J-2 Regulating Reservoirs Project

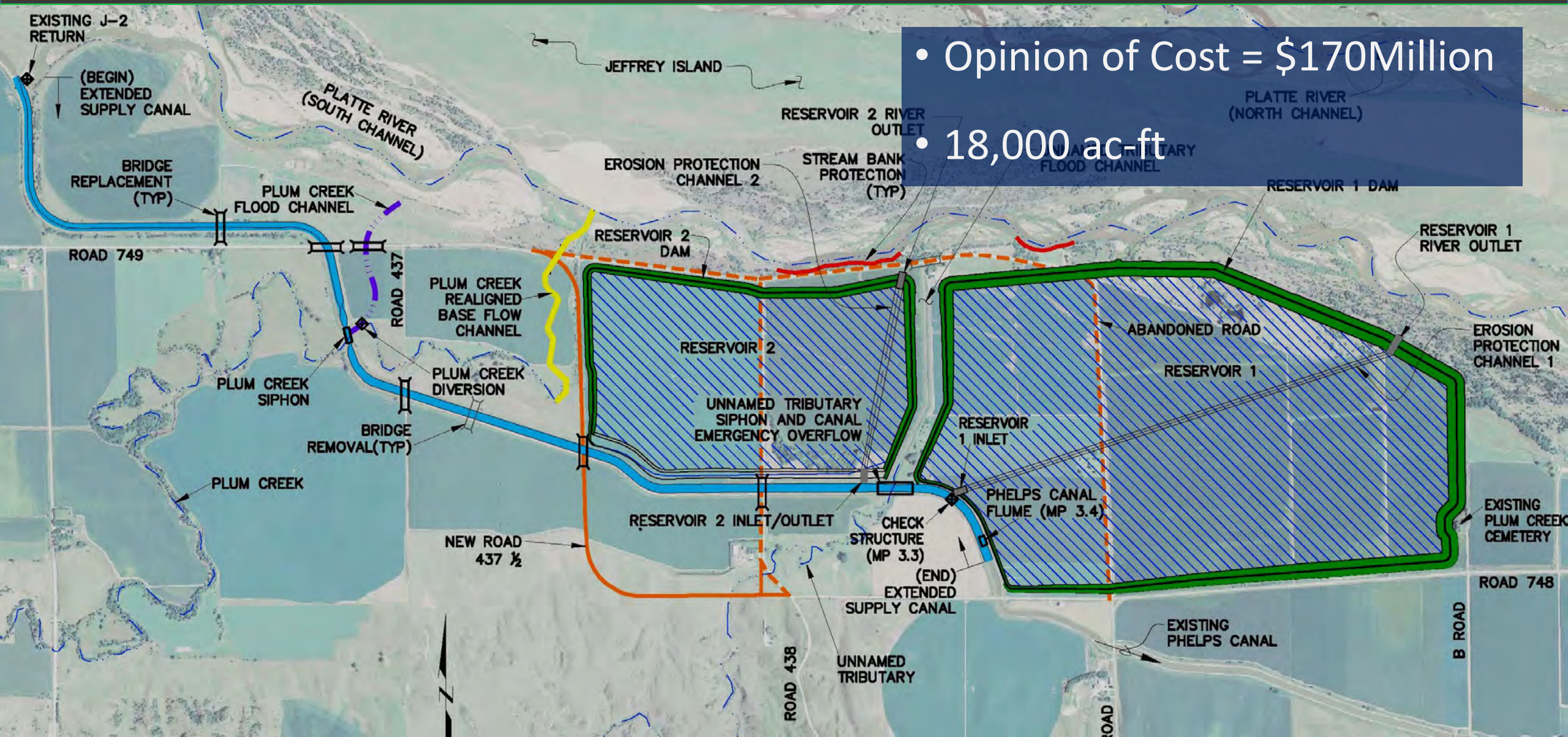
Cost Curve and VE Update to PRRIP Budget Committee| Nov 17, 2015

RJH CONSULTANTS, INC.

Discussion Overview

- Reservoir Sizes and Cost Curve
- Value Engineering Alternatives
- Advancing the Project

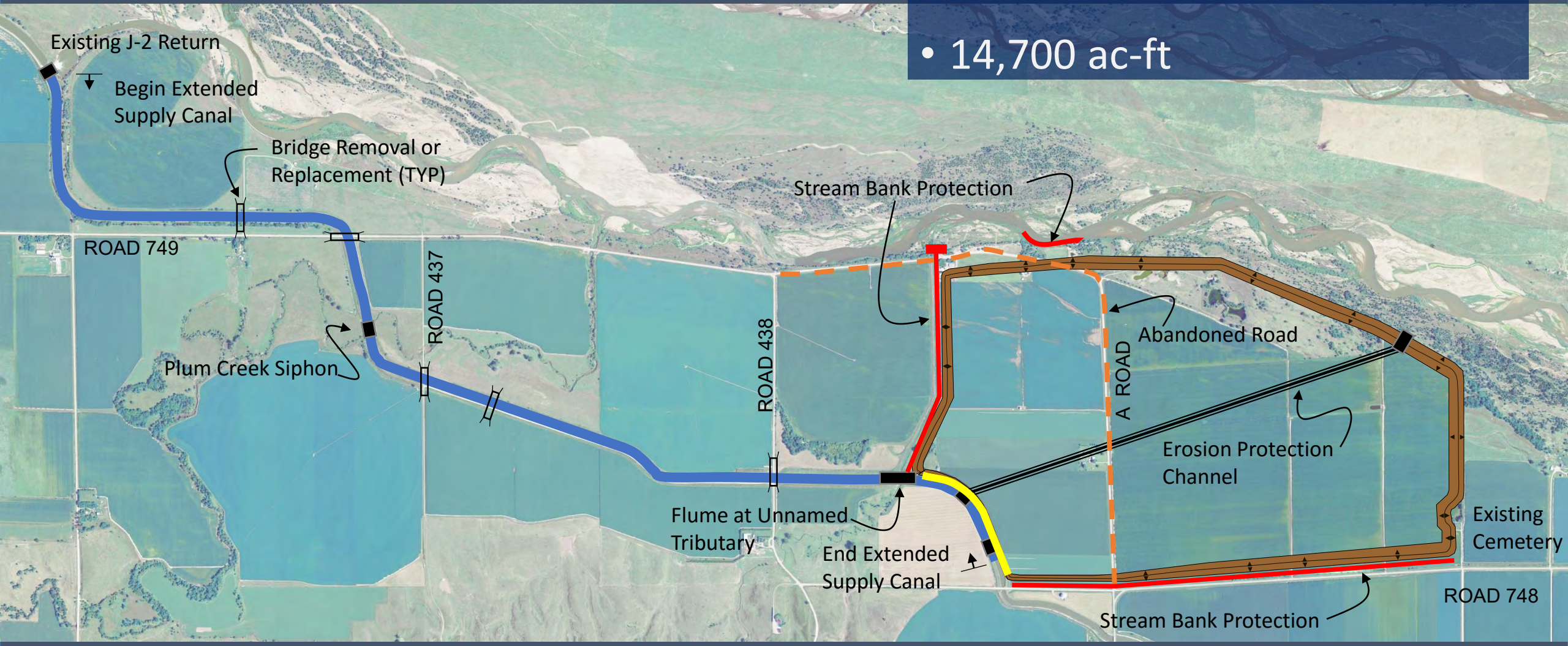
Concept Update (Sept, 2015)



- Opinion of Cost = $170Million
- 18,000 ac-ft

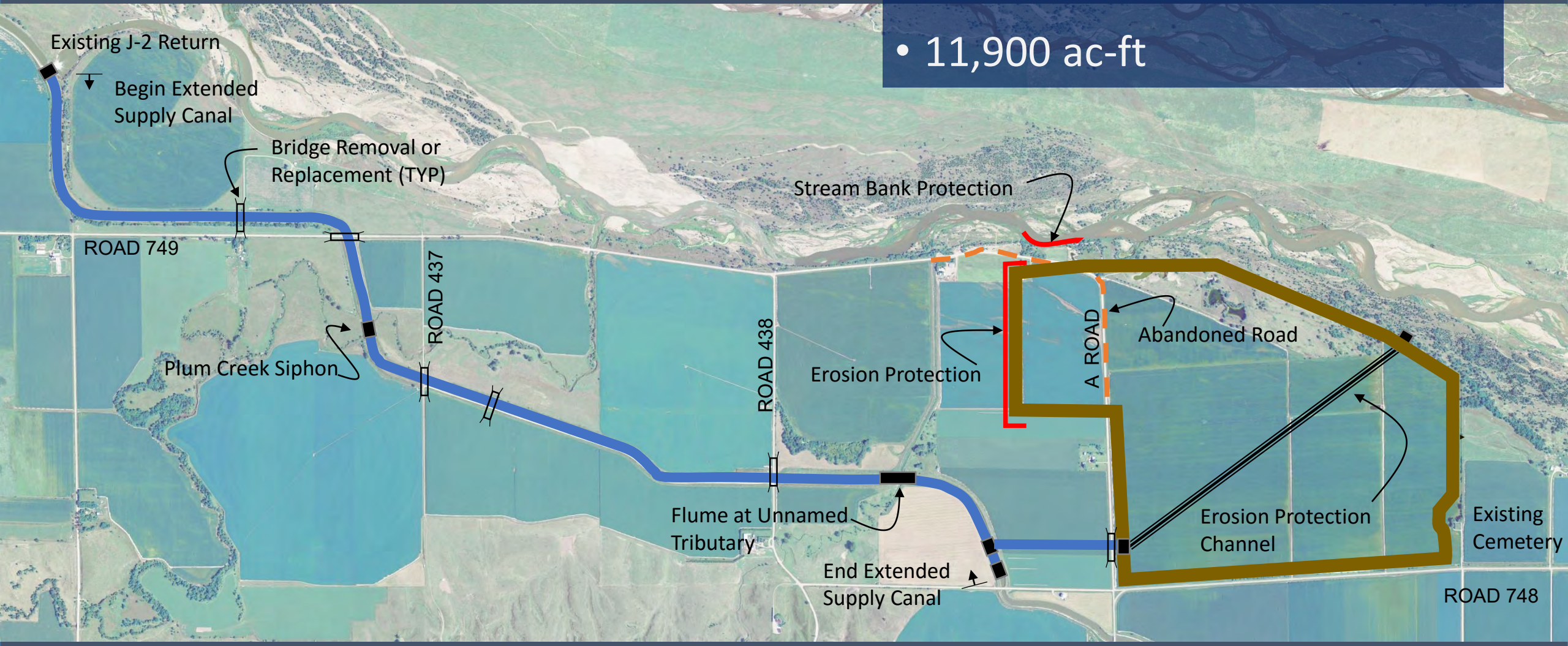
Various Sized Projects

- Opinion of Cost = $107 Million
- 14,700 ac-ft



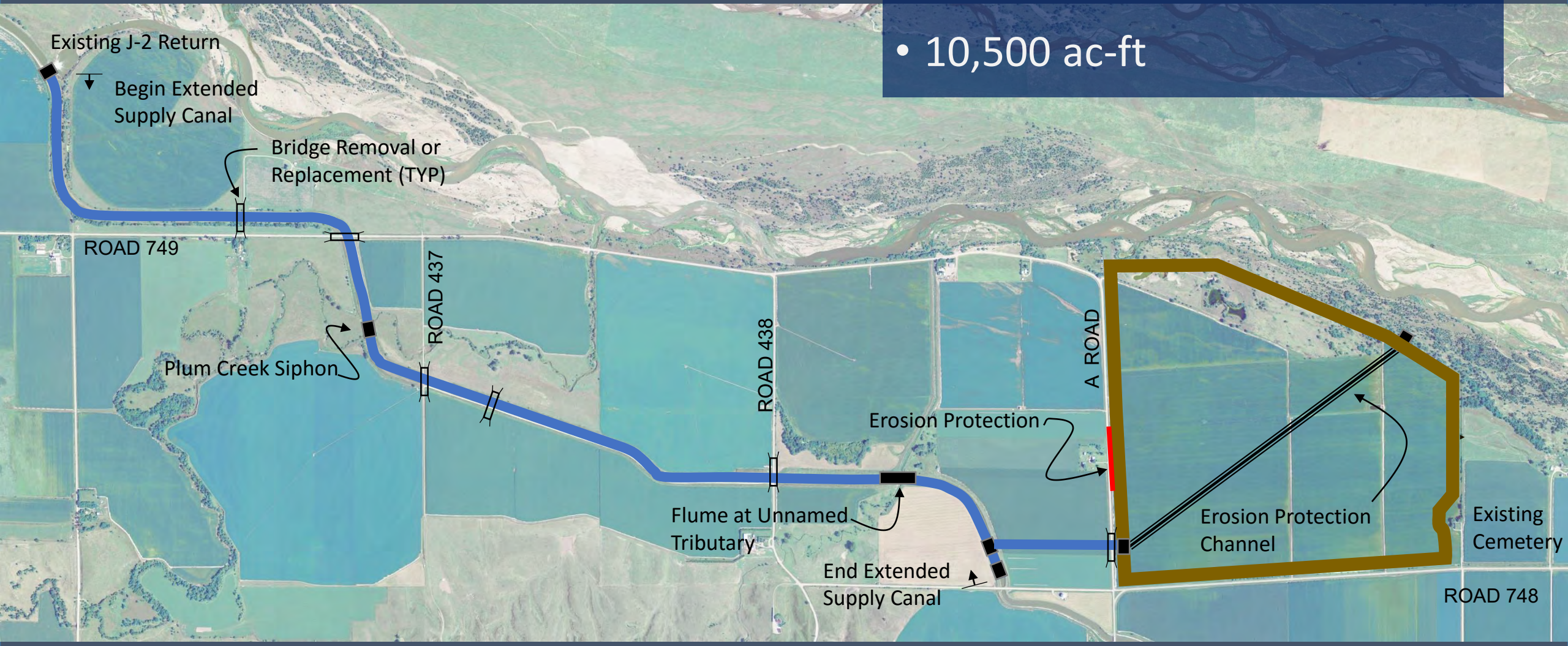
Various Sized Projects

- Opinion of Cost = $89 Million
- 11,900 ac-ft



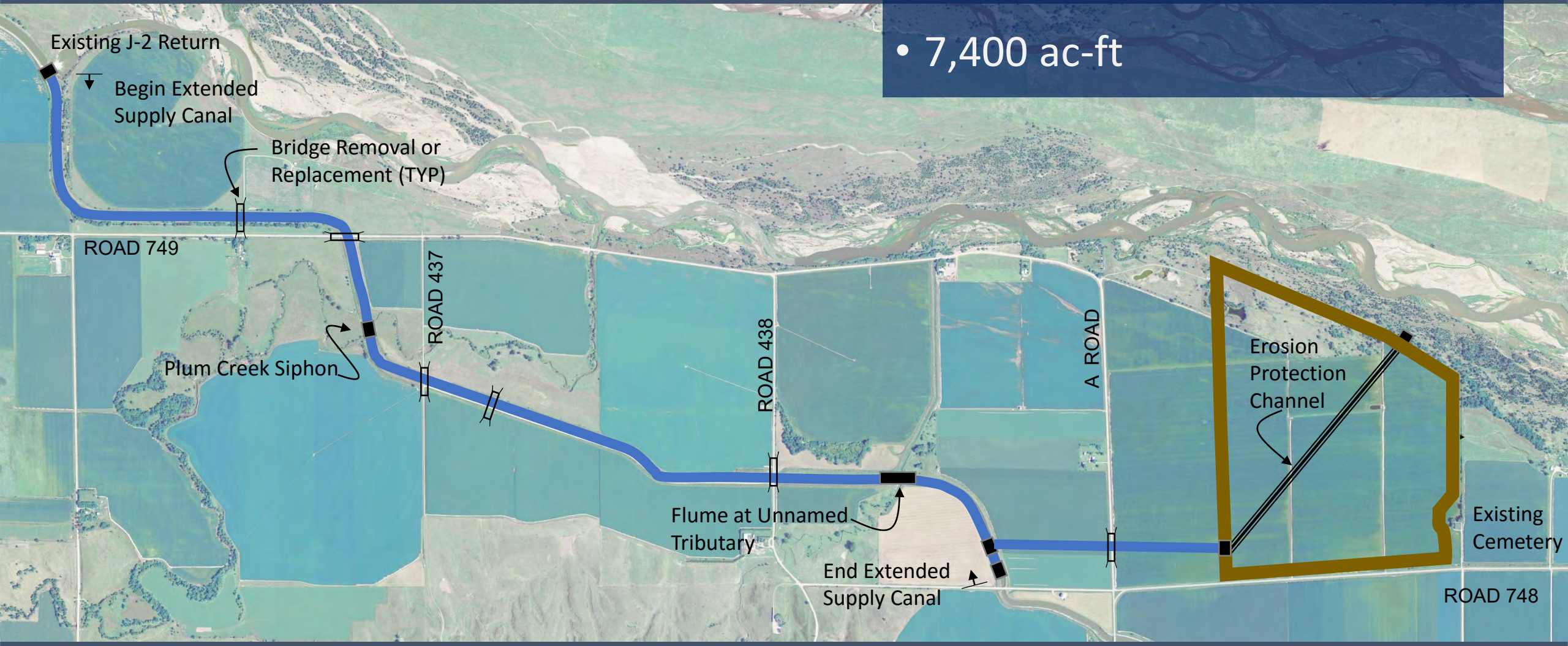
Various Sized Projects

- Opinion of Cost = $81 Million
- 10,500 ac-ft



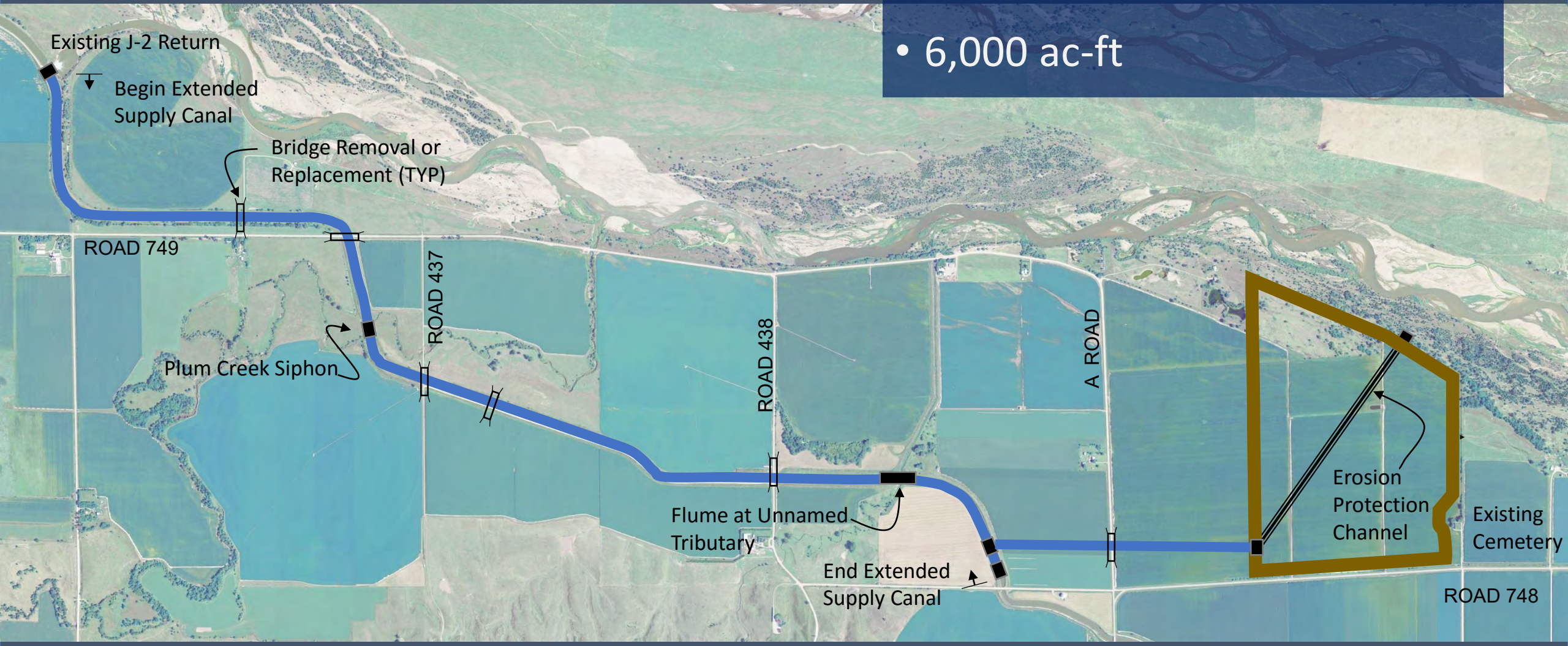
Various Sized Projects

- Opinion of Cost = $67 Million
- 7,400 ac-ft



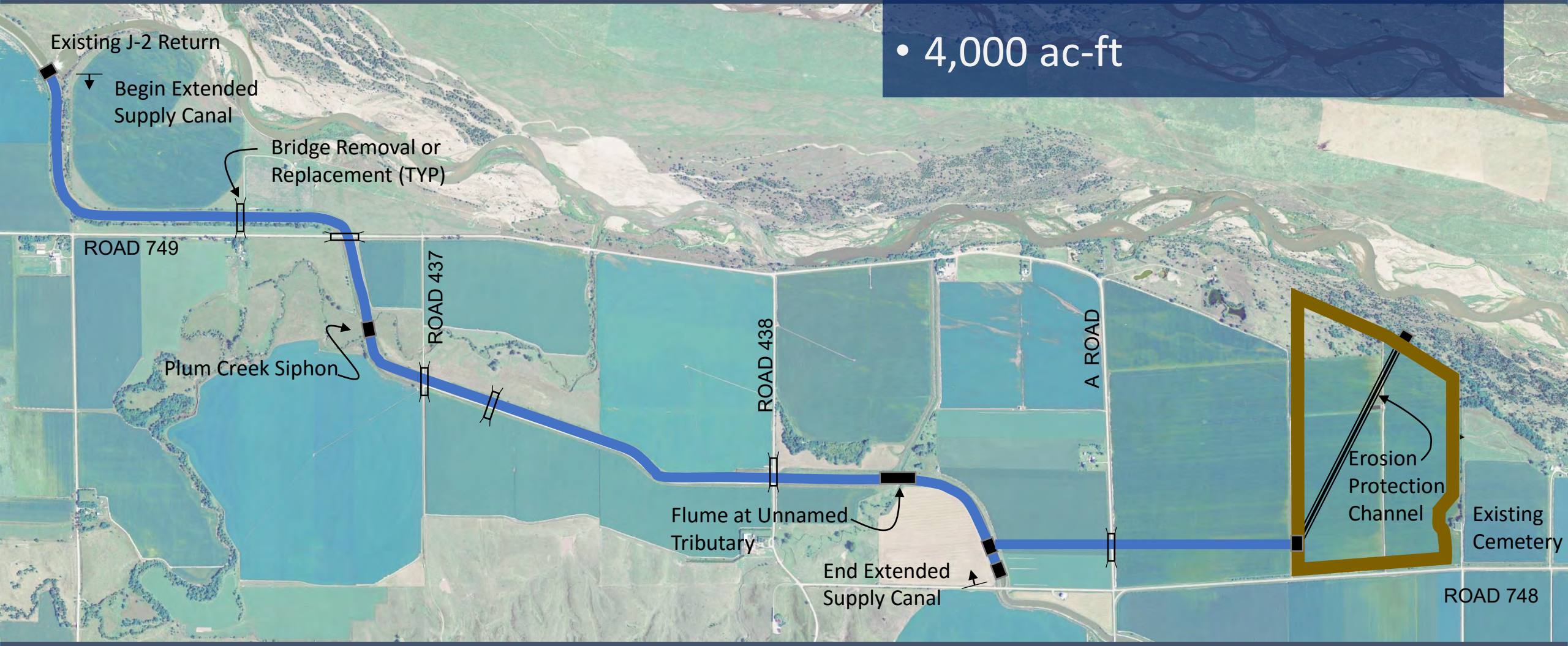
Various Sized Projects

- Opinion of Cost = $61 Million
- 6,000 ac-ft

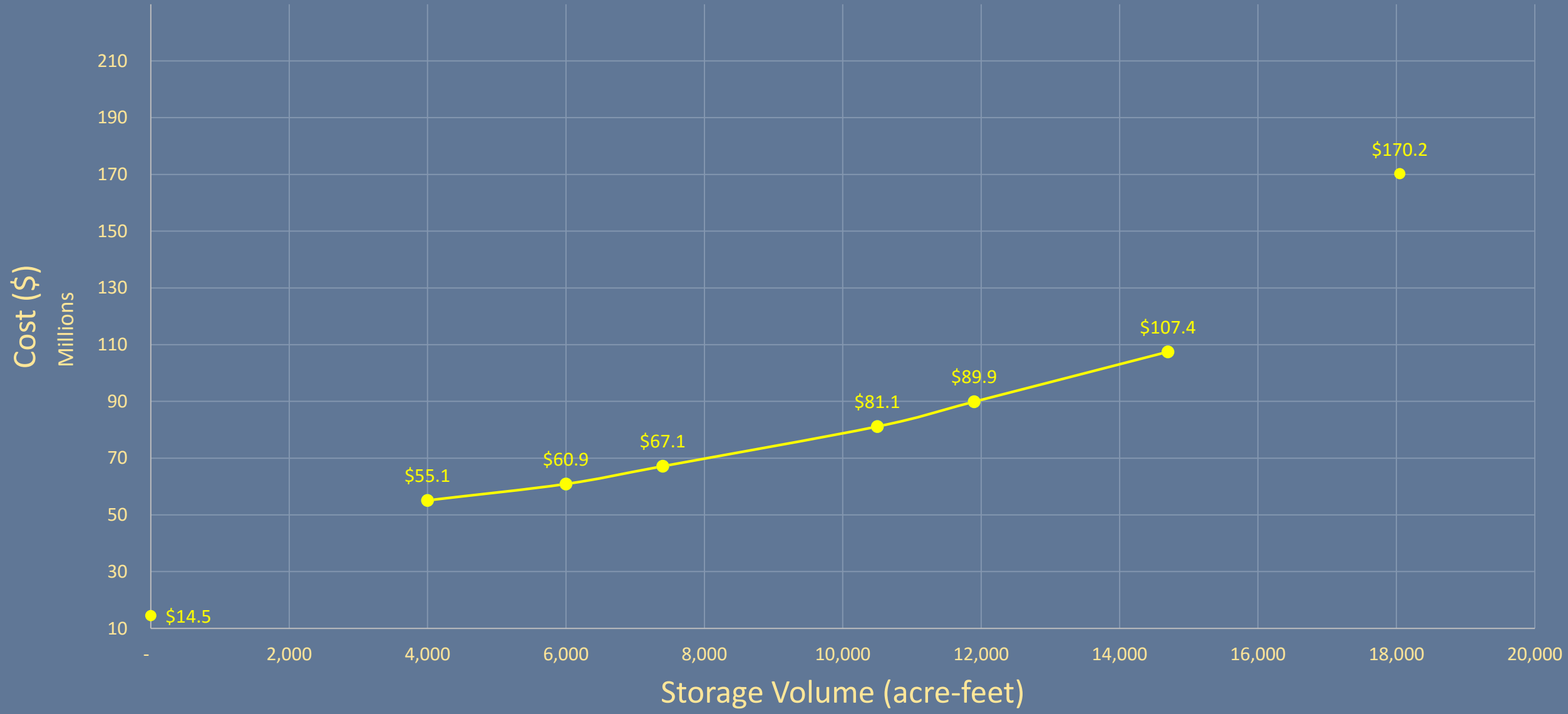


Various Sized Projects

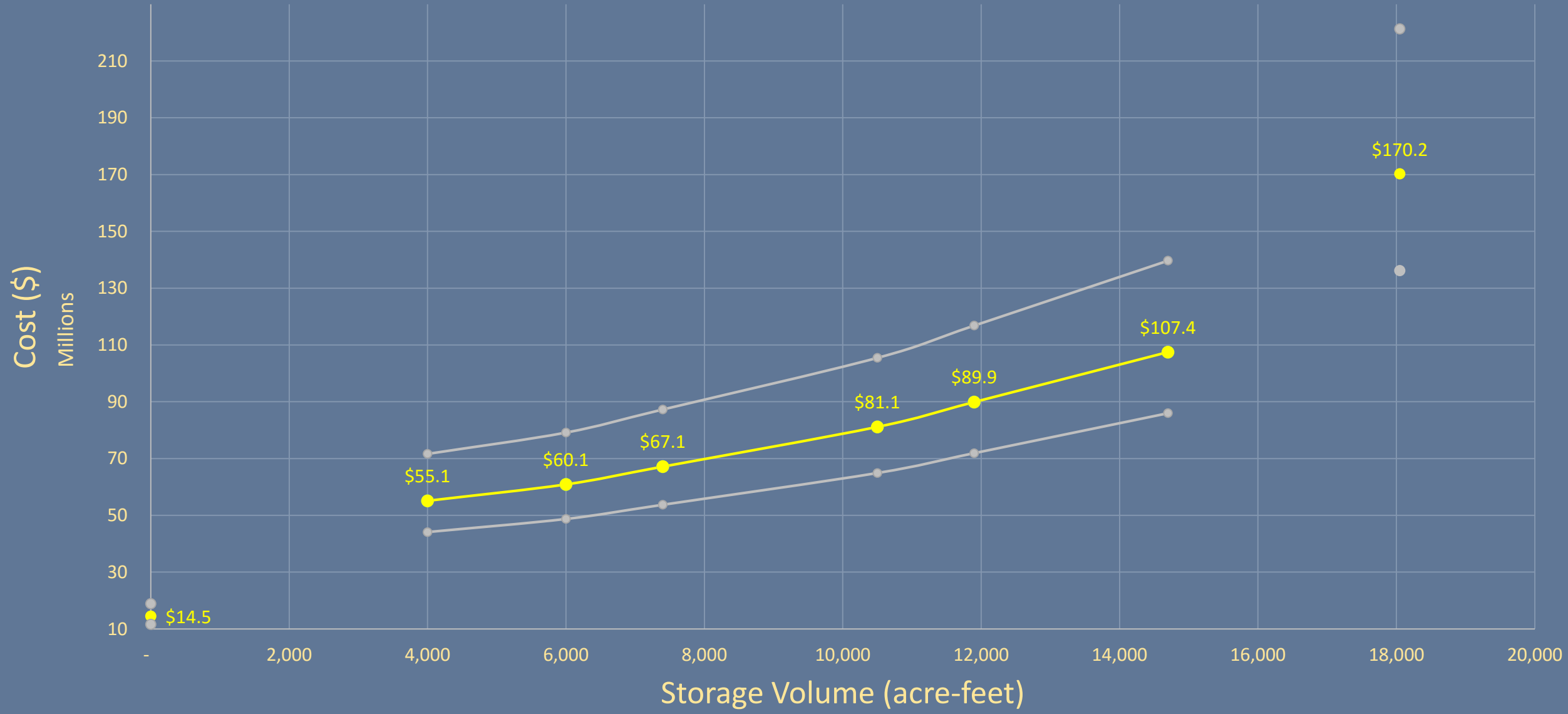
- Opinion of Cost = $55 Million
- 4,000 ac-ft



Base Cost Curve



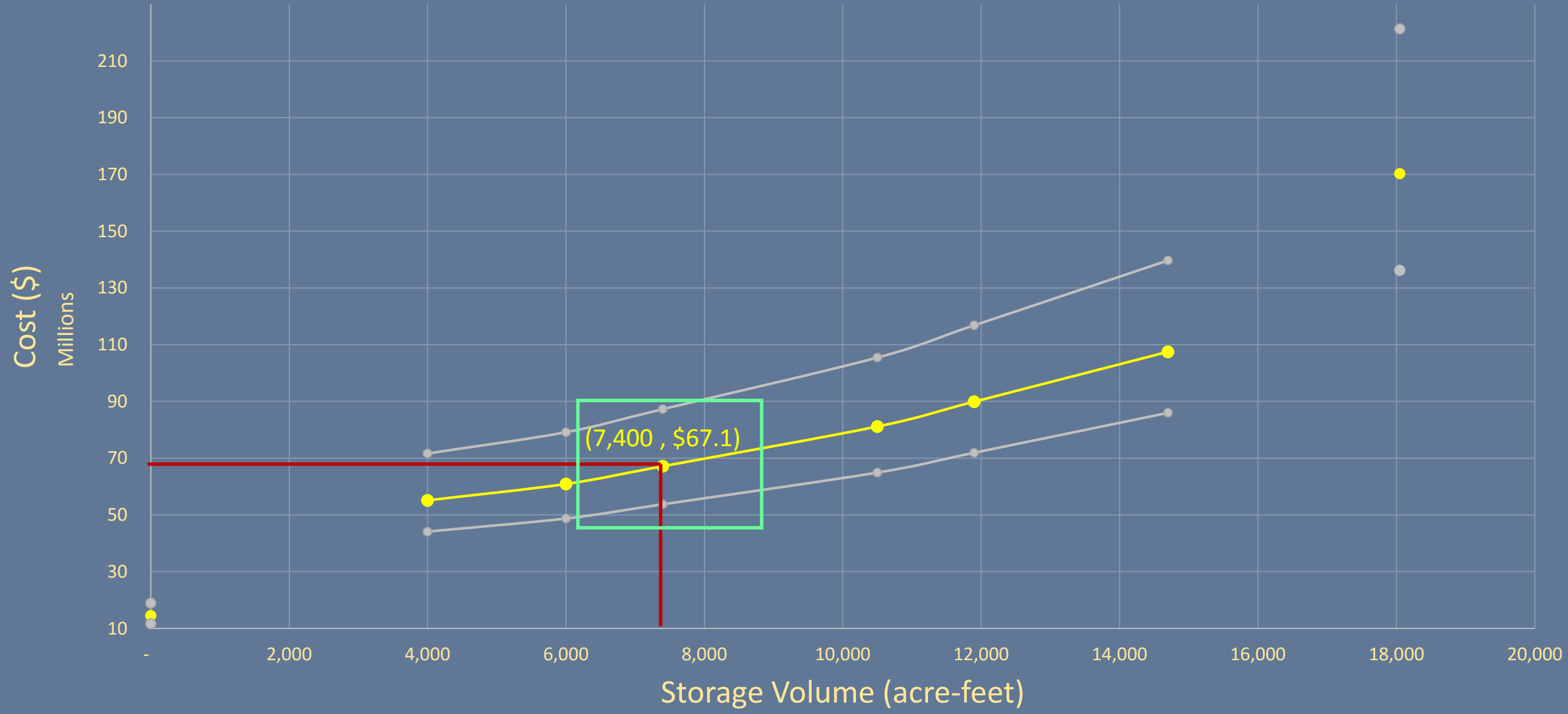
Cost Curve with Band



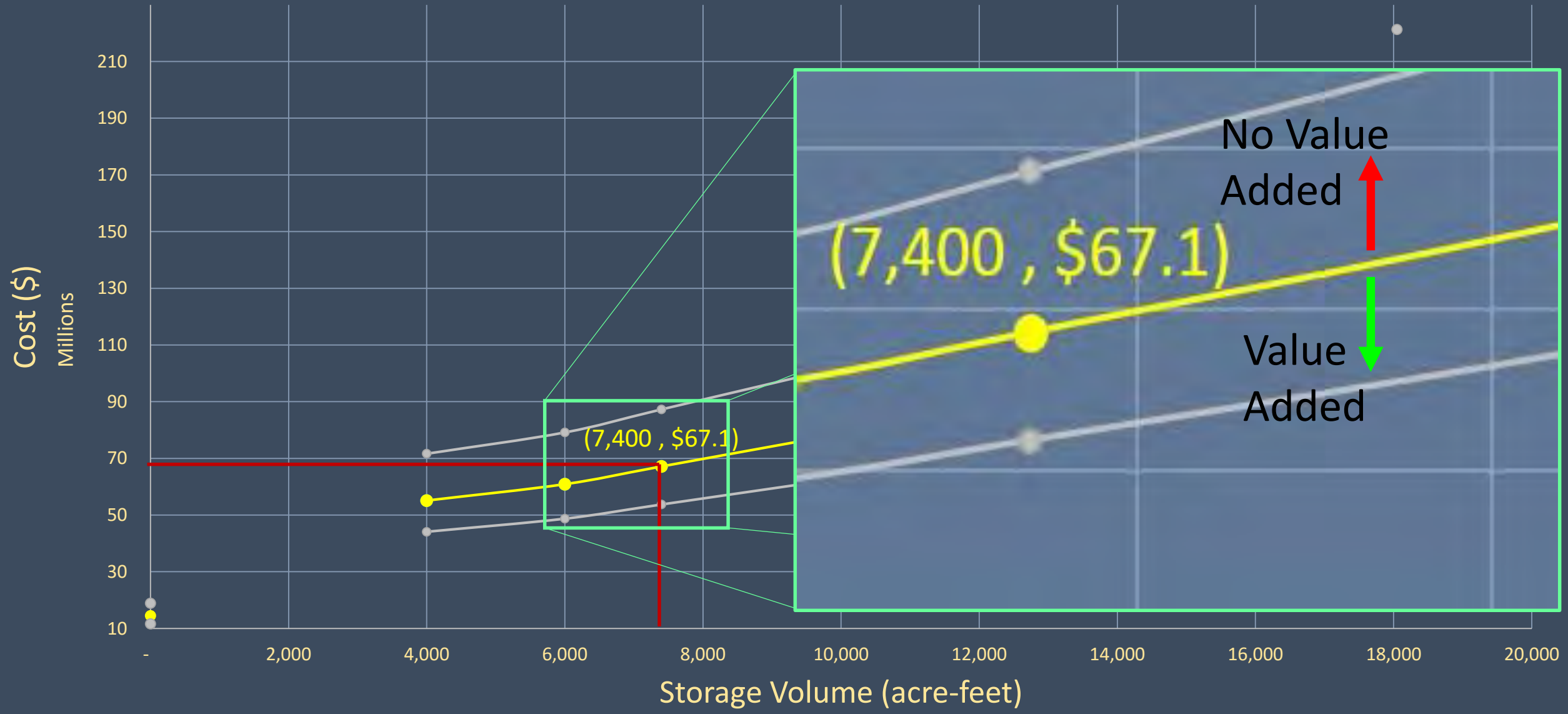
Value Engineering Studies

- Developed Ideas
- Initial Screening of Ideas
- Concept-Level Consideration for Selected Alternatives
- Applied to 7,400ac-ft Concept
- Identified Potential Value

Selected Concept for VE Studies



Value Estimate



Value Engineering Brainstorm

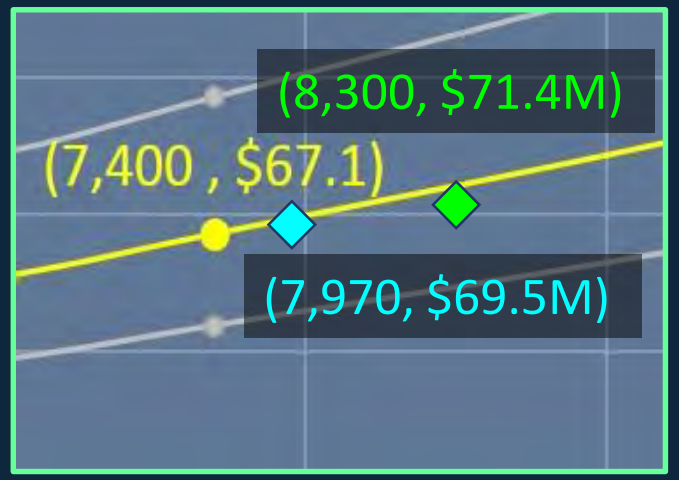
Alt #	Description	Alt #	Description
1	Improve Canal flows to raise the Maximum Water Surface Elevation in Reservoirs (1.8 ft or 3 ft)	8	Omit Liner and rely on natural soils
2	Excavate the Bottom of the Reservoir Lower	9	Modify slope protection: Use Concrete in GeoCell
3	Geomembrane Liner (Covered)	10	Route Reservoir Erosion Protection Channel at toe.
4	Geomembrane Liner (Exposed)	11	Reduce Design Flows on Unnamed Tributary from PMF by using an Incremental Damage Assessment
5	Asphaltic Liner (Exposed)	12	Route PMF of Unnamed Tributary through Canal and add spillway for overtopping.
6	Soil - Bentonite Barrier Wall	13	Dam Unnamed Tributary and pass PMF over spillway
7	Pump In System	14	Route Unnamed Tributary Flood into Plum Creek Basin about 1 mi south of end of Road 437

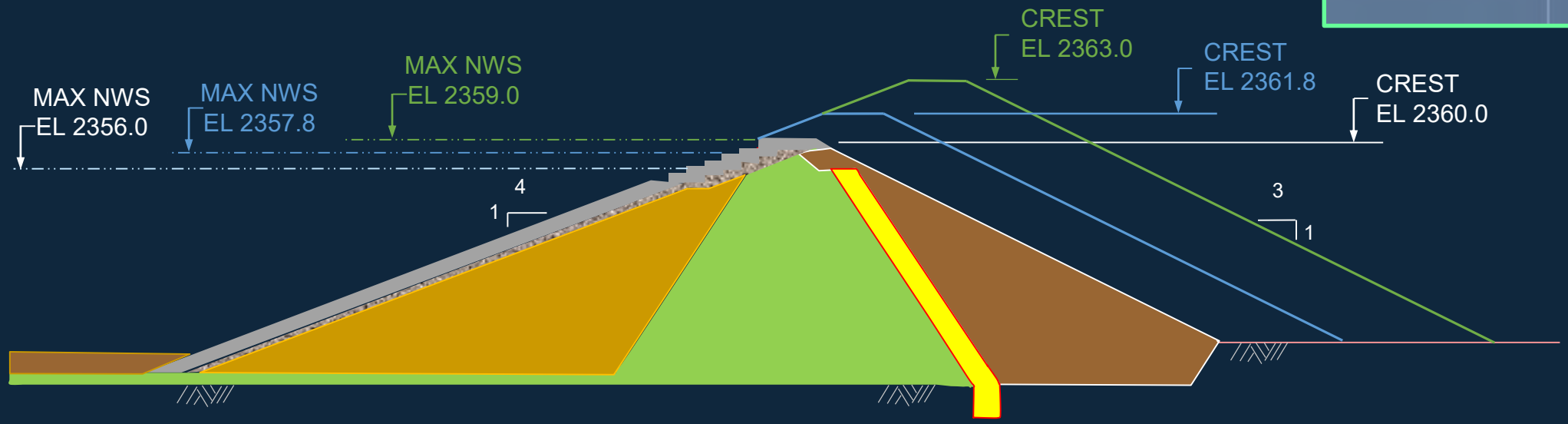
Value Engineering Evaluations

Alt #	Description
1	Raise the Maximum Water Surface Elevation 1.8 ft or 3 ft
2	Excavate the Bottom of the Reservoir Lower
3	Geomembrane Liner (Covered)
4	Geomembrane Liner (Exposed)
5	Asphaltic Liner (Exposed)
6	Soil - Bentonite Barrier Wall
7	Pump In System

Value Engineering Concept – Raise Reservoir

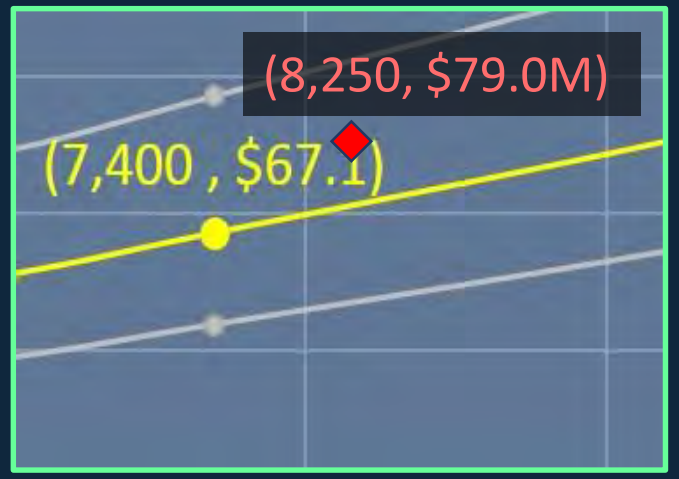
- Raise WSE by Reducing Canal Head Loss
- 1700 cfs up to 2357.8; 500 cfs to 2359.0



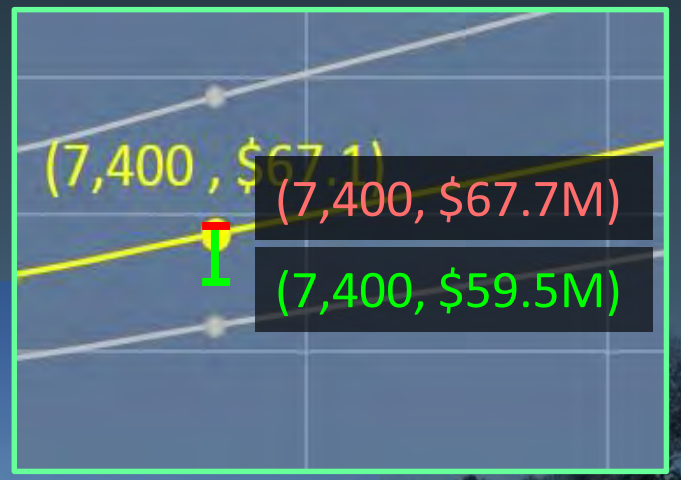


Value Engineering Concept – Lower Reservoir

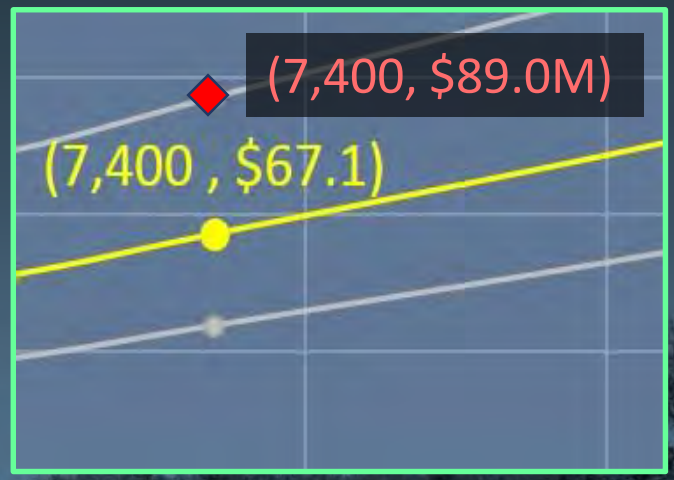
- Increase Reservoir Capacity by Excavating and Lowering Reservoir Liner
- Dewatering costs result in little to no value.



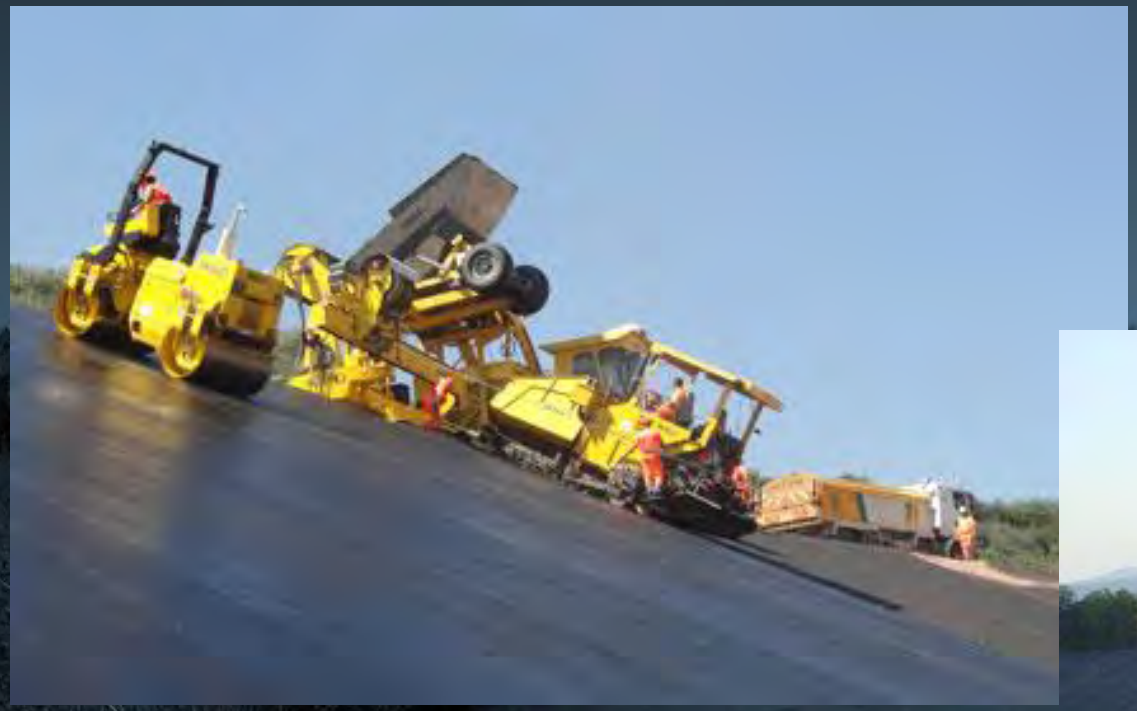
Value Engineering Concept – Geosynthetic (Covered)

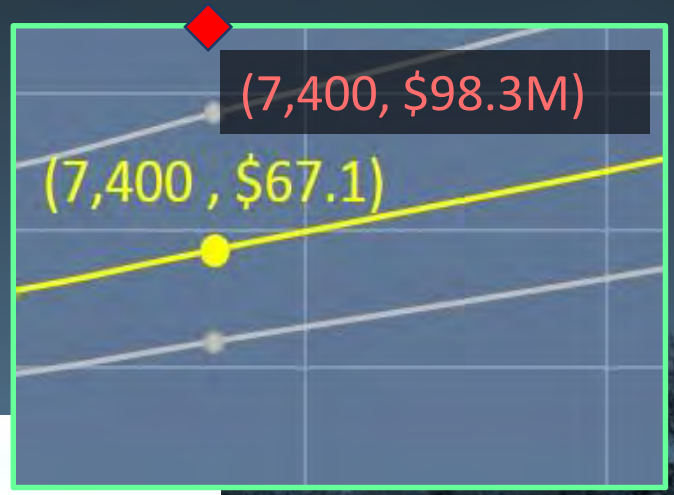


Value Engineering Concept – Geosynthetic (Exposed)

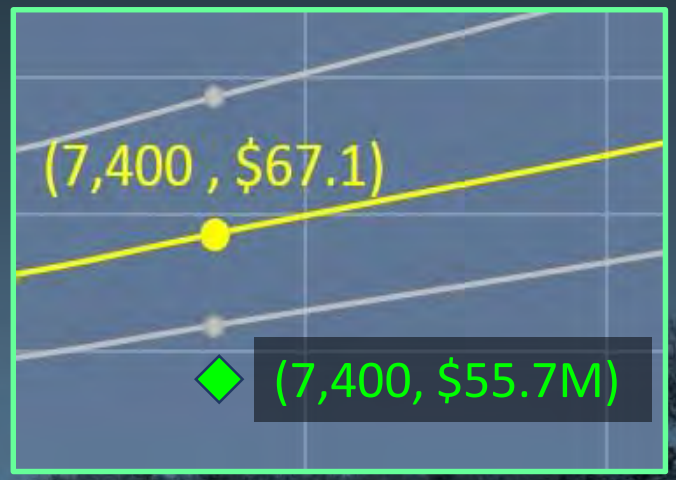


Value Engineering Concept – Asphaltic (Exposed)

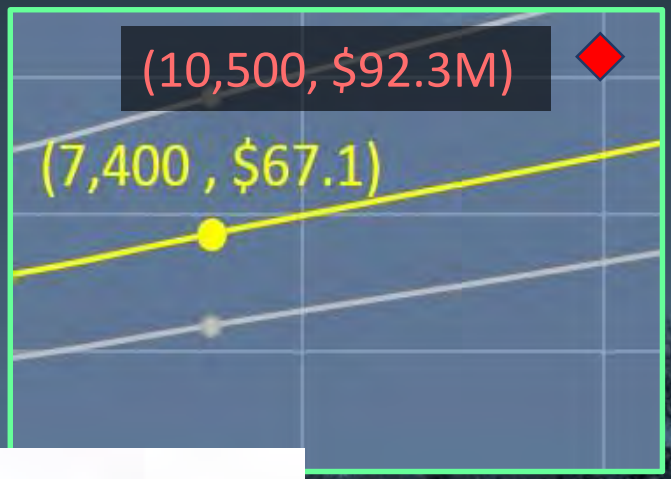




Value Engineering Concept – SB Barrier Wall



Value Engineering Concept – Pump In System



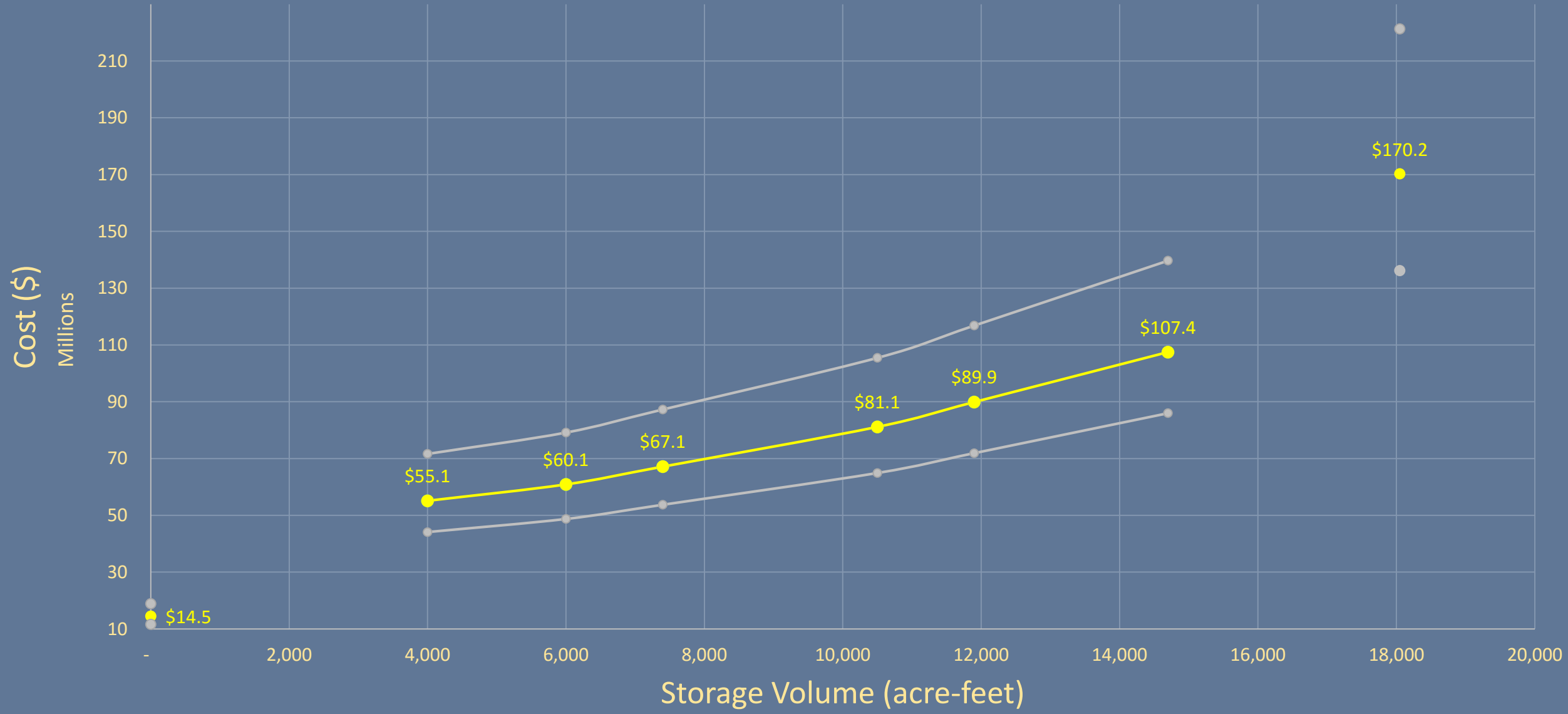
Value Engineering Concepts

Alt #	Description	Conclusion
1	Raise the Maximum Water Surface Elevation 1.8 ft or 3 ft	Minor Potential to Add Value
2	Excavate the Bottom of the Reservoir Lower	Minor potential benefit for top 1-2 ft. Not valuable deeper.
3	Geomembrane Liner (Covered)	Cost Comparable, should carry forward
4	Geomembrane Liner (Exposed)	No Value Added
5	Asphaltic Liner (Exposed)	No Value Added
6	Soil - Bentonite Barrier Wall	Significant Potential for Added Value
7	Pump In System	No Value Added

Advancing the Project

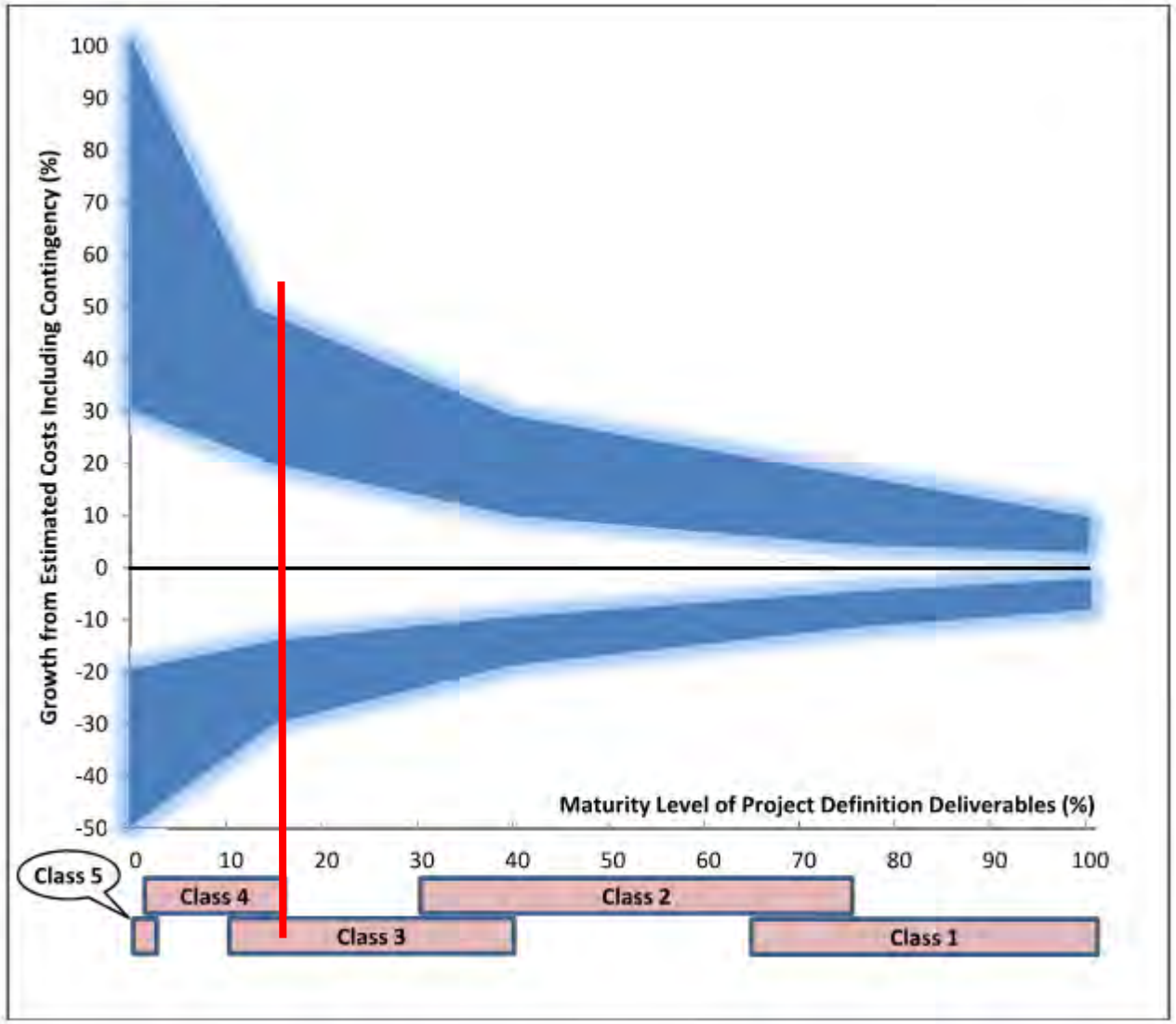
- Approximate Reservoir Size
- Pursue Evaluation of Barrier Wall
  - Geotechnical Investigations / Analysis
  - Allowable Leakage
- Advance Clay Liner & Geosynthetic

Cost Curve with Band



Questions / Discussions

Value Engineering Concept – Lower Reservoir



Value Engineering Concept – Lower Reservoir