Prepared for
Town of Paradise

Paradise Sewer Project

Town Council Meeting
Collection System Alternatives Technical Evaluation

Carollo Engineers

June 9, 2026

Intro to Carollo Engineers

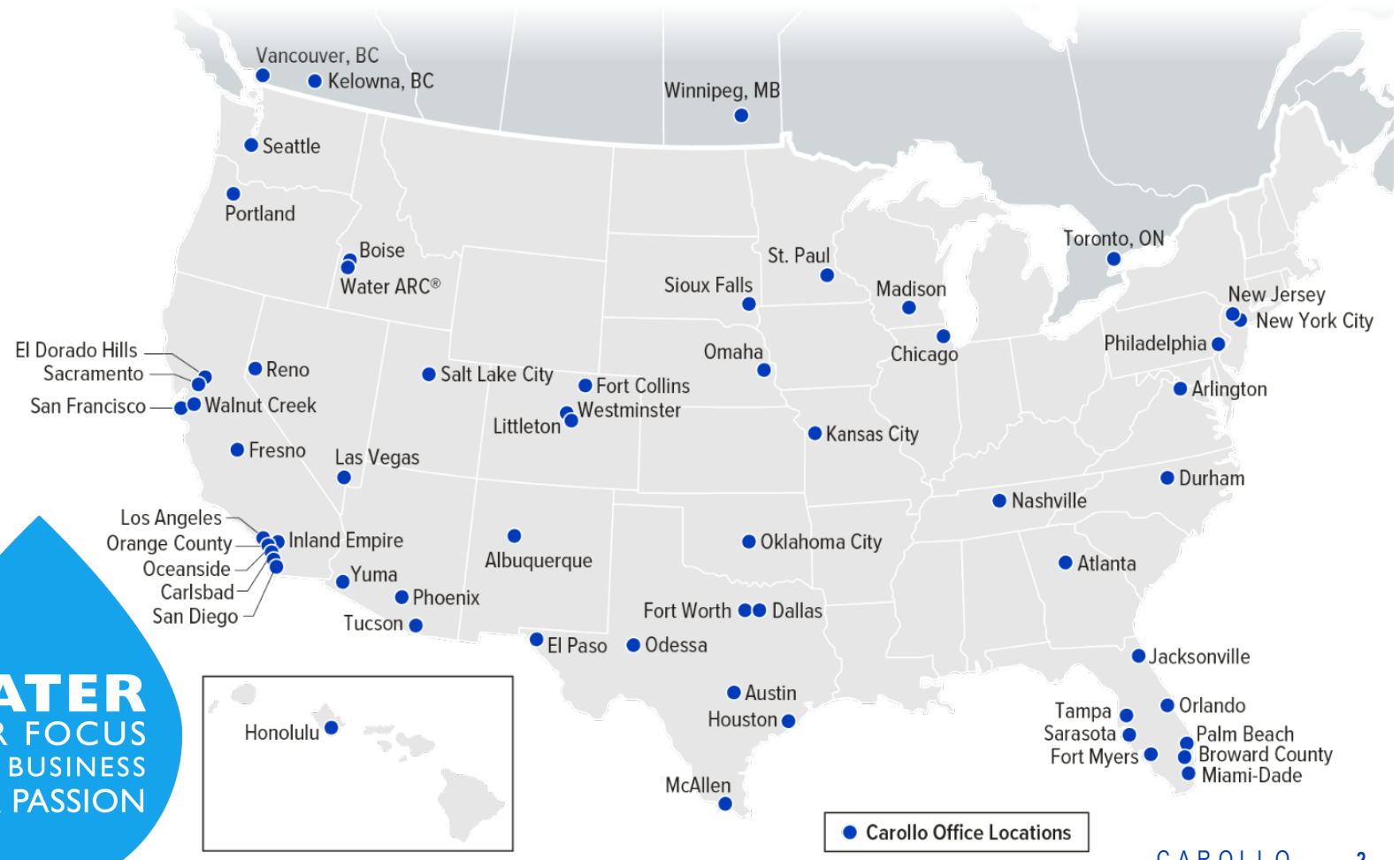
- Civil Engineers
- Water Treatment Engineers
- Structural Engineers
- Electrical Engineers
- Mechanical Engineers
- Environmental Engineers
- Electrical, Programming, and Instrumentation and Control Specialists
- Program/Project Managers
- Construction Managers
- Planners
- Architects
- CAD Designers

55+ offices in **North America**

1800+ employees

600+ professional engineers

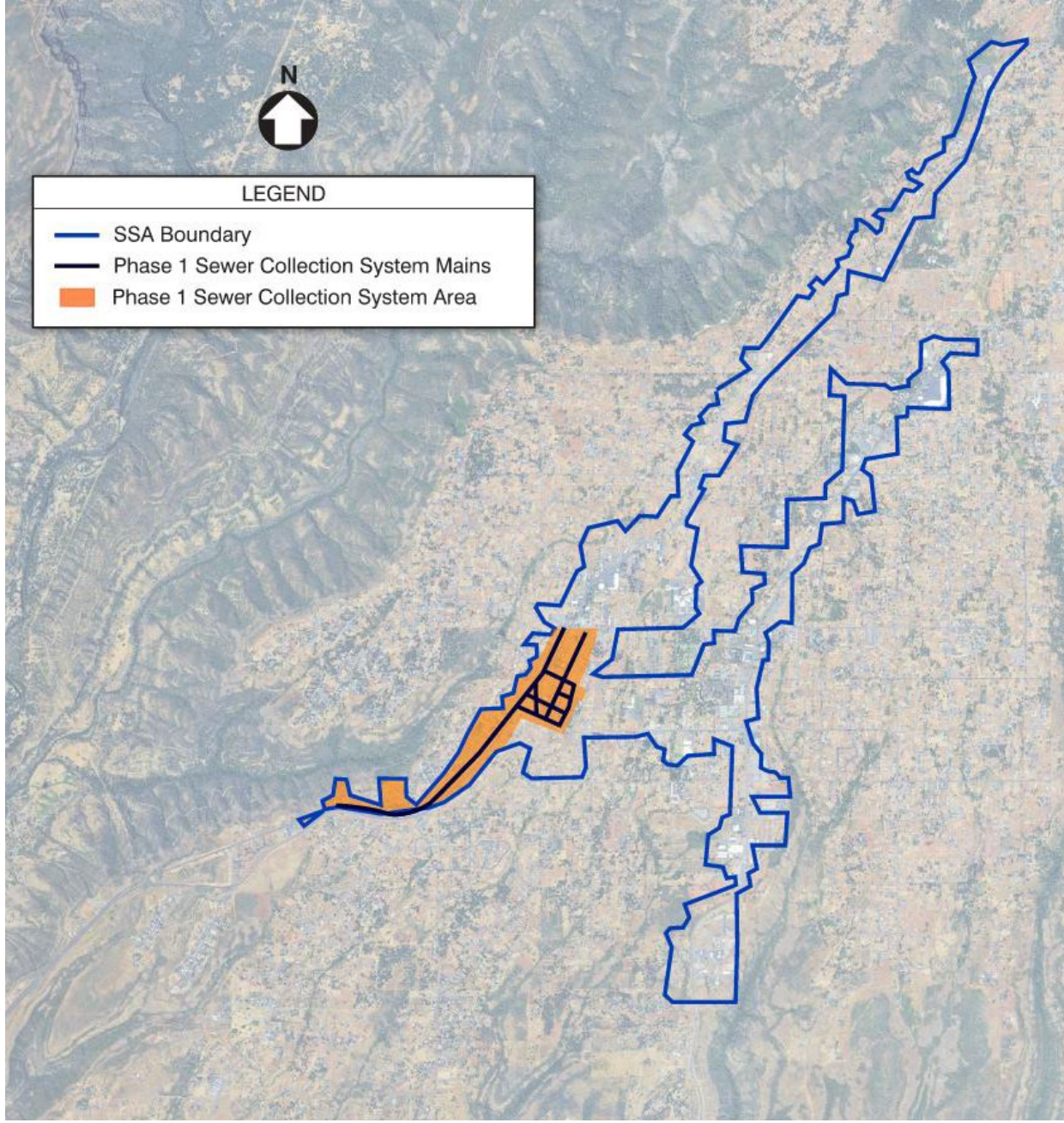
93 years providing water solutions



WATER
OUR FOCUS
OUR BUSINESS
OUR PASSION

Paradise sewer project goals

- Implement collection system for Phase 1 of the sewer service area (SSA) in a manner that is:
  - » Affordable
  - » Scalable
  - » Permittable



Phase 1 and Buildout SSA

01

Purpose of today's presentation

Town requested Carollo develop a technical evaluation to compare collection system alternatives

Hybrid Gravity and Low-Pressure Collection System

- Gravity system to WWTF.
- Potential low-pressure system in low lying areas.
- Carollo developing preliminary design of this alternative.

Full Low-Pressure Collection System

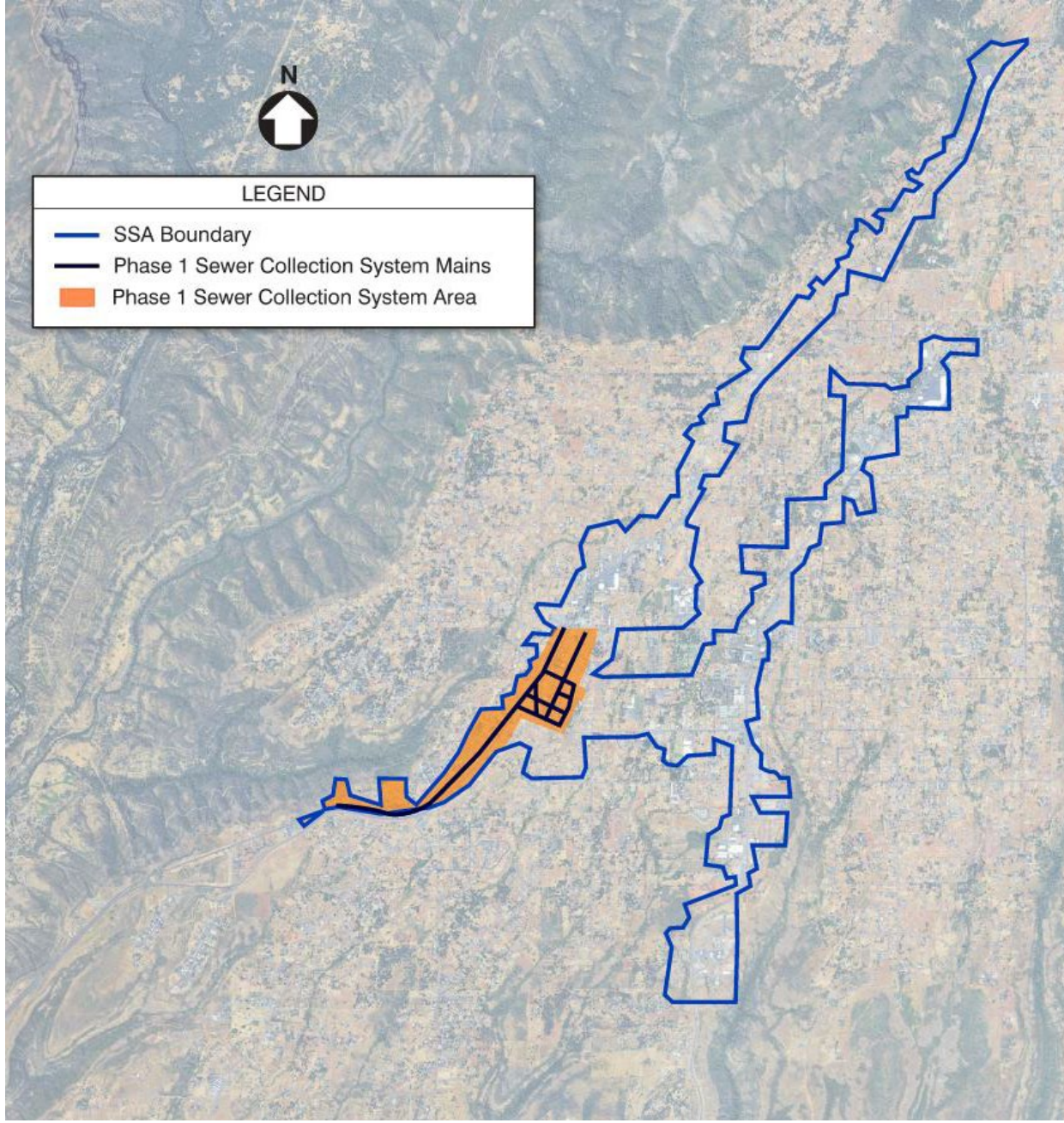
- STEP tanks or grinder pump stations at each connection.
- Pressurized wastewater pipelines to WWTFs
- Potential alternative.

02

Hybrid gravity and low-pressure collection system overview

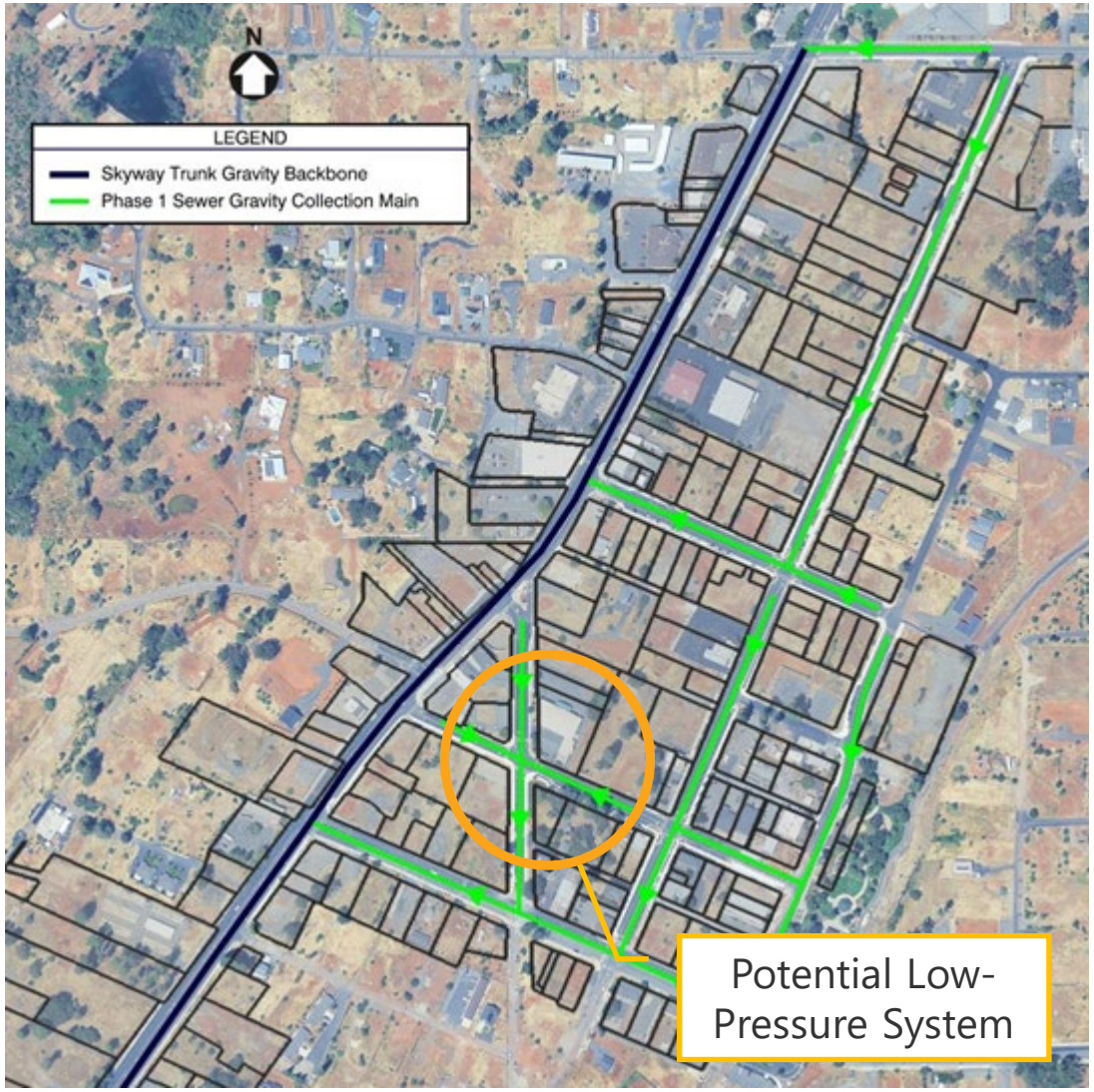
Sewer Ad Hoc Committee recommended moving forward with hybrid low-pressure gravity system in 2025

- Public outreach and technical evaluation performed in 2025.
- Carollo hired to design hybrid low pressure and gravity system.
- Carollo is developing the preliminary design.



Phase 1 and Buildout SSA

Hybrid low-pressure gravity collection system overview



Phase 1 of Collection System

- Gravity collection pipelines and laterals where system can flow by gravity.
- 20,900 feet of gravity collection pipe.
- Evaluating low-pressure collection systems in low lying areas of Town.

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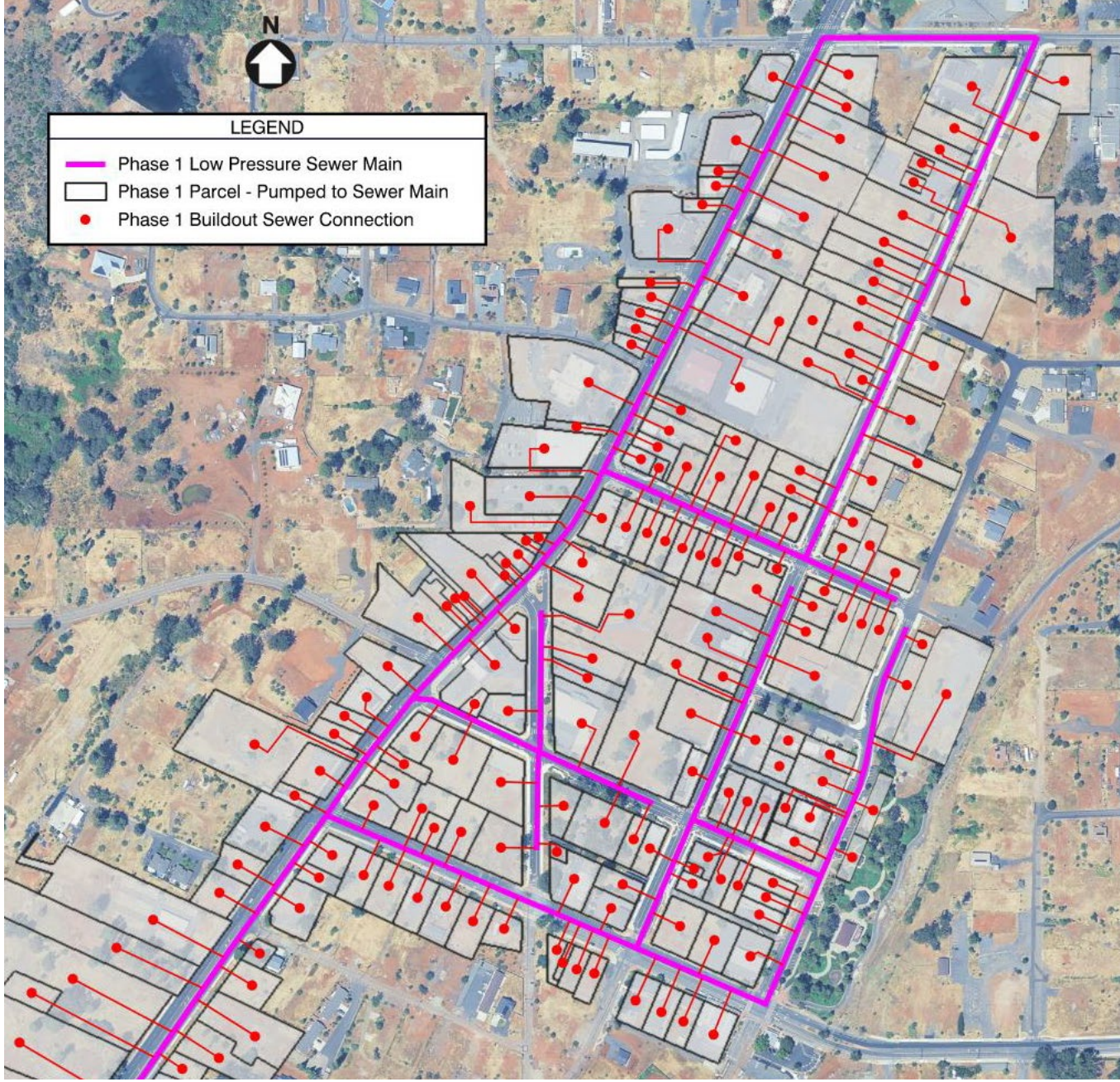
Full low-pressure system overview

Full low-pressure collection system

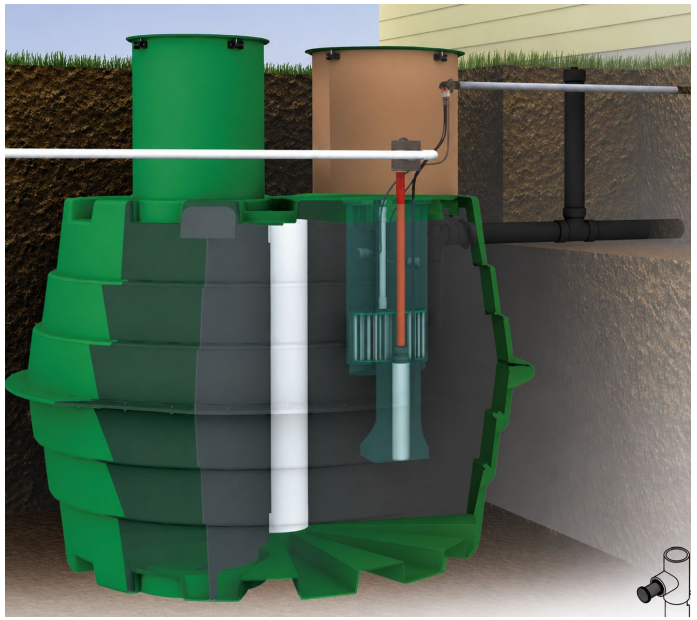
- Pump from each home/business into low-pressure system.
- System is hydraulically interconnected.



Phase 1 of Collection System

Types of low-pressure system – STEP and Grinder

Septic Tank Effluent Pump Station (STEP)



- STEP system conveys liquid waste only into low pressure system.

Grinder Pump Station

- Grinder pump station grinds solids and pumps into low pressure system.

Septic tank effluent pump (STEP) overview

- STEP tanks separate liquid from solids.
- Solids stay in the tank.
  - » Requires pump out every 3 to 5 years.
- Tank Dimensions.
  - » 1,000-to-1,500-gallon tank.
  - » 10’L x 5’W x 4.5’D for 1000 gallons.

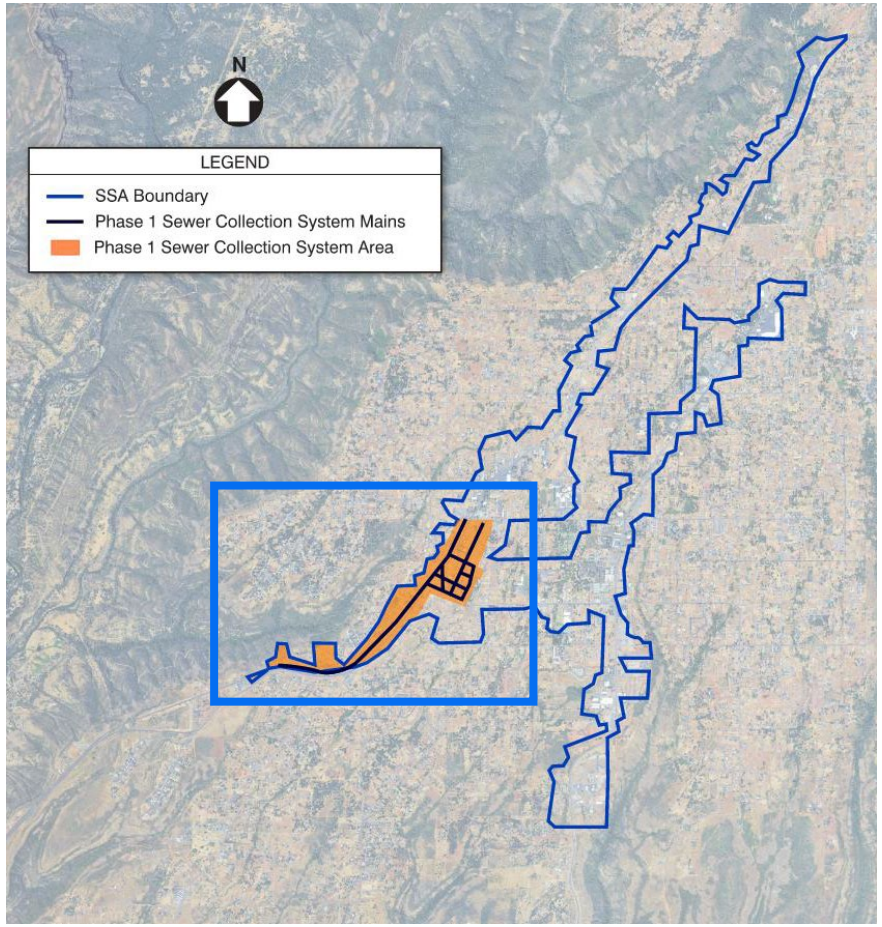
Grinder pump station system overview

- Grind solids and pump a fine slurry waste to low pressure system.
- Package can have 1 or 2 pumps.
  - » Tank holds 150 gallons to 350 gallons.
  - » Dimension: 3′ to 5′ diameter x 5′ deep.

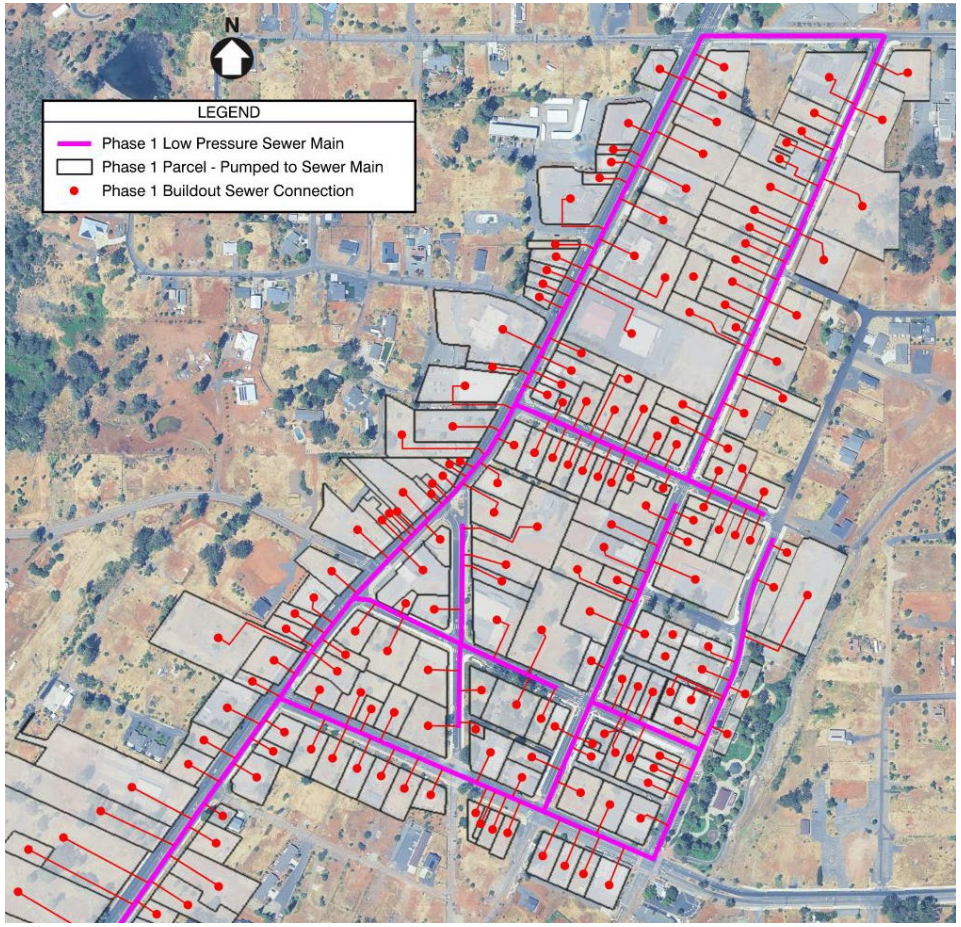
04

Summary of technical evaluation

Full low-pressure system is hydraulically interconnected (STEP or Grinder PS)

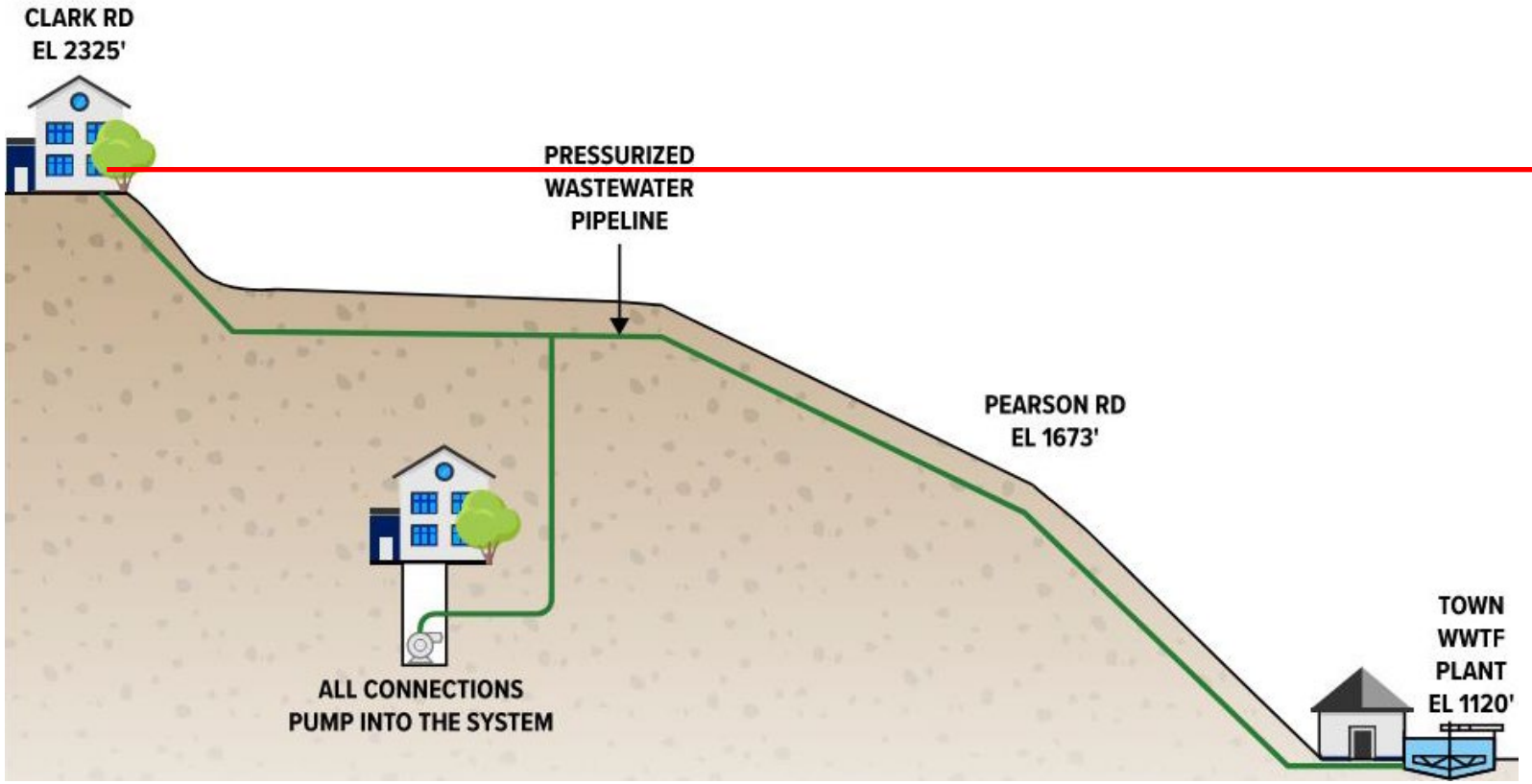


Collection system at buildout



Phase 1 of Collection System

Full low-pressure system develops high pressure due to elevation difference (STEP or Grinder PS)



Elevation Difference Creates Very High Pressure

PROFILE VIEW

Full low-pressure system has technical fatal flaws due to high system pressure

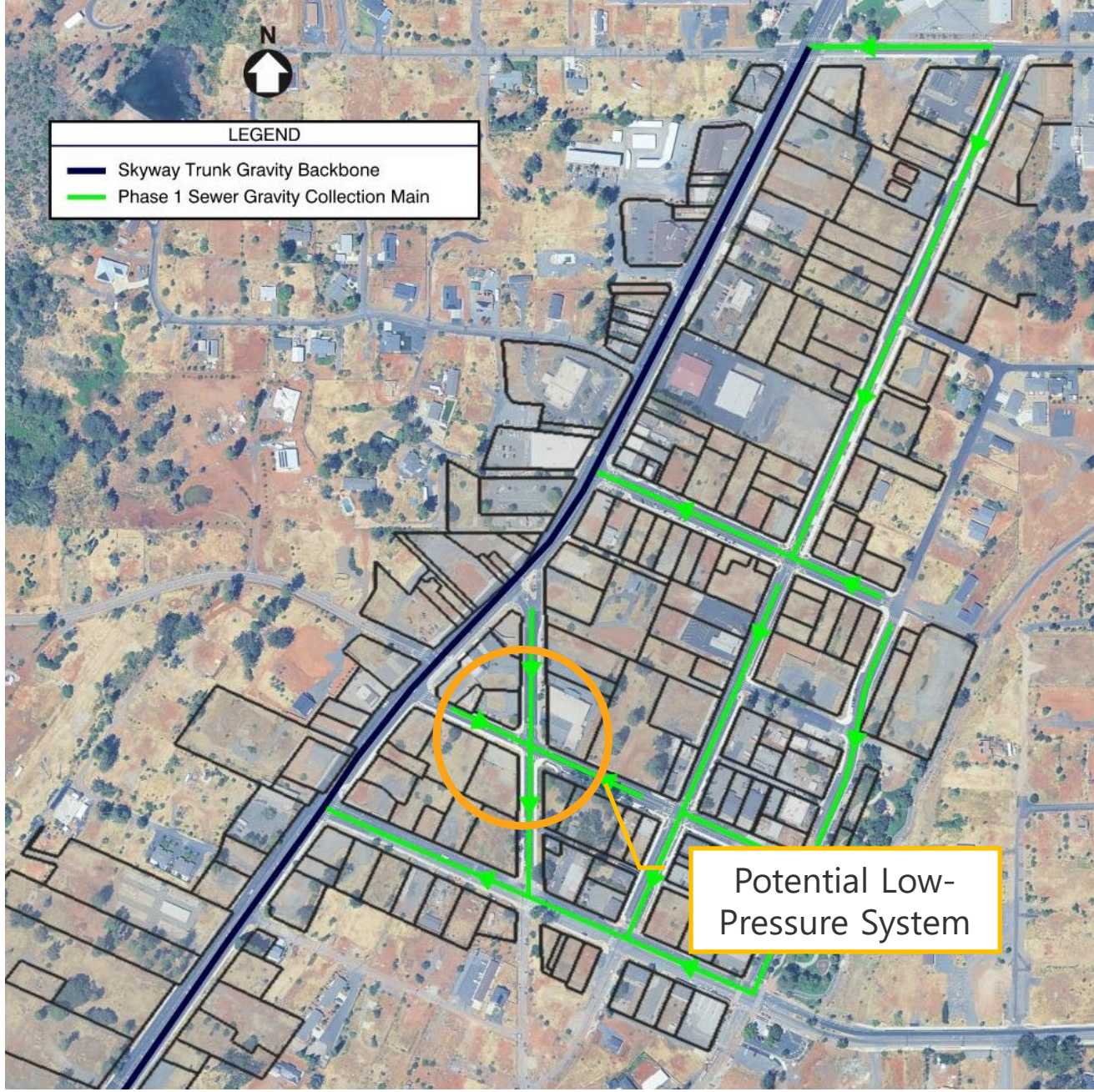
- Phase 1:
  - 635-feet of elevation change from high point in system (near Almond and Elliot) to WWTF (assumed Skyway South for this analysis).
  - 276 psi at WWTF.
- Buildout:
  - 1205-feet of elevation change from high point in system (along Skyway between Clark Road and Pentz Road) to WWTF (assumed Skyway South for this analysis).
  - 523 psi at WWTF.
- Extremely high pressure.
- Confirmed with Low-Pressure Grinder Pump Station manufacturer that the elevation difference in Town is a fatal flaw.
- HDR identified the high pressure technical fatal flaw in 2025.

Full low-pressure system has technical fatal flaws due to high system pressure

- Common operating pressure for low pressure collection systems is approx. 20-80 psi
- 276-523 psi is beyond the pressure rating of common pipes, pumps, valves and other wastewater system components
- Multiple pressure zones in a full STEP system may be possible, but require highly specialized valves and control systems not commonly used in the wastewater industry

Hybrid gravity and low-pressure system is feasible

- Gravity backbone on Skyway and other key streets.
- Low pressure system could be used to pump to gravity pipelines.
- Carollo is evaluating where low-pressure system might be beneficial.
- Hybrid approach is a typical intended use.



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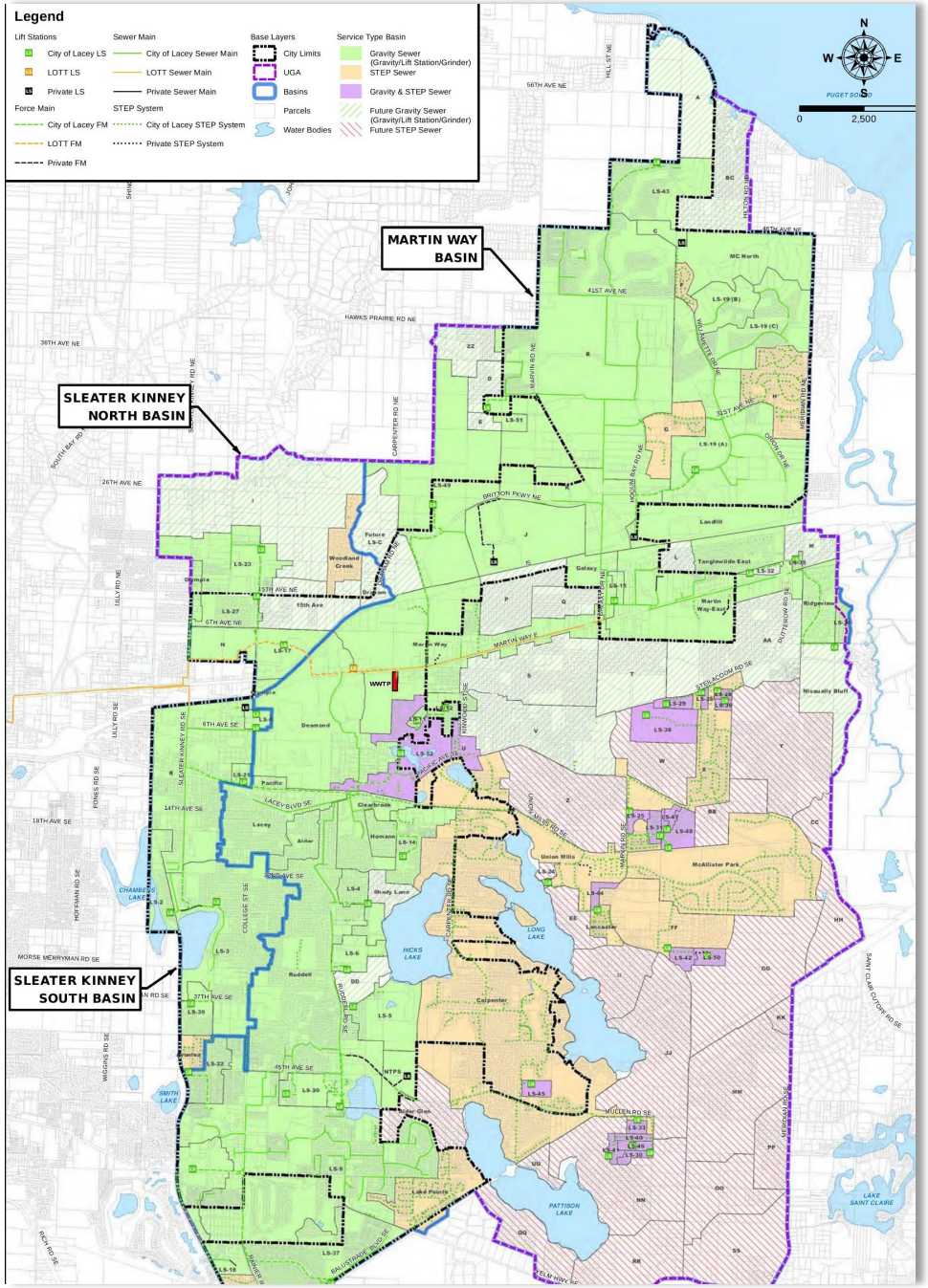
Agency Outreach and Case Studies

Carollo interviewed 9 agencies that operate low pressure (STEP and grinder pump station systems)

- **Summary of findings:**
  - Most agencies have a hybrid gravity and low pressure system – gravity for most of the system with low-lying areas pumped to the main gravity system
  - Ownership and maintenance responsibilities must be clearly defined early - most agencies owned and maintained on-lot equipment
  - Disposal of solids from STEP tanks needs to be planned

Case Study - City of Lacey, WA

- Gravity hybrid system with gravity pipes, pump stations, STEP systems, and grinder PS's that convey sewage to WWTF
- Elevation change across the City is ~50 feet
- Gravity system backbone
  - » 743,000 LF of gravity lines
  - » 27 lift stations
  - » 80,000 LF of force mains
- STEP system in low lying areas
  - » 275,000 LF of low-pressure mains
  - » 4,200 STEP connections
- 300 grinder pump stations



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Summary and recommendations

Summary and recommendations

- The full Low-Pressure System (STEP or grinder pump station) is not technically feasible due to high system pressure.
- Since the Town is planning to pursue a single WWTF site, breaking head at multiple WWTF sites is not realistic due to:
  - Site availability with suitable discharge location(s)
  - Permitability (with or without beneficial reuse)
  - Cost for capital and O&M (no economies of scale)
- We do not recommend performing a cost comparison between the Hybrid Gravity and Low-Pressure Collection System vs. Full Low Pressure System alternatives

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Questions and answers