LEWISTON-AUBURN
WATER POLLUTION CONTROL AUTHORITY

Woodard & Curran

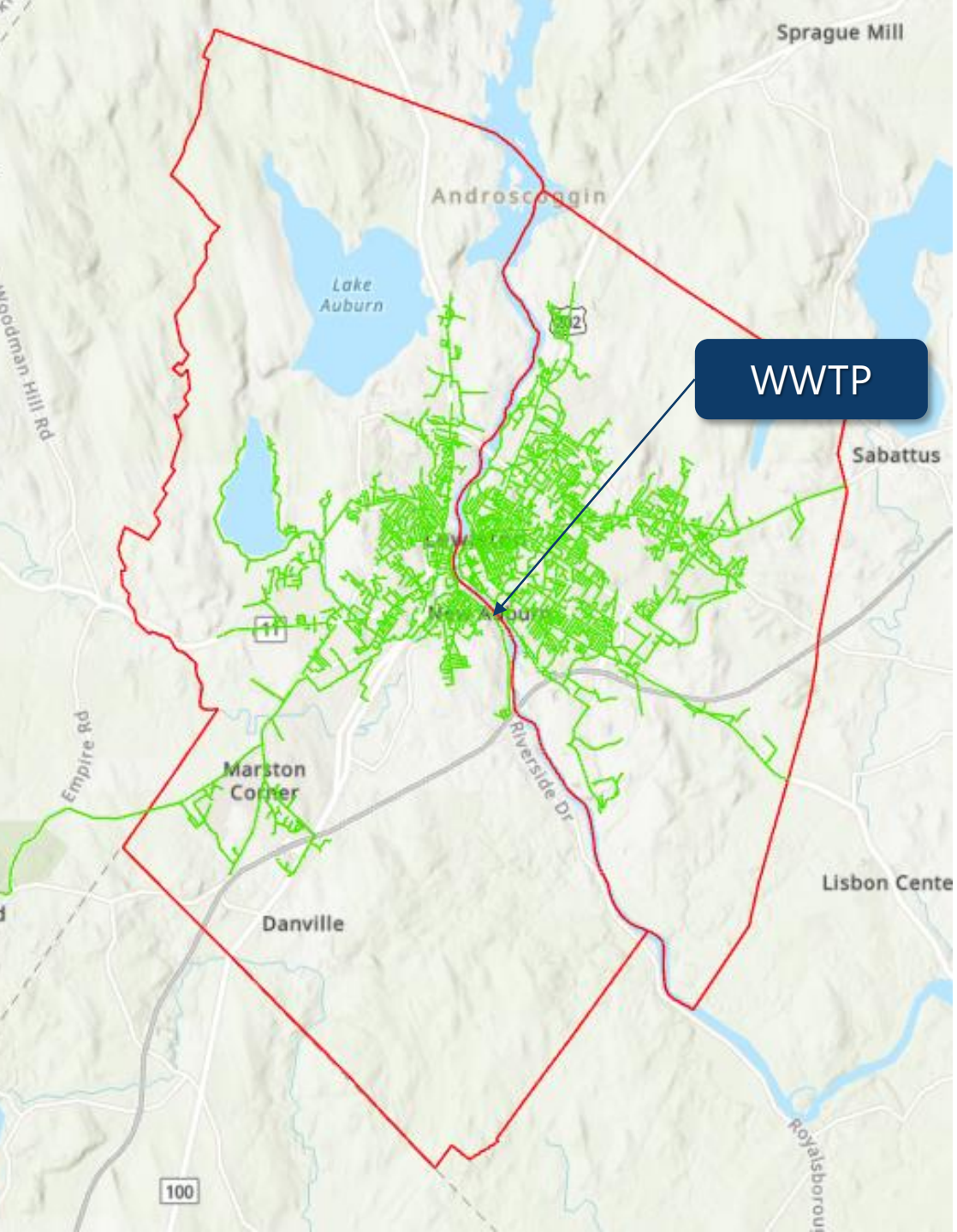
Improving Treatment to Reduce Storage

Erik Osborn, PE
Kevin Trainor, PE

January 24, 2023

Agenda

- → Background
- → Technical Approach
  - Collection System Improvements
  - Treatment Plant Optimization
  - Right-Sized Storage
- → Conceptual Design and Cost Estimating
- → Conclusion



Background – Wastewater Collection & Treatment

- City of Auburn
  - West side of Androscoggin River
  - Pop ~24,000
- Auburn Sewerage District (ASD)
  - ~112 miles collection system piping
  - 4”-54”
  - Crosses Androscoggin River through triple siphon (2x18” 1x24”)
- City of Lewiston
  - East side of Androscoggin River
  - Pop ~37,000
  - ~155 miles collection system piping
  - 4”-6’x12’
- Lewiston Auburn Water Pollution Control Authority (LAWPCA) WWTP
  - Constructed 1971
  - Primary + Secondary + Disinfection
  - 32 MGD Peak Wet Weather Capacity

Background – CSO Abatement Progress (First CWAMP in 1998)

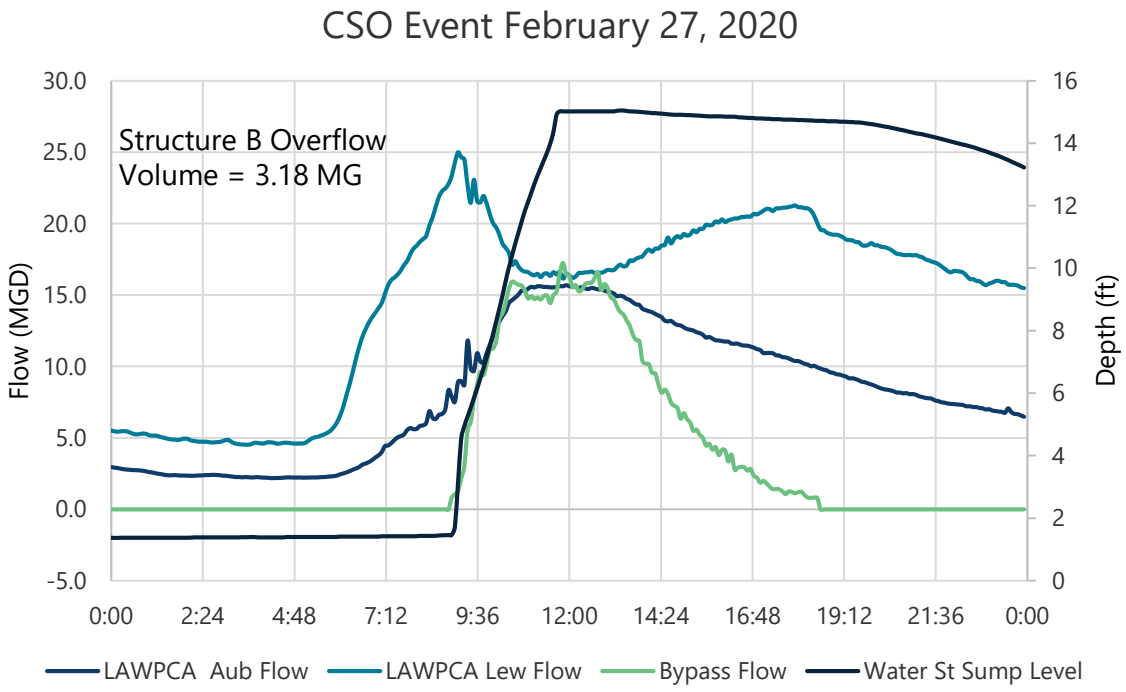
	ASD	Lewiston	LAWPCA
CSO Outfalls (initial)	8	32	1
CSO Outfalls (present)	2	8	1
Annual CSO Volume (MG) 2000	45	100	200
Annual CSO Volume (MG) 2017 – 2021	0.2 – 1.7	8.5 – 23	14.5 – 33.7
Percent Public Roads Separated	100%	96%	NA
Investment in Reduction 2000 – 2021	$22M	$37.5	$3.25
Cost per MG (approx.)	$0.5M	$0.4M	$0.02M

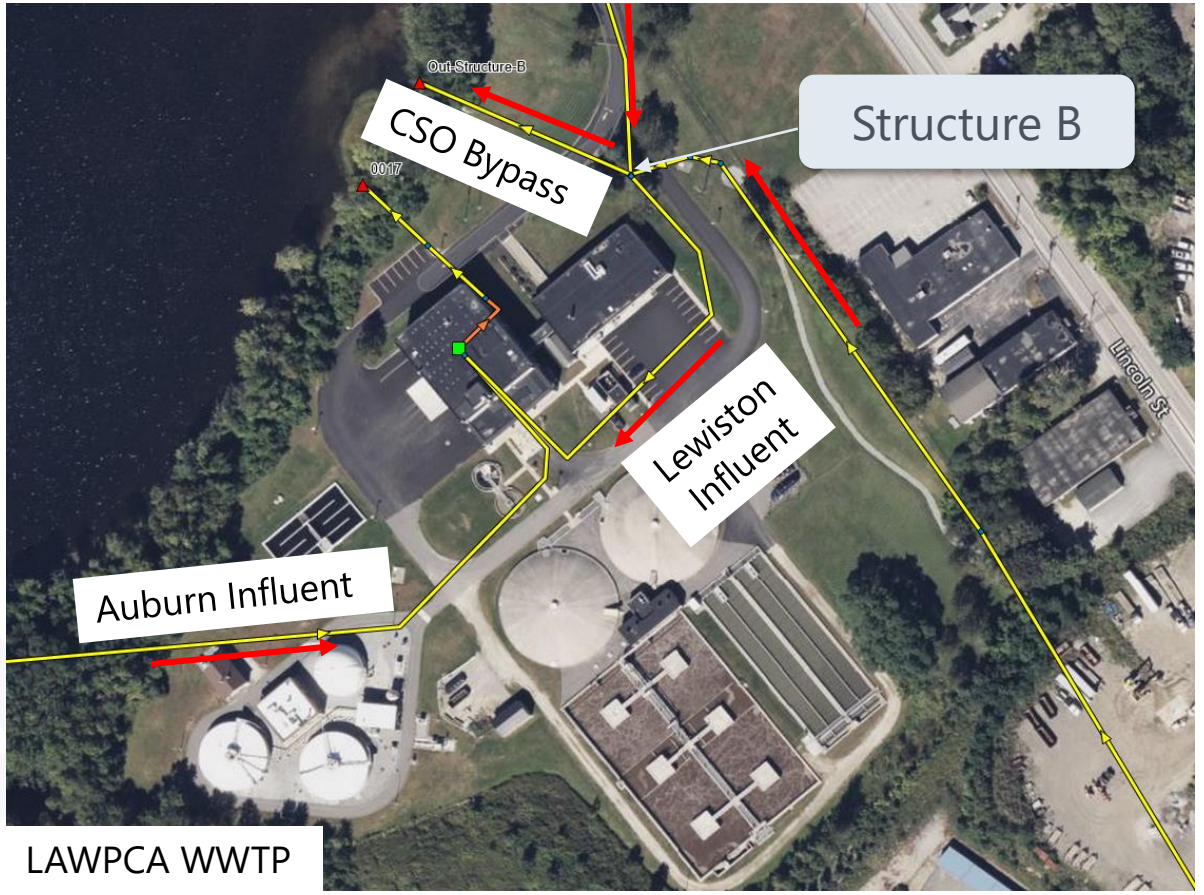
Avg: $0.2M/MG

Next Step - Storage at LAWPCA (3.1 MG)	
Storage Tank	$40+M
Annual CSO Volume Post Project (est.)	0-8 MG
Cost per MG (approx.)	$2+M

Project Objective

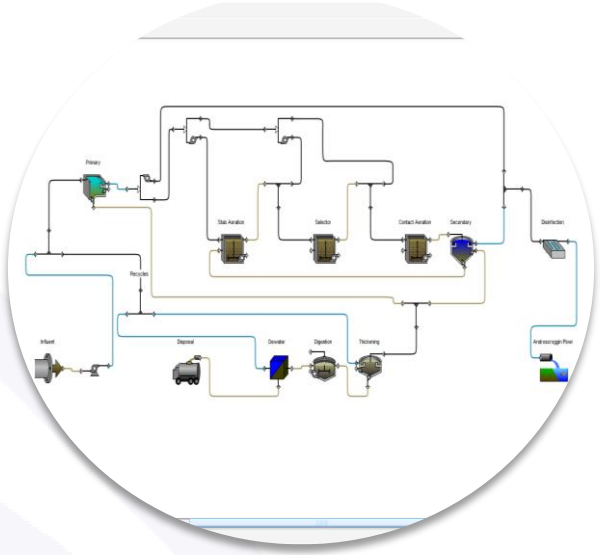
Eliminate overflow at Structure B during 1-year, 6-hour design event: 2.05 inches; 1.6 in/hour

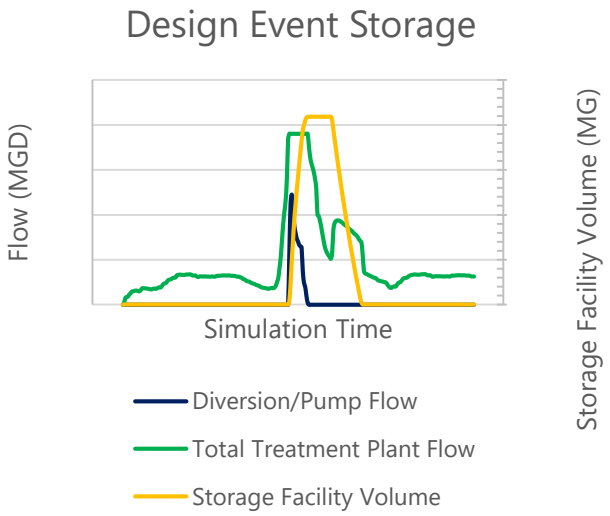




LAWPCA WWTP

Project Approach





Collection System Analysis

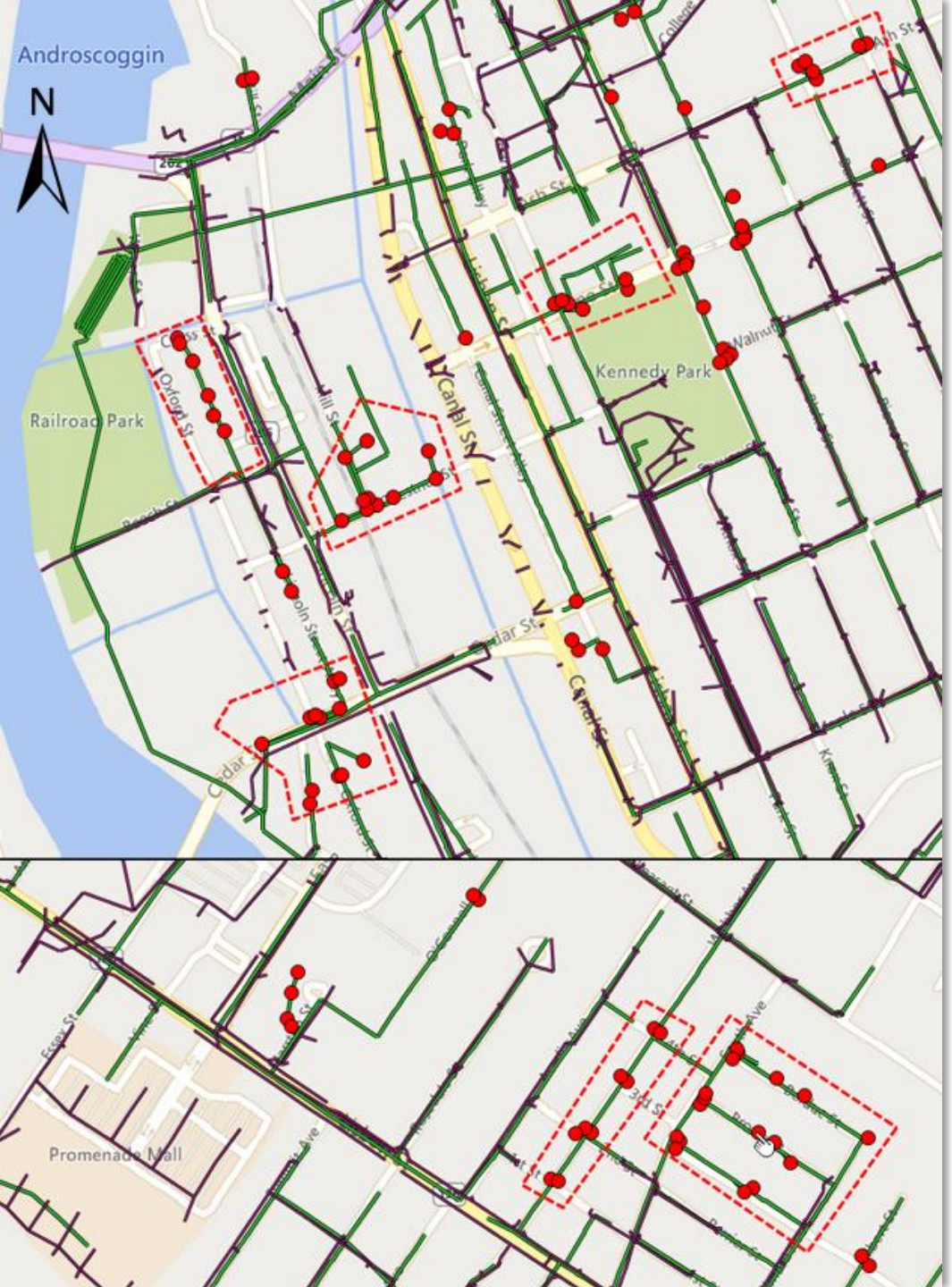
Treatment Plant Optimization

Right-Sized Storage

Best Value [$/MG]

Collection System Analysis

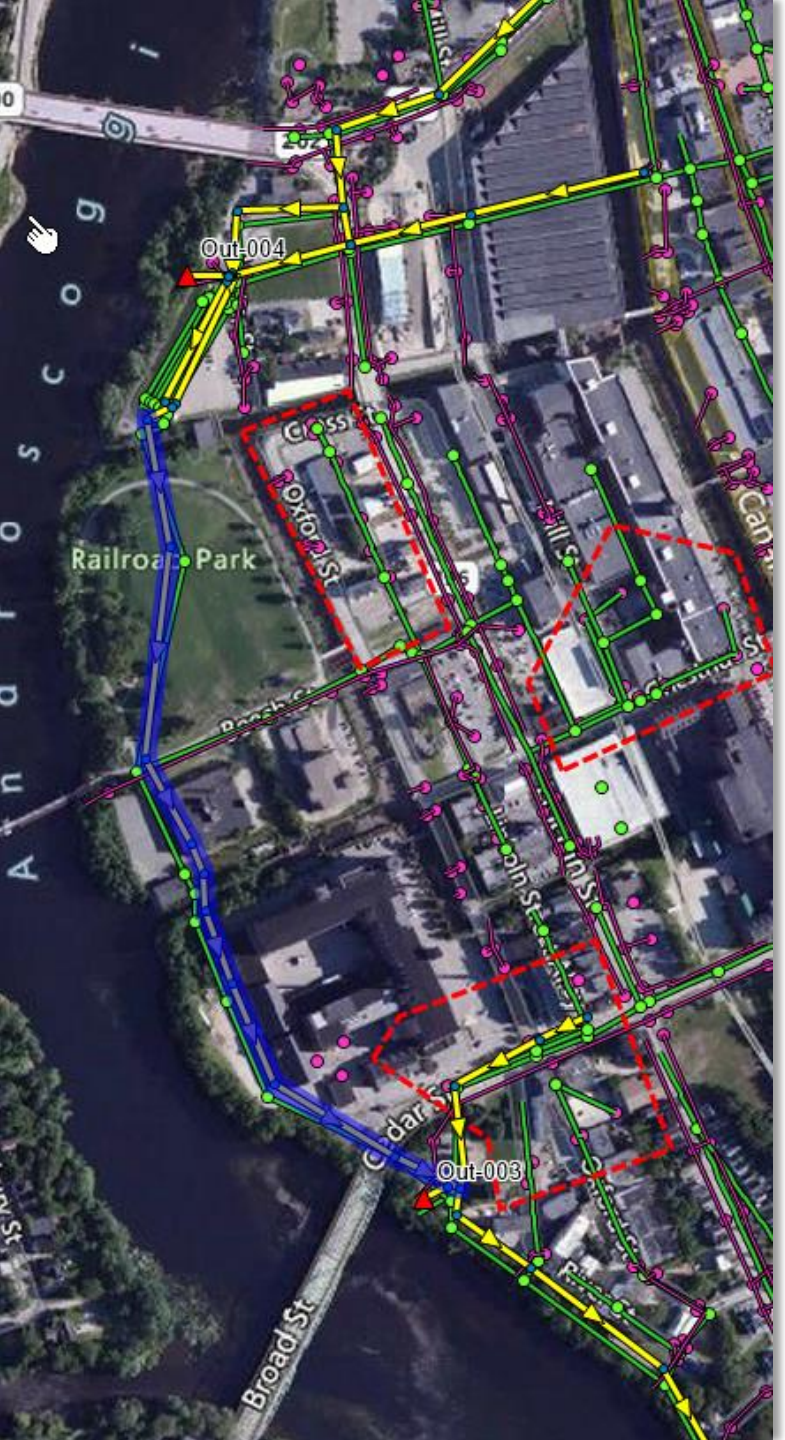
Woodard & Curran



Lewiston Sewer Model Review

Identified Inflow Sources

- → 262 drain structures connected to sewer
- → 41 catch basins scheduled for separation (2019 CWAMP)
- → 62 additional structures identified for potential separation
- → **Up to 0.6 MG CSO volume reduction**



Lewiston Sewer Model Review

Identified pipes with excess capacity during design event

→ Northwood Rd to Jepson Brook (0.07 MG)

→ Railroad Park to Cedar St (0.07 MG)

→ **Up to 0.14 MG CSO volume reduction**

Total Collection System Improvements Cost:

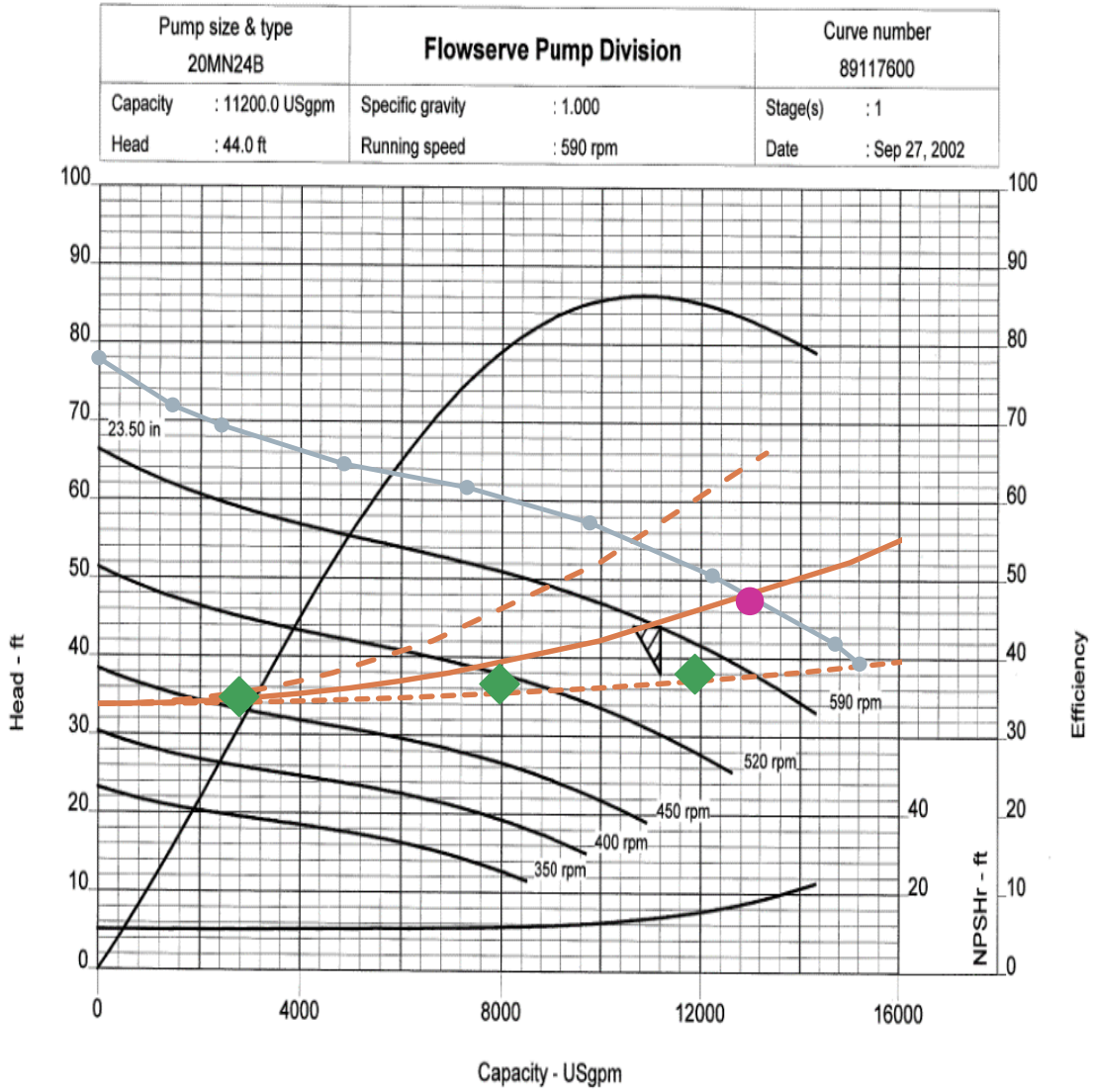
$2.8M; 0.74 MG

Treatment Plant Optimization

Woodard & Curran

Treatment Plant Optimization

- Hydraulic Capacity
  - Influent Pumps
  - Gravity Hydraulics
- Process Capacity
  - Secondary Clarifiers
  - Other Processes
    - Flow meters
    - Influent Screens
    - Grit
    - Primary
    - Chlorine Contact
- Capacity can be increased from 32 MGD to 38 MGD with modest improvements

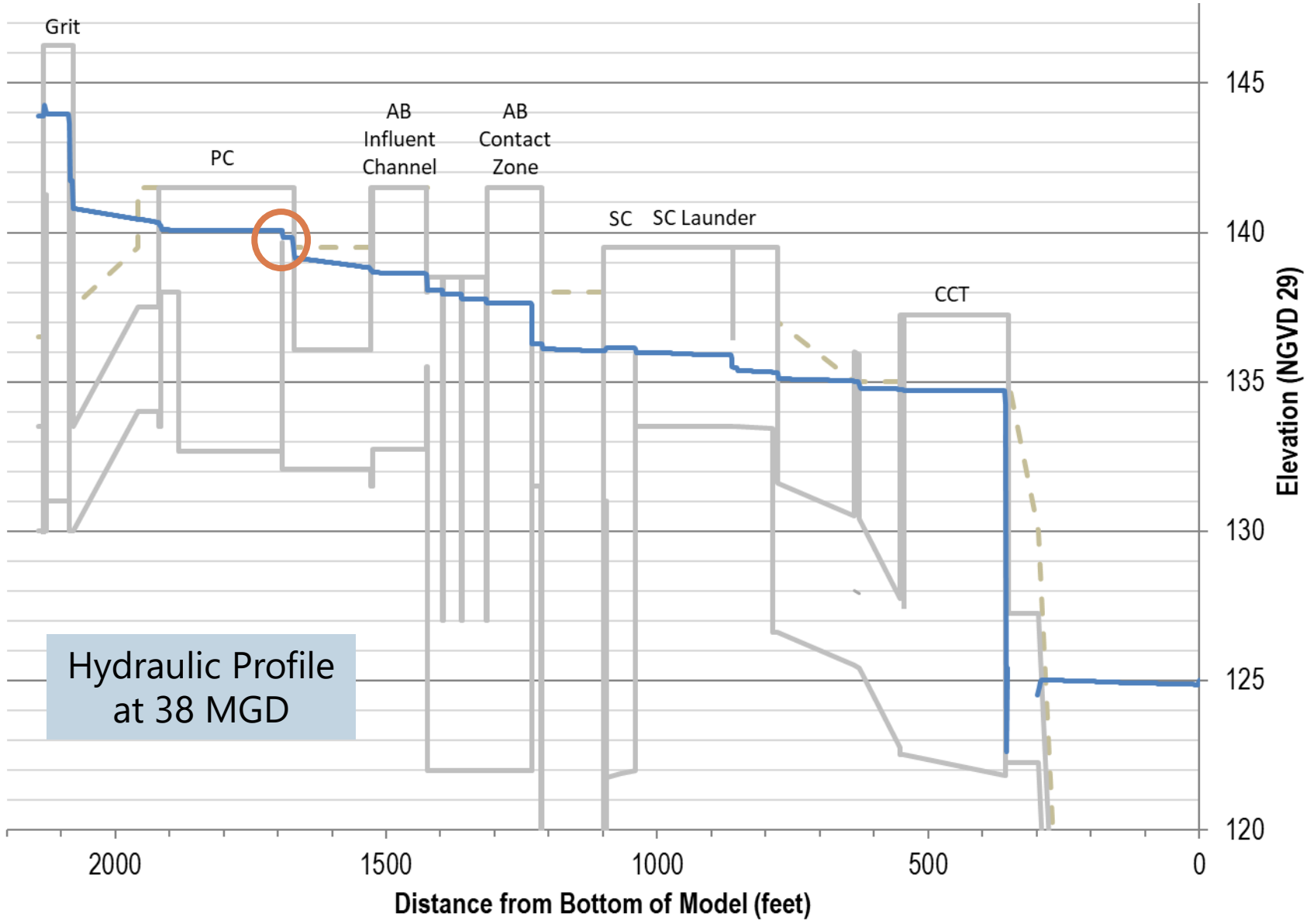


Influent Pumps

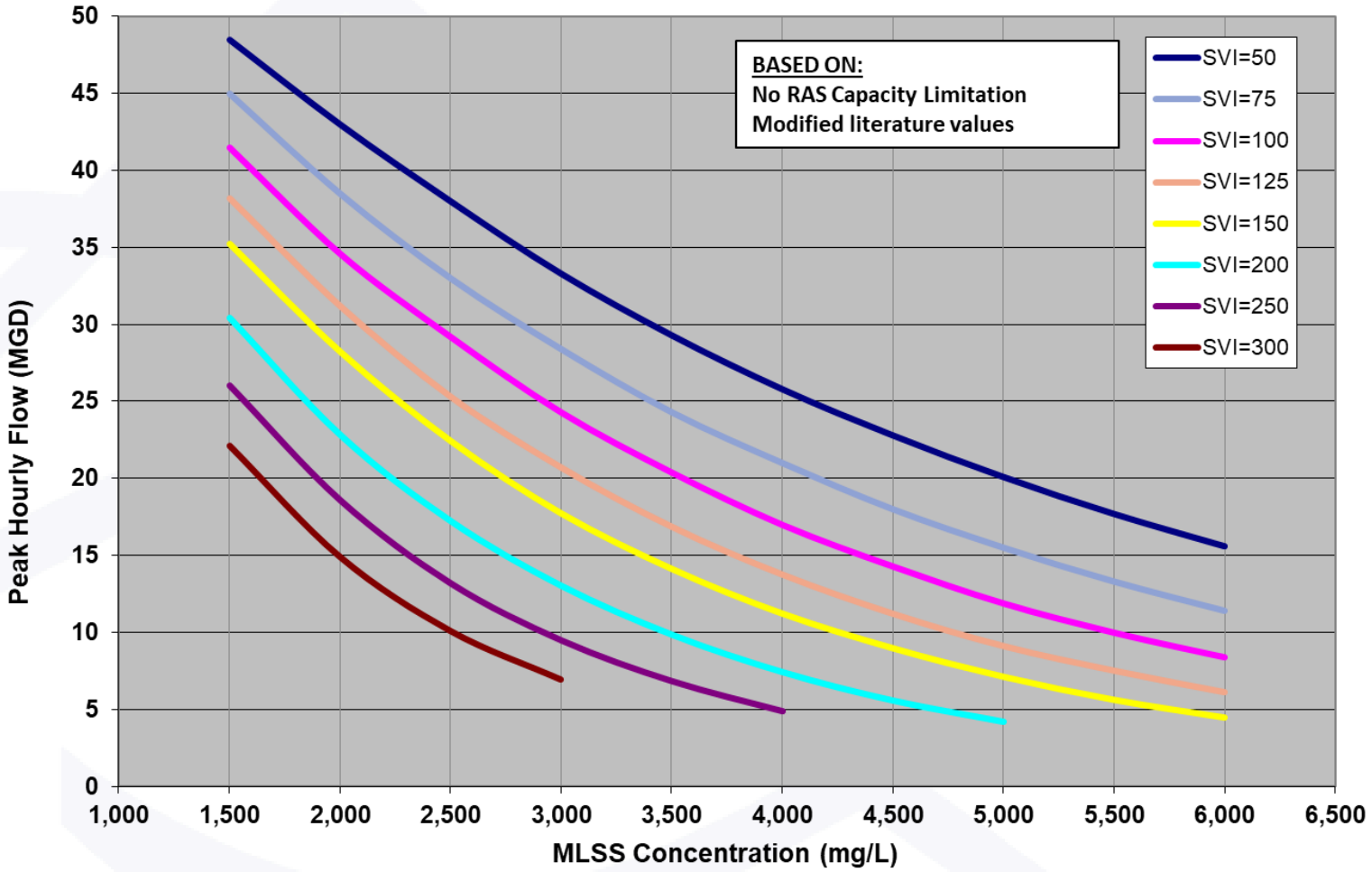
- Three 200 hp pumps
- 32 MGD with two pumps
- Increasing speed achieves 38 MGD
  - 640 rpm, 186 hp
  - Still a good operating point
  - Switch from12 to 10-pole motors
  - Increase speed to 63 Hz
- Other options:
  - Fourth pump (39 MGD)
  - Parallel FM (37 MGD)
  - Fourth Pump and Parallel FM (50 MGD)
  - Larger pumps (45 MGD)

Gravity Hydraulics

- Primary clarifier weir submerges at 36 to 40 MGD
  - Operators observe this occurs at 33 MGD
  - Investigate possible blockage of PE pipe
- Could push the plant to 43 to 47 MGD
  - Scum systems are submerged



Secondary Clarifiers



→ Clarifier operating diagram based on modified state-point equation

Secondary Clarifiers

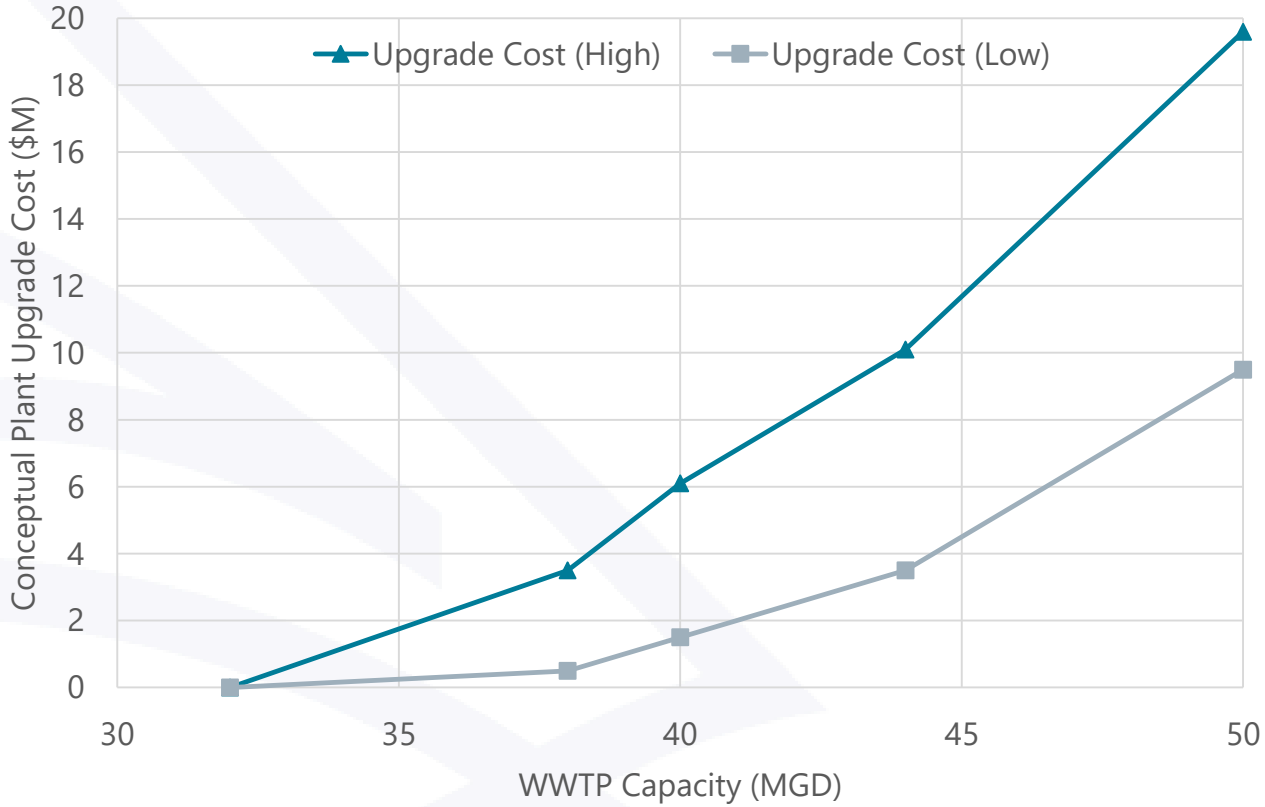
	Sludge Volume Index (g/mL)		
	100	125	150
Mixed Liquor Concentration (mg/L)	Secondary Clarifier Peak Hour Flow Capacity (MGD)		
1000	49	46	43
1500	42	38	35
2000	35	31	28
2500	29	25	22

- Process optimization can achieve 38 MGD clarifier capacity
  - wet weather contact stabilization
  - chemical addition
  - selector optimization
- Capital improvement required for higher flows
  - Intensification
  - Additional Clarifier

Other Processes

- Influent Flow Meters
  - currently being evaluated
- Influent Screens
  - design underway for new multi-rake screens
- Grit
  - 38 to 76 MGD capacity
- Primary
  - 44 MGD nominal capacity based on surface overflow rate
  - consider baffling or chemical addition
- Chlorine Contact
  - 38 MGD (15 min contact time)
  - 42 MGD (upstream dosing)
  - Increase doses of hypo & bisulfate

Conceptual Plant Upgrade Cost

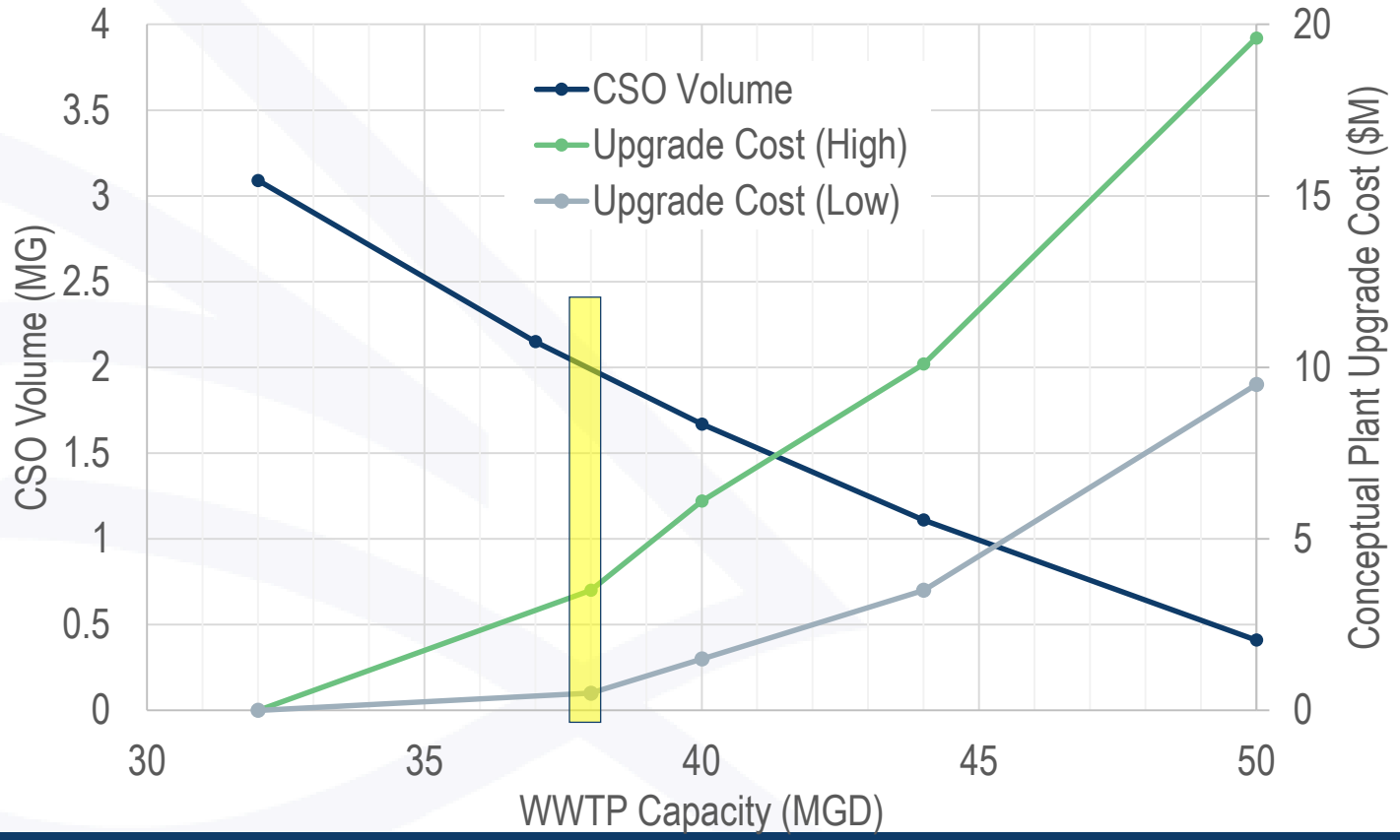


Right-Sized Storage & Alternatives Analysis

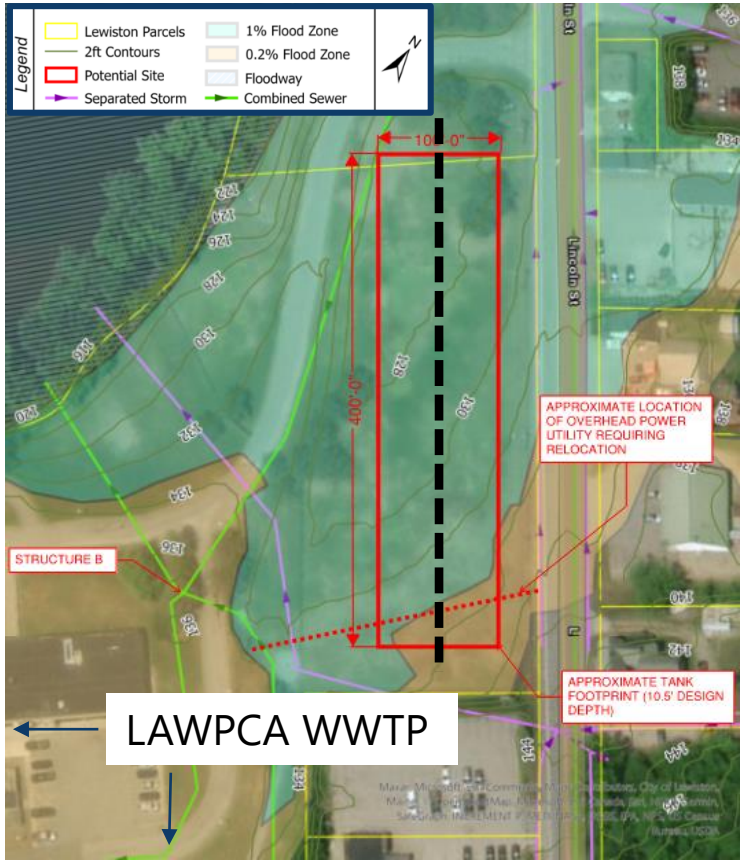
Woodard & Curran

Treatment Plant Capacity vs Storage Size

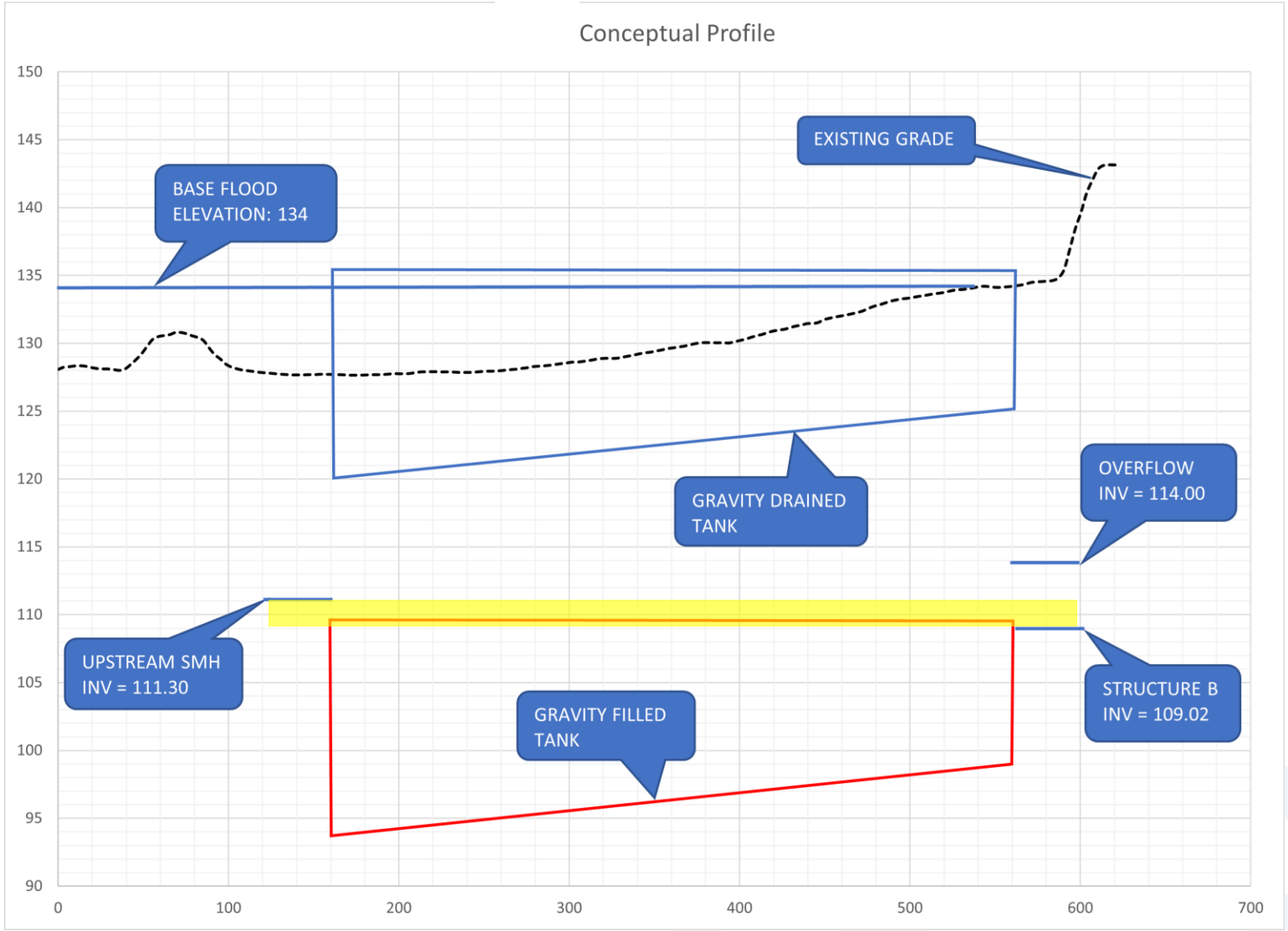
CSO Volume Required Without Plant or Collection System Improvements: 3.1 MG



Gravity vs. Pump



Conceptual Layout - LAWPCA parcel

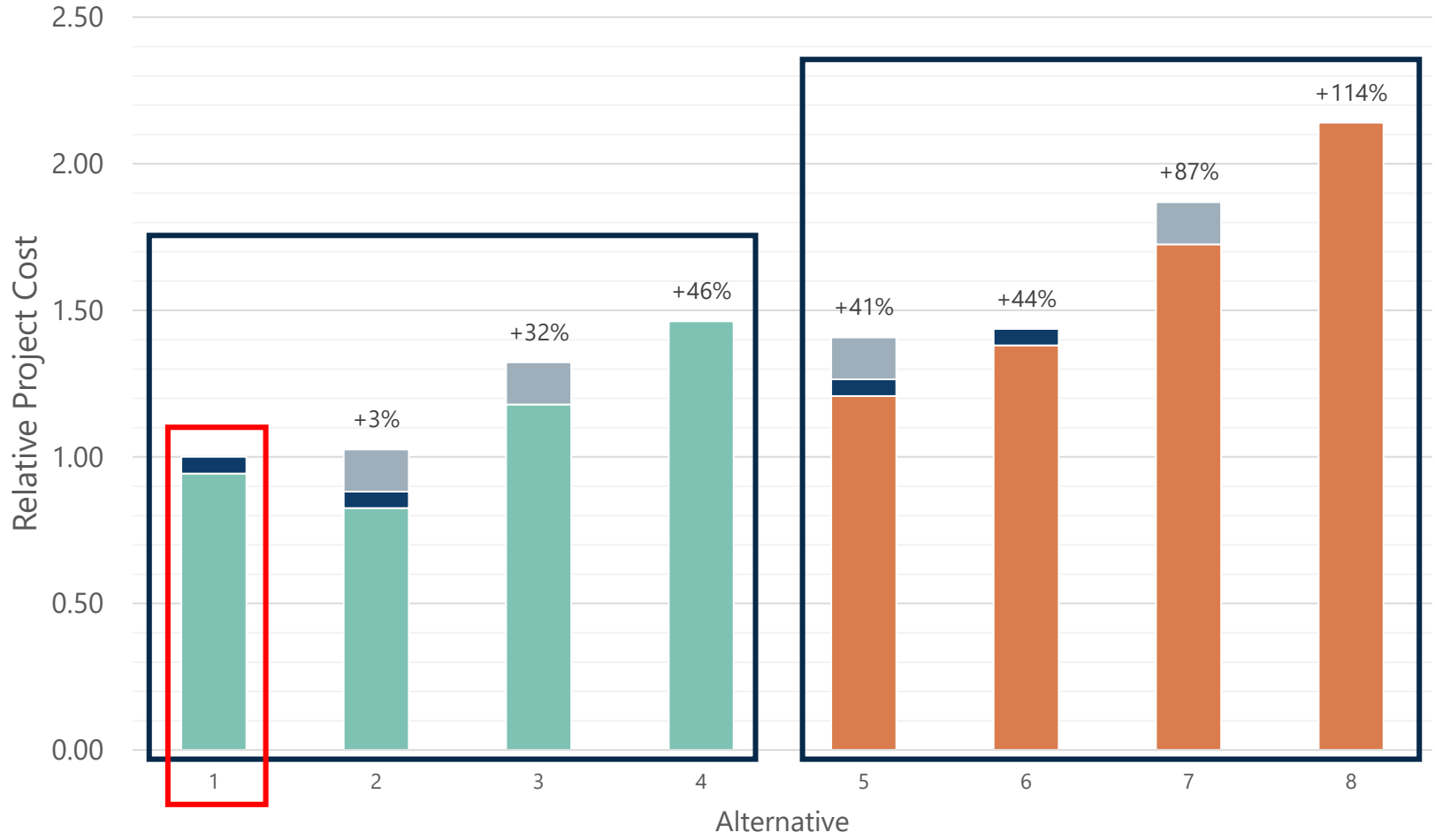


Woodard & Curran

Alternatives Evaluated

Scenario	Treatment Plant Capacity	Collection System Improvements	Tank Depth	Pumping	Tank Volume (MG)
1	38	No	Shallow	Required to fill	2.1
2	38	Yes	Shallow	Required to fill	1.75
3	32	Yes	Shallow	Required to fill	2.5
4	32	No	Shallow	Required to fill	3.1
5	38	Yes	Deep	Required to empty	1.75
6	38	No	Deep	Required to empty	2.1
7	32	Yes	Deep	Required to empty	2.5
8	32	No	Deep	Required to empty	3.1

Alternatives Cost Comparison



- Collection System Improvement Project Costs
- Treatment Plant Optimization Project Cost
- Deep Tank Project Cost
- Shallow Tank Project Cost

Note: Project costs include design, permitting, CA, construction contingency, and Owner's contingency

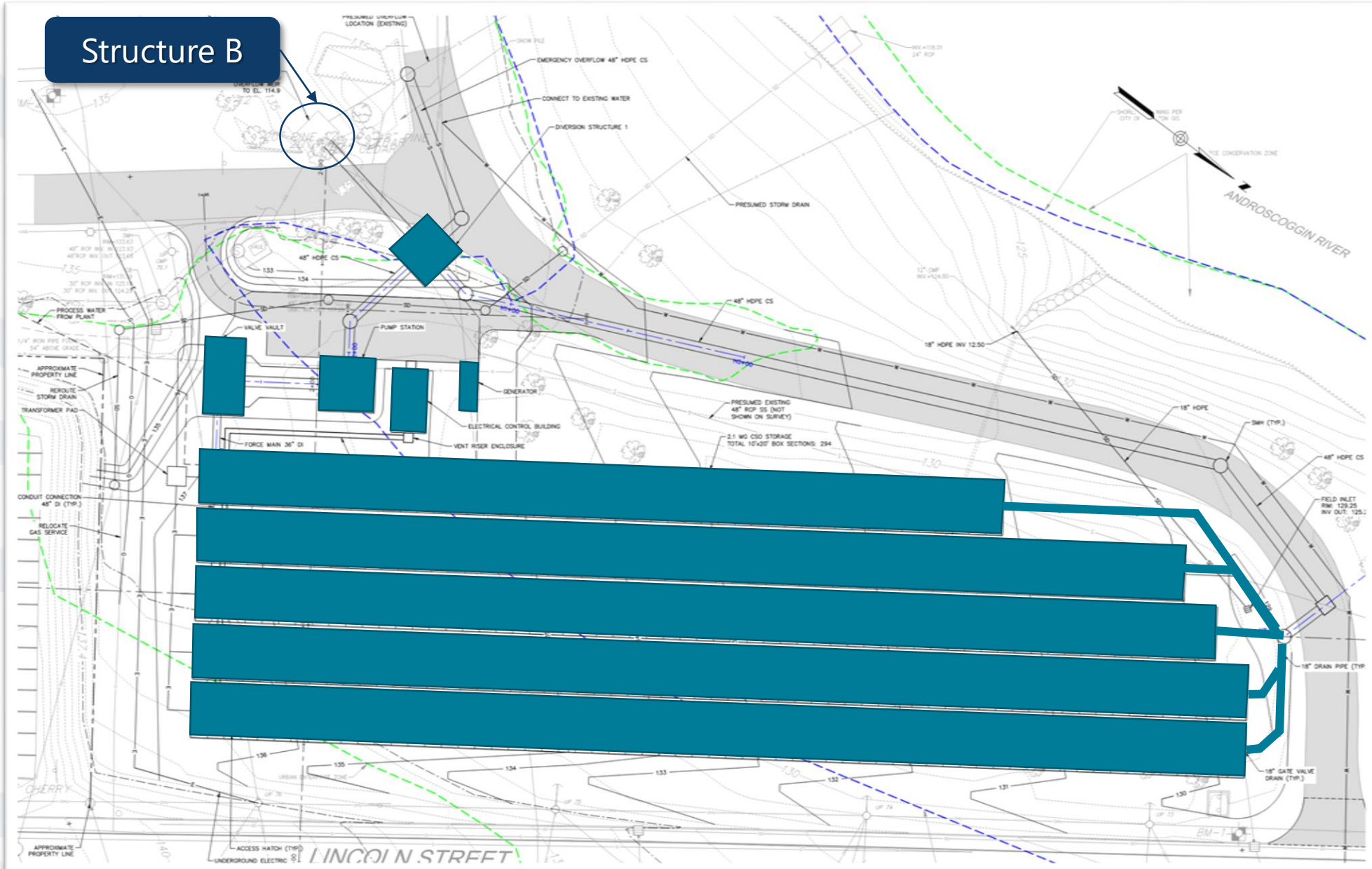
Woodard & Curran

Conceptual Design & Cost Estimate

Woodard & Curran

Conceptual Design Layout

- DIVERSION STRUCTURE
- WET WELL & PUMP STATION
- VALVE VAULT
- STORAGE CONDUITS
- DRAIN GATES & PIPING
- ELECTRICAL BUILDING & GENERATOR

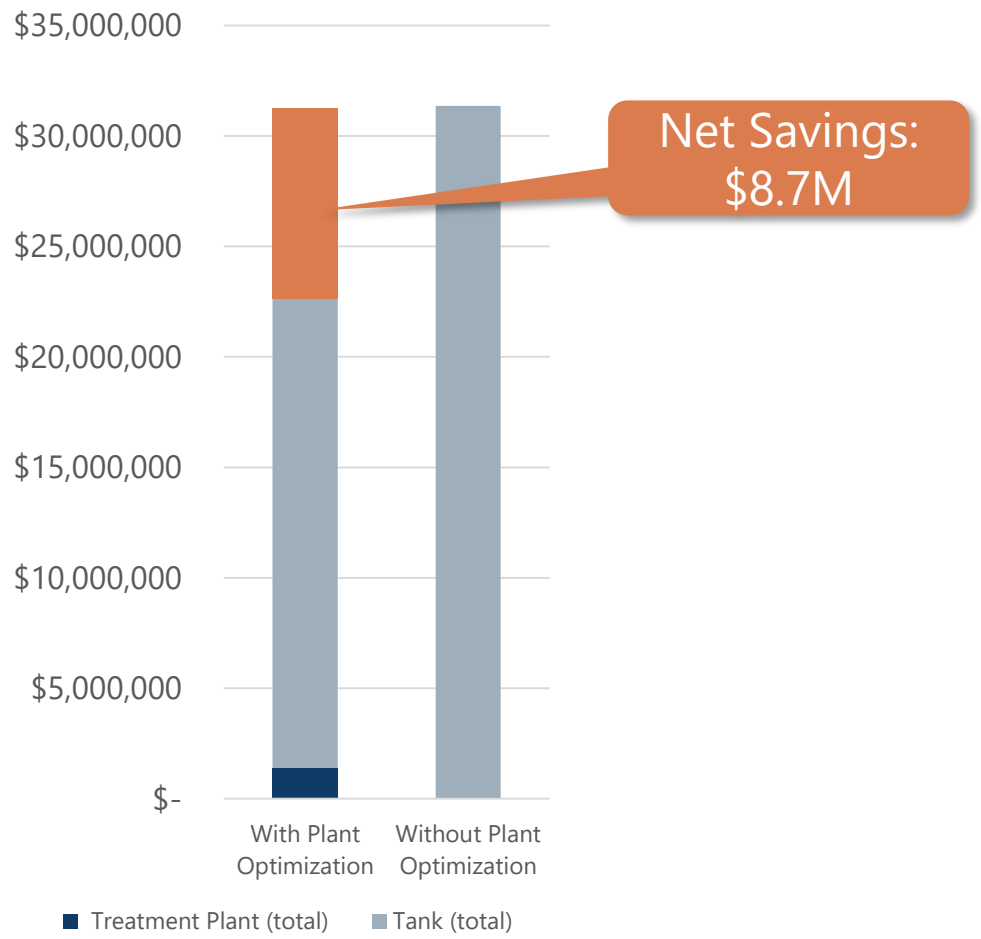


Opinion of Probable Project Cost

Project Component	Estimated Cost
Storage Conduit & Piping	$16,370,000
Pump Station & Valve Vault	$2,980,000
Electrical Building, Equipment, & Site Utilities	$1,950,000
Treatment Plant Optimization	$1,400,000
Estimated Total Project Cost	**$22,700,000**

Note: Project costs include design, permitting, CA, construction contingency, and Owner's contingency

Next Step - Storage at LAWPCA		
Option	Project Cost	Approx. Cost/MG Abated
3.1 MG Deep Storage Tank	$40+M	$2M/MG
3.1 MG Shallow Storage Tank	$31.4M	$1.6M/MG
2.1 MG Shallow Storage Conduits	$22.7M	$1.1M/MG



Conclusion

- Early phases of LTCP attack low-hanging fruit
- Costs per gallon abated only increase
- As the investment gets bigger, more detail is warranted
- **If spending $1.4M can save $8.7M, it's worth looking closer**

Contact Info:

Kevin Trainor – ktrainor@woodardcurran.com

Erik Osborn – eosborn@woodardcurran.com

Thank You!