



# **Nevada Irrigation District Centennial Reservoir Project**

## **Construction Cost Estimates Conceptual Design**

August 24, 2016

**AECOM**

## Presentation

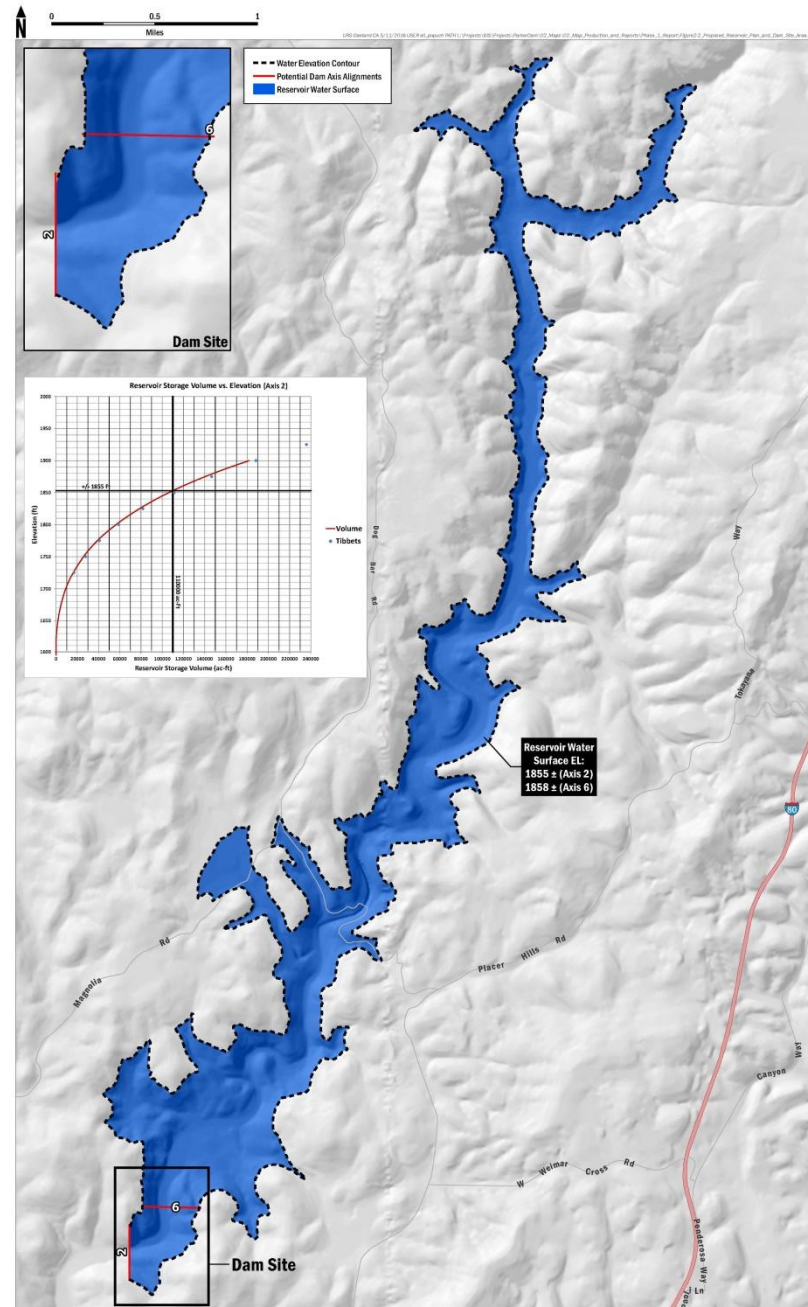
- Roller compacted concrete (RCC) dam concept and examples
- Concrete faced rockfill (CFR) dam concept and examples
- Construction schedules – concept level
- Conceptual level construction cost estimates
- Next steps

## Purpose and Scope of Cost Estimate Report

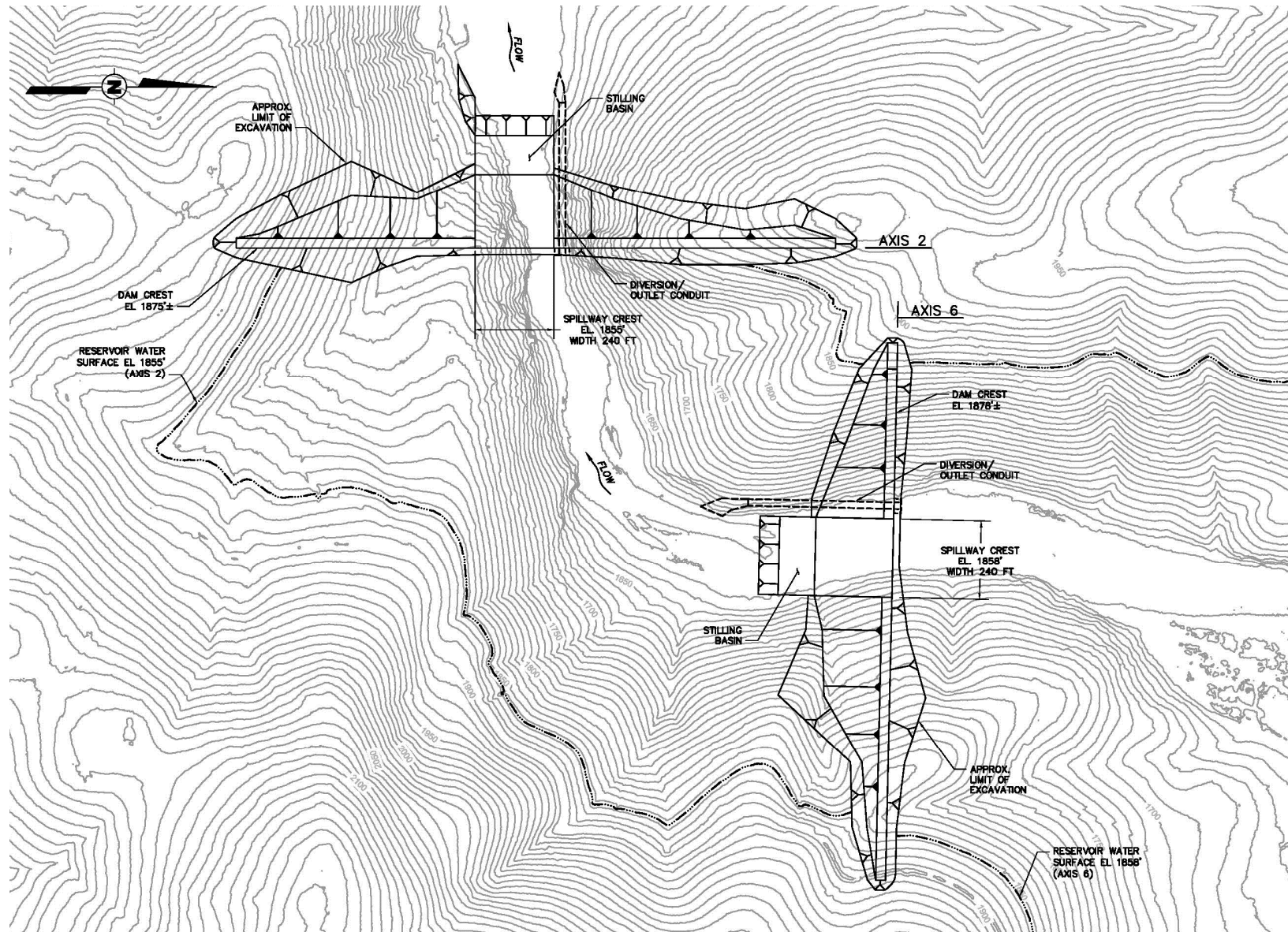
- Develop conceptual-level cost estimates based on available information (prior to current phase of geotechnical investigation)
  - Dam types and dam axis alignments from Preliminary Geotechnical Investigation Phase II Report, Feb. 2016
- Compare relative costs; provide indication to NID of potential project costs
  - RCC dam and CFR dam at Axis 2 and Axis 6



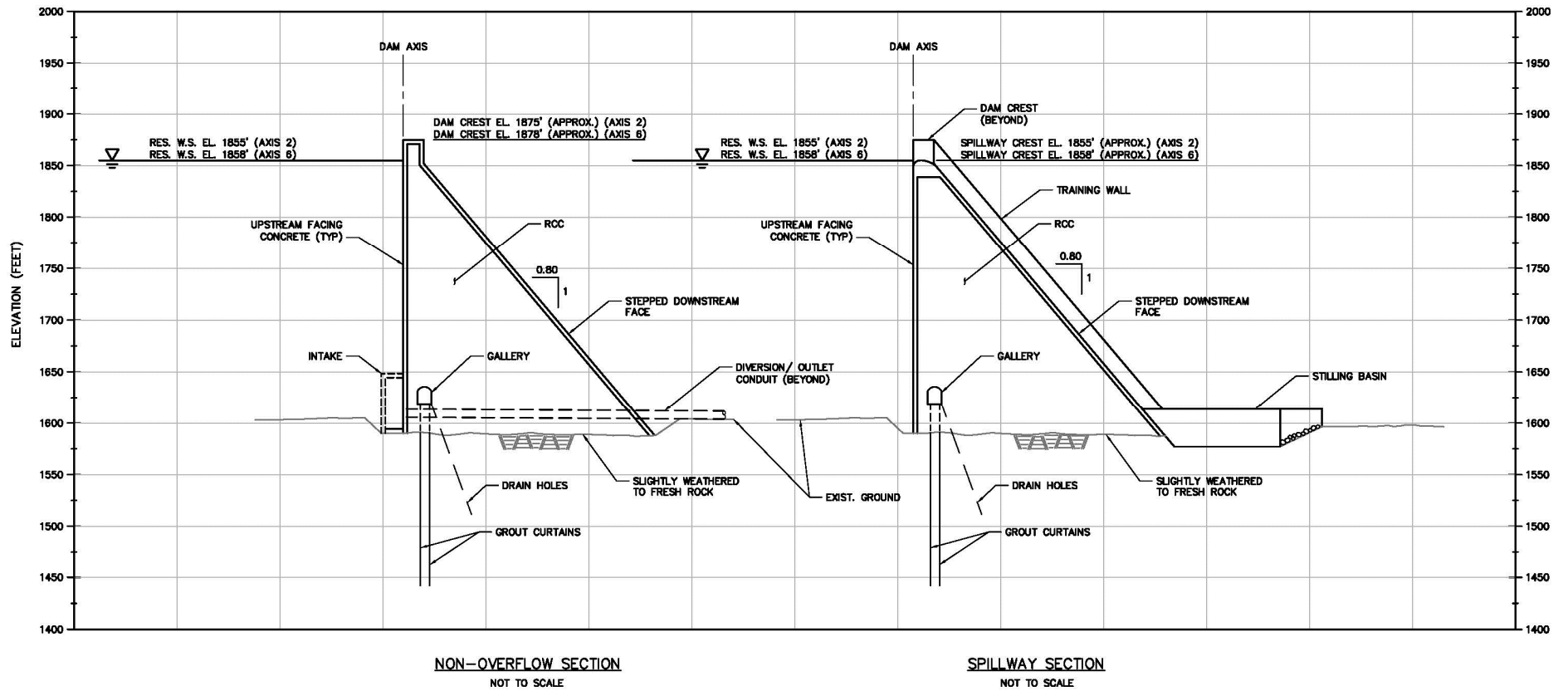
# Reservoir Plan & Dam Axis Locations



# Conceptual RCC Dam Layout – Axes 2 & 6

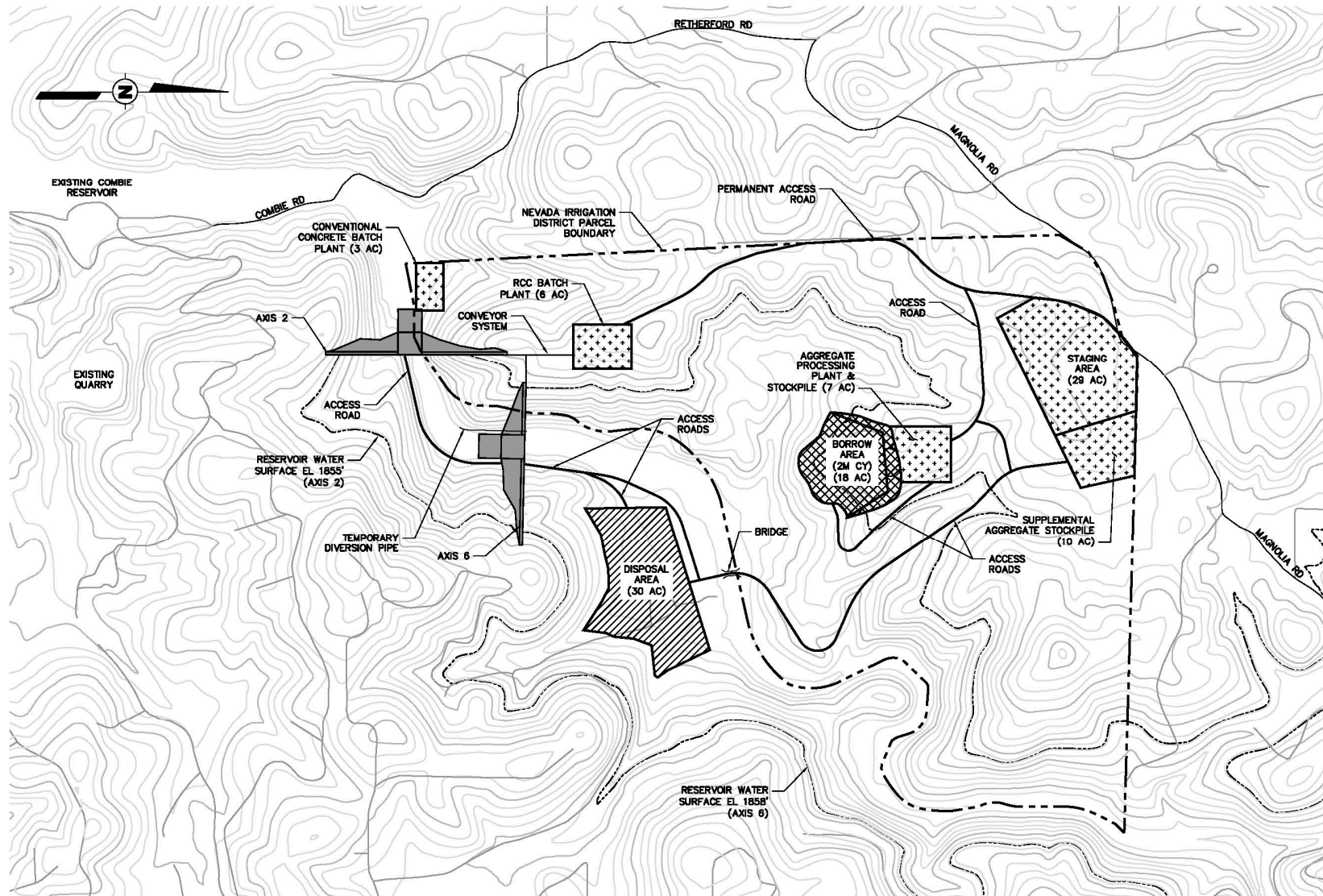


# Conceptual RCC Dam Sections





# RCC Dam Conceptual Construction Site Layout



# Stagecoach Dam, Steamboat Springs, CO



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## Toker Dam, Eritrea, E. Africa



## Littlerock Dam, Palmdale, CA





## Los Vaqueros Dam, Brentwood, CA RCC Spillway Block

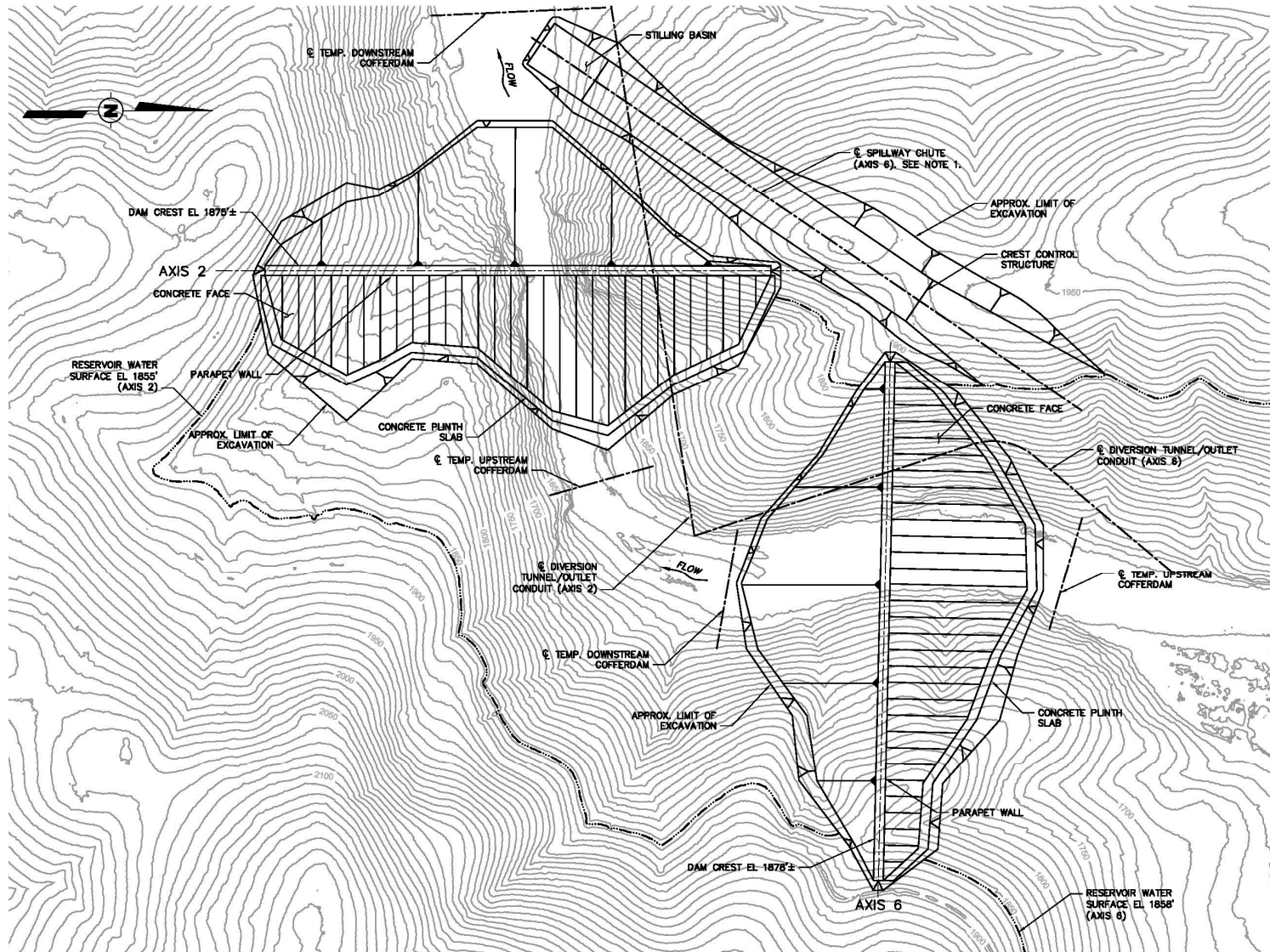


## Los Vaqueros Dam, Brentwood, CA RCC Spillway Block

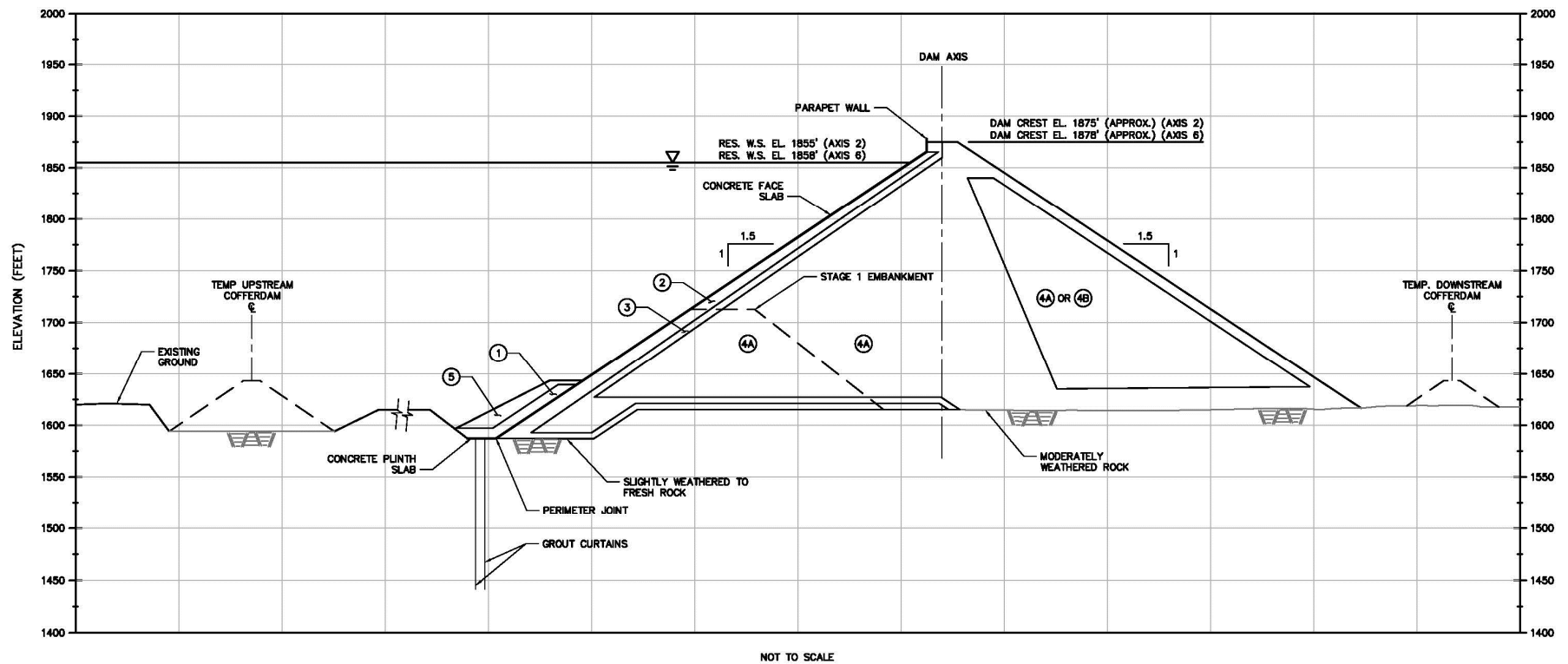




# CFR Dam Conceptual Layout – Axes 2 & 6

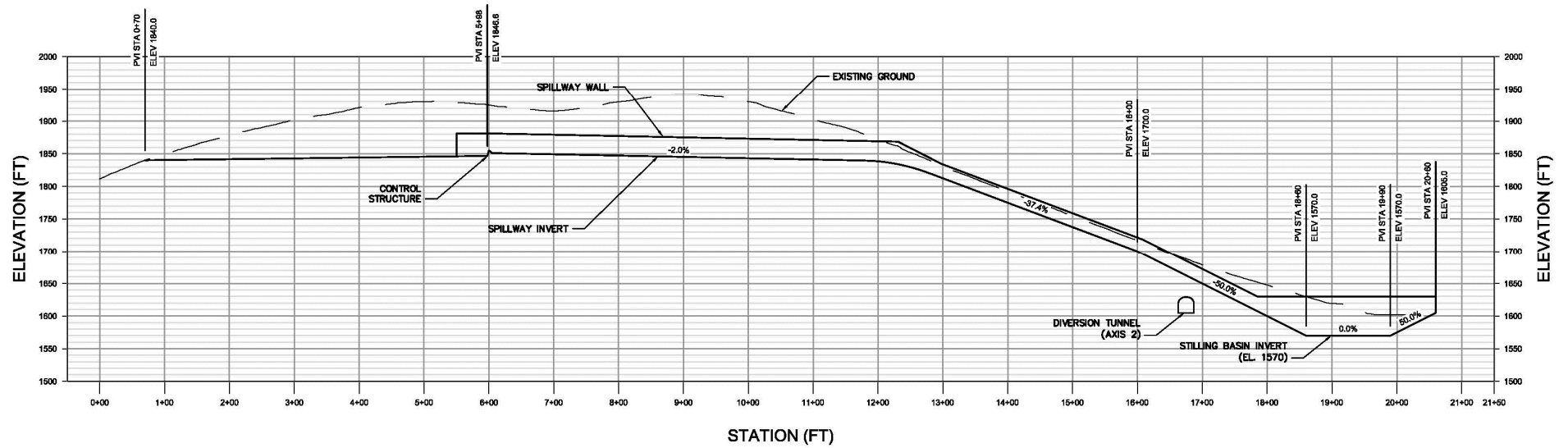


# CFR Dam Conceptual Section



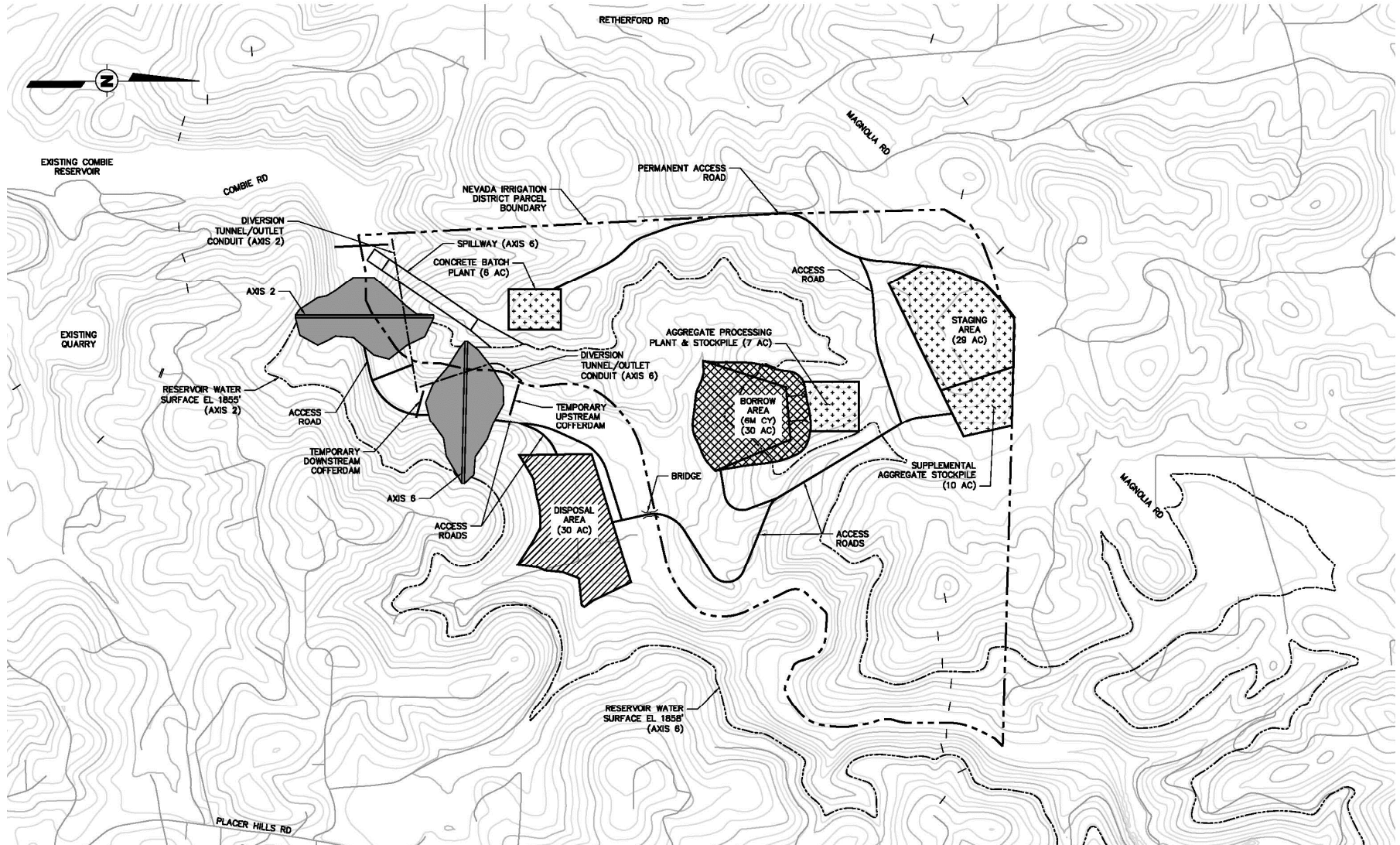


# CFR Dam Conceptual Spillway Profile



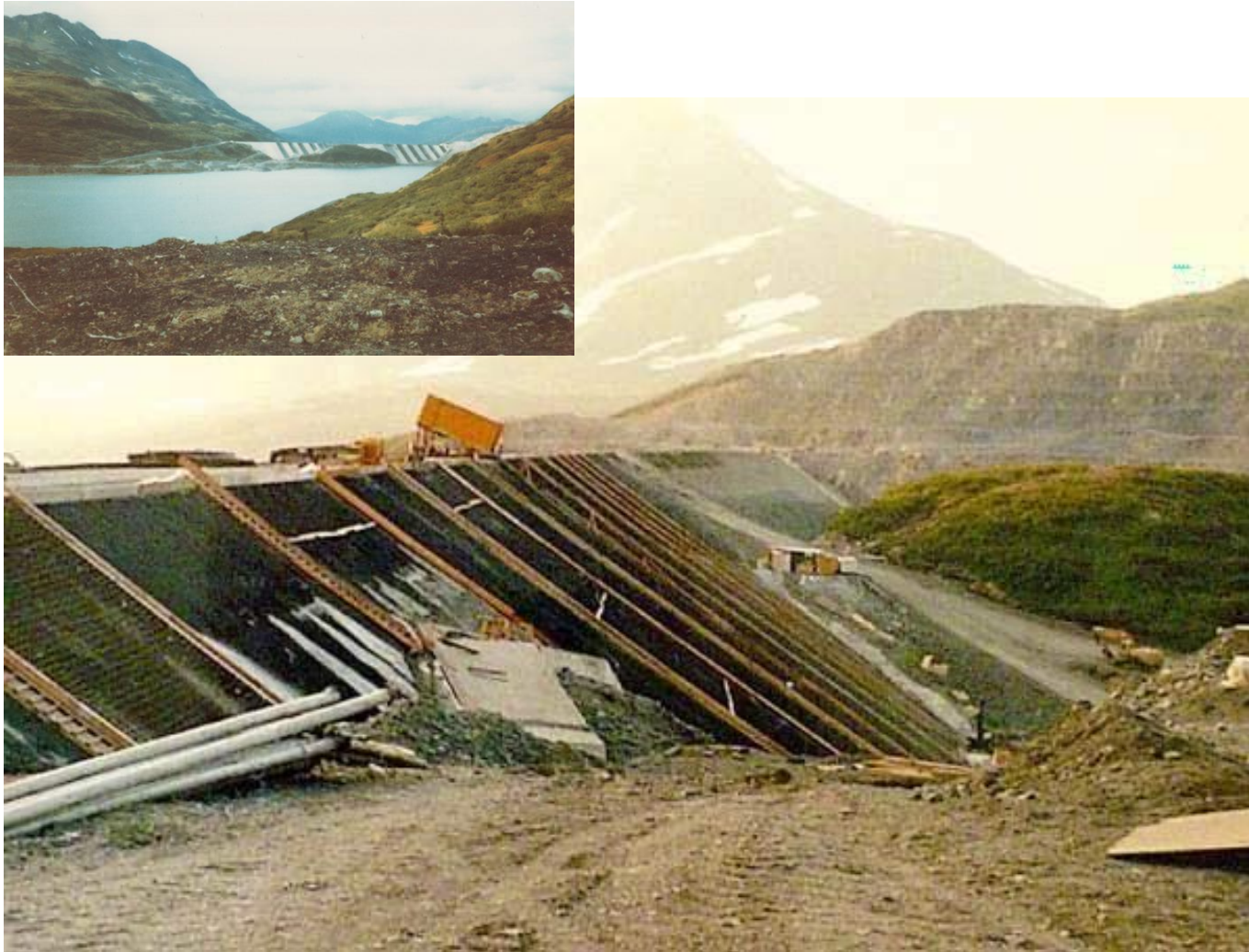
SPILLWAY PROFILE  
SCALE 1"=150'

# CFR Dam Conceptual Construction Site Layout





# Terror Lake CFR Dam, Kodiak Island, AK



## Terror Lake CFR Dam, Kodiak Island, AK





# Cirata Hydro Project CFR Dam, W. Java, Indonesia





# Kárahnjúkar CFR Dam, Iceland



# Conceptual Construction Schedule Considerations

- Variables considered in construction schedules
  - Productivity (depends on crew sizes, equipment spreads, access conditions, etc.)
  - Approaches to sequencing of activities
  - Number of shifts per day and days per work week
- Schedules focused on major activities most likely to influence total construction durations.

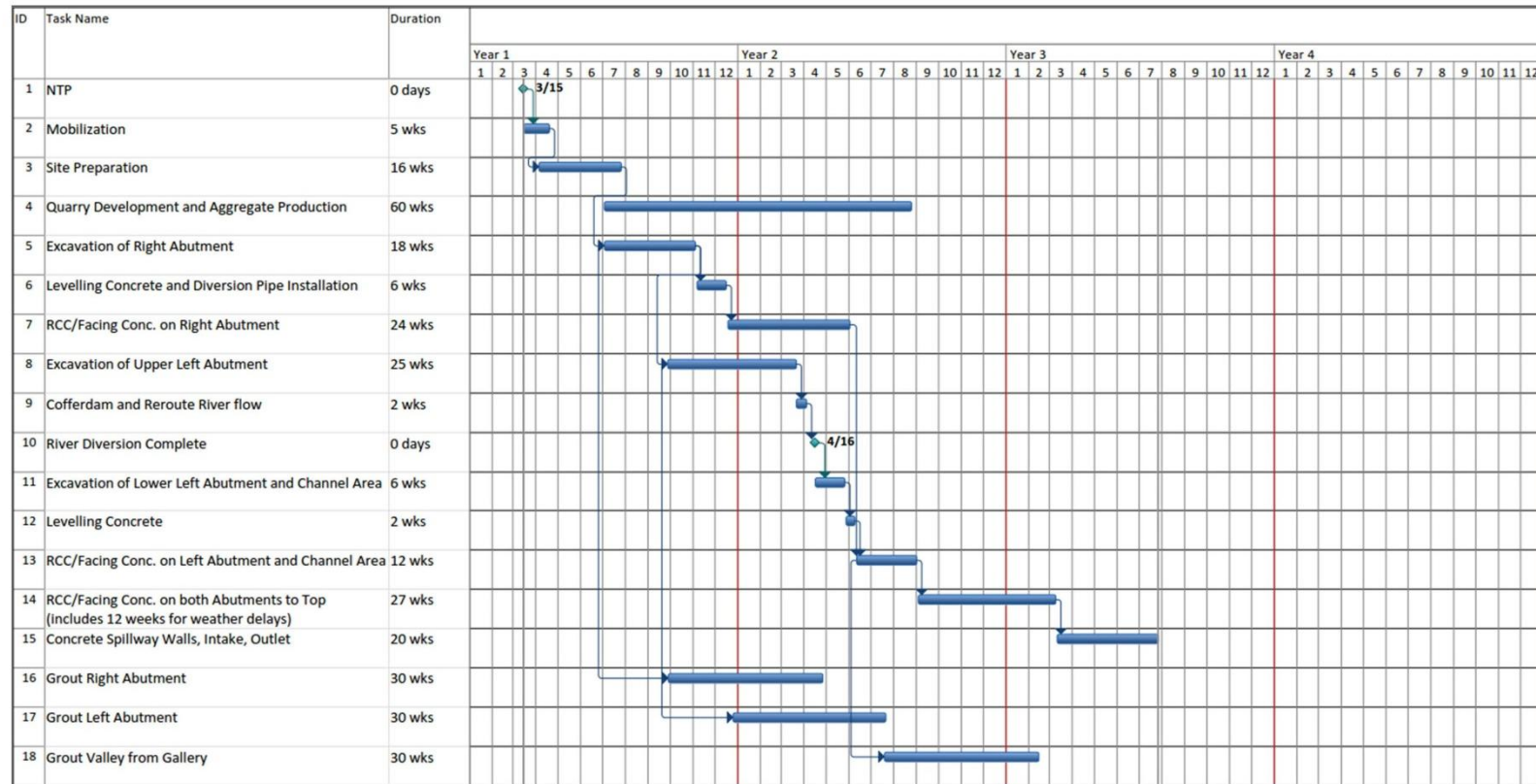
# Conceptual Construction Schedule Considerations

- Durations of construction estimated for major work activities
  - Based on work quantities and typical productivity rates.
  - Productivity rates estimated based on experience
  - Other projects of similar type and magnitude.
  - Overall estimated durations consider logical sequence of work activities.



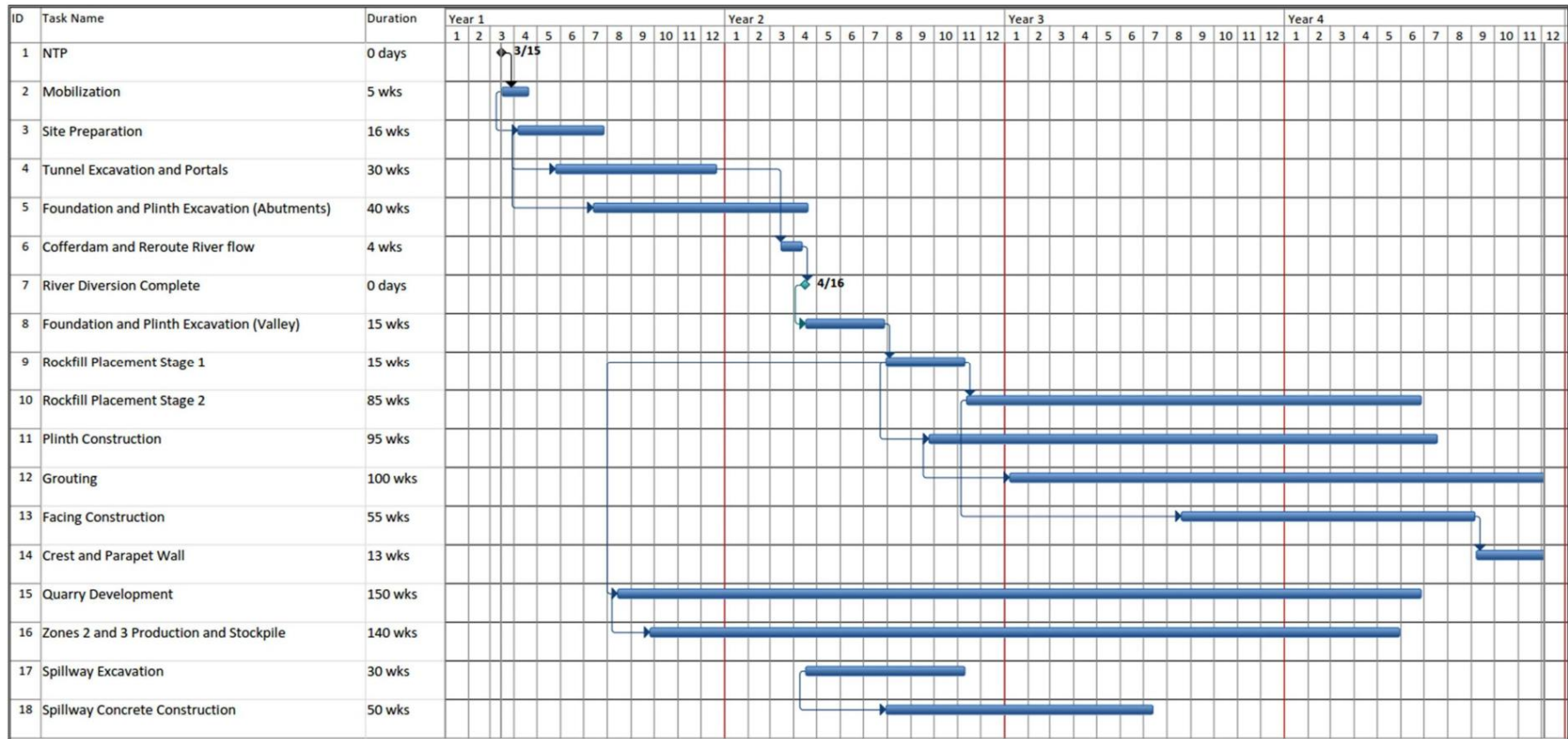
# RCC Dam Conceptual Construction Schedule

← 2½ years →



# CFR Dam Conceptual Construction Schedule

← 4 years →





## Basis of Conceptual Estimates

- Conceptual level AACE Class 4 Estimate
- Approximate estimate range of accuracy at this level: 30% below to 30% above actual construction cost.
- Includes a 30% overall design contingency
  - Part of estimated construction cost - accounts for items that cannot be fully assessed due to conceptual level of current design alternatives.
  - Variable line item contingencies:
    - Excavation – 40%
    - Grouting – 40%
    - RCC – 30%

## Basis of Conceptual Estimates

- An experienced cost estimator with construction and hard dollar contract bid experience prepared estimate.
- Estimate in 2016 dollars.
- Based on “design-bid-build” process.
- Estimates represent professional opinions of probable construction costs.
  - Actual construction costs could vary from these estimates based on many unknown and uncontrollable factors (geotechnical conditions, market conditions, etc.)



## Exclusions from Estimate

- Design engineering: 5 to 8%
- Construction management and engineering services during construction: 8 to 10%
- Other potential project costs not directly related to dam construction are excluded:
  - NID's project management & administration costs, reservoir clearing, land acquisition, legal, permitting, environmental review & documentation, and mitigation.
- Potential construction cost growth due to change orders is not included in estimate.
  - Can amount to 10% - 15% of total construction cost, particularly for projects that involve relatively large geotechnical uncertainty.

## Summary of Comparative Conceptual-level Construction Cost Estimates

Dam/Axis	Est. Construction Cost	Relative Cost
RCC Dam (Axis 2)	\$259M	1.00
RCC Dam (Axis 6)	\$284M	1.10
CFR Dam (Axis 2)	\$339M	1.31
CFR Dam (Axis 6)	\$325M	1.25

# Conceptual-level Construction Cost Estimate Summary – RCC Dam

		Axis 2		Axis 6	
Category	Description	Category Total	Category % of Total	Category Total	Category % of Total
A	Mobilization & Site Development	\$23,473,000	9.1%	\$25,368,000	8.9%
B	Diversion & Outlet	\$ 3,607,000	1.4%	\$ 3,607,000	1.3%
C	Dam Foundation	\$58,787,000	22.7%	\$53,379,000	18.8%
D	RCC & Facing Concrete	\$153,552,000	59.2%	\$182,234,000	64.1%
E	Spillway	\$10,884,000	4.2%	\$10,723,000	3.8%
F	Outlet & Intake Structures	\$ 7,775,000	3.0%	\$ 7,775,000	2.7%
G	Instrumentation & SCADA	\$ 1,125,000	0.4%	\$ 1,125,000	0.4%
	Total	\$259,203,000	100.0%	\$284,210,000	100.0%



# Conceptual-level Construction Cost Estimate Summary

## - CFR Dam

		Axis 2		Axis 6	
Category	Description	Category Total	Category % of Total	Category Total	Category % of Total
A	Mobilization & Site Development	\$32,075,000	9.5%	\$31,019,000	9.5%
B	Diversion & Outlet	\$59,190,000	17.4%	\$53,070,000	16.3%
C	Dam Foundation	\$51,579,000	15.2%	\$44,094,000	13.6%
D	Embankment	\$44,802,000	13.2%	\$47,363,000	14.6%
E	Concrete Face, Plinth & Parapet	\$46,331,000	13.7%	\$40,752,000	12.5%
F	Spillway	\$96,144,000	28.3%	\$99,672,000	30.6%
G	Outlet & Intake Structures	\$ 7,775,000	2.3%	\$ 7,775,000	2.4%
H	Instrumentation & SCADA	\$ 1,500,000	0.4%	\$ 1,500,000	0.5%
	Total	\$339,396,000	100.0%	\$325,245,000	100.0%

## Next Steps – Current Work

- Complete Phase III Geotechnical Engineering Report
- Input to project description in support of the EIR
- Conceptual design stability and hydraulic analyses
- Cost estimate update based on Phase III geotechnical investigation and additional design work
- Conceptual Engineering Report

Thank You

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