Chevron Resources Company

Enlargement of Existing Tailings Dams
Technical Specifications

Chevron Phosphate Expansion Project
Vernal, Utah

August, 1985

This appears to be part of the approved mine plan. 1/28/02 PBB

RECEIVED
OCT 28 1985
DIVISION OF OIL
GAS & MINING

ENLARGEMENT OF EXISTING TAILINGS DAM

TECHNICAL SPECIFICATIONS

INDEX

Specification Sections		Page
02100	Clearing, Stripping, Site dewatering and Foundation Preparation	1
1.	General	1
1.1	Scope	1
1.2	Definitions	1
2.	Products (not used)	2
3.	Execution	2
3.1	Clearing and Stripping	2
3.2	Foundation Preparation	3
3.3	Dewatering	3
3.4	Disposal	3
3.5	Inspection	3
02115	Foundation Excavation	4
1.	General	4
1.1	Scope	4
1.2	Definitions	4
2.	Products (not used)	4
3.	Execution	4

02200 Embankment Fill 6

1. General 6

1.1 Scope 6
1.2 Definition 6
1.3 Applicable Standards 6

2. Products 7

2.1 Materials 7
2.2 Compaction Equipment 8

3. Execution 9

3.1 General 9
3.2 General Requirements 9
3.3 Placement of Embankment Fill 9
3.4 Compaction 12
3.5 Drainage Protection During Construction 13
3.6 Quality Control 13

02290 Embankment Instrumentation 14

1. General 14

1.1 Scope 14

2. Products 14

2.1 Stand pipe Piezometers 14
2.2 Displacement Monuments 14
2.3 Seepage Measurement Weirs 14

3. Execution 15

3.1 General 15
3.2 Piezometer Installation 15
3.3 Installation of Displacement Markers 16
3.4 Installation of Seepage Measuring Weirs 16
3.5 Protection of Instrumentation 17

Section 02100

CLEARING, STRIPPING, SITE DEWATERING AND FOUNDATION PREPARATION

1. GENERAL

1.1 Scope

This specification section covers clearing of vegetation, removal of trees, stripping of topsoil, disposal of cleared and stripped materials, dewatering, and preparation of soil foundations for the construction of the dam enlargement and drainage system of the Chevron Resources dam to retain phosphate tailings.

1.2 Definitions

A. Clearing: Clearing is defined as removing brush, trees, and other vegetation in areas where the general ground cover is higher than two feet, consisting generally of brush and trees.

B. Stripping of Topsoil: This shall consist of the removal of topsoil, including all roots, organic material and vegetation less than two feet high, and any other unsuitable material, by blading with a bulldozer or other equivalent means.

C. Soil Foundation Preparation: This shall consist of preparing soil foundation areas for placement of embankment or drain materials. Foundation preparation shall include cleaning foundation areas of objectionable material and compacting foundation surfaces.

D. Sand Tailings: This shall be defined as the coarse fraction of the Vernal Phosphate mill process waste.

E. Slime Tailings: This shall be defined as the fine fraction of the Vernal Phosphate mill process waste.

F. Drain Materials: Drain materials shall be defined as the cohesionless materials used in the construction of the chimney drain, blanket drains, collector drains, and toe dike.

G. Rockfill - This shall be defined as the select, relatively gypsum free siltstone and shale materials obtained from local borrow pits in the Moenkopi unit.

H. Mine Waste Rockfill - This shall be defined as the select, predominantly hard limestone overburden waste rock materials from the phosphate mining operations.

2. PRODUCTS (NOT USED)

3. EXECUTION

3.1 Clearing and Stripping

A. Clearing of bushes, trees, and other vegetation will be required over the entire area of embankment and drain construction as shown in the Drawings.

B. All organic material will be stripped from the area covered by the embankment and drain facilities.

C. The site geotechnical engineer shall verify that a specific area has been satisfactorily cleared and stripped before any other site preparation, grading or construction work may continue in that area.

3.2 Foundation Preparation

A. Immediately after topsoil is stripped, the soil foundation shall be track-walked by a crawler tractor or similar approved equipment to seal the soil surface and minimize absorption of moisture. All stripped soil surfaces shall be left with a minimum grade of 1 to 20 to facilitate drainage. No ponding of water will be allowed on any soil foundation areas.

B. Immediately before placing any embankment or drain material on any soil foundation, the areas shall be cleaned of loose soil, organic materials, and other objectionable material as directed by the site geotechnical engineer, and the soil foundation shall be compacted in place by four passes of the specified compaction equipment in Section 02200, Embankment Fill.

C. When any soil foundation surface is too wet to enable satisfactory compaction, the wet material shall be removed as required by the site geotechnical engineer, or the water content reduced to an acceptable value by harrowing or scarifying to a minimum depth of one foot and aerating or by other approved methods, and compaction carried out as detailed in Paragraph B.

D. When any soil foundation surface is too dry to enable satisfactory compaction to be carried out as designated by the site geotechnical engineer, water shall be added to the foundation by controlled sprinkling to increase the moisture content of the surface material to a satisfactory level as established by the site geotechnical engineer. The added moisture shall be evenly distributed throughout the upper one foot layer of the surface foundation materials by harrowing, scarifying, or another approved methods and the soil shall be compacted as specified in Paragraph B.

E. No embankment materials shall be placed on any portion of the foundation until the foundation has been prepared as specified herein above and approval has been obtained from the site geotechnical engineer.

3.3 Dewatering

A. Seepage and groundwater levels in the embankment and drain foundations shall be controlled to maintain the excavation and foundation surfaces in a drained state, acceptable to the site geotechnical engineer. No ponding shall be permitted.

B. All local runoff and seepage collected from the dewatered area shall be contained and disposed of by the seepage control system.

3.4 Disposal

Disposal of all organic materials, debris and topsoil shall be in accordance with approved local and plant procedures.

3.5 Inspection

A. All foundation preparation work shall be carried out under the observation of the site geotechnical engineer.

B. Any work found unsatisfactory or any work disturbed by subsequent operations before authorization to proceed is granted shall be corrected as directed by the site geotechnical engineer.

Section 02115

FOUNDATION EXCAVATION

1. GENERAL

1.1 Scope

This specification section covers all foundation excavation for embankment and drain placement for the Chevron Resources dam to retain phosphate tailings.

1.2 Definitions

Seepage ponds - Presently existing seepage collection ponds located downstream of the existing Main Dam and existing Dam No. 1.

2. PRODUCTS

(Not Used)

3. EXECUTION

A. The seepage ponds in the northern and southern drainages shall be drained by removal of the existing retention dikes. If necessary, open trenches shall be constructed to facilitate drainage of the seepage ponds. Following drainage, loose or soft soils and other unsuitable materials as determined by the site geotechnical engineer, shall be entirely removed.

B. Following excavation of more unsuitable materials, both drainages shall be regraded as shown in Drawing No. 6. The fill material used in this process shall be properly compacted (see Section 02200) rockfill from the designated borrow areas shown on Drawing No. 2, mine waste rockfill, or sand tailings. The upper 4 feet of fill should be mine waste rockfill or sand tailings in those locations where drains will later be constructed.

C. At all times during excavation, foundation preparation, and backfilling, construction operations shall be conducted in such a manner as to preclude free standing water at the site. Likewise, areas immediately adjacent to any area under construction shall be maintained in such a condition that they will be well drained at all times. Side ditches shall be constructed at such locations and in such a manner as to avoid damage by erosion to slopes of cuts and embankments. All foundation areas shall be kept well-graded and drained.

D. Immediately prior to placing embankment fill on the foundation, the foundation shall be cleared of puddles, softened areas, clusters of rock particles, and all loose and objectionable materials in a manner approved by the site geotechnical engineer, by handwork if necessary, or other effective means.

Section 02200

EMBANKMENT FILL

I. GENERAL

1.1 Scope

A. This specification section covers all requirements for the selection, processing, placement, compaction, and testing of the materials for the embankment fill of the phosphate tailings dam for Chevron Resources at Vernal, Utah. The embankment fill consists of rockfill, sand tailings and drain materials.

B. Foundation preparation is specified in Section 02100.

C. Foundation excavation is specified in Section 02115

1.2 Definitions

A. Foundation: Any surface on which embankment fill is to be placed and the materials underlying such a surface. Foundations of the embankment include the downstream faces of the existing Main Dam, the existing Secondary Dam, a portion of Dam No. 1, and regraded areas as well as naturally occurring soil and rock surfaces.

1.3 Applicable Standards

The following standards will apply:

American Society for Testing and Materials Standard Method D422-63, Particle-Size Analysis of Soils.

American Society for Testing and Materials Standard Test Method D1557-78, Moisture-Density Relations for Soils and Soil-Aggregate Mixtures Using 10-lb Rammer and 18-in Drop.

2. PRODUCTS

2.1 Materials

A. Materials for rockfill shall be obtained from approved borrow areas as shown on Drawing No. 2, or from other similar sources approved by the site geotechnical engineer. Sand tailings are the coarse fraction of the Vernal phosphate mill process waste. Materials for the drain shall be obtained from commercial local gravel pits. No other materials will be allowed unless approved by the site geotechnical engineer. Materials shall be free from organic matter, clay lumps, and other debris.

B. Materials for the embankment fill shall conform to the following:

Material Type 1: Gravelly Sand for Drain Material 1, located as shown on Drawings Nos. 5, 6, and 7, shall be approved and clean material meeting the following particle size requirements after being compacted as tested according to the requirements in ASTM D422-63. The following gradation band for Drain Material 1 are developed based on the current mill sand tailings. Should the sand tailings gradation band be changed in the future, the gradation band for Drain Material 1 shall be revised accordingly.

U.S. Standard Sieve No.	Percentage Passing By Weight
1"	100
3/8"	70-100
#4	48-85
#8	26-62
#16	8-36
#30	0-12
#100	0-3
#200	0-2

Material Type 2: Coarse gravel for Drain Material 2, located as shown on Drawings Nos. 5, 6, and 7, shall be approved and clean material meeting the following particle size requirements after being compacted as tested according to the requirements in ASTM D422-63.

U.S. Standard Sieve No.	Percentage Passing By Weight
3"	100
2-1/2"	95-100
2"	50-100
1-1/2"	15-80
1"	0-15
3/4"	0-2

Material Type 3: Sand Tailings, as described in Section 02100, and limited to 30% passing #200 U.S. Standard Sieve will be used as embankment fill and as a finer material adjacent to Drain Materials as shown in Drawings Nos. 5, 6 and 7.

Material Type 4: Random fill shall consist of Sand Tailings, as described for Material Type 3, Rockfill, or Mine Waste Rockfill, in section 02100. Random fill shall be placed as shown on Drawing Nos. 5, 6, and 7.

All materials not meeting the requirements set forth above, as determined by tests and/or inspections at placement, will be rejected.

2.2 Compaction Equipment

A. A towed sheepsfoot or self-propelled sheepsfoot roller shall be used to compact the rockfill. The exact type of compaction equipment shall be determined by the site geotechnical engineer after placement of the test fill as described later in this section. Caterpillar D9 or D10 tractors or similar approved equipment shall be used to compact the sand tailings and drain materials. In areas inaccessible to the above compaction equipment, special compaction equipment, such as hand-operated compactors, shall be used. All such equipment will be subject to the approval of the site geotechnical engineer. Approval will be on the basis of demonstrated ability of the equipment to compact the material to the same density as the contiguous fill.

3. EXECUTION

3.1 General

A. Foundation preparation shall be in accordance with Section 02100.

3.2 General Requirements

A. No embankment fill shall be placed on any portion of the foundation until such foundation has been approved by the site geotechnical engineer.

B. Prior to resumption of construction each year, the existing embankments shall be inspected by the site geotechnical engineer to determine whether repair work is required for any part of the existing embankment.

C. If any test performed by the site geotechnical engineer determines that any part of the embankment fill does not meet the specified gradations or compaction, such material shall be removed and replaced with embankment fill and/or compacted in a manner meeting these Specifications.

D. The embankment fill shall be maintained in a manner satisfactory to the site geotechnical engineer until the final completion of the work.

E. Haul Roads

1. If any haul road crosses the dam foundation, any disturbed materials shall be removed so that the surface presents a generally smooth and continuous appearance and meets all requirements of Section 02100 before the embankment fill is placed over the haul road.

2. Haul routes across embankments and chimney drain shall be limited to the least practical number, and any material whose gradation is altered from that specified because of routing of traffic over the zone, or is otherwise contaminated shall be removed and replaced with material conforming to the requirements for the zone.

3.3 PLACEMENT OF EMBANKMENT FILL

A. General

1. The method of dumping and spreading the rockfill, drain materials, and sand tailings shall ensure uniform distribution.

2. No embankment fill may be placed on any area where ponding has been allowed to occur.

3. No embankment fill shall be placed upon a frozen surface nor shall any ice or frozen earth be incorporated in the embankment.

4. The site geotechnical engineer may direct that placement of all or any embankment material be suspended because of rain, or any other reason which would result in an unaccepted embankment.

B. Test Fill

1. Two test fills shall be constructed to determine the appropriate compaction specifications for the rockfill. This shall be completed to the satisfaction of the site geotechnical engineer before any rockfill is placed in the embankment. Test fills may be constructed so that they can be later incorporated into the embankment.

2. The first test area shall have a foundation that is well drained and approximately horizontal. The material shall be spread in horizontal lifts of 18" and 24" or as otherwise directed by the site geotechnical engineer. The site geotechnical engineer shall also determine the number of passes, type of sheepsfoot roller and amount of water application.

3. The second test area shall have a foundation that is well drained and sloping approximately 2.5(H):1(V). The material shall be spread in lifts of 18" and 24" parallel to the slope, or as otherwise directed by the site geotechnical engineer. The site geotechnical engineer shall also determine the number of passes, type of sheepsfoot roller and amount of water application.

4. The site geotechnical engineer shall determine type of compactor, appropriate lift thicknesses, water content and number of passes for the rockfill placement in the embankment on the basis of test fill performance.

C. Sand Tailings

1. Sand Tailings shall be placed to the lines and grades according to Drawings Nos. 5, 6, and 7, except when sand tailings is placed in the random fill zone. At no place shall the dimensions of the sand tailings layers be less than those shown on the Drawings.

2. Placement of sand tailings in lifts parallel to the underlying foundation surface or in horizontal continuous lifts shall be acceptable. If either placement method is used, the sand tailings after compaction shall meet the compaction criteria specified in Section 3.4.

3. To minimize segregation and to facilitate compaction, the sand tailings should be maintained in a moist state before and during placement.

4. In no case shall slime tailings be allowed to mix with the sand tailings that will be part of the embankment.

D. Drain Material

1. Drain materials shall be placed to the lines and grades according to Drawings Nos. 5, 6, and 7. At no place shall the dimensions of the drains be less than those shown on the Drawings.

2. Except for the Chimney drain, placement of drain materials in lifts parallel to the underlying foundation surface or in horizontal continuous lifts shall be acceptable. Drain material 1 shall be compacted to meet the compaction criteria specified in Section 3.4.

   If this placement method is used, drain materials shall always be maintained at least 12 inches above the adjacent material so as to minimize contamination of the drain material. Construction equipment shall not be allowed to move over placed drain materials except at designated equipment crossovers. Each crossover will be cleaned of all contaminating materials to the satisfaction of the site geotechnical engineer before additional materials are placed in these areas.

3. Placement of drain materials by the trench excavation method shall be acceptable for the chimney drain as shown on Drawings Nos. 5, 6, and 7.

   If this placement method is used, continuous lifts not exceeding 2 feet thickness of sand tailings will be placed prior to the placement of drain materials. Then, an excavation trench meeting the lines, elevations and grades of the drain zone shown on Drawings Nos. 5, 6 and 7 shall be dug by a backhoe. The excavation trench shall be filled with the drain materials meeting gradation requirements specified in Part 2. Drain materials shall be compacted as directed by the site geotechnical engineer. At no time shall the sides of the excavation trench be allowed to cave into the lines of the drain during the placement of drain materials. At no time shall the excavation trench be left open for more than 24 hours unless approved by the site geotechnical engineer.

4. An approved filter fabric shall be placed on the exposed surface of the drain zone immediately after the placement of drain materials. Markers shall be installed along the centerline of the drain zone at 100 feet intervals. When the drain material is prepared for the subseqent lift, the embedded filter fabric shall be removed before the placement of additional drain materials.

5. Drain materials will not need moisture conditioning for compaction, but the material shall be maintained in a very moist state before and during placement to minimize segregation.

6. Drain materials as placed and compacted shall be free of segregation and all contaminating materials. Care shall be exercised to prevent finer soil from adjacent areas from being tracked into the drain material by construction equipment. If unsatisfactory materials are included in the drain, these materials shall be removed to the satisfaction of the site geotechnical engineer and replaced with acceptable materials.

E. Rockfill

1. Rockfill shall be placed in the random fill zone of the embankment as shown in Drawings Nos. 5, 6, and 7.

2. Placement of the rockfill in lifts parallel to the underlying foundation surface or in approximately horizontal lifts shall be acceptable. The lift thickness shall be determined by the site geotechnical engineer after evaluation of the test fill results.

3. Whichever method of placement is selected, lifts should be continuous over the entire face of the embankment unless an alternative placement sequence is approved by the site geotechnical engineer.

3.4 COMPACTION

A. Sand Tailings and Drain Material 1 shall be compacted to a 90% relative compaction as determined by ASTM Test Method D1557-78.

B. Drain Material 2 shall be compacted by 3 passes of a Caterpillar D10 or D9 tractor or similar approved equipment. The compacted lift thickness shall not exceed 6 inches. One pass shall be defined as the required number of successive trips by which complete coverage of an entire layer or surface will occur.

C. In areas where Drain Material or Sand Tailings are inaccessible to the compaction equipment, a hand tamper shall be employed. The compaction requirements would be same and the compaction effort for this alternative equipment shall be determined by the site geotechnical engineer.

D. Compaction requirements for rockfill shall be determined by the site geotechnical Engineer after evaluation of the test fill results. However, in no case shall the uncompacted lift thickness exceed 24 inches.

3.5 DRAINAGE PROTECTION DURING CONSTRUCTION

A. During construction, sites and areas immediately adjacent to any area under construction shall be maintained in such a condition that they will be well drained at all times. All local runoff from seepage, precipitation, or springs shall be intercepted by means of side ditches and disposed of as necessary to prevent its interference with the required construction and to allow for the placement of all embankment fill in the dry.

B. Care shall be exercised in protecting the layers of compacted drain material from contamination by sediment-carrying runoff during the construction season and intervening winters. All contaminated drain materials shall be removed and replaced with clean drain materials.

3.6 QUALITY CONTROL

A. The site geotechnical engineer shall observe and test the quality of work and material during excavation and embankment construction. The site geotechnical engineer shall ensure that construction is performed in accordance with the Drawings and these Specifications.

B. The site geotechnical engineer shall sample and perform gradation tests on the sand tailings and drain materials on a regular basis throughout the construction period. Gradation tests shall be performed on sand tailings and drain materials after these have been placed in layers and compacted. All parties involved in the construction shall cooperate in providing access for the site geotechnical engineer to areas where testing is to be performed and shall schedule construction operations to avoid interference with the testing operations.

C. Every effort shall be made to place material in continuous lifts in the random fill zone.

SECTION 02290
EMBANKMENT INSTRUMENTATION

1. GENERAL

1.1 Scope

A. The work covered by this Section consists of furnishing, installing, testing, and protecting instrumentation for the dam enlargement and drainage system of the Chevron Resources dam to retain phosphate tailings.

B. Instrumentation shall consist of piezometers, displacement markers and seepage measureing weirs located as shown on the Drawings.

2. PRODUCTS

2.1 Stand Pipe Piezometers

A. All piezometers and associated equipment will be as manufactured by Hydrophilic Industrics, Inc. Puyallup, Washington 98371, or approved equal.

2.2 Displacement Markers

The displacement markers shall be Round Single Prism in Can and Assembly, Lietz No. 7270-35, or approved equivalent, surveying targets.

2.3 Seepage Measurement Weirs

The seepage measurement weirs shall be V-notched sharp crested weirs made out of galvanized metal plate or other approved durable material.

3. EXECUTION

3.1 General

A. Installation of all instrumentation will be in accordance with the manufacturers' recommendations and with the drawings, and as directed by the site geotechnical engineer.

B. Following installation of instrumentation, surveys will be carried out to establish the exact position and elevation of each.

3.2 Piezometer Installation

A. When the dam crest reaches elevation 5900 feet, three stand-pipe piezometers shall be installed at the locations and elevations as shown on the Drawings.

B. After installation, each piezometer shall be tested and water surface elevation shall be read and recorded.

C. At other times, water surface elevations of these piezometers shall be read and recorded either monthly or more often if required.

D. During the placement of the embankment fill between the crest elevation 5900 and 5930 feet, the protective metal pipe and PVC pipe shall be extended concurrently by adding additional five foot lengths in six stages. Alternatively, the protective metal pipe may be extended by pulling out the metal pipe which is already embedded in the ground, taking care not to damage the PVC pipe.

   Once the additional five foot lengths have been completed, sand tailings shall be placed immediately around the protective pipe and compacted by hand tamping. The sand tailings mound should have a minimum radius of 10 feet. At no time shall the metal pipe protrude more than 2 feet above the surrounding Sand Tailings mound.

E. Care should be exercised to protect the installed piezometers as much as possible throughout the placement of embankment fill.

F. Should any of the three piezometers be damaged or malfunction during the placement of embankment fill between the crest elevations 5900 and 5930 feet, the said piezometer or piezometers shall be replaced when the dam crest reaches elevation 5930 feet. The locations and elevations for these replaced piezometers are shown on the Drawings.

G. During the placement of embankment fill between the crest elevations 5930 and 5970 feet, procedures outlined from paragraphs B through E shall be followed.

H. When the dam crest reaches final elevation 5970 feet, any damaged or malfunctioned piezometers shall be replaced. The locations and elevations for these piezometers will be evaluated and determined at that time.

I. At any time during the work the site geotechnical engineer may require the installation of one or more additional piezometers when anomolous readings or sudden changes in readings signal the possibility of an internal drainage problem in the embankment.

3.3 Installation of Displacement Markers

A. Because the dam embankment will be raised by successive stages, using the downstream method, the crest alignment will vary accordingly. As the dam is enlarged, a system of displacement markers shall be established both at the crest of the dam and the downstream dam embankment. The system shall be correlated with on-site bench marks outside of the final embankment downstream toe line as established reference points.

B. Elevations and coordinates of installed displacement markers shall be determined within an accuracy of 0.01 foot.

C. Elevations and coordinates of displacement markers shall be read immediately after the markers are established. At other times displacement markers shall be read either monthly or more often if required.

3.4 Installation of Seepage Measuring Weir

A. The seepage measuring weirs shall be constructed at the approximate locations shown on the Drawings. The exact location of the weirs will be determined in the field. After installation, the crest of each weir plate shall be level, and an inspection shall be made to ensure that no leakage occurs around the weir. The staff gage shall be installed so that the elevation of the zero of the gage is exactly the same as the elevation of the bottom of the V-notch. A schematic diagram is shown on the Drawings.

B. Care shall be exercised to avoid damaging the weir notch itself. Any nicks or dents shall be carefully dressed with a fine-cut file or stone, stroking only in the plane of the weir upstream face, not in the plane of the weir downstream face. Only those portions of the metal that protrude above the normal surface shall be removed. Under no circumstances should the upstream corners of the notch be rounded or chamfered.

3.4 Protection of Instrumentation

Markers or barricades shall be placed, as needed, to protect instruments from damage by the construction equipment. Particular care shall be exercised to protect the tubing of the piezometers at all times. Any damaged instrument shall be repaired or replaced if required by the site geotechnical engineer.

This page is a reference page used to track documents internally for the Division of Oil, Gas and Mining

Mine Permit Number M0470007 Mine Name Vernal Phosphate
Operator SF Phosphate CO Date 10-28-1985
TO _____ FROM _____

__CONFIDENTIAL __BOND CLOSURE __LARGE MAPS X EXPANDABLE
__MULTIPUL DOCUMENT TRACKING SHEET __NEW APPROVED NOI
__AMENDMENT _OTHER _____

Description YEAR-Record Number

__NOI X Incoming __Outgoing __Internal __Superceded

Enlargement of Existing Tailings Dam Technical Specifications

___NOI __Incoming __Outgoing __Internal __Superceded

__NOI __Incoming __Outgoing __Internal __Superceded

__NOI __Incoming __Outgoing __Internal __Superceded

__TEXT/ 81/2 X 11 MAP PAGES __11 X 17 MAPS __LARGE MAP

COMMENTS: _____

CC: _____