

**TECHNICAL MEMORANDUM****DATE** September 13, 2019

1663241\_043\_TM\_Rev1

**TO** Ms. Nancy Wolverson  
Calico Resources USA Corp.**CC****FROM** Golder Associates Inc.**EMAIL** [Chris\\_MacMahon@golder.com](mailto:Chris_MacMahon@golder.com)**GRASSY MOUNTAIN PROJECT – TAILINGS STORAGE FACILITY  
TAILINGS STORAGE FACILITY LOCATION OPTIONS ANALYSIS**

Calico Resources USA Corp (Calico) retained Golder Associates Inc. (Golder) to prepare an options analysis to identify a preferred location for the tailings storage facility (TSF) at the Grassy Mountain Project located in Malheur County in southeastern Oregon. The request stems from discussions during the December 18, 2018 meeting in The Dalles, Oregon, where representatives for the Oregon Department of Environmental Quality (ODEQ) and Department of Geology and Mineral Industries (DOGAMI) requested that the original siting and trade-off study be revised and expanded to include all five (5) option locations that had been previously presented by past owners of the Project. At the request of the ODEQ and DOGAMI, the five option locations evaluated in this analysis include the three options presented in the 2015 Preliminary Economic Assessment (PEA), the current proposed TSF location, and an option for a TSF located on Bishop's property. A qualitative discussion is also presented on the best practicable technologies for tailings storage in semi-arid, relatively-low seismicity areas similar to the Grassy Mountain Project.

This technical memorandum presents a brief description of each layout and a comparison of the five locations.

**1.0 INTRODUCTION**

In late 2016, Golder prepared a trade-off study to evaluate two potential TSF locations. Option 1, located east of the underground portal, was one of three locations presented in the 2015 PEA. Golder determined that the other two locations presented in the 2015 PEA were unfavorable due to project economics, property restrictions, and/or long-term stormwater management. The second location evaluated in Golder's 2016 study was identified during Golder's August 2016 site visit. This second location, referred to as Option 2, was located immediately northwest of the proposed mine portal. A comparison of Options 1 and 2 was presented in Golder's original 2016 trade-off study. The intent of the original trade-off study, summarized for the ODEQ in a letter dated October 2018, was to provide sufficient information for Calico to evaluate the two potential TSF locations and select a preferred concept for further design and evaluation.

This letter is intended to supersede Golder's original 2016 trade-off study by presenting a comparison of five TSF location options, the two presented in the original study in addition to the locations requested by the ODEQ and DOGAMI. Section 2.0 also includes a brief discussion on the decision to utilize conventional slurry tailings at the Grassy Mountain Project.

## 2.0 TAILINGS MANAGEMENT OPTION ANALYSIS

Golder has been providing engineering and design support services for the Grassy Mountain Project since August 2016. Engineering support included a review of past data and evaluation of various tailings management options to provide Calico with a recommendation regarding tailings management at the site.

Tailings are the term used in the mining industry for mineral waste created from grinded and milling ore for precious metal removal. The milling reduces the ore to a material with a particle-size distribution typical of a silt and fine sand, and the remaining “barren” minerals (tailings) exist in the form of a slurry after metal removal. The tailings are then sent to permanent storage in a repository which is ultimately reclaimed and closed for environmental stability. Based on the information presented in the Plan of Operations prepared in July 2015 by RTR Resource Management, Inc., the produced mill tailings would be dewatered to produce a thickened tailings or “paste.” The plan stated that a total of 3.2 million tons of tailings would be produced with approximately 70% (2.6 million tons) of the tailings stored in the a TSF. The remaining 30% would be placed as backfill in the mine workings.

During the project review in 2016 with Calico and Mine Development Associates (MDA) regarding the pre-feasibility level design of the TSF, different levels of pre-disposal dewatering technologies were considered including:

- Conventional tailings slurry (25 to 60% solids, by weight, w/w); a pumpable slurry
- Filtered tailings (75-85% solids w/w); vacuum or pressure filtration removes water to create the consistency of a solid material
- Paste or high-density thickened tailings (50-80% solids w/w); paste tailings are dewatered to a non-segregating but pumpable slurry that typically has minor bleed water after placement

The conventional slurry and high-density slurry is typically pumped to a lined storage facility behind an earth-fill or rock-fill dam where the tailings drain and form a solid; the drained water is recycled in the milling and processing circuit.

The filtered and paste tailings options would require the construction of additional infrastructure to mechanically dewater the tailings prior to storage. Storage of the filtered and paste tailings is similar to conventional slurry in that those options would still require the following components and/or attributes, similar to the TSF presented in the 2018 PFS Design Report:

- A large above-ground waste disposal area
- Construction of a continuous dual containment lining system in accordance with the OAR Division 43
- Geotechnical and stability risks that would drive the design
- Stormwater management and construction of diversions structures to prevent run-on of stormwater into the storage facility
- Closure and reclamation planning and design

During the project kick-off meeting in August 2016, and subsequent discussions with the Design Team, it was determined that mechanically dewatering tailings to a paste or filtered condition prior to permanent disposal

provided a negligible benefit to the project and that the design for the Grassy Mountain Project would incorporate tailings stored in a conventional slurry TSF. Due to the relatively small quantity of tailings and short life of mine, it was judged that the high cost of producing dewatered tailings was detrimental to the project's economic feasibility; it would be cost prohibitive to construct and operate a filtration dewatering system. Additionally, mechanical dewatering of the tailings would likely create net excess water scenario that would require water treatment prior to discharge.

Golder also evaluated the use of paste backfill at a conceptual level and determined that the construction and operation of a paste backfill plant would also be cost prohibitive. In accordance to the Oregon Administrative Rules (OAR), the process water used in the paste backfill would likely require water treatment prior to being placed within the underground workings. Since conventional tailings are not suitable for structural backfill in the underground mine workings, it was decided that all mill tailings would be stored above ground in the TSF. Accordingly, the TSF locations and layouts evaluated in this option analysis were designed to contain 100% of the produced tailings; approximately 3.2 million dry short tons.

### 3.0 BASIS OF DESIGN

A conservative basis of design was used to develop conceptual facility layouts. The basis of design is based on Golder's interpretation of the OAR for Chemical Mining (Division 43) and Dam Safety (Division 20), information provided by Calico and the Design Team, information obtained during the completion of the PFS level design through engineering analyses, and geotechnical characterization of the site through site subsurface investigations and geotechnical laboratory testing, as well as Golder's experience designing and construction TSFs in similar conditions that include climate, seismicity, permitting, and operating philosophy.

Existing topography was considered in order to minimize the quantity of earthwork required to build the TSF to the greatest extent possible. Existing topography was generated from 2-ft contours provided by Calico for the area immediately surrounding Option 2, and from USGS 7.5-minute digital elevation models in UTM11 NAD83 coordinate system for all other options. Table 1 presents the design criteria for the conceptual design of the 5 TSF location options:

**Table 1: Design Criteria**

<b>Parameter</b>	<b>Value</b>
Capacity	3.2 million tons
Life of Mine	13 years
Average Tailings Deposition Rate	248,346 tons/year (680 tons/day)
Settled Tailings Density	70 pcf*
Dam Construction Method	Staged Downstream Construction
Dam Crest Width	50 ft minimum
Dam Embankment Slopes	3H:1V (horizontal to vertical)
Slope of Tailings Surface	Conceptual – no slope assumed
Freeboard Above Tailings Beach	2 feet against dam embankment

In addition to the above parameters, the following key factors were considered when comparing options:

- Human and environmental safety and protection
- Location of existing drainages
- Geotechnical and slope stability risks for the dam
- Operational risks created by steep terrain
- Closure requirements
- Availability and location of construction material borrow areas
- Tailings transport and distribution system routing
- Surface water management and diversion
- Process water management/reclaim system location and routing

The assumptions presented herein for the design of the proposed layouts are sufficient and applicable for site selection.

#### **4.0 TSF LOCATION OPTION ANALYSIS**

The TSF location options analysis included an evaluation of the following 5 locations presented on Figure 1:

- Option 1 – TSF located east of the proposed underground portal (included in the 2015 PEA)
- Option 2 – TSF located northwest of the underground portal
- Option 3 – TSF located southwest of the underground portal (Included in the 2015 PEA)
- Option 4 – TSF located south and further west of the underground portal in a separate ephemeral drainage than the other options (included in the 2015 PEA)
- Option 5 – TSF located on Bishop’s property about 3 miles southwest of the underground portal

Table 2 below presents a summary of the general site characteristics and conceptual level volumetrics for each option.

**Table 2: Site Characteristics Summary**

Parameter		Option 1	Option 2	Option 3	Option 4	Option 5
Embankment Volume (cy)		2,226,000	913,000	3,003,400	1,642,100	2,690,000
Stage 1 Starter Dam Maximum Height (ft)		107	53	116	92	70
Ultimate Embankment Maximum Height (ft)		145	83	160	100	105
Disturbance Area (sf)		2,700,000	4,126,000	2,779,000	3,303,000	3,302,000
Tailings Rate of Rise (ft/yr)	Year 1	40	37	42	31	28
	Year 2	13	7	13	8	8
	Years 3, 4	9	5	9	6	7
	Year 5+	5	3	7	3	5
Groundwater Depth (ft)*		85-125	90-165	50-220	80-265	260-295
Tailings Surface Elevation	Min.	3,740	3,546	3,631	3,611	3,412
	Max	3,852	3,616	3,750	3,670	3,498
Process Facility Elevation (ft)		3,715	3,715	3,715	3,715	3,715
Within Project Boundary		Yes	Yes	Yes	Yes	No

\* - Groundwater elevations were approximated using the 2017 Q4 Grassy Mountain Groundwater Elevation Contour map presented in the *Groundwater Resources Baseline Data Report, Grassy Mountain Gold Project*, dated February 19, 2019, prepared by SPF Water Engineering, LLC.

Preparation of the impoundment area for all options would be similar, and would include stripping and stockpiling of topsoil, and preparation of the subgrade for the lined areas and dam footprint(s). Therefore, site preparation is not addressed in detail in this study. The following sections summarize the proposed layouts, key features, advantages, disadvantages, and risks of the options.

#### 4.1 TSF Option Comparison

Golder prepared a ranking matrix that evaluates Options 1 through 5 to consolidate the advantages and disadvantages of each option to support the selection of a preferred option. The ranking matrix focused on attributes falling into two categories, Technical Criteria and Human Safety and Environmental Protection.

The Technical Criteria considered were:

- Volume of earthworks material (Embankment Fill)
- Ease of construction
- Complexity and reliability of stormwater management
- Efficiency of pumping and piping of the tailings to the TSF and return water back to the mill
- Tailings rate of rise (lower rate if rise allows for increased solidification of tailings and increased water for re-use in milling/processing circuit)

The key factors evaluated for Human Safety and Environmental Protection were:

- Disturbance area (impact to environment)

- Zero discharge facility (potential to impact ground water)
- Geotechnical stability of the facility (safety and environmental risks to downstream receptors)
- Public access around Project site (impact to public access)
- TSF location within Project boundary
- Post-closure reclamation (potential to affect long-term post-closure use and reliability)

Each attribute listed above was assigned a percentage weighting factor based on Golder's judgement of the importance of each attribute to developing a successful project. For each attribute the options were scored from 1 to 5 depending on favorability, with 5 being the most favorable. The total score for each of the main categories was calculated by multiplying the weighting factor (percentage) by the score (1 to 5) for each attribute and adding them together, resulting in total scores ranging between 1 and 5. Each of the main categories received a weighting factor as well with a greater emphasis being placed on Human Safety and Environmental Protection (60%) versus Technical Criteria (40%). The highest overall score was selected as the preferred option.

The ranking matrix is presented in Attachment A.

#### **4.1.1 Technical Criteria**

The following subsections present brief summaries comparing the technical criteria of each option.

##### **4.1.1.1 Volume of Earthworks Material (Embankment Fill)**

A lower volume of embankment fill results in lower energy consumption during construction and lower cost. The volume of embankment fill required varies greatly between the options due to the differences in the native topography at each of the locations. Option 2 has the lowest required embankment fill volume as a result of being located within a broad valley allowing it to utilize a larger surface area for tailings storage. This also allows Option 2 to predominantly utilize the natural topography to retain the tailings on the east, south and west sides requiring minimal embankment fill in these areas. Option 2 has the lowest starter dam and lowest ultimate embankment heights of 60 and 85 feet, respectively. The other options are constructed in steeper terrain requiring more embankment fill and maximum embankments heights ranging between 105 and 160 feet to achieve the desired storage capacity.

##### **4.1.1.2 Ease of Construction**

Ease of construction was evaluated by considering the distance from the embankment fill borrow source and the native terrain at each potential location. This analysis assumed that all embankment fill will be sourced from the basalt borrow located near the eastern edge of the Project boundary as shown on Figure 1.

Options 1 through 4 are all located within one mile of the borrow. Option 1 is located nearest to the borrow, partially overlapping it on the eastern edge, would require an additional borrow area to be identified. Option 5 is located southwest of the borrow with an approximate haulage distance of 4 miles between the borrow and the embankment. This additional haul distance would significantly affect the construction costs, potentially requiring an additional borrow area to be identified closure to the TSF.

The flatter terrain of the Options 2 and 4 provides the most favorable topography for site preparation and composite lining system installation. The basin areas within Options 2 and 4 would require minimal regrading and allow for the use of smooth geomembrane. Options 1, 3 and 5, are located in narrower valleys, or adjacent to

steep native topography with slopes up to 2H:1V. Any existing slope steeper than 2.5H:1V would need to be graded to 2.5H:1V or flatter and potentially require the use of textured geomembrane to allow for safe installation of the proposed composite liner system. This additional earthwork would increase both the duration and costs of construction.

#### **4.1.1.3 Stormwater Management**

Stormwater management is a critical component to the proper operation of a TSF. The intent of the design for the Grassy Mountain TSF is to be a zero-discharge facility, meaning that once water has entered the process circuit it will remain in the circuit or be lost through evaporation. Maintaining a zero-discharge facility is aided by diverting as much stormwater as possible from areas tributary to the TSF around the TSF to prevent adding additional water to the process circuit.

None of the options are located at the head of a natural drainage where little to no stormwater diversion would be required; therefore, stormwater will be collected and diverted around the TSF sites using stormwater channels to maintain the integrity of all TSF options. Golder considered the existing topography and size of upstream tributary area when evaluating the stormwater management at each location. Stormwater diversion channels are typically more reliable and easily constructed on flatter slopes. Steeper slopes will require additional earthwork and will limit access with conventional construction equipment. For this reason, it will be most difficult to construct stormwater diversion around Option 1. Options 3 and 5 have small tributary areas upstream of the TSF so the total quantity of stormwater runoff will be less, requiring less stormwater management than the other Options. Options 2 and 4 were both rated the same, with average ratings, as both locations have native slopes surrounding the TSF that are relatively flat. This allows stormwater generated from the upstream ephemeral drainages tributary to the TSF locations to be easily routed around the TSF. The large tributary area south of the TSF for Option 2 was not considered detrimental to the project since it can be easily diverted into an existing drainage west of the TSF.

#### **4.1.1.4 Pumping and Piping**

The pumping and piping rating for each location was developed considering the elevation of the tailings deposition system, the elevation of the process facility and the proximity of the TSF to the process facilities (length of piping). A lower elevation difference and shorter pipeline result in higher energy efficiency and lower cost.

Options 2 and 3 are the preferred locations when taking into consideration the close proximity to the process facilities and the fact that both locations may allow for gravity distribution of tailings during portions of the operation (higher energy efficiency). Of the two, Option 2 was rated higher due to having a greater elevation drop between the process facilities and the tailings deposition system, potentially decreasing pumping efforts during operation. Additionally, having the TSF located at an elevation lower than the process facility may allow for the emergency overflow from the process facility to gravity drain to the TSF and eliminate the need for a separate containment facility. Option 4, while located lower in elevation than the process facility, would require two reclaim ponds to manage underdrain flows, so it was rated less favorable than Options 2 and 3.

Options 1 and 5 were rated the lowest in favorability for either being higher in elevation than the process facility or for the long distance between the process facility (Option 1) and TSF (Option 5). Both options would require increased energy and larger pumps for tailings delivery.

#### **4.1.1.5 Tailings Rate of Rise**

The tailings rate of rise drives the rate of consolidation of the tailings, affecting the settled density of the tailings during operation, the quantity of water that can be re-used during operation, and the long-term settlement of the tailings after operation (affecting the time to closure). A lower rate of rise will provide:

- greater consolidation for the tailings, increasing the overall settled density and potentially reducing the size of the dam and TSF,
- increased reclaim water return from the TSF back to the mill/process plant to lessen the need for make-up water (higher water re-use during operation), and
- reducing the volume of entrained water in the tailings at the end of operation, thereby reducing long-term water management and speeding reclamation and closure.

The rate of rise of the tailings is related to the geometry of the basin; a larger and flatter basin will have a lower rate of rise. In Year 1, the rate of rise of the 5 TSF options ranged between 28 and 42 feet, with the rate of rise dropping each year as the area of deposition within the impoundment increases. Due to the steep terrain associated with the Options 1 and 3 sites, those facilities would experience the greatest rate of rise. Options 2, 4 and 5 have similar rates of rise over the life of the facility, with Option 2 having the overall lowest rate of rise. This is to be expected since the Option 2 basin is the largest of the 5 options.

#### **4.1.2 Human Safety and Environmental Protection Criteria**

The following subsections present brief summaries comparing the human safety and environmental protection criteria of each option.

##### **4.1.2.1 Disturbance Area**

The disturbance area considered in this evaluation included both the embankment footprint and the lined area of the TSFs. The options would likely have disturbance areas outside of the TSF to accommodate access and for construction staging and accommodate the installation of the tailings delivery and reclaim water pipelines. However, for this study, the footprint of each TSF was considered suitable for comparison at the conceptual design level. Smaller disturbance areas generally correspond with the taller embankments and faster rates of rise of the tailings, so the disturbance area is often considered in conjunction with the technical criteria to strike a balance that meets the design criteria.

The total lined disturbance areas ranged between 2,700,000 square feet (62 acres) for Option 5 to 4,126,000 square feet (95 acres) for Option 2.

##### **4.1.2.2 Potential Impact to Surface and Ground water**

The Grassy Mountain TSF will be designed as a zero-discharge facility. However, if the facility were to leak or overtop, there is the potential that the process water could impact the surface and ground water. The Surface Water Baseline Report prepared by SPF Water Engineering found that, "*there are no perennial surface water features located within the immediate vicinity of the proposed mine and process areas.*" The nearest perennial surface water body is the Negro Canyon Creek located just over two miles northwest of the project boundary. Due to the distance to the nearest surface water body, all options were considered to have low potential impact to surface water.

The potential impact to ground water was evaluated by examining depth to ground water at each option location. The range of ground water depths are presented in Table 2, and range between 50 feet below Option 3 (shallowest) and between 260 and 295 feet beneath Option 5 (deepest). Deeper ground water is more favorable as it provides an increased barrier to flow and a larger vadose zone often provides increased attenuation capacity to remove metals. Groundwater elevations were approximated using the 2017 Q4 Grassy Mountain Groundwater Elevation Contour map presented in the report prepared by SPF Water Engineering, LLC, dated February 19, 2019, and titled *Groundwater Resources Baseline Data Report, Grassy Mountain Gold Project*.

#### **4.1.2.3 Geotechnical Risks**

The Grassy Mountain TSF will utilize downstream construction so each of the options considered was conceptually designed using that methodology. This construction method is considered the most conservative (safest) with respect to geotechnical risks when compared with other methods currently used for TSF construction. The geotechnical risk factors for this analysis were applied by considering the ultimate maximum height and the known subsurface foundation conditions. A greater height is generally considered to have a greater geotechnical risk; however, that factor must be paired with subsurface conditions to determine if a facility poses a serious geotechnical risk. As summarized in Table 1, the ultimate maximum height ranges between 85 feet for Option 2 (lowest) and 160 feet for Option 3 (highest).

Historic drill holes located near or beneath the Options 1 through 4 sites encountered natural clay deposits. Clay materials can have low strengths and are susceptible to consolidation settlements when loaded. The subsurface conditions at these locations would need to be thoroughly characterized when designing a TSF. No information for the subsurface beneath Option 5 was available when this analysis was completed. Therefore, Option 5 was assigned a geotechnical risk rating of 3 for this analysis.

#### **4.1.2.4 Impact to Public Access**

The county road leading to the Grassy Mountain Project is a public road, so any required re-routing of this road was considered to be less favorable. Options 2, 4, and 5 would all require a re-routing of portions of the county road. Options 1 and 3 are both located east of the county road and would not require any re-routing.

#### **4.1.2.5 Located Within Project Boundary**

Options 1 through 4 are all located completely within the existing project boundary. Option 5 is located approximately 2 miles west of the project boundary on private land (Bishop's Property). For the safety of the public and security, it was considered most favorable to have the TSF located within the existing project boundary. This keeps all mining activities in close proximity where it will be easier to restrict public access to the mining operation.

#### **4.1.2.6 Reclamation and Closure**

Reclamation and closure risk ratings were developed by considering the effect of long term draindown of the tailings, long-term consolidation settlement of the tailings, tailings surface area (closure area) and stormwater management.

Options 2, 4 and 5 have similar rates of rise, that are slower than Option 1 and 5. The slower rates of rise will allow for:

- shorter duration of long-term drain down water management,

- shorter drying period of the tailings surface allowing placement of a closure cover earlier in the closure period,
- A shorter post-operation settlement period for the tailings surface that will shorten the post-operation management period prior to reclamation.

The TSFs with the greatest rate of rise and tailings thickness, Options 1 and 3, will experience longer post-operation water management delaying the final closure of the TSF.

With respect to closure cover area, Option 3 has the smallest total area while Option 2 has the largest. Option 2 will have the largest capital cost for construction of the final closure cover however some of these costs will be offset by the savings in operating and management costs by allowing for installation of the closure cover more quickly after the active mining has ceased.

Stormwater management was factored into the post closure reclamation risk rating by evaluating the contributing area upstream of the TSF and the potential for maintenance of the stormwater diversion channels into closure. Options 3 and 5 would be the most favorable for long-term stormwater management due to small contributing areas and relatively flat slopes where the perimeter stormwater diversions would be constructed. During closure, Options 2 and 4 will have to manage larger stormwater flows around or over the closed facility. Option 1 is considered the worst of the options from a stormwater management perspective due to the steep surrounding slopes and relatively large upstream tributary area.

## **5.0 CONCLUSION**

Option 2 received the best overall ranking in addition to having the best total ranking for both Technical Criteria and Human Safety and Environmental Protection. Option 2 is the only option located in a broad valley which offers significant benefits over the other alternatives including:

- The lowest volume of embankment fill material due to the large impoundment area and existing topography that only requires embankments along the north and west sides;
- Construction in the broad valley close to the borrow will allow for relatively short haul distances and limited grading within the basin to accommodate the installation of the composite lining system;
- Option 2 is located lower in elevation and close to the proposed process facilities which will decrease the pumping and piping requirements compared to the other options;
- A low tailings rate of rise, which has numerous benefits including greater consolidation, increased reclaim water return to the process circuit and a reduced long-term water management period during closure.

Additional testing on the tailings since this completion of this study indicate that settled tailings densities will be higher than 70 pcf, however that will not affect Golder's recommendation for Option 2 as the preferred location for the TSF. An increase in tailings density will allow for a smaller impoundment, better consolidation of the tailings and an increase in reclaim water that can be used in the process circuit.

## 6.0 CLOSING

Golder is pleased to present this technical memorandum summary of the options analysis completed for the TSF location at the Grassy Mountain Project. If you have any questions or comments regarding the information presented herein, please contact the undersigned at (775) 828-9604.

Sincerely,



Christopher MacMahon, PE  
*Senior Engineer, Associate*



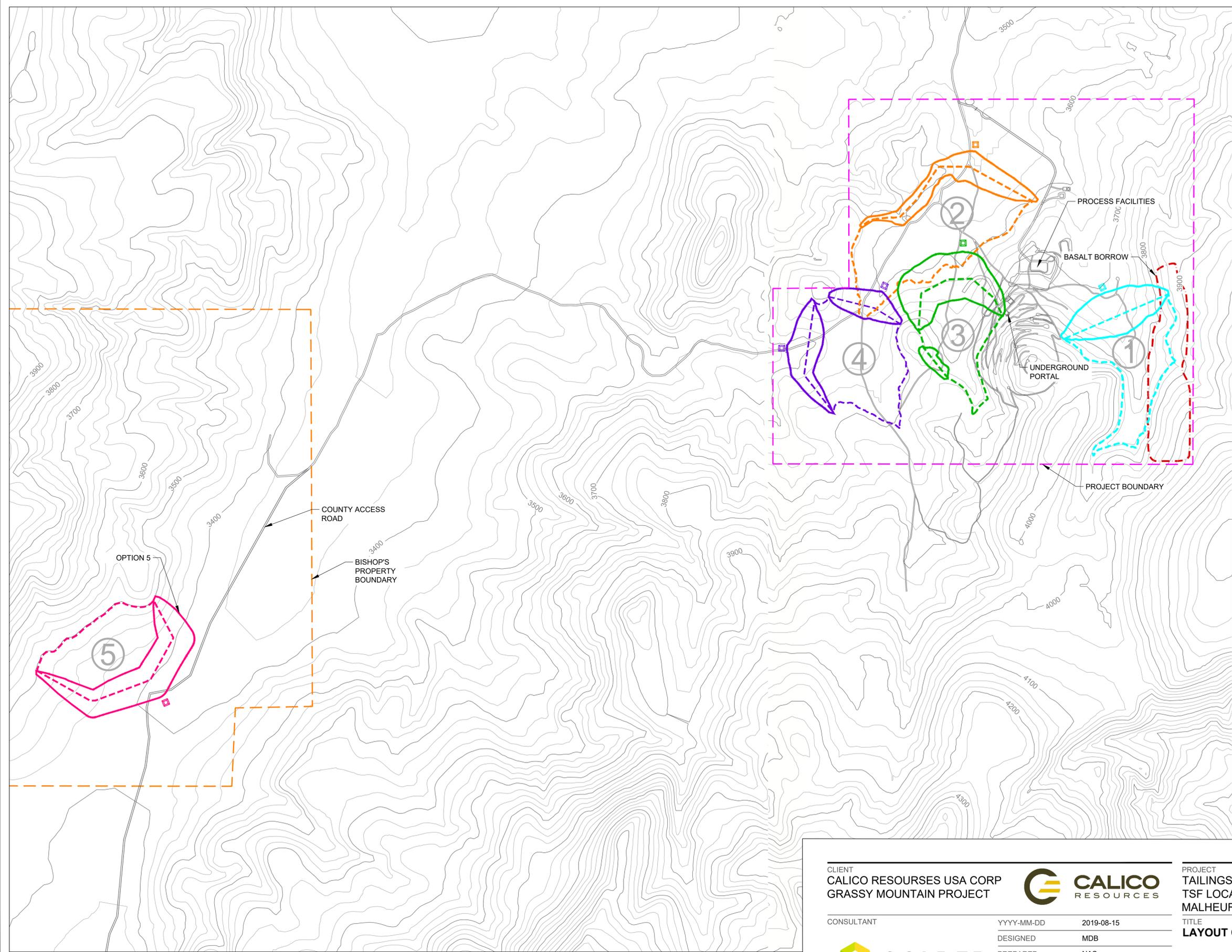
Russ Browne  
*Practice Leader, Principal*

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## Figures

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**LEGEND**

	EXISTING GROUND TOPOGRAPHY (20 FT CONTOURS) (NOTE 1)
	PROJECT BOUNDARY
	BISHOP'S PROPERTY BOUNDARY
	APPROXIMATE LIMIT OF BASALT BORROW
	LIMIT OF OPTION 1 IMPOUNDED TAILINGS
	LIMIT OF OPTION 1 EMBANKMENT
	LIMIT OF OPTION 2 IMPOUNDED TAILINGS
	LIMIT OF OPTION 2 EMBANKMENT
	LIMIT OF OPTION 3 IMPOUNDED TAILINGS
	LIMIT OF OPTION 3 EMBANKMENT
	LIMIT OF OPTION 4 IMPOUNDED TAILINGS
	LIMIT OF OPTION 4 EMBANKMENT
	LIMIT OF OPTION 5 IMPOUNDED TAILINGS
	LIMIT OF OPTION 5 EMBANKMENT

**NOTES**

- EXISTING TOPOGRAPHY PRESENTED WAS DEVELOPED USING SHAPE AND DEM FILES DOWNLOADED FROM THE USGS WEBSITE TITLED "ned10m43117f4.shx" AND "Grassy Mountain.dem". ELEVATIONS SHOWN ARE IN FEET.



CLIENT  
**CALICO RESOURCES USA CORP**  
 GRASSY MOUNTAIN PROJECT



PROJECT  
**TAILINGS STORAGE FACILITY**  
**TSF LOCATION ALTERNATIVE ANALYSIS**  
 MALHEUR COUNTY, OREGON

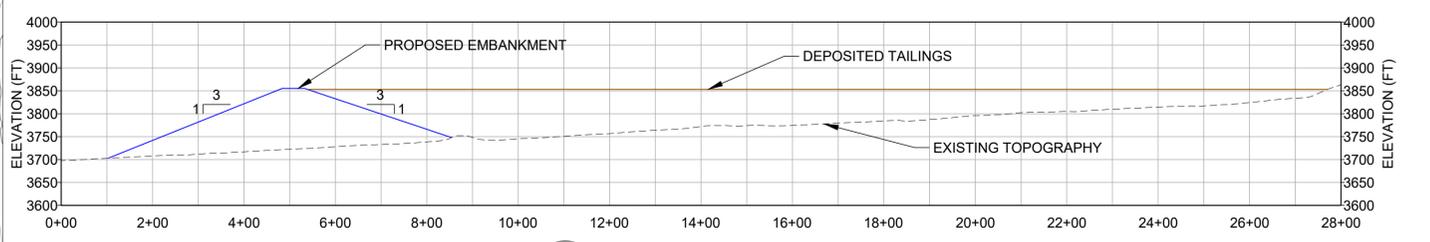
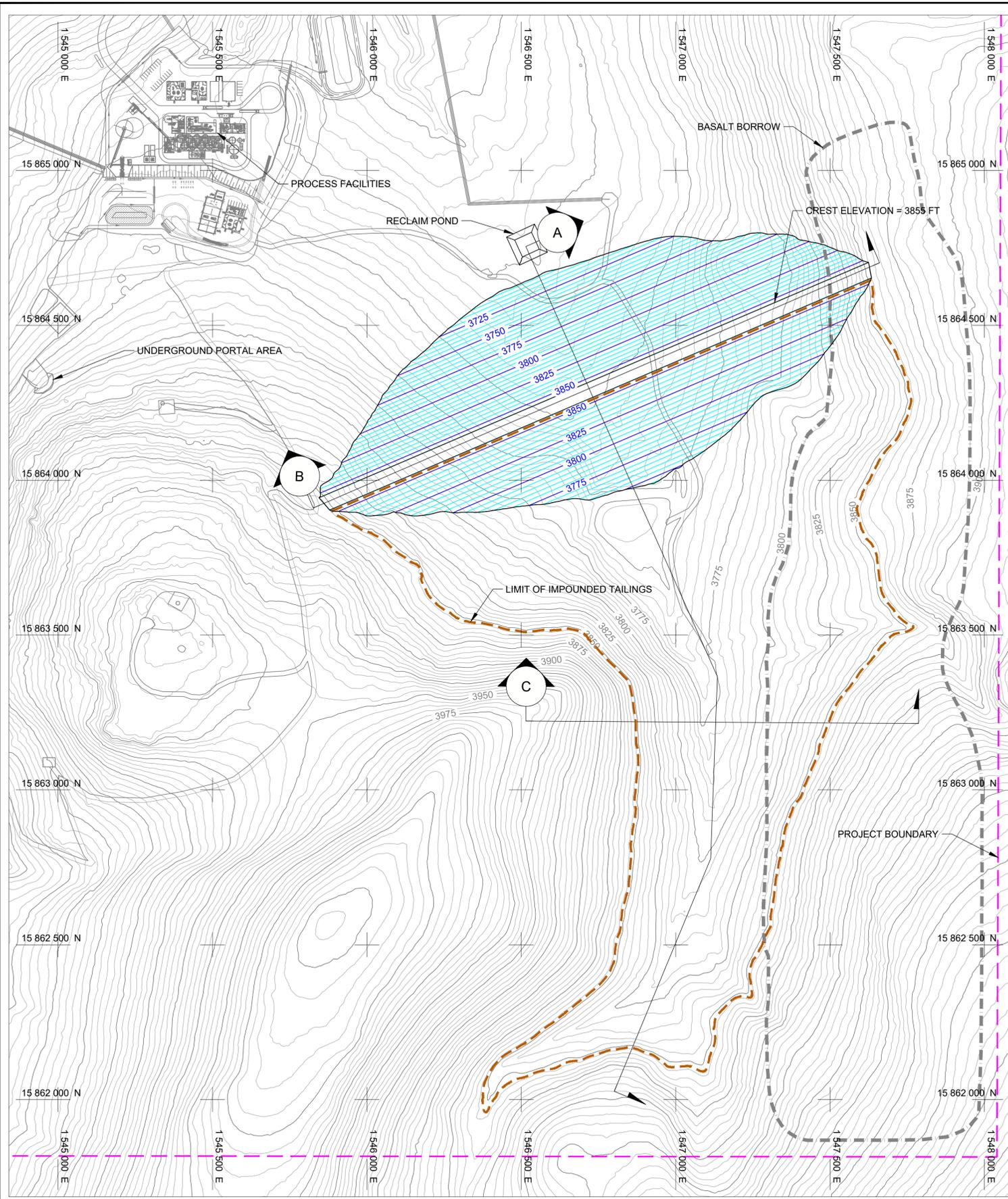
CONSULTANT	YYYY-MM-DD	2019-08-15
	DESIGNED	MDB
	PREPARED	NAS
	REVIEWED	CJM
	APPROVED	RAB

TITLE  
**LAYOUT OF ALL OPTIONS**

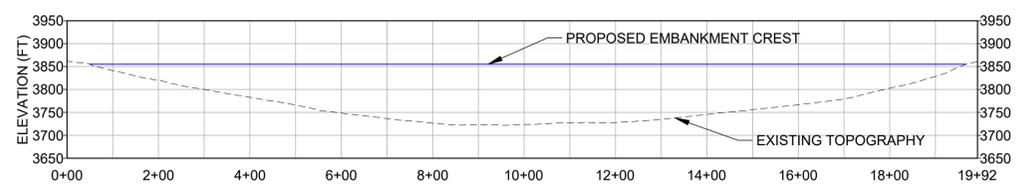
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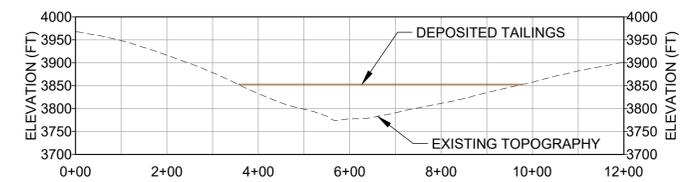
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**A SECTION THROUGH OPTION 1 TSF**  
SCALE 1"=200'



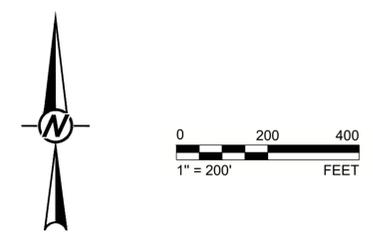
**B OPTION 1 EMBANKMENT PROFILE**  
SCALE 1"=200'



**C SECTION THROUGH TAILINGS BASIN**  
SCALE 1"=200'

- LEGEND**
- EXISTING GROUND TOPOGRAPHY
  - PROPOSED TAILINGS DAM GRADING
  - LIMIT OF IMPOUNDED TAILINGS
  - PROJECT BOUNDARY

**REFERENCE**  
 EXISTING TOPOGRAPHY PROVIDED BY CALICO RECOURSES USA CORP IN ELECTRONIC FILE TITLED "contours\_2ft\_expanded\_project\_area.zip" ON MARCH 29, 2017.  
 ELEVATIONS SHOWN ARE IN FEET A.S.L.



CLIENT  
**CALICO RESOURCES USA CORP**  
 GRASSY MOUNTAIN PROJECT



PROJECT  
**TAILINGS STORAGE FACILITY**  
 TSF LOCATION ALTERNATIVE ANALYSIS  
 MALHEUR COUNTY, OREGON

CONSULTANT



YYYY-MM-DD	2019-08-15
DESIGNED	MDB
PREPARED	NAS
REVIEWED	CJM
APPROVED	RAB

TITLE  
**LAYOUT AND SECTIONS**  
 OPTION 1

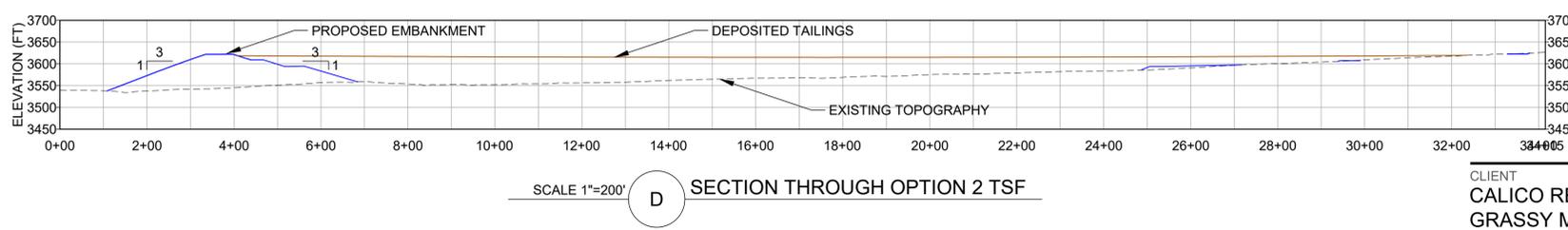
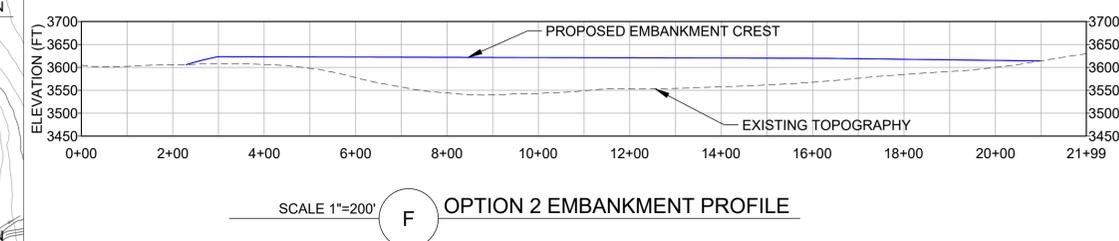
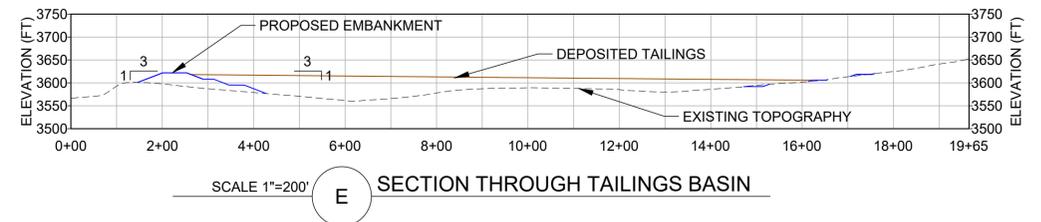
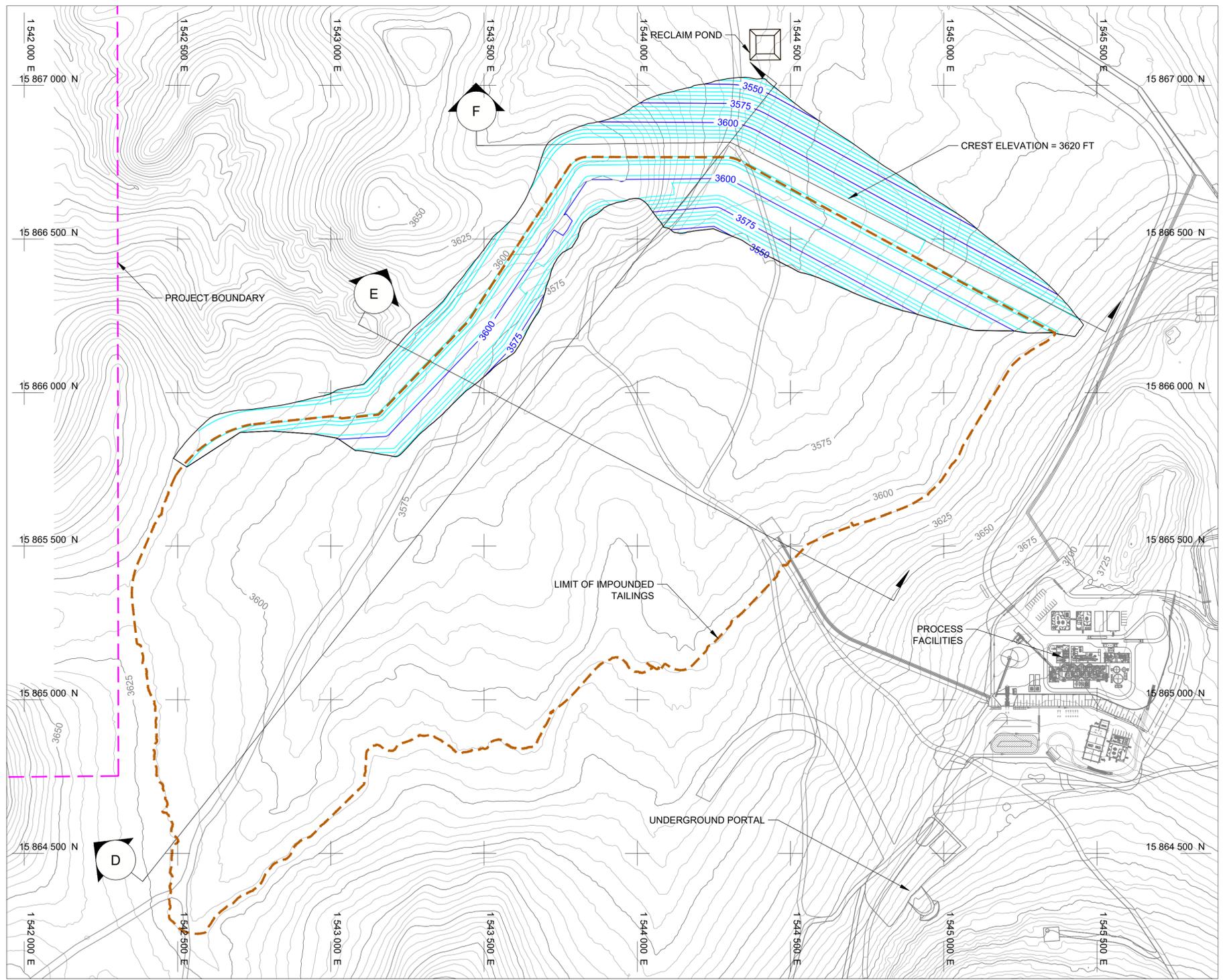
PROJECT NO.  
 1663241

REV.  
 0

FIGURE  
 2

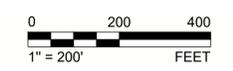
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

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**LEGEND**  
 — 3630 — EXISTING GROUND TOPOGRAPHY  
 — 3630 — PROPOSED TAILINGS DAM GRADING  
 - - - - - LIMIT OF IMPOUNDED TAILINGS  
 - - - - - PROJECT BOUNDARY

**REFERENCE**  
 EXISTING TOPOGRAPHY PROVIDED BY CALICO RECOUSES USA CORP IN ELECTRONIC FILE TITLED "contours\_2ft\_expanded\_project\_area.zip" ON MARCH 29, 2017.  
 ELEVATIONS SHOWN ARE IN FEET A.S.L.



CLIENT  
**CALICO RESOURCES USA CORP**  
 GRASSY MOUNTAIN PROJECT



PROJECT  
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 APPROVED RAB

TITLE  
**LAYOUT AND SECTIONS**  
 OPTION 2

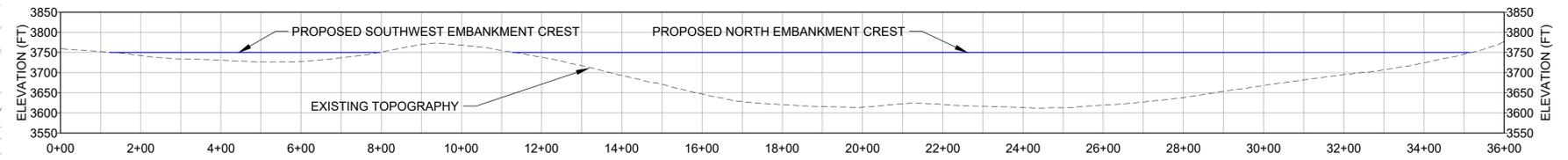
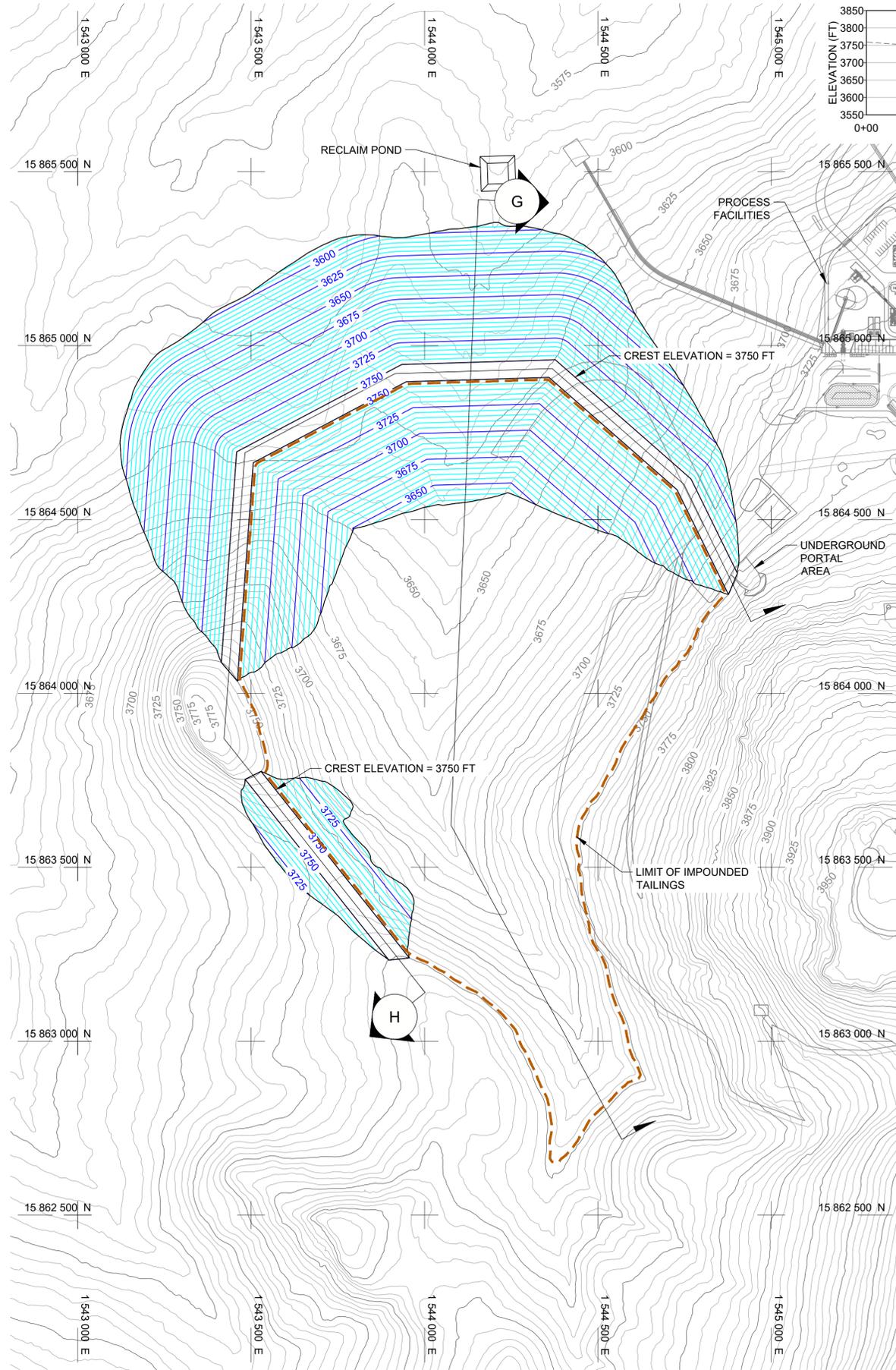
PROJECT NO.  
**1663241**

REV.  
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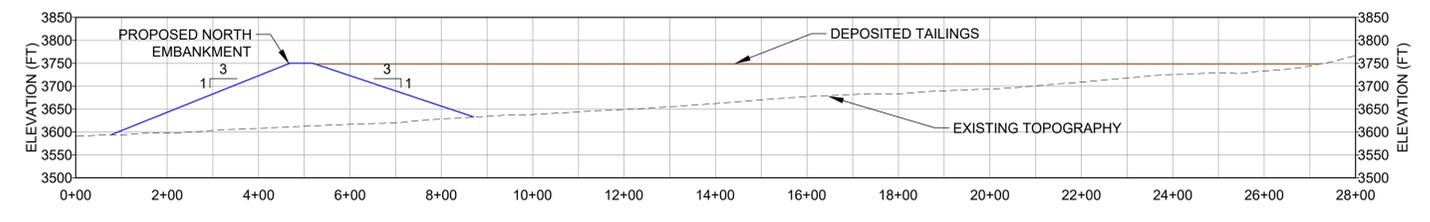
FIGURE  
**3**

1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANS/D

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SCALE 1" = 200' **G** OPTION 3 EMBANKMENT PROFILE

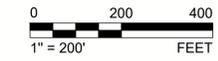


SCALE 1" = 200' **H** SECTION THROUGH OPTION 3 TSF

**LEGEND**

- 3630 EXISTING GROUND TOPOGRAPHY
- 3630 PROPOSED TAILINGS DAM GRADING
- LIMIT OF IMPOUNDED TAILINGS

**REFERENCE**  
 EXISTING TOPOGRAPHY PROVIDED BY CALICO RECOURSES USA CORP IN ELECTRONIC FILE TITLED "contours\_2ft\_expanded\_project\_area.zip" ON MARCH 29, 2017.



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APPROVED	RAB

TITLE  
**LAYOUT AND SECTIONS**  
*OPTION 3*

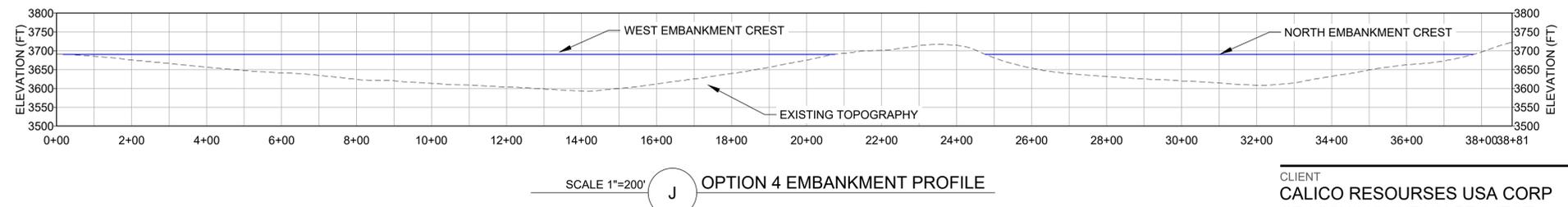
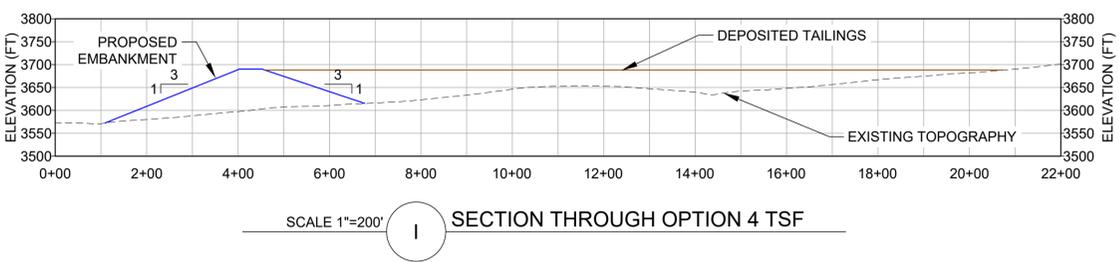
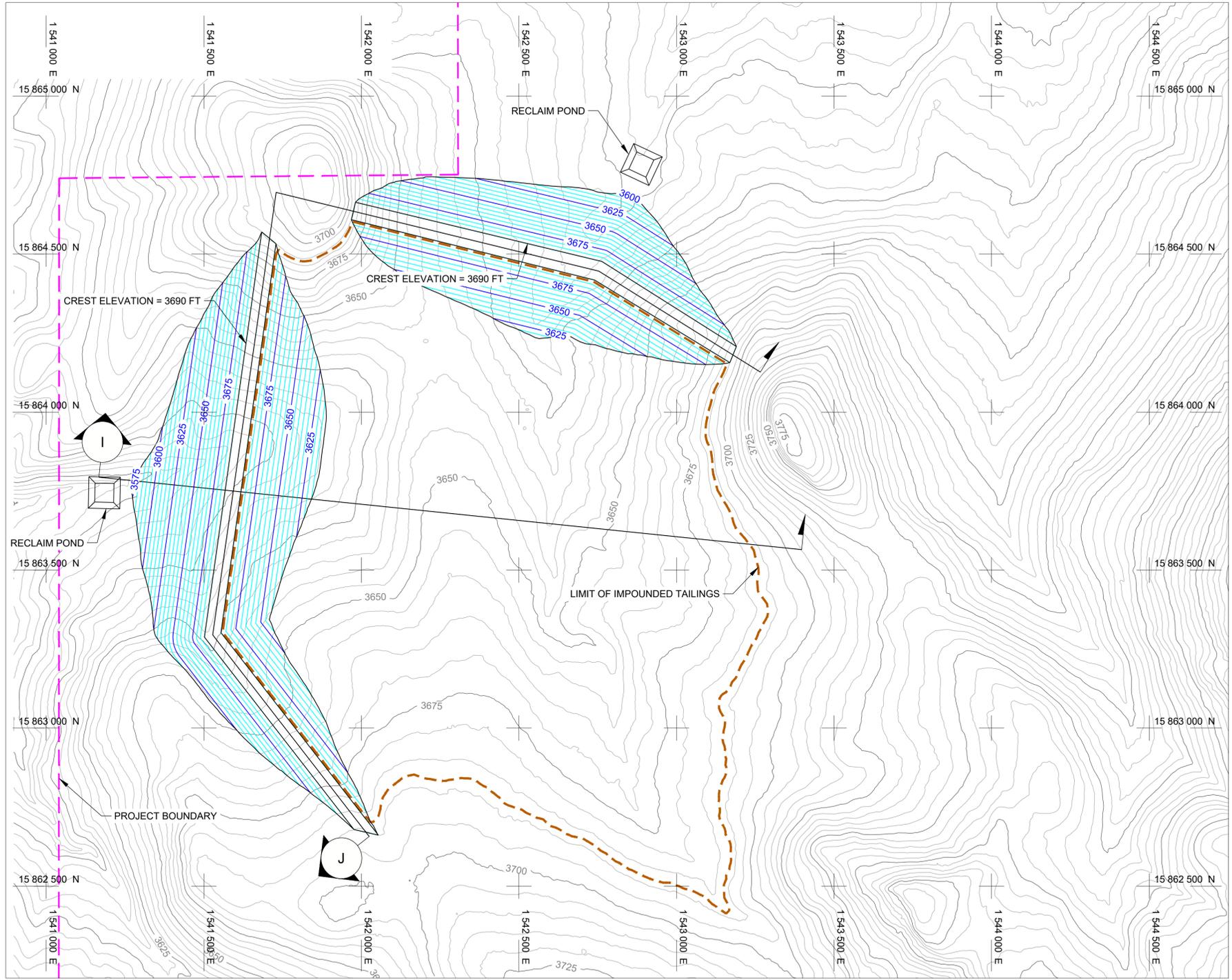
PROJECT NO.  
 1663241

REV.  
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FIGURE  
 4

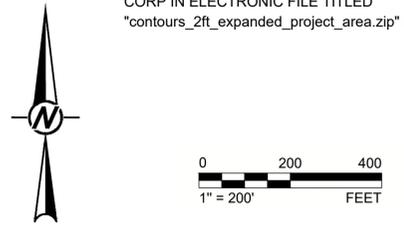
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- LEGEND**
- 3630 EXISTING GROUND TOPOGRAPHY
  - 3630 PROPOSED TAILINGS DAM GRADING
  - LIMIT OF IMPOUNDED TAILINGS
  - PROJECT BOUNDARY

**REFERENCE**  
 EXISTING TOPOGRAPHY PROVIDED BY CALICO RECOURES USA CORP IN ELECTRONIC FILE TITLED "contours\_2ft\_expanded\_project\_area.zip" ON MARCH 29, 2017.



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 GRASSY MOUNTAIN PROJECT



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DESIGNED	MDB
PREPARED	NAS
REVIEWED	CJM
APPROVED	RAB

TITLE  
**LAYOUT AND SECTIONS**  
*OPTION 4*

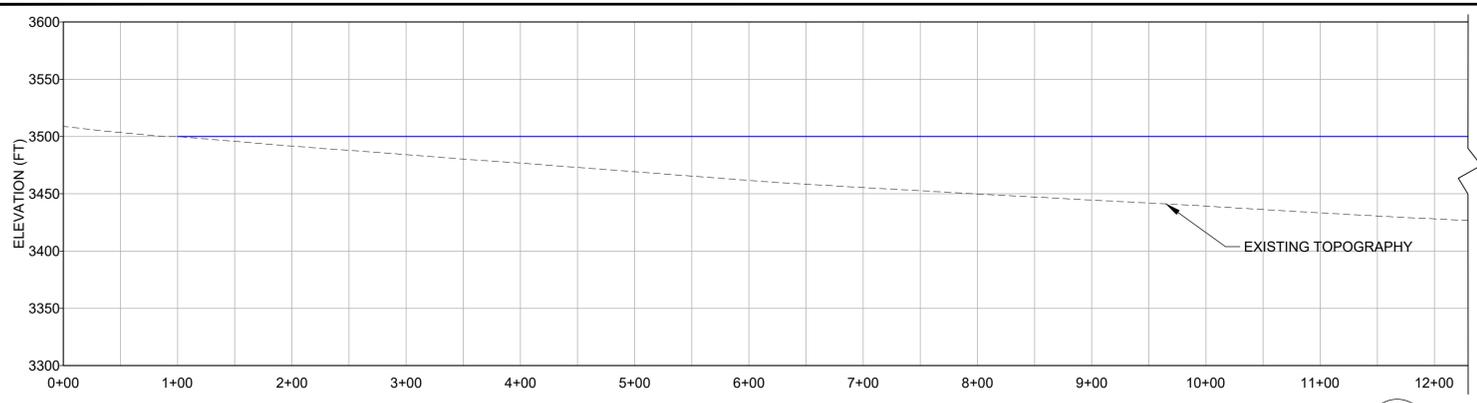
PROJECT NO.  
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REV.  
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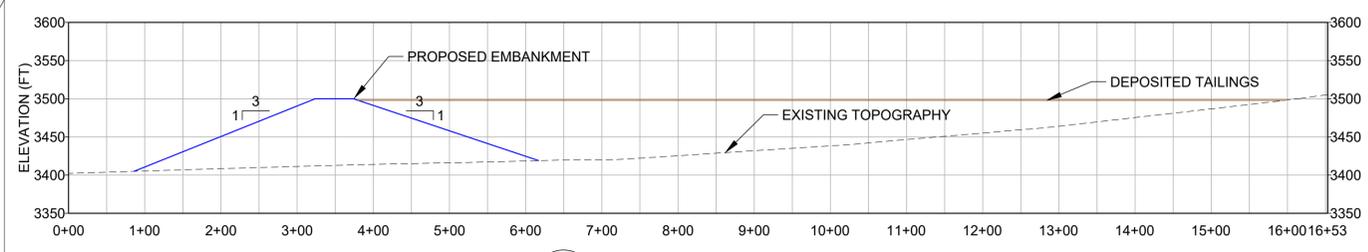
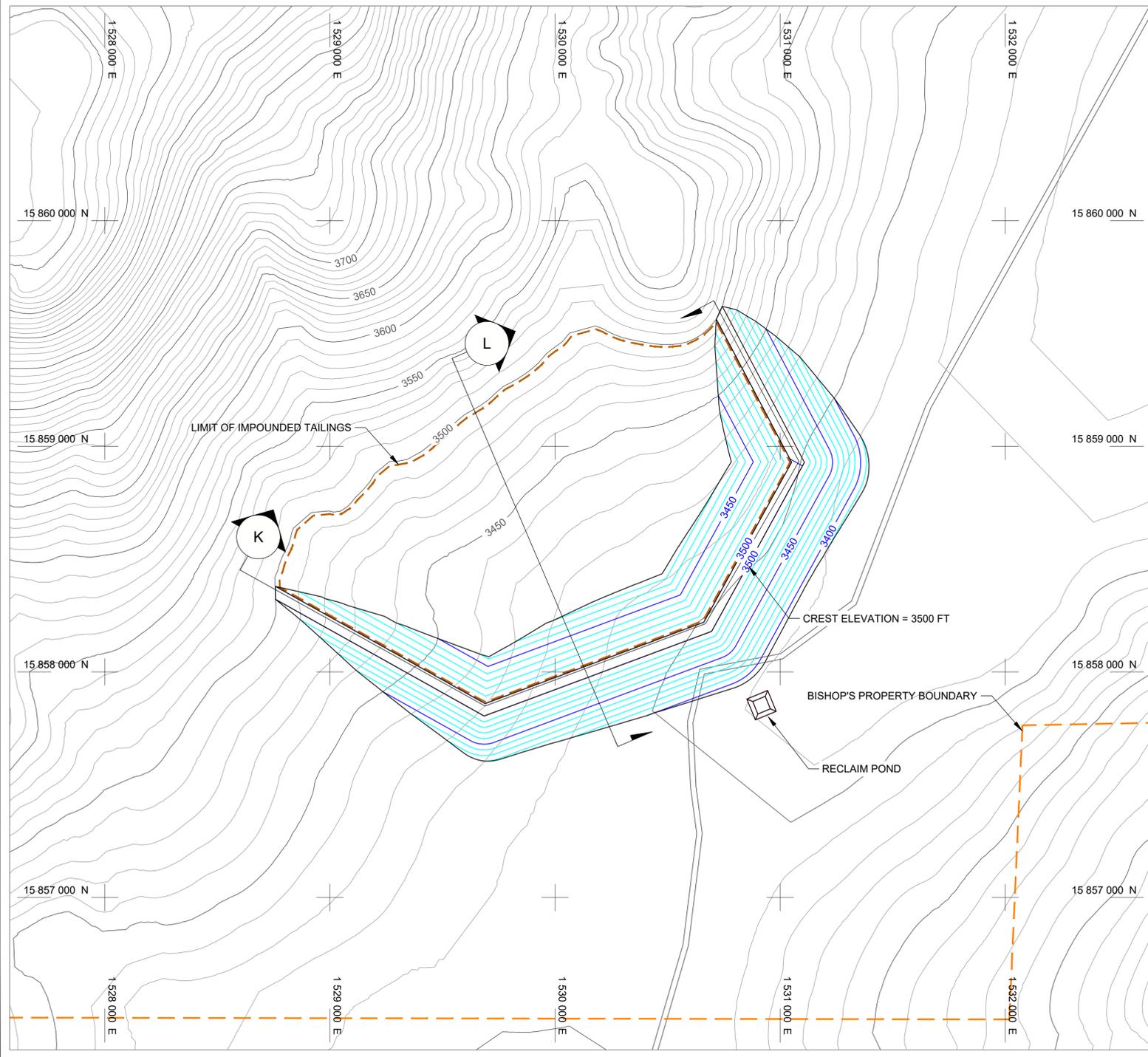
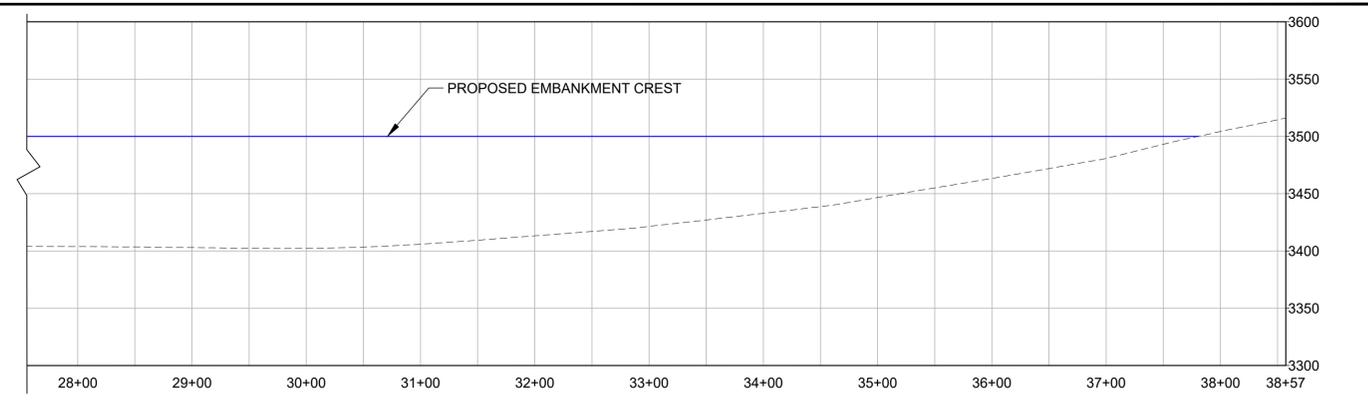
FIGURE  
 5

1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANS/D

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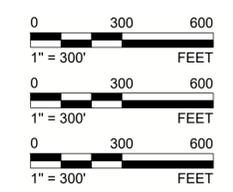


SCALE 1"=80' **K** OPTION 5 EMBANKMENT PROFILE



SCALE 1"=120' **L** SECTION THROUGH OPTION 5 TSF

- LEGEND**
- 3630 EXISTING GROUND TOPOGRAPHY
  - 3630 PROPOSED TAILINGS DAM GRADING
  - LIMIT OF IMPOUNDED TAILINGS
  - BISHOP'S PROPERTY BOUNDARY
- REFERENCE**
- EXISTING TOPOGRAPHY PROVIDED BY USGS IN ELECTRONIC SHAPE FILE TITLED "ned10m431174.shx". ELEVATIONS SHOWN ARE IN FEET.



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APPROVED	RAB

TITLE  
**LAYOUT AND SECTIONS**  
*OPTION 5*

PROJECT NO.  
 1663241

REV.  
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FIGURE  
 6

1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANS/D

## Attachment A Ranking Matrix

### Grassy Mountain Project - TSF Siting Alternatives Ranking Matrix

Aspect Under Consideration (Rated 1 to 5, 1 - Less Favorable and 5 - Most Favorable)	Weighting Factor	Option 1		Option 2		Option 3		Option 4		Option 5	
		Score	Product								
<b>Technical Criteria</b>	<b>40%</b>										
Volume of Earthworks (Embankment Fill)	15%	3	0.45	5	0.75	1	0.15	4	0.60	2	0.30
Ease of Construction	15%	4	0.60	5	0.75	3	0.45	2	0.30	1	0.15
Stormwater Management	30%	1	0.3	3	0.9	4	1.2	3	0.9	5	1.5
Pumping and Piping	15%	3	0.45	5	0.75	4	0.60	2	0.30	2	0.30
Tailings Rate of Rise	25%	2	0.5	5	1.25	1	0.25	4	1	3	0.75
TOTAL	100%	2.30		4.40		2.65		3.10		3.00	
<b>Human Safety and Environmental Protection</b>	<b>60%</b>										
Disturbance Area	10%	5	0.50	1	0.10	4	0.40	2	0.20	3	0.30
Potential Impact to Surface and Groundwater	20%	3	0.60	4	0.80	1	0.20	2	0.40	5	1.00
Geotechnical Risks	20%	2	0.40	3	0.60	2	0.40	3	0.60	3	0.60
Impact to Public Access	5%	5	0.25	3	0.15	5	0.25	3	0.15	3	0.15
Located Within Project Boundary	20%	5	1.00	5	1.00	5	1.00	5	1.00	1	0.20
Reclamation and Closure	25%	1	0.25	4	1.00	4	1.00	2	0.50	5	1.25
TOTAL	100%	3.00		3.65		3.25		2.85		3.50	
<b>OVERALL</b>	<b>100%</b>	<b>2.72</b>		<b>3.95</b>		<b>3.01</b>		<b>2.95</b>		<b>3.30</b>	