



# PIPELINES CONFERENCE

Calgary, Alberta | July 27–31, 2024

## A Route Study to Reduce Expenses and Reduce Groundwater Usage

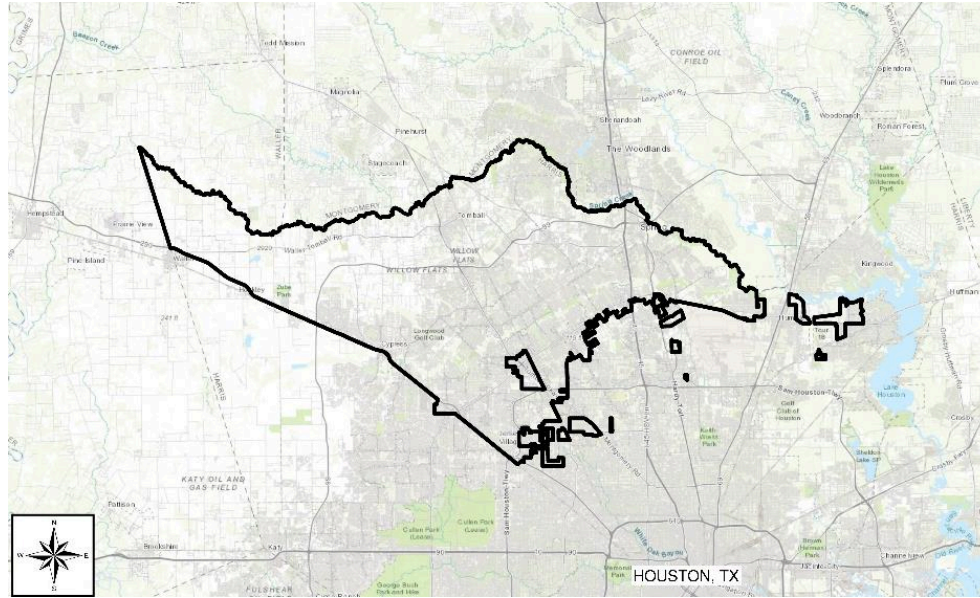
*John Rush, E.I.T | Rafael Ortega, P.E. | Rajinder Singh, P.E. | Showri Nandagiri, P.E. (Retired)*



*Utility Infrastructure: Moving Onward to a Sustainable Future*



# History of the North Harris County Regional Water Authority (NHCRWA)



- Special purpose authority created in 1999 by Texas Legislature (House Bill 2965), in response to **Harris-Galveston Subsidence District (HGSD)** extending surface water conversion mandates northward to convert groundwater usage to surface water.
- **NHCRWA's (the Authority)** area is generally bounded by US 290 on the west, Harris County line on the north, US 59 on the east and BW 8 to the south.

# Why Convert to Surface Water?

## Harris-Galveston Subsidence District (HGSD)

- Special-purpose district created by the Texas Legislature in 1975 and is authorized as a groundwater regulatory agency to cease ongoing and prevent future subsidence in Harris and Galveston counties.

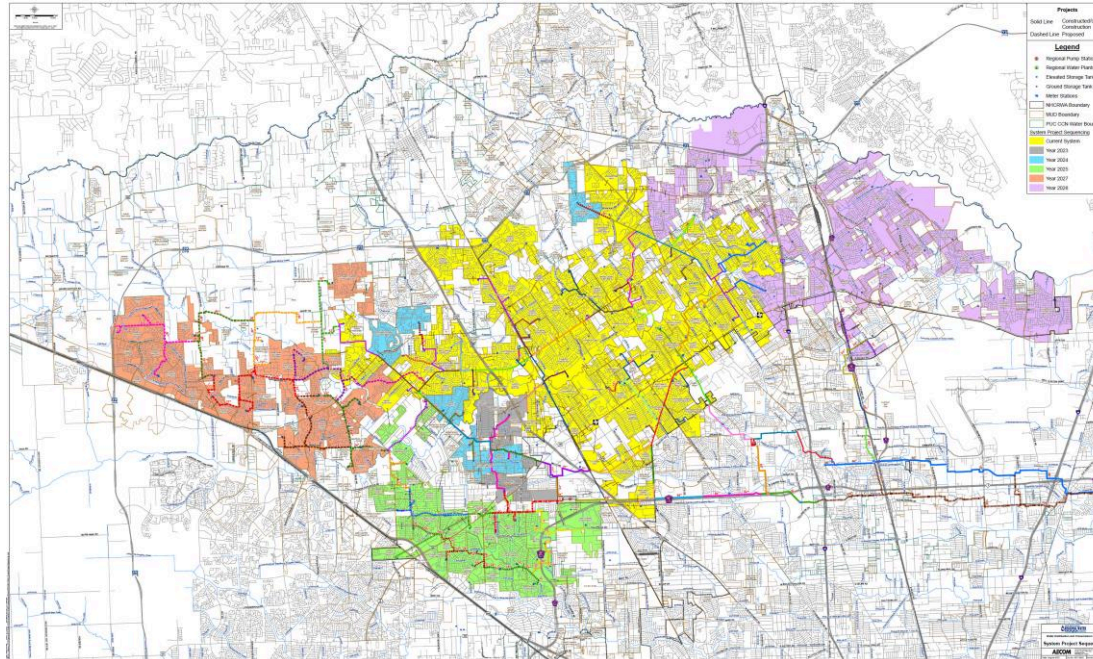
## Subsidence

- Caused by the substantial, long-term withdrawal of groundwater.
- Pumping large amounts of water from the aquifers pulls water out of layers of clay, which causes the clay to compact.
- **Compaction** is seen at the surface as subsidence and has contributed to **increased flooding, damage to our roads, and infrastructure issues** in the area.



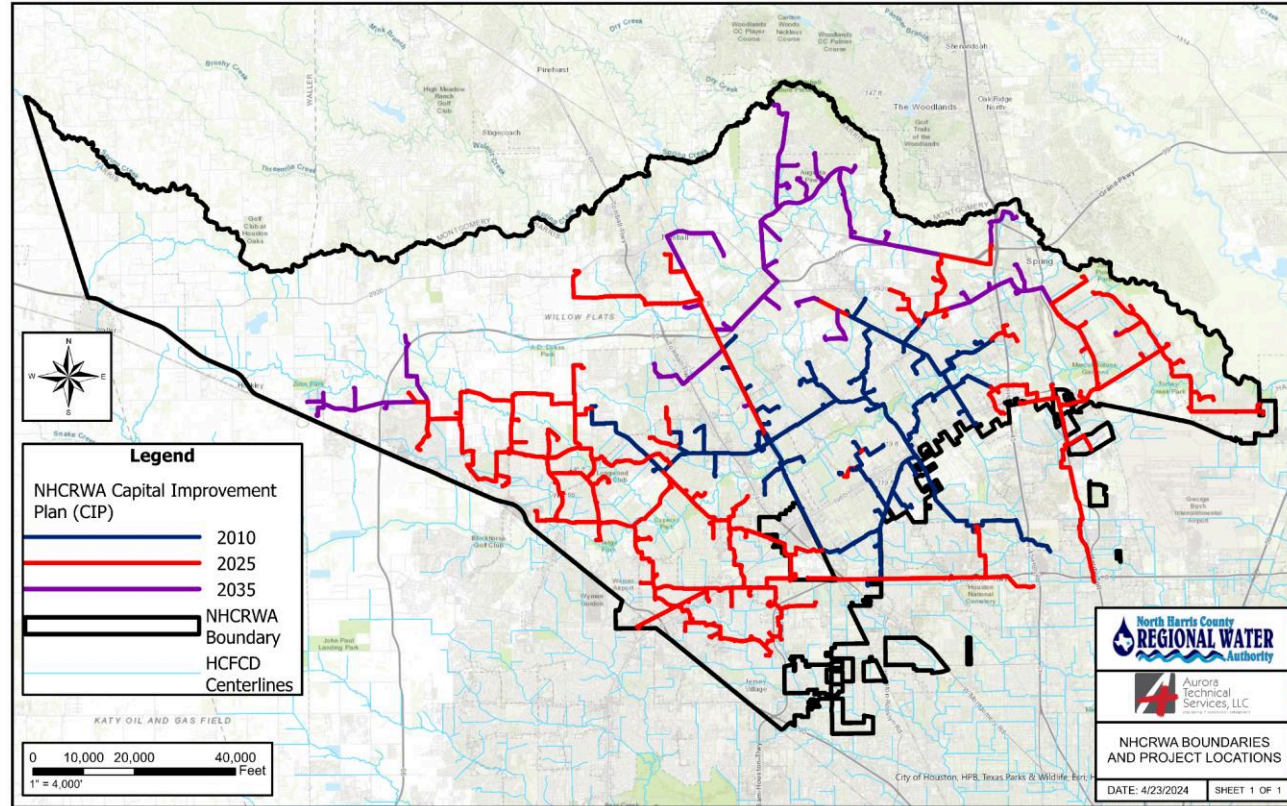
# Authority's Mission

- **Mission:** Secure a long-term supply of quality surface water and to facilitate the transition to surface water in compliance with HGSD requirements
- **Authority Water Distribution and Transmission System Project Sequencing:**



# Authority's Plan

- Reduce groundwater usage in the northeast portion of the greater Houston area to minimize subsidence.
- Work to meet the HGSD Regulatory Plan
  - 60% reduction of groundwater usage by 2025
  - 80% reduction of groundwater usage by 2035
- Primary Method: Convert Municipal Utility Districts (MUDs) to surface water



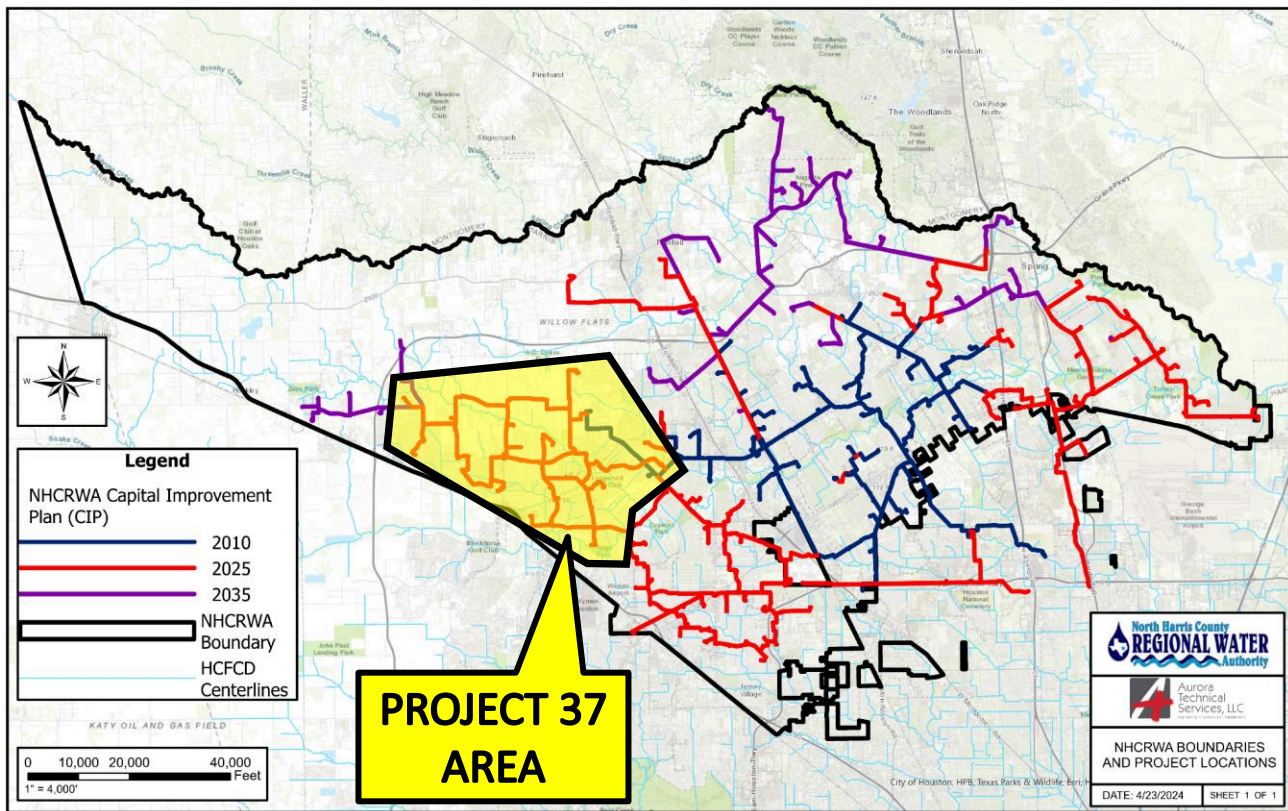


# Project Objective

## Project 37 Route Study

### Primary Objective:

- Determine feasible waterline routes
- Convert 23 water plants owned by MUDs – referred to as water receiving facilities (WRF)
- Reduce length of dead ends
- Minimize Easements
- Complete by end 12/2027



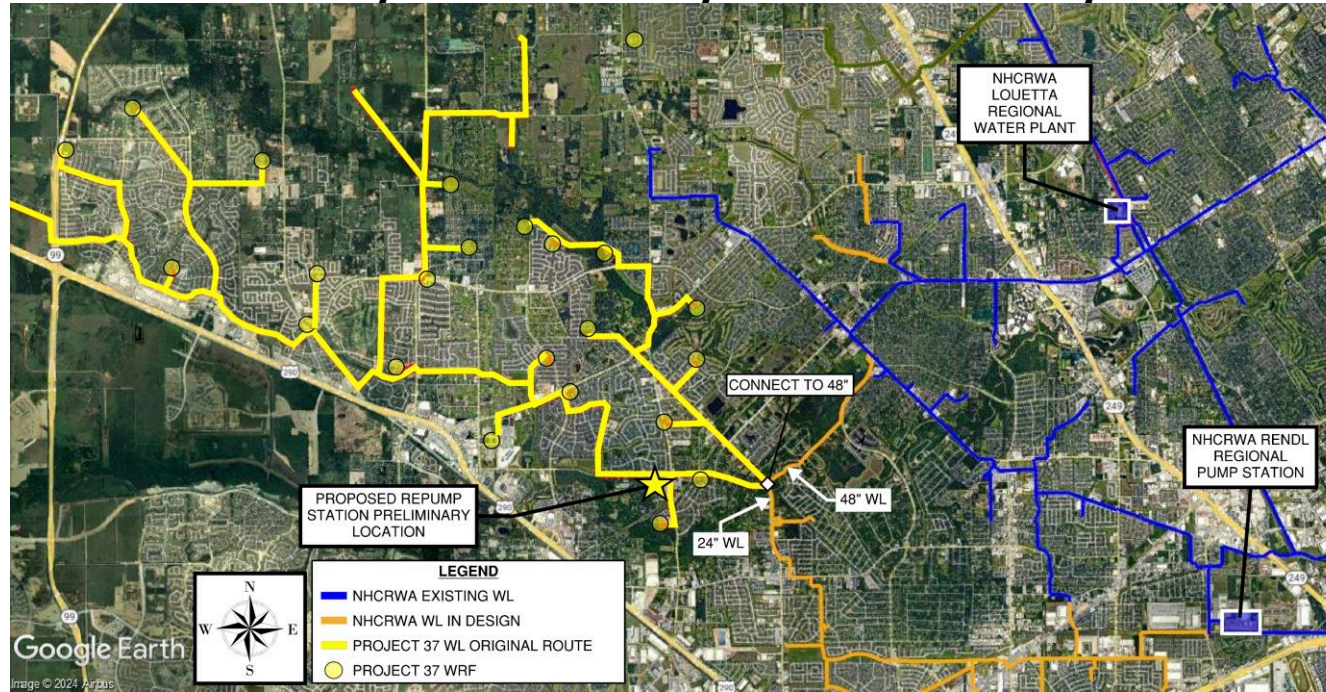
# Project 37 – Background

## Project 37 Route Study

### Background:

- Original routes planned as part of system master plan
- Included a new Repump station to serve area

## Authority Transmission System & Preliminary Routes:



# Project 37 – Alignment Considerations

- Length
- Minimize impacts to residents
- Fewer easements required
- Reduces impact to structures
- Tree protection and environmental considerations
- Construction Cost
- Maintenance and Operation of water lines



# Project 37 – Challenges



## Main Challenges

- Road ROW owned by Harris County
- Public Agencies' ongoing efforts for
  - Roadway expansions
  - Drainage channel and stream expansions
  - Neighborhood and MUD development
- Approx. 40 miles of WL
- Large distances between WRFs



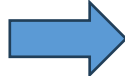
Requires easements



Reduced area for easements & extensive coordination required



High cost with significant impact to community



Long lengths of WL without redundancy

# ROW and Agency Coordination

The Authority's preference is to construct WLs in ESMTs. Typically acquired from:

- HOA landscaping properties
- Non-residential properties

The Authority will coordinate with following agencies to utilize their ROW


- Harris County – owns road ROW
- Harris County Flood Control District – owns drainage features ROW

Due to the agencies' numerous expansion projects, the Authority and the above mentioned agencies determined that coordination should occur early.

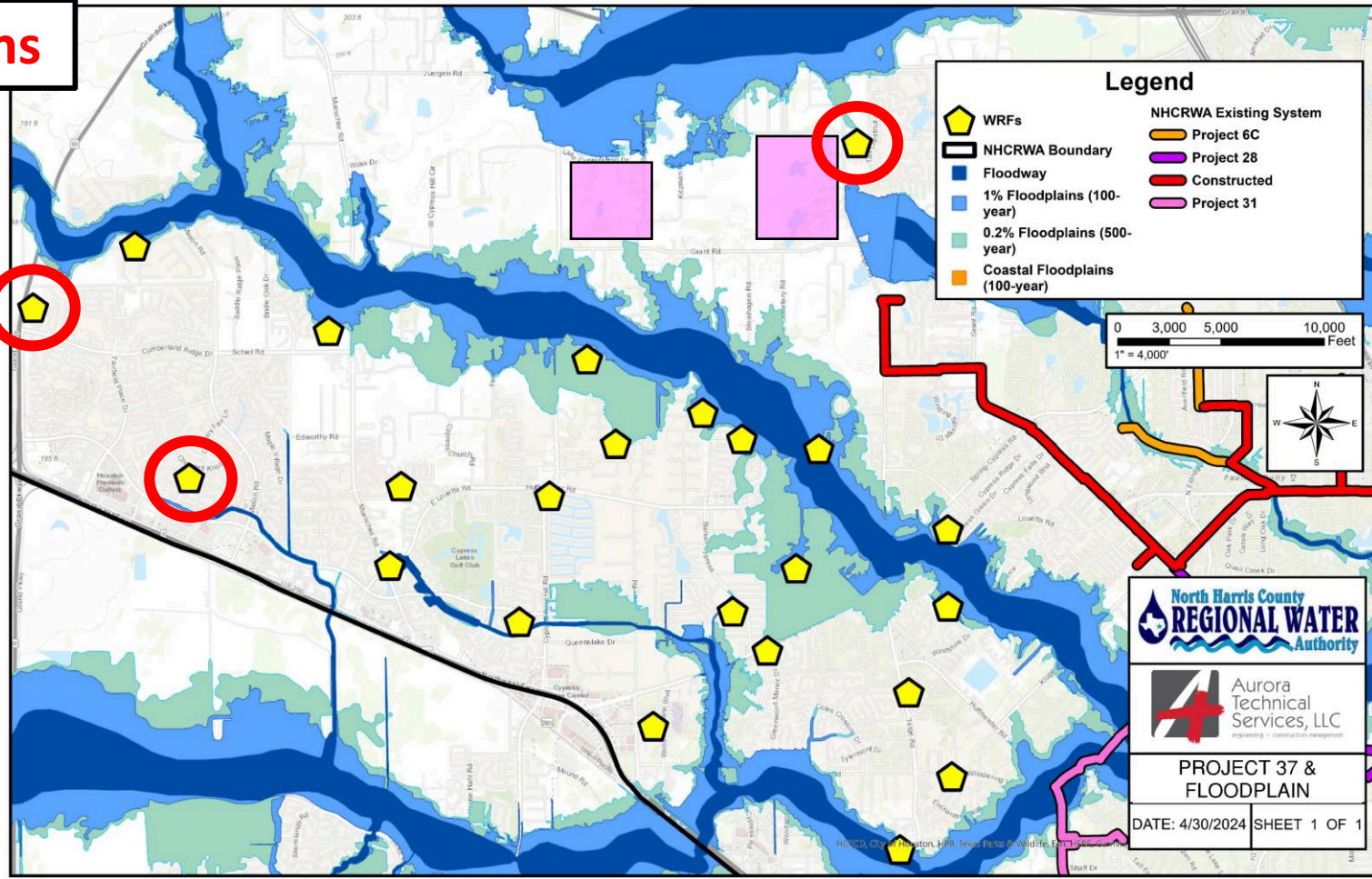
The early communication is KEY to the overall continued success of the project



# Field Conditions

 25% of Pumpage

 Future MUDs



  
**North Harris County  
REGIONAL WATER  
Authority**

  
**Aurora  
Technical  
Services, LLC**  
engineering • construction management

**PROJECT 37 &  
FLOODPLAIN**

DATE: 4/30/2024 SHEET 1 OF 1



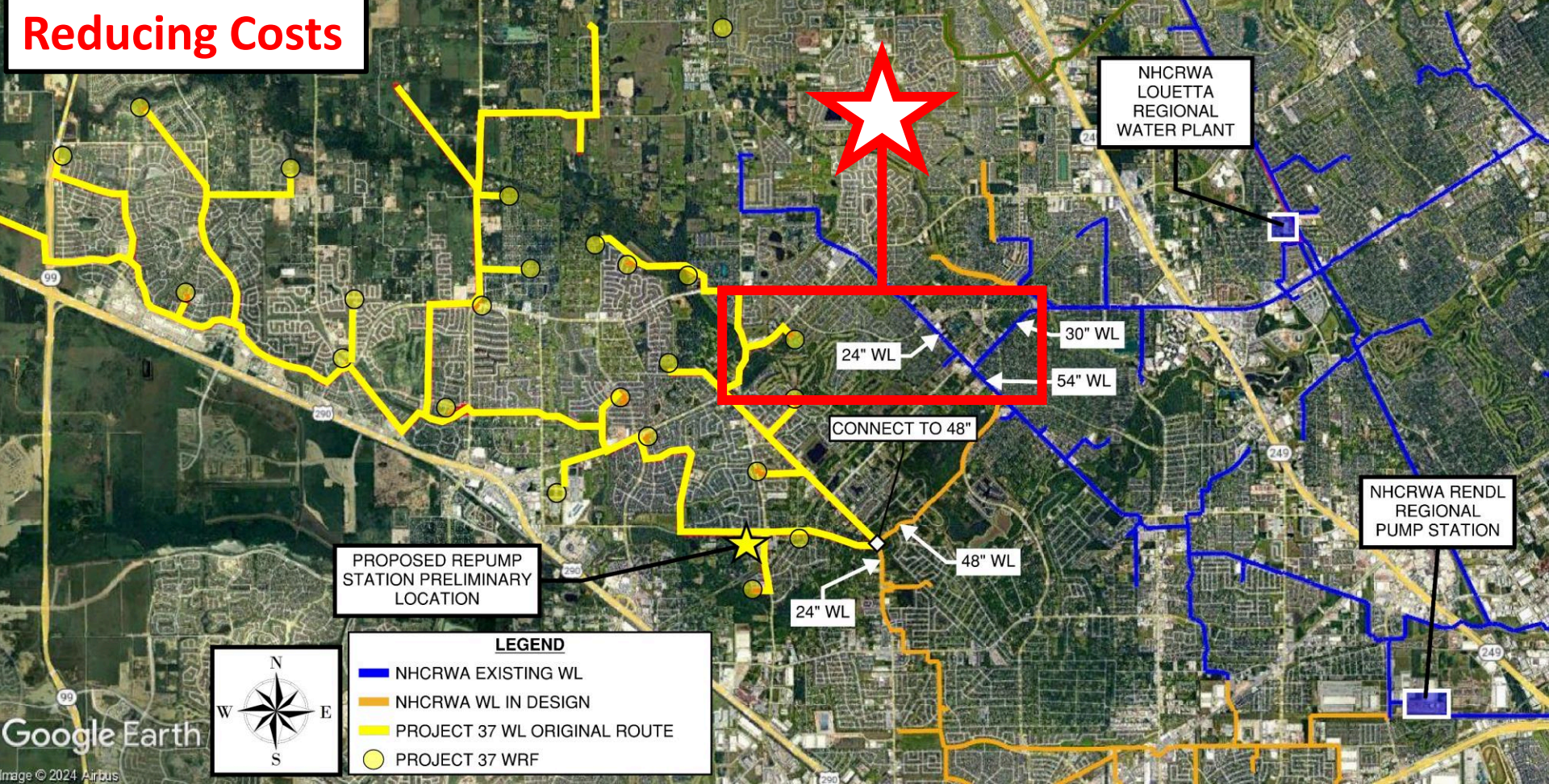
# Reducing Costs

- Utilize the pressures from existing pump stations and **eliminate** need for a new pump station
- Estimated Construction Cost Savings of not constructing Proposed Pump Station = \$ 50M+
- How? By providing a more interconnected system, better pressures realized.





# Reducing Costs



**LEGEND**

- NHCRWA EXISTING WL
- NHCRWA WL IN DESIGN
- PROJECT 37 WL ORIGINAL ROUTE
- PROJECT 37 WRF

Google Earth  
Image © 2024 Airbus



# Reducing Costs

- Team developed alignment to utilize flow from the 54" WL.
- Hydraulic modeling confirmed 42" WL or parallel lines would eliminate need for new pump station.





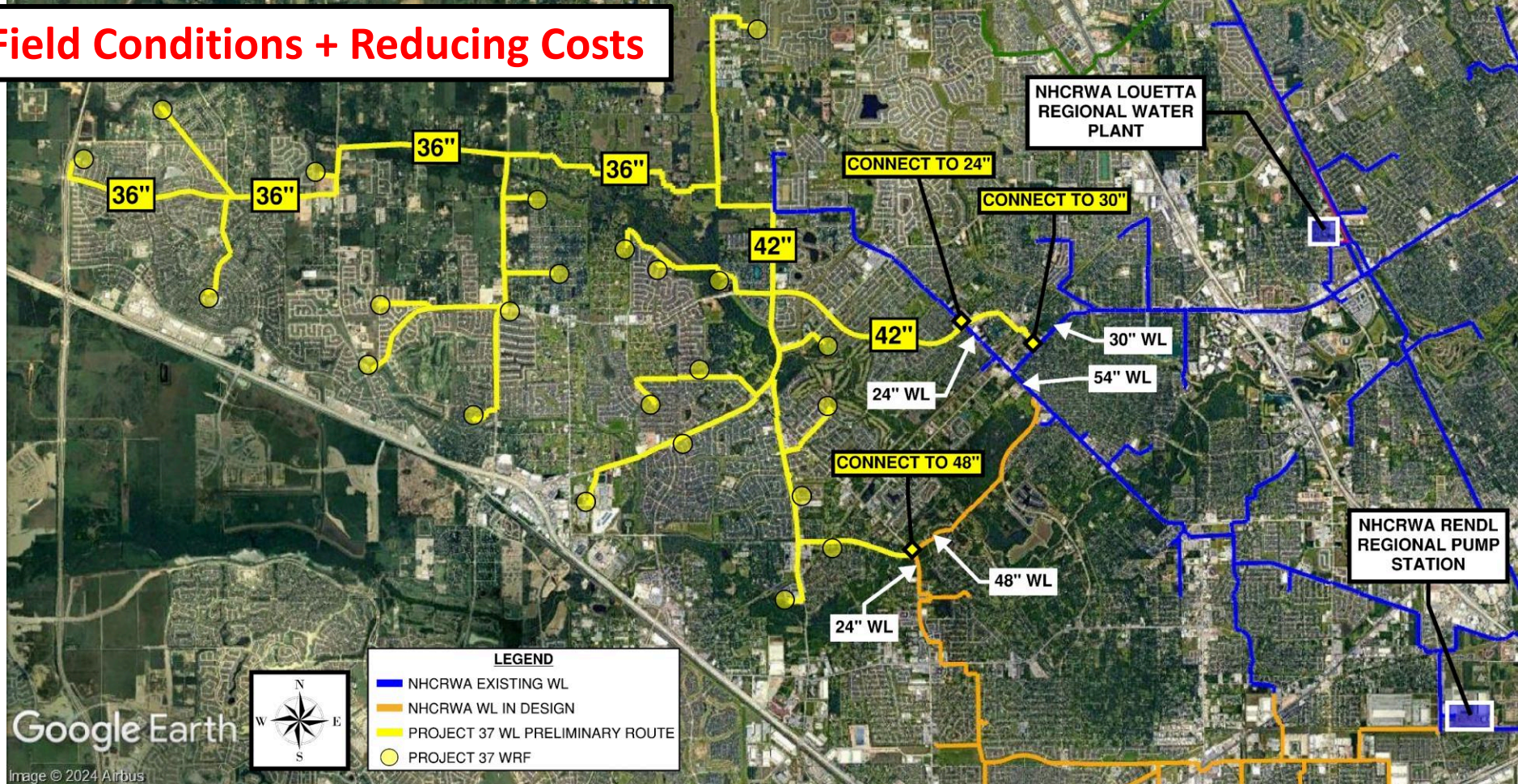
# Reducing Costs

- Team developed 2<sup>nd</sup> alignment to utilize flow from the 54" WL.
- Hydraulic modeling confirmed alignment and sizes would still eliminate need for new pump station.
- Avoided upsizing or parallel water lines.





# Field Conditions + Reducing Costs



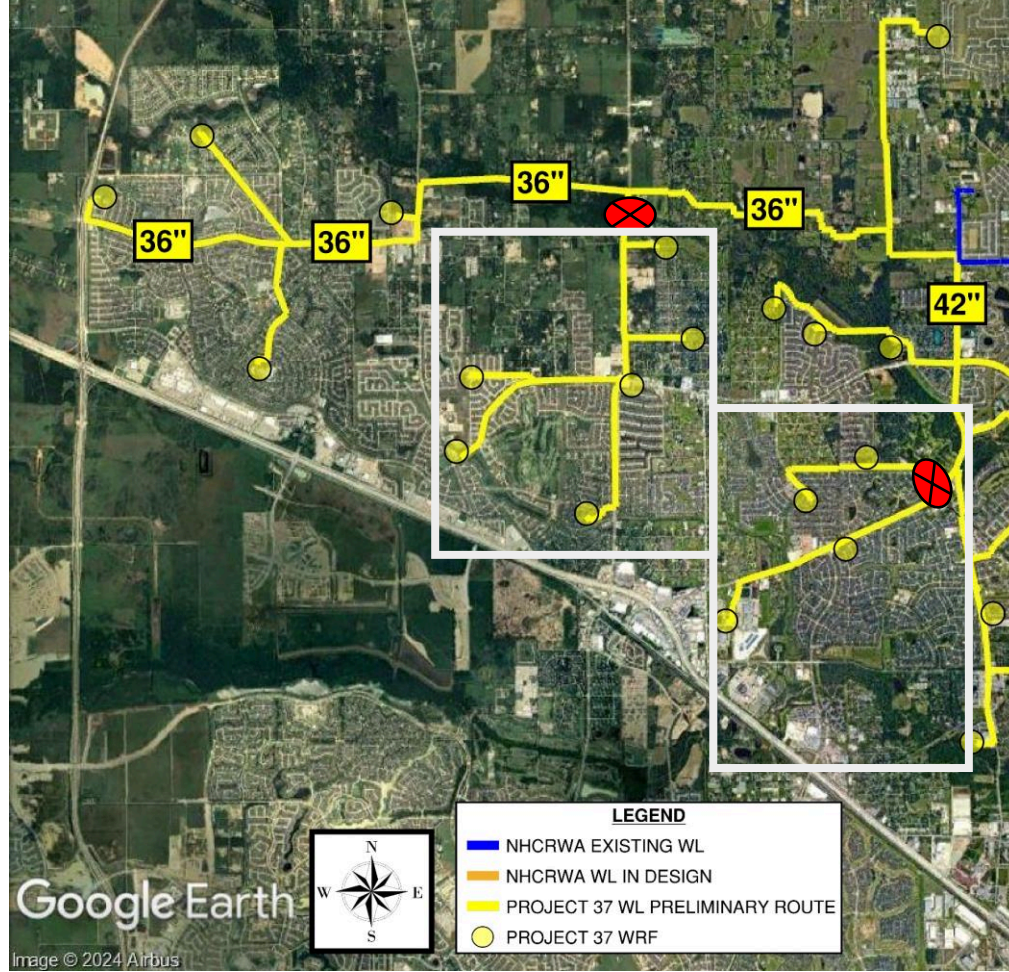


# Reliability and Backup Supply

The Authority's preference: Construct system with increased reliability when possible

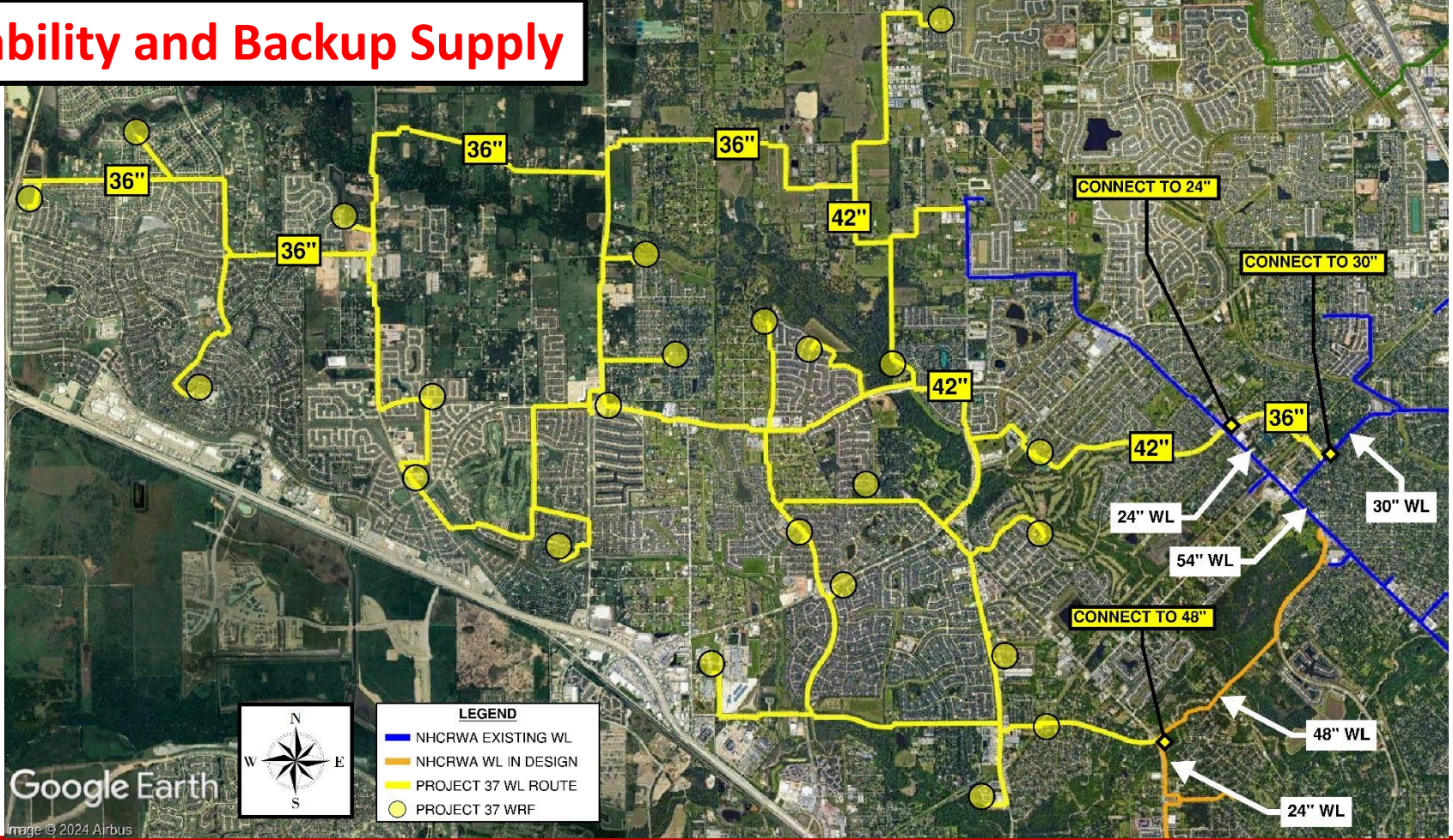
Reliability provides the following benefits:

- Interconnectivity & Looped system
- Reduced O&M risk
- Back up supply to the WRFs
- Allows for consistent supply to WRFs even during emergency line shutdowns





# Reliability and Backup Supply

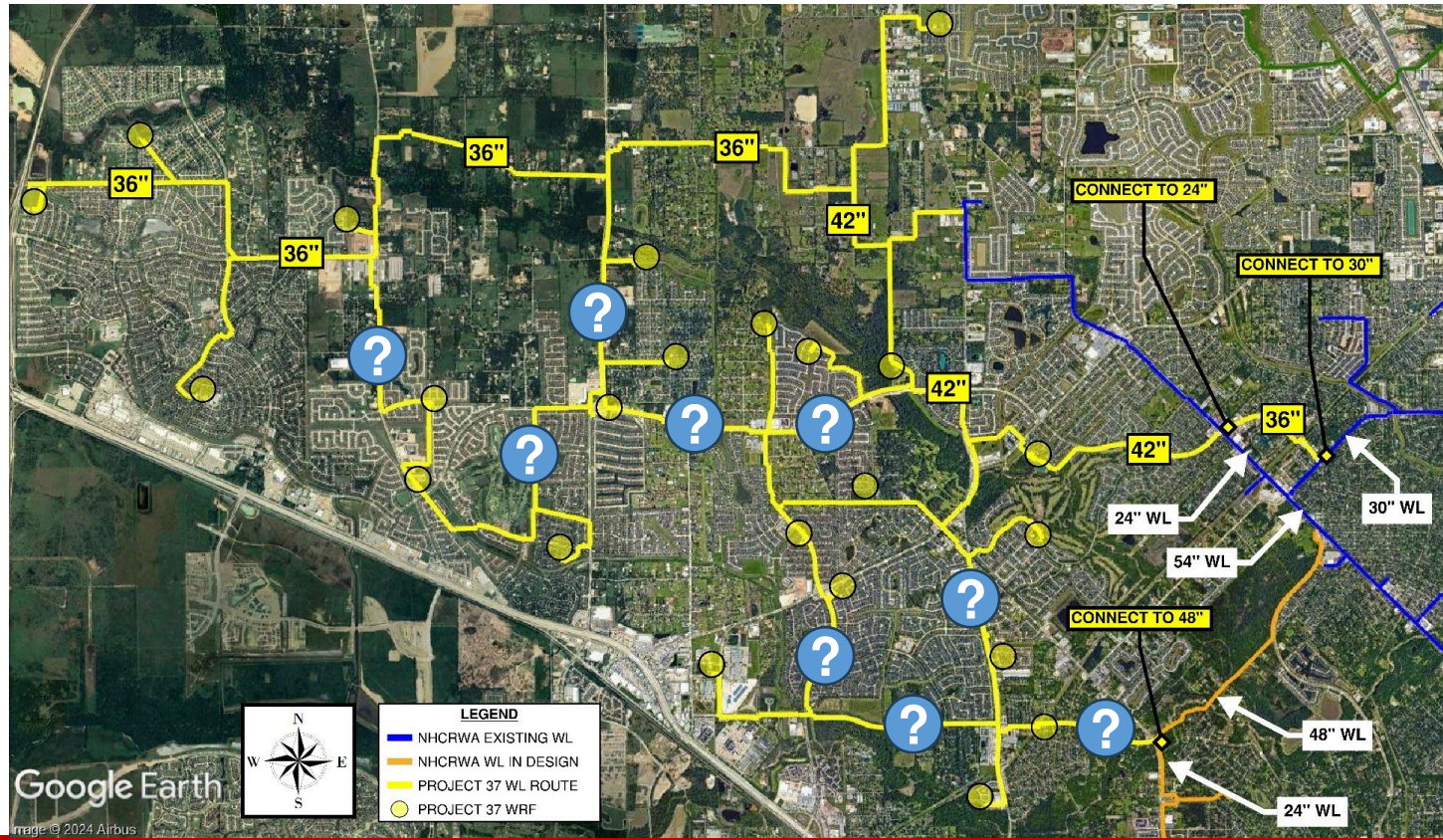


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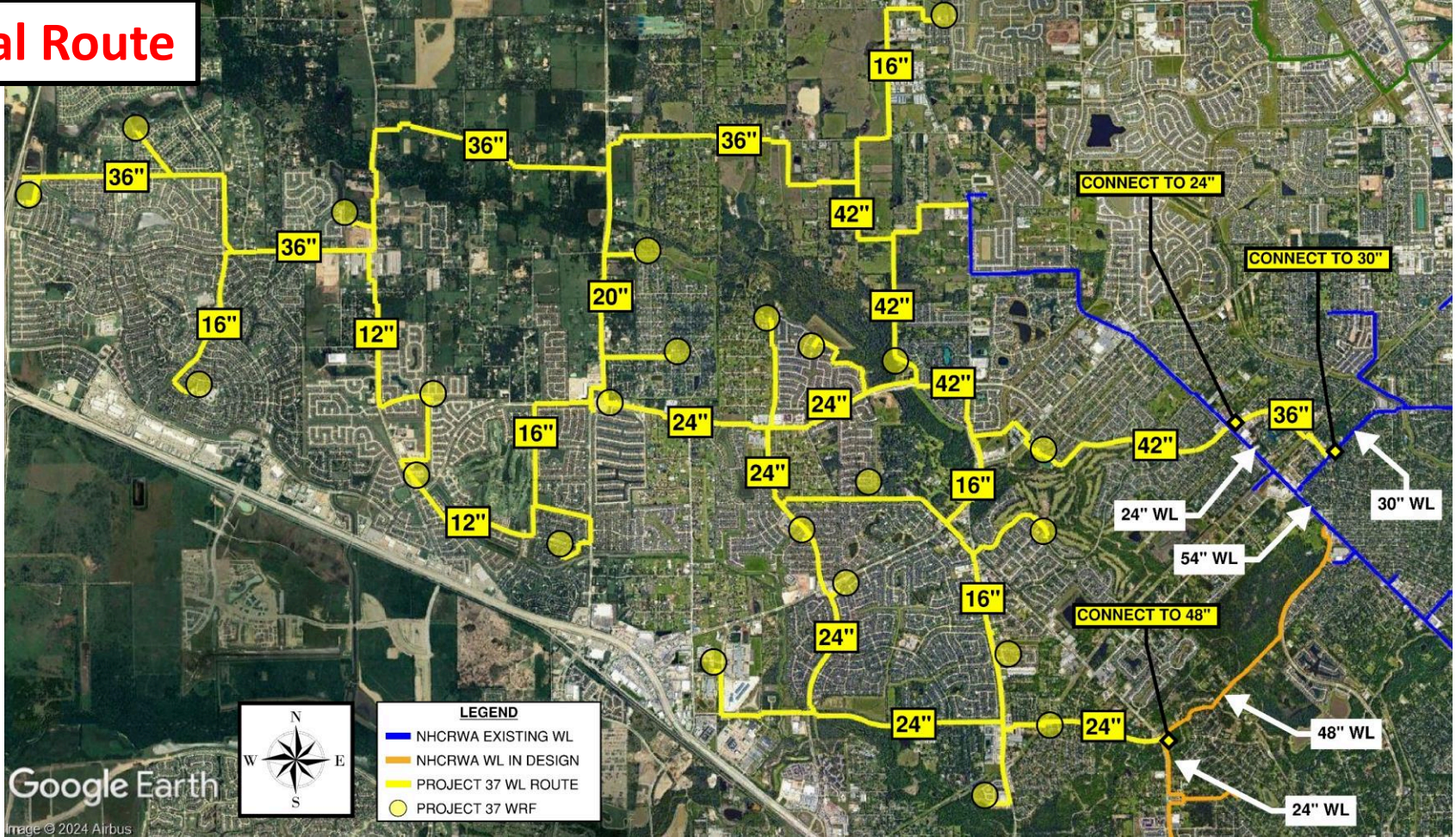
# Final Step - Diameters

- Worked with Authority's Modeling Consultant
- Found the interconnectivity improved pressures in system
- Optimized diameters to meet minimum pressures needed
- Diameters satisfy the ultimate system beyond Project 37



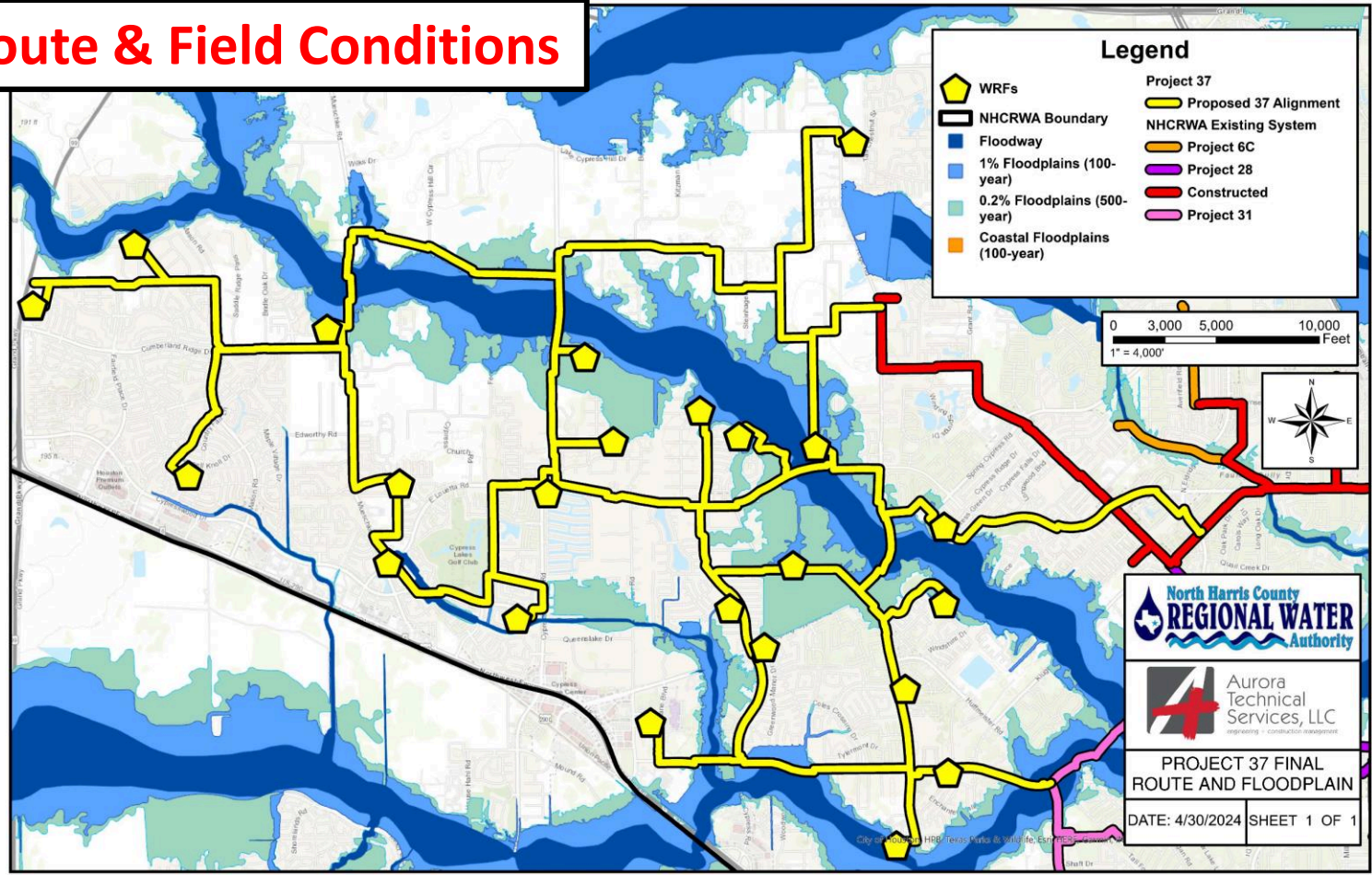


# Final Route





# Final Route & Field Conditions



# Project 37 Facts

- 240,000 LF of water line
- $\approx$  700 easements
- 10 construction contracts
- Contract Cost Range
  - \$ 20M to \$ 38M



# Project 37 Design

- Current Designs @ 60% Completion reaching 95% Completion
- Floodplain management
  - Using pole-mounted rectifiers
  - Using pole-mounted air vents
  - Keeping appurtenances out as much as possible
- ROW Acquisition
  - Divide and Conquer

# Conclusion

- Providing interconnectivity lead to
  - Optimal line sizes
  - Increase reliability
- Route eliminated need for new Pump Station and save \$50M+
- Will successfully convert 23 WRFs to surface water and reduce subsidence
- Early and consistent coordination with other agencies proved to be key
  - Thanks to Harris County Flood Control District & Harris County Precinct 3 for cooperation and support.



# Q&A / Credits



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