

Appendix D. MLA Shoreline Pad Extension Memo

Memo

To:	Merle Keefe, Catherine Paul	Client:	Sabina Gold & Silver Corp
From:	Cameron Hore, CPEng, PEng John Kurylo, MSc, PEng	Project No:	1CS020.016
Reviewed By:	<i>Review of previous 2018 revision from the late Maritz Rykaart, PhD, PEng</i>	Date:	June 5, 2020 <i>2020 update by John Kurylo</i>
Subject:	Back River Project: MLA Shoreline Pad Extension – Preliminary Design – Rev01 - June 2020		

1 Introduction

1.1 General

The Marine Laydown Area (MLA) is the primary offloading facility for annual resupply of Sabina Gold and Silver's Back River Project in Nunavut. The MLA is located on Bathurst Inlet and is seasonally connected to the Goose site, 130 kilometers to the south where the mining activity will take place.

The Shoreline Pad is the landing facility for lightering barges during the summer sealift. The initial construction for the Shoreline Pad was constructed in the spring of 2018, based on Sabina's modified designs, and commissioned during the later summer 2018 sealift. Shallow bathymetry necessitates grounding of the lightering barges to ensure safe offloading.

1.2 Objective

This memo provides a preliminary design for extending the Shoreline Pad (i.e. Shoreline Pad Extension) a nominal distance into the ocean. The original version of this memo was produced in December 2018 and then updated in June 2020 based on the latest feedback and development plans that were provided by Sabina. This scope and focus of this memorandum is the Shoreline Pad Extension only, and not any of the existing or other infrastructure Sabina plans to construct at the MLA.

2 Design Concept

2.1 Approach

The design concept for the Shoreline Pad Extension is to build out the Shoreline Pad into the ocean through in-water construction, nominally extending its footprint onto the seabed. The in-water portion of the Shoreline Pad Extension will be constructed on geogrid to minimize differential settlement and improve overall safety of the facility.

2.2 Topographic Data

Design of the Shoreline Pad Extension is based on the following topographical and survey data:

- Off-shore: 1.0 m vertical resolution bathymetry data collected by ERM (formally Rescan) in 2012. In the summer of 2018 Sabina site staff completed field bathymetry checks, depth measurements, to correct this original bathymetry data.
- On-shore: Approximately 0.3 m vertical resolution 2018 as-built pad and original ground topography. This information was collected by Nuna Logistics site survey crews using Global Navigation Satellite System (GNSS) equipment.

Additional information on the data sources are presented in the Issue for Permit drawings (Attachment 1).

2.3 Foundation Conditions

SRK previously undertook a geotechnical assessment for the MLA (SRK, 2018b). Around the Shoreline Pad location, the general foundation conditions indicate weak ground conditions in the active layer (non frozen) soils that could be prone to excess pore pressure buildup if loadings rates are not controlled throughout construction and operation. As outlined in this assessment the foundation soils around the Shoreline Pad area was logged as a sand, but based on lab testing, should be classified as silty to clayey sand. From the available data (SRK 2015, Golder 2017) permafrost is expected to extend over the Shoreline Pad area with an estimated active layer depth in the range of 2m (below original ground). SRK has assumed that the shallow sub-sea foundation conditions beneath the Shoreline Pad Extension will be consistent to those onshore in the area of the Shoreline Pad.

No offshore geotechnical investigation has been completed and is not considered necessary due to the small extent of the proposed Shoreline Pad Extension. Typically, in this region submarine permafrost can be present in areas with an average water depth of 1 m or less.

3 Design

3.1 Design Criteria

The design criteria for the Shoreline Pad Extension, based on the operational requirements stipulated by Sabina, are as follows:

- The total marine environmental footprint should not exceed 500 m²; and
- The pad should have a minimum 35-m width for stability purposes, and in consideration of the foundation conditions.
- Construction must be done at a slow rate and loadings controlled (including barge offloading) to ensure that foundation pore pressures in the unfrozen active layer foundation soils do not generate excess pore pressures and exhibit a loss of strength.

3.2 Design

The Shoreline Pad Extension will have a variable fill height which will be configured to allow a smooth transition from the existing Shoreline Pad. This means the final crest elevation at the perimeter will range from approximately 1 m to 3 m. The Shoreline Pad Extension will be constructed with run-of-quarry (ROQ) material as the bulk fill. Prior to placing the ROQ, two layers of bi-axial geogrid will be placed to mitigate against excessive differential settlement on the weak foundation soils. The pad side slopes will be 1.5H:1V for fill areas less than 2 m in height, and at 2H:1V for fill slopes equal to or greater than 2 m. The final slopes may be armoured with riprap as protection against wave erosion and ice plucking. The pad driving surface will be covered with 0.15 m of surfacing material, if required for tire protection. Preliminary design drawings are included as Attachment 1.

4 Construction

Construction fill materials will be obtained from local geochemically suitable permitted quarries or run-of-mine waste rock brought in from the Goose site. Surfacing (32 mm minus) material will be produced at an on-site crusher at either the MLA or Goose site. About 400 m³ of ROQ, 50 m³ of surfacing material, and 1200 m² of geogrid are estimated to be required (rounded neat-line quantities with overlap included / considered for the geogrid).

The construction fleet will consist of mobile equipment already staged at the MLA and is expected to include rock trucks (30 and 40T), dozers (D8 or smaller), excavators, compactor, and a crusher plant (not currently on site).

Prior to placement of ROQ, two layers of biaxial geogrid will be placed on seabed, extending approximately 3 m beyond the design footprint. ROQ is then placed from land, working from the existing Shoreline Pad, onto the geogrid. Construction rate and sequencing will be adjusted to ensure appropriate time is allowed for pore pressure dissipation of the marine sediments to ensure safe working conditions. Removal of the marine sediments is not required prior to construction and therefore no dredging of marine sediments will be carried out. Surfacing material and rip rap will not be placed until the ROQ material layer is at design grade and level. All construction will be performed in accordance with approved Technical Specifications (SRK 2018a).

Construction may occur in winter or summer, i.e. frozen or open water conditions. For open water conditions, prior to construction, the entire perimeter of the Shoreline Pad will be encircled by a silt curtain deployed approximately 20 m from the footprint of the Shoreline Pad Extension and will remain in place throughout construction. Summer construction will require careful screening of the shoreline for nesting birds, and modifications to the construction schedule may be required to avoid disturbing nesting populations. If construction during fisheries restricted activity timing windows cannot be avoided, additional mitigation measures will be discussed with Fisheries and Oceans Canada.

For frozen conditions, sediment control will not be required as all construction will occur within the ground-fast sea ice extent. Any sea ice in the footprint of the Shoreline Pad Extension will be excavated and placed adjacent to the excavation on top of the sea ice. Rockfill placement will follow ice excavation and geogrid placement. The work will progress along the length of the

existing Shoreline Pad in an ordered method by slowly working from one end of the pad to the other, and then restarting at the original end to best spread out the working face and allow the most time between subsequent foundation loading. Temporary construction routes should aim to not repeatedly drive over the same area but be continually moving around the pad with placement. The rate of barge offloading should be considered and carefully monitored; e.g. are multiple barges going to be offloaded back to back which could potentially impact foundation pore pressure build up. Safe work plans should be developed by Sabina for this construction, which should consider the inspection recommendations below.

4.1 Inspection Recommendations

Due to the close proximity to, and minimal in-water works, at least daily inspections should be completed during construction, and every day the Shoreline Pad (including extension) is used for offloading.

Note that work area should be cleared of snow, ice and any other debris prior to being inspected. For these inspections, the crests of the areas that are being worked on, the areas immediately adjacent to these areas, and the ground immediately in front (downslope) of the advancing rock placement should be examined for signs of cracking, settling, slope movement, changes in material type or moisture contact of the material being placed, and surface deflection from equipment.

Any areas which experience consistent/frequent or identifiable erosion or tension cracking, any bulging by the toe or release of pore water from the foundation, should be recorded and work should be temporarily paused in this area to allow it to stabilize.

4.2 Monitoring Recommendations

- During construction ongoing surveys should be completed over any original ground before material placement and after each lift placed. A full as-built will also be completed once the Shoreline Pad Extension has been constructed.

5 Closure

Due to the nominal extent of the Shoreline Pad Extension, Sabina intends to leave the structure in place at closure, similar to the other roads, pads and existing Shoreline Pad. This will result in minimal environmental disturbance, and the structure is not a navigation hazard.

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The opinions expressed in this report have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

6 References

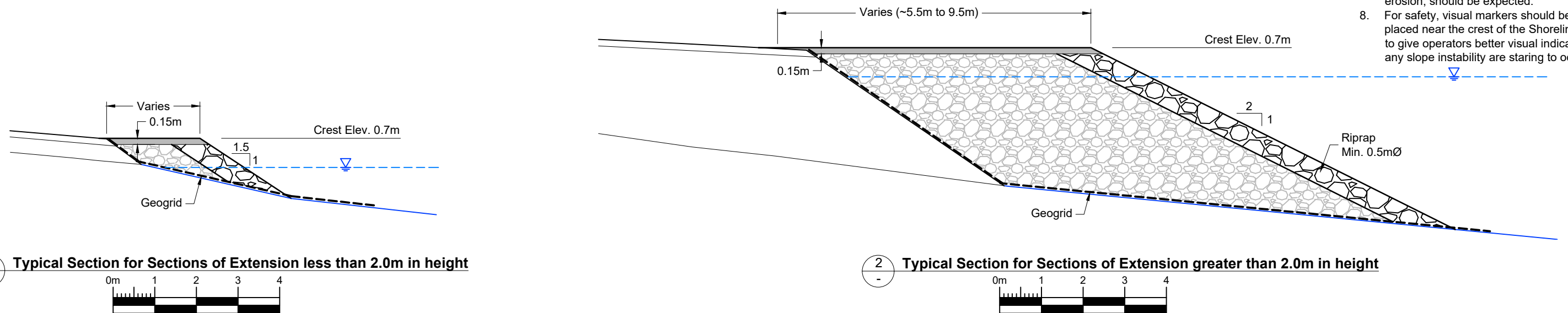
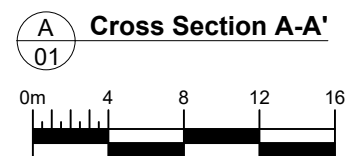
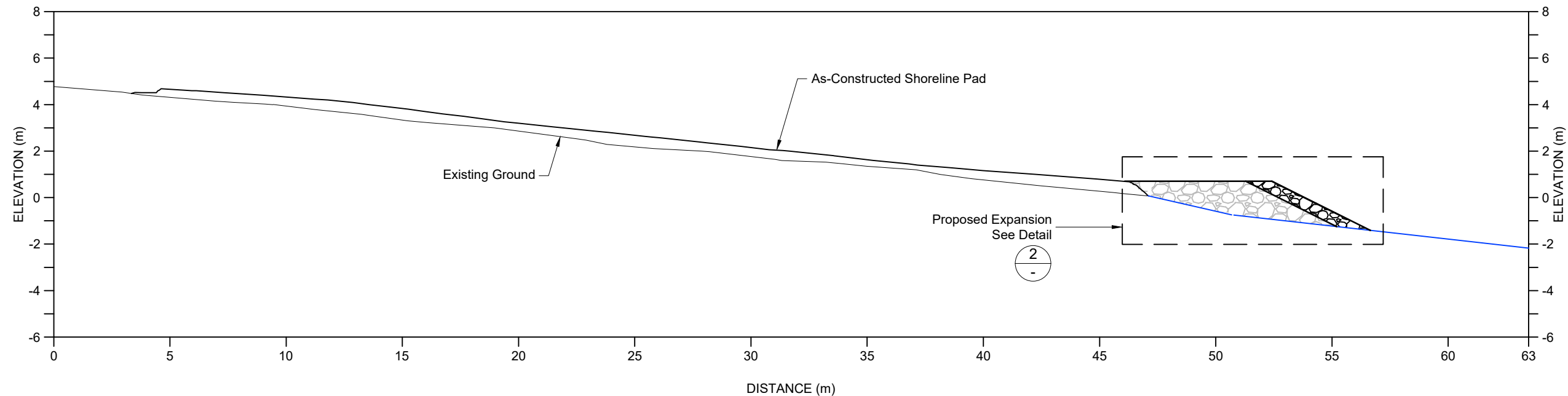
Golder Associates. 2017. Back River Project – Marine Laydown Area (MLA) – Geotechnical Factual report. Report prepared for Sabina Gold and Silver Corp. November 2017. Sabina reference number SBR5GAL-7000-G-RPT-0001. Golder reference number 17774320-036-RPT-Rev0.

SRK Consulting (Canada) Inc. 2015. Marine Laydown Area – 2015 Overburden geotechnical Investigation Program. Report prepared for Sabina Gold & Silver Corp. December 2015. Project No. 1CS020.009.

SRK Consulting (Canada) Inc. 2018a. Technical Specifications – Earthworks and geotechnical Engineering – Back River Gold Project, Nunavut Canada – Revision 0 - Issued for Construction. Prepared for Sabina. SRK job number 1CS020.016. April 2018.


SRK Consulting (Canada) Inc. 2018b. Back River Project: MLA Shoreline Pad Geotechnical Assessment. Memorandum prepared for Sabina. SRK job number 1CS020.016. June 2018.


Attachment 1: Permitting Drawings for the Shoreline Pad Extension



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DRAWING NO.	DRAWING TITLE	NO.	DESCRIPTION	CHKD	APP'D	DATE	NO.	DESCRIPTION	CHKD	APP'D	DATE									
REFERENCE DRAWINGS			REVISIONS																	







PROFESSIONAL ENGINEERS STAMP

			
DESIGN:	CH/JBK	DRAWN:	TH
CHECKED:	JBK	APPROVED:	CP
		REVIEWED:	EMR
		DATE: June 2020	
FILE NAME: 1CS020.018 - Shoreline Pad - opt 2.dwg			

	 <p>Sabina GOLD & SILVER CORP.</p>	
	<p>Back River Project</p>	
<p>SRK JOB NO.:</p>	<p>1CS020.018</p>	

<p>Marine Laydown Area</p>		
<p>DRAWING TITLE:</p> <p>Shoreline Pad Extension</p> <p>Cross Sections</p>		
<p>DRAWING NO.</p> <p>02</p>	<p>SHEET</p> <p>2 OF 2</p>	<p>REVISION NO.</p> <p>A</p>

- ### LEGEND

- | | |
|---|------------------------------|
|  | Bathymetric Surface |
|  | Approximate Water Line |
|  | Geogrid |
|  | Rip rap |
|  | Run of Quarry (ROQ) Material |
|  | Surfacing Material |

NOTES

1. All dimensions in meters unless otherwise stated.
2. For the geogrid the minimum longitudinal overlap must be 0.5m and minimum transverse overlap must be 5m.
3. All geogrid joints will be permanently secured using heavy duty zip ties at a minimum spacing 1.0m. Heavy duty zip ties will have a minimum tensile strength of 175lbs.
4. The Contractor is responsible for silt and sediment control during the construction (specifically if done during the open water season).
5. ROQ material must be coarse with limited sand and fines content. See "Technical Specifications Earthworks and Geotechnical Engineering, Back River Gold Project, Nunavut Canada. Revision 0", dated April 2018.
6. Approximate water line shown is based solely on the provided bathymetric information. No data was provided to estimate the average, high or low water levels and no assessment was done on publicly available data sets to estimate these ranges.
7. Loading within 5m of the crest should be kept to a minimum, and/or avoided wherever possible. Slope relaxation of the outside slope is expected and ongoing maintenance, due to wave and ice erosion, should be expected.
8. For safety, visual markers should be placed near the crest of the Shoreline Pad to give operators better visual indication if any slope instability are starting to occur.