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STATE OF NEW MEXICO
OFFICE OF THE STATE ENGINEER
Santa Fe

March 20, 2020

David Pierce
Homestake Mining Company of California
P.O. Box 98
Grants, NM 87020

RE: **Design Report, Construction Drawings, and Technical Specifications**
Homestake Evaporation Pond No. 1 Dam, Liner Repair Project
OSE File No. D-657, Cibola County

Dear Mr. Pierce:

Mr. David Heber, P.E., of the Office of the State Engineer (OSE) staff has completed a review of the subject documents for Homestake Evaporation Pond No. 1 Dam. This was the second submittal of the design documents and most of the comments from OSE review of the initial submittal have been addressed. A copy of Mr. Heber's review memorandum and review checklist for the second submittal is enclosed for your information. I concur with the review comments contained in the memorandum.

The OSE Dam Safety Bureau understands that liner repair project plans call for dewatering activities to begin on April 1st, 2020 and that in order to proceed, an OSE construction permit will be needed near that time. If further discussion or guidance would be helpful to expedite revisions and resubmittal of the documents, please contact myself at (505) 383-4134, e-mail: Charles.Thompson@state.nm.us or David Heber at (505) 827-6143, email: David.Heber@state.nm.us.

Sincerely,

Charles N. Thompson, P.E.
Chief, Dam Safety Bureau

Enclosures

CNT/dnh

E-mail: David Pierce, Homestake Mining Company (dpierce@barrick.com)
Reginald Shirley, Homestake Mining Company (regishirley@barrick.com)
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MEMORANDUM
OFFICE OF THE STATE ENGINEER
Dam Safety Bureau

DATE: March 20, 2020

TO: Charles N. Thompson, P.E., Chief, Dam Safety Bureau CNT

FROM: David N. Heber, P.E., Dam Safety Engineer

SUBJECT: Review of Design Report, Construction Drawings, and Technical Specifications
Homestake Evaporation Pond No. 1 Dam, Application for Permit,
Liner Repair Project, OSE File No. D-657, Cibola County

I have reviewed the subject documents for the Homestake Evaporation Pond No. 1 (EP-1) Dam. The documents were prepared by Stantec Consulting Services, Inc., on behalf of the dam owner, Homestake Mining Company of California. The documents are dated February 19, 2020, were received electronically by the Office of the State Engineer (OSE) Dam Safety Bureau on February 20, 2020, and hand delivered to the OSE on March 2, 2020. This was the second submittal of the subject documents and addresses OSE comments transmitted to Homestake and Stantec on May 22, 2019 from the original November 29, 2018 submittal. The documents describe the proposed repairs to the EP-1 dam liner and evaluate the dam's compliance with selected design criteria. The following comments were generated as a result of my review.

General Comments:

1) To expedite completion of the review process for the pending resubmittal of the documents, the engineer responsible for implementing the changes will need to provide a corresponding written response to each of the OSE Dam Safety Bureau comments provided below. In order to facilitate the response process and upon request, the OSE Dam Safety Bureau can provide an electronic version of this review memorandum to the owner and engineer.

Design Report:

2) Table 2-1 (page 2.4) – Within Table 2-1, the Design Approach for Freeboard lists flood inflows, wind-generated waves, normal/ abnormal operations, overfilling, and run-on. In the freeboard calculations within Appendix A.2, the freeboard for EP-1 also incorporated seismic deformation; please add seismic deformation to the design approach items listed within the Freeboard section of Table 2-1.

3) Section 2.12 (page 2.18) – Please elaborate on the penultimate sentence within Section 2.12, which states, "The potential for liquefaction induced settlement is minimal and contained in a localized area and layer within the north embankment and meets the requirements of NMAC 19.25.12.11.C(13)(d)." The referenced Subparagraph (d) of Paragraph (13) of Subsection C of 19.25.12.11 NMAC states: "For dams not satisfying the requirements for pseudostatic analysis, a deformation analysis is required. The resulting embankment must be capable of withstanding the design earthquake without breaching and with at least 3 feet of freeboard remaining after deformation. The analysis shall also assess the potential for internal erosion as a result of cracking during deformation." Please comment on the embankment soils and the potential for embankment cracking during deformation, along with any associated internal erosion potential. It is recognized that there are a number of analyses within the design report intended to determine a reasonable minimum freeboard requirement, and that these analyses may lead to a freeboard requirement that is less than three feet; OSE comments on some of those analyses or their parameters are contained within this memo.

4) Appendix A.1 – Please attach to Appendix A.1 the input and output screens from the USGS Uniform Hazard Tool that were used to estimate a PGA of 0.128 g and 0.1910 g (for a significant and high hazard potential classified dam, respectively).

5) Appendix A.2 – Please note that the freeboard calculations for Evaporation Ponds EP-2 and EP-3 will need to be revised to reflect the full PMP if a hazard potential classification study for those dams indicates that a high hazard potential classification is appropriate.

6) Appendix A.2 – In reviewing the wave run-up and wind setup for EP-1 (Attachment A of Appendix A.2), the input value for "Internal Slope Geometry" appears to be off. Sheet G1 of the Drawings and Page 2.7 of the report describe an internal (upstream) side slope on the East, South, and West embankments of 4:1 (H:V). However, the Internal Slope Geometry input value used in the calculation spreadsheet is 5:1 (H:V). In addition, the "Average Water Depth" input value utilized in the same calculation is 12.5 ft. However, in reviewing the proposed water depth as shown on Sheet C3 (Grading Plan), the pond floor elevation will vary from approximately 6587 ft (near the sumps in the SW and NE corners), to approximately 6592 ft (along the ridge of the pond floor), for an average elevation of approximately 6589.5 ft. Assuming a water surface elevation of roughly 6200 ft, the average water depth would be roughly 10.5 feet (6200 – 6589.5). Applying these values to the excel spreadsheet submitted increases the Wave Run-Up and Wind Setup output from 1.91 ft to 2.38 ft. Please revisit these inputs and revise the freeboard requirements for EP-1 accordingly throughout the report and on Sheet G1 (minimum freeboard is listed in the Pond Properties Table).

7) Appendix A.9 – The Appendix A.9 Liquefaction Triggering and Deformation Analysis calculations (Page 5 of 9) include the following formulae for the factor C_N , parameter m, and D_R:

$$C_N = \left(\frac{P_a}{\sigma'_{vc}}\right)^m$$

$$m = 0.784 - 0.521 \cdot D_R$$

$$D_R = \sqrt{(N_1)_{60cs}}$$

where:

C_N: SPT overburden correction factor
P_a: atmospheric pressure (calculated for an average elevation of 7,000 feet for the site)
m: parameter dependent on sand properties and relative density
σ'_{vc}: vertical effective stress
D_R: relative density

In examining the Excel spreadsheet and the monograph referenced in the calculations (Idriss and Boulanger 2008, Soil Liquefaction During Earthquakes), it appears that the above formulae were not used. Rather, the following formula from the monograph appears in the excel spreadsheet:

$$C_N = \left(\frac{P_a}{\sigma'_{vc}}\right)^{0.784 - 0.0768\sqrt{(N_1)_{60}}} \leq 1.7 \qquad (39)$$

Please revisit the calculation narrative and edit as necessary to make it better reflect the formulae utilized in the liquefaction and deformation computation spreadsheet.

8) Appendix A.9 – As displayed above, the Appendix A.9 Liquefaction Triggering and Deformation Analysis calculations (Page 5 of 9) describe P_a as being calculated for an average elevation of 7,000 ft for the site. The corresponding atmospheric pressure would be approximately 78 kPa. The excel spreadsheet used to compute deformation utilized a P_a value of 101 kPa (sea level ambient pressure). Applying this ambient pressure correction to the spreadsheet for boring N-1 resulted in an increase from 0.07 ft of settlement to approximately 0.17 ft of settlement (failed liner scenario). Please edit the calculations (failed liner and normal operating conditions scenarios), verify the corrected deformation, and edit the related sections of the report, appendices, and drawings. These edits include, but may not be limited to: freeboard calculations (Appendix A.2); discussion of freeboard (Table 2-2 and Table 2-6) and seismic deformation (Section 2.12) within the main body of the report; and the minimum freeboard listed in the Dam Properties table on drawing G1.

9) Appendix A.9 – Please expand the footnote to Table 2 of Appendix A.9, to state that the soil was determined to be not susceptible to liquefaction (NL), when the Factor of Safety (FOS; Cyclic Stress Ratio/Cyclic Resistance Ratio) was greater than 5.0 and update the listed 'Post-Liquefaction Consolidation Settlement' values as appropriate.

Construction Drawings:

10) OSE review comments transmitted to Homestake and Stantec, based on the original November 2018 Construction Drawing submittal, appear to have been addressed in the February 2020 submittal. As discussed above, please note that the Freeboard depth listed in the Dam Properties table on Drawing G1, may require adjustment.

Technical Specifications

11) OSE review comments transmitted to Homestake and Stantec, based on the original November 2018 Technical Specification submittal, appear to have been addressed in the February 2020 submittal. It was noticed that the term "Principal" appears once within the Specifications (Lining System, Page 02272-11, Section 2.5.A.1): "The type of HDPE resin to be used shall be reported to the Principal". Please revise the term Principal to ENGINEER, or another entity, if that would add clarity.

Recommendation:

The submittal has a limited number of items that will need to be resolved before an OSE construction permit can be issued for the subject repairs. Once the design documentation has been revised to address the listed review comments, the design report, construction drawings, and technical specifications may be accepted for filing with the OSE Dam Safety Bureau and an OSE construction permit may be issued.

David N. Heber, P.E.

DNH

Disclaimer

Review of the documents described in this memo is only for completeness and general compliance with state regulations. Any OSE approval shall not be interpreted or construed as any warranty or guarantee. Approval of the documents does not relieve the owner or engineer of legal responsibilities for the overall integrity of the project, adequacy of the design, or full compliance with applicable regulations. The Office of the State Engineer is not responsible for increased costs resulting from defects in the documents. Continued compliance with State regulations will require that the facility be properly operated and maintained.

Dam: Homestake Evaporation Pond No. 1 (EP-1) **File No.:** D-657

Owner: Homestake Mining Company of California

Designer: Liner Replacement Design prepared by Stantec Consulting Services, Inc.

Application, Fees and Detailed Plans	Submitted		Accepted By OSE		Not Required
	YES	NO	YES	NO	
1. Correctly completed **Application** (19.25.12.11.A) Submit as a separate document	x		x		
2. Detailed **Cost Estimate** (19.25.12.11.A) Submit as a separate document	x		x		
3. **Filing Fee and Plan Review Fee** (19.25.12.8) Check payable to Office of the State Engineer and attached to the transmittal letter	x		x		
4. **Water rights** for water impounded by the dam (19.25.12.11.B) Letter from the OSE Water Right District Office					/1
5. **Design Report** (19.25.12.11.C). Design Report may be organized into multiple reports. Submit as a hard copy report(s) and electronically in Adobe pdf.	x			x	
6. **Construction Drawings** (19.25.12.11.D) Submit in hard copy and single file multi page TIFF	x			/2	
7. **Specifications** for the Project (19.25.12.11.E) Submit in hard copy and electronically in Adobe pdf.	x		x		
8. **Plat of Survey** (19.25.12.11.F) Submit as a rolled paper copy. Do not fold.					/3
9. **Dam Site Security** (19.25.12.11.G) Submit as part of the design report or as a separate document and electronically in Adobe pdf.	x		x		
10. **Instrumentation Plan** (19.25.12.11.H) Submit as part of the design report or as a separate document and electronically in Adobe pdf.	x		x		
11. **Operation and Maintenance Manual** (19.25.12.11.I) Submit as a separate document bound in a 3 ring binder and electronically in Microsoft Word.					/4
12. **Emergency Action Plan** (19.25.12.11.J) Submit as a separate document bound in a 3 ring binder and electronically in Microsoft Word.					/4

(Note: References in parenthesis corresponds to the appropriate rule in Dam Design, Construction and Dam Safety, Title 19, Chapter 25, Part 12 of the New Mexico Administrative Code)

Notes:
/1 – No increase to storage or pond surface is proposed.
/2 – Drawing acceptance is pending approval of EP-1 minimum freeboard.
/3 – Per section 2.15 of Design Report, Plat of Survey will be prepared following construction completion.
/4 – Operation and Maintenance (O&M) Manual and Breach Analysis Report have been submitted. OSE review will be conducted and submittal of an acceptable O&M Manual and Emergency Action Plan (EAP) will be a condition of the OSE construction permit, when issued.

Design Report	OSE Accepted		Not Required
	YES	NO	
1. Paper copy and Adobe PDF of final accepted Report (19.25.12.11.C)	X		
2. Front cover has dam name, dam owner, county and document title (19.25.12.11.C)	X		
3. First page behind the title page shall include the following (19.25.12.11.C):			
3.a. Dam name and county	X		
3.b. Engineer's certification properly completed and signed (19.25.12.12.B)	X		
3.c. State Engineer's certification (19.25.12.12.E)	X		
4. Design Report is free of errors and consistent with construction drawings (19.25.12.11.C)	X		
5. Hazard Potential Classification that addresses the following (19.25.12.11.C.1):			/5
5.a. Professional engineer's certification, signature and stamp if separate from the design report. Certification for the State Engineer (19.25.12.11.C)			/5
5.b. Hazard potential classification indentified and based on engineer's recommendation and OSE concurrence. Future development addressed. Concurrence not required for high hazard potential classification (19.25.12.11.C.1)			/5
5.c. Hazard potential classification based on dam breach analysis and future development addressed. Analysis includes the following information (19.25.12.11.C.1):			/5
5.c.i. Description of dam breach and flood routing methodology (19.25.12.11.C.1.a)			/5
5.c.ii. Tabulation and justification of parameters used in the analysis (19.25.12.11.C.1.b)			/5
5.c.iii. Sensitivity analysis of the parameters used in the analysis (19.25.12.11.C.1.c)			/5
5.c.iv. Reference and version of all computer models used in the analysis (19.25.12.11.C.1.d)			/5
5.c.v. Appropriate data sheets, computer program input & output computations and electronic computer files. Files must be annotated if software is not used by the OSE. (19.25.12.11.C.1.e)			/5
5.c.vi. Table of results for the sunny day failure and failure and no failure for events up to the SDF. (19.25.12.11.C.1.f)			/5
5.c.vii. Inundation maps for the sunny day failure and SDF (19.25.12.11.C.1.g)			/5
6. Hydrologic Analysis that addresses the following (19.25.12.11.C.2):			
6.a. Professional engineer's certification, signature and stamp if separate from the design report. Certification for the State Engineer (19.25.12.11.C)			Not Applicable (NA)
6.b. Topographic map of the drainage area (19.25.12.11.C.2.a)			NA
6.c. Description of topography, soils, vegetative cover and land treatment, if proposed (19.25.12.11.C.2.b)			NA
6.d. Design storm depth, duration and distribution discussed and justified (19.25.12.11.C.2.c)	X		
6.e. Discussion of methodology of converting rainfall to runoff independent of the software program used in the analysis (19.25.12.11.C.2.d)			NA
6.f. Discussion, justification and tabulation of all model input parameters independent of the software program used in the analysis (19.25.12.11.C.2.d)			NA
6.g. Table of reservoir area and storage capacity for each foot of elevation referenced to NAVD 88. Indicate elevation of outlet invert, spillway(s) and dam crest (19.25.12.11.C.2.g)	X		

Design Report	OSE Accepted		Not Required
	YES	NO	
6.h. Outlet and spillway rating tables including calculations (19.25.12.11.C.5)			NA
6.i. Plot of inflow and outflow hydrographs on the same figure (19.25.12.11.C.2.f)			NA
6.j. Discussion of results including peak inflow, volume of runoff, and max. reservoir level of routed hydrograph, outflow hydrograph, etc. (19.25.12.11.C.2.e)			NA
6.k. Computer input and output files provided including a digital copy. Files must be annotated if software is not used by the OSE. (19.25.12.11.C.2.h)			NA
7. Passes or contains Spillway Design Flood (SDF) (19.25.12.11.C.3)	X		
8. Incremental Damage Assessment if SDF criteria not met and assessment addresses the following (19.25.12.11.C.4):			NA
8.a. Assessment compares flood routing with dam failure and without dam failure. Items under Checklist 5.c addressed.			NA
8.b. Criteria for determining incremental damage documented			NA
8.c. Incremental damage assessment supports reduced SDF			NA
9. Spillway rating curve and table from spillway crest to dam crest and the following supporting information (19.25.12.11.C.5):			NA
9.a. Justification of parameters used to determine spillway capacity			NA
9.b. Annotated computer input and output files provided including a digital copy			NA
10. Spillway Design that addresses the following (19.25.12.11.C.6):			NA
10.a. Spillway lining and erosion potential addressed (19.25.12.11.C.6.a)			NA
10.b. Cavitation addressed on control weirs (19.25.12.11.C.6.b)			NA
10.c. Discharge away from the downstream toe and abutment slopes (19.25.12.11.C.6.c)			NA
10.d. Accumulation of debris addressed (19.25.12.11.C.6.d)			NA
10.e. Energy dissipation addressed (19.25.12.11.C.6.e)			NA
10.f. Channel lining addresses erosion, joints, displacement, water stops, etc. (19.25.12.11.C.6.f)			NA
10.g. Adequate design of training dike (19.25.12.11.C.6.g)			NA
11. Outlet Works Capacity including the following information (19.25.12.11.C.7)			NA
11.a. Hydraulic calculations documented including justification of assumptions (19.25.12.11.C.7)			NA
11.b. Stage/discharge rating curve and table in 1-foot increments from invert to dam crest (19.25.12.11.C.7)			NA
11.c. Reservoir drains in 45 days for water storage or 96 hours for flood control dam (unless waiver is approved by Water Rights District Office) (19.25.12.11.C.7. a or b.)			NA
11.d. Annotated computer input and output files provided including a digital copy (19.25.12.11.C.7)			NA
12. Outlet Works Design including the following information (19.25.12.11.C.8):			NA
12.a. Conduit diameter greater than or equal to 18 inches (19.25.12.11.C.8.a)			NA
12.b. Appropriate use of metal conduits (19.25.12.11.C.8.b)			NA
12.c. Gate located at upstream end or includes guard gate or bulkhead (19.25.12.11.C.8.c)			NA
12.d. Conduit adequately vented with supporting calculations (19.25.12.11.C.8.d)			NA
12.e. Conduit by-pass valve if conduit ties to a downstream pipe – note exception if adequate access (19.25.12.11.C.8.d)			NA
12.f. Outlet operators designed to prevent damage from vandalism, weather, ice, floating debris, wave action, settlement, etc. (19.25.12.11.C.8.e)			NA

Design Report	OSE Accepted		Not Required
	YES	NO	
12.g. Outlet operators accessible during outlet and spillway releases (19.25.12.11.C.8.e)			NA
12.h. Flood control dams have ungated outlet conduit (19.25.12.11.C.8.f)			NA
12.i. Trash racks on intake structure with appropriate grate openings (19.25.12.11.C.8.g)			NA
12.j. Energy dissipation addressed at terminal structure (19.25.12.11.C.8.h)			NA
12.k. Structural design calculations for all loading conditions (19.25.12.11.C.8.i)			NA
12.l. Watertight joints and fittings for the conduit (19.25.12.11.C.8.j)			NA
12.m. Conduit on stable foundation with settlement analysis if necessary (19.25.12.11.C.8.k)			NA
12.n. Seepage and compaction along the conduit addressed (19.25.12.11.C.8.l)			NA
12.o. Structural design calculations for intake, conduit and terminal structure provided (19.25.12.11.C.8.m)			NA
13. Geologic Assessment for high and significant hazard dam including the following (19.25.12.11.C.9):	X		
13.a. Professional engineer's certification, signature and stamp if separate from the design report. Certification for the State Engineer (19.25.12.11.C)	X		
13.b. Regional geologic setting, local and site geology	X		
13.c. Geologic suitability of the dam foundation	X		
13.d. Slide potential of the reservoir rim and abutment areas			NA
13.e. Seismic history and potential	X		
14. Geotechnical Investigation including the following information (19.25.12.11.C.10):			
14.a. Professional engineer's certification, signature and stamp if separate from the design report. Certification for State Engineer (19.25.12.11.C)			NA
14.b. Test borings in footprint of dam, spillway and other appurtenant structures (19.25.12.11.C.10.a)	X		
14.c. SPT or other field testing to assess soil character and consistency (19.25.12.11.C.10.b)	X		
14.d. Undisturbed sampling for density, shear strength and compressibility tests (19.25.12.11.C.10.c)	X		
14.e. Measurement of water level in drill holes and elevations provided (19.25.12.11.C.10.e)	/6		
14.f. Field permeability testing if necessary (19.25.12.11.C.10.f)			Not Required (NR)
14.g. Logs of test borings and test pits, location map and profile along dam axis (19.25.12.11.C.10.g)	X		
14.h. Testing of construction materials to determine shear strength, permeability, compressibility and filter characteristics (19.25.12.11.C.10.h)	X		
14.i. Evaluation of liquefaction potential (19.25.12.11.C.10.i)	X		
14.j. Evaluation of dynamic shear strength if deformation analysis required (19.25.12.11.C.10.i)	X		
14.k. Location of the borrow material and borrow stock piles identified (19.25.12.11.C.10.j)	X		
14.l. Other supplemental tests (19.25.12.11.C.10.d)			NR
14.m. Parameters to be used in the design recommended	X		

Design Report	OSE Accepted		Not Required
	YES	NO	
15. Seepage Analysis for high and significant hazard including the following information(19.25.12.11.C.11):			/7
15.a. Waiver request for flood control dams that drain in 96 hours (19.25.12.11.C.11)			
15.b. Discussion of methodology independent of the software program used in the analysis			
15.c. Discussion, justification and tabulation of all model input parameters independent of the software program used in the analysis			
15.d. Flow nets of appropriate size and scale (19.25.12.11.C.11.a)			
15.e. Annotated computer input and output files provided including an electronic copy of the model(19.25.12.11.C.11.a)			
15.f. Adequate design of filter, transition and drainage zones; thickness greater than or equal to 3 feet (19.25.12.11.C.11.b)			
15.g. Exit seepage gradient acceptable (19.25.12.11.C.11.b)			
15.h. Drain pipes made of non-corrodible material (19.25.12.11.C.11.c)			
15.i. Drain pipes enveloped in properly designed filter material (19.25.12.11.C.11.c)			
15.j. Perforation size is acceptable (19.25.12.11.C.11.c)			
15.k. Drain and collector pipes designed to flow depth ≤1/4 diameter (19.25.12.11.C.11.d)			
15.l. Drain diameter greater than or equal to 6 inches (19.25.12.11.C.11.d)			
15.m. Drain pipes isolated to allow flow measurement of each pipe (19.25.12.11.C.11.d)			
15.n. Measuring device appropriate for the rate of flow (19.25.12.11.C.11.d)			
15.o. Measuring device equipped with sediment trap (19.25.12.11.C.11.d)			
15.p. Rodent screens provided if discharging to daylight (19.25.12.11.C.11.d)			
16. Stability Analysis including the following information (19.25.12.11.C.12):			
16.a. Low hazard dam with U.S. slope ≤ 3H to 1 V; D.S. slope ≤ 2H to 1V and Height ≤25 ft., analysis not required (19.25.12.11.C.12)			NA
16.b. Model adequately represents the proposed dam	X		
16.c. Discussion of methodology independent of the software program used in the analysis	X		
16.d. Discussion, justification and tabulation of all model input parameters independent of the software program used in the analysis	X		
16.e. Scaled drawing with critical failure plane identified	X		
16.f. Factor of safety for steady state long-term stability ≥1.5 (19.25.12.11.C.12.a)	X		
16.g. Factor of safety for operational drawdown, ≥ 1.5 (19.25.12.11.C.12.b)			/8
16.h. Factor of safety for rapid drawdown ≥ 1.3 (19.25.12.11.C.12.c)			/8
16.i. Factor of safety for end of construction ≥ 1.3 (19.25.12.11.C.12.d)	X		
16.j. Stability of reservoir rim for slopes steeper than 3h to 1V			NA
16.k. Annotated computer input and output files provided including an electronic copy of the model	X		
17. Seismic Analysis for high and significant hazard dams (19.25.12.11.C.13)	X		
17.a. Seismological investigation including justification of the seismic parameters for the earthquake of appropriate frequency or MCE (19.25.12.11.C.13.a)	X		
17.b. Potential for liquefaction or sliding addressed for the foundation, abutments, embankment and reservoir area (19.25.12.11.C.13.b)	X		
17.c. Conditions met for pseudostatic analysis (19.25.12.11.C.13.c)			NA
17.d. Factor of safety for pseudostatic condition, ≥1.1 (19.25.12.11.C.13.c)			NA

Design Report	OSE Accepted		Not Required
	YES	NO	
17.e. If deformation analysis performed, freeboard ≥ 3 feet after deformation (19.25.12.11.C.13.d)		/9	
17.f. If deformation analysis performed, justification and tabulations of all input parameters, annotated computer input and output files including a digital copy		/9	
17.g. Appurtenant structures stable under seismic analysis			NA
18. Dam Geometry (19.25.12.11.C.14)			
18.a. Adequate crest width, H/5 + 8 (19.25.12.11.C.14.a)	X		
18.b. Appropriate surfacing for road on dam crest (19.25.12.11.C.14.b)	X		
18.c. Cover above clay core ≥ 2 feet (19.25.12.11.C.14.c)			NA
18.d. Turnarounds on dam crest, as needed (19.25.12.11.C.14.d)	X		
18.e. Crest graded to prevent ponding (19.25.12.11.C.14.e)	/10		
18.f. Slopes with adequate erosion protection from crest drainage (19.25.12.11.C.14.f)	/10		
18.g. Concentrated crest drainage discharged to prevent embankment erosion (19.25.12.11.C.14.h)	/10		
18.h. Adequate camber supported by embankment settlement analysis (19.25.12.11.C.14.g)	X		
19. Freeboard (minimum of 4 feet) (19.25.12.11.C.15)			
19.a. Wave runup from 100 mph wind w/ w.l. at spillway crest (19.25.12.11.C.15.a)		/9	
19.b. Wave runup from 50 mph wind w/ w.l. at max. reservoir level (19.25.12.11.C.15.b)		/9	
19.c. Minimum 3 feet remain after seismic deformation analysis, if required (19.25.12.11.C.15.d)		/9	
20. Erosion protection (19.25.12.11.C.16)			
20.a. Wave erosion protection waived for flood control dams that drain in 96 hours (19.25.12.11.C.16.a)			NA
20.b. Wave erosion protection. Riprap and filter design is documented and provides adequate coverage (19.25.12.11.C.16.a)	X		Liner in lieu of riprap
20.c. Area of erosion protection adequate (19.25.12.11.C.16.a)	X		
20.d. Surface erosion protection for crest, slopes, abutments, toe area, etc. (19.25.12.11.C.16.b)	X		
21. Geotextile Design (19.25.12.11.C.17)			
21.a. Location of use is appropriate	X		
21.b. Used in accordance with manufacturer's recommendations and specifications	X		
21.c. Design computation provided	X		
22. Structural Design (19.25.12.11.C.18)			NA
22.a. Structural design calculations for all appurtenant structures including appropriate loading conditions (water, earth, ice, etc.)			
22.b. Reinforced concrete design calculations provided including appropriate loading conditions			
22.c. Computer input and output computations provided			
23. Utility placement or relocation addressed (19.25.12.11.C.18)			NA
23.a. Utility relocation addressed within embankment, spillway and seepage footprint			
23.b. Utilities remaining satisfy provisions for outlet conduits (compaction & seepage)			
24. Other Design considerations (19.25.12.11.C.20)	X		

Notes:

/5 – Design was adjusted to meet high hazard potential design criteria in Feb 2020 submittal, which is an acceptable hazard potential classification to the OSE.
/6 – Free water was not encountered in boreholes per May 2019 Geotechnical Investigation Report.
/7 – Assumptions presented in Appendix A of the Design Report (Attachment A.6) do not appear to be unreasonable in determining a phreatic surface and are excerpted below:

> *"As requested by the NM Office of the State Engineer (OSE), a scenario was included for the static analysis to represent liner failure after the dam is filled. This scenario was represented by a phreatic surface at 3 feet below the crest elevation to mid-embankment and continuing linearly to the toe of the downstream slope. This event of liner failure and seepage through the embankment, such that a continuous zone of saturation develops in the unsaturated tailings is considered highly unlikely to occur."*

/8 – Drawdown stability not evaluated. EP-1 has limited drawdown capacity (dewatering pumps and evaporation) and pond is lined. Liner replacement project schedule calls for EP-1 to be dewatered over approximately two months.
/9 – Please see OSE review comments related to deformation analysis and freeboard requirements.
/10 – Routine dam crest and exterior (downstream) slope maintenance is anticipated to prevent ponding and concentrated drainage from dam, with the objective of limiting and correcting embankment surface erosion.

Construction Drawings	OSE Accepted		Not Required
	YES	NO	
1. Drawings are error free and in satisfactory condition (19.25.12.11.D)	X		
2. Multi-page TIFF file of drawings prepared w/ aid of computer (19.25.12.11.D)	X (pdf)		
3. Drawings and maps prepared with black ink on mylar (19.25.12.11.D.1)			/11
4. Accuracy of maps acceptable (19.25.12.11.D.1)	X		
5. Signatures in permanent ink and drawings rolled (19.25.12.11.D.1)	X		
6. Sheet size 22" to 24" x 34" to 36" sheets with appropriate scale & bar scale provided (19.25.12.11.D.2)	X		
7. Sheet numbered sequentially with only pertinent sheets incl. Number of the last sheet equals the total number of sheets submitted. (19.25.12.11.D.3)	X		
8. Engineer's seal and signature on each sheet (19.25.12.11.D.4)	X		
9. Direction of north and date on all maps including data of field survey or aerial photography (19.25.12.11.D.5)	X		
10. Title sheet is first sheet of plans and includes dam properties (19.25.12.11.D.6)	X		
10.a. Dam owner's certification on the title sheet, completed and signed (19.25.12.12.A)	X		
10.b. Engineer's certification on the title sheet, completed and signed (19.25.12.12.B)	X		
10.c. State engineer's certification on the title sheet (19.25.12.12.E)	X		
11. Vicinity map of sufficient size and scale on sheet 1 or 2 (19.25.12.11.D.7)	X		
12. Site topography sufficient and elevations based on NAVD88 (19.25.12.11.D.8)	X		
13. Plan view of construction features (19.25.12.11.D.9)	X		
14. Cross-sections at the max. section and along outlet works (19.25.12.11.D.9)	X		(O/W Not Applicable)
15. Profile along dam centerline showing construction features and foundation materials (19.25.12.11.D.9)			NA
16. Cross-sections and profile of the emergency spillway (19.25.12.11.D.9)			NA
17. Cross-sections of structural features (19.25.12.11.D.9)			NA
18. Other details of structural features (19.25.12.11.D.9)			NA
19. Topography of the proposed reservoir with 1 foot contour elevations (if appropriate) based on NAVD 88 (19.25.12.11.D.10)	X		
20. High water line highlighted on contour map (19.25.12.11.D.10)			NA
21. Elevation vs. area and elevation vs. storage capacity curve & table from bottom of reservoir to the dam crest. Area in acres and storage capacity in acre-ft. (19.25.12.11.D.10)	X		
22. Permanent bench mark in appropriate location (19.25.12.11.D.12)	X		
23. Permanent bench mark tied to NAVD88 and lat and long in decimal degrees (19.25.12.11.D.11)	X		
24. Construction detail of the permanent bench mark (19.25.12.11.D.11)	X		

Notes:

/11 – Paper drawings provided in full scale with wet signatures, which is acceptable for the as-let drawings. As-built drawings will need to be prepared with black ink on mylar for archival purposes.

Specifications	OSE Accepted		Not Required
	YES	NO	
1. Specific for this project in paper copy and Adobe PDF format. (19.25.12.11.E)	X		
2. Front cover has dam name, county and document properly identified (19.25.12.11.E.1)	X		
3. Engineer's certification on the first page, completed and signed (19.25.12.12.B)	X		
4. State Engineer's certification on the first page (19.25.12.12.E)	X		
5. Bound and submitted 8 ½ " by 11" paper (19.25.12.11.E.3)	X		
6. Include a Table of Contents (19.25.12.11.E.2)	X		
7. Clear, concise and error free (19.25.12.11.E)	X		
8. General conditions include the model statements recognizing the authority of the state engineer and the statement that the construction drawings and specifications cannot be changed without prior written approval of the state engineer (19.25.12.11.E.4)	X		
9. Foundation Specification includes depths, acceptable material criteria, cleaning, and grouting requirements (19.25.12.11.E)			NR
10. Earthwork Specification includes all material descriptions, placement criteria, compaction equipment and construction requirements. (19.25.12.11.E)	X		
11. Concrete, Grout and Shotcrete Specifications (19.25.12.11.E)			NA
12. Methods and frequency of testing	X		
13. Manufacturer's Specifications for Geotextile Use and Installation (19.25.12.11.E)	X		
14. Geotextile required to be installed by certified personnel and final installation to be certified by a qualified independent entity (19.25.12.11.C.17)	X		
15. Control of stream during construction (19.25.12.11.E)			NA
16. Blasting, Dust Control or Other Environmental Protection Requirements (19.25.12.11.E)	X		
17. Quality Assurance/Quality Control adequate for the project (19.25.12.11.E)	X		