

Technical Specifications for Pogo Dry Stack Tailings Facility Expansion – Revision 2

Report Prepared for

Sumitomo Metal Mining Pogo LLC



Report Prepared by



SRK Consulting (Canada) Inc.
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Technical Specifications for Pogo Dry Stack Tailings Facility Expansion – Revision 1

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Disclaimer

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1 General Requirements

1.1 Part 1 – General

1.1.1 Documents

This section forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

1.1.2 Revision Summary

Table 1.1 below provides a summary of the revision history of this document.

Table 1.1: Technical Specifications Revision Summary

Revision	Status	Issue Date	Major Changes
1	Issued for Discussion	December 21, 2011	N/A
2	Issued for Tender	December 21, 2011	Edited to address reviewer comments

1.1.3 Definitions

The following definitions and interpretations shall apply to these Technical Specifications:

1. PROJECT means the Dry Stack Tailings Facility (DSTF) Expansion earthworks which consist of the Work, in whole or part, described in this document.
2. WORK is defined as the entire, completed construction as defined by this document or the various separately identifiable parts thereof as required to be furnished under the Contract Documents. Work includes the results of furnishing and incorporating materials and equipment for construction as well as performing services and furnishing labour as required by the Contract Documents.
3. CONTRACT DOCUMENTS together with all Modifications issued after the execution of the Contract are defined as (a) the Contract, (b) the Contractor’s bid including accompanying documentation and any post-bid addenda submitted when attached as an exhibit to the Contract, (c) the Contractor’s proposed plans and schedule, (d) these Specifications, (e) the Drawings, and (f) bonds, general conditions, supplementary conditions, and addenda pertaining to the Contract Documents. TECHNICAL SPECIFICATIONS or SPECIFICATIONS are defined as this document of specifications prepared by SRK Consulting (Canada) Inc. on behalf of Pogo. These Specifications are to be read, interpreted, and coordinated with all Drawings, Modifications, revisions, or any other relevant documents produced by Pogo.
4. ENGINEERING DRAWINGS or DRAWINGS are defined as all engineering drawings, plans, sketches and maps issued for tender with these Specification or subsequently issued as deemed necessary by Pogo.

5. MODIFICATIONS are defined as changes made to the Specifications and/or Drawings and approved by Pogo in writing. These Modifications can be issued at any time including after issuance of these Specifications or any accompanying Drawings and/or other Modifications.
6. Responsible Parties:
 - a. CLIENT is defined as Sumitomo Metals Mining Pogo LLC (Pogo) or an authorized agent of Pogo.
 - b. ENGINEER or ENGINEER-OF-RECORD is defined as a representative appointed and authorized by Pogo for the Work described in this document. The Engineer or his/her designated site representatives under his/her direct supervision during construction shall be registered professional engineers in Alaska. The Engineer or his/her designated representatives are considered as part of Pogo.
 - c. CONTRACTOR is defined as the party or appointed representative of the party that has an agreement with Pogo to execute the Work defined in this document.
 - d. SUB-CONTRACTOR is defined as the party or appointed representative of the party that has an agreement with the Contractor to execute specialized components of the Work defined in these Specifications that cannot be carried out by the Contractor.
 - e. SITE SURVEYOR or SURVEYOR is defined as the party or appointed representative of the party that has an agreement with the Contractor to act as Site Surveyor for the execution of the Work defined in this document. The Surveyor shall have equipment and means on-site to carry out horizontal and vertical ground surveys with an accuracy of one-half inch. The Surveyor shall also have the equipment and means to prepare digital terrain models and drawings on-site that are compatible with AutoCAD 2008. The Surveyor reports to the Contractor, but will be available for use as required by Pogo provided Pogo has requested such needs through the Contractor.
 - f. QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC) TEAM is defined as the individual(s) working under POGO to perform on-site QA/QC for the Work defined in this document.
 - g. LAND OWNER is defined as the party or appointed representative of the party that has the land rights outside of the mine vicinity. At this document's time of issue, the Land Owner is the State of Alaska and the land lease holder of the Land is Pogo.
7. ON-SITE MATERIAL is defined as borrow materials obtained from within designated on-site excavations.
8. OFF-SITE MATERIAL is defined as material obtained from sources other than on-site.
9. RECORD DOCUMENTS are defined as the documents prepared and certified by a land surveyor, material testing technician, QA/QC personnel, specialist professional, or any other parties documenting any aspect of the Work.

10. PRODUCTS are defined as processed fill material, synthetic products, machines, components, equipment, fixtures, and systems used to form the Work. This does not include machinery and equipment used for preparation, fabrication, conveyance, and erection of the Work. Products may also include existing material or components required for reuse.
11. SLOPES, in all instances within these Specifications and on Drawings, are defined in terms of horizontal distance to vertical distance, i.e., 2H:1V shall be read as two horizontal units of distance to one vertical unit of distance).
12. EQUIPMENT means all construction mobile equipment used to complete the Work.

1.1.4 Summary of Work

1. The Contractor will be responsible for ensuring that all the Work defined in this document will be executed in accordance with all appropriate permits and approvals. Furthermore, the Contractor shall be responsible for ensuring that all Work will be carried out in accordance with Pogo's environmental and safety standards.
2. The Work covered by this Specification includes but is not limited to the following:
 - a. Implementation, operation, maintenance, and removal of construction sediment and surface-runoff control.
 - b. Operation and management of temporary-surface runoff-water management controls up to the time of complete demobilization.
 - c. Clearing, stripping, and excavation in required areas.
 - d. Construction of earthworks components of the New Haul Road.
 - e. Construction of earthworks and concrete components of the New North Diversion Ditch.
 - f. Construction of earthworks, concrete and hydraulic components of the New South Diversion Ditch.
 - g. Borrow development, management, and reclamation.
 - h. Construction closure including demobilization (e.g., shaping, contouring, grading final surfaces, removal of temporary structures, removal of any temporary access roads, etc.).
3. Stockpile development, management, and closure are not part of these Specifications.

1.1.5 Contradictions

Should any implied or inferred contradictions exist between the Specifications and the Drawings, the Contractor shall: (a) Notify Pogo, and (b) stop all Work that concerns the contradiction until it is remedied or clarified by Pogo. The decision of Pogo shall be final.

1.1.6 Contractor's Responsibilities

The Contractor in context of the Work defined in this document shall:

1. Comply with Mine Safety and Health Administration (MSHA), Alaska Occupational Safety and Health (AKOSH), Pogo Health and Safety as well as any other relevant required health and safety regulations.
2. Provide Pogo with a copy of its Health and Safety Plan that will be specifically prepared for this Project.
3. Become familiar with the relevant regional and site-specific conditions—especially those that deviate from the Specifications and Drawings—and inform Pogo when a problem or delay is anticipated.
4. Be responsible for making its own measurements and installing the Work to fit the conditions encountered.
5. Before proceeding with the Work, examine all Drawings and report to Pogo any apparent discrepancies or interferences. Pogo shall have the privilege of making minor alterations to the Drawings and the Specifications. Alterations affecting the terms of the Contract shall be issued under a covering Work Order that is authorized and signed by Pogo prior to the start of the alteration.

1.1.7 Testing by the Contractor and Pogo

Testing of the Work by the Contractor and Pogo shall adhere to the following:

1. Pogo will carry out quality assurance for the Work defined in this document, and will undertake testing at a frequency and at the location specified in the various sections of these Specifications. Pogo may undertake any additional testing which shall be deemed necessary by Pogo on any part of the Work.
2. Performance testing by Pogo shall in no way relieve the Contractor of its sole responsibility for completing the Work in accordance with the specified requirements.
3. The Contractor shall undertake its own quality assurance and quality control (QA/QC), and shall submit a copy of its QA/QC program for review by Pogo at least seven days prior to commencement of the Work.
4. All survey, QA/QC, or other test data collected by the Contractor shall be made available to Pogo on request.

1.1.8 Submittals

1. The Contractor shall submit information as specified and requested from Pogo. All submittals required by Pogo will be requested through formal transmittal to the Contractor.

2. Pogo has the right to request as a submittal any other information deemed necessary throughout execution of the Work. This includes information not currently defined as Submittal information on the Drawings and in the Specifications.

1.1.9 Changes

Any changes that are outside of the Contract shall be submitted to Pogo for approval via a Change Order. The Contractor shall submit the Change Order to Pogo's review and approval.

1.1.10 Construction Schedule

1. The Contractor shall submit a detailed schedule of construction to Pogo 28 days prior to the commencement of mobilization. Pogo reserves the right to halt commencement of specific construction components if, in its opinion, there would be any risk construction cannot be completed under safe conditions or optimum weather conditions.
2. The Contractor shall be responsible to update and modify the construction schedule every month or as part of progress payment requests. The update schedule must include ongoing reports of progress and delays. The construction schedule shall be made available to Pogo upon request. The Contractor shall notify Pogo seven days before the scheduled component start date if and when major delay in the schedule is anticipated.

1.1.11 Construction Drawings

1. Drawings specific to construction need will be issued by Pogo prior to commencement of the Work. Drawings shall be reviewed by the Contractor to ensure all aspects of the construction are covered, and the Contractor shall report to Pogo any discrepancies and interferences. The Contractor shall notify and inform Pogo of construction progress and Drawing requirements four weeks prior to commencement of any Work.
2. Only Drawings specifically marked with "ISSUED FOR TENDER" or "IFT" are considered acceptable for use in tender.
3. The following table contains a list of Drawings that accompany this document.

Table 1.2: List of Drawings

Drawing ID	Title	Date of Issue	Revision
1	Engineering Drawings for the Dry Stack Tailings Facility Expansion Detailed Design	December 21, 2011	1
2	Mine Site Plan	December 21, 2011	1
3	Expanded DSTF General Arrangement	December 21, 2011	1
4	New Haul Road Plan View	December 21, 2011	1
5	New Haul Road Profile and Stakeout Table	December 21, 2011	1
6	New Haul Road Sections	December 21, 2011	1
7	New South Diversion Ditch Plan and Profile	December 21, 2011	1
8	New North Diversion Ditch Plan and Profile Sheet 1 of 2	December 21, 2011	1
9	New North Diversion Ditch Plan and Profile Sheet 2 of 2	December 21, 2011	1
10	Typical Diversion Channel Sections	December 21, 2011	1
11	Existing Diversion Channel Sections and North Diversion Tie-In Details	December 21, 2011	1
12	Typical Inlet Plan and Sections	December 21, 2011	1
13	South Diversion Flume Plan and Profile	December 21, 2011	1
14	South Diversion Flume Intake Details	December 21, 2011	1
15	North and South Diversion Channel Stakeout Table	December 21, 2011	1

1.1.12 Survey and As-built Drawings

1. The Contractor shall be responsible for all construction surveys needed to complete the Work. Construction survey data will be made available to Pogo upon request. The Surveyor shall also be made available upon request to Pogo for quality assurance purposes.
2. The Contractor will provide as-built drawings and surveys to Pogo for completion approval. The as-built drawings and surveys must be provided to Pogo within 21 days of task completion, otherwise the Work will have to be resurveyed for completion approval. A final as-built drawing and survey must be made available to Pogo within 28 days after demobilization.

END OF SECTION 1

2 Mobilization and Demobilization

2.1 Part 1 – General

2.1.1 Documents

This section forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

2.1.2 Description

1. The Work covered by this section consists of supplying all plants, labour, materials, and equipment as well as performing all Work necessary for the Contractor's mobilization and demobilization.
2. Mobilization shall be to the mine site and shall include all costs required to:
 - a. Provide Pogo with a complete list of plants, equipment, tools, supplies, and materials that will be required for the Work. The list must include separate weights and shipping dimensions for each piece as well as highway and access road limitations.
 - b. Mobilize all labour, supervision, technical personnel, and other service providers required for completion of the Work to the mine site.
 - c. Furnish and install temporary facilities and utilities required for construction including the Engineer's work place as well as station and communication services including radio, phone, and Internet within the site office area.
 - d. Set up and assemble plant and equipment, at specific Work and staging locations.
 - e. Ensure each new person attends initial and all subsequent health and safety site briefings as specified in MSHA as well as Pogo requirements and standards.
3. Demobilization shall be considered at the end of each construction season as agreed upon by Pogo. Demobilization shall be regarded as completed when all plants, labour, equipment, temporary facilities, and surplus and waste materials resulting from the Contractor's operations are removed from site and the Work areas are cleaned, reclaimed, and graded to the satisfaction of Pogo.

2.1.3 Submittals

Within 28 days after award of the Contract, the Contractor shall submit a mobilization plan including:

1. Construction Schedule for the Work.
2. Weight and shipping dimensions of all plants, supplies, tools, equipment, materials, and facilities.
3. Shipping schedule for mobilization and demobilization for each construction season.
4. A layout drawing of the Contractor's temporary facilities and staging areas including potable water source for the Work.
5. Contractor health and safety plan.

END OF SECTION 2

3 General Construction and Site Preparations

3.1 Part 1 – General

3.1.1 Documents

This section forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

3.1.2 Description

The following tasks are part of the initial Work required prior to the main reclamation Work at the mine site.

1. **PERMITS and REGULATIONS:** The Contractor shall acquire all necessary permits required to complete the Work for scheduled construction seasons. The Contractor shall also require to follow all safety and environmental regulations outlined by the applicable federal, state, and local authorities as well as that of the Land Owner.
2. **PROTECTION:** Unless otherwise instructed, the Contractor shall take all necessary precautions to prevent damages to natural and man-made features including but not limited to wildlife habitat, survey monuments, and instrumentation outside of project areas. The Contractor may not perform any Work outside of the permitted and pre-approved construction areas.
3. **PREPARATION –** The Contractor shall confirm Work limits by having its Surveyor lay out the extents of all Work, prior to commencement of earthworks or surface Work. Pogo will inspect these demarcated areas and confirm all limits before giving written approval to proceed. The Contractor shall inspect the Work site and verify with Pogo any restrictions within or adjacent to the Work limits.
4. **SITE OFFICES AND LAYDOWN:** The Contractor shall set up a site office to which all new personnel should report prior to entering and working on-site. The site office should be equipped according to the Contractor's daily needs including a Work station for Pogo. Laydown area(s) should be identified in the project area for staging of materials and equipment. The laydown area(s) must not affect construction progress or traffic. Any cutting, clearing, and stripping shall be done according to the Specifications. The site office and laydown area(s) shall be fully reclaimed upon completion of the Work.
5. **CUTTING:** Cutting is defined as the removal and processing of any standing timber in the project area. The Contractor shall contact the Land Owner for permission prior to any cutting. All cutting must be approved by the Land Owner and carried out according to directions and specifications from the Land Owner.
6. **CLEARING:** Clearing is defined as the removal and processing of any vegetation and/or stumps in the project area. The removed waste shall be stockpiled in designated area(s) for reclamation use.

7. STRIPPING: Stripping is defined as excavation and removal of unsuitable material and organic topsoil in the project area. The removed waste and topsoil shall be stockpiled separately in designated areas for disposal and reclamation use.
8. DISPOSAL: Unsuitable soil material and organics stripped off from the construction areas shall be stockpiled in designated areas approved by Pogo. The stockpile should have proper sediment and surface water control and be free standing without short-term stability issues.

END OF SECTION 3

4 Soil Excavation

4.1 Part 1 – General

4.1.1 Documents

This section forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

4.1.2 Description

1. The excavation Work entails excavation of soil and other material below the original ground surface to neat lines as indicated on the Drawings.
2. Approved soil material from the excavation will be used as fill for the temporary and permanent structures as indicated on the Drawings.
3. The Work to be done under this Section consists of furnishing all labour, material, and equipment as well as the performance of all Work necessary to carry out rock and soil excavation as shown on the Drawings and as specified herein including but not limited to the following:
 - a. Construction of earthworks components of the New Haul Road.
 - b. Excavation of the New North Diversion Ditch.
 - c. Excavation for the New South Diversion Ditch.
 - d. Excavation for Drainage Inlets.
 - e. Excavation for the Diversion Intake Flume Inlets and Discharge Basin.
4. The Work shall include the loading, transporting, and permanent disposal of all excavated materials which are deemed by Pogo to be surplus or unsuitable for use as construction material. The Work shall also include the loading, transporting, and possible temporary stockpiling and re-handling of acceptable material to identified location(s) identified by Pogo; there the material can either be used as part of the temporary or permanent structures, or stockpiled in readiness for future temporary or permanent use.

4.1.3 Exclusions

The Work is designed to be material balanced between the excavation and fill. If the balance cannot be met due to unforeseen reasons, extra material can be developed from the Site B Borrow Area. The Contractor shall be responsible for borrow development, operation, and management. Pogo does, however, reserve the right to request modifications to the borrow development plan if the material being produced does not meet Specifications.

4.1.4 Definitions

The following words and terms in this Specification, unless the context otherwise requires, shall have the meaning set out below:

1. SOIL means general overburden material free of organics which can be used in part as fill-material in the Work as approved by Pogo.
2. ROCK means bedrock material which forms part of the foundation of the Work or which will be used as fill material for the Work.
3. UNSUITABLE MATERIAL means any soil or rock that does not meet the Specifications for the use in this project.
4. NEAT LINE means the final line or grade to which excavation will be performed.
5. COMMON EXCAVATION means excavation of all materials including blasted rock, weathered bedrock, soil, and unsuitable material by mechanical means.

4.1.5 Procedures

1. The details of the surface excavation shown on the Drawings represent an engineered design cut-and-fill operation under particular, assumed conditions. At Pogo's discretion, variations in site conditions may require adjustments to the excavation shape, slope reinforcement, and drainage.
2. Temporary slope stability and rock-fall hazard measures must be in place where conditions require including but not limited to the drilled and blasted rock slopes and rock slide areas along the New South Diversion Ditch alignment.
3. If, in a specific area, a plan that was previously adopted does not fit the site conditions in accordance with the requirements of this Specification, Pogo shall submit a revised plan to the Contractor before continuing excavation in identified areas.
4. Water management measures shall be constructed and implemented prior to the Work, and emergency adjustments shall be made to accommodate any change in site conditions.

4.1.6 Submittals

1. At least fourteen days prior to the commencement of Work, the Contractor shall notify Pogo outlining its intended methods for excavation within a given area, including but not limited to the following details:
 - a. Typical equipment deployment.
 - b. Work schedule including Work area(s), volume, stockpile area(s), traffic pattern, and hours of operations.
 - c. Contingency plan for change in weather conditions and other foreseeable risks.

- d. Sediment and surface water controls within and around the intended Work area(s).
 - e. Slope stability and rock-fall hazard health and safety plan.
 - f. Traffic control and safety plan for construction vehicle in conjunction with mining operations.
2. Contractor shall notify Pogo forty days in advance to request approval for development of the Site B Borrow Area. A borrow development plan submittal must be provided to Pogo 28 days in advance of the borrow Work and must detail development, operation, and management for approval.

4.2 Part 2 – Execution

4.2.1 Preparation

1. Prior to beginning a grading or excavation operation in any area, all necessary clearing and stripping in that area shall be performed in accordance with these Specifications.
2. The Contractor shall be satisfied as to the character, quantity, and distribution of all the material to be excavated.
3. The Contractor shall have a contingency plan in place for sudden unforeseeable change of weather condition prior to excavation commencement.
4. The Contractor shall be responsible for sediment and surface water runoff control around the construction area to ensure there will be minimal impact on the natural state of the surrounding environment in accordance to all issued regulations and permits.

4.2.2 Common Excavation Methods

1. Common excavation of soil and blasted rock shall be performed as indicated on the Drawings or as directed by Pogo to the lines, grades, and elevations. Excavation shall be finished to a reasonable smooth and uniform surface. The tolerances from construction lines, shown on the Drawings, are six inches in blasted rock, and three inches in soil, or as approved by Pogo.
2. Should the Contractor, through carelessness or other fault, excavate exceeding the designated grades, it shall replace the excavation in an approved method according to these Specifications or as directed by Pogo.
3. At all times during the construction, the Contractor shall adopt excavation procedures such that at no time shall the stability of any slope be impaired. Pogo reserves the right to stop Work if it deems conditions to be unsafe.

4.2.3 Control of Surficial Water

The Contractor is responsible to control and management all surface water within the Work areas. Surface water flows outside of the Work areas during precipitation events shall be directed away

from the Work by means of temporary diversion berms, channels, or other acceptable means. In any case, all surface flow on the Work area(s) shall be satisfactorily controlled to the specified environmental standard.

4.2.4 Slope Stability and Safety

1. Immediately following excavation and at any time during the Project, all loose material on slopes that appears to be unsafe or a danger to workmen, structures, or equipment, shall be removed.
2. It shall be the responsibility of the contractor to stabilize Work areas that are identified as rock-slide zones prior to performing excavation Work.
3. All slope stability measures will be done according to the approved safety plan and applicable government mine safety standards.

END OF SECTION 4

5 Drilling and Blasting

5.1 Part 1 – General

5.1.1 Documents

This section forms part of the Contract Documents and is to be read interpreted and coordinated with all other parts.

5.1.2 Description

1. All blasting operations must be performed in accordance with all federal and state regulations.
2. The Contractor will be responsible for becoming familiar with all appropriate conditions that apply to blasting.
3. The Work to be done under this Section consists of supplying all labour, materials, plants, and equipment as well as performing all Work necessary to carry out drilling and blasting with certified personnel and chemical agents as shown on the Drawings and as specified herein.
4. The Work performed by the Contractor shall include but is not limited to:
 - a. Provide a typical list of safety protocols and typical operation procedures that will be suitable for carrying out the Work.
 - b. Provide suitably qualified personnel with current blasting certifications, and chemical reagents for the specified Work.
 - c. Drill and blast in bedrock portions of the New Haul Road, New North Diversion Ditch, and New South Diversion Ditch.
 - d. Drill and blast in borrow area to develop additional material if necessary.

5.1.3 Definitions

The following words and terms in this Specification, unless the context otherwise requires, shall have the meaning set out below:

1. CERTIFIED PERSONNEL means a suitably qualified person that holds current blasting certificates issued by all necessary federal and state regulatory agencies for the Project.
2. CHEMICAL BLASTING REAGENT means any form of reagent and components that are suitable for use in the Project.

5.1.4 Submittals

The Contractor shall submit a drilling and blasting plan describing the schedule and proposed methods for road and diversion construction 28 days prior to commencement of Work. The plan shall

include the personnel certifications, products use and storage, equipment, schedule, safety protocols, operation and procedures.

5.2 Part 2 – Products and Personnel

1. The Contractor shall be responsible for procuring all necessary supplies, personnel, and equipment, as well as acquiring all necessary licenses and notifications from all federal and state agencies.
2. The Contractor shall be responsible for management, maintenance, operation, and security of the explosives facility, whether temporary or permanent.

5.3 Part 3 – Execution

5.3.1 Drilling

The Contractor will lay out an appropriate blast pattern for the specified grade or material size taking due care to prevent over-breaking.

5.3.2 Blasting

1. The Contractor's health and safety plan, list of blasting reagents, technician certifications, and proposed methods shall be in place prior to blasting operations.
2. The Contractor will be responsible for notifying all air and land traffic as to the time and location of any blast according to provincial and federal regulations.
3. The Contractor will be responsible for putting into place all protocols and physical barriers to warn and prevent land and air traffic from entering the designated blast zone in accordance with all applicable regulations.
4. The Contractor shall use controlled blasting methods to minimize fly rocks and satisfy minimum safe distance requirements.
5. Prior to continuing the Work, certified personnel must inspect the post-blast pattern to ensure no unconsumed agents and explosives are left behind. If unconsumed agents are found, the certified personnel shall remove them according to standard procedures.
6. All blasted material shall be removed to expose competent bedrock for survey. Final blasted bedrock surface shall be graded for free draining.

5.3.3 Tolerance

Drilling and blasting shall be finished to a reasonable uniform surface within six inches of the construction lines shown on the drawings or as approved by Pogo.

END OF SECTION 5

6 Fill Material Specifications

6.1 Part 1 – General

6.1.1 Documents

This section forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

6.1.2 Description

1. The sources and borrow area(s) of all fill are shown in the Drawings or as designed by Pogo. For the types of material and related Specifications, see the gradation requirement herein. The material types required for completion of the Work are labelled as (a) General Fill, (b) One-Inch Minus Material, and (c) Rip-Rap.
2. All construction material shall be free of organic matter, ice, frozen material or similar impurities.

6.2 Part 2 – Product

6.2.1 General

1. Fill source(s):
 - a. Fill, required for the Work, shall be obtained from the excavation and designated borrow area(s) as shown on the Drawings.
 - b. Unsuitable material from the excavation or borrow area shall be disposed of or stockpiled on-site in a designated on-site disposal or stockpile area as specified in this Specifications. All topsoil or organic material shall be stockpiled at the designated area.
 - c. The Contractor shall determine the adequacy of excavation and the borrow source intended to be exploited.

6.2.2 General Fill

1. The General Fill will be used in the New Haul Road, New North Diversion Ditch, and New South Diversion Ditch, and in other hydraulic structures that require backfilling. The material shall be free of organics and other contaminants and shall be below saturation state for transportation and placement.
2. Two types of general fill shall be used for the Work. Type 1 General Fill shall be used outside of traffic limits as indicated on the Drawings. Type 1 General Fill shall have a maximum particle diameter of three feet. Particles larger than three feet should be removed.
3. The gradation limits for this material type are shown below.

4. Type 2 General Fill shall be used within traffic limits as indicated on the Drawings. Type 2 General Fill shall have a maximum particle diameter of one foot. Particles larger than one foot should be removed for compaction and traffic purpose.
5. The gradation limits for this material type are shown below.

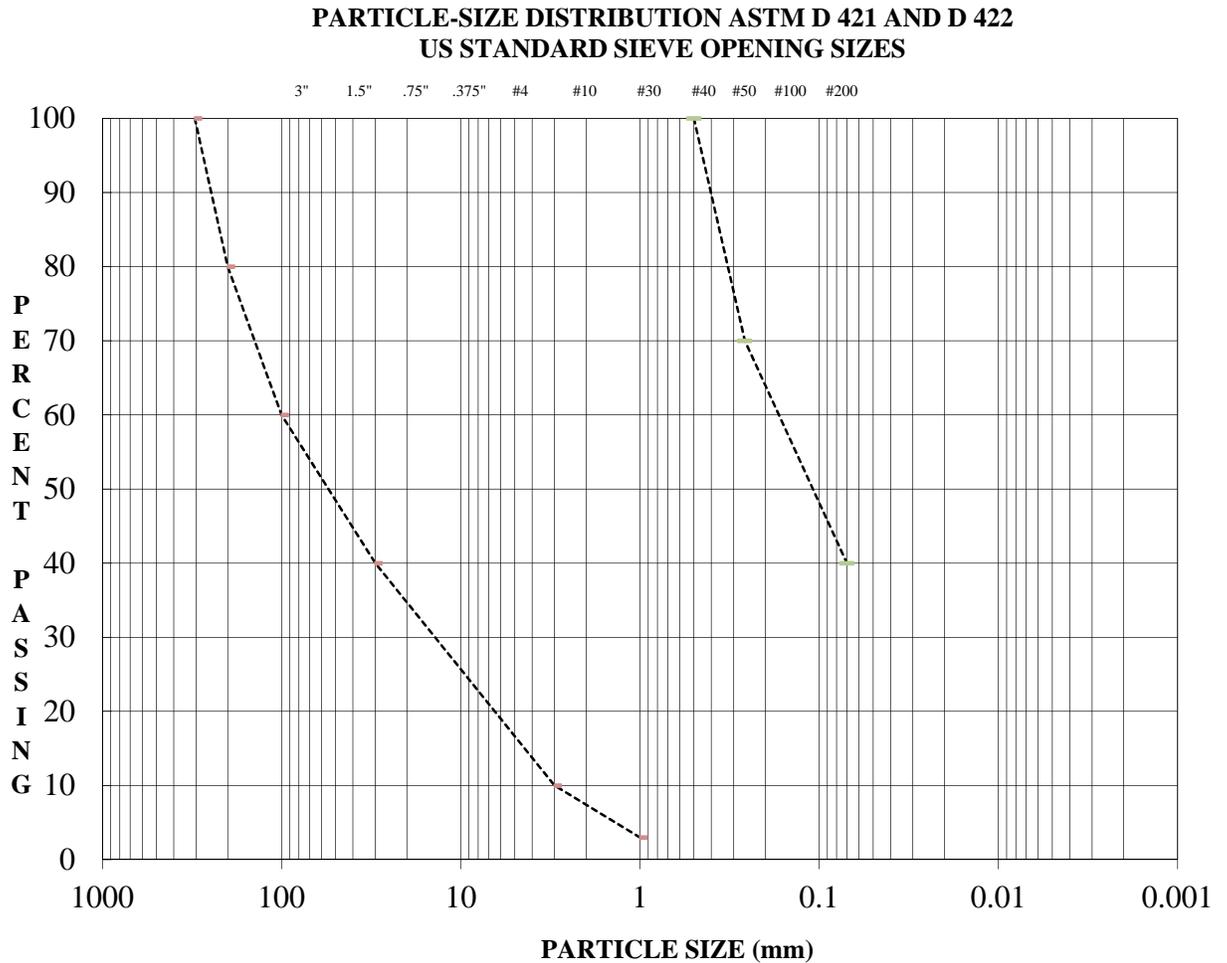


Figure 6.2: Gradation Chart for Type 2 General Fill.

Table 6.2: Type 2 General Fill Gradation Limits

Percent Passing	Coarse Limit (mm)	Fine Limit (mm)
100	305	0.5
90	-	-
80	200	-
70	-	0.26
60	100	-
40	30	0.07
10	3	-
3	1	-

6.2.3 One-Inch Minus Material

1. One-Inch Minus Material shall be processed from competent non-acid generating material, free of organics, ice and frozen material, from the excavation or borrow area(s) deemed suitable by the Contractor.
2. The Contractor shall have trial production of the material from the plant facility to demonstrate the suitability of the processed material. Gradation test shall be done to ensure the material meets the Specifications herein and the trial gradation test results shall be made available to Pogo.
3. The gradation of the drainage gravel material shall meet the specifications provided below.

Table 6.3: One-Inch Minus Material Gradation Limits

Percent Passing	Coarse Limit (mm)	Fine Limit (mm)
100	30	0.5
90	-	0.4
80	22	-
70	-	-
60	15	-
40	10	-
15	-	0.07
10	3	-
3	2	-

6.2.4 Rip-Rap

1. Rip-Rap material shall be competent non-acid generating rock sourced from the excavation or borrow area(s) that the Contractor deems to be suitable. It should be free of organic matter and other contaminants.
2. The gradation of the Rip-Rap material shall meet the Specifications shown herein.
4. The D₅₀ of the Rip-Rap shall be nine inches. For example 50% of the stones will pass through a sieve with nine-inch openings. The remaining stones will be larger.

6.2.5 Growth Medium

Growth medium is a loose, organic well-graded material that is free of large timbers and large boulders greater than two-feet in diameter. It is typically found within the top foot of natural undisturbed ground. The natural moisture content should be below saturation for transportation and placement.

END OF SECTION 6

7 Geosynthetics Specifications

7.1 Part 1 – General

7.1.1 Documents

This section along with the manufacturer's technical documents form part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

7.1.2 Description

The Work to be done under this section consists of furnishing all labour, material, and equipment as well as the performance of all Work necessary to carry out the geosynthetics installation as shown on the Drawings and as specified herein, including but not limited to, installation of 80-mil HDPE textured geomembrane in stream inlets.

7.2 Part 2 – Products

7.2.1 Submittals

1. The Contractor will submit the following information at least 14 days prior to material arrival at site:
 - a. Manufacturer's written certification that the high density polyethylene (HDPE) liner to be used meets the Specifications and was continuously inspected.
 - b. All manufacturer's in-house quality assurance/quality control (QA/QC) certifications on resin and laboratory testing.
 - c. A proposed layout plan for HDPE installation.
 - d. Manufacturer's installation and specification documents.
2. The Contractor shall submit a deployment, seaming, QA/QC, and repair plan for Pogo's review 14 days prior to Work.
3. The Contractor will submit an as-built report on all geosynthetics installation showing the specified information/data herein that will include but is not limited to the following:
 - a. Manufacturer's batch number associated with each panel and pipe installed.
 - b. All QA/QC tests done during the installation.
 - c. A certification of completion and warranty of the installation.
 - d. Survey data showing area(s) covered and locations of seams and repairs.

7.2.2 Quality Assurance and Quality Control

1. The Contractor shall be responsible to ensure that all geosynthetic materials delivered to site meet these Specifications.

2. Geosynthetics that do not meet these Specifications will be rejected. The Contractor will replace any rejected material with new material that meets these Specifications.
3. The Contractor must ensure that the geosynthetics installation will be carried out by a suitably qualified and experienced team or subcontractor.
4. Delivery, storage, and handling:
 - a. Supply geosynthetics in rolls or bundles with straps for unloading.
 - b. Supply geosynthetics marked or tagged with the following information:
 - i. Manufacturer's name
 - ii. Product information
 - iii. Roll/pipe serial number
 - iv. Batch or lot number
 - v. Roll/pipe dimensions
 - c. Ensure geosynthetics are handled with care to prevent damage during transit and handling.
 - d. Store geosynthetics in an enclosed structure to protect them from excessive cold, heat, puncture, cutting, or other damaging or deleterious conditions.
 - e. Ensure personnel responsible for loading, transport, and unloading of geosynthetics are familiar with the handling and transport constraints imposed by the manufacturer.
5. Acceptance at work site:
 - a. The Engineer may perform inventory and surface inspection for defects and damages of geosynthetics upon delivery.
 - b. The Contractor will repair damages resulting from handling and transport of geosynthetics. If irreparable in the opinion of Pogo, the Contractor will replace the damaged materials.
6. Storage and protection:
 - a. Prepare the storage area so that the geosynthetic products are stored off the ground and protected from the elements and other damaging or deleterious conditions.
 - b. Preserve integrity and readability of the geosynthetics labels as well as store geosynthetic products in a fashion that Pogo has access to the package slips or labels for each product for verifications and acceptance.

7. Subgrade preparation:
 - a. Prior to liner deployment, all subgrade surfaces shall be compacted when specified, and free of sharp protruding debris. All subgrade must be approved by Pogo prior to geosynthetics deployment.
 - b. Prior to HDPE liner deployment, all subgrade surfaces shall be smooth and compacted with a continuous grade as specified in this document.
8. The Contractor shall supply all testing technicians and equipment required for the QA/QC program.
9. The Contractor or subcontractor's testing technicians shall be responsible for all QA/QC protocol such as: panel labelling, destructive testing, repair labelling, control inspections, and record keeping.

7.2.3 Product Specifications

1. The 80-mil HDPE textured liner shall have the basic requirements listed in Table 7.1 with American Society for Testing and Materials (ASTM) Standards.

Table 7.1: 80-mil HDPE Textured Liner (Typical Product)

Parameter	Standard	Value
Nominal Thickness (mm)	ASTM D5199	76 mil
Surface Density (kg/m ²)	ASTM D792	0.94
Tensile Strength Modified Type IV Die	D638 @ Yield	168 ppi
	D638 @ Break	120 ppi
	Strain @ Yield	12%
	Strain @ Break	100%
Tear Resistance	D1004	56 lbs
Dimensional Stability	D1204	2%
Stress Cracking	D5397	300 hours
Puncture Resistance	D4833	120 lbs
Black Content	D1603	2-3%
Black Dispersion	D5596	Cat 1 or 2

2. Extrusion rods and other welding supplies shall conform to the following Specifications:
 - a. Extruded material shall be made from same type resin as the HDPE liner.
 - b. The extrusion rod has compatible diameter for proposed apparatus.
 - c. Contractor shall submit product certificates to the engineering, procurement, and construction manager and to Pogo for approval prior to deployment.
 - d. Additives shall be thoroughly dispersed.

- e. Material shall be free of contamination by moisture or foreign matter.

7.2.4 Equipment

1. The Contractor shall ensure the installation team or Sub-Contractor has proper handling equipment and procedures as recommended by the manufacturer for the geosynthetic installation. The Contractor shall further ensure the handling equipment and procedures do not pose any danger to personnel as well as risk damage to or deformation of the geosynthetic material. Examples of the suitable handling equipment include, but are not limited to:
 - a. Spreader bar assembly
 - b. Stinger
 - c. Roller cradles
 - d. Straps
2. Equipment specifications for welding HDPE shall include but are not limited to:
 - a. A self-propelled fusion wedge welder and an extrusion welding apparatus from a recognized manufacturer.
 - b. The fusion wedge welder shall have certified working gauges showing working temperature and speed.
 - c. An adequate number of extrusion welding apparatus shall be available to maximize production.
 - d. The Contractor must supply an adequate power source capable of providing constant voltage under combined line load.
 - e. The Contractor must provide an adequate shelter and heater to ensure that a suitable environment can be created for completion of seams according to the Specifications.

7.3 Part 3 – Geomembrane Liner Installation

7.3.1 Subgrade

1. The subgrade shall be prepared to a compacted, smooth surface that shall be free of loose, deleterious material that could puncture or damage the liner in anyway.
2. The Contractor shall request Pogo's approval on the subgrade no less than eight hours prior to liner deployment. The Contractor or Sub-Contractor that provides the liner warranty and Pogo shall sign off on the subgrade prior to deployment.
3. If subgrade is damaged or deteriorated due to weather, traffic, etc., the Contractor shall repair the subgrade to approved condition prior to liner deployment. Pogo shall inspect and approve the subgrade repair.

4. Anchor trenches shall be in place at the installation areas and constructed according to the Drawings.

7.3.2 Installation

1. This Specification is a typical guideline for the HDPE installation. The detailed installation procedures and protocols should be done according to the manufacturer's specifications.
2. The Contractor shall be responsible to ensure availability of enough temporary ballast (i.e., sand bags) for the liner installations.
3. The liner should cover the depth and width of the anchor trench, plus a minimum of two-foot slack beyond the width of the anchor trench.
4. Liner Deployment:
 - a. The liner shall be unrolled and deployed with the textured surface down and anti-root film on top.
 - b. The liner panels shall be deployed longitudinally parallel to the slope.
 - c. Horizontal tie-in should be avoided on the slopes.
 - d. The overlap spacing for seaming and sealing shall be a minimum of eight inches and shall be done according to the manufacturer's specifications.
 - e. Horizontal seams shall have a shingle-type overlap toward the down slope direction.
5. Quality control personnel shall assign each panel a simple and logical identifying code. The coding system shall be subject to Pogo's approval and shall be determined on-site.
6. Quality control personnel shall visually inspect the geomembrane during the deployment for imperfections and mark faulty or suspect areas for repair.
7. The Contractor shall determine to its own satisfaction that sufficient extra material for thermal expansion and contraction of the material, anchor embedment, seams, slack, and waste are included on top of the neat area given.
8. Wedge welding:
 - a. Where possible, the Contractor shall minimize the number of field seams in corners, outside corners, and odd-shape geometric locations.
 - b. Seam overlap must be clear of dust, mud, sand, and other debris.
 - c. Sufficient heat and pressure from wedge welding shall be provided according to manufacturer's specifications to ensure sealing of the seams.
 - d. All welding must be carried out upwards on sloped areas.

- e. Seaming shall not proceed when adverse weather conditions could jeopardize the integrity of the liner installation.
 - f. The Contractor shall protect against moisture build-up between sheets due to condensations.
9. Extrusion welding:
- a. The Contractor shall hot-air tack adjacent pieces together using procedures that do not damage the geomembrane.
 - b. Geomembrane surfaces shall be cleaned and roughened by disc grinder or equivalent.
 - c. Before welding, extrusion welding apparatus shall be purged of heat-degrading extrudate.
10. Seaming shall not proceed when ambient air temperature or adverse weather conditions jeopardize the integrity of the liner installation. The Contractor shall demonstrate that acceptable seaming can be performed by completing a weld and obtaining approval by Pogo.
11. Each suspect location shall be repaired and non-destructively tested in both seam and non-seam areas. Geomembrane shall not be covered at locations that were repaired until test results with passing values are available to Pogo.
12. Field QA/QC:
- a. All seams shall be visually inspected by the QA/QC personnel for any defects and abnormalities.
 - b. Vacuum tests and echo graph tests to confirm the integrity of the seams shall be done at Pogo's discretion.
13. The Contractor shall be responsible for repair of defective and or damaged areas. All repairs shall be done according to the manufacturer's specifications and verified by Pogo.

7.3.3 Liner Cover

- 1. All exposed HDPE liner will be covered with minimum six inches of One-Inch Minus Material (overliner) unless stated otherwise. The material shall be deployed with care to ensure that the liner will not be damaged during the operation. The material shall be spread evenly without any compaction. Traffic shall not be permitted directly on the geomembrane.
- 2. All geosynthetics installation shall be inspected and approved by Pogo prior to coverage.

7.3.4 Acceptance

- 1. Final acceptance of liner deployment will be made only after Pogo has received all certifications, is satisfied with the deployment, and has approved the QA/QC test results.

2. Pogo will re-inspect previously approved areas for damage and instruct the Contractor to repair any damage in accordance with the Specifications.

END OF SECTION 7

8 Fill Placement

8.1 Part 1 – General

8.1.1 Documents

This section forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

8.1.2 Description

1. The Work specified in this section includes furnishing all supervision, labour, materials, tools, and equipment for placement of fill material to the lines and grades shown on the Drawings and specified herein.
2. The Work shall include but is not limited to the following:
 - a. Foundation preparation to receive the fill.
 - b. The supply, hauling, placing, and compacting of the specified fill material as shown on the Drawings.
 - c. All related surveys to lay out and control of the Work.
 - d. Assisting and providing Pogo with quality assurance/quality control (QA/QC) testing and results.
 - e. Maintenance of haul roads when and where applicable.
 - f. The development, maintenance, and closure of the topsoil stockpile and the fill-material borrow area.
 - g. Any other related Work not covered elsewhere.
3. Fill materials required to be placed includes but are not limited to the following:
 - a. Haul, doze, and place General Fill materials in the New Haul Road, New North Diversion Ditch, and New South Diversion Ditch.
 - b. Haul, place, spread, and compact One-Inch Minus Material on the New Haul Road.
 - c. Haul and place Rip-Rap in stream inlets, Flume Inlet, and Dissipation Pool.

8.1.3 Codes and Standards

QA/QC shall use testing procedures from but not limited to the list of American Society for Testing and Materials (ASTM) Standards in Table 8.1.

Table 8.1: List of QA/QC Testing Standards

Test	Protocol
ASTM D2216	Water (Moisture) Content in Soil and Rock
ASTM D422	Particle Size Analysis of Soils
ASTM D698, Procedure A, B or C	Laboratory Compaction Characteristics of Soil Using Standard Effort (Standard Proctor Test)
ASTM D2922	Density of Soil in Place by Nuclear Methods
ASTM D1556-07	Standard Test Method for Density and Unit Weight of Soil in Place by Sand Cone Method

8.1.4 Submittals

1. The Contractor shall submit fill placement plans and procedures for dozing, hauling, and compacting operations 28 days prior to Work for the Engineer’s review and approval.
2. The Contractor shall submit weekly as-built surveys of the Work to demonstrate overall material balance of the Work for the Engineer’s review.
3. The Contractor shall submit all quality control data and documents at the end of the Project and upon request of Pogo.
4. Testing responsibilities:
 - a. Quality control testing will be done by the Contractor.
 - b. Quality assurance testing will be done by Pogo.
 - c. Pogo’s testing shall not relieve the Contractor of its sole responsibility to construct the Work in accordance with specified requirements.

8.2 Part 2 – Execution

8.2.1 Compaction Equipment

1. The compaction equipment shall be the appropriate size and type to achieve the specified densities of respective fill materials.
2. Where compaction procedure (lift thickness, number of passes, compactor type) is specified, the Contractor shall ensure the Work meets or exceeds that described in the Specifications.
3. Notwithstanding the requirements stated above, the equipment and compaction procedures employed by the Contractor shall be subject to approval of Pogo.

8.2.2 Fill Placement

1. Fill placement shall be done to maintain overall material balance from excavation and blasting. The use of material from the borrow area(s) shall be limited and approved by Pogo prior to Work.

2. The Contractor shall prepare an acceptable foundation surface to receive the specified fill material. An acceptable foundation surface shall be stripped, clean, sound, and firm. It shall not contain any organic, loose, softened, or disturbed material as described in Section 4 and determined by Pogo.
3. Fill shall not be placed on the prepared foundations until the foundation and blasted surface is inspected and approved by Pogo.
4. The Contractor shall doze, dump, spread, and level fill in such a manner as to avoid multiple Work zones and crossing traffic patterns.
5. General fill placement shall be done in two categories. Fill that is placed within the vertical traffic limit of the final Work shall be considered Type 2 General Fill and requires compaction. Fill that is placed outside the vertical traffic limit shall be considered Type 1 General Fill, and compaction shall not required. The traffic limits are defined on the Drawings and as determined by Pogo.
6. The compaction operation for fill shall be conducted within the same Work day to provide a smoothly compacted surface and to meet the density requirements shown in Table 8.2. Adjacent individual passes of the compactor shall overlap by approximately one third of the width of the compactor's drum. New fill shall be "keyed" into the existing approved fill. Keying in is done by placing new fill adjacent to exposed compacted fill. The Contractor shall be responsible to repair all damage on unfinished Work from the previous Work day.
7. Any placed material that does not meet the specified requirement shall be reworked to produce a material that does satisfy the specified requirement, or it shall be removed and disposed of accordingly.
8. Maximum lift thickness and compaction requirement of construction material shall be as indicated in Table 8.2.

Table 8.2: Compaction Requirements

Fill Description	Maximum Lift Thickness Before Compaction (ft)	Minimum Density % of the Standard Proctor Maximum Dry Density	Placed Consolidated Density ⁽¹⁾ lbs/ft ³	Minimum Passes/Lift & Compactor Type ⁽²⁾	Construction Tolerance
General Fill within Traffic Limits	1.5	95	125	5, 15t vibratory or equivalent	±2 in.
One-Inch Minus Material	1	95	118	5, 15t vibratory or equivalent	±0.5 in.

1. Density herein is assumed. Field tests will confirm the actual densities from borrow material.

2. Compaction effort might be adjusted by field compaction trial results. Pogo will determine on-site if the compaction specification needs to be adjusted to reflect the results.

8.2.3 Tolerances

Fill shall be placed (a) in horizontal lifts to the lines and levels shown on the Drawings or as directed by Pogo, (b) to the tolerances as shown in Table 8.2, and (c) in elevation and horizontal dimension determined by survey.

8.2.4 Compaction Trials

1. Compaction trials shall be performed upon production of fill material to determine site specific parameters such as density and compaction standards. The trial shall be carried out as part of the fill-placing operation.
2. Pogo may request the Contractor to periodically conduct field trials to optimize moisture conditioning, lift thickness, and compaction effort.
3. The compaction trials on the material in question shall be done using a survey method according to the general procedures listed below and as specified by Pogo.
 - a. A pad, approximately 20 feet by 60 feet, made with approved, specified materials at a specified thickness and according to a placement method specified by this document.
 - b. A set of survey points with accuracy of ± one-eighth inch shall be laid out in a grid pattern as specified by Pogo.
 - c. The elevation of each survey point shall be recorded immediately after placement and after each compaction effort.
 - d. Compaction shall be done upwards of 10 passes in accordance with this document or otherwise specified by Pogo. Survey will be done after each pass.
 - e. This process shall be repeated to simulate construction as directed by Pogo.
4. The Contractor shall obtain the Engineer’s approval before implementing any change to the Specifications.

8.2.5 Restrictions due to Weather and Suspension of Operations

1. The Contractor shall not place any fill when conditions for such operations are unsatisfactory due to heavy rainfall or any other reason determined by Pogo. Frozen material is unsuitable for fill material and shall be hauled to a designated area as spoil.
2. Where operation has been discontinued by the Contractor or suspended by Pogo, the effects of adverse conditions shall be assessed by Pogo and the surficial layer of fill reworked or replaced to the satisfaction of Pogo before resumption of fill placement.
3. Before suspension of operation each day or each construction shift as described in this section and before suspension due to inclement weather, fine grain soil material shall be:
 - a. Surface shaped to drain excess water.
 - b. Rolled smooth to seal against water infiltration.
 - c. Examined by Pogo to determine the quality of surficial fill and if rework shall be required to meet Specifications.

8.2.6 Sediment and Runoff Control

1. The Contractor shall be responsible to provide construction facilities such as temporary diversion berms, ditches, sediment control measures, and other measures required to prevent the discharge of fines from construction areas and from entering any natural water courses downstream of the Work. Pogo will review the measures and notify the Contractor if the measurements are inadequate.
2. In general, when placing fill material, the Contractor shall slope the surface toward collection channels for surface water management.

8.2.7 Quality Assurance and Quality Control

1. The QA/QC Team will conduct testing according the Table 8.3 or as specified by Pogo.
2. The Contractor shall perform regular quality tests to ensure the quality of the Work shall be done according to the Specifications.
3. Testing shall be performed in accordance with the principles and methods prescribed by the ASTM and other such recognized authorities.
4. Testing shall be carried out across the full length, width, and depth of the various fill zones so as to fully represent the overall quality of the structure.
5. The Contractor shall conduct regular topographic surveys to demonstrate the placement of fill to the specified lines, levels, grades and tolerances. Pogo may from time to time conduct check surveys. Survey results shall be reported to Pogo within 24 hours of the completion of each survey.

6. As a minimum, frequency of the fill compaction shall be done according to Table 8.3. Pogo will at his discretion, carry out tests on areas where listed placement volumes are not met.

Table 8.3: Testing Schedule

Fill	Tests and Frequency (One Test per Volume in feet ³) ⁽¹⁾			
Description	Moisture Content	In-Situ Density	Gradation	Standard Proctor
General Fill within Traffic Limits	-	50,000	50,000	50,000
One-Inch Minus Material	10,000	5,000	10,000	10,000

1. Volume is measure in placed volume.

8.2.8 Acceptance

1. Final acceptance of earthworks will be made only after fill materials are dumped, spread, moisture conditioned, and compacted, and only after tests and surveys demonstrate compliance with the Specifications.
2. If on the basis of the sampling and testing, or if in the opinion of Pogo, an area of the fill does not meet the specified requirements, such fill shall be removed and replaced with conforming material. Rejection of fill material by Pogo may be made at source, in transporting vehicles, or in place.
3. Pogo will re-inspect previously approved areas for damage and instruct the Contractor to repair said damage in accordance with the Specifications.

END OF SECTION 8

9 Concrete and Shotcrete Specifications

9.1 Part 1 – General

9.1.1 Documents

This section forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

9.2 Part 2 – Concrete Specifications

1. Cement shall be a Portland Type I cement and conform to the requirements of the American Society for Testing and Materials (ASTM) C150.
2. All concrete aggregates shall be clean, hard, durable sand and gravel, and free from deleterious material, and shall meet the requirements of ASTM C33. Coarse aggregates particles shall general be cubical, and a proportion of flat, elongated particles in a representative sample shall not exceed 15%.
3. Mixing water for concrete shall be clear and free from injurious amounts of oil, acid, alkali, organic matter, sediment, or any other deleterious substance.
4. Concrete and Wet-Mix shotcrete Specifications:

Table 9.1: Concrete Mixture Specifications

Content	Concrete Specifications	Shotcrete Specification
Cement	Type I	Type I
Coarse Aggregates	Maximum 3/4 inch	Maximum 1/2 inch
Compressive Strength @ 28 days	5000psi ± 500psi	5800psi ± 500psi
Slump	3-1/8 inch ± 1-1/8 inch	2 inch ± 3/4 inch
Air Content	5 to 8%	5 to 8%
Fibre Reinforcement	n/a	5 lbs/yd ³

5. Admixtures:
 - a. Air entraining admixtures shall conform to the requirements of ASTM C494.
 - b. Water reducing agents shall conform to the requirements of ASTM C494 (Type A).
 - c. Fly Ash shall conform to the requirements of ASTM C494 (Type F) for wet-mix shotcrete.
 - d. Internal Membrane additive of 2% for wet-mix shotcrete.
6. Collated fibrillated-polypropylene fibres of 1-1/2 inch length shall be added to the wet-mixed shotcrete mixture for reinforcement.
7. The Contractor shall perform the following:

- a. Take minimum three test cylinder for each batch of concrete mixture for concrete and shotcrete placed in any one day.
 - b. Conduct compression tests according to ASTM C684 of one cylinder of each set at test specimen age of seven days and forward the test results to Pogo within fourteen days of concrete placement.
 - c. Conduct compression tests according to ASTM C684 of one cylinder of each set at test specimen age of twenty-eight days and forward the test results to Pogo within thirty-five days of concrete placement.
 - d. Conduct slump and air content tests and provide Pogo with the test results within 24 hours.
8. If the results of tests indicate that the concrete is not of the specified quality, the Contractor shall remove the concrete in question at Pogo directions.

9.3 Part 3 – Forms

1. Forms shall be made of steel or heavy waterproof plywood.
2. Form shall conform to the shape, lines and dimensions of the finished concrete structure according to the drawings. The concrete surfaces shall not deviate from the specified lines and grades by more than 1/8 inch.
3. The completed forms shall be rigid, unyielding, sufficiently tight to prevent loss of mortar, and assembled, tied, and supported by the Contractor that they will not deflect or bulge during placement and compaction of the concrete.
4. Removal of forms and form supports shall not done before the expiration of the minimum time indicated below and as specifically authorized by Pogo.
 - a. Bottom forms and supports shall not be removed before 7 days and 10 days if ambient temperature is below 40°F.
 - b. Side forms and support shall not be removed before 3 days and 7 days if ambient temperature is below 40°F.
5. Removal of forms shall be stripped with care to avoid damages to the green concrete and special precautions shall be taken to avoid chipping of exposed edges and corners.

9.4 Part 4 – Wet-Mix Shotcrete Process

1. The cement, aggregate, and admixtures shall be thoroughly mixed. The concrete shall be fed into the gun and propelled through the delivery hose to the nozzle by pneumatic-feed equipment.
2. The shotcrete shall be applied to the minimum and shall not exceed the thickness limits shown on the Drawings.

3. The shotcrete placed shall form a relatively smooth finished surface without segregation of the aggregates or cement.
4. The operating pressures of the shotcrete equipment shall be greater than 40 psi.

END OF SECTION 9

10 Construction

10.1 Part 1 – General

10.1.1 Documents

This section forms part of the Contract Documents and is to be read, interpreted, and coordinated with all other parts.

10.1.2 Description

The Work to be done under this Section consists of performing all Work necessary to carry out the Work as shown on the Drawings and specified herein. The Work shall include but is not limited to:

- a. Surface Runoff Ditch along the New Haul Road
- b. Stream inlets
- c. New North Diversion Ditch and New South Diversion Ditch
- d. New South Diversion Flume

10.2 Part 2 – Stream Inlets

10.2.1 Construction and Installation

1. The stream inlets shall be constructed at the location and dimension as shown on the Drawings.
2. Blasting might be required in the bedrock to maintain grade, dimensions, and alignment. Blasting shall conform to the specifications in Section 5.
3. The stream inlets' side slopes will vary based on foundation, where side slope shall be 1H:1V in bedrock and a minimum of 1.5H:1V in fill or overburden soil as directed by Pogo.
4. The base of each stream inlet shall be a minimum of ten feet by ten feet.
5. The stream inlets shall be lined with 80-mil HDPE textured liner to the limits as shown on the Drawings. At a minimum, the liner shall extend up the side slopes of the inlet to the freeboard elevation of the channel, approximately one foot below channel crest.
6. A liner cut-off trench shall be constructed up-gradient of stream inlets in areas where bedrock is not encountered to reach bedrock in accordance with the Drawings; or, at minimum, five feet into the in-situ soil overburden.
7. The liner shall be constructed in accordance with the geosynthetics Specification in Section 7.
8. A minimum six-inch layer of One-Inch Minus Material shall be placed above the liner for protection.

9. The stream inlets shall be lined with Rip-Rap according to the Drawings and material Specifications in Section 6.
10. Field fitting might be required for the construction to fit site condition. The Contractor shall be responsible to identify areas where field fitting will be required and to notify Pogo two days prior to Work.

10.3 Part 3 – Surface Runoff Ditch along the New Haul Road

10.3.1 Construction

1. The surface diversion ditches shall be excavated to the lines and limits as shown on the Drawings.
2. Channel side slopes will vary based on foundation where, side slope shall be 1V:1H in bedrock and minimum 1V:1.5H in fill or overburden soil as directed by Pogo.
3. Blasting might be required in the bedrock to maintain grade and alignment. Blasting shall conform to the specifications in Section 5.
4. A smooth transition shall be constructed where the surface runoff ditch along the New Haul Road intersects the existing surface runoff ditch to maintain grade and prevent pooling.

10.4 Part 4 – New North and South Diversion Ditches

10.4.1 Construction

1. The surface diversion ditches shall be excavated to the lines and limits as shown on the Drawings.
2. Channel side slopes will vary based on foundation where, side slope shall be 1V:1H in bedrock and minimum 1V:1.5H in fill or overburden soil as directed by Pogo.
3. Blasting might be required in the bedrock to maintain grade and alignment. Blasting shall conform to the specifications in Section 5.
4. A smooth transition shall be constructed where the New North Diversion Channel intersects the existing North Diversion Channel to maintain grade and prevent pooling.
5. The diversion channels shall be lined with shotcrete to the limits and thickness according to the Drawings.
6. Shotcrete mixture and application process shall meet the requirements listed in Section 9.
7. Field fitting might be for the construction to fit site condition. The Contractor shall be responsible to identify areas where field fitting will be required and to notify Pogo two days prior to Work.

10.5 Part 5 – New South Diversion Flume

10.5.1 Construction and Installation

1. The New South Diversion Flume shall be constructed according to the alignment and grades as shown on the Drawings.
2. All concrete construction (drop inlet and thrust blocks) shall be constructed to the dimensions as shown on the Drawings and concrete specifications in Section 9.
3. The 24-inch SDR 21 HDPE pipe shall be installed and welded according to manufacturer's specifications.
4. Electrofusion flex restrainers shall be installed and welded on to the HDPE pipe according to manufacturer's specifications at the quantities and locations as shown on the Drawings.
5. The 30-inch diameter galvanized 10-gauge corrugated metal pipe (CMP) with 3-inch by 1-inch corrugations shall be installed and lock-seamed to the alignment as shown on the Drawings and according to the manufacturer's specifications.
6. The transition from HDPE pipe to CMP shall consist of a minimum two feet overlap, where the HDPE extends a minimum of two feet onto the CMP.
7. Blasting might be required for the construction to maintain grade and alignment of the flume. Blasting shall conform to the blasting Specifications in Section 5.
8. Field fitting might be required for the construction to fit site condition. The Contractor shall be responsible to identify areas where field fitting will be required and notify Pogo two days prior to Work.

END OF SECTION 10

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All data used as source material plus the text, tables, figures, and attachments of this document were reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

11 References

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Standard Practice for Shotcrete, Engineer Manual No. 1110-2-2005, US Army Corps of Engineers, January 31, 1993.