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Northshore Mining Company
Milepost 7 Tailings Basin

Five-Year Operations Plan
Years 2004-2008

December 2003

BARR

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Milepost 7 Tailings Basin

Five-Year Operations Plan
Years 2004-2008

December 2003

BARR

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Milepost 7 Tailings Basin
Five-Year Operations Plan
Years 2004-2008

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I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly registered Professional Engineer under the laws of the State of Minnesota.

Philip B. Solseng Reg. No. 12465

Executive Summary

1.0 Introduction

This 2004 Operations Plan is Northshore Mining Company's five-year plan for 2004 through 2008. It is a continuation of the overall conceptual plan for operations through the planned life of the facility as presented in the "Milepost 7 Tailings Basin Five-Year Operating Plan," dated March 21, 1997 by Sitka Corp. and the Closure Consensus Plan. Implementation of the Northshore Mining Company Milepost 7 Tailings Basin Five-Year Operations Plan, Years 2004-2008 (2004 Operations Plan) is summarized in the Summary section at the end of this report.

2.0 Construction Activities Performed in 2003

2003 construction consisted of ongoing raising of dams 1 and 2 using plant aggregate and continued placement of the fine tailings for seepage control. The filter berm was raised to a minimum elevation of 1211 feet resulting in a freeboard of about 14 feet. Two design changes proposed and implemented in 2003 include:

1. Replacing the upstream plant aggregate berm with a seepage blanket upstream of the filter berm.

2. Construction of a drainage ditch upstream of the existing clay till core at Dam 1.

With the construction activities completed in 2003, the basin, containment dams, and water levels are consistent with the existing operations plan.

3.0 Projected Pellet Production and Tailing Production for 2004

Pellet production is projected to increase from 4.6 MLT in 2003 to 4.85 MLT in 2004. The corresponding plant aggregate and fine tailings are projected to be 2.94 MLT and 5.79 MLT respectively in 2004. Plant aggregate will be used for continued dam construction, raising railroad grades in 2004, and other facilities and excess material will be stockpiled for future use in closure.

4.0 Fine Tailings Placement

More beach area exposed. under new plan which will require more temp. stabilization

Fine tailings will be placed upstream of the filter berms at dams 1 and 2 to further develop the upstream blanket for seepage control. Also, if evaluations prove positive, fine tailings (and plant aggregate) will be placed to reestablish Splitter Dike 2 and fill deep areas in the pond. Reestablishing Splitter Dike 2 is under evaluation to determine if it assists with water quality enhancements at the reclaim pond.

5.0 Water Quality Enhancement at Reclaim Pond

Options for decreasing turbidity (suspended solids) in the basin prior to reaching the reclaim pond are being evaluated and include: (1) a flocculating agent, (2) reestablishing Splitter Dike 2, and

(3) constructing a new reclaim dike. Decreasing turbidity will improve water for the concentrator processing facilities and allow the water treatment plant to meet performance criteria for discharging water from the basin. Discharging treated water from the basin is needed to meet water balance goals that minimize water accumulation in the basin. The evaluation of these options will be completed by May 31, 2004.

Final Design by May 31, 04

6.0 Dam Freeboard

Dams will be maintained to provide a 10-foot minimum freeboard (7-foot water rise and 3-foot wave run-up). In the event of a 1% probable wet year, there will remain enough volume in the basin to contain the PMP. There is sufficient plant aggregate onsite to raise the dams to regain 10 feet of freeboard in the event of a low probability storm. The basin pond water surface elevation will be monitored and the dam crest elevations will be raised annually (if needed) to provide adequate freeboard.

Factor Safety

7.0 Dam Stability

Dam 1 1.3

Dam 2 not analyzed - Satisfactory 1.3

Dam safety review and design modifications implemented in 2003 resulted in dams 1 and 2 having acceptable stability factors. Geotechnical investigations/instrumentation/analyses are proposed to determine additional geotechnical parameters for continued monitoring of dam performance and long-term dam stability and for assessing fine tailing seepage control. Dam 5 is proposed to be raised in 2004 to meet the design criteria. Upon approval, Dam 5 will be raised using centerline construction methods and the existing clay till core for seepage control. Reinstall instrument in some areas. Dam 5 1.1-1.2 will be increased in '04

8.0 Bear Lake Outlet

Dam 5 is at about Elevation 1208 feet and does not yet affect the outlet from Bear Lake (Elevation 1209). If Bear Lake rises above elevation 1209 the water from Bear Lake will flow into the tailings basin and will not adversely impact Bear Lake. Similarly if the PMP event occurs, the basin water will not flow into Bear Lake. An assessment of the Bear Lake outlet options will be completed in 2004.

9.0 Available Plant Aggregate for Closure

There are an estimated 3,000,000 cy of plant aggregate available within the basin for cover/closure. This is enough to cover the exposed fine tailings (above water) and the first 100 feet of fine tailings underwater with three feet of plant aggregate. Don't need excess storage ~~for~~ for all of pond bottom as (1 ft cover)

10.0 Conclusion

The dams, basin, and water treatment plant are functioning properly and are capable of serving their intended purpose and accommodating the needs of the concentrator processing plant and the objectives of the permits.

Glossary

The following definitions are made for this 2004 Operations Plan:

- The Basin Supervisor is defined as the person from Northshore Mining Company responsible for the daily operation and supervision of basin activities.
- The Basin Engineer is defined as the designer of the dams or other qualified person approved by the Agencies who is not a direct employee of Northshore Mining or Cleveland Cliffs and is a registered Professional Engineer in the state of Minnesota. For this 2004 Operations Plan, it is Barr Engineering Company.
- Railroad Dispatcher is defined as the person from Northshore responsible for the daily operation and supervision for railroad services to the basin.
- Concentrator Area Manager is defined as the person from Northshore responsible for the daily operation and supervision of the overall operations of the concentrating process plant facilities.
- Concentrator Area Supervisor is defined as the person from Northshore responsible for the daily operation and supervision of the concentrating process plant facilities and tailings pipelines.
- The Agencies are defined as the Minnesota Department of Natural Resources (MDNR) and the Minnesota Pollution Control Agency (MPCA).
- The Closure Consensus Plan is defined as the "Tailings Basin Closure Consensus Plan for Reserve Mining Company," dated August 16, 1988.
- The Permits are defined as the existing issued Minnesota Department of Natural Resources Milepost 7 Master Permit, the Minnesota Department of Natural Resources Permit to Mine for the Northshore Facility, and the Minnesota Pollution Control Agency National Pollutant Discharge Elimination System (NPDES) and State Disposal System (SDS) Permit MN0055301.
- Basin, tailings basin, disposal system, and tailings disposal system have historically been used to generally define the "tailings basin" and appurtenant facilities used to dispose of the tailings and includes the Pond, dams, pipelines, diversion ditches, etc.
- Coarse tailing and plant aggregate have historically been used to describe the tailings that are not fine tailings. For clarification, plant aggregate (coarse tailings) is a combination of dry cobber aggregate (formerly called dry cobb tailings) and filter sands (formerly called belt filter tailings).
- Tailings are generally used in lieu of tailing.
- Fine tailings is the -200 mesh product of the concentrating process.
- Pond is meant to refer to the main body of water in the basin.
- Reclaim Pond is meant to refer to the water body contained by the reclaim dike.
- The Northshore Mining Company Milepost 7 Tailings Basin Five-Year Operations Plan, Years 2004-2008; 2004 Five-Year Operations Plan; Operations Plan; and 2004 Operations Plan are meant to be the same and represent the Five-Year Operations Plan prepared and submitted to the Agencies for 2004 operations.

1.0 Introduction

1.1 Introduction

Northshore Mining Company operates a disposal system west of Silver Bay, Minnesota, where it transport tailings and aggregate from its plant. This Northshore Mining Company Milepost 7 Tailings Basin Five-Year Operations Plan, Years 2004-2008 (2004 Operations Plan) includes a discussion of Relevant Information, 2003 Construction Activities, and then describes the Disposal System Operations for the Basin. The Design and Engineering and Basin Closure sections of this 2004 Operations Plan address the design of the basin through the life of operations. The Design and Engineering section also addresses permit issues raised by the Agencies in their correspondence to Northshore Mining Company. A summary of the Five-Year Operations Plan is presented at the end of this 2004 Operations Plan.

1.2 Background

The previous five-year operations plan for Northshore's Milepost 7 tailings disposal system was presented in a document entitled "Northshore Mining Company, Disposal System, 5-Year Operations Plan," dated December 17, 2002 and signed by Roy T. Mayfield of Sitka Corp. Responses to this 2002 document from the Agencies are contained in memorandums from Memos Katsoulis (MDNR) to Arlo Knoll (Manager, Mineland Reclamation – MDNR) dated April 17, 2003 and from John Adams (MDNR) to Steve Dewar (MDNR), dated March 28, 2003, regarding MP-7 water balance comments. A formal response from the Agencies is presented in a letter dated June 3, 2003 from Arlo Knoll, MDNR to David Skolasinski, Northshore Mining Company. A copy of the June 3, 2003 letter is in Appendix H.

Because Sitka Corp. no longer exists, Northshore Mining Company has selected Barr Engineering Company, to assist it with preparing the 2004 Operations Plan and responding to the comments from the Agencies. As a part of the change in consultants and in response to the comments from the Agencies, Northshore Mining Company has chosen to reevaluate the tailings disposal concepts, including the water/material balance, dam design and construction, and dam safety. The Design and Engineering section and Appendices A, B, C, and D of this 2004 Operations Plan present the details of the water balance, dam safety, instrumentation, and dam stability and respond to the engineering issues associated with the comments from Arlo Knoll in his June 3, 2003 letter.

As a result of the reevaluation, an initial conceptual design modification was proposed by Northshore Mining Company and submitted to the Agencies on October 1, 2003 for approval. In an October 15, 2003 letter to Dave Skolasinski (Area Manager, Environmental–Northshore Mining Company), Arlo Knoll approved the conceptual design changes to Dam 1 and Dam 2 but requested additional information before the Agencies give final approval for the Five-Year Operations Plan. A copy of the October 15,

2003 letter is in Appendix H. This 2004 Operations Plan presents the information requested by Mr. Knoll and is specifically addressed as part of Appendix D.

The tailing disposal concept reevaluation is an initial step in the evaluation of maximizing basin discharge and minimizing discharge of suspended solids loading through water filtration and sedimentation pretreatment technologies as requested by the Minnesota Pollution Control Agency (MPCA). The preliminary conceptual plans for a splitter dike across the pond are presented in this 2004 Operations Plan in conceptual form only, as one option being evaluated for reducing turbidity in the water reclaim pond. Another conceptual option for reducing turbidity is a new dike upstream of the existing reclaim dike as discussed later in the plan.

Dam 5 is proposed to be raised in 2004. Raising of Dam 5 greater than Elevation 1209 feet will prevent overflow from Bear Lake. Therefore, this 2004 Operations Plan addresses, in concept form, the outlet to Bear Lake.

1.3 Summary

Northshore Mining Company's 2004 Operations Plan is a five-year plan for 2004 through 2008. It is a continuation of the overall conceptual plan for operations through the planned life of the facility as presented in the "Milepost 7 Tailings Basin Five-Year Operating Plan," dated March 21, 1997 by Sitka Corp. and the Closure Consensus Plan and revised herein, pending approval by the Agencies. Implementation of this 2004 Operations Plan is summarized in the Summary section at the end of this report. The summary presents the 2004 action items required for 2004 through 2008, with the 2004 action items listed in greater detail. Northshore Mining Company is providing this 2004 Operations Plan to the Agencies for approval so that the operational objectives of the disposal system can continue.

2.0 2003 Construction Activities

In 2003, construction of the tailings basin consisted of ongoing raising of containment dams 1 and 2 using plant aggregate and continued placement of the fine tailings on the beaches upstream of the dams to seal the bottom of the pond. A drainage ditch was also constructed on Dam 1, just upstream of the clay till core. The drainage ditch planned on the east end of Dam 1 (Dam 1E) has not been completed.

Northshore Mining Company placed plant aggregate downstream of the filter berm on dams 1 and 2 and discharged fine tailings upstream of the filter berm on dams 1 and 2. The filter berm was raised to a minimum elevation of 1211 feet on dams 1 and 2. Since the filter berm represents the current crest elevation for dams 1 and 2, the freeboard on the dams is about 14 feet above the current pond elevation. Plans and specifications for the filter berm are included in the 2003 Final Contractor Construction Report, being sent under separate cover. A drainage ditch was constructed on Dam 1, and the plans and specifications for that structure are also included in the 2003 Final Constructor Construction Report.

Efforts to raise Dam 5 by upstream methods were discontinued in 2003 and a design using downstream construction methods and a clay till cutoff will be proposed to the Agencies for 2004 construction. The existing minimum elevation of the plant aggregate on the crest on Dam 5 is approximately Elevation 1208 and results in about 11 feet of freeboard.

In a letter to the Agencies dated October 1, 2003, Northshore Mining Company proposed conceptual design changes from those presented in the 1997 Operating Plan and the 5-Year Operating Plan (2002 Operating Plan), dated December 17, 2002 and developed by Sitka Corp. The conceptual design changes are presented in a September 24, 2003 letter from Barr Engineering Company to Northshore Mining Company and depicted on drawings A-01 and A-02, attached to the letter. The letter from Barr Engineering Company, drawings A-01 and A-02, and the letter from Northshore Mining Company are attached herein as figures 1 through 4. These conceptual design changes were approved in an October 15, 2003 letter from Arlo Knoll of MDNR to Dave Skolasinski, Area Manager, Environmental (Northshore Mining) (Figure 5). Appendix D presents the detailed stability analyses and computations of the conceptual design changes requested by Arlo Knoll and is signed by a professional engineer.

Plans and specifications for the construction activities performed during 2003 were also certified by Barr Engineering. These construction activities were monitored and construction reports were prepared and are available for Agency review.

NORTHSHORE MINING

Northshore Mining Company
A Subsidiary of Cliffs Minnesota Minerals Company

October 1, 2003

Mr. Arlo Knoll
DNR Lands and Minerals
1525 3rd Avenue East
Hibbing, MN 55746

Dear Mr. Knoll:

Northshore Mining and Barr Engineering are currently reviewing the planning and operation of the Mile Post 7 Tailings Basin at Silver Bay as part of developing a new 5-year Basin Operating Plan to be submitted to the Agencies this December. As part of this review and as discussed with Agency representatives on September 12, 2003, Barr has recommended several modifications to the current 1997 Operating Plan.

1. The upstream coarse aggregate berms for the seepage cut-off trenches on all dams are being eliminated. The coarse aggregate berms, as currently designed, serve as a pipe for seepage under the fine tailings blanket sealing the dams. Elimination of the berm will decrease seepage through the dams that must be recovered and pumped back to the Basin.

2. An interceptor ditch is being excavated along the upstream side of the clay cores on the original dams to catch seepage and reroute it around the original dams. This will help control the water level in the downstream portion of the dams and increase stability.

3. The interceptor ditch eliminates the need for the aggregate drain on the downstream slopes of the dams as proposed in the 1997 plan.

4. The interceptor ditch increases the safety factor for the dams and eliminates the need for the toe berms proposed in the 1997 plan.

The attached letter and prints from Barr to Northshore, provide more details of the changes. The changes are consistent with the intent of Consensus Closure Plan submitted in 1989 and designed to limit future basin closure liabilities. In addition to decreasing seepage and increasing dam stability, the changes will minimize the amount of coarse aggregate which must go into dam construction and maximize the coarse aggregate available to be stockpiled for any future reclamation needs. Further details will be provided as part of the new 5-Year Basin Operating Plan.

Sincerely,

David F. Skolasinski

David Skolasinski
Area Manager, Environmental

DS/pr

CC: Ann Foss - MPCA

10 Outer Drive · Silver Bay, MN 55614-1499 · 218-226-4125 · Fax 218-226-6096

Figure 1

BARR

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Minneapolis, MN • Hibbing, MN • Duluth, MN • Ann Arbor, MI • Jefferson City, MO

September 24, 2003

Mr. Pete Pastika
Northshore Mining Co.
Mine Site
Babbitt, MN 55706

Dear Mr. Pastika:

The purpose of this letter is to present the conceptual design changes proposed for Northshore Mining Co.'s Milepost 7 Tailing Basin at Silver Bay, Minnesota. Conceptual design changes are proposed from those presented in the 1997 Operating Plan and shown in the Northshore Mining Company, Disposal System 5-Year Operating Plan (2002 Operating Plan), dated December 17, 2002 by Sitka Corp. to enhance the performance of the tailing basin seepage control system and improve stability of the tailing basin dams. These design changes also allow for additional plant aggregate material to be stockpiled and available for future tailing basin closure.

The proposed 2003 conceptual design changes to the typical tailings dam section are shown on attached Barr Drawing No. A-01 which shows the 2003 Typical Tailings Dam Section (long term) by Barr and the 2003 Barr Concept Plan of Existing Typical Tailings Dam Section (August 2003). To more easily review and compare the 2003 conceptual design changes, Barr Drawing No. A-01 also shows the 1997 Typical Tailings Dam Section (by Sitka, as presented in the 2002 Operating Plan, Drawing No. 1151). The 2003 conceptual design changes proposed by Barr consist of the following:

1. Modify Seepage Cutoff (upstream)—Elimination of the upstream berm of plant aggregate material on the seepage cutoff. The upstream berm of plant aggregate material as proposed by Sitka Corp. is shown on Sitka Drawing No. 1151 in the 2002 Operating Plan and is also shown on attached Barr Drawing No. A-01 along with the 2003 concept design proposed by Barr Engineering Co.

2. Construct New Drainage Ditch—Construction of a new drainage ditch along the upstream side of the clay core of the starter dam of Dam No. 1 and Dam No. 2 is proposed. The drainage ditch along the crest of the starter dams, as proposed by Barr Engineering Co., is shown on attached Barr Drawing No. A-01. Water from the drainage ditch will discharge into the seepage recovery ponds, the same as presented in the 2002 Operating Plan (by Sitka).

3. Eliminate Aggregate Drain (downstream slope of dam)—Elimination of the aggregate drain consisting of 2-foot-thick dry cobber material on the downstream slope of the starter dam shown on Sitka Drawing No. 1151 and also on attached Barr Drawing No. A-01. This aggregate drain will not be necessary since the drainage ditch proposed by Barr Engineering Co. will not allow water to flow over the crest of the starter dam.

4. Eliminate Toe Berm (along the downstream toe of the dam)—Elimination of the toe berm consisting of plant aggregate, 2-foot filter sand and 2-foot dry cobber aggregate drain shown on Sitka Drawing No. 1151 and also on attached Barr Drawing No. A-01. This toe berm is not

necessary since similar factors of safety are achieved by constructing the drainage ditch upstream of the clay core and removing the plant aggregate material from the crest of the dam.

A comparison of the dams' factors of safety with the proposed drainage ditch in lieu of the toe berm is shown on attached Barr Drawing No. A-02. The analyses show that the factor of safety computed by Sitka in the 2002 Operating Plan for the typical section with a toe berm is similar to the factor of safety computed by Barr in 2003 with the proposed drainage ditch and no toe berm. The analyses performed by Barr assumed the same parameters, properties, piezometric pressures, and shear surfaces as the Sitka analyses (as presented in the 2002 Operating Plan) without consideration for appropriateness. Therefore, the results of the analyses are to be used only for comparison purposes of the dam's stability with the toe berm (Sitka) and with the drainage channel in lieu of the toe berm (Barr).

Construction drawings of the actual design will be prepared and signed by a professional engineer upon approval of the conceptual design shown on Barr Drawing No. A-01. As a note, the existing plant aggregate material on the crest of the dam is about 15 feet lower than assumed in the previous analyses. Therefore, the existing factor of safety is higher than previously reported by Sitka and is also shown on Barr Drawing No. A-02. The signed drawings along with more detailed computations of the design will be submitted to Northshore Mining Co. as part of the end-of-the-year report.

The proposed design changes by Barr Engineering Co. are in agreement with the Closure Consensus Plan and will benefit the overall long-term tailing basin management plan. The proposed design changes maintain both the current dam stability and water quality into the Seepage Return Ponds. In this regard, Barr Engineering Co. respectively requests that the proposed conceptual design changes be considered for approval.

Sincerely,

Philip B. Solseng, P.E.
Vice President

Enclosure
cc: Gary Goodman w/Enclosure
John Quist
P:\23\38\086\Letter to NSM re 2003 design changes to State.doc

Figure 2 (cont.)

3.0 Relevant 2003 Information

3.1 Introduction

This section presents information on current status of the tailings disposal system and anticipated future production levels that are relevant for the 2004 Operations Plan.

3.2 Current Status

Drawing 3.1 shows the general arrangement of the basin as of December 1, 2003. Current conditions are:

1. The pond levels in the basin and reclaim pond are at Elevation 1196.9 and 1187.6 feet, respectively as of December 2, 2003.
2. The pond free water volume based on the results of a bathymetric survey performed August 12, 2003 is approximately 25,700 acre-feet.
3. Fine tailings are being discharged from dams 1 and 2 to maintain the beaches and seal the bottom of the pond.
4. The crests of dams 1 and 2, as defined by the minimum elevation of the filter berms where fine tailings are discharged, have been completed to a minimum elevation of 1211 feet.
5. Dam 5 is currently constructed to Elevation 1208. Dam 5 is proposed to be raised in 2004 as a clay till core dam using centerline construction methods.
6. Dam 5 is still below the outlet of Bear Lake, approximate Elevation 1209 feet, allowing drainage from Bear Lake to enter the pond.
7. The pond level plus 10 feet of freeboard is still below the outlet elevation of Bear Lake, so a flood event at the basin will not enter Bear Lake.
8. Dams 1 and 2 were constructed as outlined in the Northshore letter to the Agencies, dated October 1, 2003. The letter and details of the 2003 Barr design are included as Figures 2, 3 and 4 in Section 2 of this report.
9. The instrumentation readings and dam safety inspection for 2003 have been completed and the details are included in Appendix B. The dams were found to be acceptable for continued operation.
10. Projected 2003 plant production rates are:
    a. Pellets – 4.6 MLT*
    b. Concentrate – 4.5 MLT

c. Plant Aggregate – 3.58 MLT

d. Fine Tailings – 5.91 MLT

* MLT = Million Dry Long Tons

11. The fine tailings handling system (including clarifier and pipelines) from the plant to the basin is acceptable for continued operation as presented in Appendix F. The details include short- and long-term fine tailings pipeline testing, a maintenance and replacement plan, and semiannual tailings pipeline inspection report.

3.3 Anticipated Production Levels

3.3.1 Anticipated Production Levels

Northshore Mining Company expects to continue to operate at a full three furnace level in 2004 and throughout the five-year period of this plan. Expected yearly operating rates, based on the 2004 Operations Plan are:

1. Pellets 4.85 MLT* including sinter
2. Concentrate 4.72 MLT including concentrate sales
3. Crude Ore 13.50 MLT
4. Dry Cobb Aggregate 2.23 MLT
5. Filter Sands 0.71 MLT
6. Plant Aggregate 2.94 MLT (dry cobb + filters)
7. Fine Tailings 5.79 MLT

* MLT = Million Dry Long Tons

Actual production rates for the plant aggregate and fine tailings may vary depending on ore grade and plant performance. These normal variations are small, however, and will not affect the 2004 Operations Plan. Annual updated production schedules and alterations to the 2004 Operations Plan will be provided as necessary. As required by the permits, the Agencies will be notified in the event of major production changes and the 2004 Operations Plan will be adjusted as needed to be consistent with the production rate.

3.4 Anticipated Pond Levels and Dam Raising Schedule

Anticipated basin pond levels for the period of this plan are listed in Table 3.1. These water levels are based on a 2003 pond water surface elevation of 1197.3 (May 2003).

Table 3.1

Milepost 7 Anticipated Basin Pond Water Levels[a]

Year	Normal Anticipated Level	Anticipated Level if 1% Probable Wet Year occurs in 2004[b]	Comments
2004	1198.8	1201.3 – 1202.8	Dam 5 raise required[c]
2005	1200.3	1202.8 – 1204.3	Dams 1 and 2 raise required[c]
2006	1201.8	1204.3 – 1205.8	
2007	1203.3	1205.8 – 1207.3	
2008	1204.8	1207.3 – 1208.8	

[a] See Water Balance Report for anticipated pond level rise for normal precipitation year.

[b] See Water Balance Report for range of estimated pond water surface rise for a 1% probable wet year.

[c] Minimum dam elevation 10 feet above pond water level to accommodate water storage for PMP's 3-foot wave run-up.

4.0 Disposal System Operations

4.1 Tailings Basin Operations

4.1.1 Introduction

The Milepost 7 tailings basin disposal system operations follow the general philosophy developed in the Closure Consensus Plan and the 1997 Milepost 7 Tailings Basin Five Year Operations Plan with the conceptual revisions proposed to the Agencies. This disposal system operations section of the 2004 Operations Plan describes basin operations as required by the permits. It includes the handling and disposal of plant aggregate and fine tailings, water management, and requirements for the dams related to flood storage and monitoring. The tailing clarifiers, tailings pipeline, tailings pipeline testing, maintenance and replacement plan, and testing pipeline inspection report are not addressed in this section, but they are included in Appendix F. Drawing 4.1 shows the general basin layout.

4.2 Handling and Disposal of Plant Aggregate

4.2.1 General

Plant aggregate is a portion of the tailings stream produced from the concentrating process, defined as the combined dry cobb aggregate (approximately 65% to 75%) and filter sands (approximately 25% to 35%). For purposes of clarification in this report, plant aggregate is used in general terms to describe all tailing except fine tailing. Also, where specific materials are discussed, such as filter sands for the filter berms, the specific material name will be used.

Normally, the plant aggregate is hauled by rail from the plant to the basin and used to construct the containment dams (dams 1, 2 and 5) and other structures. If required, the dry cobb aggregate and filter sands can be kept separate at the plant and hauled separately to the basin for special needs such as the filter berm in the dams. At the basin, the plant aggregate is unloaded from railcars and placed by dozers, loaders, trucks or scrapers as required to meet planned needs. Excess plant aggregate not used for the dams is placed within the basin to build roads, dikes, and railroad grades, or stored for future use to provide material for closure-related activities as defined herein, in Section 6, Basin Closure, and in accordance with the Closure Consensus Plan. About 0.5 MLT of plant aggregate are returned to the mine each year for use as road covering and blast hole stemming.

4.2.2 Schedule for Plant Aggregate Disposal

Plant aggregate will be delivered to the planned construction areas for the dams, dikes, roads, railroads, and stockpiles. The Basin Supervisor or his designee work with the Railroad Dispatcher and Concentrating Department to schedule the daily delivery of the plant aggregate.

4.2.3 Plant Aggregate for Dam Construction

Construction of dams 1 and 2 will continue utilizing plant aggregate for dam construction. Filter sands will be used for the filter berm construction on dams 1 and 2 and plant aggregate (dry cobb aggregate and filter sands) will be used downstream of the filter berms. Dam 5 will be raised using centerline construction with plant aggregate downstream and upstream of the clay till core. Details for Dam 5 construction are being developed.

Normally dam construction takes place in the summer months. However, a single lift less than about four feet thick may be placed on the dams in the winter (freezing conditions), provided all snow has been removed from the area being covered and the layer is compacted after thawing and before any further lifts are placed.

The placement of plant aggregate in the dams and any associated foundation work within the dams will be monitored as required by the permits and are the responsibility of the Basin Engineer. Adequate testing for quality assurance and control (QA/QC) will continue to be performed.

4.2.4 Plant Aggregate for Railroads and Roads

Beginning in 2004, the main railroad line to dams 2 and 5 will be raised or moved to avoid flooding as the pond rises. Options include: (1) raising the track with ballast near its current location, (2) moving the track further west to approximate Elevation 1240, or (3) rerouting the track across Dam 1 and extending it along the east side of the Basin to dams 2 and 5. These options are being evaluated at this time. As the dams are raised, the railroad grades on the dams will be raised to continue to provide sites for unloading the plant aggregate.

Plant aggregate will be used to build the railroad grades and raise or relocate the track. Small amounts of plant aggregate will also be required each year to build and maintain roads for access within the basin. Plant aggregate will not be used for roads outside of the basin, except within the plant area in a covered or bonded state or as otherwise allowed by the Agencies.

4.2.5 Plant Aggregate for Splitter Dike 2 and the Reclaim Dike

Studies are currently being conducted to determine the feasibility of reestablishing Splitter Dike 2 and/or constructing a new dike upstream of the existing reclaim dike to provide sedimentation and filtration of suspended solids as pretreatment to the concentrator plant and the water treatment plant. Plant aggregate material will be used as a part of the splitter dike and the reclaim dike if the studies prove positive.

4.2.6 Plant Aggregate Stockpiles

Excess plant aggregate not required at the basin (for dams, railroads, roads, or dikes) or at the mine will be stockpiled within the basin for future closure activities. Records will be kept of stockpiled plant aggregate.

4.2.7 Dust Control on Plant Aggregate Surfaces

All plant aggregate surfaces at the basin will be vegetated, covered, or otherwise treated as described below.

1. Total plant aggregate surfaces at the basin will be limited as much as practical and consistent with current designs
2. Plant aggregate used for road construction will be adequately covered with native soils or other suitable natural or artificial barriers
3. Untreated plant aggregate surfaces will be limited to 300 acres (treatment includes precipitation and other methods)
4. Untreated plant aggregate surfaces will be limited to 400-foot widths on splitter dikes and 200-foot widths on railroad grades

These treatments and operating constraints are intended to maintain essentially zero visible dust emissions, except under extreme meteorological conditions.

4.2.8 Contingencies

The projected plant aggregate volumes for 2004 are listed in Section 3, Relevant 2003 Information. Variations in ore grade and plant performance will cause the actual amounts delivered to the basin to vary as much as ±60% over short periods. Such normal variations average out in the long term, and no alterations to the 2004 Operations Plan are required.

In the case of a major disruption or reduction in operations due to reduced plant operating levels, outages, or other causes, the following steps will be taken:

1. The Agencies will be notified of the disruption.
2. Plant aggregate deliveries to the mine may be temporarily curtailed or suspended as required to provide material to raise the dams or otherwise protect the integrity and safety of the basin.
3. Plant aggregate will be utilized as required from the plant aggregate stockpiles at the basin to provide material to raise the dams or to otherwise protect the integrity and safety of the basin.
4. Detailed contingency plans will be developed to deal with the duration and extent of the situation.

Increases in plant production due to expanded production will include notification to the Agencies and alterations to the 2004 Operations Plan, if necessary, to handle the added production.

4.3 Handling and Disposal of Fine Tailings

4.3.1 General

Fine tailings are defined as the -200 mesh product of the concentrating process. With the upstream method of raising dams 1 and 2, the fine tailings provide a seal for the dams and are an integral part of the 2003 Barr design. During the period of this 2004 Operations Plan, the fine tailings will continue to be discharged upstream of dams 1 and 2 to create beaches to provide a seal for limiting seepage through the dams. Fine tailings not required to seal the dams will be discharged from the east side of the basin near Dam 5 to provide a foundation to reconstruct Splitter Dike 2 and to fill the deep areas in the pond.

The fine tailings handling and disposal system consists of clarifying equipment at the plant, fine tailings storage at the basin system, and the tailings pipeline system between the two. Operation of the tailings clarifier and the pipeline system between the plant and the tailings disposal system is the responsibility of the Concentrating Area Manager. Fine tailings disposal at the basin is the responsibility of the Basin Supervisor.

Clarifying equipment at the plant consists of two launder systems and four 400-foot diameter clarifiers. The fine tailings pipeline system consists of two parallel pumping/piping systems as described in more detail in Appendix F. One system serves as a standby. The pipeline is inspected and tested as described in Appendix F.

4.3.2 Fine Tailings Operations and Monitoring

The fine tailings system, including the fine tailings clarifiers, pumphouses, and pipeline, will be operated and monitored consistent with the criteria identified in the following documents:

1. The *Incident Report* (December 14, 2000)
2. The follow-up letter (March 26, 2001), addressing additional MPCA information and clarification requests
3. The *Revised Plan for Operation and Monitoring of the Fine Tailings Handling System (*dated January, 25, 2002)
4. The *Pipeline Testing, Maintenance and Replacement Plan – Final Report* (July 19, 2002)

Appendix F describes the operation and maintenance of the fine tailings handling system consistent with the requirements.

4.3.3 Schedule for Fine Tailings Disposal

Fine tailings will be discharged at Dam 2 and the west end of Dam 1 during non-freezing months to further establish the impervious blanket. During freezing months, fine tailings will be discharged west of Dam 5 for proposed Splitter Dike 2 and at the east end of Dam 1.

4.3.4 Fine Tailings for Upstream Blanket on Dams

The 2003 Barr design uses an upstream method for dam construction. The fine tailings are discharged upstream of the dams and to control seepage and seal the pond as evidenced in the following observation:

1. As detailed in the Reserve Mining Company Research Department report from November 18, 1975, *Fine Tailings Filter Tests*, fine tailings effectively created a self-sealing blanket over any pervious material types that may be found in dam foundations. In laboratory studies at that time, fine tailings were deposited on various foundation materials ranging from glacial till to sand and gravel samples. The results show that pore spaces were effectively plugged by the fine tailings, and the samples became impervious to passing tailings particles.
2. Observations at the reclaim pond dike, which was built out of plant aggregate but has become plugged over time by the infiltration of fine tailings.

3. Observations of Dam 2 seepage decreasing from 2002 to 2003 after fine tailings were placed upstream.

Based on the above information plus the additional insitu and laboratory testing of fine tailings permeability and subsequent analyses proposed for 2004, a fine tailings blanket will be used to control seepage from the pond.

4.3.5 Fine Tailings for Splitter Dike

Studies are currently being conducted to determine the feasibility of reestablishing Splitter Dike 2. Fine tailings will be used to establish the foundation of the splitter dike (underwater portions), if the studies prove positive. Splitter dike construction will also assist in filling deep areas in the pond.

4.3.6 Fine Tailings for Mitigation of Pervious Zones

The MPCA permit requires that any pervious zones encountered in the dam foundations or in borrow pits within the basin be blanketed or otherwise treated to prevent the transmission of tailings to outside waters of the State. Past excavations in Borrow Pit 1 near Dam 2 and in the foundation for Dam 2 have shown the existence of small sand seams in the clay and glacial till along the west side of the basin. Previous plans called for an extensive cutoff trench and till blanket to be placed through this area to cut off any potential seepage. This 2004 Operations Plan proposes that these pervious zones be sealed with the upstream fine tailings blanket being further developed in the Dam 2 area.

4.3.7 Dust Control on Fine Tailing Beaches (above Pond)

Exposed fine tailings beaches will be vegetated, mulched, and/or otherwise treated to the maximum extent possible to control fugitive dust.

4.4 Water Management (including Water Quality and Quantity)

4.4.1 General

The Silver Bay plant and Milepost 7 tailings basin operate as a closed water system with no direct discharge of water except through the water treatment plant or as otherwise authorized by the Agencies. Because the basin is a closed system, it is necessary to recycle treated water back to the Plant, treat and discharge water to the Beaver River, and build dams to contain the excess water in the pond at the basin. Appendix A presents the water balance for the basin.

A key goal of this 2004 Operations Plan is to control the pond water level and reduce the water volume. Controlling the pond water level will minimize the need to raise dams. Reduced water volume will also be beneficial for closure and reduce potential closure liabilities.

In general, Northshore Mining Company controls the water within the basin by the following:

1. Net inflow—Controlling the net inflow to the pond from the plant,
2. Basin diversions—Diverting runoff away from the basin through the basin diversions,
3. Water treatment plant—Discharging water from the basin through the water treatment plant,
4. Upstream blanket—Reducing seepage by sealing the pond with fine tailings.

These methods of water control and contingencies are discussed in the following sections.

4.4.2 Net Inflow

The net water flow from the plant is a Key Performance Indicator (KPI) for Northshore and is tracked and recorded daily. All the process water from plant operations and runoff from within the plant area is collected and pumped to the basin with the fine tailings. The tailings settle or are filtered out at the basin and clearer water is reclaimed and pumped back to the plant for process needs.

Under normal conditions, makeup water for process water at the plant is not required. Under special conditions such as starting a tailings pipeline, makeup water is required and an automatic valve opens to add makeup water to the system. Makeup water is also added to the system through other plant uses, such as dust control. The Concentrator Section Manager is responsible for monitoring the net water pumped to the basin and makeup water additions and is responsible for taking corrective action as needed to keep net water flow within normal ranges.

4.4.3 Basin Diversions

The basin diversions consist of the headwaters diversions for Big Thirty-Nine Creek, Little Thirty-Nine Creek, and the west diversions, which are west of dams 1 and 2. The basin diversions reduce the runoff to the pond and normally are self-sustaining and are monitored periodically by the Basin Supervisor.

4.4.4 Water Treatment Plant

In 1985, the water treatment plant was completed at the basin to allow water to be treated and discharged from the plant/basin to the Beaver River. This discharge reduces the need for storing water in the pond. The water treatment plant released an average of 2,515 gpm from startup through 2002, although annual average discharge rates as high as 3,143 gpm have been achieved. The water treatment plant reduces the volume of free water accumulating in the basin, minimizes the pond level rises, and limits the need to raise the dams.

For 2004, it is anticipated that the water treatment plant will be operated at an average annual rate of 2,500 gpm. According to the water balance in Appendix A, under normal meteorological conditions and

at current plant operating rates, the water in the pond will be reduced. However, the pond will still rise about 1.5 feet per year because of fine tailings displacing the water.

The Concentrator Section Manager is responsible for operation and control of the water treatment plant. An important aspect of the operation and control of the water treatment plant for permitting purposes is the water quality of the discharge to the Beaver River.

4.4.4.1 Water Quality Control at Water Treatment Plant

Based on historical data, the turbidity of the influent water to the treatment plant must be less than 50 NTUs to meet the current MPCA discharge limits and plant discharge requirements. As originally constructed, the basin water was filtered through splitter dikes and the reclaim dike surrounding the reclaim pond before being pumped to the processing plant and water treatment plant. These dikes and the resulting filtration served to minimize influent turbidity to the processing plant and water treatment plant. As anticipated in the 1997 operating plan, the splitter dikes are now underwater. The reclaim dike has also become plugged and ineffective, requiring an overflow weir to allow water to get from the main basin pond into the reclaim pond. As a result, this has caused higher turbidity (suspended solids) in the water for the concentrator processing facilities and the water treatment plant. Several steps are currently being evaluated to maintain basin discharge rates and minimize the influent turbidity (suspended solids) to the concentrator processing facilities and the water treatment plant.

Northshore Mining Company is evaluating water filtration and basin water pretreatment technologies to maintain basin discharge volumes, minimize discharge of suspended solids, and provide cleaner water to the concentrator processing plant and water treatment plant. Turbidity is an indicator of the water treatment plant's effectiveness and the following technologies are being evaluated:

1. A flocculating agent is currently being added to the water flowing over the weir and feeding the reclaim pond to reduce turbidity (suspended solids). Tests will continue through the winter of 2003-2004 to evaluate alternative reagents and cold weather performance.

2. Studies are being conducted to determine the feasibility of constructing a new Splitter Dike 2 to separate the basin into two cells and reduce turbidity in Cell 1 by sedimentation. Cell 2 will be the active cell for fine tailings deposition and initial tailings settlement and will overflow into Cell 1. Cell 1 will function as a clear water pond and will provide less turbid water to the reclaim pond.

3. Studies are being conducted to examine the feasibility of constructing another reclaim dike to replace the existing reclaim dike to reduce turbidity by filtration.

4. Studies and tests have already been done to examine the feasibility of treating the water treatment plant influent in a small clarifier ahead of the water treatment plant to reduce turbidity.

5. Studies have already been done to examine expanding the capacity of the water treatment plant to increase the discharge potential.

These tests, study results, and recommendations will be available to the MPCA by May 31, 2004.

4.4.5 Upstream Blanket

Seepage from the pond will continue to be reduced with the fine tailing blanket in the pond upstream of the major containment dams. Seepage flowing through the fine tailings will be collected in the seepage recovery facilities and returned to the basin as described below.

4.4.5.1 Seepage Recovery Facilities

Each of the three major containment structures (dams 1, 2, and 5) has its own downstream seepage recovery facility. These consist of a pond, an emergency spillway, pumping facilities, and a pipeline. The seepage recovery systems collect any seepage through or under the dams plus any runoff from the dams and adjacent watershed, then reroute the water back to the tailings pond to complete the closed water system at the basin. The seepage recovery systems are operated and maintained as described in the August 1976 Klohn Leonoff Consultants Ltd. report "Volume I Engineering Report On Geotechnical, Hydrologic, and Hydraulic Design For Tailings Disposal Milepost No. 7 Site" including Drawing 292-069, "Seepage Recovery Dams – Reservoir Volume Curves & Mass Curves."

The Basin Supervisor is responsible for the operation and control of the seepage recovery systems.

4.4.6 Contingencies

Water management contingencies are needed for two scenarios:

1. Significantly less direct precipitation (and resulting runoff) or plant production (fine tailings and/or water) to the basin than assumed in the 2004 Operations Plan

2. Significantly more direct precipitation (and resulting runoff) or plant production (fine tailings and/or water) to the basin than assumed in the 2004 Operations Plan.

If less water than assumed is available at the basin, the discharge of water through the water treatment plant will be reduced and the exposed beaches will be mulched, vegetated, or otherwise treated to control dust emissions.

If more water than assumed is available at the basin, the crest heights of the containment dams (dams 1, 2 and 5) will be increased to provide adequate flood storage, and the water level will be drawn down over time as conditions return to normal.

4.5 Requirements for the Dams for Flood Storage Freeboard and Dam Monitoring

Basin operations monitoring and reporting will be conducted as required by the permits to provide adequate information to measure the performance of the dams. The primary reporting and monitoring requirements relevant to the dams are flood storage and freeboard requirements, and dam instrumentation as discussed in the following sections.

4.5.1 Flood Storage and Freeboard Requirements

The dams must be maintained with sufficient freeboard to store water from a Probable Maximum Precipitation (PMP) event. This has been defined by Barr Engineering (March 1997) as 32.2 inches of rain over a 72-hour period resulting in about 10,400 acre-feet of water accumulation in the basin. This PMP raises the pond level by 7 feet. At the current pond elevation of about 1197, the dams must be a minimum of Elevation 1204 feet to contain the water from the PMP. The design also requires an additional three feet of freeboard above the PMP level to allow for wave run-up. The total PMP freeboard requirement is 10 feet. All dams meet this permit requirement.

For the period 2005-2008, the dams will be raised to meet freeboard requirements. Table 3.1 in Section 3, Relevant 2003 Information, shows the anticipated water levels (and inferred minimum dam elevations) for 2004-2008 based on normal hydrological and plant operating conditions. The actual amounts the dams must be raised each year will depend on actual conditions and updated dam raising requirements will be provided in the annual update to the 2004 Operations Plan. A wet meteorological condition of a 1% probable wet year occurring in 2004 was analyzed as described in Appendix A and presented in Table 3.1 of Section 3, Relevant 2003 Information. This table shows that the 1% probable wet year raises the pond level between about 2.5 and 4 feet. This is reasonably close to the three feet of freeboard above the PMP water level in the pond, and no further freeboard is needed.

The freeboard requirements for the PMP and the 1% probable wet year have also shown that an allowance should be made as described in subsection 4.4.6, Contingencies.

4.5.2 Instrumentation

Dams 1 and 2 have instruments including settlement gauges, inclinometers, and piezometers. These instruments will be monitored and reported as required under the supervision of the Basin Engineer. Instruments that are damaged or become inoperative may be replaced or abandoned and new instruments added as required at the direction of the Basin Engineer. Instrumentation at Dam 5 will be added in 2004. Appendix C shows the current instrumentation.

5.0 Design and Engineering

5.1 Tailings Basin Evaluations

As discussed previously, Northshore Mining Company requested Barr to conduct a reevaluation of certain aspects of the tailings basin, including the water balance, dam performance, instrumentation and monitoring of the tailings dams, the dam stability, the tailings basin operation options, the Bear Lake outlet options, and site survey control monumentation.

5.1.1 Water Balance

A water balance analysis was completed in response to the June 3, 2003 letter from Arlo Knoll, MDNR Mineland Reclamation Manager. Appendix A provides the details of the water balance analysis.

The basin water balance affects the rate of dam raise and, to some degree, the seepage from the pond. The pond level also affects the minimum dam elevation required for containing a PMP, possible wave run-up, and the amount of beach above water that may require mitigation to minimize fugitive emissions.

The water balance analysis shows that:

1. An average annual pond water level gain is 1.5 feet due to the volume of fine tailings added to the basin less evaporation and discharge. As a note, the amount of free water above the tailings should be decreasing about 0.7 feet per year over time, but deposition of fine tailings within the basin will cause the pond to come up an average of 2.2 feet per year.

2. A wet cycle year with a 10% probability of occurrence in any one year will raise the free water an additional 2.0 feet above the average annual gain predicted above.

3. The 1% probability wet year would result in an estimated 2.5- to 4-foot raise above the average annual gain predicted above.

Therefore, the combined effect of a 10% probability wet year with an average annual gain yields a potential for a pond level raise of about 3.5 feet. The combined effect of a 1% probability wet year with an average annual gain yields a potential for about 4.0 to 5.5 feet of pond level rise. Annual changes to the 2004 Operations Plan will be made depending upon the climatic conditions that have occurred the previous year.

The tailings basin is required to contain and store the probable maximum precipitation (PMP) and the resulting runoff. A PMP for the existing basin watershed yields a 7-foot increase on the pond level. A wave run-up of three feet is used for additional freeboard above the PMP. The total freeboard needed for normal pond levels is 10 feet.

The potential 3.5 feet of pond level raise with a 10% probability wet cycle combined with a seven-foot increase from the PMP event yields 10.5 feet of freeboard required. This 10.5 feet of freeboard is close to the 10 feet of freeboard already required and acceptable given the low probability of the combined events.

Therefore, assuming a pond elevation of 1197 feet, the minimum elevation of the filter berm on the upstream cutoff should be about 1207.5 feet, and the 1211 feet as constructed in 2003 is adequate. The crest of Dam 5 at about Elevation 1208 feet is also adequate.

Please note that a five-year wet cycle with a 10% probability in any five-year period will raise the pond an average of an additional 2.4 feet instead of the 2.0 feet mentioned previously, for a 10% probability single wet year. However, the five-year time period is long enough to compensate for any one year and is not considered to be critical for annual design purposes.

5.1.2 Dam Performance

A dam safety inspection was completed to evaluate dam performance. The dam safety inspection was performed as required by permit in response to the June 3, 2003 letter from Arlo Knoll. Appendix B provides the details of that inspection.

The dams and diversions along the tailings basin were inspected October 14-16, 2003. The inspection included Dam 1 (including Dam 1E), Dam 2, Dam 5 (including dams 5A and 5B), seepage recovery dams 1A, 1B, and 2-3, the reclaim dam, and diversion dams. Based on the observations made during the inspection, all dams are acceptable for continued operation. Details of the dam safety inspection are included as Appendix B.

Major observations related to stability:

1. Water was overflowing the clay till core on dams 1 and 5. This was corrected with a drainage ditch upstream of the clay till core on Dam 1. Dam 5 is proposed to be corrected in 2004 by raising the clay till core in the dam. Water was ponded on Dam 2 and has been pumped back to the basin.

2. Water was exiting as small pencil-sized boils downstream of Dam 5. This will be corrected when Dam 5 is raised in 2004.

3. Minor erosion was present on the downstream slopes of Dam 1. This ongoing erosion is partly related to the seepage over the crest and is being corrected with the drainage ditch and as part of routine dam maintenance.

4. Water was present along the downstream toe of the dams. This is currently being evaluated and appropriate corrective measures will be performed in 2004, if necessary.

5. The seepage water observed in 2002 along the crest of Dam 2 was not evident during the 2003 dam safety inspection. This reduced seepage is attributed to the fine tailings beach placed upstream of

Dam 2 in 2003 and demonstrates the ability of fine tailings to provide a seal on the upstream face to control seepage.

5.1.3 Instrumentation and Monitoring

The dam instrumentation and monitoring was performed, and the results are included in Appendix C.

Instruments on dams 1 and 2 are used to measure the performance of the dams and their foundation, as the dams are raised and the pond rises. There is currently no instrumentation at Dam 5. The two major geologic features being monitored on dams 1 and 2 that significantly affect stability are the lacustrine clay and glacial till foundation.

The lacustrine clay is characteristically soft and when loaded, deforms and "builds" pore pressures. The lacustrine clay is also varved, so that pore pressures are easily transferred horizontally. These characteristics are being measured using inclinometers, settlement plates, and piezometers.

The glacial till is characteristically very "hard" but relatively pervious. It is pressurized from the pond and adjacent groundwater flow and contained by the relatively impervious lacustrine clay above it. This creates potential uplift pressure downstream of the dams along the toe. This condition is being managed using relief wells along the downstream toe of the dams. The pressure in the glacial till is being measured with piezometers.

With the 2003 Barr design for dams 1 and 2, a new critical factor for future stability will be the fine tailings foundation. The fine tailings were hydraulically placed and are loose. Piezometers installed in the fine tailings show significant pore pressure increases when loaded. These pore pressures are currently not affecting dam stability, but the measurements will be valuable for establishing future design parameters as the dams are raised.

The instrumentation and monitoring schedules are currently being reevaluated to ascertain which instruments are adequate and usable. Additional instrumentation will be specified in 2004 for dams 1, 2, and 5 to measure their performance. Instruments that are not usable will be abandoned.

A plan will be developed in 2004 that identifies actions to be taken based on the instrument readings, and the stability analyses of the dams. Appendix D contains the results of the dam stability analyses for current and predicted future conditions of dams 1 and 5 for use in developing the plan for identifying actions to be taken based on the instrumentation readings.

5.1.4 Dam Stability Analysis

A dam stability analysis was completed in response to June 3 and October 15, 2003 letters from Arlo Knoll. Appendix D provides the details of the dam stability analyses.

The Disposal System Five-Year Operations Plan, compiled by Sitka Corporation and dated December 17, 2002, recommended that a berm be constructed along the toe of Dam 1. Subsequently, the conceptual geometry of Dam 1 was revised (per 2003 Barr design) and approved by MDNR in the October 15, 2003 letter. The Barr 2003 design included:

1. Removing plant aggregate material along the upstream side of the clay till core at the crest of Dam 1
2. A drainage ditch along the upstream side of the clay till core
3. Elimination of the plant aggregate berm upstream of the filter berm

These revisions were completed as part of the 2003 construction. As a result, factors of safety on Dam 1 are currently adequate. Dam stability evaluations of the revised geometry for future conditions are ongoing, although preliminary evaluations indicate an adequate factor of safety (greater than 1.3).

Dam 2 was previously analyzed by Sitka Corp. in the Disposal System Five-Year Operations Plan, and reported to have a factor of safety greater than 1.3. Therefore, no further analysis of this dam was included in this plan. The drainage ditch and elimination of the plant aggregate berm as discussed for Dam 1 per 2003 Barr design also applies to Dam 2. A downstream plant aggregate berm was constructed along portions of Dam 2 prior to 2003. Analyses of dams 1 and 2 show stability factors that are greater than 1.3. Preliminary analyses of future dam raises to dams 1 and 2 show acceptable safety factors. Prior to the next anticipated dam raise projected for 2005, additional detailed analyses to consider liquefaction and staged construction will be performed.

Dam 5 is proposed to be raised using centerline construction methods and the existing clay till for a cutoff. Dam 5 has no instrumentation and limited foundation information is available. Therefore, reasonably worst-case conditions were analyzed for the stability analysis, and the analysis is judged to give conservatively low factors of safety. Additional investigations and analyses are being completed and a design for Dam 5 will be provided to the Agencies for approval of the proposed 2004 construction.

The dam stability analyses performed for dams 1 and 5 used both limit equilibrium and finite element methods of analyses and incorporated seepage pressures. The finite element method of analyses was used because it models deformation and is considered to provide more accurate factors of safety for the lacustrine clay. Also, all the analyses used data from previous reports. Although this data is considered to be of good quality, it will be updated with geotechnical investigations and subsequent analyses using the data gathered through investigations and analyses planned for 2004.

In summary, the dam stability analysis results presented in Appendix D show that the factors of safety for existing dams 1 and 2 are adequate; the Dam 5 factor of safety is marginal using reasonably worst-case assumptions. Additional information will be gathered to refine the dam stability analysis for dams 1, 2,

and 5. Dam 5 will be analyzed and designed to be raised in 2004. Further analysis for liquefaction and staged-construction on Dam 1 and Dam 2 will be performed.

5.1.5 Tailings Basin Operation Options

The tailing basin operation options evaluation is a result of Northshore Mining Company's reevaluation of disposal system operations and the concept being considered for maximizing basin discharge rate while minimizing discharge of suspended solids discharge content. A splitter dike across the pond is being evaluated to control sedimentation of fine tailings throughout the basin on an as-required basis (i.e., Cell 1 versus Cell 2). A dike upstream of the reclaim dike is also being evaluated for filtration of fine tailings. Also, an option for leaving a portion of Dam 5 below the Bear Lake outlet is being considered to postpone construction of an outlet. Appendix E discusses these options in more detail.

Fine tailings are discharged from the filter berms on dams 1 and 2 into the pond to provide an impervious blanket to control seepage. Fine tailings discharged for the impervious blanket near the reclaim pond is plugging the reclaim dike surrounding the reclaim pond. As a result, water in the reclaim pond is not effectively clarified. Therefore, Splitter Dike 2 is proposed to clarify the water before it reaches the reclaim pond. Construction of the splitter dike is proposed to begin in 2004.

The splitter dike is also being evaluated as an option to fill the deep areas in the pond and reduce the volume of free water. Reducing the volume of free water will be beneficial to final closure.

Splitter Dike 2 would divide the pond into two cells (north cell and south cell). After Splitter Dike 2 is reestablished across the pond with fine tailings, plant aggregate would be placed on the splitter dike for support of the fine tailing pipeline. Fine tailings would then be discharged off the plant aggregate berm into the north cell.

The advantage of the splitter dike is that the pond water will be clarified by sedimentation before it is discharged to the south cell. This disposal option also has a potential advantage in that, if constructed to meet design requirements for stability and PMP events, Dam 1 will not need to be raised as often which will allow the use of longer-term dust suppression on the beaches. This promotes progressive reclamation and closure activities.

Another option for clarifying the water before it reaches the reclaim pond is constructing a dike upstream of the existing reclaim dike to filter the water before it enters the reclaim pond. This option is being evaluated and will be completed prior to May 31, 2004.

There may be an advantage to keeping the south portion of Dam 5 at a lower elevation so that the PMP flood from Bear Lake would be contained in the basin, as it does now. This allows a longer period of time before construction of an outlet to Bear Lake is required. This option is being evaluated and, if advantageous, will be proposed to the Agencies for approval prior to construction of Dam 5 in 2004.

Appendix E describes the options in more detail.

5.1.6 Bear Lake Outlet Options

The existing natural outlet for Bear Lake drains into a depression downstream of Dam 5 and is pumped periodically to the basin reclaim pond. Currently, if it is not pumped, the water in the depression will overflow Dam 5 and into the pond. The outlet options for Bear Lake have been evaluated because the next raise to Dam 5 may cause the crest of the dam to be above the outlet elevation of Bear Lake (1209 feet). When this occurs, provisions must be made for those low probability flood events that would raise the water in Bear Lake above what would naturally occur.

5.1.7 Site Survey Control Monumentation

The tailings basin has been surveyed historically as part of the permit requirements, and site survey control is available within the basin. The site survey monumentation is shown on Sheet C-01 in Appendix G.

The Milepost 7 Tailings Basin control system for basin construction has been primarily based on control surveys transferred to the basin in the late 1970s from state or county monuments located along the east and south sides of the basin. Permanent monument pins were placed at each end of the original starter dams and future ultimate dams. These pins were positioned beyond the dam abutments, where they would less likely be disturbed or destroyed. These monuments mark the points of centerline alignment as they existed when the starter dams were originally constructed in 1980 and where the centerline of future ultimate dams may be located. The baseline alignments that were established for each dam have been used for all major basin construction. Benchmarks were also established around the perimeter of the basin, including locations of wells and instrumentation.

In May of 2003, Aero-metric of Sheboygan, Wisconsin completed a ground survey placing targets throughout the basin in preparation for an aerial survey. Target locations were established using the Minnesota State Plane coordinate system (North Zone, NAD 83/96). Vertical datum was based on the North American Vertical Datum (NAVD) of 1988. The results of the May survey were used for all documentation completed in 2003. Another aerial survey was completed in November 2003, and the results are pending and will be supplied to the Agencies as appropriate.

In addition to the targets placed and recorded by Aero-metric, Barr Engineering surveyed permanent monuments (two iron pins and seven monitoring well casings) located near Dam 1 using a Trimble Real Time Kinematics Survey unit, which consists of a model 4800 base station and a 5800 GPS receiver. The level of accuracy for this survey was within 0.02 feet for the vertical and horizontal positions. The procedures used are described in Appendix G.

6.0 Basin Closure

6.1 Introduction

Basin closure plans including the following items are required by the Agencies' permits:

1. General descriptions of plans (both planned and unplanned closures)
2. Programs for perpetual maintenance and safety of the basin including adequate monitoring
3. Management of ponded waters
4. Monitoring and mitigation of surface and groundwater pollution
5. Vegetation and landscaping plans

In general, basin closure plans will conform to the *Closure Consensus Plan.*

A primary consideration for the Milepost 7 design and operations is to limit the risks and liabilities associated with any future basin closure. When Reserve Mining Company closed in 1986, the basin was left with excess stored water, threatening the long-term stability and safety of the containment dams (dams 1, 2, and 5). Costs to close the basin, drain the pond, and reclaim the disturbed areas were estimated at that time to be as high as $70 million.

To reduce the closure liabilities, the *Closure Consensus Plan* was developed. This plan called for the basin to be closed over a five-year period using the available fine tailings and plant aggregate produced by the plant. Through the use of the materials from the plant, closure liabilities were reduced to less than $10 million.

An option was also written in the *Closure Consensus Plan* to allow operations to continue if desired. If operations continued beyond the five-year closure period, the final phase of the closure plan was to be placed on hold until the operations ceased, at which point the basin closure would continue as defined in the *Closure Consensus Plan.*

This plan continues to follow the *Closure Consensus Plan* with details updated as noted herein to reflect existing conditions and information.

6.2 Definition of Closure

Closure is defined as the cessation of operations of the concentrating plant in Silver Bay and the resulting cessation of tailings deposition at the basin. Closure can occur in several forms, including:

1. Temporary closure, which is defined as a short-term shutdown of the plant and basin operations for a time period that may last several years, as experienced between 1986 and 1990. A temporary closure becomes a permanent closure when the plant in Silver Bay is no longer maintained in a condition to restart operations.

2. Premature closure, which is defined as an unplanned permanent cessation of operations with little or no prior notice

3. Planned final closure, which is defined as permanent cessation of operations with sufficient prior notice to accomplish much of the basin closure during the last years of plant operation

In all three cases, the closure would follow the concepts developed in the *Closure Consensus Plan,* with the main differences being matters of timing and the source of the materials to be used to cover the exposed fine tailing beaches.

As defined by Minnesota State Law, the planned final closure and demolition of a taconite plant must include a two-year holding period where the facilities are sufficiently maintained to allow operations to restart. Any final closure can only proceed after this holding period. The effect is that any planned final closure would be treated like a temporary closure for at least two years.

At the Milepost 7 Basin, a planned final closure would begin several years in advance of the cessation of operations, and the basin water volume would be reduced and the beaches covered with plant aggregate from ongoing operations. In a premature closure, no notice would be given but closure would proceed in a manner similar to a planned final closure. Plant aggregate from stockpiles at the basin would be used to cover exposed fine tailings beaches to create a reclaimable surface. Currently, there are approximately 3,000,000 cy of plant aggregate available for closure/cover. Appendix E presents an evaluation of plant aggregate stockpile volume by year.

The following sections contain general closure plans for each of the three scenarios listed above. In all cases, detailed plans including the final pond level to be achieved, the location and design of spillways, perpetual maintenance requirements, and other details would be finalized at the time of closure.

6.3 Temporary Closure

In the event of a temporary cessation of operations at Milepost 7, the following steps will be taken:

1. The Basin Operations Plan will be adjusted to reflect the cessation of operations and detailed plans developed to hold the basin for the required two-year period

2. The freeboard and stability of the containment dams (dams 1, 2, and 5) will be evaluated and corrective action will be taken as required to protect public health and safety

3. Water treatment plant operations will continue as required to control the pond level and maintain adequate freeboard for the dams

4. Areas of exposed untreated plant aggregate and fine tailings will be treated or covered as required to minimize dust emissions

5. Monitoring and instrumentation of air and water quality will continue as required

6. Operation of the seepage recovery facilities will continue as designed

7. Stream diversions will continue to be inspected and maintained

8. The basin facilities will be maintained and kept in a condition to allow operations to resume when appropriate

6.4 Premature Closure

In the event of a premature closure of the basin, the following steps will be taken:

1. The basin will be held for a period as defined by Minnesota State Law (two years) to allow operations to resume if appropriate, using steps listed in the temporary closure section.

2. A detailed closure plan will be developed to define the final closed configuration of the basin including spillway design, a vegetation plan, perpetual maintenance requirements, and a closure schedule.

3. If required, steps will be taken to increase the factor of safety for the containment dams (dams 1, 2, and 5) to suitable, long-term standards.

4. At the end of the temporary closure period, over a time schedule as developed by Northshore and approved by the Agencies:

    a. All remaining exposed fine tailings and wave erosion zones will be covered with plant aggregate taken from onsite stockpiles to produce a reclaimable surface. Where slopes and conditions allow, the fine tailings beaches may be vegetated to prevent erosion and dust emissions.

    b. Buildings, pipelines, and other structures not required for future maintenance will be removed

    c. All roads, railroad grades, dikes, borrow pits, building sites, or other disturbed areas not required for future maintenance will be contoured and vegetated

    d. An emergency spillway will be built to handle runoff and protect the integrity of the containment dams (dams 1, 2, and 5)

5. The water treatment plant will continue to operate to control the pond level as required until such time as the pond water quality allows direct discharge of pond water outside of the basin.

6. With time, the water quality will improve allowing direct discharge and the following will be performed:

    a. An operating spillway will be excavated to control the basin surface water level.

    b. The stream diversions and seepage recovery dams will be breached.

    c. The water treatment plant will be shut down.

    d. All remaining structures and roads not required for future access will be reclaimed.

7. Periodic monitoring and inspections will continue until the basin is deemed to be reclaimed to a natural self-sustaining condition.

6.5 Planned Final Closure

For a planned closure of the basin, the following steps will be taken:

1. Upon cessation of operations, closure will continue with the steps listed for the temporary and premature closures

2. Prior to closure:

    a. The basin will be managed to minimize the pond water volume and the pond will be filled in a manner that will force the water to the west shore of the basin

    b. The plant aggregate produced by the plant will be used to cover exposed beaches and wave erosion zones to form a surface capable of reclamation

    c. The water treatment plant will operate as required to control the pond level and minimize the pond water volume

One difference between the current closure plans as listed above (subsections 6.3, 6.4, and 6.5) and the *Closure Consensus Plan* is that in the current plan, the fine tailings stored underwater in the pond below wave erosion zones will not be covered with plant aggregate. At the time of the *Closure Consensus Plan,* it was thought that the fine tailings covering the pond bottom would be continually resuspended and not allow the pond to clarify at the time. To stabilize the tailings, a one-foot layer of plant aggregate was to be placed over the entire pond bottom to cover and contain all the fine tailings. However, observations during the temporary plant closure (1986 to 1990) showed that the basin water clarity improved dramatically during the first few months after operations ceased. This experience demonstrated that from a water clarity and corresponding water quality perspective, a layer of plant aggregate over the entire fine

tailings under water in the pond is not necessary. Studies and experience since 1988 have also shown this to be impractical and unnecessary.

Uncompacted plant aggregate weighs about 134 pounds per cubic foot and the fine tailings in the center of the basin can weigh as low as 75 pounds per cubic foot. Since the plant aggregate is so much heavier than the fine tailings, it would be difficult to place a layer of plant aggregate under water on top of the fine tailings without displacing the fine tailings. This difficulty would be compounded by the long-term differential settlement of fine tailings (and slimes) that would occur with the added weight of the plant aggregate. Even if a thin layer of plant aggregate could be established on the fine tailings, the differential settlement would likely expose the fine tailings and the cover would be ineffective. Based on this, placing plant aggregate cover over the entire pond bottom is unnecessary and not part of the current plan.

7.0 Summary

7.1 Objectives of 2004 Operations Plan

The 2004 Operations Plan is intended to meet the following major objectives:

1. Providing disposal of all fine tailings in the basin with special emphasis on (a) supplementing the fine tailings blankets upstream of dams 1 and 2 for sealing the dams and the bottom of the pond, (b) reestablishing a splitter dike in the basin, and (c) filling deep areas in the pond.

2. Raising all dams, as necessary, to maintain adequate freeboard to contain the PMP. Dam raising will include dam stability and safety considerations.

3. Managing plant aggregate material for dam construction and stockpiling for basin closure.

4. Controlling the basin water level and volume by diverting runoff away from the basin, discharging water from the basin (via water treatment plant and discharge to the Beaver River), and managing net plant water.

5. Improving discharge quantity and water quality (suspended solids levels) at the reclaim pond (prior to plant reclaim and the water treatment plant) by reducing turbidity. Options being evaluated include constructing a splitter dike to control sedimentation and constructing a dike upstream of the reclaim dike for filtration, and using flocculants.

6. Controlling dust from the fine tailing beaches in the basin.

7. Relocating the west diversion ditch, west of Dam 2, if necessary.

8. Establishing the appropriate option and possible design and construction of the Bear Lake outlet.

9. Raising and/or relocating the railroad grade to dams 2 and 5.

10. Performing basin reclamation as appropriate during operations to minimize activities required for closure.

7.2 General Considerations, 2004 through 2008

The water balance analysis shows that the dams, if constructed as proposed and shown in Table 3.1, will provide enough freeboard for the PMP flood event. The dam safety inspection, along with the ongoing testing, instrumentation, and stability analyses will continue to demonstrate reliable dam design. The ongoing approach for the dams is to prepare plans and specifications for construction along with

construction inspection to verify that the dams are constructed as designed and within acceptable margins of safety. The ongoing evaluations of the splitter dike and upstream reclaim dike are expected to result in an improvement to the basin water quality and improve the clarity of reclaim water to the concentrator processing plant and the efficiency of the water treatment plant. Treated water will continue to be discharged from the basin to Beaver River.

7.3 Action Items Completed in 2003 (Past Activities)

The following summarizes the activities from 2003:

1. Completed a detailed water balance study and met with MDNR to discuss water balance (Appendix A)
2. Raised dams 1 and 2 to minimum Elevation 1211
3. Constructed drainage ditch on Dam 1
4. Completed dam safety inspection of basin dams and prepared a report (Appendix B)
5. Evaluated instrumentation and monitoring (Appendix C, ongoing)
6. Evaluated dam stability for dams 1 and 5 (Appendix D, Dam 2 not included in 2003, due to previous stability improvement) (ongoing)
7. Evaluated conceptual tailing basin operation options (Appendix E, ongoing)
8. Evaluated options for improving water quality (ongoing)
9. Evaluated options for Bear Lake outlet.

COMPARISON OF FACTORS OF SAFETY
BETWEEN SITKA AND BARR ANALYSES WITH DAM AT ELEVATION 1230
(PER 2002 OPERATING PLAN)

ANALYSIS 1

FACTORS OF SAFETY			
CONDITION		USA	ESA
NO TOE BERM	(A)	1.10	1.35
WITH TOE BERM	(B)	1.28	-
WITH TOE BERM	(C)	-	1.58

SITKA ANALYSIS
(FOR NORTHSHORE MINING COMPANY
DISPOSAL SYSTEM 5 YEAR PLAN
DECEMBER 17, 2002, SITKA CORP)

FACTOR OF SAFETY
WITH DRAINAGE CHANNEL (NO TOE BERM) WITH DAM AT ELEVATION 1230

ANALYSIS 2

FACTORS OF SAFETY			
CONDITION		USA	ESA
DRAINAGE CHANNEL IN LIEU OF TOE BERM	(A)	1.27	1.54

BARR ANALYSIS
USING SPENCERS PROCEDURE *1
(SEPTEMBER, 2003))

*1 - *SPENCERS PROCEDURE IS CONSIDERED TO BE MORE ACCURATE THAN ORDINARY METHOD OF SLICES*

FACTOR OF SAFETY
WITH DRAINAGE CHANNEL (NO TOE BERM) WITH DAM AT ELEVATION 1215
(APPROXIMATE EXISTING CONDITIONS AUGUST 2003)

ANALYSIS 3

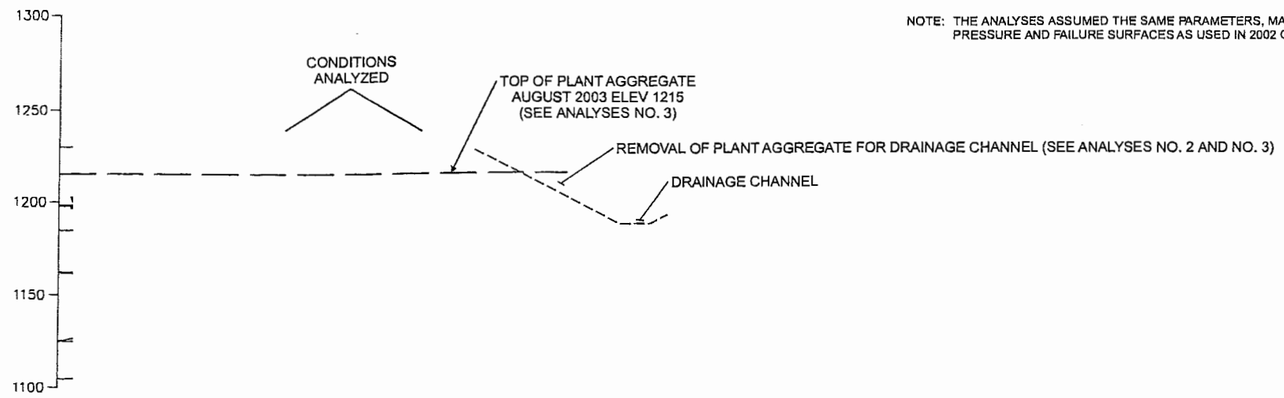
FACTORS OF SAFETY			
CONDITION		USA	ESA
DRAINAGE CHANNEL IN LIEU OF TOE BERM	(A)	1.39	1.69

BARR ANALYSIS
USING SPENCERS PROCEDURE *1
(SEPTEMBER, 2003))

*1 - *SPENCERS PROCEDURE IS CONSIDERED TO BE MORE ACCURATE THAN ORDINARY METHOD OF SLICES*

	UNIT WEIGHT (PSF)	(PSF)			
	144				
	157				
	130				
	137				
	145				
	113				
DATED (NC)	113				
	147				

USA = UNDRAINED STRENGTH ANALYSIS
ESA = EFFECTIVE STRENGTH ANALYSIS
USR = UNDRAINED STRENGTH RATIO (C/P)



NOTE: THE ANALYSES ASSUMED THE SAME PARAMETERS, MATERIAL PROPERTIES, PIEZOMETRIC PRESSURE AND FAILURE SURFACES AS USED IN 2002 OPERATING PLAN

Figure 4

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION

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PRINTED NAME
DATE REG. NO

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DATE RELEASED

BARR
Corporate Headquarters: Minneapolis, Minnesota Ph: 1-800-632-2277
Project Office: BARR ENGINEERING CO. 4700 WEST 77TH STREET MINNEAPOLIS, MN 55435-4803
Ph: 1-800-632-2277 Fax: (952) 832-2601 www.barr.com

Scale
Date 09-25-03
Drawn RLG
Checked
Designed
Approved

NORTHSHORE MINING COMPANY
SILVER BAY, MINNESOTA

PROPOSED 2003 CONCEPTUAL DESIGN CHANGES

FACTOR OF SAFETY COMPARISONS

BARR PROJECT No. 23/38-086
CLIENT PROJECT No.
DRAWING No. A-02
REV No. 0

COMPARISON OF FACTORS OF SAFETY
BETWEEN SITKA AND BARR ANALYSES WITH DAM AT ELEVATION 1230
(PER 2002 OPERATING PLAN)

ANALYSIS 1

FACTORS OF SAFETY			
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WITH TOE BERM	(B)	1.28	-
WITH TOE BERM	(C)	-	1.58

SITKA ANALYSIS
(FOR NORTHSHORE MINING COMPANY
DISPOSAL SYSTEM 5 YEAR PLAN
DECEMBER 17, 2002, SITKA CORP)

FACTOR OF SAFETY
WITH DRAINAGE CHANNEL (NO TOE BERM) WITH DAM AT ELEVATION 1230

ANALYSIS 2

FACTORS OF SAFETY			
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DRAINAGE CHANNEL IN LIEU OF TOE BERM	(A)	1.27	1.54

**1 - SPENCERS PROCEDURE IS CONSIDERED TO BE MORE ACCURATE THAN ORDINARY METHOD OF SLICES*

BARR ANALYSIS
USING SPENCERS PROCEDURE *1
(SEPTEMBER, 2003))

FACTOR OF SAFETY
WITH DRAINAGE CHANNEL (NO TOE BERM) WITH DAM AT ELEVATION 1215
(APPROXIMATE EXISTING CONDITIONS AUGUST 2003)

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USING SPENCERS PROCEDURE *1
(SEPTEMBER, 2003))

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DATED (NC)	113				
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USA = UNDRAINED STRENGTH ANALYSIS
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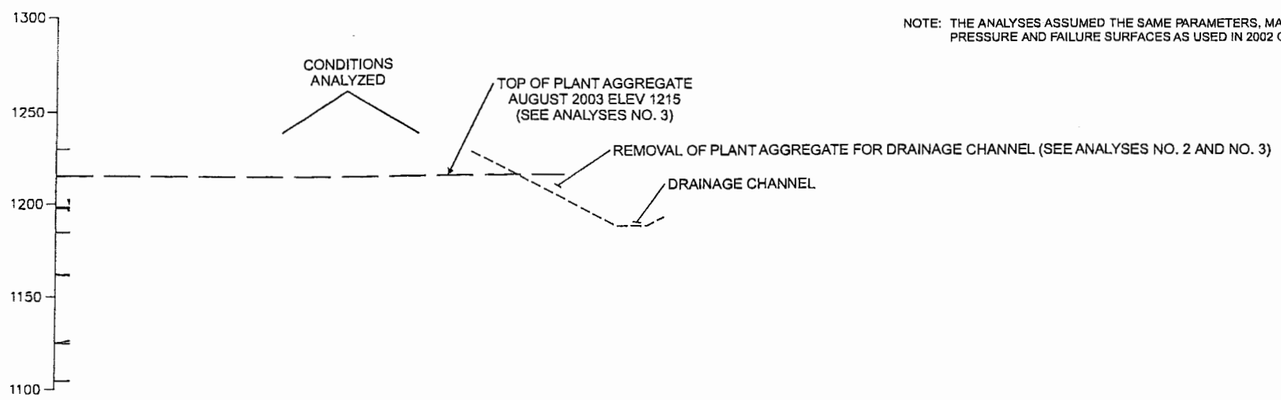
USR = UNDRAINED STRENGTH RATIO (C/P)



NOTE: THE ANALYSES ASSUMED THE SAME PARAMETERS, MATERIAL PROPERTIES, PIEZOMETRIC PRESSURE AND FAILURE SURFACES AS USED IN 2002 OPERATING PLAN

Figure 4

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Date	09-25-03
Drawn	RLG
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Designed	
Approved	

NORTHSHORE MINING COMPANY
SILVER BAY, MINNESOTA

PROPOSED 2003 CONCEPTUAL DESIGN CHANGES

FACTOR OF SAFETY COMPARISONS

BARR PROJECT No. 23/38-086
CLIENT PROJECT No.
DRAWING No. A-02
REV No. 0

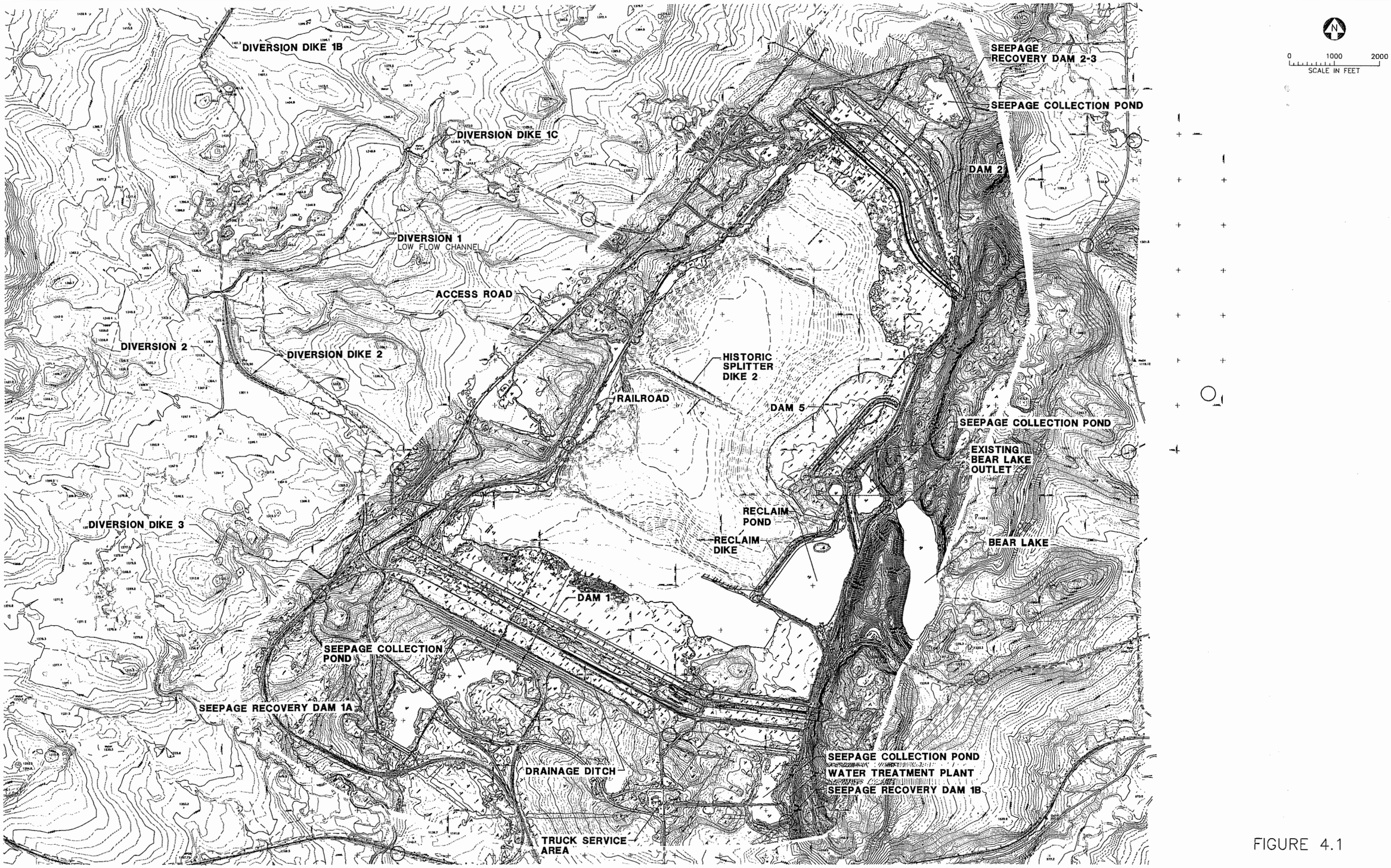

FIGURE 4.1

NO.	BY	CHK.	APP.	DATE	REVISION DESCRIPTION

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Drawn	BJH
Checked	TSH
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Approved	

NORTHSHORE MINING COMPANY
SILVER BAY, MINNESOTA

MP-7 TAILING BASIN
WORKING DRAWINGS

BASIN SITE PLAN

BARR PROJECT No.	23/38-086
CLIENT PROJECT No.	MP7-
DWG. No.	G-05
REV. No.	0

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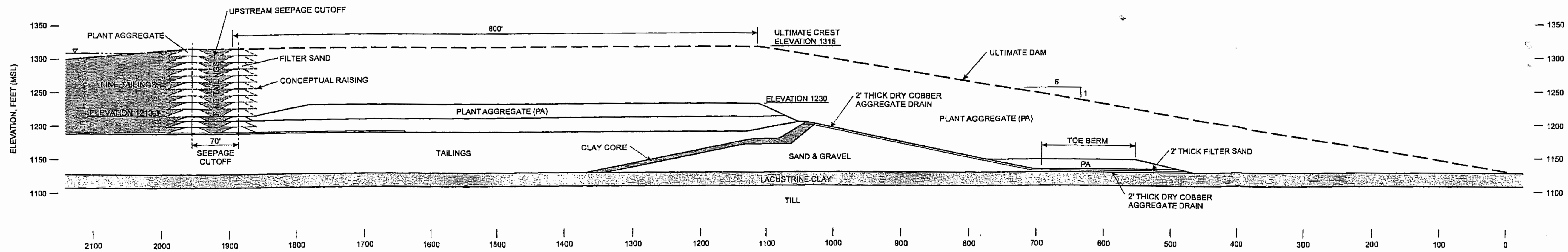
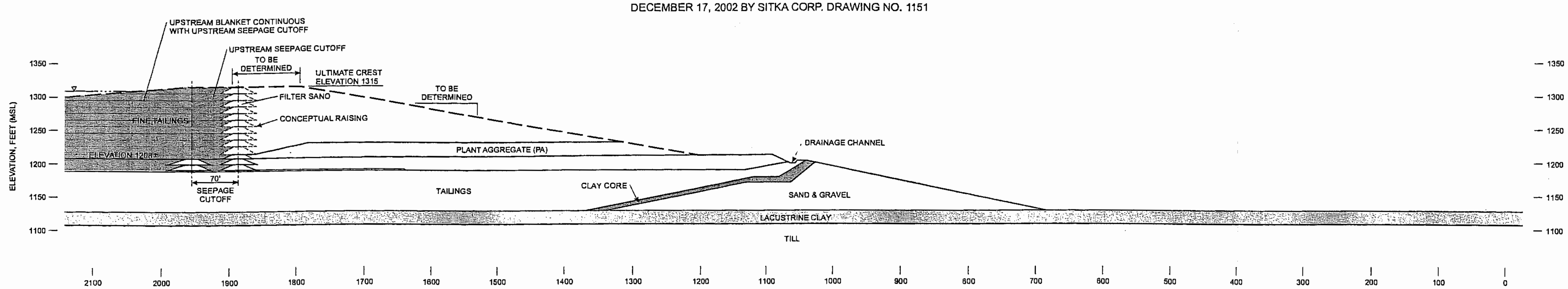


1997 TYPICAL TAILINGS DAM SECTION BY SITKA[*1]

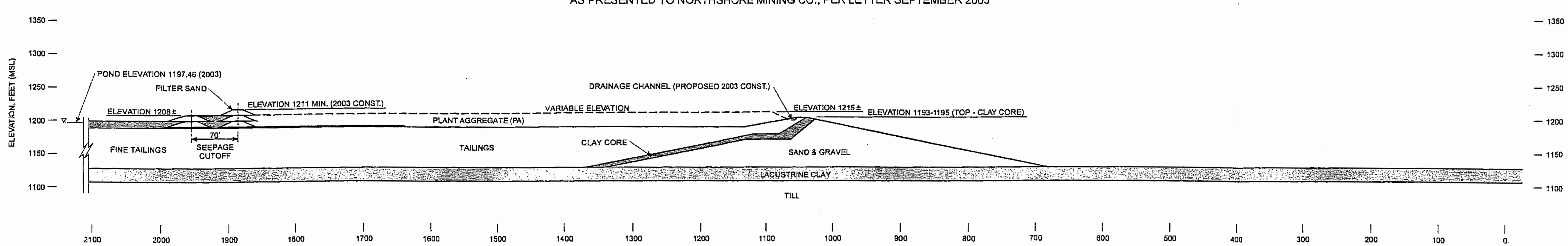
[*1] AS SHOWN IN "DISPOSAL SYSTEM 5 YEAR OPERATING PLAN DECEMBER 17, 2002 BY SITKA CORP. DRAWING NO. 1151



2003 TYPICAL TAILINGS DAM SECTION BY BARR[*2]

(REVISED UPSTREAM CUTOFF/BLANKET, NEW DRAINAGE CHANNEL, ELIMINATE TOE BERM AND AGGREGATE DRAIN, AND MOVE DOWNSTREAM SLOPE)

[*2] AS PRESENTED TO NORTHSHORE MINING CO., PER LETTER SEPTEMBER 2003



2003 BARR CONCEPT PLAN OF EXISTING TAILINGS DAM SECTION (AUGUST 2003)

Figure 3

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NORTHSHORE MINING COMPANY
SILVER BAY, MINNESOTA

PROPOSED 2003
CONCEPTUAL DESIGN CHANGES

TYPICAL TAILINGS DAM SECTIONS

BARR PROJECT No. 23/38-086
CLIENT PROJECT No.
DRAWING No. A-01
REV. No. 0