

MaRS ENGINEERING PRESSURE ZONE ANALYSIS – LINDON CITY

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Overview

The primary objectives of MaRS was to determine possible locations for future tanks, model these locations in EPA net and determine the most efficient and cost effective locations.

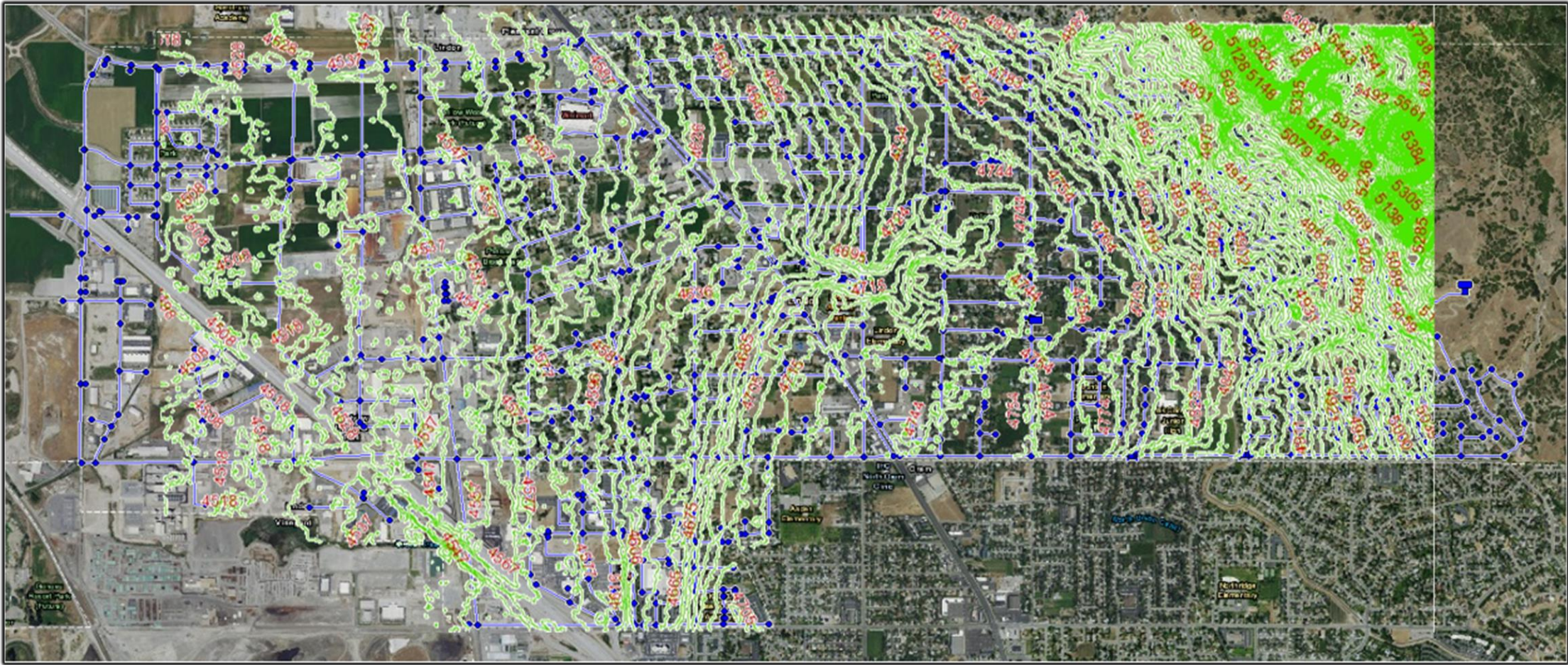
TESTS						
Test Locations	Provide Zones	Status	Initial Cost	Yearly Cost	Supplemental Notes	Tested Designs
1) Sumac Hollow	1, 2, 3	Pass	\$ 2,282,000	\$ 5,171	Recommended Design	2
2) Expansion of Tank	1, 2, 3, 4	Pass	\$ 2,556,000	\$ 4,512	Removal of Current 0.5MG Tank	2
3) Oak Canyon J. High	1	Pass	\$ 4,414,000	\$ 4,366	Excessive Pipe Instalment	2
4) City Center Park	1	Pass	\$ 4,346,000	\$ 4,541	Requires High Water Tower	4
Murdock Canal Trail Head	1	Fail	N/A	N/A	Pump Failure - Neg Pressure	4
Squaw Hollow Park	1, 2	Fail	N/A	N/A	Pump Failure - Neg Pressure	2
Pioneer Park	1	Fail	N/A	N/A	Insufficient Head	1
Hollow Park	1	Fail	N/A	N/A	Pump Failure - Neg Pressure	4
Fryer Park	1	Fail	N/A	N/A	Feeds N. Area - Pump Failure	2

Determining Locations for a New Tank

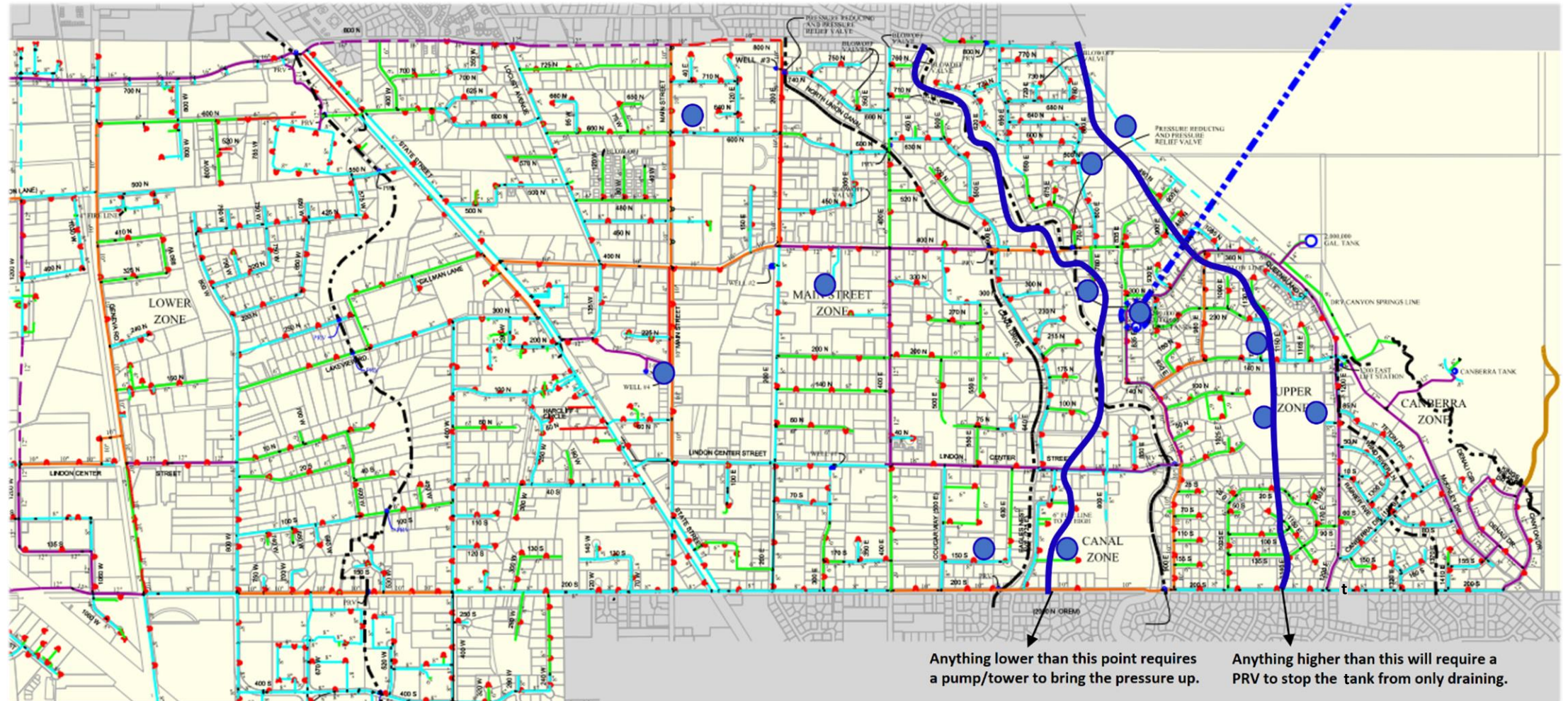
Find the overall cheapest tank location for Lindon

- **Land owned by Lindon City**
 - **However, other parcels of land were also tested**
- **Reduce need of PRVs if possible**
- **Low energy costs (analyzed based on pump use)**
 - **Reduce the head lost from pumping by placing tank at lower elevation**
 - **Place tank at high enough elevation to drain without pumping**

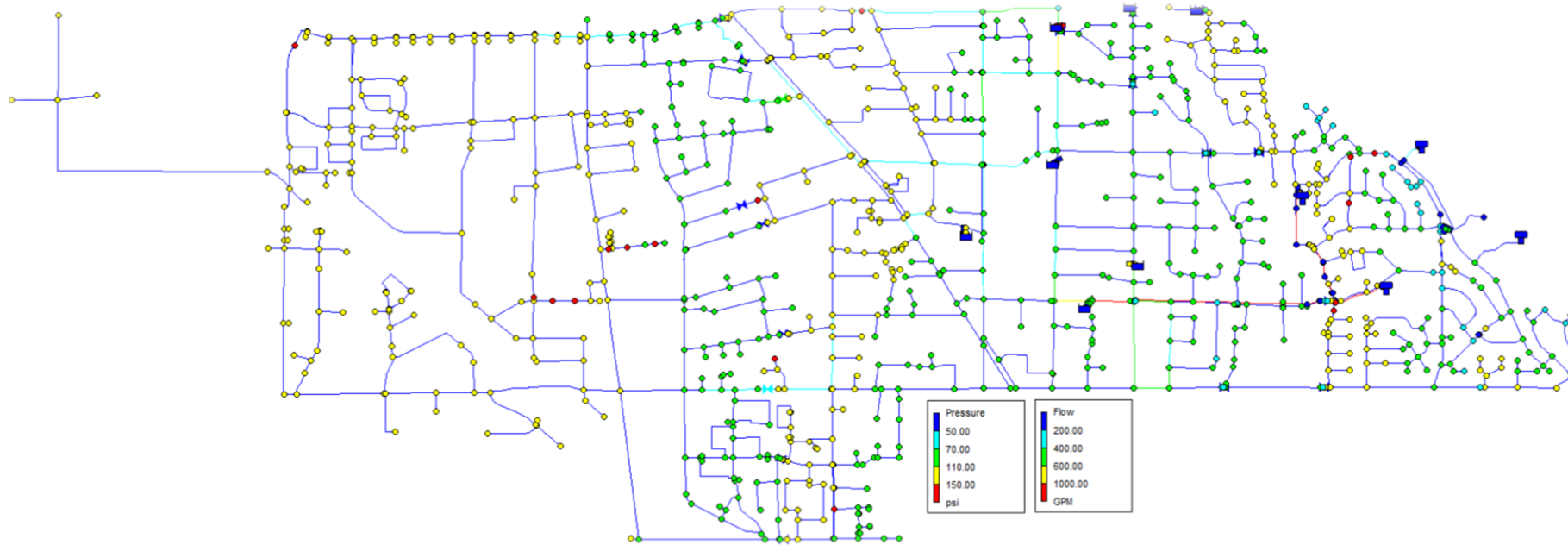
Contour Map



Test Tank Locations



EPA Net



- EPA Net was download for free at <https://www.epa.gov/water-research/epanet> along side its tutorials.
- The layout to Lindon's culinary water system was imported and tested.
- Mock Trials were completed to gain a better understanding of the City's water patterns.
- Errors in the given data were found and resolved through contact with JUB Engineering.

Tank Analysis

- **Design Criteria**
 - Sustained indefinitely with a peak daily factor of 1.86
 - Minimum 20 psi with fire flow during peak day demand
 - Minimum of 30 psi during peak instantaneous demand
 - Minimum of 40 psi during peak day demand
 - Maximum of 150 psi
- **Loop discovered among the upper tanks which limited their ability to supply the lower zones**
 - Caused every model to fail

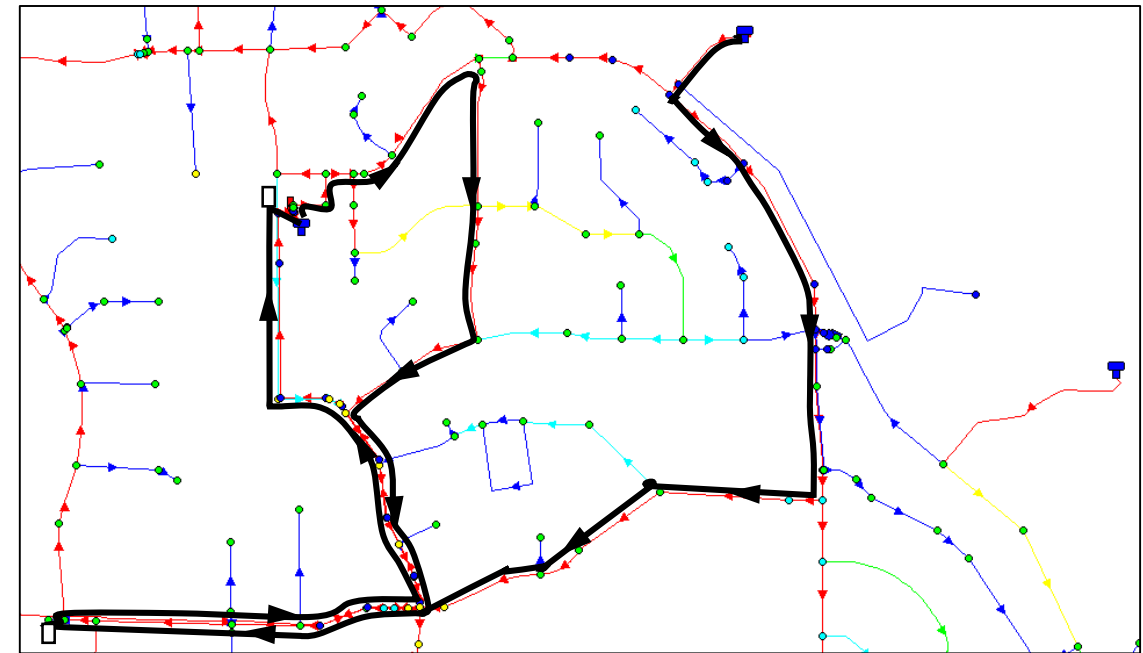


Figure of Water Drainage Loop

Loop Resolution

- Relocate the connection of the 18-inch pipeline from 700 E to 400 E
- Allows for tanks to drain directly to the lower zones



New connection point

Extended pipeline

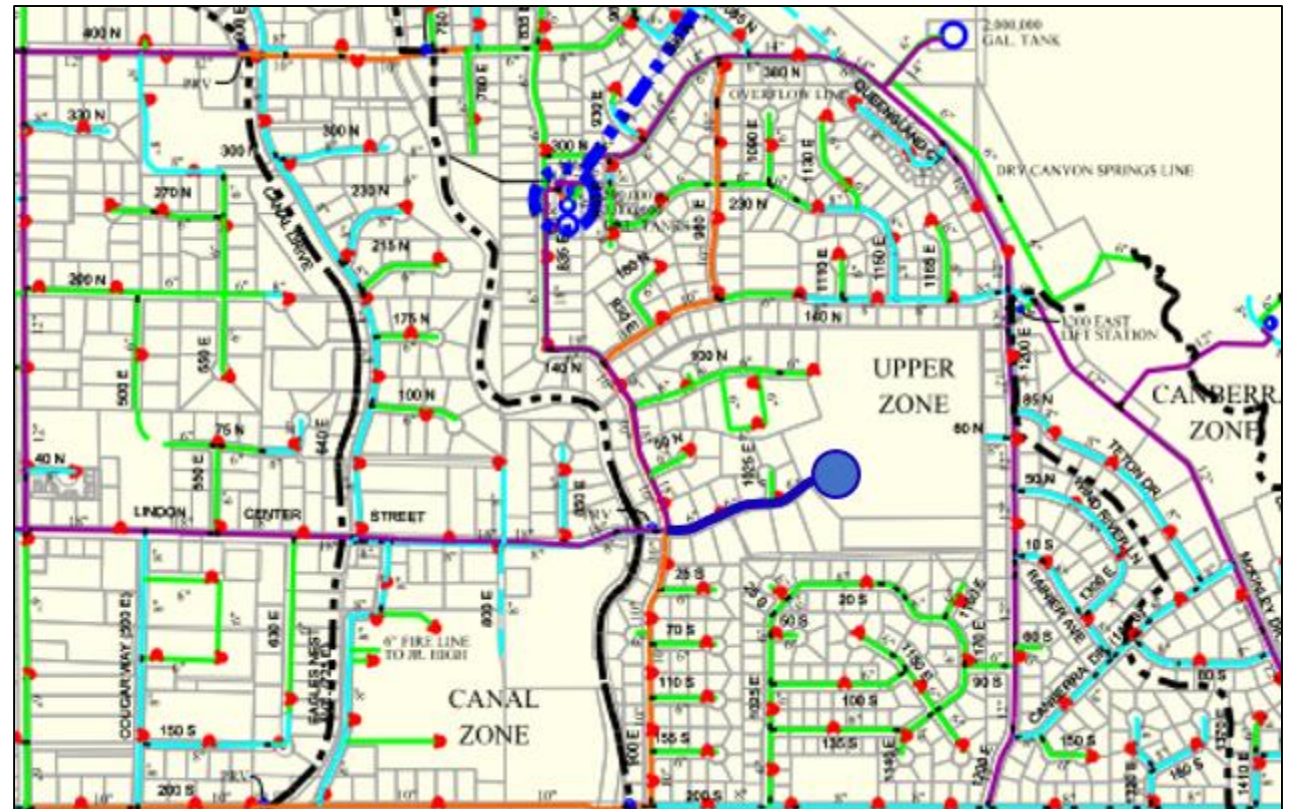
Existing connection point

Successful Locations

- **Sumac Hollow: Undeveloped Area in the Upper Zone**
- **Expansion of Current Tank: Redevelopment of current 500,000 gal tank**
- **Oak Canyon Jr. High: South side of the School soccer field in the Canal Zone**
- **City Center Park: Within the Main Street Zone this Tank will require a 100ft tower**

Recommended Design: Sumac Hollow

- **Would connect directly to the lines feeding the lower tanks**
- **Approximately 109 ft. in diameter and 15 ft. tall.**
- **Requires 1200ft of 18-inch pipe (not including the 900 East extension)**



Sumac Hollow

- Elevation is 10ft higher than existing two water tanks. To optimize yearly cost, 10-15ft additional excavation will be required.
- The picture to the right shows the tank in the natural stream bed, the location for lowest elevation.

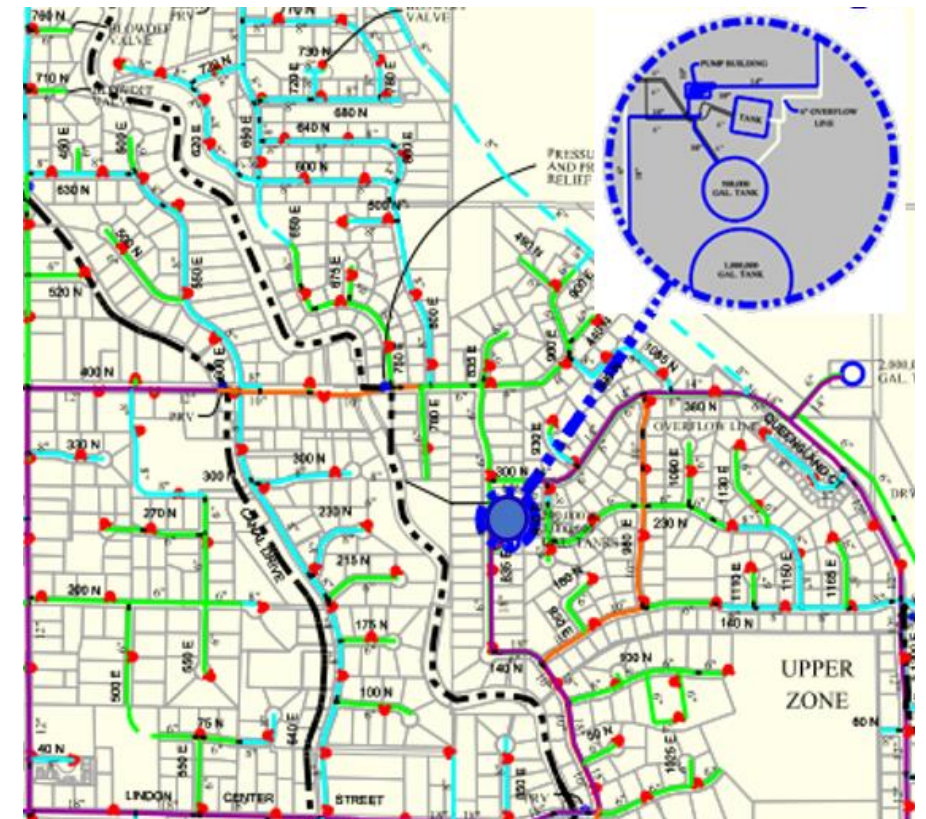


Sumac Hollow - Cost

Field Near Sumac Hollow				
Item Description	Quantity	Unit	Unit Price	Amount
Earthwork (cut)	9500	C.Y.	\$ 11	\$ 104,500
Earthwork (fill)	100	C.Y.	\$ 10	\$ 1,000
1 MG Tank	1	each	\$ 1,000,000	\$ 1,000,000
Piping, fittings, valves, meters, etc.	1	each	\$ 55,000	\$ 55,000
Telemetry/Control/Monitoring	1	each	\$ 55,000	\$ 55,000
Land acquisition	0.3	acre	\$ 30,000	\$ 9,000
Pipe From Tank to Corner of Center Street and 900 E				
Earthwork (cut)	667	C.Y.	\$ 11	\$ 7,333
Earthwork (fill)	560	C.Y.	\$ 10	\$ 5,600
18-inch pipe	1200	L.F.	\$ 148	\$ 177,600
Asphalt repair	1200	L.F.	\$ 35	\$ 42,000
18" Extension to 400 E				
Earthwork (cut)	1055	C.Y.	\$ 11	\$ 11,605
Earthwork (fill)	880	C.Y.	\$ 10	\$ 8,800
18-inch Main Line	1900	L.F.	\$ 148	\$ 281,200
Asphalt repair	1900	L.F.	\$ 35	\$ 66,500
Other Fees: Engineering, Legal Administrative, Finance 25%				\$ 456,285
Total Cost				\$ 2,282,000

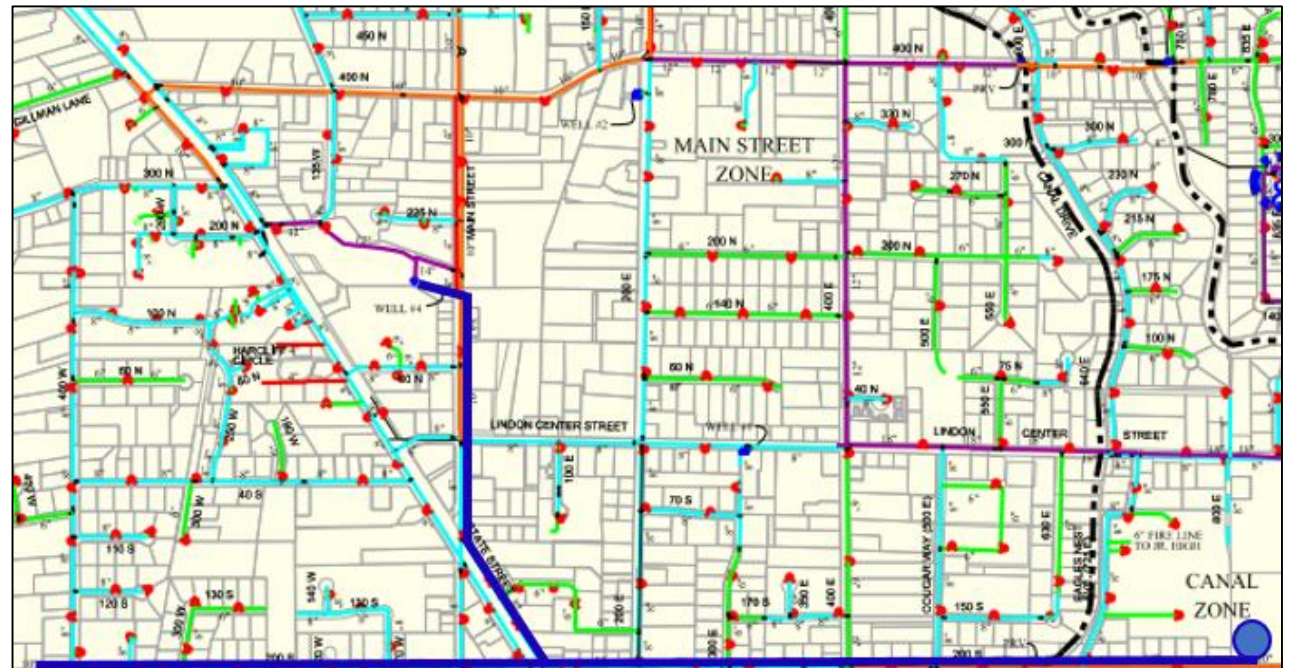
Other Design: Expansion of Current Tank

- The expansion of the current tank was the most straight forward test.
- Extra cost came into the analysis by having to remove the current 500,000 gal tank.
- The total initial cost is estimated to be about \$2,556,000.
- The yearly cost for the system's pumps and wells is estimated to be \$4,512.12.



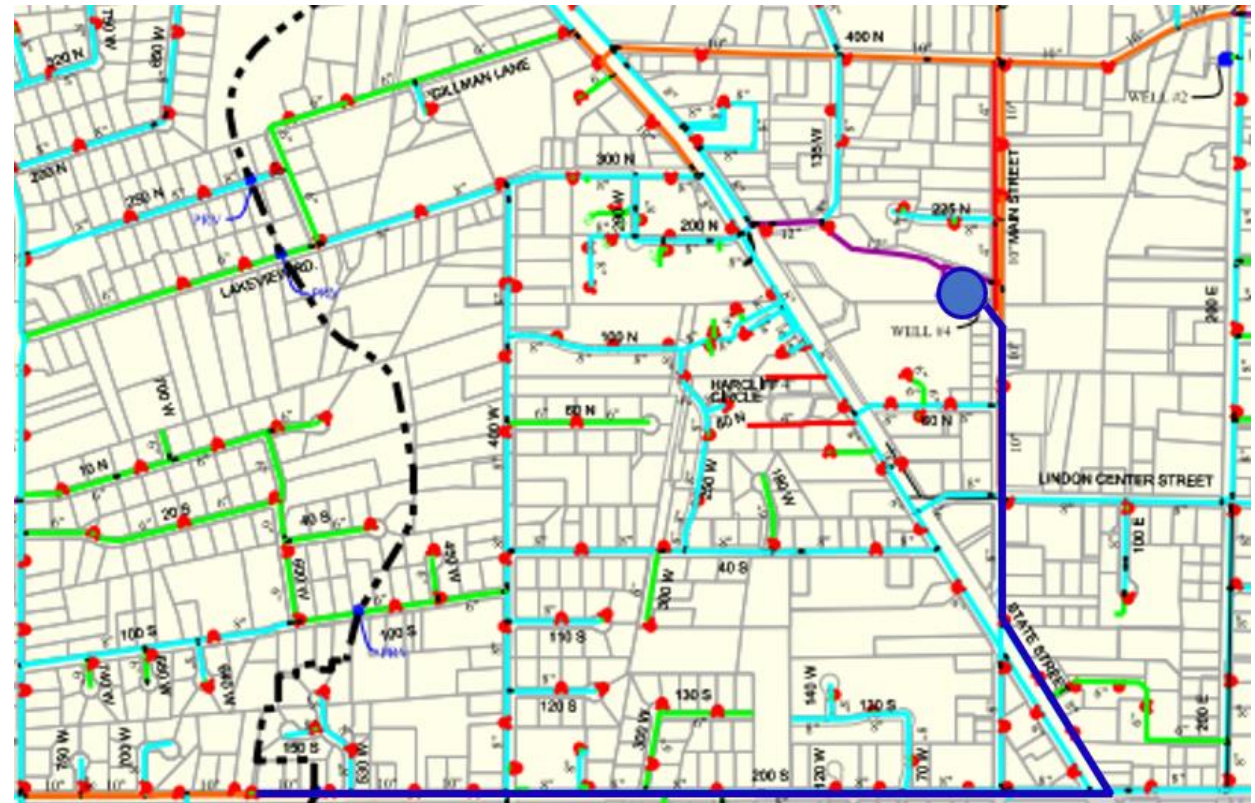
Other Design: Oak Canyon Jr. High

- The Design at Oak Canyon Jr. High was completed with the hopes of minimizing yearly cost.
- Extra cost came into the analysis by having to add 15,010 ft. of extra pipe.
- The total initial cost is estimated to be about \$4,414,000.
- The yearly cost for the system's pumps and wells is estimated to be \$4,366.



Other Design: City Center Park

- The Design at City Center Park was created to look into another possibility to reduce Head.
- This design includes a 100ft water tower, costing about \$1,600,000
- The total initial cost is estimated to be about \$4,346,000.
- The yearly cost for the system's pumps and wells is estimated to be \$4,541.



Conclusion

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- The recommended location for a storage tank is Sumac Hollow.
- This design does not require any pumps and allows Lindon to fulfill their water need without significant new construction.
- The estimated cost is \$ 2,282,000, which includes the new tank instalment and the extension of the 18" pipeline.