

Appendix P

Tailings Dam Breach Consequence Assessment Report

**Crawford Nickel Project: Tailings
Dam Breach Consequence
Assessment Report**

September 30, 2024

Prepared for:

Canada Nickel Company



Prepared by:

Stantec Consulting Ltd.



Limitations and Sign-off

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Acronyms and Abbreviations

CDA	Canadian Dam Association
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
ECC	Environmental Consequence Classification
IDF	Inflow Design Flood
kV	Kilovolts
m/s	metres per second
TMF	Tailings Management Facility

1 Introduction

Stantec Consulting Ltd. (Stantec) was retained by Canada Nickel Company Inc. (Canada Nickel) to complete a Dam Breach Consequence Assessment of the Crawford Nickel Project ('the Project') feasibility level tailings management facility (TMF) dams. The Project site is located approximately 42 km north of the City of Timmins, Ontario, in the geographic townships of Crawford, Carnegie, Kidd, Lucas, Beck, Nesbitt, Wark, and Prosser. The TMF will be located to the south of the Open Pit. The site location plan is presented in Figure A.1 within Appendix A and the adjacent watercourses and lakes are indicated on Figure A.2 within Appendix A. Ausenco completed dam breach and inundation modelling of the TMF (see Appendix O of the Impact Statement). Stantec was retained to complete the effects assessment of dam breach and inundation based on Ausenco's 2024 modelling work.

The objective of the assessment is to assign a Canadian Dam Association (CDA) classification to the TMF dams that represents a conservative assessment of dam breach consequence or losses from various event categories based on a quantitative assessment of dam breach release.

As described in detail in subsequent sections of this report, the CDA dam classification of Significant is assigned to the tailings dam based on the governing dam consequence of loss of life. The dam classification is predicated on implementation of a deflector berm that extends north of the TMF between the pit to the processing plant which reduces the dam classification from Extreme to Significant. The deflector berm would be constructed to protect more than 100 workers in populated mine facilities, including the mine workshop, pit and Processing Plant.

1.1 Site Description

The Tailings Management Facility Feasibility Design report (WSP 2023), states that the TMF will be operated as a "thickened tailings cone" with tailings being deposited near the center of the facility, which allows for a steeper beach slope (relative to conventional slurry deposition), thus increasing the TMF storage capacity and limiting perimeter dam height.

A TMF perimeter dam will be progressively raised as the volume of tailings increases using the centerline method, whereby the dam will be raised vertically with both upstream and downstream shells being raised. The perimeter dam will encircle the TMF and will include a low permeability core, filter, and transition zones, downstream and upstream shells. The low permeability core will be covered by a layer of frost protection material (sand) to insulate the core and reduce potential for degradation from freeze-thaw action. Rip-rap erosion protection will be provided over the exposed sand slopes of the frost protection and upstream shell.

As per the TMF design (WSP 2023), the TMF collects all contact water and seepage, and routes these flows to two water collection ponds (i.e., Northwest Collection Pond and the Northeast Collection Pond) via the downstream toe ditch and the TMF internal drainage system. The collection ponds manage water from the TMF and other mine facilities, provides reclaim water to the mill, and feeds excess water to water treatment prior to discharge.

Surface flows generated within the TMF will be conveyed by gravity to the northwest and northeast corners of the TMF via ditches along the TMF dam upstream slopes. The internal water management ditches within the TMF will be established using the tailings deposition plan, though some local grading of the ditch should be expected to accommodate for upset operating conditions. The TMF dams will include a spillway at each of the northwest and northeast corners which discharge to the Northwest Collection Pond and the Northeast Collection Pond, respectively.

During the Environmental Design Flood events (CDA 2019), the TMF internal water management channel of 0.5 metre (m) depth is expected to be locally exceeded at areas of limited grade, resulting in local internal inundation but below the dam low permeability core. The dam upstream shell has been designed to resist erosion resulting from this localized and temporary flooding. No overtopping of the TMF dam crest is expected during the Inflow Design Flood (IDF) event.

The Process Plant building(s) will consist of a pre-engineered rigid frame metal building whose interior components will be supported on reinforced concrete pile caps and steel piles down to bedrock. The building will house the grinding and chemical processing facilities, including the Semi-Autonomous Grinding mill, primary and secondary ball mills, regrind mills, thickeners, coarse flotation cells, fine flotation cells, reagents, and access and operating platforms. Concentrate Load-out Bays will be attached to the Process Plant Building and will be used to store concentrates prior to it being sold and shipped off site by rail.

2 Dam Breach & Inundation Analysis

Ausenco (Appendix O of the Impact Statement) completed a dam breach and inundation quantitative modelling analysis of the TMF.

The rationale for the selection of dam breach locations was to simulate a conservative prediction of dam breach consequences, as it relates to loss of life, environmental, infrastructure, and socio-economic categories (CDA 2019, 2023).

Table 2.1 summarizes two hypothetical failure scenarios evaluated per the CDA (2019) guidelines; these include:

1. A sunny day (fair weather) failure which assumes high normal operating conditions and a sudden failure due to a realistic cause (e.g., earthquake). There are four breaches in this scenario – west towards the North Driftwood River and chain of lakes, south towards Jocko Creek, east towards the West Buskegau River and north toward the Open Pit. The sunny day breach locations were selected at locations where the tailings dams were highest (relative to natural ground) on the east, north, west, and south and may result in the greatest extent of release during a breach.
2. A flood induced (wet weather/snowmelt-induced) failure, which could potentially occur due to a large flooding event. The IDF is set at 2/3 between the 1:1000 year return period flood and the Probable Maximum Flood for four breach locations. Internally water drains to the northwest and northeast corners of the TMF where emergency spillways are located. The flood induced failure was assessed to be an overtopping event and thus breaches were simulated at the northwest and northeast corners proximal to the spillways and to the north center and southeast corner proximal to potential losses.

The two failure scenarios are presented on maps in Appendix O of the Impact Statement. Each failure scenario includes two maps: Map A.0X-1 and Map A.0X-2 with Map A.0X-1 presenting maximum flow depth, maximum flow velocity and time to one foot (30 centimetres [cm]) of accumulation and Map A.0X-2 presenting maximum volumetric solids content, floodwave arrival time and time to maximum depth. Four sunny day and four flood induced scenarios with two maps each totaling 16 maps present these cases where the mapping presents the mud flow outflow from the dam breach.

In flood induced cases (east, south, and west) the solids content of the mud flow is estimated to exceed 20% and, in these scenarios, solids deposition and water flooding are distinguished in keeping with CDA guideline recommendations (CDA 2021). Finally, to address concerns with population at risk and loss of life concerns, Maps A.07-3 (sunny day) and A.08-3 (flood induced) (Appendix B) present the influence of a breach outflow control berm (deflector berm) on preventing northern breaches from inundating the mine office, truck shop, warehouse, medical office, fire hall and other mine infrastructure where mine staff will work. The outflow control/deflector berm would protect the proposed fuel farm and avoid a potential major environmental incident.

Table 2.1 Sunny Day and Flood Induced Breach Scenarios Figure Key

Scenario	Sector	All Results		Only Results $C_{vmax} > 20\%$		Notes
		Depth/ Velocity/ Time to One Foot	C_{vmax} , Arrived Time, Time to Peak	Depth/ Velocity/ Time to One Foot	C_{vmax} , Arrived Time, Time to Peak	
'Sunny Day'	West	Map A.01-1	Map A.01-2	-	-	For 'sunny day', all C_v results $> 20\%$ (C_v in TMF ~37%)
	East	Map A.03-1	Map A.03-2			
	South	Map A.05-1	Map A.05-2			
	North	Map A.07-1	Map A.07-2			
'Flood Induced'	West	Map A.02-1	Map A.02-2	Map A.02-3	-	All C_v results less than 20% Maps without symbology of: <ul style="list-style-type: none"> • Depth • Velocity • TtoOneF • C_{vmax} • ArriveTime • TimetoPeak • Only continuous polyline of flooded area
	East	Map A.04-1	Map A.04-2	Map A.04-3	-	
	South	Map A.06-1	Map A.06-2	Map A.06-3	Map A.06-4	Mixed results Maps with symbology of: <ul style="list-style-type: none"> • Depth • Velocity • TtoOneF • C_{vmax} • ArriveTime • TimetoPeak Only continuous polyline of flooded area
	North	Map A.08-1	Map A.08-2	-	-	All C_v results less than 20% No natural stream involved
Notes: See Appendix O of the Impact Statement Green shading – First set of maps Red shading – Second set of maps						

The flood wave is predominantly liquified tailings with no separate water component, as the TMF has no internal tailings pond and drains to external Northwest and Northeast Collection Ponds outside the TMF footprint. Flood routing was completed to assess the incremental impacts downstream for these scenarios at eight independent breach locations. The extent of the tailings runout from a dam breach is reduced from the designed low dam height (up to 25 m) and the thickened tailings cone disposal concept compared to traditional submerged tailings or non-thickened tailings disposal methods.

Non-Newtonian or mud flow tailings runout inundation maps were prepared to illustrate the incremental flooding extent caused by a dam breach. In addition, comparisons between maximum flow depths, flow velocities, and depth-velocity products were generated to identify the incremental effects between breach and no breach scenarios to aid in the assessment of flood severity.

The Tailings Management Facility Feasibility Design report (WSP 2023) in consideration of CDA guidelines (2019), assigned the preliminary dam classification for the TMF during Construction, Operation, Transition and Closure Active Care phases¹ is 'Very High' and 'Significant' during Closure Passive Care phase. The preliminary dam classification of 'Very High' was driven by increased loss of life and population at risk potential during Construction, Operation, Transition and Closure Active Care due to the presence of workers on site. During Closure Passive Care, workers are no longer present on site and as such the loss of life and population at risk potential decreases to the 'Significant' category, like other classification categories.

¹ Project phases are aligned with those used in the Tailings Management Facility Feasibility Design report (WSP 2023). This phrasing is generally aligned with the Project's construction, operations, and decommissioning and closure phases.

3 Dam Classification Assessment Methodology

The assessment is based on the dam breach analysis conducted by Ausenco (Appendix O of the Impact Statement) and associated dam breach inundation mapping and tailings runout predictions. As per Table 3.1 CDA guidelines (2019; Table 6-1 from guideline), the assessment considers the incremental consequence of failure, as it relates to population at risk, loss of life, environmental and cultural values, infrastructure and economics categories. Incremental consequences are the differences between the flood induced event with no dam breach and the flood induced event with a breach. In addition to the flood induced scenarios, the fair-weather or sunny day scenario is considered to estimate the consequences of dam breach in the event of a dam breach failure caused by a non-flooding event such as a seismic event.

Table 3.1 CDA Dam Breach Assessment Categories and Consequences

Dam Class	Population at Risk	Incremental losses		
		Loss of Life	Environmental and Cultural Values	Infrastructure and Economics
Low	None	0	Minimal short-term loss No long-term loss	Low economic losses: area contains limited infrastructure or services
Significant	Temporary only	Unspecified	No significant loss or deterioration of fish or wildlife habitat Loss of marginal habitat only Restoration or compensation in kind highly possible	Loss to recreational facilities, seasonal workplaces, and infrequently used transportation routes
High	Permanent	10 or fewer	Significant loss or deterioration of important fish or wildlife habitat Restoration or compensation in kind highly possible	High economic losses affecting infrastructure, public transportation, and commercial facilities
Very high	Permanent	100 or fewer	Significant loss or deterioration of critical fish or wildlife habitat Restoration or compensation in kind possible for impractical	Very high economic losses affecting important infrastructure or services (e.g. highway, industrial facility, storage facilities for dangerous substances)
Extreme	Permanent	More than 100	Major loss of critical fish or wildlife habitat Restoration or compensation in kind impossible	Extreme losses affecting critical infrastructure or services (e.g. hospital, major industrial complex, major storage facilities for dangerous substances)

Notes:
 Definitions for population at risk:
 None – No identifiable population at risk, no possibility of loss of life other than through unforeseeable misadventure.
 Temporary – People are only temporarily in the dam-breach inundation zone (e.g. seasonal cottage use, transportation routes, recreation).
 Permanent – Population at risk is ordinarily located in the dam-breach inundation zone (e.g., permanent residents) 2.
 Implications for loss of life:
 Unspecified – The appropriate level of safety required at a dam where people are temporarily at risk depends on the number of people, exposure time, nature of activity and other conditions. Higher classes could be appropriate depending on requirements.
 Source: CDA 2019

4 Population at Risk and Loss of Life

The population at risk in the inundated area provides an indication of the number of people exposed to the flood hazard (CDA 2014) and the potential loss of life, severity of tailings runout, and warning or suitable emergency response during the emergency.

The determination of loss of life potential was based on the two-by-two rule included in the Technical Guide - River and Stream Systems: Flooding Hazard Limits (MNR 2002). The two-by-two rule determines maximum allowable criteria for water depths and velocities that are considered as the threshold for potential loss of life.

The two-by-two rule contains three criteria that must be considered to evaluate the loss of life potential with respect to population at risk:

- outflow depth cannot exceed 0.8 m
- outflow velocity cannot exceed 1.7 metres per second (m/s)
- and the product of depth and velocity must be lower than 0.37 square metres per second (m²/s)

No permanent or temporary residents will be permitted in the mine site during operations. The nearest larger communities are the City of Timmins (42 km to the south), Town of Cochrane (35 km to the northeast), Town of Smooth Rock Falls (50 km to the northwest), and Town of Iroquois Falls (50 km to the east). Simulated breaches for the sunny day (fair weather) condition are located along the north, east, south and west sides of the TMF at the highest point of the dam along that side. Flood induced (wet weather) breach locations are also organized north, west, south and east, with north and south flood induced breaches simulated where water is modelled to pool deepest during the flood event and the east and west occurring at the spillways in the northeast and northwest corners of the TMF.

North Breaches: Mine facilities that are located north of the TMF dam include the fuel farm, medical clinic and firehall, mine substation, mine office, mine workshop and warehouse, primary crusher, and crusher E-room, of which the mine workshop would have the largest population of workers. In addition, the Open Pit located further north will have a high transient population of mine workers associated with pit development and moving ore and mine rock out of the pit. These facilities are directly adjacent to the TMF and result in the potential of hundreds of mine workers associated with these facilities at the time of a dam breach. The Process Plant is located to the northwest of the TMF and is proposed to have a large population of workers.

The proposed deflector berm constructed along the north perimeter of the TMF dam creates a barrier of tailings outwash from the adjacent mine facilities and thus reduces the population at risk and associated loss of life potential. As summarized in Table 4.1, the loss of life potential was calculated at locations where populations of mine workers are highest if a deflector berm is not constructed adjacent to the northern perimeter of the TMF. The loss of life potential without the outflow deflector berm was calculated for the sunny day breach as both sunny day and flood induced scenarios yielded similar outflow depth and velocities.

Table 4.1 Loss of Life Potential – North Breach

Breach Scenario	Location applied two-by-two Rule	Population at Risk	Depth X Velocity = Product	Loss of Life Potential Product >0.37
North Flood Induced Breach (No deflector berm)	Mine workshop	Permanent Population of more than 100 mine workers operating 24 hours	14 m x 5.0 m/s = 70	Yes
North Sunny Day Breach (No deflector berm)	Pit workers near bottom, mine workshop, warehouse and ancillary buildings	Permanent population of more than 100 workers operating 24 hours	14 m x 12 m/s = 168	Yes

The sunny day breach is presented in Maps A07-1 and A07-2 (Appendix B) without the effect of the tailings outflow deflective berm. Map A07-3 (Appendix B) presents the implementation of a deflective berm. Under the sunny day release scenario, the deflective berm would protect mine workers in mine facilities north of the TMF and the Process Plant to the northwest of the TMF. The flood induced breach is presented in Maps A08-1 and A08-2 (Appendix B) without the tailings outflow deflective berm. Map A08-3 (Appendix B) presents the implementation of the northern deflective berm. While workers directly north of the TMF in the mine office, medical clinic and firehall, workshop and other worker facilities would be protected. The outflow modeling demonstrates that outflow would round the western extent of the deflective berm and track back northeast towards the Process Plant. To protect workers at the Process Plant, the deflector berm must extend west of the process plant. In addition to the deflective berm other design considerations may also reduce the risk of loss of life including final grade elevation of the Process Plant, which if higher than used in the dam break modeling would reduce flood depth and extent. Another important consideration in light of dam breach outflow extent modeling would be to relocate worker facilities to area of lower inundation risk.

East Breaches: The sunny day breach was located at the low point in grade near the center of the berm and not considered to pose a risk to mine workers. The flood induced breach was placed at the northwest corner adjacent to the TMF Northwest Collection Pond and associated water treatment plant. The northeast dam breach scenario poses a risk of loss of life to mine personnel working at the water treatment plant associated with the Northeast Collection Pond. The population at risk in the water treatment plant was assumed to be temporary. However, consideration of raising the elevation of the water treatment plant or moving the plant outside of the inundation zone to protect mine workers is recommended.

A hydro line and access road are located to the east of the TMF. The two-by-two rule loss of life potential is summarized in Table 4.2 for the east breaches.

The sunny day east breach is presented in Maps A03-1 and A03-2 (Appendix B). The flood induced eastern breach in the northeast of the TMF is presented in Maps A04-1 and A04-2 (Appendix B). Map A04-3 (Appendix B) presents flooding extents with volumetric solids content $\geq 20\%$.

Table 4.2 Loss of Life Potential – East Breach

Breach Scenario	Location applied two-by-two Rule	Population at Risk	Depth X Velocity = Product	Loss of Life Potential Product >0.37
East Sunny Day Breach	Hydro line and access road	Transient/temporary population associated to maintenance	3 m x 0.5 m/s = 1.5	Yes
Northeast Flood Induced Breach	Water Treatment Plant workers	Temporary population of fewer than 10 mine workers; reduced in numbers if plant raised or moved from inundation zone	0.50 m x 0.15 m/s = 0.075	No

At the proposed location of the Northeast Collection Pond treatment plant the breach outflow depth x velocity are below loss of life trigger thresholds. However, to reduce the potential for loss of life of mine workers working temporarily or permanently at the Northeast Collection Pond treatment plant it is recommended to consider raising the elevation of the plant out of the flood inundation zone or moving the plant slightly west further away from the inundation zone.

South Breaches: Mine infrastructure is not located south of the TMF dam, and the area is unpopulated; the existing Highway 655 and 500 kilovolt (kV) hydro line will be relocated to accommodate Project development. The south sunny day breach outflow does not extend to public roads, or hydro rights-of-way. Maps A05-1 and A05-2 (Appendix B) present the south sunny day breach.

The flood induced southwest breach is not considered to pose a risk to mine workers however the flood induced southwest breach may run up to and over the realigned Highway 655. The rate of highway inundation is 3 to 4.5 hours to reach 30 centimetres in depth, however, as summarized in Table 4.3 is not anticipated to result in potential loss of life. A flood induced south breach would have a minor effect on water levels in the Mattagami River near the Lower Sturgeon Dam but is not expected to affect dam operation or its capacity for flood control. Maps A06-1 and A06-2 (Appendix B) present southwest flood induced conditions. Maps A06-3 and A06-4 (Appendix B) present symbology representative of total volumetric solids content $\geq 20\%$.

Table 4.3 Loss of Life Potential – South Breach

Breach Scenario	Location applied two-by-two Rule	Population at Risk	Depth X Velocity = Product	Loss of Life Potential Product >0.37
South Flood Induced Breach	Highway 655 realignment	Transient/temporary population associated to highway use	0.25 m x 0.75 m/s = 0.19	No

West Breaches: The west sunny day breach outflow does not extend to proposed worker facilities or public roadways. A population at risk as a result of a sunny day breach to the west is associated to any recreational use of Sutherland Lake and a portion of Jack Lake or other nearby lakes accessed from the highway. As summarized in Table 4.4, there is potential for loss of life under the west sunny day breach. Maps A01-1 and A01-2 (Appendix B) present the west sunny day breach.

Highway 655 is planned to be relocated to the west of the TMF as it is within the proposed Project footprint. Under the west flood induced breach scenario, which breaches the northwest spillway, the approximately 400 mine workers within the Open Pit may be at risk during operations. However, as indicated in the north breaches discussion, the implementation of a northern breach outflow deflective berm would divert outflow toward the Open Pit and protect pit workers. The Northwest Collection Pond treatment plant and explosives pad are located on higher ground east and west of Martin Lake and would be above the west breach flood induced inundation zone.

Table 4.4 Loss of Life Potential – West Breach

Breach Scenario	Location applied two-by-two Rule	Population at Risk	Depth X Velocity = Product	Loss of Life Potential Product >0.37
West Sunny Day Breach	Sutherland Lake	Temporary population associated to recreational lake use	3.0 m x 1.75 m/s = 5.25	Yes
West Flood Induced Breach	Highway 655 realignment	Transient/temporary population associated to highway use	0.25 m x 0.75 m/s = 0.19	No
West Flood Induced Breach (No deflector berm)	Open Pit Bottom	Transient population of more than 100 mine workers	0.3 m x 2.0 m/s = 0.6	Yes

Installation of the proposed deflector berm along the norther perimeter of the TMF would divert tailings and water outwash from entering the Open Pit, further north in the event of a dam failure to the north. If the deflector berm is in place, then a flood induced dam breach to the west would inundate the Processing Plant. As indicated for the northern flood induced breach, the deflector berm should be extended west beyond the Process Plant to reduce potential inundation at the Process Plant and protect mine workers. Maps A02-1 and A02-2 (Appendix B) present flood induced conditions. Maps A02-3 (Appendix B) presents flooding extents in light of the volumetric solids content is < 20% of total volume. Maps A02-1, A02-2 and A02-3 (Appendix B) do not present the effects of the tailings outwash with the deflective berm.

Loss of life potential in the event of flood induced dam breach would be reduced in Operations from flood hazards warnings, communication lines, etc., as part of emergency preparedness and response practices at the mine. The population of mining personal during the Closure Passive Care phase would be 0 or unspecified and temporary in nature.

In summary, there is a transient/temporary population at risk to users of adjacent Highway 655 to the west, adjacent hydro access road to the east, workers conducting maintenance and or vegetation management associated with the transmission lines both to the west, and users of the mine ore rail line to the west (i.e., non-passenger rail line used by the mine to haul concentrate). There is road access to lakes connected to North Driftwood River (e.g., Martin Lake, Gerry Lake, Jack Lake, Sutherland Lake, Mel Lake and Davis Lake) and therefore transient/temporary recreational use of these lakes for fishing and boating was considered.

The loss of life potential results in a CDA classification of Extreme as a result of more than 100 mine workers that may be at risk during a sunny day north breach or flood induced dam failure north/northwest breach. However, installation of the deflector berm along the northern perimeter of the TMF lowers the CDA classification from Extreme to Significant by eliminating the population at risk at the mine facilities adjacent to the TMF including the medical clinic, firehall, mine office, mine workshop, warehouse and Open Pit, however results in the redistribution of tailings and water outwash at the Process Plant. To avoid incurring population at risk at the Process Plant the deflector berm would need to extend further west and deflect tailings outwash from the Process Plant Area. The incorporation of the tailings deflector berm north of the TMF and extending west beyond the Process Plant has the potential to reduce population at risk to temporary transient persons along Highway 655 and workers temporarily in the inundation zone thus reducing loss of life potential to unspecified. Permanent design of the tailings deflective berm into the mine design is therefore expected to reduce the dam classification during Operation and Active Care under population at risk and loss of life potential categories to Significant.

The CDA classification is Significant during the Closure Passive Care phase with respect to the transient/temporary population at risk of users of adjacent Highway 655 to the west, adjacent hydro line and access road to the east, and the recreational use of the West Buskegau River and North Driftwood River and local lakes.

5 Environmental and Cultural Values

Although the TMF will not contain a significant amount of ponded water, tailings liquefaction and subsequent mud flow could infill adjacent lakes, wetlands and watercourses. The lakes immediately adjacent to the west side of the TMF including Martin, Gerry, Jack Sutherland and Mel Lakes host fish and are considered fish habitat. As reported in the feasibility level design (WSP 2023), a dam breach has the potential to release tailings solids into the waterways that connect to the West Buskegau River and North Driftwood River, all of which provide fish habitat. The simulated tailings runout (Appendix O of the Impact Statement) of the west sunny day breach directly infills Sutherland Lake and a portion of Jack Lake. The flood induced breach to the northwest would infill the Northwest Collection Pond and result in inundation of Martin Lake and Gerry Lake.

The flood induced breach to the east infills approximately 1 km of West Buskegau River and the sunny day breach infills adjacent wetland areas. The southern simulated sunny day breach would not extend to a lake or waterbody, however the southwest simulated flood induced breach would inundate Zed Lake and affect flows and total suspended solids concentrations in Jocko Creek. As a result, the existing habitat and aquatic or amphibian species would be lost during the dam breach. The existing benthic invertebrate community as well as some benthic fish species would likely be smothered, and substrate would be filled with tailings.

The environmental and cultural value losses was assessed following the guidance outlined in the CDA Technical Bulletin Revision to CDA Dam Safety Guidelines: The Environmental Consequence Classification (ECC) Procedures for Mining Dams issued in 2023. As described in the technical bulletin, the ECC framework is based on three variables as described in the Table 5.1 (CDA 2023 Table 4):

- **Ecological Impact** – Related to the potential area of habitat loss resulting from physical changes for a Species of Special Interest (SSI) (e.g., species at risk [SAR]). The ecological impact of a potential dam breach is determined through the quantification of habitat impacted. This is calculated by determining the loss of SSI habitat resulting from a potential dam breach in comparison to an appropriate regional habitat for the SSI.
- **Intrinsic Hazard of Contents** – Related to the potential for impacts beyond physical disturbance (e.g., chemical composition of effluent and solids).
- **Duration of Impact** – Related to the duration of the physical or chemical effects described for the previous two variables.

These variables are used along with a decision matrix to determine the overall ECC. An initial ECC is determined based on the ecological impact and intrinsic hazard of contents. Then this ECC is assessed based on the Duration of Impact. The ECC results in a rating of Low, Significant, High, or Very High as outlined in Table 5.1 (CDA 2023 Table 4).

Table 5.1 Environmental Consequence Classification Matrix (CDA 2023)

Step 1: Matrix		Ecological Impact			
		Level A: <5% of species of special interest habitat impacted	Level B: 5 to 20% of species of special interest habitat impacted	Level C: 20 to 50% of species of special interest habitat impacted	Level D: >50% of species of special interest habitat impacted
Intrinsic Hazard of Contents	Level A: transported water/liquid is non-acutely lethal, and/or no solids are present.	Low	Low	Significant	High
	Level B: transported water/liquid is non-acutely lethal, and/or no solids released not expected to leach metal (oids) and/or produce acidity within the timeframe of reclamation activities	Low	Significant	Significant	High
	Level C: transported water/liquid is acutely lethal, and/or no solids released not expected to leach metal (oids) and/or produce acidity within the timeframe of reclamation activities	Significant	Significant	High	Very High
	Level D: transported water/liquid is acutely lethal, and/or solids released are expected to leach metal (oids), produce acidity and/or are radioactive	High	High	Very High	Very High
Step 2: Dial		Reduce ECC Class	No Change to ECC Class	Increase ECC Class	
		A return to acceptable restoration is feasible within 5 years.	A return to acceptable restoration is feasible within 5 to 25 years.	A return to acceptable restoration is unlikely to occur within 25 years.	

Supplemental baseline data is described in the baseline study reports (Appendix B of the Impact Statement). These reports summarize baseline conditions for fish and fish habitat, wildlife, migratory birds and plant species, including species of importance to Indigenous nations. Some fish species identified, which may be a food source include brook/lake trout, pickerel, northern pike, and lake white fish. Lake sturgeon southern Hudson Bay – James Bay populations, a Committee on the Status of Endangered Wildlife in Canada (COSEWIC) species of special concern, that are known to be present in the Mattagami River were not identified within the lakes and watercourses of the North Driftwood River (west) or the West Buskegau River (east).

Common wildlife and migratory birds reported of importance to Indigenous nations include beaver, moose, boreal caribou, deer, ruffed grouse, bald eagle, North American river otter, crane, osprey, among others. Plant species in the area were identified to be used for Indigenous medicinal purposes. Examples of plant species identified include cedar, birch, horsetail, chokecherries, male, mint, wild blueberries, yarrow.

As reported in the feasibility level design (WSP 2023), a search of the online Canadian Register of Historic Places shows no Federal, Provincial, or Territorial recognized historic sites within a 100 km radius of the site, and no site of Aboriginal Cultural Significance have been listed by the Ministry of Mines in the immediate vicinity of the site. However, through engagement with Indigenous nations, areas of cultural importance have been identified in the vicinity of the TMF. Some examples include areas of past or current use for hunting, trapping, fishing, harvesting, and/or knowledge sharing. Indigenous use of areas around the TMF are considered through the loss of life category as transitional persons.

The ecological impact is based on the habitat impact quantification applied to the SSI. A provincially/territorially or federally listed (e.g., by COSEWIC) aquatic/wildlife species was not confirmed to be or is likely to be present within the predicted tailings runout inundation area, and therefore a listed species was not selected as a SSI. Black ash (*Fraxinus nigra*) is a provincially recognized SAR in Ontario, under the *Endangered Species Act* (2007) and was identified to be located in the vicinity of the Project. Little brown myotis (*Myotis lucifugus*), olive-sided flycatcher (*Contopus cooperi*), and Canada warbler (*Cardellina canadensis*) are COSEWIC listed bird species and have been identified in the area. In addition, the little brown myotis is a protected SAR under the *Species at Risk Act* (SARA; S.C. 2002, c.29).

Little brown myotis was considered as the SSI because of the SARA protected status. Habitat of the little brown myotis includes summer maternity colonies in buildings or large-diameter trees. Foraging occurs over water, along waterways, forest edges, and in gaps in the forest. Large open fields or clearcuts generally are avoided. Foraging and nesting habitat may be lost in the event of dam breach from tailings runout. However, as similar habitat is available regionally this loss of habitat as a result of a dam breach is considered under CDA guidelines (2023) to be of low ecological impact.

Pickrel (*Sander vitreus*) was considered as the SSI based on the importance to Indigenous nations and its use as a food source. Pickerel inhabit shallow, vegetated ponds, lakes and sluggish streams; characteristic of the small lakes west of the TMF dams (i.e. Martin Lake, Gerry Lake, Jack Lake, Sutherland Lake) and the headwaters of the West Buskegau River watershed. The loss of habitat, as a result of a dam breach, results in what CDA defines as low ecological impact because of the large regional pickerel populations.

The beaver (*Castor canadensis*) was considered as the wildlife SSI because of its cultural importance to Indigenous nations (Stantec 2024). The beaver lives in ponds, lakes, rivers, marshes, streams and adjacent wetland areas representing a wide range of habitat. The loss of habitat as a result of a dam breach would have low ecological impact (CDA 2023) due to the regional availability of beaver habitat.

Black ash was selected as the SSI because of the provincially recognized status. Black ash is predominantly found in swamps, floodplains and fens. Based on a review of the forest resource inventory (OMNRF 2023) the breach outflow to the west is approximately half deciduous/coniferous forest stand and the other half lake/wetland/bog area. The breach outflow to the east is predominantly swamp and a fen wetland. The ecological impact is assessed at Level A < 5% of the SSI habitat may be lost regionally due to the tailings runout area.

The intrinsic hazard of contents is based on the quality of water and tailings in the breach. As described in the geochemical assessment (Lorax 2024), the water and tailings are not expected to produce acidity or leach metals. The water and tailings are not expected to be acutely lethal. The intrinsic hazard of contents is Level B as the dam breach will release tailings solids and water effluent.

Based on the ecological impact being assessed at Level A and intrinsic hazard of contents at Level B, the initial ECC is assessed at Low.

In the event of the west dam breach, the adjacent lakes would not recover without human intervention (i.e., remediation may include the physical removal or dredging of tailings). With mitigation applied, black ash habitat is expected to recover within 5 to 25 years, resulting in no change to the initial ECC of Low. Within a similar duration of time the east breach may recover with increased potential opportunity for natural processes from flows in the river and the upstream West Buskegau River watershed. Restoration may include stabilization of tailings material and planting/revegetation. It is also anticipated that the benthic invertebrate community and/or local fish populations would restore naturally after physical tailings remediation or stabilization/re-establishment of the lakes/watercourse.

In the event of a north breach and without implementation of the deflector berm, the fuel farm would be at risk of containment rupture, with the contents of the tank farm released to predominantly the Open Pit and to the local environment. The deflector berm would protect the fuel farm from water and tailings runout in the event of a dam breach.

As described by CDA (2023), acute lethality resulting from suspended solids was not included as a possible cause of toxicity in the intrinsic hazard of contents assessment. This is because following the initial debris flood, suspended solids content will reduce to below lethal levels quickly, and its spatial bounds will reasonably coincide with the footprint of physical impacts (ecological impact variable). The intrinsic hazard of contents is then evaluated on the continuation of leaching from these solids prior to remediation of the released contents. In the Mattagami River, elevated suspended solids concentrations under a flood induced southern breach would extend to the Lower Sturgeon dam. However, during an IDF flooding event, it is expected that suspended solids concentrations in the Mattagami River would be elevated as well. Effects of a south flood induced breach on suspended solids would be expected to recover to baseline conditions under the same IDF at the dam or immediately downstream. No effects are predicted downstream at Smooth Rock Falls. This is similarly the case for east and west breaches entering the North Driftwood River and West Buskegau River, where suspended solids concentrations would be elevated but settle out rapidly in the receiving environment with no incremental effects observed downstream in the Abitibi River.

The environmental and cultural losses in the event of a dam breach is Low as a result of the loss of lake, river, wetland and floodplain habitat. As the TMF will remain during closure, this CDA ECC classification is not expected to change between the Operations and Passive Closure phase.

6 Infrastructure and Economics

The Project is situated in the Timmins-Cochrane Mining Camp in Northeastern Ontario, Canada, a region with a strong mining history of gold, nickel, zinc and lead, and a Canadian province supportive of mining with regulations that reflect that history.

The Project is located in an area well-connected by local infrastructure. The Project is bisected by Highway 655, a two-laned paved provincial highway connecting Highway 101 to Highway 11 (Trans-Canada Highway). An existing rail spur line connects Glencore's existing Kidd Mine west of Highway 655 to the Kidd Metallurgical Site to the southeast of the Project site. Other local infrastructure includes a regional transmission line (500 kV), which parallels Highway 655 and extends from the Hydro One Porcupine Transformer Station located east of Timmins. In addition, a 115 kV transmission line runs north south along the east side of the Project. A hydro-electric generating station, Lower Sturgeon, is located along Mattagami River to the west of the Project site, within the boundaries of Mahaffy Township.

The mine facilities are located in an undeveloped wooded area. Damages to the Highway 655 and adjacent railway infrastructure may result in tailing/sediment blocking the associated culvert infrastructure resulting in scour and erosion. Access to the transmission line to the east may be blocked from tailings sediment overtopping the access road or damaging the tower/abutment structures. The energy in the breach runout will be low by the time the outwash debris wave reaches the transportation/hydro infrastructure. Notification of the Ministry of Transportation, Ontario Hydro Networks Inc. and Ontario Northland Transportation Commission, the owner of the rail line, is expected to be included in the emergency response plan for a dam breach emergency.

The CDA (2019) primarily considers direct damage to third-party property and infrastructure when assessing the economic losses associated with dam failure. Financial consequences to the mining company/owner are not considered in the classification. Losses of mine infrastructure are not considered in the consequence classification.

The infrastructure and economics classification from construction through to Closure Passive Care phase is assigned as Significant due to the potential loss to recreational use of lakes associated with the North Driftwood River, and West Buskegau River, damage to transportation routes (i.e. Highway 655, rail line, and infrequently used hydro line access/rural roads would be sustained and access may be temporarily impacted). However, restoration of access to Highway 655, the rail spur and hydro corridor would be a priority to restore immediately after the emergency incident.

7 Summary of Dam Consequence Classification

As the breach outflow paths run into the Open Pit and may reach the Process Plant and other mine worker buildings, the loss of life potential consequence of failure will be the governing dam classification.

Governing Consequence - Loss of Life Potential

The governing consequence in the assessment is the loss of life potential for the population at risk.

There are five potential breach location scenarios which may influence loss of life potential:

- West sunny day failure breach to recreational users of the North Driftwood River watershed lakes.
- West flood induced failure to the Open Pit, recreational users of North Driftwood River watershed lakes and users of Highway 655.
- East sunny day breach to hydro line and access road.
- North flood induced breach (without deflector berm) to the Open Pit mine and mine workers at the truck shop, warehouse, medical clinic, firehall and mine office.
- North sunny day failure (without deflector berm) to the Open Pit mine and mine workers at the truck shop, warehouse, medical clinic, firehall and mine office.

Without the construction of the tailings outflow deflector berm extending north of the TMF from the East Stockpile, west past the Process Plant, the CDA classification of Extreme would be applied to the loss of life category as a result of more than 100 mine workers that may be at risk during a flood induced dam failure at a breach of the north dam or the northwest spillway location during the Operations and Active closure phases. This classification represents an increase from the preliminarily Very High classification in the feasibility study (WSP 2023), during the Operations and Active Closure phases.

With the installation of a tailings outflow deflector berm north of the TMF extending from the East Stockpile, west past the Process Plant, the TMF facility CDA classification is assigned Significant during the Operations and Active Closure phases. The population at risk would be temporary persons driving along Highway 655, or along the rail spur or mine roads and the loss of life potential would be reduced to Unspecified. The tailings outflow deflector berm would protect workers in the mine workshop, warehouse, medical clinic and firehall, mine office, Open Pit and Process Plant, effectively protecting all otherwise potentially affected permanent mine worker populations. The tailings outflow deflector berm is an effective structural/physical mitigative strategy to reduce the loss of life potential as a result of a dam breach toward the Open Pit and the adjacent mine facilities north and northwest of the TMF. Protection of mine workers at the northeast water treatment plant by raising the plant elevation or relocating outside the inundation zone should be considered.

Environmental Consequence

The ECC was assigned as Low. The ecological impact of <5% of black ash habitat lost is Level A, combined with the intrinsic impact of contents being non-acutely lethal and solids released not expected to leach metal(oids) or produce acidity within the timeframe of reclamation activities at Level B results in an ECC classification of Low. Then when a return to acceptable restoration is considered feasible within 5 – 25 years the ECC classification of Low is confirmed.

The tailings outflow deflector berm would protect the fuel farm from water and tailings runoff in the event of a dam breach, thus mitigating the release of fuel to the pit and surrounding environment.

The dam breach and inundation model accounted for the footprint of the relocated highway located west of the TMF. No tailings were assessed to reach Jocko Creek in the consequence assessment however tailings water would reach Jocko Creek under the south end flood induced breach scenario.

Infrastructure Economics Consequence

The infrastructure and economics classification from Construction through to the Closure Passive Care phase is assigned as Significant due to the potential loss to recreational use of North Driftwood River watershed lakes, and West Buskegau River, damage and temporary access loss to transportation routes (i.e., Highway 655, rail line, and infrequently used hydro line access/rural roads). However, restoration of access to Highway 655, the rail spur and hydro corridor would be a priority to restore immediately after the emergency incident.

Classification

Without implementation of a tailings outflow deflector berm, the loss of life classification would be Extreme and the governing consequence category. However, the implementation of a tailings outflow deflector berm north of the TMF extending from the East Stockpile west past the Process Plant would reduce population at risk and loss of life potential to a Significant classification. The ECC is assigned at Low and infrastructure and economics classification was assigned at Significant. As a result, with implementation of the deflector berm the TMF dam, consequence classification would be assigned at Significant.

7.1 Recommendations & Next Steps

Reduce the population at risk through implementation of a deflector berm and a slight modification/relocation of Northeast Collection Pond treatment plant. The berm should be designed north of the TMF extending from the East Stockpile west past the Process Plant to sustain the tailings and water outflow in the event of dam breach. Similarly, confirm that the explosives pad and Northwest Collection Pond treatment plant are located above the inundation zone or relocated out of the potential inundation zone.

The consequence should be re-assessed if additional potential losses are identified in subsequent baseline information and/or environmental effects assessments that may result in a change of classification.

The assessment of infrastructure losses could benefit by updating the model to include the designed conveyance infrastructure materials, type, dimensions, and slopes associated to the highway/railway re-alignment and the North Driftwood River Diversion Channel from Martin Lake under Highway 655 and the rail spur. To support emergency preparedness and response planning, the tailings runout and inundation maps should show the full extent of the tailings outflow deflector berm, account for North Driftwood River Diversion Channel culvert sizing and proposed crest elevation, width and locations of Highway 655, the rail spur and mine roads to better characterize the potential losses.

The dam classification will be used in design to define the IDF flood and the Earthquake Design Ground Motion for a geotechnical failure. This classification is reduced to Significant with the deflector berm, from Extreme without the deflector berm in place and tailings and water freely flowing to toward the Process Plant, Open Pit and other mine worker facilities.

During the Passive Care Closure phase the consequences are typically reduced because the mining activities have ceased in the pit and Active Closure has ceased and workers are no longer present at site; the classification of Significant is recommended. As recommended in the CDA (2007) guidelines, the dam owner may choose to dial up the consequence classification one level as mine workers will no longer be regularly onsite to conduct visual inspections of the TMF dams.

8 References

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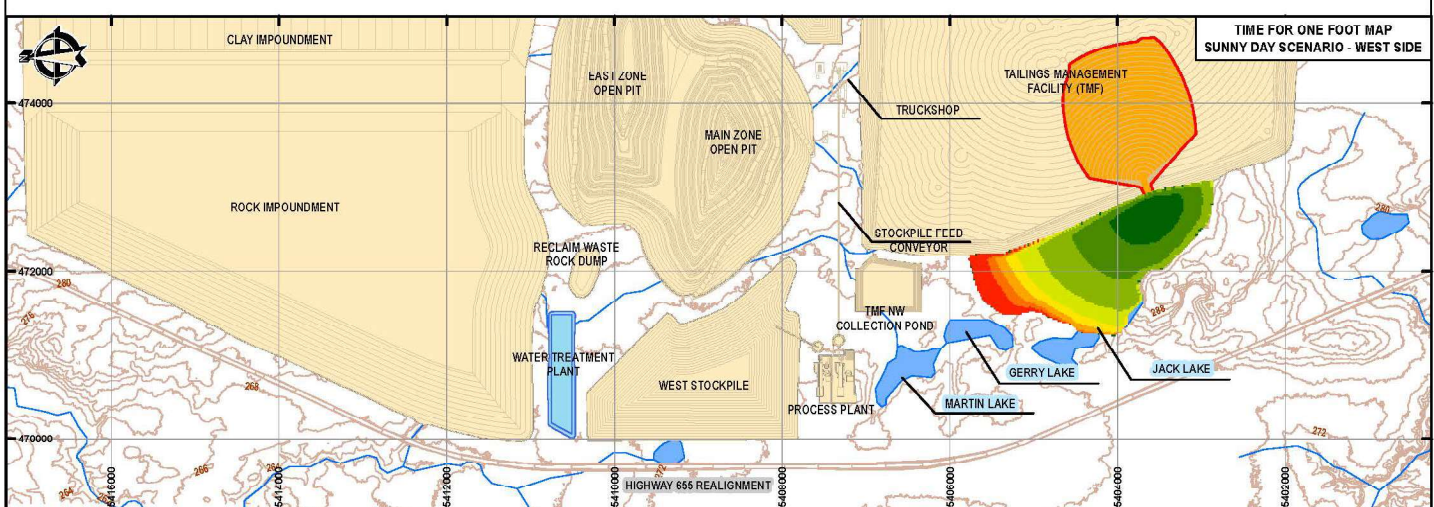
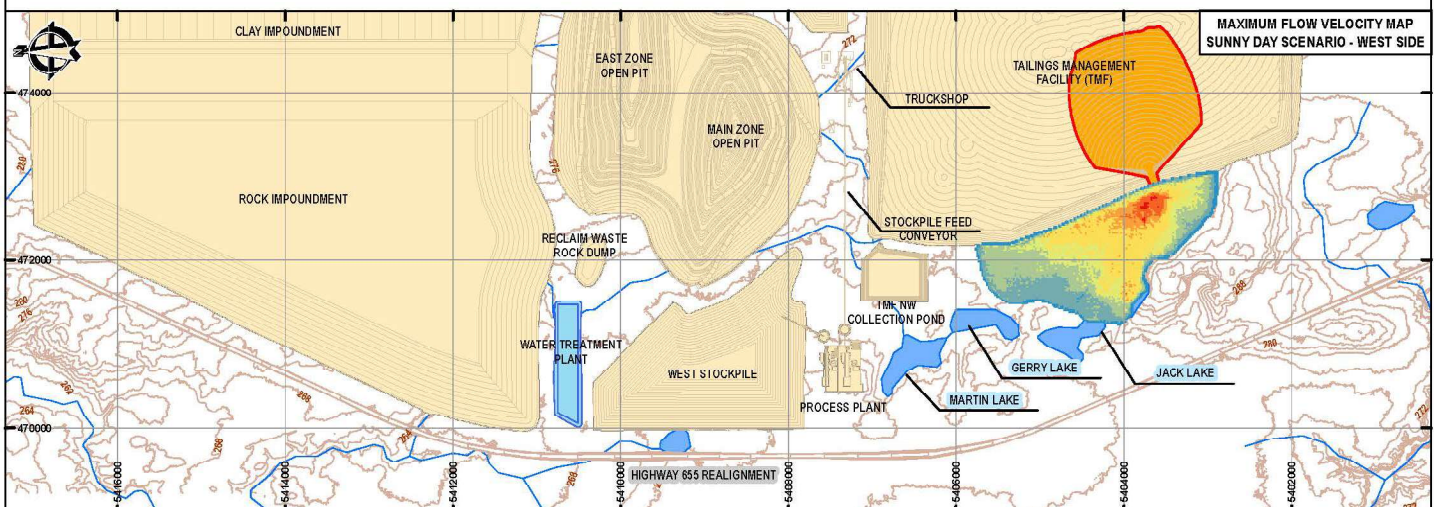
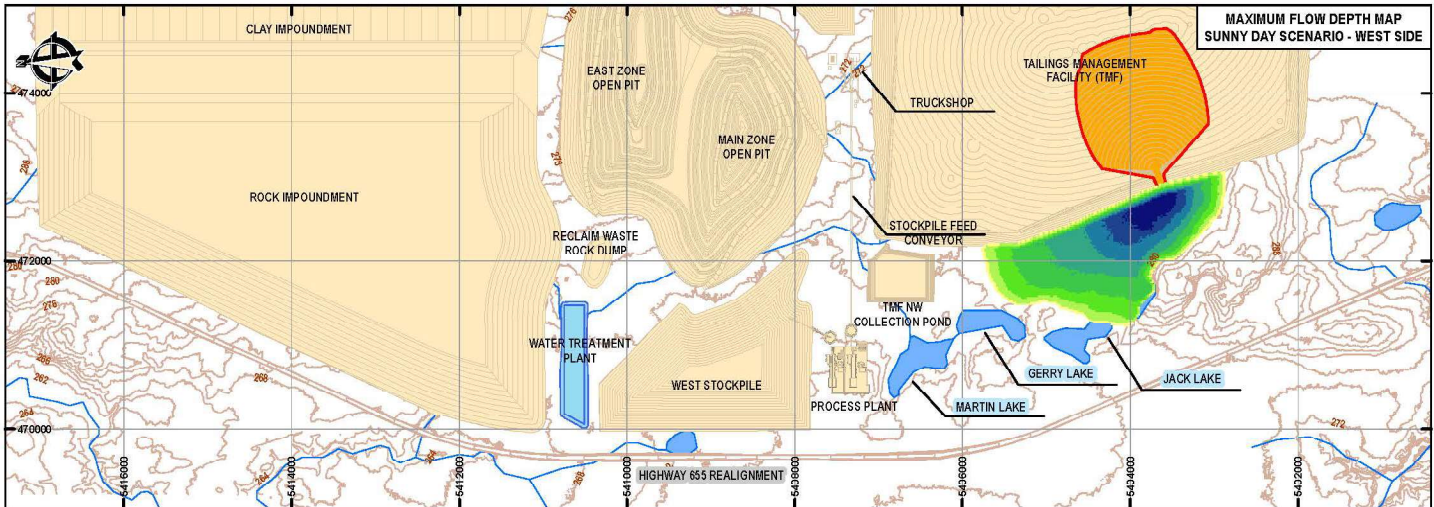
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Appendices

Appendix A Figures

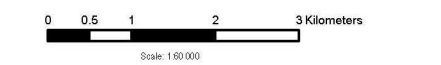
Appendix B Inundation Maps

West Dam Breach



SCALE: 1:60,000

SIMBOLOGY		
MAXIMUM FLOW DEPTHS (m)	MAXIMUM VELOCITIES (m/s)	TIME FOR ONE FOOT (hr)
0.00 - 2.00	0.00 - 0.50	0.00 - 0.25
2.00 - 4.00	0.50 - 1.00	0.25 - 0.50
4.00 - 6.00	1.00 - 1.50	0.50 - 0.75
6.00 - 8.00	1.50 - 2.00	0.75 - 1.00
8.00 - 10.00	2.00 - 3.00	1.00 - 1.25
10.00 - 12.00	3.00 - 4.00	1.25 - 1.50
12.00 - 14.00	4.00 - 6.00	1.50 - 1.75
14.00 - 19.81	6.00 - 8.03	1.75 - 2.40



NOTES:

1. PROJECTION: UTM WGS 84 - ZONE 17N.
2. TOPOGRAPHY: LIDAR DATA INFORMATION PROVIDED BY THE CLIENT.
3. SATELLITE IMAGE: WORLD TOPOGRAPHIC MAP

LEGEND

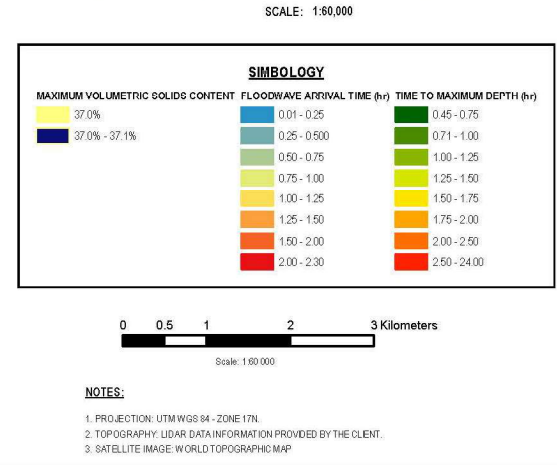
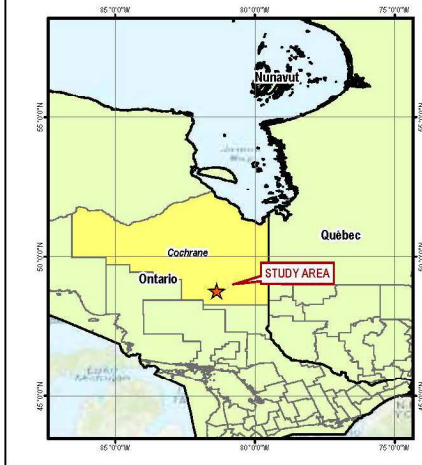
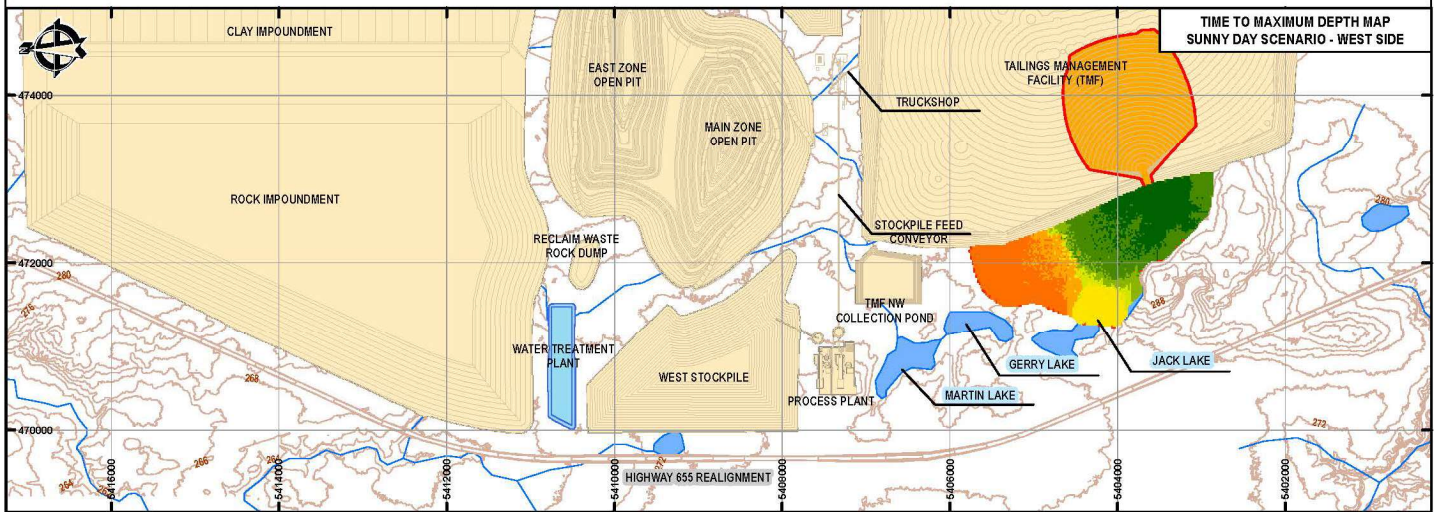
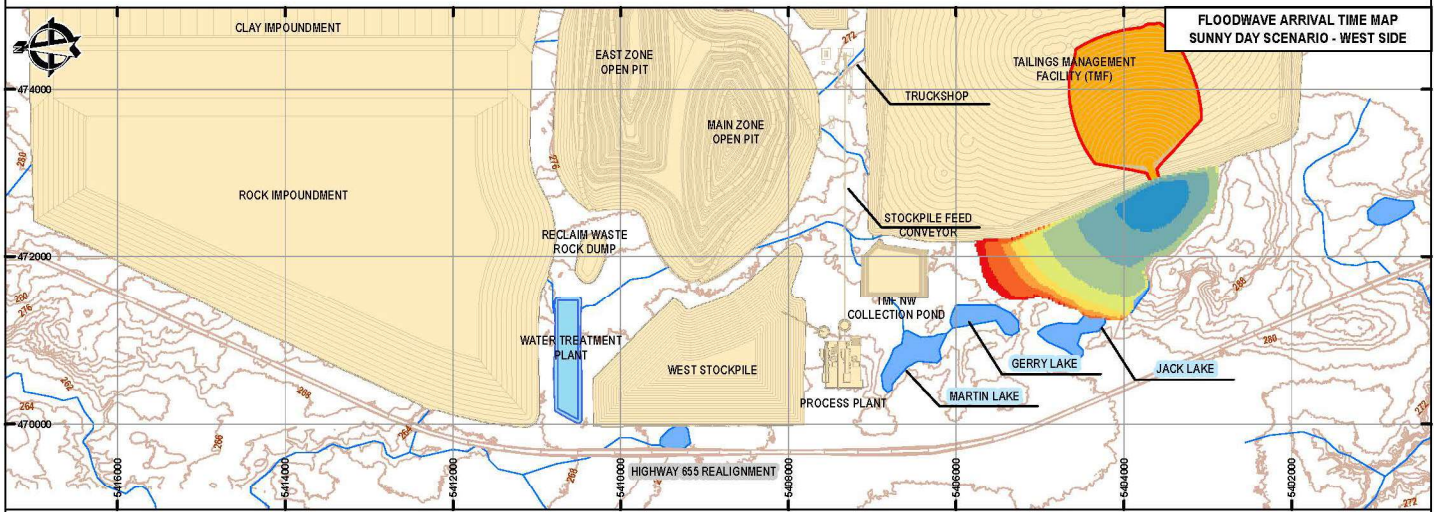
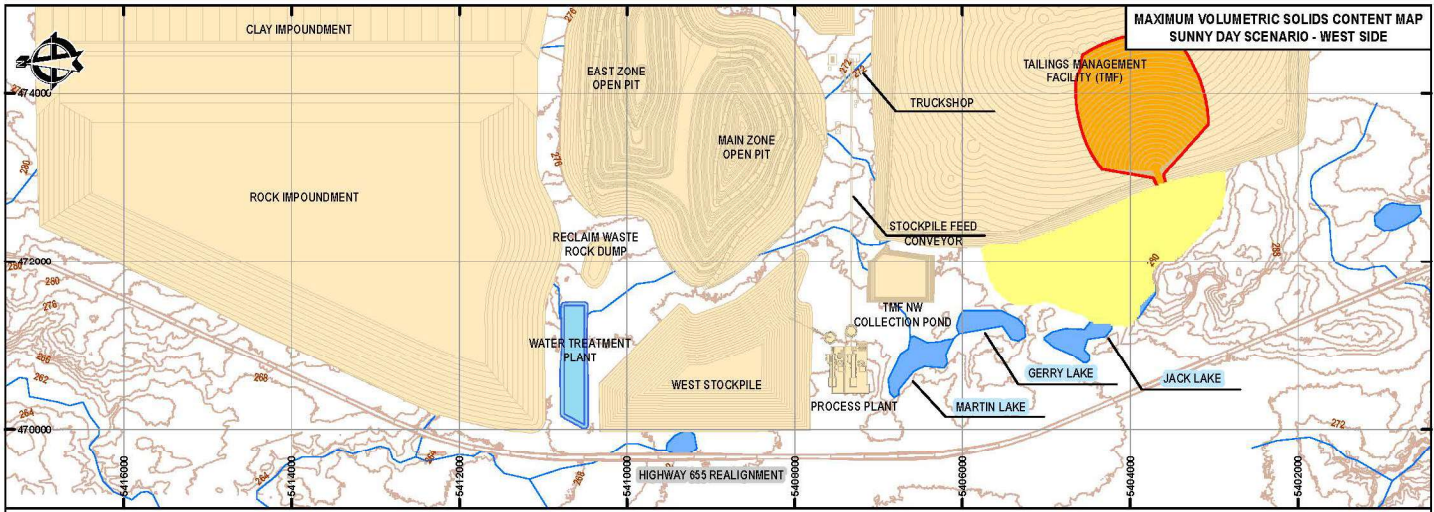
- DAM BREACH AREA WITH TMF IMPOUNDMENT
- COMPONENT FOOTPRINT
- PROJECT COMPONENTS
- RIVERS AND STREAMS
- WATER BODIES
- CONTOUR LINES (INTERVAL: 2m)

PROJECT: CRAWFORD NICKEL PROJECT - PERMITTING SUPPORT

TITLE: TAILINGS DAM BREACH ANALYSIS
SUNNY DAY SCENARIO - WEST SIDE

Ausenco	CANADIAN NICKEL	PROJECT NO: 1984505	REVISION: A
PROJECT CODE: UTM	ZONE: 17N	ISSUE DATE: MAY 15, 2024	DRAWN BY: L. PROON
DATE: 05/24	SCALE: REDUCED	CHECKED BY: M. EDWIN	MAP NO: A01-1
		APPROVED BY: D. STEWART	

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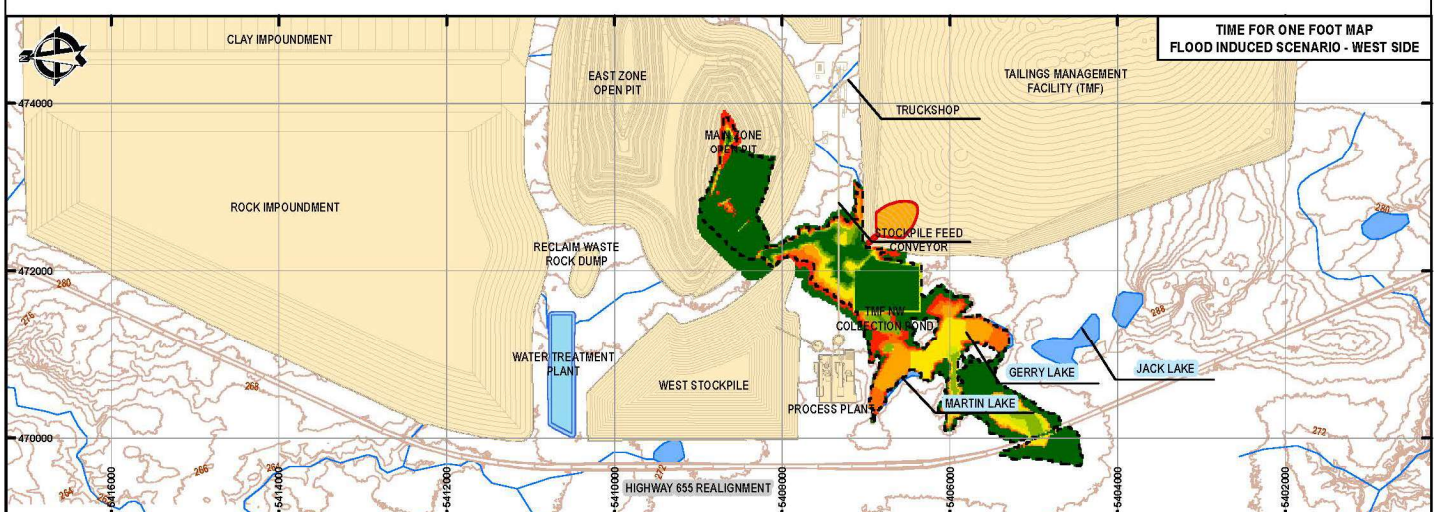
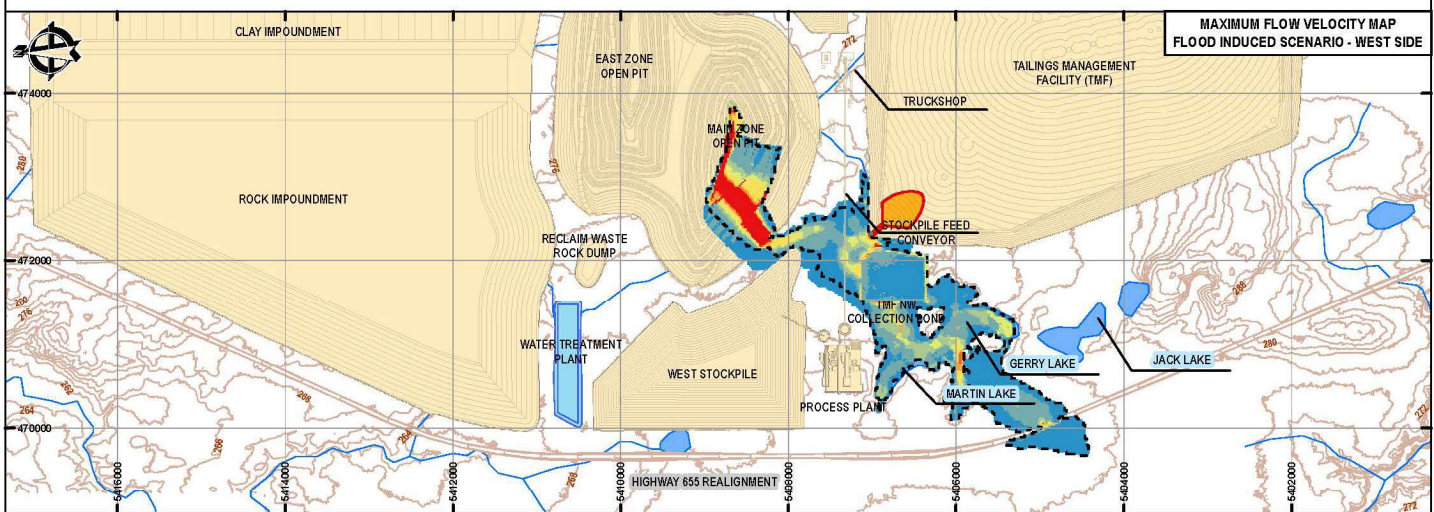
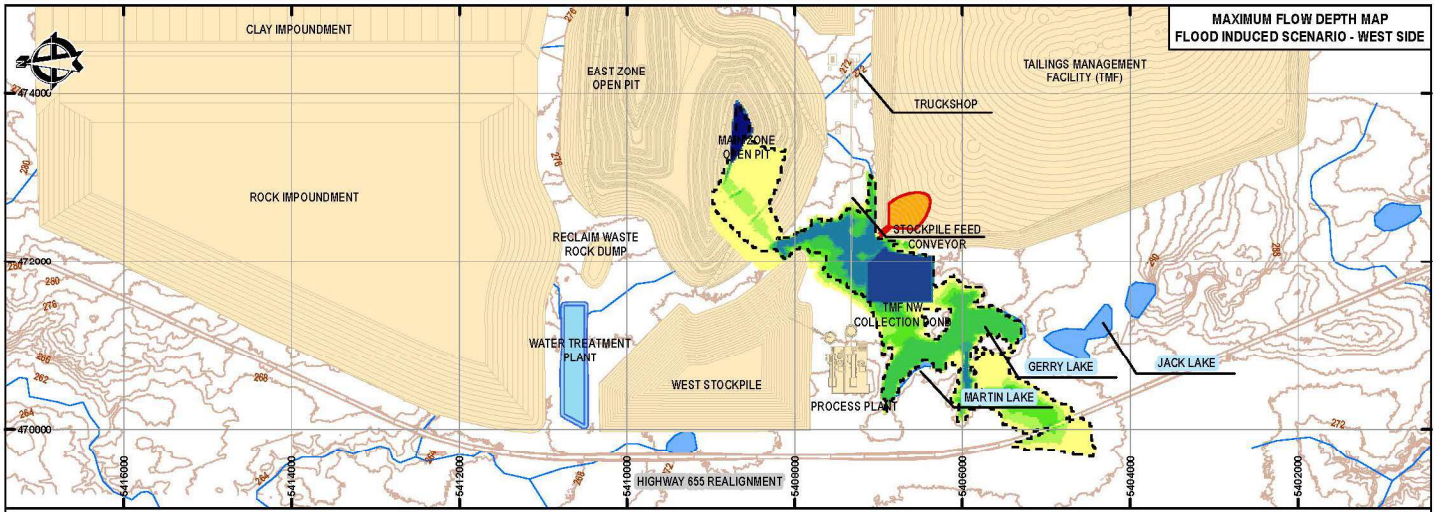
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- COMPONENT FOOTPRINT
- PROJECT COMPONENTS
- RIVERS AND STREAMS
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- CONTOUR LINES (INTERVAL: 2m)

PROJECT: CRAWFORD NICKEL PROJECT - PERMITTING SUPPORT
TITLE: TAILINGS DAM BREACH ANALYSIS
 SUNNY DAY SCENARIO - WEST SIDE

Ausenco	CANADIAN NICKEL	PROJECT ID: 10484505	REVISION: A
PROJECT CODE: UTM	DATE: 17N	ISSUE DATE: MAY 23, 2024	DRAWN BY: L. PROON
SCALE: 1:60,000	APPROVED BY: S. STELLING		

A01-2

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SCALE: 1:60,000

SYMBOLGY		
MAXIMUM FLOW DEPTHS (m)	MAXIMUM VELOCITIES (m/s)	TIME FOR ONE FOOT (h)
0.00 - 0.20	0.00 - 0.10	0.00 - 10.00
0.20 - 0.40	0.10 - 0.20	10.00 - 12.00
0.40 - 0.60	0.20 - 0.30	12.00 - 13.50
0.60 - 0.80	0.30 - 0.40	13.50 - 14.00
0.80 - 1.00	0.40 - 0.60	14.00 - 15.00
1.00 - 2.00	0.60 - 0.80	15.00 - 15.50
2.00 - 10.00	0.80 - 1.00	15.50 - 16.50
10.00 - 70.72	1.00 - 11.15	16.50 - 47.32



- NOTES:**
1. PROJECTION: UTM WGS 84 - ZONE 17N.
 2. TOPOGRAPHY: LIDAR DATA INFORMATION PROVIDED BY THE CLIENT.
 3. SATELLITE IMAGE: WORLD TOPOGRAPHIC MAP

LEGEND

- IDF FOOTPRINT
- DAM BREACH AREA WITHIN TMF IMPOUNDMENT
- COMPONENT FOOTPRINT
- PROJECT COMPONENTS
- RIVERS AND STREAMS
- WATER BODIES
- CONTOUR LINES (INTERVAL: 2m)

PROJECT: CRAWFORD NICKEL PROJECT - PERMITTING SUPPORT

TITLE: TAILINGS DAM BREACH ANALYSIS
FLOOD INDUCED SCENARIO - WEST SIDE

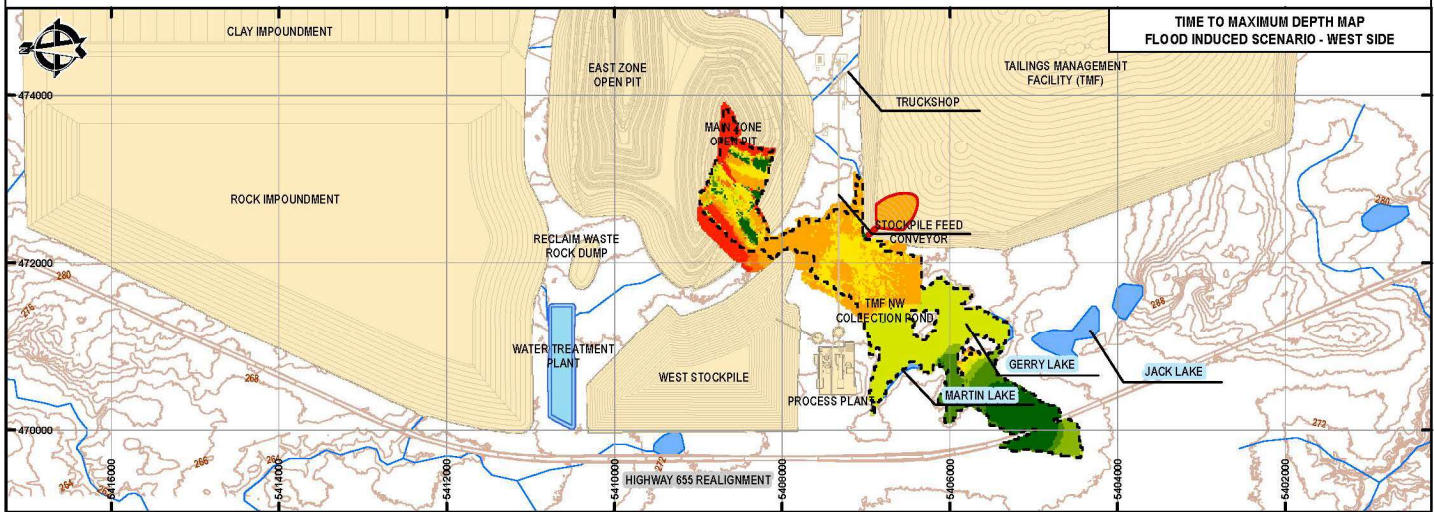
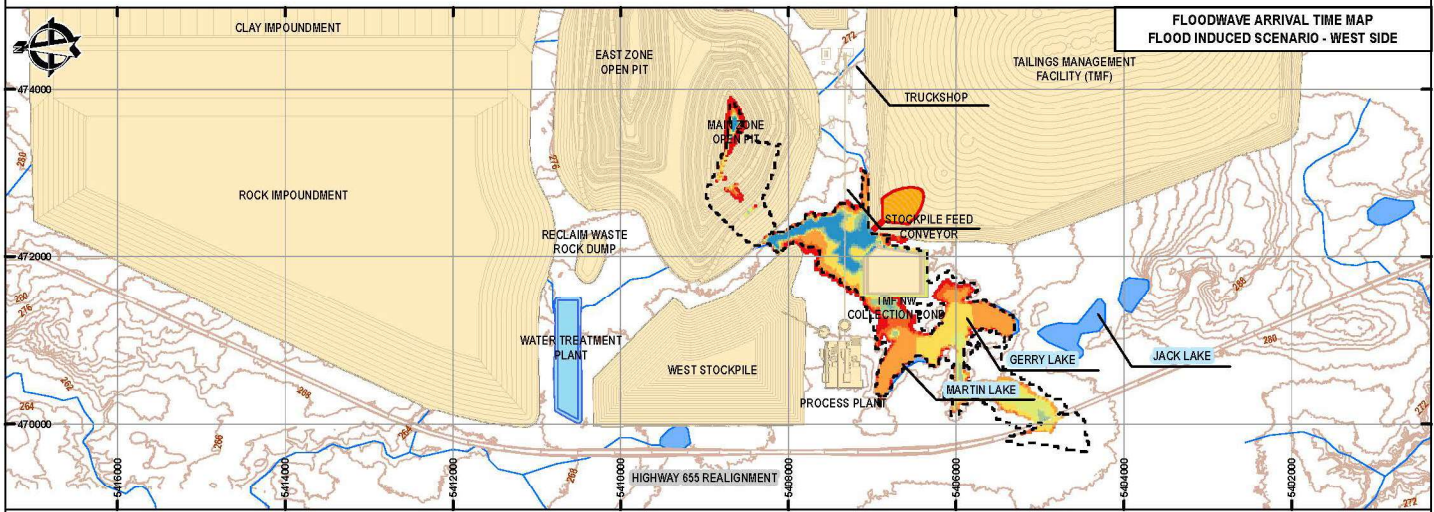
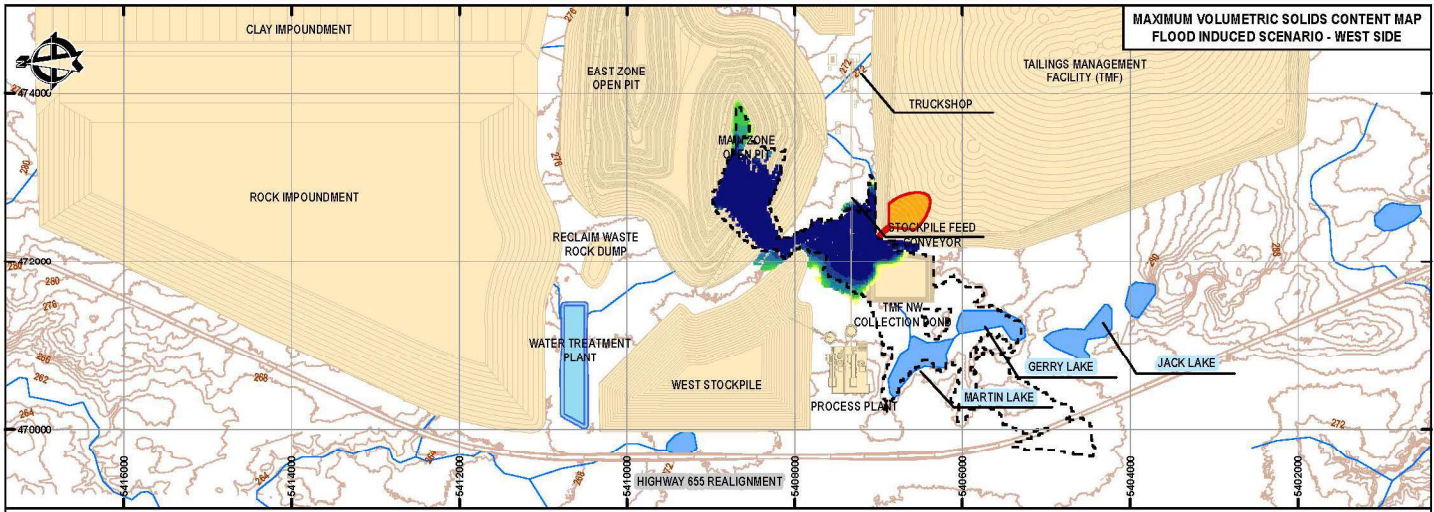
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PROJECT ID: 10484505
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 DRAWN BY: L. PROON
 CHECKED BY: S. HEDIN
 APPROVED BY: S. STELLING

PROJECT CODE: UTM
 SHEET: 1/11
 SCALE: REDUCED

REVISION: A
 MAP ID: A02-1

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SCALE: 1:60,000

SYMBOLOLOGY		
MAXIMUM VOLUMETRIC SOLIDS CONTENT	FLOODWAVE ARRIVAL TIME (hr)	TIME TO MAXIMUM DEPTH (hr)
0.1% - 1.0%	2.82 - 11.00	12.17 - 17.00
1.0% - 1.2%	11.00 - 12.00	17.00 - 18.00
1.2% - 1.4%	12.00 - 13.00	18.00 - 19.00
1.4% - 1.6%	13.00 - 14.00	19.00 - 20.00
1.6% - 1.8%	14.00 - 15.00	20.00 - 21.00
1.8% - 2.0%	15.00 - 16.00	21.00 - 22.00
2.0% - 2.2%	16.00 - 17.00	22.00 - 23.00
2.2% - 2.3%	17.00 - 47.32	23.00 - 48.00

0 0.5 1 2 3 Kilometers
Scale: 1:60,000

NOTES:

1. PROJECTION: UTM WGS 84 - ZONE 17N.
2. TOPOGRAPHY: LIDAR DATA INFORMATION PROVIDED BY THE CLIENT.
3. SATELLITE IMAGE: WORLD TOPOGRAPHIC MAP

LEGEND

- IDF FOOTPRINT
- DAM BREACH AREA WITHIN TMF IMPOUNDMENT
- COMPONENT FOOTPRINT
- PROJECT COMPONENTS
- RIVERS AND STREAMS
- WATER BODIES
- CONTOUR LINES (INTERVAL: 2m)

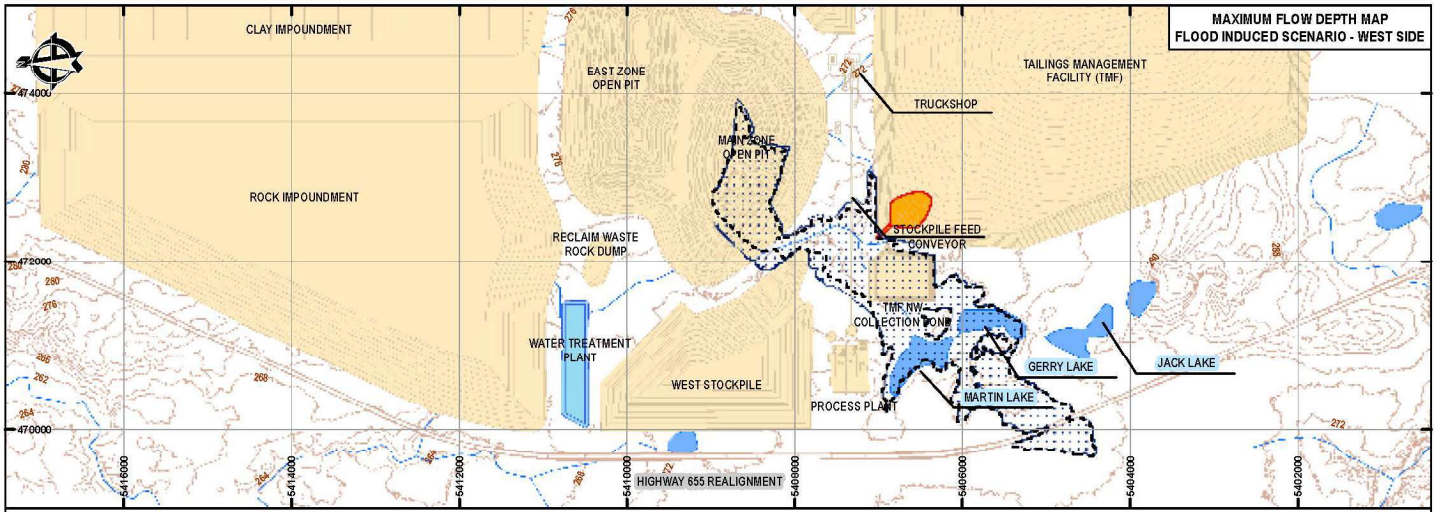
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Ausenco CANADIAN NICKEL

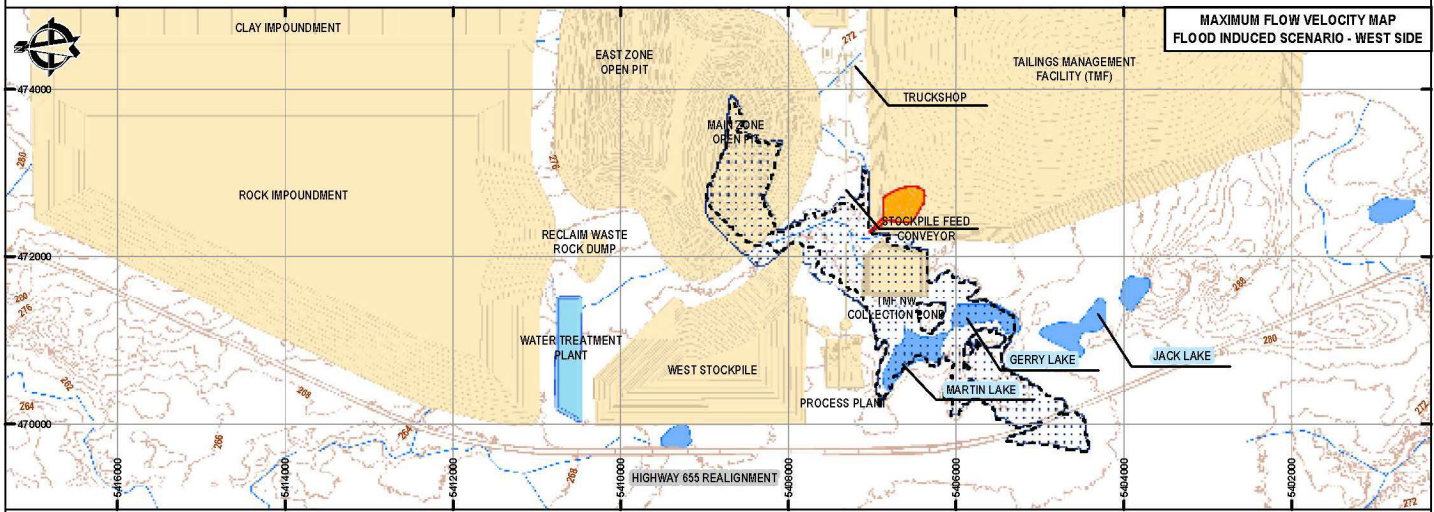
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A02-2

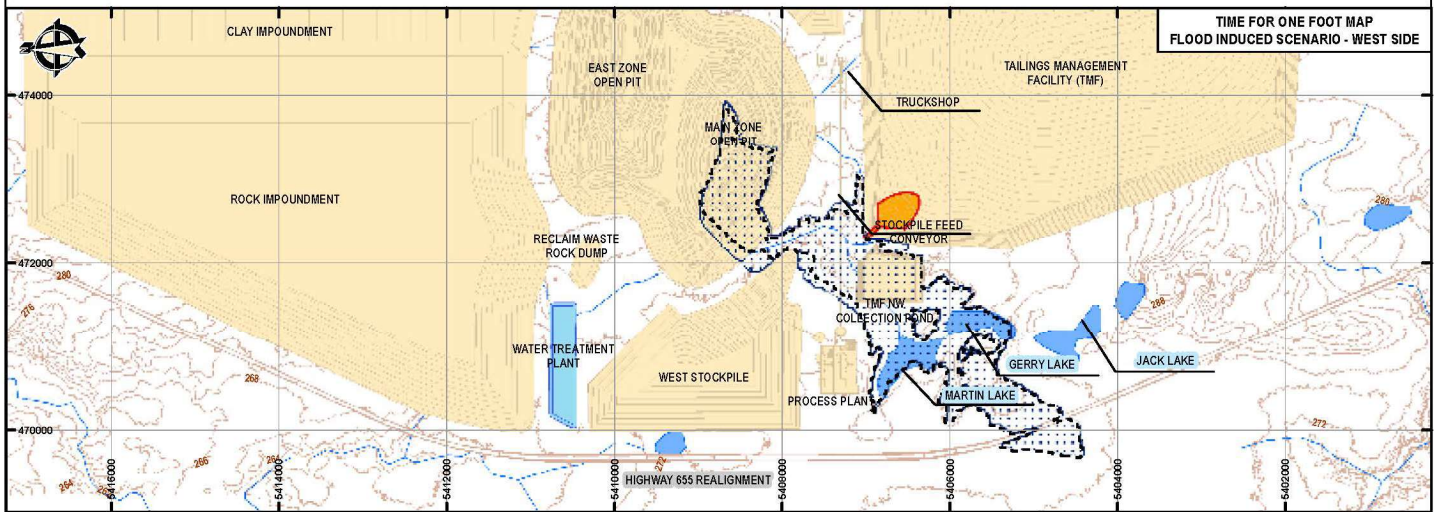
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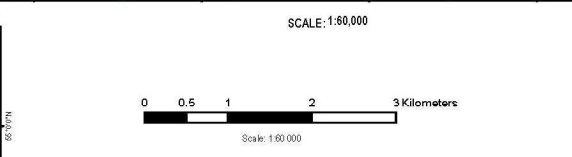
MAXIMUM FLOW DEPTH MAP
FLOOD INDUCED SCENARIO - WEST SIDE



MAXIMUM FLOW VELOCITY MAP
FLOOD INDUCED SCENARIO - WEST SIDE



TIME FOR ONE FOOT MAP
FLOOD INDUCED SCENARIO - WEST SIDE



- NOTES:**
1. PROJECTION: UTM WGS 84 - ZONE 17N.
 2. TOPOGRAPHY: LIDAR DATA INFORMATION PROVIDED BY THE CLIENT.
 3. SATELLITE IMAGE: WORLD TOPOGRAPHIC MAP.
 4. FOR THIS SCENARIO, THE ENTIRE DAM BREACH FLOOD FOOTPRINT HAS A MAXIMUM VOLUMETRIC SOLIDS CONTENT LESS THAN 20%. FOR THIS REASON, THE SYMBOLOLOGY OF MAXIMUM FLOW DEPTHS, MAXIMUM VELOCITIES, TIME FOR ONE FOOT, MAXIMUM VOLUMETRIC SOLIDS CONTENT, FLOODWAVE ARRIVAL TIME AND TIME TO MAXIMUM DEPTH ARE NOT PRESENTED.

LEGEND

- DAM BREACH AREA WITHIN TMF IMPOUNDMENT
- DAM BREACH FLOOD FOOTPRINT
- IDF FOOTPRINT
- COMPONENT FOOTPRINT
- PROJECT COMPONENTS
- RIVERS AND STREAMS
- WATER BODIES
- CONTOUR LINES (INTERVAL: 2m)

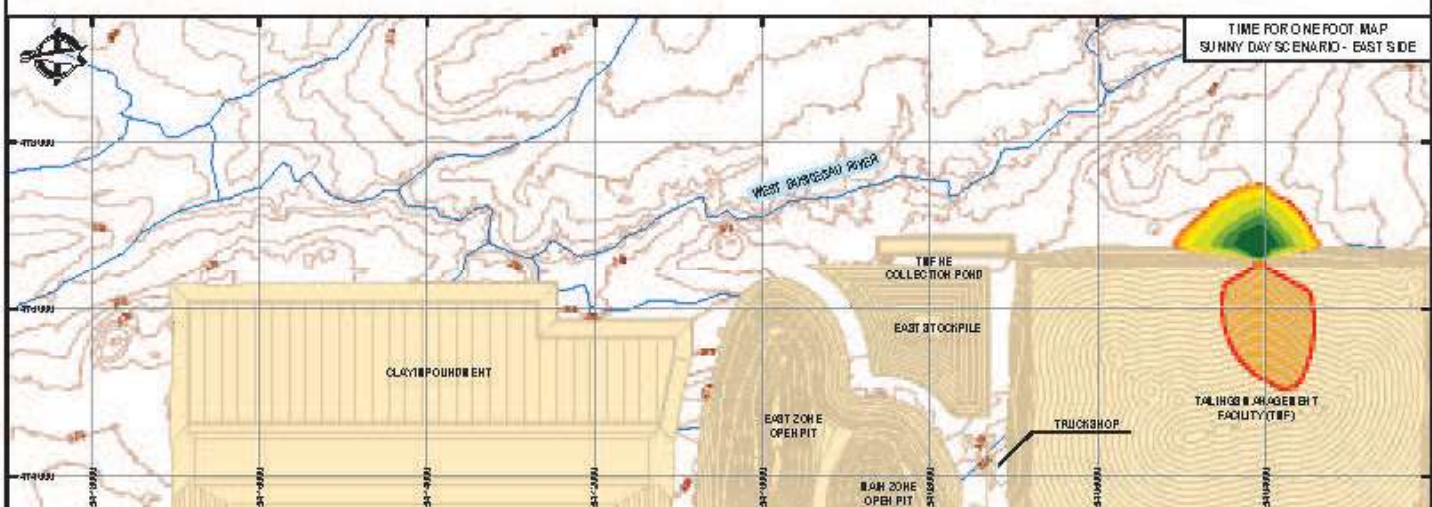
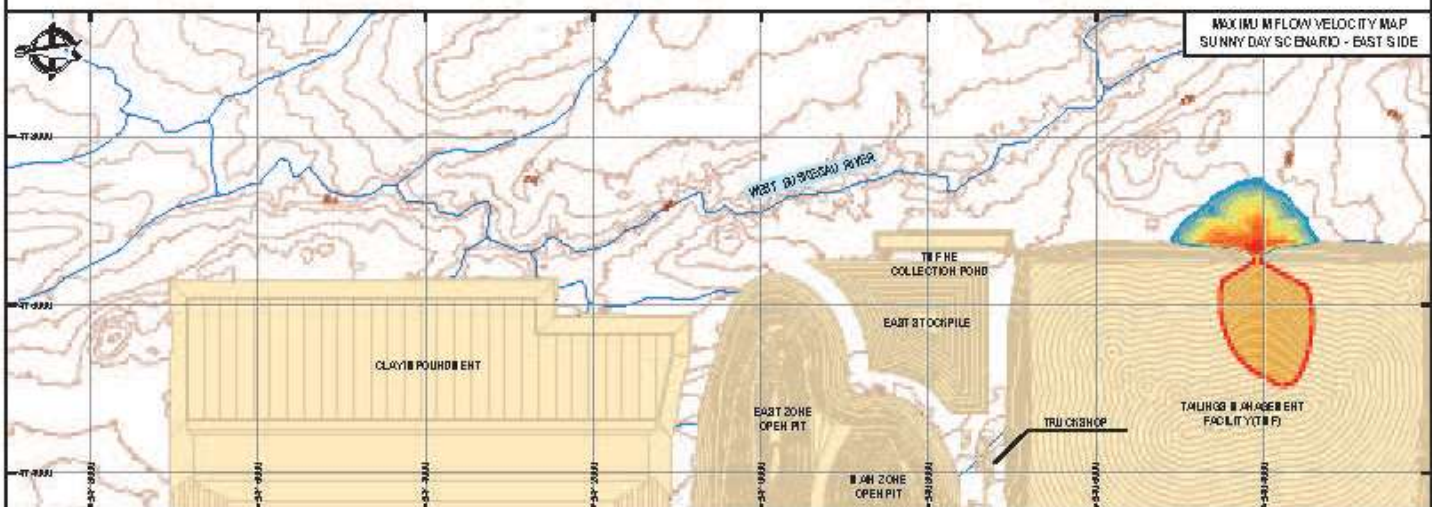
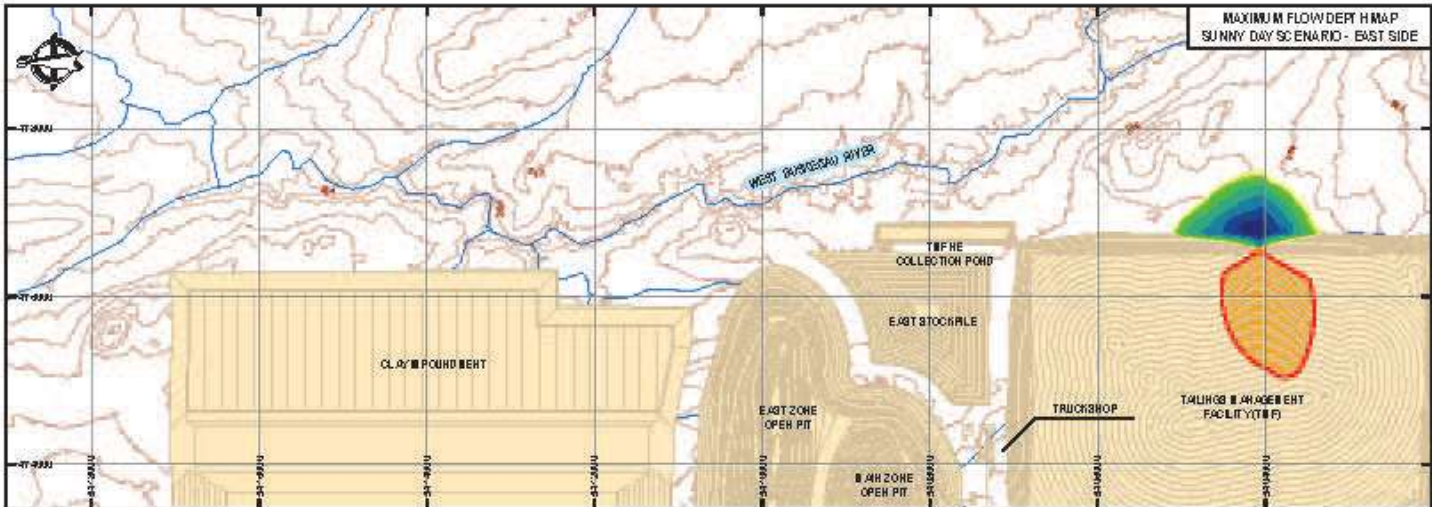
PROJECT: CRAWFORD NICKEL PROJECT - PERMITTING SUPPORT

TITLE: TAILINGS DAM BREACH ANALYSIS
FLOOD INDUCED SCENARIO - WEST SIDE

Ausenco	CANADIAN NICKEL	PROJECT ID: 10484505	REVISION: A
PROJECT CODE: UTM	DATE: 17N	ISSUE DATE: MAY 23, 2024	DRAWN BY: L. PROON
DATE: 03/24	SCALE: REDUCED	CHECKED BY: S. STELLING	APP'D BY: S. STELLING

A02-3

East Dam Breach



SCALE: 1:50,000

SIMBOLY

MAXIMUM FLOW DEPTH (m)	MAXIMUM VELOCITIES (m/s)	TIME FOR ONE FOOT (hr)
0.00 - 3.00	0.01 - 0.24	0.00 - 0.20
3.00 - 3.99	0.24 - 0.75	0.20 - 0.20
3.99 - 4.99	0.75 - 1.00	0.20 - 0.40
4.99 - 9.99	1.00 - 1.25	0.40 - 0.80
9.99 - 19.99	1.25 - 1.50	0.80 - 0.80
19.99 - 29.99	1.50 - 2.00	0.80 - 1.00
29.99 - 39.99	2.00 - 2.50	1.00 - 1.20
39.99 - 49.99	2.50 - 3.24	1.20 - 4.20



NOTES:

1. PROJECTION: UTM NCS 24 - ZONE 17N
2. TOPOGRAPHY: DEM DATA INFORMATION PROVIDED BY THE CLIENT
3. SATELLITE IMAGE: WORLD TOPOGRAPHIC MAP

LEGEND

- DAF BREACH AREA WITH IN FUNDAMENTAL
- COMPONENT FOOTPRINT
- PROJECT COMPONENTS
- RIVERS AND STREAMS
- WATER BODIES
- CONTOUR LINES (INTERVAL 3M)

CRAWFORD NICKEL PROJECT - PERMITTING SUPPORT

TAILING'S DAM BREACH ANALYSIS
SUNNY DAY SCENARIO - EAST SIDE

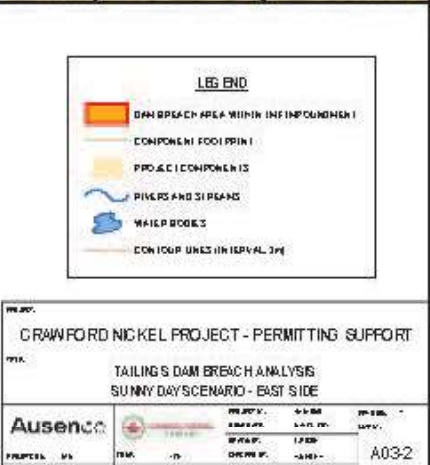
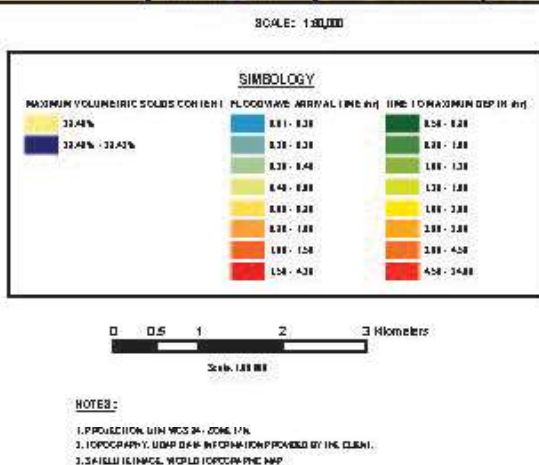
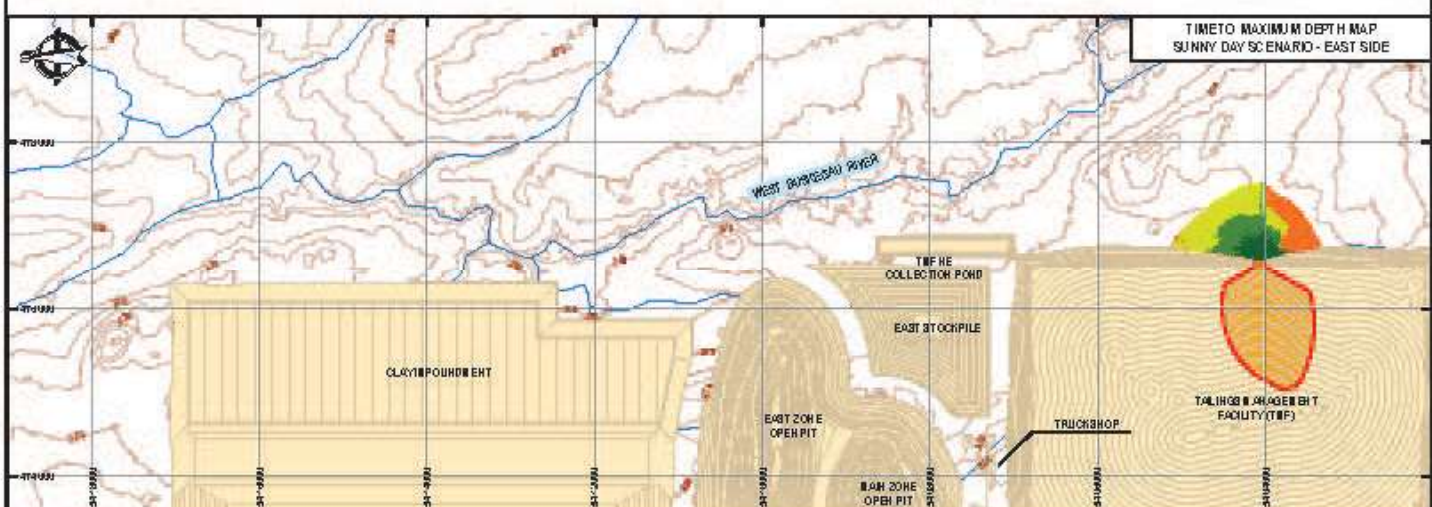
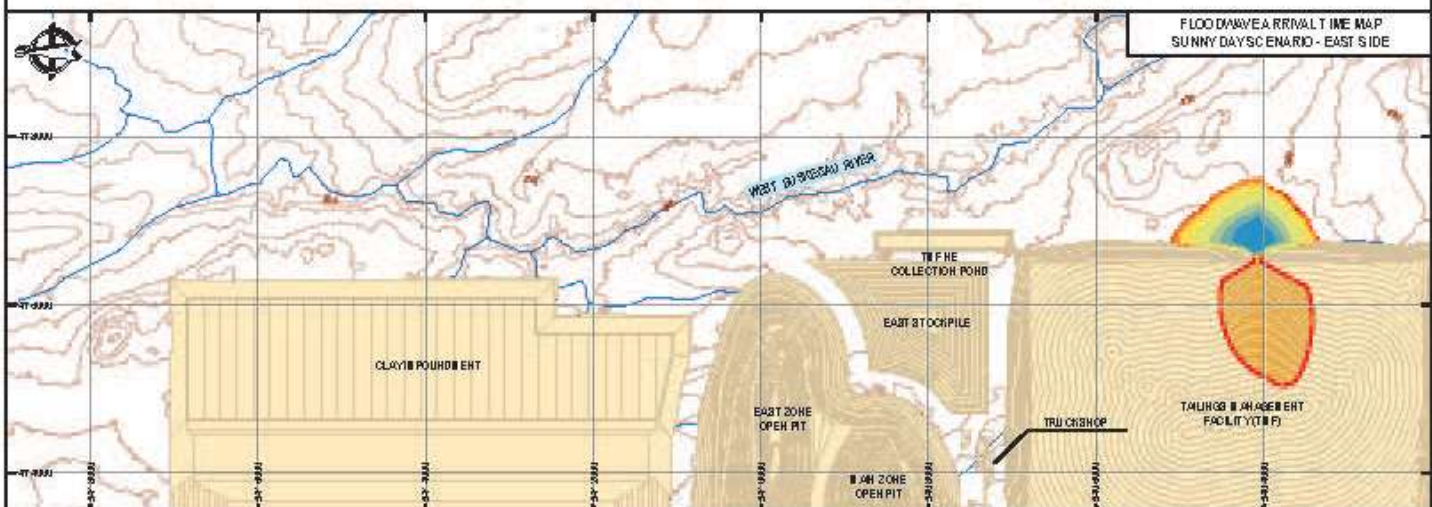
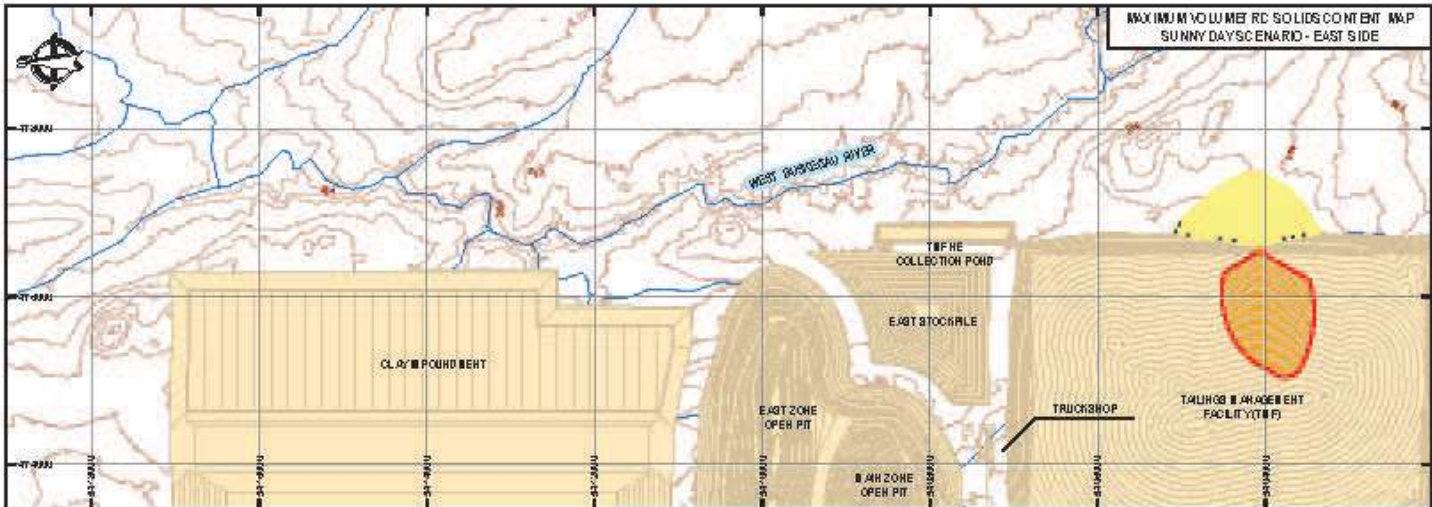
Ausenco

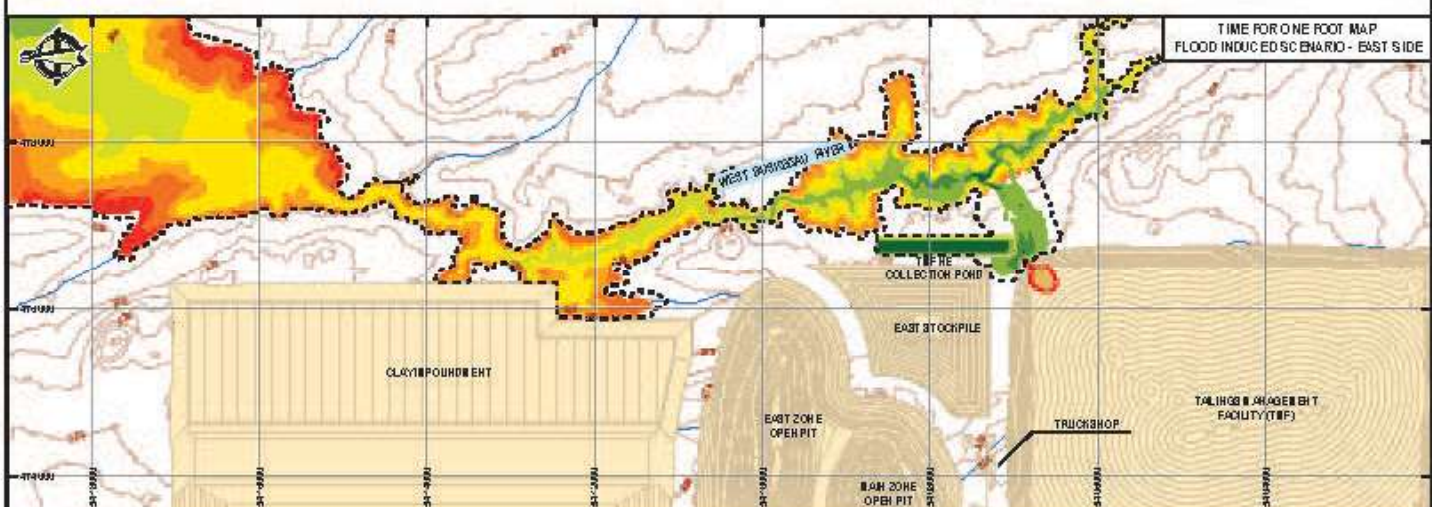
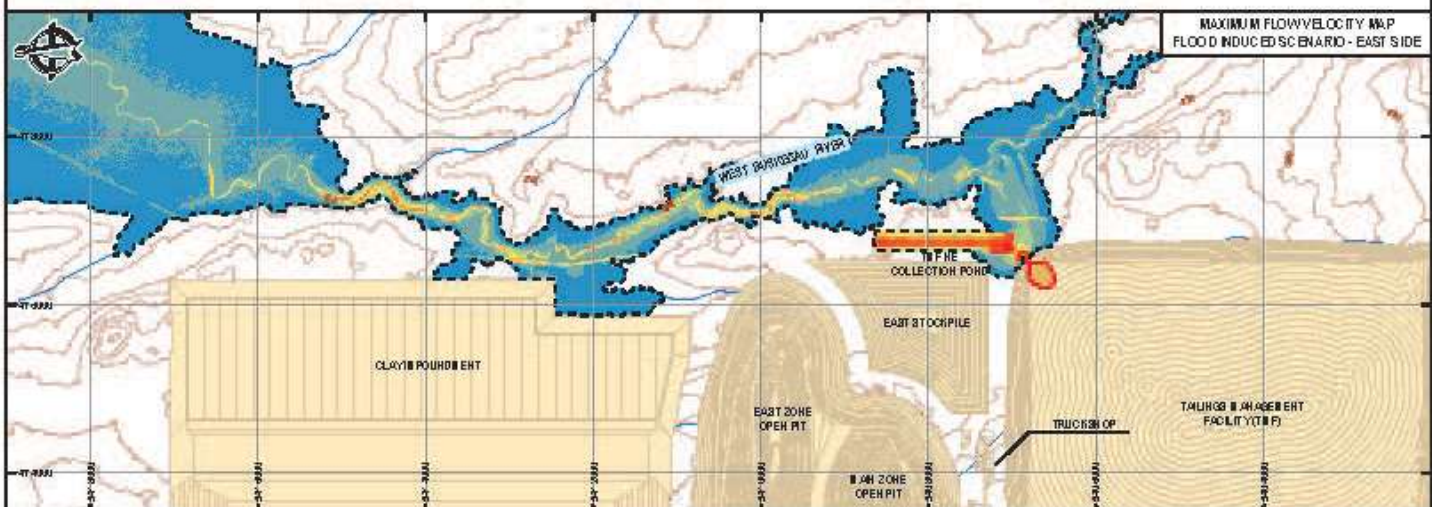
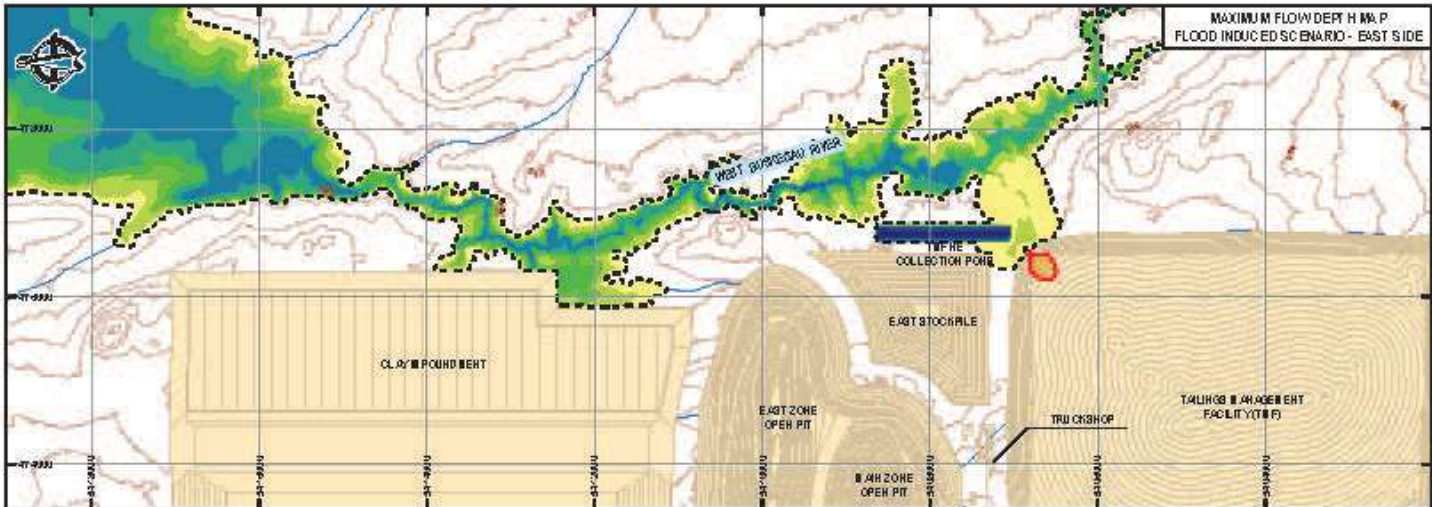
PROJECT: CRAWFORD NICKEL PROJECT
CLIENT: NICKEL
DATE: 2024
DRAWING NO.: A031

DATE: 2024
BY: [Name]
CHECKED: [Name]
APPROVED: [Name]

SCALE: 1:50,000

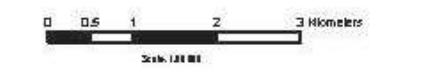
PROJECT: CRAWFORD NICKEL PROJECT
CLIENT: NICKEL
DATE: 2024
DRAWING NO.: A031





SCALE: 1:50,000

SIMBOLGY		
MAXIMUM FLOW DEPTHS (m)	MAXIMUM VELOCITIES (m/s)	TIME FOR ONE FOOT (m)
0.00 - 0.25	0.00 - 0.15	0.00 - 2.00
0.25 - 1.00	0.15 - 0.30	2.00 - 12.00
1.00 - 1.50	0.30 - 0.45	12.00 - 18.00
1.50 - 2.00	0.45 - 0.60	18.00 - 24.00
2.00 - 3.00	0.60 - 0.75	24.00 - 30.00
3.00 - 4.00	0.75 - 1.00	30.00 - 36.00
4.00 - 5.00	1.00 - 2.00	36.00 - 48.00
5.00 - 6.00	2.00 - 3.00	48.00 - 50.00



NOTES:

1. PROJECTION: UTM NCS 24 - ZONE 17N
2. TOPOGRAPHY: DEM DATA INFORMATION PROVIDED BY THE CLIENT
3. SATELLITE IMAGE: WORLD TOPOGRAPHIC MAP

LEGEND

- DRY FOOTPRINT
- DAM BREACH AREA WITHIN THE INFUNDAMENT
- COMPONENT FOOTPRINT
- PROJECT COMPONENTS
- PIPES AND SIPRANGS
- WATER BODIES
- CONTOUR LINES IN 5 METAL 3M

CRAWFORD NICKEL PROJECT - PERMITTING SUPPORT

**TAILINGS DAM BREACH ANALYSIS
FLOOD INDUCED SCENARIO - EAST SIDE**

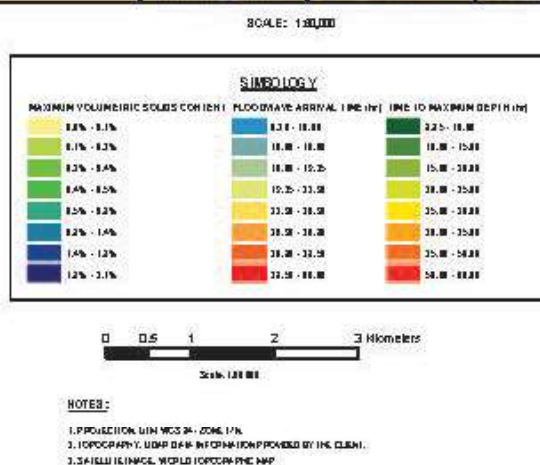
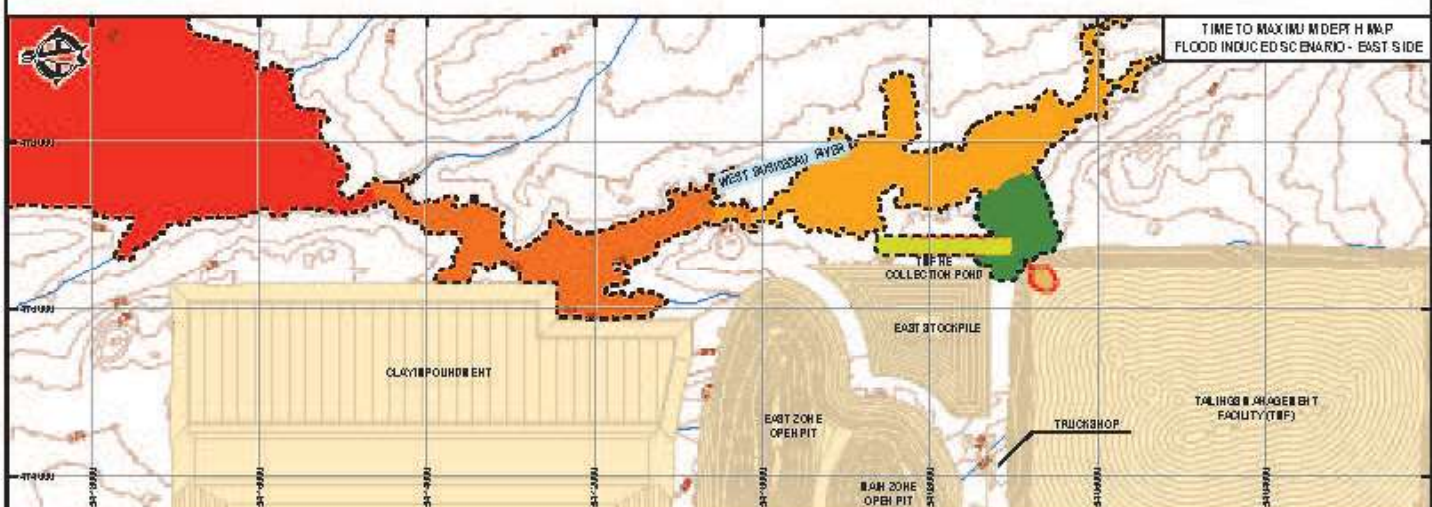
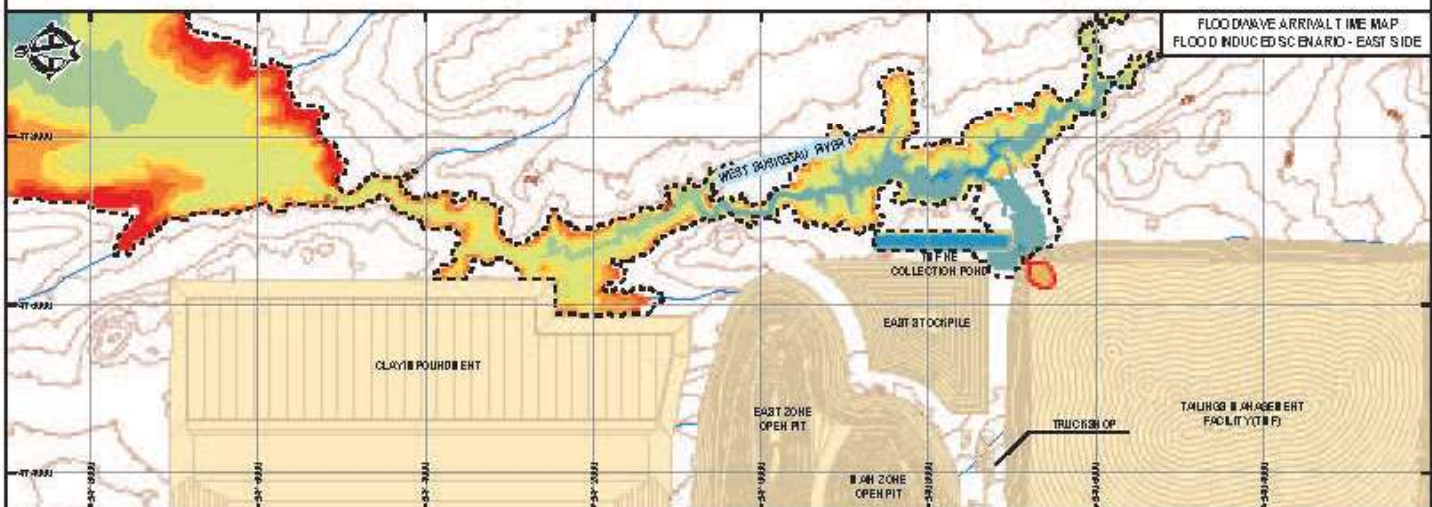
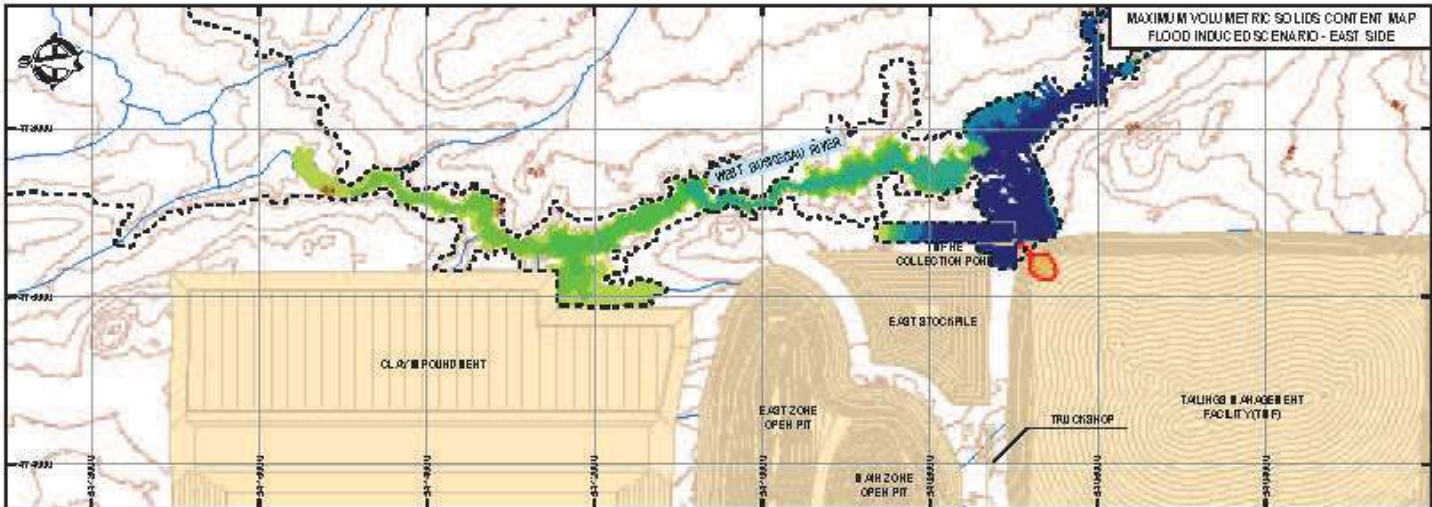
Ausenco

PROJECT: [] TEAM: [] CLIENT: [] DATE: []

SCALE: [] DRAWN BY: [] CHECKED BY: []

A04-1

ISSUED: []



LEGEND

- DAM BREACH AREA WITHIN THE INFUNDMENT
- COMPONENTS OF FLOOD POND
- PROJECT COMPONENTS
- PIPES AND SLEEVES
- WATER BODIES
- CONTOUR LINES IN 10M INTERVAL

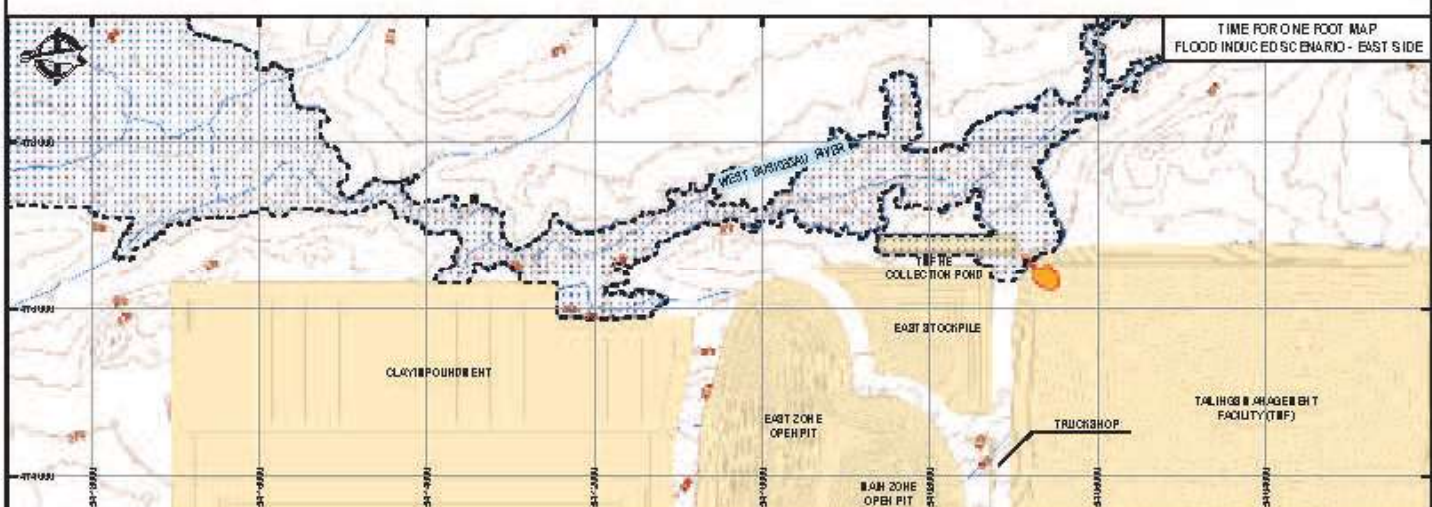
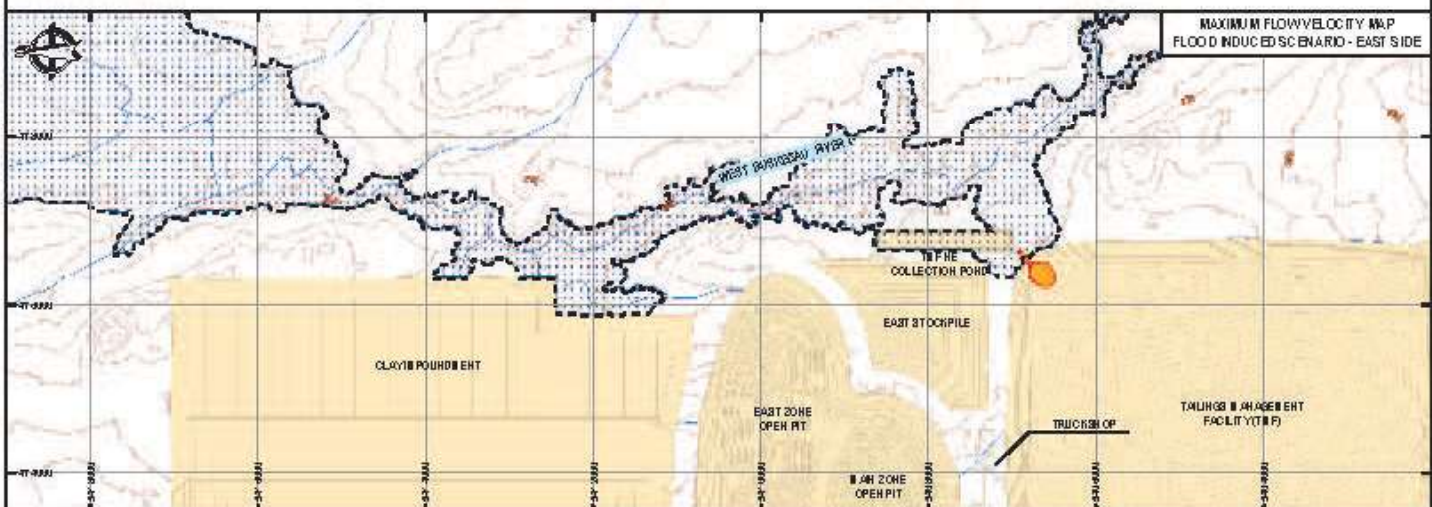
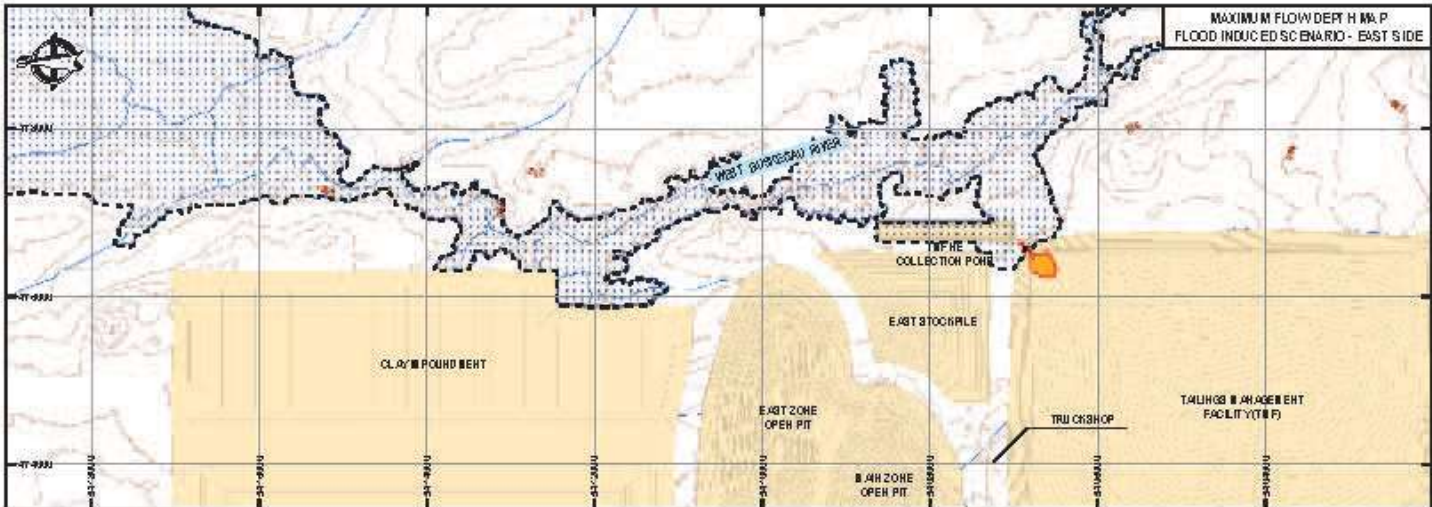
CRAWFORD NICKEL PROJECT - PERMITTING SUPPORT

TAILINGS DAM BREACH ANALYSIS
FLOOD INDUCED SCENARIO - EAST SIDE

Ausenco

PROJECT: CRAWFORD NICKEL PROJECT
DATE: 2018
SCALE: 1:50,000
DRAWN BY: [Name]
CHECKED BY: [Name]
APPROVED BY: [Name]

A04-2



NOTES:

1. PROJECTION: UTM NAD 83 - ZONE 17N
2. TOPOGRAPHY: LIDAR DATA INFORMATION PROVIDED BY THE CLIENT
3. SATELLITE IMAGE: WORLD TOPOGRAPHIC MAP
4. FOR THIS SCENARIO, THE ENTIRE DAM BREACH FLOOD FOOTPRINT HAS A MAXIMUM VOLUME (REGARDLESS OF WHETHER LESS THAN 10% FOR INFRASTRUCTURE, THE SIMULATED OF MAXIMUM FLOW DEPTHS, MAXIMUM VELOCITIES, TIME FOR ONE FOOT, MAXIMUM VOLUME, TIME TO SOLID CONCENTRATED, FLOODWAVE ARRIVAL TIME, AND TIME TO MAXIMUM DEPTH ARE NOT PRESENTED.

CRAWFORD NICKEL PROJECT - PERMITTING SUPPORT

**TAILINGS DAM BREACH ANALYSIS
FLOOD INDUCED SCENARIO - EAST SIDE**

Ausenco

PROJECT: CN
SCALE: 1:50,000
DATE: 2024-08-15

PROJECT: CN
SCALE: 1:50,000
DATE: 2024-08-15

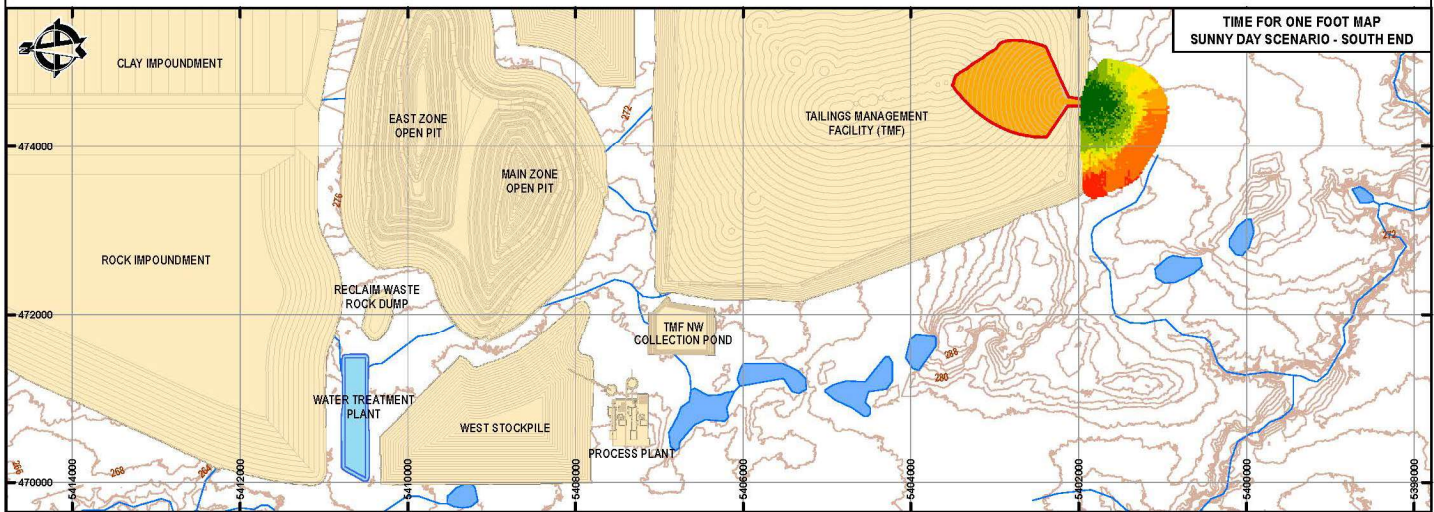
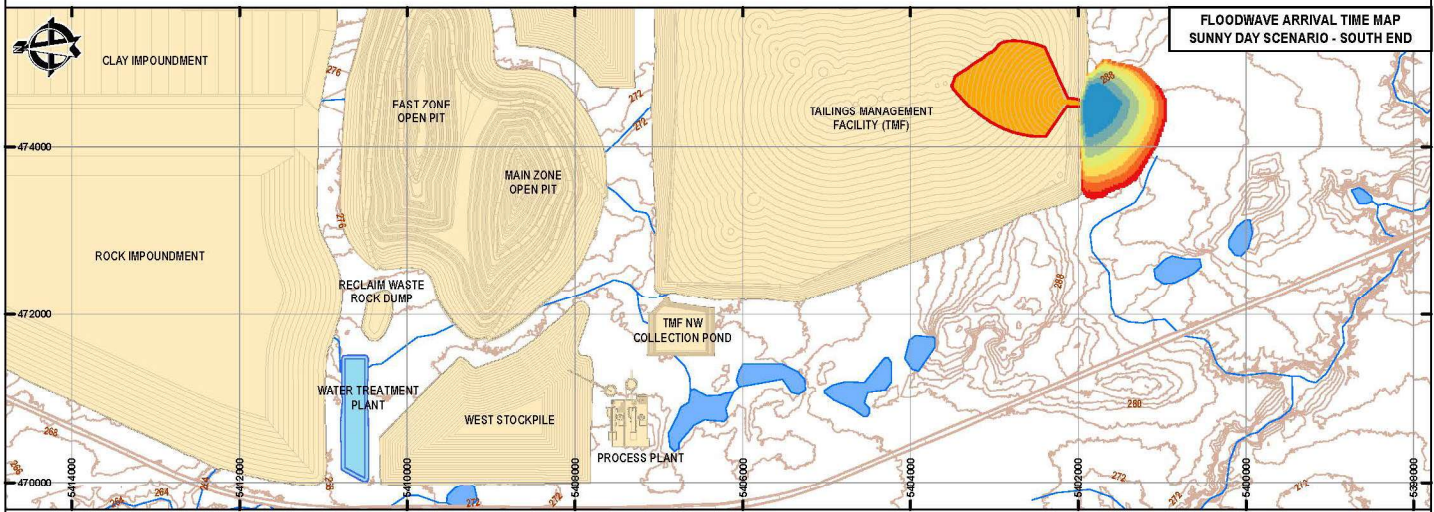
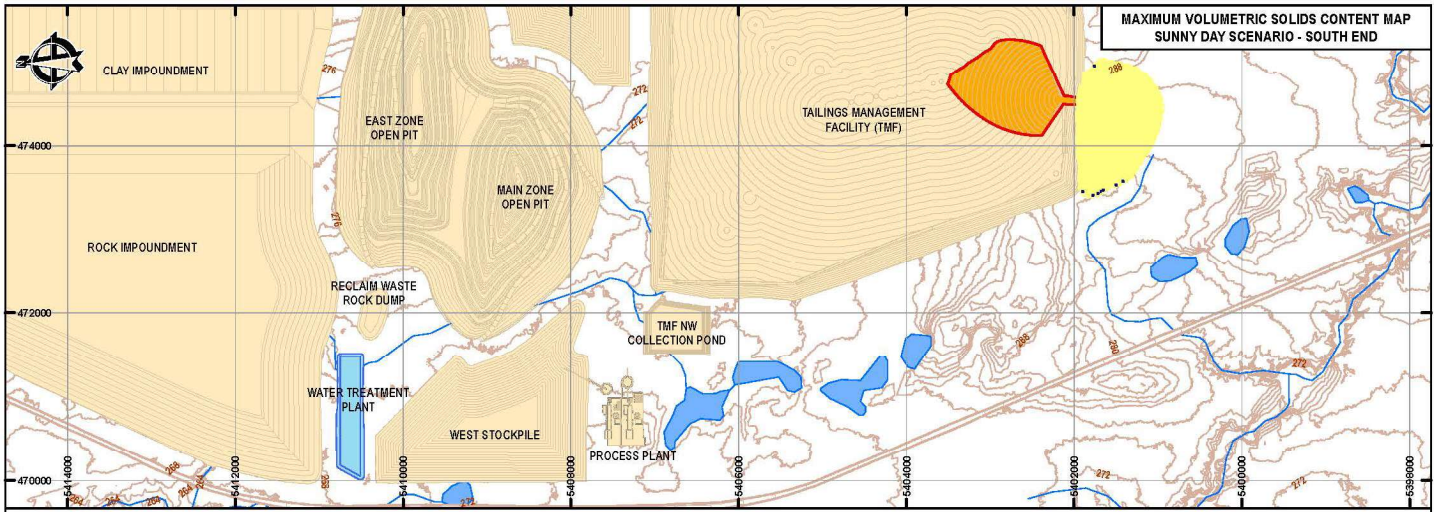
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SCALE: 1:50,000
DATE: 2024-08-15

PROJECT: CN
SCALE: 1:50,000
DATE: 2024-08-15

PROJECT: CN
SCALE: 1:50,000
DATE: 2024-08-15

A04-3

ISSUED: 2024-08-15



SCALE: 1:60,000

SYMBOLOLOGY

MAXIMUM VOLUMETRIC SOLIDS CONTENT	FLOODWAVE ARRIVAL TIME (hr)	TIME TO MAXIMUM DEPTH (hr)
38.00%	0.00 - 0.25	0.00 - 0.70
38.00% - 38.02%	0.25 - 0.35	0.70 - 0.75
	0.35 - 0.45	0.75 - 0.85
	0.45 - 0.55	0.85 - 0.90
	0.55 - 0.65	0.90 - 0.95
	0.65 - 0.75	0.95 - 1.00
	0.75 - 0.90	1.00 - 1.10
	0.90 - 13.30	1.10 - 24.00

LEGEND

- DAM BREACH AREA WITHIN TMF IMPOUNDMENT
- COMPONENT FOOTPRINT
- PROJECT COMPONENTS
- RIVERS AND STREAMS
- WATER BODIES
- CONTOUR LINES (INTERVAL: 2m)

Scale: 1:60,000

NOTES:

1. PROJECTION: UTM WGS 84 - ZONE 17N.
2. TOPOGRAPHY: LIDAR DATA INFORMATION PROVIDED BY THE CLIENT.
3. SATELLITE IMAGE: WORLD TOPOGRAPHIC MAP

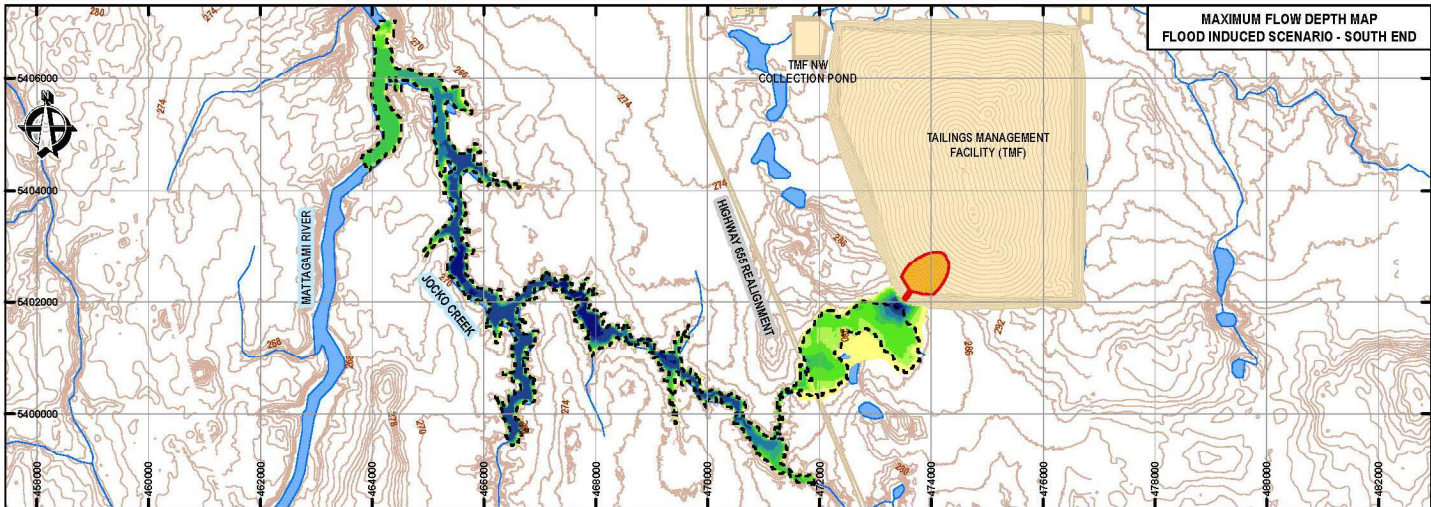
PROJECT:
CRAWFORD NICKEL PROJECT - PERMITTING SUPPORT

TITLE:
TAILINGS DAM BREACH ANALYSIS
SUNNY DAY SCENARIO - SOUTH END

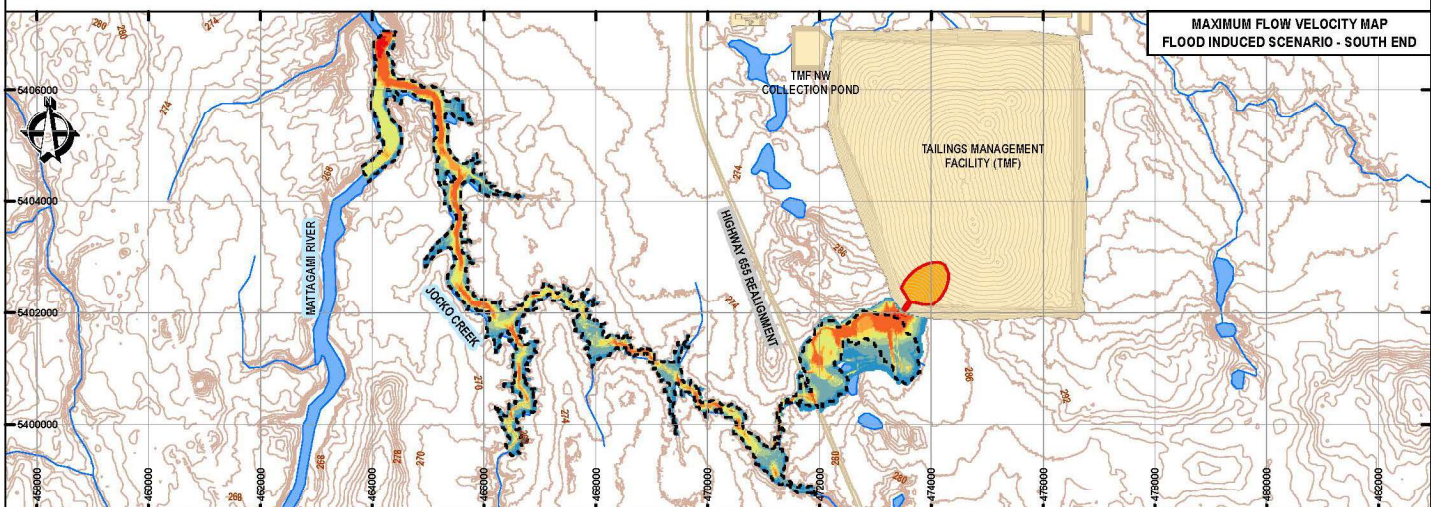
PROJECT ID: 10484505 **REVISION:** A
ISSUE DATE: MAY 23, 2024 **DRAWN BY:** L. PROON
PROJECT LEAD: UTM **CHECKED BY:** V. MEDINA
DATE: 05/24/24 **APPROVED BY:** G. STELLING

PROJECT CODE: UTM **SCALE:** PREFERRED **MAP ID:** A05-2

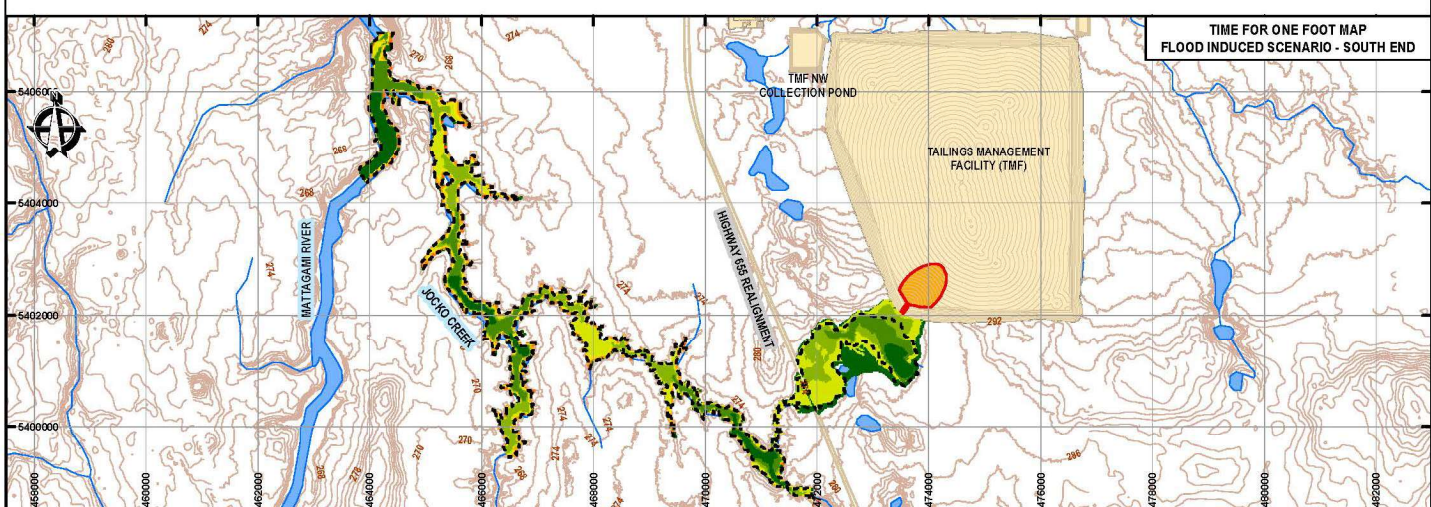
COPYRIGHT © Ausenco International



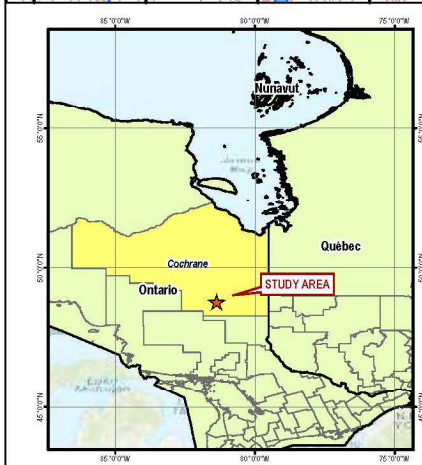
MAXIMUM FLOW DEPTH MAP
FLOOD INDUCED SCENARIO - SOUTH END



MAXIMUM FLOW VELOCITY MAP
FLOOD INDUCED SCENARIO - SOUTH END



TIME FOR ONE FOOT MAP
FLOOD INDUCED SCENARIO - SOUTH END



SCALE: 1:90,000

SYMBOLGY		
MAXIMUM FLOW DEPTHS (m)	MAXIMUM VELOCITIES (m/s)	TIME FOR ONE FOOT (h)
0.00 - 0.50	0.00 - 0.15	0.00 - 1.00
0.50 - 1.00	0.15 - 0.30	1.00 - 2.00
1.00 - 2.00	0.30 - 0.45	2.00 - 3.00
2.00 - 3.00	0.45 - 0.60	3.00 - 4.50
3.00 - 4.00	0.60 - 0.75	4.50 - 6.00
4.00 - 5.00	0.75 - 1.00	6.00 - 8.00
5.00 - 6.50	1.00 - 3.00	8.00 - 10.00
6.50 - 7.95	3.00 - 7.95	10.00 - 11.75



Scale: 1:90,000

NOTES:

1. PROJECTION: UTM WGS 84 - ZONE 17N.
2. TOPOGRAPHY: LIDAR DATA INFORMATION PROVIDED BY THE CLIENT.
3. SATELLITE IMAGE: WORLD TOPOGRAPHIC MAP

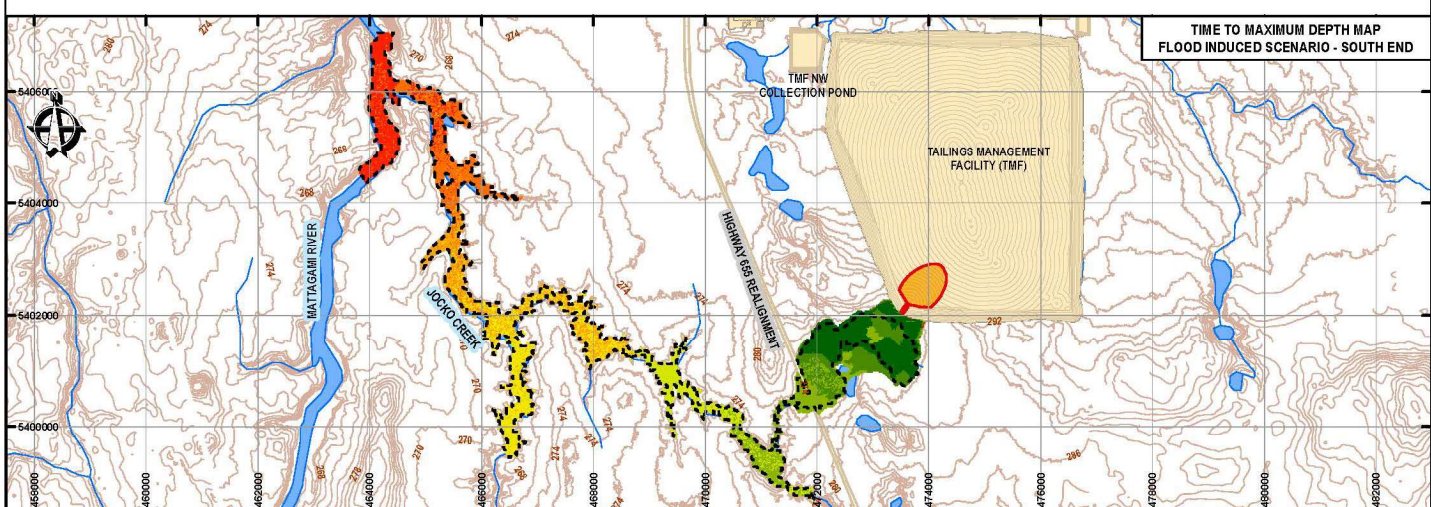
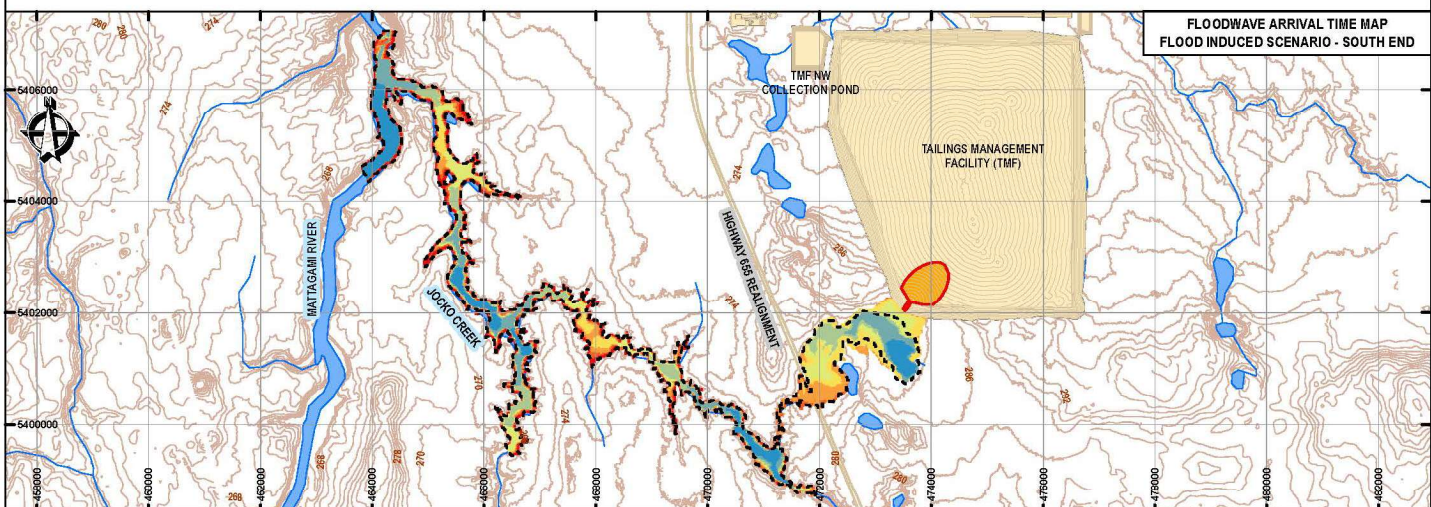
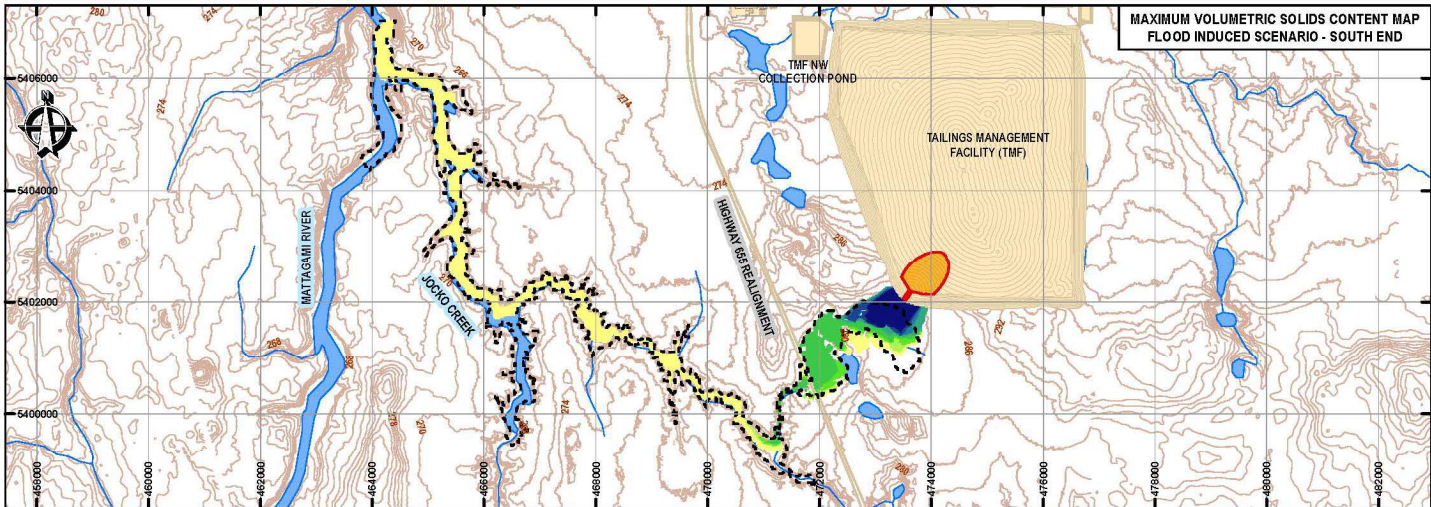
LEGEND	
	DAM BREACH AREA WITH TMF IMPOUNDMENT
	LDL FOOTPRINT
	COMPONENT FOOTPRINT
	PROJECT COMPONENTS
	RIVERS AND STREAMS
	WATER BODIES
	CONTOUR LINES (INTERVAL: 2m)

PROJECT: CRAWFORD NICKEL PROJECT - PERMITTING SUPPORT

TITLE: TAILINGS DAM BREACH ANALYSIS
FLOOD INDUCED SCENARIO - SOUTH END

Ausenco	CANADIAN NICKEL	PROJECT ID: 1084605	REVISION: A
PROJECT CODE: UTM	SCALE: 1:90,000	DATE: MAY 23, 2024	DRAWN BY: L. PROON
DATE: 05/24	SCALE: 1:90,000	CHECKED BY: S. STERLING	APP'D BY: S. STERLING

A06-1



SCALE: 1:90,000

SYMBOLGY		
MAXIMUM VOLUMETRIC SOLIDS CONTENT	FLOODWAVE ARRIVAL TIME (hr)	TIME TO MAXIMUM DEPTH (hr)
0.4% - 5.0%	0:00 - 1:10	2:00 - 3:40
5.0% - 7.5%	1:10 - 1:30	3:40 - 4:50
7.5% - 11.5%	1:30 - 2:45	4:50 - 8:30
11.5% - 19.0%	2:45 - 3:00	8:30 - 10:45
19.0% - 22.5%	3:00 - 3:30	10:45 - 10:70
22.5% - 26.5%	3:30 - 4:10	10:70 - 11:10
26.5% - 30.0%	4:10 - 5:00	11:10 - 11:70
30.0% - 40.0%	5:00 - 5:30	11:70 - 48:00

LEGEND

- DAM BREACH AREA WITHIN TMF IMPOUNDMENT
- IDF FOOTPRINT
- COMPONENT FOOTPRINT
- PROJECT COMPONENTS
- RIVERS AND STREAMS
- WATER BODIES
- CONTOUR LINES (INTERVAL: 2m)



- NOTES:
1. PROJECTION: UTM WGS 84 - ZONE 17N.
 2. TOPOGRAPHY: LIDAR DATA INFORMATION PROVIDED BY THE CLIENT.
 3. SATELLITE IMAGE: WORLD TOPOGRAPHIC MAP

PROJECT: CRAWFORD NICKEL PROJECT - PERMITTING SUPPORT

TITLE: TAILINGS DAM BREACH ANALYSIS FLOOD INDUCED SCENARIO - SOUTH END

PROJECT NO: 1084505	REVISION: A
DATE: MAY 23, 2024	MAP NO:
DRAWN BY: L. PROON	A06-2
CHECKED BY: S. STEWART	
PROJECT LEAD: WJH	SCALE: REDUCED
DATE: 1/17	APPROVED BY: S. STEWART

PROJECT: CRAWFORD NICKEL PROJECT - PERMITTING SUPPORT

TITLE: TAILINGS DAM BREACH ANALYSIS FLOOD INDUCED SCENARIO - SOUTH END

PROJECT NO: 1084505

DATE: MAY 23, 2024

DRAWN BY: L. PROON

CHECKED BY: S. STEWART

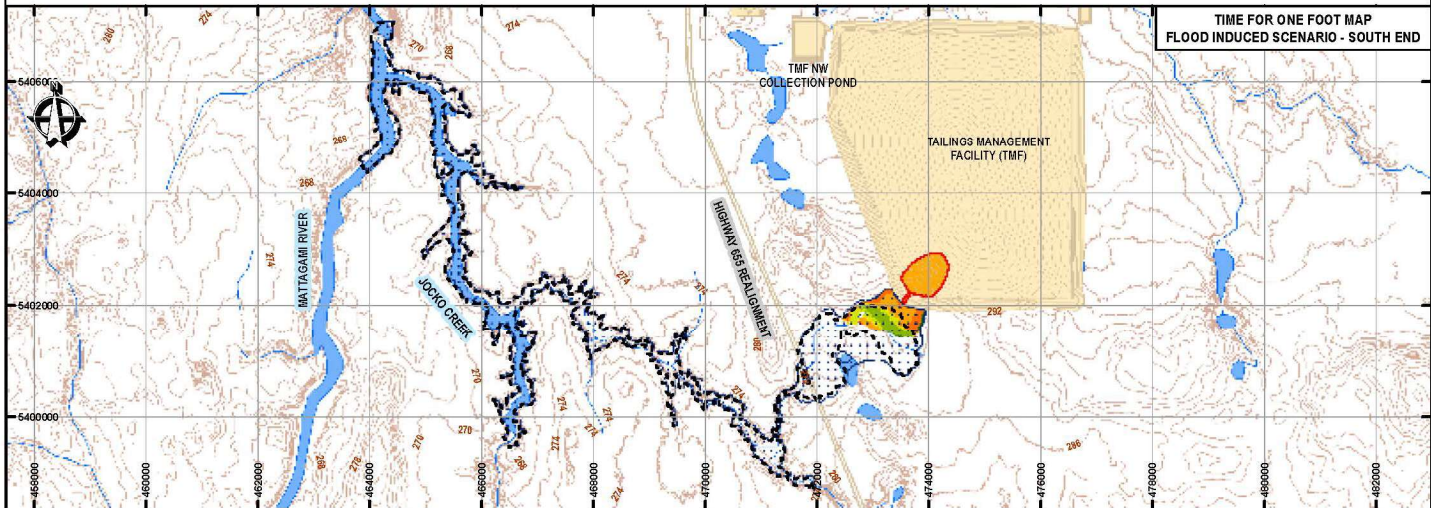
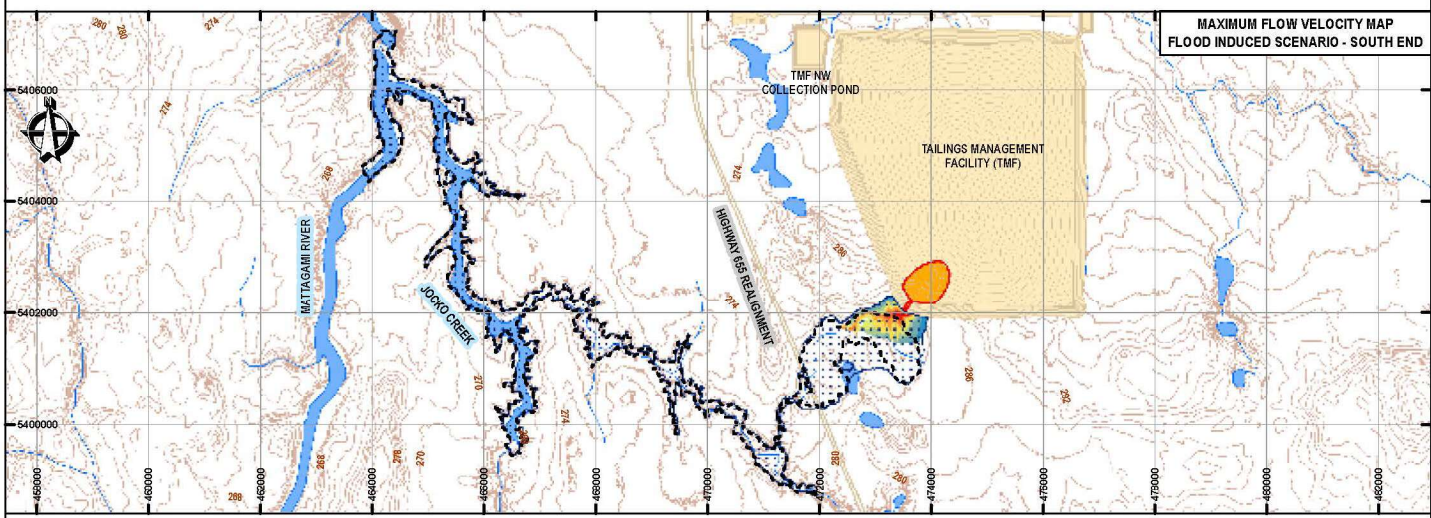
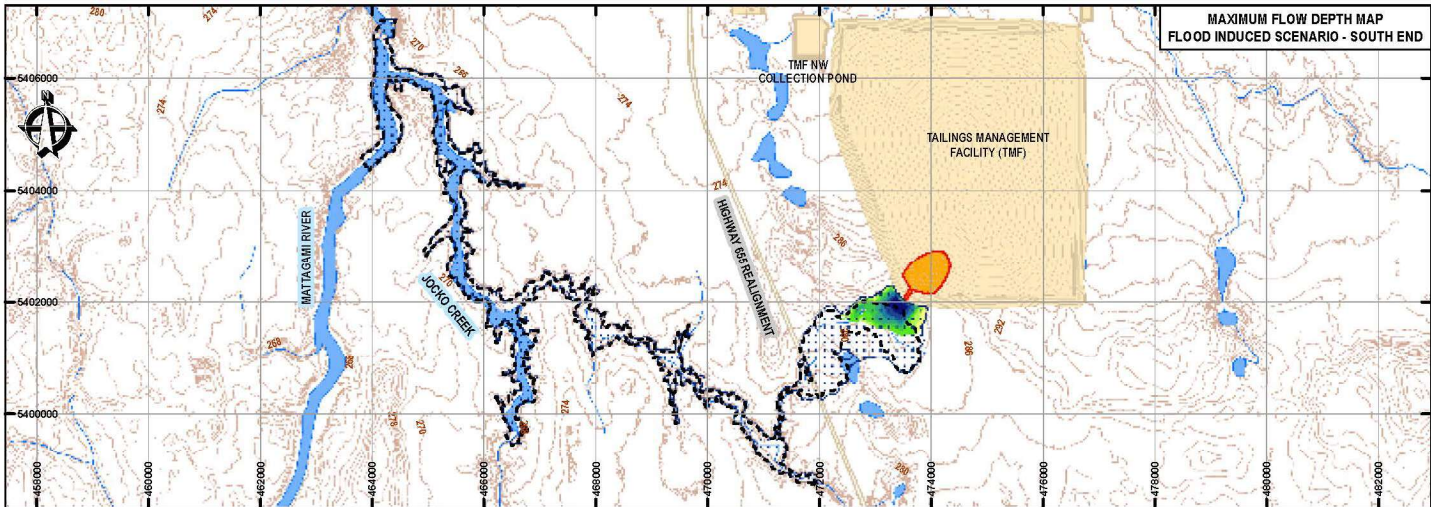
PROJECT LEAD: WJH

SCALE: REDUCED

DATE: 1/17

APPROVED BY: S. STEWART

MAP NO: A06-2



SCALE: 1:90,000

SYMBOLGY		
MAXIMUM FLOW DEPTHS (m)	MAXIMUM VELOCITIES (m/s)	TIME FOR ONE FOOT (hr)
0.01 - 0.50	0.00 - 0.25	0.00 - 0.50
0.50 - 1.00	0.25 - 0.50	0.50 - 1.00
1.00 - 1.50	0.50 - 0.75	1.00 - 1.50
1.50 - 2.00	0.75 - 1.00	1.50 - 2.00
2.00 - 3.00	1.00 - 1.50	2.00 - 2.50
3.00 - 4.00	1.50 - 2.00	2.50 - 3.00
4.00 - 5.00	2.00 - 2.50	3.00 - 3.50
5.00 - 7.95	2.50 - 3.88	3.50 - 5.00

0 0.75 1.5 3 4.5 Kilometers

Scale: 1:90,000

NOTES:

1. PROJECTION: UTM WGS 84 - ZONE 17N.
2. TOPOGRAPHY: LIDAR DATA INFORMATION PROVIDED BY THE CLIENT.
3. SATELLITE IMAGE: WORLD TOPOGRAPHIC MAP.
4. FOR THIS SCENARIO, THE SIMBOLOGY SHOWN CORRESPONDS TO THE DAM BREACH FLOOD FOOTPRINT WHOSE MAXIMUM VOLUMETRIC SOLIDS CONTENT IS GREATER OR EQUAL TO 20%.

LEGEND

- DAM BREACH AREA WITHIN TMF IMPOUNDMENT
- DAM BREACH FLOOD FOOTPRINT
- IDF FOOTPRINT
- COMPONENT FOOTPRINT
- PROJECT COMPONENTS
- RIVERS AND STREAMS
- WATER BODIES
- CONTOUR LINES (INTERVAL: 2m)

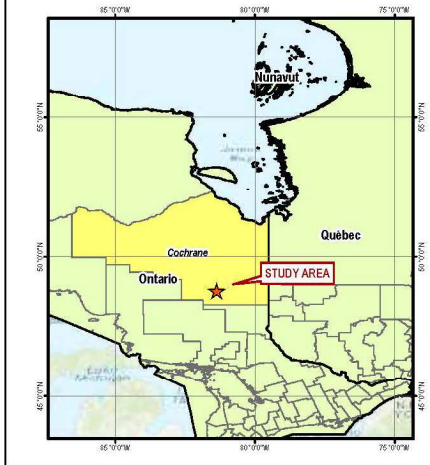
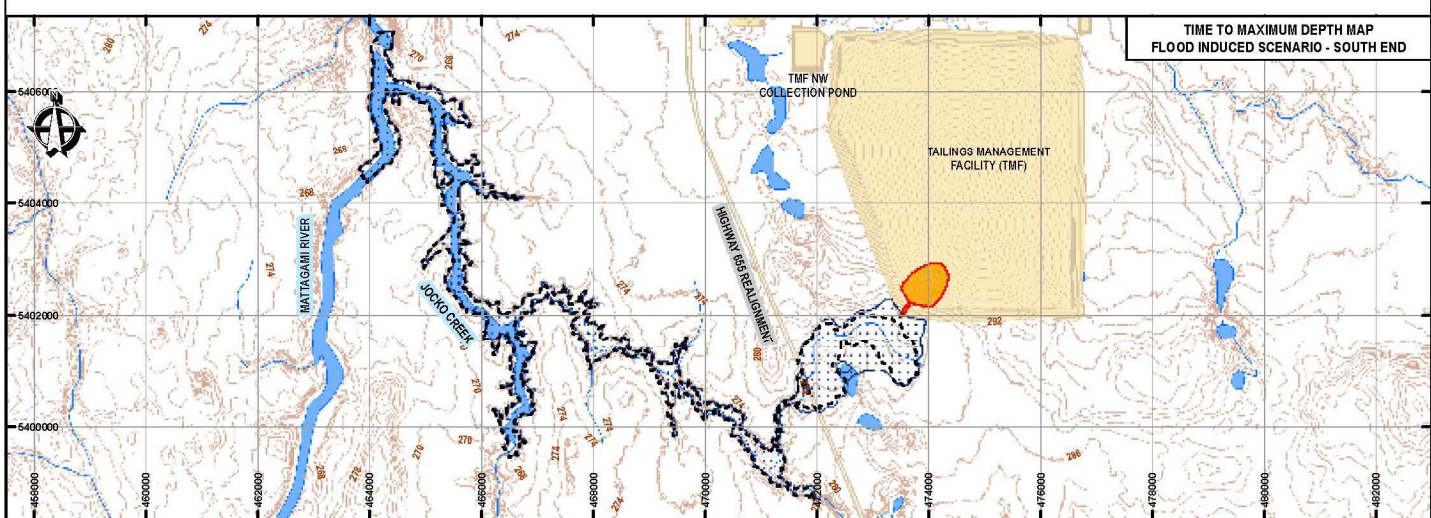
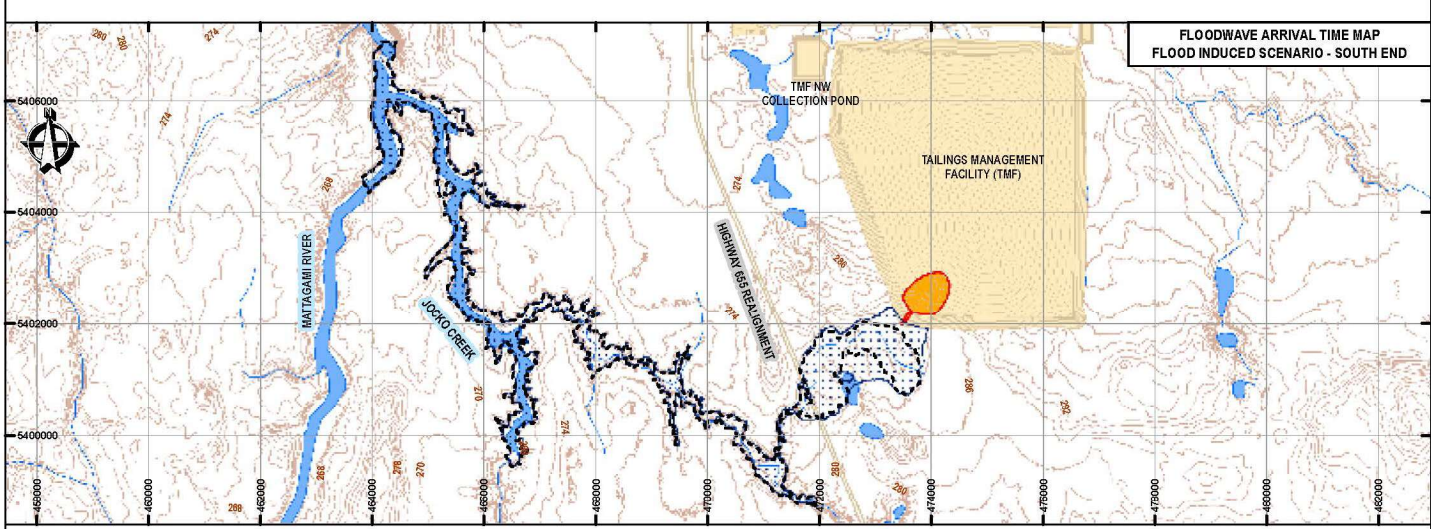
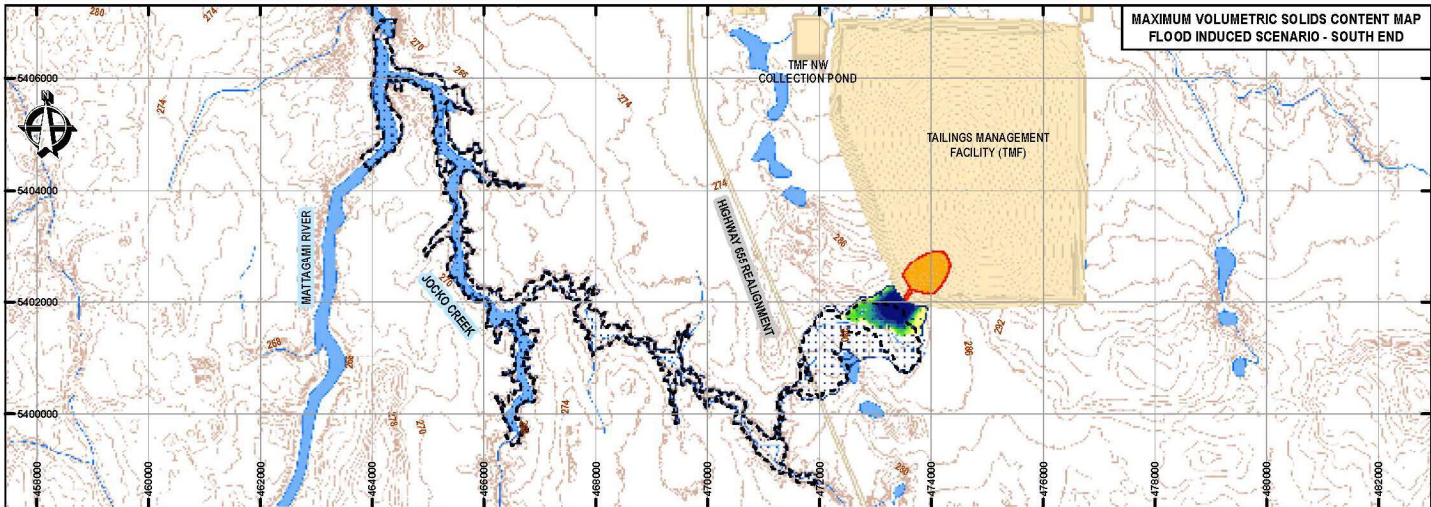
CRAWFORD NICKEL PROJECT - PERMITTING SUPPORT

**TAILINGS DAM BREACH ANALYSIS
FLOOD INDUCED SCENARIO - SOUTH END**

Ausenco **CANADIAN NICKEL**

PROJECT ID: 10484505
 ISSUE DATE: MAY 23, 2024
 DRAWN BY: L. PROON
 CHECKED BY: S. STEWART
 REVISION: A
 MAP ID: A06-3

PROJECT CODE: UTM
 DATE: 17N
 SCALE: PWD/CRS
 APPROVED BY: S. STEWART



SCALE: 1:90,000

SYMBOLY		
MAXIMUM VOLUMETRIC SOLIDS CONTENT	FLOODWAVE ARRIVAL TIME (hr)	TIME TO MAXIMUM DEPTH (hr)
20% - 24%	0.95 - 1.20	3.05 - 3.10
24% - 26%	1.20 - 1.40	3.10 - 3.20
26% - 28%	1.40 - 1.60	3.20 - 3.30
28% - 30%	1.60 - 2.00	3.30 - 3.40
30% - 32%	2.00 - 2.60	3.40 - 3.60
32% - 34%	2.50 - 3.00	3.60 - 4.00
34% - 36%	3.00 - 3.60	4.00 - 5.00
36% - 38%	3.60 - 5.00	5.00 - 13.77

0 0.75 1.5 3 4.5 Kilometers
Scale: 1:90,000

NOTES:

1. PROJECTION: UTM WGS 84 - ZONE 17N.
2. TOPOGRAPHY: LIDAR DATA INFORMATION PROVIDED BY THE CLIENT.
3. SATELLITE IMAGE: WORLD TOPOGRAPHIC MAP
4. FOR THIS SCENARIO, THE SYMBOLY SHOWN CORRESPONDS TO THE DAM BREACH FLOOD FOOTPRINT WHOSE MAXIMUM VOLUMETRIC SOLIDS CONTENT IS GREATER OR EQUAL TO 20%.

LEGEND

- DAM BREACH AREA WITHIN TMF IMPONDMENT
- DAM BREACH FLOOD FOOTPRINT
- IDF FOOTPRINT
- COMPONENT FOOTPRINT
- PROJECT COMPONENTS
- RIVERS AND STREAMS
- WATER BODIES
- CONTOUR LINES (INTERVAL: 2m)

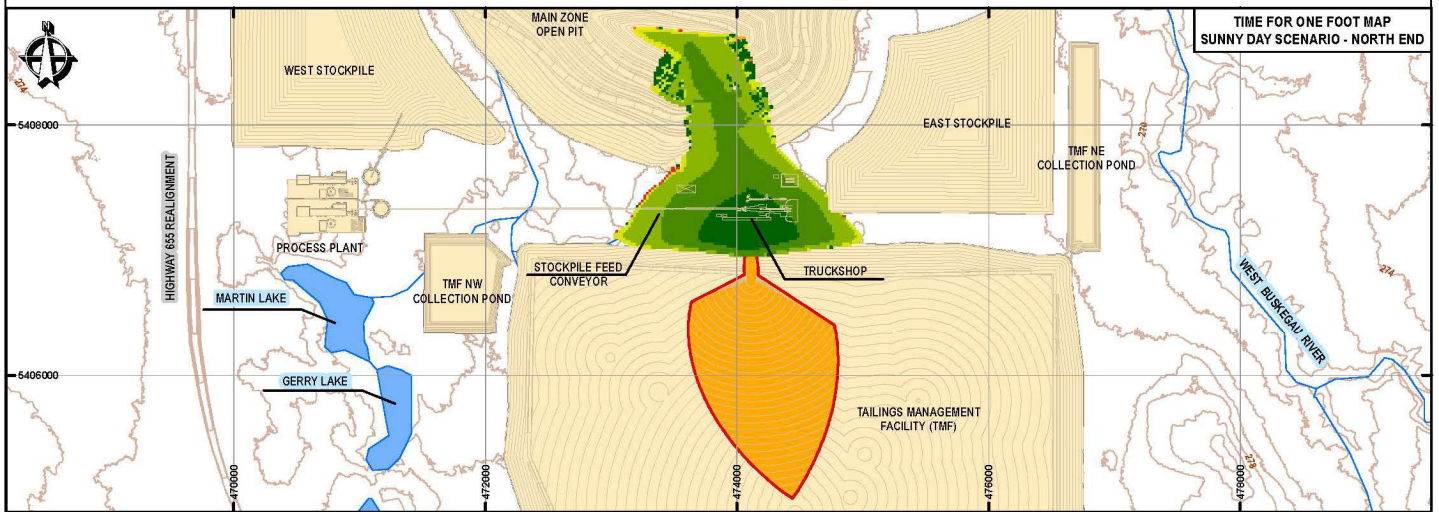
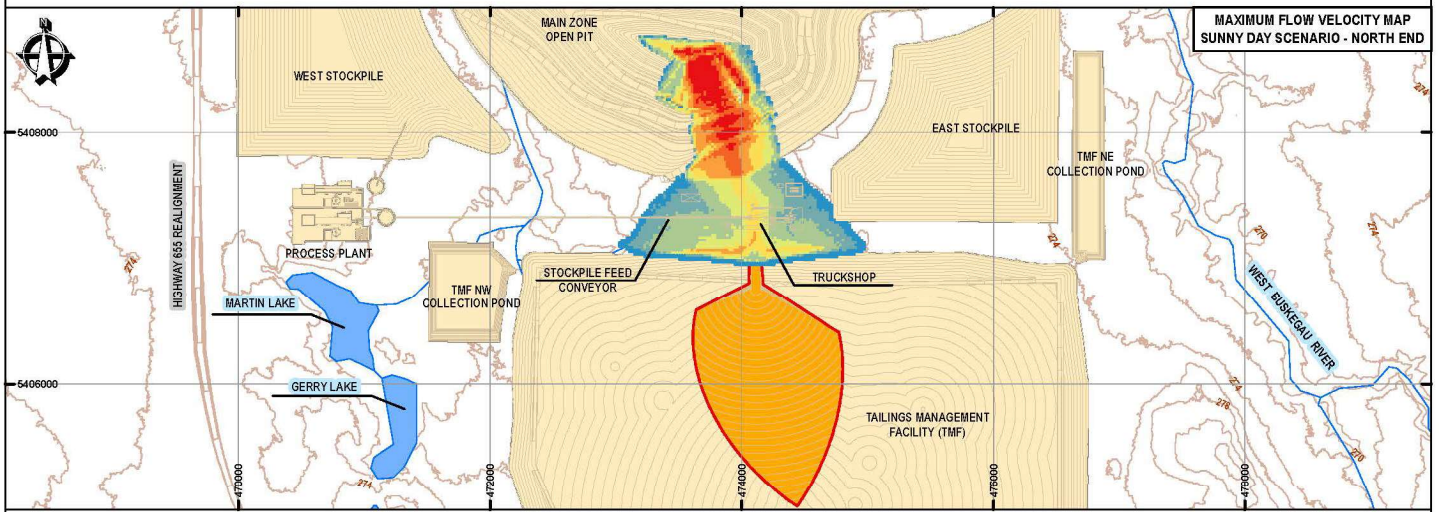
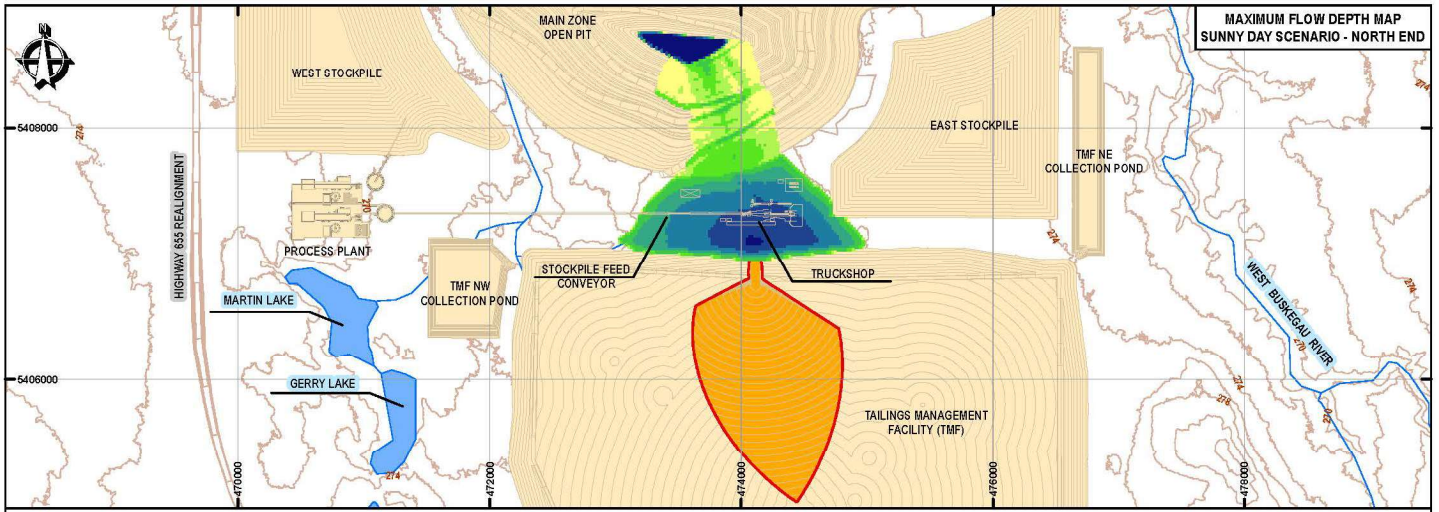
PROJECT: CRAWFORD NICKEL PROJECT - PERMITTING SUPPORT

TITLE: TAILINGS DAM BREACH ANALYSIS
FLOOD INDUCED SCENARIO - SOUTH END

Ausenco		PROJECT ID: 1048450	REVISION: A
PROJECT CODE: UTM	DATE: 17N	ISSUE DATE: MAY 23, 2024	MAP ID:
DWG NO: 10334	SCALE: PREFERRED	DRAWN BY: L. PROON	A06-4
		CHECKED BY: S. HEDRICK	
		APPROVED BY: S. STEWART	

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North Dam Breach



SCALE: 1:140,000

SYMBOLOY

MAXIMUM FLOW DEPTHS (m)	MAXIMUM VELOCITIES (m/s)	TIME FOR ONE FOOT (hr)
0.00 - 0.50	0.00 - 0.75	0.00 - 0.25
0.50 - 1.00	0.75 - 1.50	0.25 - 0.50
1.00 - 2.00	1.50 - 2.50	0.50 - 0.75
2.00 - 4.00	2.50 - 3.50	0.75 - 1.00
4.00 - 6.00	3.50 - 5.00	1.00 - 1.50
6.00 - 9.00	5.00 - 8.00	1.50 - 2.00
9.00 - 14.00	8.00 - 12.00	2.00 - 3.00
14.00 - 108.10	12.00 - 26.42	3.00 - 6.44

LEGEND

- DAM BREACH AREA WITHIN TMF IMPONDMENT
- COMPONENT FOOTPRINT
- PROJECT COMPONENTS
- RIVERS AND STREAMS
- WATER BODIES
- CONTOUR LINES (INTERVAL: 2m)

Scale: 1:140,000

NOTES:

1. PROJECTION: UTM WGS 84 - ZONE 17N.
2. TOPOGRAPHY: LIDAR DATA INFORMATION PROVIDED BY THE CLIENT.
3. SATELLITE IMAGE: WORLD TOPOGRAPHIC MAP

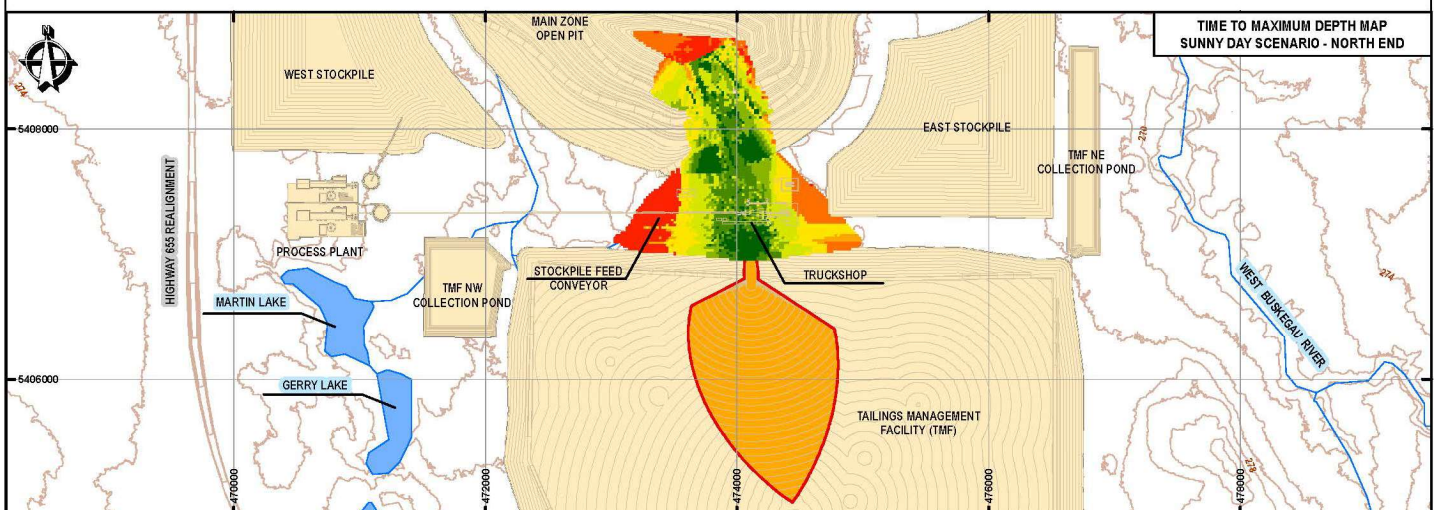
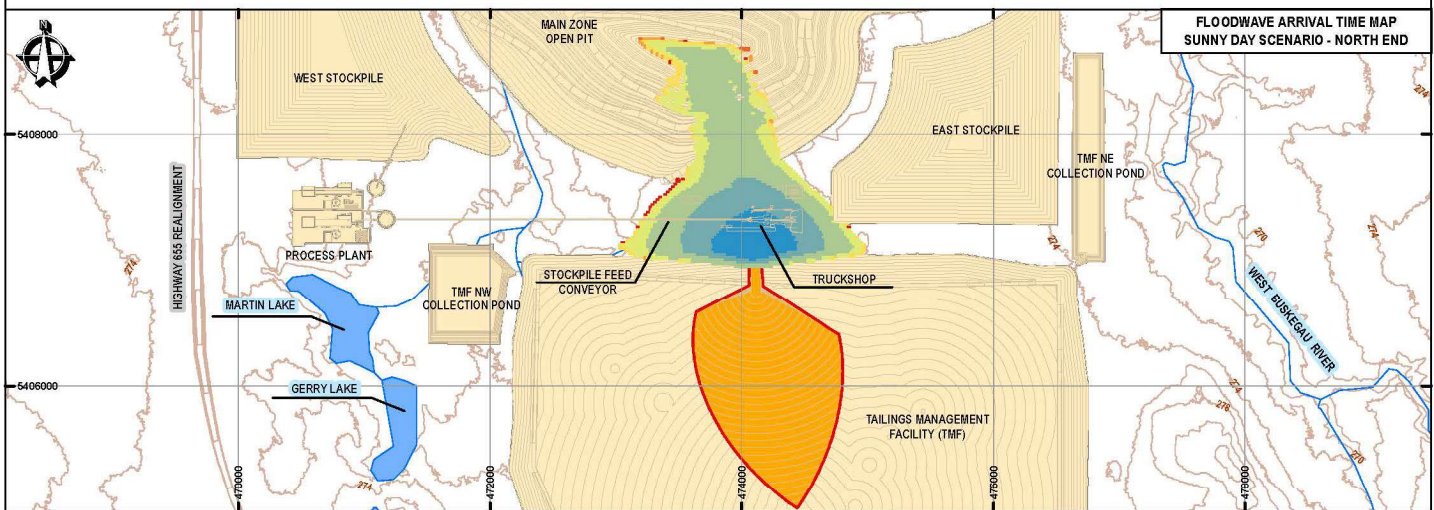
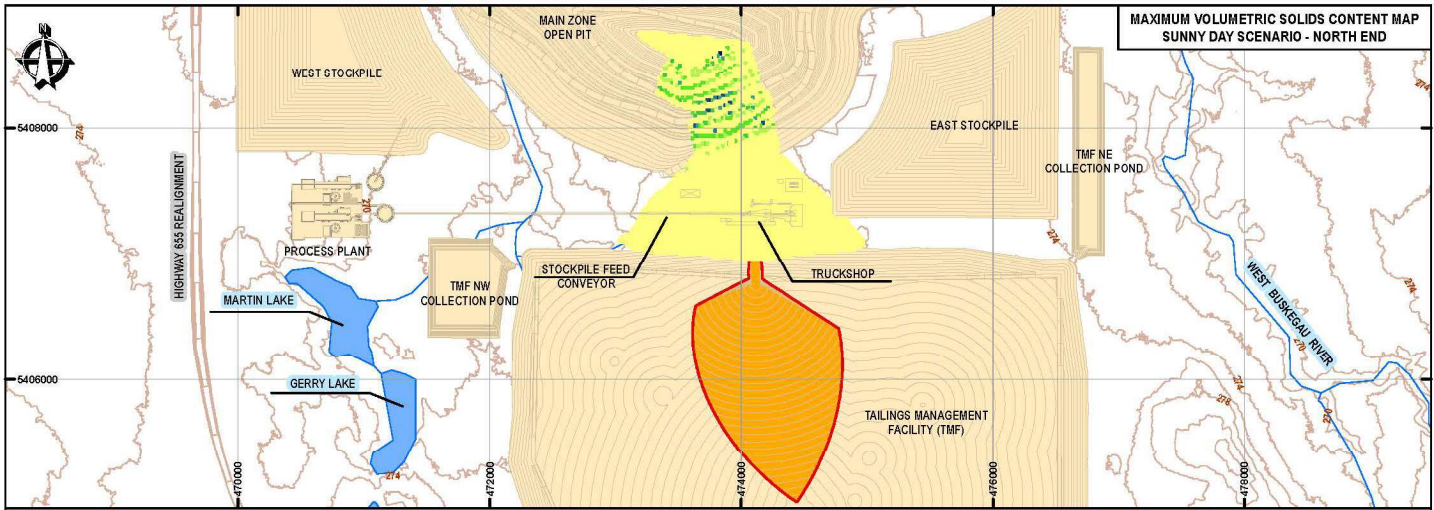
PROJECT: CRAWFORD NICKEL PROJECT - PERMITTING SUPPORT

TITLE: TAILINGS DAM BREACH ANALYSIS
SUNNY DAY SCENARIO - NORTH END

Ausenco	CANADIAN NICKEL	PROJECT ID: 1084805	REVISION: A
PROJECT CODE: UTM	SCALE: 1:140,000	DATE: MAY 15, 2024	DRAWN BY: L. PROON
DATE: 05/24	SCALE: 1:140,000	CHECKED BY: S. B. STREHLING	APP'D BY: S. B. STREHLING

A07-1

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SCALE: 1:40,000

SYMBOLOLOGY

MAXIMUM VOLUMETRIC SOLIDS CONTENT	FLOODWAVE ARRIVAL TIME (hr)	TIME TO MAXIMUM DEPTH (hr)
38.0% - 38.2%	0.01 - 0.20	0.41 - 0.60
38.2% - 38.4%	0.20 - 0.40	0.60 - 0.65
38.4% - 38.6%	0.40 - 0.60	0.65 - 0.70
38.6% - 38.8%	0.60 - 0.80	0.70 - 0.80
38.8% - 39.0%	0.80 - 1.00	0.80 - 0.90
39.0% - 39.2%	1.00 - 1.50	0.90 - 1.00
39.2% - 39.6%	1.50 - 3.00	1.00 - 6.00
39.6% - 40.0%	3.00 - 6.44	6.00 - 24.00

LEGEND

- DAM BREACH AREA WITHIN TMF IMPOUNDMENT
- COMPONENT FOOTPRINT
- PROJECT COMPONENTS
- RIVERS AND STREAMS
- WATER BODIES
- CONTOUR LINES (INTERVAL: 2m)

0 0.5 1 2 Kilometers

Scale: 1:40,000

NOTES:

1. PROJECTION: UTM WGS 84 - ZONE 17N.
2. TOPOGRAPHY: LIDAR DATA INFORMATION PROVIDED BY THE CLIENT.
3. SATELLITE IMAGE: WORLD TOPOGRAPHIC MAP

PROJECT: CRAWFORD NICKEL PROJECT - PERMITTING SUPPORT

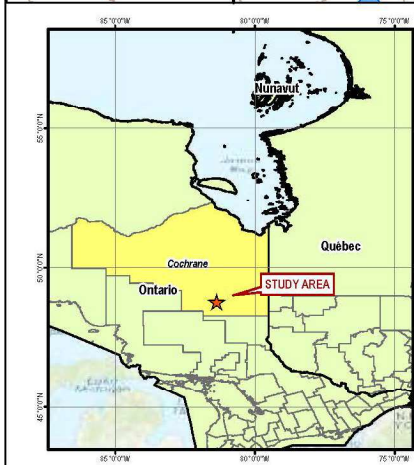
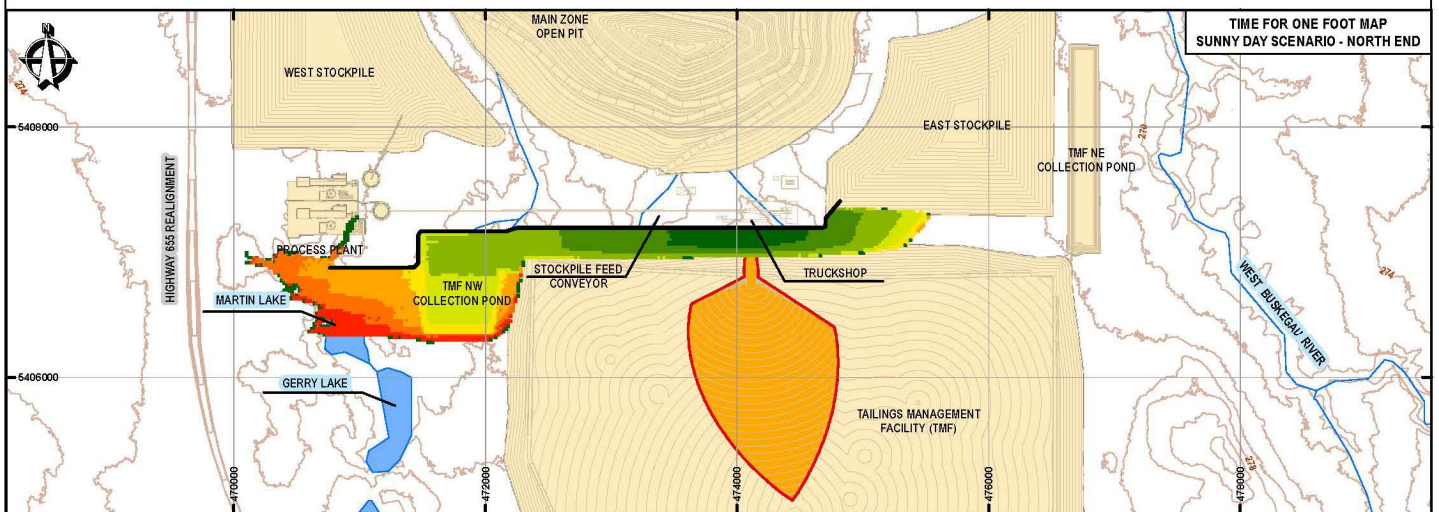
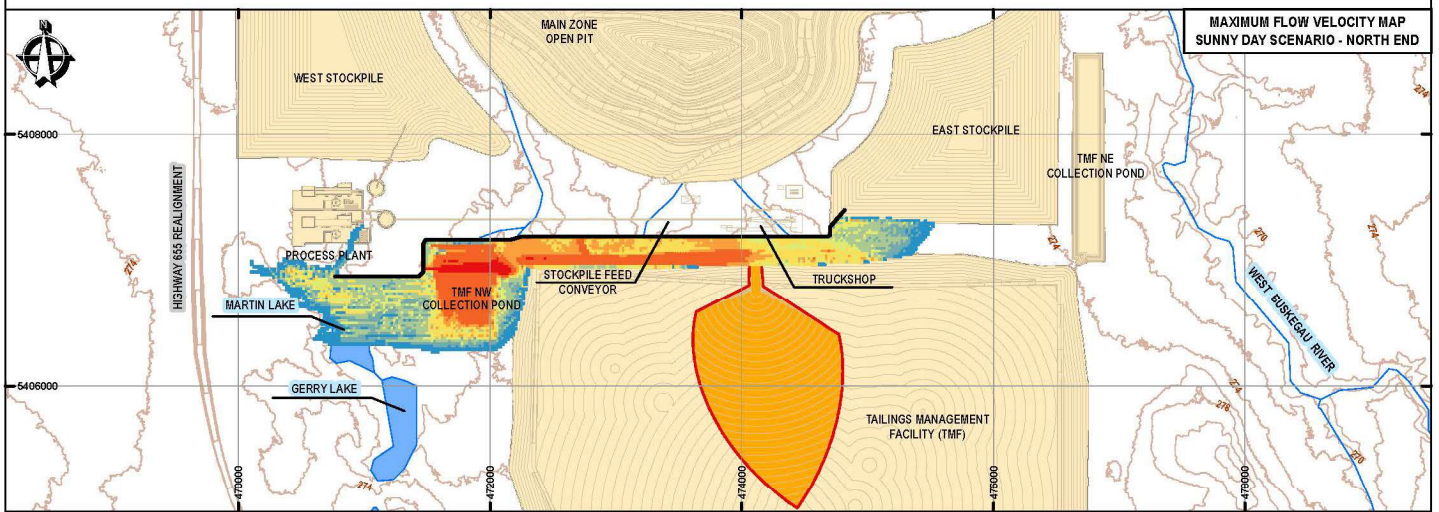
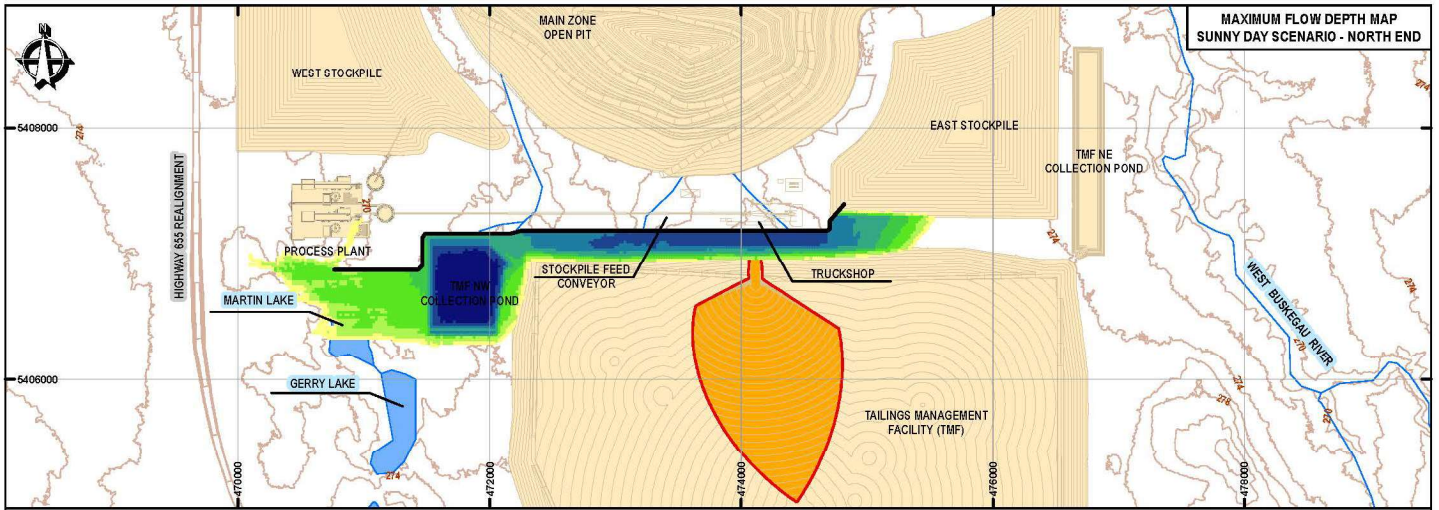
TITLE: TAILINGS DAM BREACH ANALYSIS
SUNNY DAY SCENARIO - NORTH END

Ausenco CANADIAN NICKEL

PROJECT ID: 1084605 **REVISION:** A
ISSUE DATE: MAY 23, 2024 **MAP ID:**
DRAWN BY: L. PROON **SCALE:** 1:40,000
CHECKED BY: V. ANDERSON **DATE:** A07-2
APPROVED BY: G. STELLING

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Mitigation Deflector B



SCALE: 1:40,000

SYMBOLGY		
MAXIMUM FLOW DEPTHS (m)	MAXIMUM VELOCITIES (m/s)	TIME FOR ONE FOOT (hr)
0.00 - 1.50	0.00 - 0.80	0.00 - 0.20
1.50 - 3.00	0.80 - 1.20	0.20 - 0.40
3.00 - 4.50	1.20 - 1.60	0.40 - 0.60
4.50 - 6.00	1.60 - 2.00	0.60 - 0.80
6.00 - 8.50	2.00 - 3.00	0.80 - 1.00
8.50 - 11.00	3.00 - 4.00	1.00 - 1.50
11.00 - 15.00	4.00 - 7.50	1.50 - 2.00
15.00 - 26.15	7.50 - 18.44	2.00 - 4.05



- NOTES:**
1. PROJECTION: UTM WGS 84 - ZONE 17N.
 2. TOPOGRAPHY: LIDAR DATA INFORMATION PROVIDED BY THE CLIENT.
 3. SATELLITE IMAGE: WORLD TOPOGRAPHIC MAP

LEGEND

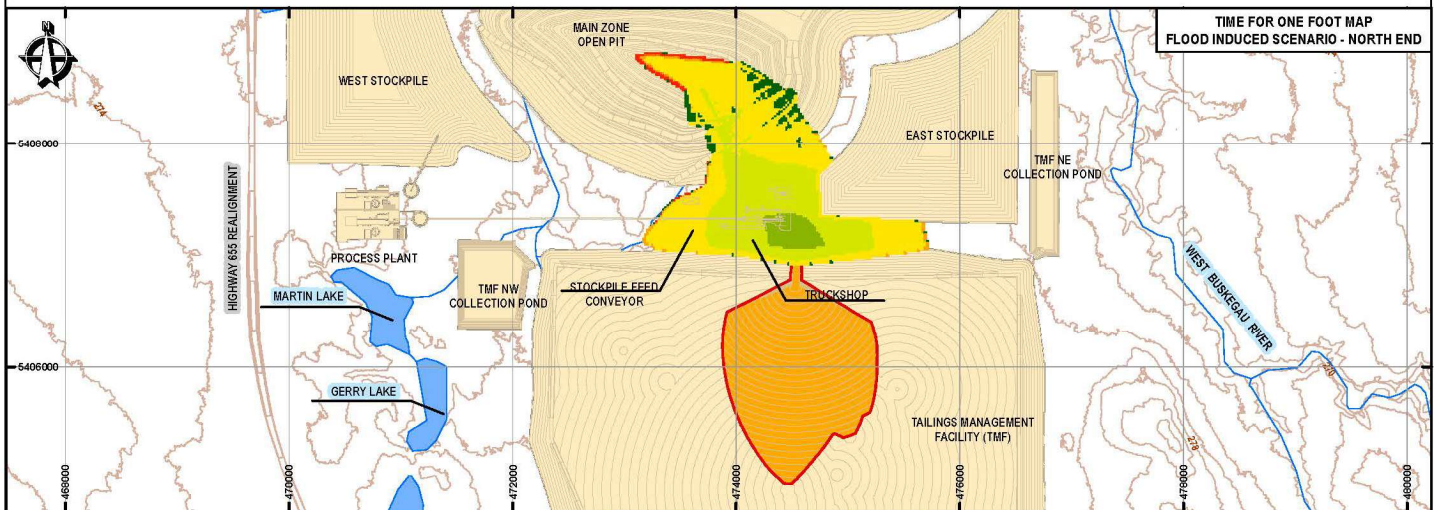
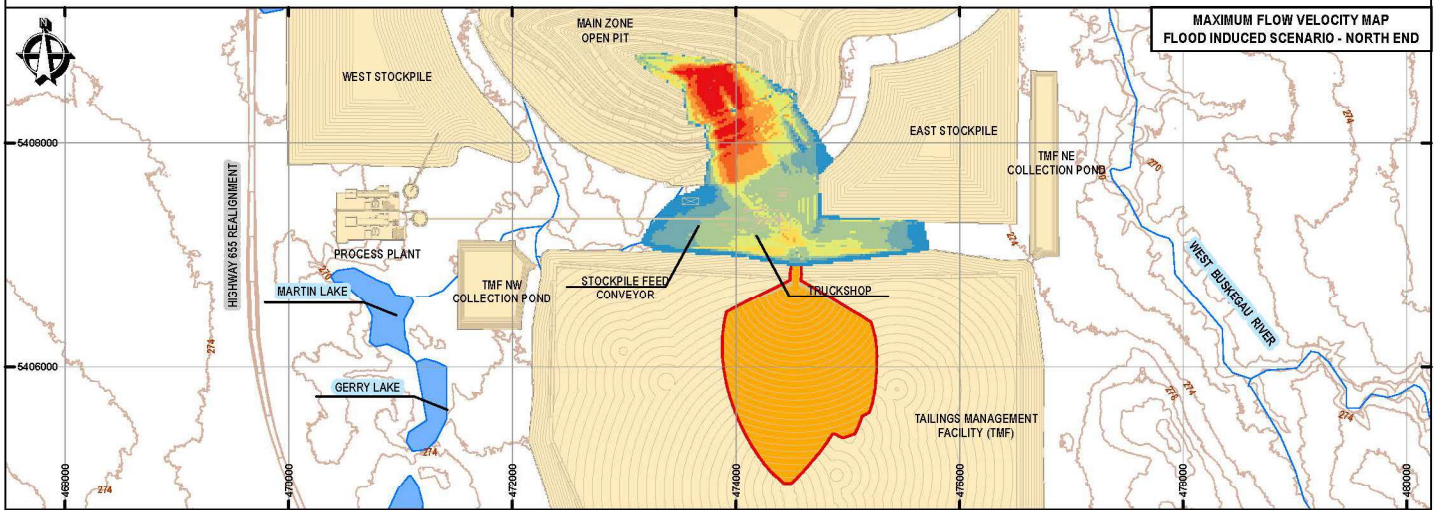
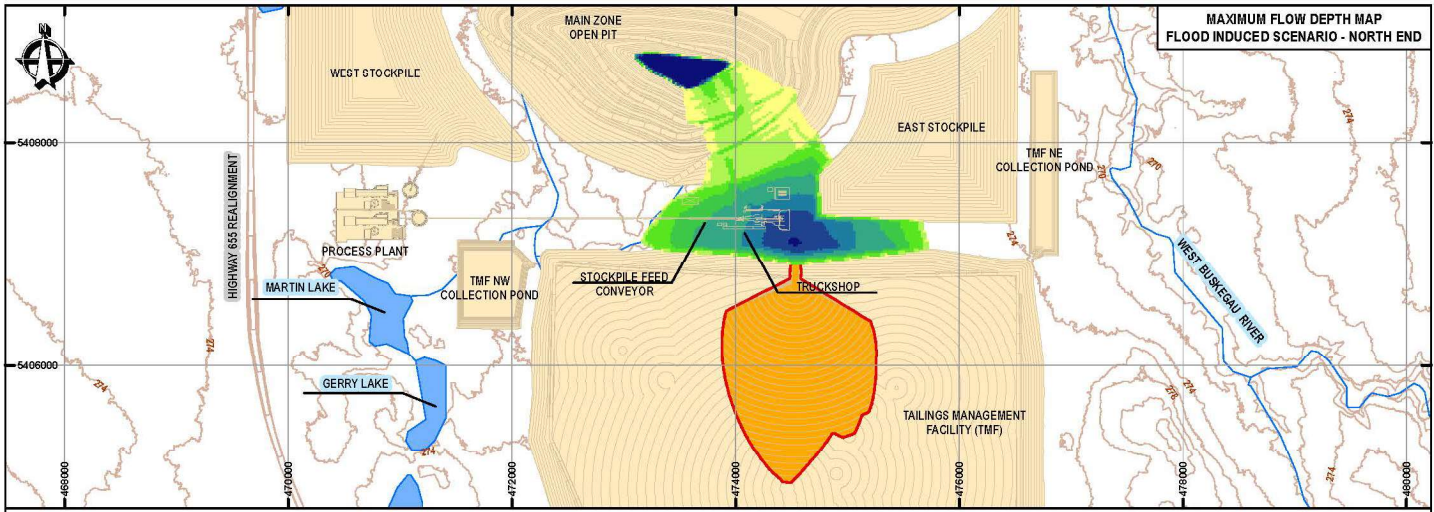
- DAM BREACH AREA WITHIN TMF IMPOUNDMENT
- PROJECTED BERM
- COMPONENT FOOTPRINT
- PROJECT COMPONENTS
- RIVERS AND STREAMS
- WATER BODIES
- CONTOUR LINES (INTERVAL: 2m)

PROJECT: CRAWFORD NICKEL PROJECT - PERMITTING SUPPORT

TITLE: TAILINGS DAM BREACH ANALYSIS
SUNNY DAY SCENARIO - NORTH END

Ausenco	CANADIAN NICKEL	PROJECT ID: 10848505	REVISION: A
PROJECT CODE: 10334	DATE: 17N	ISSUE DATE: JUNE 4, 2024	DRAWN BY: L. PROON
SCALE: PLOTTED	APPROVED BY: S. STELLING	MAP NO: A07-3	

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SCALE: 1:145,000

SYMBOLGY		
MAXIMUM FLOW DEPTHS (m)	MAXIMUM VELOCITIES (m/s)	TIME FOR ONE FOOT (hr)
0.00 - 0.50	0.00 - 0.75	0.00 - 1.00
0.50 - 1.50	0.75 - 1.50	1.00 - 1.50
1.50 - 3.50	1.50 - 2.50	1.50 - 2.00
3.50 - 5.50	2.50 - 3.50	2.00 - 2.50
5.50 - 8.50	3.50 - 5.00	2.50 - 3.00
8.50 - 11.50	5.00 - 8.00	3.00 - 3.50
11.50 - 18.50	8.00 - 14.00	3.50 - 4.00
18.50 - 180.94	14.00 - 26.35	4.00 - 34.80



- NOTES:**
1. PROJECTION: UTM WGS 84 - ZONE 17N.
 2. TOPOGRAPHY: LIDAR DATA INFORMATION PROVIDED BY THE CLIENT.
 3. SATELLITE IMAGE: WORLD TOPOGRAPHIC MAP

LEGEND

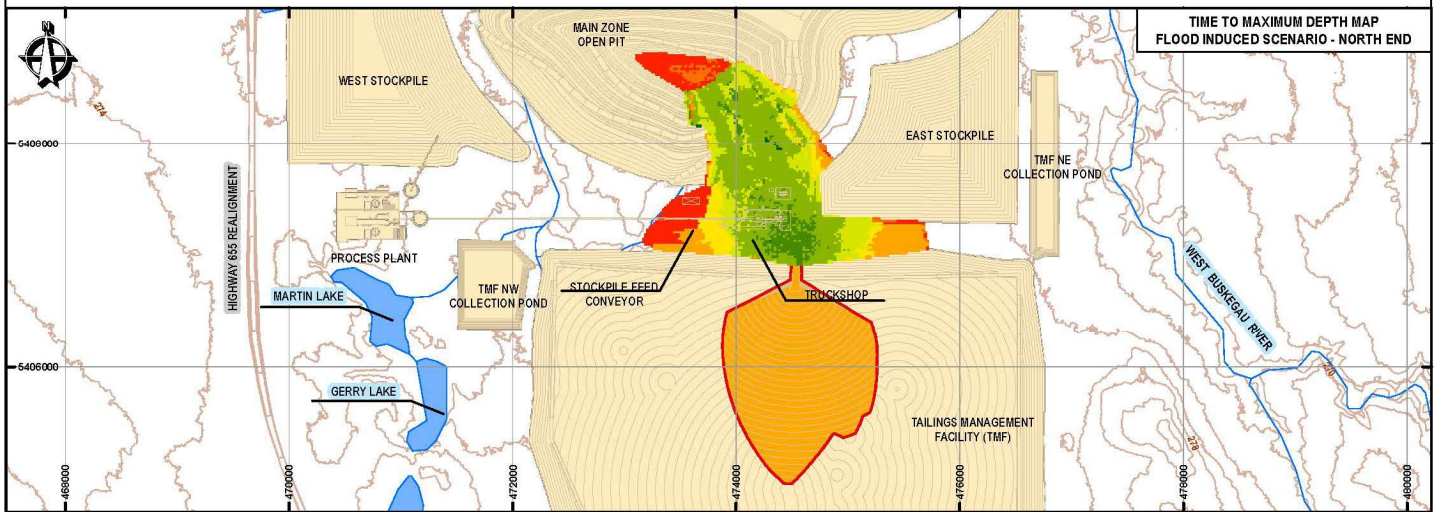
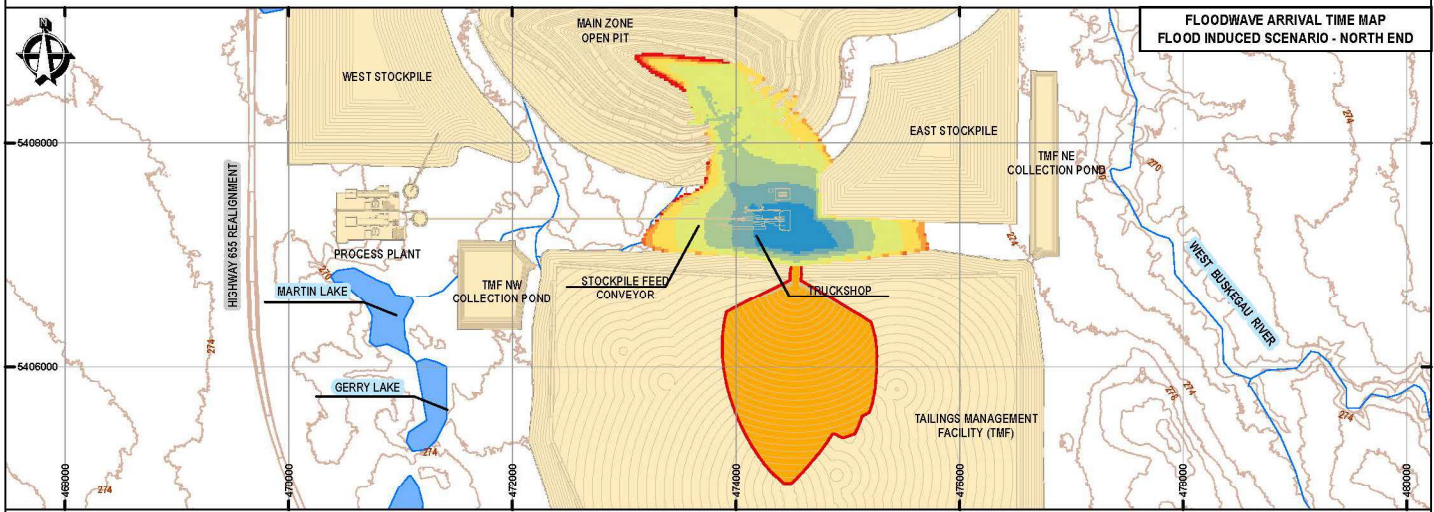
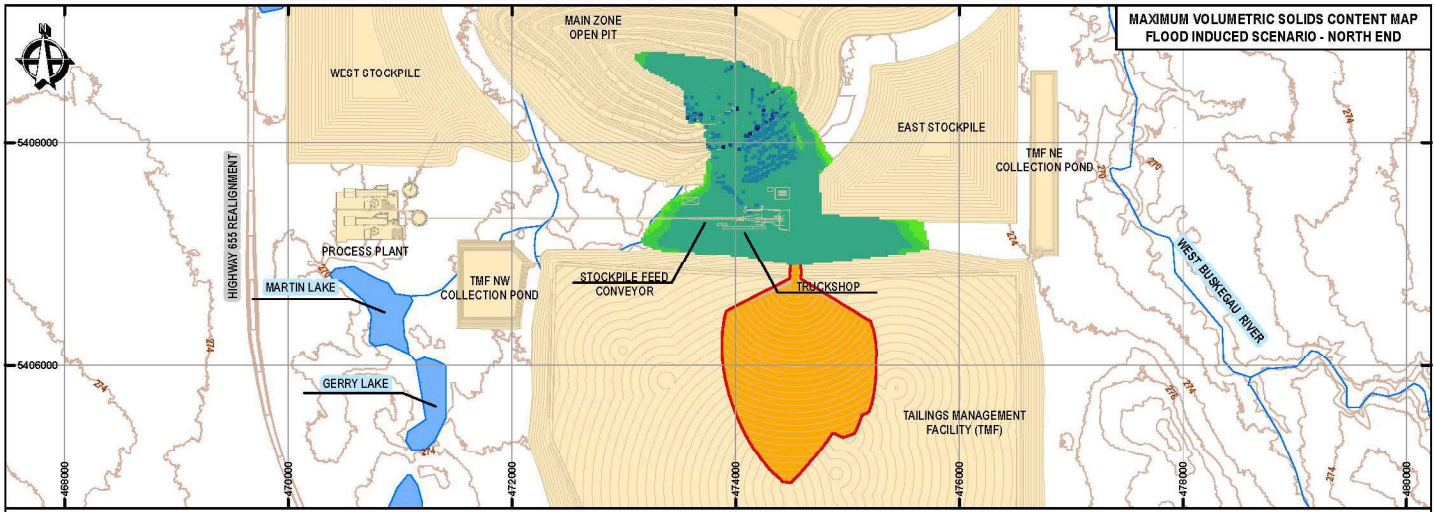
- DAM BREACH AREA WITHIN TMF IMPONDEMENT
- COMPONENT FOOTPRINT
- PROJECT COMPONENTS
- RIVERS AND STREAMS
- WATER BODIES
- CONTOUR LINES (INTERVAL: 2m)

PROJECT: CRAWFORD NICKEL PROJECT - PERMITTING SUPPORT

TITLE: TAILINGS DAM BREACH ANALYSIS
FLOOD INDUCED SCENARIO - NORTH END

Ausenco		PROJECT ID: 10484505	REVISION: A
PROJECT CODE: UTM	DATE: 17N	ISSUE DATE: MAY 15, 2024	DRAWN BY: L. PROON
SCALE: 1:145,000	APPROVED BY: S. STERLING	DATE: 17N	MAP ID: A08-1

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SCALE: 1:145,000

SYMBOLOLOGY		
MAXIMUM VOLUMETRIC SOLIDS CONTENT	FLOODWAVE ARRIVAL TIME (hr)	TIME TO MAXIMUM DEPTH (hr)
31% - 33%	1.70 - 2.10	2.50 - 2.80
33% - 34%	2.10 - 2.30	2.60 - 2.70
34% - 35%	2.30 - 2.50	2.70 - 2.80
35% - 36%	2.50 - 2.70	2.80 - 2.90
36% - 37%	2.70 - 2.90	2.90 - 3.00
37% - 38%	2.90 - 3.10	3.00 - 3.50
38% - 39%	3.10 - 3.50	3.50 - 30.00
39% - 40%	3.50 - 34.80	30.00 - 36.00

LEGEND	
	DAM BREACH AREA WITHIN TMF IMPONDEMENT
	COMPONENT FOOTPRINT
	PROJECT COMPONENTS
	RIVERS AND STREAMS
	WATER BODIES
	CONTOUR LINES (INTERVAL: 2m)

0 0.5 1 2 Kilometers

Scale: 1:145,000

NOTES:

1. PROJECTION: UTM WGS 84 - ZONE 17N.
2. TOPOGRAPHY: LIDAR DATA INFORMATION PROVIDED BY THE CLIENT.
3. SATELLITE IMAGE: WORLD TOPOGRAPHIC MAP

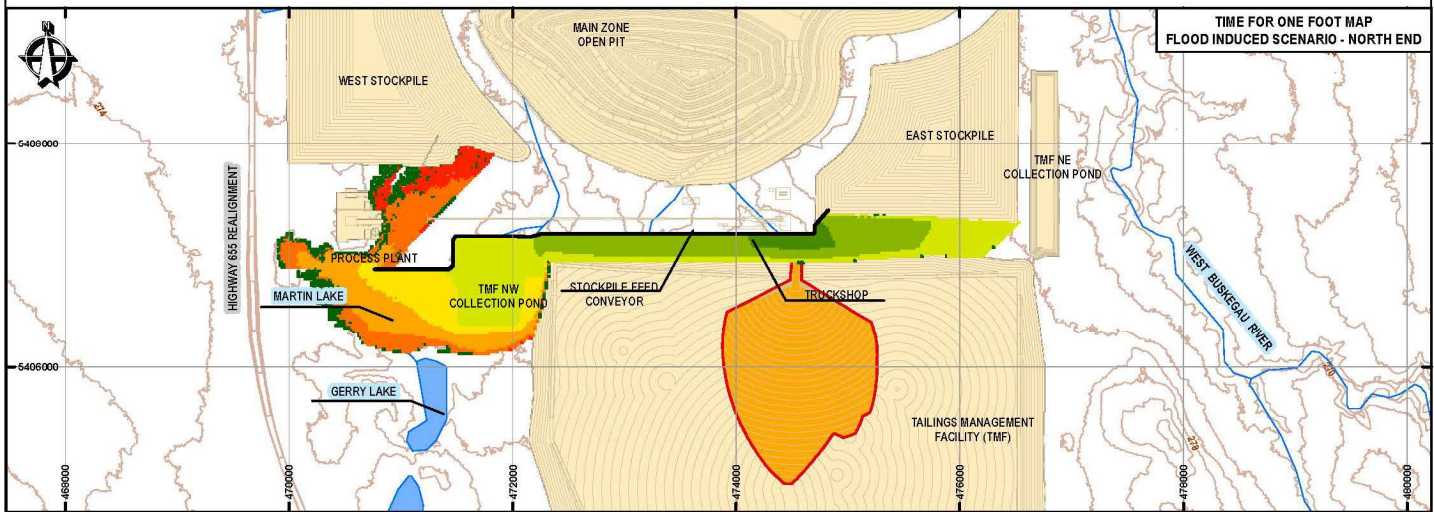
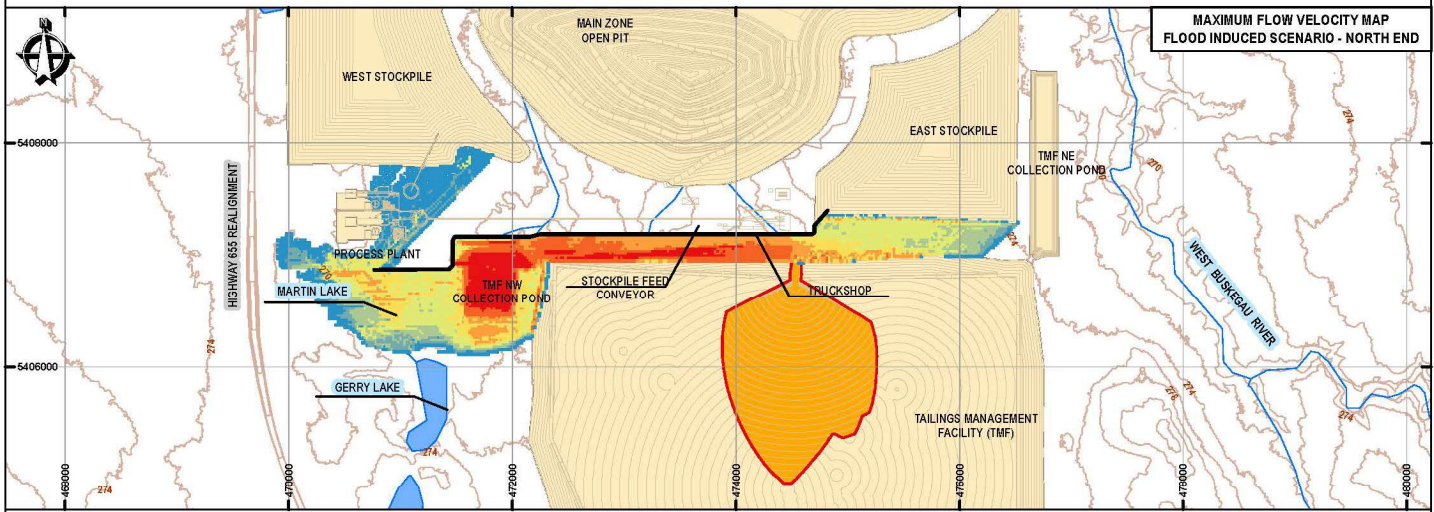
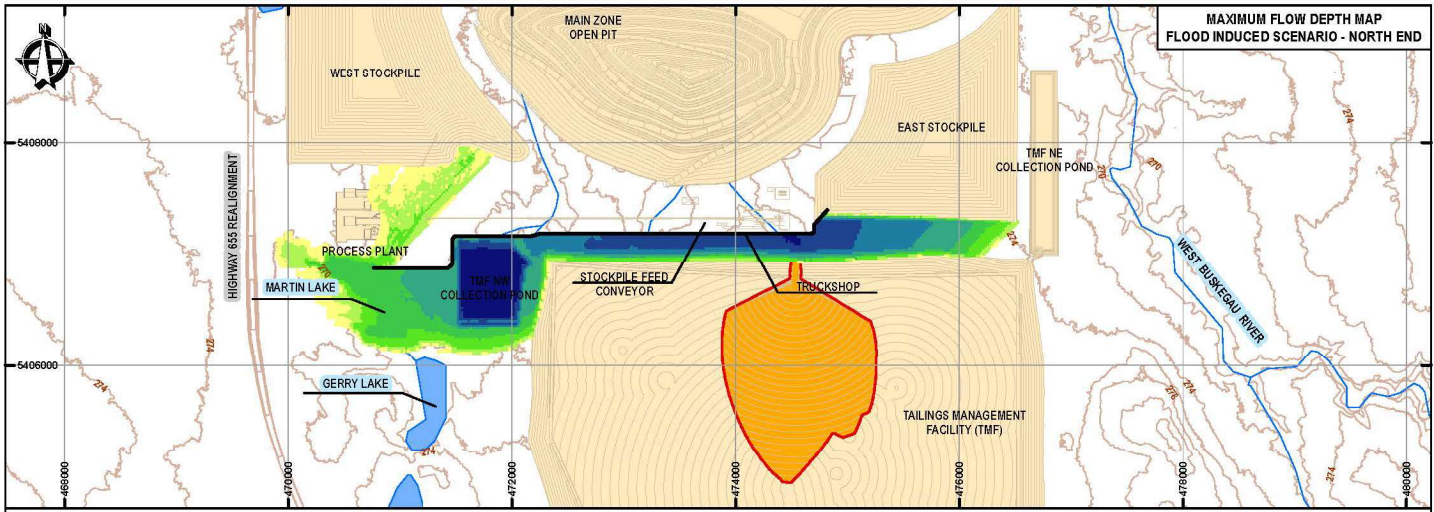
PROJECT: CRAWFORD NICKEL PROJECT - PERMITTING SUPPORT

TITLE: TAILINGS DAM BREACH ANALYSIS
FLOOD INDUCED SCENARIO - NORTH END

Ausenco		PROJECT ID: 10484505	REVISION: A
PROJECT CODE: UTM	DATE: 17N	ISSUE DATE: MAY 23, 2024	DRAWN BY: L. PROON
SCALE: 1:145,000	APPROVED BY: S. STELLING		

A08-2

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SCALE: 1:45,000

SYMBOLOLOGY		
MAXIMUM FLOW DEPTHS (m)	MAXIMUM VELOCITIES (m/s)	TIME FOR ONE FOOT (hr)
0.004 - 0.500	0.00 - 0.30	0.00 - 1.00
0.50 - 1.50	0.30 - 0.60	1.00 - 2.00
1.50 - 3.00	0.60 - 1.00	2.00 - 2.50
3.00 - 4.50	1.00 - 1.50	2.50 - 3.00
4.50 - 7.00	1.50 - 2.00	3.00 - 3.50
7.00 - 10.00	2.00 - 3.00	3.50 - 4.00
10.00 - 15.00	3.00 - 6.00	4.00 - 6.00
15.00 - 28.49	6.00 - 14.05	6.00 - 20.30



- NOTES:**
1. PROJECTION: UTM WGS 84 - ZONE 17N.
 2. TOPOGRAPHY: LIDAR DATA INFORMATION PROVIDED BY THE CLIENT.
 3. SATELLITE IMAGE: WORLD TOPOGRAPHIC MAP

LEGEND

- DAM BREACH AREA WITHIN TMF IMPONDMENT
- PROJECTED BERM
- COMPONENT FOOTPRINT
- PROJECT COMPONENTS
- RIVERS AND STREAMS
- WATER BODIES
- CONTOUR LINES (INTERVAL: 2m)

PROJECT: CRAWFORD NICKEL PROJECT - PERMITTING SUPPORT

TITLE: TAILINGS DAM BREACH ANALYSIS
FLOOD INDUCED SCENARIO - NORTH END

Ausenco	CANADIAN NICKEL	PROJECT ID: 1084505	REVISION: A
PROJECT CODE: UTM	SCALE: 1:45,000	DATE: JUNE 4, 2024	DRAWN BY: L. PROHN
DATE: 05/24	SCALE: 1:45,000	CHECKED BY: S. STERLING	APP'D BY: S. STERLING

A08-3

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