BARRICK GOLD INC.
GIANT NICKEL MINE

TAILINGS FACILITY
2014 DAM SAFETY INSPECTION REPORT

PREPARED FOR:

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EXECUTIVE SUMMARY

The Giant Nickel Mine is a nickel project owned by Barrick Gold Inc. (formerly Homestake Canada Inc.). The mine site is located approximately 8 km north of Hope, B.C. and about 2 km west of the Trans-Canada Highway. The mine and tailings facility ceased operations in 1974. The tailings facility consists of two impoundment areas, an Upper Tailings Pond constructed initially, and a Lower Tailings Pond constructed during expansion of the facility. A till capping layer was placed on the tailings surface in 1995. The capped tailings surface and embankments have since been allowed to revegetate naturally. Currently, much of the runoff from the facility drains to a low point on the Lower Tailings Pond and a pond has formed adjacent to the eastern embankment. The tailings facility is located in the watershed of an unnamed tributary to Stulkawhits Creek, which flows into the Fraser River approximately 2.7 km downstream. Water management structures at the tailings facility include a channel spillway and concrete decant spillway structure.

The tailings facility has been closed for 40 years and there is no on site staff presence or regular dam safety inspections. Barrick Gold staff visit the site periodically (Quarterly as a minimum) to conduct water quality sampling. A routine inspection of the tailings facility is typically carried out during these visits. Consequently, the facility can generally be considered to be in the Passive Closure phase, pursuant to satisfying long-term water management objectives.

The tailings facility was inspected on September 8, 2014, as part of the annual dam safety inspection. Significant revegetation has occurred across the tailings facility, particularly around the downstream slopes of the tailings dams. Although some areas were difficult to inspect there were no obvious signs of embankment instability, mass movement or uncontrolled seepage observed during the site inspection. The embankment crests are generally in a good condition. The tailing surface is capped and generally well vegetated. Revegetation is lighter in some surface areas, including recreational trails which cross the capped tailings surface. Ponding of water was observed along the downstream embankment toe of the Lower Berm at the southern end of the Upper Tailings Pond. It is recommended that this area be appropriately graded to eliminate ponding of water and direct surface drainage away from the toe of the embankment.

There are no active piezometers installed in the tailings facility embankments, foundation or tailings deposit. It is not considered a requirement to provide any instrumentation (piezometers) at this time given the tailings facility is essentially in a Passive Closure phase.

The potential consequences of failure and classification of the tailings dams was reviewed as part of a dam stability assessment conducted previously by Knight Piesold. The findings of this review recommend a “HIGH” consequence classification, using the classification scheme defined by the 1999 Canadian Dam Association (CDA) “Dam Safety Guidelines”. The potential for loss of life was assessed to be minor, but the environmental impacts likely significant, particularly to Stulkawhits Creek which flows south of the tailings facility and enters the Fraser River.

The dam classification has been reviewed and reassessed for this annual dam safety inspection using the revised 2013 CDA Guidelines. This assessment has also included consideration of the recently published CDA Technical Bulletin “Application of Dam Safety Guidelines to Mining Dams” (October, 2014), which identifies specific issues to be considered for the design and safety evaluation of mining (tailings) dams. It has been determined that a preliminary Dam Classification of

"VERY HIGH" is appropriate for the tailings facility, based on a preliminary assessment of a dam break on potential loss of life, impact to infrastructure, economic losses and environmental impacts downstream. A dam break inundation has not been carried out to date for the Giant Nickel tailings facility. However, it is understood that a dam break inundation study is currently being conducted for the tailings facility. The findings of the dam break study will allow a more precise evaluation of the potential inundation area and downstream impact, and can be used to review and confirm the Dam (Consequence) Classification for the tailings facility.

The 2013 CDA Guidelines and recently published CDA 2014 Technical Bulletin "Application of Dam Safety Guidelines to Mining Dams" require the Earthquake Design Ground Motion (EDGM) for a dam with a "VERY HIGH" classification to be a value equal to "1/2 between 1/2475 and 1/10,000 or MCE". An appropriate value for the EDGM is 0.46g. This is applicable to tailings dams in the Active Closure phase. However, for a tailings dam in the Passive Closure phase the EDGM for a "VERY HIGH" dam classification is increased to the 1/10,000 year event or MCE. The peak ground acceleration corresponding to the 1 in 10,000 year return period earthquake is estimated to be 0.58g. A conservative design earthquake Magnitude of 7.5 has been selected for the EDGM, based on a review of regional tectonics, potential seismic source zones in the region and historical seismicity.

Static and seismic stability analyses have been carried out previously for the tailings embankments forming the Upper Tailings Pond and Lower Tailings Pond. The findings of the static stability analyses indicated that the factors of safety for the tailings embankments are 1.6 or higher and satisfy the minimum required factor of safety of 1.5 for long-term (steady-state) conditions. Hydrostatic pore water pressure conditions were conservatively assumed for the stability analyses. Actual pore pressure conditions recorded during a 2002 SCPT program were 60% to 80% hydrostatic. It is expected that the pore water pressures in the tailings deposit will remain in steady-state or potentially reduce gradually with time. Therefore, actual factors of safety are likely higher than those calculated. The stability assessment did not consider the impact of the current pond on the surface of the Lower Tailings Pond. The stability of the eastern embankment will need to be checked if regrading of the capped tailings surface to remove this pond and prevent future ponding is not implemented.

The previous seismic stability assessment adopted a deterministically derived MCE as the design event, with a peak ground acceleration on rock of 0.17g and earthquake magnitude of 7.5. Predicted displacements for the tailings embankments during seismic loading from this event were negligible (less than 0.05 metres). The tailings were predicted to be potentially liquefiable. However, post liquefaction stability analyses indicated that the embankments are not susceptible to a flow slide or large deformations resulting from earthquake induced liquefaction of the tailings deposit. However, some lateral deformation of the Upper Berm (southern end of the Upper Tailings Pond) would be expected, assuming complete liquefaction of the underlying tailings. Conservative lateral deformations of approximately 1 to 4 metres were estimated for the Upper Berm. It was determined that deformation of the Upper Berm due to liquefaction of the tailings would not impact the stability of the Lower Berm.

The impact of a revised (larger) EDGM on the seismic stability of the tailings embankments has been examined for this annual dam safety inspection. For an EDGM corresponding to the 1 in 10,000 year return period earthquake the peak ground acceleration is estimated to be 0.58g, with a corresponding earthquake Magnitude of 7.5. Maximum embankment deformations are estimated to be about 0.6 m or less, and maximum crest settlements are predicted to be about 0.25 m or less. These deformations and settlements will not have a significant impact on the available embankment freeboard or result in any loss of embankment integrity. This indicates that the seismic stability of the embankments remains satisfactory for the higher earthquake loading associated with the revised EDGM.

The 2013 CDA Guidelines and recently published CDA 2014 Technical Bulletin “Application of Dam Safety Guidelines to Mining Dams” require that a dam with a “VERY HIGH” classification be designed for an Inflow Design Flood (IDF) having a value equal to “2/3 between 1/1000 and PMF”. This is applicable to tailings dams in the Active Closure phase. For a tailings facility in the Passive Closure phase the IDF for a “VERY HIGH” dam classification is increased to the PMF. The current spillway system would be overwhelmed by both of these IDF scenarios. The channel spillway, in a condition of partial blockage with vegetation and debris, will permit the safe passage of a flood event with a return period of approximately 1,000 years. This is achieved assuming full blockage of the concrete decant spillway structure. If only a partial blockage of the concrete decant spillway is assumed, the system capacity is increased to approximately the 1 in 10,000 year flood, although there is no remaining freeboard for this scenario. A similar capacity is achieved by the channel spillway alone, if it is assumed to be cleared of vegetation and debris. If both the channel spillway and concrete decant spillway are cleared and returned to their original full capacity, the combined spillway system will be able to safely pass a flood event with a return period of approximately 10,000 years, with adequate freeboard.

The channel spillway was generally clear of bushes and debris at the time of the site inspection. The concrete decant structure is partially blocked by debris at the inlet. Periodic clearing of vegetation and debris from the channel spillway is necessary to maintain flow capacity and prevent potential blockage during a large flood event. Removal of debris at the inlet area of the concrete decant structure will increase the available discharge capacity. Regrading the capped tailings surface to prevent ponding (including the pond on the Lower Tailings Facility surface) and to direct all drainage to a channel spillway capable of passing the PMF will satisfy the water management objectives for a tailings dam in the Passive Closure phase.

An Operation, Maintenance and Surveillance (OMS) plan has been prepared for the Giant Nickel tailings facility by Barrick Gold Inc.. There is currently no emergency planning and response plan information included with the OMS plan. However, it is understood that this information will be incorporated together with the inundation maps provided by the dam break study.

No known dam safety review has been carried out for the Giant Nickel tailings facility. The last dam stability assessment was the study conducted by Knight Piesold from 2002 to 2006. This study included a review of the dam (consequence) classification for the tailings facility and the determination of appropriate design earthquake and flood events. For a “VERY HIGH” dam classification a formal dam safety review is required every five years for a tailings facility during operations. However, for a tailings facility in the closure phase the frequency of dam safety reviews needs to be established from consideration of the site conditions, downstream environment and risk assessment. It is recommended that a formal dam safety review be carried out and the frequency of future dam safety reviews and dam safety inspections established and incorporated into the OMS manual.

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1 – INTRODUCTION

The Giant Nickel Mine is a nickel project owned by Barrick Gold Inc. (formerly Homestake Canada Inc.). The mine site is located approximately 8 km north of Hope, B.C. and about 2 km west of the Trans-Canada Highway. The mine and tailings facility ceased operations in 1974. The site location is shown on Figure 1.1.

The tailings facility consists of two impoundment areas, an Upper Tailings Pond constructed initially, and a Lower Tailings Pond constructed during expansion of the facility. A till capping layer was placed on the tailings surface in 1995. The capped tailings surface and embankments have since been allowed to revegetate naturally. Currently, much of the runoff from the facility drains to a low point on the Lower Tailings Pond. A permanent water pond (approximately 200 m long by 100 m wide) has formed adjacent to the eastern embankment. Information provided by Barrick Gold staff indicates that the average pond depth is approximately 2 metres. The tailings facility is located in the watershed of Texas Creek, a tributary to Stulkawhits Creek which flows into the Fraser River approximately 2.7 km downstream. Water management structures at the tailings facility include a channel spillway and concrete decant spillway structure. The general arrangement of the tailings facility is shown on Figure 1.2. An aerial photograph (taken August 5th, 2014) of the tailings facility is shown on Figure 1.3.

Knight Piésold Ltd. was retained by Barrick Gold Inc. in 2002 to conduct a stability assessment of the tailings facility. The study included a review of the dam hazard (consequence) classification for the decommissioned tailings facility and the determination of appropriate design earthquake and flood events. The ability of the channel spillway and concrete decant spillway structures at the tailings facility to safely pass extreme flood events was also assessed. A review of pertinent documentation was carried out, including a previous stability assessment of the tailings facility carried out by Golder, Brawner & Associates in 1970. A site investigation program (including geotechnical drilling and seismic cone penetration testing) was carried out in 2002 to provide information and data for the stability assessment. Based on the available information to define the embankment configurations the stability analyses indicated that the tailings dams were stable under static conditions but were potentially unstable in the Upper Tailings Pond under seismic loading. It was recommended that appropriate buttressing and berms be provided to improve seismic stability. Field observation and a GPS survey of the tailings dam in 2003 indicated that some modifications to the dam had been carried out previously at the tailings facility. However, it was difficult to complete a detailed survey as the area is heavily overgrown with trees and shrubbery.

A more detailed survey was completed in 2005 to confirm the existing geometry of the Upper Tailings Pond berms (Upper Berm and Lower Berm). This enabled a revised embankment stability analyses to be conducted using the revised berm configurations. The survey showed that the upper berm is only about 1 to 2 metres in height, with a very flat downstream slope of approximately 10H:1V. This indicated that some remedial work had been conducted previously at the site to improve stability, including a flattening of the Upper Berm, perhaps during capping of the tailings surface at closure. Flattening of the Upper Berm significantly increased the stability of the upper pond. Subsequent stability analyses indicated that predicted displacements due to liquefaction of the tailings were not considered to be large enough to affect the overall stability and integrity of the tailings facility. Details of this study are presented in the Knight Piésold report "Tailings Dam Stability Assessment" (Ref. No. VA101-93/1-1, Rev 0, March 6th, 2006).

This dam safety inspection report has been prepared to meet the guidelines of the Ministry of Energy and Mines. The report is based on information contained in previous documents prepared for the project and on observations made by Graham Greenaway, P.Eng. of Knight Piésold Ltd. during a site visit on September 8, 2014.

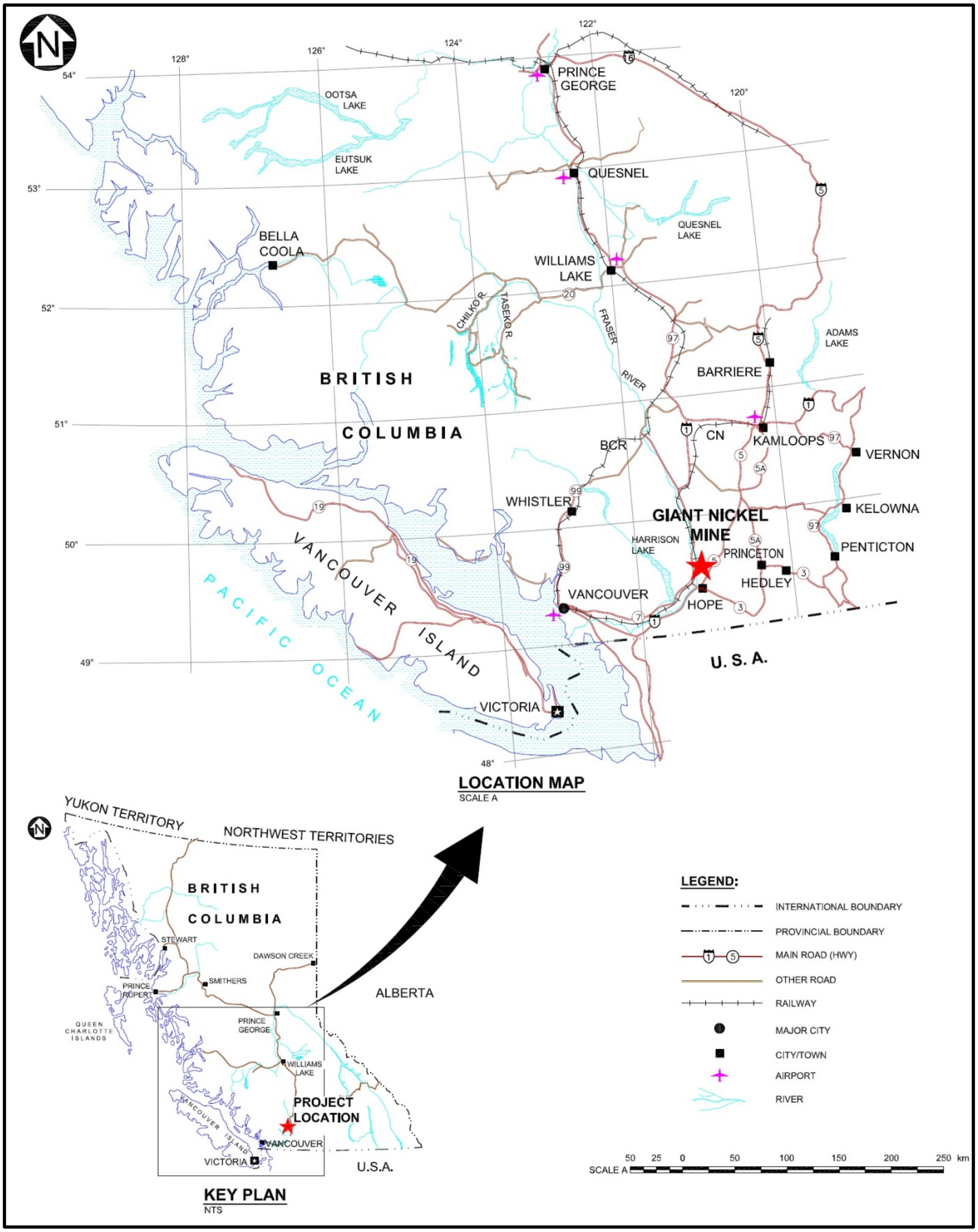

Figure 1.1 Site Location

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Figure 1.2 Tailings Facility – General Arrangement

Figure 1.3 Aerial Photograph of the Tailings Facility (August 5, 2014)

2 – DAM CLASSIFICATION

2.1 CONSEQUENCE CLASSIFICATION

The potential consequences of failure and classification of the tailings dams was reviewed as part of the dam stability assessment conducted previously by Knight Piesold (Ref. No. VA101-93/1-1, Rev 0, March 6th, 2006). The findings of this review recommend a "HIGH" consequence classification, using the classification scheme defined by the 1999 Canadian Dam Association (CDA) "Dam Safety Guidelines". The potential for loss of life was assessed to be minor, but the environmental impacts likely significant, particularly to Stulkawhits Creek which flows south of the tailings facility and enters the Fraser River.

Revisions to the CDA "Dam Safety Guidelines" in 2007 and 2013 include changes to the dam classification and associated design earthquake and flood events. Consequently, the dam classification for the Giant Nickel tailings facility has been reviewed and reassessed for this annual dam safety inspection using the revised CDA Guidelines. This assessment has also included consideration of the recently published CDA Technical Bulletin "Application of Dam Safety Guidelines to Mining Dams" (October, 2014), which identifies specific issues to be considered for the design and safety evaluation of mining (tailings) dams.

Classification of a tailings dam is carried out by considering the potential incremental consequences of a failure. The incremental consequences of failure are defined by the CDA as "*the total damage from an event with dam failure minus the damage that would have resulted from the same event had the dam not failed.*" The consequences of failure considered include loss of life, environmental and cultural impacts and losses, and infrastructure and economic loss.

A dam break inundation has not been carried out to date for the Giant Nickel tailings facility. The Notification of Chief Inspector's Orders (August 18, 2014) states that a dam break inundation study shall be conducted for all tailings dams that have a failure consequence classification of High, Very High or Extreme. It is understood that a dam break inundation study is currently being conducted for the tailings facility. The findings of the dam break study will allow a more precise evaluation of the potential inundation area and downstream impact, and can be used to review and confirm the Dam (Consequence) Classification for the tailings facility.

A preliminary assessment of the potential population at risk downstream of the tailings facility has been assessed using publically available mapping and observations noted during the site inspection of September 8, 2014. Figure 2.1 provides a Google Earth image of the tailings facility and downstream area as far as the Fraser River. There are several dwellings downstream of the tailings facility, located close to Stulkawhits Creek and the Trans-Canada Highway. The potential for loss of life from a dam failure is likely low but cannot be discounted. A dam classification of "HIGH" (loss of life less than 10) is likely appropriate, but may be "VERY HIGH" depending on the predicted inundation area, flood volume and flow velocities.

There are two 500 kV transmission lines which pass (north-south) through the site, one downstream of the Upper Tailings Pond and the other immediately downstream of the Lower Tailings Pond, as shown on Figures 1.2 and 1.3. Other infrastructure located in the potential downstream inundation area include the Trans-Canada Highway and a railway line (aligned approximately adjacent to and east of the highway). The economic impact associated with damage to the 500 kV transmission towers and lines, highway and railway line (including loss of revenue, service interruption and repair) would likely be major. Therefore, the economic consequences have been assessed as at least "HIGH", and potentially "VERY HIGH" depending on the extent of the inundation area.

The environmental impact on downstream watercourses has the potential to be significant if a dam failure resulted in the release of tailings and/or process water into Stulkawhits Creek. The potential environmental consequences of a dam breach have been assessed using the methodology presented by Eagen and Greenaway (2010, 2011) and the classification criteria provided by the CDA Guidelines (2013). Information on fish species presence and habitat use was compiled from the following sources:

- Chambers, K. Klahater Lake, Stulkawhits Creek Fish Inventory-2012;SU12-82268. Oct 2012. Hemmera Consultants. The Ecological Reports Catalogue. Available at: http://a100.gov.bc.ca/pub/acat/public/viewReport.do?reportId=42933.
- Fisheries Information Summary System. Fish Inventories Data Queries (FIDQ). Ministry of Environment. Available at: http://a100.gov.bc.ca/pub/fidq/infoSingleWaterbody.do. \
- BC Water Resources Atlas. Available at: http://webmaps.gov.bc.ca/imf5/imf.jsp?site=wrbc.
- BC Species and Ecosystems Explorer. Ministry of Environment. Available at: http://www.env.gov.bc.ca/atrisk/toolintro.html.
- Status of Pacific Salmon Resources in Southern British Columbia and the Fraser River Basin. 2009. Marc Labelle. Pacific Fisheries Resource Conservation Council.

The available information indicates that cutthroat trout, rainbow trout and coho salmon are present in Stulkawhits Creek. A native fishery is present in the lower creek reaches, as is a recreational fishery. The rainbow trout are likely a resident species. Fish species present in the Fraser River include coho, pink, sockeye, and chum salmon; rainbow and steelhead trout; peamouth chub, redside shiner, chiselmouth, largescale sucker, mountain whitefish, northern pikeminnow, white sucker, longnose dace, sculpin. These species are all Yellow listed provincially (apparently secure and not at risk of extinction) and none are listed in Schedule 1 of the federal Species at Risk Act. Most salmon populations in the Fraser basin are currently at low but sustainable levels; however, there continues to be conservation concerns for some populations. An unnamed tributary to the Fraser River approximately 300 metres downstream of the confluence with Stulkawhits Creek has spawning populations of pink, chum, and coho salmon at the mouth. Cutthroat trout are also present in the creek.

Using the above information and the matrix classification scheme presented by Eagen and Greenaway (2011), the consequence classification for potential environmental losses has been assessed as "HIGH" if the dam break inundation area was confined to Stulkawhits Creek (species status unthreatened; small watershed; habitat used by several life stages) and "VERY HIGH" if the downstream inundation area extended into the Fraser River (medium watershed; limiting habitat).

It has been determined that a preliminary Dam Classification of "VERY HIGH" is appropriate for the tailings facility, based on the assessment of a dam break on potential loss of life, impact to infrastructure, economic losses and environmental impacts downstream. Once the dam break study has been completed the findings can be used to review the dam classification, and revise if appropriate.

An Operation, Maintenance and Surveillance (OMS) plan has recently been prepared by Barrick Gold Inc. . An Emergency Preparedness Plan is required by the Ministry of Energy and Mines for a dam with a consequence category of “HIGH”, “VERY HIGH” or “EXTREME”. There is currently no emergency planning and response plan information included with the OMS plan. However, it is understood that this information will be incorporated together with the inundation maps provided by the dam break study.

The CDA Technical Bulletin “Application of Dam Safety Guidelines to Mining Dams” (October, 2014) includes recommendations and guidance for the Active and Passive phases of tailings facility closure. The Giant Nickel tailings facility has been closed for 40 years and there is no on site staff presence. Regular dam safety inspections by a qualified Engineer have not been conducted, but Barrick Gold staff visit the site periodically (Quarterly as a minimum) to conduct water quality sampling. A routine inspection of the tailings facility is typically carried out during these visits. Consequently, the facility can generally be considered to be in the Passive Closure phase. The CDA dam safety requirements (including target levels for design earthquake and design flood) applicable for Operations and Transition (to closure) phases of the facility also apply for the Active Closure phase. Once the facility is considered to have entered the Passive Closure phase the target levels for design earthquake and flood events increase, as discussed in Sections 2.2 and 2.3 below.

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Figure 2.1 Google Earth Image of the Tailings Facility and Downstream Area

2.2 DESIGN EARTHQUAKE

Site specific earthquake ground motion parameters for the Giant Nickel tailings facility have been obtained using the probabilistic seismic hazard database provided by Natural Resources Canada (http://earthquakescanada.nrcan.gc.ca/hazard-alea/). This database provides peak ground accelerations for return periods ranging from 100 years to 2475 years. The results are summarised in Table 2.1 in terms of earthquake return period, annual exceedance probability and the median value of peak ground acceleration. Peak ground accelerations for return periods greater than 2475 years have been conservatively estimated by extrapolation of the data. For geotechnical structures such as dams the CDA Guidelines recommended that the mean average peak ground acceleration be used. The mean average peak ground acceleration is typically approximately 10 to 20 percent greater than the median value. Estimated mean average values are included in Table 2.1. These values are representative for very dense soil and soft rock site conditions.

Table 2.1 Summary of Probabilistic Seismic Hazard Analysis

Return Period (Years)	Probability of Exceedance per Annum (%)	Peak Ground Acceleration (PGA)[2]	
		Median PGA[3,4] (g)	Mean PGA[5] (g)
100	1.0	0.08	0.09
475	0.2	0.16	0.19
1000	0.1	0.21	0.25
2475	0.04	0.29	0.34
5000	0.02	0.37	0.44
10000	0.01	0.48	0.58

NOTES:

1. Probability of Exceedance calculated from:
$$Q = 1 - \mathrm{Exp}\,(-L/T)$$
Where, Q = Probability of Exceedance
L = Design Life in Years
T = Return Period in Years
2. Peak Ground Accelerations are for Soft Rock / Very Dense Soil (Vs30 = 360 to 760 m/sec).
3. Median Peak Ground Accelerations for Return Periods up to 2,475 Years obtained from the Seismic Hazard database of Natural Resources Canada (NRC).
4. Median Peak Ground Accelerations for Return Periods of 5,000 and 10,000 Years obtained by extrapolation of NRC data.
5. Mean PGA values estimated as 1.2 x Median PGA values.

The 2013 revision to the CDA Guidelines and recently published CDA 2014 Technical Bulletin “Application of Dam Safety Guidelines to Mining Dams” require the Earthquake Design Ground Motion (EDGM) for a dam with a “VERY HIGH” classification to be a value equal to “1/2 between 1/2475 and 1/10,000 or MCE”, where MCE is the Maximum Credible Earthquake. Using the seismic hazard data provided in Table 2.1, an appropriate value for the EDGM is 0.46g (using the 1/10,000 year event for calculation and not the MCE). This is applicable to tailings dams in the Active Closure phase. However, for a tailings facility in the Passive Closure phase the EDGM for a “VERY HIGH” dam classification is increased to the 1/10,000 year event or MCE. The peak ground acceleration corresponding to the 1 in 10,000 year return period earthquake is estimated to be 0.58g.

A conservative design earthquake Magnitude of 7.5 has been selected for the EDGM, based on a review of regional tectonics, potential seismic source zones in the region and historical seismicity.

The previous tailings dam stability assessment carried out by Knight Piesold adopted a deterministically derived MCE as the design event, with a peak ground acceleration on rock of 0.17g and earthquake magnitude of 7.5 (Knight Piésold report Ref. No. 101/93-1, Rev 0, March 6, 2006). The impact of a larger EDGM on the stability of the tailings dams has been examined. Details and findings are discussed in Section 3.3 of this report.

2.3 DESIGN FLOOD

The 2013 revision to the CDA Guidelines and recently published CDA 2014 Technical Bulletin "Application of Dam Safety Guidelines to Mining Dams" require that a dam with a "VERY HIGH" classification be designed for an Inflow Design Flood (IDF) having a value equal to "2/3 between 1/1000 and PMF", where PMF is the Probable Maximum Flood. This is applicable to tailings dams in the Active Closure phase. For a tailings facility in the Passive Closure phase the IDF for a "VERY HIGH" dam classification is increased to the PMF.

Flood values for extreme storm events (including the 1000 year, 10,000 year and PMF events) were calculated as part of the previous dam stability assessment studies carried out by Knight Piesold (Ref. No. 101/93-1, Rev 0, March 6, 2006). These values were reviewed by Knight Piesold for a more recent spillway study in 2013 (Ref. No. VA13-00339, January 30, 2013) and were found to still be valid.

An assessment of the flood storage capacity of the tailings facility and ability of the channel spillway and concrete decant spillway to safely pass extreme flood events (including the IDF) is provided in Section 4.

3 – TAILINGS FACILITY PERFORMANCE

3.1 SITE INSPECTION

The tailings facility was inspected by Graham Greenaway, P.Eng. of Knight Piésold Ltd. on September 8, 2014. It was a clear day with no precipitation. Revegetation at the site has resulted in much of the facility being overgrown with trees and shrubbery, making a complete visual inspection of the embankments difficult.

Specific components of the tailings facility that were inspected included the following:

- Lower Tailings Pond - tailings surface and pond area
- Upper Tailings Pond - tailings surface
- Tailings embankments (including the crest, downstream face and toe areas – where possible)
- Channel Spillway Structure
- Concrete Decant Spillway Structure, and
- Downstream area (between tailings facility and Trans-Canada Highway).

A photographic record of the site inspection is included with this report in Appendix B.

Significant revegetation has occurred across the tailings facility, particularly around the downstream slopes of the tailings dams. Although some areas were difficult to inspect there were no obvious signs of embankment instability, mass movement or uncontrolled seepage observed during the site inspection. The embankment crests are generally in a good condition. Photo 1 shows the trail along the embankment crest of the Lower Tailings Pond. Photo 2 shows the revegetated downstream slope of the Lower Tailings Pond.

The tailing surface is capped and generally well vegetated. Revegetation is lighter in some surface areas, including the recreational trails which cross the capped tailings surface (see Figure 3.1 and Photos 3 and 12). A water pond is present on the Lower Tailings Pond surface, adjacent to the eastern embankment (see Photos 4 to 6). The location of this pond is included on Figure 1.2 and can be seen in the aerial photograph of Figure 1.3. Regrading of the capped tailings surface will facilitate elimination of ponded water on the surface of the facility, as discussed in Section 4.

The channel spillway located at the north end of the Lower Tailings Pond was generally clear of bushes and debris (see Photo 7). The concrete decant structure located at the south end of the Lower Tailings Pond is partially blocked by debris at the inlet, as shown by Photo 8. Periodic clearing of vegetation and debris from the channel spillway is necessary to maintain flow capacity and prevent potential blockage during a large flood event. Removal of debris at the inlet area of the concrete decant structure will increase the available discharge capacity, as discussed in Section 4.

The downstream embankment slopes for the Upper Tailings Pond are shown by Photos 9 and 10. Ponding of water was observed along the downstream embankment toe of the Lower Berm at the southern end of the Upper Tailings Pond (see Photo 11). To ensure long-term performance of the dam and satisfy Passive Closure objectives this area will need to be appropriately graded to eliminate ponding of water and direct surface drainage away from the toe of the embankment.

The natural slope above the tailings facility is well vegetated with trees. There are no obvious signs of instability that would impact the stability and integrity of the tailings facility.

3.2 INSTRUMENTATION AND MONITORING

Barrick Gold staff visit the site periodically (Quarterly as a minimum) to conduct water quality sampling. A routine inspection of the tailings facility is typically carried out during these visits.

There are no active piezometers installed in the tailings facility embankments, foundation or tailings deposit.

Pore water pressures recorded during a Seismic Cone Penetration Test (SCPT) program in 2002 indicated that the majority of the tailings deposit has achieved a high degree of consolidation (Knight Piésold report Ref. No. 101/93-1, Rev 0, March 6, 2006). Equilibrium pore pressure distributions recorded within the tailings deposit were typically about 60% to 80% of hydrostatic pore pressure. This indicates that some drainage is occurring from the base of the tailings but that the downward flow is likely impeded by low permeability tailings layers and underlying foundation soils. Consolidation seepage from the tailings deposit is likely negligible, if any. Any on-going seepage from the tailings facility is predominantly due to steady-state seepage conditions.

It is not considered a requirement to provide any instrumentation (piezometers) at this time given the tailings facility is essentially in a Passive Closure phase, pursuant to satisfying long-term water management objectives (as discussed in Section 4).

3.3 EMBANKMENT STABILITY

Stability analyses for the tailings facility embankments have been conducted by Knight Piésold Ltd. over the period from 2002 to 2006. This included a geotechnical site investigation program in 2002 and field surveys to confirm the geometry of the embankments, in particular the Upper Berm located at the southern end of the Upper Tailings Pond. Details of these studies are provided in the Knight Piésold report “Tailings Dam Stability Assessment” (Ref. No. VA101-93/1-1, Rev 0, March 6th, 2006). Selected Figures from this report are provided in Appendix A, including a site investigation plan showing the location of the test holes, and embankment cross-sections developed for the stability assessment.

Static and seismic stability analyses were carried out for the tailings embankments forming the Upper Tailings Pond and Lower Tailings Pond. The findings of the static stability analyses indicated that the factors of safety for the tailings facility embankments are 1.6 or higher and satisfy the minimum required factor of safety of 1.5 for long-term (steady-state) conditions. Hydrostatic pore water pressure conditions were conservatively assumed for the stability analyses. Actual pore pressure conditions recorded during the 2002 SCPT program were 60% to 80% hydrostatic. It is expected that the pore water pressures in the tailings deposit will remain in steady-state or potentially reduce gradually with time. Therefore, the actual factors of safety are likely higher than those calculated.

However, it should be noted that this stability assessment did not consider the impact of the current pond on the surface of the Lower Tailings Pond. The stability of the eastern embankment will need to be checked if regrading of the capped tailings surface to remove this pond and prevent future ponding is not implemented.

The seismic stability assessment included a dynamic response analysis and liquefaction assessment of the tailings and underlying foundation materials. The performance of the tailings dams during and after earthquake loading were examined. The design earthquake was a deterministically defined Magnitude 7.5 event, with a peak ground acceleration (on rock) of 0.17g. Predicted displacements for the tailings embankments during seismic loading from this event were negligible (less than 0.05 metres). The tailings were predicted to be potentially liquefiable. However, post liquefaction stability analyses indicated that the embankments are not susceptible to a flow slide or large deformations resulting from earthquake induced liquefaction of the tailings deposit. However, some lateral deformation of the flattened Upper Berm (southern end of the Upper Tailings Pond) would be expected, assuming complete liquefaction of the underlying tailings. Conservative lateral deformations of approximately 1 to 4 metres were estimated for the Upper Berm. It was determined that deformation of the Upper Berm due to liquefaction of the tailings would not impact the stability of the Lower Berm.

The impact of a larger EDGM (see Section 2.2) on the seismic stability of the tailings embankments has been examined for this annual dam safety inspection. For the 1 in 10,000 year return period earthquake the peak ground acceleration is estimated to be 0.58g, with a corresponding earthquake Magnitude of 7.5. Potential deformations and settlements under earthquake loading have been estimated using simplified semi-empirical and empirical methods.

The tailings deposit is assumed to be liquefiable for the revised (larger) EDGM, based on the findings of the previous stability assessment. The embankment fill materials and granular foundation soils underlying the tailings facility comprise dense soil materials, and are assumed to not be susceptible to liquefaction under seismic loading. This is based on the findings of the previous stability assessment and information on the condition of the foundation soils and embankment fill materials (including SPT blow count data and SCPT data).

The Bray method (2007) has been used to predict seismically induced slide displacement of the embankments. This method estimates displacement of a potential sliding mass based on the critical (yield) acceleration, which corresponds to the ground acceleration required to initiate movement of the sliding mass (reduce the factor of safety to 1.0). Critical acceleration values determined for the embankment sections considered for the previous stability assessment were used for this analysis. In addition to the critical acceleration, this method considers the predominant period of response of the embankment under seismic loading and the corresponding spectral ground acceleration. The predominant period is related to the stiffness characteristics of the embankment fill and to the height of the embankment. Spectral acceleration values were provided by a uniform hazard spectrum defined for the 1 in 10,000 year earthquake. This was developed using the probabilistic seismic hazard database provided by Natural Resources Canada (see Section 2.2), extrapolated for the 10,000 year return period event. Maximum displacements of approximately 0.2 m to 0.6 m are predicted, based on the stiffness of the embankment fill and predominant period of the embankments under seismic loading (estimated to be in the range of about 0.15 to 0.25 seconds).

Some deformation of the tailings facility embankments is expected to result from settlement of the fill materials during earthquake shaking. Potential settlement of the embankment crests has been estimated using the empirical relationship provided by Swaisgood (2003). This relationship was developed from an extensive review of case histories of embankment dam behaviour due to earthquake loading. Required inputs to the relationship are the earthquake magnitude, the peak ground acceleration on rock at the site, the depth to rock (overburden thickness) and the embankment height. The predicted maximum crest settlement for the eastern embankment of the

Lower Tailings Pond is approximately 0.25 m for the 1 in 10,000 year earthquake. The predicted maximum crest settlement is 0.15 m for the lower height Upper Tailings Pond embankment.

Maximum embankment deformations calculated for the 1 in 10,000 year EDGM are estimated to be about 0.6 m or less, and maximum crest settlements are predicted to be about 0.25 m or less. These deformations and settlements will not have a significant impact on the available embankment freeboard or result in any loss of embankment integrity. This indicates that the seismic stability of the embankments remains satisfactory for the higher earthquake loading associated with the revised EDGM.

4 – WATER MANAGEMENT

Flood water inflows to the tailings facility are temporarily stored within the facility and then discharged through two spillways. A channel spillway is located at the northern corner of the lower tailings pond and a concrete decant spillway structure is located at the southern corner, as shown on Figure 1.2. The concrete decant spillway is currently partially blocked by debris.

The tailings facility and the two spillway structures were assessed in terms of their ability to safely pass extreme flood events as part of the dam stability assessment conducted previously by Knight Piesold (Ref. No. VA101-93/1-1, Rev 0, March 6th, 2006). The storm water catchment area developed for that study is shown on Figure 5.1, included in Appendix A. Storm water modeling to determine the largest flood event that could be safely sustained indicated that the channel spillway, in a condition of partial blockage with vegetation and debris, will permit the safe passage of a flood event with a return period of approximately 1,000 years. This is achieved assuming full blockage of the concrete decant spillway structure. If only a partial blockage of the concrete decant spillway is assumed, the system capacity is increased to approximately the 1 in 10,000 year flood, although there is no remaining freeboard for this scenario. A similar capacity is achieved by the channel spillway alone, if it is assumed to be cleared of vegetation and debris. If both the channel spillway and concrete decant spillway are cleared and returned to their original full capacity, the combined spillway system will be able to safely pass a flood event with a return period of approximately 10,000 years, with adequate freeboard.

The Probable Maximum Flood (PMF) results from a rain on snow event involving the 24 hour Probable Maximum Precipitation (PMP). The runoff is calculated to occur from the entire catchment upstream of the lower TSF, with no diversion. Previous studies by Knight Piesold have defined the PMF by adopting a conservative PMP of 954 mm, combined with a snowmelt of 233 mm. The findings of a recent review of the PMP by Knight Piesold and Golder Associates (based on communications between Barrick Gold, Knight Piesold and Golder , November 2014) found that the value of 954 mm is likely very conservative, and that a lower value of approximately 765 mm is more appropriate. As discussed in Section 2.3, the Inflow Design Flood (IDF) for a dam with a “VERY HIGH” classification is a value equal to “2/3 between 1/1000 and PMF”, if the tailings dam is in the Active Closure phase. For a tailings dam in the Passive Closure phase, the IDF for a “VERY HIGH” dam classification is increased to the PMF. Regardless of the PMP value adopted, the current spillway system at the tailings facility would be overwhelmed by both of these IDF scenarios.

Barrick Gold has examined options to regrade the capped tailings surface to prevent ponding in the Lower Tailings Facility (remove the existing pond) and to direct all drainage to a channel spillway. Knight Piésold has recently completed a review of the current drainage conditions of the tailings facility and developed conceptual drainage plans to eliminate ponding from the surface of the facility, and provide an upgraded closure spillway capable of safely passing the PMF.

An initial design concept developed by Knight Piesold routed all storm water flows through the existing channel spillway at the north end of the Lower Tailings Facility (Ref. No.VA12-01472 July 30, 2012). Upgrading of the channel spillway would also be required to enable safe passage of the IDF. An alternative design concept was also developed (titled the South Outcrop Spillway option) which routes all flows through a new spillway located in an outcrop of natural ground between the mid-point and south end of the Lower Tailings Pond embankment (Ref. No. VA13-00339, January

30, 2013). This alternative concept required significantly less fill to regrade the surface capping layer.

Regrading the capped tailings surface to prevent ponding (particularly in the Lower Tailings Facility) and to direct all drainage to a channel spillway capable of passing the PMF would satisfy the water management objectives for a tailings dam in the Passive Closure phase.

4.1 WATER QUALITY MONITORING

Water quality monitoring is routinely carried out by Barrick Gold, as part of the closure and reclamation monitoring program. Barrick Gold staff visit the site periodically (Quarterly as a minimum) to conduct water quality sampling.

5 – SUMMARY

The findings and conclusions of this annual report are summarised as follows:

5.1 DAM CLASSIFICATION

- The potential consequences of failure and classification of the tailings dams was reviewed as part of the dam stability assessment conducted previously by Knight Piesold. The findings of this review recommend a "HIGH" consequence classification, using the classification scheme defined by the 1999 Canadian Dam Association (CDA) "Dam Safety Guidelines". The potential for loss of life was assessed to be minor, but the environmental impacts likely significant, particularly to Stulkawhits Creek which flows south of the tailings facility and enters the Fraser River.
- Revisions to the CDA "Dam Safety Guidelines" in 2007 and 2013 include changes to the dam classification and associated design earthquake and flood events. Consequently, the dam classification for the Giant Nickel tailings facility has been reviewed and reassessed for this annual dam safety inspection using the revised CDA Guidelines. This assessment has also included consideration of the recently published CDA Technical Bulletin "Application of Dam Safety Guidelines to Mining Dams" (October, 2014), which identifies specific issues to be considered for the design and safety evaluation of mining (tailings) dams.
- It has been determined that a preliminary Dam Classification of "VERY HIGH" is appropriate for the tailings facility, based on the assessment of a dam break on potential loss of life, impact to infrastructure, economic losses and environmental impacts downstream.
- A dam break inundation has not been carried out to date for the Giant Nickel tailings facility. However, it is understood that a dam break inundation study is currently being conducted for the tailings facility. The findings of the dam break study will allow a more precise evaluation of the potential inundation area and downstream impact, and can be used to review and confirm the Dam (Consequence) Classification for the tailings facility.

5.2 DESIGN EARTHQUAKE AND FLOOD EVENTS

- A previous tailings dam stability assessment, carried out prior to the 2007 CDA Guidelines, adopted a deterministically derived MCE as the design event, with a peak ground acceleration on rock of 0.17g and earthquake magnitude of 7.5.
- The 2013 revision to the CDA Guidelines and recently published CDA 2014 Technical Bulletin "Application of Dam Safety Guidelines to Mining Dams" require the Earthquake Design Ground Motion (EDGM) for a dam with a "VERY HIGH" classification to be a value equal to "1/2 between 1/2475 and 1/10,000 or MCE". An appropriate value for the EDGM is 0.46g. This is applicable to tailings dams in the Active Closure phase. However, for a tailings dam in the Passive Closure phase the EDGM for a "VERY HIGH" dam classification is increased to the 1/10,000 year event or MCE. The peak ground acceleration corresponding to the 1 in 10,000 year return period earthquake is estimated to be 0.58g.
- A conservative design earthquake Magnitude of 7.5 has been selected for the EDGM, based on a review of regional tectonics, potential seismic source zones in the region and historical seismicity.

- The 2013 revision to the CDA Guidelines and recently published CDA 2014 Technical Bulletin "Application of Dam Safety Guidelines to Mining Dams" require that a dam with a "VERY HIGH" classification be designed for an Inflow Design Flood (IDF) having a value equal to "2/3 between 1/1000 and PMF". This is applicable to tailings dams in the Active Closure phase. For a tailings facility in the Passive Closure phase the IDF for a "VERY HIGH" dam classification is increased to the PMF. The current spillway system at the tailings facility would be overwhelmed by both of these IDF scenarios.

5.3 TAILINGS FACILITY PERFORMANCE

- The Giant Nickel tailings facility has been closed for 40 years and there is no on site staff presence or regular dam safety inspections. Barrick Gold staff visit the site periodically (Quarterly as a minimum) to conduct water quality sampling. A routine inspection of the tailings facility is typically carried out during these visits. Consequently, the facility can generally be considered to be in the Passive Closure phase, pursuant to satisfying long-term water management objectives.
- There are no active piezometers installed in the tailings facility embankments, foundation or tailings deposit. It is not considered a requirement to provide any instrumentation (piezometers) at this time given the tailings facility is essentially in a Passive Closure phase.
- Significant revegetation has occurred across the tailings facility, particularly around the downstream slopes of the tailings dams. Although some areas were difficult to inspect there were no obvious signs of embankment instability, mass movement or uncontrolled seepage observed during the site inspection. The embankment crests are generally in a good condition.
- The tailing surface is capped and generally well vegetated. Revegetation is lighter in some surface areas, including the recreational trails which cross the capped tailings surface.
- A water pond is present on the Lower Tailings Pond surface, adjacent to the eastern embankment. Regrading of the capped tailings surface will facilitate elimination of ponded water on the surface of the facility.
- Pore water pressure conditions within the tailings deposit were typically about 60% to 80% of hydrostatic pore pressure (recorded 2002). This indicates that some drainage is occurring from the base of the tailings but that the downward flow is likely impeded by low permeability tailings layers and underlying foundation soils. Consolidation seepage from the tailings deposit is likely negligible, if any. Any on-going seepage from the tailings facility is predominantly due to steady-state seepage conditions.
- The channel spillway, in a condition of partial blockage with vegetation and debris, will permit the safe passage of a flood event with a return period of approximately 1,000 years. This is achieved assuming full blockage of the concrete decant spillway structure. If only a partial blockage of the concrete decant spillway is assumed, the system capacity is increased to approximately the 1 in 10,000 year flood, although there is no remaining freeboard for this scenario. A similar capacity is achieved by the channel spillway alone, if it is assumed to be cleared of vegetation and debris. If both the channel spillway and concrete decant spillway are cleared and returned to their original full capacity, the combined spillway system will be able to safely pass a flood event with a return period of approximately 10,000 years, with adequate freeboard.
- The channel spillway was generally clear of bushes and debris. The concrete decant structure is partially blocked by debris at the inlet. Periodic clearing of vegetation and debris from the

channel spillway is necessary to maintain flow capacity and prevent potential blockage during a large flood event. Removal of debris at the inlet area of the concrete decant structure will increase the available discharge capacity.

- Regrading the capped tailings surface to prevent ponding (particularly in the Lower Tailings Facility) and to direct all drainage to a channel spillway capable of passing the PMF will satisfy the water management objectives for a tailings dam in the Passive Closure phase.
- Ponding of water was observed along the downstream embankment toe of the Lower Berm at the southern end of the Upper Tailings Pond. To ensure long-term performance of the dam and satisfy Passive Closure objectives this area will need to be appropriately graded to eliminate ponding of water and direct surface drainage away from the toe of the embankment.
- Static and seismic stability analyses have been carried out previously for the tailings embankments forming the Upper Tailings Pond and Lower Tailings Pond. The findings of the static stability analyses indicated that the factors of safety for the tailings facility embankments are 1.6 or higher and satisfy the minimum required factor of safety of 1.5 for long-term (steady-state) conditions. However, this stability assessment did not consider the impact of the current pond on the surface of the Lower Tailings Pond. The stability of the eastern embankment will need to be checked if regrading of the capped tailings surface to remove this pond and prevent future ponding is not implemented.
- The impact of a revised (larger) EDGM on the seismic stability of the tailings embankments has been examined for this annual dam safety inspection. For an EDGM corresponding to the 1 in 10,000 year return period earthquake the peak ground acceleration is estimated to be 0.58g, with a corresponding earthquake Magnitude of 7.5. Maximum embankment deformations are estimated to be about 0.6 m or less, and maximum crest settlements are predicted to be about 0.25 m or less. These deformations and settlements will not have a significant impact on the available embankment freeboard or result in any loss of embankment integrity. This indicates that the seismic stability of the embankments remains satisfactory for the higher earthquake loading associated with the revised EDGM.

An Operation, Maintenance and Surveillance (OMS) plan has recently been prepared by Barrick Gold Inc for the tailings facility. An Emergency Preparedness Plan is required by the Ministry of Energy and Mines for a dam with a consequence category of “HIGH”, “VERY HIGH” or “EXTREME”. There is currently no emergency planning and response plan information included with the OMS plan. It is understood that this information will be incorporated together with inundation maps provided by the dam break study currently being conducted for the tailings facility.

No known dam safety review has been carried out for the Giant Nickel tailings facility. The last dam stability assessment was the study conducted by Knight Piesold from 2002 to 2006. This study included a review of the dam (consequence) classification for the tailings facility and the determination of appropriate design earthquake and flood events. For a “VERY HIGH” dam classification a formal dam safety review is required every five years for a tailings facility during operations. However, for a tailings facility in the closure phase the frequency of dam safety reviews needs to be established from consideration of the site conditions, downstream environment and risk assessment. It is recommended that a formal dam safety review be carried out and the frequency of future dam safety reviews and dam safety inspections established and incorporated into the OMS manual.

6 – REFERENCES

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7 – CERTIFICATION

This report was prepared, reviewed and approved by the undersigned.

PROFESSIONAL
PROVINCE OF
G.R. Greenaway
BRITISH COLUMBIA
ENGINEER

Nov. 25th, 2014.

Prepared: G.R. Greenaway

Graham R Greenaway, P.Eng.
Specialist Geotechnical Engineer

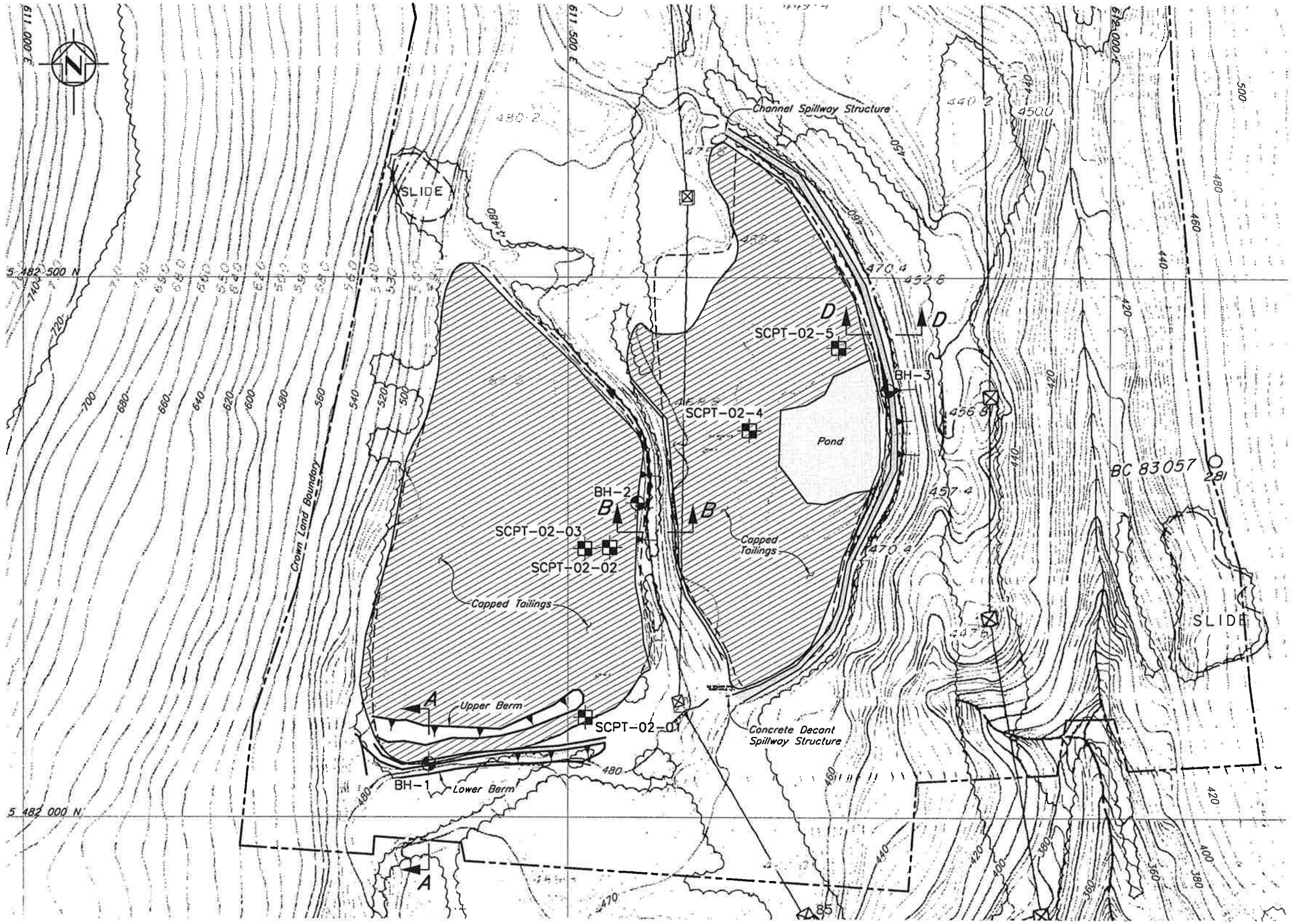
Approved:

pe Jeremy P. Haile, P.Eng.
Principal Consultant

APPENDIX A

SELECTED FIGURES FROM PREVIOUS STUDIES

(Pages A-1 to A-3)



NOTES

1. *Mapping base is image supplied by Barrick Gold Inc.*
2. *Upper Berm and Lower Berm configuration based on survey date provided by Valley Surveys (July 2005)*

LEGEND

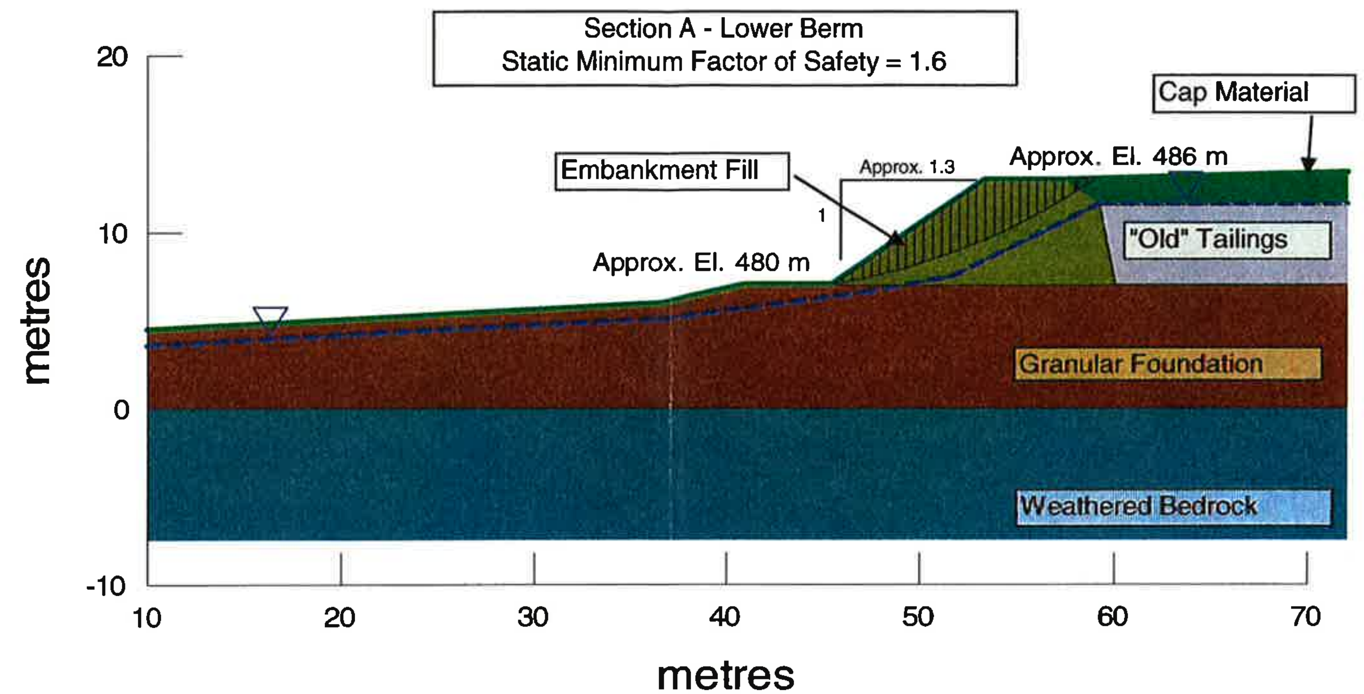
BH-1 — *1970 Site Investigation Borehole Locations*

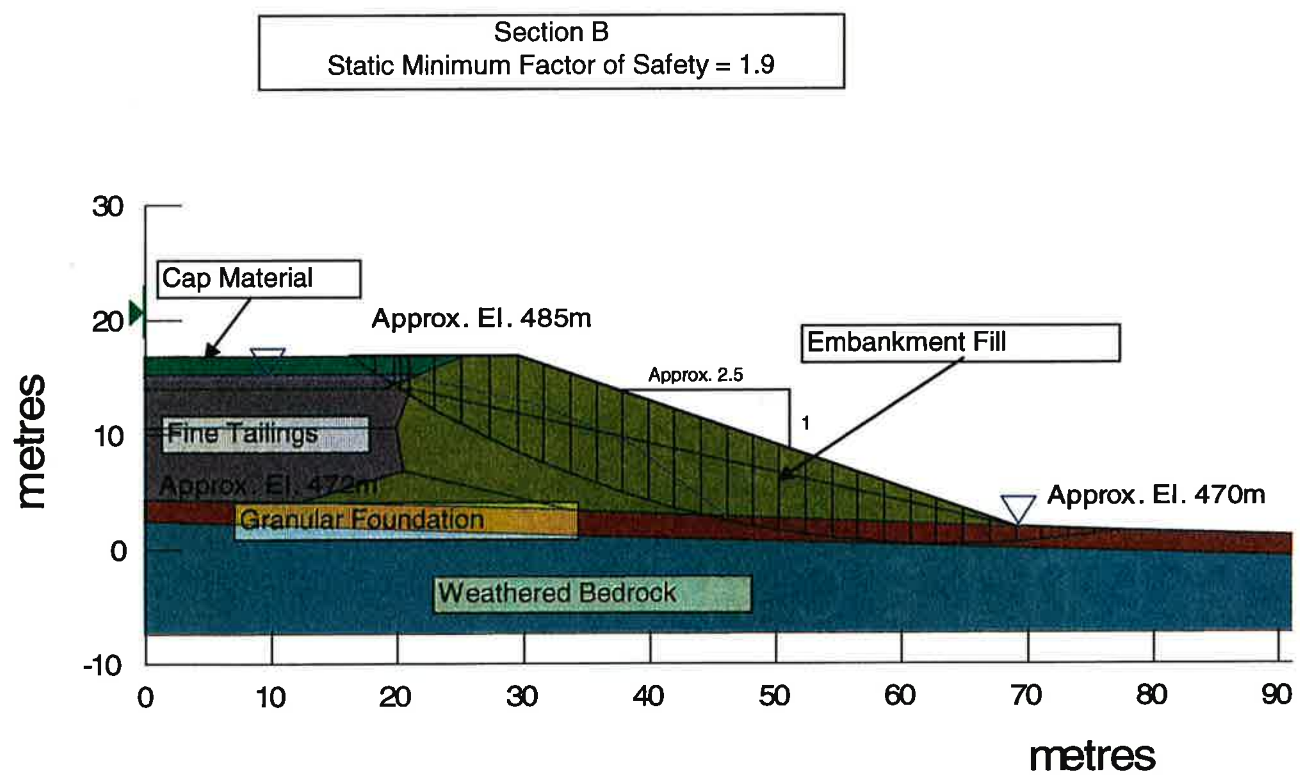
SCPT-02-03 — *2002 Cone Penetration Test Locations*

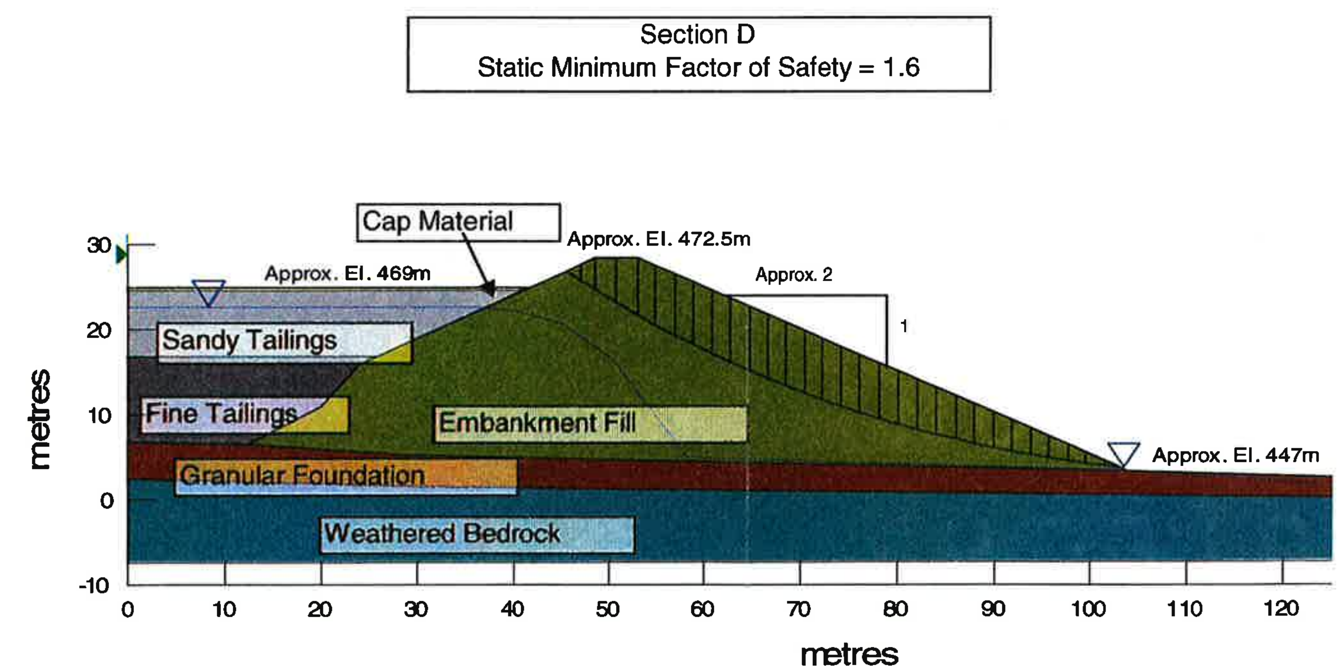
Scale 40 0 40 80 120 160 200 m

BARRICK GOLD INC.	
GIANT NICKEL MINE	
TAILINGS DAM STABILITY ASSESSMENT SITE INVESTIGATION PLAN	
Knight Piésold CONSULTING	PROJECT/ASSIGNMENT NO. VA101-93/1 · REF. NO. 1 · FIGURE 2.1 · REV. 0

REV. 0 | 02MAR'06 | ISSUED FOR REPORT



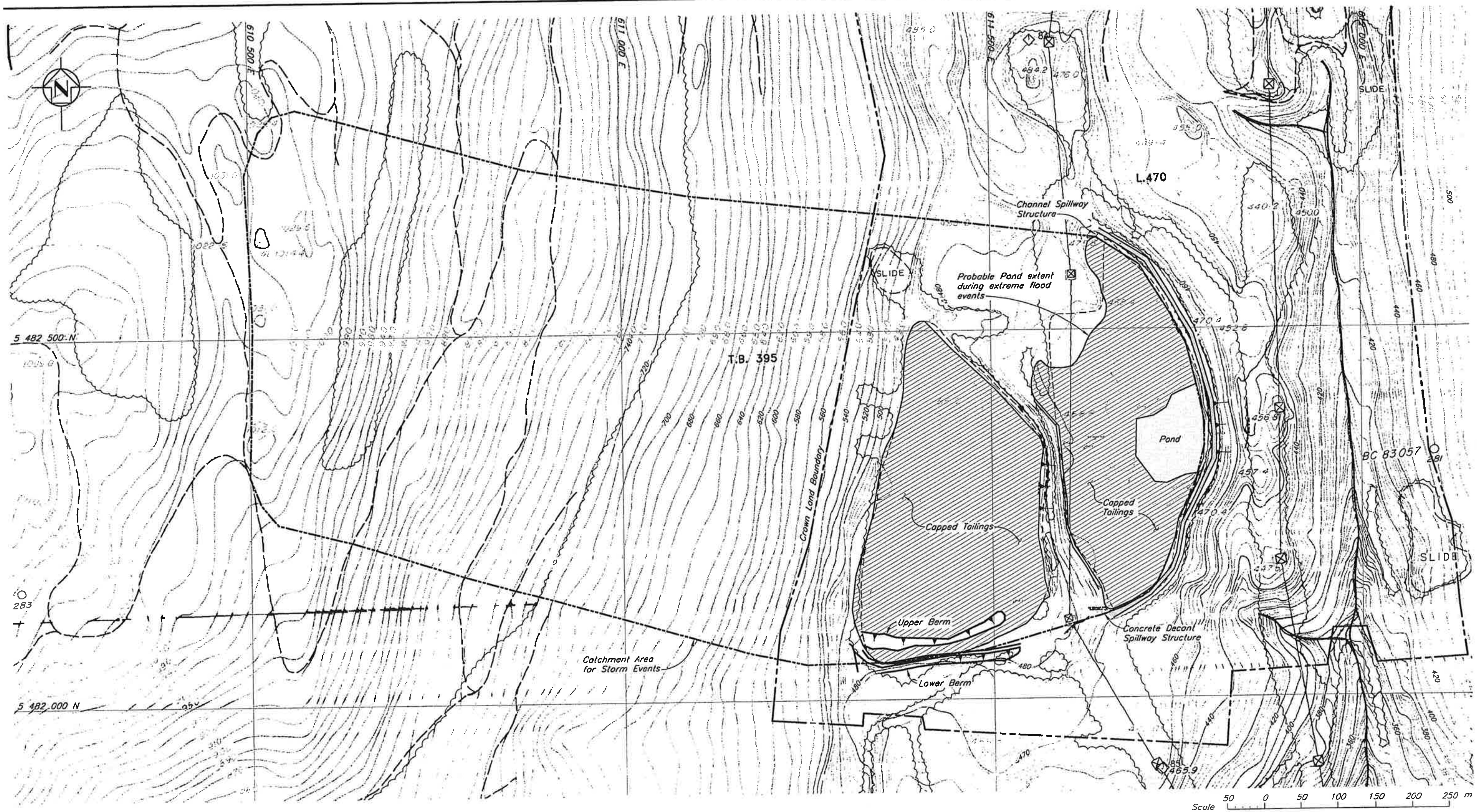




Notes:
1. Material Parameters for stability analyses are shown in Table 4.1.

BARRICK GOLD INC.			
GIANT NICKEL MINE			
TAILINGS EMBANKMENT STATIC STABILITY			
Knight Piésold CONSULTING	PROJECT / ASSIGNMENT NO. VA101-00093/1	REF NO 1	REV. 0
	FIGURE 4.1		

Rev 0 - Issued for Report



NOTES

1. Spillway inverts at approximate elevation 471.6 m
2. Maximum Pond Area 69 000 m2
3. Minimum embankment elevation 472.7 m
4. Mapping base is image supplied by Barrick Gold Inc.
5. Upper Berm and Lower Berm configuration based on survey date provided by Valley Surveys (July 2005)

BARRICK GOLD INC.

GIANT NICKEL MINE

TAILINGS STORAGE FACILITY
STORM RUNOFF CATCHMENT AREA

Knight Piésold CONSULTING

PROJECT/ASSIGNMENT NO.	REF. NO.
VA101-93/1	1

FIGURE 5.1 REV. 0

REV. 0 | 02MAR'06 | ISSUED FOR REPORT

APPENDIX B

PHOTOGRAPHS OF 2014 SITE INSPECTION

(Pages B-1 to B-6)

PHOTO 1 - Lower Tailings Pond - Embankment crest (looking south)

PHOTO 2 - Lower Tailings Pond - Reclaimed downstream slope (looking east)

GIANT NICKEL MINE
VA101-93/4-1

PHOTO 3 - Lower Tailings Pond - Capped tailings surface in foreground with water pond and eastern embankment behind (looking east)

PHOTO 4 - Lower Tailings Pond - Water pond adjacent to eastern embankment

GIANT NICKEL MINE
VA101-93/4-1

PHOTO 5 - Lower Tailings Pond - Water pond on tailings surface (looking north)

PHOTO 6 - Lower Tailings Pond - Water pond with eastern embankment behind (looking east)

GIANT NICKEL MINE
VA101-93/4-1

PHOTO 7 - Lower Tailings Pond - Channel Spillway (looking downstream)

PHOTO 8 - Lower Tailings Pond - Concrete Decant Spillway Structure (looking downstream)

PHOTO 9 - Upper Tailings Pond - Downstream embankment slope (looking west)

PHOTO 10 - Upper Tailings Pond - Reclaimed downstream slope at Lower Berm

GIANT NICKEL MINE
VA101-93/4-1

PHOTO 11 - Upper Tailings Pond - Downstream of Lower Berm

PHOTO 12 - Upper Tailings Pond - Access along capped and reclaimed tailings surface

GIANT NICKEL MINE
VA101-93/4-1