LMI CRP Discussion

July 22, 2021
10:00 AM – 12:15 PM PST
Teams call
 # 20446521-006-MM-Rev0-1000

Meeting Chair: Karyn Lewis

Record Keeper: Erin Salo

Attendees: LMI: Karyn Lewis
Golder: Ken Bocking, Steven Fiddler
Stantec: Alvin Tong, Jim McKinley
CIRNAC: Krista Pooley, Spencer Dewar, Erik Allain, Baba K. Pedersen, Justin Hack, Vincent Okonkwo
NWB: Sergey Kuflevskiy, Karen Kharatyan,
Arcadis: Gerd Wiatzka, Charles Gravelle

Discussion Items		Item Owner
1.	GW did not receive LMI response document • KL resent doc 210707 2AM-LUP2032 LMI Responses to CIRNAC – CRP Land Lease • Not having received document earlier, GW provided comments on technical aspects and consideration wrt Dome as per current review of July Dome design submission. GW also asked questions related to TCA closure aspects dam and cover status, pond water levels and evidence of exposed tailings.	
	<u>Mill Site – Review of Golder Technical Memo 25 June 2021</u>	
2.	Dome Design Package (Part G WL), Section 2 Item a) : GW - Lack of detail grading info on dome – addressed	
3.	Dome design Package (Part G WL), Section 2 Item b) GW - Lack of design information on storm/freshet flows – outstanding / partial response • GW – noted Golder had provided design capacity of each chute, but not the design flows expected for each chut? • KB – 1m^3/sec, not tied to particular design storm, each chute has 2 hectares or less reporting to them • **GW – suggests KB provide information on predicted runoff from design storms and freshet to allow for comparison to chute design capacity**	

Discussion Items		Item Owner
4.	Dome design Package (Part G WL), Section 2 Item c): Slope Erosion - Potential for rilling of longer slopes – outstanding, looking for context/design basis/analogue for self-armouring; and how robust is berm design (esker material)? • KB – analogue is experience, based on dam designed previously elsewhere with a downstream slope of 2:1 of exposed esker gravel – has performed well based on > 15 years of annual inspections; therefore, the expectation is that a 10:1 slope will perform well providing we prevent external runoff from the top surface of the dome from going over the slope. • **GW – please put above into response** • GW - Perimeter berm is 0.5m high with 2:1 slopes on either side– should have downslope armour in case of long-term erosion/icing events? • KB – perimeter berms are just esker, (see detail in Rev. 1 dwg.) KB is comfortable with that as the longitudinal slope is very low (<1%); TCA esker cover (with a slope of about 1%) has performed quite well over the years with respect to sheet flow from runoff. • **GW – please put logic above into response** • AT –at freshet, the esker cover is frozen and not very susceptible to erosion. • **KB – will provide additional information re: basis of design and comfort** Dome design Package (Part G WL), Section 2 Item d) and e) • GW - Toe erosion from discharge chute runoff; didn't provide technical basis on design of stilling basin and exit velocities; dwg note to confirm positive drainage away from the toe • CG – did KB intend for chute to settle in a pond? • KB - 10% slope is supercritical flow, so we included stilling basins at the bottom of each chute to dissipate energy. The stilling basins are imbedded into original ground to force the hydraulic jump. Flow exiting the stilling basins will be low velocity subcritical flow. We will field fit the proper drainage to ensure there will be positive drainage away from the toe. Golder will have an earthworks inspector on site in the fall to view the field fits. • **KB – will document/respond above**	
5.	Dome design Package (Part G WL), Section 2 Item f) : lack of notes on construction constraints, to be addressed before cover placement • GW – note 2 is specific, appropriate, and applicable • GW - note 1 is broad and undefined; LMI and GAL need to provide clear guidance to contractor; FCRP talks about mounding waste rock above the crown pillar, then later says the waste rock will be brought to final grade. • KB – GAL has a drawing (19136158-003-CM-001, Rev. D) showing the locations of all known contaminated soils; GAL has crew onsite full-time for cleanup verification • SF – We have a field crew onsite full time (day and night shift) during remedial works monitoring the contaminated soil excavations and completing field screening using either a RKI Eagle (PHC soils) or XRF (metals soils). Upon reaching anticipated final extents, confirmatory soil samples are sent for lab analysis. • KL - as long as there is work being done on the dome, there is a GAL - engineer/crew onsite and Stantec engineer onsite for tailings area, and a full-time surveyor	

Discussion Items		Item Owner
	• GW – noted slabs had not been broken, as they should have been, according to FCRP • KB – last year we noted that as a non-conformance and required that it be fixed up this year • KL – slabs are currently being uncovered and hoe-rammed • GW – dome/toe issue: no distinction between slope and where it meets native soils; will there be any rip rap at the bottom? • KB – see typical detail (Dwg. 19136158-002-CM-002, Rev1) – toe meets original ground at 10% slope with no rip rap; will be field fitted to ensure water flows radially away from the toe, not along it. **We will note that in our response**. • BP – please add plain language for inspection purposes; provide maps with circles/x's; use GPS coordinates so he knows what he needs to be inspecting in the field • GW – Dome design – notes crown pillar location has been added to the drawing, would also like to have seen slab locations shown on drawings; please update drawings with phantom lines for slabs under the dome • **KB – We will add slab locations when we do the as-builts**.	
6.	Portals/Shafts/UG -unsure of filling UG (shaft and vents) • KB – currently piling material beside the crown pillar and dozing it into crown pillar • KL - nothing down the vent raise yet; possibly some material in the main shaft last year • GW – all fill, no cap? Approval by mines inspector? • KL – yes, approval has been provided by the mine inspector, • GW – what is potential for consolidation/settlement underground? What is the material? • KB – The material is contaminated soils from cleanup activities. It is mostly comprised of waste rock; we expect the waste will settle quickly; we will then top up and monitor • KL – no plans for anything else to be put down. (Demolition waste will all go into the landfill) • KB – plan is to fill contaminated soil to the top of bedrock; there may be some settlement; will top up the crown pillar and shafts with waste rock and mound as we progress; by the end of this season, we plan to bring the dome up to final grade and cap with esker; **The dome surface will be observed annually, and we will mitigate any post construction settlement, as necessary** • GW – Blasting in progress? • KL – yes, should be complete and blasting crew offsite next Wednesday • KB - the crown pillar opening will be very as similar as shown in drawing in revised FCRP • KB – the crown pillar has been blasted down to stable condition, and filling is progressing • GW – what is the biggest waste rock size generally onsite? • SF – during remedial works, a few larger boulders have been encountered, but generally the waste rock has been approximately 1 foot or less.	

	Discussion Items	Item Owner
	Shaft • GW - how deep is the shaft? • KL – shown on drill blast plan drawing; sent w/mines inspector approval • KB – The shaft is 3.4 by 3.4 m and the depth is stated in the FCRP Portal • KB - esker cover to toe out at original ground • GW – how deep is plug going into portal? • KB – 10 m plug of waste rock at full culvert section, and the last 7 m is tapered • GW – shown as an area to be covered by esker materials, but dome didn't extend that far? • KB – The portal cover will be an island of esker cover over the immediate portal area • GW – will be graded or mounded? • GW – cover around portal will extend down to original ground; waste rock has to be removed from the area outside the perimeter of the portal cover • GW – is it mounded? Subject to erosion? • KB – there will be a mound around entire perimeter of portal down to native soils • CG – comfortable with portal and shaft plans • KL – new contractor is JDS; onsite person supervising the work for them is a P.Eng. Landfill • GW – have not seen the drawings for the landfill; how has construction been managed? • **KL – will send the two landfill dwgs (Rev. 1 is current**) • KB – all demolition material is being placed there as it comes; at the end, we will have to place 1 m minimum of waste rock over the demolition waste, which in turn will be covered by 1 m of esker cover. The surface of the waste rock layer and the esker cover will be graded as per the drawings. • KL/BP – was inspected last year • GW – any compaction? • KB – When the waste rock is placed over the top of the waste, it will be spread and dozer compacted. The waste rock is generally fine graded (being underground mine muck). • CG – interim plans for day covers? • KB - no • GW – what type of dozer is onsite? • AT – D8 is the largest; there are also D6's • BP – During the inspection last year, there were big voids in the waste and the waste rock was irregular. The waste surface will have to be smoothed before the 1.0 m of waste rock is placed. • KB - agreed • **GW – provide response with details/info, as above** • **KB - will document/respond above**	

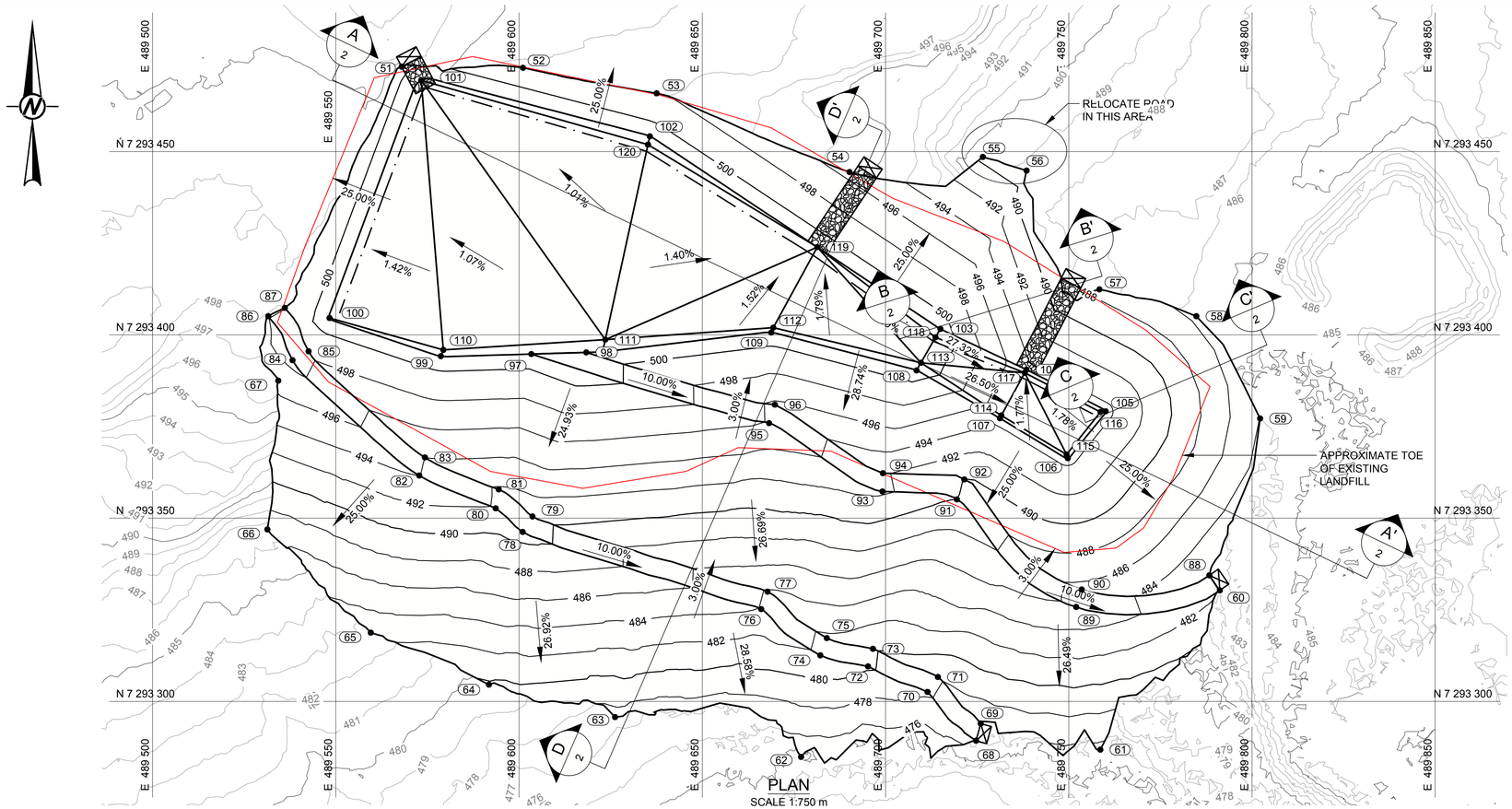
	Tailings Containment Area	
7.	K Dam, Divider Dams, M Dam, L Dam, N Dam • GW – main concern is not the perimeter dams (largely irrelevant after closure) • GW – what is the water level (not clear), and what mitigative work has been done on K Dam? • AT – have been continuously treating and discharging; water in Pond 2 is lower than toe on Dam K; have built a buttress which will be graded to 2.1:1 slope; same thing will be executed on Dam M; • GW – can Stantec/LMI provide actual water level? The target is 480 m. • JM – can provide a tracking sheet/snapshot of freeboard measurements, with permission from KL • AT – as of yesterday, the elevation at pond 2 is 481.65, cell 4 is 486.04; pond 1 is 484.99 • GW – buttressing/more armoring at toe for K Dam? • AT – no, that is a contingency only; if/where the bottom is steep at final WL, we will armour the toe; it appears to be flat from bathymetry and drone surveyGW - have we seen any exposed tailings at pond 2? • AT – haven't done an investigation of that yet; will do when pond 1 and cell 4 get close to closure elevation, and crew is onsite • JM – Once TCA water levels reach closure elevations, LMI will conduct a forensic investigation within the newly exposed shoreline area. The investigation will involve collection of samples within a grid pattern, field screening, and confirmatory laboratory analysis. Any tailings material will be identified during the construction season so that mitigation actions can be planned. • GW – when in the schedule will that happen? • JM – closure elevations are expected at end of August / beginning of September; planning inspection for then • GW – cell 3 interceptor ditch • AT - interceptor ditch is not on crest – it is away from dam, upstream - ties into Cell 3 ditch • GW – problems with divider dikes? will be broken at end of summer (breached)? • AT – not removing divider dike; constructing engineered spillway; material (small amount) will be put into cover construction, if deemed clean • GW – Cell 5 is dewatered? • AT – mostly, yes; still a little remaining • GW – water behind N Dam? • AT – N dam water moving to Cell 5 • GW – visible tailings in N Dam? • AT – yes, cover going in • JM – have advanced a platform into N Dam in the last few days • JM – end of this season go into 2 years of monitoring • CG – no questions on tailings area • GW asked that summary comments on status of dams and tailings covers be provided as part of the LMI response and GW also asked that LMI's response also provide information on the Forensic program as discussed by JM (see also below) • KL - the status and the forensic investigation has been included above, as requested by GW that these comments be recorded in the minutes for future reference	

8.	Resolving Outstanding Issues • KP – would like to see today's call (dome design & TCA) summarized in written response and drawings • KL – can we respond within NWB process? Dominic wants this resolved ASAP • SD – please provide minutes and responses to CIRNAC and NWB ASAP • VO – all comments on dome design are due by July 28 on FCRP; provide comments on mine site cover, when they come in • ES – minutes could be issued tomorrow • SD – require 2 additional submittals to conclude this (minutes and technical document); these will be part of CIRNAC's recommendations to the NWB • KL – any outstanding issues, outside of mine site cover? Are concerns addressed? Can the mine site cover be addressed within NWB process? Dominic is looking for reassurance that CIRNAC's concerns are addressed, so he doesn't feel LMI needs to pull people offsite • GW – today's call still requires a written response; good to record planned forensic investigation, and AT's comments on K, M dams (re-armouring) • KL – Dominic wants reassurance that CIRNAC's concerns are addressed, and there are not outstanding questions; or requirements for additional FCRP • SK – FCRP Rev. 1 is approved; FCRP Rev. 2 is under review; this doesn't mean personnel need to be pulled offsite; Rev. 1 is to be followed for the work until it is succeeded by Rev. 2 • KL – CIRNAC is asking for a separate approval under their own process/land lease • SK – is CIRNAC requesting an additional plan? • KP – CIRNAC is not asking for an updated/second FCRP: CIRNAC is asking for responses to technical comments; LMI is not understanding the process; detailed minutes and 1 additional submission as part of the NWB process, due July 28th can resolve the technical comments • KL – lands lease states new/updated plan needs to be approved or not approved by minister • KP – CIRNAC is looking for a consolidated document, responding to technical comments • KL – LMI provided consolidated response on July 7; under items 25, 26, 27 (T&C), CIRNAC missed opportunities to comment, and tried to do it under a different process, which wasn't under review at the time; LMI was not deferring questions • KP – LMI has stated these plans are living documents; back and forth is part of the process; documenting today's call will go far to resolving outstanding technical comments • KP – formalizing today's call and responses will resolve the technical comments • SD – if CIRNAC receives detailed minutes tomorrow, and a follow up technical submission re: dome design and mine site cover, CIRNAC will include in comments to NWB, due July 28 • KB – will flesh out a few items to supplement the minutes • GW – agree; comments dealing with condition 25, 26, 27 questions • SD – detailed minutes indicating additional information to come from LMI are sufficient • KL – is this an ongoing process? Did this call address all outstanding concerns and obligations under the lease? • SD/KP – yes, for all intents and purposes, all CIRNAC's outstanding issues were captured, and should be resolved with detailed minutes and additional requested details provided	

	• SK – KP, the FCRP needs to be completed, with FCRP updates, does each update need to be signed off by the minister? • KP – Doesn't believe that's the case • KL - under land lease, it's stated "any updates or plans submitted or requested by Lands needs to be approved by the minister or his designates" • KP – Eric and Tracy have those designated powers • SD – a single plan, approved by the minister can be reviewed and approved by Lands subsequently • KK – Updated FCRP for review, NWB expectation is that all comments provided by CIRNAC capture all issues from water Licence and Lands lease process, • KL - does CIRNAC agree with NWB? Both reviews can be captured in single process (as per memorandum of understanding) • SD – NWB process is holistic; materials produced within NWB licensing (e.g., reclamation plan) process can satisfy the lands process	

Attachments: - TCA_Water_Elevation_Freeboard_Checks_20210722
- 19136158-0001-CM-0001,2_Rev 1
- MOU - AANDC-NWB
- 20446521-005-TM-Rev0-1000-Supplemental Information on Design of Dome and Landfill 04AUG_21

Date	Pond 1	Pond 2	Cell 3	Cell 4	Cell 5	Cell N
15-Jul-2021	485.13	481.58	Dewatered	486.25	Dewatered	483.69
16-Jul-2021	485.14	481.57	Dewatered	486.22	Dewatered	483.68
17-Jul-2021	485.11	481.58	Dewatered	486.16	Dewatered	483.67
18-Jul-2021	485.07	481.64	Dewatered	486.13	Dewatered	483.66
19-Jul-2021	485.04	481.64	Dewatered	486.12	Dewatered	483.66
20-Jul-2021	485.03	481.65	Dewatered	486.08	Dewatered	483.66
21-Jul-2021	484.99	481.65	Dewatered	486.04	Dewatered	483.65
22-Jul-2021	484.83	481.70	Dewatered	486.03	Dewatered	483.68



PLAN
SCALE 1:750 m

LEGEND

- EXISTING GROUND SURFACE CONTOUR (1 m INTERVAL)
- 490 — PROPOSED LANDFILL EXPANSION COVER CONTOUR (2 m INTERVAL)
- 83 — PROPOSED LANDFILL EXPANSION COVER LAYOUT POINT
- PERIMETER BERM
- DRAINAGE CHUTE
- STILLING BASIN

NOTE(S)

1. PLACEMENT OF WASTE MATERIALS TO COMPLY WITH WATER LICENSE NO. 2AM - LUP2032 AND THE LUPIN MINE LANDFILL MANAGEMENT PLAN. WASTE SHALL CONSIST OF NON-COMBUSTIBLE NON-HAZARDOUS SOLID WASTE LISTED AS ACCEPTABLE UNDER THE PLAN.
2. WASTE MATERIALS SHALL NOT BE PLACED ON TOP OF SNOW.
3. WASTE ROCK SHALL BE USED TO INFILL VOIDS IN WASTE AND TO PROVIDE A 1 m CAP OVER THE FINAL WASTE SURFACE.
4. THE FINAL SURFACE OF WASTE / WASTE ROCK SHALL BE COVERED BY 1.0 m MINIMUM OF ESKER SAND AND GRAVEL COVER TO BE PLACED PROGRESSIVELY.
5. SURFACE SHOWN PROVIDES CAPACITY FOR ABOUT 106,000 m^3 OF WASTE AND WASTE ROCK. IF LESS CAPACITY IS REQUIRED, A LOWER TOP ELEVATION SHALL BE USED WHILE MAINTAINING THE GRADES AND DRAINAGE PATTERN SHOWN
6. EXISTING CORE BOXES TO BE RELOCATED AS DIRECTED BY OWNER.

REFERENCE(S)

1. EXISTING GROUND TOPOGRAPHY FROM STANTEC, SURVEYED AUGUST 23 TO 25, 2019.
2. COORDINATES ARE IN METERS TO UTM NAD83, NRCS ZONE 12N.

0 25 50
1:750 METRES

LANDFILL EXPANSION COVER SETOUT TABLE

POINT No.	EASTING (m)	NORTHING (m)	ELEVATION (m)
51	489567.95	7293473.16	499.43
52	489601.06	7293472.85	498.69
53	489637.52	7293465.88	498.08
54	489690.17	7293444.41	495.52
55	489726.54	7293448.53	489.63
56	489738.48	7293444.80	488.75
57	489758.35	7293412.39	487.37
58	489784.82	7293405.08	485.57
59	489802.21	7293377.16	483.96
60	489791.21	7293330.27	482.19
61	489758.62	7293286.82	475.47
62	489676.94	7293284.83	474.55
63	489626.19	7293295.71	477.31
64	489591.77	7293304.57	479.75

LANDFILL EXPANSION COVER SETOUT TABLE

POINT No.	EASTING (m)	NORTHING (m)	ELEVATION (m)
65	489559.53	7293318.75	482.52
66	489531.33	7293346.90	486.58
67	489534.29	7293387.50	496.72
68	489724.71	7293289.26	475.87
69	489725.99	7293293.93	476.32
70	489711.45	7293302.56	478.31
71	489714.28	7293306.66	478.17
72	489695.23	7293309.54	480.27
73	489696.56	7293314.34	480.16
74	489682.18	7293312.55	481.72
75	489683.96	7293317.26	481.65
76	489666.07	7293325.18	483.86
77	489667.79	7293329.94	483.85
78	489600.97	7293346.22	490.76

LANDFILL EXPANSION COVER SETOUT TABLE

POINT No.	EASTING (m)	NORTHING (m)	ELEVATION (m)
79	489603.65	7293350.45	490.62
80	489593.60	7293352.67	491.79
81	489594.44	7293357.83	491.81
82	489572.75	7293361.62	494.03
83	489574.30	7293366.55	494.00
84	489538.18	7293393.08	498.50
85	489542.55	7293395.50	498.31
86	489531.58	7293405.07	497.84
87	489536.07	7293407.35	497.93
88	489788.35	7293334.38	482.00
89	489752.02	7293325.76	485.61
90	489753.53	7293330.52	485.46
91	489719.47	7293355.10	490.00
92	489721.49	7293360.54	489.97

LANDFILL EXPANSION COVER SETOUT TABLE

POINT No.	EASTING (m)	NORTHING (m)	ELEVATION (m)
93	489699.13	7293357.25	492.28
94	489699.27	7293362.25	492.21
95	489668.23	7293375.89	495.83
96	489669.81	7293380.94	495.71
97	489603.34	7293394.76	501.00
98	489618.34	7293395.21	501.00
99	489578.65	7293394.17	501.00
100	489548.28	7293404.59	501.00
101	489573.29	7293469.42	501.00
102	489635.67	7293454.16	501.00
103	489714.95	7293401.62	501.00
104	489738.45	7293390.50	494.50
105	489760.08	7293379.14	494.50
106	489749.73	7293366.35	494.50

LANDFILL EXPANSION COVER SETOUT TABLE

POINT No.	EASTING (m)	NORTHING (m)	ELEVATION (m)
107	489731.20	7293377.24	494.50
108	489708.46	7293390.28	501.00
109	489668.83	7293400.63	501.00
110	489579.34	7293395.89	501.46
111	489623.51	7293398.68	501.85
112	489669.36	7293401.96	501.38
113	489709.66	7293392.38	501.60
114	489731.60	7293378.00	494.71
115	489749.42	7293367.36	494.92
116	489758.65	7293378.94	494.92
117	489737.98	7293389.65	494.51
118	489713.63	7293399.31	501.60
119	489681.36	7293423.94	501.00
120	489635.17	7293451.89	501.58

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
1	2021-06-29	ISSUED FOR CONSTRUCTION	DB	TDR	KAB	KAB
0	2020-06-24	ISSUED FOR CONSTRUCTION	DB	MR	KAB	KAB
A	2020-05-29	ISSUED FOR REVIEW	DB	MR	KAB	KAB

SEAL

PERMIT TO PRACTICE
GOLDER ASSOCIATES LTD.
Signature
Date 29 JUN 2021
PERMIT NUMBER: P 049
NT/NU Association of Professional Engineers and Geoscientists

CLIENT
LUPIN MINES INCORPORATED

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MEMBER OF WSP
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PROJECT
LANDFILL EXPANSION DETAILED DESIGN
LUPIN MINE CLOSURE
NUNAVUT, CANADA

TITLE
PROPOSED LANDFILL EXPANSION AND COVER

PROJECT NO.	CONTROL	REV.		DRAWING
19136158	0001	1	1 of 2	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

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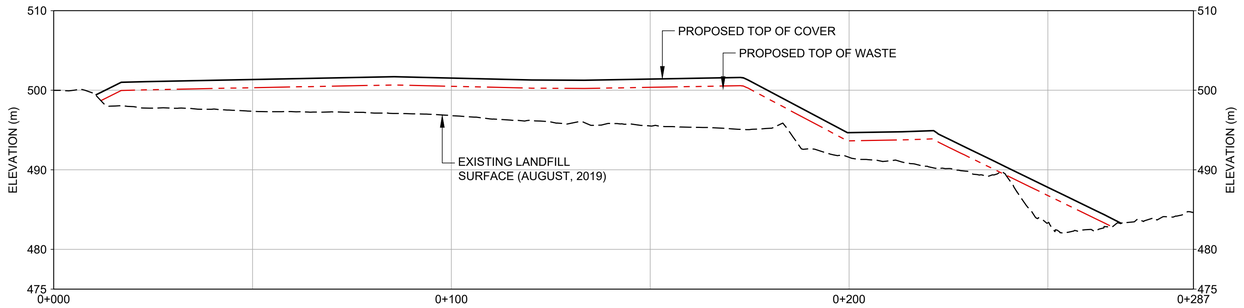
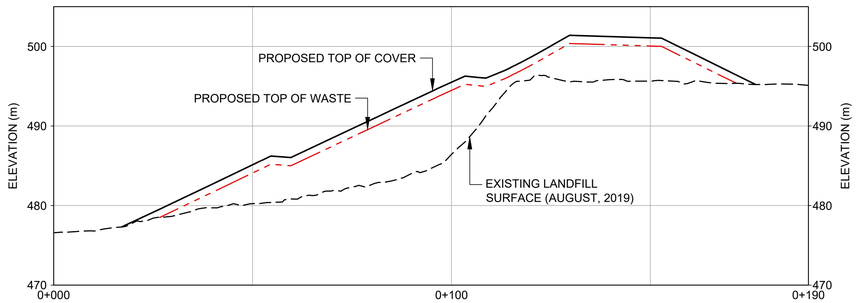


SCALE 1:750 m, 2 X V.E. — A-1 — CROSS-SECTION A-A'



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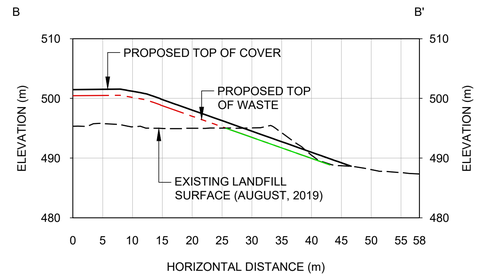
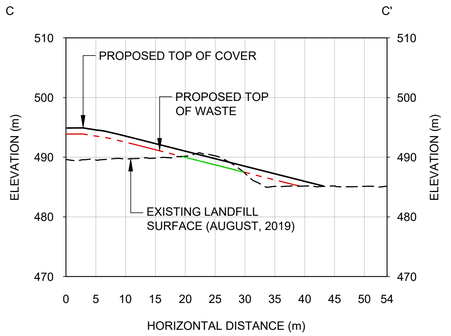


SCALE 1:500 m — B-1 — CROSS-SECTION B-B'



SCALE 1:500 m — C-1 — CROSS-SECTION C-C'

LEGEND

- PROPOSED TOP OF COVER IN SECTION
- PROPOSED TOP OF WASTE / WASTE ROCK IN SECTION
- PROPOSED BASE REGRADE
- EXISTING LANDFILL SURFACE (AUGUST, 2019)

MATERIAL ZONATION

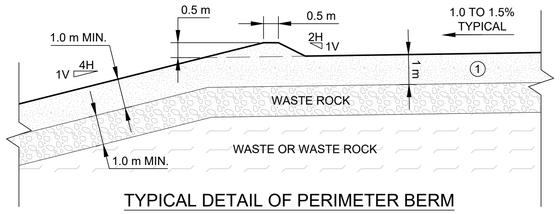
- (1) ESKER SAND AND GRAVEL
- (2) 10 kg EROSION PROTECTION
- (3) 25 kg EROSION PROTECTION
- NON-WOVEN GEOTEXTILE

NOTE(S)

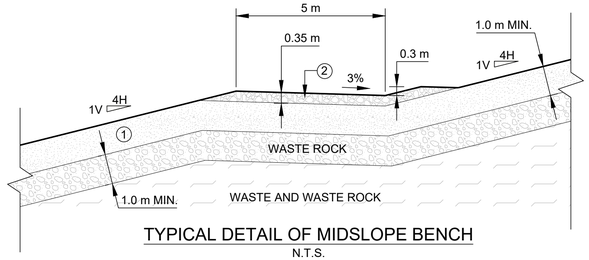
1. REFER TO DRAWING 1 FOR LOCATIONS OF CROSS-SECTIONS, PERIMETER BERMS, DRAINAGE CHUTES AND STILLING BASINS.
2. GEOTEXTILE TO BE NON-WOVEN NEEDLE-PUNCHED MINIMUM 350 g/m^2.
3. 10 kg EROSION PROTECTION TO HAVE D_{50} OF 190 mm MINIMUM AND MAXIMUM SIZE 350 mm.
4. 25 kg EROSION PROTECTION TO HAVE D_{50} OF 260 mm MINIMUM AND MAXIMUM SIZE 450 mm.

REFERENCE(S)

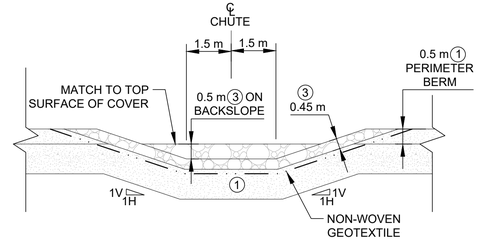
1. EXISTING GROUND TOPOGRAPHY FROM STANTEC, SURVEYED AUGUST 23 TO 25, 2019.



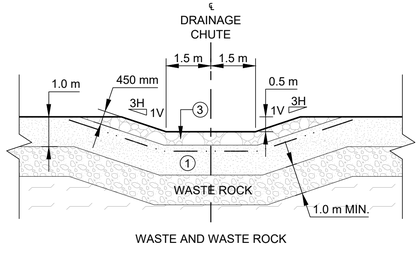
TYPICAL DETAIL OF PERIMETER BERM
N.T.S.



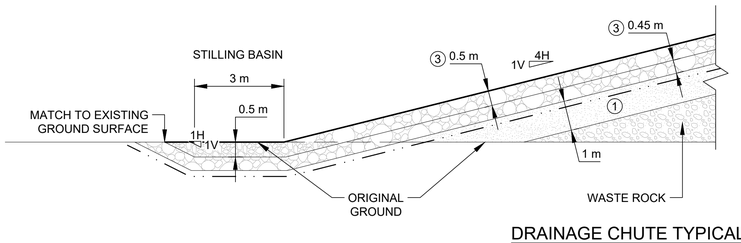
TYPICAL DETAIL OF MIDSLOPE BENCH
N.T.S.

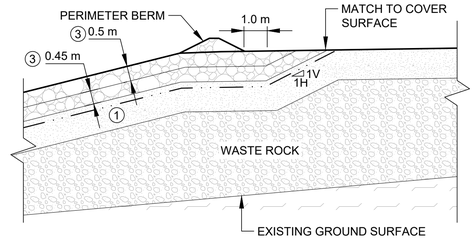


SECTION OF ENTRANCE TO DRAINAGE CHUTE 1
N.T.S.



DRAINAGE CHUTE TYPICAL CROSS-SECTION
N.T.S.





DRAINAGE CHUTE TYPICAL PROFILE 1
N.T.S.

0 20 40
1:500 METRES

0 25 50
1:750 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
1	2021-06-29	ISSUED FOR CONSTRUCTION	KAB	TDR	KAB	KAB
0	2020-06-24	ISSUED FOR CONSTRUCTION	KAB	MR	KAB	KAB
A	2020-05-29	ISSUED FOR REVIEW	KAB	MR	KAB	KAB

SEAL

PERMIT TO PRACTICE GOLDER ASSOCIATES LTD.
Signature
Date 29 JUNE 2021
PERMIT NUMBER: P 049
NT/NU Association of Professional Engineers and Geoscientists

CLIENT
LUPIN MINES INCORPORATED

CONSULTANT
GOLDER
MEMBER OF WSP
GOLDER ASSOCIATES LTD.
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MISSISSAUGA, ONTARIO, L5N 7K2
CANADA
[+1] (905) 567-4444
www.golder.com

PROJECT
LANDFILL EXPANSION DETAILED DESIGN
LUPIN MINE CLOSURE
NUNAVUT, CANADA

TITLE
PROPOSED LANDFILL EXPANSION SECTIONS AND DETAILS

PROJECT NO.	CONTROL	REV.		DRAWING
19136158	0001	1	2 of 2	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 — 25 mm

Aboriginal Affairs and Northern Development Canada | Affaires autochtones et Développement du Nord Canada

MEMORANDUM OF UNDERSTANDING

FOR A FRAMEWORK TO CO-OPERATE AND COORDINATE EFFORTS FOR WATER MANAGEMENT, LICENSING AND ENFORCEMENT IN THE NUNAVUT SETTLEMENT AREA

BETWEEN:

THE NUNAVUT WATER BOARD (THE NWB)

AND:

THE DEPARTMENT OF ABORIGINAL AFFAIRS AND NORTHERN DEVELOPMENT CANADA (AANDC)

PREAMBLE

WHEREAS the NWB and AANDC (the Parties) have interrelated regulatory co-management powers and duties under the *Nunavut Land Claims Agreement (NLCA)* and the *Nunavut Waters and Nunavut Surface Rights Tribunal Act (NWNSRTA)*.

WHEREAS the NWB and AANDC are establishing a non-binding cooperative management framework to assist in discharging their respective water management, licensing and enforcement mandates efficiently and effectively.

WHEREAS this initiative must not fetter the statutory authority, discretion, powers or functions of either the NWB or AANDC. Likewise, it must not improperly influence any particular administrative process or decision before any statutory actor.

THEREFORE, THE PARTIES AGREE AS FOLLOWS:

1.0 COORDINATION ACTIVITIES AND PROCESSES

1.1 All coordination activities and processes under this MOU shall:

(a) respect the authority and reflect the decision-making powers of AANDC's Minister as set out in the *NWNSRTA*;

(b) establish and implement efficient coordination mechanisms to: streamline procedures and policies; minimize duplication of administrative functions, technical assessment (where appropriate) and assessment; implement strategic water management initiatives; and provide consistent direction to stakeholders on any jurisdictional issues;

(c) support positive interaction and open communication between the personnel responsible for water management in Nunavut and ensure consistent dialogue and communication between the Parties on water management, licensing, technical, enforcement and financial issues;

(d) work together to improve how compliance with water licensing terms and conditions is verified in support of inspections, licensing and enforcement activities;

(e) work together to improve governance, transparency and involvement of stakeholders in the design, implementation and monitoring of water licenses;

(f) work together on water and waste education initiatives and enhance the information and education on strategic water management initiatives to the public;

(g) work cooperatively to assess needs and to modernize the technological support systems in place for water license administration;

(h) work together under the MOU in a manner that is consistent with the *NLCA* and give due regard and weight to Inuit, customs and knowledge; and

(i) improve support for national efforts on water management issues as they relate to the North.

2.0 LABORATORY SERVICES

2.1 The Head of Laboratory Services for AANDC will continue to be the "Analyst" as defined in the *NWNSRTA* and as appointed by the Minister of AANDC.

3.0 REPORTING

3.1 Each of the Parties will also develop internal mechanisms to document and track their progress in respect of coordination initiatives adopted under this MOU and will provide a progress report on these initiatives during the Parties' bi-annual meeting.

4.0 RESOURCE COMMITMENT

4.1 The costs of the NWB shall be the responsibility of AANDC. The NWB shall prepare an annual budge, subject to review and approval by AANDC.

5.0 PRIMARY CONTACTS

The primary contacts for the Parties under this MOU are as follows:

(a) For Governance or Executive matters:

NWB Contact	AANDC Contact
Executive Director PO Box 119 Gjoa Haven, NU X0B 1J0	Regional Director General PO Box 2200 Iqaluit, NU X0A 0H0
Tel: 867-360-6338 Fax: 867-360-6369 Email: dionne@nuanvutwaterboard.org	Tel: 867-975-4501 Fax: 867-975-4560 Email: robin.aitken@aandc.gc.ca

(b) For matters related to licence applications, or licensing process:

NWB Contact	AANDC Contact
Manager of Licensing PO Box 119 Gjoa Haven, NU X0B 1J0	Manager, Water Resources PO Box 2200 Iqaluit, NU X0A 0H0
Tel: 867-360-6338 Fax: 867-360-6369 Email: licensing@nuanvutwaterboard.org	Tel: 867-975-4550 Fax: 867-975-4585 Email: david.abernethy@aandc.gc.ca

(c) For matters related to water licence compliance, inspection and/or enforcement:

NWB Contact	AANDC Contact
Director of Technical Services PO Box 119 Gjoa Haven, NU X0B 1J0	Manager, Field Operations PO Box 2200 Iqaluit, NU X0A 0H0
Tel: 867-360-6338 Fax: 867-360-6369 Email: dts@nunavutwaterboard.org	Tel: 867-975-4550 Fax: 867-975-4585 Email: bernie.macisaac@aandc.gc.ca

6.0 MEETINGS/BI-ANNUAL REVIEW

6.1 The Parties agree to meet in person at least twice annually (wherever possible, these meetings will be scheduled to coincide with other activities to minimize costs) to review the status of initiatives taken under this MOU and to undertake the joint planning necessary to review implementation issues and identify future initiatives necessary to comply with the spirit and intent of this MOU.

IN WITNESS WHEREOF, the Parties to this Memorandum of Understanding have signed on the 20 day of April, 2012.

Thomas Kabloona

Chairman
Nunavut Water Board

Janet King

Assistant Deputy Minister,
Northern Affairs Organization
Aboriginal Affairs and Northern
Development Canada

TECHNICAL MEMORANDUM

DATE August 04, 2021 **Reference No.** 20446521-005-TM-Rev0-1000

TO Karyn Lewis
Lupin Mines Inc.

FROM Ken Bocking, P.Eng., Dionne Filiatrault, P.Eng. **EMAIL kbocking@golder.com, dfiliatrault@golder.com**

SUPPLEMENTAL INFORMATION ON THE DESIGN OF THE DOME AND THE LANDFILL

1.0 INTRODUCTION

On July 22, 2021, an online meeting was held to discuss, amongst other things, the basis of the design for the waste rock dome and the landfill. The discussion was summarized in minutes. It was agreed that some supplemental information should be provided on several points regarding the designs. These points were highlighted in the minutes. The required information is provided in the following sections.

2.0 HYDROLOGIC DESIGN OF DOME CHUTES

The dome incorporates 6 chutes to carry runoff from the top surface down to the toe of the dome. For the design of the chute capacity and erosion protection sizing, a presumptive high flow of 1.0 m^3/sec. was used. CIRNAC requested that this flow be related to a design storm or freshet flow.

The top surface of the dome has an area of approximately 8 hectares. On average, the contributory area for each chute is about 1.33 hectares. The nearest meteorological station for which intensity - duration-frequency (IDF) curves are available is Fort Reliance, Northwest Territories. The IDF curves are attached for information. For the minimum collection time of 5 minutes, the intensity that corresponds to a 100 year return rainstorm is 105 mm/hr. or 0.029 mm/sec. For the 1.33 hectare contributory area, the expected flow down each chute would be about 0.39 m^3/sec. In other words, the return period for a storm that would generate a flow of 1 m^3/sec. considerably exceeds 100 years. A freshet from spring melting is not expected to generate such intense flows.

3.0 REASONING FOR NO EROSION PROTECTION ON DOME SIDESLOPES OR PERIMETER BERMS

The sideslopes of the dome will be covered by sand and gravel esker material at a design slope of 10:1 (H:V). No erosion protection will be placed on the sideslopes. It is recognized that erosion rilling could occur if concentrated runoff was to spill over from the top surface onto the sideslopes and that is why berms have been included around the perimeter of the top surface, so that runoff from the top surface will be intercepted and directed into one of the erosion protected chutes. The sideslopes are not expected to erode from the sheet runoff that will result from snow melting or rainfall on the sideslopes themselves. This is based on observations of the performance of slopes on dams constructed with well graded sand and gravel. One such slope stood up well over the course of about 15 years of annual inspections, notwithstanding the fact that it was much steeper at 2:1 (H:V).

No erosion protection is planned to be placed on the inside of the esker berm around the perimeter of the top surface of the dome. The slope along the inside of the berms towards the inlet of the chutes is very gentle, so the flow velocities will be slow. It is noted that the esker cover on the Tailings Containment Area (TCA) has not eroded even though it typically slopes at roughly 1%.

4.0 STILLING BASIN DESIGN AND FLOW AWAY FROM THE TOE OF THE DOME

A stilling basin has been incorporated at the base of each of the chutes. The 10% slope on the chutes will result in supercritical (i.e., high velocity, shallow depth) flow conditions. The chute erosion protection as been sized for the high velocities. The stilling basins are designed to force a hydraulic jump which will result in subcritical (low velocity) flow exiting the stilling basins and flowing over original ground. The stilling basins are designed to be imbedded 0.5 m into original ground to contain the hydraulic jumps.

It is intended that water will flow away from the toe of the esker cover, not along the toe. In general, the natural topography will result in water flowing radially away from the toe of the dome. The final ground surface is currently obscured by the existing waste rock, which will be removed. If there are places where the original ground surface would otherwise result in flow along the toe, this will be corrected as a field fit by constructing ditches or swales as necessary. It is noted that a Golder earthworks inspector will be on site later in the fall to ensure that appropriate drainage is achieved.

5.0 LANDFILL GRADING

The current (Rev 1) drawings for the landfill were attached to the minutes for the meeting.

Demolition waste and any other non-hazardous waste is currently being placed into the existing landfill as needed. The landfill design requires that the final surface of the waste to be graded, following which a layer of waste rock at least 1.0 m thick is to be spread on top of the waste. After the waste rock layer is brought to final grade, the 1.0 m esker cover will be spread on top. The grading of the waste, the waste rock and the esker cover will all be accomplished using dozers. This will have the effect of compacting the material and infilling voids.

6.0 CLOSURE

We trust the information provided in this memo meets your current needs. Please contact the undersigned should you require clarification.

Golder Associates Ltd.

REGISTERED PROFESSIONAL ENGINEER
K. A. BOCKING
LICENSEE
NWT.
04 Aug 2021.

Dionne Filiatrault, P.Eng.
Project Manager

Ken Bocking, P.Eng
Principal

PERMIT TO PRACTICE
GOLDER ASSOCIATES LTD.
Signature Ken Bocking
Date 04 Aug 2021
PERMIT NUMBER: P 049
NT/NU Association of Professional Engineers and Geoscientists

KAB/DF/es/rd

Attachment: IDF Curve for Fort Reliance, NWT.

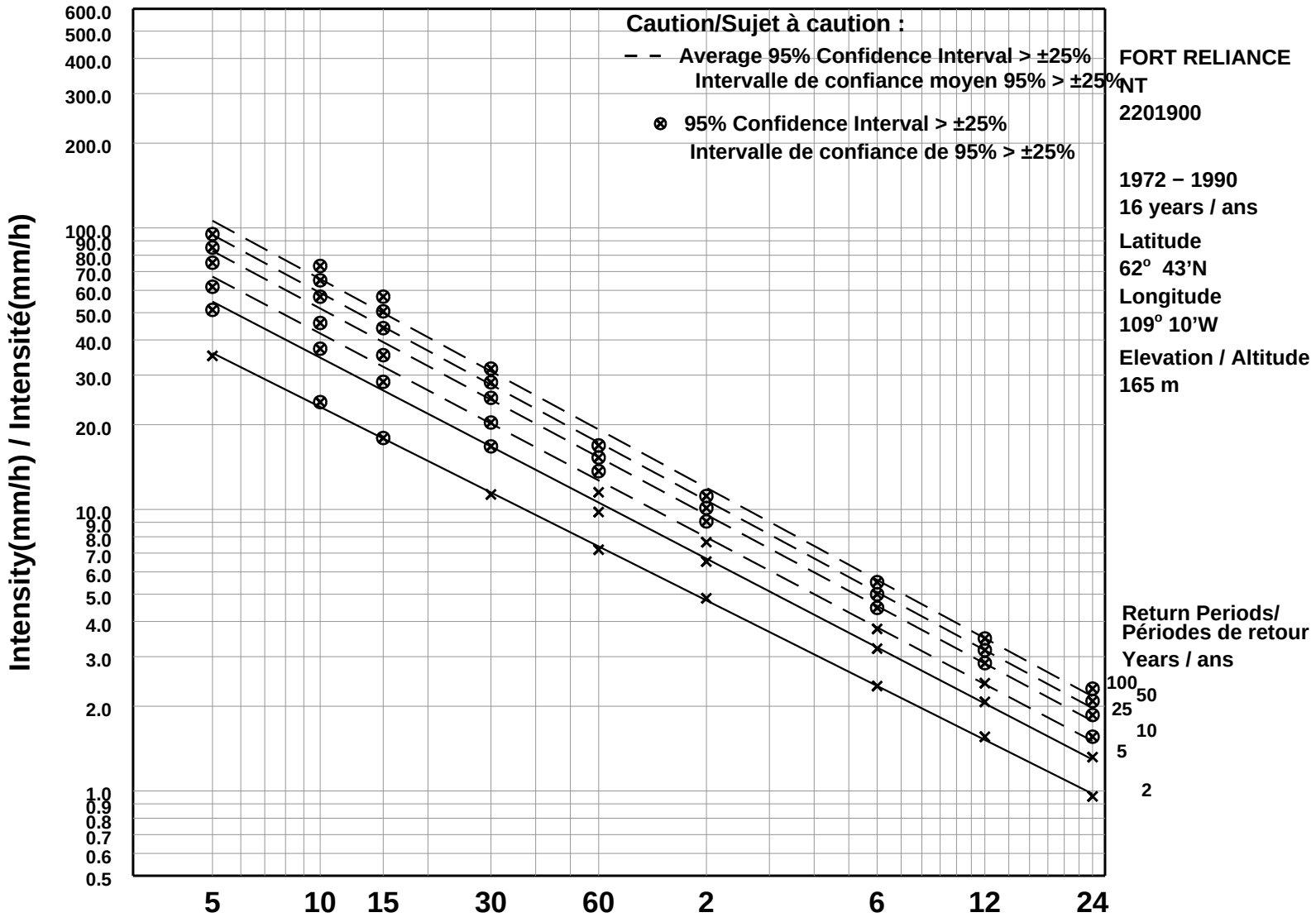
ATTACHMENT

IDF Curve for Fort Reliance, NWT.

Short Duration Rainfall Intensity−Duration−Frequency Data

2014/12/21

Données sur l'intensité, la durée et la fréquence des chutes de pluie de courte durée



Environment Canada Environnement Canada

Canada