PIPES, PUMPS, AND STORAGE FOR OPTIMIZATION

Sewer Infrastructure Advisory Group

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PRESENTATION CONTENTS

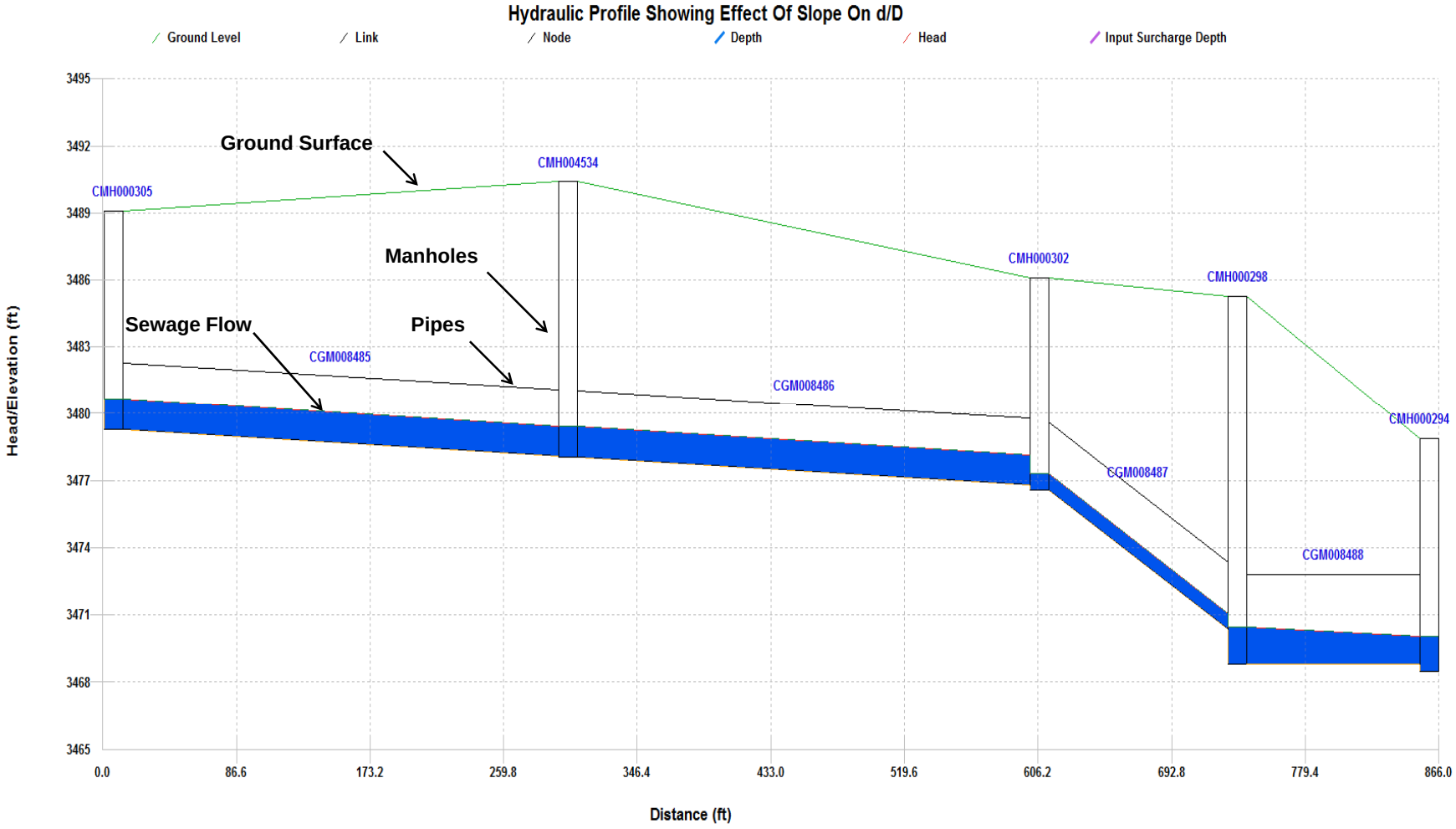
- Overview of Pipe, Pump, and Storage information used in the Optimization model
- Provide information about "What's in the Toolbox"
  - Pipe alternatives
  - Pump alternatives
  - Storage Alternatives
- Discuss how "Community Values" might be considered in Optimization

Why are We Discussing This?

- To develop common understanding of the elements that comprise conveyance system alternatives
  - Build on our understanding of system deficiencies
  - Verify that we are considering all useful alternatives
  - Hone in on best alternatives for specific issues
  - Discuss using a “Base Cost” for initial Optimization
  - Explore how some higher cost alternatives may have higher value to the community

Pipe and Pumps in Optimization

- Gravity Pipes – Hydraulic Model Identifies Deficiencies

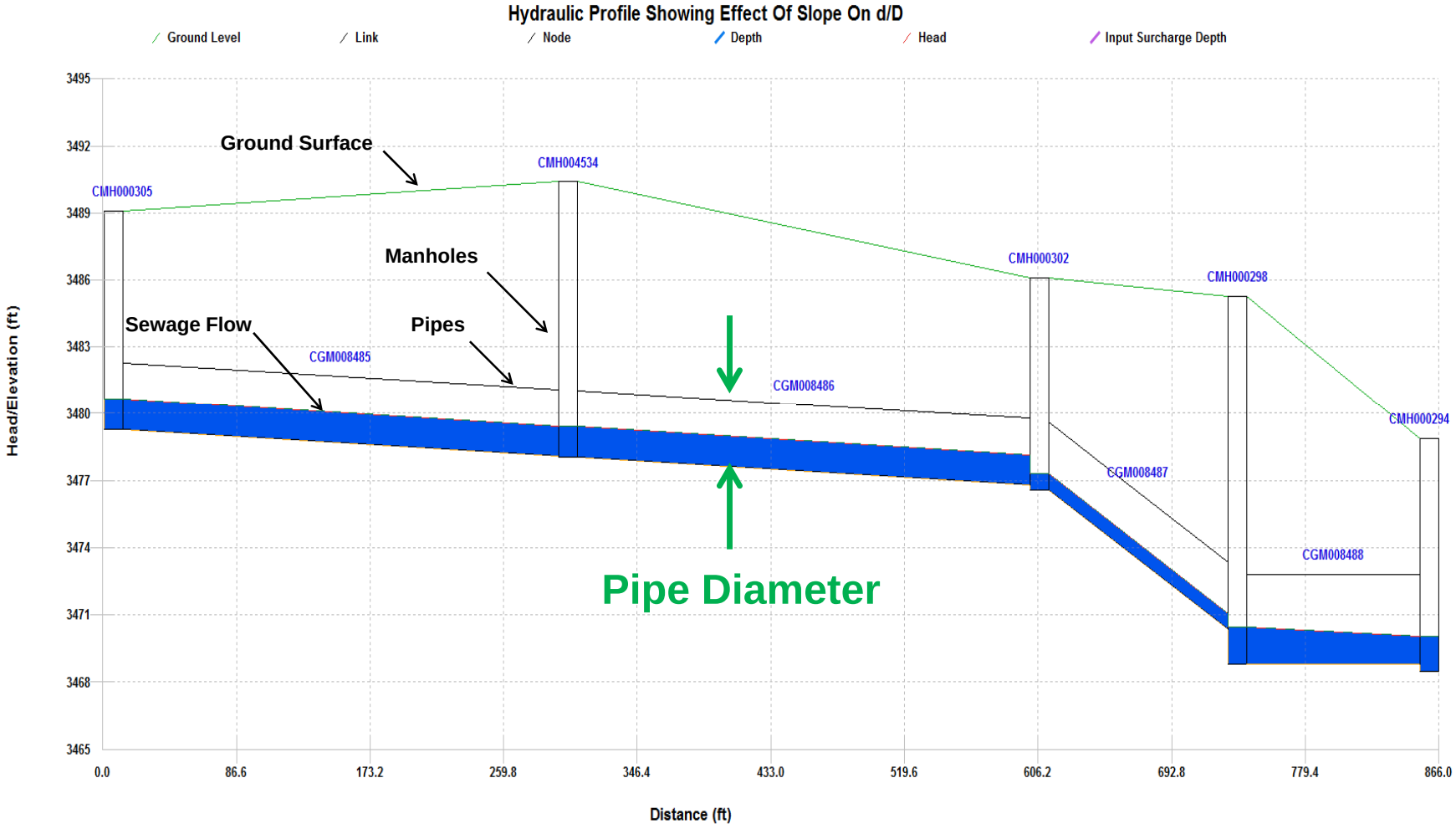


Pipe and Pumps in Optimization

- Pipe Alternatives – In Response to Hydraulic Deficiencies
  - Replace existing pipe in existing alignments
  - Parallel existing pipe in existing alignments
  - New pipe in new alignments
  - Rehabilitate existing pipe in existing alignments
    - In response to pipes in poor condition
    - Lets us continue to use the existing capacity into the future

Pipe and Pumps in Optimization

- Optimization responds to both hydraulics and cost



Pipe and Pumps in Optimization

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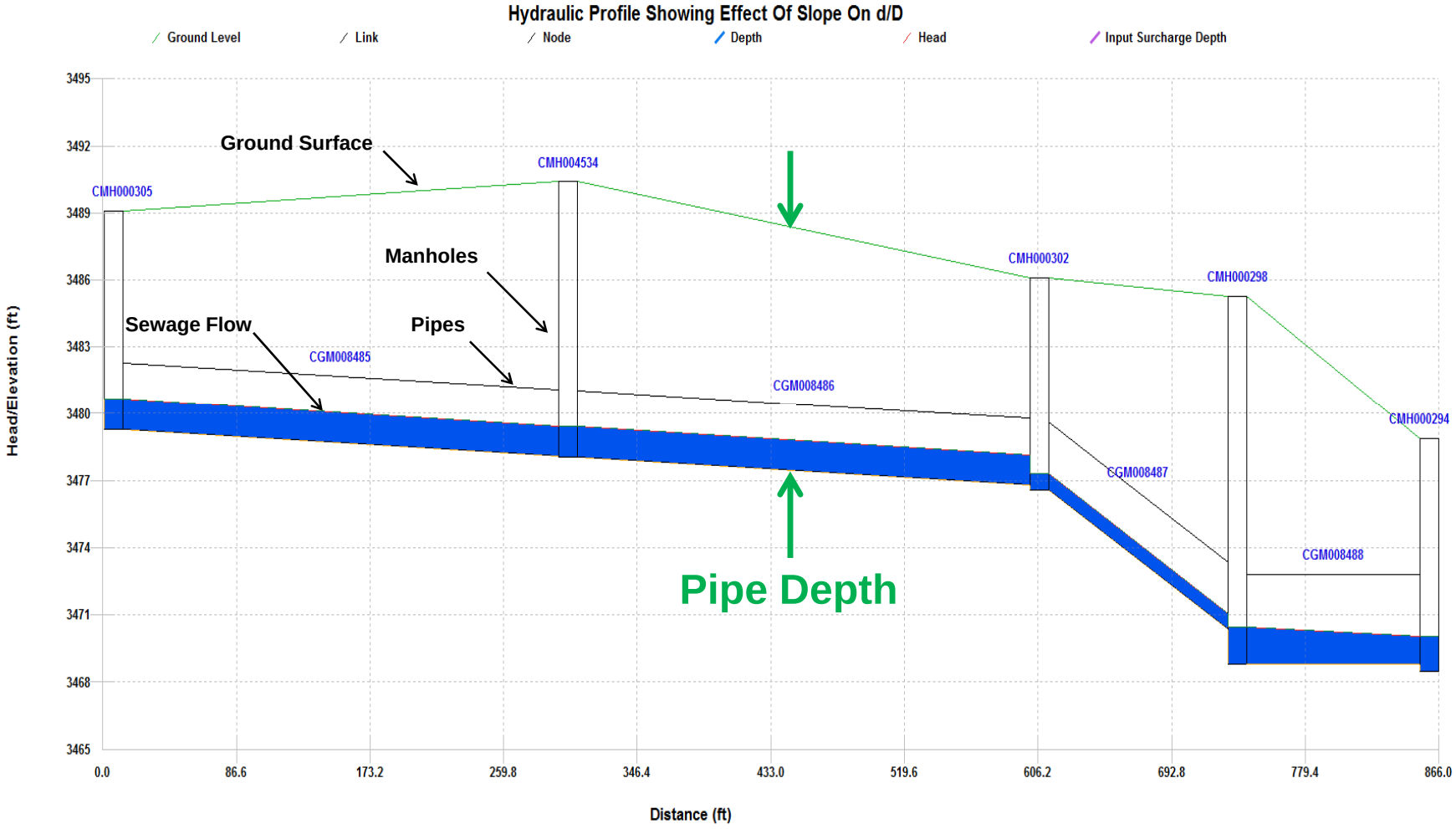
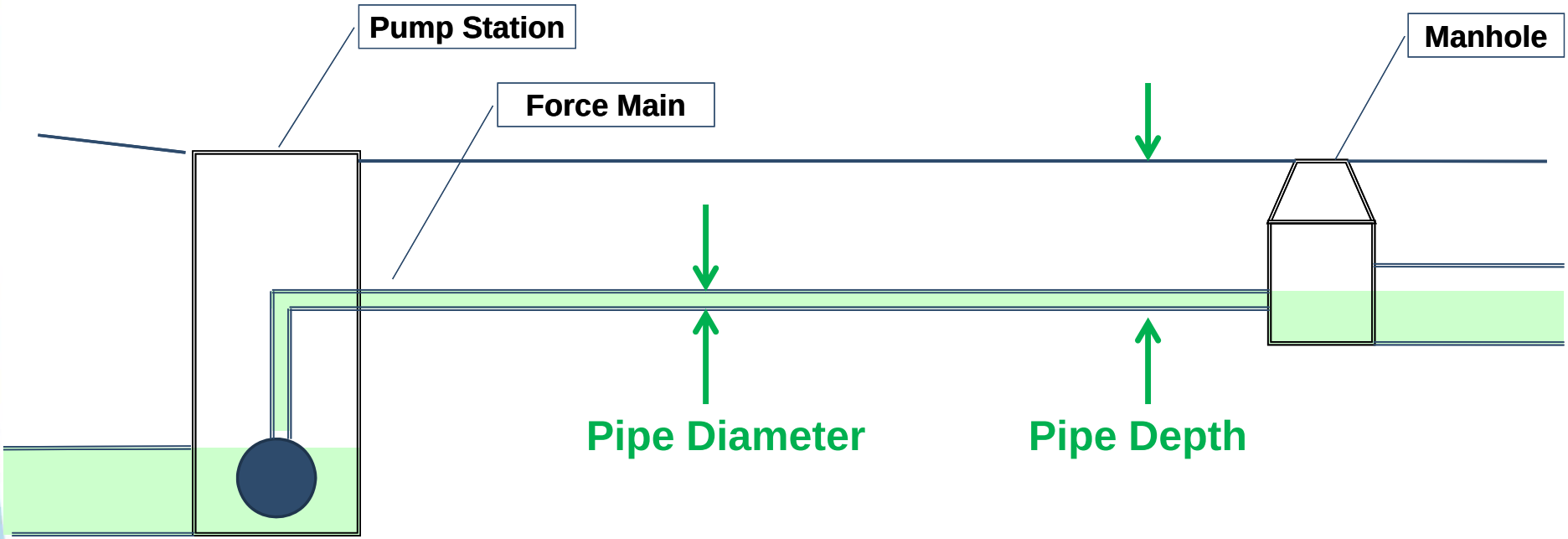


Pipe and Pumps in Optimization

- Force Mains - Optimization responds to both hydraulics and cost



Pipe and Pumps in Optimization

- Optimization responds to both hydraulics and cost using;
  - Diameter
  - Depth
  - Material
  - Installation Technique

→To Identify a <u>best cost solution</u>

TECHNOLOGY SELECTION

- Remember that **comparable** costs are critical to the accuracy of the optimization process
- Life Cycle Costs required for the optimization:
  - Capital
  - Operations
  - Maintenance
  - Energy
  - Replacement
- Must have confidence in solutions

Pipe and Manhole Materials

- Base Cost in Optimization - PVC (City of Bend Standard Sewer Pipe Material)

Polyvinyl Chloride (PVC)

Concrete Pipe and Manholes (Plastic Lined)

High Density Polyethylene (HDPE) Pipe and Manholes

PIPE AND MANHOLE INSTALLATION TECHNIQUES

- Cost Basis in Optimization – Open Cut Trench

Cut and Cover Trenching

Typical Trenching

Issues and Concerns

- Significant area impact

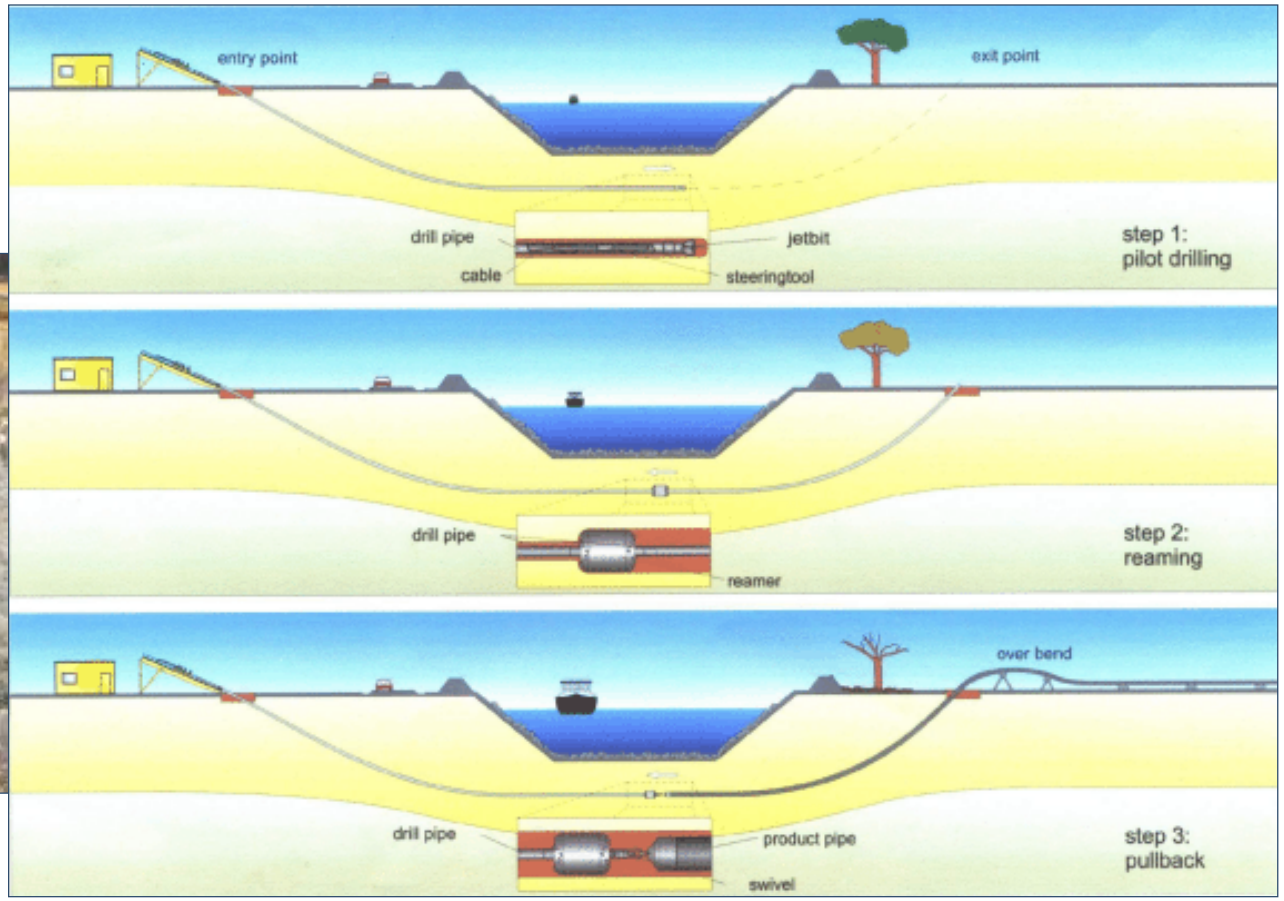
PIPE INSTALLATION TECHNIQUES - SPECIAL

- Unique Costs – Assigned in Optimization first Run

Issues and Concerns

- Geotechnical conditions
- Line and grade control

Bore and Jack



Directional Drilling

PIPE INSTALLATION - ALTERNATIVES

- Potential Savings Through Innovative Techniques at the Contractors Option – Not Considered in Optimization

Issues

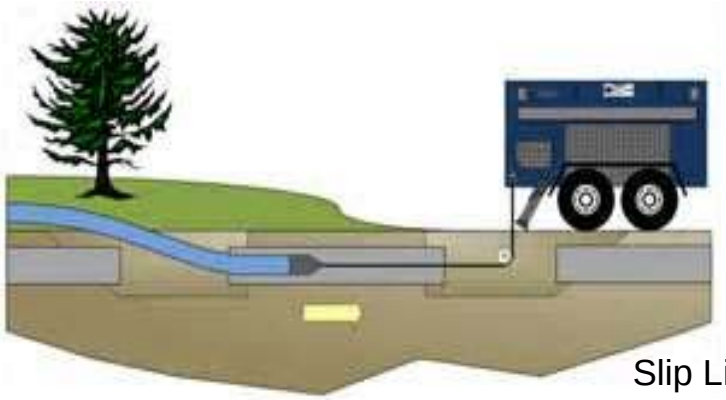
- Geotechnical conditions
- Contractor experience
- Availability of equipment

Saw Trenching

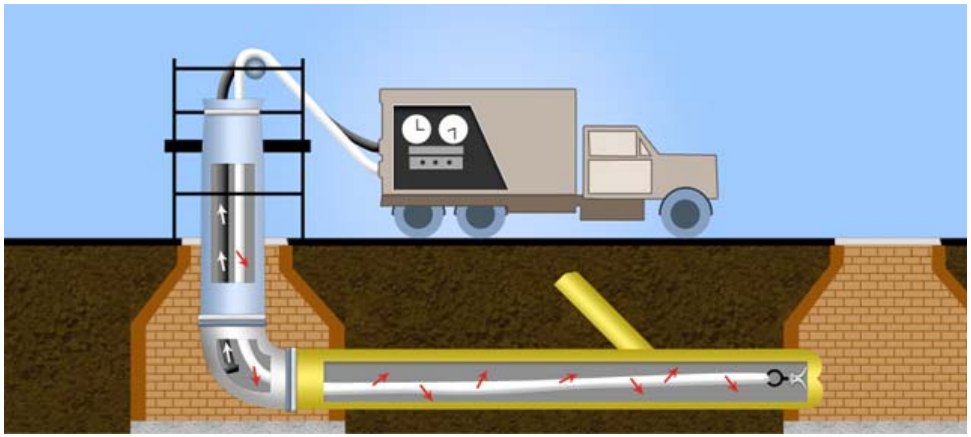
Rock Sawing

PIPE REHABILITATION - ALTERNATIVES

- Unique Costs – Assigned in Optimization Refinement Phase
- Value Proposition for Unique Locations



Slip Lining



Cured in Place Pipe

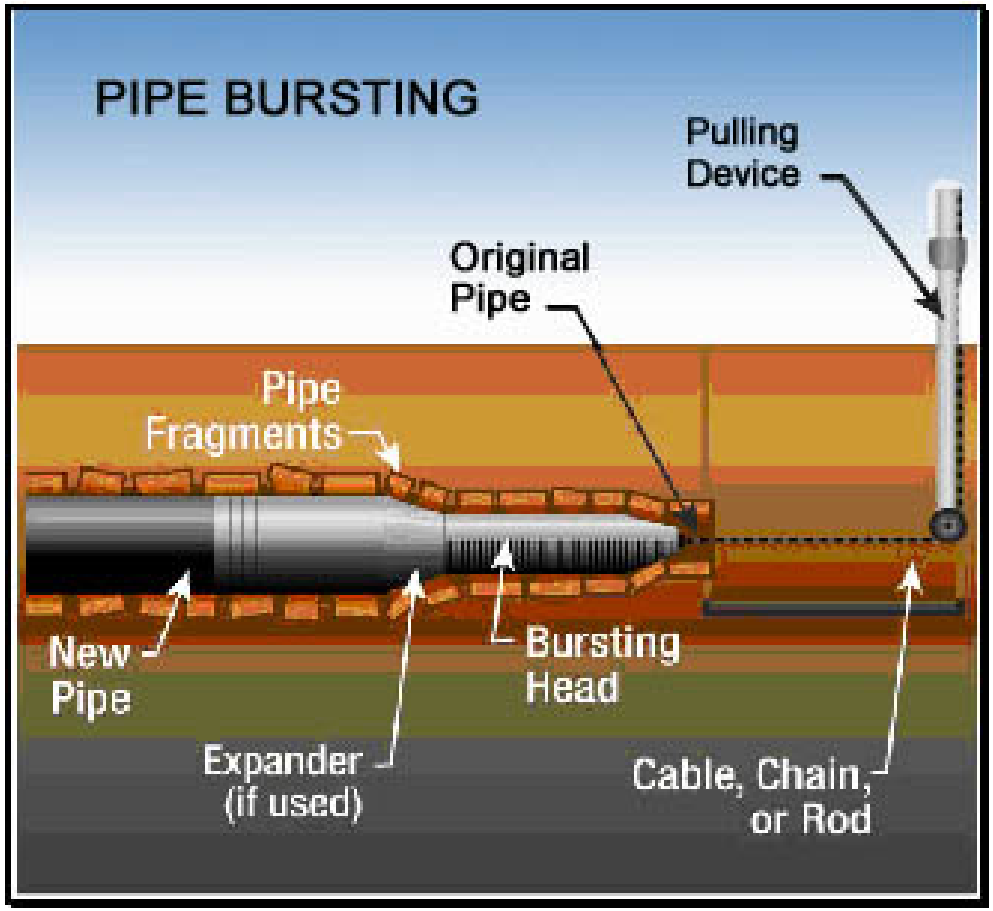
Slip Lining

PIPE REHABILITATION - ALTERNATIVES

- Unique Costs - Assigned in Optimization Refinement Phase
- Value Proposition for Unique Locations

Issues and Concerns

- Geotechnical conditions
- Depth and size limitations
- Line and grade control



DISCUSSION

- Are there additional pipe options that should be considered?

PUMPING FOR OPTIMIZATION

- Pumping Alternatives
  - Area Pump Stations
  - Regional Pump Stations

  Objective
  Strategically located Area / regional facilities
  - With dedicated Force Mains only
  - Per City Standards no shared Force Mains

- What we do not expect to evaluate in Optimization
  - Individual Residential Pump Stations (Low Pressure Sewer Networks)
    - A subject for discrete parcels
    - No City-owned Individual Residential Pump Stations
  - Vacuum Sewers
    - Not Permitted by City Standards

PUMPING ALTERNATIVES

- Area Pump Stations
  - Variable Speed (VFD) Pumps
  - Wet Well
  - Standby Power / Pump
  - Bypass Pumping Facilities
  - Odor Control
  - Instrumentation & Controls
  - Telemetry

PUMPING ALTERNATIVES

- Regional Pump Stations
  - Variable Speed (VFD) Pumps
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  - Instrumentation & Controls
  - Telemetry

PUMPING FOR OPTIMIZATION SUMMARY

- Pumping Alternatives
  - Area Pump Stations
  - Regional Pump Stations
- Life Cycle Costs required for the optimization
  - Capital ← Value Proposition
  - Operations
  - Maintenance
  - Energy
  - Replacement
- Must have confidence in solutions
  - Strategically Located Area / Regional Facilities

DISCUSSION

- Are there additional pump options that should be considered?

DISCUSSION

Value Propositions

- Does SIAG concur with incorporating a buffer zone, and odor control facilities in the capital cost of Pump Stations?
- Where a buffer is needed, how wide should it be? 20 feet setback, 50 feet, 100 feet?

Sewage Storage for Optimization

- Storage Alternatives – Typically Used for Combined Sewer Systems, not for Sewage Only Sewer Systems
  - Inline Storage
    - Sewage flows through the "pipe" on daily basis
    - Reserve volume is available in the "pipe" to store some of the peak flow as it passes through
  - Offline Storage
    - Sewage does not flow through the storage facility on a daily basis
    - Sewage is diverted to the storage facility during peak wet weather, and is sent back to the system when the peak subsides

EXAMPLE OF STORAGE TECHNOLOGY

- In-line Raw Sewage Storage Alternatives

- Usually a big pipe or box culvert
- Probably best deployed ‘higher’ in the system
- Important to capture the ‘real’ initial cost for the cost basis
- Important to capture the ‘real’ O&M cost and resource commitment for the cost basis

EXAMPLE OF STORAGE TECHNOLOGY

- Off-line Raw Sewage Storage Alternatives

- Tank or basin or vault
- More applicable ‘lower’ in the system
- Important to capture the ‘real’ initial and O&M costs for the cost basis

DISCUSSION

- Should offline storage be considered as an alternative
- Are there additional storage options that should be considered