ALTERNATIVE METHODS of INCREASING FLOW in a GROWING CITY

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AGENDA

- PROJECT BACKGROUND
- EXISTING SYSTEM AND CONSTRAINTS
- ALTERNATIVE ANALYSIS
- FINDINGS AND CONCLUSION
- SUMMARY

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PROJECT BACKGROUND

- A City in South Texas is experiencing rapid growth
- Need to increase accessible water from 15 MGD to 20 MGD
- Completed a hydraulic analysis to examine alternatives

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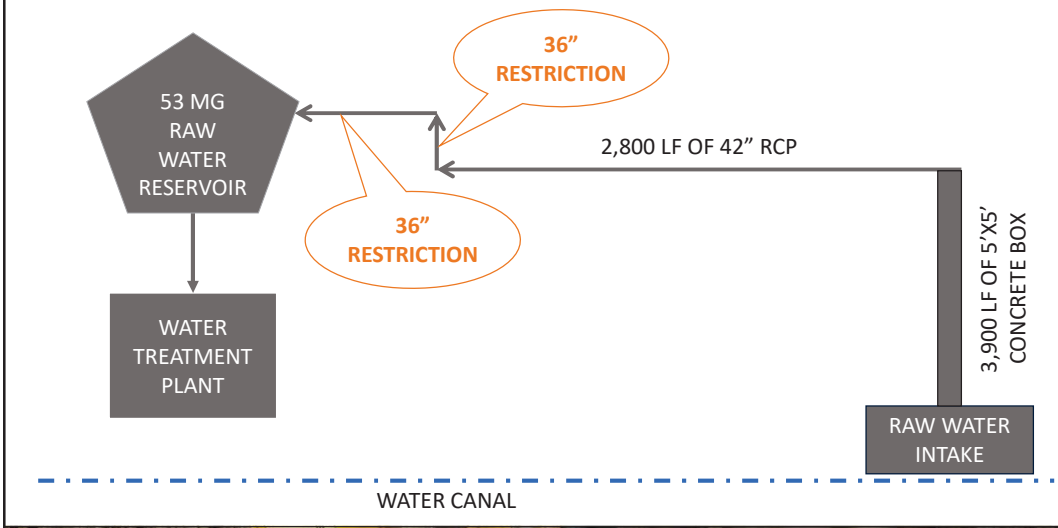
EXISTING SYSTEM AND CONSTRAINTS



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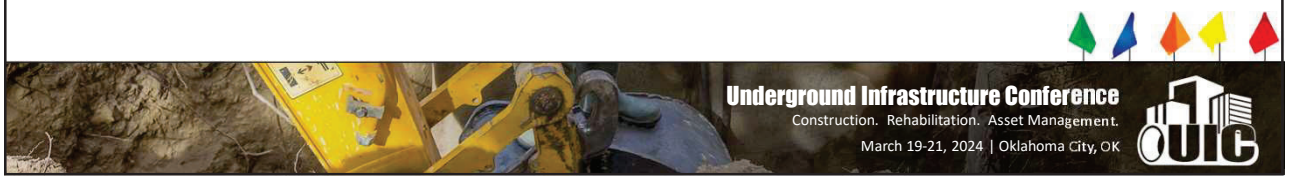
EXISTING SYSTEM AND CONSTRAINTS

- Entirely gravity fed, flow can only be increased with modifications
- Existing concrete box is in poor condition, with previous leak repairs
- Very limited information and access points are paved over, so inspection is difficult
- Inspection requires conveyance system be offline for extended period



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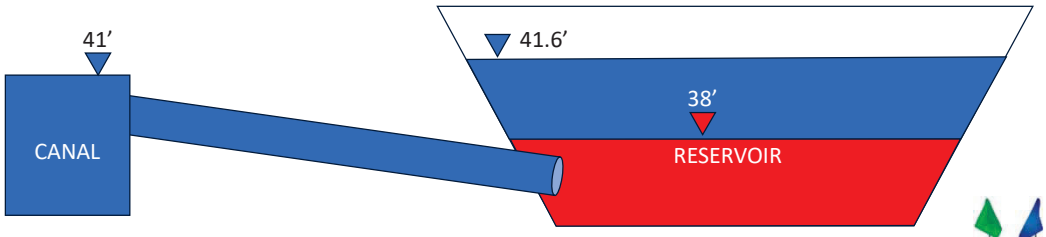
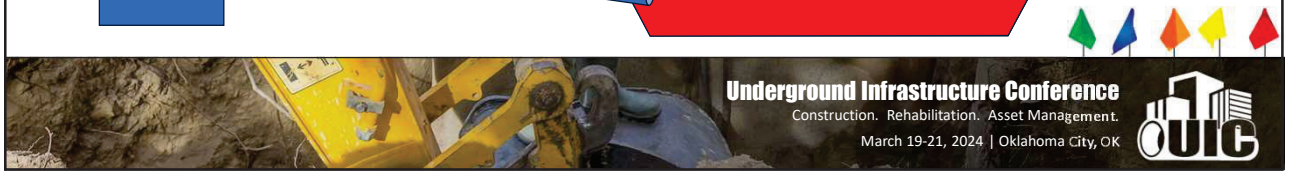
EXISTING SYSTEM AND CONSTRAINTS

- Intake Elevation – WSEL 41’
- Outfall Elevation – Max WSEL 41.6’
- Water Quality Elevation – WSEL 38’





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ALTERNATIVE ANALYSIS

Alternative 1 (Proposed & Parallel)	Alternative 2 (Facilities, Replacement, and Rehab)	Alternative 3 (Minor Replacement and Rehab)
Intake Structure	Intake Structure	Intake Structure
Wet Well Pump Station	Wet Well Pump Station	Rehabilitation of 5'x5' Concrete Box
36-inch Pipe	Standpipe	Replacement of 42" RCP with 48" DIP
	Rehabilitation of 5'x5' Concrete Box	
	Replacement of 42" RCP Pipe	

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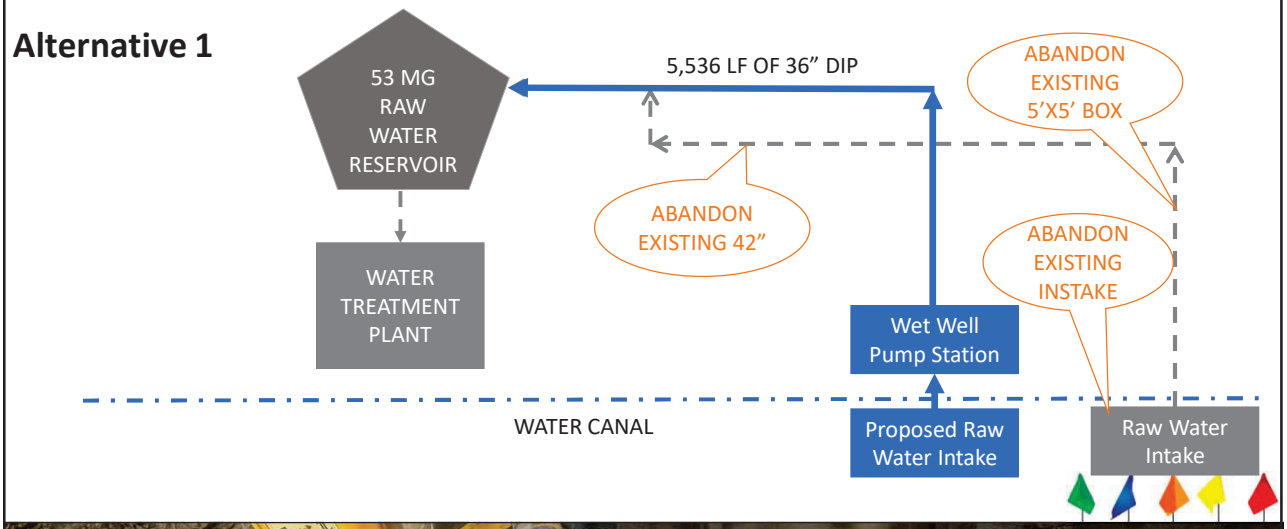
ALTERNATIVE ANALYSIS

Alternative 1



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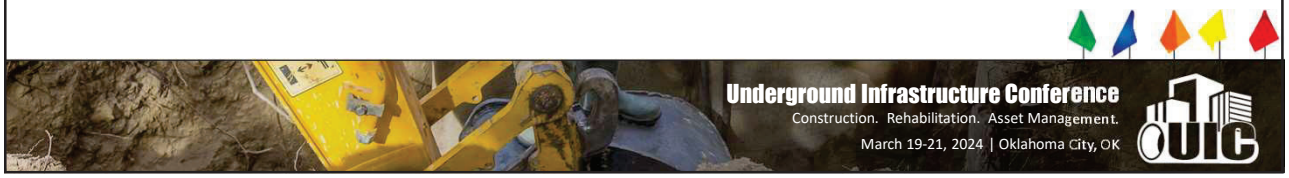
ALTERNATIVE ANALYSIS

Alternative 1

- City/Engineer decides the desired flow rate
- Pressurized system allows 20-MGD delivery in any condition, with reservoir at any elevation
- Wet Well Pump Station to utilize two (2) 10-MGD pumps with 10’ dynamic head



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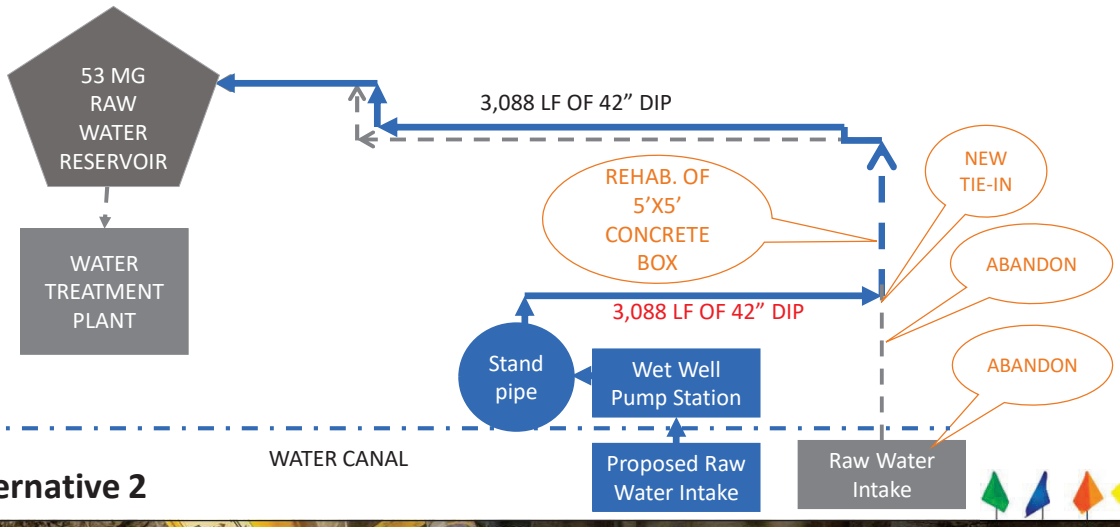
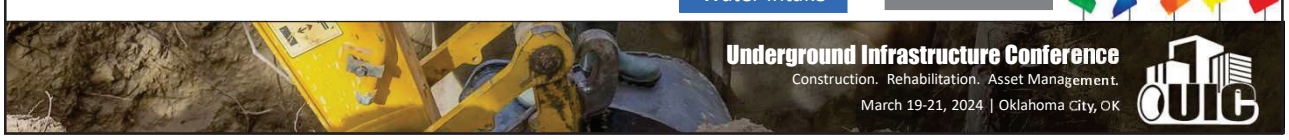
ALTERNATIVE ANALYSIS



Alternative 2



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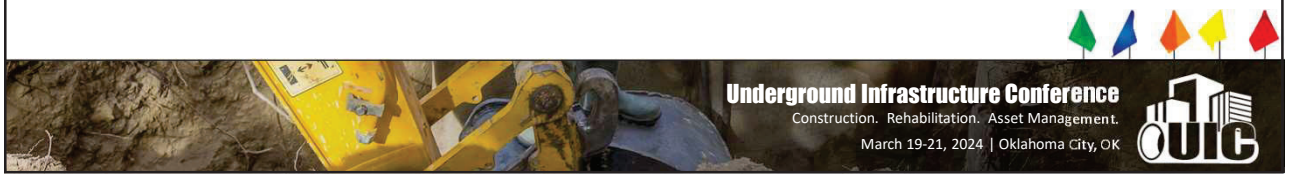
ALTERNATIVE ANALYSIS

Alternative 2

- Use of existing non-pressurized system
- Construction of standpipe to supply required head into system
- Wet Well Pump Station will pump water to the standpipe, increasing head difference to the outfall.



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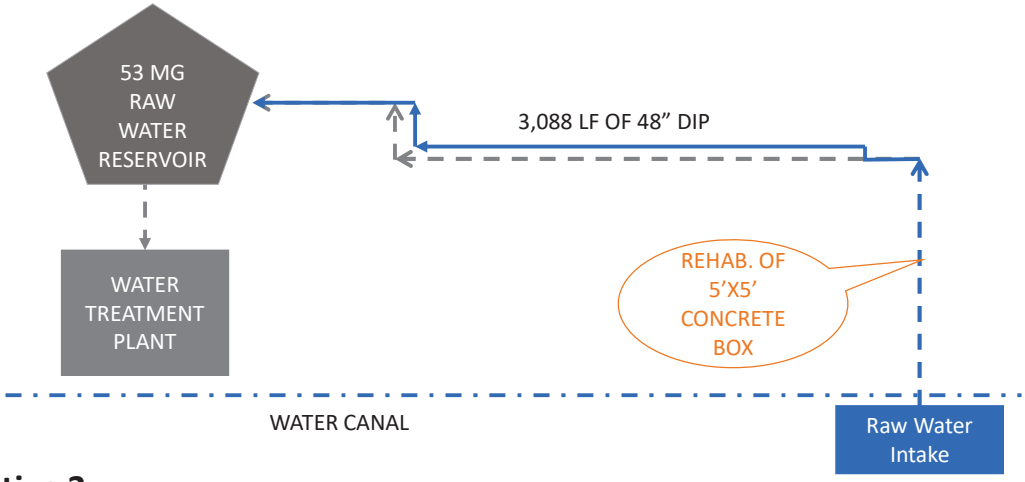
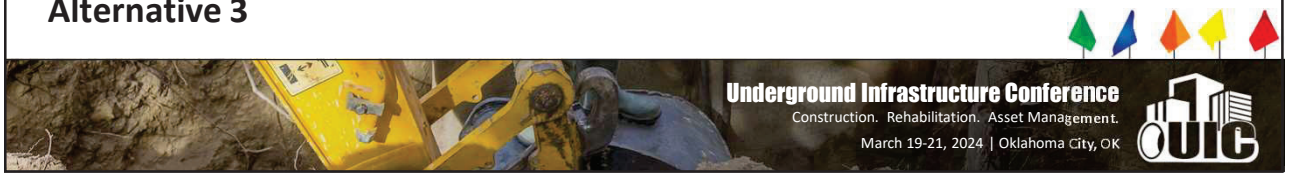
ALTERNATIVE ANALYSIS



Alternative 3



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ALTERNATIVE ANALYSIS

Alternative 3

- Once the elevation difference between the canal and reservoir is under 2', flow rate drops from 20 MGD to 0 MGD
- No flow when downtown reservoir is at elevation of 41.6'
- To achieve 20-MGD flow, must replace 42" pipe and 36" restrictions with 48" pipe and reservoir at maximum elevation of 38', limiting reservoir capacity

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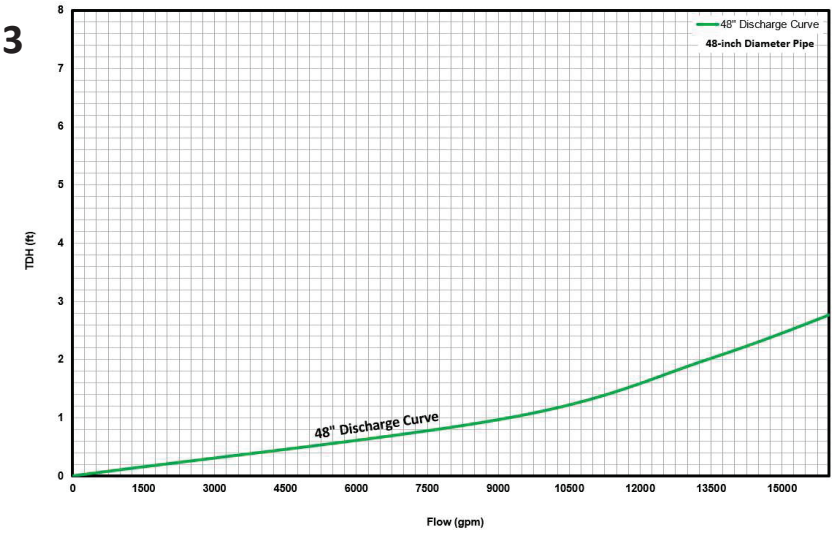
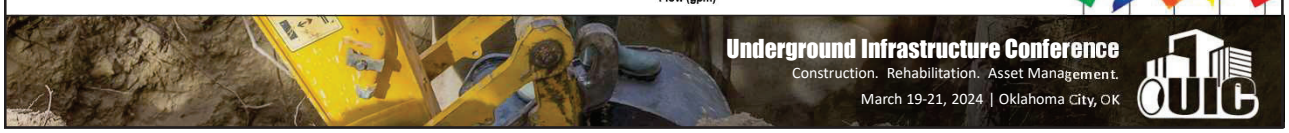
ALTERNATIVE ANALYSIS

Alternative 3





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ALTERNATIVE ANALYSIS

Rehabilitation of 5'x5' Concrete Box

- Poor condition; previously patched leaks won't address continual deterioration
- City has limited information; access points were paved over during road rehabilitations
- Unknown amount of water lost through conveyance to reservoir
- Intake has no flow monitoring

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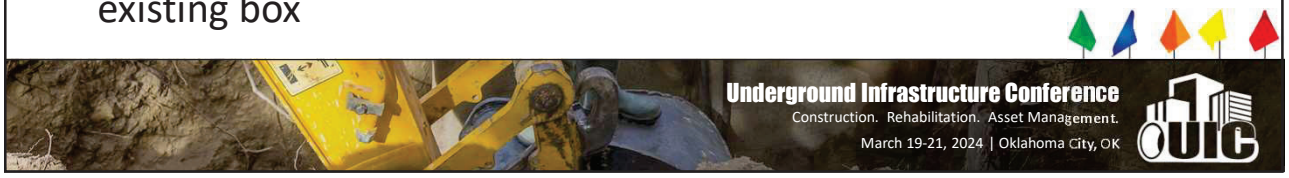
ALTERNATIVE ANALYSIS

Rehabilitation Methods

- **Slip-Lining:** place a smaller pipe inside existing box and grouting
  Con: Reduced capacity due to current elevations
- **Cured-in-Place Pipe:** cylindrical flexible liner saturated in resin and cured
  Con: Only feasible for circular or conical pipe
- **Geopolymer Lining:** apply geopolymer spray to walls of the existing box



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ALTERNATIVE ANALYSIS

Geopolymer Lining

- Selected rehabilitation alternative
- 1”-1.5” thickness sprayed to walls of the box
- Act as a structure itself, reinstating integrity
- Requires two access points and hand-spraying

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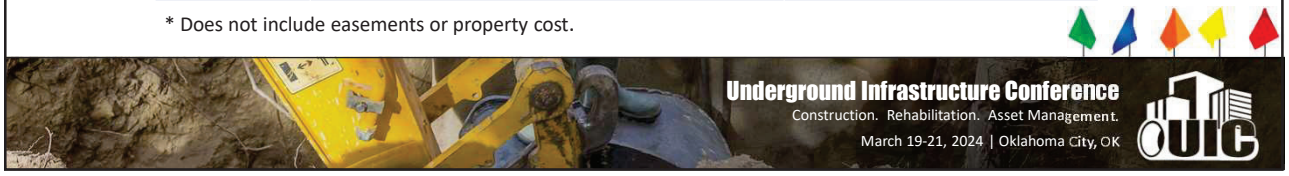
ALTERNATIVE ANALYSIS

Construction Cost Constraints

Alternative	Description	Construction Cost*
1	Installation of intake structure, wet well pump station, and 36” pipeline.	$14,104,000
2	Installation of intake structure, wet well pump station, standpipe, rehabilitation of 5’x5’ concrete box, and installation of 42” pipeline.	$16,218,000
3	Installation of intake structure, rehabilitation of 5’x5’ concrete box, and installation of a 48” pipeline.	$12,126,000

* Does not include easements or property cost.



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ALTERNATIVE ANALYSIS

Construction Cost Constraints

Budgetary limitation from City requires working in phases:

- Alternative 1 must be completed all at once
- Alternative 2 has 3 construction phases
- Alternative 3 involved 2 construction phases

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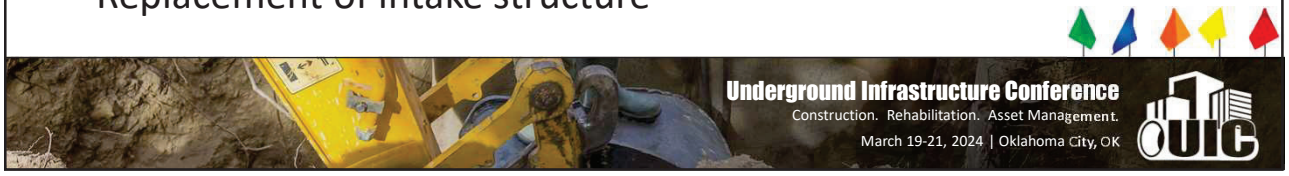
FINDINGS AND CONCLUSIONS

Modified Alternative 3 Selected

- First, replace 42” RCP with 48” DIP
- Replacement of outfall structure
- Rehabilitation of 5’x5’ concrete box
- Replacement of intake structure



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QUESTIONS?

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