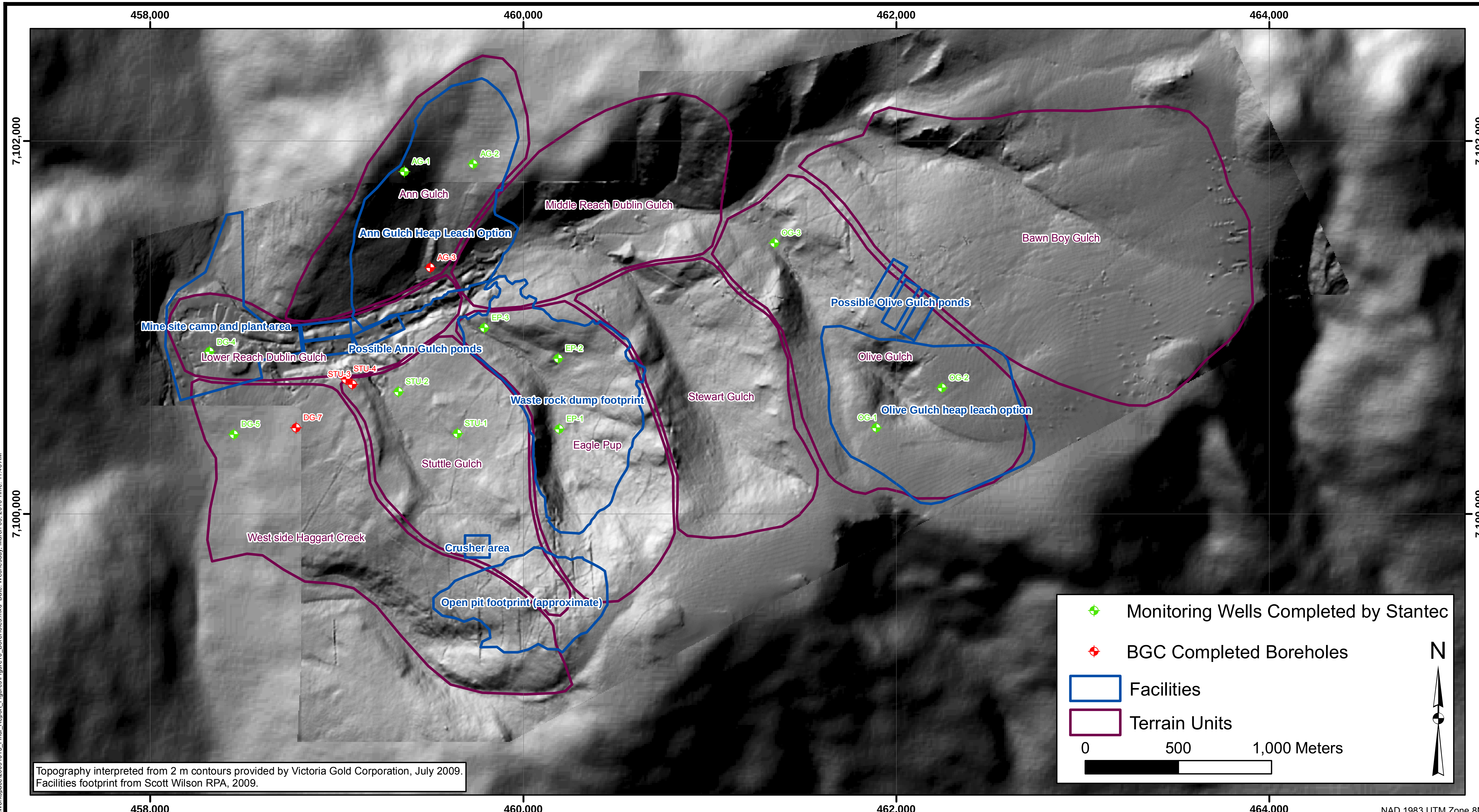
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: VICTORIA GOLD

PROJECT: EAGLE GOLD PROJECT
SITE FACILITIES GEOTECHNICAL ASSESSMENT

TITLE: TEST PIT LOCATION PLAN

PROJECT No.:	FIG No.:	REV.:
0792-002	9	



X:\Projects\0792 Victoria Gold\002 Eagle Creek\Workspace\20091015_Final_Report_Figures\Figure10_BoreHoles.mxd Date: Wednesday, March 03, 2010 Time: 11:46 AM

REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:20,000
DATE:	MAR 2010
DRAWN:	GLT
DESIGNED:	PQ
CHECKED:	PQ
APPROVED:	JTCS

PROFESSIONAL SEAL:

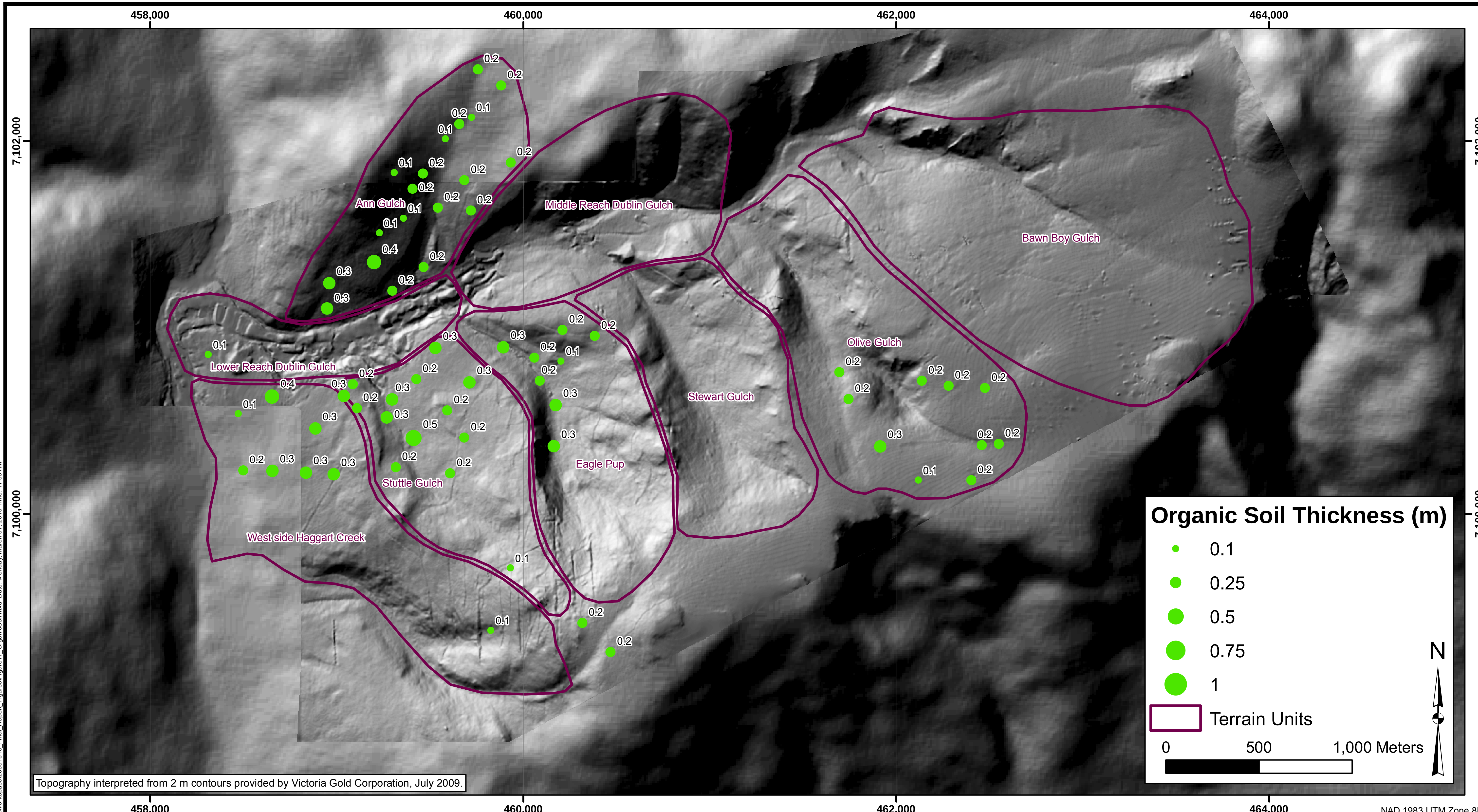
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT:
VICTORIA GOLD

PROJECT:
EAGLE GOLD PROJECT
SITE FACILITIES GEOTECHNICAL ASSESSMENT

TITLE:
BOREHOLE LOCATION PLAN

PROJECT No.:	FIG No.:	REV.:
0792-002	10	



REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE: 1:20,000
DATE: MAR 2010
DRAWN: GLT
DESIGNED: PQ
CHECKED: PQ
APPROVED: JTCS

PROFESSIONAL SEAL:

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

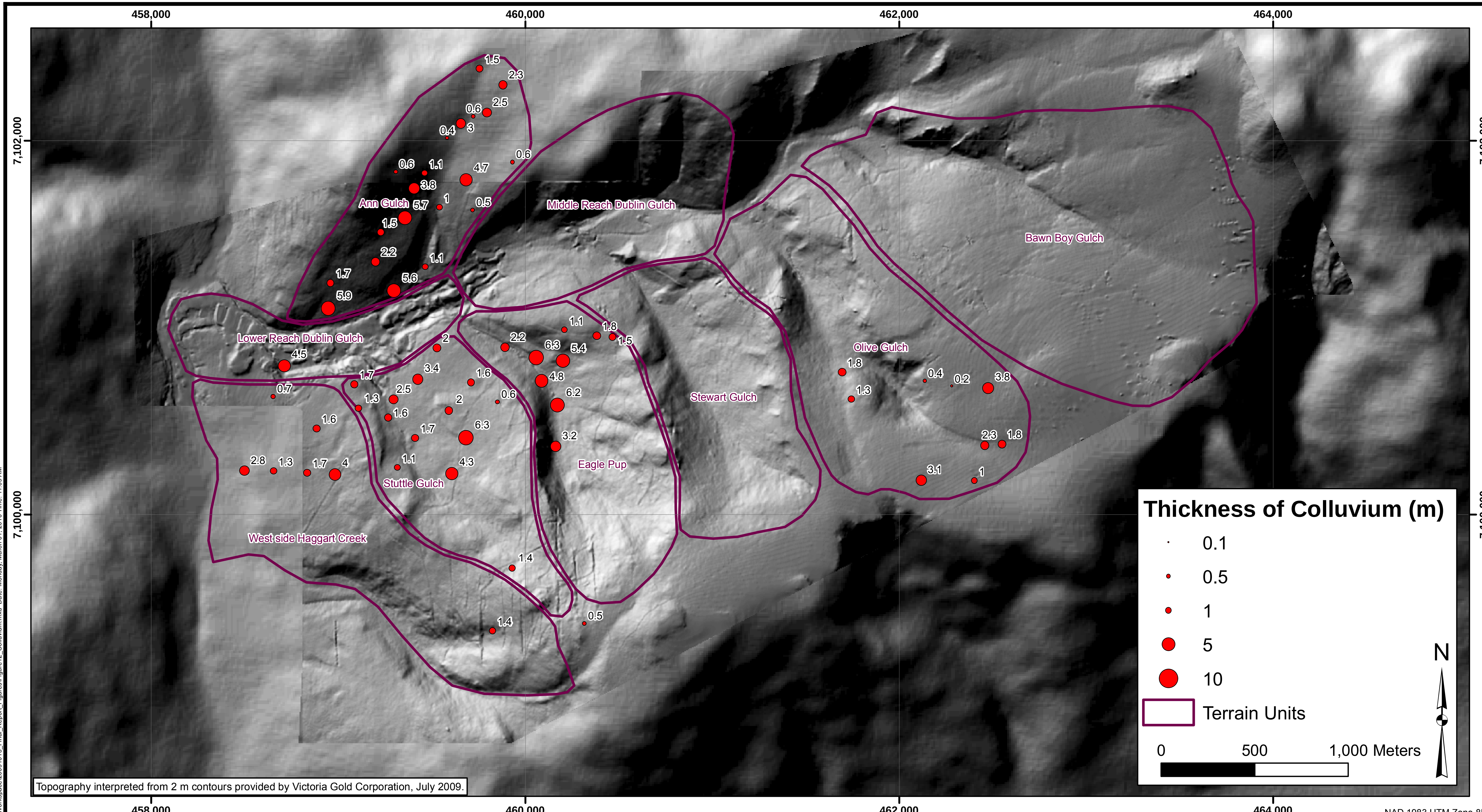
CLIENT: VICTORIA GOLD

PROJECT: EAGLE GOLD PROJECT
SITE FACILITIES GEOTECHNICAL ASSESSMENT

TITLE: DISTRIBUTION OF ORGANIC SOIL THICKNESS IN TEST PITS

PROJECT No.: 0792-002
FIG No.: 11
REV.:

X:\Projects\0792 Victoria Gold\002 Eagle Creek\Workspace\20091015_Final_Report_Figures\Figure11_OrganicSoil.mxd Date: Monday, March 01, 2010 Time: 11:08 AM



REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:20,000
DATE:	MAR 2010
DRAWN:	GLT
DESIGNED:	PQ
CHECKED:	PQ
APPROVED:	JTCS

PROFESSIONAL SEAL:

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

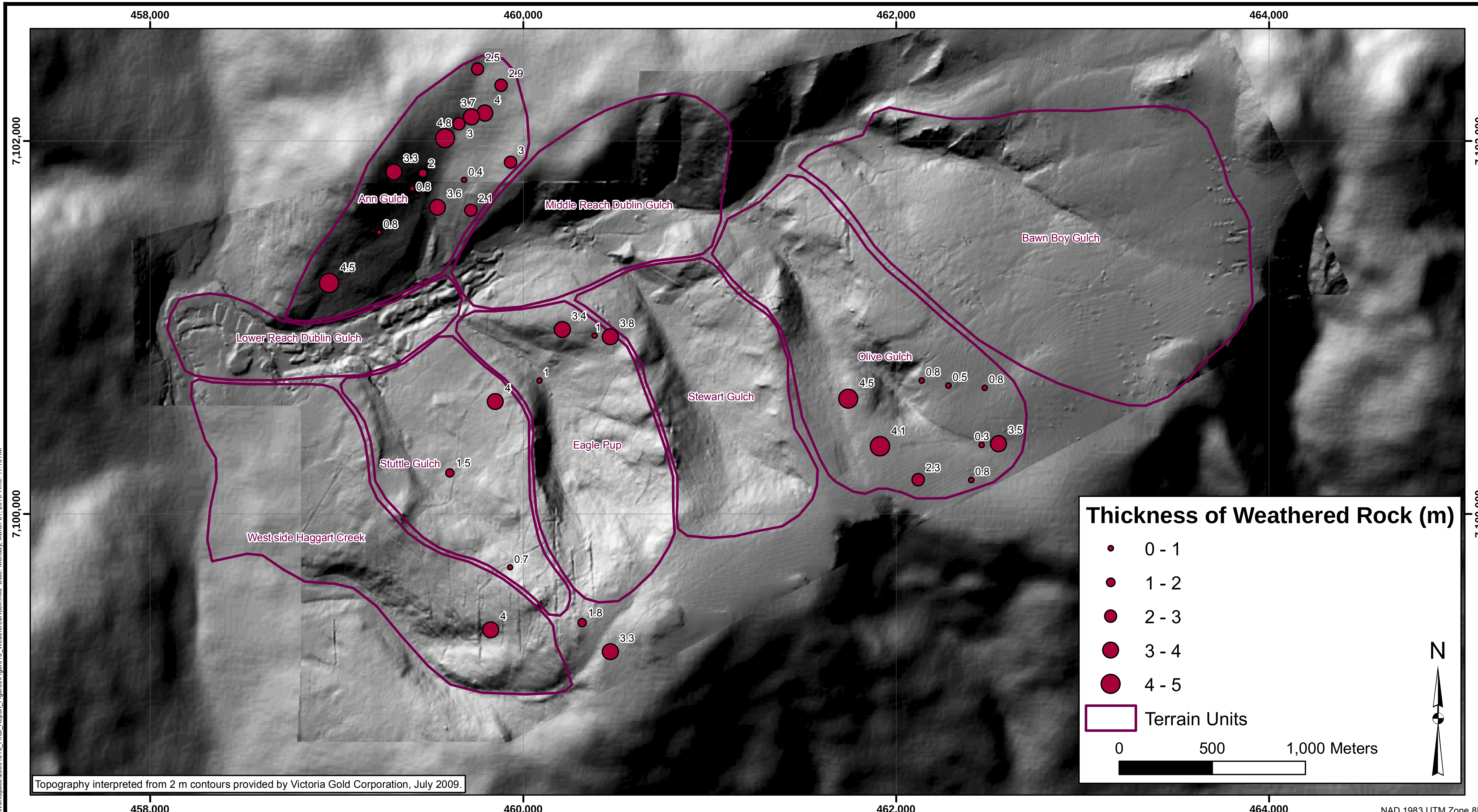
CLIENT: VICTORIA GOLD

PROJECT: EAGLE GOLD PROJECT
SITE FACILITIES GEOTECHNICAL ASSESSMENT

TITLE: DISTRIBUTION OF COLLUVIUM THICKNESS FROM 2009 TEST HOLES

PROJECT No.:	FIG No.:	REV.:
0792-002	12	

X:\Projects\0792 Victoria Gold\002 Eagle Creek\Workspace\20091015_Final_Report_Figures\Figure12_Colluvium.mxd Date: Monday, March 01, 2010 Time: 11:09 AM



X:\Projects\0792 Victoria Gold\002 Eagle Creek\Workspace\20091015_Final_Report_Figures\Figure13_WeatheredRock.mxd Date: Monday, March 01, 2010 Time: 11:13 AM

REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:20,000
DATE:	MAR 2010
DRAWN:	GLT
DESIGNED:	PQ
CHECKED:	PQ
APPROVED:	JTCS

PROFESSIONAL SEAL:

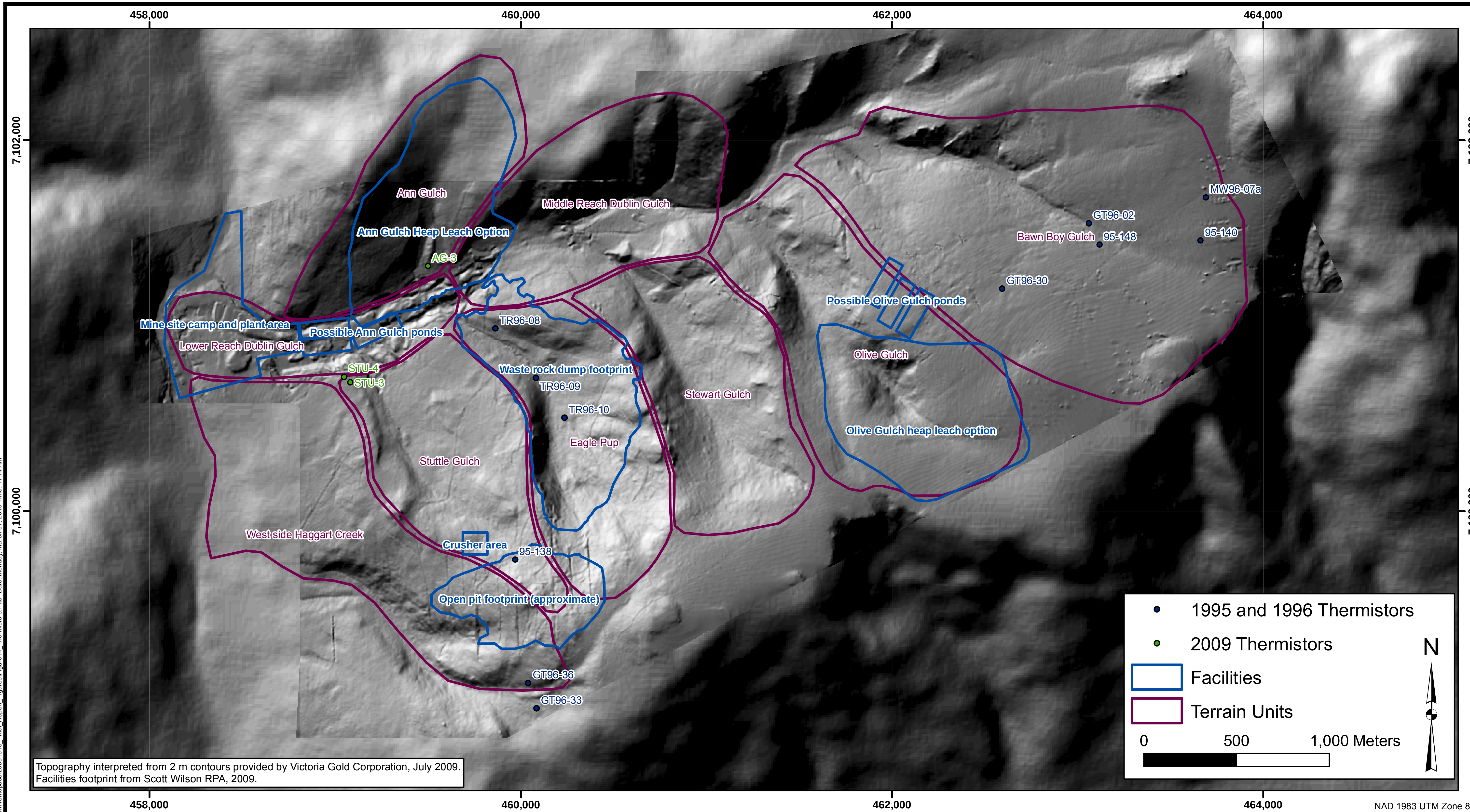
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT:
VICTORIA GOLD

PROJECT:
EAGLE GOLD PROJECT
SITE FACILITIES GEOTECHNICAL ASSESSMENT

TITLE:
DISTRIBUTION OF THICKNESS OF WEATHERED ROCK
FROM 2009 TEST HOLES

PROJECT No.:	FIG No.:	REV.:
0792-002	13	



REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:20,000
DATE:	MAR 2010
DRAWN:	GLT
DESIGNED:	PQ
CHECKED:	PQ
APPROVED:	JTCS

PROFESSIONAL SEAL:

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

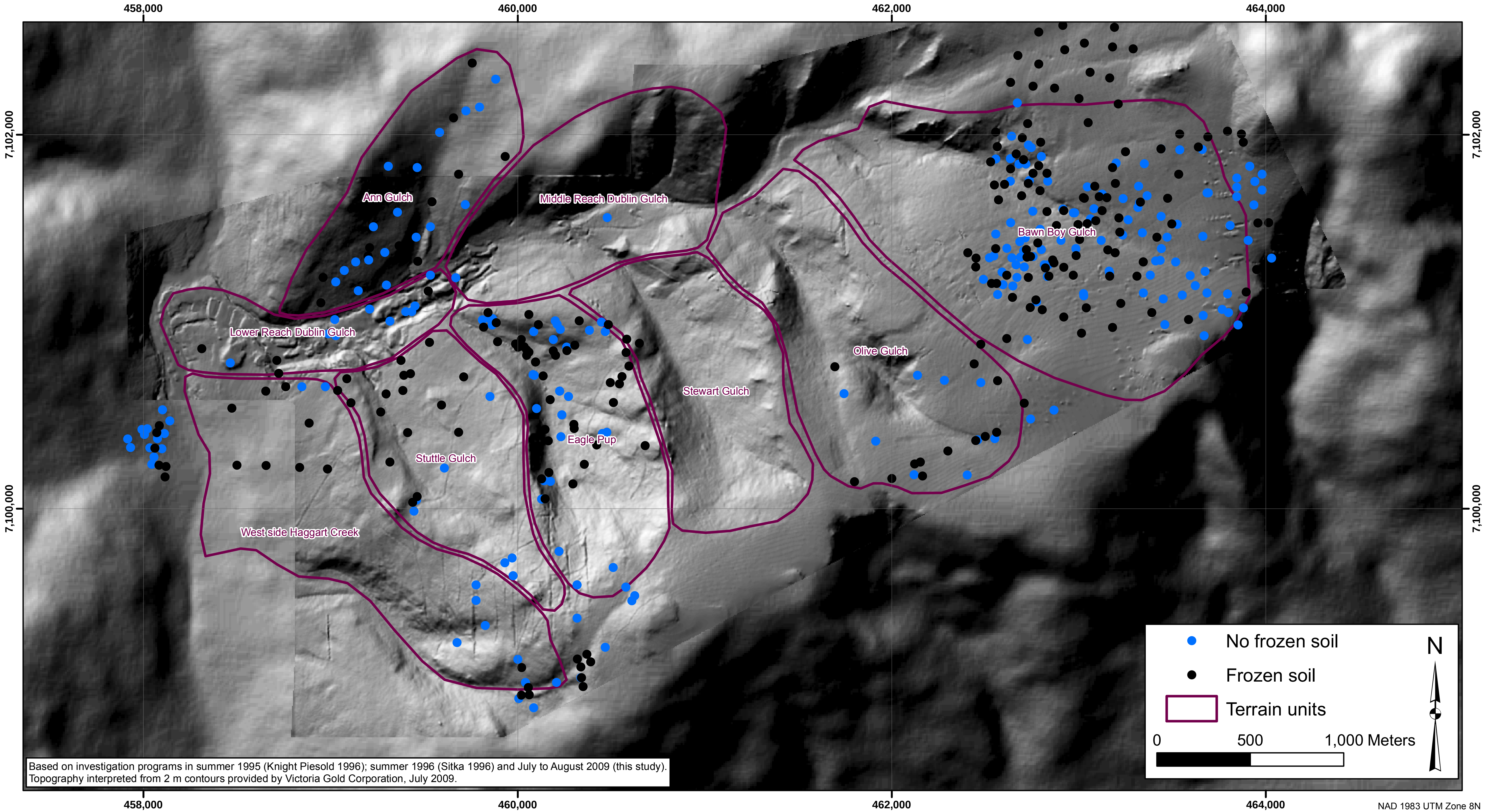
CLIENT: VICTORIA GOLD

PROJECT: EAGLE GOLD PROJECT
SITE FACILITIES GEOTECHNICAL ASSESSMENT

TITLE: LOCATIONS OF PRESENT AND PAST THERMISTORS

PROJECT No.:	FIG No.:	REV.:
0792-002	14	

X:\Projects\0792 Victoria Gold\002 Eagle Creek\Workspace\20091015_Final_Report_Figures\Figure14_Thermistors.mxd Date: Monday, March 01, 2010 Time: 11:14 AM



Based on investigation programs in summer 1995 (Knight Piesold 1996); summer 1996 (Sitka 1996) and July to August 2009 (this study).
Topography interpreted from 2 m contours provided by Victoria Gold Corporation, July 2009.

REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:20,000
DATE:	MAR 2010
DRAWN:	GLT
DESIGNED:	PQ
CHECKED:	PQ
APPROVED:	JTCS

PROFESSIONAL SEAL:

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

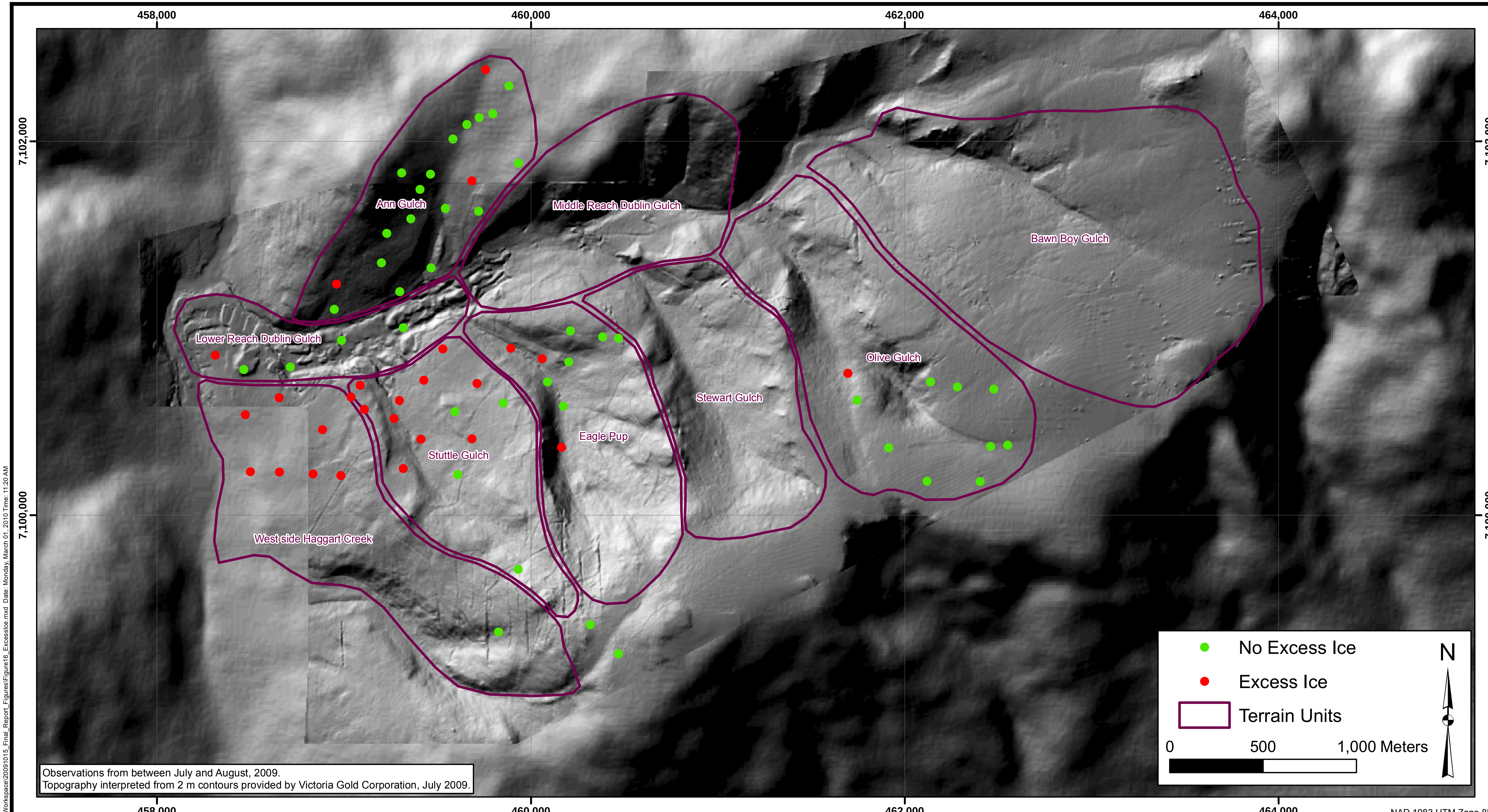
CLIENT: VICTORIA GOLD

PROJECT: EAGLE GOLD PROJECT
SITE FACILITIES GEOTECHNICAL ASSESSMENT

TITLE: FROZEN GROUND OBSERVATIONS

PROJECT No.: 0792-002 | FIG No.: 15 | REV.:

X:\Projects\0792 Victoria Gold\002 Eagle Creek\Workspace\20091015_Final_Report_Figures\Figure15_FrozenGround.mxd Date: Monday, March 01, 2010 Time: 11:18 AM



X:\Projects\0792 Victoria Gold\002 Eagle Creek\Workspace\20091015_Final_Report_Figures\Figure16_ExcessIce.mxd Date: Monday, March 01, 2010 Time: 11:20 AM

REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:20,000
DATE:	MAR 2010
DRAWN:	GLT
DESIGNED:	PQ
CHECKED:	PQ
APPROVED:	JTCS

PROFESSIONAL SEAL:

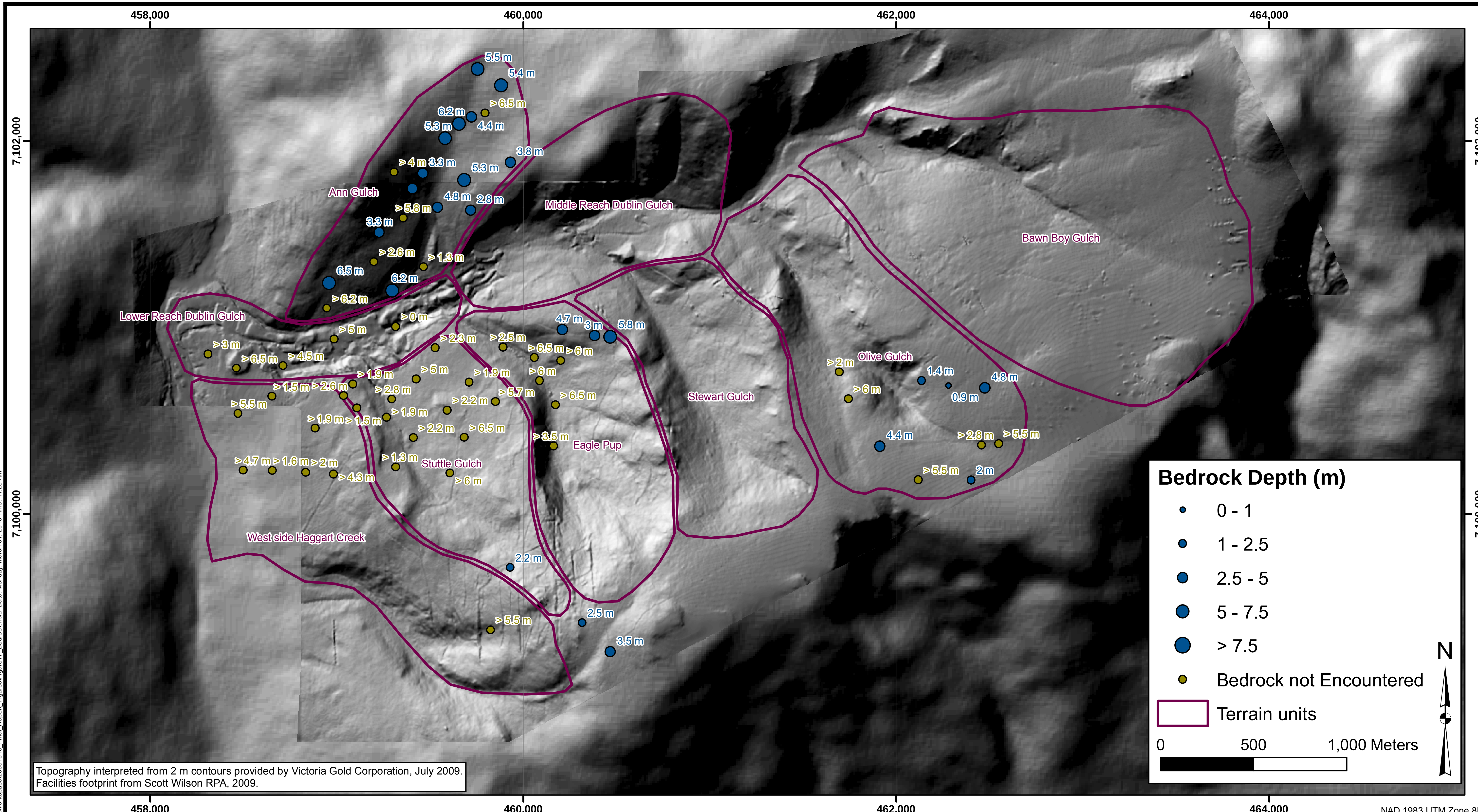
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT:
VICTORIA GOLD

PROJECT:
EAGLE GOLD PROJECT
SITE FACILITIES GEOTECHNICAL ASSESSMENT

TITLE:
GROUND ICE OBSERVATIONS IN 2009 TEST HOLES

PROJECT No.:	FIG No.:	REV.:
0792-002	16	



X:\Projects\0792 Victoria Gold\002 Eagle Creek\Workspace\20091015_Final_Report_Figures\Figure17_Bedrock.mxd Date: Monday, March 01, 2010 Time: 11:25 AM

REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:20,000
DATE:	MAR 2010
DRAWN:	GLT
DESIGNED:	PQ
CHECKED:	PQ
APPROVED:	JTCS

PROFESSIONAL SEAL:

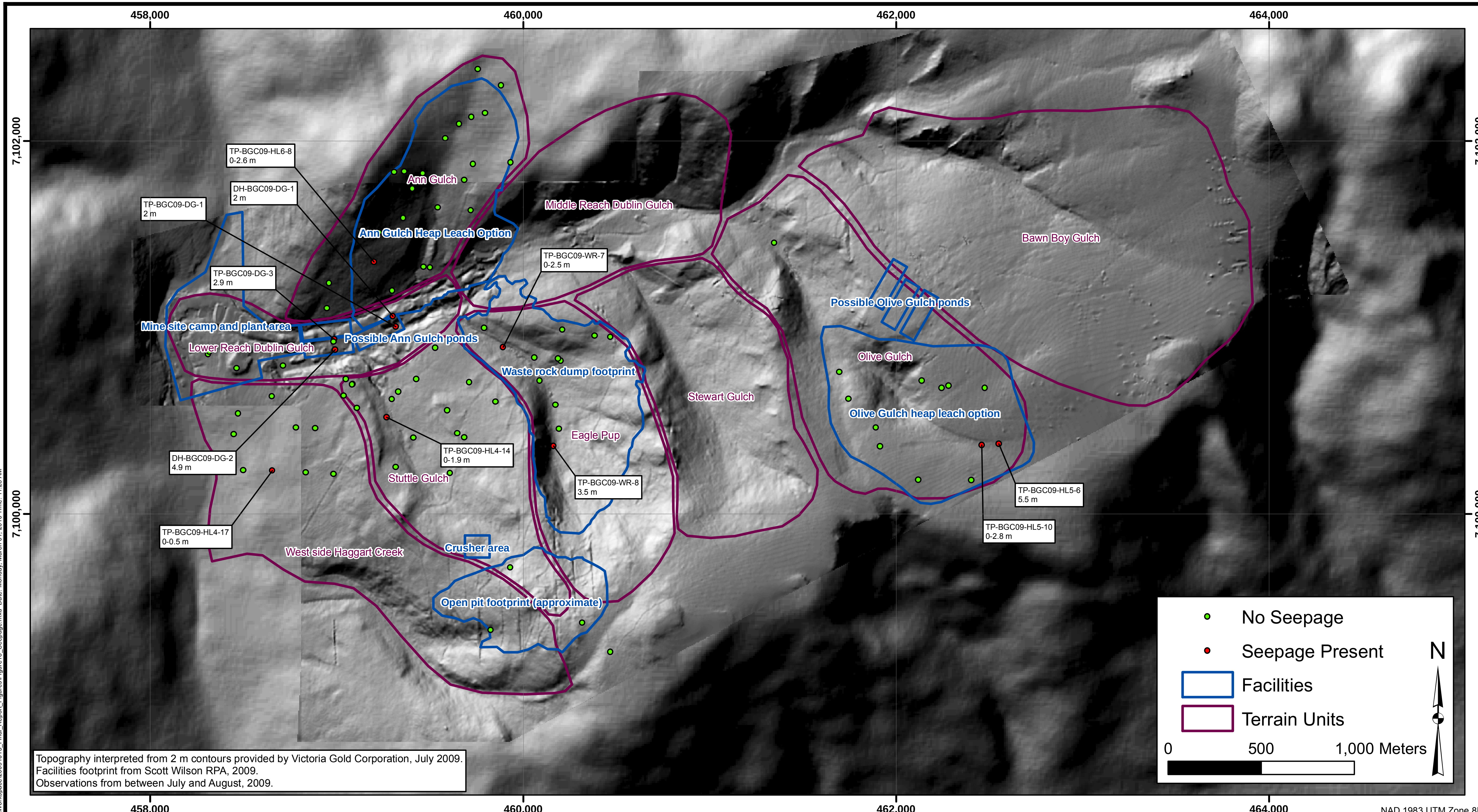
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT:
VICTORIA GOLD

PROJECT:
EAGLE GOLD PROJECT
SITE FACILITIES GEOTECHNICAL ASSESSMENT

TITLE:
DEPTH TO BEDROCK OBSERVED IN TEST PITS

PROJECT No.:	FIG No.:	REV.:
0792-002	17	



REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:20,000
DATE:	MAR 2010
DRAWN:	GLT
DESIGNED:	PQ
CHECKED:	PQ
APPROVED:	JTCS

PROFESSIONAL SEAL:

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

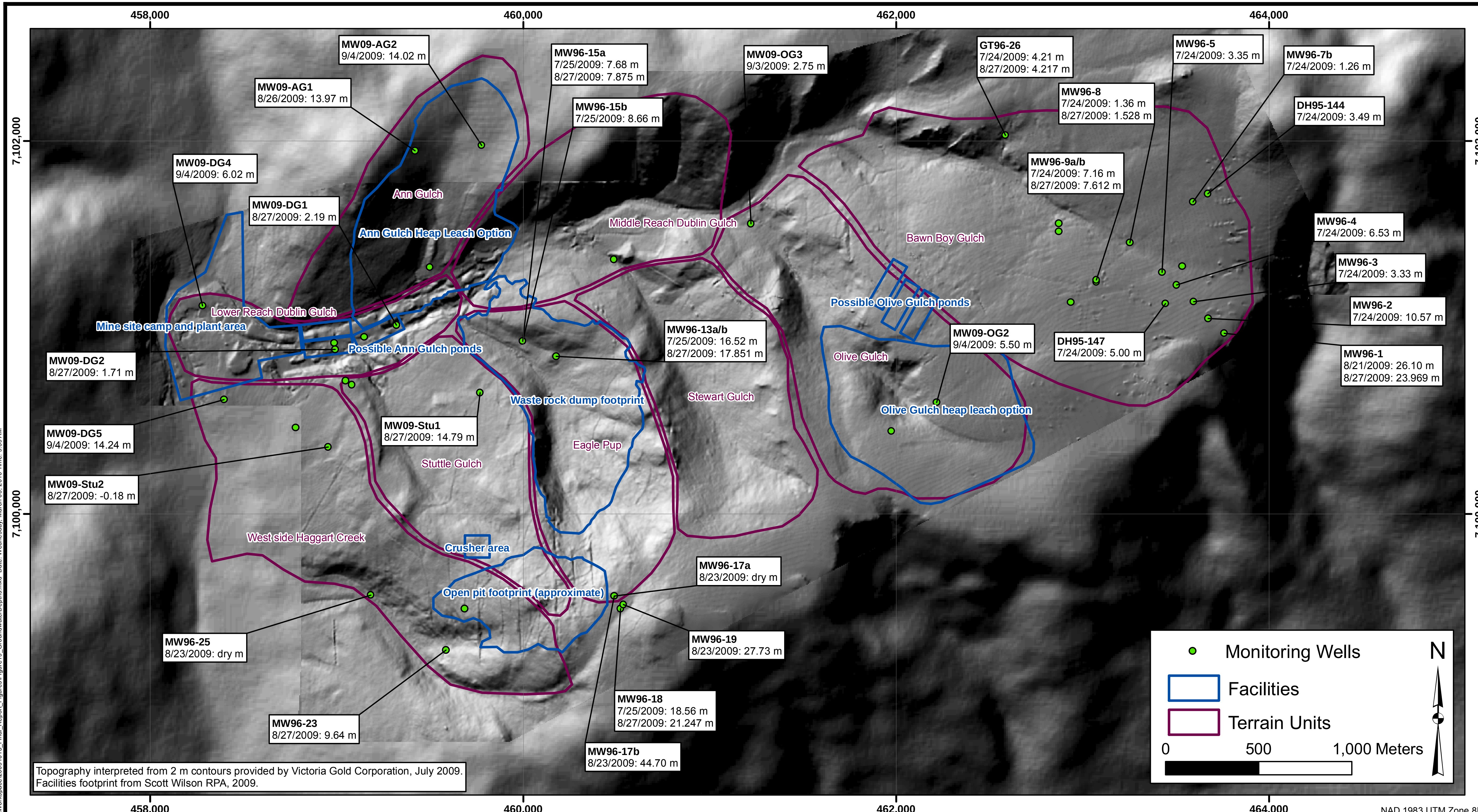
CLIENT:
VICTORIA GOLD

PROJECT:
EAGLE GOLD PROJECT
SITE FACILITIES GEOTECHNICAL ASSESSMENT

TITLE:
TEST PIT AND BOREHOLE SEEPAGE OBSERVATIONS AND DEPTH

PROJECT No.:	FIG No.:	REV.:
0792-002	18	

X:\Projects\0792 Victoria Gold\002 Eagle Creek\Workspace\20091015_Final_Report_Figures\Figure18_Seepage.mxd Date: Monday, March 01, 2010 Time: 11:28 AM



X:\Projects\0792 Victoria Gold\002 Eagle Creek\Workspace\20091015_Final_Report_Figures\Figure19_GroundwaterDepths.mxd Date: Wednesday, March 03, 2010 Time: 9:59 AM

REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:20,000
DATE:	MAR 2010
DRAWN:	GLT
DESIGNED:	PQ
CHECKED:	PQ
APPROVED:	JTCS

PROFESSIONAL SEAL:

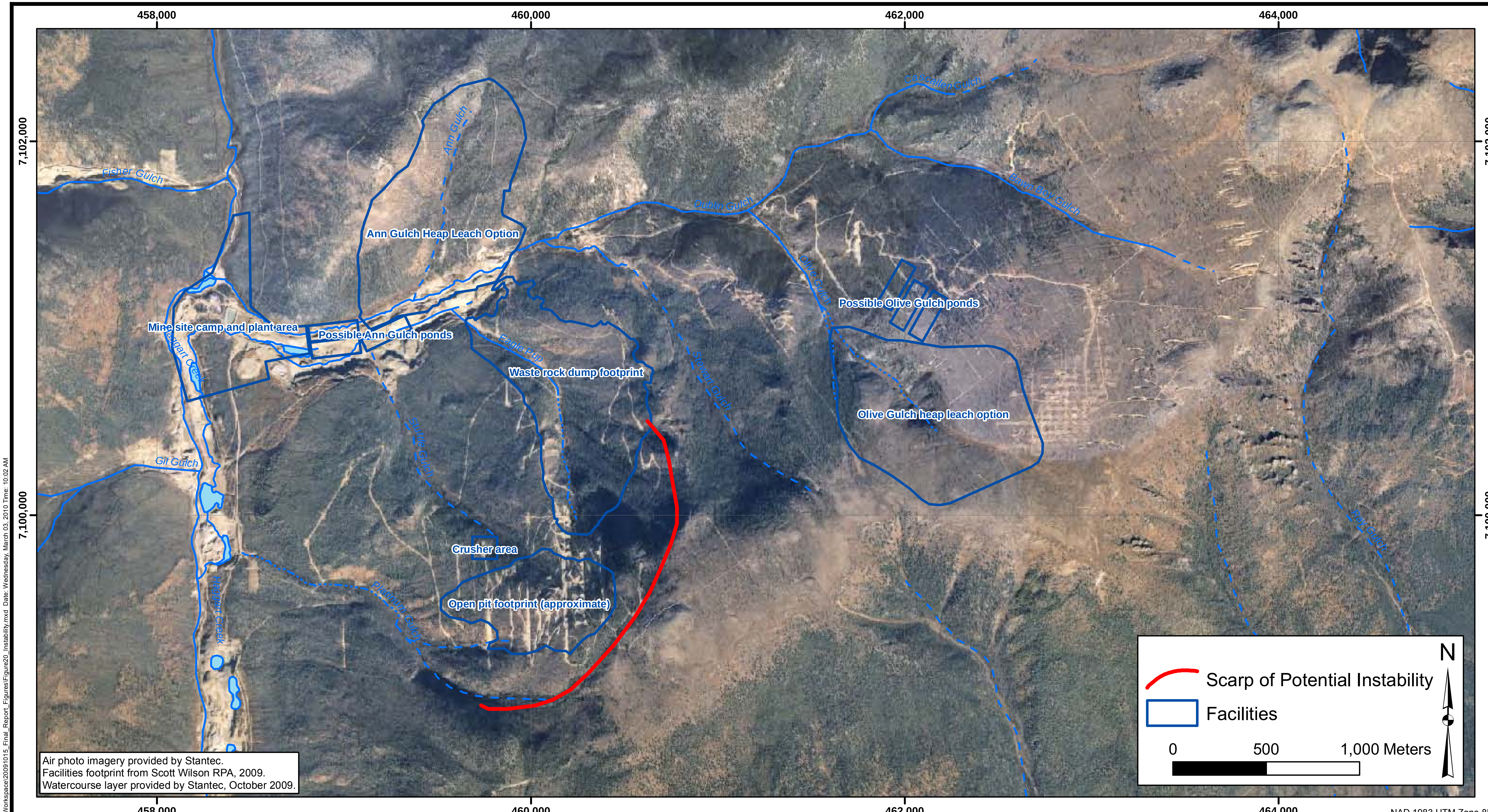
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: VICTORIA GOLD

PROJECT: EAGLE GOLD PROJECT
SITE FACILITIES GEOTECHNICAL ASSESSMENT

TITLE: GROUNDWATER DEPTHS

PROJECT No.:	FIG No.:	REV.:
0792-002	19	



NAD 1983 UTM Zone 8N

REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:20,000
DATE:	MAR 2010
DRAWN:	GLT
DESIGNED:	PQ
CHECKED:	PQ
APPROVED:	JTCS

PROFESSIONAL SEAL:

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: VICTORIA GOLD

PROJECT: EAGLE GOLD PROJECT
SITE FACILITIES GEOTECHNICAL ASSESSMENT

TITLE: POTENTIAL INSTABILITY FEATURE

PROJECT No.:	FIG No.:	REV.:
0792-002	20	

X:\Projects\0792 Victoria Gold\002 Eagle Creek\Workspace\20091015_Final_Report_Figures\Figure20_Instability.mxd Date: Wednesday, March 03, 2010 Time: 10:02 AM

APPENDIX A

TEST PIT LOGS

ANN GULCH

TP-BGC09-A-1

TP-BGC09-HL1-1

TP-BGC09-HL1-2

TP-BGC09-HL6-1

TP-BGC09-HL6-2

TP-BGC09-HL6-3

TP-BGC09-HL6-4

TP-BGC09-HL6-5

TP-BGC09-HL6-6

TP-BGC09-HL6-7

TP-BGC09-HL6-8

TP-BGC09-HL6-9

TP-BGC09-HL6-10

TP-BGC09-HL6-11

TP-BGC09-HL6-12

TP-BGC09-HL6-13

TP-BGC09-HL6-14

TP-BGC09-HL6-15

TP-BGC09-HL6-16

TP-BGC09-HL6-17

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-A-1

Location : Heap Leach #1

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459464E, 7101321N
Ground Elevation (m) 884
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 18 Jul 09
Finish Date: 18 Jul 09
Final Depth of Pit (m) : 2.2
Logged by : PQ
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS Root mat, forest litter.
					SAND (SW), Silty, fine grained, compact, damp, brown, occasional cobbles, trace gravel. [COLLUVIUM]
1					GRAVEL (GW) Sandy, trace silt, occasional cobbles, FROZEN: Nf, Nbn. [COLLUVIUM] 1.0m - Refused on clean out bucket, changed to ripper bucket.
2					SILT (ML) Organic, trace sand, occasional gravel and cobbles, grey, FROZEN: Nbn. [TILL?]
3					END OF TP @ 2.2m. REFUSAL ON FROZEN GROUND. NOTES: 1) No samples collected. 2) No seepage. 3) Hole left open, backfilled to surface later.
4					
5					
6					
7					
8					
9					
10					

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: $W_P\%$ × — — — — — o W% — — — — — × $W_L\%$: 20, 40, 60, 80

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL1-1

Location : Dublin Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 458960E, 7101237N
Ground Elevation (m) 892
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 07 Aug 09
Finish Date: 07 Aug 09
Final Depth of Pit (m) : 6.5
Logged by : MRR
Reviewed by : PQ

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% × — W% ○ — W_L% ×; 20, 40, 60, 80

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					PEAT (PT) Organics, dark brown, trace rootlets.
					SAND and GRAVEL (SW/GW) Fine to Coarse, trace cobble, trace clay, dense, max particle size=15cm, angular, brown, moist to wet, partially FROZEN: Vx, 5%, stratified grey/orange horizons. [COLLUVIUM]
					CLAY (CL) Gravelly, trace sand, non-plastic, firm, greyish blue, moist, homogeneous, clay has sheen possibly highly altered mica schist, partially FROZEN.
					QUARTZITE Orangish grey, medium grained, sugary texture, very weak, completely weathered to gravelly sand, disintegrated, unfrozen.
					Alternating mottled highly weathered quartzite sand and gravel and and highly weathered mica schist gravelly clay greyish blue to orangish grey, very dense, moist, mottled, gap graded, angular, max clast 5cm. [WEATHERED BEDROCK] 5.2m - Sloughing.
					End of TP @ 6.5m. REFUSAL ON QUARTZITE BEDROCK. NOTES: 1) Roots down to 0.30m. 2) No seepage. 3) Backfilled to surface.

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL1-2

Location : Dublin Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 458947E, 7101102N
Ground Elevation (m) 854
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 07 Aug 09
Finish Date: 07 Aug 09
Final Depth of Pit (m) : 6.2
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					PEAT (PT) Organics, roots 10cm diam, dark brown
					SAND and GRAVEL (SC/GC) Clayey, trace cobbles, fine to coarse, clayey, very dense, max particle size 20cm, angular, brown, moist, homogeneous, metasedimentary clasts, FROZEN: Vx, 1%.
1					1.5m to 4.0m - Hard digging.
4					4.5m - Partially FROZEN, trace clay, trace cobbles.
5					5.5m to 5.8m - Grey, laminated, silty fine sand lens, trace organics, compact.
6					End of TP @ 6.2m. EXTENT OF EXCAVATOR REACH. NOTES: 1) Roots down to 0.50m. 2) No seepage. 3) Backfilled to surface.

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% × — — o — — × W_L%, W%: 20, 40, 60, 80

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL6-1

Location : Ann Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459795E, 7102150N
Ground Elevation (m) 1038
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 28 Jul 09
Finish Date: 28 Jul 09
Final Depth of Pit (m) : 6.5
Logged by : HG
Reviewed by : PQ

Su - kPa: 40, 80, 120, 160
VANE FIELD LAB; PEAK ◆ ■; REMOLD ◇ □; ▲ UC/2; △ Pocket Pen /2
★ % Fines
Moisture Content: W_P% × — W% ○ — W_L% ×; 20, 40, 60, 80

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0–0.4					ORGANICS/TOPSOIL Very thin layer of leaves, needles and debris, small spruce seedlings.
0.4–2.5		S1			GRAVELLY SAND (SW) Some silt, trace clay, well graded, loose-compact, metasedimentary clasts (up to 6cm), subangular, brown, moist, thin grey silt with a trace of clay lenses (approx 2cm thick, spaced ~30cm apart), no evident structure, weak cementation. Occasional cobble from ~1m down. [COLLUVIUM]
2.5–6.5		S2, S3			WEATHERED METASEDIMENTARY BEDROCK Brown and oxidized orangey-brown rock, fine grained corestones, medium strong (R3), highly-completely weathered (W4-W5), ground rock fines and fractured rock. [WEATHERED BEDROCK]
6.5					END OF TP @ 6.5m. EXTENT OF EXCAVATOR REACH, BEDROCK. NOTES: 1) Roots down to 1.0m. 2) No Seepage, minor sloughing, no visible ground ice. 3) Backfilled to surface.

BGC ENGINEERING INC.
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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL6-2

Location : Ann Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459724E, 7102128N
Ground Elevation (m) 1024
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 28 Jul 09
Finish Date: 28 Jul 09
Final Depth of Pit (m) : 4.4
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Moisture Content (W%)
0					ORGANICS/TOPSOIL Thin moss, needles and leaves over silty black soil.	
		S1			SAND and GRAVEL (SW) Trace clay, well graded, loose-compact, metasedimentary clasts up to 6cm, subangular-angular, dry, greyish-brown, no visible structure, weak cementation. [COLLUVIUM]	O
1		S2				O
					WEATHERED METASEDIMENTARY ROCK Color varies from brown to yellowish-brown and reddish-brown, fine grained, weak-medium-strong (R2-R3), laminated, visible folding, highly-completely weathered (W4-W5), ground rock fines and platy, fractured fragments. [WEATHERED BEDROCK]	
4.4					END OF TP @ 4.4m. WEATHERED METASEDIMENTARY BEDROCK. NOTES: 1) Roots down to 1.2m. 2) No seepage, minor sloughing, no visible ground ice. 3) Backfilled to surface.	

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% × — W% O — W_L% × ; 20, 40, 60, 80

Depth scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

BGC ENGINEERING INC.
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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL6-3

Location : Ann Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459660E, 7102091N
Ground Elevation (m) 1010
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 28 Jul 09
Finish Date: 28 Jul 09
Final Depth of Pit (m) : 6.2
Logged by : HG
Reviewed by : PQ

Su - kPa: 40, 80, 120, 160

VANE: FIELD / LAB — PEAK ◆ ■; REMOLD ◇ □; ▲ UC/2; △ Pocket Pen /2

★ % Fines

Moisture Content: W_P% — W% — W_L%; 20, 40, 60, 80

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Moisture Content
0 – ~0.4		S1 (~0.4 m)			ORGANICS/TOPSOIL Brown, silty topsoil, covered with moss, rootlets throughout.	○
~0.4 – 1.2		S2 (~1.0 m)			GRAVEL (GM) Some sand, trace clay, well graded, fine - very coarse sand, loose, subangular, subrounded and angular clasts (max 6cm), brown, moist, no visible structure. [COLLUVIUM]	○
1.2 – 2.0					SANDY SILT and GRAVEL (MH/GM) Loose, subrounded/angular and angular clasts, brown, moist, no evident structure, occasional cobble. FROZEN: Nf, 5-10%. [COLLUVIUM]	
2.0 – 3.2		S3 (~2.2 m)			SAND (SW) Trace silt, well graded, loose, occasional gravel clasts (up to 6cm), sub-rounded/angular particles, brown, cool but dry, no evident structure, none-weak cementation, occasional rounded-subrounded cobbles.	○
3.2 – 6.2		S4 (~5.2 m)			METASEDIMENTARY ROCK Brown with reddish zones and orange oxide staining, fine grained, firm (S2), completely weathered (W5), dry, platy fines, friable pieces of laminated rock crumble under finger pressure. Ground/broken rock fines. [WEATHERED BEDROCK]	○
6.2					END OF TP @ 6.2m. BEDROCK. NOTES: 1) Roots down to 0.9m. 2) No seepage. No visible ground ice. 3) Backfilled to surface.	

BGC ENGINEERING INC.
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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL6-4

Location : Ann Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459406E, 7101744N
Ground Elevation (m) 981
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 28 Jul 09
Finish Date: 28 Jul 09
Final Depth of Pit (m) : 4.8
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS/TOPSOIL Leaves, needles and rootlets over thin, dry silty soil.
		S1			SANDY GRAVEL (GW) Trace silt, well graded, brown, dry, interlensing of grey clayey material and loose reddy sand (dipping downhill), metasedimentary subangular-angular clasts (up to 5cm), weakly cemented. [COLLUVIUM?]
1		S2			
3		S3			2.8m - FROZEN: Nf.
4		S4			METASEDIMENTARY BEDROCK Mixture of colors (reds and brown), fine grained, completely-highly weathered (W4-W5) gravel and fines (crushed rock).
5					END OF TP @ 4.8m. WEATHERED BEDROCK. NOTES: 1) Roots down to 0.7m. 2) No seepage, minor sloughing, no visible ground ice. 4) Dug uphill off old road, approximately 28 degree slope. 5) Backfilled to surface.

Su - kPa: 40, 80, 120, 160

VANE FIELD LAB; PEAK ◆ ■; REMOLD ◇ □; ▲ UC/2; △ Pocket Pen /2

★ % Fines

Moisture Content: W_p% W% W_L%; 20, 40, 60, 80

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL6-5

Location : Ann Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459309E, 7101833N
Ground Elevation (m) 1022
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 30 Jul 09
Finish Date: 30 Jul 09
Final Depth of Pit (m) : 4.0
Logged by : HG
Reviewed by : PQ

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% — W% ○ — W_L% (20, 40, 60, 80)

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Moisture Content
0					ORGANICS/TOPSOIL Thin moss and lichen cover over silty soil.	
		S1				○
					SILTY GRAVEL (GM) Trace sand, trace clay, well graded, loose to compact, angular, grey-brown, dry, none to weak cementation. [COLLUVIUM]	
1		S2				○
					SILTY GRAVEL (GM) Some sand, well graded, loose to compact, gravel (up to 6cm), occasional cobble (~10cm), angular to subangular, brown, dry, no structure, weak cementation. [COLLUVIUM]	
2					GRAVEL (GW) Some silt, trace clay, well graded, loose to compact, gravel (up to 6cm) and odd cobble, subangular to angular,dark grey-black, possbile structure, weak cementation, oxide staining on metased clasts. [COMPLETELY WEATHERED BEDROCK]	
3					WEATHERED METASEDIMENTRAY ROCK Brown with oxide staining, fine grained, highly weathered (W4) rock, comprised of gravel and crushed rock fines. [HIGHLY WEATHERED BEDROCK]	
		S3				○
4					END OF TP @ 4.0m. WEATHERED BEDROCK. NOTES: 1) Roots down to 1.0m. 2) No seepage, major sloughing (under spoil pile), no visible ground ice. 3) Backfilled to surface.	
5						
6						
7						
8						
9						
10						

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL6-6

Location : Ann Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459758E, 7102385N
Ground Elevation (m) 1062
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 30 Jul 09
Finish Date: 30 Jul 09
Final Depth of Pit (m) : 5.5
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS/TOPSOIL Moss and lichen cover over silty brown soil with some angular gravel.
		S1			GRAVELLY SILT (ML) Some sand, brown, moist, no structure, weak cementation, weathered metasedimentary clasts (up to 6cm), angular. [COLLUVIUM?]
1		S2			
3					WEATHERED SEDIMENTARY BEDROCK Brown, crushed rock and fines, pockets of reddish brown sand, weathered gravel corestones (R2-R3) with oxidized surfaces and fracture planes, relict structure visible. [WEATHERED BEDROCK]
5.5					END OF TP @ 5.5m. EXTENT OF EXCAVATOR REACH. NOTES: 1) Roots down to 0.6m. 2) No seepage, no major sloughing, no visible ground ice. 3) Backfilled to surface.

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% — W% — W_L%; 20, 40, 60, 80

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

BGC ENGINEERING INC.
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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL6-7

Location : Ann Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459883E, 7102297N
Ground Elevation (m) 1072
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 30 Jul 09
Finish Date: 30 Jul 09
Final Depth of Pit (m) : 5.4
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Su - kPa / Moisture Content
0		S1			ORGANICS/TOPSOIL Moss old tree decay and rootlets in brown, dry silt, with some gravel, trace sand.	○
		S2			GRAVEL (GM) Some silt, trace sand well graded, brown, moist, angular to subangular clasts up to 6cm.	○
1					GRAVELLY SILT (ML) Some sand, trace clay, low plastic, firm, brown, moist, no structure evident, weakly cemented, slow dilatancy, clasts of metasedimentary weathered rock (R3), angular, occasional cobble. [COLLUVIUM]	
2		S3			GRAVEL (GW) Some silt, well graded, loose, angular and subangular particles, brown, cold and moist, no evident structure. [COLLUVIUM]	○
3					WEATHERED METASEDIMENTARY BEDROCK Brown, crushed rock and fines, occasional boulder, some cobbles, visible stratification, oxide staining, weathering grade decreases from W5 to W4 with depth. [WEATHERED BEDROCK]	
5.4					END OF TP @ 5.4m. NEAR EXTENT OF EXCAVATOR REACH. NOTES: 1) Roots down to 0.6m. 2) No seepage, minor sloughing, no visible ground ice. 3) Backfilled to surface.	

Su - kPa: 40, 80, 120, 160
VANE FIELD LAB: PEAK ◆ ■; REMOLD ◇ □; ▲ UC/2; △ Pocket Pen /2
★ % Fines
Moisture Content: W_P% — W% — W_L%: 20, 40, 60, 80

Depth scale: 0 1 2 3 4 5 6 7 8 9 10

BGC ENGINEERING INC.
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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL6-8

Location : Ann Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459200E, 7101352N
Ground Elevation (m) 920
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 30 Jul 09
Finish Date: 30 Jul 09
Final Depth of Pit (m) : 2.6
Logged by : HG
Reviewed by : PQ

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% × — W% ○ — W_L% × (20, 40, 60, 80)

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Moisture Content
0		S1			ORGANICS/TOPSOIL Thin grass/needle cover over black, wet silty soil.	>>○
1		S2			GRAVELLY SILT (ML) Some sand, trace clay, grey, moist-wet, loose, rapid dilatancy, angular and subangular metasedimentary clasts with occasional subrounded cobble. [COLLUVIUM]	○
2	Hand	S3			GRAVELLY SILT (ML) Some sand, trace clay, brown, frozen: poorly bonded non-vsible ice (Nf), thin coatings near clasts, angular and subangular metased clasts, occasional subrounded cobble. [COLLUVIUM]	○
3					End of Hole @2.6m. SLOUGHING AND SEEPAGE. NOTES: 1) Root depth indistinguishable under mud. 2) Ponded water on surface, in ruts from the excavator getting stuck two days earlier. 3) Major sloughing, visible seepage, no visible ground ice. 4) Backfilled to surface.	
4						
5						
6						
7						
8						
9						
10						

BGC ENGINEERING INC.
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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL6-9

Location : Ann Gulch

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Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459933E, 7101886N
Ground Elevation (m) 1042
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 31 Jul 09
Finish Date: 31 Jul 09
Final Depth of Pit (m) : 3.8
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Moisture Content (W%)
0					ORGANICS/TOPSOIL Moss and lichen cover over silt, trace sand, trace gravel, brown, dry.	
		S1			GRAVELLY SILT (ML) Some sand, firm, brown, dry, no stucture, weak cementation, subangular, weathered metased clasts (up to 6cm), interlensed with black organic material. [COLLUVIUM]	○
1		S2				○
					GRAVELLY SILT (ML) Some sand, trace clay, firm, orangey brown to brown, metallic sheen to materials completely weathered bedrock (crushed to gravel and fines). Grey layer of thin platy particles. [WEATHERED BEDROCK TO RESIDUAL SOIL?] 1.2m to 1.5m - FROZEN GROUND: Nf, 5-10%.	
2						
					WEATHERED METASEDIMENTARY BEDROCK Reddish-brown/orangey-brown/brown rock, crushed, gravel and fines, some relict structure visible, shiny, platy particles rub into silt and clay between fingers; occasional boulders near bottom (8cm to 12cm), oxide staining, weak to medium strong (R2-R3). [WEATHERED BEDROCK]	
3						
4					END OF TP @ 3.8m. REFUSAL ON WEATHERED BEDROCK. NOTES: 1) Roots down to 0.6m. 2) No seepage, no sloughing. 4) Backfilled to surface.	
5						
6						
7						
8						
9						
10						

Su - kPa: 40 80 120 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% — W% — W_L%; 20 40 60 80

BGC ENGINEERING INC.
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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL6-10

Location : Ann Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459542E, 7101644N
Ground Elevation (m) 939
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 31 Jul 09
Finish Date: 31 Jul 09
Final Depth of Pit (m) : 4.8
Logged by : HG
Reviewed by : PQ

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% — W% — W_L%: 20, 40, 60, 80

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0		S1			ORGANICS/TOPSOIL Thin moss, needles, leaves and lichen covering brown, silty, dry soil, with some gravel and sand.
		S2			GRAVELLY SILT (ML) Some sand, firm - stiff, brown, odourless, moist, no evident structure, weak cementation, weathered subangular to angular metasedimentary clasts up to 4cm, flat, platy, particles with metallic sheen. [FILL OR COLLUVIUM]
1–4.8					WEATHERED METASEDIMENTARY BEDROCK Brown with layers of grey and reddish brown visible, friable weathered rock crushed to gravel sand and fines, platy shiny particles which rub into a siltey/clayey material persist, completely weathered bedrock (W5). FROZEN at 2.0m: Nbn. [WEATHERED BEDROCK].
4.8					END OF TP @ 4.8m. REFUSAL ON WEATHERED BEDROCK. NOTES: 1) Roots down to 0.5m. 2) No seepage, no sloughing. 3) PVC casing installed for thermistor string. 5) Backfilled to surface.

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

BGC ENGINEERING INC.
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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL6-11

Location : Ann Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459720E, 7101628N
Ground Elevation (m) 976
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 06 Aug 09
Finish Date: 06 Aug 09
Final Depth of Pit (m) : 2.8
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS
					SAND (SP) Fine, silty, trace gravel, poorly graded, compact, max clast=5cm, subangular, orange brown, dry, homogeneous. [COLLUVIUM]
1					MICA SCHIST Greyish brown, fine grained, extremely weak, highly weathered ,disintegrated, some sand infill, joint spacing <1cm,
					0.9m - Blocky, orangish brown.
2					METASEDIMENT Orangish grey, medium grained, very weak, highly weathered, blocky, joint spacing 1-5cm, trace sand infill. 1.8m - Moderately weathered, blocky, three, joint sets, joint spacing 1-10cm.
3					End of Test Pit @2.8m. REFUSAL ON BEDROCK. NOTES: 1) Roots down to 0.65m. 2) No seepage, no visible ground ice. 3) Backfilled to surface.
4					
5					
6					
7					
8					
9					
10					

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% × — W% o — W_L% ×
20, 40, 60, 80

BGC ENGINEERING INC.
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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL6-12

Location : Ann Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459358E, 7101588N
Ground Elevation (m) 957
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 07 Aug 09
Finish Date: 07 Aug 09
Final Depth of Pit (m) : 6.0
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					PEAT (Pt) Organics, thin moss cover, dark brown roots, 10cm max diameter.
					SAND and GRAVEL (SW/GW) Fine to coarse, some clay, well graded, compact, max clast size 10cm, angular, orangish brown, moist, homogeneous, trace wood fragments, metasedimentary and Micaschist clasts. [COLLUVIUM]
1.5					GRAVEL (GW) Coarse, some sand. 5.8m - Hole sloughing.
6					End of TP @ 6.0m. EXTENT OF EXCAVATOR REACH. NOTES: 1) No seepage, no visible ground ice. 2) Hole sloughing. 3) Backfilled to surface.

Su - kPa: 40, 80, 120, 160
VANE: FIELD, LAB — PEAT ◆ ■; REMOLD ◇ □
▲ UC/2; △ Pocket Pen /2
★ % Fines
Moisture Content: W_P%, W%, W_L% — 20, 40, 60, 80

Depth scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL6-13

Location : Ann Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459228E, 7101509N
Ground Elevation (m) 959
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 07 Aug 09
Finish Date: 07 Aug 09
Final Depth of Pit (m) : 2.4
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS Thin moss cover, dark brown, rootlets.
					GRAVEL (GW) Fine to coarse, some silt, trace cobbles, compact, max particle size 20cm, subangular, orangish-brown, dry, homogeneous, from 1.0m to 1.1m fine silty sand lens, some gravel, moist.
1					
					SAND and GRAVEL (SW/GW) Fine to medium , silty, dense, max particle size = 3cm, subangular.
2					[WEATHERED MICA SCHIST] METASEDIMENTARY BEDROCK Orangish-grey, medium grained, highly weathered, disintegrated to blocky, very weak, sandy gravel infill.
3					END OF TP @ 2.4m. REFUSAL ON BEDROCK. NOTES: 1) Rootlets down to 0.65m. 2) No seepage, no visible ground ice. 3) Backfilled to surface.
4					
5					
6					
7					
8					
9					
10					

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% — W% — W_L%: 20, 40, 60, 80

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL6-14

Location : Dublin Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459299E, 7101197N
Ground Elevation (m) 870
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 07 Aug 09
Finish Date: 07 Aug 09
Final Depth of Pit (m) : 6.2
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0 – 0.2					ORGANICS Peat, dark brown, rootlets.
0.2 – 2.7					SAND and GRAVEL (SM/GM) Fine to coarse, some silt, trace clay, trace cobble, very dense, max particle size 0.25m, subrounded to subangular, brown, moist, metasedimentary and quartzite clasts, homogeneous. [COLLUVIUM]
2.7 – 5.8					SAND (SM) Silty, fine to medium grained, some gravel, dense, max particle size 10cm, subrounded to angular, brown, moist, homogeneous, trace wood fragments. [COLLUVIUM]
5.8 – 6.2					BOULDERS Some cobbles, some sand, max particle diameter 0.40m, subrounded, orangish-grey, dry, [old buried stream channel?].
6.2					END OF TP @ 6.20m. REFUSAL ON BEDROCK. NOTES: 1) No seepage, no visible ground ice. 2) Backfilled to surface.

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% × — — — W% ○ — — — × W_L%; 20, 40, 60, 80

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL6-15

Location : Ann Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459685E, 7101790N
Ground Elevation (m) 979
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 06 Aug 09
Finish Date: 06 Aug 09
Final Depth of Pit (m) : 5.3
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Su - kPa / Moisture Content
0					PEAT (Pt) and ORGANICS	
					SAND and GRAVEL (SM/GM) Fine to coarse, silty, dense, max clast 5cm, subrounded to angular, orangish brown, moist, homogeneous, trace wood fragments. FROZEN: Vx, 1-5%. [COLLUVIUM]	
1					SAND (SW) Gravelly, fine to coarse, trace cobbles, well graded, dense, subrounded to angular, grey, moist, stratified colluvium. [COLLUVIUM]	
5					BEDROCK Mica Schist, grey, fine grained, foliated, extremely weak, extremely weathered, disintegrated, gravel to cobble angular fragments, easily ripped.	
					End of TP @ 5.3m. EXTENT OF EXCAVATOR REACH. NOTES: 1) No seepage. 2) Backfilled to surface.	

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% × — — — W% o — — — × W_L%
20, 40, 60, 80

BGC ENGINEERING INC.
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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL6-16

Page 1 **of** 1

Location : Ann Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459584E, 7012014N
Ground Elevation (m) 999
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 06 Aug 09
Finish Date: 06 Aug 09
Final Depth of Pit (m) : 5.3
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					PEAT (Pt) Organics, moss, twigs 10mm in diameter, dark brown.
					SAND and GRAVEL (SM/GM) Fine to coarse, some silt, compact, max particle size 10cm, subrounded to angular, orangish brown, trace rootlets to 0.7M. [COMPLETEY WEATHERED BEDROCK]
					2.5m - Cobbles and gravel, some sand, highly weathered metasedimentary.
					3.3m to 4.5m - Loose, hole sloughing.
					METASEDIMENTARY Orangish grey, medium grained, very weak, highly weathered, blocky, joint spacing <5cm.
					END OF TEST PIT @ 5.3m. REFUSAL ON BEDROCK. NOTES: 1) No seepage no visible ground ice. 2) Backfilled to surface.

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: $W_P\%$ — W% — $W_L\%$: 20, 40, 60, 80

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL6-17

Location : Ann Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459463E, 7101825N
Ground Elevation (m) 984
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 06 Aug 09
Finish Date: 06 Aug 09
Final Depth of Pit (m) : 3.3
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					PEAT (Pt) Organics, sandy, dark brown.
					SAND and GRAVEL (SW/GW) Fine to coarse, some cobbles, trace silt, loose, max particle size 10cm, subrounded to angular, orangish brown, dry, homogeneous, metasedimentary clasts. [COLLUVIUM]
1					BEDROCK Metasedimentary, orangish grey, medium grained, very weak, highly weathered, gravelly sand and cobbles, joint spacing mm to cm, loose to dense.
3					END OF TP @ 3.3m. REFUSAL ON BEDROCK. NOTES: 1) Roots down to 1.1m. 2) No seepage, no visible ground ice. 3) Backfilled to surface.

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% × — W% ○ — W_L% ×
20, 40, 60, 80

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

EAGLE PUP

TP-BGC09-WR-1

TP-BGC09-WR-2

TP-BGC09-WR-3

TP-BGC09-WR-4

TP-BGC09-WR-5

TP-BGC09-WR-6

TP-BGC09-WR-7

TP-BGC09-WR-8

TP-BGC09-WR-9

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-WR-1

Location : Eagle Pup

Project No. : 0792-002

Survey Method : Handheld GPSHandheld GPS
Co-ordinates (m): 460086E, 7100715N
Ground Elevation (m) 971
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 21 Jul 09
Finish Date: 21 Jul 09
Final Depth of Pit (m) : 6.0
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS/TOPSOIL Fine, dark brown-black silt, moss and rootlets.
		S1			SILTY GRAVEL (GM) Some sand, trace clay, particles vary from fine to coarse, cobbles up to 20cm, loose to compact, subangular metased gravel and weathered rock fragments, reddish brown, moist, homogeneous, weak-moderate cementation. [COLLUVIUM]
1					
2					
3					
					GRAVEL (GM) Some silt and sand, well graded, loose, gravel up to 5cm, subangular and subrounded particles, greyish-brown, moist, none to weak cementation. [COLLUVIUM?]
4					
5		S2			SAND (SW) Some gravel, trace silt, well graded, loose, subangular and subrounded particles, metased flakes, brown red and grey particles, moist, weak cementation. [COLLUVIUM?]
6		S3			END OF TP @ 6.0m. EXTENT OF EXCAVATOR REACH. NOTES: 1) Roots down to 0.3m. 2) No seepage, no visible ground ice. 3) Backfilled to surface.
7					
8					
9					
10					

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% × — — ○ W% — — × W_L%: 20, 40, 60, 80

GENERAL BGC (TESTPIT) 0792-002_03.GPJ BGC.GDT 10/2/09

BGC ENGINEERING INC.
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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-WR-2

Location : Eagle Pup

Page 1 **of** 1

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 460203E, 7100819N
Ground Elevation (m) 995
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 21 Jul 09
Finish Date: 21 Jul 09
Final Depth of Pit (m) : 6.0
Logged by : HG
Reviewed by : PQ

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% — W% — W_L% (20, 40, 60, 80)

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Moisture Content
0					ORGANICS/TOPSOIL Moss, rootlets and black silty soil.	
					SANDY GRAVEL (GW) Well graded, light grey-brown, dry, distinct contact zone with lower material. [FILL]	
1		S1				○
					ORGANICS/TOPSOIL Silty black soil with roots and some chunks of wood evident.	
2					SANDY GRAVEL (GW) Some silt, trace clay, cobbles+boulders up to 20cm, fine-coarse grains, compact, angular and subangular, cold, moist, no evident structure, weak cementation. [COLLUVIUM]	
3						
4		S2			SANDY GRAVEL (GW) Some clay, trace silt, dark brown with orange-cream mottling, some quartz evident. FROZEN: Nf.	○
5					SANDY GRAVEL (GW) Some silt, trace clay, occasional cobbles and boulders up to 20cm, fine-coarse grains, compact, angular and subangular, cold, moist, no evident structure, weak cementation. [COLLUVIUM]	
6					END OF TP @ 6.0m. EXTENT OF EXCAVATOR REACH. NOTES: 1) Roots down to 0.3m. 2) No seepage, some sloughing. 3) Backfilled to surface.	
7						
8						
9						
10						

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-WR-3

Location : Eagle Pup area

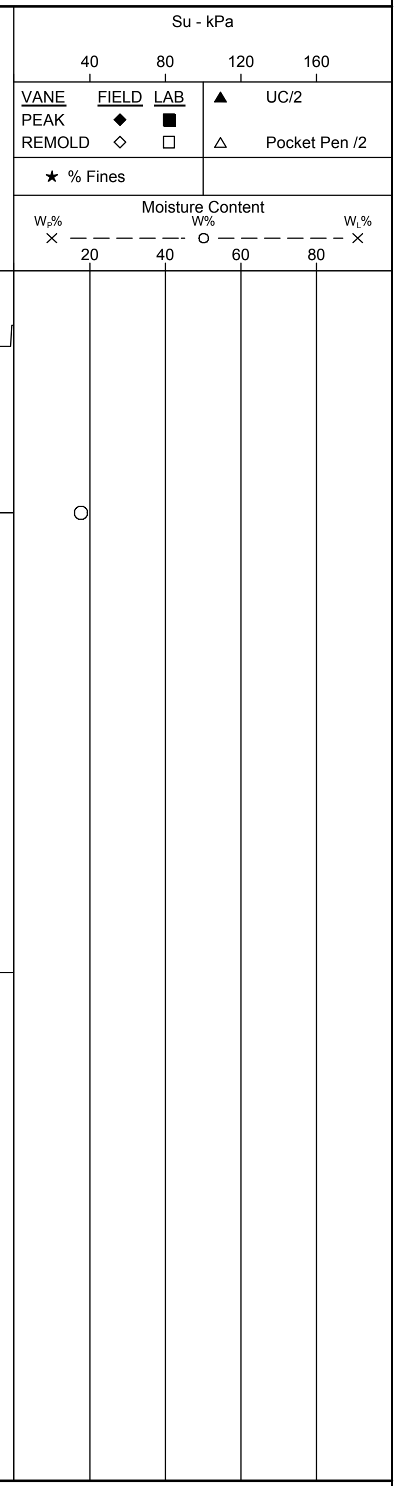
Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 460472E, 7100948N
Ground Elevation (m) 1088
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 21 Jul 09
Finish Date: 21 Jul 09
Final Depth of Pit (m) : 5.8
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					SAND (SM) Silty, some cobbles and boulders, grey-brown. [FILL]
0.6					SANDY GRAVEL (GM) Some silt, trace boulders, cool, moist, compact, no structure, angular gravel, grey brown. [COLLUVIUM]
2		S1			WEATHERED BEDROCK Highly fractured metasedimentary rock, visible relict structure, trace fines, loose - easy digging.
5.8					END OF TP @ 5.8m. REFUSAL ON WEATHERED BEDROCK. NOTES: 1) Roots down to 0.3m. 2) No seepage, no visible ground ice. 3) Backfilled to surface.



Depth scale: 0 1 2 3 4 5 6 7 8 9 10

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-WR-4

Location : Eagle Pup area

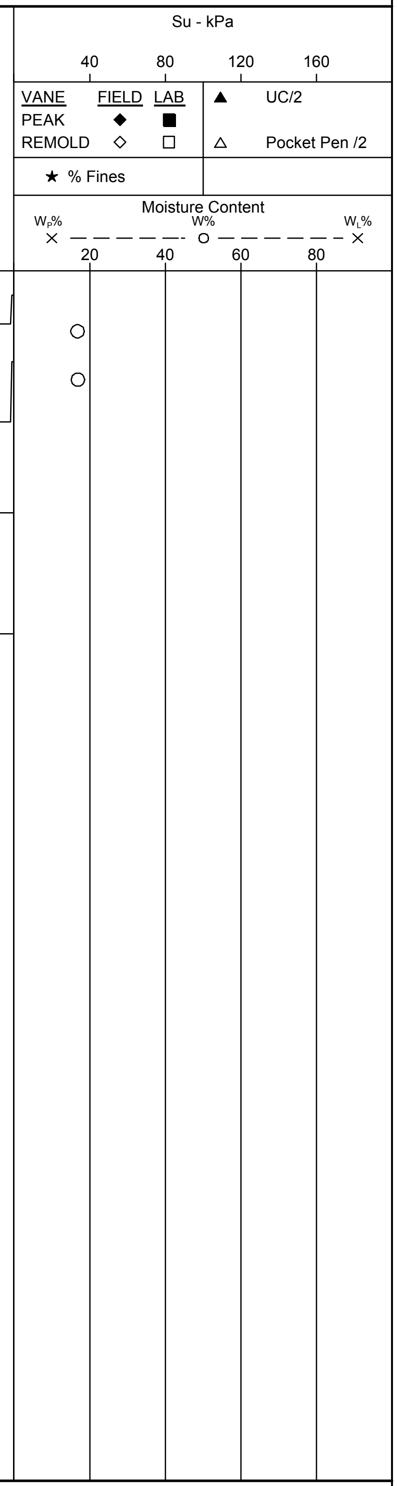
Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 460387E, 7100955N
Ground Elevation (m) 1068
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 22 Jul 09
Finish Date: 22 Jul 09
Final Depth of Pit (m) : 3.0
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS/TOPSOIL Moss, rootlets, fine soil.
		S1			GRAVELLY SILT (ML) Some cobbles, non plastic, soft, moist, no visible structure, angular gravel, none to weak cementation, slow dilatancy. [COLLUVIUM]
1		S2			GRAVELLY SAND (SW) Fine, some cobbles, trace yellowish mottling in sandy brown material. [COLLUVIUM]
2					METASEDIMENTARY ROCK Highly fractured, dippiing down into pit, greyish blue with some oxide staining. [WEATHERED BEDROCK].
3					END OF TP @ 3.0m. REFUSAL ON BEDROCK. NOTES: 1) Roots down to 0.4m. 2) Note that at 0.4m a rounded granodiorite cobble (10cm) was found in the gravely silt material (fluvial origin?). 3) No seepage or visible ground ice. 4) Backfilled to surface.
4					
5					
6					
7					
8					
9					
10					



BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-WR-5

Location : Eagle Pup area

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 460212E, 7100988N
Ground Elevation (m) 1032
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 22 Jul 09
Finish Date: 22 Jul 09
Final Depth of Pit (m) : 4.7
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0–0.4					ORGANICS/TOPSOIL Rootlets and organic soil.
0.4–1.3		S1, S2			SILTY GRAVEL (GM) Some sand, angular, moist, some structure becoming evident at 07.m, compact. [COLLUVIUM transitioning into BEDROCK?]
1.3–4.7					METASEDIMENTARY ROCK Some silt, coarse and fine sand, friable, visible relict bedding, stiff, highly weathered, some orange oxide staining visible, cobbles up to 15cm, medium strong to strong (R3-R4) bedrock, strengthening with depth.
4.7					END OF TP @ 4.7m. REFUSAL ON WEATHERED BEDROCK. NOTES: 1) Roots down to 0.6m. 2) No seepage, no visible ground ice, substantial sloughing. 3) Backfilled to surface.

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% — W% — W_L%; 20, 40, 60, 80

Depth scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-WR-6

Location : Eagle Pup

Project No. : 0792-002

Survey Method : Handheld GPSHandheld GPS
Co-ordinates (m): 460060E, 7100837N
Ground Elevation (m) 958
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 22 Jul 09
Finish Date: 22 Jul 09
Final Depth of Pit (m) : 6.5
Logged by : HG
Reviewed by : PQ

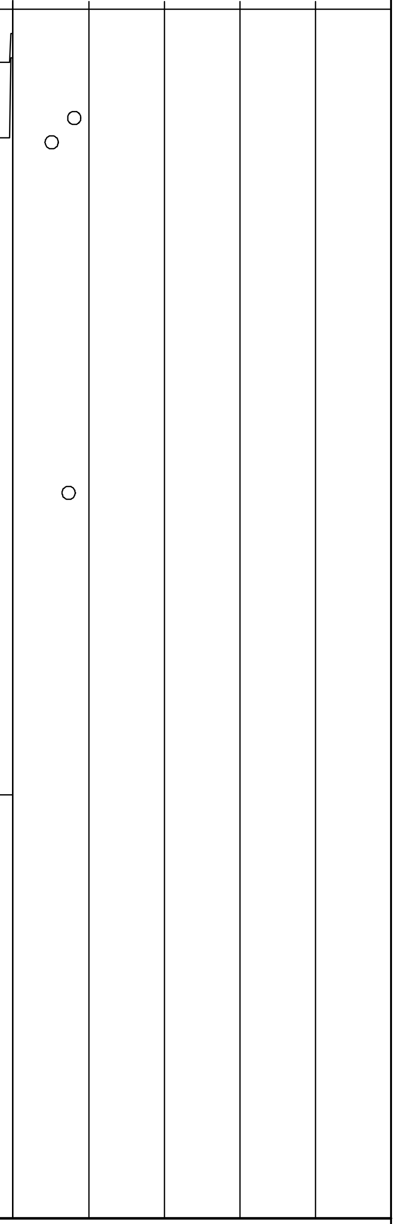
Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS/TOPSOIL Moss cover, rootlets throughout black silty soil.
					GRAVEL and SILTY SAND (GW/SM) Trace cobbles (up to 15cm), angular gravel, coarse sand, very loose to loose, brown, dry, no evident structure or cementation.
1		S1 S2			SANDY SILT (ML) Some clay, firm to stiff, red brown to grey, moderate cementation, very slow dilatancy, moist, subangular to angular gravel. FROZEN from 1.5m: Nbe. [COLLUVIUM]
4		S3			
6.5					END OF TP @ 6.5m. EXTENT OF EXCAVATOR REACH. NOTES: 1) Roots down to 0.5m. 2) No seepage. 3) Backfilled to surface.

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% — W% — W_L% (20, 40, 60, 80)



BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-WR-7

Location : Eagle Pup

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459893E, 7100896N
Ground Elevation (m) 930
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 22 Jul 09
Finish Date: 22 Jul 09
Final Depth of Pit (m) : 2.5
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Su - kPa / Moisture Content
0					ORGANICS/TOPSOIL Moss cover, rootlets, wood in black silty soil.	
					SILTY GRAVEL (GM) Trace sand,well graded, granodiorite and metasedimentary boulders (25cm), angular-subangular particles, grey to brown, no apparent structure. FROZEN: Nbe. [COLLUVIUM]	
1		S1				W% ≈ 17
2						
					END OF TP @ 2.5m. SEEPAGE & SLOUGHING. NOTES: 1) Roots down to 0.4m. 2) Eagle Pup creek approximately 8m north of testpit. 3) Backfilled to surface.	
3						
4						
5						
6						
7						
8						
9						
10						

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% × — W% ○ — W_L% ×; 20, 40, 60, 80

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-WR-8

Location : Eagle Pup area

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 460165E, 7100363N
Ground Elevation (m) 1031
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 23 Jul 09
Finish Date: 23 Jul 09
Final Depth of Pit (m) : 3.5
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS Moss and grasses covering black silt, rootlets throughout.
					SAND (SM) Some silt and gravel, well graded, occasional cobble/boulder (up to 25cm), loose to compact, some orange oxide staining, moist, no apparent structure. FROZEN from 0.4-0.5m: Vs, 5-10%. [COLLUVIUM]
1		S1			
2		S2			
3.5					End of Test Pit @ 3.5m. SEEPAGE & SLOUGHING. NOTES: 1) Roots down to 0.5m. 2) Seepage and sloughing at 3.5m. 3) PVC casing installed for thermistor string. 4) Slotted PVC installed for ground water monitoring. 7) Backfilled to surface.

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% — W% — W_L%: 20, 40, 60, 80

Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-WR-9

Location : Eagle Pup

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 460175E, 7100585N
Ground Elevation (m) 1003
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 23 Jul 09
Finish Date: 23 Jul 09
Final Depth of Pit (m) : 6.5
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS/TOPSOIL Thick moss (10cm) covering, rootlets, dark brown-black soil.
	grab	S1			SILTY SAND (SM) Fine to coarse, some gravel, compact, brown w/ layers of reddy brown & dark grey organics, moist, weak to moderate cementation. FROZEN from 1.1m to 1.4m: Nbe. [COLLUVIUM]
1.4	grab	S2			SAND (SW) Fine to coarse, some gravel, trace silt, well graded, loose to compact, occasional cobbles and boulders up to 25cm, subangular to angular gravel, orangey-brown, moist, homogeneous, weak cementation. [COLLUVIUM?]
3					SILTY SAND (SM) Trace boulders and cobbles, both subangular-angular, loose, grey, dry, no evident structure, weak cementation. [COLUVIUM?]
6.5					END OF TP @ 6.5m. EXTENT OF EXCAVATOR REACH. NOTES: 1) Roots down to 0.9m. 2) No seepage. 3) Backfilled to surface.

Su - kPa: 40, 80, 120, 160

VANE — FIELD — LAB; PEAK ◆ ■; REMOLD ◇ □; ▲ UC/2; △ Pocket Pen /2

★ % Fines

Moisture Content: W_P% — W% — W_L%; 20, 40, 60, 80

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

LOWER REACH DUBLIN GULCH

TP-BGC09-A-2

TP-BGC09-DG-1

TP-BGC09-DG-3

TP-BGC09-DG-4

TP-BGC09-HL4-10

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-A-2

Location : Heap Leach #1

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 458708E, 7100789N
Ground Elevation (m) 823
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 18 Jul 09
Finish Date: 18 Jul 09
Final Depth of Pit (m) : 4.5
Logged by : PQ
Reviewed by : PQ

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% — W% — W_L%: 20, 40, 60, 80

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					SAND AND GRAVEL (SM/GM) Silty, compact, light brown, damp. [TILL]
1.5					GRAVEL (GW) Sandy, cobbly, compact, reddish, damp. [COLLUVIUM]
2.1					SILT (ML) Sandy, light brown, FROZEN: Nbn. [TILL]
2.5					SAND and GRAVEL (SW/GW) Trace-some silt and cobbles, well graded, compact, brown, dry to damp. [TILL]
4.5					END OF TP @ 4.5m. LIMIT OF EXCAVATOR REACH. NOTES: 1) No seepage. 2) Backfilled to surface.

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-DG-1

Location : Dublin Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459317E, 7101005N
Ground Elevation (m) 848
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 10 Aug 09
Finish Date: 10 Aug 09
Final Depth of Pit (m) : 2.5
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Su - kPa (40, 80, 120, 160): VANE FIELD / LAB — PEAK ◆ ■, REMOLD ◇ □; ▲ UC/2; △ Pocket Pen /2; ★ % Fines; Moisture Content W_P% — W% — W_L% (20, 40, 60, 80)
0					SAND and GRAVEL (SM/GM) Silty, well graded, very dense, max clast 20cm, subrounded to subangular, brown, moist, homogeneous.	
1					SAND and GRAVEL (SM/GM) Some silt, some cobbles, trace boulders, well graded, dense, max clast 0.40m, subrounded to subangular, orangish-brown, moist, homogeneous. [Possibly Fluvial] 0.70m - Trace Seepage.	
2					2.0m - Becomes gravelly, with cobbles and boulders. Seepage.	
3					END OF TP @ 2.5m. SLOUGHING. NOTES: 1) At 2.5m, the pit filled with water and caved in to 2.0m 2) No visible ground ice. 3) Backfilled to surface.	
4						
5						
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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-DG-3

Location : Dublin Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 458987E, 7100938N
Ground Elevation (m) 837
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 08 Aug 09
Finish Date: 08 Aug 09
Final Depth of Pit (m) : 5.0
Logged by : MRR
Reviewed by : PQ

Su - kPa: 40, 80, 120, 160

VANE FIELD LAB ▲ UC/2
PEAK ◆ ■
REMOLD ◇ □ △ Pocket Pen /2
★ % Fines
Moisture Content: W_P% — W% — W_L%: 20, 40, 60, 80

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					SAND and GRAVEL (SW/GW) Fine to coarse, trace silt, loose, max clast 5cm, angular, brown, moist, homogeneous. [PLACER TAILINGS]
1		S1			CLAYEY SILT (ML) Low plastic, grey, moist, low dry strength, rapid dilatancy. [PLACER TAILINGS, Settling Pond]
2					SAND and GRAVEL (SM/GM) Fine to coarse, trace silt, compact, max clast 5cm, subrounded to angular, orangish brown, moist, homogeneous. 2.9m - Seepage.
3		S2			SILTY SAND and GRAVEL (SW/GW) Fine to coarse, trace clay, compact, max clast 10cm, subrounded to angular, tan, wet, homogeneous. 3.3m to 3.5m - Clayey silt. 3.5m - Subrounded boulders.
4					
5					END OF TP @ 5.0m. REFUSAL ON BOULDERS. NOTES: 1) Rootlets to 0.6m. 2) Seepage at 2.9m, no visible ground ice. 3) Backfilled to surface.
6					
7					
8					
9					
10					

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-DG-4

Location : Haggart Creek

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 458311E, 7100857N
Ground Elevation (m) 801
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 08 Aug 09
Finish Date: 08 Aug 09
Final Depth of Pit (m) : 3.0
Logged by : MRR
Reviewed by : PQ

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% × — W% o — W_L% ×; 20, 40, 60, 80

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS Moss, dark brown, rootlets.
					GRAVEL and BOULDERS Some sand, some silt, subrounded, compact, max clast 40cm, moist, grey silt laminations.
1					SILT and COBBLES Some gravel, subrounded to subangular, max clast 30cm, very dense, tan, homogeneous. FROZEN. 1.0m - FROZEN: Vs, 5%.
2					SANDY SILT (SM) Fine sand, trace clay, non plastic, very hard, tan, faint laminations, low dry strength. FROZEN: Vx, 3%. 2.20m - ICE, 2 cm thick horizontal laminations.
3					END OF TP @ 3.0m. REFUSAL ON FROZEN GROUND. NOTES: 1) Rootlets down to 0.4m. 2) No seepage. 3) Backfilled to surface.
4					
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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL4-10

Location : Near weather station, by camp burn pit

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 458467E, 7100779N
Ground Elevation (m) 827
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 31 Jul 09
Finish Date: 31 Jul 09
Final Depth of Pit (m) : 6.5
Logged by : HG
Reviewed by : PQ

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_p% × — W% ○ — W_L% ×; 20, 40, 60, 80

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0		S1			SILT (ML) Some sand, some gravel, trace clay, firm - stiff, greyish-brown, moist, no evident structure, weak-moderate cementation. Gravel clasts (up to 6cm), occasional cobbles (up to 12cm), including medium strong (R3) metasedimetary subangular and extremely strong (R6) subrounded granodiorite. [FILL?]
3		S2			SILTY SAND (SM) Some gravel, very fine to fine sand, poorly graded, loose, trace gravel (up to 6cm), occasional cobble (up to 12cm), subangular and subrounded particles, moist, no structure, none to weak cementation. [FILL?]
5		S3			
5.5					SILT (ML) Some fine sand and gravel, firm brown, moist, subangular and subrounded gravel with occasional cobbles, no structure, weak cementation. [FILL?]
6.5		S4			END OF TP @ 6.5m. EXTENT OF EXCAVATOR REACH. NOTES: 1) Roots down to 0.45m. 2) No seepage, no visible ground ice. 3) Backfilled to surface.

Depth scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

OLIVE GULCH

TP-BGC09-HL5-1

TP-BGC09-HL5-2

TP-BGC09-HL5-3

TP-BGC09-HL5-4

TP-BGC09-HL5-5

TP-BGC09-HL5-6

TP-BGC09-HL5-7

TP-BGC09-HL5-8

TP-BGC09-HL5-9

TP-BGC09-HL5-10

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL5-1

Location : Olive Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 461915E, 7100367N
Ground Elevation (m) 1340
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 20 Jul 09
Finish Date: 20 Jul 09
Final Depth of Pit (m) : 4.4
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS/TOPSOIL Scrub brush, small spruce and moss covering, boulders also visible on surface.
					Grandorite BOULDERS and COBBLES Silty sand infill, subangular cobbles and angular boulders, slightly weathered, some oxide staining, strong to very strong, silty sand matrix, fine to med grains, some gravel, compact. [WEATHERED ROCK]
4.4					END OF TP @ 4.4m. REFUSAL ON BEDROCK. NOTES: 1) Roots down to 0.4m. 2) No seepage or visible ground ice. 3) During excavation pit walls collapsed. 4) Relict joints visible in weathered rock along TP walls. 5) Backfilled to surface.

Su - kPa: 40, 80, 120, 160

VANE FIELD LAB: PEAK ◆ ■; REMOLD ◇ □; ▲ UC/2; △ Pocket Pen /2

★ % Fines

Moisture Content: W_P% — W% — W_L%: 20, 40, 60, 80

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL5-2

Location : Olive Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 461740E, 7100620N
Ground Elevation (m) 1290
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 20 Jul 09
Finish Date: 20 Jul 09
Final Depth of Pit (m) : 6.0
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0 – 0.4					ORGANICS/TOPSOIL Vegetation cover consists of sparse spruce, moss and some scrub brush.
0.4 – 1.5					Granodiorite BOULDERS and COBBLES Subangular, strong, in a dark grey silty sand (SM) infill. [COLLUVIUM?]
1.5 – 6.0					SAND (SM) Weathered Bedrock in a gravelly sand matrix, fine to coarse, some silt, some boulders and cobbles, compact, brown ocher colored sand, some oxide discoloration, moist, weak cementation.
6.0					END OF TP @ 6.0m. EXTENT OF EXCAVATOR REACH. NOTES: 1) Roots down to 0.4m. 2) No seepage or visible ground ice. 3) Large variation in cobble/boulder strength, from weak to very strong (R2-R5). 4) Backfilled to surface.

Depth scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% — W% — W_L%: 20, 40, 60, 80

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL5-3

Location : Olive Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 461692E, 7100763N
Ground Elevation (m) 1256
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 20 Jul 09
Finish Date: 20 Jul 09
Final Depth of Pit (m) : 2.0
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Su - kPa (40, 80, 120, 160) / Moisture Content W% (20, 40, 60, 80)
0					ORGANICS/TOPSOIL Fairly open vegetation, scattered spruce and shrubs, boulder field just East of testpit.	
					GRAVEL (GW) Fine to med sand, trace cobbles and boulders, dark greyish-brown zone cold and moist, compact, FROZEN: Nf to Nbn.	
1		S1				○
		S2				○
		S3				○
2					END OF TP @ 2.0m. REFUSAL ON FROZEN GROUND. NOTES: 1) Roots down to 0.4m. 2) No seepage. 3) Backfilled to surface.	
3						
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Legend: VANE FIELD LAB; PEAK ◆ ■; REMOLD ◇ □; ▲ UC/2; △ Pocket Pen /2; ★ % Fines; Moisture Content W_P% × — W% ○ — W_L% ×

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL5-4

Location : Olive Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 462120E, 7100182N
Ground Elevation (m) 1364
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 26 Jul 09
Finish Date: 26 Jul 09
Final Depth of Pit (m) : 5.5
Logged by : HG
Reviewed by : PQ

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% × — — o W% — — × W_L%; 20, 40, 60, 80

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS/TOPSOIL Moss and lichen cover over thin layer of black silty soil.
		S1			GRAVELLY SILT (ML), Some sand, low plastic, soft, brown, moist, no visible structure, none-weak cementation, slow dilatancy, weathered metasedimentary clasts and cobbles (up to 8cm), from medium strong to strong (R3-R4), surface staining, subangular to angular quartz evident.
2		S2			GRAVELLY SAND (SM) Some silt, well graded, loose, angular metasedimentary clasts (up to 6cm), reddy-brown, dry, no evident structure, none-weak cementation.
3		S3			SAND (SP) Medium-coarse grained, loose-compact, subrounded particles, yellowish-brown, dry visible relict structure in corestones which crumble under finger pressure, very weak to weak (R1-R2), completely weathered (W5) corestones. Strength improves with depth, angular cobble with surface staining observed was mediumstrong-strong (R3-R4). [WEATHERED GRANODIORITE]
5.5					END OF TP @ 5.5m. EXTENT OF EXCAVATOR REACH. NOTES: 1) Roots down to 0.3m. 2) No seepage, minor sloughing, no visible ground ice. 3) Backfilled to surface.

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL5-5

Location : Olive Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 462403E, 7100182N
Ground Elevation (m) 1378
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 27 Jul 09
Finish Date: 27 Jul 09
Final Depth of Pit (m) : 2.0
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Su - kPa (40 / 80 / 120 / 160); VANE FIELD/LAB: PEAK ◆ ■, REMOLD ◇ □; ▲ UC/2; △ Pocket Pen /2; ★ % Fines; Moisture Content W_P% — W% ○ — W_L% (20 / 40 / 60 / 80)
0					ORGANICS/TOPSOIL	
		S1			SILT (ML) Some sand, low plastic, firm, brown, moist, no evident structure, weak cementation, metasediment clasts increasing in size with depth, surface and joint staining evident.	○
1					METASEDIMENTARY BEDROCK Brown fine, medium grained, stratified, strong (R3), slight moderate weathering (WII - WIII), dippiing (roughly) SW, oxide joint/surface staining.	
2					END OF TP @ 2.0m. REFUSAL ON BEDROCK. NOTES: 1) Roots down to 0.65m. 2) No seepage, no visible ground ice. 3) Appears to be dipping South to Southwest. 4) Backfilled to surface.	
3						
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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL5-6

Location : Olive Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 462551E, 7100377N
Ground Elevation (m) 1370
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 27 Jul 09
Finish Date: 27 Jul 09
Final Depth of Pit (m) : 5.5
Logged by : HG
Reviewed by : PQ

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% × — W% ○ — W_L% ×; 20, 40, 60, 80

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS/TOPSOIL Brown silty soil with rootlets, moss and grass cover.
		S1			SILT (ML) Some gravel, trace sand, low plasticity, firm, brown with thin lenses of sandy reddish-brown and grey material near 1m depth, subangular to angular metasedimentary clasts, moist, no structure, none-weak cementation. Material changes to a grey color with depth, sand content increases with depth. [COLLUVIUM]
2		S2			SAND (SP) Fine to medium grained, poorly graded, trace silt, trace gravel, loose, some flat mineral grains, other brown and beige subrounded grains, dry, none-weak cementation. [COMPLETELY WEATHERED GRANODIORITE] 3.0m - Relict structure becomes evident in corestones, crumble to sand with finger pressure.
5		S3			SAND (SW) Medium to coarse grained, some subrounded gravel, grey, moist-wet, seepage.
					END OF TP @ 5.5m. SEEPAGE AND SLOUGHING. NOTES: 1) Roots down to 0.65m. 2) Seepage at 5.5m, no visible ground ice. 3) Slotted PVC groundwater monitoring standpipe installed. 4) Backfilled to surface.

Depth scale: 0 1 2 3 4 5 6 7 8 9 10

BGC ENGINEERING INC.
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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL5-7

Location : Olive Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 462478E, 7100677N
Ground Elevation (m) 1366
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 27 Jul 09
Finish Date: 27 Jul 09
Final Depth of Pit (m) : 4.8
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS/TOPSOIL Black silty soil with moss cover and rootlets throughout.
		S1			SILT (ML) Trace sand, trace gravel, low plastic, soft, brown, moist, weak cementation.
1		S2			SILTY SAND (SM) Some gravel, loose, grey moist, some gravel/cobbles, clast size increasing with depth, both metasedimentary and granodiorite subrounded-subangular clasts. [COLLUVIUM]
2		S3			GRAVELLY SAND (SM) Some silt, silt content decreasing with depth, loose, subangular and subrounded gravel and clasts of both metasedimentary and granodiorite origin, brown, moist, no structure. [COLLUVIUM]
4					GRANODIORITE - grey with black and white flecks, coarse grained, very strong (R5), fresh-slightly weathered (W1-W2), angular-subangular cobbles. [BEDROCK]
5					END OF TP @ 4.8m. REFUSAL ON BEDROCK. NOTES: 1) Roots down to 0.5m. 2) Sharp contact between colluvium and bedrock at 4.0m, no evidence of a weathered intermediate zone. 3) No seepage or visible ground ice. 4) Backfilled to surface.
6					
7					
8					
9					
10					

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_p% — W% — W_L%: 20, 40, 60, 80

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL5-8

Location : Olive Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 462281E, 7100688N
Ground Elevation (m) 1348
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 27 Jul 09
Finish Date: 27 Jul 09
Final Depth of Pit (m) : 0.9
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS/TOPSOIL Dark brown silty soil covered with moss and lichen.
		S1			SANDY SILT (ML) Trace gravel, subrounded metasedimentary clasts (<5cm) and some weathered granodiorite clasts, brown matrix, moist, firm, no structure. [COLLUVIUM]
1					GRANODIORITE BEDROCK Black and white specs, coarse grains, homogeneous, strong - very strong (R4-R5), no notable weathering, slight surface discoloration, fractured tabular boulders (up to 1.1m on B axis). [BEDROCK]
2					END OF TP @ 0.9m. REFUSAL ON BEDROCK. NOTES: 1) Roots down to 0.3m. 2) Thin colluvium layer appears to be washed into fractured bedrock (0.2-0.4m). 3) No seepage or visible ground ice. 4) Backfilled to surface.
3					
4					
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10					

Su - kPa: 40 80 120 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% — W% — W_L%: 20 40 60 80

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL5-9

Location : Olive Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 462138E, 7100715N
Ground Elevation (m) 1320
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 27 Jul 09
Finish Date: 27 Jul 09
Final Depth of Pit (m) : 1.4
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Su - kPa / Moisture Content
0					ORGANICS/TOPSOIL Black silty soil, moist, thin moss and lichen cover.	
		S1			SILT (ML) Some coarse sand, fine gravel, low plasticity, soft, brown, moist, no structure, rapid dilation, lenses of completely weathered granodiorite sand.	W% ≈ 29
1					GRANODIORITE ROCK Black and white specs, coarse grains, tabular, strong-very strong (R4-R5), fresh (WI). [BEDROCK]	
2					END OF TP @ 1.4m. REFUSAL ON BEDROCK. NOTES: 1) Roots down to 0.5m. 2) Dug into valley slope, granodiorite boulders and cobbles visible on surface. 3) No seepage, no visible ground ice. 4) Backfilled to surface.	
3						
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Su - kPa: 40, 80, 120, 160
VANE FIELD LAB: PEAK ◆ ■; REMOLD ◇ □
▲ UC/2; △ Pocket Pen /2
★ % Fines
Moisture Content: W_P% — W% — W_L%: 20, 40, 60, 80

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL5-10

Location : Olive Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 462460E, 7100369N
Ground Elevation (m) 1358
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 27 Jul 09
Finish Date: 27 Jul 09
Final Depth of Pit (m) : 2.8
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Su - kPa (40, 80, 120, 160); VANE FIELD/LAB: PEAK ◆ ■, REMOLD ◇ □; ▲ UC/2; △ Pocket Pen /2; ★ % Fines; Moisture Content W_P% — W% ○ — W_L% (20, 40, 60, 80)
0					ORGANICS/TOPSOIL Silty, wet soil under grass hummocks.	
		S1			SILTY GRAVEL (GM) Some sand, wet matrix with metasedimentary and granodiorite subangular clasts and the odd subrounded granodiorite boulder, brown. [COLLUVIUM]	○
1						
2						
					GRANODIORITE ROCK White and black rock, speckled, some structure visible under wet sloughing material. [BEDROCK]	
3					END OF TP @ 2.8m. RAPID SEEPAGE AND SLOUGHING, BEDROCK ENCOUNTERED. NOTES: 1) Root depth unobservable. 2) Ponded water on surface in a 20m - 30m wide boggy area with hummocks. 3) Seepage and sloughing from initial excavation, measured only from ground level. 4) Backfilled to surface.	
4						
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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

STUTTLE GULCH

TP-BGC09-HL4-1

TP-BGC09-HL4-2

TP-BGC09-HL4-3

TP-BGC09-HL4-4

TP-BGC09-HL4-5

TP-BGC09-HL4-6

TP-BGC09-HL4-7

TP-BGC09-HL4-8

TP-BGC09-HL4-9

TP-BGC09-HL4-13

TP-BGC09-HL4-14

TP-BGC09-HL4-15

TP-BGC09-STU-3

TP-BGC09-STU-4

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL4-1

Location : Eagle Pup area

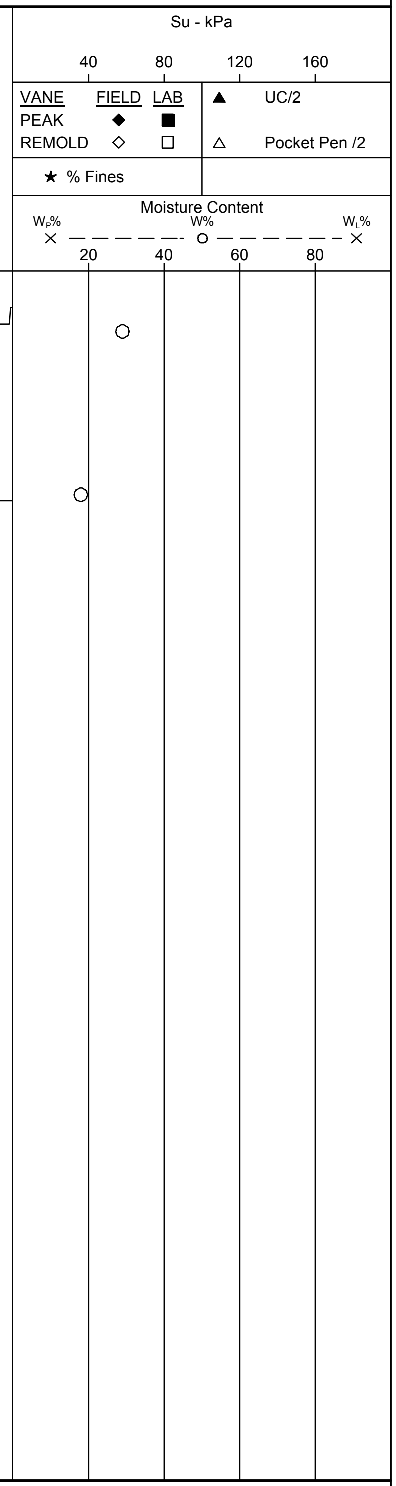
Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459710E, 7100706N
Ground Elevation (m) 963
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 24 Jul 09
Finish Date: 24 Jul 09
Final Depth of Pit (m) : 1.9
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS/TOPSOIL Moss, roots, black to light brown silty soil.
		S1			SILT (ML) Some gravel, trace fine sand, trace clay, weathered metased clasts, FROZEN: Vx, Vr, 10 - 20%.
1					
		S2			
2					END OF TP @ 1.9m. REFUSAL ON FROZEN GROUND. NOTES: 1) Roots down to 0.3m. 2) No seepage. 3) PVC casing installed for thermistor string. 4) Backfilled to surface.
3					
4					
5					
6					
7					
8					
9					
10					



Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL4-2

Location : Eagle Pup

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459528E, 7100891N
Ground Elevation (m) 910
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 24 Jul 09
Finish Date: 24 Jul 09
Final Depth of Pit (m) : 2.3
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Moisture Content W%
0		S1			ORGANICS/TOPSOIL Moss and lichens, rootlets, black silty soil.	~35
		S2			SILT (ML) Some gravel, trace fine sand, trace clay, subrounded and subangular clasts, slight mottling in brown soil. FROZEN from 0.3m down: Vs, 20-40%.	~75
2.3		S3			END OF TP @ 2.3m. REFUSAL ON FROZEN GROUND. NOTES: 1) Roots down to 0.4m. 2) No seepage. 3) PVC installed for thermistor string. 4) Backfilled to surface.	~25

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% — W% — W_L%; 20, 40, 60, 80

Depth scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

GENERAL BGC (TESTPIT) 0792-002_03.GPJ BGC.GDT 10/2/09

BGC ENGINEERING INC.
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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL4-3

Location : Eagle Pup area

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459427E, 7100724N
Ground Elevation (m) 913
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 24 Jul 09
Finish Date: 24 Jul 09
Final Depth of Pit (m) : 5.0
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0 – 0.4					ORGANICS Moss and lichen over brown silty soil, trace gravel.
0.4 – 1.0		S1			SILTY SAND (SM) Some subrounded cobbles and boulders, up to 0.4m. [FILL?]
1.0 – 4.0		S2			SILTY SAND (SW-SM) Some gravel, trace clay, grey brown with oxidized zones of orange sand (5 cm) and thin clay seams (1.5cm), angular to sub-angular clasts, occasional sub-rounded boulders (0.4m). FROZEN: Nf, Nbe. [TILL?]
4.0 – 5.0		S3			CLAY (CL), Trace gravel, trace silt, grey, wet when thawed, well bonded when fresh, FROZEN: Nbe, Vx. [TILL?]
5.0					END OF TP @ 5.0m. EXTENT OF REACH IN FROZEN MATERIAL. NOTES: 1) Roots down to 0.5m. 2) No seepage. 3) Backfilled to surface.

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% × — W% ○ — W_L% ×: 20, 40, 60, 80

Depth scale (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL4-4

Location : Eagle Pup

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459592E, 7100556N
Ground Elevation (m) 962
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 24 Jul 09
Finish Date: 24 Jul 09
Final Depth of Pit (m) : 2.3
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS Moss, roots and organic soil.
		S1			SANDY SILT (SM) Trace clay, trace gravel, firm, brown, moist, sub-angular clasts up to 6cm.
1		S2			SAND (SW) Well graded, trace silt, sub-anglular clasts - mainly metasedimentary, grey and rust colored sand lenses, oxidized quartz clasts (up to 3cm),dry to wet. FROZEN from 0.5m: Nbn. [COLLUVIUM?]
2					
					END OF TP @ 2.3m. REFUSAL ON FROZEN GROUND. NOTES: 1) Roots down to 0.5m. 2) No seepage. 3) Backfilled to surface.
3					
4					
5					
6					
7					
8					
9					
10					

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: $W_P\%$ — W% — $W_L\%$ (20, 40, 60, 80)

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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL4-5

Location : Eagle Pup area

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459685E, 7100410N
Ground Elevation (m) 987
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 25 Jul 09
Finish Date: 25 Jul 09
Final Depth of Pit (m) : 6.5
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS/TOPSOIL Moss, lichen, black soil, some sub-angular cobbles up to 7cm near surface.
					SANDY SILT (ML) Some gravel, trace clay, low plastic, brown, moist with exposed pockets of visible free water, no visible structure, slow dilatancy, clasts up to 4cm of weathered subangular metasedimentary rock. FROZEN: Nf. [COLLUVIUM] 0.5m - Drier, friable sand lenses, no evident structure. Material becomes FROZEN: Nbe.
3					SILT (ML) Some clay, trace sand, FROZEN: Nbe.
					GRAVEL (GM) Some silt, well graded, angular to subangular clasts up to 6cm, light brown. FROZEN: Nf, trace Vx. [COLLUVIUM]
6.5					END OF TP @ 6.5m. EXTENT OF EXCAVATOR REACH. NOTES: 1) Roots down to 0.5m. 2) Some sloughing, no seepage. 3) Backfilled to surface.

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% × — ○ W% — × W_L%
20, 40, 60, 80

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL4-6

Location : Eagle Pup area

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459607E, 7100219N
Ground Elevation (m) 991
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 25 Jul 09
Finish Date: 25 Jul 09
Final Depth of Pit (m) : 6.0
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0 – 0.4					ORGANICS/TOPSOIL Moss and lichen cover, roots, dark brown top soil.
0.4 – 2.0					SAND (SM) Some silt, some angular gravel, cool not frozen, loose, brown, moist, no evident structure, weakly cemented. Gravel to cobble sized metasedientary clasts, orange oxide surface staining. [COLLUVIUM]
2.0 – 4.5					GRAVEL (GM) Some silt, well graded, loose, angular, brown, moist, no notable structure, weakly cemented, lenses of reddy brown sand. [COLLUVIUM?]
4.5 – 6.0					Highly Weathered Metasedimentary Rock Some sand, trace silt, oxidized surfaces, highly fractured rock. [WEATHERED BEDROCK]
6.0					END OF TP @ 6.0m. EXTENT OF EXCAVATOR REACH. NOTES: 1) Roots down to 0.5m. 2) No seepage, no visible ground ice, minor sloughing. 3) Backfilled to surface.

Su - kPa: 40, 80, 120, 160
VANE FIELD LAB — PEAK ◆ ■ — REMOLD ◇ □ — ▲ UC/2 — △ Pocket Pen /2
★ % Fines
Moisture Content: W_P% — W% — W_L%: 20, 40, 60, 80

Depth (m): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

BGC ENGINEERING INC.
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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL4-7

Location : Stuttle Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459296E, 7100615N
Ground Elevation (m) 894
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 25 Jul 09
Finish Date: 25 Jul 09
Final Depth of Pit (m) : 2.8
Logged by : HG
Reviewed by : PQ

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% × — — ○ W% — — × W_L%; 20, 40, 60, 80

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Moisture Content
0					ORGANICS/TOPSOIL Moss and lichen cover, brown and black silty soil, rootlets throughout.	
	Grab	S1			SILT (ML) Some gravel clasts, trace ice inclusions, poorly bonded. [COLLUVIUM]	○ (~15)
1					SAND (SW) Gravelly, some silt, well graded, brown, weathered, metasedimentary clasts up to 4cm, orange oxide stained quartz clasts predominant. FROZEN: Vr, 20%. [COLLUVIUM]	
	Grab	S2				○ (~33)
2						
3					END OF TP @ 2.75m. REFUSAL ON FROZEN GROUND. NOTES: 1) Roots down to 0.6m. 2) No seepage. 3) PVC casing installed for thermistor string. 4) Backfilled to surface.	
4						
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7						
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BGC ENGINEERING INC.
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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL4-8

Location : Stuttle Gulch

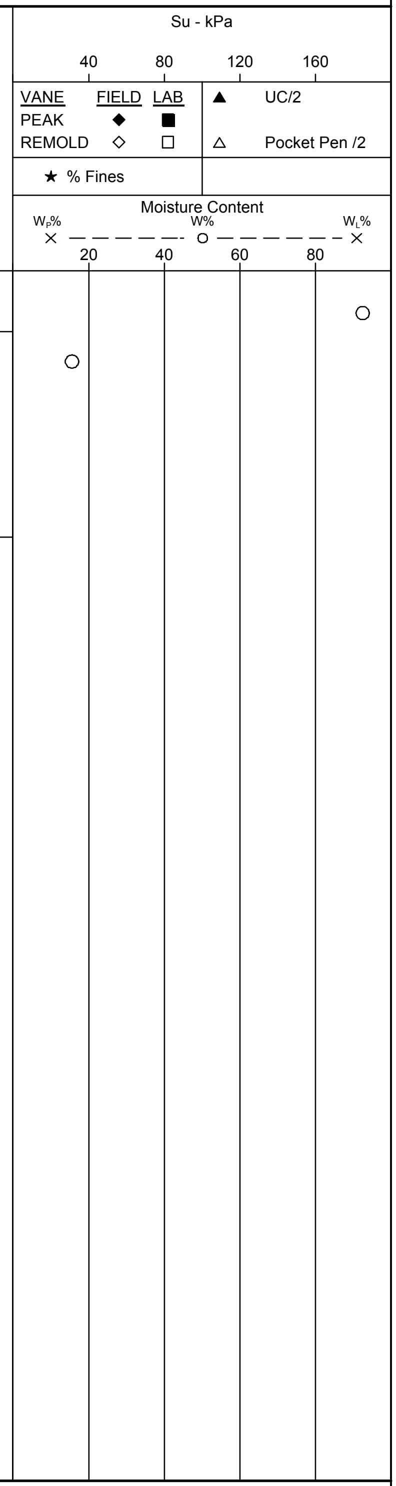
Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459412E, 7100409N
Ground Elevation (m) 928
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 25 Jul 09
Finish Date: 25 Jul 09
Final Depth of Pit (m) : 2.2
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0–0.5		S1			ORGANICS/TOPSOIL Black silty soil with rootlets thorughout, trace gravel, trace sand.
0.5–2.2		S2			SILT and GRAVEL Sandy, well graded, clasts up to ~6cm, angular-subangular, colour changes gradationally from brown to grey with depth and back to brown, lenses of orangey brown sand, stratified 2cm thick, grey and black bands for ~20cm, very spatially variable. No notable structure. FROZEN from 0.8m: Vs, 10-20%. [COLLUVIUM]
2.2					END OF TP @ 2.2m. REFUSAL ON FROZEN GROUND. NOTES: 1) Roots down to 0.6m. 2) Thick, 0.5m organic layer. 3) No water observed in Stuttle Gulch, however further upstream running water exposed at surface. 4) PVC casing installed for thermistor string. 5) Backfilled to surface.



Depth scale: 0 1 2 3 4 5 6 7 8 9 10

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Client: Victoria Gold

Project: Eagle Gold, Site Facilites	TEST PIT # TP-BGC09-HL4-9 **Location** : Eagle Pup	**Page** 1 **of** 1 **Project No.** : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459853E, 7100602N
Ground Elevation (m) 1002
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 26 Jul 09
Finish Date: 26 Jul 09
Final Depth of Pit (m) : 5.7
Logged by : HG
Reviewed by : PQ

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% × — W% ○ — W_L% × ; 20, 40, 60, 80

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Moisture Content
0 – 1.1		S1 (~0.85 m)			GRAVELLY SAND (SM) Some silt, well graded, loose, gravel up to 6cm, angular-subangular, brown, damp to moist, no structure, none-weak cementation. Two visible 5cm thick organic layers (black soil and old wood) at 0.7m and 1.0m. [FILL]	○
1.1 – 1.7					GRAVELLY SAND (SM) Some silt, well graded, loose, clasts, up to 6cm, angular-subangular, greyish-brown, dry, no structure, none-weak cementation. [COLLUVIUM]	
1.7 – 5.7	Hand (~3.5 m)	S2			METASEDIMENTARY ROCK Grey with oxide staining on fracture surfaces, stratified, strength varies weak to medium strong (R2-R3), highly weathered (W4), dipping downhill. [WEATHERED BEDROCK]	○
5.7					END OF TP @ 5.7m. SLOUGHING. NOTES: 1) Roots down to 1.0m. 2) Dry to bottom, no visible ground ice. 3) Sloughing in after 1.5m, undercutting occurring. 4) Backfilled to surface.	

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

BGC ENGINEERING INC.
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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL4-13

Location : HL4 area

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459110E, 7100567N
Ground Elevation (m) 902
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 01 Aug 09
Finish Date: 01 Aug 09
Final Depth of Pit (m) : 1.5
Logged by : HG
Reviewed by : PQ

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% — W% — W_L% (20, 40, 60, 80)

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS/TOPSOIL Moss and lichen covering brown silty soil.
		S1, S2			SILT (ML) Some fine interlensed grey and reddish-brown sand, some gravel, angular, subangular/rounded clasts (up to 6cm), FROZEN from 0.3m: Vs, 40-50%.
		S3			SAND (SW) Some silt, brown, well graded, subangular/subrounded and angular clasts (up to 6cm). FROZEN: trace Vx.
					END OF TP @ 1.5m. REFUSAL ON FROZEN GROUND. NOTES: 1) Roots down to 0.3m. 2) No seepage. 3) Backfilled to surface.

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL4-14

Location : HL4 area

Page 1 **of** 1

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459269E, 7100518N
Ground Elevation (m) 910
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 01 Aug 09
Finish Date: 01 Aug 09
Final Depth of Pit (m) : 1.9
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS/TOPSOIL Moss and lichen mat over wet black silty soil.
		S1			SILT (ML) Some gravel, some sand, brown, weathered angular and subangular metasedimentary clasts (up to 6cm) with an occasional cobble (up to 12cm). FROZEN from 0.2m down: Nbe. [COLLUVIUM].
1		S2			
2					END OF TP @ 1.9m. REFUSAL ON FROZEN GROUND. NOTES: 1) Roots down to 0.3m. 2) Minor seepage/melting, weepy walls and pooling in bottom of test pit after 20-30 minutes. 3) PVC casing installed for thermistor string. 4) Backfilled to surface.
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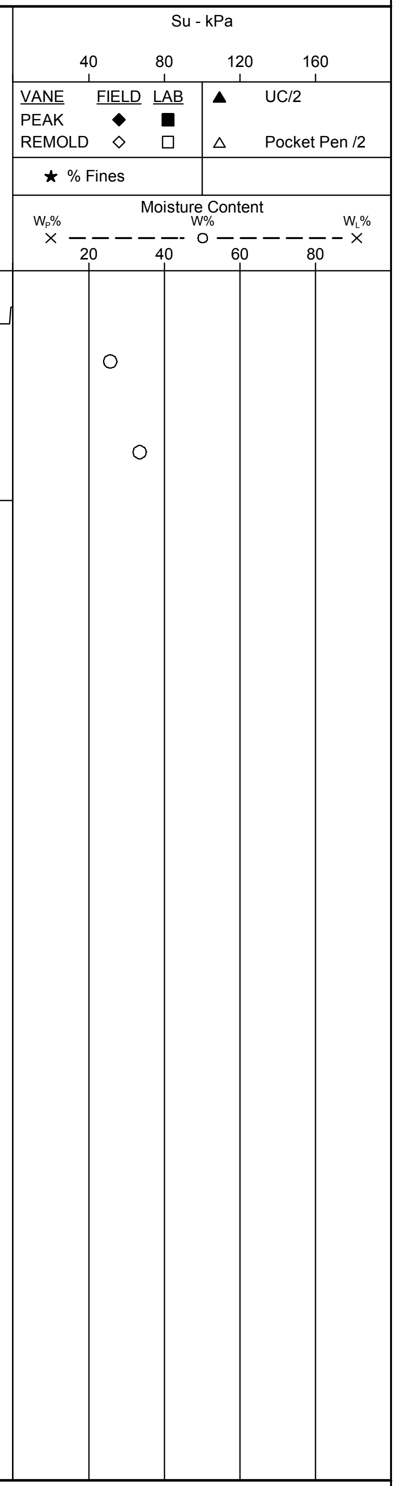
9					
10					



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AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL4-15

Location : HL4 area

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459317E, 7100252N
Ground Elevation (m) 961
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 01 Aug 09
Finish Date: 01 Aug 09
Final Depth of Pit (m) : 1.3
Logged by : HG
Reviewed by : PQ

Legend: Su - kPa (40, 80, 120, 160); VANE: FIELD / LAB; PEAK ◆ ■; REMOLD ◇ □; ▲ UC/2; △ Pocket Pen /2; ★ % Fines; Moisture Content: W_P%, W%, W_L% (20, 40, 60, 80)

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Moisture Content
0		S1			ORGANICS/TOPSOIL Thick moss over matt of decomposing organics and brown moist silty soil.	~26
1		S2			SILT (ML) Some sand, some gravel, firm to stiff, brown, moist, no structure, weakly cemented, angular and subangular metasediment clasts (up to 6cm), [COLLUVIUM]	~12
					SILT (ML) Some sand, trace clay, brown, no evident strucuture, some angular and subangular and subrounded metasedimantary and granodiorite clasts, lens of grey silt with some gravel. FROZEN from 0.2m: Vr, 5-10%, 25mm thick ice lens at 0.2m. [COLLUVIUM]	
2					END OF TP @ 1.3m. REFUSAL ON FROZEN GROUND. NOTES: 1) Roots down to 0.3m. 2) No seepage. 4) Backfilled to surface.	

Depth scale: 0–10 m

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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-STU-3

Location : Stuttle Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459086E, 7100696N
Ground Elevation (m) 884
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 08 Aug 09
Finish Date: 08 Aug 09
Final Depth of Pit (m) : 1.9
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Su - kPa (40, 80, 120, 160) / Moisture Content (20, 40, 60, 80)
0					ORGANICS Peat, dark brown, rootlets.	
					SAND and GRAVEL (SW/GW) Some silt, trace cobbles and boulders, well graded, dense, subrounded to angular, max clast size 40cm, orangish brown, dry to moist, homogenous. Below 0.8m - FROZEN: Vx, 1-5%. Between 1.2m and 1.6m - part of test pit comprises sandy silt to silty sand and gravel with some clay At 1.6m - stratified sand and gravel layers, subrounded, tan, some silt, Vx, 1%.	
					END OF TP @ 1.9m. REFUSAL ON FROZEN GROUND. NOTES: 1) Rootlets down to 0.4m. 2) No seepage. 3) Backfilled to surface.	

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Legend: VANE FIELD LAB; PEAK ◆ ■; REMOLD ◇ □; ▲ UC/2; △ Pocket Pen /2; ★ % Fines; W_P% × — W% ○ — W_L% ×

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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-STU-4

Location : Stuttle Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 459038E, 7100635N
Ground Elevation (m) 886
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 08 Aug 09
Finish Date: 08 Aug 09
Final Depth of Pit (m) : 2.6
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS Peat, dark brown, trace rootlets.
					SILTY SAND (SM) Some organic silt, fine to medium, loose, max clast 1mm, subrounded, dark brown, FROZEN.
1					SANDY SILT (SM) Some fine gravel (subrounded), non plastic, dark grey/orange, low dry strength, FROZEN: Vs, 20%, ice lenses 1-3mm thick.
2					1.5m to 2.6m - Gravel is subrounded to subangular, max clast 10 cm, FROZEN, hard digging.
					END OF TP @ 2.6m. REFUSAL ON FROZEN GROUND.
3					NOTES: 1) No seepage. 2) Backfilled to surface.
4					
5					
6					
7					
8					
9					
10					

Su - kPa: 40 80 120 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% — W% — W_L%: 20 40 60 80

GENERAL BGC (TESTPIT) 0792-002_03.GPJ BGC.GDT 10/2/09

BGC ENGINEERING INC.
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Client: Victoria Gold

WEST HAGGART CREEK

TP-BGC09-A-3

TP-BGC09-A-4

TP-BGC09-HL4-11

TP-BGC09-HL4-12

TP-BGC09-HL4-16

TP-BGC09-HL4-17

TP-BGC09-HL4-18

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-A-3

Location : Haggart Creek

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 458464E, 7100539N
Ground Elevation (m) 804
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 19 Jul 09
Finish Date: 19 Jul 09
Final Depth of Pit (m) : 5.5
Logged by : PQ
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS Root mat.
					SILT (ML) Clayey, sandy, some cobbles and boulders, compact to dense, mottled light brown, damp. [TILL]
1					GRAVEL (GW) Sandy, trace silt, compact, brown. [TILL]
2					SILT (ML) Clayey, sandy, some cobbles and boulders, compact to dense, mottled light brown, damp. Material becomes sandier with depth, with cobbles and boulders almost absent below 2.0m. [TILL] 0.9m to 1.3m - Becomes FROZEN: Vr, Vx, 5-10%, ice lenses. 4.0m - Becomes grey.
5					END OF TP @ 5.5m. LIMIT OF EXCAVATOR REACH. NOTES: 1) No seepage. 2) Backfilled to surface.
6					
7					
8					
9					
10					

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: $W_p\%$ — W% — $W_L\%$: 20, 40, 60, 80

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-A-4

Location : Heap Leach #4

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 458985E, 7100207N
Ground Elevation (m) 904
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 19 Jul 09
Finish Date: 19 Jul 09
Final Depth of Pit (m) : 4.3
Logged by : PQ
Reviewed by : PQ

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% × — W% o — W_L% ×; 20, 40, 60, 80

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS Root mat, forest litter.
					SAND and GRAVEL (SW/GW) Trace to some silt, occasional cobbles, compact to dense, damp, brown. [COLLUVIUM] 0.9m to 1.1m - Old organic horizon.
1					GRAVEL (GW), Sandy, trace to some silt, clasts are subrounded to subangular, randomly oriented. FROZEN: Nbn, trace Vx. [COLLUVIUM]
2					
3					
4					END OF TP @ 4.3m. REFUSAL ON FROZEN GROUND. NOTES: 1) Very hard digging from 1.1m to 4.3m, only progress 0.5m in 20-30 minutes. 2) No seepage. 3) Backfilled to surface.
5					
6					
7					
8					
9					
10					

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL4-11

Location : HL4 area

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 458652E, 7100630N
Ground Elevation (m) 831
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 01 Aug 09
Finish Date: 01 Aug 09
Final Depth of Pit (m) : 1.5
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0					ORGANICS/TOPSOIL Light brown silt and moss (0-0.2m); black silt , FROZEN: Nbn (0.2-0.4m).
		S1			SILT (ML) Trace clay, trace sand, silt is interbedded thin grey and brown layers. FROZEN:Vs, 40%.
1		S2			SANDY GRAVEL (GM) Some silt, well graded, FROZEN - well bonded, excess non-visible ice (Nbe), individual crystals and inclusions around clasts, angular and subangular+subrounded particles, metasedimentary and granodiorite present, quartz clasts (up to 6cm). [COLLUVIUM?]
2					END OF TP @ 1.5m. REFUSAL ON FROZEN GROUND. NOTES: 1) Roots down to 0.4m. 2) Sharp contact between silt and sandy gravel with silt, possibly old fluvial deposit? 3) No seepage. 4) PVC casing installed for thermistor string. 5) Backfilled to surface.
3					
4					
5					
6					
7					
8					
9					
10					

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% × — W% ○ — W_L% ×

20 40 60 80

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL4-12

Location : HL4 area

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 458884E, 7100459N
Ground Elevation (m) 870
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 01 Aug 09
Finish Date: 01 Aug 09
Final Depth of Pit (m) : 1.9
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Moisture Content W%
0		S1			ORGANICS/TOPSOIL Depth varies from 0.2-0.3m thick, brown silty soil, trace clay, thick moss and lichen cover, roots thoughout.	~18 (S1)
1		S2 S3			SILT (ML) Some gravel, some sand, soft to firm until 0.8m, moist, no structure, weak cementation, thin zones of organics mixed in, angular and subangular metasedimentary clasts - predominantly oxide stained quartz (up to 4cm). FROZEN: Vr, 30%, trace Vx, ice lenses up to 5 cm thick. [COLLUVIUM]	~53 (S2) ~52 (S3)
2					GRAVEL (GM) Some silt, well graded, angular, subangular to subrounded particles, both metasedimentary and granodiorite clasts. FROZEN: Nbe. [COLLUVIUM?]	
3					END OF TP @ 1.9m. REFUSAL ON FROZEN GROUND. NOTES: 1) Roots down to 0.5m. 2) No seepage. 3) PVC casing installed for thermistor string. 4) Backfilled to surface.	
4–10						

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% × — — o W% — — × W_L%; scale 20, 40, 60, 80

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

TEST PIT # TP-BGC09-HL4-16

Project: Eagle Gold, Site Facilites

Location : Platinum Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 458836E, 7100222N
Ground Elevation (m) 865
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 02 Aug 09
Finish Date: 02 Aug 09
Final Depth of Pit (m) : 2.0
Logged by : HG
Reviewed by : PQ

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB		
PEAK	◆	■	▲	UC/2
REMOLD	◇	□	△	Pocket Pen /2

★ % Fines

Moisture Content: W_P% ×— — — — — ○ W% — — — — — —× W_L%; 20, 40, 60, 80

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Moisture Content
0					ORGANICS Thick moss coverage, rootlets throughout black, moist silt.	
		S1			SAND (SM) Some silt, some gravel, well graded, loose to compact, metasedimentary clasts (up to 4cm), angular to subangular, brown, moist, no structure, weak cementation.	○
1		S2				○
					SAND (SM) Some silt, some gravel, trace clay, greyish-brown, angular metasedimentary clasts (up to 4cm). FROZEN from 0.5m: Nbe, 5-10%. [COLLUVIUM]	
2		S3				○
					END OF TP @ 2.0m. REFUSAL ON FROZEN GROUND. NOTES: 1) Roots down to 0.3m. 2) No seepage. 3) Backfilled to surface.	
3						
4						
5						
6						
7						
8						
9						
10						

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL4-17

Location : Platinum Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 458655E, 7100232N
Ground Elevation (m) 844
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 02 Aug 09
Finish Date: 02 Aug 09
Final Depth of Pit (m) : 1.6
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Su - kPa / Moisture Content
0					ORGANICS Thick moss coverage, wet black silty soil	
		S1				W% ≈ 80
		S2B			SILT (ML) Traces of clay, gravel and organics, very soft, grey-black, moist-wet, homogeous. FROZEN from 0.60m down: Nf.	W% ≈ 17
1					SAND (SM) Gravel, well graded, brown angular and subangular clasts, grey lenses and oxidized reddish-brown sand. FROZEN: Nbe to Vs, 10-20%. [COLLUVIUM]	
2					END OF TP @ 1.6m. REFUSAL ON FROZEN GROUND. NOTES: 1) Roots down to 0.3m. 2) Some sloughing from the uphill (East) side wall, which had no visible ground ice. 3) Seepage, likely stored moisture in moss from showers the last few days. 4) PVC casing installed for thermistor string. 5) Backfilled to surface.	
3						
4						
5						
6						
7						
8						
9						
10						

Su - kPa: 40, 80, 120, 160
VANE FIELD LAB — PEAK ◆ ■; REMOLD ◇ □; ▲ UC/2; △ Pocket Pen /2
★ % Fines
Moisture Content: W_P% × — W% ○ — W_L% ×; 20, 40, 60, 80

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

TEST PIT # TP-BGC09-HL4-18

Location : Platinum Gulch

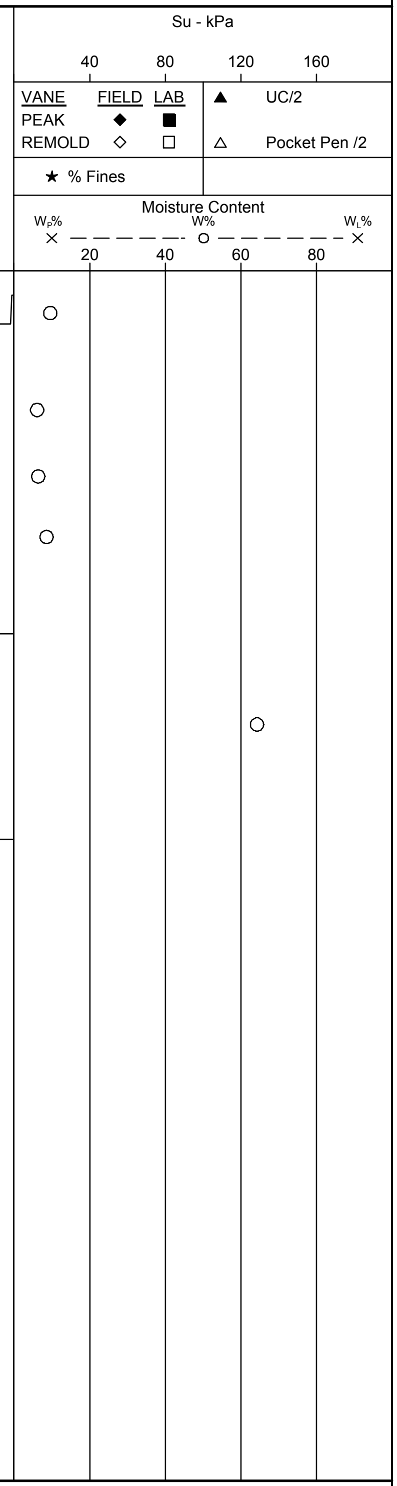
Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m): 458499E, 7100230N
Ground Elevation (m) 790
Datum : UTM NAD 83

Excavator : CAT 325B
Operator : Larry Paulsen

Start Date : 03 Aug 09
Finish Date: 03 Aug 09
Final Depth of Pit (m) : 4.7
Logged by : HG
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description
0		S1			ORGANICS Moss and lichen covering moist, black silty soil.
1		S2			SAND and GRAVEL (SM/GM) Silty, loose to compact, angular and subangular and subrounded metased clasts (up to 6cm), trace cobbles, brown, moist, interlensed with brown sandy gravel and grey silt. [COLLUVIUM?] 1.0m - Organic lens.
2		S3, S4			
3		S5			SILT (ML) Some clay, trace gravel, trace sand, FROZEN: Vx, Vr, 30-40%, ice lenses up to 1cm thick. [COLLUVIUM?]
4.7					END OF TP @ 4.7m. REFUSAL ON FROZEN GROUND. NOTES: 1) Roots down to 0.4m. 2) Sloughing from uphill side of test pit. 3) No seepage. 4) Backfilled to surface.



BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

APPENDIX B
LABORATORY TEST REPORTS

MOISTURE CONTENT TEST RESULTS

Project: Eagle Gold Project
Project No.: W14101304
Client: BGC Engineering Inc.
ATTN: Heather Grinde

Sample No.: TPBGC09-HL5
Date Tested: 8/14/2009
Tested By: IM
Page: 1 of 1

B.H. Number	Sample Number (depth)	Tare Number	Tare Mass (g)	Mass of Wet Soil & Tare (g)	Mass of Dry Soil & Tare (g)	Moisture Content (%)	Visual Description of Soil EBA Work Method WM4400
TP4-S1	0.5-0.6					12.0	SAND - sitly, some gravel
TP4-S2	2.0-2.5					9.1	SAND - sitly, some gravel
TP4-S3	4.0-4.5					6.0	Decomposed granite
TP5-S1	0.5-0.6					17.8	SAND - sitly, some gravel
TP6-S1	0.6-0.7					17.6	SILT and SAND
TP6-S2	2.0-2.5					13.9	SAND - some silt
TP6-S3	5.0-5.5					11.9	SAND and GRAVEL - trace silt
TP7-S1	0.4-0.5					17.9	SILT - some sand
TP7-S2	0.8-0.9					9.5	SAND - sitly, some gravel
TP7-S3	2.0-2.5					11.7	SAND - sitly, some gravel
TP8-S1	0.2-0.4					10.6	SILT - sand, some gravel
TP8-S2	1.5					16.7	GRAVEL and SILT - some sand
TP9-S1	0.4-0.5					29.0	SAND and SILT - trace gravel
TP10-S1	0.5					23.8	SAND - silty, some gravel, trace organics

Tested in accordance with ASTM standard D2216, subject to review .
issued for internal use

EBA Engineering Consultants Ltd.

MOISTURE CONTENT TEST RESULTS

Project: Eagle Gold Project
Project No.: W14101304
Client: BGC Engineering Inc.
ATTN: Heather Grinde

Sample No.: TPBGC09-HL4
Date Tested: 8/14/2009
Tested By: IM
Page: 1 of 1

B.H. Number	Sample Number (depth)	Tare Number	Tare Mass (g)	Mass of Wet Soil & Tare (g)	Mass of Dry Soil & Tare (g)	Moisture Content (%)	Visual Description of Soil EBA Work Method WM4400
TP1-S1	0.5					29.0	CLAY - sitly
TP1-S2	1.8-1.9					18.0	CLAY - sitly
TP2-S1	0.2-0.4					35.9	SAND - sitly, some gravel
TP2-S2	0.6-0.7					74.8	SAND - sitly, some gravel (mostly water)
TP2-S3	2.3					25.6	SILT - trace sand
TP3-S1	0.4-0.5					18.6	SILT - sandy
TP3-S2	2.5					8.8	SILT and CLAY - some sand
TP3-S3	2.3					31.5	SAND and SILT - trace gravel
TP4-S1	0.4-0.5					14.7	SILT and CLAY
TP4-S2	1.5					10.7	SILT - trace sand
TP5-S1						23.6	SAND - silty, trace gravel
TP5-S2							missing.
TP5-S3						10.4	SAND - sitly, some gravel
TP5-S4						7.8	SAND - sitly, some gravel
TP6-S1						10.4	SAND - gravelly, trace silt
TP6-S2						5.7	SAND - sitly, some gravel
TP7-S1	0.5-0.7					14.9	GRAVEL - sandy, trace silt
TP7-S2	1.5-1.85					33.2	GRAVEL - sandy, trace silt
TP8-S1	0.3-0.4					92.5	SILT - sandy
TP8-S2	0.7-0.8					15.6	SILT - sandy, some gravel
TP9-S1	0.8-0.9					11.2	GRAVEL - sandy, some silt
TP9-S2	3.3-3.8					5.6	GRAVEL - sandy, trace silt

Tested in accordance with ASTM standard D2216, subject to review .
issued for internal use

EBA Engineering Consultants Ltd.

MOISTURE CONTENT TEST RESULTS

Project: Eagle Gold Project
Project No.: W14101304
Client: BGC Engineering Inc.
ATTN: Heather Grinde

Sample No.: TPBGC09-WR#
Date Tested: 8/14/2009
Tested By: IM
Page: 1 of 1

B.H. Number	Sample Number (depth)	Tare Number	Tare Mass (g)	Mass of Wet Soil & Tare (g)	Mass of Dry Soil & Tare (g)	Moisture Content (%)	Visual Description of Soil EBA Work Method WM4400
TP1-S1	0.6					10.2	GRAVEL - some sand and silt
TP1-S2	5.0					8.2	GRAVEL - silty, some sand
TP1-S3	6.0					12.5	weathered bedrock
TP2-S1	0.8-0.9					9.4	GRAVEL - some sand and silt
TP2-S2	4.0					11.0	weathered bedrock
TP3-S1	2.0					17.7	Decomposed granite
TP4-S1	0.5					16.8	SAND and SILT - trace gravel
TP4-S2	0.9					16.9	SAND - sitly, some gravel
TP5-S1	0.5					9.7	GRAVEL and SAND - some silt
TP5-S2	1.0					4.8	weathered bedrock
TP6-S1	0.9					16.2	SAND - silty, trace gravel
TP6-S2	1.0-1.2					10.2	SAND - some silt, some gravel
TP6-S3	4.0					14.7	SILT - sandy, trace gravel
TP7-S1	0.9					17.0	SAND and SILT - some gravel
TP8-S1	0.9-1.0					11.8	SAND and SILT - some gravel
TP8-S2	2.0					8.0	SAND - some silt, some gravel
TP9-S1	0.5-0.7					19.3	SAND and GRAVEL - some silt
TP9-S2	2.0-2.5					9.7	GRAVEL - some sand, some silt

Tested in accordance with ASTM standard D2216, subject to review .
issued for internal use

EBA Engineering Consultants Ltd.

MOISTURE CONTENT TEST RESULTS

Project: Eagle Gold Project
Project No.: W14101304
Client: BGC Engineering Inc.
ATTN: Heather Grinde

Sample No.: TPBGC09-HL6
Date Tested: 8/14/2009
Tested By: IM
Page: 1 of 1

B.H. Number	Sample Number (depth)	Tare Number	Tare Mass (g)	Mass of Wet Soil & Tare (g)	Mass of Dry Soil & Tare (g)	Moisture Content (%)	Visual Description of Soil EBA Work Method WM4400
TP1-S1	0.5-0.6					12.9	GRAVEL - some sand, some silt
TP1-S2	2.5-3.0					15.2	SAND and SILT - trace gravel
TP1-S3	5.0-5.5					9.3	GRAVEL - some sand, some silt
TP2-S1	0.4-0.5					11.8	GRAVEL - silty, some sand
TP2-S2	1.0-11					7.9	GRAVEL - some sand, trace silt
TP3-S1	0.4-0.5					11.7	SAND and SILT - trace gravel
TP3-S1	1.0-1.2					7.9	GRAVEL - some sand, some silt
TP3-S3	2.0-2.5					9.8	SAND - gravelly, some silt
TP3-S4	5.0-5.5					7.3	GRAVEL - some sand, trace silt
TP4-S1	0.4-0.6						part of second lab program
TP4-S2	0.8-1.0						part of second lab program
TP4-S3	2.8						part of second lab program
TP4-S4	4.0-4.4						part of second lab program

Tested in accordance with ASTM standard D2216, subject to review .
issued for internal use

EBA Engineering Consultants Ltd.

MOISTURE CONTENT TEST RESULTS

Project: Eagle Gold Project
Project No.: W14101304
Client: BGC Engineering Inc.
ATTN: Heather Grinde

Sample No.: TPBGC09-P
Date Tested: 8/14/2009
Tested By: CH
Page: 1 of 1

B.H. Number	Sample Number (depth)	Tare Number	Tare Mass (g)	Mass of Wet Soil & Tare (g)	Mass of Dry Soil & Tare (g)	Moisture Content (%)	Visual Description of Soil EBA Work Method WM4400
1-S1	0.7-0.8					10.5	GRAVEL and SAND - silty
1-S2	2.7-3.2					5.2	GRAVEL - trace sand, trace silt
2-S1	0.3-0.4					8.4	GRAVEL - silty sand
2-S2	1.0-1.1					6.2	SAND and SILT - some gravel
3-S1	0.6-0.7					8.6	GRAVEL and SAND - some silt
4-S1	0.9-1.0					6.8	GRAVEL - some sand, some silt
4-S2	1.8-2.0					6.8	GRAVEL and SAND - trace silt
4-A-S1A	1.2					19.5	SAND - some gravel, some silt
A-3-S1	1.0					n\a	missing

Tested in accordance with ASTM standard D2216, subject to review .

EBA Engineering Consultants Ltd.

MOISTURE CONTENT TEST RESULTS

Project: Eagle Gold Project
Project No.: W14101304
Client: BGC Engineering Inc.
ATTN: Heather Grinde

Sample No.: TPBGC09-HL4
Date Tested: 8/14/2009
Tested By: CH
Page: 1 of 1

B.H. Number	Sample Number (depth)	Tare Number	Tare Mass (g)	Mass of Wet Soil & Tare (g)	Mass of Dry Soil & Tare (g)	Moisture Content (%)	Visual Description of Soil EBA Work Method WM4400
TP10-S1	0.5-0.6					12.8	SAND and SILT - some gravel
TP10-S2	3.0-3.4					12.6	GRAVEL and SILT - some sand
TP10-S3	5.0-5.5					9.4	GRAVEL and SILT - some sand
TP10-S4	6.5					14.0	SAND and SILT - trace gravel
TP11-S1	0.4-0.6					57.8	ORGANICS and SILT
TP11-S2	0.9-1.1					11.8	weathered bedrock, some sand, some silt
TP12-S1	0.3-0.4					18.5	SAND and SILT - trace gravel
TP12-S2	1.0-1.1					53.1	SILT - trace sand
TP12-S3	1.3-1.4					51.4	SAND and SILT - some gravel
TP13-S1	0.4-0.5					13.2	SILT - trace sand, trace gravel
TP13-S2	0.9-1.0					83.2	SILT - trace sand
TP13-S3	1.3-1.5					14.8	GRAVEL and SAND - some silt
TP14-S1	0.7-0.8					25.7	SAND and SILT - some gravel
TP14-S2	1.5					33.5	SILT - some sand, visible organics
TP15-S1	0.2-0.3					25.9	SAND and SILT
TP15-S2	0.9-1.0					12.3	SAND and SILT - trace gravel
TP16-S1	0.4-0.5					13.2	SILT - trace sand
TP16-S2	0.9-1.0					13.4	SAND and SILT
TP16-S3	1.8-2.0					15.6	SILT - trace sand, trace gravel
TP17-S1	0.3-0.5					80.4	ORGANICS and SILT
TP17-S2A	0.7-0.8					20.3	SILT - some sand
TP17-S2B	0.7-0.8					16.9	SAND and SILT - some gravel
TP18-S1	0.3-0.4					9.6	SAND and SILT - some gravel
TP18-S2	1.1-1.2					6.1	SAND and SILT - some gravel
TP18-S3	1.6-1.8					6.4	GRAVEL and SAND - some silt
TP18-S4	2.0-2.4					8.6	SILT - trace sand
TP18-S5	3.5-4.0					64.3	SILT and CLAY

Tested in accordance with ASTM standard D2216, subject to review .

EBA Engineering Consultants Ltd. eba

MOISTURE CONTENT TEST RESULTS

Project: Eagle Gold Project
Project No.: W14101304
Client: BGC Engineering Inc.
ATTN: Heather Grinde

Sample No.: TPBGC09-HL5
Date Tested: 8/14/2009
Tested By: CH
Page: 1 of 1

B.H. Number	Sample Number (depth)	Tare Number	Tare Mass (g)	Mass of Wet Soil & Tare (g)	Mass of Dry Soil & Tare (g)	Moisture Content (%)	Visual Description of Soil EBA Work Method WM4400
TP3-S1	1					8.8	GRAVEL and SAND - some silt
TP3-S2	1.5					10.7	GRAVEL and SAND - some silt
TP3-S3	1.8					7.9	SAND - some gravel, some silt

Tested in accordance with ASTM standard D2216, subject to review .

EBA Engineering Consultants Ltd.

MOISTURE CONTENT TEST RESULTS

Project: Eagle Gold Project
Project No.: W14101304
Client: BGC Engineering Inc.
ATTN: Heather Grinde

Sample No.: TPBGC09-HL6
Date Tested: 8/14/2009
Tested By: CH
Page: 1 of 1

B.H. Number	Sample Number (depth)	Tare Number	Tare Mass (g)	Mass of Wet Soil & Tare (g)	Mass of Dry Soil & Tare (g)	Moisture Content (%)	Visual Description of Soil EBA Work Method WM4400
TP4-S1	0.4-0.6					3.9	SAND - some gravel, some silt
TP4-S2	0.8-1.0					3.8	GRAVEL and SAND - some silt
TP4-S3	2.5					11.2	SAND and SILT - trace gravel
TP4-S4	4.0-4.4					6.3	GRAVEL and SAND - some silt
TP5-S1	0.3-0.4					12.1	SAND and GRAVEL - some silt
TP5-S2	0.9-1.0					7.0	SAND and GRAVEL - some silt
TP5-S3	3.5-4.0					5.1	SAND and GRAVEL - some silt
TP6-S1	0.3-0.4					13.8	SILT - trace sand
TP6-S2	1.0-1.2					12.6	SAND and SILT - trace gravel
TP7-S1	0.2-0.3					13.3	SAND and SILT - trace gravel
TP7-S2	0.8-0.9					11.0	SAND and SILT - trace gravel
TP7-S3	2.0-2.5					8.6	SAND and GRAVEL - some silt
TP8-S1	0.3					246.4	Orgsnics, silt (?)
TP8-S2	1.0					13.6	SAND and SILT - some gravel
TP8-S3	2.0-2.4					13.4	SILT - some sand, trace gravel
TP9-S1	0.3-0.4					13.2	SAND and GRAVEL - some silt
TP9-S2	0.9-1.1					11.8	SAND and GRAVEL - some silt
TP10-S1	0.2-0.4					17.1	SAND - some gravel, some silt w/ organics
TP10-S2	0.8-0.9					10.6	SAND - some gravel, some silt
TP10-S3	2.2-2.7					10.6	SILT and decomposed bedrock

Tested in accordance with ASTM standard D2216, subject to review .

EBA Engineering Consultants Ltd.

MOISTURE CONTENT TEST RESULTS

Project: Eagle Gold Project
Project No.: W14101304
Client: BGC Engineering Inc.
ATTN: Heather Grinde

Sample No.: TPBGC09-HL6
Date Tested: 9/2/2009
Tested By: CH
Page: 1 of 1

B.H. Number	Sample Number (depth)	Tare Number	Tare Mass (g)	Mass of Wet Soil & Tare (g)	Mass of Dry Soil & Tare (g)	Moisture Content (%)	Visual Description of Soil EBA Work Method WM4400
TP11-S1			11.9	635.0	558.7	14.0	GRAVEL - Silty, some sand
TP12-S1			16.5	692.0	630.8	10.0	SAND and GRAVEL - some silt
TP12-S2			11.6	555.7	506.8	9.9	SAND and GRAVEL - trace silt
TP13-S1			17.8	575.8	533.6	8.2	GRAVEL - Silty, some sand
TP14-S1			12.1	646.5	560.9	15.6	SAND and GRAVEL - silty
TP14-S2			12.2	567.2	495.6	14.8	SAND and GRAVEL - silty
TP15-S1			15.4	622.7	551.9	13.2	SAND and SILT - some gravel
TP15-S2			14.9	538.2	463.1	16.8	SILT - trace sand
TP16-S1			11.5	628.6	570.0	10.5	GRAVEL - Silty, some sand
TP17-S1			12.9	618.4	590.9	4.8	SAND and GRAVEL - some silt

Tested in accordance with ASTM standard D2216, subject to review .

EBA Engineering Consultants Ltd.

MOISTURE CONTENT TEST RESULTS

Project:	Eagle Gold Project	Sample No.:	TPBGC09-AG
Project No.:	W14101304	Date Tested:	9/2/2009
Client:	BGC Engineering Inc.	Tested By:	CH
ATTN:	Heather Grinde	Page:	1 of 1

B.H. Number	Sample Number (depth)	Tare Number	Tare Mass (g)	Mass of Wet Soil & Tare (g)	Mass of Dry Soil & Tare (g)	Moisture Content (%)	Visual Description of Soil EBA Work Method WM4400
DH3	15-20ft		18.5	295.8	284.5	4.2	SAND

Tested in accordance with ASTM standard D2216, subject to review .

EBA Engineering Consultants Ltd.

MOISTURE CONTENT TEST RESULTS

Project: Eagle Gold Project
Project No.: W14101304
Client: BGC Engineering Inc.
ATTN: Heather Grinde

Sample No.: TPBGC09-STU
Date Tested: 9/2/2009
Tested By: CH
Page: 1 of 1

B.H. Number	Sample Number (depth)	Tare Number	Tare Mass (g)	Mass of Wet Soil & Tare (g)	Mass of Dry Soil & Tare (g)	Moisture Content (%)	Visual Description of Soil EBA Work Method WM4400
TP3-S1			12.7	586.3	524.6	12.1	SAND and GRAVEL - some silt
TP3-S2			11.4	602.6	516.1	17.1	SILT - trace sand and gravel
TP4-S1			392.4	1572.8	930.6	119.3	SILT - trace sand
TP4-S2			404.0	1444.7	1263.3	21.1	SILT - some sand
DH3	5-10ft		16.7	403.1	335.5	21.2	SILT - trace sand
DH3	25-30ft		16.7	581.6	510.9	14.3	SILT and SAND
DH3	30-35ft						missing
DH3	45-50ft		15.3	601.2	532.7	13.2	SAND and GRAVEL - silty
DH3	60-70ft		14.8	260.3	229.0	14.6	SILT - trace sand
DH4	5-10ft		12.7	478.0	425.9	12.6	SAND and GRAVEL - silty
DH4	25-30ft		16.6	486.4	386.6	27.0	SILT - trace sand and gravel
DH4	50-60ft		16.8	829.2	722.1	15.2	SAND and SILT - trace gravel

Tested in accordance with ASTM standard D2216, subject to review .

EBA Engineering Consultants Ltd.

MOISTURE CONTENT TEST RESULTS

Project: Eagle Gold Project
Project No.: W14101304
Client: BGC Engineering Inc.
ATTN: Heather Grinde

Sample No.: TPBGC09-D6
Date Tested: 9/2/2009
Tested By: CH
Page: 1 of 1

B.H. Number	Sample Number (depth)	Tare Number	Tare Mass (g)	Mass of Wet Soil & Tare (g)	Mass of Dry Soil & Tare (g)	Moisture Content (%)	Visual Description of Soil EBA Work Method WM4400
TP1-S1			11.6	658.9	601.7	9.7	GRAVEL - silty, some sand
TP1-S2			15.3	765.9	728.5	5.2	SILT and SAND - some gravel
TP3-S1			14.7	671.7	488.5	38.7	SAND and SILT
TP3-S2			11.5	529.1	495.2	7.0	SAND and GRAVEL - some silt
TP4-S1			15.0	579.8	444.5	31.5	SILT - trace sand
TP4-S2			14.5	551.6	435.9	27.5	SILT
TP3-S2			11.5	529.1	495.2	7.0	SAND and GRAVEL - some silt
DH1	15-20ft		18.1	470.7	419.7	12.7	SILT - trace sand and gravel
DH2	5-10ft		15.5	579.0	519.0	11.9	SAND and SILT - trace gravel
DH2	25-30ft		12.2	659.0	566.1	16.8	SAND and SILT
DH3	5-10ft		14.5	622.7	499.5	25.4	SILT - some sand
DH3	20-25ft		16.9	558.5	491.4	14.1	SILT - some sand
DH7	10-15ft		12.1	437.1	385.3	13.9	SAND and GRAVEL - silty
DH7	20-25ft		17.0	276.3	229.9	21.8	SILT - trace sand and gravel
DH7	40-45ft		11.6	512.0	436.5	17.8	SILT
DH7	50-60ft		11.8	422.8	362.9	17.1	SILT
DH7	60-65ft		17.1	149.7	131.3	16.1	SAND - silty

Tested in accordance with ASTM standard D2216, subject to review .

EBA Engineering Consultants Ltd.

MOISTURE CONTENT TEST RESULTS

Project: Eagle Gold Project
Project No.: W14101304
Client: BGC Engineering Inc.
ATTN: Heather Grinde

Sample No.: TPBGC09-HL1
Date Tested: 9/2/2009
Tested By: CH
Page: 1 of 1

B.H. Number	Sample Number (depth)	Tare Number	Tare Mass (g)	Mass of Wet Soil & Tare (g)	Mass of Dry Soil & Tare (g)	Moisture Content (%)	Visual Description of Soil EBA Work Method WM4400
TP1-S1			12.2	854.6	777.0	10.1	GRAVEL - silty, some sand
TP2-S1			14.9	837.0	752.3	11.5	SILT and SAND - some gravel
TP2-S2			12.2	375.1	290.5	30.4	SILT - trace sand and gravel

Tested in accordance with ASTM standard D2216, subject to review .

EBA Engineering Consultants Ltd.

MOISTURE CONTENT TEST RESULTS

Project:	Eagle Gold Project	Sample No.:	TPBGC09-HL6
Project No.:	W14101304	Date Tested:	9/2/2009
Client:	BGC Engineering Inc.	Tested By:	CH
ATTN:	Heather Grinde	Page:	1 of 1

B.H. Number	Sample Number (depth)	Tare Number	Tare Mass (g)	Mass of Wet Soil & Tare (g)	Mass of Dry Soil & Tare (g)	Moisture Content (%)	Visual Description of Soil EBA Work Method WM4400
TP11-S1			11.9	635.0	558.7	14.0	GRAVEL - Silty, some sand
TP12-S1			16.5	692.0	630.8	10.0	SAND and GRAVEL - some silt
TP12-S2			11.6	555.7	506.8	9.9	SAND and GRAVEL - trace silt
TP13-S1			17.8	575.8	533.6	8.2	GRAVEL - Silty, some sand
TP14-S1			12.1	646.5	560.9	15.6	SAND and GRAVEL - silty
TP14-S2			12.2	567.2	495.6	14.8	SAND and GRAVEL - silty
TP15-S1			15.4	622.7	551.9	13.2	SAND and SILT - some gravel
TP15-S2			14.9	538.2	463.1	16.8	SILT - trace sand
TP16-S1			11.5	628.6	570.0	10.5	GRAVEL - Silty, some sand
TP17-S1			12.9	618.4	590.9	4.8	SAND and GRAVEL - some silt

Tested in accordance with ASTM standard D2216, subject to review .

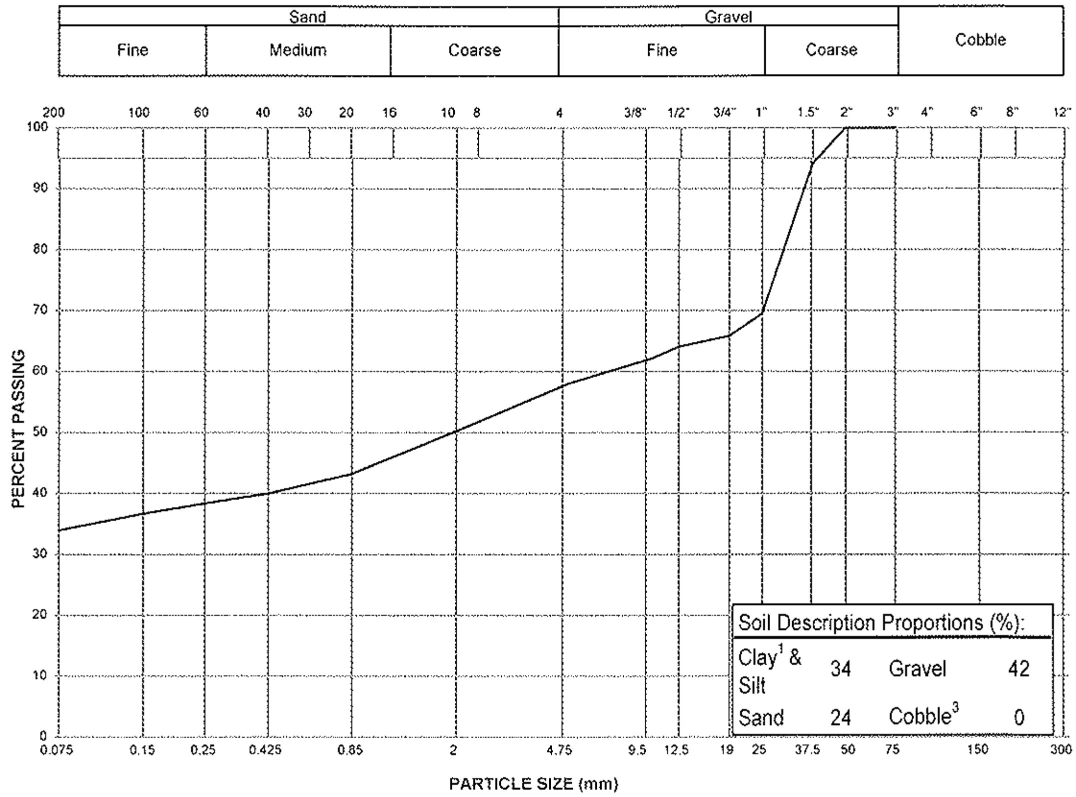
EBA Engineering Consultants Ltd.

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

Project:	Eagle Gold Project	Client:	BGC Engineering Inc.
Project No.:	W14101304	Client Rep.:	Heather Grinde
Site:			
Material Type:		Date Tested:	17-Sep-2009 By: IM
Sample No.:	HL5-4-S1	Soil Description[2]:	GRAVEL - silty, sandy
Sample Loc.:	0.5 - 0.6 m		
Sample Depth:		USC Classification:	Cu:
Sampling Method:			Cc:
Date sampled:	By:	Moisture Content:	17.0

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	100
50	100
38	94
25	69
19	66
12.5	64
10	62
5	58
2	50
0.85	43
0.425	40
0.25	38
0.15	37
0.075	34



Soil Description Proportions (%):			
Clay[1] & Silt	34	Gravel	42
Sand	24	Cobble[3]	0

Notes:

[1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification: ______

Remarks: ______

Reviewed By: ______

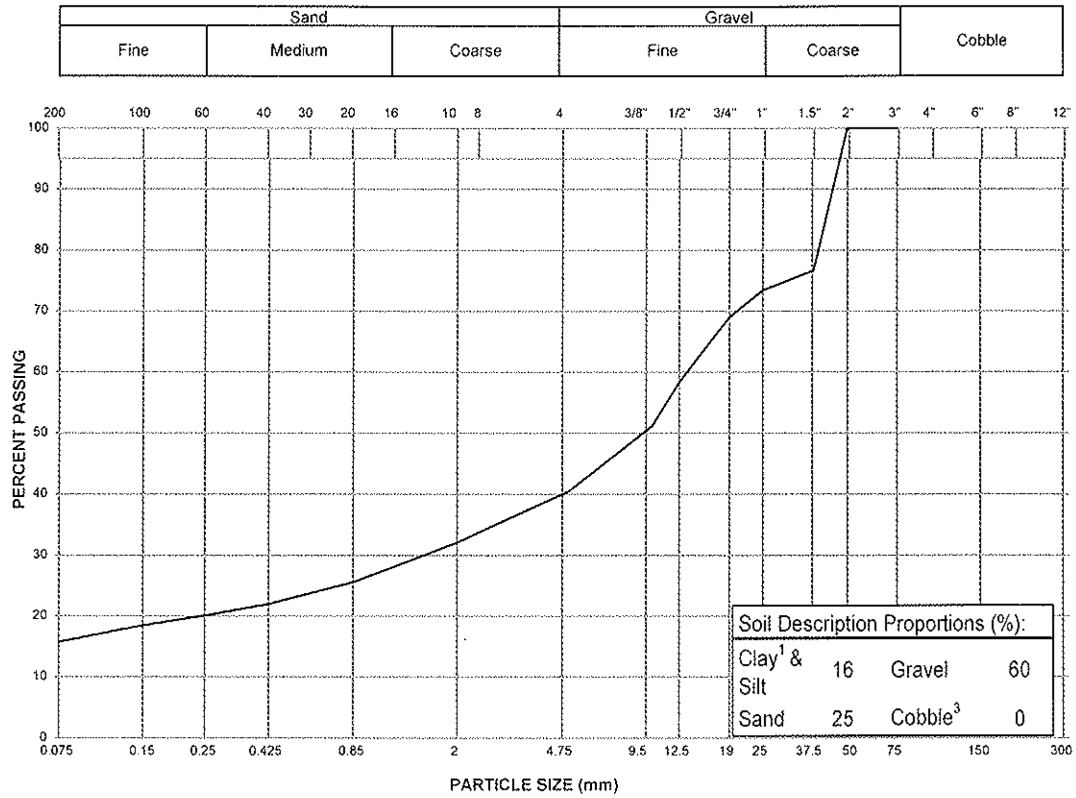
EBA Engineering Consultants Ltd.

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

Project:	Eagle Gold Project	Client:	BGC Engineering Inc.
Project No.:	W14101304	Client Rep.:	Heather Grinde
Site:			
Material Type:		Date Tested:	12-Sep-2009 By: IM
Sample No.:	WR-9-S2	Soil Description[2]:	GRAVEL - sandy, some silt
Sample Loc.:	2 - 2.5 m		
Sample Depth:		USC Classification:	Cu:
Sampling Method:			Cc:
Date sampled:	By:	Moisture Content:	7.9

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	100
50	100
38	77
25	73
19	69
12.5	58
10	51
5	40
2	32
0.85	26
0.425	22
0.25	20
0.15	18
0.075	16



Soil Description Proportions (%):			
Clay[1] & Silt	16	Gravel	60
Sand	25	Cobble[3]	0

Notes:

[1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification: ______________________

Remarks: ______________________

Reviewed By: ______________________

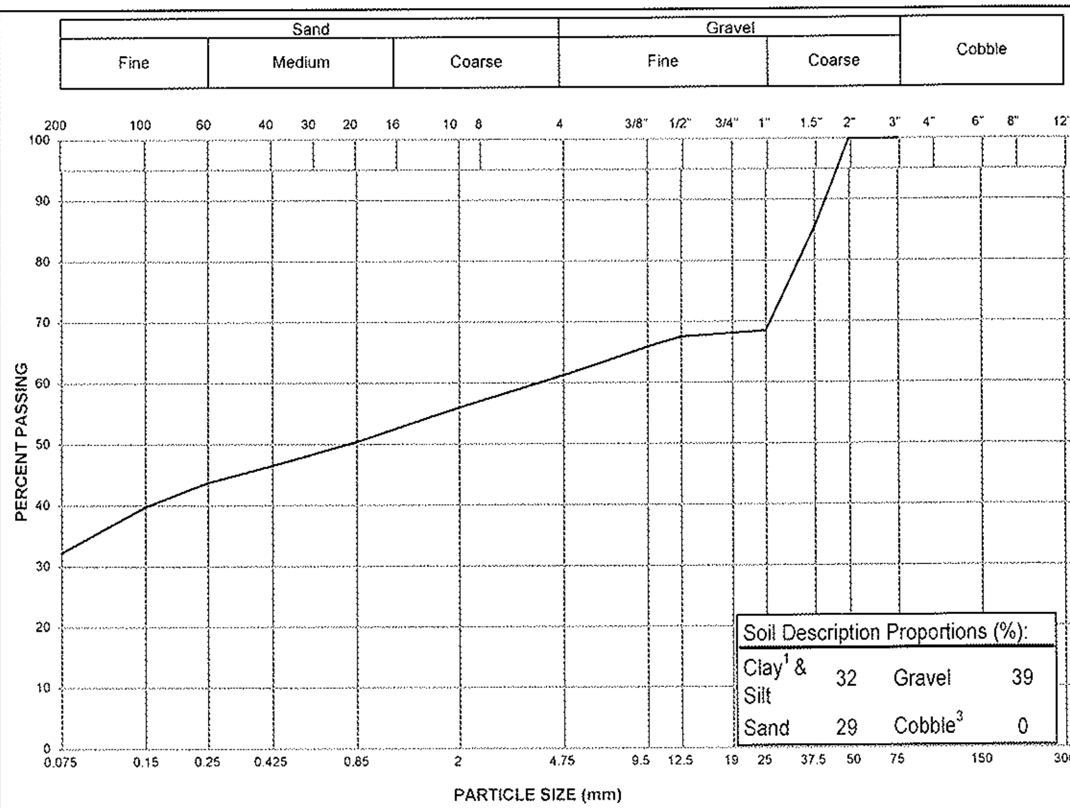
EBA Engineering Consultants Ltd.

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

Project:	Eagle Gold Project	Client:	BGC Engineering Inc.
Project No.:	W14101304	Client Rep.:	Heather Grinde
Site:			
Material Type:		Date Tested:	17-Sep-2009 By: IM
Sample No.:	HL6-6-S2	Soil Description[2]:	GRAVEL - silty, sandy
Sample Loc.:	1 - 1.2 m		
Sample Depth:		USC Classification:	Cu:
Sampling Method:			Cc:
Date sampled:	By:	Moisture Content:	0.6

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	100
50	100
38	86
25	69
19	
12.5	67
10	66
5	62
2	56
0.85	50
0.425	46
0.25	44
0.15	40
0.075	32



Soil Description Proportions (%):			
Clay[1] & Silt	32	Gravel	39
Sand	29	Cobble[3]	0

Notes:

[1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification: __________

Remarks: __________

Reviewed By:

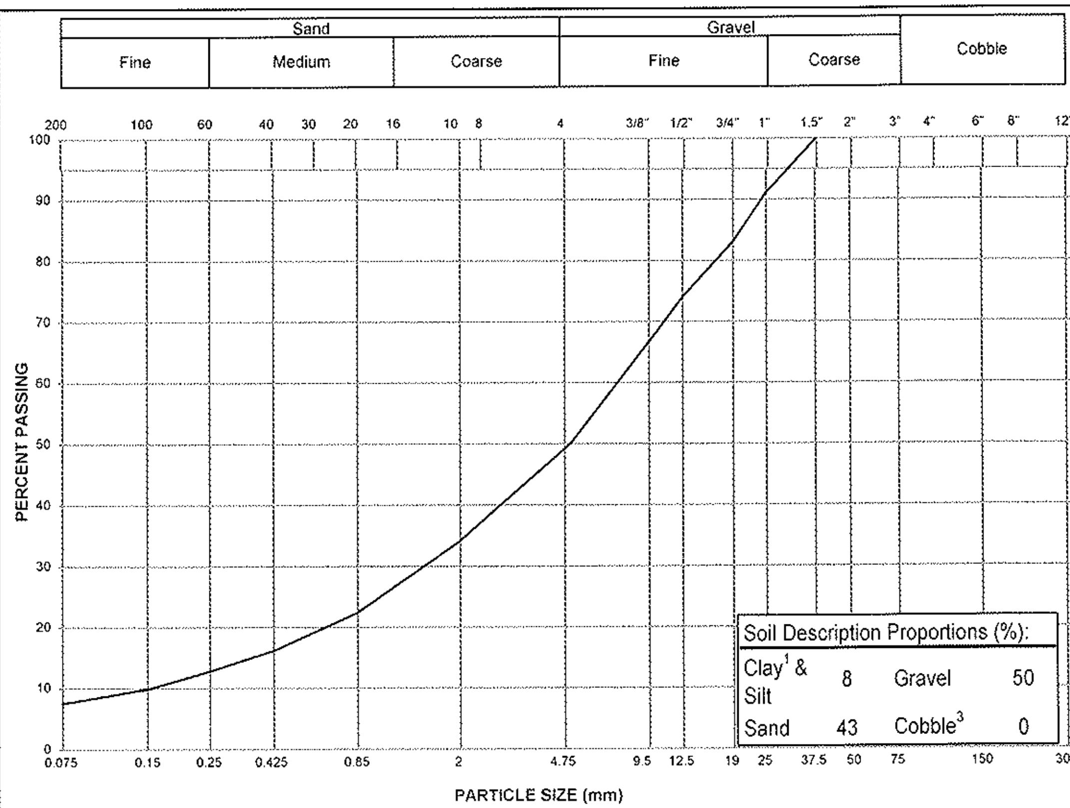
EBA Engineering Consultants Ltd.

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

Project:	Eagle Gold Project	Client:	BGC Engineering Inc.
Project No.:	W14101304	Client Rep.:	Heather Grinde
Site:			
Material Type:		Date Tested:	17-Sep-2009 By: IM
Sample No.:	HL6-4-S4	Soil Description[2]:	GRAVEL AND SAND - trace silt
Sample Loc.:	4 - 4.4 m		
Sample Depth:		USC Classification:	Cu:
Sampling Method:			Cc:
Date sampled:	By:	Moisture Content:	5.5

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	
50	
38	100
25	91
19	83
12.5	74
10	68
5	50
2	34
0.85	22
0.425	16
0.25	13
0.15	10
0.075	8



Soil Description Proportions (%):			
Clay[1] & Silt	8	Gravel	50
Sand	43	Cobble[3]	0

Notes:

[1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification: ______

Remarks: ______

Reviewed By: ______

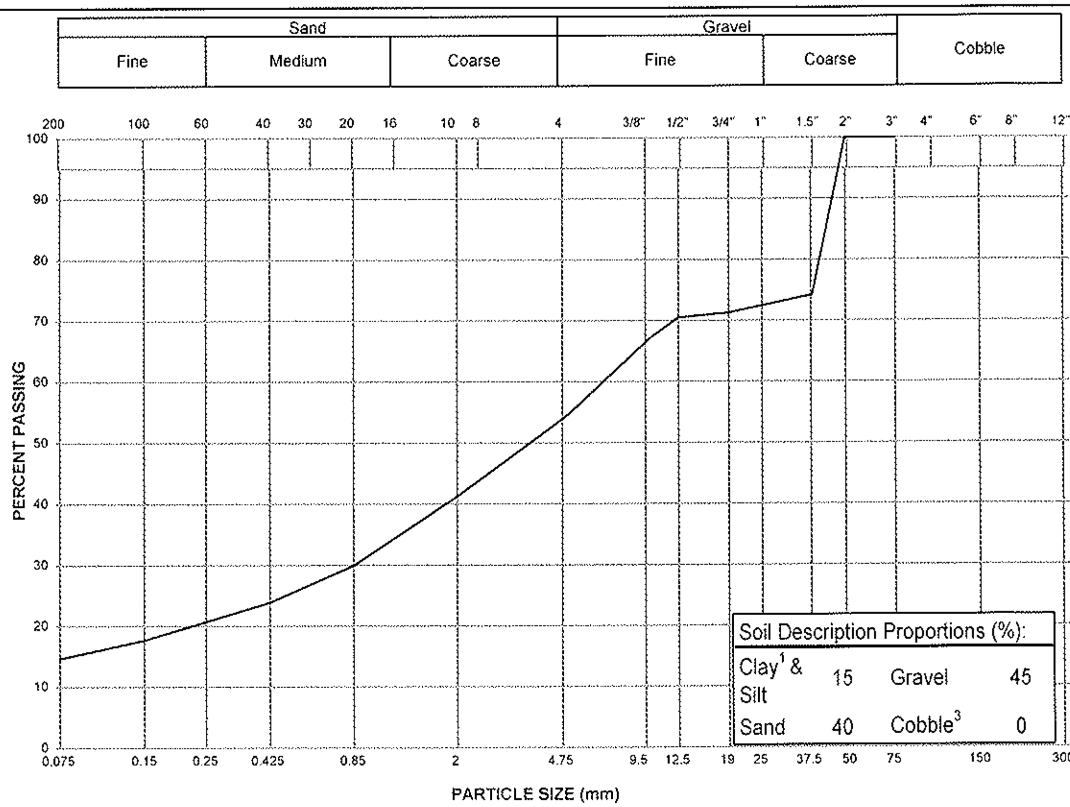
EBA Engineering Consultants Ltd.

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

Project:	Eagle Gold Project	Client:	BGC Engineering Inc.
Project No.:	W14101304	Client Rep.:	Heather Grinde
Site:			
Material Type:		Date Tested:	17-Sep-2009 By: IM
Sample No.:	HL4-6-S2	Soil Description[2]:	GRAVEL AND SAND - some silt
Sample Loc.:	3 - 3.5 m		
Sample Depth:		USC Classification:	Cu:
Sampling Method:			Cc:
Date sampled:	By:	Moisture Content:	10.1

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	100
50	100
38	74
25	
19	71
12.5	71
10	67
5	55
2	41
0.85	30
0.425	24
0.25	21
0.15	18
0.075	15



Soil Description Proportions (%):			
Clay[1] & Silt	15	Gravel	45
Sand	40	Cobble[3]	0

Notes:

[1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification:

Remarks:

Reviewed By:

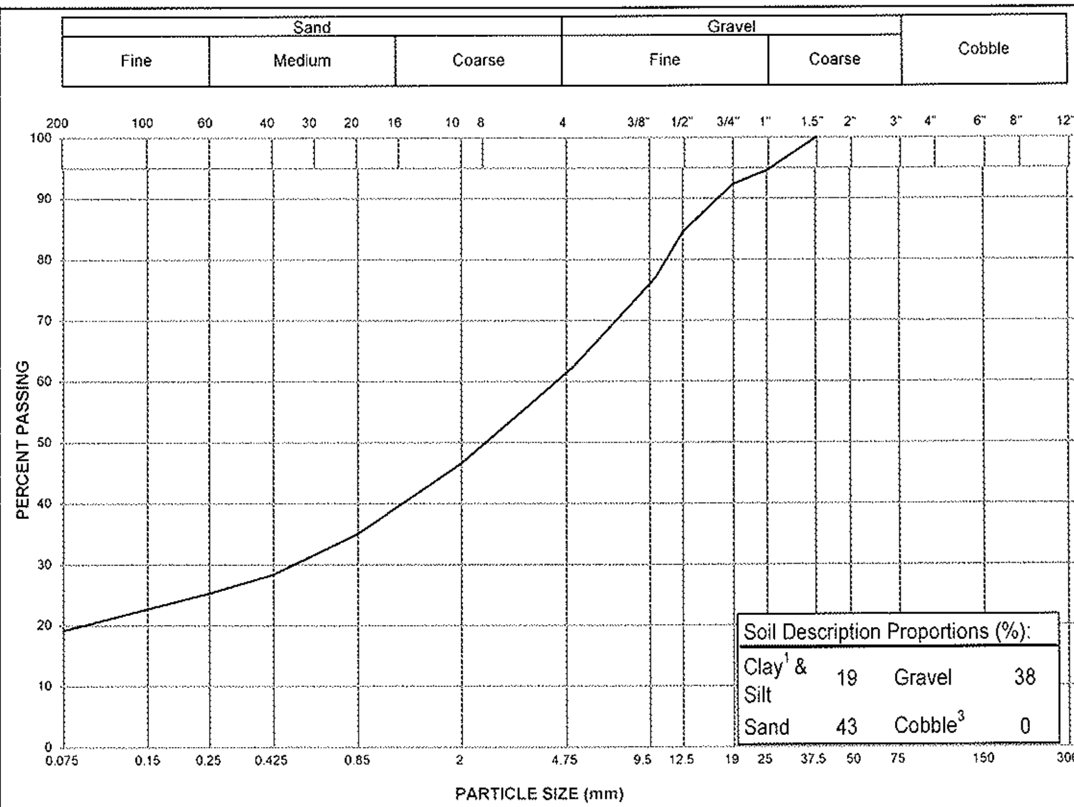
EBA Engineering Consultants Ltd.

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

Project:	Eagle Gold Project	Client:	BGC Engineering Inc.
Project No.:	W14101304	Client Rep.:	Heather Grinde
Site:			
Material Type:		Date Tested:	17-Sep-2009 By: IM
Sample No.:	WR-7-S1	Soil Description[2]:	SAND AND GRAVEL - some silt
Sample Loc.:	0.9 m		
Sample Depth:		USC Classification:	Cu:
Sampling Method:			Cc:
Date sampled:	By:	Moisture Content:	7.3

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	
50	
38	100
25	95
19	92
12.5	84
10	77
5	62
2	47
0.85	35
0.425	28
0.25	25
0.15	23
0.075	19



Notes:

[1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification: __________

Remarks: __________

Reviewed By:

EBA Engineering Consultants Ltd.

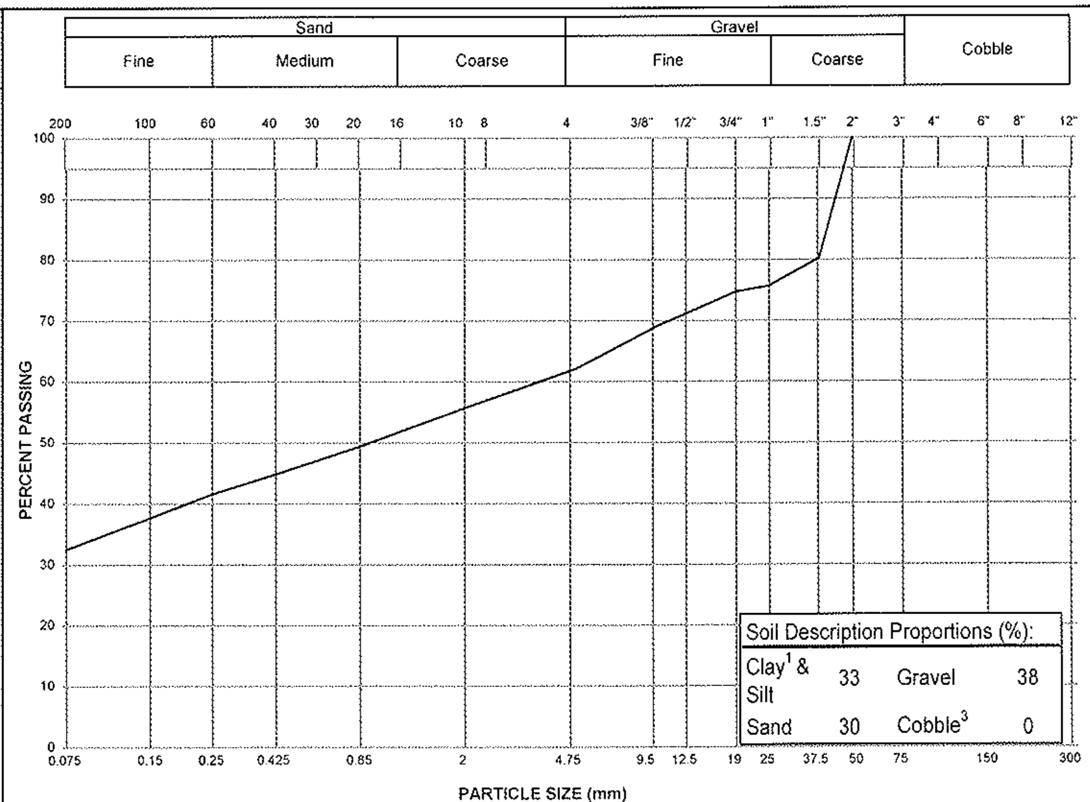
PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

Project:	Eagle Gold Project	Client:	BGC Engineering Inc.
Project No.:	W14101304	Client Rep.:	Heather Grinde
Site:			

Material Type:		Date Tested:	17-Sep-2009	By:	IM
Sample No.:	P2-S2	Soil Description[2]:	GRAVEL - silty, sandy		
Sample Loc.:	1.0 - 1.1 m				
Sample Depth:		USC Classification:		Cu:	
Sampling Method:				Cc:	
Date sampled:	By:	Moisture Content:	6.6		

Particle Size (mm)	Percent Passing
300	
200	
150	
100	
75	
50	100
38	80
25	76
19	75
12.5	71
10	69
5	62
2	56
0.85	49
0.425	45
0.25	42
0.15	38
0.075	33



Soil Description Proportions (%):			
Clay[1] & Silt	33	Gravel	38
Sand	30	Cobble[3]	0

Notes:
[1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual
[2] The description is visually based & subject to EBA description protocols
[3] If cobbles are present, sampling procedure may not meet ASTM C702 & D75

Specification:

Remarks:

Reviewed By:

EBA Engineering Consultants Ltd.

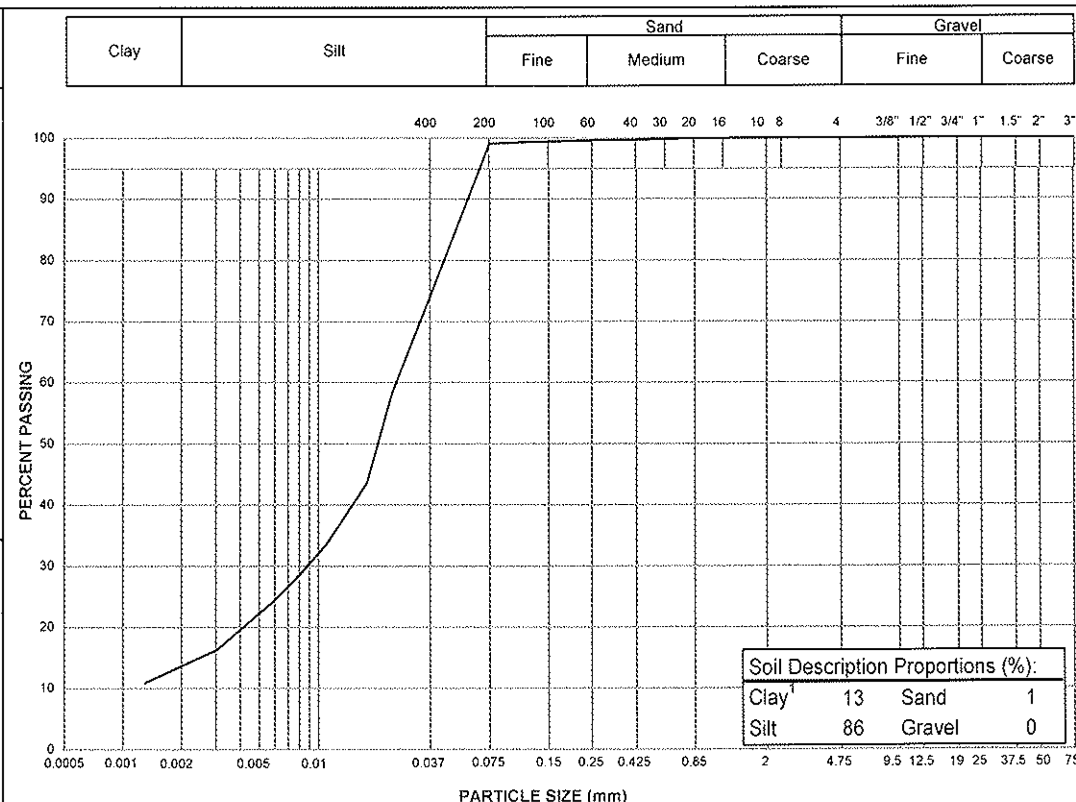
PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

Project:	Eagle Gold Project	Client:	BGC Engineering Inc.
Project No.:	W14101304	Client Rep.:	Heather Grinde
Site:			

Material Type:		Date Tested:	17-Sep-2009	By:	CH
Sample No.:	HL4-3-S3	Soil Description[2]:	SILT - some clay, trace sand		
Sample Loc.:					
Sample Depth:		USC Classification:		Cu:	
Sampling Method:				Cc:	
Date sampled:	By:	Moisture Content:	34.6		

Particle Size (mm)	Percent Passing
75	100
50	100
38	100
25	100
19	100
12.5	100
10	100
5	100
2	100
0.85	100
0.425	100
0.25	100
0.15	99
0.075	99
0.0238	58.4
0.0177	43.6
0.0111	33.7
0.0081	28.7
0.0059	24.3
0.0031	16.3
0.0013	10.9



Soil Description Proportions (%):			
Clay[1]	13	Sand	1
Silt	86	Gravel	0

Notes:
[1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual
[2] The description is visually based & subject to EBA description protocols

Specification: ____________________

Remarks: ____________________

Reviewed By: ____________________

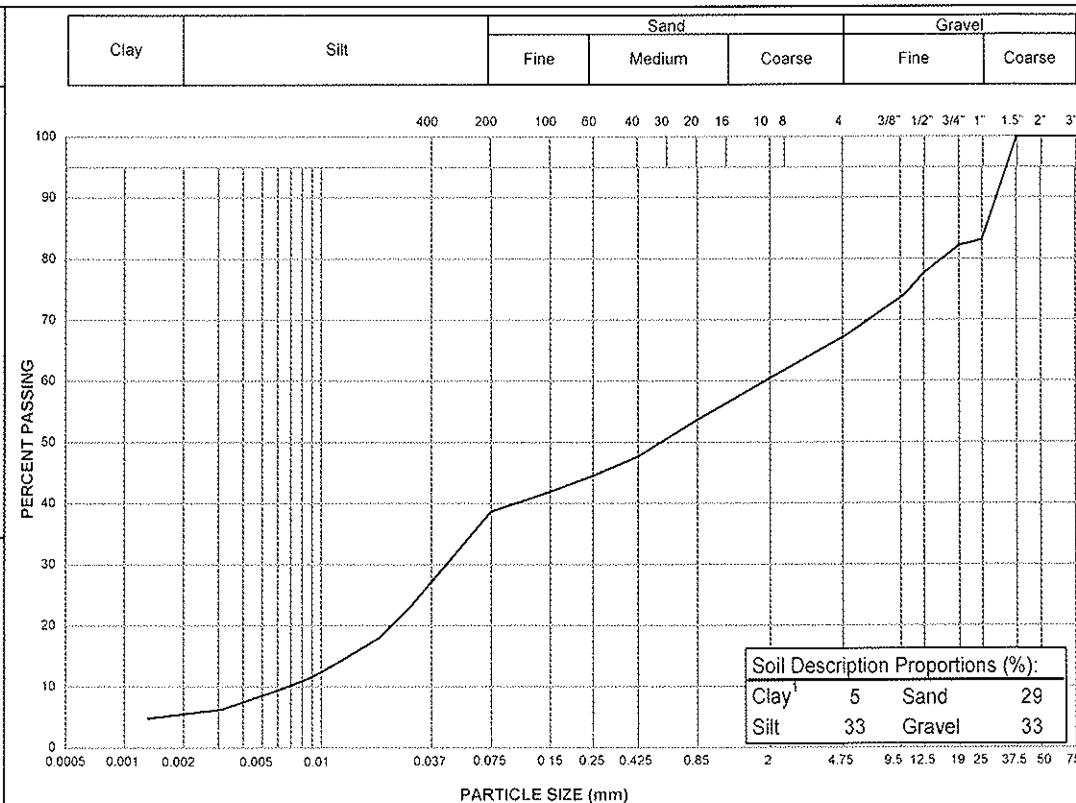
EBA Engineering Consultants Ltd.

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

Project:	Eagle Gold Project	Client:	BGC Engineering Inc.
Project No.:	W14101304	Client Rep.:	Heather Grinde
Site:			
Material Type:		Date Tested:	17-Sep-2009 By: CH
Sample No.:	HL6-3-S1	Soil Description[2]:	SILT and GRAVEL - sandy trace clay
Sample Loc.:			
Sample Depth:		USC Classification:	Cu:
Sampling Method:			Cc:
Date sampled:	By:	Moisture Content:	22.2

Particle Size (mm)	Percent Passing
75	100
50	100
38	100
25	83
19	82
12.5	78
10	74
5	68
2	60
0.85	54
0.425	48
0.25	44
0.15	42
0.075	39
0.0292	23.3
0.0198	17.9
0.0120	13.8
0.0087	11.4
0.0063	9.6
0.0031	6.3
0.0013	4.8



Soil Description Proportions (%):			
Clay[1]	5	Sand	29
Silt	33	Gravel	33

Notes:

[1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

Specification: ______

Remarks: ______

Reviewed By: ______

EBA Engineering Consultants Ltd.

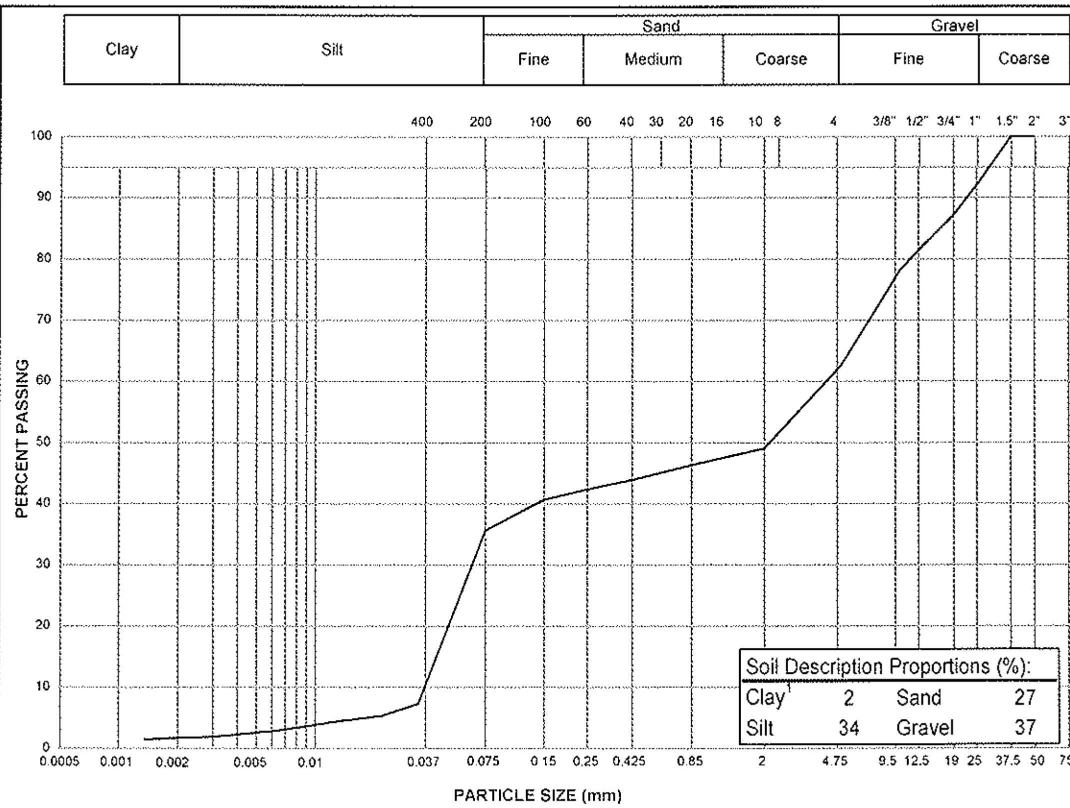
PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

Project:	Eagle Gold Project	Client:	BGC Engineering Inc.
Project No.:	W14101304	Client Rep.:	Heather Grinde
Site:			

Material Type:		Date Tested:	21-Sep-2009 By: CH
Sample No.:	HL6-10-S2	Soil Description[2]:	SILT AND GRAVEL - sandy trace clay
Sample Loc.:			
Sample Depth:		USC Classification:	Cu:
Sampling Method:			Cc:
Date sampled:	By:	Moisture Content:	9.5

Particle Size (mm)	Percent Passing
75	
50	100
38	100
25	92
19	87
12.5	81
10	78
5	63
2	49
0.85	46
0.425	44
0.25	42
0.15	41
0.075	36
0.0341	7.3
0.0221	5.3
0.0129	4.4
0.0092	3.6
0.0065	2.9
0.0032	1.9
0.0014	1.5



Soil Description Proportions (%):			
Clay[1]	2	Sand	27
Silt	34	Gravel	37

Notes:

[1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

Specification: ______

Remarks: ______

Reviewed By: ______

EBA Engineering Consultants Ltd.

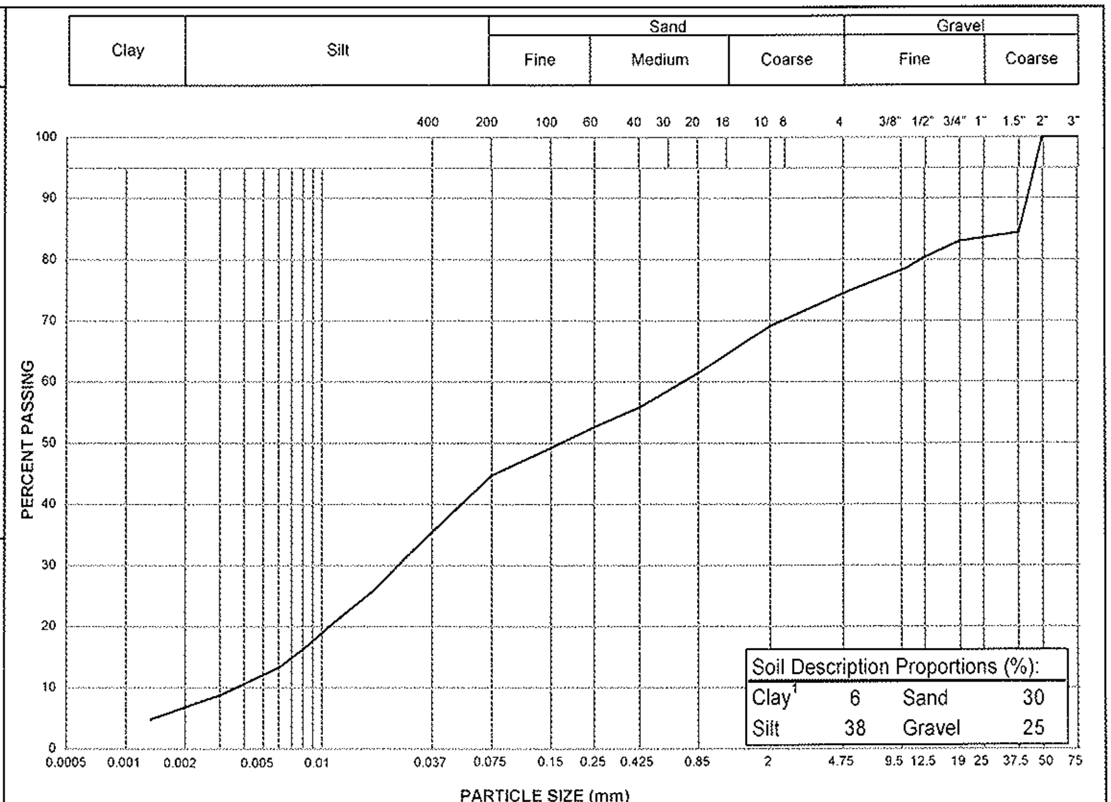
PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

Project:	Eagle Gold Project	Client:	BGC Engineering Inc.
Project No.:	W14101304	Client Rep.:	Heather Grinde
Site:			

Material Type:		Date Tested:	17-Sep-2009	By:	CH
Sample No.:	HL5-7-S3	Soil Description[2]:	SILT - gravelly and sandy trace clay		
Sample Loc.:					
Sample Depth:		USC Classification:		Cu:	
Sampling Method:				Cc:	
Date sampled:	By:	Moisture Content:	13.8		

Particle Size (mm)	Percent Passing
75	100
50	100
38	84
25	
19	83
12.5	80
10	78
5	75
2	69
0.85	61
0.425	56
0.25	53
0.15	49
0.075	45
0.0275	31.5
0.0186	26.0
0.0114	20.5
0.0084	16.8
0.0061	13.3
0.0031	8.9
0.0013	4.8



Notes:
[1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual
[2] The description is visually based & subject to EBA description protocols

Specification:

Remarks:

Reviewed By:

EBA Engineering Consultants Ltd.

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

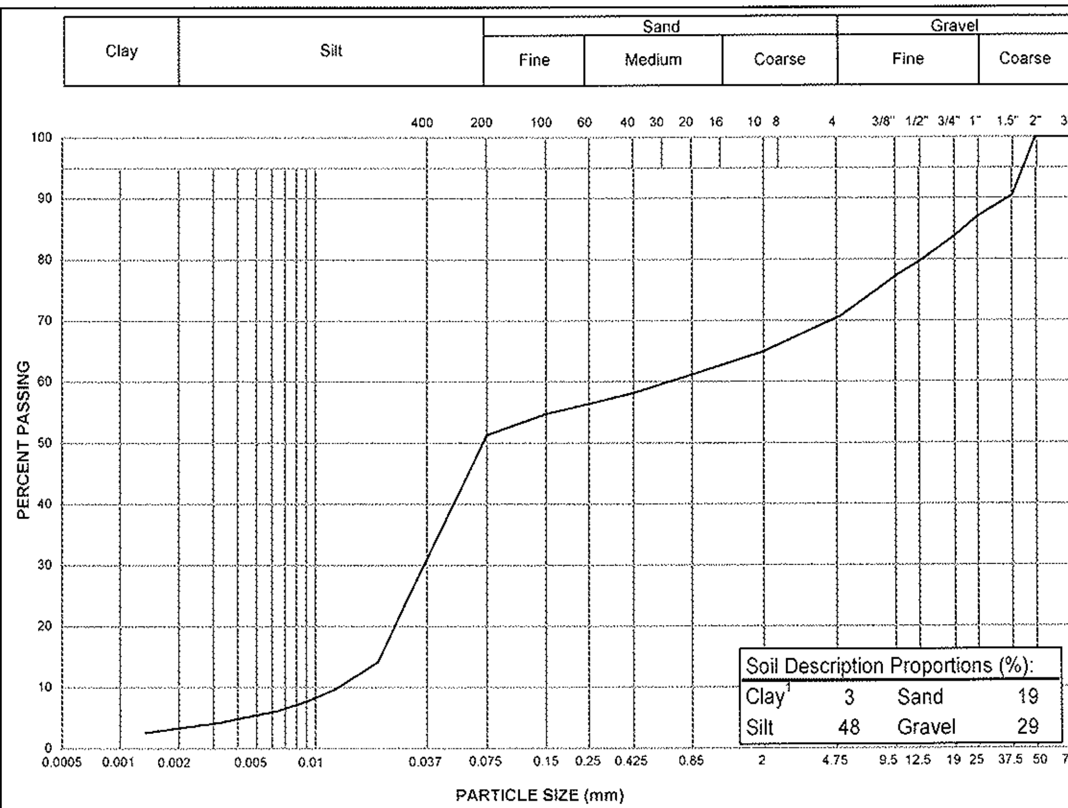
Project: Eagle Gold Project
Project No.: W14101304
Site:

Client: BGC Engineering Inc.
Client Rep.: Heather Grinde

Material Type:
Sample No.: HL4-16-S3
Sample Loc.:
Sample Depth:
Sampling Method:
Date sampled: By:

Date Tested: By:
Soil Description[2]: SILT - gravelly, some sand trace clay
USC Classification: Cu:
Cc:
Moisture Content: 1.5

Particle Size (mm)	Percent Passing
75	100
50	100
38	90
25	87
19	84
12.5	80
10	78
5	71
2	65
0.85	61
0.425	58
0.25	56
0.15	55
0.075	51
0.0295	24.4
0.0209	14.1
0.0126	9.6
0.0091	7.7
0.0064	6.1
0.0032	4.2
0.0013	2.6



Soil Description Proportions (%):			
Clay[1]	3	Sand	19
Silt	48	Gravel	29

Notes:
[1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual
[2] The description is visually based & subject to EBA description protocols

Specification:

Remarks:

Reviewed By:

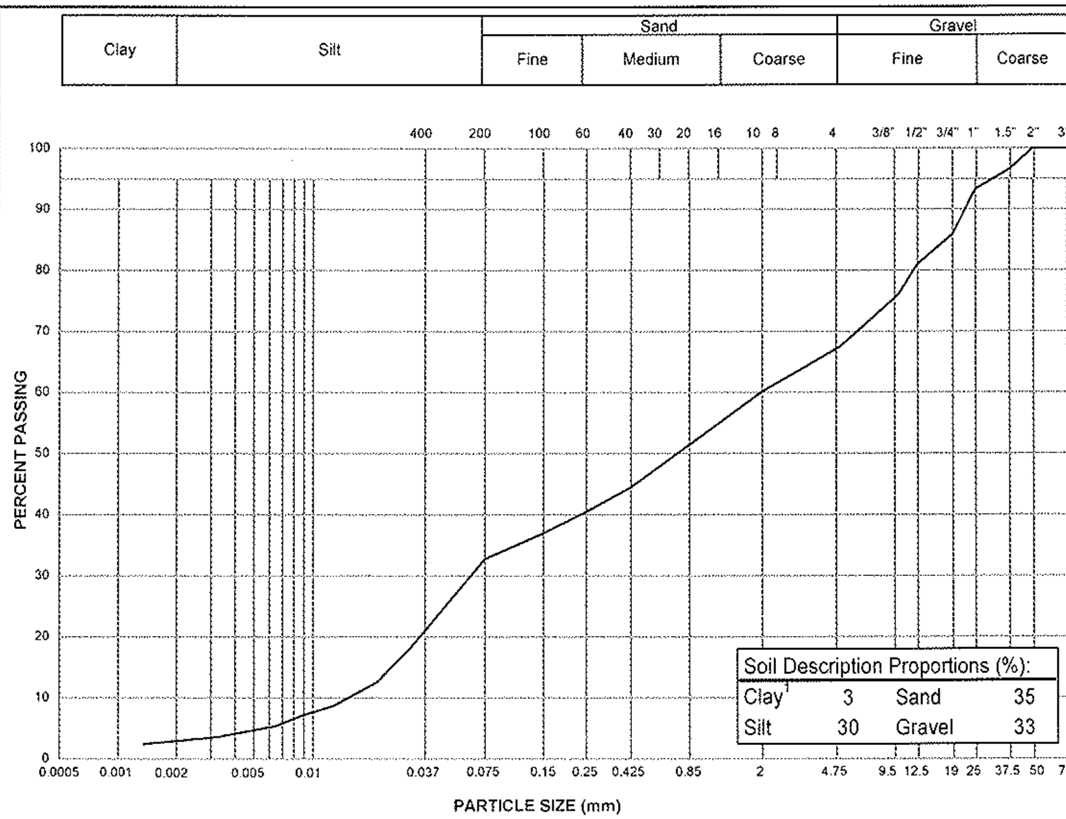
EBA Engineering Consultants Ltd.

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

Project:	Eagle Gold Project	Client:	BGC Engineering Inc.
Project No.:	W14101304	Client Rep.:	Heather Grinde
Site:			
Material Type:		Date Tested:	17-Sep-2009 By: CH
Sample No.:	HL4-12-S3	Soil Description[2]:	SAND - silty, gravelly, trace clay
Sample Loc.:			
Sample Depth:		USC Classification:	Cu:
Sampling Method:			Cc:
Date sampled: By:		Moisture Content:	0.6

Particle Size (mm)	Percent Passing
75	100
50	100
38	97
25	93
19	86
12.5	81
10	76
5	68
2	60
0.85	51
0.425	44
0.25	40
0.15	37
0.075	33
0.0312	18.2
0.0211	12.5
0.0126	8.6
0.0090	7.1
0.0064	5.4
0.0032	3.6
0.0014	2.4



Soil Description Proportions (%):			
Clay[1]	3	Sand	35
Silt	30	Gravel	33

Notes:

[1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

Specification:

Remarks:

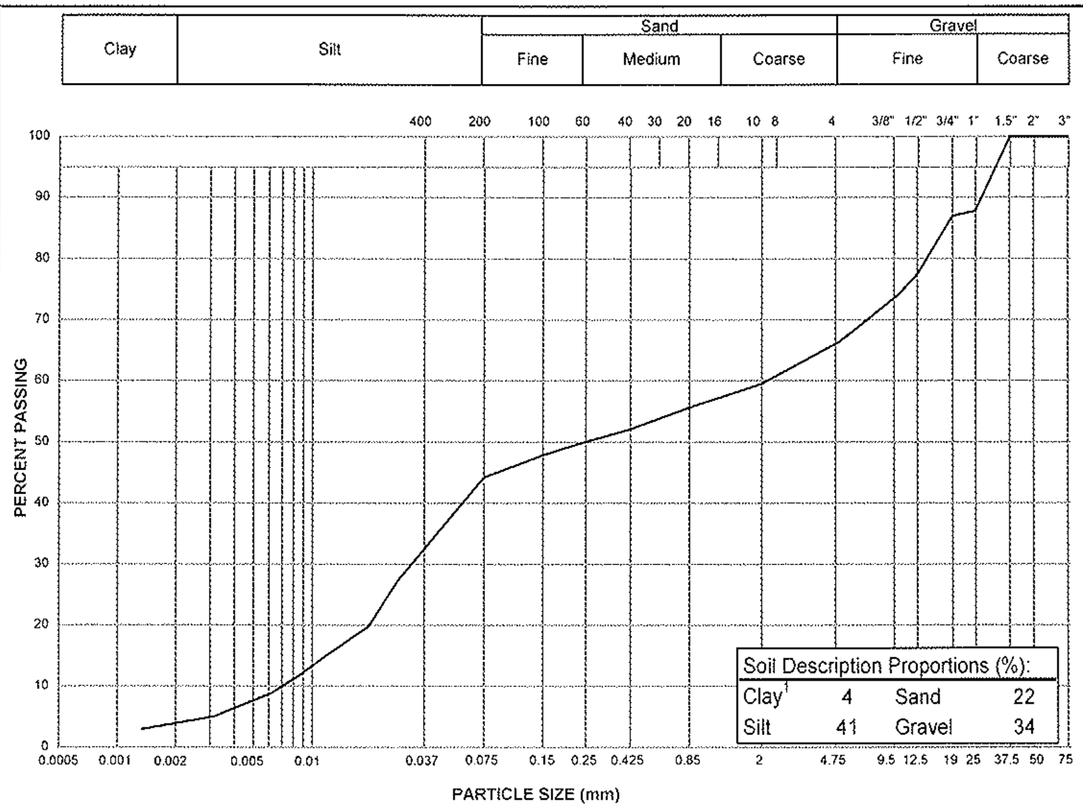
Reviewed By:

PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

Project:	Eagle Gold Project	Client:	BGC Engineering Inc.
Project No.:	W14101304	Client Rep.:	Heather Grinde
Site:			
Material Type:		Date Tested:	17-Sep-2009 By: CH
Sample No.:	WR-4-S1	Soil Description[2]:	SILT - gravelly, sandy, trace clay
Sample Loc.:			
Sample Depth:		USC Classification:	Cu:
Sampling Method:			Cc:
Date sampled:	By:	Moisture Content:	4.8

Particle Size (mm)	Percent Passing
75	100
50	100
38	100
25	88
19	87
12.5	77
10	74
5	66
2	60
0.85	56
0.425	52
0.25	50
0.15	48
0.075	44
0.0274	27.4
0.0193	19.7
0.0118	15.0
0.0086	11.8
0.0062	8.8
0.0032	5.0
0.0013	2.9



Soil Description Proportions (%):			
Clay[1]	4	Sand	22
Silt	41	Gravel	34

Notes:

[1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

Specification:

Remarks:

Reviewed By:

EBA Engineering Consultants Ltd.

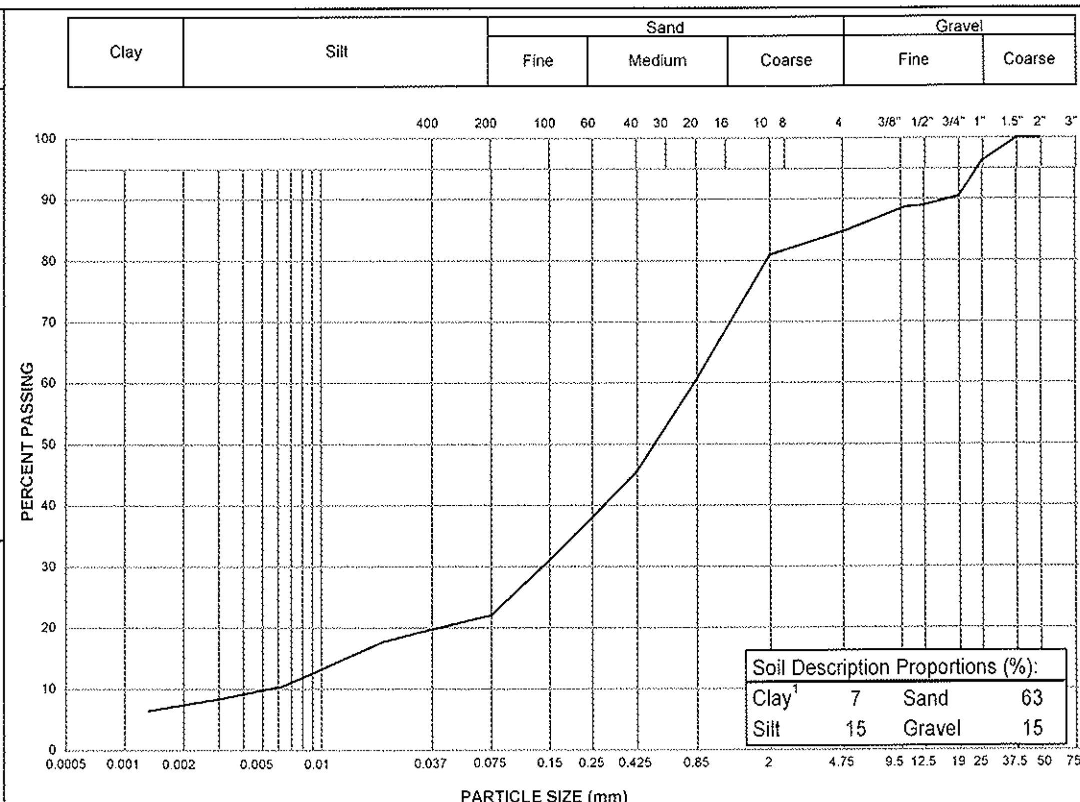
PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

Project:	Eagle Gold Project	Client:	BGC Engineering Inc.
Project No.:	W14101304	Client Rep.:	Heather Grinde
Site:			

Material Type:		Date Tested:	17-Sep-2009	By:	CH
Sample No.:	HL4-10-S2	Soil Description[2]:	SAND - some gravel and silt trace clay		
Sample Loc.:					
Sample Depth:	3 - 3.4 m	USC Classification:		Cu:	
Sampling Method:				Cc:	
Date sampled:	By:	Moisture Content:	14.1		

Particle Size (mm)	Percent Passing
75	
50	100
38	100
25	96
19	90
12.5	89
10	89
5	85
2	81
0.85	61
0.425	46
0.25	38
0.15	31
0.075	22
0.0319	19.2
0.0204	17.6
0.0122	14.4
0.0088	12.4
0.0063	10.4
0.0031	8.4
0.0013	6.4



Soil Description Proportions (%):			
Clay[1]	7	Sand	63
Silt	15	Gravel	15

Notes:

[1] The upper clay size of 2 um, per the Canadian Foundation Engineering Manual

[2] The description is visually based & subject to EBA description protocols

Specification:

Remarks:

Reviewed By:

EBA Engineering Consultants Ltd.

APPENDIX C
BOREHOLE LOGS

Project: Eagle Gold, Site Facilites

DRILL HOLE # DH-BGC09-AG-3

Location : Ann Gulch

Project No. : 0792-002

Survey Method : Handheld GPS	**Drill Designation** : Pioneer 2	**Start Date** : 23 Aug 09
Co-ordinates (m) : 459,479.E, 7,101,319.N	**Drilling Contractor** : Aggressive Driling	**Finish Date**: 23 Aug 09
Ground Elevation (m) : 900.0	**Drill Method** : Solid Stem Auger/HQ3	**Final Depth of Hole (m):** : 13.7
Datum : UTM NAD 83	**Core** : HQ3	**Depth to Top of Rock (m)** : 7.60
Dip (degrees from horizontal) :	**Fluid** : polymer	**Logged by** : MRR
Direction : n/a	**Casing** : **Cased To (m)** :	**Reviewed by** : PQ

Columns: Depth (m) | Sample Type | Sample No. | Weathering Grade | Symbol | Lithologic Description | Instrument Details | SPT Blows per 150mm | SPT-T Friction (kPa) | DCT Blows per 300mm

Su - kPa: 40, 80, 120, 160

VANE: FIELD / LAB — PEAK ◆ ■; REMOLD ◇ □

★ % Fines

Hydraulic Conductivity (m/sec): 10^{-8}, 10^{-6}, 10^{-4}, 10^{-2}

Core Recovery: 20, 40, 60, 80

▲ UC/2; △ Pocket Pen /2; DCT (blows/300mm); ● SPT (blows/300mm)

Moisture Content & SPT N: W_p%, W%, W_L% — 20, 40, 60, 80

Depth (m)	Lithologic Description
0	ORGANICS Peat, dark brown, silty, rootlets.
	SANDY SILT Non plastic, frozen, hard, brown, laminated, rapid dilatancy, trace rootlets. [ORGANIC]
1	SAND and GRAVEL (SW/GW) Fine to coarse, some silt, trace clay, trace cobble, very dense, max particle 0.25m, subrounded to subangular, brown, moist, metasedimentary and quartz clasts, homogeneous. [COLLUVIUM]
2.8	SILTY SAND (SP) Fine to medium, some gravel, dense, max particle size 10cm, subrounded to angular, brown, dry, homogeneous.
7.6	7.60m - Switch from solid stem auger drilling to diamond driling.
	Rock encountered at 7.60 m depth. See DH-BGC09-AG-3 rock log.
10	

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Location : Ann Gulch

Project No. : 0792-002

Survey Method :Handheld GPS
Co-ordinates (m) : 459,479.E, 7,101,319.N
Ground Elevation (m) : 900.0
Datum : UTM NAD 83
Dip (degrees from horizontal) : -90
Direction :

Drill Designation : Pioneer 2
Drilling Contractor : Aggressive Driling
Drill Method : Solid Stem Auger/HQ3
Core : HQ3
Fluid : polymer
Casing : ***Cased To (m)*** :

Start Date : 23 Aug 09
Finish Date: 23 Aug 09
Final Depth of Hole : 13.7
Depth to Top of Rock (m) : 7.60
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details	Hydraulic Conductivity m/sec (10^{-8} 10^{-6} 10^{-4} 10^{-2}); Core Recovery %; RQD % (20 40 60 80)	UCS - MPa (50 100 150 200); ■ Point Load; ◇ Triaxial; RMR (20 40 60 80)
0–7.60					0 to 7.60 m - See DH-BGC09-AG-3 soil log.			
7.60					METASEDIMENTARY (Quartzite) Greyish pink, medium grained, foliated, slightly to moderately weathered, weak, broken rock, sand and gravel, trace silt infill, joints rough planar, joints iron stained.			
9.10					9.10m to 10.6m - NO RECOVERY, mislatch.			

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

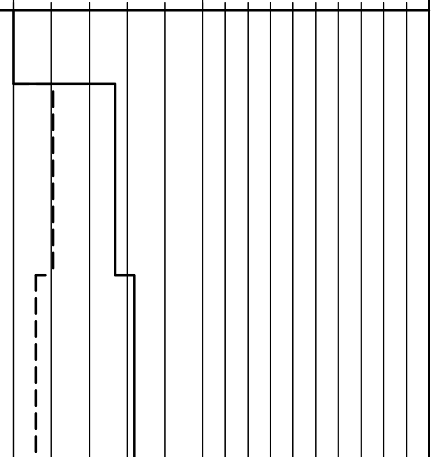
(Continued on next page)

Location : Ann Gulch

Project No. : 0792-002

Survey Method :Handheld GPS	**Drill Designation** : Pioneer 2	**Start Date** : 23 Aug 09
Co-ordinates (m) : 459,479.E, 7,101,319.N	**Drilling Contractor** : Aggressive Driling	**Finish Date**: 23 Aug 09
Ground Elevation (m) : 900.0	**Drill Method** : Solid Stem Auger/HQ3	**Final Depth of Hole** : 13.7
Datum : UTM NAD 83	**Core** : HQ3	**Depth to Top of Rock (m)** : 7.60
Dip (degrees from horizontal) : -90	**Fluid** : polymer	**Logged by** : MRR
Direction :	**Casing** : **Cased To (m)** :	**Reviewed by** : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details	Hydraulic Conductivity m/sec (10^{-8} 10^{-6} 10^{-4} 10^{-2}); Core Recovery %; RQD % (20 40 60 80)	UCS - MPa (50 100 150 200): Point Load, Triaxial; RMR (20 40 60 80)
10								
10.7					METASEDIMENTARY ROCK (Biotite Schist) Grey, fine grained, phylitic, slightly to moderately weathered, weak, two joint sets plus random, predominant joint set parallel to foliation (subhorizontal), joints smooth planar, trace sand and clay infill.			
13.72					END OF HOLE @ 13.72m. NOTES: 1) PVC casing installed for thermistor string. 2) Dynamic cone testing attempted at: 2.1m - blow per foot @ 2ft = 7; @ 8ft = 24 (refusal at 5"); 3.2m - blows per foot = 40, bouncing at 10". 3) Hole backfilled upon completion.			
20								



BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Location : Dublin Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m) : 459,302.E, 7,101,060.N
Ground Elevation (m) : 923.0
Datum : UTM NAD 83
Dip (degrees from horizontal) :
Direction : n/a

Drill Designation : Pioneer 2
Drilling Contractor : Aggressive Drilling
Drill Method : Solid Stem Auger/HQ3
Core : HQ3
Fluid : Polymer
Casing : ***Cased To (m)*** :

Start Date : 14 Aug 09
Finish Date: 15 Aug 09
Final Depth of Hole (m): : 12.8
Depth to Top of Rock (m) : 7.62
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details	SPT Blows per 150mm	SPT-T Friction (kPa)	DCT Blows per 300mm
0					SAND and GRAVEL (SW/GW) Silty, well graded, very dense, max clast 20cm, subrounded to subangular, brown, moist, homogeneous. [PLACER TAILINGS]				
1					SAND and GRAVEL (SW/GW) Some silt, some cobbles, trace boulders, well graded, dense, max clast 40cm, subrounded to subangular, oranigsh brown, moist, homogeneous. [PLACER TAILINGS] 2.0m - Gravelly cobbles and boulders, water table at 2.0m				
2									
3									
4									
5					SILTY GRAVEL (GP) Some sand, medium to coarse, coarse gravel, some cobbles, poorly graded, very dense, max visible clast 3cm, subrounded to angular, brown, wet, homogeneous.				
6					CLAY and COBBLES (CL) Gravelly (fine, angular), some silt, poorly graded, very dense, slow dilatancy, non plastic, grey. [WEATHERED BEDROCK] 6.71m - Switch from solid stem auger drilling to HQ3 coring.				
7									
8					Rock encountered at 7.62 m depth. See DH-BGC09-DG-1 rock log.				
9									
10									

Su - kPa: 40, 80, 120, 160

VANE: FIELD, LAB
PEAK ◆ ■
REMOLD ◇ □
★ % Fines
Hydraulic Conductivity (m/sec): 10^{-8} 10^{-6} 10^{-4} 10^{-2}
Core Recovery: 20 40 60 80

▲ UC/2
△ Pocket Pen /2
DCT (blows/300mm)
● SPT (blows/300mm)
Moisture Content & SPT N
W_p% W% W_L%
20 40 60 80

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

DRILL HOLE # DH-BGC09-DG-1

Location : Dublin Gulch

Project No. : 0792-002

Survey Method :Handheld GPS	***Drill Designation*** : Pioneer 2	***Start Date*** : 14 Aug 09
Co-ordinates (m) : 459,302.E, 7,101,060.N	***Drilling Contractor*** : Aggressive Drilling	***Finish Date***: 15 Aug 09
Ground Elevation (m) : 923.0	***Drill Method*** : Solid Stem Auger/HQ3	***Final Depth of Hole*** : 12.8
Datum : UTM NAD 83	***Core*** : HQ3	***Depth to Top of Rock (m)*** : 7.62
Dip (degrees from horizontal) : -90	***Fluid*** : Polymer	***Logged by*** : MRR
Direction :	***Casing*** : ***Cased To (m)*** :	***Reviewed by*** : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details	Hydraulic Conductivity m/sec (10^{-8}, 10^{-6}, 10^{-4}, 10^{-2}); Core Recovery %; RQD % (20, 40, 60, 80)	UCS - MPa (50, 100, 150, 200); Point Load; Triaxial; RMR (20, 40, 60, 80)
0–7.62					0 to 7.62 m - See DH-BGC09-DG-1 soil log.			
7.62–10					METASEDIMENTARY Dark-grey, fine grained, foliated, medium strong, slightly weathered, two joint sets plus random, trace clay and fine gravel infilling, joints rough and planar, core 1-4" pieces.			

(Continued on next page)

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

DRILL HOLE # DH-BGC09-DG-1

Location : Dublin Gulch

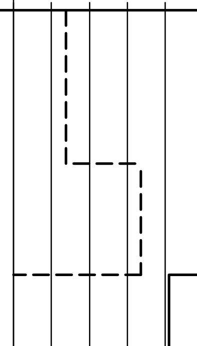
Project No. : 0792-002

Survey Method :Handheld GPS
Co-ordinates (m) : 459,302.E, 7,101,060.N
Ground Elevation (m) : 923.0
Datum : UTM NAD 83
Dip (degrees from horizontal) : -90
Direction :

Drill Designation : Pioneer 2
Drilling Contractor : Aggressive Drilling
Drill Method : Solid Stem Auger/HQ3
Core : HQ3
Fluid : Polymer
Casing : ***Cased To (m)*** :

Start Date : 14 Aug 09
Finish Date: 15 Aug 09
Final Depth of Hole : 12.8
Depth to Top of Rock (m) : 7.62
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details	Hydraulic Conductivity m/sec (10^{-8} 10^{-6} 10^{-4} 10^{-2}); Core Recovery %; RQD % (20 40 60 80)	UCS - MPa (50 100 150 200); Point Load; Triaxial; RMR (20 40 60 80)
10								
11								
12					11.89m to 12.34m - Circulation lost, NO RECOVERY.			
13					END OF HOLE @ 12.8m. NOTES: 1) 2" slotted PVC pipe installed from 3.05m-6.10m. 2) No recovery zone from 11.89 to 12.34m, lost circulation.			
14								
15								
16								
17								
18								
19								
20								



BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Survey Method : Handheld GPS
Co-ordinates (m) : 458,992.E, 7,100,880.N
Ground Elevation (m) : 828.0
Datum : UTM NAD 83
Dip (degrees from horizontal) :
Direction : n/a

Drill Designation : Pioneer 2
Drilling Contractor : Aggressive Drilling
Drill Method : Solid Stem Auger/HQ3
Core : HQ3
Fluid : polymer
Casing : **Cased To (m)** :

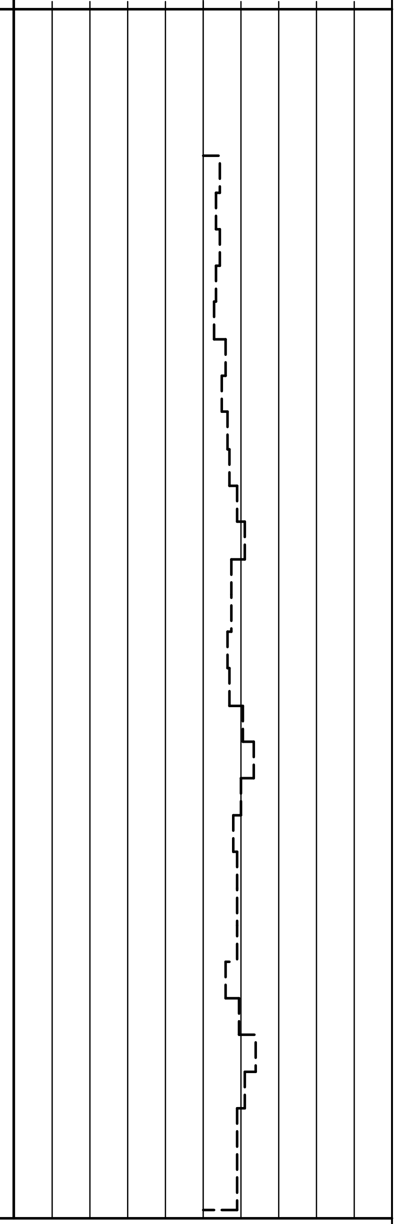
Start Date : 13 Aug 09
Finish Date: 14 Aug 09
Final Depth of Hole (m): : 16.3
Depth to Top of Rock (m) : 14.60
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details	SPT Blows per 150mm	SPT-T Friction (kPa)	DCT Blows per 300mm
0					SILTY SAND (SW-SM) Some fine to medium gravel, loose, max visible clast 20mm, subangular, brown, dry. [PLACER TAILINGS]				
1.5					CLAYEY GRAVEL (GP) Some sand, some silt, loose to compact, max visible clast 25mm, subrounded to subangular, brown, moist. [PLACER TAILINGS]				
4.5					SANDY GRAVEL (GP) Some silt, compact, max visible clast 40mm, subrounded to subangular, brown, wet. [PLACER TAILINGS] 4.9m - Water table encountered. Below 7.6m - Cobbly. 9.1m - Switch from fishtail bit to cutter, little return on auger stem.				
10									

Su - kPa: 40 80 120 160

VANE FIELD LAB
PEAK ◆ ■
REMOLD ◇ □
★ % Fines
Hydraulic Conductivity (m/sec) 10^{-8} 10^{-6} 10^{-4} 10^{-2}
Core Recovery 20 40 60 80

▲ UC/2
△ Pocket Pen /2
DCT (blows/300mm)
● SPT (blows/300mm)
Moisture Content & SPT N
W_p% W% W_L%
20 40 60 80



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Project: Eagle Gold, Site Facilites

DRILL HOLE # DH-BGC09-DG-2

Location : Dublin Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m) : 458,992.E, 7,100,880.N
Ground Elevation (m) : 828.0
Datum : UTM NAD 83
Dip (degrees from horizontal) :
Direction : n/a

Drill Designation : Pioneer 2
Drilling Contractor : Aggressive Drilling
Drill Method : Solid Stem Auger/HQ3
Core : HQ3
Fluid : polymer
Casing : **Cased To (m)** :

Start Date : 13 Aug 09
Finish Date: 14 Aug 09
Final Depth of Hole (m): : 16.3
Depth to Top of Rock (m) : 14.60
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details	SPT Blows per 150mm	SPT-T Friction (kPa)	DCT Blows per 300mm	Core Recovery (%)
10					10.0m to 14.10m - Poor recovery, cobbly.					
12.1					12.1m - Switch from solid stem augering to HQ3 diamond drilling.					
12.5					12.5m - Sandy, hole squeezing on drill pipes.					
14.60					Rock encountered at 14.60 m depth. See DH-BGC09-DG-2 rock log.					

Chart header: Su - kPa: 40, 80, 120, 160

Legend: VANE FIELD LAB; PEAK ◆ ■; REMOLD ◇ □; ★ % Fines; Hydraulic Conductivity (m/sec) 10^{-8} 10^{-6} 10^{-4} 10^{-2}; Core Recovery 20 40 60 80; ▲ UC/2; △ Pocket Pen /2; DCT (blows/300mm); ● SPT (blows/300mm); Moisture Content & SPT N: W_p% W% W_L% 20 40 60 80

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

Client: Victoria Gold

Project: Eagle Gold, Site Facilites

DRILL HOLE # DH-BGC09-DG-2

Location : Dublin Gulch

Project No. : 0792-002

Survey Method :Handheld GPS
Co-ordinates (m) : 458,992.E, 7,100,880.N
Ground Elevation (m) : 828.0
Datum : UTM NAD 83
Dip (degrees from horizontal) : -90
Direction :

Drill Designation : Pioneer 2
Drilling Contractor : Aggressive Drilling
Drill Method : Solid Stem Auger/HQ3
Core : HQ3
Fluid : polymer
Casing : **Cased To (m)** :

Start Date : 13 Aug 09
Finish Date: 14 Aug 09
Final Depth of Hole : 16.3
Depth to Top of Rock (m) : 14.60
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details	Hydraulic Conductivity m/sec (10^{-8}, 10^{-6}, 10^{-4}, 10^{-2}); Core Recovery %; RQD % (20, 40, 60, 80)	UCS - MPa (50, 100, 150, 200): Point Load, Triaxial; RMR (20, 40, 60, 80)
10–14.60					0 to 14.60 m - See DH-BGC09-DG-2 soil log.			
14.60–16.31					METASEDIMENTARY Grey, fine grained, phylitic, medium strong, slightly weathered, 3 joint sets plus random (predominant joints parallel to schistosity), trace clay infilling, joints planar and rough, typical joint spacing 2"-4", 1-3mm quartz veins.			
16.31					END OF HOLE @ 16.31m. NOTES: 1) Monitoring well installed by Stantec. 2) Dynamic cone pushed from 1.52m to 9.75m, DCPT bouncing at 9.75m.			

Depth scale: 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

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Client: Victoria Gold

Project: Eagle Gold, Site Facilites

DRILL HOLE # DH-BGC09-DG-3

Location : Dublin Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m) : 458,988.E, 7,100,919.N
Ground Elevation (m) : 844.0
Datum : UTM NAD 83
Dip (degrees from horizontal) :
Direction : n/a

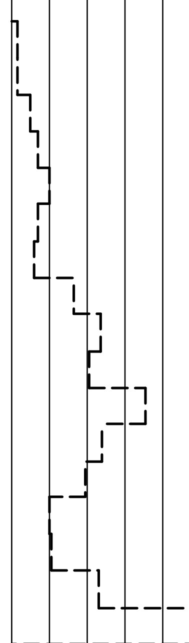
Drill Designation : Pioneer 2
Drilling Contractor : Aggressive Drilling
Drill Method : Solid Stem Auger/HQ3
Core : HQ3
Fluid : polymer
Casing : **Cased To (m)** :

Start Date : 11 Aug 09
Finish Date: 12 Aug 09
Final Depth of Hole (m): : 20.7
Depth to Top of Rock (m) : 12.10
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details	SPT Blows per 150mm	SPT-T Friction (kPa)	DCT Blows per 300mm
0					SAND and GRAVEL (SW/GW) Fine to coarse, trace silt, loose, max clast 5cm, angular, brown, moist, homogeneous. [PLACER TAILINGS]				
1					CLAYEY SILT (ML) Some fine sand, low plastic, firm, grey, moist, varved, low dry strength, rapid dilatancy. [PLACER TAILINGS - Settling Pond]				
2					SAND and GRAVEL (SW/GW) Fine to coarse, trace silt, compact, max clast 5cm, subrounded to angular, orangish-brown, moist, homogeneous.				
3					SILTY SAND and GRAVEL (SW/GW) Fine to coarse, trace clay, dense, max clast 10cm, subrounded to angular, tan, wet, homogeneous. [PLACER TAILINGS] 3.60m - Boulders, slow augering.				
5					GRAVEL, COBBLES and BOULDERS Silty, some sand, compact, wet, granodiorite and metasedimentary clasts. [PLACER TAILINGS] 7.60m - Switch from hollow stem auger to HQ3 coring.				
10									

Su - kPa: 40, 80, 120, 160

VANE FIELD LAB
PEAK ◆ ■
REMOLD ◇ □
★ % Fines
Hydraulic Conductivity (m/sec) 10^{-8} 10^{-6} 10^{-4} 10^{-2}
Core Recovery 20 40 60 80
▲ UC/2
△ Pocket Pen /2
DCT (blows/300mm)
● SPT (blows/300mm)
Moisture Content & SPT N
W_p% W% W_L%
20 40 60 80



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Survey Method : Handheld GPS	**Drill Designation** : Pioneer 2	**Start Date** : 11 Aug 09
Co-ordinates (m) : 458,988.E, 7,100,919.N	**Drilling Contractor** : Aggressive Drilling	**Finish Date**: 12 Aug 09
Ground Elevation (m) : 844.0	**Drill Method** : Solid Stem Auger/HQ3	**Final Depth of Hole (m):** : 20.7
Datum : UTM NAD 83	**Core** : HQ3	**Depth to Top of Rock (m)** : 12.10
Dip (degrees from horizontal) :	**Fluid** : polymer	**Logged by** : MRR
Direction : n/a	**Casing** : **Cased To (m)** :	**Reviewed by** : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details	SPT Blows per 150mm	SPT-T Friction (kPa)	DCT Blows per 300mm
10–12.10									
12.10					Rock encountered at 12.10 m depth. See DH-BGC09-DG-3 rock log.				

Depth scale: 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

Su - kPa: 40, 80, 120, 160

VANE / FIELD / LAB; PEAK ◆ ■; REMOLD ◇ □; ★ % Fines; Hydraulic Conductivity (m/sec) 10^{-8} 10^{-6} 10^{-4} 10^{-2}; Core Recovery 20 40 60 80

▲ UC/2; △ Pocket Pen /2; DCT (blows/300mm); ● SPT (blows/300mm); Moisture Content & SPT N; W_p% W% W_L%; 20 40 60 80

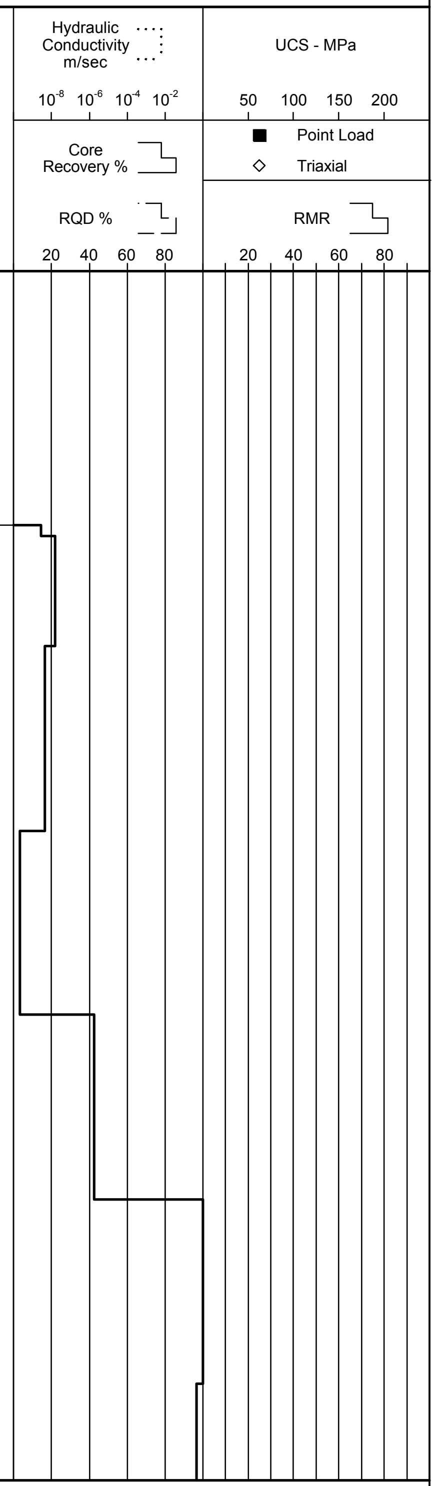
Location : Dublin Gulch | **Project No.** : 0792-002

Survey Method :Handheld GPS
Co-ordinates (m) : 458,988.E, 7,100,919.N
Ground Elevation (m) : 844.0
Datum : UTM NAD 83
Dip (degrees from horizontal) : -90
Direction :

Drill Designation : Pioneer 2
Drilling Contractor : Aggressive Drilling
Drill Method : Solid Stem Auger/HQ3
Core : HQ3
Fluid : polymer
Casing : **Cased To (m)** :

Start Date : 11 Aug 09
Finish Date: 12 Aug 09
Final Depth of Hole : 20.7
Depth to Top of Rock (m) : 12.10
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details
10–12.10					0 to 12.10 m - See DH-BGC09-DG-3 soil log.	
12.10–16.20					METASEDIMENTARY Grey, fine to coarse, brecciated, extremely to very weak, moderately to highly weathered, dense clay with angular coarse gravel sized clasts, broken rock to fault gouge. [FAULT]	
16.20–20					METASEDIMENTARY (Quartzite) Grey to pink, fine grained, phyllitic, very weak to weak, slightly to moderately weathered, three joint sets plus random, some sandy clay gouge, joints rough and planar, quartzite veins (1-3mm), texture is healed breccia to 19m.	



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BGC ENGINEERING INC.
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Client: Victoria Gold

Location : Dublin Gulch

Project No. : 0792-002

Survey Method :Handheld GPS
Co-ordinates (m) : 458,988.E, 7,100,919.N
Ground Elevation (m) : 844.0
Datum : UTM NAD 83
Dip (degrees from horizontal) : -90
Direction :

Drill Designation : Pioneer 2
Drilling Contractor : Aggressive Drilling
Drill Method : Solid Stem Auger/HQ3
Core : HQ3
Fluid : polymer
Casing : **Cased To (m)** :

Start Date : 11 Aug 09
Finish Date: 12 Aug 09
Final Depth of Hole : 20.7
Depth to Top of Rock (m) : 12.10
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details	Hydraulic Conductivity m/sec (10^{-8} 10^{-6} 10^{-4} 10^{-2}); Core Recovery %; RQD % (20 40 60 80)	UCS - MPa (50 100 150 200); Point Load; Triaxial; RMR (20 40 60 80)
20								
21					END OF HOLE @ 20.73m. NOTES: 1) Dynamic cone pushed from 1.22m to 6.10m, refusal on boulders. 2) Hole backfilled upon completion.			
22								
23								
24								
25								
26								
27								
28								
29								
30								

Survey Method : Handheld GPS
Co-ordinates (m) : 458,918.E, 7,100,426.N
Ground Elevation (m) : 878.0
Datum : UTM NAD 83
Dip (degrees from horizontal) : -90
Direction :

Drill Designation : Pioneer 2
Drilling Contractor : Aggressive Drilling
Drill Method : Solid Stem Auger
Core :
Fluid : polymer
Casing : **Cased To (m)** :

Start Date : 22 Aug 09
Finish Date: 22 Aug 09
Final Depth of Hole (m) : 19.8
Depth to Top of Rock (m) :
Logged by : MRR
Reviewed by : PQ

Legend: Su - kPa (40, 80, 120, 160); VANE FIELD LAB; PEAK ◆ ■; REMOLD ◇ □; ▲ UC/2; △ Pocket Pen /2; DCT (blows/300mm); ● SPT (blows/300mm); ★ % Fines; Core Recovery (20 40 60 80); Moisture Content & SPT N, W_P% W% W_L% (20 40 60 80)

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details	SPT Blows per 150mm	SPT-T Friction (kPa)	DCT Blows per 300mm
0					ORGANICS Peat, dark brown, silty, trace rootlets.				
					SILT (ML) Some gravel, some sand, firm, brown, rapid dilatancy, no visible ice, excess moisture when thawed, trace organics, partially FROZEN.				
1									
					SILTY GRAVEL (GM) Some sand, some clay, gap graded, compact, max visible clast 3cm. [COLLUVIUM]				
2									
3									
4									
					SAND and GRAVEL (SM/GM) Silty, cobbly, well graded, very dense, max visible clast 3cm, subrounded to subangular, tan, moist, no cementation. [COLLUVIUM]				
5									
6									
					CLAY and GRAVEL Some sand, some silt, fine to medium gravel (subangular to angular), very dense, max visible clast 5mm, brown, moist, homogeneous. [COLLUVIUM]				
7									
8									
9									
					CLAYEY GRAVEL (GC) Some silt, poorly graded, subangular to subrounded, fine to medium gravel, dense, max visible clast 2cm, light orangish-brown, moist, fine angular mica gravel.				
10									

(Continued on next page)

Survey Method : Handheld GPS
Co-ordinates (m) : 458,918.E, 7,100,426.N
Ground Elevation (m) : 878.0
Datum : UTM NAD 83
Dip (degrees from horizontal) : -90
Direction :

Drill Designation : Pioneer 2
Drilling Contractor : Aggressive Drilling
Drill Method : Solid Stem Auger
Core :
Fluid : polymer
Casing : **Cased To (m)** :

Start Date : 22 Aug 09
Finish Date: 22 Aug 09
Final Depth of Hole (m) : 19.8
Depth to Top of Rock (m) :
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details	SPT Blows per 150mm	SPT-T Friction (kPa)	DCT Blows per 300mm	Su - kPa (40, 80, 120, 160); VANE FIELD LAB; PEAK ◆ ■; REMOLD ◇ □; ★ % Fines; Core Recovery (20 40 60 80)	▲ UC/2; △ Pocket Pen /2; DCT (blows/300mm); ● SPT (blows/300mm); Moisture Content & SPT N: W_P% W% W_L% (20 40 60 80)
10 – 12.6											
12.6 – 15.6					SANDY CLAY (CL) Some silt, some fine gravel (angular), light brown, moist, hard, low plastic, low dry strength, homogeneous.						
15.6 – 19.81					SANDY CLAY (CL) Some fine to medium gravel (angular), low plastic, blueish-grey, moist, hard, no cementation, no dry strength, homogeneous. [TILL]						
19.81					END OF HOLE @ 19.81m. Maximum extent of available auger						

(Continued on next page)

Project: Eagle Gold, Site Facilites

DRILL HOLE # DH-BGC09-DG-7

Location : Dublin Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m) : 458,918.E, 7,100,426.N
Ground Elevation (m) : 878.0
Datum : UTM NAD 83
Dip (degrees from horizontal) : -90
Direction :

Drill Designation : Pioneer 2
Drilling Contractor : Aggressive Drilling
Drill Method : Solid Stem Auger
Core :
Fluid : polymer
Casing : **Cased To (m)** :

Start Date : 22 Aug 09
Finish Date: 22 Aug 09
Final Depth of Hole (m) : 19.8
Depth to Top of Rock (m) :
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details	SPT Blows per 150mm	SPT-T Friction (kPa)	DCT Blows per 300mm
20					rods. NOTES: 1) Dynamic cone test attempts at: 5.18m - refusal at 2"; 6.71m - @ 22ft - 1 blow, @ 23ft - refusal at 3"; 19.80m - 10 blows for 1"				
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

Su - kPa: 40 80 120 160

VANE	FIELD	LAB
PEAK	◆	■
REMOLD	◇	□

★ % Fines

Core Recovery: 20 40 60 80

▲ UC/2
△ Pocket Pen /2
DCT (blows/300mm)
● SPT (blows/300mm)

Moisture Content & SPT N
W_P% W% W_L%
20 40 60 80

BGC ENGINEERING INC.
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Client: Victoria Gold

Location : Stuttle Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m) : 459,098.E, 7,100,673.N
Ground Elevation (m) : 887.0
Datum : UTM NAD 83
Dip (degrees from horizontal) : -90
Direction :

Drill Designation : Pioneer 2
Drilling Contractor : Aggressive Drilling
Drill Method : Solid Stem Auger
Core :
Fluid : polymer
Casing : **Cased To (m)** :

Start Date : 18 Aug 09
Finish Date: 19 Aug 09
Final Depth of Hole (m) : 31.1
Depth to Top of Rock (m) :
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details	SPT Blows per 150mm	SPT-T Friction (kPa)	DCT Blows per 300mm	Su - kPa (40, 80, 120, 160); VANE FIELD/LAB: PEAK ◆ ■, REMOLD ◇ □; ★ % Fines; Core Recovery (20 40 60 80)	▲ UC/2; △ Pocket Pen /2; DCT (blows/300mm); ● SPT (blows/300mm); Moisture Content & SPT N: W_P% W% W_L% (20 40 60 80)
0					ORGANICS Peat, dark brown, rootlets.						
					SAND and GRAVEL (SM/GM) Some silt, trace cobbles, well graded, dense, subrounded to angular, max clast 40cm, orangish-brown, dry to moist, homogeneous. [COLLUVIUM] 0.80m - FROZEN: Vx, 1-5%. 1.60m - Stratified sand and gravel, subrounded, tan, some silt. FROZEN: Vx, 1%.						
3					SAND and GRAVEL (SW/GW) Fine to coarse, trace silt, well graded, dense, max visible clast 3cm, subrounded to subangular, brown, dry, homogeneous, partially FROZEN: Nbn. [COLLUVIUM] 4.57m - FROZEN: Nbn.						
6					SILTY SAND and GRAVEL (SW/GW) Fine to coarse sand, fine to medium gravel, some clay, well graded, dense, max visible clast 2cm, angular to subangular, brown, moist, homogeneous, FROZEN: Nbn. 9m - Subrounded to subangular, max clast 4cm.						
10											

(Continued on next page)

Survey Method : Handheld GPS
Co-ordinates (m) : 459,098.E, 7,100,673.N
Ground Elevation (m) : 887.0
Datum : UTM NAD 83
Dip (degrees from horizontal) : -90
Direction :

Drill Designation : Pioneer 2
Drilling Contractor : Aggressive Drilling
Drill Method : Solid Stem Auger
Core :
Fluid : polymer
Casing : **Cased To (m)** :

Start Date : 18 Aug 09
Finish Date: 19 Aug 09
Final Depth of Hole (m) : 31.1
Depth to Top of Rock (m) :
Logged by : MRR
Reviewed by : PQ

Su - kPa: 40, 80, 120, 160

VANE	FIELD	LAB
PEAK	◆	■
REMOLD	◇	□

★ % Fines

Core Recovery: 20 40 60 80

▲ UC/2
△ Pocket Pen /2
DCT (blows/300mm)
● SPT (blows/300mm)

Moisture Content & SPT N: W_P% W% W_L% — 20 40 60 80

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details	SPT Blows per 150mm	SPT-T Friction (kPa)	DCT Blows per 300mm
10–13.4									
13.4–15.2					SILT and GRAVEL (ML/GP) Sandy, trace clay, fine to medium gravel, gap graded, dense, max visible clast 3cm, subangular brown, moist, partially FROZEN. [COLLUVIUM]				
15.2–20					SILT and CLAY (ML/CL) Low plastic, some fine to coarse sand, trace fine to medium gravel, hard, greyish brown, moist, homogeneous, no cementation, low dry strength, no dilatancy. FROZEN: Nbn, trace Vx, 1%. 19.70m - Unfrozen.				

(Continued on next page)

Survey Method : Handheld GPS
Co-ordinates (m) : 459,098.E, 7,100,673.N
Ground Elevation (m) : 887.0
Datum : UTM NAD 83
Dip (degrees from horizontal) : -90
Direction :

Drill Designation : Pioneer 2
Drilling Contractor : Aggressive Drilling
Drill Method : Solid Stem Auger
Core :
Fluid : polymer
Casing : **Cased To (m)** :

Start Date : 18 Aug 09
Finish Date: 19 Aug 09
Final Depth of Hole (m) : 31.1
Depth to Top of Rock (m) :
Logged by : MRR
Reviewed by : PQ

Su - kPa: 40, 80, 120, 160

VANE FIELD LAB; PEAK ◆ ■; REMOLD ◇ □; ▲ UC/2; △ Pocket Pen /2; DCT (blows/300mm); ● SPT (blows/300mm); ★ % Fines; Core Recovery; Moisture Content & SPT N; W_P% W% W_L%; 20 40 60 80

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details	SPT Blows per 150mm	SPT-T Friction (kPa)	DCT Blows per 300mm
20									
21									
22									
23									
24									
25					25m to 26.5m - Boulders.				
26									
27					CLAYEY GRAVEL (GP) Some sand, trace silt, fine to coarse gravel, very dense, max visible clast 4cm, subangular to subrounded clasts (dark grey, green, pink) in brown matrix, moist, homogeneous, weak cementation. [TILL]				
28									
29									
30									

(Continued on next page)

Survey Method : Handheld GPS	**Drill Designation** : Pioneer 2	**Start Date** : 18 Aug 09
Co-ordinates (m) : 459,098.E, 7,100,673.N	**Drilling Contractor** : Aggressive Drilling	**Finish Date**: 19 Aug 09
Ground Elevation (m) : 887.0	**Drill Method** : Solid Stem Auger	**Final Depth of Hole (m)** : 31.1
Datum : UTM NAD 83	**Core** :	**Depth to Top of Rock (m)** :
Dip (degrees from horizontal) : -90	**Fluid** : polymer	**Logged by** : MRR
Direction :	**Casing** : **Cased To (m)** :	**Reviewed by** : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details	SPT Blows per 150mm	SPT-T Friction (kPa)	DCT Blows per 300mm
30									
31					END OF HOLE @ 31.09m. Rods snapped off, rods and core barrel stuck in hole.				
32					NOTES: 1) At 24 m - switch from solid stem auger drilling to HQ3 diamond drilling. Drilling hard, slow augering, little recovery from 19m to 24m. 2) Thermistor EBA 2194 installed, 10m string; beads at 0.5, 1.5, 2.5, 4.0, 7.0, 10.0. 3) DCPT unable to penetrate frozen ground. Attempted to push at 1.52m, 2.44m, 3.05m.				
33									
34									
35									
36									
37									
38									
39									
40									

Su - kPa: 40 80 120 160

VANE FIELD LAB; PEAK ◆ ■; REMOLD ◇ □; ★ % Fines; Core Recovery 20 40 60 80

▲ UC/2; △ Pocket Pen /2; DCT (blows/300mm); ● SPT (blows/300mm); Moisture Content & SPT N W_P% W% W_L% 20 40 60 80

Project: Eagle Gold, Site Facilites

DRILL HOLE # DH-BGC09-STU-4

Location : Stuttle Gulch

Project No. : 0792-002

Survey Method : Handheld GPS
Co-ordinates (m) : 459,057.E, 7,100,712.N
Ground Elevation (m) : 882.0
Datum : UTM NAD 83
Dip (degrees from horizontal) : N/A
Direction : N/A

Drill Designation : Pioneer 2
Drilling Contractor : Aggressive Drilling
Drill Method : Solid Stem Auger/HQ3
Core : N/A
Fluid : polymer
Casing : **Cased To (m)** :

Start Date : 20 Aug 09
Finish Date: 21 Aug 09
Final Depth of Hole (m) : 18.3
Depth to Top of Rock (m) :
Logged by : MRR
Reviewed by : PQ

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details	SPT Blows per 150mm	SPT-T Friction (kPa)	DCT Blows per 300mm
0					ORGANICS Peat, dark brown, rootlets.				
					SILTY SAND (SM) Gravelly, well graded, compact, max visible clast 4cm, subrounded, brown, homogeneous. FROZEN. [COLLUVIUM]				
1.5		S1			SILTY SAND and GRAVEL (SM/GW) Some clay, well graded, dense, max visible clast 3cm, subrounded, brown, homogeneous. FROZEN. [COLLUVIUM] 2.1m to 2.7m - Cobbly. From 3.5m - Boulders.				
7.6		S2			GRAVELLY CLAY (CL) Some sand, some silt, occasional boulders, low plastic, very stiff, grey, moist, homogeneous, no cementation, low dry strength, non dilatant, gravel clasts, fine to coarse (subangular to angular). [TILL]				
10									

Su - kPa: 40, 80, 120, 160

VANE: FIELD / LAB; PEAK ◆ ■; REMOLD ◇ □; ★ % Fines; Core Recovery

▲ UC/2; △ Pocket Pen /2; DCT (blows/300mm); ● SPT (blows/300mm)

Moisture Content & SPT N: W_P% W% W_L%; 20 40 60 80

(Continued on next page)

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Client: Victoria Gold

Survey Method : Handheld GPS	**Drill Designation** : Pioneer 2	**Start Date** : 20 Aug 09
Co-ordinates (m) : 459,057.E, 7,100,712.N	**Drilling Contractor** : Aggressive Drilling	**Finish Date**: 21 Aug 09
Ground Elevation (m) : 882.0	**Drill Method** : Solid Stem Auger/HQ3	**Final Depth of Hole (m)** : 18.3
Datum : UTM NAD 83	**Core** : N/A	**Depth to Top of Rock (m)** :
Dip (degrees from horizontal) : N/A	**Fluid** : polymer	**Logged by** : MRR
Direction : N/A	**Casing** : **Cased To (m)** :	**Reviewed by** : PQ

Su - kPa: 40, 80, 120, 160

VANE / FIELD / LAB: PEAK ◆ ■; REMOLD ◇ □; ★ % Fines; Core Recovery (20 40 60 80)

▲ UC/2; △ Pocket Pen /2; DCT (blows/300mm); ● SPT (blows/300mm)

Moisture Content & SPT N: W_P% W% W_L% (20 40 60 80)

Depth (m)	Sample Type	Sample No.	Weathering Grade	Symbol	Lithologic Description	Instrument Details	SPT Blows per 150mm	SPT-T Friction (kPa)	DCT Blows per 300mm
10									
					From 10.6m - Boulders.				
11									
12									
13									
14									
15		S3							
16									
17									
18									
					END OF HOLE @ 18.29m. Auger rig only has 60 ft of rods at present time. NOTES: 1) Thermistor EBA 2193; 10m string, beads at 0.5, 1.5, 2.5, 4.0, 7.0, 10.0m. 2) DCPT hit refusal at boulders at 1.52m, 3.10m, 6.10m, 10.6m.				
19									
20									

APPENDIX D
THERMISTOR DATA

Appendix D - Thermistor Readings

Thermistors were installed temporarily in standpipes in several test pits to obtain instantaneous temperature readings, and permanently installed in three boreholes to allow readings to be made over time. The temperature measurements are summarized in Tables D-1 and D-2 below. The resistance-temperature conversion chart is presented as Figure D-1. Calibration results, and appropriate temperature adjustment factors, are attached.

Table D-1. Temperature Measurements in Test Pits.

Test Pit	Date	Depth (m)	Temperature (^{o}C)
TP-BGC09-HL4-1	15-Aug-09	1.9	-0.1
TP-BGC09-HL4-2	16-Aug-09	2.3	-0.1
TP-BGC09-HL4-12	13-Aug-09	1.9	0
TP-BGC09-HL4-14	13-Aug-09	1.9	0
TP-BGC09-HL4-17	13-Aug-09	1.6	0
TP-BGC09-HL6-10	12-Aug-09	4.8	0
TP-BGC09-HL4-11	21-Aug-09	1.5	-0.1
TP-BGC09-HL4-8	17-Aug-09	2.2	0
TP-BGC09-WR-8	17-Aug-09	3.5	0.2
TP-BGC09-HL4-7	17-Aug-09	2.75	0

Table D-2. Temperature Measurements in Boreholes.

Borehole	Date	Temperature (^{o}C) at Depth					
		0.5 m	1.5 m	2.5 m	4.0 m	7.0 m	10.0 m
DH-BGC09-AG-3	25-Aug-09	3	0	0.3	1	1.6	1.4
	15-Sep-09	--	--	--	--	--	0.7
	12-Oct-09						0.7
DH-BGC09-STU-3	24-Aug-09	2.3	0.1	-0.1	0	-0.3	0.2
	15-Sep-09	2.2	-0.2	-0.3	-0.4	-0.4	-0.3
	12-Oct-09	-1	-0.1	-0.3	-0.4	-0.4	-0.3
DH-BGC09-STU-4	24-Aug-09	2.2	0.2	0.1	0	0	0
	15-Sep-09	2.5	0	-0.1	-0.1	0	0
	12-Oct-09	-0.4	0	-0.2	-0.2	-0.1	-0.2

Figure D-1. Thermistor Temperature-Resistance Curve.

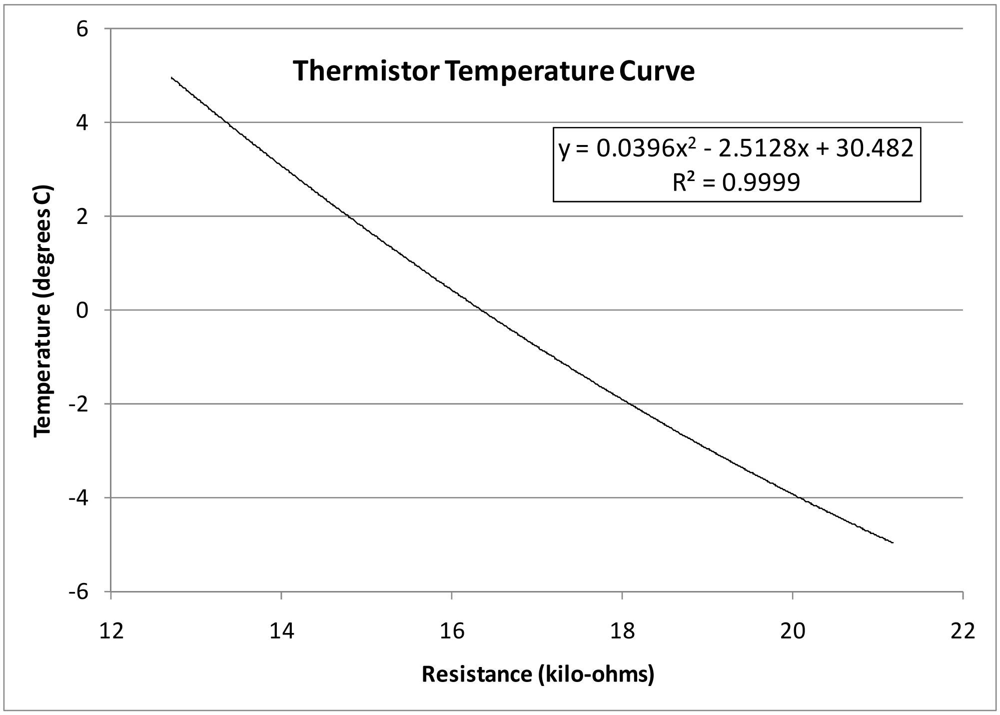


Figure D-2. Thermistor Temperature-Depth Curve DH-BGC09-STU-3.

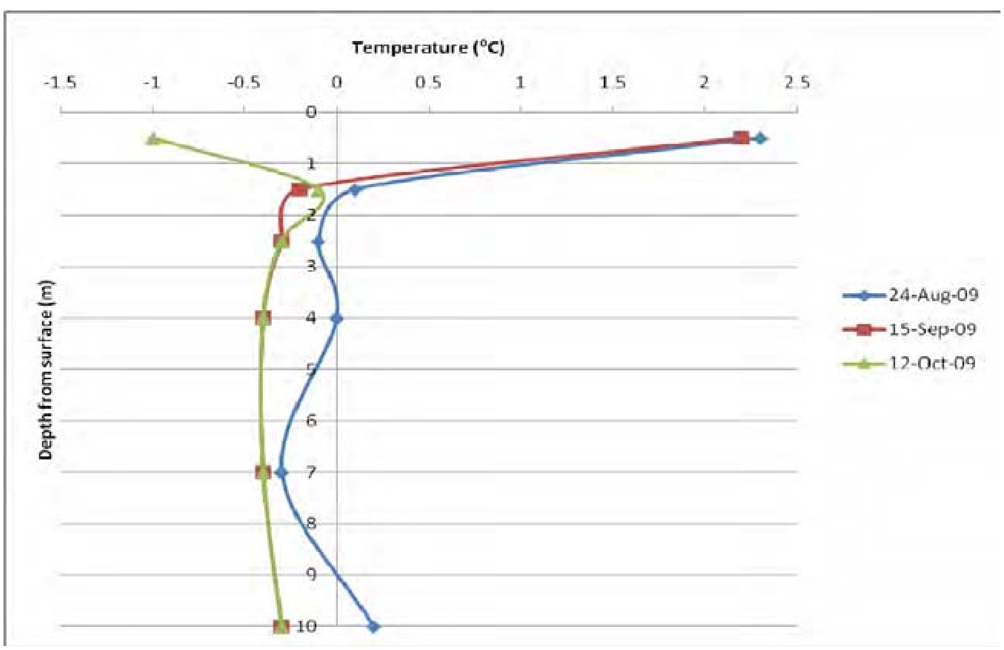
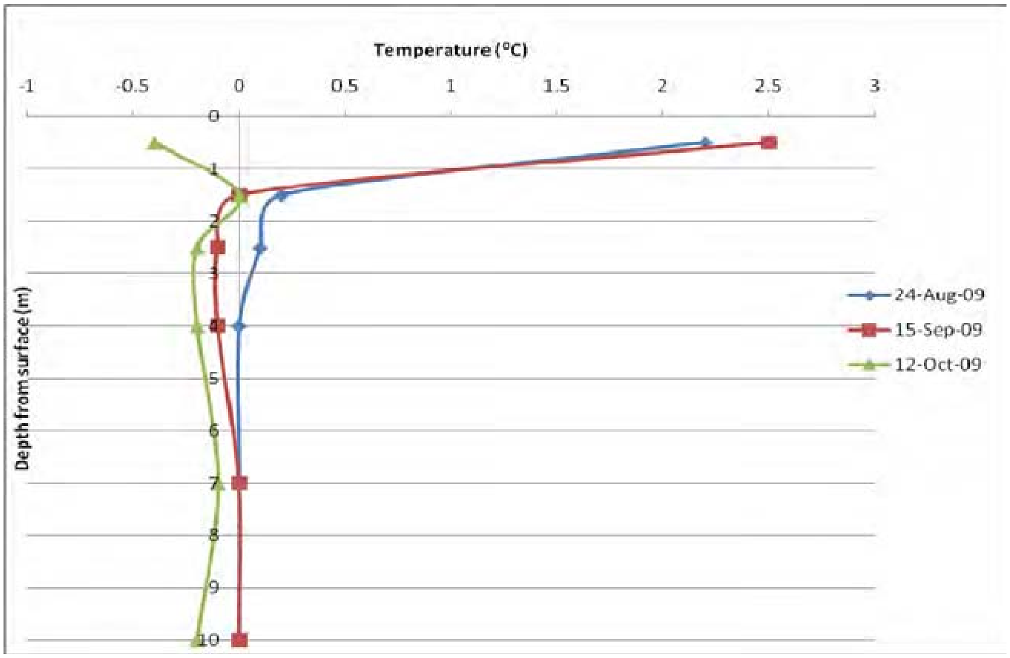


Figure D-3. Thermistor Temperature-Depth Curve DH-BGC09-STU-4.



EBA Engineering Consultants Ltd.

THERMISTOR STRING CALIBRATION

Project: Cable Fabrication
Client: BGC
Date: 09-07-21
Job No.: E12101148

EBA Thermistor String #: 2192
Client String number:
Location of Installation:
Calibration Temperature: 0.02

	Depth of Thermistor ☐ feet ■ meters	Color of Wire	Plug Letter	Calibration Resistance (Kilo-Ohms) Trial 1	Trial 2	Trial 3	Temperature (deg C)	Calibration Factor (add deg C)
1	0.5	Black	A	16.30	16.30	16.30	0.03	-0.01
2	1.5	Purple	B	16.32	16.32	16.32	0.00	0.02
3	2.5	Tan	C	16.32	16.32	16.32	0.00	0.02
4	4.0	Grey	D	16.39	16.39	16.39	-0.08	0.10
5	7.0	Red	E	16.30	16.30	16.30	0.03	-0.01
6	10.0	Brown	F	16.29	16.29	16.29	0.04	-0.02
7		Pink	G					
8		Blue	H					
9		Green	J					
10		Yellow	K					
11		Silver	L					
12		Orange	N					
13		Orange/Wh	P					
14		Black/Wh	R					
15		Brown/Wh	S					
16		Red/Wh	T					
	Common	White	M					

Lead Length: **2m**

Date Shipped:
Carrier:
W/B Number

eba

EBA Engineering Consultants Ltd.

THERMISTOR STRING CALIBRATION

Project: Cable Fabrication
Client: BGC
Date: 09-07-21
Job No.: E12101148

EBA Thermistor String #: 2193
Client String number:
Location of Installation:
Calibration Temperature: 0.02

	Depth of Thermistor ☐ feet ■ meters	Color of Wire	Plug Letter	Calibration Resistance (Kilo-Ohms) Trial 1	Trial 2	Trial 3	Temperature (deg C)	Calibration Factor (add deg C)
1	0.5	Black	A	16.39	16.39	16.39	-0.08	0.10
2	1.5	Purple	B	16.31	16.31	16.31	0.02	0.00
3	2.5	Tan	C	16.33	16.33	16.33	-0.01	0.03
4	4.0	Grey	D	16.30	16.30	16.30	0.03	-0.01
5	7.0	Red	E	16.29	16.29	16.29	0.04	-0.02
6	10.0	Brown	F	16.32	16.32	16.32	0.00	0.02
7		Pink	G					
8		Blue	H					
9		Green	J					
10		Yellow	K					
11		Silver	L					
12		Orange	N					
13		Orange/Wh	P					
14		Black/Wh	R					
15		Brown/Wh	S					
16		Red/Wh	T					
	Common	White	M					

Lead Length: **2m**

Date Shipped:
Carrier:
W/B Number

eba

EBA Engineering Consultants Ltd.

THERMISTOR STRING CALIBRATION

Project: Cable Fabrication
Client: BGC
Date: 09-07-21
Job No.: E12101148

EBA Thermistor String #: 2194
Client String number:
Location of Installation:
Calibration Temperature: 0.02

	Depth of Thermistor ☐ feet ■ meters	Color of Wire	Plug Letter	Calibration Resistance (Kilo-Ohms)			Temperature (deg C)	Calibration Factor (add deg C)
				Trial 1	Trial 2	Trial 3		
1	0.5	Black	A	16.31	16.31	16.31	0.02	0.00
2	1.5	Purple	B	16.31	16.31	16.31	0.02	0.00
3	2.5	Tan	C	16.33	16.33	16.33	-0.01	0.03
4	4.0	Grey	D	16.29	16.29	16.29	0.04	-0.02
5	7.0	Red	E	16.31	16.32	16.32	0.00	0.02
6	10.0	Brown	F	16.32	16.33	16.33	-0.01	0.03
7		Pink	G					
8		Blue	H					
9		Green	J					
10		Yellow	K					
11		Silver	L					
12		Orange	N					
13		Orange/Wh	P					
14		Black/Wh	R					
15		Brown/Wh	S					
16		Red/Wh	T					
	Common	White	M					

Lead Length: **2m**

Date Shipped:
Carrier:
W/B Number

eba

APPENDIX E

PHOTOGRAPHS

ANN GULCH

TP-BGC09-HL1-1

TP-BGC09-HL1-1

TP-BGC09-HL1-2

TP-BGC09-HL1-2

TP-BGC09-HL6-1

TP-BGC09-HL6-1

TP-BGC09-HL6-2

TP-BGC09-HL6-2

TP-BGC09-HL6-3

TP-BGC09-HL6-3

TP-BGC09-HL6-4

TP-BGC09-HL6-4

TP-BGC09-HL6-5

TP-BGC09-HL6-5

TP-BGC09-HL6-6

TP-BGC09-HL6-6

TP-BGC09-HL6-7

TP-BGC09-HL6-7

TP-BGC09-HL6-8

TP-BGC09-HL6-8

TP-BGC09-HL6-9

TP-BGC09-HL6-9

TP-BGC09-HL6-10

TP-BGC09-HL6-10

TP-BGC09-HL6-11

TP-BGC09-HL6-11

TP-BGC09-HL6-12

TP-BGC09-HL6-12

TP-BGC09-HL6-13

TP-BGC09-HL6-13

TP-BGC09-HL6-14

TP-BGC09-HL6-14

TP-BGC09-HL6-15

TP-BGC09-HL6-15

TP-BGC09-HL6-16

TP-BGC09-HL6-16

TP-BGC09-HL6-17

TP-BGC09-HL6-17

DH-BGC09-AG-3

DH-BGC09-AG-3

EAGLE PUP

TP-BGC09-WR-1

TP-BGC09-WR-1

TP-BGC09-WR-2

TP-BGC09-WR-2

TP-BGC09-WR-3

TP-BGC09-WR-3

TP-BGC09-WR-4

TP-BGC09-WR-4

TP-BGC09-WR-5

TP-BGC09-WR-5

TP-BGC09-WR-6

TP-BGC09-WR-6

TP-BGC09-WR-7

TP-BGC09-WR-7

TP-BGC09-WR-8

TP-BGC09-WR-8

TP-BGC09-WR-9

TP-BGC09-WR-9

LOWER REACH
DUBLIN GULCH

TP-BGC09-DG-1

TP-BGC09-DG-1

TP-BGC09-DG-3

TP-BGC09-DG-3

TP-BGC09-DG-4

TP-BGC09-DG-4

TP-BGC09-HL4-10

TP-BGC09-HL4-10

DH-BGC09-DG-1

DH-BGC09-DG-1

DH-BGC09-DG-2

DH-BGC09-DG-2

DH-BGC09-DG-3

DH-BGC09-DG-3

OLIVE GULCH

TP-BGC09-HL5-1

TP-BGC09-HL5-1

TP-BGC09-HL5-2

TP-BGC09-HL5-2

TP-BGC09-HL5-3

TP-BGC09-HL5-3

TP-BGC09-HL5-4

TP-BGC09-HL5-4

TP-BGC09-HL5-5

TP-BGC09-HL5-5

TP-BGC09-HL5-6

TP-BGC09-HL5-6

TP-BGC09-HL5-7

TP-BGC09-HL5-7

TP-BGC09-HL5-8

TP-BGC09-HL5-8

TP-BGC09-HL5-9

TP-BGC09-HL5-9

TP-BGC09-HL5-10

TP-BGC09-HL5-10

STUTTLE GULCH

TP-BGC09-HL4-1

TP-BGC09-HL4-1

TP-BGC09-HL4-2

TP-BGC09-HL4-3

TP-BGC09-HL4-4

TP-BGC09-HL4-5

TP-BGC09-HL4-5

TP-BGC09-HL4-6

TP-BGC09-HL7

TP-BGC09-HL4-8

TP-BGC09-HL4-9

TP-BGC09-HL4-13

TP-BGC09-HL4-14

TP-BGC09-HL4-14

TP-BGC09-HL5-15

TP-BGC09-STU-3

TP-BGC09-STU-4

DH-BGC09-STU-3

DH-BGC09-STU-3

DH-BGC09-STU-4

WEST HAGGART CREEK

TP-BGC09-HL4-11

TP-BGC09-HL4-11

TP-BGC09-HL4-12

TP-BGC09-HL4-12

TP-BGC09-HL4-16

TP-BGC09-HL4-16

TP-BGC09-HL4-17

TP-BGC09-HL4-17

TP-BGC09-HL4-18

TP-BGC09-HL4-18

DH-BGC09-DG-7

DH-BGC09-DG-7 Grab sample from 20ft deep.