BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

NEW GOLD INC.

NEW AFTON DAM BREAK

INUNDATION ASSESSMENT

FINAL

PROJECT NO.:	0921015		
DATE:	November 28, 2014	RECIPIENT:	2 copies
		BGC:	2 copies

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November 28, 2014
Project No.: 0921015

Mr. Scott Davidson
New Gold Inc.
New Afton Mine
Box 948 Stn. Main
Kamloops, BC, V2C 5N4

Dear Mr. Davidson,

Re: New Afton Dam Break Inundation Assessment – Final Report

Please find enclosed under cover of this letter two (2) copies of our aforementioned final report for your review and comment. The dam breach and inundation study is a requirement pursuant to the Chief Inspector of Mines' Order Dated August 18, 2014.

Yours sincerely,

BGC ENGINEERING INC.
per:

ISSUED AS DIGITAL DOCUMENT.
SIGNED AND SEALED HARDCOPY ON
FILE WITH BGC ENGINEERING INC.

Clint Logue, P.Eng., P.Geo.
Senior Geotechnical Engineer and
Project Manager

EXECUTIVE SUMMARY

BGC Engineering (BGC) was retained by New Gold Inc. (New Gold) to perform a tailings dam breach and inundation study for New Gold's New Afton Project (New Afton). The New Afton Copper Gold Project is located approximately 350 km northeast of Vancouver and approximately 10 km west of Kamloops, in the Thompson-Nicola Region of the South-Central Interior of British Columbia. Tailings from the New Afton mine comprise milled rock mixed with water. The primary cyclone overflow (O/F) sand and secondary cyclone O/F sand from the mill are deposited into the Tailings Storage Facility (TSF) basin or Pothook Pit. Secondary cyclone underflow (U/F) sand is used for dam construction.

The New Afton TSF utilizes five dams and natural topography for containment of the tailings. The five dams are labeled as: Dam A; Dam B; Dam C; South Dam; and West Dam. The Canadian Dam Association (CDA) published dam safety guidelines (CDA, 2007, revised 2013) and a technical bulletin: Application of Dam safety guidelines to Mining Dams (CDA, 2014) which recommend dam breach and inundation studies for all water and tailings dams. CDA (2007) also provides a scheme for classification of dams based on the consequences of failure. BGC's 2014 report, New Afton 2014 Tailings Storage Facility Design, assigns the dams a consequence classification of Very High (BGC Engineering Inc., 2014a) based on the CDA (2007) guidelines. The design criteria adopted for all of the dams are consistent with a Very High consequence classification, and the dams will be constructed and operated accordingly.

This report presents the dam breach and inundation study for all five dams at their ultimate permitted elevation of 765 masl. The dam breach and inundation analyses completed for the five dams are based on hypothetical modes of failure under extreme and highly unlikely conditions and, as such, the results of the analyses presented herein in no way reflect upon the structural integrity or safety of the dams.

This study was undertaken to inform emergency preparedness and response plan (EPRP) development. The results of the dam breach and inundation modelling validate the previously established Very High consequence classification and design criteria, and therefore have no design implications.

The results of the dam breach and inundation analyses are generally used for two purposes:

1. To establish the failure consequence classification of the dams.
2. To develop an EPRP, which would be activated in the event of an emergency at the dams.

To inform emergency preparedness and response planning, dam breach and inundation studies estimate the following key outputs:

- Potential inundation area
- Maximum flood flow depth

- Arrival time of the outbreak flow front
- Arrival time of the peak flow.

Dam breach and inundation analyses of the five TSF dams at New Afton indicated that the majority of breached water and tailings were retained on site through storage in existing mining features. Under PMF conditions, some tailings and water overtopped the Old Afton TSF and flowed through Cherry Creek into Kamloops Lake. In addition, a hypothetical breach of the South Dam indicated that water and tailings overtopped the Trans-Canada Highway and discharged into Kamloops Lake through the Mission Flats Waste Water Treatment Plant.

Based on the information provided by this study, New Gold is considering additional works for containing dam breach flows as a means of further risk reduction by reducing the consequences of a hypothetical failure. Containment options could include increasing the capacity of the Old Afton TSF spillway to prevent overtopping of the Old Afton TSF West Dam, and the combination of construction training berms and flow channels along the breach flow paths directing all breach flow to the Afton Open Pit. These measures would also reduce the potential for inundating the Mill and Administrative areas as well as the inundation of the TransCanada highway and flows to Kamloops Lake.

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LIMITATIONS

BGC Engineering Inc. (BGC) prepared this document for the account of New Gold Inc. 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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1.0 INTRODUCTION

1.1. Introduction

BGC Engineering (BGC) was retained by New Gold Inc. (New Gold) to perform a tailings dam breach and inundation study for New Gold's New Afton Project (New Afton). The New Afton Copper Gold Project is located approximately 350 km northeast of Vancouver and approximately 10 km west of Kamloops, in the Thompson-Nicola Region of the South-Central Interior of British Columbia. The New Afton mine produces copper and gold through a hard rock mining process which involves the grinding of the mined rock into fine particles, sand size and smaller, such that copper and gold concentrate can be extracted via a conventional flotation process. Tailings from the concentrator are pumped to cyclones with the primary cyclone overflow (O/F) sand and the secondary cyclone O/F sand deposited in the Tailings Storage Facility (TSF) basin or Pothook Pit. The secondary cyclone underflow (U/F) sand is used for dam construction.

1.2. Dam Safety Guidelines

The Canadian Dam Association (CDA) has published dam safety guidelines (CDA, 2007, revised 2013) informing design, operation, maintenance, and overall stewardship of water and tailings dams in Canada. Included in these guidelines is a recommendation to complete periodic dam breach and inundation studies. These studies model potential consequences of hypothetical dam failures on areas downstream of the dam. The consequences are evaluated in terms of incremental impacts, which are defined in the CDA guidelines as the damage above and beyond the damage that would have occurred in the same conditions had a breach of the dam not occurred. The consequences of failure are divided into three categories: loss of life; loss of environmental and cultural values; and infrastructure and economic losses.

The CDA guidelines specify five dam consequence classifications: Low, Significant, High, Very High and Extreme. The Low classification is assigned to dams which would result in minimal consequences from the breach of the dam. The Extreme classification is assigned to dams which would result in very severe consequences from the dam breach.

The results of the dam breach and inundation analyses are used for two purposes:

1. To establish the failure consequence classification of the dam.
2. To develop emergency preparedness and response plans (EPRP), which would be activated in the event of an incident at the dam.

This study was undertaken only to inform EPRP development, as the consequence classifications of the dams have been established previously during the design stage of the project. The design criteria adopted for all of the dams are consistent with a Very High consequence classification, and the dams will be constructed and operated accordingly. The results of the dam breach and inundation modelling therefore inform the EPRP, but merely reaffirm the suitability of design criteria already in place.

1.3. Objectives and Scope

This report presents a dam breach and inundation study for all five dams at New Afton based on their final permitted configurations and heights. The study models hypothetical breaches of each of the dams, and the potential downstream consequences for the purpose of informing the emergency preparedness and response plan (EPRP) for the New Afton mine. Given that purpose, analyses used to simulate downstream consequences are by design conservative so that response and evacuation plans derived on the basis of these analyses are judged to err on the side of caution. The dam breach and inundation analyses completed for the five dams are based on hypothetical modes of failure under extreme and highly unlikely conditions and, as such, the results of the analyses presented herein in no way reflect upon the structural integrity or safety of the dams.

To inform emergency preparedness and response planning, dam breach and inundation studies estimate the following key outputs:

- Potential inundation area
- Maximum flood flow depth along the outflow path
- Arrival time of the flow front along the outflow path
- Arrival time of the peak flow along the outflow path
- Incremental difference in water level between dam breach events and Probable Maximum Flood (PMF) conditions (rainy day scenario) and Mean Average Flow (MAF) conditions (sunny day scenario).

The report only addresses the potential inundation extent in the event of a hypothetical breach of the individual dams under ultimate permitted TSF design conditions. It does not attempt to quantify the consequences to facilities, calculate economic losses, address potential loss of life within the inundation area, or suggest potential risk management strategies. The results of the analyses documented herein are intended to inform such assessments that form part of emergency preparedness and response planning, which represents the next step upon completion of these analyses.

1.4. Report outline

This report details the project setting (Section 2), breach modeling framework (Section 3), assessment methodology (Section 4), assessment results (Section 5), and discussion and conclusions (Section 6). Additional supporting information, such as design drawings, inundation maps, depth maps and numerical modeling details are provided in appendices at the end of the report.

2.0 PROJECT SETTING

The New Afton Copper Gold Project is located approximately 350 km northeast of Vancouver and approximately 10 km west of Kamloops, in the Thompson-Nicola Region of the South-Central Interior of British Columbia. The property is situated southwest of the junction of the Trans-Canada Highway and the Coquihalla Highway (Highway No. 3). Mine site access is located just south of the Trans-Canada Highway.

Mine tailings (from the block cave operation) are contained within the TSF, which consists of five (5) distinct dams: Dam A, Dam B, Dam C, South Dam, and West Dam. At the ultimate dam crest elevation of 765 masl, Dams A, B and C merge into a single dam approximately 2 km in length. Other site infrastructure includes the mill facilities (Mill) and administration buildings (Administration). Also located on site are historic mining facilities, which include the Afton Pit, Pothook Pit and closed Old Afton Tailings Storage Facility (Old Afton TSF). The Old Afton TSF discharges through a spillway designed to pass the PMF to the Afton Pit. The Old Afton TSF is currently owned by KGHM International Ltd.

The northern portion of the mine site is separated by the Trans-Canada Highway from an Unnamed Creek which drains to the northeast before discharging to Kamloops Lake.

This extent of this assessment covers the New Afton site, the surrounding mining facilities and the drainage pathways along Cherry Creek and Unnamed Creek to Kamloops Lake/Thompson River. This extent covers the range of inundation where a dam breach may cause damage above and beyond the damage that would have occurred under the same conditions had a breach of the dam not occurred.

The current and historic mining facilities and study extent are depicted in Drawing 01.

2.1. TSF Dams

The dam breach and inundation study is based upon the projected final configuration of the New Afton TSF. Conditions at the end of mine life assume 23.6 million cubic meters (Mm^3) of deposited tailings and a nominal pond volume at closure of 0.5 Mm^3 at an elevation of 763.4 masl, providing 1.6 m of freeboard to the final dam crests. Additional specific details of the dams are provided below. Technical details about dam materials, required as input to the breach analyses, are summarized in Appendix A.

2.1.1. Dams A and B

The New Afton TSF is contained to the west by Dams A and B. These dams have 3H:1V downstream slopes. The upstream and downstream dam shell of both dams is constructed of cyclone sand. While Dams A and B are connected at the ultimate crest elevation (765 masl), they are separated by a topographic high buried within the dam. Starter Dam A was approximately 240 m in length and Starter Dam B was approximately 320 m in length.

Dam A has a compacted glacial till core constructed of borrow material for its entire length. Downstream of the till core is a fine filter chimney drain which connects into a fine and coarse blanket filter. The core and filter are supported by hydraulically placed and compacted cyclone sand shells.

Dam B comprises a compacted till section faced with smooth 60 mil (1.5 mm) linear low density polyethylene (LLDPE). The northeast half of the dam is founded on waste rock and the southwest is founded on native till. The liner is embedded in the central till core. Downstream of the till core is a fine filter chimney drain which connects into a fine and coarse blanket drain. The core and filter are supported by hydraulically placed and compacted cyclone sand shells.

Both dams are currently being raised to an elevation of 741 masl. Details of Dams A and B are shown on Drawings NA-XD-03-14 to -03-17, which are appended to this report.

2.1.2. Dam C

The New Afton TSF is contained to the north by Dam C. This dam has a 3H:1V downstream slope. The Dam C starter dam comprises a smooth 60-mil (1.5 mm) LLDPE fully lined, compacted till starter dam founded entirely on waste rock. The LLDPE liner will be continued above the starter dam crest by raising the dam using centerline construction. The liner will be embedded in the upstream cyclone sand cells. Downstream of the liner is a vertical fine filter chimney drain which extends down the starter dam slope into a horizontal fine and coarse blanket drain. Dam C abuts Dam B on the west side and a topographic high to the east.

The Starter Dam C was 860 m in length and is currently being raised to a crest elevation of 741 masl. Details of Dam C are shown on Drawings NA-XD-03-13, and -03-17, which are appended to this report.

2.1.3. South and West Dams

The New Afton TSF is contained to the south and southeast by the West Dam and South Dam, respectively. The South and West Dams have been built to their ultimate containment elevation of 765 masl and no further construction is planned. The South and West Dams include a central compacted till core separated with filters and core trench constructed into till foundations, with waste rock shells. The waste rock shells were constructed with 2H:1V upstream and 3H:1V downstream slopes and a maximum height of 20 m and 23 m, respectively. The South Dam is 200 m long and the West Dam is 280 m long. Containment is also provided by a topographic high between these dams. Additional details of the South and West Dams are provided in Vector (2008).

2.2. Onsite Infrastructure

2.2.1. Old Afton TSF

The Old Afton TSF was constructed approximately 1 km southwest of the Afton Pit, and consists of two rockfill dams (East and West Dams), a spillway, two seepage collection dams, and diversion ditches. The East and West Starter Dams were constructed between 1976 and 1977 with nominal raises completed between 1978 and 1996 (BGC, 2009). The facility was subsequently closed in 1997. The tailings were deposited from the dam crests and from the north portion of the basin, with the pond located toward the southern end of the basin. The Old Afton TSF was built in the drainage of Alkali Creek, tributary of Cherry Creek with a 50 km^2 drainage area. Alkali Creek flows are currently diverted around the south side of the TSF. This diversion channel discharges at the base of the dam within the original drainage course.

2.2.1.1. Old Afton Spillway

The Old Afton TSF Spillway is located in the middle of the north portion of the East Dam. The spillway width is approximately 50 m at an elevation ranging between 703.9 and 704.3 m with a gradient of 3%, and a design flow depth of 0.9 m (Klohn-Crippen, 1997). The spillway was designed to discharge PMF flows for the Alkali Creek Catchment towards the Afton Open Pit.

2.2.1.2. Old Afton East and West Dams

The East and West Starter Dams were constructed to a crest elevation of 664.5 masl (20 m height) (BGC, 2004). The dams have a rockfill shell, which is approximately 4 m wide at the final crest elevation. The final crest widths are approximately 119 m and 110 m, respectively for the West and East Dams. With the current configuration as described above, the Old Afton TSF has a water storage capacity of 3.1 Mm^3 prior to discharging via the spillway, and a capacity of 4.2 Mm^3 prior to overtopping, assuming the spillway is blocked to the dam crest elevation.

2.2.2. Open Pit, Mill Site and Administrative Buildings

The Afton Open Pit was in operation between 1977 and 1997. Waste rock from the mining activities of the open pit was used in the construction of the East and West Dams, while the remaining waste rock was deposited and compacted in random waste dumps to the east and north of the East Dam (Scott Wilson RPA, 2009). The base elevation of the open pit is 453 masl, and the capacity of the pit is 53.7 Mm^3.

The New Afton Mill is located to the west of the open pit, with administrative buildings located to the east. Underground mining of the New Afton block cave began in June 2012.

2.2.3. Pothook Pit Dam and Spillway

Pothook Pit and Pothook Dam is a tailings containment area located to the northeast of the New Afton TSF. The Pothook Pit Dam comprises a rockfill dam with a central compacted till core separated with filters. The dam was built into the containment provided by the small satellite pit of Pothook and was constructed between October 8 and December 6, 2008 to an ultimate containment elevation of 730 masl. A smooth 60-mil (1.5 mm) LLDPE liner was installed on the upstream face of the dam in 2011. The Pothook Pit Dam is 430 m long, and containment to the east and south is provided by natural topography.

2.3. Offsite Features

2.3.1. Cherry Creek

Cherry Creek is located to the west of New Afton and has a catchment area of approximately 160 km^2 at its mouth where it discharges into Kamloops Lake. Alkali Creek is the major tributary of Cherry Creek and as discussed, the Old Afton TSF was built across this watercourse. For this study, it is assumed that the channel diversion around the Old Afton TSF is not operable during a PMF event.

Downstream of the project, there are a number of residences along Cherry Creek. Immediately below the Old Afton TSF Dam there is a trailer park, while further downstream there are intermittent residences which are typically associated with agricultural use. Cherry Creek is confined along most of its route with an occasional floodplain up to several hundred meters wide. Near Kamloops Lake, Cherry Creek crosses the Trans-Canada Highway and the CP Rail line (Drawing 01).

2.3.2. Unnamed Creek

Northeast of the site, Unnamed Creek descends northeast through a confined gully towards Kamloops Lake. An active channel is not defined in the upper portions of the gully, but some channel definition exists at lower reaches. Near its outlet, Unnamed Creek crosses Mission Flats Road, the CP Railway, and into the Kamloops Wastewater Treatment Plant on the shore of Kamloops Lake. The total catchment area of Unnamed Creek is approximately 5 km^2.

3.0 BREACH MODELLING FRAMEWORK

3.1. CDA Guidelines

The New Afton TSF dams are designed in accordance with the CDA (2007, revised 2013) guidelines. The guidelines are based on a risk-based approach and classify dams based on failure consequences. The failure consequence classification is then used to determine the appropriate design criteria in terms of the maximum design earthquake (MDE) and the inflow design flood (IDF). The higher the consequence classification, the more stringent the design criteria that are applied to the dams for floods and earthquakes.

The CDA Dam Safety Guidelines indicate that the term "consequence" refers to the incremental damage above and beyond the damage that would have occurred in the same event or conditions had the dam not failed. These may also be called "incremental consequences" of failure.

The consequence classification also informs the frequency at which formal dam safety reviews (DSRs) are to be carried out. The consequence classification scheme is defined in the CDA (2007, revised 2013) guidelines. Using this classification scheme, all of the dams have been assigned a Very High Hazard consequence classification (Vector, 2008).

3.2. Breach Modelling Scenarios

In accordance with the CDA guidelines the following dam breach scenarios were assessed for the A, B, C, South, and West Dams of the New Afton TSF.

- Flood-induced dam failure:
    - Flood-induced dam failures are also referred to as rainy day failures. A rainy-day or overtopping type failure may occur during large flood inflow conditions when the pond water level rises high enough to overtop the dam.
- Sunny day dam failure:
    - Sunny day failures are normally assumed to occur when the pond is at its normal operating level. Examples of sunny day failures include dam slope failure due to static or earthquake loading, or piping-induced dam failure (internal erosion).

CDA (2007) indicates that "*typically, for earthfill dams, both overtopping failure and piping failure are included in the analysis*". For this study, the modelled breach scenarios were:

- Sunny day scenario: piping-induced failure with MAF conditions in the downstream water courses.
- Rainy day scenario: overtopping failure with PMF conditions in the downstream water courses.

The use of PMF values from 100% of the TSF and downstream catchments provides a conservative approach for the formulation of the emergency response plan.

3.3. ASSESMENT METHODOLOGY

In practice, breach and inundation modelling for tailings dams is performed using a two-step approach. The first step involves breach modelling to estimate the outflow rate from the tailings dam breach. The second step involves inundation modelling to simulate the downstream propagation of the outbreak flood. In this study, the inundation modelling has been conducted with a hydrodynamic model that incorporates the assumed rheological properties of tailings flow.

The dam breach and downstream flood analyses were carried out using the following computer model packages:

- The one-dimensional model BREACH was used to simulate the breach of the dam, and the initiation of the flood wave, including the rate at which water and tailings are released from the breached dam.
- FLO-2D, a two-dimensional hydraulic model, was used to simulate the downstream advance of the flood wave from the point of the dam breach to the downstream limit of the modelled domain. For EPRP development purposes, this model provides estimates of:
  - Inundation extents
  - The time it takes for the flood wave to reach key features
  - Peak flows and maximum water levels along the flood route
  - The time required for the water level to rise to its maximum level.

Both of these software packages are industry accepted models that were judged by BGC to be appropriate for this project site and the downstream conditions.

3.3.1. Breach Modelling

The BREACH program (Fread, 1991) simulates physical processes that lead to the failure of an embankment. This program is a preferred modelling strategy in that the breach rate, which is typically the source of the greatest uncertainty in empirical-parametric modeling, is an output of the model rather than an input. Furthermore, the physical processes simulated by the BREACH program provide a physical basis for interpreting the model results.

The BREACH program was used in the present study, and various model parameters were adjusted so that peak breach outflow rates were consistent with empirical methods provided in the technical literature that are based on failure case records. This constitutes a necessary step in the process of developing the breach hydrograph so as to obtain peak breach outflows, critical to subsequent inundation modelling, that are grounded in documented case record experience.

Additional BREACH modeling details are provided in Appendix A.

3.3.2. Inundation Modelling

The numerical model FLO-2D (FLO-2D Software Inc., 2007) was used to simulate the tailings flow runout from each dam breach location. FLO-2D is on the U.S. Federal Emergency Management Agency's list of approved hydraulic models for this type of study, and has been used in practice for more than 15 years.

FLO-2D is a depth-averaged volume conservation based flood routing model that was developed specifically for the analysis of muddy flows travelling over complex three-dimensional terrain, making it well-suited to tailings runout analysis. For flows with volumetric solid concentrations less than 20%, the influence of the solids component on the rheology of the breaching fluid is negligible and the material is expected to flow like water. In this case, FLO-2D reverts to a conventional clear water flood routing model, in which the breaching fluid is treated as clear water and flow resistance is governed simply by surface roughness along the flow path.

Additional FLO-2D modeling details are provided in Appendix B.

4.0 ASSESSMENT RESULTS

Inundation assessments were completed for rainy day (overtopping failure) and dry day (piping failure) scenarios for each of the five New Afton TSF dams. An additional inundation assessment was completed for the regional PMF event without a dam failure to assess the incremental impacts of the rainy day dam breach scenario. The results of the inundation modelling are shown on the following drawings:

- Drawing 01 for the locations of the potentially impacted areas
- Drawings 02 to 12, which show the maximum inundation extents for each of the modelled scenarios
- Drawings 13 to 22, which show the maximum modelled water depths.

For the sunny day simulation, the flows in the surrounding creeks were assumed to be negligible relative to the peak flow of the piping failure. A summary of downstream areas affected by each of the dam breach scenarios is provided below in Table 4-1.

Table 4-1. Summary of inundation area by dam breach scenario.

		FEATURE NAME / LOCATION														
DAM	**SCENARIO**	**Old Afton TSF Impoundment**	**Old Afton TSF Spillway**	**Afton Open Pit**	**Mill**	**Old Afton TSF Dam Crest**	**Confluence of Alkali Creek - Cherry Creek**	**Cherry Creek**	**Cherry Creek Lower Flood Plain**	**Cherry Creek Near Kamloops Lake**	**Pothook Pit**	**Administration**	**TransCanada Highway at dry pond**	**TransCanada Highway at Mine Entrance**	**Unnamed Creek**	**Mission Flats**
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	PMF , No Breach (Dwg 2)					✓	✓	✓	✓	✓						
A	**Piping (Dwg 3)**		✓	✓	✓											
	Overtopping (Dwg 4)	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓			
B	**Piping (Dwg 5)**	✓	✓	✓	✓											
	Overtopping (Dwg 6)	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓			
C	**Piping (Dwg 7)**			✓							✓	✓				
	Overtopping (Dwg 8)			✓							✓	✓				
SOUTH	**Piping (Dwg 9)**			✓							✓	✓		✓	✓	✓
	Overtopping (Dwg 10)			✓							✓	✓		✓	✓	✓
WEST	**Piping (Dwg 11)**	✓														
	Overtopping (Dwg 12)	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓			

For each of the breach scenarios details of flood inundation at key features are provided in the following sections and on drawings 2 through 22. Details are provided for:

- Time of Arrival - this is the time, in minutes, it takes for the flood resulting from a dam breach to arrive at a key feature, measured from the commencement of the dam breach.
- Time of Peak - this is the time when the water level at a particular location reaches its maximum at a key feature, measured from the commencement of the dam breach.
- Maximum Flood Depth - this is the maximum water level reached during the flood event including natural water levels (i.e. no flow for sunny day scenario, PMF flows for rainy day scenario).
- Incremental Difference in Flood Depth - this is the rise in water level from the background PMF for overtopping scenarios and dry watercourses for piping scenarios.

A summary of each of the ten dam breach scenarios is provided below.

4.1. No Dam Breach

Maximum flood depths at key locations are summarized in Table 4-2 below. Features referenced in the table below are identified on Drawing 02, which shows the maximum inundation extents for the PMF (assuming no dam breach).

Table 4-2. Summary of inundation analysis for PMF conditions without a dam breach.

Map Reference	Location	Maximum Flood Depth (m)
1	Old Afton TSF Impoundment	4
6	Cherry Creek-Alkali Creek Confluence	1
7	Cherry Creek	2.3
8	Cherry Creek Lower Floodplain	1.4
9	Cherry Creek Near Kamloops Lake	1.2

4.2. Dam A Breach

Results of the piping scenario are provided in Drawings 03 (inundation extent) and 13 (maximum flow depth), while Drawings 04 (inundation extent) and 14 (maximum flow depth) illustrate the results of the overtopping scenario.

4.2.1. Piping Breach

For the piping breach of Dam A, 4.7 Mm^3 of water and tailings were discharged over 2 hours at a peak rate of 4,700 m^3/s.

Table 4-3 below summarizes the details of the piping breach inundation at key features along the flood path.

Table 4-3. Summary of inundation analysis for piping breach of Dam A.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Depth (m)
1	Old Afton TSF Impoundment	6	72	5.5	5.5
2	Old Afton TSF Spillway	24	84	1	1
3⁺	Afton Open Pit	66	> 12 hrs	> 10	> 10
4	Mill	108	240	0.9	0.9

+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit.

4.2.2. Overtopping Breach

For the overtopping breach of Dam A, 5.5 Mm^3 of tailings and water were discharged at a peak rate of 5,900 m^3/s. Table 4-4 below summarizes the details of the breach inundation at key features along the flood path.

Table 4-4. Summary of inundation analysis for overtopping breach of Dam A.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Level (m)	Incremental Difference in Flood Depth (m)
1	Old Afton TSF Impoundment	6	30	7.3	3.3
2	Old Afton TSF Spillway	18	30	6.9	6.9
3+	Afton Open Pit	24	> 12 hrs	> 50	> 50
4	Mill	30	42	1.6	1.6
5	Old Afton TSF Dam Crest	18	36	0.6	0.6
6	Confluence of Cherry Creek-Alkali Creek	36	42	2.8	1.8
7	Cherry Creek	42	48	5.1	2.8
8	Cherry Creek Lower Floodplain	60	60	2.7	1.3
9	Cherry Creek Near Kamloops Lake	78	90	2.4	1.2
12+	Trans-Canada Highway at dry pond	108	> 12 hrs	> 6	> 6

\+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit and toward the Trans-Canada Highway.

4.3. Dam B Breach

Results of the piping breach are provided in Drawings 05 (inundation extent) and 15 (maximum flow depth), while Drawings 06 (inundation extent) and 16 (maximum flow depth) illustrate the results of the overtopping breach.

4.3.1. Piping Breach

For the piping breach of Dam B, 4.1 Mm^3 were discharged over 2 hours at a peak rate of 4,800 m^3/s. Table 4-5 below summaries the details of the breach inundation at key features along the flood path.

Table 4-5. Summary of inundation analysis for piping breach of Dam B.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Depth (m)
1	Old Afton TSF Impoundment	18	102	5.2	5.2
2	Old Afton TSF Spillway	12	12	1.2	1.2
3+	Afton Open Pit	30	> 12 hrs	> 8	>8
4	Mill	240	260	0.4	0.4

\+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit.

4.3.2. Overtopping Breach

For the overtopping breach of Dam B, 5 Mm^3 of tailings and water were discharged at a peak rate of 5,900m^3/s. Table 4-6 below summarizes the details of the breach inundation at key features along the flood path.

Table 4-6. Summary of inundation analysis for overtopping breach of Dam B.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Level (m)	Incremental Difference in Flood Depth (m)
1	Old Afton TSF Impoundment	12	54	7.1	3.1
2	Old Afton TSF Spillway	12	30	6.7	6.7
3+	Afton Open Pit	24	> 12 hrs	> 50	> 50
4	Mill	30	42	1.6	1.6
5	Old Afton TSF Dam Crest	18	30	0.4	0.4
6	Confluence of Cherry Creek-Alkali Creek	36	42	2.5	1.5
7	Cherry Creek	42	54	4.4	2.1
8	Cherry Creek Lower Flood Plain	60	66	2.4	1
9	Cherry Creek Near Kamloops Lake	78	90	2.1	0.9
12+	TransCanada Highway at dry pond	108	> 12 hrs	> 6	> 6

\+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit and toward the Trans-Canada Highway.

4.4. Dam C Breach

Results of the piping are provided in Drawings 07 (inundation extent) and 17 (maximum flow depth), while Drawings 08 (inundation extent) and 18 (maximum flow depth) illustrate the results of the overtopping breach.

4.4.1. Piping Breach

For the piping breach of Dam C, 5.5 Mm^3 of tailings and water were discharged over 2 hours at a peak rate of 5,500 m^3/s. Table 4-7 below summarizes the details of the breach inundation at key features along the flood path.

Table 4-7. Summary of inundation analysis for piping breach of Dam C.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Depth (m)
3+	Afton Open Pit	12	> 12 hrs	> 57	> 57
10	Pothook Pit	12	48	12	12
11	Administration	18	54	0.5	0.5

\+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit.

4.4.2. Overtopping Breach

For the overtopping breach of Dam C, 6.3 Mm^3 of tailings and water were discharged over 2 hours at a peak rate of 6,700 m^3/s. Table 4-8 below summarizes the details of the breach inundation at key features along the flood path.

Table 4-8. Summary of inundation analysis for overtopping breach of Dam C.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Depth (m)
3+	Afton Open Pit	12	> 12 hrs	> 68	> 68
10	Pothook Pit	12	30	12.2	12.2
11	Administration	18	18	0.6	0.6

\+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit.

4.5. South Dam Breach

Results of the piping breach are provided in Drawings 09 (inundation extent) and 19 (maximum flow depth), while Drawings 10 (inundation extent) and 20 (maximum flow depth) illustrate the results of the overtopping breach.

4.5.1. Piping Breach

For the piping breach of the South Dam, 3.6 Mm^3 were discharged over 2 hours at a peak rate of 3,400 m^3/s. Table 4-9 below summarizes the details of the breach inundation at key features along the flood path.

Table 4-9. Summary of inundation analysis for piping breach of South Dam.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Depth (m)
3+	Afton Open Pit	138	> 12 hrs	> 45	> 45
10	Pothook Pit	108	126	12.4	12.4
11	Administration	132	132	0.7	0.7

\+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit.

4.5.2. Overtopping Breach

For the overtopping breach of the South Dam, 4.4 Mm^3 were discharged over 2 hours at a peak rate of 4,800 m^3/s. Table 4-10 below summarizes the details of the breach inundation at key features along the flood path.

Table 4-10. Summary of inundation analysis for overtopping breach of South Dam.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Depth (m)
3+	Afton Open Pit	36	> 12 hrs	> 45	> 45
10	Pothook Pit	24	36	13.2	13.2
11	Administration	36	36	1.2	1.2
13	Trans-Canada Highway at Mine Entrance	54	96	0.4	0.4
14	Unnamed Creek	200	220	0.6	0.6
15	Mission Flats	300	300	0.05	0.05

\+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit.

4.6. West Dam Breach

Results of the piping breach are provided in Drawings 11 (inundation extent) and 21 (maximum flow depth), while Drawings 04 (inundation extent) and 22 (maximum flow depth) illustrate the results of the overtopping breach.

4.6.1. Piping Breach

For the piping breach of West Dam, 4.4 Mm^3 of tailings and water were discharged over 1 hour at a peak rate of 3,100 m^3/s. Table 4-11 below summaries the details of the breach inundation at key features along the flood path.

Table 4-11. Summary of inundation analysis for piping breach of West Dam.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Depth (m)
1+	Old Afton TSF Impoundment	42	> 12hrs	> 3.4	> 3.4

\+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the Old Afton TSF.

4.6.2. Overtopping Breach

For the overtopping breach of West Dam, 3.5 Mm^3 of tailings and water were discharged at a peak rate of 3,900 m^3/s.

Table 4-12 below summaries the details of the breach inundation at key features along the flood path.

Table 4-12. Summary of inundation details for overtopping breach of West Dam.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Level (m)	Incremental Difference in Flood Depth (m)
1	Old Afton TSF Impoundment	24	54	6.8	2.8
2	Old Afton TSF Spillway	30	60	5.3	5.3
3+	Afton Open Pit	48	> 12 hrs	> 50	> 50
4	Mill	48	66	1.5	1.5
5	Old Afton TSF Dam Crest	36	60	0.2	0.2
6	Confluence of Cherry Creek-Alkali Creek	72	78	1.5	0.5
7	Cherry Creek	78	90	3.0	0.8
8	Cherry Creek Lower Flood Plain	96	108	1.72	0.4
9	Cherry Creek Near Kamloops Lake	120	144	1.56	0.4
12+	Trans-Canada Highway at dry pond	144	> 12 hrs	> 4	> 4

+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit and toward the Trans-Canada Highway.

5.0 DISCUSSION AND CONCLUSION

The dam breach and inundation analyses of the five dams comprising the New Afton TSF, in their ultimate condition, indicate that the majority of breached water and tailings would be retained on site through storage in existing mining features, in particular, the Old Afton TSF and the Afton Open Pit. Under PMF conditions, the modelling results indicate that some tailings and water would overtop the Old Afton TSF West Dam and flow through Cherry Creek into Kamloops Lake. Furthermore, a breach of the South Dam could result in water and tailings overtopping the Trans-Canada Highway and discharging into Kamloops Lake through the Mission Flats Waste Water Treatment Plant.

In the current elevations of the retained tailings of the New Afton TSF, retained tailings and water would not reach the upstream toe of the South or West Dams and the volume capable of breaching from Dams A, B and C is a small fraction of the modeled scenarios.

The risk associated with a potential dam failure is probability multiplied by consequence. The design, construction and operation are focused on achieving an extremely low probability of failure. Based on the information provided by this study, New Gold is considering additional works for containing dam breach flows as a means of further risk reduction by reducing failure consequences. Containment options could include increasing the capacity of the Old Afton TSF spillway to prevent overtopping of the Old Afton TSF West Dam, and the combination of construction training berms and flow channels along the breach flow paths directing all breach flow to the Afton Open Pit. These measures would also reduce the potential for inundating the Mill and Administrative areas as well as the inundation of the TransCanada highway and flows to Kamloops Lake.

The inundation model results indicate that the Old Afton TSF Dam would overtop in response to a New Afton overtopping breach of Dam A, Dam B, or West Dam. However, considering the duration of filling and the primary discharge through the Old Afton TSF Spillway, the likelihood of the overtopping leading to a breach of the Old Afton Dam in this timeframe is low. However, the emergency preparedness and response plan for The Old Afton TSF should be engaged in the instance of a breach at Dams A, B or West Dam.

This report only addresses the potential run out characteristics following the hypothetical breach of the New Afton TSF Dams under current conditions. It does not evaluate the structural integrity of the New Afton TSF Dams nor does it attempt to quantify the consequences to facilities, calculate economic losses, address potential for loss of life to people within the inundation area, or suggest potential risk management strategies. As such, this study does not constitute an Emergency Preparedness and Response Plan. The inundation maps prepared for and presented in this study should be utilized to inform the revision of such documents.

6.0 CLOSURE

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Yours sincerely,

BGC ENGINEERING INC.
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SIGNED AND SEALED HARDCOPY ON
FILE WITH BGC ENGINEERING INC.

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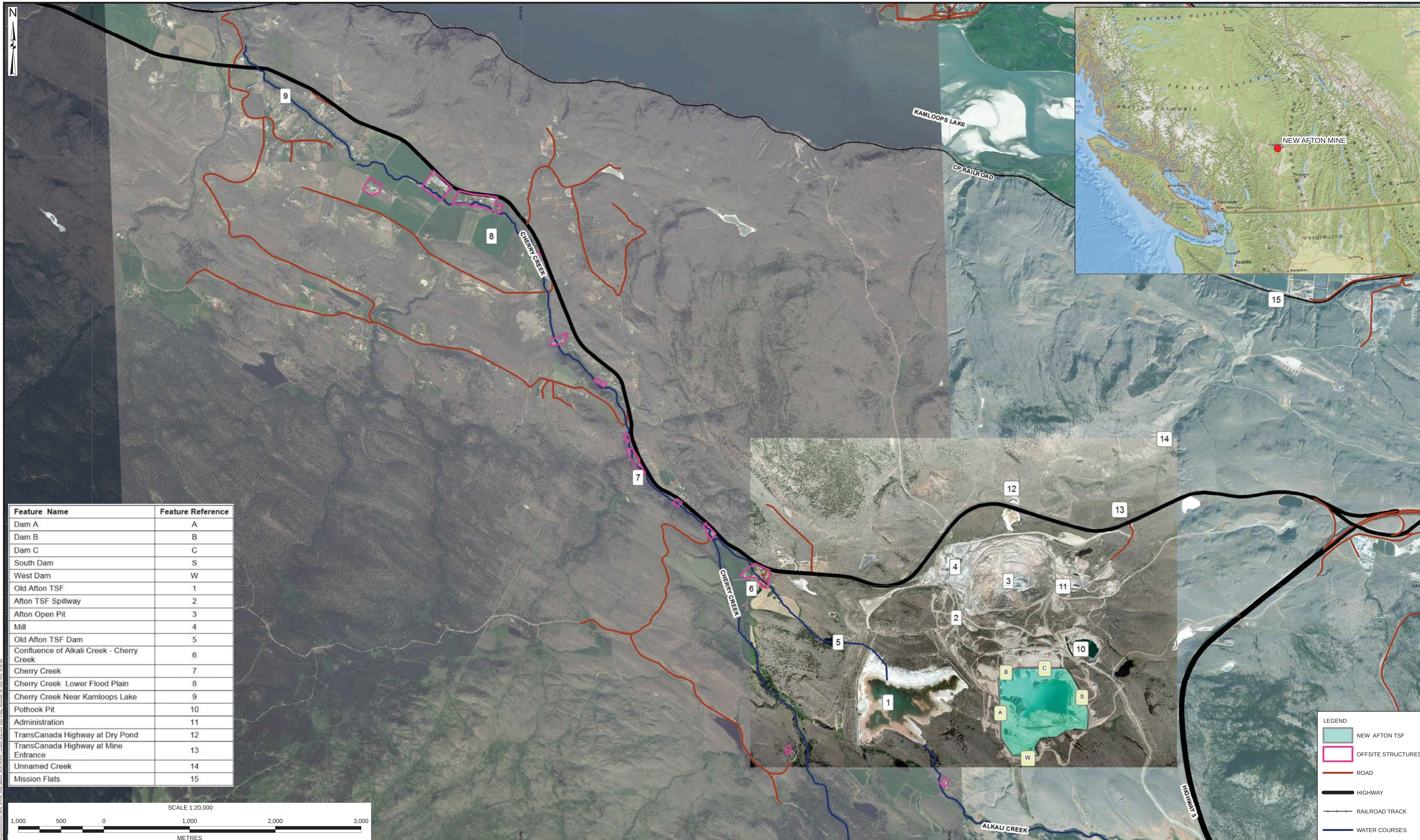
FIGURES



Feature Name	Feature Reference
Dam A	A
Dam B	B
Dam C	C
South Dam	S
West Dam	W
Old Afton TSF	1
Afton TSF Spillway	2
Afton Open Pit	3
Mill	4
Old Afton TSF Dam	5
Confluence of Alkali Creek - Cherry Creek	6
Cherry Creek	7
Cherry Creek Lower Flood Plain	8
Cherry Creek Near Kamloops Lake	9
Pothook Pit	10
Administration	11
TransCanada Highway at Dry Pond	12
TransCanada Highway at Mine Entrance	13
Unnamed Creek	14
Mission Flats	15

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PROJECT: NEW AFTON DAM BREAK ANALYSIS
TITLE: SITE LOCALITY
PROJECT No.: 0921-015-01
DWG No.: 1
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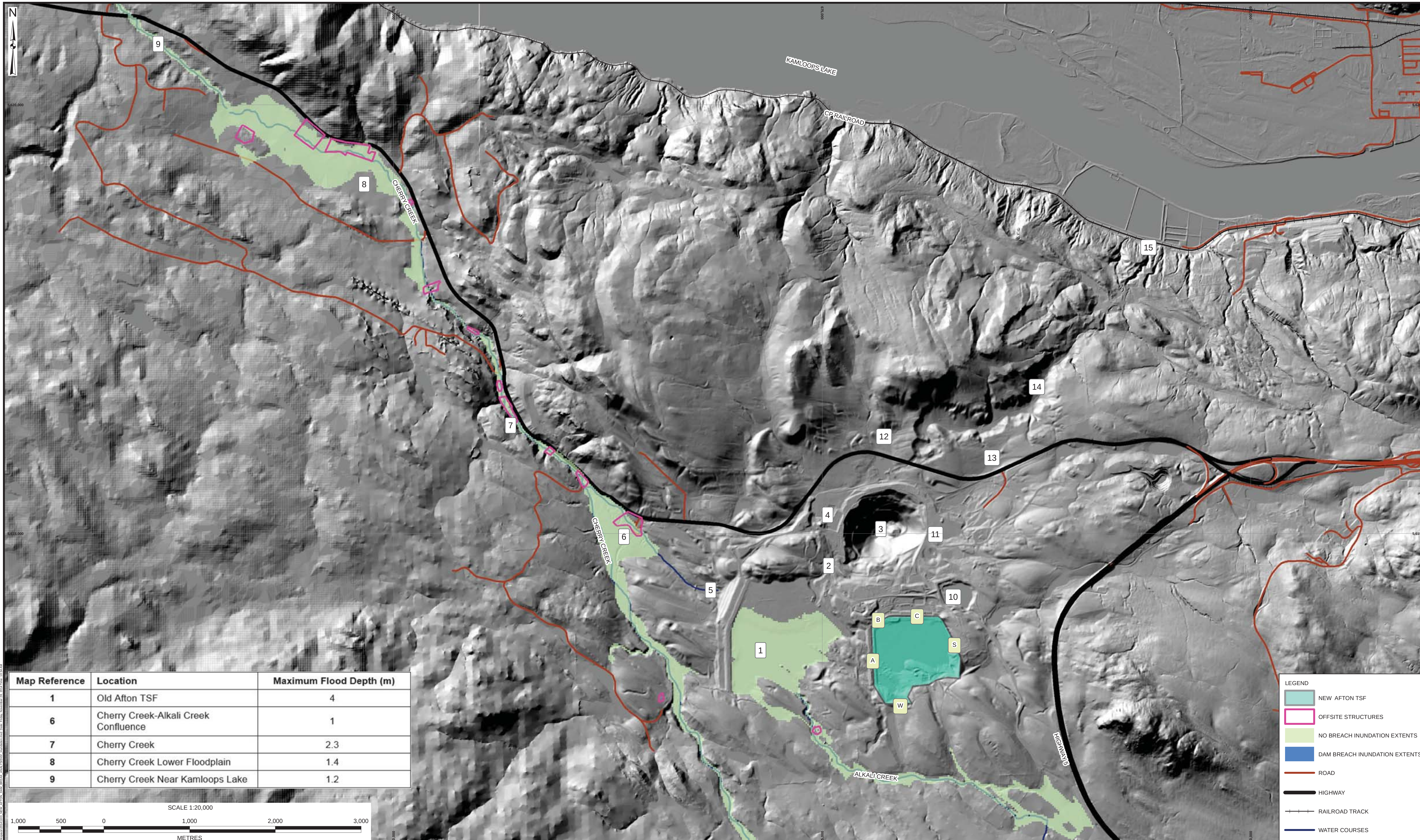

Map Reference	Location	Maximum Flood Depth (m)
1	Old Afton TSF	4
6	Cherry Creek-Alkali Creek Confluence	1
7	Cherry Creek	2.3
8	Cherry Creek Lower Floodplain	1.4
9	Cherry Creek Near Kamloops Lake	1.2

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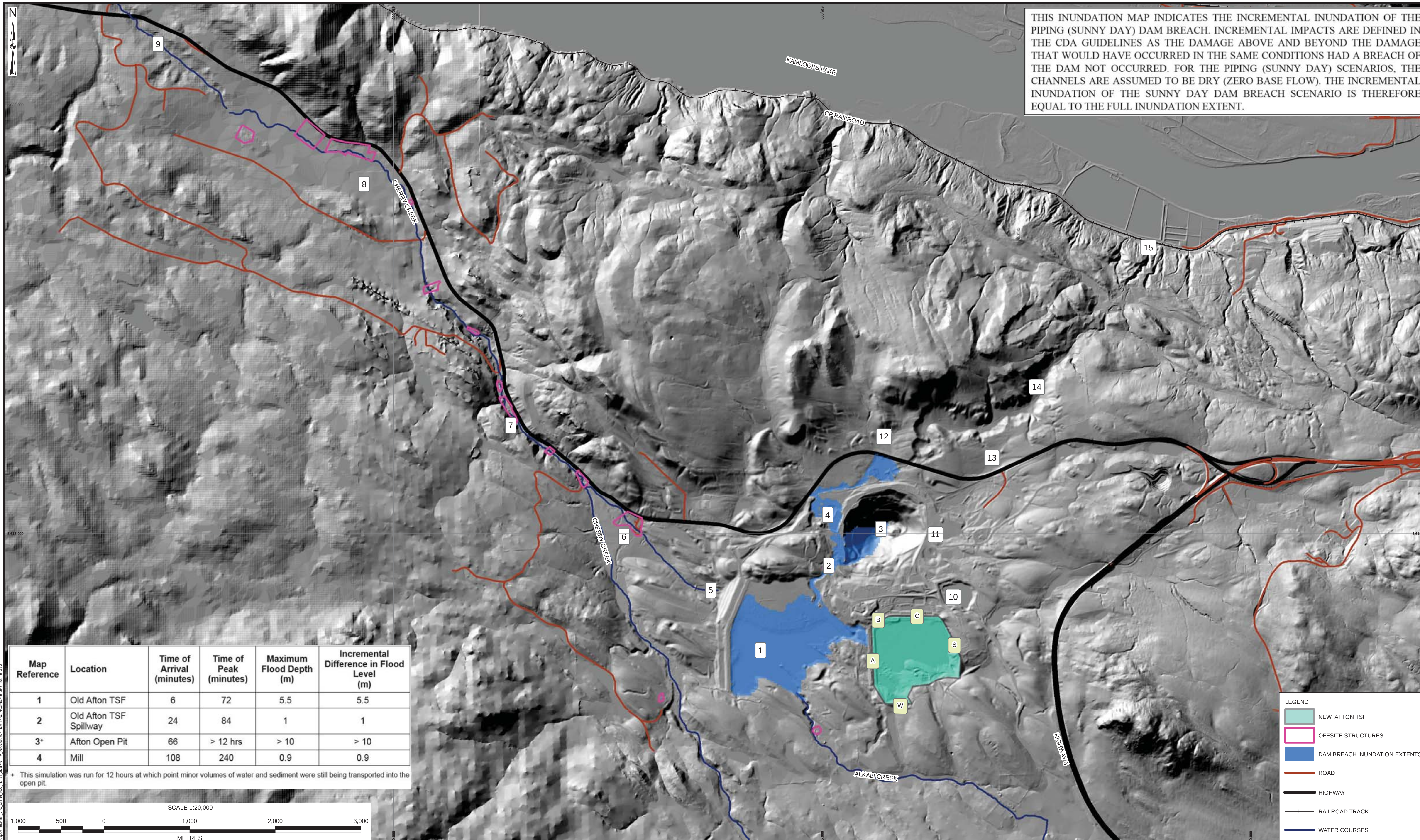
PROJECT: NEW AFTON DAM BREAK ANALYSIS

TITLE: MAXIMUM INUNDATION EXTENTS PMF WITH NO BREACH

PROJECT No.: 0921-015-01 | DWG No.: 2 | REV.:

THIS INUNDATION MAP INDICATES THE INCREMENTAL INUNDATION OF THE PIPING (SUNNY DAY) DAM BREACH. INCREMENTAL IMPACTS ARE DEFINED IN THE CDA GUIDELINES AS THE DAMAGE ABOVE AND BEYOND THE DAMAGE THAT WOULD HAVE OCCURRED IN THE SAME CONDITIONS HAD A BREACH OF THE DAM NOT OCCURRED. FOR THE PIPING (SUNNY DAY) SCENARIOS, THE CHANNELS ARE ASSUMED TO BE DRY (ZERO BASE FLOW). THE INCREMENTAL INUNDATION OF THE SUNNY DAY DAM BREACH SCENARIO IS THEREFORE EQUAL TO THE FULL INUNDATION EXTENT.



Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Level (m)
1	Old Afton TSF	6	72	5.5	5.5
2	Old Afton TSF Spillway	24	84	1	1
3+	Afton Open Pit	66	> 12 hrs	> 10	> 10
4	Mill	108	240	0.9	0.9

+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit.

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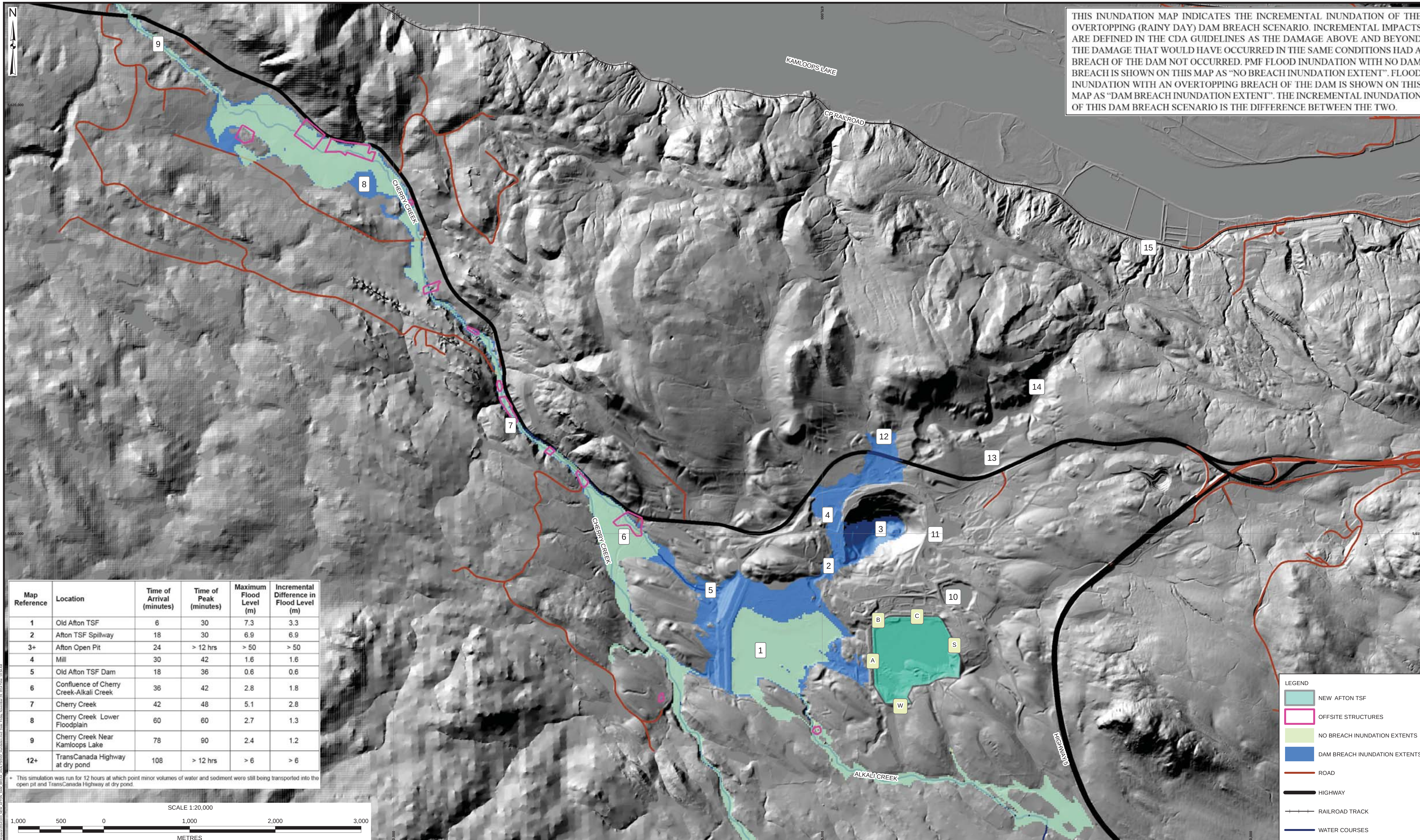
PROJECT: NEW AFTON DAM BREAK ANALYSIS

TITLE: MAXIMUM INUNDATION EXTENTS
DAM A
PIPING BREACH

PROJECT No.:	DWG No.:	REV.:
0921-015-01	3	

THIS INUNDATION MAP INDICATES THE INCREMENTAL INUNDATION OF THE OVERTOPPING (RAINY DAY) DAM BREACH SCENARIO. INCREMENTAL IMPACTS ARE DEFINED IN THE CDA GUIDELINES AS THE DAMAGE ABOVE AND BEYOND THE DAMAGE THAT WOULD HAVE OCCURRED IN THE SAME CONDITIONS HAD A BREACH OF THE DAM NOT OCCURRED. PMF FLOOD INUNDATION WITH NO DAM BREACH IS SHOWN ON THIS MAP AS "NO BREACH INUNDATION EXTENT". FLOOD INUNDATION WITH AN OVERTOPPING BREACH OF THE DAM IS SHOWN ON THIS MAP AS "DAM BREACH INUNDATION EXTENT". THE INCREMENTAL INUNDATION OF THIS DAM BREACH SCENARIO IS THE DIFFERENCE BETWEEN THE TWO.



Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Level (m)	Incremental Difference in Flood Level (m)
1	Old Afton TSF	6	30	7.3	3.3
2	Afton TSF Spillway	18	30	6.9	6.9
3+	Afton Open Pit	24	> 12 hrs	> 50	> 50
4	Mill	30	42	1.6	1.6
5	Old Afton TSF Dam	18	36	0.6	0.6
6	Confluence of Cherry Creek-Alkali Creek	36	42	2.8	1.8
7	Cherry Creek	42	48	5.1	2.8
8	Cherry Creek Lower Floodplain	60	60	2.7	1.3
9	Cherry Creek Near Kamloops Lake	78	90	2.4	1.2
12+	TransCanada Highway at dry pond	108	> 12 hrs	> 6	> 6

+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit and TransCanada Highway at dry pond.

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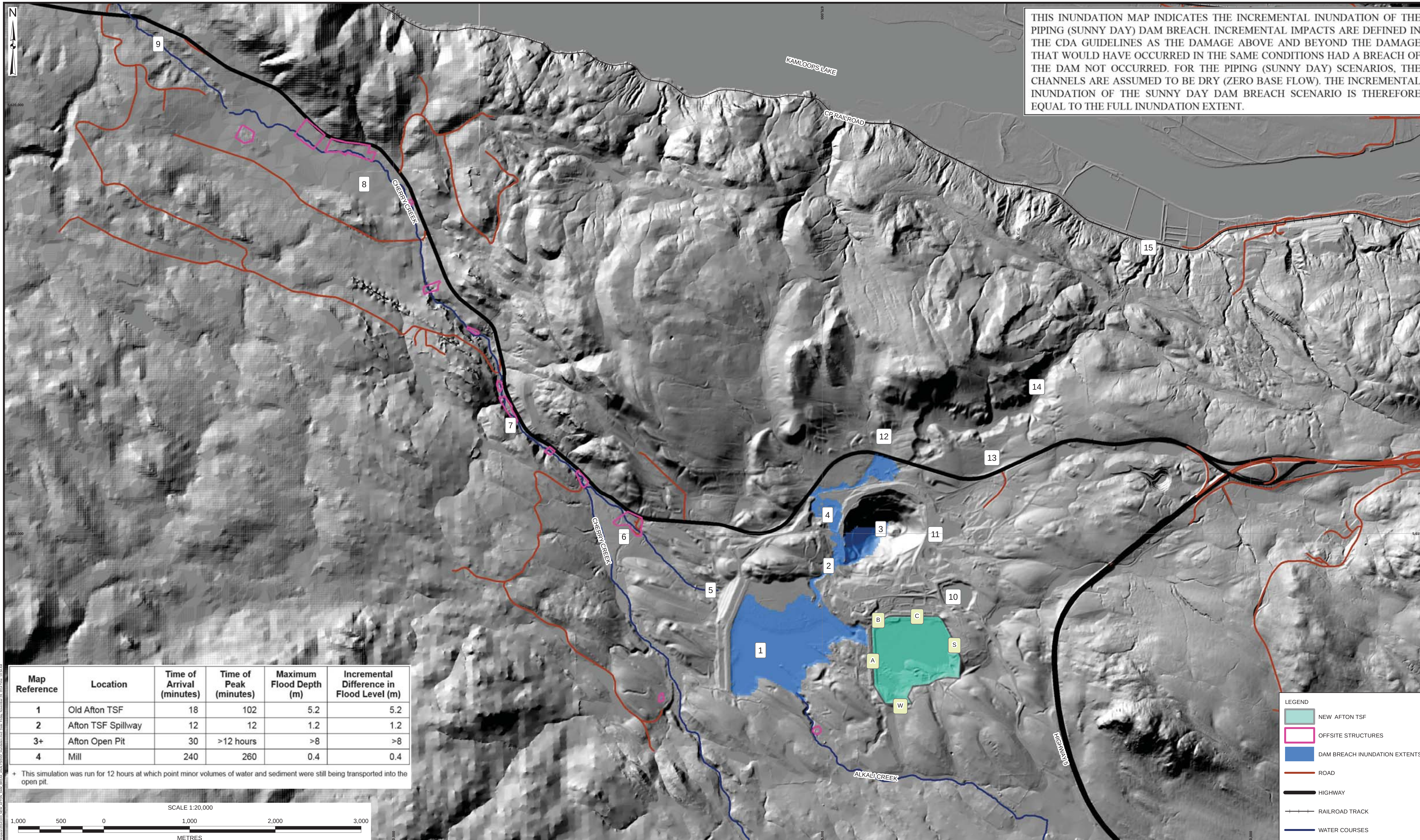
CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON DAM BREAK ANALYSIS

TITLE: MAXIMUM INUNDATION EXTENTS
DAM A
OVERTOPPING BREACH

PROJECT No.: 0921-015-01
DWG No.: 4
REV.:



THIS INUNDATION MAP INDICATES THE INCREMENTAL INUNDATION OF THE PIPING (SUNNY DAY) DAM BREACH. INCREMENTAL IMPACTS ARE DEFINED IN THE CDA GUIDELINES AS THE DAMAGE ABOVE AND BEYOND THE DAMAGE THAT WOULD HAVE OCCURRED IN THE SAME CONDITIONS HAD A BREACH OF THE DAM NOT OCCURRED. FOR THE PIPING (SUNNY DAY) SCENARIOS, THE CHANNELS ARE ASSUMED TO BE DRY (ZERO BASE FLOW). THE INCREMENTAL INUNDATION OF THE SUNNY DAY DAM BREACH SCENARIO IS THEREFORE EQUAL TO THE FULL INUNDATION EXTENT.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Level (m)
1	Old Afton TSF	18	102	5.2	5.2
2	Afton TSF Spillway	12	12	1.2	1.2
3+	Afton Open Pit	30	>12 hours	>8	>8
4	Mill	240	260	0.4	0.4

+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit.

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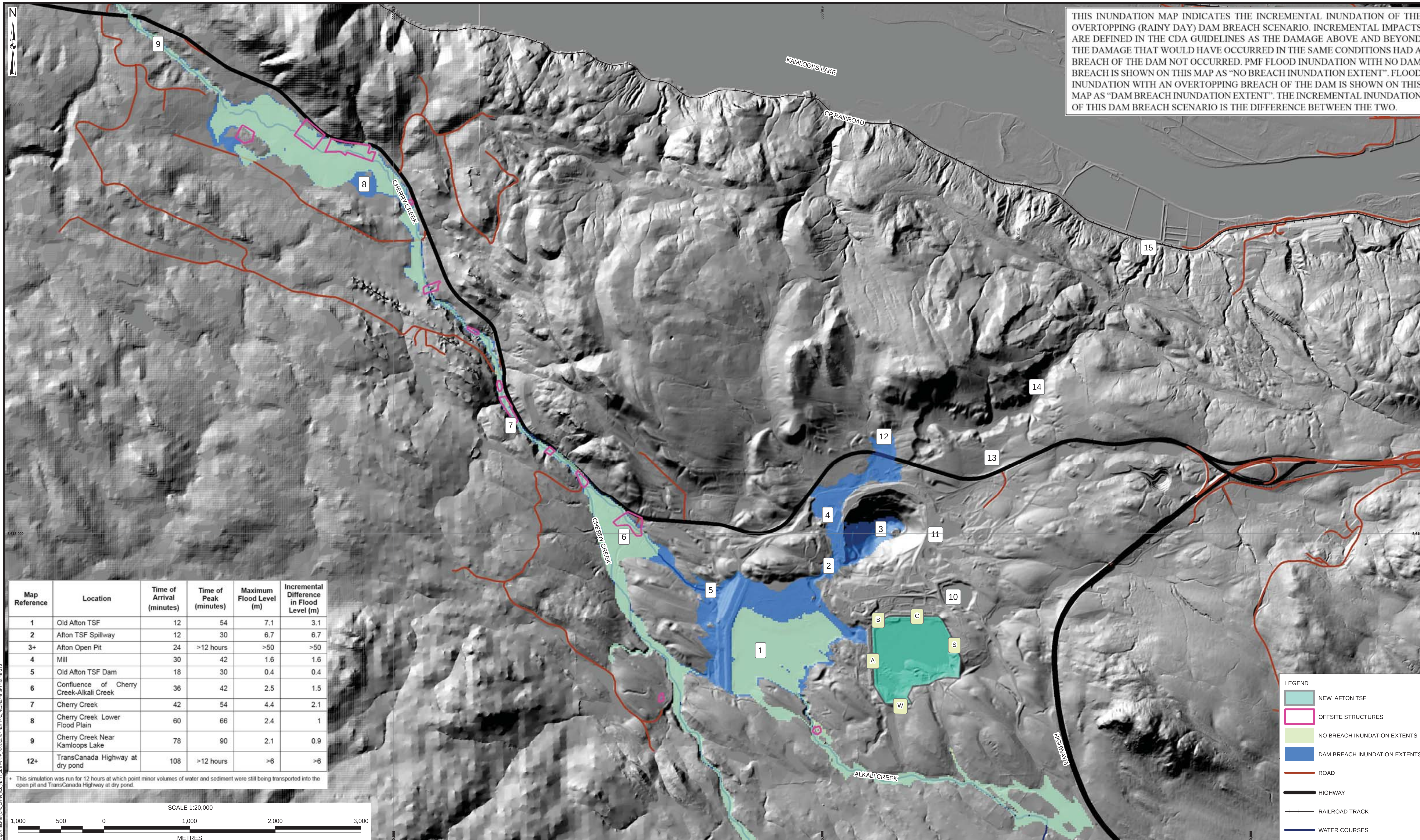
TITLE: MAXIMUM INUNDATION EXTENTS
DAM B
PIPING BREACH

PROJECT No.:	DWG No.:	REV.:
0921-015-01	5	



Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Level (m)	Incremental Difference in Flood Level (m)
1	Old Afton TSF	12	54	7.1	3.1
2	Afton TSF Spillway	12	30	6.7	6.7
3+	Afton Open Pit	24	>12 hours	>50	>50
4	Mill	30	42	1.6	1.6
5	Old Afton TSF Dam	18	30	0.4	0.4
6	Confluence of Cherry Creek-Alkali Creek	36	42	2.5	1.5
7	Cherry Creek	42	54	4.4	2.1
8	Cherry Creek Lower Flood Plain	60	66	2.4	1
9	Cherry Creek Near Kamloops Lake	78	90	2.1	0.9
12+	TransCanada Highway at dry pond	108	>12 hours	>6	>6

+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit and TransCanada Highway at dry pond.

NOTES:
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4. TOPOGRAPHY WAS DERIVED FROM 1 m RESOLUTION LIDAR ACQUIRED IN 2013 AND 2014

REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:20,000
DATE:	NOV 2014
DRAWN:	RC
DESIGNED:	WW
CHECKED:	TM
APPROVED:	CL

PROFESSIONAL SEAL:

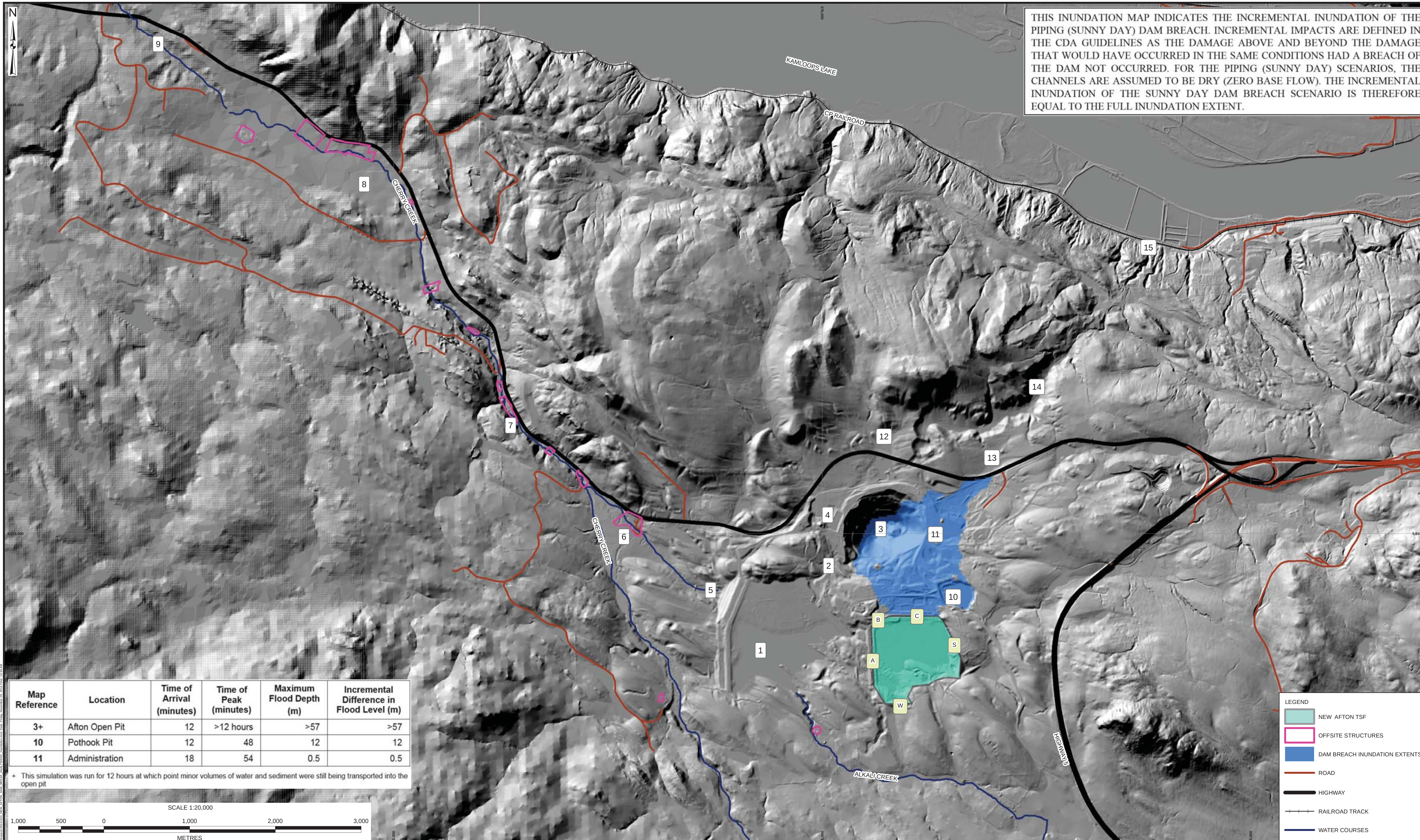
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON DAM BREAK ANALYSIS

TITLE: MAXIMUM INUNDATION EXTENTS
DAM B
OVERTOPPING BREACH

PROJECT No.:	DWG No.:	REV.:
0921-015-01	6	



THIS INUNDATION MAP INDICATES THE INCREMENTAL INUNDATION OF THE PIPING (SUNNY DAY) DAM BREACH. INCREMENTAL IMPACTS ARE DEFINED IN THE CDA GUIDELINES AS THE DAMAGE ABOVE AND BEYOND THE DAMAGE THAT WOULD HAVE OCCURRED IN THE SAME CONDITIONS HAD A BREACH OF THE DAM NOT OCCURRED. FOR THE PIPING (SUNNY DAY) SCENARIOS, THE CHANNELS ARE ASSUMED TO BE DRY (ZERO BASE FLOW). THE INCREMENTAL INUNDATION OF THE SUNNY DAY DAM BREACH SCENARIO IS THEREFORE EQUAL TO THE FULL INUNDATION EXTENT.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Level (m)
3+	Afton Open Pit	12	>12 hours	>57	>57
10	Pothook Pit	12	48	12	12
11	Administration	18	54	0.5	0.5

+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit

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REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE:	1:20,000
DATE:	NOV 2014
DRAWN:	RC
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CHECKED:	TM
APPROVED:	CL

PROFESSIONAL SEAL:

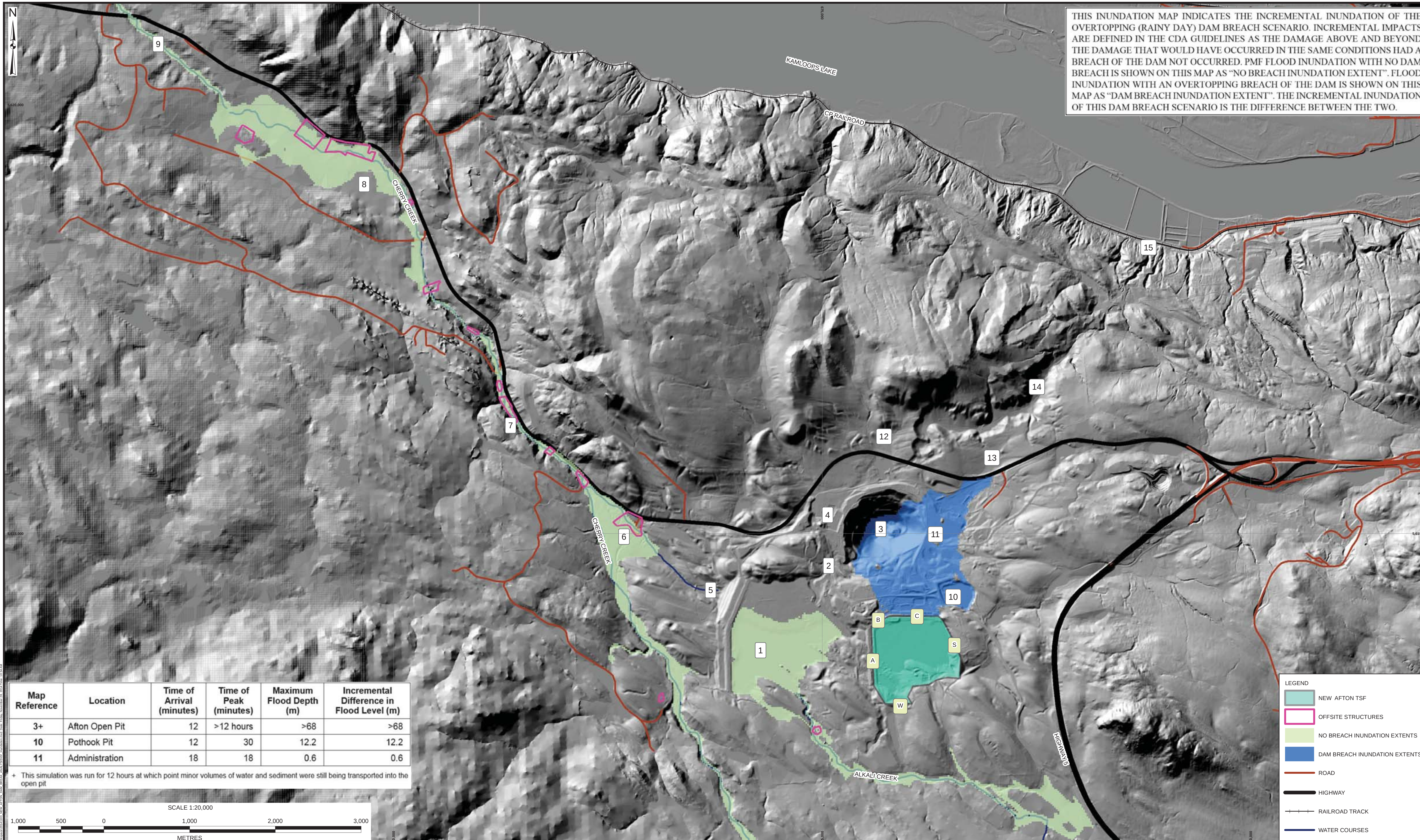
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON DAM BREAK ANALYSIS

TITLE: MAXIMUM INUNDATION EXTENTS
DAM C
PIPING BREACH

PROJECT No.:	DWG No.:	REV.:
0921-015-01	7	



THIS INUNDATION MAP INDICATES THE INCREMENTAL INUNDATION OF THE OVERTOPPING (RAINY DAY) DAM BREACH SCENARIO. INCREMENTAL IMPACTS ARE DEFINED IN THE CDA GUIDELINES AS THE DAMAGE ABOVE AND BEYOND THE DAMAGE THAT WOULD HAVE OCCURRED IN THE SAME CONDITIONS HAD A BREACH OF THE DAM NOT OCCURRED. PMF FLOOD INUNDATION WITH NO DAM BREACH IS SHOWN ON THIS MAP AS "NO BREACH INUNDATION EXTENT". FLOOD INUNDATION WITH AN OVERTOPPING BREACH OF THE DAM IS SHOWN ON THIS MAP AS "DAM BREACH INUNDATION EXTENT". THE INCREMENTAL INUNDATION OF THIS DAM BREACH SCENARIO IS THE DIFFERENCE BETWEEN THE TWO.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Level (m)
3+	Afton Open Pit	12	>12 hours	>68	>68
10	Pothook Pit	12	30	12.2	12.2
11	Administration	18	18	0.6	0.6

+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit

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REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE: 1:20,000
DATE: NOV 2014
DRAWN: RC
DESIGNED: WW
CHECKED: TM
APPROVED: CL

PROFESSIONAL SEAL:

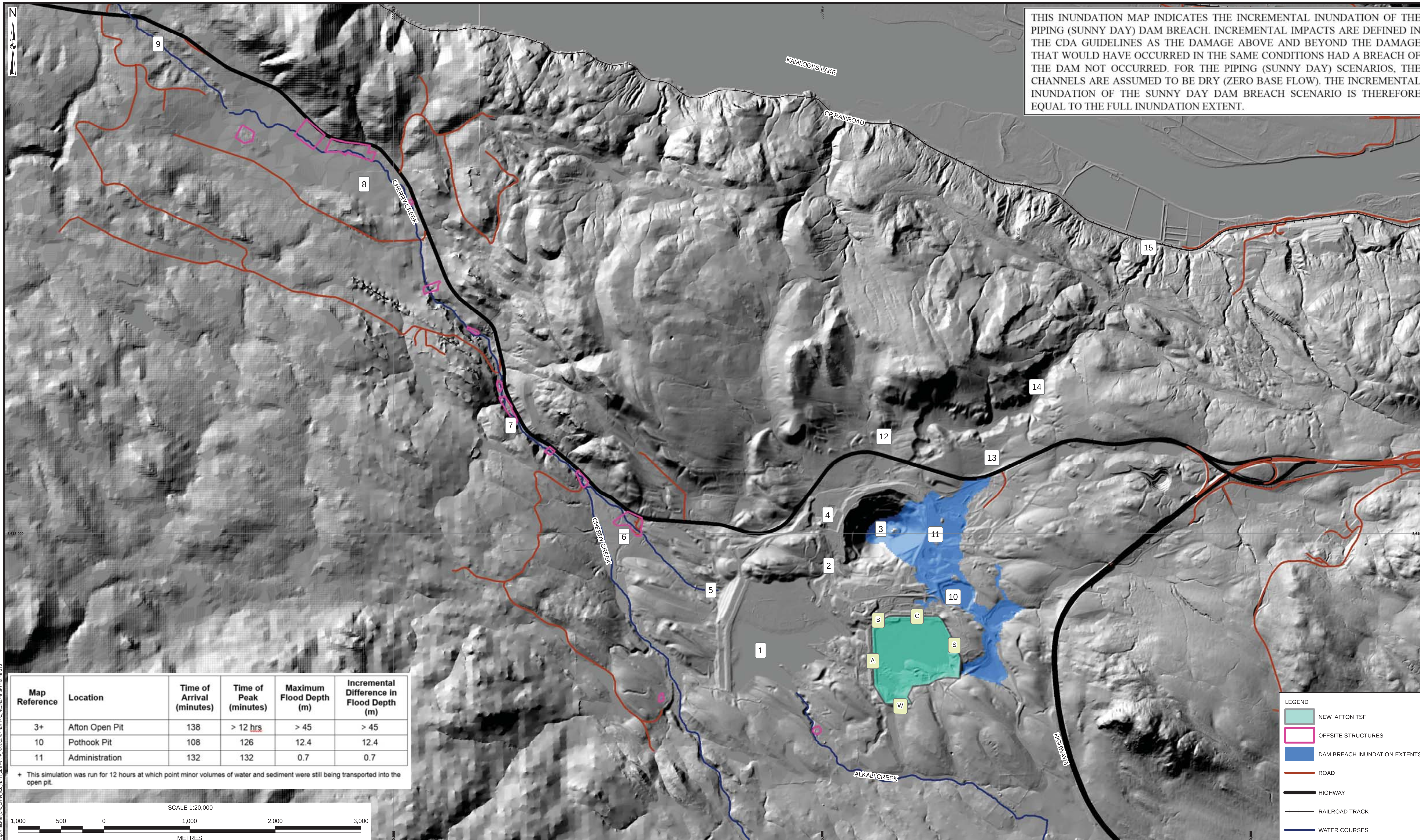
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON DAM BREAK ANALYSIS

TITLE: MAXIMUM INUNDATION EXTENTS
DAM C
OVERTOPPING BREACH

PROJECT No.: 0921-015-01
DWG No.: 8
REV.:



THIS INUNDATION MAP INDICATES THE INCREMENTAL INUNDATION OF THE PIPING (SUNNY DAY) DAM BREACH. INCREMENTAL IMPACTS ARE DEFINED IN THE CDA GUIDELINES AS THE DAMAGE ABOVE AND BEYOND THE DAMAGE THAT WOULD HAVE OCCURRED IN THE SAME CONDITIONS HAD A BREACH OF THE DAM NOT OCCURRED. FOR THE PIPING (SUNNY DAY) SCENARIOS, THE CHANNELS ARE ASSUMED TO BE DRY (ZERO BASE FLOW). THE INCREMENTAL INUNDATION OF THE SUNNY DAY DAM BREACH SCENARIO IS THEREFORE EQUAL TO THE FULL INUNDATION EXTENT.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Depth (m)
3+	Afton Open Pit	138	> 12 hrs	> 45	> 45
10	Pothook Pit	108	126	12.4	12.4
11	Administration	132	132	0.7	0.7

+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit.

NOTES:
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REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE: 1:20,000
DATE: NOV 2014
DRAWN: RC
DESIGNED: WW
CHECKED: TM
APPROVED: CL

PROFESSIONAL SEAL:

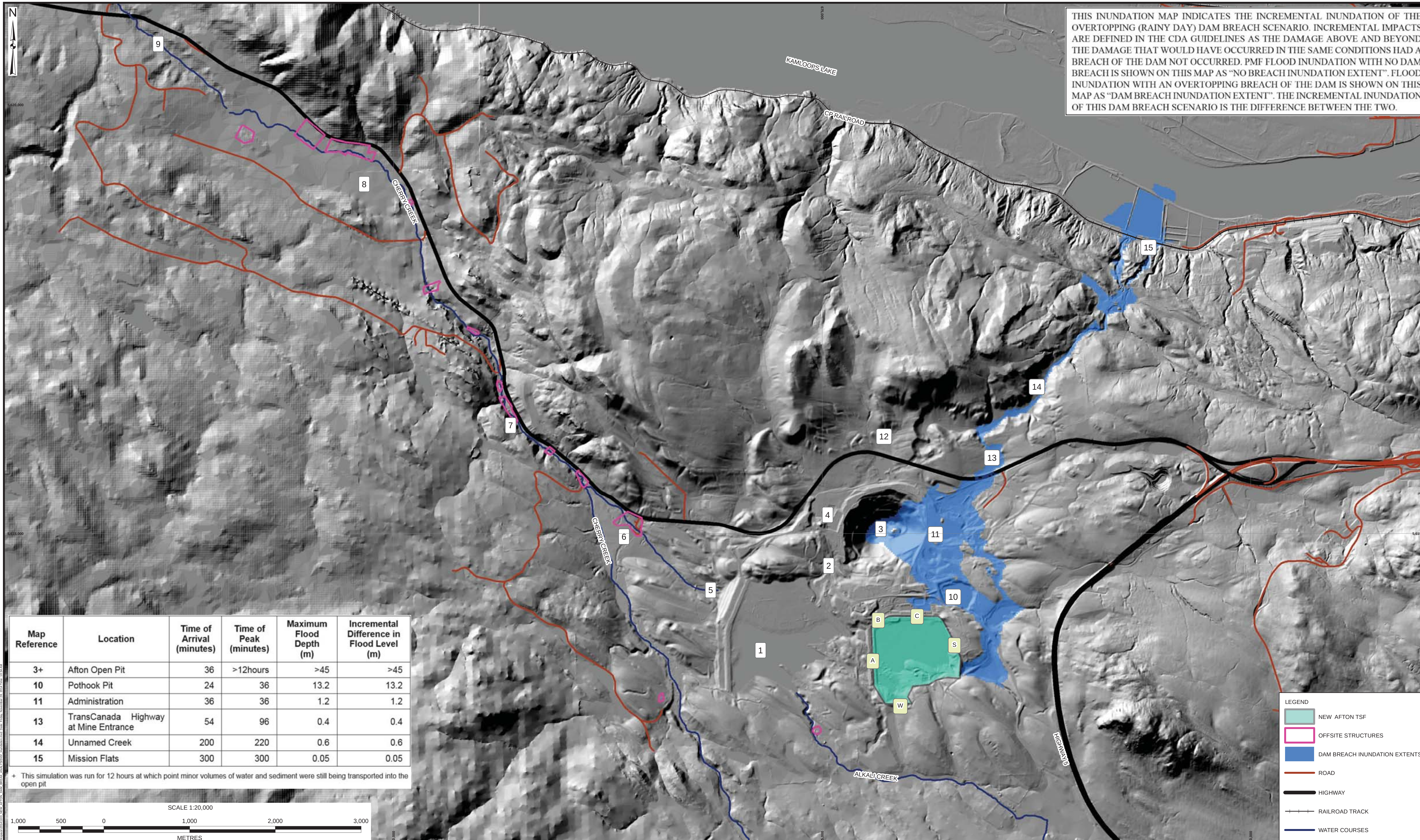
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON DAM BREAK ANALYSIS

TITLE: MAXIMUM INUNDATION EXTENTS
SOUTH DAM
PIPING BREACH

PROJECT No.: 0921-015-01
DWG No.: 9
REV.:



Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Level (m)
3+	Afton Open Pit	36	>12hours	>45	>45
10	Pothook Pit	24	36	13.2	13.2
11	Administration	36	36	1.2	1.2
13	TransCanada Highway at Mine Entrance	54	96	0.4	0.4
14	Unnamed Creek	200	220	0.6	0.6
15	Mission Flats	300	300	0.05	0.05

\+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit

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REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE: 1:20,000
DATE: NOV 2014
DRAWN: RC
DESIGNED: WW
CHECKED: TM
APPROVED: CL

PROFESSIONAL SEAL:

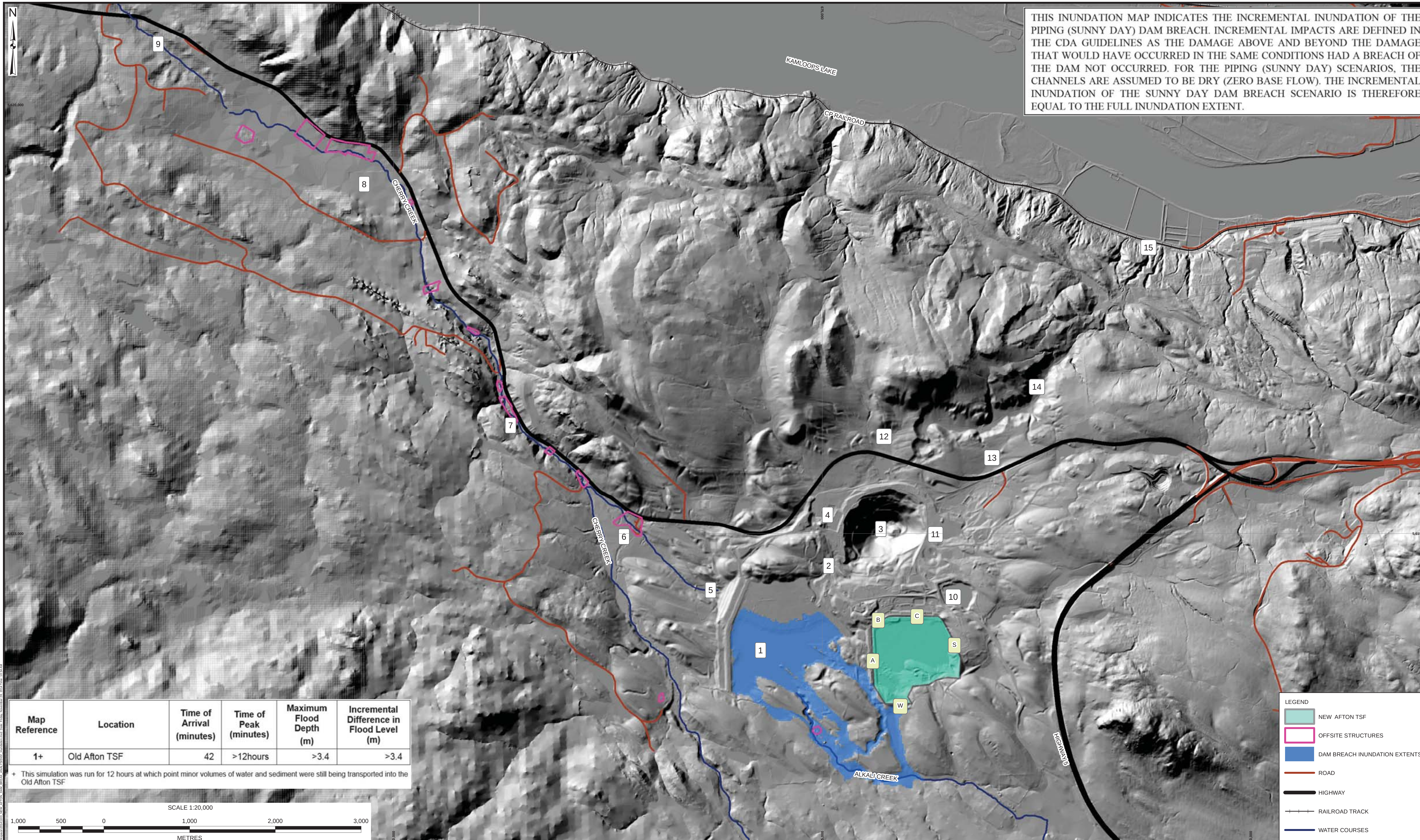
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON DAM BREAK ANALYSIS

TITLE: MAXIMUM INUNDATION EXTENTS
SOUTH DAM
OVERTOPPING BREACH

PROJECT No.: 0921-015-01
DWG No.: 10
REV.:



THIS INUNDATION MAP INDICATES THE INCREMENTAL INUNDATION OF THE PIPING (SUNNY DAY) DAM BREACH. INCREMENTAL IMPACTS ARE DEFINED IN THE CDA GUIDELINES AS THE DAMAGE ABOVE AND BEYOND THE DAMAGE THAT WOULD HAVE OCCURRED IN THE SAME CONDITIONS HAD A BREACH OF THE DAM NOT OCCURRED. FOR THE PIPING (SUNNY DAY) SCENARIOS, THE CHANNELS ARE ASSUMED TO BE DRY (ZERO BASE FLOW). THE INCREMENTAL INUNDATION OF THE SUNNY DAY DAM BREACH SCENARIO IS THEREFORE EQUAL TO THE FULL INUNDATION EXTENT.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Level (m)
1+	Old Afton TSF	42	>12hours	>3.4	>3.4

+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the Old Afton TSF

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REV.	DATE	REVISION NOTES	DRAWN	CHECK	APPR.

SCALE: 1:20,000
DATE: NOV 2014
DRAWN: RC
DESIGNED: WW
CHECKED: TM
APPROVED: CL

PROFESSIONAL SEAL:

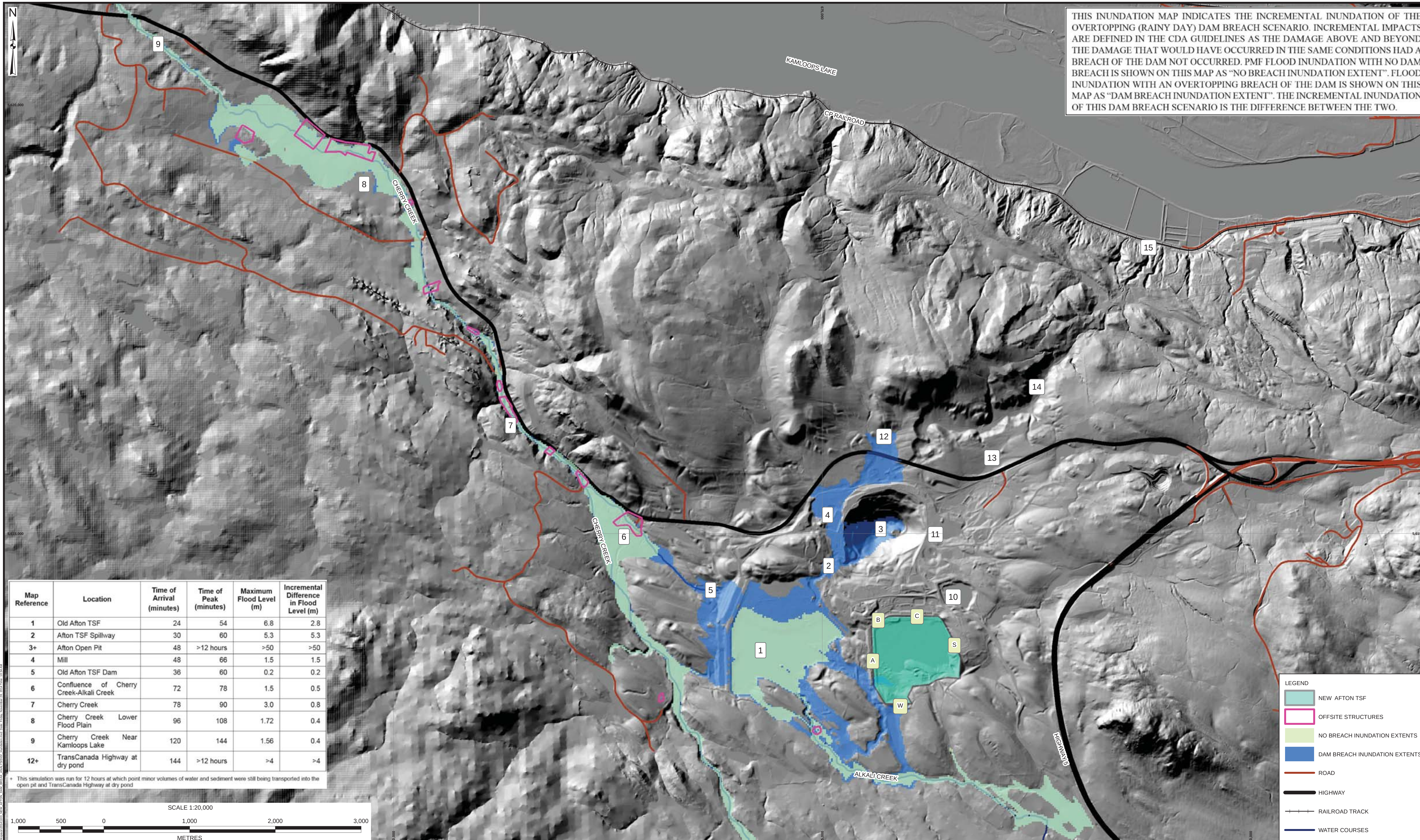
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON DAM BREAK ANALYSIS

TITLE: MAXIMUM INUNDATION EXTENTS
WEST DAM
PIPING BREACH

PROJECT No.: 0921-015-01
DWG No.: 11
REV.:



THIS INUNDATION MAP INDICATES THE INCREMENTAL INUNDATION OF THE OVERTOPPING (RAINY DAY) DAM BREACH SCENARIO. INCREMENTAL IMPACTS ARE DEFINED IN THE CDA GUIDELINES AS THE DAMAGE ABOVE AND BEYOND THE DAMAGE THAT WOULD HAVE OCCURRED IN THE SAME CONDITIONS HAD A BREACH OF THE DAM NOT OCCURRED. PMF FLOOD INUNDATION WITH NO DAM BREACH IS SHOWN ON THIS MAP AS "NO BREACH INUNDATION EXTENT". FLOOD INUNDATION WITH AN OVERTOPPING BREACH OF THE DAM IS SHOWN ON THIS MAP AS "DAM BREACH INUNDATION EXTENT". THE INCREMENTAL INUNDATION OF THIS DAM BREACH SCENARIO IS THE DIFFERENCE BETWEEN THE TWO.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Level (m)	Incremental Difference in Flood Level (m)
1	Old Afton TSF	24	54	6.8	2.8
2	Afton TSF Spillway	30	60	5.3	5.3
3+	Afton Open Pit	48	>12 hours	>50	>50
4	Mill	48	66	1.5	1.5
5	Old Afton TSF Dam	36	60	0.2	0.2
6	Confluence of Cherry Creek-Alkali Creek	72	78	1.5	0.5
7	Cherry Creek	78	90	3.0	0.8
8	Cherry Creek Lower Flood Plain	96	108	1.72	0.4
9	Cherry Creek Near Kamloops Lake	120	144	1.56	0.4
12+	TransCanada Highway at dry pond	144	>12 hours	>4	>4

+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit and TransCanada Highway at dry pond

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SCALE:	1:20,000
DATE:	NOV 2014
DRAWN:	RC
DESIGNED:	WW
CHECKED:	TM
APPROVED:	CL

PROFESSIONAL SEAL:

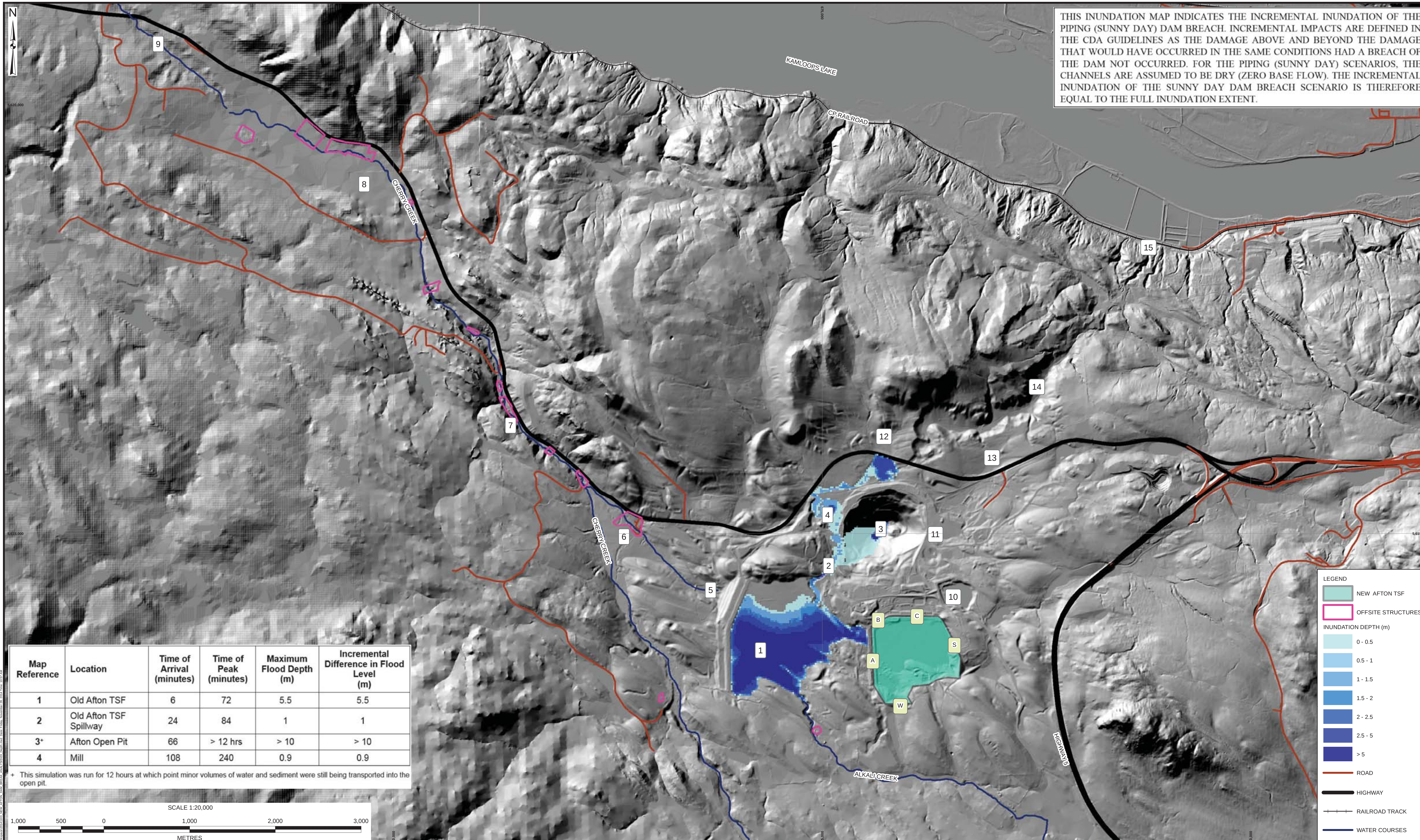
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON DAM BREAK ANALYSIS

TITLE: MAXIMUM INUNDATION EXTENTS
WEST DAM
OVERTOPPING BREACH

PROJECT No.:	DWG No.:	REV.:
0921-015-01	12	



THIS INUNDATION MAP INDICATES THE INCREMENTAL INUNDATION OF THE PIPING (SUNNY DAY) DAM BREACH. INCREMENTAL IMPACTS ARE DEFINED IN THE CDA GUIDELINES AS THE DAMAGE ABOVE AND BEYOND THE DAMAGE THAT WOULD HAVE OCCURRED IN THE SAME CONDITIONS HAD A BREACH OF THE DAM NOT OCCURRED. FOR THE PIPING (SUNNY DAY) SCENARIOS, THE CHANNELS ARE ASSUMED TO BE DRY (ZERO BASE FLOW). THE INCREMENTAL INUNDATION OF THE SUNNY DAY DAM BREACH SCENARIO IS THEREFORE EQUAL TO THE FULL INUNDATION EXTENT.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Level (m)
1	Old Afton TSF	6	72	5.5	5.5
2	Old Afton TSF Spillway	24	84	1	1
3+	Afton Open Pit	66	> 12 hrs	> 10	> 10
4	Mill	108	240	0.9	0.9

+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit.

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SCALE:	1:20,000
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DRAWN:	RC
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APPROVED:	CL

PROFESSIONAL SEAL:

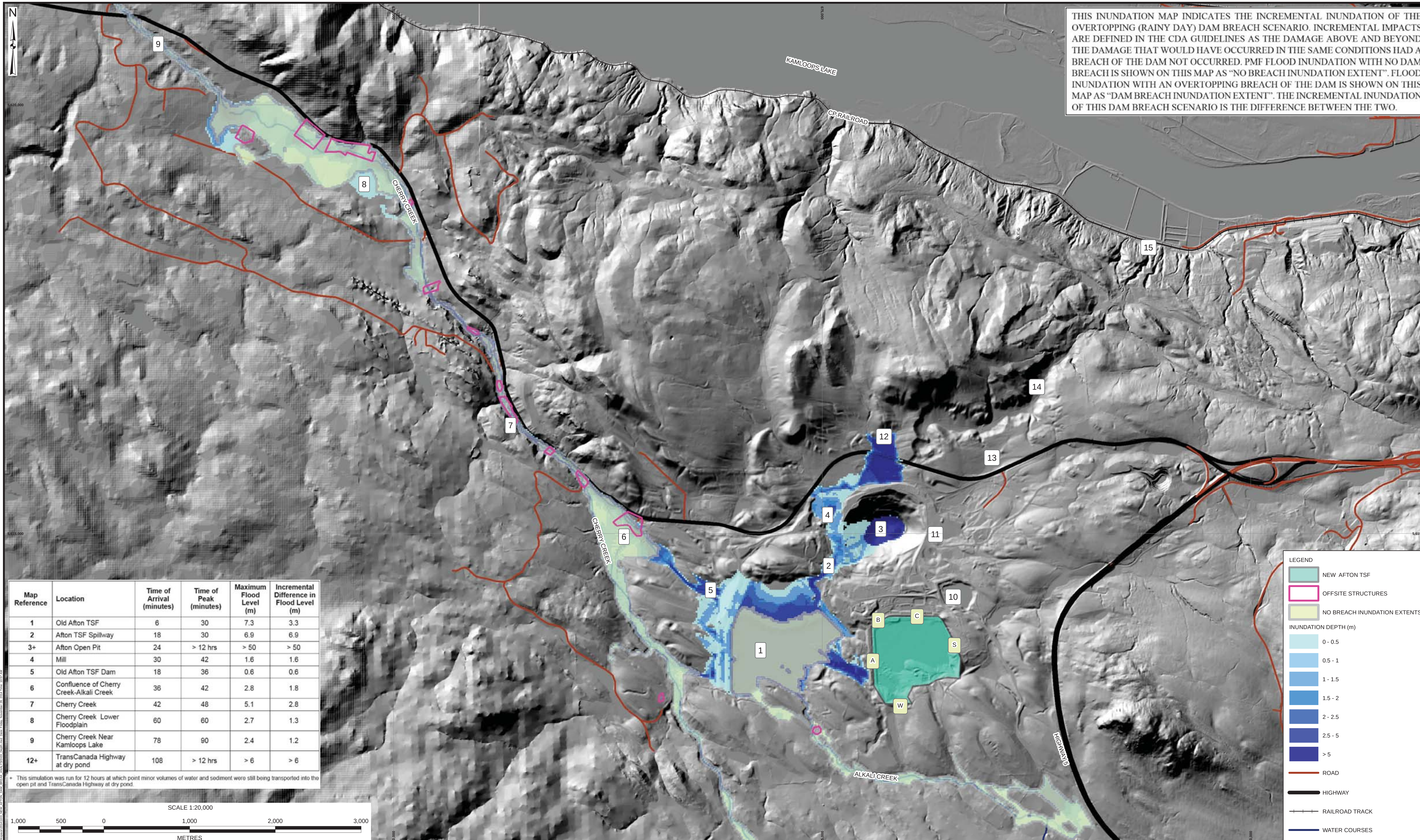
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON DAM BREAK ANALYSIS

TITLE: MAXIMUM INUNDATION DEPTH DAM A PIPING BREACH

PROJECT No.:	DWG No.:	REV.:
0921-015-01	13	



THIS INUNDATION MAP INDICATES THE INCREMENTAL INUNDATION OF THE OVERTOPPING (RAINY DAY) DAM BREACH SCENARIO. INCREMENTAL IMPACTS ARE DEFINED IN THE CDA GUIDELINES AS THE DAMAGE ABOVE AND BEYOND THE DAMAGE THAT WOULD HAVE OCCURRED IN THE SAME CONDITIONS HAD A BREACH OF THE DAM NOT OCCURRED. PMF FLOOD INUNDATION WITH NO DAM BREACH IS SHOWN ON THIS MAP AS "NO BREACH INUNDATION EXTENT". FLOOD INUNDATION WITH AN OVERTOPPING BREACH OF THE DAM IS SHOWN ON THIS MAP AS "DAM BREACH INUNDATION EXTENT". THE INCREMENTAL INUNDATION OF THIS DAM BREACH SCENARIO IS THE DIFFERENCE BETWEEN THE TWO.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Level (m)	Incremental Difference in Flood Level (m)
1	Old Afton TSF	6	30	7.3	3.3
2	Afton TSF Spillway	18	30	6.9	6.9
3+	Afton Open Pit	24	> 12 hrs	> 50	> 50
4	Mill	30	42	1.6	1.6
5	Old Afton TSF Dam	18	36	0.6	0.6
6	Confluence of Cherry Creek-Alkali Creek	36	42	2.8	1.8
7	Cherry Creek	42	48	5.1	2.8
8	Cherry Creek Lower Floodplain	60	60	2.7	1.3
9	Cherry Creek Near Kamloops Lake	78	90	2.4	1.2
12+	TransCanada Highway at dry pond	108	> 12 hrs	> 6	> 6

+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit and TransCanada Highway at dry pond.

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SCALE:	1:20,000
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APPROVED:	CL

PROFESSIONAL SEAL:

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON DAM BREAK ANALYSIS

TITLE: MAXIMUM INUNDATION DEPTH DAM A OVERTOPPING BREACH

PROJECT No.:	DWG No.:	REV.:
0921-015-01	14	

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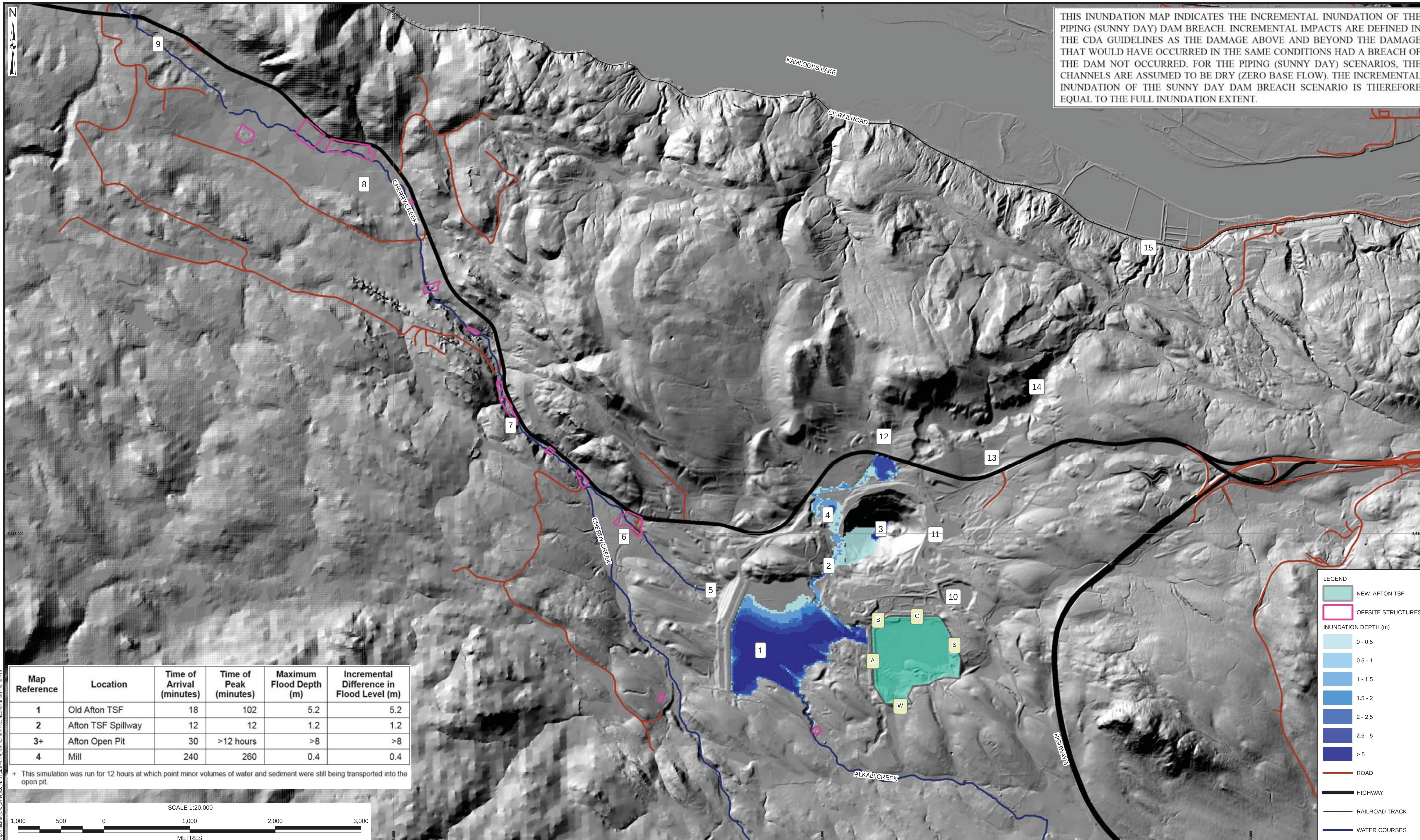

THIS INUNDATION MAP INDICATES THE INCREMENTAL INUNDATION OF THE PIPING (SUNNY DAY) DAM BREACH. INCREMENTAL IMPACTS ARE DEFINED IN THE CDA GUIDELINES AS THE DAMAGE ABOVE AND BEYOND THE DAMAGE THAT WOULD HAVE OCCURRED IN THE SAME CONDITIONS HAD A BREACH OF THE DAM NOT OCCURRED. FOR THE PIPING (SUNNY DAY) SCENARIOS, THE CHANNELS ARE ASSUMED TO BE DRY (ZERO BASE FLOW). THE INCREMENTAL INUNDATION OF THE SUNNY DAY DAM BREACH SCENARIO IS THEREFORE EQUAL TO THE FULL INUNDATION EXTENT.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Level (m)
1	Old Afton TSF	18	102	5.2	5.2
2	Afton TSF Spillway	12	12	1.2	1.2
3+	Afton Open Pit	30	>12 hours	>8	>8
4	Mill	240	260	0.4	0.4

+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit.

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PROFESSIONAL SEAL:

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON DAM BREAK ANALYSIS

TITLE: MAXIMUM INUNDATION DEPTH
DAM B
PIPING BREACH

PROJECT No.:	DWG No.:	REV.:
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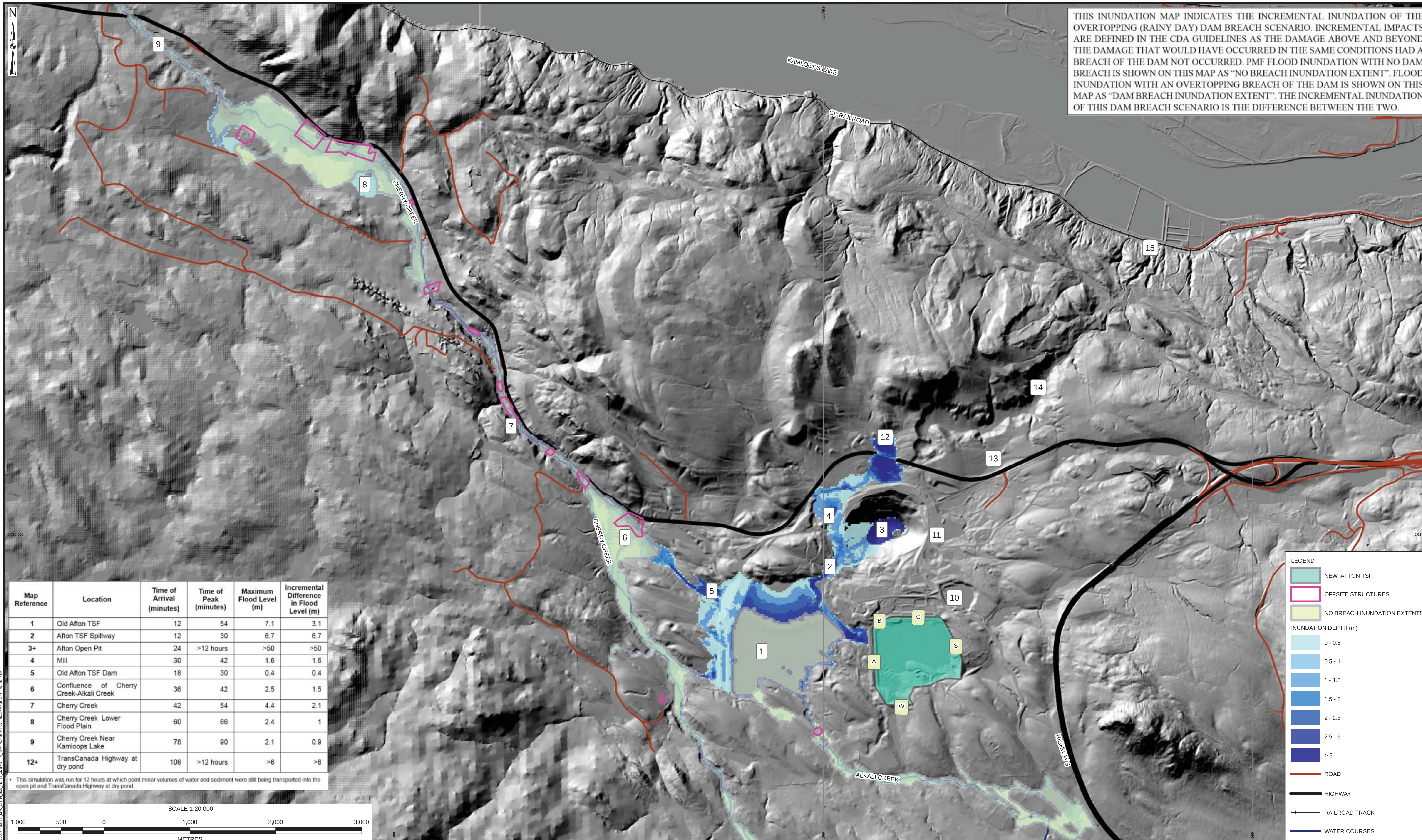

THIS INUNDATION MAP INDICATES THE INCREMENTAL INUNDATION OF THE OVERTOPPING (RAINY DAY) DAM BREACH SCENARIO. INCREMENTAL IMPACTS ARE DEFINED IN THE CDA GUIDELINES AS THE DAMAGE ABOVE AND BEYOND THE DAMAGE THAT WOULD HAVE OCCURRED IN THE SAME CONDITIONS HAD A BREACH OF THE DAM NOT OCCURRED. PMF FLOOD INUNDATION WITH NO DAM BREACH IS SHOWN ON THIS MAP AS "NO BREACH INUNDATION EXTENT". FLOOD INUNDATION WITH AN OVERTOPPING BREACH OF THE DAM IS SHOWN ON THIS MAP AS "DAM BREACH INUNDATION EXTENT". THE INCREMENTAL INUNDATION OF THIS DAM BREACH SCENARIO IS THE DIFFERENCE BETWEEN THE TWO.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Level (m)	Incremental Difference in Flood Level (m)
1	Old Afton TSF	12	54	7.1	3.1
2	Afton TSF Spillway	12	30	6.7	6.7
3+	Afton Open Pit	24	>12 hours	>50	>50
4	Mill	30	42	1.6	1.6
5	Old Afton TSF Dam	18	30	0.4	0.4
6	Confluence of Cherry Creek-Alkali Creek	36	42	2.5	1.5
7	Cherry Creek	42	54	4.4	2.1
8	Cherry Creek Lower Flood Plain	60	66	2.4	1
9	Cherry Creek Near Kamloops Lake	78	90	2.1	0.9
12+	TransCanada Highway at dry pond	108	>12 hours	>6	>6

+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit and TransCanada Highway at dry pond.

SCALE 1:20,000

1,000 500 0 1,000 2,000 3,000

METRES

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DATE:	NOV 2014
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APPROVED:	CL

PROFESSIONAL SEAL:

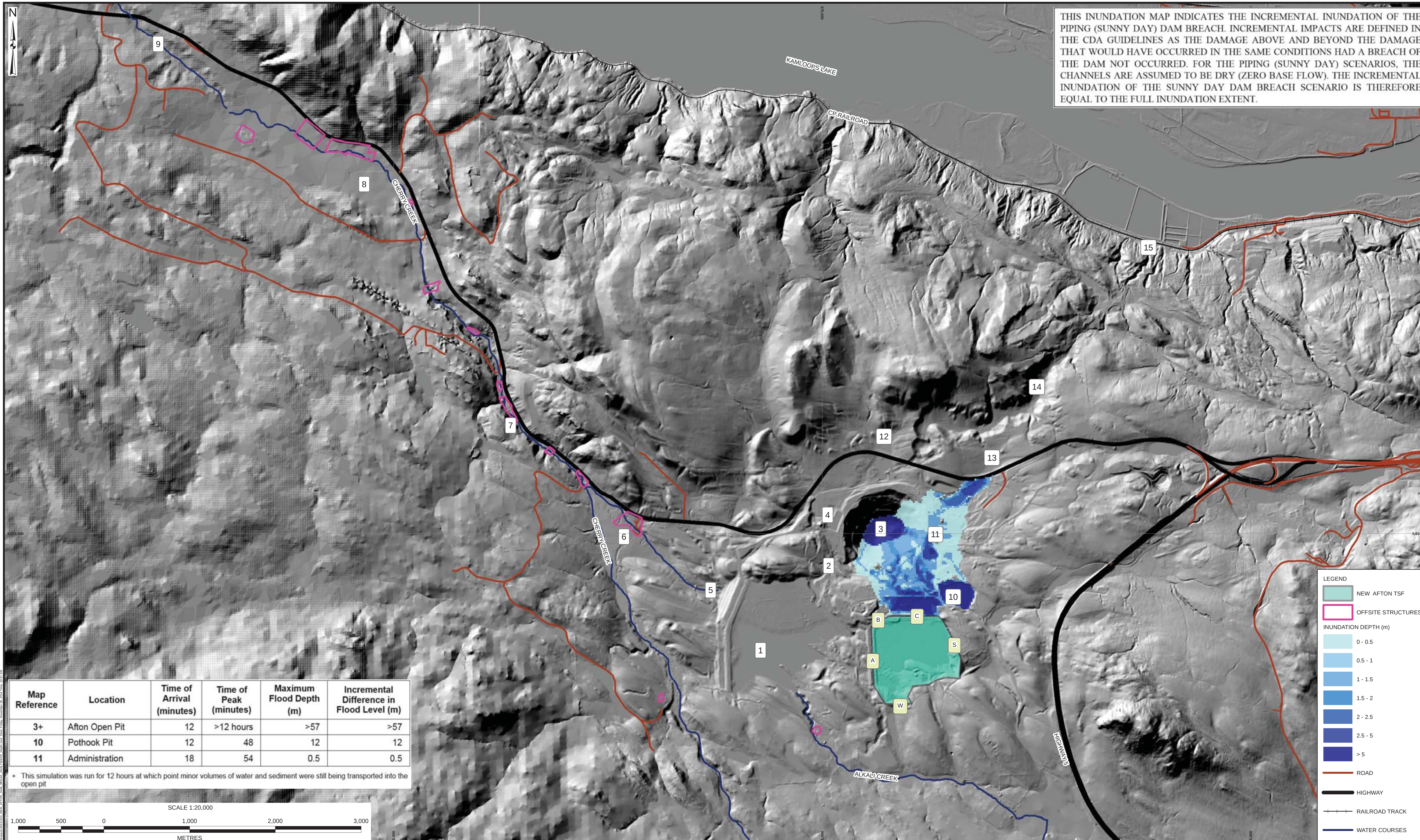
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON DAM BREAK ANALYSIS

TITLE: MAXIMUM INUNDATION DEPTH DAM B OVERTOPPING BREACH

PROJECT No.: 0921-015-01 | DWG No.: 16 | REV.:



THIS INUNDATION MAP INDICATES THE INCREMENTAL INUNDATION OF THE PIPING (SUNNY DAY) DAM BREACH. INCREMENTAL IMPACTS ARE DEFINED IN THE CDA GUIDELINES AS THE DAMAGE ABOVE AND BEYOND THE DAMAGE THAT WOULD HAVE OCCURRED IN THE SAME CONDITIONS HAD A BREACH OF THE DAM NOT OCCURRED. FOR THE PIPING (SUNNY DAY) SCENARIOS, THE CHANNELS ARE ASSUMED TO BE DRY (ZERO BASE FLOW). THE INCREMENTAL INUNDATION OF THE SUNNY DAY DAM BREACH SCENARIO IS THEREFORE EQUAL TO THE FULL INUNDATION EXTENT.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Level (m)
3+	Afton Open Pit	12	>12 hours	>57	>57
10	Pothook Pit	12	48	12	12
11	Administration	18	54	0.5	0.5

\+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit

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BGC ENGINEERING INC.
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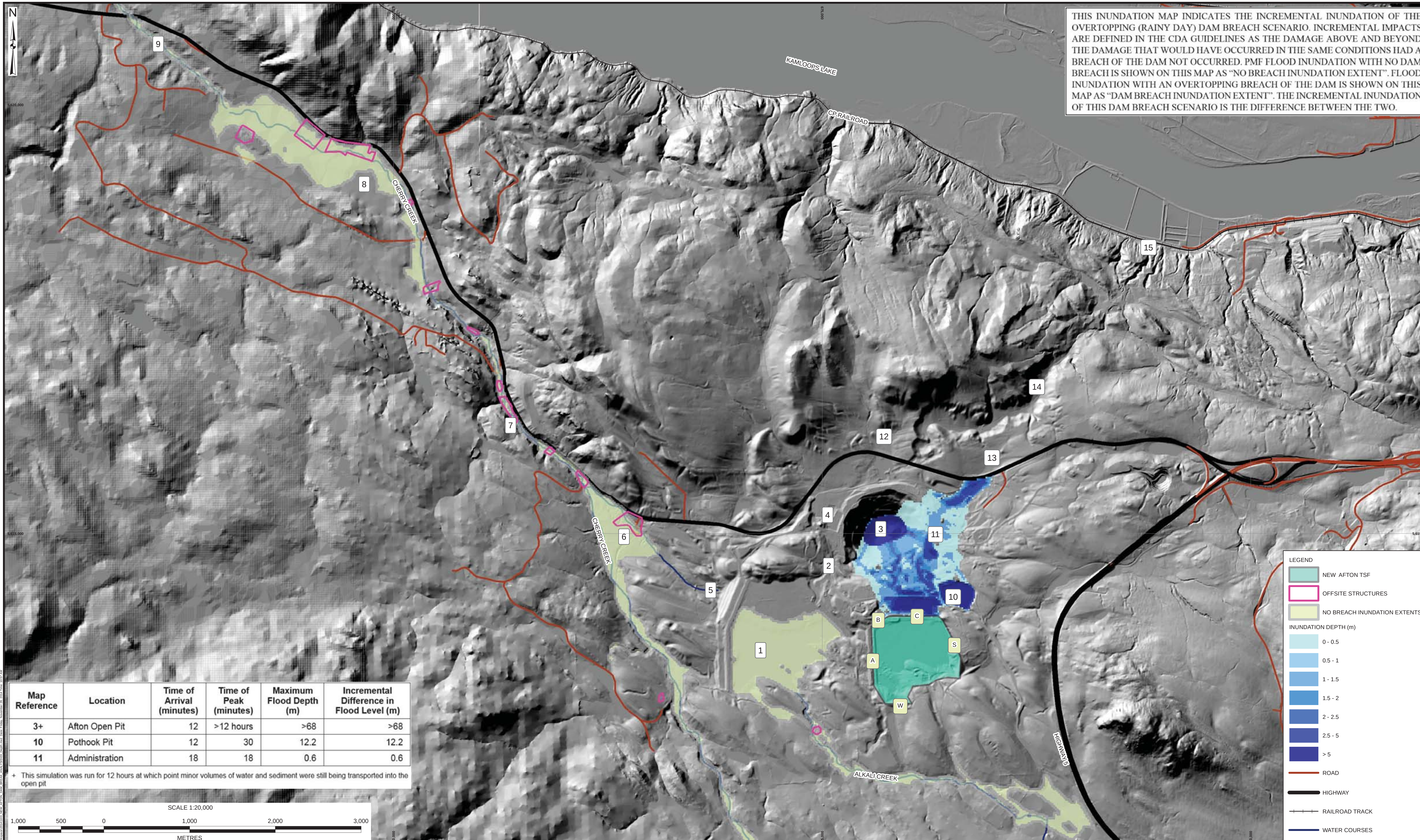
CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON DAM BREAK ANALYSIS

TITLE: MAXIMUM INUNDATION DEPTH
DAM C
PIPING BREACH

PROJECT No.: 0921-015-01
DWG No.: 17
REV.:



THIS INUNDATION MAP INDICATES THE INCREMENTAL INUNDATION OF THE OVERTOPPING (RAINY DAY) DAM BREACH SCENARIO. INCREMENTAL IMPACTS ARE DEFINED IN THE CDA GUIDELINES AS THE DAMAGE ABOVE AND BEYOND THE DAMAGE THAT WOULD HAVE OCCURRED IN THE SAME CONDITIONS HAD A BREACH OF THE DAM NOT OCCURRED. PMF FLOOD INUNDATION WITH NO DAM BREACH IS SHOWN ON THIS MAP AS "NO BREACH INUNDATION EXTENT". FLOOD INUNDATION WITH AN OVERTOPPING BREACH OF THE DAM IS SHOWN ON THIS MAP AS "DAM BREACH INUNDATION EXTENT". THE INCREMENTAL INUNDATION OF THIS DAM BREACH SCENARIO IS THE DIFFERENCE BETWEEN THE TWO.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Level (m)
3+	Afton Open Pit	12	>12 hours	>68	>68
10	Pothook Pit	12	30	12.2	12.2
11	Administration	18	18	0.6	0.6

+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit

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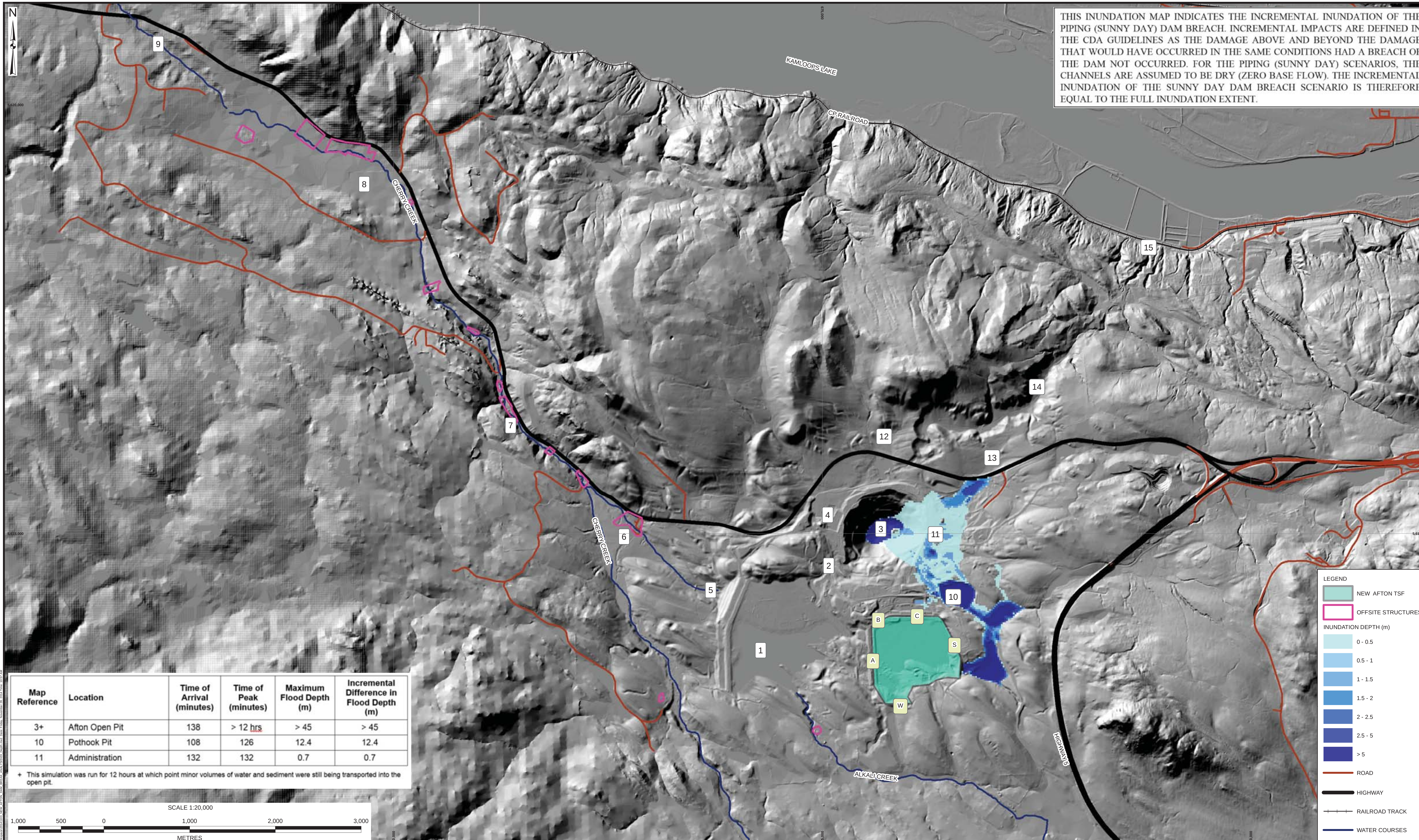
CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON DAM BREAK ANALYSIS

TITLE: MAXIMUM INUNDATION DEPTH
DAM C
OVERTOPPING BREACH

PROJECT No.: 0921-015-01 | DWG No.: 18 | REV.:



THIS INUNDATION MAP INDICATES THE INCREMENTAL INUNDATION OF THE PIPING (SUNNY DAY) DAM BREACH. INCREMENTAL IMPACTS ARE DEFINED IN THE CDA GUIDELINES AS THE DAMAGE ABOVE AND BEYOND THE DAMAGE THAT WOULD HAVE OCCURRED IN THE SAME CONDITIONS HAD A BREACH OF THE DAM NOT OCCURRED. FOR THE PIPING (SUNNY DAY) SCENARIOS, THE CHANNELS ARE ASSUMED TO BE DRY (ZERO BASE FLOW). THE INCREMENTAL INUNDATION OF THE SUNNY DAY DAM BREACH SCENARIO IS THEREFORE EQUAL TO THE FULL INUNDATION EXTENT.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Depth (m)
3+	Afton Open Pit	138	> 12 hrs	> 45	> 45
10	Pothook Pit	108	126	12.4	12.4
11	Administration	132	132	0.7	0.7

+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit.

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APPROVED:	CL

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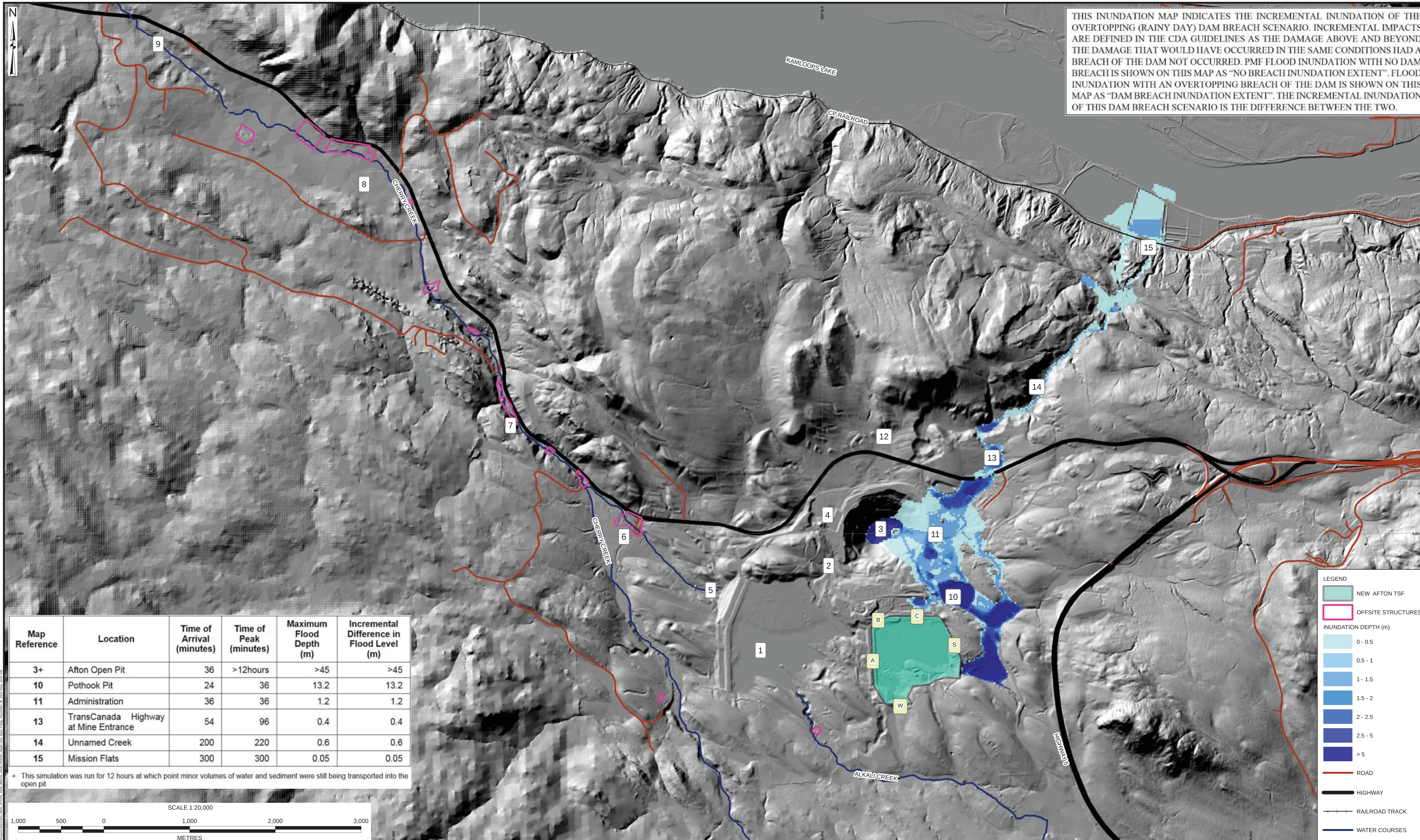
CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON DAM BREAK ANALYSIS

TITLE: MAXIMUM INUNDATION DEPTH
SOUTH DAM
PIPING BREACH

PROJECT No.: 0921-015-01 | DWG No.: 19 | REV.:



THIS INUNDATION MAP INDICATES THE INCREMENTAL INUNDATION OF THE OVERTOPPING (RAINY DAY) DAM BREACH SCENARIO. INCREMENTAL IMPACTS ARE DEFINED IN THE CDA GUIDELINES AS THE DAMAGE ABOVE AND BEYOND THE DAMAGE THAT WOULD HAVE OCCURRED IN THE SAME CONDITIONS HAD A BREACH OF THE DAM NOT OCCURRED. PMF FLOOD INUNDATION WITH NO DAM BREACH IS SHOWN ON THIS MAP AS "NO BREACH INUNDATION EXTENT". FLOOD INUNDATION WITH AN OVERTOPPING BREACH OF THE DAM IS SHOWN ON THIS MAP AS "DAM BREACH INUNDATION EXTENT". THE INCREMENTAL INUNDATION OF THIS DAM BREACH SCENARIO IS THE DIFFERENCE BETWEEN THE TWO.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Level (m)
3+	Afton Open Pit	36	>12hours	>45	>45
10	Pothook Pit	24	36	13.2	13.2
11	Administration	36	36	1.2	1.2
13	TransCanada Highway at Mine Entrance	54	96	0.4	0.4
14	Unnamed Creek	200	220	0.6	0.6
15	Mission Flats	300	300	0.05	0.05

+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit

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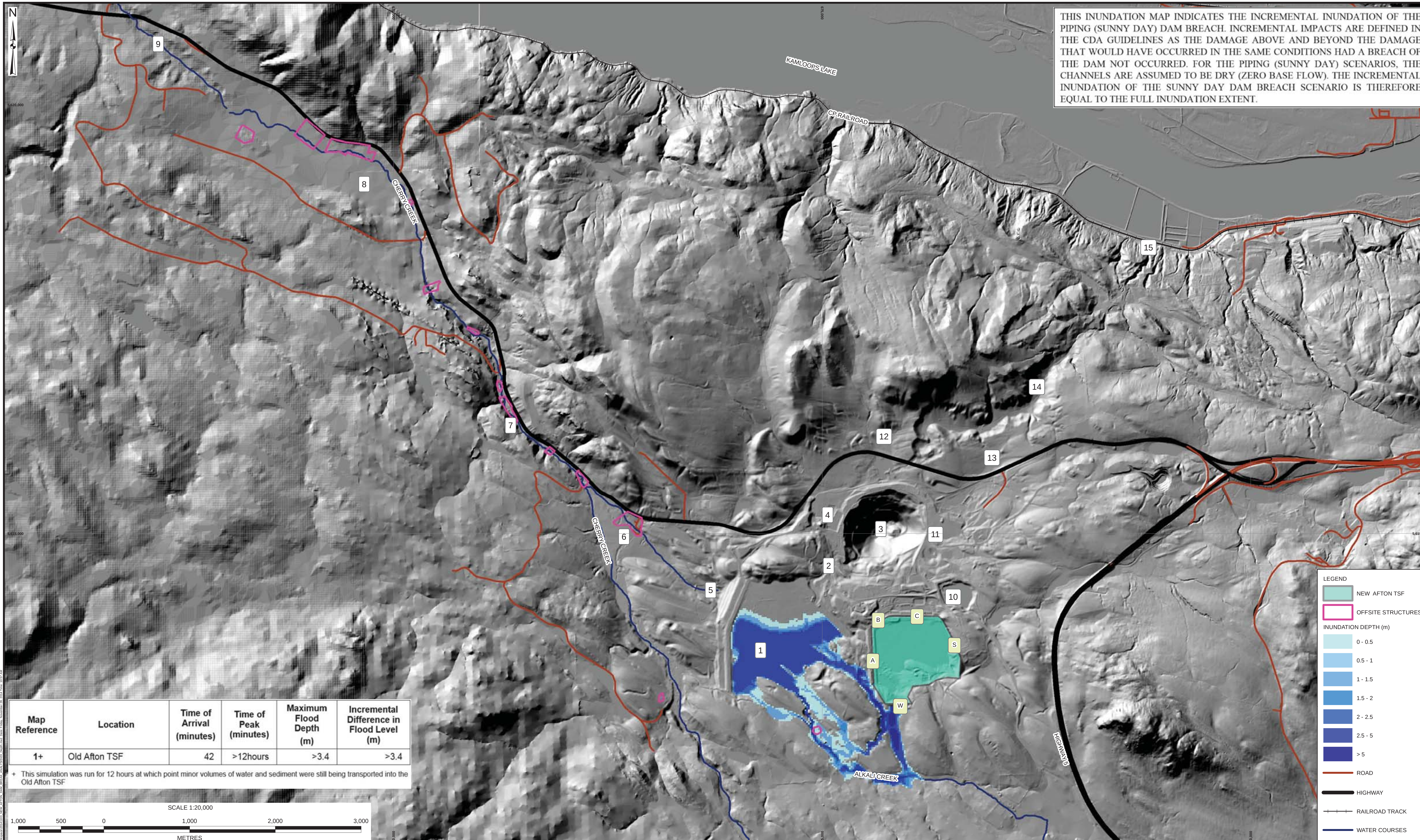
CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON DAM BREAK ANALYSIS

TITLE: MAXIMUM INUNDATION DEPTH SOUTH DAM OVERTOPPING BREACH

PROJECT No.: 0921-015-01
DWG No.: 20
REV.:



THIS INUNDATION MAP INDICATES THE INCREMENTAL INUNDATION OF THE PIPING (SUNNY DAY) DAM BREACH. INCREMENTAL IMPACTS ARE DEFINED IN THE CDA GUIDELINES AS THE DAMAGE ABOVE AND BEYOND THE DAMAGE THAT WOULD HAVE OCCURRED IN THE SAME CONDITIONS HAD A BREACH OF THE DAM NOT OCCURRED. FOR THE PIPING (SUNNY DAY) SCENARIOS, THE CHANNELS ARE ASSUMED TO BE DRY (ZERO BASE FLOW). THE INCREMENTAL INUNDATION OF THE SUNNY DAY DAM BREACH SCENARIO IS THEREFORE EQUAL TO THE FULL INUNDATION EXTENT.

Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Depth (m)	Incremental Difference in Flood Level (m)
1+	Old Afton TSF	42	>12hours	>3.4	>3.4

+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the Old Afton TSF

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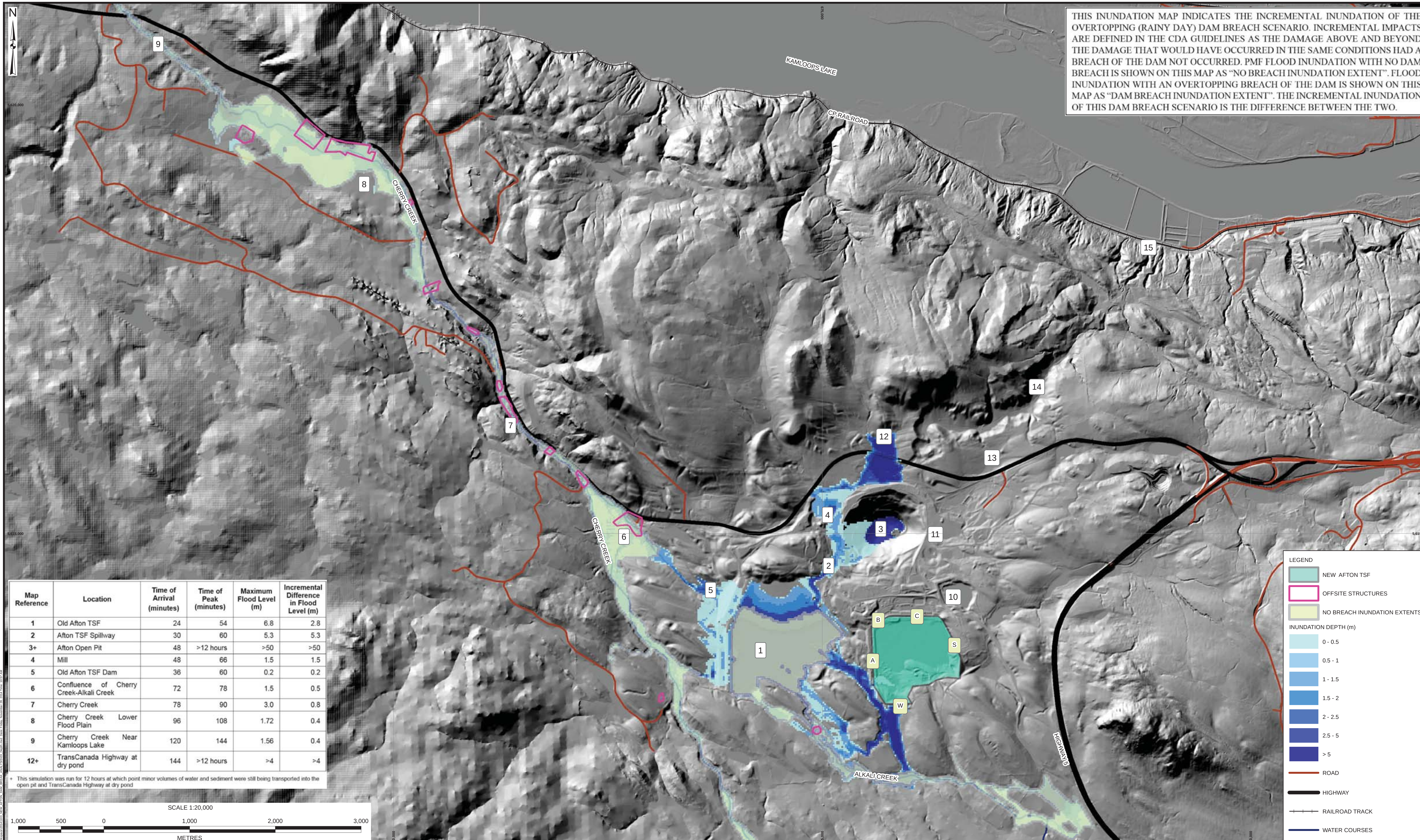
CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON DAM BREAK ANALYSIS

TITLE: MAXIMUM INUNDATION DEPTH
WEST DAM
PIPING BREACH

PROJECT No.:	DWG No.:	REV.:
0921-015-01	21	

THIS INUNDATION MAP INDICATES THE INCREMENTAL INUNDATION OF THE OVERTOPPING (RAINY DAY) DAM BREACH SCENARIO. INCREMENTAL IMPACTS ARE DEFINED IN THE CDA GUIDELINES AS THE DAMAGE ABOVE AND BEYOND THE DAMAGE THAT WOULD HAVE OCCURRED IN THE SAME CONDITIONS HAD A BREACH OF THE DAM NOT OCCURRED. PMF FLOOD INUNDATION WITH NO DAM BREACH IS SHOWN ON THIS MAP AS "NO BREACH INUNDATION EXTENT". FLOOD INUNDATION WITH AN OVERTOPPING BREACH OF THE DAM IS SHOWN ON THIS MAP AS "DAM BREACH INUNDATION EXTENT". THE INCREMENTAL INUNDATION OF THIS DAM BREACH SCENARIO IS THE DIFFERENCE BETWEEN THE TWO.



Map Reference	Location	Time of Arrival (minutes)	Time of Peak (minutes)	Maximum Flood Level (m)	Incremental Difference in Flood Level (m)
1	Old Afton TSF	24	54	6.8	2.8
2	Afton TSF Spillway	30	60	5.3	5.3
3+	Afton Open Pit	48	>12 hours	>50	>50
4	Mill	48	66	1.5	1.5
5	Old Afton TSF Dam	36	60	0.2	0.2
6	Confluence of Cherry Creek-Alkali Creek	72	78	1.5	0.5
7	Cherry Creek	78	90	3.0	0.8
8	Cherry Creek Lower Flood Plain	96	108	1.72	0.4
9	Cherry Creek Near Kamloops Lake	120	144	1.56	0.4
12+	TransCanada Highway at dry pond	144	>12 hours	>4	>4

+ This simulation was run for 12 hours at which point minor volumes of water and sediment were still being transported into the open pit and TransCanada Highway at dry pond

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CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON DAM BREAK ANALYSIS

TITLE: MAXIMUM INUNDATION DEPTH
WEST DAM
OVERTOPPING BREACH

PROJECT No.: 0921-015-01
DWG No.: 22
REV.:

APPENDIX A
BREACH MODELLING

A.1. INTRODUCTION

The BREACH program (Fread, 1991) simulates physical processes that lead to the failure of an embankment. This program is a preferred modelling strategy in that the breach rate, which is typically the source of the greatest uncertainty in empirical-parametric modeling, is an output of the model rather than an input. Furthermore, the physical processes simulated by the BREACH program provide a physical basis for interpreting the model results.

The BREACH program was used in the present study, and various model parameters were adjusted so that peak breach outflow rates were consistent with empirical methods provided in the technical literature that are based on failure case records. This constitutes a necessary step in the process of developing the breach hydrograph so as to obtain peak breach outflows, critical to subsequent inundation modelling, that are grounded in documented case record experience.

A.1.1. Breach Model Description

Given the geometry and physical properties of the embankment and impoundment, the BREACH program simulates the physical processes of overtopping or piping using the principles of hydraulics, sediment transport and slope stability. These physical and inherently complex processes are necessarily simplified in the numerical model.

In a typical overtopping (i.e. rainy day scenario) dam breach analysis, the BREACH program simulates the following processes:

1. Flow of water over the dam crest initiates erosion of a narrow channel on the downstream dam face. It is assumed that the emergency spillway has been blocked and that water overtops the dam crest.
2. The channel down-cuts parallel with the dam face and expands laterally through a combination of continuous erosion and episodic bank failures.
3. After intersecting the upstream dam face, the channel begins to down-cut vertically and continues to expand laterally. The start of step 3 typically coincides with a significant increase in the simulated outflow discharge.

In a typical piping (i.e. sunny day scenario) dam breach analysis, the BREACH program simulates the following processes:

1. Given a user-specified initial breach elevation, a narrow horizontal “pipe” is formed which joins the upstream and downstream dam faces. Water level in the impoundment is assumed to be equal to normal operational water level (NOWL).
2. The diameter of the pipe increases through continuous erosion until a critical point is reached and the pipe collapses.
3. If the top of the collapsed material is lower than the elevation of the pond surface at the time of collapse, overtopping follows as described above.

A.1.2. Dam Breach Scenarios

Two dam failure modes were modeled for each of the dams as recommended by the CDA Guidelines:

1. "Rainy Day" failure by dam overtopping; and
2. "Sunny Day" failure by piping.

Overtopping can occur as a result of increased water levels in the impoundment reaching the dam crest or as a result of deformation or settlement of the dam crest towards the pond. This dam breach study assumes "flood stage" failure from overtopping is triggered when raised water levels reach the dam crest and the impoundment is at the maximum possible volume. The "flood stage" failure therefore results in the largest potential inundation area, because the largest potential volume of water lies within the reservoir at the moment of failure.

Piping can occur for water levels lower than maximum design capacity, requiring only filter incompatibility and sufficient seepage gradients to drive particle migration in areas of filter incompatibility. For this evaluation it is assumed that piping would occur when the pond is at its normal operating condition, consistent with a "sunny day" failure scenario. The normal operating condition is the average operating pond volume and therefore results in a lower peak discharge and outflow hydrograph for dam breaching than is the case for the rainy day overtopping scenario. CDA (2007) indicates that "*typically, for earthfill dams, both overtopping failure and piping failure are included in the analysis*".

A.1.3. Model Parameterization

A.1.3.1. Dam and Impoundment Characteristics

Input parameters to BREACH include the dam and impoundment geometry as well as dam structure and dam material characteristics. Dam geometry and structure parameters were derived from information contained within the New Afton 2014 Dam Raise, Design Report (BGC, 2014). The volume-elevation curve of the impoundment to its permitted crest elevation is illustrated in Figure A.1-1 and input parameters to the BREACH program are summarized in Table A.1-1 below.

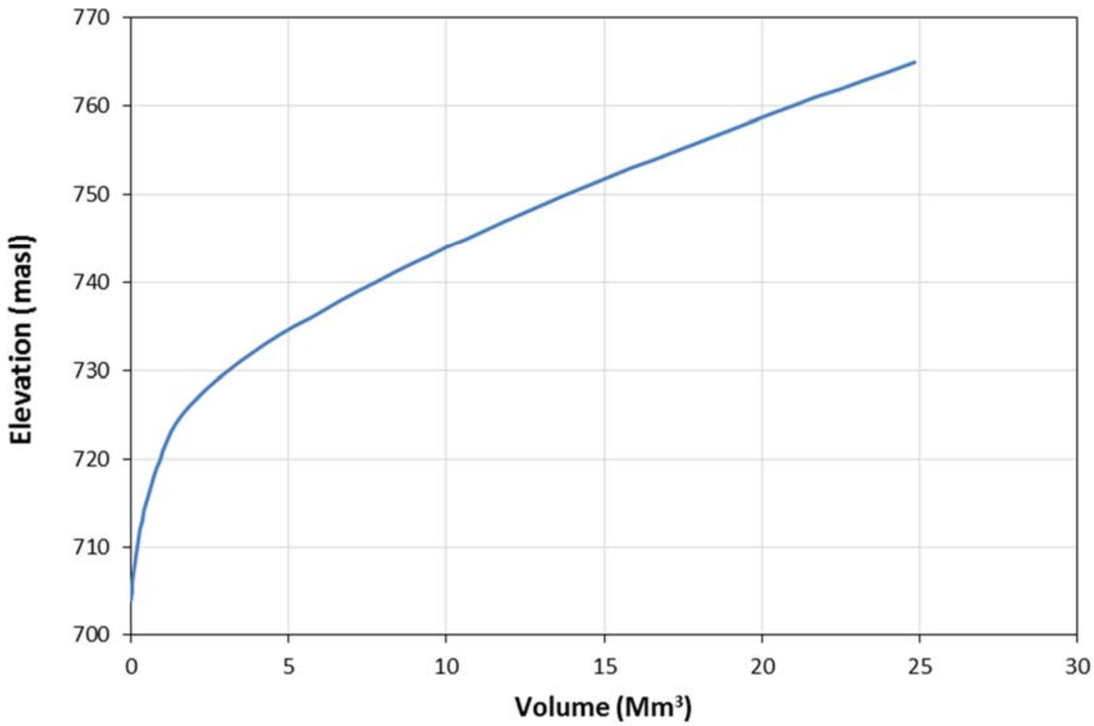


Figure A.1-1. Volume-elevation curve of the New Afton tailings storage facility.

Table A.1-1. Dam material and geometry characteristics for BREACH model input.

Zone	Parameter	Dam				
		A	**B**	**C**	**South**	**West**
Core	**Material**	Compacted Till	n/a	n/a	Compacted Till	Compacted Till
	D_{30} Grain Size (mm)	2	n/a	n/a	2	2
	D_{50} Grain Size (mm)	10	n/a	n/a	10	10
	D_{90} Grain Size (mm)	50	n/a	n/a	50	50
	D_{90} to D_{30} Grain Size Ratio	25	n/a	n/a	25	25
	Porosity	0.24	n/a	n/a	0.24	0.24
	Density (kg/m^3)	2125	n/a	n/a	2125	2125
	Manning Number, n	0.03	n/a	n/a	0.03	0.03
	Internal Friction Angle, ϕ_i (°)	25	n/a	n/a	25	25
	Cohesion (kPa)	13.8	n/a	n/a	13.8	13.8
Zone	**Parameter**	**Dam**				
		A	**B**	**C**	**South**	**West**
Shell	**Material**	**Cyclone Sand**	**Cyclone Sand**	**Cyclone Sand**	**Waste Rock**	**Waste Rock**
	D_{30} Grain Size (mm)	0.3	0.3	0.3	7	7
	D_{50} Grain Size (mm)	9	0.6	0.6	19	19
	D_{90} Grain Size (mm)	2	2	2	50	50
	D_{90} to D_{30} Grain Size Ratio	8	8	8	6	6
	Porosity	0.33	0.33	0.33	0.25	0.25
	Density (kg/m^3)	1850	1850	1850	2040	2040
	Manning Number, n	0.03	0.03	0.03	0.03	0.03
	Internal Friction Angle, ϕ_i (°)	36	36	36	37	37
	Cohesion (kPa)	0	0	0	0	0

A.1.3.2. Breached Volumes

There are two components associated with modelling the breach volumes: free water and tailings. The free water is assumed to drain entirely from the impoundment, but only a portion of the impounded tailings will typically be released (e.g. Rico et al. 2007), leaving a back scarp of tailings. The post failure surface is a conical depression starting at the base of the breached dam, extending out at a post failure slope of and average slope of approximately 3^o, as discussed further below. Using analytical tools, a post failure surface is estimated. The difference in volume between the post failure surface and the initial tailings surface determines the tailings volume released as a result of the dam breach.

In-situ testing showed an average tailings dry density of 1,200 kg/m^3, equivalent to a porosity of approximately 0.56. For the purpose of this study, tailings were assumed to be saturated and the tailings post failure angle of repose was assumed to be 3° from the base of the dam breach simulated. As the contents of the impoundment begin to flow out of the breach, starting with the operating pond and/or stored flood, the tailings are expected to fail by retrogressive liquefaction (Blight and Fourie, 2003). A post failure tailings surface profile of 3° from the upstream toe of the breach through the tailings has been assumed for the breach modeling based on case studies from the El Cobre, Merriespruit, Bafokeng, Arcturus and Saaiplaas tailings dam failures (Blight and Fourie, 2003).

The volume of free water in the pond was assumed to be 0.5 Mm^3 for the sunny day scenario. For the rainy day scenario, the volume of water in the pond was equivalent to the water level required to overtop the crest (1.3 Mm^3). Breached volumes for piping and overtopping failure scenarios are summarized in Table A.1-2.

Table A.1-2. Mobilized water and tailings volumes for various dam breach scenarios.

Dam	Failure Mode	Initial Water Eelvation (masl)	Tailings level at closure (masl)	Dam Crest Elevation (masl)	Dam Toe Elevation (masl)	Water and Tailings Depth (m)	Post Failure Angle	Released Water Volume (Mm^3)	Released Tailings Volume (Mm^3)	Released Volume (Tailings + Water) (Mm^3)
A	Overtopping	765	763.4	765	735	30	3	1.3	4.2	5.5
	Piping	763.6	763.4	765	735	28.6	3	0.5	4.2	4.7
B	Overtopping	765	763.4	765	734	31	3	1.3	3.6	4.9
	Piping	763.6	763.4	765	734	29.6	3	0.5	3.6	4.1
C	Overtopping	765	763.4	765	734	31	3	1.3	4.8	6.1
	Piping	763.6	763.4	765	734	29.6	3	0.5	4.8	5.3
South	Overtopping	765	763.4	765	737	28	3	1.3	3.1	4.4
	Piping	763.6	763.4	765	737	26.6	3	0.5	3.1	3.6
West	Overtopping	765	763.4	765	742	23	3	1.3	1.7	3.0
	Piping	763.6	763.4	765	742	21.6	3	0.5	1.7	2.2

A.1.4. Empirical Estimates of Breach Peak Flow

There is limited information to solely rely on BREACH model results to provide an estimate for the peak discharge rates of a dam failure. Therefore, the peak discharges obtained using BREACH were adjusted so that the simulated peak discharges obtained with BREACH are consistent with empirical-statistical relationships proposed by Froehlich (1995) and Walder and O'Connor (1997) for water dams. In Walder and O'Connor's (1997) method, an empirical breach rate (vertical erosion rate) must be specified. The recommended erosion rate ranges from 0.7 to 1.7 m/min based on values reported in Walder and O'Connor's case history database; a rate of 1.5 m/min was selected to provide a conservative estimate of peak flow. Results of the empirical analyses are presented in Table 1-3. This table also includes peak flow estimates using equations presented in Rico et al. (2007). Rico's calculations are based on 29 case studies of tailings dam failures, of which the maximum dam height is 65 m.

Table A.1-3. Comparison of BREACH results with empirical-statistical methods.

Dam	Failure Mode	Walder and O'Connor (m^3/s)	Froehlich (m^3/s)	Rico et al. (m^3/s)	Peak Discharge from BREACH (m^3/s)
A	Overtopping	7,400	4,000	6,000	5,900
	Piping	6,600	3,600	5,500	4,700
B	Overtopping	6,500	4,000	6,400	5,800
	Piping	5,700	3,600	5,900	4,700
C	Overtopping	8,000	4,300	6,400	6,600
	Piping	7,200	3,900	5,900	5,500
South	Overtopping	6,400	3,400	5,300	4,700
	Piping	5,500	3,000	4,800	3,400
West	Overtopping	5,200	2,400	3,600	3,900
	Piping	4,000	2,000	3,200	3,000

A.1.5. Breach Hydrographs

Breach hydrographs were estimated using two sources of information. The total volume was estimated using estimates of the post failure surface profile of tailings (3^{o}) and anticipated free water volumes, while the peak flows were estimated using the results from the BREACH modelling.

A typical discussion of a piping and overtopping breach hydrographs is provided for Figure A.1-2 and Figure A.1-3 below.

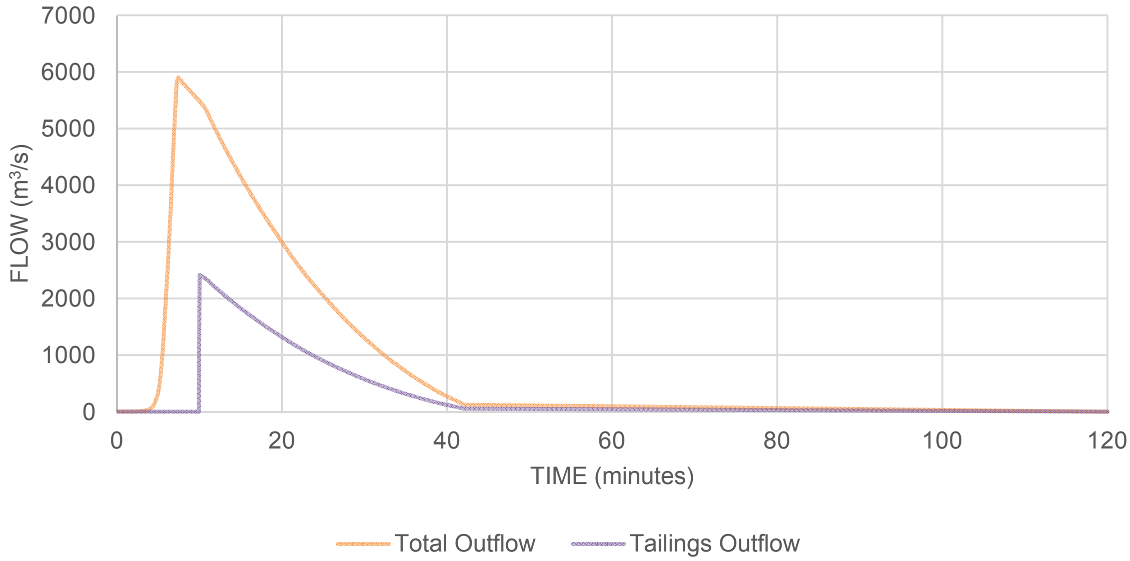


Figure A.1-2. Dam A overtopping breach hydrograph.

The overtopping breach hydrograph for Dam A is provided in Figure A.1-2 In this hypothetical overtopping scenario, the breach initiates with a nominal flow of water over the dam crest. This flow initiates erosion of a narrow channel on the downstream dam face. The channel down-cuts parallel with the dam face and expands laterally through a combination of continuous erosion and episodic bank failure and at about 6 minutes the eroded channel intersects the upstream dam face. The channel then begins to down-cut vertically and continues to expand laterally with a significant increase in the simulated outflow discharge peaking at 8 minutes. The free water pond, draining from the entire area of the impoundment, continues to drain rapidly until 10 minutes. At 10 minutes the free water pond has been completely released and the tailings and entrapped porewater begin to discharge through the breach. The volume of material available to discharge decreases rapidly with time, as the post-failure tailings surface profile of 3° develops. At 42 minutes into the simulation, the breach is complete and limited material is discharged through the breach beyond that time.

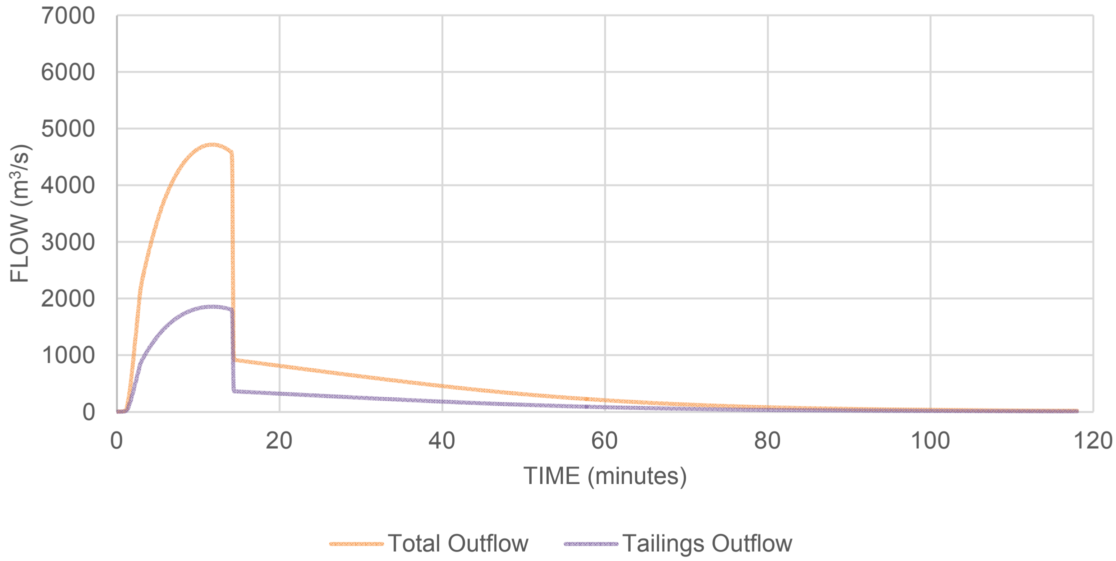


Figure A.1-3. Dam A piping breach hydrograph.

The piping breach hydrograph for Dam A is provided in Figure A.1-3. In this hypothetical failure, the breach initiates at the downstream face. The erosion progresses upstream through the dam eventually extending to the top of the tailings. The breach progressively increases in size with a corresponding increase in discharge of mixed tailings and water peaking at 13 minutes. At 15 minutes into the failure, the pipe collapses, as represented by the rapid drop in the discharge rate shown in Figure A.1-3. Immediately after the collapse, the elevation of the bottom of the breach is increased by the amount of collapsed material. After the collapse, the material acts as a weir with the remaining tailings flowing, at a reduced rate relative to the peak flow in the hydrograph, over the newly formed breach bottom where it continues to erode the breach bottom and sides, eventually releasing tailings until the assumed post-failure surface profile of 3º is achieved.

A.2. OTHER DAMS

The progression and process described in the piping and overtopping examples above are consistent for the remaining breach hydrographs. Breach hydrographs for overtopping and piping failures for Dam B, C, South and West are included below.

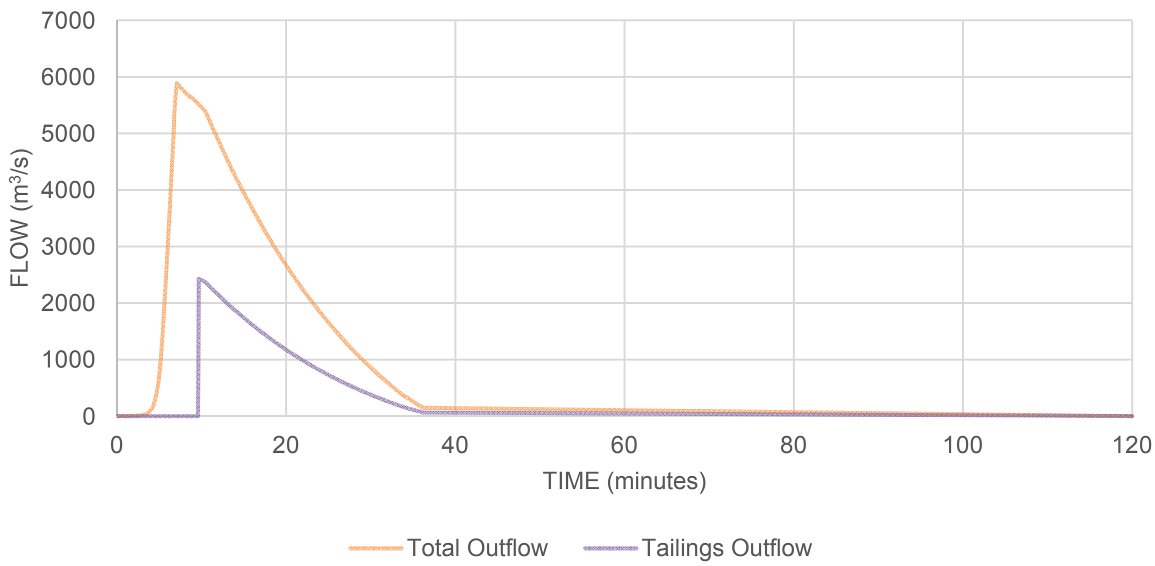


Figure A.2-2. Dam B overtopping breach hydrograph.

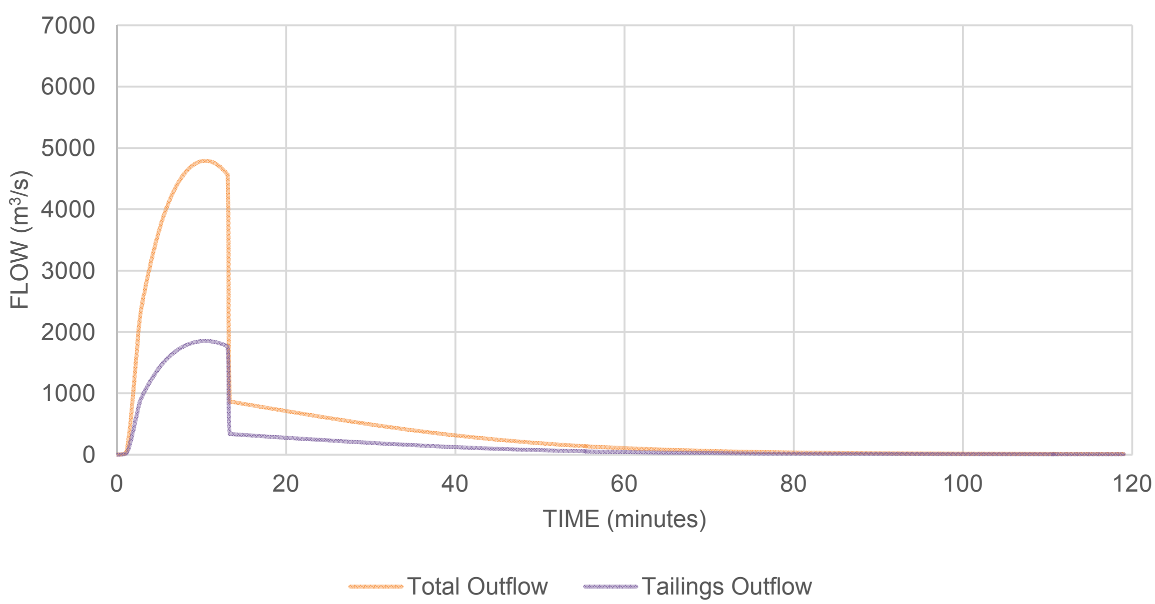


Figure A.2-3. Dam B piping breach hydrograph.

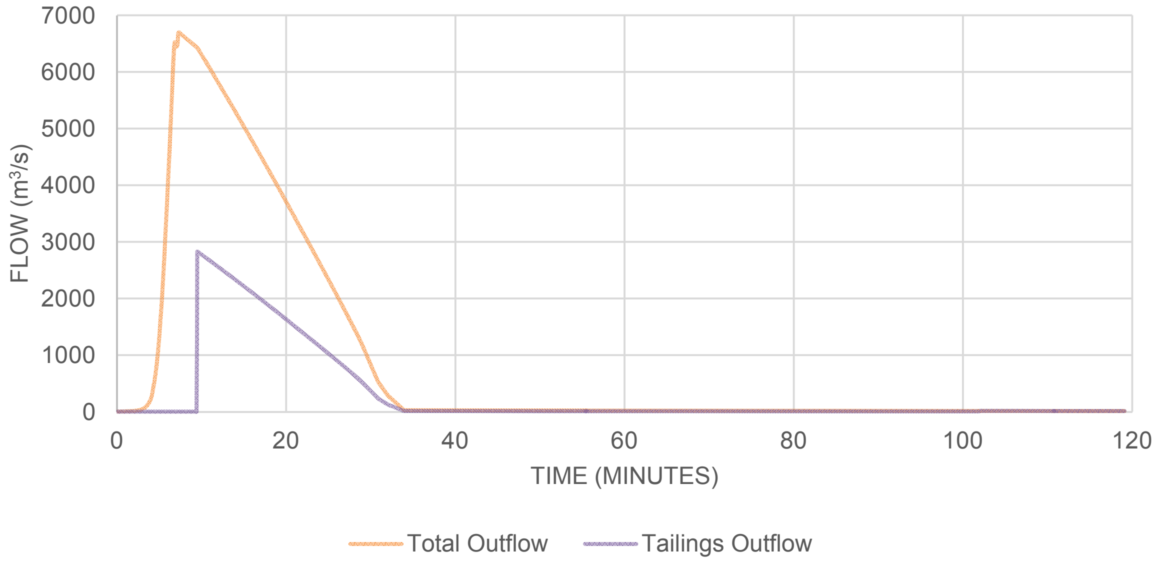


Figure A.2-4. Dam C overtopping breach hydrograph.

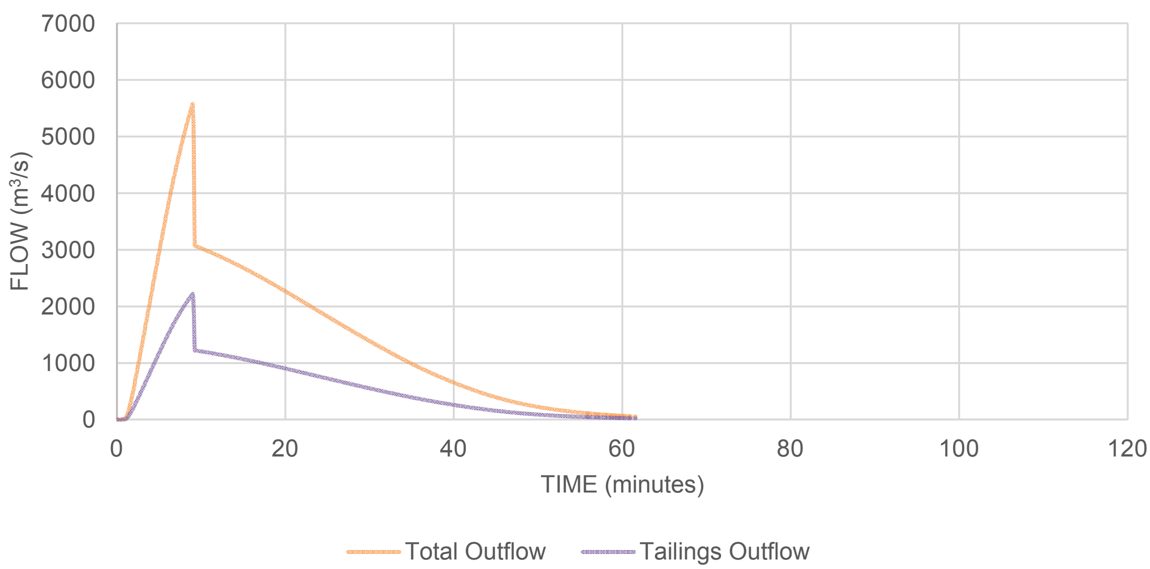


Figure A.2-5. Dam C piping breach hydrograph.

In the hypothetical piping breach of Dam C shown in Figure A.2-5 above the piping breach progresses as described above except that at 9 minutes into the failure where the pipe collapses before the tailings have dropped below the top of the piping orifice.

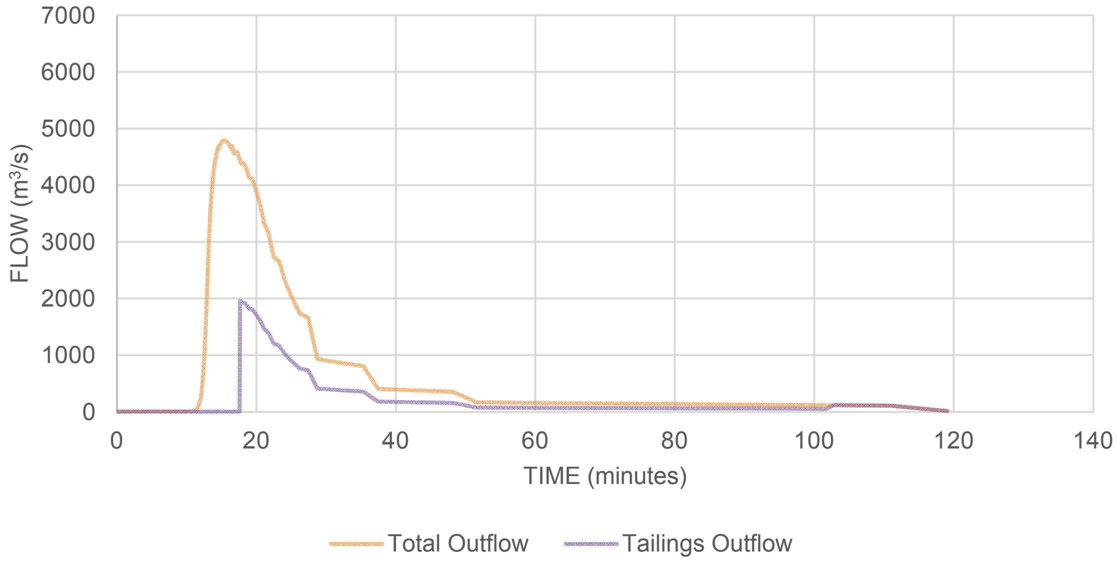


Figure A.2-6. **South Dam overtopping breach hydrograph.**

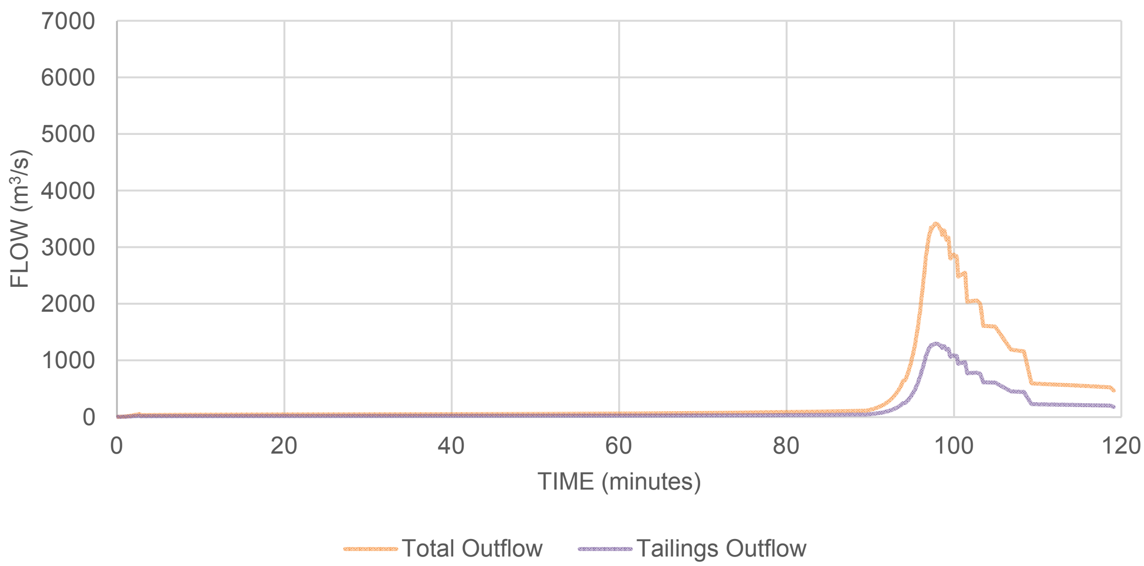


Figure A.2-7. **South Dam piping breach hydrograph.**

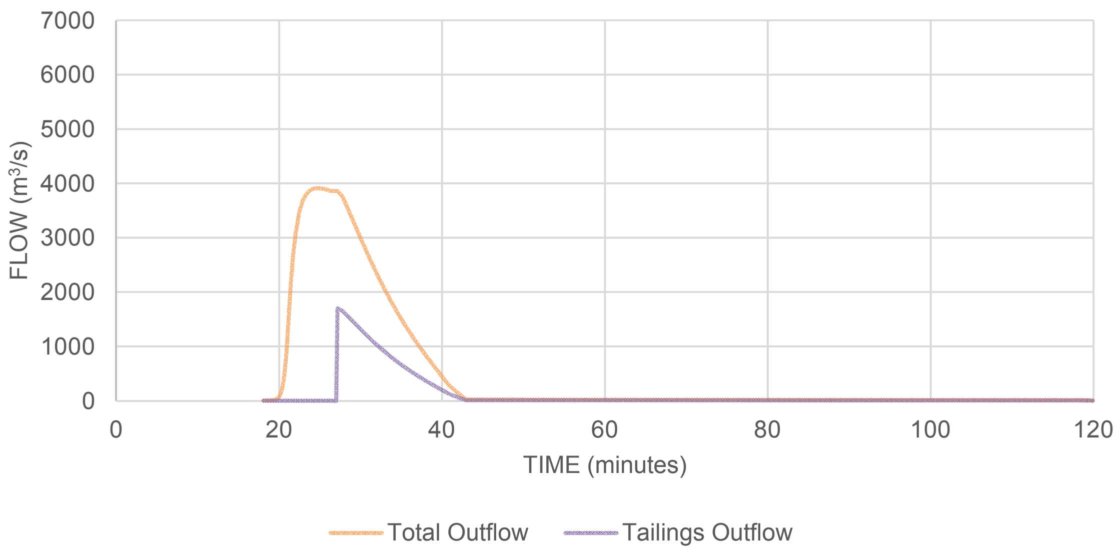


Figure A.2-8. West Dam overtopping breach hydrograph.

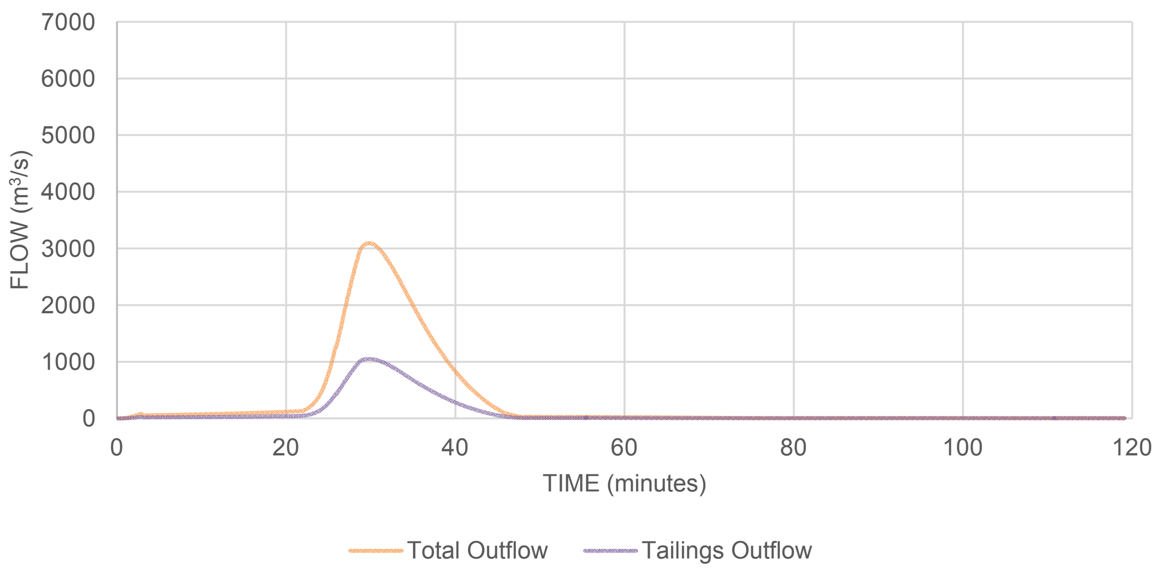


Figure A.2-9. West Dam piping breach hydrograph.

APPENDIX B
INUNDATION MODELLING

B.1.1. Introduction

The numerical model FLO-2D (FLO-2D Software Inc. 2007) was used to simulate the tailings flow runout from the New Afton Dam. FLO-2D is on the U.S. Federal Emergency Management Agency's list of approved hydraulic models and has been used in practice for more than 15 years. FLO-2D is a depth-averaged volume conservation based flood routing model that was developed specifically for the analysis of muddy flows travelling over complex 3D terrain, making it well-suited to tailings runout analysis.

For flows with volumetric sediment concentrations less than 20%, the influence of the solids component on the rheology of the breaching fluid is negligible and the material is expected to flow like water. In this case, FLO-2D reverts to a conventional clear water flood routing model, in which the breaching fluid is treated as clear water and flow resistance is governed simply by surface roughness along the path. For flows with volumetric sediment concentrations greater than 20%, such as liquefied tailings, the flood wave propagation is governed by a non-Newtonian quadratic rheological model in which flow resistance is governed by surface roughness and internal friction losses. Inundation model description

B.1.2. Model Parameterization

Key input parameters to FLO-2D include topographic data, inflow hydrographs, and resistance parameters. These parameters are discussed below.

B.1.2.1. Topography

Topographic data for the mine site were taken from December 2012 and January 2014 surveys provided by New Gold. Regional data were taken from the 2012 Canadian Digital Elevation Dataset (1:50,000 scale) and a 2014 LiDAR survey provided by New Gold. The extent of this more detailed topographic dataset is indicated on Drawing 2.

Given the magnitude of the flood wave, man-made structures such as bridges and culverts located in the path of the flood wave were neglected. Using these data, a digital elevation model (DEM) was created and inputted to FLO-2D's preprocessing program, to generate a square rgid for modelling purposes. A 20 m x 20 m grid size was used for the models as it strikes a reasonable balance between the detail needed for assessment and modelling time.

B.1.2.2. Concurrent Flows

The Dam Safety Guidelines (CDA, 2007) suggest that flow conditions in the dam breach and inundation assessment should be those most likely to occur at the time of the dam failure. Therefore, the flow in the river network downstream of the New Afton TSF Dams was assumed to be the mean annual flow (MAF) in the case of a piping (sunny day) failure. In the case of an overtopping (rainy day) failure, the flow in the river network downstream of the dams was assumed to be the Probable Maximum Flood (PMF).

These streamflow conditions represent two end member extremes. For the sunny day simulation, the Old Afton TSF was assumed to be devoid of a free water pond, and the flows in the surrounding creeks to be negligible (assumed zero in the model). For the rainy day simulation, the pond level of the Old Afton TSF was assumed to be at the spillway invert elevation and the surrounding creeks flowing at the peak PMF rate.

The PMF flows in Cherry and Alkali Creek were derived from Abrahamson and Pentland (2010), who generated regional predictive equations for estimating PMF flows for various hydrologic zones in southern British Columbia. New Afton is located within Zone 12B as defined in that reference, and for catchments less than 8,320 km^2, the predictive equation for the PMF is:

$Q = 2.1086A^{0.9240}$

Using the above equation and a catchment area (A) of 160 km^2, a peak discharge (Q) of 240 m^3/s was estimated for Cherry Creek at its confluence with Kamloops Lake. This flow was distributed, based on catchment area, to significant tributaries including 78 m^3/s into Alkali Creek. A FLO-2D simulation was then run with steady state PMF flows for 12 hours to estimate what the flood depths and inundation extents would be in Cherry Creek and to estimate flood depths in the Old Afton TSF.

The resulting hydraulic conditions included for the overtopping scenarios are shown in the attached drawing 02 which show the maximum inundation extents of the PMP flood with no dam breach. The initial conditions model for overtopping include the filling of the Old Afton TSF with 3.5 Mm^3 of water bringing the water surface elevation equal to the inlet elevation of the Old Afton Spillway. This is a conservative value consistent with estimates of the PMP inflow without a dam breach.

B.1.2.3. Resistance Parameters

For clear water flow simulations, the surface roughness along the path is characterized by Manning's n values, which must be estimated by the user. Appropriate values can be selected from established hydraulic engineering tables (e.g., Chow 1959).

The flow resistance of the tailings slurry, a mixture of tailings and water with a sediment concentration over 20% by volume, is governed by a rheological model. FLO-2D requires the input of several rheological parameters including the yield stress and viscosity of the slurry. The parameters in below, based on typical values for gold tailings from the FLO-2D manual (2007), were applied to the New Afton FLO-2D simulations. Copper tailings tend to be of somewhat coarser gradation, so the use of parameters for finer grained tailings is judged conservative in terms of the mobility of the tailings following the modelled dam breach.

Table 0-1. Yield stress and viscosity parameters for tailings.

Resistance Component	Estimated Parameter	
	α	β
Yield Stress (Pa)	0.047	21.1
Viscosity (Pa.s)	0.128	12.0

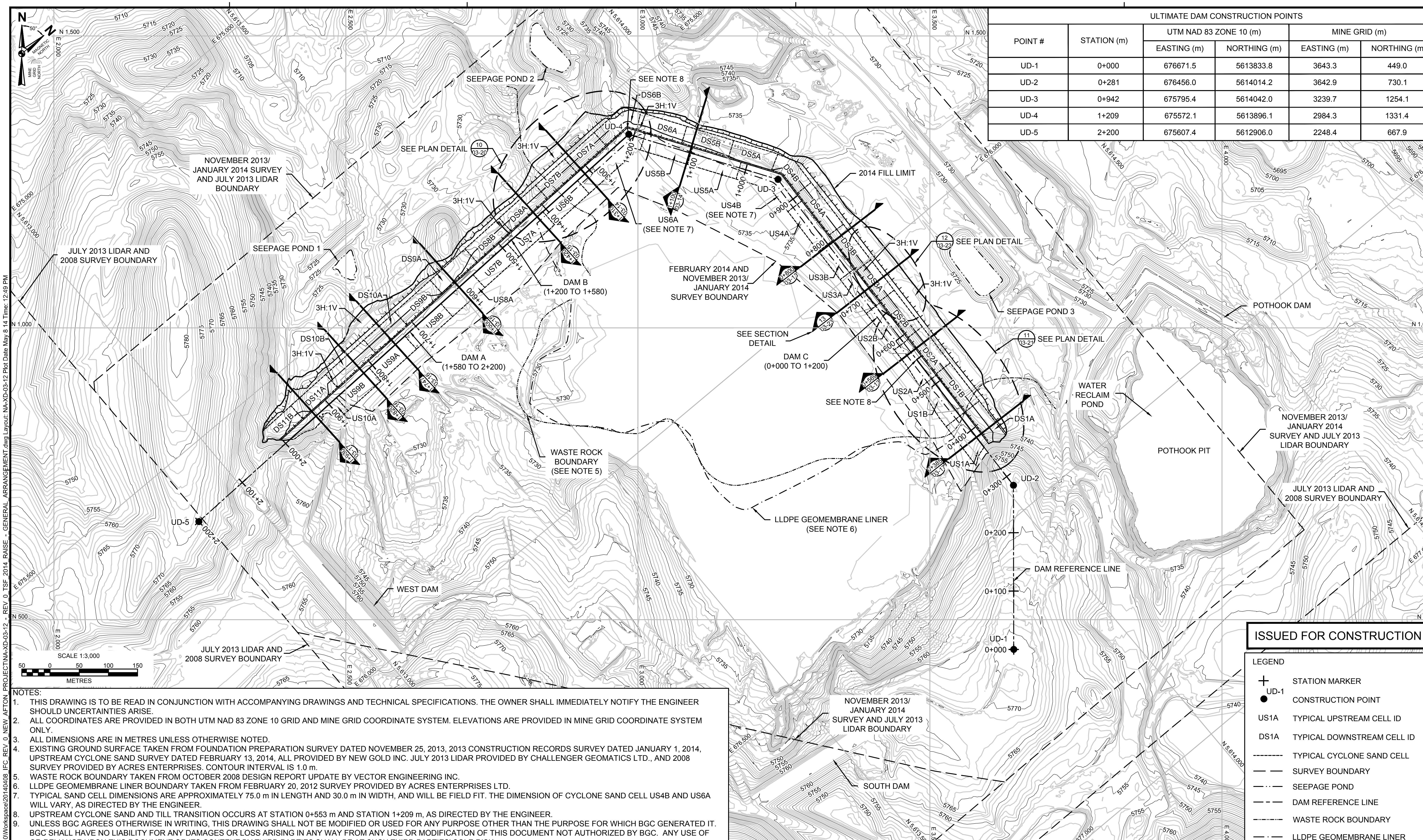
B.1.3. Modelling Assumptions

A number of assumptions were made for the inundation modeling to: provide conservative results; to simplify the assessment to fit within the capabilities of the available numerical tools; and, to compensate for the limited understanding of the complex processes involved. Some of the model assumptions include:

- The dam breach and inundation analyses occurred at the closure configuration of the New Afton TSF. The deposited tailings are fully consolidated at the closure condition, meaning that the time-dependent consolidation process of the tailings is considered complete, so there will be no further increase in the density of the tailings. The initial tailings concentration by volume has been assumed to be vertically uniform.
- Because the models cannot be calibrated with real streamflow data, values of Manning's roughness coefficient were estimated based on typical values. Higher Manning's n values will result in slower travel times and higher flow depths, while the opposite is true for lower Manning's n values.
- A relatively coarse grid of 20 m x 20 m was used for modelling. A finer grid was not practical given the required modelling times and number of scenarios to model. Additionally, a sensitivity analysis was conducted for one of the breach scenarios using a 5 m grid. Because results were similar to those obtained using the coarser grid, with a particular emphasis on inundation extent and direction, the 20 m grid was assumed to be suitable for modelling purposes.

DRAWINGS

ULTIMATE DAM CONSTRUCTION POINTS					
POINT #	STATION (m)	UTM NAD 83 ZONE 10 (m)		MINE GRID (m)	
		EASTING (m)	NORTHING (m)	EASTING (m)	NORTHING (m)
UD-1	0+000	676671.5	5613833.8	3643.3	449.0
UD-2	0+281	676456.0	5614014.2	3642.9	730.1
UD-3	0+942	675795.4	5614042.0	3239.7	1254.1
UD-4	1+209	675572.1	5613896.1	2984.3	1331.4
UD-5	2+200	675607.4	5612906.0	2248.4	667.9



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3. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
4. EXISTING GROUND SURFACE TAKEN FROM FOUNDATION PREPARATION SURVEY DATED NOVEMBER 25, 2013, 2013 CONSTRUCTION RECORDS SURVEY DATED JANUARY 1, 2014, UPSTREAM CYCLONE SAND SURVEY DATED FEBRUARY 13, 2014, ALL PROVIDED BY NEW GOLD INC. JULY 2013 LIDAR PROVIDED BY CHALLENGER GEOMATICS LTD., AND 2008 SURVEY PROVIDED BY ACRES ENTERPRISES. CONTOUR INTERVAL IS 1.0 m.
5. WASTE ROCK BOUNDARY TAKEN FROM OCTOBER 2008 DESIGN REPORT UPDATE BY VECTOR ENGINEERING INC.
6. LLDPE GEOMEMBRANE LINER BOUNDARY TAKEN FROM FEBRUARY 20, 2012 SURVEY PROVIDED BY ACRES ENTERPRISES LTD.
7. TYPICAL SAND CELL DIMENSIONS ARE APPROXIMATELY 75.0 m IN LENGTH AND 30.0 m IN WIDTH, AND WILL BE FIELD FIT. THE DIMENSION OF CYCLONE SAND CELL US4B AND US6A WILL VARY, AS DIRECTED BY THE ENGINEER.
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LEGEND

+	STATION MARKER
UD-1 ●	CONSTRUCTION POINT
US1A	TYPICAL UPSTREAM CELL ID
DS1A	TYPICAL DOWNSTREAM CELL ID
--------	TYPICAL CYCLONE SAND CELL
— —	SURVEY BOUNDARY
—·—	SEEPAGE POND
— — —	DAM REFERENCE LINE
—··—	WASTE ROCK BOUNDARY
—·—·—	LLDPE GEOMEMBRANE LINER

REVISION INFORMATION

REV. NO.	YY	MM	DD	DRAWN	DESIGN	CHECK	APPROVED	REVISION / ISSUED DESCRIPTIONS
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B	14	04	04	CJT	AR	TH	CL	ISSUED FOR PERMIT
0	14	05	08	AH	AR	CL	CL	ISSUED FOR CONSTRUCTION

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DESIGN BY: AR	CHECK DESIGN: CL
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PROJECT MANAGER: CL	APPROVAL DATE: MAY 8, 2014

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CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON PROJECT

TITLE: TSF 2014 RAISE - GENERAL ARRANGEMENT

SCALE: 1:3,000 | DWG NO.: NA-XD-03-12 | REV.: 0

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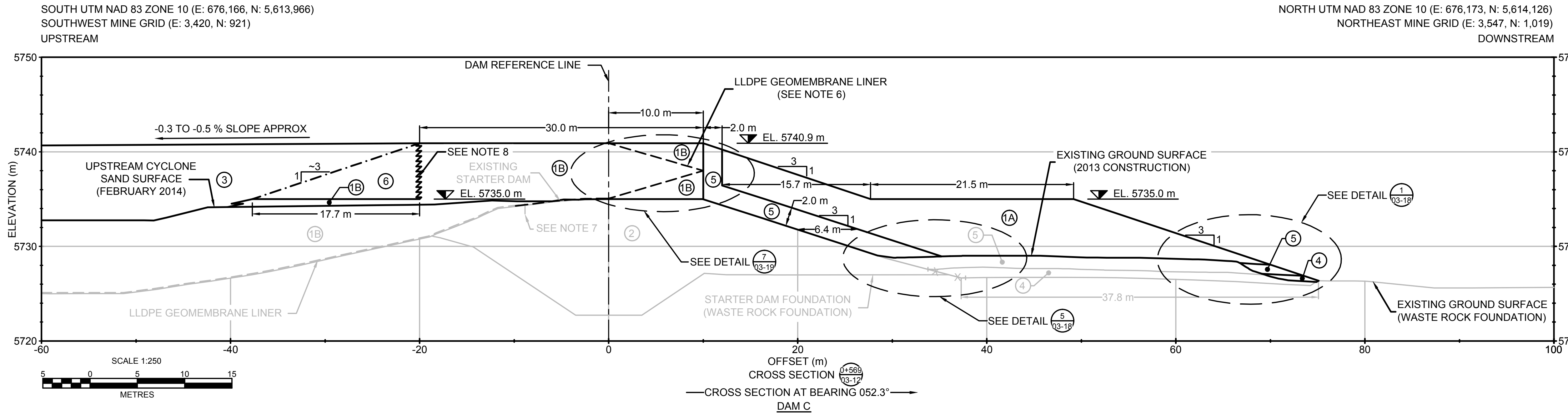

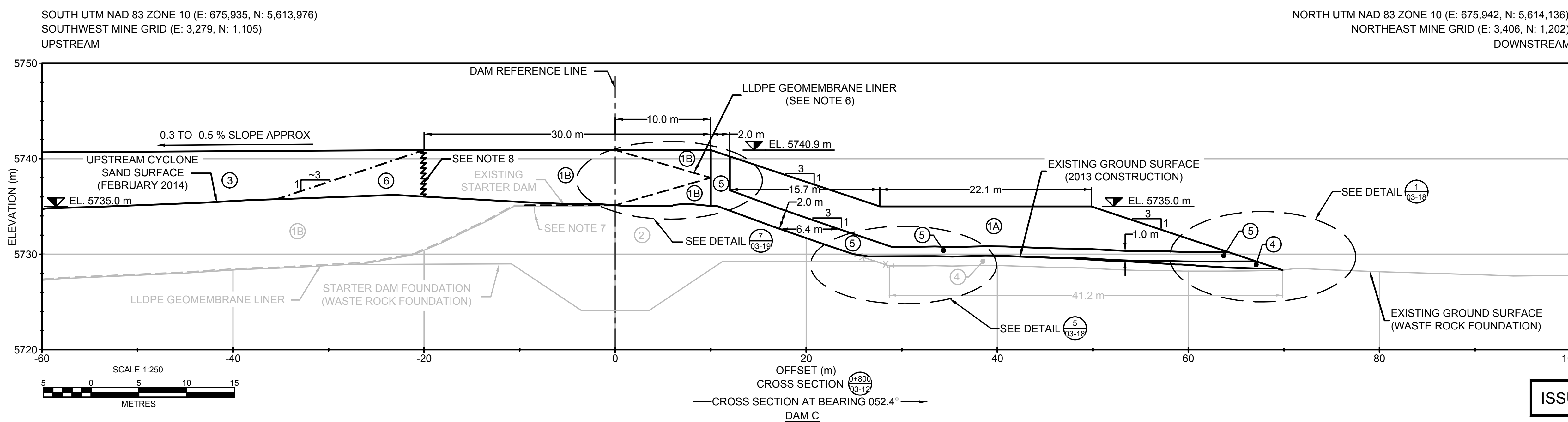

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LEGEND

- (1A) DOWNSTREAM CYCLONE SAND[4]
- (1B) UPSTREAM CYCLONE SAND[4]
- (2) TILL
- (3) WHOLE TAILINGS
- (4) COARSE FILTER
- (5) FINE FILTER
- (6) MIXED ZONE: CYCLONE SAND AND WHOLE TAILINGS
- APPROXIMATE EXTENT OF MIXED ZONE
- LLDPE GEOMEMBRANE LINER
- DAM REFERENCE LINE
- GEOTEXTILE

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4. HYDRAULICALLY PLACED MATERIAL 1A AND 1B WILL BE CONSTRUCTED BY THE OWNER. MECHANICALLY PLACED MATERIAL 1A AND 1B WILL BE CONSTRUCTED BY THE CONTRACTOR.
5. DOWNSTREAM COARSE FILTER AND FINE FILTER BLANKETS ARE MEASURED NORMAL TO THE APPROVED FOUNDATION SURFACE. A MINIMUM THICKNESS OF 1.0 m OF COARSE FILTER IS REQUIRED OVER WASTE ROCK FOUNDATION.
6. FOR THE PURPOSE OF THIS DRAWING THE LLDPE GEOMEMBRANE LINER HAS BEEN SIMPLIFIED AND WILL BE CONSTRUCTED PER THE TECHNICAL SPECIFICATIONS AND DESIGNS PROVIDED ON DRAWING NA-XD-03-19 DETAIL 7.
7. GEOMEMBRANE ANCHOR TRENCH LOCATION IS DETERMINED FROM GEOMEMBRANE LINER BOUNDARY TAKEN FROM FEBRUARY 20, 2012 SURVEY PROVIDED BY ACRES ENTERPRISES LTD.
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PROJECT: NEW AFTON PROJECT

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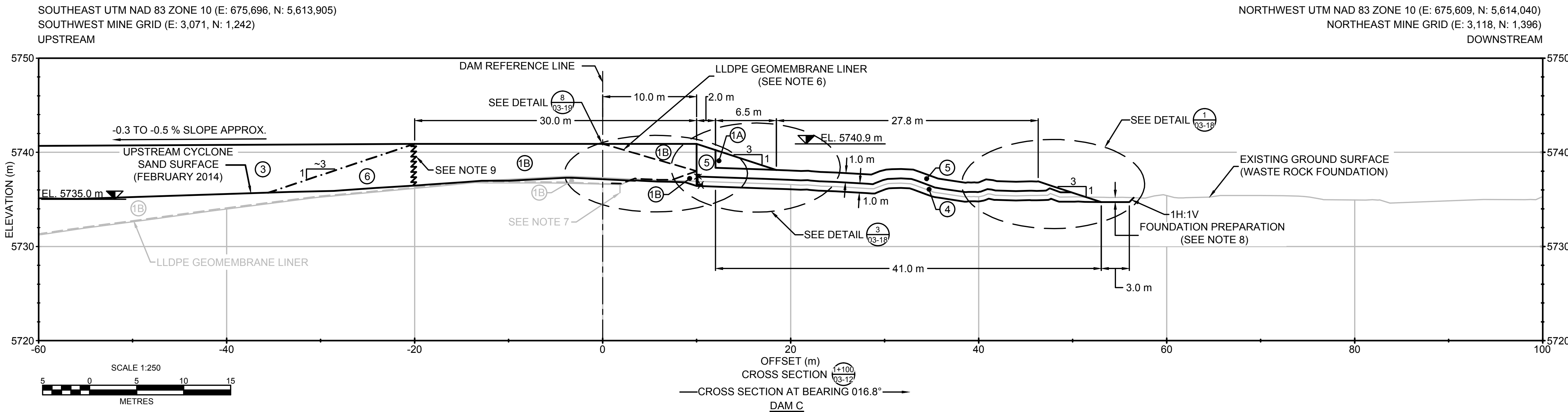
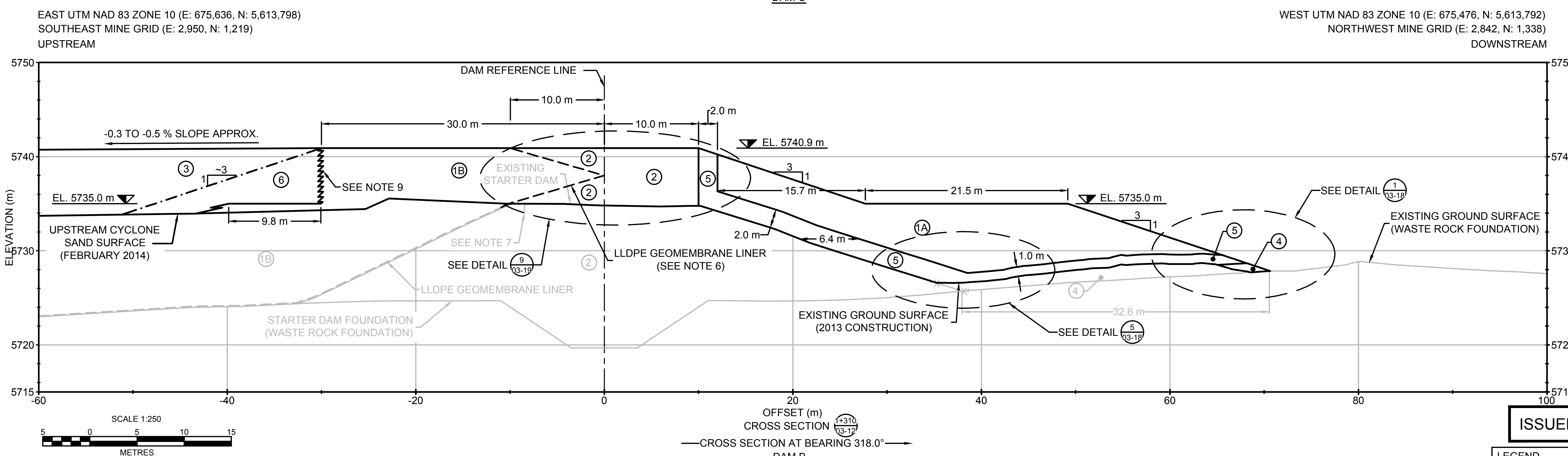
THIS BAR MEASURES 100 mm AT FULL SIZE. ALL SCALES REFERENCED TO FULL SIZE.





THIS BAR MEASURES 100 mm AT FULL SIZE. ALL SCALES REFERENCED TO FULL SIZE.

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LEGEND

- 1A DOWNSTREAM CYCLONE SAND[4]
- 1B UPSTREAM CYCLONE SAND[4]
- 2 TILL
- 3 WHOLE TAILINGS
- 4 COARSE FILTER
- 5 FINE FILTER
- 6 MIXED ZONE: CYCLONE SAND AND WHOLE TAILINGS
- APPROXIMATE EXTENT OF MIXED ZONE
- LLDPE GEOMEMBRANE LINER
- DAM REFERENCE LINE
- GEOTEXTILE

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5. DOWNSTREAM COARSE FILTER AND FINE FILTER BLANKETS ARE MEASURED NORMAL TO THE APPROVED FOUNDATION SURFACE. A MINIMUM THICKNESS OF 1.0 m OF COARSE FILTER IS REQUIRED OVER WASTE ROCK FOUNDATION.
6. FOR THE PURPOSE OF THIS DRAWING THE LLDPE GEOMEMBRANE LINER HAS BEEN SIMPLIFIED AND WILL BE CONSTRUCTED PER THE TECHNICAL SPECIFICATIONS AND DESIGNS PROVIDED ON DRAWING NA-XD-03-19 DETAIL 8 AND DETAIL 9.
7. GEOMEMBRANE LINER ANCHOR TRENCH LOCATION IS DETERMINED FROM GEOMEMBRANE LINER BOUNDARY TAKEN FROM FEBRUARY 20, 2012 SURVEY, PROVIDED BY ACRES ENTERPRISES LTD.
8. DEPTH OF FOUNDATION PREPARATION AS APPROVED BY THE ENGINEER BASED ON FOUNDATION CONDITIONS. SEE DRAWING NA-XD-03-22 FOR FOUNDATION PREPARATION DETAILS.
9. MATERIAL BOUNDARIES BETWEEN UNITS 1B AND 6 ARE SHOWN SCHEMATICALLY AND WILL BE FIELD FIT, AS DIRECTED BY THE ENGINEER.
10. UNLESS BGC AGREES OTHERWISE IN WRITING, THIS DRAWING SHALL NOT BE MODIFIED OR USED FOR ANY PURPOSE OTHER THAN THE PURPOSE FOR WHICH BGC GENERATED IT. BGC SHALL HAVE NO LIABILITY FOR ANY DAMAGES OR LOSS ARISING IN ANY WAY FROM ANY USE OR MODIFICATION OF THIS DOCUMENT NOT AUTHORIZED BY BGC. ANY USE OF OR RELIANCE UPON THIS DOCUMENT OR ITS CONTENT BY THIRD PARTIES SHALL BE AT SUCH THIRD PARTIES' SOLE RISK.

REVISION INFORMATION

REV. NO.	YY	MM	DD	DRAWN	DESIGN	CHECK	APPROVED	REVISION / ISSUED DESCRIPTIONS
A	14	03	13	CJT	AR	TH	CL	ISSUED FOR TENDER
B	14	04	04	CJT	AR	TH	CL	ISSUED FOR PERMIT
0	14	05	08	AH	AR	CL	CL	ISSUED FOR CONSTRUCTION

REV. NO.	YY	MM	DD	DRAWN	DESIGN	CHECK	APPROVED	REVISION / ISSUED DESCRIPTIONS

DRAWN BY: CJT	CHECK DRAWING: LS\GCB
DESIGN BY: AR	CHECK DESIGN: CL
LEAD ENGINEER: CL	APPROVAL DATE: MAY 8, 2014
PROJECT MANAGER: CL	APPROVAL DATE: MAY 8, 2014

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON PROJECT

TITLE: TSF 2014 RAISE - CROSS-SECTIONS 1+100 AND 1+310

SCALE:	DWG NO.:	REV.:
1:250	NA-XD-03-14	0

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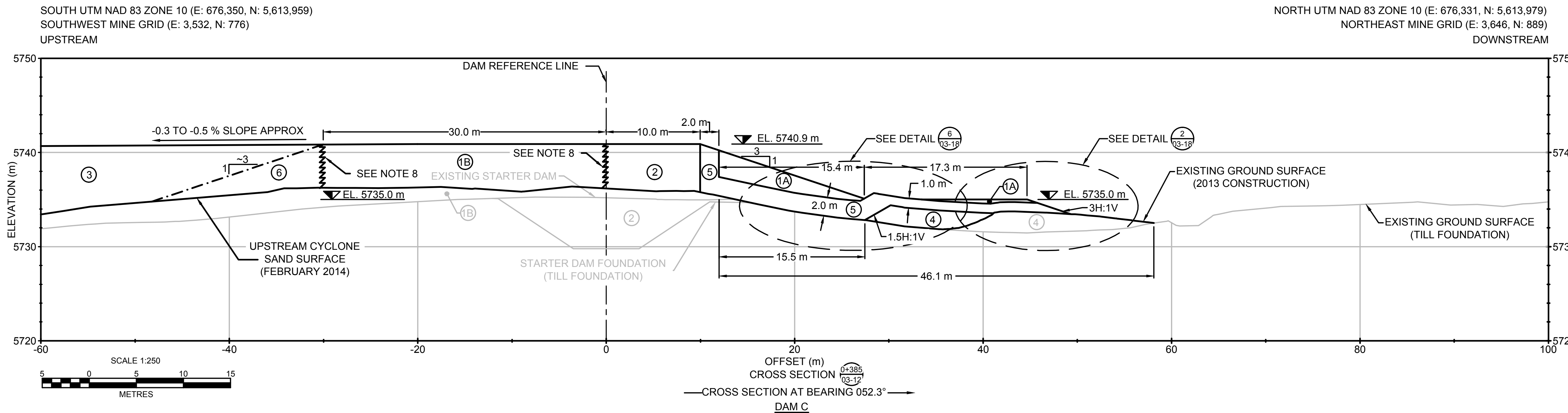

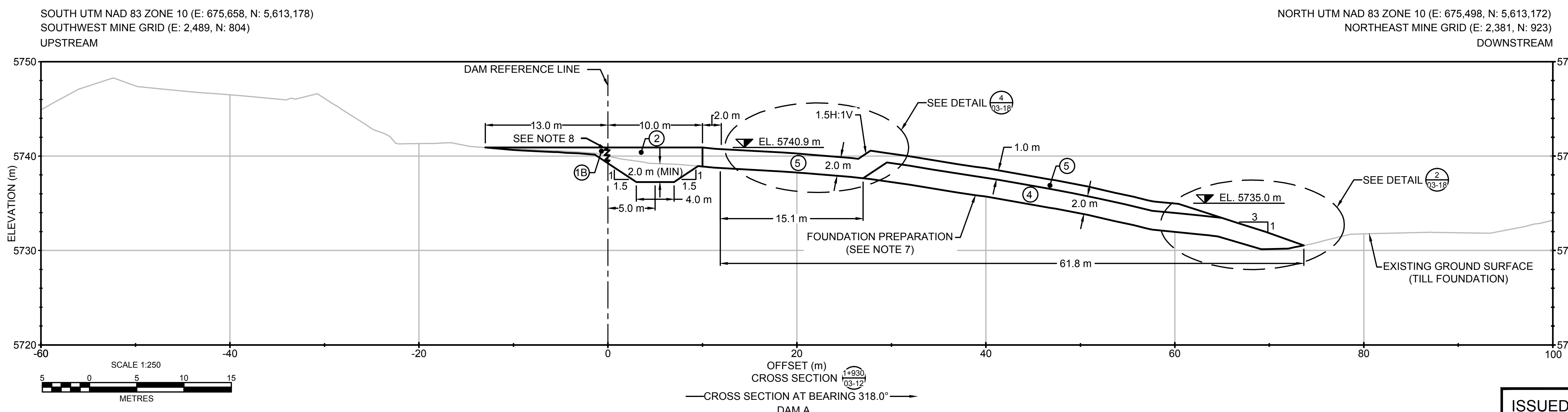

THIS BAR MEASURES 100 mm AT FULL SIZE. ALL SCALES REFERENCED TO FULL SIZE.

ISSUED FOR CONSTRUCTION

LEGEND
- 1A DOWNSTREAM CYCLONE SAND[4]
- 1B UPSTREAM CYCLONE SAND[4]
- 2 TILL
- 3 WHOLE TAILINGS
- 4 COARSE FILTER
- 5 FINE FILTER
- 6 MIXED ZONE: CYCLONE SAND AND WHOLE TAILINGS
- APPROXIMATE EXTENT OF MIXED ZONE
- DAM REFERENCE LINE

NOTES:
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS. THE OWNER SHALL IMMEDIATELY NOTIFY THE ENGINEER SHOULD UNCERTAINTIES ARISE.
2. ALL COORDINATES ARE PROVIDED IN BOTH UTM NAD 83 ZONE 10 GRID AND MINE GRID COORDINATE SYSTEM. ELEVATIONS ARE PROVIDED IN MINE GRID COORDINATE SYSTEM ONLY.
3. EXISTING GROUND SURFACE TAKEN FROM FOUNDATION PREPARATION SURVEY DATED NOVEMBER 25, 2013, 2013 CONSTRUCTION RECORDS SURVEY DATED JANUARY 1, 2014 AND UPSTREAM CYCLONE SAND SURVEY DATED FEBRUARY 13, 2014, ALL PROVIDED BY NEW GOLD INC. STARTER DAM FOUNDATION SURVEY TAKEN FROM 2008 SURVEY AND STARTER DAM CONSTRUCTION RECORDS SURVEY DATED JANUARY 8, 2012, BOTH PROVIDED BY ACRES ENTERPRISES LTD.
4. HYDRAULICALLY PLACED MATERIAL 1A AND 1B WILL BE CONSTRUCTED BY THE OWNER. MECHANICALLY PLACED MATERIAL 1A AND 1B WILL BE CONSTRUCTED BY THE CONTRACTOR.
5. DOWNSTREAM COARSE FILTER AND FINE FILTER BLANKETS ARE MEASURED NORMAL TO THE APPROVED FOUNDATION SURFACE. A MINIMUM THICKNESS OF 2.0 m OF FINE FILTER OR 2.0 m OF COARSE FILTER IS REQUIRED OVER TILL FOUNDATION.
6. KEYING INTO THE EXISTING CORE TRENCH IS REQUIRED PER THE TECHNICAL SPECIFICATIONS.
7. DEPTH OF FOUNDATION PREPARATION AS APPROVED BY THE ENGINEER BASED ON FOUNDATION CONDITIONS. SEE DRAWING NA-XD-03-22 FOR FOUNDATION PREPARATION DETAILS.
8. MATERIAL BOUNDARIES BETWEEN UNITS 1B AND 2, AND BETWEEN UNITS 1B AND 6 ARE SHOWN SCHEMATICALLY AND WILL BE FIELD FIT, AS DIRECTED BY THE ENGINEER.
9. UNLESS BGC AGREES OTHERWISE IN WRITING, THIS DRAWING SHALL NOT BE MODIFIED OR USED FOR ANY PURPOSE OTHER THAN THE PURPOSE FOR WHICH BGC GENERATED IT. BGC SHALL HAVE NO LIABILITY FOR ANY DAMAGES OR LOSS ARISING IN ANY WAY FROM ANY USE OR MODIFICATION OF THIS DOCUMENT NOT AUTHORIZED BY BGC. ANY USE OF OR RELIANCE UPON THIS DOCUMENT OR ITS CONTENT BY THIRD PARTIES SHALL BE AT SUCH THIRD PARTIES' SOLE RISK.

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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: NEW GOLD INC.

PROJECT: NEW AFTON PROJECT

TITLE: TSF 2014 RAISE - CROSS-SECTIONS 0+385 AND 1+930

SCALE:	DWG NO.:	REV.:
1:250	NA-XD-03-17	0

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