Appendix E

System Issues

Contents

Appendix E System Issues

E.1 Introduction

This appendix provides more detail for each of the capacity issues identified in the General Sewer Plan. A brief narrative discussing each issue is included with a hydraulic grade line (HGL) plot showing the maximum water surface profile in the collection system. This appendix is divided into 3 sections:

- E.2 – Existing Model
- E.3 – Committed Model
- E.4 – Master Plan Model

Each section contains a discussion for each issue and is identified by the general location of the reach.

E.2 Existing Model - System Issues

E.2.1 Location: Country Ridge Collector, at Queensgate Drive

Background

- Where the Country Ridge Collector pipe crosses Queensgate Drive, it was constructed at a reverse grade.
- City staff is aware of the issue and it is on their list for regular maintenance.

Issues

- The Existing Model scenario shows surcharging of roughly 0.10-ft through the 12-inch pipe section due to the reverse grade.

HGL Profile

Country Ridge Collector – Surcharging at MH 4648

E.3 Committed Model - System Issues

E.3.1 Location: Country Ridge Collector, Country Ridge to Yakima River

Background

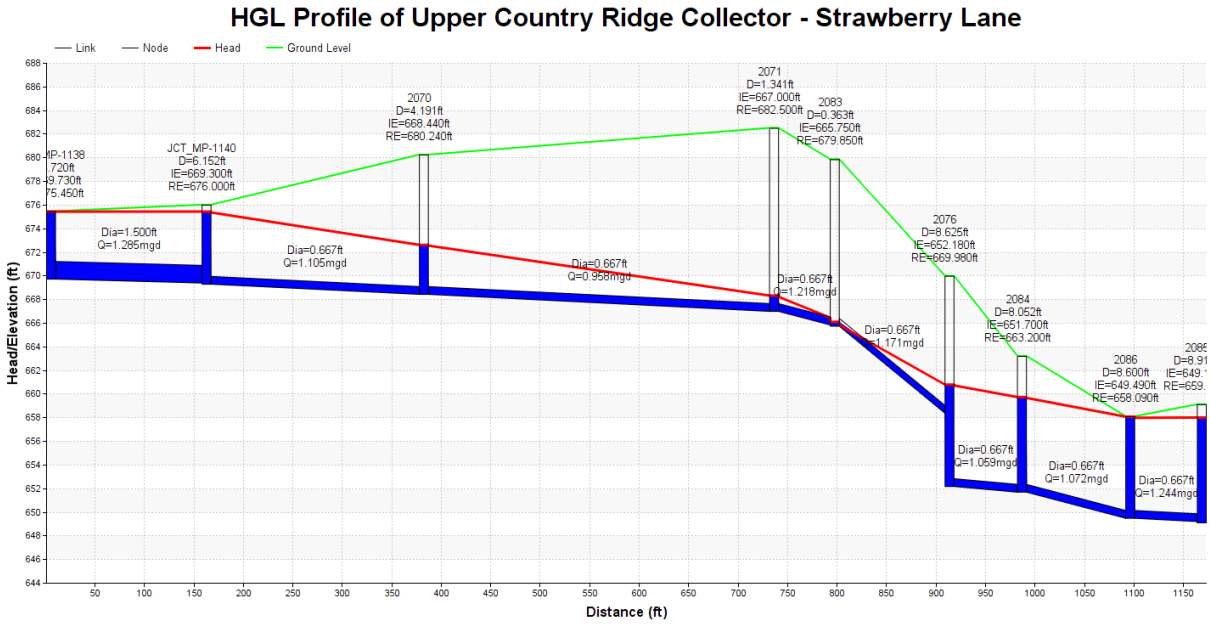
- The Country Ridge Collector routes sewer flows from both the Country Ridge development and discharge from the Dallas Road LS and the Badger South development. The buildout of Badger South will require two large lift stations to convey sewer flows from the development to the downstream gravity collection system. As a result Badger South peak flows of 3.5 mgd must be routed through the Country Ridge Collector.
- The existing collector pipe is 8-inch diameter both through the Country Ridge development and downstream to the intersection of Queensgate Dr and Jericho Rd (approximately 7,600 LF). It then increases to a mix of 12-inch and 15-inch diameter pipe and connects to the Yakima River inverted siphon crossing (approximately 4,500 LF). The 8-inch piping was mainly constructed at minimum slope (0.40%).

Issues

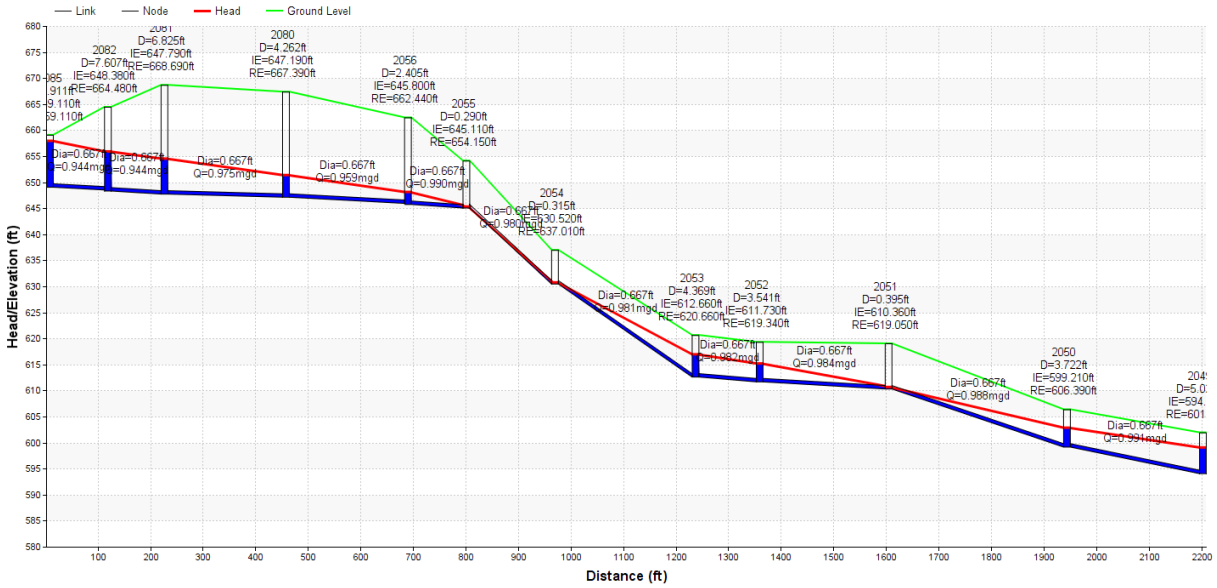
- The Committed Model scenario shows flooding through the 8-inch pipe section due increased flow. Surcharging and localized flooding continues downstream to the south side of the Yakima River where the pipe diameter increases to 18-inch, which has capacity to flow without surcharging.

HGL Profile

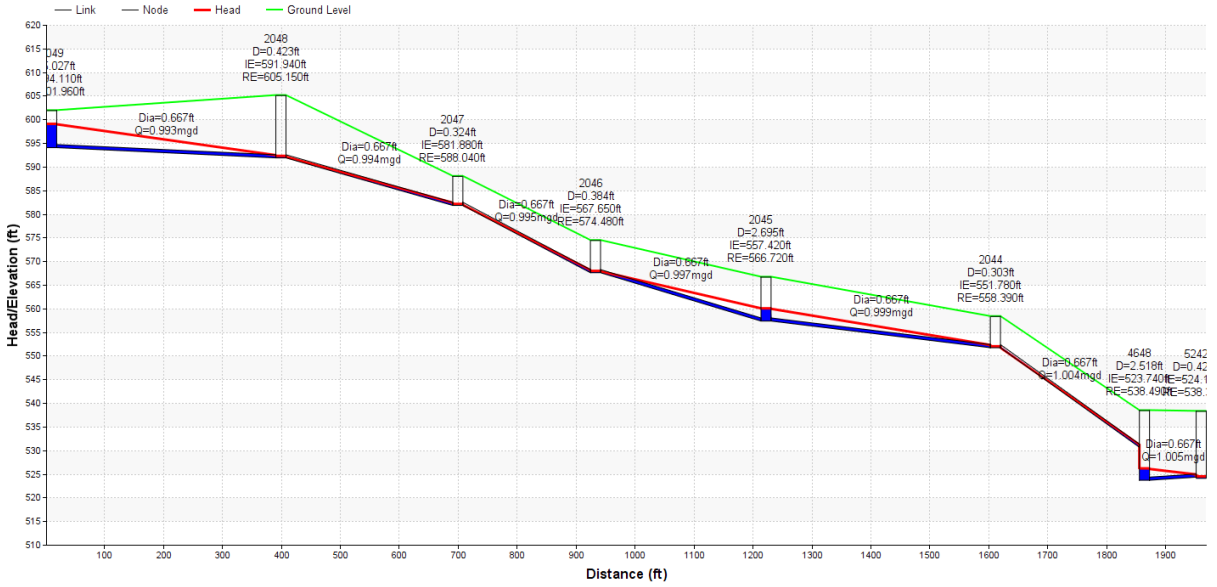
Country Ridge Collector – Surcharging and Localized Flooding



HGL Profile of Country Ridge Collector



HGL Profile of Country Ridge Collector - To Pipe Crossing at Queensgate



E.3.2 Location: Leslie Road Trunk, near Columbia Park Trail

Background

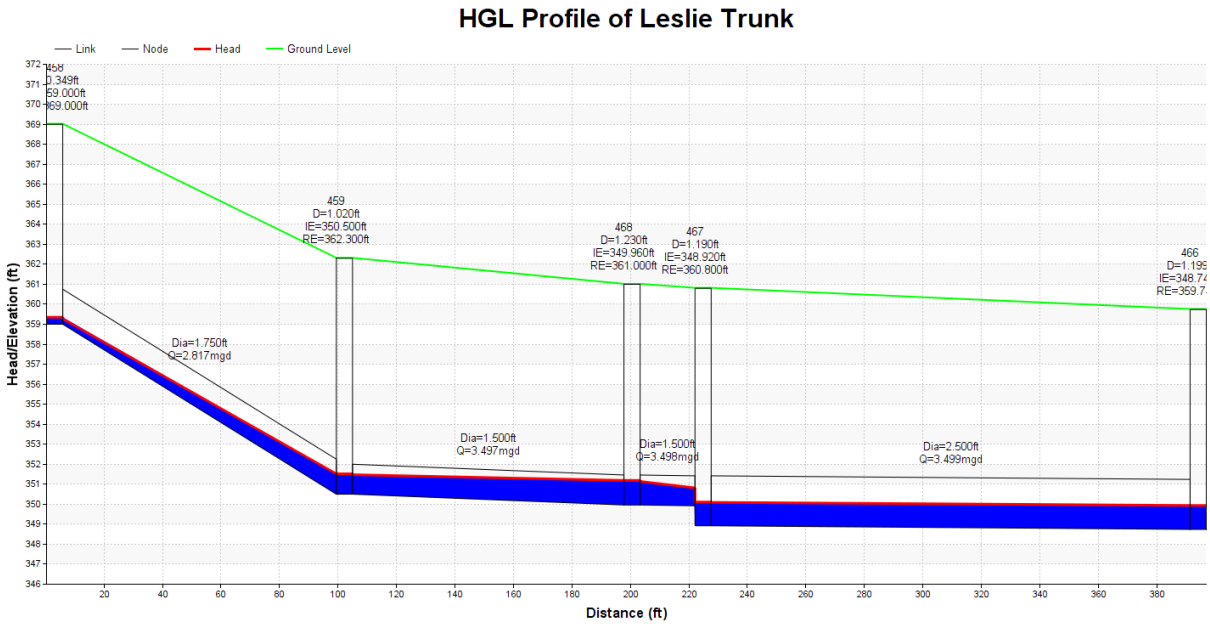
- The Leslie Road Trunk collects over half of the sewer flows from South Richland. Its basin includes the majority of drainage basin M, drainage basins N and O, the east half of drainage basin P and the east half of the Badger Mountain South development. The peak flows from these areas total roughly 3.5 mgd.
- The trunk consists of mainly 21-inch concrete pipe constructed at an average 5.0% slope down Leslie Road, toward the intersection with Columbia Park Trail. The trunk pipe slope flattens to 0.50% at approximately 300-feet south of the intersection where it first transitions to a short section of 18-inch concrete pipe (120 LF) and then to 30-inch concrete pipe.

Issues

- The Committed Model scenario shows nearly full pipe flow (d/D of 0.95) through the 18-inch pipe section due to the decreased pipe diameter and the flattened pipe slope.

HGL Profile

Leslie Trunk – Nearly full pipe flow MH 467 (COR MH# M-011) to MH 459 (COR MH# M-054)



E.3.3 Location: Keene Road Collector, at Keene/Gage Intersection

Background

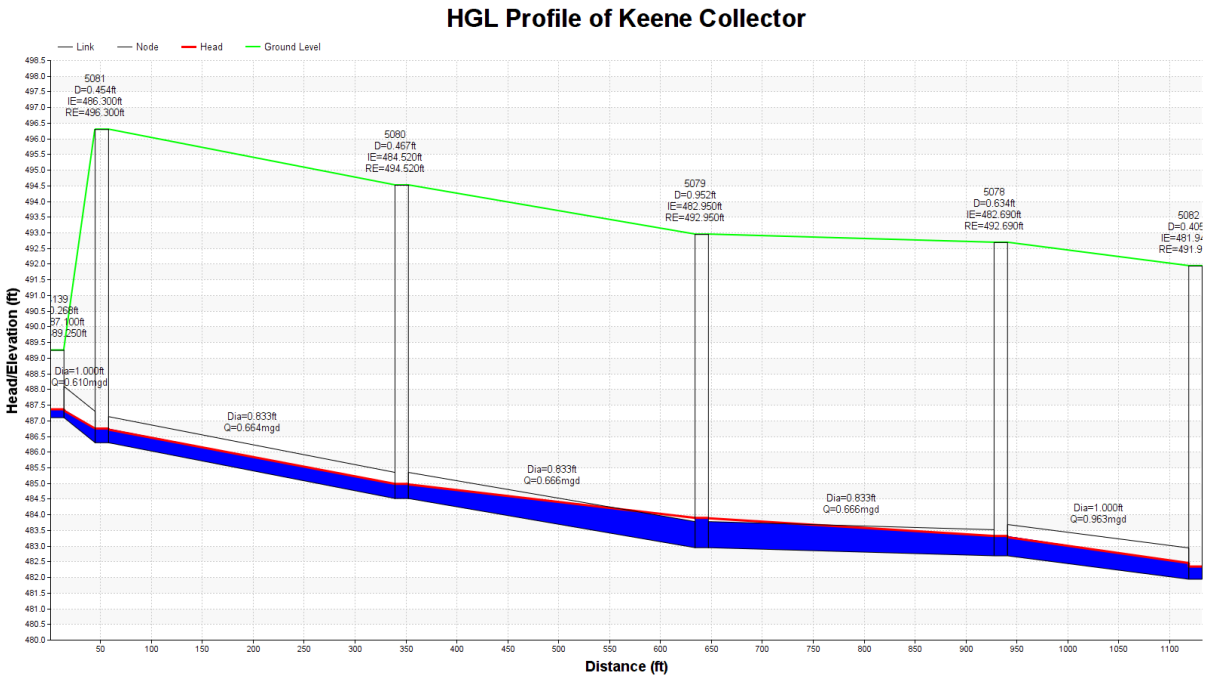
- The Keene Road Collector collects sewer flows from areas parallel to Keene Road, from Gage Blvd to Shockley Roads (portions of drainage basins A, N, and P)
- The Keene Road Collector (8,300 LF) consists of mainly 12-inch PVC pipe (7,400 LF) with a short section of 10-inch PVC pipe (900 LF) where the collector connects to 12-inch piping on Gage Blvd.
- The 10-inch pipe section was constructed at a slope of less than 0.10%, which is less than minimum slope (0.28%).

Issues

- The Committed Model scenario shows minor surcharging (approximately 0.10-ft) in one section of 10-inch piping.

HGL Profile

Backwater from MH 5078 (COR MH# P-034) to MH 5080 (COR MH# P-037)



E.3.4 Location: Upper North Interceptor (UNI), North Richland

Background

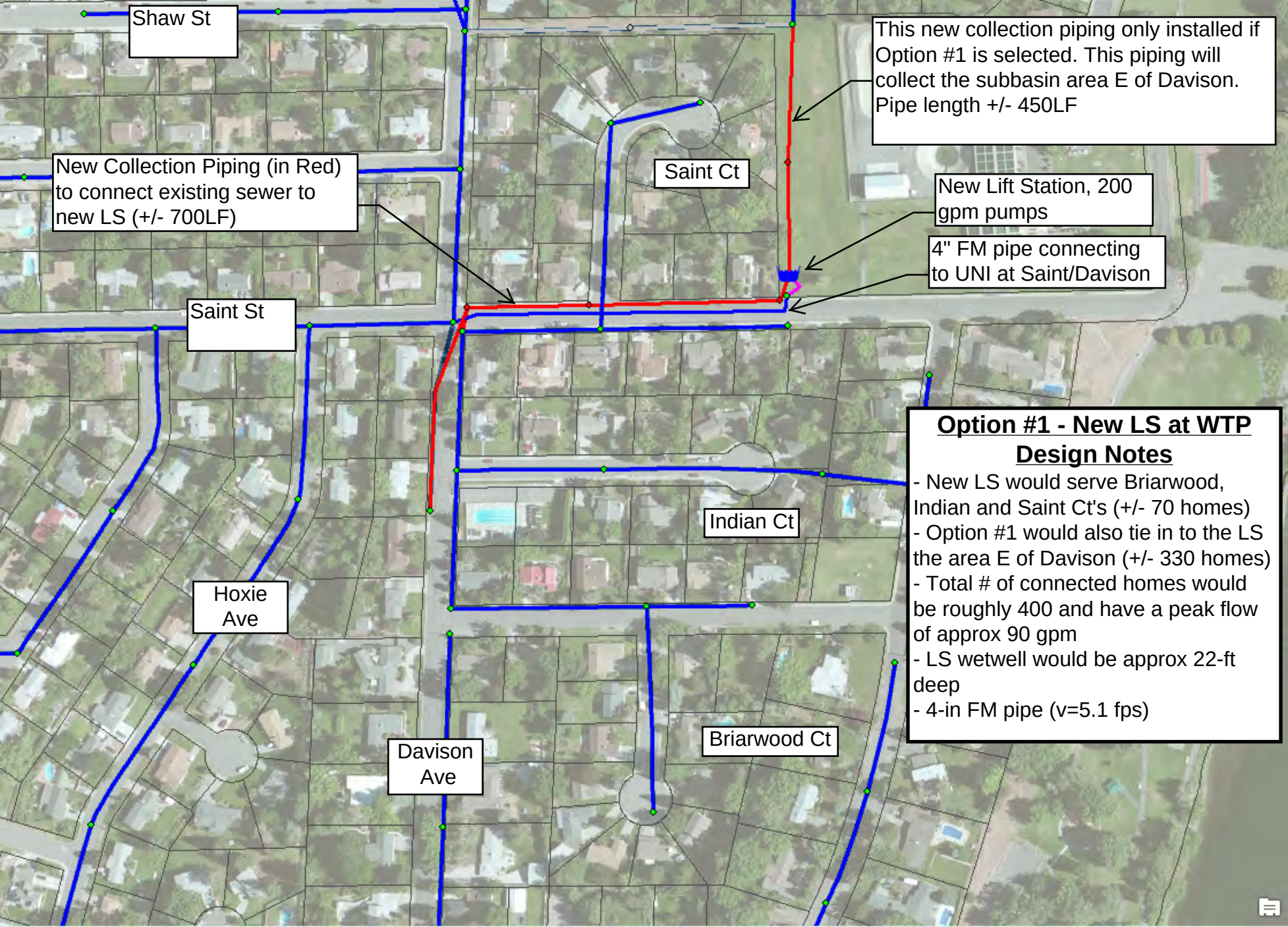
- The UNI is located in residential area of North Richland, generally north of McMurray St and east of G-Way. It is 15,000 of 18-inch and 24-inch concrete interceptor pipe that drains from the diversion structure near University Dr down to the Lower North Interceptor (54-in) pipe connection at McMurray.
- City sewer crews' note that there are several dropped pipe joints along the UNI that have been observed during routine TV inspection. Crews also note that homeowners, in specific areas along the UNI, have complained about backups or overflows into their basements when the UNI flows at or greater than half full. For that reason the diversion structure has been adjusted to keep flows below half pipe flow.

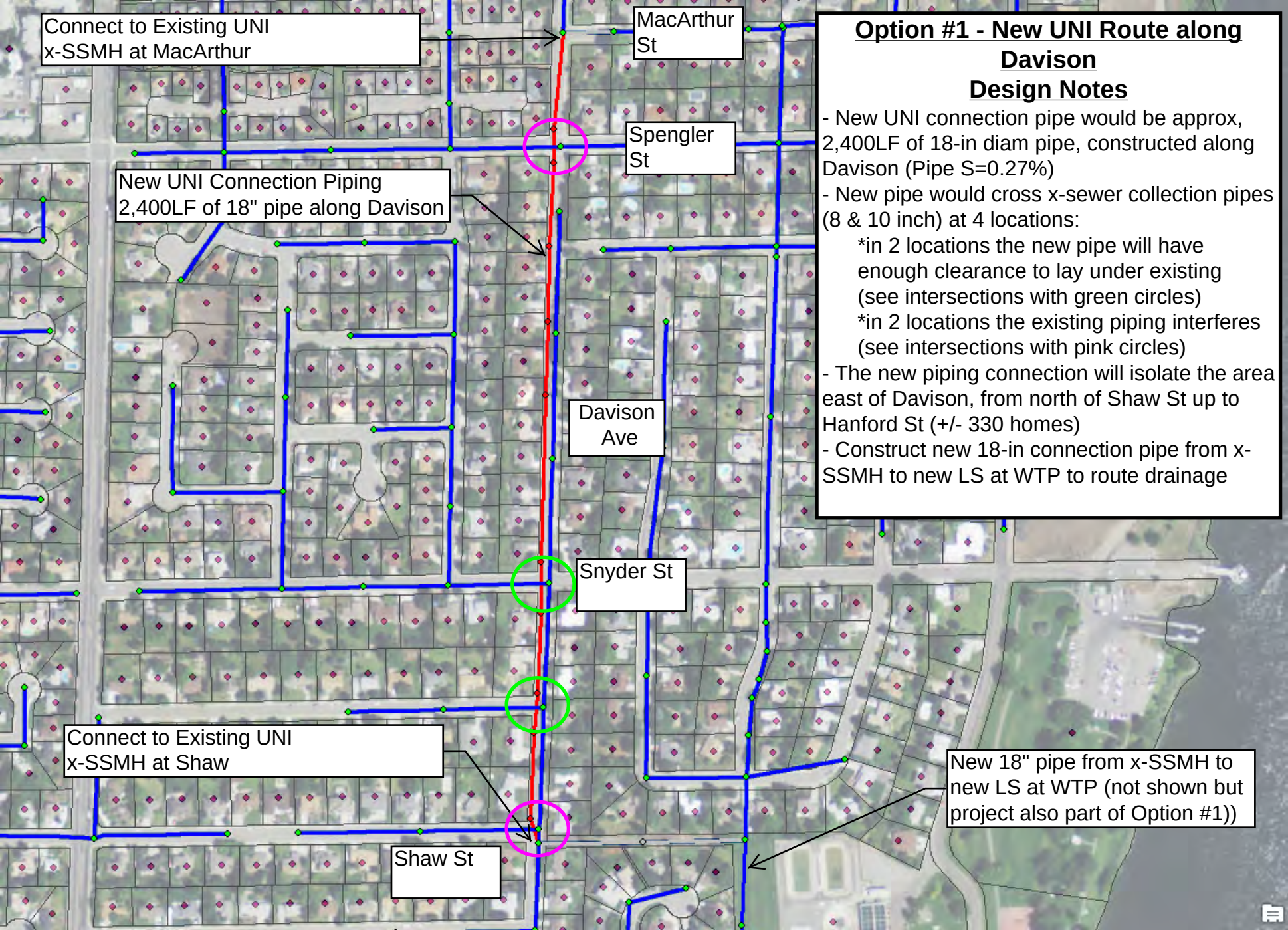
Issues

- Two options have been developed for addressing this area of service backups.

HGL Profile

Reduced interceptor capacity

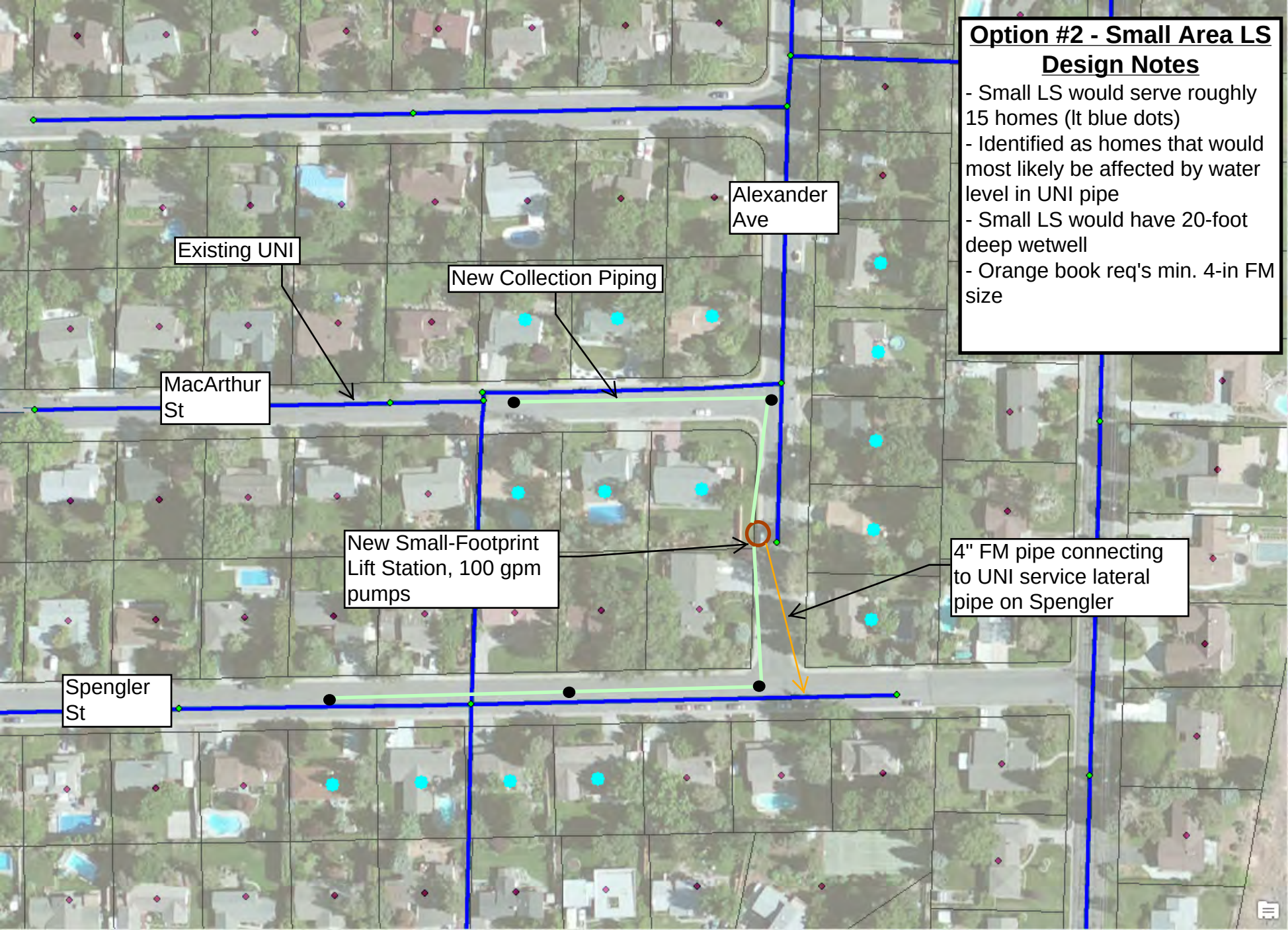

Shaw St
This new collection piping only installed if Option #1 is selected. This piping will collect the subbasin area E of Davison. Pipe length +/- 450LF
New Collection Piping (in Red) to connect existing sewer to new LS (+/- 700LF)
Saint Ct
New Lift Station, 200 gpm pumps
4" FM pipe connecting to UNI at Saint/Davison
Saint St
Indian Ct
Hoxie Ave
Briarwood Ct
Davison Ave
Option #1 - New LS at WTP
Design Notes
- New LS would serve Briarwood, Indian and Saint Ct's (+/- 70 homes)
- Option #1 would also tie in to the LS the area E of Davison (+/- 330 homes)
- Total # of connected homes would be roughly 400 and have a peak flow of approx 90 gpm
- LS wetwell would be approx 22-ft deep
- 4-in FM pipe (v=5.1 fps)



Option #1 - New UNI Route along Davison

Design Notes

- New UNI connection pipe would be approx, 2,400LF of 18-in diam pipe, constructed along Davison (Pipe S=0.27%)
- New pipe would cross x-sewer collection pipes (8 & 10 inch) at 4 locations:
  - *in 2 locations the new pipe will have enough clearance to lay under existing (see intersections with green circles)
  - *in 2 locations the existing piping interferes (see intersections with pink circles)
- The new piping connection will isolate the area east of Davison, from north of Shaw St up to Hanford St (+/- 330 homes)
- Construct new 18-in connection pipe from x-SSMH to new LS at WTP to route drainage


Option #2 - Small Area LS Design Notes
- Small LS would serve roughly 15 homes (lt blue dots)
- Identified as homes that would most likely be affected by water level in UNI pipe
- Small LS would have 20-foot deep wetwell
- Orange book req's min. 4-in FM size
Alexander Ave
Existing UNI
New Collection Piping
MacArthur St
New Small-Footprint Lift Station, 100 gpm pumps
4" FM pipe connecting to UNI service lateral pipe on Spengler
Spengler St

E.3.5 Location: Bellerive Lift Station and Downstream Gravity Piping

Background

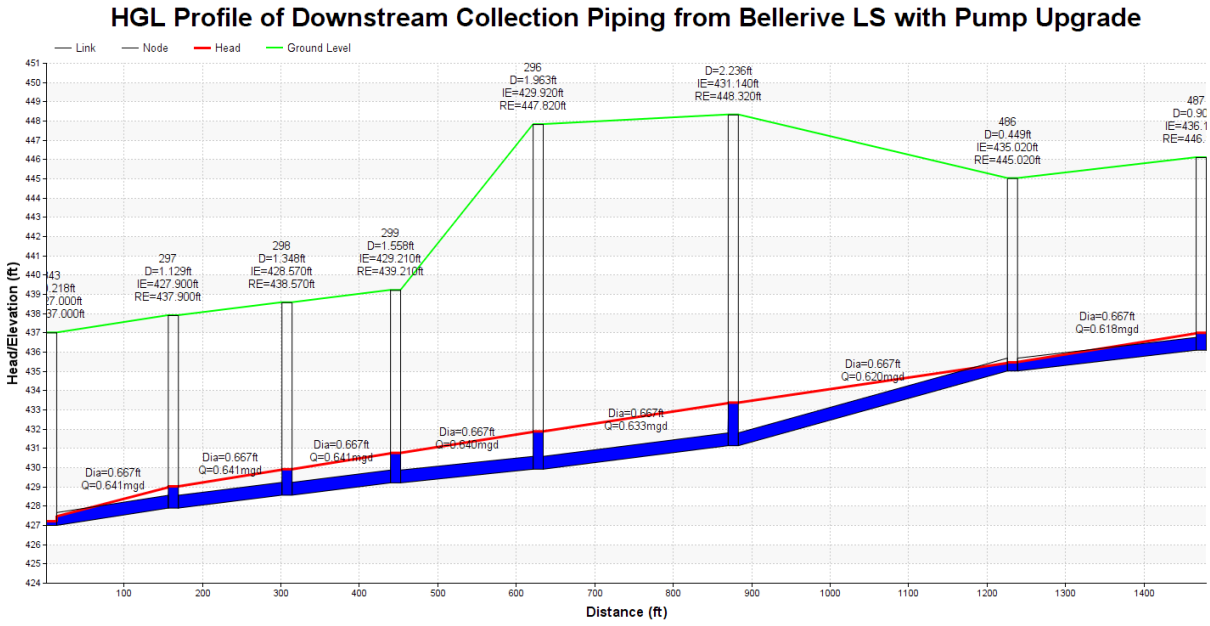
- The existing lift station has 260 gpm capacity pumps.
- Downstream of the lift station forcemain discharge manhole is 8-in gravity collection pipe that has capacity of less than 350 gpm.

Issues

- The Committed Model scenario shows the peak flow into the lift station is nearly 500 gpm and with a pump upgrade, the downstream piping has surcharging of up to 3-ft.

HGL Profile

Surcharging in the downstream gravity collection piping



E.3.6 Location: Logston Sewer Interceptor, Logston Blvd

Background

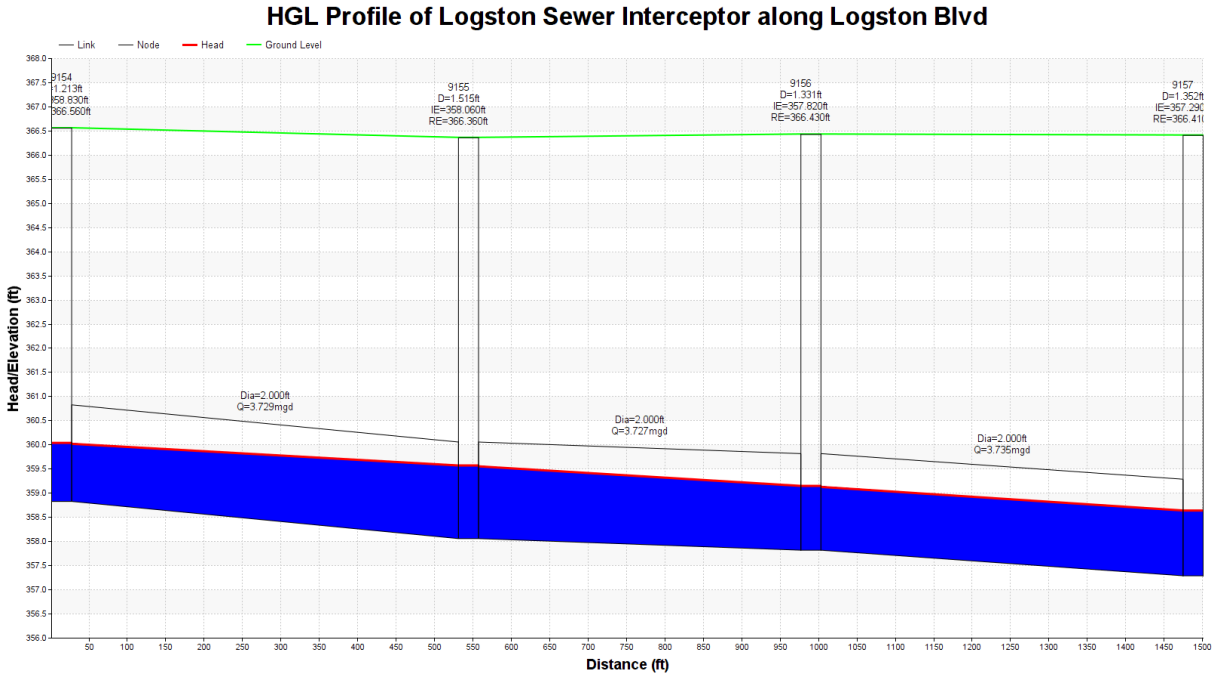
- The Logston Sewer Interceptor is a 24-inch PVC pipe that drains the Horn Rapids Industrial Park (HRIP) and areas north of Battelle Blvd. It also receives flows from the Battelle Lift Station. It was constructed in 2013 and has an average slope of 0.08%.
- The Existing Model identified approximately 30 large undeveloped parcels within the HRIP that will drain to the interceptor. These areas had a total of 2,300 acres. The Committed Model assumed these industrial areas would develop with sewer unit flows of 1,250 gpad.

Issues

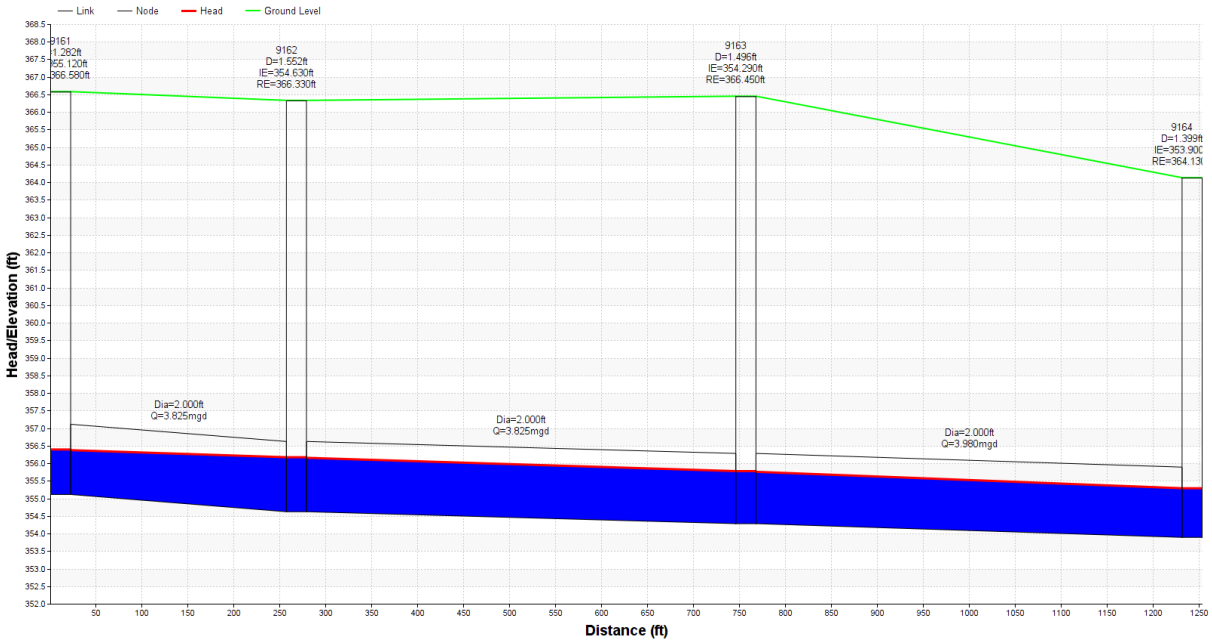
- The Committed Model scenario shows the peak flow in the interceptor is roughly 3.7 mgd and that there are two sections of the interceptor with a d/D ratio of 0.77.

HGL Profile

Reduced interceptor capacity



HGL Profile of Logston Sewer Interceptor along Logston Blvd



E.3.7 Location: Richland Airport Collector, on Hagen Road

Background

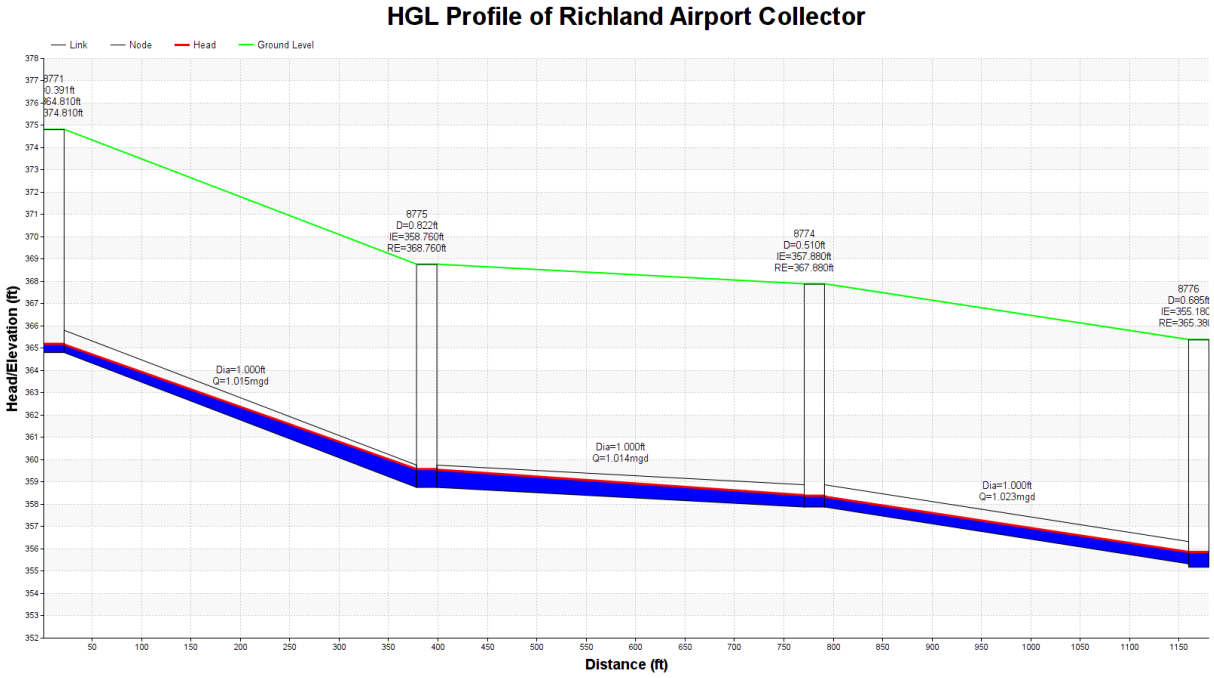
- The Richland Airport Collector is a 12-inch pipe that drains the Richland Airport area including the Terminal Drive Lift Station basin (the south area of drainage basin K).
- The collector alignment leaves the City's R-O-W, near the northeast corner of Butler Loop, and runs north and across the Richland Airport (including under the 8/26 runway) in a sewer easement to Hagen Road.
- The majority of the collector is constructed greater than minimum slope (0.22%), except for one 400-LF section along Hagen Road and adjacent to the ConAgra Richland facility.

Issues

- The Committed Model scenario shows the peak flow in the collector is roughly 1 mgd; however the capacity of 12-inch pipe at minimum slope is roughly 0.60 mgd (maintaining a d/D ratio of 0.60). Therefore the d/D ratio increases to 0.82 and the available collector pipe capacity is reduced.

HGL Profile

Reduced collector capacity at MH 8775 (COR MH# K-026)



E.3.8 Location: Horn Rapids Sewer Interceptor, Highway 240 Crossing

Background

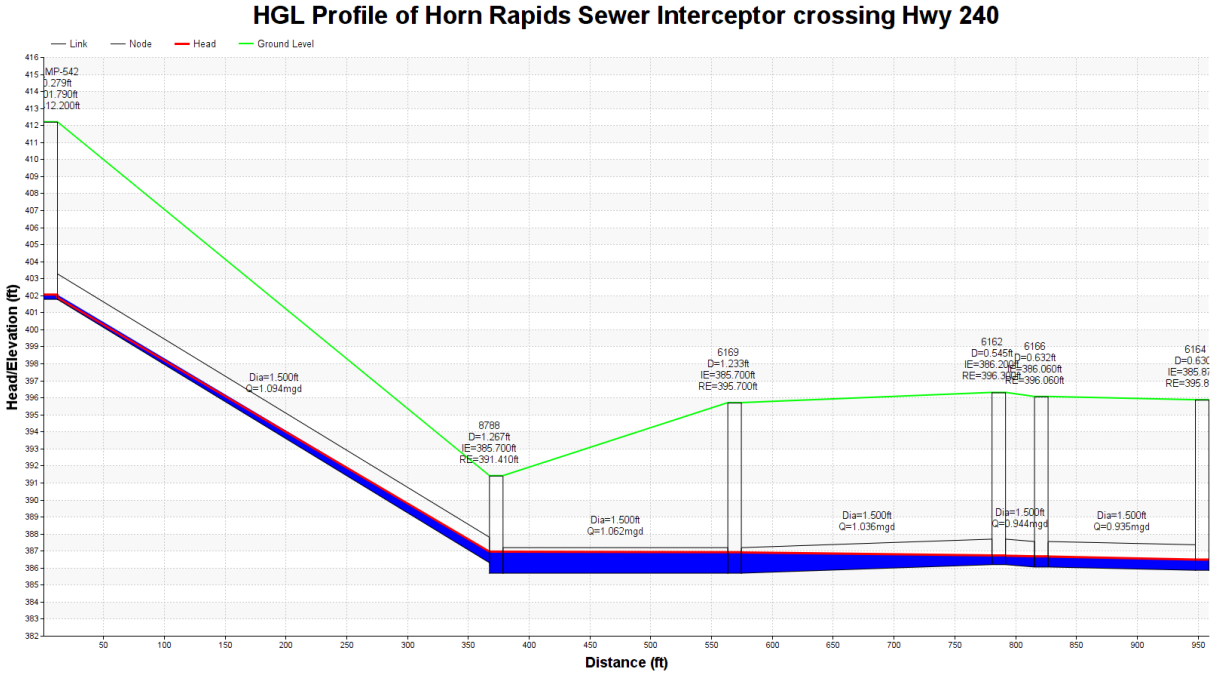
- Currently the Horn Rapids Sewer Interceptor (18-inch concrete pipe) is only stubbed across Highway 240 and terminates at MH 8788 (COR MH# K-481), south of the Horn Rapids baseball fields.
- With the continued northwesterly development of the Horn Rapids planned development, the interceptor is planned to be extended (with 18-inch PVC pipe) along the north R-O-W line of the highway to a future intersection location where it will then cross the highway. The planned extension of the sewer interceptor will serve future residential development in the northwest section of the K drainage basin.
- The highway crossing was constructed at a reverse grade and the next downstream section of 18-inch interceptor pipe was also constructed at a reverse grade.

Issues

- The Committed Model scenario shows the peak flow in the interceptor is roughly 1.0 mgd with a d/D ratio of 0.80 in the section of pipe crossing the highway – this section has a nearly flat pipe slope. The next section, downstream of MH 6169 (COR MH# K-154) has a reverse grade.

HGL Profile

Reduced interceptor capacity from MH 6162 (COR MH# K-153) to MH 8788 (COR MH# K-481)



E.4 Master Plan Model - System Issues

E.4.1 Location: Logston Sewer Interceptor, Logston Blvd

Background

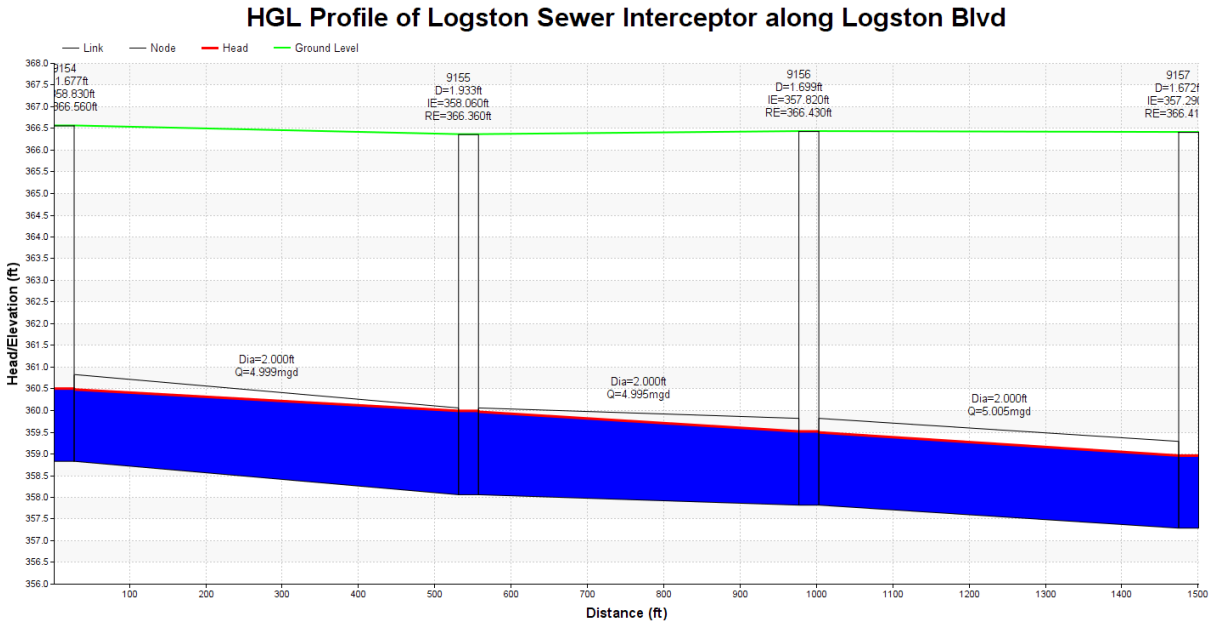
- The Logston Sewer Interceptor is a 24-inch PVC pipe that drains the Horn Rapids Industrial Park (HRIP) and areas north of Battelle Blvd. It also receives flows from the Battelle Lift Station. It was constructed in 2013 and has an average slope of 0.08%.
- The Master Plan Model includes additional area north of the UGA that is planned to be developed industrial with a unit flow of 1,250 gpad.

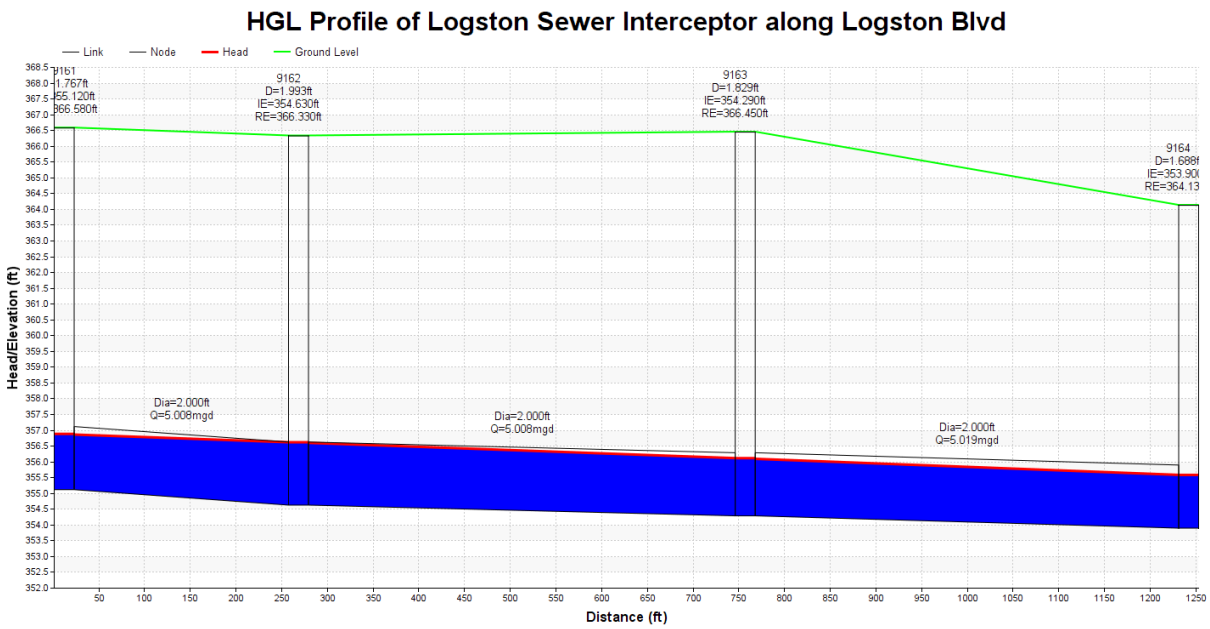
Issues

- The Master Plan Model scenario shows the peak flow in the interceptor is roughly 3.7 mgd and that there are two sections of the interceptor with a d/D ratio of 0.77.

HGL Profile

Reduced interceptor capacity




HGL Profile of Logston Sewer Interceptor along Logston Blvd
Link
Node
Head
Ground Level
9161
1.767ft
55.120ft
366.580ft
9162
D=1.993ft
IE=354.630ft
RE=366.330ft
9163
D=1.829ft
IE=354.290ft
RE=366.450ft
9164
D=1.688f
IE=353.90
RE=364.13
Dia=2.000ft
Q=5.008mgd
Dia=2.000ft
Q=5.008mgd
Dia=2.000ft
Q=5.019mgd
Head/Elevation (ft)
Distance (ft)