

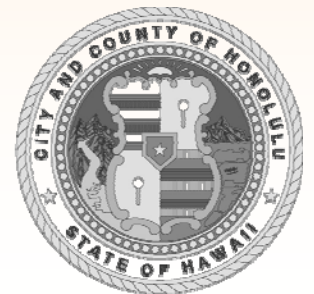
Advantages of Hydraulic Modeling: Case Studies of City Projects

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City and County of Honolulu, DDC\WD

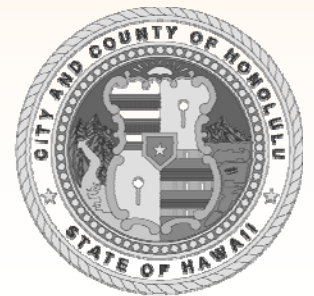
2011 HWEA Conference

February 16, 2011



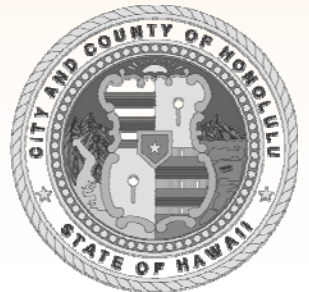
Outline

- Current Practices
- City's Approach
- Case Studies
- Other Applications
- Summary



Current Practice

- Manning's equation
- Data: GIS, As-built drawings, surveying
- Flow Routing: None
- Flow: INFIX2020
- Limitations: Adverse slopes, surcharged conditions, pipe by pipe analysis



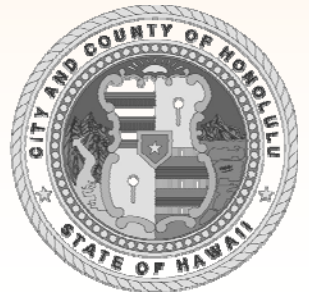
City's Approach

- USEPA SWMM5 Program
- Cost: Free
- Data: GIS, As-built drawings, surveying
- Flow Routing: Dynamic
- Flow: INFIX2020
- Key Features: Hydraulic grade line, backwater effects, adverse slopes, flow splits



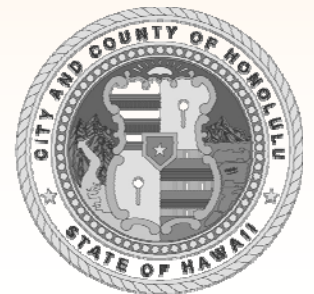
Case Studies

- Wanaao Rd/Keolu Dr Reconstructed Sewer
- Moiliili-Kapahulu Sewer Structural Rehab/Reconstruction
- Kalihi Valley Reconstructed Sewer
- Ala Moana Blvd/Auahi St Sewer Rehab
- Palolo Valley Sewer Rehab

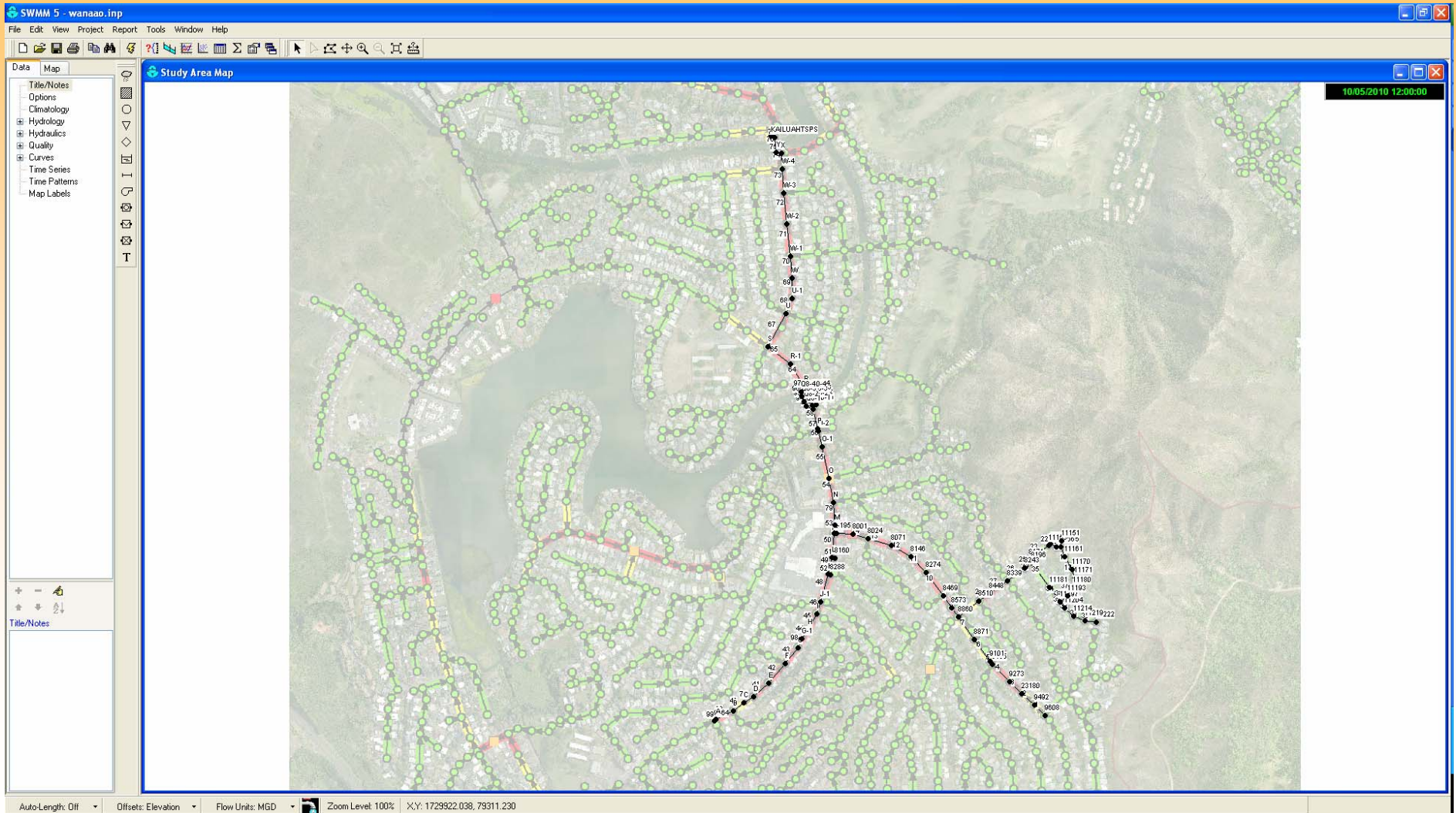


Wanaao Rd / Keolu Dr Reconstructed Sewer

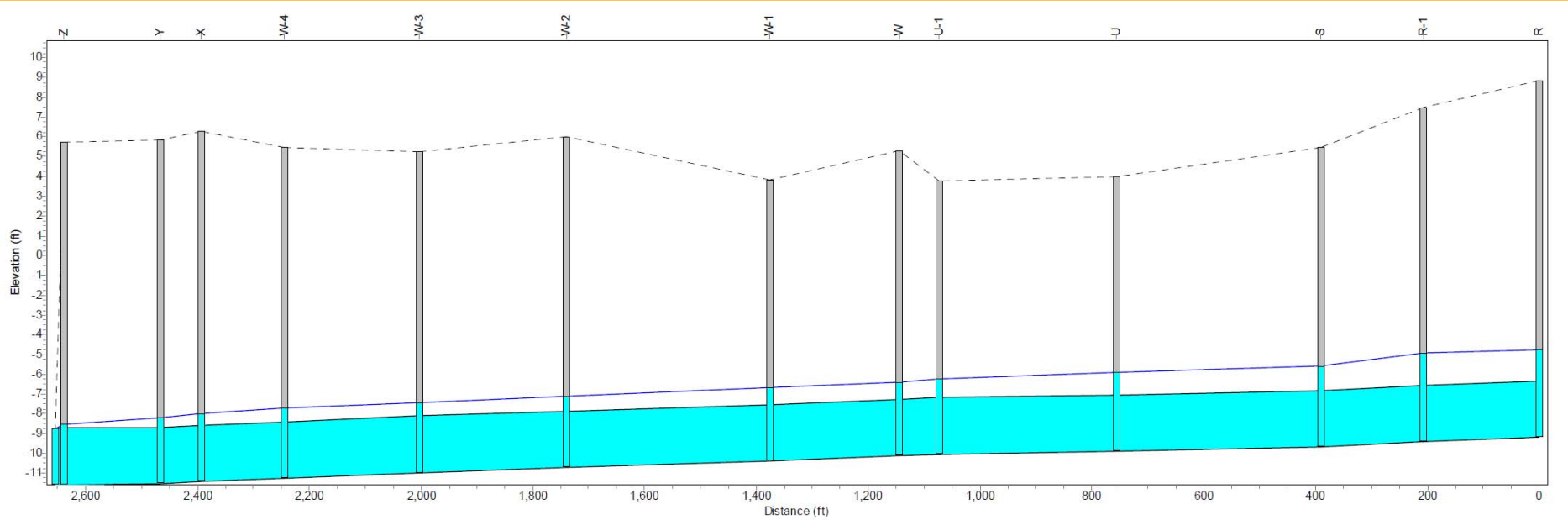
- Phase: Post-Construction
- Project: Replace ~9,300 LF of sewers
- Why: Incorrect pipe size installed
 - As designed, 36-inch ID
 - As constructed, 36-inch nominal
 - Accuracy of micro-tunneling



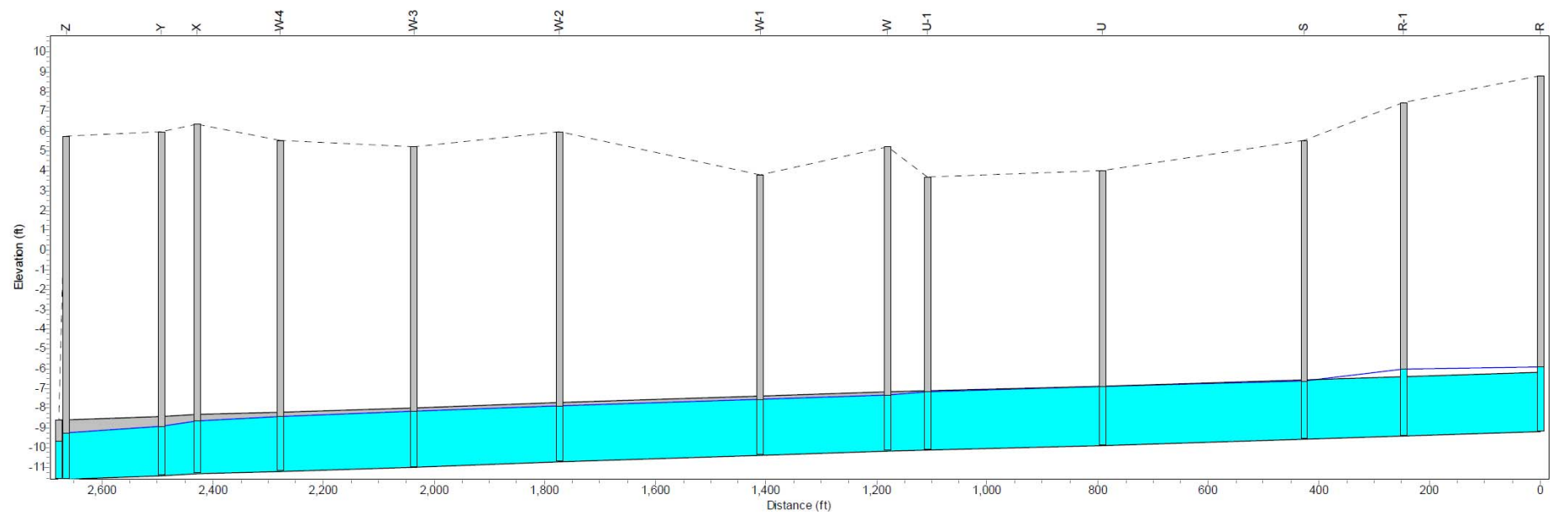
Wanaao Rd / Keolu Dr Reconstructed Sewer



As-Built

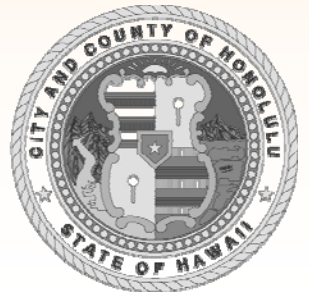


Design



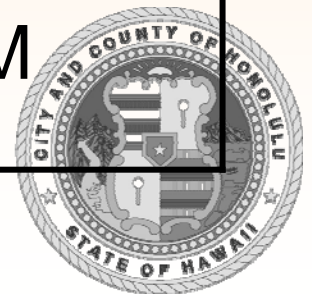
Moiliili-Kapahulu Sewer Structural Rehab/Reconstruction

- Phase: Planning
- Project: Analyze ~7,100 LF along Date Street from McCully Street to Kaimuki HS
- Why: Re-evaluate improvements due to insufficient construction funds



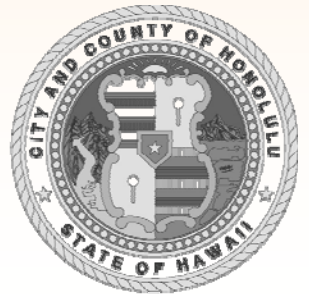
Moiliili-Kapahulu Sewer Structural Rehab/Reconstruction

<u>Improvement</u>	<u>Original</u>	<u>Final</u>
Replace/Relief	3,545 LF	440 LF
CIPP	3,128 LF	5,240 LF
Project Cost	\$20M	\$10M

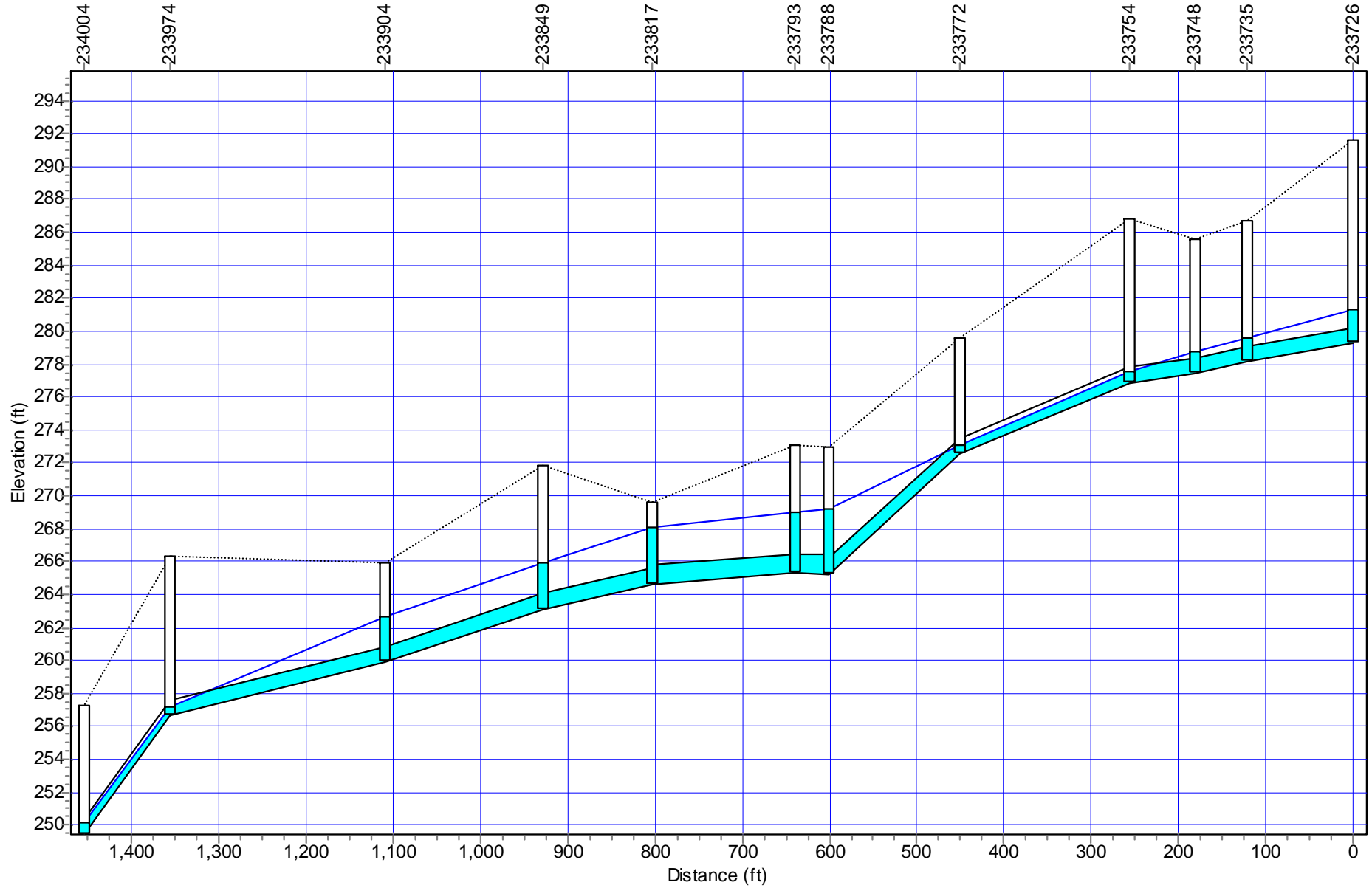


Kalihi Valley Reconstructed Sewer

- Phase: Post-construction
- Project: CIPP 8,653 LF of sewers and flow diversions
- Why: Sewer connection requests from public

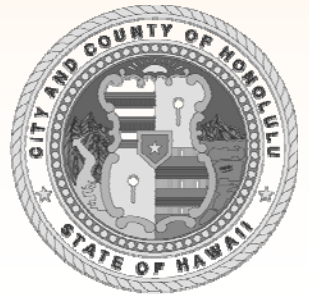


Water Elevation Profile: Node 233726 - 234004



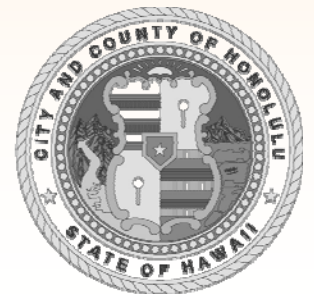
Kalihi Valley Reconstructed Sewer

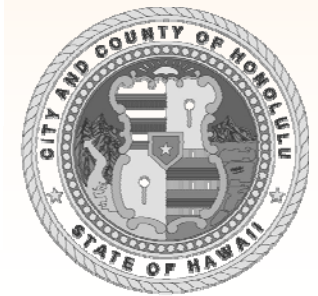
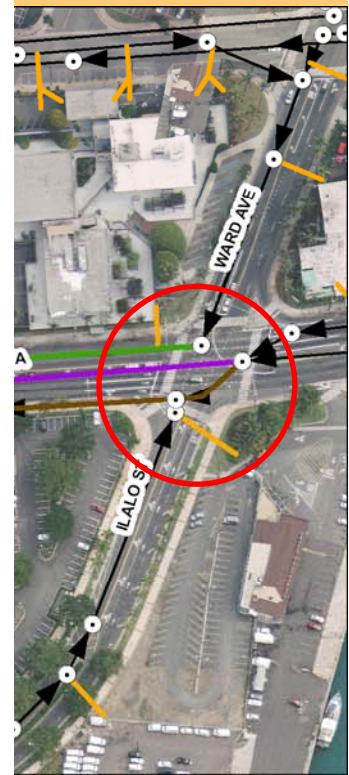
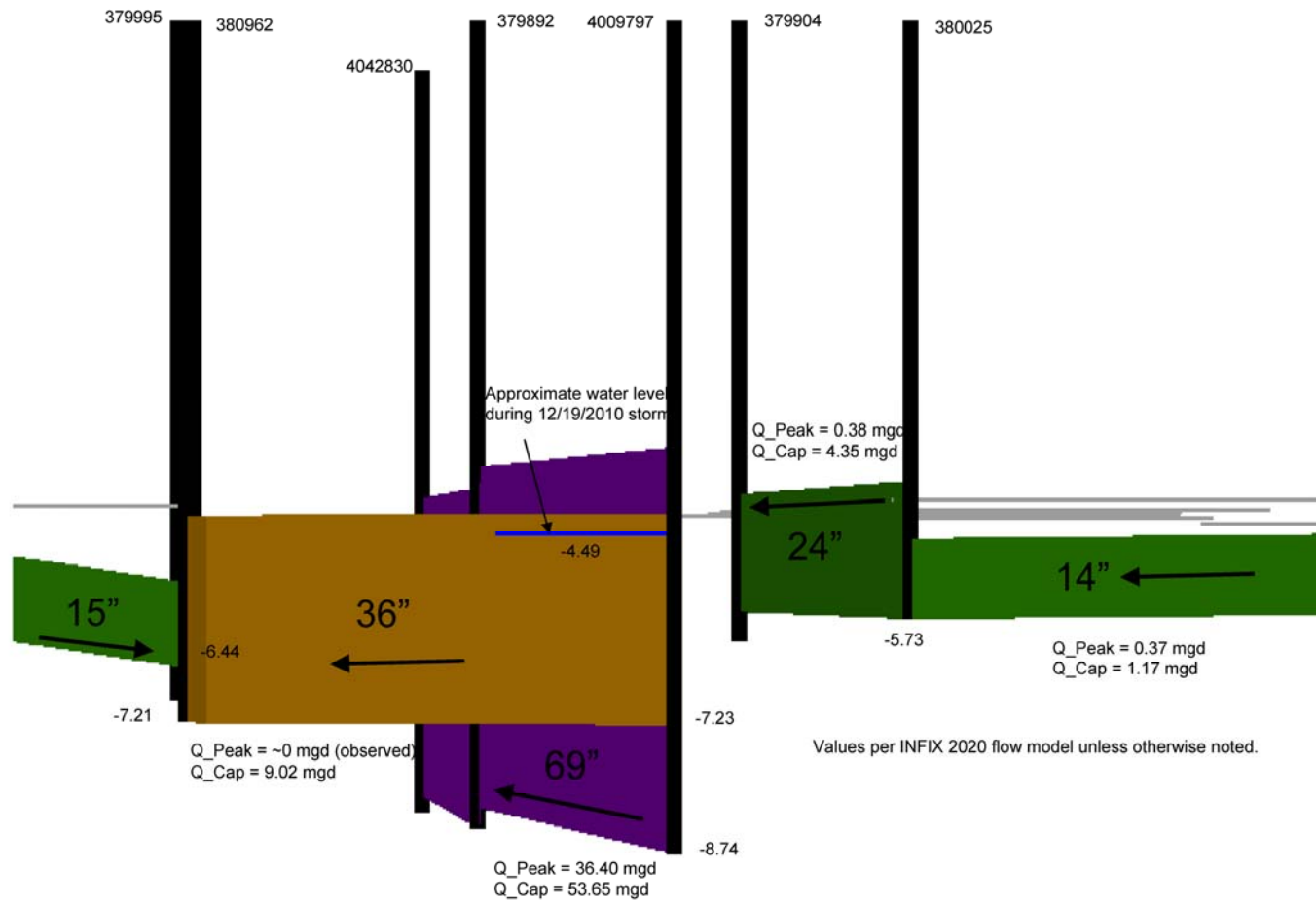
- North Valley Line: No new connections
- South Valley Line: New connections allowed
- Additional project may be needed



Ala Moana Blvd/Auahi St Sewer Rehab

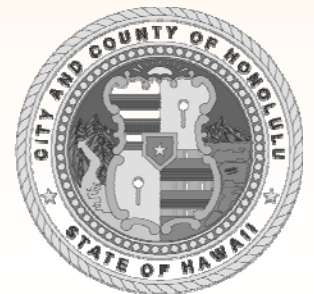
- Phase: Design
- Project: Parallel 24-inch, 36-inch, 69-inch sewers
- Why: Address maintenance problems

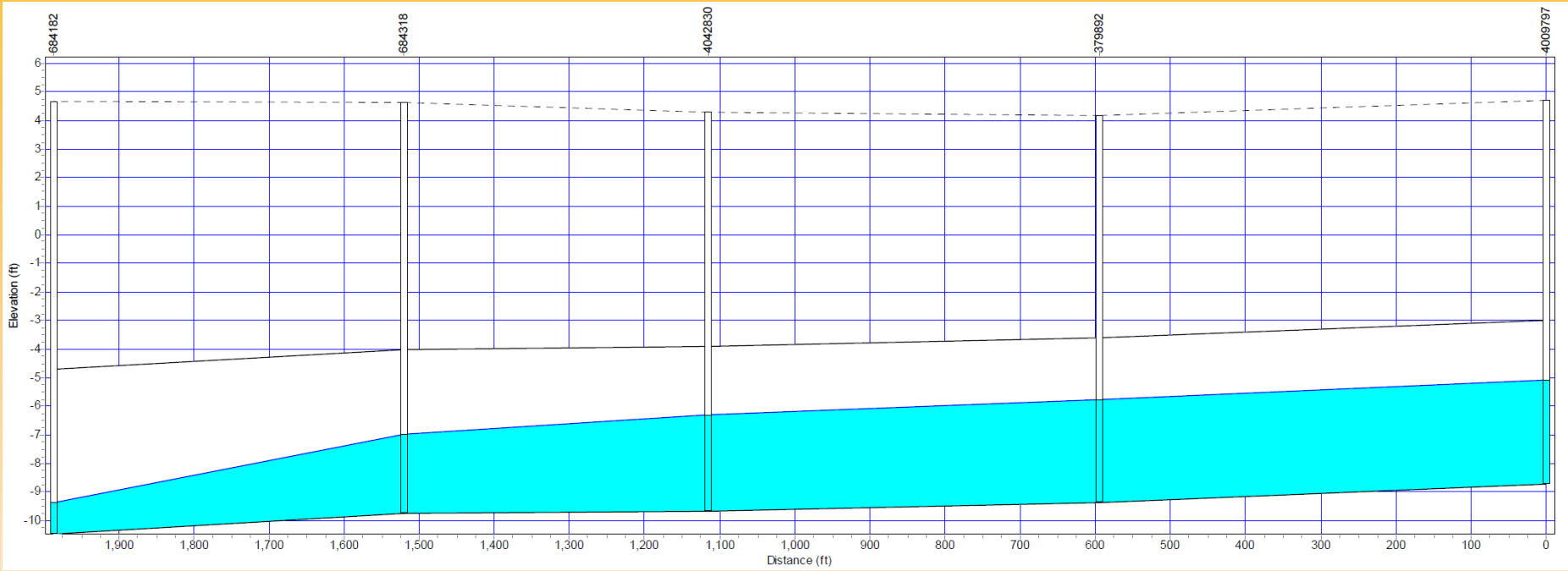




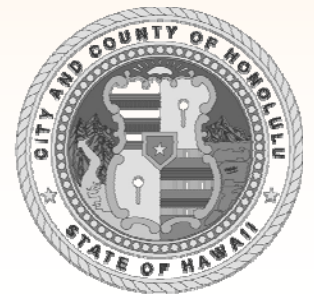
Ala Moana Blvd/Auahi St Sewer Rehab

- Original Scope: CIPP 24, 36, and 69-inch sewers
- 2-3 laterals connected to 36-inch
- H₂S gas propagating upstream and deteriorating manholes
- Does the 69-inch have enough capacity?



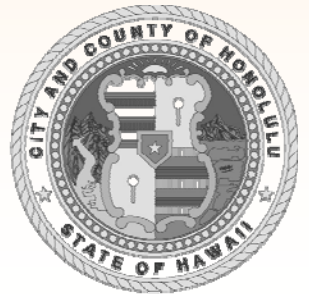


- Proposed Scope: CIPP 24 and 69-inch sewers; abandon 36-inch
- Smaller project
- Less work in Ala Moana Blvd.
- Reduced cost

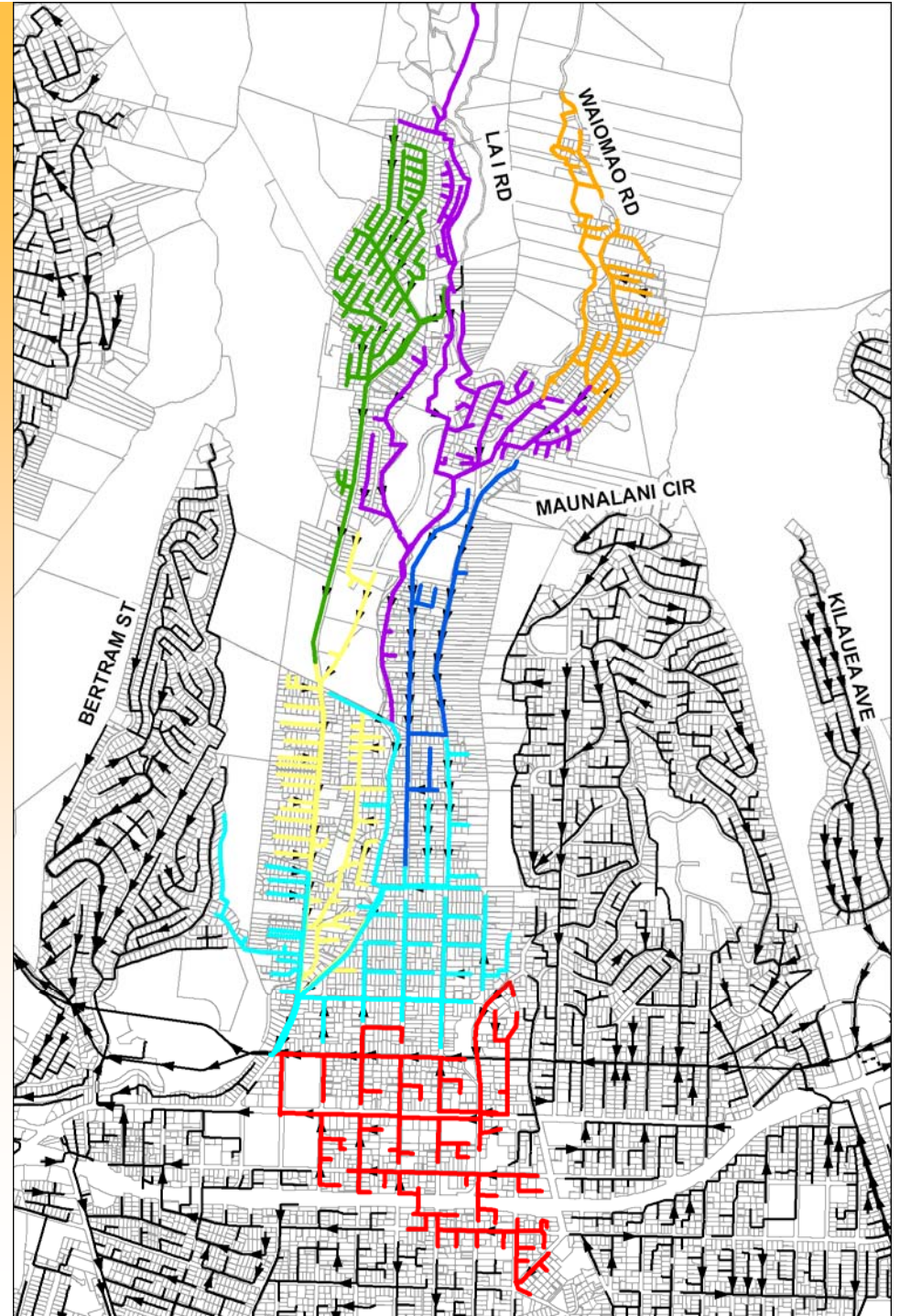


Palolo Valley Sewer Rehab

- Phase: Planning
- Project: Analyze Palolo Valley basin (~150,000 LF)
- Why: Optimize basin improvements

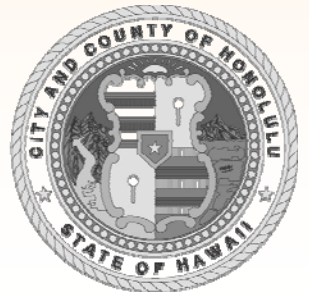


- Break basin into subbasins
- Cost effective analysis
- I/I Rehab vs. Transport and treat
- What if...? scenarios



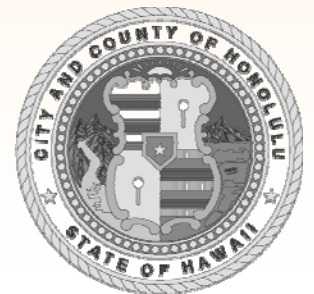
Other Applications

- Pump station operation (set points, FM breaks, spill points)
- Bypass pumping
- Siphons (analysis and design)
- Pipe issues (sags and blockages)
- Potential SSO locations
- Flow transfers



Summary

- Use at any phase of project
- More realistic view of pipe
- Ability to model various conditions
- Cost savings
- Sewer I/I Update Project will model every pipe in the system



Questions?

