October 30th, 2020

Mackenzie Valley Land and Water Board
P.O. Box 2130
Yellowknife, NT
X1A 2P6

Attention: Mavis Cli-Michaud, MVLWB Chair

Re: 2020 ANNUAL GEOTECHNICAL REPORT and ACTION PLAN for Con Mine

Dear Ms. Cli-Michaud:

As required under Part F, Condition 7 of Water License MV2017L8-0008, As amended by the compliance date change request approval dated July 28th, 2020. The Annual Geotechnical Inspection of Miramar Northern Mining Ltd. (MNML) – Con Mine was carried out by Harrison Roberts, Geotechnical Engineer from Golder Associates, with the support of Chad Mundle P.Eng, Geotechnical Engineer on August 28th and 31st, 2020. He was accompanied by Dwight Grabke, Environmental Manager, MNML. MNML is pleased to provide the corresponding report and action plan which aims to address recommendations provided in the Annual Geotechnical report. An electronic copy of the 2020 Golder Associates Annual Geotechnical report accompanies this submission.

Although no significant geotechnical concerns were identified during the inspection or noted within the Annual Geotechnical Report. A number of Maintenance, Monitoring, Operational, and further study/assessment recommendations have been made. MNML has included the following three tables to summarize the planned actions to address each of the recommendations which were provided in 2020 or those that are unchanged or remain to be addressed from previous inspections.
<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
<th>2020 Status</th>
<th>Updated Recommendation</th>
<th>2020/2021 MNML Action Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td><strong>Dam E</strong> – The alignment of the pipeline between C1 Shaft and Middle Pud be moved such that it no longer traverses the dam.</td>
<td>New</td>
<td>New for 2020.</td>
<td>MNML will engage further with the Engineer of Record as to possible alternatives including re-alignment of water management pipelines to address dam stability concerns. In some instances re-alignment may not be achievable or practical and another form of mitigation may be more appropriate.</td>
</tr>
<tr>
<td>2020</td>
<td><strong>Dam 3 West</strong> – The alignment of the pipelines between the sumps (SNP 25-9 and SNP 40-9) and Middle Pud be moved such that it no longer traverses the dam.</td>
<td>New</td>
<td>New for 2020.</td>
<td>MNML will engage further with the Engineer of Record as to possible alternatives including re-alignment of water management pipelines to address dam stability concerns. In some instances re-alignment may not be achievable or practical and another form of mitigation may be more appropriate.</td>
</tr>
<tr>
<td>2019</td>
<td><strong>Upper Pud Cover</strong> – If monitoring of cover trials is no longer required, the small area with exposed tailings is to be backfilled with rockfill, similar in particle size distribution specified in the cover design (SRK 2012).</td>
<td>Completed</td>
<td>MNML Placed rockfill in 2020.</td>
<td>No further maintenance action required, recommendation closed.</td>
</tr>
<tr>
<td></td>
<td><strong>Hazardous Waste Disposal Area Cover</strong> – isolated pockets of vegetation should be removed.</td>
<td>Incomplete</td>
<td>Remove larger plants (tree and shrub species) if they are observed.</td>
<td>MNML completed some vegetation management on the HWDA in 2020 and will continue these efforts going forward.</td>
</tr>
<tr>
<td>2018</td>
<td><strong>Middle Pud Cover</strong> - Sinkholes are to be backfilled with rockfill material, similar in particle size distribution specified in the cover design (SRK 2012).</td>
<td>Incomplete</td>
<td>East of Middle Pud Pond - Original recommendation still applies.</td>
<td>See response to Table 3 – Item 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Completed</td>
<td>East of HWDA – MNML placed rockfill in 2019.</td>
<td>No further maintenance action required, recommendation closed.</td>
</tr>
<tr>
<td>2017</td>
<td><strong>Taylor Road Dam &amp; Dam 1 North</strong> - Sinkholes observed in the backfilled sumps are to be backfilled to minimize further erosion of material.</td>
<td>Completed, but ongoing</td>
<td>Taylor Road Dam – MNML had placed backfill in 2019. One small sinkhole observed in 2020 to be backfilled in a similar manner.</td>
<td>MNML will continue to monitor this area for sinkholes, applying periodic backfill as specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Completed</td>
<td>Dam 1 North – No further action needed.</td>
<td>No further maintenance action required, recommendation closed.</td>
</tr>
<tr>
<td>Recommendation</td>
<td>2020 Annual Geotechnical Inspection Update</td>
<td>2020/2021 MNML Action Plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------</td>
<td>-------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2020</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hazardous Waste Disposal Area</td>
<td></td>
<td>MNML has identified these areas and will continue to observe, and place additional clean country rock cover as appropriate.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MNML to monitor cover for changes in the amount or location of tailings migrating through the cover.</td>
<td>New</td>
<td>MNML completed some vegetation management on the HWDA in 2020 and will continue these efforts going forward.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MNML to monitor cover for growth of larger plans (tree and shrub species. If they are observed, maintenance is required.</td>
<td>New for 2020.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2018</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle Pud Cover - Once sinkholes are backfilled, they are to be monitored for signs of further settlement and sinkholes.</td>
<td>Ongoing</td>
<td>See response to Table 3 – Item 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dam 1 - the backfilled sump be monitored as part of MNML’s regular TCA inspections</td>
<td>Ongoing</td>
<td>MNML will continue to monitor this area for sinkholes, applying periodic backfill as specified.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2017</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taylor Road Dam - slope movement cracks along the internal access road at the downstream toe of the dam are to be monitored as part of the regular TCA inspections, even after the cracks are covered and the area regraded. The inspections are to note if the cracks increase in size and/or surface water drainage is observed to be flowing into the cracks. Displacements and cracking are to not be permitted to grow such that it affects the dam. If cracking is observed along the downstream slope of the dam, additional inspections by a Professional Geotechnical Engineer may be required.</td>
<td>Ongoing</td>
<td>MNML will continue to monitor this area as part of the weekly TCA inspections.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taylor Road Dam – differential settlement cracks in the vicinity of the downstream toe of the Taylor Road Dam, in the area of the backfilled sump, are to be monitored, even after the cracks are covered and the area regraded.</td>
<td>Ongoing</td>
<td>MNML will continue to monitor this area as part of the weekly TCA inspections.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taylor Road Dam - the crest and downstream slope are to be monitored for evidence of instability or erosion.</td>
<td>Ongoing</td>
<td>MNML will continue to monitor this area as part of the weekly TCA inspections.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Recommendation</td>
<td>Description</td>
<td>2020 Annual Geotechnical Inspection Update</td>
<td>2020/2021 MNML Action Plan</td>
</tr>
<tr>
<td>------</td>
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<td>-------------</td>
<td>------------------------------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td>2017</td>
<td>Taylor Road Dam and Dam 1 North</td>
<td>visual monitoring of backfilled sumps during spring freshet and following heavy rainfalls for signs of further erosion or the occurrence of new sinkholes.</td>
<td>Ongoing</td>
<td>Taylor Road Dam – None. Original recommendation still applies. MNML will continue to monitor this area as part of the weekly TCA inspections.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Update</td>
<td>Dam 1 North – Placement of backfill complete. Original recommendation for monitoring still applies. MNML will continue to monitor this area as part of the weekly TCA inspections.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Updated Recommendation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Taylor Road Dam Southwest</td>
<td>inspect the dam for signs of instability or erosion, particularly during freshet and following heavy rainfall events.</td>
<td>Ongoing</td>
<td>None. Original recommendation still applies. MNML will continue to monitor this area as part of the weekly TCA inspections.</td>
</tr>
<tr>
<td></td>
<td>Upper Pud Spillway</td>
<td>- the performance of the spillway swale and spillway are to be monitored during the 2018 spring freshet.</td>
<td>Ongoing</td>
<td>Original recommendation still applies, but spillway should also be inspected during and following intense rainfall events. If no further displacements observed in 3 sequential AGIs, maintenance should be performed. MNML will continue to monitor this area as part of the weekly TCA inspections.</td>
</tr>
<tr>
<td></td>
<td>The Robertson Air Vent</td>
<td>is to be monitored for signs of settlement. If further settlement is observed, additional backfill should be placed in accordance with the backfill design (SRK 2007).</td>
<td>Ongoing</td>
<td>None. Original recommendation still applies. MNML will continue to monitor this area as part of the weekly TCA inspections.</td>
</tr>
<tr>
<td></td>
<td>The Robertson Shaft Cap</td>
<td>is to be monitored for settlement. If settlement is observed, it should only be backfilled in accordance with the cap design (Williams Engineering 2011).</td>
<td>Ongoing</td>
<td>None. Original recommendation still applies. MNML will continue to monitor this area as part of the weekly TCA inspections.</td>
</tr>
<tr>
<td>2015</td>
<td>Dam 3 Central</td>
<td>Crack along upstream crest is to be monitored. As the dam does not retain water, there is limited concern with the dam in its current state. However, if the water level in Middle Pud were to increase to a level where the dam would again function as a water retaining structure, backfilling or some other form of rehabilitation could be required.</td>
<td>Ongoing</td>
<td>None. Original recommendation still applies. MNML will continue to monitor this area as part of the weekly TCA inspections.</td>
</tr>
<tr>
<td>Year</td>
<td>Description</td>
<td>2020 Annual Geotechnical Inspection Update</td>
<td>2020/2021 MNML Action Plan</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>------------------------------------------</td>
<td>----------------------------</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>MNML complete a study to evaluate options for an engineered conveyance of water from the Upper Pud Spillway to the Middle Pud Pond</td>
<td>New</td>
<td>MNML agrees that a solution should be implemented in this area, but does not believe and formal options analysis is required. We have approved engineered designs on hand for the existing engineered drainage channel network within the TCA areas on site which would be suitable for this application. This area is within the confines of the Middle Pud TCA with barricades in place to identify the area of concern. MNML does not believe this poses an immediate risk to the environment, public or project. MNML currently has funds budgeted in 2022, and is planning to initiate this cover maintenance item during the 2022 construction season.</td>
<td></td>
</tr>
<tr>
<td>Hazardous Waste Disposal Area – Engage with cover designer for their recommendations with respect to vegetation growth.</td>
<td>New</td>
<td>MNML has reached out to the design firm to determine the appropriate threshold for vegetation management.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In respect to the 2020 Annual Geotechnical Inspection, this summarizes the action required on site. Please contact the writer at (867) 766-5300 ext. 5317 or by e-mail at Dwight.Grabke@Newmont.com if you have any questions about the contents of this plan.

Sincerely,

[Signature]

Dwight Grabke, Environmental Manager
Miramar Northern Mining Ltd. – Con Mine

Distribution:
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Tyree Mullaney, Regulatory Officery – Mackenzie Valley Land & Water Board
David-Scott-McQuinn, Water Resource Officer – GNWT Department of Environmental and Natural Resources
Heather Beck, Water Resource Officer – GNWT Department of Environmental and Natural Resources
Mark Aussenegg, Enforcement Officer – Environment Canada
Chad Mundle P.Eng. Golder Associates Ltd.
Bjorn Weeks, P.Eng. Golder Associates Ltd.

Enclosure (1)
2020 Annual Geotechnical Inspection, Golder Associates Ltd. 27 October 2020.
Distribution List

1 electronic copy – Miramar Northern Mining Limited
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1.0 INTRODUCTION

1.1 Site Background

Con Mine is an inactive underground gold mine located in Yellowknife, NT. Mining operations ceased in 2003 and reclamation of the mine has been ongoing since that date. The mine is owned by Miramar Northern Mining Ltd. (MNML), a division of the Newmont.

Over the life of the mine, tailings were deposited in seven Tailing Containment Areas (TCAs): Upper Pud, Middle Pud, Lower Pud, Con Pond, Negus Pond, Crank Lake, and Neil Lake. The locations of these TCAs are shown in Figure 1. Dams were constructed to contain tailings in Upper and Middle Pud, whereas in the remaining TCAs (identified as the historic TCAs), tailings are entirely retained within topographic depressions and do not involve engineered dams. The historic TCAs are Con Pond, Negus Pond, Crank Lake, Neil Lake, and Lower Pud. Con Pond and Negus Pond had previously stored hazardous waste but have been rehabilitated with the hazardous wastes removed and backfilled with clean rockfill (MNML 2014). Crank Lake, Neil Lake, and Lower Pud have been covered with peat and/or fine-grained material and vegetation now covers the majority of these areas.

The hazardous waste once stored in Con and Negus Pond was processed to improve its chemical stability and any remaining residue was relocated to new engineered disposal area located in the Middle Pud TCA. The location of the Hazardous Waste Disposal Area (HWDA) is shown in Figure 1. Construction of the cover for the HWDA was completed in the fall of 2015 (SRK 2016).

The principal water body retained in the TCAs is located in Middle Pud, as shown in Figure 1. A spillway conveys surface water runoff from Upper Pud into Middle Pud. A series of drainage channels collect surface water runoff from historic tailings areas located upstream of Middle Pud, and this runoff is also directed to the pond in Middle Pud. Furthermore, minewater from the underground is pumped to the surface and into Middle Pud for storage.

Water from Middle Pud is treated prior to discharge to the environment. This discharge takes place via a series of lakes located south of Lower Pud. For the historic TCAs, the tailings are either directly vegetated or covered with rockfill and/or peat, and drainage channels direct surface water flow to Middle Pud or Lower Pud either by gravity or pumping. Water flowing into Lower Pud is pumped into Middle Pud for treatment.

Openings to the underground mine are located along a north-south orientation, as seen in Figure 1. The openings that are grouped as the historic Negus and Rycon workings are located to the east of the current mine lease, with the C1 and Robertson group of openings located within the mine lease. All openings to the underground have either been capped or backfilled.

1.2 Scope of Work

Mine rehabilitation activities at Con Mine operate under a Water Licence (MV2017L8-0008) issued by the Mackenzie Valley Land and Water Board (MVLWB 2019). A condition of the licence is that the TCAs, Middle Pud TCA dams, and the HWDA be inspected annually by a Professional Engineer. MNML has engaged Golder Associates Ltd. (Golder) to complete the annual inspections of the TCAs, dams, and HWDA.

The scope of work for the annual inspection is as follows:

- meet with the designated representative of MNML to discuss work performed over the past year
- review the previous year’s annual inspection report
review survey data including:

- Middle Pud water elevations
- Middle Pud dam crest survey monuments

complete a visual inspection, in the presence of the MNML representative of:

- all site dams
- the HWDA
- tailings cover
- all closed openings to surface
- general mine lease for signs of subsidence

prepare a report summarizing the findings from the inspection and provide recommendations for future work or monitoring
2.0 BACKGROUND

2.1 Tailing Containment Areas

A total of 13 external and 8 internal dams retain tailings within Upper and Middle Pud. External dams retain tailings within the TCA from the environment and the internal dams divide Upper and Middle Pud. In Table 1, the names of the dams, the TCA that they are associated with, and whether they are internal or external are presented. Refer to Figure 1 for the location of the dams.

Table 1: List of External and Internal Dams

<table>
<thead>
<tr>
<th>TCA</th>
<th>External</th>
<th>Internal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Pud</td>
<td>Taylor Road Dam(^{(a)})</td>
<td>Dam A</td>
</tr>
<tr>
<td></td>
<td>Taylor Road Dam East</td>
<td>Dam B</td>
</tr>
<tr>
<td></td>
<td>Taylor Road Dam Southwest</td>
<td>Dam C</td>
</tr>
<tr>
<td></td>
<td>Taylor Road Dam West</td>
<td>Dam D</td>
</tr>
<tr>
<td></td>
<td>Dam 1 North</td>
<td>Dam E</td>
</tr>
<tr>
<td></td>
<td>Dam 1</td>
<td>Dam F</td>
</tr>
<tr>
<td>Middle Pud</td>
<td>Dam 2</td>
<td>Dam 4</td>
</tr>
<tr>
<td></td>
<td>Dam 2 North</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dam 3 West</td>
<td>Dam 5</td>
</tr>
<tr>
<td></td>
<td>Dam 3 Central</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dam 3 East</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dam 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dam 7</td>
<td></td>
</tr>
<tr>
<td>Lower Pud</td>
<td>Lower Pud Dam</td>
<td></td>
</tr>
</tbody>
</table>

\(^{(a)}\) Includes Taylor Road Dam Extension.

Lower Pud has a single structure: Lower Pud Dam; which does not retain tailings. The Lower Pud Dam is located at the south end of the Con Mine lease, as shown in Figure 1. It delineates the topographic divide between Lower Pud and the Meg-Keg-Peg Lake system to the south. Water is discharged downstream of the dam during water treatment, and the purpose of the dam is to divert any ponding water south and prevent it from flowing back into Lower Pud.

Lower Pud Dam is listed as an external dam because tailings in Lower Pud are upstream of the dam (to the north), and the Meg-Keg-Peg lake system is downstream to the south. Surface water within Lower Pud is directed north towards the downstream area of Dam 4, where along with surface water from Neil and Negus Lake TCAs, water is pumped into Middle Pud.

2.2 Dam Classifications

As outlined in the Canadian Dam Association guidelines (CDA 2013; 2014), the assessment of dam classifications includes the characterization of a hypothetical dam breach, irrespective of the likelihood of the occurrence of such an event. In previous AGIs, all dams on the site had been classified “Low” in terms of the consequence of failure. A Dam Safety Review (DSR) was initiated in 2019 and MNML is working with the DSR consultant to finalize this report and its recommendations, including the classifications for some of the dams (Stantec 2019). Golder has updated the classifications for some dams based on consideration of the draft DSR. A formal dam breach analysis has not been conducted for any of the dams.

Table 2 summarizes the dam classifications for the Con Mine dams from the 2020 AGI.
Table 2: Con Mine Dam Classifications

<table>
<thead>
<tr>
<th>TCA</th>
<th>Dam</th>
<th>Golder Dam Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Pud</td>
<td>Taylor Road Dam</td>
<td>Significant</td>
</tr>
<tr>
<td></td>
<td>Taylor Road Dam East</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Taylor Road Dam Southwest</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Taylor Road Dam West</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Dam 1</td>
<td>Significant</td>
</tr>
<tr>
<td></td>
<td>Dam 1 North</td>
<td>Significant</td>
</tr>
<tr>
<td></td>
<td>Dam A and B (2 dams)</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Dam C through F (4 dams)</td>
<td>Low</td>
</tr>
<tr>
<td>Middle Pud</td>
<td>Dam 2</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Dam 2 North</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Dam 3 East, West, and Central (3 dams)</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Dam 4</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Dam 5</td>
<td>Low</td>
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<td></td>
<td>Dam 6</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>Dam 7</td>
<td>Low</td>
</tr>
<tr>
<td>Lower Pud</td>
<td>Lower Pud Dam</td>
<td>Low</td>
</tr>
</tbody>
</table>

For Taylor Road Dam, Dam 1, and Dam 1 North, the draft DSR suggested an alternative dam classification based on environmental consequence of a failure of any of these dams on Kam Lake. Based on this consideration, Golder has increased the classification of these dams from ‘Low’ to ‘Significant’. Given the fishing advisory for Kam Lake (GNWT 2019), Golder considered the definition of ‘significant’ consequence is applicable for these dams.

2.3 Hazardous Waste Disposal Area

Up until around 1970, refractory ore at Con Mine was processed in a roaster in order to extract gold (Silke 2009). As a by-product, arsenic sludge and calcines were produced, which were placed in Con and Negus Ponds. In 1991, a pressure oxidation circuit (i.e., autoclave) was constructed that could process refractory ore, as well as reprocess the arsenic sludge and calcine. Although the sludge and calcine stored in Con and Negus Ponds were reprocessed using the autoclave and turned into a more stable arsenic compound, residual material which could not be processed through the autoclave during the reclamation required suitable disposal. This material was disposed of in the Hazardous Waste Disposal Area (HWDA).

The location of the HWDA is within the Middle Pud TCA catchment, to the east of Upper Pud, as shown in Figure 1. The engineering cover for the HWDA consists of the following, ordered according to its depth below ground surface (SRK 2016):

- Rockfill (0.5 m thick)
- Tailings Overliner (0.3 m thick)
- Bituminous geomembrane liner (Coletanche ES2)
Tailings underliner (0.15 m thick)
- Waste rock (thickness varies)
- Hazardous waste

The designer of the HWDA cover, (SRK Consulting (Canada) Inc.) identified specific monitoring requirements that could trigger the need for maintenance (SRK 2016). These are:
- Excess subsidence due to differential settlement resulting in ponding water; and
- Migration of tailings upwards through the rockfill (isolation barrier).

Although not specifically mentioned in the monitoring requirements, the HWDA cover was designed to discourage vegetation growth (SRK 2012a). This was because the area was to be excluded from future use and retained as a closed hazardous waste site.

### 2.4 Water Treatment

In 2020, MNML began water treatment on 5 June 2020 and ceased treatment on 31 August 2020 (MNML 2020). MNML treated and discharged 398,887 m³ of water in 2020. As per the Site’s current Water Licence and in keeping with historic practices, the treated water was discharged into the environment via the Meg, Keg, and Peg lake systems located south of the site and off the Con Mine lease.

For 2019, MNML treated and discharged 232,448 m³ of water between 5 June and 29 July 2019 (Golder 2020).
3.0 INSPECTION OBSERVATIONS

In the following sections, key observations from the inspection are summarized. Where recommendations are made, underlined text is used. All of these recommendations, as well as those still relevant from the 2019 inspection, are consolidated in a concordance table, which can be found in Section 1.0.

3.1 General Observations and Comments

The Annual Geotechnical Inspection (AGI) was carried out over two days: 28 and 31 August 2020 by Harrison Roberts, P.Eng., of Golder. MNML’s Environmental Manager, Mr. Dwight Grabke, P.Eng., was also present during the inspections.

During the inspection on 28 August 2020, the skies were overcast and with scattered periods of light rainfall. Less than 1 mm of rainfall fell throughout the day (Environment Canada 2020). The temperature was cool, with a daily mean of 11°C. The weather on 31 August also had overcast skies and cool air temperatures (daily mean of 7°C). No rain fell during the second day of the inspection on 31 August, but two days prior (29 August) 8 mm of rainfall fell.

MNML’s Water Licence requires that the annual geotechnical inspection be completed annually in June. For the past several years Chad Mundle, P.Eng. (Golder), completed the annual inspections, but was unable to travel to Yellowknife due to the COVID-19 pandemic. MNML request and was granted an extension for the AGI by the MWLWB, but by August Mr. Mundle was still unable to travel. Mr. Roberts, who is based in Yellowknife and has assisted with the AGI at Con Mine since 2018, was tasked with completing the AGI. Mr. Roberts was supported closely by Mr. Mundle for the 2020 AGI.

3.2 Upper Pud External Dams

3.2.1 Taylor Road Dam (including Taylor Road Dam Extension)

At the time of the inspection the dam appeared stable, with no visible evidence of settlement or slope movement since the last inspection. Ponded water was observed in the marsh area located downstream of the dam, which is north of the dam (Photograph A-1, Appendix A). The marsh area drains west to Kam Lake, via an excavated ditch. An internal mine access road separates the marsh area from the downstream toe of the dam.

During the 2017 AGI, issues downstream of the dam were observed, with sinkholes in areas of the backfilled sump, and a longitudinal crack along the internal access road. For the sinkholes, it was interpreted that fine-grained cover material placed on the backfill was migrating into the coarser rockfill below (Golder 2017). The sinkholes were backfilled in 2018, but two new sinkholes with a diameter of 200 mm or less and a depth of less than 50 mm were observed nearby during the 2019 AGI (Golder 2019a).

At the time of the 2020 inspection, backfill was observed in the location of the 2019 sinkholes. However, one small sinkhole was observed in the general vicinity of the placed backfill (Photograph A-4, Appendix A). The new sinkhole measured roughly 100 mm in diameter and was 50 mm deep, or less. Golder recommends that MNML backfill these new sinkholes in a similar manner to those completed in 2018 and 2019.

The sinkhole observed during the 2020 AGI, as well as the sinkholes and cracks observed during previous inspections, do not pose an immediate geotechnical concern as they are not located on the dam. However, Golder recommends that MNML continue to monitor the backfilled sump and covered internal access road for visual evidence of cracks and settlement as part of their regular TCA inspections. This monitoring is in addition to the monitoring of the dam’s crest and downstream slope.
In 2018 MNML also placed fill along the internal access road to minimize infiltration of water into the cracks. This fill diverted surface water runoff to the north. During the 2020 inspection, the fill was intact with no cracks (Photograph A-2, Appendix A), and vegetation was observed on the fill in the form of short grass.

3.2.2 Taylor Road Dam East

The dam appeared to be stable, with no visible evidence of erosion, settlement, or slope movement since the last inspection. No ponded water was observed at the downstream toe.

3.2.3 Taylor Road Southwest

The dam appeared to be stable, with no visible evidence of erosion, settlement, or slope movement since the last inspection. No water was observed at the downstream toe. Vegetation, in the form of short grass, was present on the dam’s downstream slope (Photograph A-7).

Between 2015 and 2016, an access road downstream of the dam was removed and a portion of the downstream slope was disturbed. As noted in the 2016 inspection, the upstream low permeability barrier did not appear to be affected and more importantly, the dam does not currently retain water (Golder 2016).

Although the role of the dam is limited, Golder recommends that MNML continue inspect the dam for signs of instability or erosion as part of their regular TCA inspections, particularly during freshet and following heavy rainfall events. Rehabilitation of the slope may be required if excessive erosion or slope movement is observed. While the growth of vegetation is expected to help reduce the potential for erosion, over time it will make it more difficult to observe the dam. The eventual development of deep-rooted vegetation at this dam is not expected to form a long-term risk to the dam, given its low height (less than 2 m), and the fact that it does not retain ponded water.

3.2.4 Taylor Road Dam West

The dam appeared to be stable, with no visible evidence of erosion, settlement, or slope movement since the last inspection. No ponded water was observed at the downstream toe.

3.2.5 Dam 1

The dam appeared to be stable, with no visible evidence of erosion, settlement or slope movement since the last inspection. No ponded water was observed at the downstream toe.

In the area of the backfilled sump, roughly 15 to 20 m downstream of the dam’s toe, a series of small holes were observed at the time of the inspection (Photograph A12, Appendix A). No ponding water was visible in the holes. These holes were first observed in 2018 and were interpreted to indicate the early stages of sinkhole formation, where the fine-grained cover placed on the backfill appeared to be migrating into the coarser rockfill below (Golder 2018). At the time of the 2020 inspection the sinkholes appeared similar in size to those observed in 2019. As the small holes are located in the backfilled sump and not on part of the dam, they are not of immediate geotechnical concern for dam stability.

Golder recommends that the backfilled sump be monitored by MNML as part of their regular TCA inspections. If the holes increase in size, they should be backfilled to minimize further erosion of the fine-grained material into the backfilled sump. Backfilling methodology can be manual placement (shovel) of fine granular material (e.g., 20 mm minus, with less than 5% weight of particles finer than 0.075 mm [No. 200 sieve]). The backfill should be covered by soil (e.g., silt and clay), with revegetation for erosion control.
3.2.6 Dam 1 North

The dam appeared to be stable, with no visible evidence of erosion, settlement, or slope movement since the last inspection. No ponded water was observed at the downstream toe.

During previous inspections, sinkholes were observed downstream of the dam in the area of the backfilled sump. The sinkholes were first observed in 2017 and interpreted to be a result of surface water runoff and snowmelt eroding the fine-grained soils into the large void spaces within the coarse sump backfill (Golder 2017). During the 2019 inspection, ponded water was observed in four of the sinkholes, but the source of the water was interpreted to be surface water runoff (Golder 2019a).

In 2019, Golder recommended that the sinkholes be backfilled to minimize further erosion of the fine-grained material into the backfilled sump. At the time of the 2020 inspection, the sinkholes had been backfilled and no new sinkholes were observed, although vegetation growth did make it difficult to observe completely (Photograph A14, Appendix A).

As the sinkholes were located in the backfilled sump and not part of the dam, they are not of immediate concern for dam stability. However, Golder recommends that MNML visually monitor the area as part of their regular TCA inspections.

3.3 Upper Pud Internal Dams

Internal Dam A through Dam F, as shown in Figure 1, divide the Upper Pud from Middle Pud. The crest and upstream slopes of these dams have been capped with rockfill, and the downstream slopes have been flattened or covered with rockfill.

At the time of inspection, the internal dams appear to be stable and there was no evidence of erosion, settlement, or slope movement since the last inspection. No seepage was observed at the downstream toe of the internal dams. The internal dams do not retain ponding water.

During the inspection, a 150 mm diameter (6 inch) diameter pipeline was observed to traverse Dam E (Photograph A-17, Appendix A). The pipeline was not yet commissioned, but MNML planned to use this pipeline to convey water pumped from the underground mine at C1 Shaft to a discharge location in Middle Pud.

Golder recommends that MNML move the pipeline alignment before it is put in service, such that it does not traverse the dam, possibly to the west of its current location where bedrock outcrops exist. The rupture of pipelines located on dam crests, was the root cause in at least two known cases of dam failure (ICOLD 2001). Moving a pipeline off of a dam eliminates a risk scenario. Although a low likelihood event in this case, the act of relocating the pipeline can completely eliminate a risk scenario, something that could not be accomplished by administrative controls (such as regular documented pipeline inspections), which can only reduce the likelihood of an event, but not eliminate it.

As shown in Figure 1, the non-hazardous waste disposal area is located downstream of Dams B and C. Materials such as steel and wood that cannot be salvaged are placed in the non-hazardous waste disposal area, and capped with clean rockfill. As such, the material placed in the area effectively buttresses the slopes of these dams (Photograph A15, Appendix A).

A culvert exists along the base of Dam F and was backfilled in 2013 (Golder 2014). The general area of the backfilled culvert was inspected, but there was no evidence for flowing water visible through the rockfill.
3.4 Upper Pud Spillway

At the time of the inspection the spillway was observed to generally be in good condition. The minor sloughing observed during previous inspections was still visible but appears to be maintaining similar dimensions and conditions between inspections. Water was flowing from Upper Pud via the swale located upstream, through the spillway and into Middle Pud. The flowing water was clear (Photograph A20, Appendix A). Vegetation is growing at the base of the spillway, between the spillway outlet in Middle Pud to the inlet in the swale in Upper Pud (Photographs A18 and A19, Appendix A).

During previous inspections, a crack and minor slough was observed along the western crest of the swale in Upper Pud, upstream of the spillway invert (Golder 2017; 2018). The crack initially appeared along the crest in the 2017 inspection, but in subsequent inspections in 2018 and 2019 a clearly defined crack was no longer visible. In 2019, the slope below the crack appeared to have settled into the swale, forming a crest where the crack had previously been observed (Golder 2019a). The likely cause of the crack and slough is consolidation of the underlying tailings in the area upstream of the spillway. The rate of this consolidation is expected to slow over time, which should limit the rate of crack propagation.

At the time of the 2020 inspection, no cracks were observed and the slough appeared similar to that observed during the 2019 AGI (Photograph A18). Golder recommends that MNML continue to monitor the upstream swale for cracks, slough, and settlement. In particular, the area should be inspected during and following significant climate events, such as intense rainfalls and during the annual spring freshet. When no further ground displacement is observed in the swale in three sequential AGIs, MNML should regrade the area.

Since the 2008 construction of the Upper Pud TCA spillway, the TCA no longer stores significant quantities of water. The surface of the TCA is graded towards the spillway and the invert of the spillway is roughly 3.4 m below the lowest crest elevation of the Upper Pud dams (Golder 2011).

3.5 Middle Pud External Dams

3.5.1 Dam 2
The dam showed no visible evidence of erosion, settlement, or slope movement since the last inspection. No water was observed at the downstream toe. Based on these observations, it appeared stable.

3.5.2 Dam 2 North
The dam showed no visible evidence of erosion, settlement, or slope movement since the last inspection. No water was observed at the downstream toe. Based on these observations, it appeared stable.

3.5.3 Dam 3 East
The dam showed no visible evidence of erosion, settlement, or slope movement since the last inspection. No water was observed at the downstream toe. Based on these observations, it appeared stable.

3.5.4 Dam 3 West
The dam showed no visible evidence of erosion, settlement, or slope movement since the last inspection. No water was observed at the downstream toe. Based on these observations, it appeared stable.

Two pipelines were observed to traverse the dam (Photograph B4 and B5, Appendix B). The pipelines are used to convey surface water runoff collected at sumps (SNP 25-9 and SNP 40-9) located west of the dam into Middle Pud.
Golder recommends that MNML move the pipeline alignment such that it does not traverse the dam, possibly to the west of its current location where bedrock outcrops exist. The rupture of pipelines located on dam crests, although a low likelihood event, was the root cause in at least two known cases of dam failure (ICOLD 2001). By moving the pipeline off the dam, a risk scenario is completely eliminated. If it is not practical to change the alignment, an engineering control should be evaluated. This could be (for example) the installation of a sleeve around the pipeline that would convey water safely off the dam if the internal pipeline were to fail. As an engineering control, this would reduce the risk associated with a failure, but could not completely eliminate the risk scenario.

3.5.5 Dam 3 Central

During the 2015 inspection, two small longitudinal cracks were observed along the upstream crest of the dam and water was observed at the upstream toe of the dam (Golder 2015). At the time of the 2020 inspection, the crack did not appear to have increased in size since previous inspections (Photograph B6, Appendix B). Some isolated ponding of water was observed upstream of the dam, close to the Middle Pud Rockfill Cover (Photograph B7, Appendix B), but not at its upstream toe. The source of the water is likely surface water runoff.

The cracking is likely due to differential settlement between the upstream crest and toe. Design drawings indicate that a vertical concrete wall, roughly 0.4 m thick, underlays the upstream crest (Golder 2006). Therefore, any settlement at the upstream toe will likely manifest as a tension crack, as the crest is retained by the concrete wall.

The mechanism driving the settlement of the upstream toe is uncertain, but it could either be due to simple consolidation of the underlying soils caused by the loading of the dam toe material, or freeze/thaw consolidation of the soil at the upstream toe, or some combination of these. Rockfill cover was placed upstream of the dam prior to the 2015 inspection, which would have loaded the soil, and could potentially drive the settlement. If surface water runoff were to pond upstream of the dam, this could drive consolidation of the soil through freeze/thaw cycles.

Due to the relatively small size of the dam, its distance from the pond, and the available freeboard in Middle Pud, the crack is of not of immediate concern. As previously recommended (Golder 2015), MNML is to monitor the crack.

3.5.6 Dam 6

The dam showed no visible evidence of erosion, settlement, or slope movement since the last inspection. No water was observed at the downstream toe. Based on these observations, it appeared stable.

3.5.7 Dam 7

The dam showed no visible evidence of erosion, settlement, or slope movement since the last inspection. No water was observed at the downstream toe. Based on these observations, it appeared stable.

3.6 Middle Pud Internal Dams

3.6.1 Dam 4

The dam showed no visible evidence of erosion, settlement, or slope movement since the last inspection. No water was observed at the downstream toe. Based on these observations, it appeared stable.

3.6.2 Dam 5

The dam showed no visible evidence of erosion, settlement, or slope movement since the last inspection. No water was observed at the downstream toe. Based on these observations, it appeared stable.
3.7 **Lower Pud Dam**

At the time of the inspection, the dam appeared to be stable and there was no evidence of erosion, settlement, or slope movement since the last inspection. No water was observed at the upstream toe of the dam, but ponded water from surface water runoff was observed in Lower Pud.

As MNML was operating the water treatment plant at the time of the inspection, water was being discharged downstream of the dam. Although the pipeline outlet was roughly 20 m from the downstream toe of the dam, the topography was such that ponded water was observed at the downstream toe of the dam. This location is covered in rockfill, and the ponding at the toe does not present a concern for dam stability. No seepage from downstream of the dam back into Lower Pud was observed.

3.8 **Covers**

The 2019 inspection includes the condition of the TCA covers. This includes the rockfill cover for the Upper and Middle Pud TCAs, the lined HWDA cover, rockfill backfill of the Con and Negus Ponds, and the vegetation cover for the historic TCAs.

3.8.1 **Middle Pud**

The Middle Pud TCA cover was observed to be in good condition at the time of the inspection. There were no signs of settlement, erosion, cracking or migration of tailings for the majority of the TCA. The exception during previous AGIs was that in two different areas of the Middle Pud cover, sinkholes were observed. These two areas were inspected during the 2020 AGI.

- **East of Middle Pud Pond**: Several sinkholes were located east of the pond in Middle Pud, at a location that is downstream of the Upper Pud spillway outlet.

- **East of the HWDA**: Several small sinkholes were identified in 2018 in the rockfill cover in Middle Pud to the east of the HWDA.

The sinkholes located east of the Middle Pud pond have been observed and documented during previous AGIs (Golder 2018, 2019), and their surface expression ranges in size from 0.3 m to 3 m (Golder 2019a). They do not appear to have changed in size significantly between inspections; however, in the 2020 AGI, a new sinkhole was observed. The sinkhole was approximately 200 mm in diameter (Photograph C5, Appendix C). To the east of the sinkholes, additional settlement in a linear pattern was observed (Linear patterns of settlement upstream of the sinkholes have been observed in previous years.

MNML has placed traffic barricades along internal access roads to prevent vehicle access to the areas with the observed sinkholes, and these barricades were present along the internal access roads in 2020.

The sinkholes are likely caused by the flow of water at the interface of the tailings and the rockfill cover. In areas where the flow velocity is high and the void spaces in the rockfill are sufficiently large, tailings can erode. Continued erosion of tailings would result in undermining the rockfill cover, manifesting at surface as settlement and sinkholes. Once the sinkholes form at surface, this appears to block the flow of water. Water forced around the collapsed sinkhole may cause similar erosion in the adjacent areas.

As originally stated in Golder (2018), **Golder recommends that MNML backfill the sinkholes with rockfill material, similar in particle size distribution specified in the cover design (SRK 2012) and upon completion continue to monitor.** However, even if the sinkholes were backfilled, it is possible that without an engineered conveyance of water from the Upper Pud Spillway to the Middle Pud Pond, that erosion of tailings at the interface of the tailings...
and rockfill could continue. Therefore, Golder recommends that MNML complete a study to evaluate options for an engineered conveyance of water from the Upper Pud Spillway to the Middle Pud Pond.

At the time of the 2020 inspection, MNML had decided to monitor the sinkholes prior to initiation of maintenance. As there is no immediate geotechnical concern with the sinkholes, Golder considers this a reasonable approach. Golder recommends that MNML maintain access control in areas where sinkholes are occurring.

On the eastern side of the HWDA, sinkholes roughly 0.3 m in diameter were first identified by MNML in 2018. During the 2019 AGI they were observed to be similar in size (Golder 2019a). At the time of the 2020 inspection, the sinkholes had been backfilled by MNML. The new rockfill was evident as it was lighter in colour (white and light pink, Photograph C6, Appendix C) than previously placed rockfill (dark grey). The completion of the work satisfied a recommendation from the 2019 AGI (Golder 2019a).

3.8.2 Upper Pud

At the time of the inspection the Upper Pud TCA cover appeared in good condition, with no signs of settlement, erosion, cracking, or migration of tailings.

During the 2019 inspection, a small area (5 m by 15 m) of cover placement was incomplete around two cover trial pads located upstream of the Taylor Road Dam. Tailings was exposed around the perimeter and in between to trial pads. Golder recommended that MNML complete placement of the cover using rockfill (Golder 2019a). At the time of the 2020 inspection, MNML had completed the placement of rockfill at this location (Photograph C7, Appendix C). The rockfill used appeared similar to that placed as part of earlier Upper Pud cover placement.

3.8.3 Hazardous Waste Disposal Area (HWDA)

At the time of the inspection the HWDA cover appeared to be in good general condition. No pronounced settlements were observed during the inspection. The following non-critical concerns were noted during the inspection:

- In one isolated area, tailings appear to have migrated through the rockfill cover, accumulating on the cover surface. The risk of this and need to address it are identified in the monitoring requirements specified in the as-built report (SRK 2016).

- Vegetation is continuing to propagate over the cover, now affecting an area approximately 20 m x 20 m. According to design documents, the cover was not intended to be vegetated, but there are no maintenance recommendations in the design or as-built with respect to vegetation incursion.

During the 2020 inspection, migration of tailings through the rockfill was observed along the eastern edge of the HWDA, near the boundary with the Middle Pud TCA (Photograph C10, Appendix C). Tailings was visible within the rockfill voids over an area roughly 2 m by 2 m (Photograph C9). As per the original design, the slope of the topography in this area is roughly 20% (5 horizontal to 1 vertical), which is steeper than the top of the cover at 2%. As the distribution of the tailings is horizontal, the mechanism causing the migration may be from surface water runoff eroding the tailings solids into the void space between rockfill particles.

Based on the quantity of tailings observed during the inspection, it is unlikely that the geomembrane liner used in the HDWS has been impacted by the migration of the tailings. However, over time, surface water flow may continue to cause migration of tailings.
Some isolated vegetation on the HWDA rockfill cover was initially observed during the 2019 inspection, and has now increased to cover an area of roughly 20 m by 20 m. In 2019 Golder recommended that vegetation be removed to avoid it propagating further. The extent of the vegetation observed during the 2020 inspection is unlikely to pose an immediate issue to the integrity of the HWDA cover, but without further action, propagation can be expected to continue over the cover.

The design basis for the cover (SRK 2012) indicates that the cover is intended to discourage vegetation. The vegetation will likely continue to propagate further unless measures to address it are undertaken.

Golder recommends that MNML engage with the original designer of the HWDA to confirm their recommended actions resulting from the observed migration of tailings through the cover and the growth of vegetation observed on the cover. In lieu of engagement with the design team, Golder recommends:

- MNML monitoring the area of observed tailings migration, as well as other areas of steep topography for migration of tailings, particularly following intense climate events. Based on the results of the monitoring, maintenance could be required.
- MNML monitor the cover for vegetation and remove larger plants (tree and shrub species) if they are observed.

### 3.8.4 Con and Negus Ponds

Con and Negus Ponds, which were the former hazardous waste storage sites, were included in the annual inspection. Hazardous materials that were previously stored in these locations were processed through the autoclave or placed in the engineered HWDA located in Middle Pud, and its location shown in Figure 1.

Con Pond and Negus Pond areas have been backfilled and graded to direct surface water flow towards Middle Pud via gravity. At the time of the inspection there was no visible evidence of erosion or settlement. In the former Negus Pond, vegetation was observed to be growing on the constructed vegetation islands.

### 3.8.5 Historic Tailings

The tailings surfaces of Crank Lake, Negus Lake, Neil Lake, and Lower Pud have been covered and surface water is directed towards Middle Pud via a series of ditches and channels. Crank Lake has been covered with rockfill and top soil for vegetation has been placed. The vegetation in Crank Lake appears to be in good condition.

### 3.9 Closed Openings to Surface

Capped openings to surface were also inspected as part of the site visit. In addition to openings on the Con Mine lease, capped openings located off the current lease association with the historic Rycon and Negus mining operations were also inspected. Some of the capped Negus openings (i.e., Negus 115 Stope, Negus 116 Stope, and Negus 351 Raise) could not be directly inspected as they have been completely covered or are located on private property with restricted access. Refer to Figure 1 for the location of the closed openings to surface.
3.9.1 Closed Openings within the Current Lease

The capped openings: Robertson Shaft cap, Robertson Air Vent, 204Q Stope, C 103 J Stope, C-1 Vent Raise, and C1 Shaft are all functioning as designed and no evidence of ground movement was visible near the openings. Based on observations there are no recommendations for maintenance at this time.

Since the 2014 inspection, the Robertson Air Vent has continued to show signs of settlement and MNML has been placing additional backfill, as required. Backfill was last placed in 2017 (Golder 2018). The depth of this opening is roughly 18 m, and as per design, there is no concrete cap, with the opening entirely filled with rockfill (SRK 2009).

At the time of the 2020 inspection there was no visual evidence of further settlement of the backfill (Photograph D1, Appendix D). Golder recommends that MNML continue to monitor the Robertson Air Vent and place additional backfill, as required in the design report specifications (SRK 2009).

During the 2016 inspection, small cracks visible south of the Robertson Air Vent (Golder 2016). MNML’s review of underground records shows no known underground working existing south of the air vent. At the time of the 2020 inspection, no obvious changes to the cracks were observed.

The Robertson Shaft Headframe was demolished in the fall of 2016 and a concrete shaft cap constructed (Golder 2017). Backfill was placed in 2018 on the cap such that fill was level with surrounding ground elevation (Golder 2018). In 2018, Golder recommended that the backfill be monitored for any signs of settlement, and if observed, backfilled should be placed in accordance with the cap design (Williams Engineering 2011).

In 2019 MNML placed fill at the Robertson Shaft Headframe. No signs of settlement were observed during the 2020 inspection (Photograph D2, Appendix D). Golder recommends that MNML continue to monitor the backfill at the Robertson Shaft Headframe for visual signs of settlement.

MNML uses the Robertson Shaft and C1 Shaft caps as access points for dewatering the underground. At the time of the inspection, water was being pumped from the C1 Shaft cap to Middle Pud. The Robertson Shaft cap was not being used to pump water.

3.9.2 Closed Openings off the Current Lease

The capped openings at the Rycon R1 Shaft, Rycon R57 Shaft, Negus 114 Raise, Negus 120 Stope, Negus Shaft (exhaust), and Negus Slot Raise were all inspected. No signs of settlement were observed at these inspection locations. At the Rycon R1 Shaft, a topographic depression has been observed in the past at the likely location of the shaft (Golder 2014). At the time of the 2020 inspection, there was no change in the topography of the backfilled shaft (Photograph D7, Appendix D).

The Negus 115 and Negus 116 caps could not be directly inspected as the cap is no longer visible at the surface. However, no signs of settlement were visible at the surface in the general vicinity of where these caps are understood to be located.

The Negus 351 Raise is located within a fenced property owned by a third party and could not be directly inspected. MNML indicates that the third party has denied access to the property for the annual geotechnical inspection.
4.0 REVIEW OF SURVEY DATA

4.1 Dam Survey

As part of the 2020 inspection, Golder requested that MNML complete a survey of the Middle Pud dam crest elevations. Results were used to identify minimum crest elevations and trends of vertical displacement, if any. A dam crest survey was not requested for the Upper Pud dams as it does not currently retain any significant quantity of water (as discussed in Section 3.4).

MNML provided Golder with the survey data collected by Ollerhead and Associates Ltd. (Ollerhead) on 25 September 2020. This data is included in Appendix E, with all surveyed elevations in units of metres with reference to geodetic datum.

Figure 2 presents total vertical displacement since 2012 using survey results, based on data from 2015 through 2018 (Golder 2015; 2016; 2017; 2018; 2019a), as well as the 2020 data in Appendix E. Two dams have recorded negative overall net vertical displacements (settlement) over the review period: Dam 3 West and Dam 7. These dams have had between 50 and 80 mm of settlement measured during this time. All other dams have either positive or zero vertical displacement measured.

Between 2019 and 2020 the displacement trend generally showed an increase in elevation, potentially a result from frost heave. Dam 2, Dam 2 North, Dam 3 East, and Dam 6 increased in elevation between 20 and 100 mm. Dam 2 North had the largest at 96 mm, but large positive fluctuations have been seen at this dam previously, as shown in Figure 2 between 2015 and 2017. A decrease in elevation of 14 mm was recorded at Dam 3 Central but this value is less than the survey tolerance of ± 15 mm.

None of the 2020 survey results were lower than the overall minimum measured historically (i.e., at Dam 3 Central in 2012). Therefore, the overall minimum top of low permeability element remains unchanged from 183.0 m (Golder 2012).

4.2 Water Elevation

MNML provided Middle Pud water elevation monitoring data for Golder’s review. The data provided spanned from June 2019 to September 2020, and Golder added that to data provided previously by MNML. For the 2020 AGI, the review considered the period between 2019 and 2020, as well as from 2007 to 2020.

In 2019 MNML completed a flood routing study, which estimated flows into Middle Pud resulting from low probability precipitation events (Golder 2019b). Flood events with a return period of 100, 500, 1,000 year, and the Probable Maximum Precipitation (PMP) were used in the study. The study found that since at least 2007, the freeboard maintained in Middle Pud was adequate to retain the simultaneous occurrence of the PMP and a wind event with a 1 in 1,000-year return period. The bathymetry of Middle Pud was updated in 2019 in support of the flood routing study.

Based on the flood routing study, **Golder recommends that MNML operate Middle Pud with a minimum freeboard of 3.1 m.** Although adopting a minimum freeboard that retains the PMP is conservative based on the CDA guidelines (this would only be required for dams with an extreme consequence classification), it is prudent given that no spillway exists for Middle Pud. This recommendation is more stringent than the Site’s Water Licence requirement of a minimum freeboard of 1.0 m.
### 4.2.1 2019 to 2020

Table 3 summarizes the Middle Pud water elevations recorded since the 2019 AGI. This period is included in the range of data illustrated in Figure 3.

**Table 3: Surveyed Water Elevation in Middle Pud**

<table>
<thead>
<tr>
<th>Year</th>
<th>Survey Date</th>
<th>Water Elevation (m)</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>27 June</td>
<td>176.43</td>
<td>Last survey point covered in Golder (2019a)</td>
</tr>
<tr>
<td></td>
<td>July</td>
<td>175.58</td>
<td>Monthly average 2019 Water treatment ended on 28 July</td>
</tr>
<tr>
<td></td>
<td>August</td>
<td>176.56</td>
<td>Monthly average</td>
</tr>
<tr>
<td></td>
<td>September</td>
<td>176.71</td>
<td>Monthly average</td>
</tr>
<tr>
<td></td>
<td>October</td>
<td>176.86</td>
<td>Monthly average</td>
</tr>
<tr>
<td></td>
<td>November</td>
<td>176.86</td>
<td>Monthly average</td>
</tr>
<tr>
<td></td>
<td>December</td>
<td>176.86</td>
<td>Monthly average</td>
</tr>
<tr>
<td>2020</td>
<td>January</td>
<td>176.86</td>
<td>Monthly average</td>
</tr>
<tr>
<td></td>
<td>February</td>
<td>176.86</td>
<td>Monthly average</td>
</tr>
<tr>
<td></td>
<td>March</td>
<td>176.86</td>
<td>Monthly average</td>
</tr>
<tr>
<td></td>
<td>April</td>
<td>176.86</td>
<td>Monthly average</td>
</tr>
<tr>
<td></td>
<td>15 May</td>
<td>178.08</td>
<td></td>
</tr>
<tr>
<td>5 June</td>
<td>178.50</td>
<td>Maximum water level for review period</td>
<td></td>
</tr>
<tr>
<td>6 July</td>
<td></td>
<td>177.10</td>
<td></td>
</tr>
<tr>
<td>31 July</td>
<td></td>
<td>176.52</td>
<td></td>
</tr>
<tr>
<td>6 August</td>
<td></td>
<td>176.27</td>
<td></td>
</tr>
<tr>
<td>11 August</td>
<td></td>
<td>176.00</td>
<td></td>
</tr>
<tr>
<td>25 August</td>
<td></td>
<td>175.60</td>
<td>Water treatment ended on 31 August</td>
</tr>
<tr>
<td>1 September</td>
<td></td>
<td>175.55</td>
<td></td>
</tr>
</tbody>
</table>

For the review period shown in Table 3, the maximum water elevation was measured on 5 June 2019. At that elevation, the Middle Pud freeboard was about 4.5 m, which satisfied the Water Licence’s minimum freeboard requirement of 1.0 m as well as the more stringent minimum of 3.1 m recommended in 2020.

### 4.2.2 2007 to 2020

Figure 3 presents the water elevation monitoring results for Middle Pud from August 2007 to September 2020. For most of the past 13 years, the measured freeboard has been in excess of 4 m. The minimum overall freeboard during this period is 3.7 m, measured in 2015, just prior to re-starting water treatment. This minimum freeboard in 2015 reflects the fact that between roughly 2010 and 2014 MNML did not discharge any water from Middle Pud.

As of September 2020, the freeboard in Middle Pud was around 7.5 m. The water elevation at the completion of the 2020 water treatment is within a similar range measured at the completion of water treatment in previous years (e.g. 2016 and 2019).
5.0 RECOMMENDATIONS

In this section all active recommendations from the Annual Geotechnical Inspections are summarized. Recommendations are placed into one of three categories:

- Maintenance (Section 5.1)
- Monitoring (Section 5.2)
- Operations (Section 5.3)
- Studies (Section 5.4)

Within the sub-sections below, recommendations from previous Annual Geotechnical Inspections are summarized, as well as new ones from the 2020 inspection. Previous recommendations are marked as one of the following.

- **Complete**: Where maintenance was carried out, work completed by MNML is observed to satisfy the intent of the recommendation. For monitoring, either work completed, results, or conditions are considered to make further monitoring unnecessary.

- **Incomplete**: Maintenance or monitoring has either not been initiated or has not been completed to the degree necessary to satisfy the intent of the recommendation.

- **Ongoing**: Maintenance work is in progress, but not yet complete. For monitoring, further collection of observations or data required before status can be updated.

5.1 Maintenance

In Table 4, recommendations for maintenance are presented. Of the six recommendations made prior to the 2020 inspection, four were either completed or were completed and are ongoing. Two previous recommendations were incomplete. The incomplete recommendations are of no immediate geotechnical concern, but we suggest that they be addressed by MNML to minimize the potential for additional work. There are two new recommendations resulting from the 2020 inspection.

5.2 Monitoring

In Table 5, recommendations for monitoring are presented. There are two new recommendations from the 2020 inspection. Recommendations from the 2015, 2017 through 2019 inspections have been carried over to apply in 2020 and the monitoring is ongoing.
<table>
<thead>
<tr>
<th>Year</th>
<th>Recommendation Description</th>
<th>2020 Status</th>
<th>2020 Annual Geotechnical Inspection Update</th>
<th>Updated Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td><strong>Dam E</strong> – The alignment of the pipeline between C1 Shaft and Middle Pud be moved such that it no longer traverses the dam.</td>
<td>New</td>
<td>New for 2020.</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td><strong>Dam 3 West</strong> – The alignment of the pipelines between the sumps (SNP 25-9 and SNP 40-9) and Middle Pud be moved such that it no longer traverses the dam.</td>
<td>New</td>
<td>New for 2020.</td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td><strong>Upper Pud Cover</strong> – If monitoring of cover trials is no longer required, the small area with exposed tailings is to be backfilled with rockfill, similar in particle size distribution specified in the cover design (SRK 2012).</td>
<td>Completed</td>
<td>MNML Placed rockfill in 2020.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Hazardous Waste Disposal Area Cover</strong> – isolated pockets of vegetation should be removed.</td>
<td>Incomplete</td>
<td>Remove larger plants (tree and shrub species) if they are observed.</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td><strong>Middle Pud Cover</strong> – Sinkholes are to be backfilled with rockfill material, similar in particle size distribution specified in the cover design (SRK 2012).</td>
<td>Incomplete</td>
<td><strong>East of Middle Pud Pond</strong> – Original recommendation still applies.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Completed</td>
<td><strong>East of HWDA</strong> – MNML placed rockfill in 2019.</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td><strong>Taylor Road Dam &amp; Dam 1 North</strong> – Sinkholes observed in the backfilled sumps are to be backfilled to minimize further erosion of material.</td>
<td>Completed, but ongoing</td>
<td><strong>Taylor Road Dam</strong> – MNML had placed backfill in 2019. One small sinkhole observed in 2020 to be backfilled in a similar manner.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Completed</td>
<td><strong>Dam 1 North</strong> – No further action needed.</td>
<td></td>
</tr>
</tbody>
</table>
## Table 5: Status of Annual Geotechnical Inspection Recommendations – Monitoring

<table>
<thead>
<tr>
<th>Year</th>
<th>Recommendation Description</th>
<th>2020 Status</th>
<th>2020 Annual Geotechnical Inspection Update</th>
<th>Updated Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td><strong>Hazardous Waste Disposal Area</strong>&lt;br&gt;MNML to monitor cover for changes in the amount or location of tailings migrating through the cover.&lt;br&gt;MNML to monitor cover for growth of larger plans (tree and shrub species. If they are observed, maintenance is required.</td>
<td>New</td>
<td>New for 2020.</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td><strong>Middle Pud Cover</strong> - Once sinkholes are backfilled, they are to be monitored for signs of further settlement and sinkholes.</td>
<td>Ongoing</td>
<td>None. Original recommendation still applies.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Dam 1</strong> - the backfilled sump be monitored as part of MNML’s regular TCA inspections</td>
<td>Ongoing</td>
<td>None. Original recommendation still applies.</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td><strong>Taylor Road Dam</strong> - slope movement cracks along the internal access road at the downstream toe of the dam are to be monitored as part of the regular TCA inspections, even after the cracks are covered and the area regraded. The inspections are to note if the cracks increase in size and/or surface water drainage is observed to be flowing into the cracks. Displacements and cracking are to not be permitted to grow such that it affects the dam. If cracking is observed along the downstream slope of the dam, additional inspections by a Professional Geotechnical Engineer may be required.&lt;br&gt;&lt;br&gt;<strong>Taylor Road Dam</strong> – differential settlement cracks in the vicinity of the downstream toe of the Taylor Road Dam, in the area of the backfilled sump, are to be monitored, even after the cracks are covered and the area regraded.&lt;br&gt;&lt;br&gt;<strong>Taylor Road Dam</strong> - the crest and downstream slope are to be monitored for evidence of instability or erosion.</td>
<td>Ongoing</td>
<td>No cracks observed. MNML to continue to monitor as per original recommendation.</td>
<td></td>
</tr>
</tbody>
</table>
Table 5: Status of Annual Geotechnical Inspection Recommendations – Monitoring

<table>
<thead>
<tr>
<th>Year</th>
<th>Recommendation Description</th>
<th>2020 Status</th>
<th>2020 Annual Geotechnical Inspection Update</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td><strong>Taylor Road Dam and Dam 1 North</strong> - visual monitoring of backfilled sumps during spring freshet and following heavy rainfalls for signs of further erosion or the occurrence of new sinkholes.</td>
<td>Ongoing</td>
<td>Taylor Road Dam – None. Original recommendation still applies.</td>
</tr>
<tr>
<td></td>
<td><strong>Taylor Road Dam Southwest</strong> - inspect the dam for signs of instability or erosion, particularly during freshet and following heavy rainfall events.</td>
<td>Ongoing</td>
<td>Dam 1 North – Placement of backfill complete. Original recommendation for monitoring still applies.</td>
</tr>
<tr>
<td></td>
<td><strong>Upper Pud Spillway</strong> - the performance of the spillway swale and spillway are to be monitored during the 2018 spring freshet.</td>
<td>Ongoing</td>
<td>None. Original recommendation still applies.</td>
</tr>
<tr>
<td></td>
<td>The <strong>Robertson Air Vent</strong> is to be monitored for signs of settlement. If further settlement is observed, additional backfill should be placed in accordance with the backfill design (SRK 2007).</td>
<td>Ongoing</td>
<td>None. Original recommendation still applies.</td>
</tr>
<tr>
<td></td>
<td>The <strong>Robertson Shaft Cap</strong> is to be monitored for settlement. If settlement is observed, it should only be backfilled in accordance with the cap design (Williams Engineering 2011).</td>
<td>Ongoing</td>
<td>None. Original recommendation still applies.</td>
</tr>
<tr>
<td>2015</td>
<td><strong>Dam 3 Central</strong> - Crack along upstream crest is to be monitored. As the dam does not retain water, there is limited concern with the dam in its current state. However, if the water level in Middle Pud were to increase to a level where the dam would again function as a water retaining structure, backfilling or some other form of rehabilitation could be required.</td>
<td>Ongoing</td>
<td>None. Original recommendation still applies.</td>
</tr>
</tbody>
</table>
5.3 Operations

In Table 6 recommendations for operations of the TCAs are presented. There is one new recommendation from 2020 and one ongoing from 2018.

Table 6: Status of Annual Geotechnical Inspection Recommendations – Operational Pond Elevation

<table>
<thead>
<tr>
<th>Year</th>
<th>Recommendation</th>
<th>2019 Status</th>
<th>Updated Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>The maximum permissible water elevation in Middle Pud is to be set at 179.9 m, which provides adequate storage for the retention of a Probably Maximum Precipitation and wind event.</td>
<td>New</td>
<td>New for 2020.</td>
</tr>
<tr>
<td>2018</td>
<td><strong>Middle Pud Cover</strong> - MNML are to maintain the traffic barriers along the internal access road where the sinkholes have been observed to prevent vehicle access.</td>
<td>Ongoing</td>
<td>None. Original recommendation still applies.</td>
</tr>
<tr>
<td>2012</td>
<td>The maximum permissible water elevation in <strong>Middle Pud</strong> is to remain at 182.0 m, which is controlled by Dam 3 Central.</td>
<td>Superseded</td>
<td>Now superseded by 2020 recommendation.</td>
</tr>
</tbody>
</table>

5.4 Studies

In Table 7, recommendations for studies related to the TCAs are presented. There are two new recommendations resulting from the 2020 inspection.

Table 7: Annual Geotechnical Inspection Recommendations – Studies

<table>
<thead>
<tr>
<th>Year</th>
<th>Recommendation</th>
<th>2019 Status</th>
<th>Updated Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>MNML complete a study to evaluate options for an engineered conveyance of water from the Upper Pud Spillway to the Middle Pud Pond</td>
<td>New</td>
<td>New for 2020.</td>
</tr>
</tbody>
</table>
6.0 CLOSURE

The reader is referred to the Study Limitations, which precedes the text and forms an integral part of this report.

We trust that the above meets your present requirements. If you have any questions or requirements, please contact the undersigned.

Golder Associates Ltd.

Chad Mundle, P.Eng.
Geotechnical Engineer

Bjorn Weeks, P.Eng.
Principal, Senior Geo-environmental Engineer

CMBWhp

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Total Vertical Displacement (mm)

Legend
- Dam 2
- Dam 2 North
- Dam 3 East
- Dam 3 Central
- Dam 3 West
- Dam 4
- Dam 5
- Dam 6
- Dam 7

Note:
The following anomalous results have been removed:
- 2016 Survey: Dam 2 North & Dam 2
- 2017 Survey: Dam 3 Central
Note: Water treatment occurs in summer months only.
REFERENCES


Photograph A1: Downstream Slope and Crest – Looking Southwest

Photograph A2: Downstream Slope and Toe – Looking Southwest
Photograph A3: Crest – Looking Northeast

Photograph A4: Small Sinkhole Along Downstream Slope, in Area of Backfilled Sump
Photograph A5: Downstream Slope – Looking East
Photograph A6: Southwest Downstream Slope and Toe – Looking West

Photograph A7: Crest and Downstream Slope – Looking Southwest
Photograph A8: Crest – Looking West
Photograph A9: Dam Crest and Upstream Cover – Looking Southeast

Photograph A10: Downstream Slope and Bedrock Outcrop – Looking East
Photograph A11: Downstream Slope and Toe – Looking East

Photograph A12: Small Sinkholes in Area of Backfilled Sump
Photograph A13: Dam Crest and Downstream Slope – Looking South

Photograph A14: Downstream Slope – Looking East
Photograph A15: Dam B Crest – Looking West
Photograph A16: Dam D Crest and Downstream Slope – Looking East

Photograph A17: Pipeline Traversing Dam E – Looking East
Photograph A18: Spillway Inlet Upper Pud – Looking Northwest

Photograph A19: Spillway Excavated Through Dams C and D – Looking North
Photograph A20: Clear Water Flow Through Spillway

Photograph A21: Spillway Outlet in Middle Pud – Looking Northwest
APPENDIX B

Middle Pud Photos
**Photograph B1:** Dam 2 Crest and Downstream Slope – Looking Southeast

**Photograph B-2:** Dam 2 North Crest and Upstream Rockfill Cover – Looking Southeast
**Photograph B3:** Dam 3 East Crest and Downstream Slope – Looking East
Photograph B4: Dam 3 West Downstream Slope and Crest – Looking Northeast

Photograph B5: Dam 3 West Crest, Pipeline Traversing Crest – Looking North
Photograph B6: Dam 3 Central, Crest and Upper Slope – Looking West
Photograph B7: Dam 3 Central, Ponding Water Upstream of Upstream Toe – Looking Northwest

Ponded Water
Photograph B8: Dam 4 Downstream Slope – Looking Northwest

Photograph B9: Dam 4 Crest – Looking West
Photograph B10: Dam 5 Crest and Upstream Rockfill Cover – Looking Northeast

Photograph B11: Dam 6 Crest and Upstream Rockfill Cover – Looking Northwest
Photograph B12: Dam 7 Bedrock Outcropping Upstream of Dam – Looking Southeast
APPENDIX C

Cover Inspection Photos
Photograph C1: Middle Pud Cover Sinkholes – Looking South

Photograph C2: Middle Pud Cover Sinkholes – Looking Southeast
Photograph C3: Middle Pud Cover Sinkholes – Erosion of Tailings below typical water level, Looking West

Photograph C4: Middle Pud Cover Sinkholes – Looking Northeast
Photograph C5: Middle Pud Cover Sinkholes – Closeup of new sinkhole

Photograph C6: Rockfill Placed to backfill sinkholes in cover located east of HWDA
Photograph C6: Upper Pud Cover – Looking Northwest

Photograph C7: Upper Pud Cover – Upstream of Taylor Road Dam, Looking East
Photograph C8: Upper Pud Cover – Upstream of Taylor Road Dam, Looking South
Photograph C9: Migration of Tailings through rockfill cover (isolation barrier)

Photograph C10: Location of observed migrated tailing
Photograph C11: Vegetation growing on rockfill cover (isolation barrier)
Photograph C12: Former Con Pond – Looking Southeast

Photograph C13: Former Negus Pond – Looking Northeast
Photograph C14: Con Pond (foreground) and Crank Lake TCA (background) – Looking Northeast
APPENDIX D

Capped Openings Photos
Photograph D1: Robertson Air Vent Backfill – Looking West

Photograph D2: Robertson Shaft Cap, Backfilled Area – Looking West
Photograph D3: C 103 J Stope – Looking Southwest

Photograph D4: C1 Shaft, Cap Covered by Structure – Looking Northeast
Photograph D5: C1 Vent Raise

Photograph D6: 204 Q Stope
Photograph D7: Rycon R1 Shaft

Photograph D8: Rycon Shaft R57
Photograph D9: Negus 114 Raise

Photograph D10: General Area of Covered Negus 115 Stope
Photograph D11: General Area of Covered Negus 116 Slope

Photograph D12: Negus 120 Stope
Photograph D13: Negus Shaft (exhaust)

Photograph D14: Negus Slot Raise
Photograph D15: General Area of Negus 351 Raise, Access Blocked by Fence (left)
APPENDIX E

Survey Results
# CON MINE COORDINATE COMPARISON measured by Ollerhead & Associates Ltd.

<table>
<thead>
<tr>
<th>Point #</th>
<th>2016 (May 12)</th>
<th>2020 (Sep 25)</th>
<th>POINT DESCRIPTION</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>NORTHING</td>
<td>EASTING</td>
<td>ELV</td>
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<td>6924732.14</td>
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<td>635356.97</td>
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<td>1155</td>
<td>6925051.79</td>
<td>634766.65</td>
<td>183.85</td>
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</table>
## CON MINE CONTROL POINTS ADDED 12 MAY 2016 measured by Ollerhead & Associates Ltd.

### 2016 (May 12) vs 2020 (Sep 25)

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<thead>
<tr>
<th>Point #</th>
<th>Northing</th>
<th>Easting</th>
<th>ELV</th>
<th>ELV</th>
<th>Comment</th>
<th>Δ ELV</th>
</tr>
</thead>
<tbody>
<tr>
<td>OA 1977</td>
<td>6924987.37</td>
<td>634752.06</td>
<td>183.84</td>
<td>183.84</td>
<td>12&quot; SPK PL &amp; TAGGED</td>
<td>0.007</td>
</tr>
<tr>
<td>OA 1979</td>
<td>6925190.56</td>
<td>634834.76</td>
<td>183.95</td>
<td>183.95</td>
<td>12&quot; SPK PL &amp; TAGGED</td>
<td>0.017</td>
</tr>
<tr>
<td>OA 1980</td>
<td>6924914.80</td>
<td>634782.29</td>
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### Notes:
- All points are tied in with Real-Time Kinematic GPS holding O&A 1 fixed.
- Positions are Con mine 2014 coordinate system.
- Elevations are orthometric (in metres)