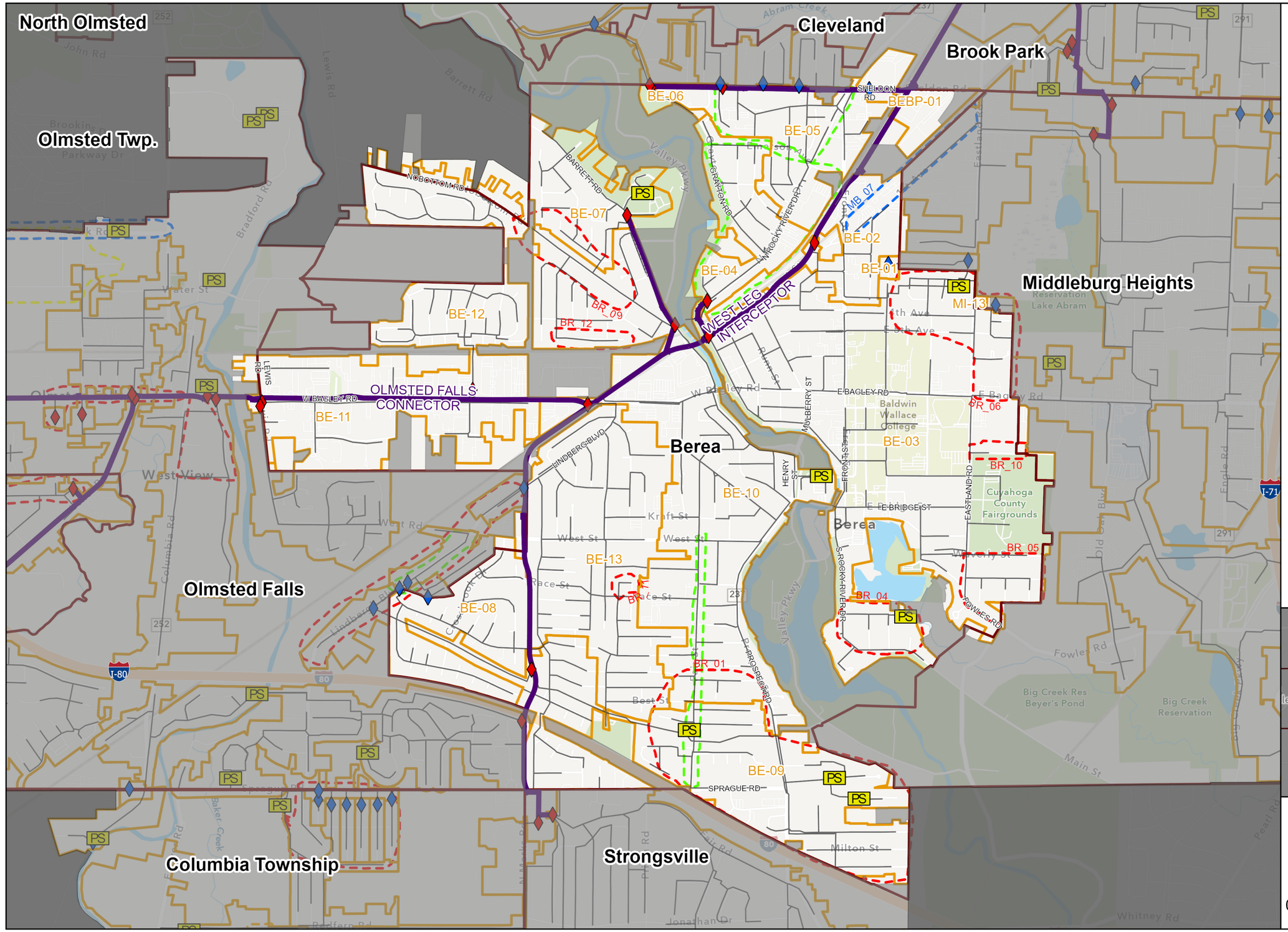


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Name: Task3_PFR Location Map (A1)

Northeast Ohio Regional Sewer District

SWI-LSSES

Berea Location Map

WADE TRIM

Brown AND Caldwell

Figure A1

North Olmsted
Cleveland
Brook Park
Olmsted Twp.
Middleburg Heights
Olmsted Falls
Berea
Columbia Township
Strongsville
West View
Ohio Tpke
OLMSTED FALLS CONNECTOR
WEST LEG INTERCEPTOR
W BAGLEY RD
E BAGLEY RD
BARKWITH RD
GRAYTON RD
HOBSON RD
HILBERG BLVD
HEIBERT ST
W BRIDGE ST
E BRIDGE ST
ROCKY RIVER DR
FRONT ST
MAPLEWOOD DR
SPRAGUE RD
TOWPATH RD
EASTLAND RD
I-71
I-80
BE-01
BE-02
BE-03
BE-04
BE-05
BE-06
BE-07
BE-08
BE-09
BE-10
BE-11
BE-12
BE-13
BEBP-01
MB_07
D-374
D361
D262
D32
D7
C438
C190
C339
C388
BR_01
BR_04
BR_05
BR_06
BR_09
BR_10
BR_12
BR_17
MI-13
PS

SSO C339 is being renamed to SSSRS2 per community request

Legend

- Community Boundary
- Septic/HSTS Location
- Adjacent Community Area
- Non-SWI LSSES Project Area
- District Sewer
- Modeled Sewer

Trench Type

- Combined Sewer
- Common Trench Standard Manhole
- Separate Trench Standard Manhole
- Non-Sewered Area
- Septic
- PFA (With ID)
- PS Modeled Pump Station

SSO Location

- New - Controlled
- Previously Eliminated - Controlled

Community Reported Problem Area

- Basement Backup Locations
- Surface Flooding
- Current\Previous Project or Other

North Olmsted Brook Park CUYAHOGA Strongsville

N

Date Created: 10/25/2021

0 1,000 2,000 Feet

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Name: Task3_TrenchTypes and Problems

Northeast Ohio Regional Sewer District

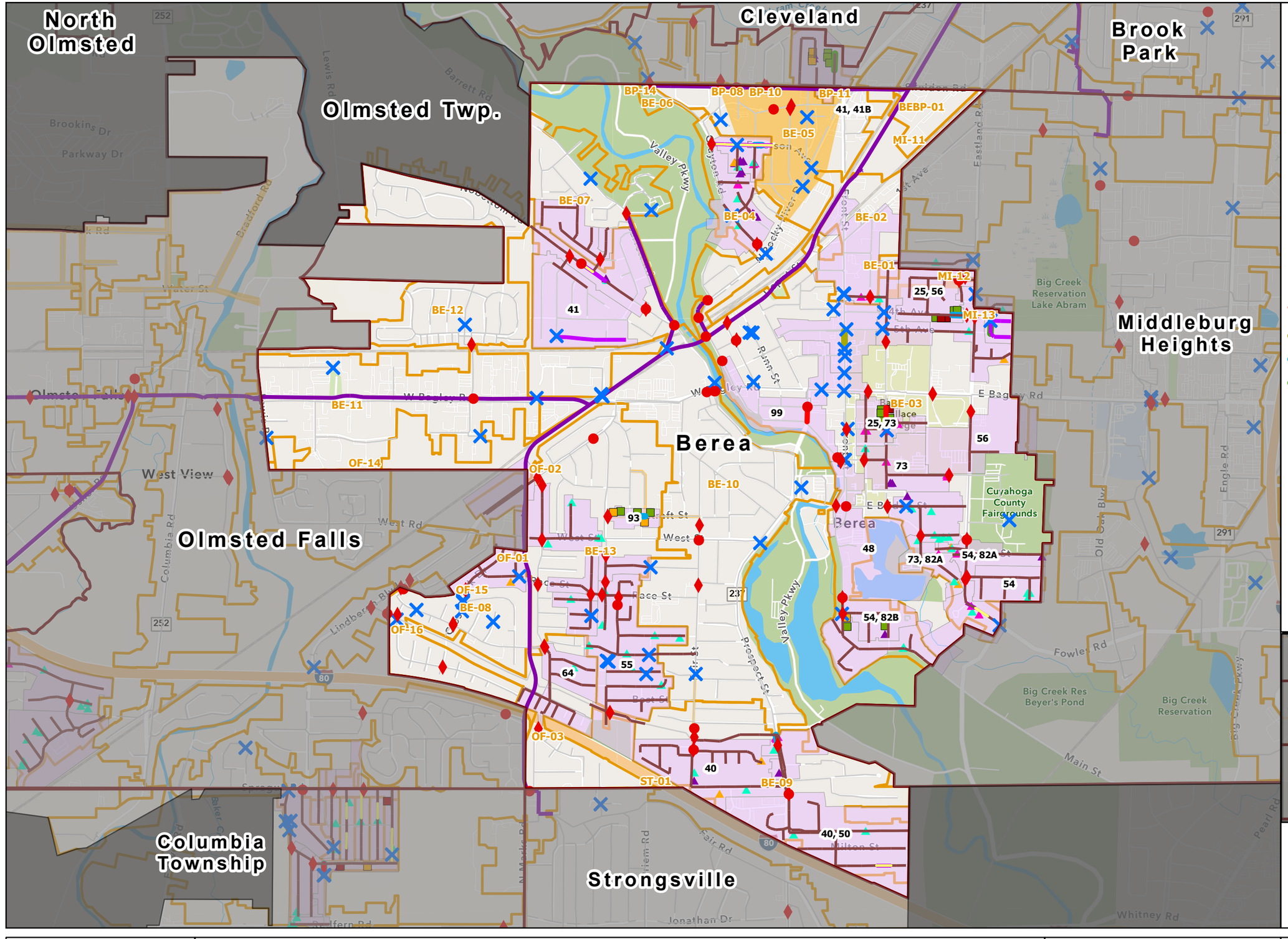
SWI-LSSES

Sanitary Sewer System, PFR Areas, and SSO Locations - Berea

WADE TRIM

Brown AND Caldwell

Figure A2

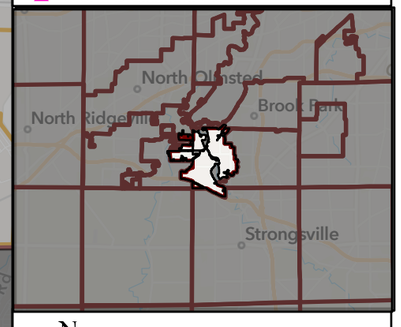


Legend

- Non-SWI LSSES Project Area
- Adjacent Community Area
- Community Boundary
- PFA Boundary Areas (With ID)
- District Sewers
- Local Sewers
- Calibration Meter
- Micrometer
- Dye Tested Sewers with I/I Potential
- Smoke Tested Sewers
- Dye Tested Sewers
- Gravity Main with Rehab Recommendation 4 or 5
- Sewers with FOG Buildup
- Sewers with Debris Buildup
- Sewers with Root Intrusion
- Residential Dye Test – Positive Rapid
- Residential Dye Test – Positive Light
- Residential Dye Test – Negative
- Field Observations
- Work Order (ID#)
- Past Rehab Projects

Smoke Defect Type

- Area Drain
- Downspout
- Cleanout/Ground
- Storm Drain/Manhole



N

Date Created: 7/29/2021

0 2,000 Feet

Northeast Ohio Regional Sewer District

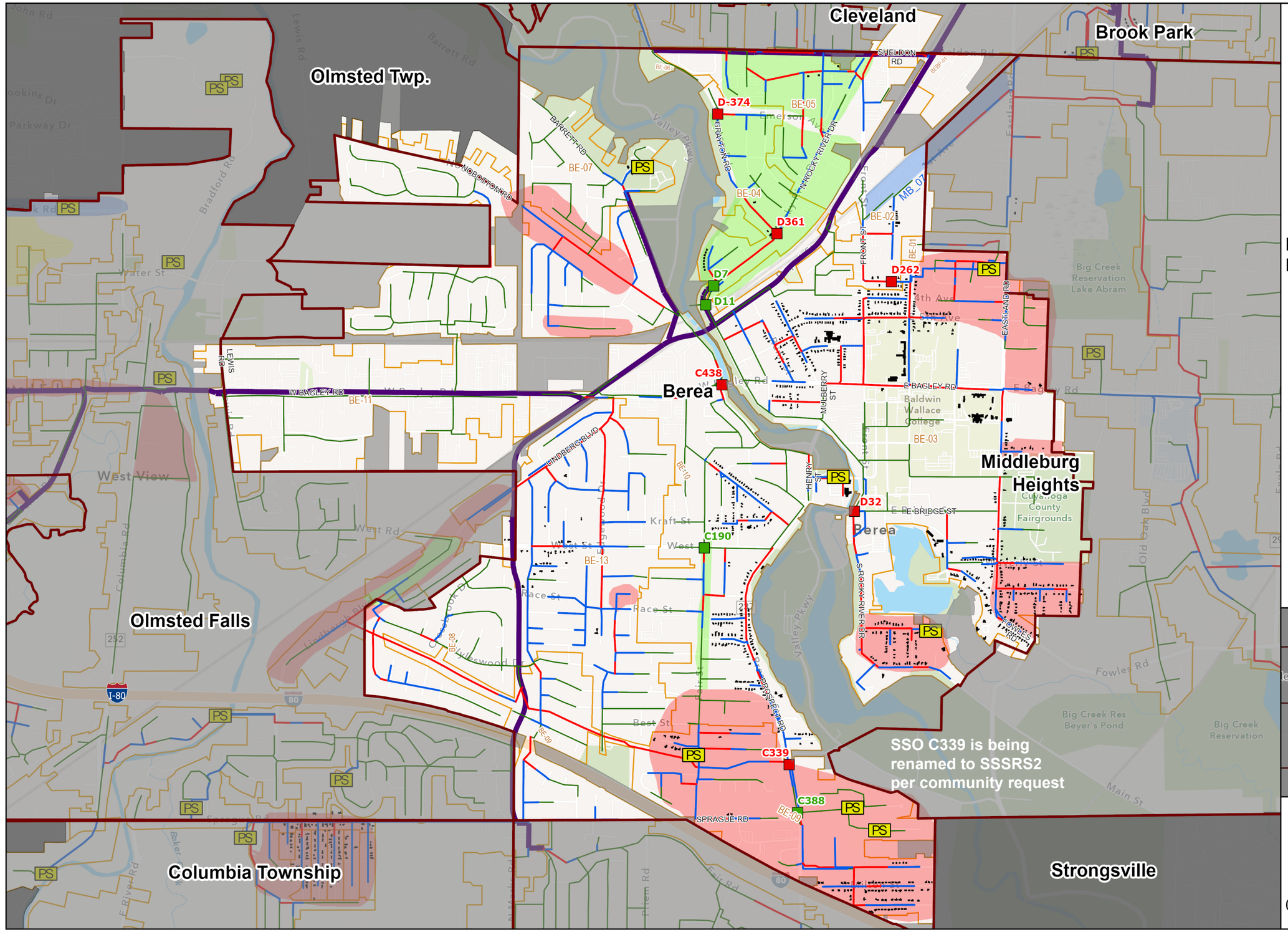
SWI-LSSES

Field Investigation Summary Map - Berea

WADE TRIM

Brown AND Caldwell

Figure A3



Legend

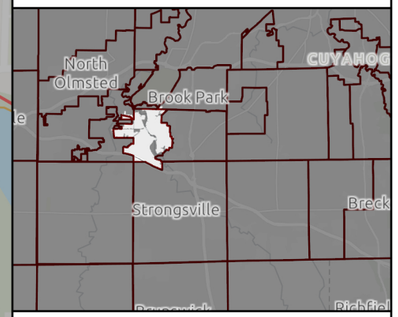
- Community Boundary
- Non-SWI LSSES Project Area
- Adjacent Community Area and/or Unsewered Area
- District Sewer
- PFA (With ID)
- PS — Pump Station

Model Predicted Performance

- Non-Surcharged Local Sewer
- Downstream Capacity Issue
- Undersized Capacity Issue
- Basement Backup

Community Reported Problem Area

- Basement Backup Locations
- Failing HSTSs
- Surface Flooding
- Current/Previous Project or Other



N

Date Created: 9/16/2021

0 1,000 2,000 Feet

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Name: Task3_Projected Problem Areas Map (5yr) (ES3)

Northeast Ohio Regional Sewer District

SWI-LSSES

Berea Model Projected Sanitary Sewer System Performance, Existing Conditions - Berea 5-yr, 1-hr (15-min rainfall)

WADE TRIM

Brown AND Caldwell

Figure A4

Table B1. City of Berea Monitoring

Meter ID	Community	Group Number	Round Number	Acres	Reason for Monitoring			Observed I/I (GPAD)	Meter Surcharge (Y/N)	Selected for Fieldwork (Y/N)	Work Order Number	Notes
					Priority Basin (Y/N)	Problem Area (Y/N)	Other					
BR-01	Berea	9	-	99	Y	Y	Calibration Meter	20,021	Y	Y	40, 50	
BR-02	Berea	9	-	67	Y	Y	Calibration Meter	18,438	Y	Y	40	
BR-03	Berea	9	-	25	Y	Y	Calibration Meter	39,147	Y	N	-	
BR-05	Berea	9	-	147	N	Y	Calibration Meter	11,081	Y	Y	73	
BR-06	Berea	15	-	82	N	N	Calibration Meter	12,972	Y	Y	55	
BR-07	Berea	15	-	215	Y	Y	Calibration Meter	9,672	Y	Y	64	
BR-08	Berea	16	-	59	N	Y	Calibration Meter	34,568	Y	Y	54, 82B	
BR-09	Berea	16	-	74	Y	Y	Calibration Meter	15,824	Y	Y	54, 82A	
BR-10	Berea	16	-	218	N	N	Calibration Meter	11,044	Y	Y	25, 48, 54, 73, 82A	
BR-11	Berea	16	-	86	Y	Y	Calibration Meter	22,374	Y	Y	25, 56	
BR-12	Berea	16	-	210	Y	Y	Calibration Meter	19,217	Y	Y	56, 99	
BR-13	Berea	16	-	38	Y	N	Calibration Meter	19,792	N	Y	99	
BR-14	Berea	16	-	38	N	N	Calibration Meter	63,348	Y	N	-	
BR-15	Berea	15	-	75	Y	Y	Calibration Meter	9,744	Y	Y	41	
BR-16	Berea	15	-	29	Y	Y	Calibration Meter	16,229	Y	Y	41	
BR-17	Berea	17	-	136	N	Y	Calibration Meter	8,448	Y	N	-	
BR-18	Berea	15	-	93	Y	Y	Calibration Meter	21,978	N	N	-	
D32-U1	Berea	16	-	58	N	N	Calibration Meter	41,713	N	Y	79, 82A	
D361-U1	Berea	16	-	55	N	Y	Calibration Meter	17,056	N	Y	73	
D7-U1	Berea	16	-	46	Y	Y	Calibration Meter	20,125	N	N	-	
MMBP-36	Berea	17	8	28	N	Y	I/I Investigation	11,371	N	N	-	
MMBR-02	Berea	16	6	29	Y	Y	Problem area investigation	6,299	Y	Y	82A	
MMBR-03	Berea	16	6	24	Y	Y	Problem area investigation	22,625	Y	Y	54	
MMBR-04	Berea	16	6	37	N	Y	Problem area investigation	13,188	N	Y	54, 82B	
MMBR-05	Berea	15	6	14	Y	N	I/I Investigation	13,927	Y	Y	55	
MMBR-06	Berea	15	6	11	Y	N	I/I Investigation	11,895	Y	Y	55	
MMBR-07	Berea	15	6	97	Y	Y	Problem area investigation	9,200	Y	Y	55, 83	
MMBR-08	Berea	15	6	11	Y	N	Basement Flooding	22,041	Y	Y	55	
MMBR-09	Berea	16	6	20	Y	Y	Basement Flooding	2,604	N	Y	56	
MMBR-10	Berea	16	6	19	Y	Y	Basement Flooding	13,994	N	Y	56	
MMBR-13	Berea	16	6	53	Y	Y	Basement Flooding	9,988	Y	Y	56	
MMBR-14	Berea	16	6	44	Y	Y	Basement Flooding	5,174	Y	N	-	
MMBR-15	Berea	16	6	16	Y	Y	Basement Flooding	5,756	Y	Y	56	
MMBR-16	Berea	16	6	40	Y	N	I/I Investigation	8,431	Y	N	-	
MMBR-24	Berea	15	7	36	N	N	I/I Investigation	11,909	Y	Y	64	
MMBR-25	Berea	15	7	17	N	N	I/I Investigation	8,616	N	N	-	
MMBR-26	Berea	15	7	22	N	N	I/I Investigation	1,618	N	N	-	
MMBR-27	Berea	9	7	35	N	N	I/I Investigation	15,222	N	Y	64	
MMBR-28	Berea	9	7	43	N	N	I/I Investigation	9,654	N	N	-	
MMBR-29	Berea	9	8	22	N	N	I/I Investigation	13,117	N	Y	73	
MMBR-30	Berea	9	8	17	N	N	I/I Investigation	5,410	N	N	-	

Table B1. City of Berea Monitoring

Meter ID	Community	Group Number	Round Number	Acres	Reason for Monitoring			Observed I/I (GPAD)	Meter Surcharge (Y/N)	Selected for Fieldwork (Y/N)	Work Order Number	Notes
					Priority Basin (Y/N)	Problem Area (Y/N)	Other					
MMBR-31	Berea	9	8	35	N	N	I/I Investigation	590	N	N	-	
MMBR-32	Berea	9	8	17	N	N	I/I Investigation	5,899	N	N	-	
MMBR-33	Berea	9	8	25	N	N	I/I Investigation	3,324	N	N	-	
MMBR-34	Berea	16	8	18	N	N	I/I Investigation	17,771	N	Y	73	
MMBR-35	Berea	16	8	30	N	N	I/I Investigation	32,392	N	Y	73	
MMBR-36	Berea	16	8	75	N	N	I/I Investigation	2,854	N	N	-	
MMBR-37	Berea	16	8	22	N	N	I/I Investigation	79,624	N	Y	25, 73	
MMBR-38	Berea	16	8	34	N	N	I/I Investigation	43,385	N	Y	73	
MMBR-41	Berea	16	9	16	N	Y	SSO	21,743	N	Y	73	
SMBR-01	Berea	9	3	99	Y	Y	Calibration meter screening	17,848	N	Y	40, 50	
SMBR-02	Berea	9	3	67	Y	Y	Basement Flooding	24,255	N	Y	40, 50	
SMBR-03	Berea	9	3	25	Y	Y	Basement Flooding	55,384	Y	Y	50	
SMBR-04	Berea	9	3	18	Y	Y	Calibration meter screening	23,179	Y	Y	40, 50	
SMBR-05	Berea	9	3	78	N	N	Calibration meter screening	8,789	N	N	-	
SMBR-06	Berea	16	3	37	N	N	Calibration meter screening	13,034	N	N	-	
SMBR-07	Berea	15	3	82	N	Y	Basement Flooding	8,716	Y	N	-	
SMBR-08	Berea	9	3	83	N	Y	Basement Flooding	752	N	N	-	
SMBR-09	Berea	15	3	51	Y	Y	Calibration meter screening	9,544	Y	N	-	
SMBR-11	Berea	9	3	143	N	Y	Basement Flooding	8,263	N	N	-	
SMBR-12	Berea	14	3	148	N	N	Calibration meter screening	1,444	N	N	-	
SMBR-13	Berea	15	3	65	Y	Y	Basement Flooding	9,076	Y	Y	41	
SMBR-14	Berea	15	3	76	Y	Y	Calibration meter screening	22,142	N	N	-	
SMBR-15	Berea	15	3	42	Y	Y	Calibration meter screening	14,445	Y	Y	41	
SMBR-16	Berea	15	3	100	N	N	Calibration meter screening			N	-	Data unreliable
SMBR-17	Berea	16	3	55	N	Y	I/I Investigation, Basement Flooding	22,716	Y	N	-	
SMBR-18	Berea	16	3	59	N	Y	Basement Flooding	9,923	N	N	-	
SMBR-19	Berea	16	3	128	N	N	Calibration meter screening	1,738	N	N	-	
SMBR-20	Berea	16	3	74	Y	Y	Basement Flooding	17,847	Y	N	-	
SMBR-21	Berea	16	3	148	N	N	Calibration meter screening	40,273	N	N	-	
SMBR-22	Berea	16	3	38	N	N	Calibration meter screening	35,769	N	N	-	
SMBR-23	Berea	16	3	86	Y	Y	Basement Flooding	7,921	Y	N	-	
SMBR-24	Berea	15	3	25	Y	Y	Basement Flooding	3,638	N	Y	41	
SMBR-25	Berea	17	3	113	N	Y	I/I Investigation, Basement Flooding	4,157	Y	N	-	
SMBR-27	Berea	17	3	22	N	Y	I/I Investigation, Basement Flooding			N	-	Data unreliable
WLD-1	Berea	16	-	115	Y	Y	Calibration Meter	20,117	N	N	-	
WLE-1	Berea	15	-	610	Y	Y	Calibration Meter	9,392	N	N	-	
TOTALS:				5,344								

Table B2. City of Berea Sanitary Sewer System Performance Summary by PFA

PFA ID	PFA[1] Area (acres)	Effective PFA Sewered Area[2] (acres)	Sewer Type					Sewer Surcharge			Active Sanitary Sewer Overflows (SSOs)					Buildings		Net Aggregated[3] 5yr-1hr (15-min) Peak Flow (MGD)	Net Aggregated[3] 5yr-1hr (15-min) Peak Flow Gallons per Day per Inch Diameter Mile (GPDIM)	Net Aggregated[3] 5yr-1hr (15-min) Peak Flow Gallons Per Acre Per Day (GPAD)	Community Identified Problem Area	Community Reported Problems or other notes
			Total Length of Sanitary Sewer (LF)	Total Length of Common Trench Sewer (LF)	% of Common Trench Sewer	Total Length of Separate Trench Sewer (LF)	% of Separate Trench Sewer	Total Sanitary Sewer Modeled (LF)	Total Modeled Sanitary Sewer Surcharged (LF)	% of Modeled Sewer Surcharged	SSO ID	Active SSOs	SSO Volume, (MG)	Typical Year SSO Frequency (# of overflows)	Typical Year SSO Volume, (MG)	Model Projected Basement Flooding (Units)	% of Total Buildings with Basement Flooding (Units)					
BE-01	2.0	4.3	163	0	0%	163	100%	0	0	0%	-	-	-	-	-	0	0%	0.14	98,601	32,791	BR_06	Basement Flooding
BE-02	93.3	73.9	7,833	2,691	34%	5,142	66%	7,932	3,449	43%	D262	D262	0.03	-	-	18	19%	1.97	42,347	26,658	MB_07	Other (Surface Flooding)
BE-03	843	683	91,129	8,289	9%	82,840	91%	76,765	47,449	62%	D32	D32	0.07	2	0.01	510	36%	21.79	52,285	30,890	BR_04; BR_05; BR_06; BR_08; BR_10	Basement Flooding; Other (Phase II of 2016 MCIP project to address I&I/basement flooding)
BE-04	114	103	14,645	7,565	52%	7,080	48%	11,814	7,585	64%	D11 & D7 & D361 & D-374	D361 & D-374	0.01	-	-	11	4%	4.19	73,984	40,523	BR_07; BR_08	Other (Phase I/II of 2016 MCIP project to address I&I/basement flooding)
BE-05	151	119	20,203	15,668	78%	4,535	22%	21,770	14,330	66%	-	-	-	-	-	3	2%	5.83	37,473	23,843	BR_07; BR_08	Other (Phase I/II of 2016 MCIP project to address I&I/basement flooding)
BE-06	7.5	7.4	1,325	0	0%	1,325	100%	1,172	15	1%	-	-	-	-	-	0	0%	0.87	174,395	116,892		
BE-07	132	102	14,936	0	0%	14,936	100%	12,453	2,671	21%	-	-	-	-	-	3	1%	2.12	36,022	20,733	BR_09	Basement Flooding
BE-08	130	133	18,361	0	0%	18,361	100%	15,356	4,930	32%	-	-	-	-	-	0	0%	1.80	20,944	10,577	OF_05; OF_06	Basement Flooding; Other (New storm system put in from Wylsewood to West.)
BE-09	387	358	54,207	0	0%	54,207	100%	46,083	32,197	70%	C339	C339	0.01	-	-	82	9%	10.14	31,288	18,016	BR_01; BR_02; BR_03	Basement Flooding; Other (Sewer replacement project 2017)
BE-10	566	512	74,733	0	0%	74,733	100%	66,986	27,860	42%	C190 & C438	C438	0.17	15	0.54	180	13%	11.87	30,903	23,191	BR_01; BR_03; BR_09; BR_12	Basement Flooding; Other (Sewer replacement project 2017)
BE-11	283	212	15,414	0	0%	15,414	100%	20,598	0	0%	-	-	-	-	-	0	0%	1.28	10,623	6,023		
BE-12	157	164	23,759	0	0%	23,759	100%	17,737	2,166	12%	-	-	-	-	-	0	0%	0.84	9,052	5,122	BR_09	Basement Flooding
BE-13	313	305	45,436	0	0%	45,436	100%	38,119	30,527	80%	-	-	-	-	-	33	3%	5.13	23,247	16,034	BR_01; BR_11	Basement Flooding
BEBP-01	35.6	43.1	1,470	0	0%	1,470	100%	3,605	1,470	41%	-	-	-	-	-	0	0%	0.59	27,731	13,782		
TOTALS:	3,215	2,819	383,614	34,213	9%	349,401	91%	340,391	174,649	51%		0	0.30		0.55	840						

[1] Peak Flow Area

[2] Includes upstream PFAs and areas from neighboring community if combined PFA

[3] Net Peak Flow: If PFA includes upstream PFAs, and/or in/out diversions, include upstream PFAs, subtract inflows and add outflows for net peak

[4] Controlled SSO

[5] This PFA is not separated by community for the following parameters: Peak Flow, GPDIM, GPAD

Table B3. City of Berea Existing SSOs						
SSO ID	Location	Peak Flow Area (PFA) ID	Modeled Status (5-yr Rainfall)	5-yr, 1-hr (15min) overflow volume (MG)	Typical Year Overflow Volume (MG)	# of Activations in Typical Year
C190	West/Fair	BE-10	Controlled	0.00	0.00	0
C339*	Prospect St at CEI Easement	BE-09	Active	0.01	0.00	0
C388	Manning/Prospect	BE-09	Controlled	0.00	0.00	0
C438	Bagley/Barrett	BE-10	Active	0.18	0.54	15
D7	North Rocky River Drive	BE-04	Controlled	0.00	0.00	0
D11	N Rocky River Southwest of D7	BE-04	Controlled	0.00	0.00	0
D32	East Bridge Street/Riverside	BE-03	Active	0.07	0.01	2
D262	Third/Pearl	BE-02	Active	0.03	0.00	0
D361	North Rocky River Drive/Grayton	BE-04	Active	<0.01	0.00	0
D374	Emerson Ave at Grayton Rd	BE-04	Active	<0.01	0.00	0
			Total	0.30	0.55	17

SSO C339 is being renamed to SSSRS2 at community request

Table B4. City of Berea Sanitary Sewer System Problem Summary by PFA

PFR Area ID	Total Sewered Area (acres)	Percentage as Common Trench System	Community Problem Area ID	Location/Roads	Reported Problems		Model Findings and Status			Fieldwork Findings (Current As of December 31, 2020)
					Description	No of Reports	No of BBUs	Surcharge caused by downstream issues (LF)	Capacity Issues (LF)	
BE-01	2.0	0%	BR_06			0	0	0	0	WO 56 - Smoke testing was performed on Beech St. 1 smoke test defect was observed, which was a building without smoke visible from its vent.
BE-02	93.3	34%	MB_07	1st St near Pearl Rd	Other (Surface Flooding)	1	18	1,416	2,033	WO 56 - Smoke testing was performed on 3rd Ave. 8 smoke test defect were observed, primarily buildings without smoke visible from their vents (5). Other smoke test defects included storm drains (2) and a sanitary manhole (1).
BE-03	843	9%	BR_04; BR_05; BR_06; BR_08; BR_10	Monroe St to S Rocky River Dr; Waverly and Eastland to Fowles Rd; Barverry Dr to E Bagley Rd, east of Eastland; University St on north end of Cuyahoga County Fairgrounds	Basement Flooding; Other (Phase II of 2016 MCIP project to address I&I/basement flooding)	17	510	24,973	21,625	WO 25 - Private property I/I testing was performed on Beech St and 4th Ave. 3 of 10 residences that were dye tested had positive results (rapid infiltration). Structural defects included cracks, fractures, a hole, and broken pipe. One sewer on 4th Ave had debris buildup. WO 48 - CCTV was performed on E. Bridge St, Riverside Dr, Front St, and N Rocky River Dr. Structural defects included a crack within a sewer on E. Bridge St. High water levels were observed in sewers on Front St. WO 54 - Smoke testing was performed on Andrew St, Fuller St, Franklin St, Austin St, Fowles Rd, Old Reservoir Rd, Main St, Monroe St, Bevans St, Stanmary Dr, Olde Town Trl, Waverly St, Quarry Stone Ln, S Rocky River Dr, and Eastland Rd. A total of 49 smoke test defects were observed, primarily buildings without smoke from their vents (27). Other smoke test defects included sanitary manholes (8), cleanouts (7), downspouts (2), storm drains (2), storm manholes (2), and an area drain (1).
										WO 56 - Smoke testing was performed on Wendy Dr, Eastland Rd, 4th Ave, Westmoor Ln, Bond Pkwy, Bishop Pl, E 15th Ave, Orchard Grv, Maple Ave, Barberry Dr, Woodlawn Cir, University St, and Beech St. A total of 63 smoke test defects were observed, primarily buildings without smoke from their vents (39) and sanitary manholes (21). Other smoke test defects included cleanouts (2) and an area drain (1). Dye flood testing was performed on Louis Dr, Janice Dr, and Robin Dr. All 6 dye flood tests were negative. All 9 catch basin tests performed were also negative. Structural defects included cracks, fractures, and holes. One sewer on Louis Dr had root instrusion.

Table B4. City of Berea Sanitary Sewer System Problem Summary by PFA

PFR Area ID	Total Sewered Area (acres)	Percentage as Common Trench System	Community Problem Area ID	Location/Roads	Reported Problems		Model Findings and Status			Fieldwork Findings (Current As of December 31, 2020)
					Description	No of Reports	No of BBUs	Surcharge caused by downstream issues (LF)	Capacity Issues (LF)	
										WO 73 - Smoke testing was performed on Seminary St, Beech St, Adams St, Spring St, Jacob St, Spring St, E Grand St, E Center St, E Bridge St, and Clark St. A total of 56 smoke test defects were observed, primarily buildings without smoke from their vents (26). Other smoke test defects included storm drains (9), cleanouts (7), downspouts (4), sanitary manholes (4), area drains (2), ground (2), and other (2). WO 82A - Dye flooding testing was performed on Fowles Dr. Although testing of the entire segment could not be completed, 1 sanitary sewer had light infiltration observed from a connection. 1 other sanitary sewer did not have any I/I defects. WO 82B - Private property I/I testing was performed on S Rocky River Dr and Stanmary Dr. All 3 residences that had their downspouts tested had negative results. WO 99 - CCTV and catch basin dye testing were performed on W. Bagley Rd, Front St, W. 5th Ave, and Mulberry St near Baldwin Wallace University. 5 of 35 catch basins dye tested were positive for dye transfer (2 due to passive
BE-04	113.8	52%	BR_07; BR_08	From Emerson to N Rocky River Dr, east of Wesley Dr	Other (Phase I/II of 2016 MCIP project to address I&I/basement flooding)	2	11	4,711	3,063	WO 73 - Smoke testing was performed on Grayton Rd, Longfellow Dr, The Burns, The Mall, and Wesley Dr. A total of 35 smoke test defects were observed, primarily downspouts (10) and buildings without smoke from their vents (10). Other smoke test defects included storm drains (7), cleanouts (3), area drains (2), sanitary manholes (2), and ground (1). Dye flood testing was also performed on Emerson Ave. All 6 sewers that were dye tested were positive for I/I with 21 infiltration defects observed (6 rapid). Infiltration was found entering the sanitary sewer from both the pipe and connections. 4 catch basins tested negative for I/I. Structural defects included cracks, fractures, and broken pipe. One sewer had debris buildup.
BE-05	151	78%	BR_07; BR_08	Riveredge Pkwy between Arden Ave and N Rocky River Dr; N Rocky River Dr east of Wesley Dr, north of	Other (Phase I/II of 2016 MCIP project to address I&I/basement flooding)	10	3	8,069	6,039	No fieldwork performed.
BE-06	7.5	0%				0	0	15	0	No fieldwork performed.
BE-07	132	0%	BR_09	Lombardy Dr	Basement Flooding	6	3	1,562	1,109	WO 41 - Smoke testing was performed on Lombardy Dr, Hickory Dr, Hemlock Dr, Laurel Dr, Larchwood Dr, and Holly Dr. A total of 21 smoke test defects were found, primarily buildings without smoke from their vents (17). Other smoke test defects included sanitary manholes (4).
BE-08	130	0%	OF_05; OF_06	Wyleswod Dr northwest of Merrimak Dr	Basement Flooding; Other (New storm system put in from Wylsewood to West.)	0	0	3,353	1,736	WO 73 - Smoke testing was performed on Crossbrook Dr, Race St, and Brockton Cir. A total of 4 smoke test defects were found, which included buildings without smoke from their vents (2), an area drain (1), and other (1).

Table B4. City of Berea Sanitary Sewer System Problem Summary by PFA

PFR Area ID	Total Sewered Area (acres)	Percentage as Common Trench System	Community Problem Area ID	Location/Roads	Reported Problems		Model Findings and Status			Fieldwork Findings (Current As of December 31, 2020)
					Description	No of Reports	No of BBUs	Surcharge caused by downstream issues (LF)	Capacity Issues (LF)	
BE-09	387	0%	BR_01; BR_02; BR_03	Dorland to Maplelawn North of the I-80; Jacqueline to Sprague centered on Fair St; Fair St, south of Best, north of Sprague	Basement Flooding; Other (Sewer replacement project 2017)	12	82	17,886	13,980	WO 40 - Smoke testing was performed on Maplelawn Dr, Edwards St, Milton St, Dorland Ave, S Point Trl, Prospect St, Greenfield Ct, Fair St, Whitehall Dr, Carteret Ct, Downing Ct, Walwick Ct, Jananna Dr, Kaye St, Vivian Dr, Sprague Rd, and Prospect St. A total of 50 smoke test defects were observed, primarily sanitary manholes (29). Other smoke test defects included buildings without smoke from their vents (8), cleanouts (4), area drains (2), storm manholes (2), storm drains (1), ground (1), and other (1). WO 50 - Dye flood testing was performed on Maplelawn Dr. Although dye was not visible, 2 light infiltration defects were observed entering the 1 sanitary sewer tested from pipe defects. 2 catch basins tested negative for I/I. One large cleanout structure at 204 Maplelawn Dr was observed smoking during WO 40 and dye tested during WO 50. Its connection to the sanitary sewer was confirmed. Leaves and grass were also observed in the sewer during flooding. Structural defects on Maplelawn included cracks and fractures. Condition-only CCTV was performed on Prospect St, where debris buildup was observed. WO 55 - Smoke testing was performed on Woodmere Dr. No smoke test defects were observed. WO 64 - Smoke testing was performed on Lapaz Blvd, Tampico Ct, Beeler Dr, Wallace Dr, and Baldwin Dr. A total of 8 smoke test defects were observed, primarily buildings without smoke from their vents (4). Other smoke test defects included sanitary manholes (3) and a cleanout (1).
BE-10	566.0	0%	BR_01; BR_03; BR_09; BR_12	Baldwin Dr and French St centered on Fair; Fair St, south of West, north of Best; Nobottom Rd east of Holly Dr; Butternut Ln	Basement Flooding; Other (Sewer replacement project 2017)	13	180	16,718	11,672	WO 41 - Smoke testing was performed on Savage St, Nobottom Rd, and Walnut Dr. A total of 12 smoke test defects were observed, primarily sanitary manholes (7). Other smoke test defects included buildings without smoke from their vents (3), downspout (1), and ground (1). Dye flood testing was also performed on Nobottom Rd and Butternut Ln. 1 of 8 sanitary sewers tested positive for I/I with light infiltration from a connection. 1 catch basin tested was negative for I/I. Structural defects included cracks. WO 55 - Smoke testing was performed on Wyleswood Dr. 1 smoke test
BE-11	283	0%				0	0	0	0	No fieldwork performed.
BE-12	157	0%	BR_09	Lombardy Dr	Basement Flooding	2	0	424	1,581	No fieldwork performed.

Table B4. City of Berea Sanitary Sewer System Problem Summary by PFA

PFR Area ID	Total Sewered Area (acres)	Percentage as Common Trench System	Community Problem Area ID	Location/Roads	Reported Problems		Model Findings and Status			Fieldwork Findings (Current As of December 31, 2020)
					Description	No of Reports	No of BBUs	Surcharge caused by downstream issues (LF)	Capacity Issues (LF)	
BE-13	313	0%	BR_01; BR_11	Fairwood Cir	Basement Flooding	13	33	21,570	9,040	WO 55 - Smoke testing was performed on Kempton Dr, Race St, Anne Dr, Pattie Dr, Girard Dr, Fairpark Dr, Wyleswood Dr, Baldwin Dr, Wallace Dr, Best St, Adrian Dr, Edgewood Cir, Fairwood Cir, Lynn Rd, Woodmere Dr, Glenwood Dr, and Glenwood Cir. A total of 27 smoke test defects were observed, primarily buildings without smoke from their vents (14) and cleanouts (9). Other smoke test defects included sanitary manholes (3) and ground (1). WO 64 - Smoke testing was performed on West St, Beeler Dr, and Wayne Dr. A total of 13 smoke test defects were observed, primarily buildings without smoke from their vents (6). Other smoke test defects observed include cleanouts (4) and sanitary manholes (3). WO 93 - Private property I/I testing was performed on Kraft St. Dyed water downspout testing was performed at 3 residences, all of which tested negative for I/I. Debris buildup (broken pipe) and an infiltration gusher located at a joint (no dye visible) were observed in 1 sewer.
BEBP-01	35.6	0%				0	0	70	1,400	No fieldwork performed.
TOTALS:	3,215					76	840	100,768	73,278	

Table B5. City of Berea - Home Sewage Treatment System Locations[1]

Address	Resident Name	PPN	Last Inspection Date	Inspection Result	NPDES	Overflow Discharge Location	Install Date
335 University ST	Aifs Property, LLC Residence	36416020	5/10/2018	Evaluation-Fail	No	Unknown	1948
317 University ST	Enold Residence	36416017	2/27/2012	Assessment	No	Storm Sewer	1981
321 University ST	Jaworske Residence	36416018	11/16/2009	Assessment	No	Storm Sewer	1948
333 University ST	Stevenson Residence	36416019	9/3/2009	Assessment	No	Unknown	Unknown
425 Rocky River DR	Kaskey Residence	36112002	3/7/2012	Evaluation-Fail	No	Unknown	Unknown
7597 Lewis RD	Rados Residence	26148006	4/16/2003	Evaluation-Pass	No	Surface	1998
7621 Lewis RD	Kleem Residence	26120004	4/10/2003	Assessment	No	Creek/Stream/River	Unknown

[1] Data based on April 2021 export from Cuyahoga County Board of Health Home Sewage Treatment System records.

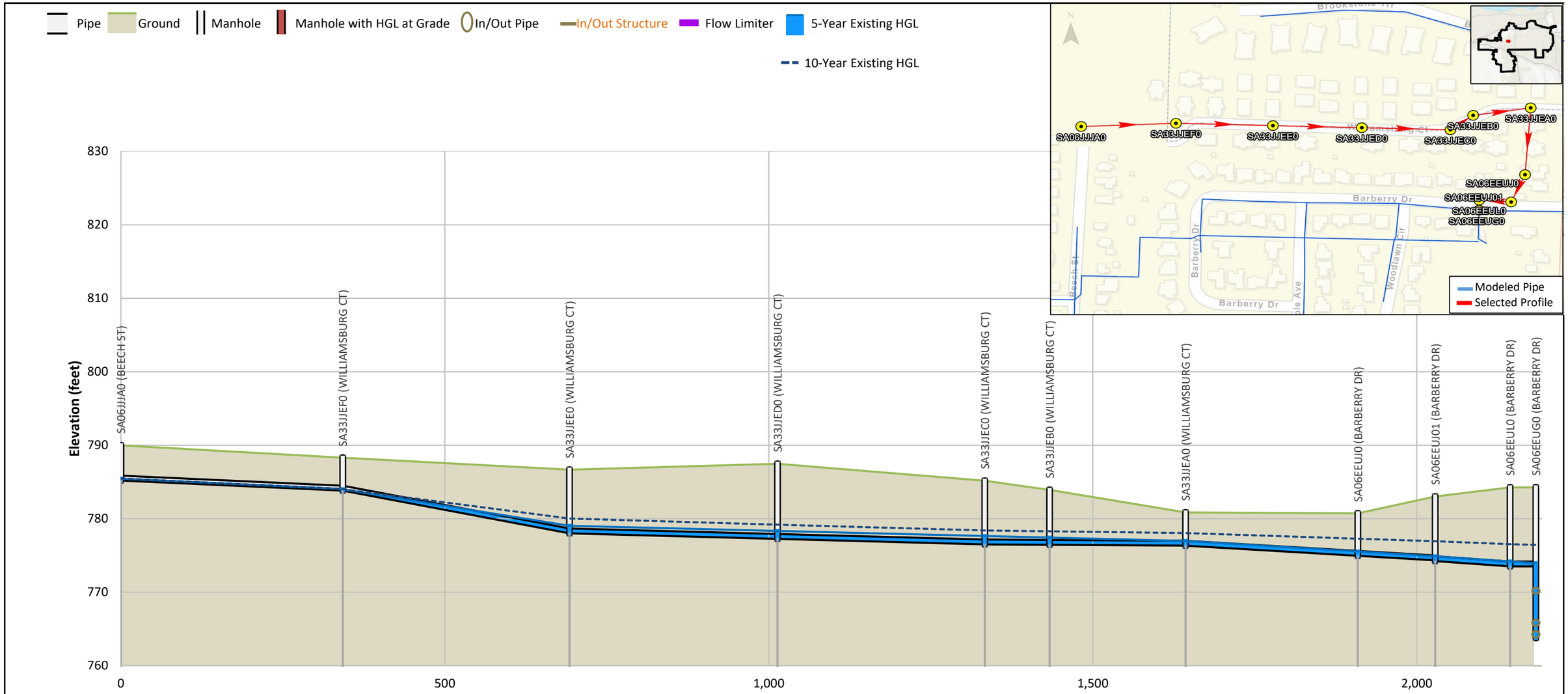
Table B6. City of Berea Illicit Discharge Investigations[1]			
Outfall/Manhole_ID	Location	Status	Comments
BCMB1250	67 Monroe St	Investigation Complete	WQIS completed five sampling events. There was no flow dischargingfor the outfall during any sampling event. WQIS investigation completed.
RREB0880	67 Riverside	Community Notified	WQIS located a water leak and is waiting on City of Berea for remediation. WQIS will verify correction after remediation is completed.

[1]Data based on the District's 2021 IDDE layer extracted on June 25, 2021

Table B7. City of Berea Field Observations Summary				
Asset ID	Location	Observation Noted	Notes	Notification Date
No ID - Unmapped Manhole	724 North Rocky River Dr	Access – Buried Manhole	None	12/13/2019
No ID - Unmapped Manhole	692 North Rocky River Dr	Access – Buried Manhole	None	12/13/2019
SA06AAAI0	276 W Bagley Rd	Access – Buried Manhole	None	8/22/2019
SA06AACG0	480 W. Bagley Rd	Access – Buried Manhole	None	1/17/2020
SA06AACG5	480 W. Bagley Rd	Access – Buried Manhole	None	1/17/2020
SA06AAKO0	633 W. Bagley Rd	Access – Buried Manhole	None	1/17/2020
SA06AAKT0	480 W. Bagley Rd	Access – Buried Manhole	None	1/17/2020
SA06ABLB0	775 Berea Industrial Pkwy	Access – Buried Manhole	None	1/17/2020
SA06CCIC0	432 Crossbrook Dr	Access – Buried Manhole	None	8/15/2019
SA06CCIC0	432 Crossbrook Dr	Access – Buried Manhole	None	1/17/2020
SA06DDID0	1230-40 W. Bagley Rd	Access – Buried Manhole	None	1/17/2020
SA06EEGA0	15007 Emerson Ave	Access – Buried Manhole	None	1/17/2020
SA06EEPC0	44 W. Bagley Rd	Access – Buried Manhole	None	1/17/2020
SA06EEWH0	615 Eastland Rd	Access – Buried Manhole	None	1/17/2020
SA06EEYG0	146 E Bridge St	Access – Buried Manhole	None	7/11/2019
SA06FFAC0	136 Eastland Rd	Access – Buried Manhole	None	1/17/2020
SA06FFFM0	319 Fowles Rd	Access – Buried Manhole	None	7/31/2019
SA06FFWA0	188 Front St	Access – Buried Manhole	None	7/11/2019
SA06GGEB0	397 Runn St	Access – Buried Manhole	None	1/17/2020
SA06GGGB0	347 Front St	Access – Buried Manhole	None	1/17/2020
SA06GGPB0	470 Front St	Access – Buried Manhole	None	8/22/2019
SA06GGRA2	401 Front St	Access – Buried Manhole	None	12/14/2020
SA06GGPC0	470 Front St	Access – Buried Manhole	None	8/22/2019
SA06GGQBI	385 Beech St	Access – Buried Manhole	None	1/17/2020
SA06GGRB1	365 E. 5th St	Access – Buried Manhole	None	1/17/2020
SA06GGWQ0	565 Fair St	Access – Buried Manhole	None	1/17/2020
SA06HHFB0	223 Wyleswood Dr	Access – Buried Manhole	None	10/19/2018
SA06IIOE0	50 W. Bridge St	Access – Buried Manhole	None	1/17/2020
SA06IIYE0	375 Brockton Cir	Access – Buried Manhole	None	1/17/2020
SA06JJLA0	546 Woodmere Rd	Access – Buried Manhole	None	1/17/2020
SA06LLEC0	571 Louis Dr	Access – Buried Manhole	None	8/22/2019

Table B7. City of Berea Field Observations Summary				
Asset ID	Location	Observation Noted	Notes	Notification Date
No ID - Storm Catch Basin	221 S Rocky River Dr	Access – Other	Cover issue	10/19/2018
SA06CCEC0	472 Walleyford Dr	Access – Other	Cover issue	1/17/2020
SA06DDJD0	8358 Lewis Rd	Access – Other	Cover issue	8/22/2019
SA06DDQC0	Emerson Ave	Access – Other	Cover issue	1/17/2020
SA06DDRD0	645 Grayton Rd	Access – Other	Cover issue	1/17/2020
SA06DDSD0	231 Emerson Dr	Access – Other	Cover issue	9/26/2019
SA06EEMG0	21 Fillier St	Access – Other	Cover issue	3/10/2020
SA06FFUA0	144 Front St	Access – Other	Cover issue	8/22/2019
SA06FFUA0	144 Front St	Access – Other	Cover issue	7/11/2019
SA06FFZA0	156 Beech St	Access – Other	Cover issue	9/17/2019
SA06GGDA0	390 Runn St	Access – Other	Cover issue	1/17/2020
SA06GGHC0	170 Bagley Rd	Access – Other	Cover issue	1/17/2020
SA06GGKG0	508 Barrett Rd	Access – Other	Cover issue	8/22/2019
SA06IIZB0	449 Adrian Dr	Access – Other	Cover issue	8/2/2019
SA06IIZB0	449 Adrian Dr	Access – Other	Cover issue	8/2/2019
SA06JALC0	221 Baldwin Dr	Access – Other	Cover issue	8/5/2019
SA06JJLA0	295 Wyleswood Dr	Access – Other	Cover issue	8/5/2019
SA06GGGA0	301 Front St	Heavy Cleaning Needed	Silt buildup and high water level	5/9/2019
SA06GGGC01	347 Front St	Heavy Cleaning Needed	Silt and sanitary debris buildup	5/9/2019
WLE00010	27 White St	Heavy Cleaning Needed	Tree branch in chamber	10/19/2018
SA06CCAH0	460 Southham Cir	Other	Possible nearby water main leak. Heavy infiltration in sanitary manhole.	8/15/2019
SA06CCIB0	450 Crossbrook Dr	Other	Possible nearby water main leak. Heavy infiltration in sanitary manhole.	8/15/2019
SA06HHSC0	216 Kempton Dr	Other	Possible nearby water main leak. Infiltration in sanitary manhole.	10/19/2018
SA06AAOG0	366 Walnut Dr	Partial Blockage	Debris/encrustation buildup	5/15/2019
SA06CCCC0	484 Merrimak Dr	Surcharge	High water level	7/11/2019
SA06EECE0	565 Grayton Rd	Surcharge	High water level	5/10/2018

Table B7. City of Berea Field Observations Summary				
Asset ID	Location	Observation Noted	Notes	Notification Date
SA06EEPD0	279 Front St	Surcharge	High water level	5/3/2019
SA06GGOB0	400 Barrett Rd	Surcharge	None	1/17/2020
ST06KKMB0	124 Prospect St	Surcharge	None	10/19/2018



Output below = 5-Year Existing HGL

Branch 316, Date created: 3/11/2021

Depth to Invert (ft)		4.5	8.7	10	8.7	7.5	4.5	5.8	8.7	11	
Depth to HGL (ft)		4.3	7.6	9.1	7.5	6.5	3.9	5.2	8.1	10	
Diameter (in)	8	8	8	8	8	8	8	8	8		
Capacity (mgd)	0.45	0.92	0.34	0.34	0.17	0.16	0.51	0.51	0.56		
Max Depth (ft)	0.26	1.0	1.1	1.1	1.1	0.99	0.65	0.60	0.67		
Dep abv Crown (ft)	-	0.36	0.41	0.48	0.48	0.32	-	-	0.00		
Max Flow (mgd)	0.14	0.14	0.34	0.33	0.33	0.33	0.51	0.51	0.56		
Max Velocity (ft/s)	2.2	0.62	1.8	1.3	1.3	1.7	2.6	3.2	2.4		
Slope (ft/ft)	0.0040	0.017	0.0023	0.0023	0.00059	0.00050	0.0052	0.0052	0.0062		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-01, BE-03, MI-12

Community: Berea, Middleburg Heights

BEECH ST to BARBERRY DR

Brown AND Caldwell

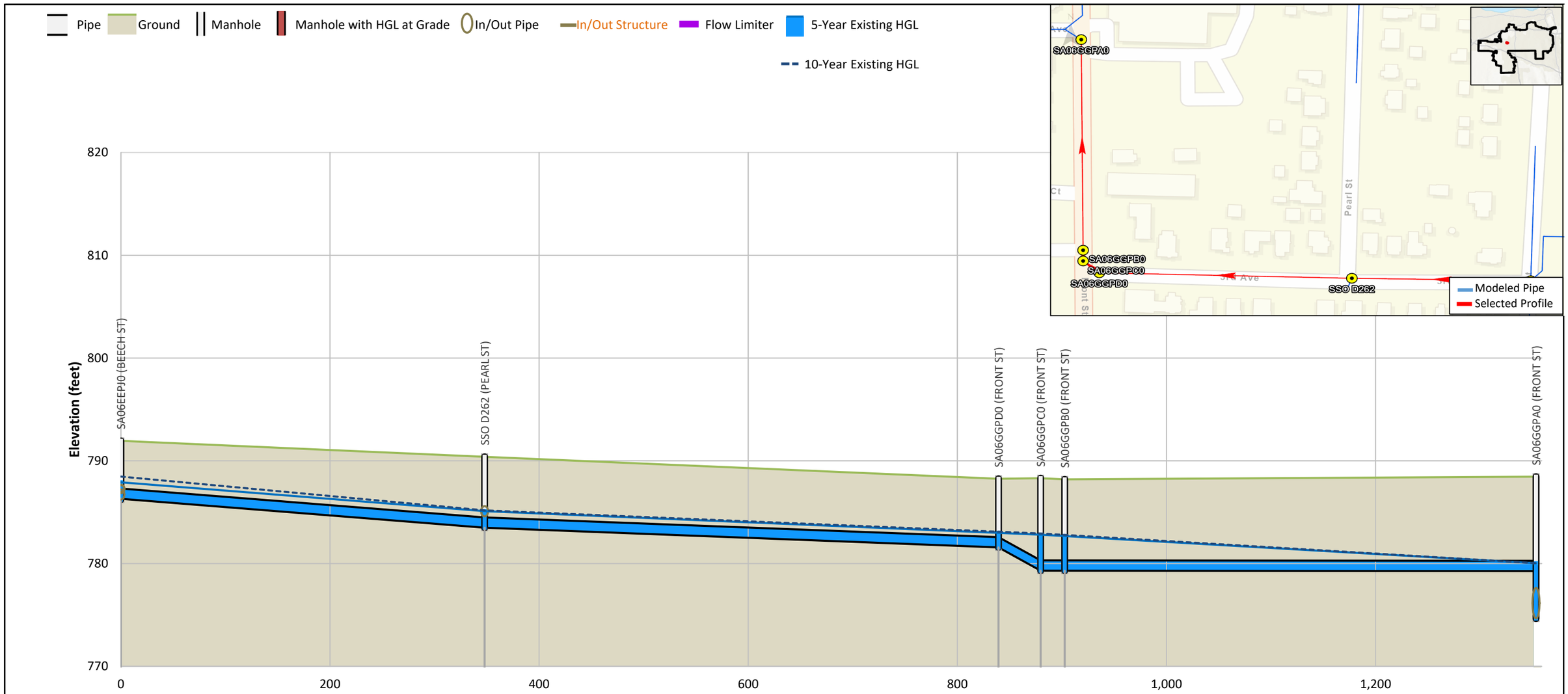
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

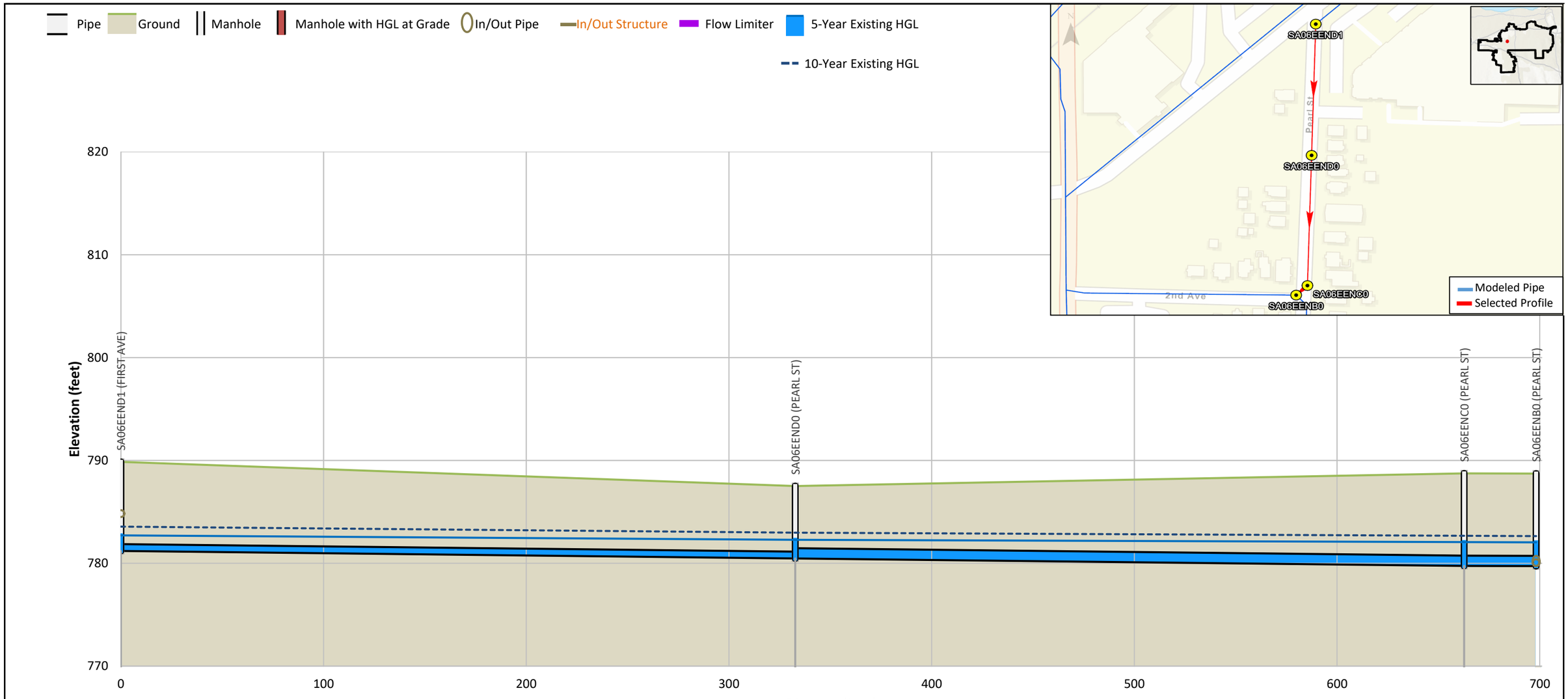
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Output below = 5-Year Existing HGL

Branch 300, Date created: 3/11/2021

| | | |



Output below = 5-Year Existing HGL

Branch 305, Date created: 3/11/2021

Depth to Invert (ft)		7.0	9.0	
Depth to HGL (ft)		5.2	6.7	
Diameter (in)	8	12	12	
Capacity (mgd)	0.33	0.98	0.48	
Max Depth (ft)	1.8	2.3	2.3	
Dep abv Crown (ft)	1.1	1.3	1.3	
Max Flow (mgd)	0.25	0.55	0.55	
Max Velocity (ft/s)	1.1	0.97	0.95	
Slope (ft/ft)	0.0022	0.0022	0.00054	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-02

Community: Berea

FIRST AVE to PEARL ST

Brown AND Caldwell

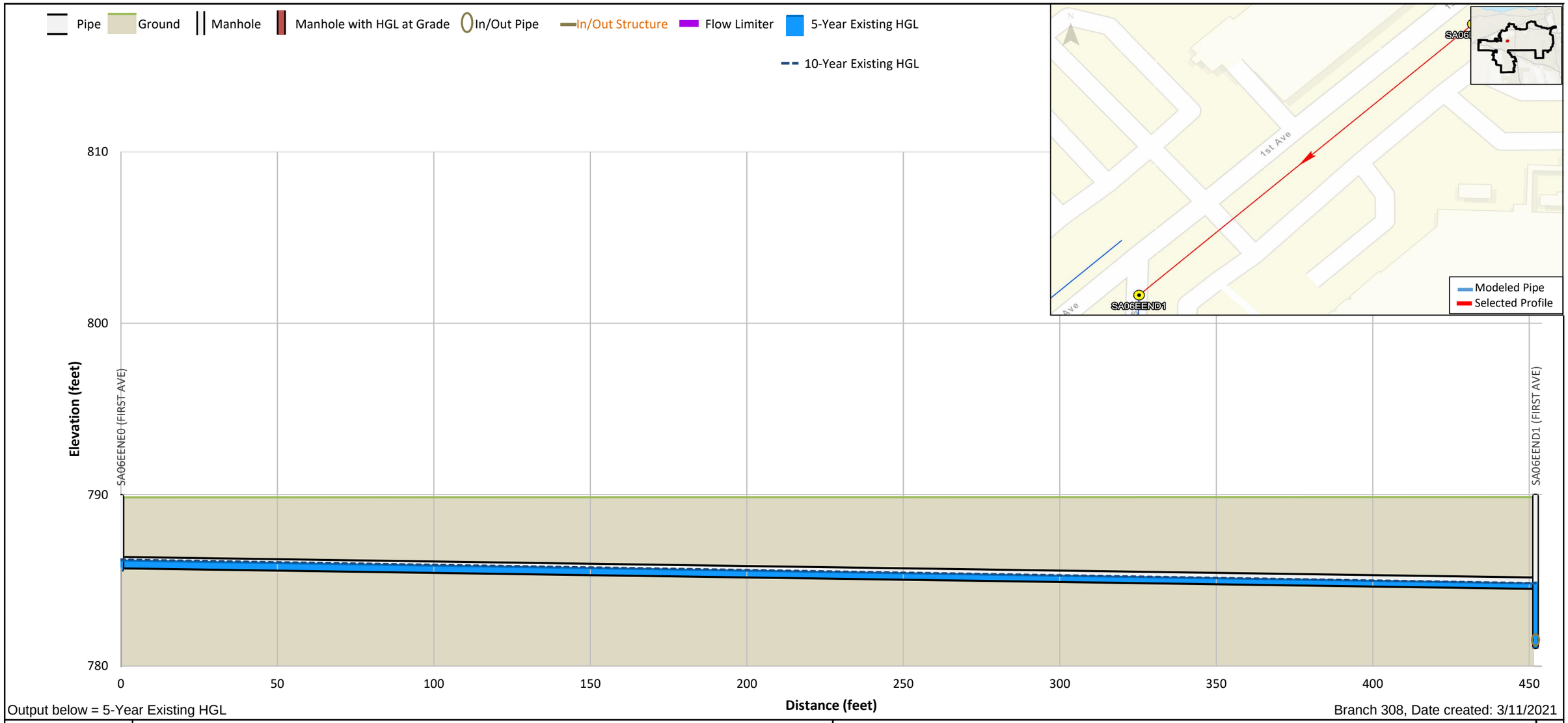
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 308, Date created: 3/11/2021

Depth to Invert (ft)	
Depth to HGL (ft)	
Diameter (in)	8
Capacity (mgd)	0.37
Max Depth (ft)	0.46
Dep abv Crown (ft)	-
Max Flow (mgd)	0.29
Max Velocity (ft/s)	2.8
Slope (ft/ft)	0.0027

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-02

Community: Berea

FIRST AVE

Brown AND Caldwell

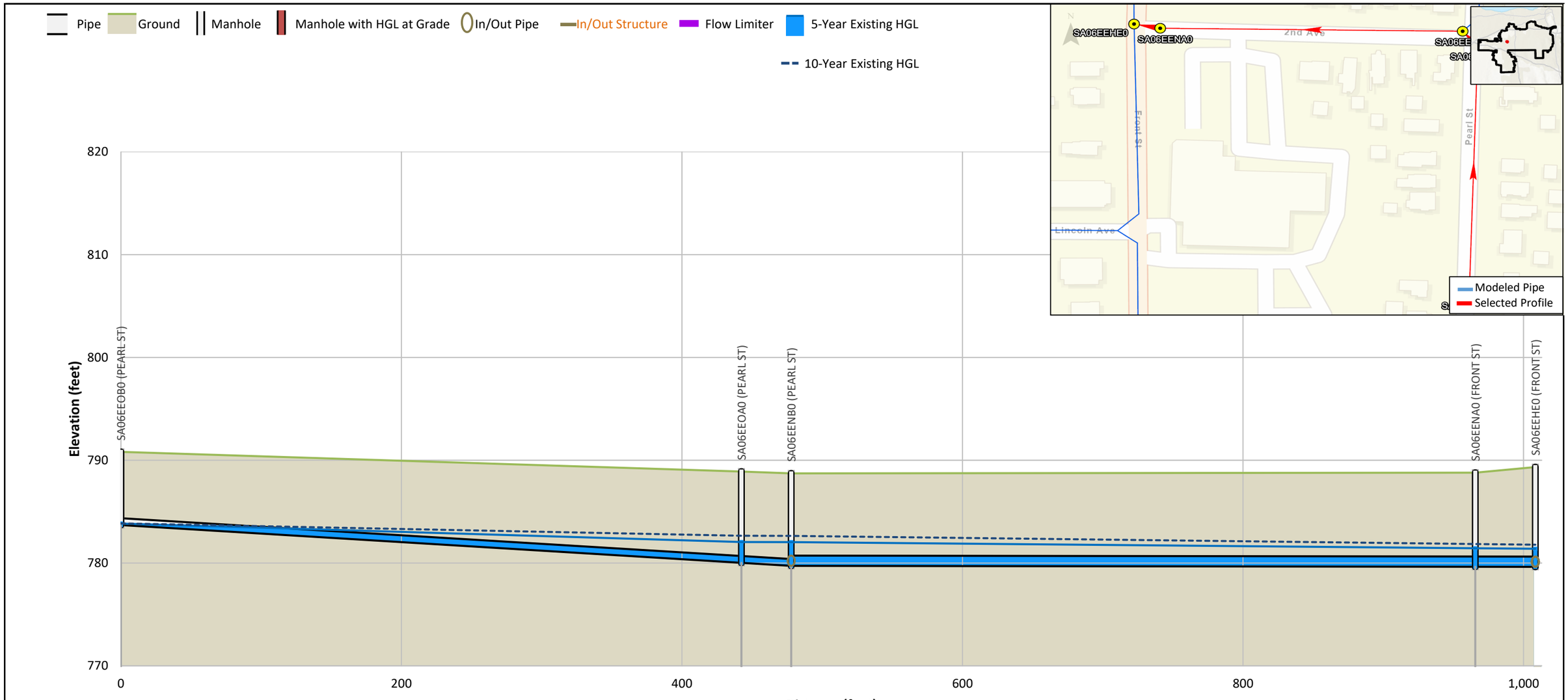
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 342, Date created: 3/11/2021

Depth to Invert (ft)			8.9		9.0			9.2		
Depth to HGL (ft)			6.9		6.7			7.4		
Diameter (in)	8			8		12			12	
Capacity (mgd)	0.65			0.65		0.28			0.28	
Max Depth (ft)	2.0			2.3		2.3			1.8	
Dep abv Crown (ft)	1.4			1.6		1.3			0.80	
Max Flow (mgd)	0.06			0.12		0.73			0.73	
Max Velocity (ft/s)	0.44			0.39		1.3			1.3	
Slope (ft/ft)	0.0083			0.0083		0.00018			0.00016	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-02
Community: Berea
PEARL ST to FRONT ST

Brown AND Caldwell

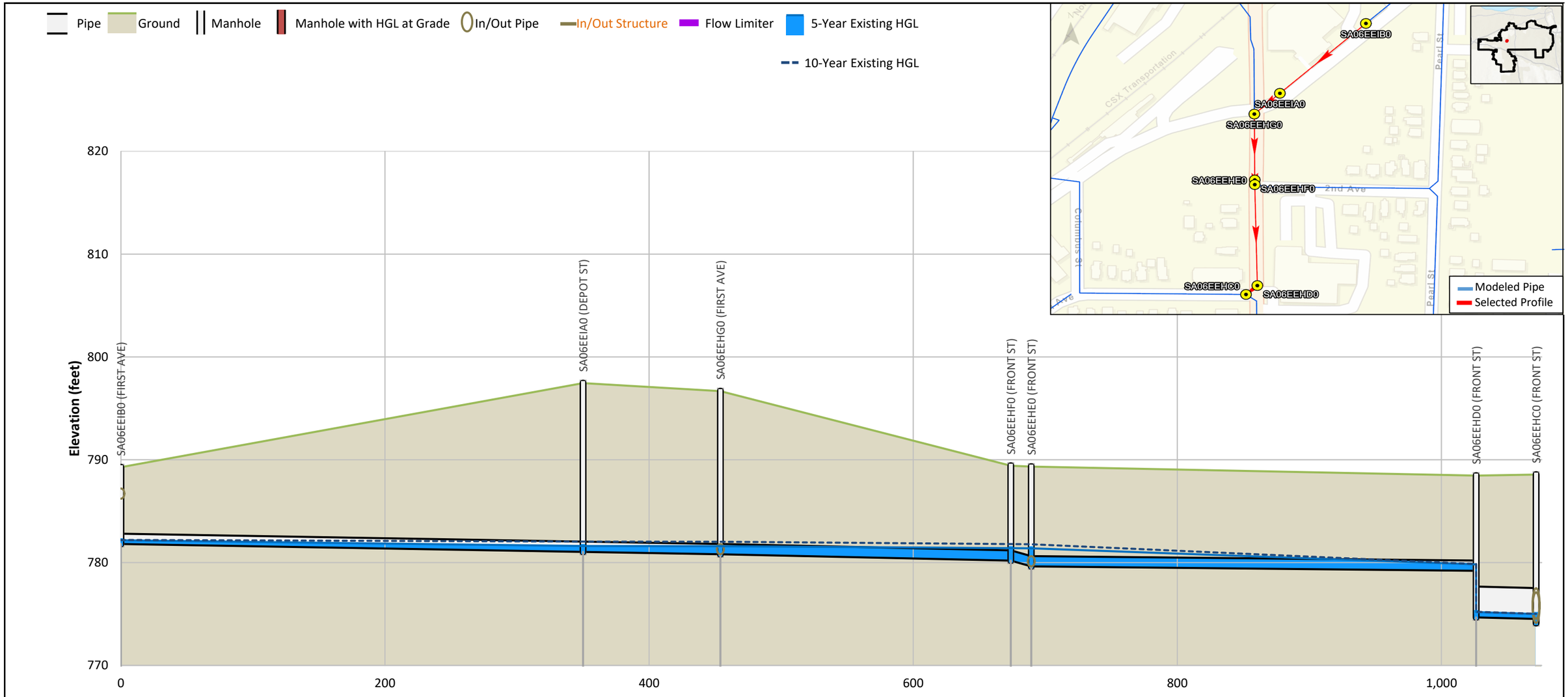
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 343, Date created: 3/11/2021

Depth to Invert (ft)			16	16		9.2	9.7			9.3		
Depth to HGL (ft)			16	15		8.0	7.9			8.6		
Diameter (in)	12		12	12				12			36	
Capacity (mgd)	0.98		0.98	1.1				0.75			23	
Max Depth (ft)	0.58		0.79	1.2				1.8			0.52	
Dep abv Crown (ft)	-		-	0.21				0.76			-	
Max Flow (mgd)	0.26		0.26	0.65				1.4			1.4	
Max Velocity (ft/s)	1.4		0.84	3.1				4.1			3.1	
Slope (ft/ft)	0.0022		0.0022	0.0028				0.0013			0.0033	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-02
Community: Berea
FIRST AVE to FRONT ST

Brown AND Caldwell

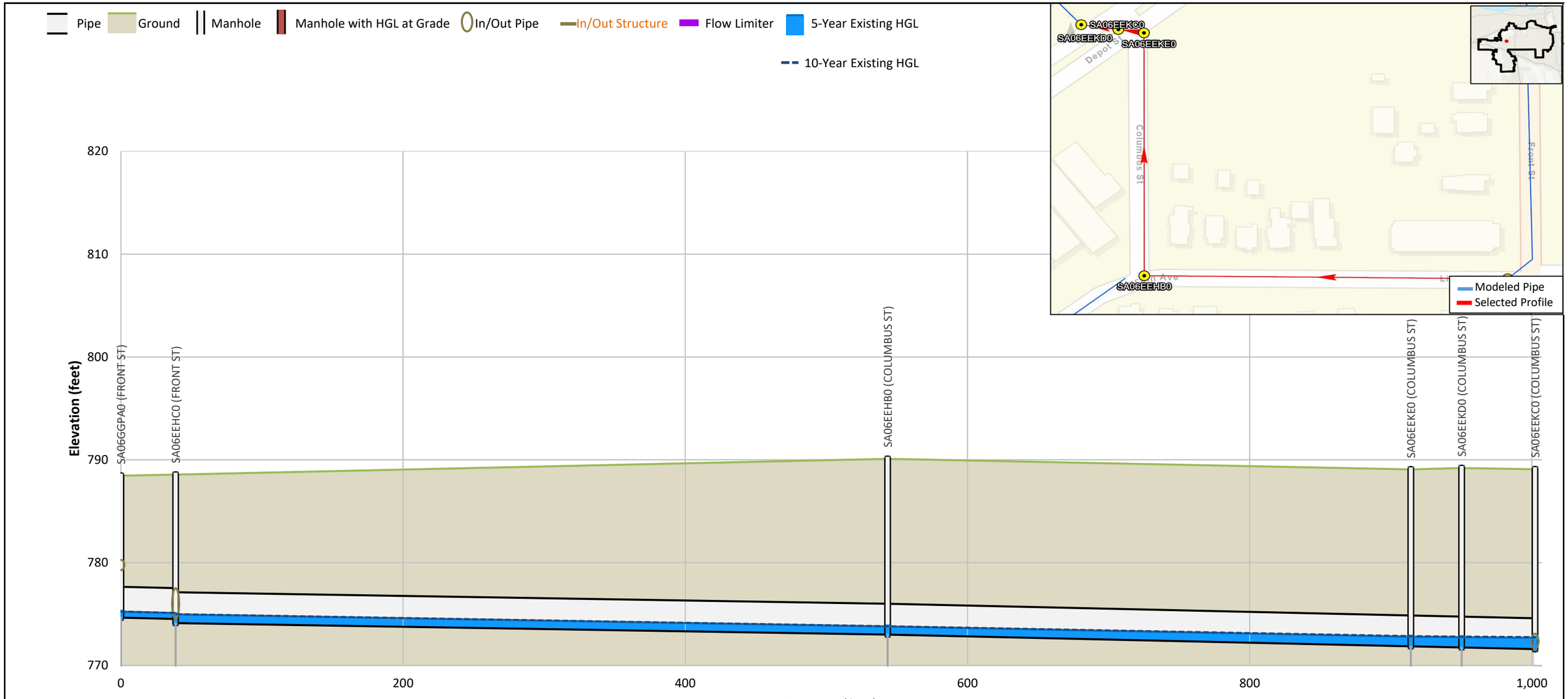
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 344, Date created: 3/11/2021

Depth to Invert (ft)		14	17	17	17	17	
Depth to HGL (ft)		13	16	16	16	16	
Diameter (in)	36	36	36	36	36	36	
Capacity (mgd)	26	21	25	25	25	25	
Max Depth (ft)	0.59	0.85	0.94	1.0	1.1		
Dep abv Crown (ft)	-	-	-	-	-		
Max Flow (mgd)	2.1	3.6	3.6	3.7	3.7		
Max Velocity (ft/s)	3.4	3.7	3.0	2.9	2.4		
Slope (ft/ft)	0.0034	0.0022	0.0031	0.0031	0.0031		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-02
Community: Berea
FRONT ST to COLUMBUS ST

Brown AND Caldwell

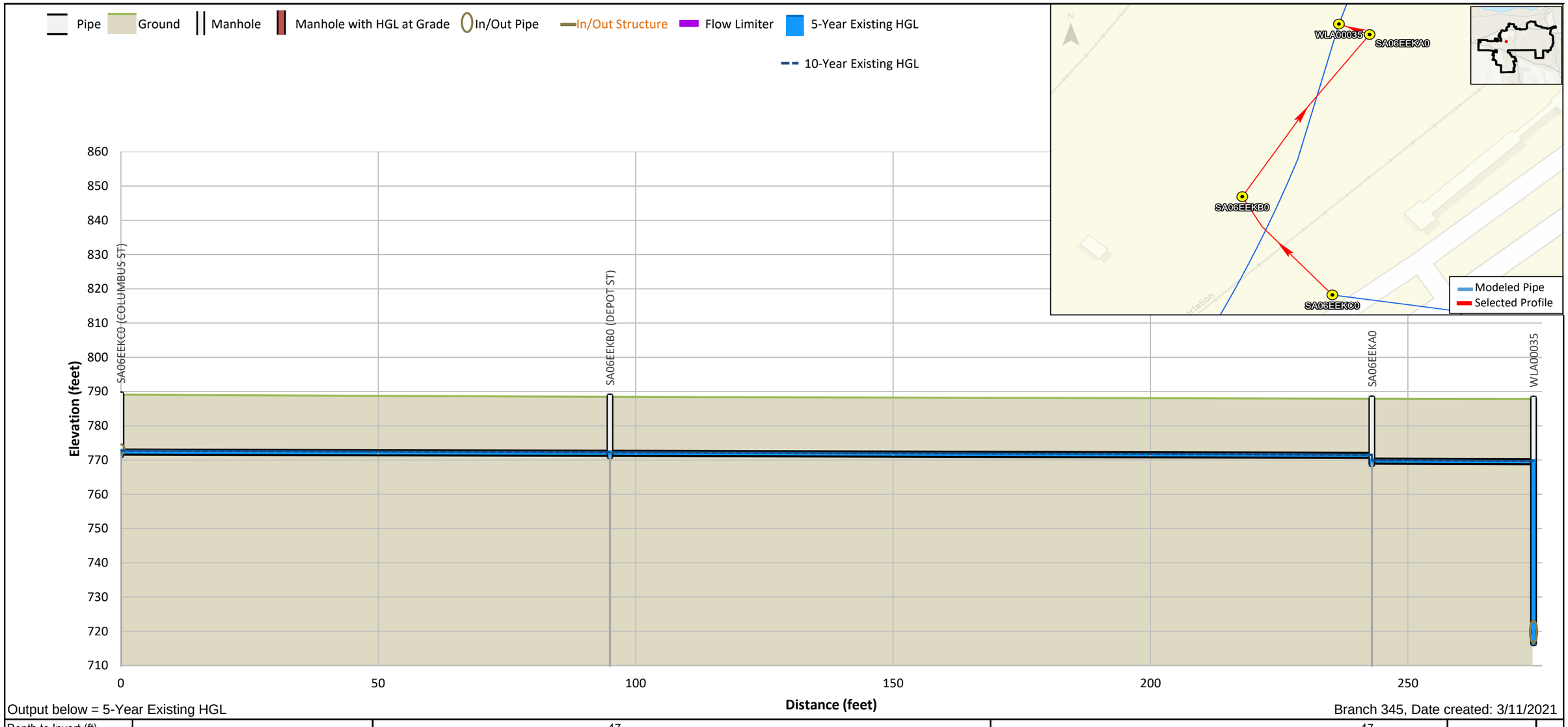
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 345, Date created: 3/11/2021

Depth to Invert (ft)		17	17	
Depth to HGL (ft)		16	16	
Diameter (in)	18	18	18	18
Capacity (mgd)	3.9	4.5	4.4	
Max Depth (ft)	1.1	1.0	0.99	
Dep abv Crown (ft)	-	-	-	
Max Flow (mgd)	3.7	3.8	3.8	
Max Velocity (ft/s)	4.4	5.0	5.0	
Slope (ft/ft)	0.0040	0.0041	0.0050	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-02

Community: Berea

COLUMBUS ST to Manhole WLA00035

Brown AND Caldwell

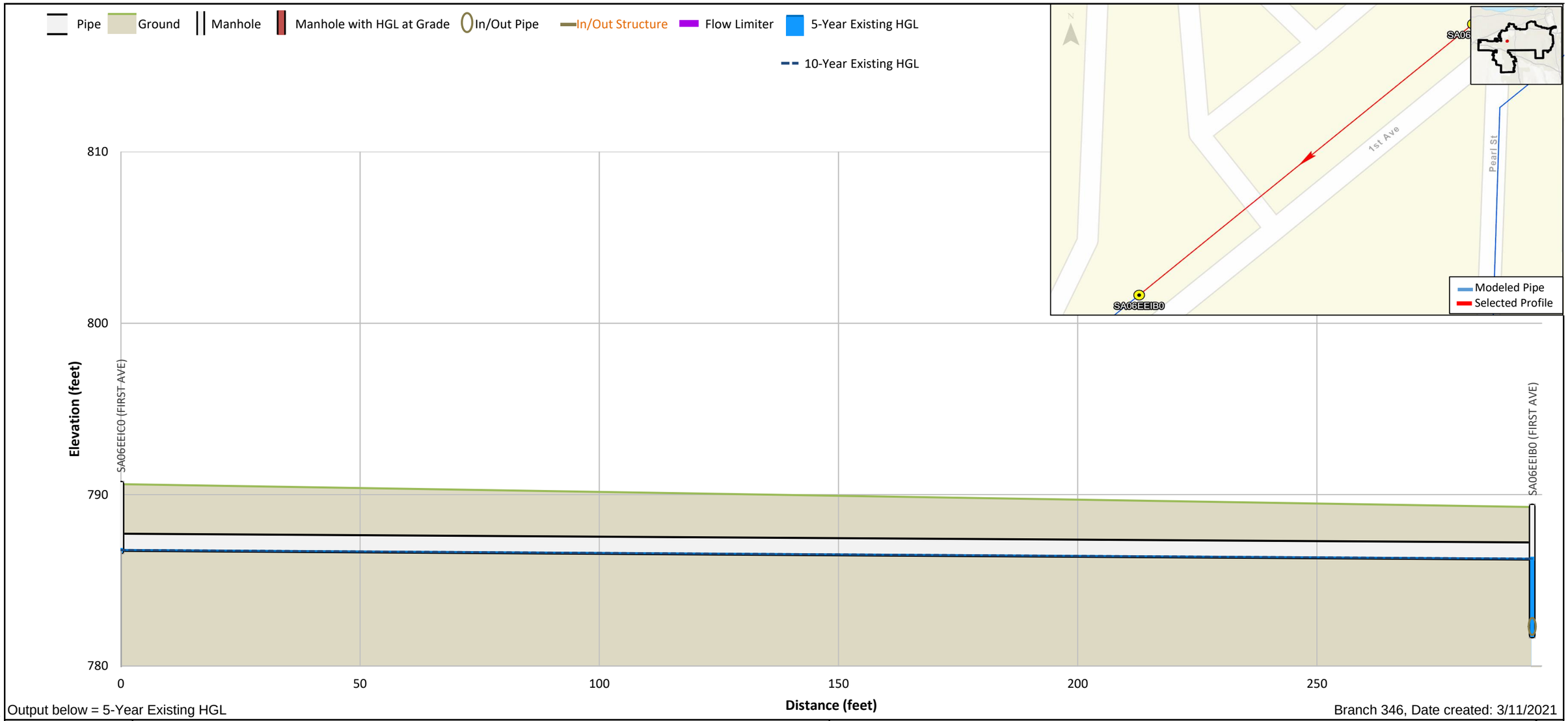
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 346, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	12	
Capacity (mgd)	0.87	
Max Depth (ft)	0.05	
Dep abv Crown (ft)	-	
Max Flow (mgd)	0.00	
Max Velocity (ft/s)	0.00	
Slope (ft/ft)	0.0017	

Northeast Ohio Regional Sewer District

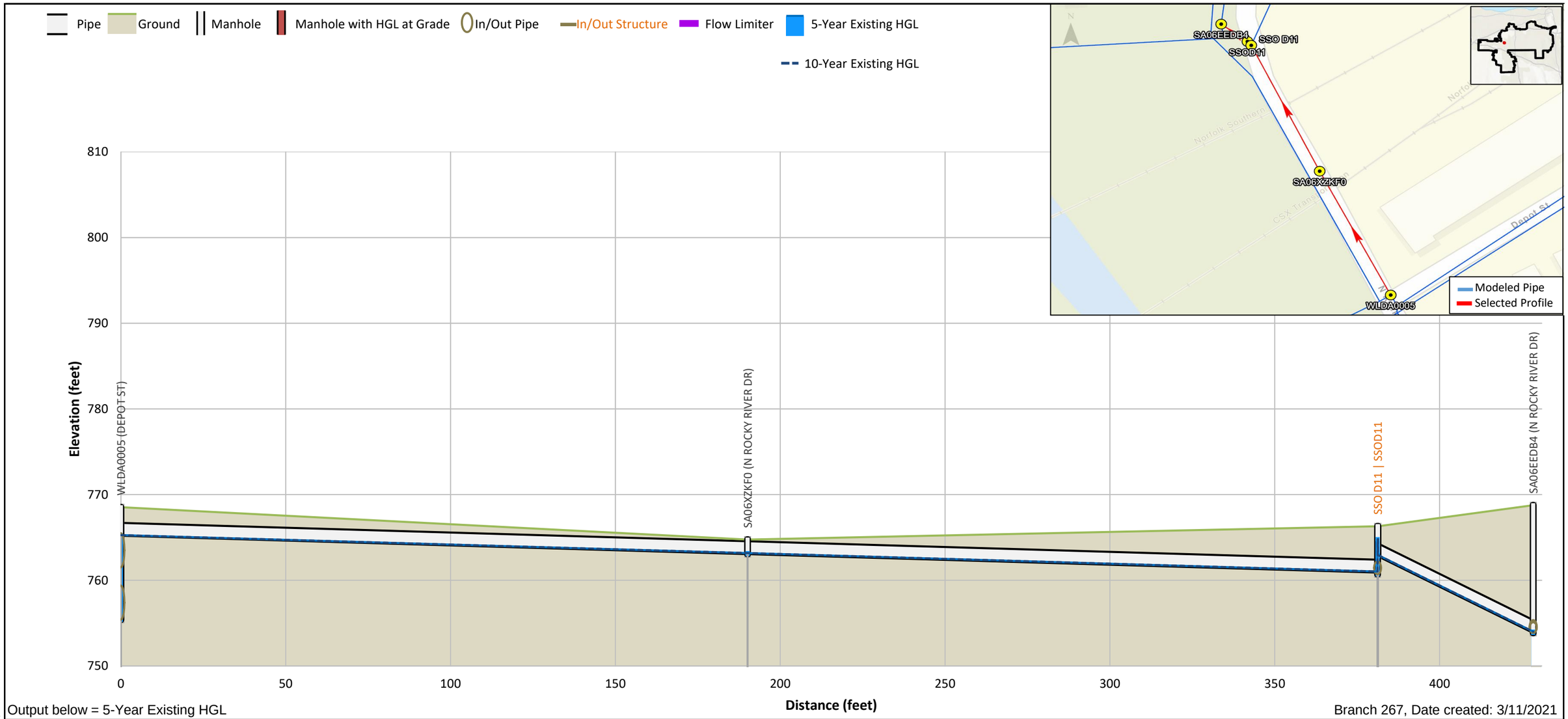
SWI-LSSES

PFA: BE-02
Community: Berea
FIRST AVE

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 267, Date created: 3/11/2021

Depth to Invert (ft)		1.7			
Depth to HGL (ft)		1.6			
Diameter (in)	18		18	18	
Capacity (mgd)	6.6		6.6	27	
Max Depth (ft)	0.12		0.12	0.15	
Dep abv Crown (ft)	-		-	-	
Max Flow (mgd)	0.00		0.05	0.00	
Max Velocity (ft/s)	-0.01		1.3	0.00	
Slope (ft/ft)	0.011		0.011	0.19	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03, BE-04
Community: Berea
DEPOT ST to N ROCKY RIVER DR

Brown AND Caldwell

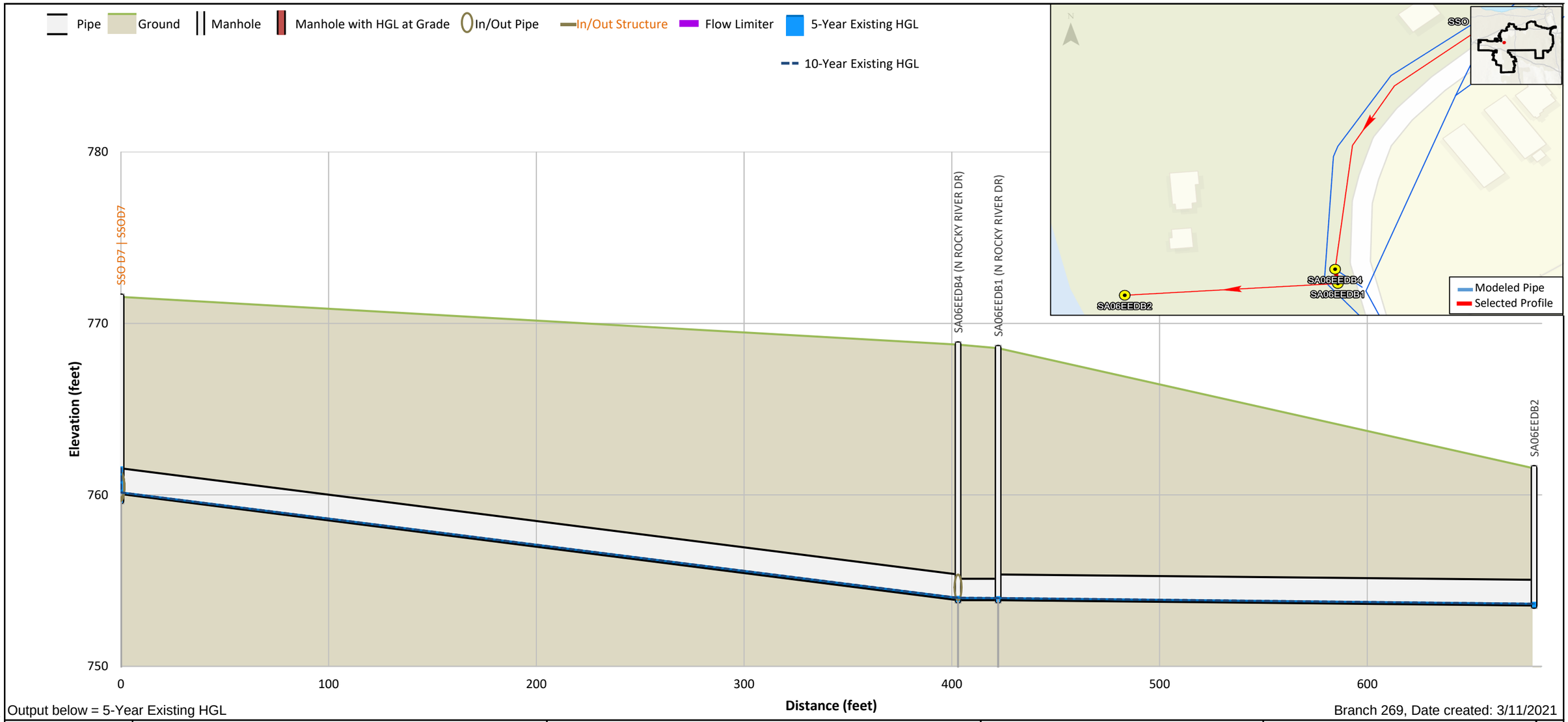
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 269, Date created: 3/11/2021

Depth to Invert (ft)			15	15	
Depth to HGL (ft)			15	15	
Diameter (in)	18		15		18
Capacity (mgd)	7.7		0.00		2.1
Max Depth (ft)	0.14		0.14		0.12
Dep abv Crown (ft)	-		-		-
Max Flow (mgd)	0.02		0.02		0.02
Max Velocity (ft/s)	0.41		0.52		0.61
Slope (ft/ft)	0.015		0		0.0012

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03, BE-04
Community: Berea
KAREN DR to Manhole SA06EEDB2

Brown AND Caldwell

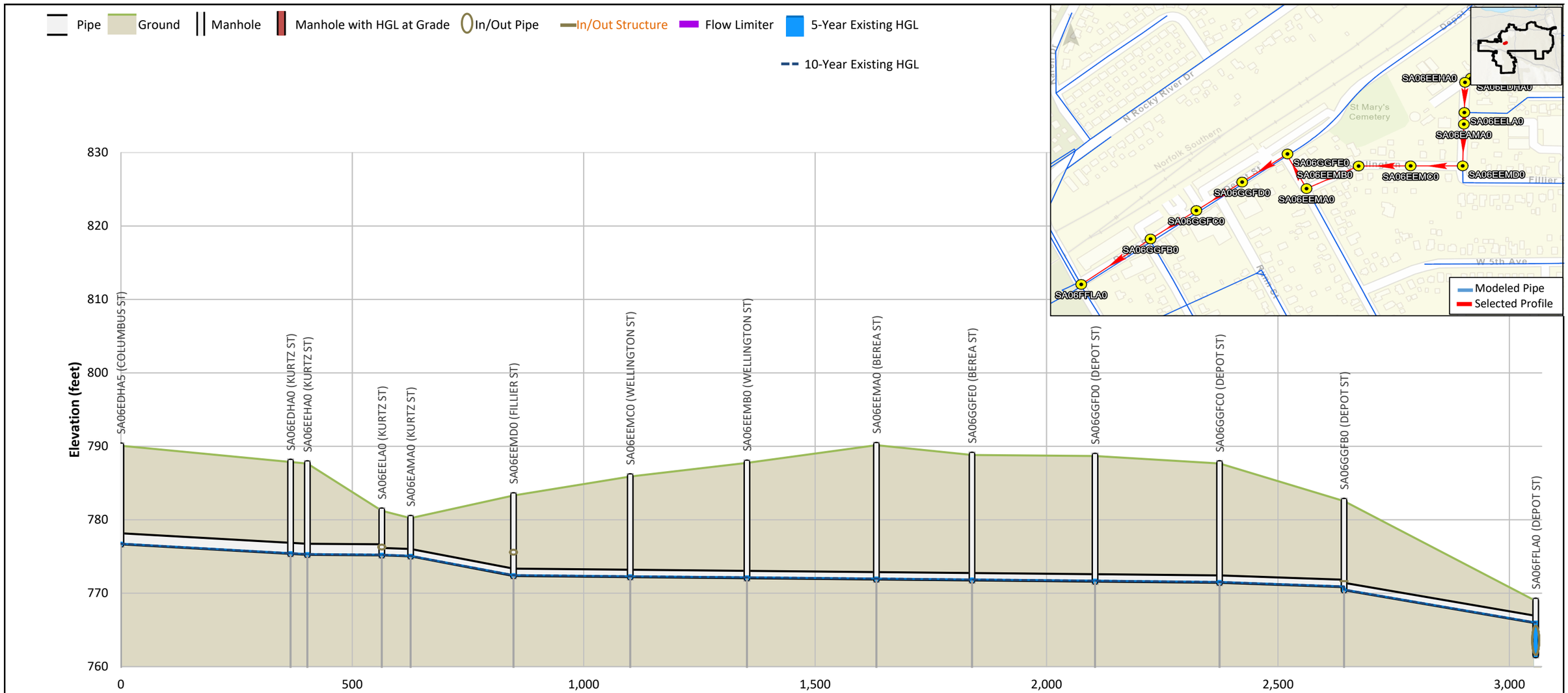
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 270, Date created: 3/11/2021

Depth to Invert (ft)		13	12	6.1	5.2	11	14	16	18	17	17	16	12		
Depth to HGL (ft)		12	12	6.0	5.1	11	14	16	18	17	17	16	12		
Diameter (in)	18		18	12	12	12	12	12	12	12	12	12	12	12	12
Capacity (mgd)	3.7		1.3	0.99	2.3	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.98	2.2	
Max Depth (ft)	0.08		0.09	0.07	0.10	0.10	0.12	0.12	0.12	0.12	0.12	0.12	0.10	0.08	
Dep abv Crown (ft)	-		-	-	-	-	-	-	-	-	-	-	-	-	
Max Flow (mgd)	0.00		0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	
Max Velocity (ft/s)	0.11		0.10	0.42	0.21	0.32	0.27	0.37	0.37	0.37	0.45	0.85	0.93		
Slope (ft/ft)	0.0035		0.00044	0.0022	0.012	0.00061	0.00061	0.00060	0.00061	0.00061	0.00061	0.0022	0.011		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03
Community: Berea
COLUMBUS ST to DEPOT ST

Brown AND Caldwell

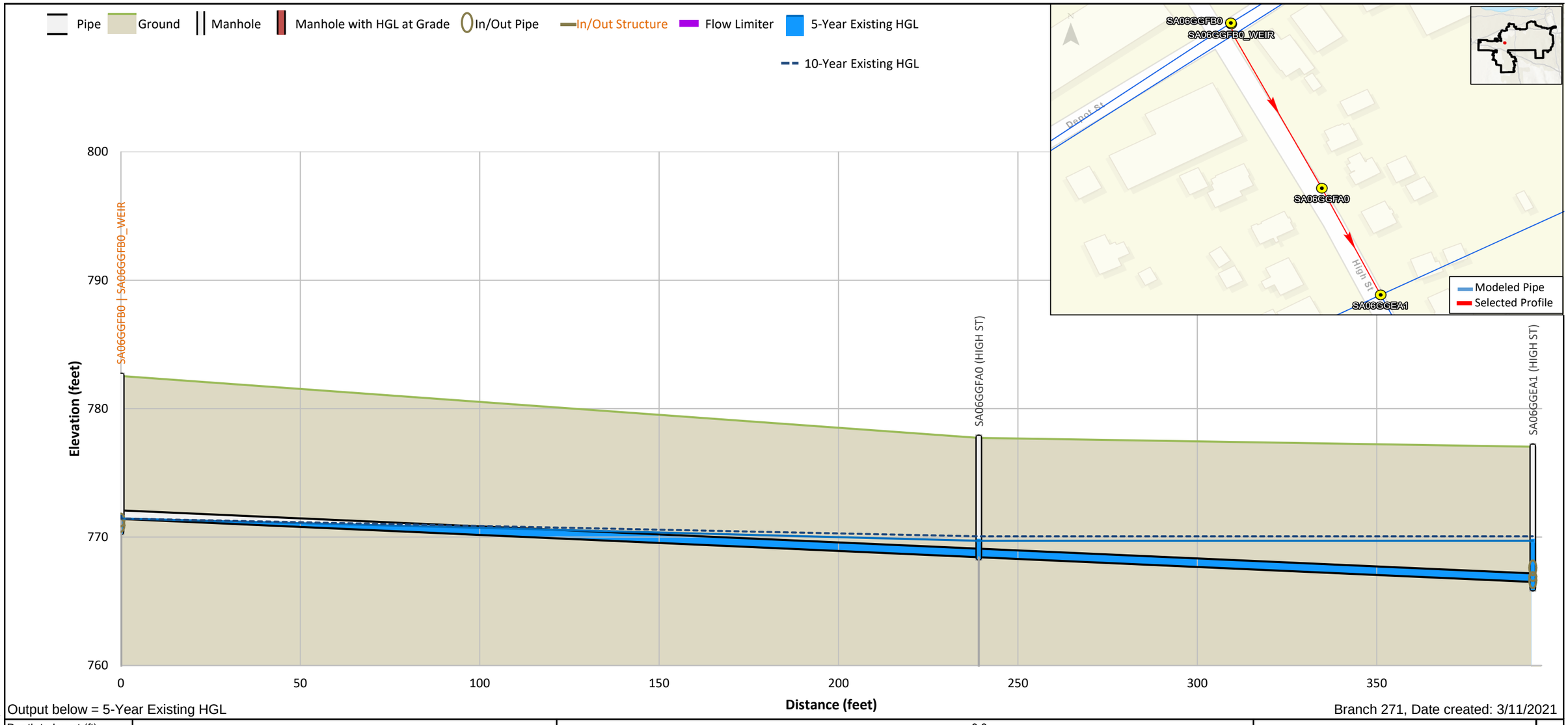
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 271, Date created: 3/11/2021

Depth to Invert (ft)		9.3	
Depth to HGL (ft)		8.0	
Diameter (in)	8		8
Capacity (mgd)	0.79		0.79
Max Depth (ft)	1.3		3.2
Dep abv Crown (ft)	0.61		2.5
Max Flow (mgd)	-0.05		-0.20
Max Velocity (ft/s)	-0.36		-0.78
Slope (ft/ft)	0.012		0.012

Northeast Ohio Regional Sewer District

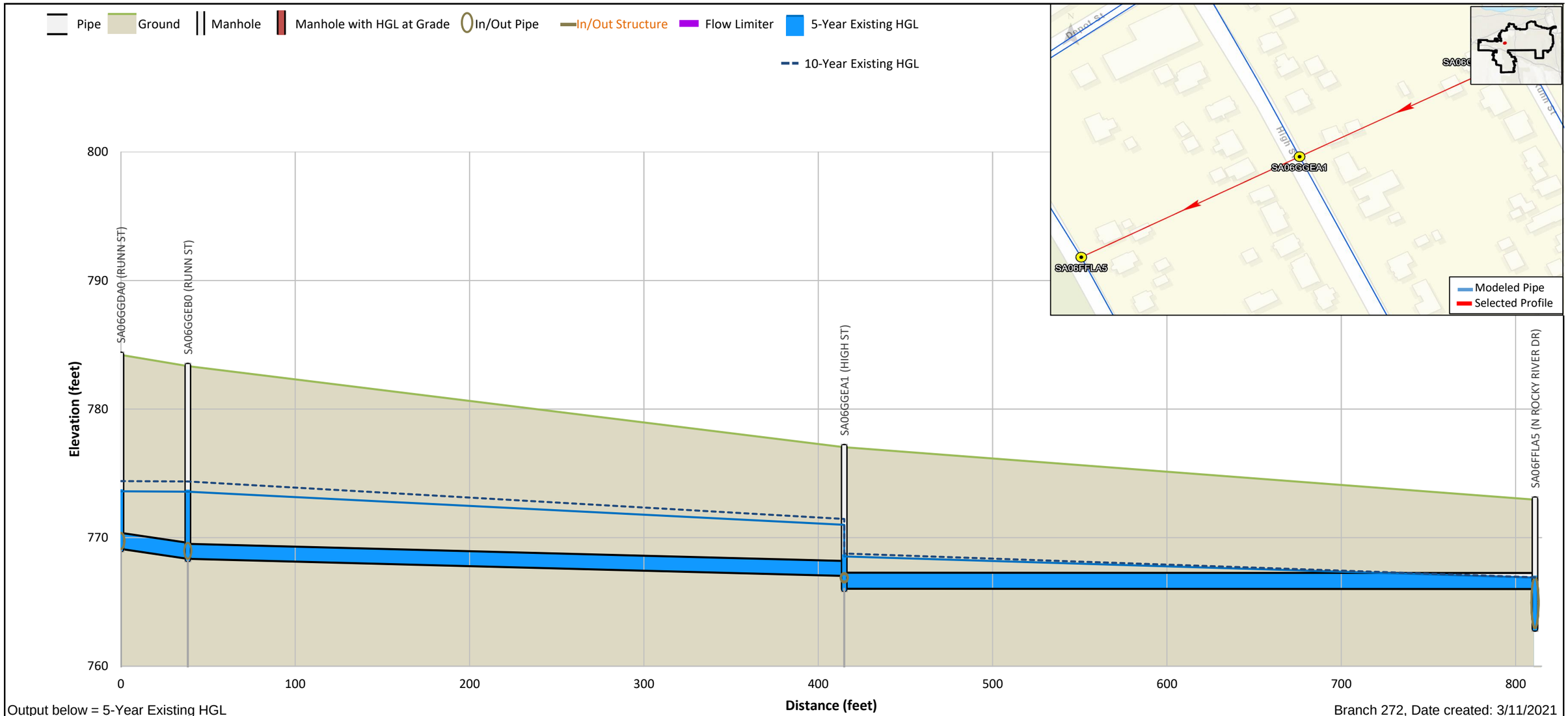
SWI-LSSES

PFA: BE-03
Community: Berea
DEPOT ST to HIGH ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 272, Date created: 3/11/2021

Depth to Invert (ft)		15	10	
Depth to HGL (ft)		9.8	6.0	
Diameter (in)	15	14	15	
Capacity (mgd)	6.4	2.2	0.38	
Max Depth (ft)	5.2	5.2	2.5	
Dep abv Crown (ft)	4.0	4.1	1.3	
Max Flow (mgd)	1.3	3.1	3.1	
Max Velocity (ft/s)	2.0	4.7	5.1	
Slope (ft/ft)	0.020	0.0035	0.000061	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

RUNN ST to N ROCKY RIVER DR

Brown AND Caldwell

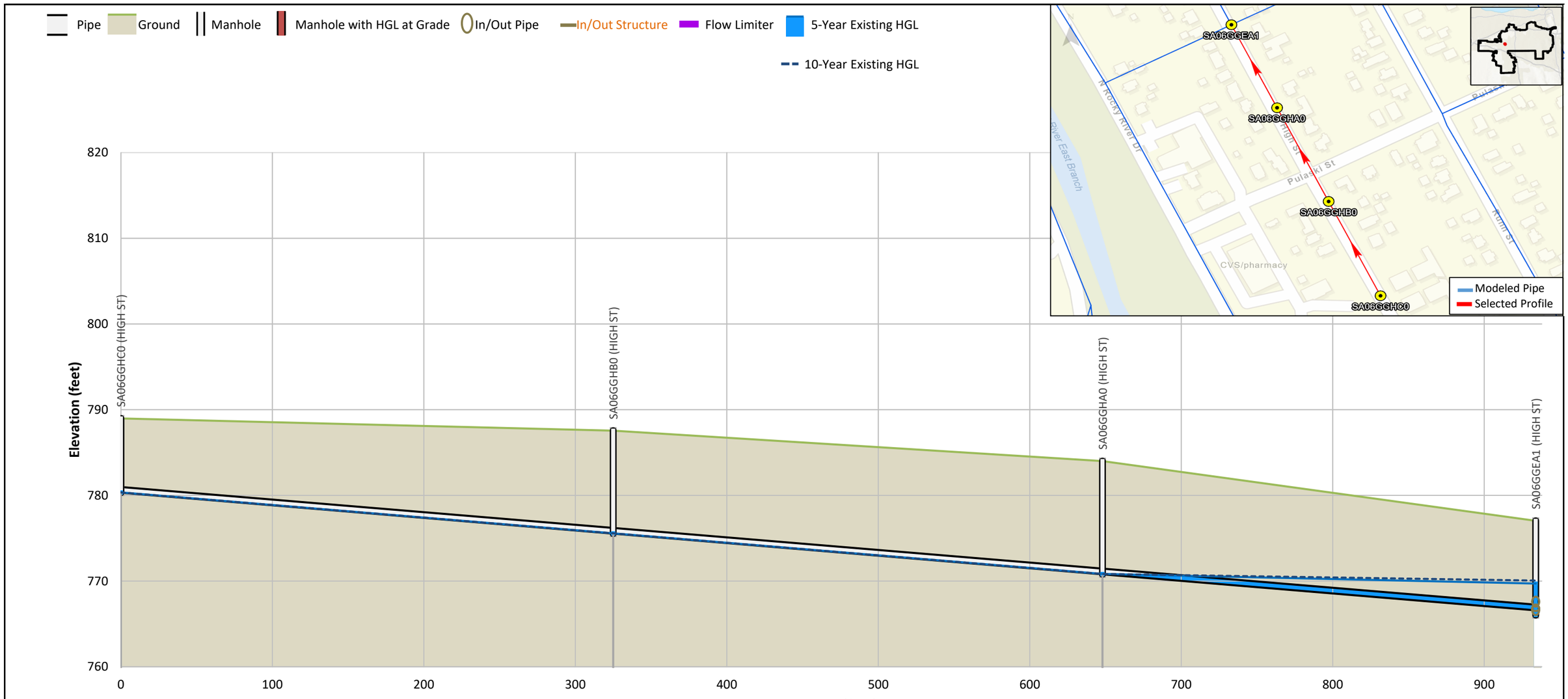
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 273, Date created: 3/11/2021

Depth to Invert (ft)		12	13	
Depth to HGL (ft)		12	13	
Diameter (in)	8	8	8	
Capacity (mgd)	0.86	0.86	0.86	
Max Depth (ft)	0.04	0.05	3.1	
Dep abv Crown (ft)	-	-	2.5	
Max Flow (mgd)	0.00	0.00	-0.19	
Max Velocity (ft/s)	0.15	0.10	-0.75	
Slope (ft/ft)	0.015	0.015	0.015	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

HIGH ST

Brown AND Caldwell

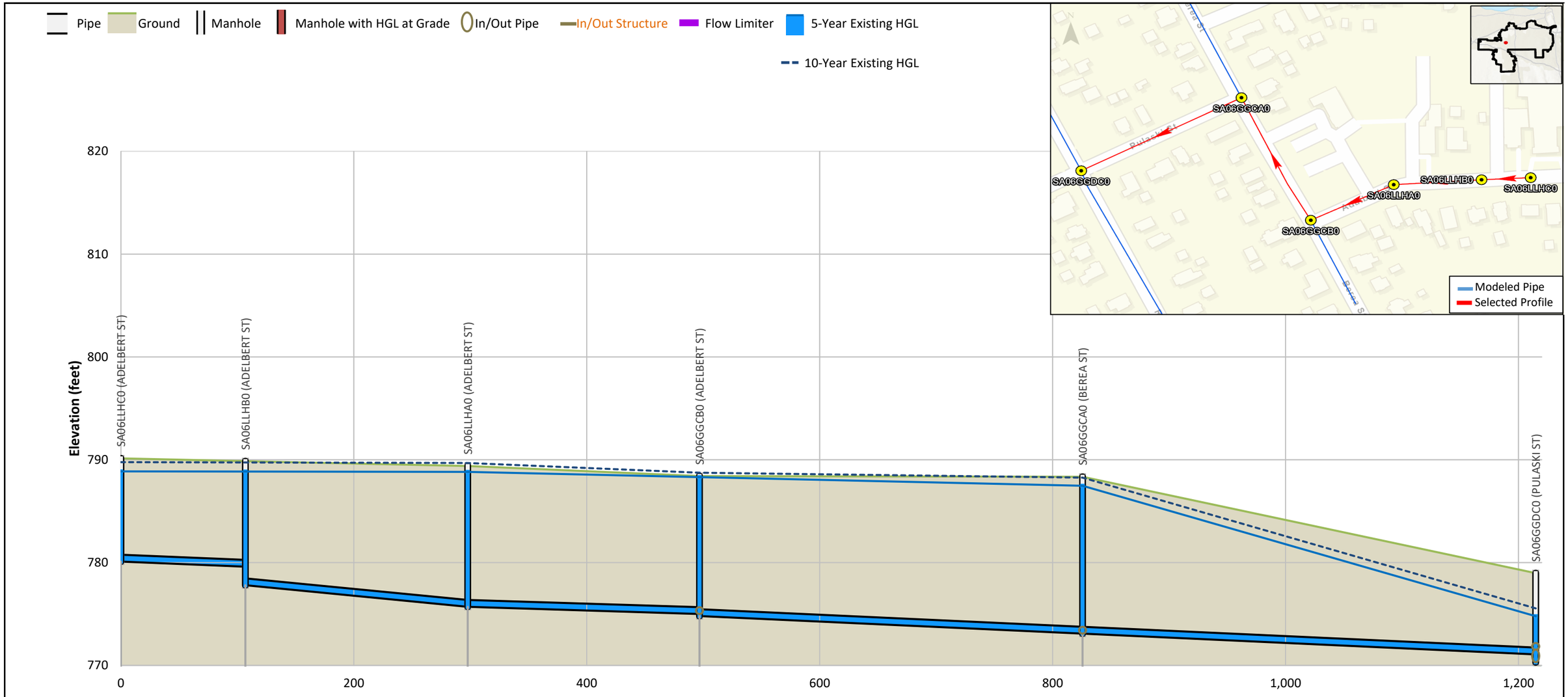
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 274, Date created: 3/11/2021

Depth to Invert (ft)		10	14	13	15	
Depth to HGL (ft)		1.0	0.57	0.10	0.87	
Diameter (in)	8	8	8	8	8	
Capacity (mgd)	0.49	0.74	0.42	0.51	0.51	
Max Depth (ft)	9.3	13	13	14	14	
Dep abv Crown (ft)	8.6	12	13	14	14	
Max Flow (mgd)	0.13	-0.23	0.39	0.64	1.3	
Max Velocity (ft/s)	2.2	-0.55	2.6	1.0	5.7	
Slope (ft/ft)	0.0047	0.011	0.0035	0.0052	0.0052	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

ADELBERT ST to PULASKI ST

Brown AND Caldwell

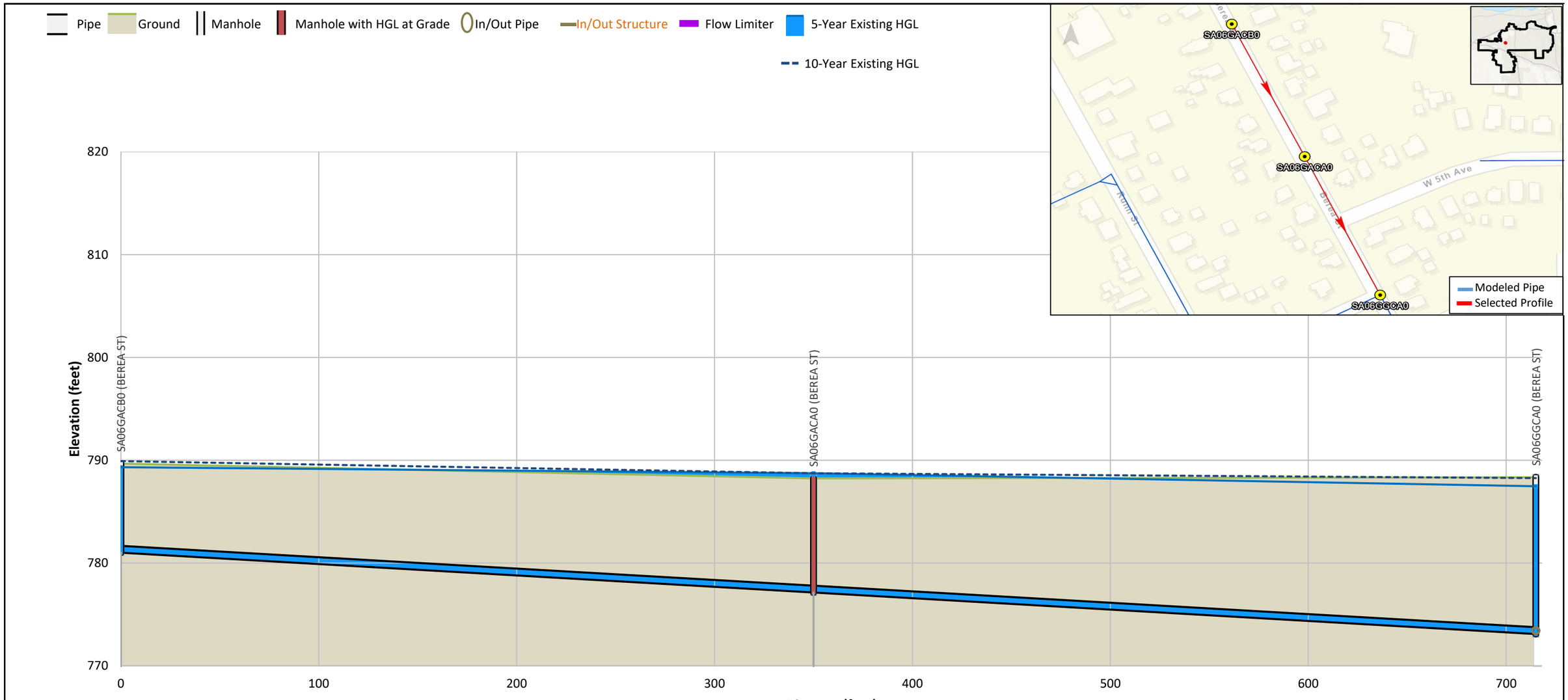
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 275, Date created: 3/11/2021

Depth to Invert (ft)		11	
Depth to HGL (ft)		-0.69	
Diameter (in)	8		8
Capacity (mgd)	0.75		0.75
Max Depth (ft)	12		14
Dep abv Crown (ft)	11		14
Max Flow (mgd)	0.28		0.53
Max Velocity (ft/s)	1.4		0.92
Slope (ft/ft)	0.011		0.011

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

BEREA ST

Brown AND Caldwell

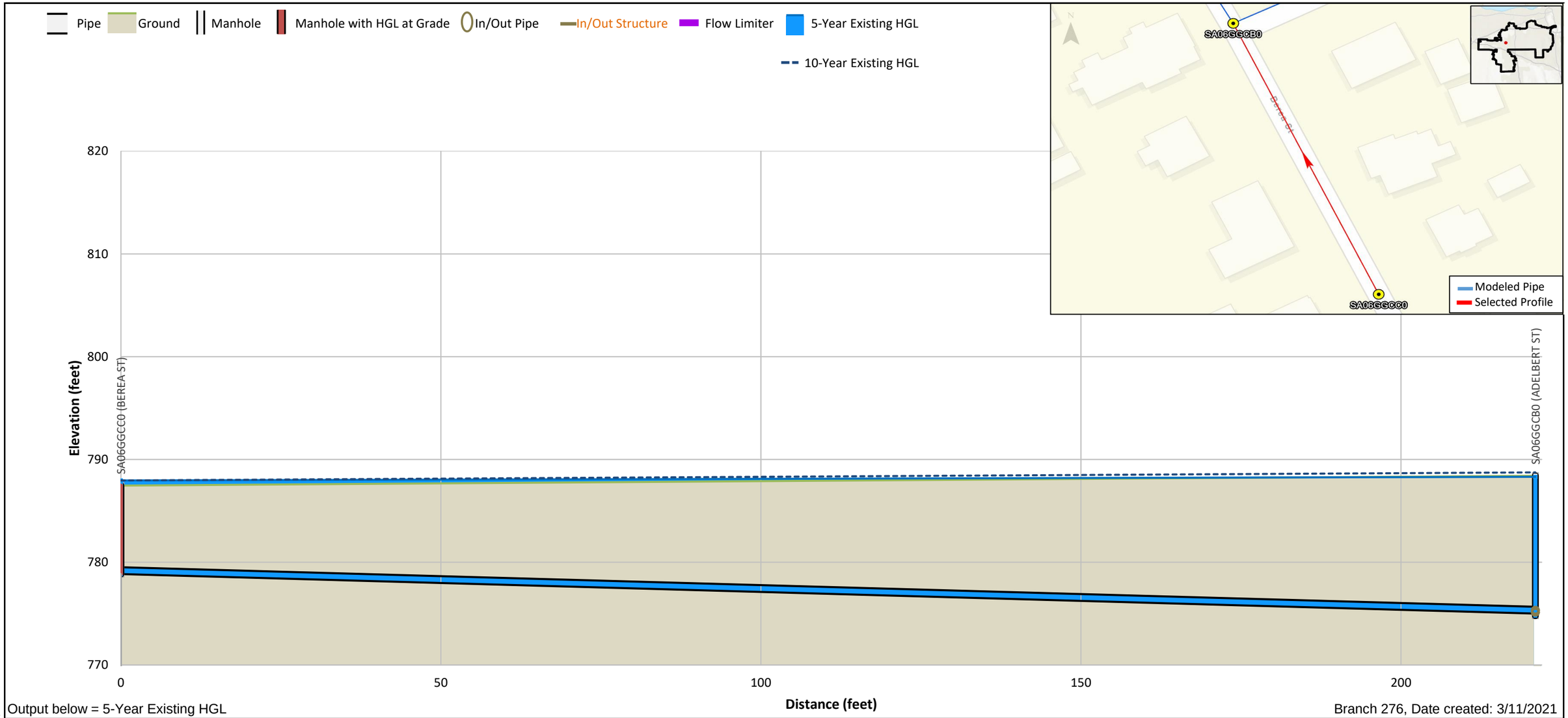
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 276, Date created: 3/11/2021

Depth to Invert (ft)	
Depth to HGL (ft)	
Diameter (in)	8
Capacity (mgd)	0.94
Max Depth (ft)	13
Dep abv Crown (ft)	13
Max Flow (mgd)	0.36
Max Velocity (ft/s)	2.8
Slope (ft/ft)	0.017

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

BEREA ST to ADELBERT ST

Brown AND Caldwell

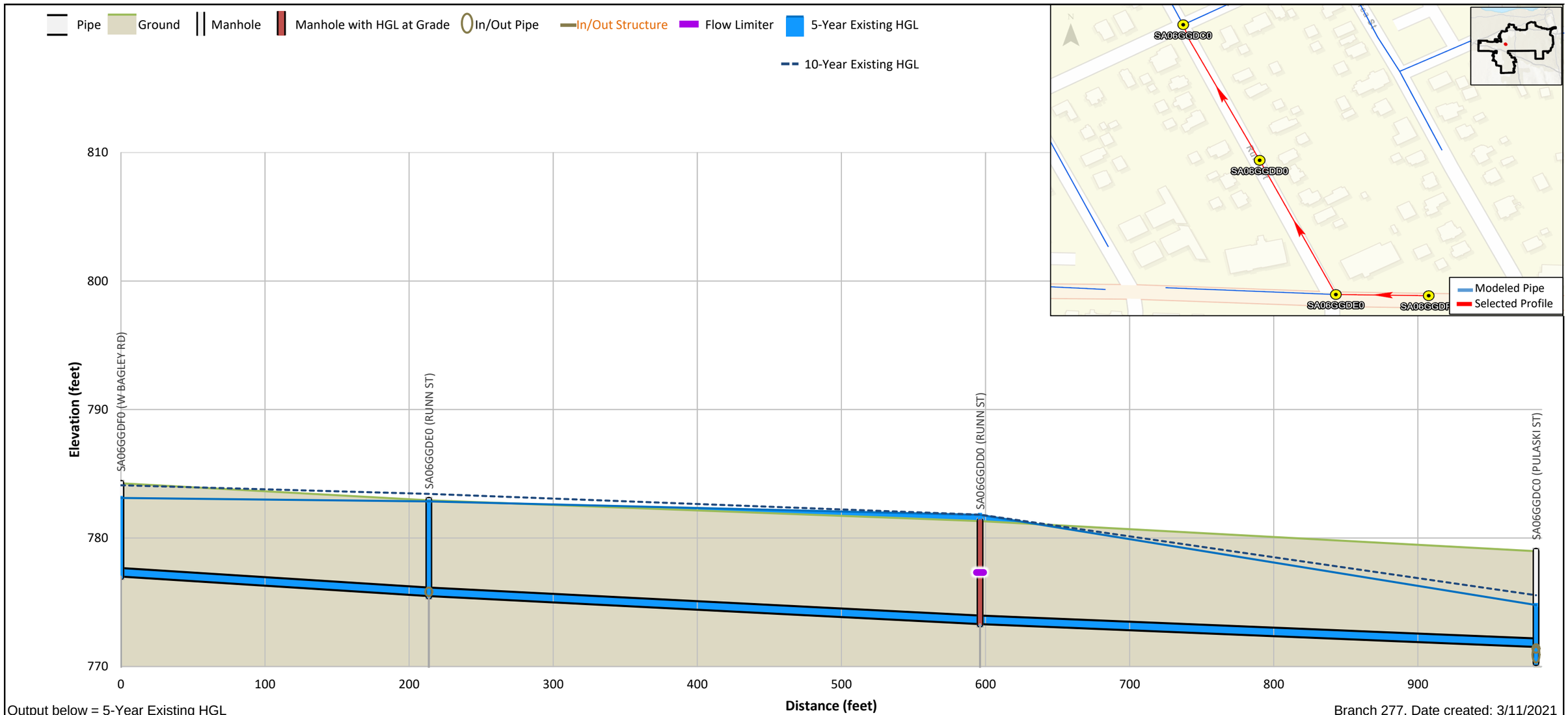
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 277, Date created: 3/11/2021

Depth to Invert (ft)		7.5	8.0	
Depth to HGL (ft)		0.08	-0.48	
Diameter (in)	8	8	8	
Capacity (mgd)	0.60	0.54	0.48	
Max Depth (ft)	7.4	8.5	8.5	
Dep abv Crown (ft)	6.7	7.8	7.8	
Max Flow (mgd)	0.27	0.49	1.0	
Max Velocity (ft/s)	1.6	1.0	4.8	
Slope (ft/ft)	0.0071	0.0057	0.0046	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

W BAGLEY RD to PULASKI ST

Brown AND Caldwell

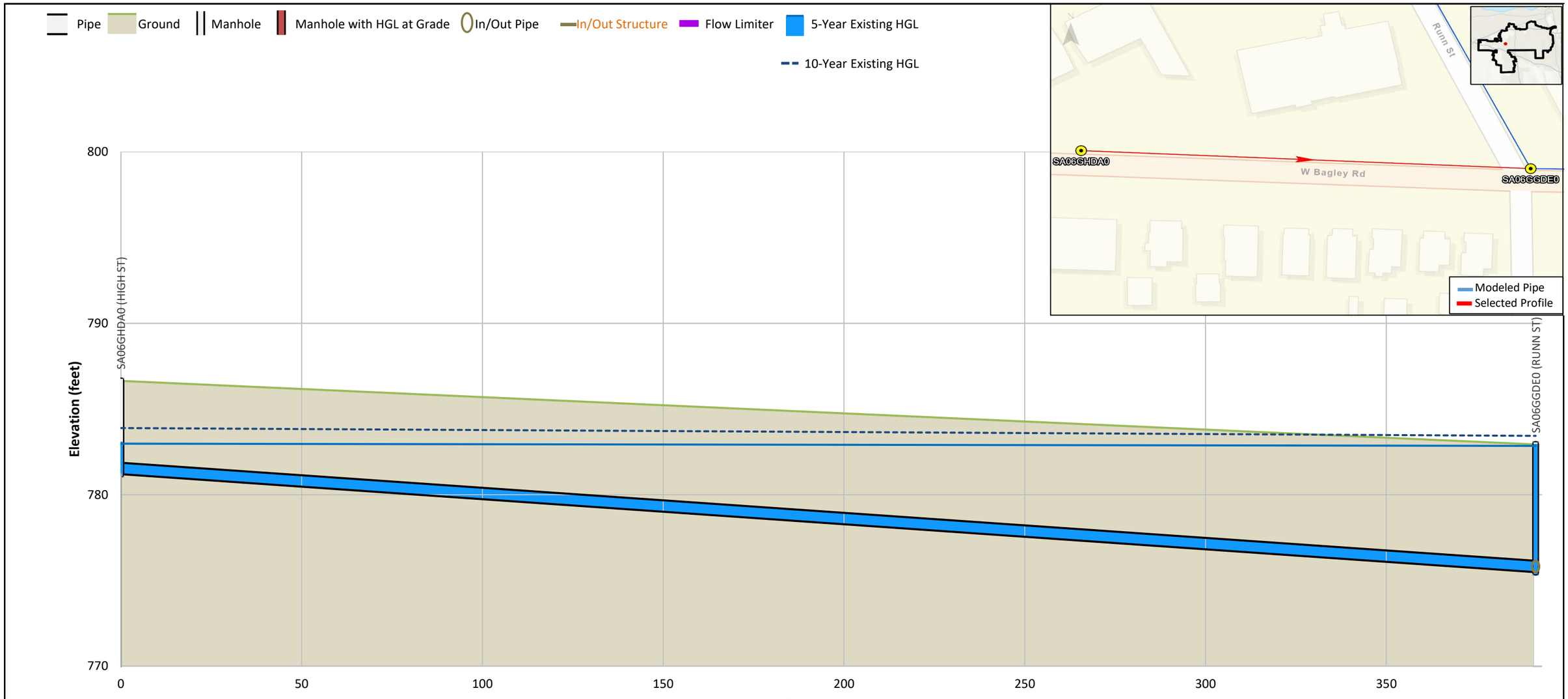
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 278, Date created: 3/11/2021

Depth to Invert (ft)	
Depth to HGL (ft)	
Diameter (in)	8
Capacity (mgd)	0.86
Max Depth (ft)	7.4
Dep abv Crown (ft)	6.7
Max Flow (mgd)	0.19
Max Velocity (ft/s)	0.79
Slope (ft/ft)	0.015

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

HIGH ST to RUNN ST

Brown AND Caldwell

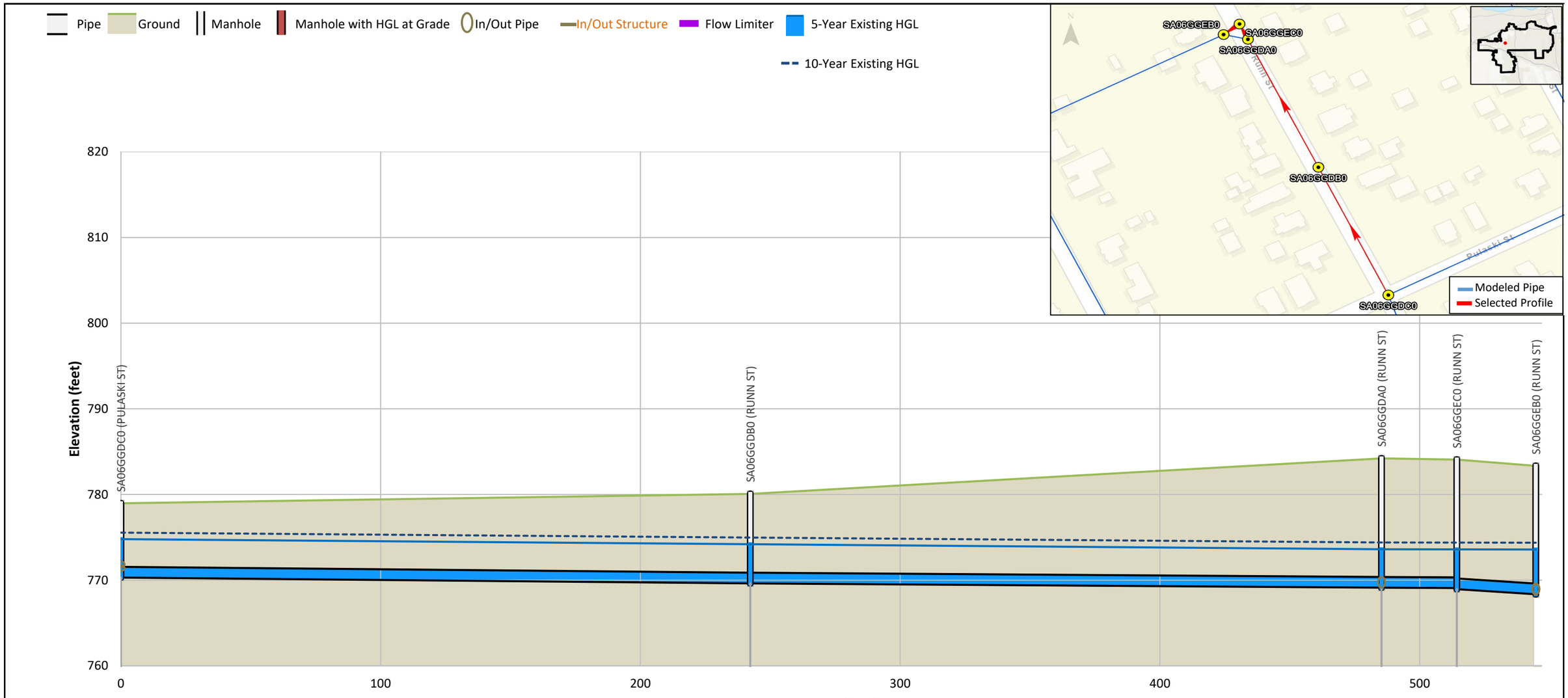
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 279, Date created: 3/11/2021

Depth to Invert (ft)		10		15	15	
Depth to HGL (ft)		5.9		11	10	
Diameter (in)	15	15	15	15	15	
Capacity (mgd)	2.4	2.1		1.8	6.3	
Max Depth (ft)	4.6	4.6		4.5	5.2	
Dep abv Crown (ft)	3.3	3.3		3.3	4.0	
Max Flow (mgd)	2.3	2.3		1.0	1.1	
Max Velocity (ft/s)	3.1	4.0		2.9	1.1	
Slope (ft/ft)	0.0028	0.0021		0.0016	0.020	

Northeast Ohio Regional Sewer District

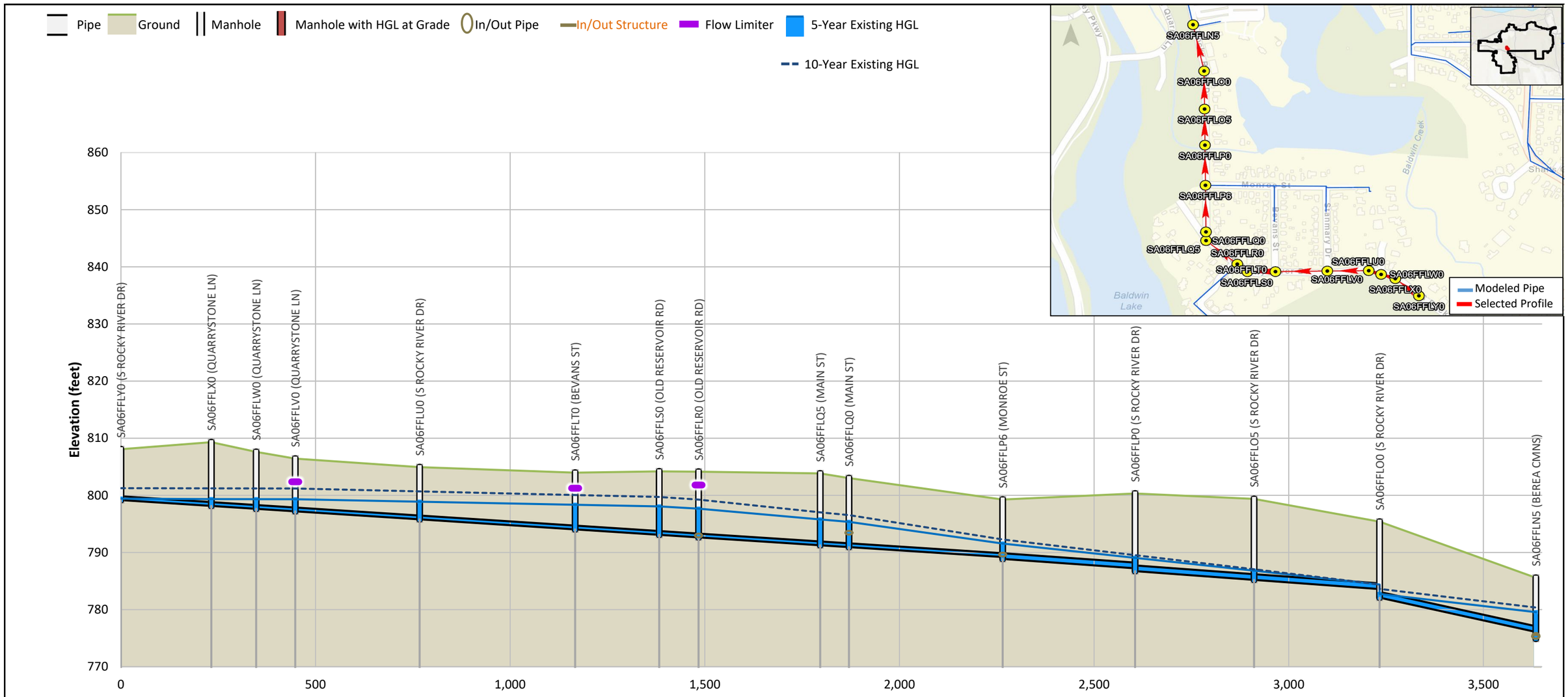
SWI-LSSES

PFA: BE-03
Community: Berea
PULASKI ST to RUNN ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 280, Date created: 3/11/2021

Depth to Invert (ft)		11	10.0	9.2	9.1	9.9	11	12	13	12	10	13	14	12		
Depth to HGL (ft)		10.0	8.3	7.1	6.0	5.6	6.1	6.5	8.1	7.7	7.7	11	13	11		
Diameter (in)	8	8	8	8	8	8	8	8	8	8	8	12	12	12	12	
Capacity (mgd)	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	1.8	1.8	1.8	3.2	
Max Depth (ft)	1.2	1.7	2.1	3.1	4.3	5.0	5.0	5.0	4.5	4.4	2.7	2.3	1.6	3.5		
Dep abv Crown (ft)	0.53	1.0	1.5	2.4	3.6	4.3	4.4	4.4	3.9	3.8	1.7	1.3	0.61	2.5		
Max Flow (mgd)	0.14	0.14	0.12	0.45	0.33	0.28	0.53	0.58	0.58	0.73	2.2	2.2	2.2	2.3		
Max Velocity (ft/s)	1.8	1.6	0.54	2.4	2.3	1.3	2.0	2.2	1.8	3.2	5.0	4.1	5.2	6.7		
Slope (ft/ft)	0.0044	0.0044	0.0044	0.0044	0.0044	0.0044	0.0045	0.0044	0.0043	0.0044	0.0048	0.0050	0.0050	0.015		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

S ROCKY RIVER DR to BEREA CMNS

Brown AND Caldwell

WADE TRIM

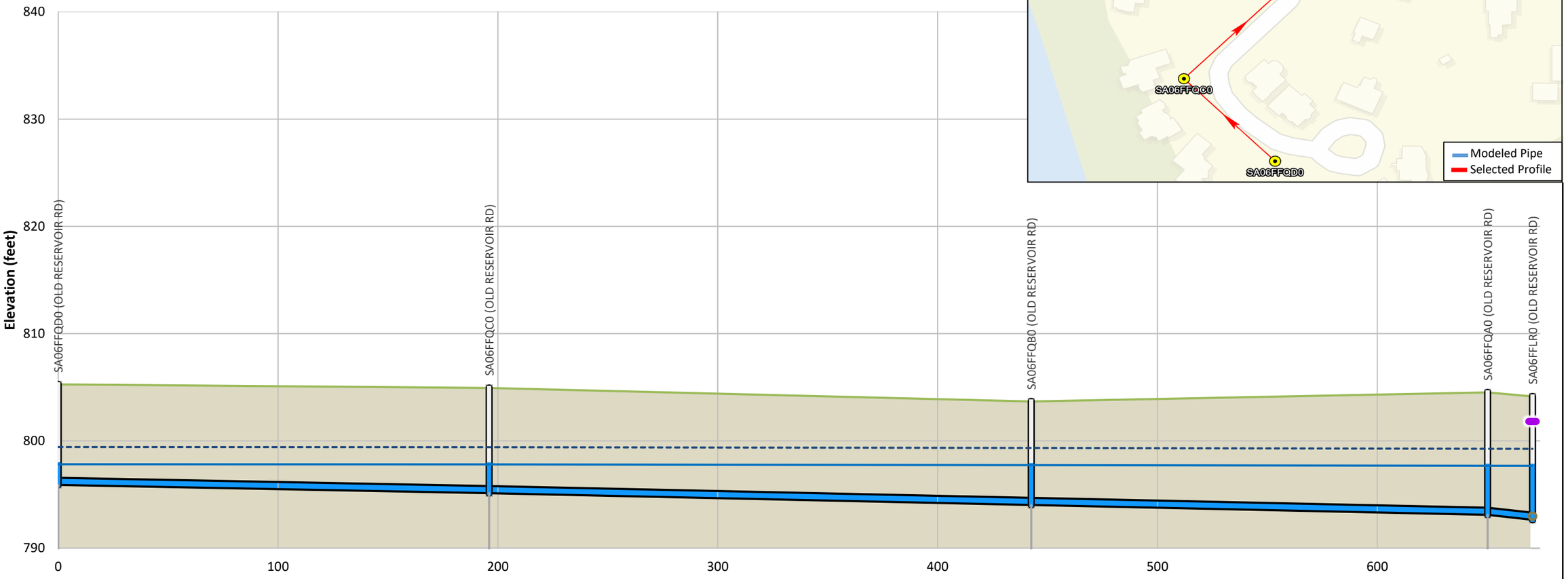
Model Projected 03/08/2021

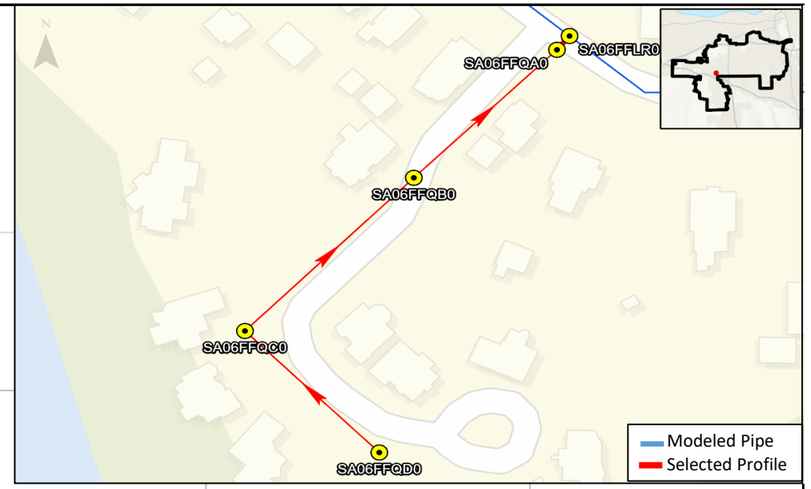
Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm

Pipe | Ground | Manhole | Manhole with HGL at Grade | In/Out Pipe | In/Out Structure | Flow Limiter | 5-Year Existing HGL | 10-Year Existing HGL





Output below = 5-Year Existing HGL

Branch 281, Date created: 3/11/2021

Depth to Invert (ft)		9.8	9.7	11	
Depth to HGL (ft)		7.1	5.9	6.8	
Diameter (in)	8	8	8	8	8
Capacity (mgd)	0.45	0.47	0.47	1.1	
Max Depth (ft)	2.7	3.7	4.6	5.0	
Dep abv Crown (ft)	2.0	3.0	3.9	4.4	
Max Flow (mgd)	0.11	0.20	0.14	0.14	
Max Velocity (ft/s)	0.98	2.0	2.2	0.54	
Slope (ft/ft)	0.0039	0.0045	0.0044	0.023	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

OLD RESERVOIR RD

Brown AND Caldwell

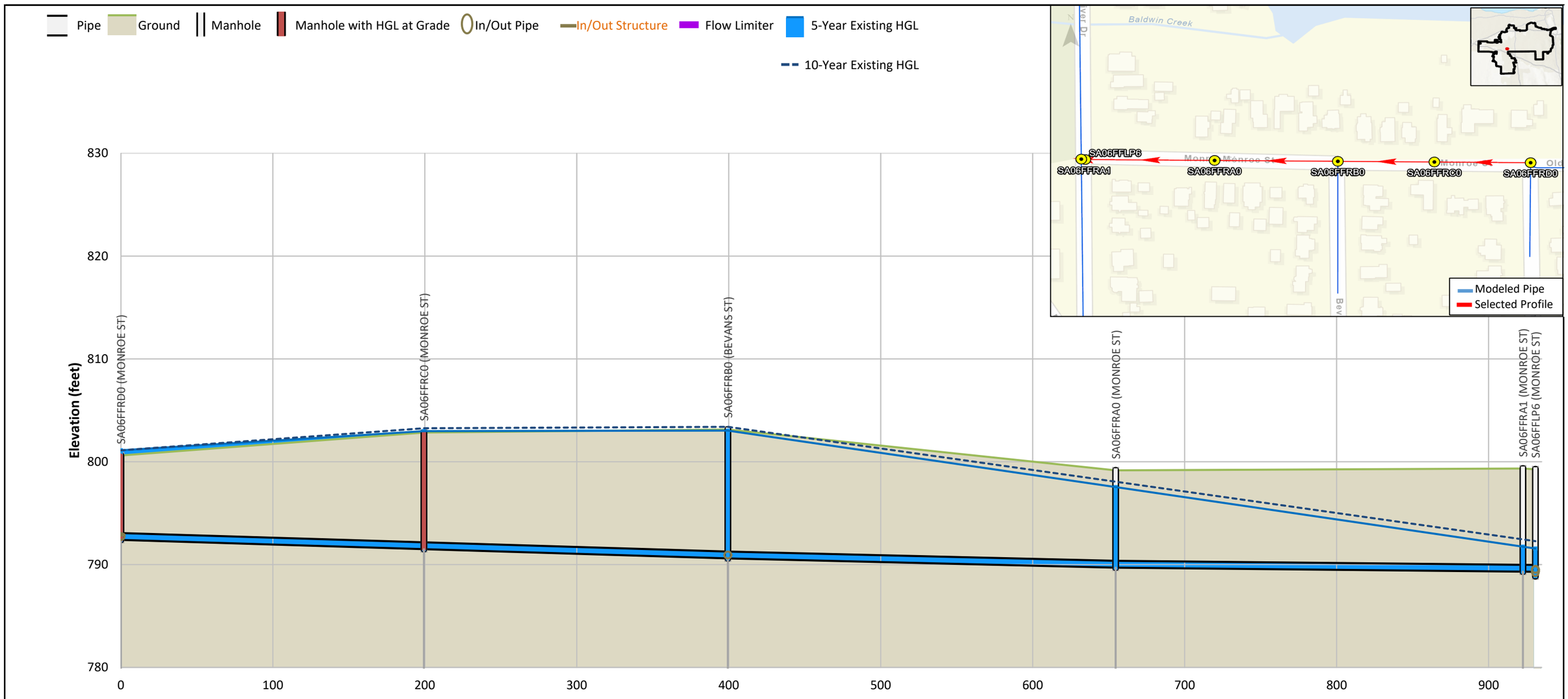
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

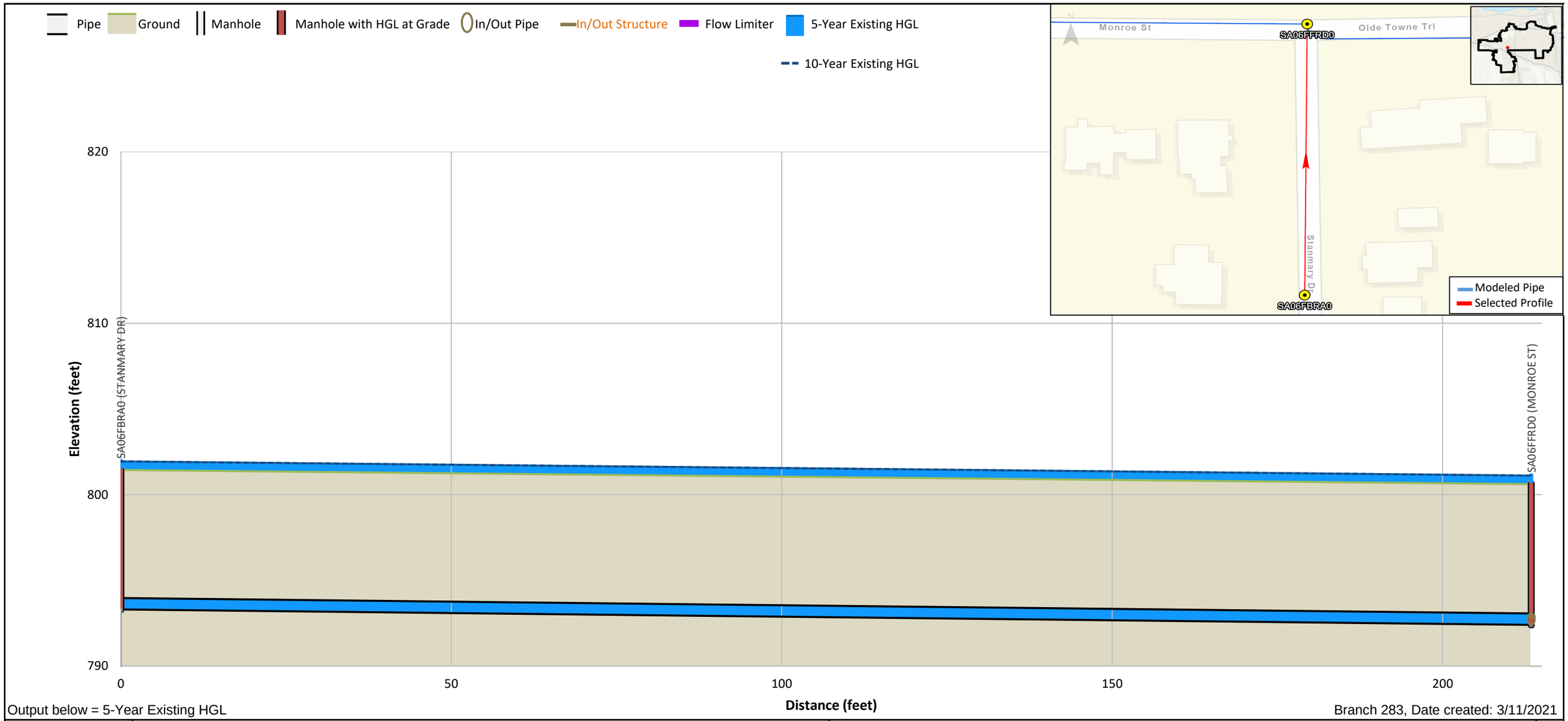
https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 282, Date created: 3/11/2021

| | | |



Output below = 5-Year Existing HGL

Branch 283, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	0.46	
Max Depth (ft)	11	
Dep abv Crown (ft)	10	
Max Flow (mgd)	0.56	
Max Velocity (ft/s)	1.9	
Slope (ft/ft)	0.0042	

Northeast Ohio Regional Sewer District

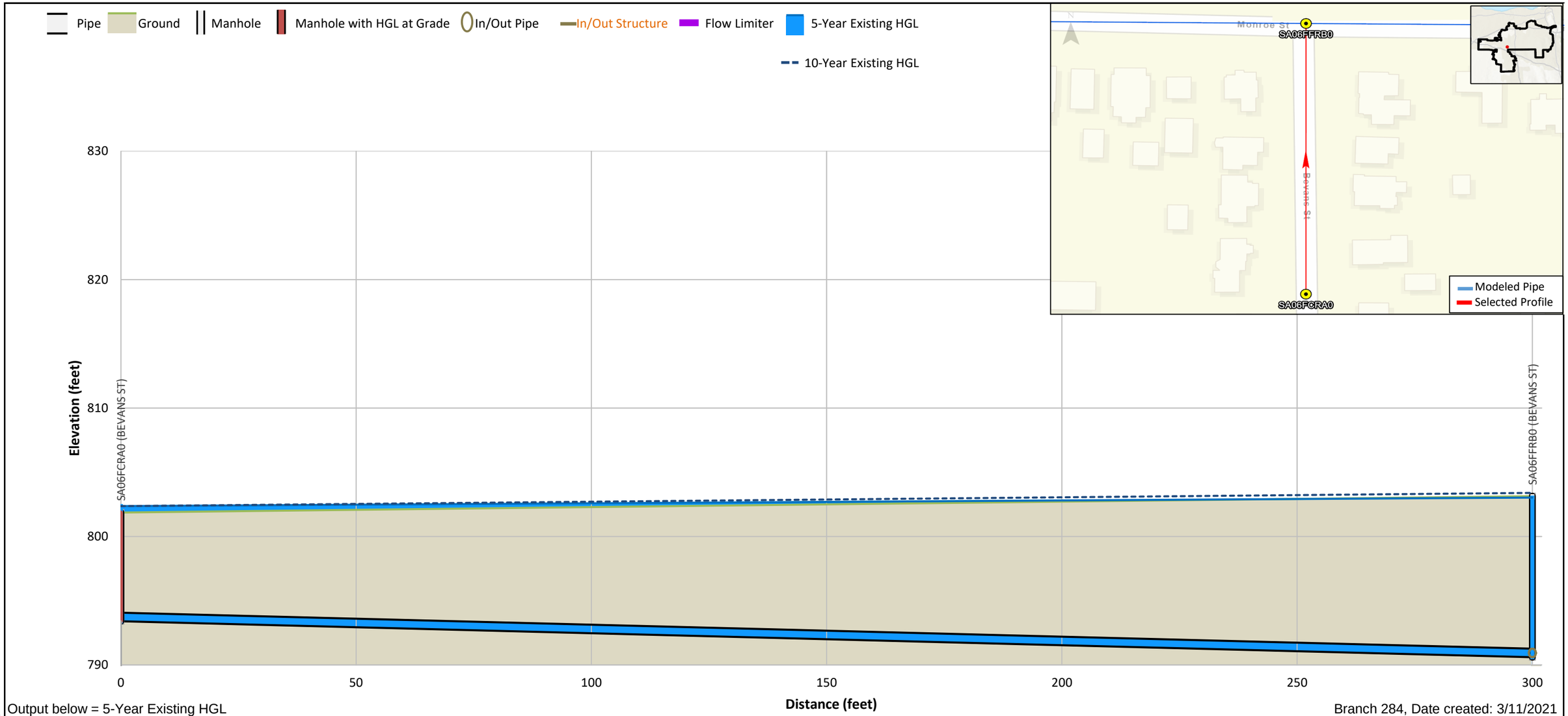
SWI-LSSES

PFA: BE-03
Community: Berea
STANMARY DR to MONROE ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 284, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	0.69	
Max Depth (ft)	12	
Dep abv Crown (ft)	12	
Max Flow (mgd)	0.37	
Max Velocity (ft/s)	0.54	
Slope (ft/ft)	0.0093	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

BEVANS ST

Brown AND Caldwell

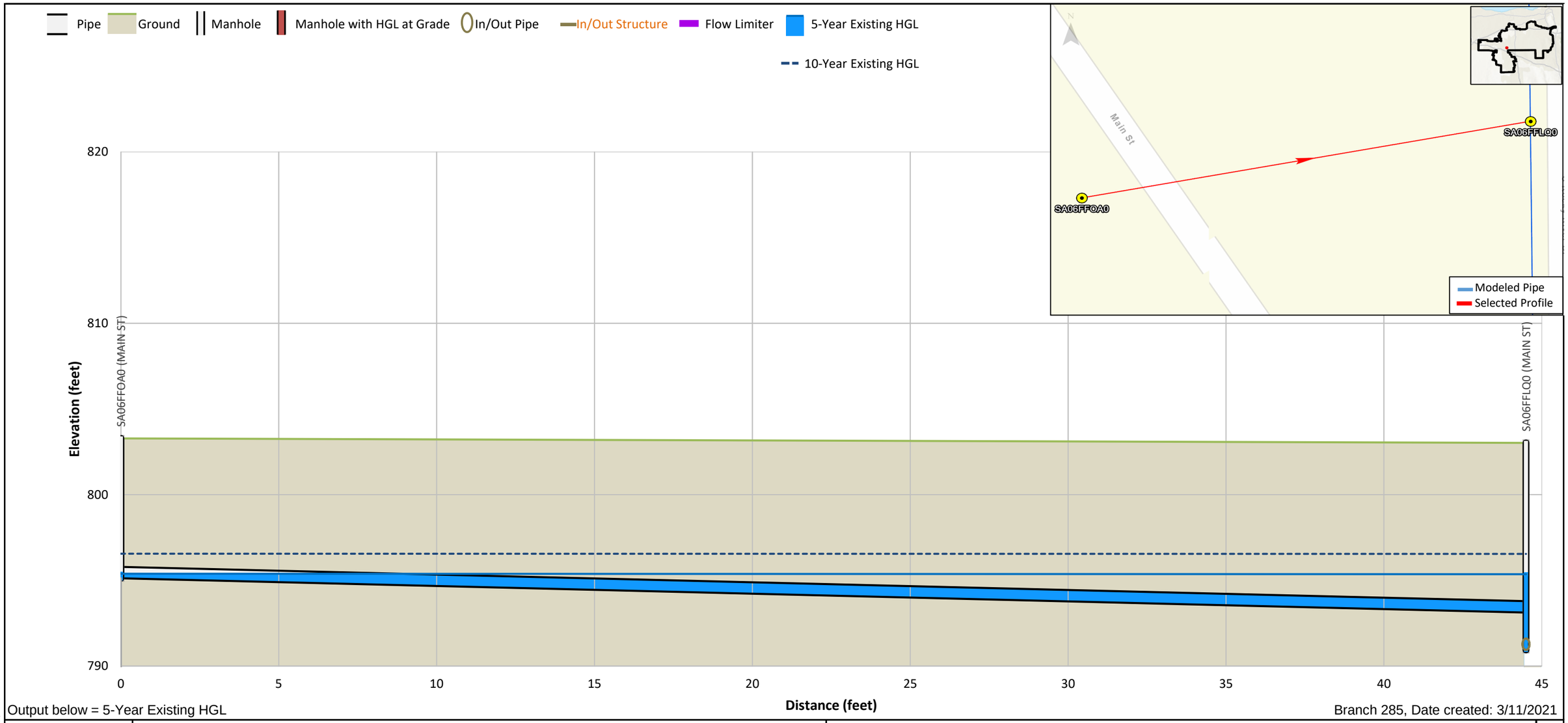
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 285, Date created: 3/11/2021

Depth to Invert (ft)	
Depth to HGL (ft)	
Diameter (in)	8
Capacity (mgd)	1.5
Max Depth (ft)	2.2
Dep abv Crown (ft)	1.6
Max Flow (mgd)	0.17
Max Velocity (ft/s)	4.3
Slope (ft/ft)	0.045

Northeast Ohio Regional Sewer District

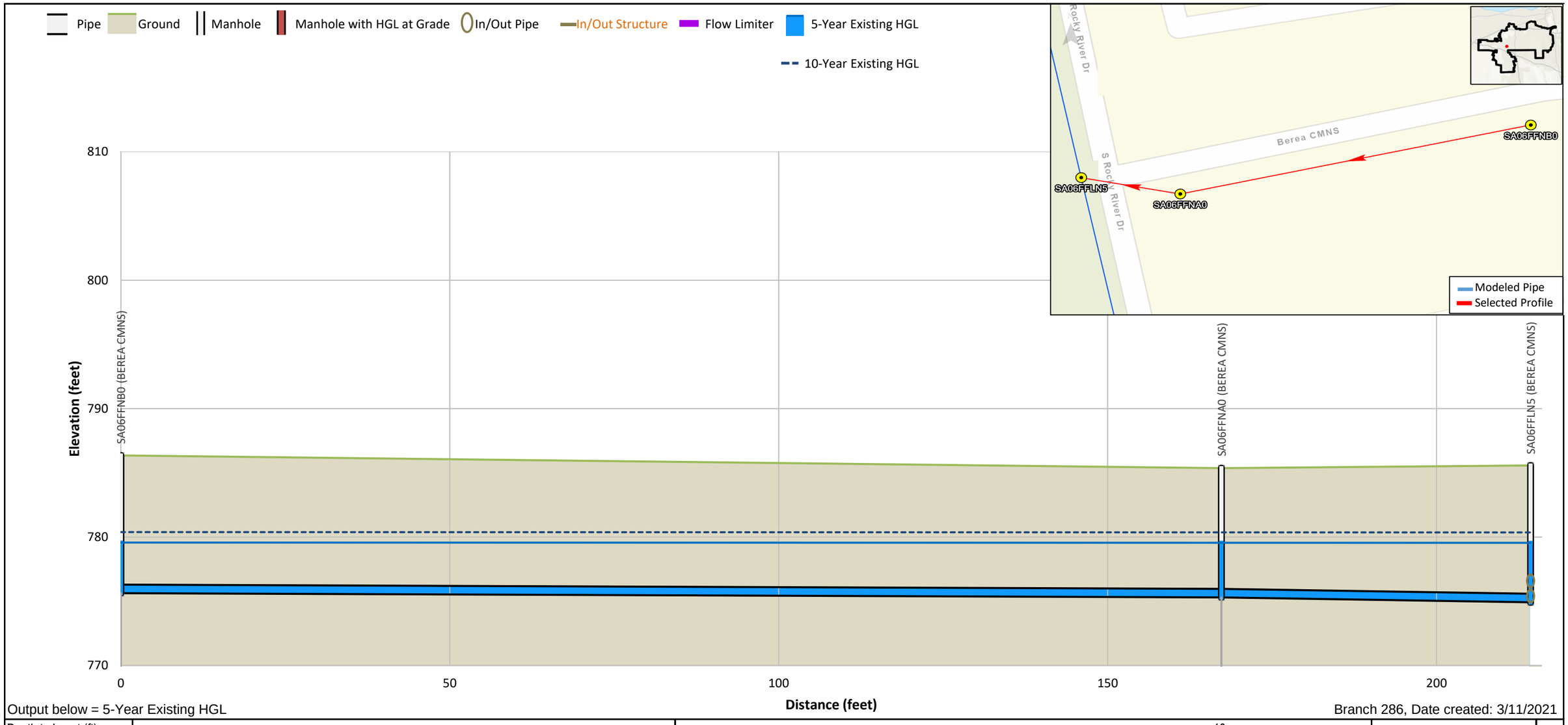
SWI-LSSES

PFA: BE-03
Community: Berea
MAIN ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 286, Date created: 3/11/2021

Depth to Invert (ft)		10	
Depth to HGL (ft)		5.8	
Diameter (in)	8		8
Capacity (mgd)	0.32		0.64
Max Depth (ft)	4.3		4.6
Dep abv Crown (ft)	3.6		4.0
Max Flow (mgd)	-0.10		-0.14
Max Velocity (ft/s)	1.4		-0.53
Slope (ft/ft)	0.0020		0.0081

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

BEREA CMNS

Brown AND Caldwell

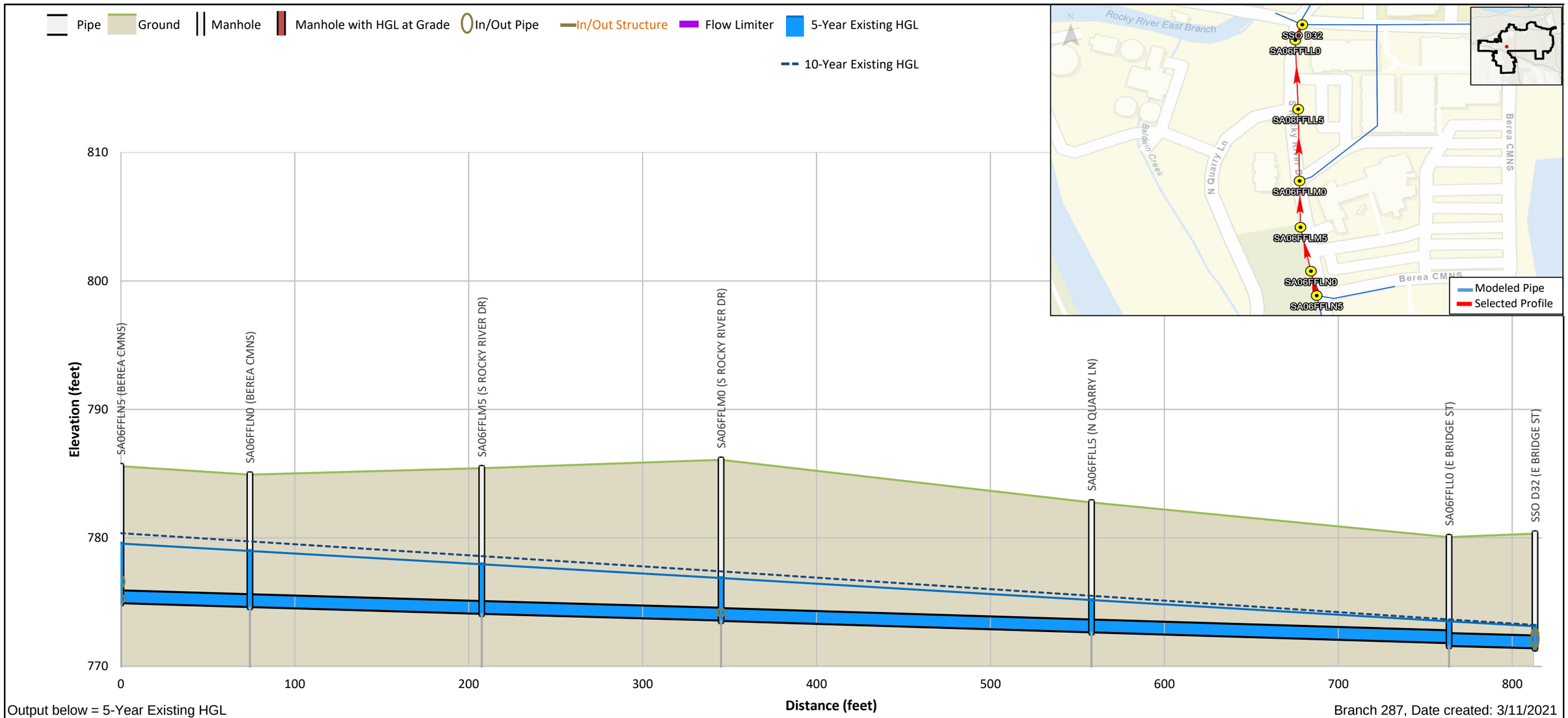
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 287, Date created: 3/11/2021

Depth to Invert (ft)		10	11	13	10	8.3	
Depth to HGL (ft)		5.9	7.5	9.2	7.6	6.6	
Diameter (in)	12	12	12	12	12	12	12
Capacity (mgd)	1.7	1.6	1.6	1.7	1.7	1.6	
Max Depth (ft)	4.6	4.4	3.9	3.3	2.5	1.9	
Dep abv Crown (ft)	3.6	3.4	2.9	2.3	1.5	0.92	
Max Flow (mgd)	2.3	2.3	2.3	2.3	2.4	2.4	
Max Velocity (ft/s)	3.8	3.7	4.0	4.0	4.3	4.3	
Slope (ft/ft)	0.0040	0.0040	0.0038	0.0042	0.0041	0.0036	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03
Community: Berea
BEREA CMNS to E BRIDGE ST

Brown AND Caldwell

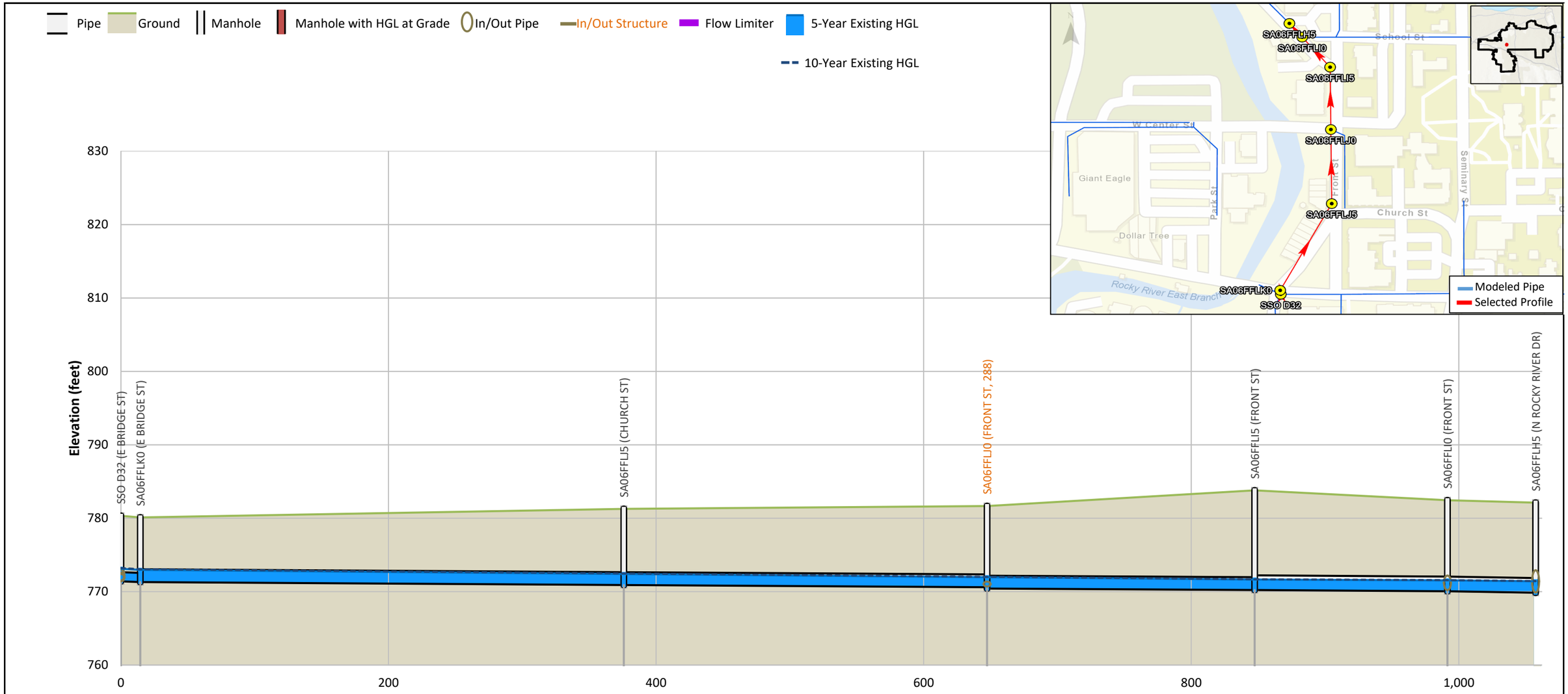
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 288, Date created: 3/11/2021

Depth to Invert (ft)	8.8	10	11	14	12		
Depth to HGL (ft)	7.1	8.9	9.7	12	11		
Diameter (in)	21	21	21	24	24		
Capacity (mgd)	3.4	3.4	3.2	5.4	8.7		
Max Depth (ft)	1.7	1.5	1.5	1.5	1.6		
Dep abv Crown (ft)	-	-	-	-	-		
Max Flow (mgd)	3.9	3.9	3.9	4.0	6.2		
Max Velocity (ft/s)	3.0	3.6	3.3	3.0	3.7		
Slope (ft/ft)	0.0011	0.0011	0.00100	0.0012	0.0030		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

E BRIDGE ST to N ROCKY RIVER DR

Brown AND Caldwell

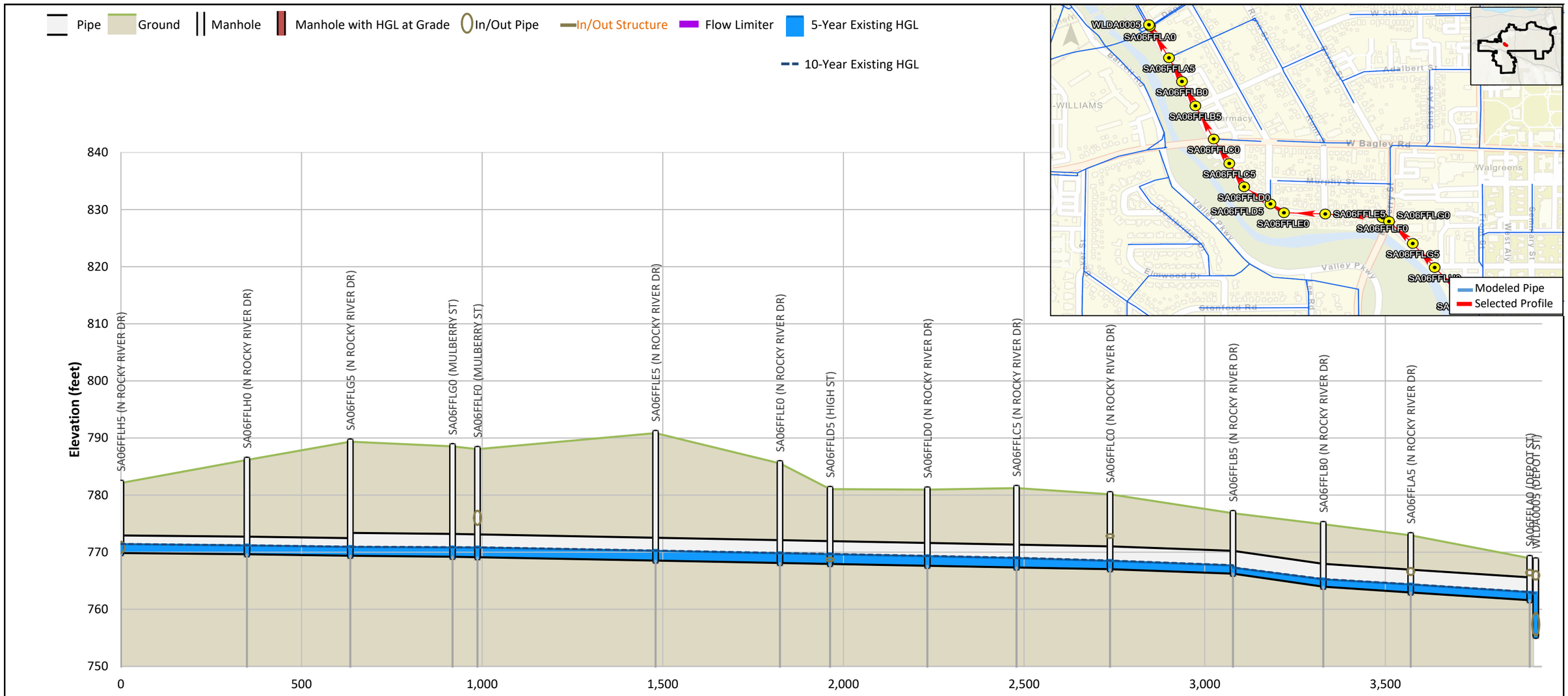
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

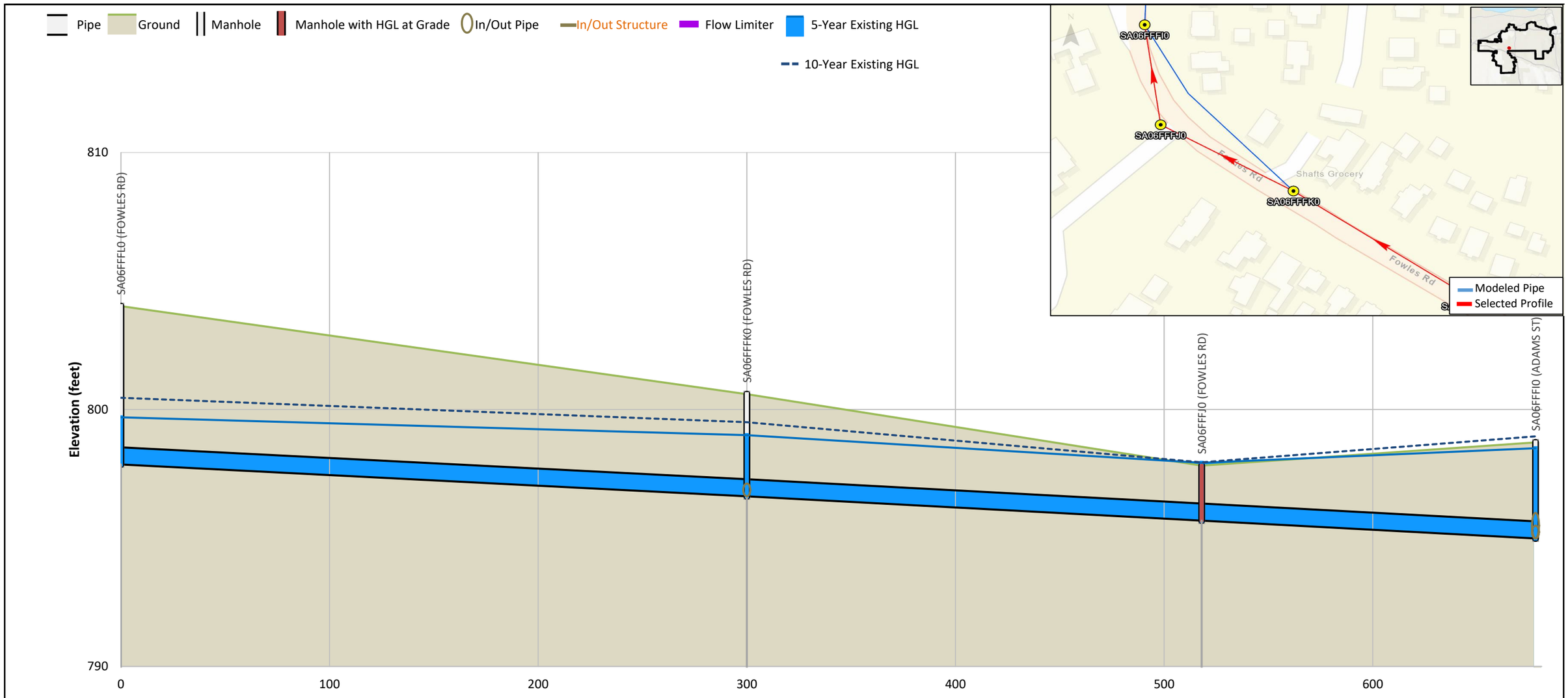
https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 289, Date created: 3/11/2021

| | | |



Output below = 5-Year Existing HGL

Branch 290, Date created: 3/11/2021

Depth to Invert (ft)			4.0		2.1			
Depth to HGL (ft)			1.6		-0.11			
Diameter (in)	8		8		8			
Capacity (mgd)	0.46		0.47		0.47			
Max Depth (ft)	2.4		2.4		3.5			
Dep abv Crown (ft)	1.7		1.7		2.8			
Max Flow (mgd)	0.34		0.50		-0.42			
Max Velocity (ft/s)	2.3		2.3		1.2			
Slope (ft/ft)	0.0041		0.0043		0.0043			

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

FOWLES RD to ADAMS ST

Brown AND Caldwell

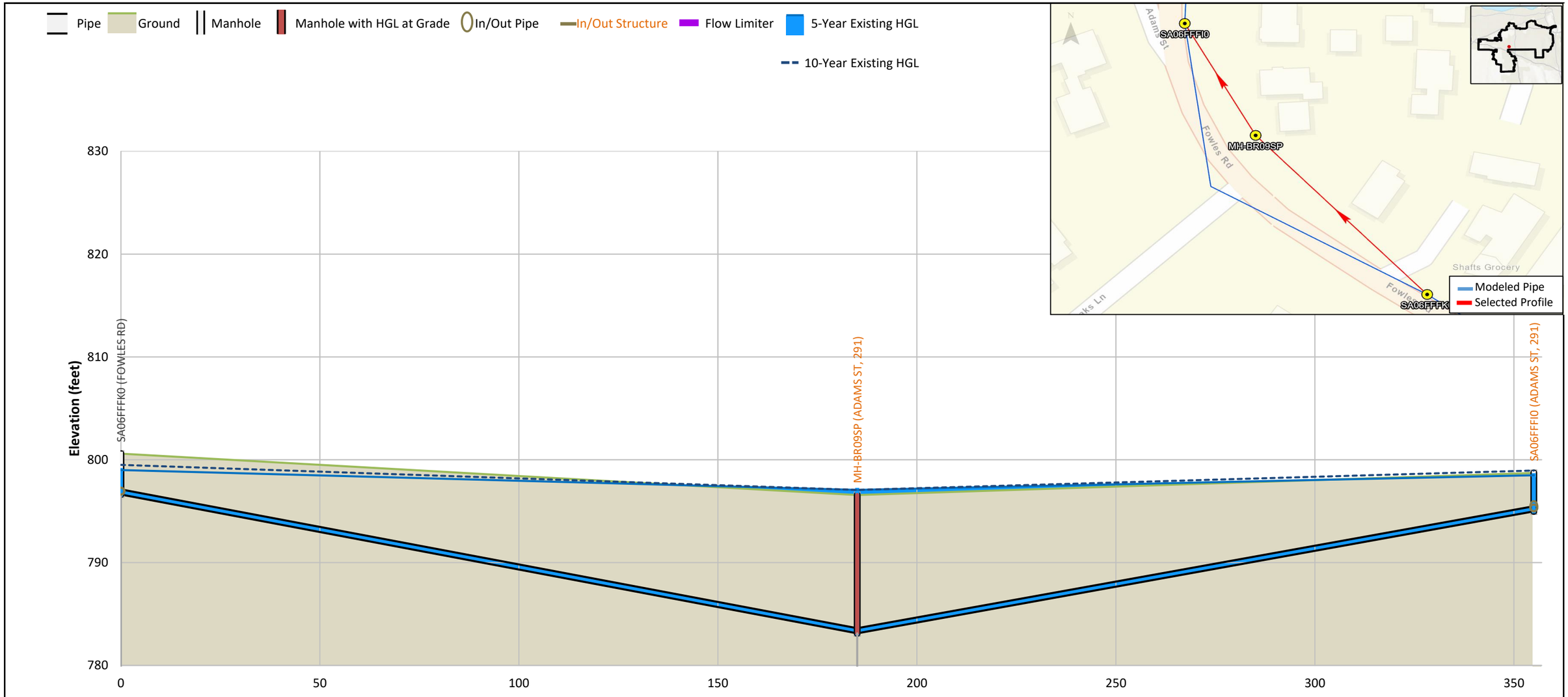
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 291, Date created: 3/11/2021

Depth to Invert (ft)		13	
Depth to HGL (ft)		-2.12	
Diameter (in)	6		6
Capacity (mgd)	0.89		-0.87
Max Depth (ft)	16		16
Dep abv Crown (ft)	15		15
Max Flow (mgd)	0.21		0.20
Max Velocity (ft/s)	0.32		1.6
Slope (ft/ft)	0.073		-0.070

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

FOWLES RD to ADAMS ST

Brown AND Caldwell

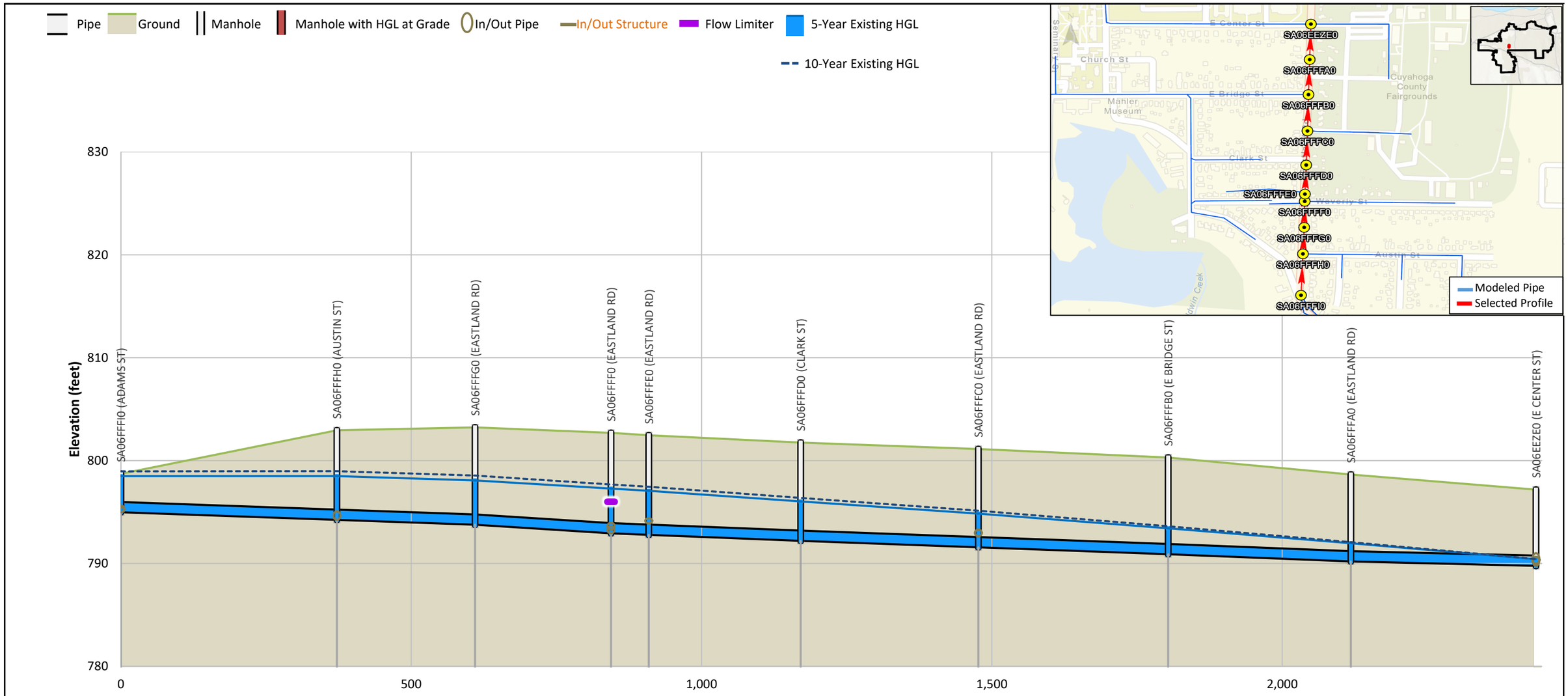
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 292, Date created: 3/11/2021

Depth to Invert (ft)		8.7	9.5	9.8	9.7	9.6	9.6	9.4	8.4	
Depth to HGL (ft)		4.5	5.2	5.4	5.4	5.7	6.3	6.9	6.7	
Diameter (in)	12	12	12	12	12	12	12	12	12	12
Capacity (mgd)	1.0	0.99	1.3	1.1	1.1	1.0	1.0	1.1	0.81	
Max Depth (ft)	4.3	4.3	4.4	4.4	4.3	3.8	3.3	2.5	1.8	
Dep abv Crown (ft)	3.3	3.3	3.4	3.4	3.3	2.8	2.3	1.5	0.77	
Max Flow (mgd)	0.46	1.0	1.4	1.6	1.4	1.4	1.5	1.5	1.5	
Max Velocity (ft/s)	1.0	2.2	2.3	2.6	2.5	2.5	2.5	2.7	4.3	
Slope (ft/ft)	0.0020	0.0020	0.0036	0.0022	0.0022	0.0021	0.0021	0.0022	0.0013	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03
Community: Berea
ADAMS ST to E CENTER ST

Brown AND Caldwell

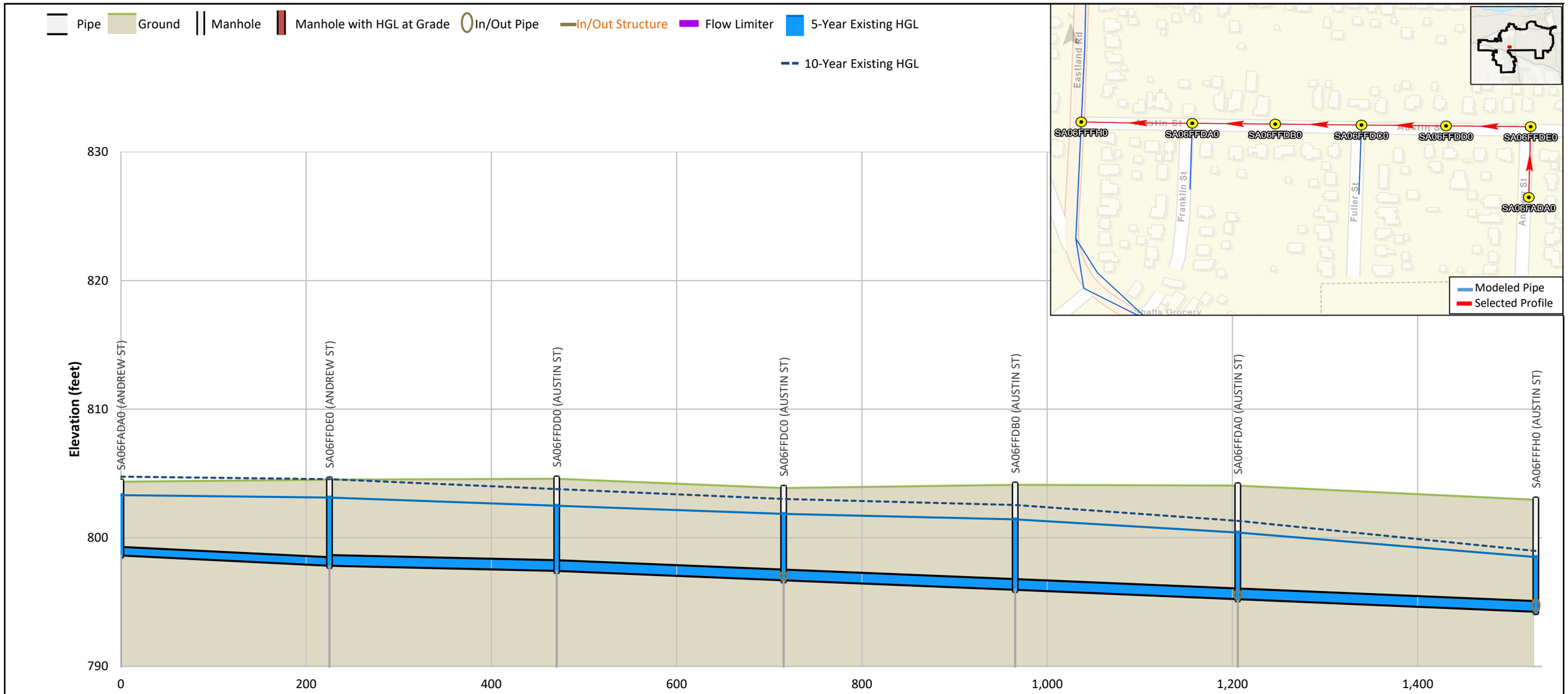
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 293, Date created: 3/11/2021

Depth to Invert (ft)		6.7	7.2	7.2	8.2	8.8	
Depth to HGL (ft)		1.4	2.1	2.0	2.7	3.7	
Diameter (in)	8	10	10	10	10	10	
Capacity (mgd)	0.42	0.52	0.70	0.70	0.71	0.71	
Max Depth (ft)	5.3	5.3	5.2	5.5	5.5	5.2	
Dep abv Crown (ft)	4.6	4.5	4.3	4.6	4.6	4.3	
Max Flow (mgd)	0.20	0.66	0.65	0.53	0.84	0.99	
Max Velocity (ft/s)	0.73	2.3	1.7	1.5	2.1	1.9	
Slope (ft/ft)	0.0036	0.0016	0.0030	0.0030	0.0030	0.0030	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

ANDREW ST to AUSTIN ST

Brown AND Caldwell

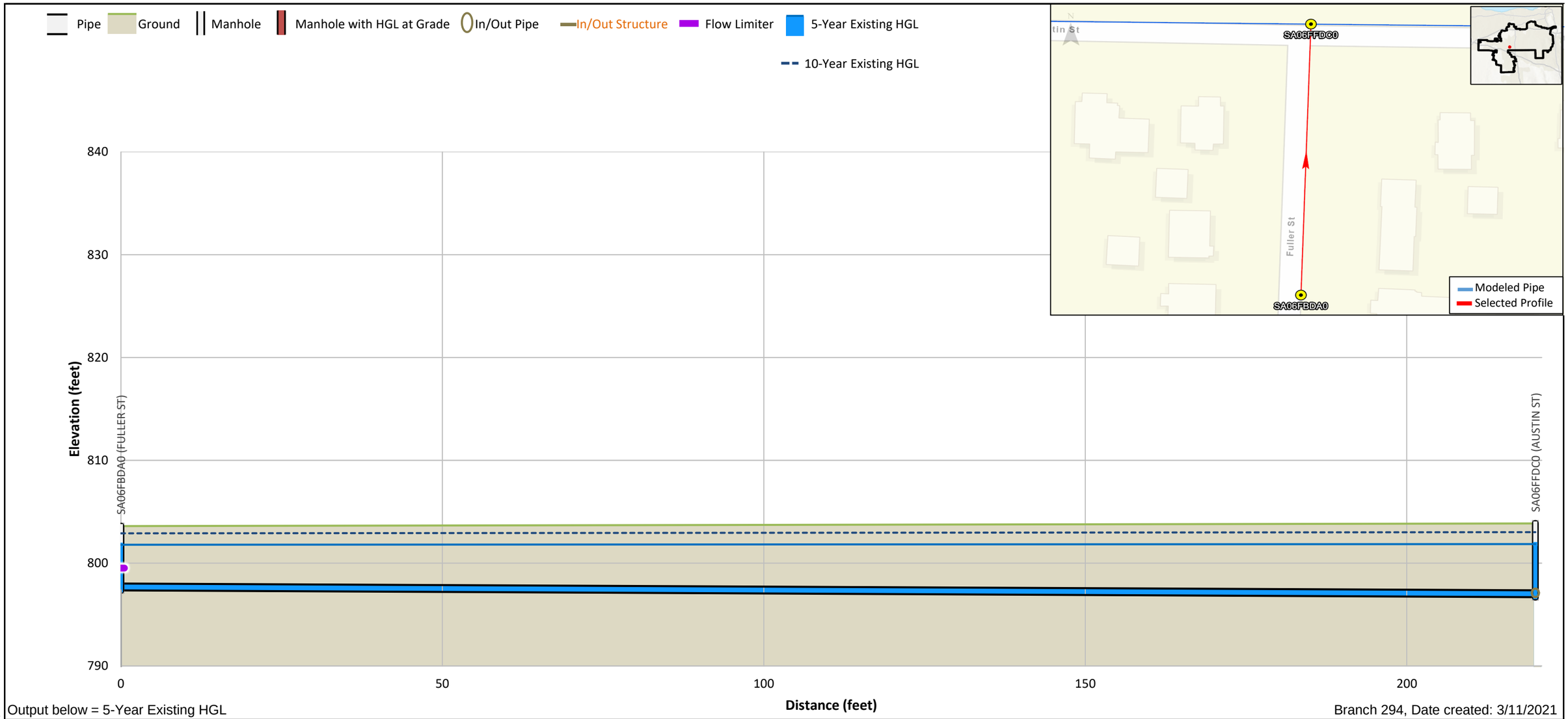
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 294, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	0.39	
Max Depth (ft)	5.2	
Dep abv Crown (ft)	4.5	
Max Flow (mgd)	0.19	
Max Velocity (ft/s)	0.75	
Slope (ft/ft)	0.0030	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

FULLER ST to AUSTIN ST

Brown AND Caldwell

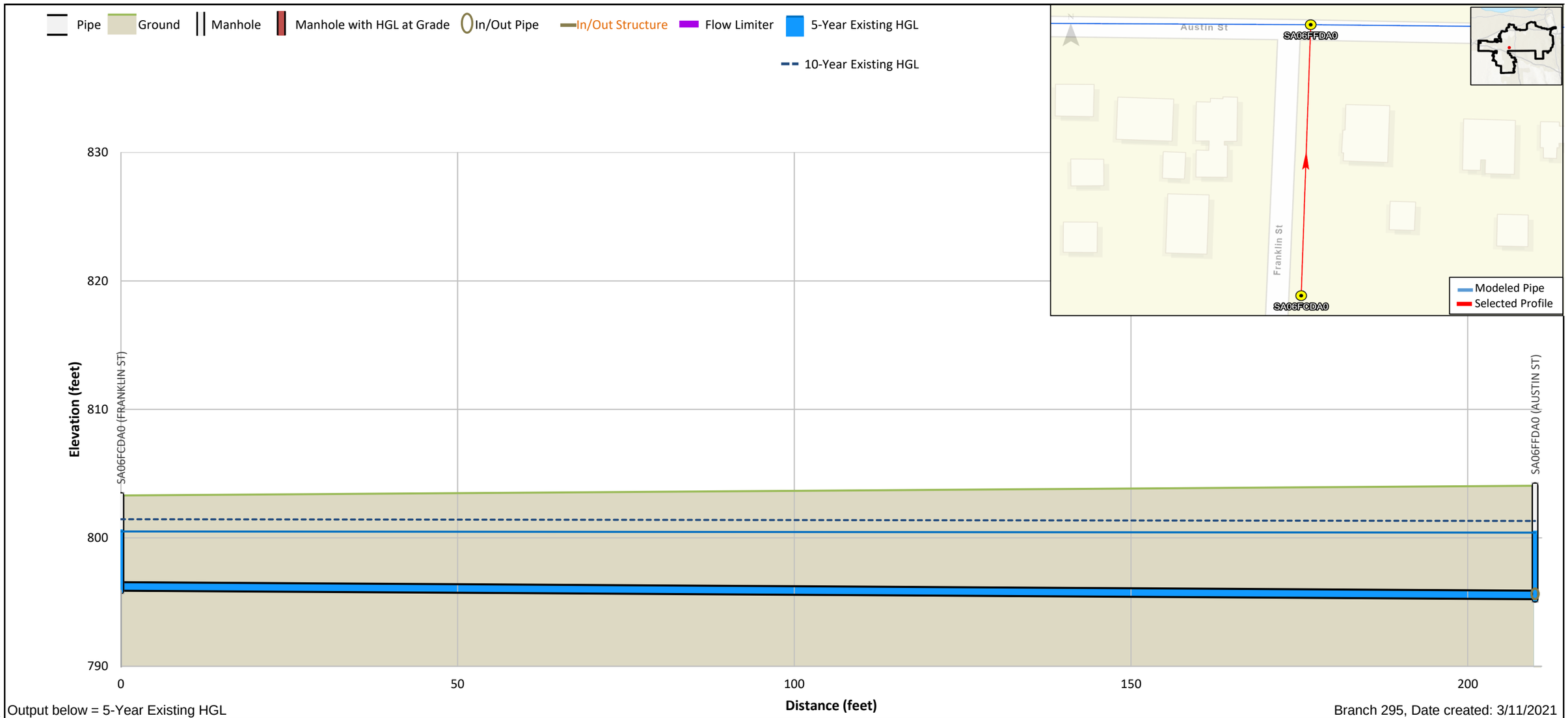
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 295, Date created: 3/11/2021

Depth to Invert (ft)	
Depth to HGL (ft)	
Diameter (in)	8
Capacity (mgd)	0.40
Max Depth (ft)	5.2
Dep abv Crown (ft)	4.5
Max Flow (mgd)	0.15
Max Velocity (ft/s)	0.40
Slope (ft/ft)	0.0031

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

FRANKLIN ST to AUSTIN ST

Brown AND Caldwell

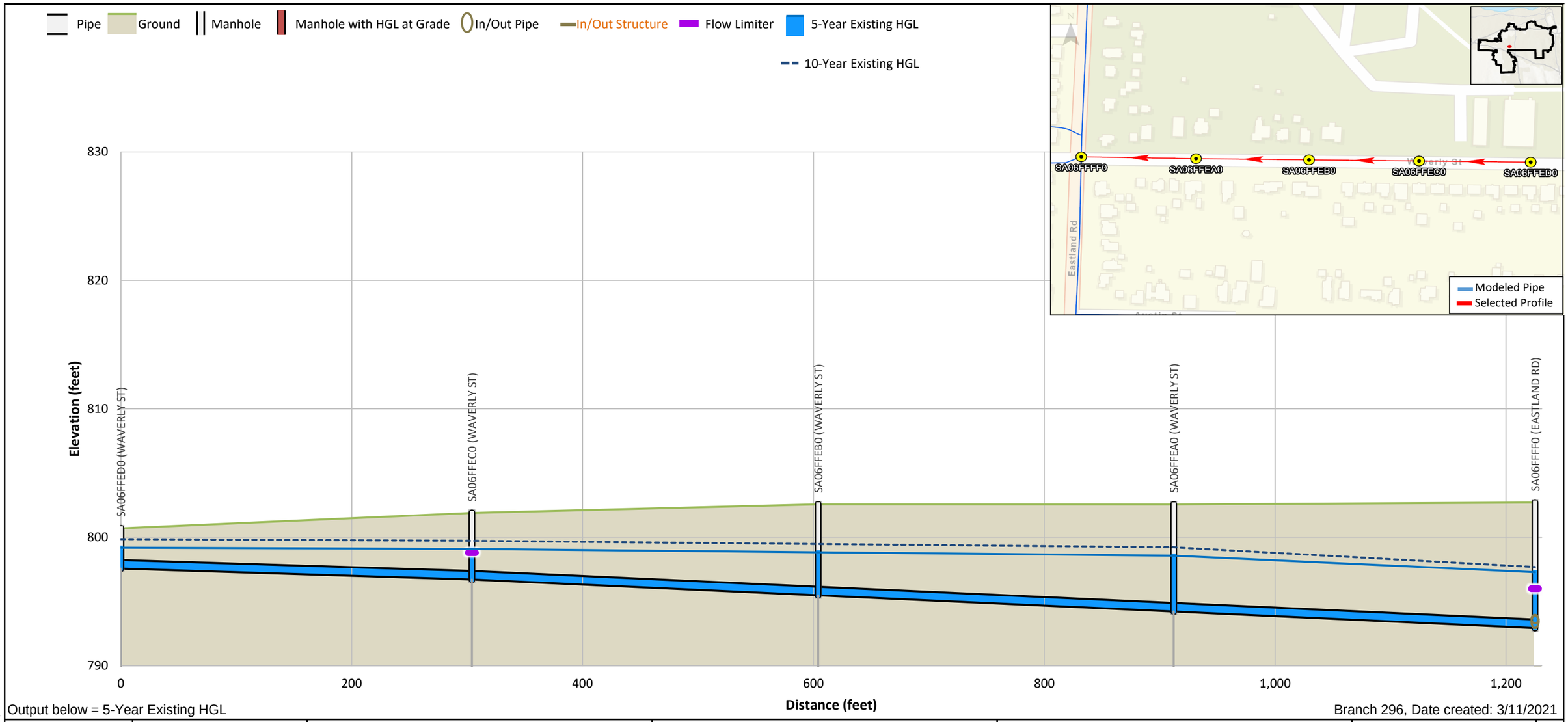
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 296, Date created: 3/11/2021

Depth to Invert (ft)		5.2	7.1	8.3	
Depth to HGL (ft)		2.8	3.7	4.0	
Diameter (in)	8	8	8	8	8
Capacity (mgd)	0.38	0.45	0.45	0.52	
Max Depth (ft)	2.4	3.4	4.3	4.4	
Dep abv Crown (ft)	1.7	2.7	3.7	3.7	
Max Flow (mgd)	0.13	0.32	0.27	0.53	
Max Velocity (ft/s)	0.78	2.2	1.1	1.4	
Slope (ft/ft)	0.0028	0.0041	0.0041	0.0041	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

WAVERLY ST to EASTLAND RD

Brown AND Caldwell

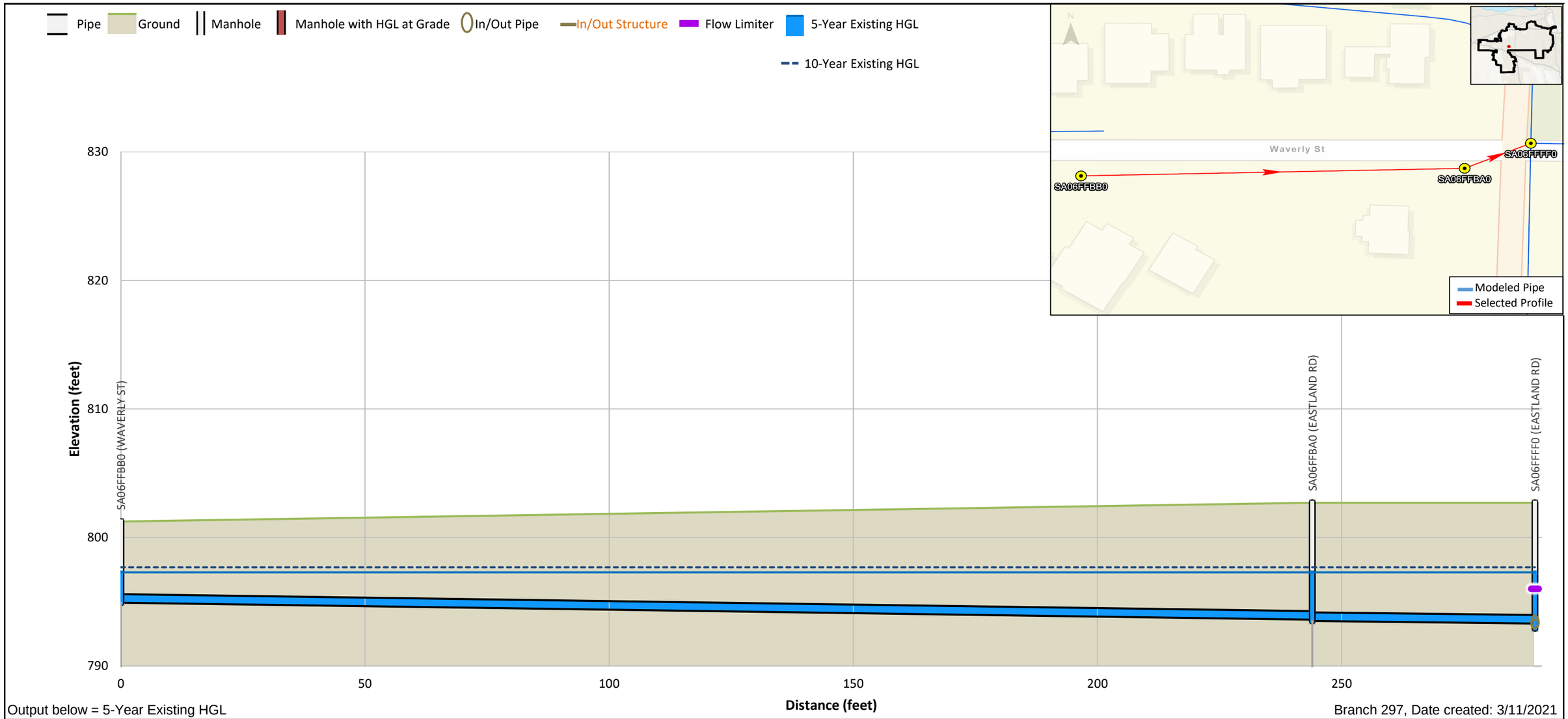
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 297, Date created: 3/11/2021

Depth to Invert (ft)		9.1	
Depth to HGL (ft)		5.4	
Diameter (in)	8		8
Capacity (mgd)	0.52		0.47
Max Depth (ft)	3.7		4.0
Dep abv Crown (ft)	3.0		3.3
Max Flow (mgd)	-0.19		-0.23
Max Velocity (ft/s)	-0.69		-0.80
Slope (ft/ft)	0.0054		0.0044

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

WAVERLY ST to EASTLAND RD

Brown AND Caldwell

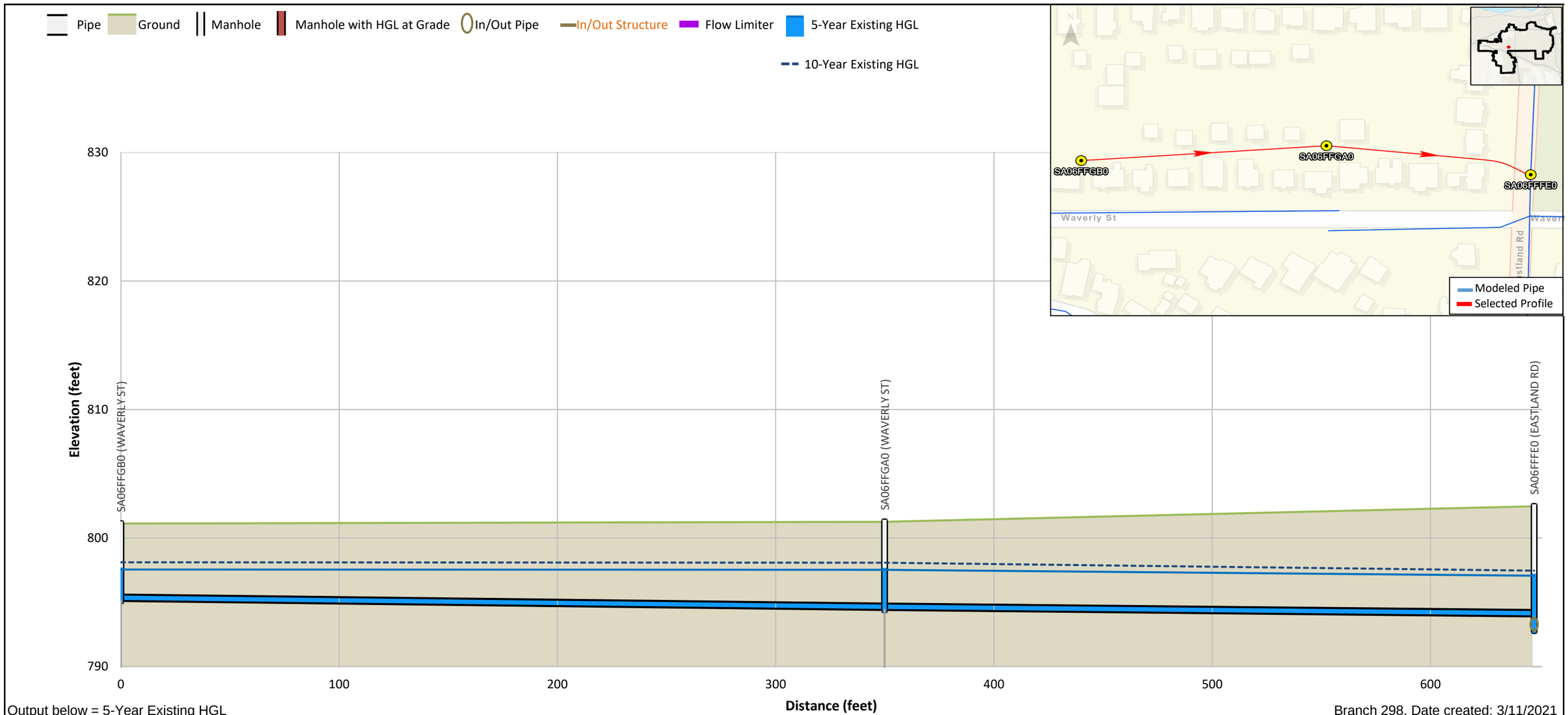
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 298, Date created: 3/11/2021

Depth to Invert (ft)		6.9	
Depth to HGL (ft)		3.7	
Diameter (in)	6		6
Capacity (mgd)	0.15		0.14
Max Depth (ft)	3.1		3.2
Dep abv Crown (ft)	2.6		2.7
Max Flow (mgd)	-0.12		0.13
Max Velocity (ft/s)	-0.75		2.2
Slope (ft/ft)	0.0020		0.0017

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

WAVERLY ST to EASTLAND RD

Brown AND Caldwell

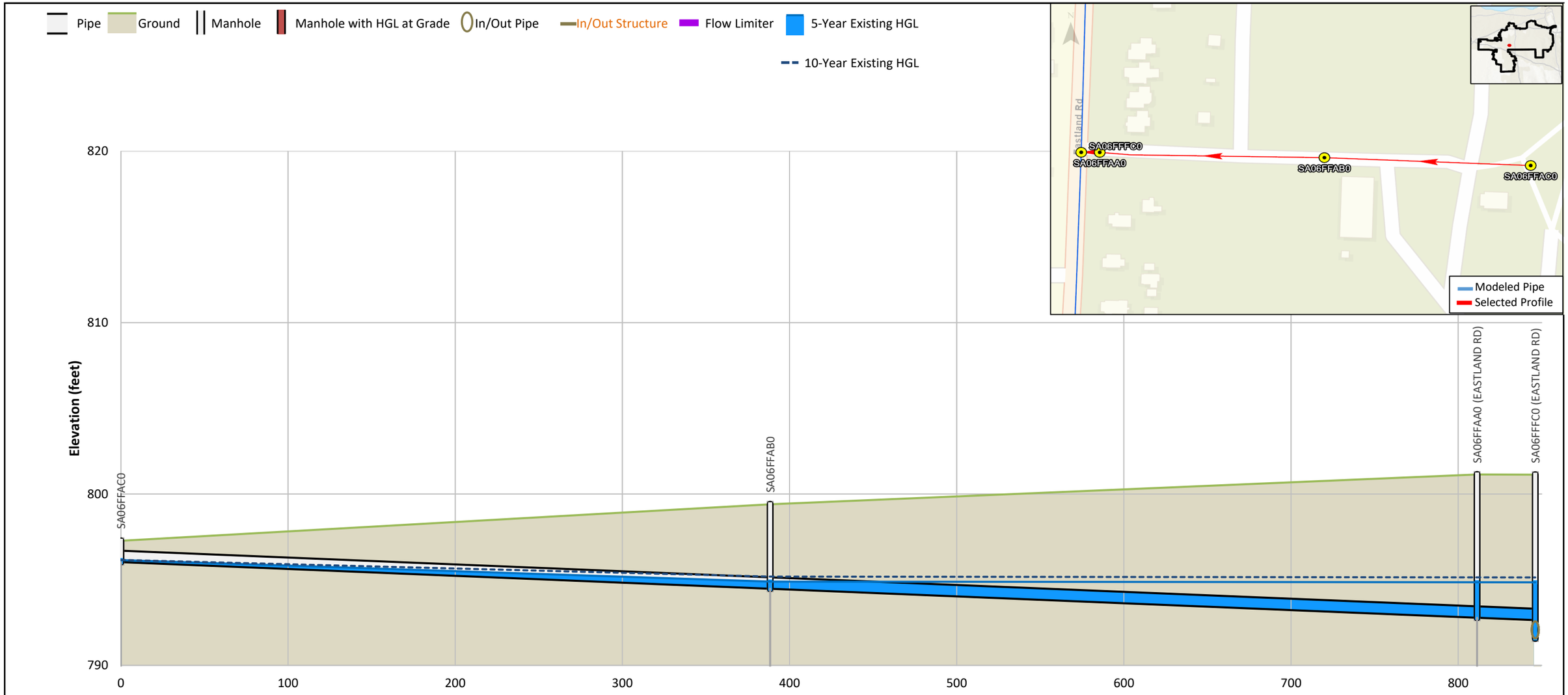
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 299, Date created: 3/11/2021

Depth to Invert (ft)		4.9	8.4	
Depth to HGL (ft)		4.5	6.3	
Diameter (in)	8	8	8	
Capacity (mgd)	0.45	0.45	0.45	
Max Depth (ft)	0.42	2.1	2.2	
Dep abv Crown (ft)	-	1.4	1.5	
Max Flow (mgd)	0.03	-0.09	-0.11	
Max Velocity (ft/s)	0.63	1.1	1.6	
Slope (ft/ft)	0.0040	0.0040	0.0040	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

Manhole SA06FFAC0 to EASTLAND RD

Brown AND Caldwell

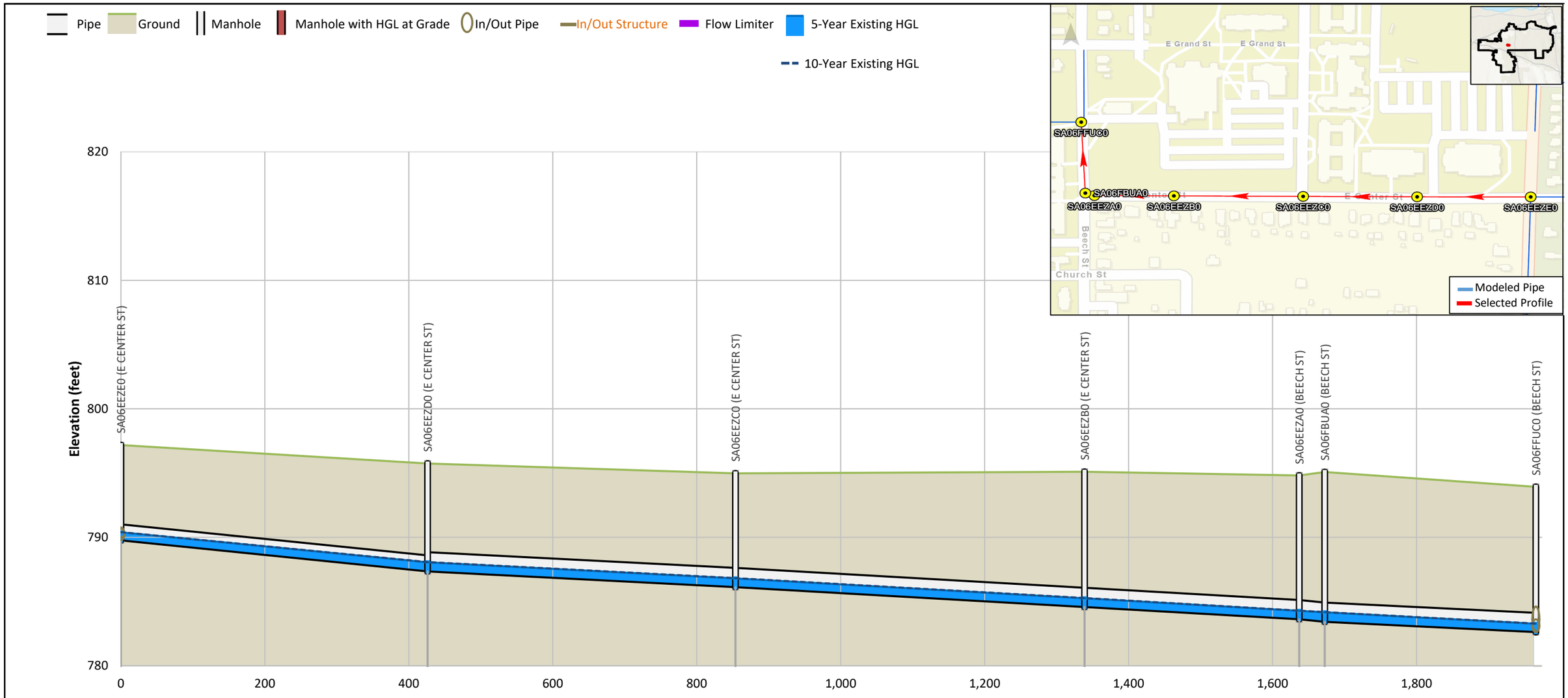
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 301, Date created: 3/11/2021

Depth to Invert (ft)		8.4	8.9	11	11	12	
Depth to HGL (ft)		7.7	8.2	9.9	11	11	
Diameter (in)	15	18	18	18		18	
Capacity (mgd)	3.4	3.9	4.2	4.2		3.8	
Max Depth (ft)	0.71	0.71	0.68	0.68		0.74	
Dep abv Crown (ft)	-	-	-	-		-	
Max Flow (mgd)	1.7	1.7	1.7	1.7		1.9	
Max Velocity (ft/s)	3.7	3.5	3.5	3.6		3.9	
Slope (ft/ft)	0.0057	0.0029	0.0032	0.0032		0.0027	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

E CENTER ST to BEECH ST

Brown AND Caldwell

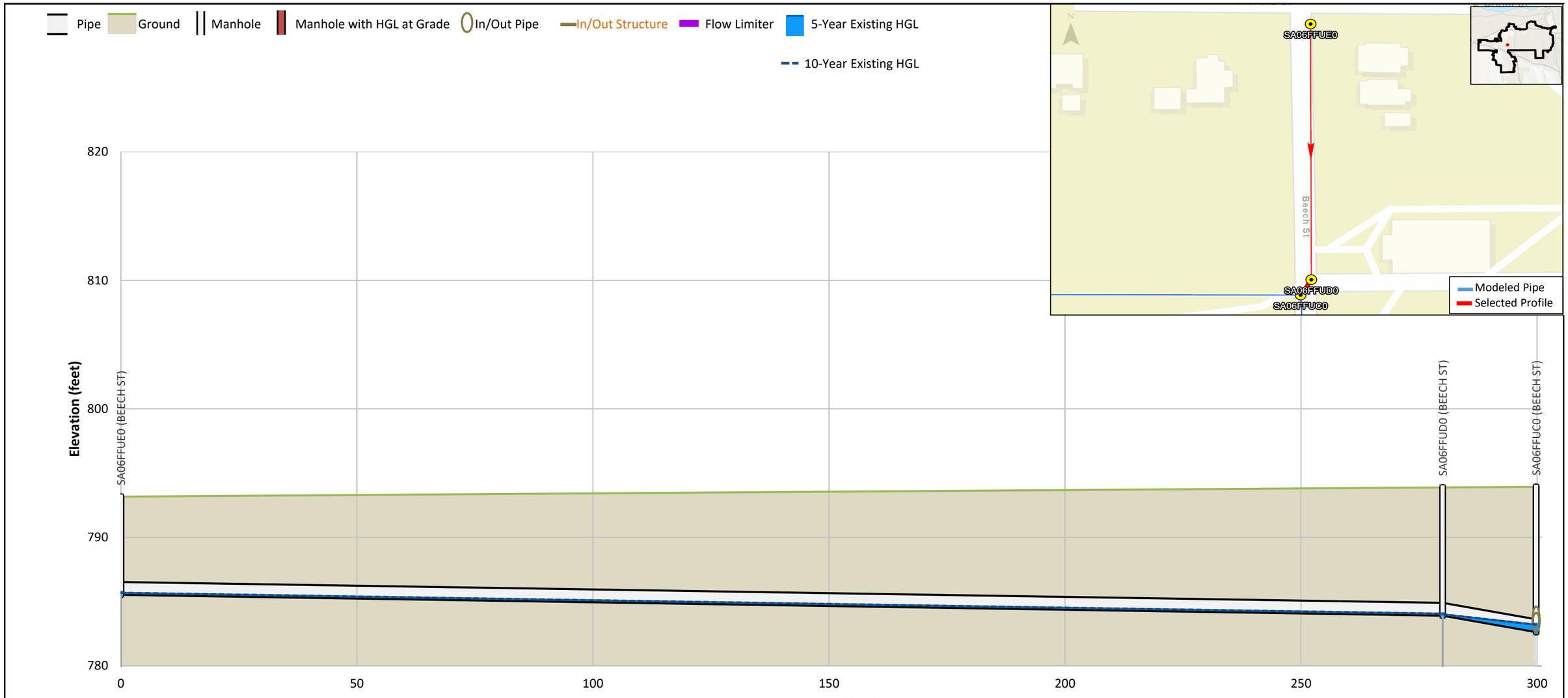
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/DesktopHGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 302, Date created: 3/11/2021

Depth to Invert (ft)		10.0	
Depth to HGL (ft)		9.8	
Diameter (in)	12		12
Capacity (mgd)	1.6		5.3
Max Depth (ft)	0.16		0.57
Dep abv Crown (ft)	-		-
Max Flow (mgd)	0.08		0.09
Max Velocity (ft/s)	1.7		0.46
Slope (ft/ft)	0.0058		0.065

Northeast Ohio Regional Sewer District

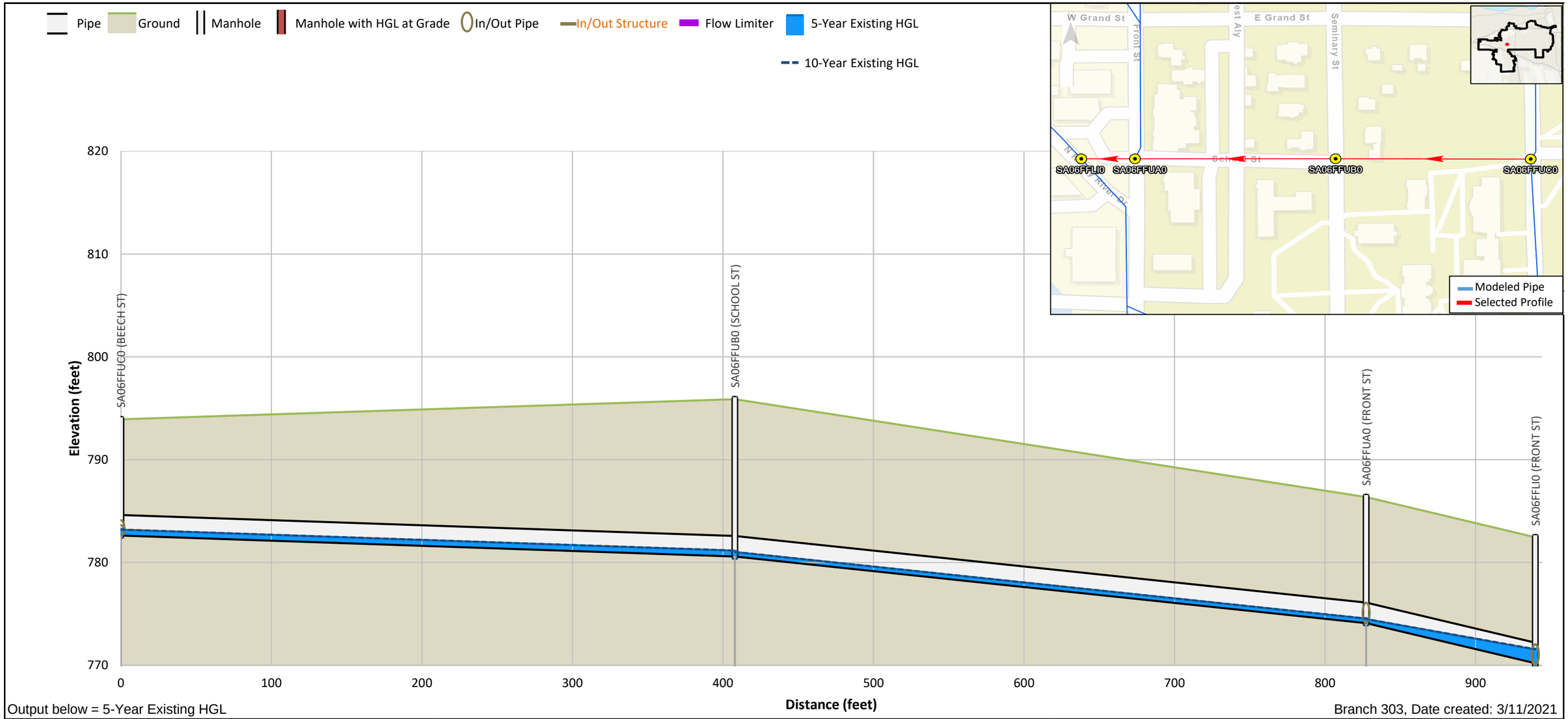
SWI-LSSES

PFA: BE-03
Community: Berea
BEECH ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 303, Date created: 3/11/2021

Depth to Invert (ft)		15	12	
Depth to HGL (ft)		15	12	
Diameter (in)	24	24	24	24
Capacity (mgd)	11	20		30
Max Depth (ft)	0.57	0.44		1.3
Dep abv Crown (ft)	-	-		-
Max Flow (mgd)	2.0	2.0		2.3
Max Velocity (ft/s)	4.1	6.1		3.2
Slope (ft/ft)	0.0050	0.015		0.035

Northeast Ohio Regional Sewer District

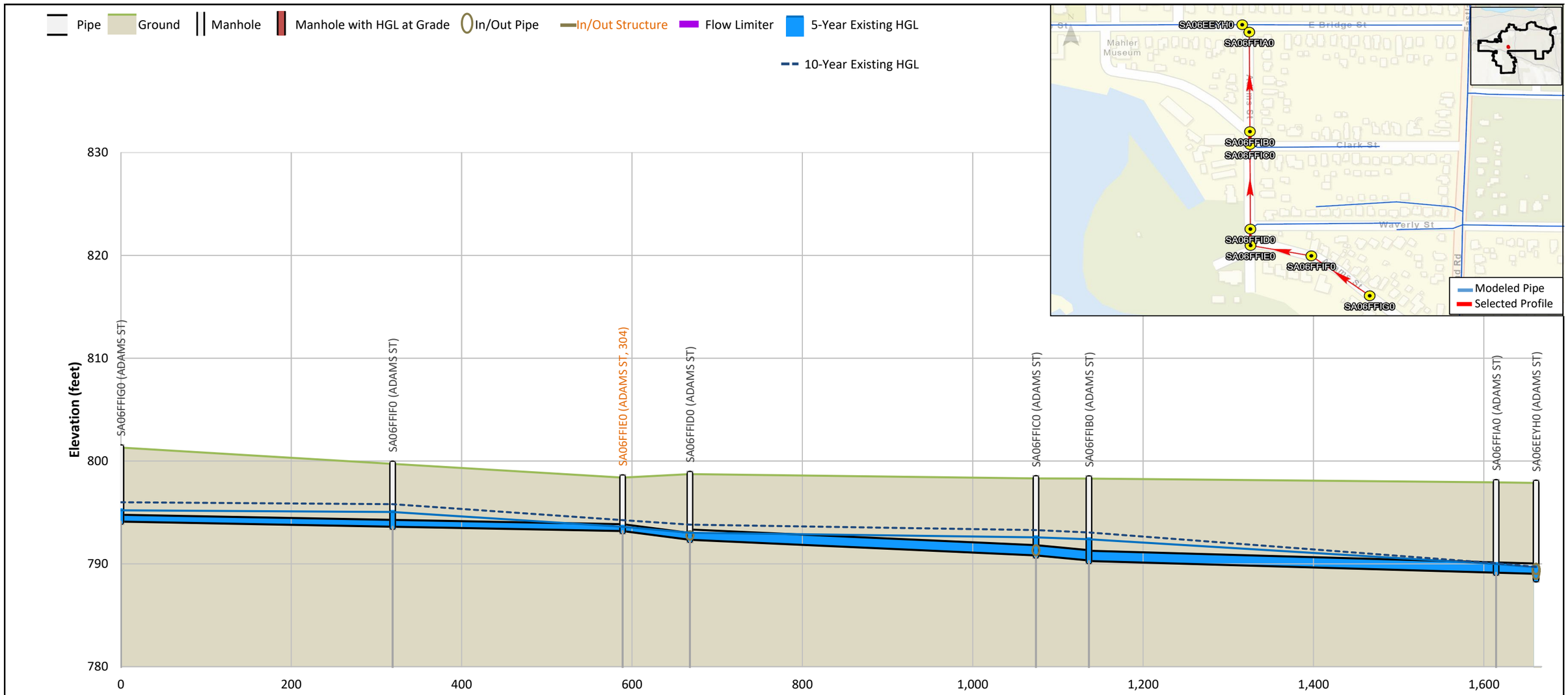
SWI-LSSES

PFA: BE-03
Community: Berea
BEECH ST to FRONT ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 304, Date created: 3/11/2021

Depth to Invert (ft)		6.1	5.2	6.4	7.5	8.0	8.8		
Depth to HGL (ft)		4.7	4.8	5.7	5.7	5.9	7.9		
Diameter (in)	8	8	8	12	12	12	12		
Capacity (mgd)	0.28	0.28	0.74	1.3	1.9	1.0	1.0		
Max Depth (ft)	1.4	1.4	0.69	1.8	2.1	2.1	0.84		
Dep abv Crown (ft)	0.77	0.77	0.02	0.76	1.1	1.1	-		
Max Flow (mgd)	0.16	0.51	0.50	0.68	1.1	1.5	1.5		
Max Velocity (ft/s)	0.61	3.4	2.5	1.9	2.0	3.2	4.2		
Slope (ft/ft)	0.0016	0.0016	0.011	0.0037	0.0079	0.0024	0.0024		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

ADAMS ST

Brown AND Caldwell

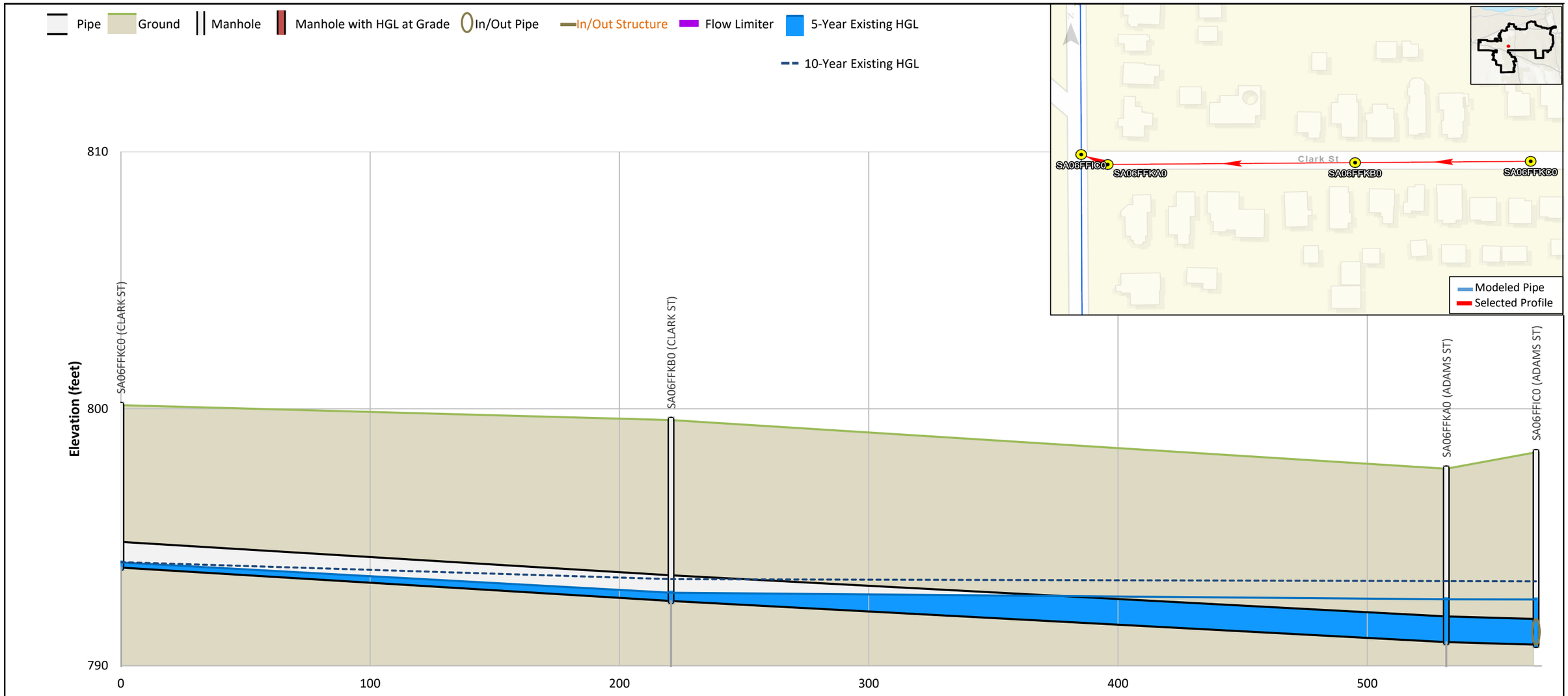
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 306, Date created: 3/11/2021

Depth to Invert (ft)		7.0	6.7	
Depth to HGL (ft)		6.7	5.1	
Diameter (in)	12	12	12	12
Capacity (mgd)	1.6	1.5	1.1	
Max Depth (ft)	0.32	1.7	1.8	
Dep abv Crown (ft)	-	0.67	0.76	
Max Flow (mgd)	0.13	0.30	0.31	
Max Velocity (ft/s)	0.92	1.3	0.88	
Slope (ft/ft)	0.0059	0.0051	0.0028	

Northeast Ohio Regional Sewer District

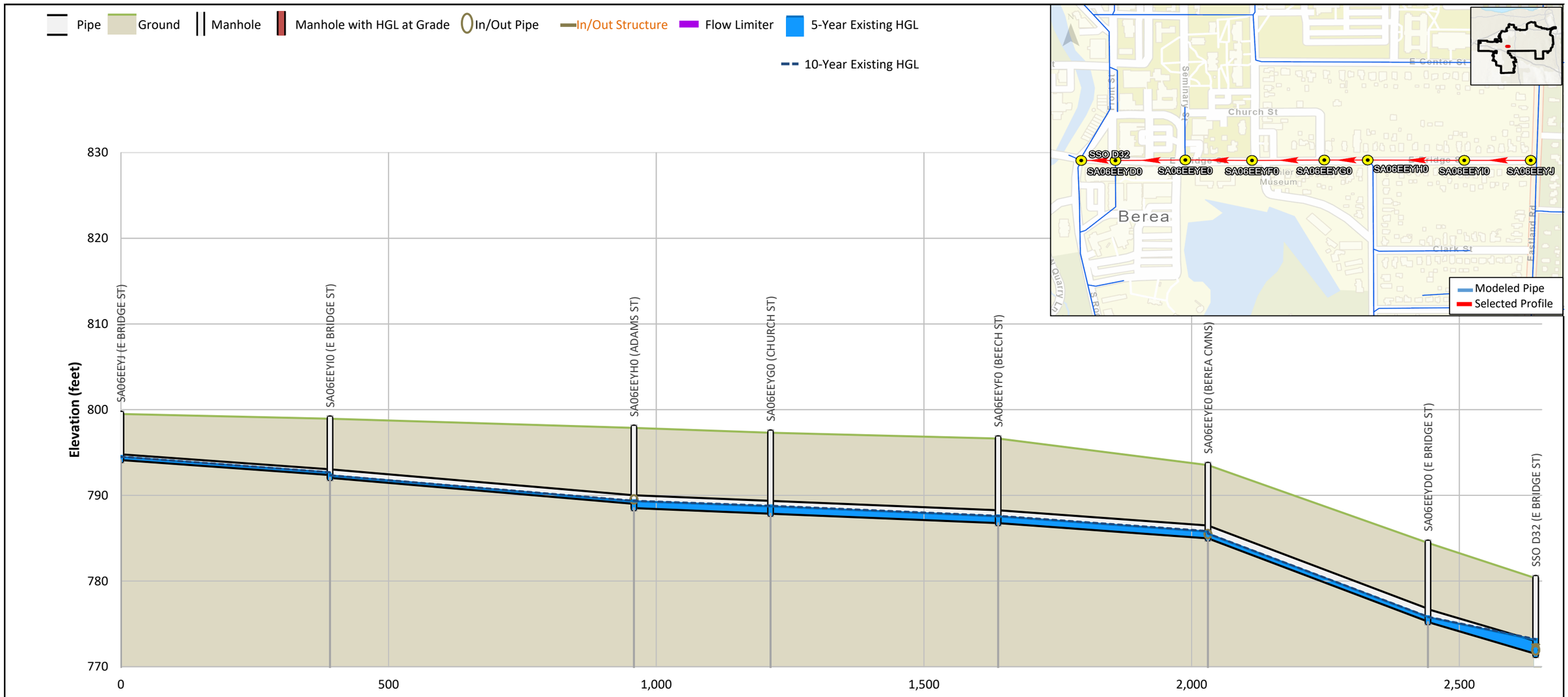
SWI-LSSES

PFA: BE-03
Community: Berea
CLARK ST to ADAMS ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 307, Date created: 3/11/2021

Depth to Invert (ft)		6.6	8.9	9.5	9.9	8.5	9.2	
Depth to HGL (ft)		6.3	8.6	8.6	9.1	7.8	8.6	
Diameter (in)	8	12	18	18	18	18	18	18
Capacity (mgd)	0.48	1.5	4.1	4.1	5.4	12	11	
Max Depth (ft)	0.36	0.30	0.86	0.86	0.78	0.53	1.6	
Dep abv Crown (ft)	-	-	-	-	-	-	0.12	
Max Flow (mgd)	0.27	0.27	2.2	2.5	2.9	3.3	3.3	
Max Velocity (ft/s)	2.7	2.4	3.3	4.2	4.8	9.0	2.8	
Slope (ft/ft)	0.0045	0.0053	0.0026	0.0026	0.0045	0.024	0.018	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

E BRIDGE ST

Brown AND Caldwell

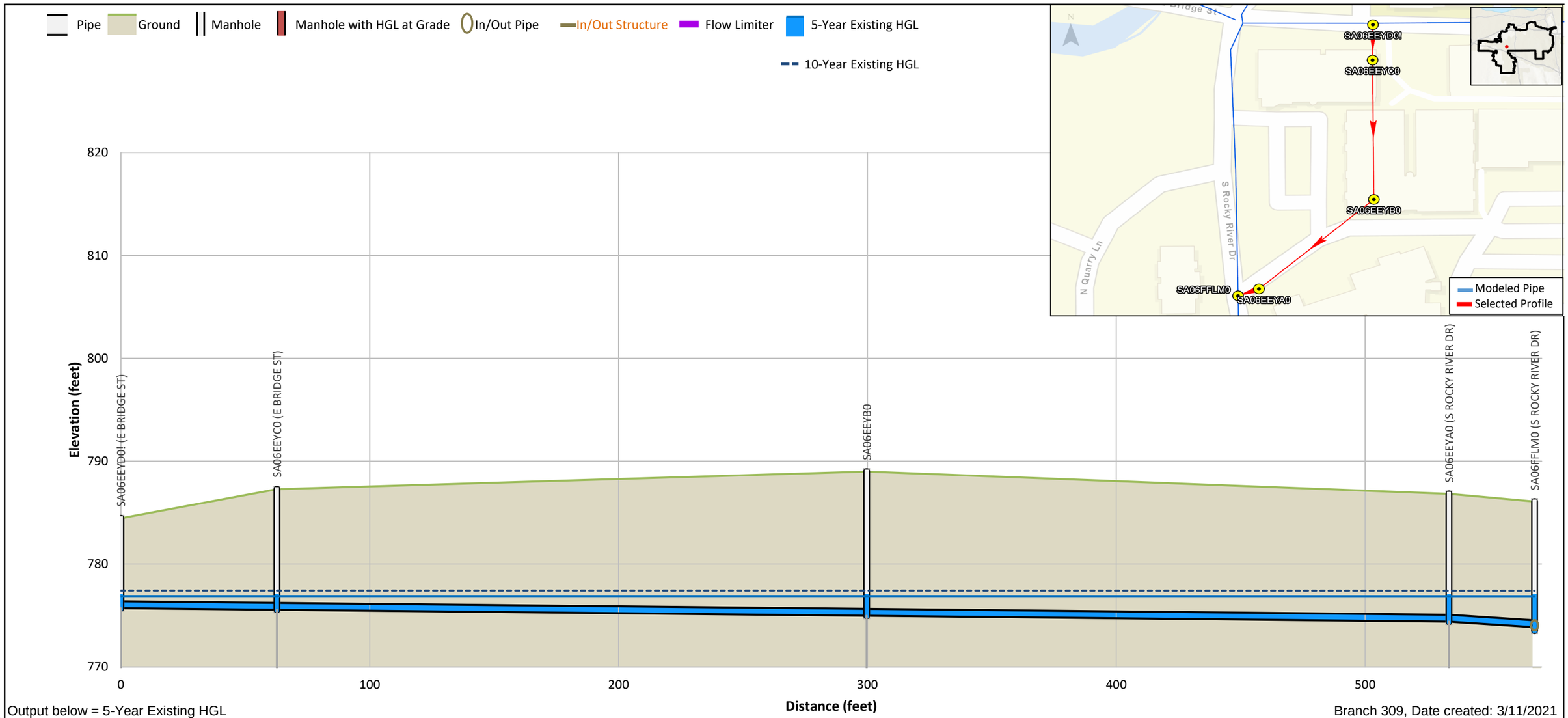
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 309, Date created: 3/11/2021

Depth to Invert (ft)		12	14	12	
Depth to HGL (ft)		10	12	10.0	
Diameter (in)	8	8	8	8	8
Capacity (mgd)	0.35	0.35	0.35	0.89	
Max Depth (ft)	1.3	1.9	2.5	3.0	
Dep abv Crown (ft)	0.67	1.2	1.8	2.3	
Max Flow (mgd)	-0.06	-0.14	-0.15	-0.16	
Max Velocity (ft/s)	-0.56	-0.64	1.5	1.6	
Slope (ft/ft)	0.0024	0.0024	0.0024	0.016	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

E BRIDGE ST to S ROCKY RIVER DR

Brown AND Caldwell

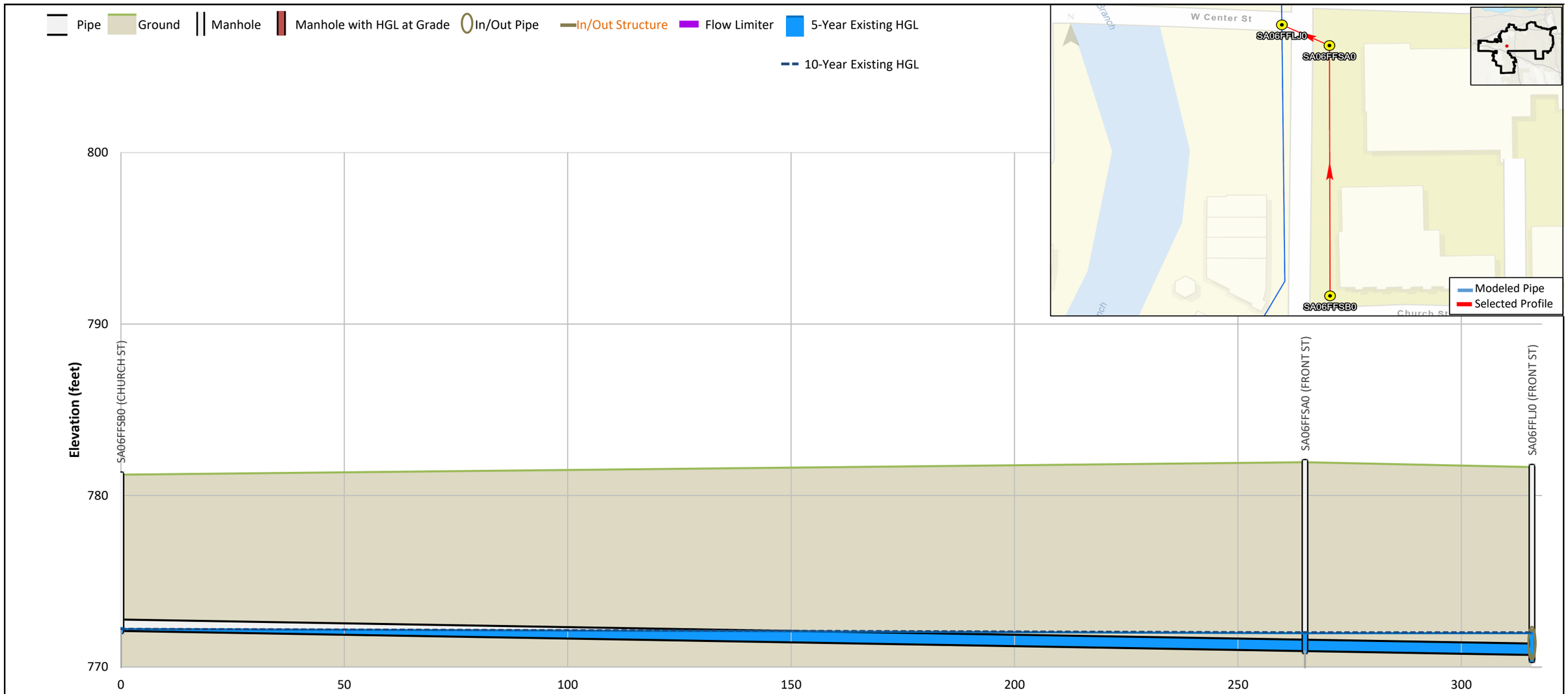
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 310, Date created: 3/11/2021

Depth to Invert (ft)			11	
Depth to HGL (ft)			10.0	
Diameter (in)	8			8
Capacity (mgd)	0.47			0.47
Max Depth (ft)	1.0			1.3
Dep abv Crown (ft)	0.38			0.60
Max Flow (mgd)	-0.03			-0.06
Max Velocity (ft/s)	0.77			0.81
Slope (ft/ft)	0.0044			0.0044

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

CHURCH ST to FRONT ST

Brown AND Caldwell

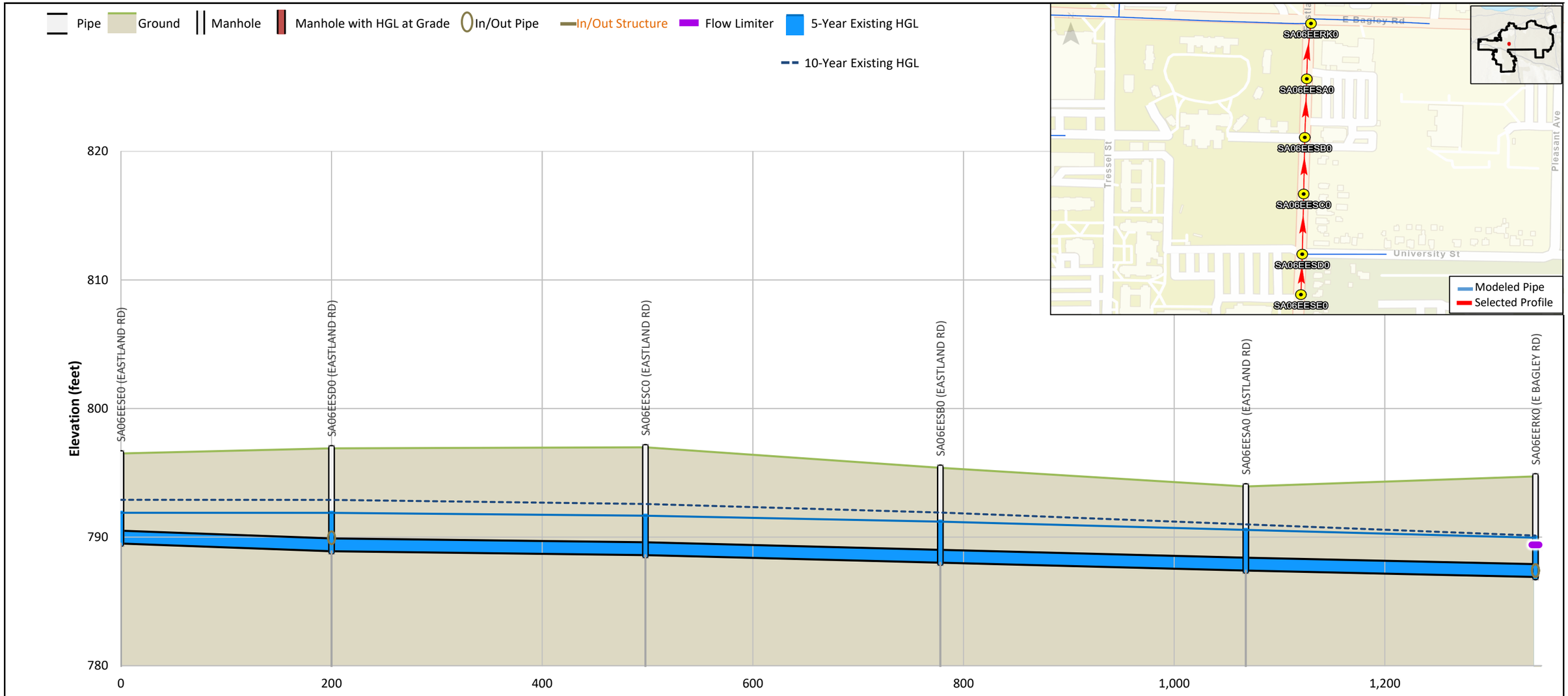
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 311, Date created: 3/11/2021

Depth to Invert (ft)		8.0	8.4	7.4	6.5	
Depth to HGL (ft)		5.0	5.3	4.2	3.4	
Diameter (in)	12	12	12	12	12	12
Capacity (mgd)	1.2	0.66	0.96	0.96	0.89	
Max Depth (ft)	3.0	3.1	3.2	3.2	3.2	
Dep abv Crown (ft)	2.0	2.1	2.2	2.2	2.2	
Max Flow (mgd)	-0.23	0.57	0.85	0.98	0.98	
Max Velocity (ft/s)	-0.45	1.4	1.9	2.0	2.5	
Slope (ft/ft)	0.0030	0.0010	0.0021	0.0021	0.0018	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03
Community: Berea
EASTLAND RD to E BAGLEY RD

Brown AND Caldwell

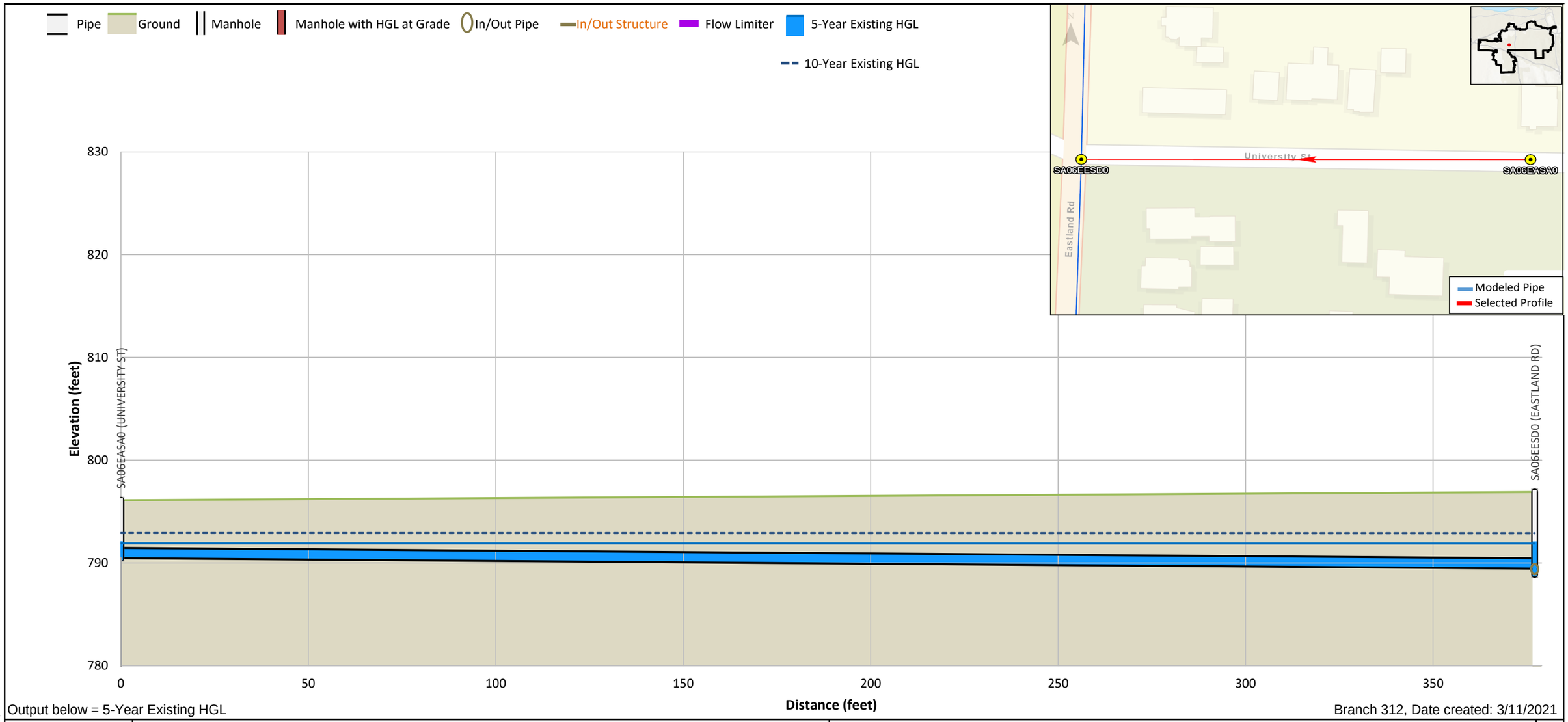
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://browncald-my.sharepoint.com/personal/jhatfield_browncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 312, Date created: 3/11/2021

Depth to Invert (ft)	
Depth to HGL (ft)	
Diameter (in)	12
Capacity (mgd)	1.1
Max Depth (ft)	2.4
Dep abv Crown (ft)	1.4
Max Flow (mgd)	-0.25
Max Velocity (ft/s)	2.0
Slope (ft/ft)	0.0027

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

UNIVERSITY ST to EASTLAND RD

Brown AND Caldwell

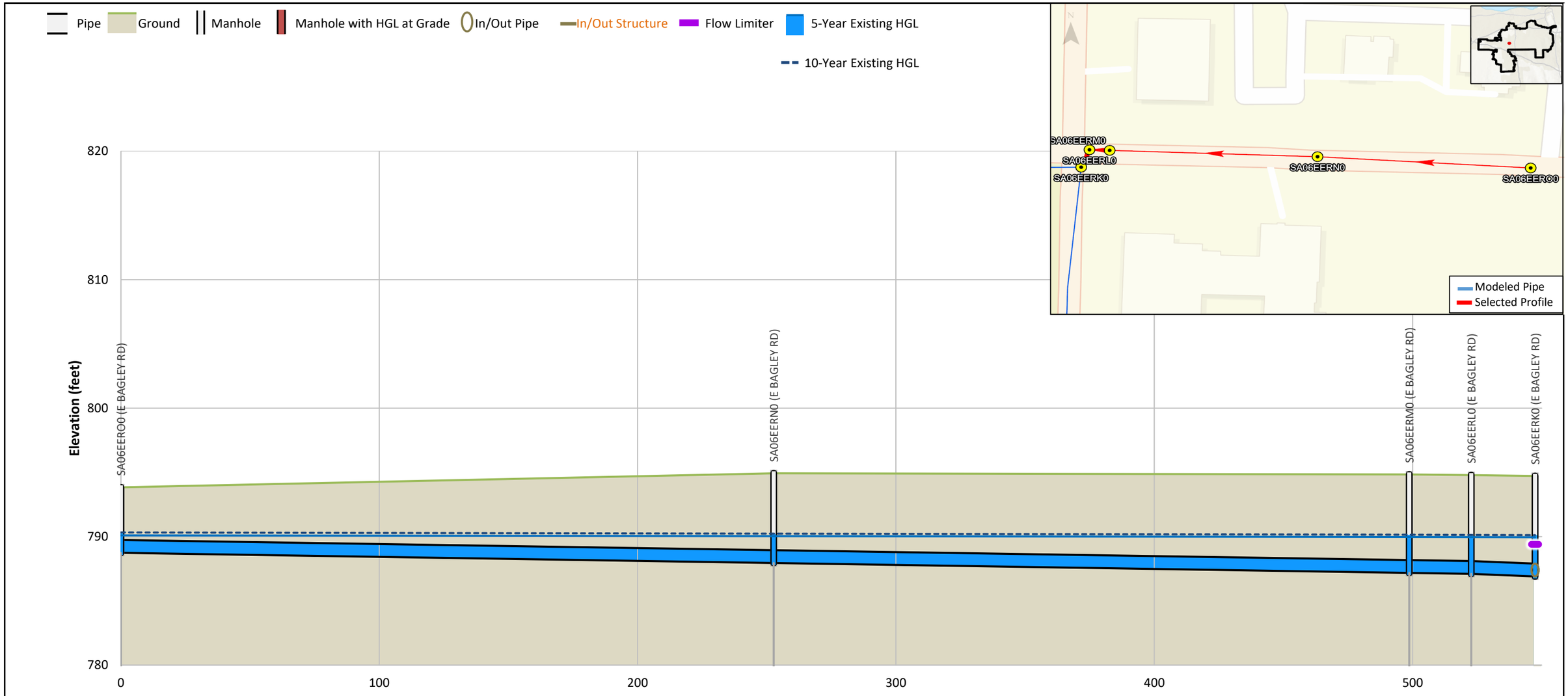
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

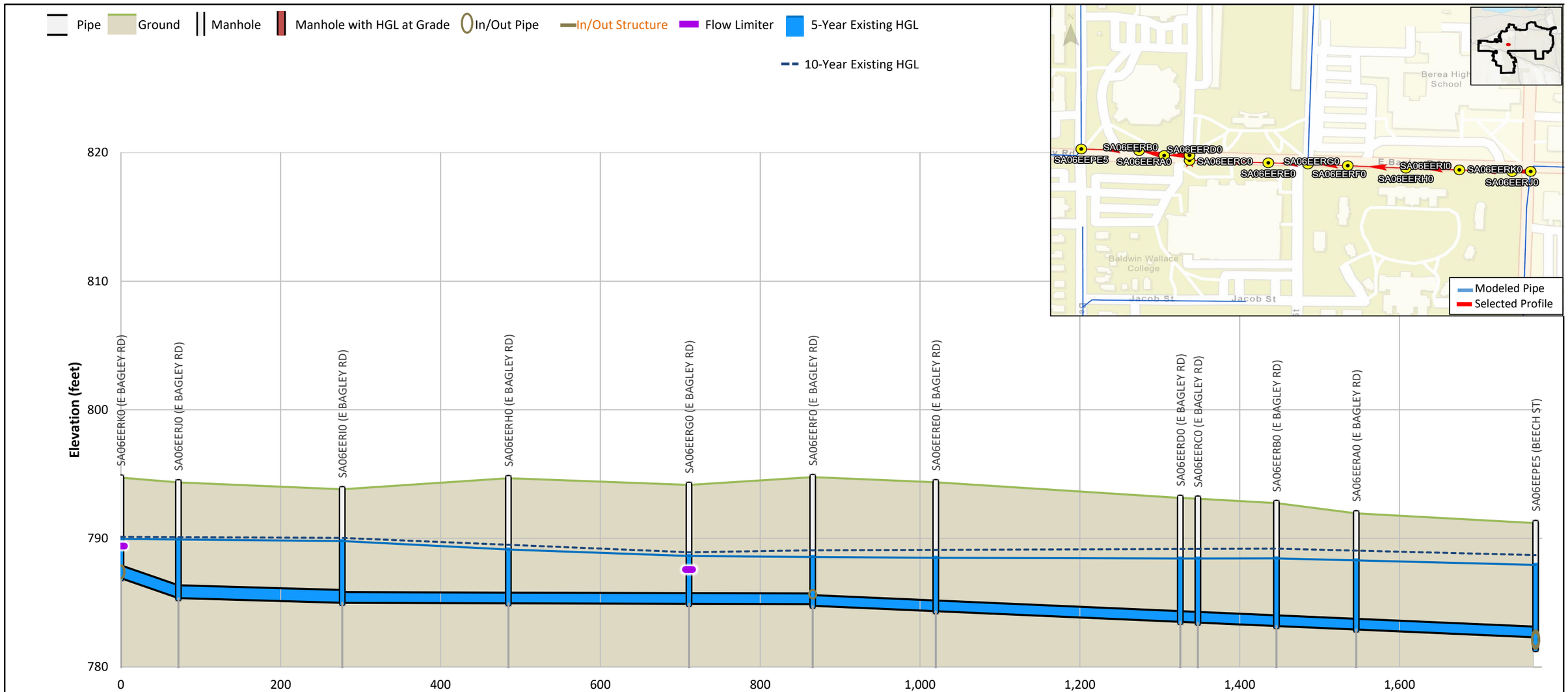
https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 313, Date created: 3/11/2021

| | | |



Output below = 5-Year Existing HGL

Branch 314, Date created: 3/11/2021

Depth to Invert (ft)		9.0	8.8	9.7	9.2	9.9	10	9.6	9.6	9.6	9.0		
Depth to HGL (ft)		4.4	4.0	5.5	5.5	6.2	5.9	4.7	4.6	4.3	3.7		
Diameter (in)	12	12	10	10	10	10	10		10	10	10		
Capacity (mgd)	3.1	0.89	0.17	0.17	0.17	0.67	0.67		0.67	0.67	0.67		
Max Depth (ft)	4.6	4.8	4.8	4.2	3.7	4.2	4.9		5.3	5.4	5.6		
Dep abv Crown (ft)	3.6	3.8	4.0	3.4	2.9	3.3	4.1		4.4	4.5	4.8		
Max Flow (mgd)	0.60	0.54	0.75	0.75	0.80	0.84	0.84		0.85	1.0	0.97		
Max Velocity (ft/s)	1.5	0.84	1.6	1.6	2.8	2.4	2.0		2.1	2.7	3.8		
Slope (ft/ft)	0.022	0.0018	0.00017	0.00017	0.00017	0.0027	0.0027		0.0027	0.0027	0.0027		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

E BAGLEY RD to BEECH ST

Brown AND Caldwell

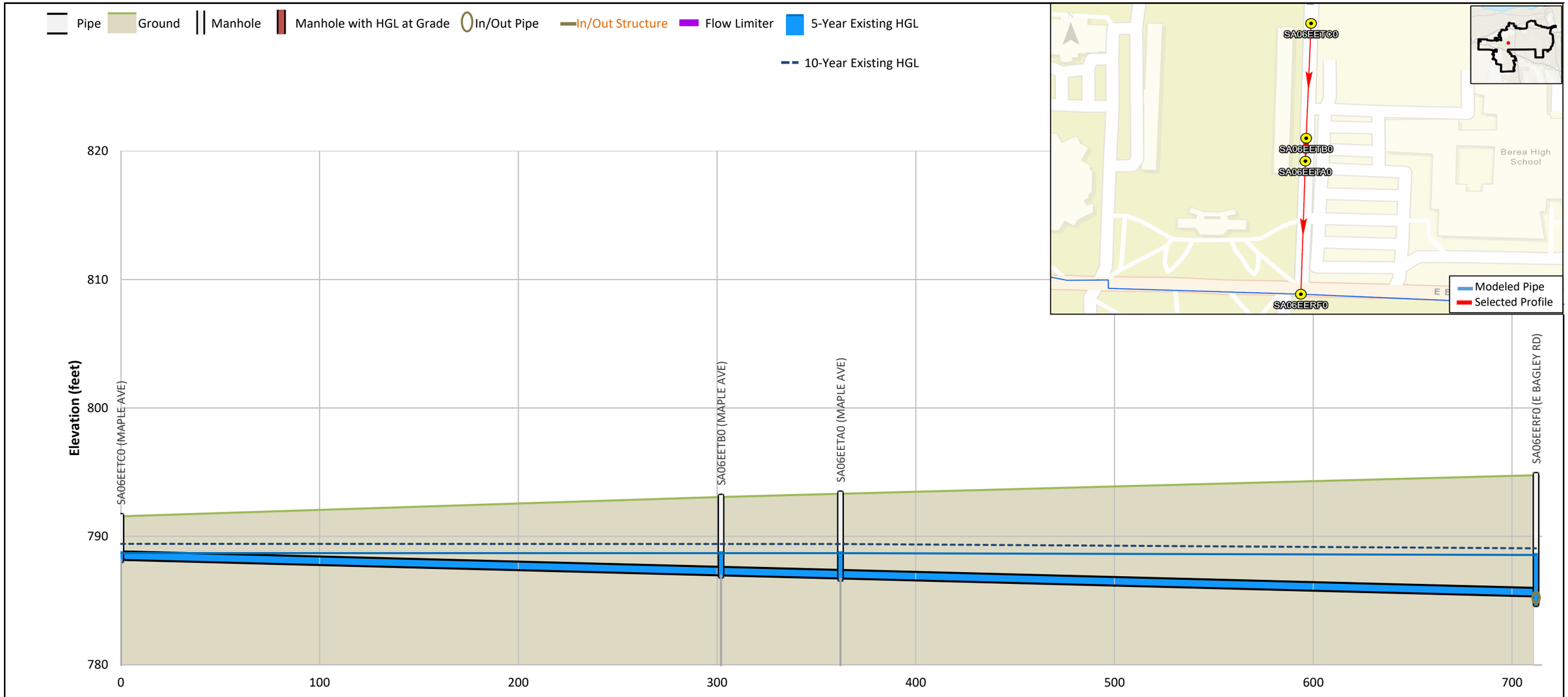
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

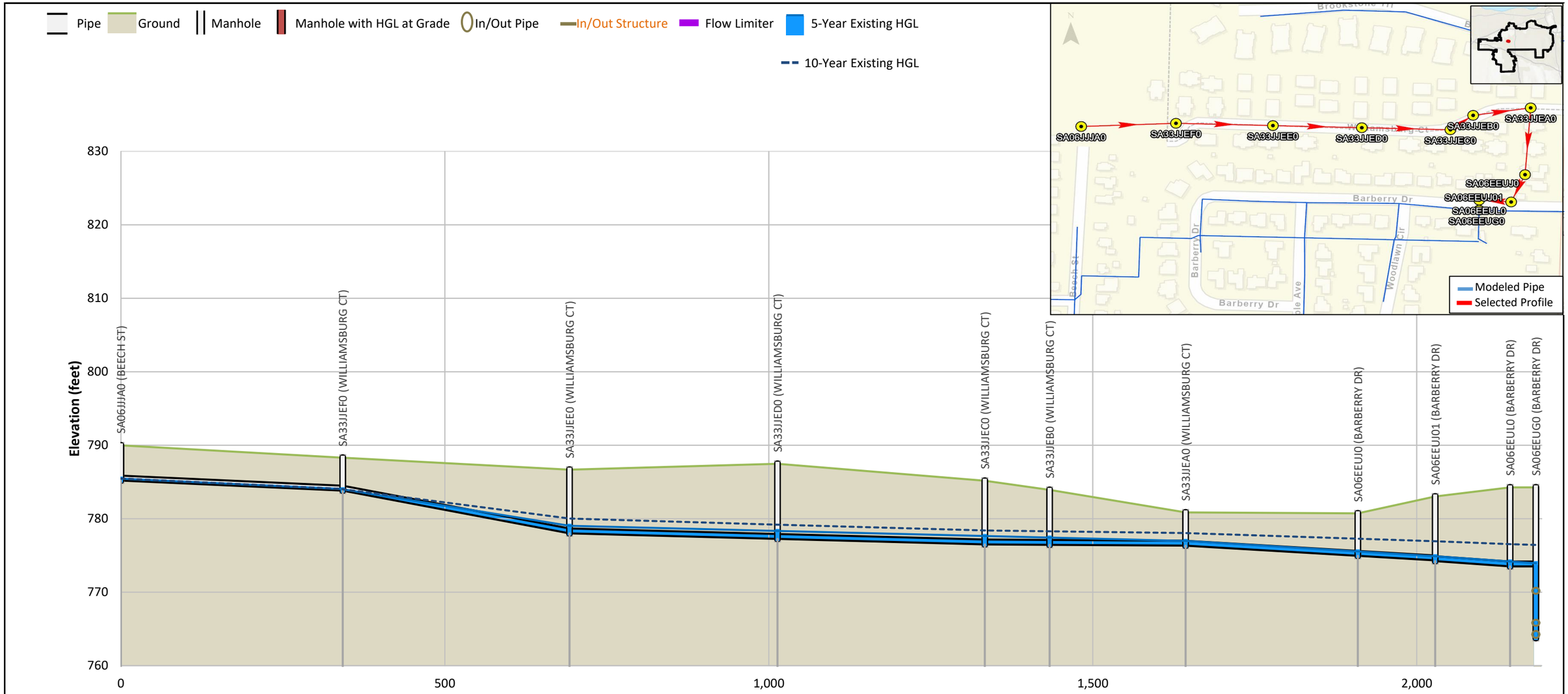
https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/DesktopHGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 315, Date created: 3/11/2021

| | | |



Output below = 5-Year Existing HGL

Branch 316, Date created: 3/11/2021

Depth to Invert (ft)		4.5	8.7	10	8.7	7.5	4.5	5.8	8.7	11	
Depth to HGL (ft)		4.3	7.6	9.1	7.5	6.5	3.9	5.2	8.1	10	
Diameter (in)	8	8	8	8	8	8	8	8	8		
Capacity (mgd)	0.45	0.92	0.34	0.34	0.17	0.16	0.51	0.51	0.56		
Max Depth (ft)	0.26	1.0	1.1	1.1	1.1	0.99	0.65	0.60	0.67		
Dep abv Crown (ft)	-	0.36	0.41	0.48	0.48	0.32	-	-	0.00		
Max Flow (mgd)	0.14	0.14	0.34	0.33	0.33	0.33	0.51	0.51	0.56		
Max Velocity (ft/s)	2.2	0.62	1.8	1.3	1.3	1.7	2.6	3.2	2.4		
Slope (ft/ft)	0.0040	0.017	0.0023	0.0023	0.00059	0.00050	0.0052	0.0052	0.0062		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-01, BE-03, MI-12

Community: Berea, Middleburg Heights

BEECH ST to BARBERRY DR

Brown AND Caldwell

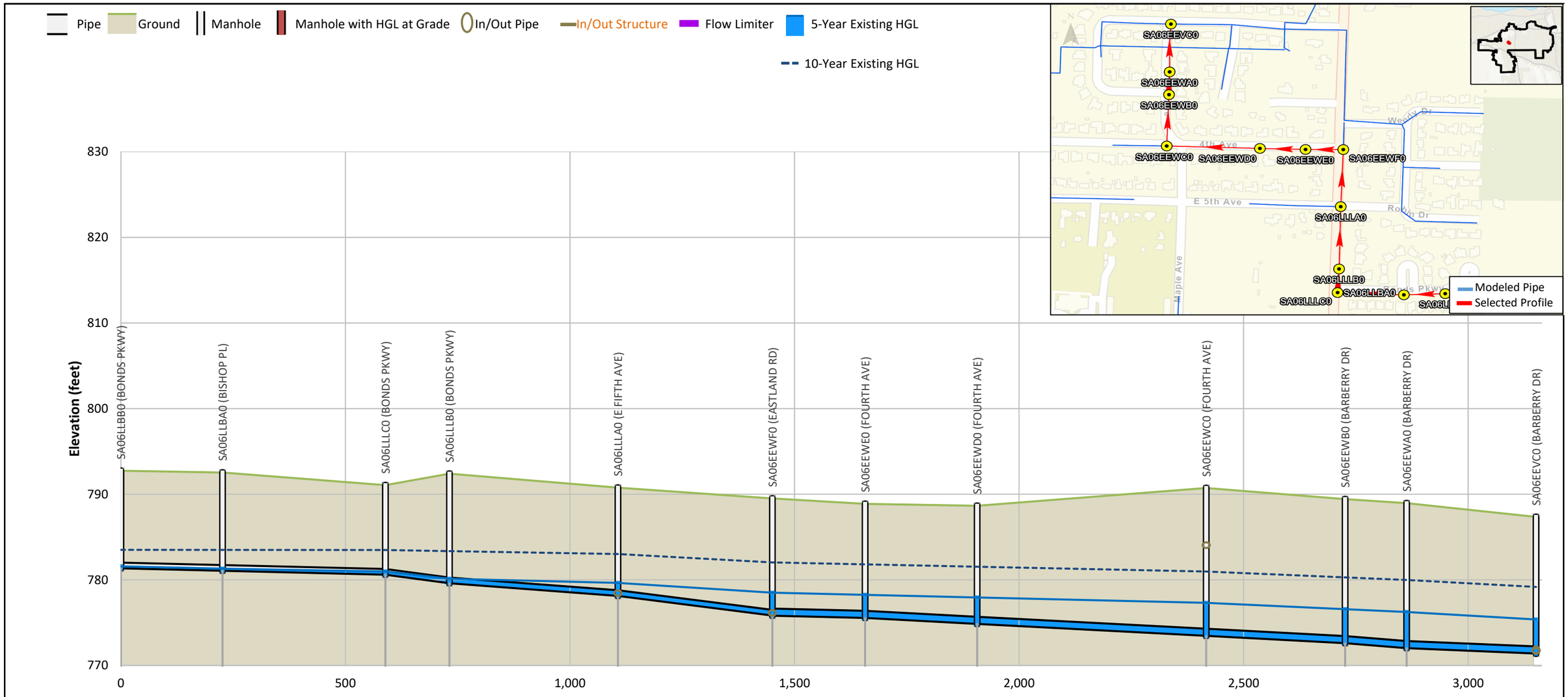
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 317, Date created: 3/11/2021

Depth to Invert (ft)		11		10	13	13	14	13	14	17		17	17	
Depth to HGL (ft)		11		10	12	11	11	11	11	13		13	13	
Diameter (in)	8		8		8	8	8	10	10		10	10		10
Capacity (mgd)	0.29		0.25	0.59	0.45	0.58	0.46	0.68	0.67		0.68	0.84		0.60
Max Depth (ft)	0.25		0.38	0.53	1.5	2.7	2.7	3.1	3.9		4.0	4.2		4.2
Dep abv Crown (ft)	-		-	-	0.86	2.0	1.9	2.3	3.0		3.1	3.4		3.4
Max Flow (mgd)	0.08		0.08	0.36	0.33	0.57	0.64	0.61	0.50		0.71	0.70		0.80
Max Velocity (ft/s)	0.99		0.61	2.2	1.5	2.4	2.2	2.2	1.4		2.5	1.6		1.8
Slope (ft/ft)	0.0013		0.0013	0.0070	0.0039	0.0067	0.0013	0.0028	0.0027		0.0028	0.0042		0.0022

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03
Community: Berea
BONDS PKWY to BARBERRY DR

Brown AND Caldwell

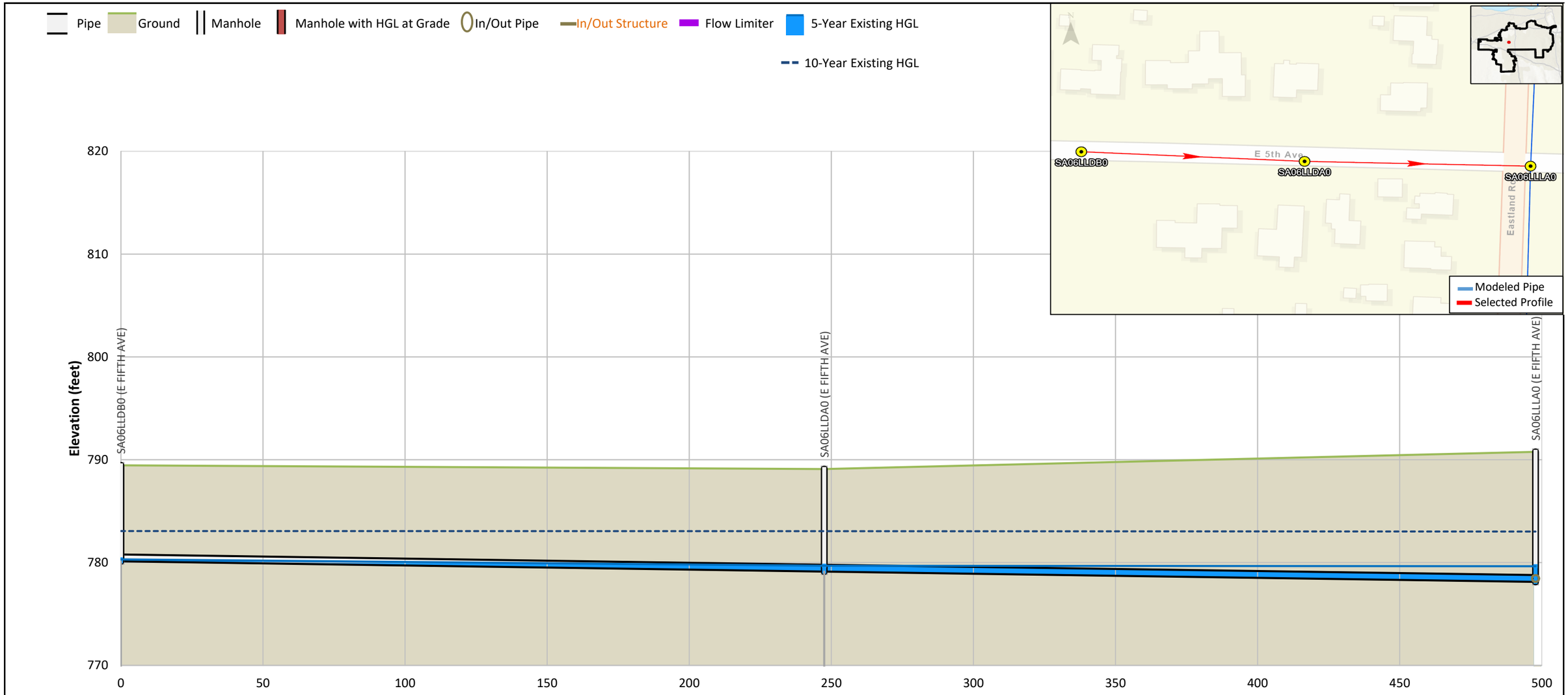
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 318, Date created: 3/11/2021

Depth to Invert (ft)		10.0	
Depth to HGL (ft)		9.4	
Diameter (in)	8		8
Capacity (mgd)	0.45		0.45
Max Depth (ft)	0.57		1.5
Dep abv Crown (ft)	-		0.86
Max Flow (mgd)	0.08		0.13
Max Velocity (ft/s)	0.92		0.67
Slope (ft/ft)	0.0040		0.0040

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

E FIFTH AVE

Brown AND Caldwell

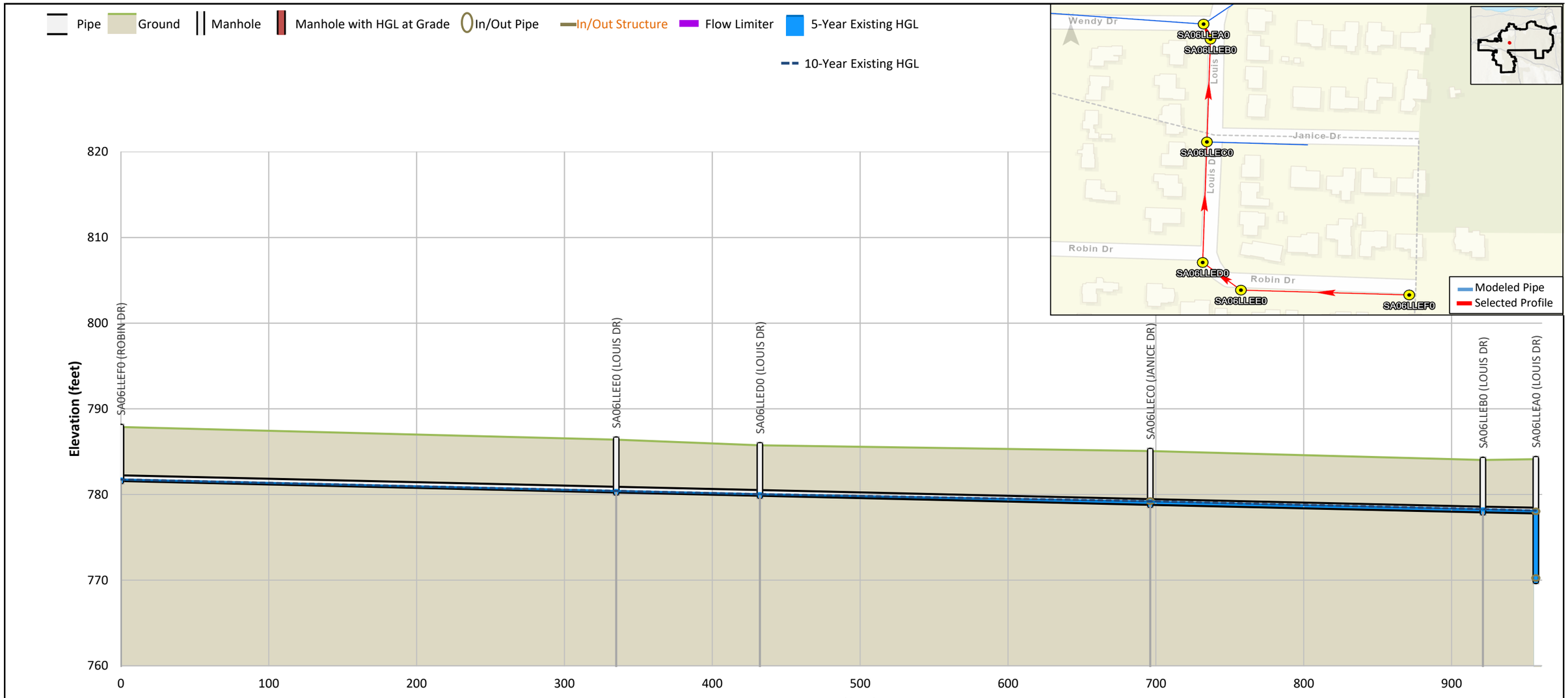
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 319, Date created: 3/11/2021

Depth to Invert (ft)		6.2		5.9		6.3		6.1				
Depth to HGL (ft)		6.0		5.7		5.9		5.8				
Diameter (in)	8		8		8		8		8			
Capacity (mgd)	0.45		0.44		0.45		0.44		0.47			
Max Depth (ft)	0.18		0.18		0.38		0.38		0.35			
Dep abv Crown (ft)	-		-		-		-		-			
Max Flow (mgd)	0.07		0.07		0.07		0.27		0.27			
Max Velocity (ft/s)	1.4		1.4		0.51		2.3		2.7			
Slope (ft/ft)	0.0040		0.0039		0.0040		0.0039		0.0034			

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03, MI-13
Community: Berea
ROBIN DR to LOUIS DR

Brown AND Caldwell

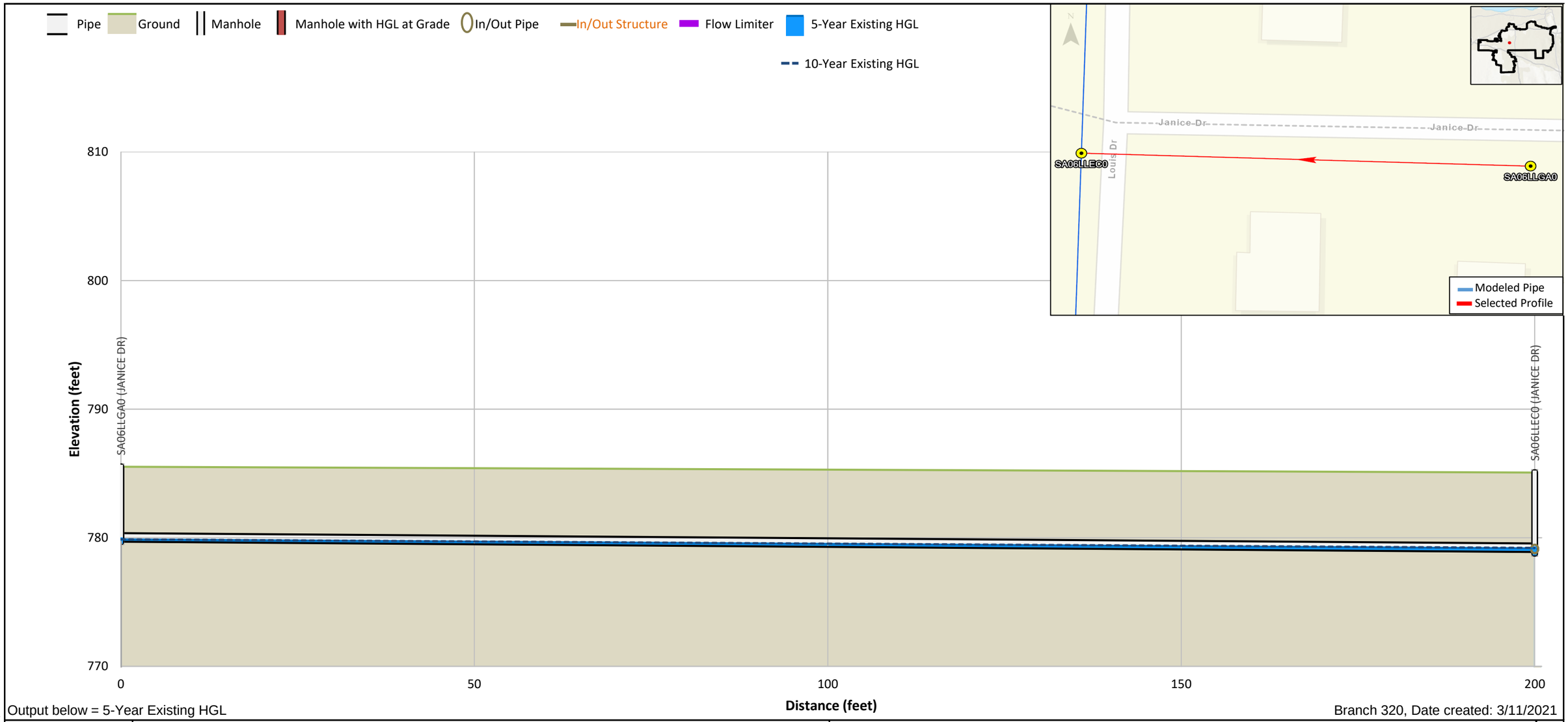
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 320, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	0.45	
Max Depth (ft)	0.28	
Dep abv Crown (ft)	-	
Max Flow (mgd)	0.07	
Max Velocity (ft/s)	1.1	
Slope (ft/ft)	0.0040	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

JANICE DR

Brown AND Caldwell

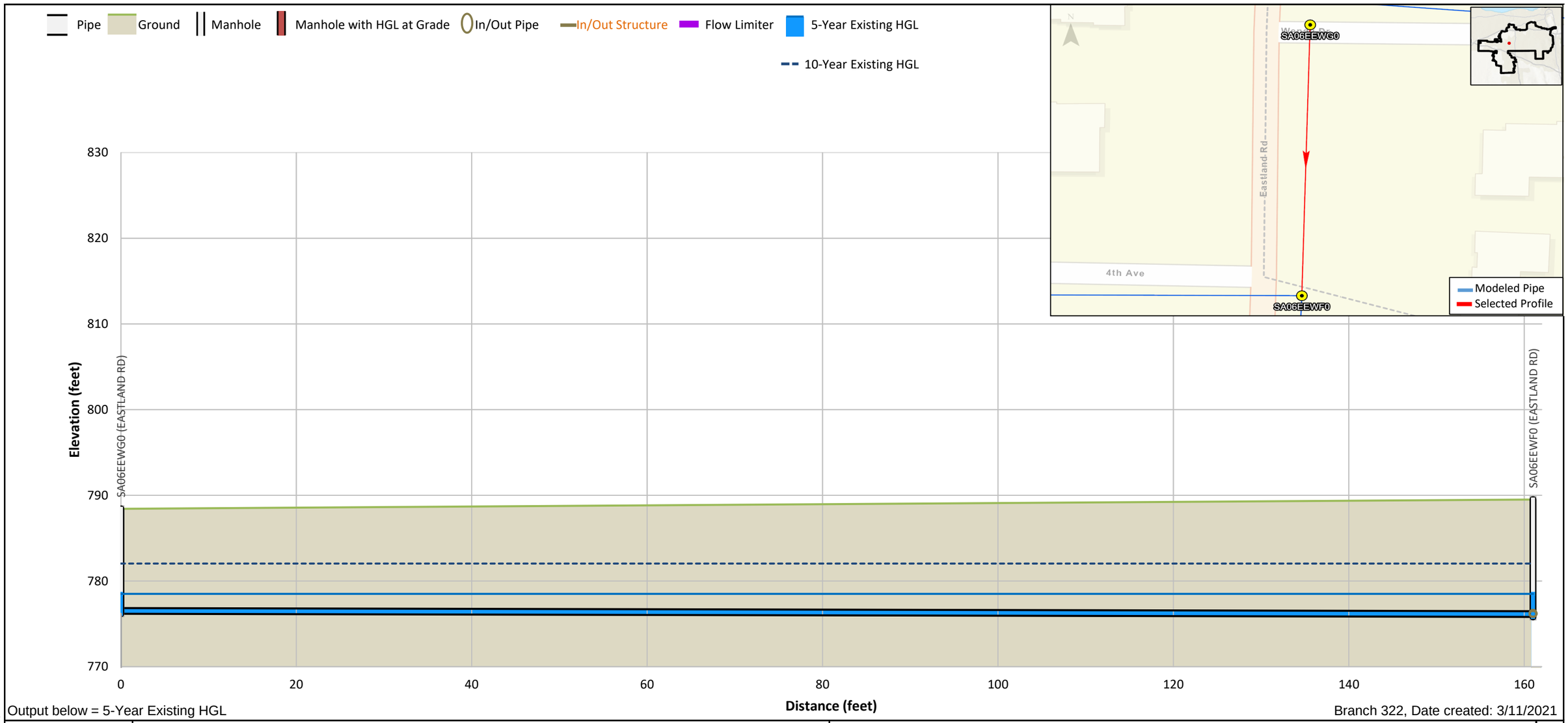
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 322, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	0.34	
Max Depth (ft)	2.7	
Dep abv Crown (ft)	2.0	
Max Flow (mgd)	-0.05	
Max Velocity (ft/s)	-0.27	
Slope (ft/ft)	0.0023	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

EASTLAND RD

Brown AND Caldwell

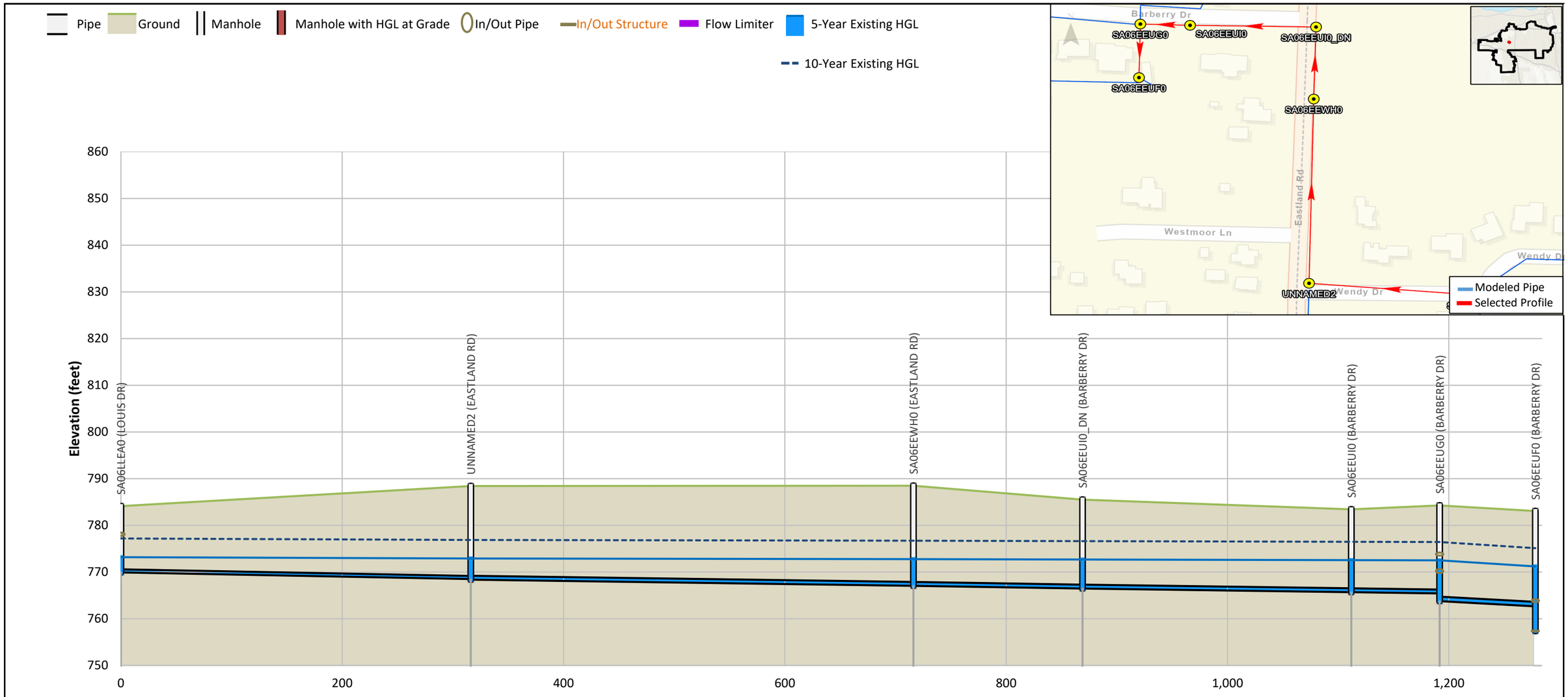
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 323, Date created: 3/11/2021

Depth to Invert (ft)	20	21	19	18	19		
Depth to HGL (ft)	16	16	13	11	12		
Diameter (in)	8	10	10	10	10	10	11.6
Capacity (mgd)	0.54	0.74	0.79	0.73	0.75	1.6	
Max Depth (ft)	4.4	5.7	6.2	6.9	7.1	8.7	
Dep abv Crown (ft)	3.7	4.9	5.4	6.0	6.3	7.8	
Max Flow (mgd)	0.40	0.40	0.48	0.56	0.60	2.0	
Max Velocity (ft/s)	3.1	1.9	2.2	2.3	3.1	5.5	
Slope (ft/ft)	0.0045	0.0033	0.0038	0.0032	0.0034	0.013	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03, MI-13
Community: Berea, Middleburg Heights
LOUIS DR to BARBERRY DR

Brown AND Caldwell

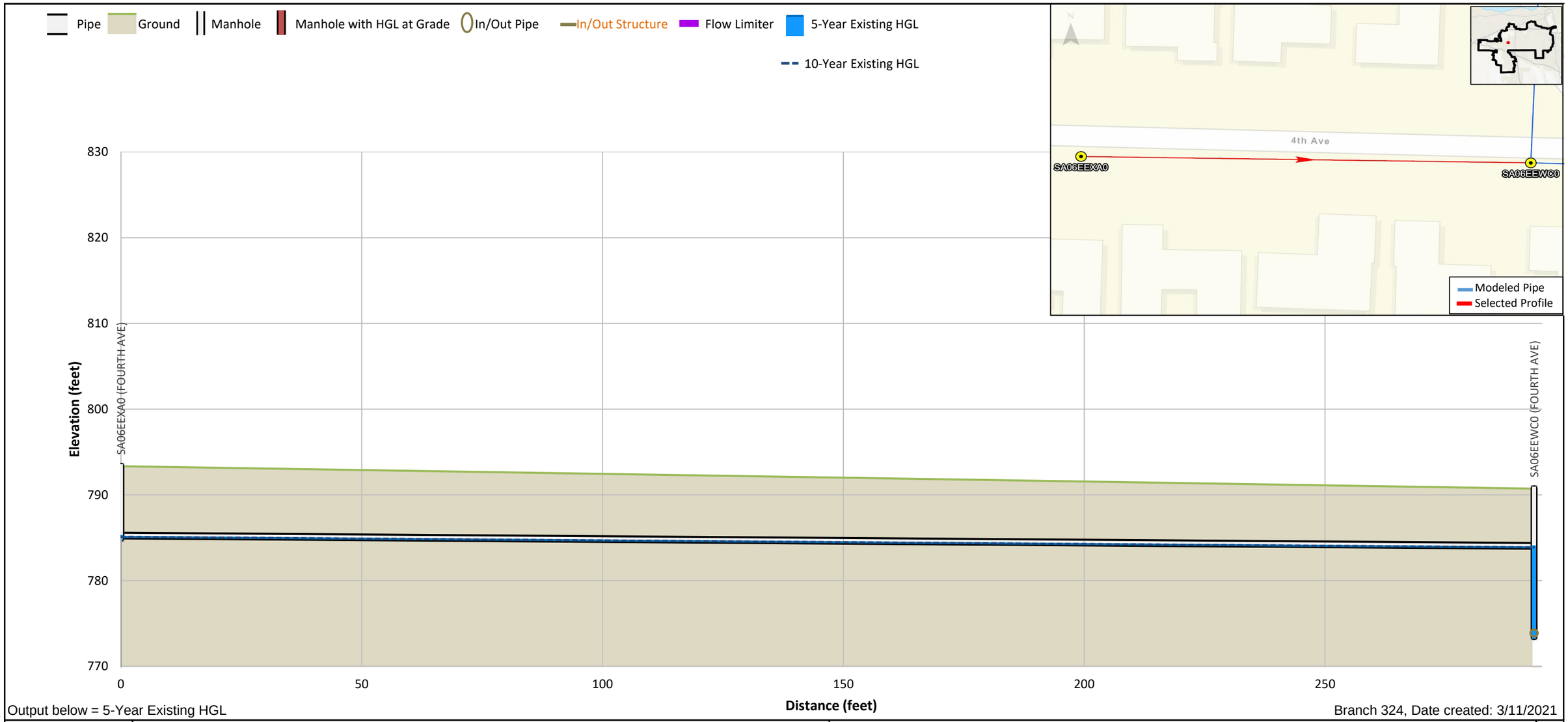
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 324, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	0.45	
Max Depth (ft)	0.18	
Dep abv Crown (ft)	-	
Max Flow (mgd)	0.07	
Max Velocity (ft/s)	1.8	
Slope (ft/ft)	0.0041	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

FOURTH AVE

Brown AND Caldwell

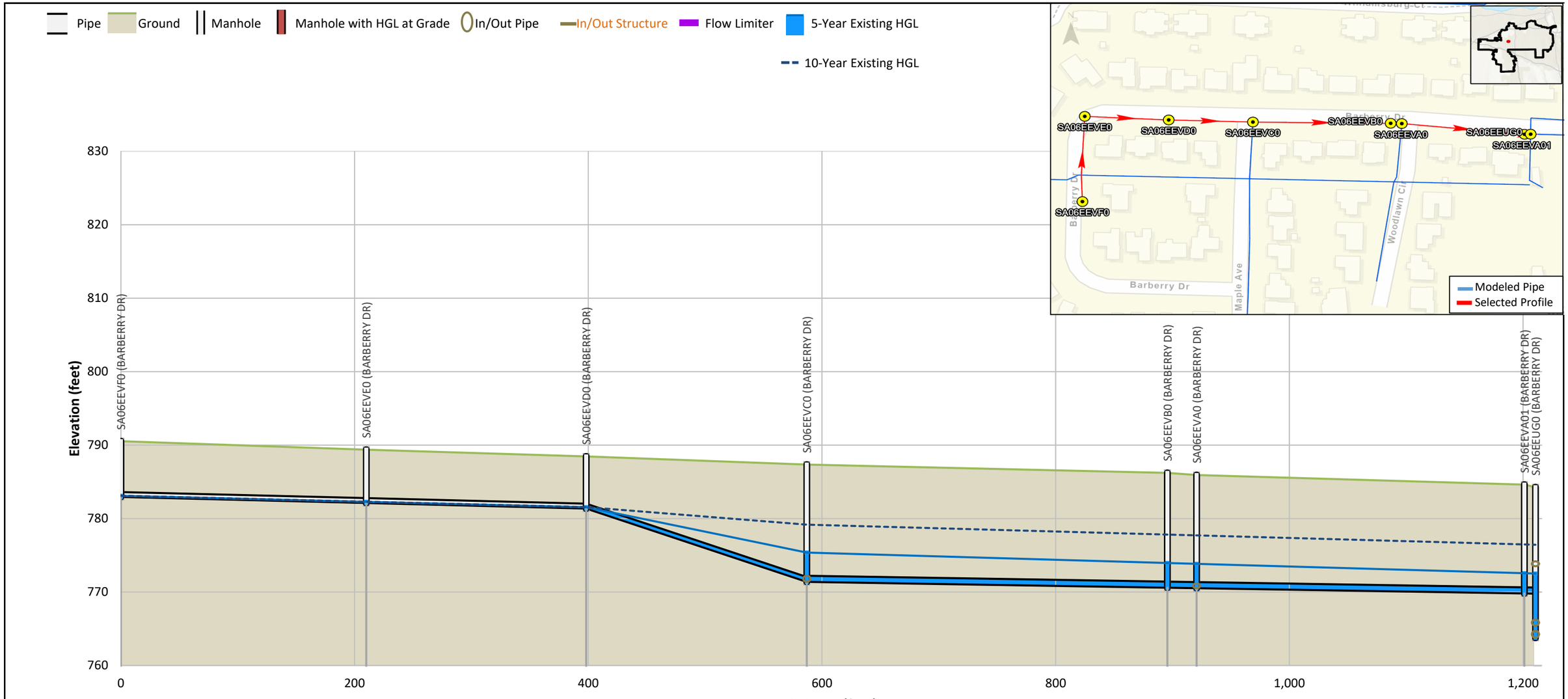
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/DesktopHGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 325, Date created: 3/11/2021

Depth to Invert (ft)		7.3	7.1	16	16	15		
Depth to HGL (ft)		7.1	6.9	12	12	12		
Diameter (in)	8	8	8	10	10	10		
Capacity (mgd)	0.44	0.45	1.6	0.65	0.65	0.74		
Max Depth (ft)	0.16	0.19	4.0	4.0	3.4	3.3		
Dep abv Crown (ft)	-	-	3.3	3.2	2.5	2.5		
Max Flow (mgd)	0.05	0.05	0.28	1.00	1.00	1.1		
Max Velocity (ft/s)	1.3	1.0	1.2	2.5	2.5	3.8		
Slope (ft/ft)	0.0039	0.0040	0.053	0.0026	0.0026	0.0026		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

BARBERRY DR

Brown AND Caldwell

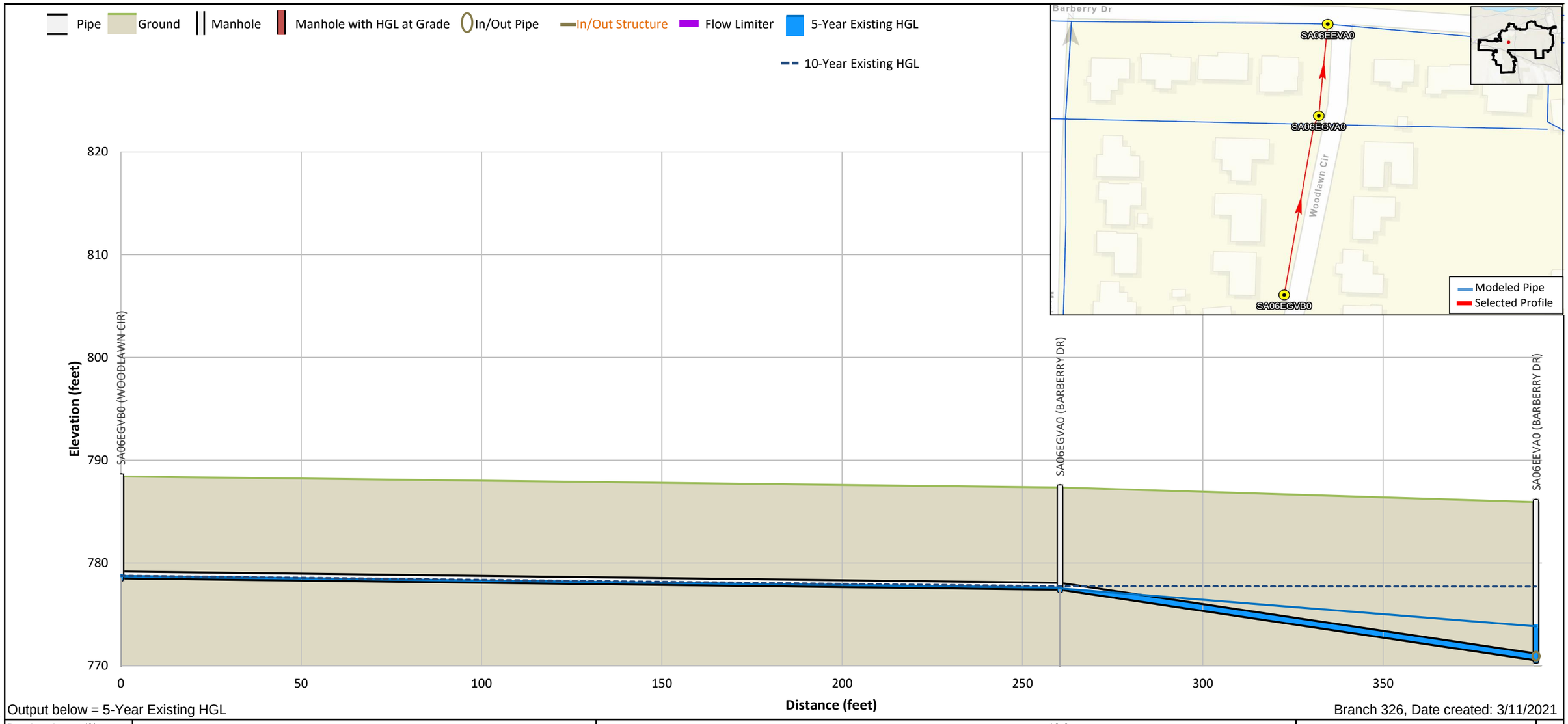
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 326, Date created: 3/11/2021

Depth to Invert (ft)		10.0	
Depth to HGL (ft)		9.7	
Diameter (in)	8		8
Capacity (mgd)	0.46		1.6
Max Depth (ft)	0.24		3.3
Dep abv Crown (ft)	-		2.6
Max Flow (mgd)	0.12		0.12
Max Velocity (ft/s)	2.1		0.52
Slope (ft/ft)	0.0042		0.052

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

WOODLAWN CIR to BARBERRY DR

Brown AND Caldwell

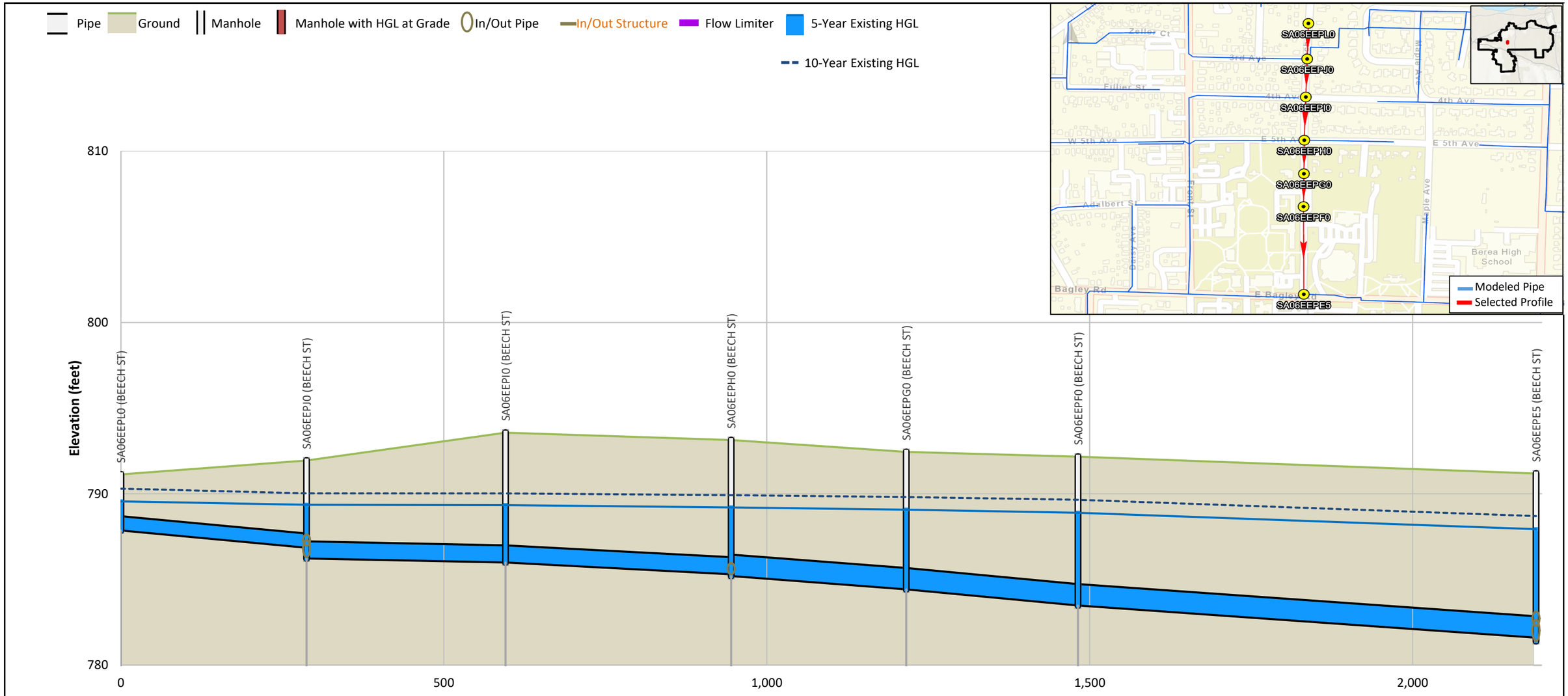
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 328, Date created: 3/11/2021

Depth to Invert (ft)		5.1	7.6	7.8	8.0	8.7	
Depth to HGL (ft)		2.6	4.2	3.9	3.4	3.3	
Diameter (in)	10	12	12	15	15	15	
Capacity (mgd)	0.87	0.66	0.93	2.0	2.3	2.0	
Max Depth (ft)	2.5	3.4	3.9	4.7	5.4	6.3	
Dep abv Crown (ft)	1.7	2.4	2.9	3.4	4.2	5.1	
Max Flow (mgd)	0.77	1.1	1.2	1.7	1.6	1.4	
Max Velocity (ft/s)	6.1	2.7	3.3	2.9	2.3	3.1	
Slope (ft/ft)	0.0035	0.00076	0.0020	0.0029	0.0035	0.0027	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

BEECH ST

Brown AND Caldwell

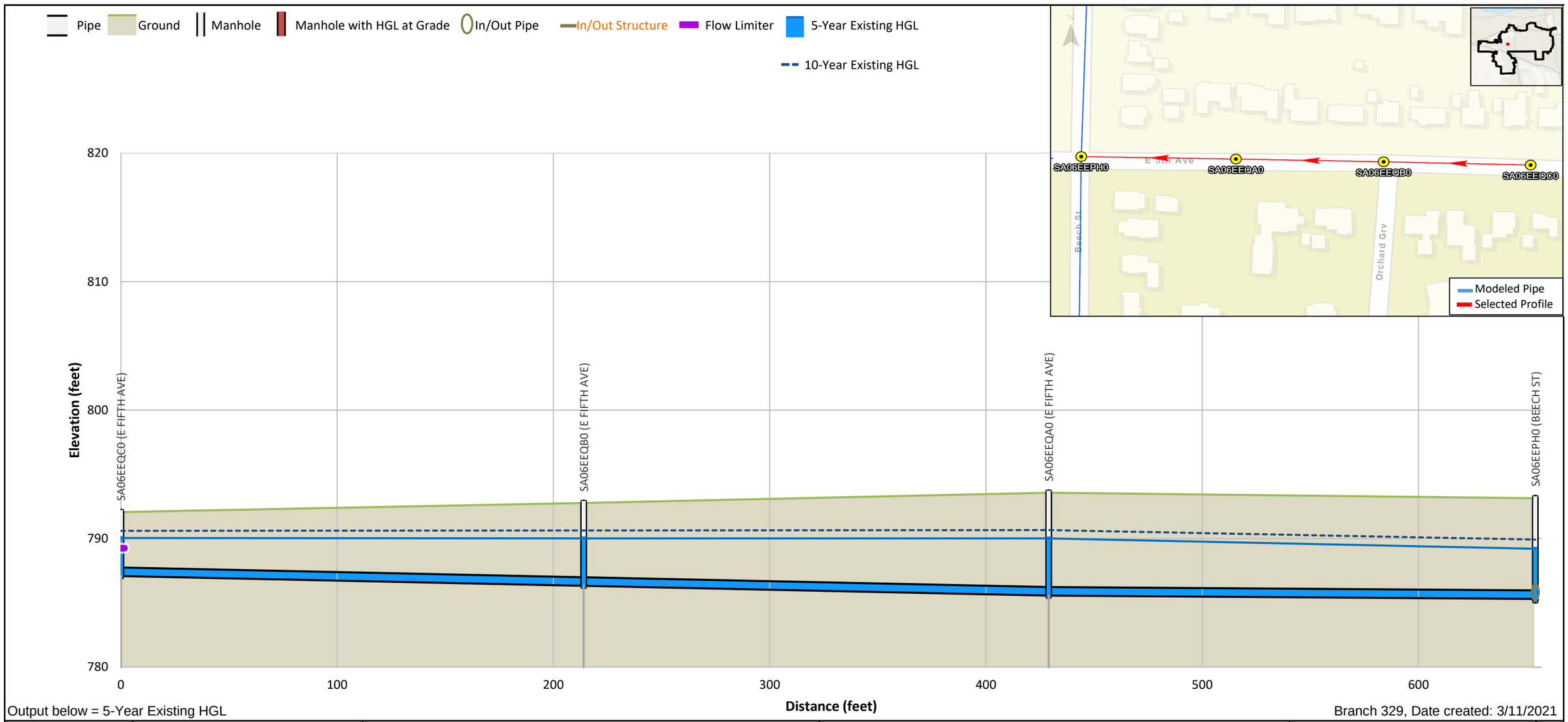
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 329, Date created: 3/11/2021

Depth to Invert (ft)		6.4	8.0	
Depth to HGL (ft)		2.8	3.6	
Diameter (in)	8	8	8	
Capacity (mgd)	0.42	0.42	0.24	
Max Depth (ft)	3.7	4.5	4.5	
Dep abv Crown (ft)	3.0	3.8	3.8	
Max Flow (mgd)	0.35	0.37	0.64	
Max Velocity (ft/s)	1.9	1.2	2.7	
Slope (ft/ft)	0.0036	0.0035	0.0012	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

E FIFTH AVE to BEECH ST

Brown AND Caldwell

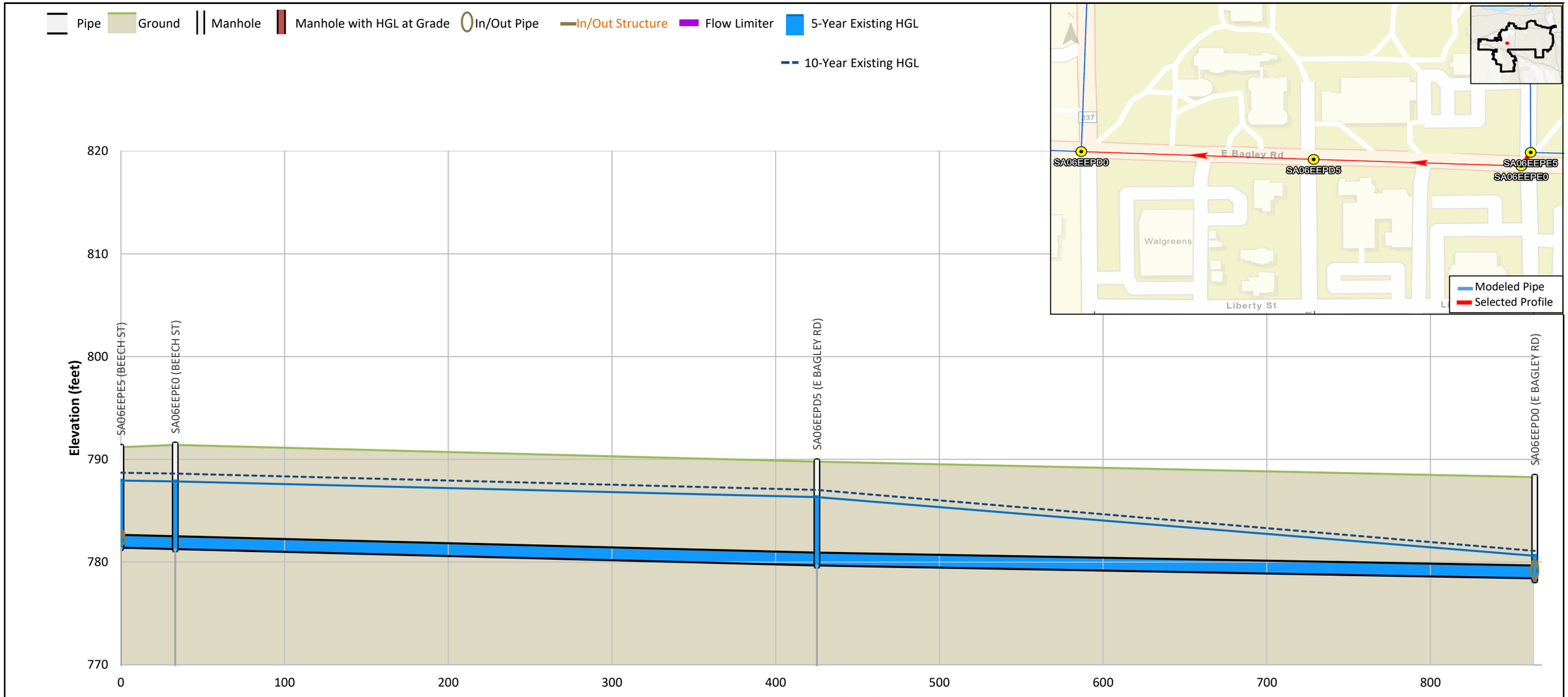
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 330, Date created: 3/11/2021

Depth to Invert (ft)		10	10	
Depth to HGL (ft)		3.6	3.5	
Diameter (in)	15	15	15	
Capacity (mgd)	2.4	2.4	1.1	
Max Depth (ft)	6.6	6.7	6.7	
Dep abv Crown (ft)	5.3	5.4	5.4	
Max Flow (mgd)	2.1	2.4	2.4	
Max Velocity (ft/s)	2.9	2.3	4.6	
Slope (ft/ft)	0.0041	0.0041	0.0029	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

BEECH ST to E BAGLEY RD

Brown AND Caldwell

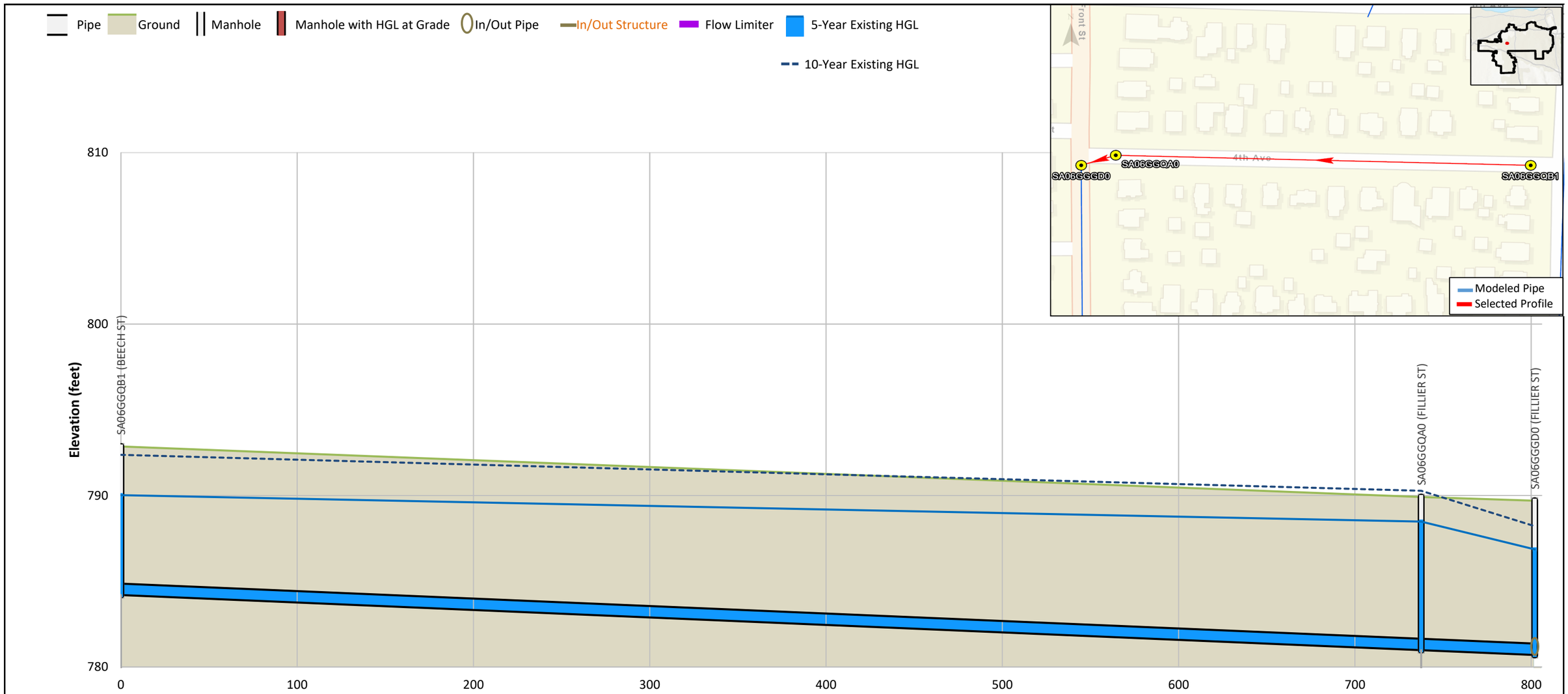
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 331, Date created: 3/11/2021

Depth to Invert (ft)			8.9	
Depth to HGL (ft)			1.4	
Diameter (in)	8			8
Capacity (mgd)	0.47			0.47
Max Depth (ft)	7.5			7.5
Dep abv Crown (ft)	6.8			6.8
Max Flow (mgd)	0.34			1.1
Max Velocity (ft/s)	0.67			2.6
Slope (ft/ft)	0.0044			0.0044

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

BEECH ST to FILLIER ST

Brown AND Caldwell

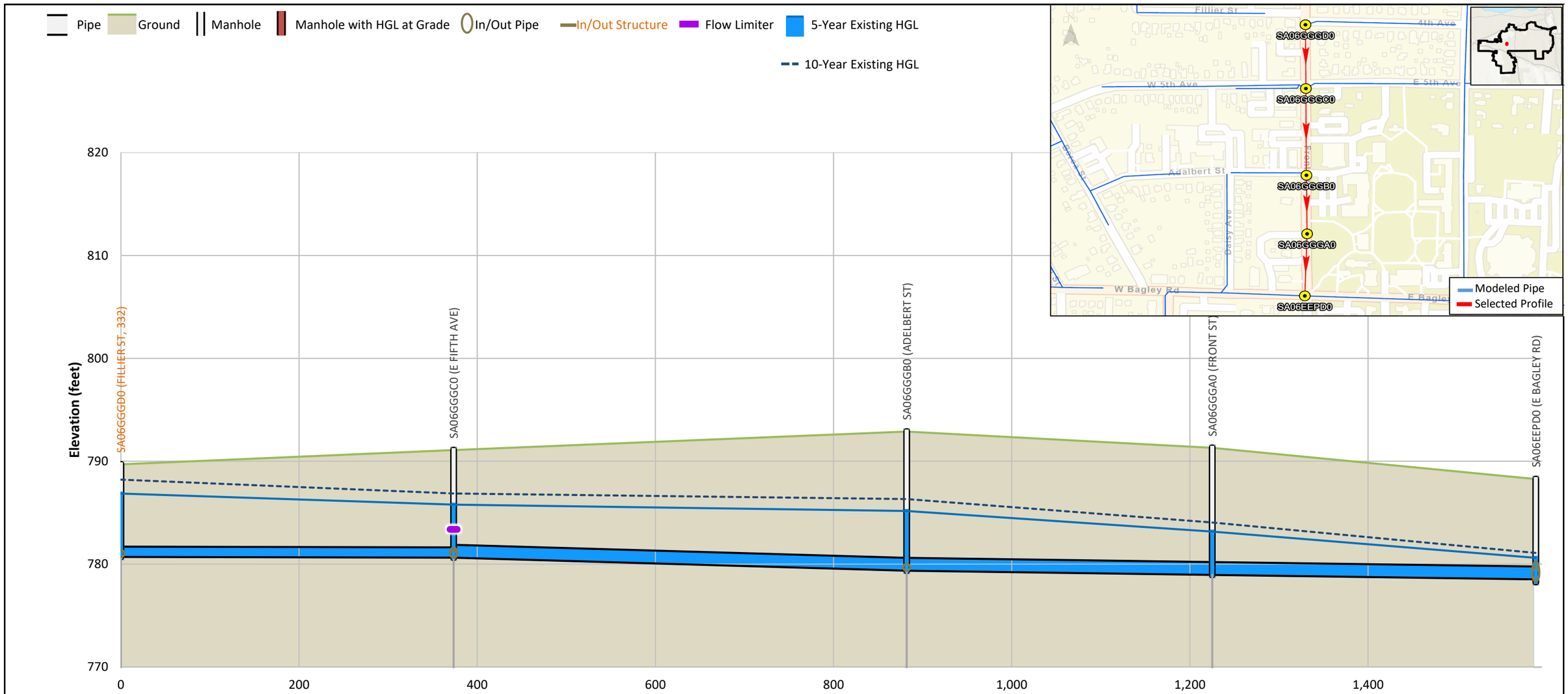
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/DesktopHGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 332, Date created: 3/11/2021

Depth to Invert (ft)		10	14	12	
Depth to HGL (ft)		5.3	7.7	8.1	
Diameter (in)	12	15	15	15	15
Capacity (mgd)	0.29	1.9	1.3	1.3	1.3
Max Depth (ft)	6.2	5.8	5.8	4.2	
Dep abv Crown (ft)	5.2	4.6	4.6	3.0	
Max Flow (mgd)	1.1	2.1	2.9	3.2	
Max Velocity (ft/s)	1.6	2.3	3.1	3.7	
Slope (ft/ft)	0.00019	0.0025	0.0012	0.0012	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

FILLIER ST to E BAGLEY RD

Brown AND Caldwell

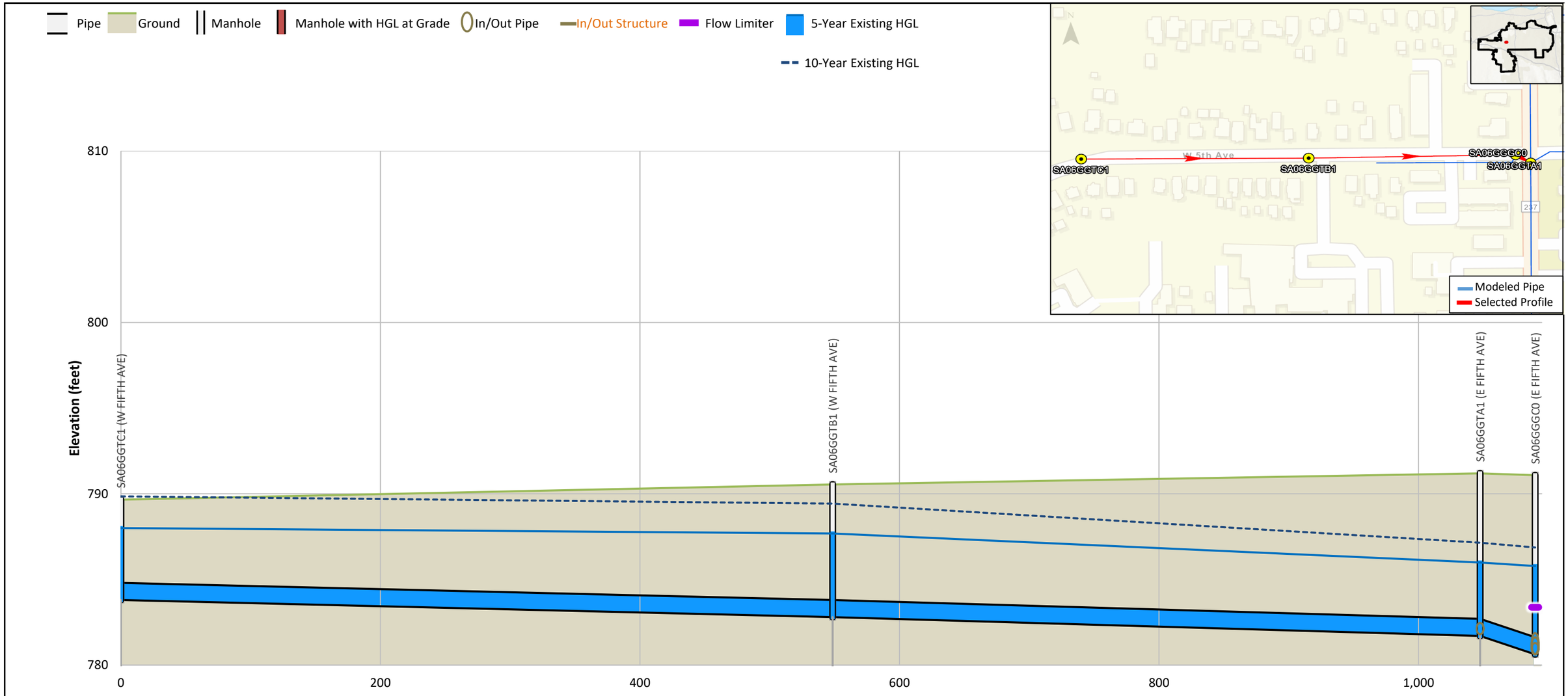
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/DesktopHGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 333, Date created: 3/11/2021

Depth to Invert (ft)		7.7	9.5	
Depth to HGL (ft)		2.9	5.2	
Diameter (in)	12	12	12	12
Capacity (mgd)	0.89	0.98	3.3	
Max Depth (ft)	4.9	4.9	5.2	
Dep abv Crown (ft)	3.9	3.9	4.2	
Max Flow (mgd)	0.50	1.2	1.5	
Max Velocity (ft/s)	0.73	3.1	2.1	
Slope (ft/ft)	0.0018	0.0022	0.025	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03
Community: Berea
W FIFTH AVE to E FIFTH AVE

Brown AND Caldwell

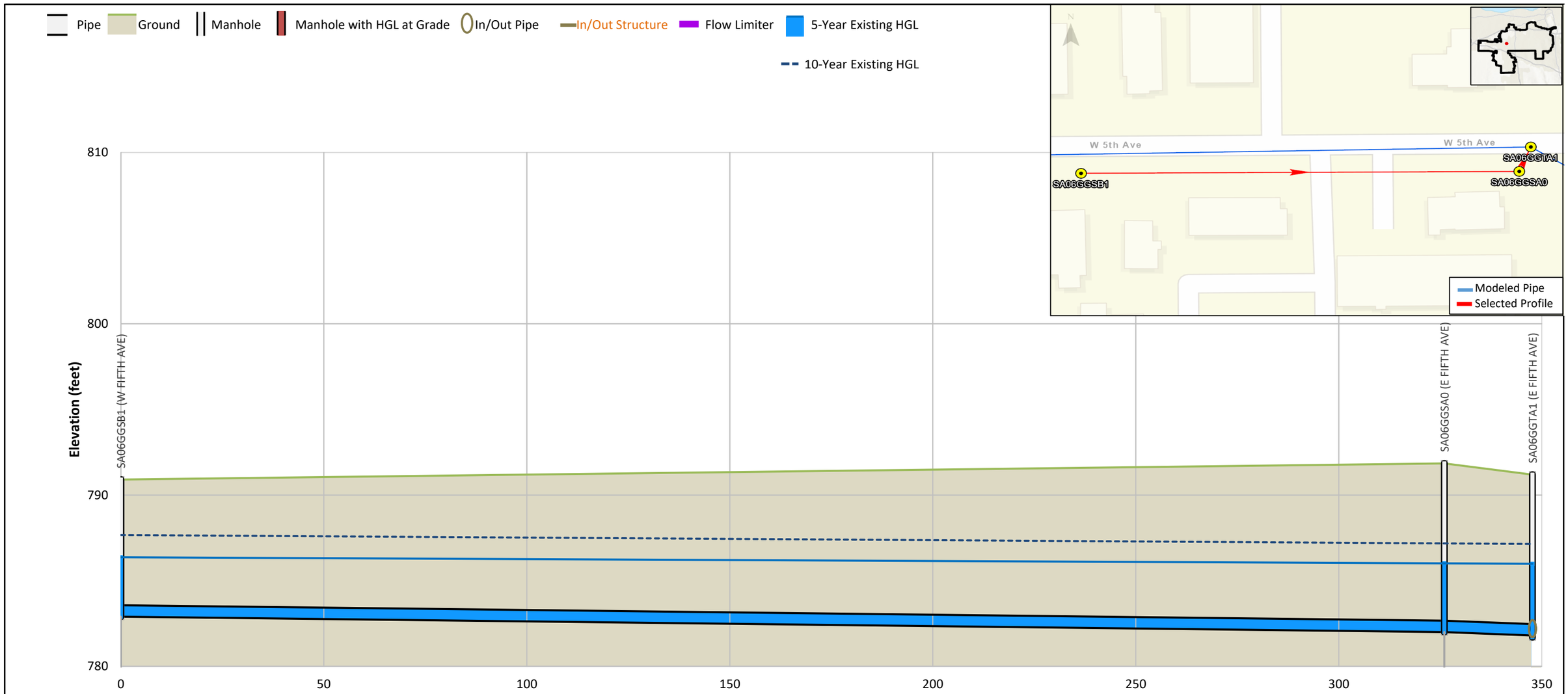
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

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Output below = 5-Year Existing HGL

Branch 334, Date created: 3/11/2021

Depth to Invert (ft)		9.8	
Depth to HGL (ft)		5.8	
Diameter (in)	8		8
Capacity (mgd)	0.37		0.68
Max Depth (ft)	4.0		4.2
Dep abv Crown (ft)	3.3		3.5
Max Flow (mgd)	0.23		0.24
Max Velocity (ft/s)	2.3		2.2
Slope (ft/ft)	0.0028		0.0092

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

W FIFTH AVE to E FIFTH AVE

Brown AND Caldwell

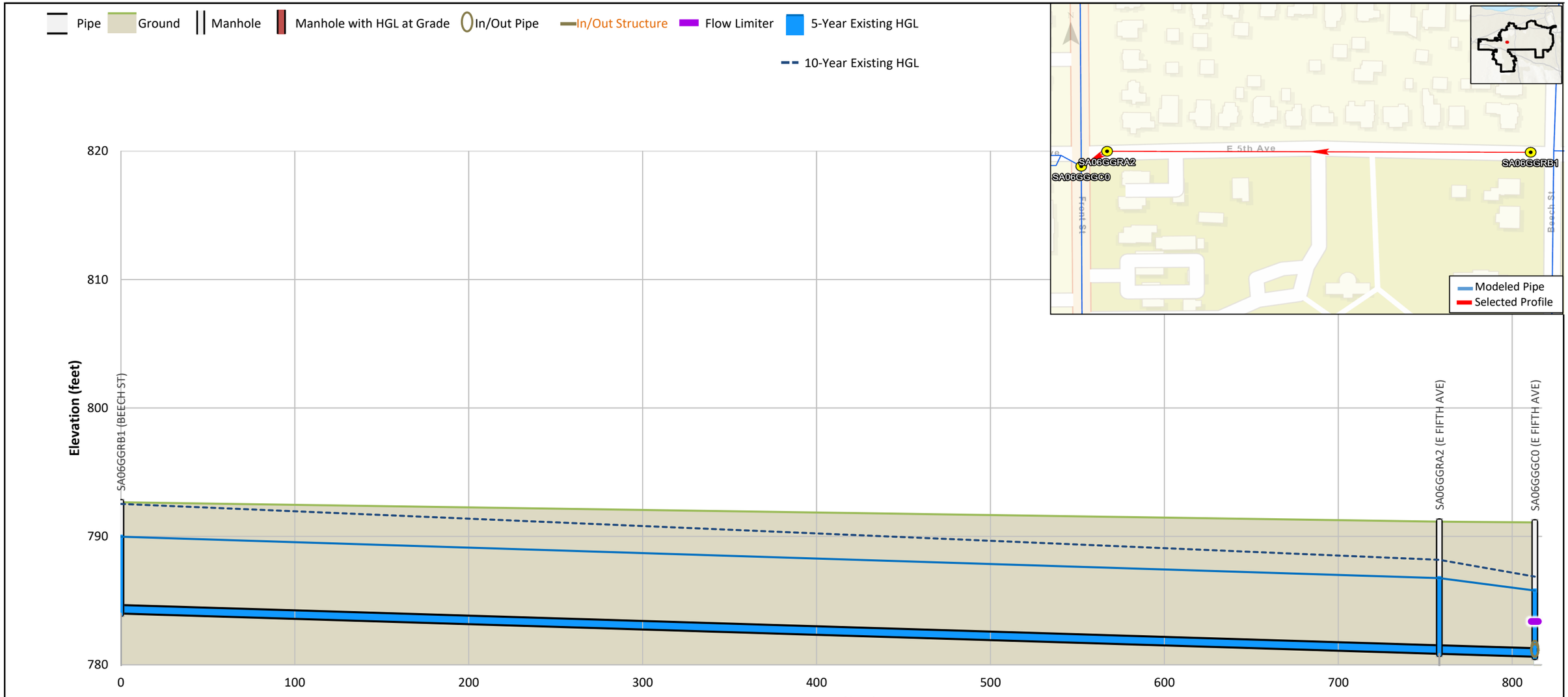
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 335, Date created: 3/11/2021

Depth to Invert (ft)		10	
Depth to HGL (ft)		4.4	
Diameter (in)	8		8
Capacity (mgd)	0.46		0.46
Max Depth (ft)	6.0		5.9
Dep abv Crown (ft)	5.3		5.2
Max Flow (mgd)	0.47		0.94
Max Velocity (ft/s)	1.1		2.4
Slope (ft/ft)	0.0041		0.0041

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03
Community: Berea
BEECH ST to E FIFTH AVE

Brown AND Caldwell

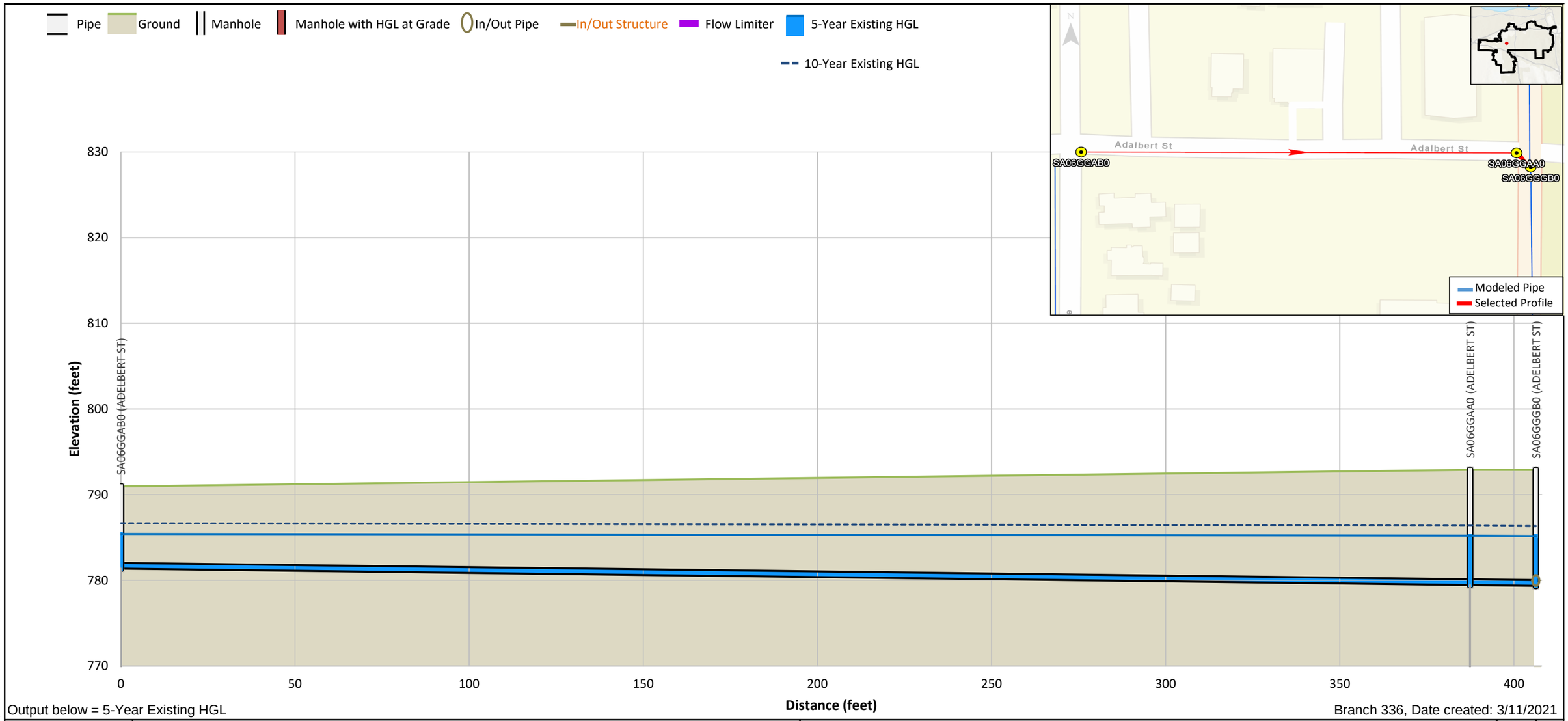
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

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Output below = 5-Year Existing HGL

Branch 336, Date created: 3/11/2021

Depth to Invert (ft)		13	
Depth to HGL (ft)		7.7	
Diameter (in)	8		8
Capacity (mgd)	0.50		0.50
Max Depth (ft)	5.8		5.8
Dep abv Crown (ft)	5.1		5.1
Max Flow (mgd)	-0.22		0.34
Max Velocity (ft/s)	-0.74		0.78
Slope (ft/ft)	0.0049		0.0049

Northeast Ohio Regional Sewer District

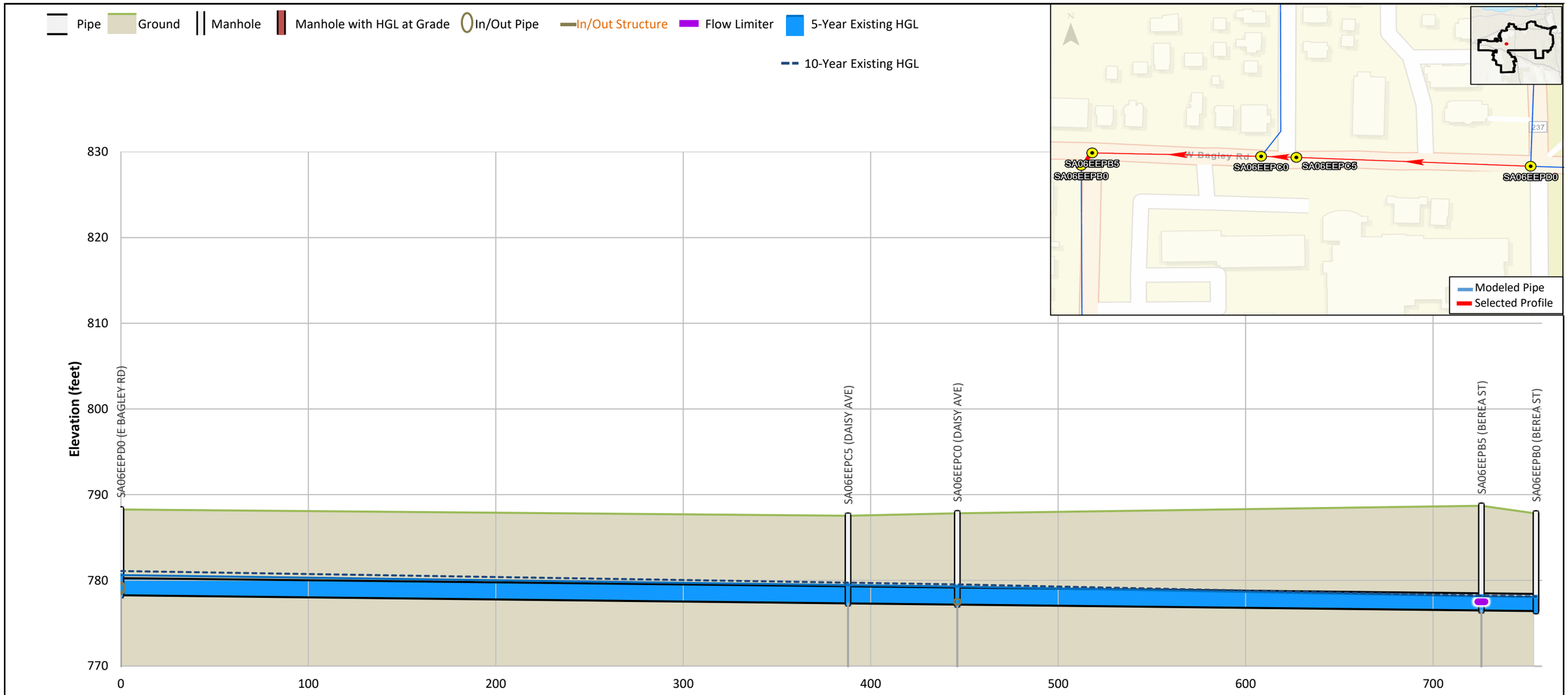
SWI-LSSES

PFA: BE-03
Community: Berea
ADELBERT ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 337, Date created: 3/11/2021

Depth to Invert (ft)				10		11			12			
Depth to HGL (ft)				8.1		8.6			11			
Diameter (in)	24				24			24				24
Capacity (mgd)	6.6				6.6			6.6				6.6
Max Depth (ft)	2.4				2.1			2.1				1.7
Dep abv Crown (ft)	0.35				0.13			0.10				-
Max Flow (mgd)	7.2				7.2			8.2				6.5
Max Velocity (ft/s)	3.5				3.5			4.6				3.6
Slope (ft/ft)	0.0024				0.0024			0.0024				0.0024

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

E BAGLEY RD to BEREA ST

Brown AND Caldwell

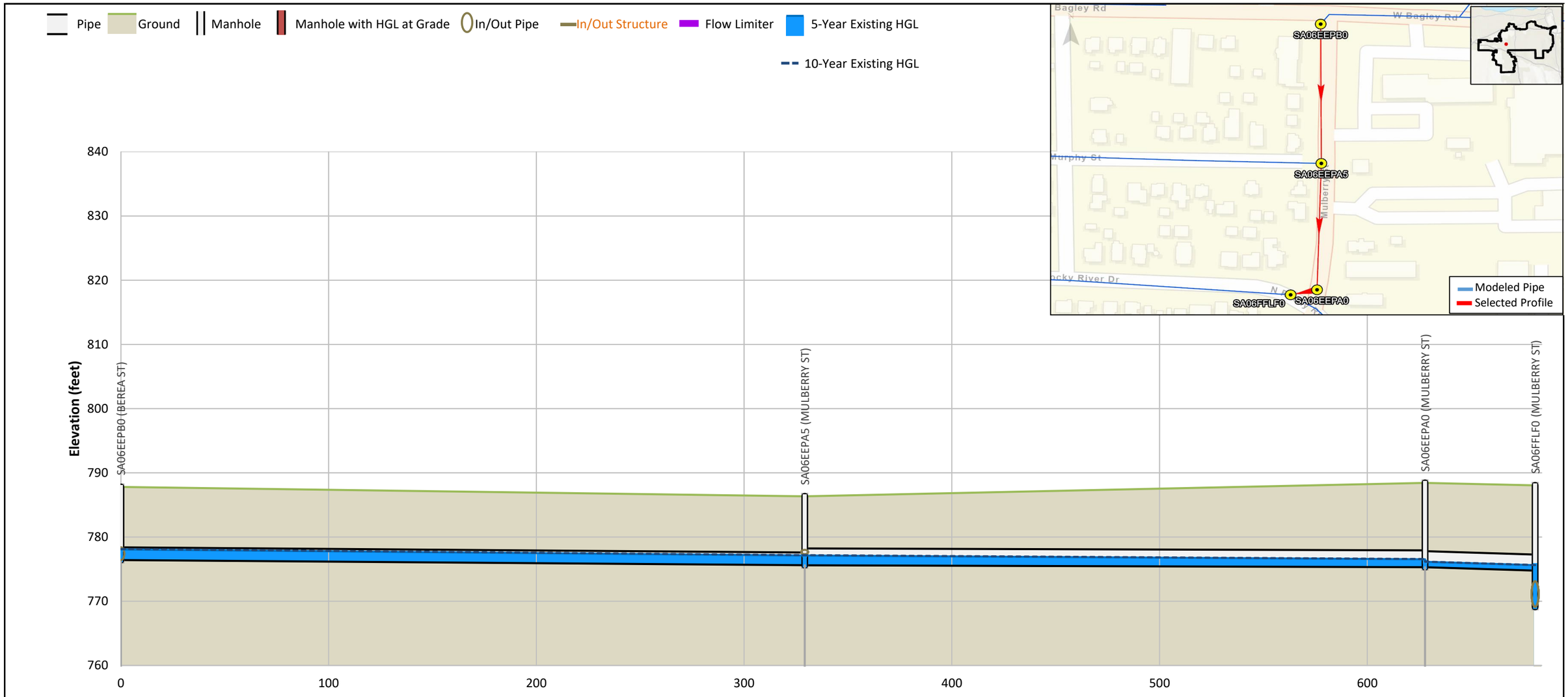
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 338, Date created: 3/11/2021

Depth to Invert (ft)		11	13	
Depth to HGL (ft)		9.2	12	
Diameter (in)	23.8	31.5	30	
Capacity (mgd)	9.7	11	31	
Max Depth (ft)	1.7	1.5	0.85	
Dep abv Crown (ft)	-	-	-	
Max Flow (mgd)	6.5	7.5	7.5	
Max Velocity (ft/s)	4.5	5.2	7.9	
Slope (ft/ft)	0.0024	0.0010	0.0100	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03
Community: Berea
BEREA ST to MULBERRY ST

Brown AND Caldwell

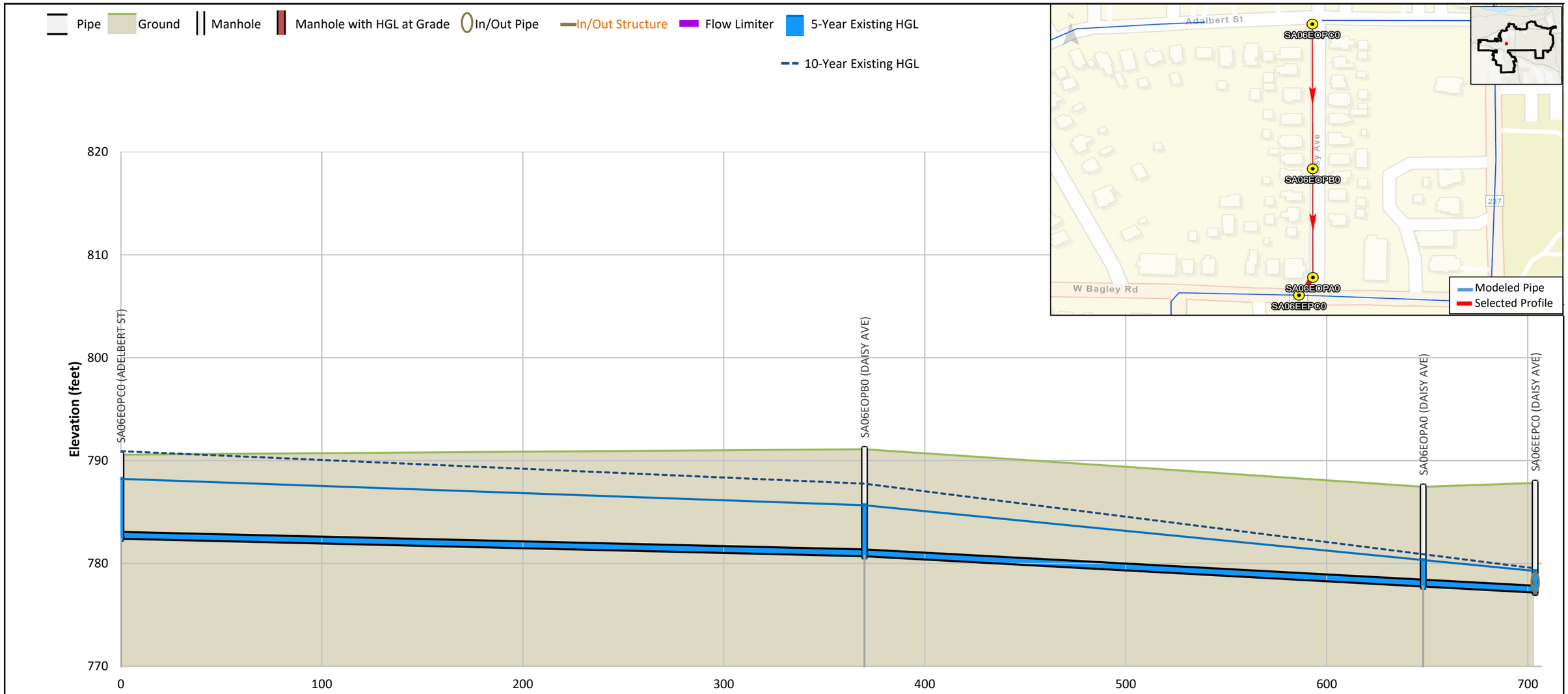
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 339, Date created: 3/11/2021

Depth to Invert (ft)		10	9.7	
Depth to HGL (ft)		5.4	7.1	
Diameter (in)	8	8	8	8
Capacity (mgd)	0.48	0.73	0.73	0.73
Max Depth (ft)	5.8	5.0	2.6	
Dep abv Crown (ft)	5.2	4.3	1.9	
Max Flow (mgd)	0.59	0.98	0.98	
Max Velocity (ft/s)	2.1	3.1	3.4	
Slope (ft/ft)	0.0046	0.011	0.011	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

ADELBERT ST to DAISY AVE

Brown AND Caldwell

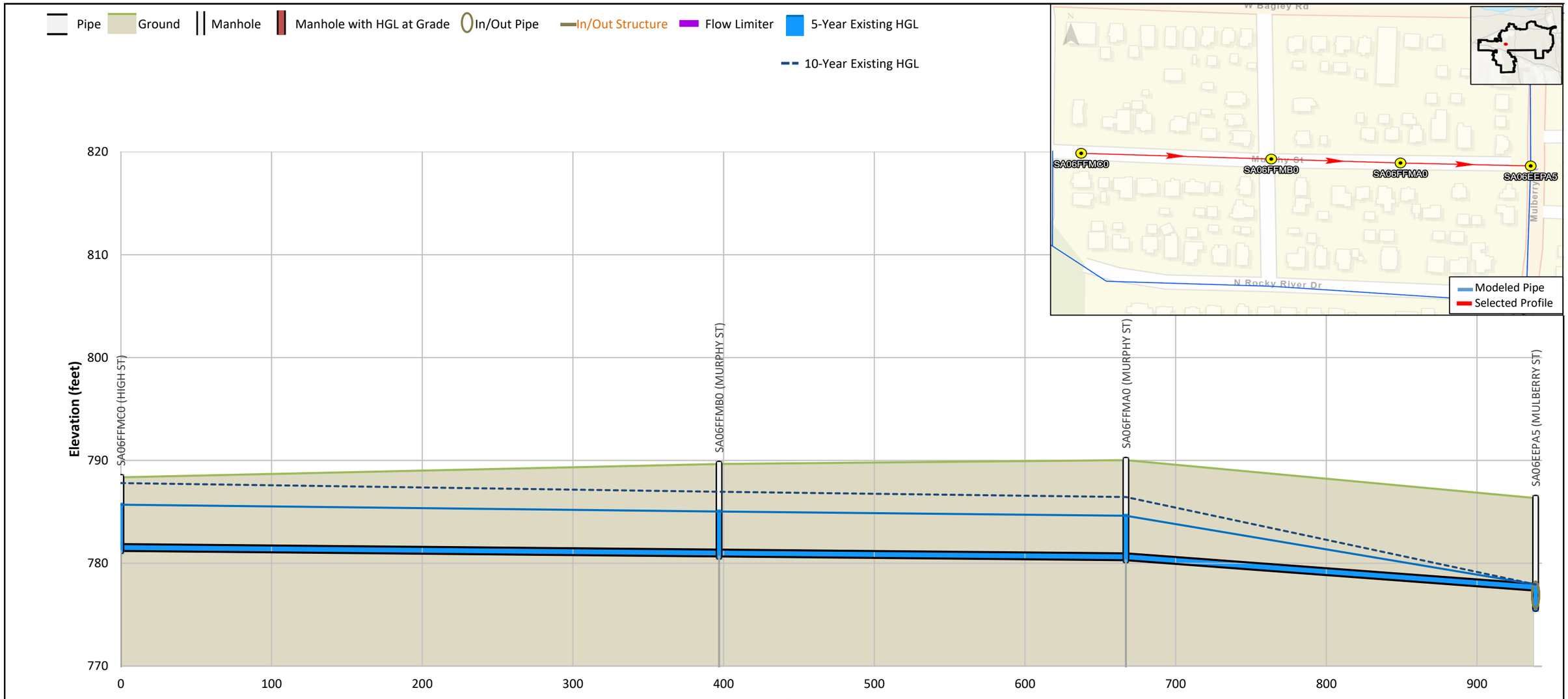
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 340, Date created: 3/11/2021

Depth to Invert (ft)		9.0	9.7	
Depth to HGL (ft)		4.6	5.4	
Diameter (in)	8	8	8	
Capacity (mgd)	0.26	0.26	0.74	
Max Depth (ft)	4.5	4.4	4.3	
Dep abv Crown (ft)	3.8	3.7	3.7	
Max Flow (mgd)	0.31	0.41	1.1	
Max Velocity (ft/s)	1.3	1.9	5.2	
Slope (ft/ft)	0.0014	0.0013	0.011	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

HIGH ST to MULBERRY ST

Brown AND Caldwell

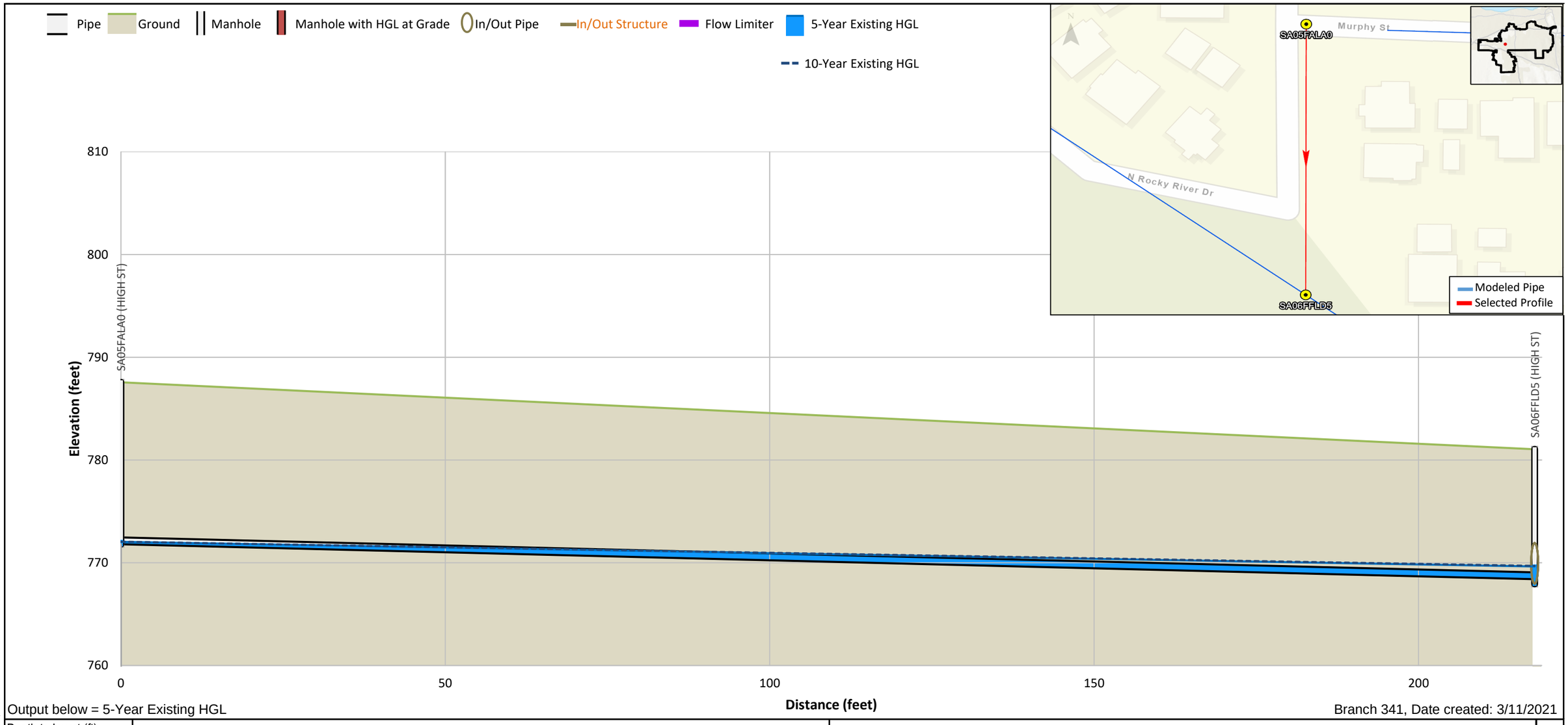
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 341, Date created: 3/11/2021

Depth to Invert (ft)	
Depth to HGL (ft)	
Diameter (in)	8
Capacity (mgd)	0.89
Max Depth (ft)	1.2
Dep abv Crown (ft)	0.57
Max Flow (mgd)	0.22
Max Velocity (ft/s)	2.2
Slope (ft/ft)	0.016

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03

Community: Berea

HIGH ST

Brown AND Caldwell

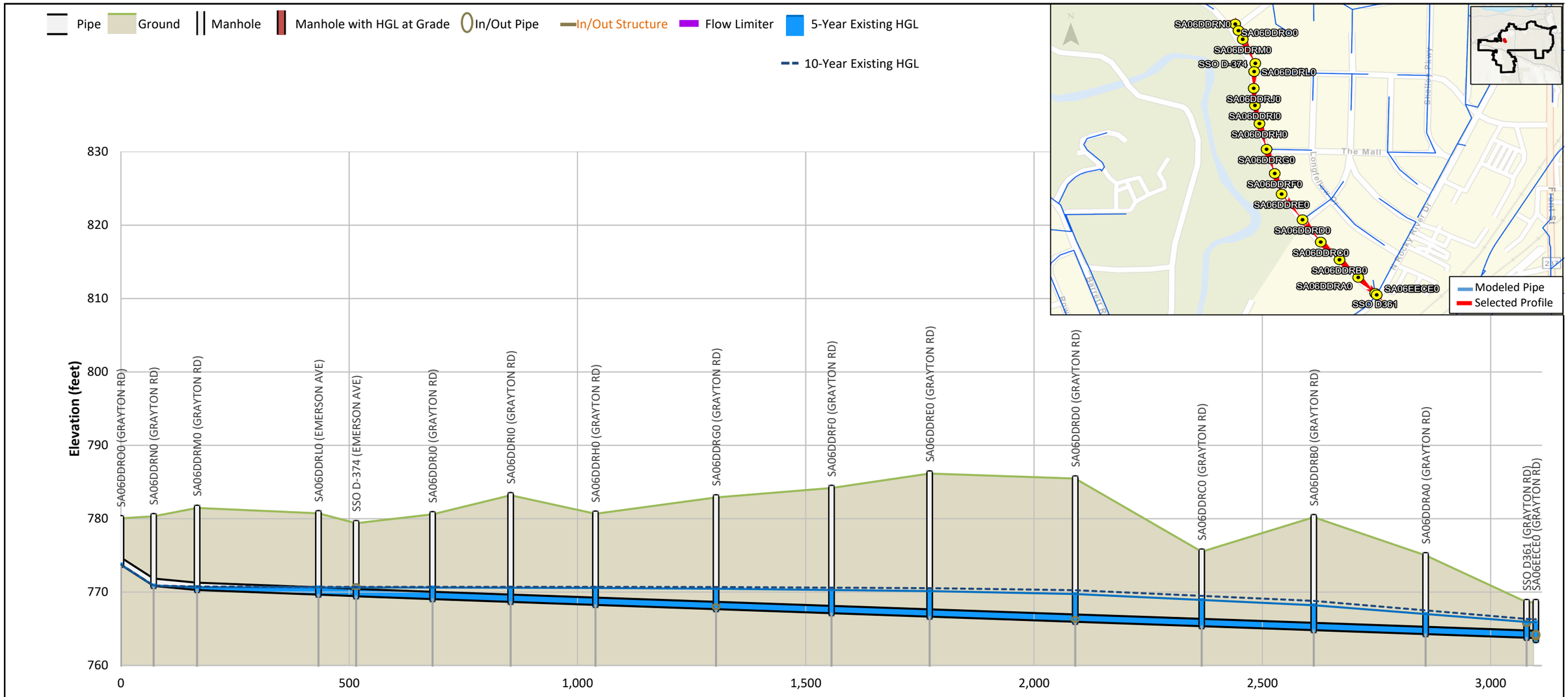
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 250, Date created: 3/11/2021

Depth to Invert (ft)		9.5	11	11	9.9	12	15	12	15	17	20	20	10	15	11		
Depth to HGL (ft)		9.4	11	10	8.8	10.0	13	10	12	14	16	16	6.6	12	8.0		
Diameter (in)	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Capacity (mgd)	4.6	1.8	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Max Depth (ft)	0.05	0.39	0.98	1.2	1.6	1.9	2.3	2.8	3.2	3.5	3.8	3.8	3.6	3.4	2.7		
Dep abv Crown (ft)	-	-	-	0.18	0.58	0.93	1.3	1.8	2.2	2.5	2.8	2.8	2.6	2.4	1.7		
Max Flow (mgd)	0.00	-0.02	0.22	0.21	0.77	0.86	0.80	0.89	0.95	0.85	0.97	1.2	1.3	1.6	1.6		
Max Velocity (ft/s)	0.00	-0.14	1.3	0.69	2.0	2.3	2.0	2.0	2.4	1.8	1.8	2.5	2.1	2.7	2.9		
Slope (ft/ft)	0.040	0.0059	0.0024	0.0024	0.0023	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022	0.0022		

Northeast Ohio Regional Sewer District

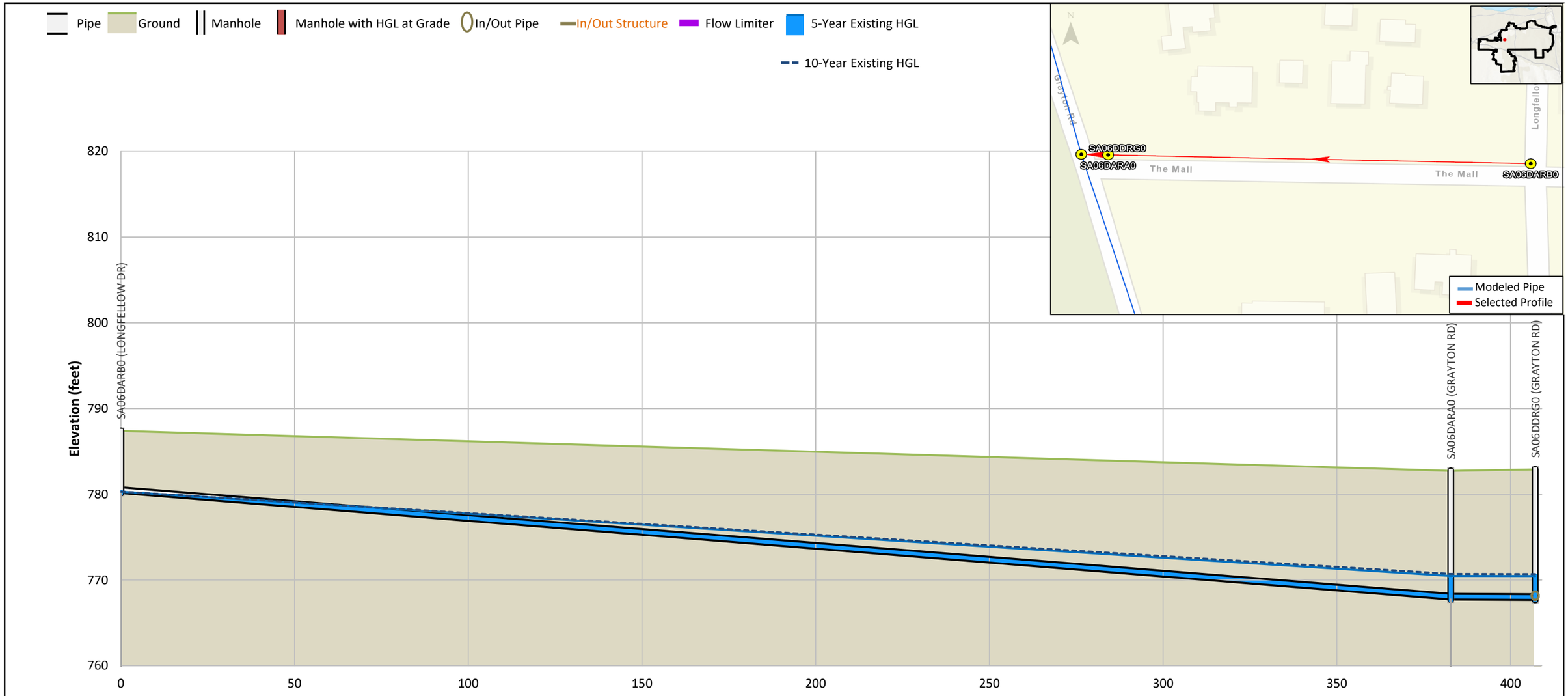
SWI-LSSES

PFA: BE-04
Community: Berea
GRAYTON RD

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGL Profiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 251, Date created: 3/11/2021

Depth to Invert (ft)		15	
Depth to HGL (ft)		12	
Diameter (in)	8		8
Capacity (mgd)	1.3		0.32
Max Depth (ft)	2.8		2.8
Dep abv Crown (ft)	2.1		2.1
Max Flow (mgd)	0.15		0.20
Max Velocity (ft/s)	0.70		0.85
Slope (ft/ft)	0.032		0.0021

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-04

Community: Berea

LONGFELLOW DR to GRAYTON RD

Brown AND Caldwell

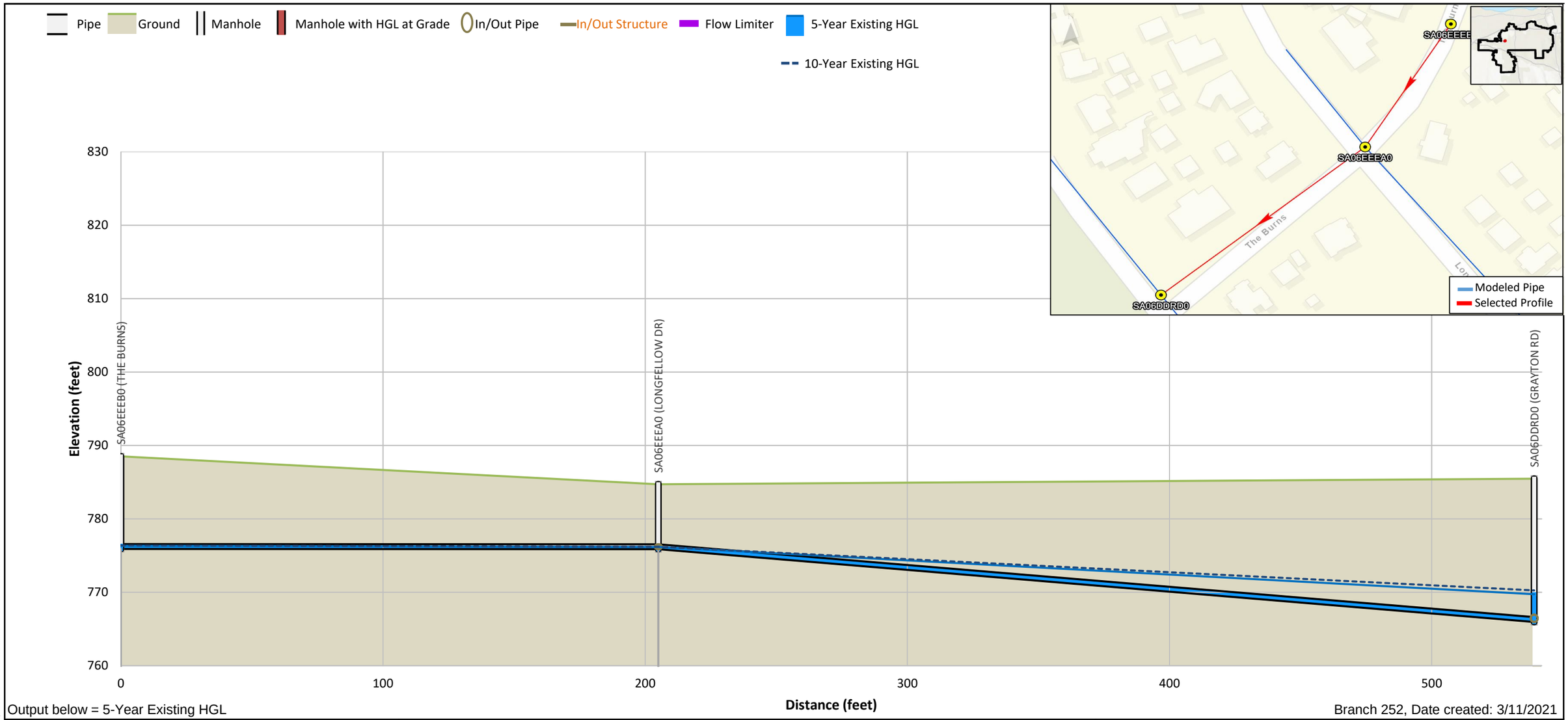
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 252, Date created: 3/11/2021

Depth to Invert (ft)		8.8	
Depth to HGL (ft)		8.5	
Diameter (in)	8		8
Capacity (mgd)	0.09		1.2
Max Depth (ft)	0.44		3.8
Dep abv Crown (ft)	-		3.1
Max Flow (mgd)	0.12		0.48
Max Velocity (ft/s)	1.2		1.9
Slope (ft/ft)	0.00015		0.030

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-04
Community: Berea
THE BURNS to GRAYTON RD

Brown AND Caldwell

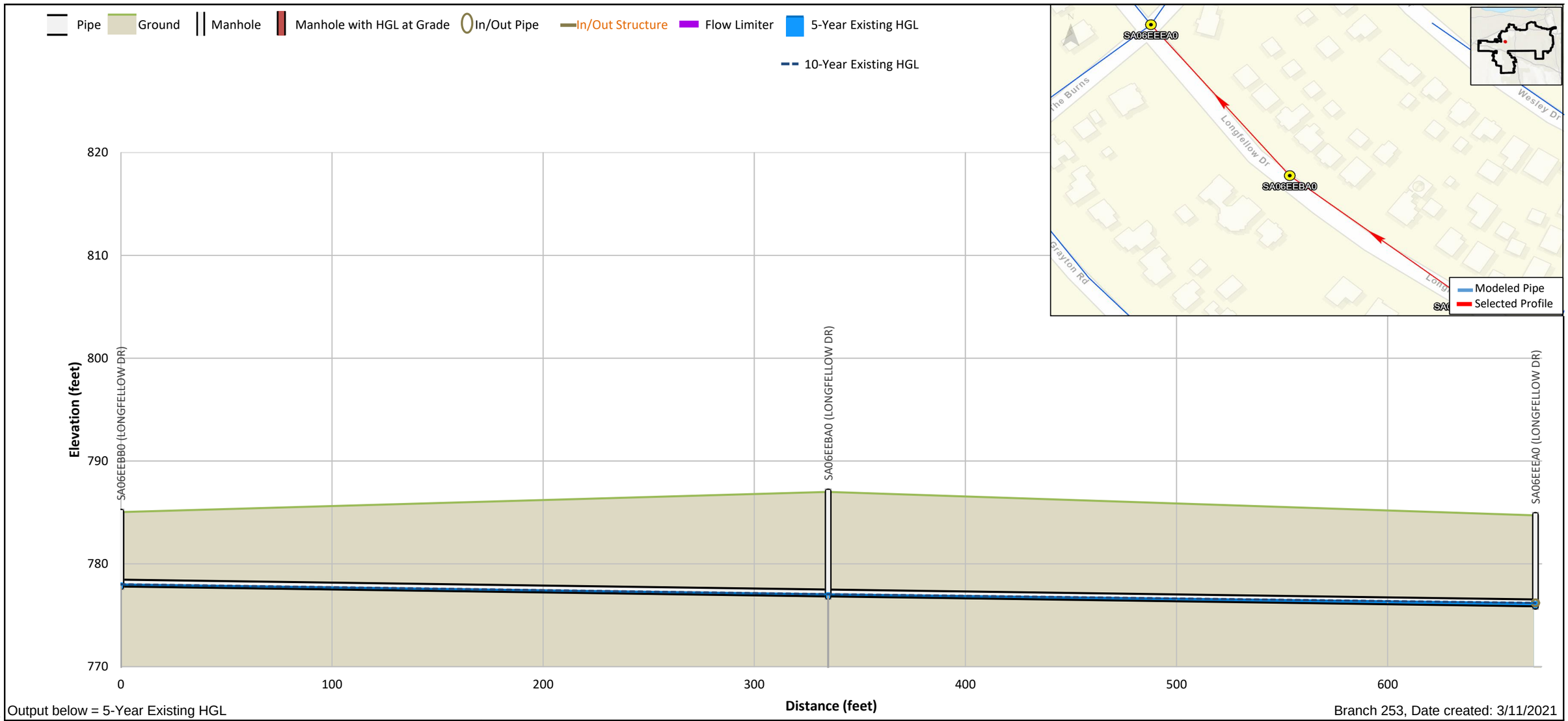
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 253, Date created: 3/11/2021

Depth to Invert (ft)		10	
Depth to HGL (ft)		10.0	
Diameter (in)	8		8
Capacity (mgd)	0.38		0.38
Max Depth (ft)	0.20		0.30
Dep abv Crown (ft)	-		-
Max Flow (mgd)	0.08		0.08
Max Velocity (ft/s)	1.3		0.79
Slope (ft/ft)	0.0029		0.0029

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-04

Community: Berea

LONGFELLOW DR

Brown AND Caldwell

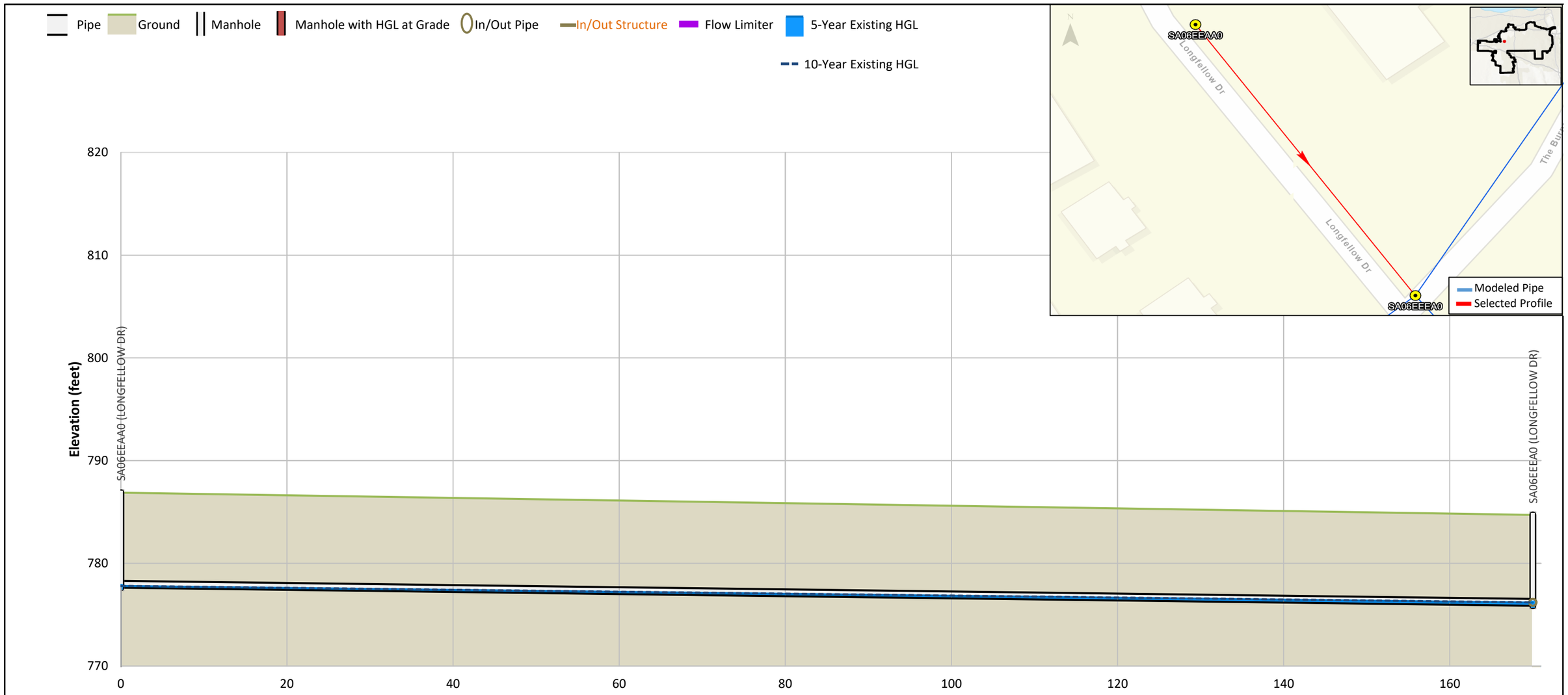
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 254, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	0.72	
Max Depth (ft)	0.30	
Dep abv Crown (ft)	-	
Max Flow (mgd)	0.09	
Max Velocity (ft/s)	0.96	
Slope (ft/ft)	0.010	

Northeast Ohio Regional Sewer District

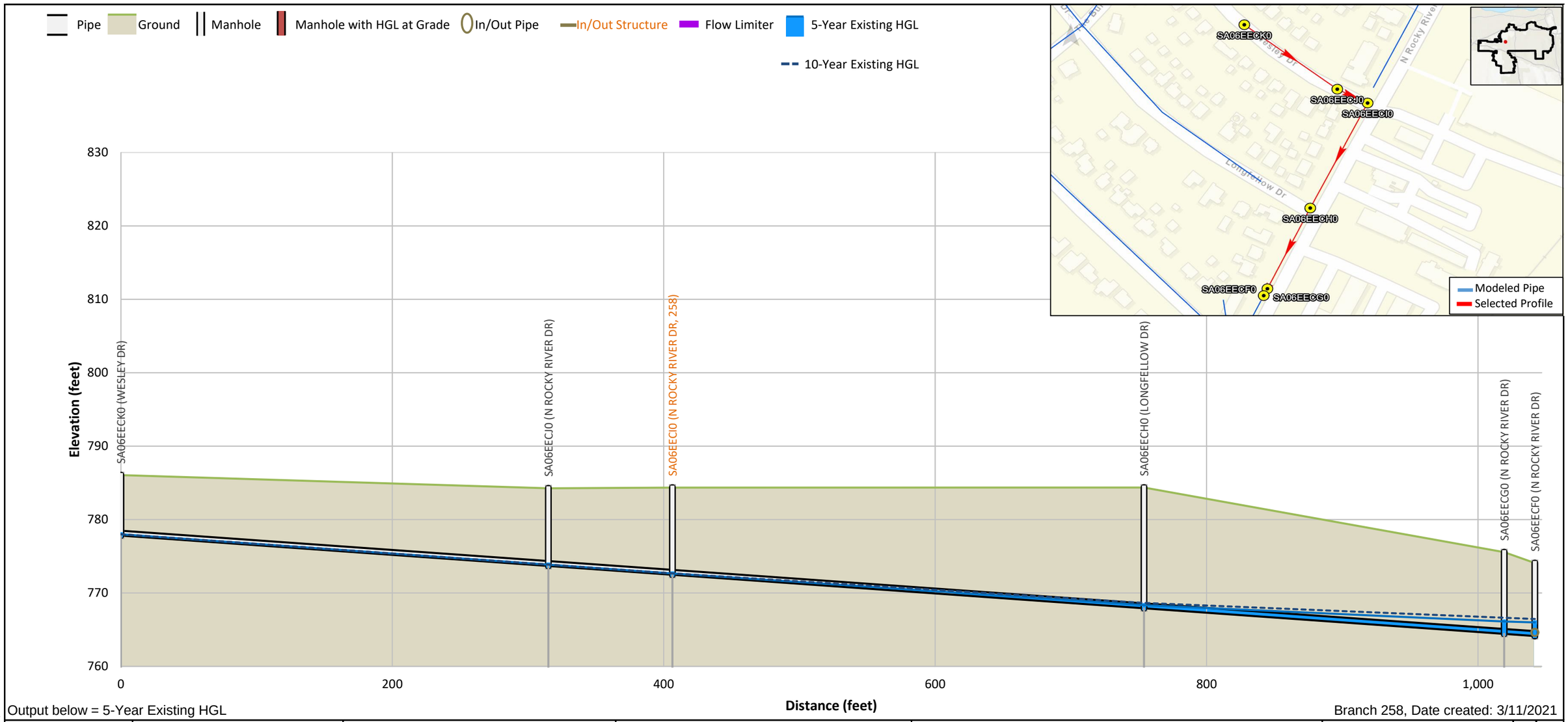
SWI-LSSES

PFA: BE-04
Community: Berea
LONGFELLOW DR

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 258, Date created: 3/11/2021

Depth to Invert (ft)		11	12	16	11	
Depth to HGL (ft)		10	12	16	9.4	
Diameter (in)	8	8	8	8	8	
Capacity (mgd)	0.81	0.81	0.81	0.81	0.81	
Max Depth (ft)	0.18	0.18	0.43	1.7	1.9	
Dep abv Crown (ft)	-	-	-	1.0	1.2	
Max Flow (mgd)	0.13	0.13	0.13	0.59	0.58	
Max Velocity (ft/s)	2.5	2.5	0.85	3.5	2.8	
Slope (ft/ft)	0.013	0.013	0.013	0.013	0.013	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-04, BE-05

Community: Berea

WESLEY DR to N ROCKY RIVER DR

Brown AND Caldwell

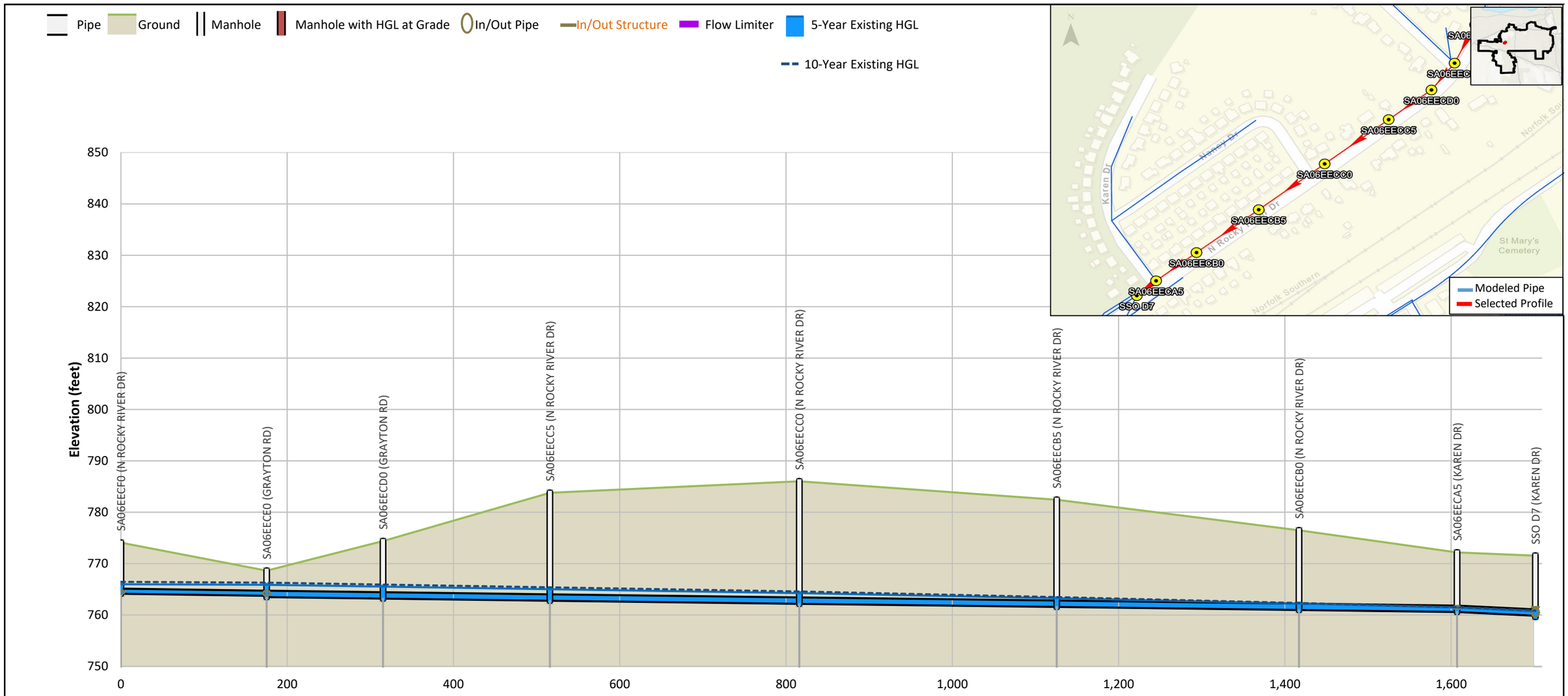
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 259, Date created: 3/11/2021

Depth to Invert (ft)		4.9	11	21	24	21	16	12	
Depth to HGL (ft)		2.7	8.9	19	22	19	14	11	
Diameter (in)	12	15	15	15	15	15	15	15	15
Capacity (mgd)	1.0	1.8	1.8	1.8	1.8	1.8	1.8	1.8	3.6
Max Depth (ft)	2.1	2.4	2.3	2.2	2.1	1.7	1.3	0.89	
Dep abv Crown (ft)	1.1	1.1	1.1	1.00	0.84	0.44	0.00	-	
Max Flow (mgd)	0.53	2.1	2.0	2.0	2.3	2.4	2.4	3.0	
Max Velocity (ft/s)	2.3	2.8	2.7	2.4	2.7	3.0	4.2	5.0	
Slope (ft/ft)	0.0023	0.0021	0.0021	0.0020	0.0019	0.0021	0.0021	0.0078	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-04
Community: Berea
N ROCKY RIVER DR to KAREN DR

Brown AND Caldwell

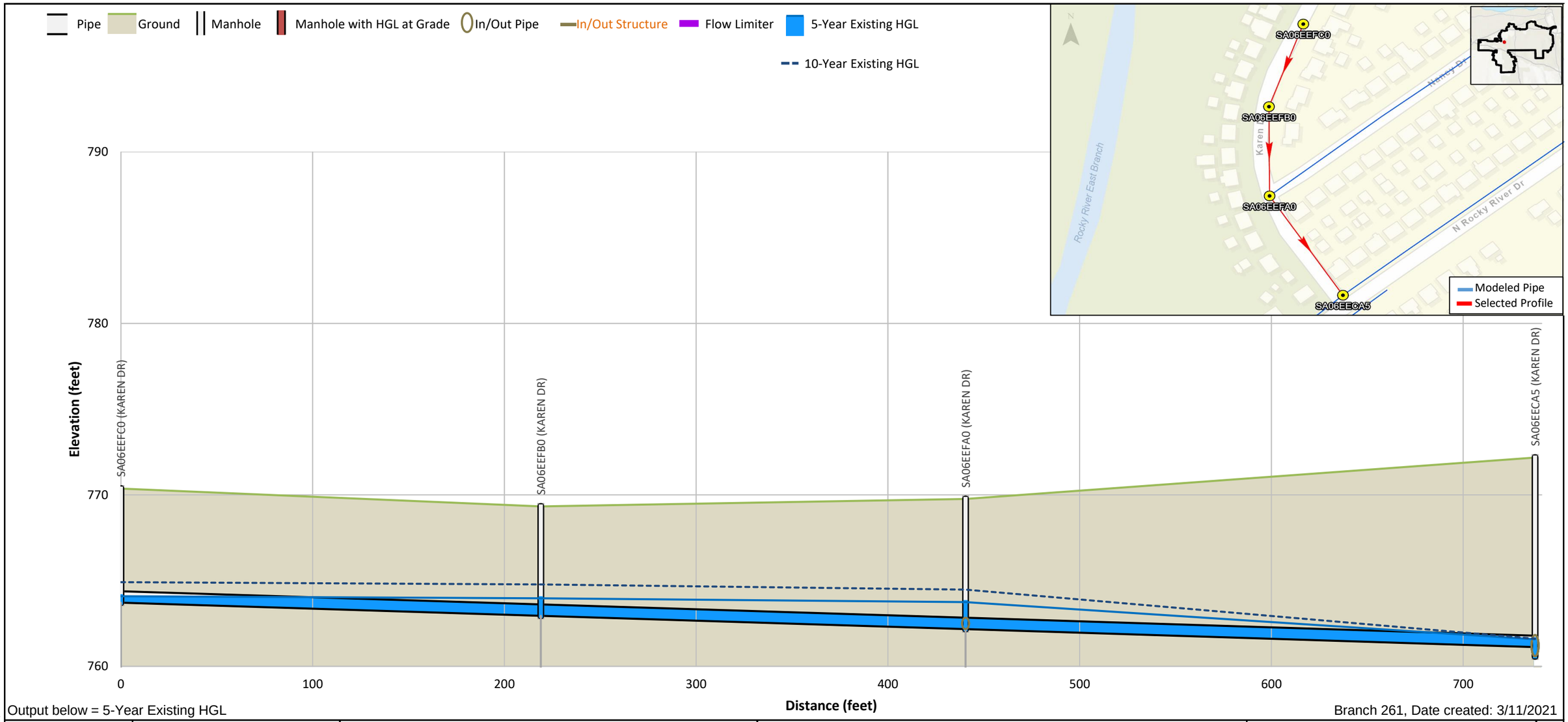
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 261, Date created: 3/11/2021

Depth to Invert (ft)		6.4	7.6	
Depth to HGL (ft)		5.4	6.0	
Diameter (in)	8	8	8	8
Capacity (mgd)	0.42	0.42	0.42	0.42
Max Depth (ft)	1.0	1.6	1.6	1.6
Dep abv Crown (ft)	0.36	0.91	0.91	0.91
Max Flow (mgd)	0.16	0.24	0.60	0.60
Max Velocity (ft/s)	1.2	0.94	3.6	3.6
Slope (ft/ft)	0.0035	0.0035	0.0035	0.0035

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-04

Community: Berea

KAREN DR

Brown AND Caldwell

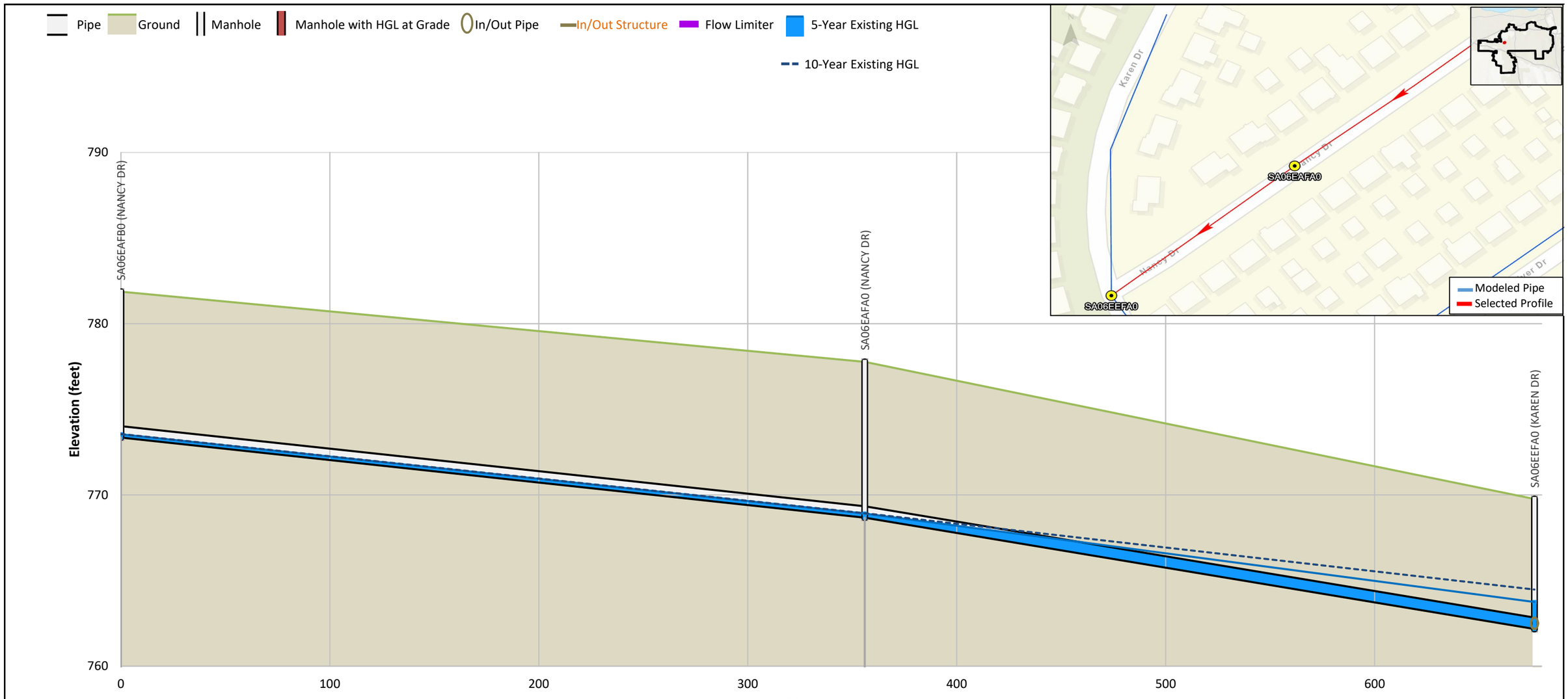
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 262, Date created: 3/11/2021

Depth to Invert (ft)		9.1	
Depth to HGL (ft)		8.9	
Diameter (in)	8		8
Capacity (mgd)	0.81		1.0
Max Depth (ft)	0.24		1.6
Dep abv Crown (ft)	-		0.91
Max Flow (mgd)	0.15		0.27
Max Velocity (ft/s)	2.0		1.0
Slope (ft/ft)	0.013		0.020

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-04

Community: Berea

NANCY DR to KAREN DR

Brown AND Caldwell

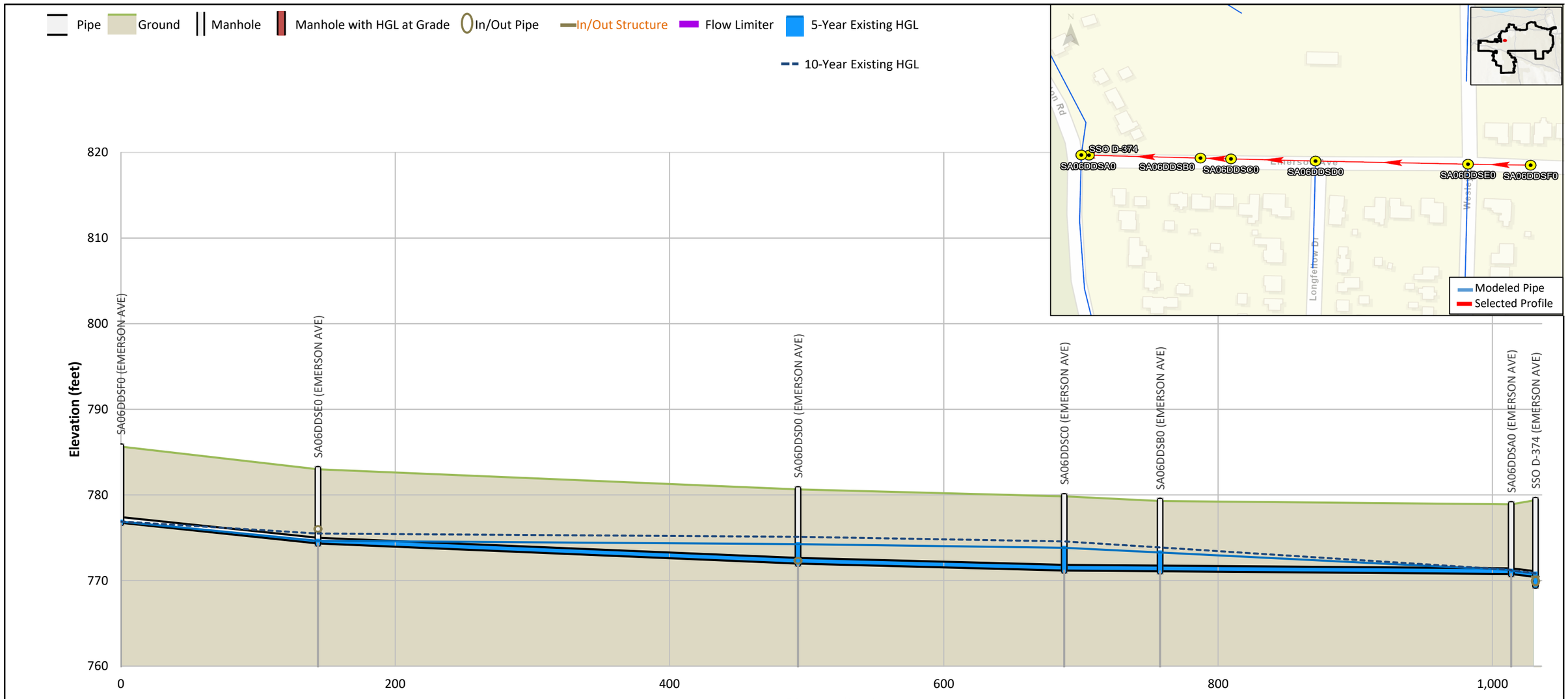
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 263, Date created: 3/11/2021

Depth to Invert (ft)	8.7	8.7	8.7	8.2	8.1	
Depth to HGL (ft)	8.4	6.4	6.0	6.0	7.7	
Diameter (in)	8	8	8	8	8	
Capacity (mgd)	0.92	0.58	0.46	0.25	0.25	
Max Depth (ft)	0.31	2.3	2.7	2.7	2.2	
Dep abv Crown (ft)	-	1.6	2.0	2.0	1.5	
Max Flow (mgd)	0.09	0.21	0.35	0.63	0.63	
Max Velocity (ft/s)	0.95	1.1	1.1	2.1	3.7	
Slope (ft/ft)	0.017	0.0067	0.0042	0.0012	0.0013	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-04

Community: Berea

EMERSON AVE

Brown AND Caldwell

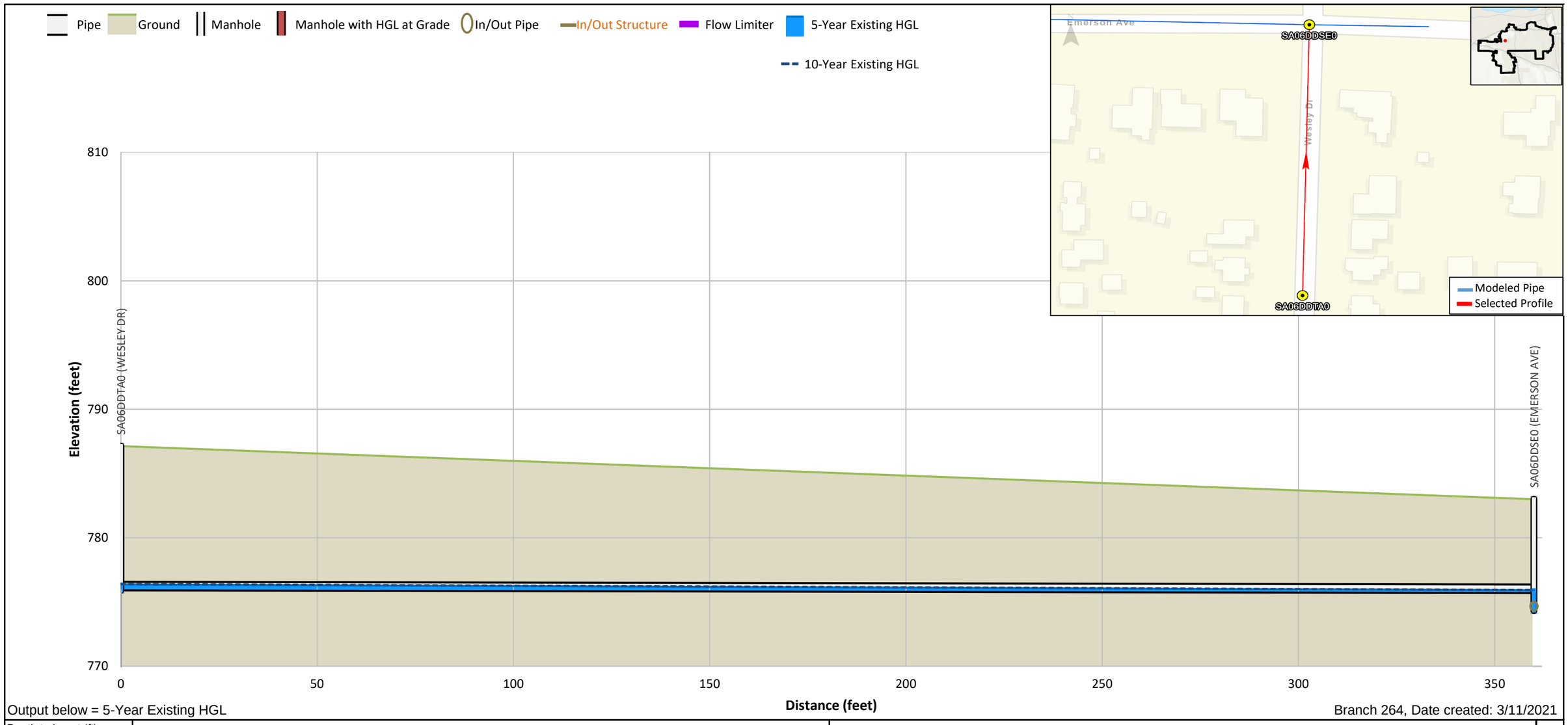
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 264, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	0.17	
Max Depth (ft)	0.46	
Dep abv Crown (ft)	-	
Max Flow (mgd)	0.15	
Max Velocity (ft/s)	2.3	
Slope (ft/ft)	0.00058	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-04

Community: Berea

WESLEY DR to EMERSON AVE

Brown AND Caldwell

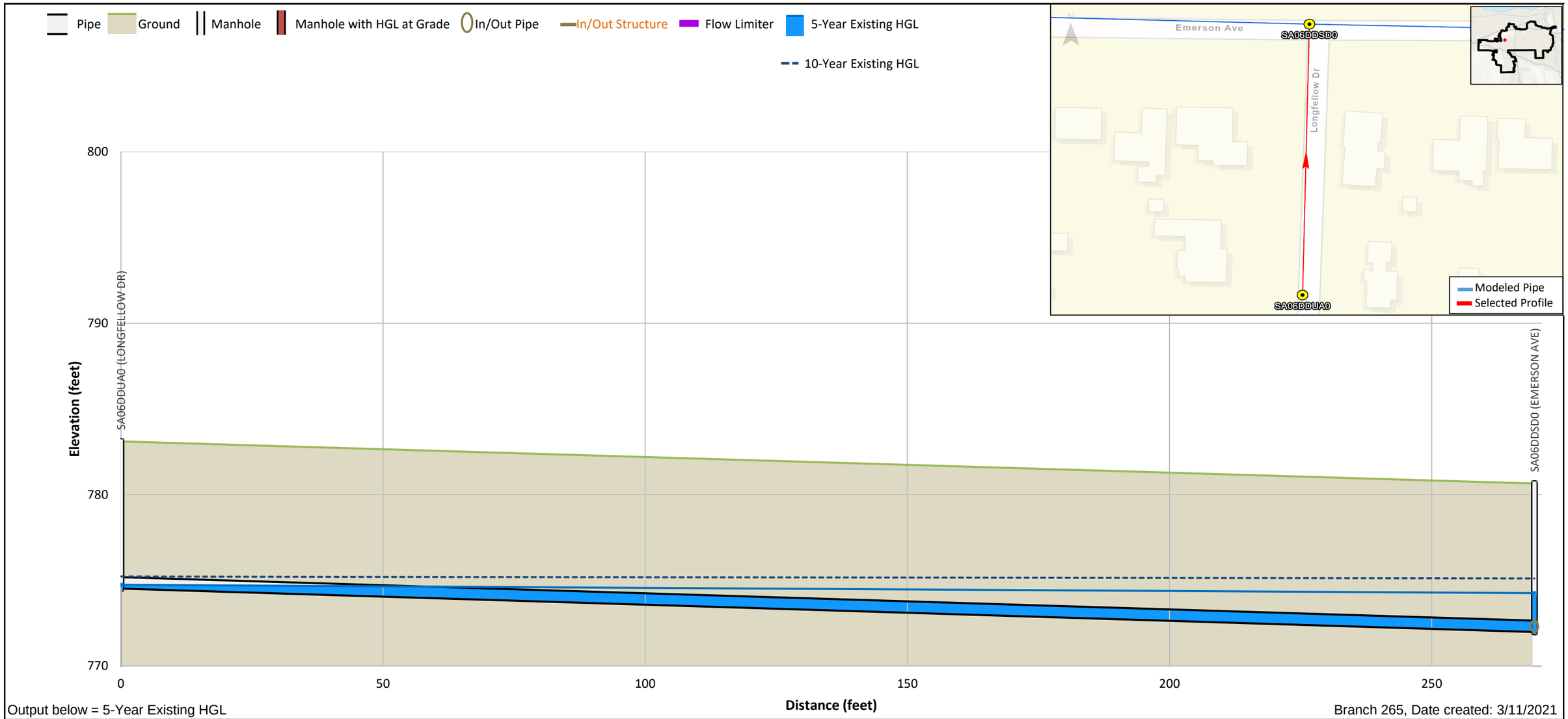
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 265, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	0.69	
Max Depth (ft)	2.3	
Dep abv Crown (ft)	1.6	
Max Flow (mgd)	0.13	
Max Velocity (ft/s)	1.0	
Slope (ft/ft)	0.0094	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-04

Community: Berea

LONGFELLOW DR to EMERSON AVE

Brown AND Caldwell

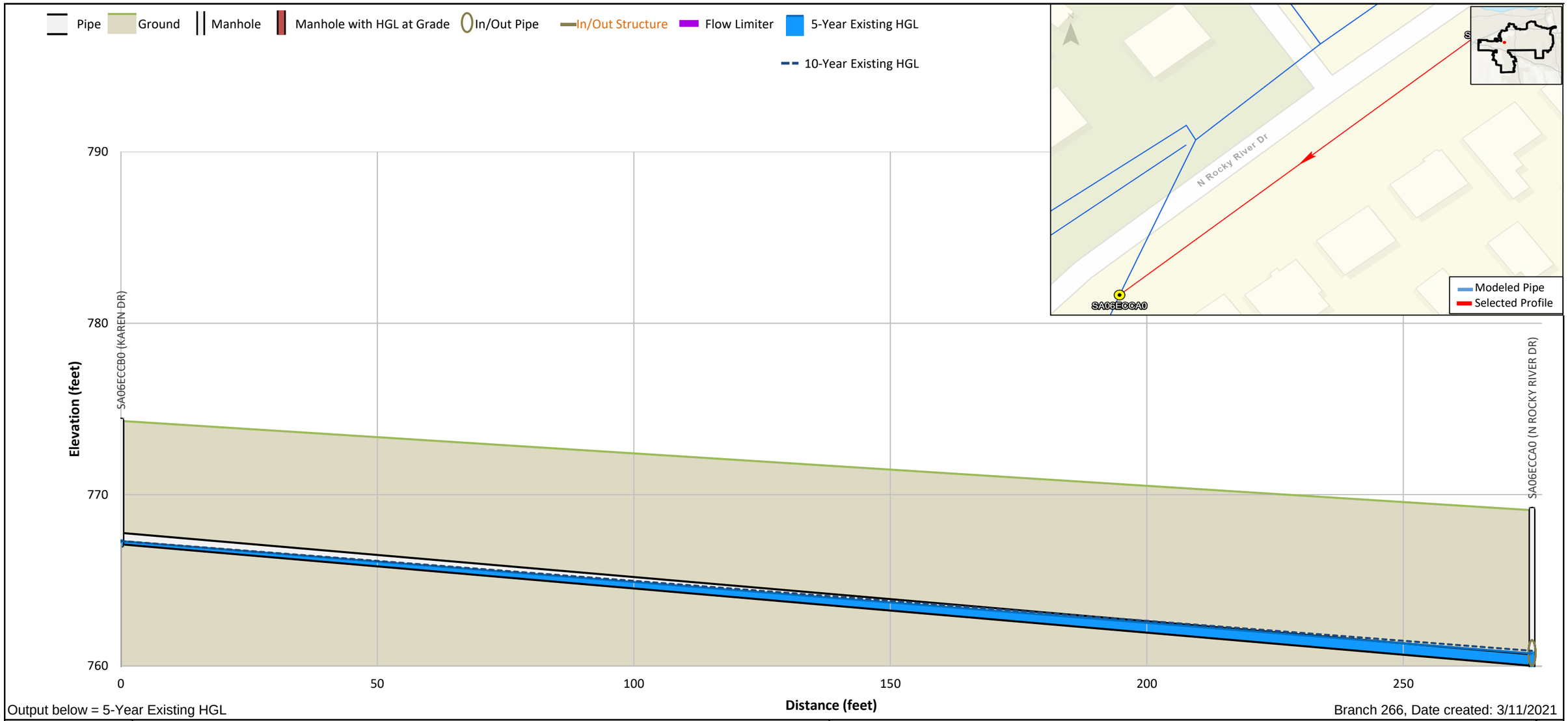
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 266, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	1.1	
Max Depth (ft)	0.72	
Dep abv Crown (ft)	0.05	
Max Flow (mgd)	0.18	
Max Velocity (ft/s)	1.8	
Slope (ft/ft)	0.026	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-04
Community: Berea
KAREN DR to N ROCKY RIVER DR

Brown AND Caldwell

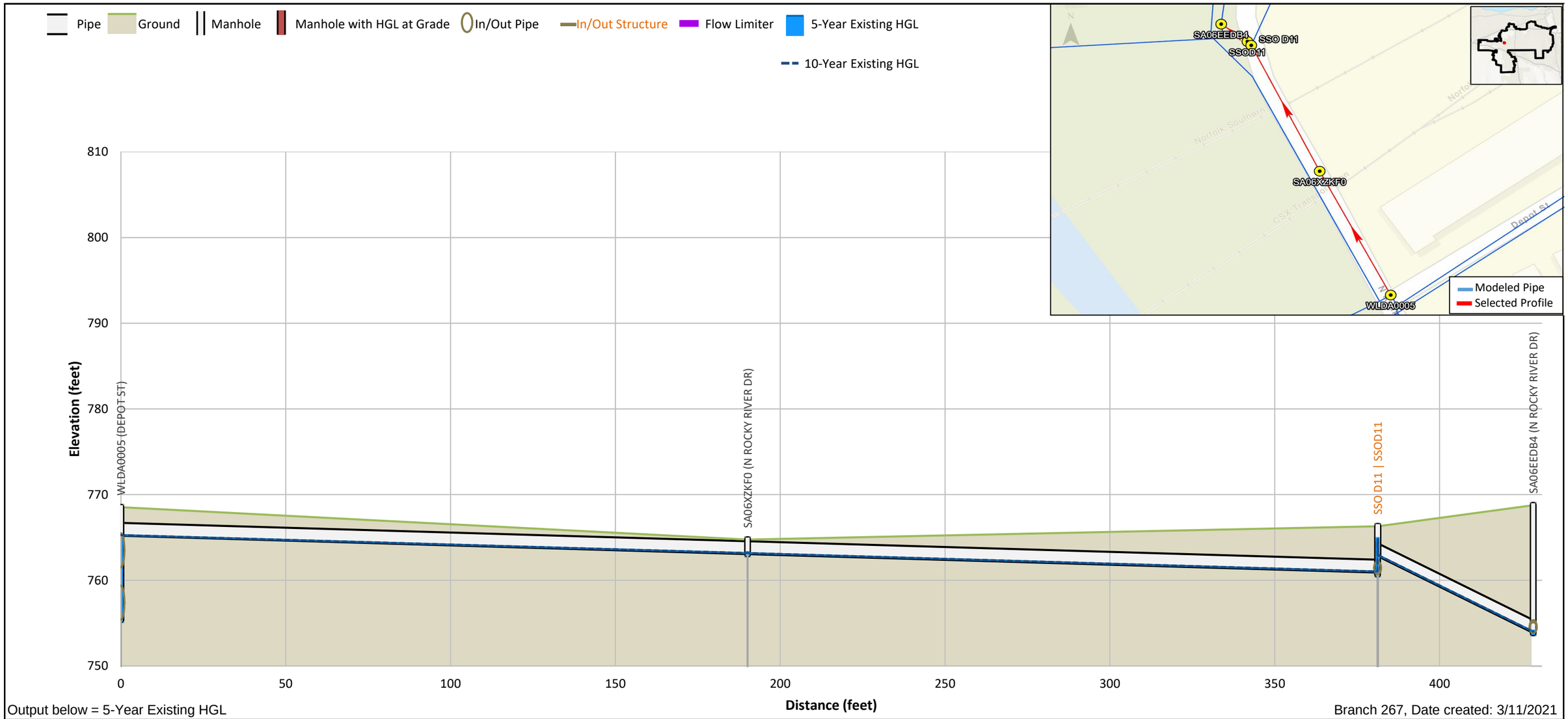
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 267, Date created: 3/11/2021

Depth to Invert (ft)		1.7			
Depth to HGL (ft)		1.6			
Diameter (in)	18		18	18	
Capacity (mgd)	6.6		6.6	27	
Max Depth (ft)	0.12		0.12	0.15	
Dep abv Crown (ft)	-		-	-	
Max Flow (mgd)	0.00		0.05	0.00	
Max Velocity (ft/s)	-0.01		1.3	0.00	
Slope (ft/ft)	0.011		0.011	0.19	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03, BE-04
Community: Berea
DEPOT ST to N ROCKY RIVER DR

Brown AND Caldwell

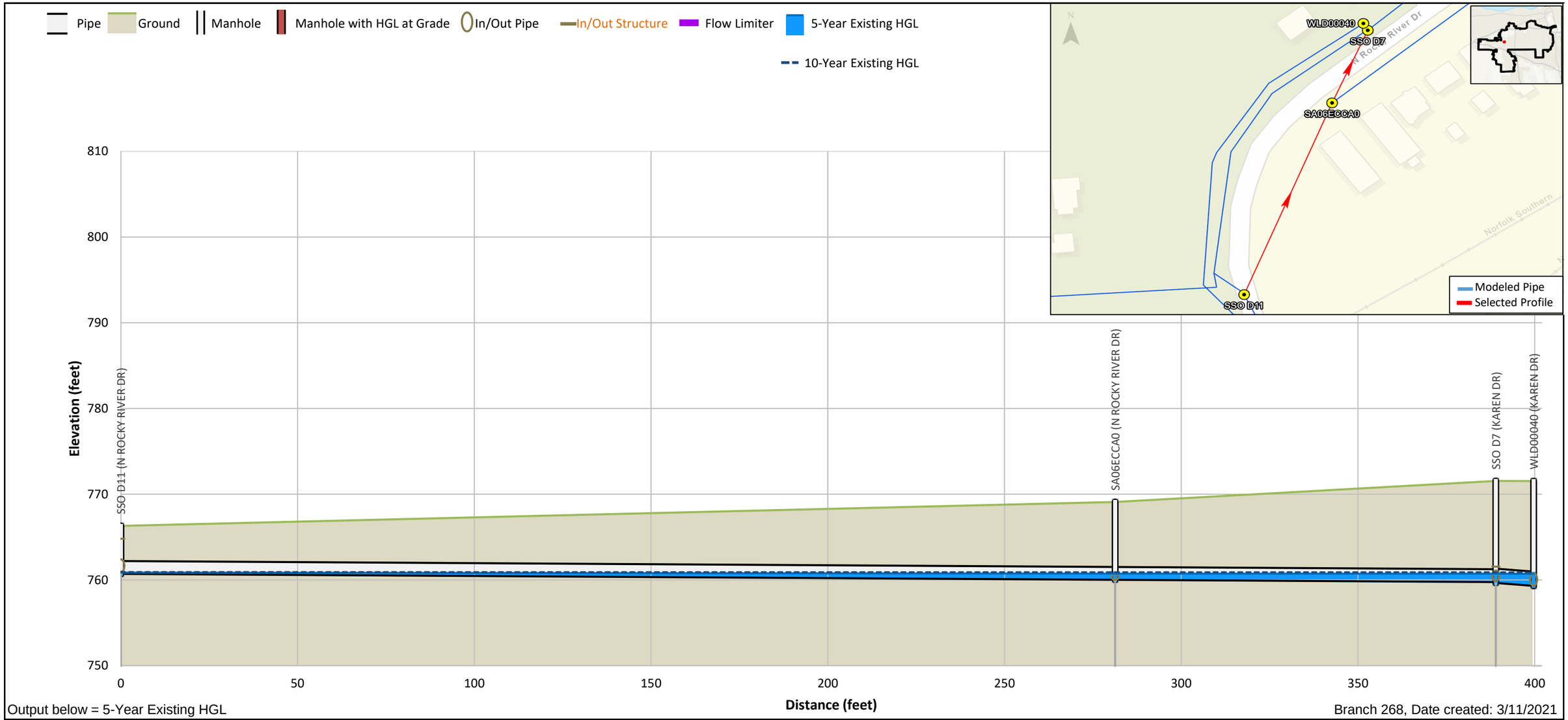
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 268, Date created: 3/11/2021

Depth to Invert (ft)		9.1	12	
Depth to HGL (ft)		8.4	11	
Diameter (in)	18	18	20	
Capacity (mgd)	3.1	3.1	15	
Max Depth (ft)	0.72	0.98	1.4	
Dep abv Crown (ft)	-	-	-	
Max Flow (mgd)	0.07	0.20	3.1	
Max Velocity (ft/s)	0.23	1.5	2.6	
Slope (ft/ft)	0.0024	0.0025	0.032	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-04
Community: Berea
N ROCKY RIVER DR to KAREN DR

Brown AND Caldwell

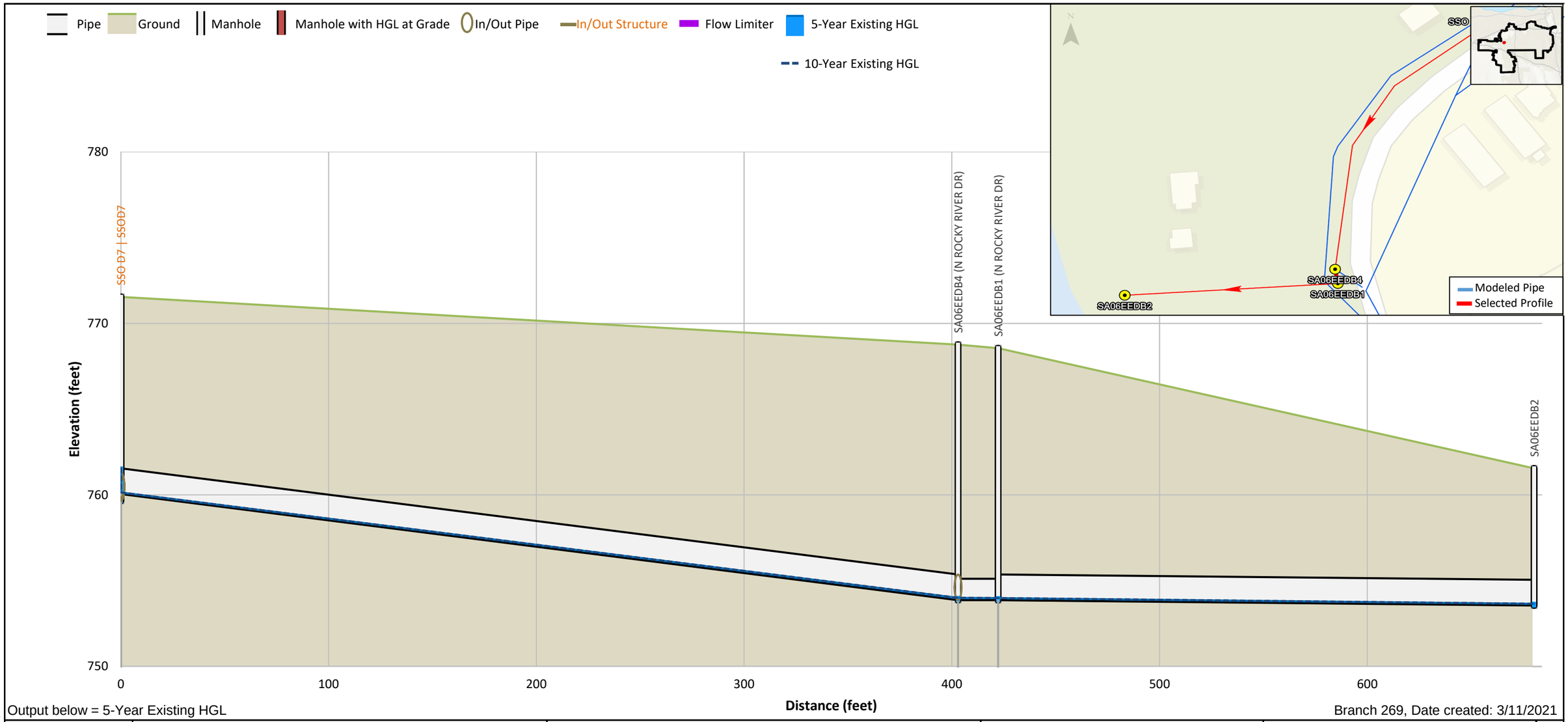
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 269, Date created: 3/11/2021

Depth to Invert (ft)			15	15	
Depth to HGL (ft)			15	15	
Diameter (in)	18		15		18
Capacity (mgd)	7.7		0.00		2.1
Max Depth (ft)	0.14		0.14		0.12
Dep abv Crown (ft)	-		-		-
Max Flow (mgd)	0.02		0.02		0.02
Max Velocity (ft/s)	0.41		0.52		0.61
Slope (ft/ft)	0.015		0		0.0012

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03, BE-04
Community: Berea
KAREN DR to Manhole SA06EEDB2

Brown AND Caldwell

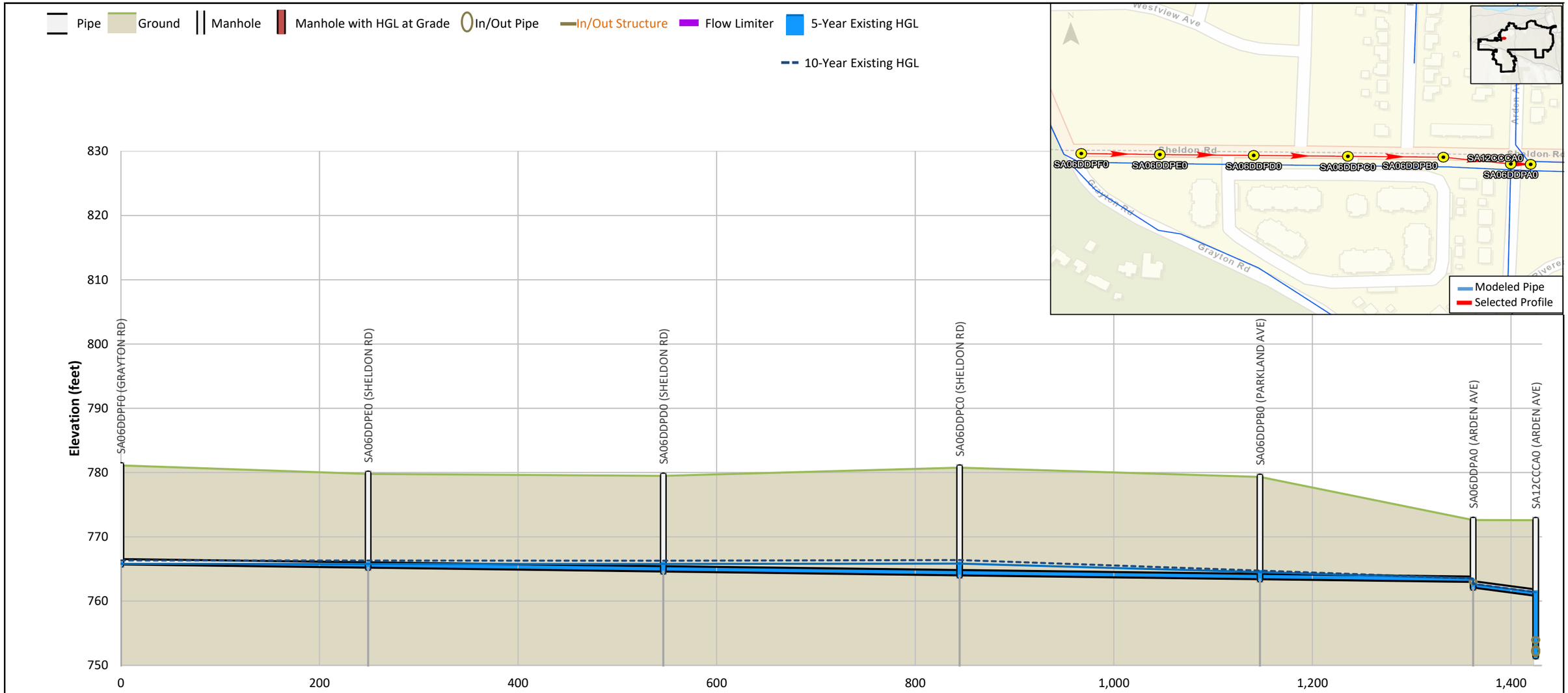
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 227, Date created: 3/11/2021

Depth to Invert (ft)		15	15	17	16	9.6	
Depth to HGL (ft)		14	14	15	15	9.1	
Diameter (in)	10	10	10	10	10	12	
Capacity (mgd)	0.58	0.58	0.58	0.57	0.57	3.0	
Max Depth (ft)	0.58	1.2	1.8	1.8	1.1	0.55	
Dep abv Crown (ft)	-	0.34	1.00	1.00	0.28	-	
Max Flow (mgd)	-0.13	-0.29	0.36	0.85	0.84	1.7	
Max Velocity (ft/s)	-0.75	0.88	0.97	2.3	3.7	6.0	
Slope (ft/ft)	0.0020	0.0020	0.0020	0.0020	0.0020	0.020	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05, BE-06

Community: Berea

GRAYTON RD to ARDEN AVE

Brown AND Caldwell

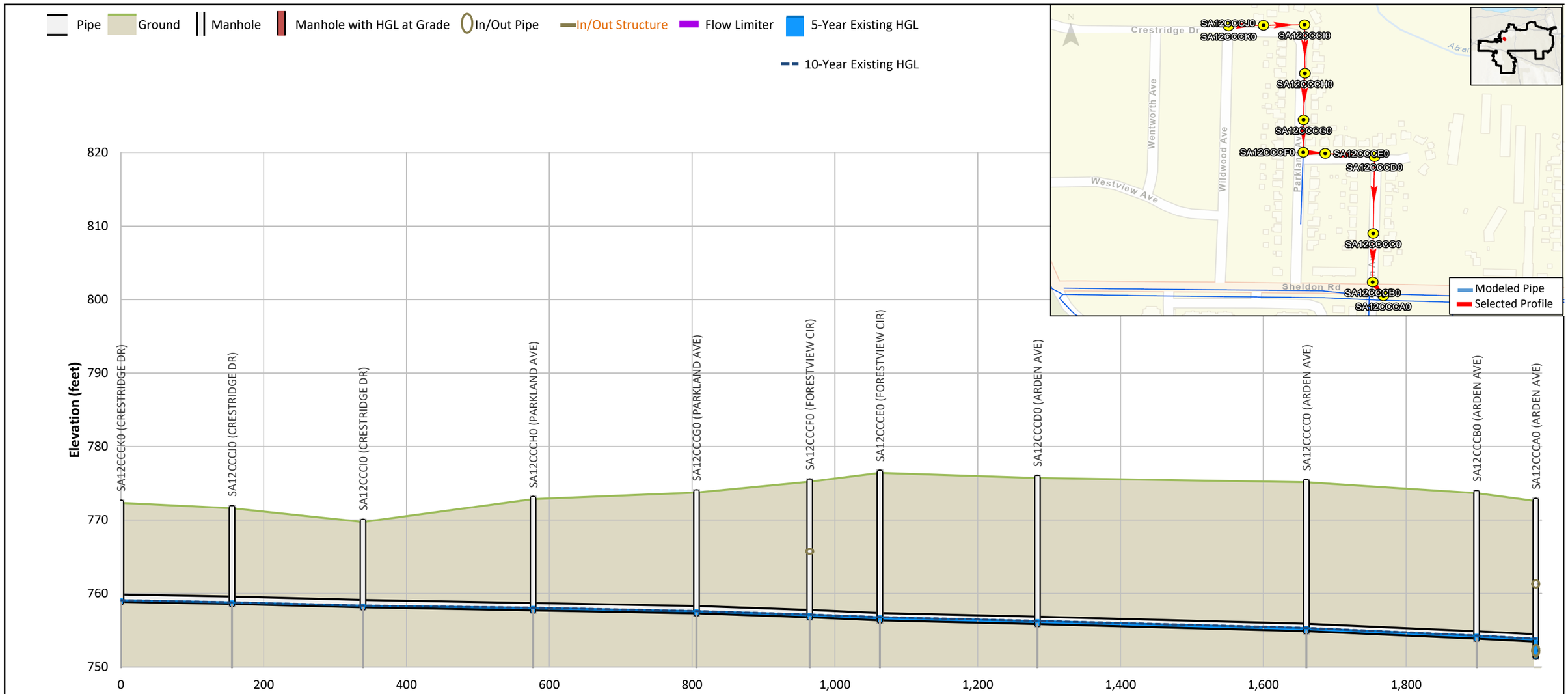
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 228, Date created: 3/11/2021

Depth to Invert (ft)		13	12	15	16	18	20	20	20	20	
Depth to HGL (ft)		13	11	15	16	18	20	19	20	19	
Diameter (in)	12	12	12	12	12	12	12	12	12	12	12
Capacity (mgd)	0.89	1.1	0.88	0.88	1.2	1.4	1.0	1.1	1.4	1.5	
Max Depth (ft)	0.22	0.22	0.34	0.34	0.35	0.41	0.41	0.41	0.41	0.39	
Dep abv Crown (ft)	-	-	-	-	-	-	-	-	-	-	
Max Flow (mgd)	0.09	0.09	0.10	0.21	0.21	0.35	0.34	0.34	0.47	0.47	
Max Velocity (ft/s)	1.2	1.1	0.70	1.8	1.4	1.8	1.9	1.9	2.6	2.9	
Slope (ft/ft)	0.0018	0.0025	0.0018	0.0017	0.0034	0.0043	0.0023	0.0025	0.0043	0.0048	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05, BP-08

Community: Berea, Brook Park

CRESTRIDGE DR to ARDEN AVE

Brown AND Caldwell

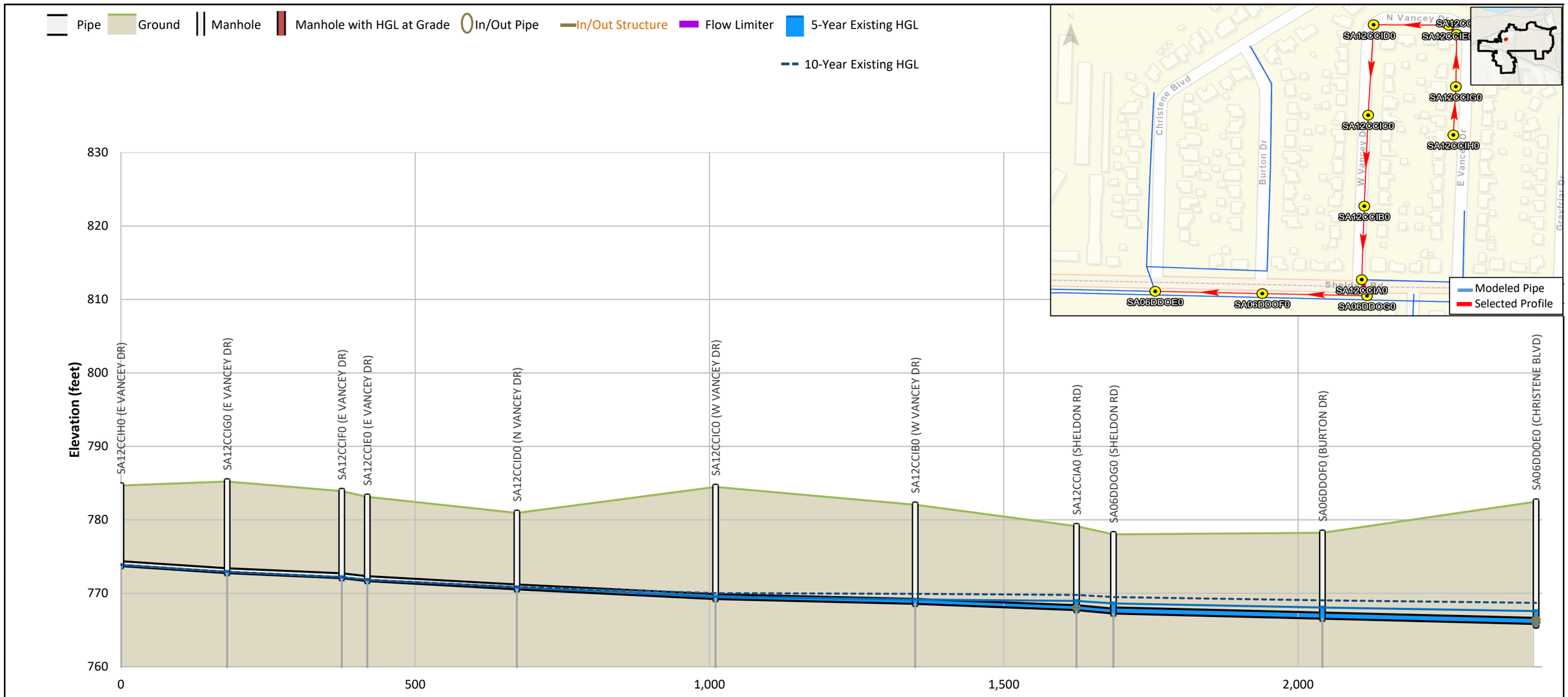
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 229, Date created: 3/11/2021

Depth to Invert (ft)		12	12	11	10	15	13	11	11	12		
Depth to HGL (ft)		12	12	11	10	15	13	10	9.4	10		
Diameter (in)	8	8		8	8	8	8	8	8	10	10	
Capacity (mgd)	0.52	0.42		0.47	0.44	0.31	0.40	0.61	0.57	0.57		
Max Depth (ft)	0.18	0.18		0.29	0.35	0.58	1.2	1.4	1.5	1.8		
Dep abv Crown (ft)	-	-		-	-	-	0.58	0.71	0.69	0.92		
Max Flow (mgd)	0.06	0.06		0.06	0.17	0.16	0.25	0.62	0.61	0.73		
Max Velocity (ft/s)	1.3	1.7		0.83	1.4	1.1	1.1	2.6	1.9	3.4		
Slope (ft/ft)	0.0053	0.0035		0.0044	0.0039	0.0019	0.0031	0.0075	0.0020	0.0020		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05, BP-11
Community: Berea, Brook Park
E VANCEY DR to CHRISTENE BLVD

Brown AND Caldwell

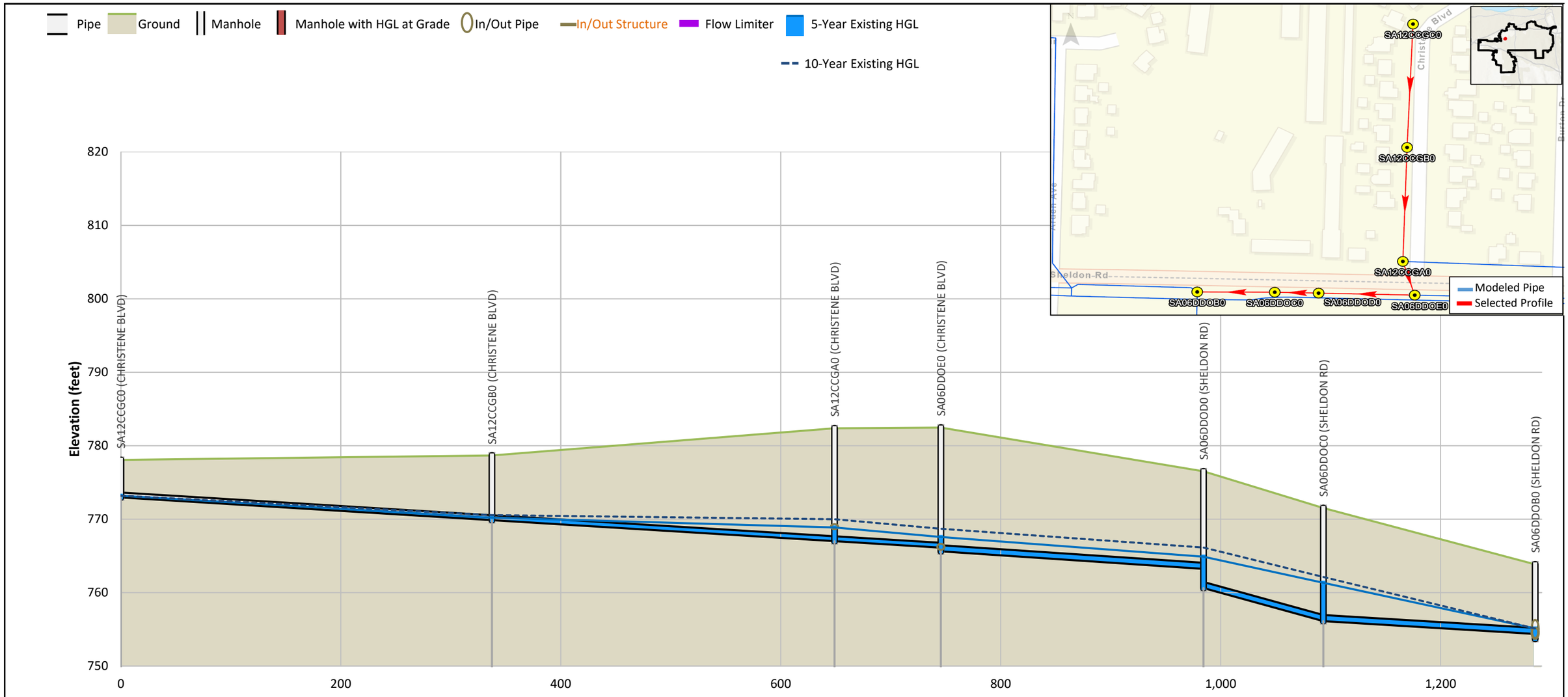
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 232, Date created: 3/11/2021

Depth to Invert (ft)		8.8	15	16	13	15	
Depth to HGL (ft)		8.5	14	15	12	10	
Diameter (in)	8	8	8	10	10	10	
Capacity (mgd)	0.68	0.68	0.68	1.3	2.6	1.2	
Max Depth (ft)	0.35	1.9	1.9	2.0	5.2	5.2	
Dep abv Crown (ft)	-	1.2	1.2	1.1	4.4	4.4	
Max Flow (mgd)	0.17	0.33	0.84	1.6	2.3	2.3	
Max Velocity (ft/s)	1.5	1.6	4.3	5.0	4.4	6.9	
Slope (ft/ft)	0.0092	0.0092	0.0092	0.010	0.041	0.0091	

Northeast Ohio Regional Sewer District

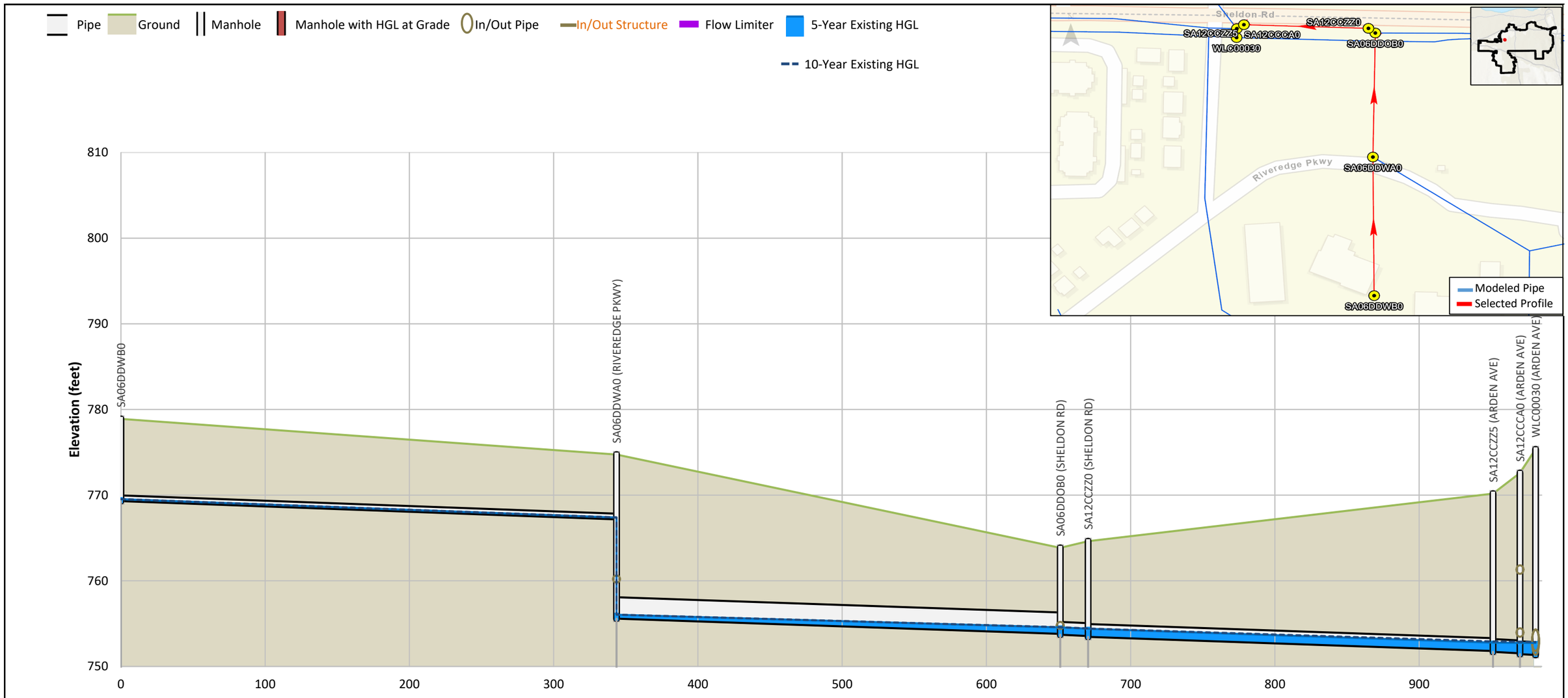
SWI-LSSES

PFA: BE-05, BP-10
Community: Berea, Brook Park
CHRISTENE BLVD to SHELDON RD

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

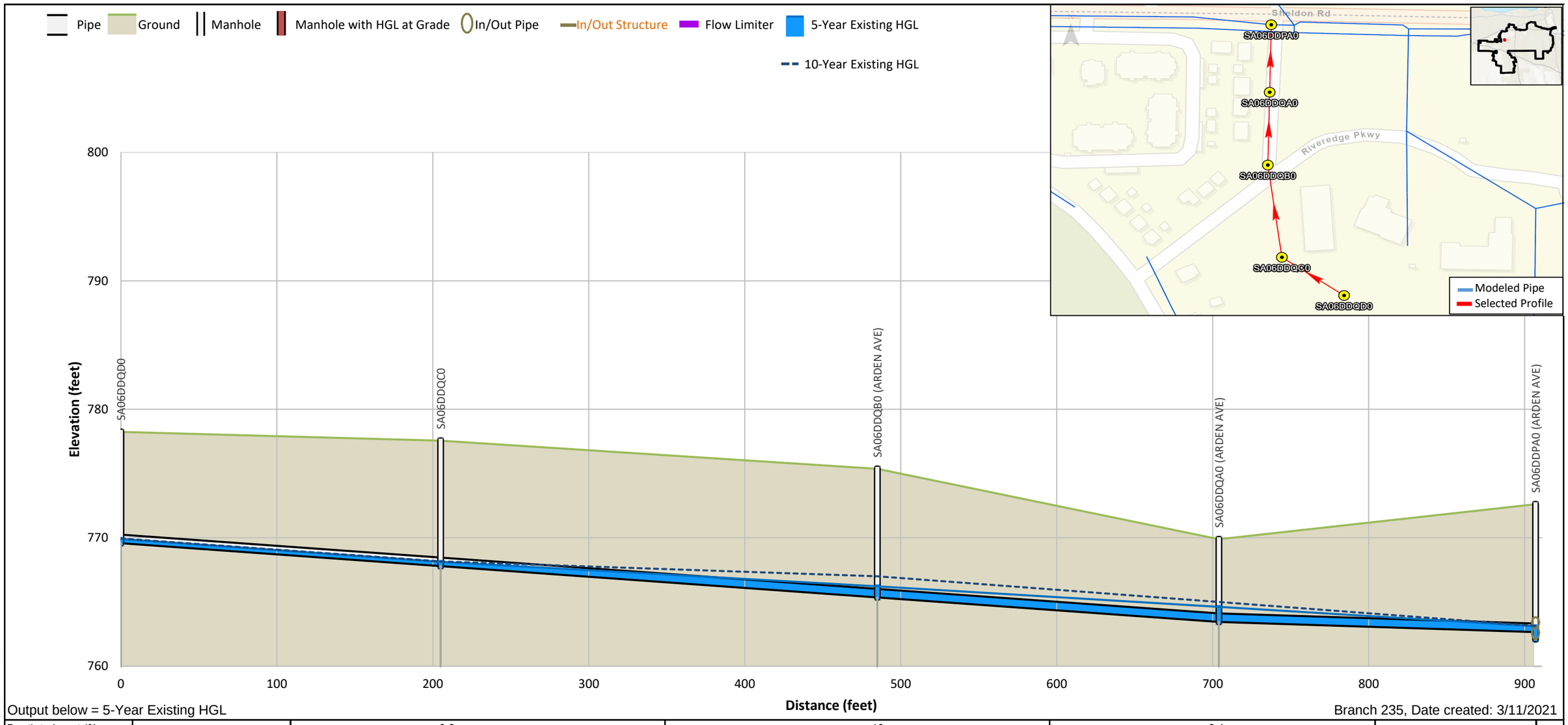
https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 234, Date created: 3/11/2021

| | | |



Output below = 5-Year Existing HGL

Branch 235, Date created: 3/11/2021

Depth to Invert (ft)		9.8	10	6.4	
Depth to HGL (ft)		9.4	9.2	5.3	
Diameter (in)	8	8	8	8	8
Capacity (mgd)	0.66	0.66	0.66	0.66	0.44
Max Depth (ft)	0.33	0.87	1.2	1.2	1.2
Dep abv Crown (ft)	-	0.20	0.51	0.51	0.51
Max Flow (mgd)	0.33	0.33	0.60	0.60	0.60
Max Velocity (ft/s)	2.9	1.8	2.4	3.6	3.6
Slope (ft/ft)	0.0087	0.0087	0.0087	0.0039	0.0039

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05
Community: Berea
Manhole SA06DDQD0 to ARDEN AVE

Brown AND Caldwell

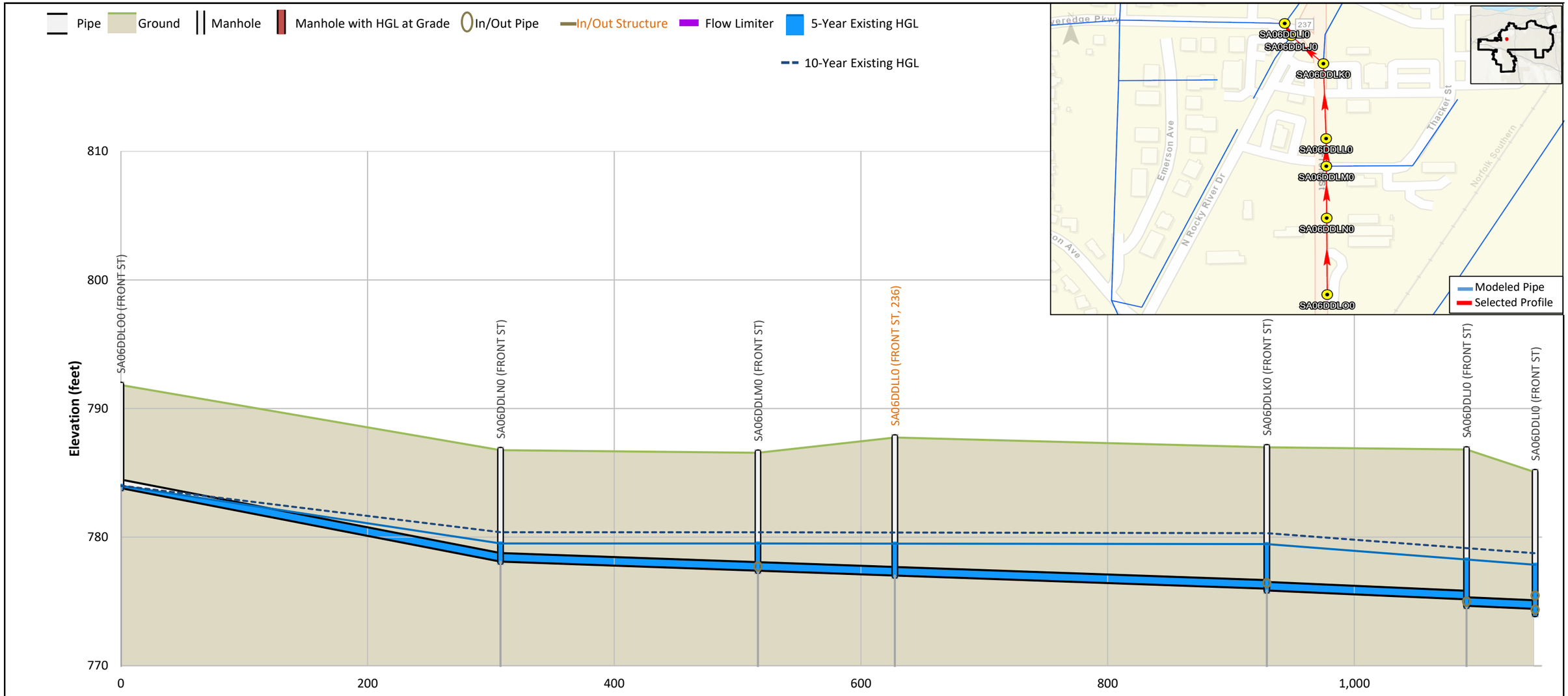
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 236, Date created: 3/11/2021

Depth to Invert (ft)		8.7	9.2	11	11	12	
Depth to HGL (ft)		7.3	7.1	8.3	7.5	8.6	
Diameter (in)	8	8	8	8	8	8	8
Capacity (mgd)	0.97	0.41	0.41	0.41	0.46	0.46	
Max Depth (ft)	1.4	2.1	2.5	3.5	3.6	3.6	
Dep abv Crown (ft)	0.75	1.5	1.8	2.8	2.9	2.9	
Max Flow (mgd)	0.15	0.11	0.37	0.26	0.76	0.69	
Max Velocity (ft/s)	1.7	0.58	2.1	1.9	4.0	3.7	
Slope (ft/ft)	0.019	0.0034	0.0034	0.0034	0.0043	0.0043	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05
Community: Berea
FRONT ST

Brown AND Caldwell

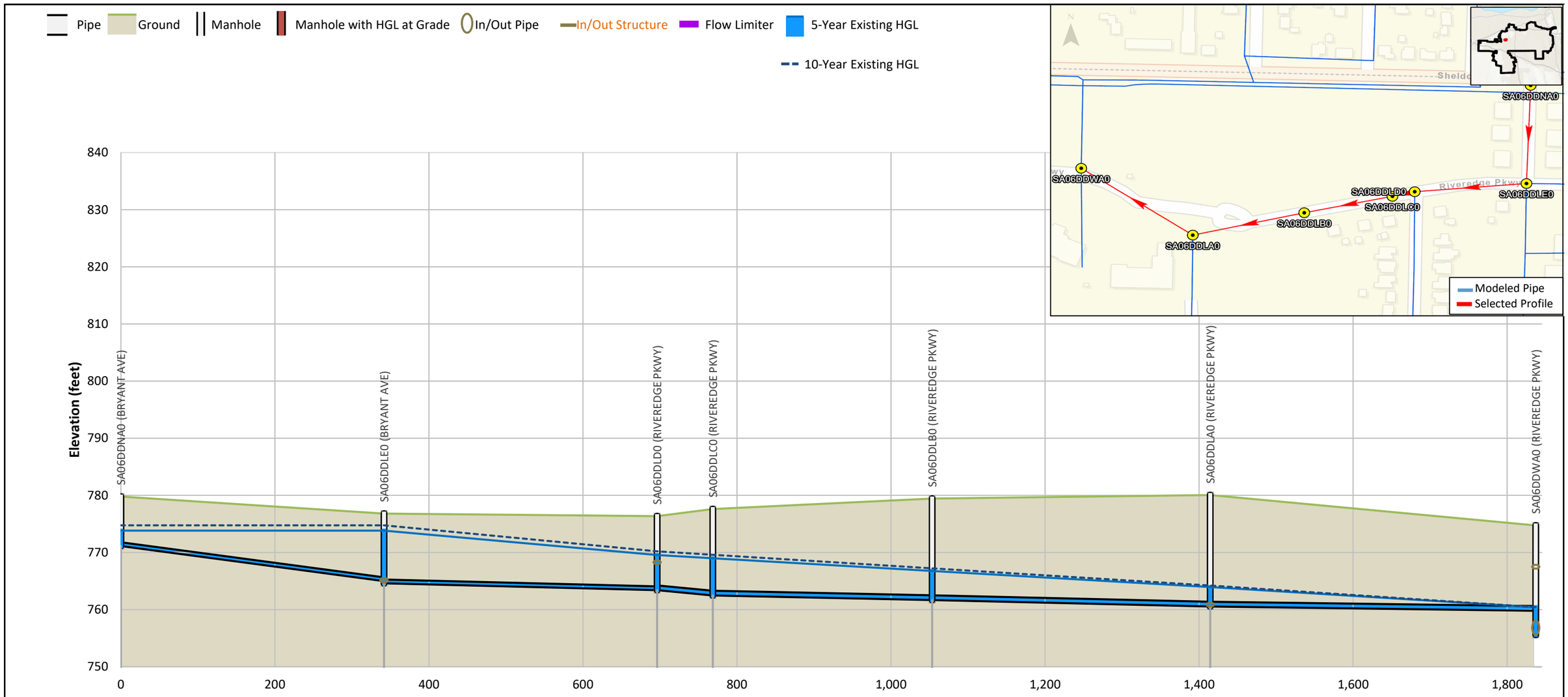
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://browncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 237, Date created: 3/11/2021

Depth to Invert (ft)		12	13	15	18	20	
Depth to HGL (ft)		3.0	6.8	8.6	13	16	
Diameter (in)	8	8	10	10	10	10	
Capacity (mgd)	0.95	0.45	1.6	0.75	0.79	0.60	
Max Depth (ft)	8.8	9.2	6.5	6.5	5.1	3.4	
Dep abv Crown (ft)	8.2	8.6	5.7	5.7	4.3	2.6	
Max Flow (mgd)	-0.08	0.97	1.3	1.2	1.2	1.3	
Max Velocity (ft/s)	1.5	3.7	2.7	2.7	2.6	4.5	
Slope (ft/ft)	0.018	0.0034	0.013	0.0028	0.0031	0.0018	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05

Community: Berea

BRYANT AVE to RIVEREDGE PKWY

Brown AND Caldwell

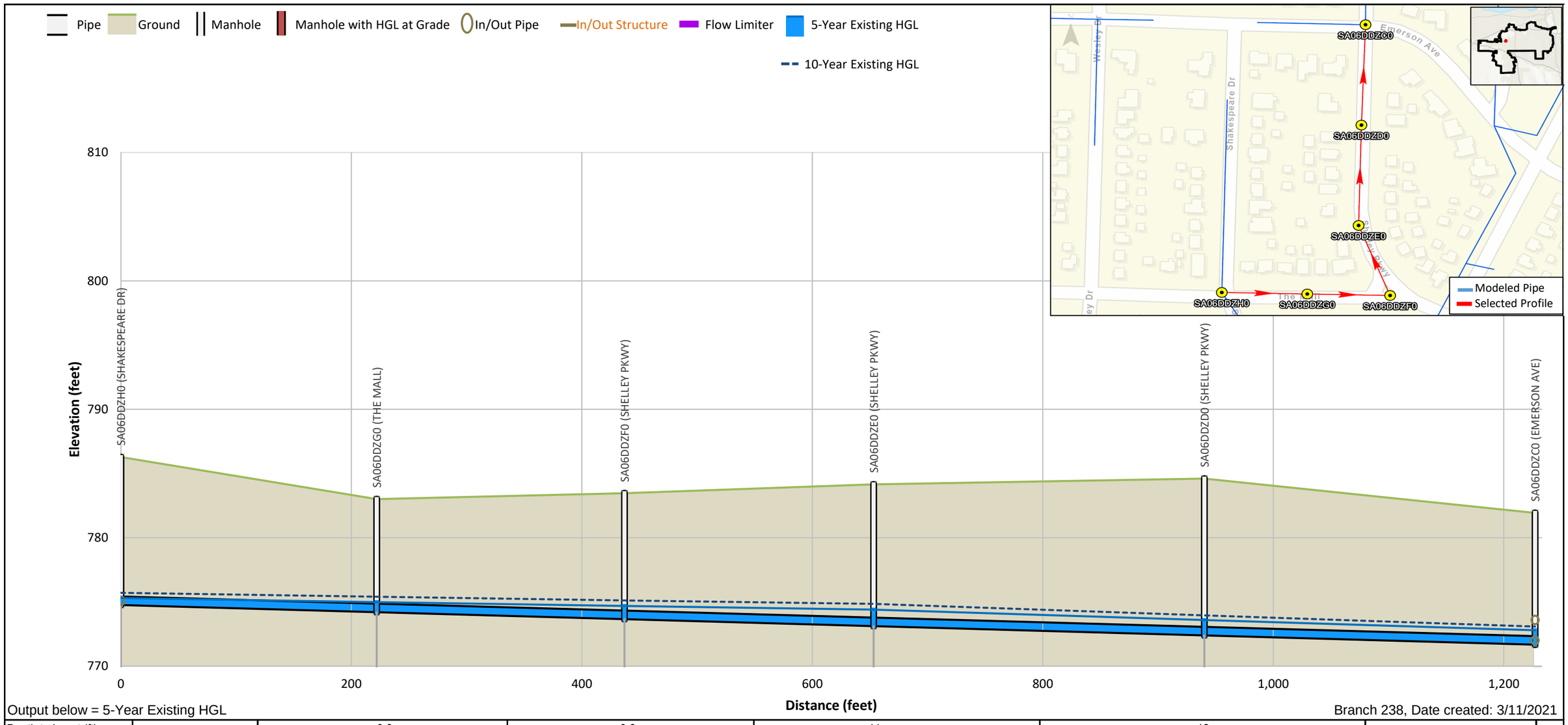
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 238, Date created: 3/11/2021

Depth to Invert (ft)		8.8	9.8	11	12	
Depth to HGL (ft)		8.0	8.8	9.8	11	
Diameter (in)	8	8	8	8	8	8
Capacity (mgd)	0.36	0.36	0.36	0.36	0.36	0.36
Max Depth (ft)	0.79	1.0	1.3	1.3	1.2	
Dep abv Crown (ft)	0.12	0.36	0.62	0.62	0.53	
Max Flow (mgd)	0.34	0.30	0.30	0.38	0.39	
Max Velocity (ft/s)	1.8	1.8	1.2	1.9	1.6	
Slope (ft/ft)	0.0025	0.0025	0.0025	0.0025	0.0025	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05

Community: Berea

SHAKESPEARE DR to EMERSON AVE

Brown AND Caldwell

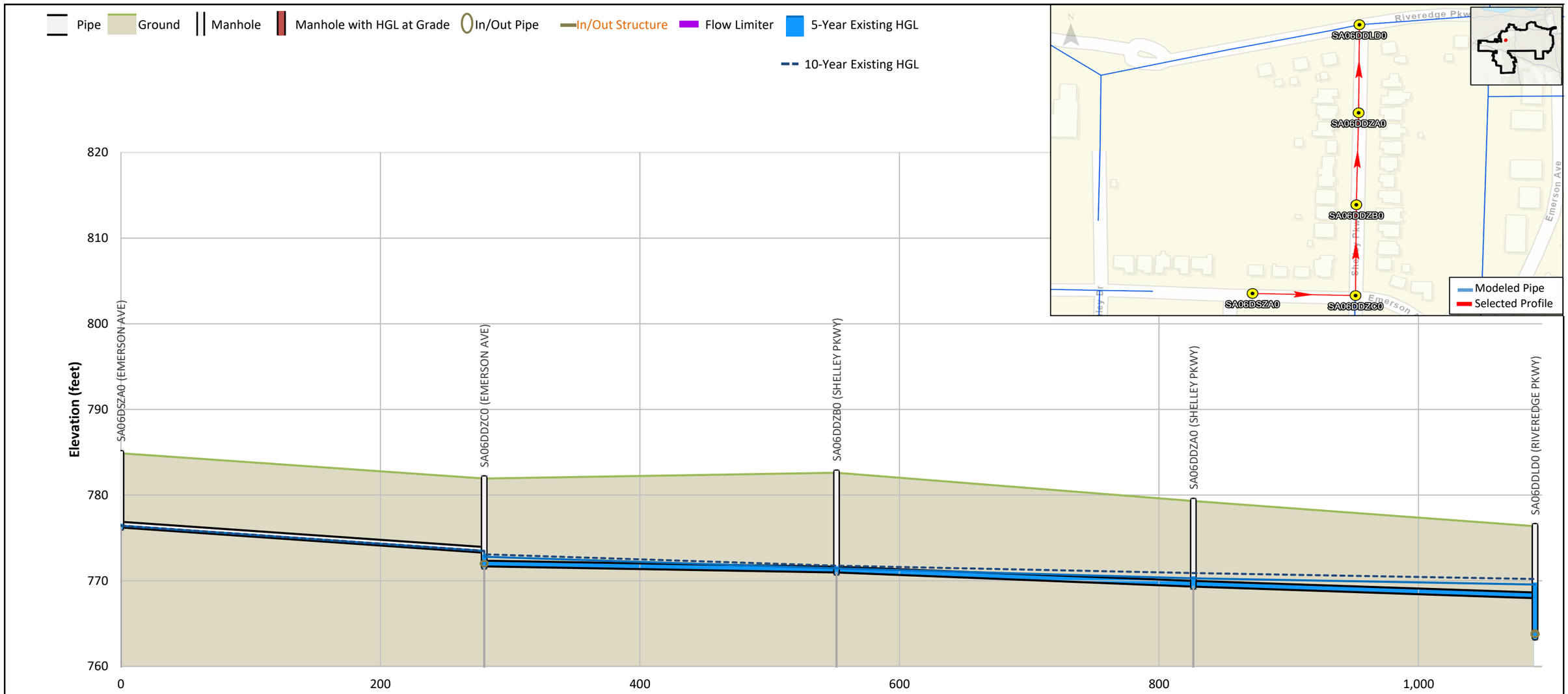
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 239, Date created: 3/11/2021

Depth to Invert (ft)		8.7	12	10.0		
Depth to HGL (ft)		8.5	11	9.0		
Diameter (in)	8	8	8	8	8	
Capacity (mgd)	0.73	0.36	0.55	0.51		
Max Depth (ft)	0.21	1.1	0.97	1.6		
Dep abv Crown (ft)	-	0.46	0.30	0.93		
Max Flow (mgd)	0.15	0.49	0.49	0.44		
Max Velocity (ft/s)	2.5	2.8	2.6	3.2		
Slope (ft/ft)	0.011	0.0026	0.0060	0.0051		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05

Community: Berea

EMERSON AVE to RIVEREDGE PKWY

Brown AND Caldwell

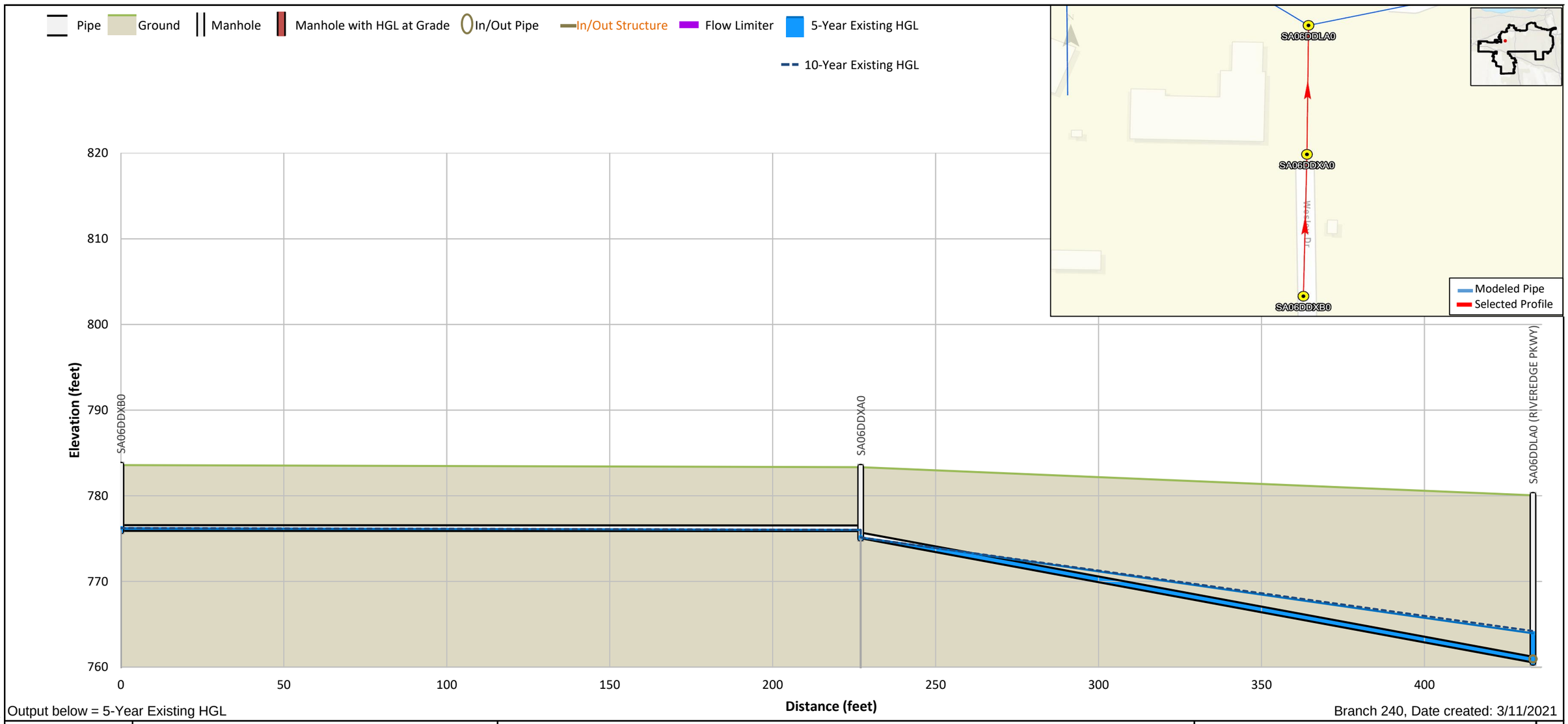
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 240, Date created: 3/11/2021

Depth to Invert (ft)		7.5		
Depth to HGL (ft)		7.3		
Diameter (in)	8		8	
Capacity (mgd)	0.08		1.9	
Max Depth (ft)	0.32		3.4	
Dep abv Crown (ft)	-		2.7	
Max Flow (mgd)	0.06		0.06	
Max Velocity (ft/s)	1.8		0.18	
Slope (ft/ft)	0.00013		0.070	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05
Community: Berea
Manhole SA06DDXB0 to RIVEREDGE PKWY

Brown AND Caldwell

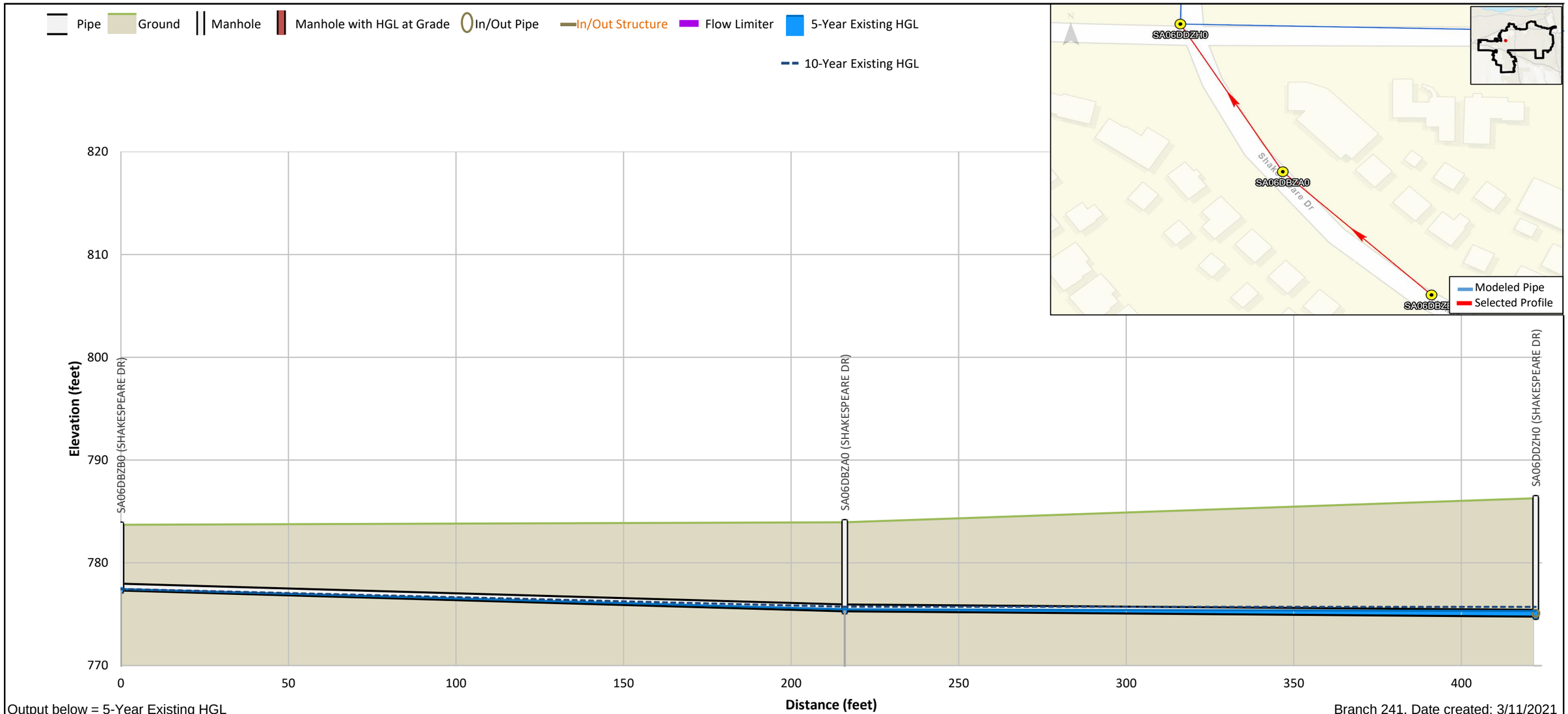
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 241, Date created: 3/11/2021

Depth to Invert (ft)		8.7	
Depth to HGL (ft)		8.5	
Diameter (in)	8		8
Capacity (mgd)	0.69		0.36
Max Depth (ft)	0.20		0.55
Dep abv Crown (ft)	-		-
Max Flow (mgd)	0.07		0.08
Max Velocity (ft/s)	1.2		0.51
Slope (ft/ft)	0.0094		0.0025

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05

Community: Berea

SHAKESPEARE DR

Brown AND Caldwell

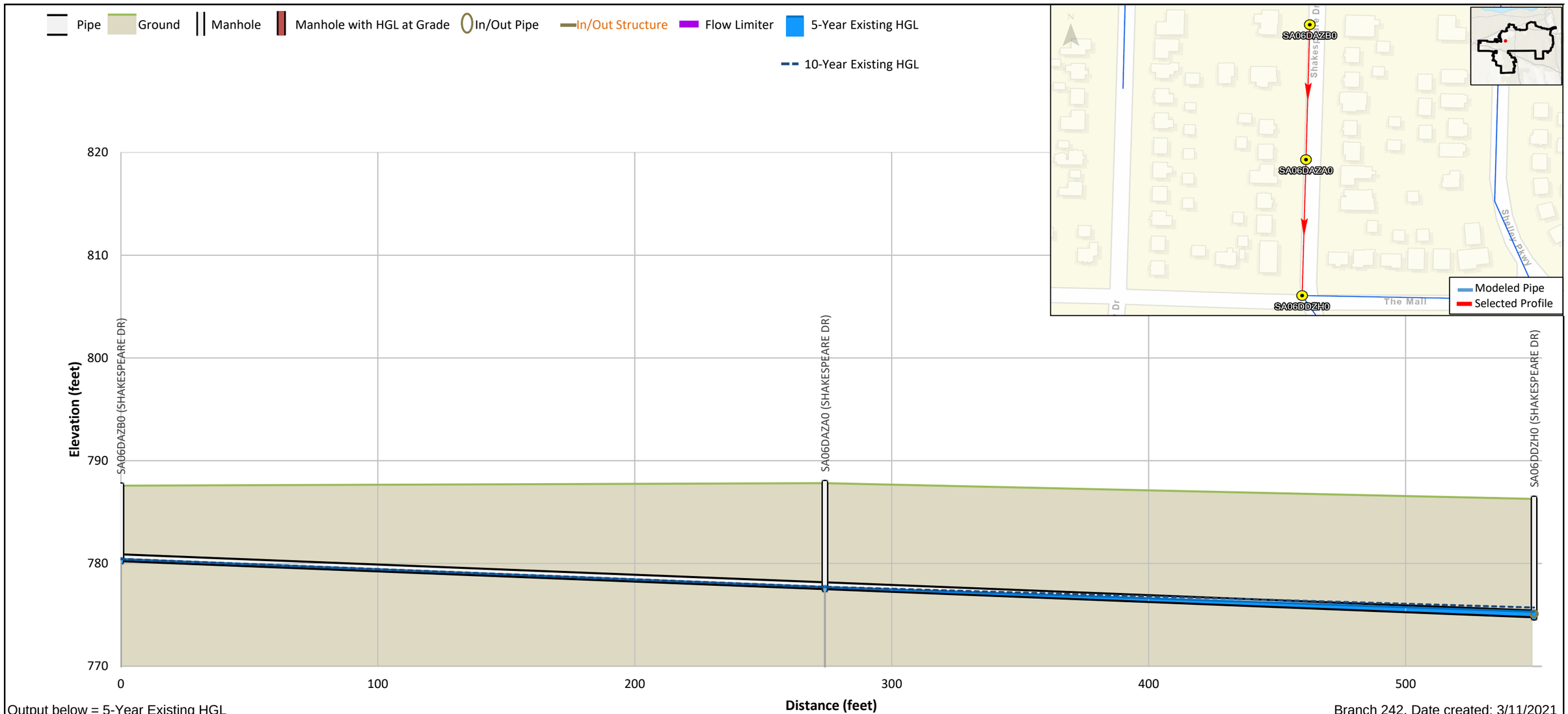
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGL Profiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 242, Date created: 3/11/2021

Depth to Invert (ft)		10	
Depth to HGL (ft)		10	
Diameter (in)	8		8
Capacity (mgd)	0.71		0.71
Max Depth (ft)	0.21		0.55
Dep abv Crown (ft)	-		-
Max Flow (mgd)	0.14		0.14
Max Velocity (ft/s)	2.4		0.76
Slope (ft/ft)	0.0099		0.0099

Northeast Ohio Regional Sewer District

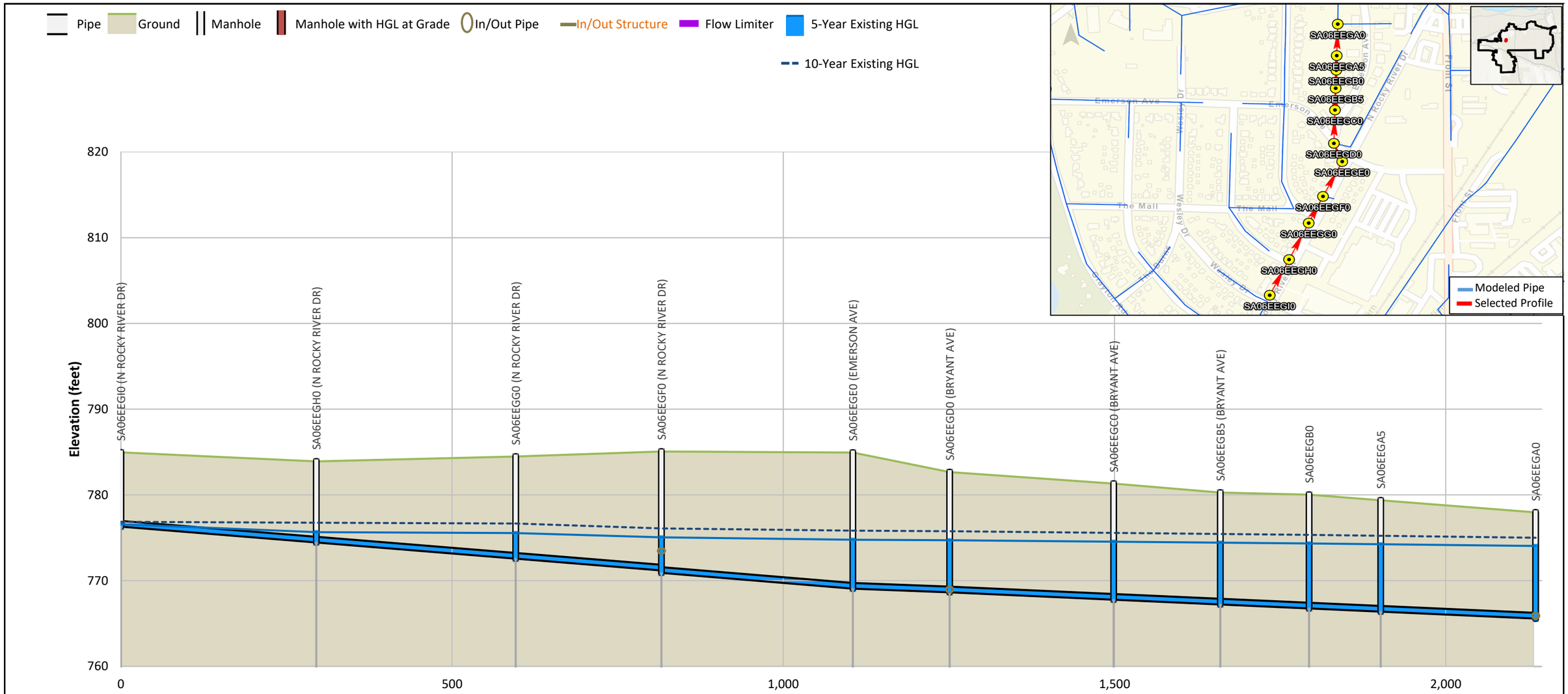
SWI-LSSES

PFA: BE-05
Community: Berea
SHAKESPEARE DR

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 243, Date created: 3/11/2021

Depth to Invert (ft)		9.5	12	14	16	14	14	13	13	13	
Depth to HGL (ft)		8.3	8.9	10	10	7.9	6.8	5.8	5.7	5.1	
Diameter (in)	8	8	8	8	8	8	8	8	8	8	8
Capacity (mgd)	0.56	0.56	0.56	0.57	0.38	0.42	0.42	0.42	0.42	0.42	
Max Depth (ft)	1.2	3.0	3.9	5.7	6.1	6.8	7.2	7.6	7.9	8.5	
Dep abv Crown (ft)	0.54	2.3	3.2	5.0	5.4	6.1	6.5	6.9	7.2	7.8	
Max Flow (mgd)	0.22	0.16	0.50	0.38	0.39	0.47	0.40	0.35	0.42	0.35	
Max Velocity (ft/s)	2.3	0.80	3.4	1.7	1.6	2.2	2.1	1.8	2.2	2.0	
Slope (ft/ft)	0.0063	0.0063	0.0063	0.0064	0.0029	0.0035	0.0035	0.0035	0.0034	0.0035	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05
Community: Berea
N ROCKY RIVER DR to Manhole SA06EEGA0

Brown AND Caldwell

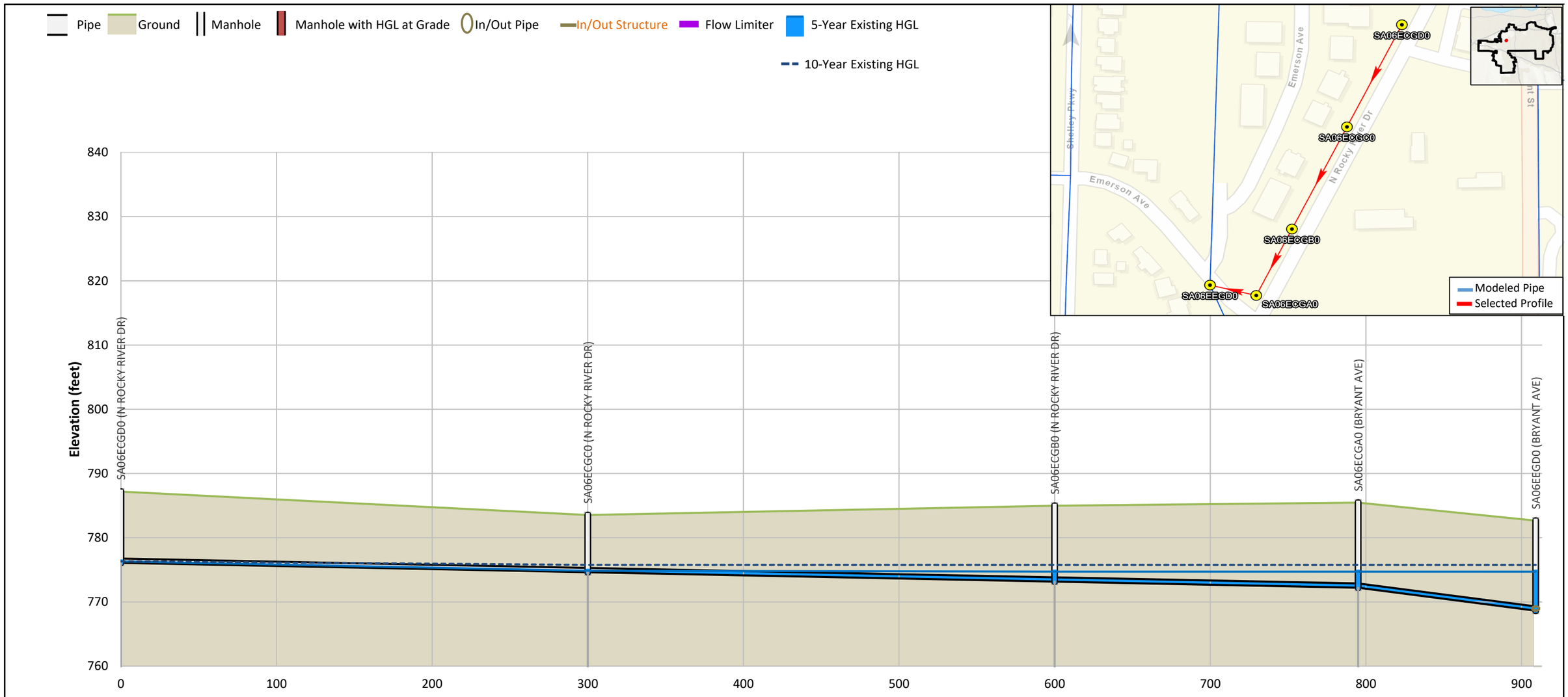
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 244, Date created: 3/11/2021

Depth to Invert (ft)		8.9	12	13	
Depth to HGL (ft)		8.7	10	11	
Diameter (in)	8	8	8	8	
Capacity (mgd)	0.50	0.50	0.50	1.3	
Max Depth (ft)	0.23	1.6	2.5	6.1	
Dep abv Crown (ft)	-	0.89	1.8	5.4	
Max Flow (mgd)	0.13	0.13	0.11	-0.07	
Max Velocity (ft/s)	1.8	1.8	2.1	0.21	
Slope (ft/ft)	0.0049	0.0049	0.0049	0.031	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05

Community: Berea

N ROCKY RIVER DR to BRYANT AVE

Brown AND Caldwell

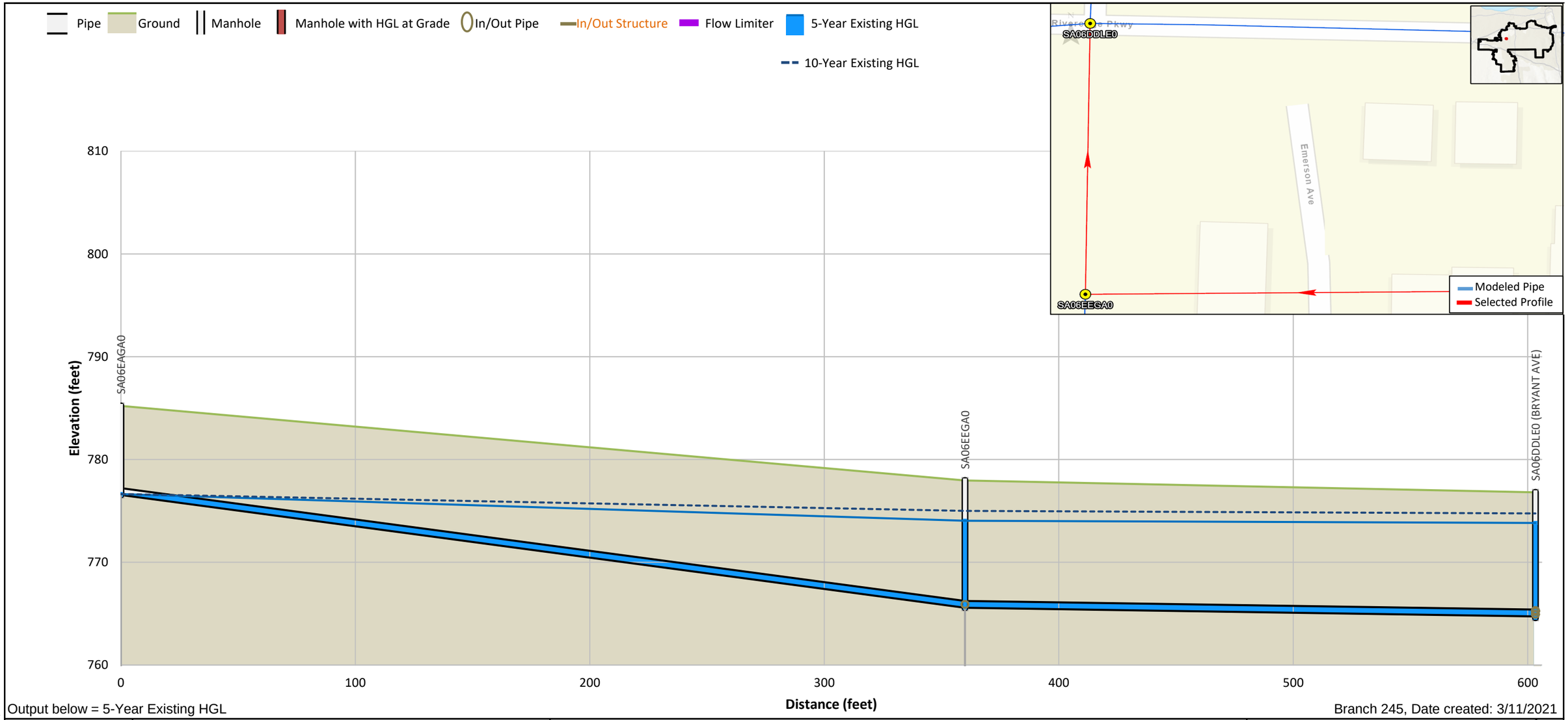
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGL Profiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 245, Date created: 3/11/2021

Depth to Invert (ft)		12	
Depth to HGL (ft)		3.9	
Diameter (in)	8		8
Capacity (mgd)	1.2		0.42
Max Depth (ft)	8.5		9.1
Dep abv Crown (ft)	7.8		8.4
Max Flow (mgd)	-0.05		0.39
Max Velocity (ft/s)	0.20		1.6
Slope (ft/ft)	0.030		0.0035

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05
Community: Berea
Manhole SA06EAGA0 to BRYANT AVE

Brown AND Caldwell

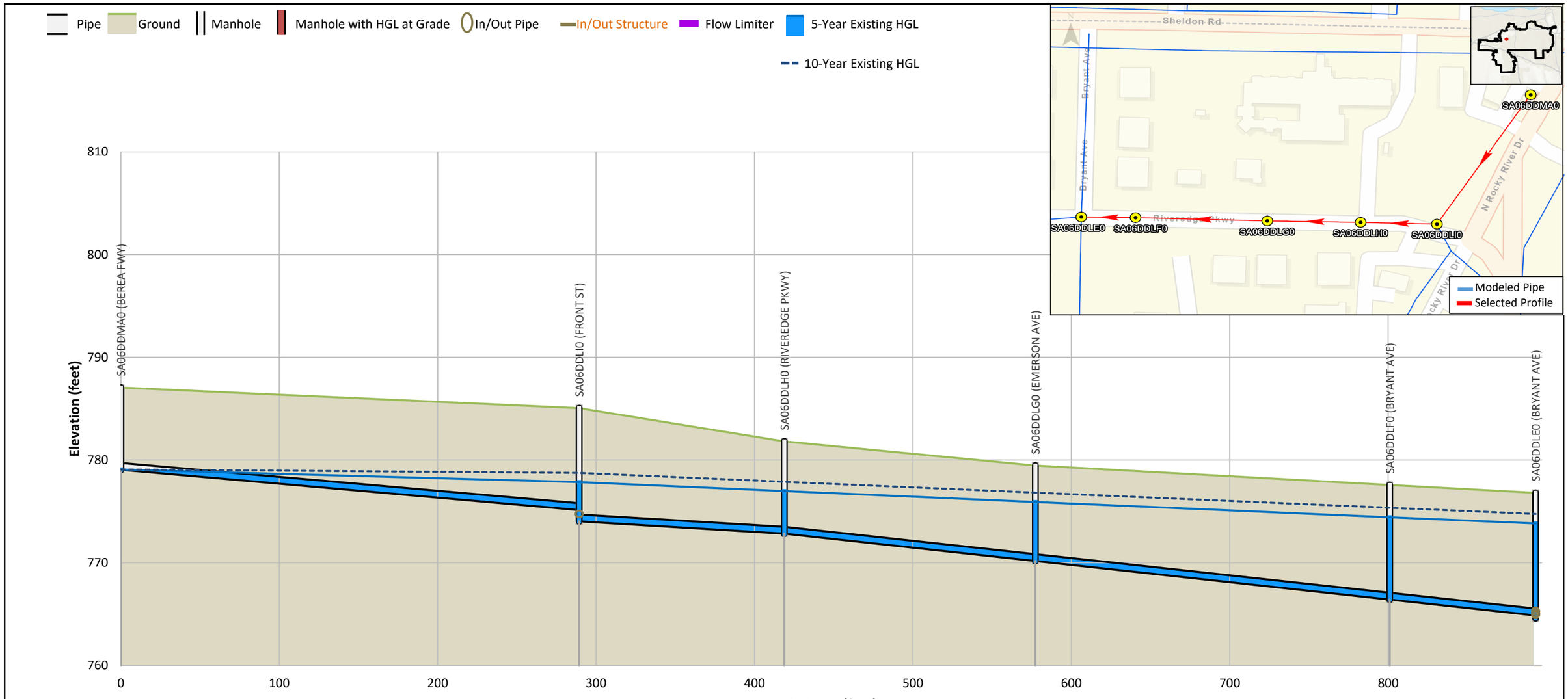
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 246, Date created: 3/11/2021

Depth to Invert (ft)		9.9	9.0	9.3	11	
Depth to HGL (ft)		7.2	4.8	3.5	3.1	
Diameter (in)	8	8	8	8	8	8
Capacity (mgd)	0.83	0.75	1.0	1.0	1.0	1.0
Max Depth (ft)	2.7	4.1	5.7	8.0	9.0	
Dep abv Crown (ft)	2.1	3.5	5.1	7.3	8.3	
Max Flow (mgd)	-0.05	0.90	0.80	0.68	0.66	
Max Velocity (ft/s)	0.77	4.5	5.0	4.5	3.6	
Slope (ft/ft)	0.014	0.0093	0.017	0.017	0.017	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05
Community: Berea
BEREA FWY to BRYANT AVE

Brown AND Caldwell

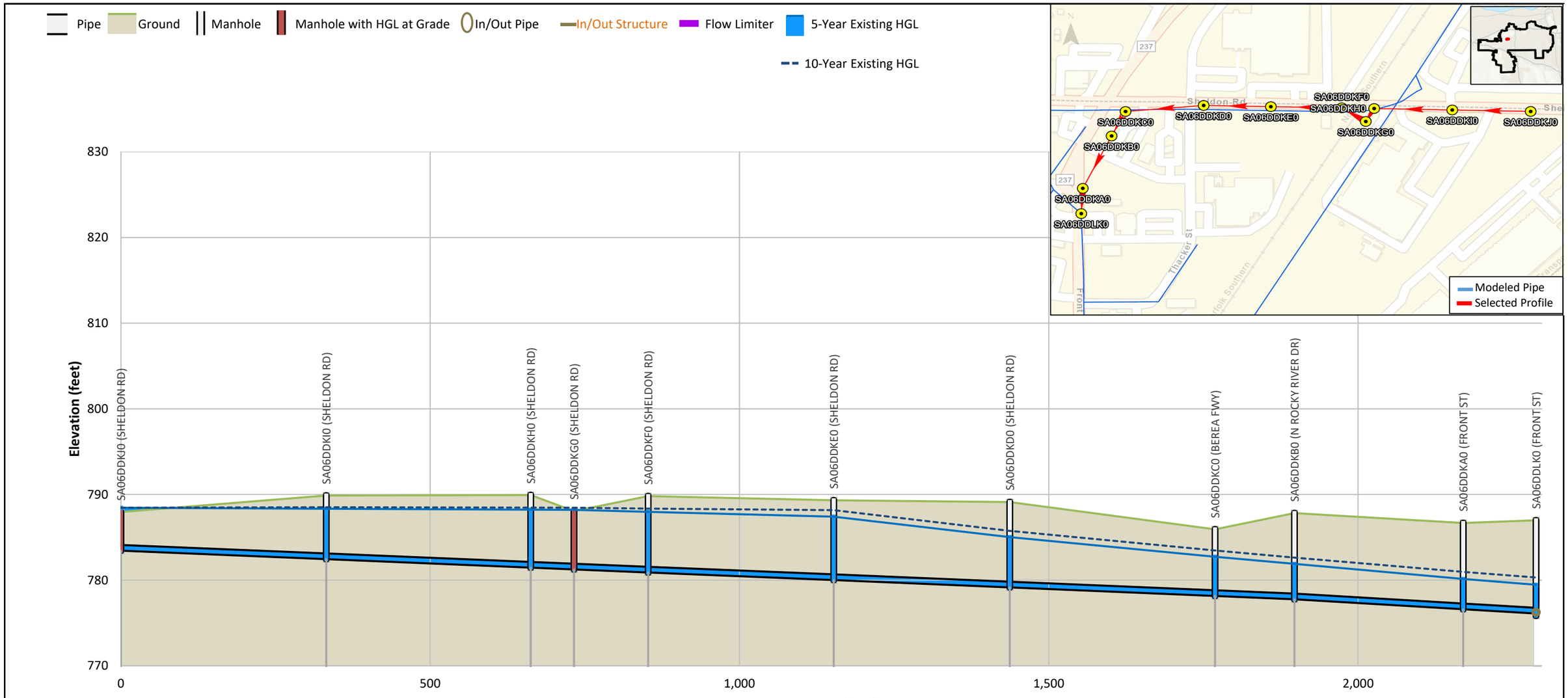
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 247, Date created: 3/11/2021

Depth to Invert (ft)		7.4		8.5	6.8	8.9	9.3	10.0		7.8	10	10	
Depth to HGL (ft)		1.5		1.7	-0.15	1.8	1.9	4.1		3.2	5.9	6.5	
Diameter (in)	8		8		8	8	8	8	8	8	8	8	8
Capacity (mgd)	0.39		0.39		0.39	0.39	0.38	0.39	0.39	0.39	0.46	0.46	
Max Depth (ft)	5.9		6.8		7.0	7.1	7.4	7.4	5.9	4.6	4.1	3.5	
Dep abv Crown (ft)	5.2		6.1		6.3	6.4	6.7	6.7	5.2	3.9	3.5	2.9	
Max Flow (mgd)	0.50		0.33		0.33	0.42	0.41	0.69	0.60	0.58	0.60	0.60	
Max Velocity (ft/s)	2.0		1.7		1.3	2.1	1.2	2.1	2.0	2.0	2.4	3.0	
Slope (ft/ft)	0.0030		0.0030		0.0030	0.0030	0.0029	0.0030	0.0030	0.0030	0.0043	0.0043	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05, BEBP-01
Community: Berea
SHELDON RD to FRONT ST

Brown AND Caldwell

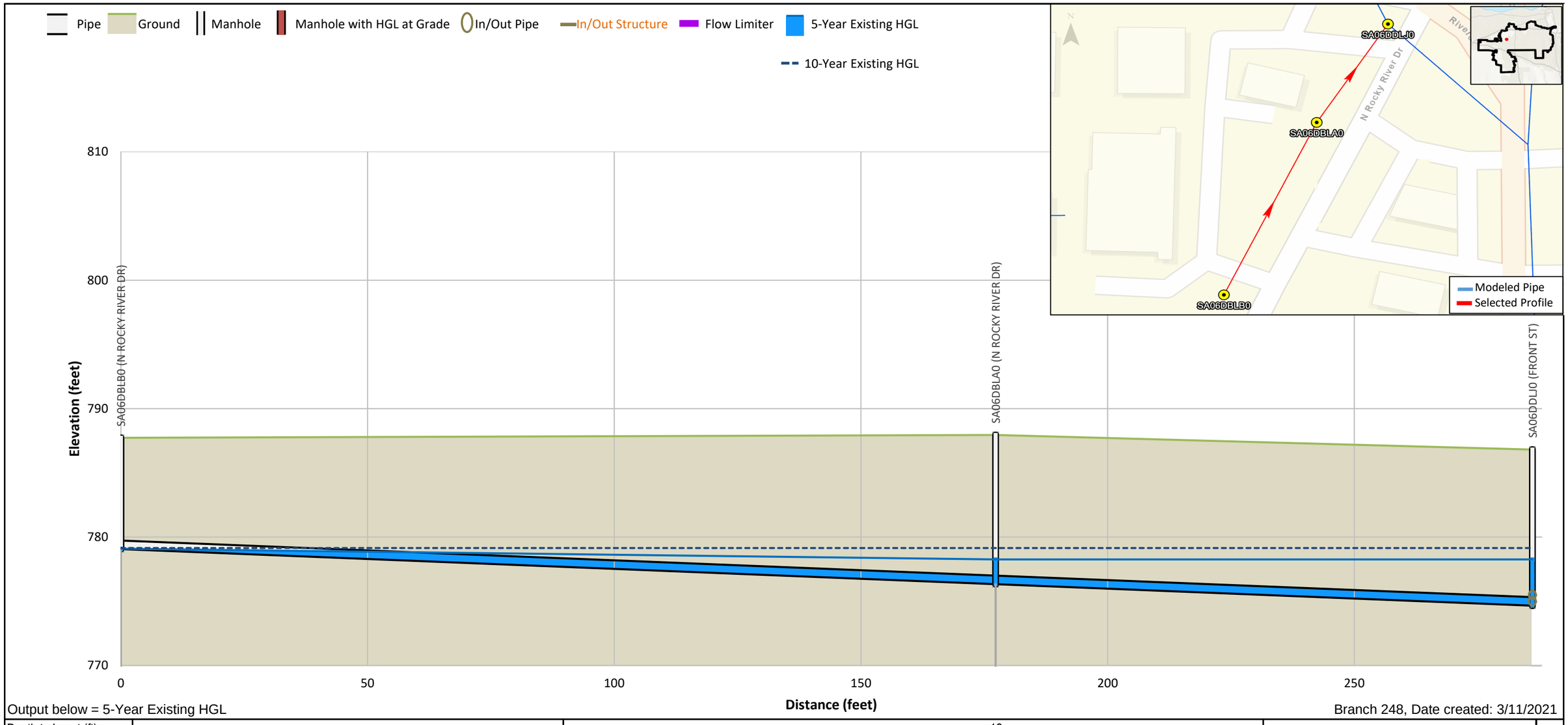
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/DesktopHGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 248, Date created: 3/11/2021

Depth to Invert (ft)		12	
Depth to HGL (ft)		9.7	
Diameter (in)	8		8
Capacity (mgd)	0.88		0.88
Max Depth (ft)	1.9		3.6
Dep abv Crown (ft)	1.3		2.9
Max Flow (mgd)	-0.03		-0.07
Max Velocity (ft/s)	-0.38		-0.26
Slope (ft/ft)	0.015		0.015

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05

Community: Berea

N ROCKY RIVER DR to FRONT ST

Brown AND Caldwell

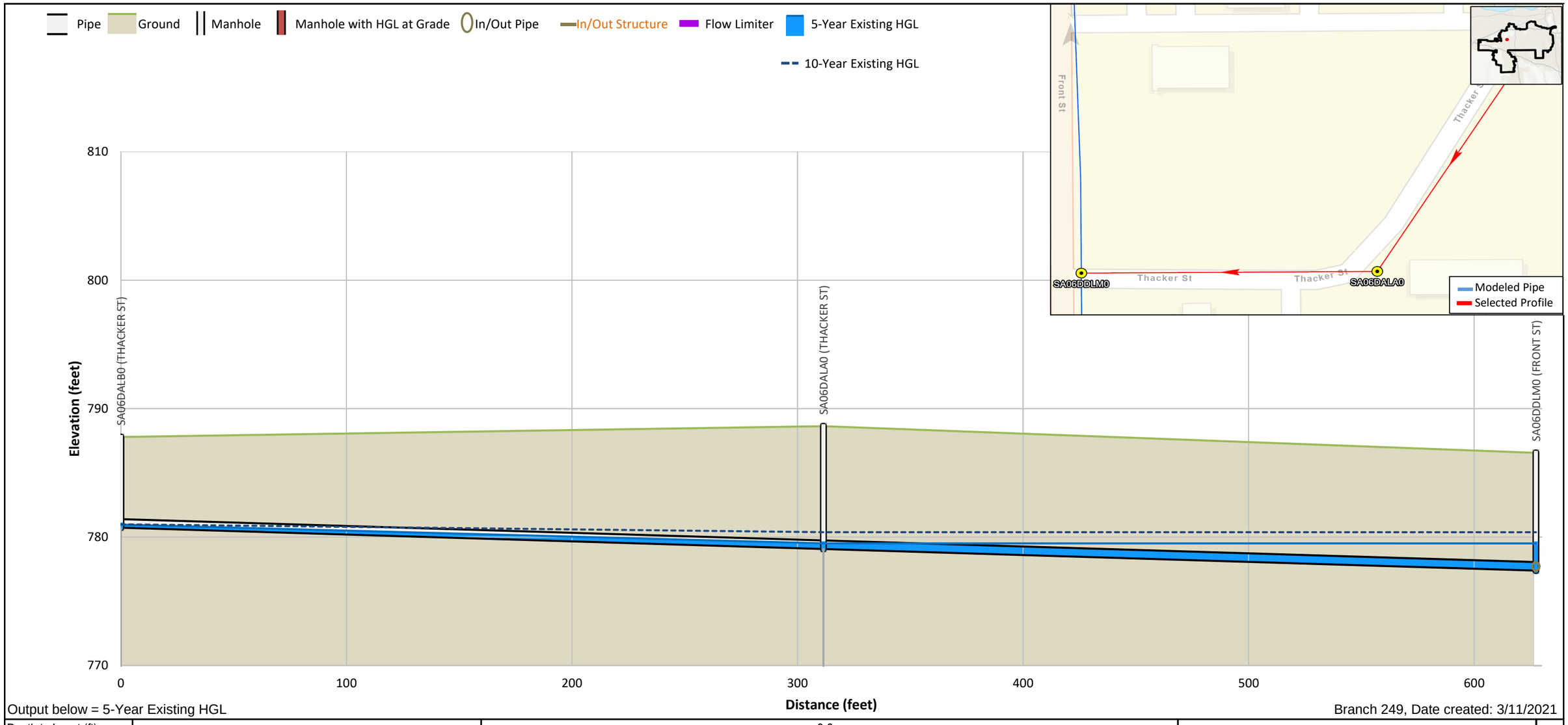
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 249, Date created: 3/11/2021

Depth to Invert (ft)		9.6	
Depth to HGL (ft)		9.1	
Diameter (in)	8		8
Capacity (mgd)	0.52		0.52
Max Depth (ft)	0.44		2.1
Dep abv Crown (ft)	-		1.5
Max Flow (mgd)	0.14		0.09
Max Velocity (ft/s)	2.0		0.49
Slope (ft/ft)	0.0053		0.0053

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05

Community: Berea

THACKER ST to FRONT ST

Brown AND Caldwell

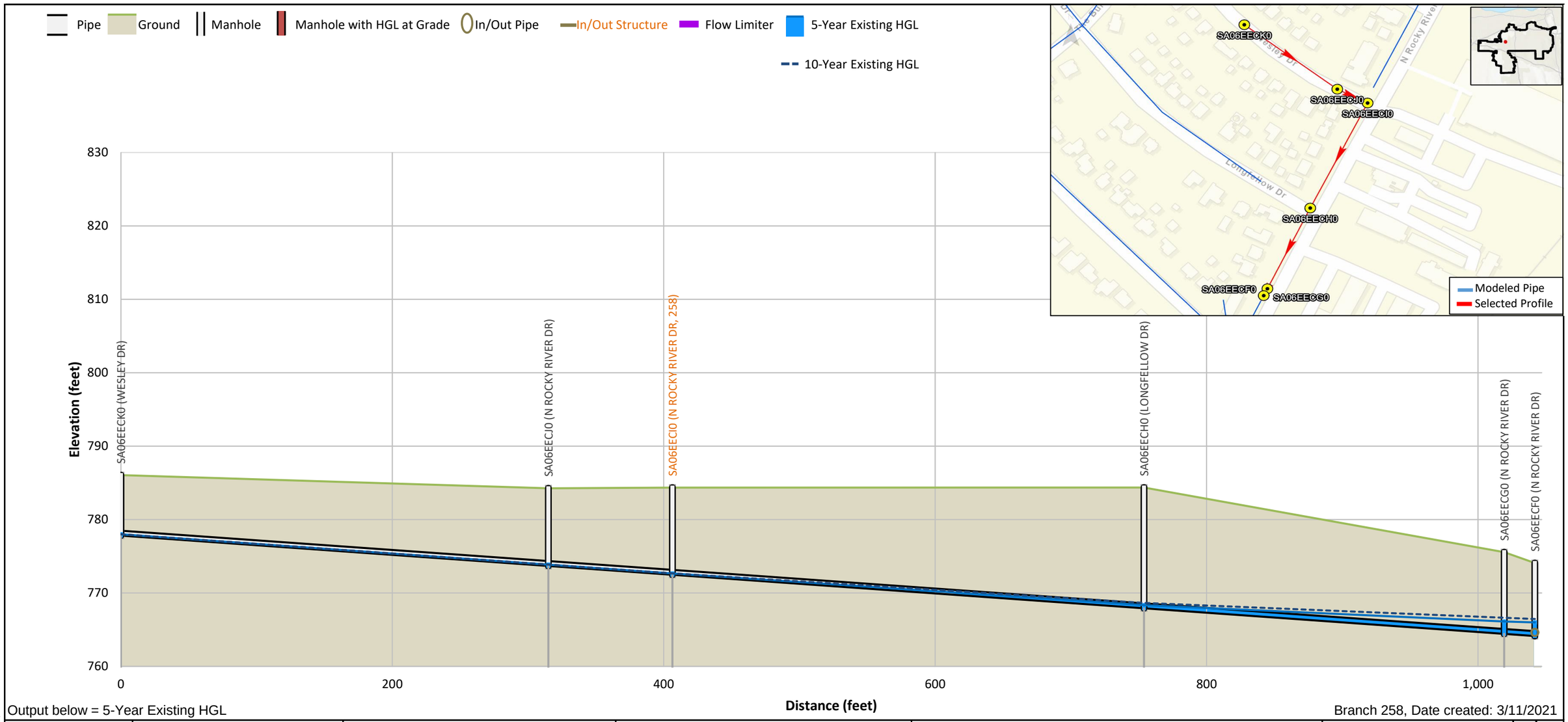
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 258, Date created: 3/11/2021

Depth to Invert (ft)		11	12	16	11	
Depth to HGL (ft)		10	12	16	9.4	
Diameter (in)	8	8	8	8	8	
Capacity (mgd)	0.81	0.81	0.81	0.81	0.81	
Max Depth (ft)	0.18	0.18	0.43	1.7	1.9	
Dep abv Crown (ft)	-	-	-	1.0	1.2	
Max Flow (mgd)	0.13	0.13	0.13	0.59	0.58	
Max Velocity (ft/s)	2.5	2.5	0.85	3.5	2.8	
Slope (ft/ft)	0.013	0.013	0.013	0.013	0.013	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-04, BE-05

Community: Berea

WESLEY DR to N ROCKY RIVER DR

Brown AND Caldwell

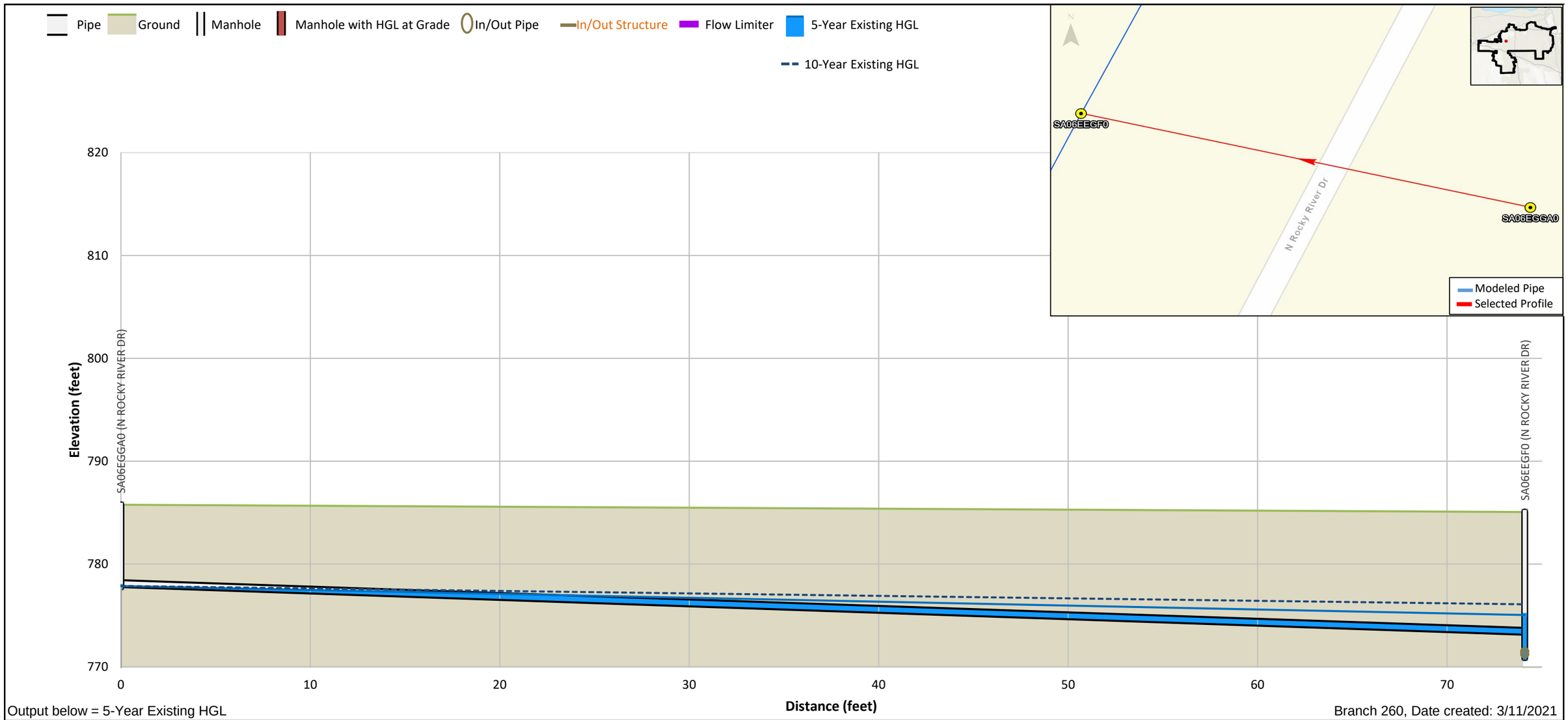
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 260, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	1.8	
Max Depth (ft)	1.9	
Dep abv Crown (ft)	1.3	
Max Flow (mgd)	0.07	
Max Velocity (ft/s)	3.7	
Slope (ft/ft)	0.063	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05

Community: Berea

N ROCKY RIVER DR

Brown AND Caldwell

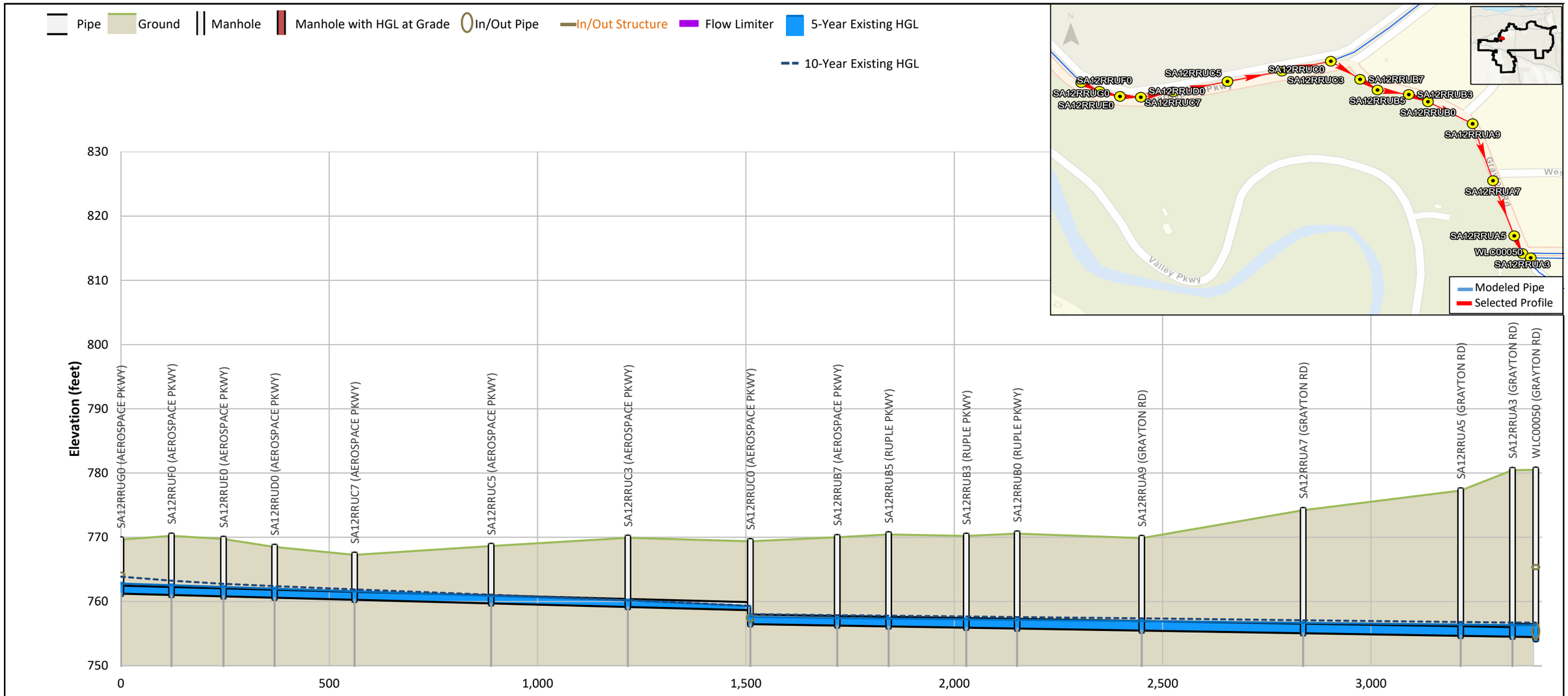
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 225, Date created: 3/11/2021

Depth to Invert (ft)	9.2	8.9	7.9	7.0	8.9	11	11	14	14	14	15	14	19	23	26			
Depth to HGL (ft)	7.7	7.5	6.5	5.7	7.7	9.7	10	13	13	13	13	13	18	21	24			
Diameter (in)	15	15	15	15	15	15	15	18	18	18	18	18	18	18	18			
Capacity (mgd)	1.6	1.6	1.6	1.6	1.6	1.6	1.6	2.0	2.3	2.3	2.0	2.3	2.0	2.0	2.0			
Max Depth (ft)	1.6	1.5	1.5	1.4	1.3	1.2	1.0	1.2	1.2	1.3	1.3	1.5	1.6	1.8	1.8			
Dep abv Crown (ft)	0.32	0.27	0.21	0.16	0.07	-	-	-	-	-	-	-	0.11	0.25	0.30			
Max Flow (mgd)	1.8	1.8	1.8	1.7	1.7	1.7	1.7	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.7			
Max Velocity (ft/s)	3.3	2.6	2.5	2.5	2.4	2.5	4.1	2.3	2.2	2.1	2.2	1.9	1.6	1.5	1.8			
Slope (ft/ft)	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011			

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-06, BP-14, CL-12

Community: Cleveland, Berea, Brook Park

AEROSPACE PKWY to GRAYTON RD

Brown AND Caldwell

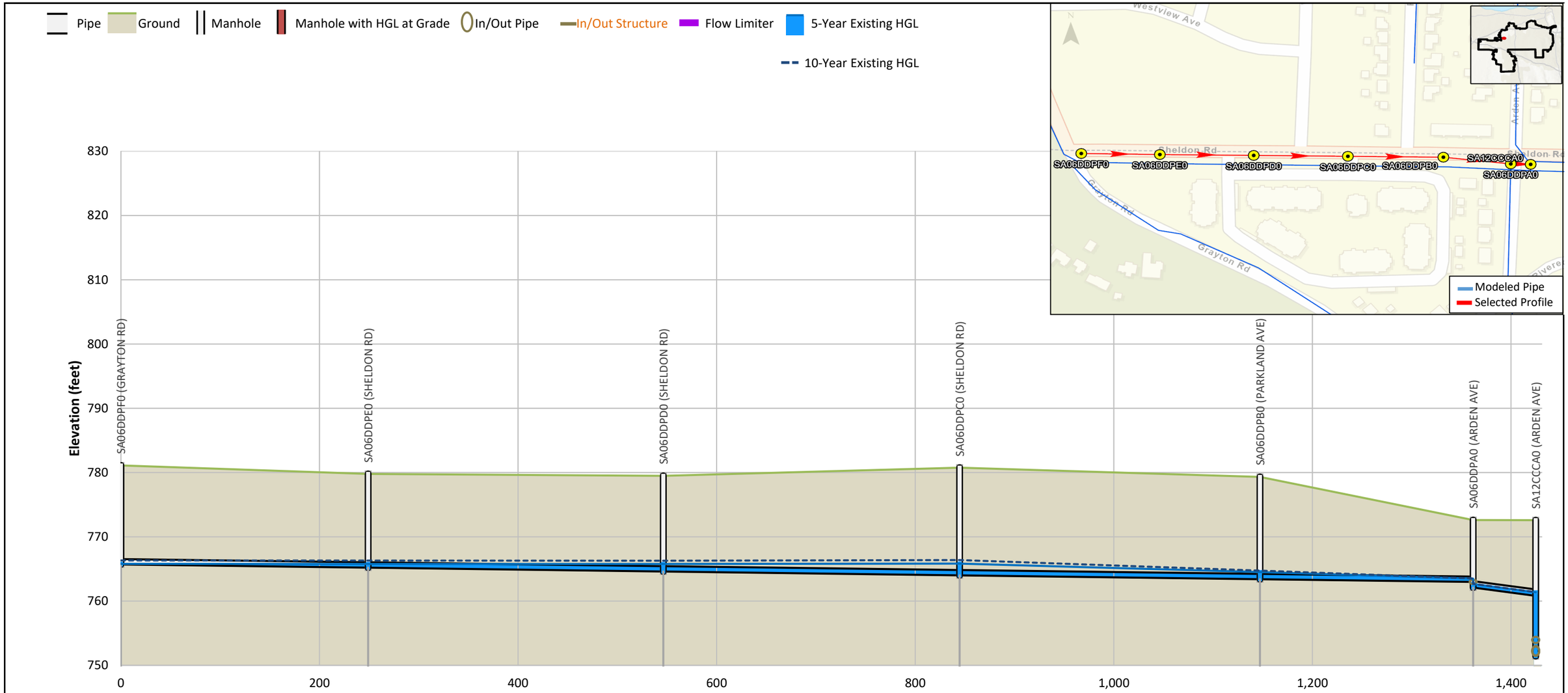
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGL Profiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 227, Date created: 3/11/2021

Depth to Invert (ft)		15	15	17	16	9.6	
Depth to HGL (ft)		14	14	15	15	9.1	
Diameter (in)	10	10	10	10	10	12	
Capacity (mgd)	0.58	0.58	0.58	0.57	0.57	3.0	
Max Depth (ft)	0.58	1.2	1.8	1.8	1.1	0.55	
Dep abv Crown (ft)	-	0.34	1.00	1.00	0.28	-	
Max Flow (mgd)	-0.13	-0.29	0.36	0.85	0.84	1.7	
Max Velocity (ft/s)	-0.75	0.88	0.97	2.3	3.7	6.0	
Slope (ft/ft)	0.0020	0.0020	0.0020	0.0020	0.0020	0.020	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05, BE-06

Community: Berea

GRAYTON RD to ARDEN AVE

Brown AND Caldwell

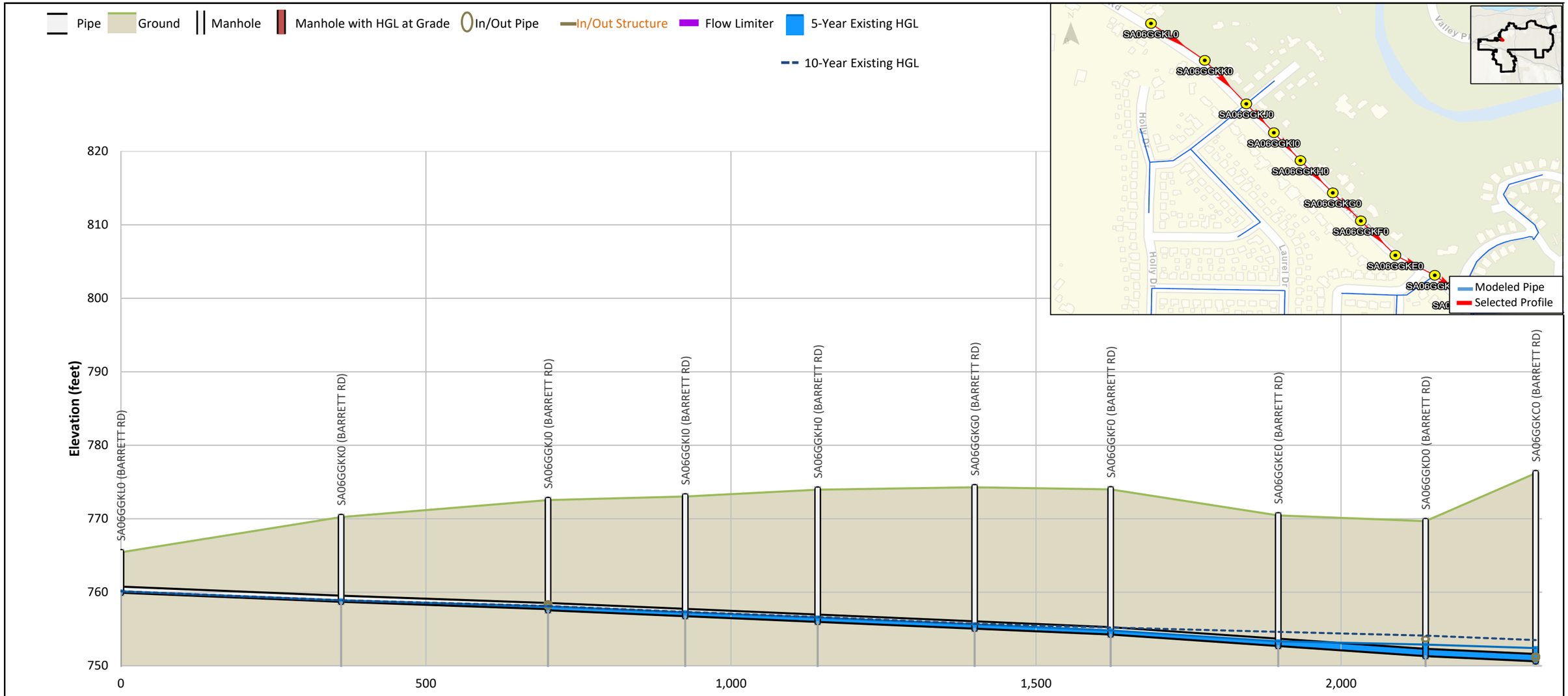
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 207, Date created: 3/11/2021

Depth to Invert (ft)		12	15	16	18	19	20	18	18	
Depth to HGL (ft)		11	14	16	17	19	19	17	17	
Diameter (in)	10	10	12	12	12	12	12	12	12	12
Capacity (mgd)	0.75	0.70	1.3	1.3	1.3	1.3	1.6	1.6	1.6	1.3
Max Depth (ft)	0.20	0.38	0.54	0.60	0.60	0.60	0.64	1.6	1.8	
Dep abv Crown (ft)	-	-	-	-	-	-	-	0.58	0.80	
Max Flow (mgd)	0.08	0.08	0.69	0.69	0.83	0.83	0.93	0.93	1.2	
Max Velocity (ft/s)	1.3	1.0	2.5	2.2	2.6	2.9	3.2	2.3	3.0	
Slope (ft/ft)	0.0034	0.0029	0.0036	0.0036	0.0036	0.0036	0.0057	0.0057	0.0039	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-07

Community: Berea

BARRETT RD

Brown AND Caldwell

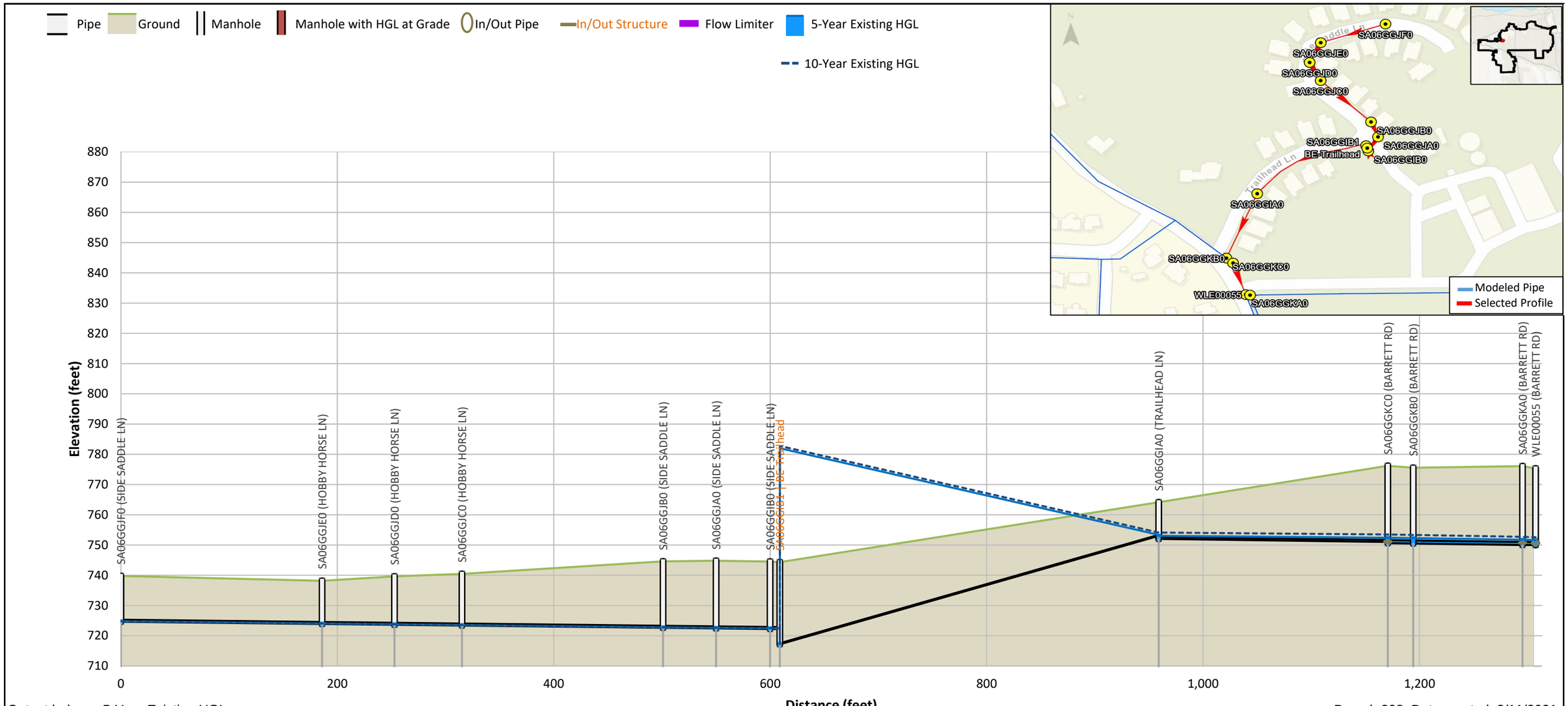
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

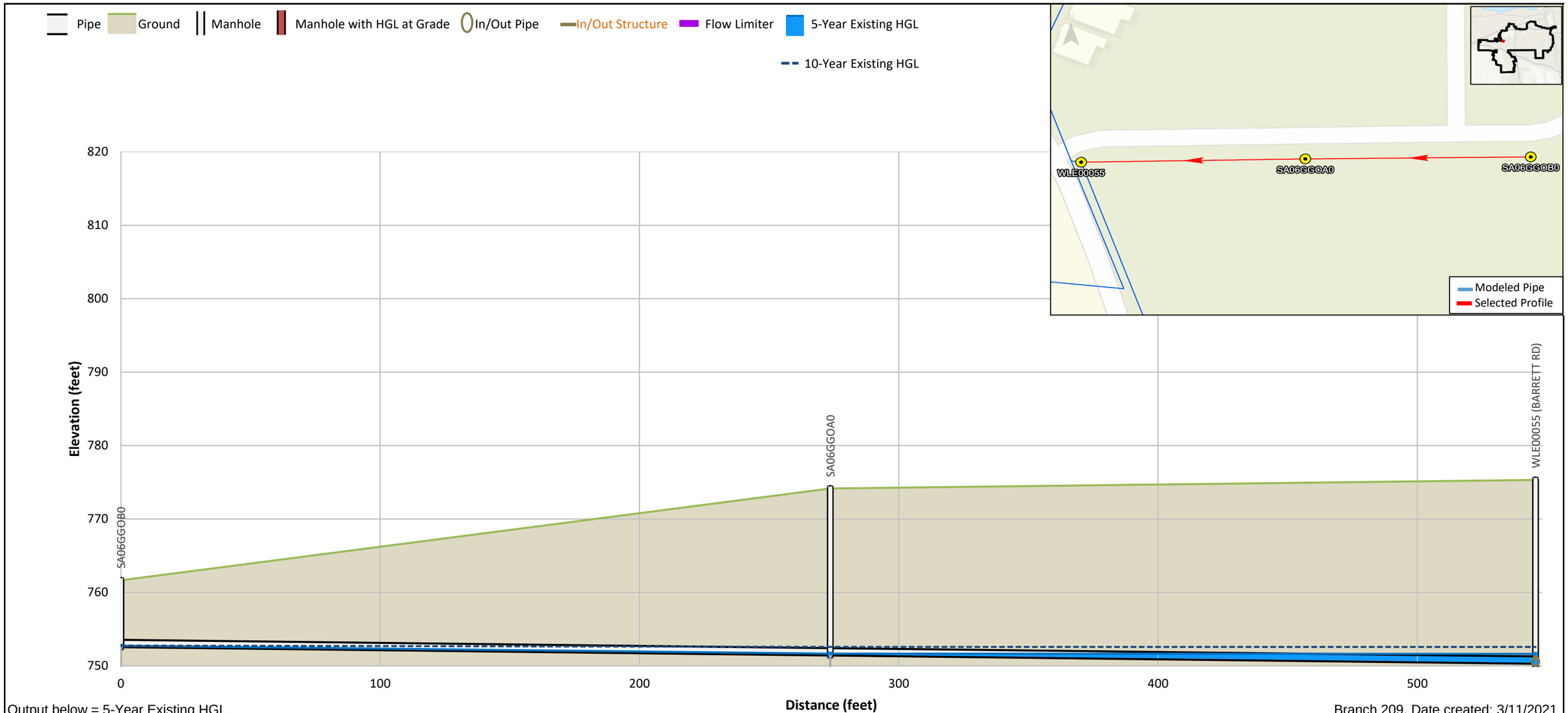
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Output below = 5-Year Existing HGL

Branch 208, Date created: 3/11/2021

| | | |



Output below = 5-Year Existing HGL

Branch 209, Date created: 3/11/2021

Depth to Invert (ft)		23	
Depth to HGL (ft)		22	
Diameter (in)	12		12
Capacity (mgd)	1.4		1.4
Max Depth (ft)	0.25		1.3
Dep abv Crown (ft)	-		0.34
Max Flow (mgd)	0.11		0.19
Max Velocity (ft/s)	1.5		1.6
Slope (ft/ft)	0.0041		0.0041

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-07

Community: Berea

Manhole SA06GGOB0 to BARRETT RD

Brown AND Caldwell

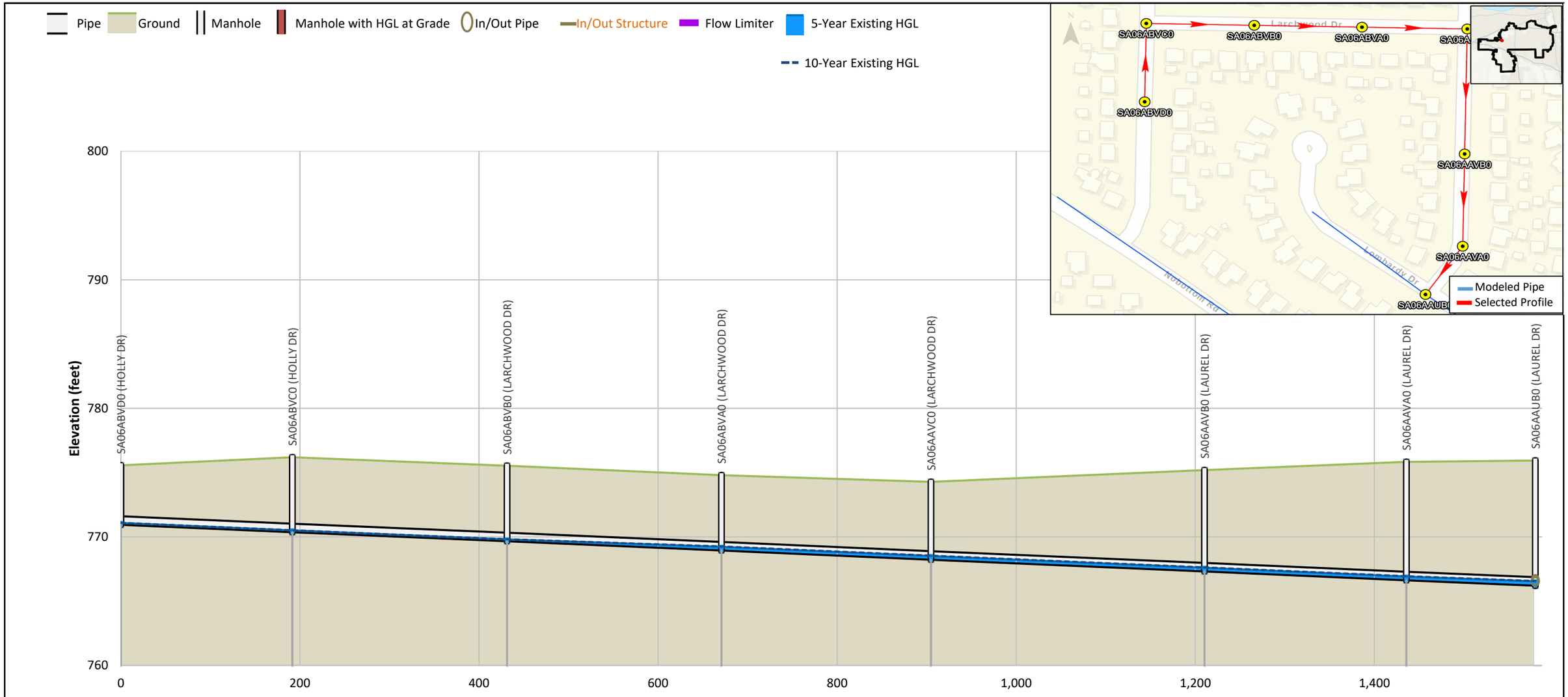
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 210, Date created: 3/11/2021

Depth to Invert (ft)		5.8	5.9	5.9	6.1	7.9	9.2	
Depth to HGL (ft)		5.7	5.7	5.6	5.8	7.6	8.9	
Diameter (in)	8	8	8	8	8	8	8	8
Capacity (mgd)	0.39	0.38	0.39	0.39	0.39	0.39	0.39	0.38
Max Depth (ft)	0.15	0.15	0.29	0.29	0.29	0.29	0.29	0.34
Dep abv Crown (ft)	-	-	-	-	-	-	-	-
Max Flow (mgd)	0.04	0.04	0.04	0.15	0.15	0.15	0.15	0.15
Max Velocity (ft/s)	1.1	1.1	0.43	1.6	1.6	1.6	1.6	1.3
Slope (ft/ft)	0.0030	0.0029	0.0030	0.0031	0.0030	0.0031	0.0029	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-07

Community: Berea

HOLLY DR to LAUREL DR

Brown AND Caldwell

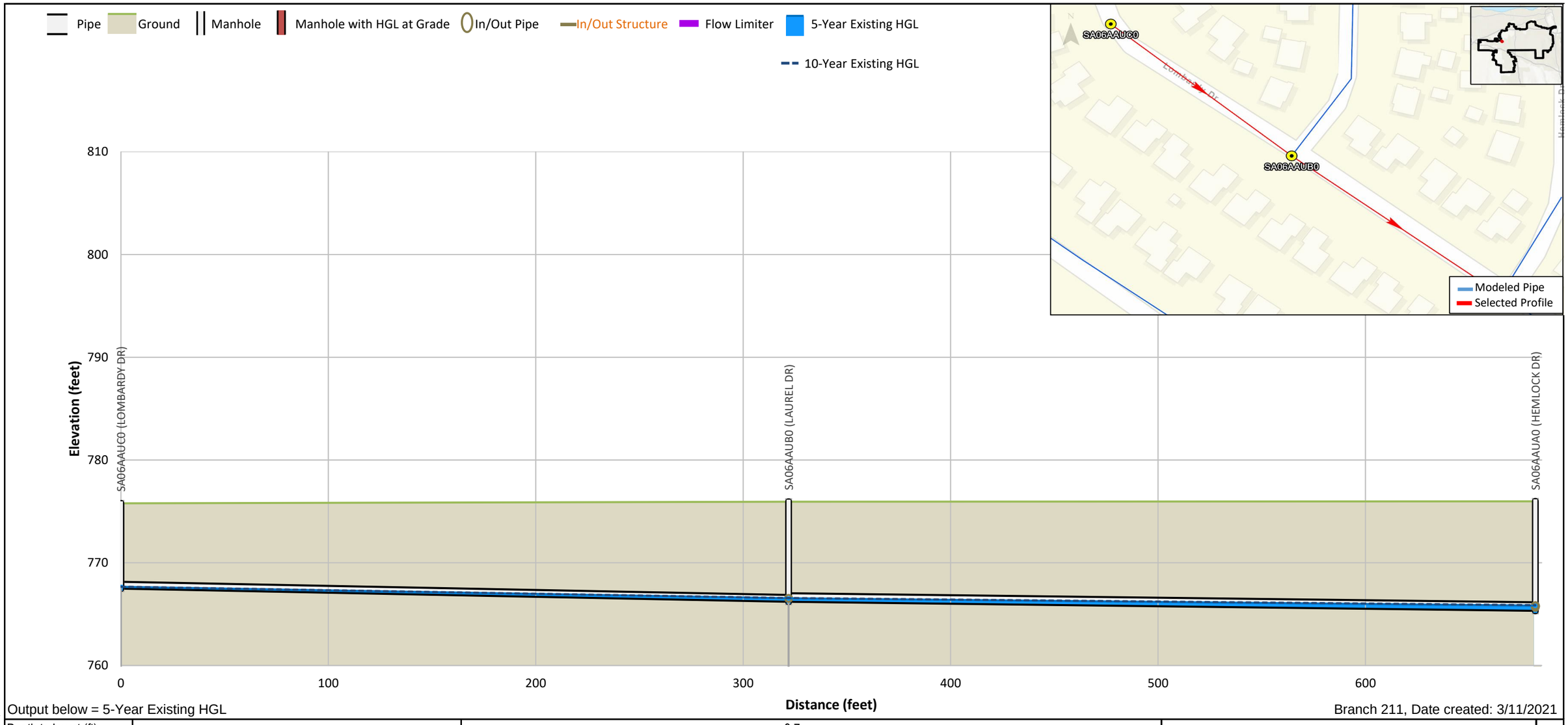
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 211, Date created: 3/11/2021

Depth to Invert (ft)		9.7	
Depth to HGL (ft)		9.4	
Diameter (in)	8		10
Capacity (mgd)	0.45		0.64
Max Depth (ft)	0.34		0.51
Dep abv Crown (ft)	-		-
Max Flow (mgd)	0.07		0.22
Max Velocity (ft/s)	0.84		1.00
Slope (ft/ft)	0.0040		0.0024

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-07

Community: Berea

LOMBARDY DR to HEMLOCK DR

Brown AND Caldwell

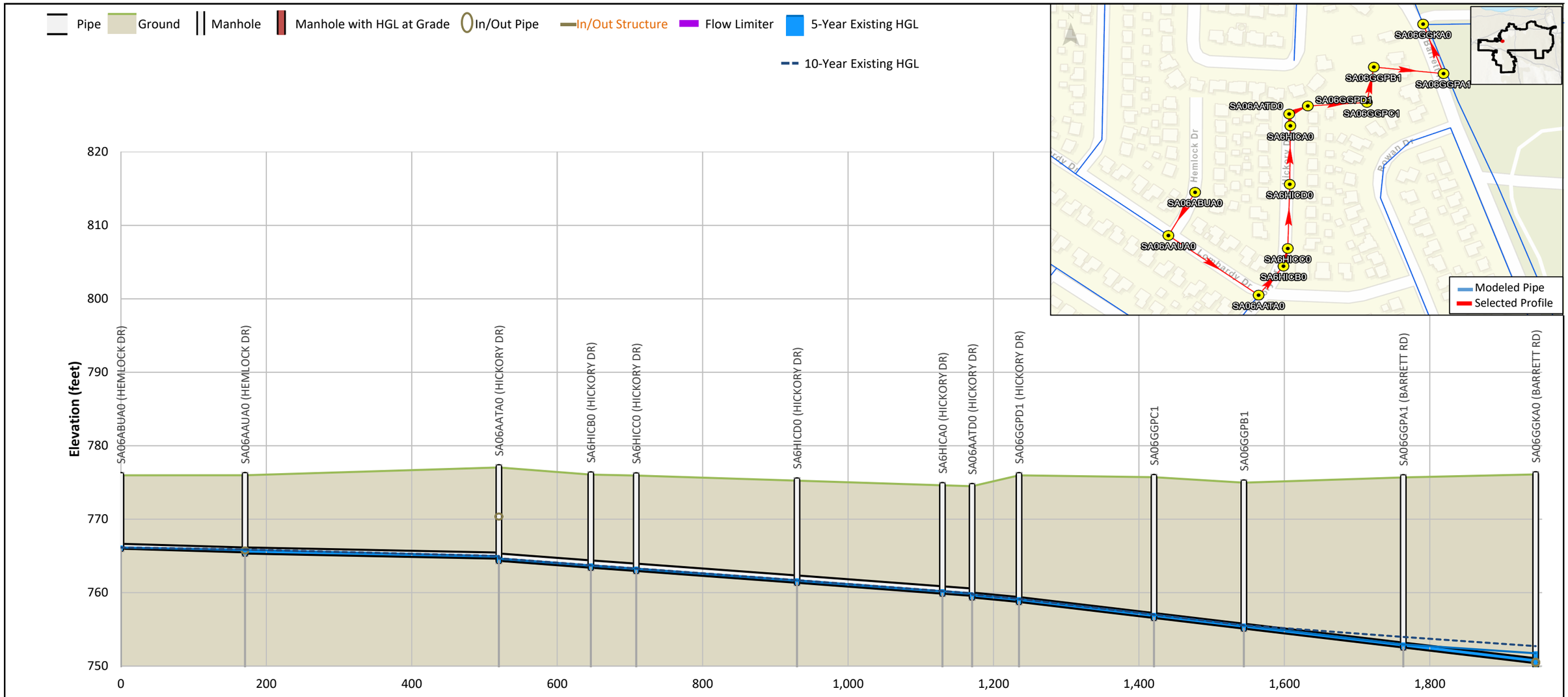
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 212, Date created: 3/11/2021

Depth to Invert (ft)		10		12	13	13	14	15	15	17	19	20	23
Depth to HGL (ft)		10		12	12	13	14	14	15	17	19	19	23
Diameter (in)	8	10	12	12	12	12	12	8	8	8	8	8	8
Capacity (mgd)	0.38	0.58	2.1	2.0	2.0	2.1	2.1	0.79	0.77	0.77	0.77	0.77	0.77
Max Depth (ft)	0.35	0.51	0.32	0.32	0.33	0.33	0.33	0.38	0.42	0.42	0.42	0.42	1.3
Dep abv Crown (ft)	-	-	-	-	-	-	-	-	-	-	-	-	0.68
Max Flow (mgd)	0.05	0.39	0.42	0.42	0.42	0.47	0.47	0.47	0.47	0.54	0.54	0.54	0.53
Max Velocity (ft/s)	1.3	2.9	3.1	3.1	2.9	3.2	3.2	3.6	3.2	3.6	3.6	3.6	3.4
Slope (ft/ft)	0.0029	0.0020	0.0074	0.0071	0.0073	0.0074	0.0074	0.0095	0.012	0.012	0.012	0.012	0.012

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-07
Community: Berea
HEMLOCK DR to BARRETT RD

Brown AND Caldwell

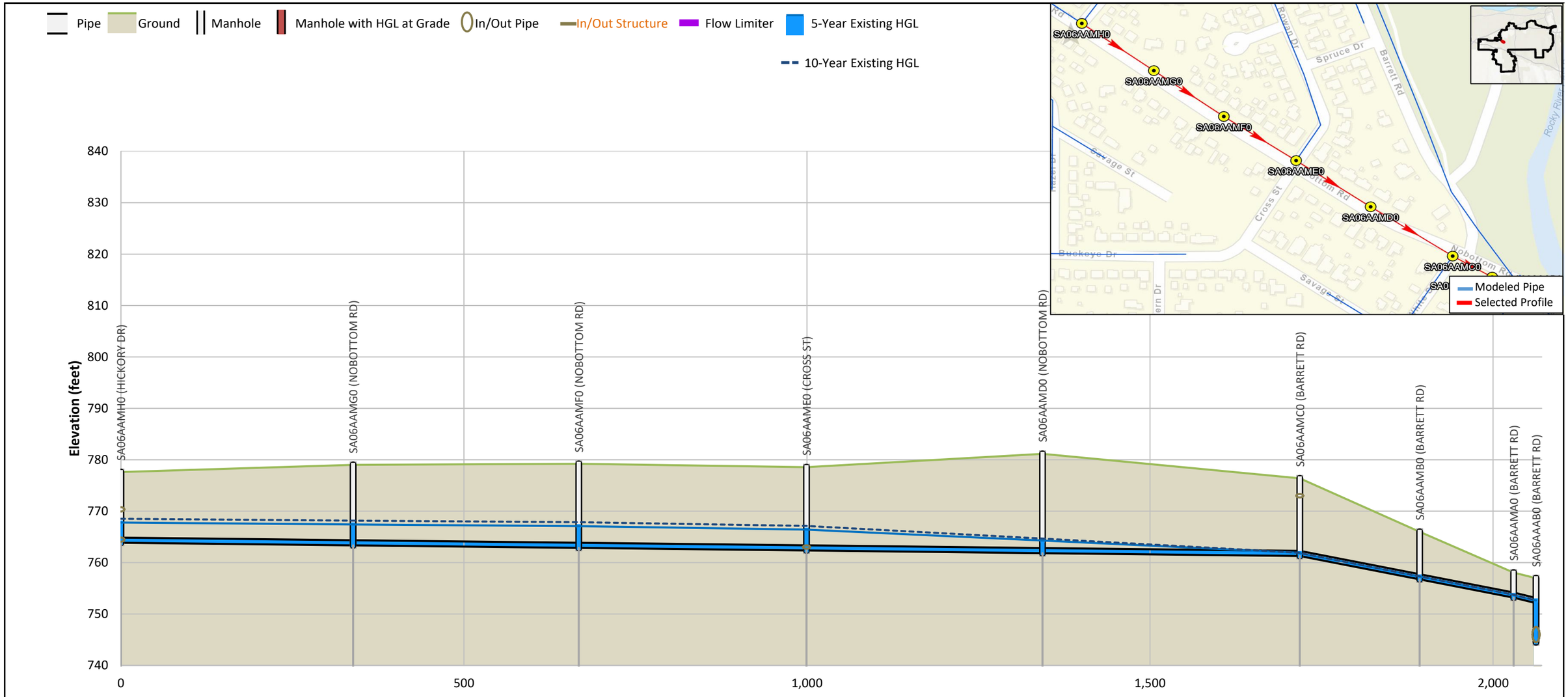
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 214, Date created: 3/11/2021

Depth to Invert (ft)		16	16	16	19	15	9.3	4.9
Depth to HGL (ft)		12	12	12	17	14	8.7	4.3
Diameter (in)	12	12	12	12	12	12	12	
Capacity (mgd)	0.68	0.68	0.68	0.69	0.67	2.8	2.8	
Max Depth (ft)	4.1	4.2	4.2	4.1	2.5	0.56	0.56	
Dep abv Crown (ft)	3.1	3.2	3.2	3.1	1.5	-	-	
Max Flow (mgd)	0.80	0.80	0.88	1.4	1.4	1.7	1.7	
Max Velocity (ft/s)	1.4	1.4	1.5	2.4	4.1	5.7	5.7	
Slope (ft/ft)	0.0015	0.0015	0.0015	0.0015	0.0015	0.026	0.026	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10, BE-07

Community: Berea

HICKORY DR to BARRETT RD

Brown AND Caldwell

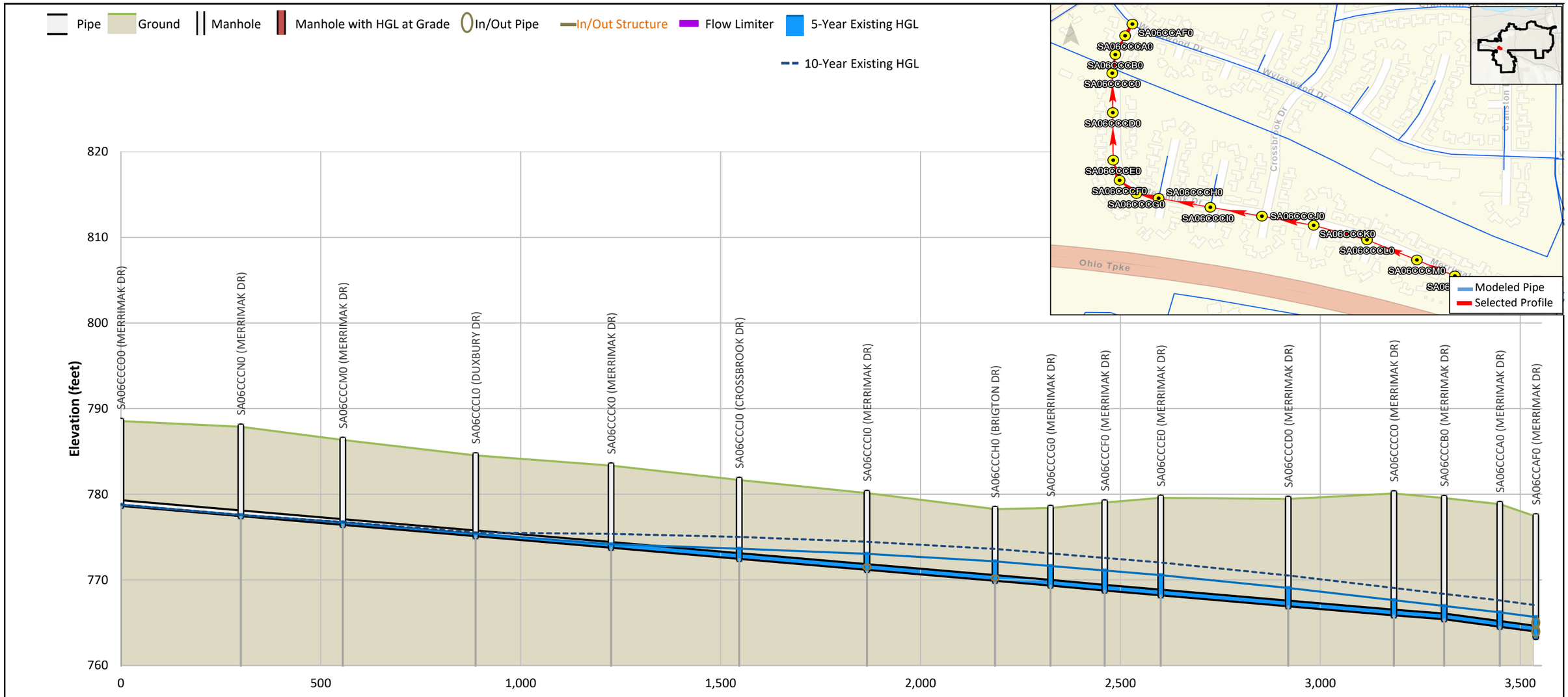
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 347, Date created: 3/11/2021

Depth to Invert (ft)		10	9.9	9.4	9.6	9.2	9.0	8.4	9.1	10	11	13	14	14	14	
Depth to HGL (ft)		10	9.6	9.1	9.2	8.0	7.1	6.1	6.8	7.9	9.0	10	12	13	13	
Diameter (in)	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Capacity (mgd)	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.46	0.45	0.45	0.45	0.42	0.56	0.56	
Max Depth (ft)	0.14	0.30	0.30	0.41	1.2	1.9	2.3	2.3	2.3	2.4	2.4	2.1	1.8	1.7	1.7	
Dep abv Crown (ft)	-	-	-	-	0.52	1.2	1.6	1.6	1.7	1.7	1.7	1.5	1.1	1.0	1.0	
Max Flow (mgd)	0.04	0.04	0.19	0.19	0.31	0.37	0.41	0.47	0.46	0.45	0.50	0.55	0.55	0.56	0.60	
Max Velocity (ft/s)	1.2	0.40	1.9	1.3	1.7	1.8	1.8	2.4	2.3	2.0	2.0	2.3	2.8	2.7	3.6	
Slope (ft/ft)	0.0040	0.0040	0.0040	0.0040	0.0041	0.0040	0.0040	0.0040	0.0043	0.0040	0.0040	0.0040	0.0036	0.0063	0.0063	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-08
Community: Berea
MERRIMAK DR

Brown AND Caldwell

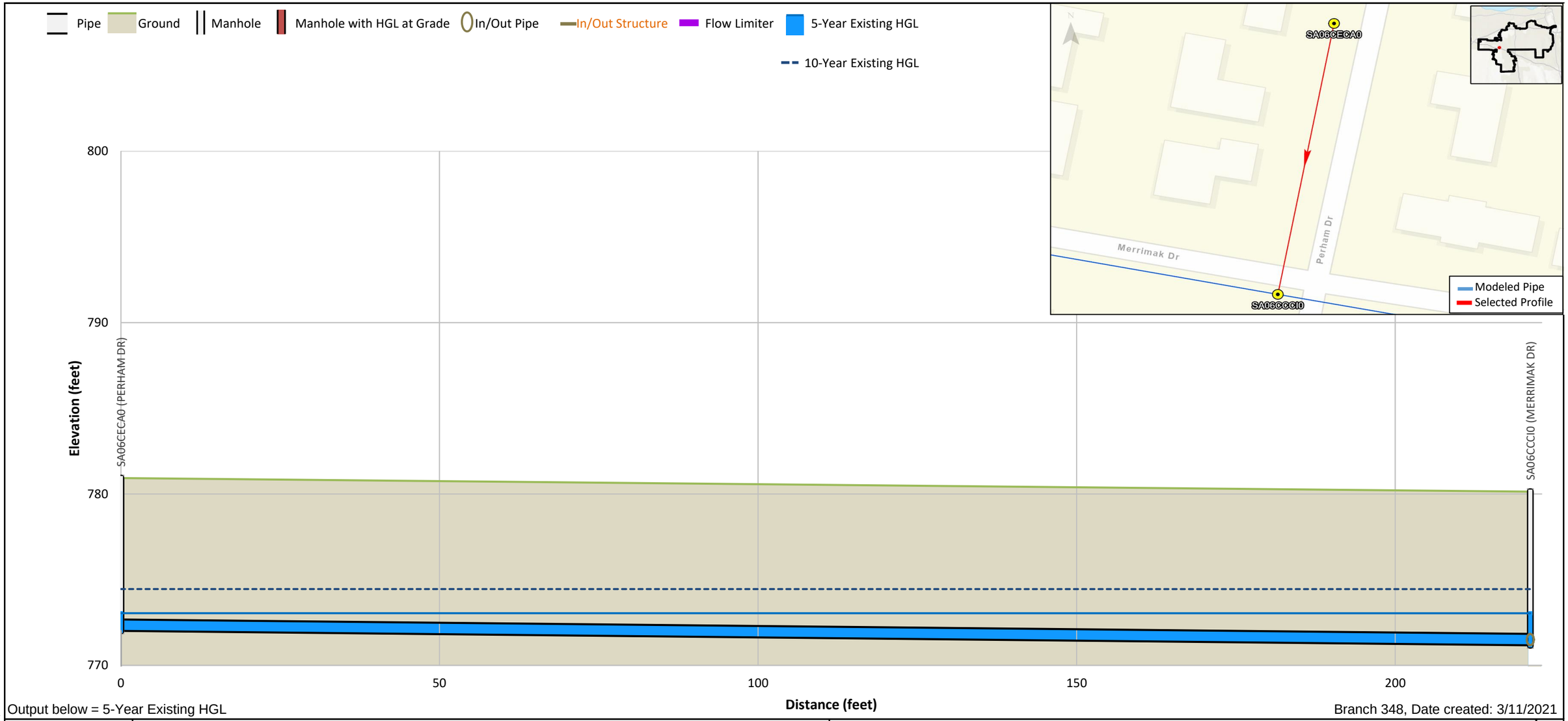
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 348, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	0.44	
Max Depth (ft)	1.9	
Dep abv Crown (ft)	1.2	
Max Flow (mgd)	0.05	
Max Velocity (ft/s)	0.24	
Slope (ft/ft)	0.0038	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-08
Community: Berea
PERHAM DR to MERRIMAK DR

Brown AND Caldwell

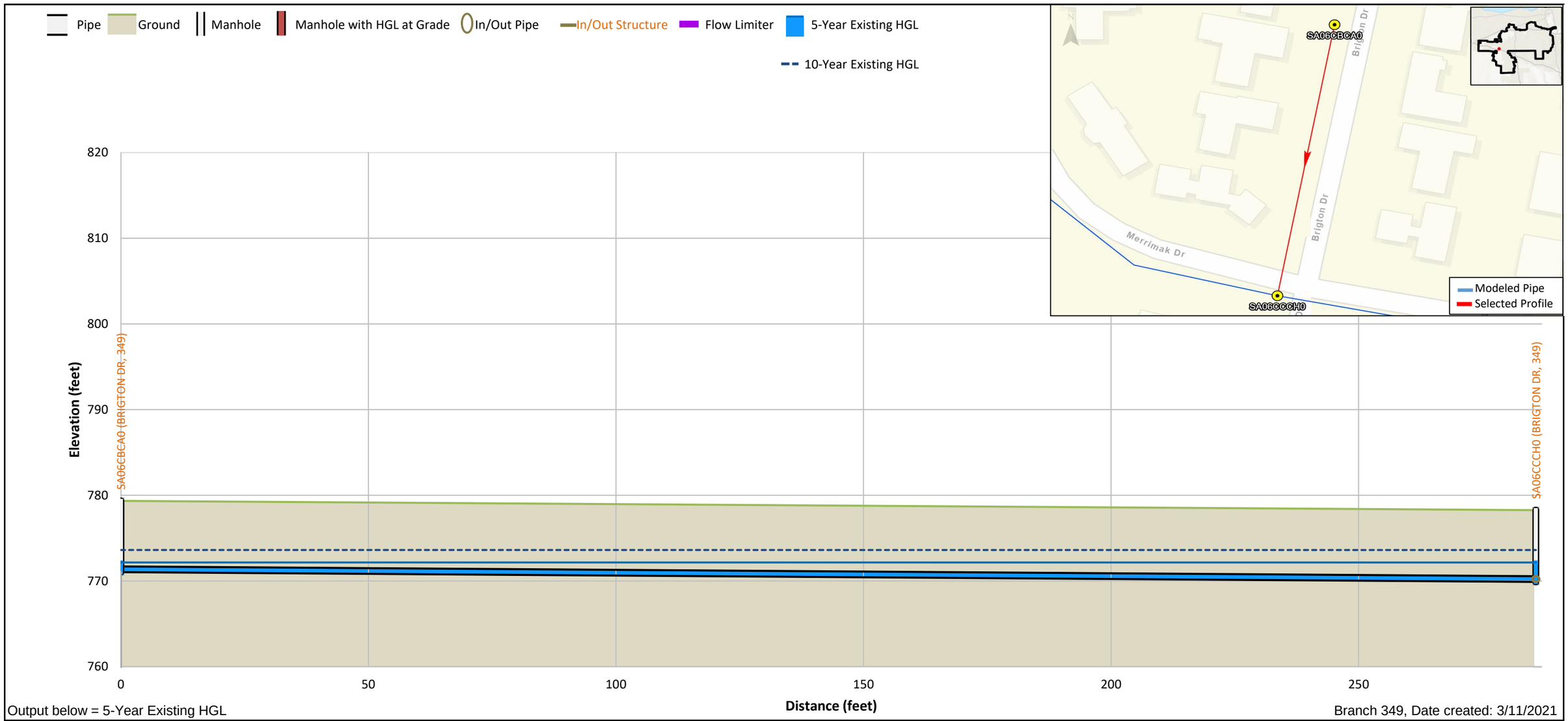
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 349, Date created: 3/11/2021

Depth to Invert (ft)	
Depth to HGL (ft)	
Diameter (in)	8
Capacity (mgd)	0.45
Max Depth (ft)	2.3
Dep abv Crown (ft)	1.6
Max Flow (mgd)	0.06
Max Velocity (ft/s)	0.26
Slope (ft/ft)	0.0040

Northeast Ohio Regional Sewer District

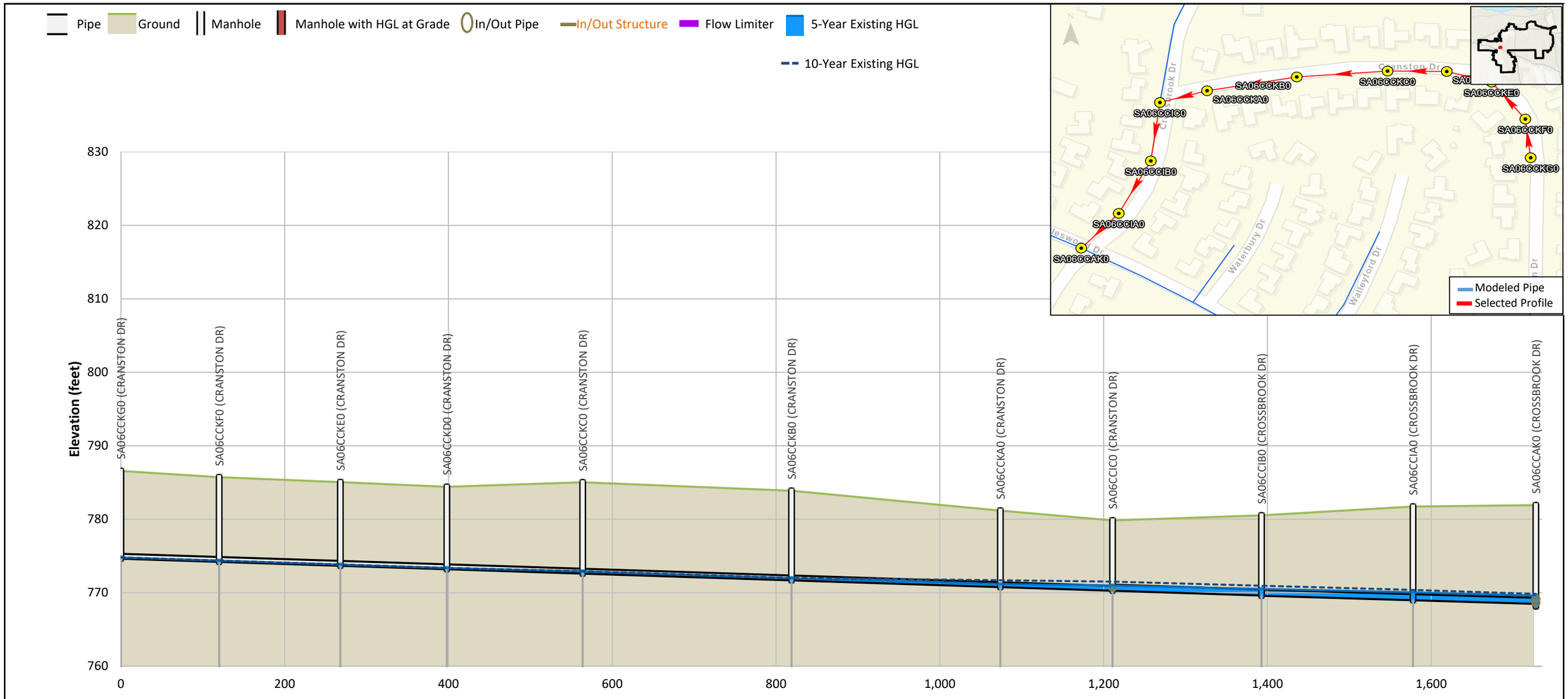
SWI-LSSES

PFA: BE-08
Community: Berea
BRIGTON DR

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://browncald-my.sharepoint.com/personal/jhatfield_browncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 350, Date created: 3/11/2021

Depth to Invert (ft)		12	11	11	12	12	10	9.6	11	13		
Depth to HGL (ft)		11	11	11	12	12	10	8.9	10	12		
Diameter (in)	8	8	8	8	8	8	8	10	10	10		
Capacity (mgd)	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.77	0.74	0.74		
Max Depth (ft)	0.17	0.17	0.17	0.31	0.31	0.41	0.72	0.90	1.1	1.1		
Dep abv Crown (ft)	-	-	-	-	-	-	0.05	0.07	0.24	0.29		
Max Flow (mgd)	0.06	0.06	0.06	0.06	0.18	0.18	0.25	0.65	0.65	0.71		
Max Velocity (ft/s)	1.3	1.3	1.3	0.59	1.8	1.3	1.2	2.5	2.0	2.4		
Slope (ft/ft)	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0033	0.0033		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-08

Community: Berea

CRANSTON DR to CROSSBROOK DR

Brown AND Caldwell

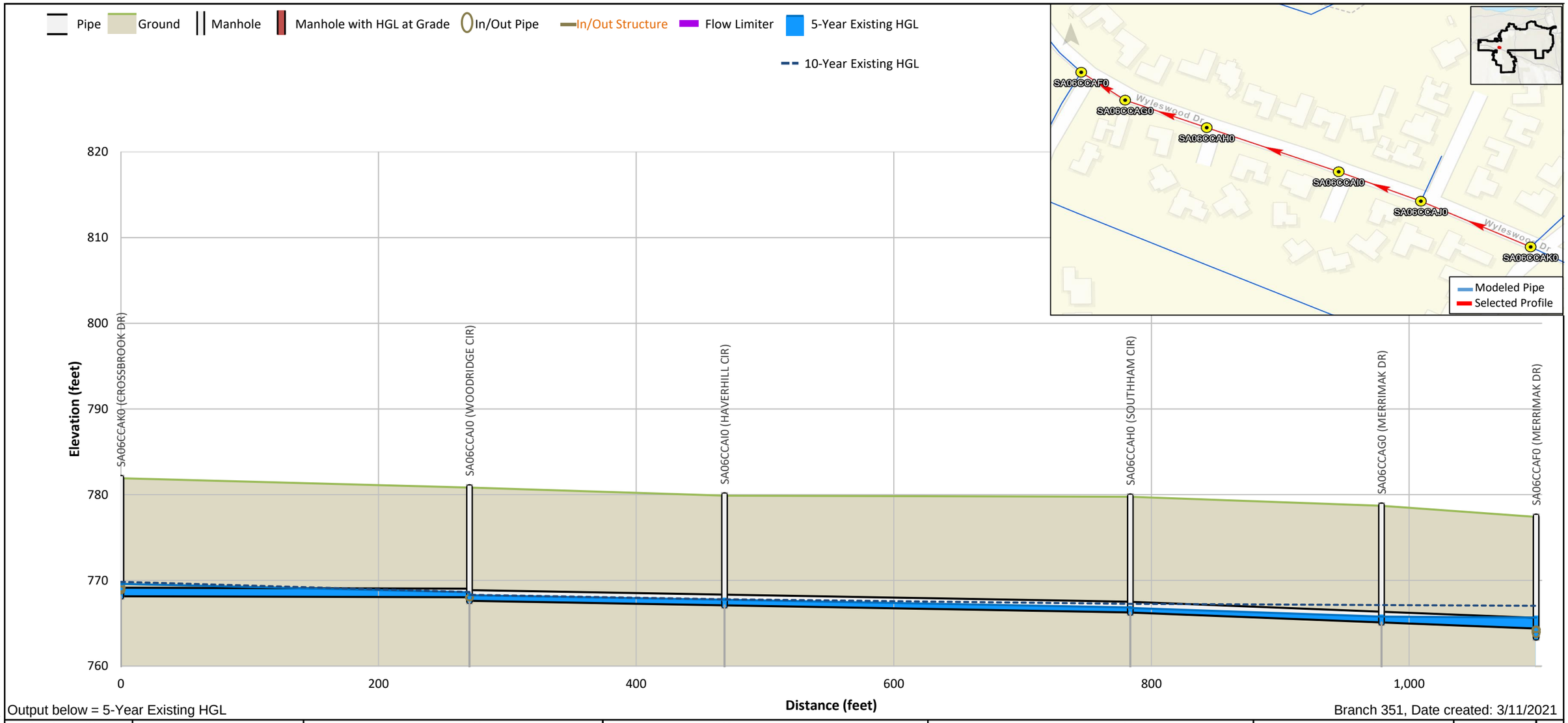
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 351, Date created: 3/11/2021

Depth to Invert (ft)		13	13	14	14	
Depth to HGL (ft)		12	12	13	13	
Diameter (in)	12	15	15	15	15	15
Capacity (mgd)	0.42	2.6	2.5	3.8	3.8	
Max Depth (ft)	1.5	0.65	0.65	0.69	1.3	
Dep abv Crown (ft)	0.45	-	-	-	0.03	
Max Flow (mgd)	1.2	1.4	1.4	1.4	1.4	
Max Velocity (ft/s)	3.9	3.3	3.8	4.4	4.4	
Slope (ft/ft)	0.00040	0.0027	0.0026	0.0059	0.0059	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-08
Community: Berea
CROSSBROOK DR to MERRIMAK DR

Brown AND Caldwell

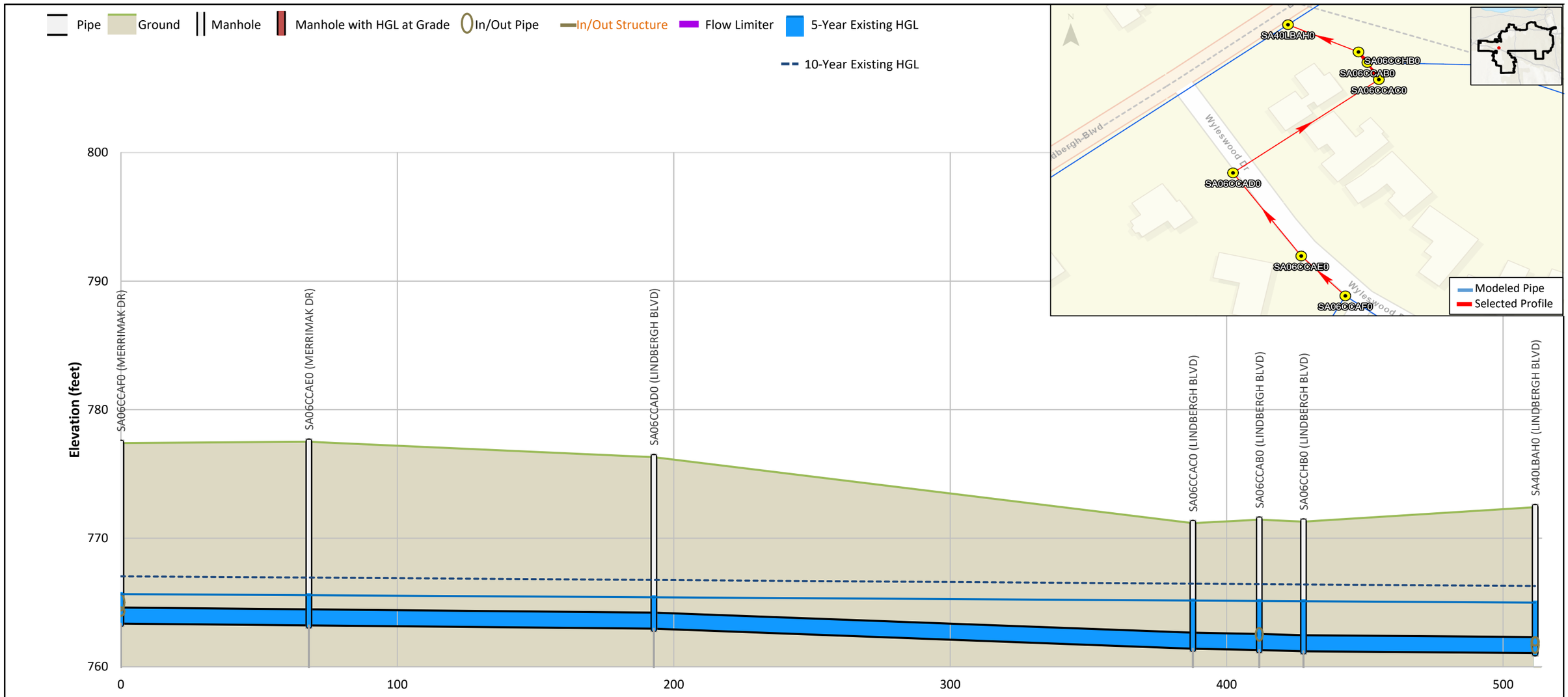
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 352, Date created: 3/11/2021

Depth to Invert (ft)		14		13		9.8		10	10			
Depth to HGL (ft)		12		11		6.0		6.3	6.2			
Diameter (in)	15		15		15		15		15	15		15
Capacity (mgd)	2.2		2.2		4.4		3.2		3.9	2.0		
Max Depth (ft)	2.4		2.4		3.7		3.8		3.9	3.9		
Dep abv Crown (ft)	1.1		1.2		2.5		2.6		2.6	2.7		
Max Flow (mgd)	2.0		2.0		1.9		1.9		1.8	1.8		
Max Velocity (ft/s)	3.4		4.3		3.0		2.8		2.4	2.3		
Slope (ft/ft)	0.0020		0.0020		0.0080		0.0042		0.0062	0.0017		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-08, OF-01
Community: Berea
MERRIMAK DR to LINDBERGH BLVD

Brown AND Caldwell

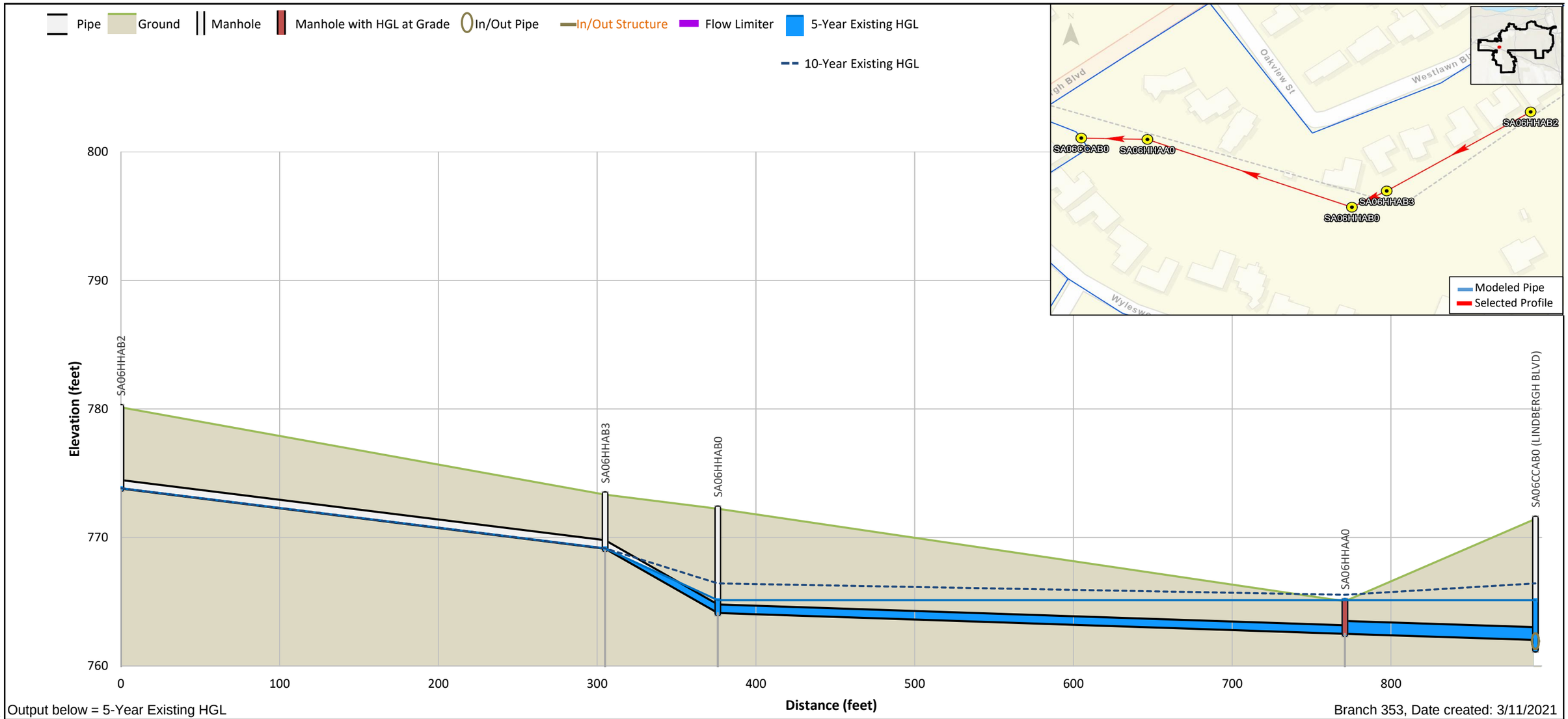
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

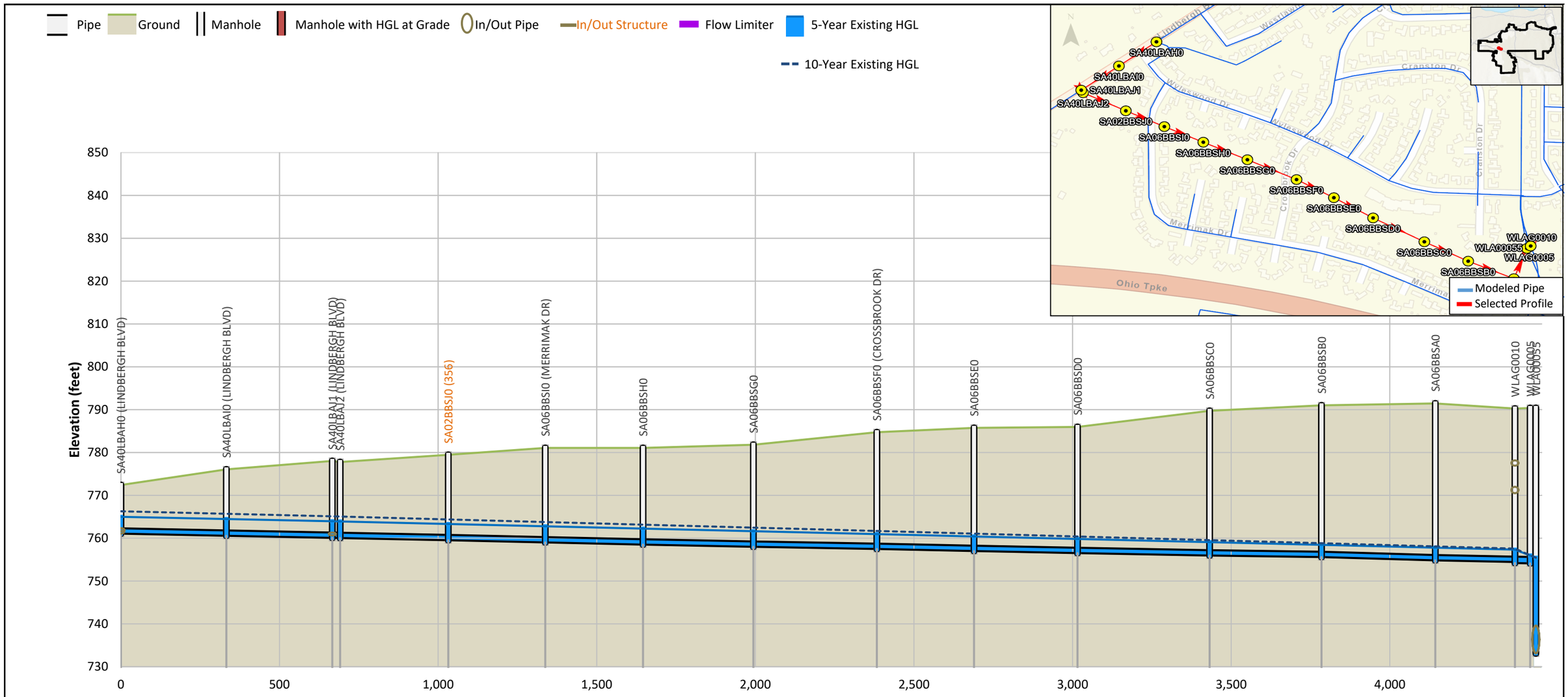
https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/DesktopHGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 353, Date created: 3/11/2021

| | | |



Output below = 5-Year Existing HGL

Branch 356, Date created: 3/11/2021

Depth to Invert (ft)		15			20	22	23	24	27	29	29	34	35	37	36
Depth to HGL (ft)		12			16	18	19	20	24	25	26	31	33	34	33
Diameter (in)	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Capacity (mgd)	1.9	1.9	1.9	2.0	2.0	1.9	1.8	2.0	1.9	1.8	1.6	2.3	1.9		
Max Depth (ft)	3.9	3.9	3.9	3.8	3.8	3.7	3.6	3.5	3.4	3.3	3.1	3.0	3.0		
Dep abv Crown (ft)	2.7	2.7	2.6	2.5	2.5	2.5	2.4	2.2	2.2	2.0	1.9	1.7	1.7		
Max Flow (mgd)	2.1	2.1	2.4	2.3	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1		
Max Velocity (ft/s)	2.6	2.4	3.1	3.0	2.9	2.8	2.8	2.9	2.8	2.5	2.8	2.4	2.4		
Slope (ft/ft)	0.0015	0.0015	0.0015	0.0017	0.0017	0.0015	0.0013	0.0016	0.0015	0.0014	0.0010	0.0021	0.0015		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-08, BE-09, OF-16, OF-01

Community: Olmsted Falls, Berea

LINDBERGH BLVD to Manhole WLA00055

Brown AND Caldwell

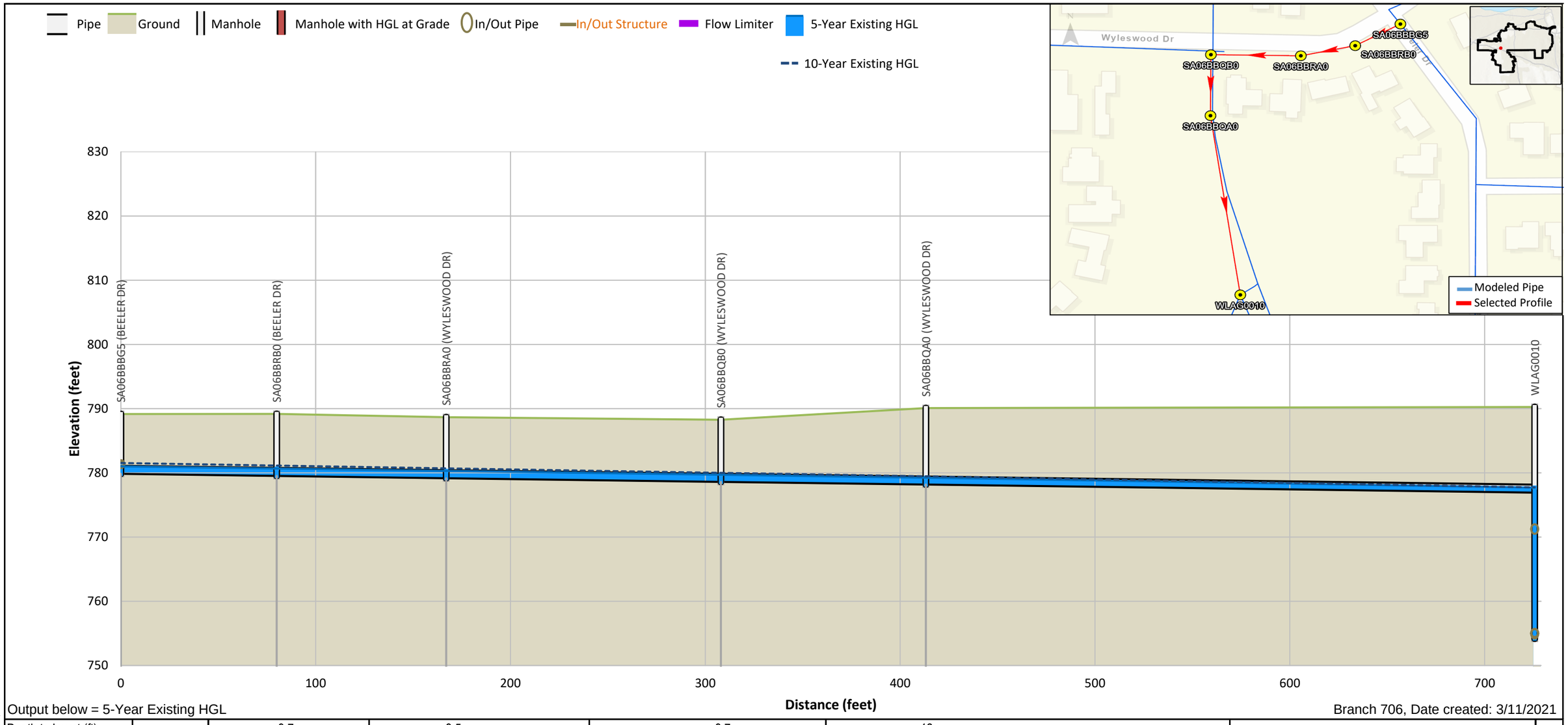
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 706, Date created: 3/11/2021

Depth to Invert (ft)		9.7	9.5	9.7	12	
Depth to HGL (ft)		8.5	8.4	8.6	11	
Diameter (in)	15	15	15	15	15	
Capacity (mgd)	2.4	2.4	2.4	2.4	2.4	
Max Depth (ft)	1.2	1.2	1.1	1.1	1.1	
Dep abv Crown (ft)	-	-	-	-	-	
Max Flow (mgd)	2.4	2.4	2.4	2.4	2.4	
Max Velocity (ft/s)	3.5	3.5	3.4	3.5	4.6	
Slope (ft/ft)	0.0041	0.0041	0.0040	0.0039	0.0040	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-08, BE-09

Community: Berea

BEELER DR to Manhole WLAG0010

Brown AND Caldwell

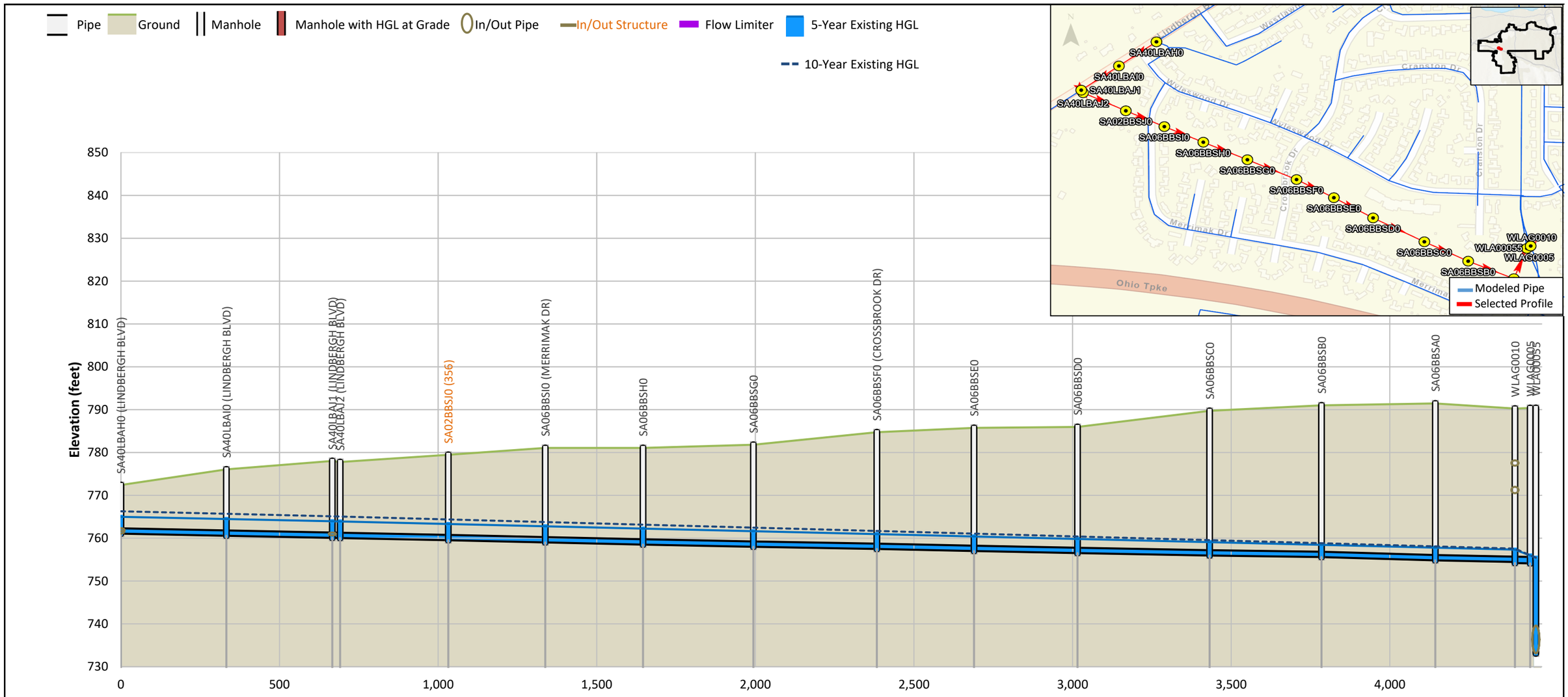
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 356, Date created: 3/11/2021

Depth to Invert (ft)		15			20	22	23	24	27	29	29	34	35	37	36
Depth to HGL (ft)		12			16	18	19	20	24	25	26	31	33	34	33
Diameter (in)	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Capacity (mgd)	1.9	1.9	1.9	2.0	2.0	1.9	1.8	2.0	1.9	1.8	1.6	2.3	1.9		
Max Depth (ft)	3.9	3.9	3.9	3.8	3.8	3.7	3.6	3.5	3.4	3.3	3.1	3.0	3.0		
Dep abv Crown (ft)	2.7	2.7	2.6	2.5	2.5	2.5	2.4	2.2	2.2	2.0	1.9	1.7	1.7		
Max Flow (mgd)	2.1	2.1	2.4	2.3	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1		
Max Velocity (ft/s)	2.6	2.4	3.1	3.0	2.9	2.8	2.8	2.9	2.8	2.5	2.8	2.4	2.4		
Slope (ft/ft)	0.0015	0.0015	0.0015	0.0017	0.0017	0.0015	0.0013	0.0016	0.0015	0.0014	0.0010	0.0021	0.0015		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-08, BE-09, OF-16, OF-01

Community: Olmsted Falls, Berea

LINDBERGH BLVD to Manhole WLA00055

Brown AND Caldwell

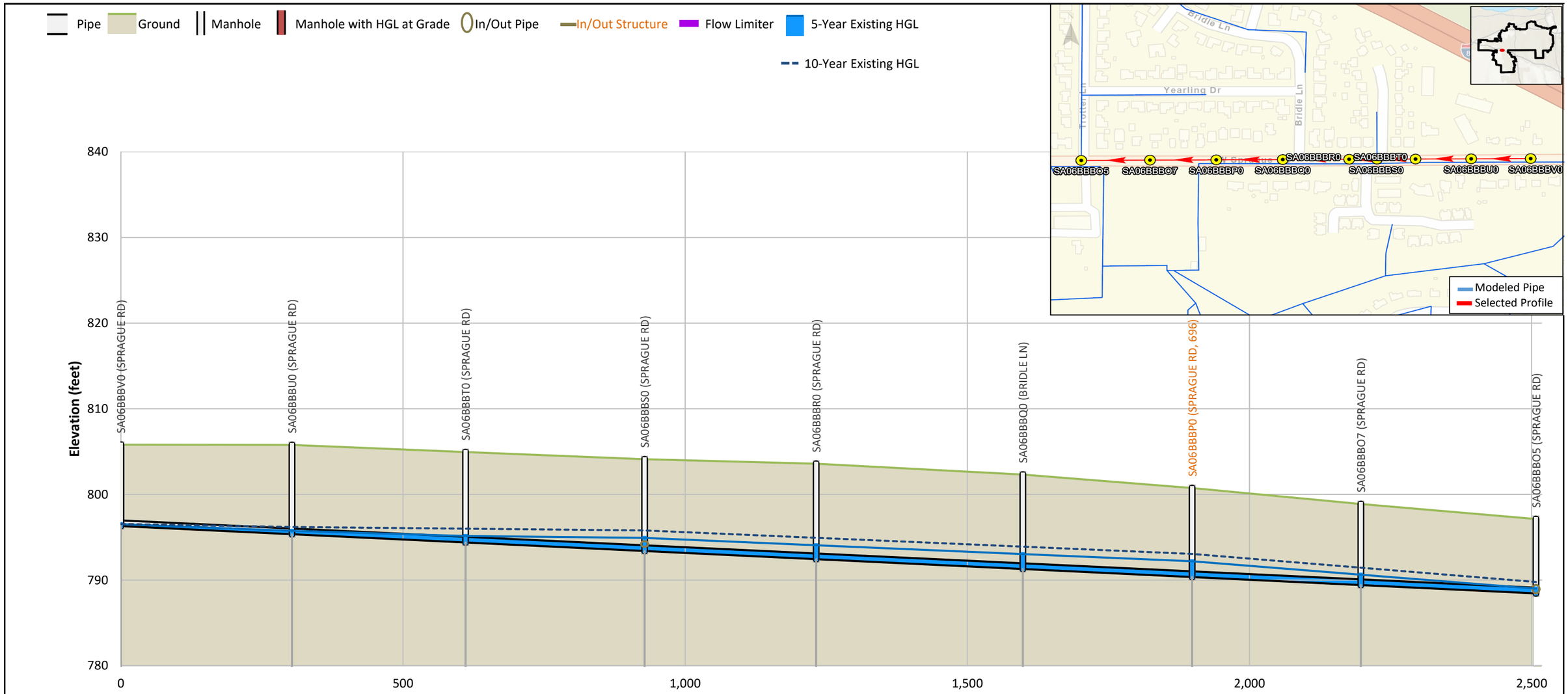
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 696, Date created: 3/11/2021

Depth to Invert (ft)		10	11	11	11	11	10	9.5	
Depth to HGL (ft)		10	9.8	9.2	9.5	9.3	8.6	8.3	
Diameter (in)	8	8	8	8	8	8	8	8	8
Capacity (mgd)	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Max Depth (ft)	0.40	0.76	1.5	1.6	1.7	1.8	1.8	1.2	
Dep abv Crown (ft)	-	0.10	0.87	0.96	1.1	1.2	1.2	0.55	
Max Flow (mgd)	0.10	0.26	0.21	0.45	0.38	0.38	0.51	0.51	
Max Velocity (ft/s)	0.71	1.9	0.91	2.1	2.1	1.4	2.1	2.9	
Slope (ft/ft)	0.0031	0.0031	0.0031	0.0031	0.0031	0.0031	0.0031	0.0031	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09

Community: Berea

SPRAGUE RD

Brown AND Caldwell

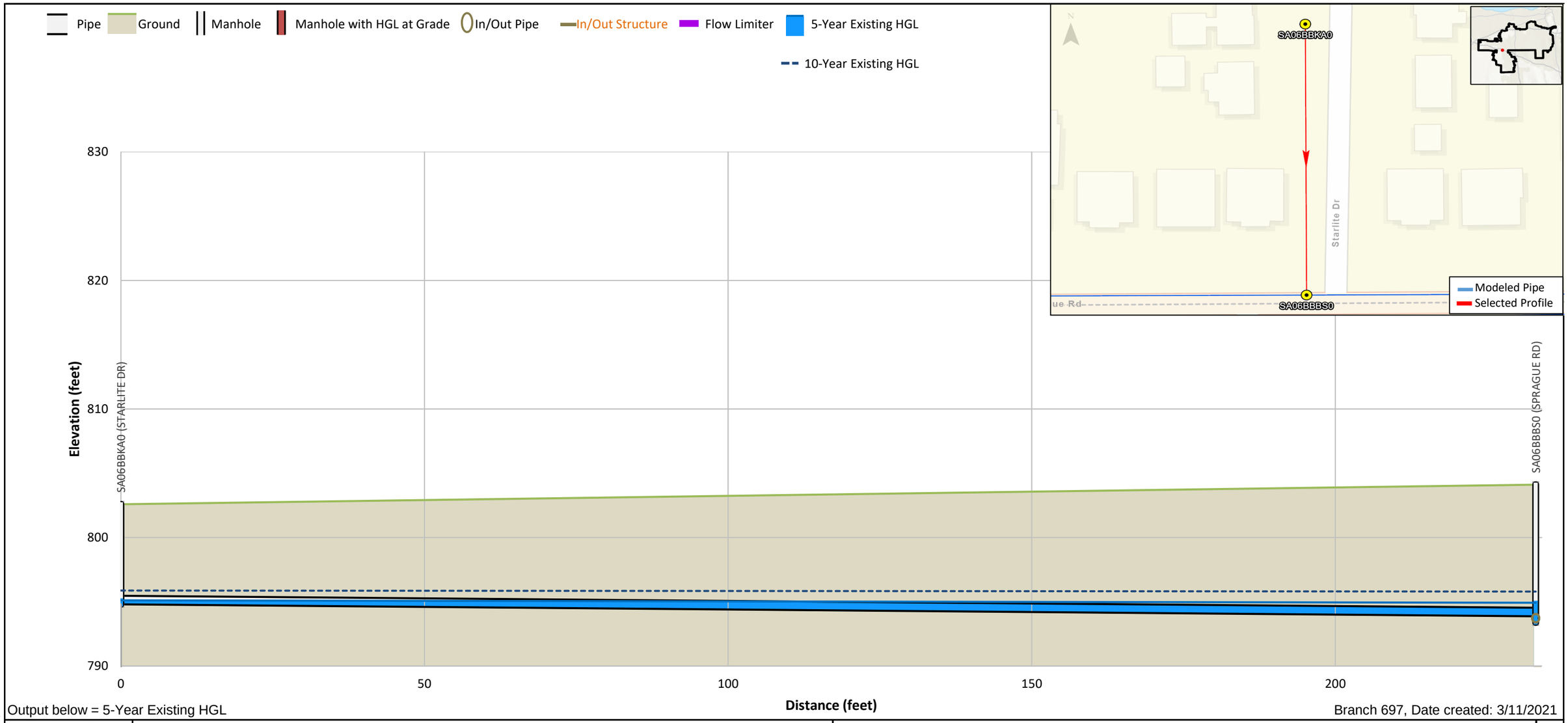
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 697, Date created: 3/11/2021

Depth to Invert (ft)	
Depth to HGL (ft)	
Diameter (in)	8
Capacity (mgd)	0.45
Max Depth (ft)	1.1
Dep abv Crown (ft)	0.39
Max Flow (mgd)	0.19
Max Velocity (ft/s)	2.4
Slope (ft/ft)	0.0040

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09

Community: Berea

STARLITE DR to SPRAGUE RD

Brown AND Caldwell

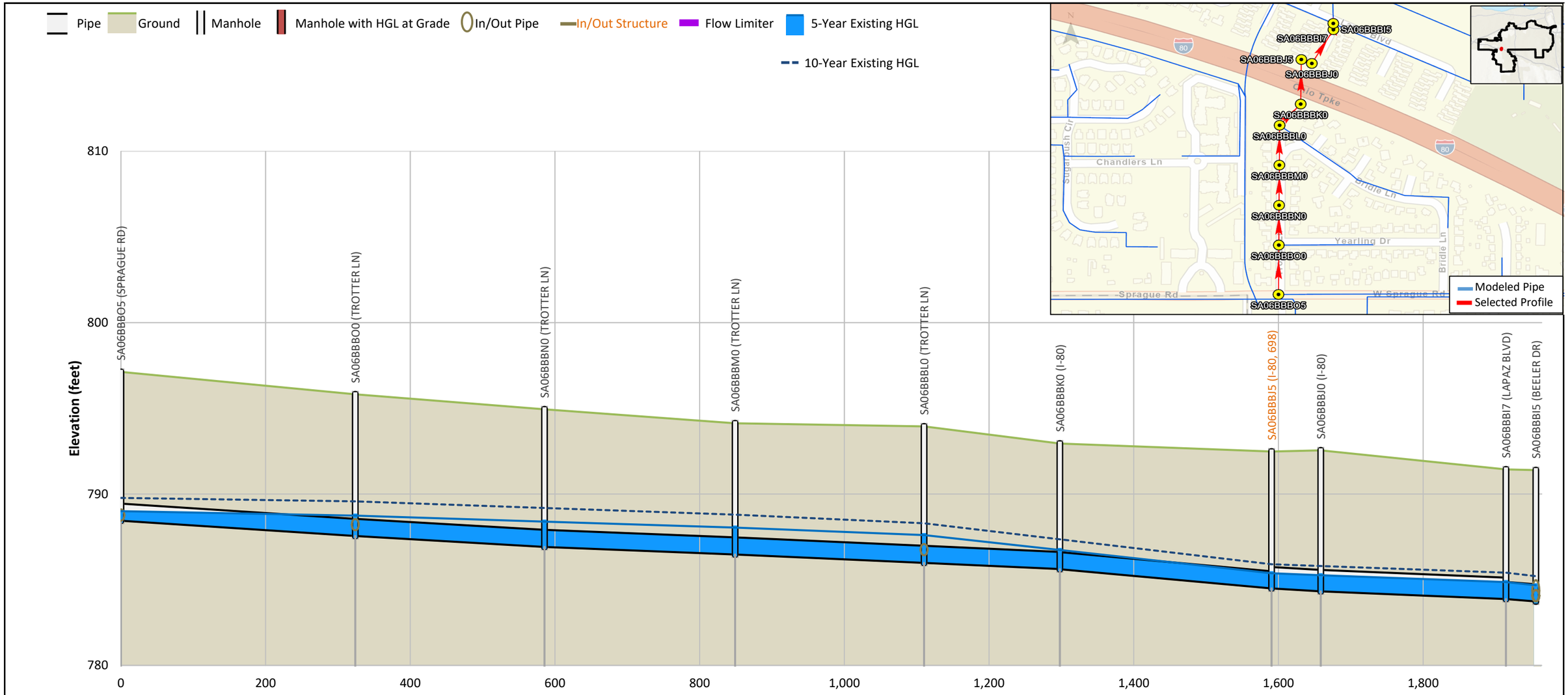
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 698, Date created: 3/11/2021

Depth to Invert (ft)		8.3	8.0	7.7	8.0	7.3	8.0	8.2	7.6	
Depth to HGL (ft)		7.1	6.6	6.1	6.3	6.2	7.1	7.3	6.6	
Diameter (in)	12	12	12	12	12	12	15	15	12	
Capacity (mgd)	1.1	1.0	0.86	0.91	0.92	1.3	1.9	1.6	1.2	
Max Depth (ft)	1.2	1.5	1.6	1.6	1.6	1.1	0.94	0.99	0.99	
Dep abv Crown (ft)	0.19	0.48	0.57	0.62	0.62	0.12	-	-	-	
Max Flow (mgd)	0.53	0.78	0.79	0.89	1.4	1.4	1.4	1.4	1.4	
Max Velocity (ft/s)	1.4	1.9	1.6	1.6	3.0	3.0	2.3	2.4	3.1	
Slope (ft/ft)	0.0027	0.0024	0.0017	0.0019	0.0019	0.0038	0.0025	0.0018	0.0034	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09
Community: Berea
SPRAGUE RD to BEELER DR

Brown AND Caldwell

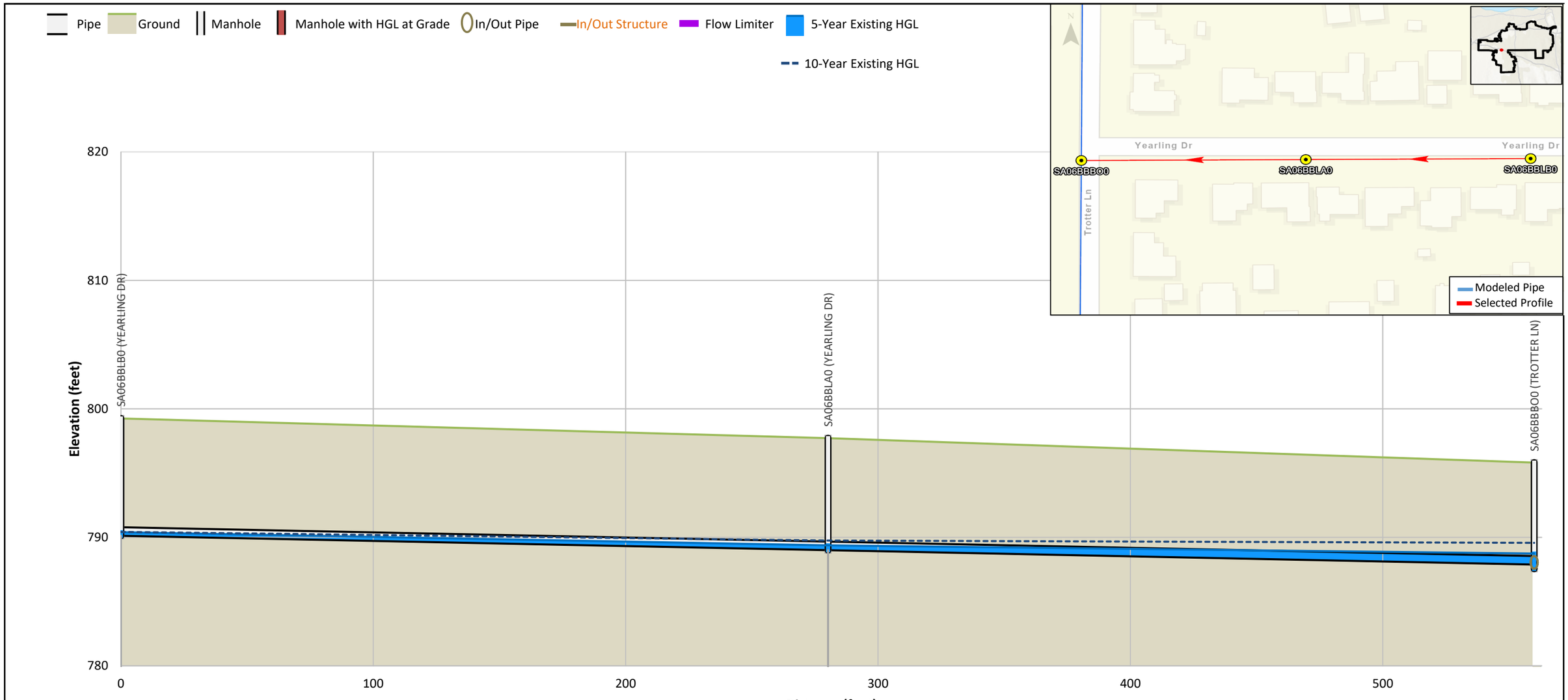
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 699, Date created: 3/11/2021

Depth to Invert (ft)		8.7	
Depth to HGL (ft)		8.3	
Diameter (in)	8		8
Capacity (mgd)	0.45		0.45
Max Depth (ft)	0.38		0.86
Dep abv Crown (ft)	-		0.19
Max Flow (mgd)	0.16		0.27
Max Velocity (ft/s)	1.2		2.7
Slope (ft/ft)	0.0040		0.0040

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09

Community: Berea

YEARLING DR to TROTTER LN

Brown AND Caldwell

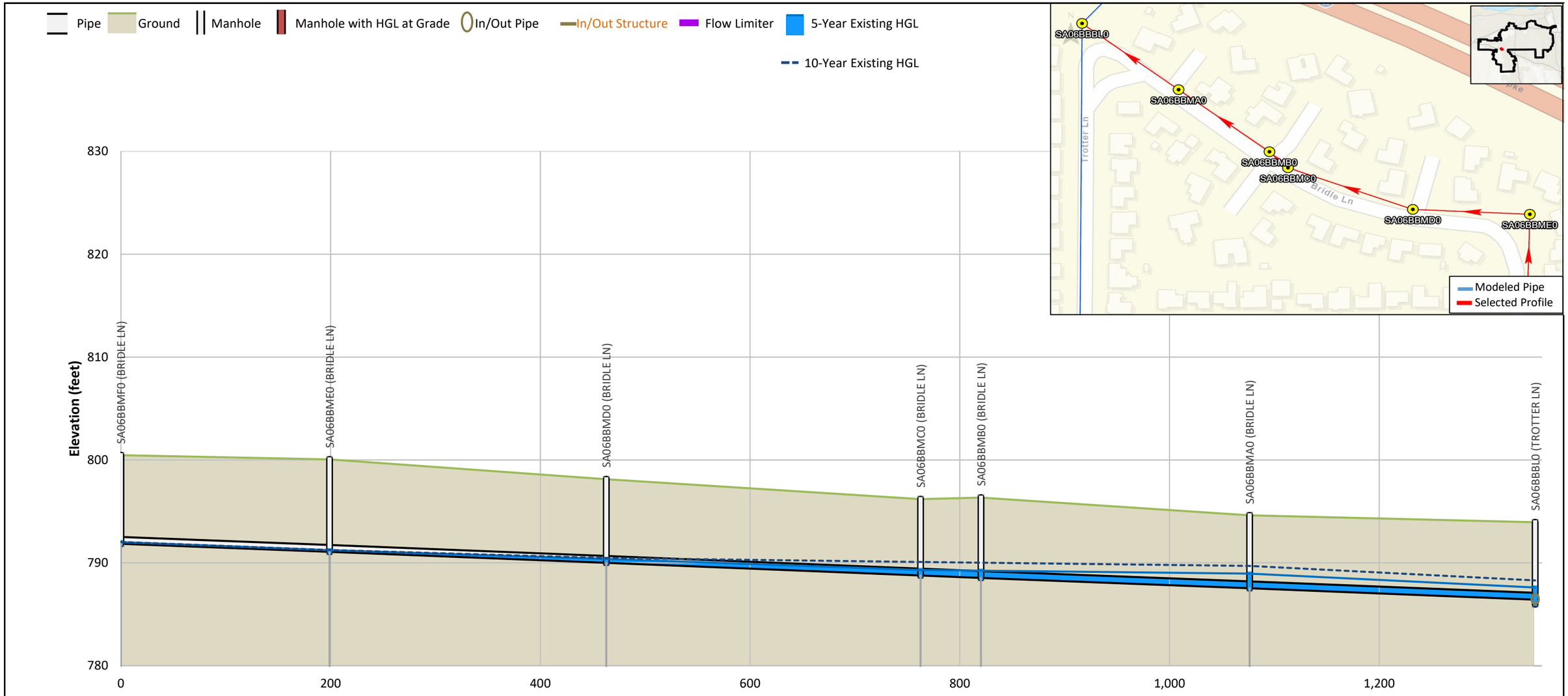
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 700, Date created: 3/11/2021

Depth to Invert (ft)		9.0	8.1	7.4	7.8	7.1	
Depth to HGL (ft)		8.8	7.7	6.9	7.1	5.7	
Diameter (in)	8	8	8	8	8	8	8
Capacity (mgd)	0.44	0.45	0.46	0.46	0.44	0.45	
Max Depth (ft)	0.16	0.38	0.54	0.71	1.4	1.4	
Dep abv Crown (ft)	-	-	-	0.04	0.76	0.76	
Max Flow (mgd)	0.06	0.06	0.28	0.27	0.24	0.53	
Max Velocity (ft/s)	1.3	0.45	2.1	2.0	0.96	3.3	
Slope (ft/ft)	0.0039	0.0041	0.0041	0.0042	0.0039	0.0041	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09
Community: Berea
BRIDLE LN to TROTTER LN

Brown AND Caldwell

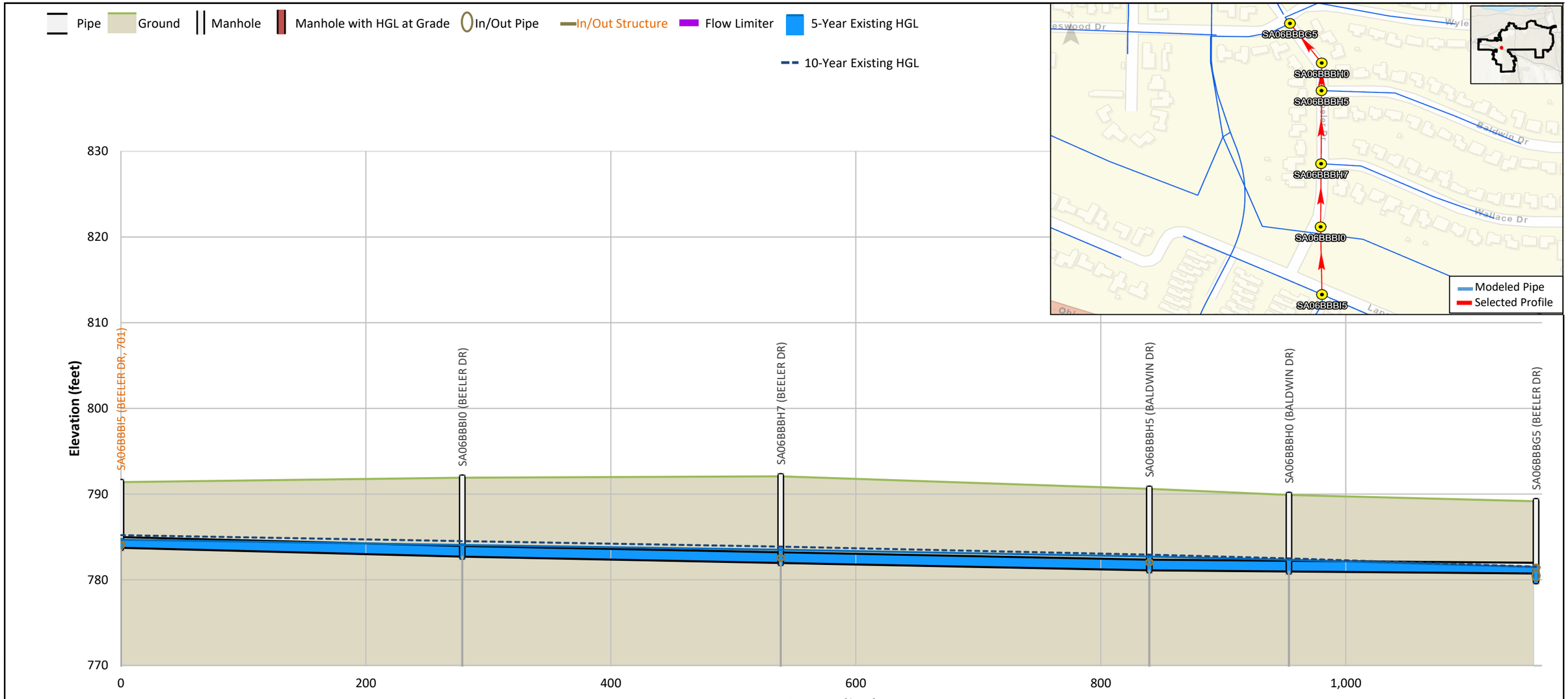
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://browncald-my.sharepoint.com/personal/jhatfield_browncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 701, Date created: 3/11/2021

Depth to Invert (ft)		9.2	10	9.5	8.9	
Depth to HGL (ft)		7.9	8.6	7.9	7.6	
Diameter (in)	15	15	15	15	15	15
Capacity (mgd)	2.3	2.0	2.0	1.3	1.3	
Max Depth (ft)	1.4	1.5	1.6	1.6	1.4	
Dep abv Crown (ft)	0.11	0.30	0.36	0.36	0.12	
Max Flow (mgd)	1.8	1.8	1.9	2.1	2.3	
Max Velocity (ft/s)	2.9	2.5	2.3	2.6	4.5	
Slope (ft/ft)	0.0037	0.0029	0.0029	0.0012	0.0012	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09

Community: Berea

BEELER DR

Brown AND Caldwell

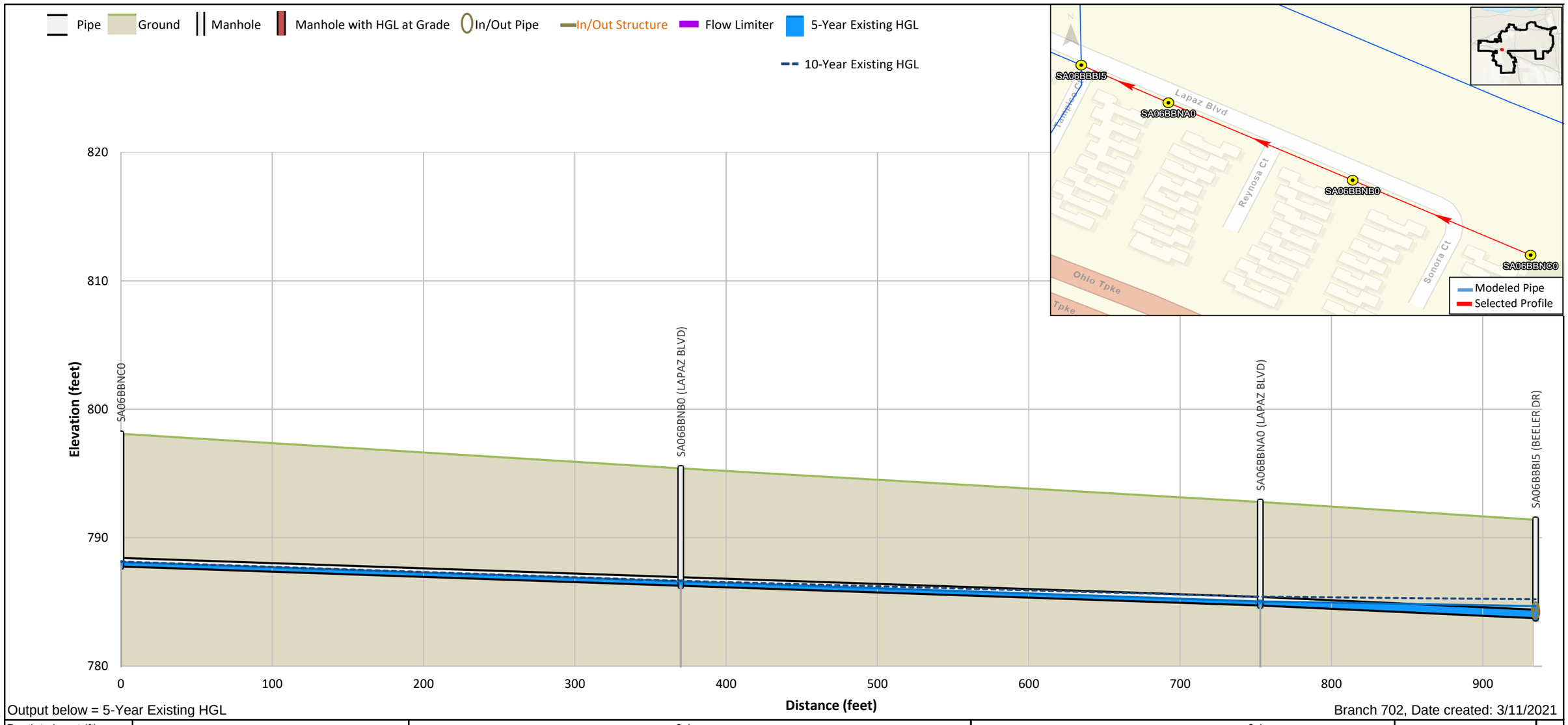
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 702, Date created: 3/11/2021

Depth to Invert (ft)		9.1	8.1	
Depth to HGL (ft)		8.8	7.7	
Diameter (in)	8	8	8	
Capacity (mgd)	0.45	0.45	0.52	
Max Depth (ft)	0.34	0.34	0.95	
Dep abv Crown (ft)	-	-	0.28	
Max Flow (mgd)	0.23	0.23	0.23	
Max Velocity (ft/s)	2.0	2.2	0.97	
Slope (ft/ft)	0.0041	0.0040	0.0054	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09

Community: Berea

Manhole SA06BBNC0 to BEELER DR

Brown AND Caldwell

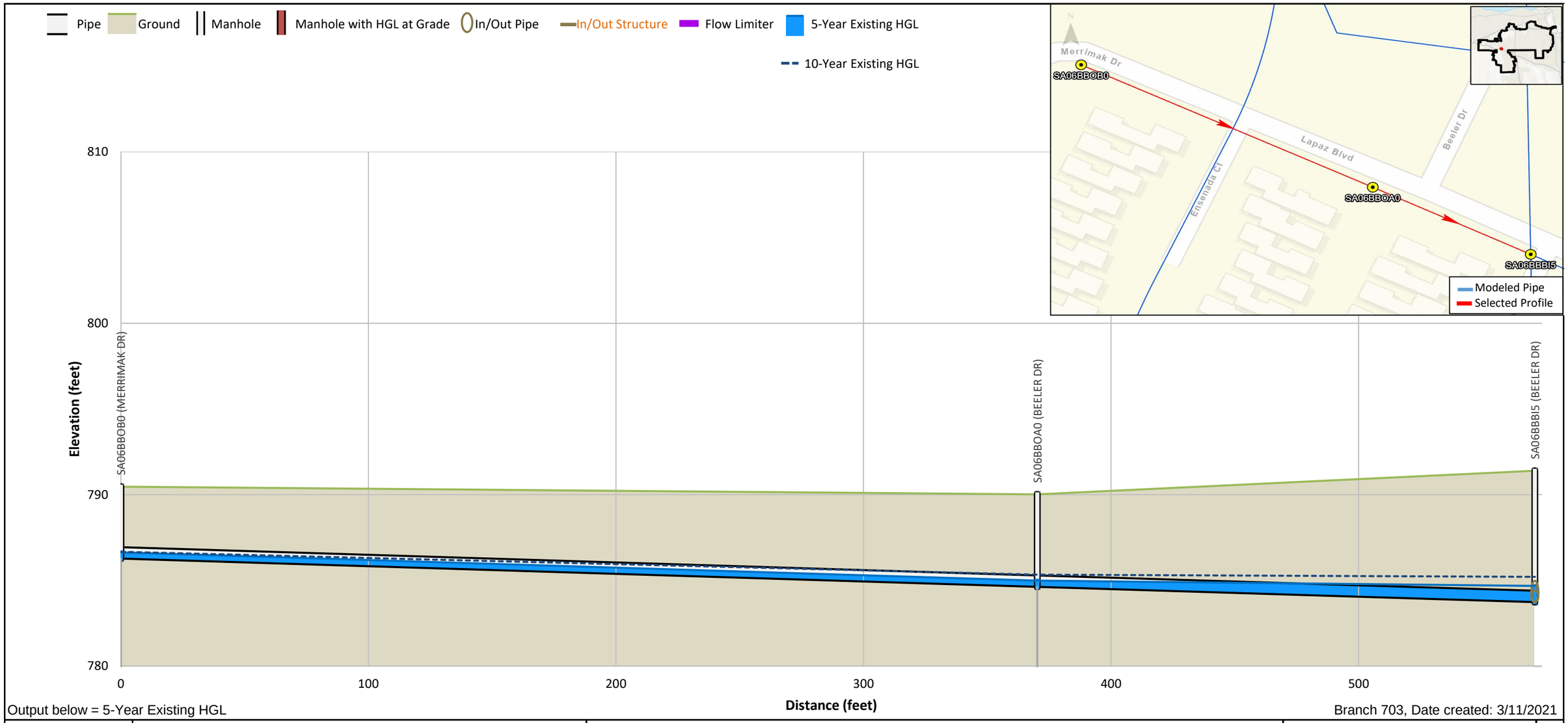
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 703, Date created: 3/11/2021

Depth to Invert (ft)		5.4	
Depth to HGL (ft)		5.0	
Diameter (in)	8		8
Capacity (mgd)	0.47		0.47
Max Depth (ft)	0.36		0.95
Dep abv Crown (ft)	-		0.28
Max Flow (mgd)	0.27		0.25
Max Velocity (ft/s)	2.1		1.1
Slope (ft/ft)	0.0045		0.0044

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09

Community: Berea

MERRIMAK DR to BEELER DR

Brown AND Caldwell

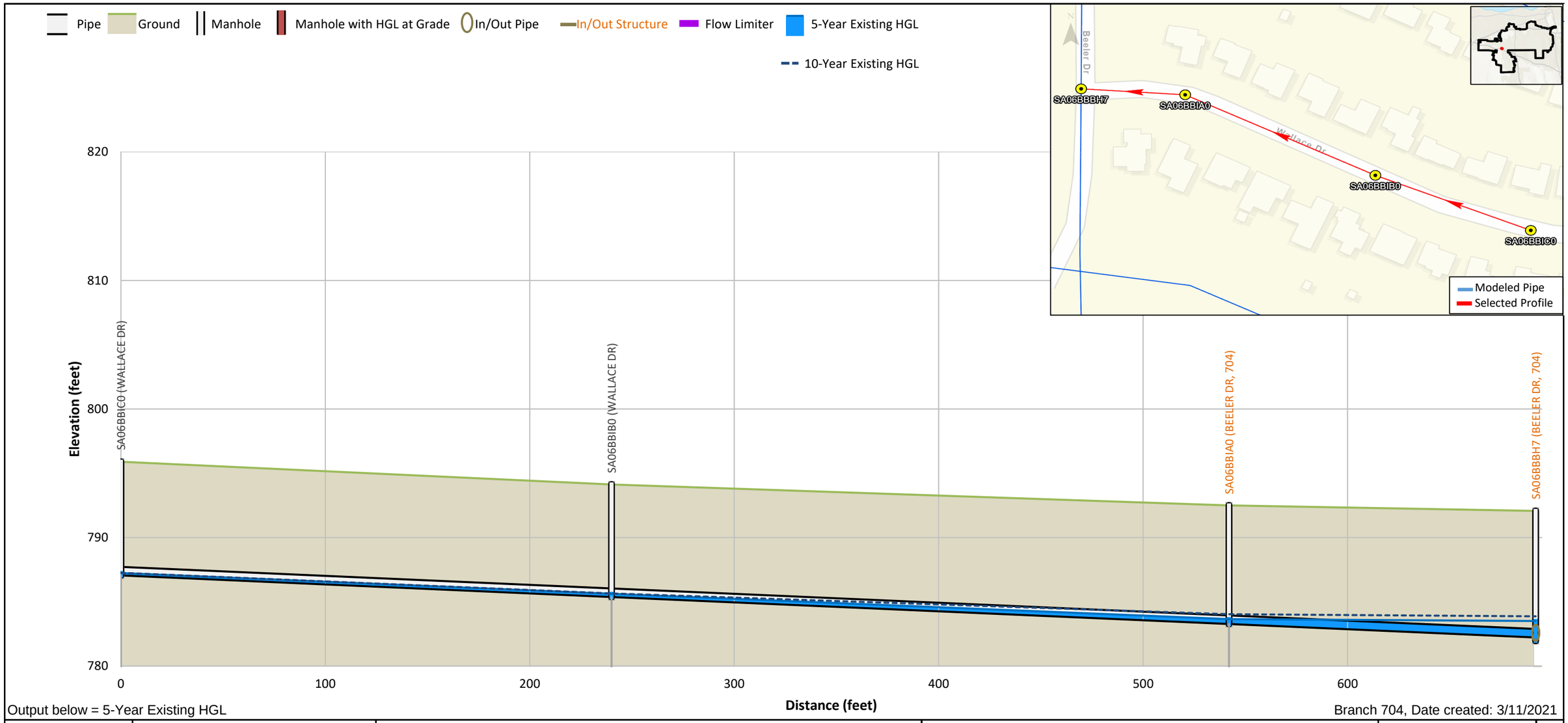
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 704, Date created: 3/11/2021

Depth to Invert (ft)		8.8	9.2	
Depth to HGL (ft)		8.5	8.8	
Diameter (in)	8	8	8	8
Capacity (mgd)	0.59	0.59	0.59	0.59
Max Depth (ft)	0.25	0.38	1.3	
Dep abv Crown (ft)	-	-	0.62	
Max Flow (mgd)	0.10	0.18	0.22	
Max Velocity (ft/s)	1.3	1.9	2.3	
Slope (ft/ft)	0.0070	0.0070	0.0070	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09

Community: Berea

WALLACE DR to BEELER DR

Brown AND Caldwell

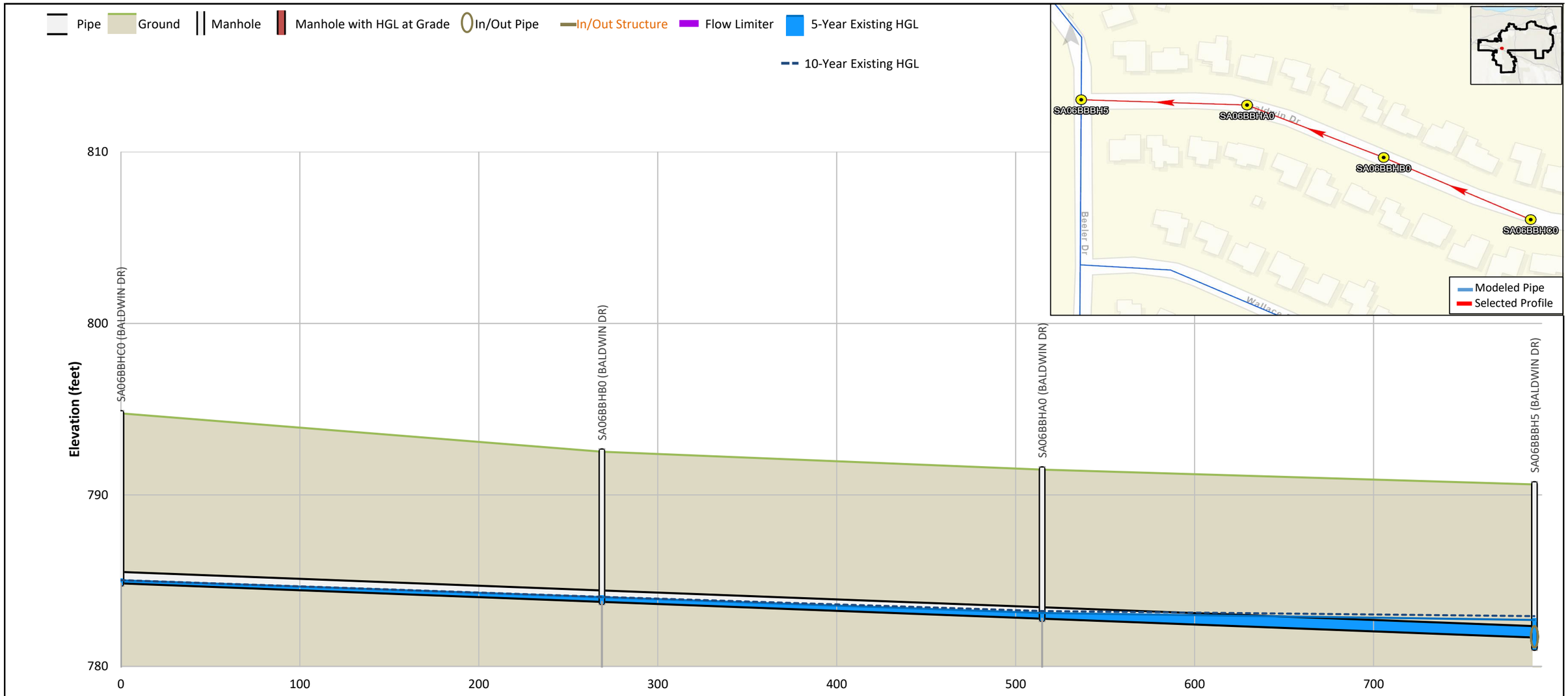
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 705, Date created: 3/11/2021

Depth to Invert (ft)		8.8	8.7	
Depth to HGL (ft)		8.5	8.4	
Diameter (in)	8	8	8	8
Capacity (mgd)	0.45	0.45	0.45	0.45
Max Depth (ft)	0.27	0.33	1.0	
Dep abv Crown (ft)	-	-	0.36	
Max Flow (mgd)	0.07	0.15	0.20	
Max Velocity (ft/s)	0.77	1.4	2.4	
Slope (ft/ft)	0.0040	0.0040	0.0040	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09

Community: Berea

BALDWIN DR

Brown AND Caldwell

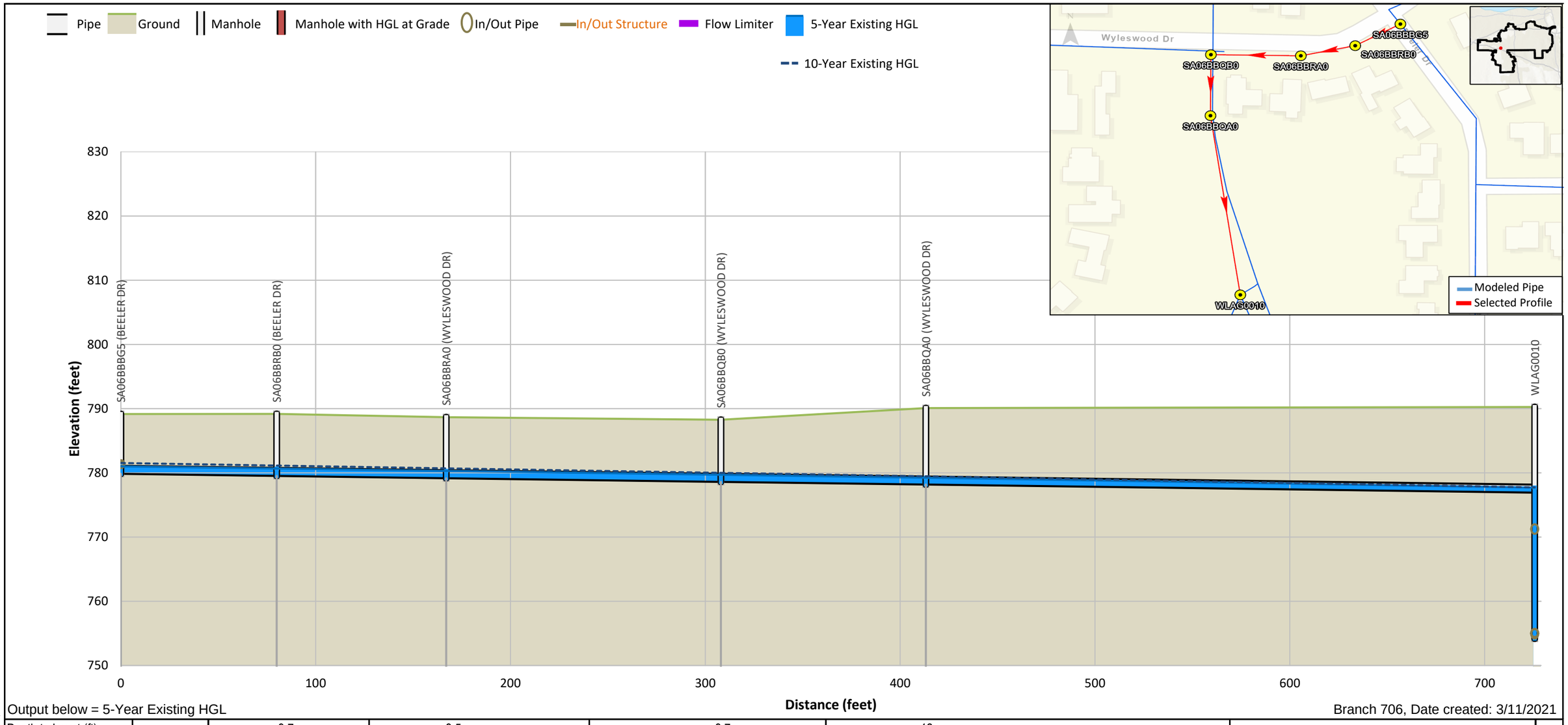
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 706, Date created: 3/11/2021

Depth to Invert (ft)		9.7	9.5	9.7	12	
Depth to HGL (ft)		8.5	8.4	8.6	11	
Diameter (in)	15	15	15	15	15	
Capacity (mgd)	2.4	2.4	2.4	2.4	2.4	
Max Depth (ft)	1.2	1.2	1.1	1.1	1.1	
Dep abv Crown (ft)	-	-	-	-	-	
Max Flow (mgd)	2.4	2.4	2.4	2.4	2.4	
Max Velocity (ft/s)	3.5	3.5	3.4	3.5	4.6	
Slope (ft/ft)	0.0041	0.0041	0.0040	0.0039	0.0040	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-08, BE-09

Community: Berea

BEELER DR to Manhole WLAG0010

Brown AND Caldwell

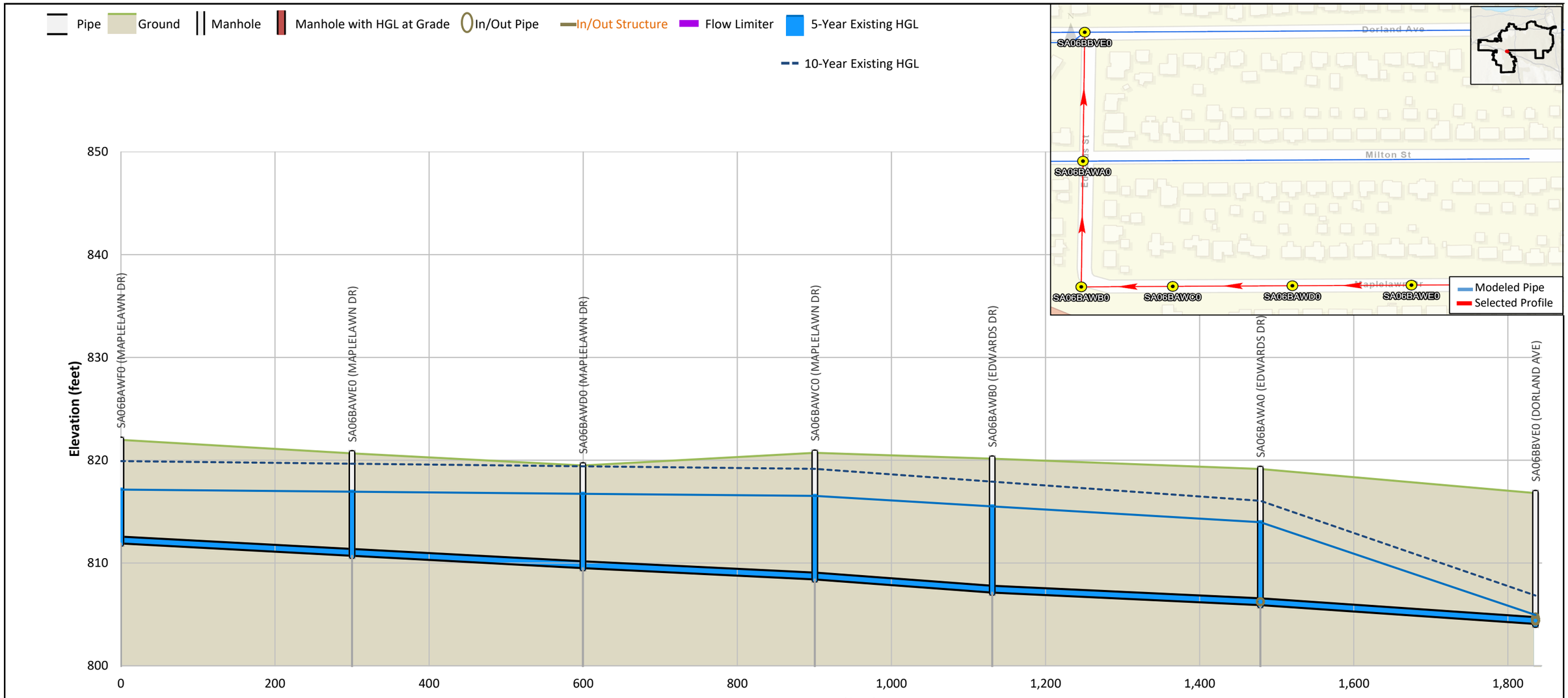
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 707, Date created: 3/11/2021

Depth to Invert (ft)		10.0	10.0	12	13	13	
Depth to HGL (ft)		3.7	2.8	4.2	4.6	5.2	
Diameter (in)	8	8	8	8	8	8	
Capacity (mgd)	0.45	0.45	0.43	0.53	0.42	0.51	
Max Depth (ft)	6.2	7.2	8.1	8.4	8.4	8.1	
Dep abv Crown (ft)	5.6	6.6	7.5	7.7	7.7	7.4	
Max Flow (mgd)	0.35	0.26	0.21	0.50	0.47	1.1	
Max Velocity (ft/s)	2.2	2.0	0.85	2.3	1.1	4.8	
Slope (ft/ft)	0.0040	0.0040	0.0037	0.0056	0.0035	0.0051	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09
Community: Berea
MAPLELAWN DR to DORLAND AVE

Brown AND Caldwell

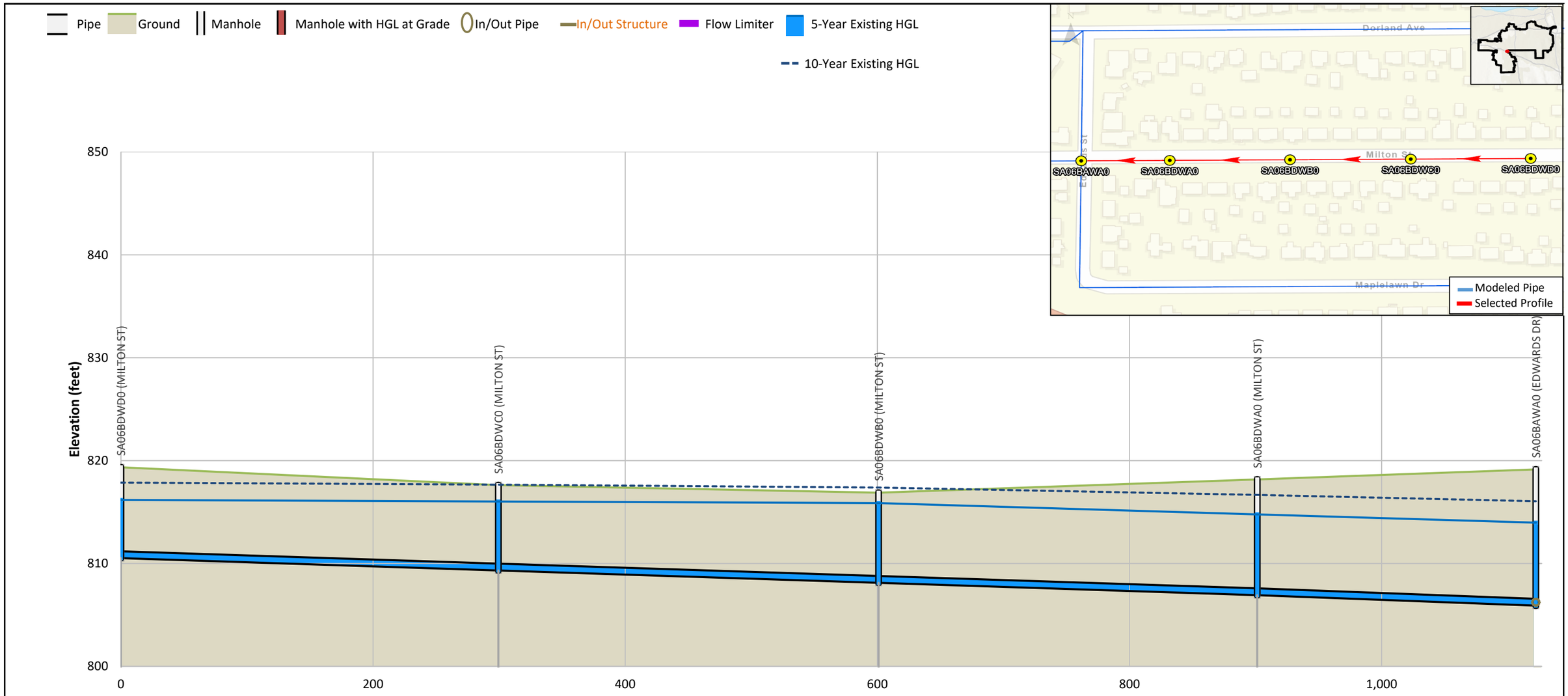
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 708, Date created: 3/11/2021

Depth to Invert (ft)		8.3	8.8	11	
Depth to HGL (ft)		1.6	1.0	3.4	
Diameter (in)	8	8	8	8	8
Capacity (mgd)	0.45	0.45	0.45	0.48	
Max Depth (ft)	6.7	7.8	7.9	8.1	
Dep abv Crown (ft)	6.0	7.1	7.2	7.4	
Max Flow (mgd)	0.25	0.17	0.48	0.43	
Max Velocity (ft/s)	2.0	0.65	2.4	1.0	
Slope (ft/ft)	0.0040	0.0040	0.0040	0.0046	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09

Community: Berea

MILTON ST to EDWARDS DR

Brown AND Caldwell

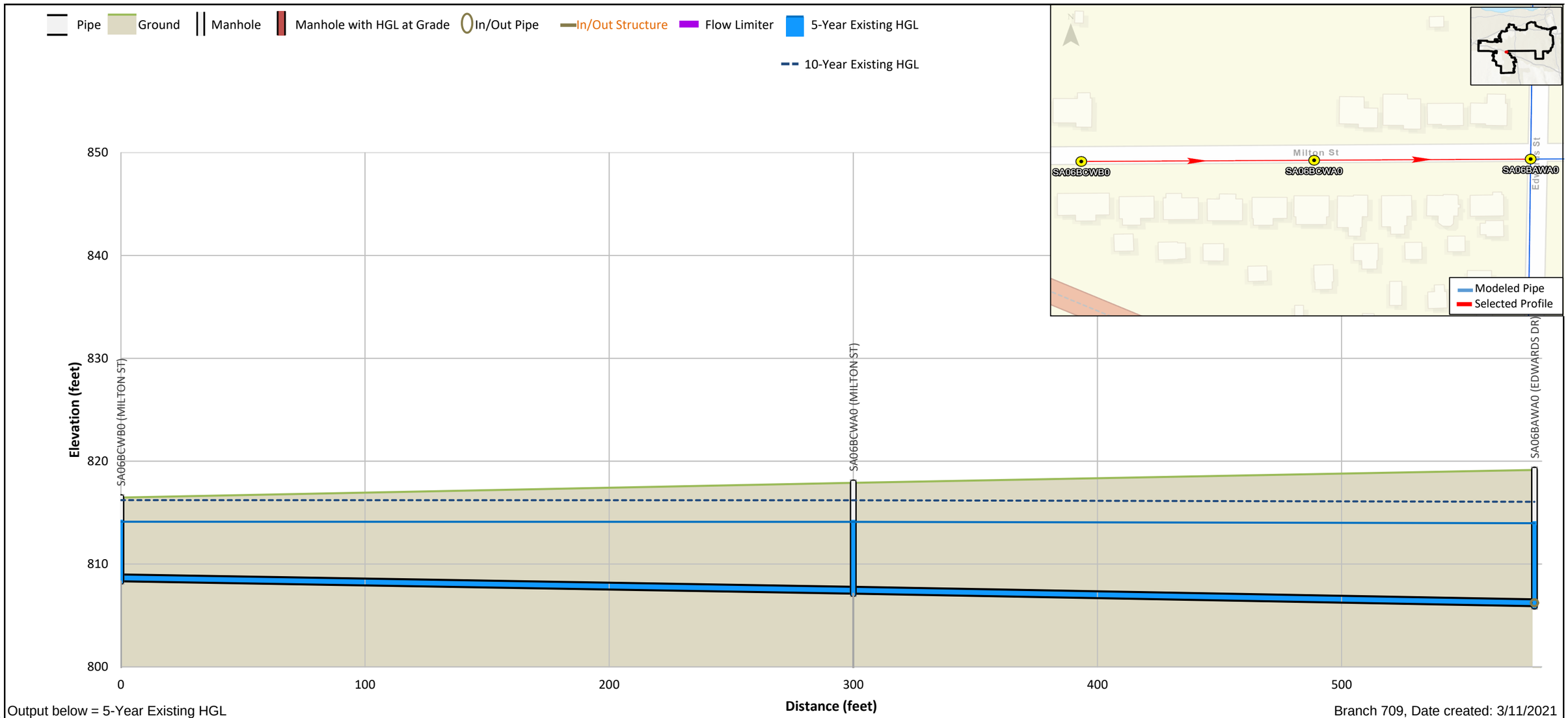
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 709, Date created: 3/11/2021

Depth to Invert (ft)		11	
Depth to HGL (ft)		3.8	
Diameter (in)	8		8
Capacity (mgd)	0.45		0.47
Max Depth (ft)	7.0		8.1
Dep abv Crown (ft)	6.3		7.4
Max Flow (mgd)	-0.15		0.15
Max Velocity (ft/s)	-0.57		0.54
Slope (ft/ft)	0.0040		0.0044

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09

Community: Berea

MILTON ST to EDWARDS DR

Brown AND Caldwell

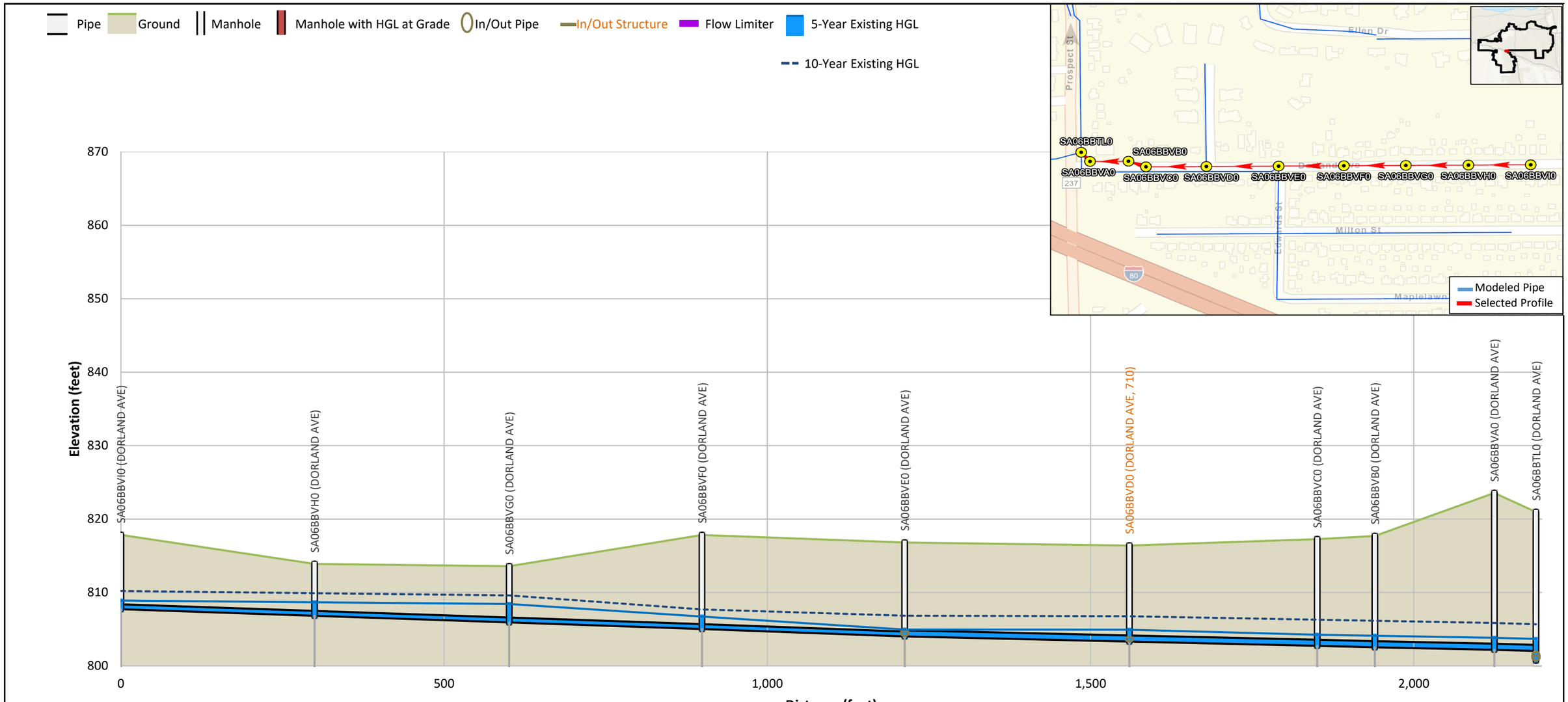
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 710, Date created: 3/11/2021

Depth to Invert (ft)		7.1	7.7	13	13	13	15	15	21	
Depth to HGL (ft)		5.2	5.1	11	12	11	13	14	20	
Diameter (in)	8	8	8	8	10	10	10	10	10	
Capacity (mgd)	0.39	0.39	0.39	0.40	0.58	0.58	0.61	0.55	0.66	
Max Depth (ft)	1.8	2.5	2.5	1.7	1.6	1.6	1.6	1.6	1.7	
Dep abv Crown (ft)	1.2	1.8	1.8	1.0	0.78	0.78	0.74	0.80	0.82	
Max Flow (mgd)	0.22	0.22	0.54	0.54	0.44	0.73	0.74	0.74	1.1	
Max Velocity (ft/s)	1.8	0.82	2.1	2.2	1.4	2.1	2.0	2.3	4.1	
Slope (ft/ft)	0.0030	0.0030	0.0030	0.0032	0.0020	0.0020	0.0022	0.0018	0.0026	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09
Community: Berea
DORLAND AVE

Brown AND Caldwell

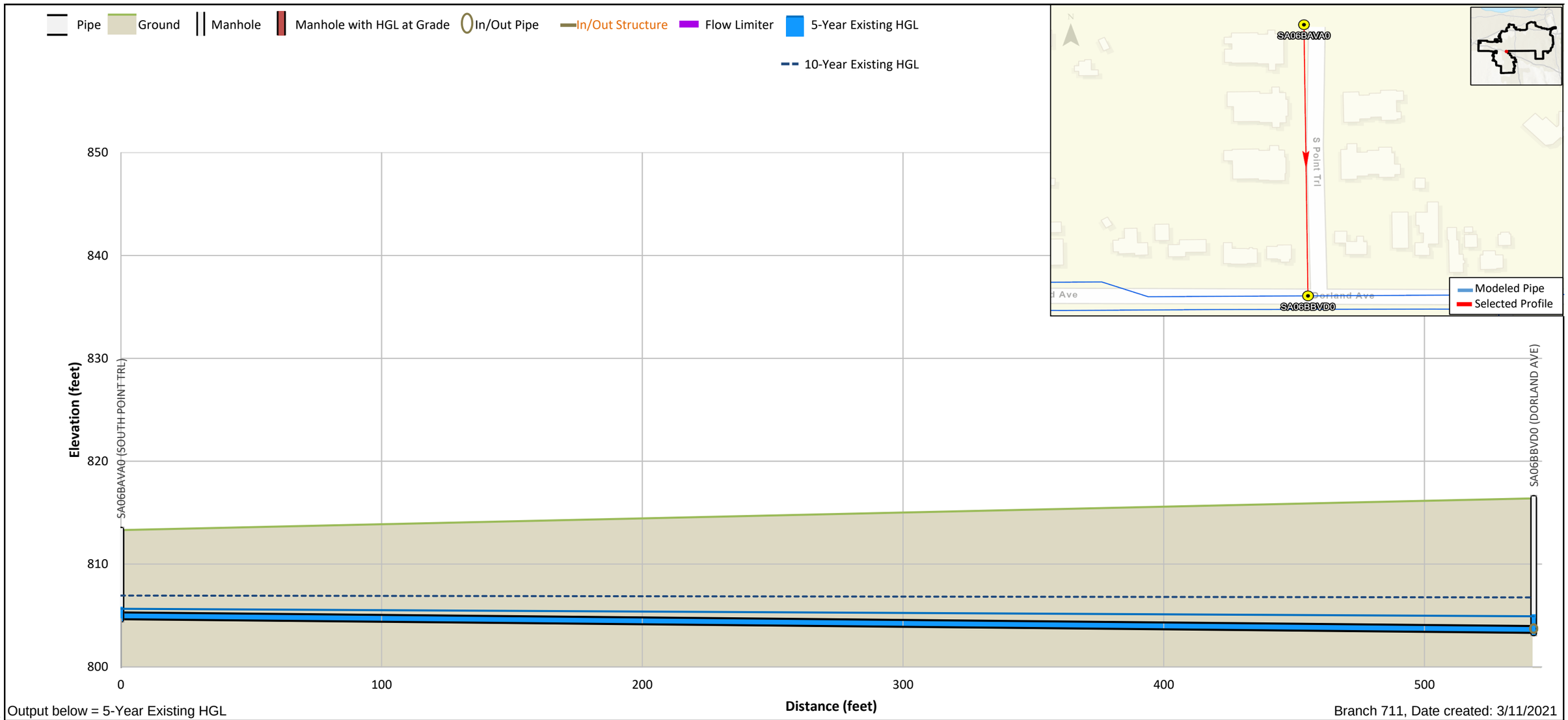
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 711, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	0.35	
Max Depth (ft)	1.6	
Dep abv Crown (ft)	0.95	
Max Flow (mgd)	0.26	
Max Velocity (ft/s)	0.95	
Slope (ft/ft)	0.0024	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09

Community: Berea

SOUTH POINT TRL to DORLAND AVE

Brown AND Caldwell

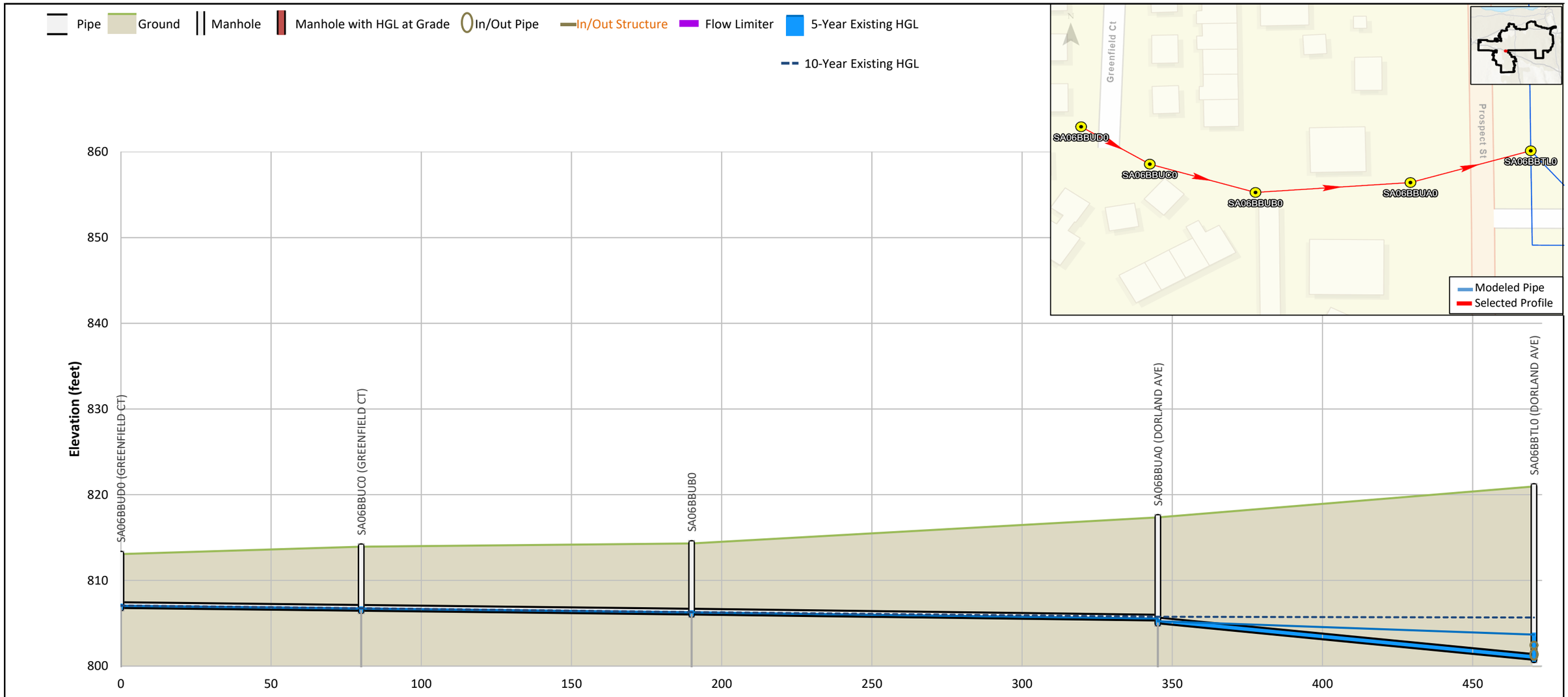
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

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Output below = 5-Year Existing HGL

Branch 712, Date created: 3/11/2021

Depth to Invert (ft)		7.5	8.3	12	
Depth to HGL (ft)		7.2	8.0	12	
Diameter (in)	8	8	8	8	
Capacity (mgd)	0.45	0.45	0.48	1.3	
Max Depth (ft)	0.27	0.27	0.26	2.9	
Dep abv Crown (ft)	-	-	-	2.3	
Max Flow (mgd)	0.15	0.15	0.15	0.38	
Max Velocity (ft/s)	1.8	1.9	2.3	1.6	
Slope (ft/ft)	0.0040	0.0040	0.0045	0.034	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09
Community: Berea
GREENFIELD CT to DORLAND AVE

Brown AND Caldwell

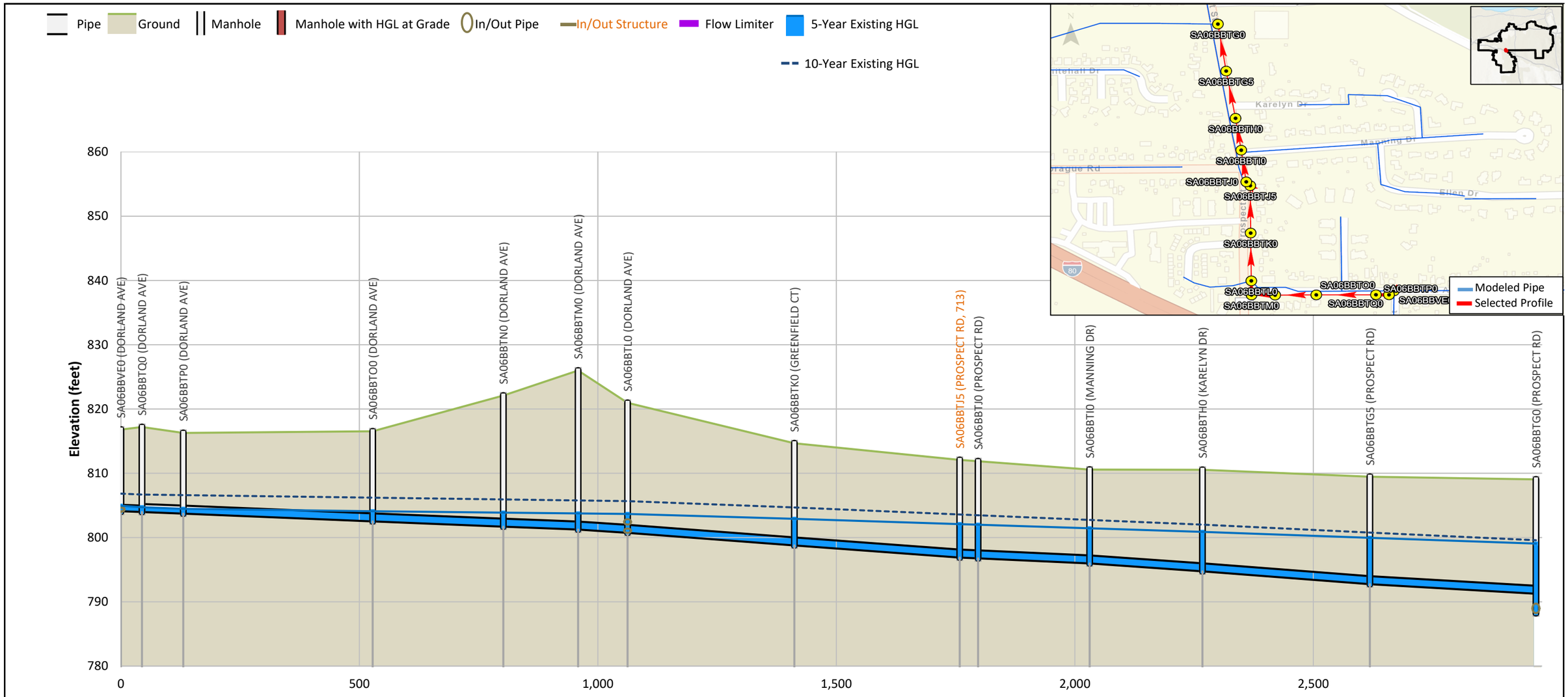
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

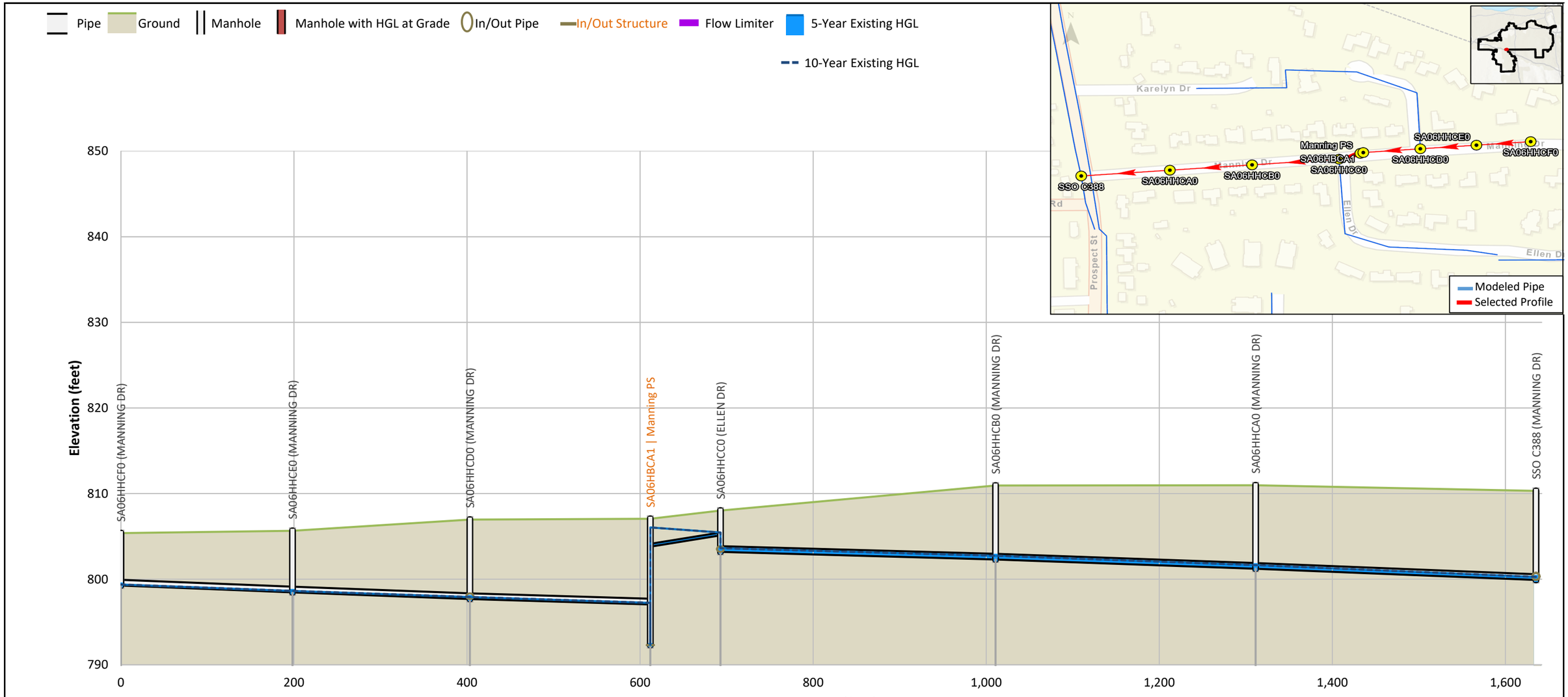
https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 713, Date created: 3/11/2021

| | | |



Output below = 5-Year Existing HGL

Branch 714, Date created: 3/11/2021

Depth to Invert (ft)		7.2	9.3		2.9	8.6	9.8	
Depth to HGL (ft)		7.0	9.1		2.6	8.2	9.3	
Diameter (in)	8	8	8	4	8	8	8	
Capacity (mgd)	0.45	0.44	0.39	-0.19	0.38	0.43	0.45	
Max Depth (ft)	0.17	0.23	0.23	2.2	0.43	0.43	0.42	
Dep abv Crown (ft)	-	-	-	1.9	-	-	-	
Max Flow (mgd)	0.03	0.06	0.10	0.13	0.28	0.32	0.32	
Max Velocity (ft/s)	0.64	0.86	2.0	2.2	2.0	2.2	2.7	
Slope (ft/ft)	0.0040	0.0038	0.0030	-0.016	0.0028	0.0036	0.0040	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09
Community: Berea
MANNING DR

Brown AND Caldwell

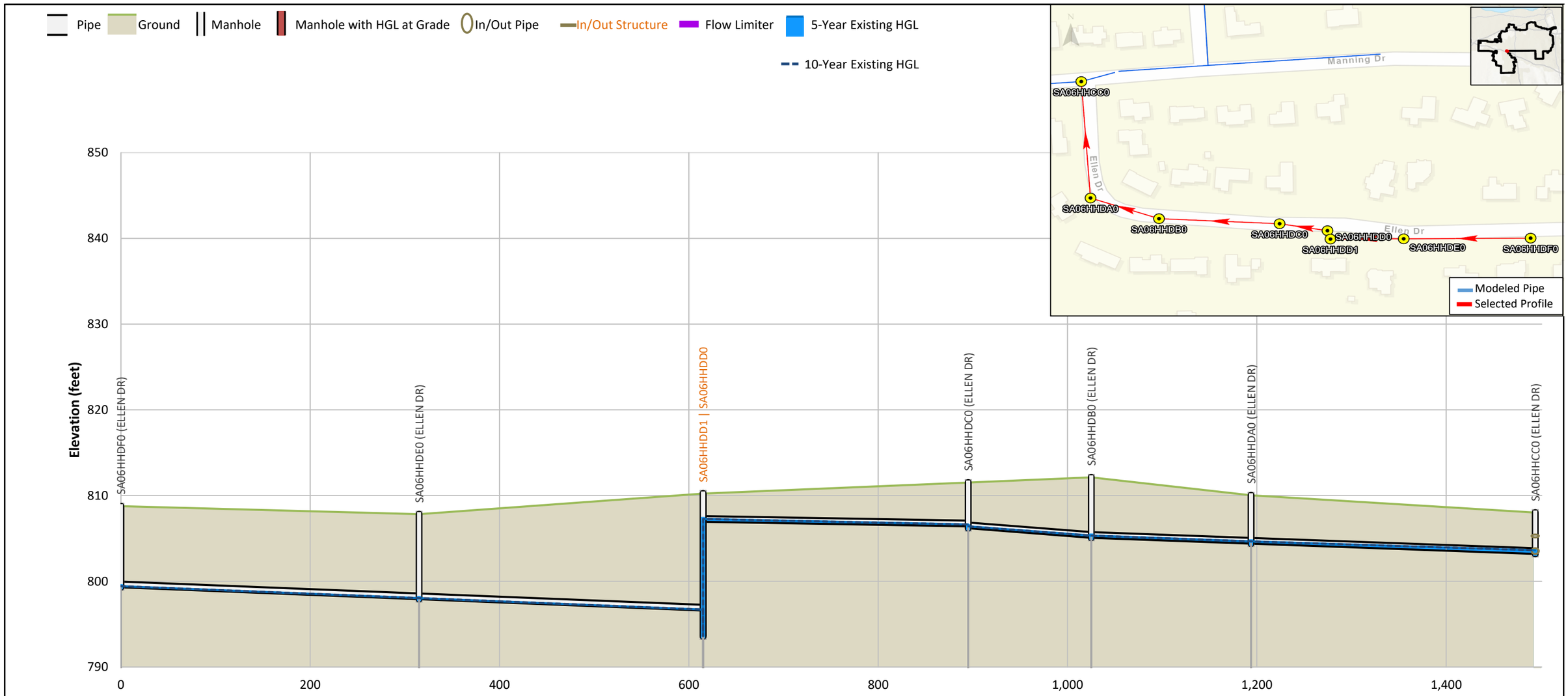
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 715, Date created: 3/11/2021

Depth to Invert (ft)		9.9			5.1	7.1	5.6					
Depth to HGL (ft)		9.8			4.9	6.8	5.4					
Diameter (in)	8		8	8		8	8		8			
Capacity (mgd)	0.47		0.47	0.31		0.66	0.45		0.45			
Max Depth (ft)	0.13		0.13	0.33		0.27	0.27		0.43			
Dep abv Crown (ft)	-		-	-		-	-		-			
Max Flow (mgd)	0.04		0.04	0.15		0.15	0.15		0.15			
Max Velocity (ft/s)	1.2		1.5	2.3		2.0	1.9		1.8			
Slope (ft/ft)	0.0044		0.0044	0.0019		0.0086	0.0040		0.0040			

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09

Community: Berea

ELLEN DR

Brown AND Caldwell

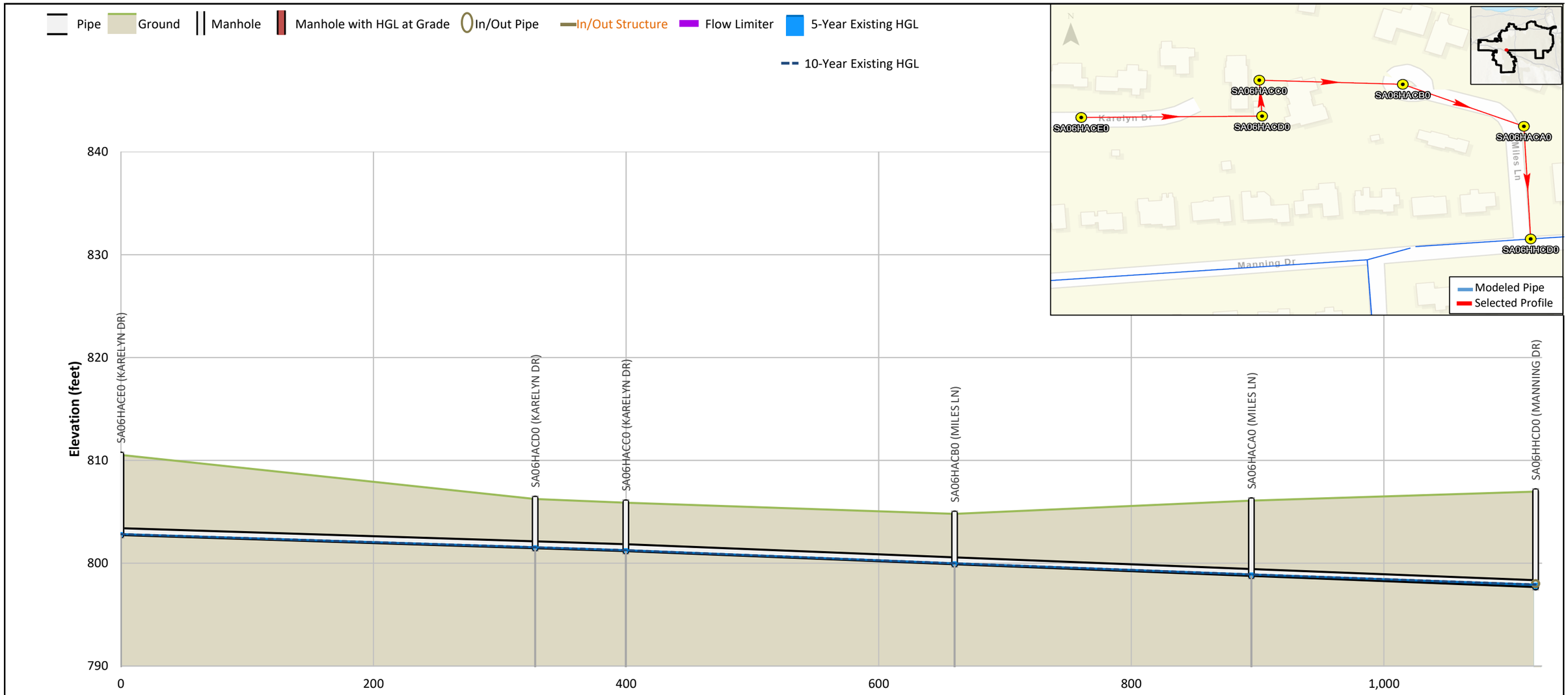
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 716, Date created: 3/11/2021

Depth to Invert (ft)		4.8	4.7	4.9	7.3	
Depth to HGL (ft)		4.7	4.6	4.8	7.2	
Diameter (in)	8	8	8	8	8	8
Capacity (mgd)	0.44	0.44	0.50	0.49	0.49	
Max Depth (ft)	0.09	0.09	0.09	0.14	0.23	
Dep abv Crown (ft)	-	-	-	-	-	
Max Flow (mgd)	0.01	0.01	0.01	0.01	0.04	
Max Velocity (ft/s)	0.81	0.86	0.86	0.43	0.61	
Slope (ft/ft)	0.0039	0.0039	0.0049	0.0048	0.0048	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09

Community: Berea

KARELYN DR to MANNING DR

Brown AND Caldwell

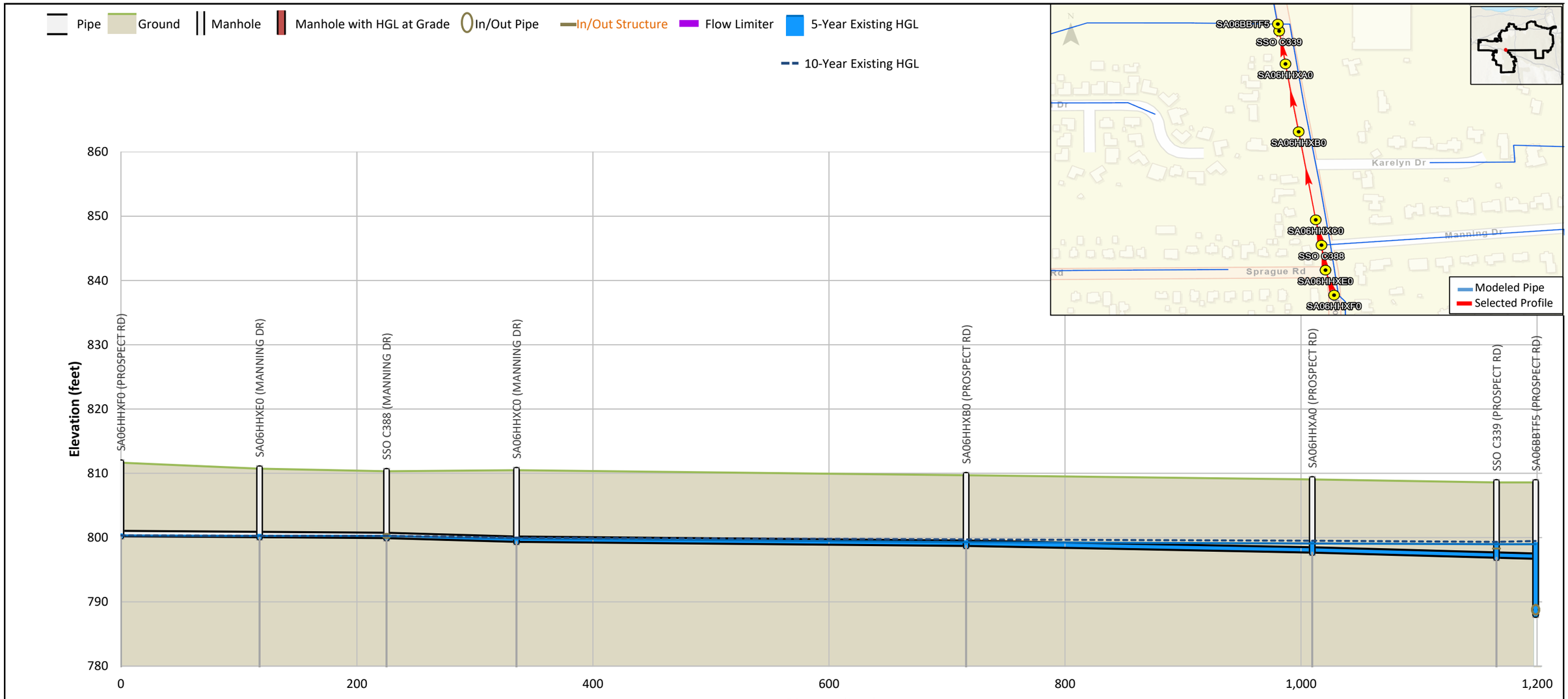
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 717, Date created: 3/11/2021

Depth to Invert (ft)		11	10	11	11	11	12	
Depth to HGL (ft)		10	10	11	10	10.0	9.6	
Diameter (in)	10	10	10	10	10	10	10	10
Capacity (mgd)	0.46	0.46	0.93	0.52	0.77	0.92	0.92	
Max Depth (ft)	0.20	0.34	0.48	0.58	1.4	2.1	2.3	
Dep abv Crown (ft)	-	-	-	-	0.59	1.3	1.4	
Max Flow (mgd)	0.02	-0.03	0.33	0.32	0.33	0.41	0.36	
Max Velocity (ft/s)	0.58	-0.48	1.6	2.1	2.2	2.5	2.8	
Slope (ft/ft)	0.0013	0.0013	0.0053	0.0017	0.0035	0.0051	0.0051	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09
Community: Berea
PROSPECT RD

Brown AND Caldwell

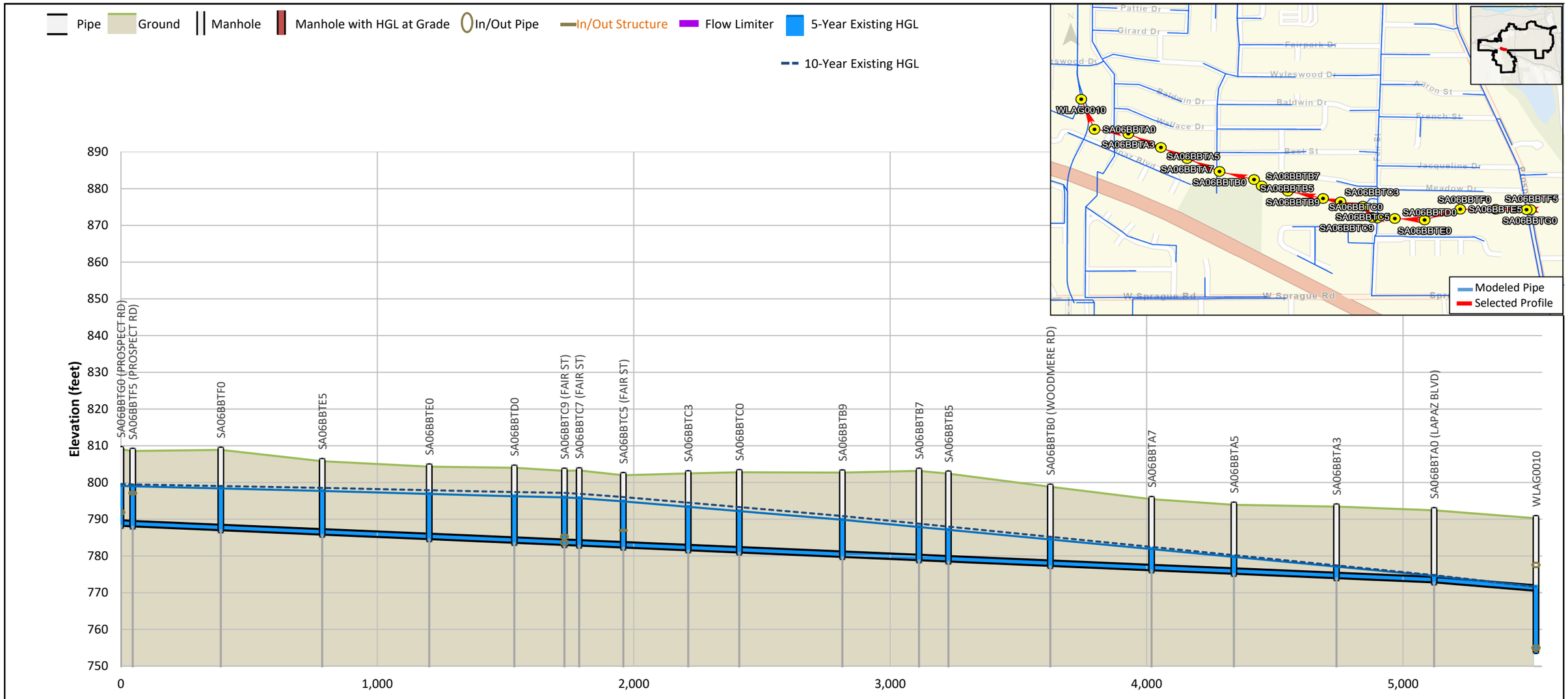
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 718, Date created: 3/11/2021

Depth to Invert (ft)		22	20	20	20	20 20	20	21	22	23	24	24	22	19	19	19	20		
Depth to HGL (ft)		11	8.1	7.4	7.8	7.27.5	7.1	9.1	11	13	15	15	14	14	14	16	18		
Diameter (in)	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Capacity (mgd)	3.4	3.4	3.4	3.4	3.9	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.3	3.4	3.4	4.7		
Max Depth (ft)	11	12	12	13	13	13	13	12	11	10	9.0	8.6	7.2	5.8	4.6	3.1	1.8		
Dep abv Crown (ft)	9.9	10	11	11	11	11	11	10	9.8	8.6	7.5	7.1	5.7	4.3	3.1	1.6	0.27		
Max Flow (mgd)	3.5	3.1	3.1	3.1	3.0	4.8	4.7	4.7	4.7	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.2		
Max Velocity (ft/s)	3.5	3.2	3.4	2.5	1.9	3.5	3.6	3.5	3.3	3.6	3.6	3.5	3.7	3.8	4.0	4.5	5.8		
Slope (ft/ft)	0.0030	0.0030	0.0029	0.0030	0.0030	0.0031	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0029	0.0030	0.0030	0.0058		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09, BE-13
Community: Berea
PROSPECT RD to Manhole WLAG0010

Brown AND Caldwell

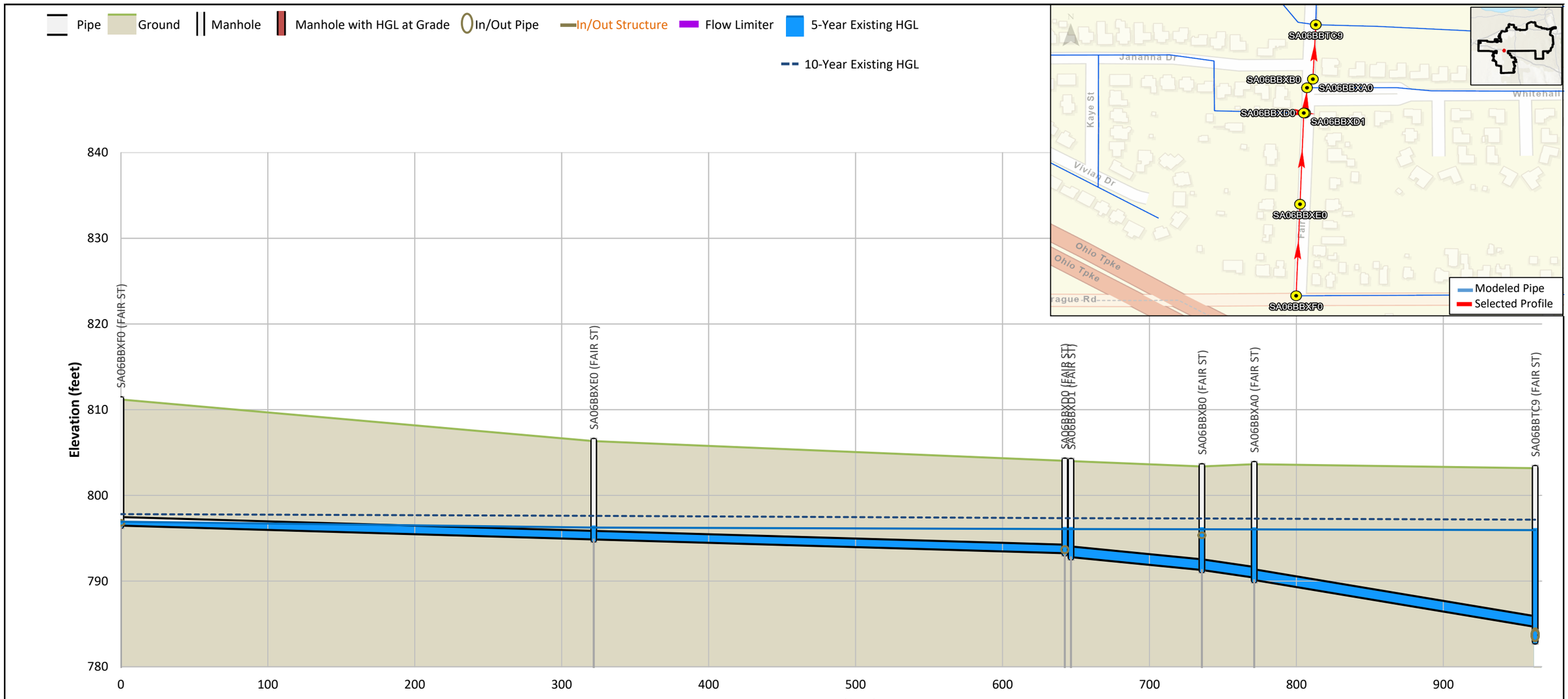
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

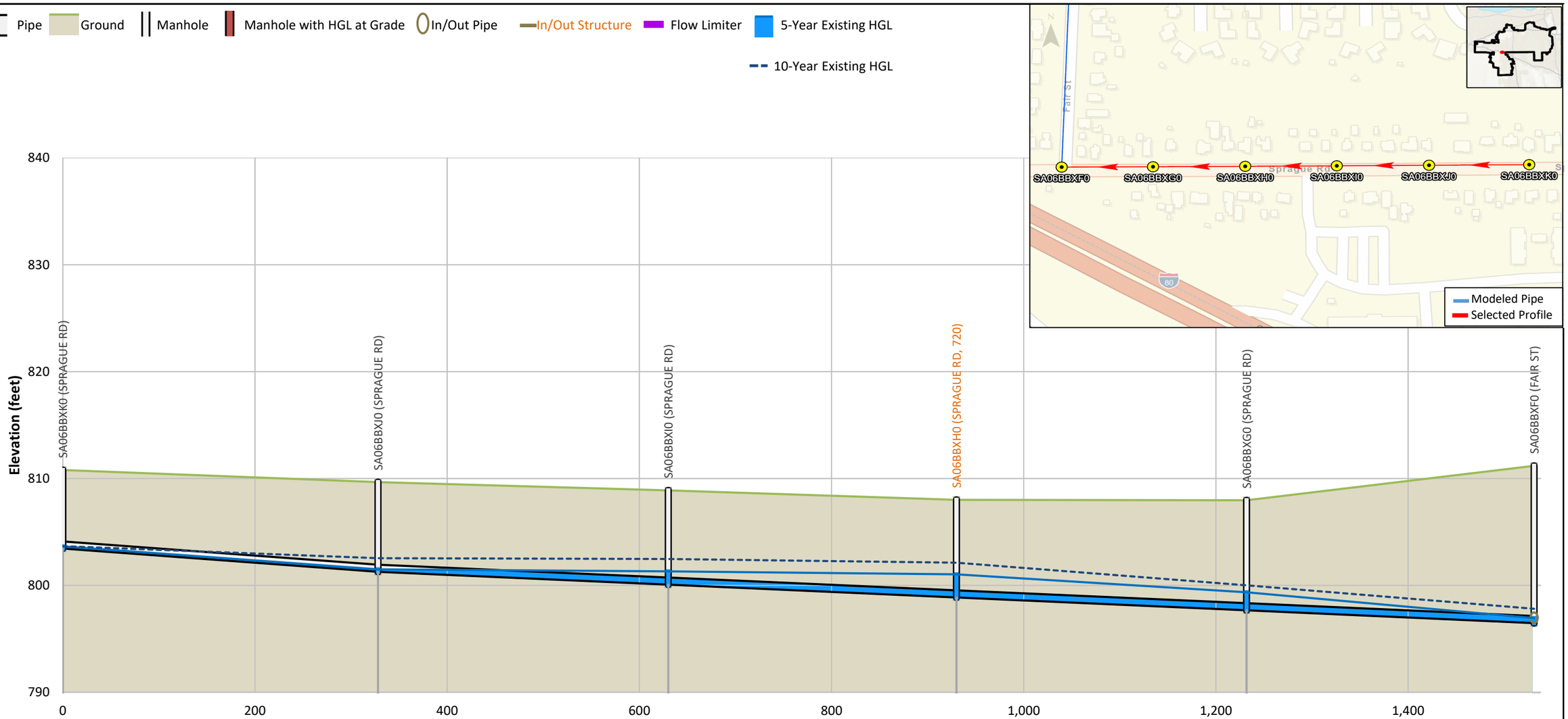
https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 719, Date created: 3/11/2021

| | | |



Output below = 5-Year Existing HGL

Branch 720, Date created: 3/11/2021

Depth to Invert (ft)		8.4	8.8	9.1	10	
Depth to HGL (ft)		8.2	7.6	7.0	8.6	
Diameter (in)	8	8	8	8	8	8
Capacity (mgd)	0.58	0.45	0.45	0.45	0.45	0.45
Max Depth (ft)	0.23	1.2	2.2	2.2	1.7	
Dep abv Crown (ft)	-	0.58	1.5	1.5	1.0	
Max Flow (mgd)	0.11	0.13	0.24	0.53	0.63	
Max Velocity (ft/s)	1.6	0.88	0.91	1.9	3.7	
Slope (ft/ft)	0.0066	0.0040	0.0040	0.0040	0.0040	

Northeast Ohio Regional Sewer District

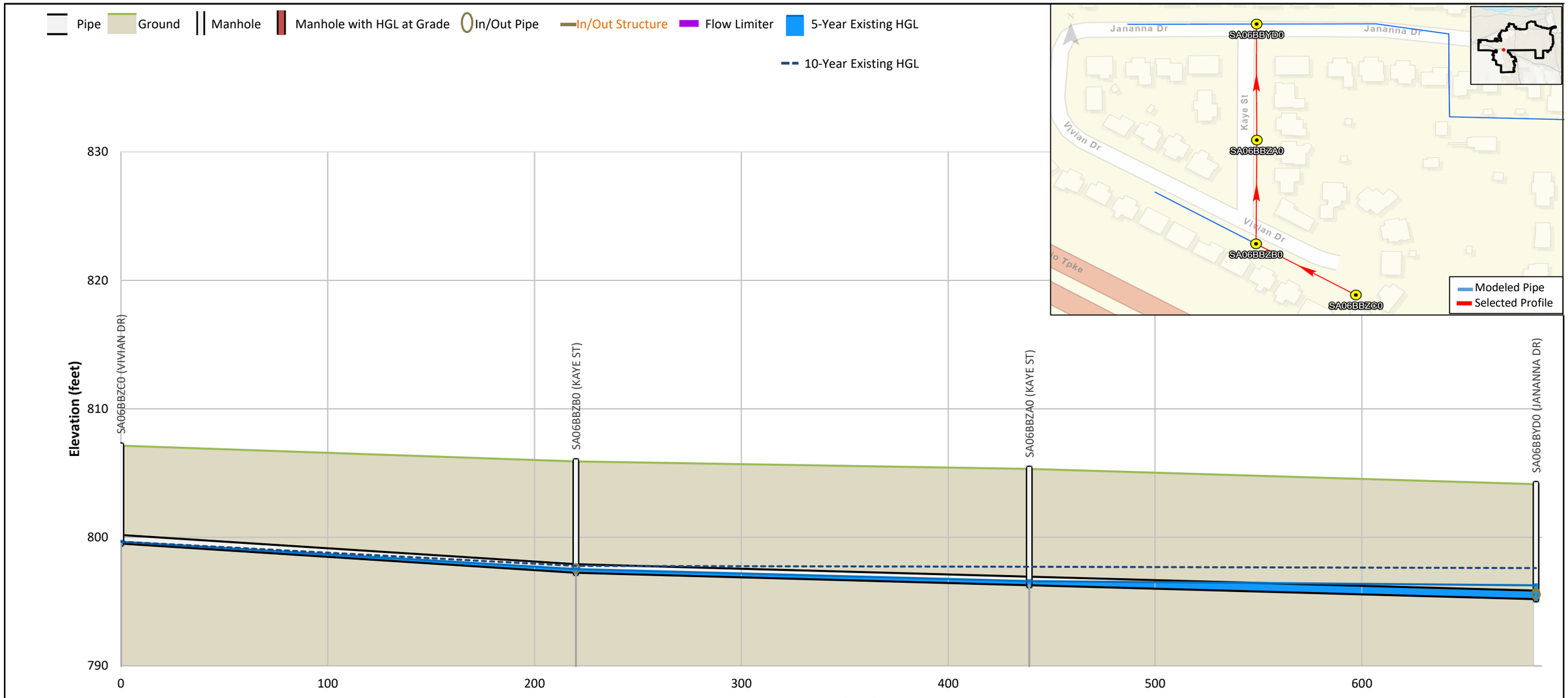
SWI-LSSES

PFA: BE-09
Community: Berea
SPRAGUE RD to FAIR ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 721, Date created: 3/11/2021

Depth to Invert (ft)		8.7	9.1	
Depth to HGL (ft)		8.4	8.7	
Diameter (in)	8	8	8	8
Capacity (mgd)	0.72	0.47	0.47	
Max Depth (ft)	0.29	0.32	1.1	
Dep abv Crown (ft)	-	-	0.41	
Max Flow (mgd)	0.06	0.18	0.22	
Max Velocity (ft/s)	0.69	1.7	2.0	
Slope (ft/ft)	0.010	0.0044	0.0044	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09

Community: Berea

VIVIAN DR to JANANNA DR

Brown AND Caldwell

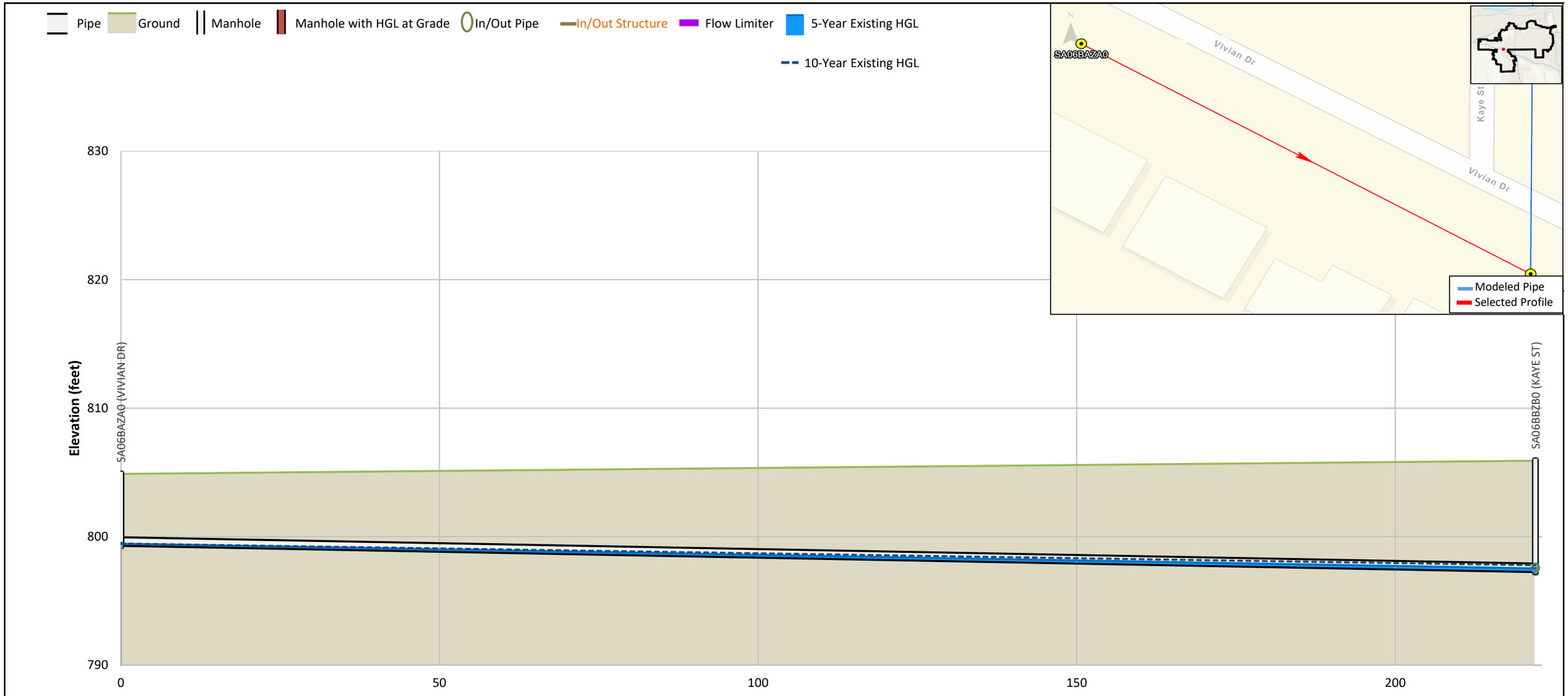
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 722, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	0.68	
Max Depth (ft)	0.29	
Dep abv Crown (ft)	-	
Max Flow (mgd)	0.09	
Max Velocity (ft/s)	0.94	
Slope (ft/ft)	0.0092	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09

Community: Berea

VIVIAN DR to KAYE ST

Brown AND Caldwell

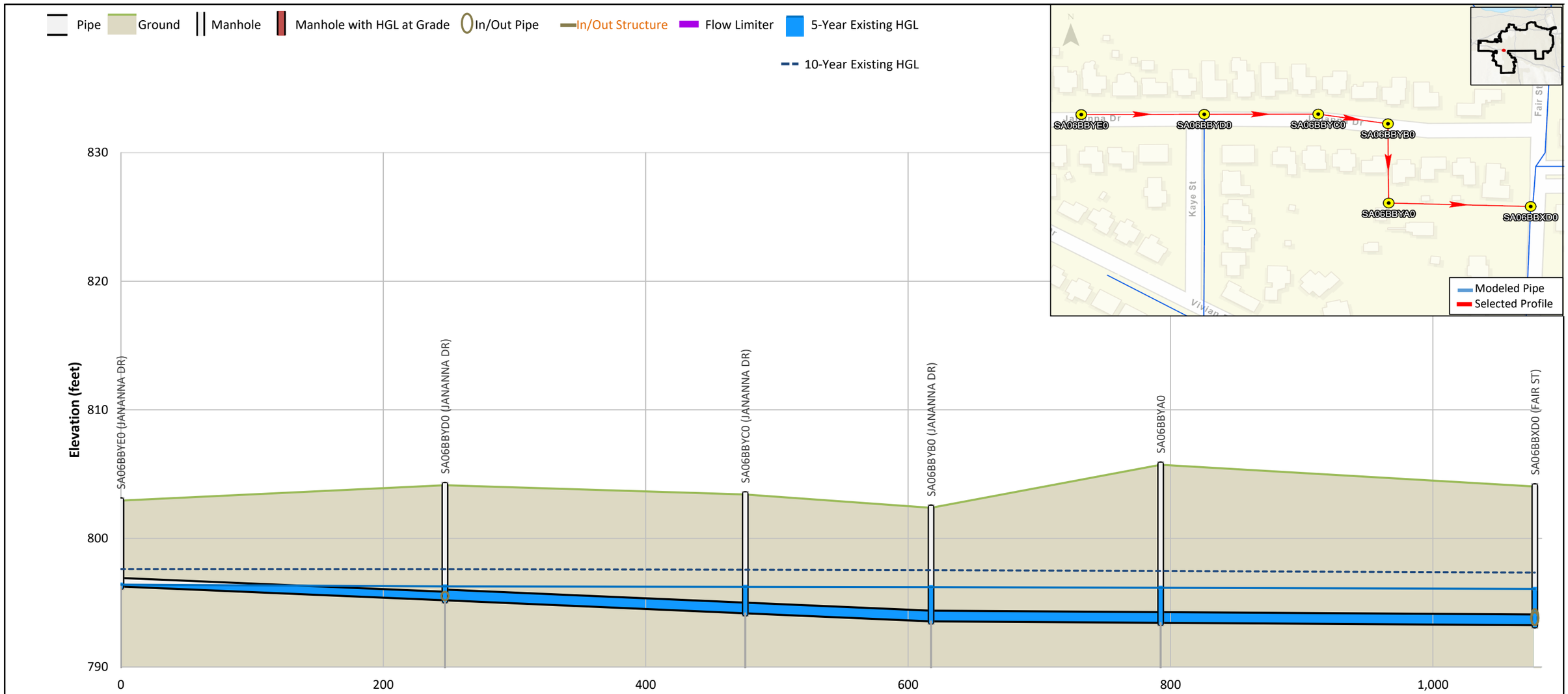
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 723, Date created: 3/11/2021

Depth to Invert (ft)		9.0	9.2	8.8	12	
Depth to HGL (ft)		7.9	7.2	6.2	9.6	
Diameter (in)	8	10	10	10	10	
Capacity (mgd)	0.47	0.86	0.86	0.33	0.33	
Max Depth (ft)	1.1	2.1	2.7	2.7	2.8	
Dep abv Crown (ft)	0.41	1.2	1.8	1.9	2.0	
Max Flow (mgd)	0.05	0.27	0.26	0.39	0.41	
Max Velocity (ft/s)	0.47	2.0	0.82	1.3	2.9	
Slope (ft/ft)	0.0043	0.0044	0.0044	0.00064	0.00064	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09

Community: Berea

JANANNA DR to FAIR ST

Brown AND Caldwell

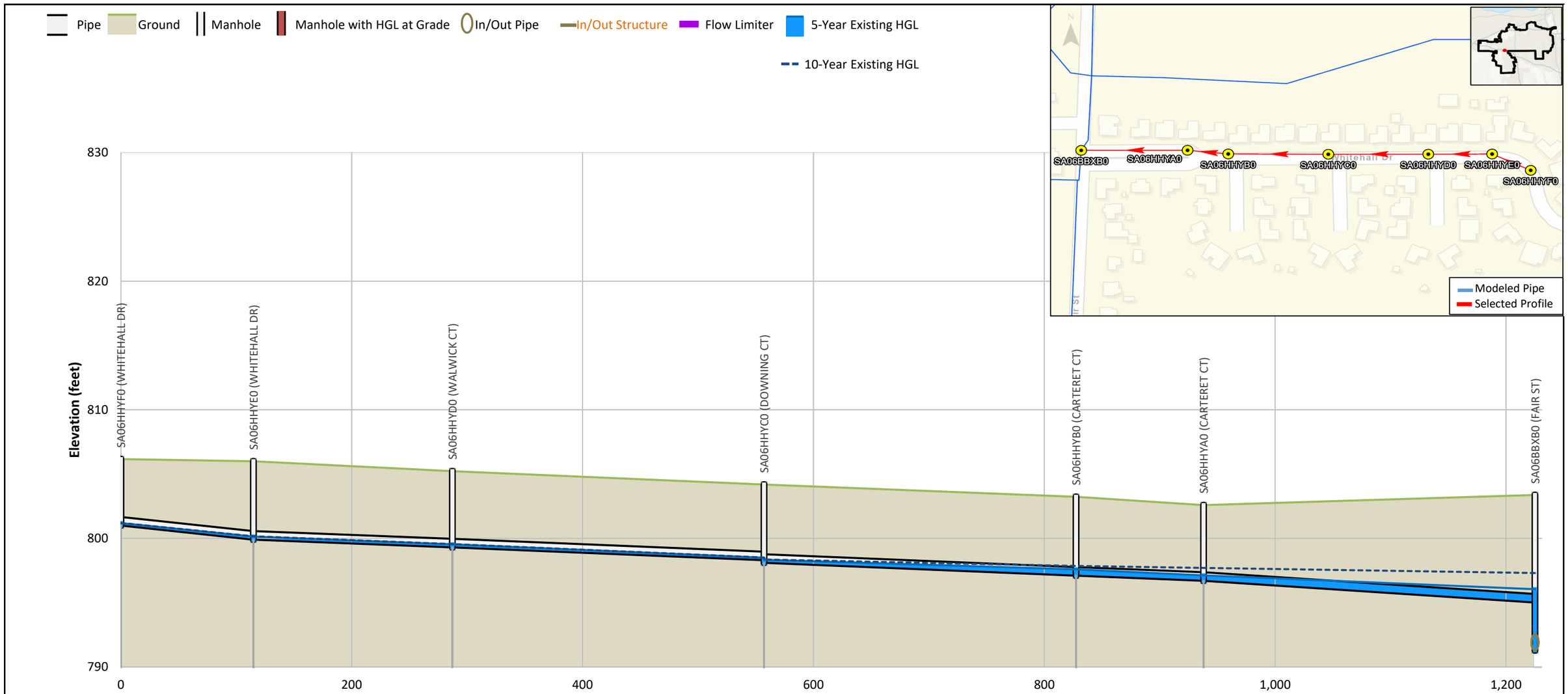
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 724, Date created: 3/11/2021

Depth to Invert (ft)		6.1	5.9	5.9	6.1	5.9	
Depth to HGL (ft)		5.9	5.7	5.7	5.6	5.5	
Diameter (in)	8	8	8	8	8	8	
Capacity (mgd)	0.70	0.42	0.43	0.43	0.43	0.54	
Max Depth (ft)	0.24	0.24	0.24	0.49	0.49	1.0	
Dep abv Crown (ft)	-	-	-	-	-	0.37	
Max Flow (mgd)	0.12	0.12	0.12	0.12	0.39	0.39	
Max Velocity (ft/s)	1.6	1.6	2.1	0.66	2.6	3.1	
Slope (ft/ft)	0.0096	0.0035	0.0037	0.0037	0.0036	0.0059	

Northeast Ohio Regional Sewer District

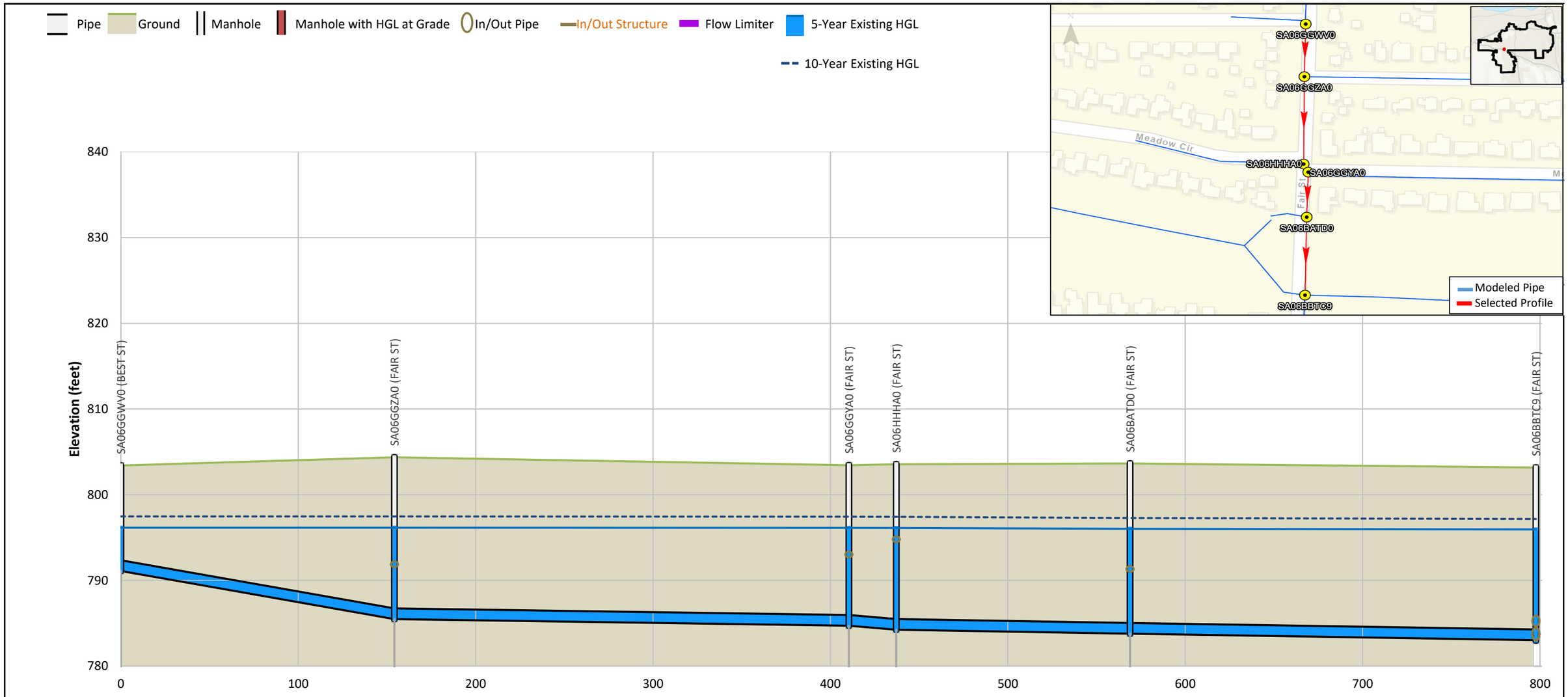
SWI-LSSES

PFA: BE-09
Community: Berea
WHITEHALL DR to FAIR ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/DesktopHGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 725, Date created: 3/11/2021

Depth to Invert (ft)		19		19		19		20				
Depth to HGL (ft)		8.2		7.3		7.4		7.6				
Diameter (in)	15		15		15		15		15			
Capacity (mgd)	5.2		1.5		3.6		1.6		1.6			
Max Depth (ft)	11		11		12		12		13			
Dep abv Crown (ft)	9.4		10		11		11		12			
Max Flow (mgd)	-0.33		0.42		1.1		1.5		1.2			
Max Velocity (ft/s)	-0.38		1.1		1.7		2.3		1.7			
Slope (ft/ft)	0.036		0.0030		0.018		0.0035		0.0033			

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09
Community: Berea
BEST ST to FAIR ST

Brown AND Caldwell

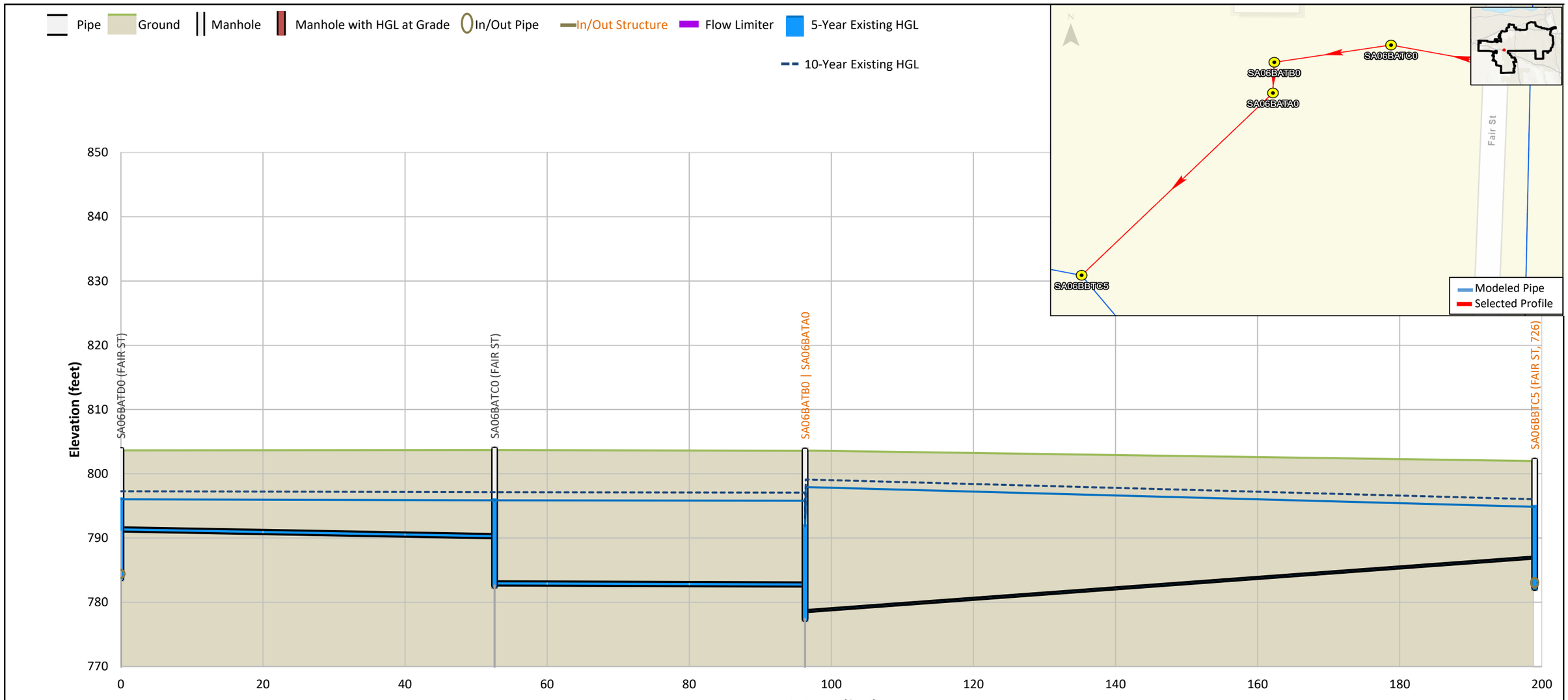
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 726, Date created: 3/11/2021

Depth to Invert (ft)		14		
Depth to HGL (ft)		7.8		
Diameter (in)	8	8	4	
Capacity (mgd)	0.72	0.44	-0.44	
Max Depth (ft)	5.9	13	19	
Dep abv Crown (ft)	5.2	13	19	
Max Flow (mgd)	1.3	1.1	0.27	
Max Velocity (ft/s)	5.9	5.0	4.8	
Slope (ft/ft)	0.020	0.0039	-0.081	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09

Community: Berea

FAIR ST

Brown AND Caldwell

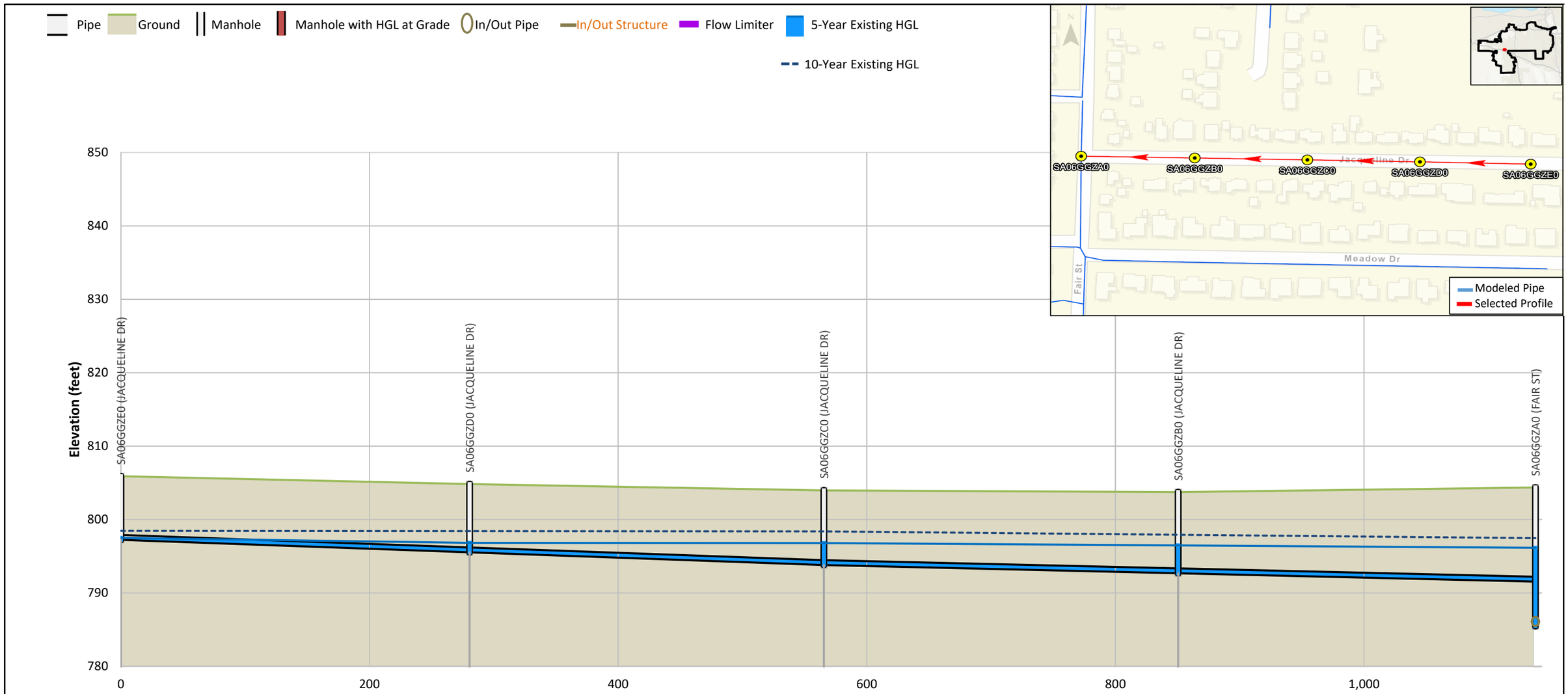
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 727, Date created: 3/11/2021

Depth to Invert (ft)		9.3	10	11	
Depth to HGL (ft)		8.0	7.2	7.3	
Diameter (in)	8	8	8	8	8
Capacity (mgd)	0.55	0.55	0.45	0.45	
Max Depth (ft)	1.3	3.0	3.8	4.6	
Dep abv Crown (ft)	0.63	2.3	3.1	3.9	
Max Flow (mgd)	0.18	0.18	0.55	0.55	
Max Velocity (ft/s)	2.2	0.71	2.3	3.5	
Slope (ft/ft)	0.0061	0.0061	0.0039	0.0040	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09

Community: Berea

JACQUELINE DR to FAIR ST

Brown AND Caldwell

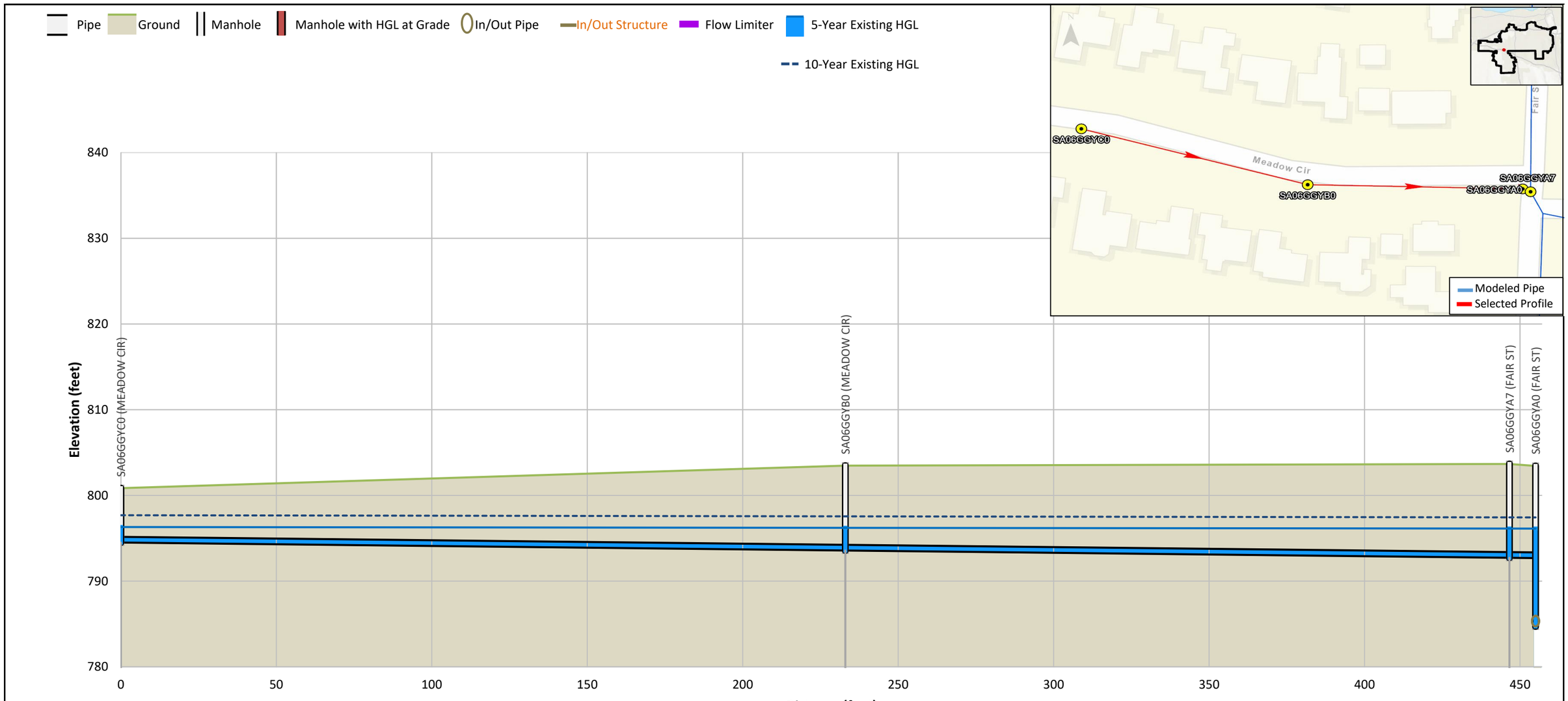
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 728, Date created: 3/11/2021

Depth to Invert (ft)		9.9						11		
Depth to HGL (ft)		7.3						7.5		
Diameter (in)	8		8							
Capacity (mgd)	0.45		0.45							
Max Depth (ft)	2.6		3.4							
Dep abv Crown (ft)	2.0		2.7							
Max Flow (mgd)	0.38		0.38							
Max Velocity (ft/s)	2.2		2.7							
Slope (ft/ft)	0.0040		0.0040							

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09

Community: Berea

MEADOW CIR to FAIR ST

Brown AND Caldwell

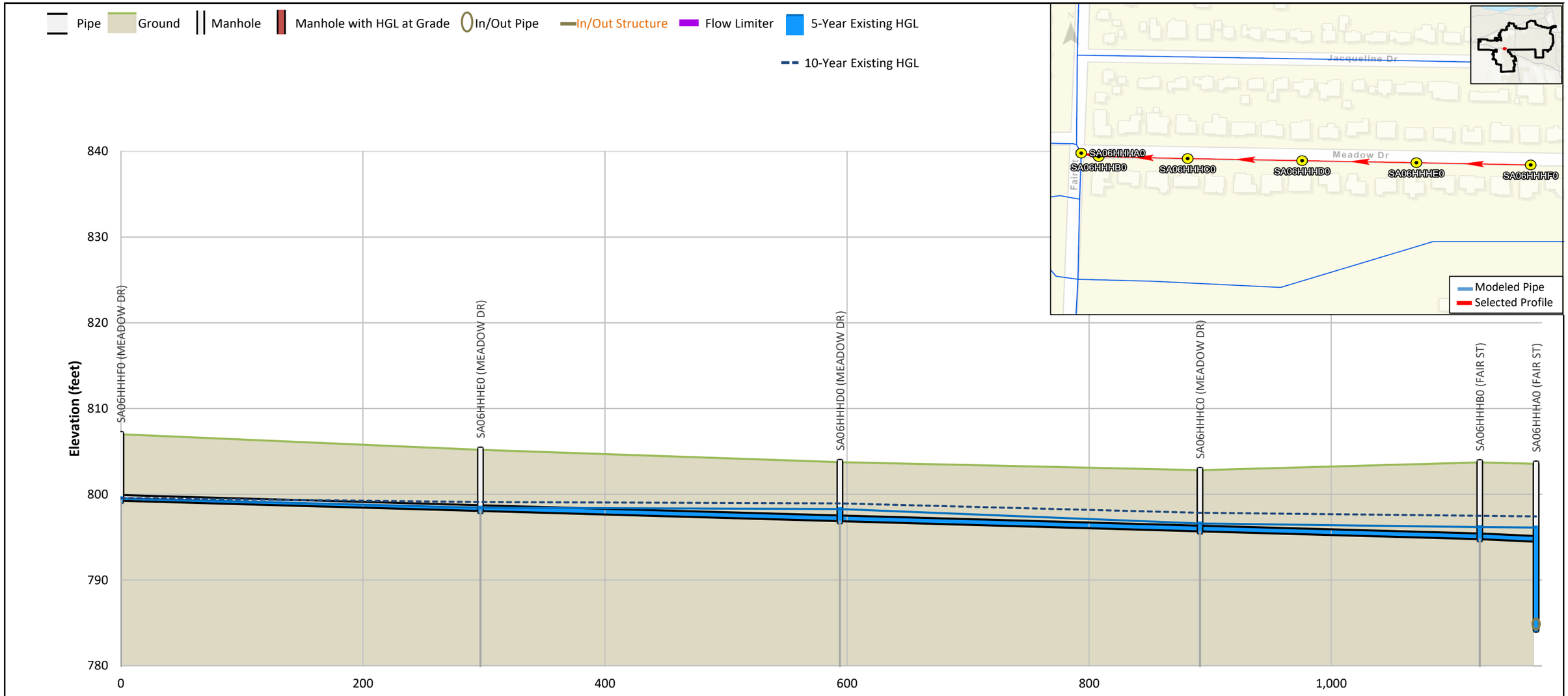
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 729, Date created: 3/11/2021

Depth to Invert (ft)		7.1	6.9	7.1	9.0	
Depth to HGL (ft)		6.7	5.5	6.2	7.5	
Diameter (in)	8	8	8	8	8	8
Capacity (mgd)	0.45	0.45	0.45	0.45	0.57	
Max Depth (ft)	0.38	1.4	1.4	1.4	1.7	
Dep abv Crown (ft)	-	0.75	0.75	0.74	0.99	
Max Flow (mgd)	0.18	0.19	0.53	0.53	0.53	
Max Velocity (ft/s)	1.9	0.78	2.3	3.0	3.4	
Slope (ft/ft)	0.0040	0.0040	0.0040	0.0039	0.0065	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09
Community: Berea
MEADOW DR to FAIR ST

Brown AND Caldwell

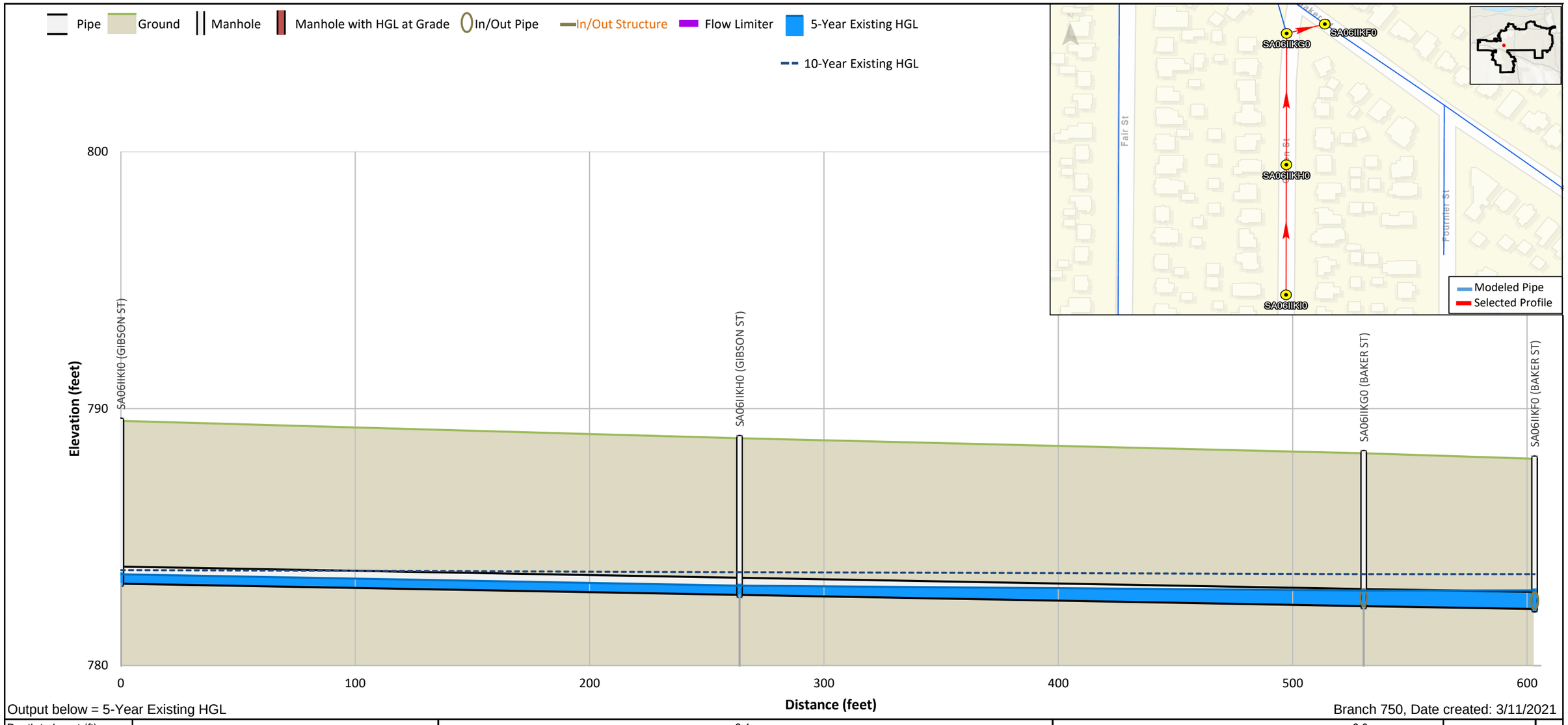
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 750, Date created: 3/11/2021

Depth to Invert (ft)		6.1	6.0	
Depth to HGL (ft)		5.7	5.3	
Diameter (in)	8	8	8	
Capacity (mgd)	0.29	0.29	0.28	
Max Depth (ft)	0.37	0.61	0.72	
Dep abv Crown (ft)	-	-	0.06	
Max Flow (mgd)	0.16	0.16	0.14	
Max Velocity (ft/s)	1.3	1.3	1.8	
Slope (ft/ft)	0.0016	0.0016	0.0015	

Northeast Ohio Regional Sewer District

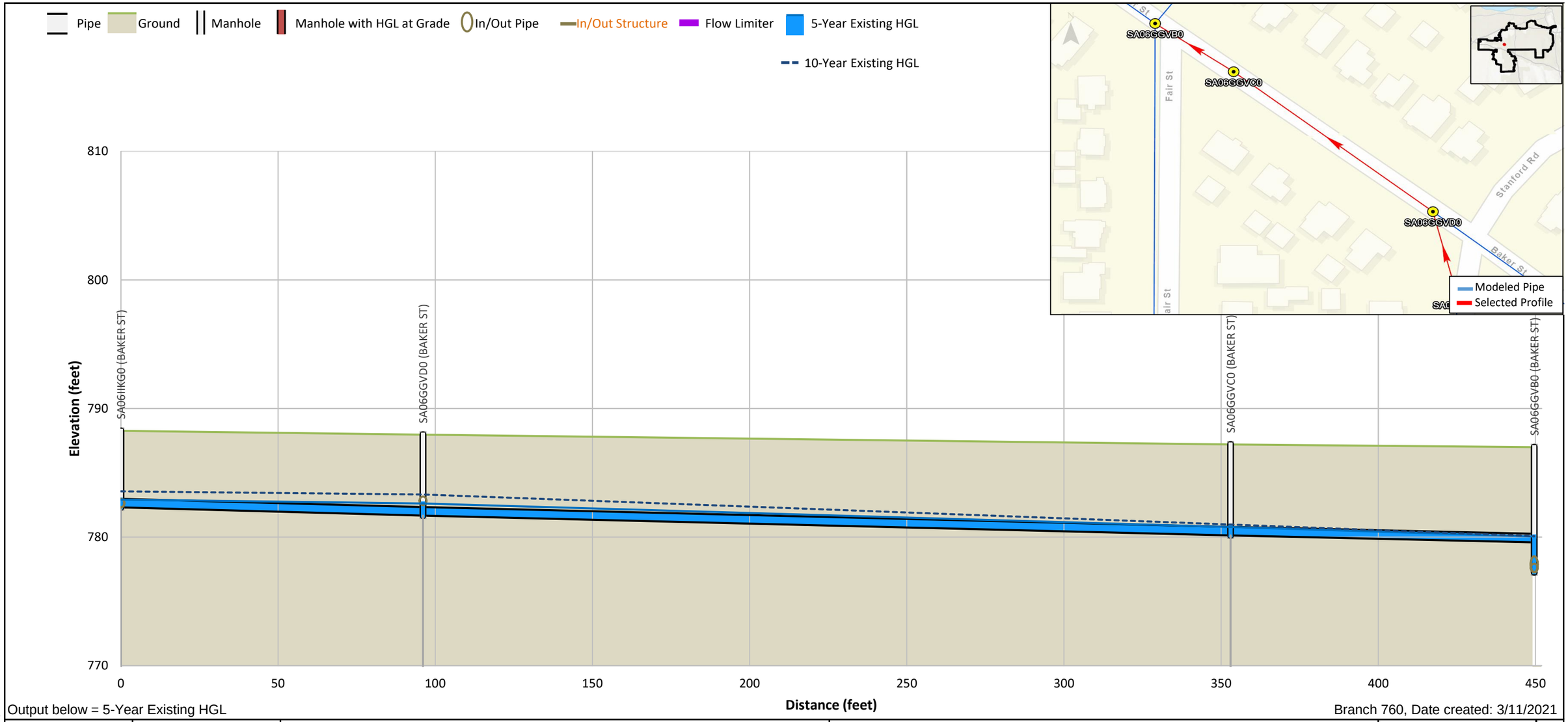
SWI-LSSES

PFA: BE-10, BE-09
Community: Berea
GIBSON ST to BAKER ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 760, Date created: 3/11/2021

Depth to Invert (ft)		6.3	7.1	
Depth to HGL (ft)		5.4	6.4	
Diameter (in)	8	8	8	8
Capacity (mgd)	0.58	0.55	0.53	
Max Depth (ft)	0.94	0.94	0.66	
Dep abv Crown (ft)	0.28	0.28	-	
Max Flow (mgd)	0.47	0.60	0.60	
Max Velocity (ft/s)	2.5	2.8	3.6	
Slope (ft/ft)	0.0067	0.0060	0.0056	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10, BE-09

Community: Berea

BAKER ST

Brown AND Caldwell

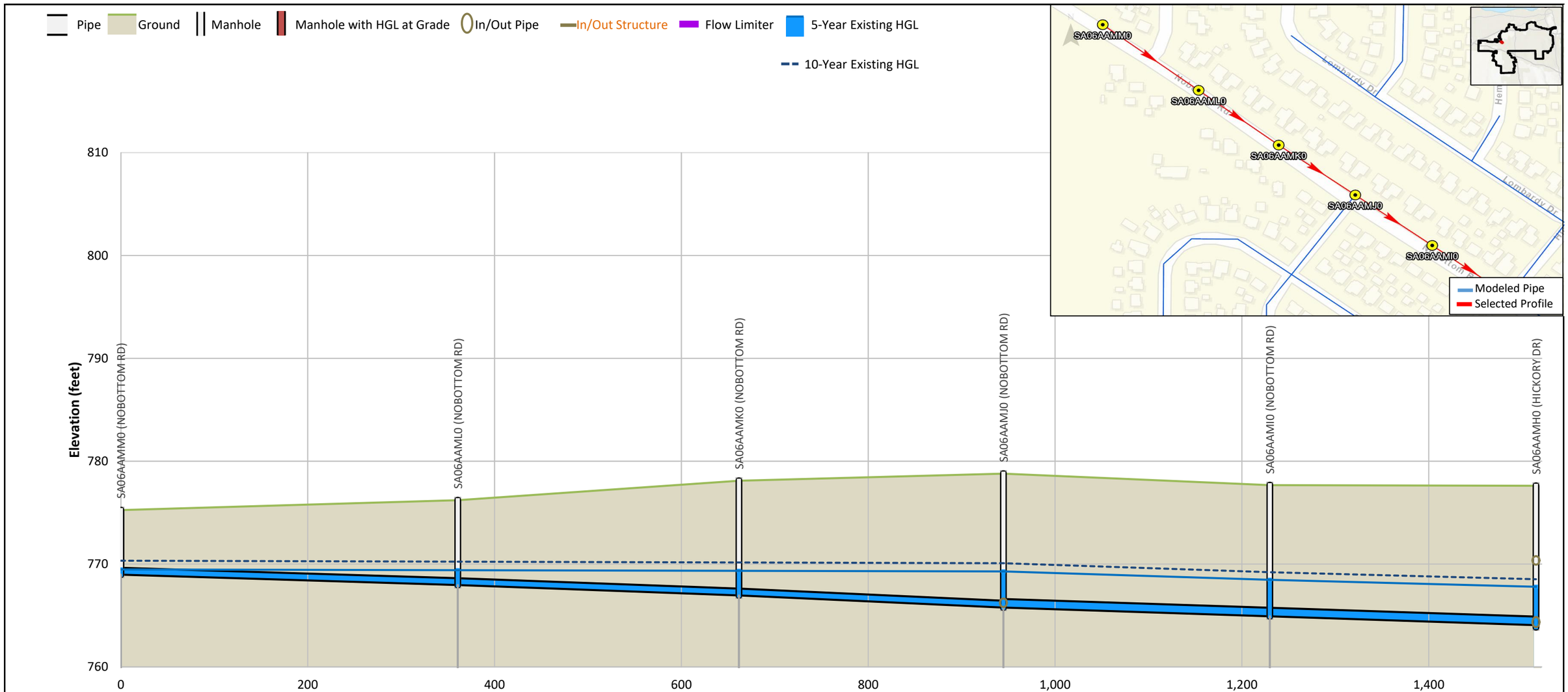
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 213, Date created: 3/11/2021

Depth to Invert (ft)		8.2	11	13	13	
Depth to HGL (ft)		6.8	8.8	9.5	9.2	
Diameter (in)	8	8	8	10	10	
Capacity (mgd)	0.38	0.41	0.46	0.70	0.71	
Max Depth (ft)	1.4	2.4	3.5	3.5	3.7	
Dep abv Crown (ft)	0.78	1.7	2.8	2.7	2.9	
Max Flow (mgd)	0.23	0.22	0.16	0.79	0.80	
Max Velocity (ft/s)	1.9	2.0	0.66	2.4	3.1	
Slope (ft/ft)	0.0028	0.0034	0.0042	0.0030	0.0030	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

NOBOTTOM RD to HICKORY DR

Brown AND Caldwell

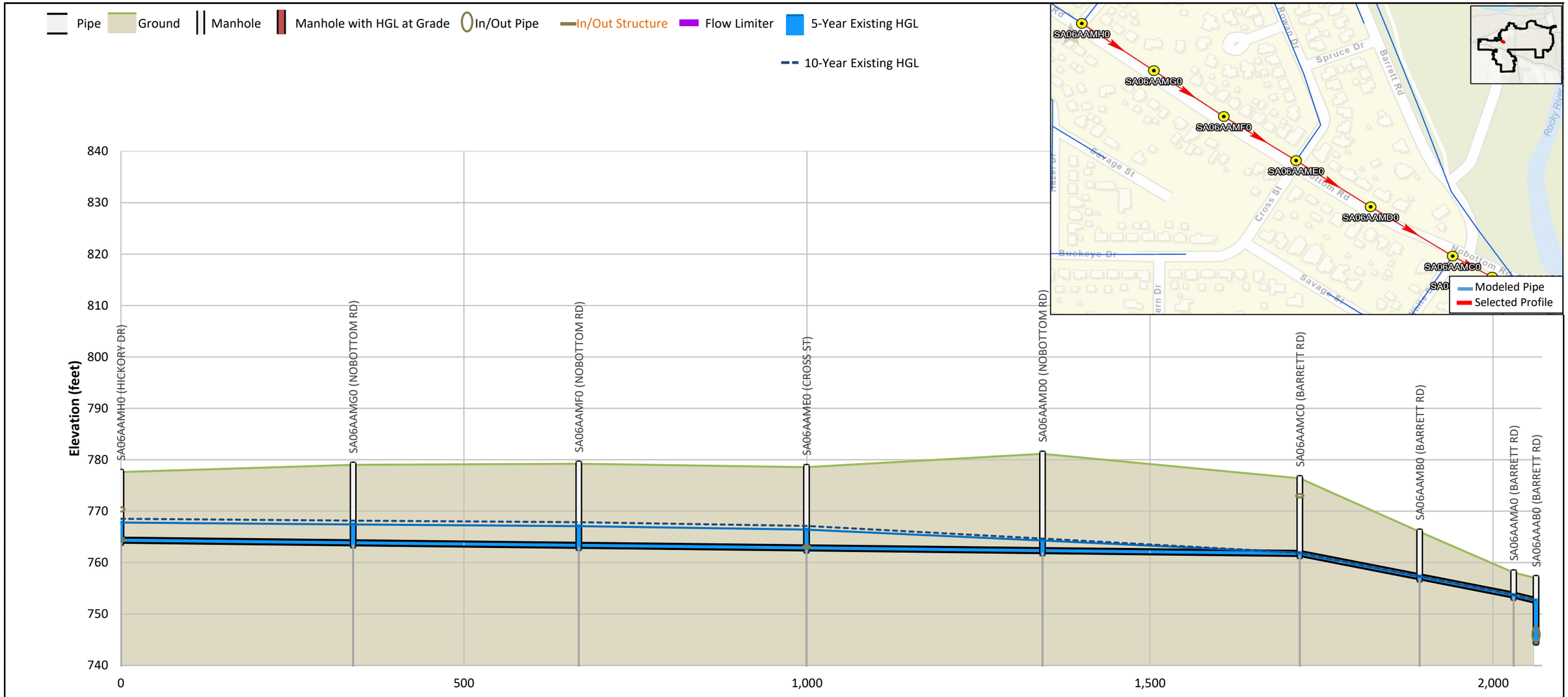
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/DesktopHGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 214, Date created: 3/11/2021

Depth to Invert (ft)		16	16	16	19	15	9.3	4.9
Depth to HGL (ft)		12	12	12	17	14	8.7	4.3
Diameter (in)	12	12	12	12	12	12	12	
Capacity (mgd)	0.68	0.68	0.68	0.69	0.67	2.8	2.8	
Max Depth (ft)	4.1	4.2	4.2	4.1	2.5	0.56	0.56	
Dep abv Crown (ft)	3.1	3.2	3.2	3.1	1.5	-	-	
Max Flow (mgd)	0.80	0.80	0.88	1.4	1.4	1.7	1.7	
Max Velocity (ft/s)	1.4	1.4	1.5	2.4	4.1	5.7	5.7	
Slope (ft/ft)	0.0015	0.0015	0.0015	0.0015	0.0015	0.026	0.026	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10, BE-07

Community: Berea

HICKORY DR to BARRETT RD

Brown AND Caldwell

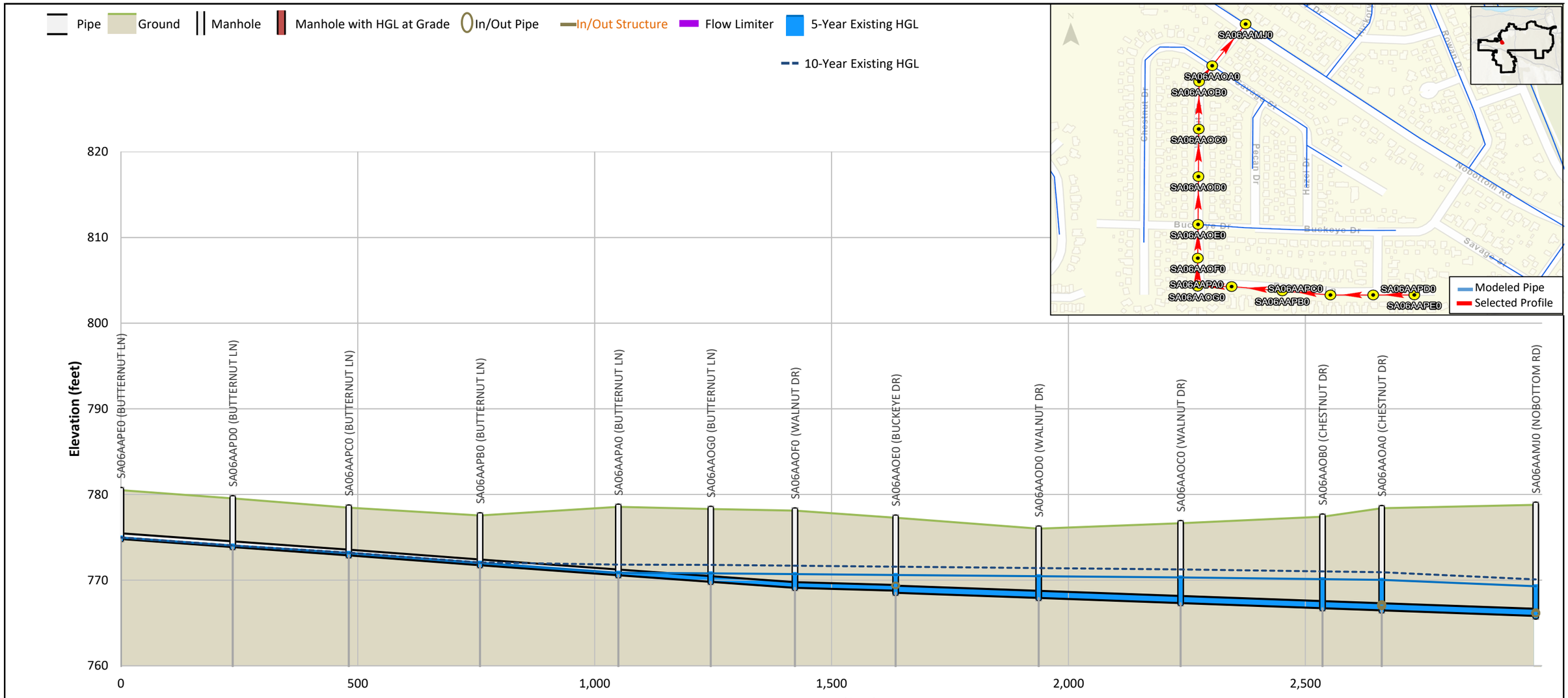
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 215, Date created: 3/11/2021

Depth to Invert (ft)		5.7	5.6	5.8	8.0	8.5	9.0	8.5	8.1	9.3	11	12	
Depth to HGL (ft)		5.5	5.3	5.5	7.7	7.5	7.4	6.7	5.6	6.3	7.3	8.4	
Diameter (in)	8	8	8	8	8	8	8	10	10	10	10	10	
Capacity (mgd)	0.45	0.45	0.46	0.45	0.45	0.45	0.28	0.57	0.58	0.58	0.58	0.58	
Max Depth (ft)	0.18	0.29	0.29	0.29	0.99	1.6	1.8	2.5	3.0	3.4	3.6	3.6	
Dep abv Crown (ft)	-	-	-	-	0.33	0.94	1.2	1.7	2.2	2.6	2.7	2.7	
Max Flow (mgd)	0.07	0.07	0.18	0.18	0.18	0.33	0.31	0.52	0.40	0.40	0.37	0.70	
Max Velocity (ft/s)	1.4	0.70	1.9	1.9	1.2	1.6	2.5	1.9	1.4	1.4	0.94	2.1	
Slope (ft/ft)	0.0040	0.0040	0.0042	0.0040	0.0039	0.0039	0.0016	0.0020	0.0020	0.0020	0.0020	0.0020	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10
Community: Berea
BUTTERNUT LN to NOBOTTOM RD

Brown AND Caldwell

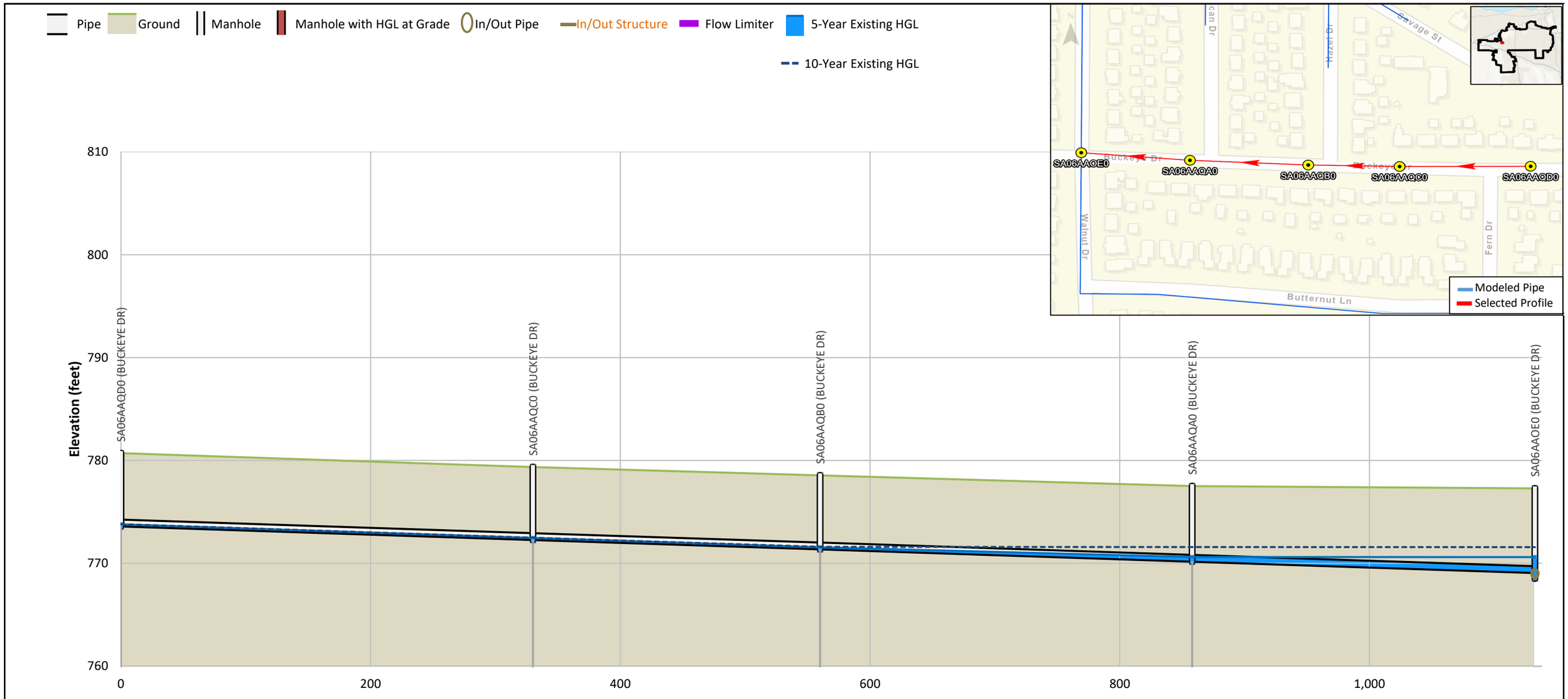
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 216, Date created: 3/11/2021

Depth to Invert (ft)		7.1	7.2	7.4	
Depth to HGL (ft)		6.9	7.0	6.9	
Diameter (in)	8	8	8	8	8
Capacity (mgd)	0.45	0.45	0.45	0.45	0.45
Max Depth (ft)	0.21	0.20	0.46	1.6	
Dep abv Crown (ft)	-	-	-	0.88	
Max Flow (mgd)	0.09	0.09	0.09	0.09	
Max Velocity (ft/s)	1.5	1.5	1.5	1.9	
Slope (ft/ft)	0.0040	0.0040	0.0040	0.0040	

Northeast Ohio Regional Sewer District

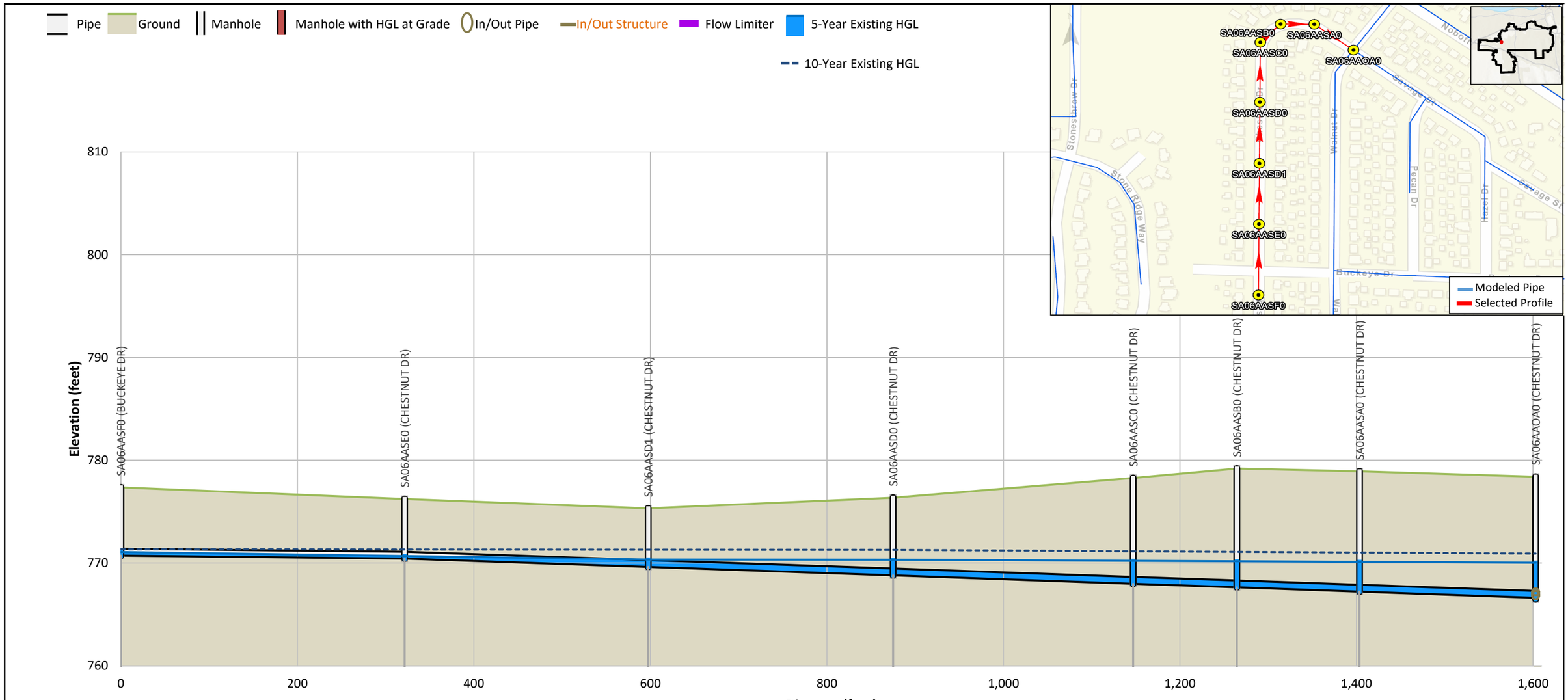
SWI-LSSES

PFA: BE-10
Community: Berea
BUCKEYE DR

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 217, Date created: 3/11/2021

Depth to Invert (ft)		5.8	5.7	7.6	10	12	12	
Depth to HGL (ft)		5.6	5.0	6.0	8.1	9.0	8.8	
Diameter (in)	8	8	8	8	8	8	8	8
Capacity (mgd)	0.21	0.38	0.39	0.39	0.38	0.39	0.39	
Max Depth (ft)	0.35	0.72	1.5	2.2	2.5	2.9	3.4	
Dep abv Crown (ft)	-	0.05	0.86	1.6	1.9	2.2	2.7	
Max Flow (mgd)	0.12	0.12	0.12	0.31	0.30	0.25	0.17	
Max Velocity (ft/s)	1.5	1.5	0.71	1.9	1.9	1.8	1.3	
Slope (ft/ft)	0.00090	0.0029	0.0030	0.0030	0.0029	0.0030	0.0030	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

BUCKEYE DR to CHESTNUT DR

Brown AND Caldwell

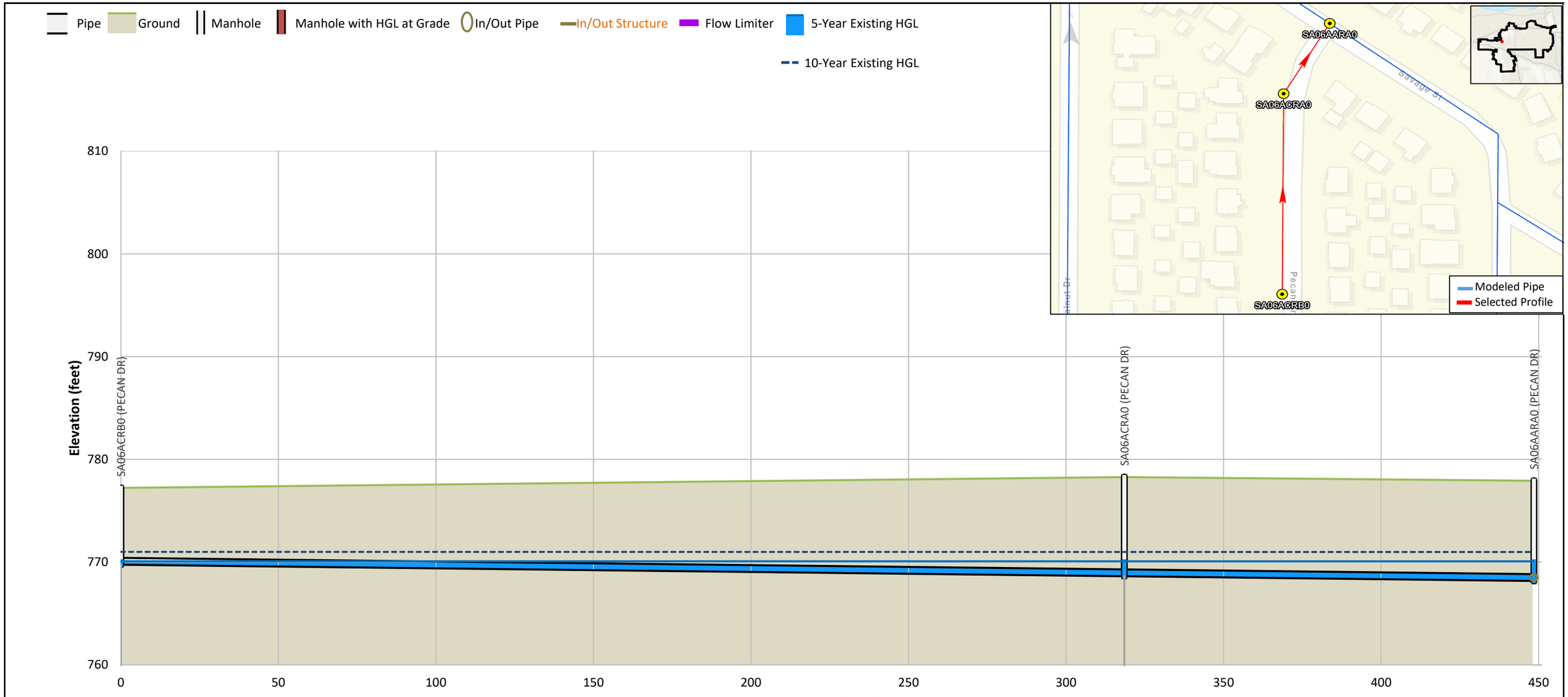
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 218, Date created: 3/11/2021

Depth to Invert (ft)		9.7	
Depth to HGL (ft)		8.2	
Diameter (in)	8		8
Capacity (mgd)	0.42		0.42
Max Depth (ft)	1.5		1.9
Dep abv Crown (ft)	0.79		1.2
Max Flow (mgd)	0.08		0.08
Max Velocity (ft/s)	1.4		0.80
Slope (ft/ft)	0.0035		0.0035

Northeast Ohio Regional Sewer District

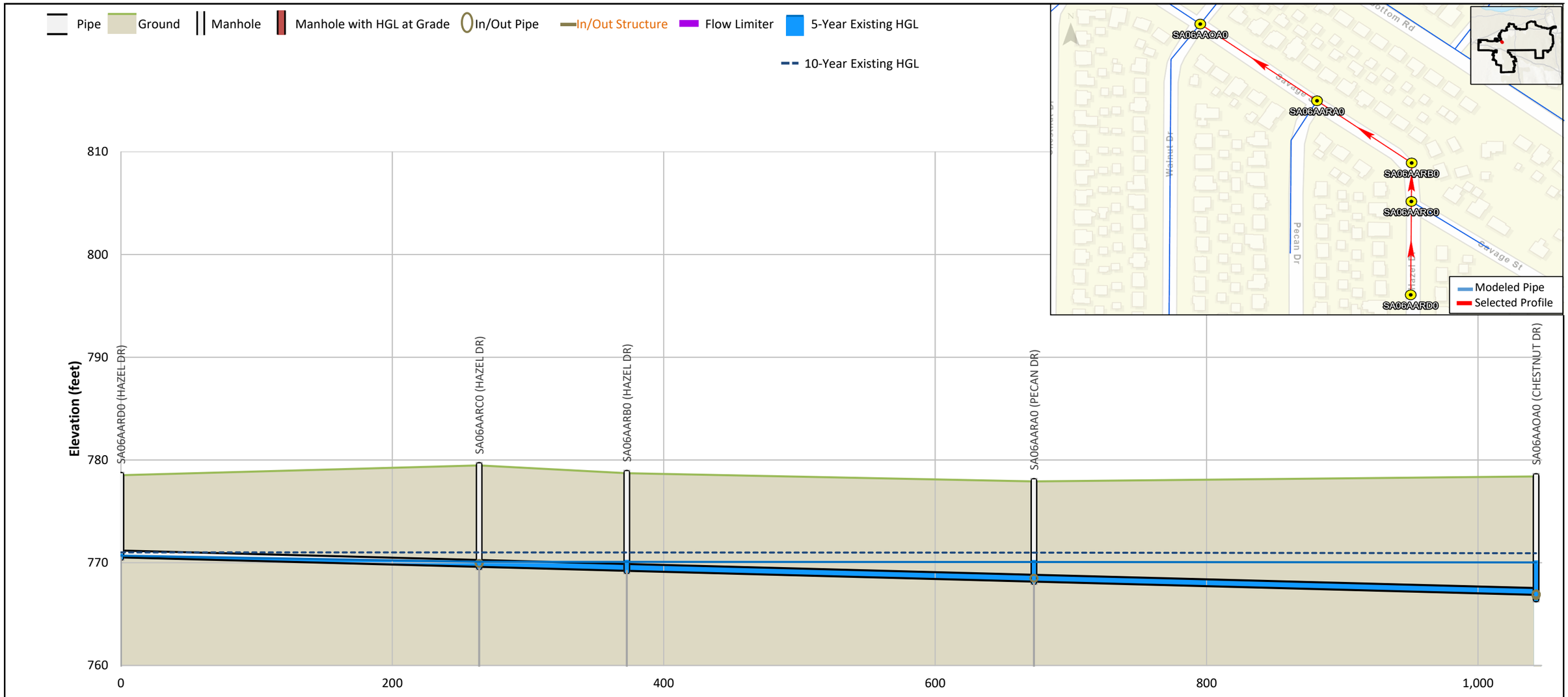
SWI-LSSES

PFA: BE-10
Community: Berea
PECAN DR

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 219, Date created: 3/11/2021

Depth to Invert (ft)		9.9	9.5	9.8	
Depth to HGL (ft)		9.4	8.6	7.8	
Diameter (in)	8	8	8	8	
Capacity (mgd)	0.48	0.43	0.42	0.42	
Max Depth (ft)	0.49	0.88	1.9	3.2	
Dep abv Crown (ft)	-	0.21	1.2	2.5	
Max Flow (mgd)	0.07	0.11	0.11	0.10	
Max Velocity (ft/s)	0.92	1.5	1.0	1.7	
Slope (ft/ft)	0.0035	0.0036	0.0035	0.0035	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10
Community: Berea
HAZEL DR to CHESTNUT DR

Brown AND Caldwell

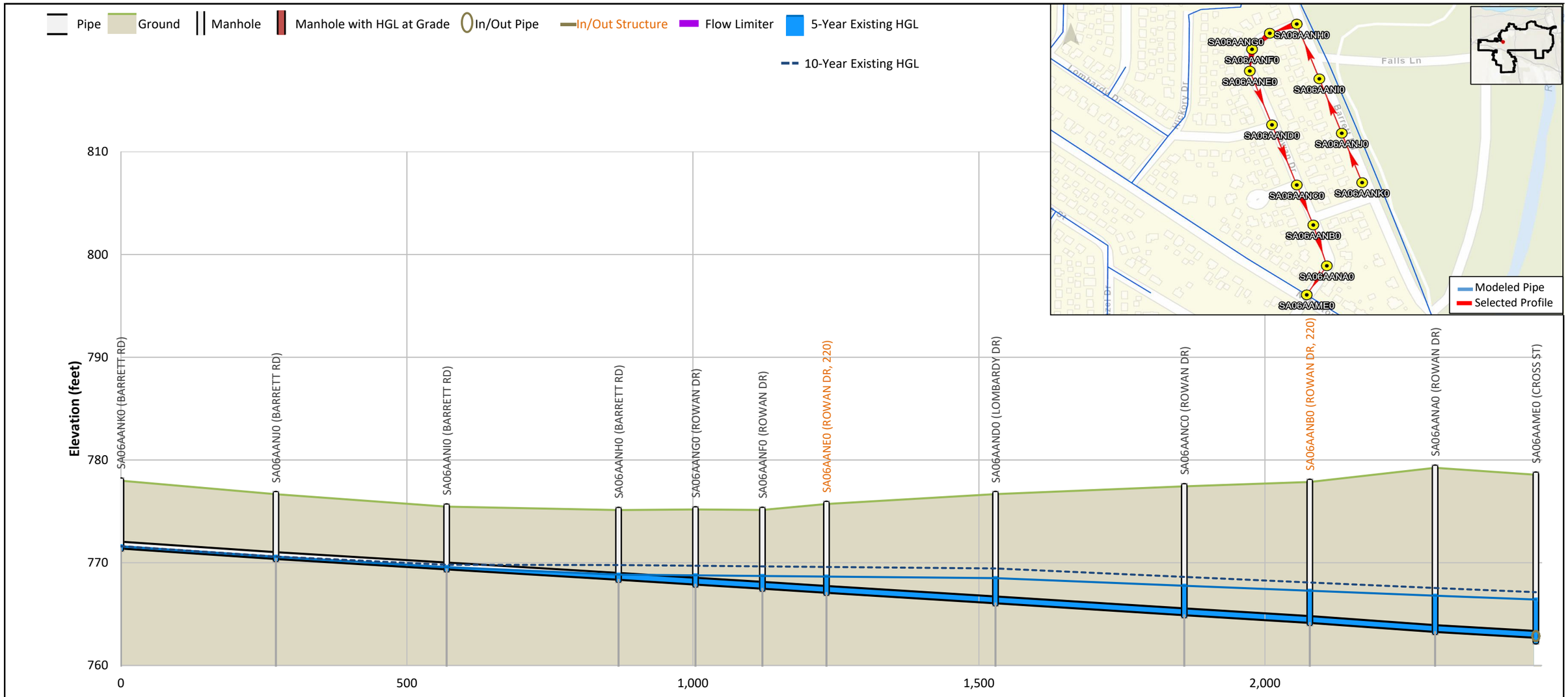
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/DesktopHGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 220, Date created: 3/11/2021

Depth to Invert (ft)		6.3	6.1	6.8	7.3	7.7	8.6	11	13	14	16		
Depth to HGL (ft)		6.1	5.9	6.3	6.4	6.4	7.1	8.2	9.7	11	12		
Diameter (in)	8	8	8	8	8	8	8	8	8	8	8	8	8
Capacity (mgd)	0.44	0.41	0.41	0.42	0.42	0.42	0.42	0.42	0.42	0.45	0.40		
Max Depth (ft)	0.22	0.22	0.50	0.90	1.2	1.6	2.4	2.9	3.1	3.5	3.7		
Dep abv Crown (ft)	-	-	-	0.23	0.57	0.91	1.8	2.2	2.5	2.9	3.1		
Max Flow (mgd)	0.10	0.10	0.10	0.28	0.28	0.27	0.20	0.46	0.40	0.34	0.35		
Max Velocity (ft/s)	1.5	1.5	0.73	2.0	2.0	2.0	0.78	2.2	2.3	1.9	1.1		
Slope (ft/ft)	0.0038	0.0034	0.0034	0.0035	0.0034	0.0036	0.0035	0.0035	0.0034	0.0040	0.0032		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10
Community: Berea
BARRETT RD to CROSS ST

Brown AND Caldwell

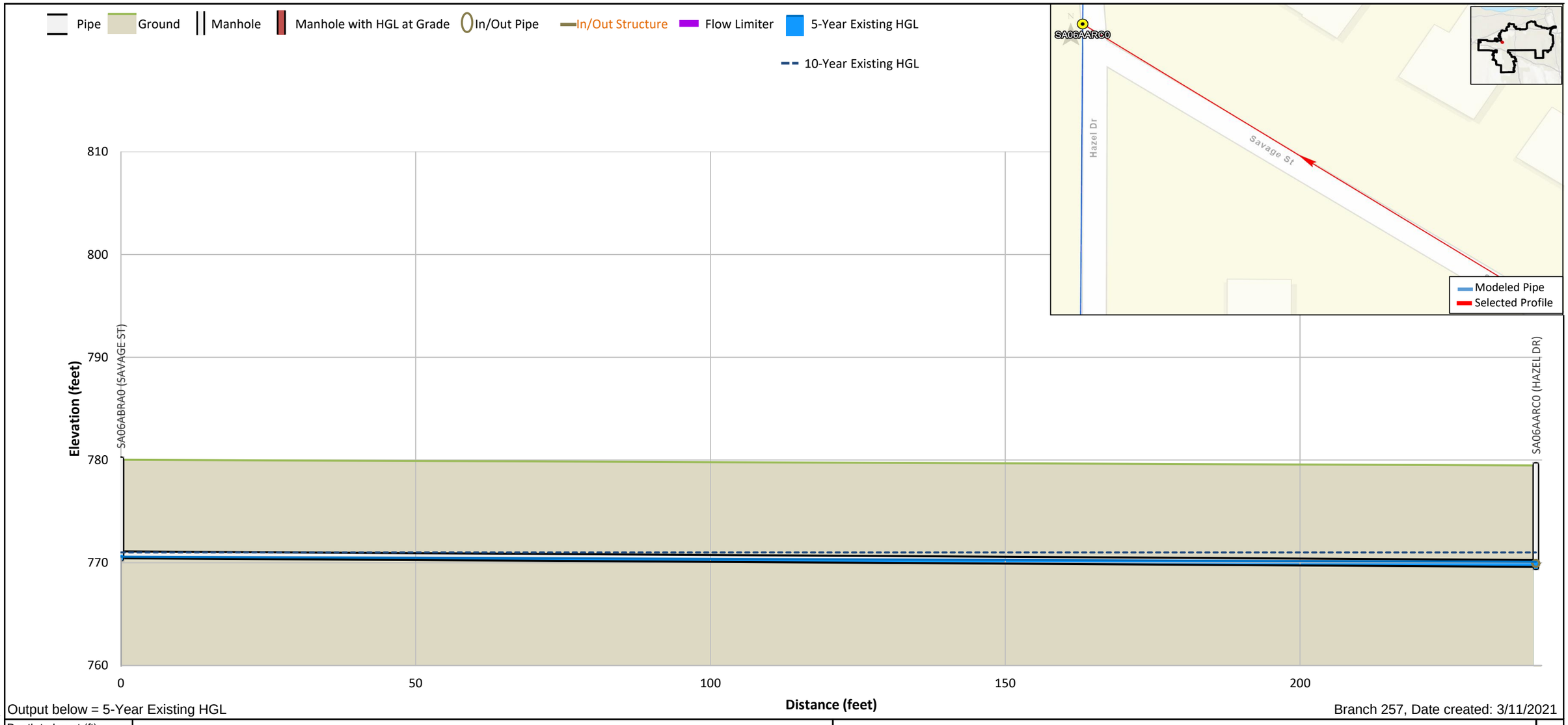
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 257, Date created: 3/11/2021

Depth to Invert (ft)	
Depth to HGL (ft)	
Diameter (in)	8
Capacity (mgd)	0.42
Max Depth (ft)	0.49
Dep abv Crown (ft)	-
Max Flow (mgd)	0.05
Max Velocity (ft/s)	0.65
Slope (ft/ft)	0.0035

Northeast Ohio Regional Sewer District

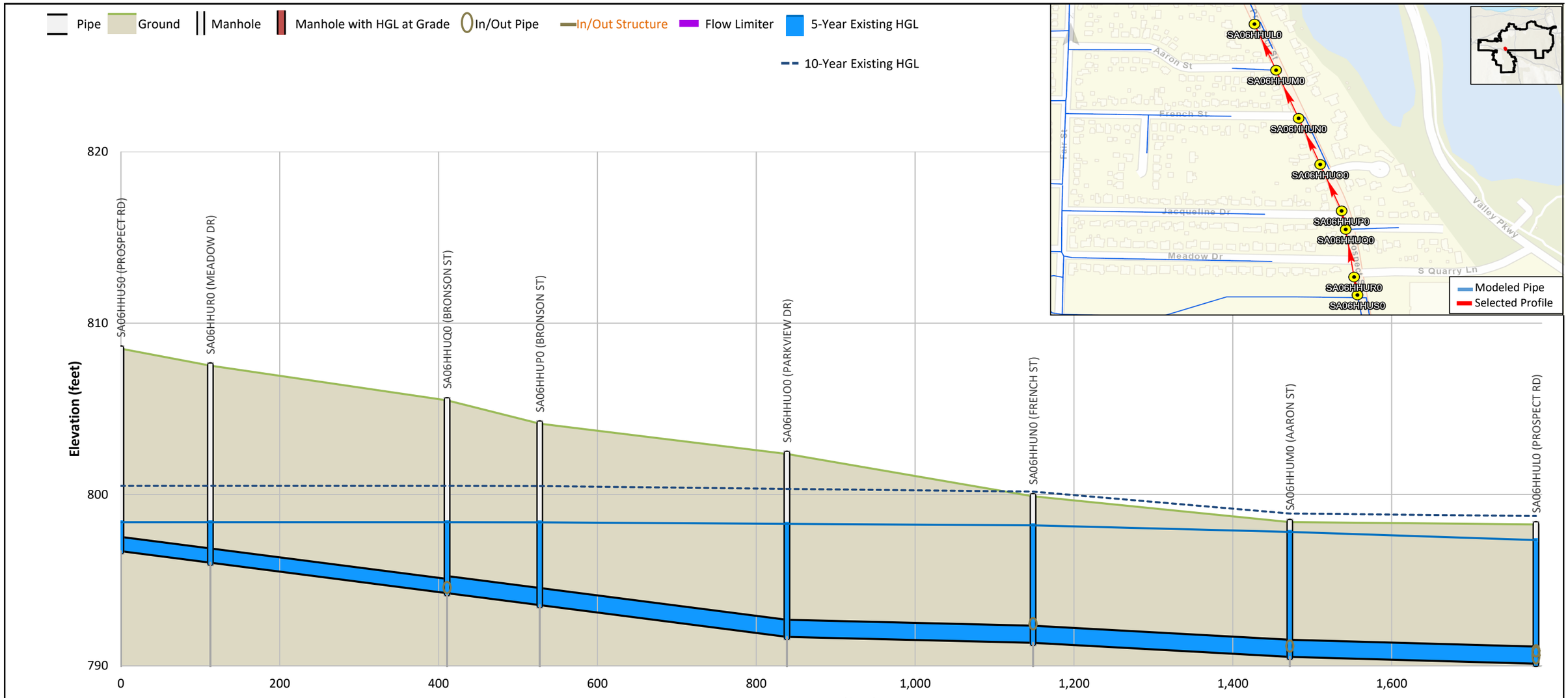
SWI-LSSES

PFA: BE-10
Community: Berea
SAVAGE ST to HAZEL DR

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 730, Date created: 3/11/2021

Depth to Invert (ft)		12	11	11	11	8.6	7.9	
Depth to HGL (ft)		9.1	7.1	5.8	4.1	1.7	0.57	
Diameter (in)	10	10	12	12	12	12	12	12
Capacity (mgd)	0.99	0.99	1.6	1.6	0.70	1.1	0.75	
Max Depth (ft)	2.4	4.1	4.8	6.6	6.9	7.3	7.3	
Dep abv Crown (ft)	1.5	3.3	3.8	5.6	5.9	6.3	6.3	
Max Flow (mgd)	-0.20	-0.29	0.35	0.63	0.46	1.1	1.0	
Max Velocity (ft/s)	-0.68	-0.74	1.3	1.6	1.0	2.0	3.7	
Slope (ft/ft)	0.0060	0.0060	0.0060	0.0060	0.0011	0.0025	0.0013	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

PROSPECT RD

Brown AND Caldwell

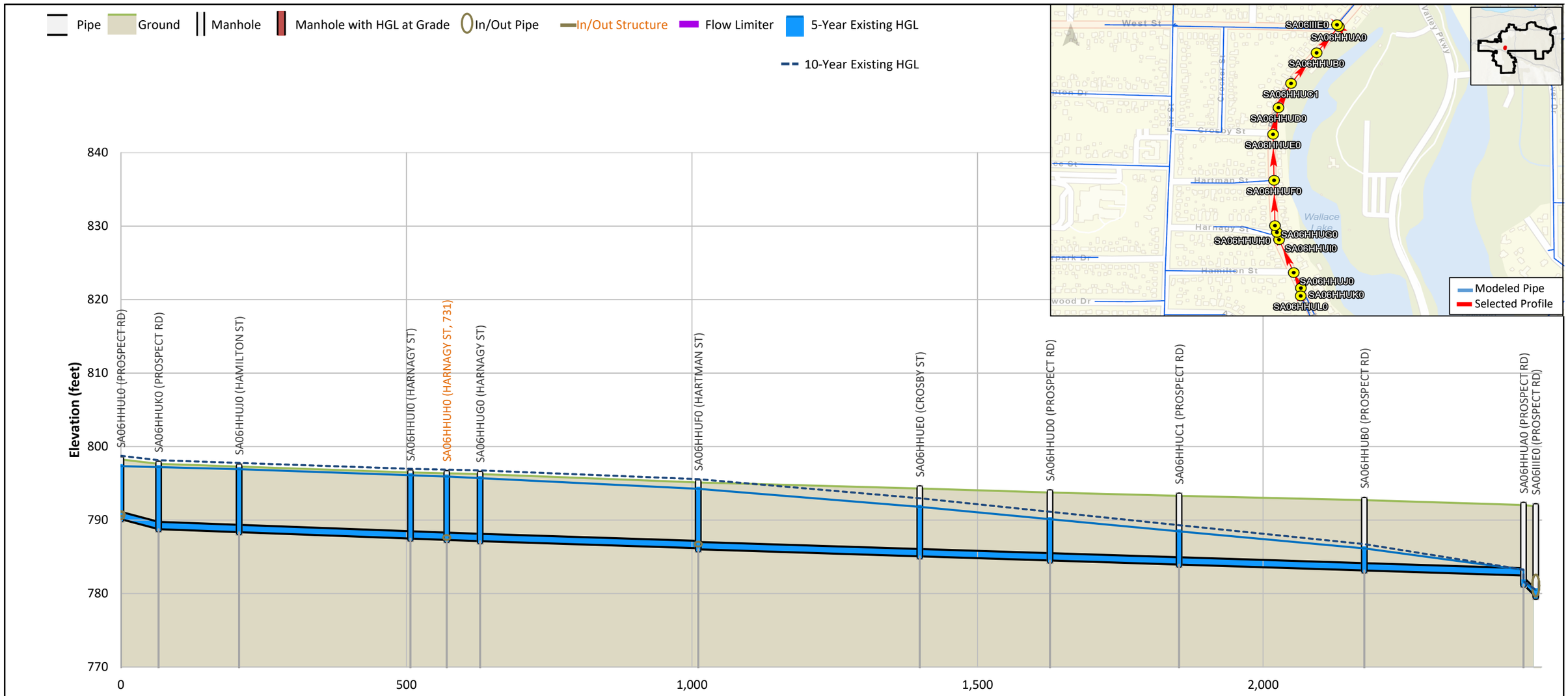
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 731, Date created: 3/11/2021

Depth to Invert (ft)		8.9	8.9	9.0	9.1	9.1	9.0	9.2	9.3	9.4	9.6		
Depth to HGL (ft)		0.44	0.35	0.37	0.44	0.56	0.87	2.5	3.6	4.8	6.6		
Diameter (in)	12	12	12	12	12	12	12	12	12	12	12	12	12
Capacity (mgd)	3.0	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	
Max Depth (ft)	8.4	8.6	8.6	8.6	8.6	8.6	8.2	6.7	5.6	4.5	3.0		
Dep abv Crown (ft)	7.4	7.6	7.6	7.6	7.6	7.6	7.2	5.7	4.6	3.5	2.0		
Max Flow (mgd)	1.1	0.98	1.2	1.1	1.3	1.4	1.7	1.8	1.8	1.8	2.1		
Max Velocity (ft/s)	2.5	2.0	2.3	2.0	2.6	2.7	2.3	2.6	2.7	3.0	5.0		
Slope (ft/ft)	0.021	0.0029	0.0029	0.0029	0.0029	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

PROSPECT RD

Brown AND Caldwell

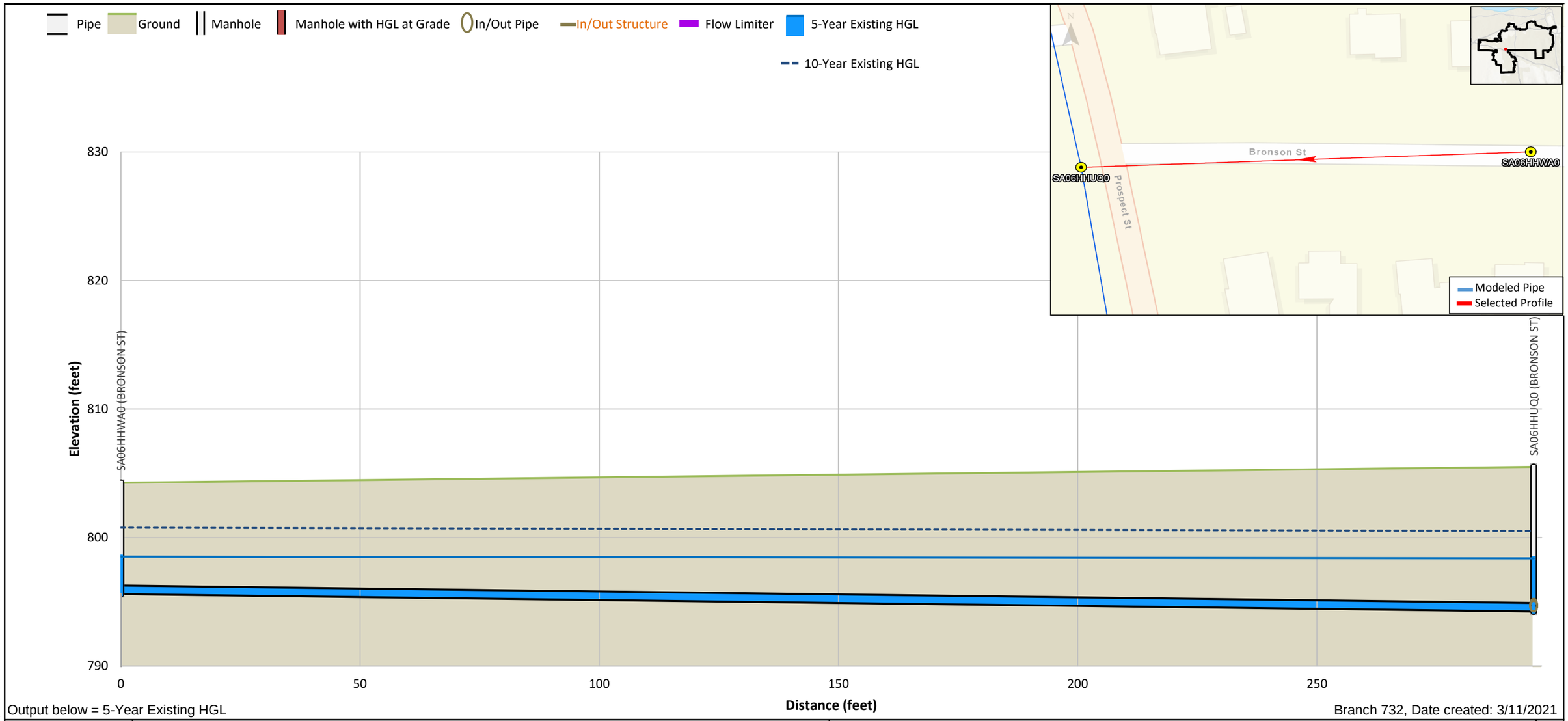
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 732, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	0.48	
Max Depth (ft)	4.1	
Dep abv Crown (ft)	3.5	
Max Flow (mgd)	0.39	
Max Velocity (ft/s)	3.1	
Slope (ft/ft)	0.0046	

Northeast Ohio Regional Sewer District

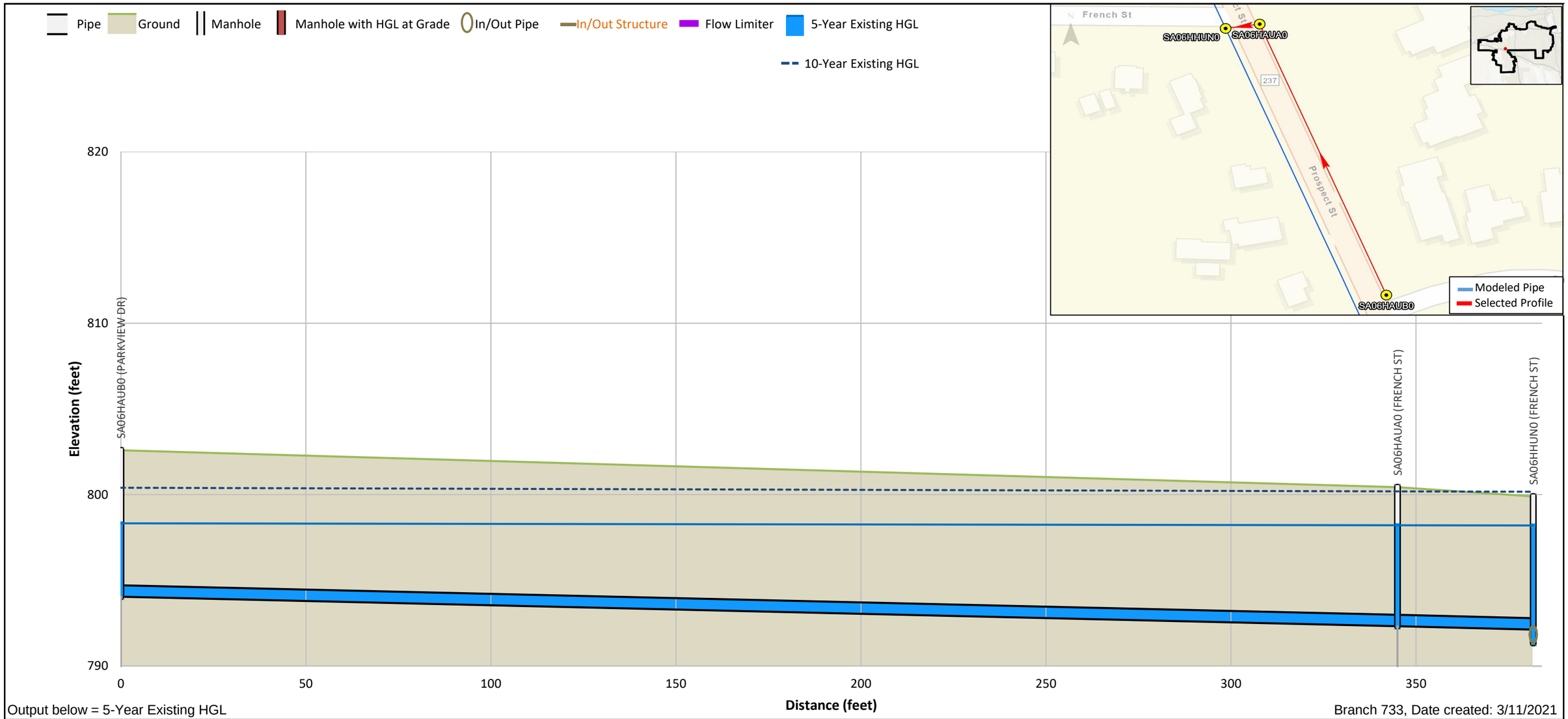
SWI-LSSES

PFA: BE-10
Community: Berea
BRONSON ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 733, Date created: 3/11/2021

Depth to Invert (ft)		8.1	
Depth to HGL (ft)		2.2	
Diameter (in)	8		8
Capacity (mgd)	0.50		0.52
Max Depth (ft)	5.9		6.1
Dep abv Crown (ft)	5.2		5.4
Max Flow (mgd)	0.27		0.26
Max Velocity (ft/s)	2.4		2.7
Slope (ft/ft)	0.0050		0.0054

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

PARKVIEW DR to FRENCH ST

Brown AND Caldwell

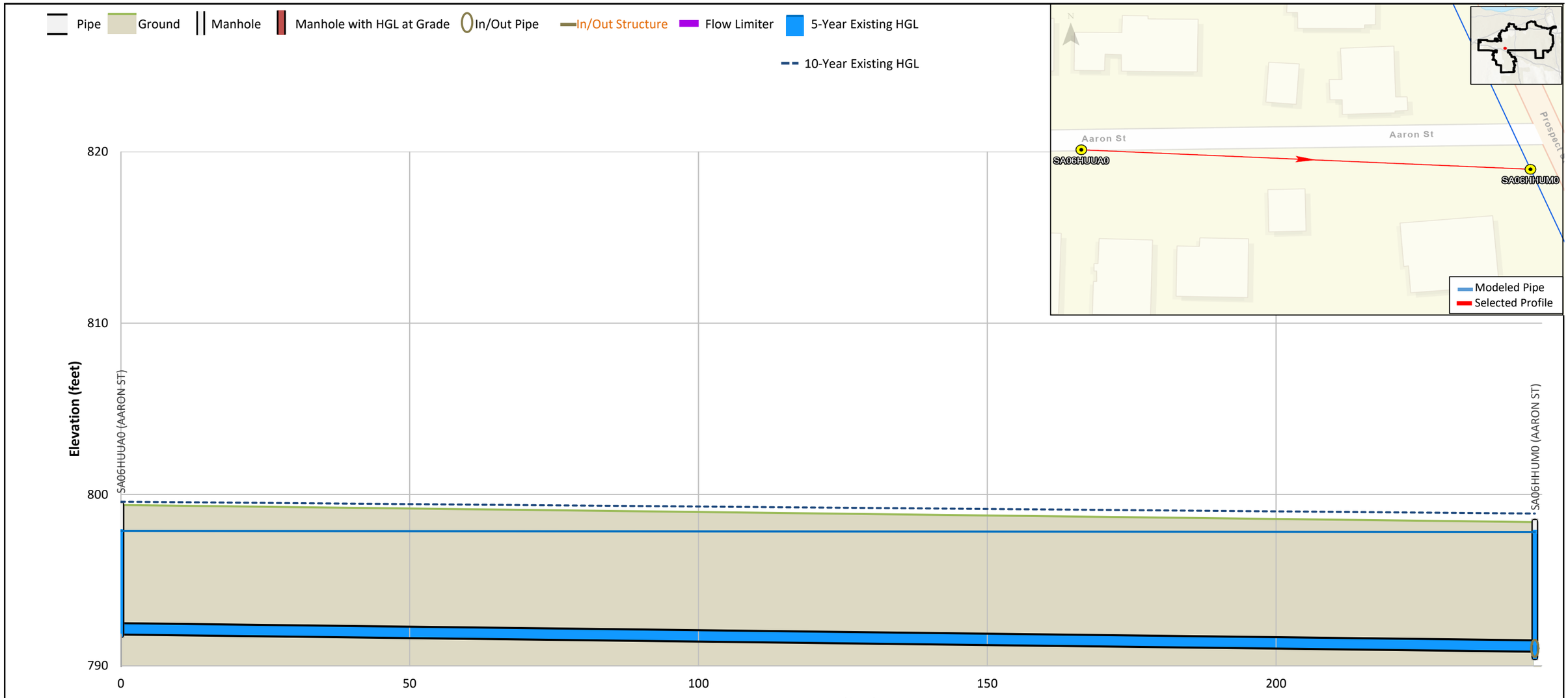
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 734, Date created: 3/11/2021

Depth to Invert (ft)	
Depth to HGL (ft)	
Diameter (in)	8
Capacity (mgd)	0.45
Max Depth (ft)	7.0
Dep abv Crown (ft)	6.3
Max Flow (mgd)	0.16
Max Velocity (ft/s)	1.9
Slope (ft/ft)	0.0041

Northeast Ohio Regional Sewer District

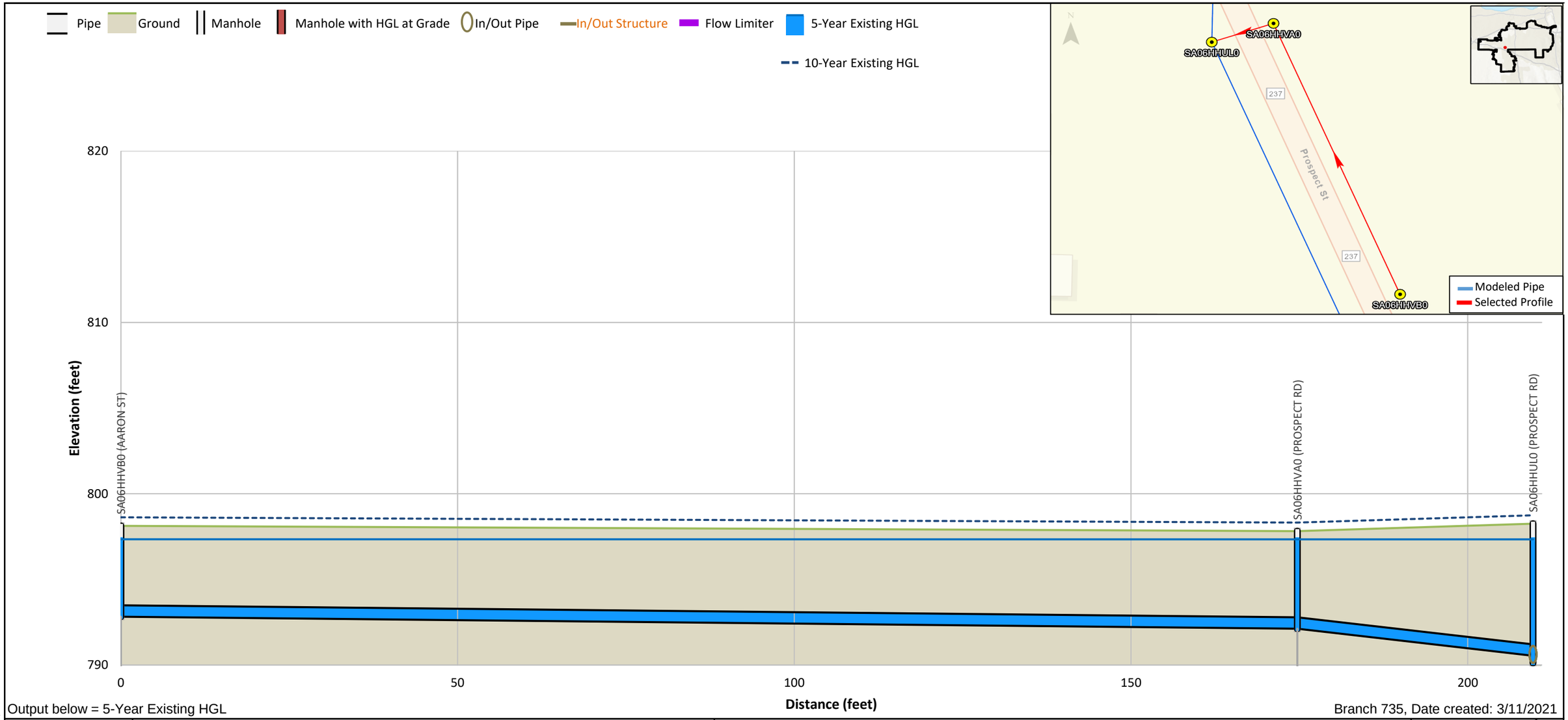
SWI-LSSES

PFA: BE-10
Community: Berea
AARON ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 735, Date created: 3/11/2021

Depth to Invert (ft)			5.7	
Depth to HGL (ft)			0.48	
Diameter (in)	8			8
Capacity (mgd)	0.45			1.5
Max Depth (ft)	5.2			6.8
Dep abv Crown (ft)	4.6			6.1
Max Flow (mgd)	-0.16			-0.22
Max Velocity (ft/s)	1.9			3.3
Slope (ft/ft)	0.0040			0.045

Northeast Ohio Regional Sewer District

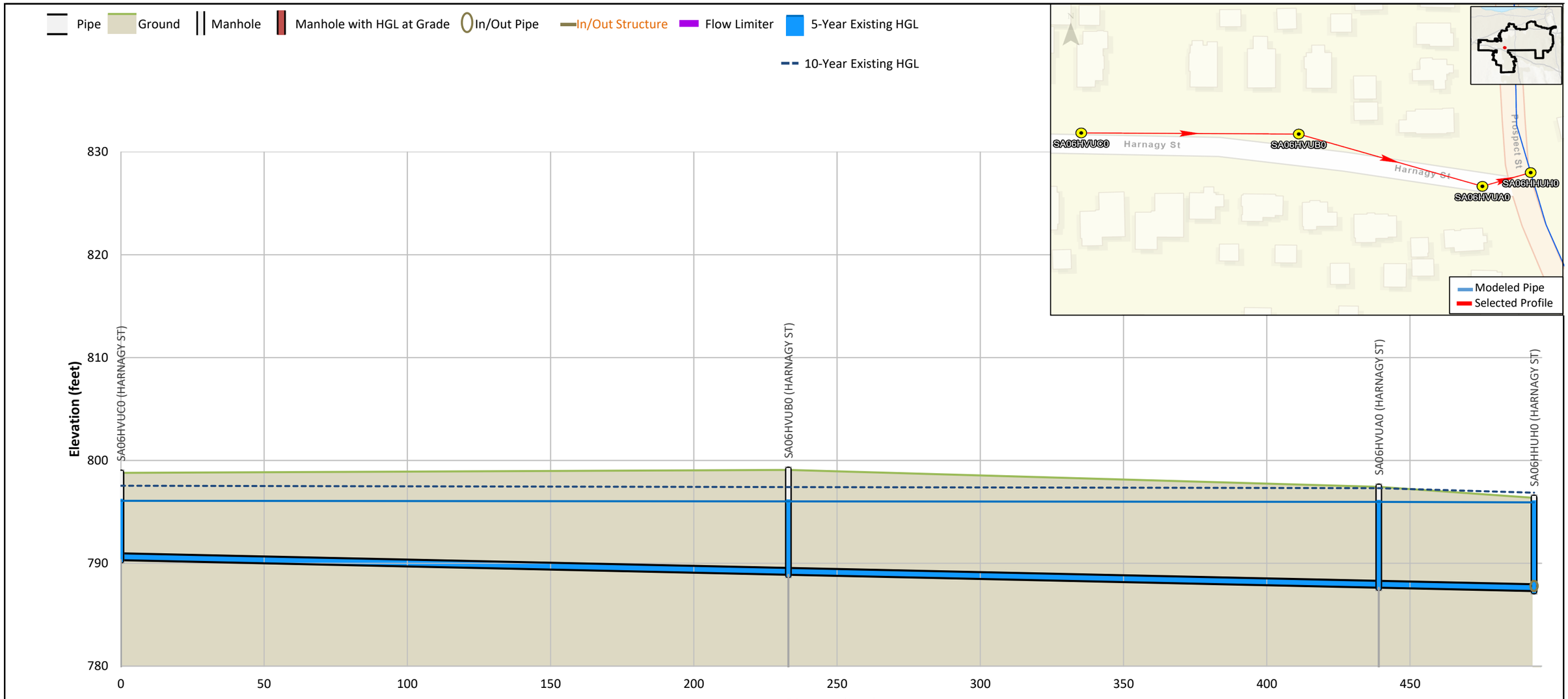
SWI-LSSES

PFA: BE-10
Community: Berea
AARON ST to PROSPECT RD

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 736, Date created: 3/11/2021

Depth to Invert (ft)			10			9.8		
Depth to HGL (ft)			3.1			1.5		
Diameter (in)	8		8			8		
Capacity (mgd)	0.55		0.55			0.55		
Max Depth (ft)	7.1		8.3			8.6		
Dep abv Crown (ft)	6.5		7.7			8.0		
Max Flow (mgd)	0.23		0.15			0.32		
Max Velocity (ft/s)	2.4		0.88			1.3		
Slope (ft/ft)	0.0061		0.0061			0.0061		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

HARNAGY ST

Brown AND Caldwell

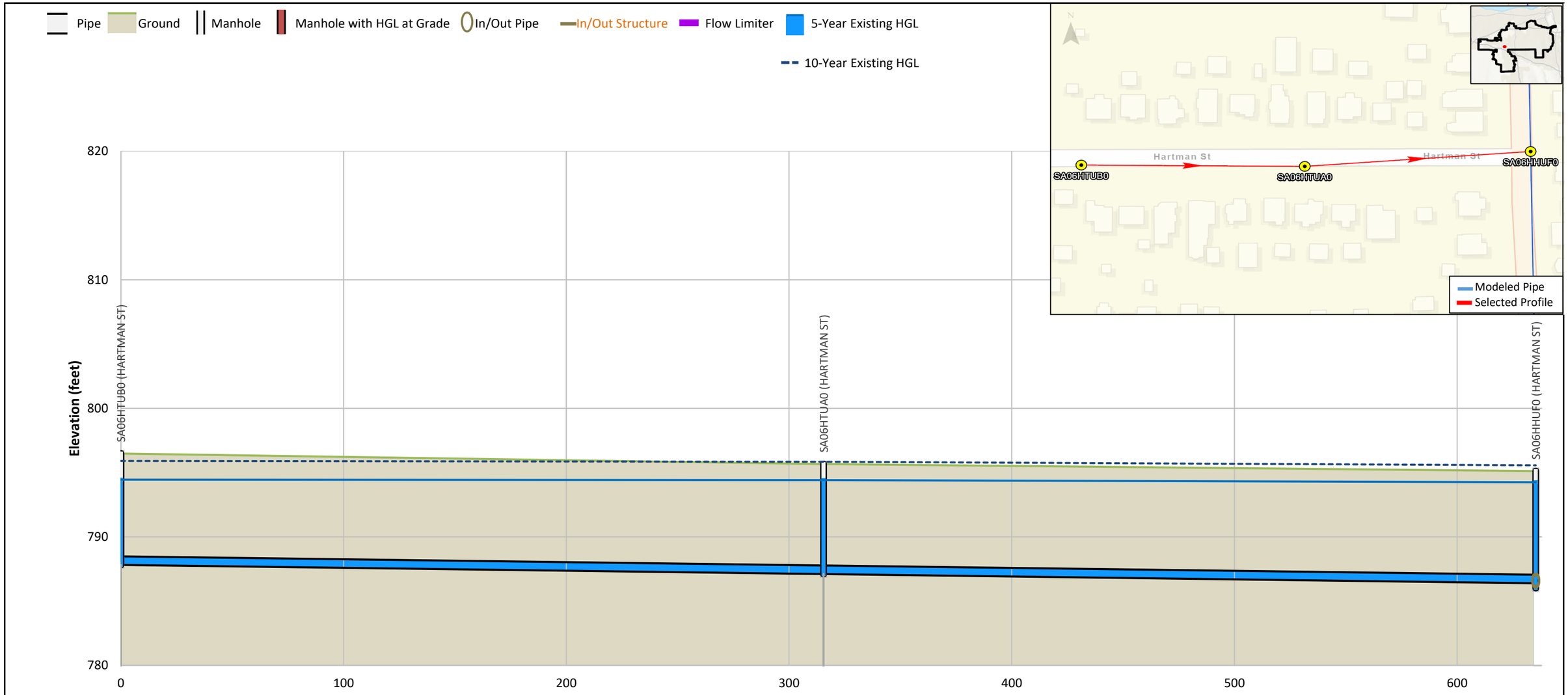
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 737, Date created: 3/11/2021

Depth to Invert (ft)		8.6	
Depth to HGL (ft)		1.2	
Diameter (in)	8		8
Capacity (mgd)	0.34		0.34
Max Depth (ft)	7.3		7.9
Dep abv Crown (ft)	6.6		7.2
Max Flow (mgd)	-0.19		0.17
Max Velocity (ft/s)	-0.76		2.0
Slope (ft/ft)	0.0022		0.0022

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

HARTMAN ST

Brown AND Caldwell

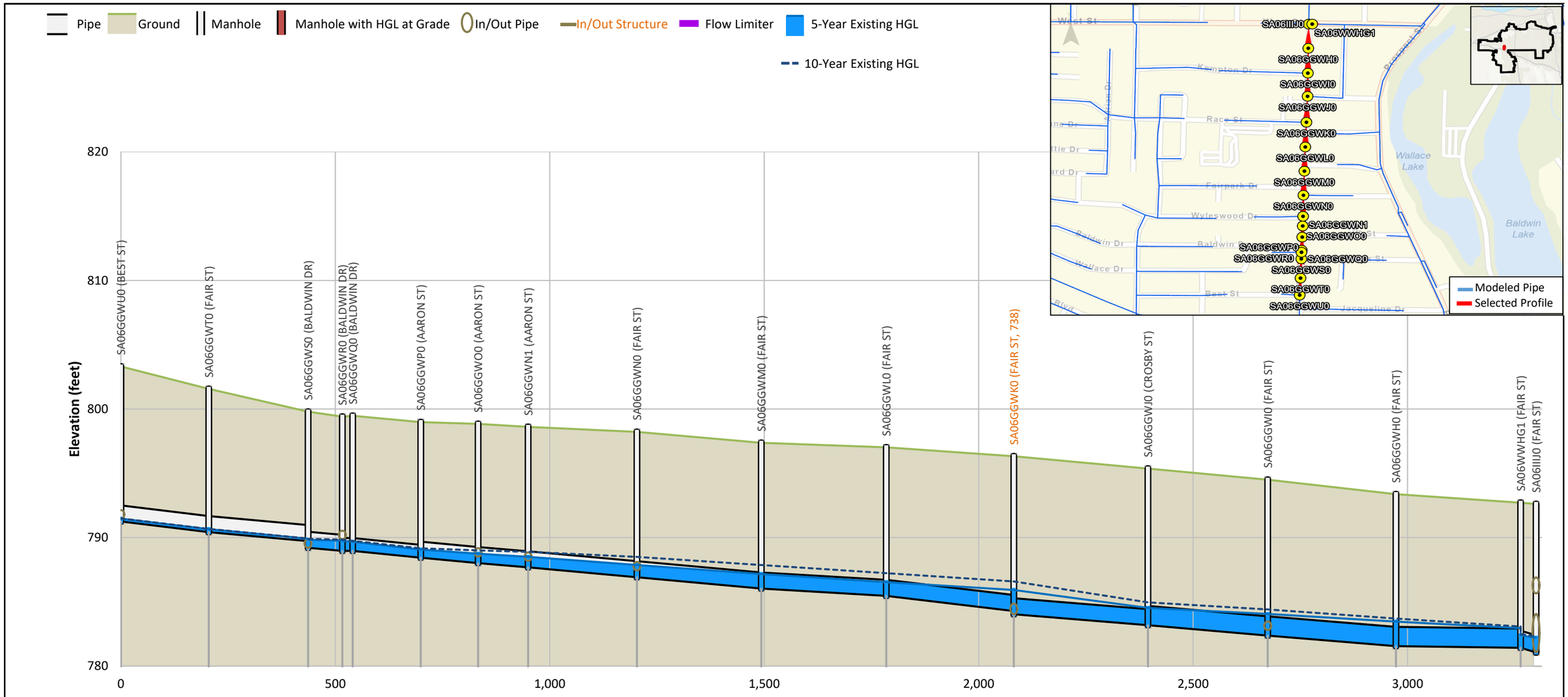
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 738, Date created: 3/11/2021

Depth to Invert (ft)		11	10			11	11	11	11	11	11	12	12	12	12	12	11
Depth to HGL (ft)		11	9.9			9.9	10	10	10	10	10	10	10	11	10	9.9	9.8
Diameter (in)	15	15	15	12	15	15	15	15	15	15	15	15	15	18	18	18	
Capacity (mgd)	2.4	2.1	2.1	1.2	2.1	2.0	2.1	2.1	1.7	2.4	2.0	3.3	3.2	1.5			
Max Depth (ft)	0.23	0.23	0.79	0.71	0.73	0.82	0.96	1.1	1.1	1.6	1.9	1.7	1.9	1.9			
Dep abv Crown (ft)	-	-	-	-	-	-	-	-	-	0.39	0.64	0.18	0.41	0.41			
Max Flow (mgd)	0.15	0.15	0.66	1.0	1.0	1.2	1.6	1.8	1.8	1.7	2.6	2.5	2.7	2.9			
Max Velocity (ft/s)	1.4	1.9	1.3	3.0	2.1	2.2	2.5	2.6	3.3	3.1	3.7	2.6	2.3	2.5			
Slope (ft/ft)	0.0041	0.0030	0.0030	0.0033	0.0031	0.0028	0.0030	0.0030	0.0020	0.0040	0.0027	0.0029	0.0027	0.00045			

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10
Community: Berea
BEST ST to FAIR ST

Brown AND Caldwell

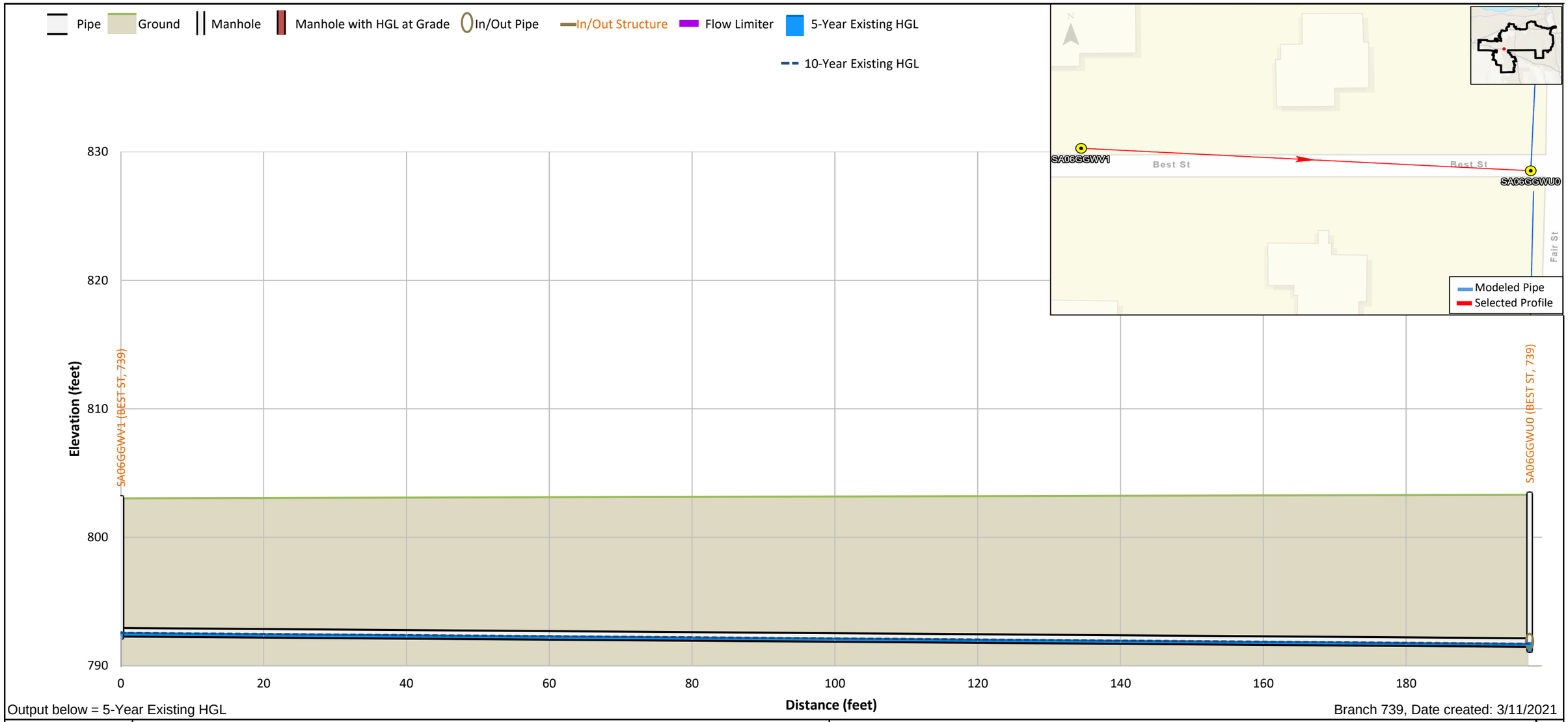
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 739, Date created: 3/11/2021

Depth to Invert (ft)	
Depth to HGL (ft)	
Diameter (in)	8
Capacity (mgd)	0.45
Max Depth (ft)	0.27
Dep abv Crown (ft)	-
Max Flow (mgd)	0.15
Max Velocity (ft/s)	2.3
Slope (ft/ft)	0.0041

Northeast Ohio Regional Sewer District

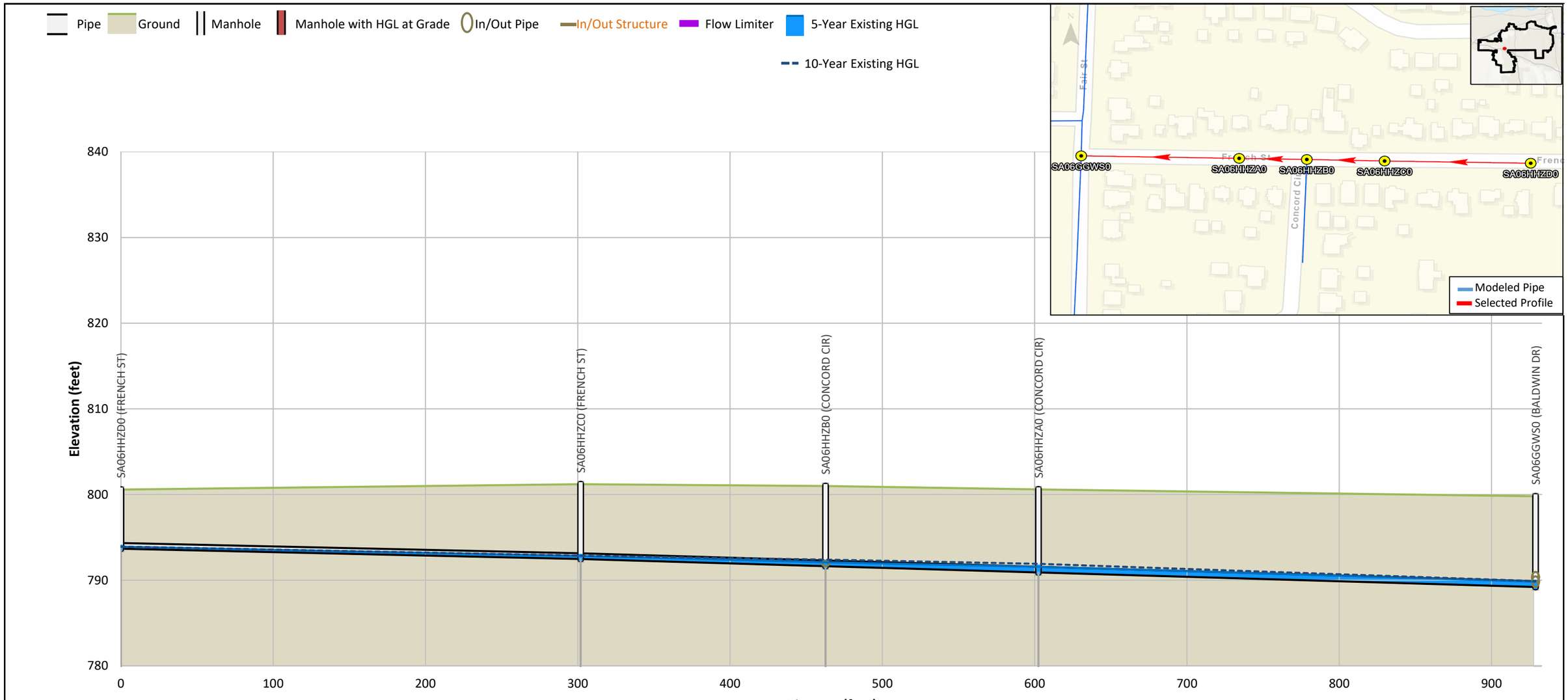
SWI-LSSES

PFA: BE-10
Community: Berea
BEST ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 740, Date created: 3/11/2021

Depth to Invert (ft)		8.7	9.4	9.7	
Depth to HGL (ft)		8.4	8.9	9.0	
Diameter (in)	8	8	8	8	
Capacity (mgd)	0.45	0.51	0.51	0.51	
Max Depth (ft)	0.36	0.46	0.67	0.67	
Dep abv Crown (ft)	-	-	0.00	0.00	
Max Flow (mgd)	0.12	0.29	0.40	0.52	
Max Velocity (ft/s)	0.96	1.8	1.9	2.4	
Slope (ft/ft)	0.0040	0.0052	0.0052	0.0052	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

FRENCH ST to BALDWIN DR

Brown AND Caldwell

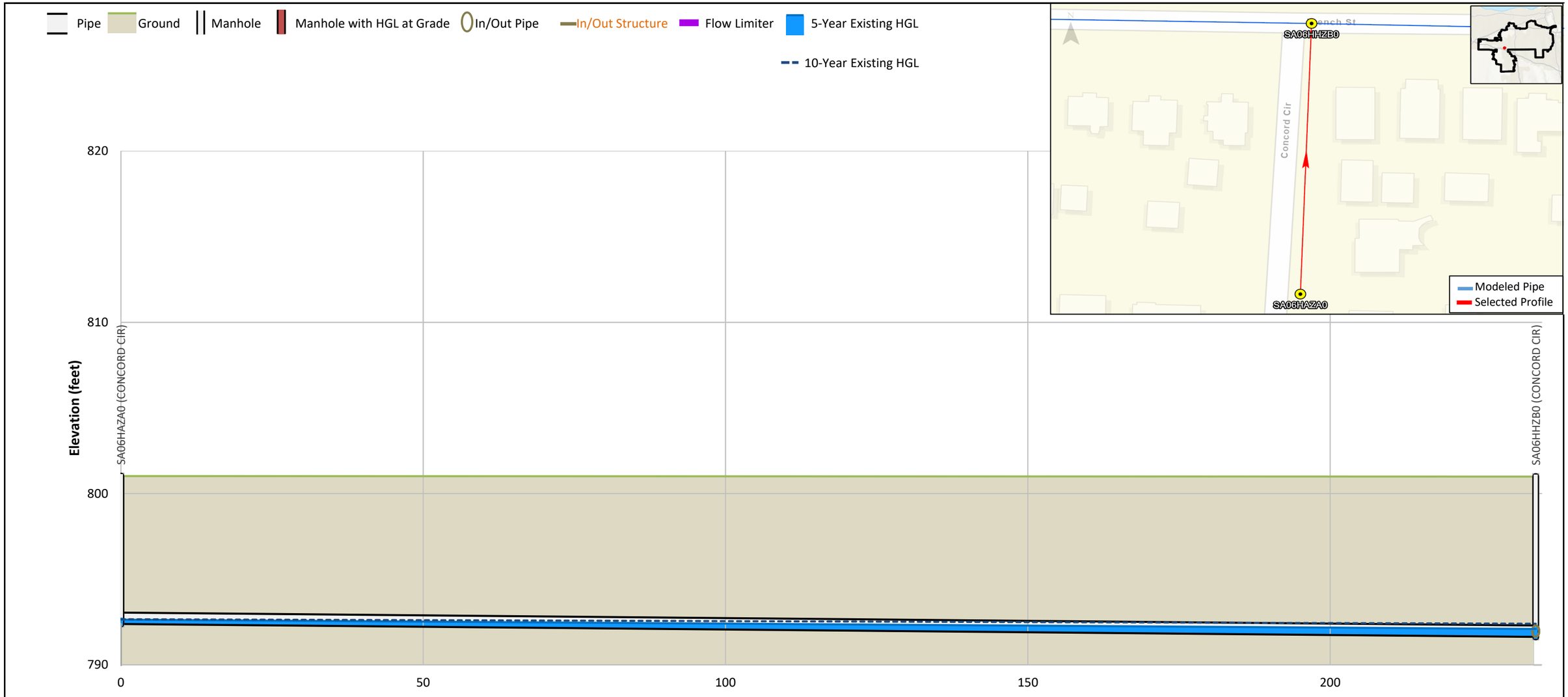
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 741, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	0.40	
Max Depth (ft)	0.46	
Dep abv Crown (ft)	-	
Max Flow (mgd)	0.12	
Max Velocity (ft/s)	0.75	
Slope (ft/ft)	0.0032	

Northeast Ohio Regional Sewer District

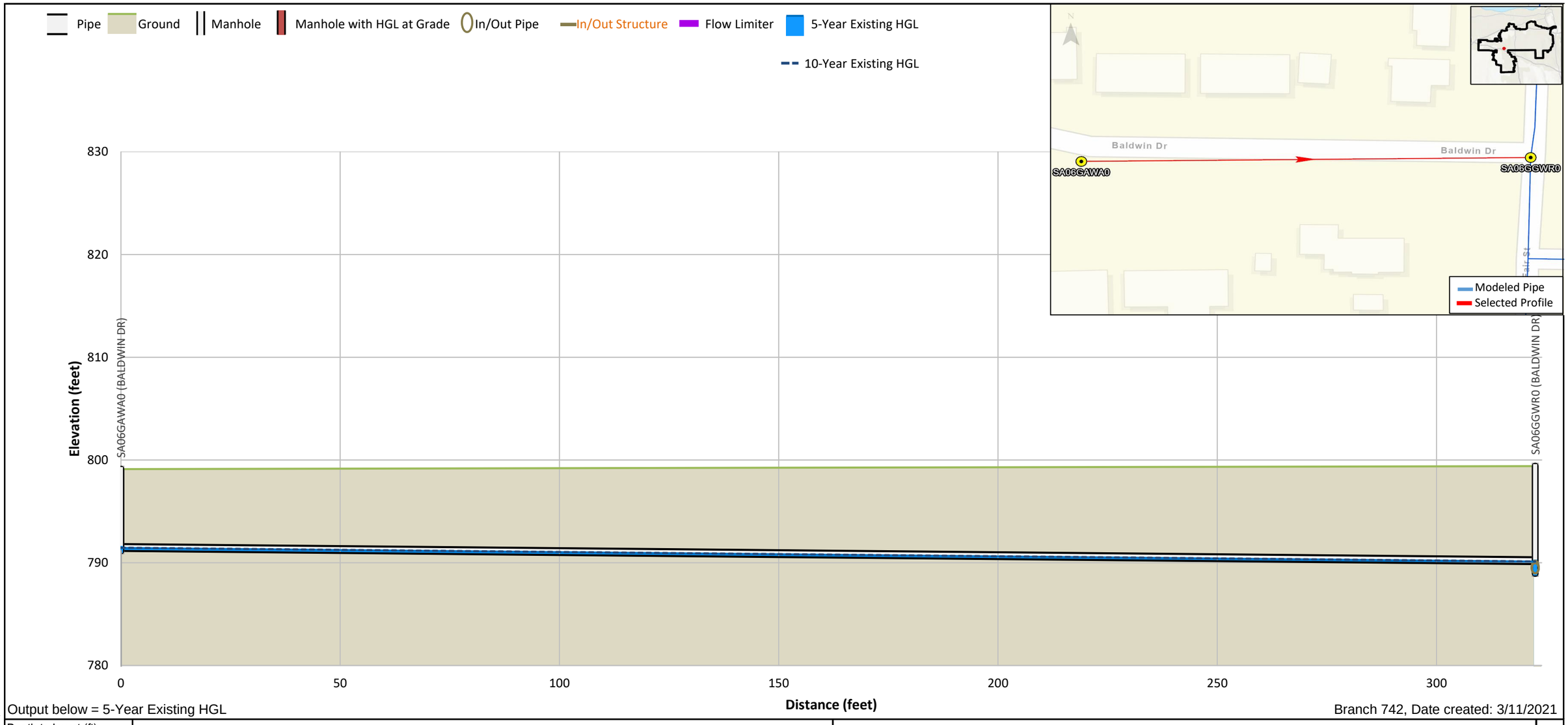
SWI-LSSES

PFA: BE-10
Community: Berea
CONCORD CIR

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 742, Date created: 3/11/2021

Depth to Invert (ft)	
Depth to HGL (ft)	
Diameter (in)	8
Capacity (mgd)	0.45
Max Depth (ft)	0.29
Dep abv Crown (ft)	-
Max Flow (mgd)	0.17
Max Velocity (ft/s)	2.4
Slope (ft/ft)	0.0040

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

BALDWIN DR

Brown AND Caldwell

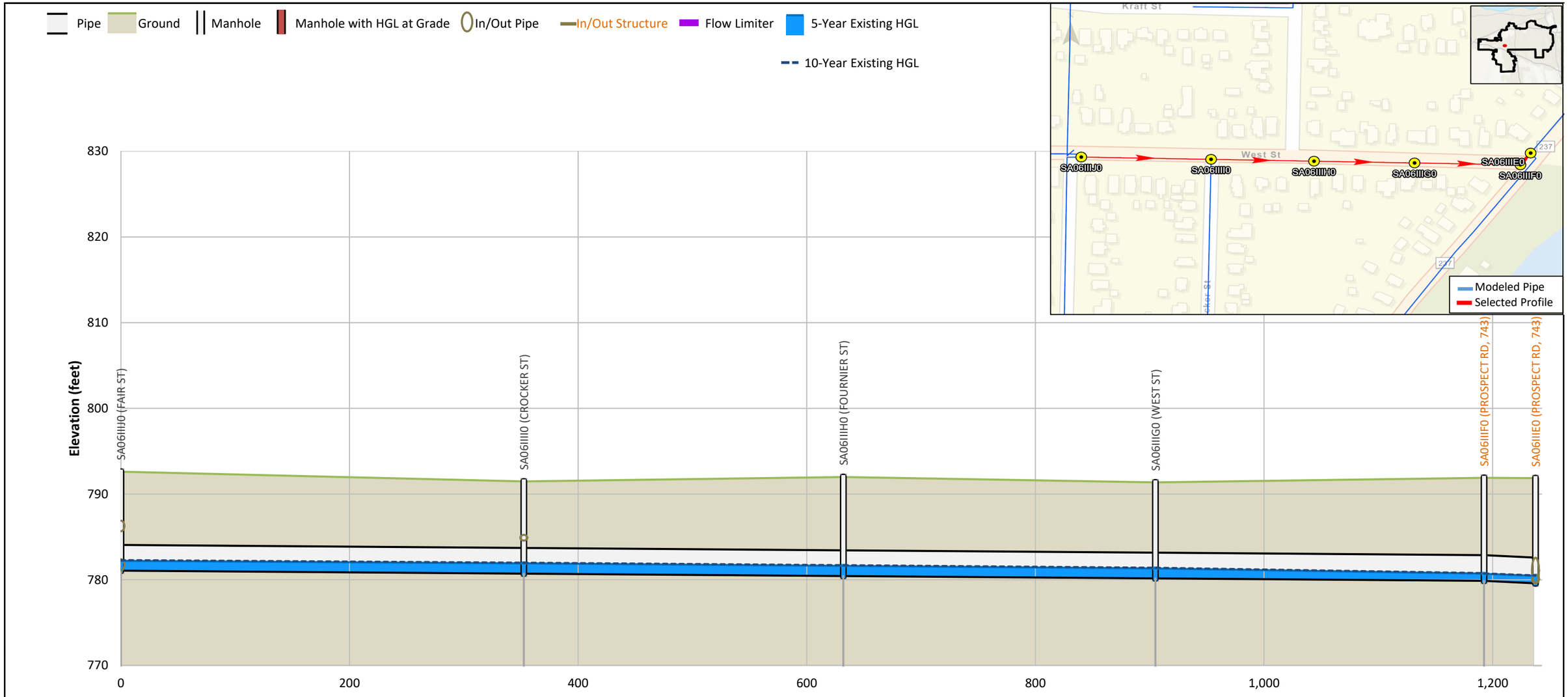
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 743, Date created: 3/11/2021

Depth to Invert (ft)		11	12	11	12	
Depth to HGL (ft)		9.6	10	10	11	
Diameter (in)	36	36	36	36	36	36
Capacity (mgd)	12	12	12	12	12	31
Max Depth (ft)	1.2	1.2	1.2	1.2	1.2	0.87
Dep abv Crown (ft)	-	-	-	-	-	-
Max Flow (mgd)	3.6	4.1	4.1	4.6	4.6	
Max Velocity (ft/s)	2.1	2.5	2.6	4.4	4.2	
Slope (ft/ft)	0.00099	0.0010	0.00099	0.0010	0.0064	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

FAIR ST to PROSPECT RD

Brown AND Caldwell

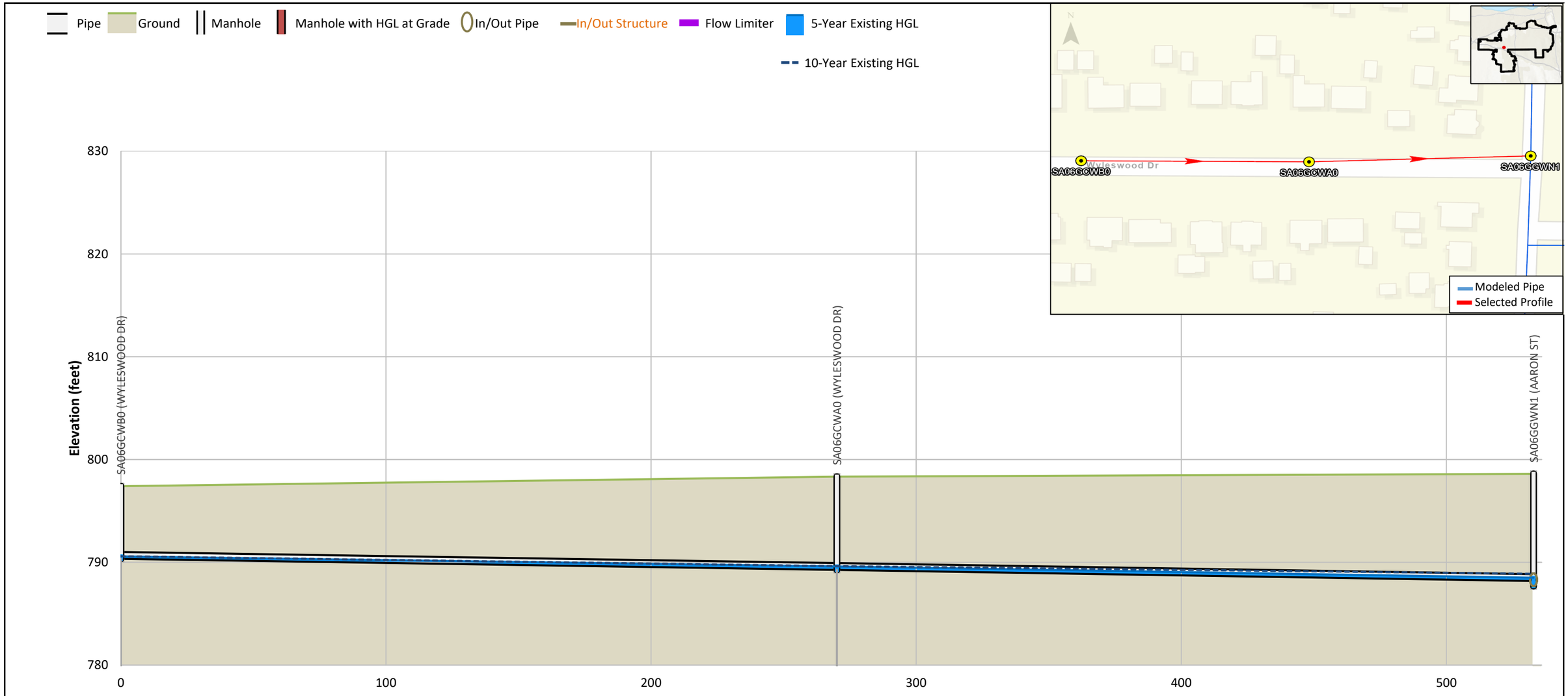
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 744, Date created: 3/11/2021

Depth to Invert (ft)		9.1	
Depth to HGL (ft)		8.7	
Diameter (in)	8		8
Capacity (mgd)	0.45		0.46
Max Depth (ft)	0.34		0.34
Dep abv Crown (ft)	-		-
Max Flow (mgd)	0.12		0.23
Max Velocity (ft/s)	1.0		2.6
Slope (ft/ft)	0.0040		0.0041

Northeast Ohio Regional Sewer District

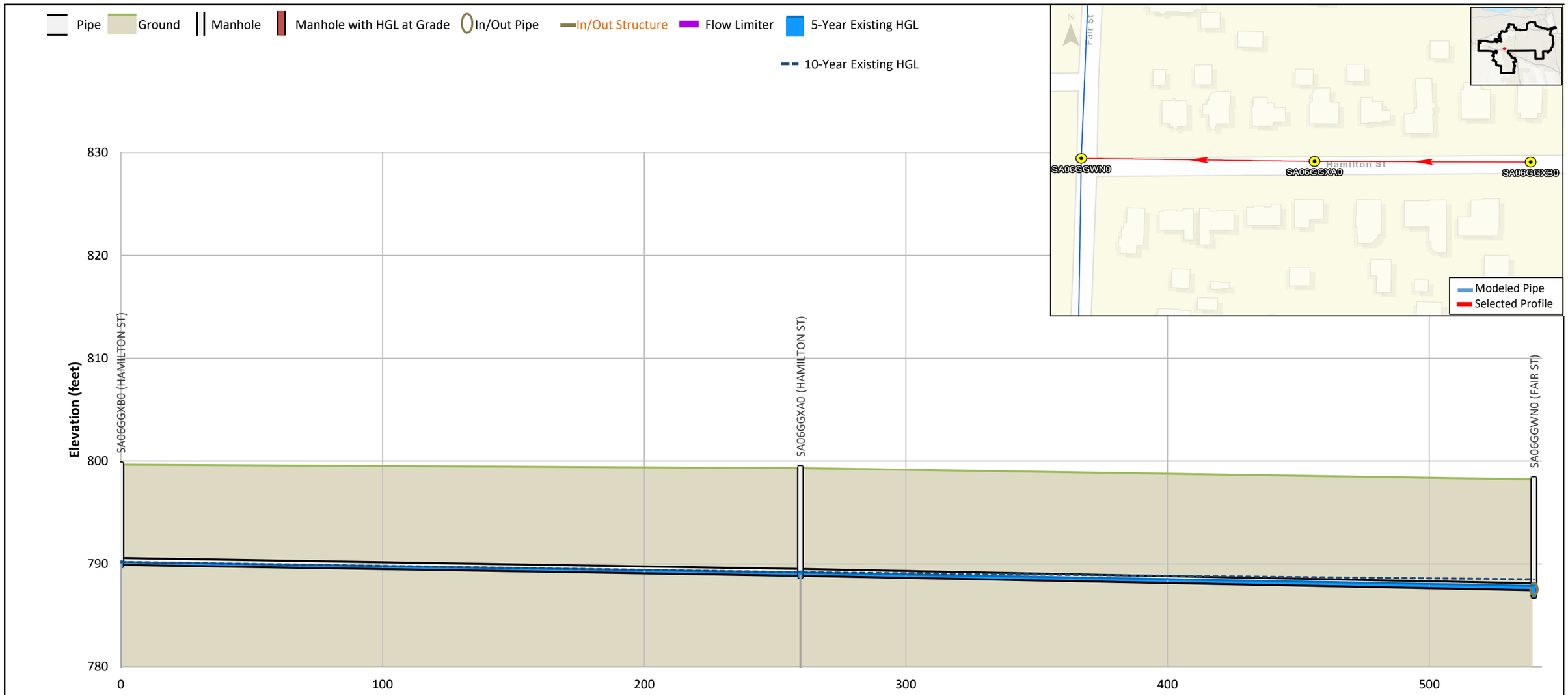
SWI-LSSES

PFA: BE-10
Community: Berea
WYLESWOOD DR to AARON ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 745, Date created: 3/11/2021

Depth to Invert (ft)		10	
Depth to HGL (ft)		10	
Diameter (in)	8		8
Capacity (mgd)	0.45		0.50
Max Depth (ft)	0.32		0.43
Dep abv Crown (ft)	-		-
Max Flow (mgd)	0.15		0.23
Max Velocity (ft/s)	1.4		2.5
Slope (ft/ft)	0.0041		0.0050

Northeast Ohio Regional Sewer District

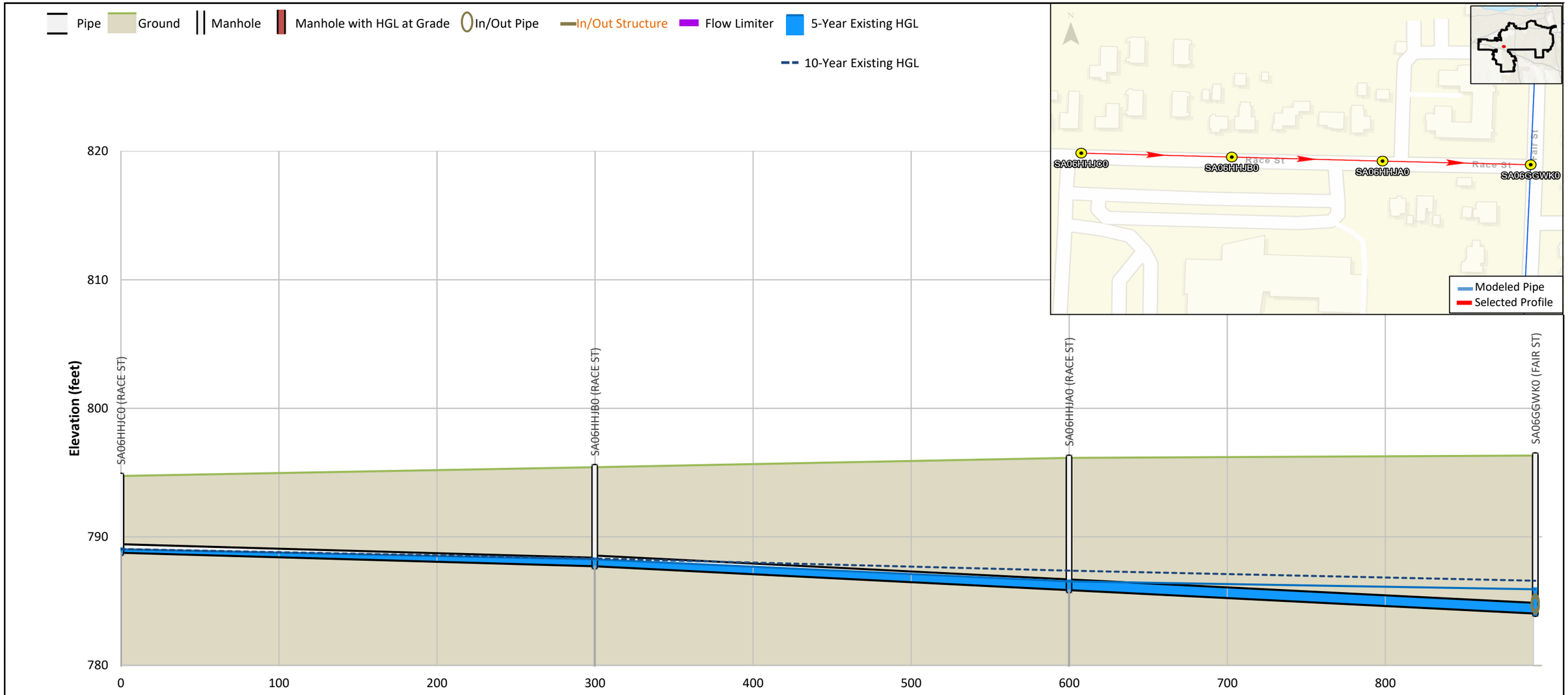
SWI-LSSES

PFA: BE-10
Community: Berea
HAMILTON ST to FAIR ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGL Profiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 746, Date created: 3/11/2021

Depth to Invert (ft)		7.7	10	
Depth to HGL (ft)		7.2	9.6	
Diameter (in)	8	10	10	
Capacity (mgd)	0.42	1.0	1.0	
Max Depth (ft)	0.54	0.68	1.9	
Dep abv Crown (ft)	-	-	1.1	
Max Flow (mgd)	0.15	0.76	0.68	
Max Velocity (ft/s)	0.77	3.1	1.8	
Slope (ft/ft)	0.0035	0.0062	0.0062	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

RACE ST to FAIR ST

Brown AND Caldwell

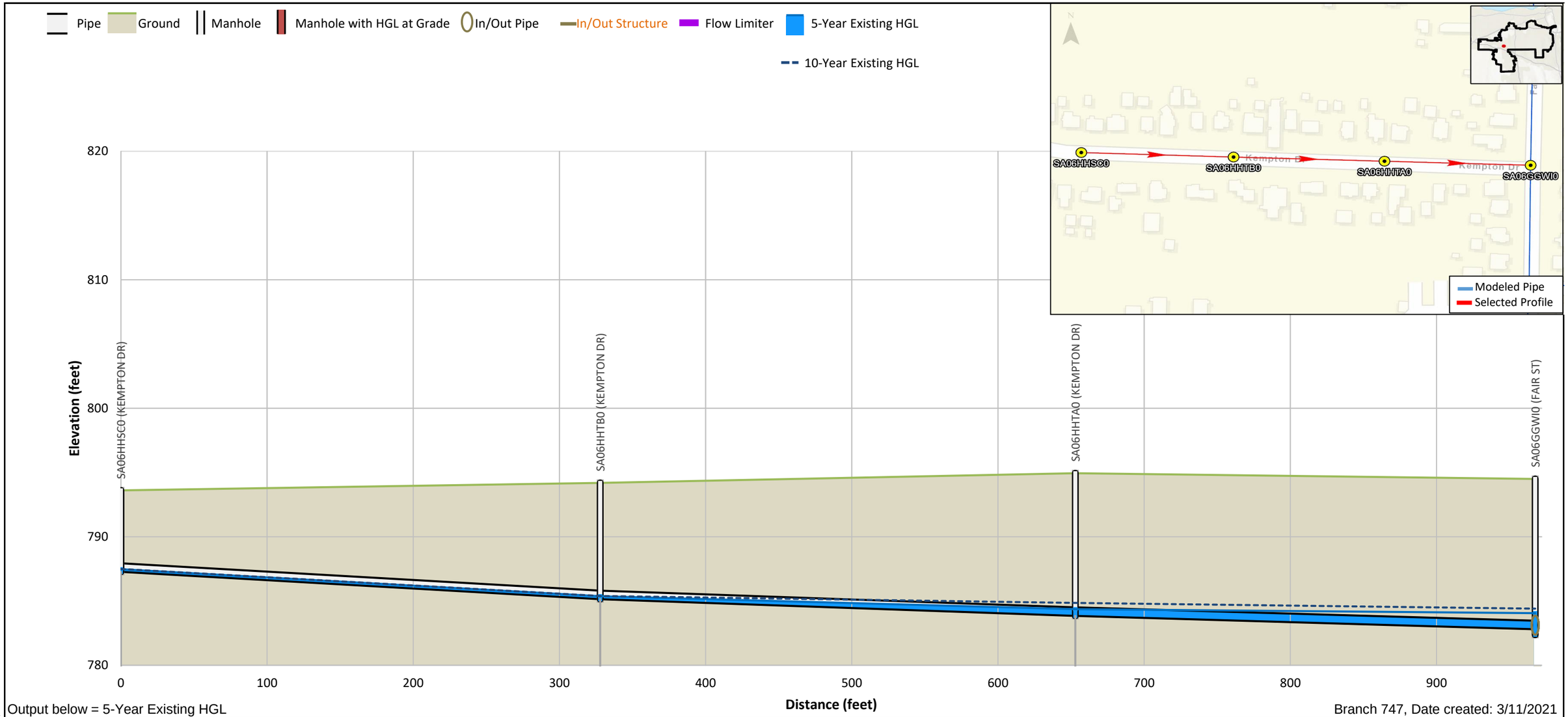
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 747, Date created: 3/11/2021

Depth to Invert (ft)		9.1	11	
Depth to HGL (ft)		8.8	11	
Diameter (in)	8	8	8	
Capacity (mgd)	0.57	0.45	0.41	
Max Depth (ft)	0.23	0.53	1.3	
Dep abv Crown (ft)	-	-	0.59	
Max Flow (mgd)	0.12	0.12	0.29	
Max Velocity (ft/s)	1.6	0.74	2.7	
Slope (ft/ft)	0.0065	0.0040	0.0033	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

KEMPTON DR to FAIR ST

Brown AND Caldwell

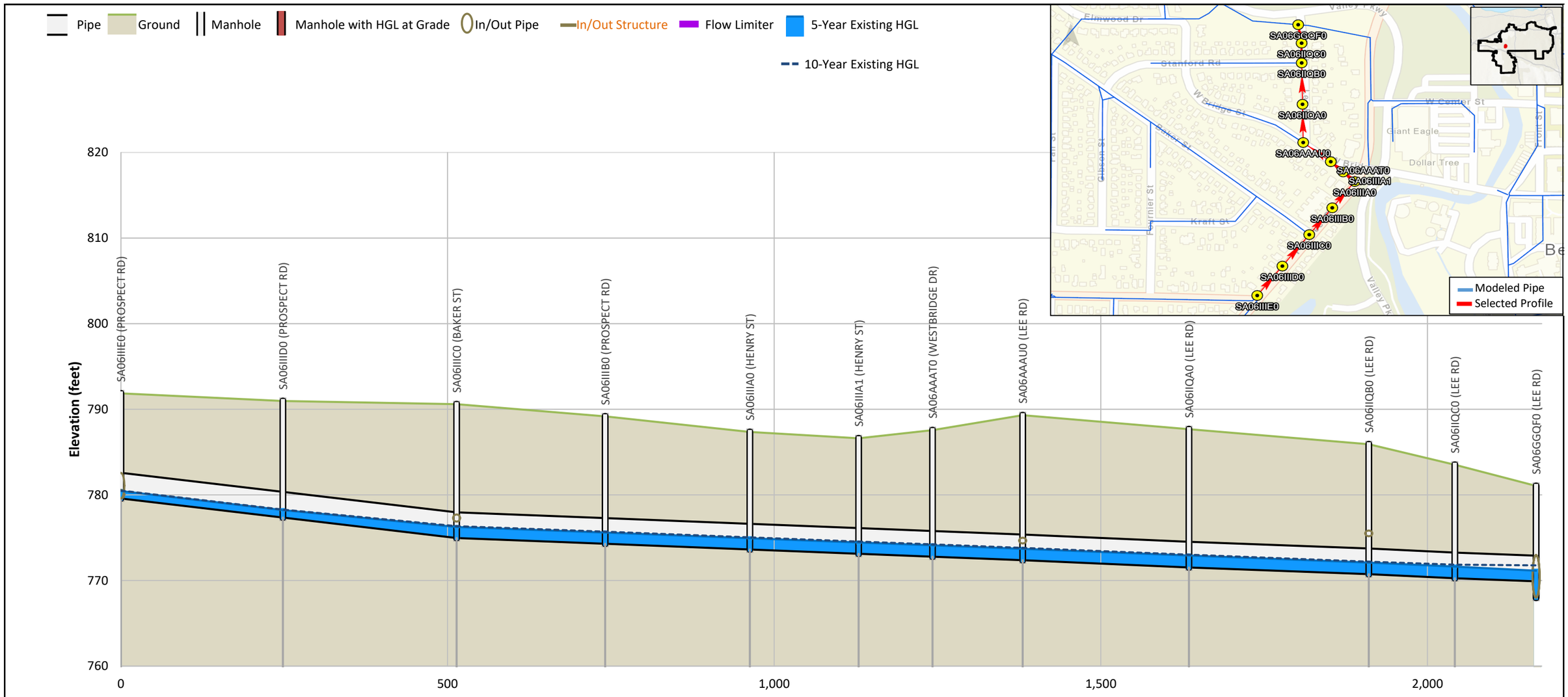
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 748, Date created: 3/11/2021

Depth to Invert (ft)		14	16	15	14	13	15	17	16	15	13	
Depth to HGL (ft)		13	14	14	12	12	13	16	15	14	12	
Diameter (in)	36	36	36	36	36	36	36	36	36	36	36	
Capacity (mgd)	37	37	21	22	21	21	21	23	21	24	21	
Max Depth (ft)	0.87	1.3	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.4	
Dep abv Crown (ft)	-	-	-	-	-	-	-	-	-	-	-	
Max Flow (mgd)	6.7	6.7	8.1	8.5	8.5	8.5	8.7	9.0	9.2	9.7	9.7	
Max Velocity (ft/s)	6.1	3.6	4.2	4.4	4.4	4.3	4.4	4.3	4.6	4.8	5.4	
Slope (ft/ft)	0.0090	0.0090	0.0029	0.0030	0.0030	0.0030	0.0030	0.0033	0.0028	0.0036	0.0029	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

PROSPECT RD to LEE RD

Brown AND Caldwell

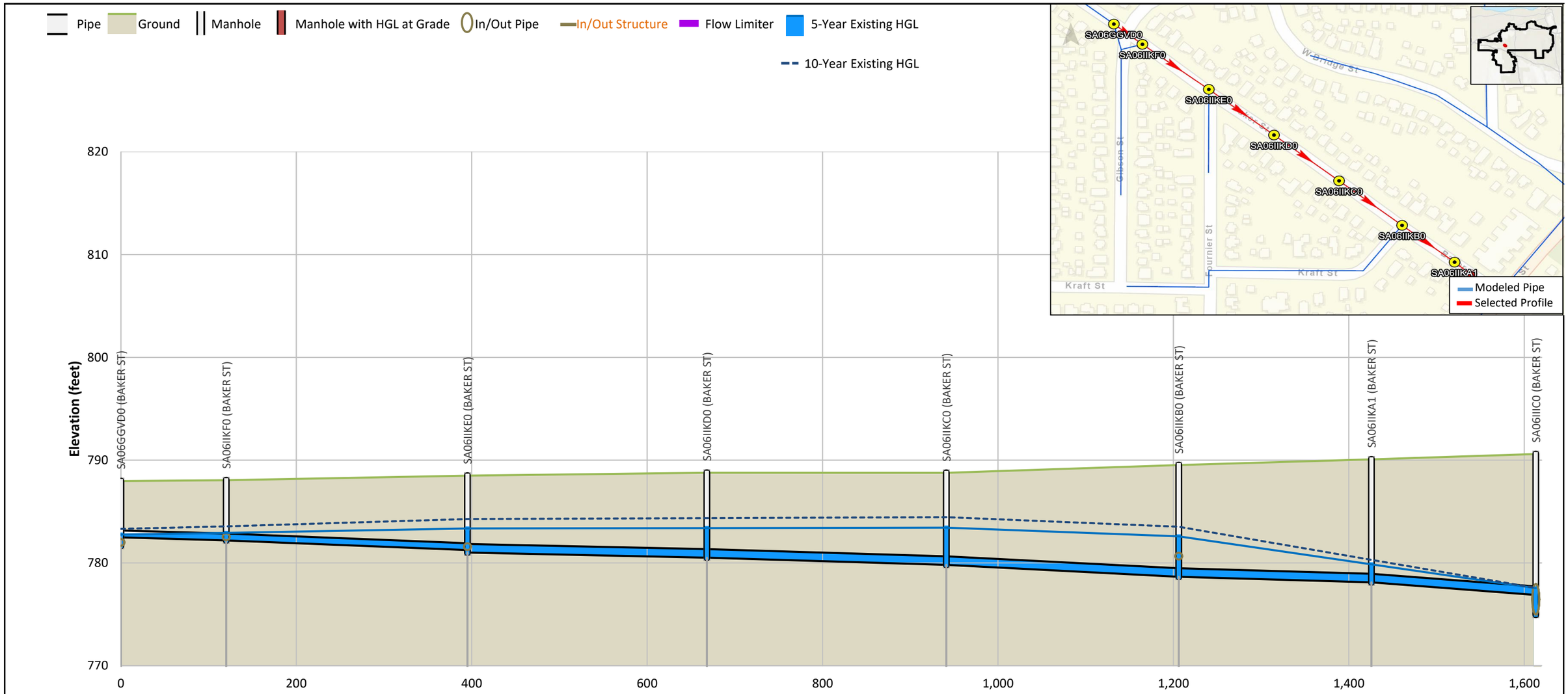
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 749, Date created: 3/11/2021

Depth to Invert (ft)		5.9	7.2	8.3	9.0	11	12	
Depth to HGL (ft)		5.1	5.1	5.4	5.3	6.9	10	
Diameter (in)	8	8	10	10	10	10	10	10
Capacity (mgd)	0.35	0.42	0.55	0.65	0.85	0.64	1.0	
Max Depth (ft)	0.73	2.1	2.9	3.6	3.9	3.9	1.8	
Dep abv Crown (ft)	0.07	1.4	2.0	2.8	3.1	3.1	0.92	
Max Flow (mgd)	-0.20	-0.30	0.32	0.38	0.76	1.4	1.4	
Max Velocity (ft/s)	-0.86	2.0	1.4	1.1	1.6	3.5	4.7	
Slope (ft/ft)	0.0025	0.0034	0.0018	0.0026	0.0044	0.0025	0.0066	

Northeast Ohio Regional Sewer District

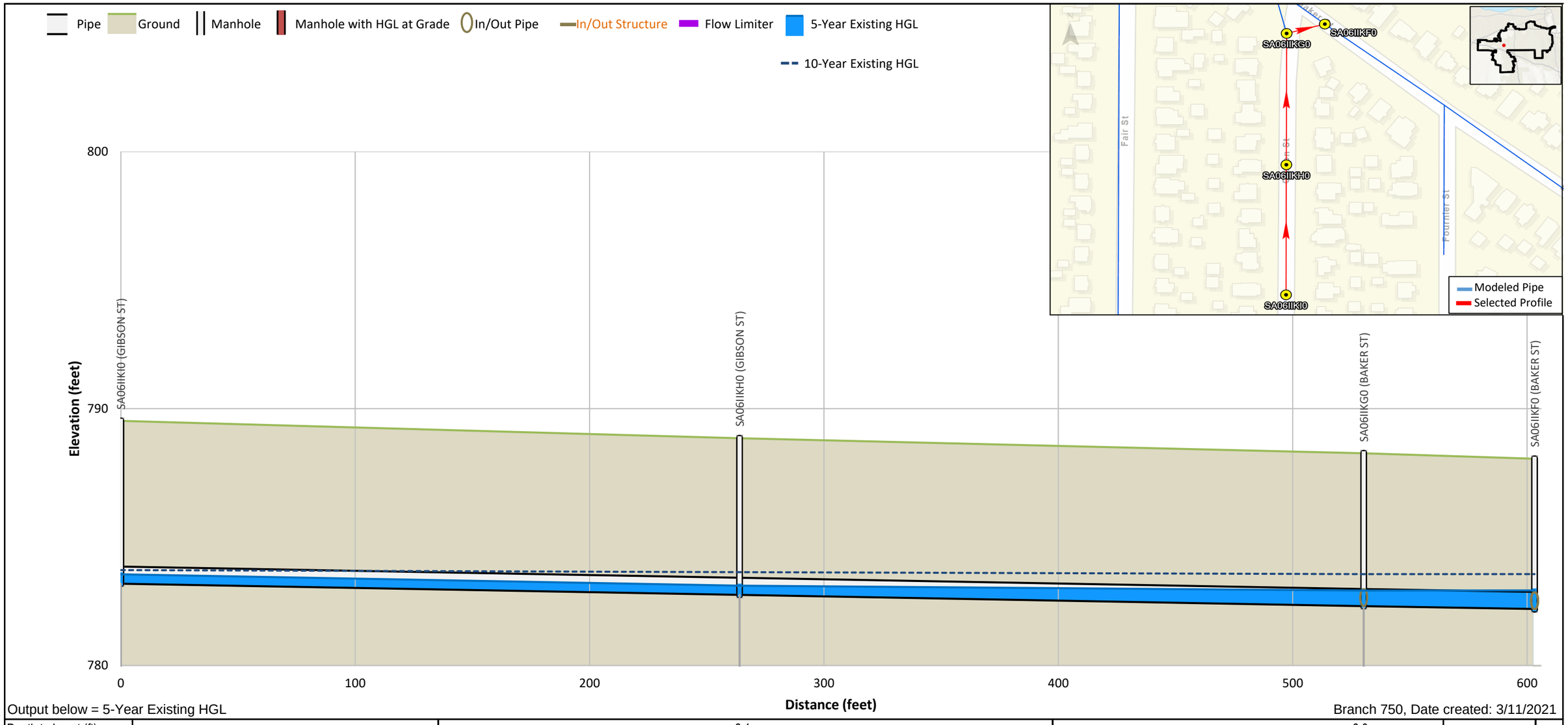
SWI-LSSES

PFA: BE-10
Community: Berea
BAKER ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 750, Date created: 3/11/2021

Depth to Invert (ft)		6.1	6.0	
Depth to HGL (ft)		5.7	5.3	
Diameter (in)	8	8	8	
Capacity (mgd)	0.29	0.29	0.28	
Max Depth (ft)	0.37	0.61	0.72	
Dep abv Crown (ft)	-	-	0.06	
Max Flow (mgd)	0.16	0.16	0.14	
Max Velocity (ft/s)	1.3	1.3	1.8	
Slope (ft/ft)	0.0016	0.0016	0.0015	

Northeast Ohio Regional Sewer District

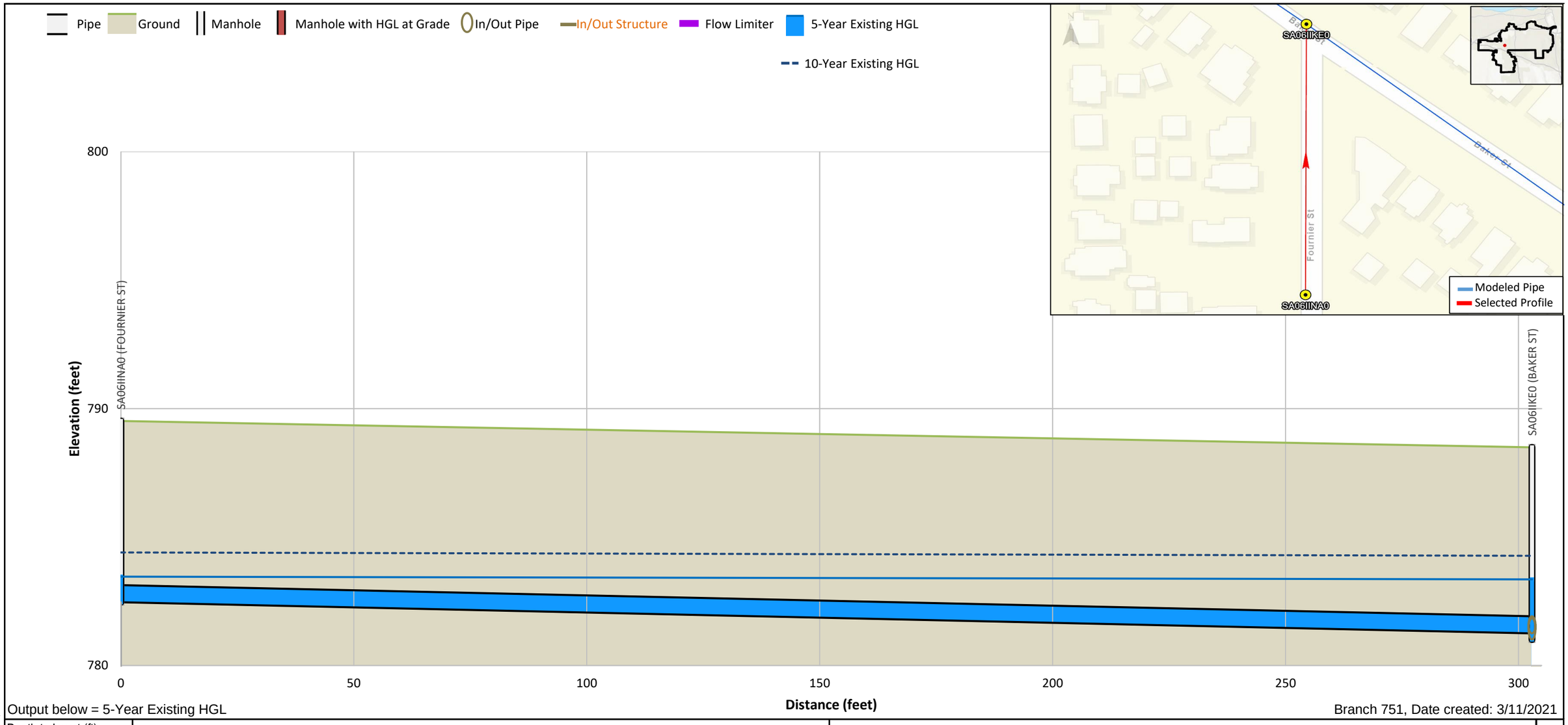
SWI-LSSES

PFA: BE-10, BE-09
Community: Berea
GIBSON ST to BAKER ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 751, Date created: 3/11/2021

Depth to Invert (ft)	
Depth to HGL (ft)	
Diameter (in)	8
Capacity (mgd)	0.45
Max Depth (ft)	2.1
Dep abv Crown (ft)	1.4
Max Flow (mgd)	0.14
Max Velocity (ft/s)	2.2
Slope (ft/ft)	0.0040

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

FOURNIER ST to BAKER ST

Brown AND Caldwell

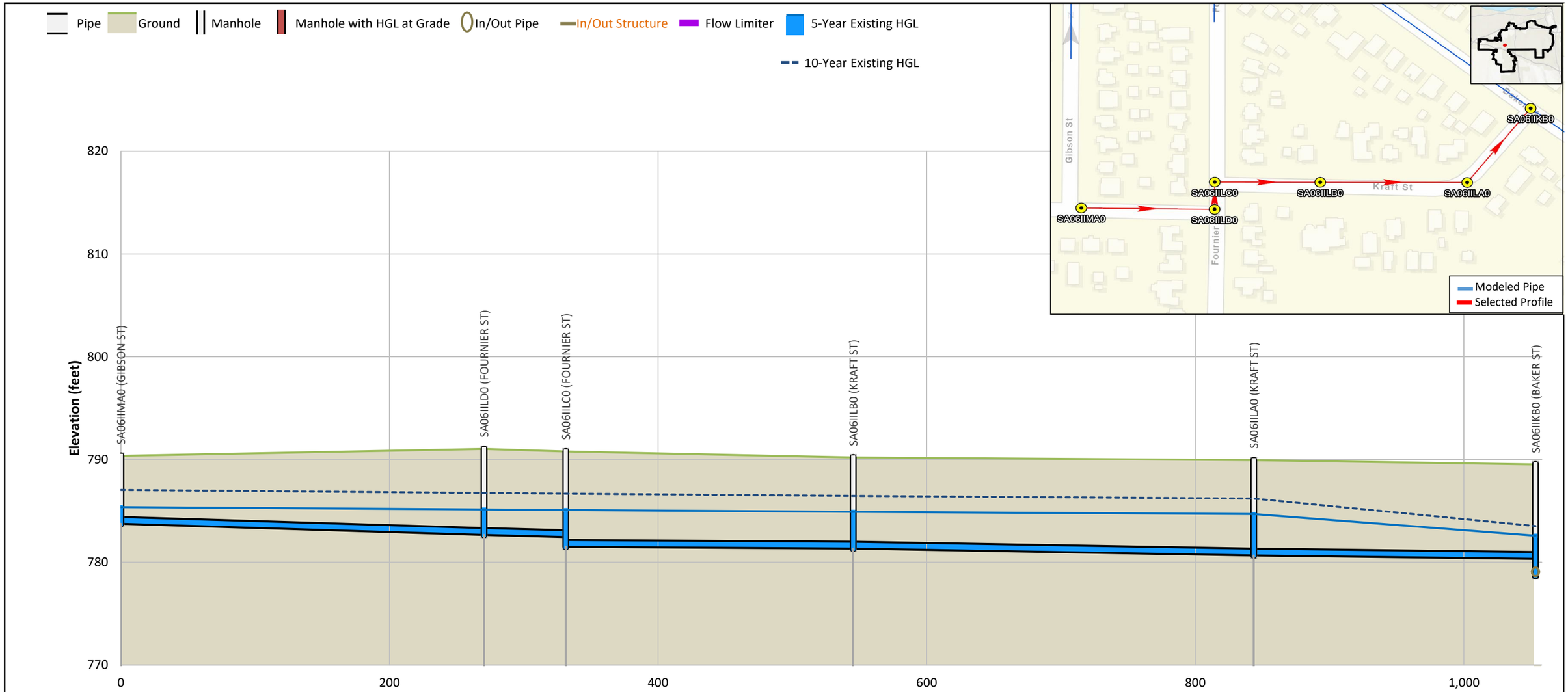
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 752, Date created: 3/11/2021

Depth to Invert (ft)		8.4		8.3		8.9		9.3				
Depth to HGL (ft)		5.9		5.7		5.3		5.2				
Diameter (in)	8		8		8		8		8			
Capacity (mgd)	0.45		0.42		0.20		0.34		0.28			
Max Depth (ft)	2.5		2.6		3.6		4.0		4.0			
Dep abv Crown (ft)	1.8		2.0		2.9		3.4		3.4			
Max Flow (mgd)	0.26		0.24		0.27		0.31		0.71			
Max Velocity (ft/s)	2.0		2.6		1.4		1.1		3.6			
Slope (ft/ft)	0.0040		0.0034		0.00079		0.0022		0.0016			

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

GIBSON ST to BAKER ST

Brown AND Caldwell

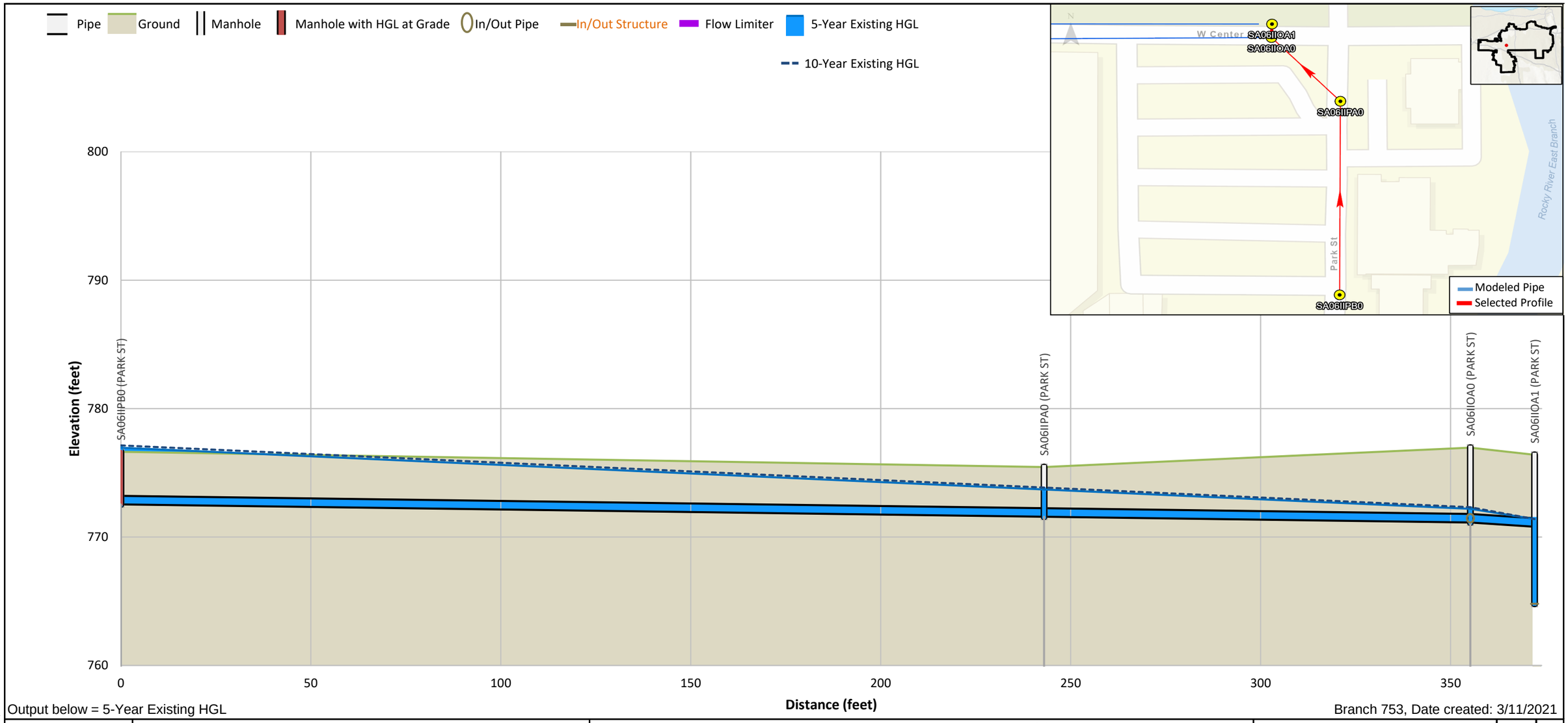
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfiles/30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 753, Date created: 3/11/2021

Depth to Invert (ft)		3.9	5.8	
Depth to HGL (ft)		1.7	4.8	
Diameter (in)	8	8	8	
Capacity (mgd)	0.45	0.45	0.99	
Max Depth (ft)	4.4	2.1	1.1	
Dep abv Crown (ft)	3.7	1.5	0.40	
Max Flow (mgd)	0.82	0.82	1.5	
Max Velocity (ft/s)	2.9	3.3	7.2	
Slope (ft/ft)	0.0040	0.0040	0.020	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

PARK ST

Brown AND Caldwell

WADE TRIM

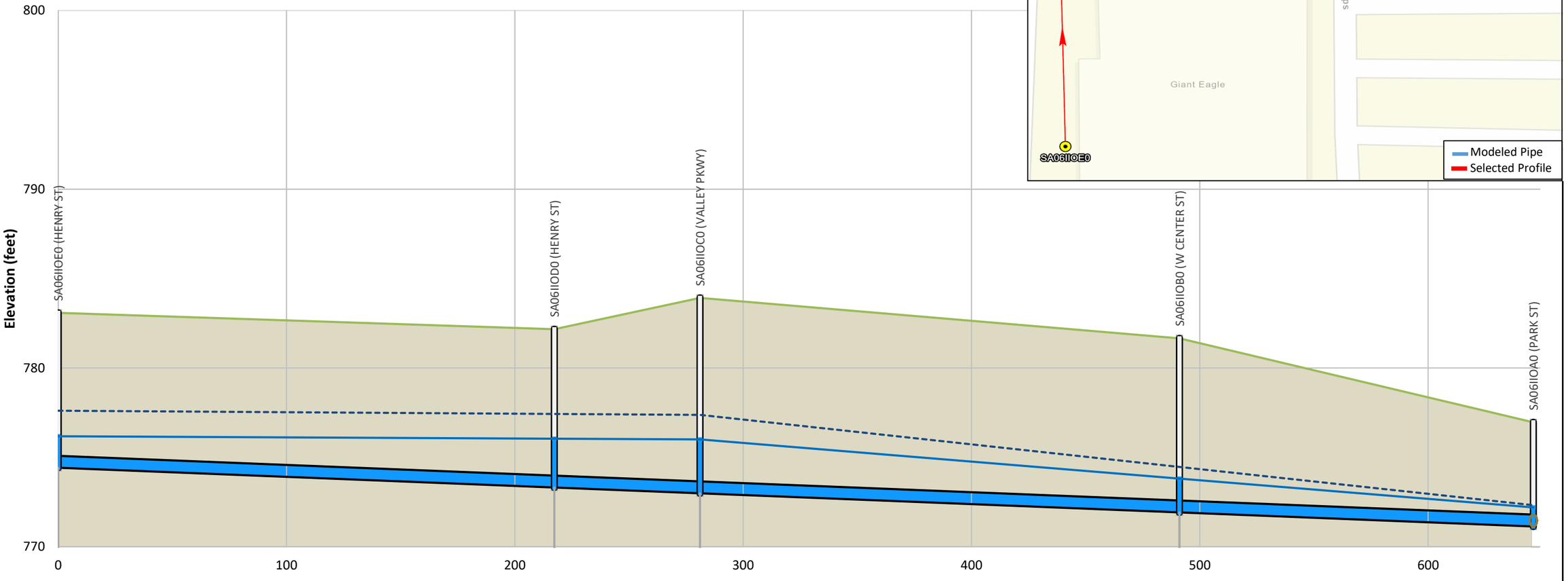
Model Projected 03/08/2021

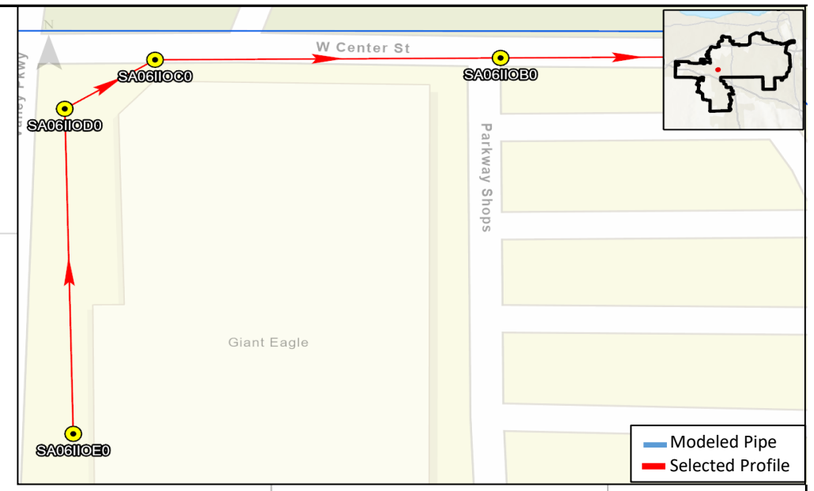
Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm

Pipe | Ground | Manhole | Manhole with HGL at Grade | In/Out Pipe | In/Out Structure | Flow Limiter | 5-Year Existing HGL | 10-Year Existing HGL





Output below = 5-Year Existing HGL

Branch 754, Date created: 3/11/2021

Depth to Invert (ft)		8.9	11	9.7	
Depth to HGL (ft)		6.1	7.9	7.8	
Diameter (in)	8	8	8	8	8
Capacity (mgd)	0.51	0.51	0.51	0.51	0.51
Max Depth (ft)	2.7	3.0	3.0	1.9	
Dep abv Crown (ft)	2.1	2.3	2.3	1.2	
Max Flow (mgd)	0.21	0.24	0.72	0.72	
Max Velocity (ft/s)	1.5	1.0	2.6	2.9	
Slope (ft/ft)	0.0051	0.0051	0.0051	0.0051	

Northeast Ohio Regional Sewer District

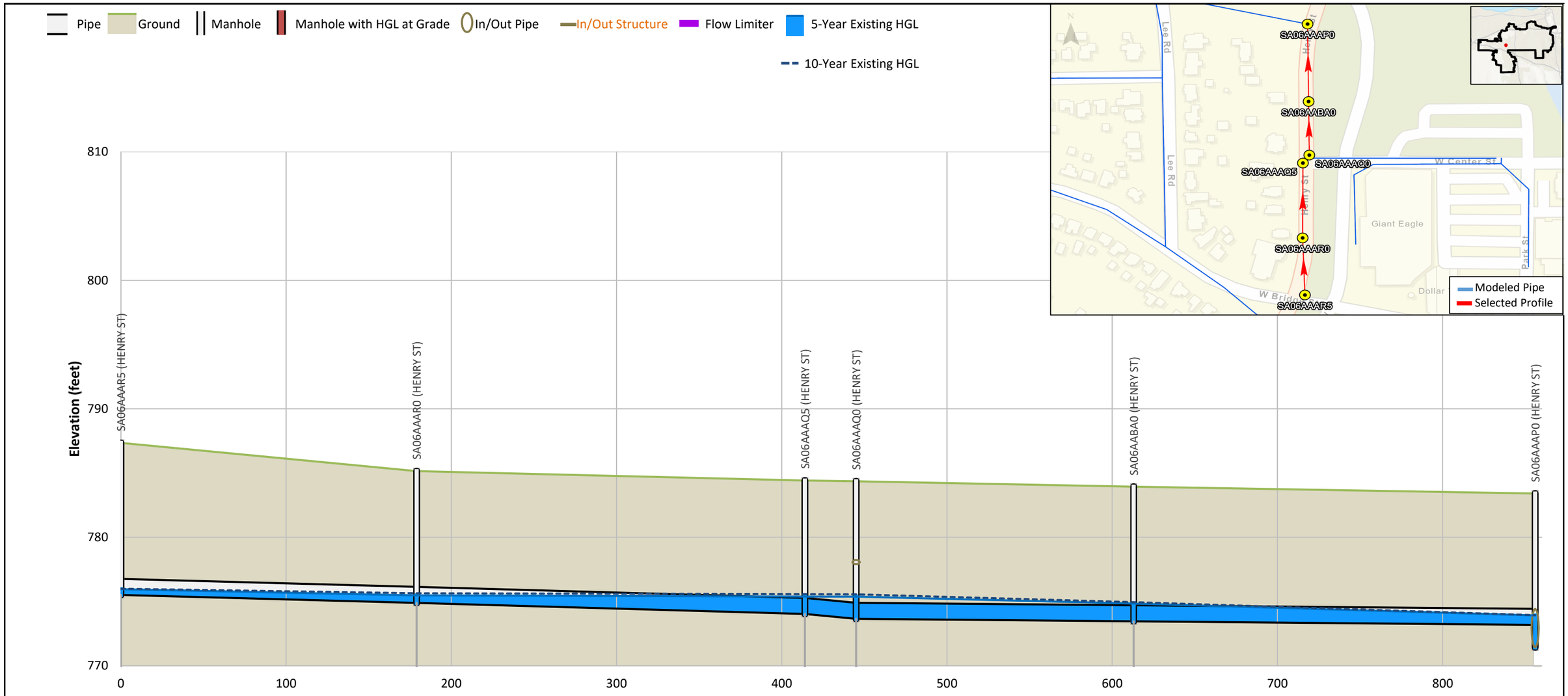
SWI-LSSES

PFA: BE-10
Community: Berea
HENRY ST to PARK ST

Brown AND Caldwell | WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 755, Date created: 3/11/2021

Depth to Invert (ft)		10	10	11	10	
Depth to HGL (ft)		9.7	9.0	9.0	9.1	
Diameter (in)	15	15	15	15	15	
Capacity (mgd)	2.2	2.3	4.2	1.3	1.3	
Max Depth (ft)	0.59	1.4	1.7	1.7	1.4	
Dep abv Crown (ft)	-	0.11	0.48	0.48	0.13	
Max Flow (mgd)	0.58	0.54	0.54	2.1	2.1	
Max Velocity (ft/s)	2.3	2.7	1.6	3.0	4.4	
Slope (ft/ft)	0.0035	0.0037	0.012	0.0011	0.0011	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

HENRY ST

Brown AND Caldwell

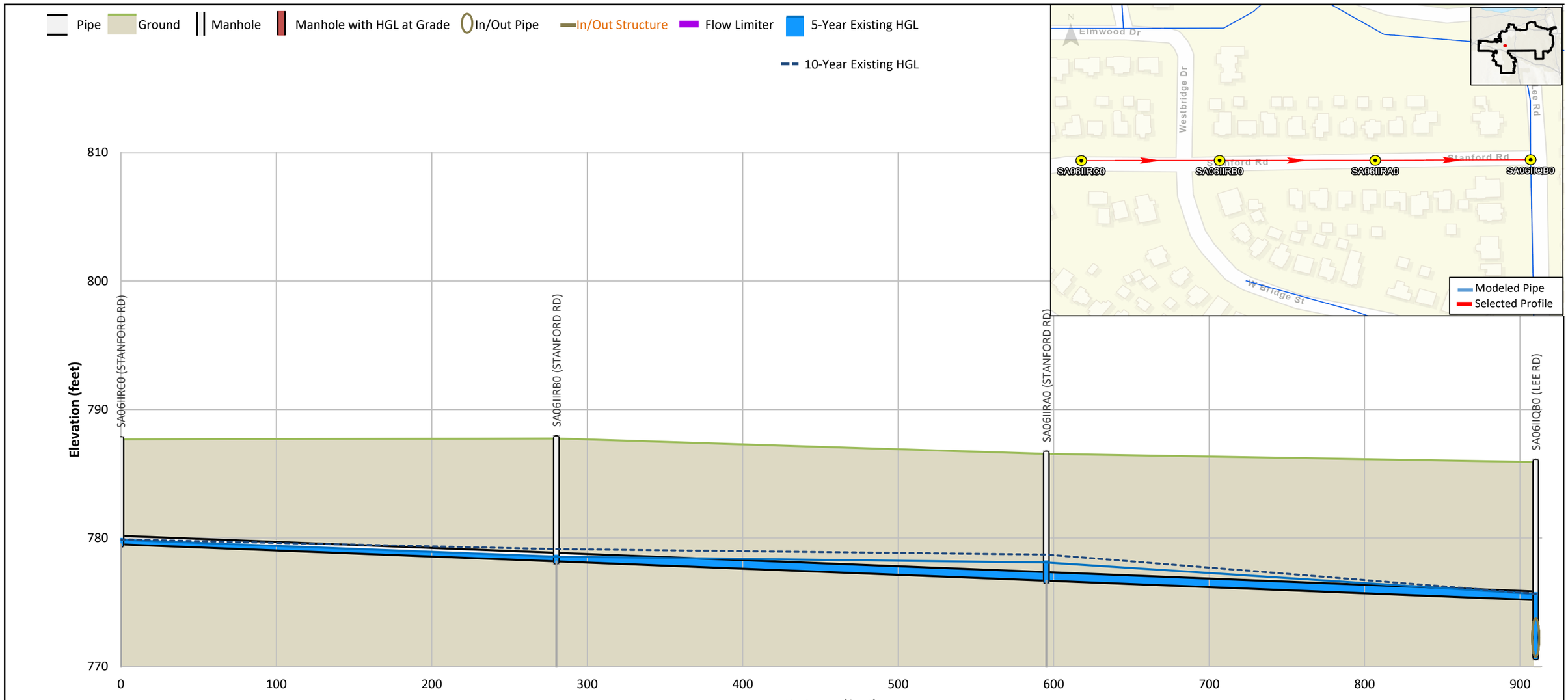
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/DesktopHGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 756, Date created: 3/11/2021

Depth to Invert (ft)		9.6	9.9	
Depth to HGL (ft)		9.2	8.5	
Diameter (in)	8	8	8	8
Capacity (mgd)	0.49	0.49	0.49	0.49
Max Depth (ft)	0.37	1.4	1.4	1.4
Dep abv Crown (ft)	-	0.75	0.75	0.75
Max Flow (mgd)	0.26	0.27	0.62	
Max Velocity (ft/s)	2.2	1.1	3.7	
Slope (ft/ft)	0.0047	0.0048	0.0048	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

STANFORD RD to LEE RD

Brown AND Caldwell

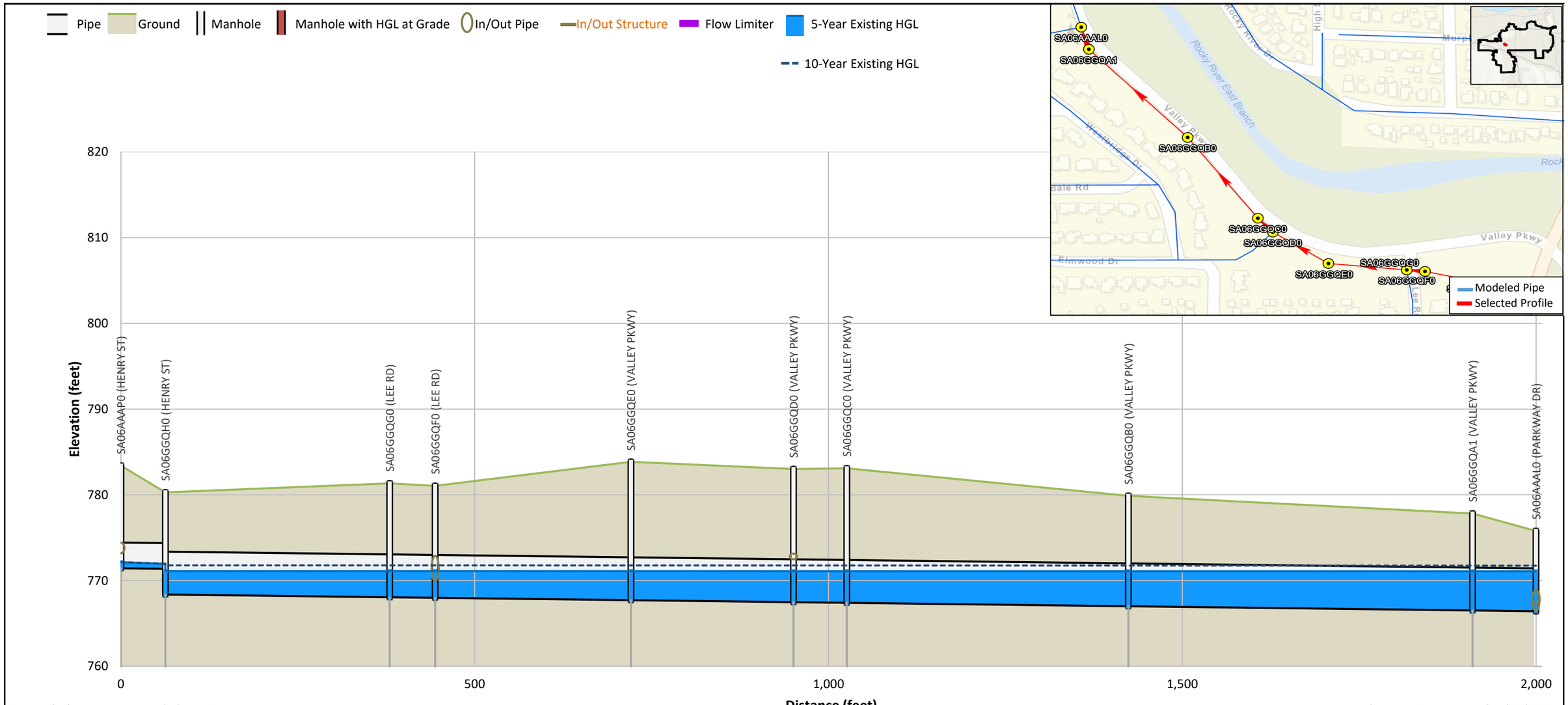
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 757, Date created: 3/11/2021

Depth to Invert (ft)		8.9		13	13		16		16	16		13		11	
Depth to HGL (ft)		8.3		10	9.9		13		12	12		8.8		6.7	
Diameter (in)	36		60		60	60		60		60	60		60		60
Capacity (mgd)	12		49		48	48		49		49	49		49		49
Max Depth (ft)	0.71		3.1		3.1	3.4		3.6		3.7	4.1		4.6		4.7
Dep abv Crown (ft)	-		-		-	-		-		-	-		-		-
Max Flow (mgd)	2.1		1.7		1.8	9.7		8.8		8.4	6.4		6.1		6.2
Max Velocity (ft/s)	3.5		0.59		0.57	3.0		2.9		2.9	2.2		0.67		0.60
Slope (ft/ft)	0.00095		0.0010		0.00100	0.00100		0.0010		0.0010	0.0010		0.0010		0.0010

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10
Community: Berea
HENRY ST to PARKWAY DR

Brown AND Caldwell

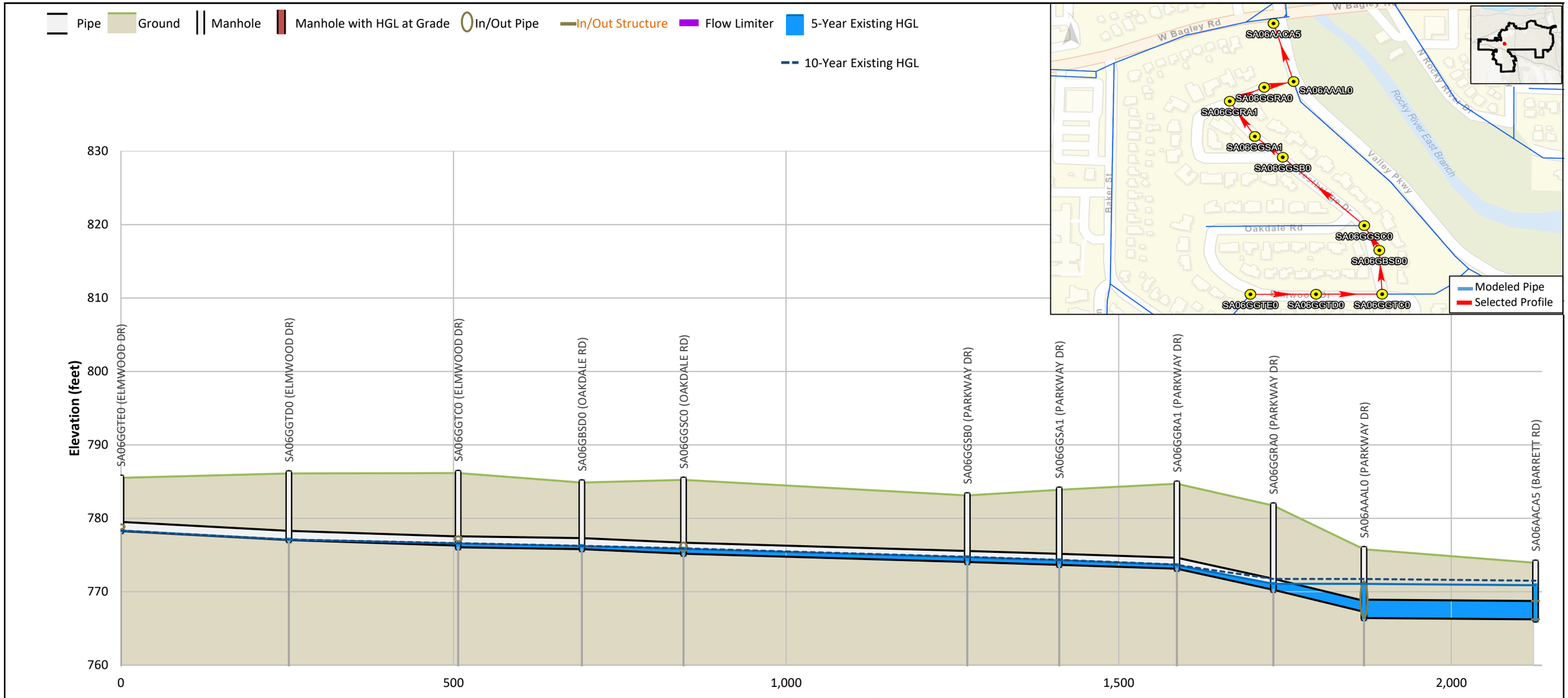
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 758, Date created: 3/11/2021

Depth to Invert (ft)		9.1	9.9	9.1	10	9.1	10	12	11	8.5	
Depth to HGL (ft)		9.0	9.6	8.7	9.4	8.4	9.6	11	11	4.7	
Diameter (in)	15	15	18	18	18	18	18	18	18	30	
Capacity (mgd)	2.6	2.1	2.3	3.9	3.2	3.3	3.4	8.7	9.2	6.4	
Max Depth (ft)	0.06	0.30	0.53	0.66	0.66	0.65	0.64	0.82	3.8	4.7	
Dep abv Crown (ft)	-	-	-	-	-	-	-	-	2.3	2.2	
Max Flow (mgd)	0.00	-0.01	0.61	0.61	1.3	1.3	1.3	1.9	1.8	6.5	
Max Velocity (ft/s)	0.00	-0.10	2.4	1.3	2.7	2.7	3.5	6.0	6.1	1.9	
Slope (ft/ft)	0.0048	0.0030	0.0013	0.0041	0.0026	0.0028	0.0030	0.020	0.022	0.00070	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10
Community: Berea
ELMWOOD DR to BARRETT RD

Brown AND Caldwell

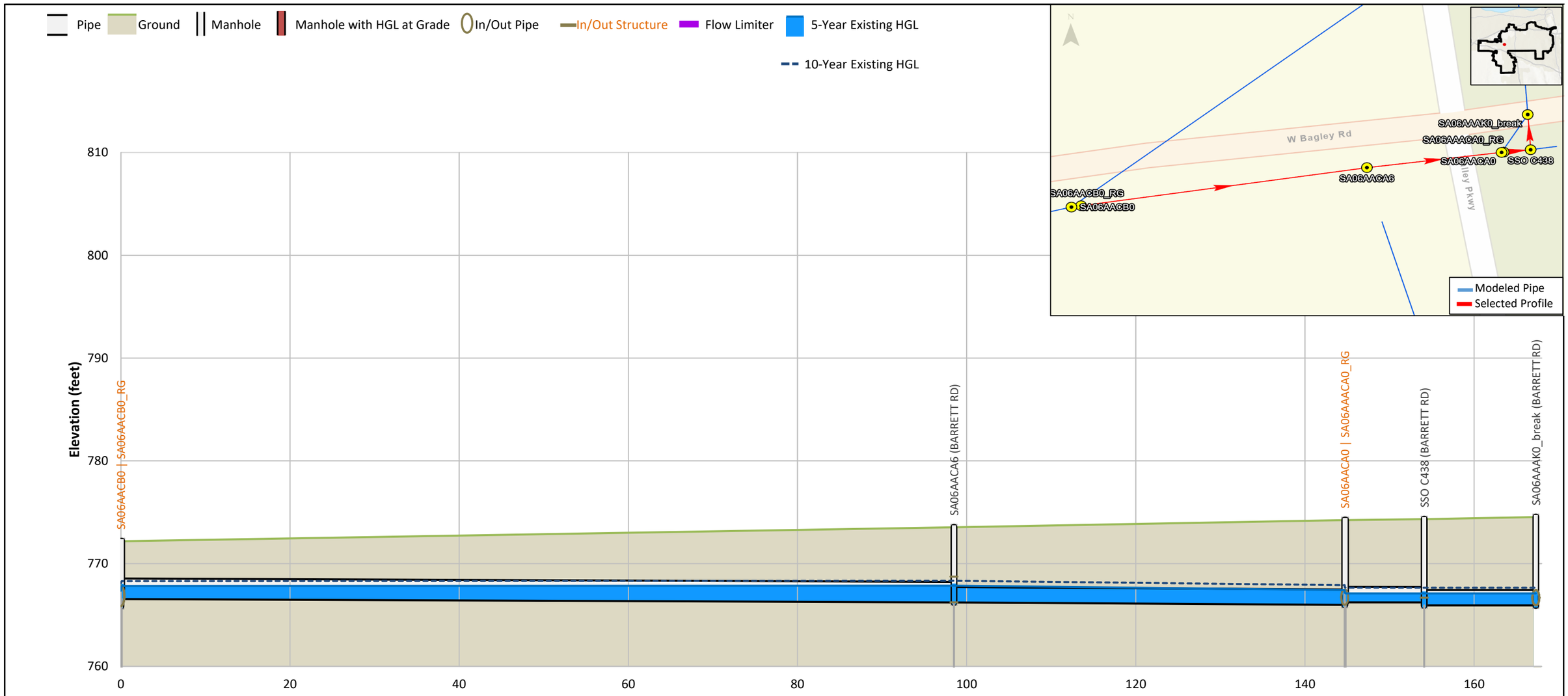
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 759, Date created: 3/11/2021

Depth to Invert (ft)		7.3		8.1	
Depth to HGL (ft)		5.7		7.2	
Diameter (in)	24	18	18	18	
Capacity (mgd)	7.7	3.5	1.7	0.00	
Max Depth (ft)	1.6	1.6	0.87	1.2	
Dep abv Crown (ft)	-	0.14	-	-	
Max Flow (mgd)	-1.83	4.7	0.82	-0.50	
Max Velocity (ft/s)	-1.03	4.1	1.2	-0.90	
Slope (ft/ft)	0.0033	0.0051	0.00075	0	

Northeast Ohio Regional Sewer District

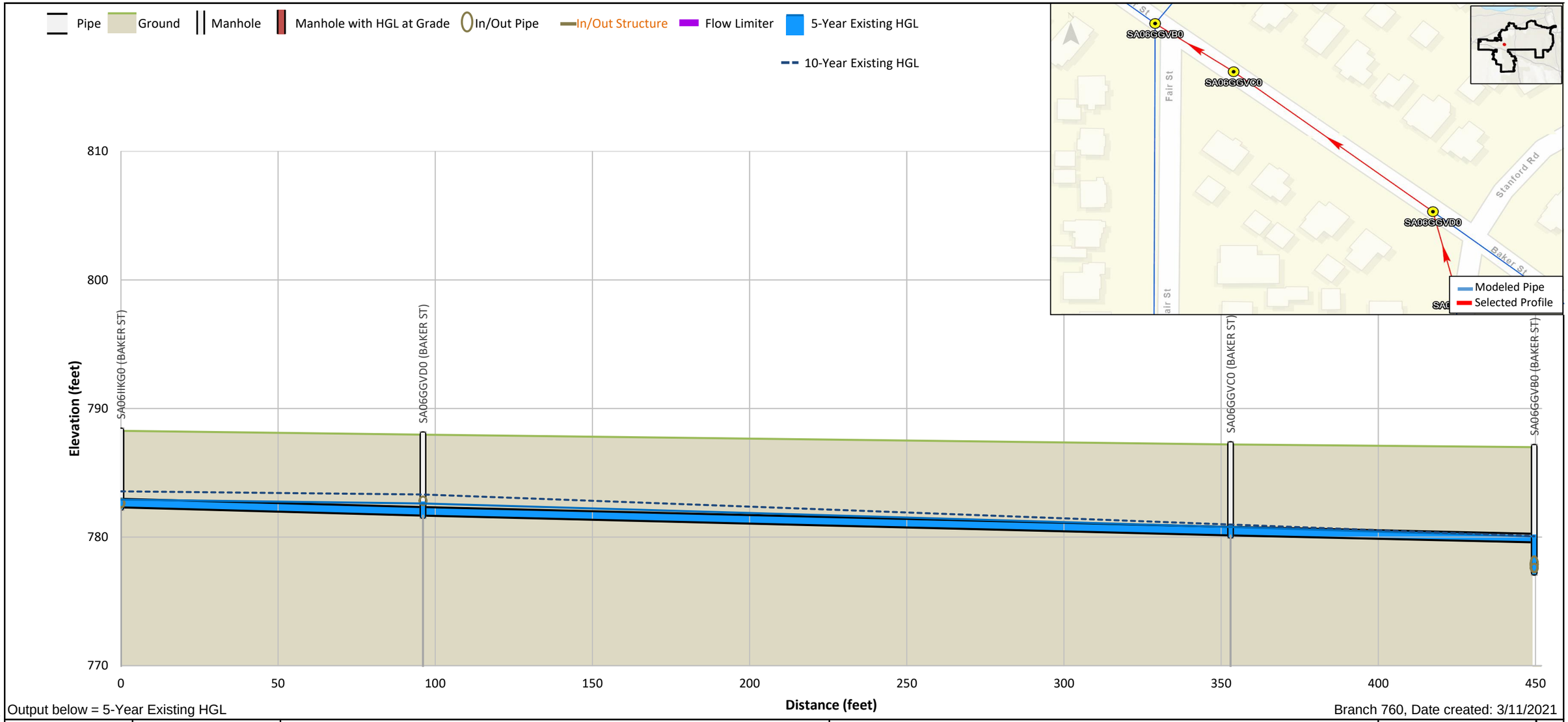
SWI-LSSES

PFA: BE-10
Community: Berea
BARRETT RD

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGL Profiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 760, Date created: 3/11/2021

Depth to Invert (ft)		6.3	7.1	
Depth to HGL (ft)		5.4	6.4	
Diameter (in)	8	8	8	8
Capacity (mgd)	0.58	0.55	0.53	
Max Depth (ft)	0.94	0.94	0.66	
Dep abv Crown (ft)	0.28	0.28	-	
Max Flow (mgd)	0.47	0.60	0.60	
Max Velocity (ft/s)	2.5	2.8	3.6	
Slope (ft/ft)	0.0067	0.0060	0.0056	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10, BE-09

Community: Berea

BAKER ST

Brown AND Caldwell

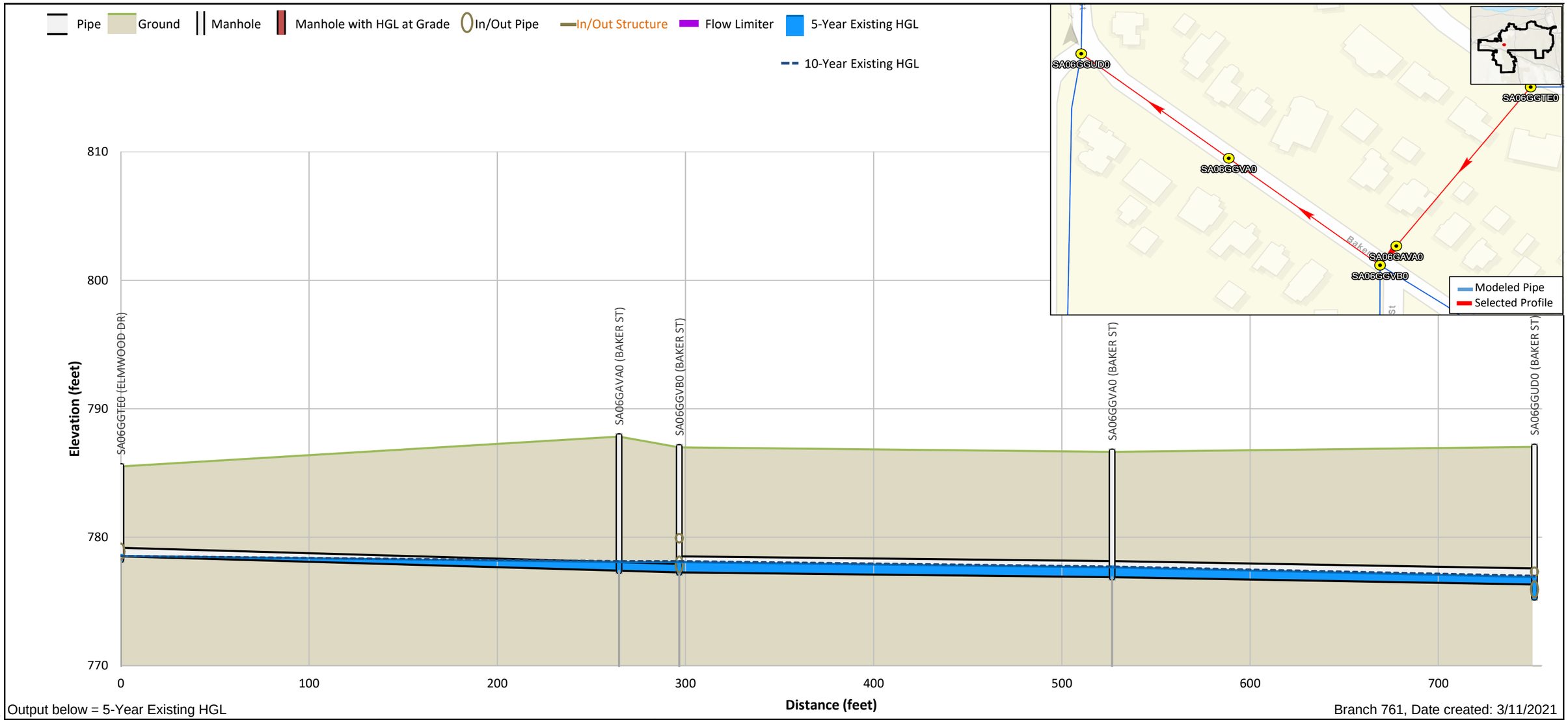
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 761, Date created: 3/11/2021

Depth to Invert (ft)			10		9.7		9.8			
Depth to HGL (ft)			9.8		8.9		9.0			
Diameter (in)	8		8		15		15			
Capacity (mgd)	0.46		0.46		1.5		1.9			
Max Depth (ft)	0.66		0.80		0.80		0.76			
Dep abv Crown (ft)	-		0.13		-		-			
Max Flow (mgd)	-0.03		-0.04		1.1		1.3			
Max Velocity (ft/s)	-0.17		-0.19		2.2		3.8			
Slope (ft/ft)	0.0042		0.0042		0.0016		0.0025			

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10
Community: Berea
ELMWOOD DR to BAKER ST

Brown AND Caldwell

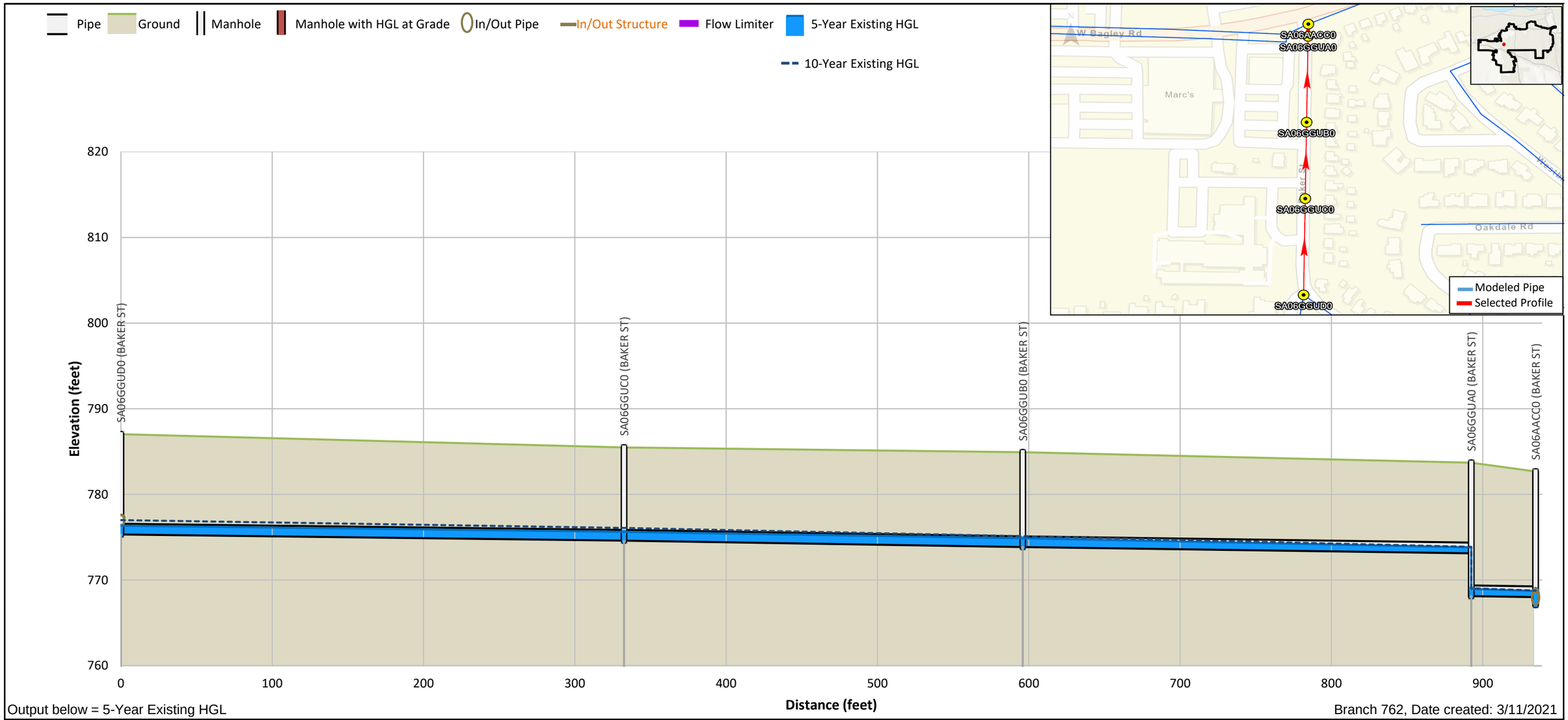
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 762, Date created: 3/11/2021

Depth to Invert (ft)		11	11	11	
Depth to HGL (ft)		9.9	10	9.9	
Diameter (in)	15	15	15	15	15
Capacity (mgd)	1.8	2.0	1.9	2.0	
Max Depth (ft)	1.0	1.0	1.0	0.85	
Dep abv Crown (ft)	-	-	-	-	
Max Flow (mgd)	1.7	2.0	2.0	2.0	
Max Velocity (ft/s)	2.5	2.8	4.3	4.3	
Slope (ft/ft)	0.0022	0.0028	0.0025	0.0027	

Northeast Ohio Regional Sewer District

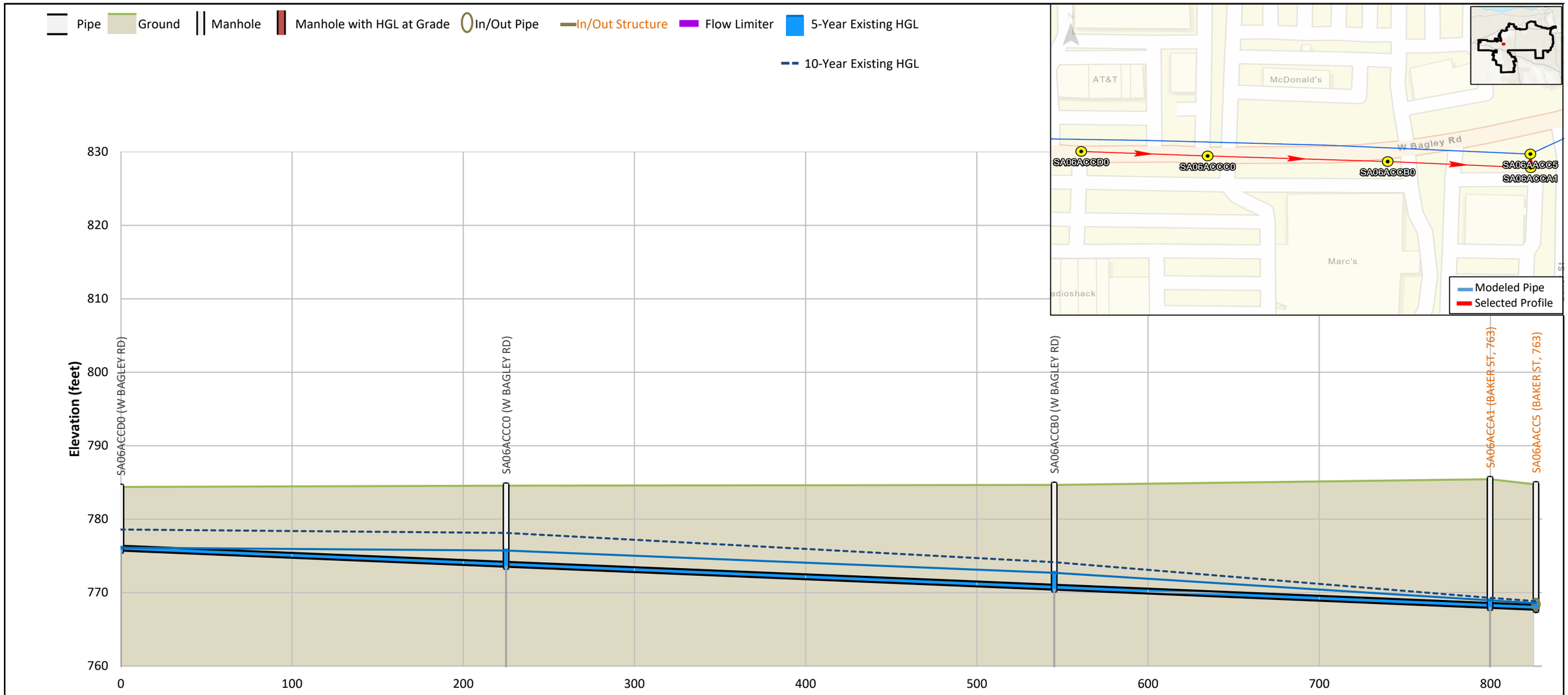
SWI-LSSES

PFA: BE-10
Community: Berea
BAKER ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 763, Date created: 3/11/2021

Depth to Invert (ft)		11	14	18	
Depth to HGL (ft)		8.8	12	16	
Diameter (in)	8	8	8	8	8
Capacity (mgd)	0.70	0.70	0.70	0.70	0.70
Max Depth (ft)	2.2	2.3	2.3	1.0	
Dep abv Crown (ft)	1.5	1.6	1.6	0.35	
Max Flow (mgd)	0.28	0.69	0.86	0.86	
Max Velocity (ft/s)	1.4	2.8	3.7	4.0	
Slope (ft/ft)	0.0097	0.0097	0.0097	0.0097	

Northeast Ohio Regional Sewer District

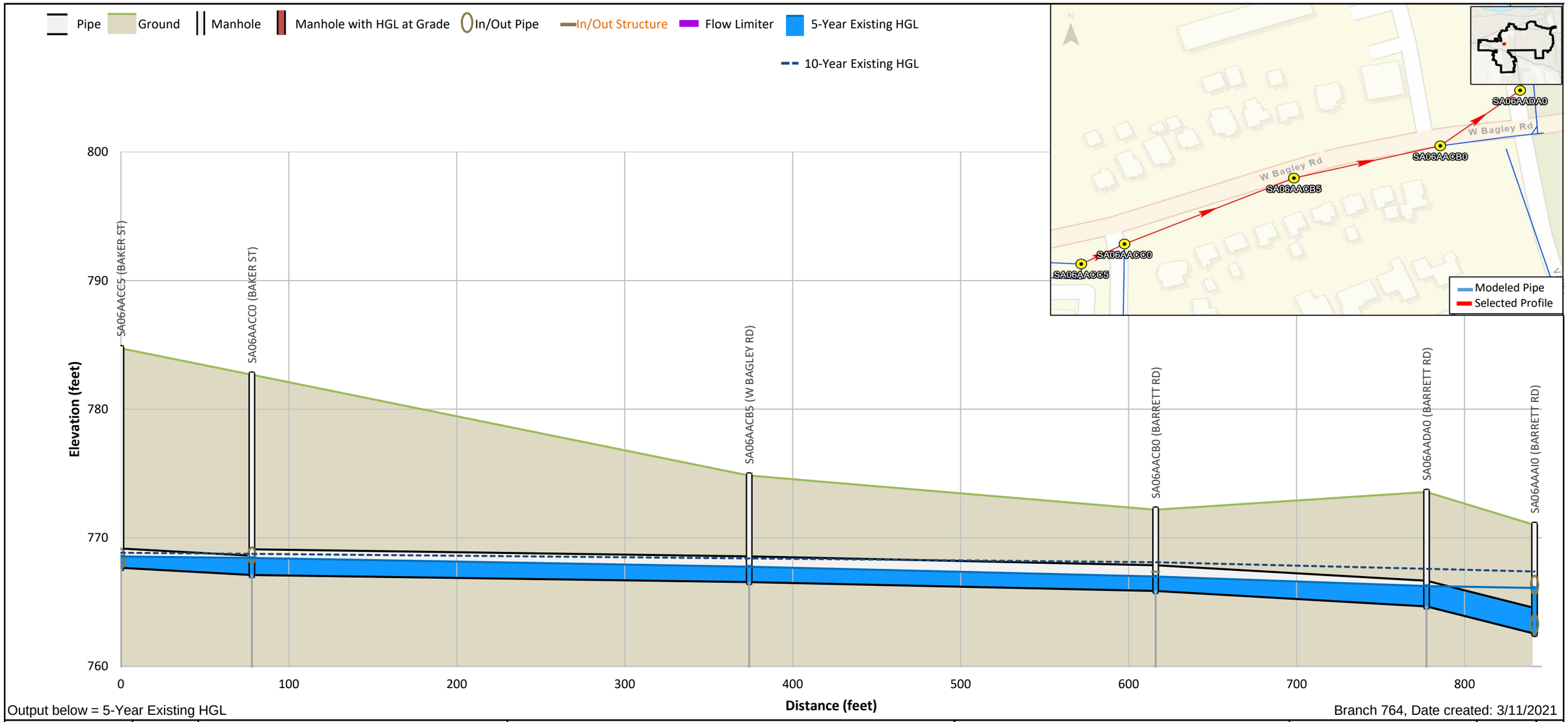
SWI-LSSES

PFA: BE-10
Community: Berea
W BAGLEY RD to BAKER ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 764, Date created: 3/11/2021

Depth to Invert (ft)		16		8.3		6.3		8.9				
Depth to HGL (ft)		14		7.1		5.2		7.3				
Diameter (in)	18		24		24		24		24		24	
Capacity (mgd)	5.2		4.8		6.0		9.7		20			
Max Depth (ft)	1.3		1.3		1.2		1.6		3.6			
Dep abv Crown (ft)	-		-		-		-		1.6			
Max Flow (mgd)	1.9		3.9		4.1		5.3		5.2			
Max Velocity (ft/s)	1.8		3.1		4.3		5.1		3.6			
Slope (ft/ft)	0.0072		0.0019		0.0029		0.0075		0.033			

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

BAKER ST to BARRETT RD

Brown AND Caldwell

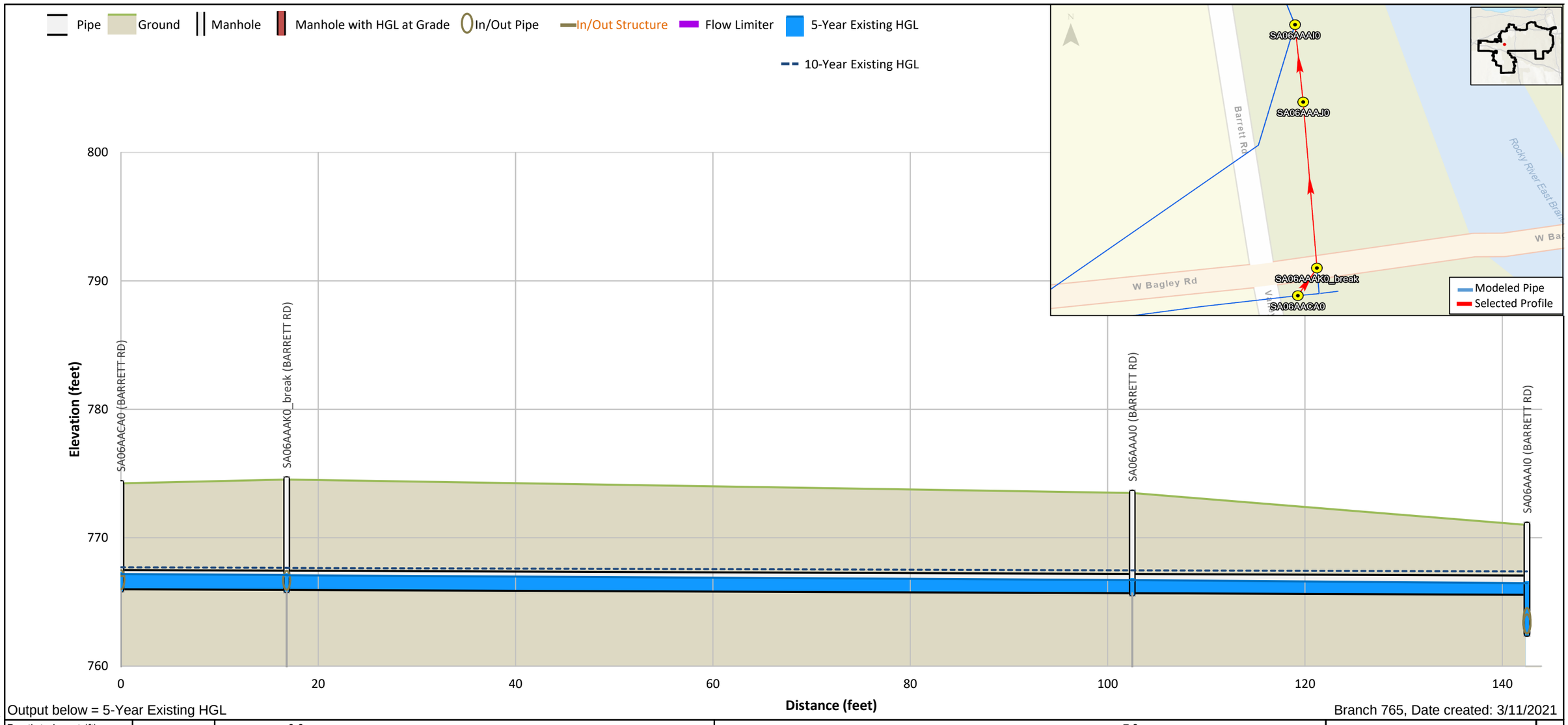
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 765, Date created: 3/11/2021

Depth to Invert (ft)		8.6	7.8	
Depth to HGL (ft)		7.4	6.8	
Diameter (in)	18	18	18	18
Capacity (mgd)	3.4	3.4	3.4	3.4
Max Depth (ft)	1.2	1.1	1.0	
Dep abv Crown (ft)	-	-	-	
Max Flow (mgd)	3.9	3.5	3.5	
Max Velocity (ft/s)	4.1	4.2	4.9	
Slope (ft/ft)	0.0030	0.0030	0.0030	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

BARRETT RD

Brown AND Caldwell

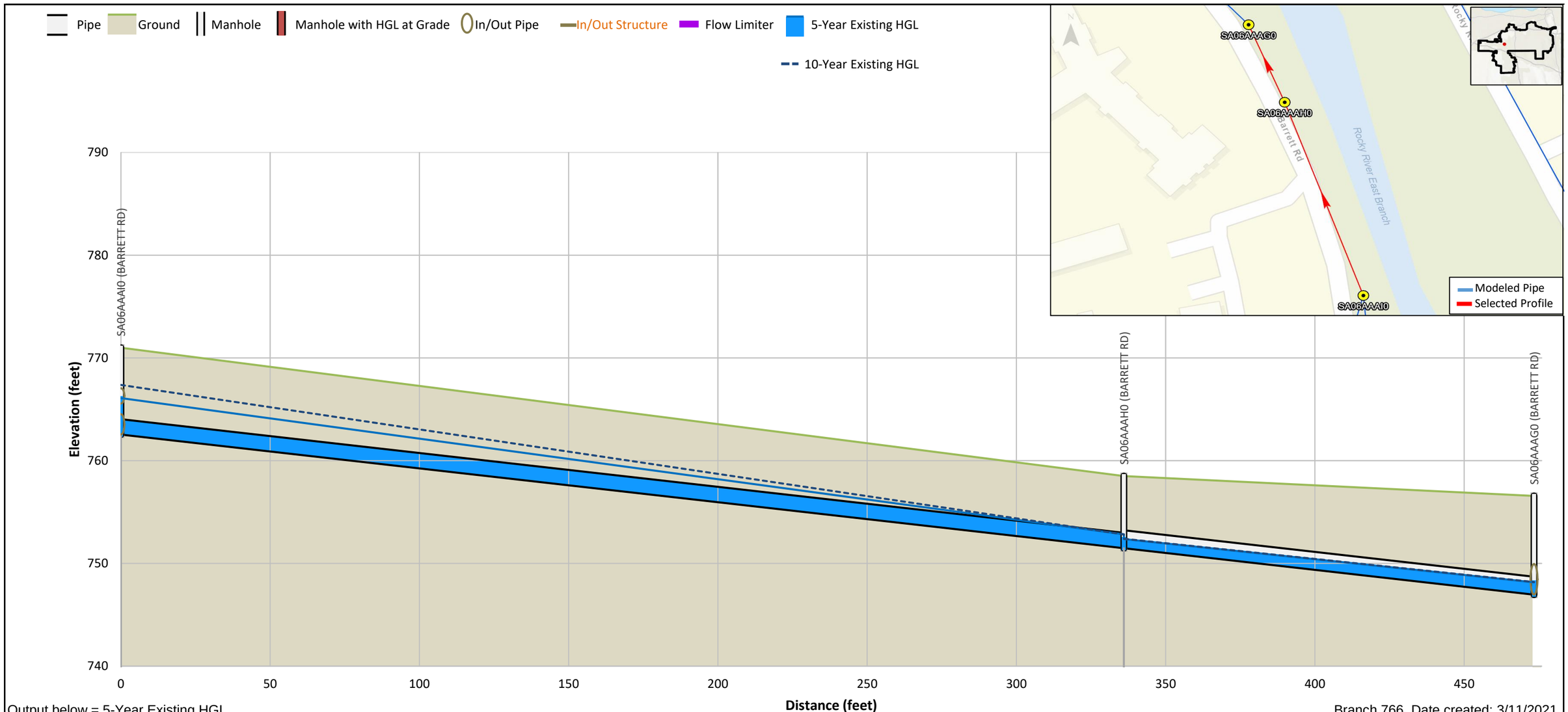
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 766, Date created: 3/11/2021

Depth to Invert (ft)		7.0	
Depth to HGL (ft)		5.7	
Diameter (in)	18		21
Capacity (mgd)	8.0		17
Max Depth (ft)	3.6		1.2
Dep abv Crown (ft)	2.1		-
Max Flow (mgd)	8.7		8.7
Max Velocity (ft/s)	8.1		7.7
Slope (ft/ft)	0.033		0.033

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

BARRETT RD

Brown AND Caldwell

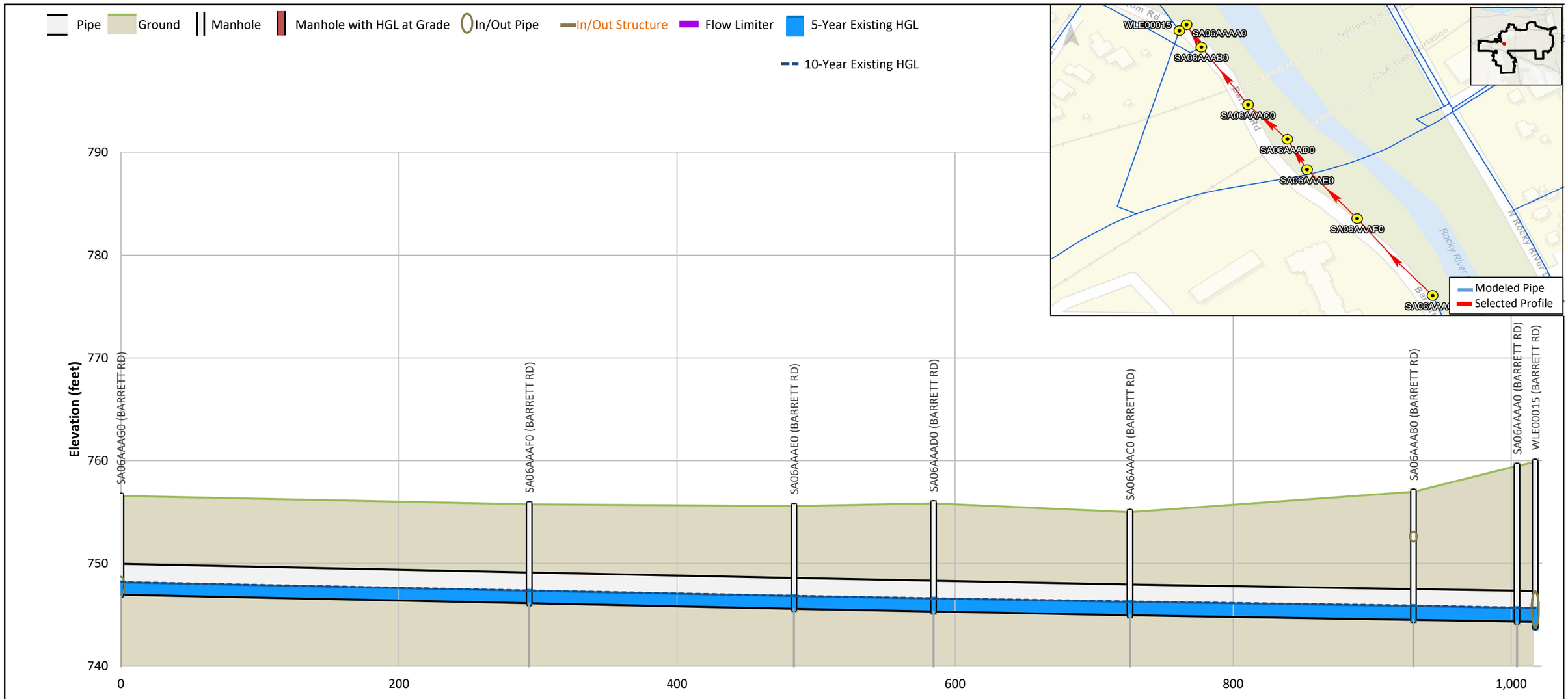
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 767, Date created: 3/11/2021

Depth to Invert (ft)		9.6	10	11	10	12	15	
Depth to HGL (ft)		8.4	8.8	9.3	8.7	11	14	
Diameter (in)	36	36	36	36	36	36	36	
Capacity (mgd)	27	27	26	26	24	24		
Max Depth (ft)	1.2	1.2	1.3	1.3	1.4	1.4		
Dep abv Crown (ft)	-	-	-	-	-	-		
Max Flow (mgd)	8.9	8.9	8.9	8.9	9.1	11		
Max Velocity (ft/s)	5.2	5.0	4.9	4.7	4.6	5.6		
Slope (ft/ft)	0.0028	0.0028	0.0026	0.0026	0.0022	0.0021		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10

Community: Berea

BARRETT RD

Brown AND Caldwell

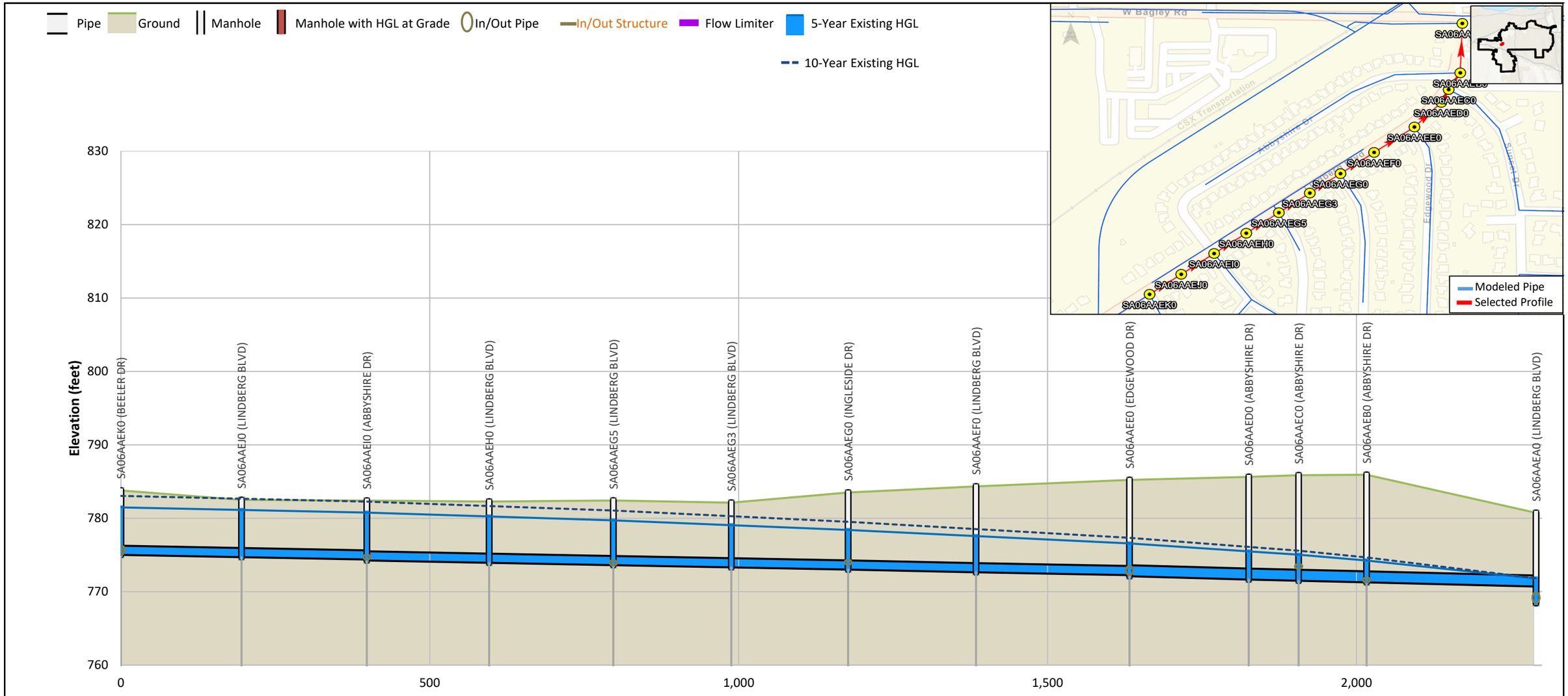
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://browncald-my.sharepoint.com/personal/jhatfield_browncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 771, Date created: 3/11/2021

Depth to Invert (ft)		7.8	8.0	8.3	8.8	8.8	10	12	13	14	14	15		
Depth to HGL (ft)		1.4	1.6	2.0	2.7	3.1	5.1	6.8	8.7	10	11	12		
Diameter (in)	15	15	15	15	15	15	15	15	15	18	18	18	18	
Capacity (mgd)	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.5	2.7	2.5	2.5	2.5		
Max Depth (ft)	6.5	6.4	6.5	6.3	6.1	5.7	5.4	4.9	4.5	3.8	3.5	3.0		
Dep abv Crown (ft)	5.2	5.2	5.3	5.1	4.9	4.5	4.1	3.7	3.0	2.3	2.0	1.5		
Max Flow (mgd)	1.6	1.6	2.0	2.0	2.2	2.2	2.4	2.4	4.2	4.2	4.7	5.1		
Max Velocity (ft/s)	2.3	2.2	2.2	2.1	2.3	2.3	2.5	2.6	3.3	3.4	3.8	5.8		
Slope (ft/ft)	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0018	0.0016	0.0023	0.0020	0.0020	0.0021		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10, BE-13

Community: Berea

BEELER DR to LINDBERG BLVD

Brown AND Caldwell

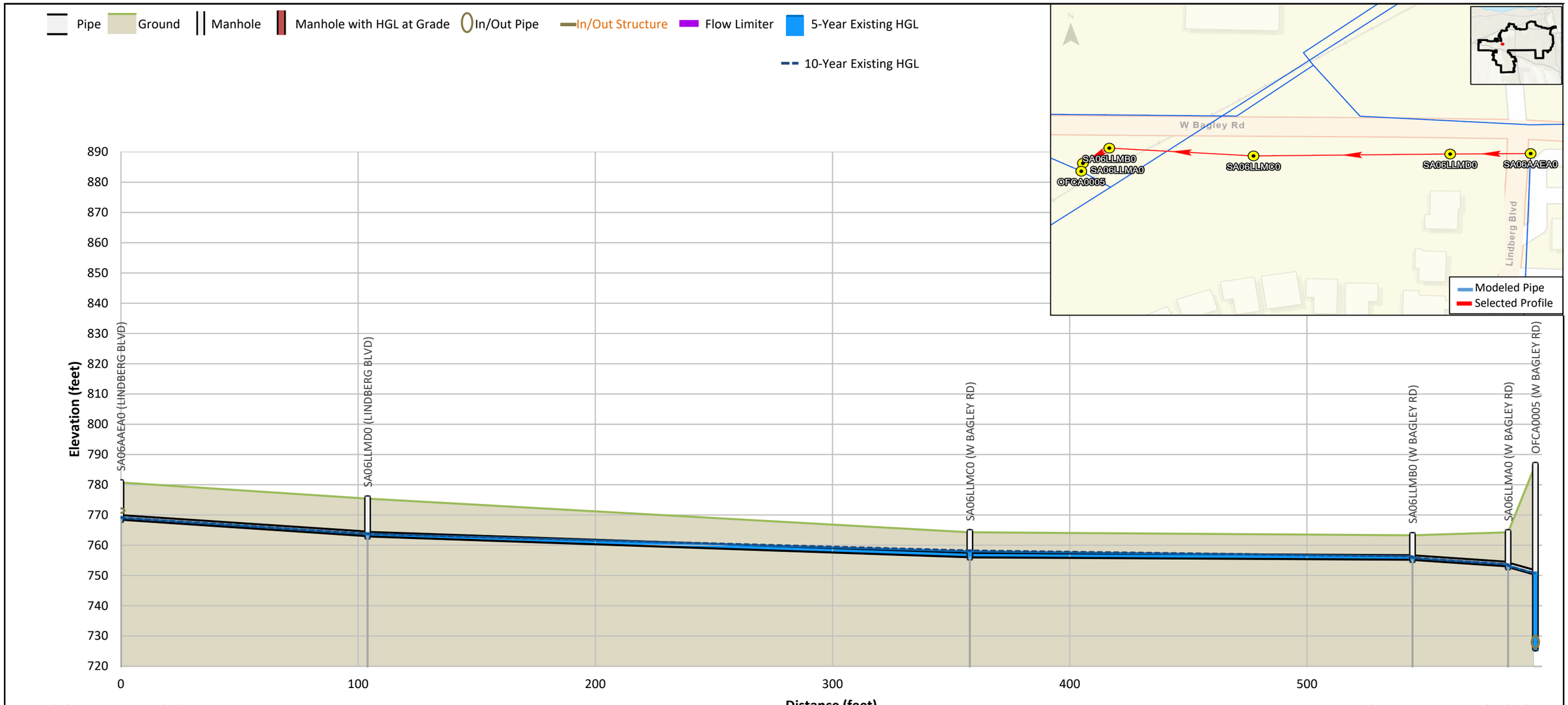
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 805, Date created: 3/11/2021

Depth to Invert (ft)		12		8.3		8.1	11					
Depth to HGL (ft)		12		6.3		7.0	11					
Diameter (in)	18		18		18		18					
Capacity (mgd)	13		9.1		3.6		13					
Max Depth (ft)	0.72		1.9		2.0		0.66					
Dep abv Crown (ft)	-		0.45		0.49		-					
Max Flow (mgd)	5.1		5.1		5.1		5.1					
Max Velocity (ft/s)	9.7		4.3		5.8		11					
Slope (ft/ft)	0.052		0.027		0.0042		0.053					

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10
Community: Berea
LINDBERG BLVD to W BAGLEY RD

Brown AND Caldwell

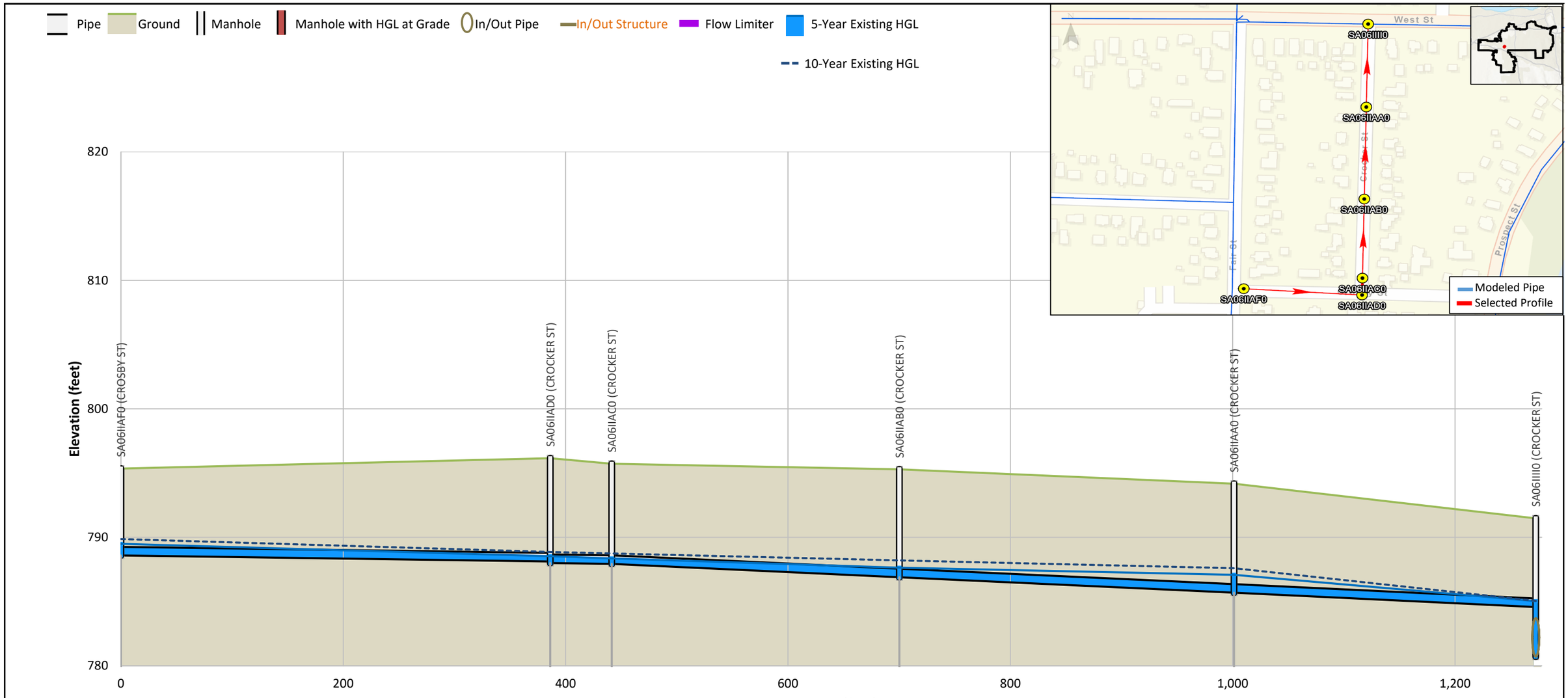
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 1134, Date created: 3/11/2021

Depth to Invert (ft)			8.0		7.8		8.4		8.5		
Depth to HGL (ft)			7.6		7.4		7.7		7.1		
Diameter (in)	8		8		8		8		8		8
Capacity (mgd)	0.25		0.25		0.45		0.45		0.46		
Max Depth (ft)	0.91		0.53		0.75		1.4		1.4		
Dep abv Crown (ft)	0.24		-		0.08		0.72		0.72		
Max Flow (mgd)	0.34		0.34		0.31		0.33		0.61		
Max Velocity (ft/s)	2.5		2.2		2.1		1.4		3.7		
Slope (ft/ft)	0.0012		0.0012		0.0040		0.0040		0.0041		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10
Community: Berea
CROSBY ST to CROCKER ST

Brown AND Caldwell

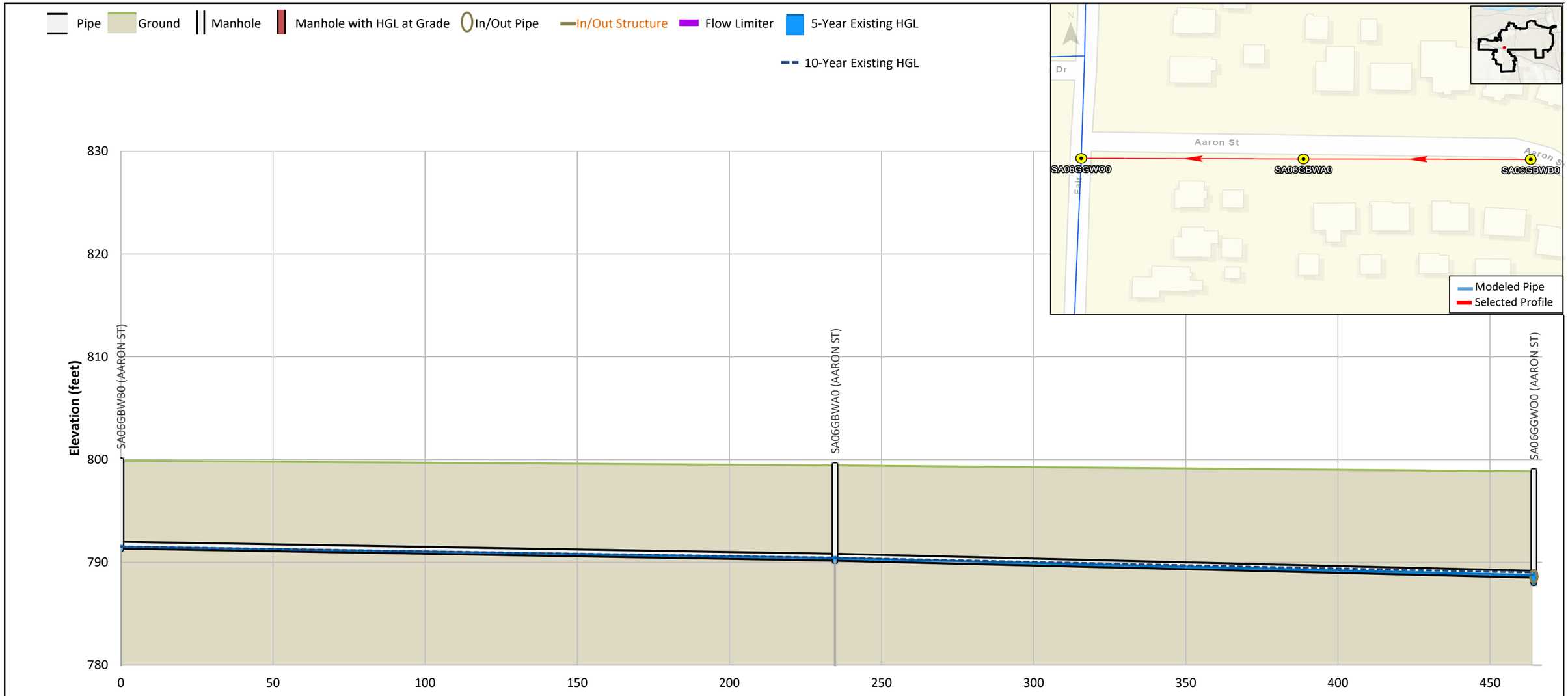
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 1145, Date created: 3/11/2021

Depth to Invert (ft)		9.3	
Depth to HGL (ft)		9.0	
Diameter (in)	8		8
Capacity (mgd)	0.50		0.60
Max Depth (ft)	0.26		0.26
Dep abv Crown (ft)	-		-
Max Flow (mgd)	0.08		0.19
Max Velocity (ft/s)	1.0		2.4
Slope (ft/ft)	0.0050		0.0072

Northeast Ohio Regional Sewer District

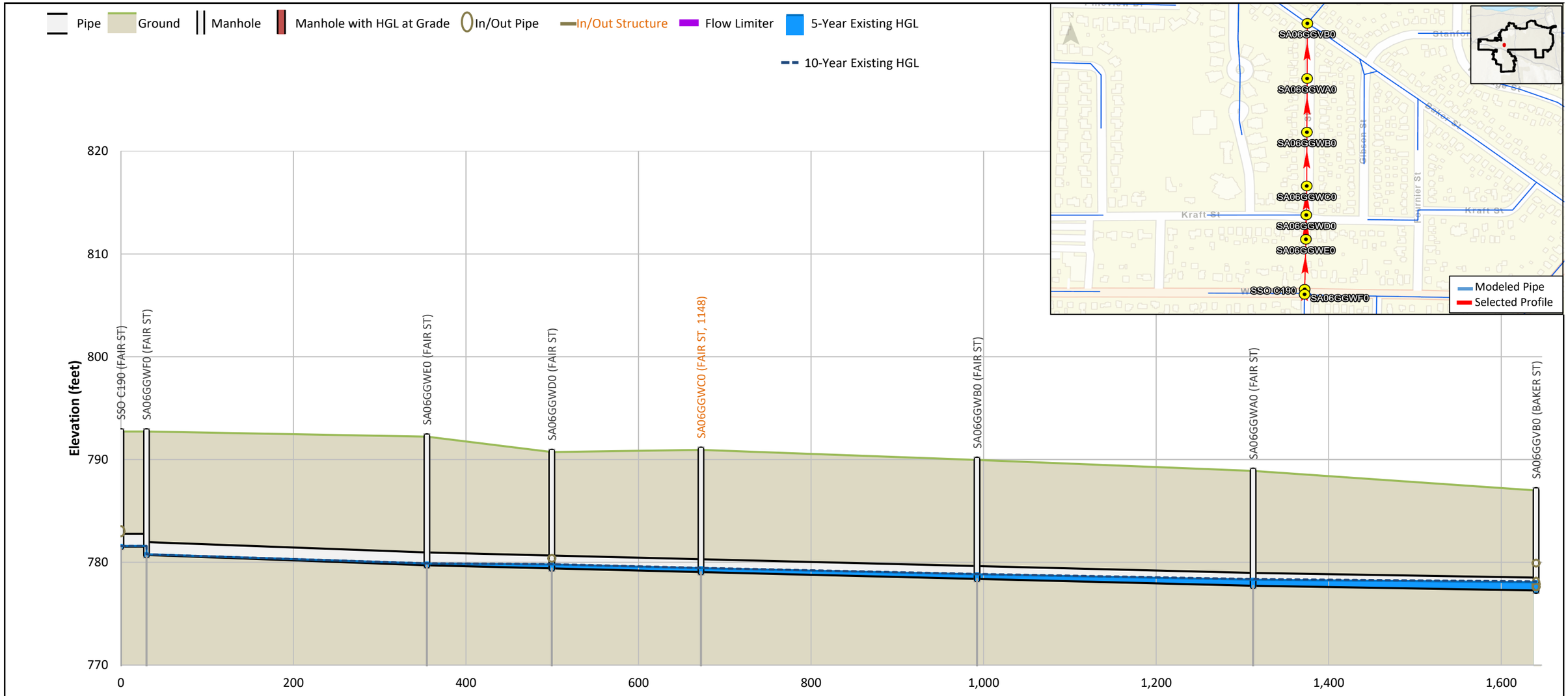
SWI-LSSES

PFA: BE-10
Community: Berea
AARON ST

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 1148, Date created: 3/11/2021

Depth to Invert (ft)	11	13	11	12	12	11		
Depth to HGL (ft)	11	12	11	12	11	11		
Diameter (in)	15	15	15	15	15	15	15	
Capacity (mgd)	2.1	1.7	1.7	1.7	1.7	1.7	1.4	
Max Depth (ft)	0.18	0.38	0.38	0.45	0.59	0.80		
Dep abv Crown (ft)	-	-	-	-	-	-		
Max Flow (mgd)	0.00	0.06	0.34	0.34	0.46	0.62		
Max Velocity (ft/s)	-0.02	0.29	1.7	1.3	1.3	1.5		
Slope (ft/ft)	0.0031	0.0021	0.0021	0.0021	0.0021	0.0014		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10
Community: Berea
FAIR ST to BAKER ST

Brown AND Caldwell

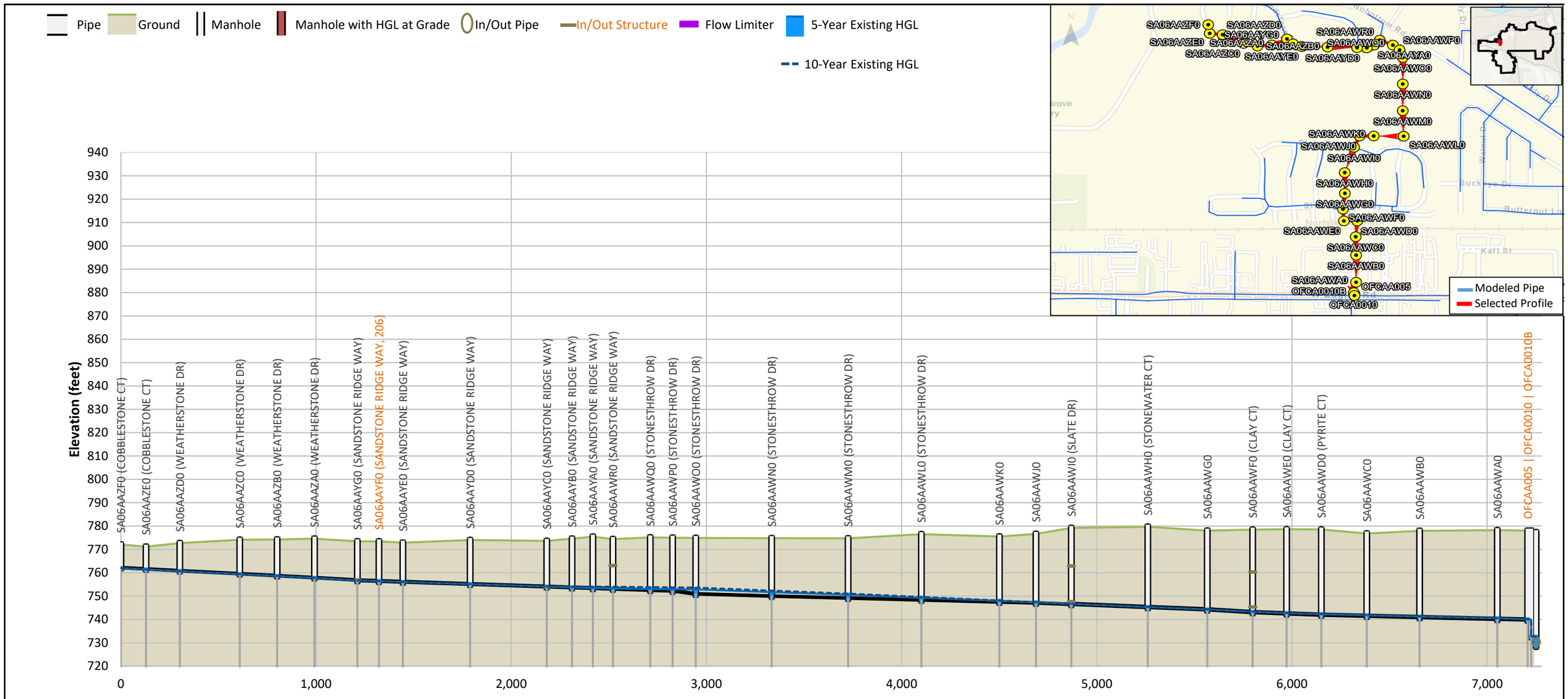
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

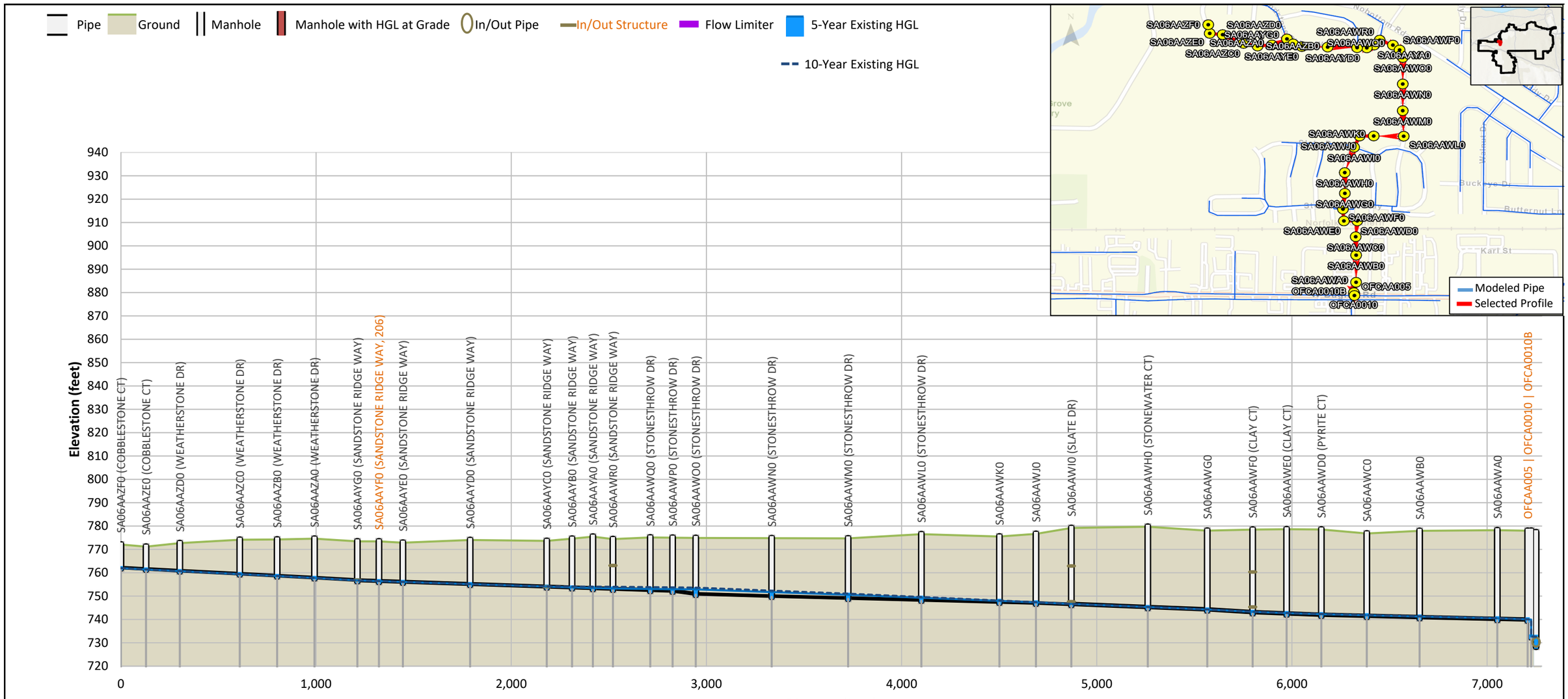
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Output below = 5-Year Existing HGL

Branch 206, Date created: 3/11/2021

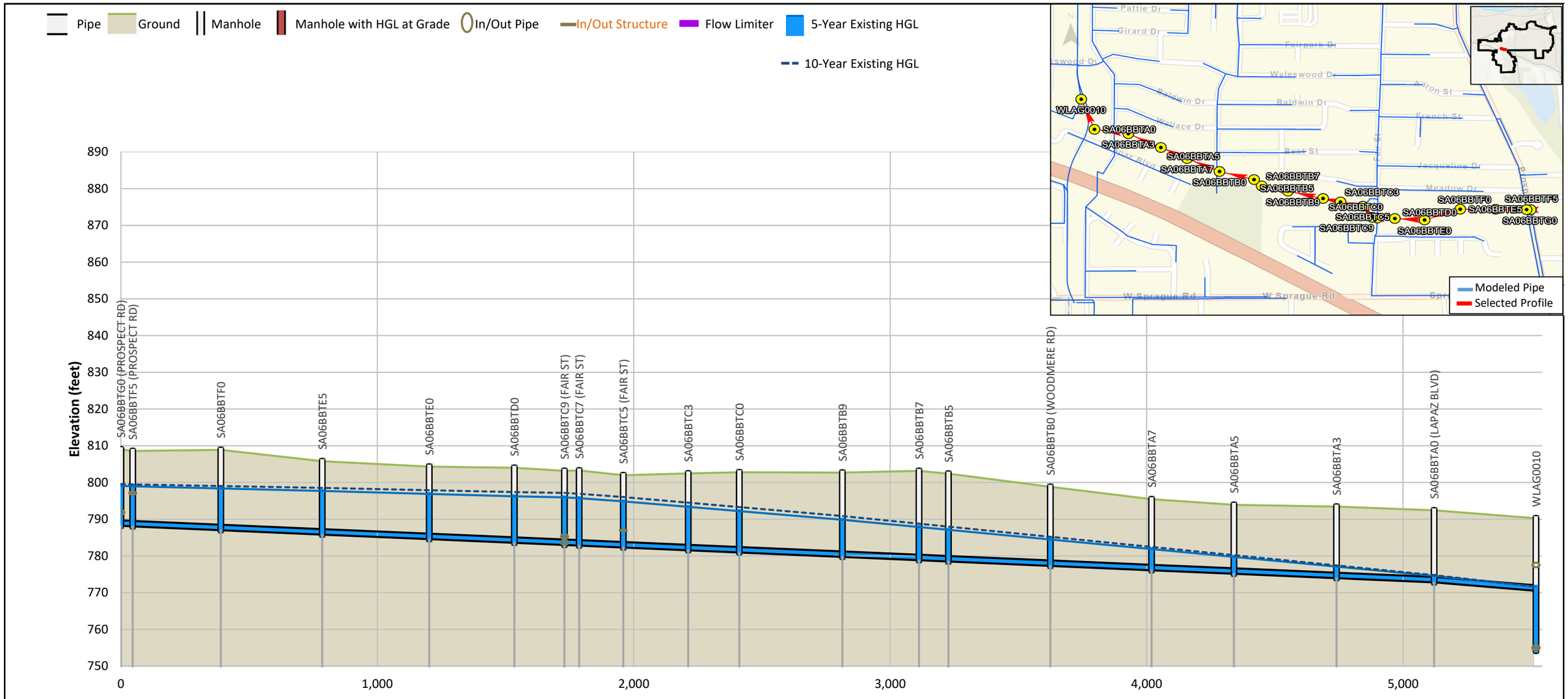
| | | |



Output below = 5-Year Existing HGL

Branch 206, Date created: 3/11/2021

| | | |



Output below = 5-Year Existing HGL

Branch 718, Date created: 3/11/2021

Depth to Invert (ft)		22	20	20	20	20 20	20	21	22	23	24	24	22	19	19	19	20		
Depth to HGL (ft)		11	8.1	7.4	7.8	7.27.5	7.1	9.1	11	13	15	15	14	14	14	16	18		
Diameter (in)	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Capacity (mgd)	3.4	3.4	3.4	3.4	3.9	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.3	3.4	3.4	4.7		
Max Depth (ft)	11	12	12	13	13	13	13	12	11	10	9.0	8.6	7.2	5.8	4.6	3.1	1.8		
Dep abv Crown (ft)	9.9	10	11	11	11	11	11	10	9.8	8.6	7.5	7.1	5.7	4.3	3.1	1.6	0.27		
Max Flow (mgd)	3.5	3.1	3.1	3.1	3.0	4.8	4.7	4.7	4.7	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.2		
Max Velocity (ft/s)	3.5	3.2	3.4	2.5	1.9	3.5	3.6	3.5	3.3	3.6	3.6	3.5	3.7	3.8	4.0	4.5	5.8		
Slope (ft/ft)	0.0030	0.0030	0.0029	0.0030	0.0030	0.0031	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0029	0.0030	0.0030	0.0058		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-09, BE-13
Community: Berea
PROSPECT RD to Manhole WLAG0010

Brown AND Caldwell

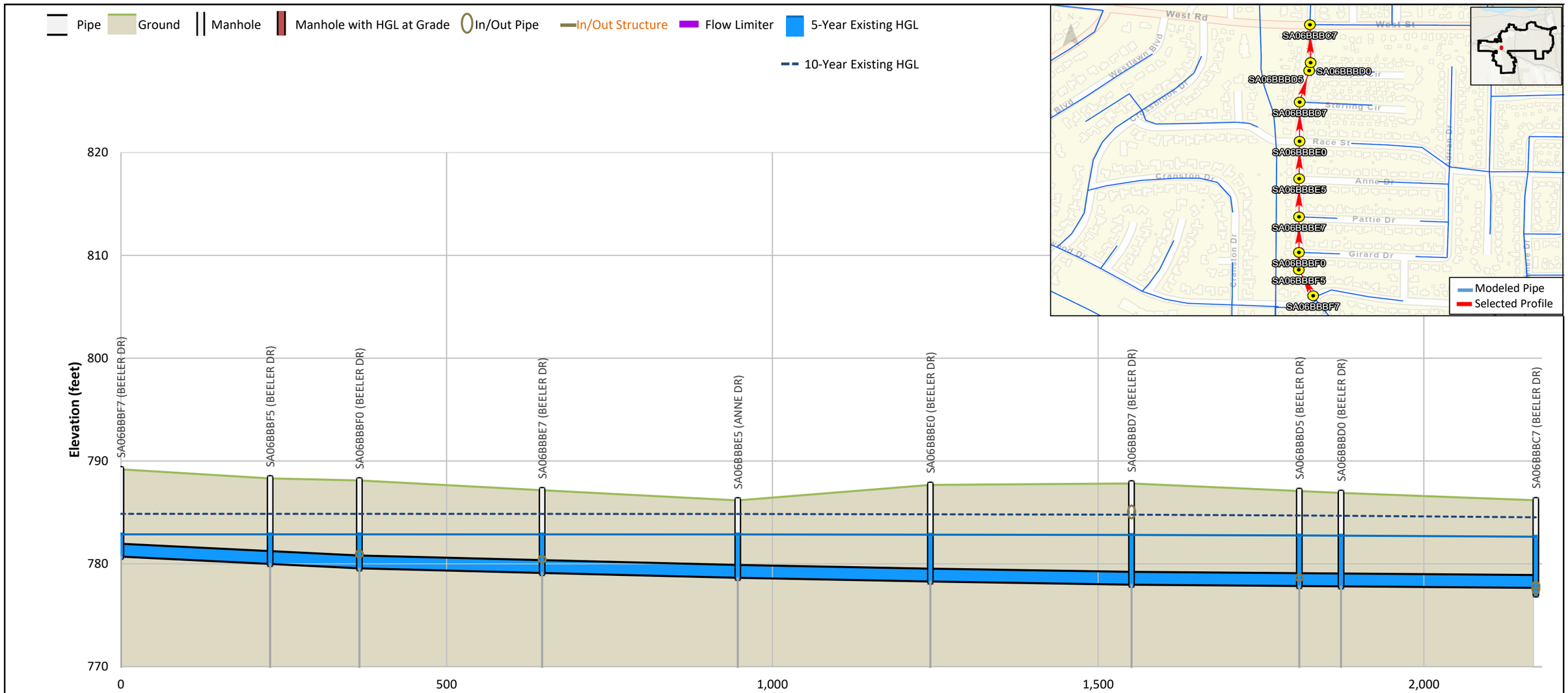
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 768, Date created: 3/11/2021

Depth to Invert (ft)		8.3	8.5	8.0	7.5	9.4	9.8	9.2	9.1	
Depth to HGL (ft)		5.4	5.2	4.3	3.3	4.8	5.0	4.3	4.2	
Diameter (in)	15	15	15	15	15	15	15	15	15	15
Capacity (mgd)	2.1	2.1	1.5	1.5	1.3	1.2	0.85	0.85	0.85	
Max Depth (ft)	2.9	3.3	3.8	4.2	4.6	4.8	4.9	4.9	5.0	
Dep abv Crown (ft)	1.6	2.1	2.5	3.0	3.3	3.6	3.7	3.7	3.7	
Max Flow (mgd)	-0.35	-0.51	-0.57	-0.60	0.64	0.50	0.86	1.0	0.95	
Max Velocity (ft/s)	1.3	-0.64	0.95	-0.73	1.4	0.70	1.3	1.6	3.3	
Slope (ft/ft)	0.0031	0.0031	0.0016	0.0016	0.0012	0.0010	0.00050	0.00050	0.00049	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13

Community: Berea

BEELER DR

Brown AND Caldwell

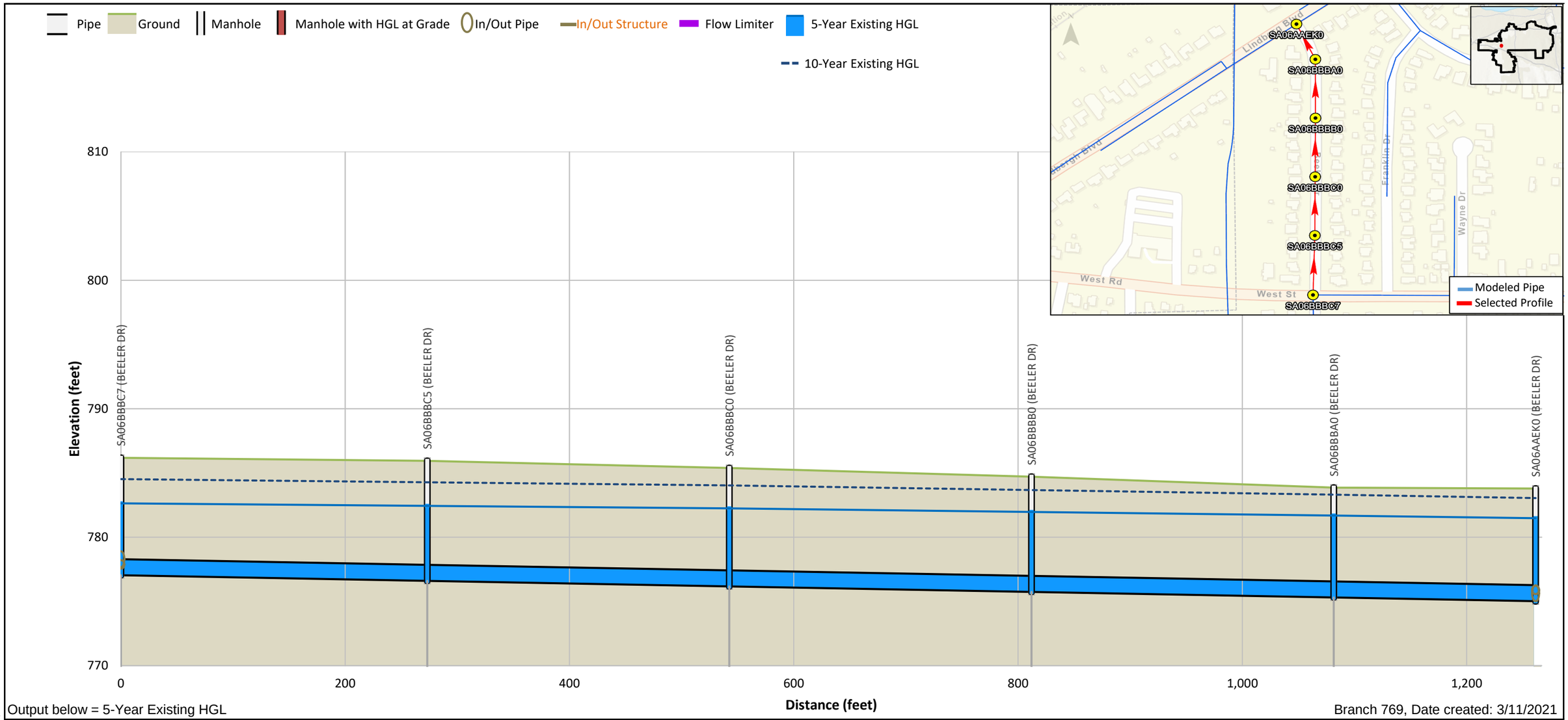
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 769, Date created: 3/11/2021

Depth to Invert (ft)		9.3	9.2	9.0	8.6	
Depth to HGL (ft)		3.5	3.1	2.7	2.2	
Diameter (in)	15	15	15	15	15	15
Capacity (mgd)	1.5	1.5	1.5	1.5	1.5	1.5
Max Depth (ft)	5.8	6.1	6.2	6.4	6.5	
Dep abv Crown (ft)	4.6	4.8	5.0	5.1	5.2	
Max Flow (mgd)	1.5	1.3	1.6	1.3	1.4	
Max Velocity (ft/s)	2.2	1.7	2.3	2.0	1.8	
Slope (ft/ft)	0.0016	0.0016	0.0016	0.0016	0.0016	

Northeast Ohio Regional Sewer District

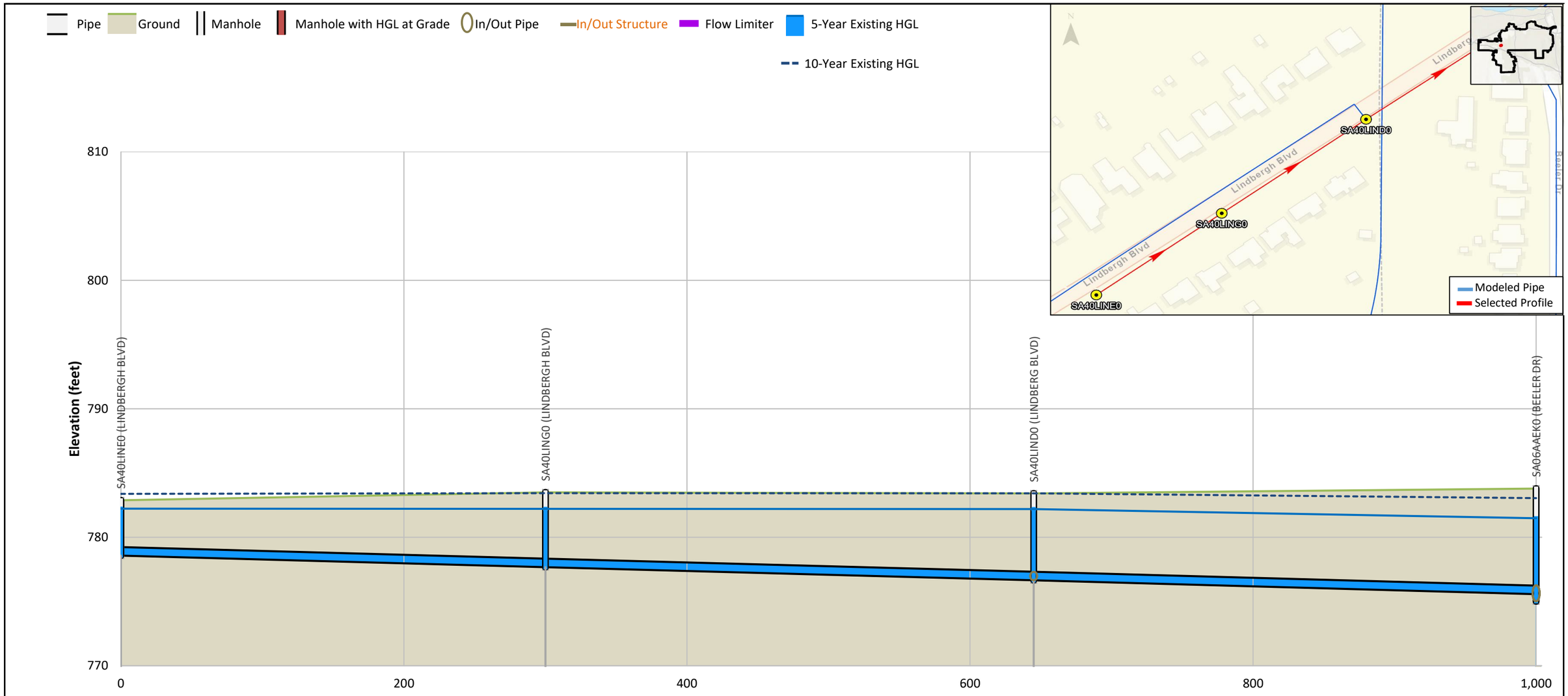
SWI-LSSES

PFA: BE-13
Community: Berea
BEELER DR

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 770, Date created: 3/11/2021

Depth to Invert (ft)		5.8	6.8	
Depth to HGL (ft)		1.3	1.2	
Diameter (in)	8	8	8	8
Capacity (mgd)	0.39	0.39	0.39	0.39
Max Depth (ft)	4.5	5.5	5.9	
Dep abv Crown (ft)	3.9	4.9	5.2	
Max Flow (mgd)	0.12	-0.11	0.44	
Max Velocity (ft/s)	1.5	-0.36	3.2	
Slope (ft/ft)	0.0030	0.0030	0.0030	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: OF-02, BE-13
Community: Olmsted Falls, Berea
LINDBERGH BLVD to BEELER DR

Brown AND Caldwell

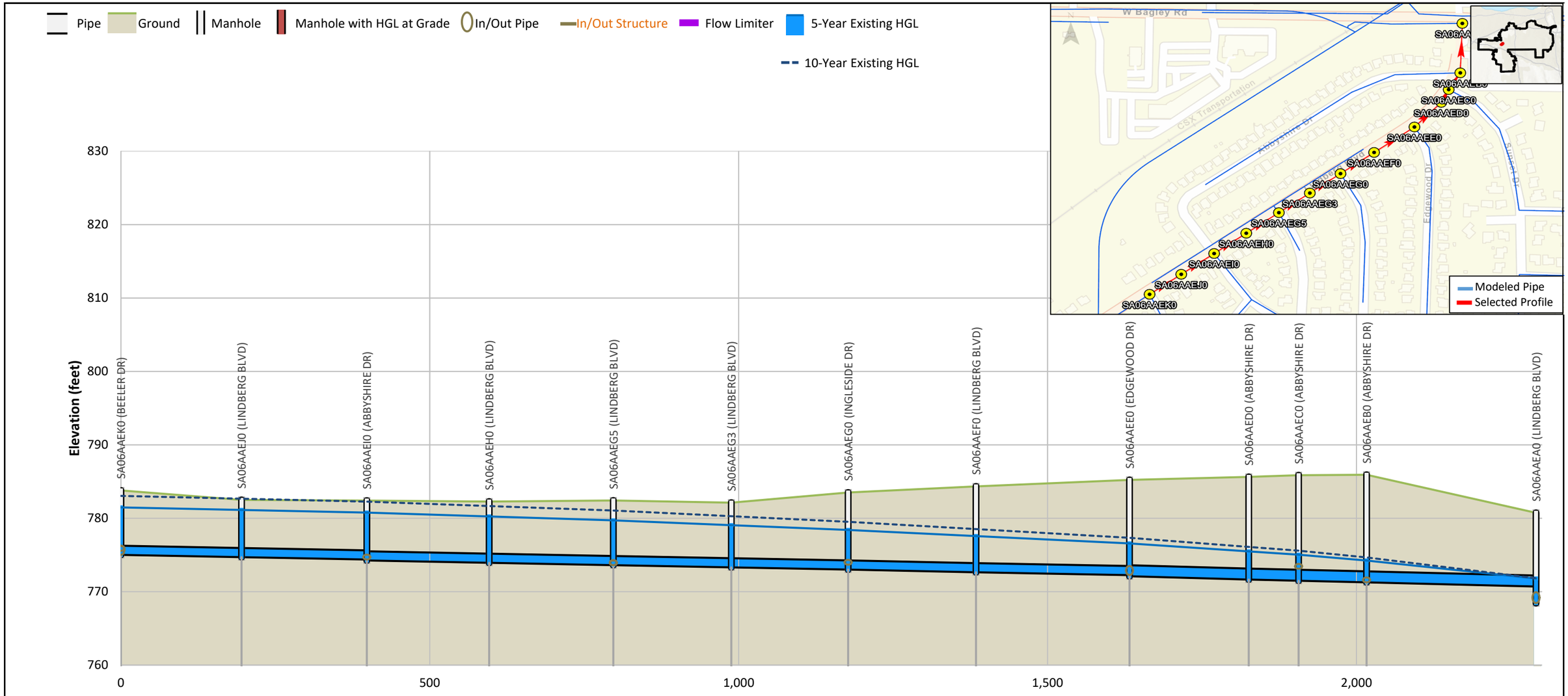
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/DesktopHGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 771, Date created: 3/11/2021

Depth to Invert (ft)		7.8	8.0	8.3	8.8	8.8	10	12	13	14	14	15		
Depth to HGL (ft)		1.4	1.6	2.0	2.7	3.1	5.1	6.8	8.7	10	11	12		
Diameter (in)	15	15	15	15	15	15	15	15	15	18	18	18	18	
Capacity (mgd)	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.5	2.7	2.5	2.5	2.5		
Max Depth (ft)	6.5	6.4	6.5	6.3	6.1	5.7	5.4	4.9	4.5	3.8	3.5	3.0		
Dep abv Crown (ft)	5.2	5.2	5.3	5.1	4.9	4.5	4.1	3.7	3.0	2.3	2.0	1.5		
Max Flow (mgd)	1.6	1.6	2.0	2.0	2.2	2.2	2.4	2.4	4.2	4.2	4.7	5.1		
Max Velocity (ft/s)	2.3	2.2	2.2	2.1	2.3	2.3	2.5	2.6	3.3	3.4	3.8	5.8		
Slope (ft/ft)	0.0016	0.0016	0.0016	0.0016	0.0016	0.0016	0.0018	0.0016	0.0023	0.0020	0.0020	0.0021		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-10, BE-13

Community: Berea

BEELER DR to LINDBERG BLVD

Brown AND Caldwell

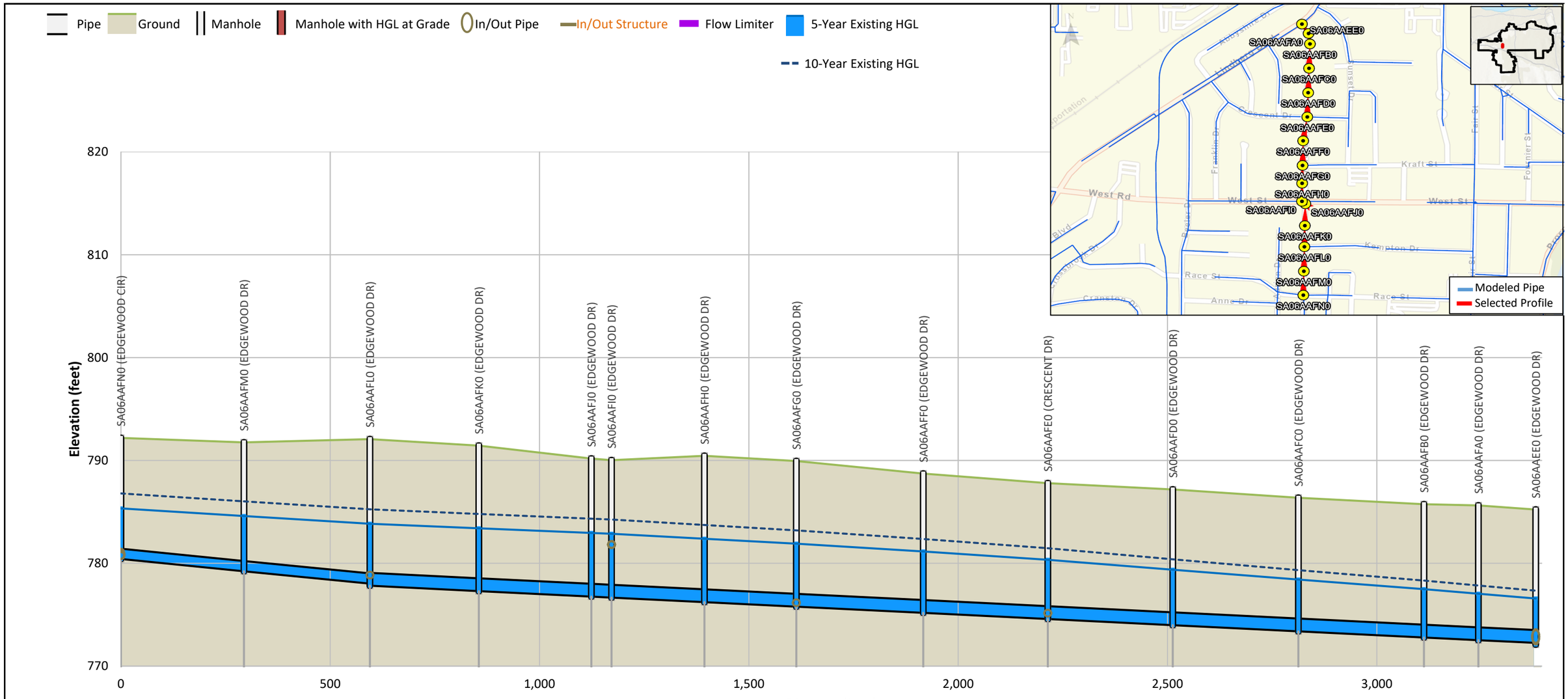
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 772, Date created: 3/11/2021

Depth to Invert (ft)		13	14	14	13	13	14	14	14	13	13	13	13	13		
Depth to HGL (ft)		7.2	8.2	8.0	7.2	7.2	8.1	8.0	7.6	7.5	7.8	8.0	8.3	8.6		
Diameter (in)	12	12	15	15		15	15	15	15	15	15	15	15	15	15	
Capacity (mgd)	1.5	1.5	1.4	1.3		1.3	1.4	1.3	1.4	1.4	1.4	1.4	1.4	1.3		
Max Depth (ft)	5.4	5.8	6.1	6.2		6.2	6.2	6.1	6.0	5.8	5.4	5.0	4.7	4.5		
Dep abv Crown (ft)	4.4	4.8	4.9	4.9		5.0	4.9	4.9	4.7	4.5	4.1	3.8	3.5	3.3		
Max Flow (mgd)	1.5	1.4	1.6	1.4		1.6	1.4	1.5	1.6	1.8	1.8	1.8	1.9	1.9		
Max Velocity (ft/s)	3.3	3.0	2.1	1.8		2.1	1.7	1.8	1.8	2.2	2.1	1.9	2.0	2.3		
Slope (ft/ft)	0.0041	0.0040	0.0020	0.0020		0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020	0.0019		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13
Community: Berea
EDGEWOOD CIR to EDGEWOOD DR

Brown AND Caldwell

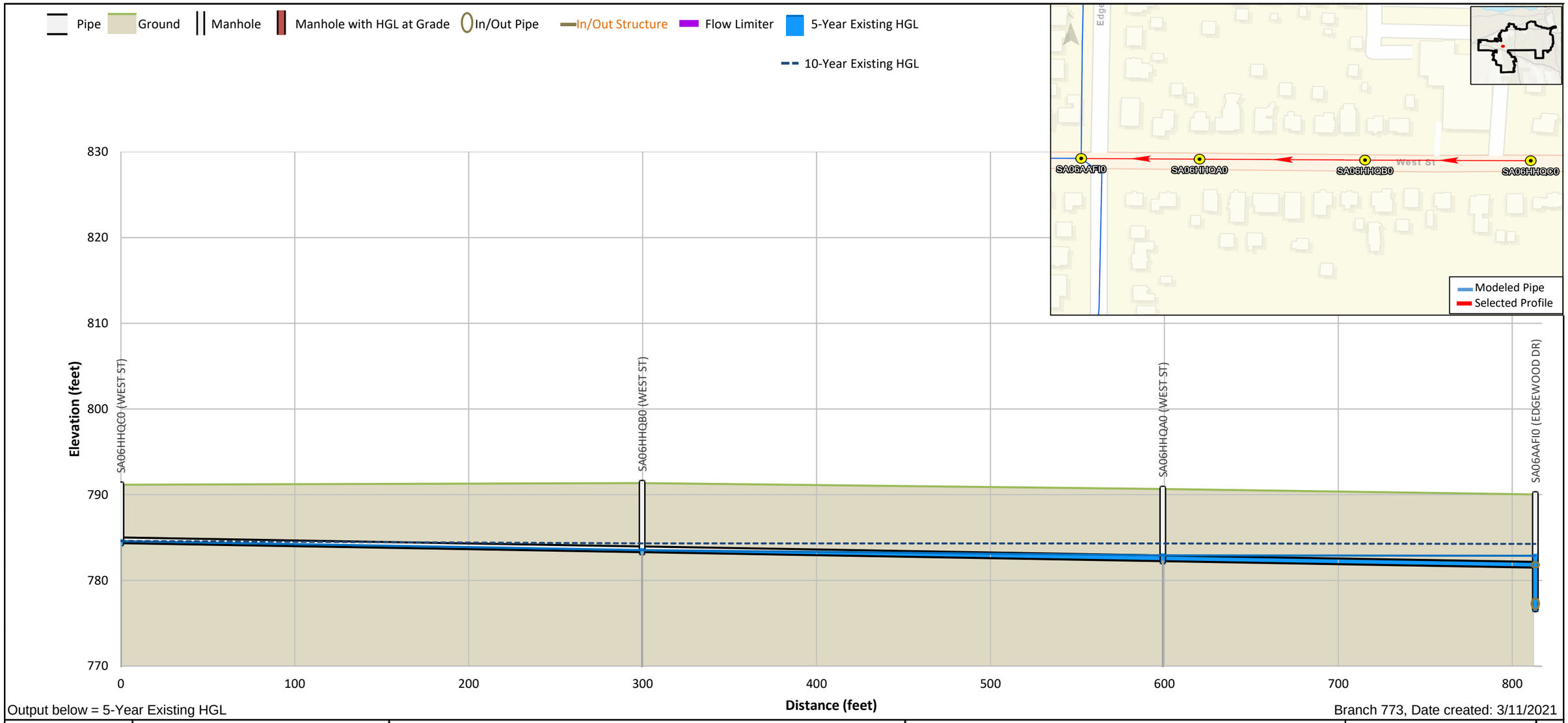
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 773, Date created: 3/11/2021

Depth to Invert (ft)		8.1	8.4	
Depth to HGL (ft)		7.8	7.7	
Diameter (in)	8	8	8	8
Capacity (mgd)	0.42	0.42	0.42	0.42
Max Depth (ft)	0.24	0.68	1.4	
Dep abv Crown (ft)	-	0.01	0.71	
Max Flow (mgd)	0.11	0.12	0.32	
Max Velocity (ft/s)	1.6	0.77	2.9	
Slope (ft/ft)	0.0035	0.0035	0.0035	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13
Community: Berea
WEST ST to EDGEWOOD DR

Brown AND Caldwell

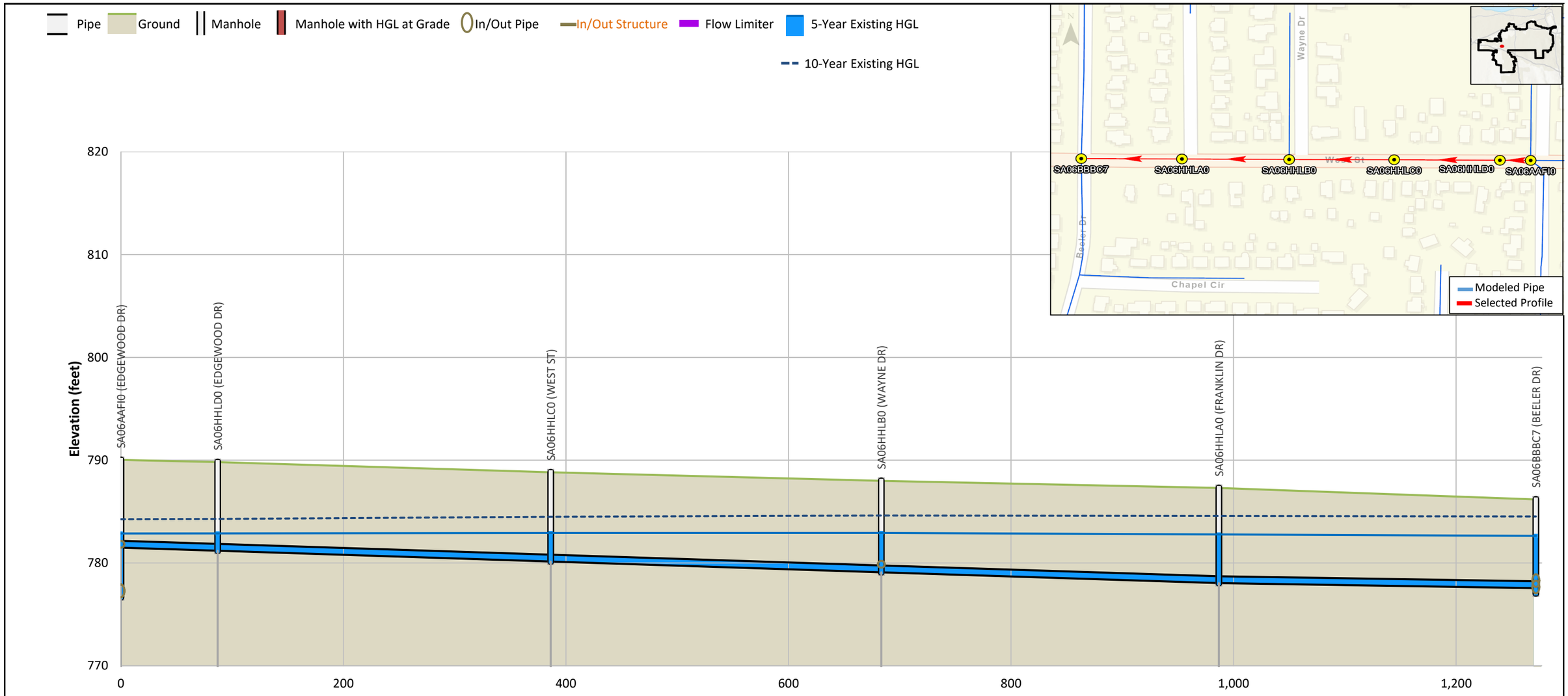
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 774, Date created: 3/11/2021

Depth to Invert (ft)		8.6	8.7	8.9	9.3	
Depth to HGL (ft)		6.9	5.9	5.1	4.5	
Diameter (in)	8	8	8	8	8	8
Capacity (mgd)	0.42	0.42	0.42	0.42	0.42	0.29
Max Depth (ft)	1.7	2.8	3.8	4.7	5.1	
Dep abv Crown (ft)	1.0	2.1	3.2	4.1	4.4	
Max Flow (mgd)	-0.18	-0.20	0.15	0.46	0.42	
Max Velocity (ft/s)	-0.80	-0.68	0.62	1.8	3.0	
Slope (ft/ft)	0.0034	0.0035	0.0035	0.0035	0.0017	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13
Community: Berea
EDGEWOOD DR to BEELER DR

Brown AND Caldwell

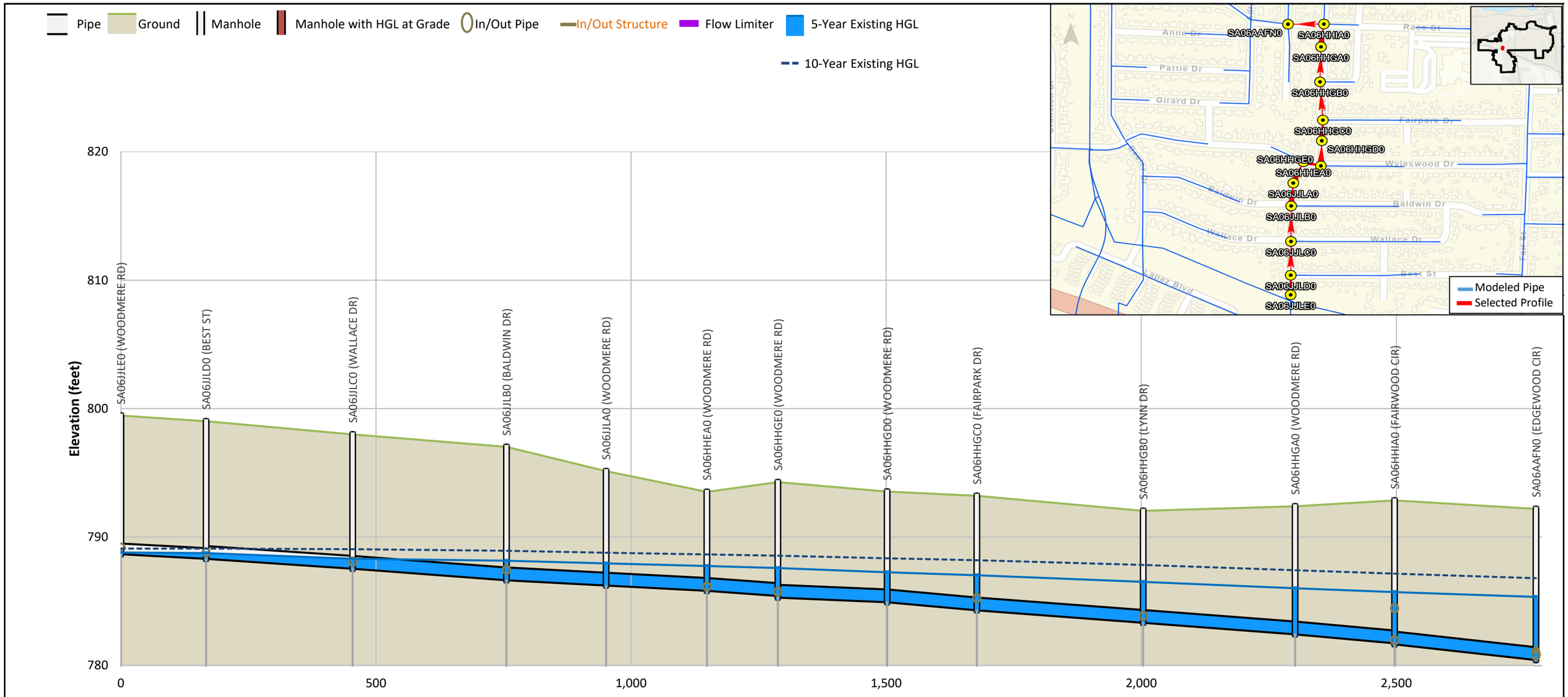
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/DesktopHGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 775, Date created: 3/11/2021

Depth to Invert (ft)		11	10	10	8.9	7.7	8.9	8.6	8.9	8.7	10.0	11	
Depth to HGL (ft)		10	9.7	8.9	7.2	5.8	6.7	6.3	6.2	5.5	6.4	7.1	
Diameter (in)	10	12	12	12	12	12	12	12	12	12	12	12	12
Capacity (mgd)	0.60	1.0	1.1	0.91	0.91	1.1	0.82	1.2	1.1	1.1	1.2	1.5	
Max Depth (ft)	0.45	0.78	1.5	1.7	1.9	2.2	2.3	2.7	3.2	3.6	4.0	4.9	
Dep abv Crown (ft)	-	-	0.53	0.73	0.93	1.2	1.3	1.7	2.2	2.6	3.0	3.9	
Max Flow (mgd)	0.03	0.42	0.61	0.91	0.83	0.80	0.97	0.89	1.1	1.2	1.1	1.2	
Max Velocity (ft/s)	0.18	1.4	1.3	2.1	2.1	2.1	2.6	1.8	2.1	2.8	3.2	2.1	
Slope (ft/ft)	0.0022	0.0027	0.0030	0.0021	0.0021	0.0029	0.0017	0.0036	0.0030	0.0030	0.0036	0.0044	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13
Community: Berea
WOODMERE RD to EDGEWOOD CIR

Brown AND Caldwell

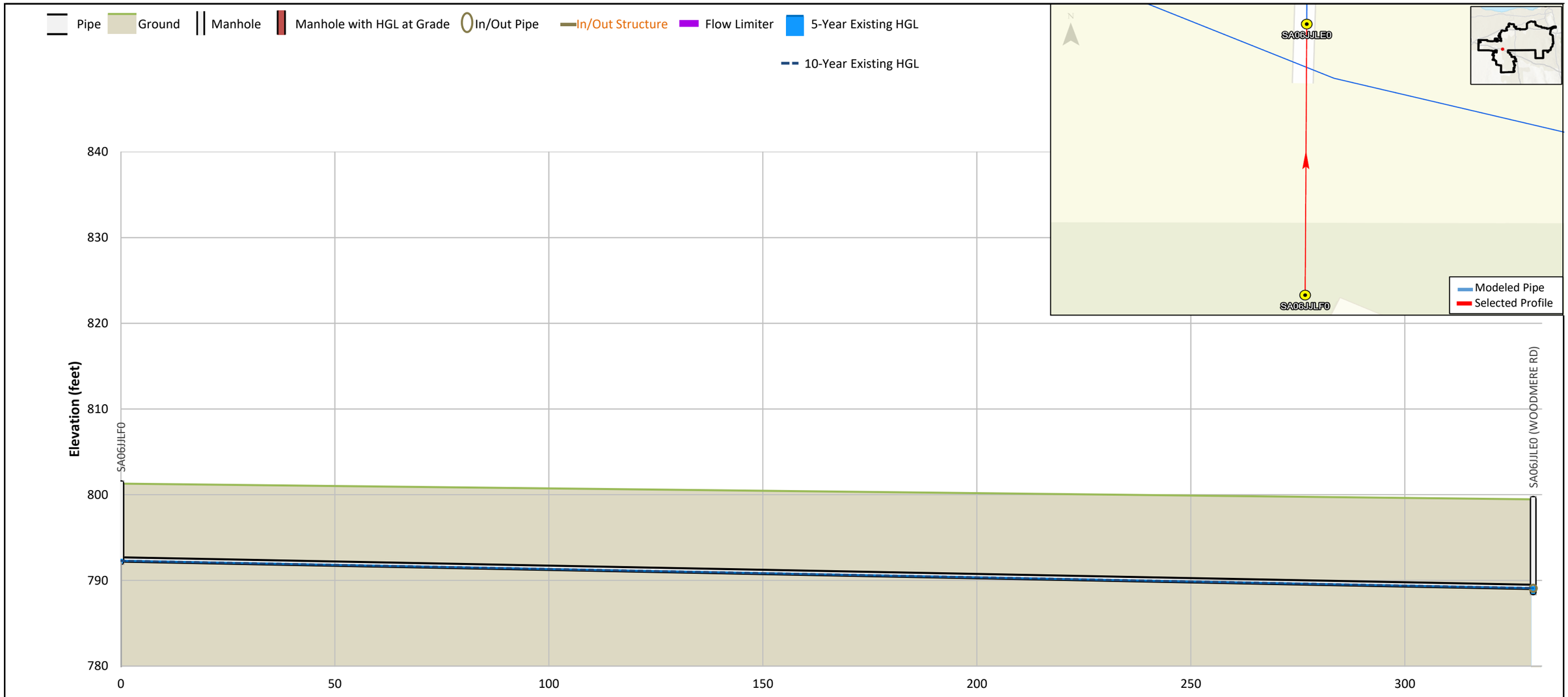
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

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Output below = 5-Year Existing HGL

Branch 776, Date created: 3/11/2021

Depth to Invert (ft)	
Depth to HGL (ft)	
Diameter (in)	6
Capacity (mgd)	0.32
Max Depth (ft)	0.10
Dep abv Crown (ft)	-
Max Flow (mgd)	0.03
Max Velocity (ft/s)	1.4
Slope (ft/ft)	0.0097

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13
Community: Berea
Manhole SA06JJLF0 to WOODMERE RD

Brown AND Caldwell

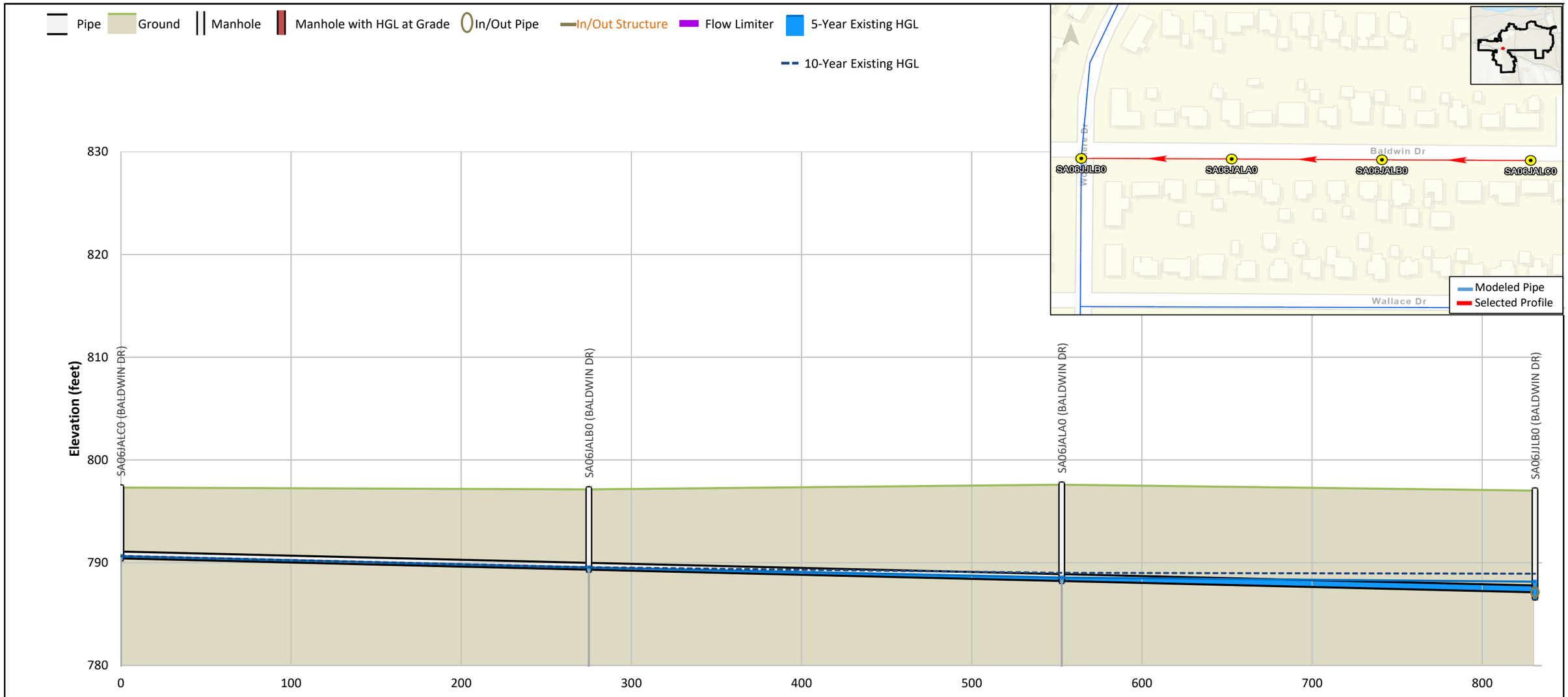
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 777, Date created: 3/11/2021

Depth to Invert (ft)		7.8	9.4	
Depth to HGL (ft)		7.6	9.0	
Diameter (in)	8	8	8	
Capacity (mgd)	0.45	0.45	0.45	
Max Depth (ft)	0.23	0.34	1.0	
Dep abv Crown (ft)	-	-	0.37	
Max Flow (mgd)	0.11	0.11	0.22	
Max Velocity (ft/s)	1.6	0.93	2.5	
Slope (ft/ft)	0.0040	0.0040	0.0040	

Northeast Ohio Regional Sewer District

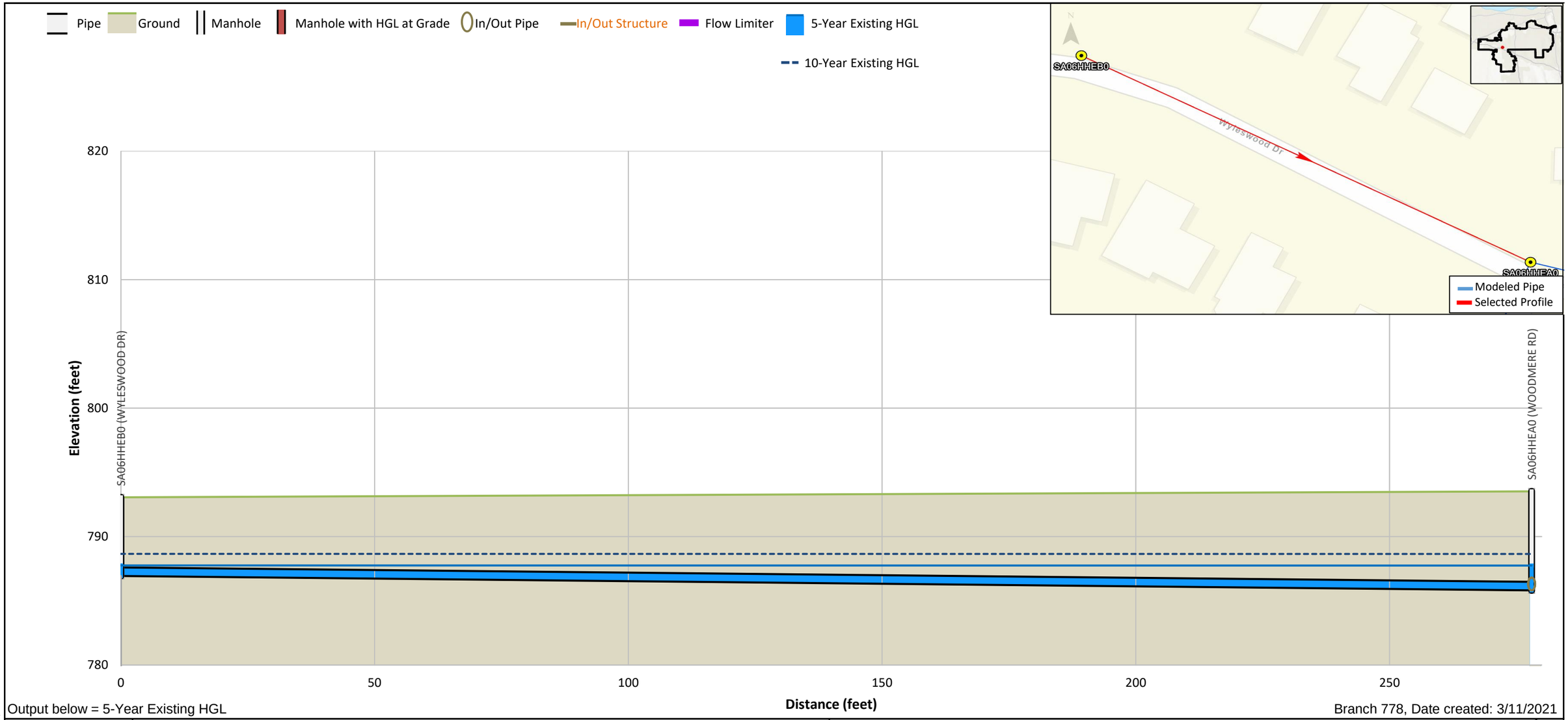
SWI-LSSES

PFA: BE-13
Community: Berea
BALDWIN DR

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 778, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	0.45	
Max Depth (ft)	1.9	
Dep abv Crown (ft)	1.3	
Max Flow (mgd)	0.07	
Max Velocity (ft/s)	0.35	
Slope (ft/ft)	0.0040	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13
Community: Berea
WYLESWOOD DR to WOODMERE RD

Brown AND Caldwell

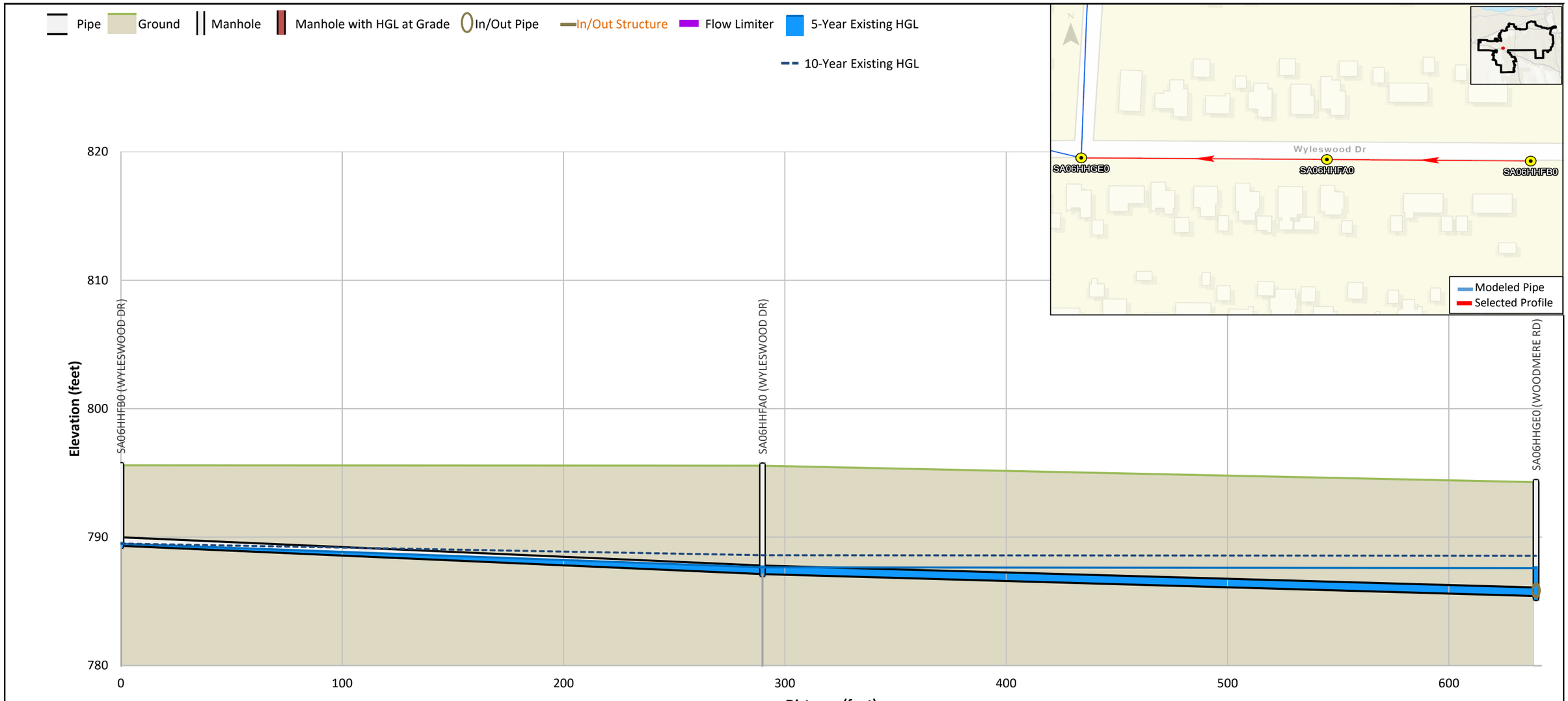
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 779, Date created: 3/11/2021

Depth to Invert (ft)		8.4	
Depth to HGL (ft)		7.9	
Diameter (in)	8		8
Capacity (mgd)	0.62		0.50
Max Depth (ft)	0.53		2.2
Dep abv Crown (ft)	-		1.5
Max Flow (mgd)	0.08		0.17
Max Velocity (ft/s)	0.82		1.1
Slope (ft/ft)	0.0076		0.0049

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13

Community: Berea

WYLESWOOD DR to WOODMERE RD

Brown AND Caldwell

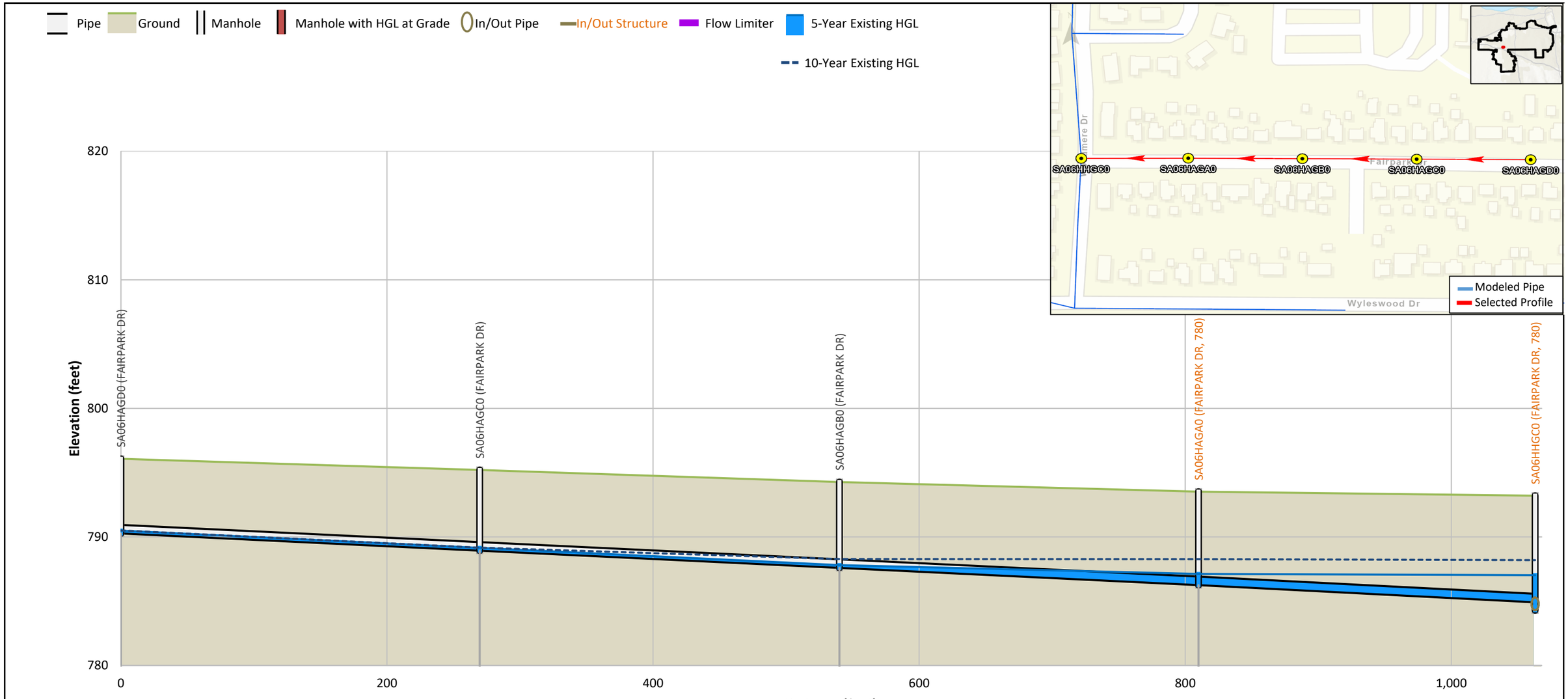
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 780, Date created: 3/11/2021

Depth to Invert (ft)		6.3	6.7	7.3		
Depth to HGL (ft)		6.1	6.5	6.4		
Diameter (in)	8	8	8	8	8	
Capacity (mgd)	0.50	0.50	0.50	0.52		
Max Depth (ft)	0.22	0.22	0.87	2.1		
Dep abv Crown (ft)	-	-	0.21	1.4		
Max Flow (mgd)	0.11	0.11	0.11	0.34		
Max Velocity (ft/s)	1.8	1.8	0.84	2.9		
Slope (ft/ft)	0.0050	0.0050	0.0050	0.0053		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13

Community: Berea

FAIRPARK DR

Brown AND Caldwell

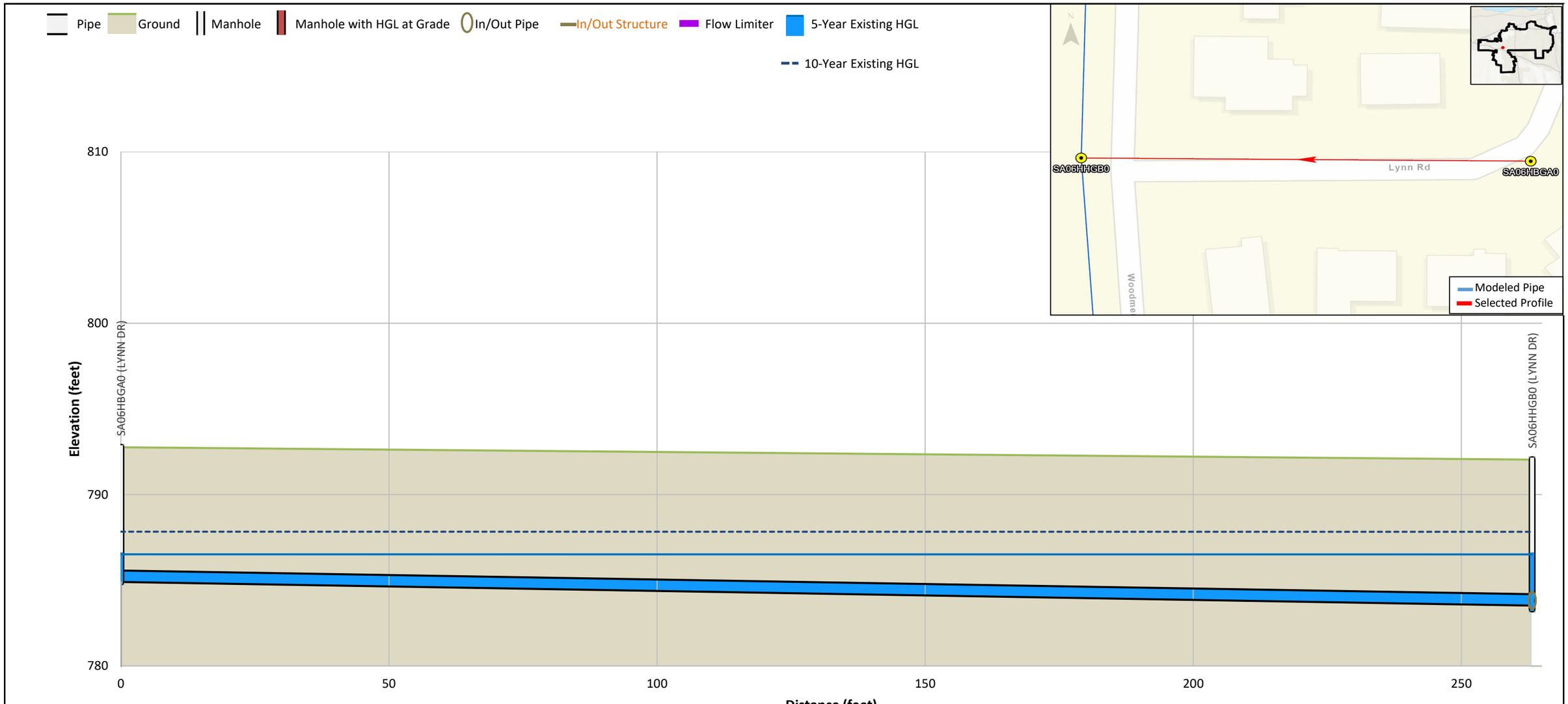
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 781, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	0.51	
Max Depth (ft)	3.0	
Dep abv Crown (ft)	2.3	
Max Flow (mgd)	0.06	
Max Velocity (ft/s)	1.3	
Slope (ft/ft)	0.0052	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13

Community: Berea

LYNN DR

Brown AND Caldwell

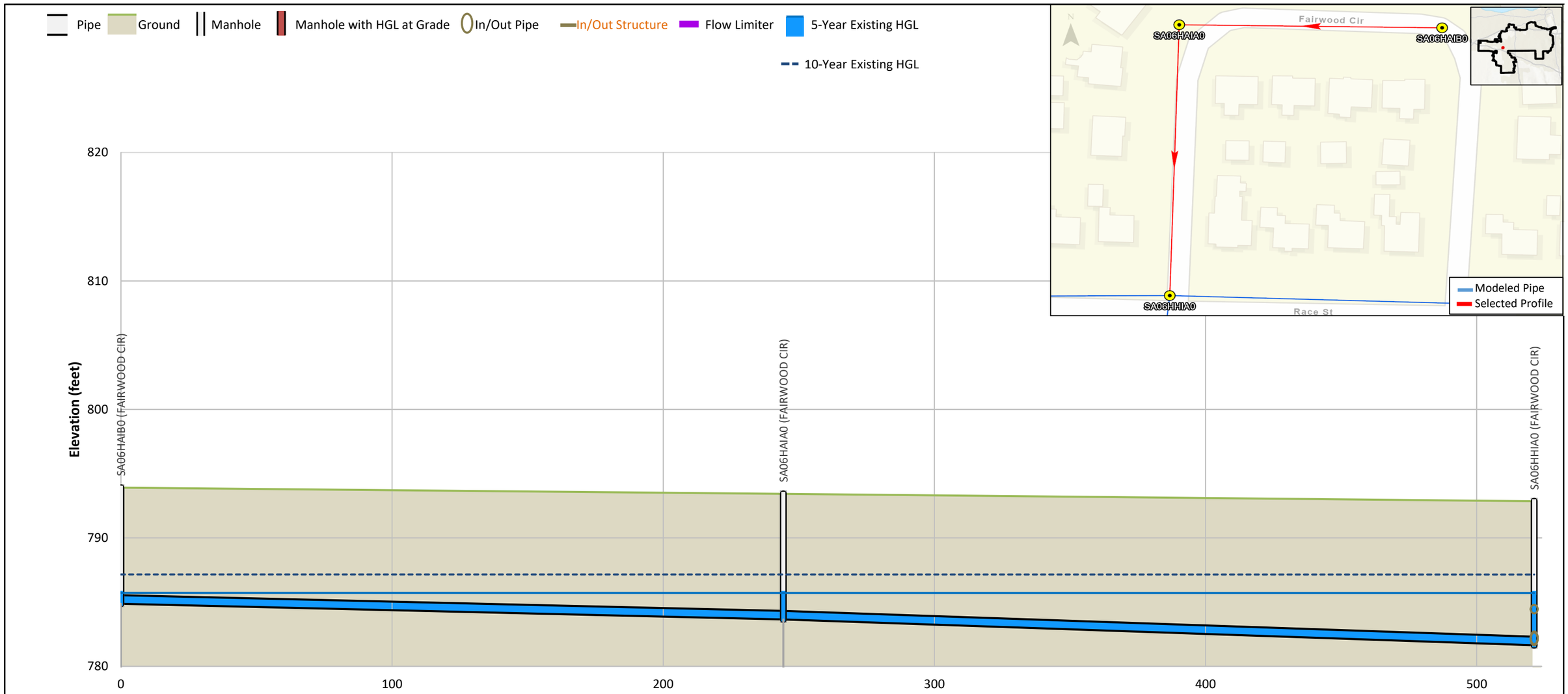
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 782, Date created: 3/11/2021

Depth to Invert (ft)		9.8	
Depth to HGL (ft)		7.7	
Diameter (in)	8		8
Capacity (mgd)	0.50		0.61
Max Depth (ft)	2.1		4.1
Dep abv Crown (ft)	1.4		3.4
Max Flow (mgd)	0.07		0.05
Max Velocity (ft/s)	1.8		0.22
Slope (ft/ft)	0.0050		0.0073

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13

Community: Berea

FAIRWOOD CIR

Brown AND Caldwell

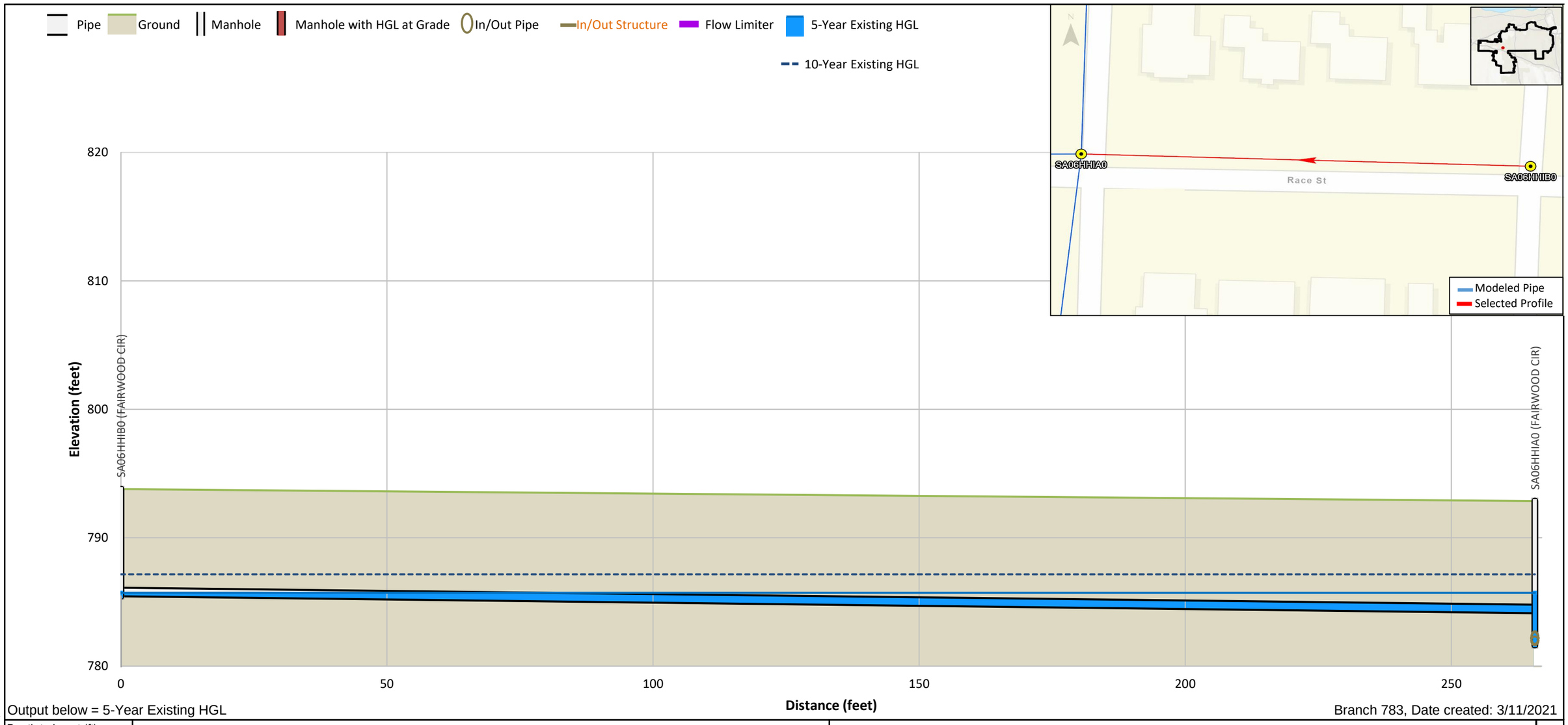
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 783, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	0.50	
Max Depth (ft)	1.6	
Dep abv Crown (ft)	0.93	
Max Flow (mgd)	0.06	
Max Velocity (ft/s)	1.7	
Slope (ft/ft)	0.0050	

Northeast Ohio Regional Sewer District

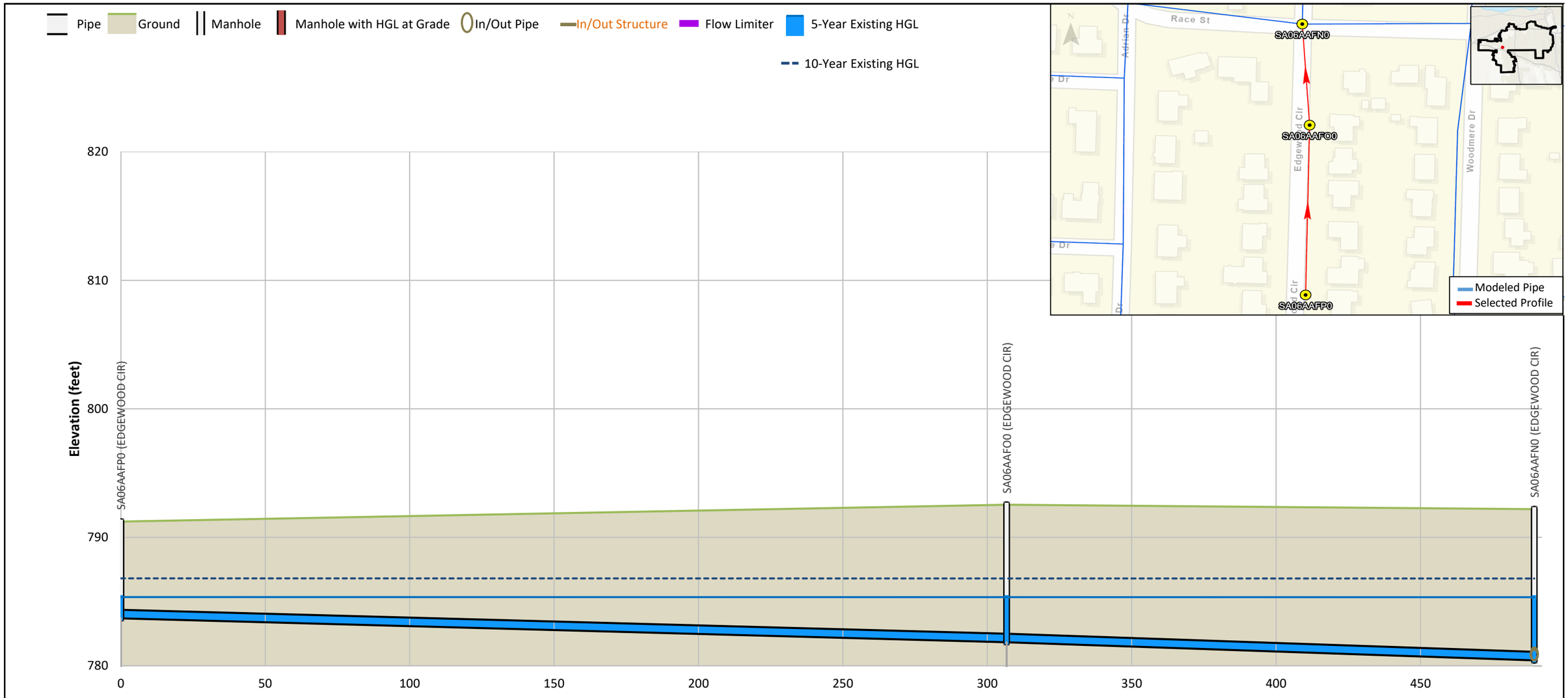
SWI-LSSES

PFA: BE-13
Community: Berea
FAIRWOOD CIR

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 784, Date created: 3/11/2021

Depth to Invert (ft)		11	
Depth to HGL (ft)		7.2	
Diameter (in)	8		8
Capacity (mgd)	0.55		0.62
Max Depth (ft)	3.5		4.9
Dep abv Crown (ft)	2.8		4.3
Max Flow (mgd)	0.09		0.05
Max Velocity (ft/s)	1.9		0.22
Slope (ft/ft)	0.0061		0.0077

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13

Community: Berea

EDGEWOOD CIR

Brown AND Caldwell

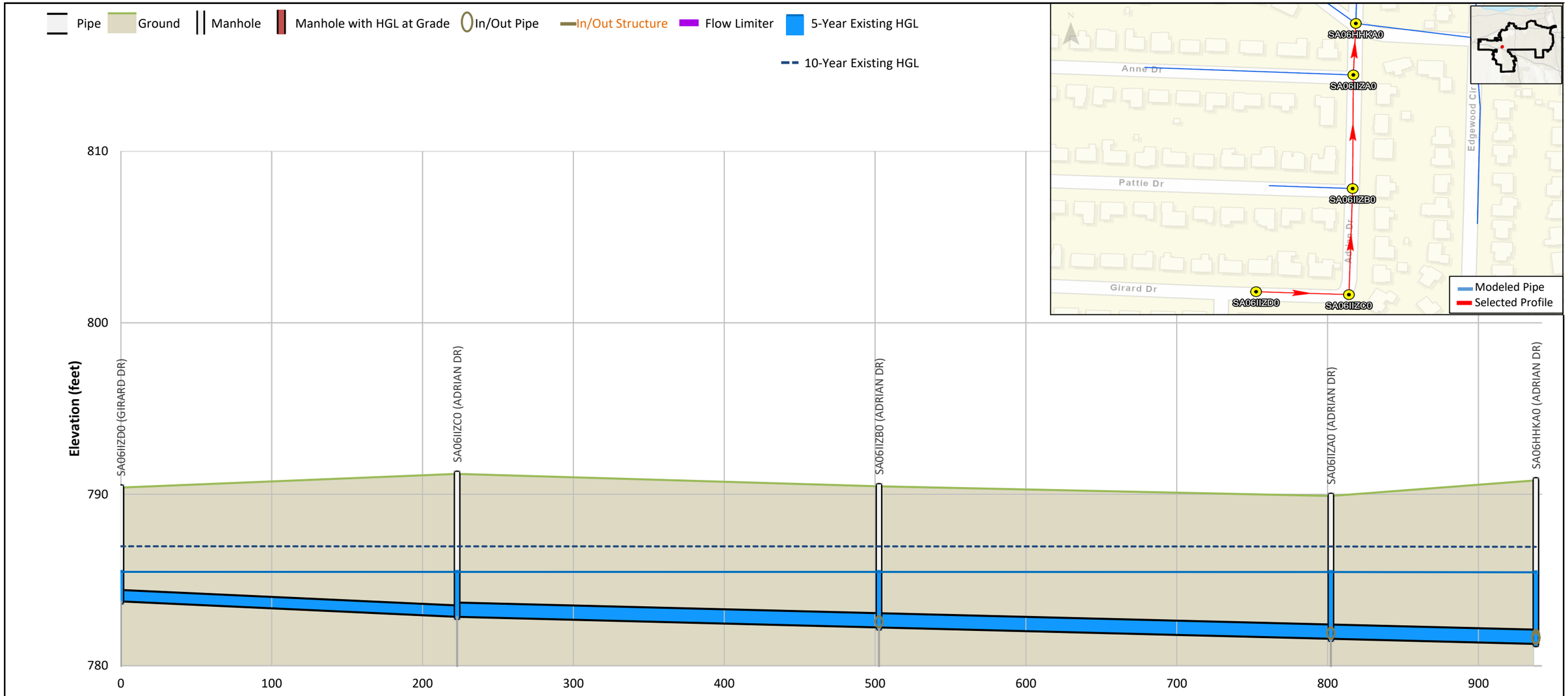
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 785, Date created: 3/11/2021

Depth to Invert (ft)		8.3	8.2	8.3	
Depth to HGL (ft)		5.7	5.0	4.4	
Diameter (in)	8	10	10	10	
Capacity (mgd)	0.45	0.61	0.60	0.61	
Max Depth (ft)	2.6	3.2	3.9	4.2	
Dep abv Crown (ft)	2.0	2.4	3.1	3.3	
Max Flow (mgd)	0.08	-0.17	-0.22	0.32	
Max Velocity (ft/s)	1.3	0.66	-0.55	1.1	
Slope (ft/ft)	0.0040	0.0022	0.0022	0.0022	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13

Community: Berea

GIRARD DR to ADRIAN DR

Brown AND Caldwell

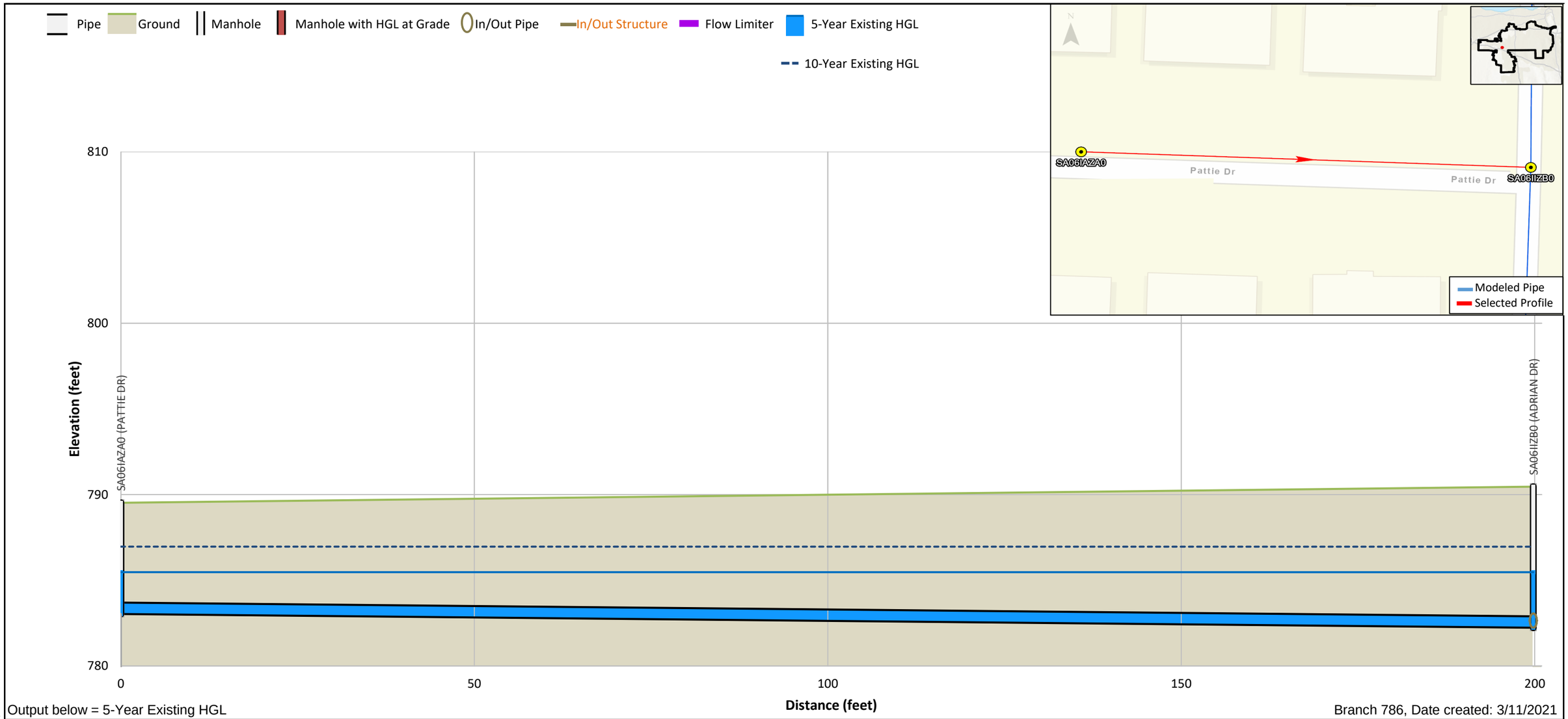
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 786, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	0.45	
Max Depth (ft)	3.2	
Dep abv Crown (ft)	2.6	
Max Flow (mgd)	0.09	
Max Velocity (ft/s)	0.96	
Slope (ft/ft)	0.0040	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13
Community: Berea
PATTIE DR to ADRIAN DR

Brown AND Caldwell

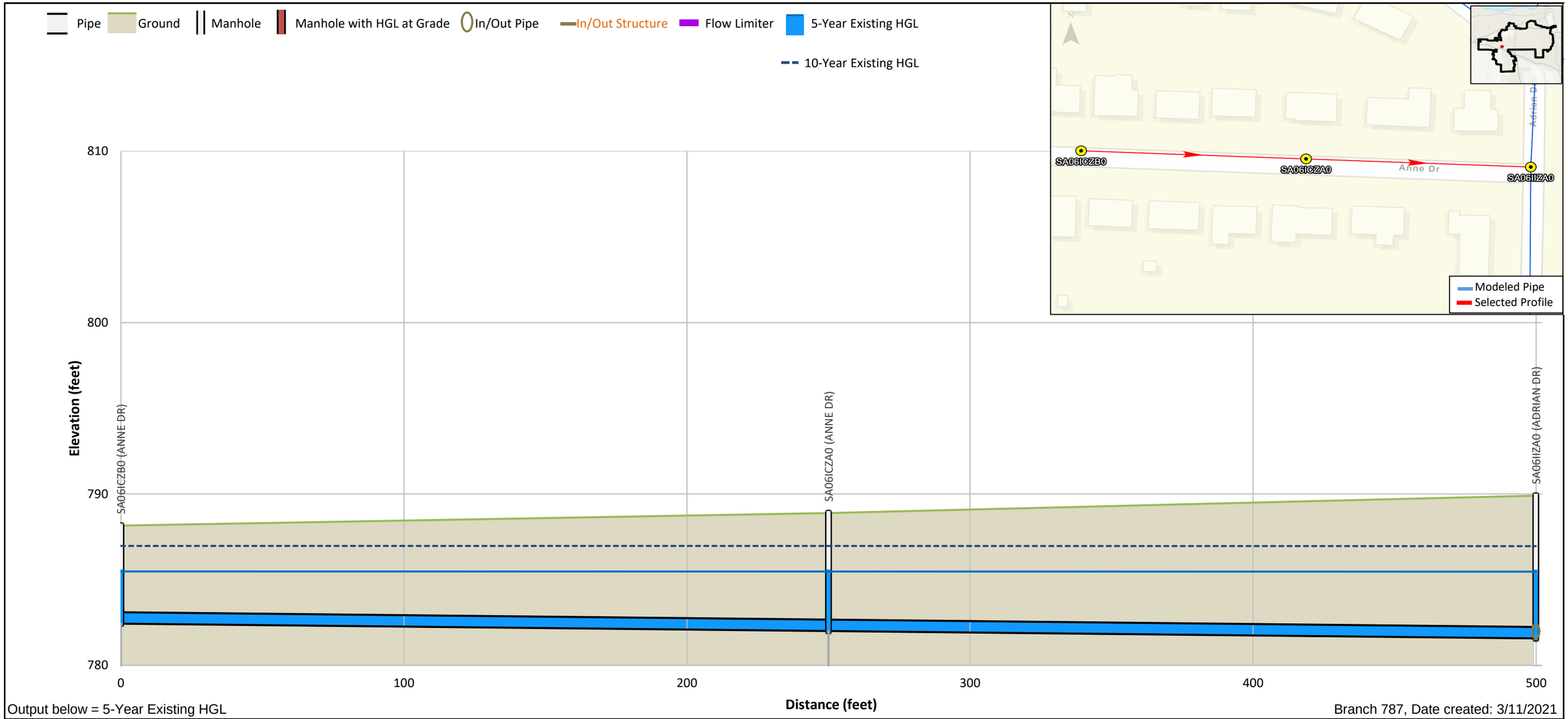
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 787, Date created: 3/11/2021

Depth to Invert (ft)		6.9	
Depth to HGL (ft)		3.4	
Diameter (in)	8		8
Capacity (mgd)	0.29		0.29
Max Depth (ft)	3.5		3.9
Dep abv Crown (ft)	2.8		3.2
Max Flow (mgd)	-0.11		0.11
Max Velocity (ft/s)	0.55		0.56
Slope (ft/ft)	0.0017		0.0017

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13

Community: Berea

ANNE DR to ADRIAN DR

Brown AND Caldwell

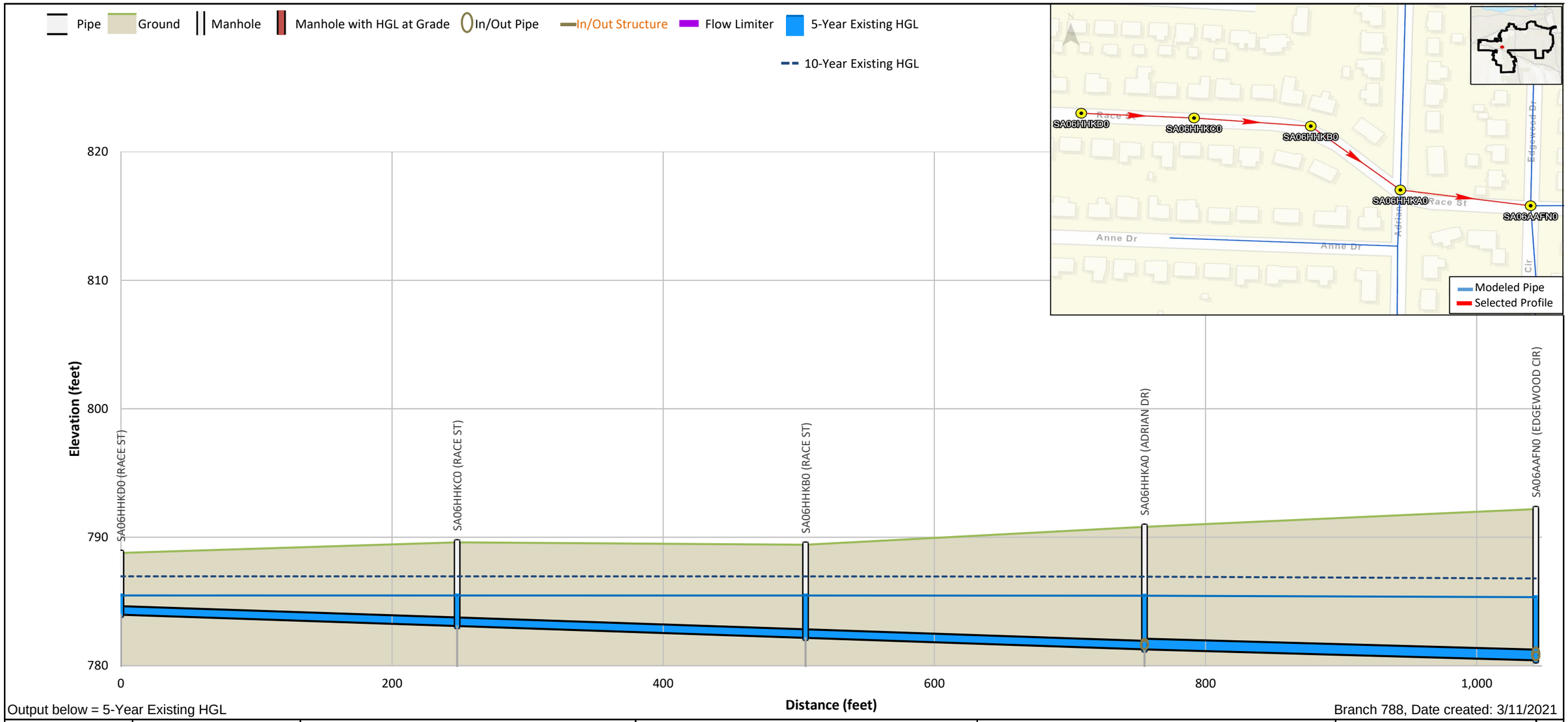
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 788, Date created: 3/11/2021

Depth to Invert (ft)		6.5	7.3	9.5	
Depth to HGL (ft)		4.1	4.0	5.4	
Diameter (in)	8	8	8	10	
Capacity (mgd)	0.42	0.43	0.43	0.70	
Max Depth (ft)	2.4	3.3	4.2	4.9	
Dep abv Crown (ft)	1.7	2.6	3.5	4.1	
Max Flow (mgd)	0.06	-0.08	0.14	0.48	
Max Velocity (ft/s)	1.3	0.55	0.67	1.3	
Slope (ft/ft)	0.0035	0.0036	0.0036	0.0029	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13
Community: Berea
RACE ST to EDGEWOOD CIR

Brown AND Caldwell

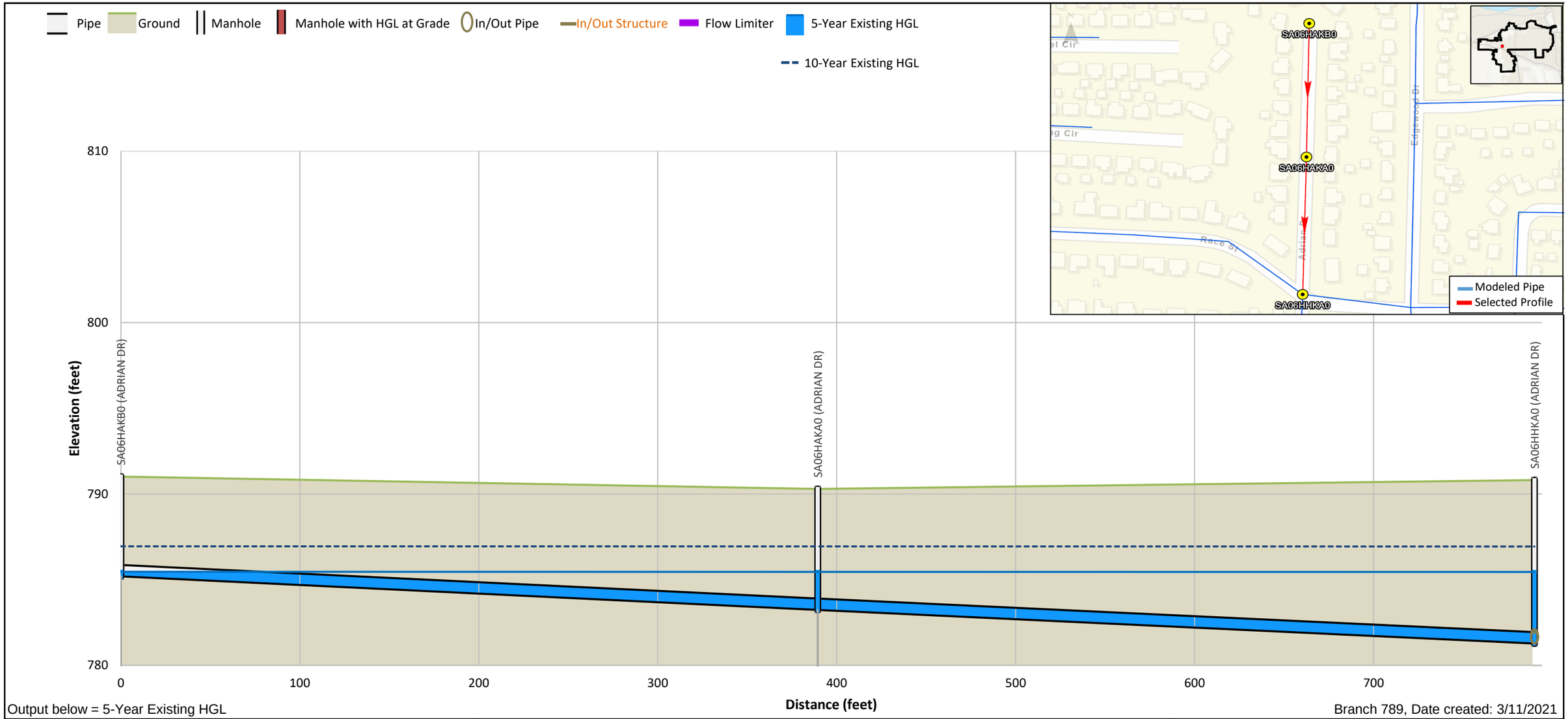
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 789, Date created: 3/11/2021

Depth to Invert (ft)		7.1	
Depth to HGL (ft)		4.8	
Diameter (in)	8		8
Capacity (mgd)	0.50		0.50
Max Depth (ft)	2.2		4.2
Dep abv Crown (ft)	1.6		3.5
Max Flow (mgd)	0.07		-0.06
Max Velocity (ft/s)	1.5		0.23
Slope (ft/ft)	0.0050		0.0049

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13

Community: Berea

ADRIAN DR

Brown AND Caldwell

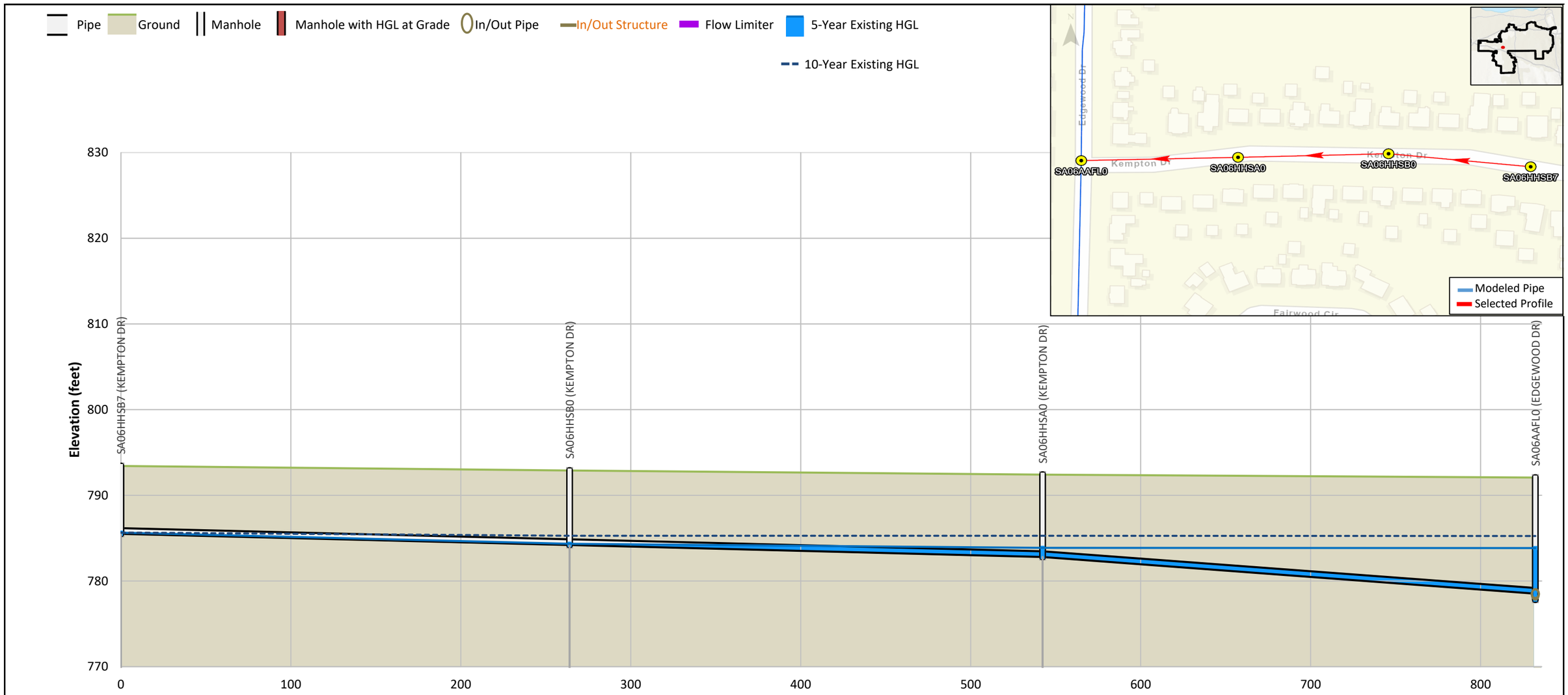
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 790, Date created: 3/11/2021

Depth to Invert (ft)		8.7	9.6	
Depth to HGL (ft)		8.6	8.5	
Diameter (in)	8	8	8	8
Capacity (mgd)	0.50	0.50	0.86	
Max Depth (ft)	0.14	1.1	5.3	
Dep abv Crown (ft)	-	0.40	4.7	
Max Flow (mgd)	0.05	0.05	0.17	
Max Velocity (ft/s)	1.4	0.80	2.9	
Slope (ft/ft)	0.0049	0.0050	0.015	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13
Community: Berea
KEMPTON DR to EDGEWOOD DR

Brown AND Caldwell

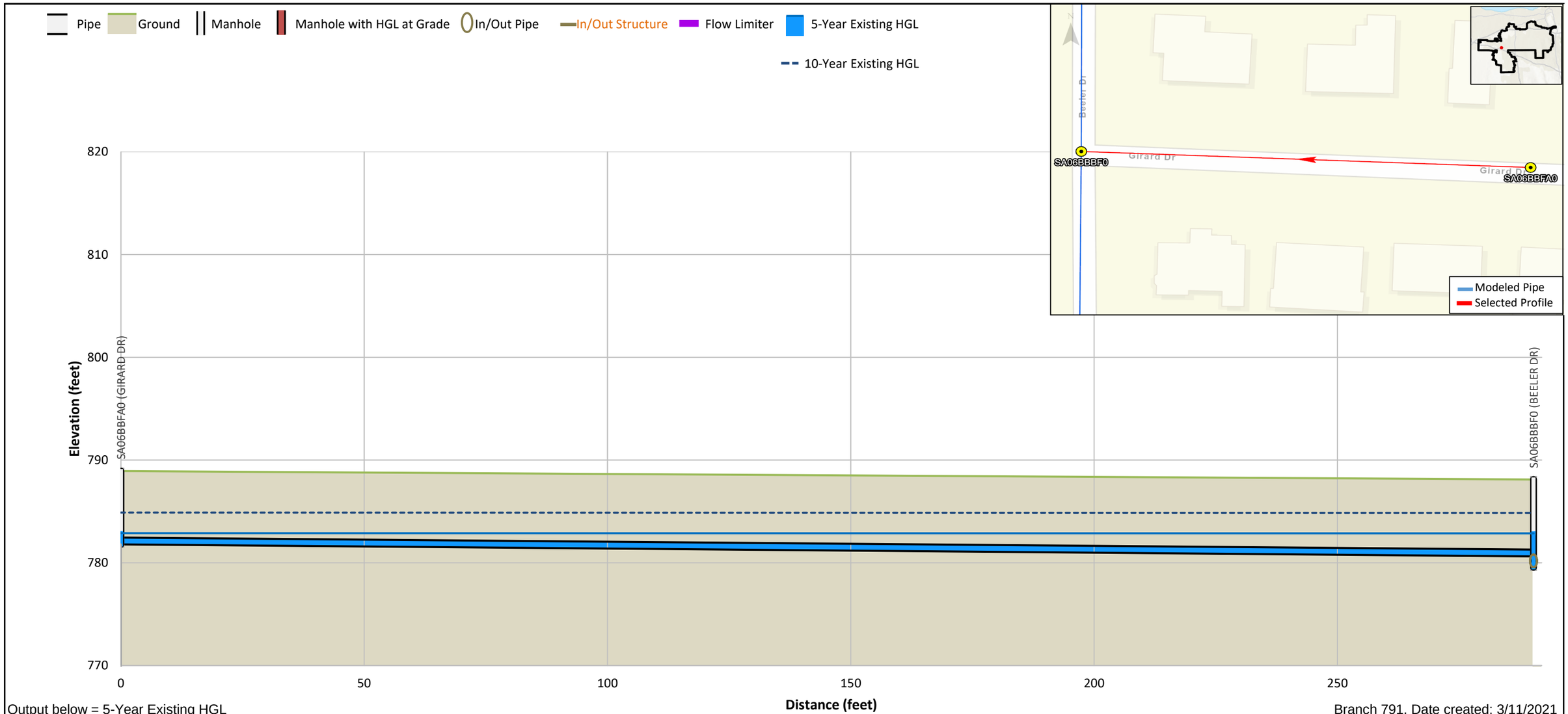
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGL Profiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 791, Date created: 3/11/2021

Depth to Invert (ft)		
Depth to HGL (ft)		
Diameter (in)	8	
Capacity (mgd)	0.45	
Max Depth (ft)	2.2	
Dep abv Crown (ft)	1.6	
Max Flow (mgd)	0.15	
Max Velocity (ft/s)	2.3	
Slope (ft/ft)	0.0040	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13

Community: Berea

GIRARD DR to BEELER DR

Brown AND Caldwell

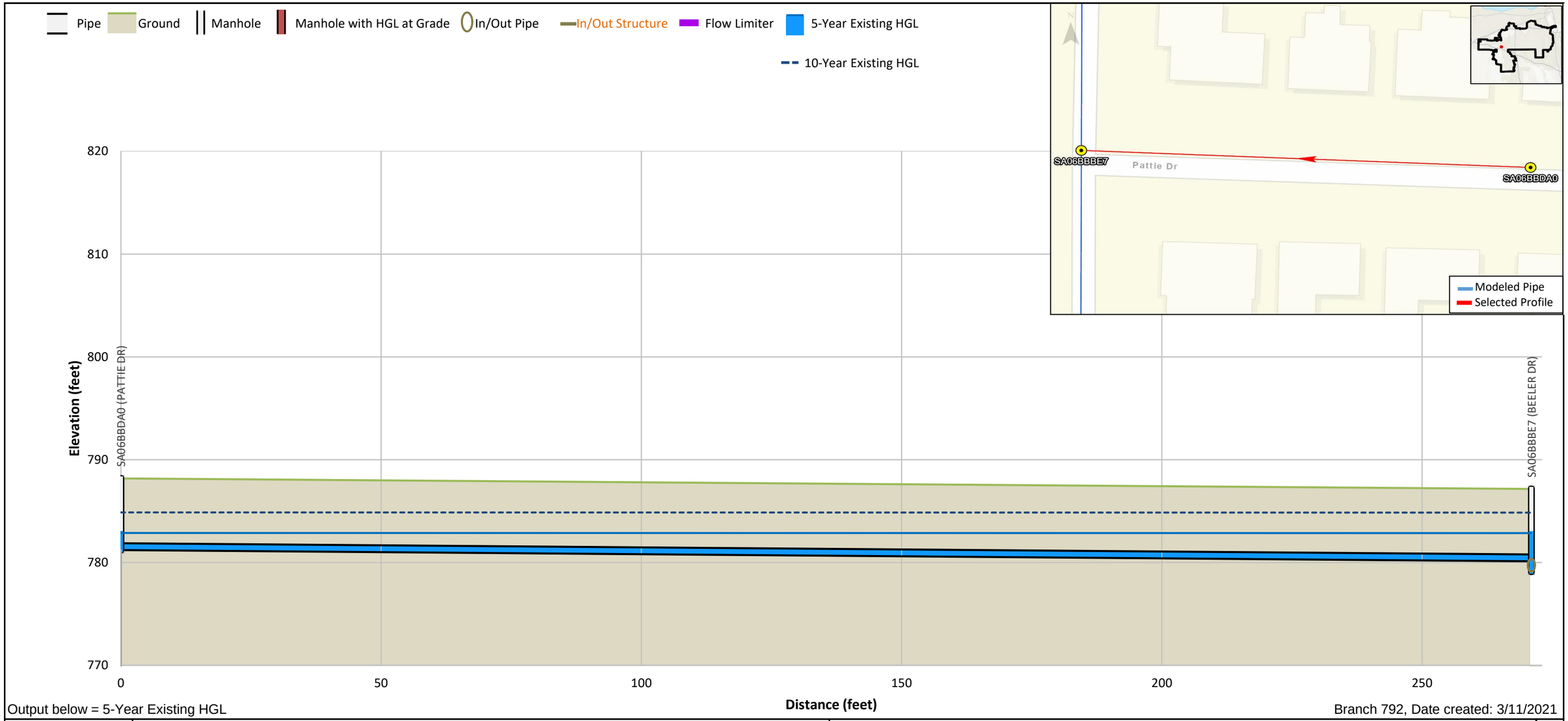
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 792, Date created: 3/11/2021

Depth to Invert (ft)	
Depth to HGL (ft)	
Diameter (in)	8
Capacity (mgd)	0.45
Max Depth (ft)	2.7
Dep abv Crown (ft)	2.1
Max Flow (mgd)	0.12
Max Velocity (ft/s)	2.1
Slope (ft/ft)	0.0040

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13

Community: Berea

PATTIE DR to BEELER DR

Brown AND Caldwell

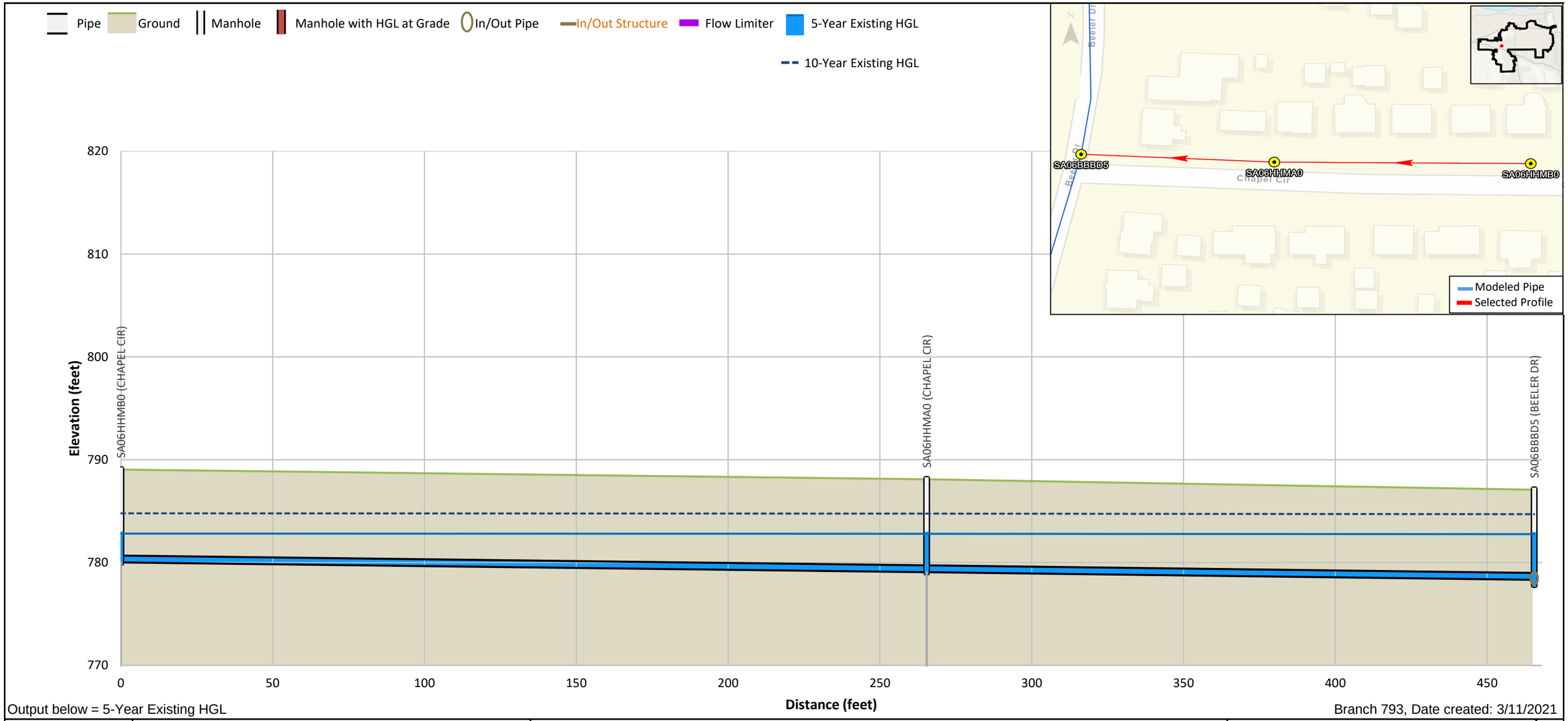
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 793, Date created: 3/11/2021

Depth to Invert (ft)		9.0	
Depth to HGL (ft)		5.3	
Diameter (in)	8		8
Capacity (mgd)	0.42		0.43
Max Depth (ft)	3.7		4.4
Dep abv Crown (ft)	3.1		3.8
Max Flow (mgd)	0.14		0.21
Max Velocity (ft/s)	1.2		2.4
Slope (ft/ft)	0.0036		0.0037

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13

Community: Berea

CHAPEL CIR to BEELER DR

Brown AND Caldwell

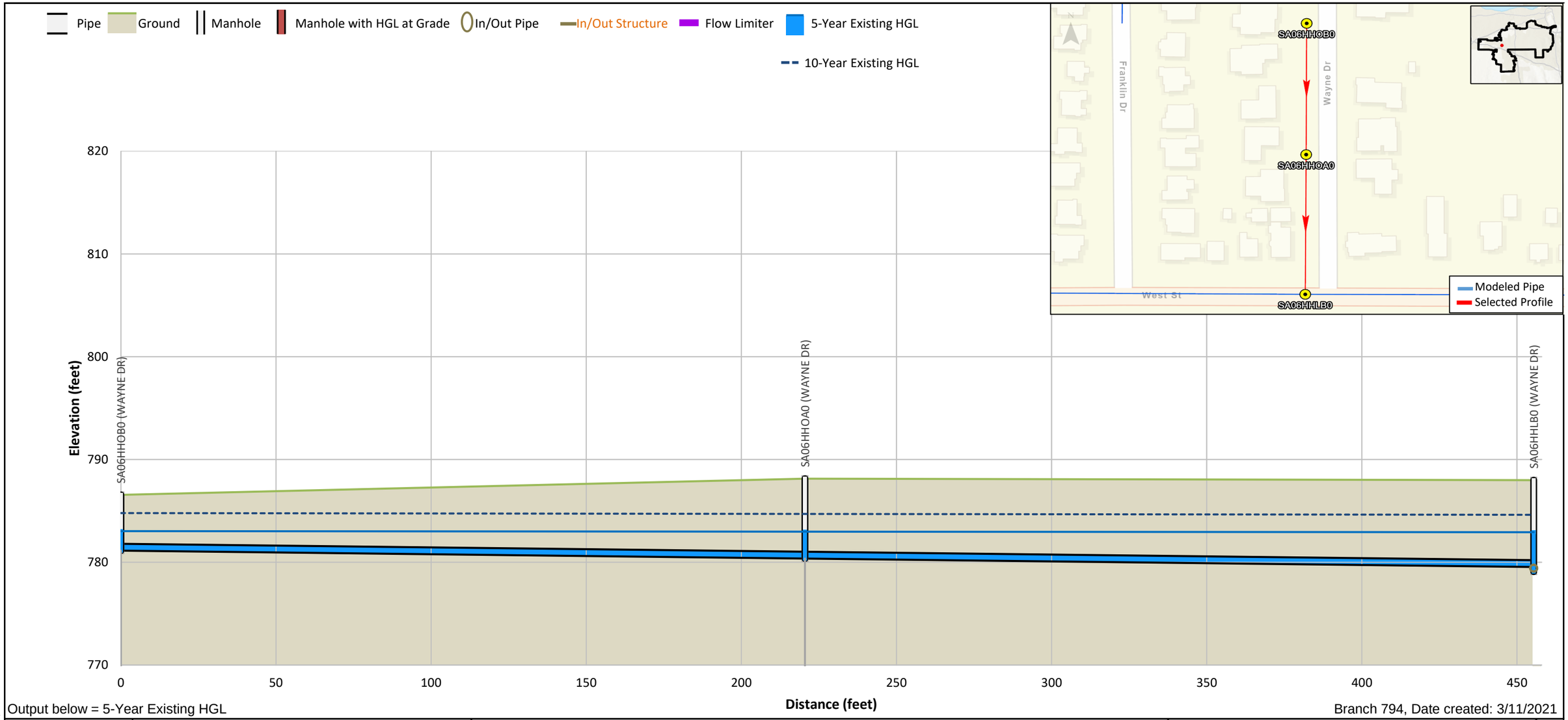
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 794, Date created: 3/11/2021

Depth to Invert (ft)		7.8	
Depth to HGL (ft)		5.2	
Diameter (in)	8		8
Capacity (mgd)	0.42		0.42
Max Depth (ft)	2.6		3.4
Dep abv Crown (ft)	2.0		2.7
Max Flow (mgd)	0.26		0.20
Max Velocity (ft/s)	2.0		2.4
Slope (ft/ft)	0.0035		0.0035

Northeast Ohio Regional Sewer District

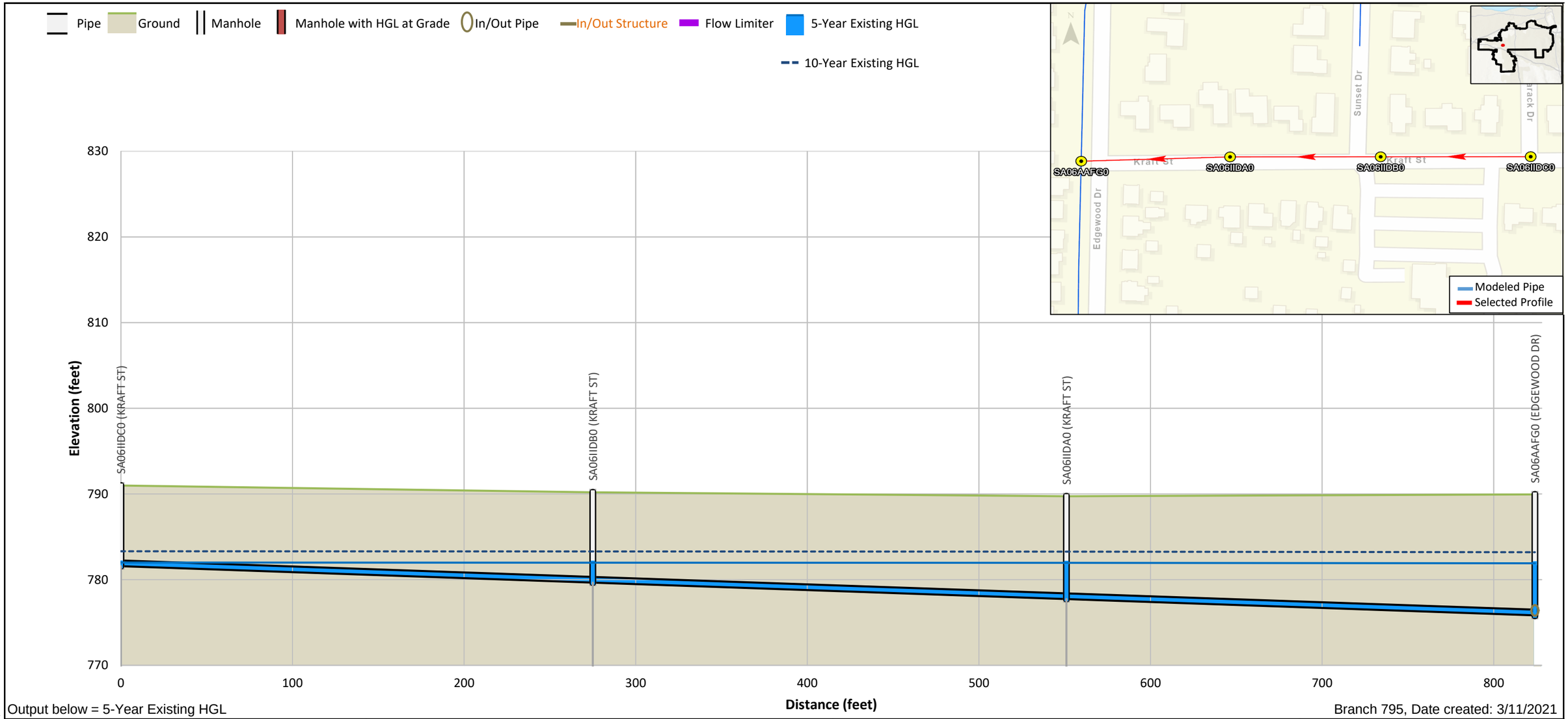
SWI-LSSES

PFA: BE-13
Community: Berea
WAYNE DR

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 795, Date created: 3/11/2021

Depth to Invert (ft)		11	12	
Depth to HGL (ft)		8.2	7.8	
Diameter (in)	8	8	8	
Capacity (mgd)	0.59	0.59	0.59	
Max Depth (ft)	2.3	4.2	6.1	
Dep abv Crown (ft)	1.7	3.6	5.4	
Max Flow (mgd)	0.18	0.18	0.29	
Max Velocity (ft/s)	2.3	1.5	1.2	
Slope (ft/ft)	0.0070	0.0070	0.0070	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13
Community: Berea
KRAFT ST to EDGEWOOD DR

Brown AND Caldwell

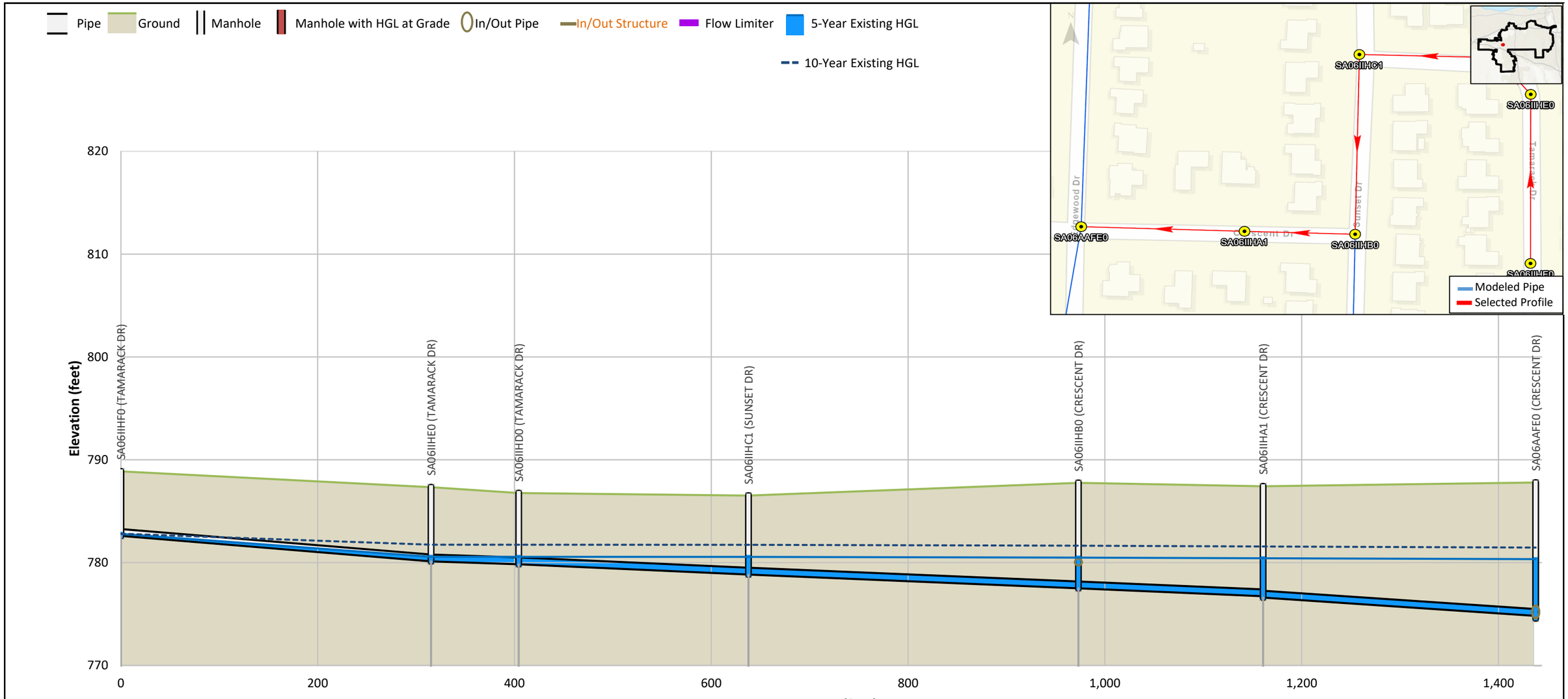
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 796, Date created: 3/11/2021

Depth to Invert (ft)		7.2	6.9	7.7	10	11	
Depth to HGL (ft)		6.8	6.2	6.0	7.3	7.0	
Diameter (in)	8	8	8	8	8	8	8
Capacity (mgd)	0.63	0.40	0.46	0.45	0.45	0.57	
Max Depth (ft)	0.45	0.72	1.7	3.0	3.7	5.5	
Dep abv Crown (ft)	-	0.06	1.1	2.3	3.0	4.9	
Max Flow (mgd)	0.12	0.12	0.12	0.33	0.42	0.35	
Max Velocity (ft/s)	1.5	1.7	0.80	1.8	3.2	1.4	
Slope (ft/ft)	0.0079	0.0031	0.0043	0.0040	0.0041	0.0064	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13

Community: Berea

TAMARACK DR to CRESCENT DR

Brown AND Caldwell

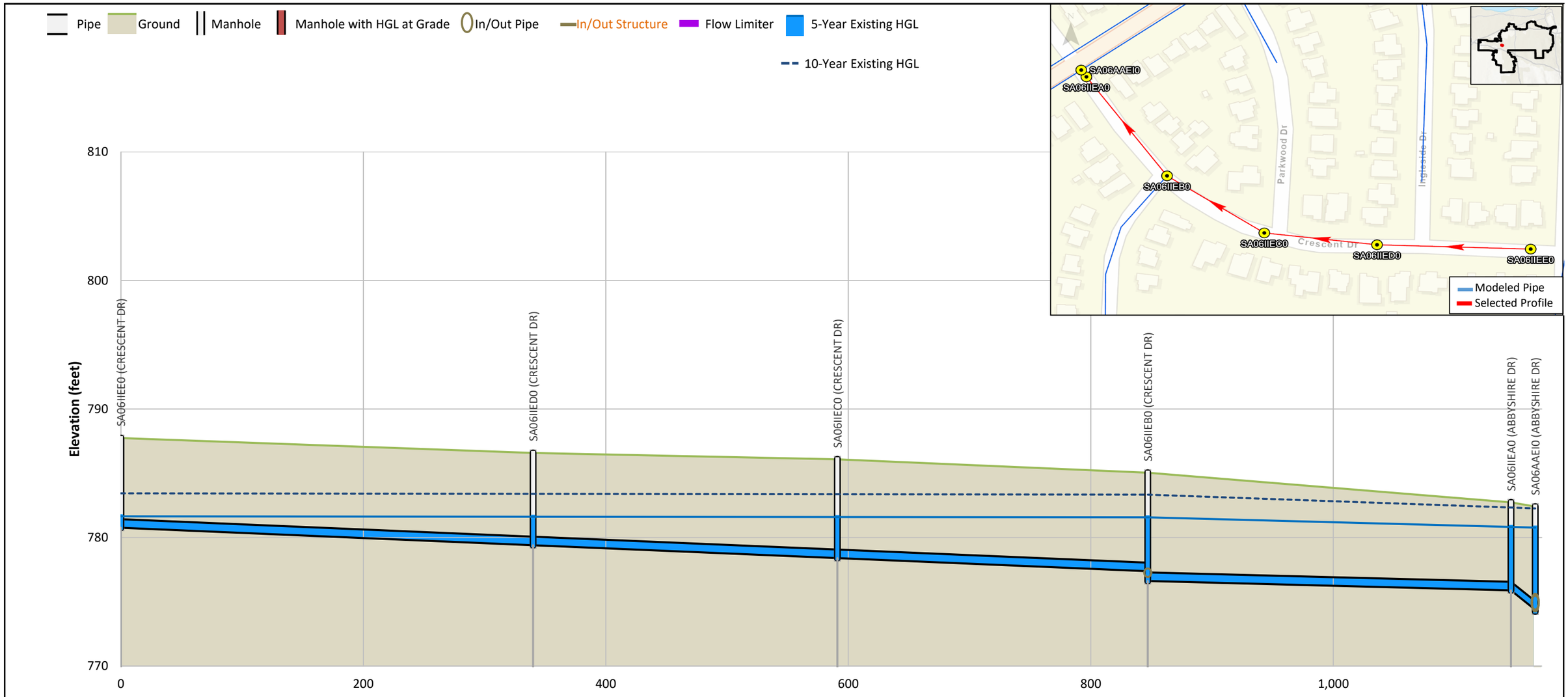
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 797, Date created: 3/11/2021

Depth to Invert (ft)		7.2	7.7	7.7	6.8	
Depth to HGL (ft)		5.0	4.5	3.5	1.9	
Diameter (in)	8	8	8	8		
Capacity (mgd)	0.45	0.45	0.45	0.35		
Max Depth (ft)	2.2	3.2	4.2	5.0		
Dep abv Crown (ft)	1.6	2.5	3.5	4.3		
Max Flow (mgd)	0.16	0.15	0.09	0.60		
Max Velocity (ft/s)	1.8	1.8	1.7	3.6		
Slope (ft/ft)	0.0040	0.0040	0.0040	0.0024		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13
Community: Berea
CRESCENT DR to ABBYSHIRE DR

Brown AND Caldwell

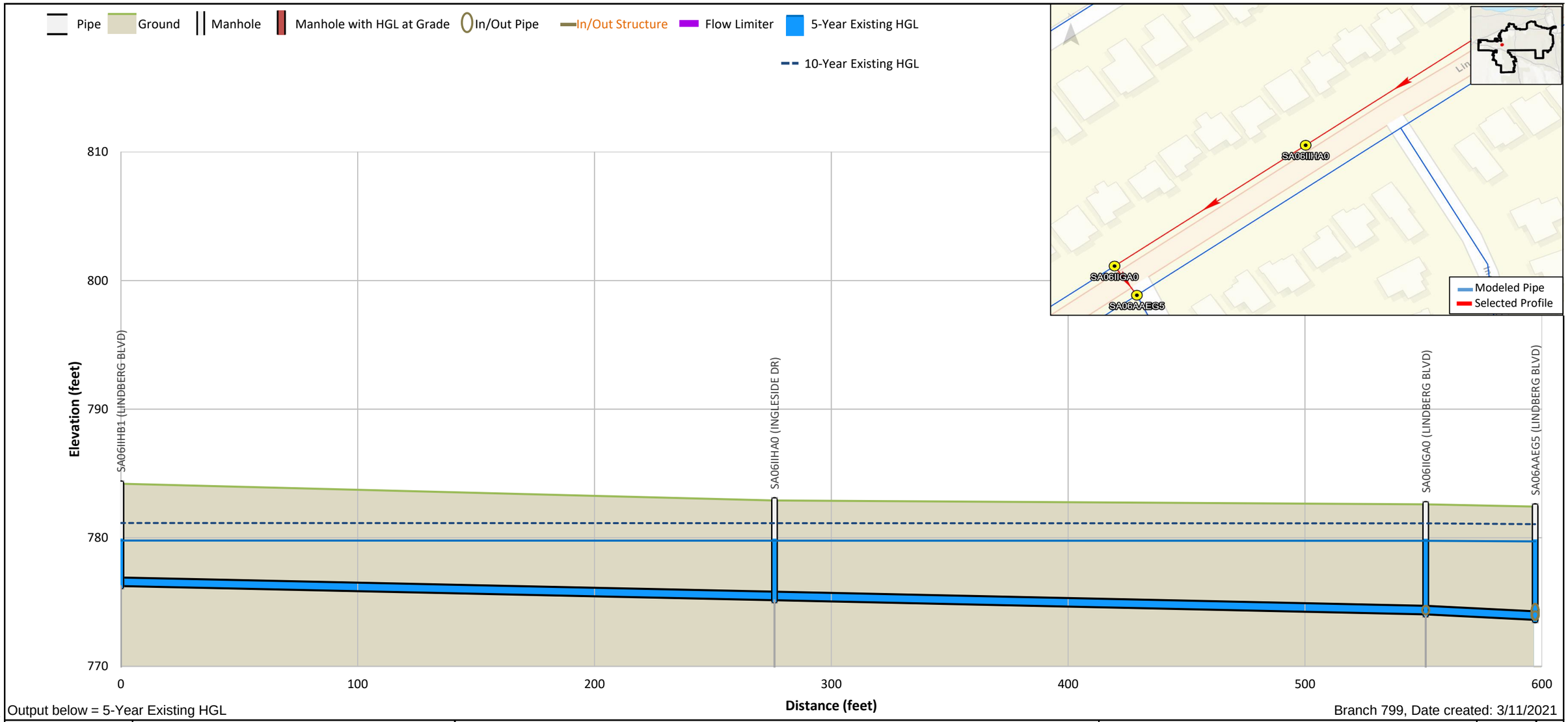
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 799, Date created: 3/11/2021

Depth to Invert (ft)		7.8	8.6	
Depth to HGL (ft)		3.1	2.8	
Diameter (in)	8	8	8	
Capacity (mgd)	0.45	0.45	0.69	
Max Depth (ft)	4.6	5.7	6.1	
Dep abv Crown (ft)	4.0	5.1	5.4	
Max Flow (mgd)	-0.11	-0.19	0.32	
Max Velocity (ft/s)	1.6	-0.64	1.3	
Slope (ft/ft)	0.0040	0.0040	0.0093	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13

Community: Berea

LINDBERG BLVD

Brown AND Caldwell

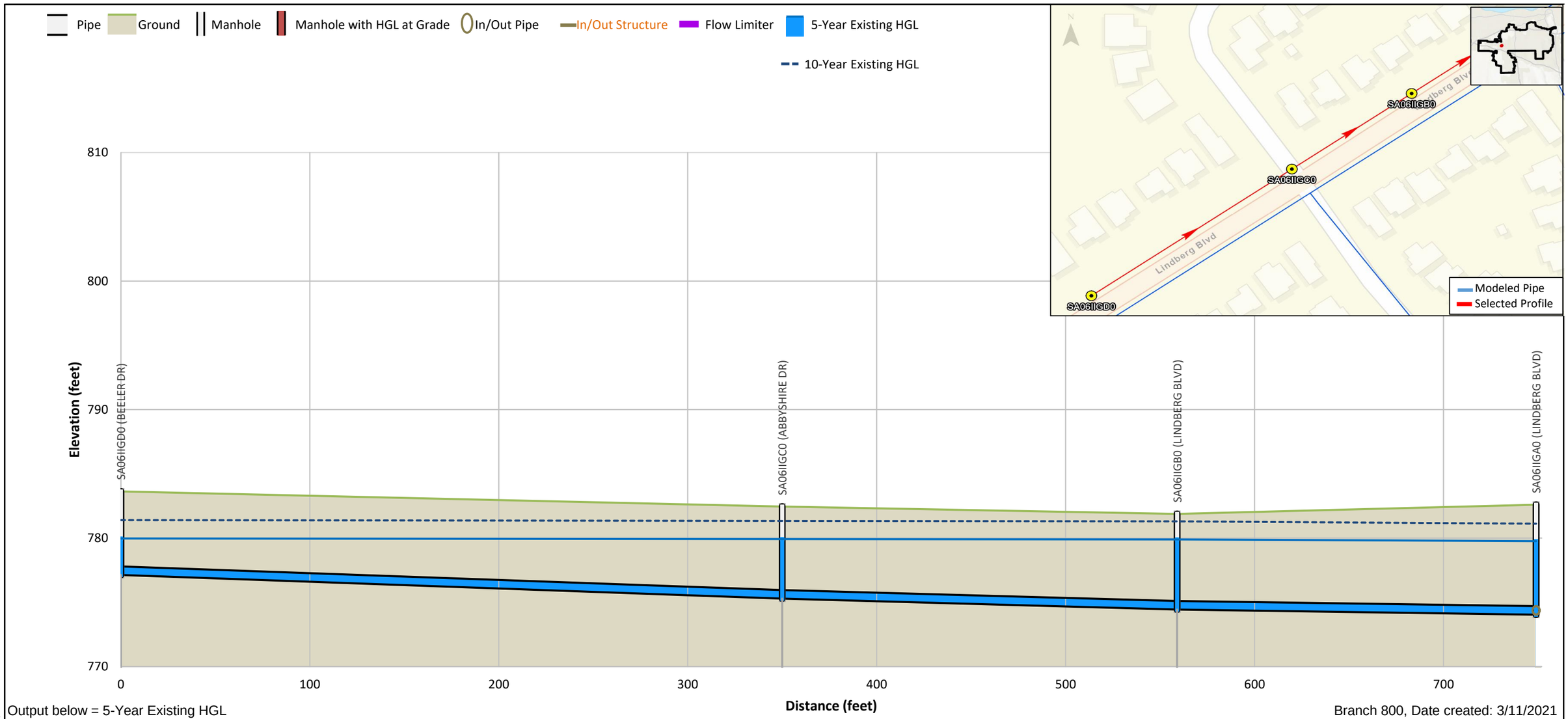
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 800, Date created: 3/11/2021

Depth to Invert (ft)		7.2	7.4	
Depth to HGL (ft)		2.5	2.0	
Diameter (in)	8	8	8	
Capacity (mgd)	0.51	0.45	0.33	
Max Depth (ft)	4.6	5.5	5.7	
Dep abv Crown (ft)	4.0	4.8	5.1	
Max Flow (mgd)	0.18	0.12	0.33	
Max Velocity (ft/s)	1.9	0.59	2.2	
Slope (ft/ft)	0.0053	0.0041	0.0021	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13

Community: Berea

BEELER DR to LINDBERG BLVD

Brown AND Caldwell

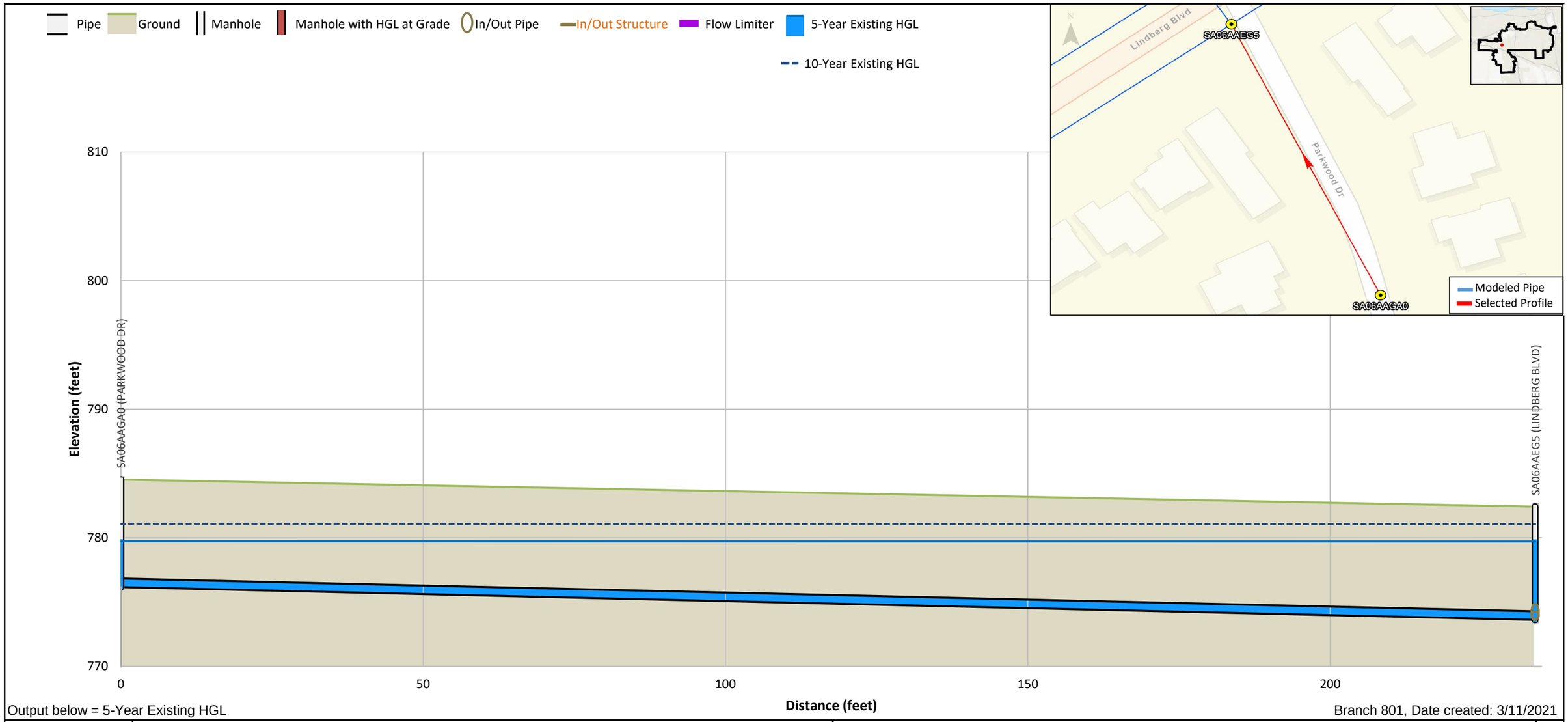
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 801, Date created: 3/11/2021

Depth to Invert (ft)	
Depth to HGL (ft)	
Diameter (in)	8
Capacity (mgd)	0.74
Max Depth (ft)	6.1
Dep abv Crown (ft)	5.4
Max Flow (mgd)	0.09
Max Velocity (ft/s)	0.37
Slope (ft/ft)	0.011

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13

Community: Berea

PARKWOOD DR to LINDBERG BLVD

Brown AND Caldwell

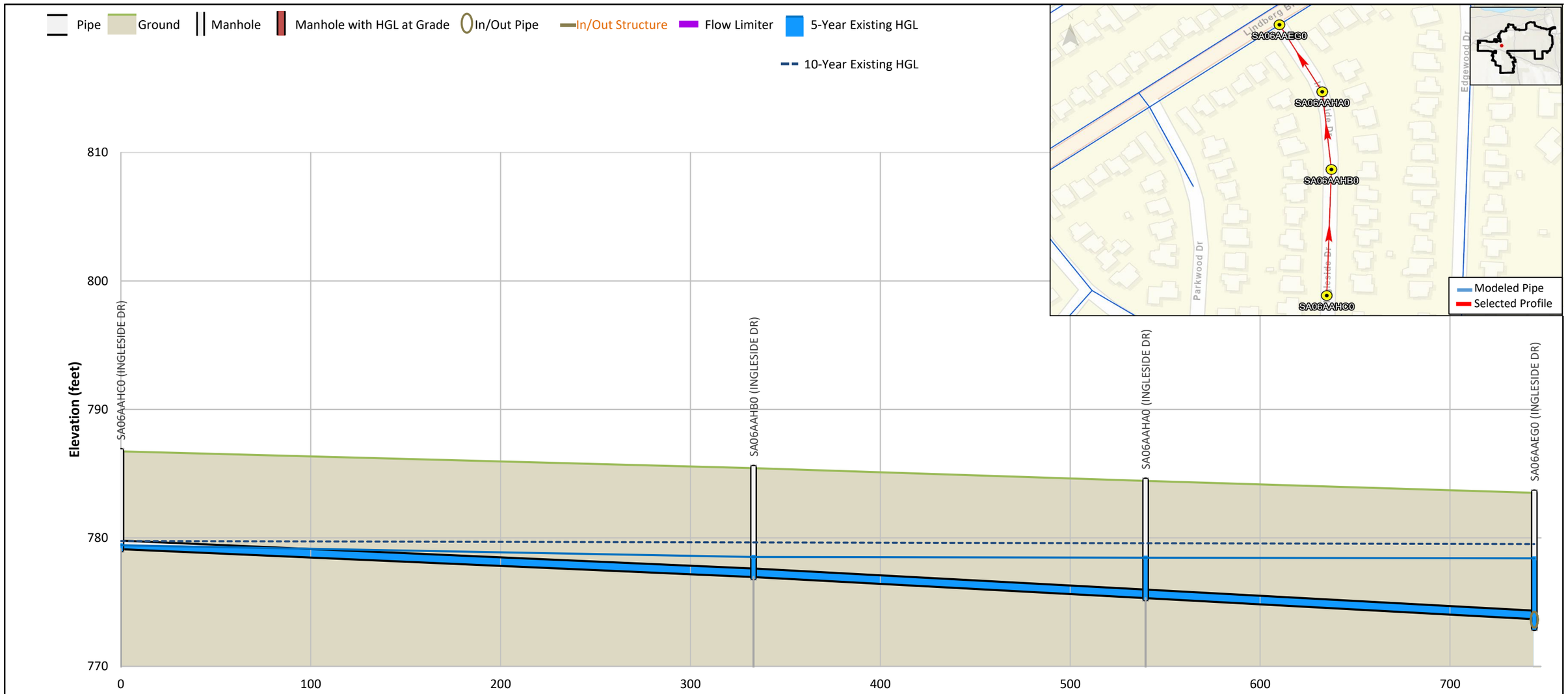
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 802, Date created: 3/11/2021

Depth to Invert (ft)		8.5	9.1		
Depth to HGL (ft)		6.9	6.0		
Diameter (in)	8	8	8	8	
Capacity (mgd)	0.57	0.63	0.64		
Max Depth (ft)	1.6	3.2	4.7		
Dep abv Crown (ft)	0.90	2.5	4.1		
Max Flow (mgd)	0.24	0.24	0.21		
Max Velocity (ft/s)	2.6	2.6	2.5		
Slope (ft/ft)	0.0065	0.0079	0.0080		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13

Community: Berea

INGLESIDE DR

Brown AND Caldwell

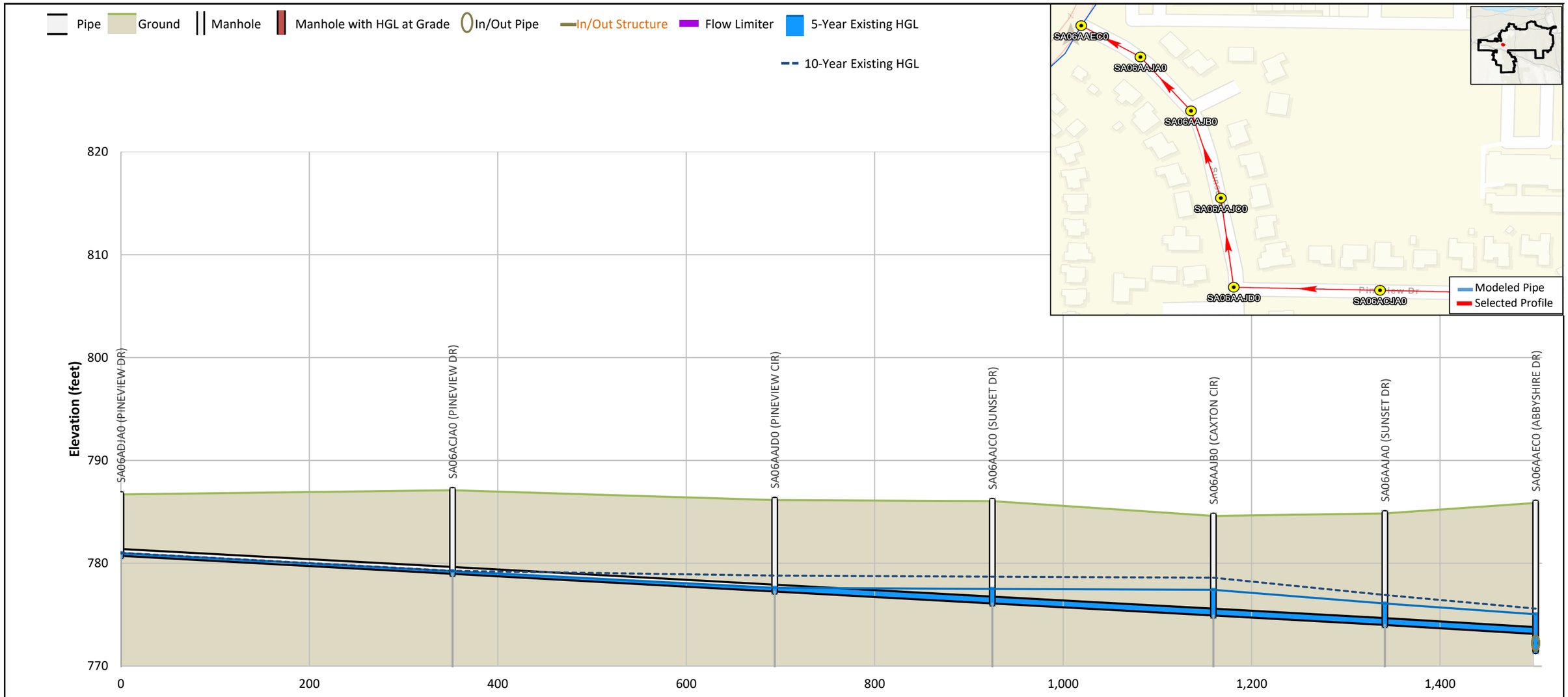
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 803, Date created: 3/11/2021

Depth to Invert (ft)		8.1	8.9	10.0	9.7	11	
Depth to HGL (ft)		7.9	8.5	8.5	7.2	8.8	
Diameter (in)	8	8	8	8	8	8	
Capacity (mgd)	0.50	0.50	0.50	0.50	0.50	0.53	
Max Depth (ft)	0.27	0.36	1.4	2.5	2.5	2.1	
Dep abv Crown (ft)	-	-	0.75	1.8	1.8	1.4	
Max Flow (mgd)	0.16	0.16	0.16	0.18	0.67	0.66	
Max Velocity (ft/s)	2.0	2.0	1.9	0.66	2.7	3.8	
Slope (ft/ft)	0.0050	0.0050	0.0050	0.0050	0.0051	0.0055	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13

Community: Berea

PINEVIEW DR to ABBYSHIRE DR

Brown AND Caldwell

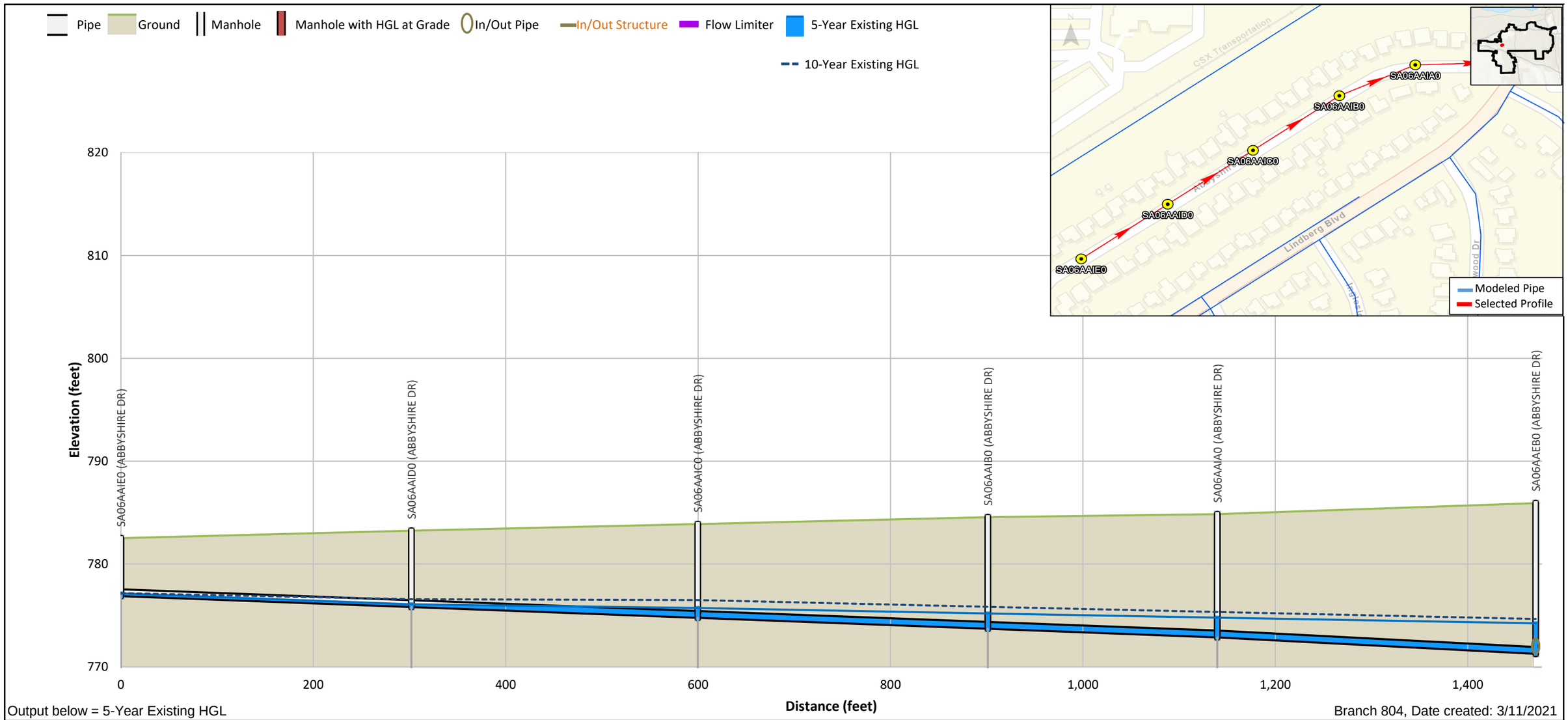
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 804, Date created: 3/11/2021

Depth to Invert (ft)		7.4	9.1	11	12	
Depth to HGL (ft)		7.2	8.2	9.4	10	
Diameter (in)	8	8	8	8	8	8
Capacity (mgd)	0.42	0.42	0.42	0.42	0.49	
Max Depth (ft)	0.27	0.96	1.5	1.9	3.0	
Dep abv Crown (ft)	-	0.29	0.82	1.3	2.3	
Max Flow (mgd)	0.14	0.14	0.39	0.36	0.29	
Max Velocity (ft/s)	1.7	0.74	2.1	2.4	1.1	
Slope (ft/ft)	0.0035	0.0035	0.0035	0.0035	0.0048	

Northeast Ohio Regional Sewer District

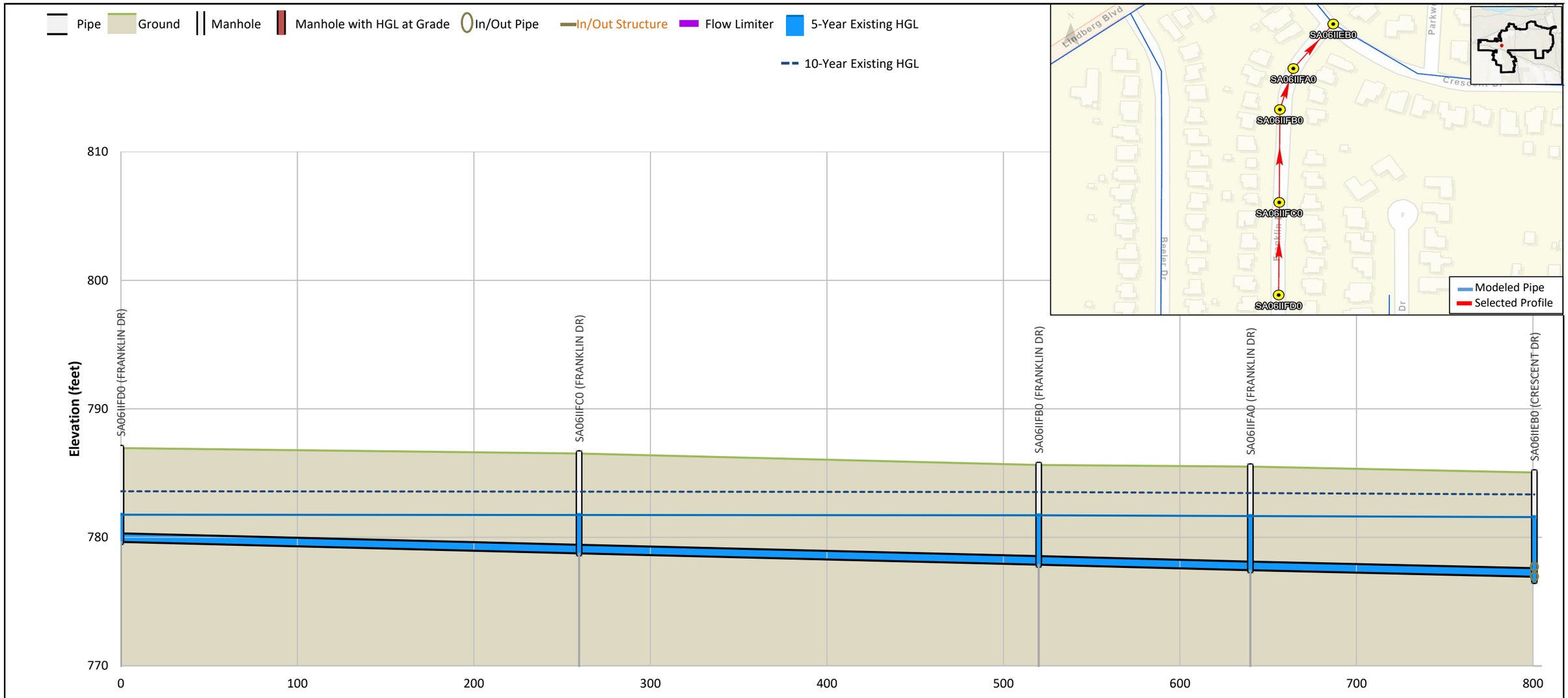
SWI-LSSES

PFA: BE-13
Community: Berea
ABBYSHIRE DR

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 1146, Date created: 3/11/2021

Depth to Invert (ft)		7.8	7.8	8.1	
Depth to HGL (ft)		4.8	3.9	3.8	
Diameter (in)	8	8	8	8	8
Capacity (mgd)	0.42	0.41	0.43	0.40	
Max Depth (ft)	3.0	3.8	4.2	4.6	
Dep abv Crown (ft)	2.3	3.2	3.5	4.0	
Max Flow (mgd)	0.15	0.11	0.26	0.23	
Max Velocity (ft/s)	1.7	0.68	1.9	2.2	
Slope (ft/ft)	0.0034	0.0034	0.0036	0.0032	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-13

Community: Berea

FRANKLIN DR to CRESCENT DR

Brown AND Caldwell

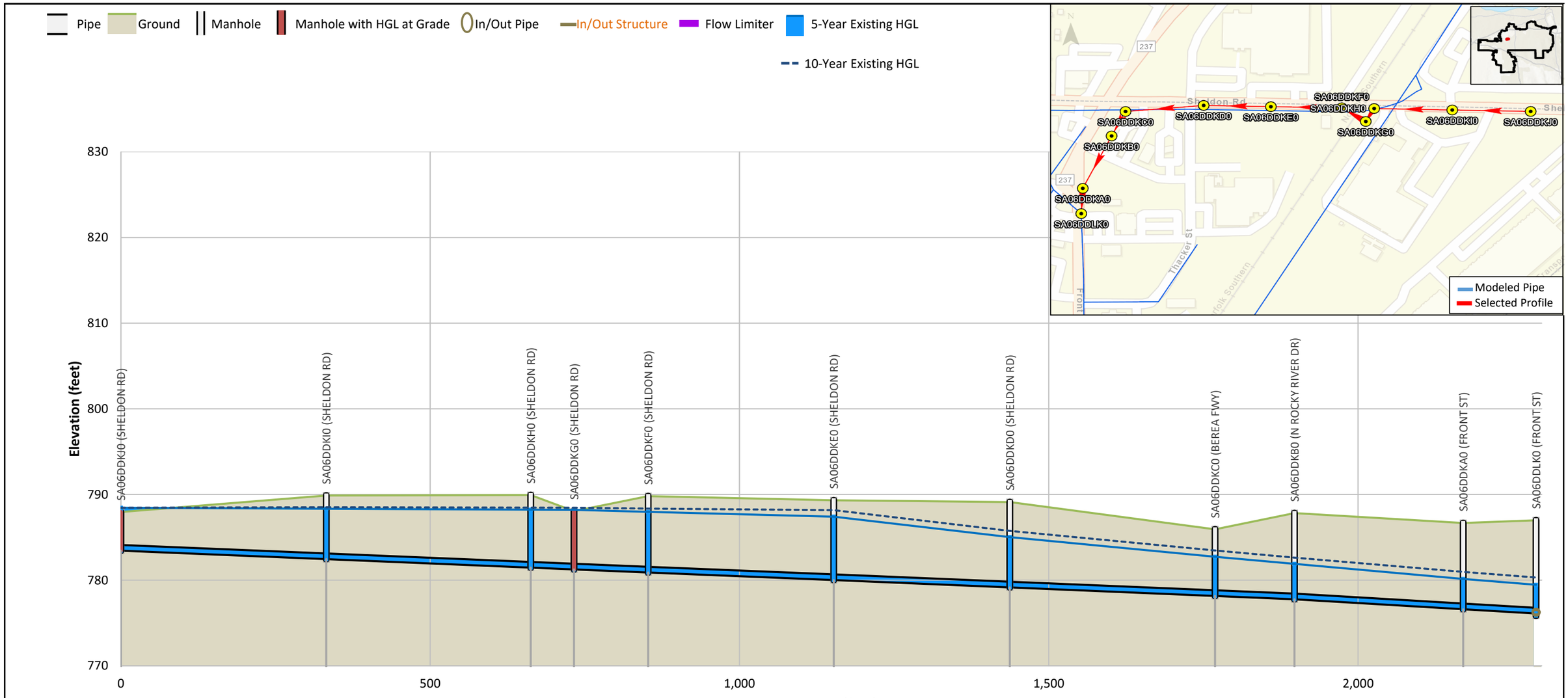
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 247, Date created: 3/11/2021

Depth to Invert (ft)		7.4		8.5	6.8	8.9	9.3	10.0		7.8	10	10	
Depth to HGL (ft)		1.5		1.7	-0.15	1.8	1.9	4.1		3.2	5.9	6.5	
Diameter (in)	8		8		8	8	8	8	8	8	8	8	8
Capacity (mgd)	0.39		0.39		0.39	0.39	0.38	0.39	0.39	0.39	0.46	0.46	
Max Depth (ft)	5.9		6.8		7.0	7.1	7.4	7.4	5.9	4.6	4.1	3.5	
Dep abv Crown (ft)	5.2		6.1		6.3	6.4	6.7	6.7	5.2	3.9	3.5	2.9	
Max Flow (mgd)	0.50		0.33		0.33	0.42	0.41	0.69	0.60	0.58	0.60	0.60	
Max Velocity (ft/s)	2.0		1.7		1.3	2.1	1.2	2.1	2.0	2.0	2.4	3.0	
Slope (ft/ft)	0.0030		0.0030		0.0030	0.0030	0.0029	0.0030	0.0030	0.0030	0.0043	0.0043	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05, BEBP-01
Community: Berea
SHELDON RD to FRONT ST

Brown AND Caldwell

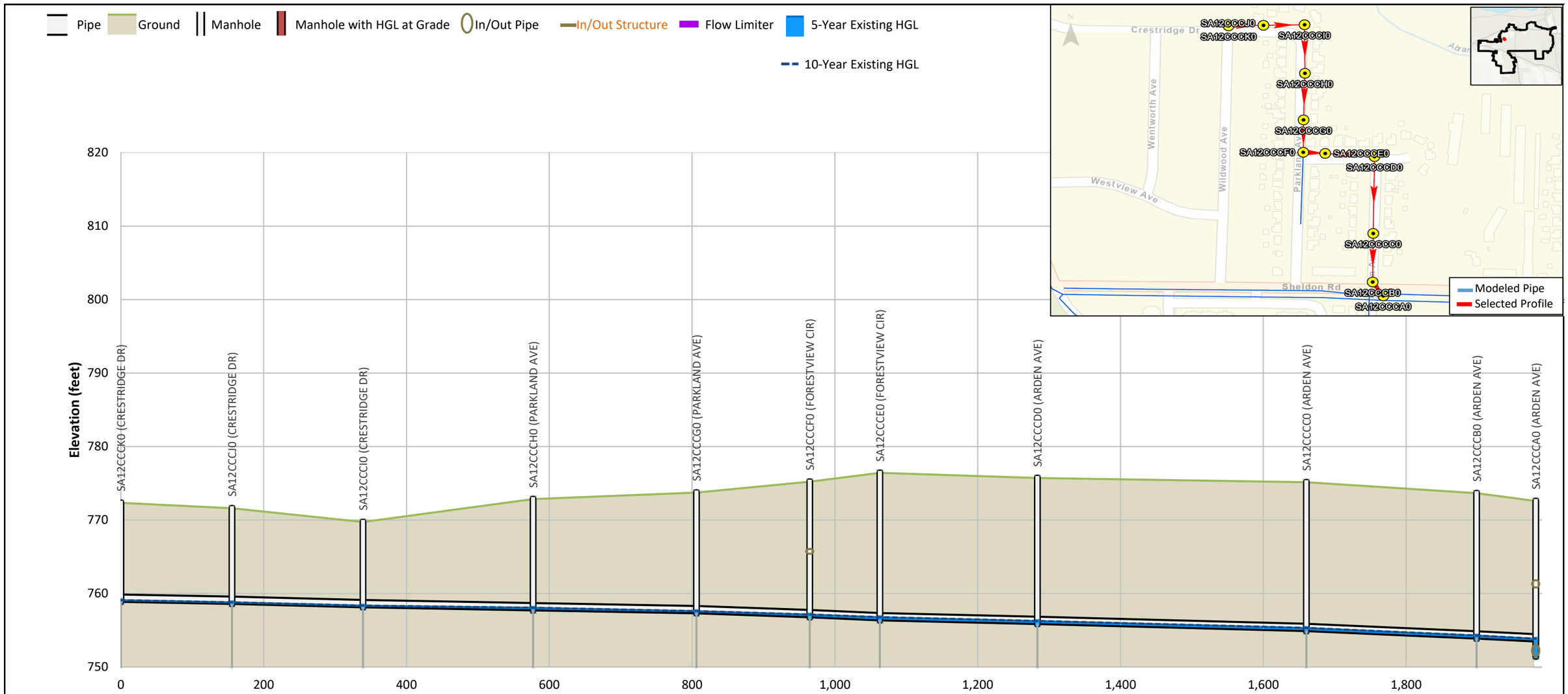
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/DesktopHGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 228, Date created: 3/11/2021

Depth to Invert (ft)		13	12	15	16	18	20	20	20	20	
Depth to HGL (ft)		13	11	15	16	18	20	19	20	19	
Diameter (in)	12	12	12	12	12	12	12	12	12	12	12
Capacity (mgd)	0.89	1.1	0.88	0.88	1.2	1.4	1.0	1.1	1.4	1.5	
Max Depth (ft)	0.22	0.22	0.34	0.34	0.35	0.41	0.41	0.41	0.41	0.39	
Dep abv Crown (ft)	-	-	-	-	-	-	-	-	-	-	
Max Flow (mgd)	0.09	0.09	0.10	0.21	0.21	0.35	0.34	0.34	0.47	0.47	
Max Velocity (ft/s)	1.2	1.1	0.70	1.8	1.4	1.8	1.9	1.9	2.6	2.9	
Slope (ft/ft)	0.0018	0.0025	0.0018	0.0017	0.0034	0.0043	0.0023	0.0025	0.0043	0.0048	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05, BP-08

Community: Berea, Brook Park

CRESTRIDGE DR to ARDEN AVE

Brown AND Caldwell

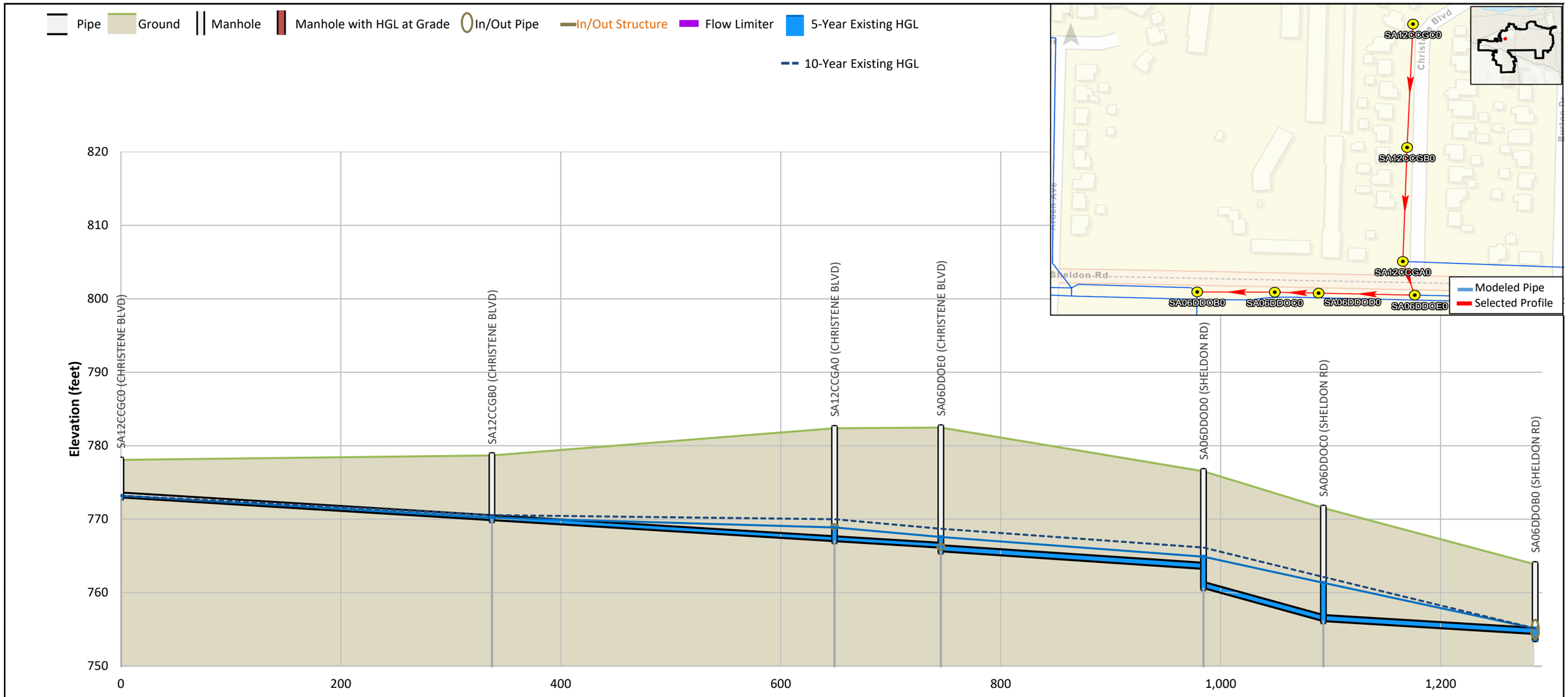
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 232, Date created: 3/11/2021

Depth to Invert (ft)		8.8	15	16	13	15	
Depth to HGL (ft)		8.5	14	15	12	10	
Diameter (in)	8	8	8	10	10	10	
Capacity (mgd)	0.68	0.68	0.68	1.3	2.6	1.2	
Max Depth (ft)	0.35	1.9	1.9	2.0	5.2	5.2	
Dep abv Crown (ft)	-	1.2	1.2	1.1	4.4	4.4	
Max Flow (mgd)	0.17	0.33	0.84	1.6	2.3	2.3	
Max Velocity (ft/s)	1.5	1.6	4.3	5.0	4.4	6.9	
Slope (ft/ft)	0.0092	0.0092	0.0092	0.010	0.041	0.0091	

Northeast Ohio Regional Sewer District

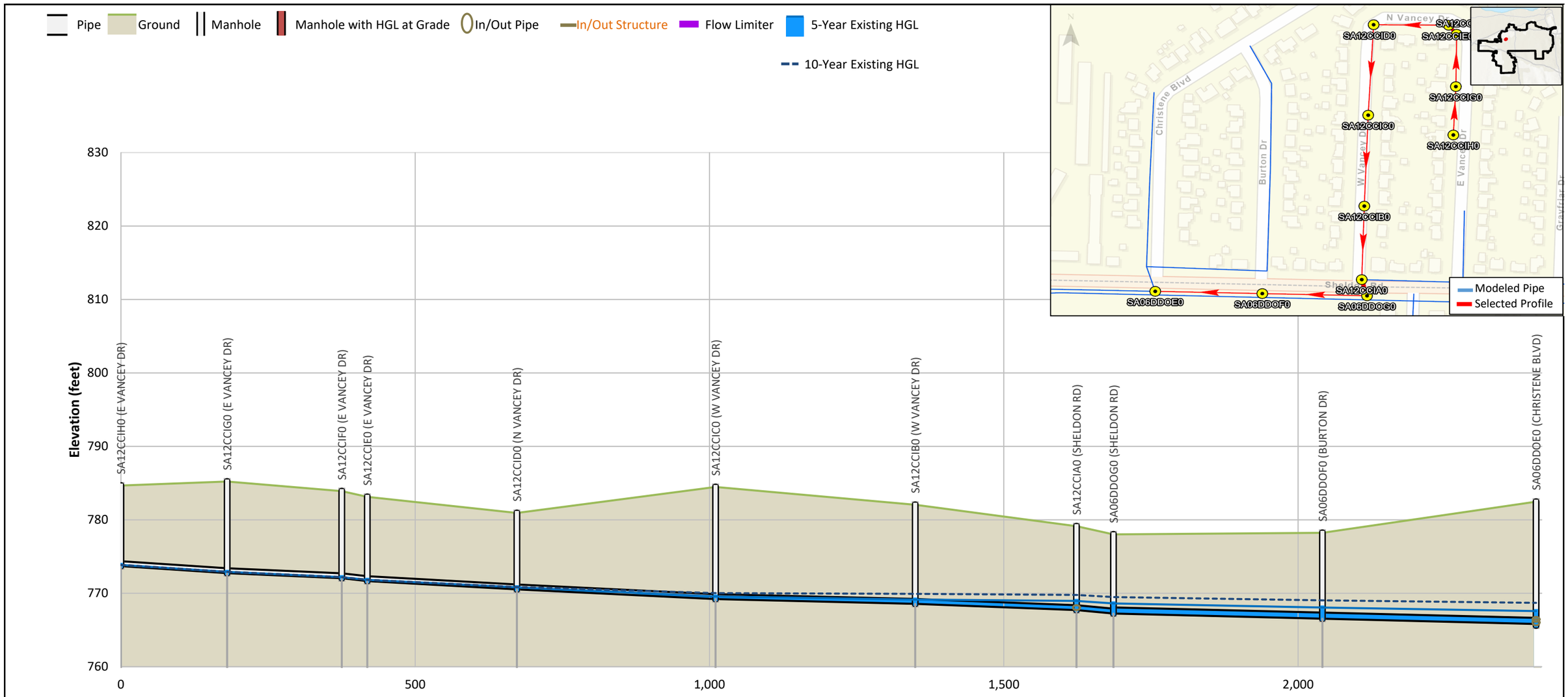
SWI-LSSES

PFA: BE-05, BP-10
Community: Berea, Brook Park
CHRISTENE BLVD to SHELDON RD

Brown AND Caldwell
WADE TRIM

Model Projected 03/08/2021
Max HGL for 5/10-yr, 1-Hour Rain
Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 229, Date created: 3/11/2021

Depth to Invert (ft)		12	12	11	10	15	13	11	11	12		
Depth to HGL (ft)		12	12	11	10	15	13	10	9.4	10		
Diameter (in)	8	8		8	8	8	8	8	8	10	10	
Capacity (mgd)	0.52	0.42		0.47	0.44	0.31	0.40	0.61	0.57	0.57		
Max Depth (ft)	0.18	0.18		0.29	0.35	0.58	1.2	1.4	1.5	1.8		
Dep abv Crown (ft)	-	-		-	-	-	0.58	0.71	0.69	0.92		
Max Flow (mgd)	0.06	0.06		0.06	0.17	0.16	0.25	0.62	0.61	0.73		
Max Velocity (ft/s)	1.3	1.7		0.83	1.4	1.1	1.1	2.6	1.9	3.4		
Slope (ft/ft)	0.0053	0.0035		0.0044	0.0039	0.0019	0.0031	0.0075	0.0020	0.0020		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-05, BP-11
Community: Berea, Brook Park
E VANCEY DR to CHRISTENE BLVD

Brown AND Caldwell

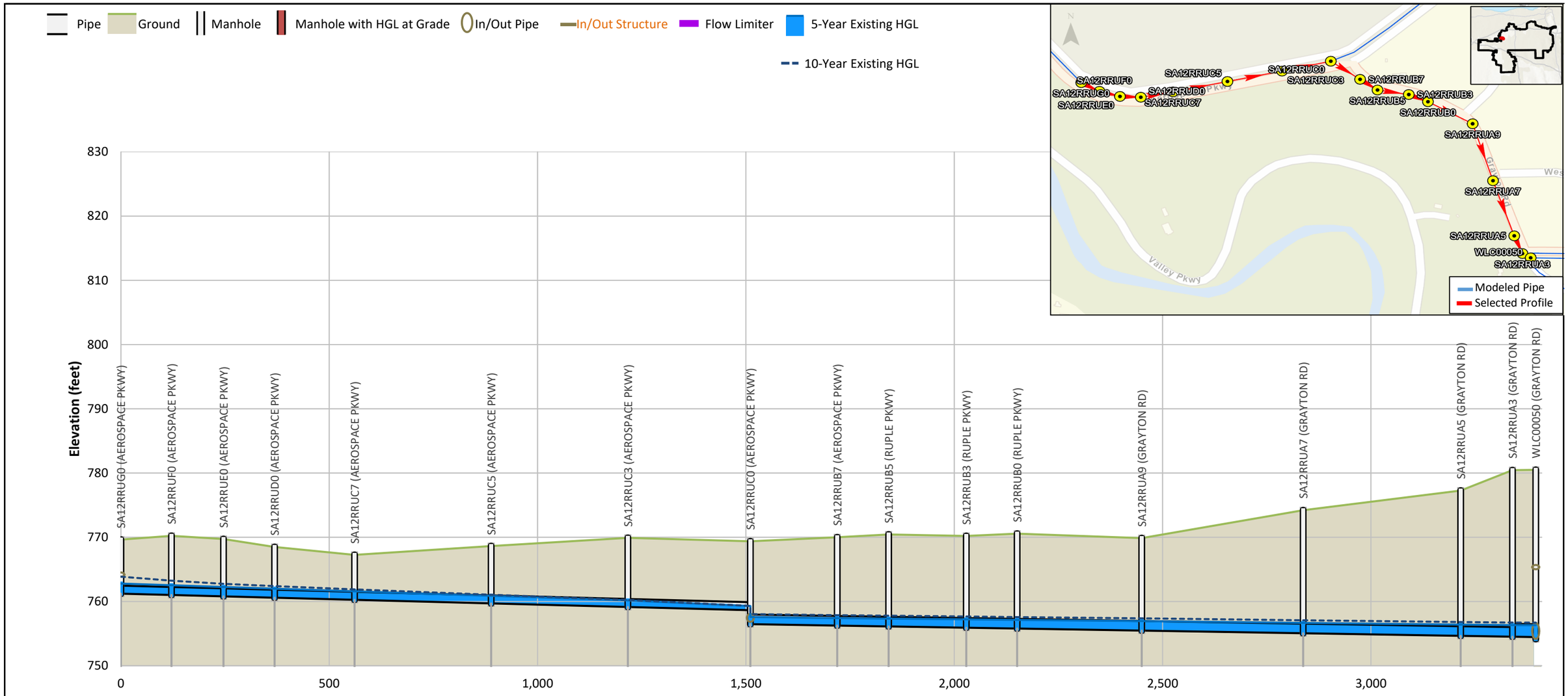
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 225, Date created: 3/11/2021

Depth to Invert (ft)	9.2	8.9	7.9	7.0	8.9	11	11	14	14	14	15	14	19	23	26			
Depth to HGL (ft)	7.7	7.5	6.5	5.7	7.7	9.7	10	13	13	13	13	13	18	21	24			
Diameter (in)	15	15	15	15	15	15	15	18	18	18	18	18	18	18	18			
Capacity (mgd)	1.6	1.6	1.6	1.6	1.6	1.6	1.6	2.0	2.3	2.3	2.0	2.3	2.0	2.0	2.0			
Max Depth (ft)	1.6	1.5	1.5	1.4	1.3	1.2	1.0	1.2	1.2	1.3	1.3	1.5	1.6	1.8	1.8			
Dep abv Crown (ft)	0.32	0.27	0.21	0.16	0.07	-	-	-	-	-	-	-	0.11	0.25	0.30			
Max Flow (mgd)	1.8	1.8	1.8	1.7	1.7	1.7	1.7	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.7			
Max Velocity (ft/s)	3.3	2.6	2.5	2.5	2.4	2.5	4.1	2.3	2.2	2.1	2.2	1.9	1.6	1.5	1.8			
Slope (ft/ft)	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011			

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-06, BP-14, CL-12

Community: Cleveland, Berea, Brook Park

AEROSPACE PKWY to GRAYTON RD

Brown AND Caldwell

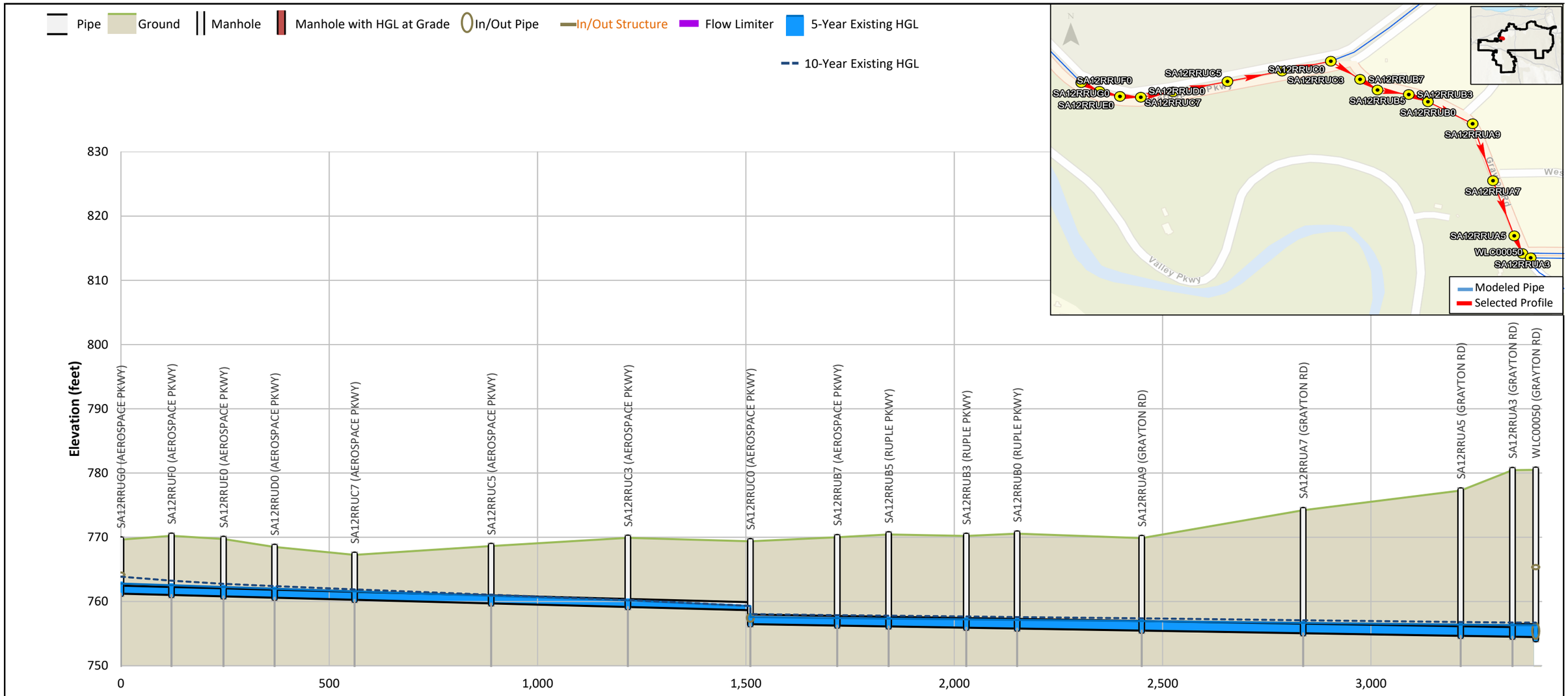
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGL Profiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 225, Date created: 3/11/2021

Depth to Invert (ft)	9.2	8.9	7.9	7.0	8.9	11	11	14	14	14	15	14	19	23	26			
Depth to HGL (ft)	7.7	7.5	6.5	5.7	7.7	9.7	10	13	13	13	13	13	18	21	24			
Diameter (in)	15	15	15	15	15	15	15	18	18	18	18	18	18	18	18			
Capacity (mgd)	1.6	1.6	1.6	1.6	1.6	1.6	1.6	2.0	2.3	2.3	2.0	2.3	2.0	2.0	2.0			
Max Depth (ft)	1.6	1.5	1.5	1.4	1.3	1.2	1.0	1.2	1.2	1.3	1.3	1.5	1.6	1.8	1.8			
Dep abv Crown (ft)	0.32	0.27	0.21	0.16	0.07	-	-	-	-	-	-	-	0.11	0.25	0.30			
Max Flow (mgd)	1.8	1.8	1.8	1.7	1.7	1.7	1.7	1.8	1.7	1.7	1.7	1.7	1.7	1.7	1.7			
Max Velocity (ft/s)	3.3	2.6	2.5	2.5	2.4	2.5	4.1	2.3	2.2	2.1	2.2	1.9	1.6	1.5	1.8			
Slope (ft/ft)	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011			

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-06, BP-14, CL-12

Community: Cleveland, Berea, Brook Park

AEROSPACE PKWY to GRAYTON RD

Brown AND Caldwell

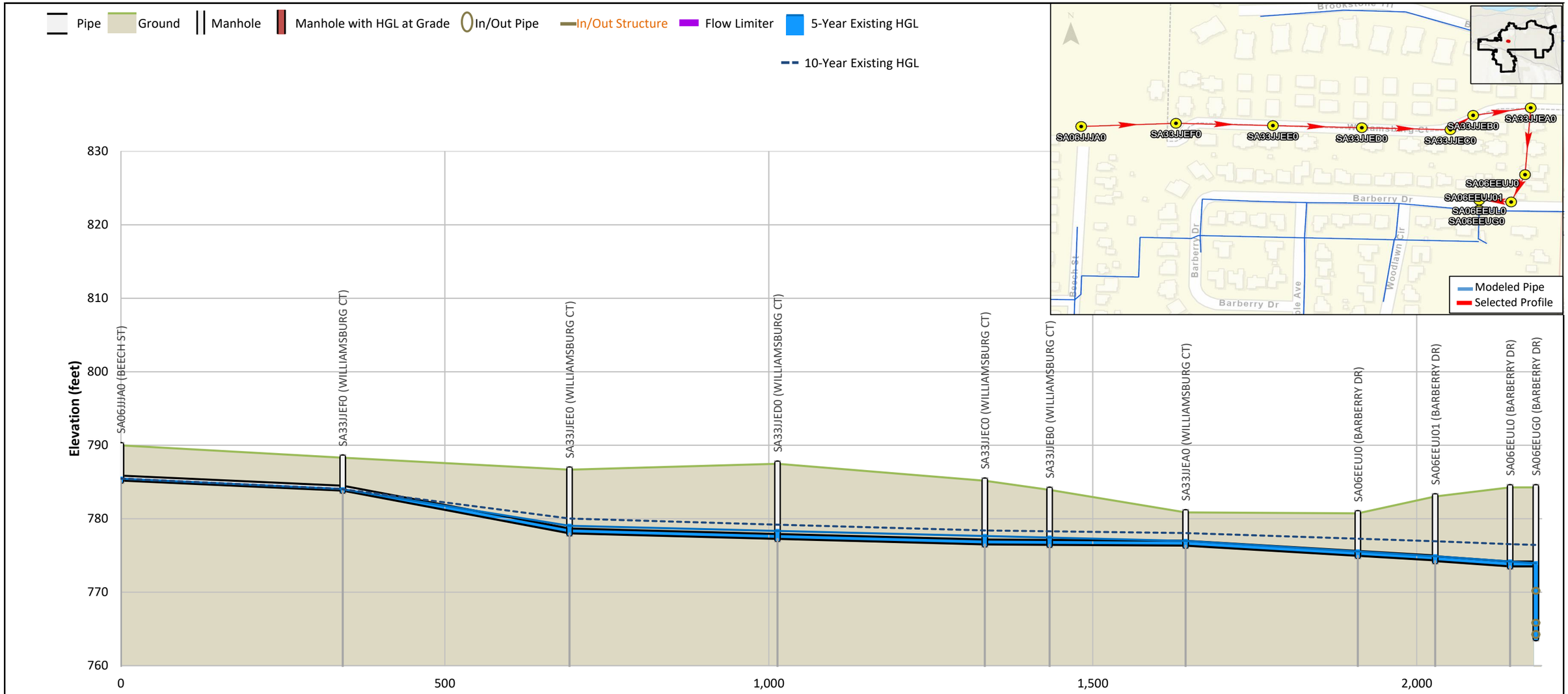
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGL Profiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 316, Date created: 3/11/2021

Depth to Invert (ft)		4.5	8.7	10	8.7	7.5	4.5	5.8	8.7	11	
Depth to HGL (ft)		4.3	7.6	9.1	7.5	6.5	3.9	5.2	8.1	10	
Diameter (in)	8	8	8	8	8	8	8	8	8		
Capacity (mgd)	0.45	0.92	0.34	0.34	0.17	0.16	0.51	0.51	0.56		
Max Depth (ft)	0.26	1.0	1.1	1.1	1.1	0.99	0.65	0.60	0.67		
Dep abv Crown (ft)	-	0.36	0.41	0.48	0.48	0.32	-	-	0.00		
Max Flow (mgd)	0.14	0.14	0.34	0.33	0.33	0.33	0.51	0.51	0.56		
Max Velocity (ft/s)	2.2	0.62	1.8	1.3	1.3	1.7	2.6	3.2	2.4		
Slope (ft/ft)	0.0040	0.017	0.0023	0.0023	0.00059	0.00050	0.0052	0.0052	0.0062		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-01, BE-03, MI-12

Community: Berea, Middleburg Heights

BEECH ST to BARBERRY DR

Brown AND Caldwell

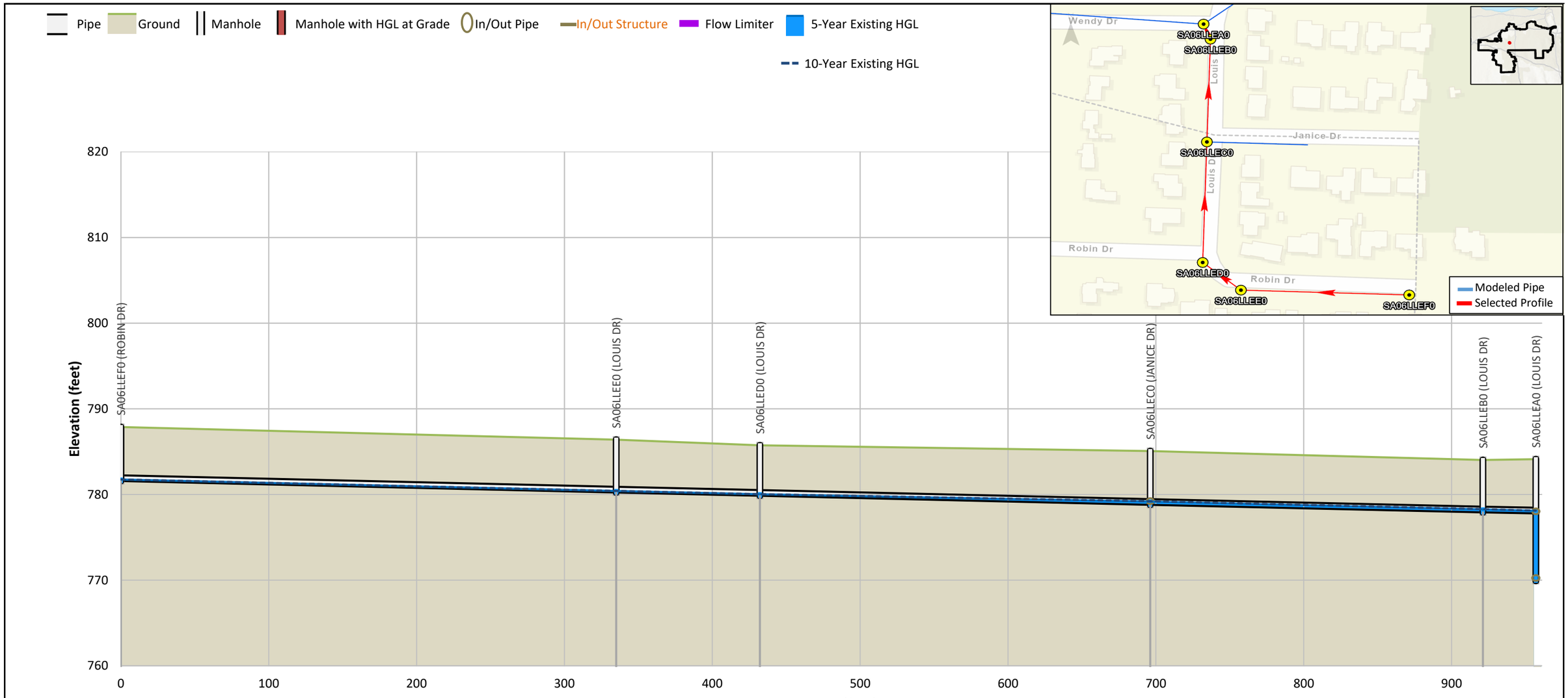
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 319, Date created: 3/11/2021

Depth to Invert (ft)		6.2		5.9		6.3		6.1				
Depth to HGL (ft)		6.0		5.7		5.9		5.8				
Diameter (in)	8		8		8		8		8			
Capacity (mgd)	0.45		0.44		0.45		0.44		0.47			
Max Depth (ft)	0.18		0.18		0.38		0.38		0.35			
Dep abv Crown (ft)	-		-		-		-		-			
Max Flow (mgd)	0.07		0.07		0.07		0.27		0.27			
Max Velocity (ft/s)	1.4		1.4		0.51		2.3		2.7			
Slope (ft/ft)	0.0040		0.0039		0.0040		0.0039		0.0034			

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03, MI-13
Community: Berea
ROBIN DR to LOUIS DR

Brown AND Caldwell

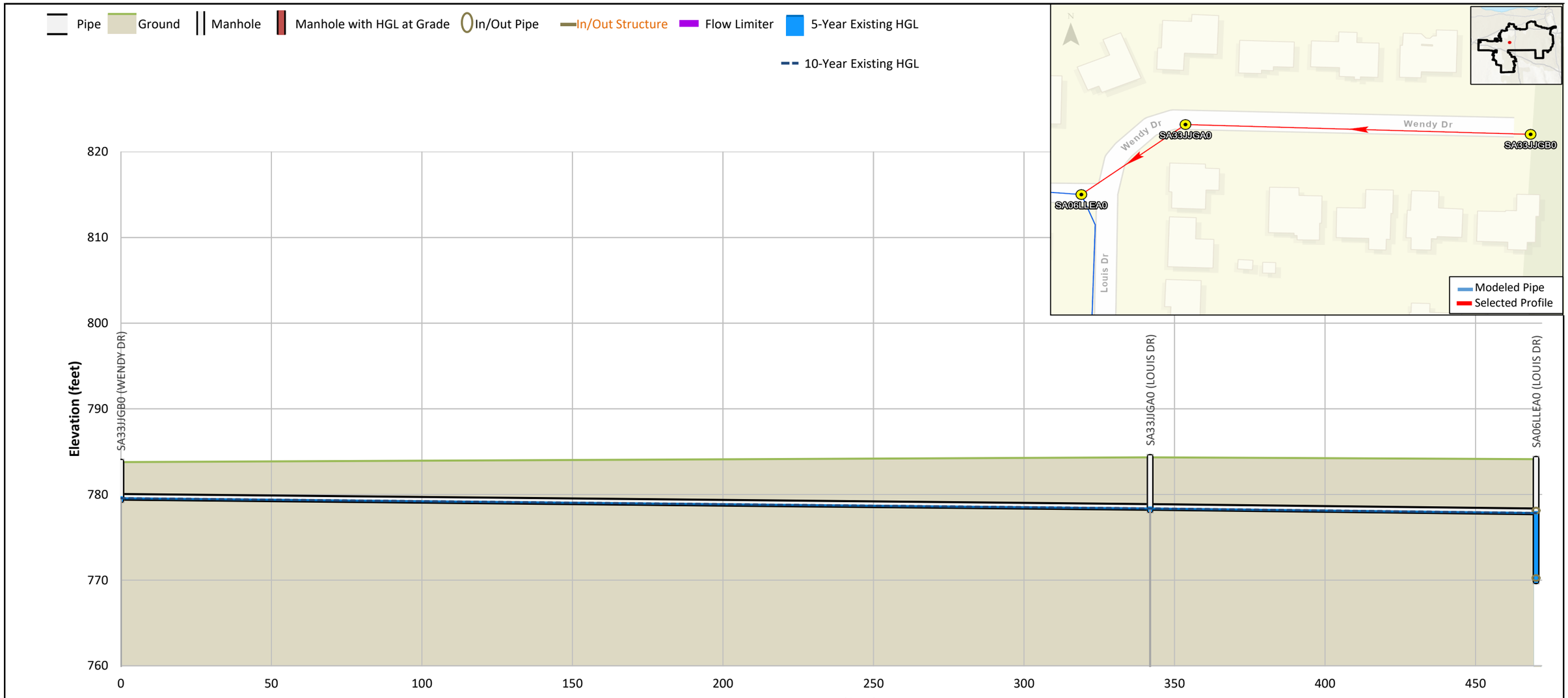
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 321, Date created: 3/11/2021

Depth to Invert (ft)		6.1	
Depth to HGL (ft)		6.0	
Diameter (in)	8		8
Capacity (mgd)	0.42		0.51
Max Depth (ft)	0.17		0.15
Dep abv Crown (ft)	-		-
Max Flow (mgd)	0.05		0.05
Max Velocity (ft/s)	1.5		1.7
Slope (ft/ft)	0.0035		0.0040

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: MI-13

Community: Berea, Middleburg Heights

WENDY DR to LOUIS DR

Brown AND Caldwell

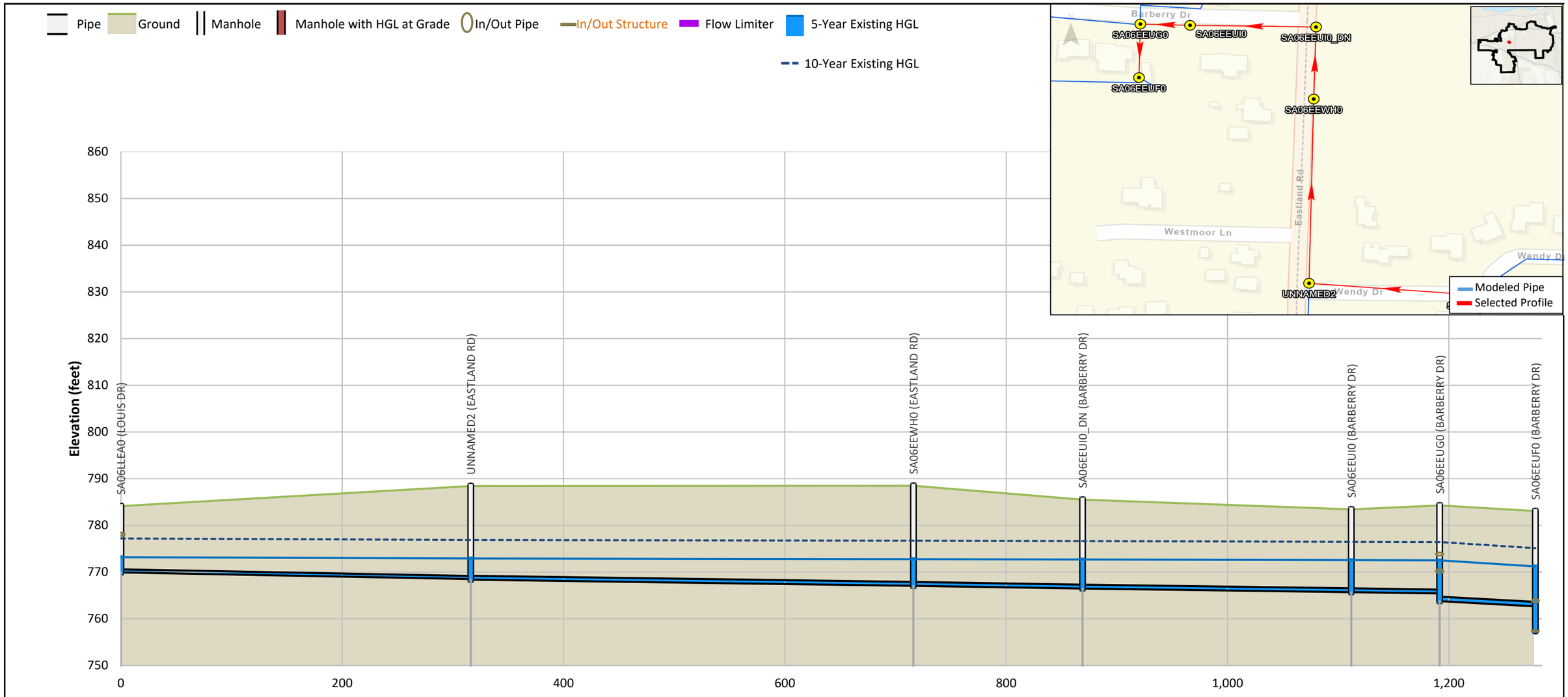
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 323, Date created: 3/11/2021

Depth to Invert (ft)	20	21	19	18	19		
Depth to HGL (ft)	16	16	13	11	12		
Diameter (in)	8	10	10	10	10	10	11.6
Capacity (mgd)	0.54	0.74	0.79	0.73	0.75	1.6	
Max Depth (ft)	4.4	5.7	6.2	6.9	7.1	8.7	
Dep abv Crown (ft)	3.7	4.9	5.4	6.0	6.3	7.8	
Max Flow (mgd)	0.40	0.40	0.48	0.56	0.60	2.0	
Max Velocity (ft/s)	3.1	1.9	2.2	2.3	3.1	5.5	
Slope (ft/ft)	0.0045	0.0033	0.0038	0.0032	0.0034	0.013	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-03, MI-13
Community: Berea, Middleburg Heights
LOUIS DR to BARBERRY DR

Brown AND Caldwell

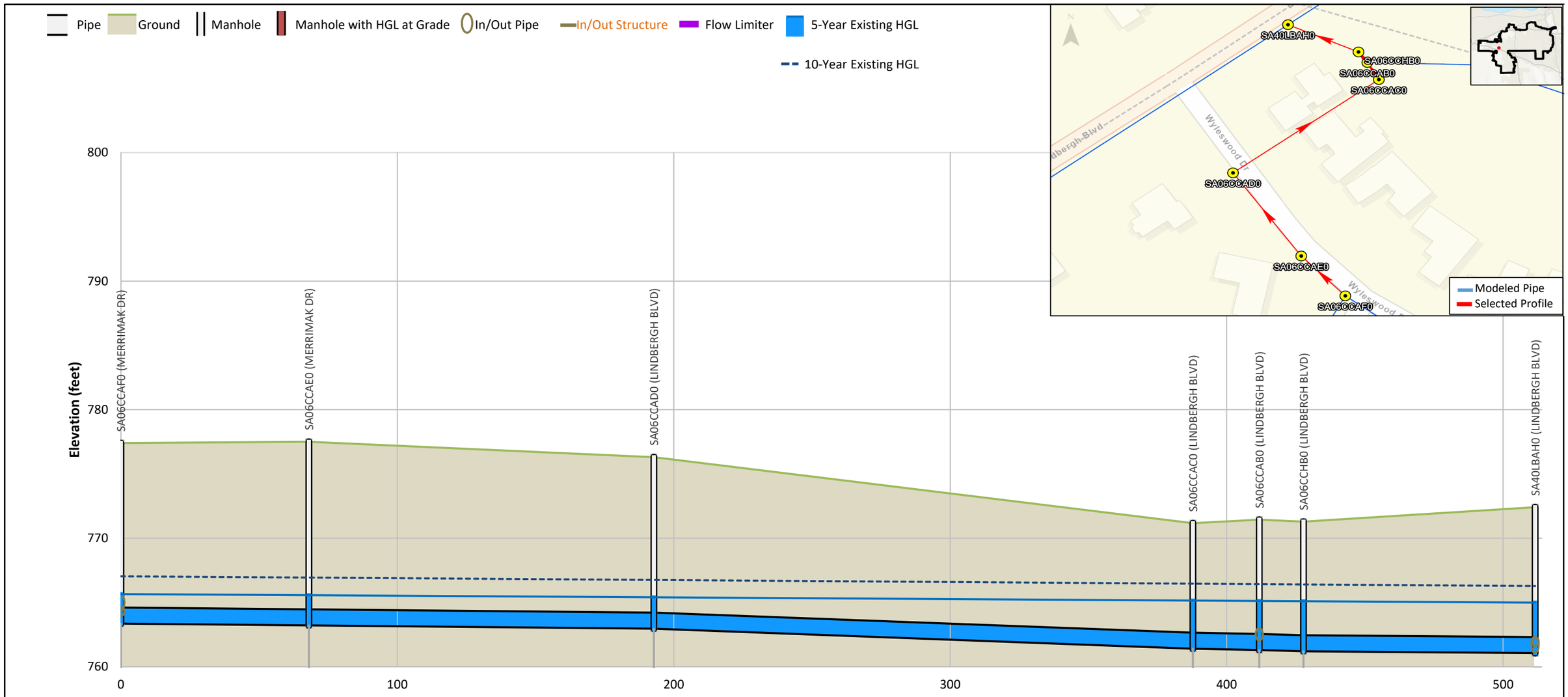
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 352, Date created: 3/11/2021

Depth to Invert (ft)		14		13		9.8		10	10			
Depth to HGL (ft)		12		11		6.0		6.3	6.2			
Diameter (in)	15		15		15		15		15	15		15
Capacity (mgd)	2.2		2.2		4.4		3.2		3.9	2.0		
Max Depth (ft)	2.4		2.4		3.7		3.8		3.9	3.9		
Dep abv Crown (ft)	1.1		1.2		2.5		2.6		2.6	2.7		
Max Flow (mgd)	2.0		2.0		1.9		1.9		1.8	1.8		
Max Velocity (ft/s)	3.4		4.3		3.0		2.8		2.4	2.3		
Slope (ft/ft)	0.0020		0.0020		0.0080		0.0042		0.0062	0.0017		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-08, OF-01
Community: Berea
MERRIMAK DR to LINDBERGH BLVD

Brown AND Caldwell

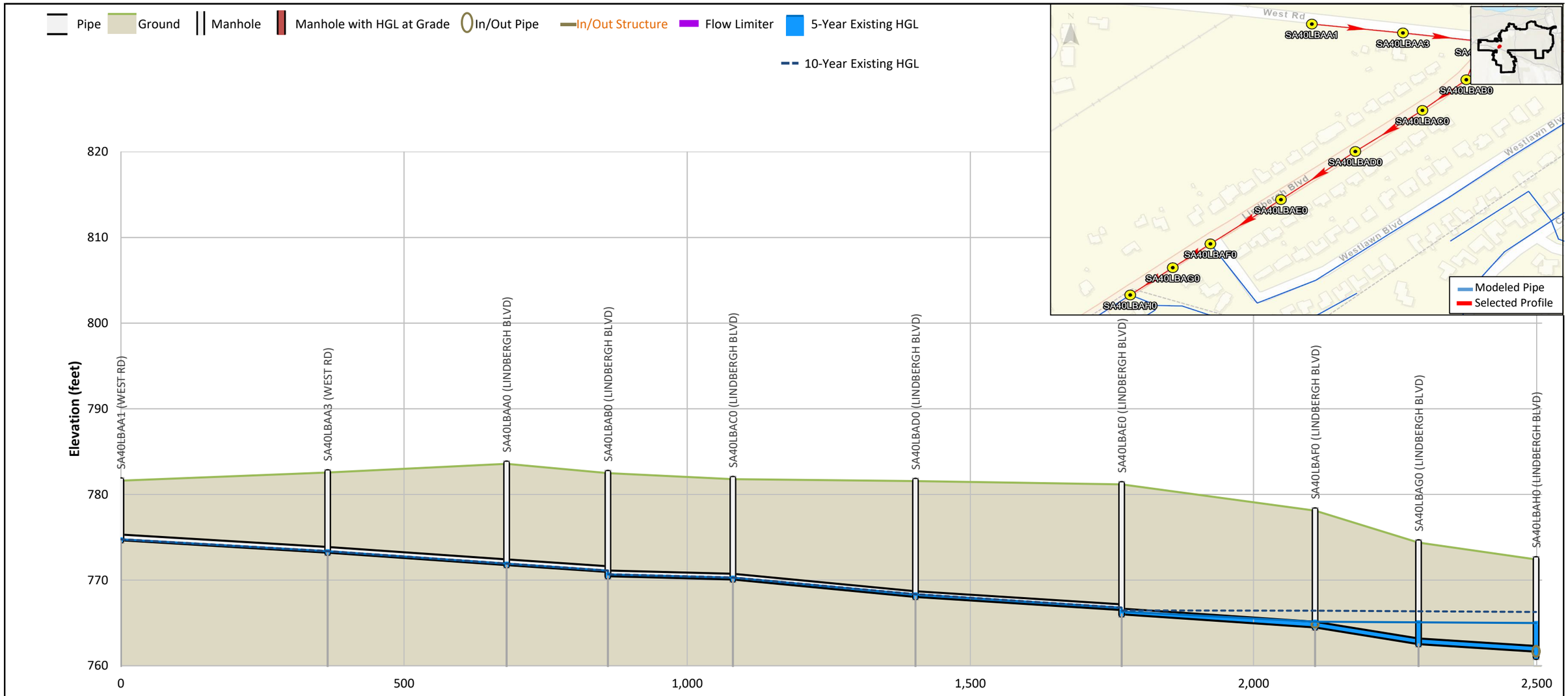
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/DesktopHGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 355, Date created: 3/11/2021

Depth to Invert (ft)		9.4	12	12	12	14	15	14	12	
Depth to HGL (ft)		9.2	12	11	12	13	14	13	9.3	
Diameter (in)	8	8	8	8	8	8	8	8	8	8
Capacity (mgd)	0.51	0.55	0.54	0.34	0.65	0.53	0.54	0.84	0.53	
Max Depth (ft)	0.17	0.17	0.17	0.21	0.30	0.30	0.67	2.5	3.3	
Dep abv Crown (ft)	-	-	-	-	-	-	0.00	1.9	2.7	
Max Flow (mgd)	0.03	0.07	0.07	0.07	0.14	0.22	0.27	0.61	0.58	
Max Velocity (ft/s)	0.65	1.6	1.8	1.3	1.5	2.5	1.7	2.7	3.6	
Slope (ft/ft)	0.0040	0.0046	0.0045	0.0017	0.0063	0.0042	0.0045	0.011	0.0042	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: OF-01

Community: Olmsted Falls, Berea

WEST RD to LINDBERGH BLVD

Brown AND Caldwell

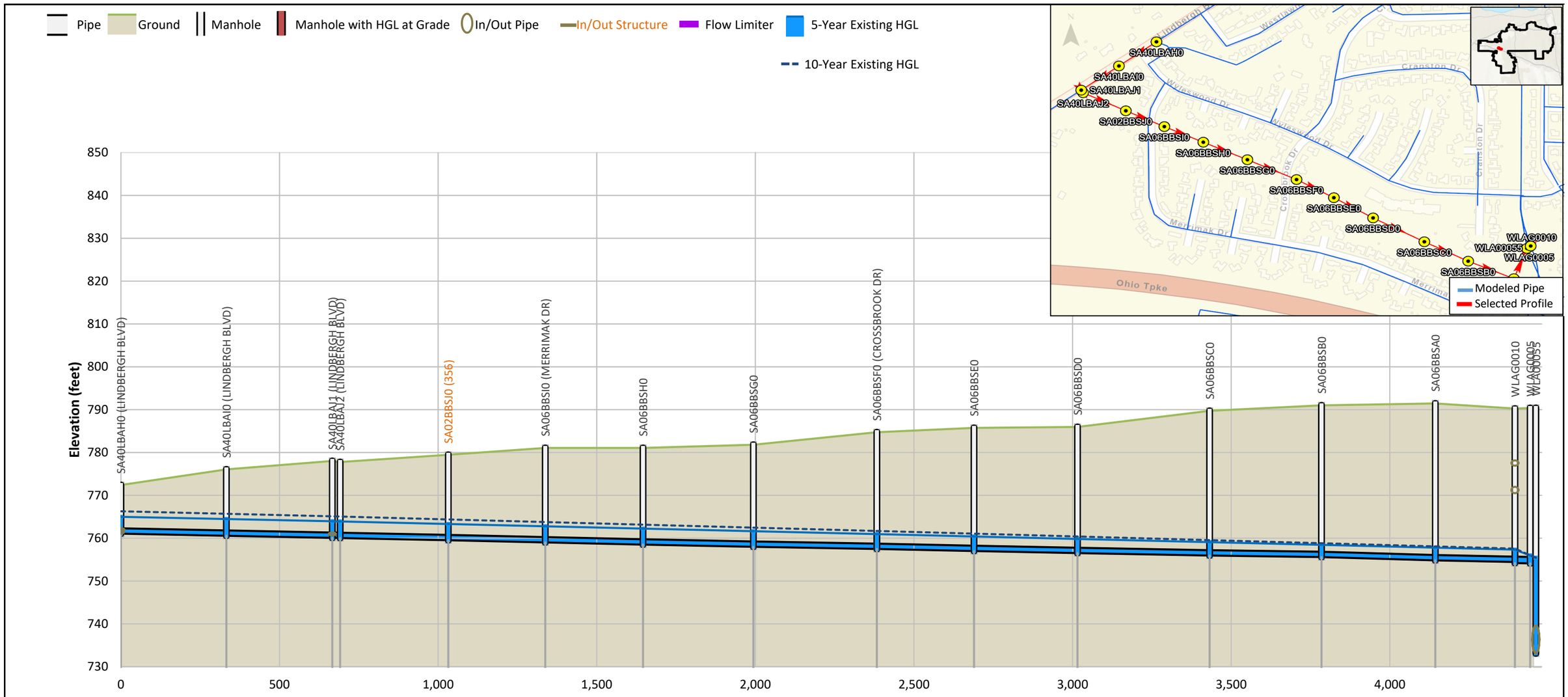
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://bwncald-my.sharepoint.com/personal/jhatfield_bwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 356, Date created: 3/11/2021

Depth to Invert (ft)		15			20	22	23	24	27	29	29	34	35	37	36
Depth to HGL (ft)		12			16	18	19	20	24	25	26	31	33	34	33
Diameter (in)	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Capacity (mgd)	1.9	1.9	1.9	2.0	2.0	1.9	1.8	2.0	1.9	1.8	1.6	2.3	1.9		
Max Depth (ft)	3.9	3.9	3.9	3.8	3.8	3.7	3.6	3.5	3.4	3.3	3.1	3.0	3.0		
Dep abv Crown (ft)	2.7	2.7	2.6	2.5	2.5	2.5	2.4	2.2	2.2	2.0	1.9	1.7	1.7		
Max Flow (mgd)	2.1	2.1	2.4	2.3	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1		
Max Velocity (ft/s)	2.6	2.4	3.1	3.0	2.9	2.8	2.8	2.9	2.8	2.5	2.8	2.4	2.4		
Slope (ft/ft)	0.0015	0.0015	0.0015	0.0017	0.0017	0.0015	0.0013	0.0016	0.0015	0.0014	0.0010	0.0021	0.0015		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-08, BE-09, OF-16, OF-01

Community: Olmsted Falls, Berea

LINDBERGH BLVD to Manhole WLA00055

Brown AND Caldwell

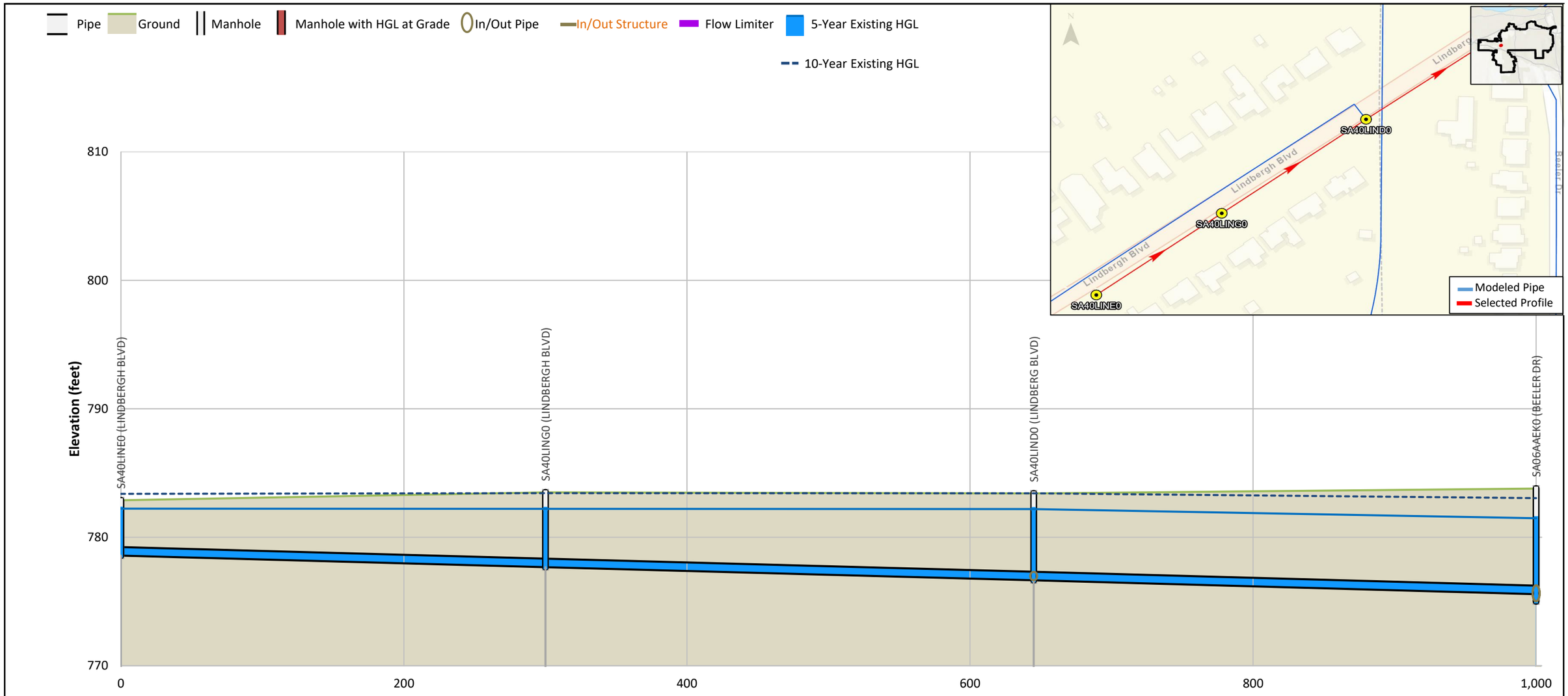
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 770, Date created: 3/11/2021

Depth to Invert (ft)		5.8	6.8	
Depth to HGL (ft)		1.3	1.2	
Diameter (in)	8	8	8	8
Capacity (mgd)	0.39	0.39	0.39	0.39
Max Depth (ft)	4.5	5.5	5.9	
Dep abv Crown (ft)	3.9	4.9	5.2	
Max Flow (mgd)	0.12	-0.11	0.44	
Max Velocity (ft/s)	1.5	-0.36	3.2	
Slope (ft/ft)	0.0030	0.0030	0.0030	

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: OF-02, BE-13
Community: Olmsted Falls, Berea
LINDBERGH BLVD to BEELER DR

Brown AND Caldwell

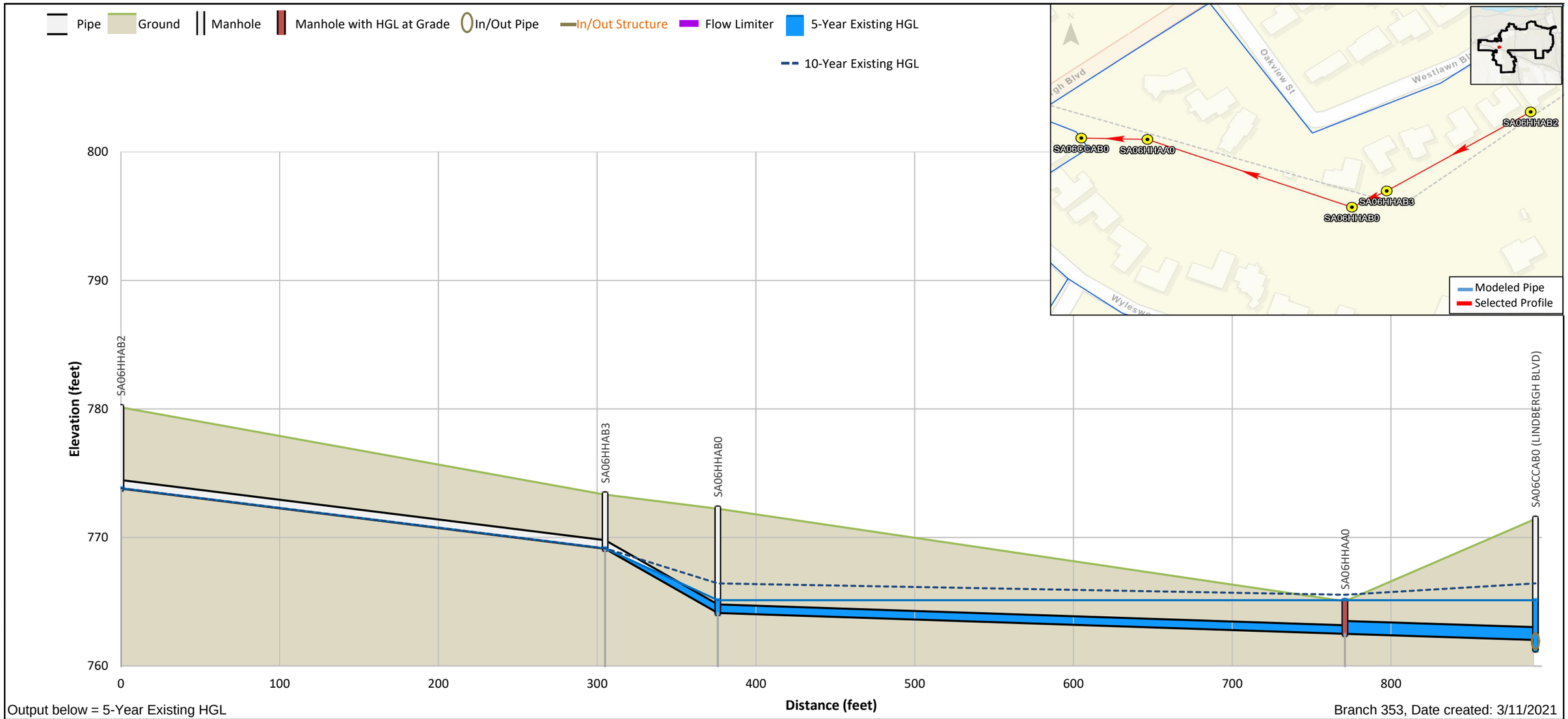
WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

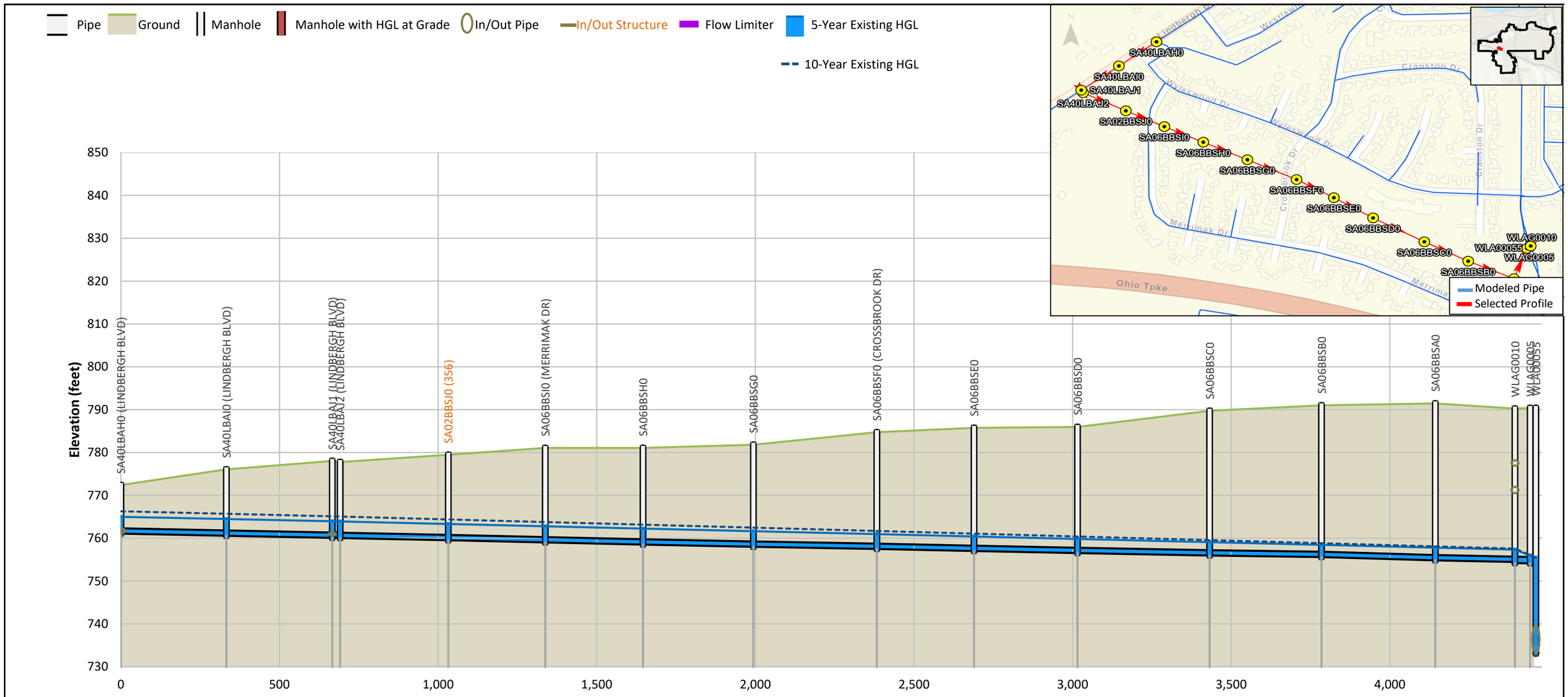
https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/DesktopHGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm



Output below = 5-Year Existing HGL

Branch 353, Date created: 3/11/2021

| | | |



Output below = 5-Year Existing HGL

Branch 356, Date created: 3/11/2021

Depth to Invert (ft)		15			20	22	23	24	27	29	29	34	35	37	36
Depth to HGL (ft)		12			16	18	19	20	24	25	26	31	33	34	33
Diameter (in)	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Capacity (mgd)	1.9	1.9	1.9	2.0	2.0	1.9	1.8	2.0	1.9	1.8	1.6	2.3	1.9		
Max Depth (ft)	3.9	3.9	3.9	3.8	3.8	3.7	3.6	3.5	3.4	3.3	3.1	3.0	3.0		
Dep abv Crown (ft)	2.7	2.7	2.6	2.5	2.5	2.5	2.4	2.2	2.2	2.0	1.9	1.7	1.7		
Max Flow (mgd)	2.1	2.1	2.4	2.3	2.3	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1		
Max Velocity (ft/s)	2.6	2.4	3.1	3.0	2.9	2.8	2.8	2.9	2.8	2.5	2.8	2.4	2.4		
Slope (ft/ft)	0.0015	0.0015	0.0015	0.0017	0.0017	0.0015	0.0013	0.0016	0.0015	0.0014	0.0010	0.0021	0.0015		

Northeast Ohio Regional Sewer District

SWI-LSSES

PFA: BE-08, BE-09, OF-16, OF-01

Community: Olmsted Falls, Berea

LINDBERGH BLVD to Manhole WLA00055

Brown AND Caldwell

WADE TRIM

Model Projected 03/08/2021

Max HGL for 5/10-yr, 1-Hour Rain

Existing Conditions

https://brwncald-my.sharepoint.com/personal/jhatfield_brwncald_com/Documents/Desktop/HGLProfiles/CreateBranchProfilesV30 - SWI2019-03082021.xlsm

ARCGIS ONLINE (AGOL) COMMUNITY REPORT VIEWER ACCESS GUIDE

1485: Southwest Interceptor Local Sewer System Evaluation Study

Revision No. 2

Draft

Prepared For

Northeast Ohio Regional Sewer District

May 2021

WADE TRIM

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1.0 INTRODUCTION

This Guide was created to help community representatives access the Southwest Interceptor (SWI) Local Sewer System Evaluation Study (LSSES) results online. The SWI LSSES is the third of four NEORSD LSSES projects being implemented to address sewer infrastructure problems that adversely affect human health and the environment. This document was created with guidance from the SWI LSSES project team and Northeast Ohio Regional Sewer District (NEORSD). The data contained in this map is "live" and provides the latest information and results related to the SWI LSSES project.

2.0 NEORSD GIS ACCESS

IF YOU ALREADY HAVE ACCESS TO THE SWI AGOL SITE, PLEASE SKIP THIS SECTION

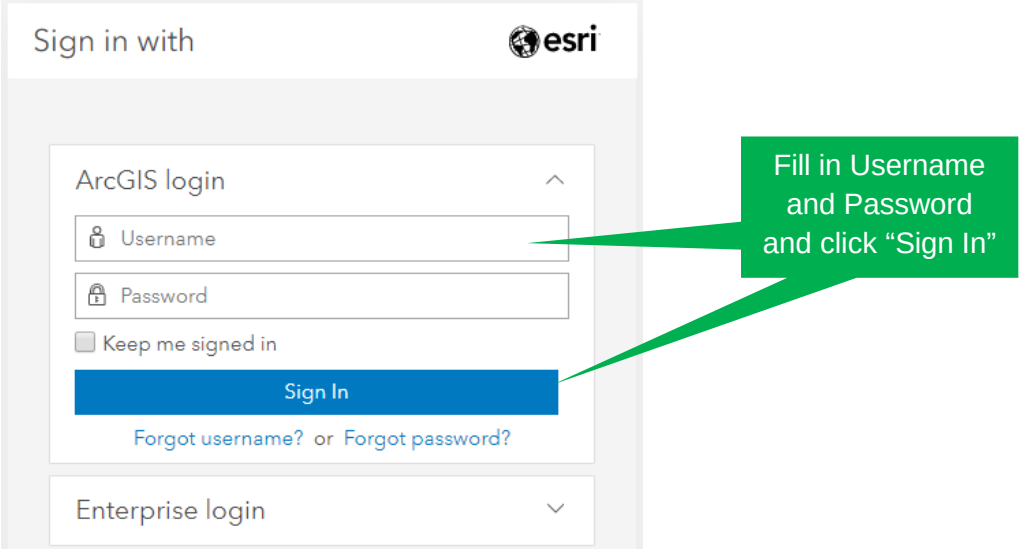
1. To receive access to NEORSD's GIS group, you first must contact GIS@neorsd.org to receive the most up-to-date GIS Access Form.
2. Complete and email the form to GIS@neorsd.org, and CC Lita Laven (LavenL@neorsd.org). In the email, please request access to the "1485 – Southwest Interceptor – Local SSES Group" and include the name of the community you are representing.
3. After the form is approved and processed, you will receive a login that will grant access to the SWI-LSSES Group of NEORSD's GIS. User accounts will be deleted after six months of inactivity. If your account is deleted, the GIS Access Form will need to be resubmitted to NEORSD.

3.0 HOW TO ACCESS AND USE THE *COMMUNITY REPORT VIEWER* MAP

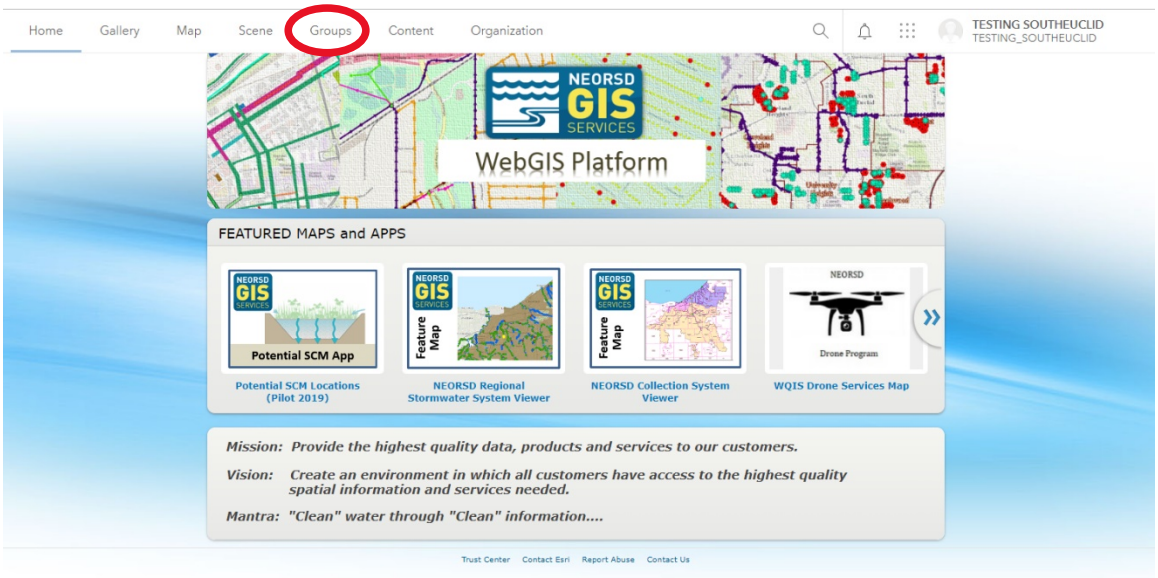
The *Community Report Viewer* is an interactive web map that allows community representatives to view data from fieldwork and reports associated with the SWI LSSES project. Initial data collection activities related to the physical characteristics of the local system are represented as basemap information including sewer location, size, material, etc.; sewer construction type; housing stock age; household sewage treatment system locations; etc. The web map also includes findings and information from varying types of inspections that were performed in select parts of the study area where community issues were identified. Additionally, the map contains results of model simulations intended to evaluate system performance during the 5-year, 1-hour design event, identifying projected locations of active SSOs, capacity restrictions, or basement back-ups. Additional detail related to the type of data and results provided for each community can be found in more detail in the draft and final versions of community reports developed as part of the SWI LSSES project.

3.1 ACCESSING THE SWI LSSES *COMMUNITY REPORT VIEWER* MAP ON AGOL

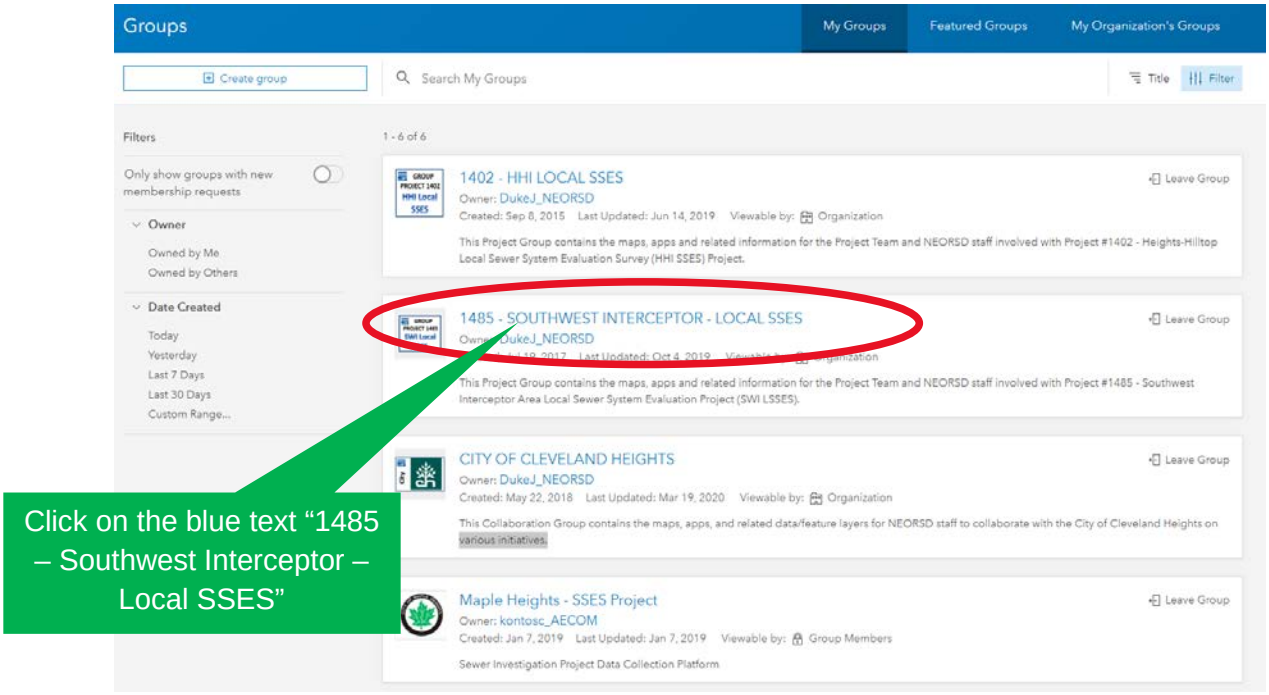
1. In a web browser, navigate to www.arcgis.com and click "Sign In" in the upper right-hand corner.
2. Enter the **username that has been provided to you** and **the password you've set-up**, and click **"Sign In."**



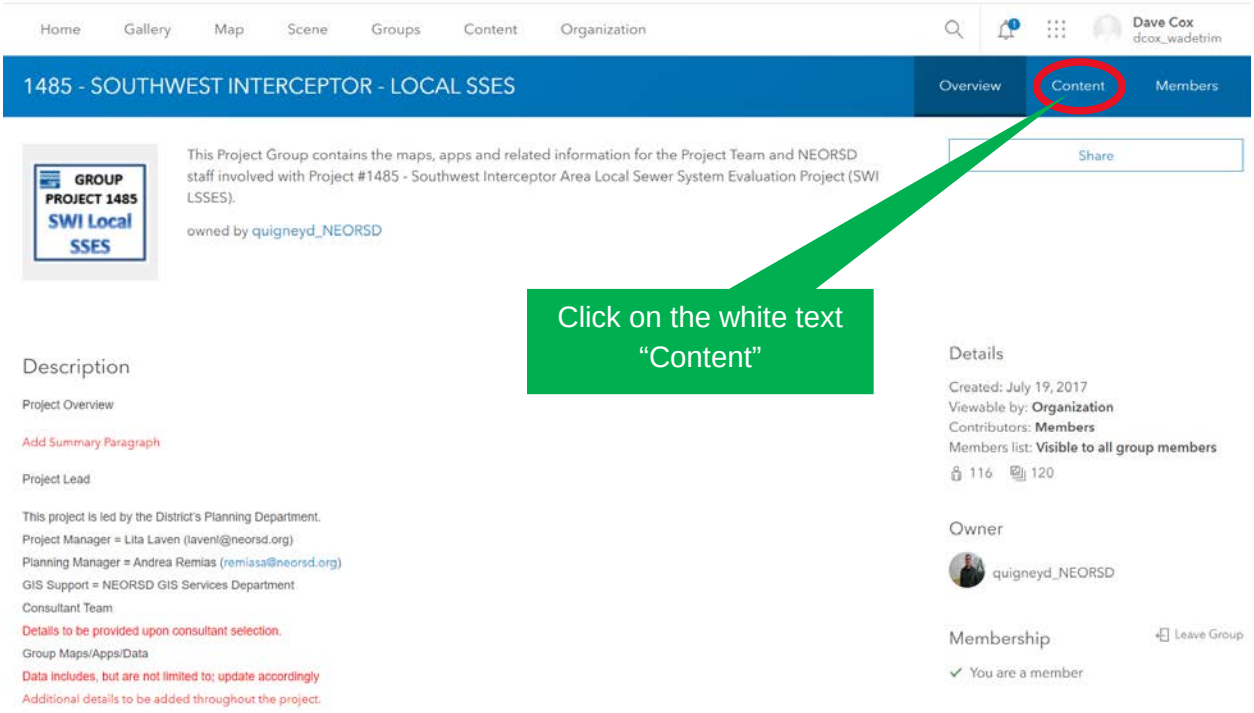
3. Click on the **"Groups"** tab at the top of the screen.



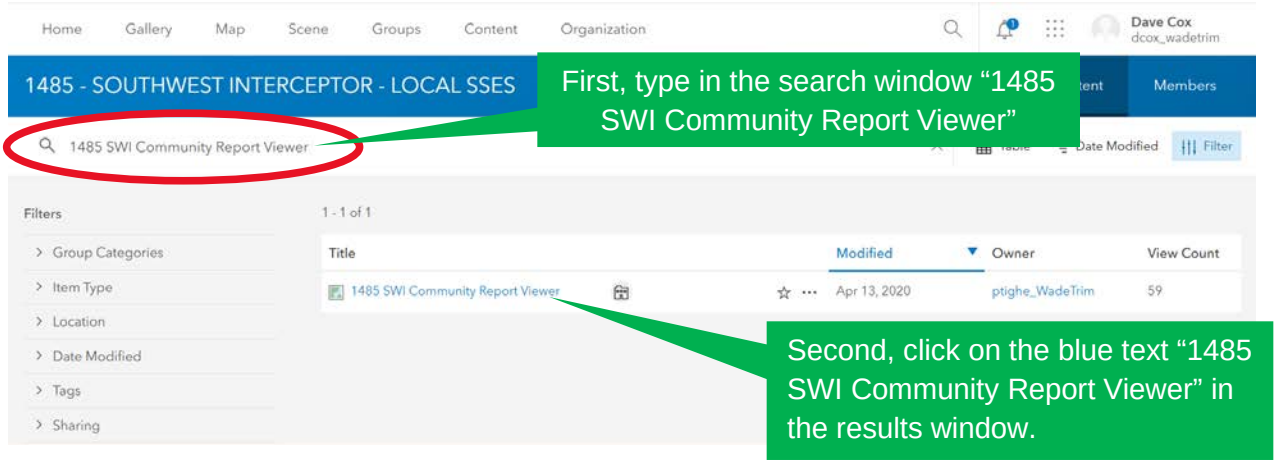
4. This will bring you to a list of groups that your account has access to. Click on the group named **"1485 – SOUTHWEST INTERCEPTOR – LOCAL SSES."** If you do not see this group, please email GIS@neorsd.org.



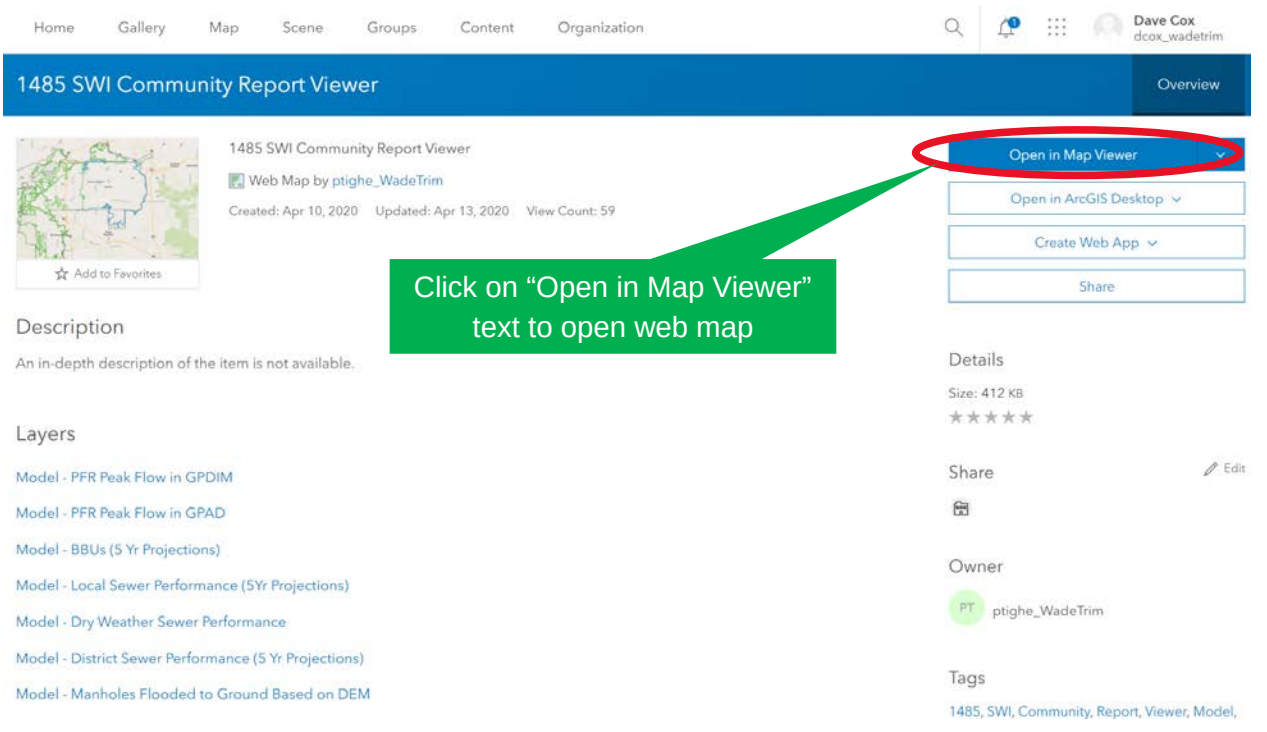
5. On the group's page, click on **"Content"** near the top right corner of the screen.



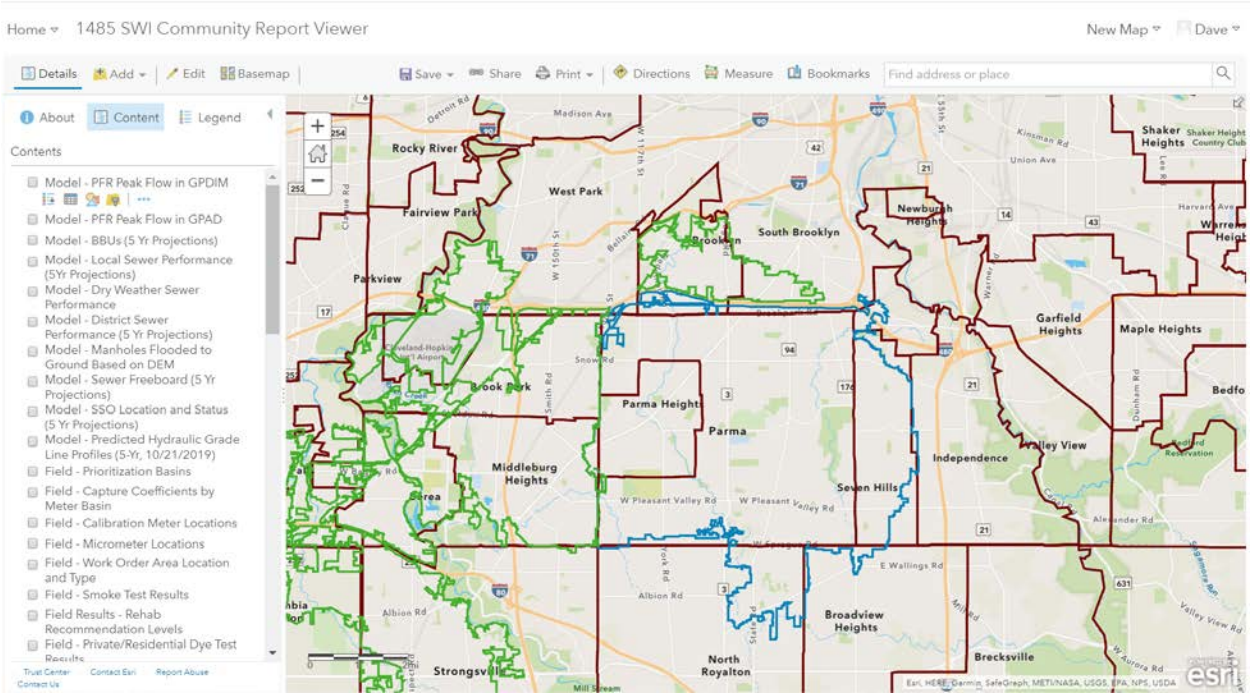
6. In the "search" window in the upper left of the screen, type "1485 SWI Community Report Viewer" to find the appropriate web map. Then, click on the blue text in the results area in the center of the page. If you do not see it here, please email GIS@neorsd.org.



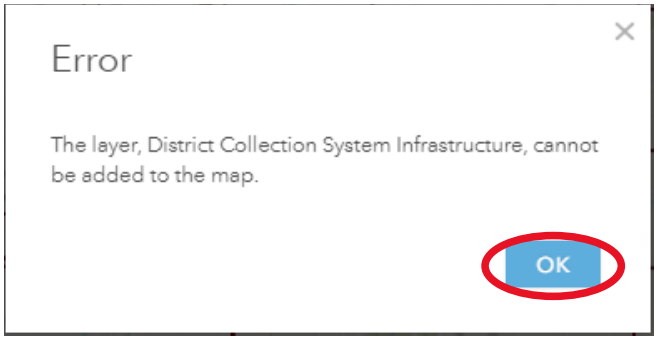
7. Next, click the **"Open in Map Viewer"** button in the top right corner of the screen to open the "Inspection Results" map.



8. The map will now open, and you should see a page similar to the image below.



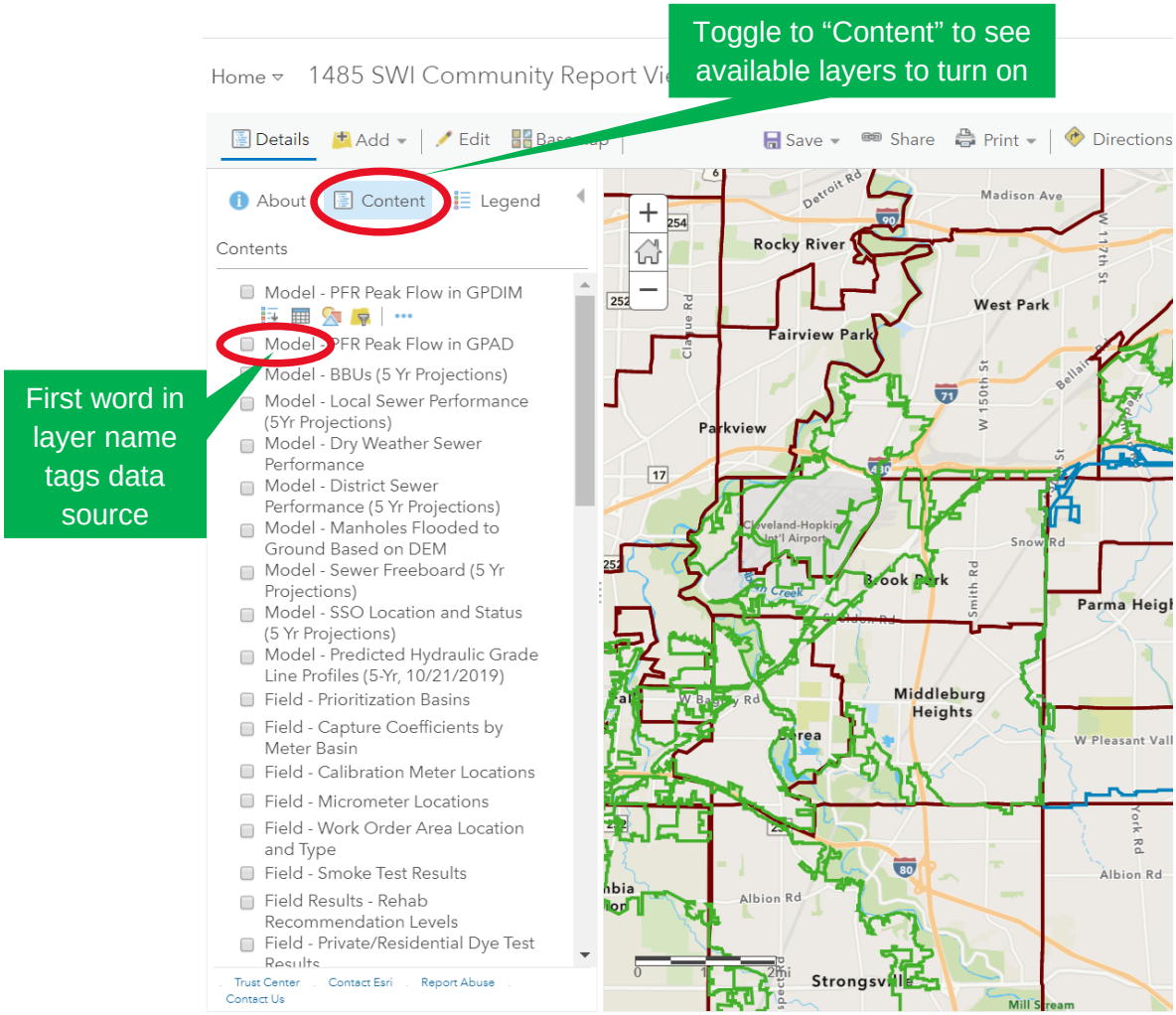
At times, while the map is opening, some layers may have difficulty loading. If you see an "Error" message such as the one below, simply click the **"OK"** button and continue. If a layer is consistently not loading, please contact GIS@neorsd.org.



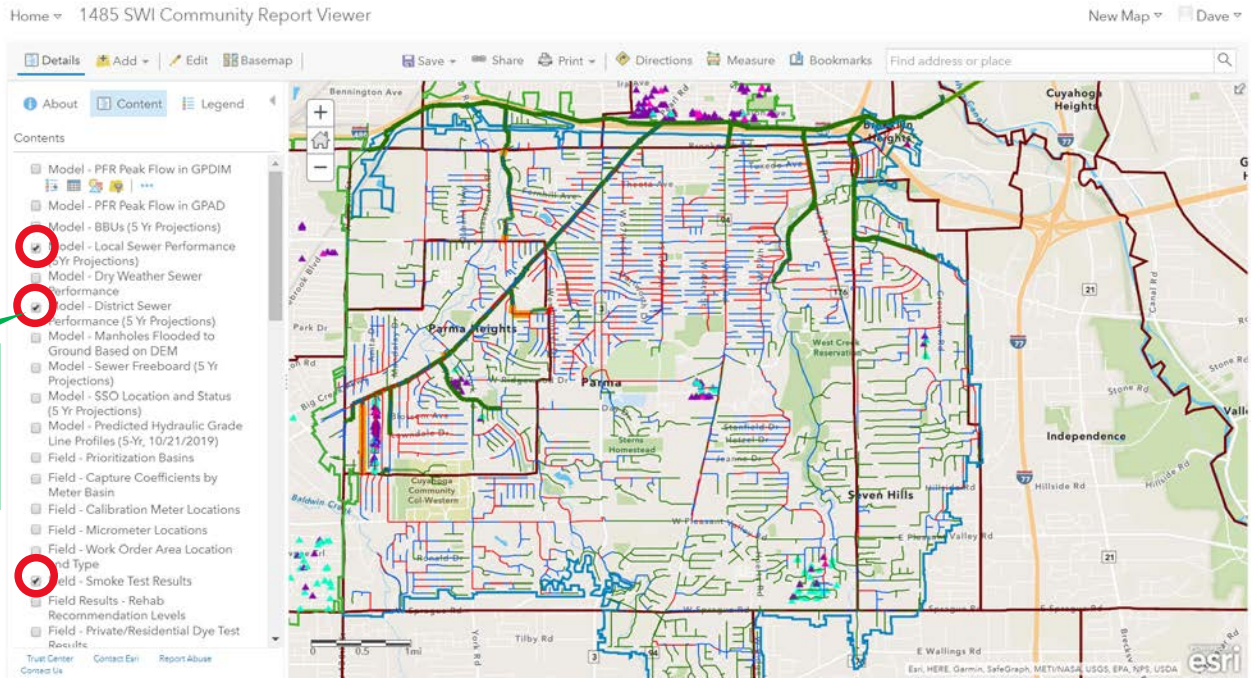
3.2 USING THE 1485 SWI *COMMUNITY REPORT VIEWER* MAP

Once the web map is loaded, users can zoom in and out of areas and select various types of information to display based on individual data layers assembled as part of the SSES project. Instructions on how to navigate and view data on the *Community Report Viewer* map follow.

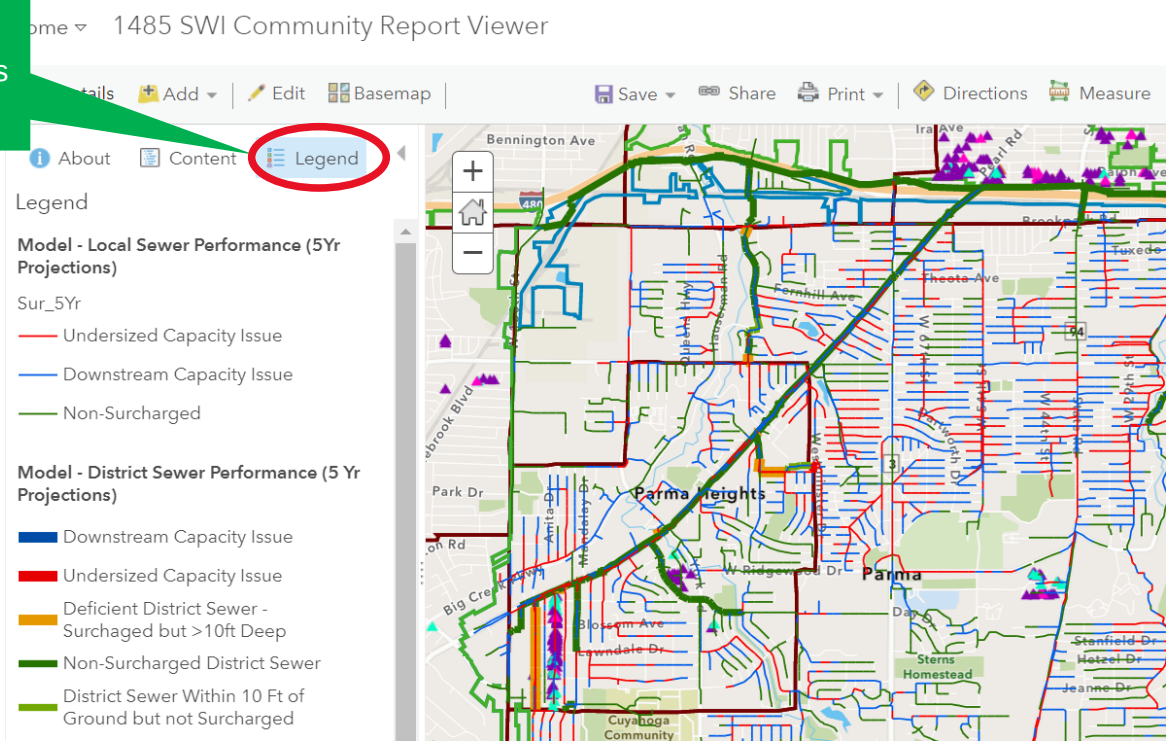
1. On the left side of the Map Viewer, there is a navigation panel. At the top of the panel, there are three tabs - “About,” “Content,” and “Legend.” Toggling to the “Content” portion will show all available layers for display. Each layer name is tagged by the first word as either – “Model”, “Fieldwork”, “Basemap”, or “Water Quality”. “Model” tagged layers allow the user to view model data and simulation results; “Fieldwork” tagged layers allow the user to view the locations of performed fieldwork and associated results; “Basemap” layers are related to physical characteristics or other data developed from existing data sources; and “Water Quality” information is from past studies or data related to water quality within the study area. Section 4 contains a complete listing of the layers with a description of what data is contained in the layer.



2. Once in the Content tab, map layers can be **turned on and off by toggling the checkbox** next to the name of each layer. Some layers may remain grayed out if they are not visible at the current scale. To see these layers, zoom in on the map.



3. To view the meaning of the various colored lines, polygons, and symbols, toggle to the "Legend" view at the top of the navigation panel. Section 4 provides a more detailed description of the meaning and results of legend categories.



4.0 *COMMUNITY REPORT VIEWER* LAYER DESCRIPTIONS

This section provides a short description of the meaning of the features and results displayed in each layer. Layers in this table are displayed in their order of appearance on AGOL.

LAYER NAME	DESCRIPTION
Screening Alternative 1 – Capacity Improvements	Displays limitations of the District's infrastructure to mitigate all known and projected problems by adding capacity where needed to avoid surcharging.
Screening Alternative 2 – Capacity Improvements	Displays areas where sewer rehabilitation alone is not expected to provide acceptable performance during the 5-year, 1-hour rainfall, capacity improvements were identified to provide the 5-year, 1-hour level of service.
Screening Alternative 2 – Sewer Rehab Improvements	Displays how sewer system rehabilitation in high I/I areas alone would be sufficient to mitigate the known and projected problems. Sewer rehabilitation may include repairs to **Common Trench Lining** and **Separate Trench Lining**.
Screening Alternative 3 – Capacity Improvements	Displays areas where sewer rehabilitation and private I/I remediation alone are not expected to provide acceptable performance during the 5-year, 1-hour rainfall, capacity improvements were identified to provide the 5-year, 1-hour level of service.
Screening Alternative 3 – Sewer Rehab Improvements	Displays sewer system rehabilitation to determine if this alternative is sufficient to mitigate the known and projected problems. Sewer rehabilitation may include repairs to **Common Trench Lining** and **Separate Trench Lining**.
Screening Alternative 3 – Private I/I Improvements	Displays private I/I remediation to determine if this alternative is sufficient to mitigate the known and projected problems.
Tier 1 Improvements – Building Private I/I Location	Layer based on 2017 Cuyahoga County Building Footprint Data obtained through Cuyahoga County GIS FTP site
Tier 1 Improvements – Manhole/Facility Improvements	Displays structural **SSOs Controlled by System Improvement** that are projected to activate for rainfalls less than the design rainfall event (5-year, 1-hour rainfall for SWI system) and locations for potential **Manhole Modification**.

LAYER NAME	DESCRIPTION
Tier 1 Improvements – Capacity Improvements	Displays areas where infrastructure may be improved to mitigate all known and projected problems by adding capacity to address critical system structural, obstructions and capacity bottlenecks. This layer displays the following recommended rehabilitations: **Increase Capacity** **New Flow Connection** **Inline Storage** **Cleaned**
Tier 1 – Sewer Rehab Improvements	Displays areas where rehabilitation to **Common Trench Standard Manhole** and **Separate Trench** linings are recommended.
Tier 2 Improvements – Capacity Improvements	Displays areas where **Storm Sewer Separation** is recommended. When common trench systems are severely deteriorated, undersized or part of replacement project, potential alternatives should include separation of the sanitary and storm trench construction.
Tier 2 – Sewer Rehab Improvements	Displays areas where rehabilitation to **Common Trench Standard Manhole** and **Separate Trench** linings are recommended.
Tier 3 Improvements – Building Private I/I Location	Displays **Building Private I/I Locations** where infiltration and inflow reduction is recommended.
Tier 3 Improvements – Manhole/Facility Improvements	Displays locations where **Manhole Modification** is recommended, including any additional facility improvements.
Tier 3 Improvements – Capacity Improvements	Displays locations where rehabilitations to allow for **Increase Capacity** and **New Flow Connection** is recommended.
Tier 3 – Sewer Rehab Improvements	Displays areas where rehabilitation to **Common Trench Standard Manhole** and **Separate Trench** linings are recommended.
Model – PFA GPDIM (Routed Pipe)	Displays model-projected results for the gallons per inch diameter mile in routed pipes by peak flow area during the 5-year, 1-hour design storm.
Model – PFA GPAD (Routed Pipe)	Displays model-projected results for the gallons per acre per day in routed pipes by peak flow area during the 5-year, 1-hour design storm.

LAYER NAME	DESCRIPTION
Model – PFA GPDIM (Based on Runoff)	Displays model-projected results for the gallons per inch diameter mile by peak flow area during the 5-year, 1-hour design storm based on runoff.
Model – PFA GPAD (Based on Runoff)	Displays model-projected results for the gallons per acre per day by peak flow area during the 5-year, 1-hour design storm based on runoff.
Model - PFA Boundaries	Displays the boundaries of peak flow areas.
Model – Local Sewer Performance (5Yr Projections)	Displays the modeled projected capacity of the local sewers during the 5-year, 1-hour design storm; conduit capacity is shown as one of the following conditions during that event: **Undersized Capacity Issue** - Issue is likely due to this conduit no having enough capacity to handle the flow **Downstream Capacity Issue** - Issue is likely due to the conduits downstream backing up to this conduit **Non-Surcharged District Sewer** - District Sewer whose HGL is below the crown
Model - Model Predicted BBUs (5Yr Max)	Displays modeled projected basement backups (BBUs) during the 5-year, 1-hour design storm, with assumed basement floor elevations at 8 feet below ground; buildings are flagged if the sewer hydraulic grade line is greater than or equal to the basement floor; building footprints were taken from 2018 Cuyahoga County GIS data.
Model – Dry Weather Sewer Performance	Displays the modeled projected capacity of the sewers during dry weather flow conditions; color coding relates to the percent fullness of the conduit. Conduit capacity is shown as one of the following conditions during that event: **Undersized Capacity Issue** - Issue is likely due to this conduit no having enough capacity to handle the flow **Downstream Capacity Issue** - Issue is likely due to the conduits downstream backing up to this conduit **Non-Surcharged District Sewer** - District Sewer whose HGL is below the crown
Model – District Sewer Performance (5 Yr Projections)	Displays modeled projection capacity of the District interceptors during the 5-year, 1-hour design storm; conduit capacity is shown as one of the following conditions during that event:

LAYER NAME	DESCRIPTION
	Undersized Capacity Issue - Issue is likely due to this conduit no having enough capacity to handle the flow **Downstream Capacity Issue** - Issue is likely due to the conduits downstream backing up to this conduit **Non-Surcharged District Sewer** - District Sewer whose HGL is below the crown
Model – Manholes Flooded to Ground Based on DEM	Displays the manholes projected to surcharge to and above ground surface during the 5-year design storm; indicates that HGL at the manhole is higher than the ground elevation (based on DEM data)
Model – Sewer Freeboard	Displays sewer freeboard in relation to the distance of their endpoints to the ground surface; conduits are flagged with "freeboard less than 8 feet" if both ends of the conduit do not have freeboard within 8 feet of the ground surface elevation
Model – SSO Location and Status (5 Yr Projections)	Displays model-projected SSO activation results during the 5-year, 1-hour design storm; also displays the location and status of non-active SSOs – either controlled or previously eliminated; available conditions include: **Controlled** - SSO already known that is controlled during the 5-year event **Active** - SSO that is active during the 5-year event
Model – Predicted Hydraulic Grade Line Profiles (5-Yr/10-Yr, 03/2021)	Provides model projected grade line profiles of local and District interceptors during the 5-year, 1-hour design storm; the dataset is provided for select sewers in the SWI LSSES
Field - Field Observations	Displays field observations that were visible from the surface, such as buried manholes, clogged catch basins, and general cleaning needs.
Field - Field Inspections	Displays locations within the system where inspections were required.
Field - Flow Divider Inspection	Displays locations where flow dividers were inspected, and status of the inspections are displayed as follows: **Assigned, Complete, Could Not Complete,** and **Others**
Field – Prioritization Basins	Displays the model calibration flow meter basins by fieldwork prioritization status: **Top 50 Priority Rank** - Meter basins that were initially prioritized for fieldwork **Below Top 50 Priority Rank** - Meter basins that were not initially prioritized for fieldwork

LAYER NAME	DESCRIPTION
Field – Capture Coefficients by Meter Basin	Displays the calculated capture coefficient for model calibration flow meter basins. Capture coefficient is the total measured infiltration and inflow (I/I) volume divided by the total calculated rainfall for a specific storm event. It is shown as a percentage ranging from 0% to 30%.
Field – Calibration Meter Location	Displays the location of model calibration flow meters.
Field – Micrometer Location	Displays the location of short-term, small-scale flow meters ("micrometers").
Field - Sewer Video Inspection Reports	Displays locations of sewer inspections and their respective reports.
Field Results – Rehab Recommendation Levels – Sanitary Sewers	Displays sanitary sewer rehabilitation recommendation levels. Recommendations were developed after performing a condition assessment of sewers that were inspected using National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP) standards. **1 - Monitor** - Structure is in good condition and only requires regular monitoring to ensure that deterioration is not occurring. **2 - Perform Maintenance** - Sewer structures are in need of maintenance to prevent hydraulic failure (e.g., flooding, flow bypassing, dry weather overflow, blockage). Maintenance will also include minor, local repairs. **3 - Stabilize Existing Sewer (Spot Repair)** - Sewers need local repairs to prevent further deterioration. The objective of this approach is to maximize the remaining useful life of the sewer by delaying the deterioration processes. **4 - Line Existing Sewer** - More extensive work is required and would include renovating a sewer to enhance its structural and hydraulic performance and increase its life. **5 - Replace Existing Sewer** - Replacement and/or abandonment of the existing sewer. This is most often selected when the existing sewer is badly deteriorated and cannot be rehabilitated, where the sewer requires rehabilitation and is in an undesirable location, or where the sewer lacks hydraulic capacity.

LAYER NAME	DESCRIPTION
	Reinspect - More information about the sewer is needed to determine if rehabilitation or repair is needed.
Field Results – Rehab Recommendation Levels – Storm Sewers	Displays storm sewer rehabilitation recommendation levels. Recommendations were developed after performing a condition assessment of sewers and displayed similarly to the "Field – Rehab Recommendation Levels – Sanitary Sewers" layer.
Field – Private/Residential Dye Test Results	Displays results of private property dyed water downspout testing performed. **Negative** - No dye in the sanitary sewer was observed. **Positive Light** - Light or delayed infiltration into the sanitary sewer was observed. **Positive Rapid** - Heavy or rapid infiltration into the sanitary sewer was observed.
Field – Mainline Sewer Dye Test Results	Displays results of dye flood testing performed on sanitary sewer mainlines by their modified NASSCO inflow and infiltration (I/I) score. I/I scores were calculated based on a review of the number and severity of I/I defects observed in both the sanitary mainline sewer and its connections. Higher I/I scores indicate a larger potential for I/I. Sanitary sewers that "passed" the dye flood test did not show potential for I/I.
Field – Infiltration Inflow Test	Displays results of inflow and infiltration source dye testing performed. **Negative** - No dye in the sanitary sewer was observed. **Positive** - Inflow or infiltration into the sanitary sewer was observed.
Field – Catch Basin I/I Test Results	Displays results of catch basin dye testing performed. **Negative** - No dye in the sanitary sewer was observed. **Positive** - Inflow or infiltration into the sanitary sewer was observed.
Field - Lateral Inspection Observations	Displays locations of lateral inspection sites with observations.
Field – PFA Average O&M I/I Score	Displays the modified NASSCO inflow and infiltration (I/I) scores averaged for peak flow areas (PFAs) that had at least 2,000 LF of mainline dye flood testing performed. Higher I/I scores indicate a large potential for I/I.

LAYER NAME	DESCRIPTION
Field – Sewers with FOG Buildup	Displays the location of sewers with significant fats, oils, or grease (FOG) buildup observed. Sewers received NASSCO PACP operational defect grades of 3 or higher or resulted in incomplete inspections due to the observed defect(s).
Field – Sewers with Debris Buildup	Displays the location of sewers with significant debris buildup observed. Sewers received NASSCO PACP operational defect grades of 3 or higher or resulted in incomplete inspections due to the observed defect(s).
Field – Sewers with Root Intrusion	Displays the location of sewers with significant root intrusion observed. Sewers received NASSCO PACP operational defect grades of 3 or higher or resulted in incomplete inspections due to the observed defect(s).
Field – Manhole Depth (Rim to Invert)	Displays the location of manhole inspections that had rim to invert measurements of all inlet and outlet pipes collected, as well as photographs and a sketch of the piping configuration.
Field – Smoke Test Results	Displays the results of smoke testing performed on sanitary sewer mainlines by defect type. Defect types include area drains, downspouts, cleanouts/ground, and storm drains/manholes. All of these were identified as potential sources of I/I.
Field - Smoke Tested Pipes	Displays locations where smoke tests were performed.
Basemap Data – MCIP Project Locations	Displays MCIP (Member Community Infrastructure Program) projects that were approved between 2017 and 2019. The symbology of the layer is the year in which the project was presented and approved via MCIP.
Basemap Data – Past Rehab Locations (Source: CCDPW)	Displays the location of rehabilitation work performed by Cuyahoga County Dept of Public Works (CCDPW) throughout the SWI study area (Source: CCDPW 2019)
Basemap Data – Trench Construction Types	Displays types of sewer trench construction in **Sewered - Combined Sewer** – Sanitary and Storm sewers are buried in the same trench **Sewered - Common Trench Standard Manhole** **Sewered - Separate Trench** – Sanitary and Storm sewers are buried in separate trenches **Non-Sewered - Septic/HSTS Parcel** **Non-Sewered - Non-Sewered Area**

LAYER NAME	DESCRIPTION
Basemap Data – Sewer Construction Types	Displays trench types of model conduits obtained from record drawings and other District resources: **Separate Trench (Local)** **Common Standard (Local) –** Sanitary and Storm sewers are buried in the same trench **Combined Sewer (Local)** **Over/Under Sewer (Local)** **Separate Trench (District) –** Sanitary and Storm sewers are buried in separate trenches
Basemap Data – Building Age (Cuyahoga Co)	Displays the era in which buildings were constructed within Cuyahoga County by parcel. The different eras include the 1800s, 1900 to 1944 (Pre-WWII), 1945 to 1967 (Post-WWII), 1968 to 1990, and Post 1990. Parcels that do not have buildings or their age is not available are also displayed.
Basemap Data – SWI Problem Areas	Displays problem areas as identified by NEORSD GIS falling within the SWI Model Study Area: **Basement Backup Locations –** Location of reporting basement backups **Current/Previous Project –** Area that has already undergone or is currently undergoing rehabilitation **Failing Septic Tanks –** Area containing failing septic tanks **Illicit Discharge Location –** Area with excessive illicit discharge **Surface Flooding –** Area experiencing surface flooding
Basemap Data - Problem Locations	Displays problem locations of various types.
Basemap Data – Model Study Areas	Displays the hydraulic model defined boundaries; these areas are defined by a combination of the model catchments; the model development occurred in two phases – east and west; and are designated as follows: **2018 SWI Model Area –** Eastern study, represents model development in 2018 **2019 SWI Model Area –** Western study, represents model development in 2019
Basemap Data – Pump Stations	Displays **Modeled** and **Non-Modeled** pump stations

LAYER NAME	DESCRIPTION
Basemap Data – Modeled Local Sewers	Designates local sewers included in the SWI LSSES project model
Water Quality – SWI Study Area Watersheds	Displays watershed boundaries within the SWI LSSES area; data obtained from the District RSS dataset; each subwatershed in this layer is displayed in a different color
Water Quality – Existing HSTSs (Septic) Status – Lorain County	Displays the location and status of existing HSTSs (Septic Tanks) within the SWI Project area. Obtained from Lorain County GIS. **Existing (Less than 20 years old) –** HSTSs that passed inspection and were installed fewer than 20 years ago **Reported as Failing –** HSTSs reported as failing in their last inspection **Assumed Failing (Over 20 years old)** – HSTSs that passed their last inspection, but were installed more than 20 years ago
Water Quality – Existing HSTSs (Septic) Status – Cuyahoga County	Displays the location and status of existing HSTSs (Septic Tanks) within the SWI Project area. Obtained from Cuyahoga County GIS. **Existing (Less than 20 years old) –** HSTSs that passed inspection and were installed fewer than 20 years ago **Reported as Failing –** HSTSs reported as failing in their last inspection **Assumed Failing (Over 20 years old)** – HSTSs that passed their last inspection, but were installed more than 20 years ago
Water Quality – District WQIS IDDE Investigation Status	Displays the status and location of District WQIS investigations; status are noted as follows: **Investigation Complete or Remediated –** Problems discovered in the investigation have been solved or no problems were found **Community Notified –** Issues identified during the investigation have been sent on to the community **Ongoing Investigation –** The investigation is incomplete
Water Quality – Dry Weather Projected Estimate – E. Coli	Displays E. Coli results from water quality dry weather sampling; includes samples collected and tested by the NEORSD WQIS department during project

LAYER NAME	DESCRIPTION
Water Quality – Dry Weather Projected Estimate – Ammonia	Displays Ammonia results from water quality dry weather sampling; includes samples collected and tested by the NEORSD WQIS department during project
Water Quality – Dry Weather Projected Estimate – Phosphorus	Displays Phosphorus results from water quality dry weather sampling; includes samples collected and tested by the NEORSD WQIS department during project
Water Quality – Dry Weather Projected Estimate – Turbidity	Displays Turbidity results from water quality dry weather sampling; includes samples collected and tested by the NEORSD WQIS department during project
Water Quality – Dry Weather Projected Estimate – Chloride	Displays Chloride results from water quality dry weather sampling; includes samples collected and tested by the NEORSD WQIS department during project
Basemap Data - Cuyahoga County Parcels	Displays parcel data for Cuyahoga County
Basemap Data – Lorain County Parcels	Displays parcel data for Lorain County
Basemap Data – SWI – LSSES Study Boundary	Displays the boundary for the Southwest Interceptor Local Sewer System Evaluation Study
Basemap Data – Community Boundaries	Original boundaries for communities provided at the project onset
Basemap Data – Cuyahoga County 2 Ft. Contours – Open Data – Cuyahoga County 2 ft Contours	
Basemap Data – District Collection System Infrastructure	Displays various district infrastructure data such as locations and further classifications of; **District Flow Regulator, District Network Structure, District Pump Station, District Facility, District CSO Permit Point, District Manhole, District Sewer Pipe,** and **Abandoned District Flow Regulating Structure**

LAYER NAME	DESCRIPTION
Basemap Data – Local Collection System Infrastructure	Displays various local infrastructure data such as locations and further classifications of; **Local Pump Station, Local Flow Regulating Structure, Local Manhole, Local Sewer Pipe, Local Separate Storm Inlet,** and **Local Separate Storm Outfall**

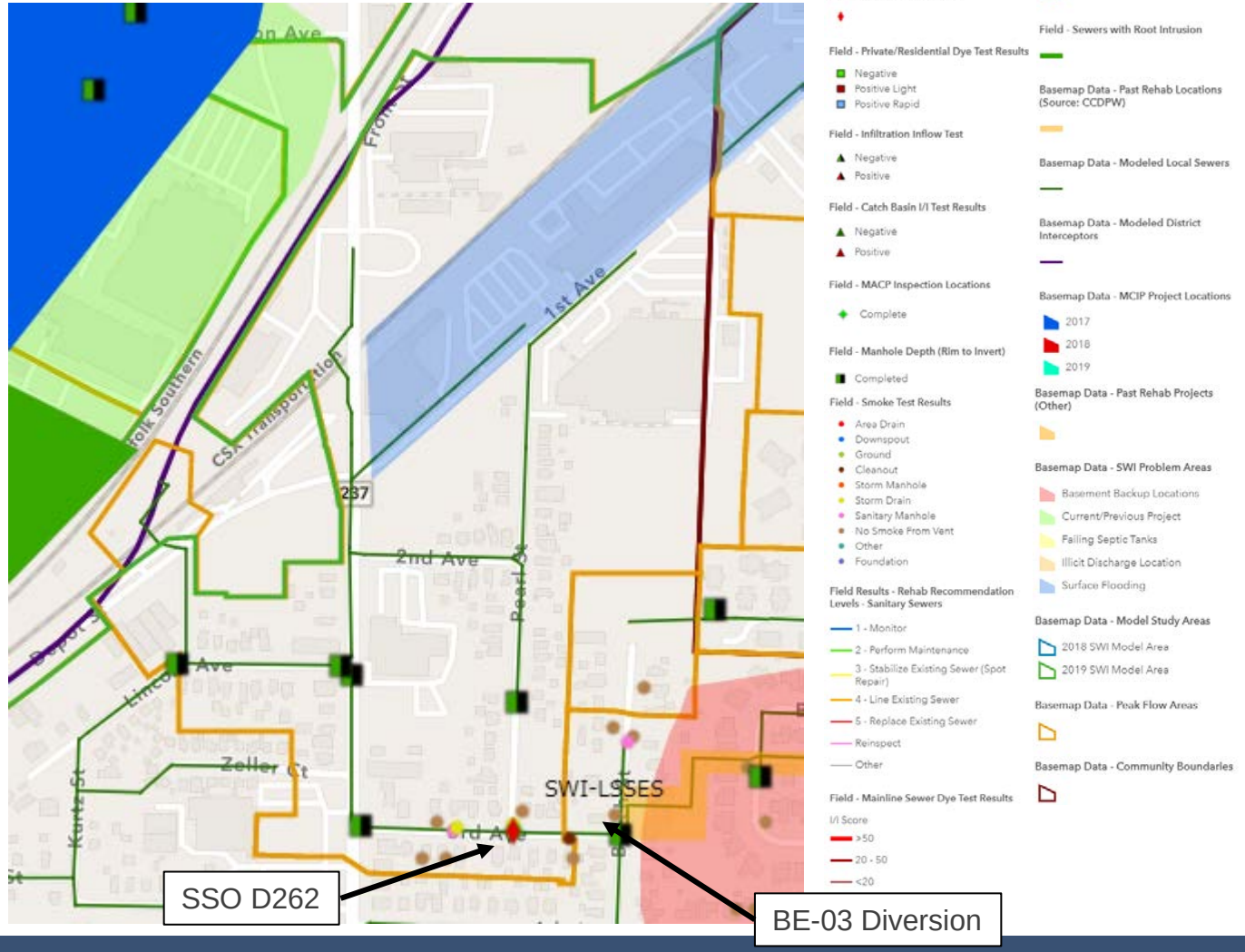
Hazen

SWI-LSSES PFA BE-02 Optimization

BE-02

Tier 3 Optimization - Field Data

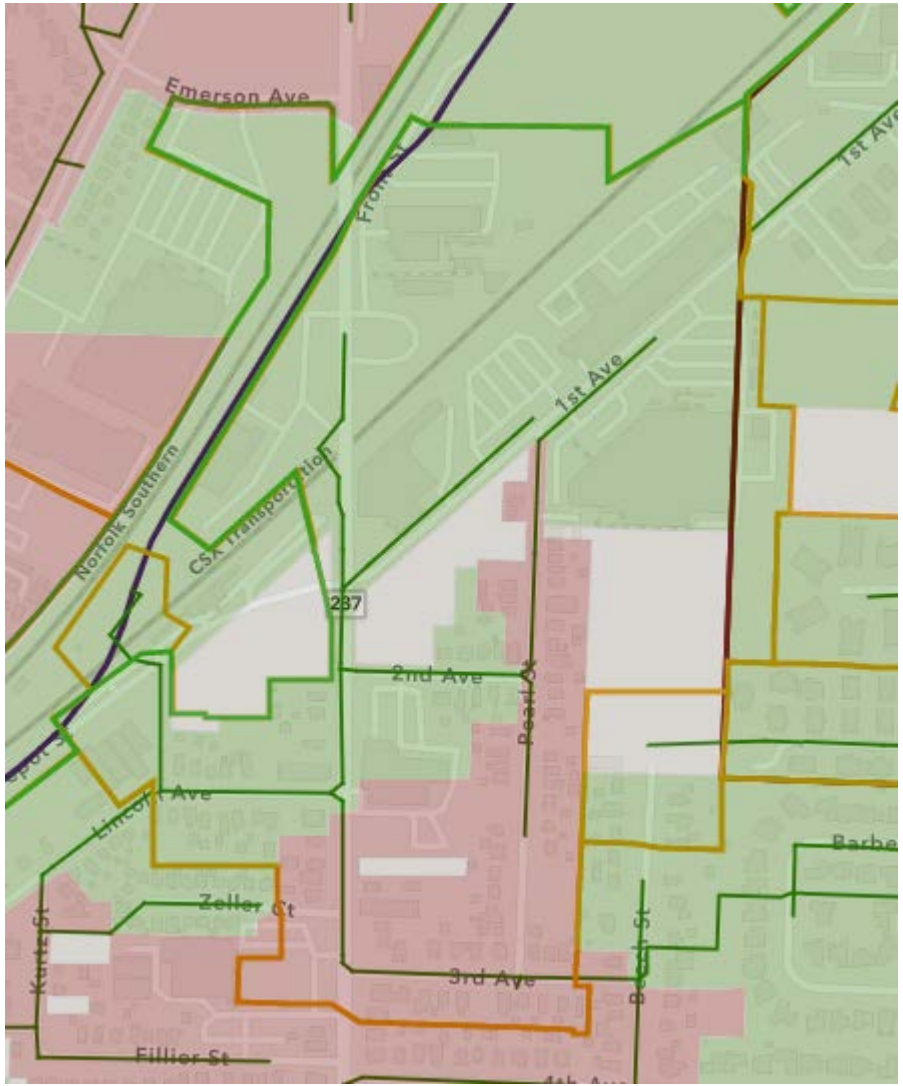
- One CIPA (surface flooding)
- SSO D262 removed from optimization model
- Receives diversion flow from BE-03



BE-02

Optimization – Trench Type

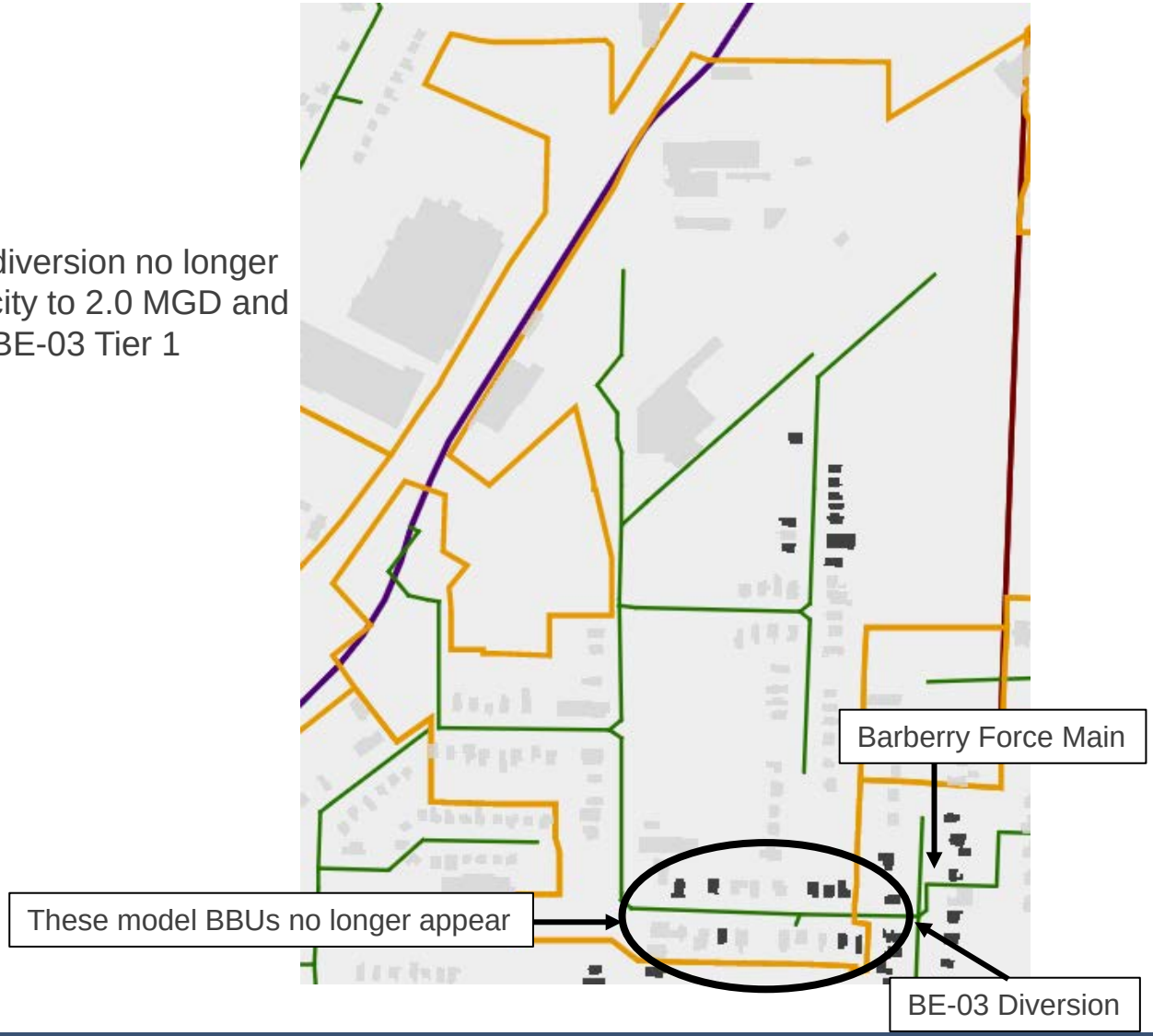
- Mix of common and separate trench



BE-02

Base Model for Optimization BBUs

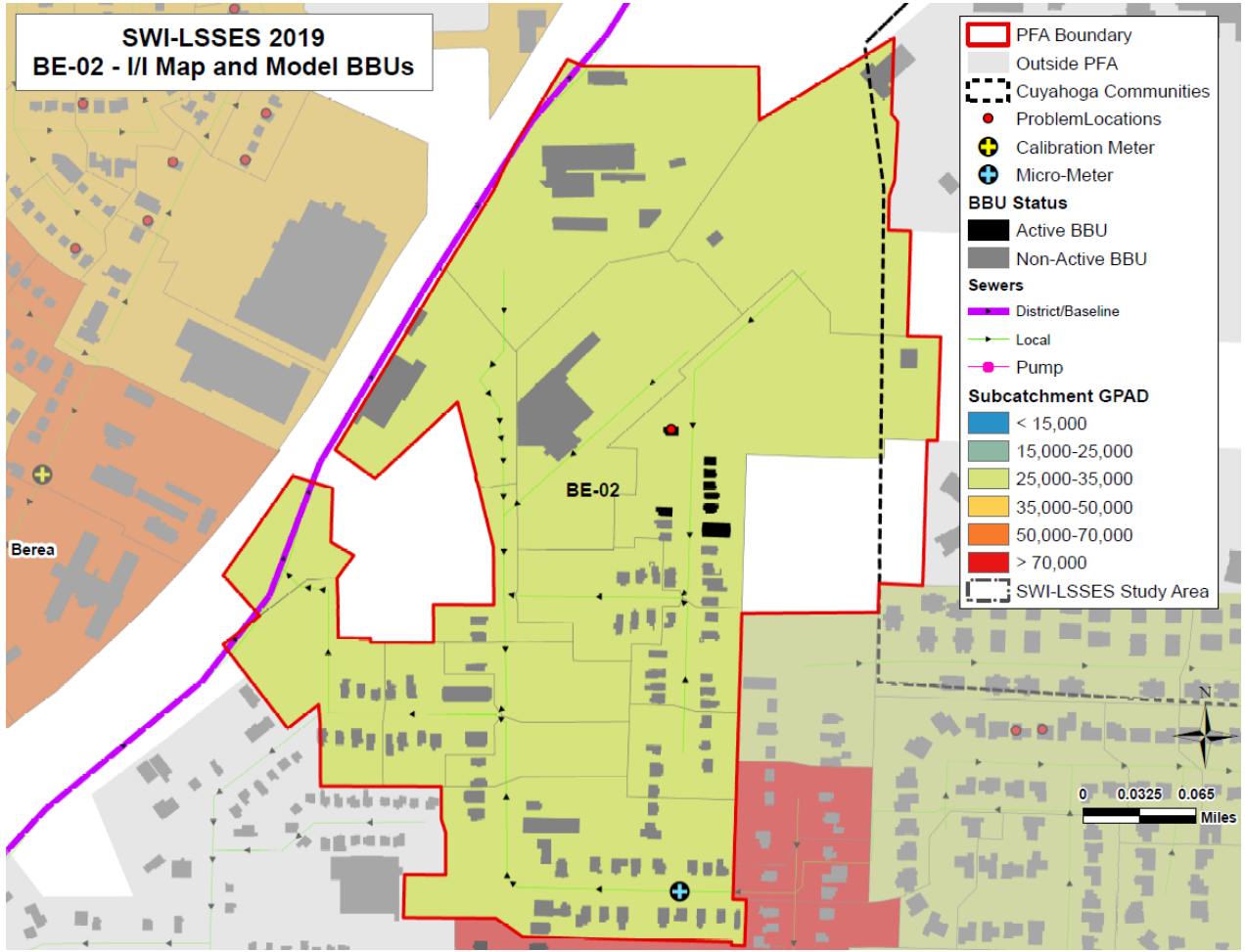
- The model BBUs downstream of the BE-03 diversion no longer appear after reducing the Barberry PS capacity to 2.0 MGD and redistributing the BR-12 flows as part of the BE-03 Tier 1 Optimization



BE-02

Model Predicted BBUs and I/I

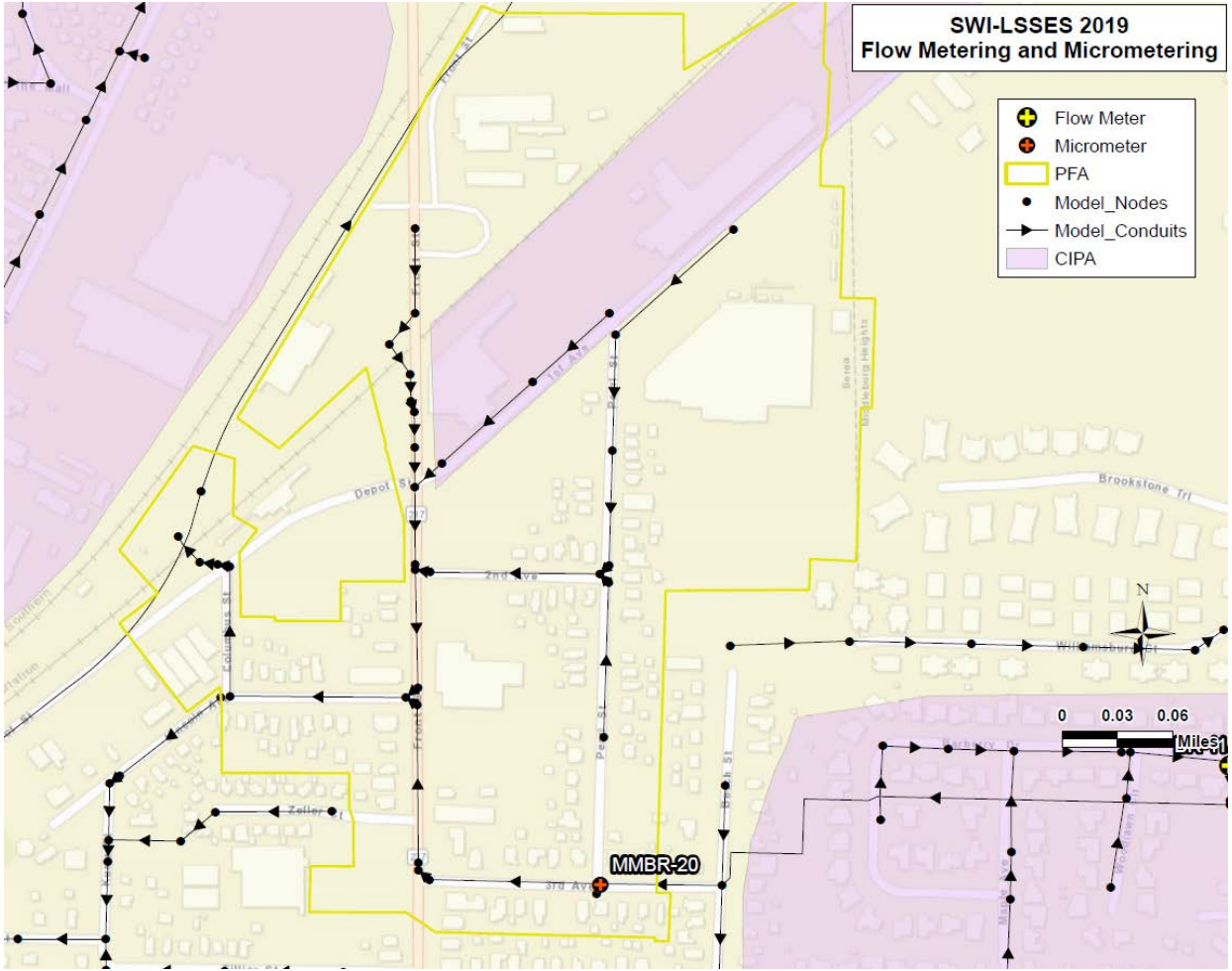
- This was an unmetered area during calibration
- GPAD is an estimate
- 8 modeled BBUs
  - Adding steps will remove these BBUs. See following slides
- One problem location – likely not capacity-related
  - From 5/15/2020 storm event that received only 1 inch of rain
  - Problem location comment indicates that 30 feet of grease was found in the line



BE-02

Micrometer Data and Flow Meter Data

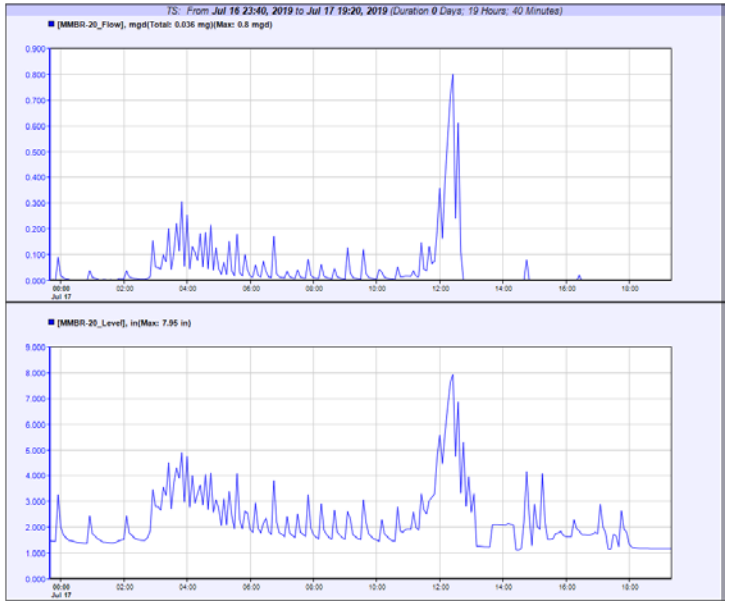
- MMBR-20 was installed downstream of the diversion from BE-03
- There were no other meters installed in this PFA
  - **I/I was estimated**

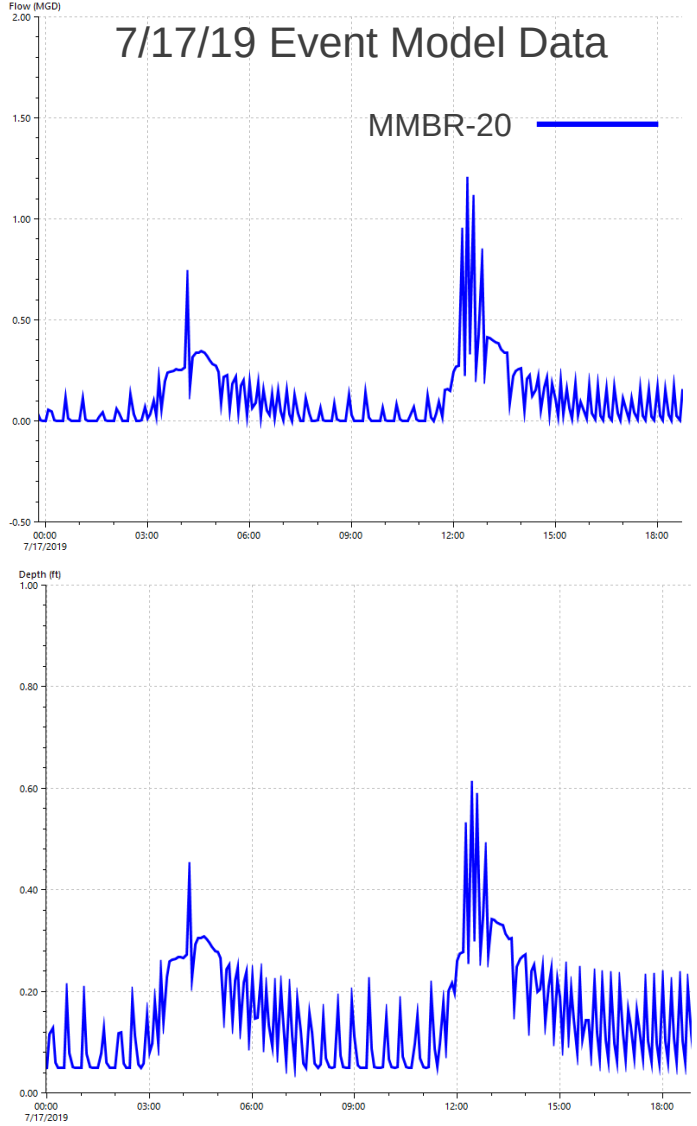


BE-02

Calibration Meter Data

7/17/19 Event Meter Data



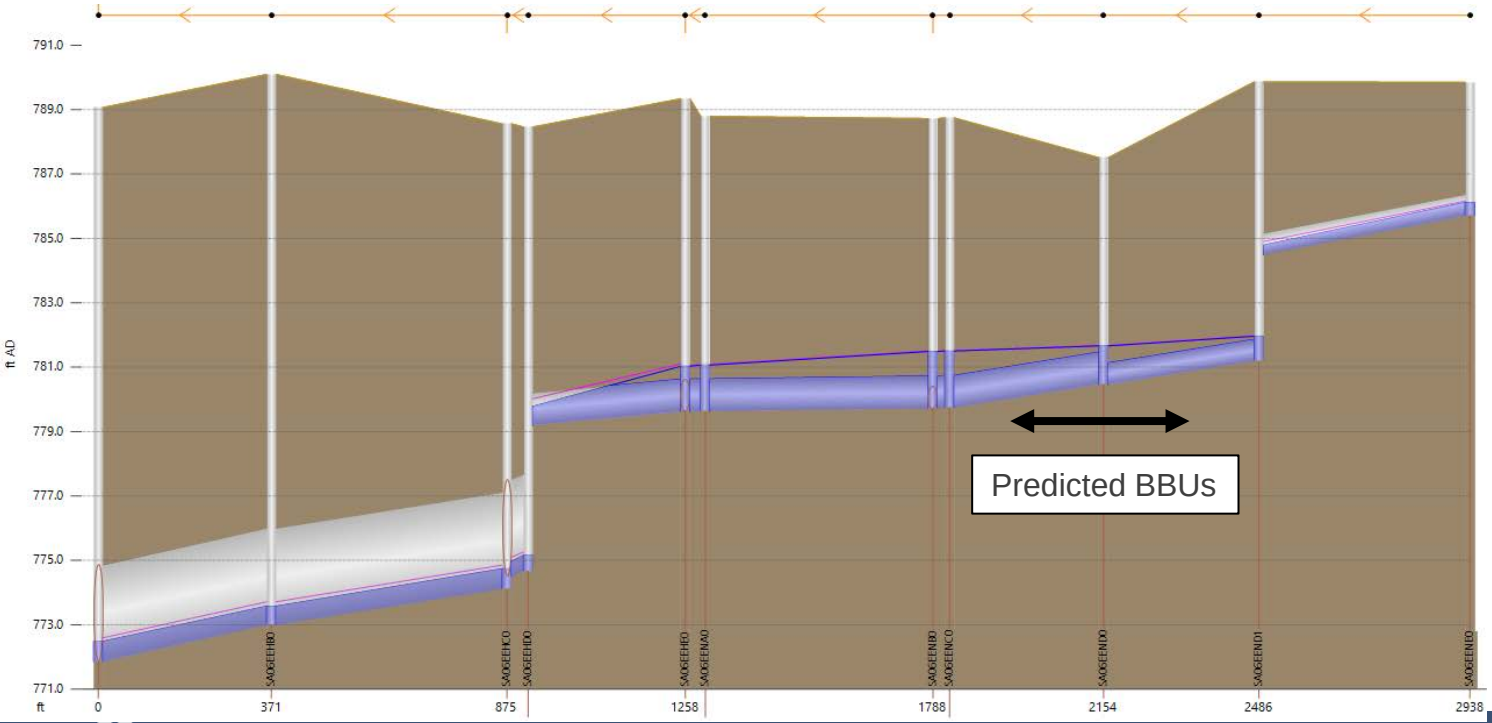


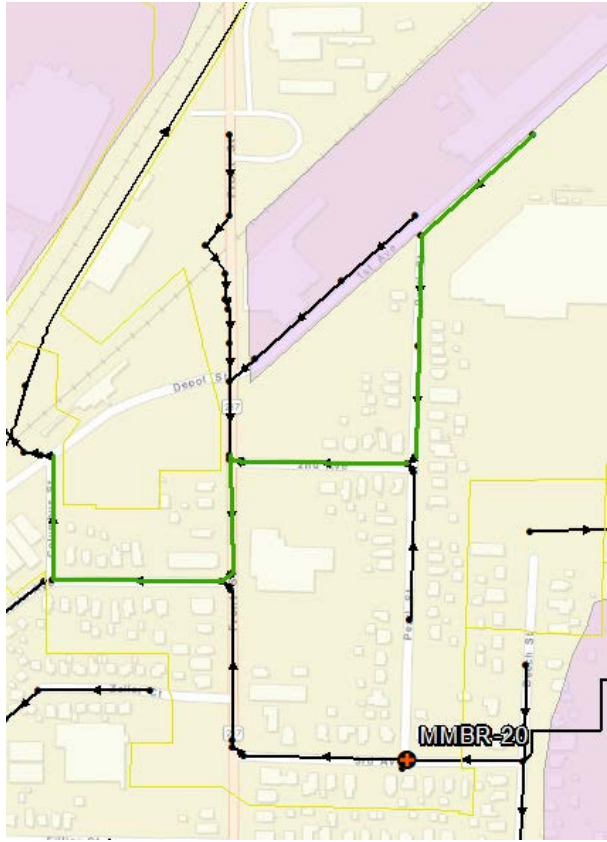
- MMBR-20 is downstream of the flow diversion from PFA BE-03 which receives flow from Barberry PS
- As part of the optimization of BE-02, Barberry PS capacity was reduced to 2.0 MGD and RTKs upstream of MMBR-15 (located in BE-03) were reduced
  - **These changes are included in the optimization of BE-02 and are reflected in the model data shown here**
- The model matches the micrometer data for both flow and depth

BE-02

5-Year Model Design Storm Profile

- Model
  - **Six pipes are surcharged a few inches above the crown**
  - **Eight houses in this area have predicted BBUs**





Model Profile Highlighted Green

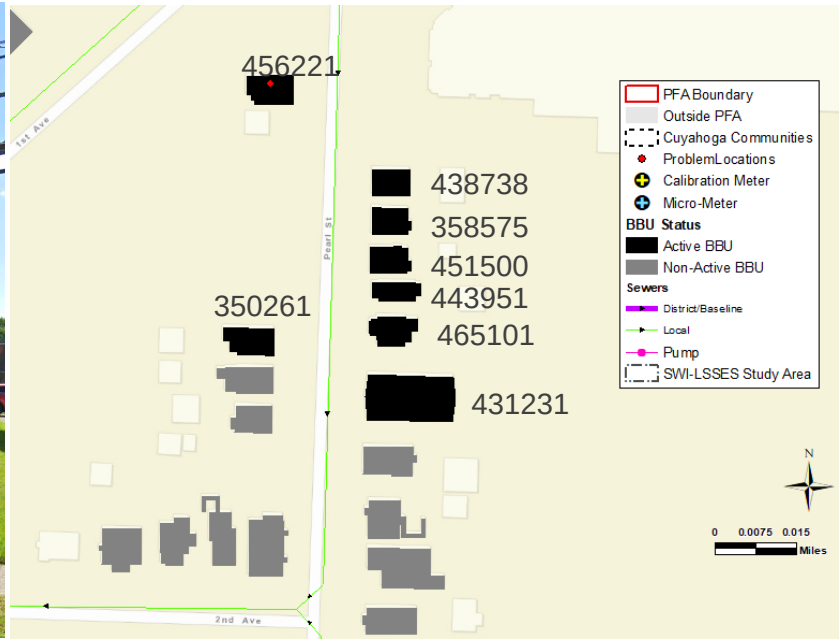
BE-02

Model BBUs

- Steps were counted and added to the BBU tool for the eight buildings with BBUs
  - **Building 431231 is the Mt. Zion Baptist Church. It doesn't have steps but the basement appears to be split-level with an estimated four steps**
  - **Adding steps removed all BBUs**

BldgID	# of Stairs
350261	4
358575	6
431231	4
438738	6
443951	5
451500	6
456221	4
465101	4





BE-02

Conclusions

- This PFA was not explicitly metered. Model flows were estimated
  - **In order to achieve better certainty in this area, Hazen recommends flow monitoring and recalibrating this area**
- There is one CIPA that was caused by surface flooding
- After steps are added to the BBU tool, no BBUs remain
- The model predicted surcharge based on 5-year design storm in this area is slightly over the pipe crown
- The one reported problem in this PFA appears to be caused by grease
- No Tier 3 solution needed

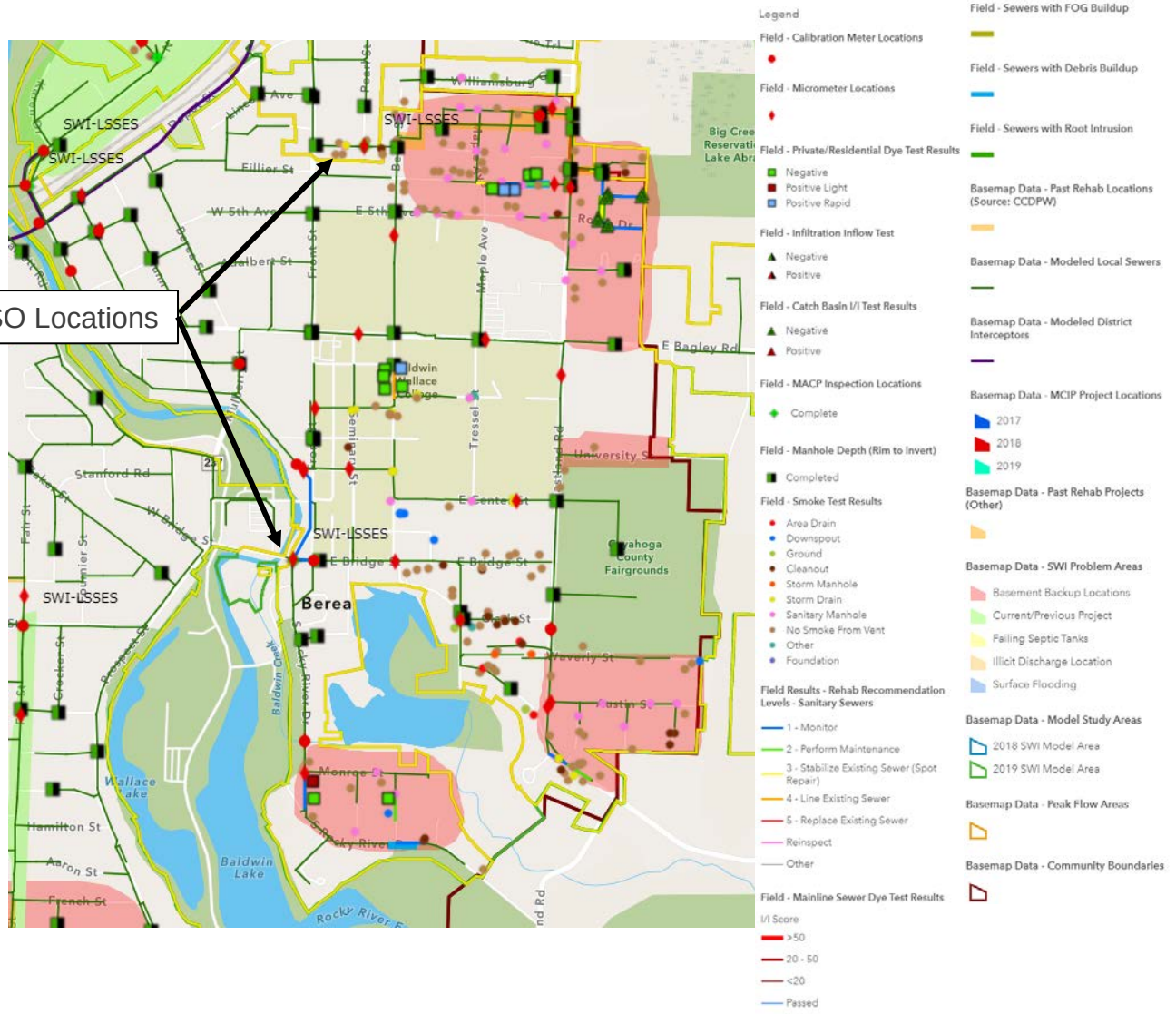
Hazen

SWI-LSSES PFA BE-03 Optimization

BE-03

Tier 1 Optimization - Field Data

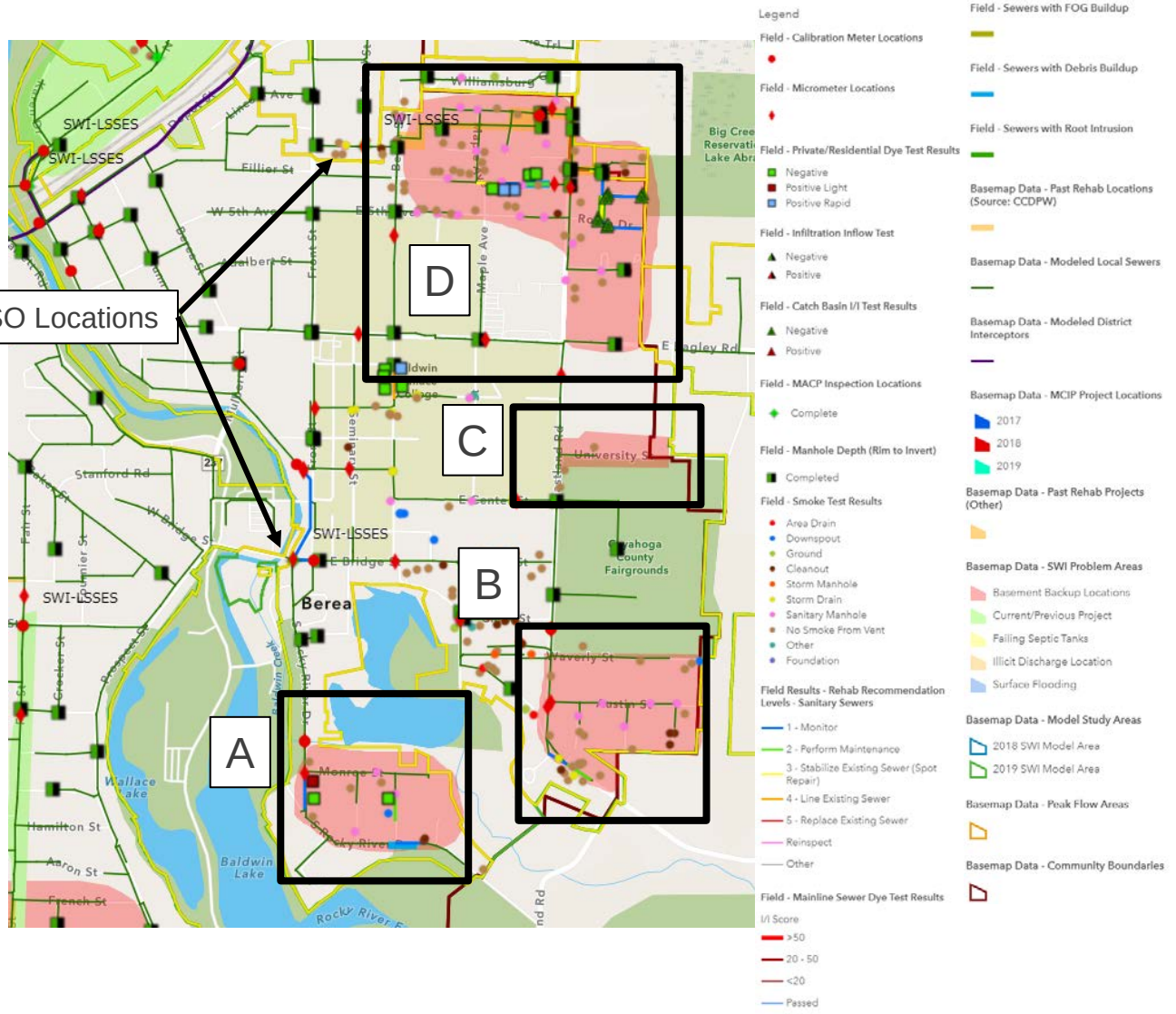
- SSOs removed from optimization model
- Four CIPAs



BE-03

Tier 1 Optimization - Field Data

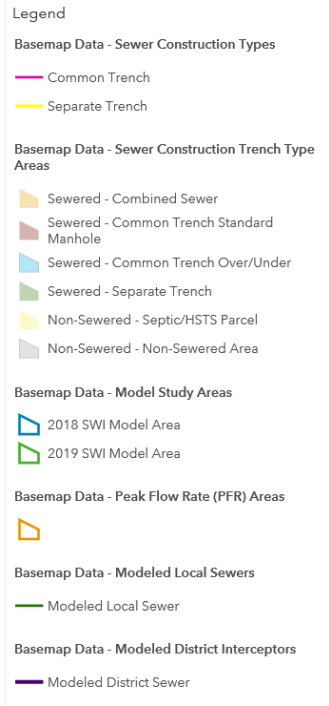
- SSOs removed from optimization model
- Four CIPAs
  - **Broken down into four different areas**

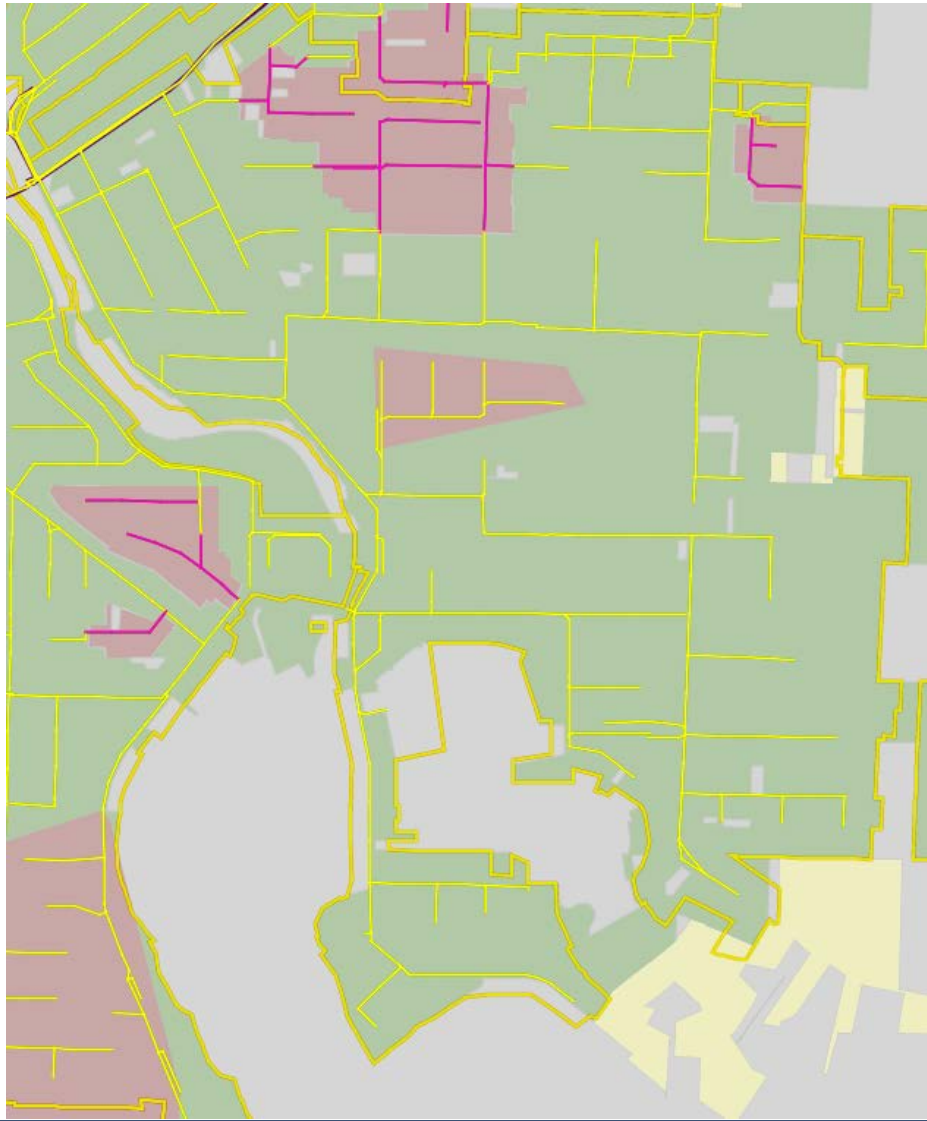


BE-03

Optimization – Trench Type

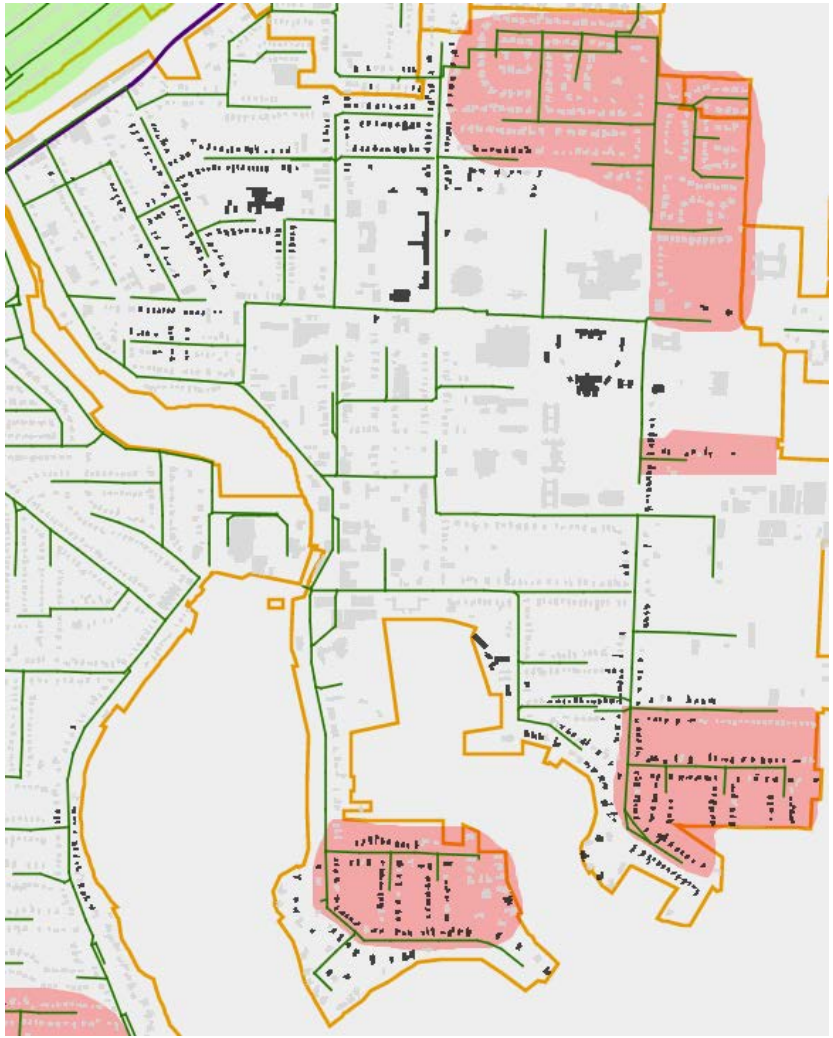
- Mostly Separate Trench with some Common Trench areas





BE-03

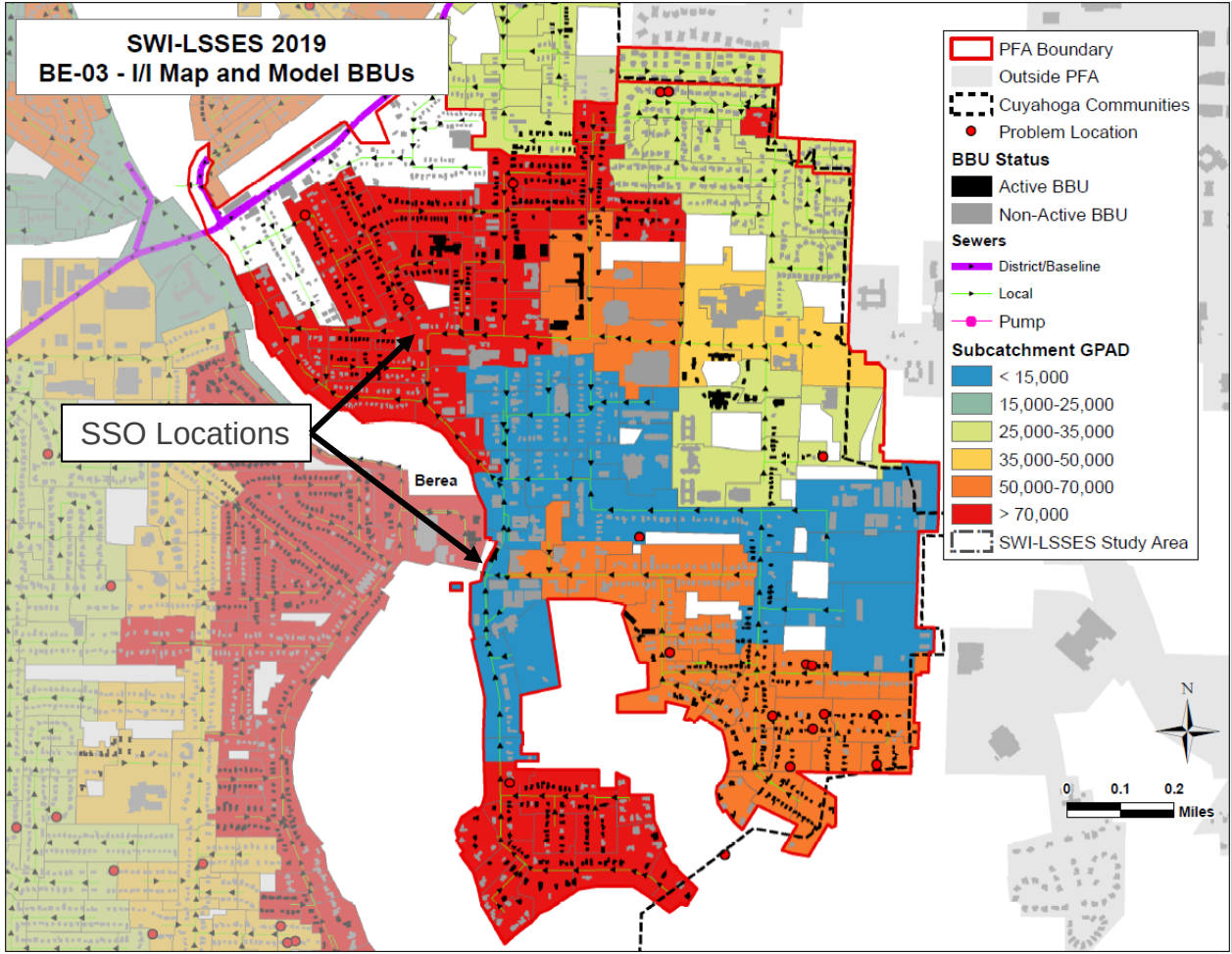
Base Model for Optimization BBUs



BE-03

Model Predicted BBUs and I/I

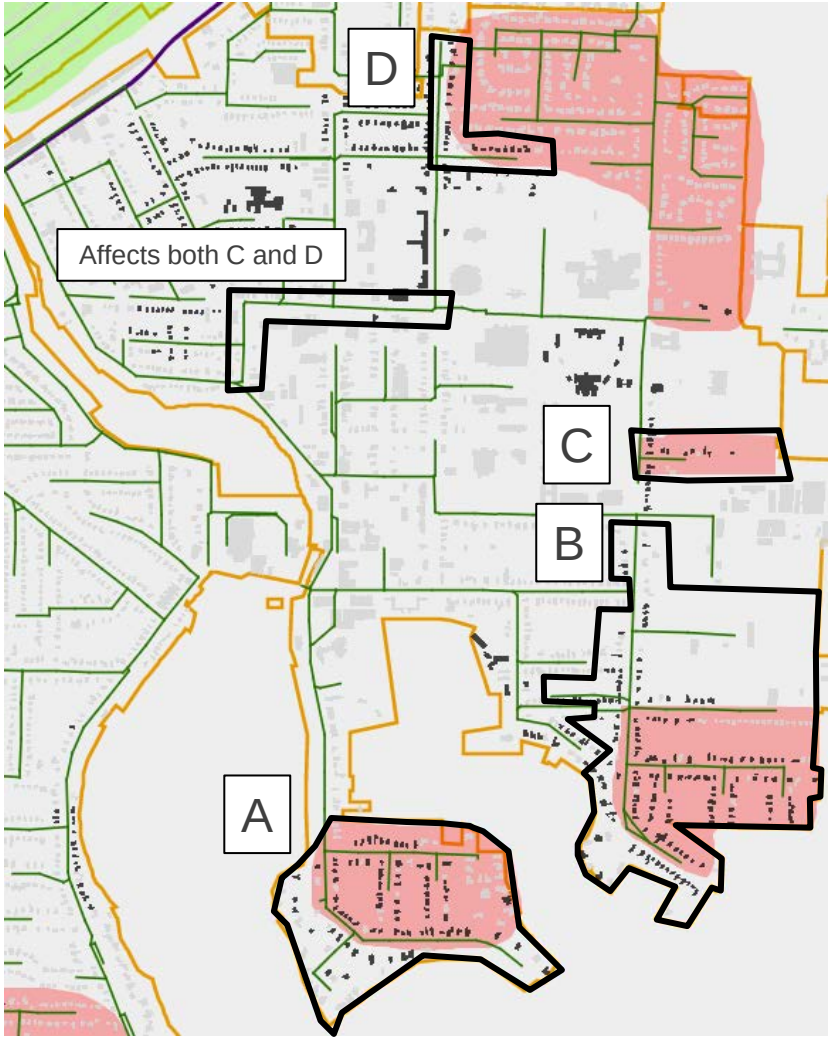
- Rate of I/I varies widely by metershed
- Some separate trench areas have very high I/I



BE-03

Base Model for Optimization BBUs

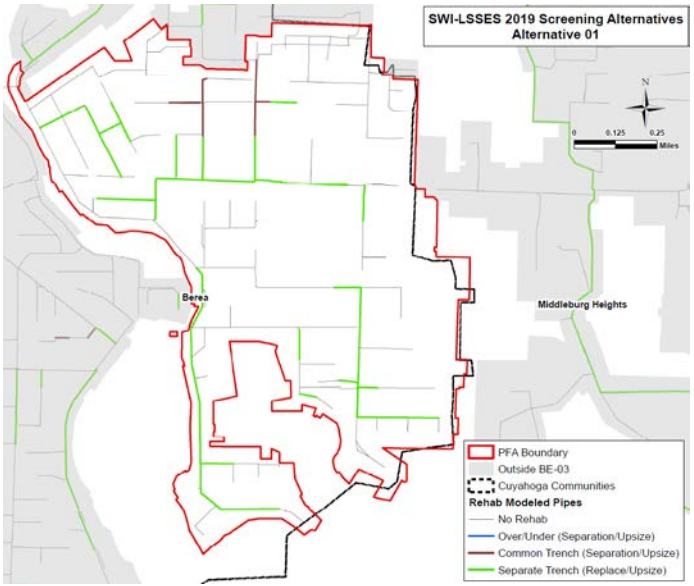
- Area breakdown
- CIPA BBUs fall into four hydraulically independent areas
  - **Areas C and D are not completely independent, there are some under-capacity sewers that affect both areas, as indicated on the figure**

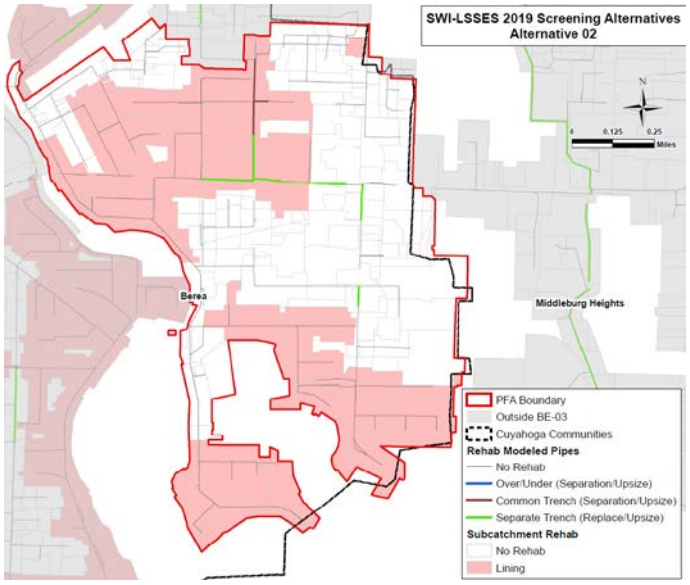


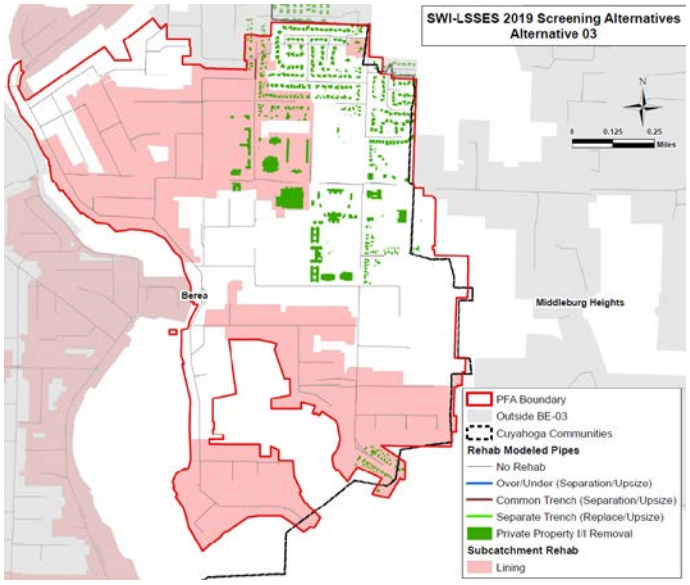
BE-03

Screening Alternatives Provided

Update PFL Cost (YES/NO)	NEORSD Branch	PFL Area	Catchment ID (Use "ALL" to cost for all catchments within PFL)	Alternative		Summary				
				Alternative	Description	Replace Sewer (LF)	Sewer Lining (LF)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
YES	SWI2019	BE-03	ALL	A1	Screening Alternative One	25,124	0	0	0	$ 26,631,271
YES	SWI2019	BE-03	ALL	A2	Screening Alternative Two	5,789	35,098	0	0	$ 18,649,791
YES	SWI2019	BE-03	ALL	A3	Screening Alternative Three	308	38,249	306	438	$ 17,193,916





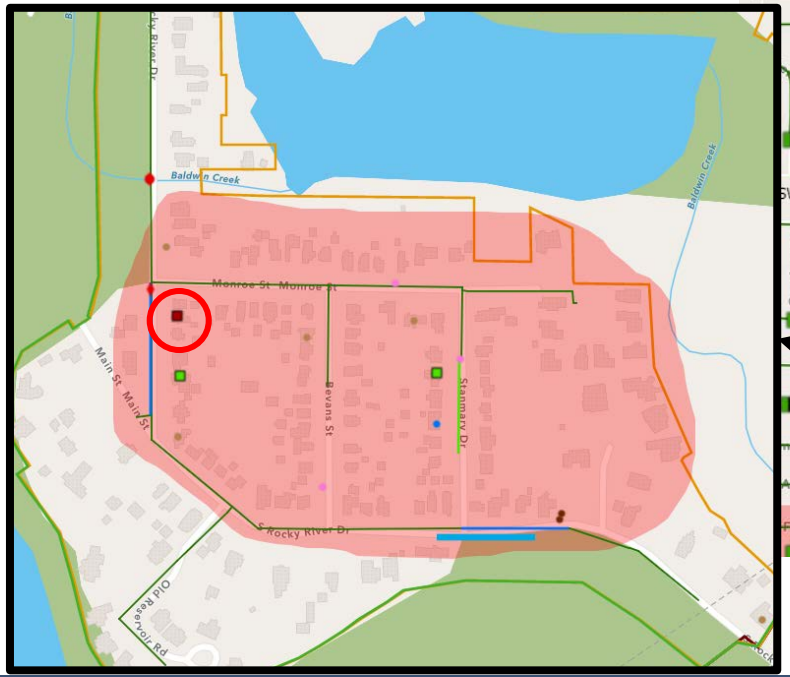


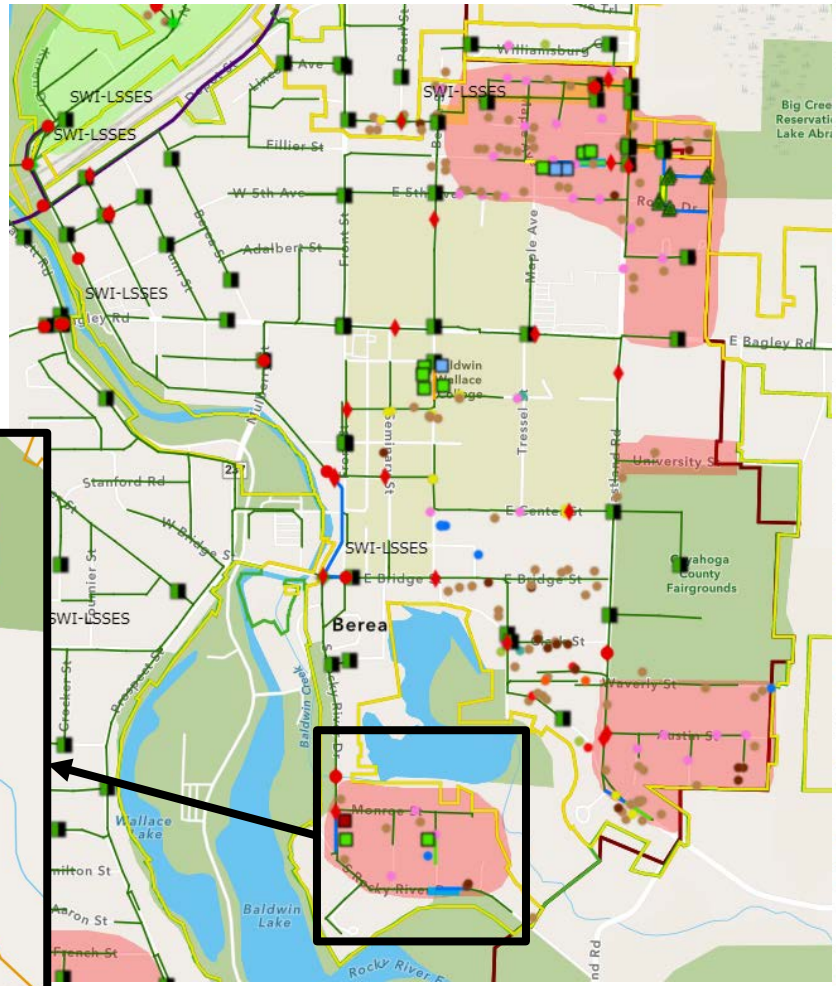
- Difficult to break down the screening alternative costs by area, therefore all three alternatives were refined for each area individually

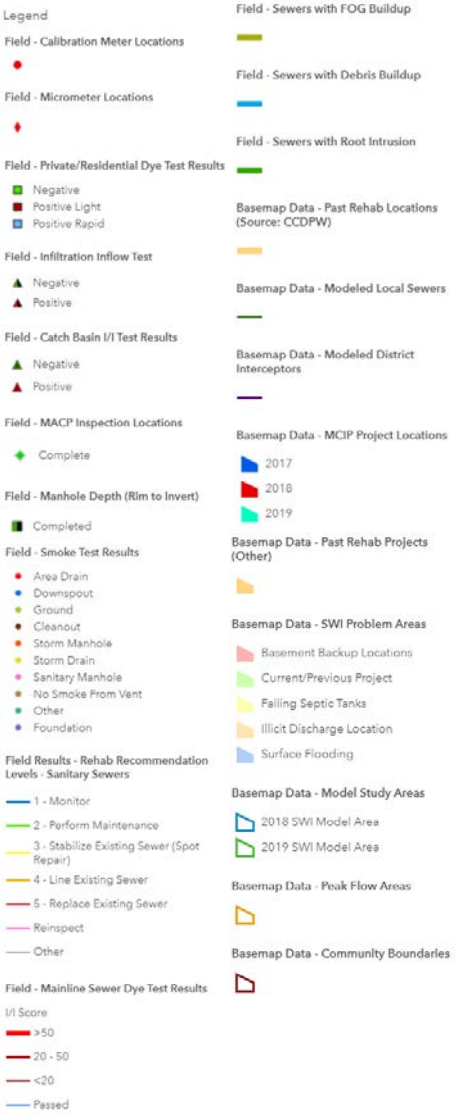
BE-03 – Area A

Tier 1 Optimization – Area A Field Data

- One positive (light) dye test
- Several smoke test defects but not location-specific







BE-03 – Area A

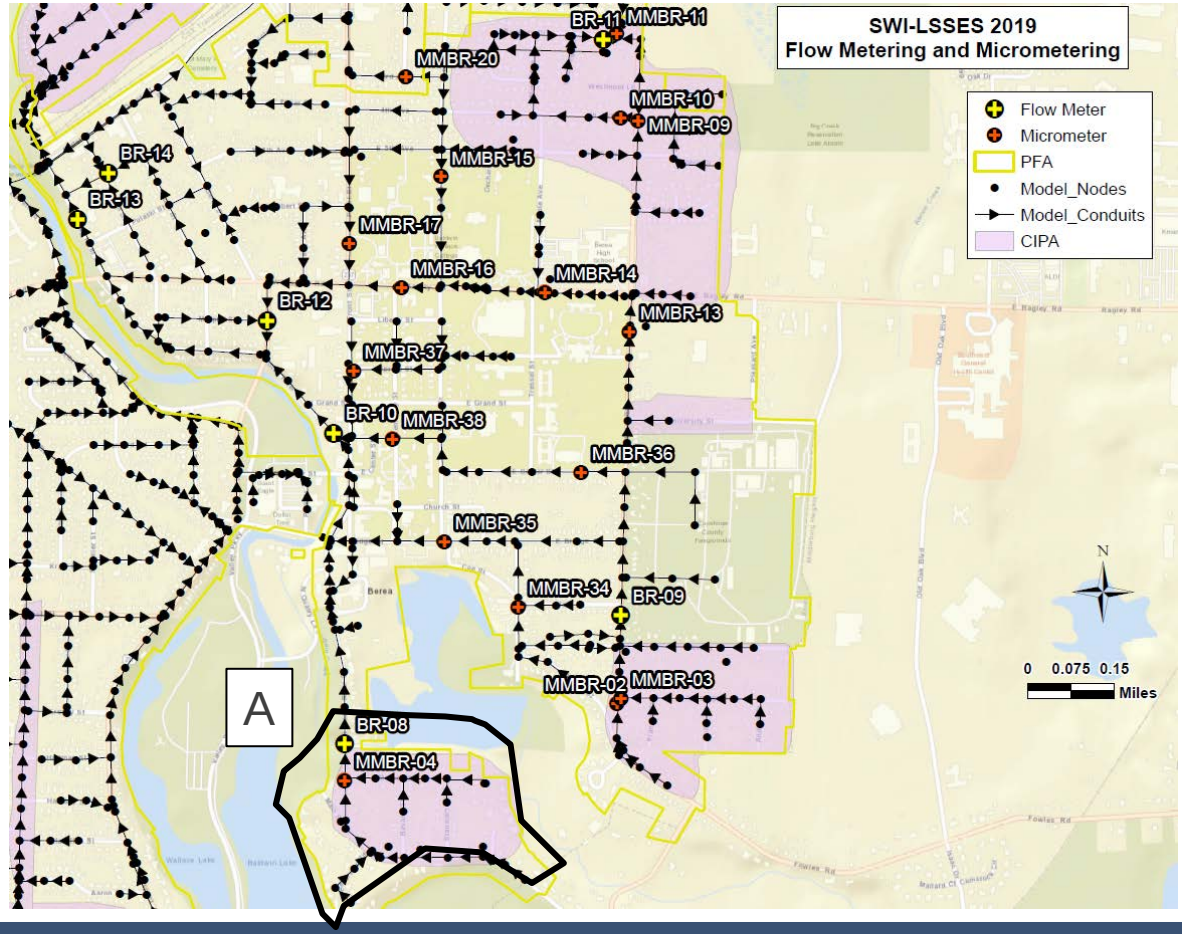
Tier 1 Optimization – Field Data Summary

- Smoke and dye test results indicate there are I/I related defects but not enough to explain the high I/I (97,000 GPAD)
- The CIPA is Separate Trench

BE-03 – Area A

Micrometer Data

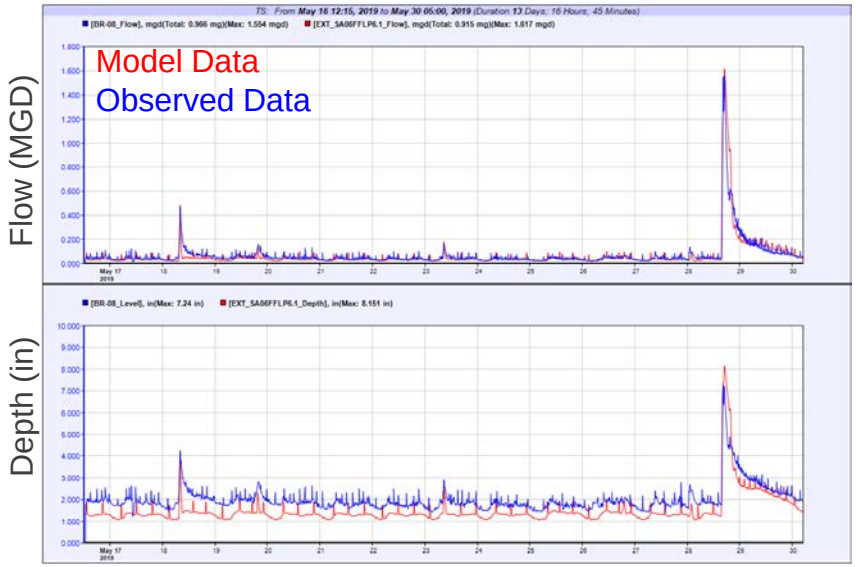
- BR-08 and MMBR-04 were installed in Area A



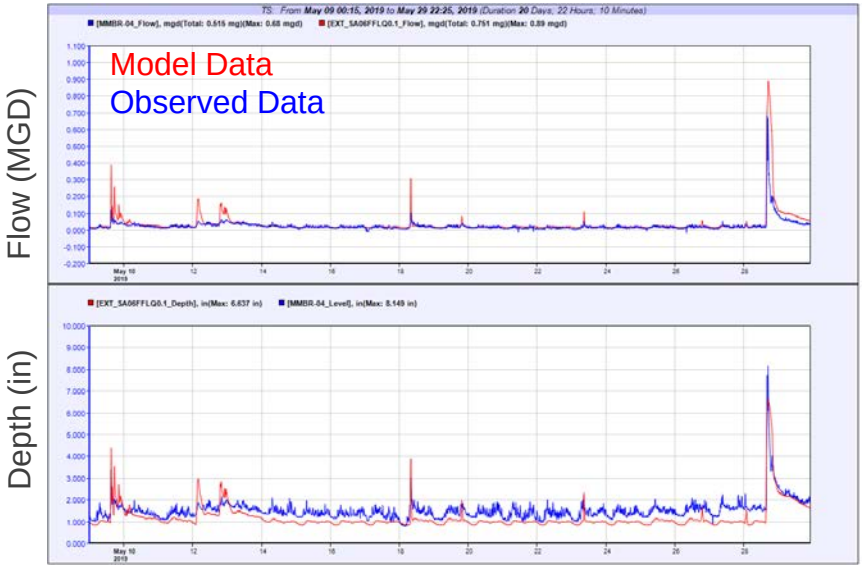
BE-03 – Area A (BR-08)

Micrometer Data

- The model matches level well at BR-08 and MMBR-04
- The model overestimates flow at MMBR-04
  - **Need to redistribute flows**



BR-08 Data

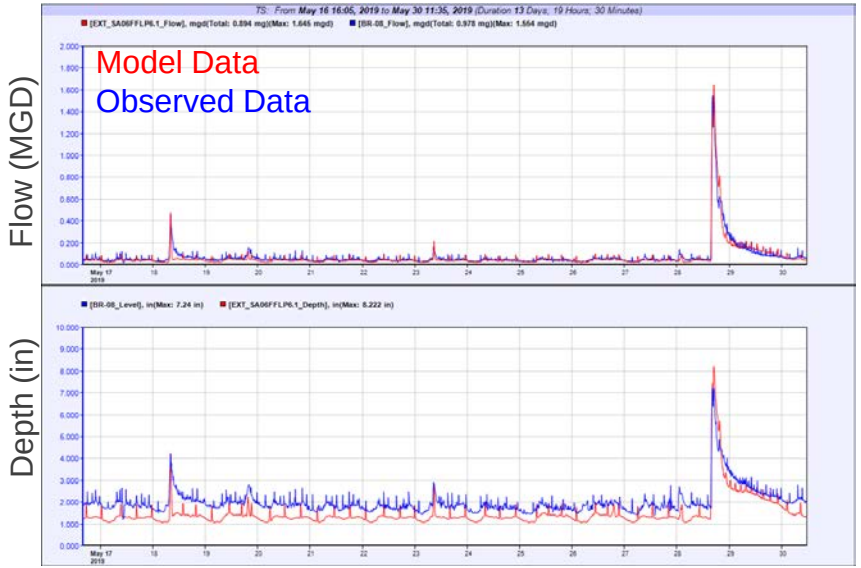


MMBR-04 Data

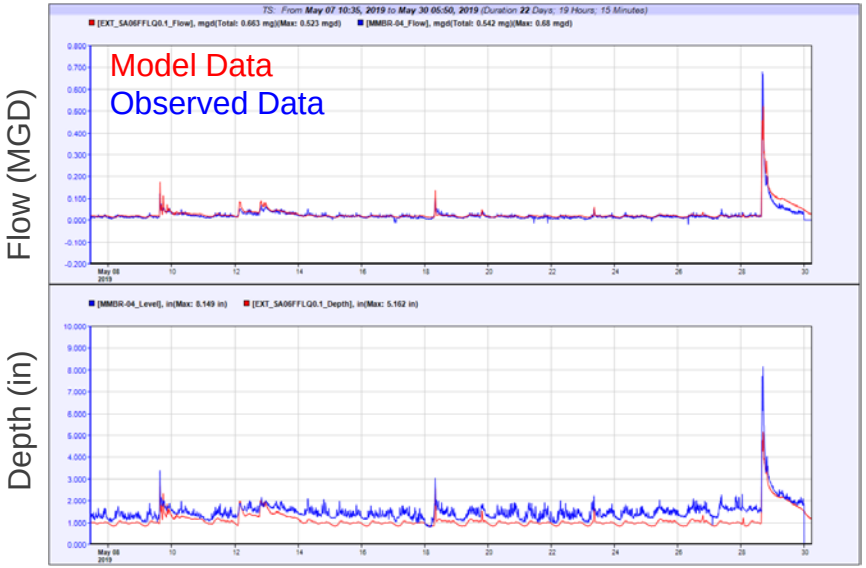
BE-03 – Area A (BR-08)

Micrometer Data – After Redistribution

- After redistributing flows, the model matches both metering locations well
- The BR-08 subcatchments now have 152,000 GPAD
- The MMBR-04 subcatchments now have 42,000 GPAD



BR-08 Data

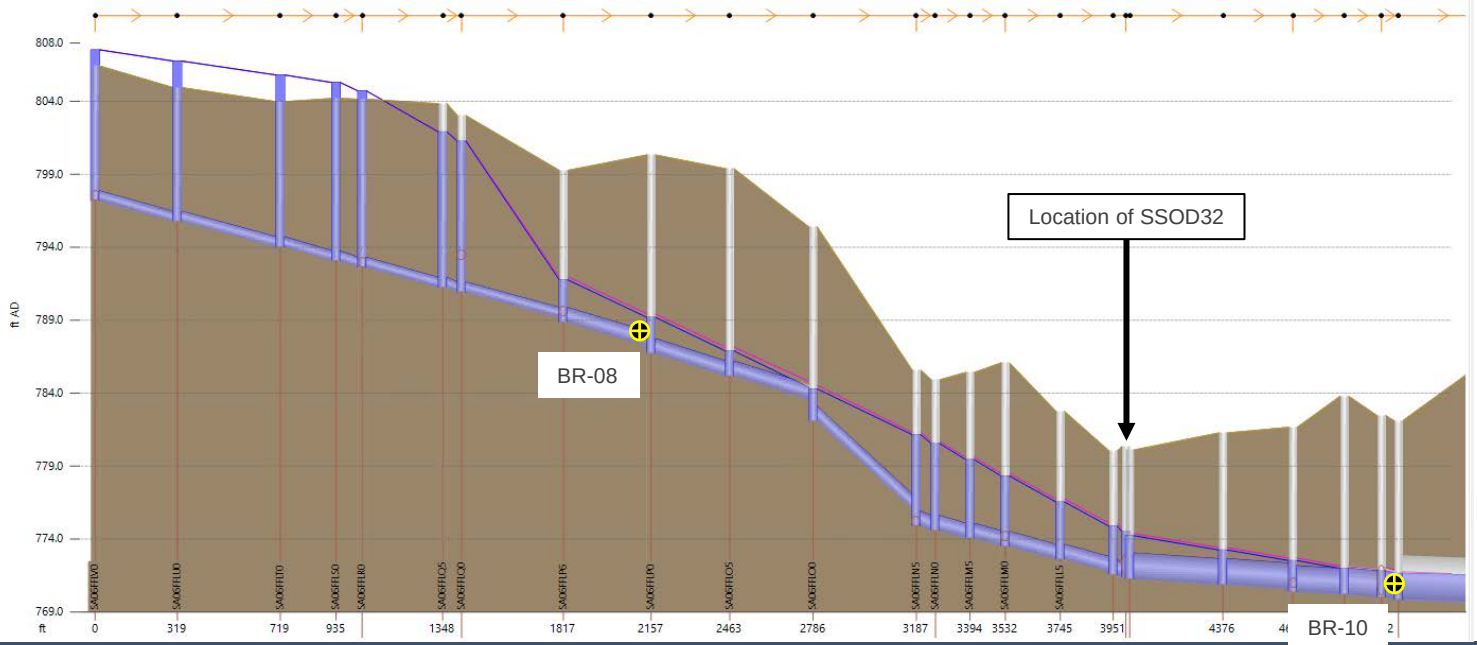


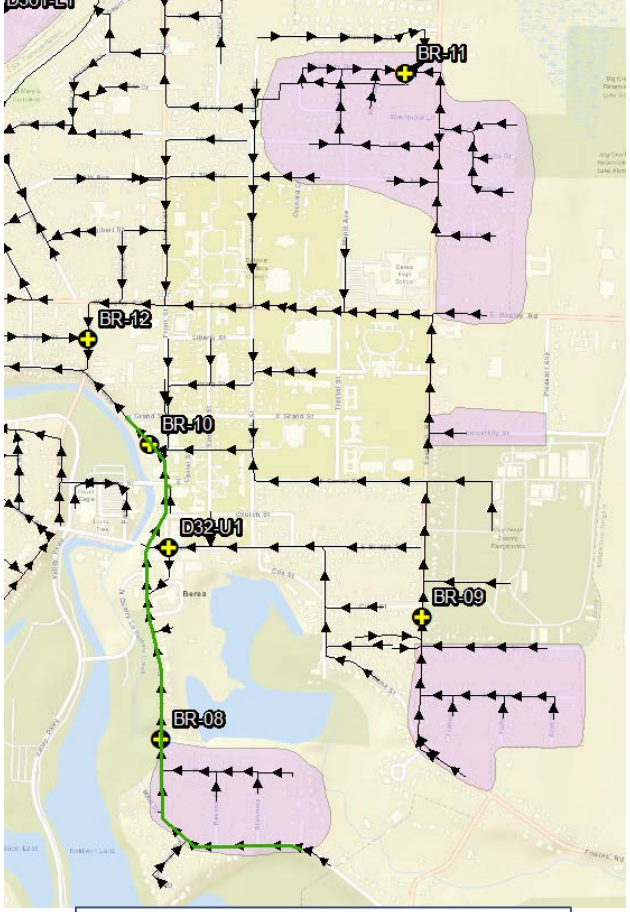
MMBR-04 Data

BE-03 – Area A

5-Year Model Design Storm Profile

- Model
  - Surcharge caused by undercapacity sewer
  - Inline or local storage not feasible (too many undercapacity pipes)

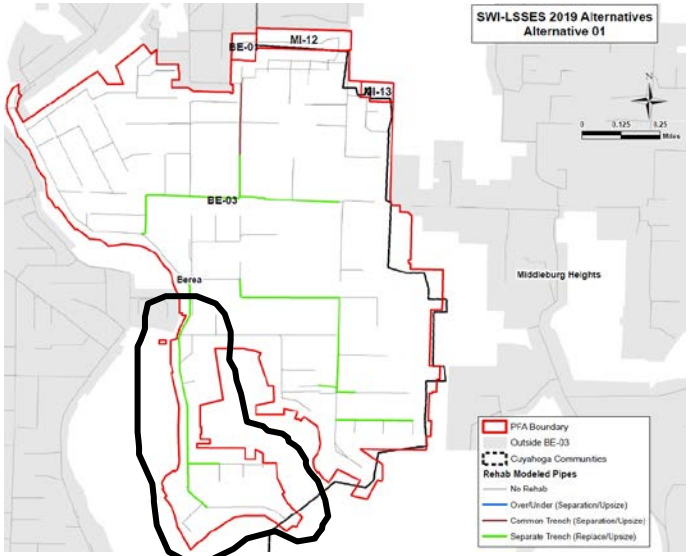


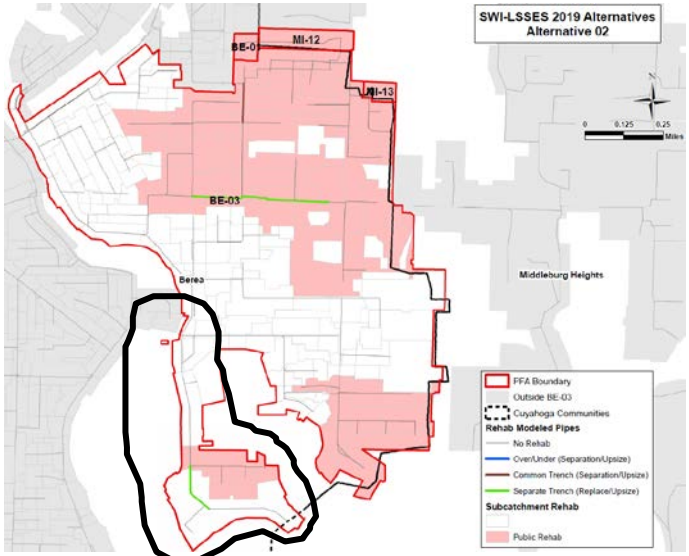


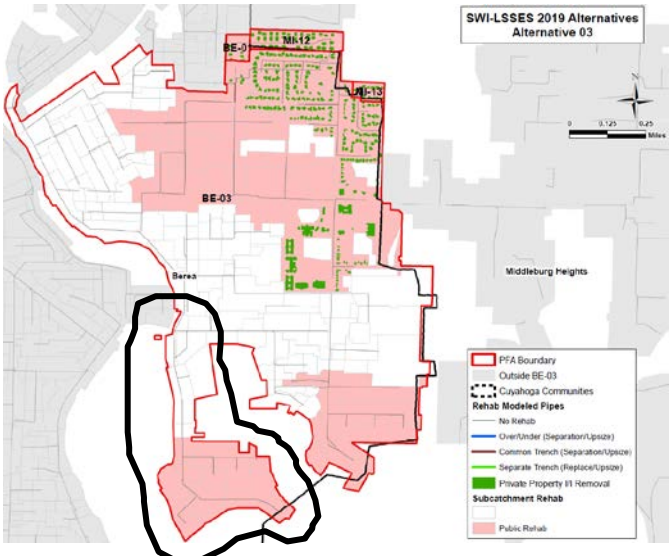
Model Profile Highlighted Green

BE-03 – Area A

Refined Alternatives







Alternative 1 requires upsizing far downstream of the CIPA and is not cost effective

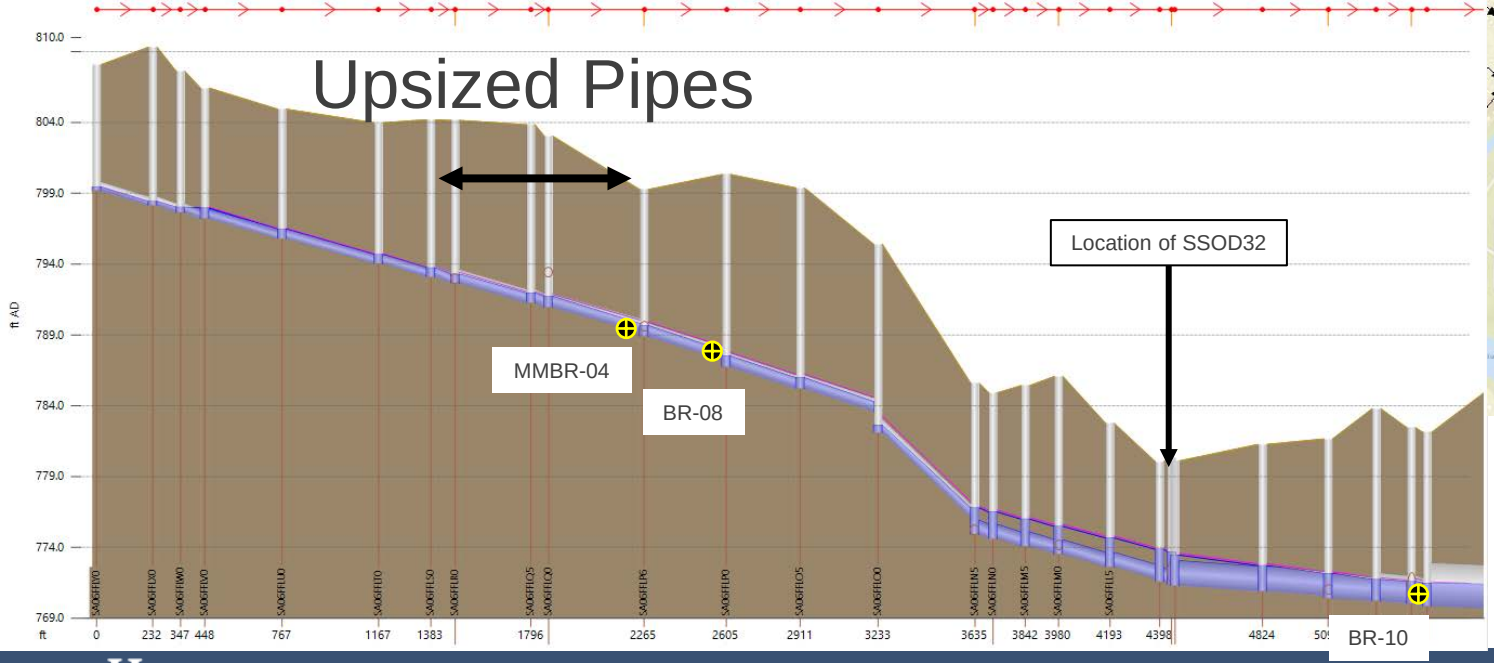
Alternative 2 is cheapest option

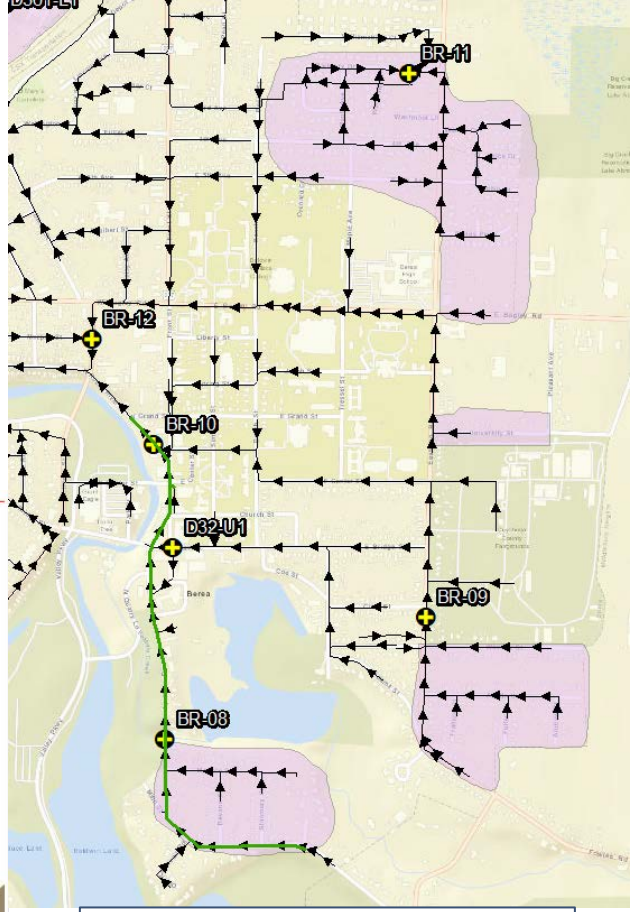
Update PFL Cost (YES/NO)	NEORSD Branch	PFL Area	Catchment ID	Alternative		Summary										Planning Costs, $ AACE Class 5
				Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
YES	SWI2019	BE-03	ALL	A1	Area A	5589	0	0	0	0	0	0	0	0	0	$ 6,096,155.00
YES	SWI2019	BE-03	ALL	A2	Area A	882	0	0	0	3126	0	0	0	0	0	$ 1,804,150.00
YES	SWI2019	BE-03	ALL	A3	Area A	0	0	0	0	7081	0	0	0	0	0	$ 2,146,307.00

BE-03 – Area A

Tier 1 Solution Profile

- Public lining of BR-08 Metershed (excluding the portion upstream of MMBR-04
  - **Additional field investigation may be necessary to find the sources of I/I**
- Upsizing four pipes upstream of MMBR-04



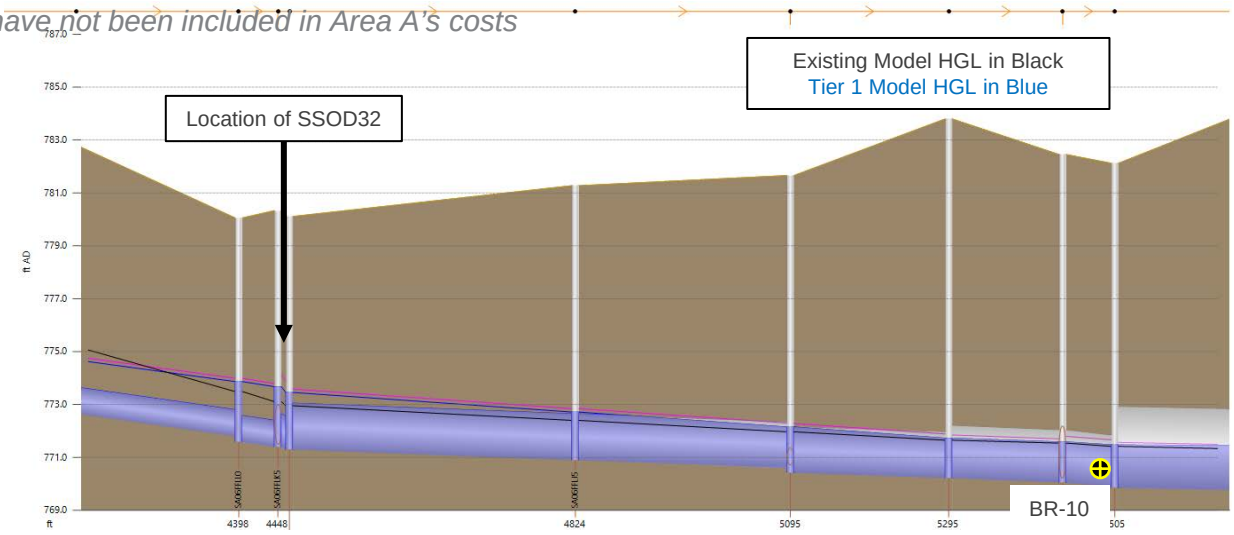


Model Profile Highlighted Green

BE-03 – Area A

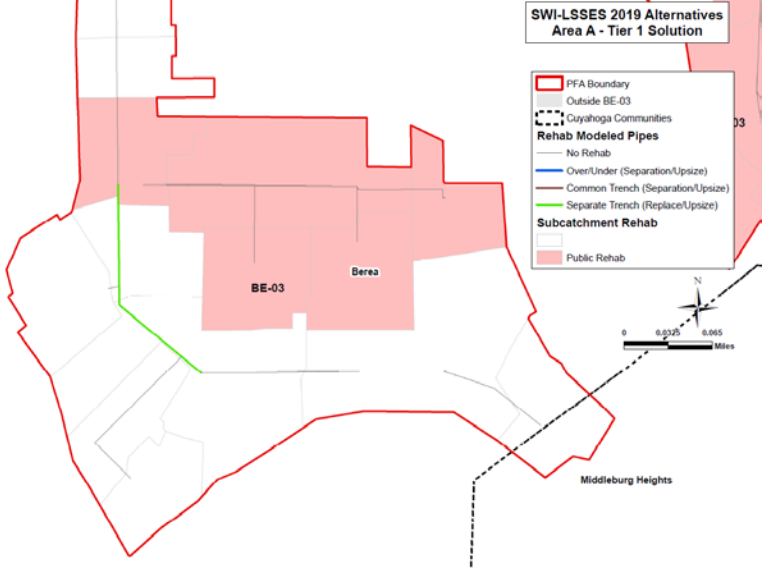
Tier 1 Solution Profile

- Due to the removal of SSOD32 in the optimization model, the HGL in the three pipes downstream rises above the crown of the pipes
  - **SSOD32 had been controlling the HGL in this area**
    - *The optimized model HGL is only a few inches higher than the crown of the pipes*
    - *Does not result in any BBUs*
    - *It is not necessary to replace these pipes and they have not been included in Area A's costs*



BE-03 – Area A

Tier 1 Summary

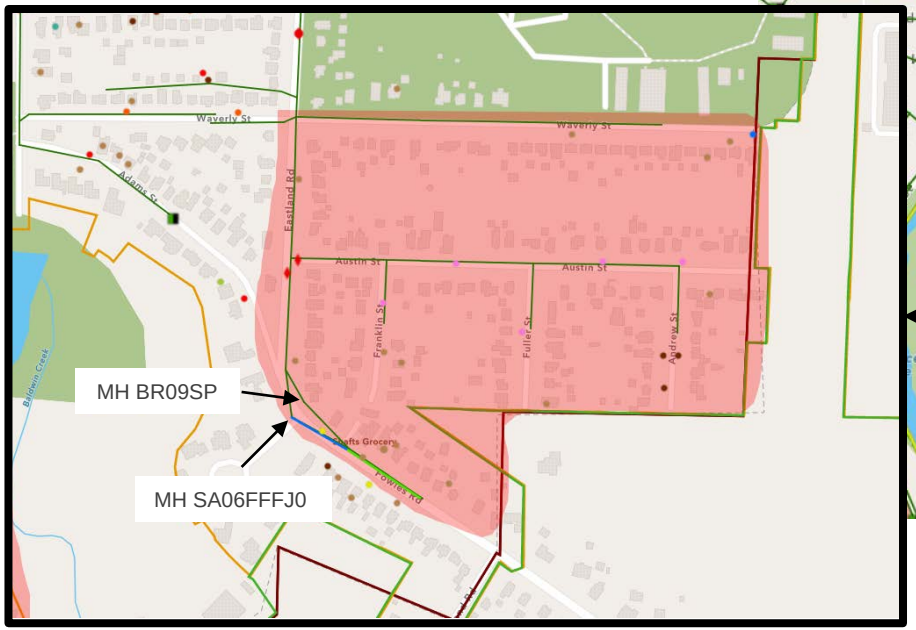


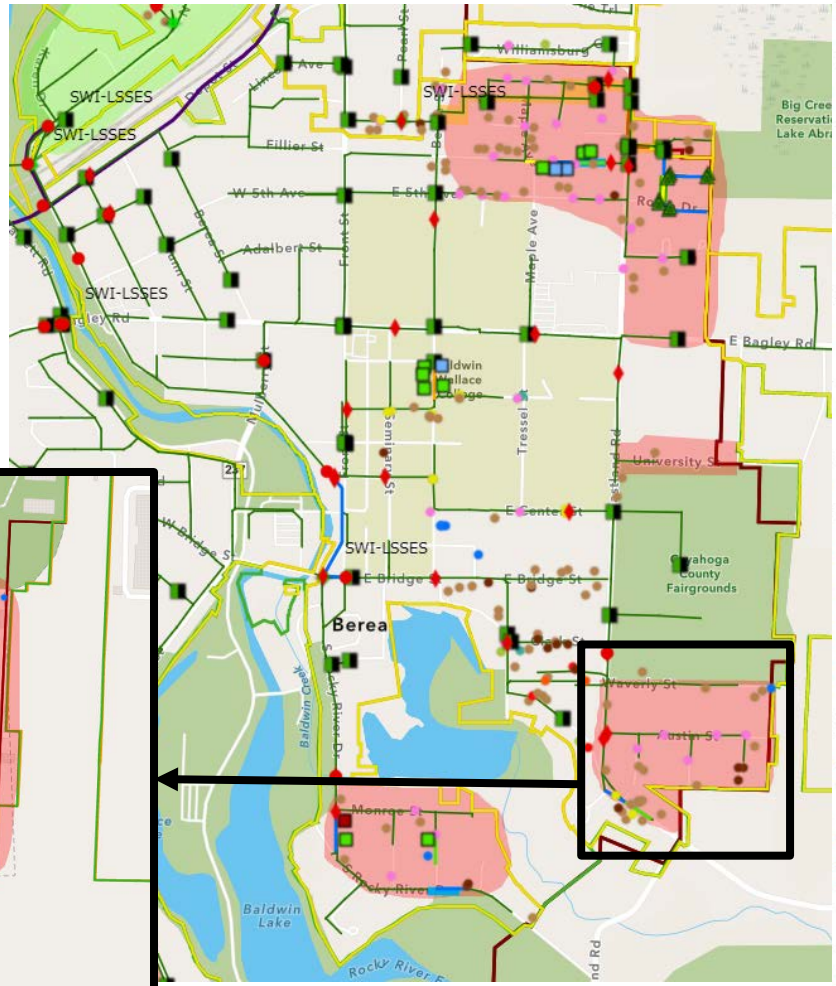
- Field data
  - **Smoke test defects throughout the PFA**
  - **One positive dye test**
- Model data
  - **Flow contributions were reduced upstream of MMBR-04 and increased in the rest of the BR-08 metershed**
  - **Model shows surcharge caused by undercapacity sewer**
- Tier 1 Solution
  - **Public rehab of the BR-08 metershed (excluding subcatchments upstream of MMBR-04)**
    - *Public lining for 4,145 LF of pipe (all separate trench)*
    - *This area is entirely **separate trench**, so more investigation should be done to find I/I sources*
  - **Upsize four pipes upstream of MMBR-04**
  - **Costs $2,128,842**

BE-03 – Area B

Tier 1 Optimization – Area B Field Data

- Several smoke test defects but not location-specific
- The model shows wo manholes that overflow into nearby stream (MH BR09SP & MH SA06FFFJ0)







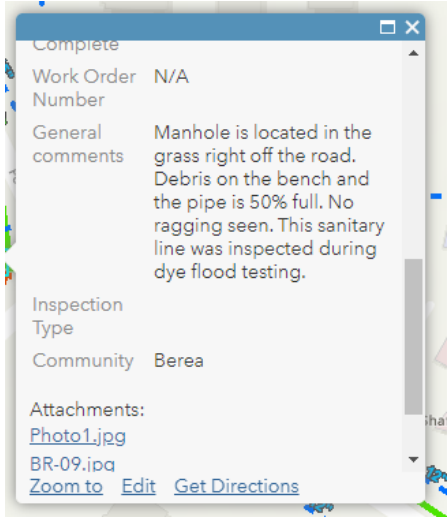
BE-03 – Area B

Tier 1 Optimization – Area B Field Data

- The model shows wo manholes that overflow into nearby stream (MH BR09SP & MH SA06FFFJ0)
- Field inspection did not find direct evidence of overflow, but it did find that one of the manholes is shallow, not sealed, and near the stream







BE-03 – Area B

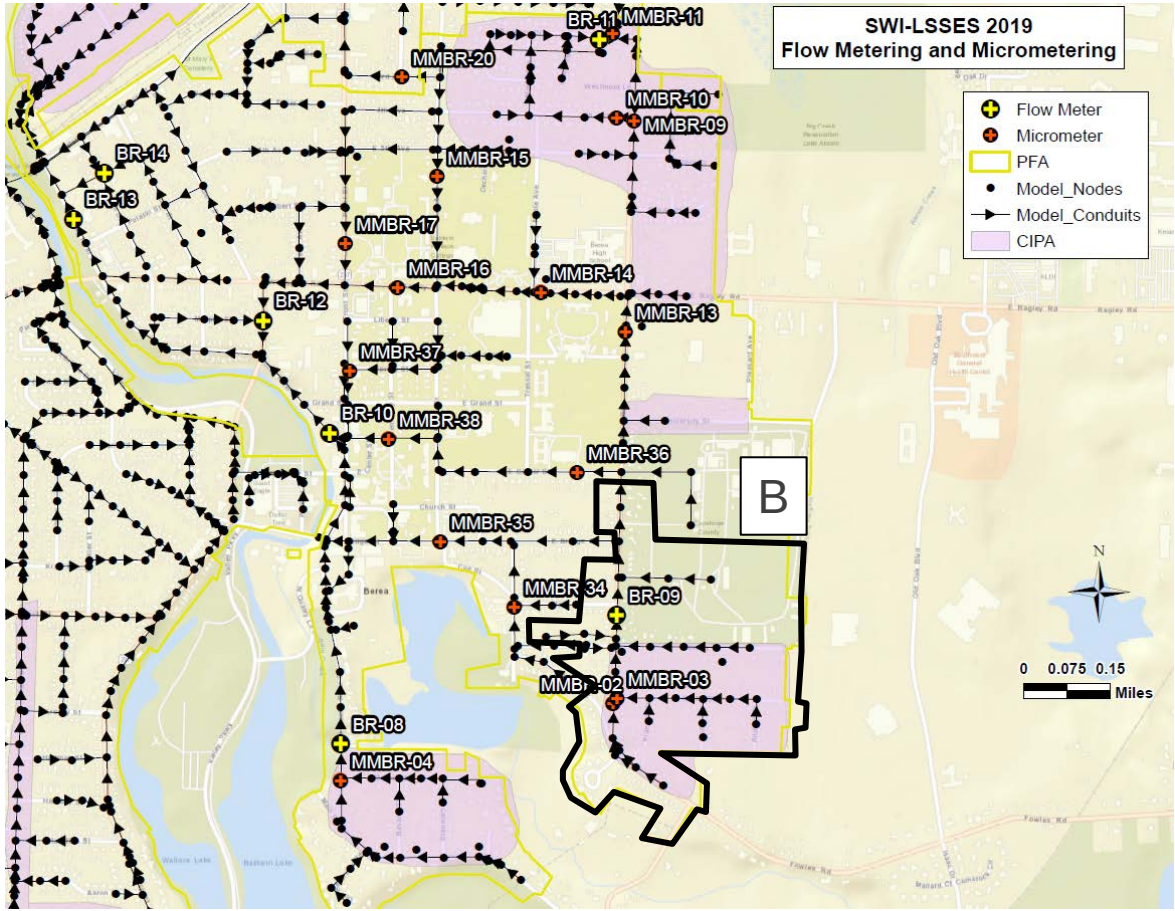
Tier 1 Optimization – Field Data Summary

- Smoke test results indicate there are I/I related defects but not enough to explain the high I/I (68,000 GPAD)
- The CIPA is Separate Trench
- No direct evidence of the model-predicted overflows but field investigation shows that is plausible

BE-03 – Area B

Micrometer Data

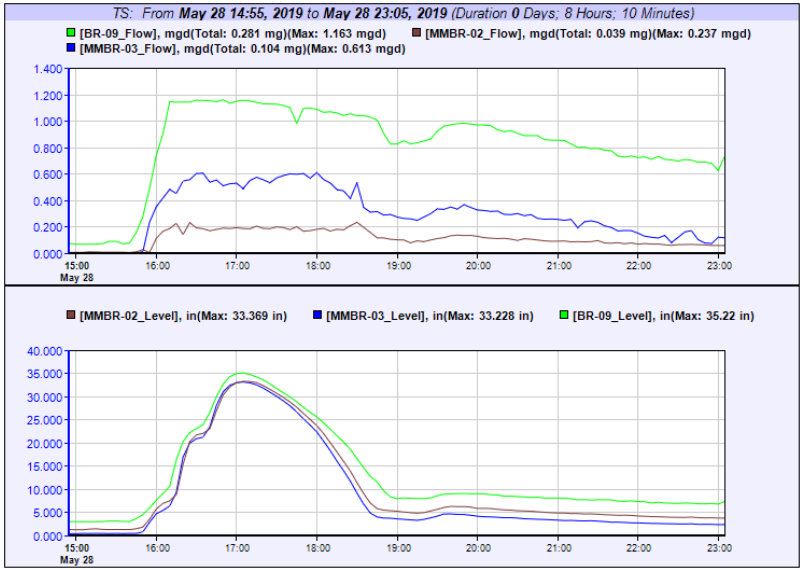
- BR-09, MMBR-02, and MMBR-03 were installed in Area B

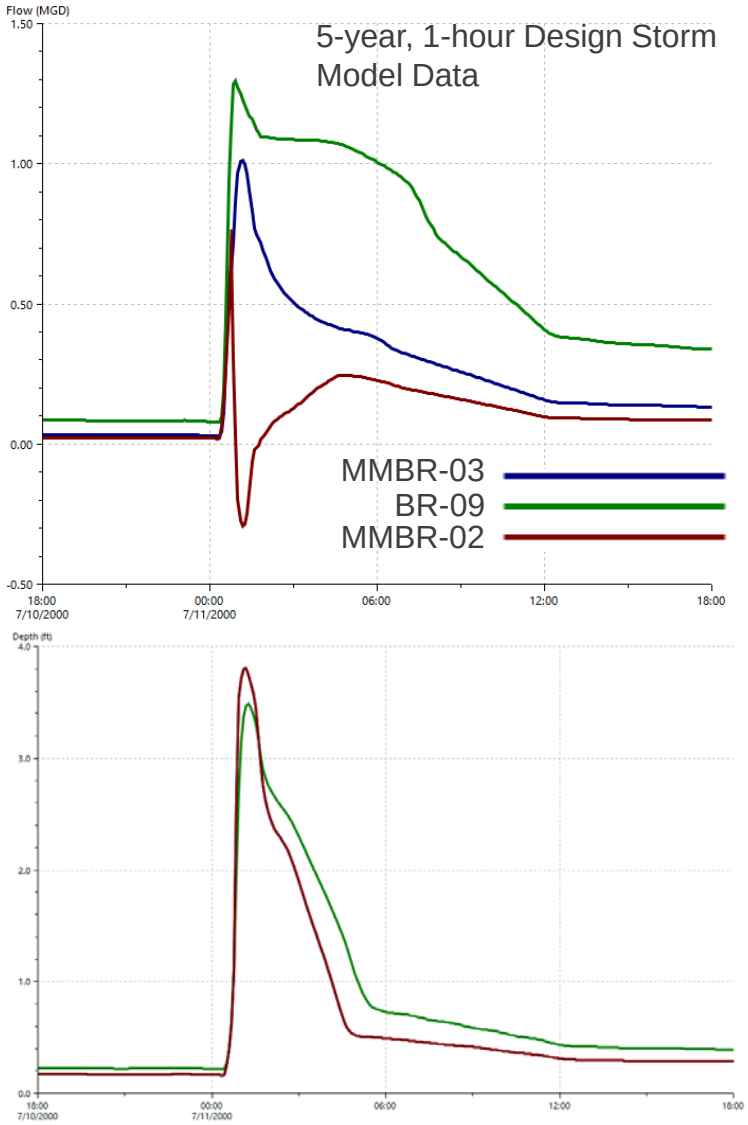


BE-03 – Area B (BR-09)

Micrometer Data

5/28/19 Event Meter Data



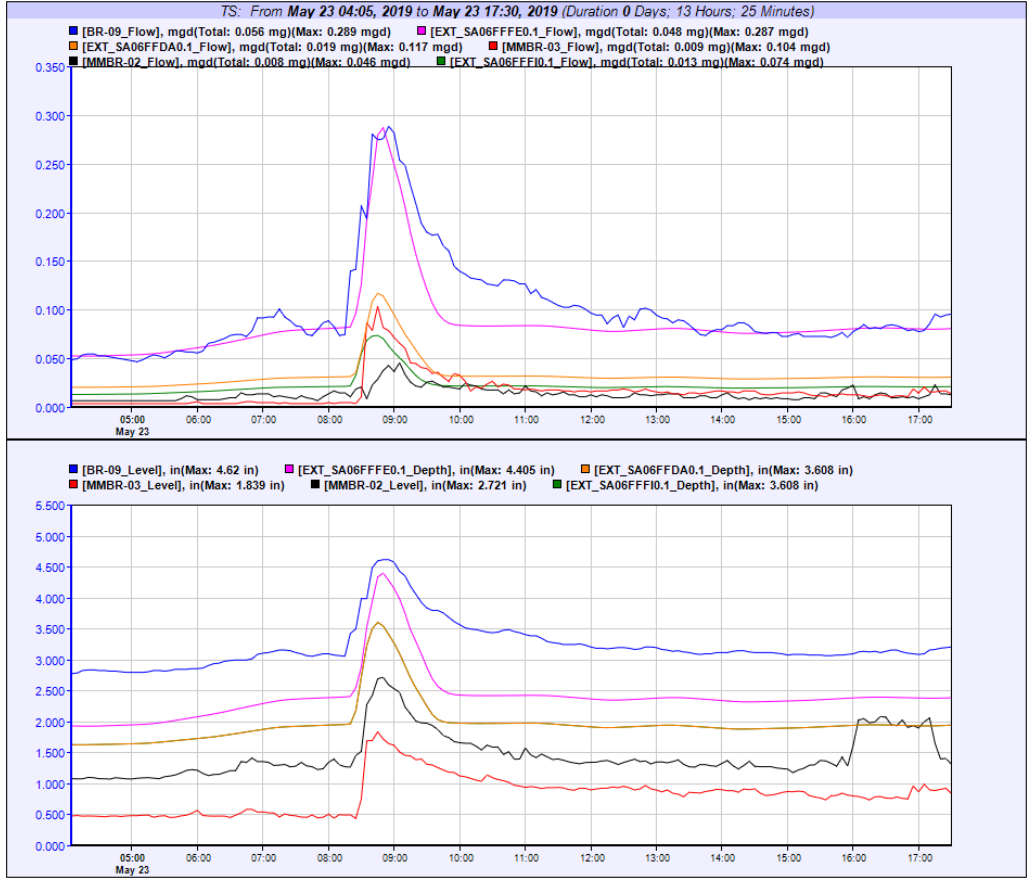


- Model design storm surcharge levels are a little bit higher than observed
- Model shows a reasonable match between the ratio of flows at meter locations, however, because of the higher modeled surcharge there is more volume lost upstream of MMBR-02

BE-03 – Area B (BR-09)

Micrometer Data

BR-09 Meter
BR-09 Model
MMBR-02 Meter
MMBR-02 Model
MMBR-03 Meter
MMBR-03 Model



5/23/19 Event
Meter and Model Data

- The smaller, 5/23/19 event shows a reasonable match between flows and unsurcharged depths

BE-03 – Area B (BR-09)

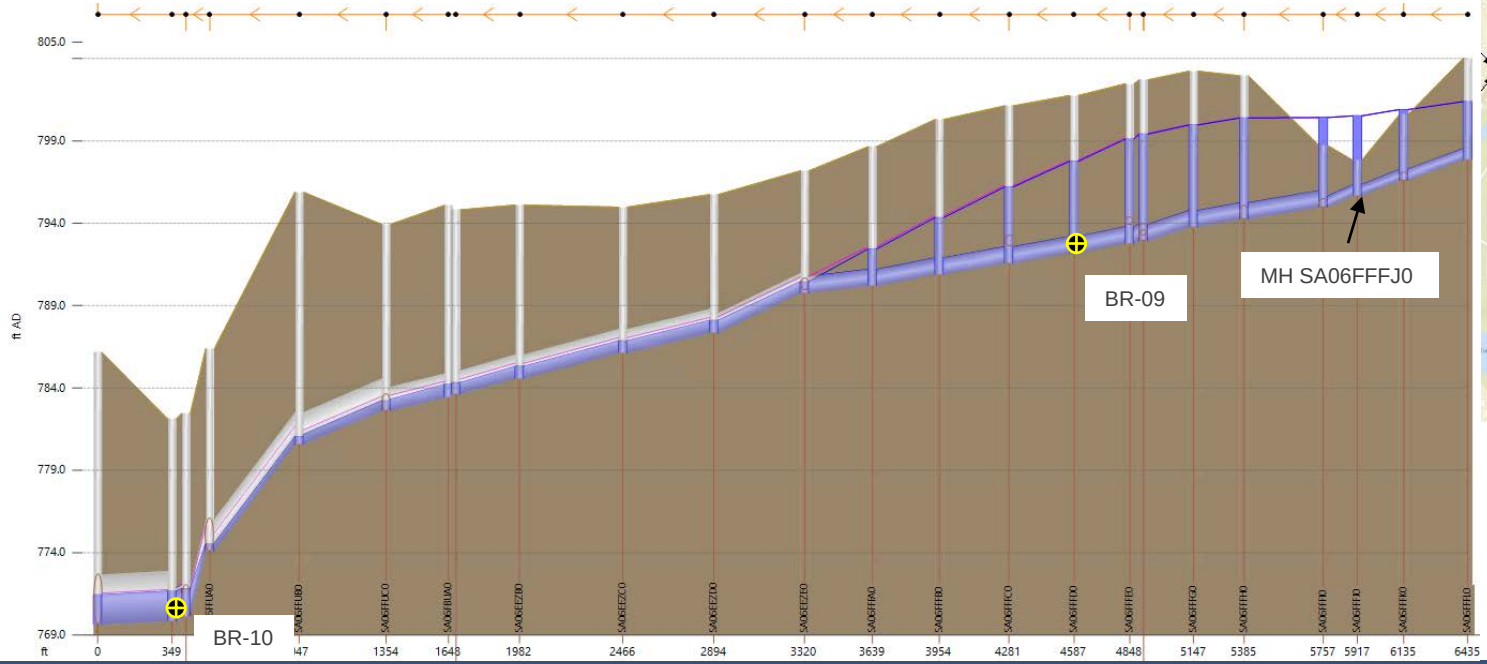
Micrometer Data

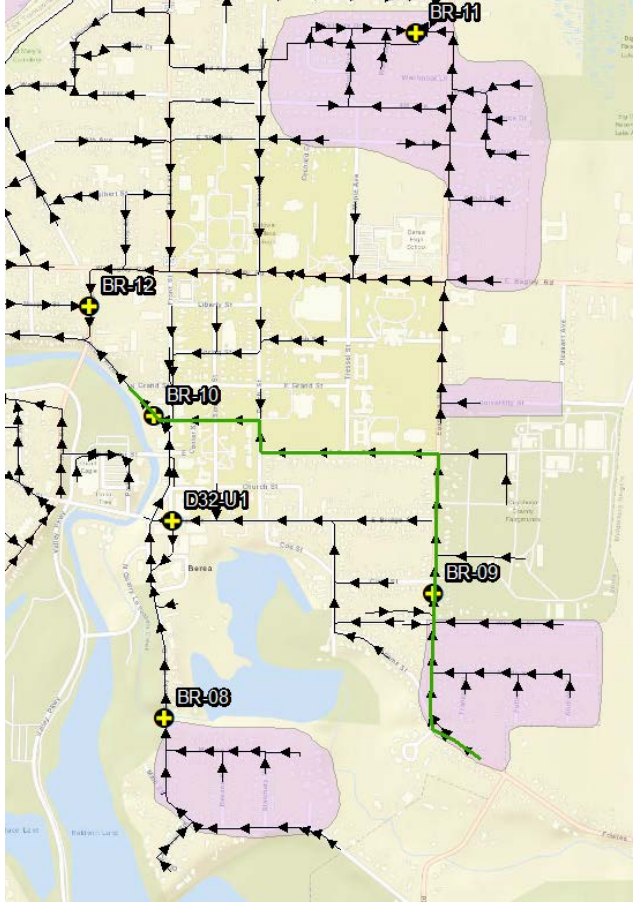
- Conclusions
  - **No evidence to show that the model flows should be redistributed**
    - *micromonitoring data was used during calibration, so it is already incorporated into the model*
  - **No evidence to show that the model level calibration should be adjusted**
    - *The 5-year design storm shows surcharge at some micrometer locations where surcharge wasn't observed*
    - *The largest storm during micromonitoring period had 1-year return interval, so it's possible these locations will surcharge during a 5-year storm*

BE-03 Area B

5-Year Model Design Storm Profile

- Model
  - Surcharge caused by undercapacity sewer
  - Overflows at MH BR09SP and MH SA06FFFJ0
  - Inline or local storage not feasible (estimated lateral elevations are too close to existing sewer crown)
  - Flow from Area B does not affect SSOD32



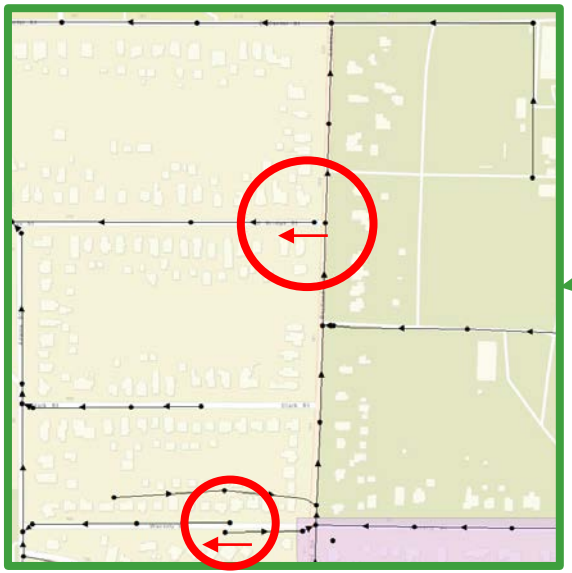


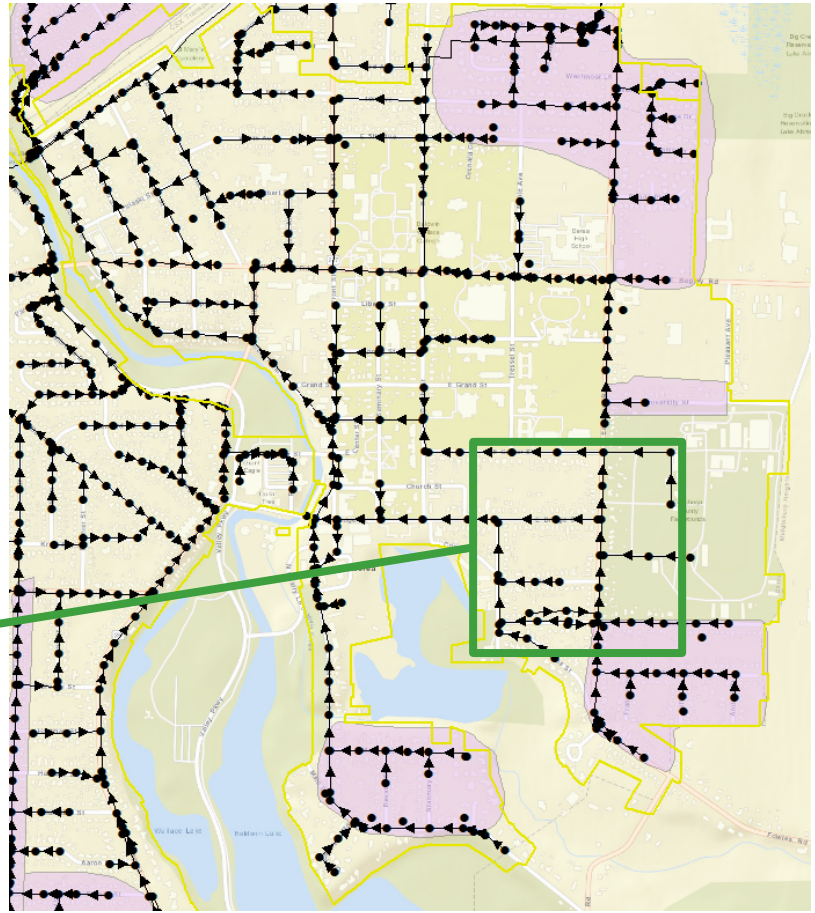
Model Profile Highlighted Green

BE-03 – Area B

Potential Direct Connections

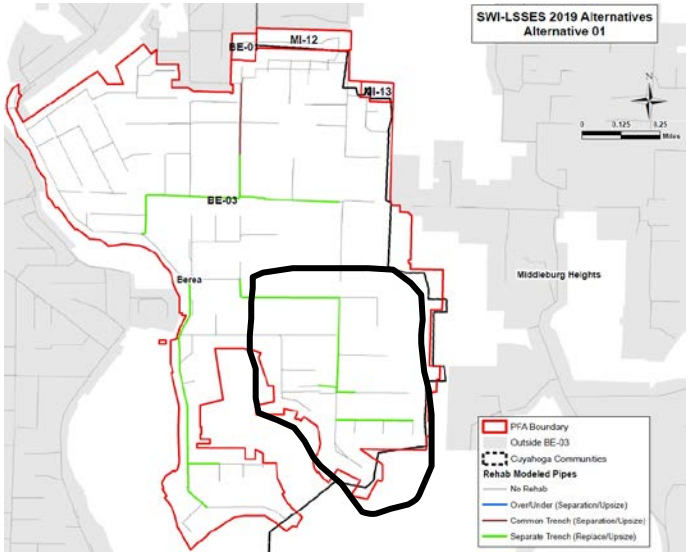
- Two possible connections identified from plan view
- After review of profiles, neither work because outgoing pipe invert is higher than the modeled HGL

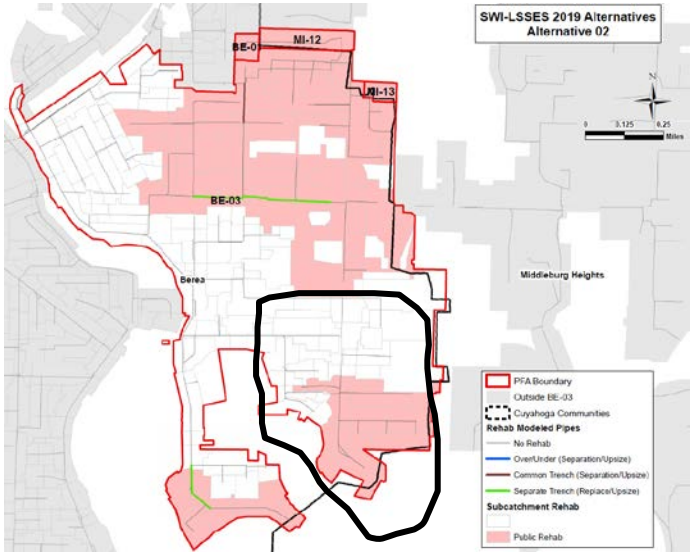


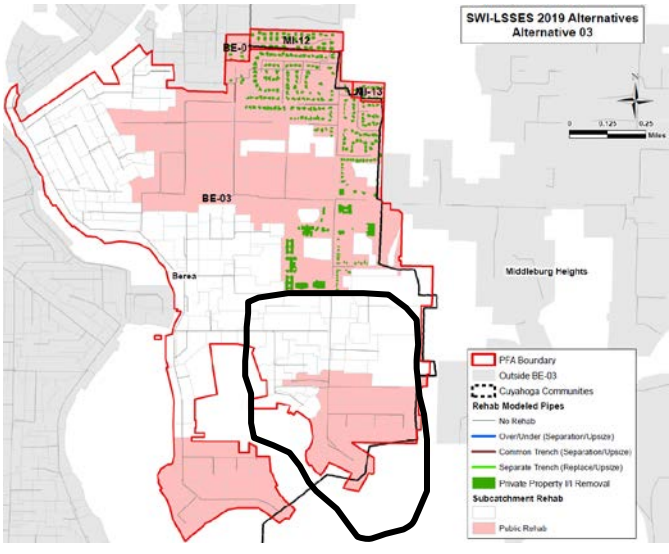


BE-03 – Area B

Refined Alternatives







Alternative 1 requires upsizing far downstream of the CIPA and is not cost effective

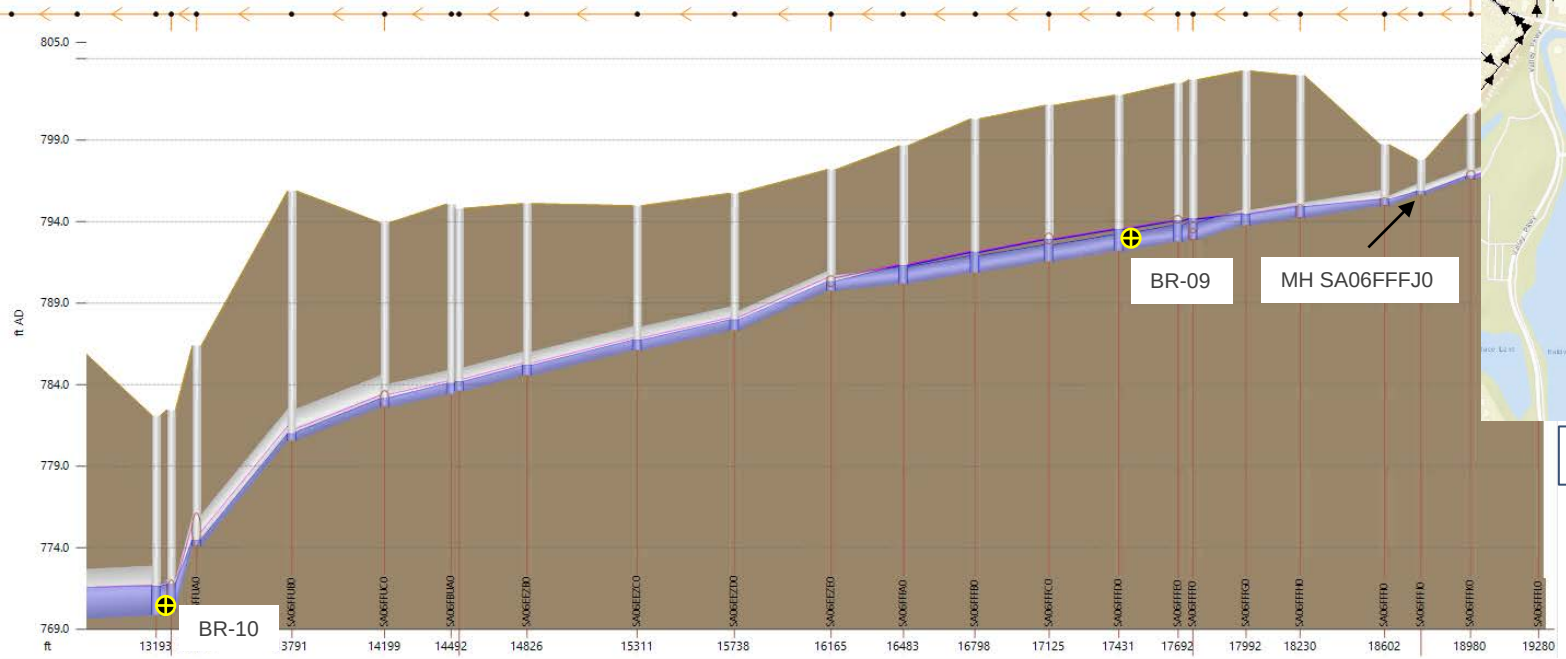
Public sewer lining (Alternatives 2 & 3) is the cheapest option

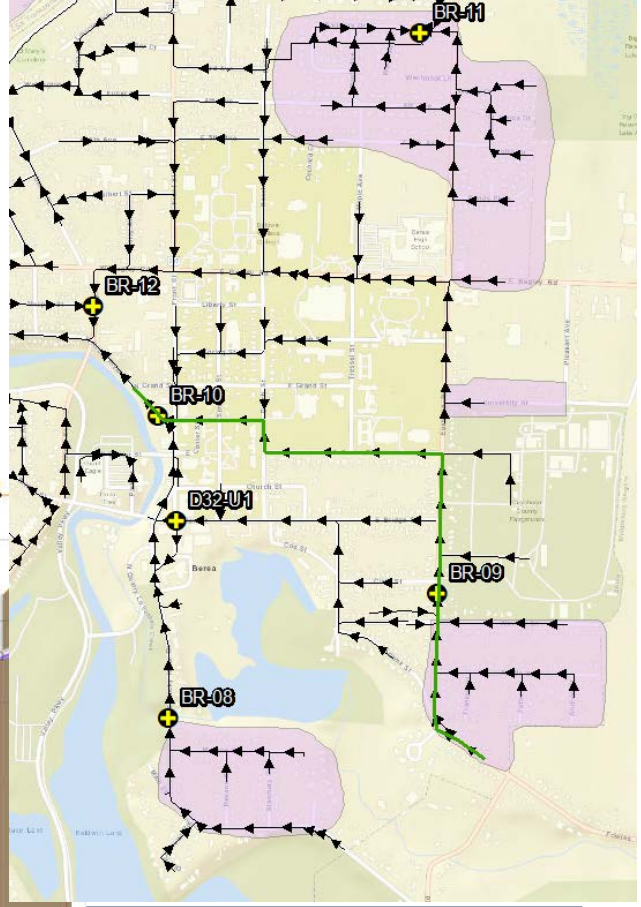
Update PFL Cost (YES/NO)	NEORSD Branch	PFL Area	Catchment ID	Alternative		Summary										Planning Costs, $ AACE Class 5
				Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
YES	SWI2019	BE-03	ALL	A1	Area B	5944	0	0	0	0	0	0	0	0	0	$ 6,483,538.00
YES	SWI2019	BE-03	ALL	A2	Area B	0	0	0	0	8470	0	0	0	0	0	$ 2,561,236.00
YES	SWI2019	BE-03	ALL	A3	Area B	0	0	0	0	8470	0	0	0	0	0	$ 2,561,236.00

BE-03 – Area B

Tier 1 Solution Profile

- Public lining of BR-09 Metershed
  - **Overflows at MH BR09SP and MH SA06FFFJ0 are resolved**
  - **Additional field investigation may be necessary to find the sources of I/I**



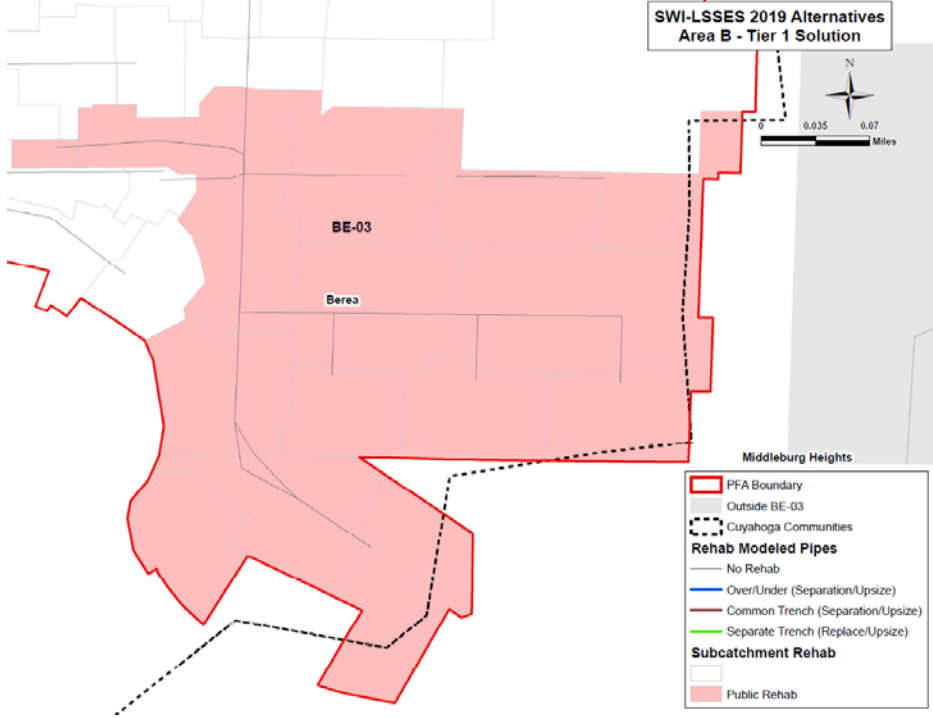


Model Profile Highlighted Green

BE-03 – Area B

Tier 1 Summary

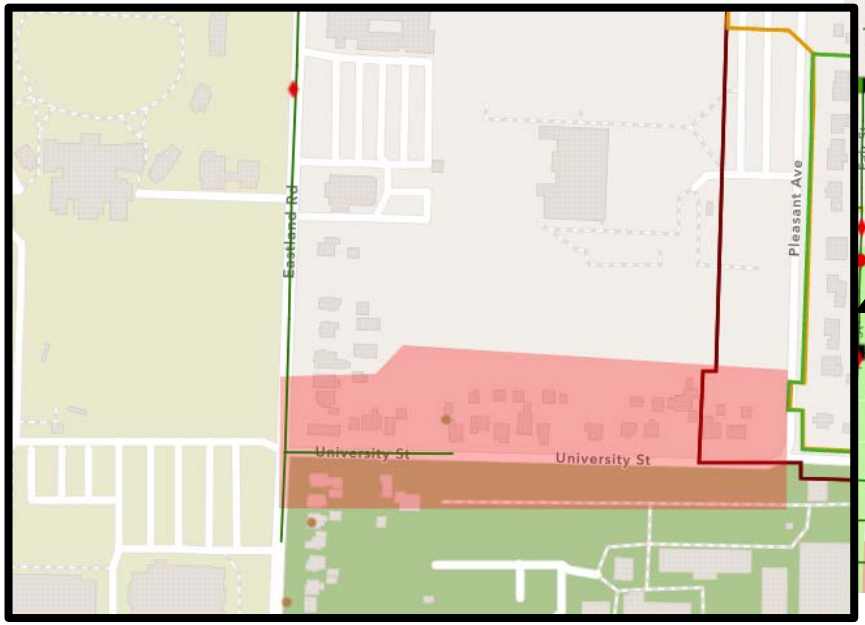
- Field data
  - **Smoke test defects throughout the PFA**
  - **Model predicts two manholes overflow. Field inspection did not verify but did confirm that model representation is accurate**
- Model data
  - **Flows are distributed well**
  - **Surcharge caused by undercapacity sewer**
- Tier 1 Solution
  - **Public rehab of the BR-09 metershed**
  - **Public lining for 8,470 LF of pipe (all separate trench)**
    - *This area is entirely **separate trench**, so more investigation should be done to find I/I sources*
  - **Costs $2,561,236**

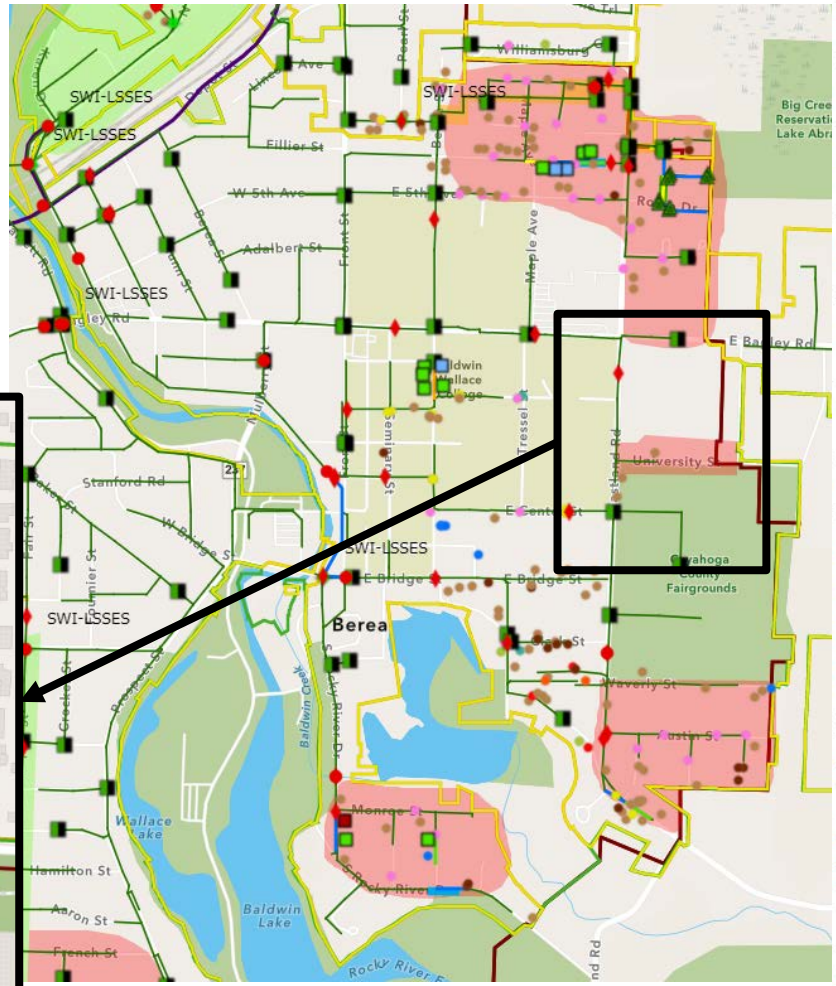


BE-03 – Area C

Tier 1 Optimization – Area C Field Data

- Smoke tested, but no significant defects







BE-03 – Area C

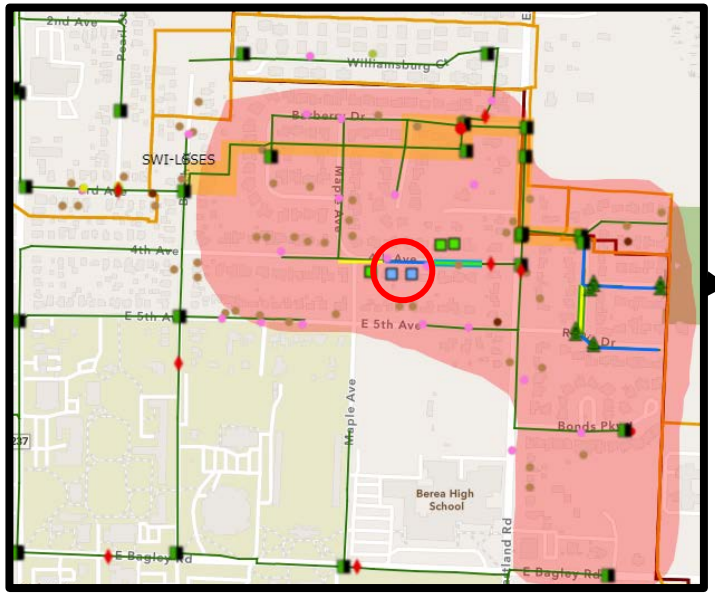
Tier 1 Optimization – Field Data Summary

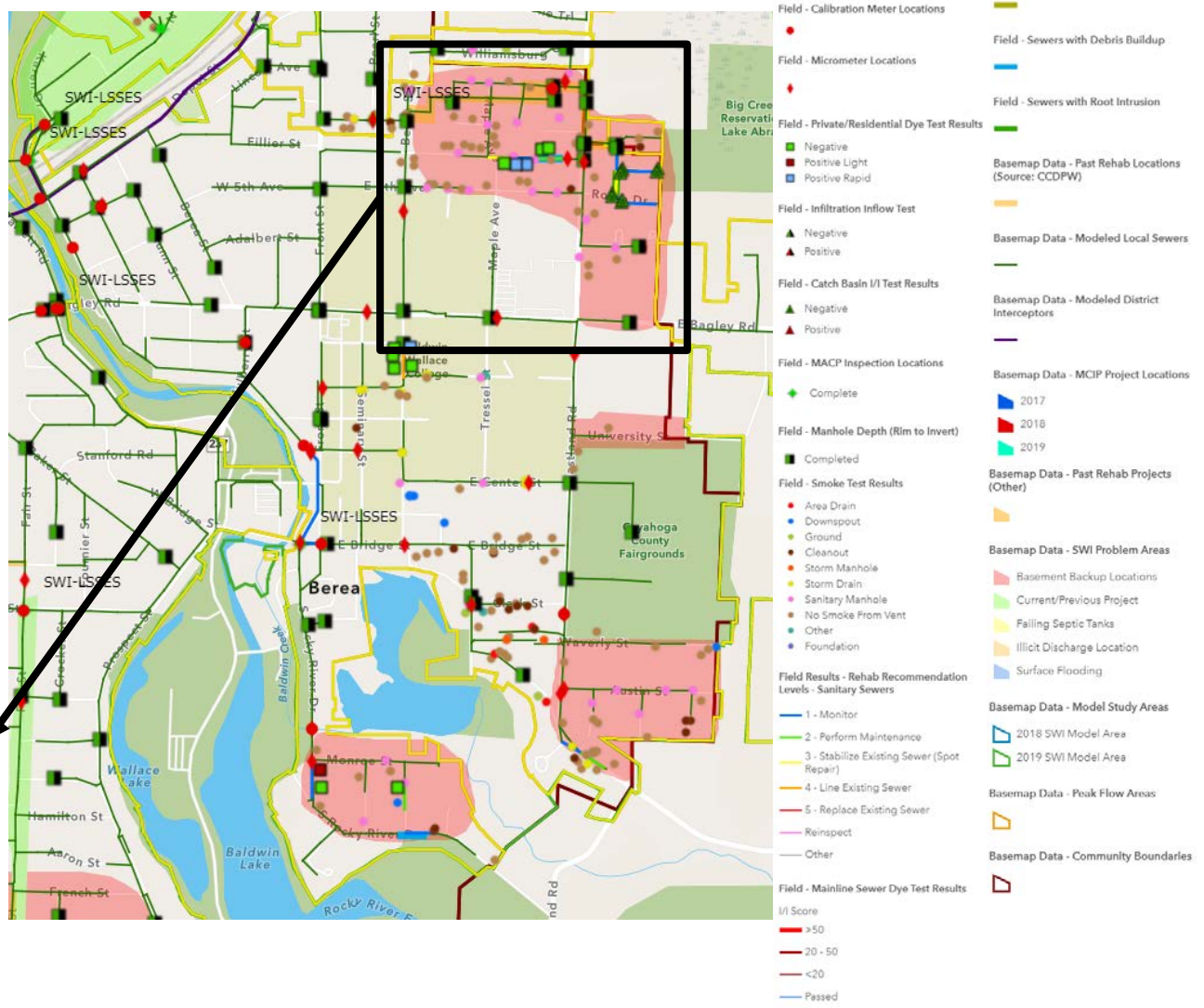
- No significant defects found through smoke testing
  - **Very high peaking factor for MMBR-13 (discussed in micrometer data in following slides), which was installed just downstream of this area**
  - **Where is the I/I coming from? Baldwin Wallace University campus is adjacent to this area and may have illicit connections (also discussed in micrometer data)**

BE-03 – Area D

Tier 1 Optimization – Area D Field Data

- Two positive (rapid) dye tests
- Several smoke test defects but not location-specific and not in location of BBUs





BE-03 – Area D

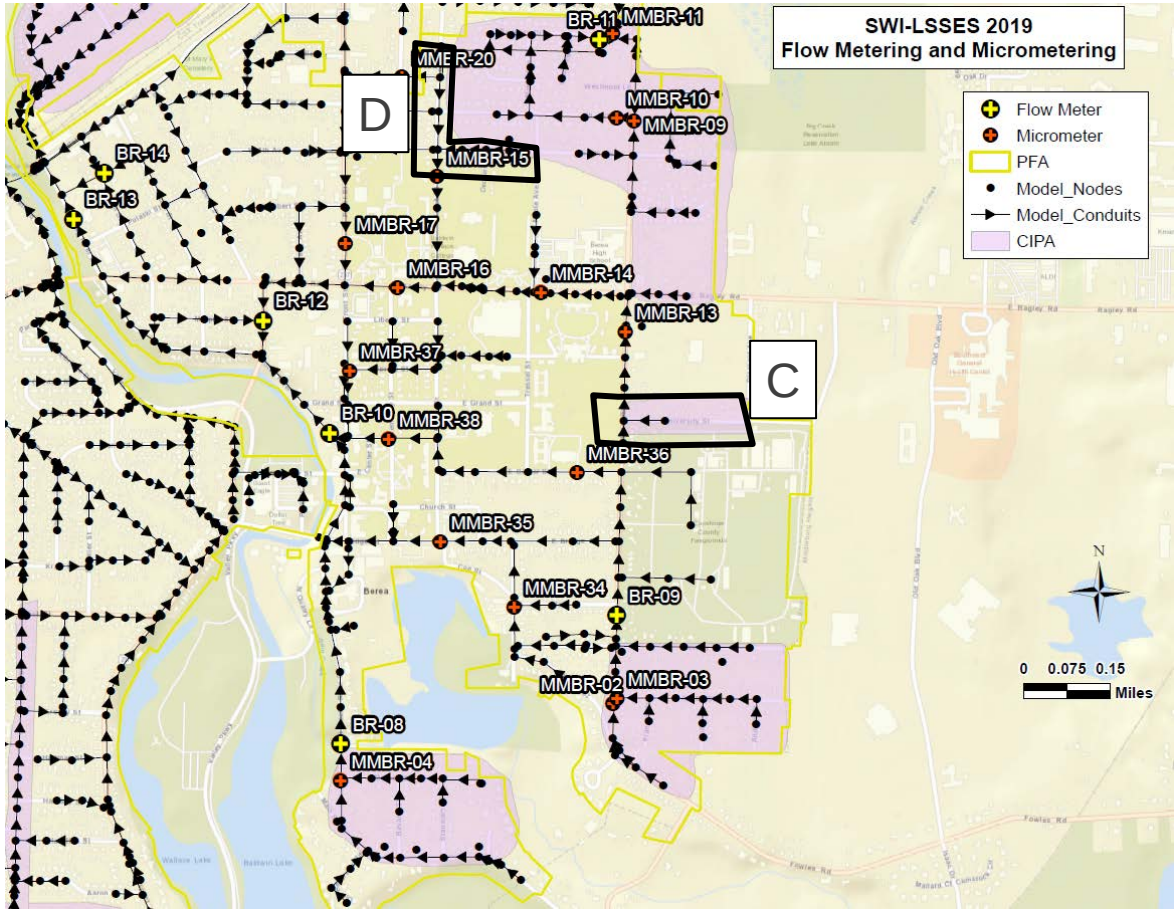
Tier 1 Optimization – Field Data Summary

- Smoke and dye tests found I/I related defects but they are not location-specific

BE-03 – Areas C & D

Micrometer Data

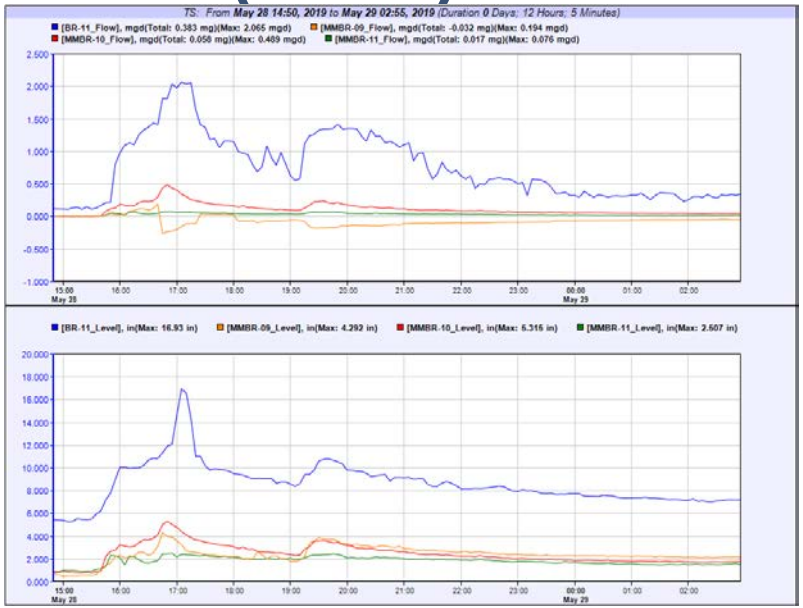
- BR-11, MMBR-09, MMBR-10, and MMBR-11 were installed upstream of Area D
- BR-12, MMBR-13, MMBR-14, MMBR-15, and MMBR-16 were installed downstream of Areas C & D

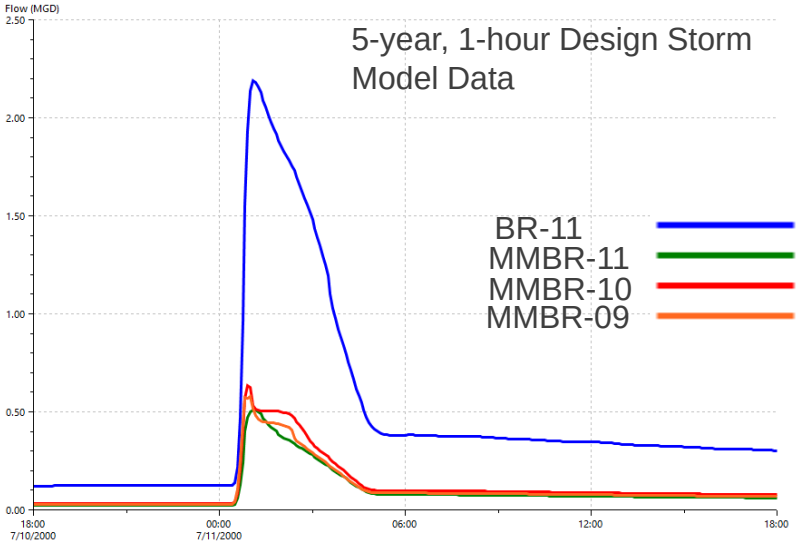


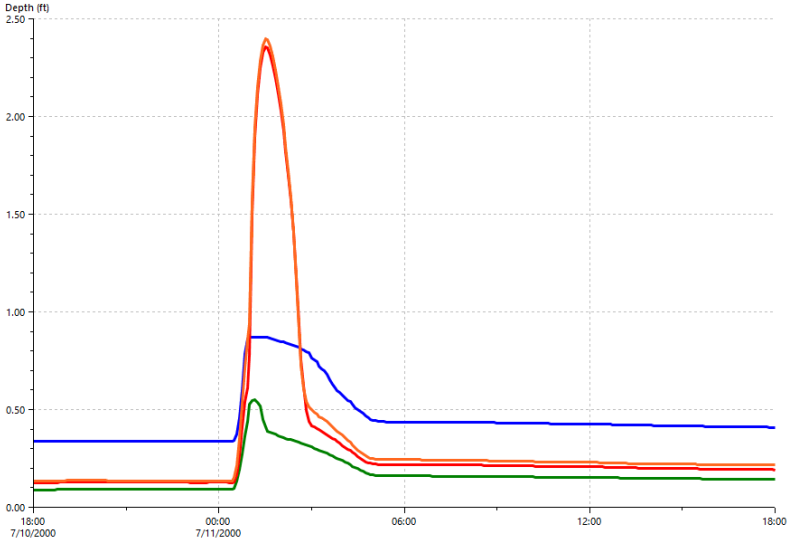
BE-03 – Areas C & D (BR-11)

Micrometer Data

5/28/19 Event Meter Data







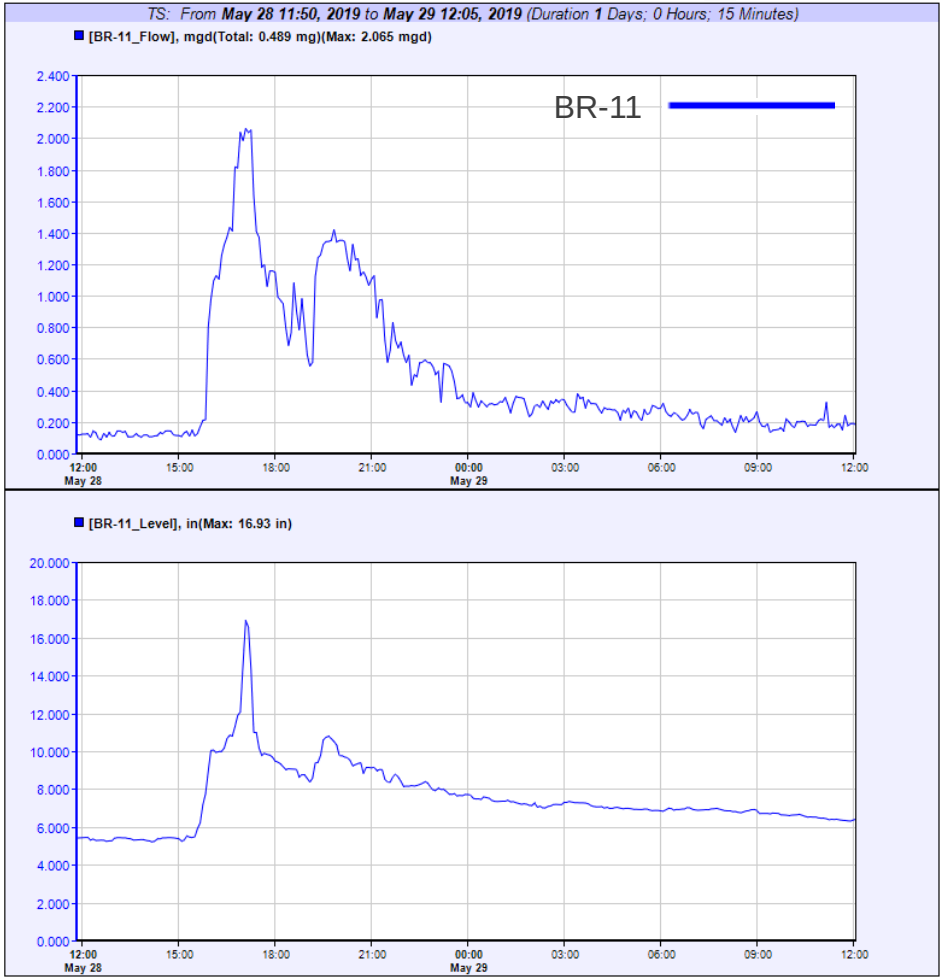
- Model predicts surcharge during design storm at BR-11, MMBR-09 and MMBR-10
- Model shows a reasonable match between the ratio of flows at meter locations except for MMBR-09 which shows negative flows. This is likely meter error, because MMBR-09 is one pipe upstream of MMBR-10, which does not have negative flows

BE-03 – Areas C & D (BR-11)

Micrometer Data

- BR-11 was just upstream of Barberry PS
- Meter data shows surcharge starting when the flow rate reaches 2.0 MGD
  - **The design Barberry PS capacity is 2.6 MGD**
    - *This value was in the calibrated model*
  - **The PS capacity may need to be adjusted to 2.0 MGD**
  - **Changing the model PS capacity to 2.0 MGD does not cause any BBUs upstream of the station**

5/28/19 Event Meter Data

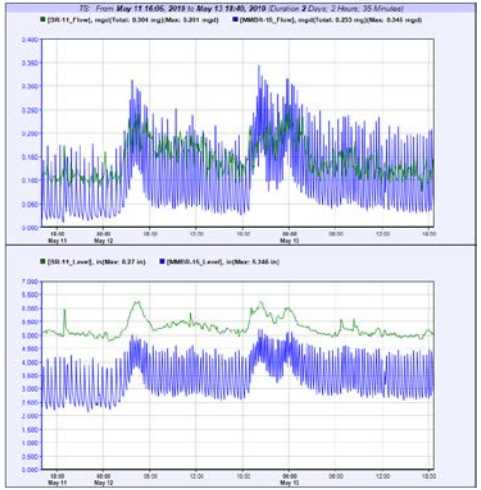


BE-03 – Areas C & D (BR-11)

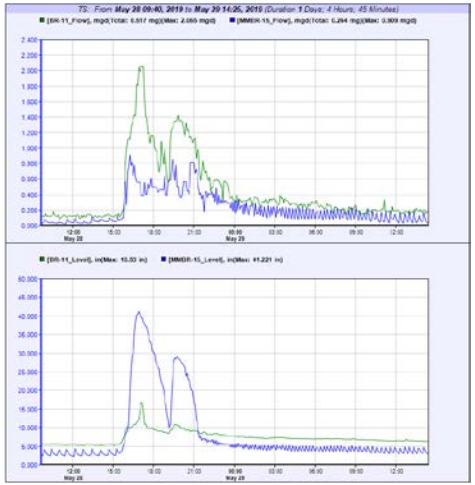
Micrometer Data

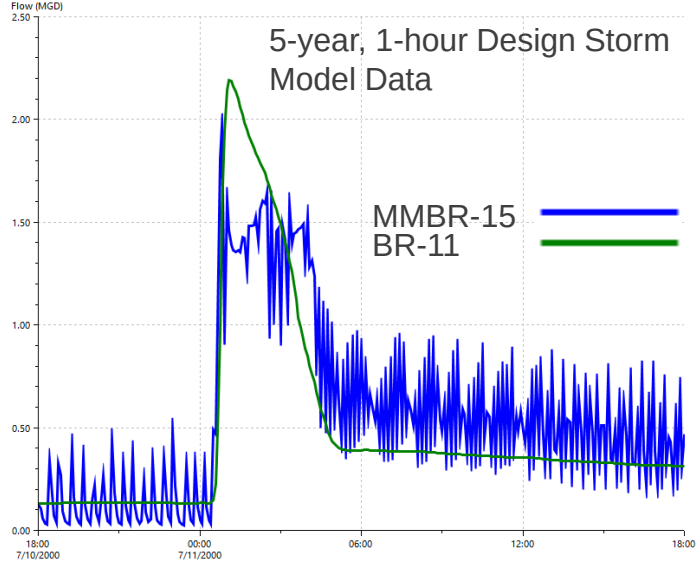
- The Barberry PS force main discharges into a diversion manhole that splits flow between PFAs BE-02 and BE-03
- MMBR-15 monitors the BE-03 side of the diversion (along with some intermediate contributing area)
- During smaller events (5/12/19), MMBR-15 receives most of the flow from BR-11
- During larger events (5/28/19), MMBR-15 surcharges and receives a smaller portion of BR-11's flow

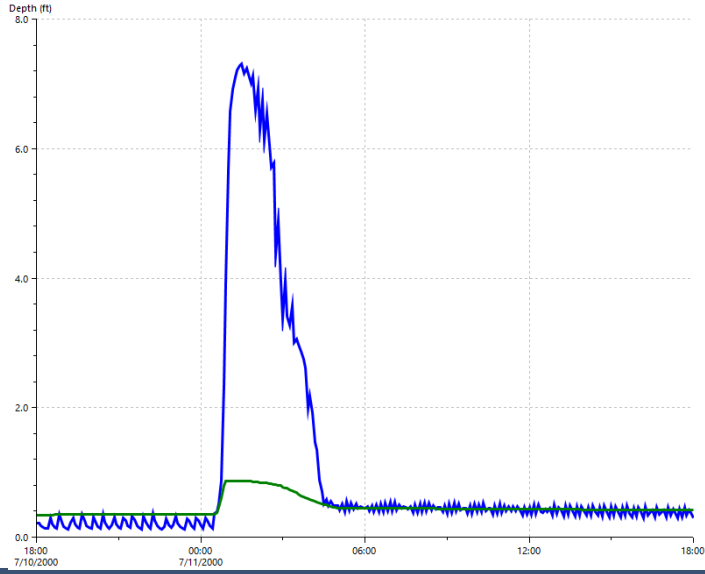
5/12/19 Event Meter Data



5/28/19 Event Meter Data



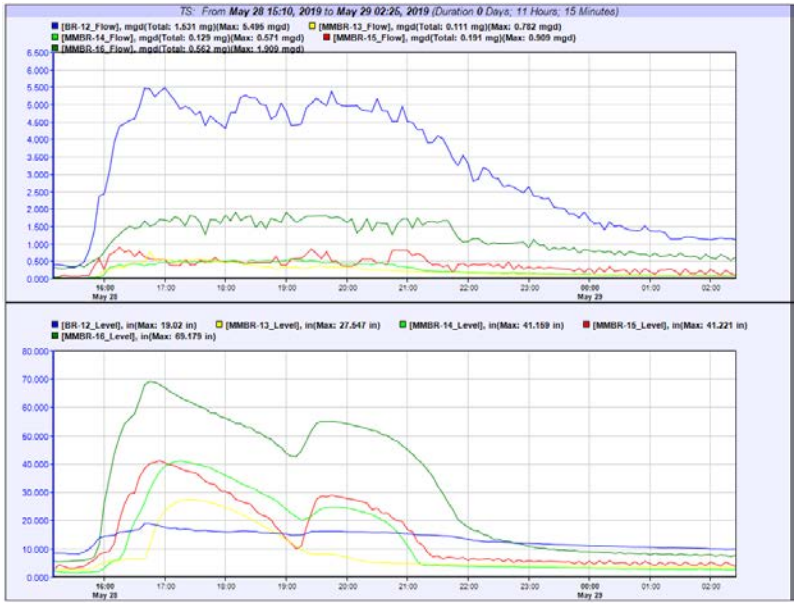


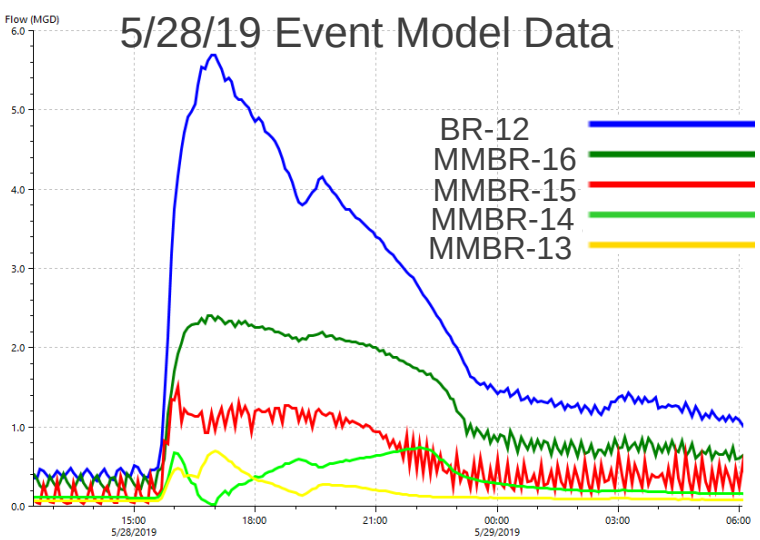


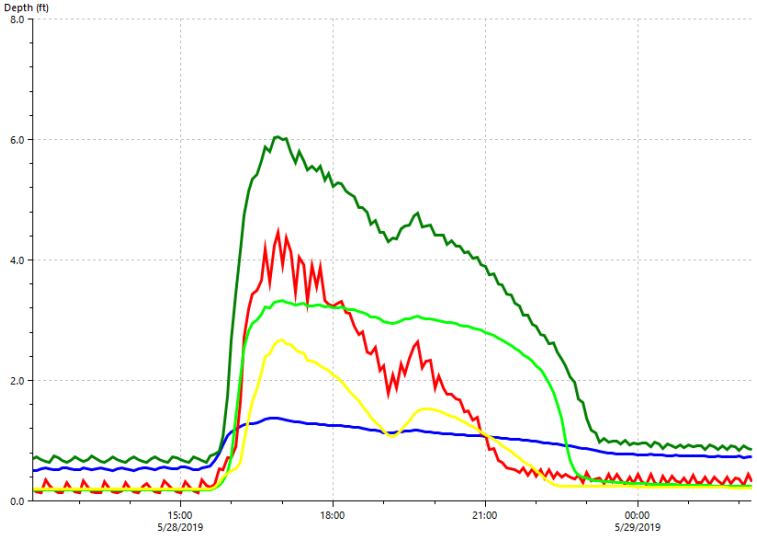
BE-03 – Areas C & D (BR-12)

Micrometer Data

5/28/19 Event Meter Data





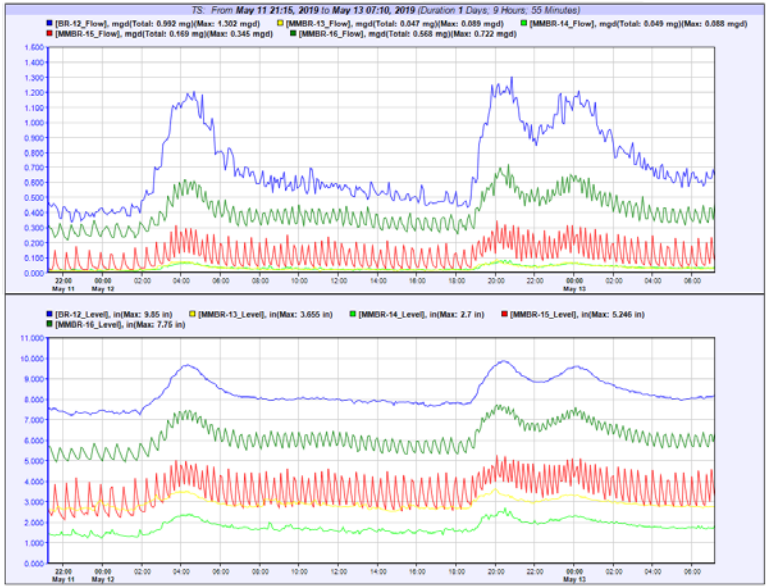


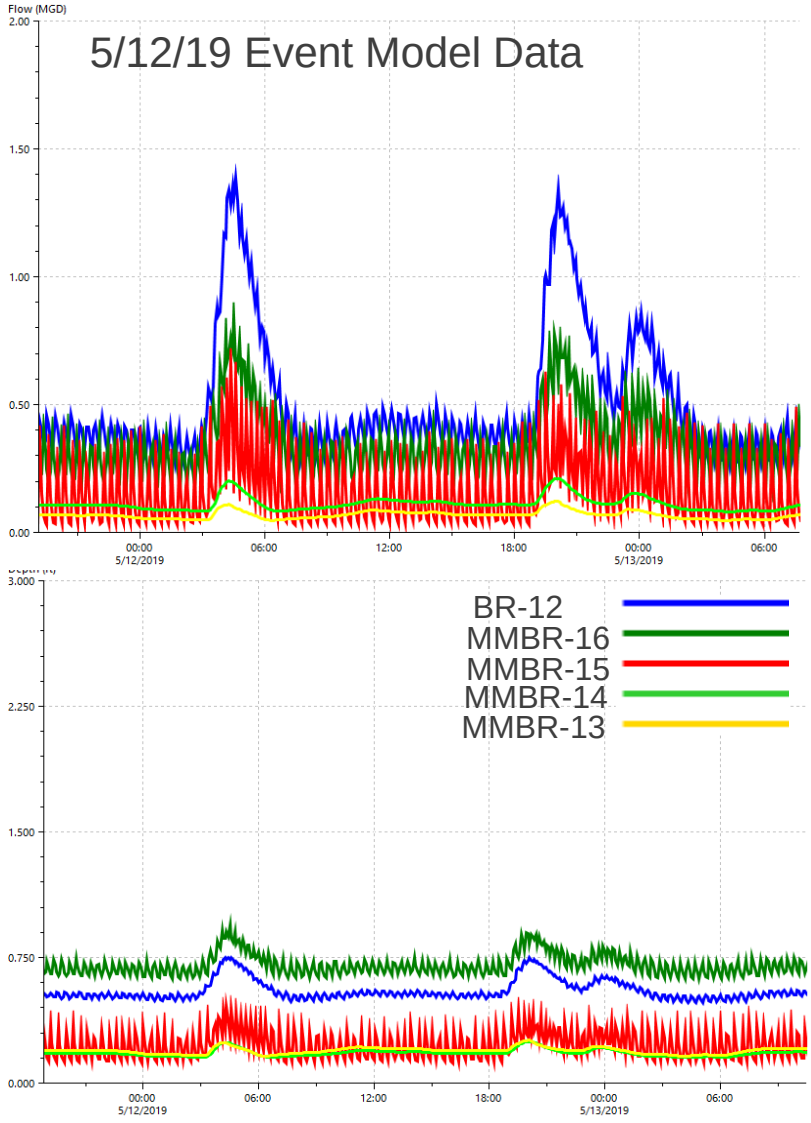
- 5/28/19 event has between 1- and 2-year return period
- Model surcharge reasonably matches observed surcharge
- Model shows a reasonable match between the ratio of flows at meter locations. MMBR-14 experiences a backflow during the design storm
- Peaking factor almost 30x for MMBR-13 and MMBR-14

BE-03 – Areas C & D (BR-12)

Micrometer Data

5/12/19 Event Meter Data





- 5/12/19 event has <2-month return period
- Very high I/I in the intermediate area that is upstream of meter MMBR-16 and downstream of meters MMBR-14 and MMBR-15
- This area serves Baldwin Wallace University

BE-03 – Areas C & D (BR-12)

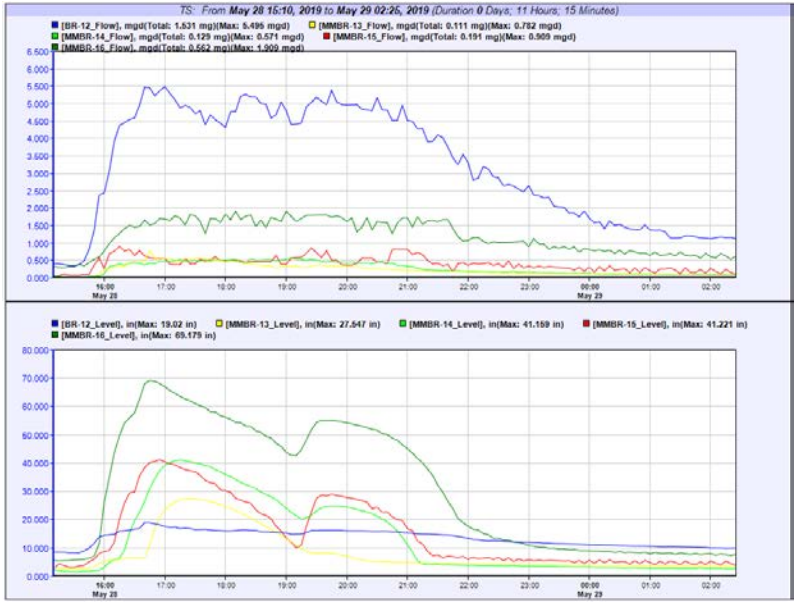
Micrometer Data

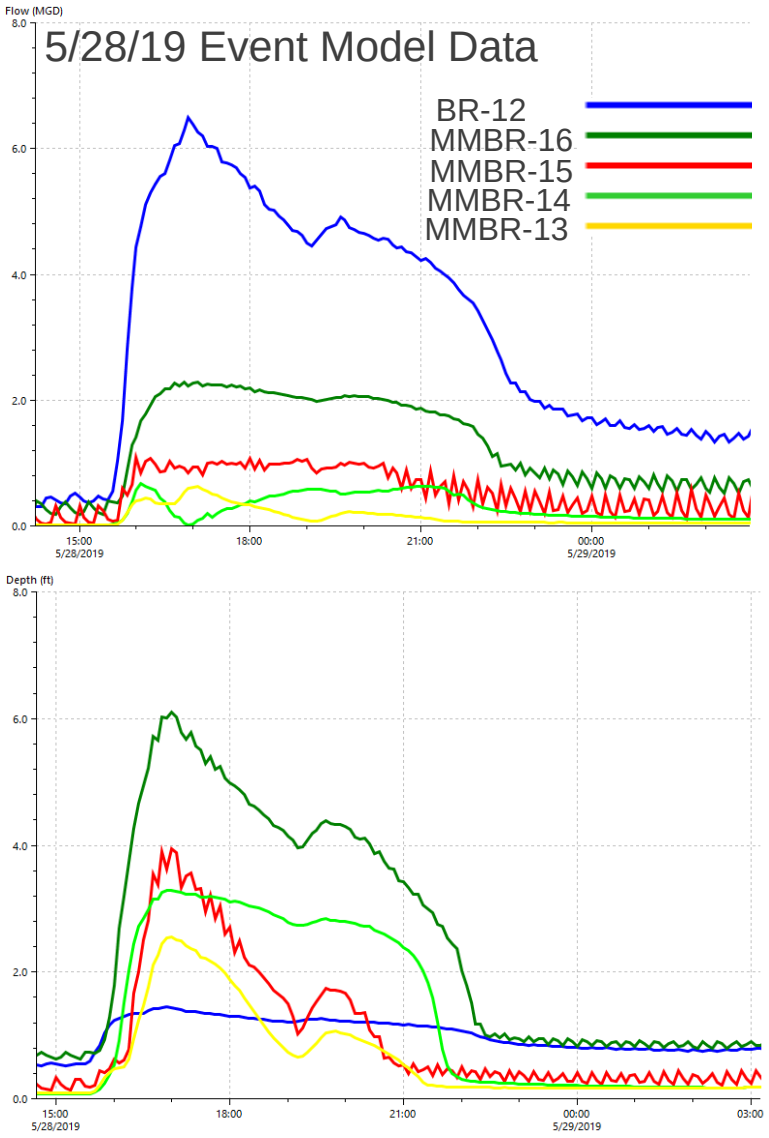
- Model dry weather and wet weather flows are overestimated at MMBR-13 and MMBR-14
- Flows at MMBR-15 are overestimated
  - **At the diversion upstream, there is a fixed head loss applied to the pipe that sends flow to PFA BE-02**
  - **Barberry PS model capacity is 2.6 MGD but meter data shows that its capacity is 2.0 MGD (see BR-11 micrometer data)**
- In order to better match the micrometer data:
  - **Dry weather flows and RTKs were reduced in the contributing areas for MMBR-13 and MMBR-14**
  - **RTKs were reduced in the contributing area for MMBR-15**
  - **Dry weather flows were increased in the contributing area for MMBR-16**
  - **RTKs were increased in the net contributing area for BR-12**
  - **Barberry PS capacity was reduced to 2.0 MGD**
  - **The fixed headloss at the flow diversion to PFA BE-02 was removed as a test, but it was found to be critical to balance the flows in the two directions and was put back in the model**

BE-03 – Areas C & D (BR-12)

Model Redistribution Micrometer Data

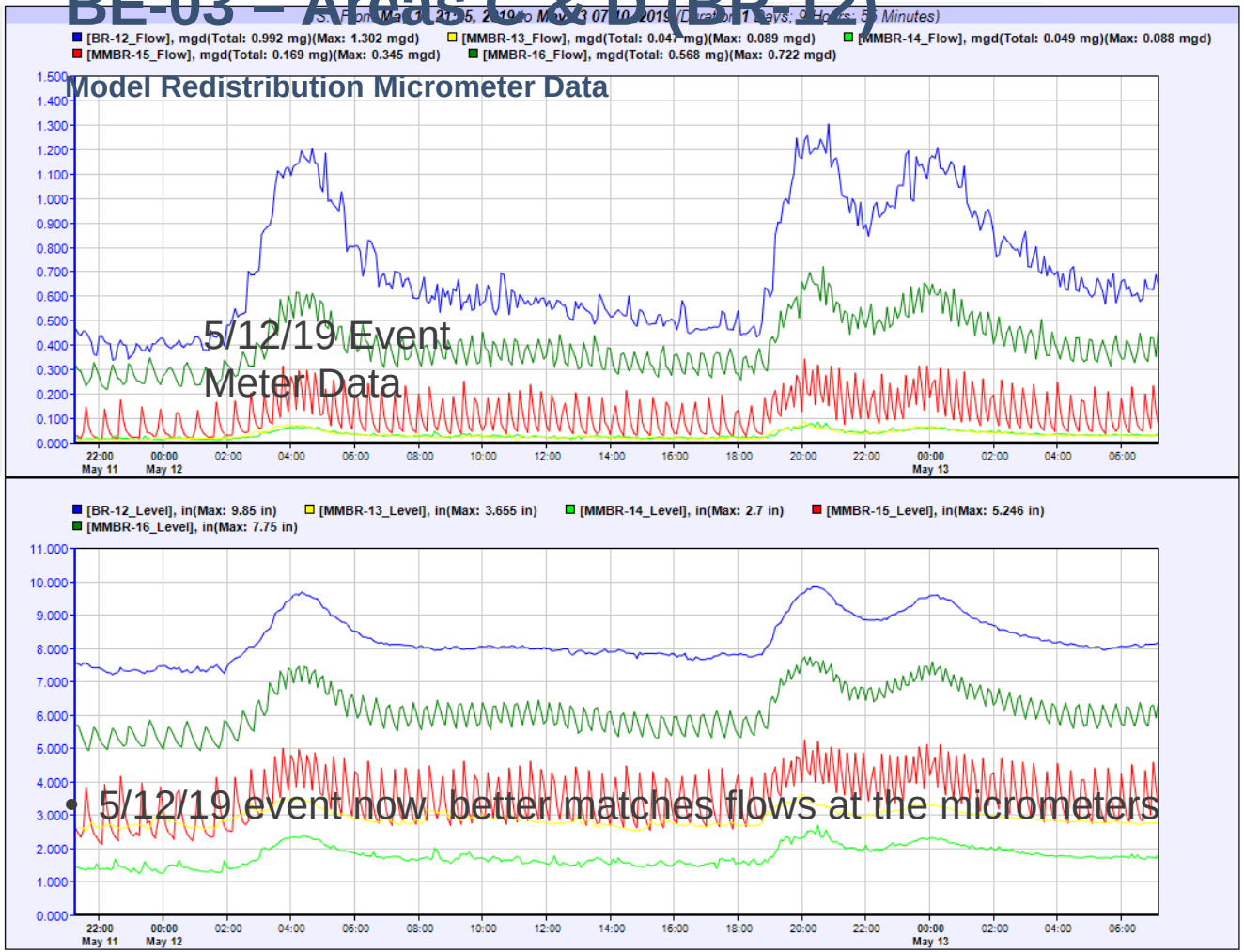
5/28/19 Event Meter Data

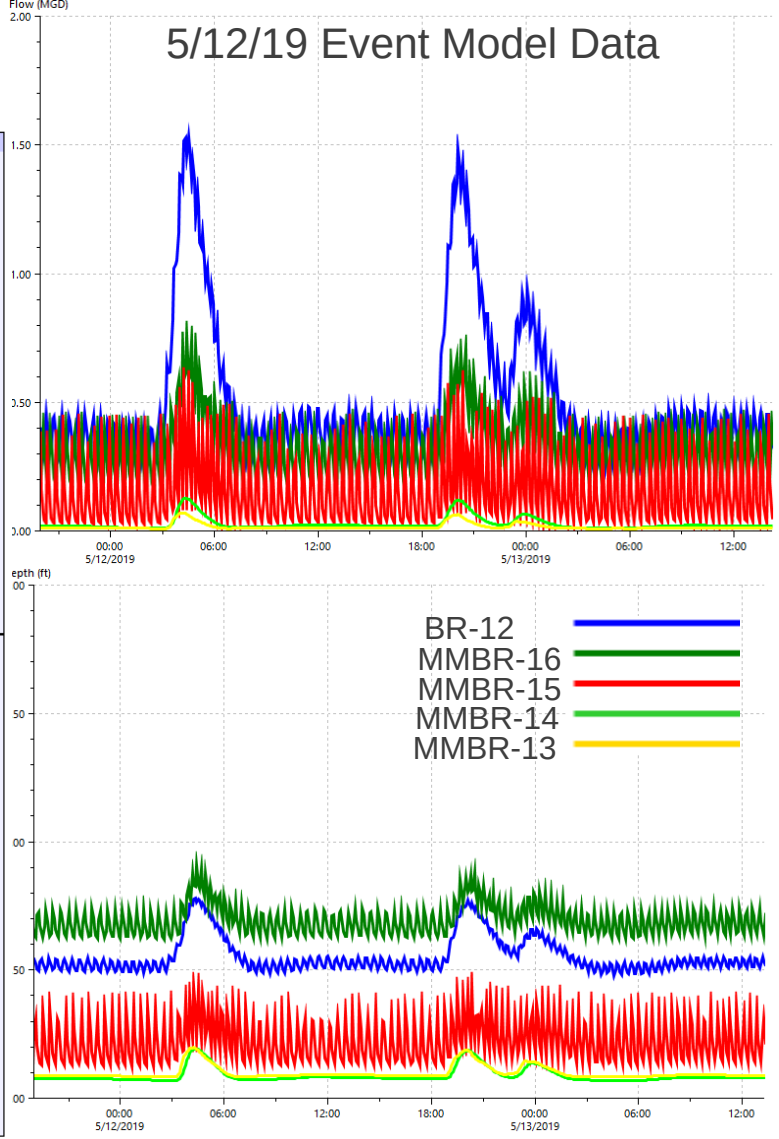




- Due to the capacity restrictions and flow limiters, the large 5/28/19 event doesn't see much change from the previous model at the micrometer locations

BE-03 – Areas C & D (BR-12)



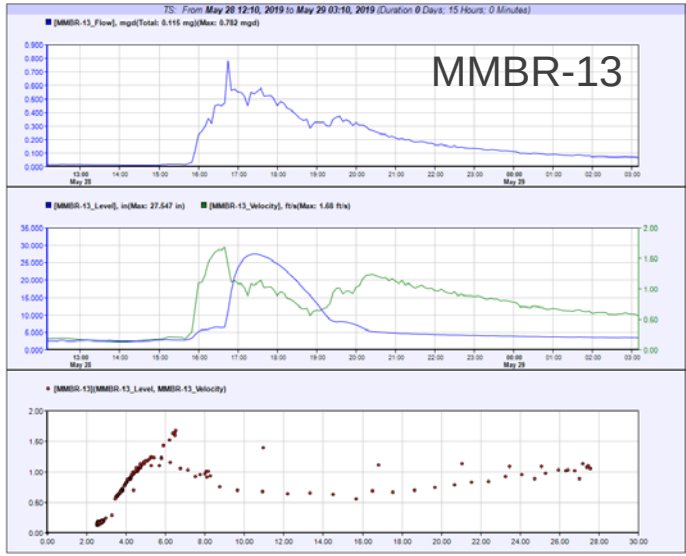


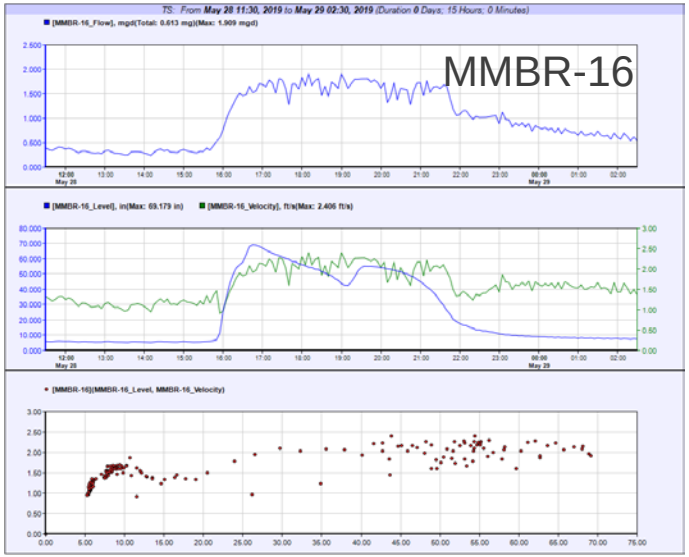
- 5/12/19 event now better matches flows at the micrometers

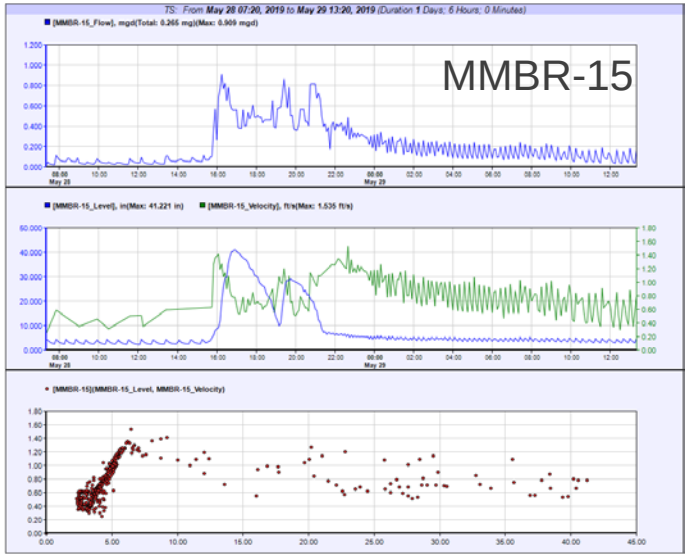
BE-03 – Areas C & D (BR-12)

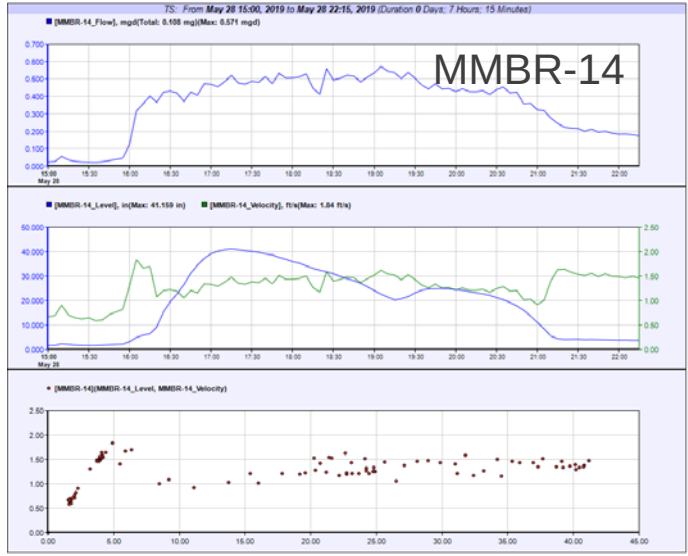
Micrometer Data

- The scatterplots for each micrometer during the 5/28/19 event show a capacity issue downstream





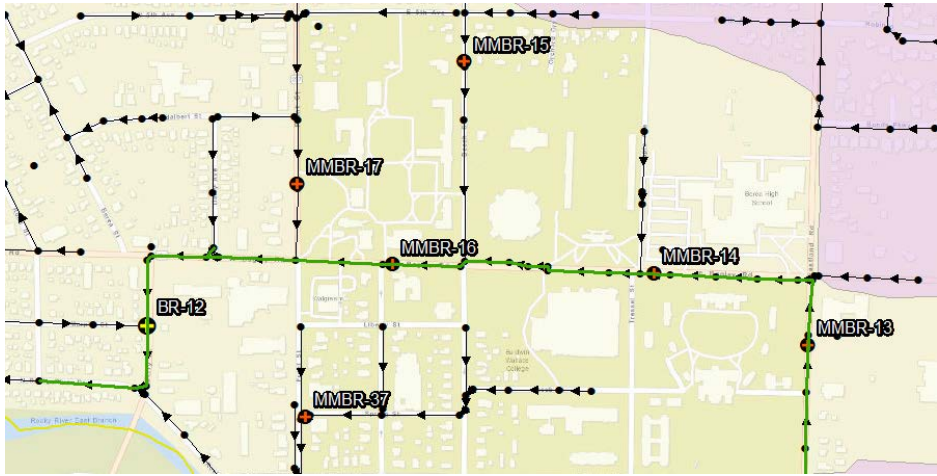




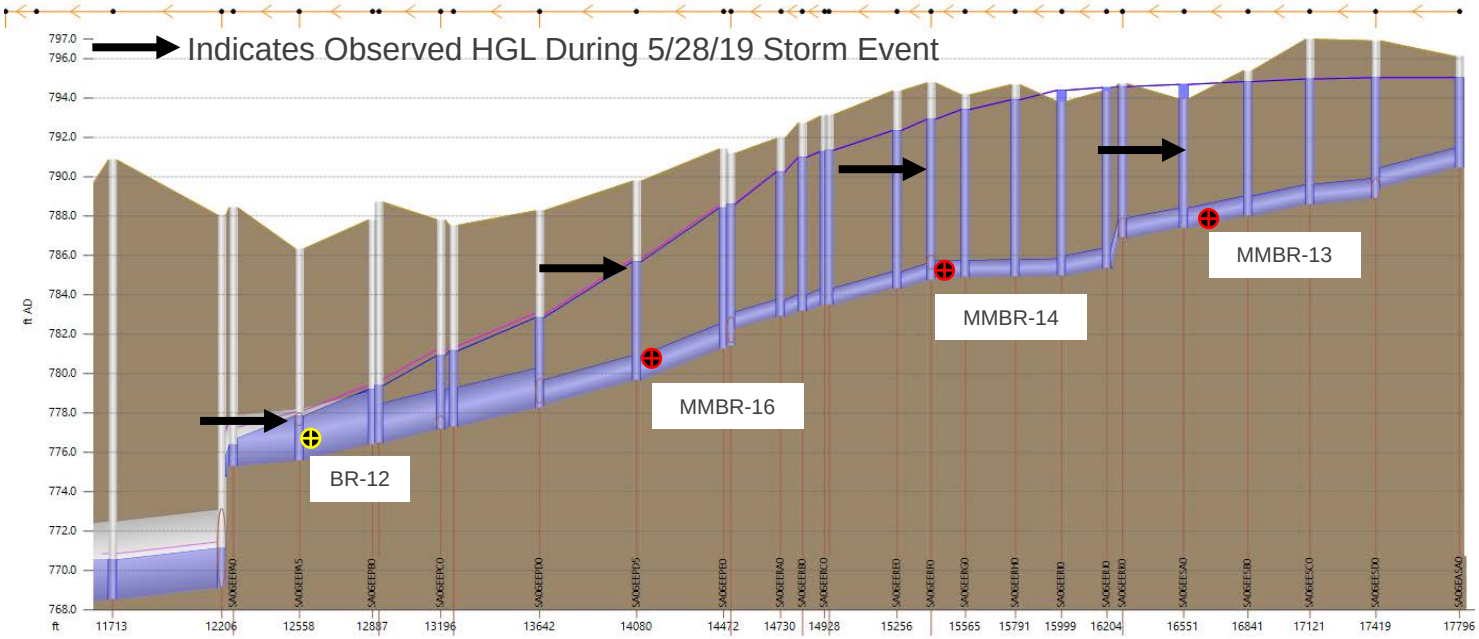
BE-03 – Areas C & D (BR-12)

5-Year Model Design Storm Profile

- Comparison of model HGL with observed HGL at micrometer locations
  - **Reasonable match between observed and model data considering the difference in return periods**



Model Profile Highlighted Green



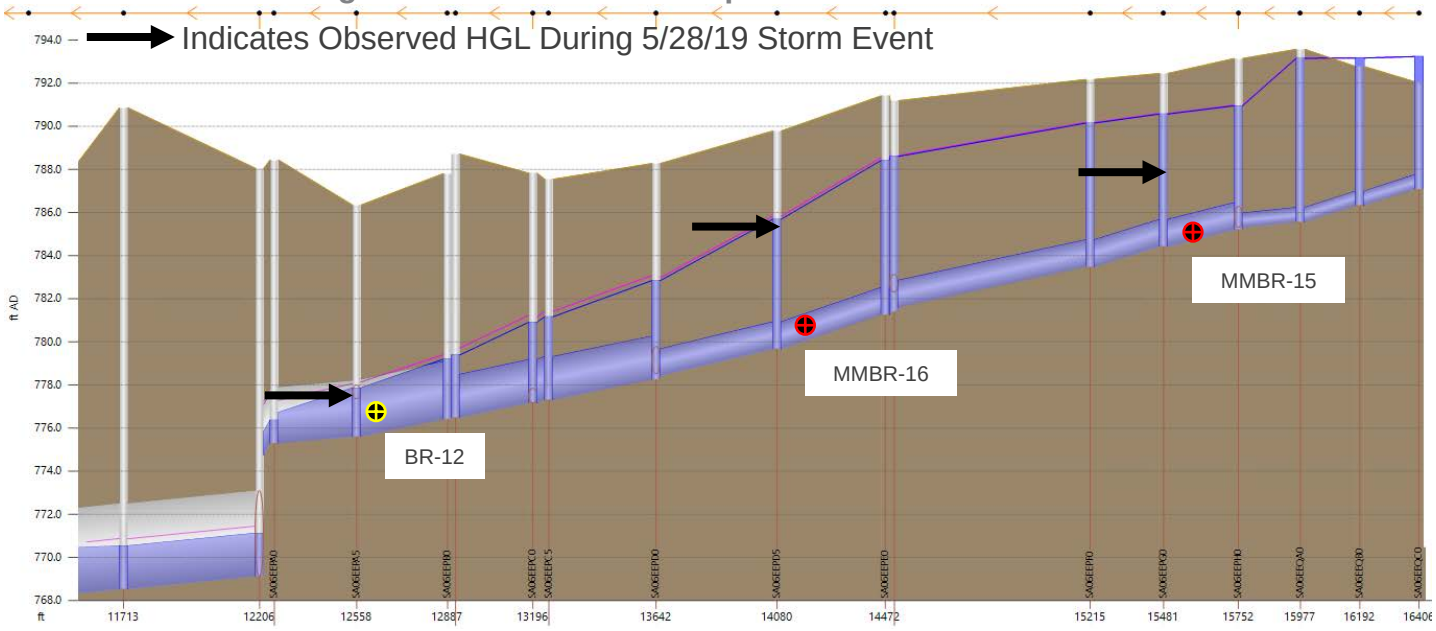
BE-03 – Areas C & D (BR-12)

5-Year Model Design Storm Profile

- Comparison of model HGL with observed HGL at micrometer locations
  - **Reasonable match between observed and model data considering the difference in return periods**



Model Profile Highlighted Green

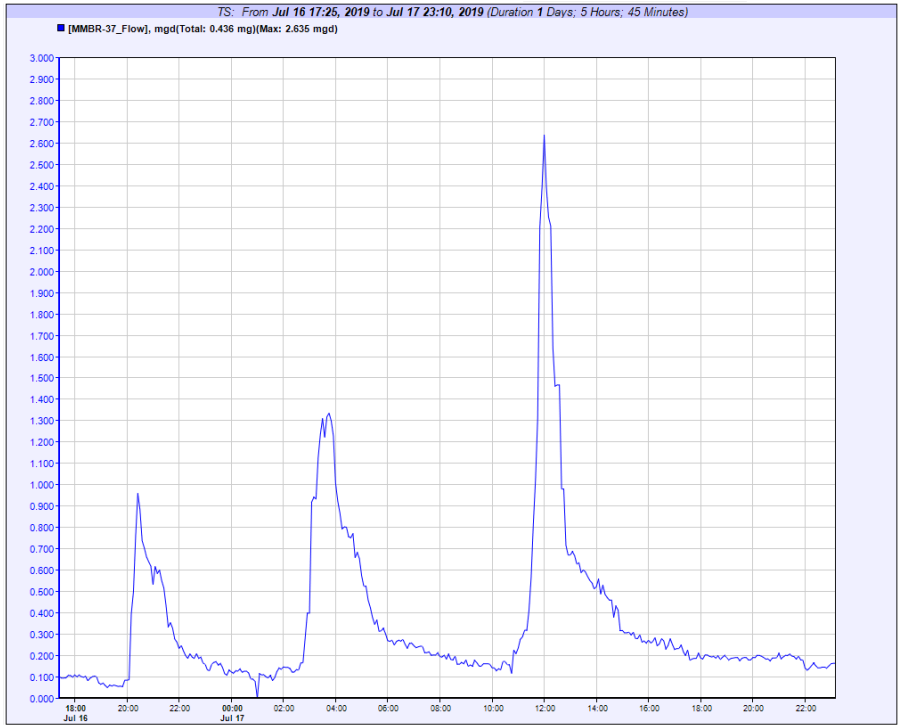


BE-03 – Areas C & D (BR-10)

Micrometer Data

- 7/16/19 event has between 1- and 2-year return period
- Micrometer data for MMBR-37 (upstream of BR-10) also shows very high I/I (25x peaking factor) on the sewer that serves the south portion of the University

7/16/19 Event Meter Data

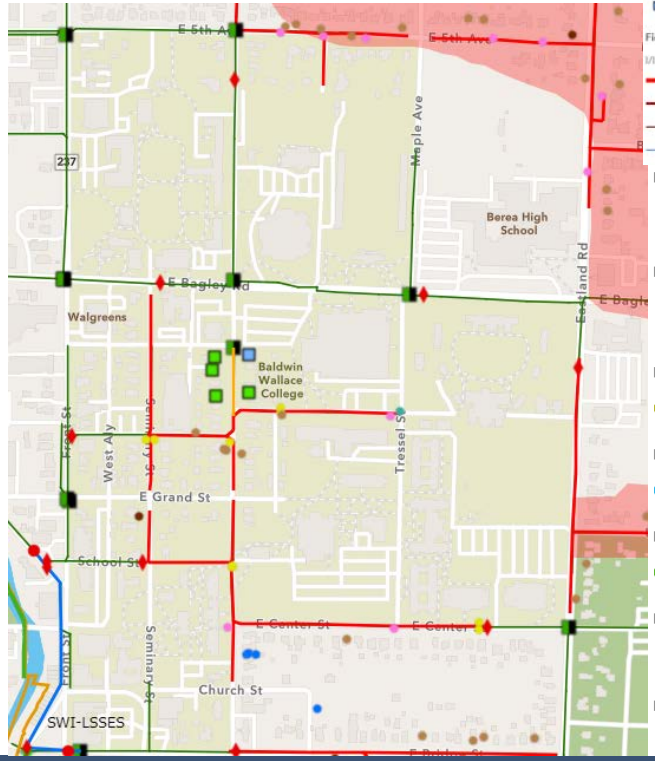


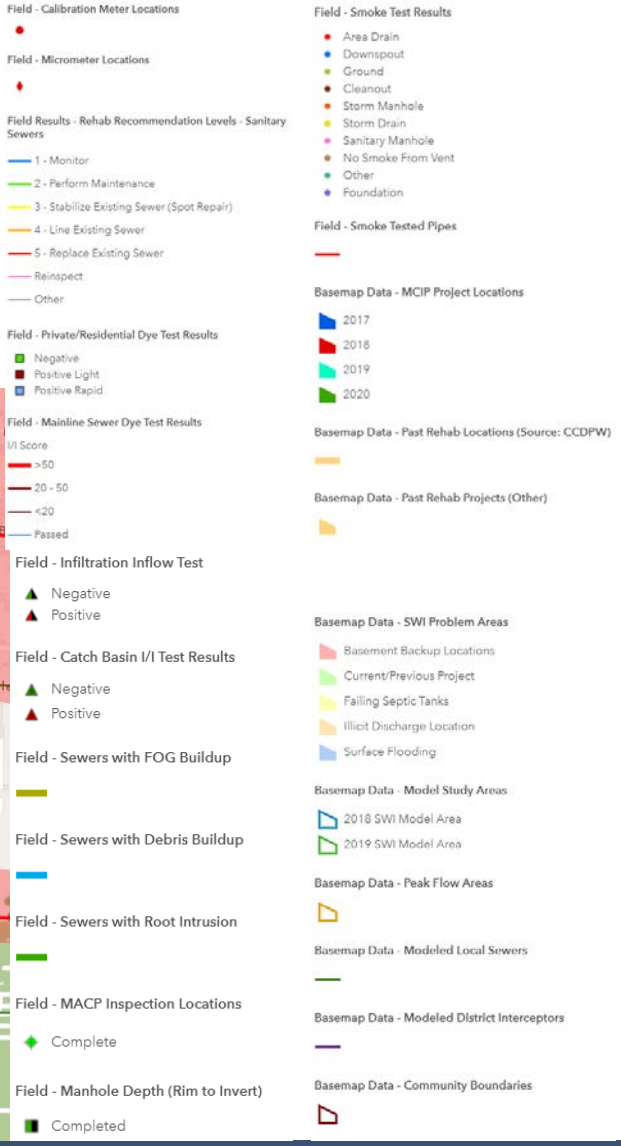
MMBR-37

BE-03 – Areas C & D (BR-12)

Micrometer Data

- Field data at Baldwin Wallace
  - **Positive dye test and positive smoke tests from storm drains at Baldwin Wallace University**
- More field testing for I/I and rehab of defects is recommended for this area

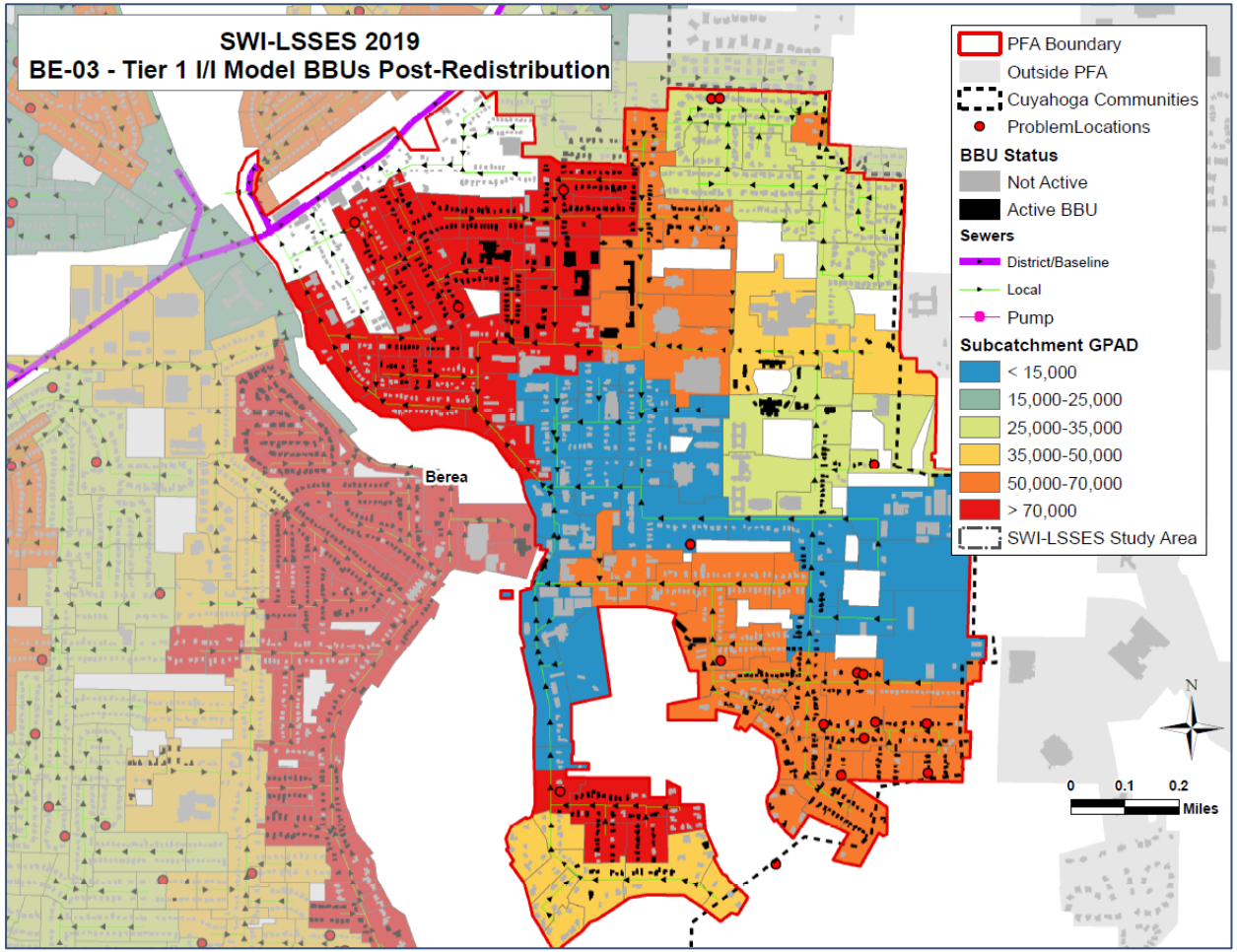




BE-03 – Areas C & D

Post-Redistribution I/I

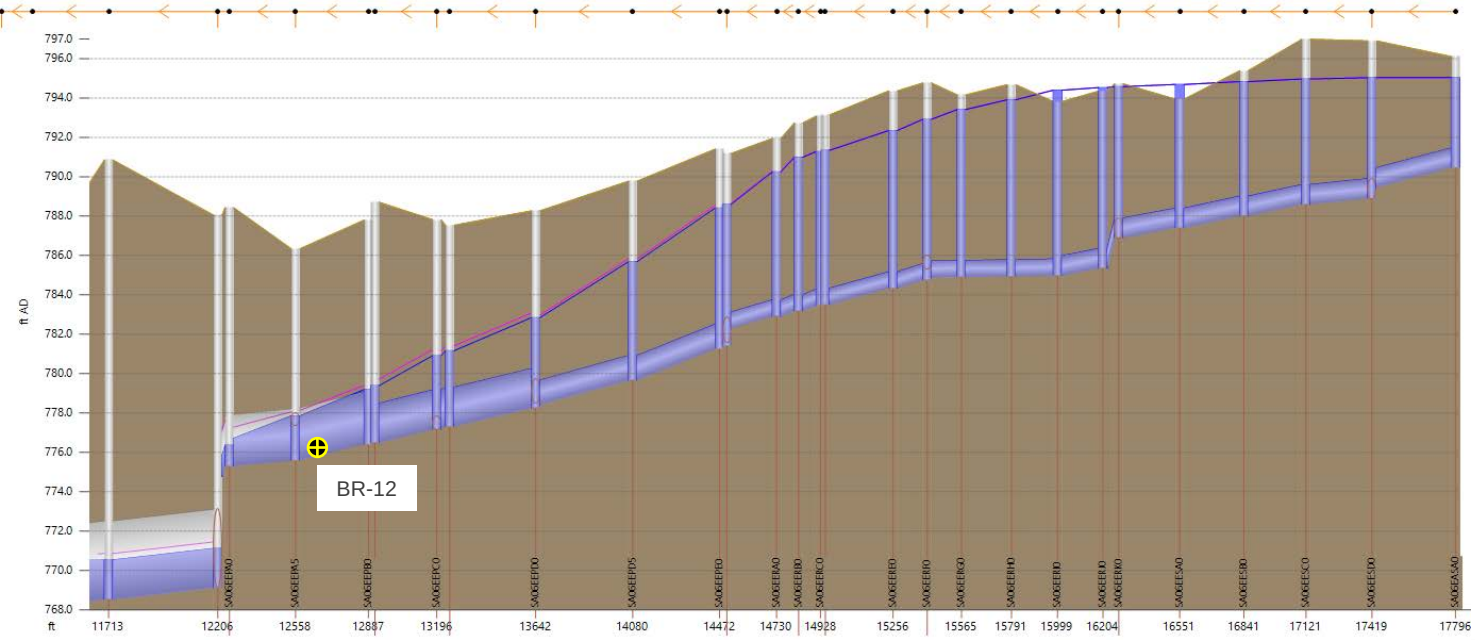
- MMBR-15 and -16 have high I/I (65,000 GPAD and 59,000 GPAD, respectively)
- Other micrometers have less < 50,000 GPAD

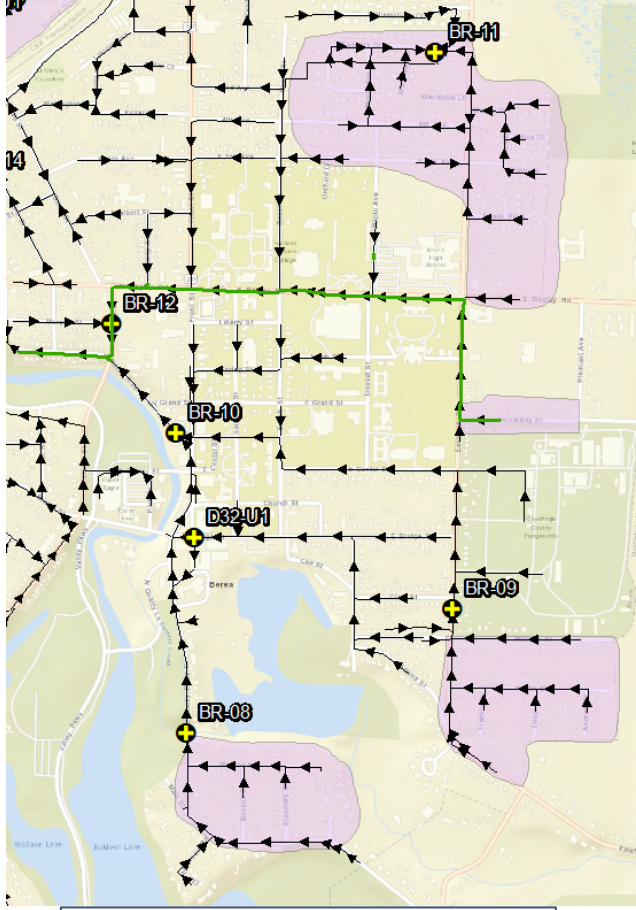


BE-03 – Area C

5-Year Model Design Storm Profile

- Model
  - Surcharge caused by undercapacity sewer
  - Several pipe sections are hydraulically connected with Area D



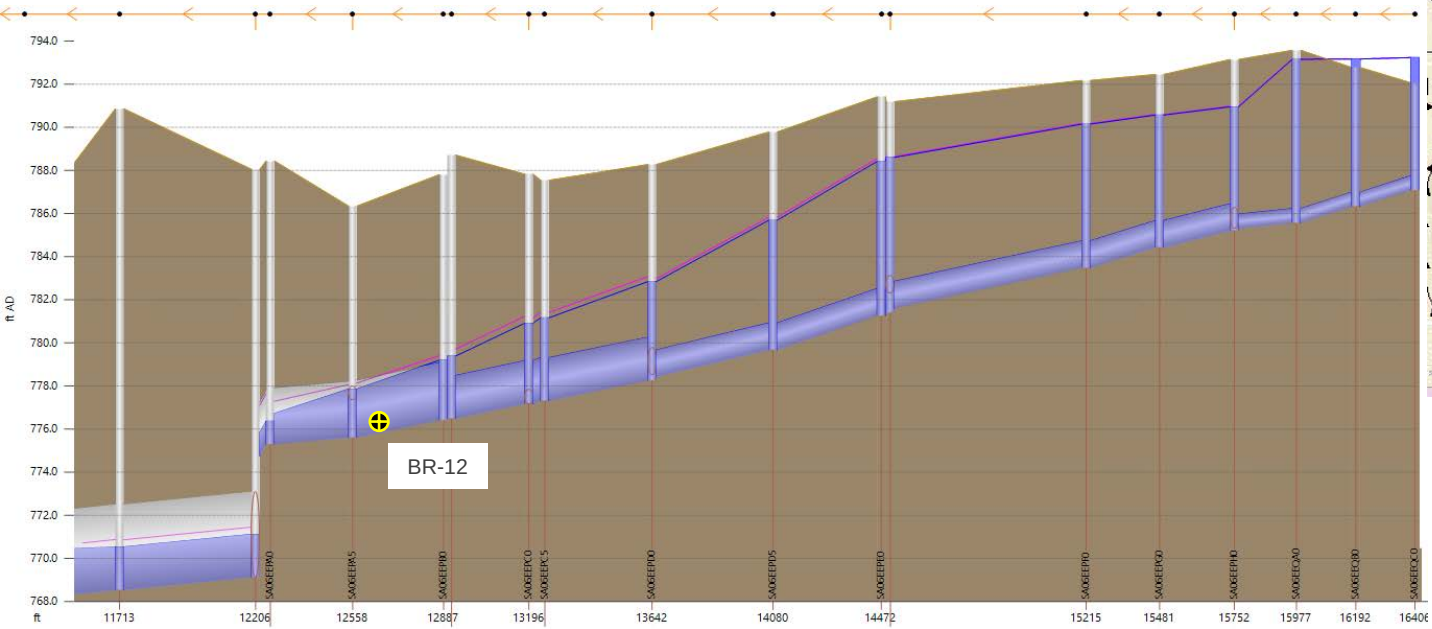


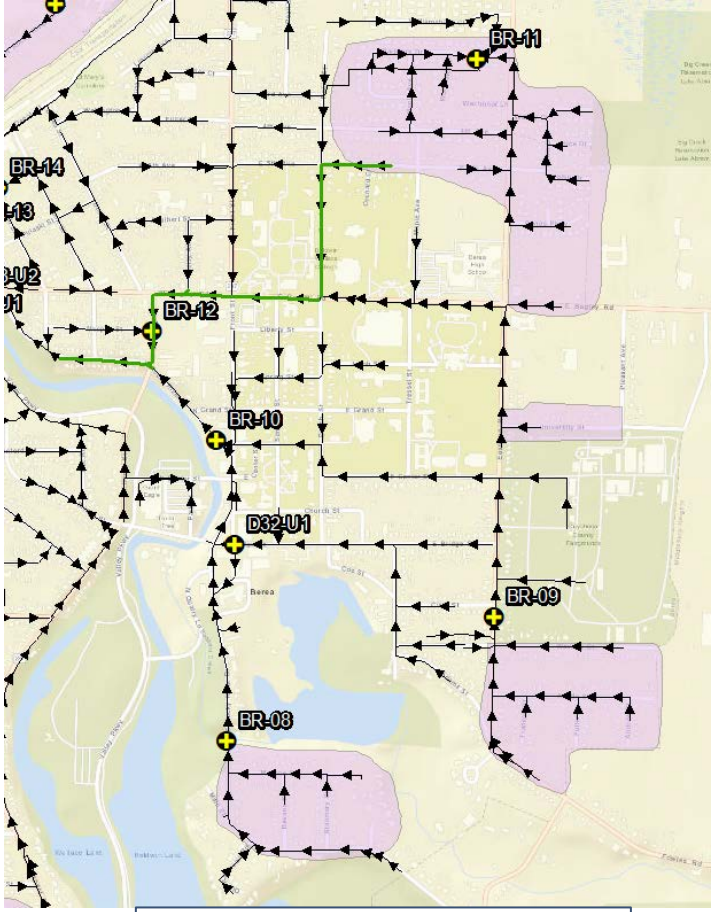
Model Profile Highlighted Green

BE-03 – Area D

5-Year Model Design Storm Profile

- Model
  - **Surcharge caused by undercapacity sewer**
  - **Several pipe sections are hydraulically connected with Area C**



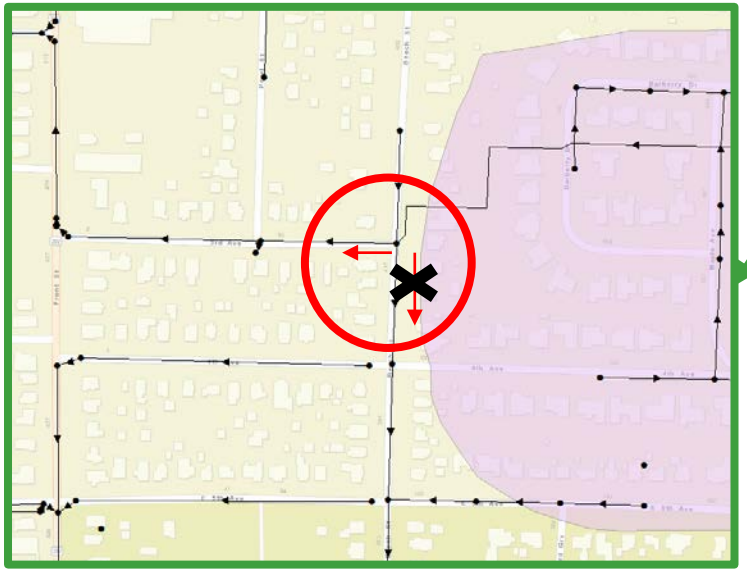


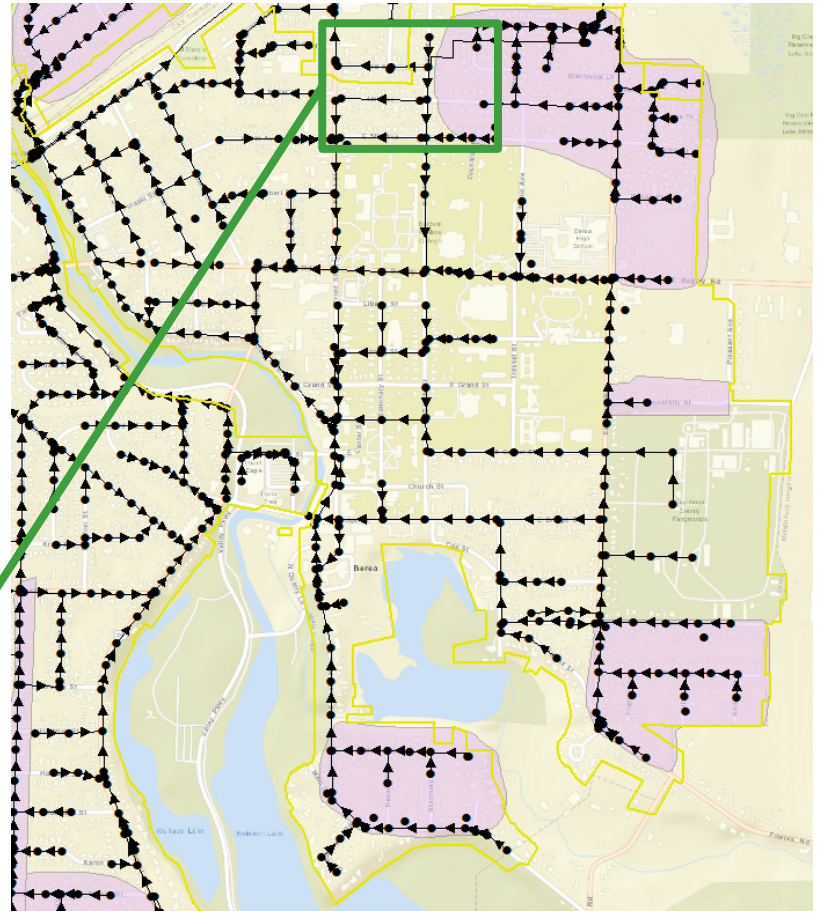
Model Profile Highlighted Green

BE-03 – Area D

Potential Direct Connections

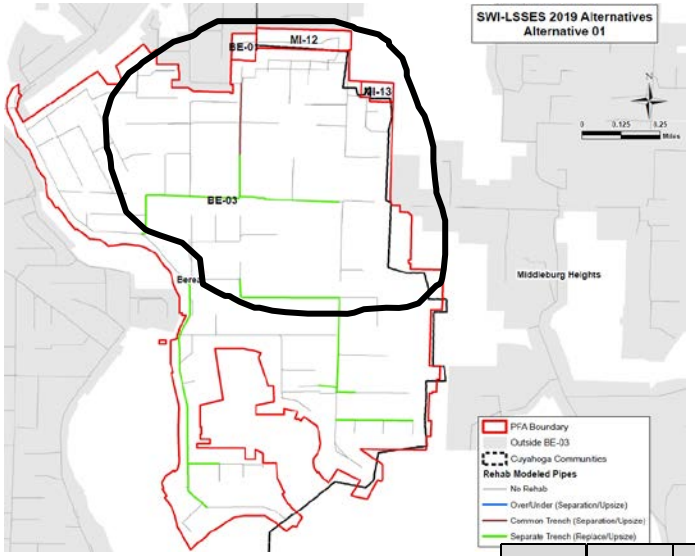
- Already an existing diversion to BE-02
- Possible to disconnect south sewer
- Considered as Alternative 4

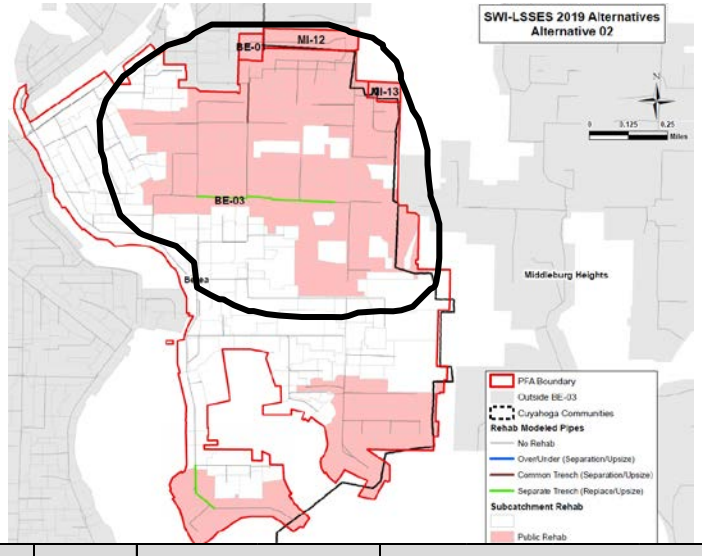


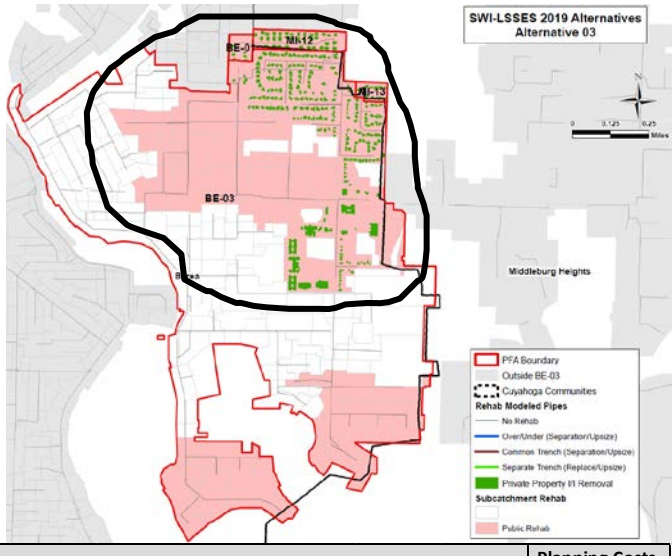


BE-03 – Area C & D

Refined Alternatives







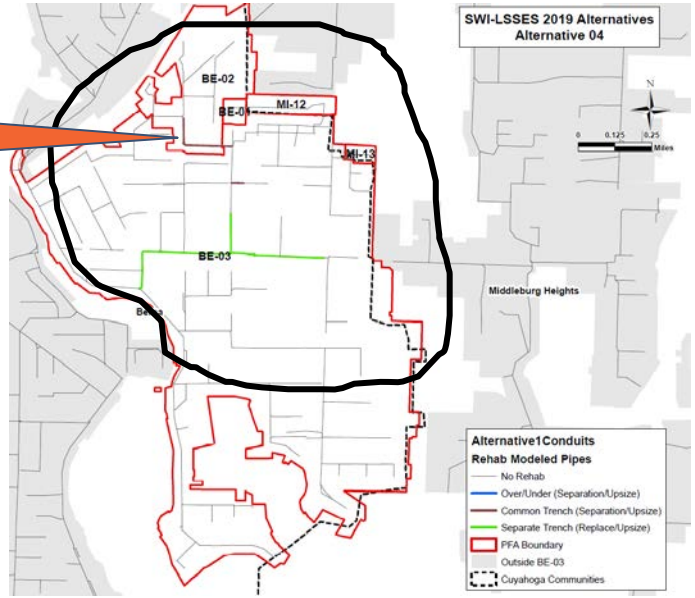
- Alternative 4 is on next sheet

Update PFL Cost (YES/NO)	NEORSD Branch	PFL Area	Catchment ID	Alternative		Summary										Planning Costs, $ AACE Class 5
				Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
NO	**SWI2019**	BE-03	ALL	A1	Areas C & D	6320	0	0	0	0	0	0	0	0	0	$ 6,775,661.00
NO	**SWI2019**	BE-03	ALL	A2	Areas C & D	3014	0	0	0	28108	0	0	0	0	0	$ 12,598,744.00
NO	**SWI2019**	BE-03	ALL	A3	Areas C & D	0	0	0	0	31123	0	0	0	228	0	$ 12,694,617.00
NO	**SWI2019**	BE-03	ALL	A4	Areas C & D	7728	0	0	0	0	0	0	0	0	0	$ 7,482,342.00

BE-03 – Area C & D

Refined Alternatives

Additional Replacement Needed in BE-02

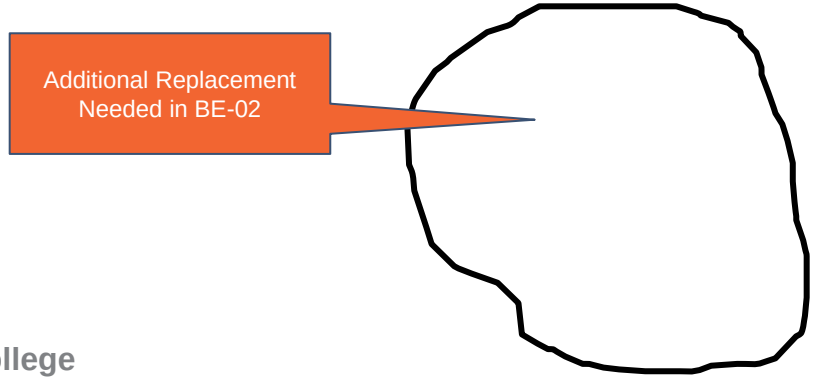


- Alternative 4 makes use of a cross-connection to BE-02, but it still results in the nearly the same pipe replacements as Alternative 1 plus additional replace in PFA BE-02
  - **Not cost effective**

Update PFL Cost (YES/NO)	NEORSD Branch	PFL Area	Catchment ID	Alternative		Summary										Planning Costs, $ AACE Class 5
				Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
NO	SWI2019	BE-03	ALL	A1	Areas C & D	6320	0	0	0	0	0	0	0	0	0	$ 6,775,661.00
NO	SWI2019	BE-03	ALL	A2	Areas C & D	3014	0	0	0	28108	0	0	0	0	0	$ 12,598,744.00
NO	SWI2019	BE-03	ALL	A3	Areas C & D	0	0	0	0	31123	0	0	0	228	0	$ 12,694,617.00
NO	SWI2019	BE-03	ALL	A4	Areas C & D	7728	0	0	0	0	0	0	0	0	0	$ 7,482,342.00

BE-03 – Area C & D

Refined Alternatives



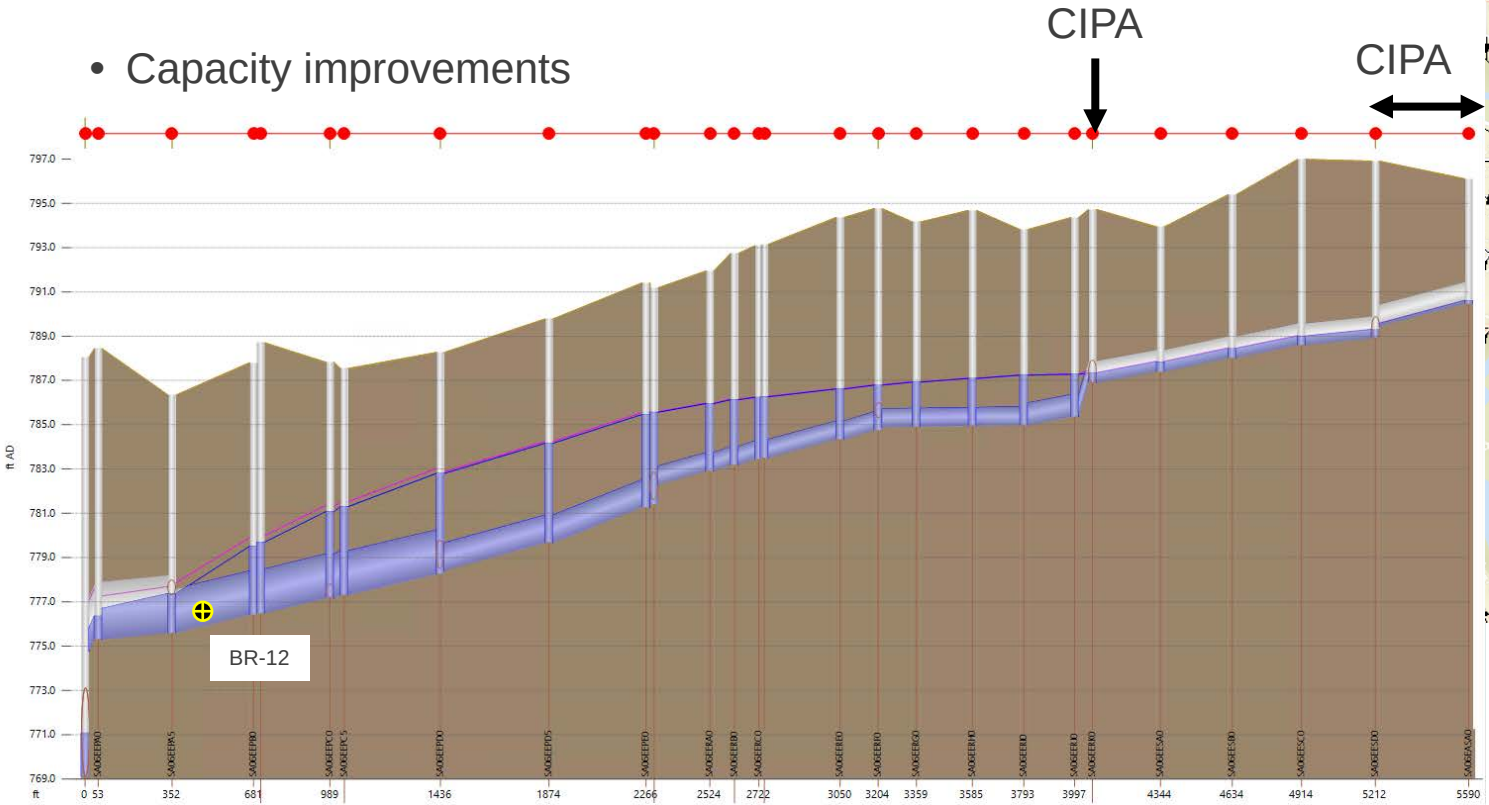
- Alternative 5
  - Targeted Rehab
  - Private and Public rehab in the area of Baldwin Wallace College
  - High I&I may be causes by direct connections from the college

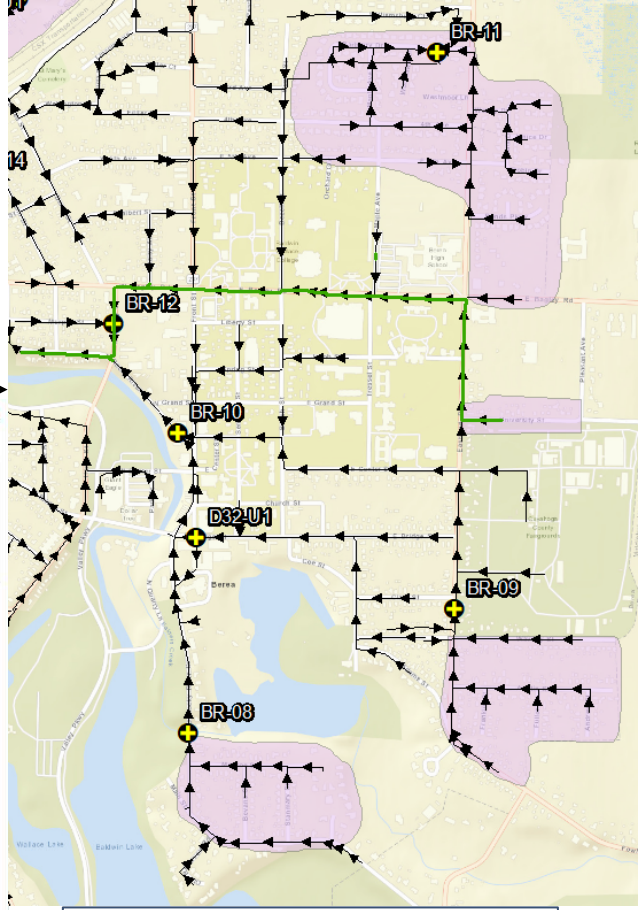
Update PFL Cost (YES/NO)	NEORSD Branch	PFL Area	Catchment ID (Use "ALL" to cost for all catchments within PFL)	Alternative		Summary										Planning Costs, $						
				Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)	Design Cost (15% of Construction Cost)	CA/RE (10%)	Capital Cost	Contingency (30%)	Baseline Year Total Project Cost	Current Year Total Project Cost
YES	SWI2019	BE-03	ALL	T1	Tier One All Rehab Option					7258				46		$ 2,990,351						

BE-03 – Area C

Tier 1 Solution Profile

- Capacity improvements



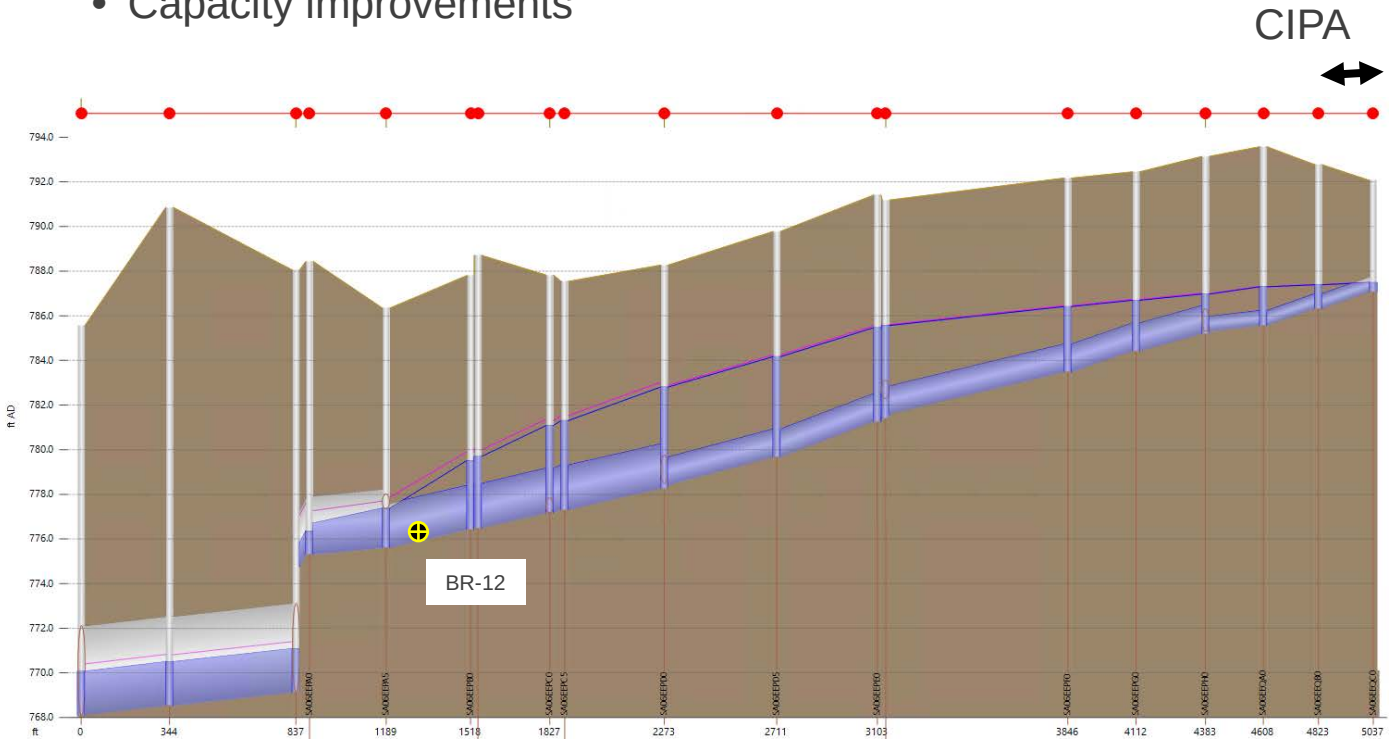


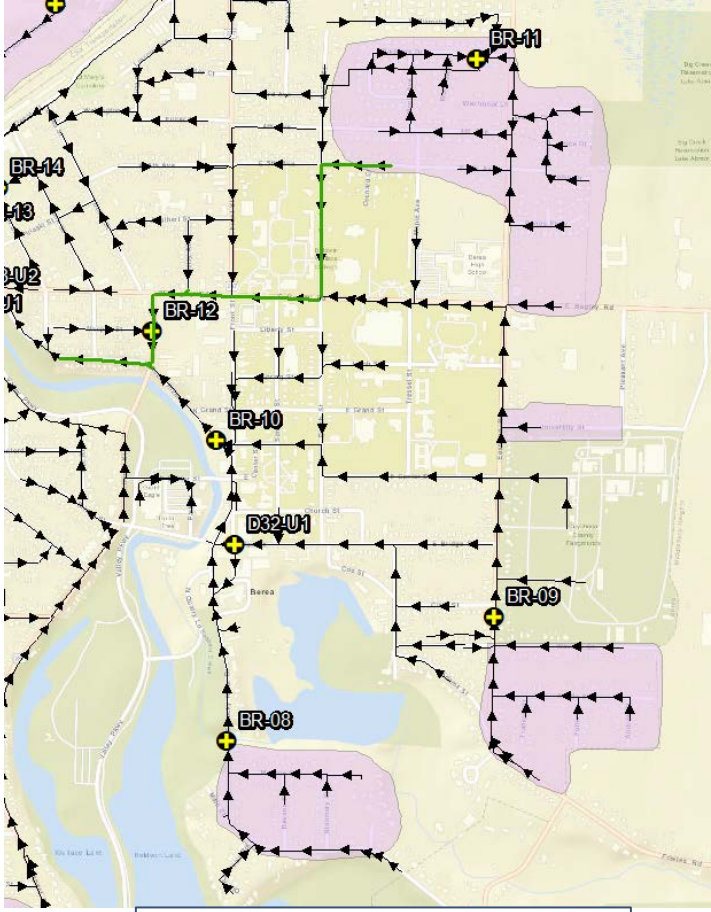
Model Profile Highlighted Green

BE-03 – Area D

Tier 1 Solution Profile

- Capacity improvements



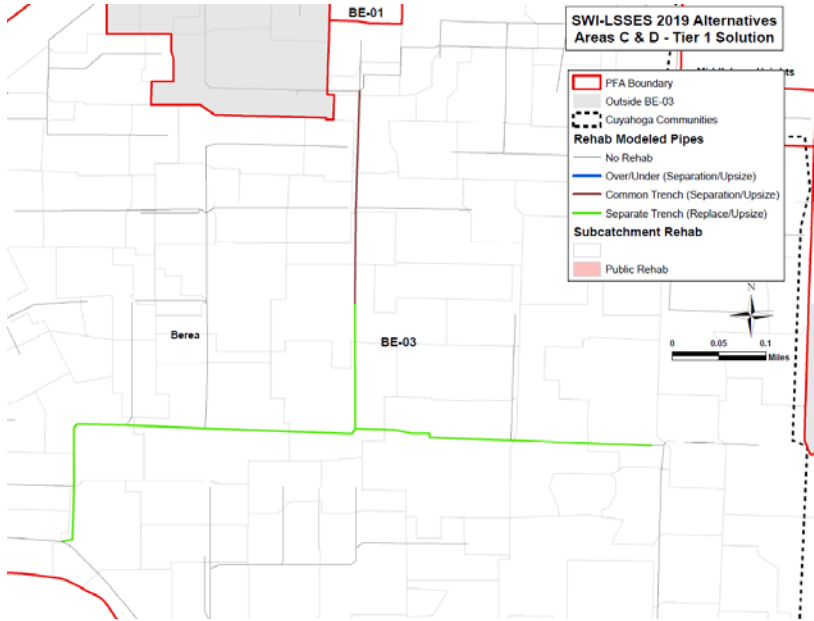


Model Profile Highlighted Green

BE-03 – Areas C & D

Tier 1 Summary

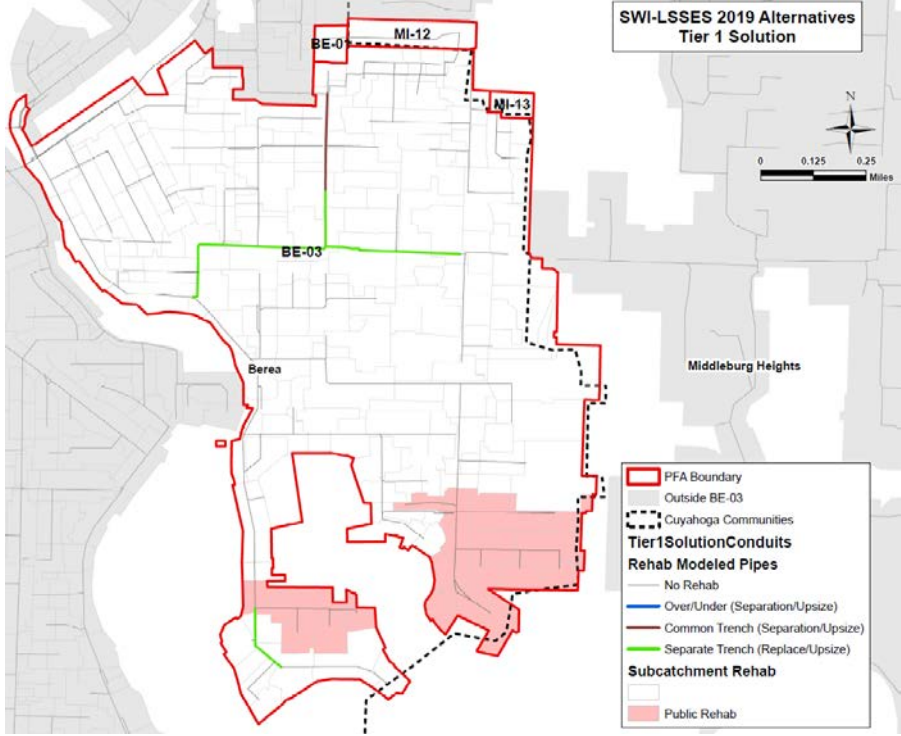
- Field data
  - **Positive smoke and dye tests in Area D and in the area of Baldwin-Wallace University**
    - *More field testing and rehab of any defects is recommended in the area of Baldwin-Wallace University*
  - **Area C was smoke tested but no defects were found**
- Model data
  - **Flows were redistributed to better match micrometer data**
  - **Surcharge caused by undercapacity sewer**
- Tier 1 Solution
  - **Public and Private Rehab**
  - **Public Lining 7,258 LF of sewer**
  - **Costs $2,990,351**



BE-03

Tier 1 Solution

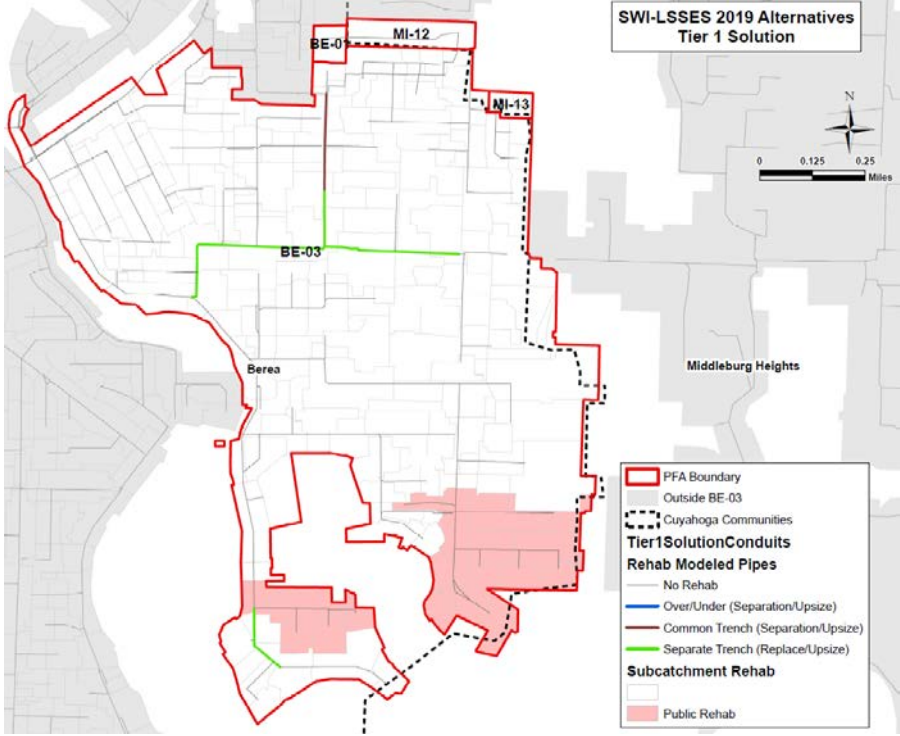
- For Area A, a combination of public rehab and upsizing was the lowest cost option
- For Area B, public rehab only was the lowest cost option
- For Areas C and D, public and private rehab



Update PFL Cost (YES/NO)	NEORSD Branch	PFL Area	Catchment ID	Alternative		Summary										Planning Costs, $ AACE Class 5
				Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
NO	**SWI2019**	BE-03	ALL	Tier1Solution		7202	0	0	0	11596	0	0	0	0	0	$ 11,141,047.00

BE-03

- Final Tier 1 Solution
  - Replace 882 ft of sewer
  - Line 18,854 ft of sewer
  - Private rehab for 46 buildings
  - Construction cost of $7,355,737

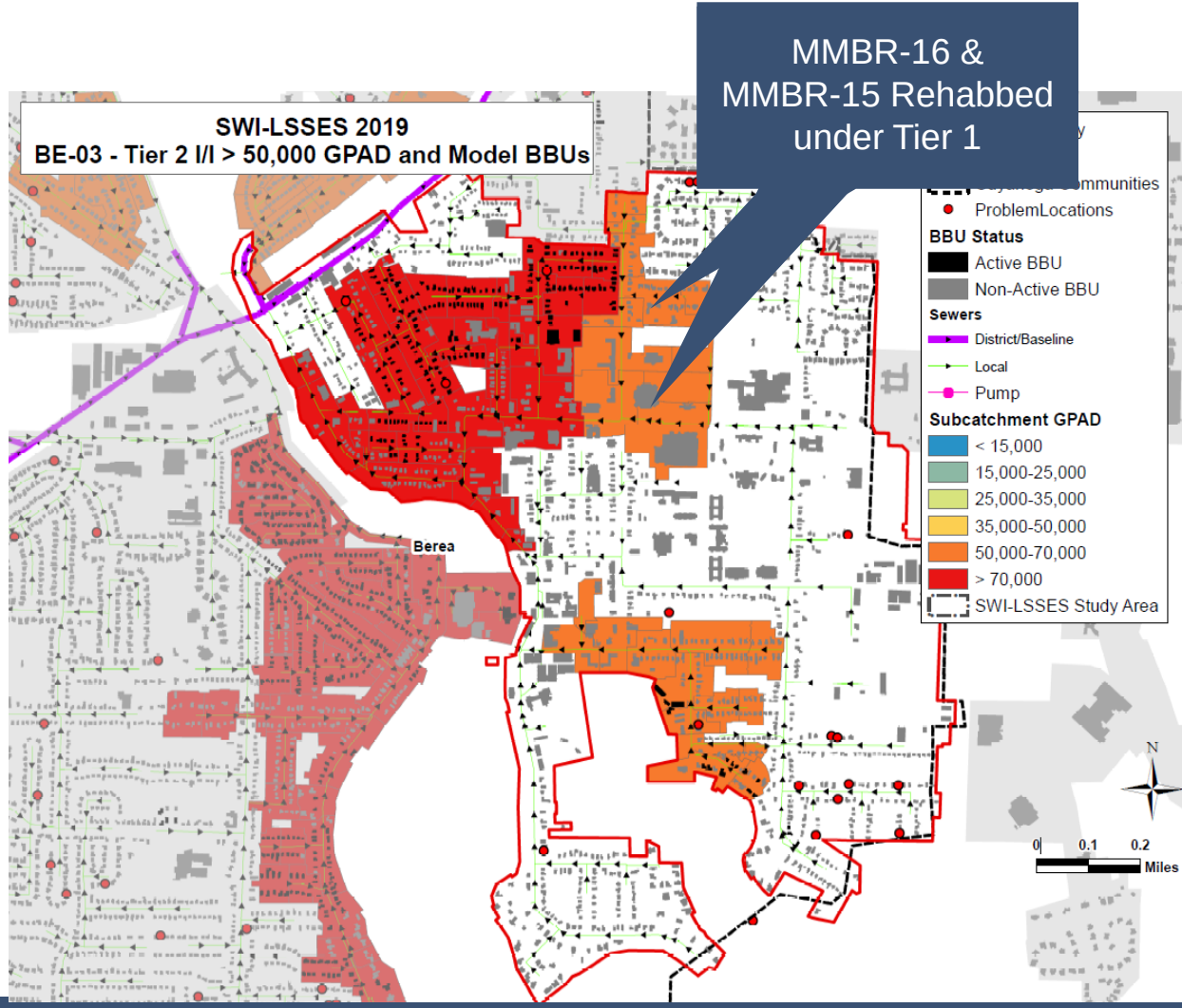


Update PFL Cost (YES/NO)	NEORSD Branch	PFL Area	Catchment ID (Use "ALL" to cost for all catchments within PFL)	Alternative		Summary										
				Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
NO	SWI2019	BE-03	ALL	T1_full		882				18854				46		$ 7,355,737

BE-03

Tier 2 Model-Predicted BBUs and I/I

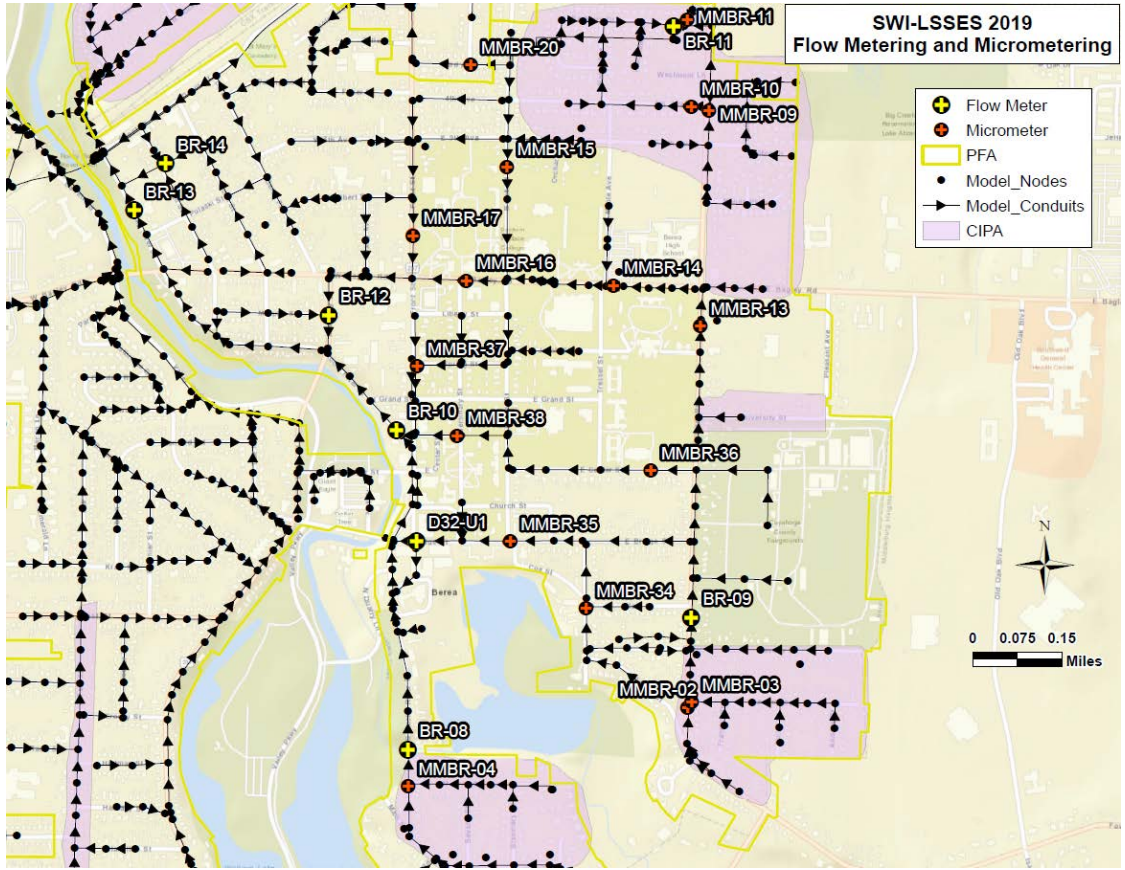
- BBUs and high I/I in four metersheds:
  - BR-12
  - BR-13
  - BR-14
  - D32-U1



BE-03

Micrometer Data

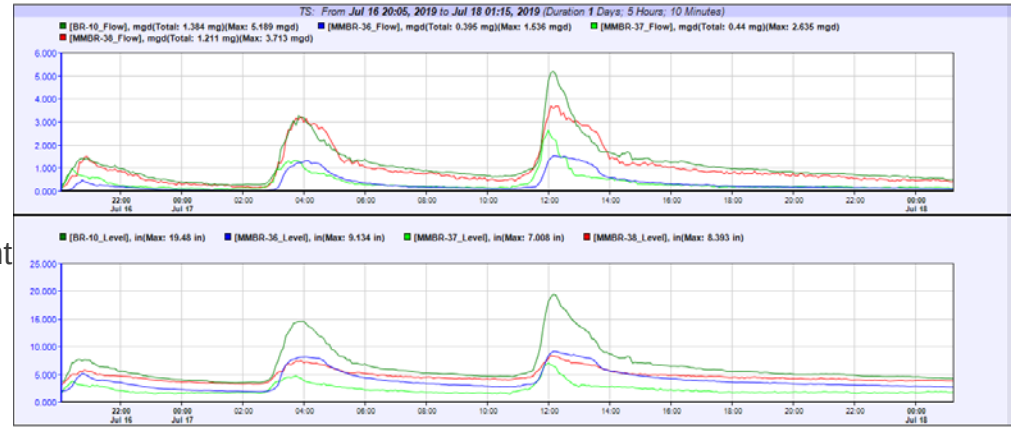
- There were two sets of micrometer (in addition to those reviewed as part of Tier 1) installed in areas of high I/I
  - **BR-10**
    - *Upstream micrometers are MMBR-36, -37, and -38*
  - **D32-U1**
    - *Upstream micrometers are MMBR-34 and -35*



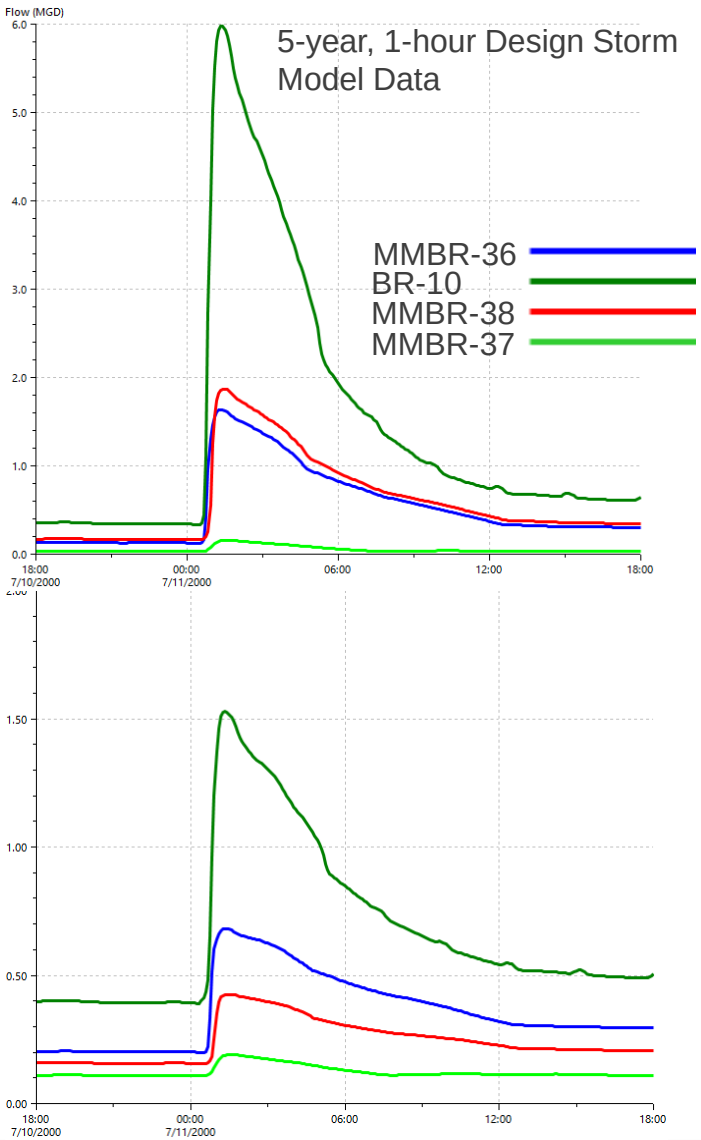
BE-03 – BR-10

Micrometer Data

7/16/19 Event Meter Data



- No surcharge observed in the model or observed data
- The ratio of model flows between the micrometers in this area does not match the ratio of observed flows
  - **Model flow at MMBR-38 is underpredicted. However, the observed flow data is suspect because, based on catchment area, the flow through this location should be much lower than the flow at BR-10**
  - **Model flow at MMBR-37 is underpredicted**

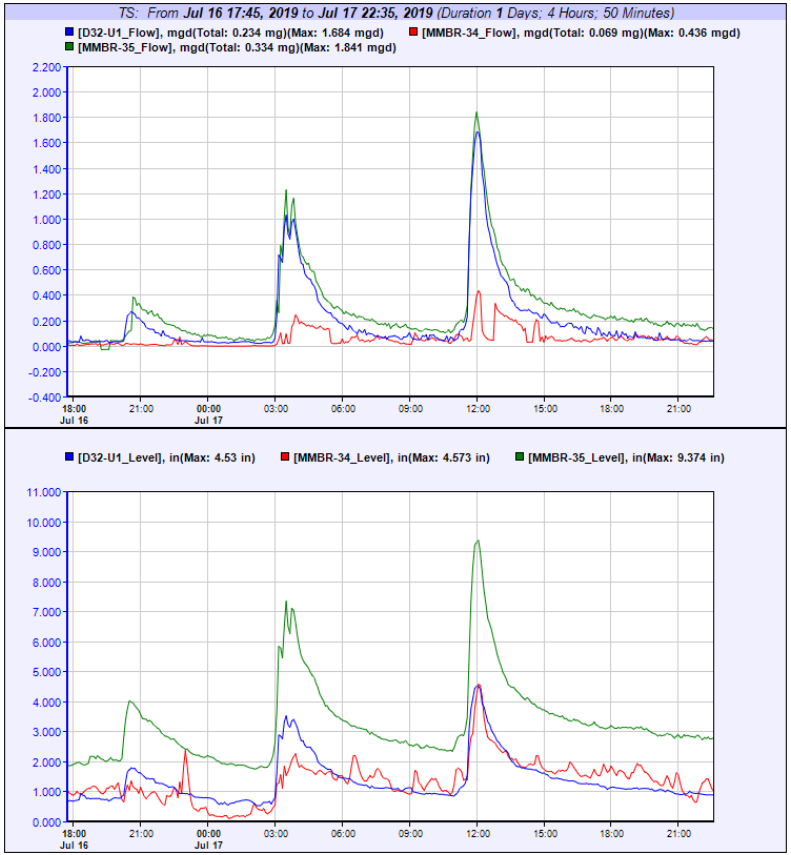


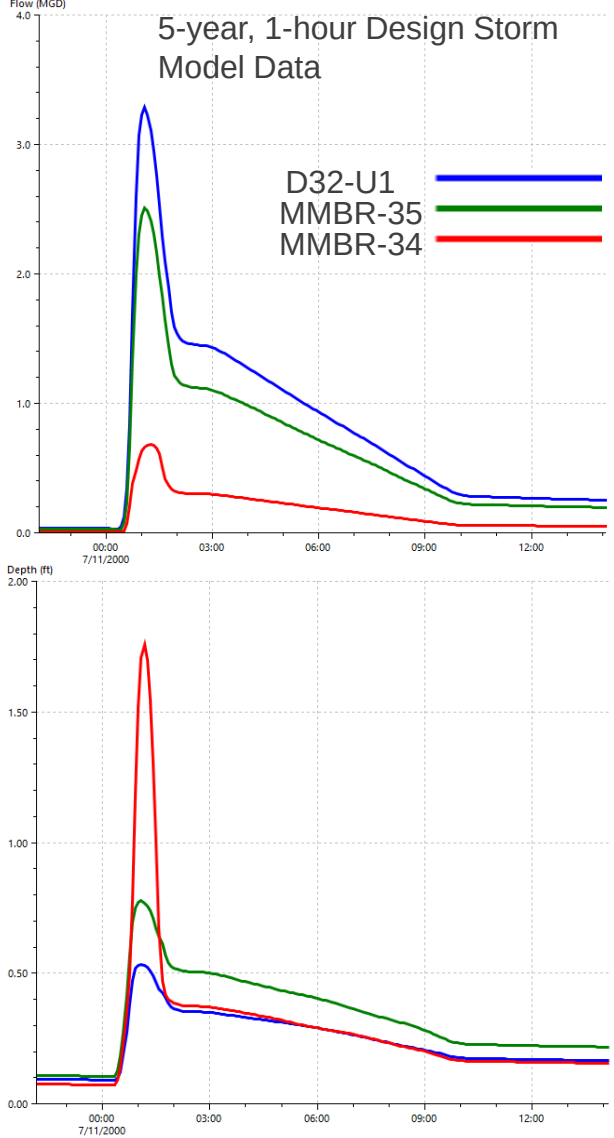
BE-03 – D32-U1

Micrometer Data

- Model shows a reasonable match between the ratio of flows at meter locations
- Surcharge occurs at MMBR-34 during the model 5-year design storm but not during the 7/16/2019 observed event (1-year return period)

7/16/19 Event Meter Data





BE-03

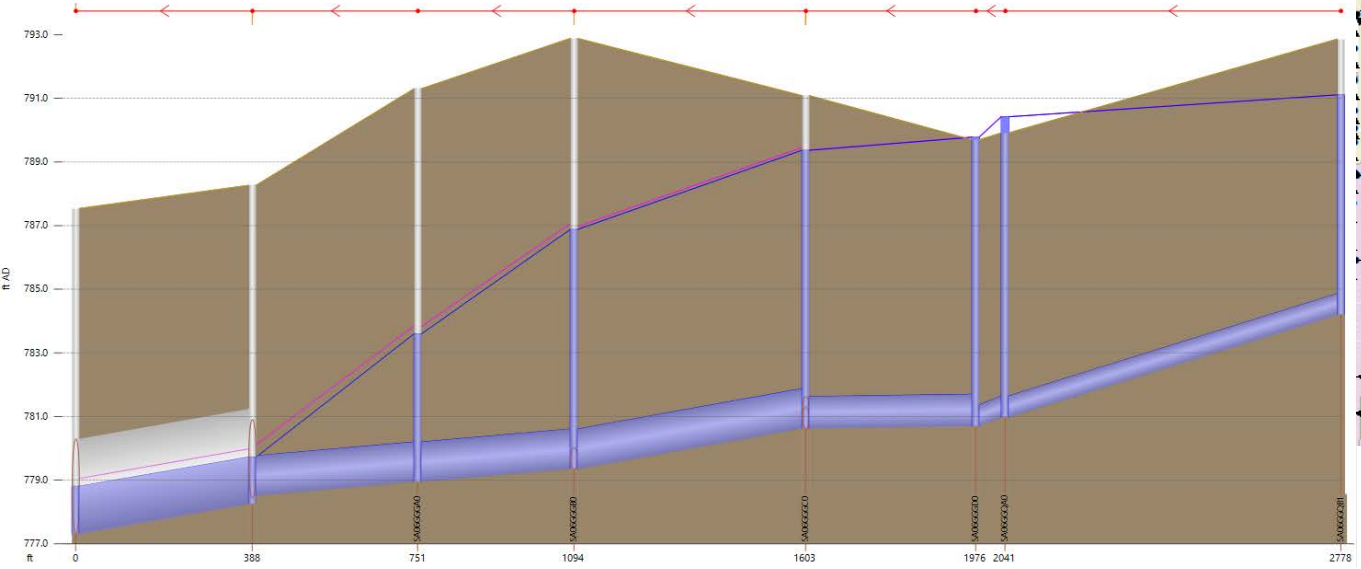
micromonitoring

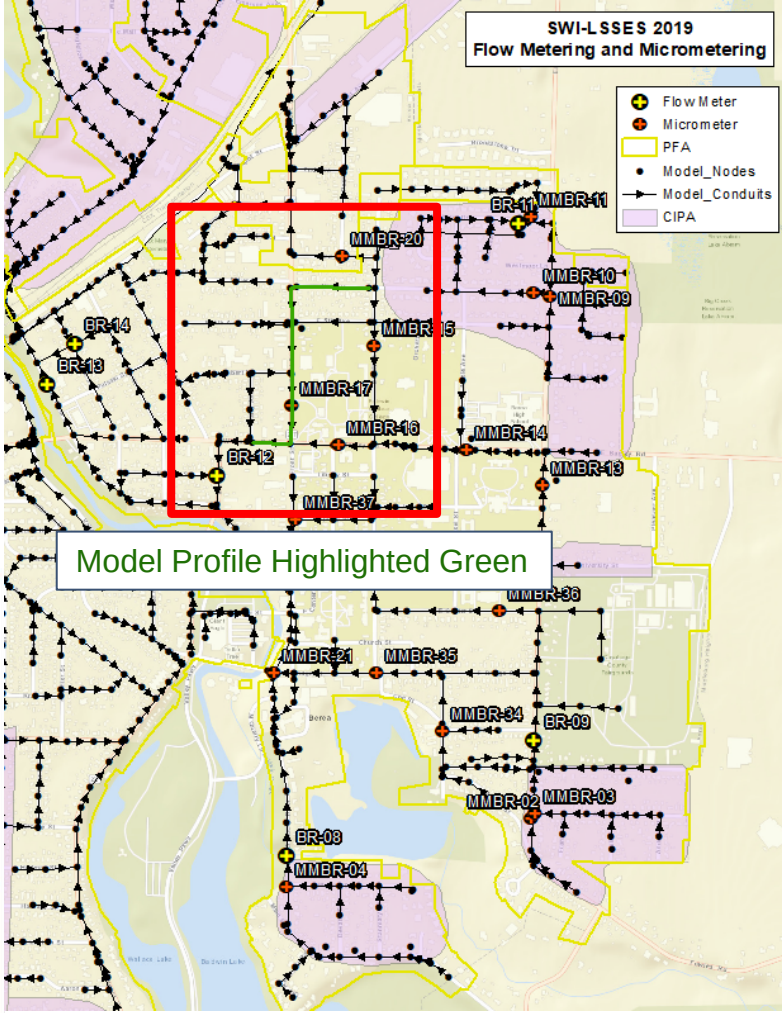
- Conclusions
  - **Meter BR-10 and its upstream micrometers (MMBR-36, MMBR-37, MMBR-38) don't have a very good distribution of flows**
    - *There are no BBUs predicted in this area, so redistributing flows does not affect the optimization solutions*
  - **At all other areas, no evidence to show that the model flows should be redistributed**
    - *micromonitoring data was used during calibration, so it is already incorporated into the model*
  - **No evidence to show that the model level calibration should be adjusted**
    - *The 5-year design storm shows surcharge at some micrometer locations where surcharge wasn't observed*
    - *The largest storm during micromonitoring period had 1-year return interval, so it's possible these locations will surcharge during a 5-year storm*

BE-03

Tier 2 Model Profiles

- BR-12 Post-Tier 1 Profile

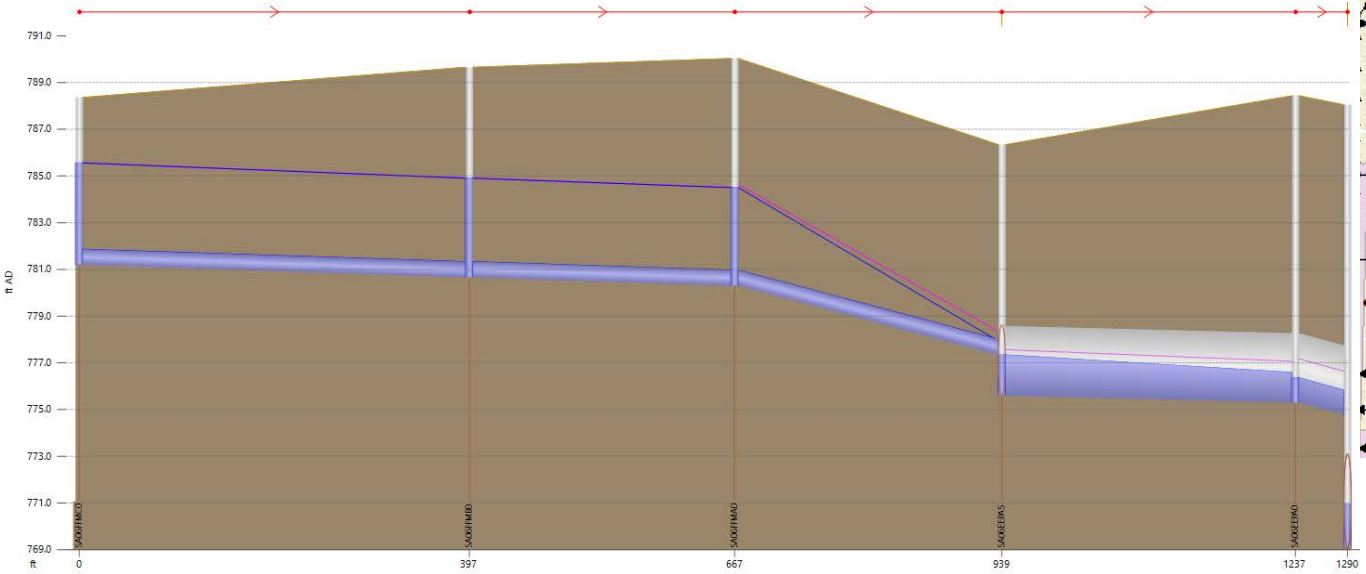


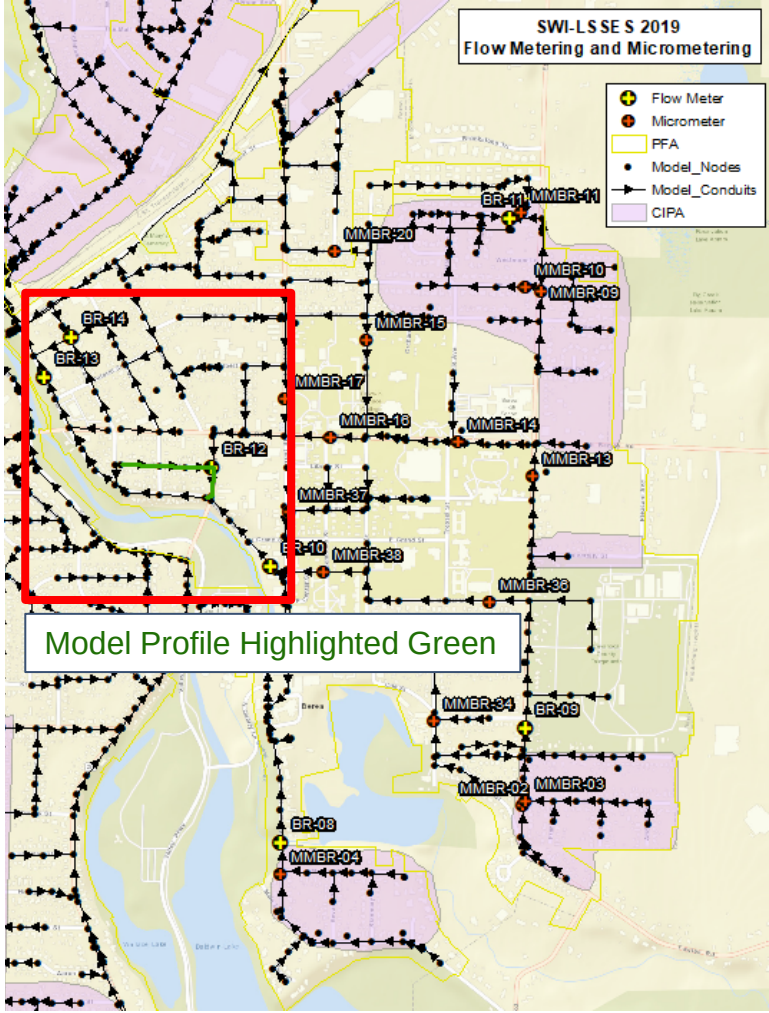


BE-03

Tier 2 Model Profiles

- BR-13 Post-Tier 1 Profile



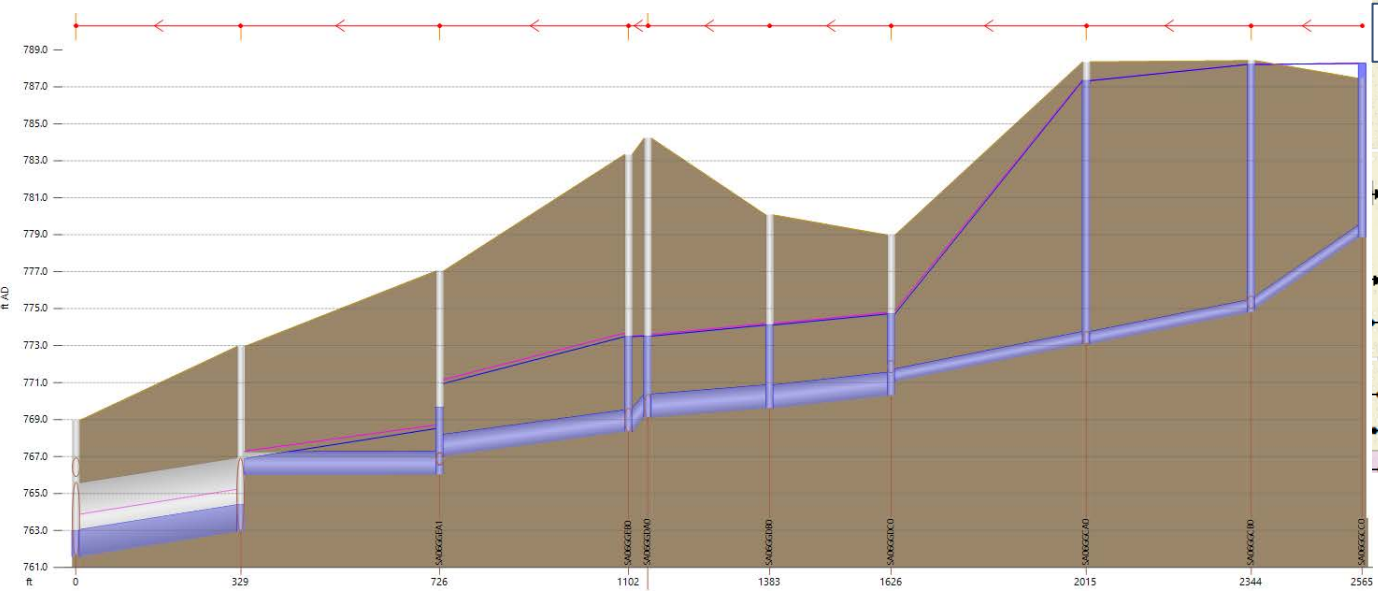


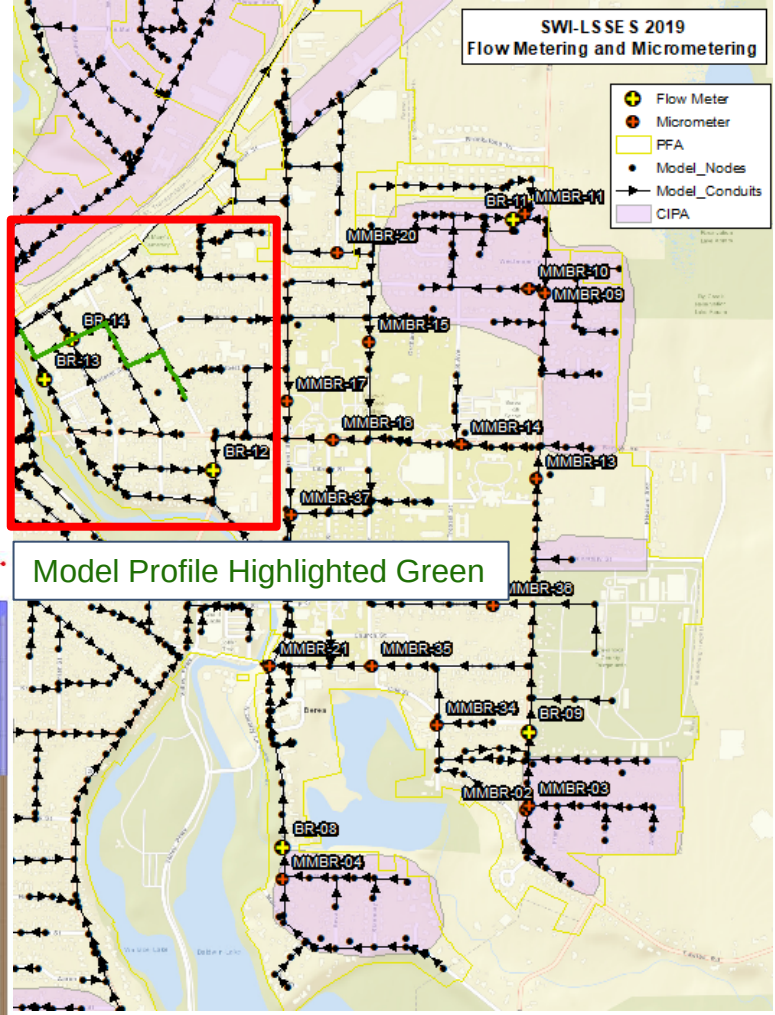
Model Profile Highlighted Green

BE-03

Tier 2 Model Profiles

- BR-14 Post-Tier 1 Profile



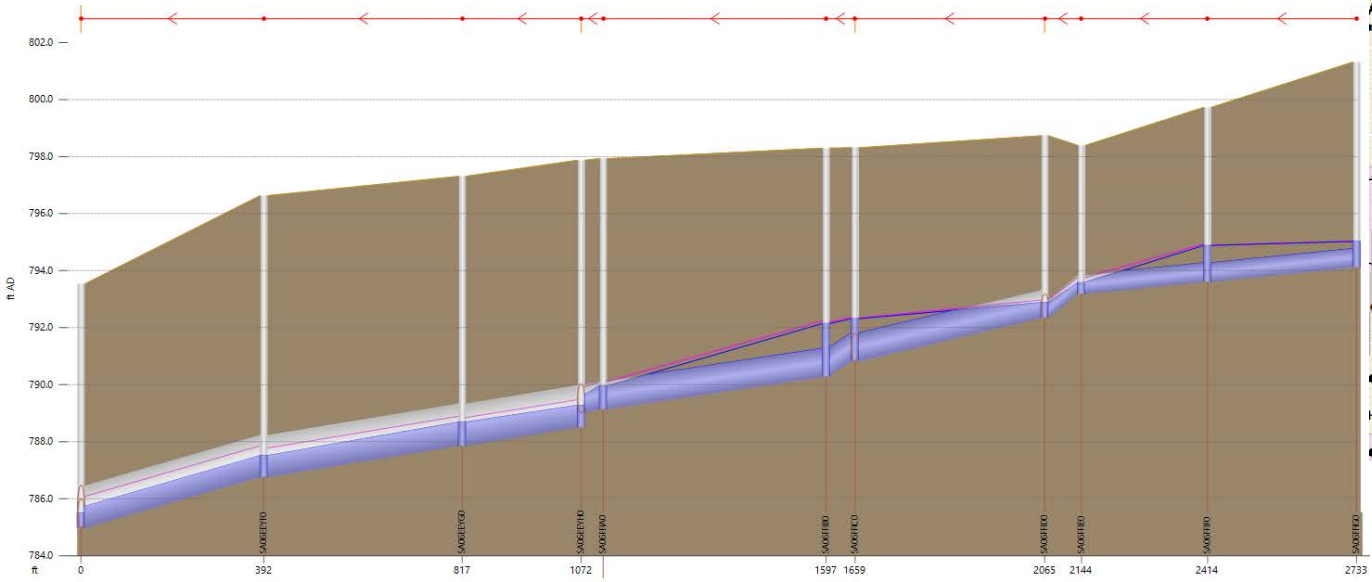


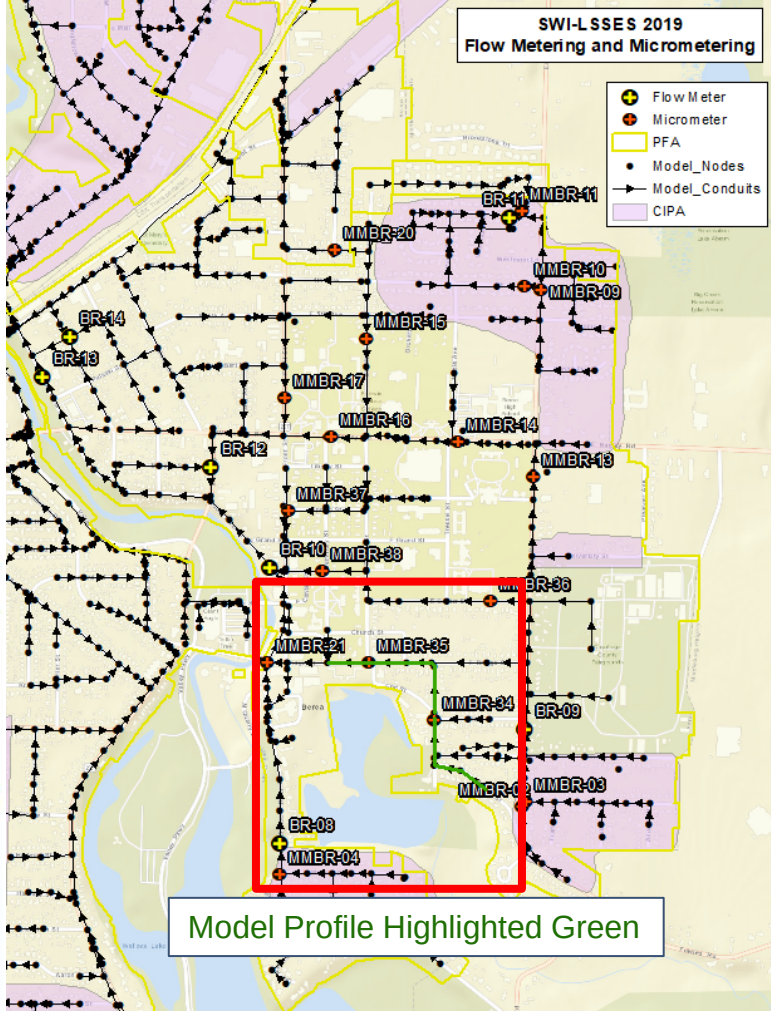
Model Profile Highlighted Green

BE-03

Tier 2 Model Profiles

- D32-U1 Post-Tier 1 Profile

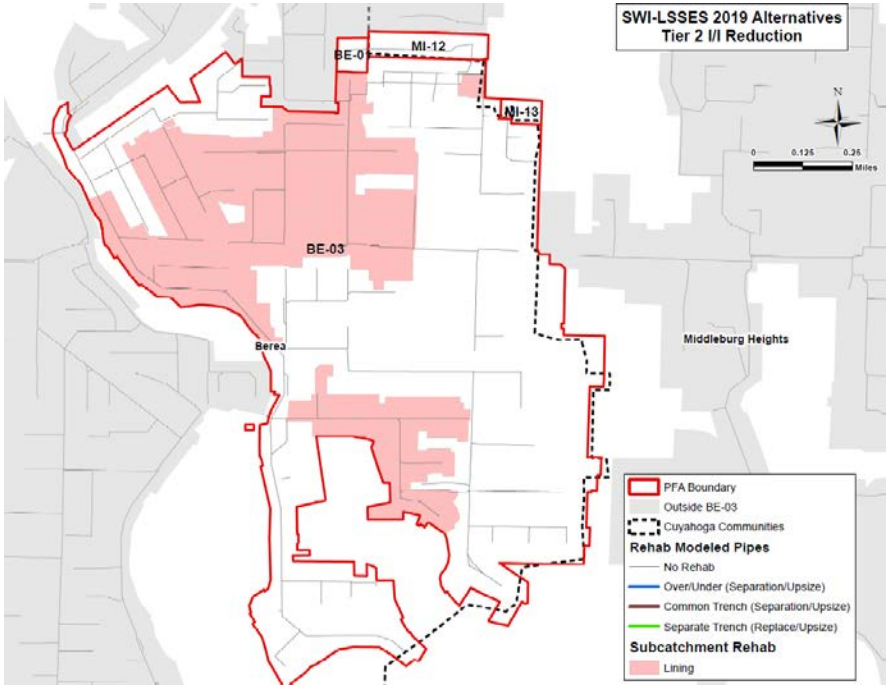




BE-03

Tier 2 Model-Predicted BBUs and I/I

- Public rehab of all subcatchments with >50,000 GPAD

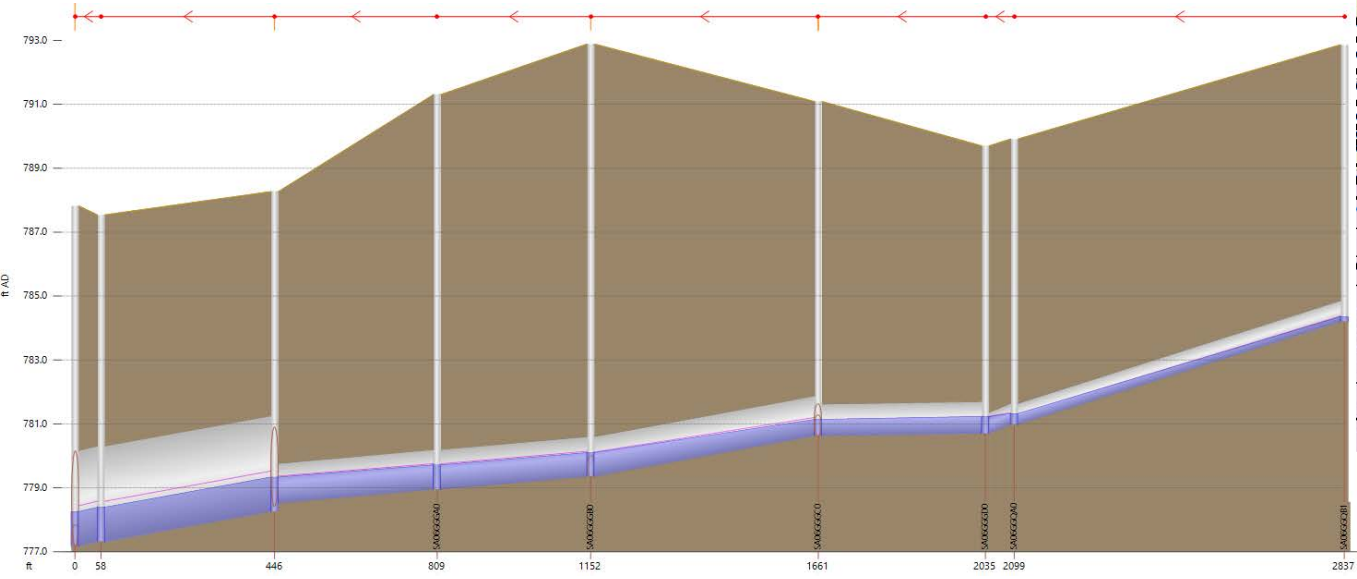


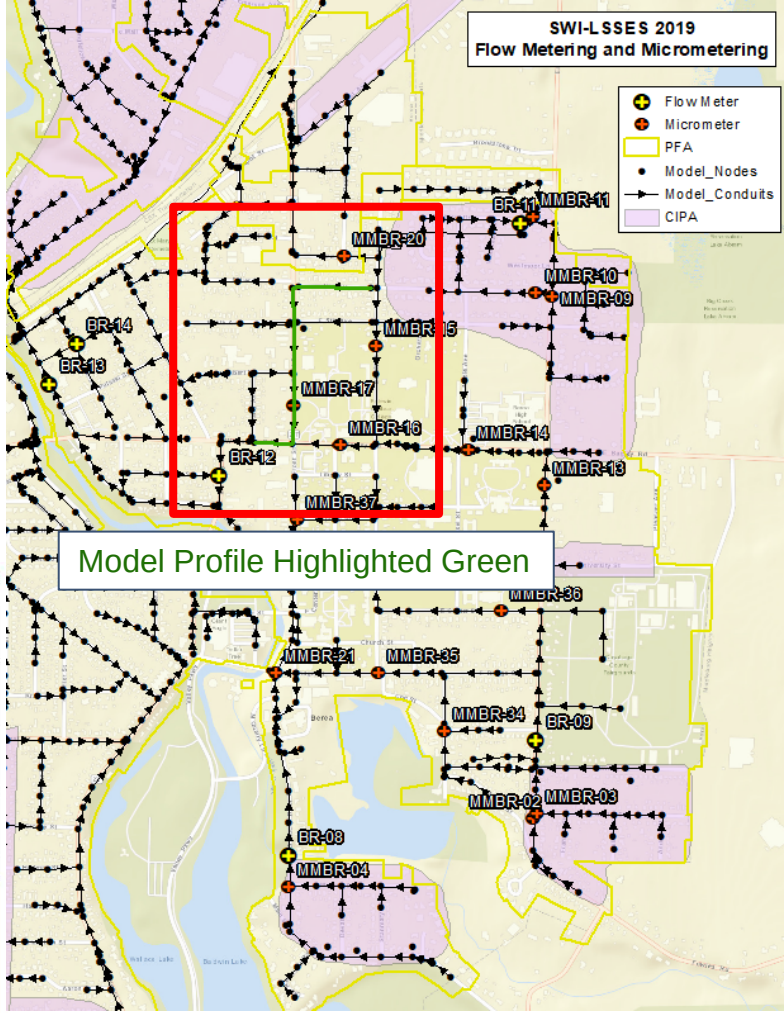
Update PFL Cost (YES/NO)	NEORSD Branch	PFL Area	Catchment ID (Use "ALL" to cost for all catchments within PFL)	Alternative		Summary										
				Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
YES	SWI2019	BE-03	ALL	T2_full						22660						$ 8,701,228

BE-03

Tier 2 Model Profiles

- BR-12 Tier 2 Solution Profile

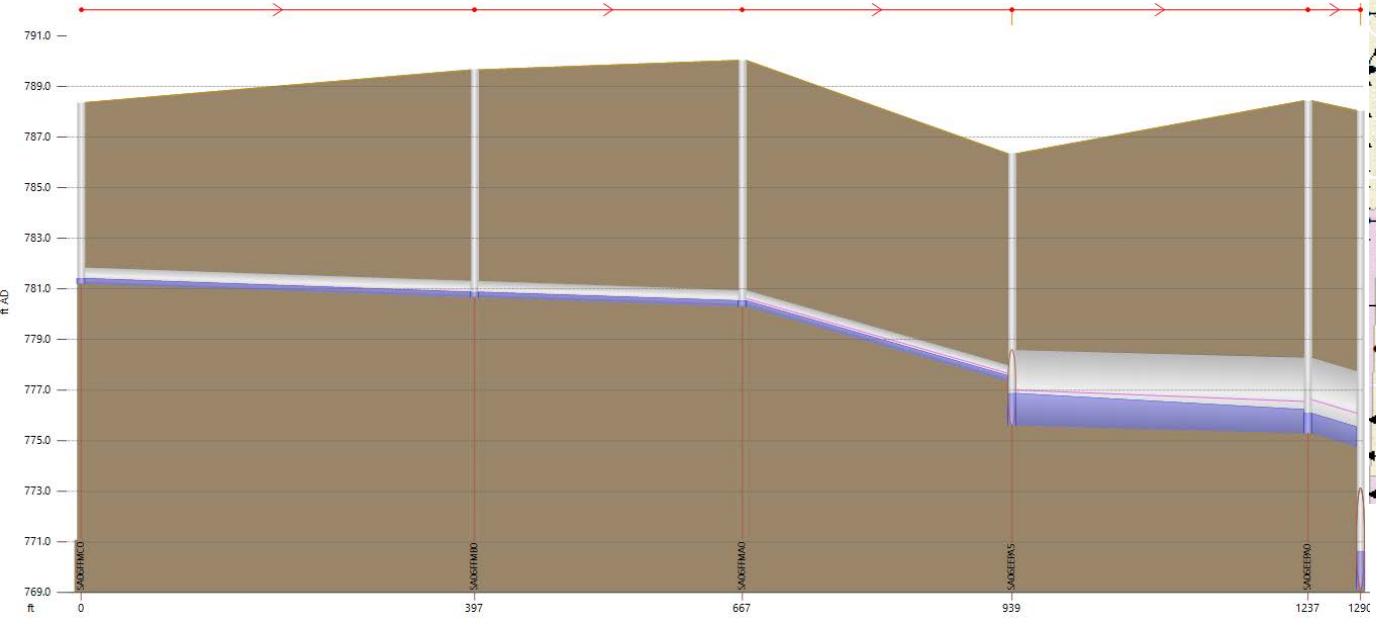


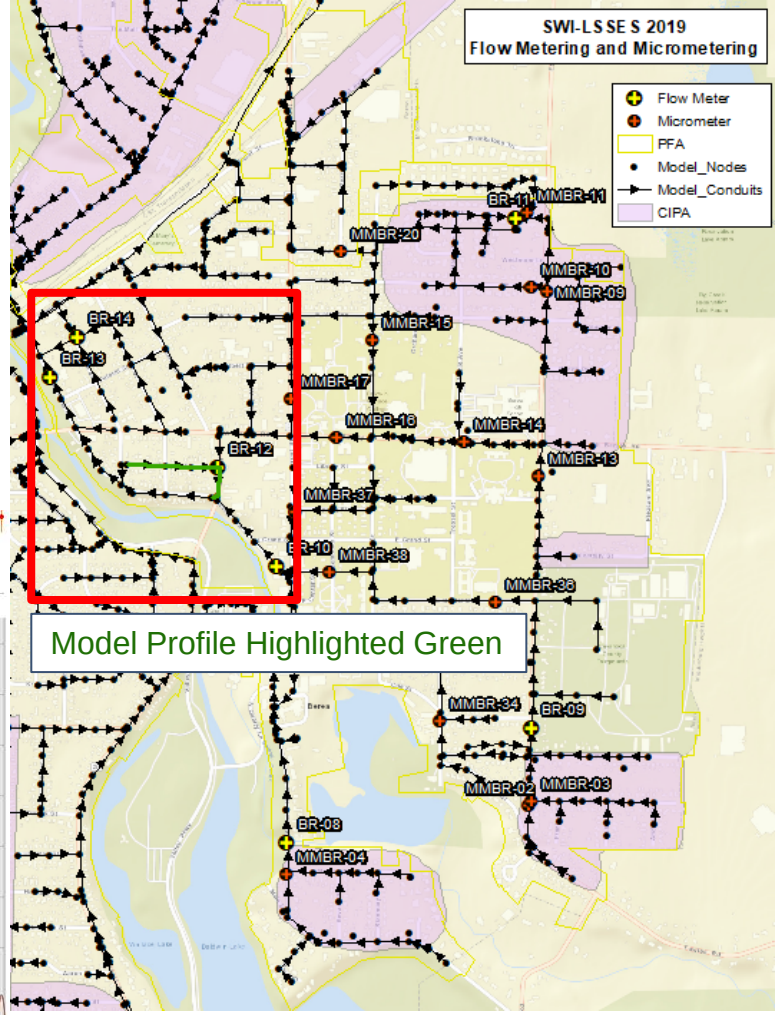


BE-03

Tier 2 Model Profiles

- BR-13 Tier 2 Solution Profile

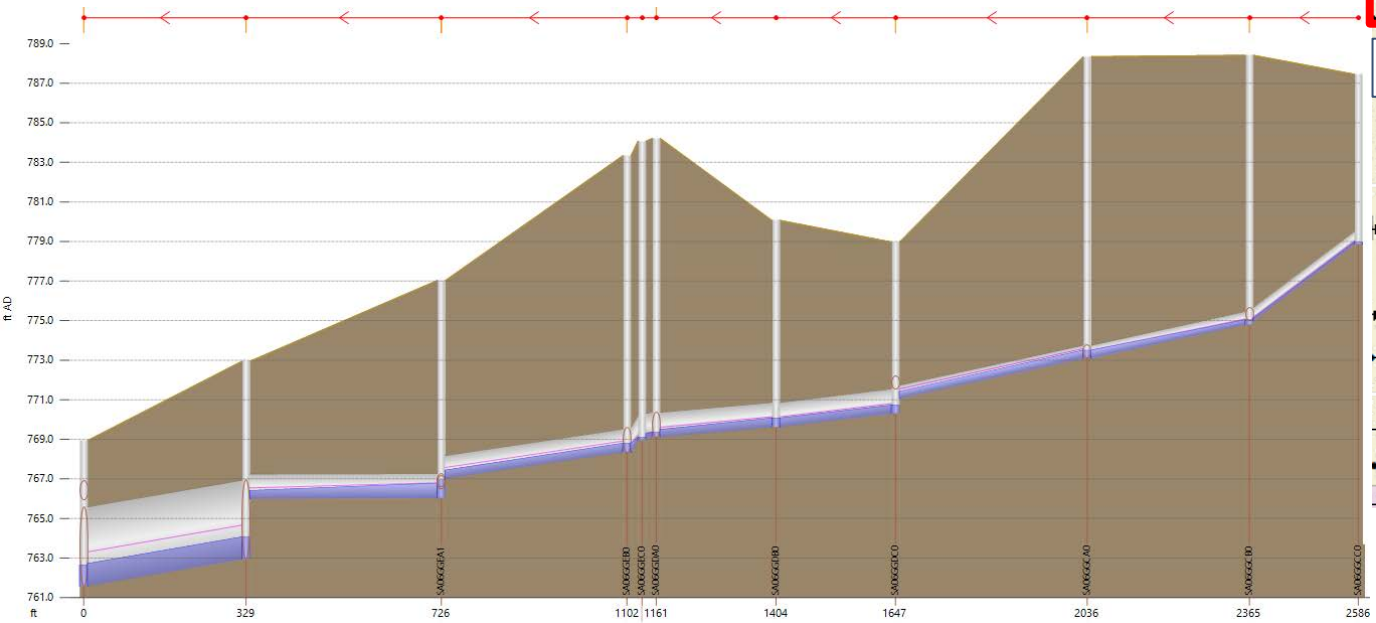


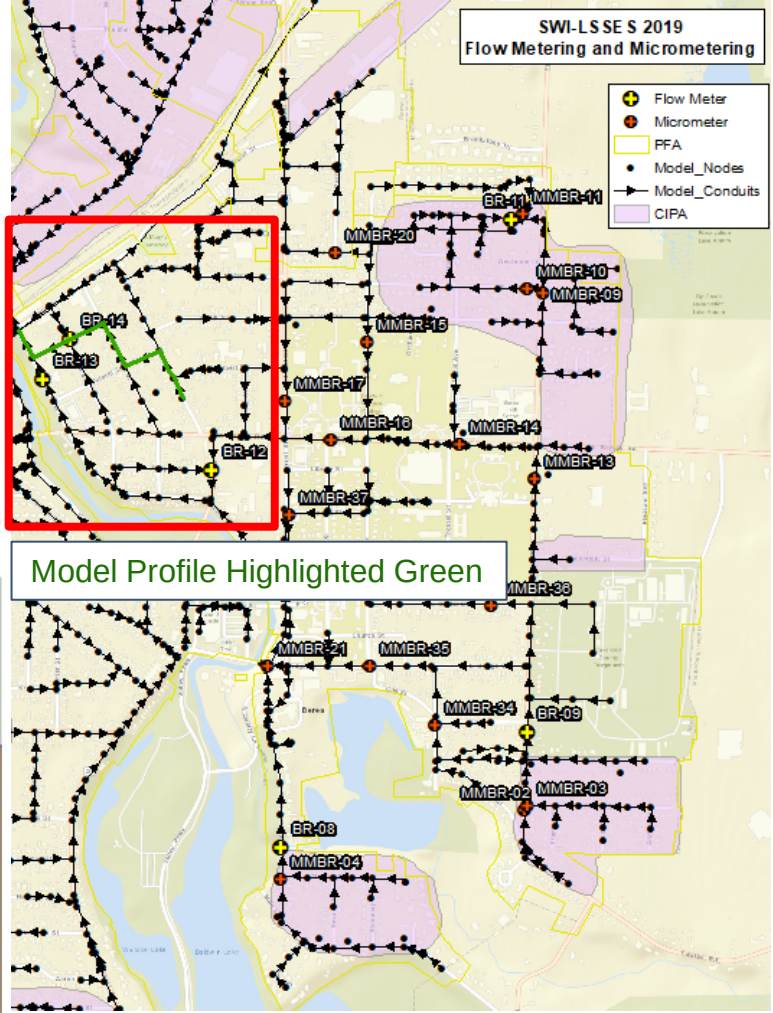


BE-03

Tier 2 Model Profiles

- BR-14 Tier 2 Solution Profile

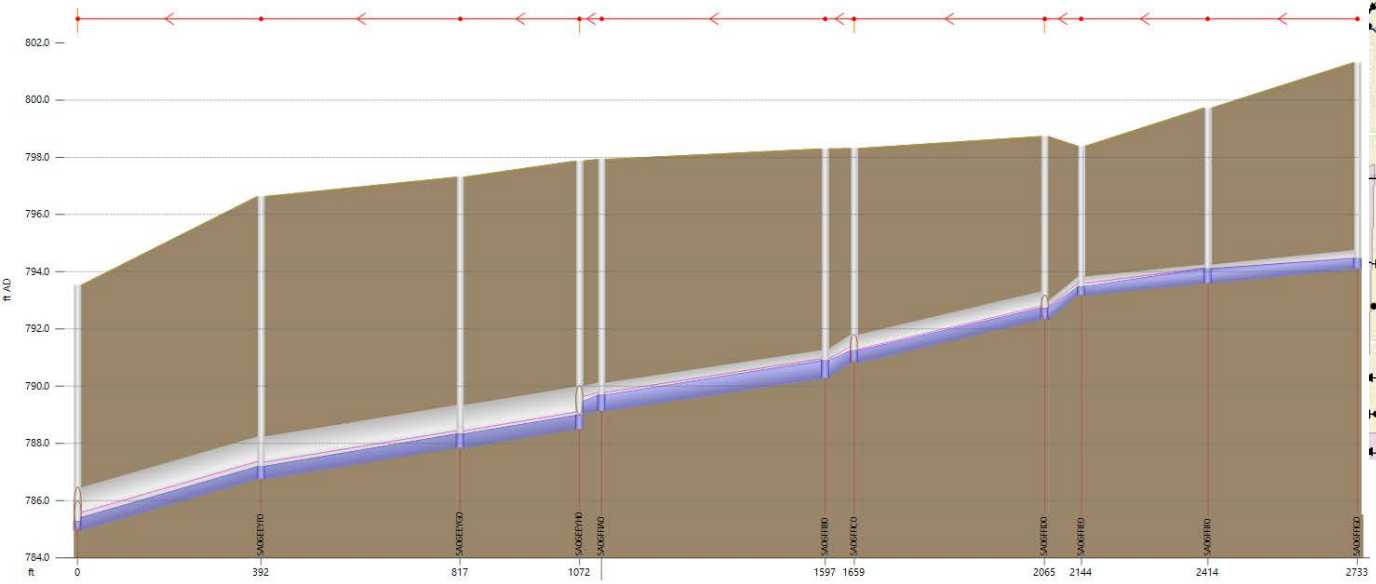


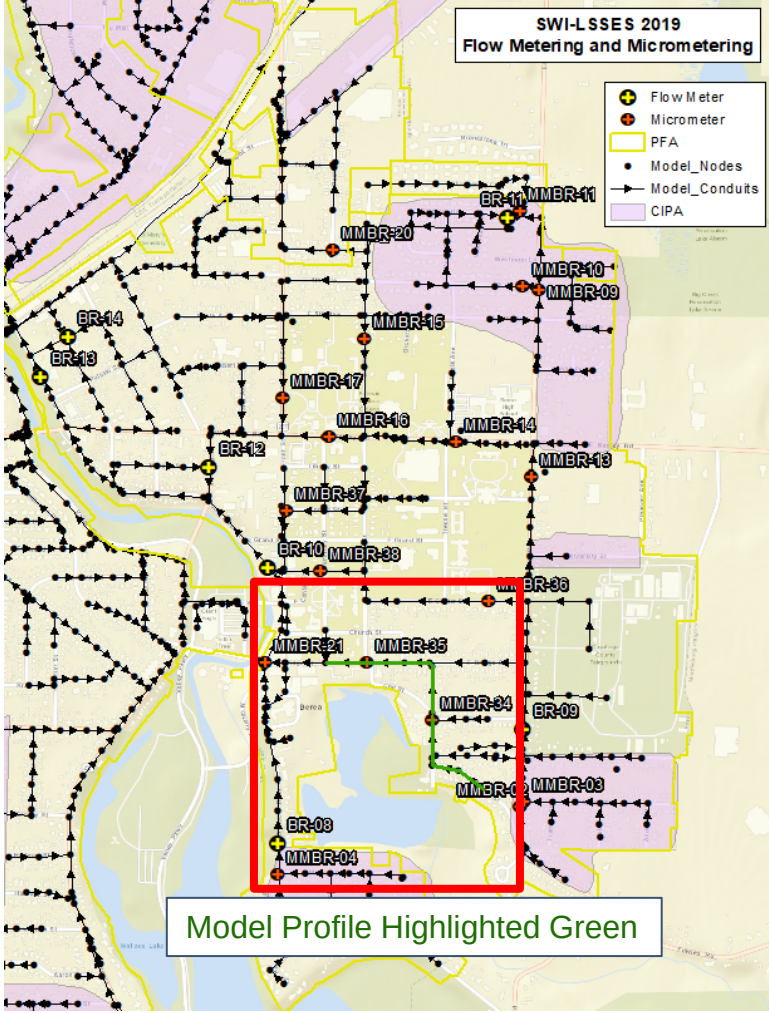


BE-03

Tier 2 Model Profiles

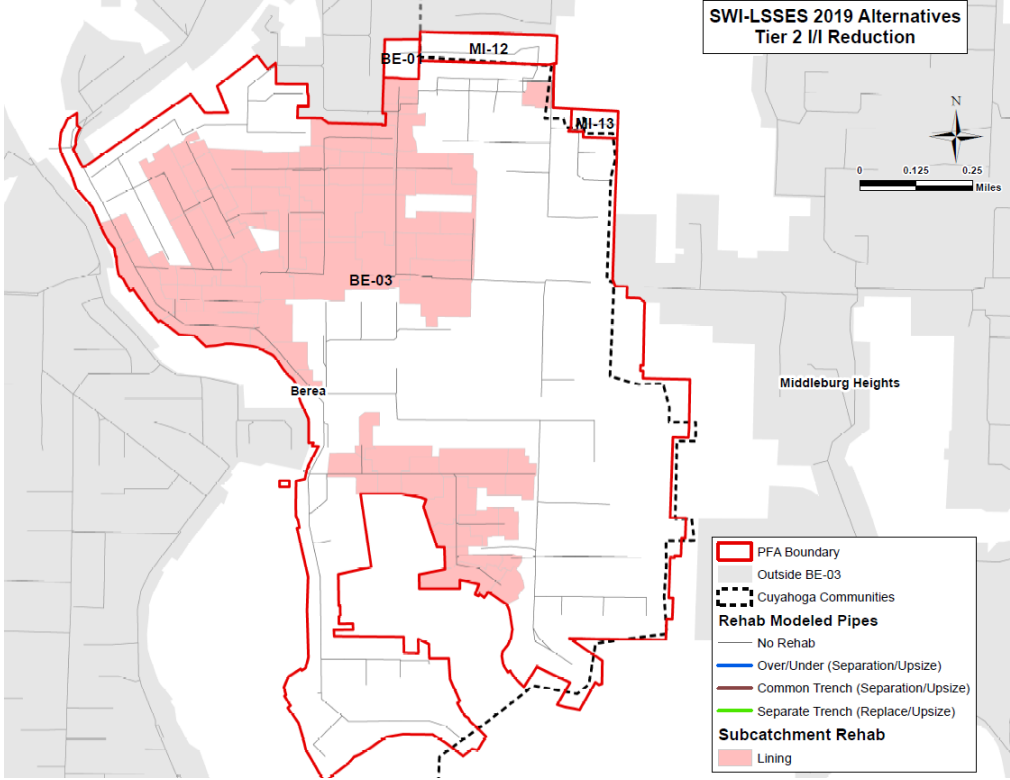
- D32-U1 Tier 2 Solution Profile





BE-03

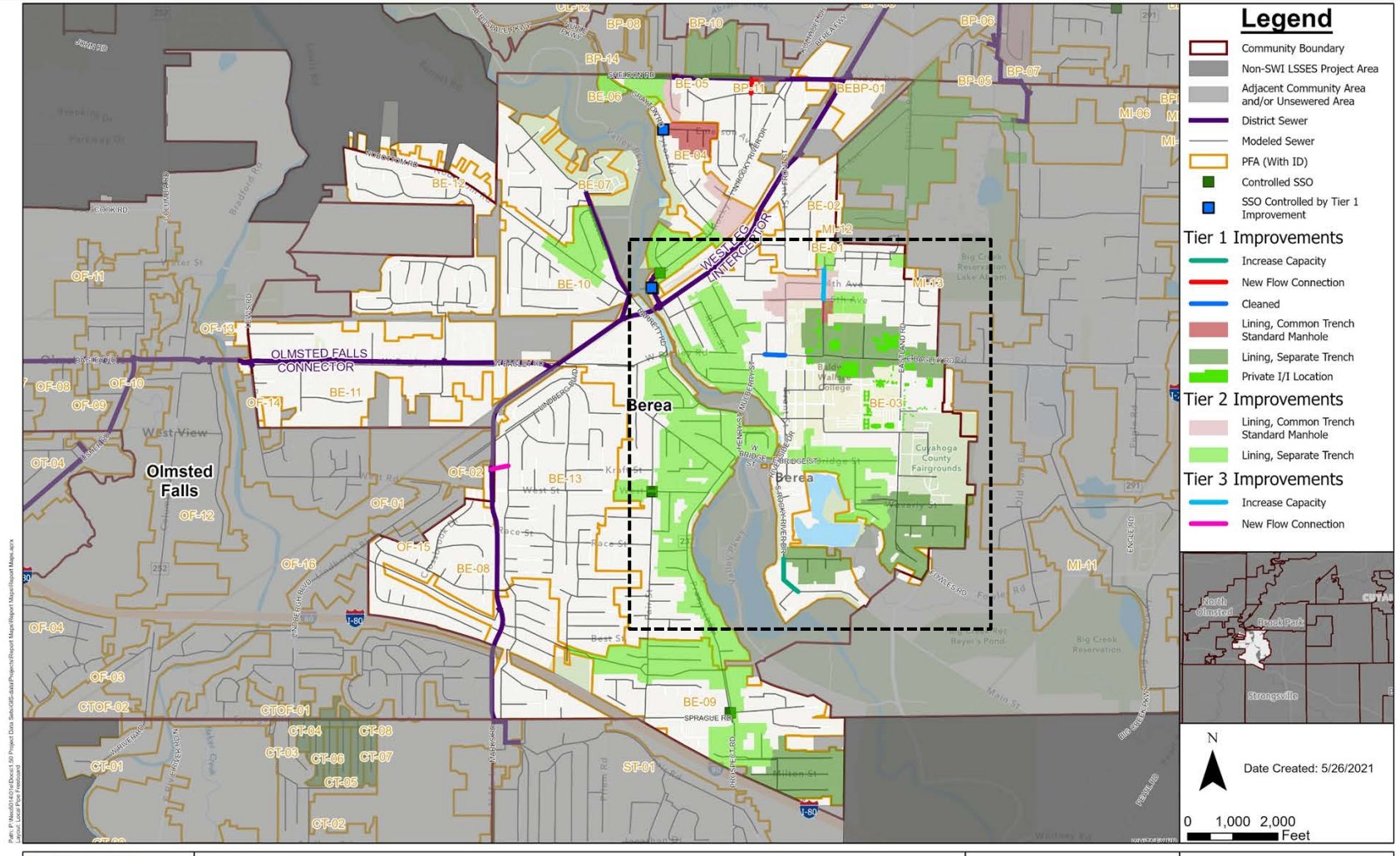
- Final Tier 2 Solution
  - **Line all subcatchments with > 50,000 GPAD**
    - *22,660 ft of sewer*
    - *Construction cost of $8,701,228*
  - **All BBUs are resolved**



Update PFL Cost (YES/NO)	NEORSD Branch	PFL Area	Catchment ID (Use "ALL" to cost for all catchments within PFL)	Alternative		Summary										
				Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
YES	SWI2019	BE-03	ALL	T2_full						22660						$ 8,701,228

BE-03 Final

- Final recommendation after refinement
- Tier 1
  - Common trench rehab = 537 LF
  - Separate trench rehab = 16,512 LF
  - Capacity enhancement = 882 LF
  - Private property rehab = 46 parcels
  - Total cost = $11,493,000
- Tier 2
  - Common trench rehab = 4,921 LF
  - Separate trench rehab = 18,769 LF
  - Total cost = $16,241,000
- Tier 3
  - Capacity enhancement = 657 LF
  - Total cost = $1,113,000
- Total Cost = Total Capital Cost + Contingency + Project Definition Investigation



Northeast Ohio Regional Sewer District

SWI-LSSES

Berea Overall Rehab

WADE TRIM

Brown AND Caldwell

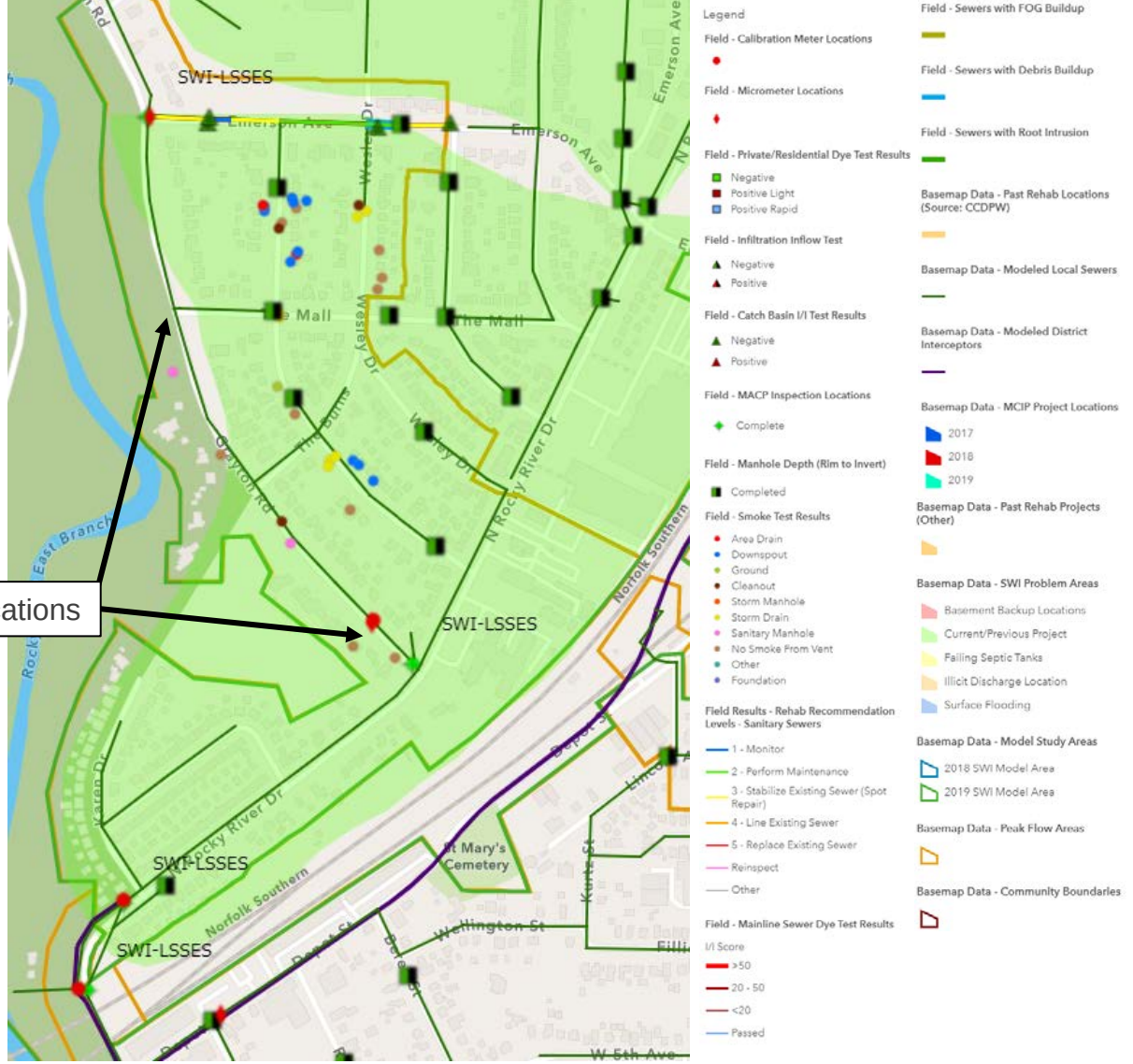
Hazen

SWI-LSSES PFA BE-04 Optimization

BE-04

Optimization - Field Data

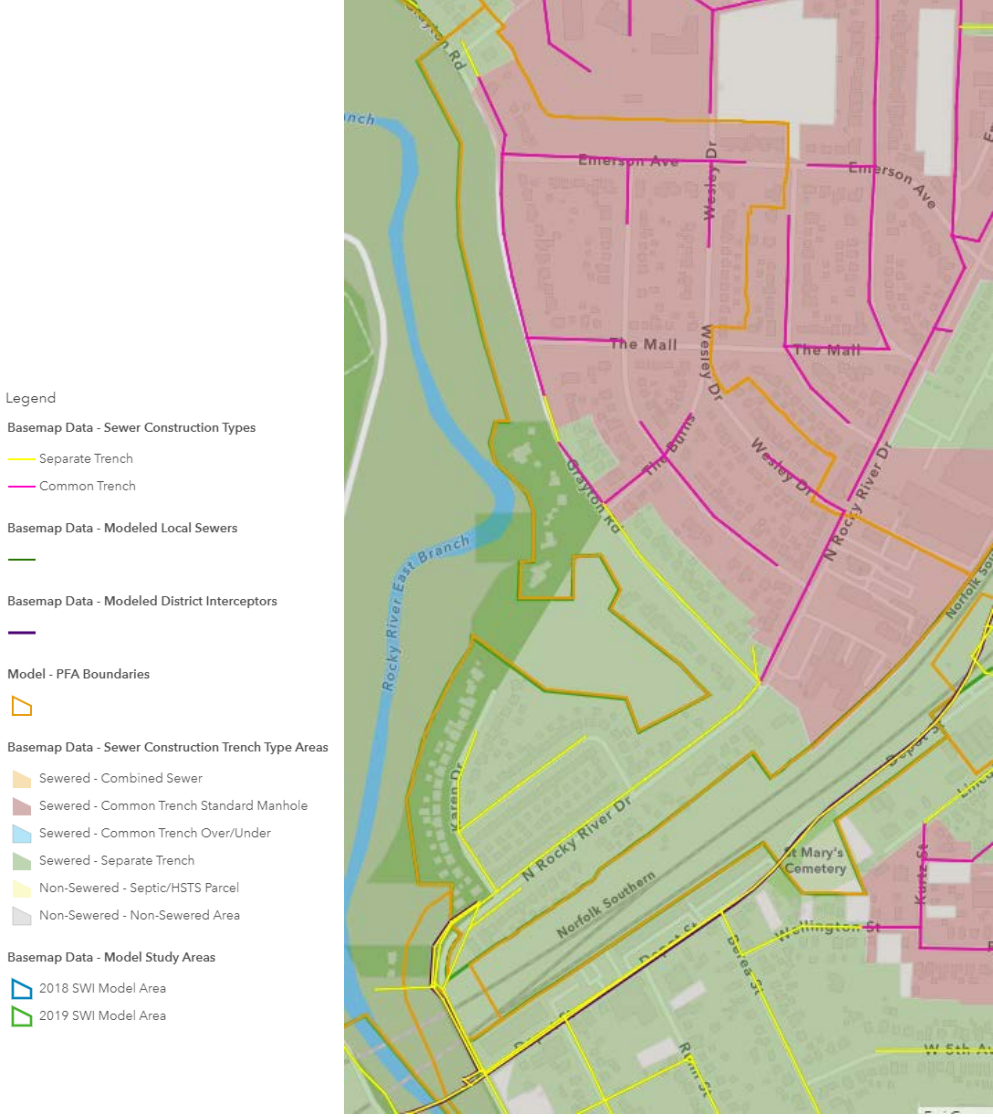
- This PFA is part of the Phase II 2016 MCIP project to address I&I/basement flooding. At the time of model calibration, this project had not been completed
- SSOs removed from optimization model
- Smoke testing revealed several connections with downspouts, storm drains, and an area drain all upstream of the BBUs
- No synoptic micrometer data



BE-04

Optimization – Trench Type

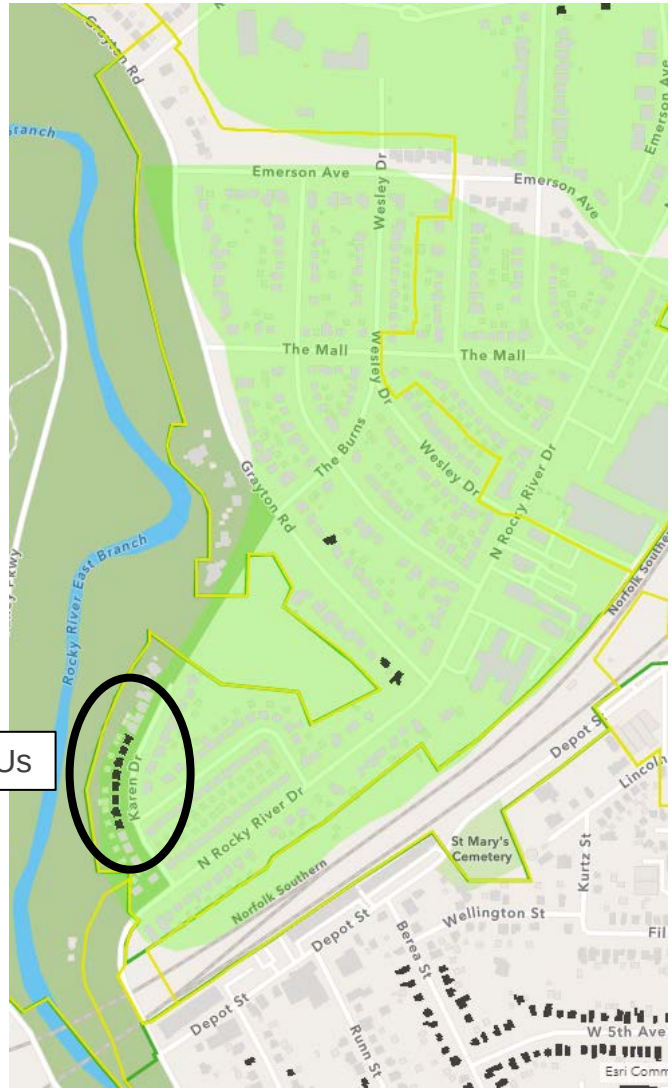
- Mostly Common Trench in the upstream area of the PFA
- Separate Trench in the downstream area



BE-04

Base Model for Optimization BBUs

Adding steps solves BBUs



Legend

Model - PFA Boundaries

Model - Model Predicted BBUs (5Yr Max)

- No BBU
- BBU

Basemap Data - SWI Problem Areas

- Basement Backup Locations
- Current/Previous Project
- Failing Septic Tanks
- Illicit Discharge Location
- Surface Flooding

Basemap Data - Model Study Areas

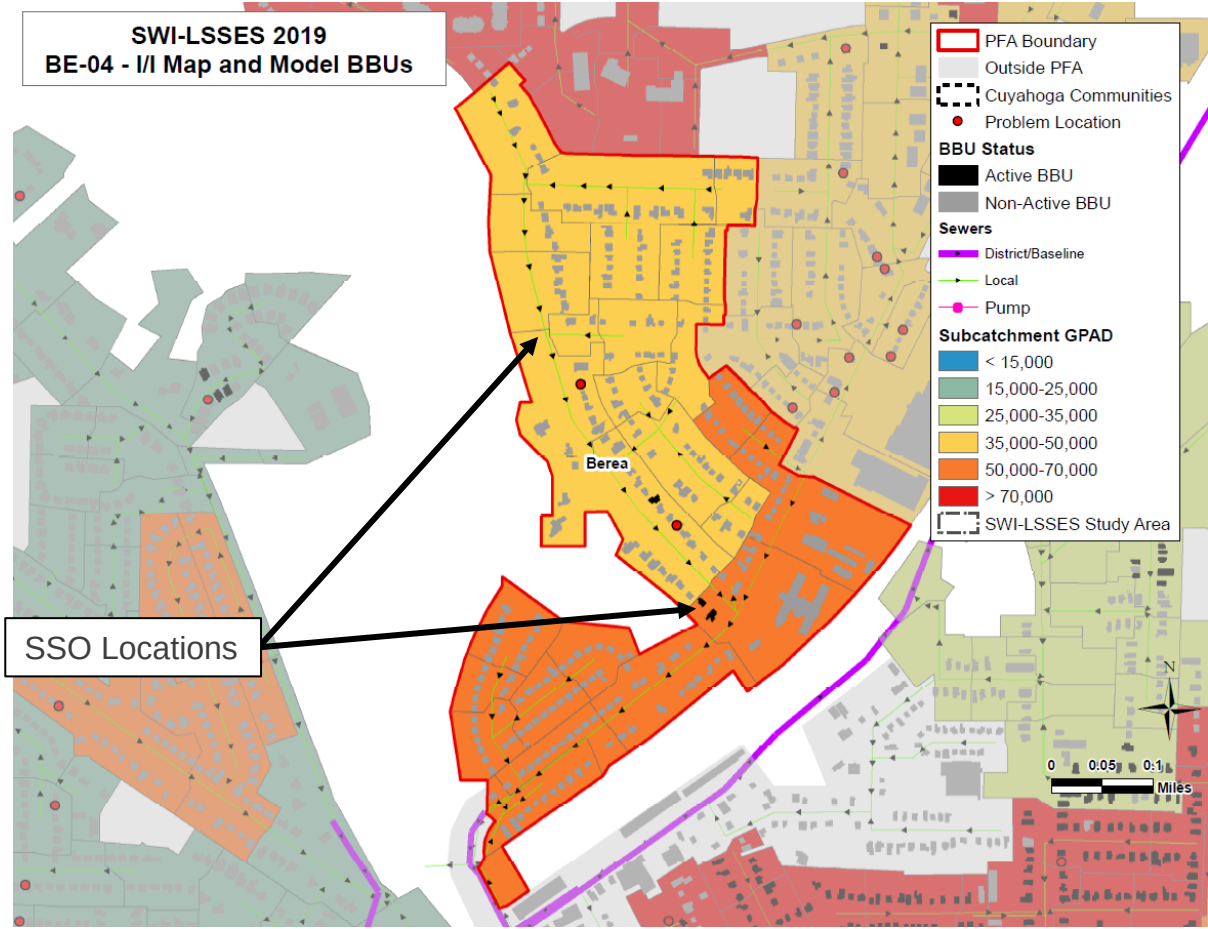
- 2018 SWI Model Area
- 2019 SWI Model Area

Basemap Data - Community Boundaries

BE-04

Model Predicted BBUs and I/I

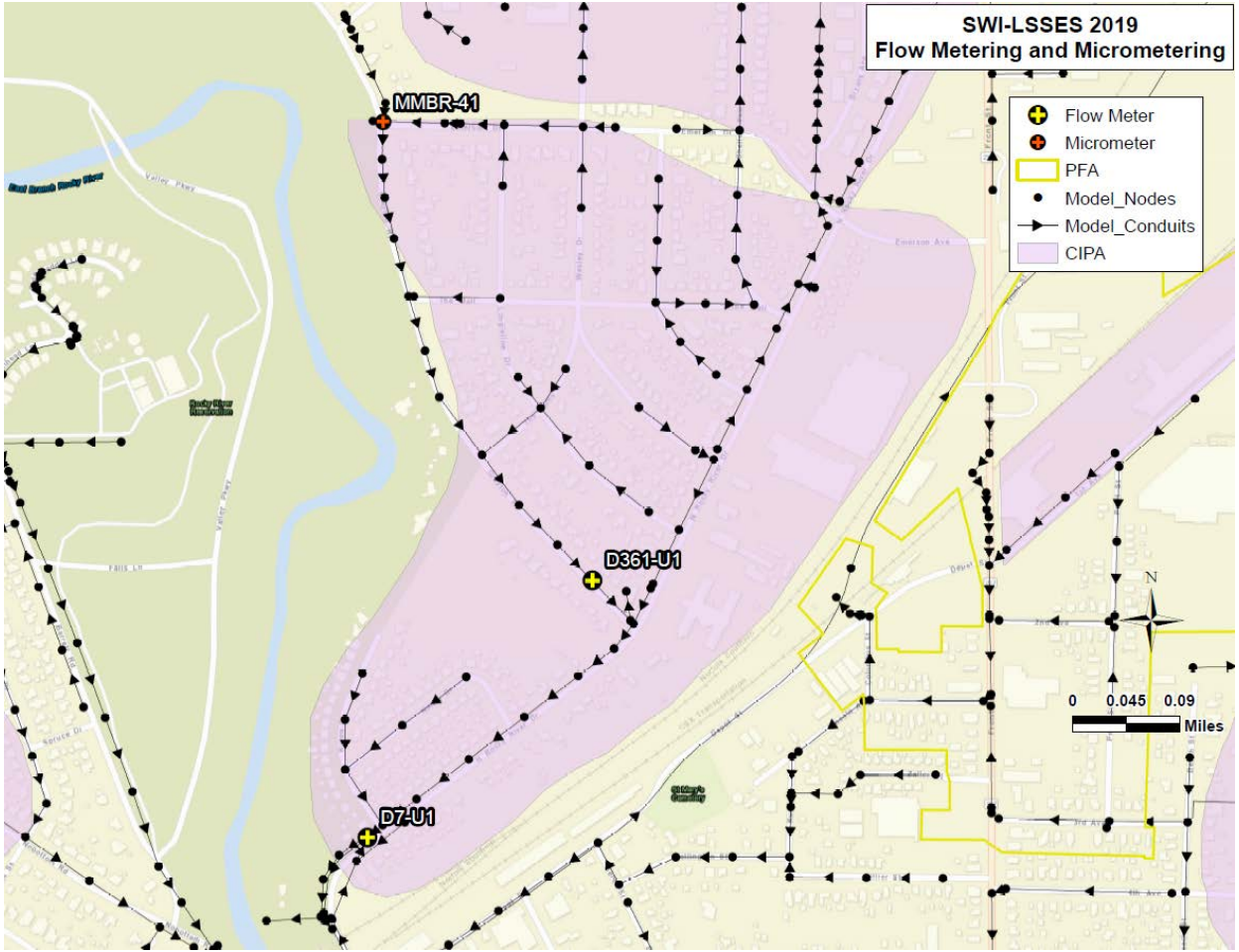
- Some Moderate I/I (D361-U1 Metershed)
- Some High I/I (D7-U1 Metershed)
- Problem locations are from 5/15/2020 storm event which had 10-year return interval



BE-04

Micrometer Data and Flow Meter Data

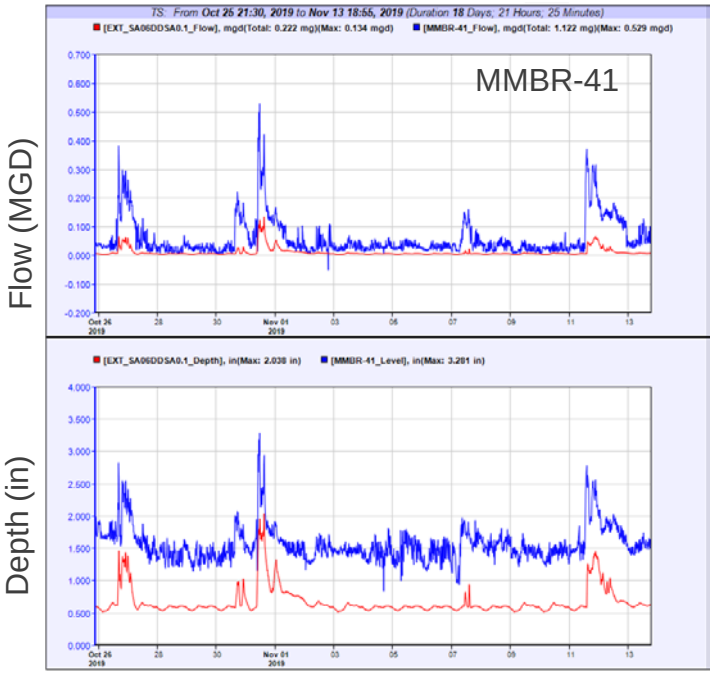
- MMBR-41
  - Installed August – November 2019

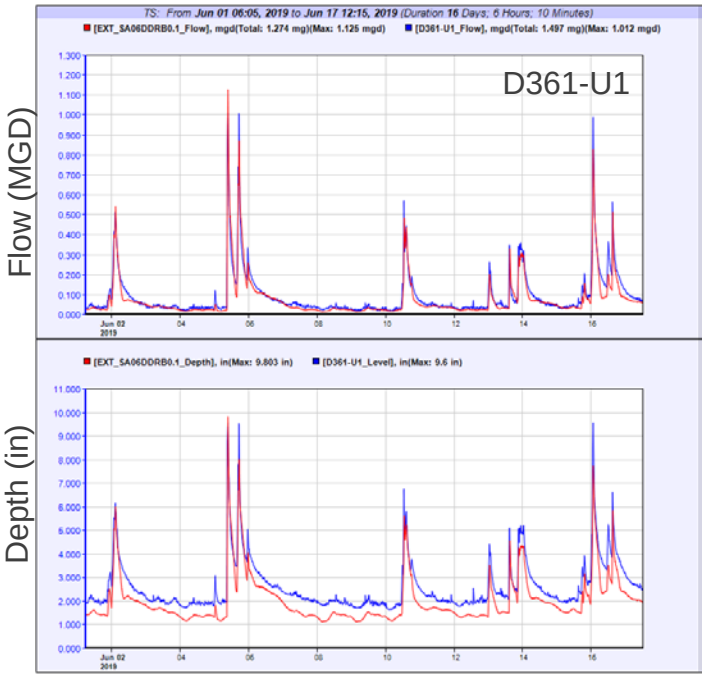


BE-04

Micrometer Data

- Model data in red, Observed data in blue
- Model flows at MMBR-41 are low
- Model flows at D361-U1 match the observed data
- Level at both locations match well
- Flows needed to be redistributed

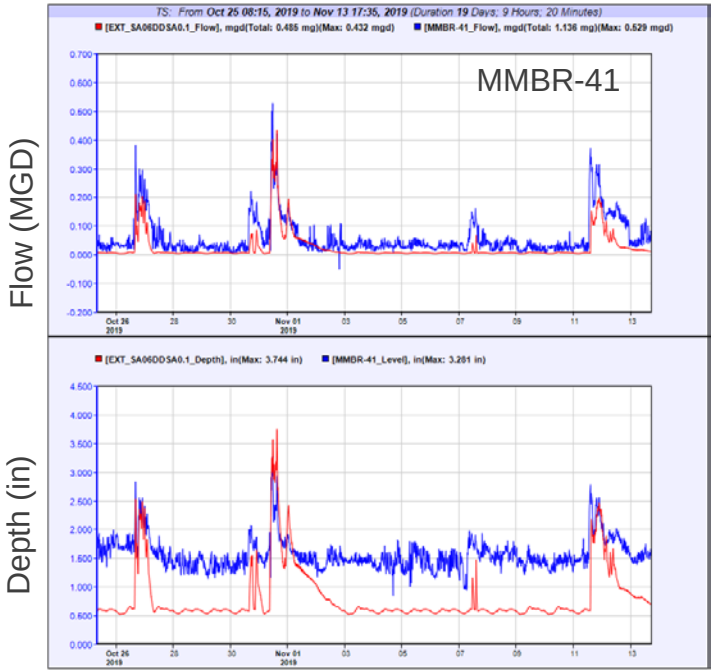


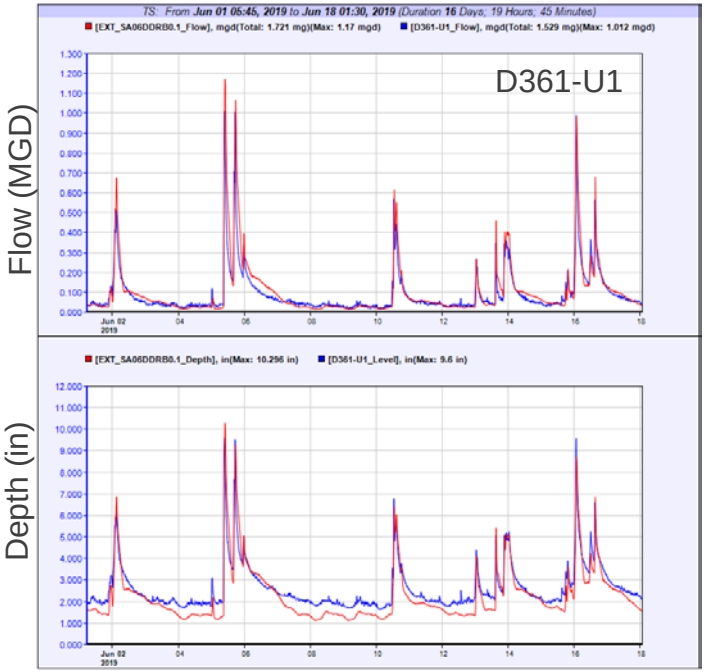


BE-04

Micrometer Data – After Redistribution

- Model data in red, Observed data in blue
- Model flows at MMBR-41 now match the observed data

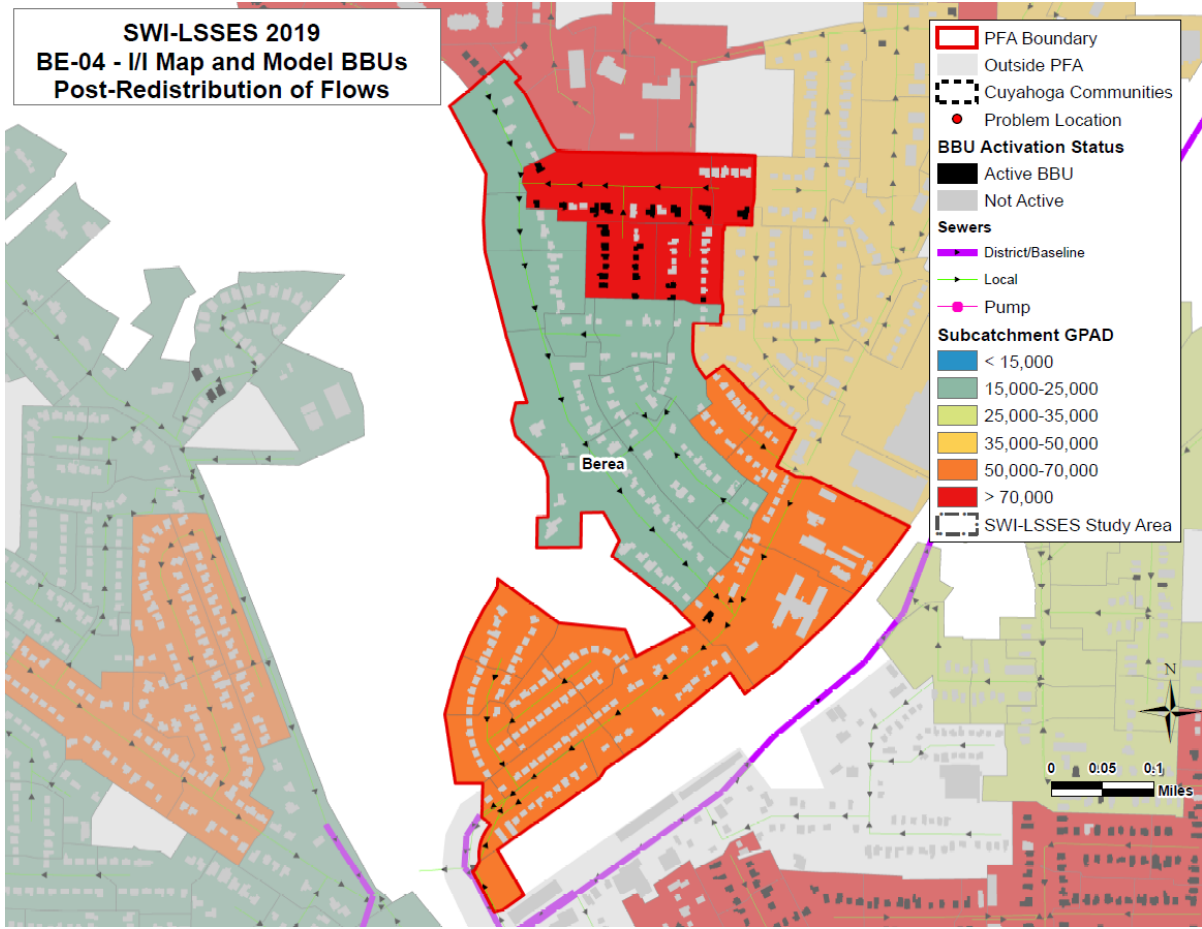




BE-04

Model Predicted BBUs and I/I After Redistribution

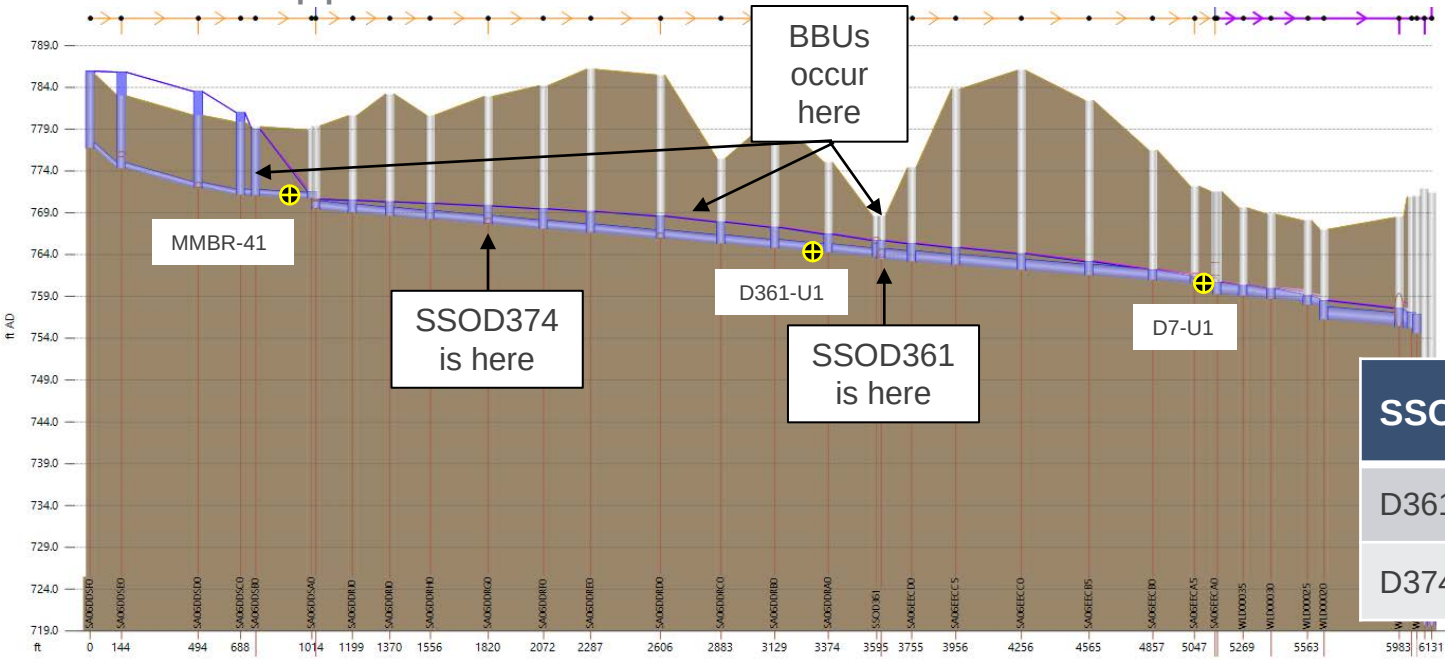
- MMBR-41 area now has 161,000 GPAD
- The rest of the D361-U1 metershed now has 24,000 GPAD
- Several BBUs are now predicted upstream of MMBR-41

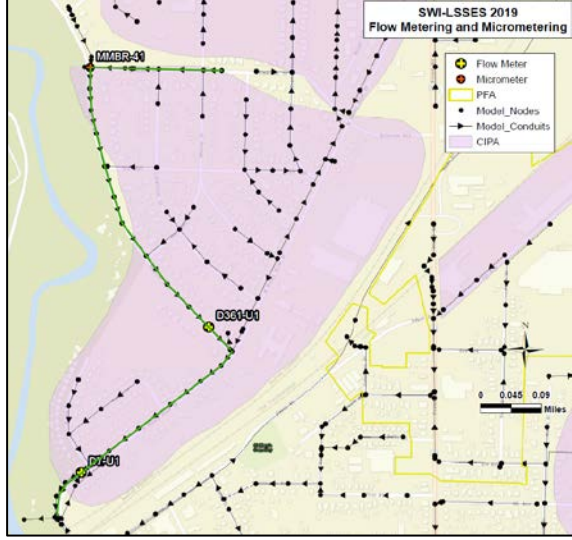


BE-04

5-Year Model Design Storm Profile

- Model
  - Surcharge caused by undercapacity sewer
  - After redistribution, there is additional surcharge and BBUs upstream of MMBR-41
  - Due to depth of pipe at BBU location downstream of D361-U1 (< 8 ft), the HGL must remain in pipe to solve this BBU





Model Profile Highlighted Green

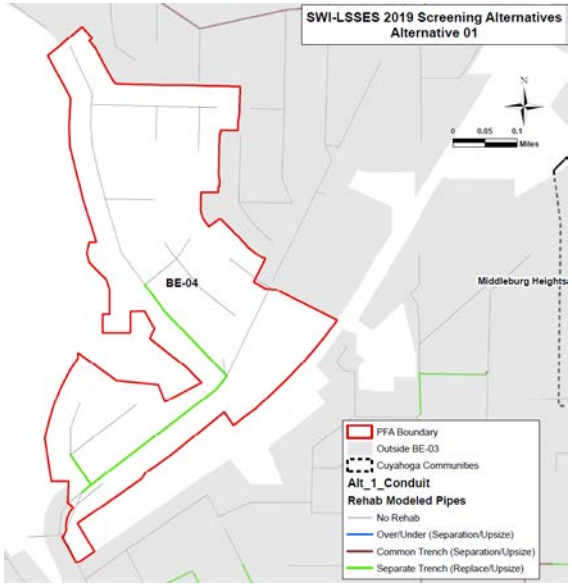
SSO	5-Year, 1-Hour Design Storm Volume Lost (gallons)
D361	1,500
D374	29,500

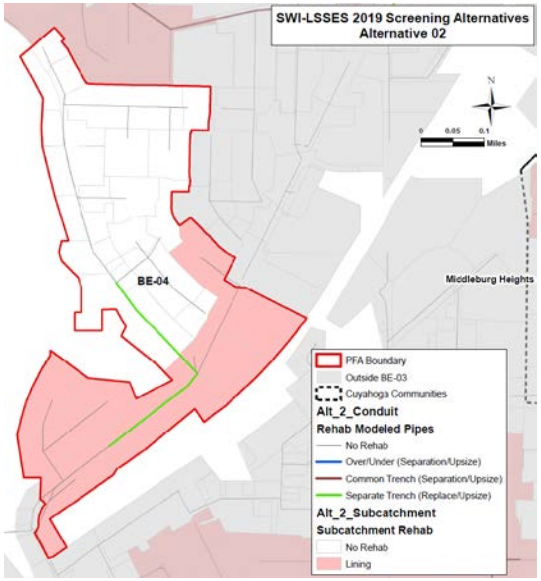
BE-04

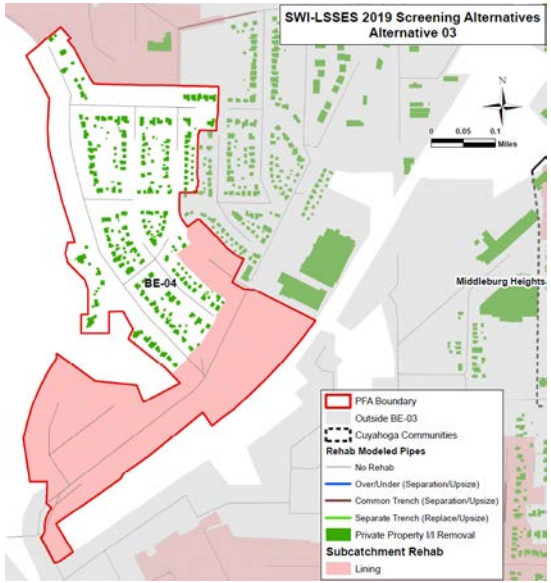
Screening Alternatives Provided

All costs are within 30% of each other

NEORSD Branch	PFL Area	Catchment ID	Alternative		Summary										Planning Costs, $ AACE Class 5
			Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
SWI2019	BE-04	ALL	A1		2,832	0	0	0	0	0	0	0	0	0	$ 3,817,275.00
SWI2019	BE-04	ALL	A2		1,939	0	0	0	5,480	0	0	0	0	0	$ 4,461,760.00
SWI2019	BE-04	ALL	A3		0	0	0	0	6,651	0	0	0	133	0	$ 3,592,141.00



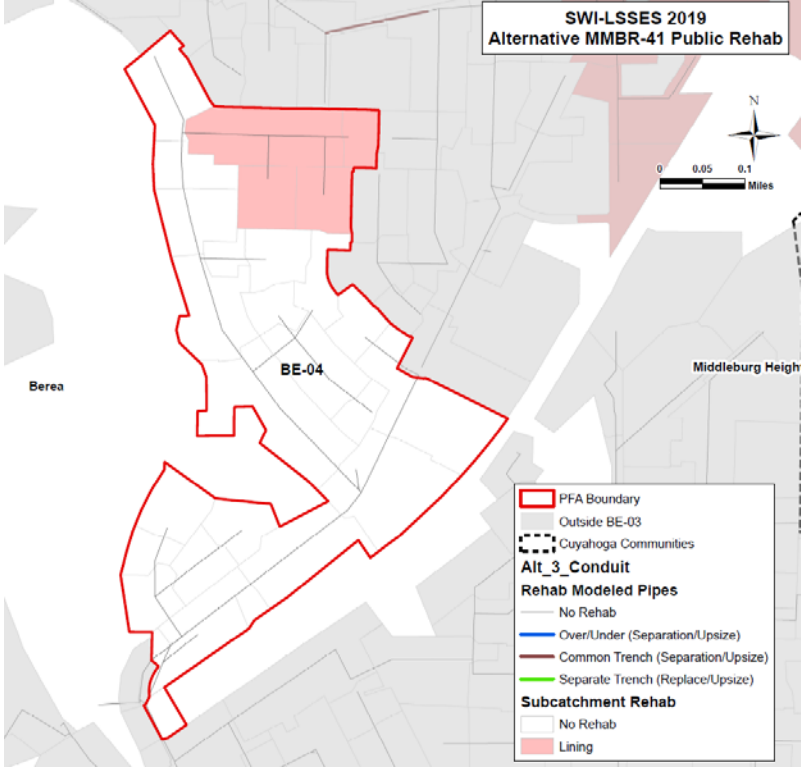




BE-04

Refined Alternative – MMBR-41 Public Rehab

- After redistribution of flows, the subcatchments upstream of MMBR-41 have very high I/I (161,000 GPAD)
  - Public rehab upstream of MMBR-41 becomes the clear solution
  - Lining of 2,464 LF of pipe
  - Cost of $784,638

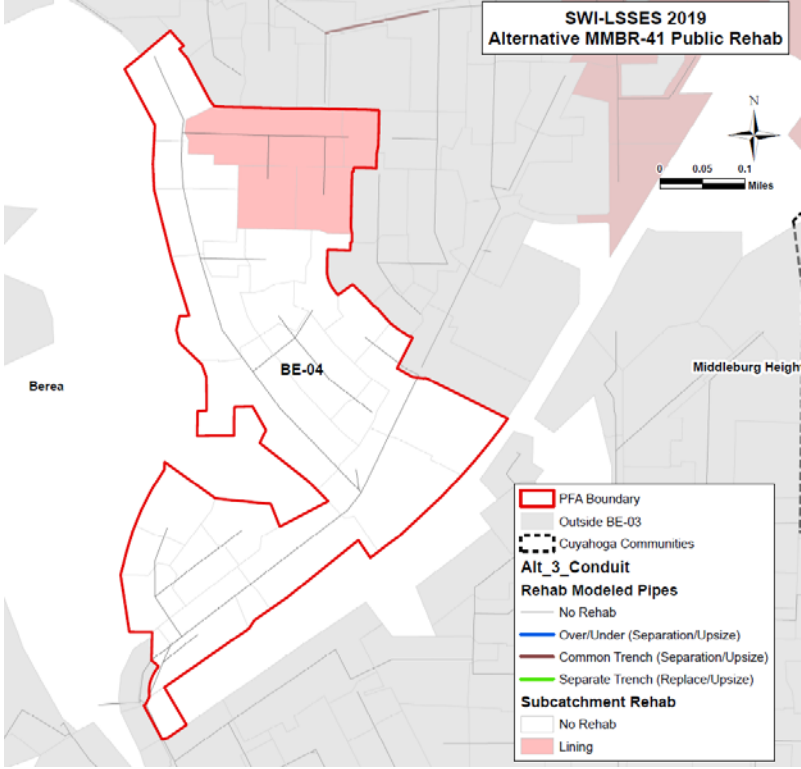


NEORSD Branch	PFL Area	Catchment ID	Alternative		Summary										Planning Costs, $ AACE Class 5
			Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
SWI2019	BE-04	ALL	MMBR-41 Public Rehab		0	0	0	0	2464	0	0	0	0	0	$ 784,638

BE-04

Tier 1 Solution

- Tier 1 Solution is public rehab upstream of MMBR-41
- Final Tier 1 Solution
  - Line 2,464 ft of sewer
  - Construction cost of $784,638
- 2016 MCIP Phase II project may solve this PFA and should be checked against the model

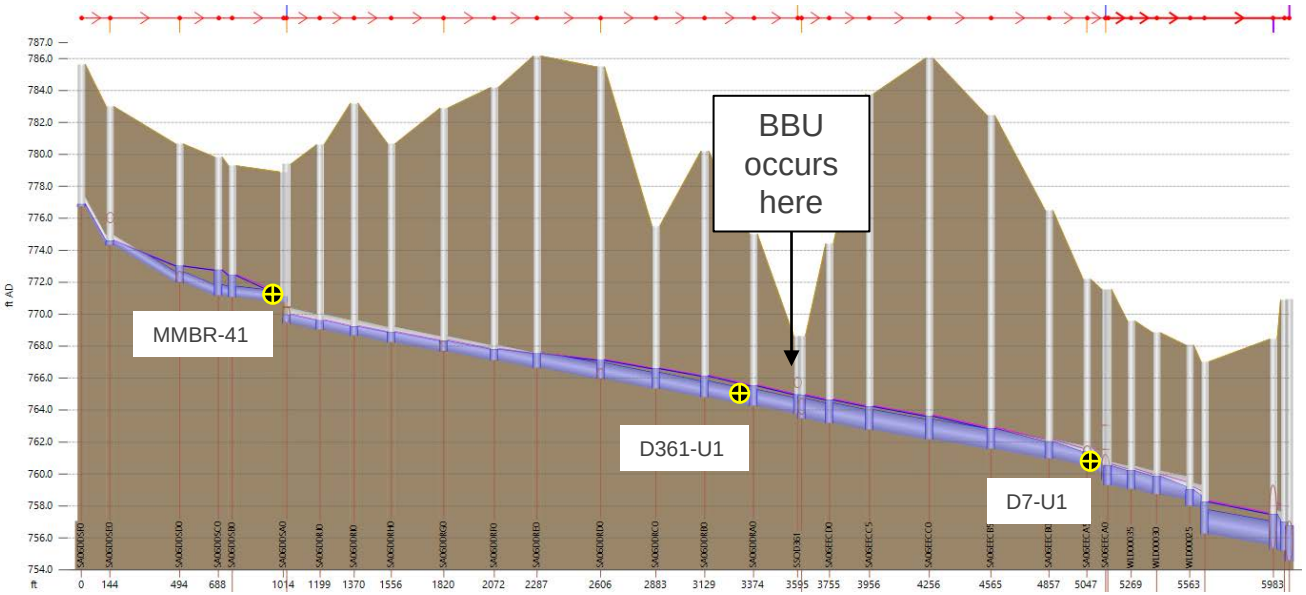


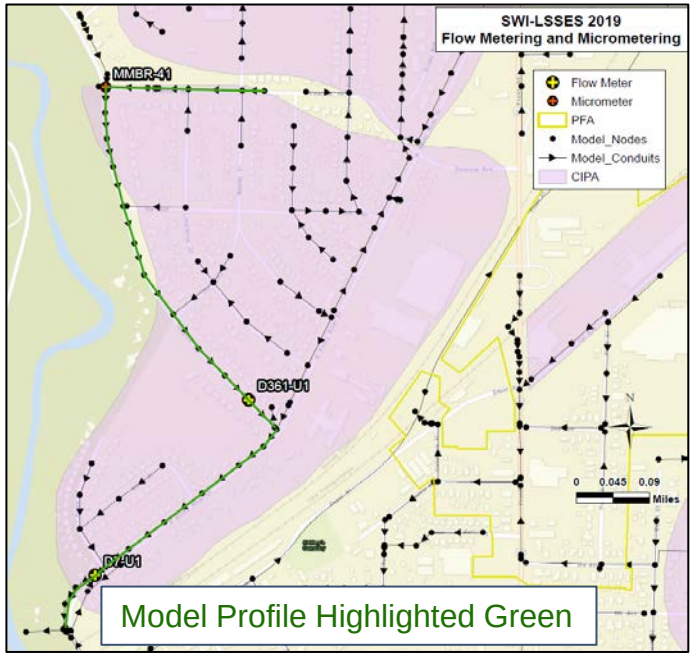
NEORSD Branch	PFL Area	Catchment ID	Alternative		Summary										Planning Costs, $ AACE Class 5
			Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
SWI2019	BE-04	ALL	MMBR-41 Public Rehab		0	0	0	0	2464	0	0	0	0	0	$ 784,638

BE-04

Tier 1 Solution Profile for 5-year, 1-hour Design Storm

- Model
  - **One remaining BBU**
    - *Less than 1 ft of surcharge at BBU location*
    - *Tier 2 I/I solves the BBU*
  - **HGL is below activation level of SSO locations**



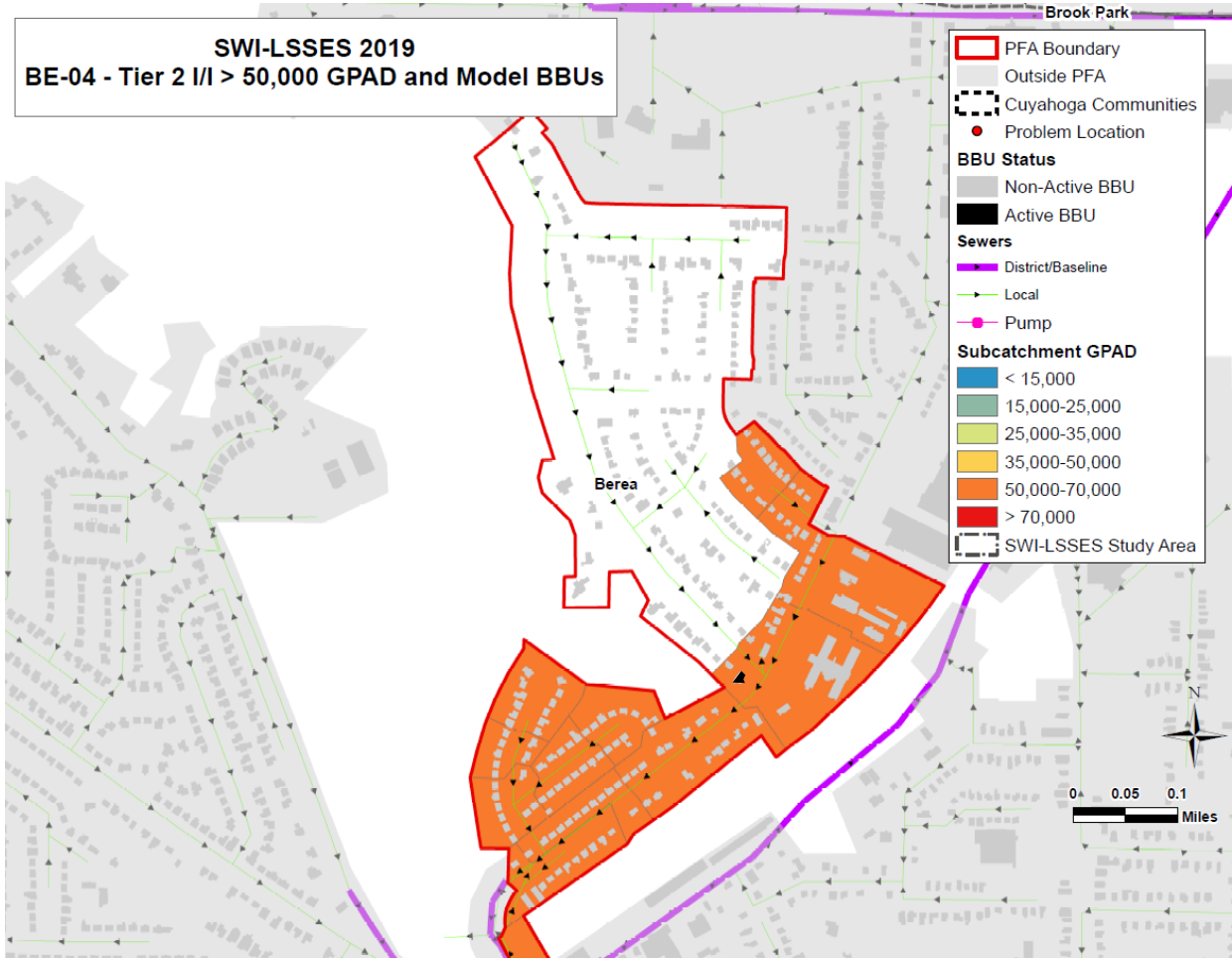


Model Profile Highlighted Green

BE-04

Tier 2 Model-Predicted BBUs and I/I

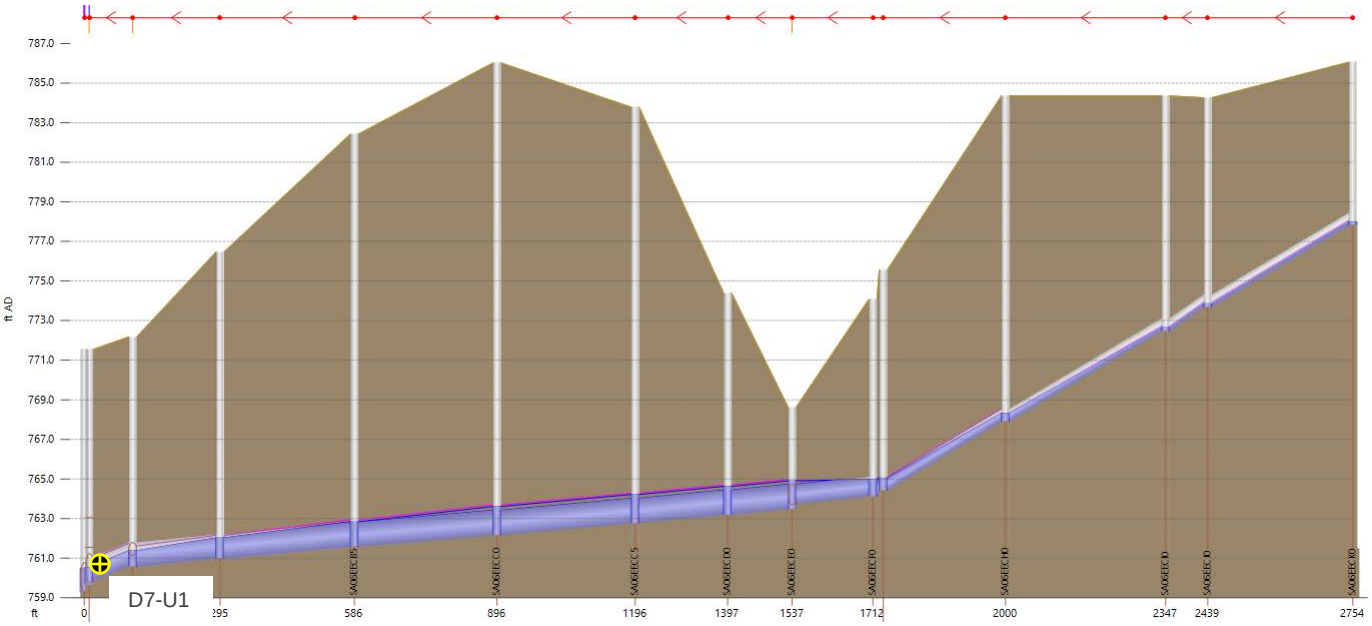
- High I/I (51,000 GPAD) in D7-U1 Metershed
- One BBU

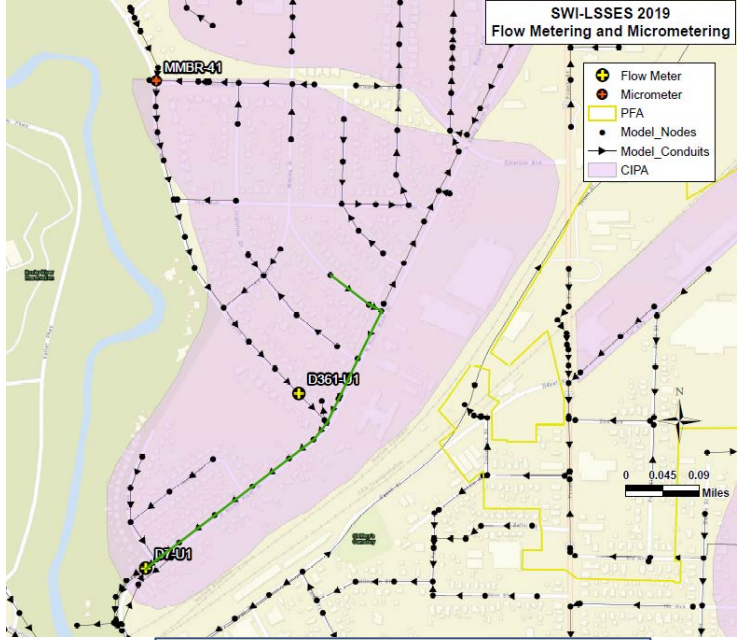


BE-04

Tier 2 Model Profiles

- Post-Tier 1 Profile



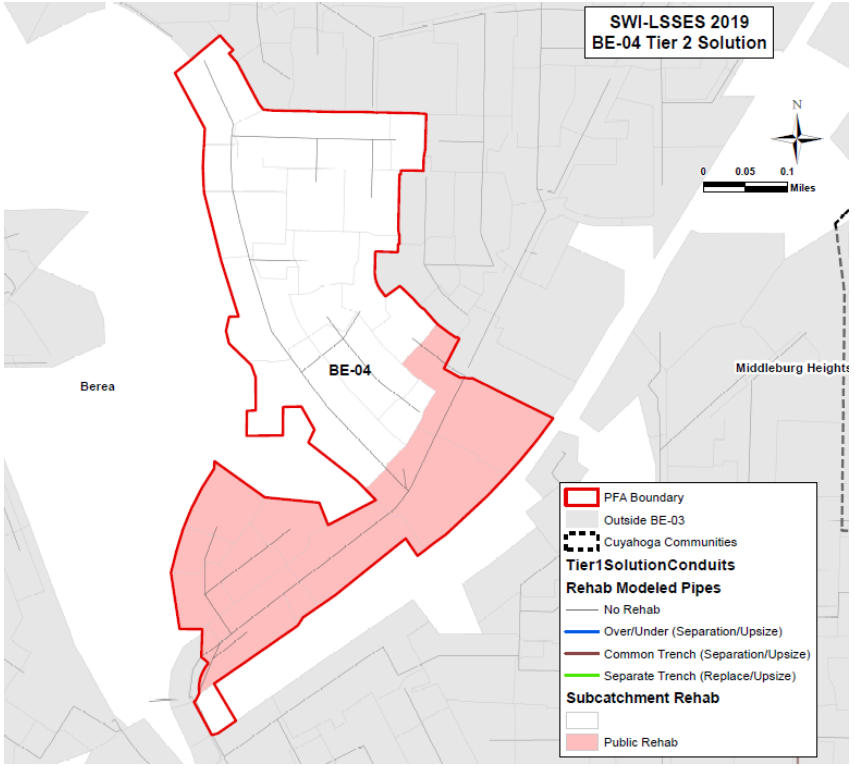


Model Profile Highlighted Green

BE-04

Tier 2 Model-Predicted BBUs and I/I

- Public rehab of all subcatchments with >50,000 GPAD

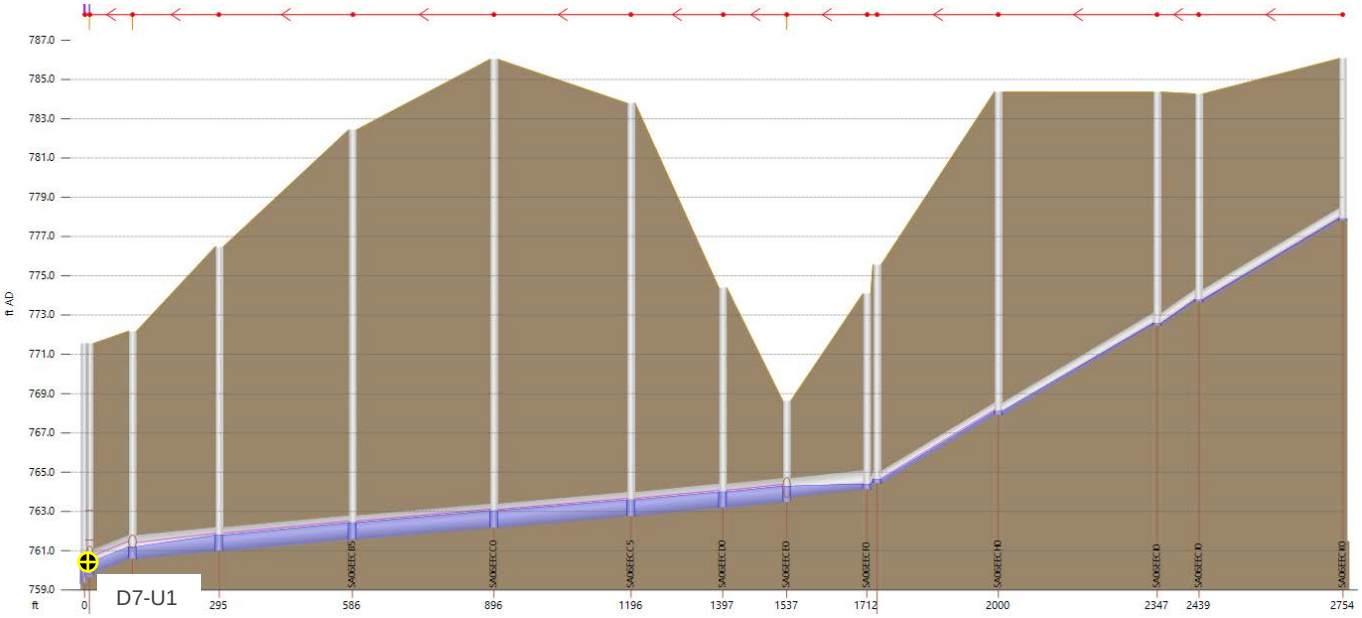


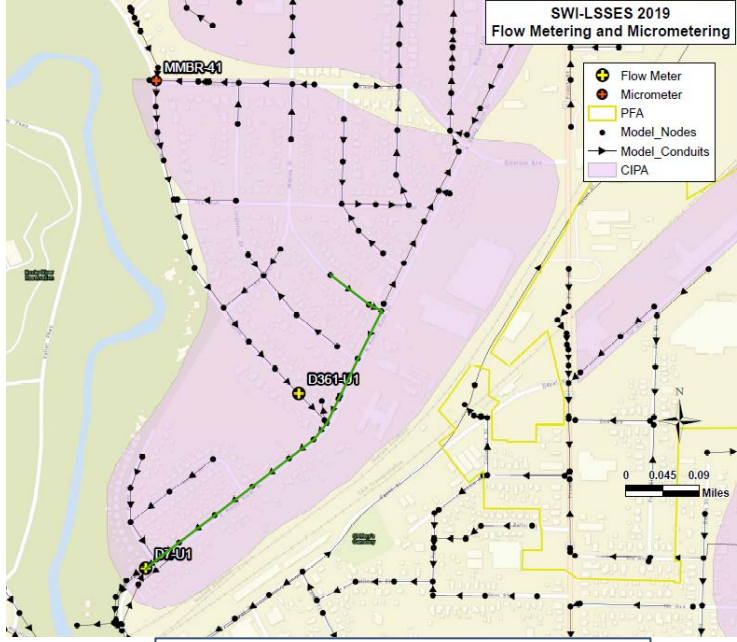
NEORSD Branch	PFL Area	Catchment ID	Alternative		Summary										Planning Costs, $ AACE Class 5
			Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
SWI2019	BE-04	ALL	Tier 2 Solution		0	0	0	0	6206	0	0	0	0	0	$ 2,077,668

BE-04

Tier 2 Model Profiles

- Tier 2 Solution Profile
  - **BBU is resolved**

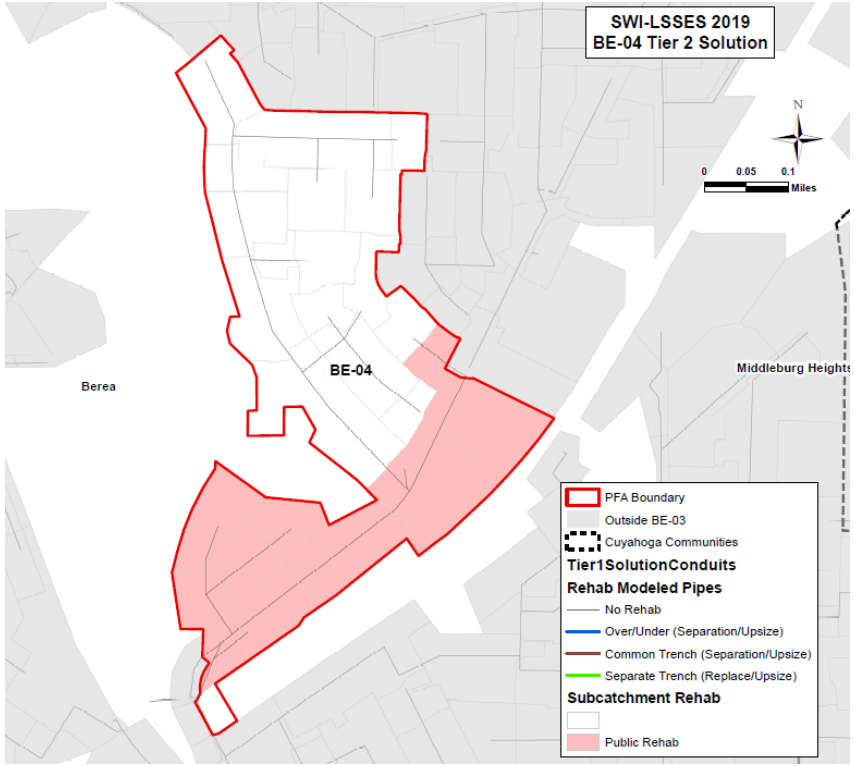




Model Profile Highlighted Green

BE-04

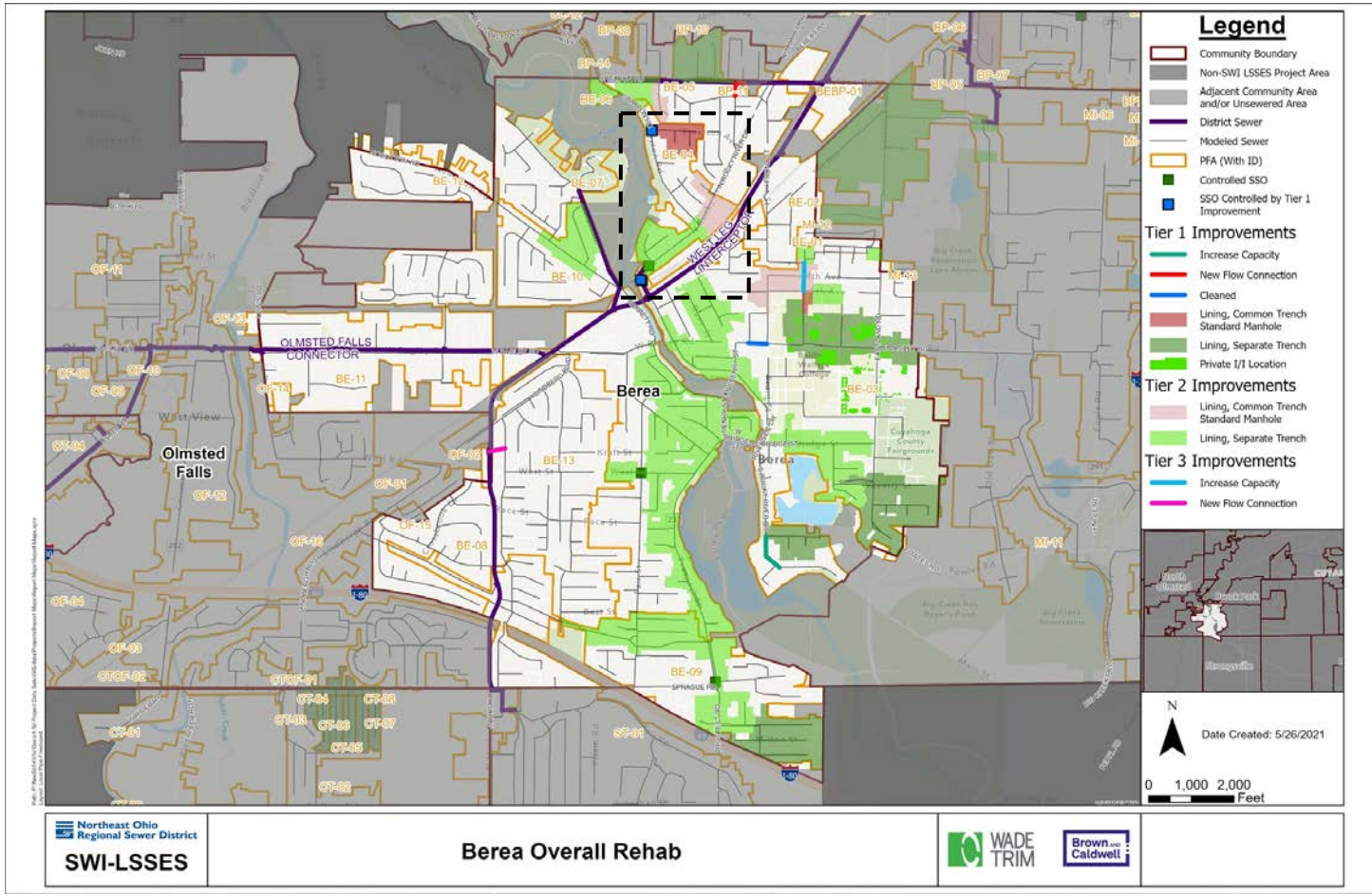
- Final Tier 2 Solution
  - **Line all subcatchments with > 50,000 GPAD**
    - *6,206 ft of sewer*
    - *Construction cost of $2,077,668*
  - **BBU is resolved**



NEORSD Branch	PFL Area	Catchment ID	Alternative		Summary										Planning Costs, $ AACE Class 5
			Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
SWI2019	BE-04	ALL	Tier 2 Solution		0	0	0	0	6206	0	0	0	0	0	$ 2,077,668

BE-04 Final

- Final recommendation after refinement
- Tier 1
  - Common trench rehab = 2,464 LF
  - Total cost = $1,447,000
- Tier 2
  - Common trench rehab = 1,429 LF
  - Separate trench rehab = 4,274 LF
  - Total cost = $3,216,000
- Tier 3 N/A
- Total Cost = Total Capital Cost + Contingency + Project Definition Investigation



Indicates the location of the PFA. (Map includes adjacent PFAs.)

Hazen

SWI-LSSES PFA BE-05 Optimization

BE-05

Tier 1 Optimization - Field Data

- MCIP Phase I project was completed in this PFA



Legend

Field - Calibration Meter Locations

Field - Micrometer Locations

Field - Private/Residential Dye Test Results
- Negative
- Positive Light
- Positive Rapid

Field - Infiltration Inflow Test
- Negative
- Positive

Field - Catch Basin I/I Test Results
- Negative
- Positive

Field - MACP Inspection Locations
- Complete

Field - Manhole Depth (Rim to Invert)
- Completed

Field - Smoke Test Results
- Area Drain
- Downspout
- Ground
- Cleanout
- Storm Manhole
- Storm Drain
- Sanitary Manhole
- No Smoke From Vent
- Other
- Foundation

Field Results - Rehab Recommendation Levels - Sanitary Sewers
- 1 - Monitor
- 2 - Perform Maintenance
- 3 - Stabilize Existing Sewer (Spot Repair)
- 4 - Line Existing Sewer
- 5 - Replace Existing Sewer
- Reinspect
- Other

Field - Mainline Sewer Dye Test Results

I/I Score
- >50
- 20 - 50
- <20
- Passed

Field - Sewers with FOG Buildup

Field - Sewers with Debris Buildup

Field - Sewers with Root Intrusion

Basemap Data - Past Rehab Locations (Source: CCDPW)

Basemap Data - Modeled Local Sewers

Basemap Data - Modeled District Interceptors

Basemap Data - MCIP Project Locations
- 2017
- 2018
- 2019

Basemap Data - Past Rehab Projects (Other)

Basemap Data - SWI Problem Areas
- Basement Backup Locations
- Current/Previous Project
- Failing Septic Tanks
- Illicit Discharge Location
- Surface Flooding

Basemap Data - Model Study Areas
- 2018 SWI Model Area
- 2019 SWI Model Area

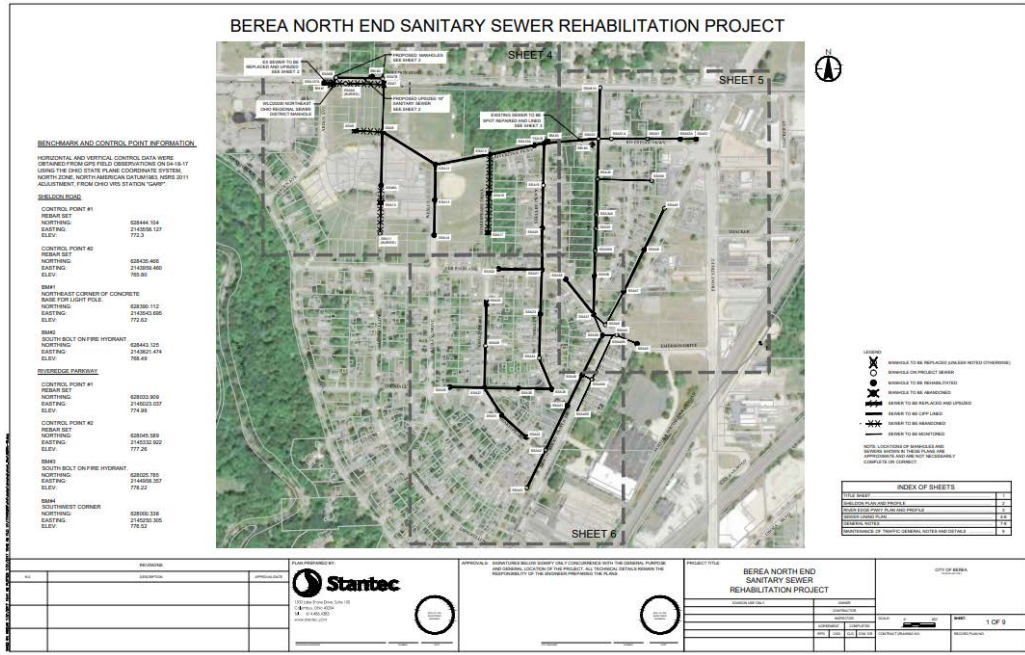
Basemap Data - Peak Flow Areas

Basemap Data - Community Boundaries

BE-05

Tier 1 Optimization – MCIP Phase I Project

- MCIP Phase I called for lining for many pipes in this PFA
- Alternatives 1 & 2 call for sewer separation of pipes that were lined. For these alternatives:
  - **For the subcatchment that corresponds to the sewer separation pipes, contributing area is reduced to 20k GPAD**
- Alternatives 2 & 3 call for lining of the remaining unlined pipes in BR-17 metershed. For these alternatives:
  - **Public lining area reduction is included for all subcatchments in the metershed, including those previously lined. The assumption is that the whole metershed has now been lined and contributing areas can be reduced to their rehabbed values**
  - **Costing is calculated for only the pipes outside of the MCIP Phase I area. The assumption is that the previously lined pipes do not need to be lined again**



BE-05

Optimization – Trench Type

- Mostly Common Trench

Legend

Basemap Data - Sewer Construction Types

- Separate Trench
- Common Trench

Basemap Data - Modeled Local Sewers

Basemap Data - Modeled District Interceptors

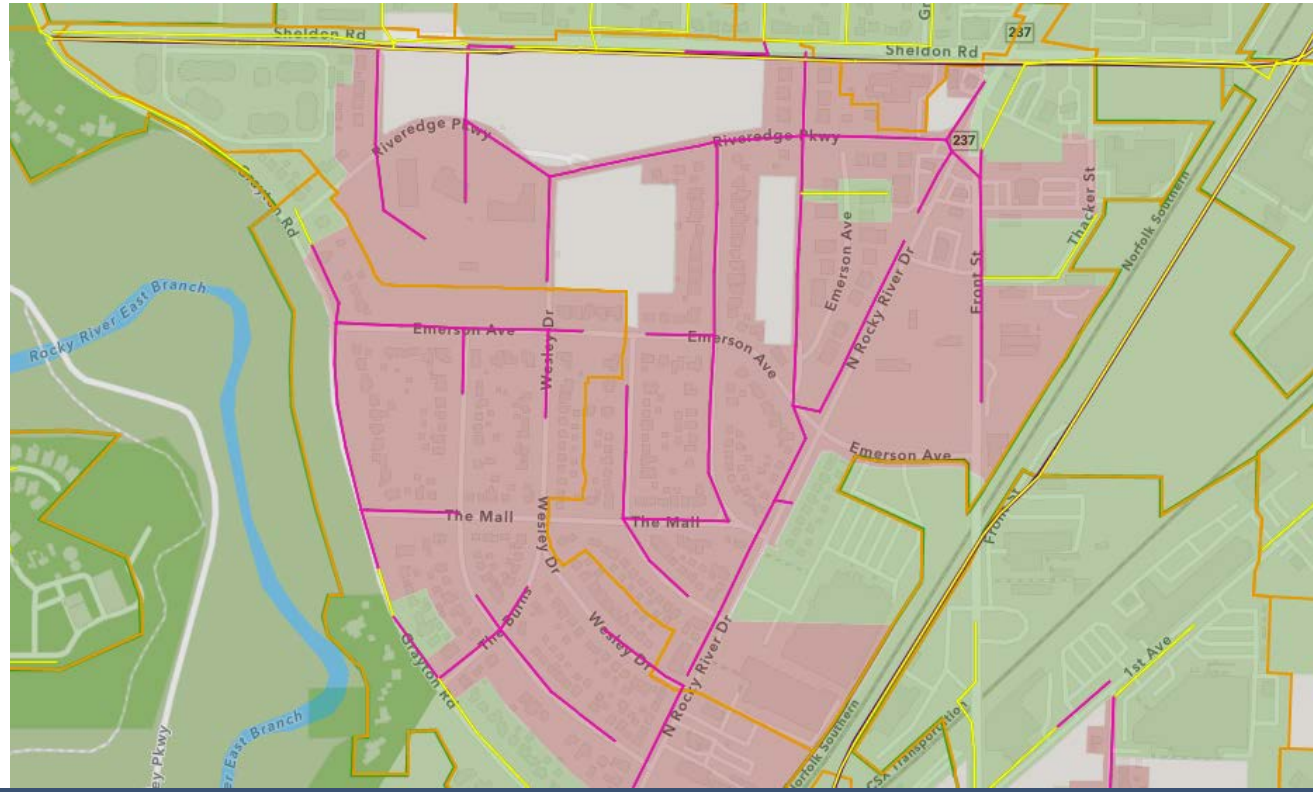
Model - PFA Boundaries

Basemap Data - Sewer Construction Trench Type Areas

- Sewered - Combined Sewer
- Sewered - Common Trench Standard Manhole
- Sewered - Common Trench Over/Under
- Sewered - Separate Trench
- Non-Sewered - Septic/HSTS Parcel
- Non-Sewered - Non-Sewered Area

Basemap Data - Model Study Areas

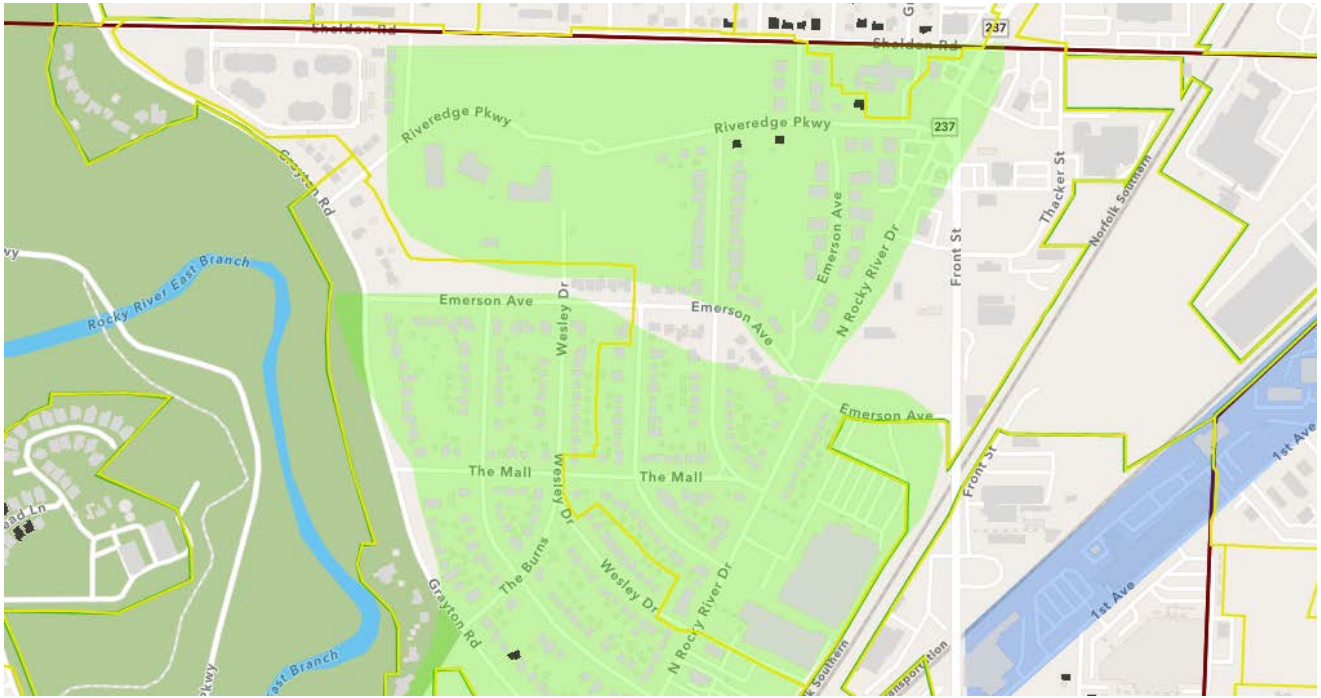
- 2018 SWI Model Area
- 2019 SWI Model Area



BE-05

Base Model for Optimization BBUs

- Three BBUs



Legend

Model - PFA Boundaries

Model - Model Predicted BBUs (5Yr Max)

- No BBU
- BBU

Basemap Data - SWI Problem Areas

- Basement Backup Locations
- Current/Previous Project
- Failing Septic Tanks
- Illicit Discharge Location
- Surface Flooding

Basemap Data - Model Study Areas

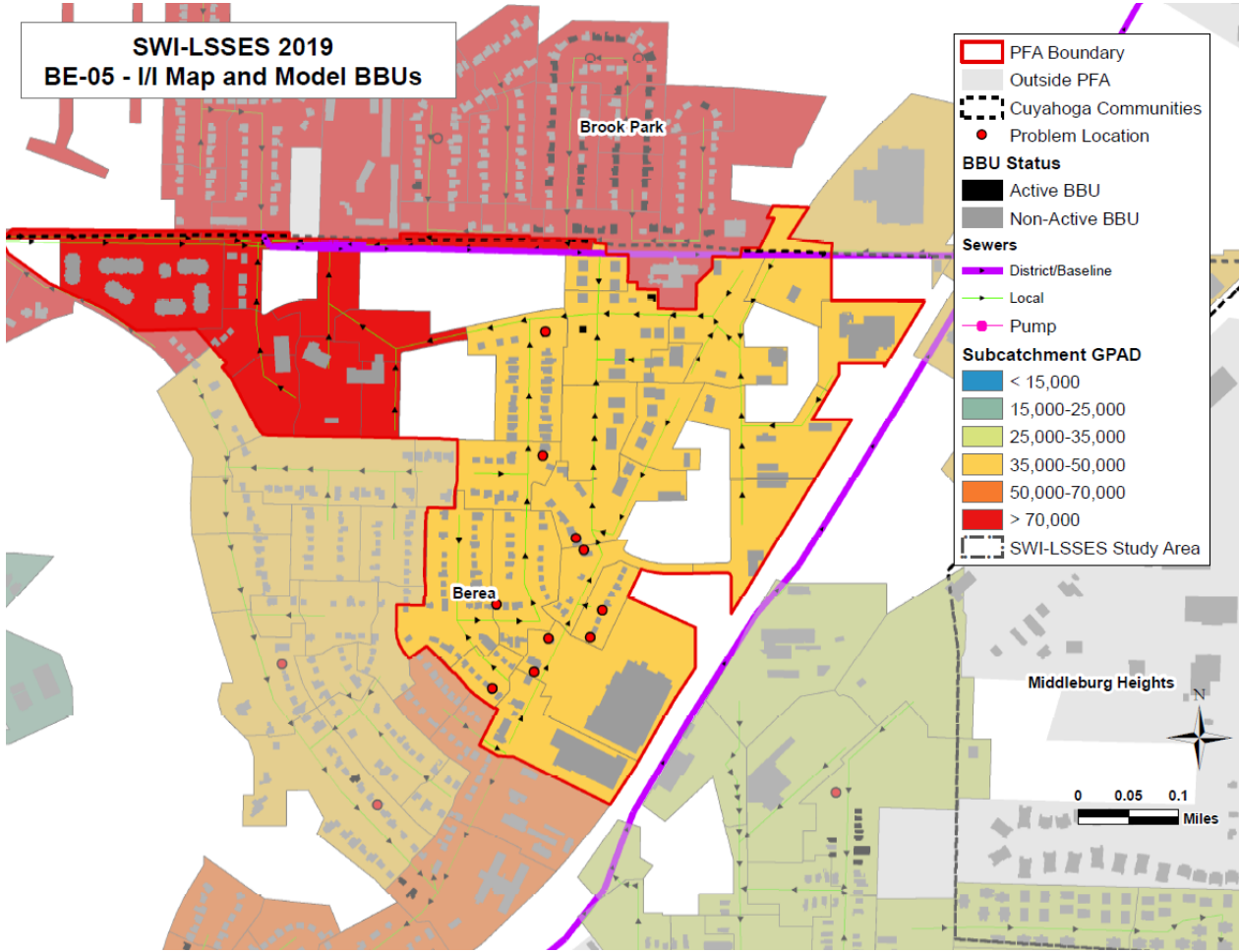
- 2018 SWI Model Area
- 2019 SWI Model Area

Basemap Data - Community Boundaries

BE-05

Model Predicted BBUs and I/I

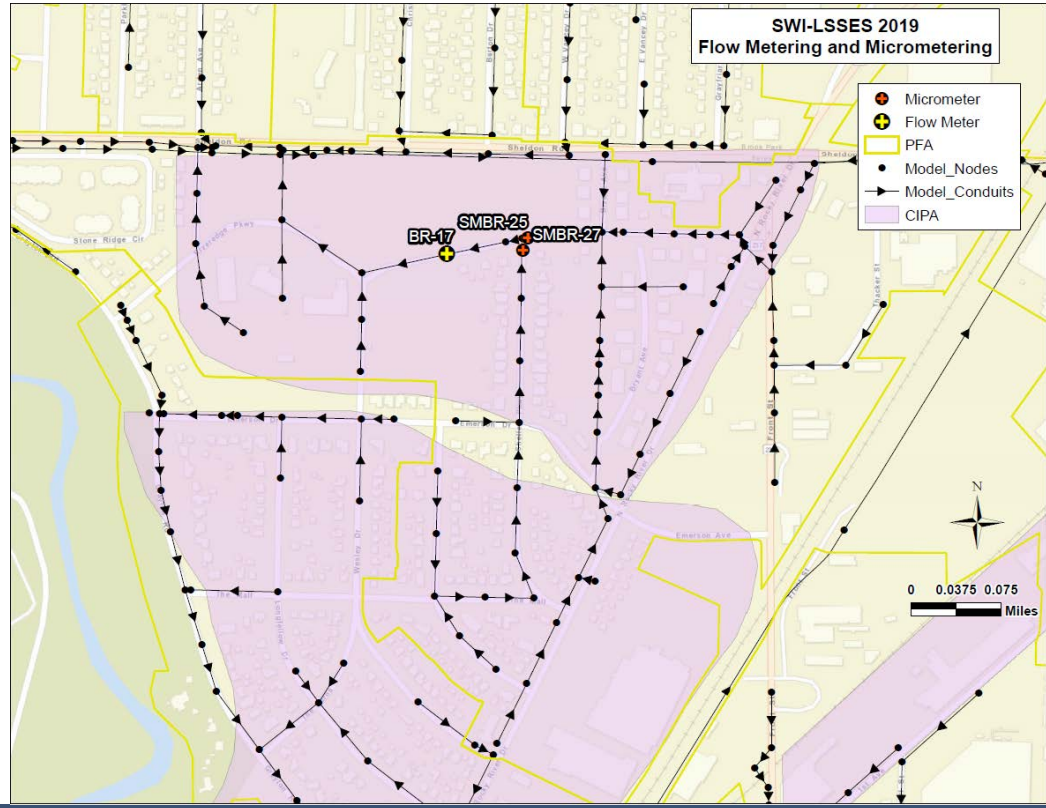
- 39,000 GPAD I/I upstream of BBU locations (BR-17 metershed)
- High I/I in WLC-1 metershed
- Several problem locations
  - All of them are from the 5/15/2020 storm, which was 10-year, 2-hr event
  - One problem location matches a model-predicted BBU
- No SSOs



BE-05 – BR-17

Micrometer Data

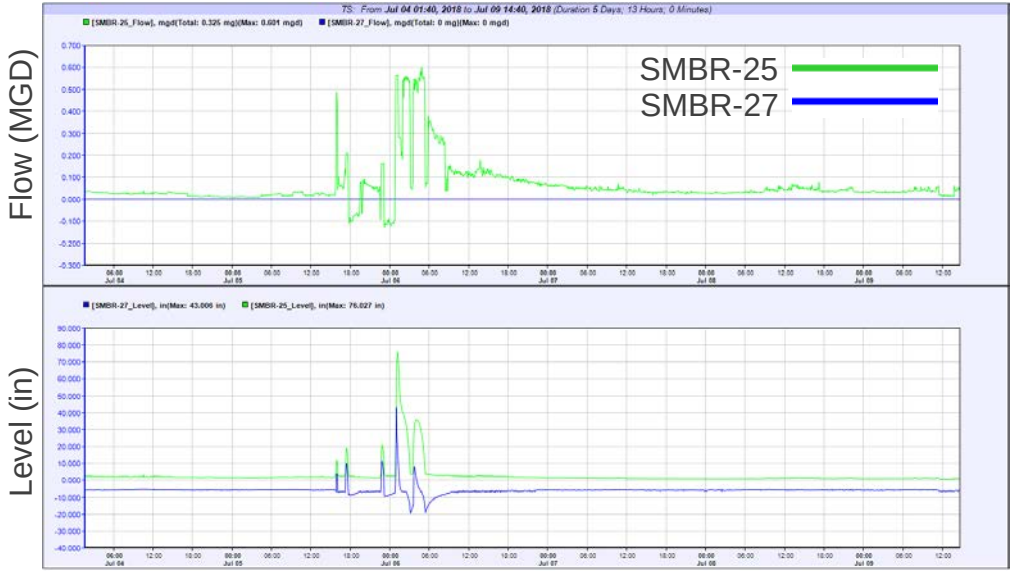
- Micrometer data was collected during the flow monitoring period and was used in calibration



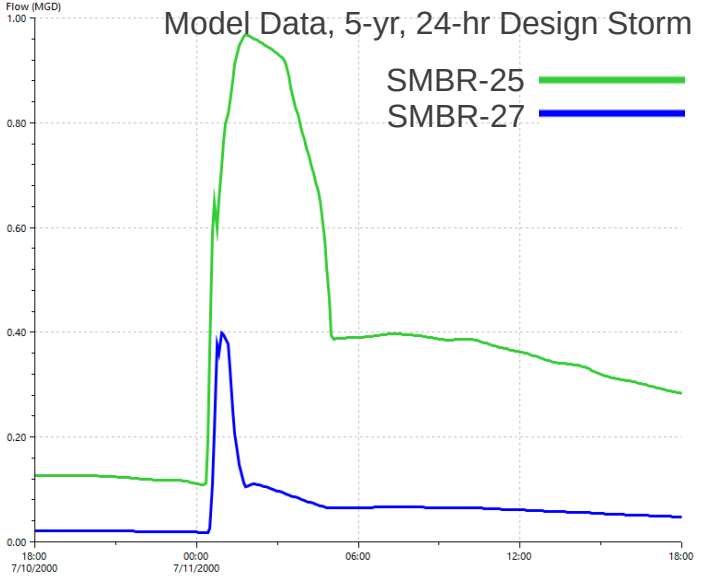
BE-05 – BR-17

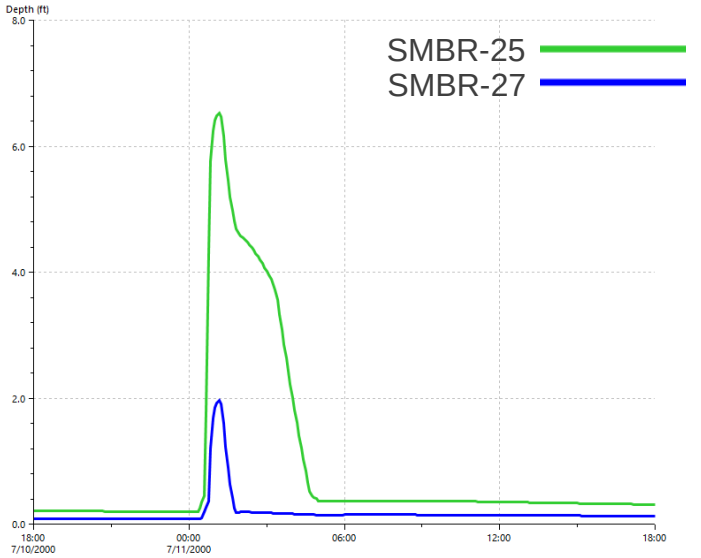
Micrometer Data

Observed Data, 7/5/2018 Event



Model Data, 5-yr, 24-hr Design Storm





- Data for SMBR-27 is suspect
  - **Flow is zero and level goes negative**
- Surcharge is shown at SMBR-25 in both model and meter data

BE-05

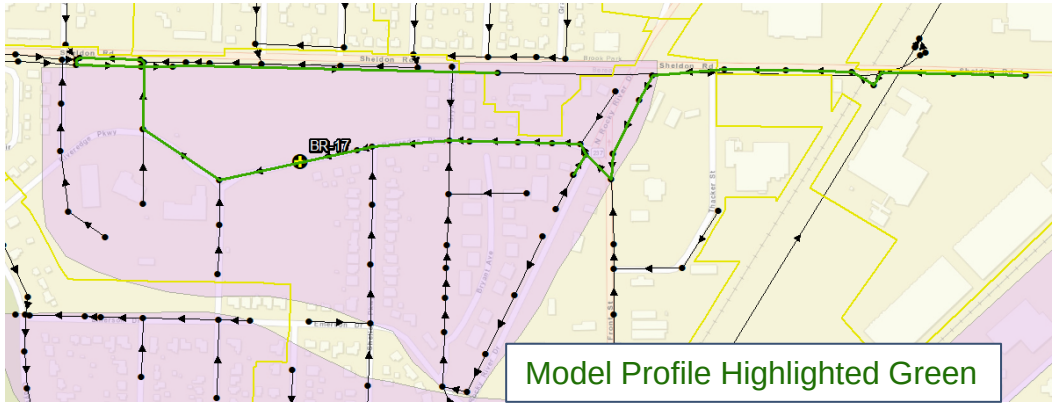
Micrometering

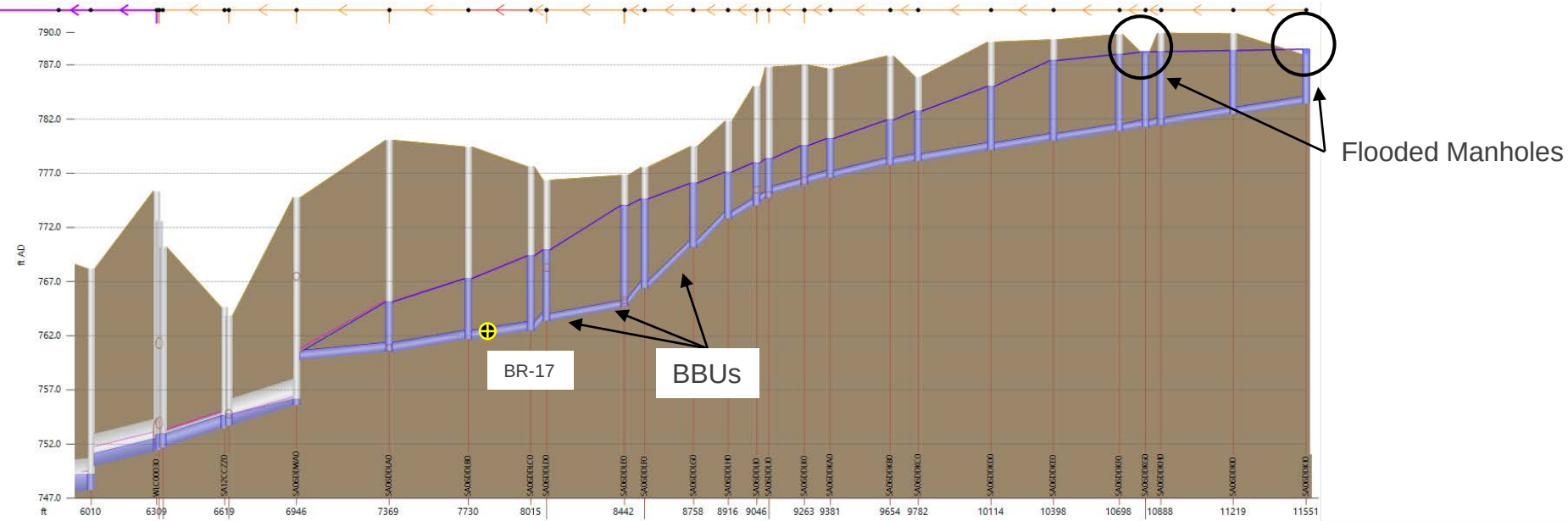
- Conclusions
  - **No evidence to show that the model flows should be redistributed**
    - *Quality meter data not available for SMBR-27. Therefore, a useful comparison of micrometer flows was not possible*
  - **No evidence to show that the model level calibration should be adjusted**
    - *Surcharge at SMBR-25shows a reasonable match between the model and the micrometer data*

BE-05

5-Year Model Design Storm Profile

- Model
  - Surcharge caused by undercapacity sewer
  - Two flooded manholes





BE-05

Flooded Manholes

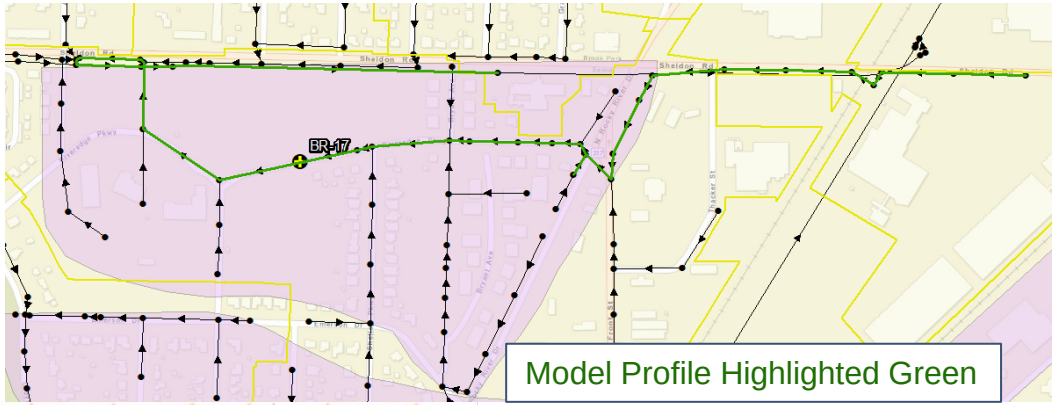
- The two flooded manholes are at the upstream end of an 8-inch sewer
  - **No field data or problem locations in this area**
- There is a 20-acre subcatchment (BR-17_001) loaded to this sewer
  - **Contains three commercial buildings**
  - **Likely loading an inordinate amount of I/I due to it's large area**
- In order to achieve a more realistic flow distribution:
  - **Contributing area for BR-17_001 was reduced to 10k GPAD**
  - **Contributing area for all other subcatchments in the metershed was increased to compensate**



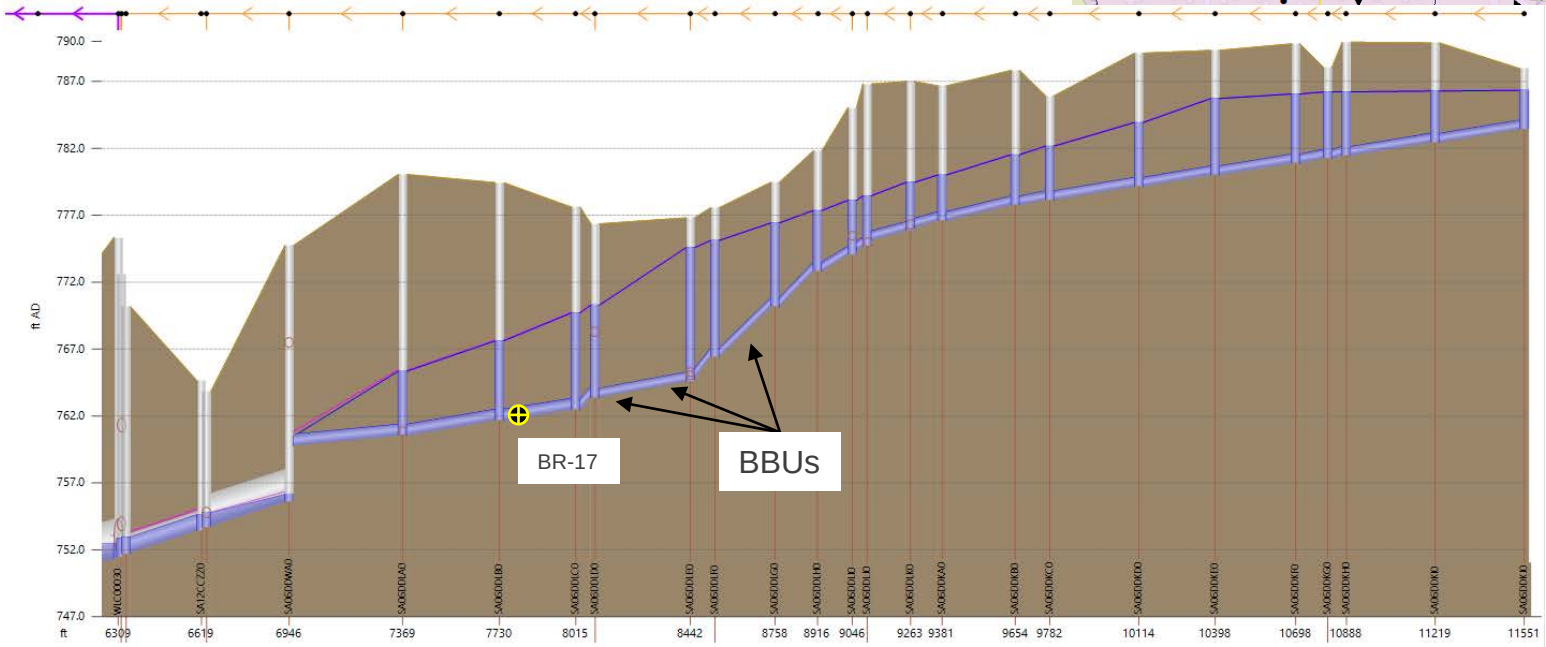
BE-05

5-Year Model Design Storm Profile

- Refined Model
  - Surcharge caused by under-capacity sewer
  - No flooded manholes



Model Profile Highlighted Green

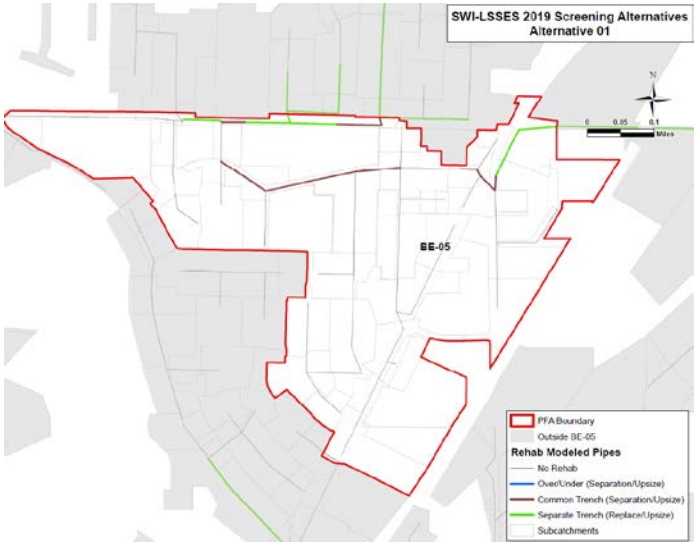


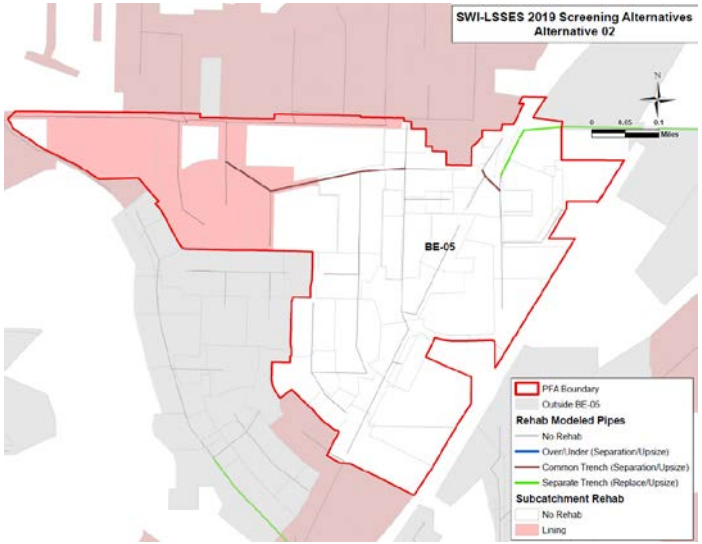
BE-05

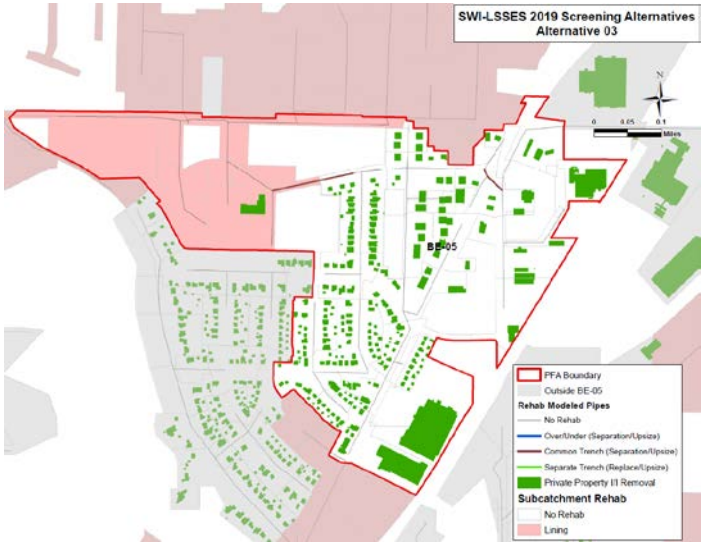
Screening Alternatives Provided

All alternatives' costs are within 30% of each other

NEORSD Branch	PFL Area	Catchment ID	Alternative		Summary										Planning Costs, $ AACE Class 5
			Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
SWI2019	BE-05	ALL	A1		6,387	0	0	0	0	0	0	0	0	0	$ 6,472,288.00
SWI2019	BE-05	ALL	A2		4,380	0	0	0	5,301	0	0	0	0	0	$ 5,791,638.00
SWI2019	BE-05	ALL	A3		2,021	0	0	0	5,723	0	0	0	157	0	$ 5,275,122.00





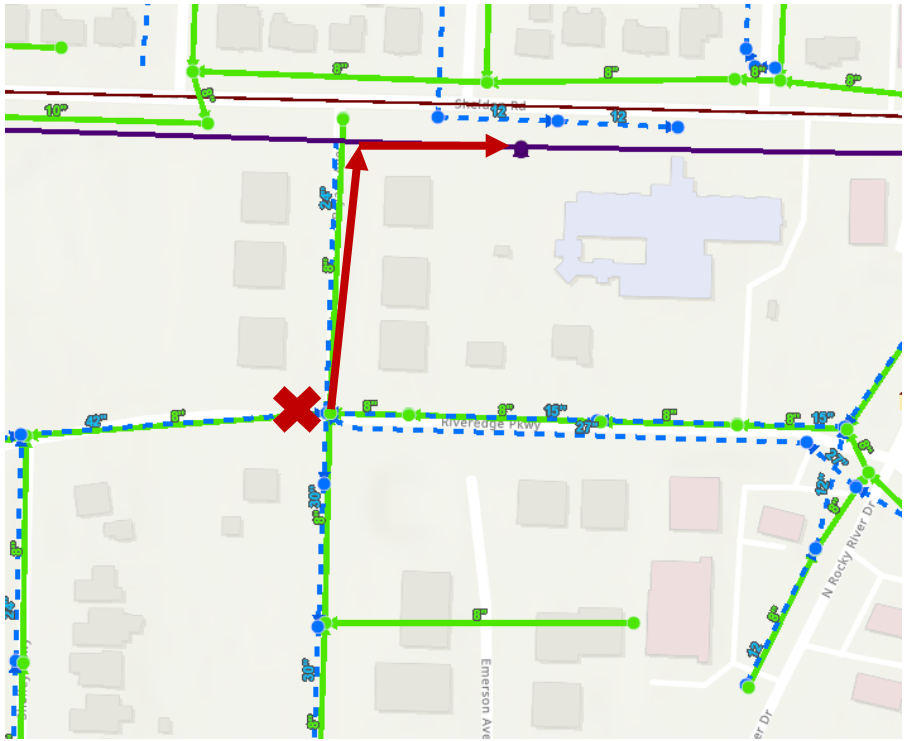


BE-05

Direct Connection

- Connection to district sewer
  - From SA06DDLE0 to WLC00015
  - Includes 508 LF of 18-inch sewer
- Disconnect existing downstream pipe from SA06DDLE0

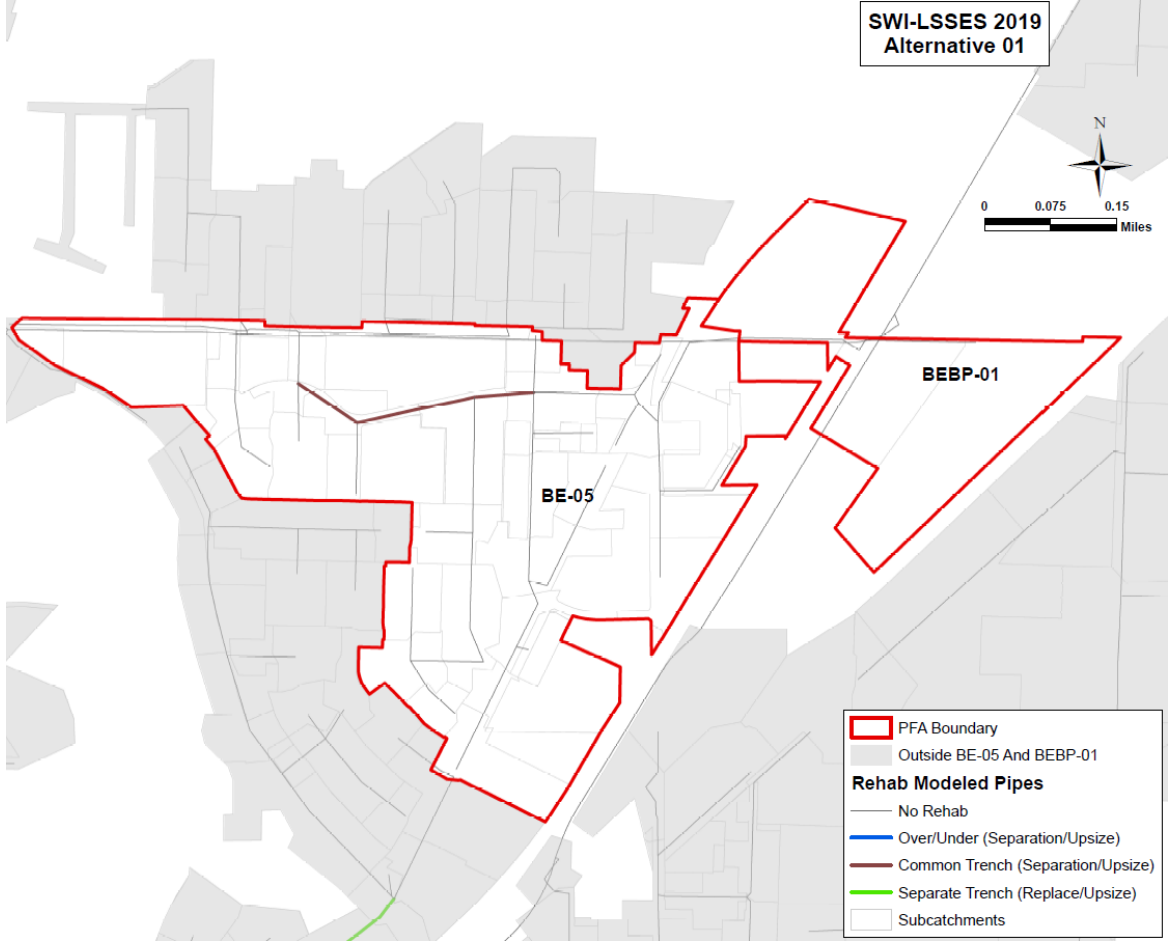




BE-05

Refined Alternatives

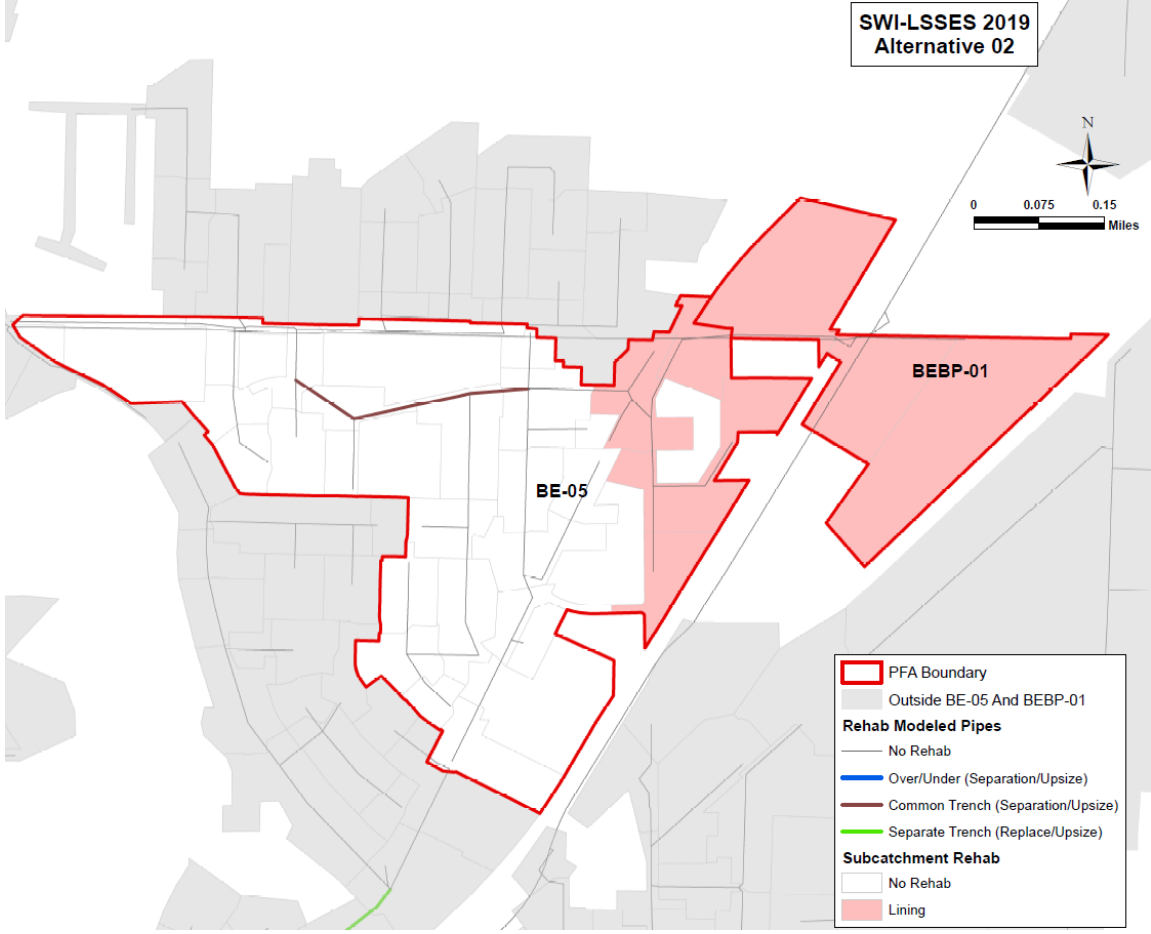
- Alternative 1 Refined
  - 3,239 ft of sewer separation



BE-05

Refined Alternatives

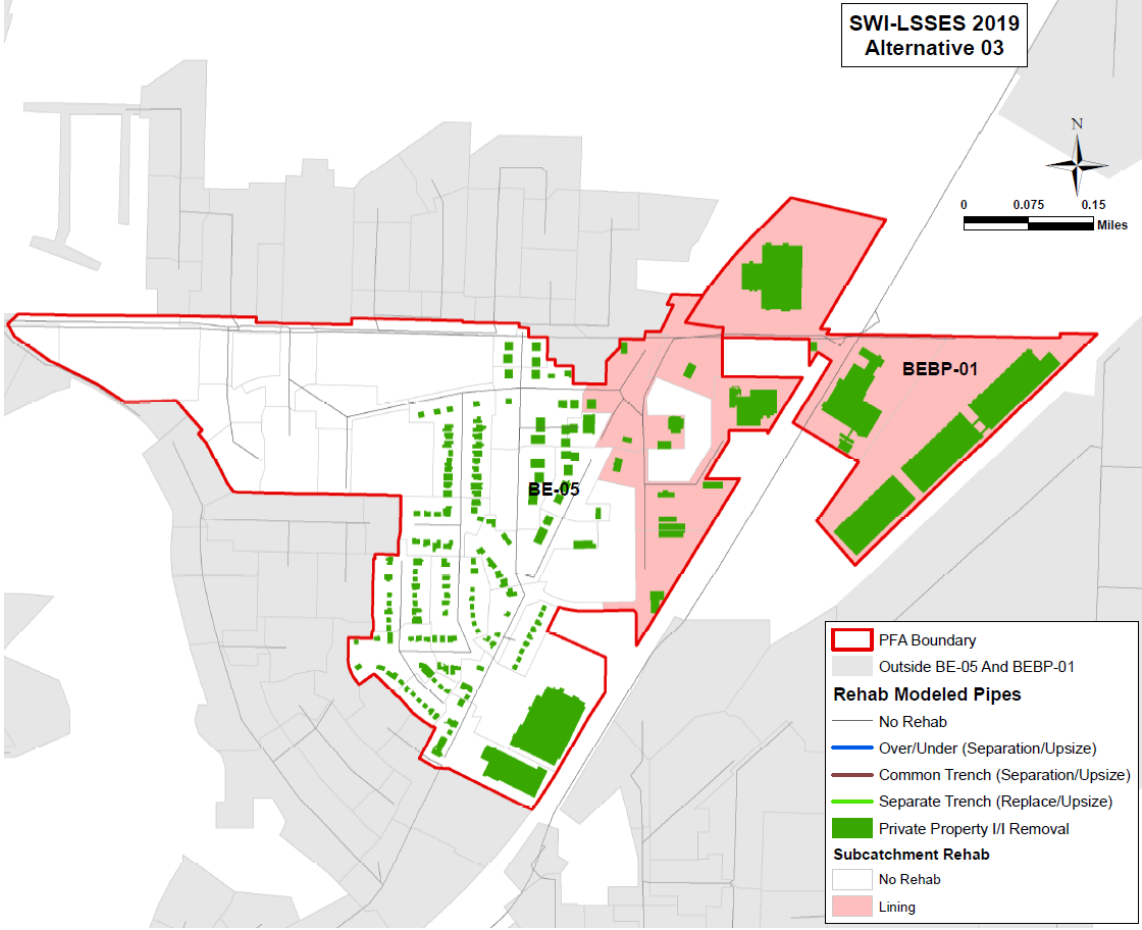
- Alternative 2 Refined
  - **Public rehab for pipes in BR-17 metershed that weren't included in Phase I MCIP**
    - *Contributing area was reduced for all subcatchments in metershed*
    - *Only the pipes in the highlighted subcatchments were costed*
  - **Requires same replacements as Alternative 1 (although sizes of new pipes are smaller in some cases)**
  - **Public rehab of BEBP-01 was also included**



BE-05

Refined Alternatives

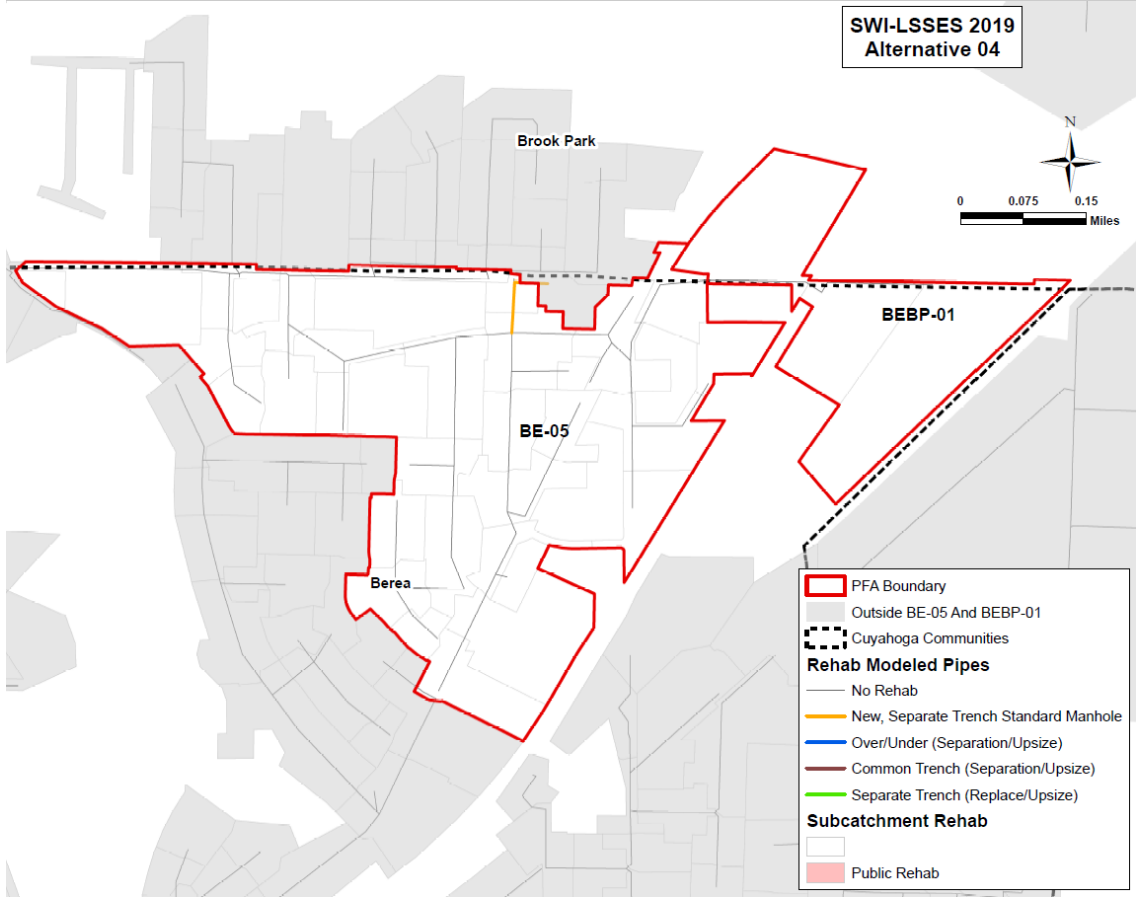
- Alternative 3 Refined
  - **Public rehab for pipes that weren't included in Phase I MCIP**
    - *Only the pipes in the highlighted subcatchments were costed*
  - **Private rehab for all buildings in BR-17 metershed**
    - *Contributing area was reduced for all subcatchments in metershed*
    - *All rehabbed buildings were costed*
  - **Public rehab of BEBP-01 was also included**



BE-05

Refined Alternatives

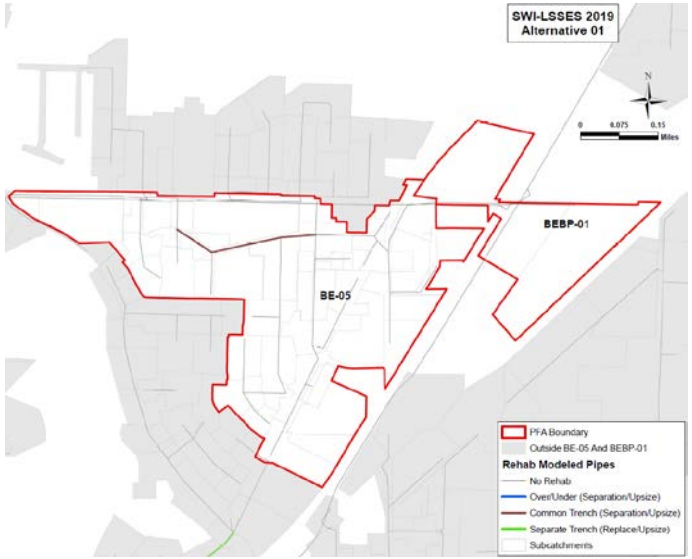
- Alternative 4
  - **Connection to district sewer**
    - *From SA06DDLE0 to WLC00015*
    - *Includes 508 LF of 18-inch sewer*
    - *Bulkheads existing sewer and adds one manhole*

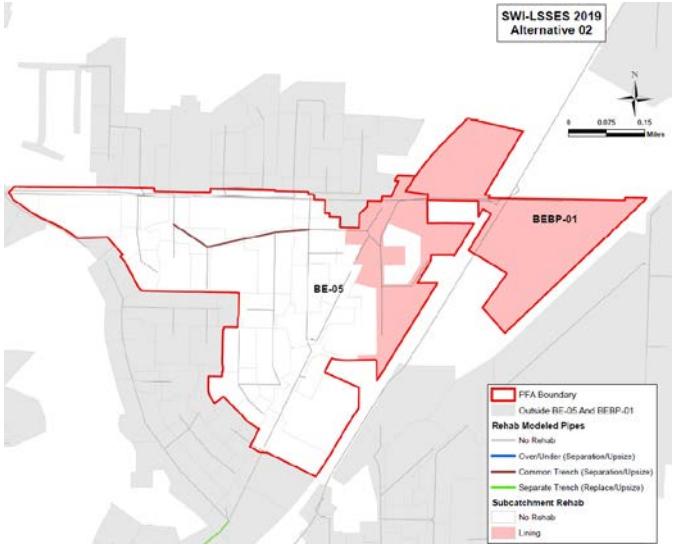


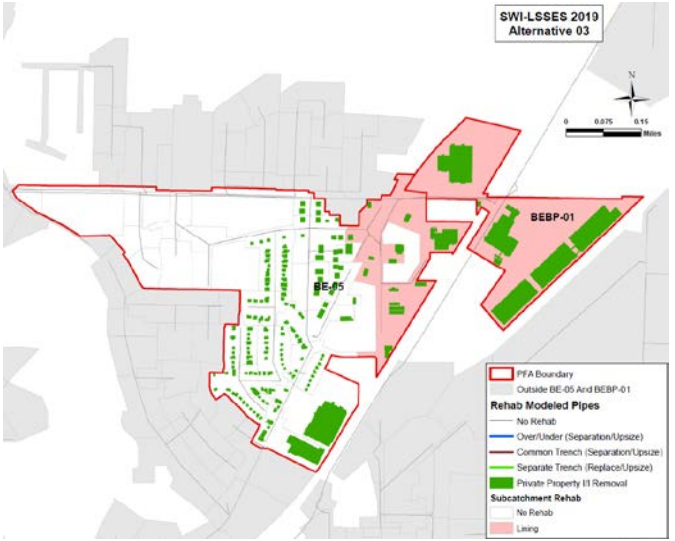
BE-05

Refined Alternatives

NEORSD Branch	PFL Area	Catchment ID	Alternative		Summary										Planning Costs, $ AACE Class 5
			Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
SWI2019	BE-05	ALL	A1		3239	0	0	0	0	0	0	0	0	0	$ 2,954,229
SWI2019	BEBP-01	ALL	A1		0	0	0	0	0	0	0	0	0	0	$ -
SWI2019	BE-05 and BEBP-01	ALL	A1		3239	0	0	0	0	0	0	0	0	0	$ 2,954,229
SWI2019	BE-05	ALL	A2		3239	0	0	0	5927	0	0	0	0	0	$ 4,797,422
SWI2019	BEBP-01	ALL	A2		0	0	0	0	1437	0	0	0	0	0	$ 457,562
SWI2019	BE-05 and BEBP-01	ALL	A2		3239	0	0	0	7364	0	0	0	0	0	$ 5,254,984
SWI2019	BE-05	ALL	A3		0	0	0	0	5927	0	0	0	156	0	$ 3,447,114
SWI2019	BEBP-01	ALL	A3		0	0	0	0	1437	0	0	0	6	0	$ 517,562
SWI2019	BE-05 and BEBP-01	ALL	A3		0	0	0	0	7364	0	0	0	162	0	$ 3,964,676
SWI2019	BE-05	ALL	A4		0	508	0	0	0	2	20000	0	0	0	$ 621,837.00
SWI2019	BEBP-01	ALL	A4		0	0	0	0	0	0	0	0	0	0	$ -
SWI2019	BE-05 and BEBP-01	ALL	A4		0	508	0	0	0	2	20000	0	0	0	$ 621,837







- Refinement of Alternatives 2 & 3 includes public rehab in BEBP-01
- Alternative 4 is shown on next slide

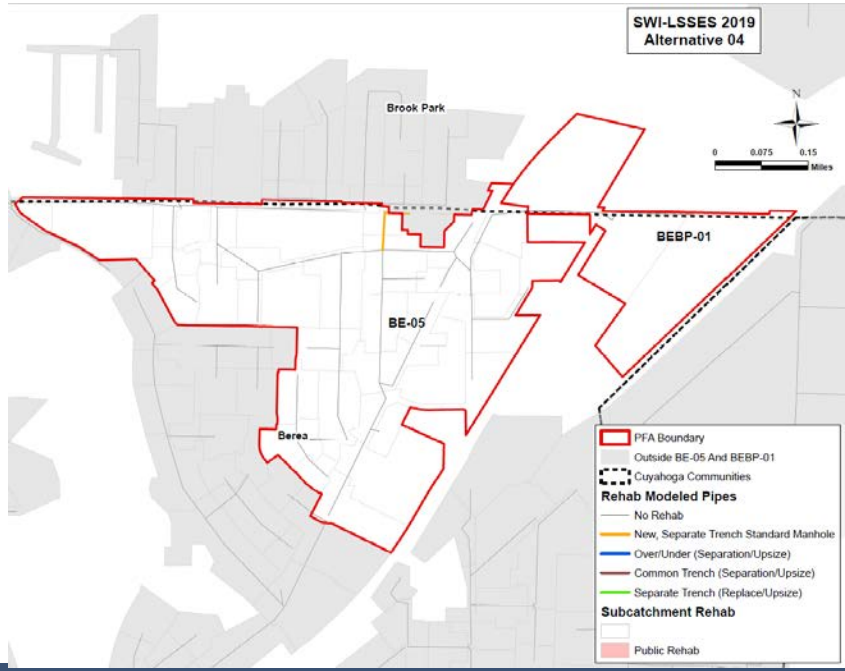
BE-05

Refined Alternatives

NEORSD Branch	PFL Area	Catchment ID	Alternative		Summary										Planning Costs, $ AACE Class 5
			Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
SWI2019	BE-05	ALL	A1		3239	0	0	0	0	0	0	0	0	0	$ 2,954,229
SWI2019	BEBP-01	ALL	A1		0	0	0	0	0	0	0	0	0	0	$ -
SWI2019	BE-05 and BEBP-01	ALL	A1		3239	0	0	0	0	0	0	0	0	0	$ 2,954,229
SWI2019	BE-05	ALL	A2		3239	0	0	0	5927	0	0	0	0	0	$ 4,797,422
SWI2019	BEBP-01	ALL	A2		0	0	0	0	1437	0	0	0	0	0	$ 457,562
SWI2019	BE-05 and BEBP-01	ALL	A2		3239	0	0	0	7364	0	0	0	0	0	$ 5,254,984
SWI2019	BE-05	ALL	A3		0	0	0	0	5927	0	0	0	156	0	$ 3,447,114
SWI2019	BEBP-01	ALL	A3		0	0	0	0	1437	0	0	0	6	0	$ 517,562
SWI2019	BE-05 and BEBP-01	ALL	A3		0	0	0	0	7364	0	0	0	162	0	$ 3,964,676
SWI2019	BE-05	ALL	A4		0	508	0	0	0	2	20000	0	0	0	$ 621,837.00
SWI2019	BEBP-01	ALL	A4		0	0	0	0	0	0	0	0	0	0	$ -
SWI2019	BE-05 and BEBP-01	ALL	A4		0	508	0	0	0	2	20000	0	0	0	$ 621,837

Alternative 4 is lowest cost

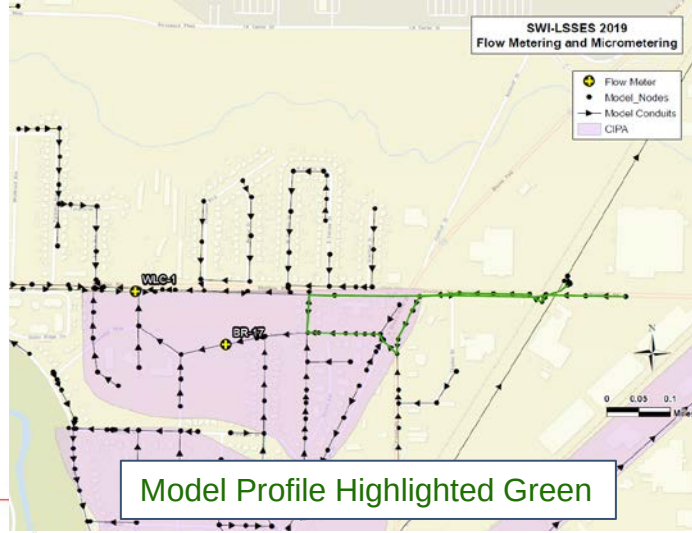
- Alternative 4 adds a new sewer that reroutes flow to the district sewer

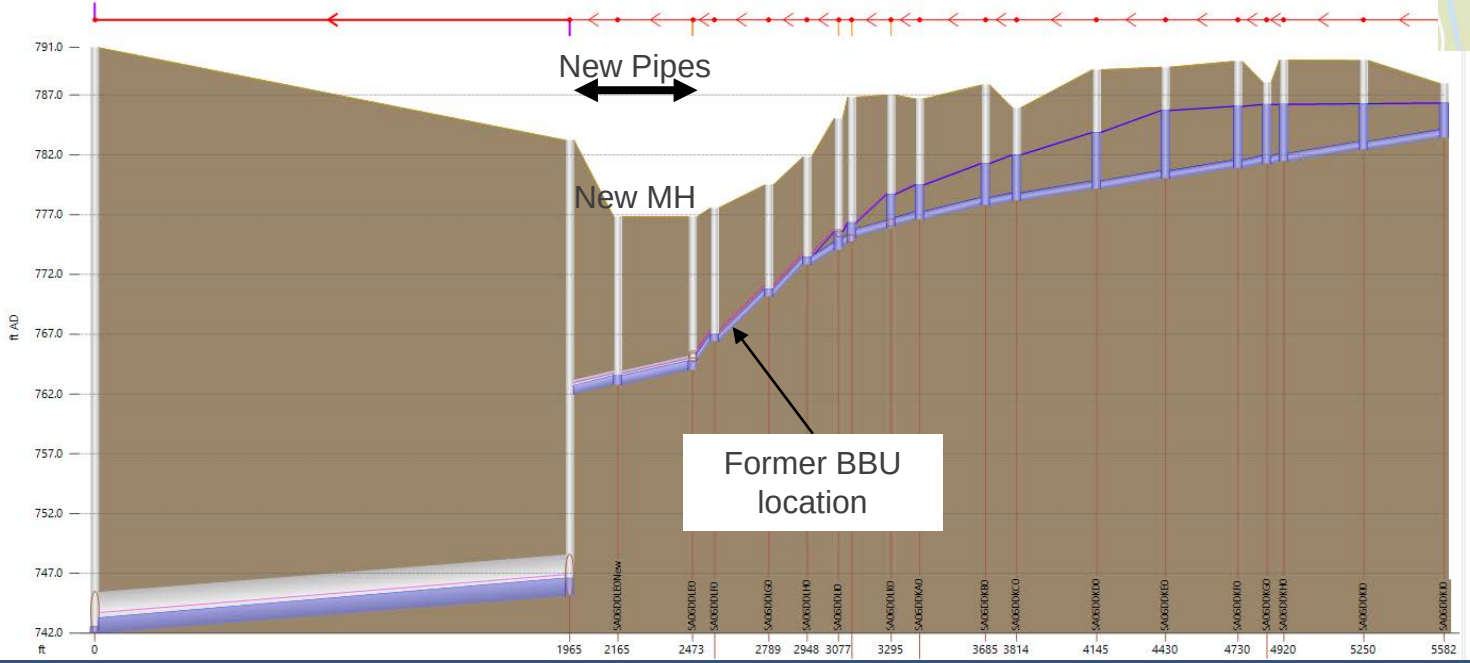


BE-05

Tier 1 Solution Profile

- BBUs are resolved

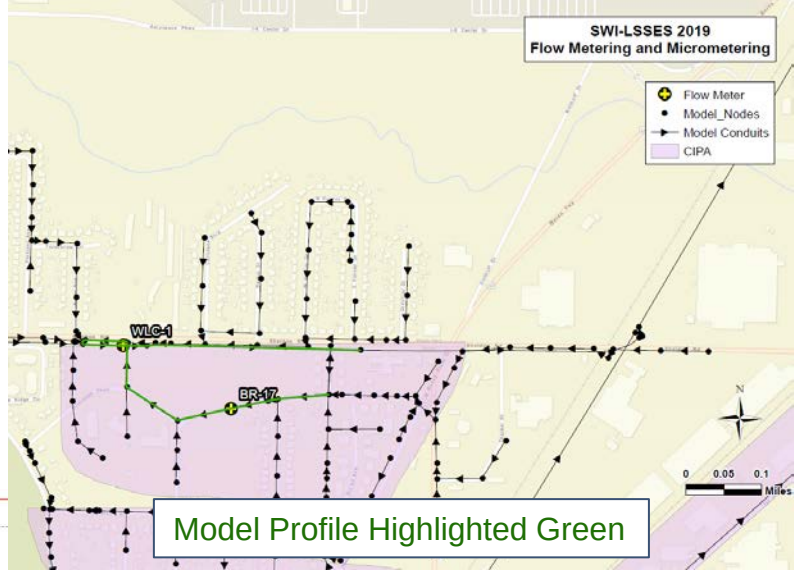


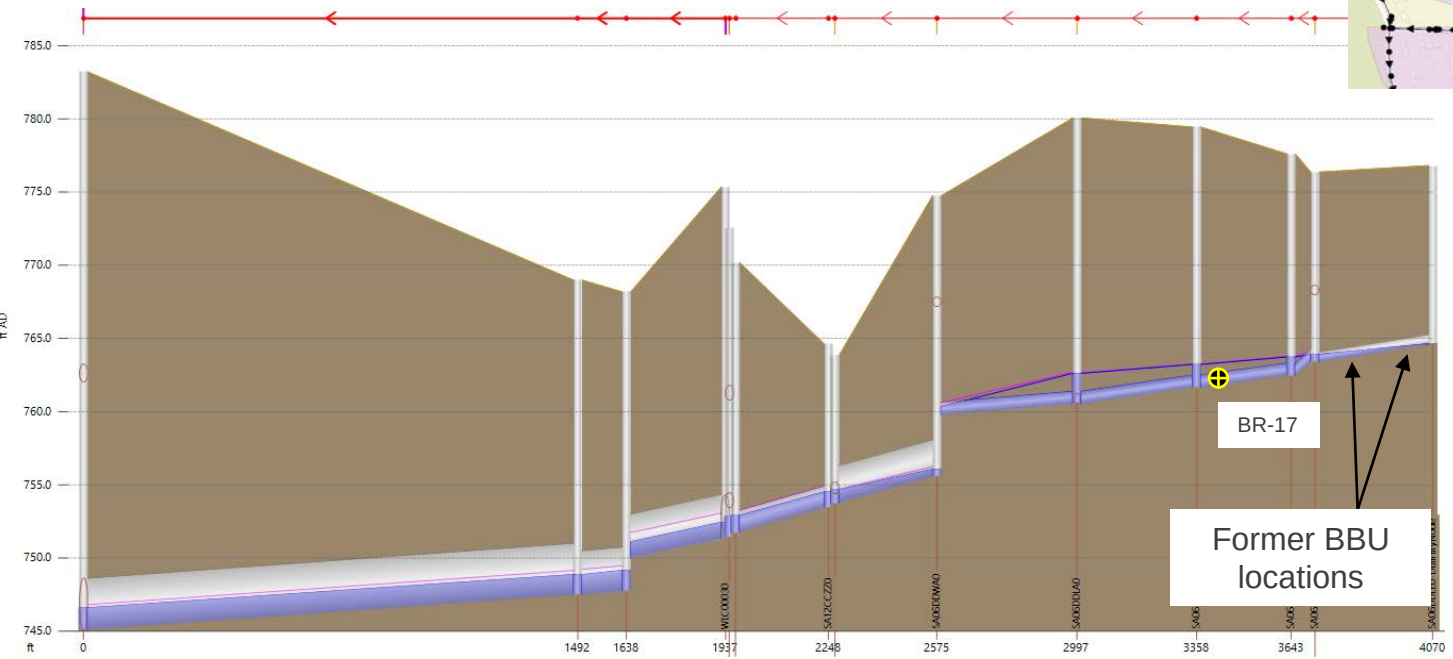


BE-05

Tier 1 Solution Profile

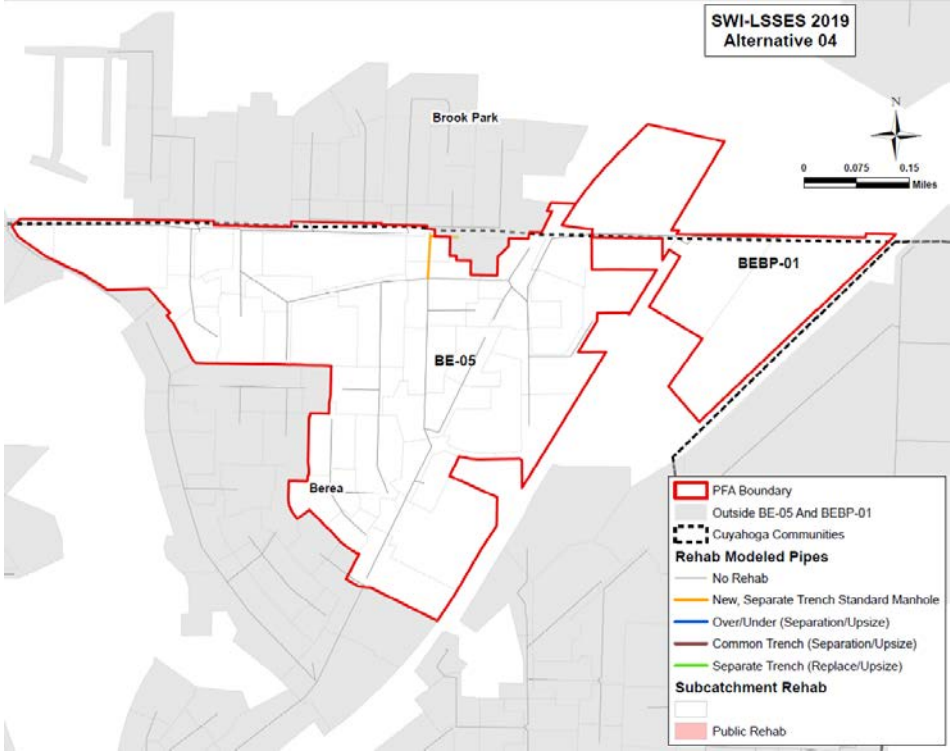
- BBUs are resolved





BE-05

- Final Tier 1 Solution
  - 508 LF of new sewer connecting to the District sewer
  - Bulkheads existing sewer
  - Adds one manhole

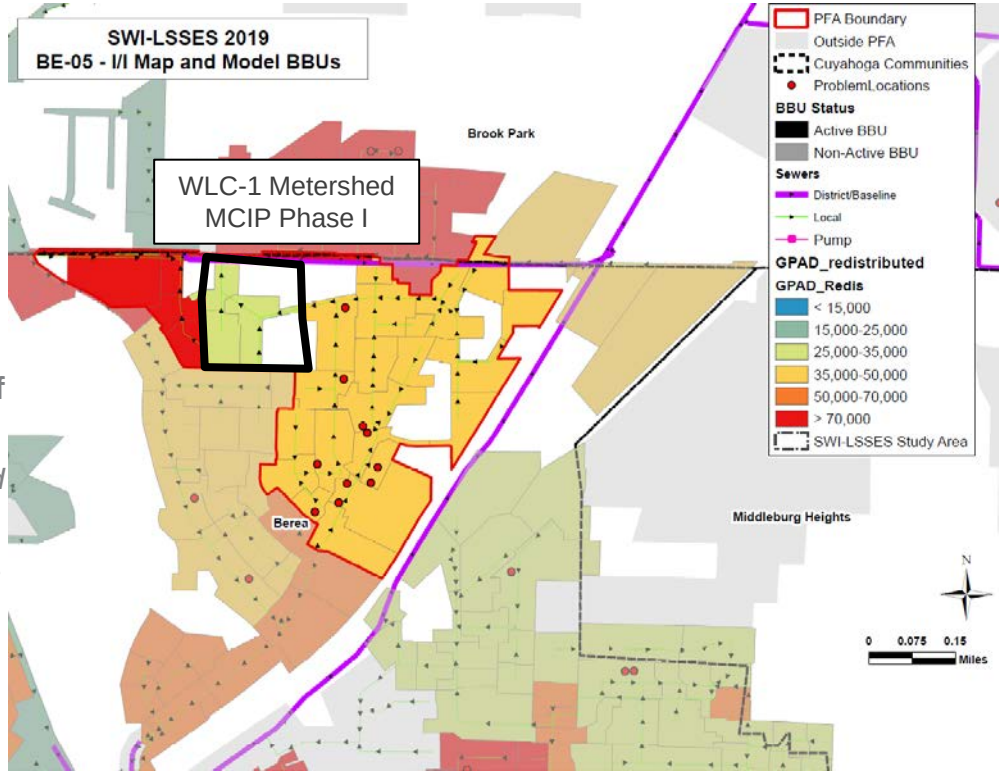


NEORSD Branch	PFL Area	Catchment ID	Alternative		Summary										Planning Costs, $ AACE Class 5
			Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
SWI2019	BE-05	ALL	A4		0	508	0	0	0	2	20000	0	0	0	$ 621,837.00
SWI2019	BEBP-01	ALL	A4		0	0	0	0	0	0	0	0	0	0	$ -
SWI2019	BE-05 and BEBP-01	ALL	A4		0	508	0	0	0	2	20000	0	0	0	$ 621,837

BE-05

Tier 2

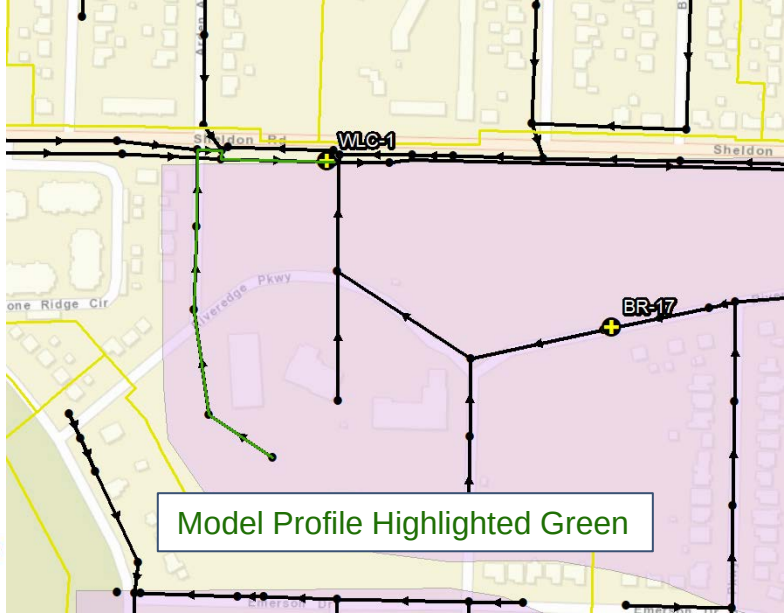
- High GPAD in the WLC-1 metershed
  - **WLC-1 flows were redistributed using micrometer data (see Tier 2 slides for PFA BE-06, BP-08, BP-10, BP-11, BP-14, CL-12 Combined)**
  - **Some pipes in the WLC-1 metershed were CIPP lined as part of MCIP Phase I**
    - *The subcatchments containing these pipes (indicated in the figure) had their RTKs adjusted so that they contribute 35k GPAD*
  - **After redistribution, the rest of the WLC-1 metershed produces 275,000 GPAD**

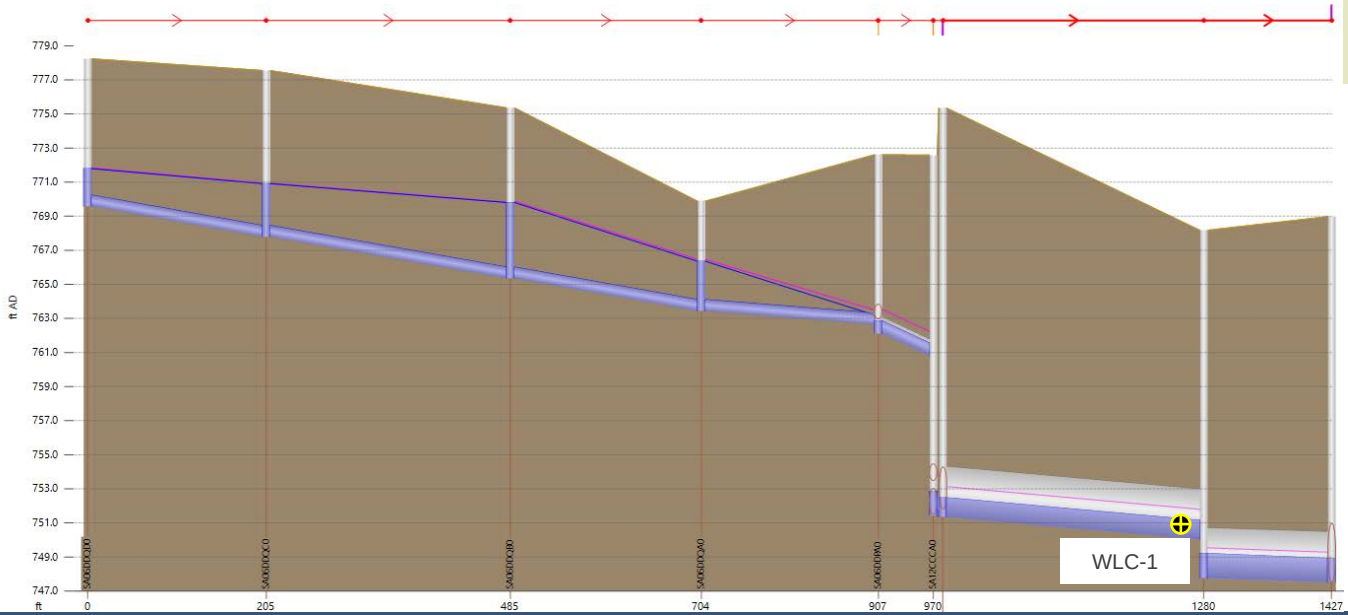


BE-05

Tier 2 Model Profiles

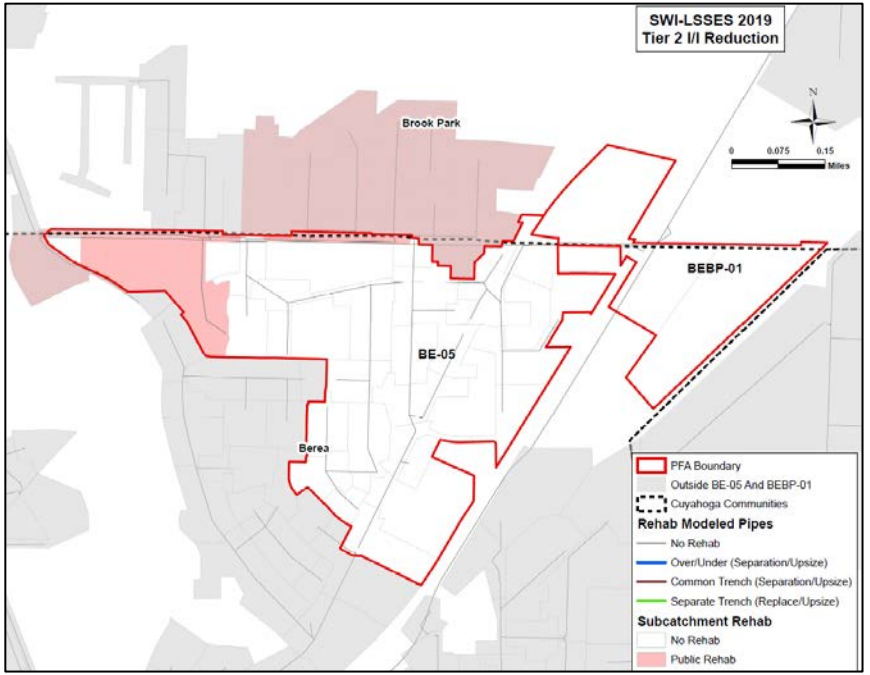
- Post-Tier 1 Profile
  - **Surcharge but no BBUs**





BE-05

- Public rehab of all subcatchments with >50,000 GPAD

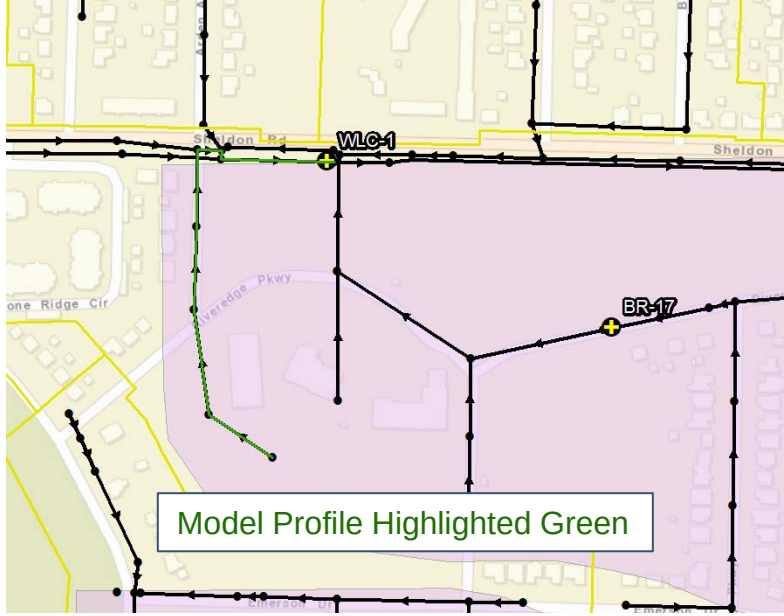


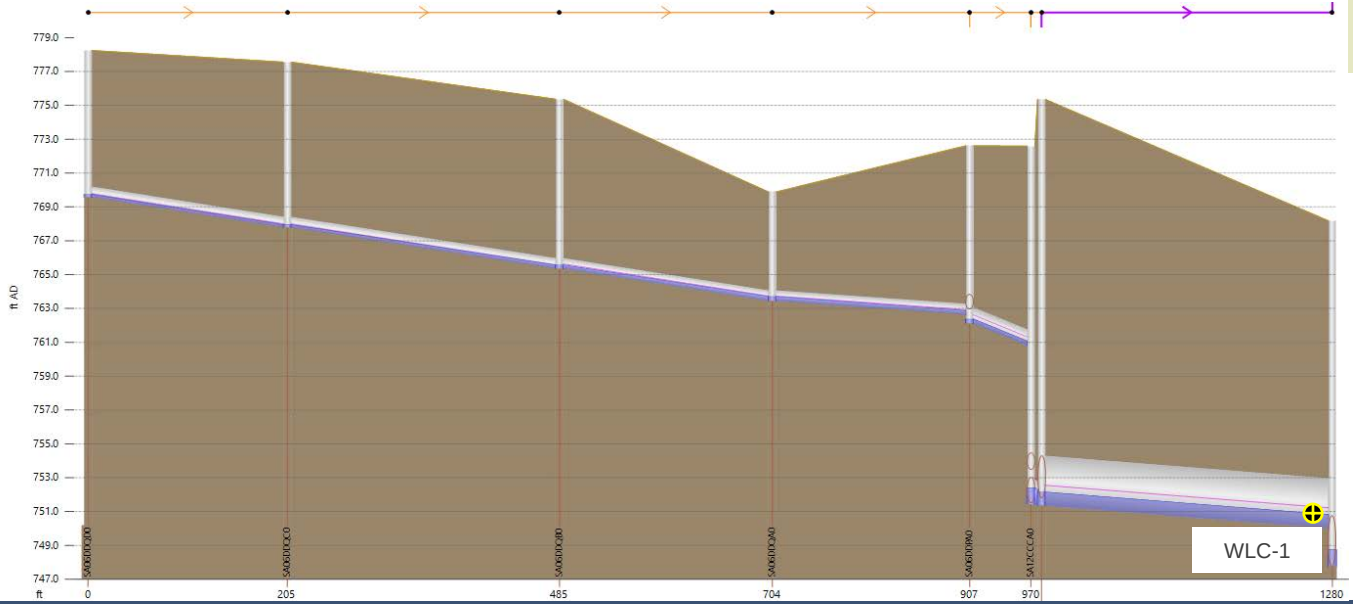
NEORSD Branch	PFL Area	Catchment ID	Alternative		Summary										Planning Costs, $ AACE Class 5
			Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
SWI2019	BE-05	ALL	Tier2Solution		0	0	0	0	3444	0	0	0	0	0	$ 1,151,475

BE-05

Tier 2 Model Profiles

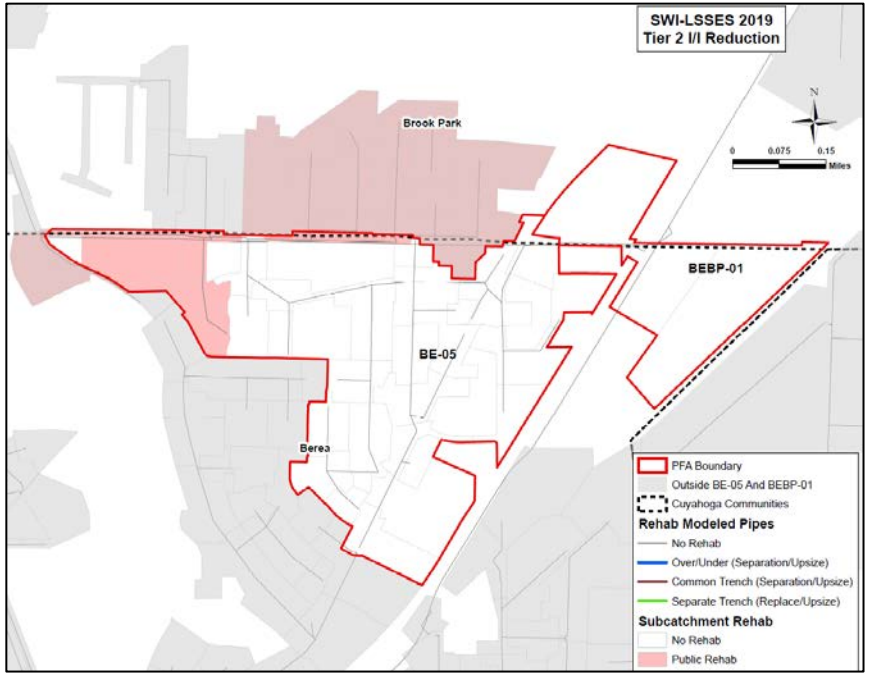
- Post-Tier 2 Profile





BE-05

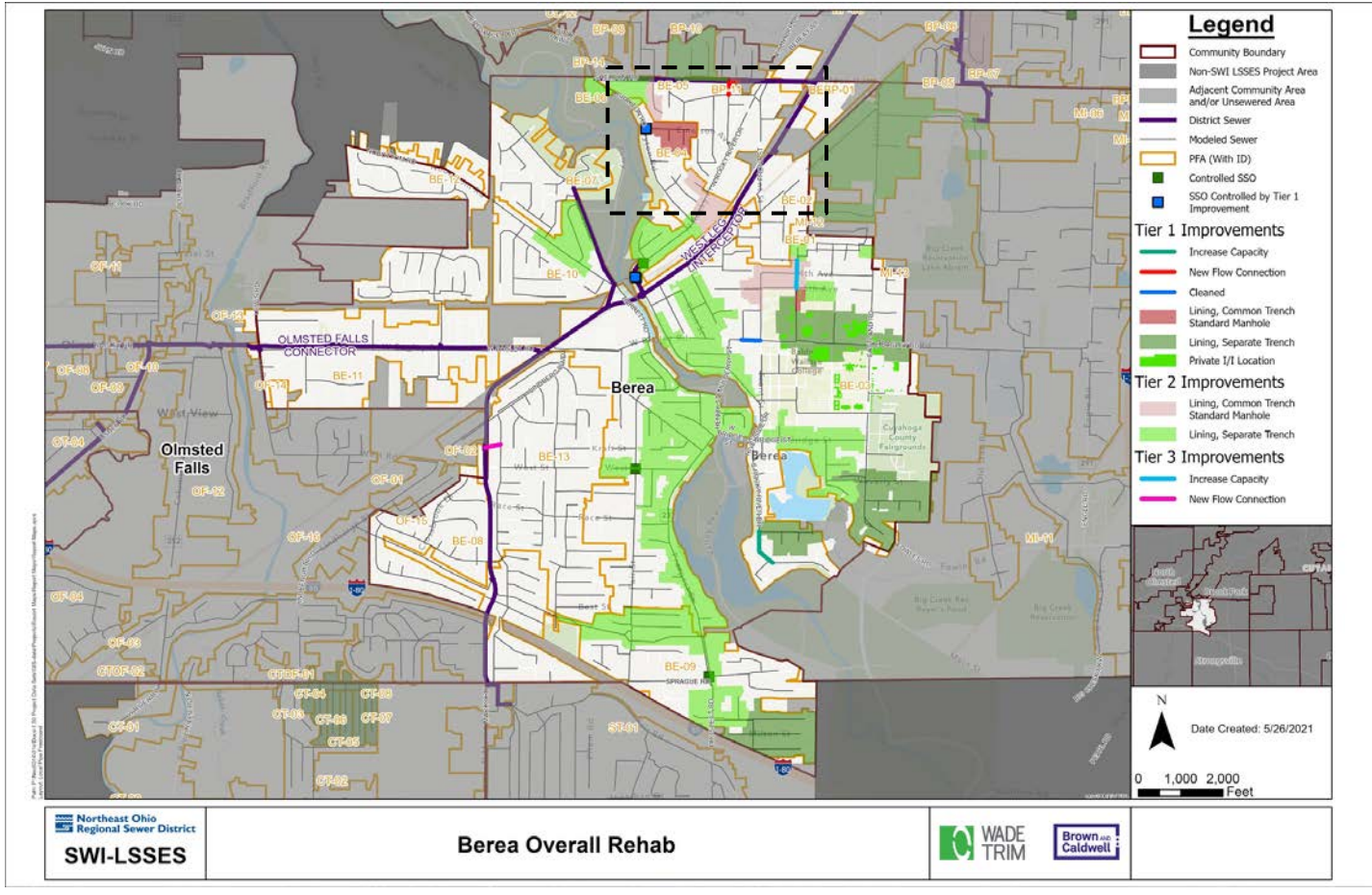
- Final Tier 2 Solution
  - **Line all subcatchments with > 50,000 GPAD**
    - *3,444 ft of sewer*
    - *Construction cost of $1,151,475*



NEORSD Branch	PFL Area	Catchment ID	Alternative		Summary										Planning Costs, $ AACE Class 5
			Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
SWI2019	BE-05	ALL	Tier2Solution		0	0	0	0	3444	0	0	0	0	0	$ 1,151,475

BE-05 Final

- Final recommendation after refinement
- Tier 1
  - New/relief sewers = 508 LF
  - Total cost = $978,000
- Tier 2
  - Common trench rehab = 1,403 LF
  - Separate trench rehab = 1,920 LF
  - Total cost = $1,907,000
- Tier 3 N/A
- Total Cost = Total Capital Cost + Contingency + Project Definition Investigation



Indicates the location of the PFA. (Map includes adjacent PFAs.)

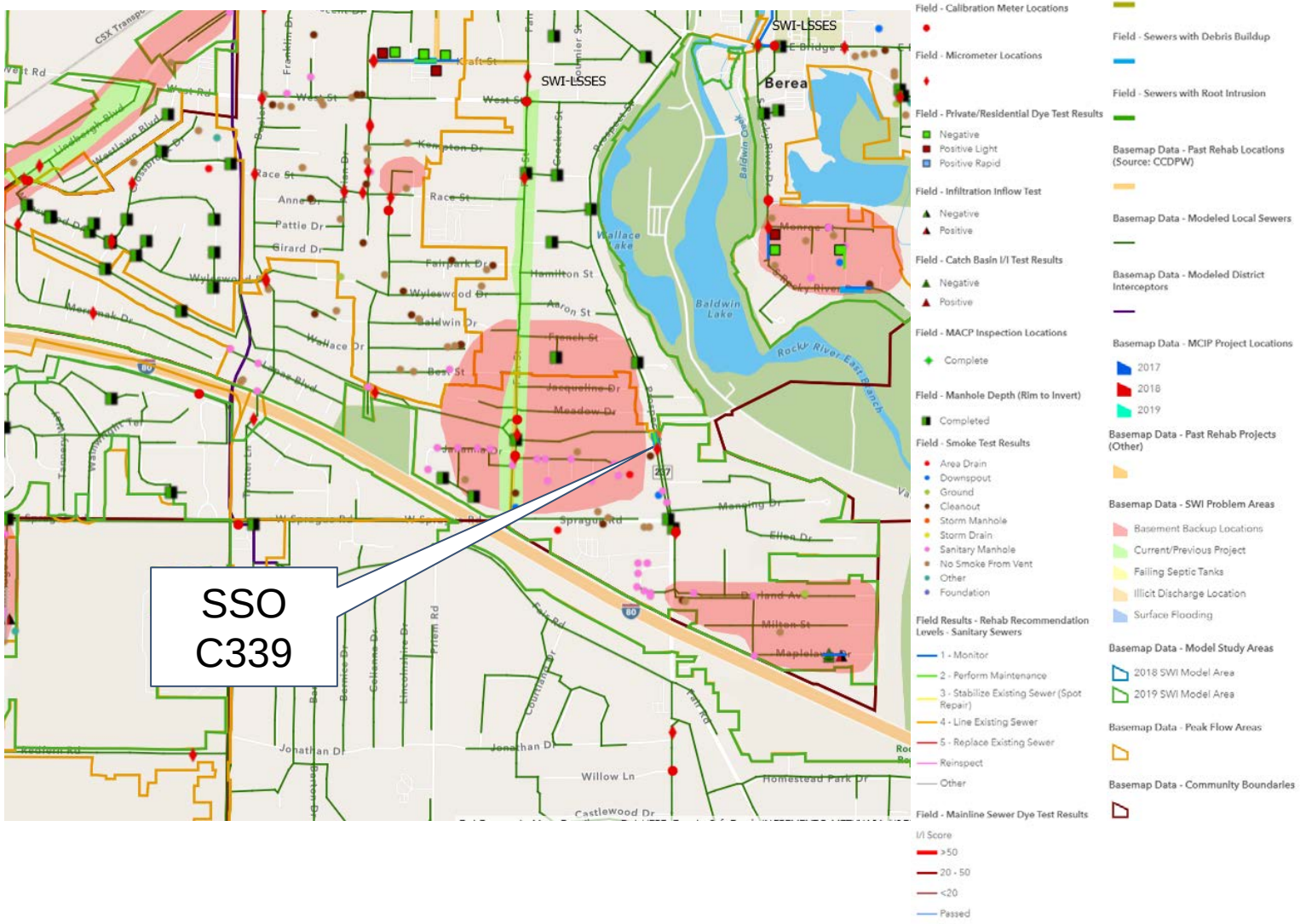
Hazen

SWI-LSSES PFA BE-09 Optimization

BE-09

Field Data

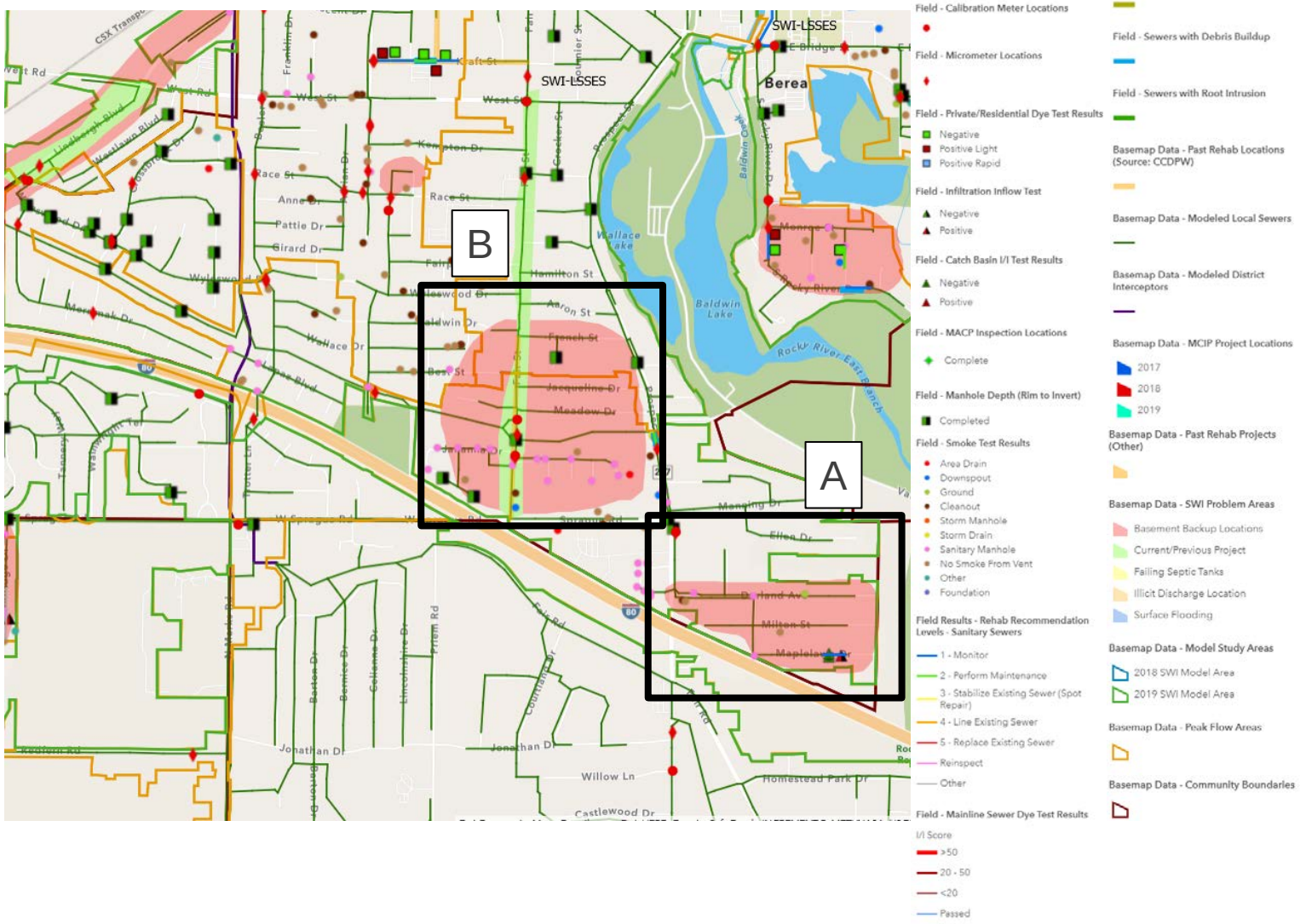
- Two CIPAs
- SSO C339



BE-09

Field Data

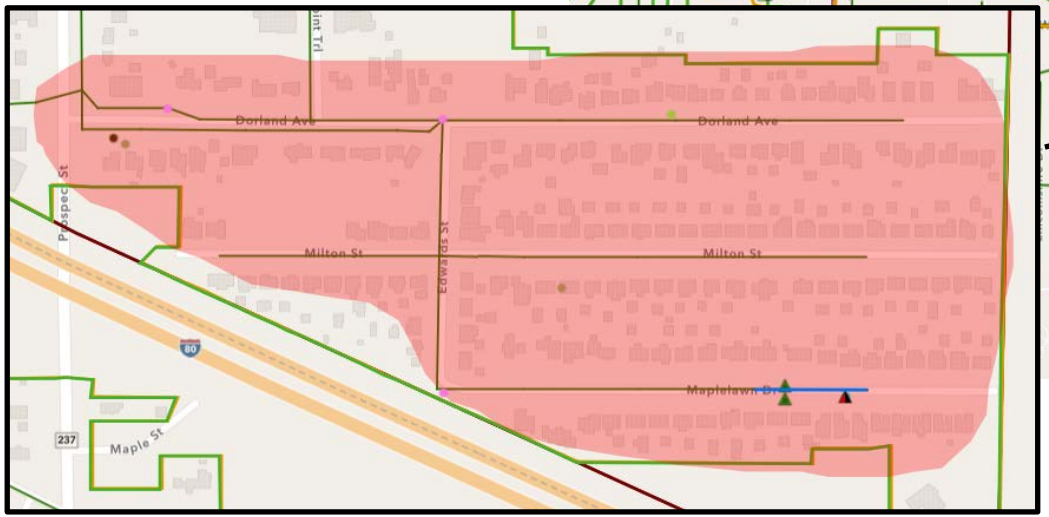
- Two CIPAs
  - Broken down into two different areas

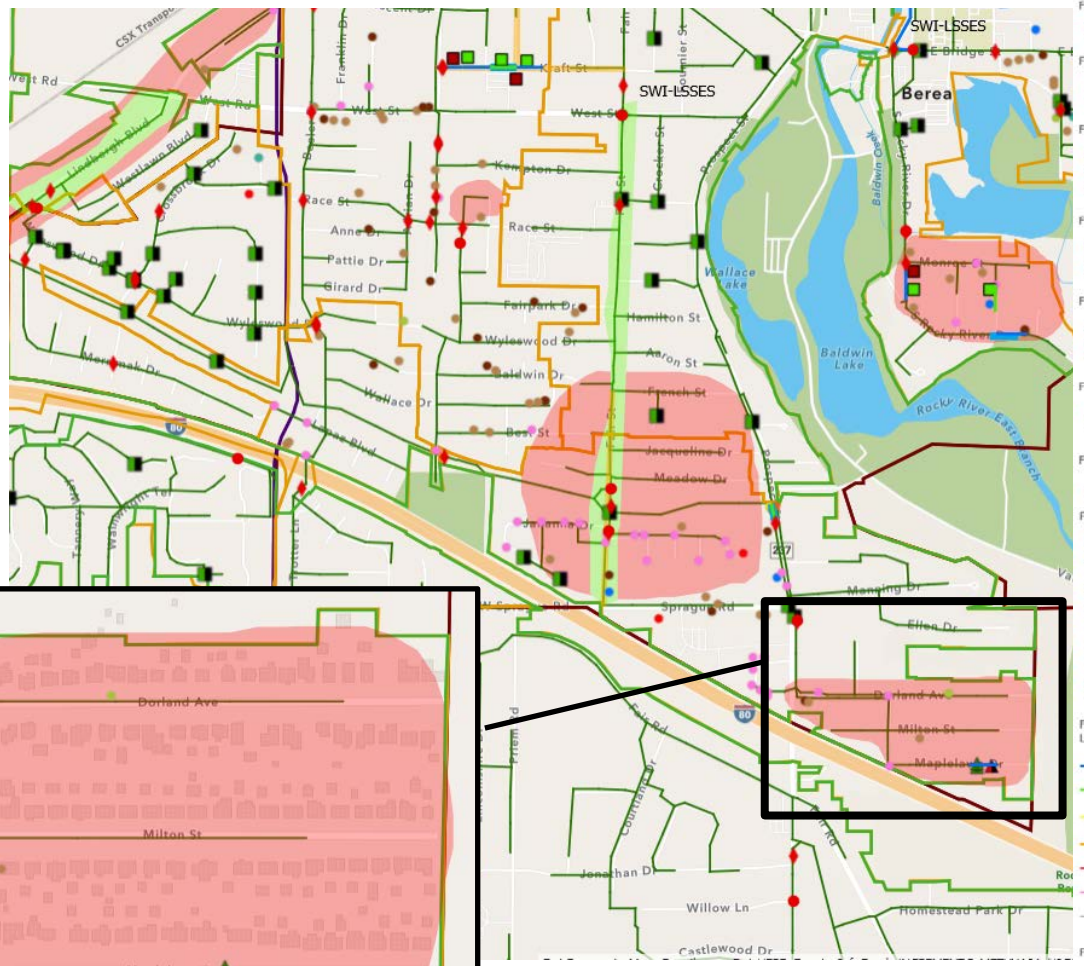


BE-09

Area A - Field Data

- One positive dye test, two negative
- Several smoke test defects (cleanouts, ground, manhole)



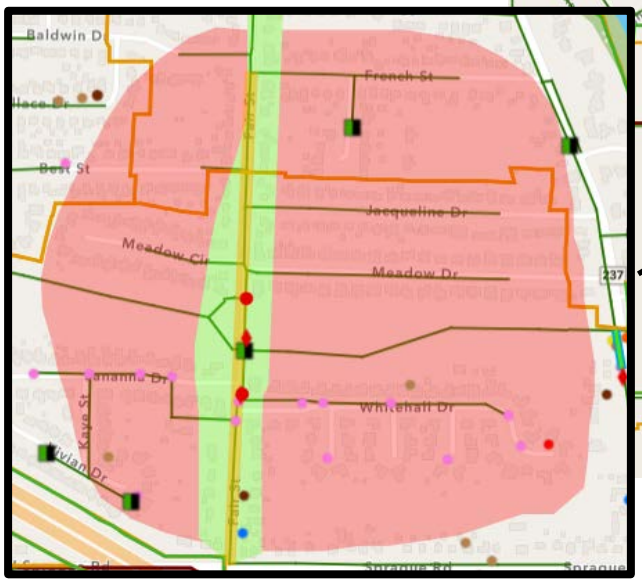


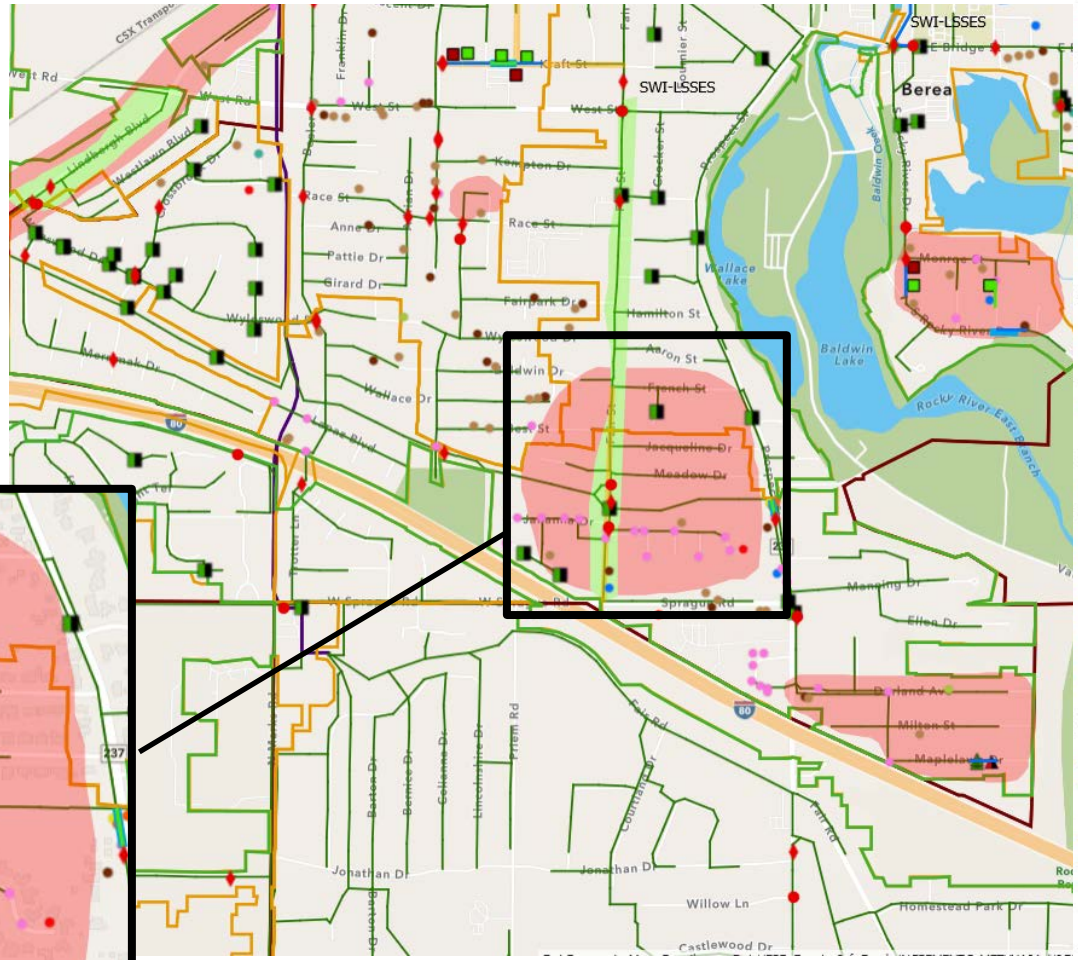


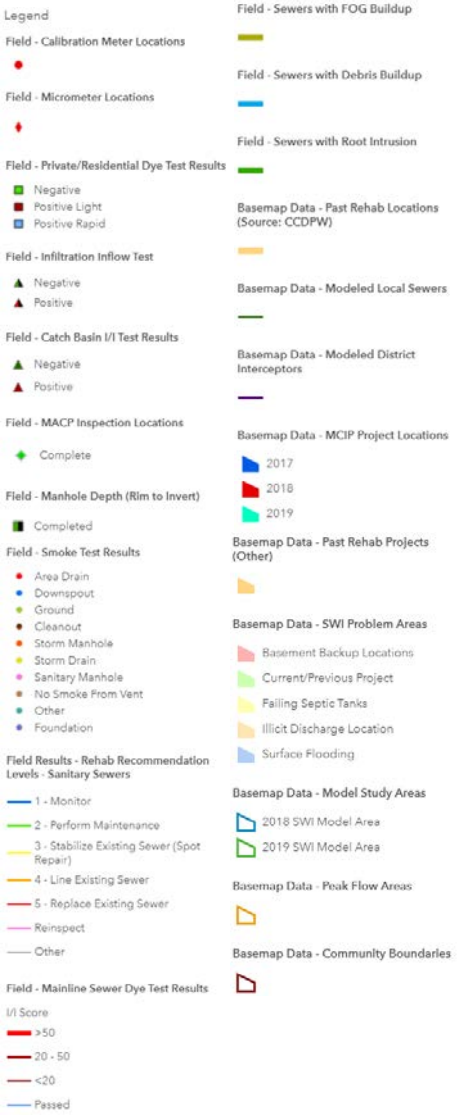
BE-09

Area B - Field Data

- Several smoke test defects (cleanouts, manhole, drain)



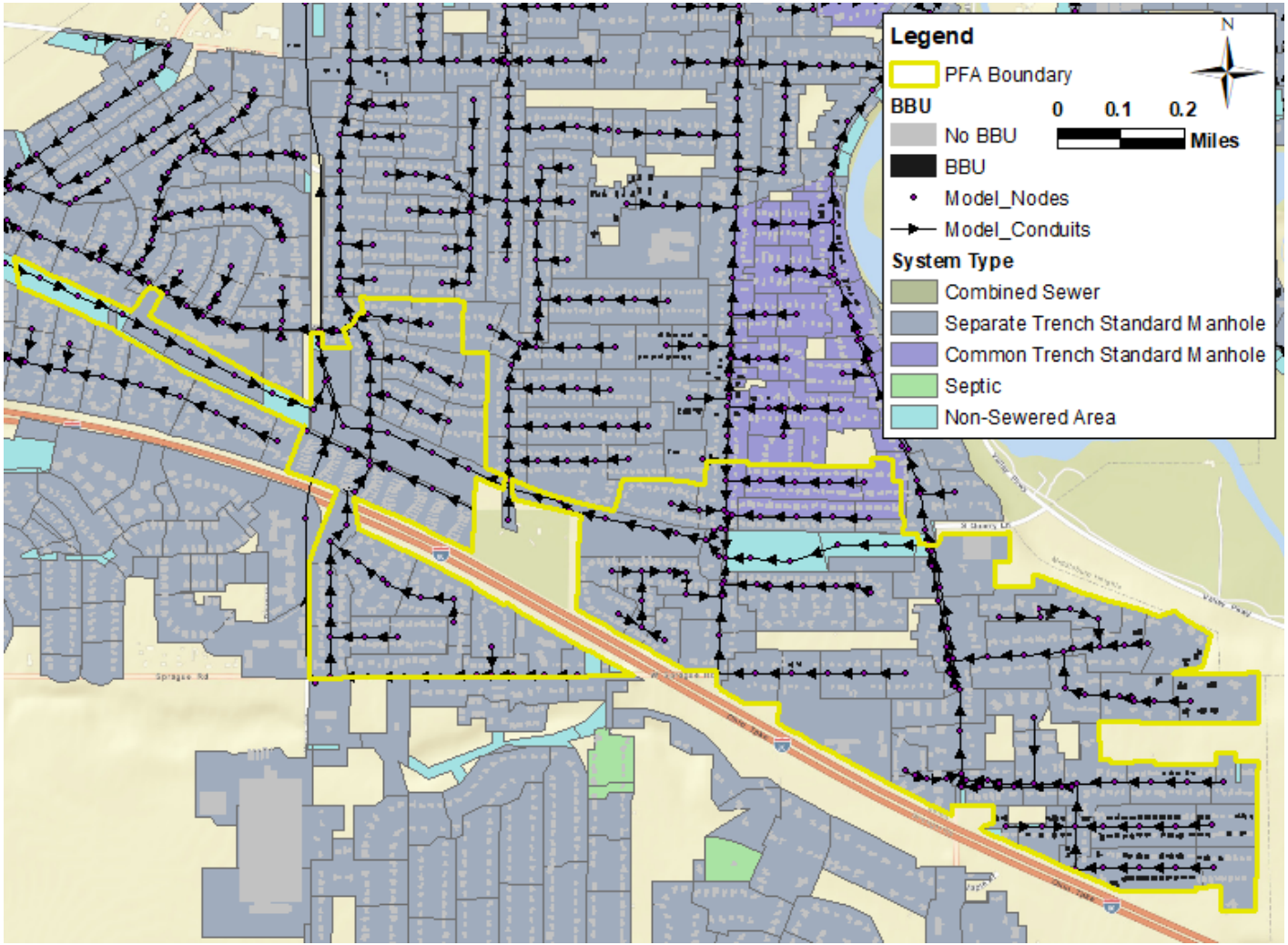




BE-09

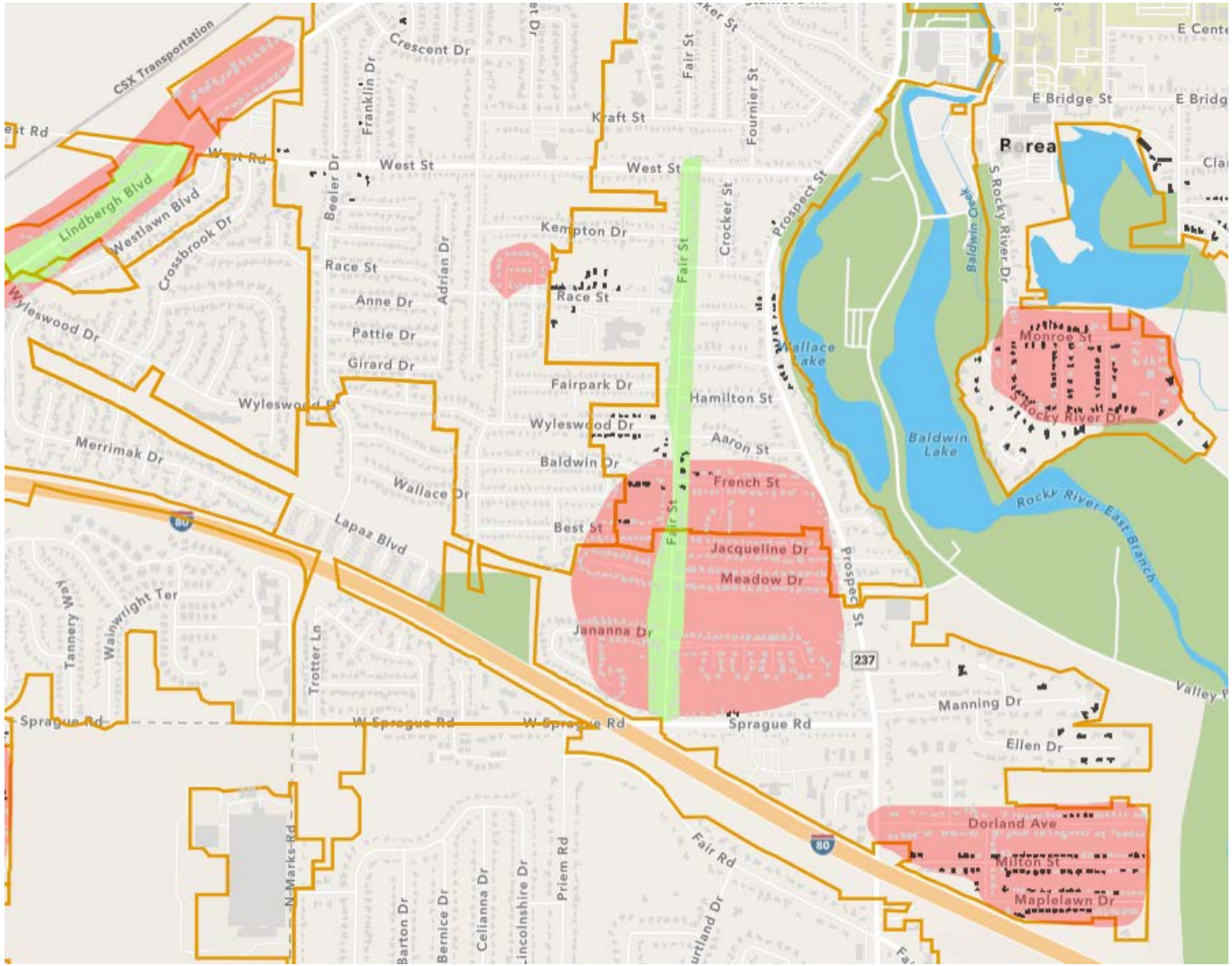
Trench Type

- Mostly Separate Trench with one Common Trench area



BE-09

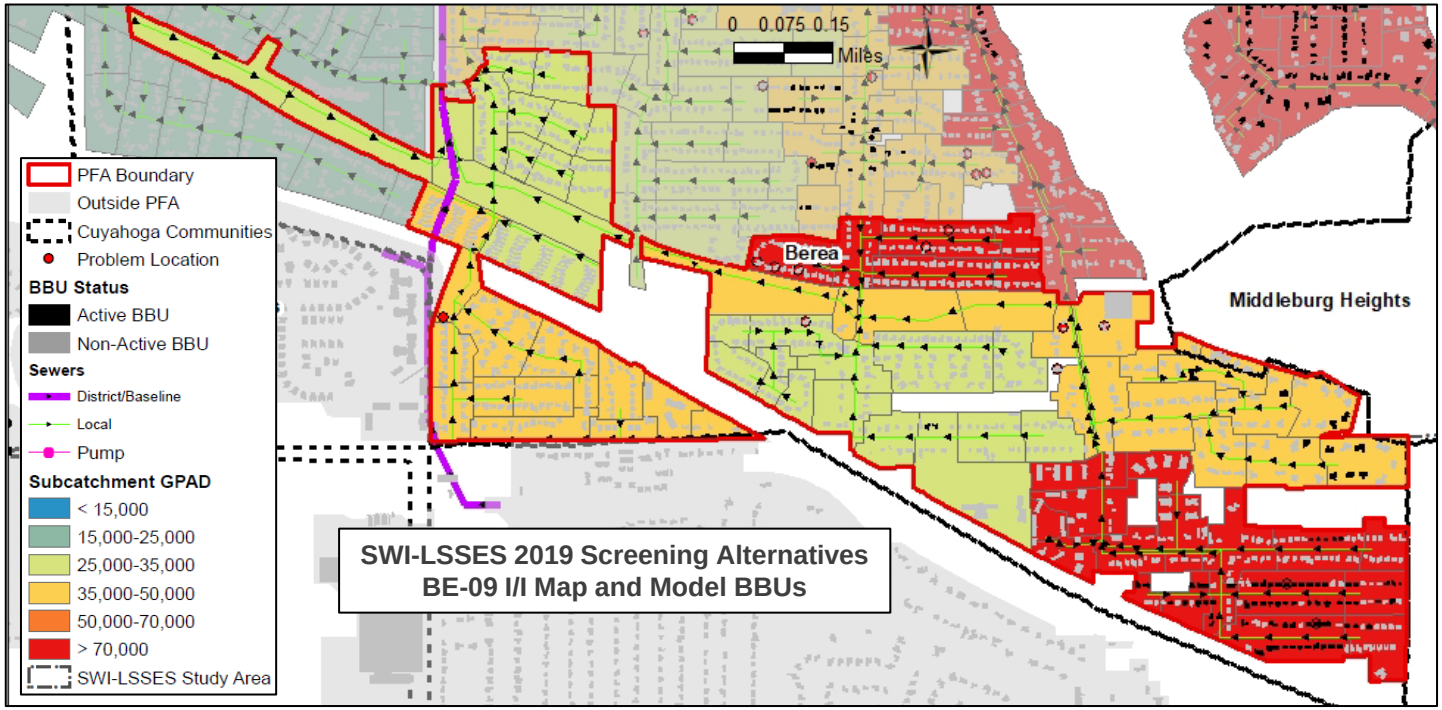
Base Model for Optimization BBUs



BE-09

Model Predicted BBUs and I/I

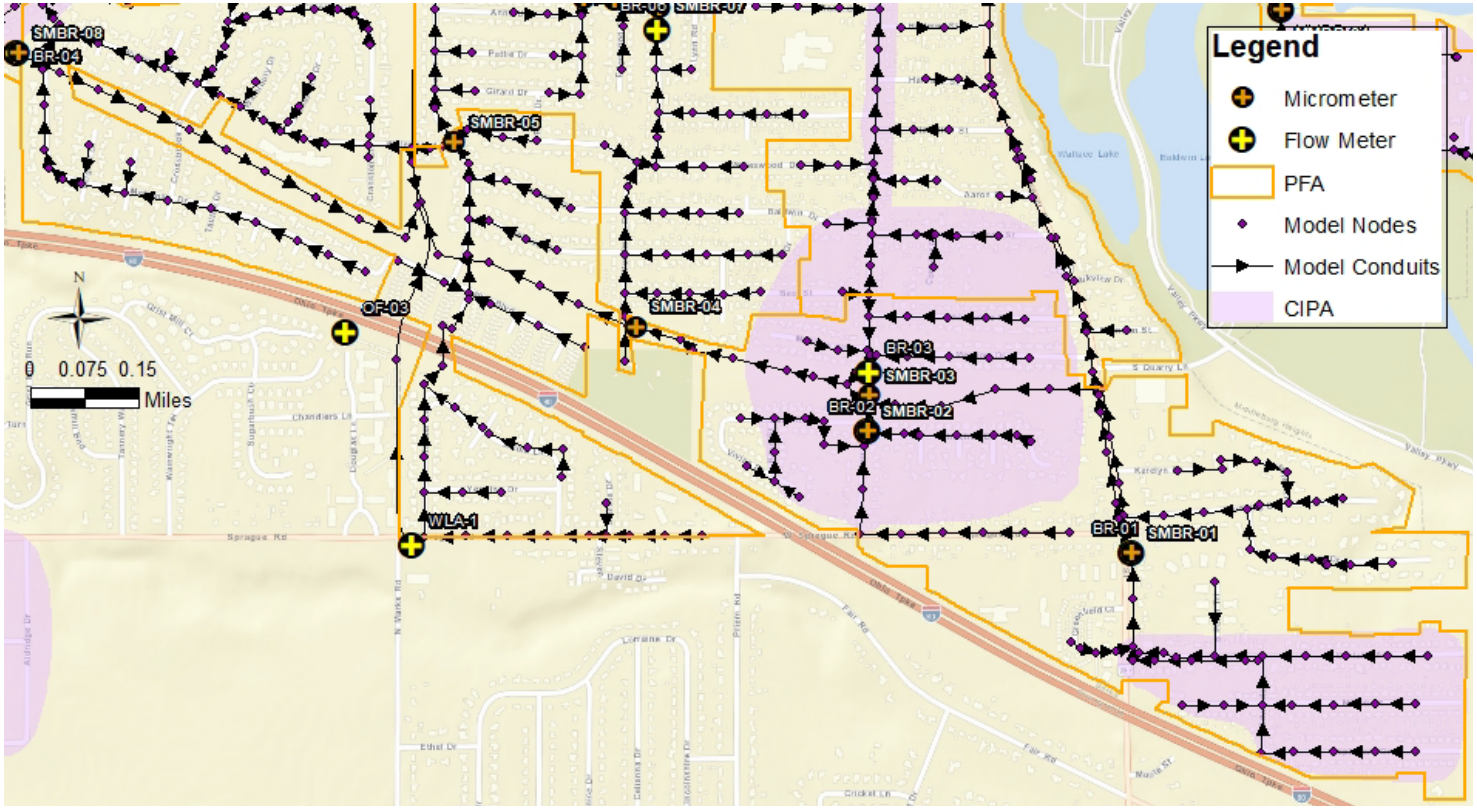
- Rate of I/I varies by metershed



BE-09

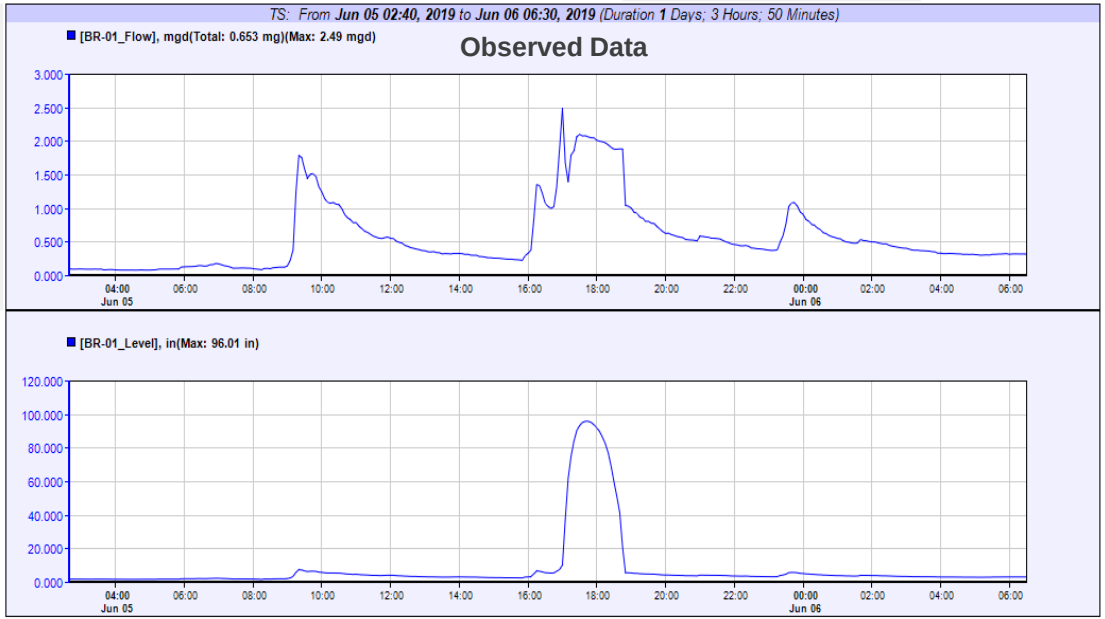
Micrometer Data and Flow Meter Data

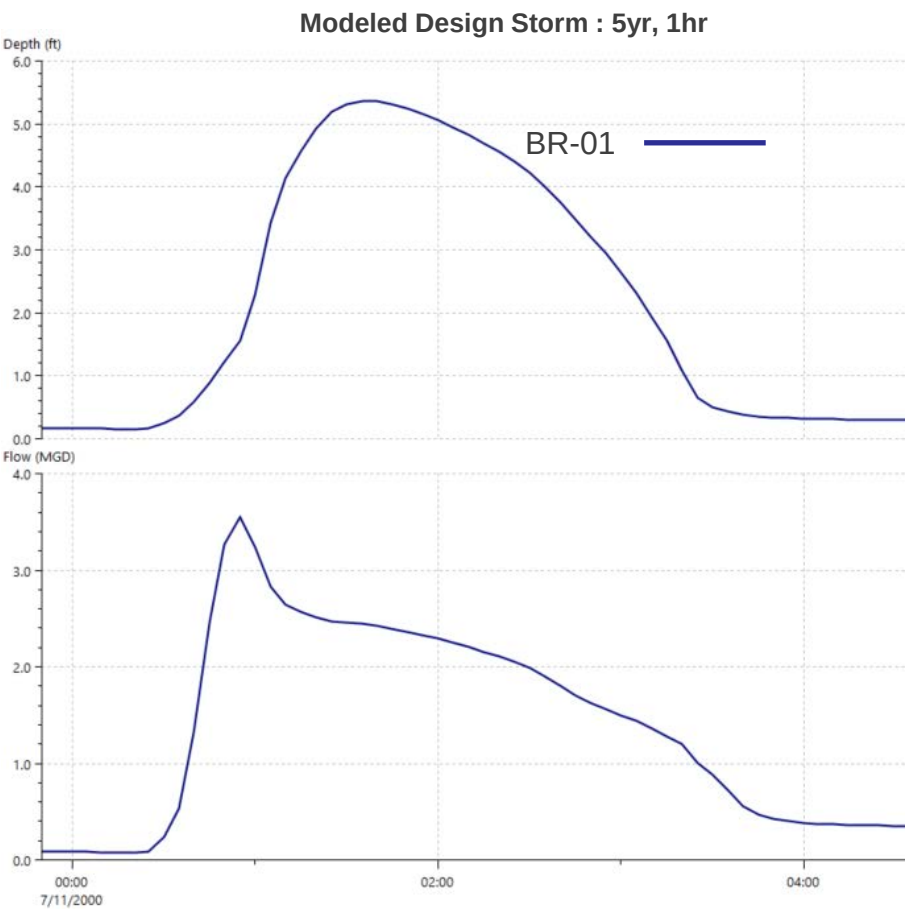
- Micrometer data and flow monitoring data was collected and used in calibration



BE-09 : BR-01

Calibration Meter Data

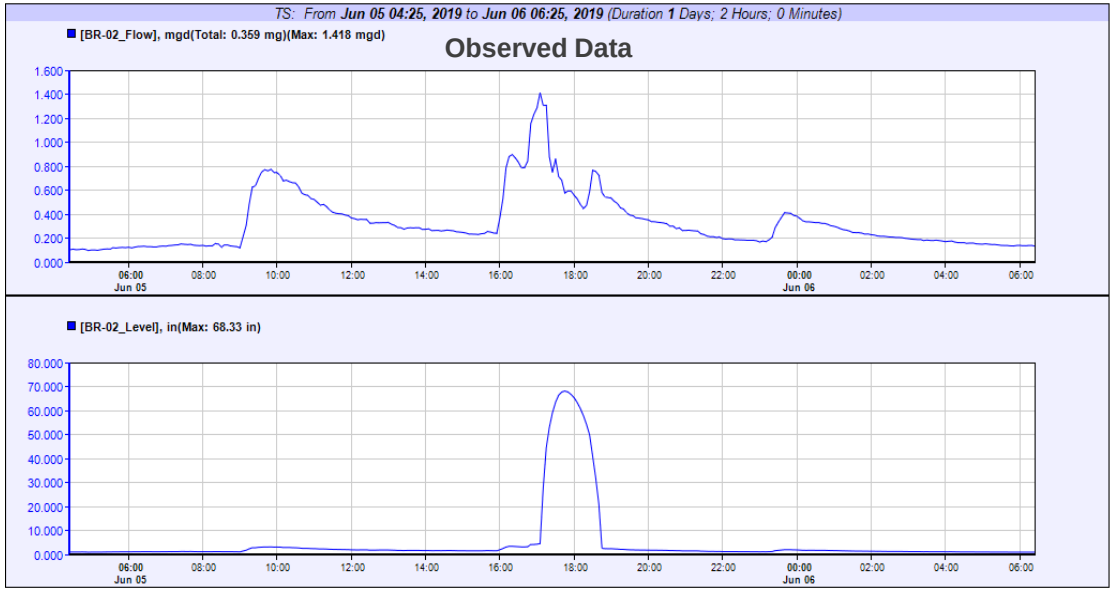


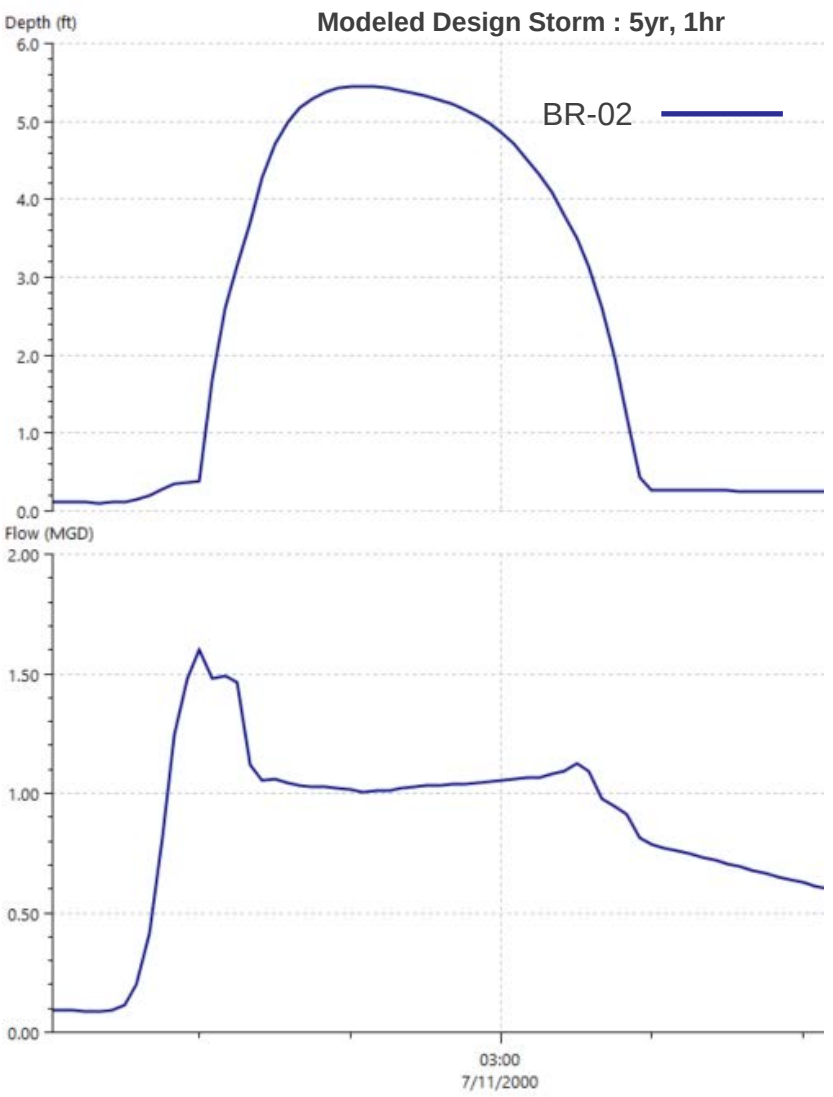


- Surcharge observed twice during monitoring period, June 5 (shown in left plot) and July 24
- Model predicts surcharge during the June 5 event of the monitoring period as well as the design storm
- Model shows a reasonable match between the ratio of flows at meter locations

BE-09 : BR-02

Calibration Meter Data

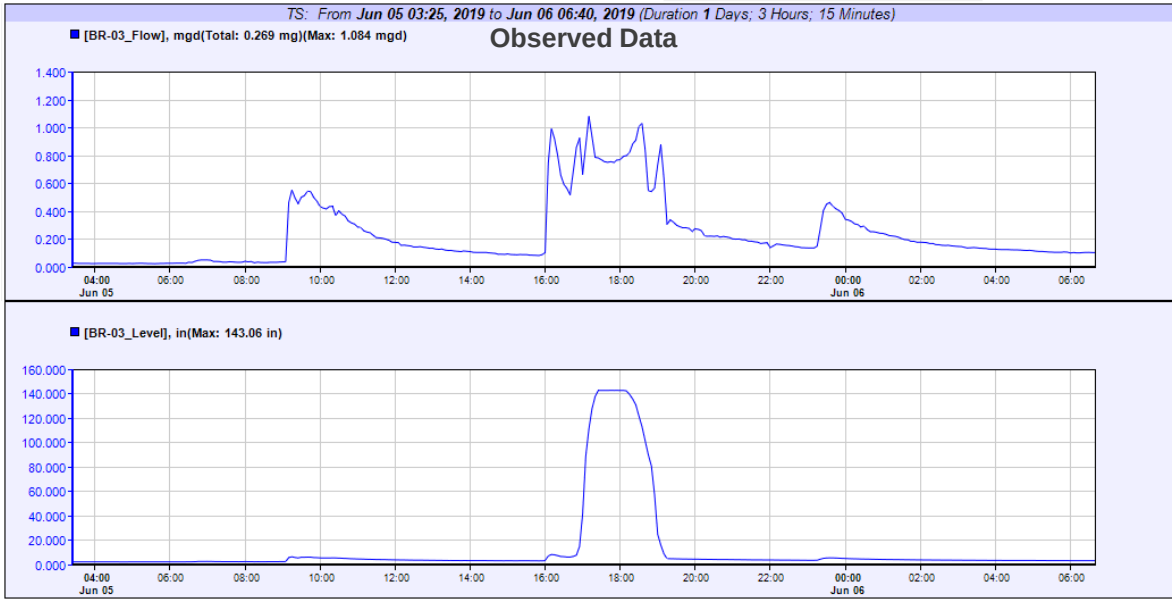


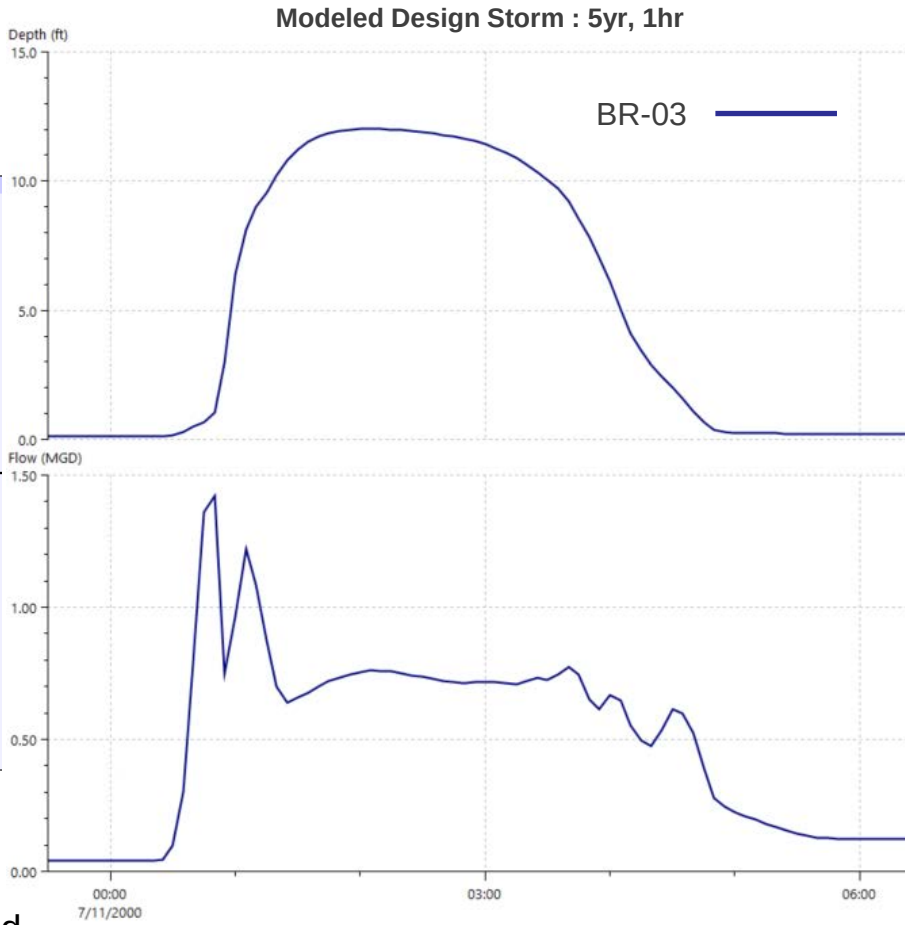


- Surcharge observed once during monitoring period, June 5 (shown in left plot) ; Model predicts surcharge during this event as well as the design storm
- Model shows a reasonable flow match at meter location but modeled depth is pretty consistently higher than observed

BE-09 : BR-03

Calibration Meter Data





- Surcharge observed twice during monitoring period; Model predicts surcharge during these event as well as the design storm
- Model shows a reasonable flow match at meter location but modeled depth is pretty consistently lower than observed

BE-09

Micrometering

- **The only available micrometer data was from 2018 and was collected at the following relevant locations:**
  - *SMBR-01: same location as Calibration Meter BR-01 (Slide 10)*
  - *SMBR-02: same location as Calibration Meter BR-02 (Slide 11)*
  - *SMBR-03: immediately downstream of Calibration Meter BR-03 (slide 12)*
- **Since the micrometer data was collected at the same locations as the calibration meter data and was collected earlier, the calibration meter data was prioritized**

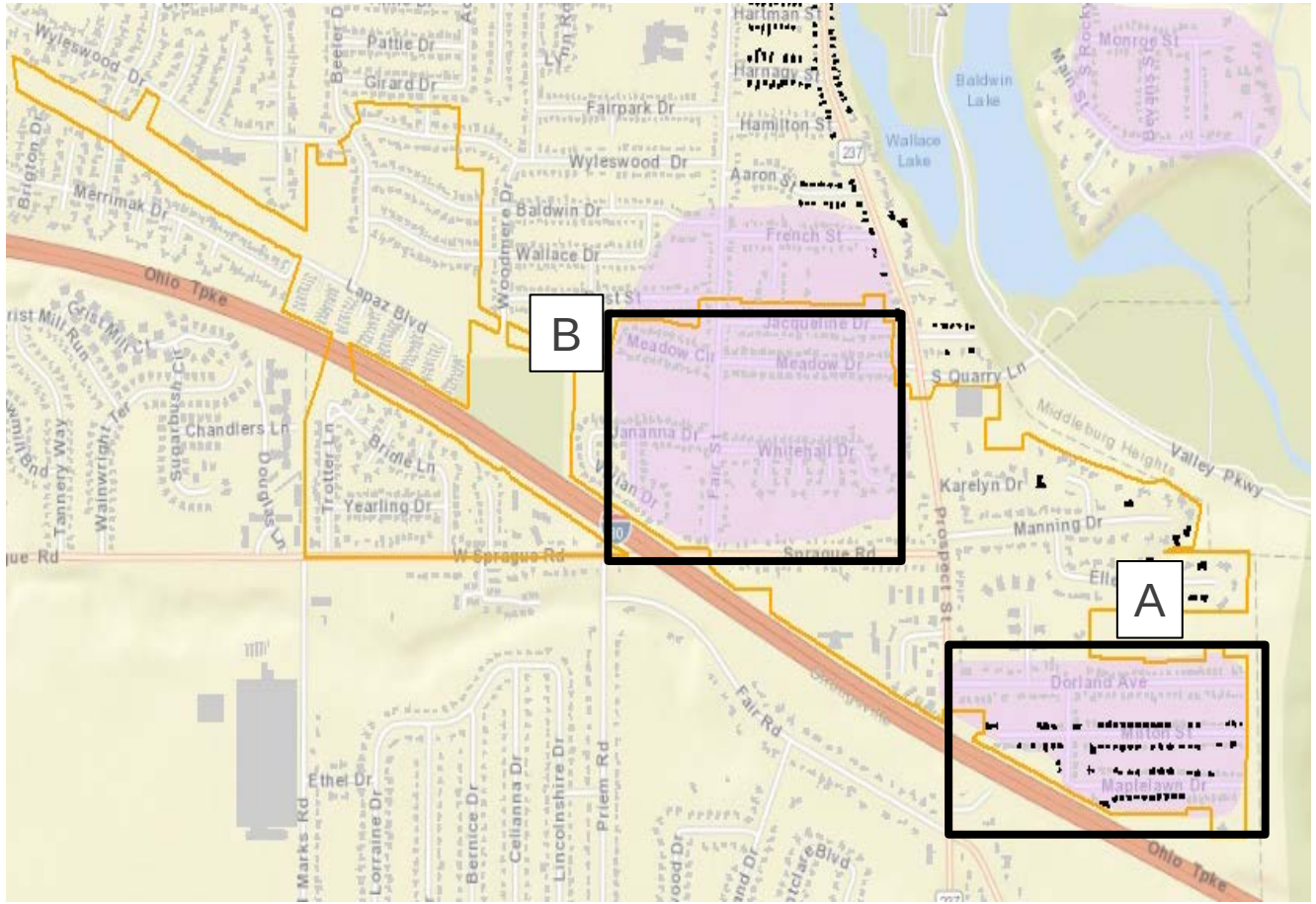
Calibration Meter Data

- Conclusions
  - **No evidence to show that the model flows should be redistributed**
    - *Meter data was used during calibration, so it is already incorporated into the model*
  - **No evidence to show that the model level calibration should be adjusted**
    - *The 5-year design storm shows surcharge at meter locations that experienced surcharge during the monitoring period*

BE-09

Base Model for Optimization BBUs

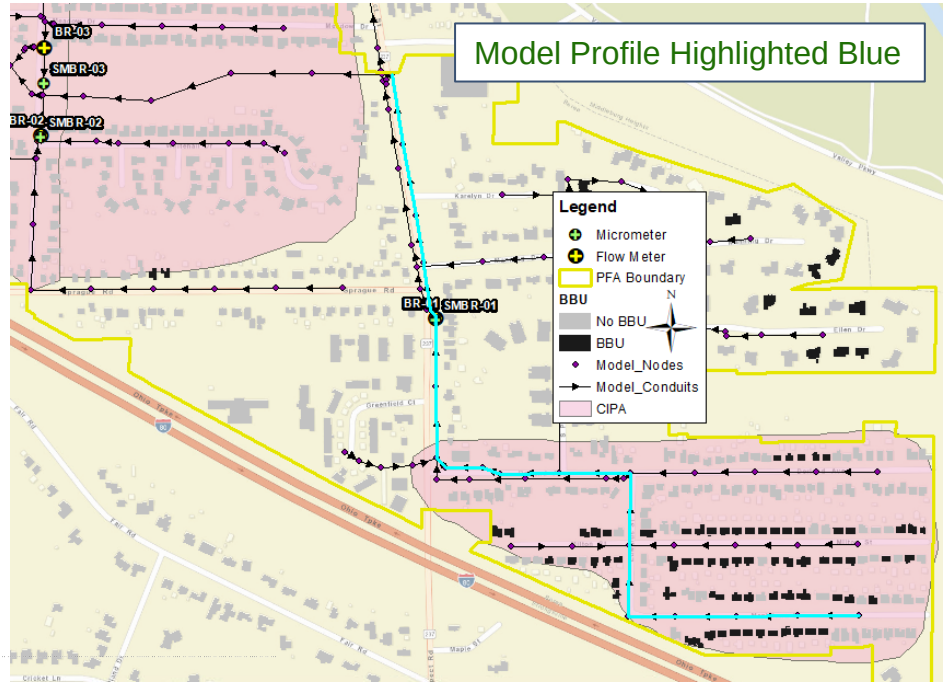
- Tier 1 Area breakdown
- CIPA BBUs are only present in Area A. Thus, this is the focus area for the Tier 1 solution

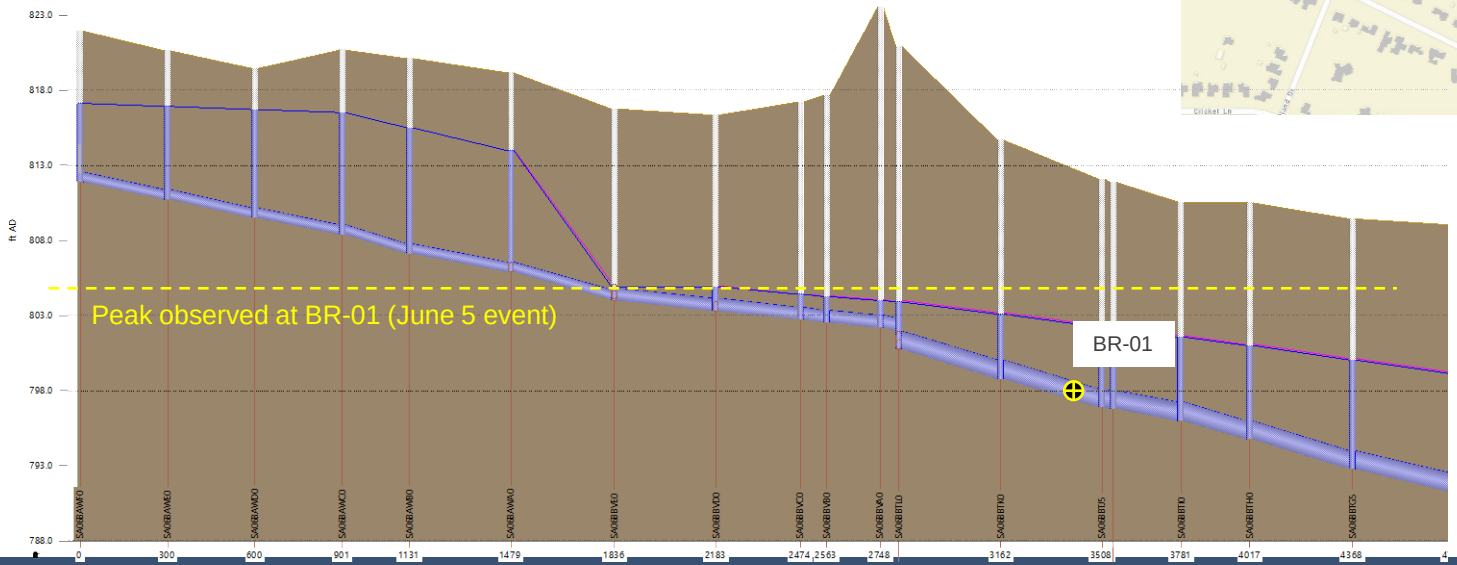


BE-09 Area A

5-Year Model Design Storm Profile

- Model
  - **Surcharge caused by under capacity sewer or blockage.**
  - **The surcharge is seen at all calibration meters upstream of the District connection with some velocities (e.g. BR-02) approaching zero.**



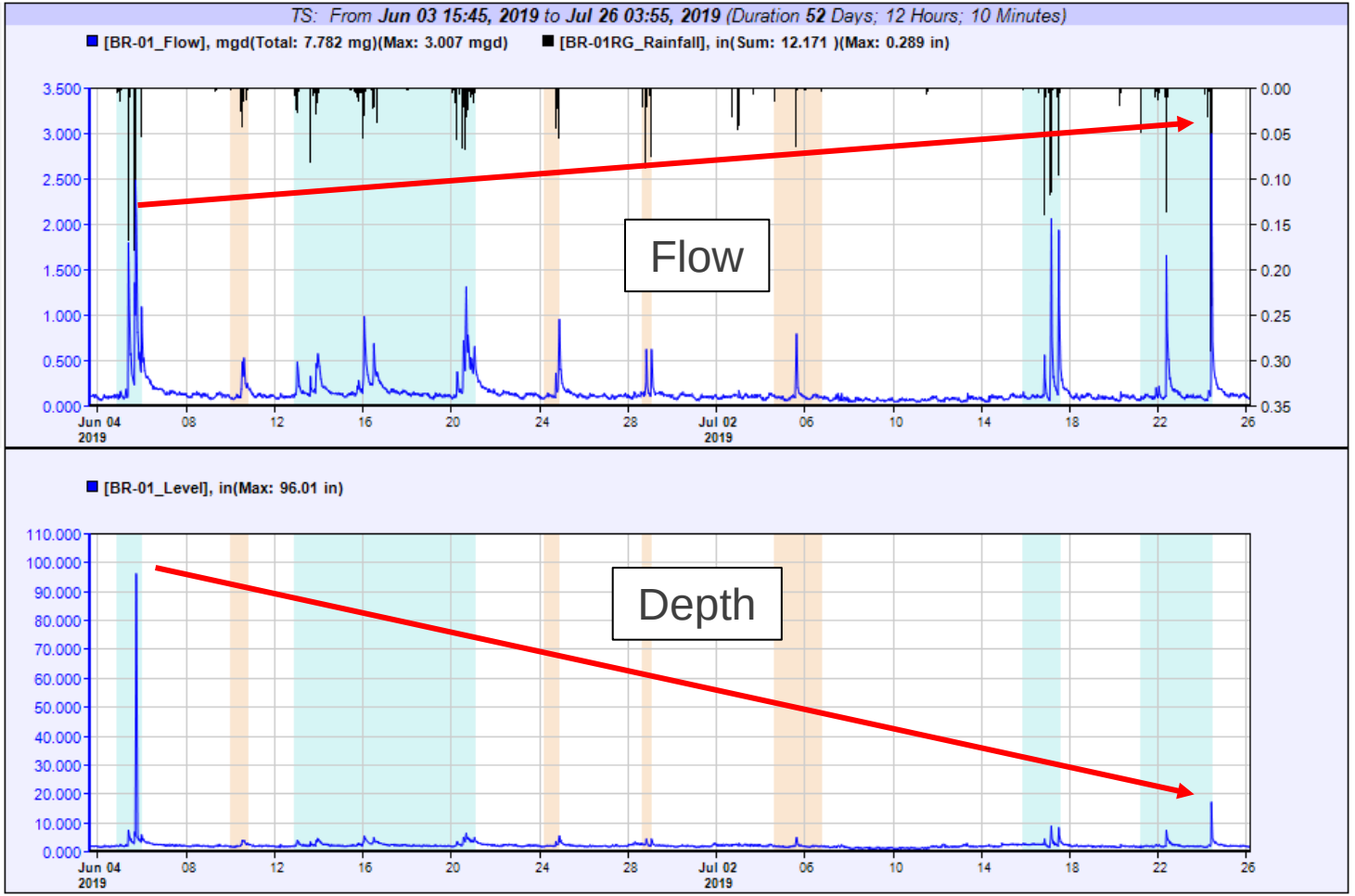


BE-09 Area A

5-Year Model Design Storm Profile

BR-01

- Model
  - **Surcharge caused by under capacity sewer**
  - **June 5th depth was extreme for every calibration meter upstream of the District connection.**
  - **Similar flow rates at calibration meter show very different flow depths.**

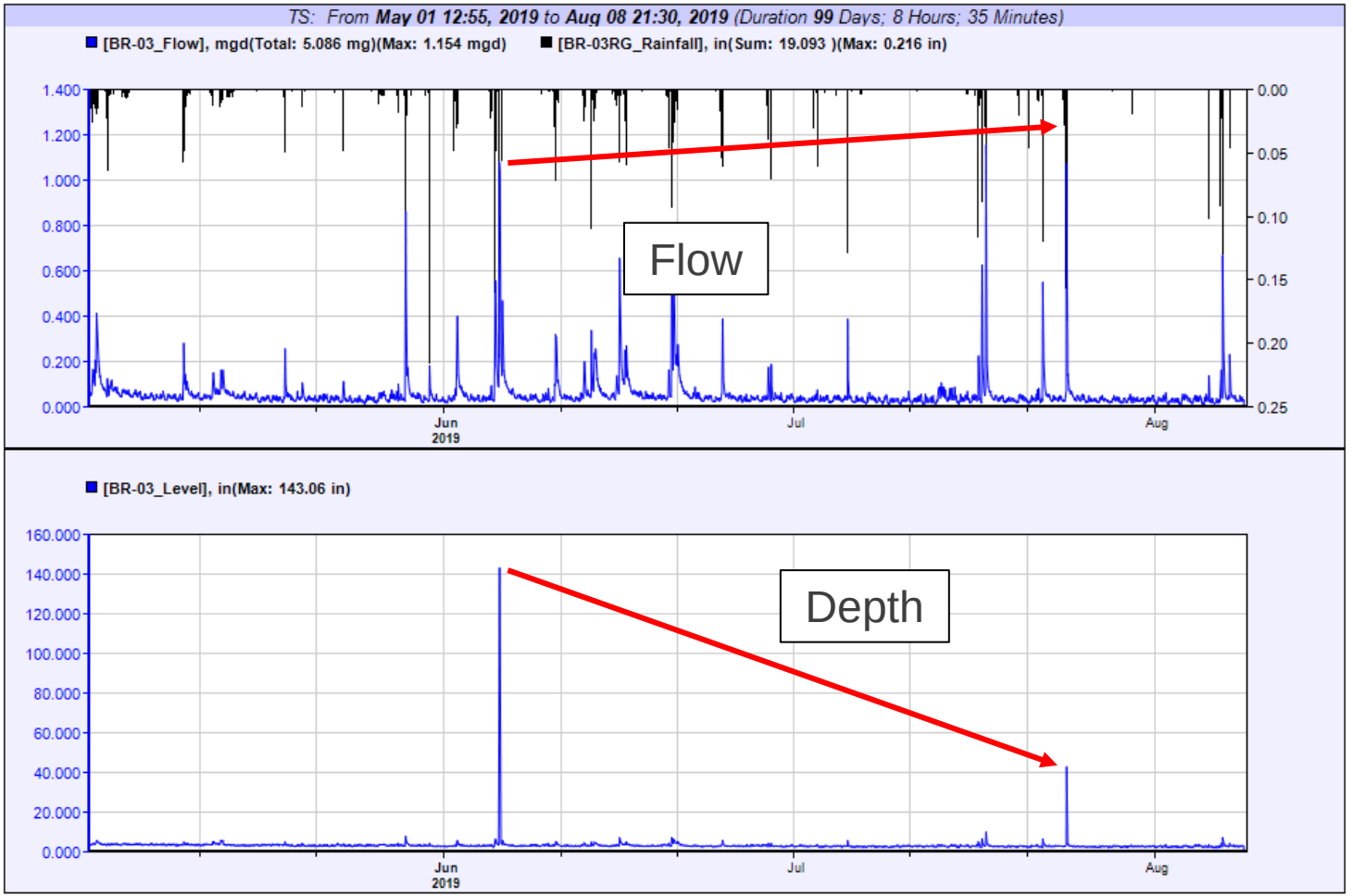


BE-09 Area A

5-Year Model Design Storm Profile

BR-03

- Model
  - Surcharge caused by under capacity sewer
  - June 5th depth was extreme for every calibration meter upstream of the District connection.
  - Similar flow rates at calibration meter show very different flow depths.

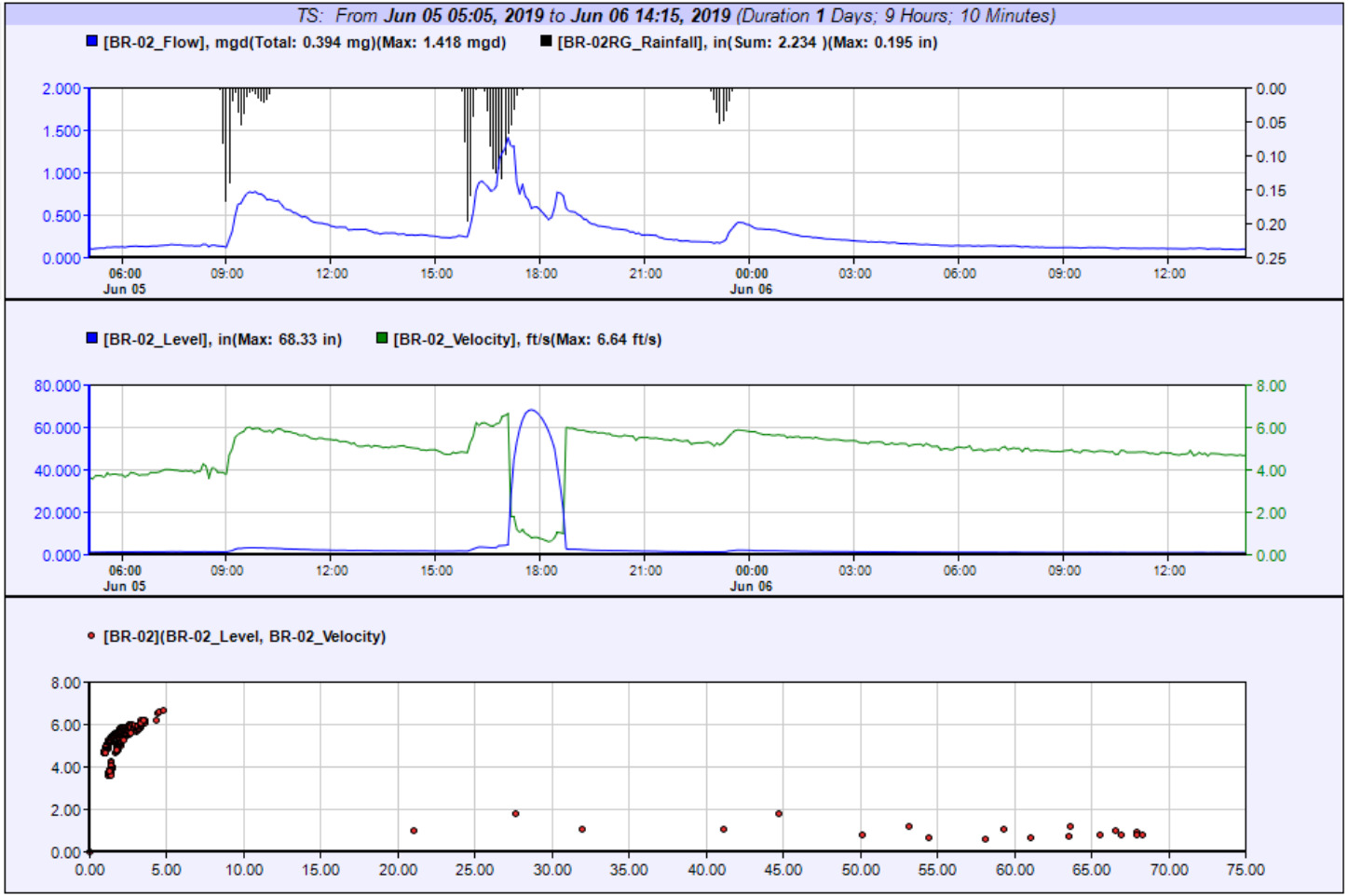


BE-09 Area A

5-Year Model Design Storm Profile

BR-02

- Scatterplot
  - **Backwater seen and flow nearly stops.**
  - **Overflow to the pump station at BR-03 likely provides enough relief to keep flow at BR-02 moving.**

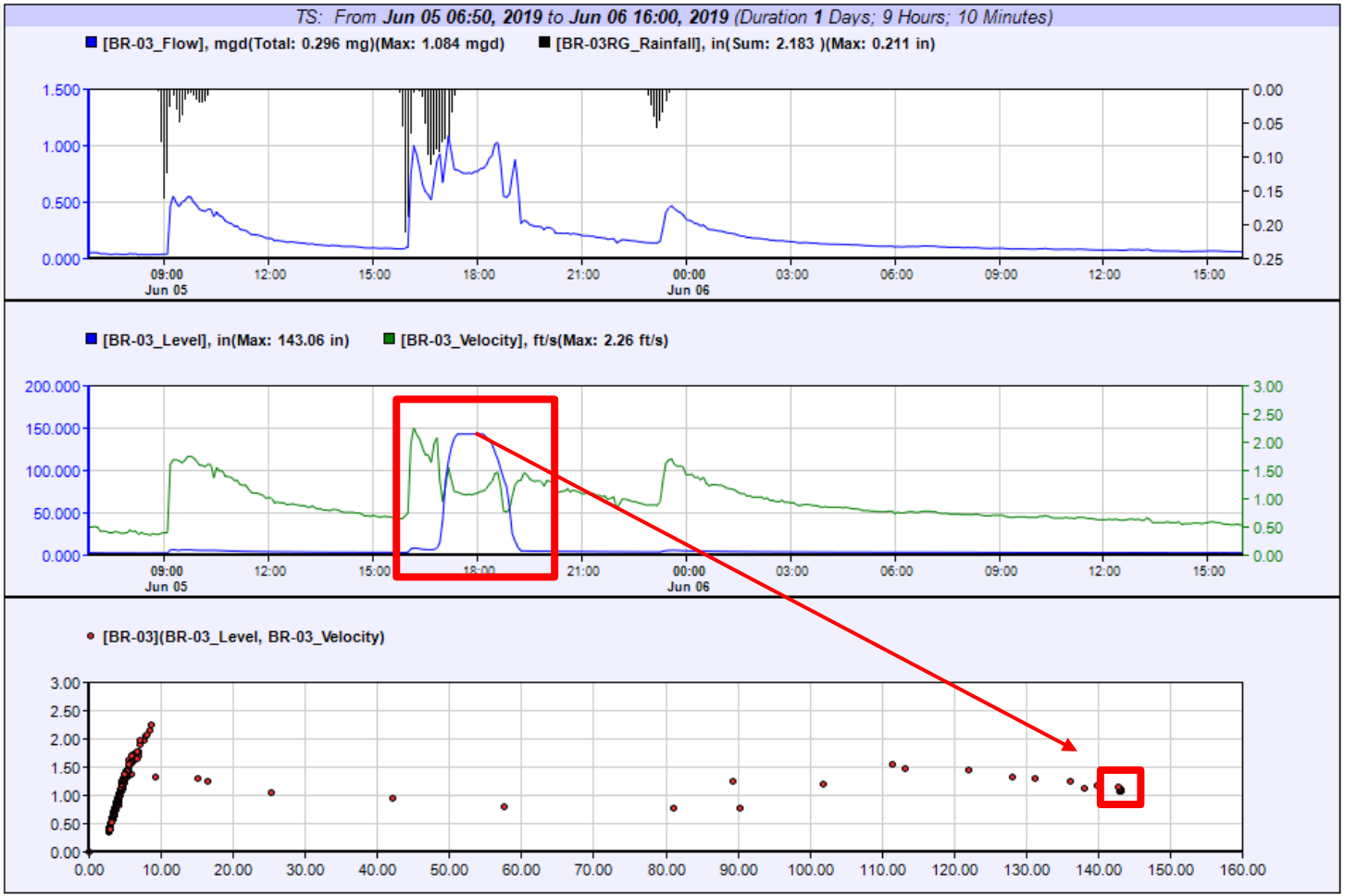


BE-09 Area A

5-Year Model Design Storm Profile

BR-03

- Scatterplot
  - **Depth flattens out showing an SSO.**
  - **Overflow to the pump station at BR-03 likely provides enough relief to keep flow moving.**

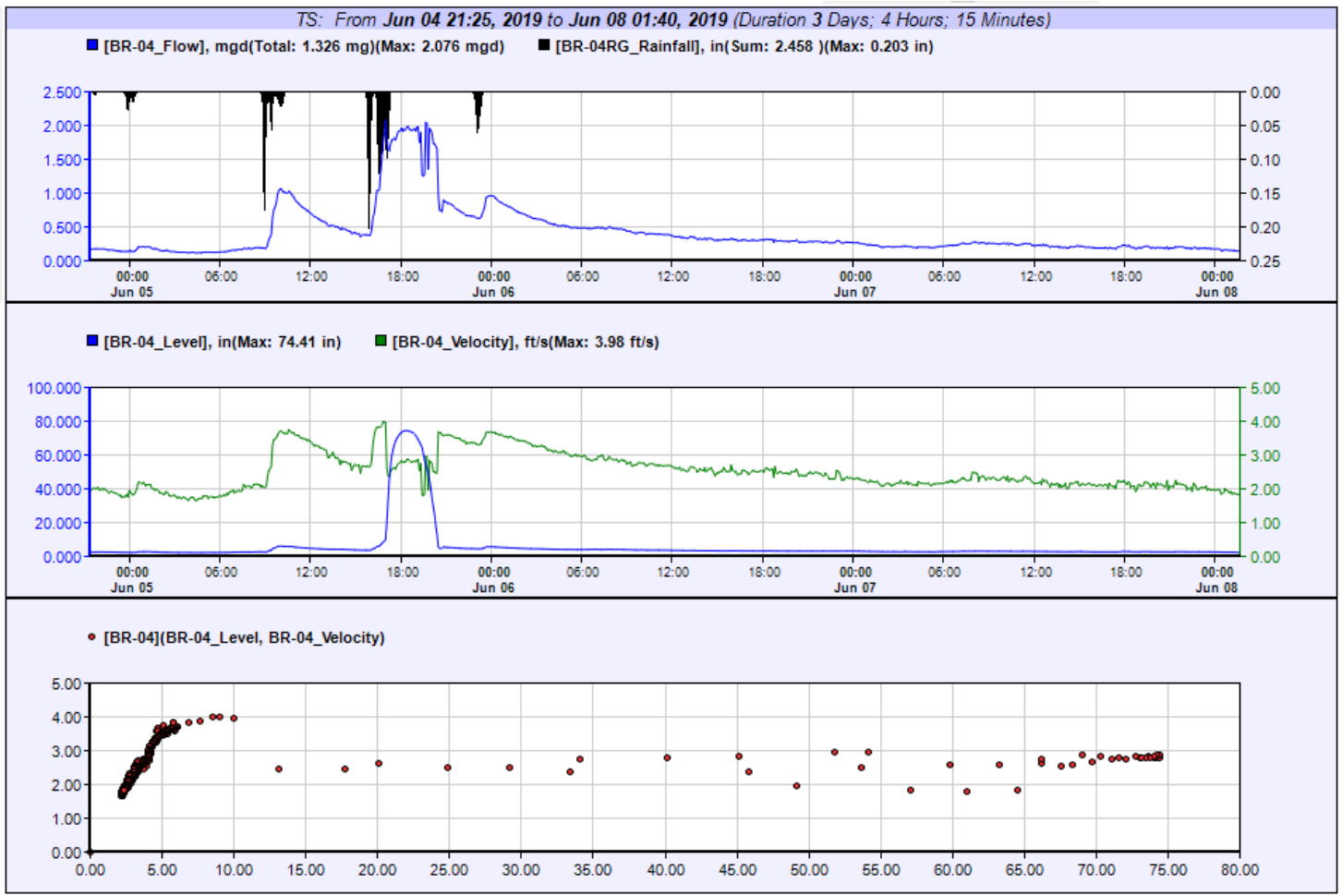


BE-09 Area A

5-Year Model Design Storm Profile

BR-04

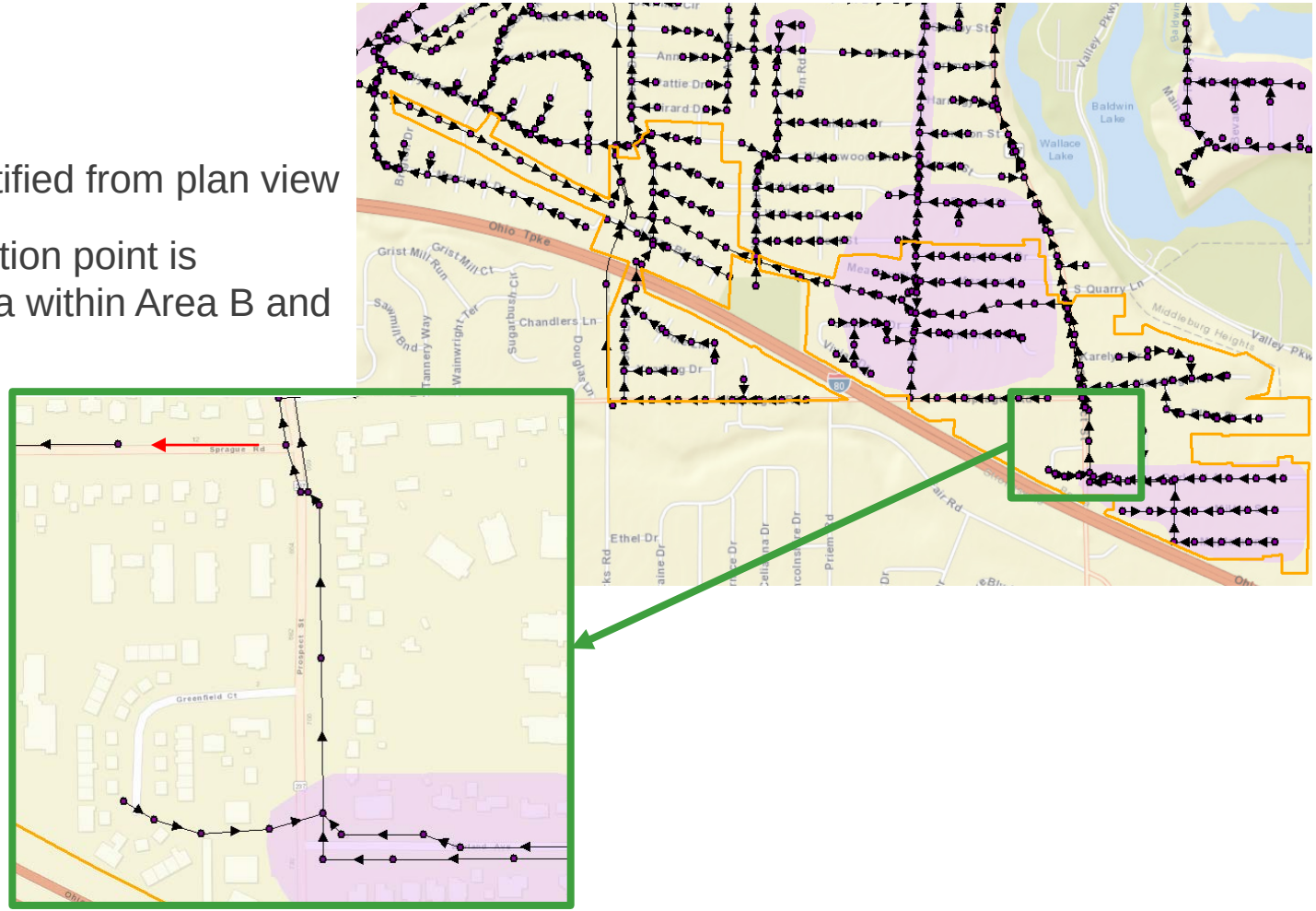
- Scatterplot
  - **Backwater seen and but velocity stays above 2 ft/sec.**
- BR-04 is the opposite side of PFA BE-09 from BR-01, -02, and 03.
- Conclusion
  - **The June 5th depth may be a result of more than just an under capacity sewer (e.g. temporary blockage) and not represent clean conditions. CCTV the sewers.**



BE-09 – Area A

Potential Direct Connections

- One possible connection identified from plan view
- However, the possible connection point is upstream of a surcharged area within Area B and thus is not a good relief option

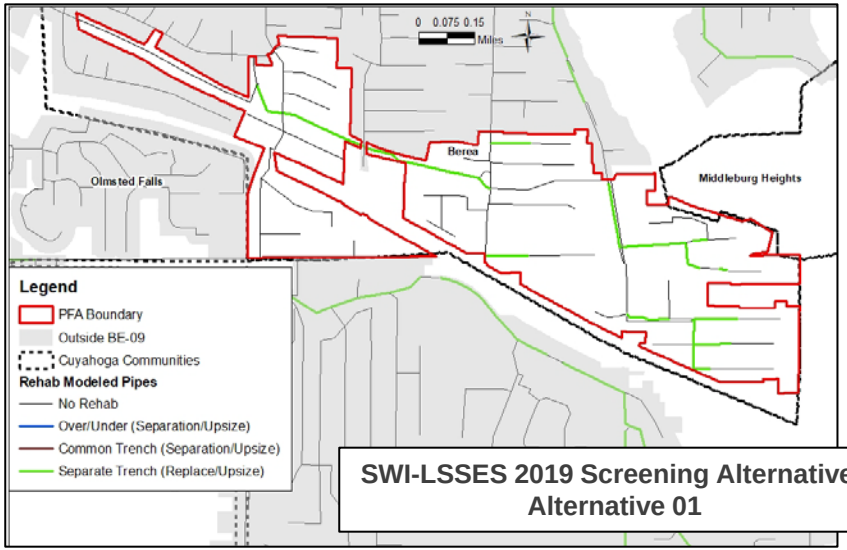


BE-09

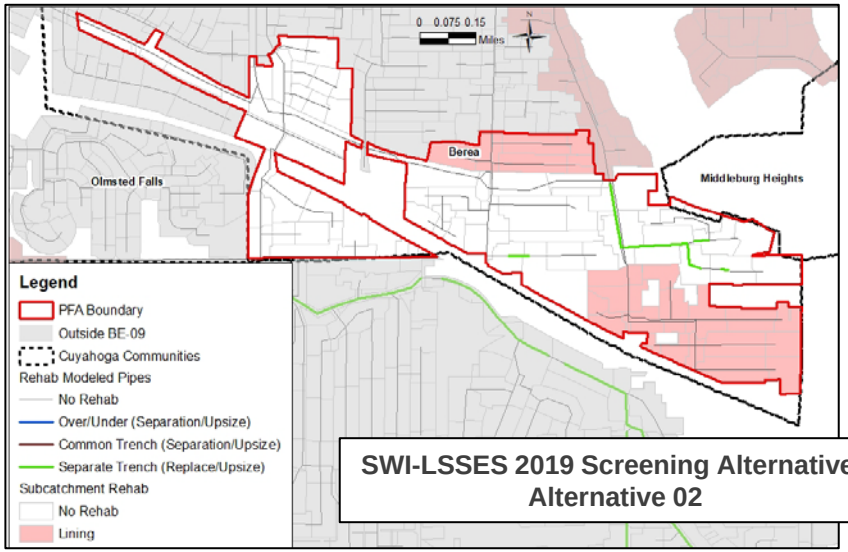
Screening Alternatives Provided

Alternatives 2 and 3 costs are within 30% of each other

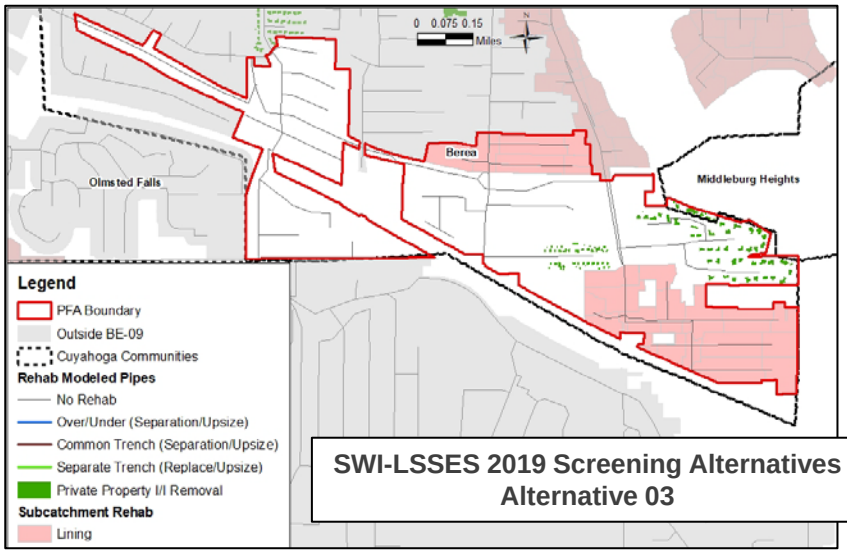
NEORSD Branch	PFL Area	Catchment ID (Use "ALL" to cost for all catchments within PFL)	Alternative		Summary			Planning Costs,
			Alternative	Description	Replace Sewer (LF)	Sewer Lining (LF)	Private II Removal (# parcels)	Construction Cost ($)
SWI2019	BE-09	ALL	A1	Screening Alternative One	10,544	0	0	$13,942,758
SWI2019	BE-09	ALL	A2	Screening Alternative Two	3,142	14,321	0	$7,964,900
SWI2019	BE-09	ALL	A3	Screening Alternative Three	0	14,321	72	$5,435,812



SWI-LSSES 2019 Screening Alternatives
Alternative 01



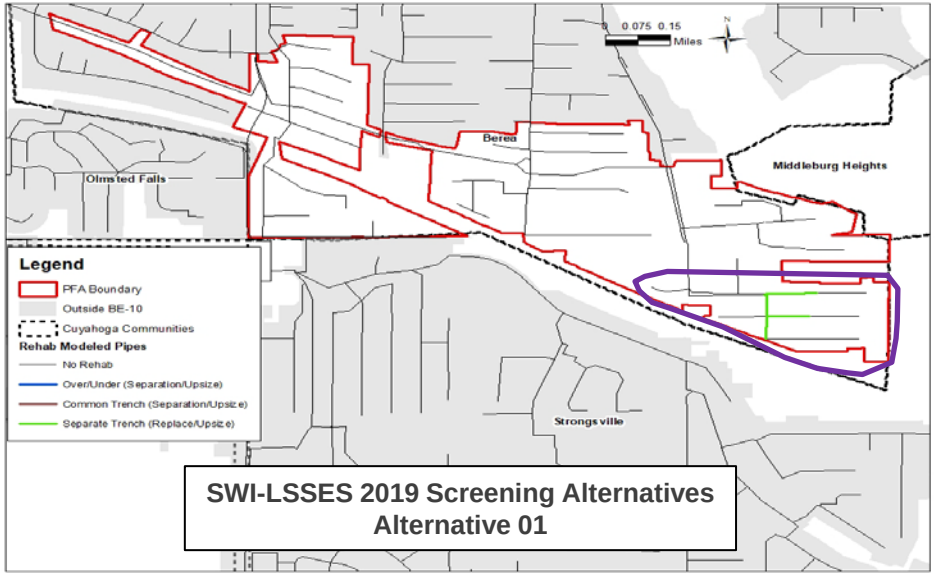
SWI-LSSES 2019 Screening Alternatives
Alternative 02

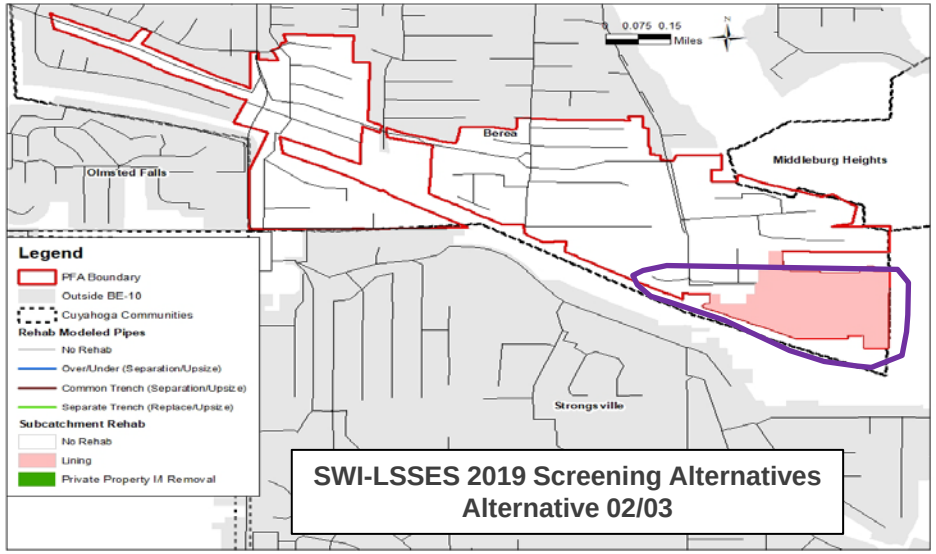


SWI-LSSES 2019 Screening Alternatives
Alternative 03

BE-03 – Area A

Refined Alternatives

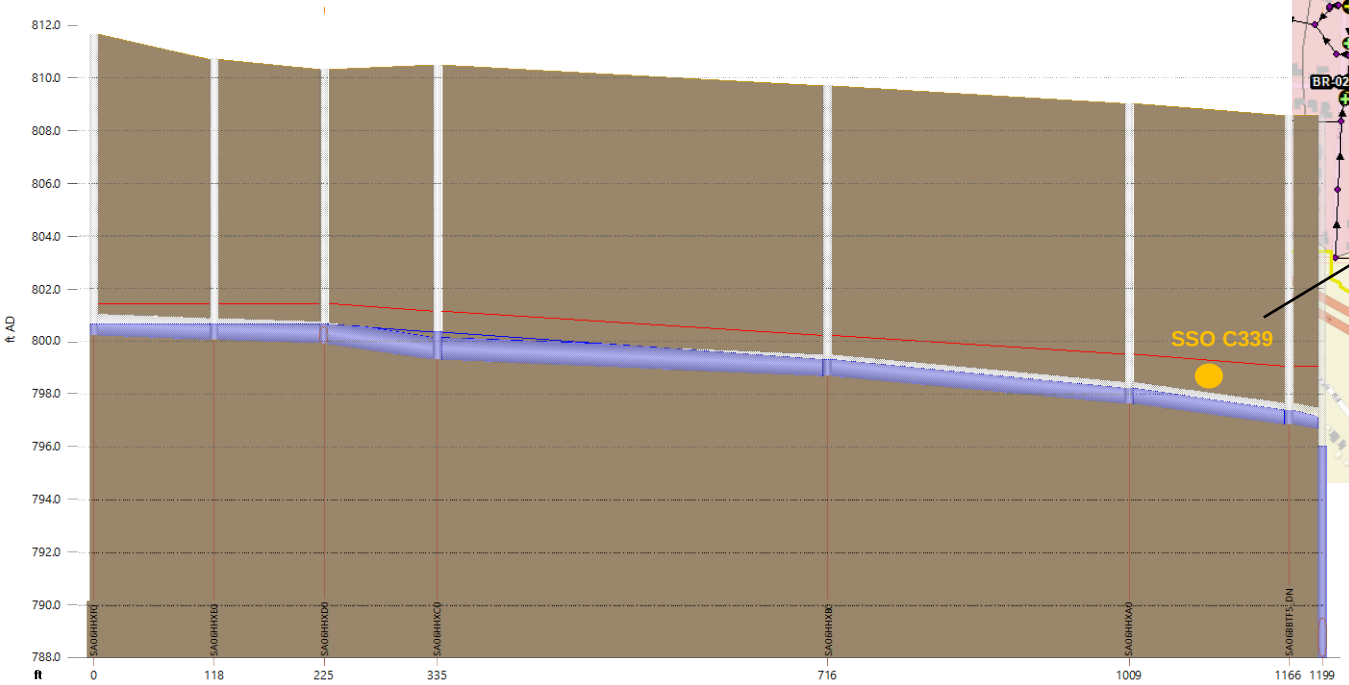


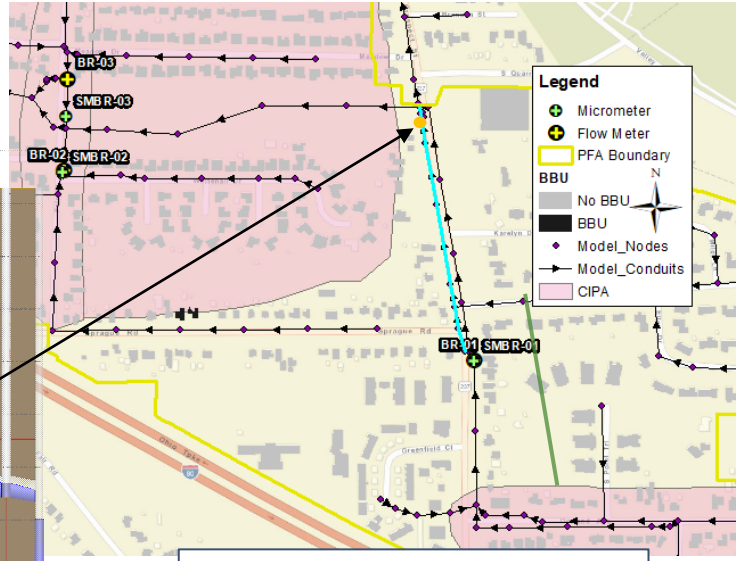


PFL Area	Catchment ID	Alternative		Summary										Planning Costs, $ AACE Class 5
		Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
BE-09	All	A1	Area A	1,882										$1,938,695
BE-09	All	A2	Area A					4,750						$1,512,343
BE-09	All	A3	Area A					4,750						1,512,343

BE-03 – Area A: Tier 1 Solution Impacts to SSO C339

5-Year Model Design Storm Profiles





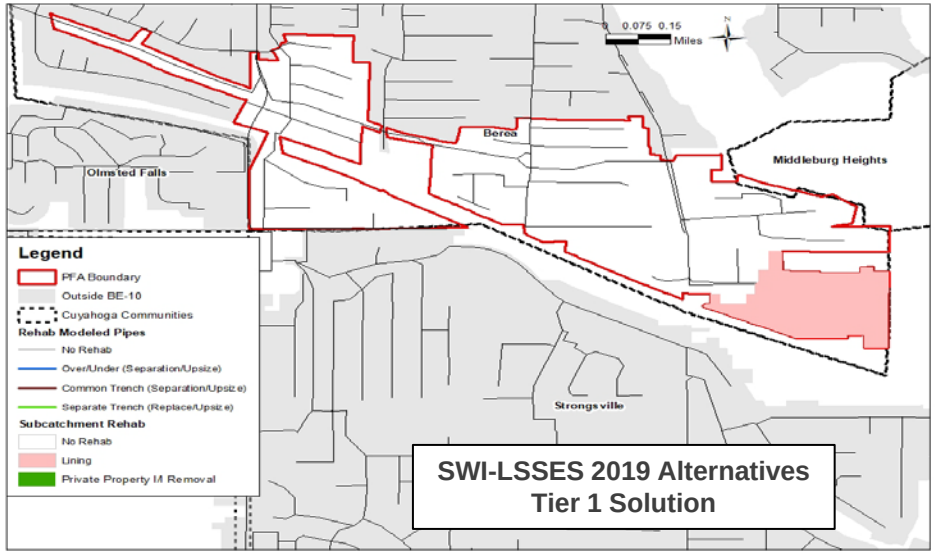
Model Profile Highlighted Blue

HGL associated with Tier 1 solution is shown in blue.
Prior HGL is shown in red – Tier 1 solution reduces

BE-09

Tier 1 Solution

- For Areas A, public rehab only was the lowest cost option.

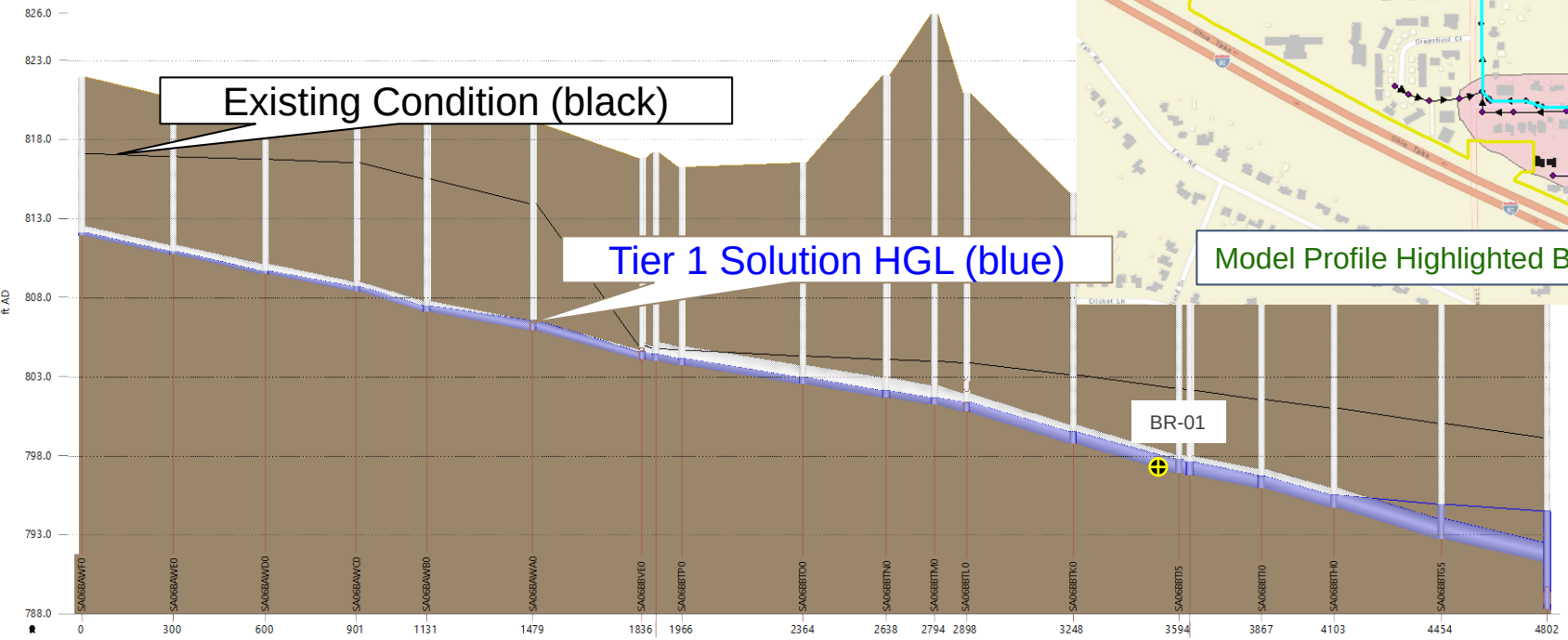


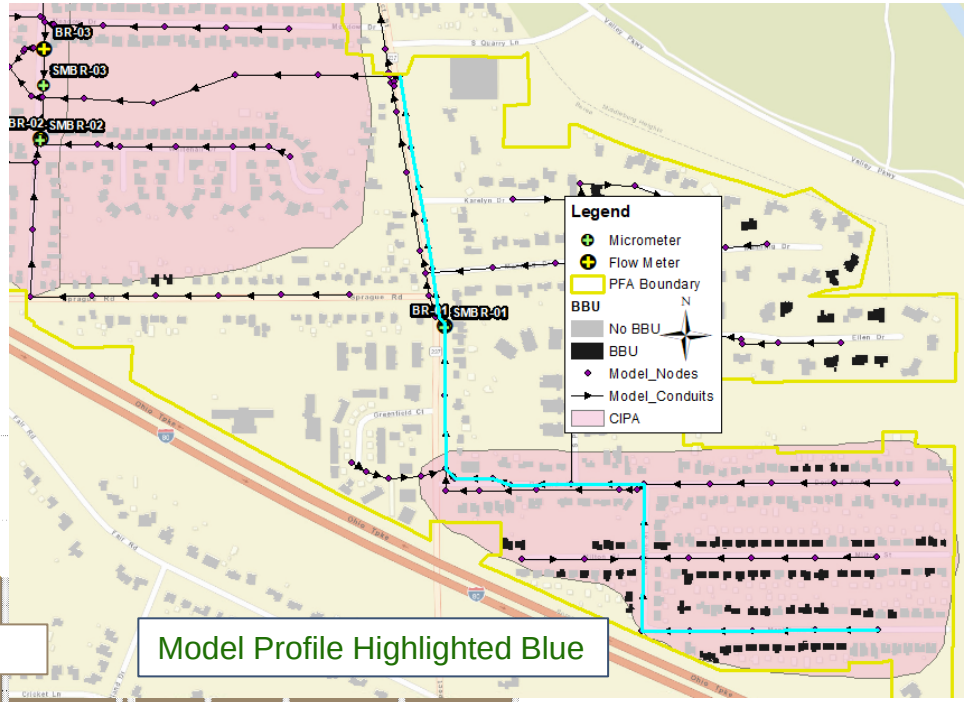
PFL Area	Catchment ID	Alternative		Summary										Planning Costs, $ AACE Class 5
		Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
BE-09	All	Tier 1 Solution						4,750						$1,512,343

BE-09 Area A

Tier 1 Solution Profile

- The Tier 1 solution resolves all BBUs and the majority of surcharge within CIPA area A



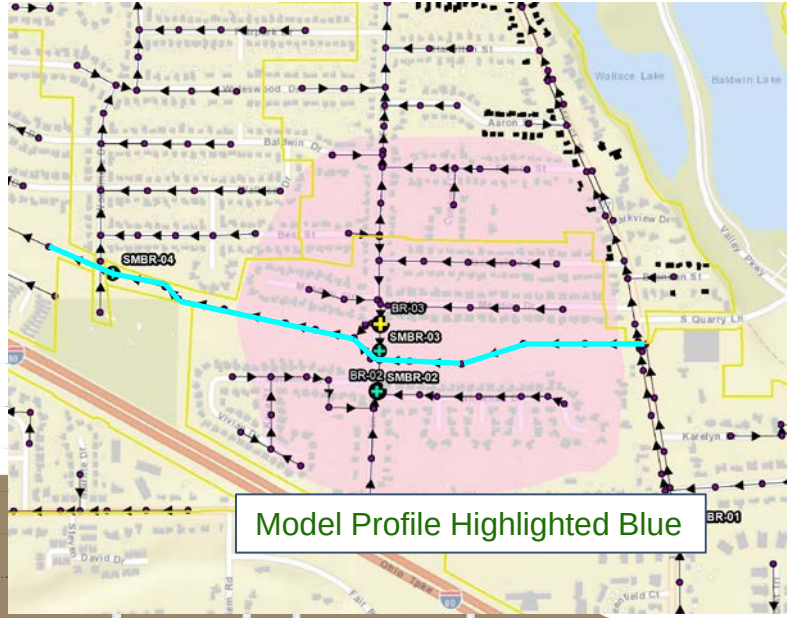


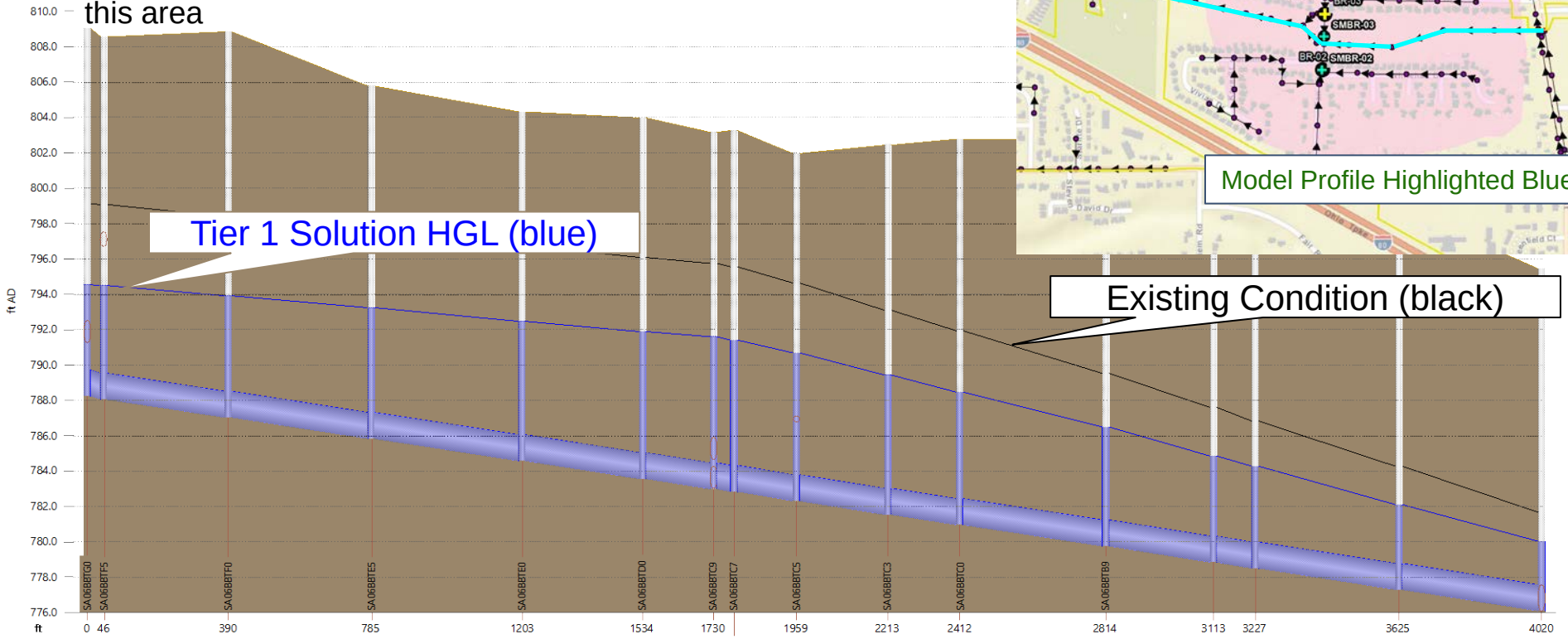
Model Profile Highlighted Blue

BE-09 Area A

Tier 1 Solution Profile

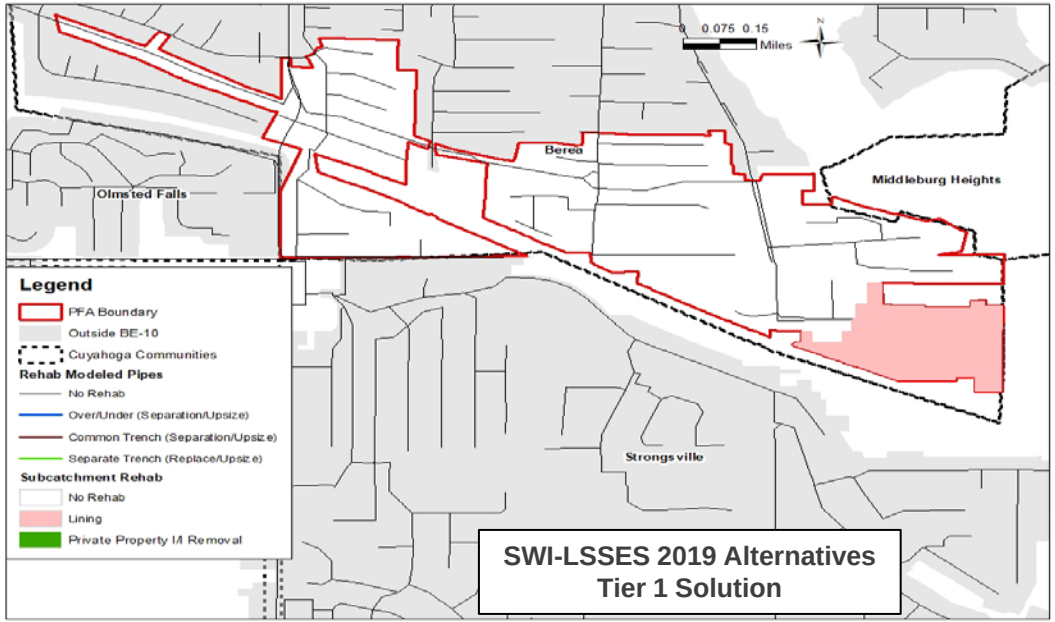
- The Tier 1 solution does not resolve surcharge in Area B downstream; the Tier 2 solution is required to resolve surcharge in this area





BE-09

- Final Tier 1 Solution
  - **Line 4,750 ft of sewer**
  - **Construction cost of $1,512,343**
- The model did not predict any HGL increases in the vicinity of the SSO (see slide 19) or other downstream areas as a result of the Tier 1 solution. The Tier 1 solution eliminates BBUs in the Area A CIPA but does not completely resolve surcharge in the Area B CIPA; this is handled under the Tier 2 solution

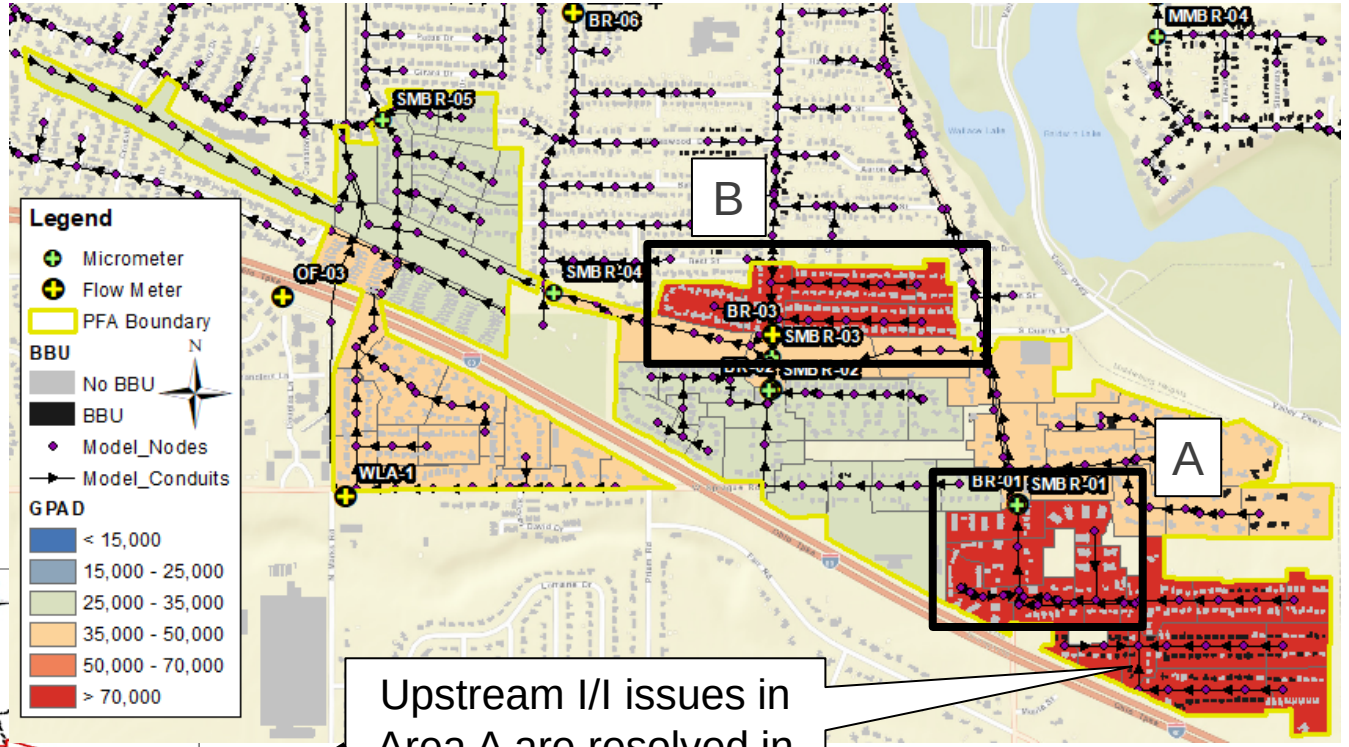


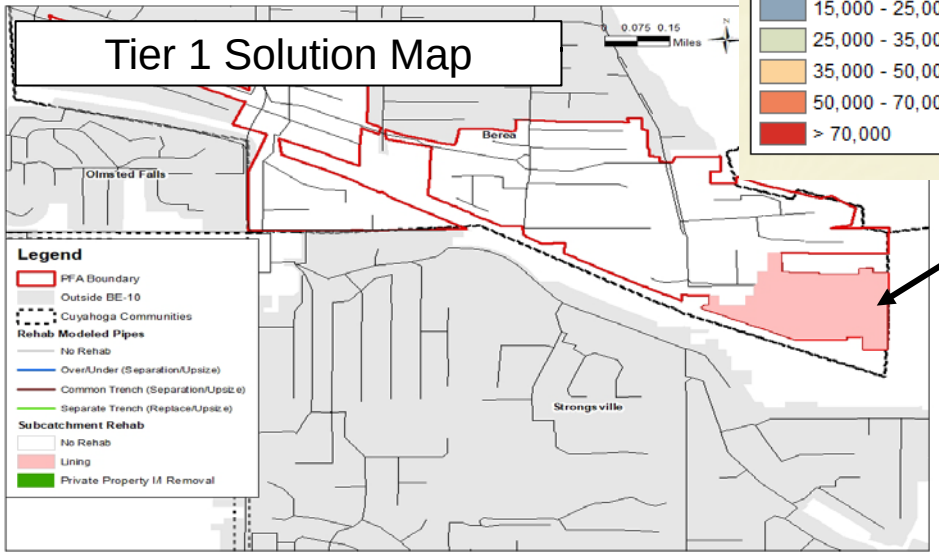
PFL Area	Catchment ID	Alternative		Summary										Planning Costs, $ AACE Class 5
		Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
BE-09	All	Tier 1 Solution						4,750						$1,512,343

BE-09

Tier 2 Model for Optimization
Excessive I/I

- Tier 2 Area breakdown
- Excessive I/I areas not resolved in Tier 1 are lined (i.e. >= 50,000 GPAD)





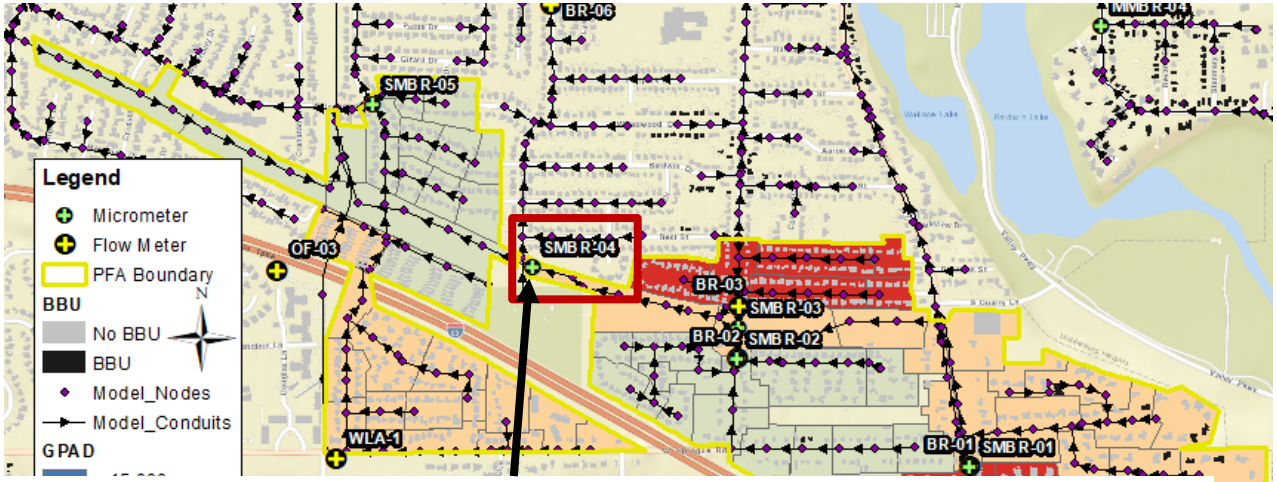
Upstream I/I issues in Area A are resolved in Tier 1 solution (lining)

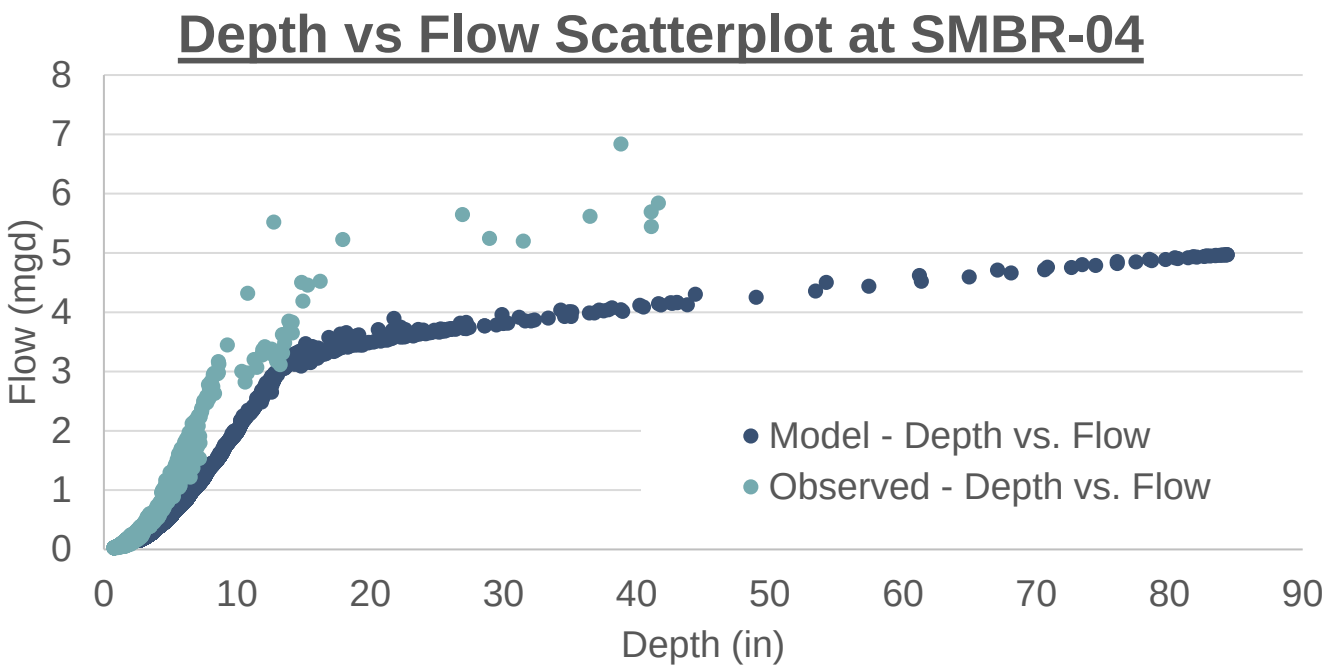
BE-09

Micrometering: SMBR-04

- **The only available micrometer data not included in the Tier 1 assessment is SMBR-04 from 2018**
  - *SMBR-04: The Depth vs. Flow scatterplot show the model conservatively over estimates depth at a given flow rate.*

- Conclusions
  - **No evidence to show that the 2019 model level calibration should be adjusted down at SMBR-04 to better match the 2018 observed values**

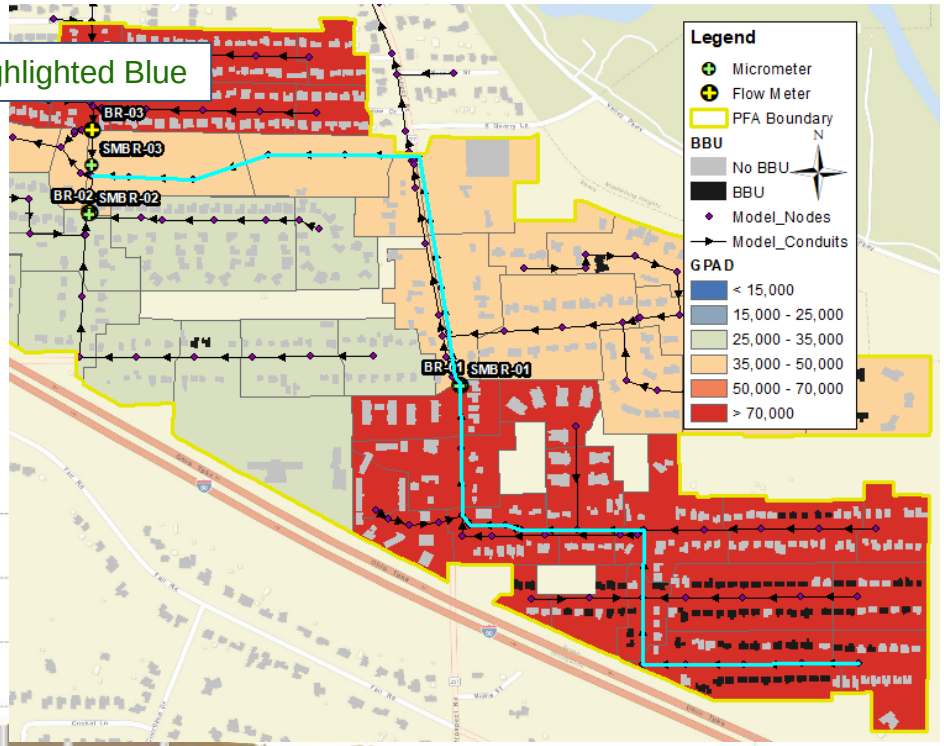


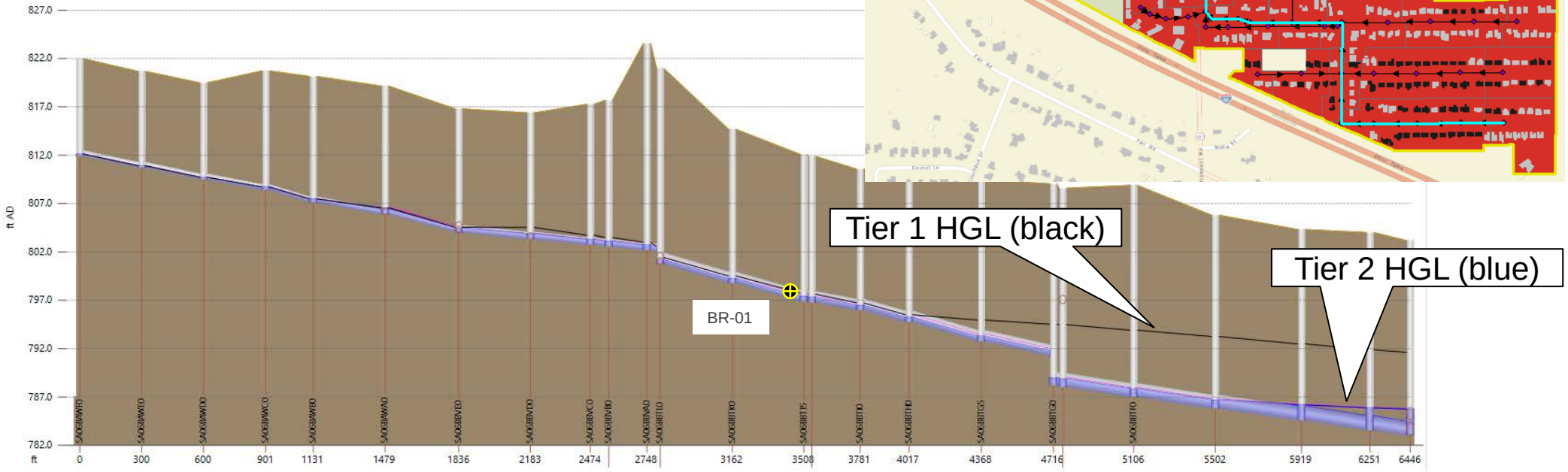


BE-09 Area A

Tier 2 Solution Profile

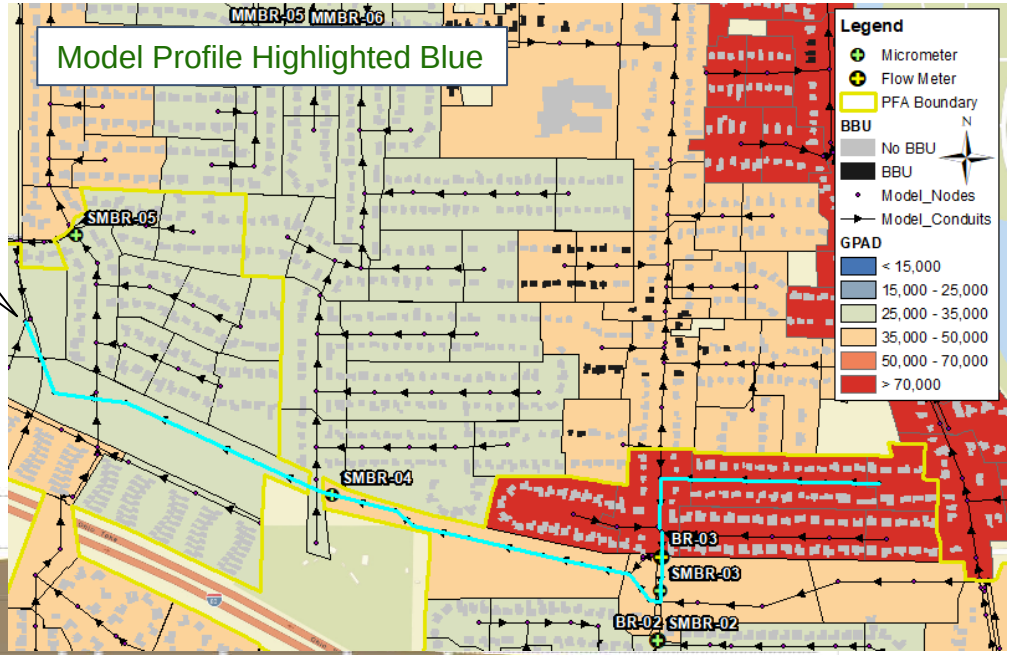
Model Profile Highlighted Blue



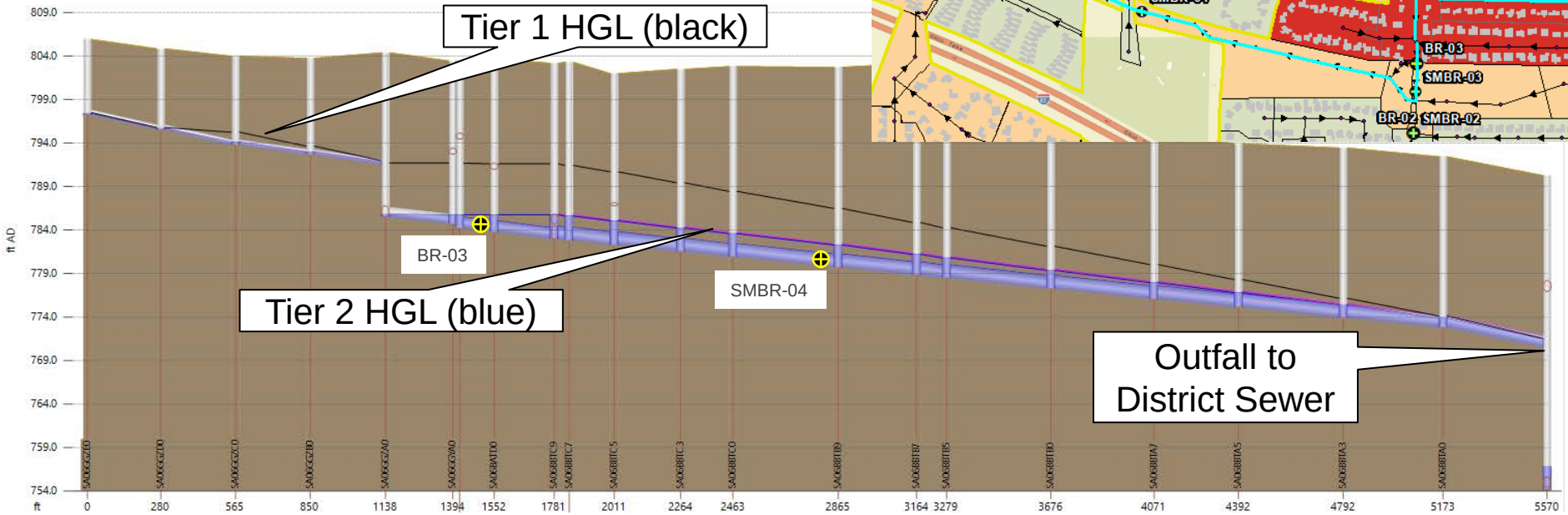


BE-09 Area B

Tier 2 Solution Profile



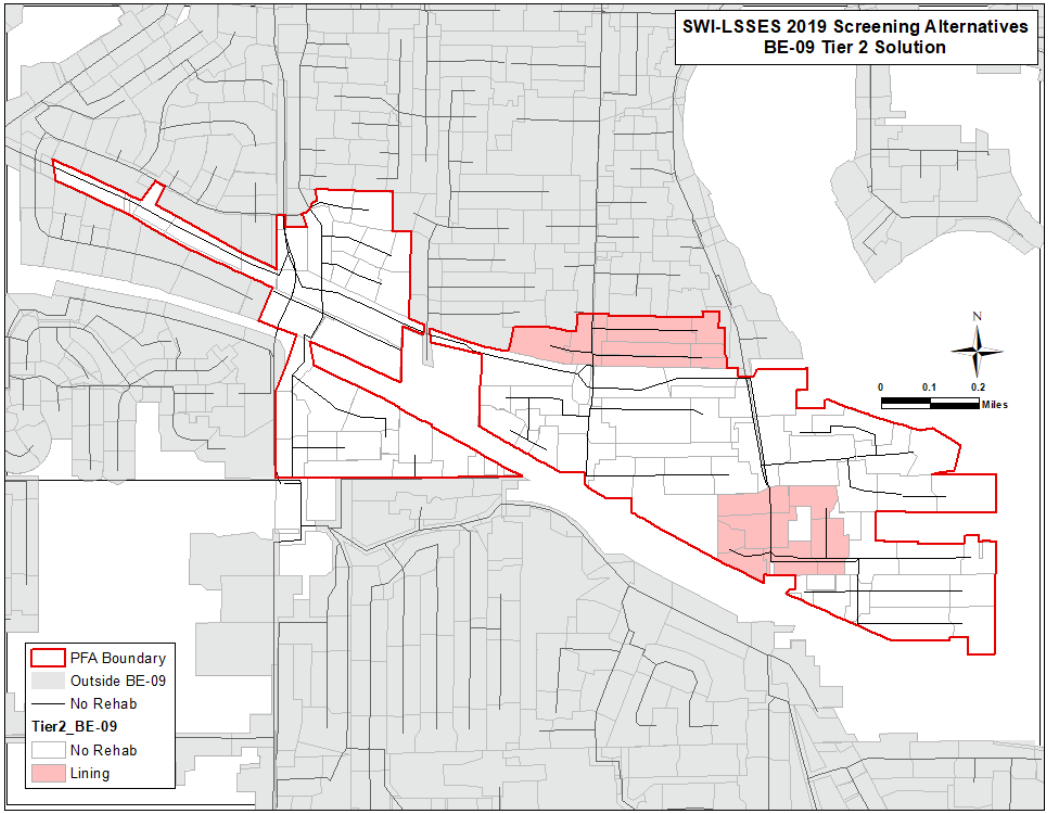
Outfall to District Sewer



BE-09

Tier 2 Solution

- To resolve excessive I/I, public rehab only.

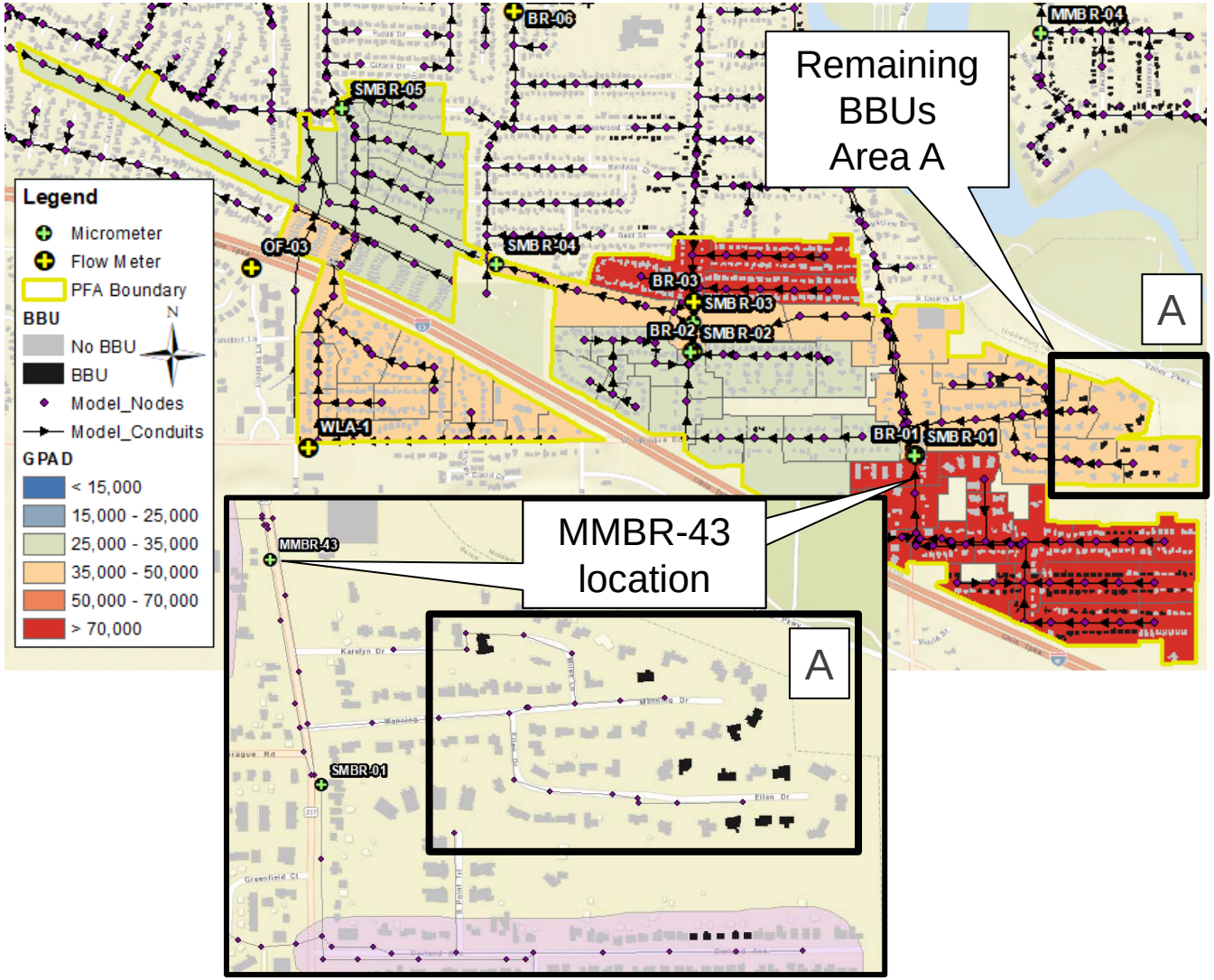


Update PFL Cost (YES/NO)	NEORSD Branch	PFL Area	Catchment ID (Use "ALL" to cost for all catchments within PFL)	Alternative		Summary										
				Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
YES	SWI2019	BE-09	ALL	A2	Lining Only - Tier 02.					8720						$ 2,932,301

BE-09

Tier 3 Model for Optimization
Remaining BBUs

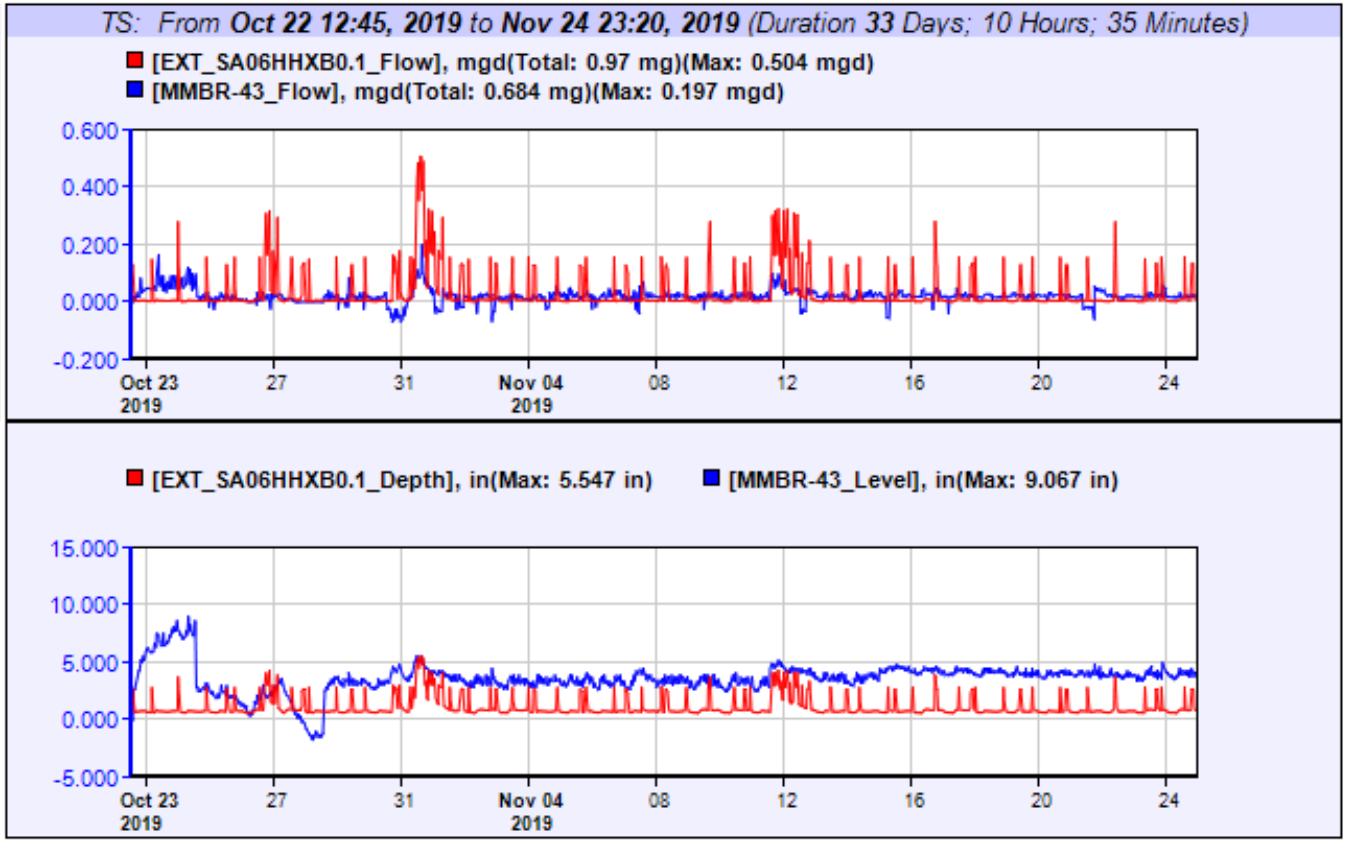
- Tier 3 Area breakdown
  - **Not in a CIPA**
  - **No excessive I/I**
  - **Micrometer MMBR-43**
    - *10/22/19 – 11/25/19*



BE-09

Tier 3 Model for Optimization
Remaining BBUs

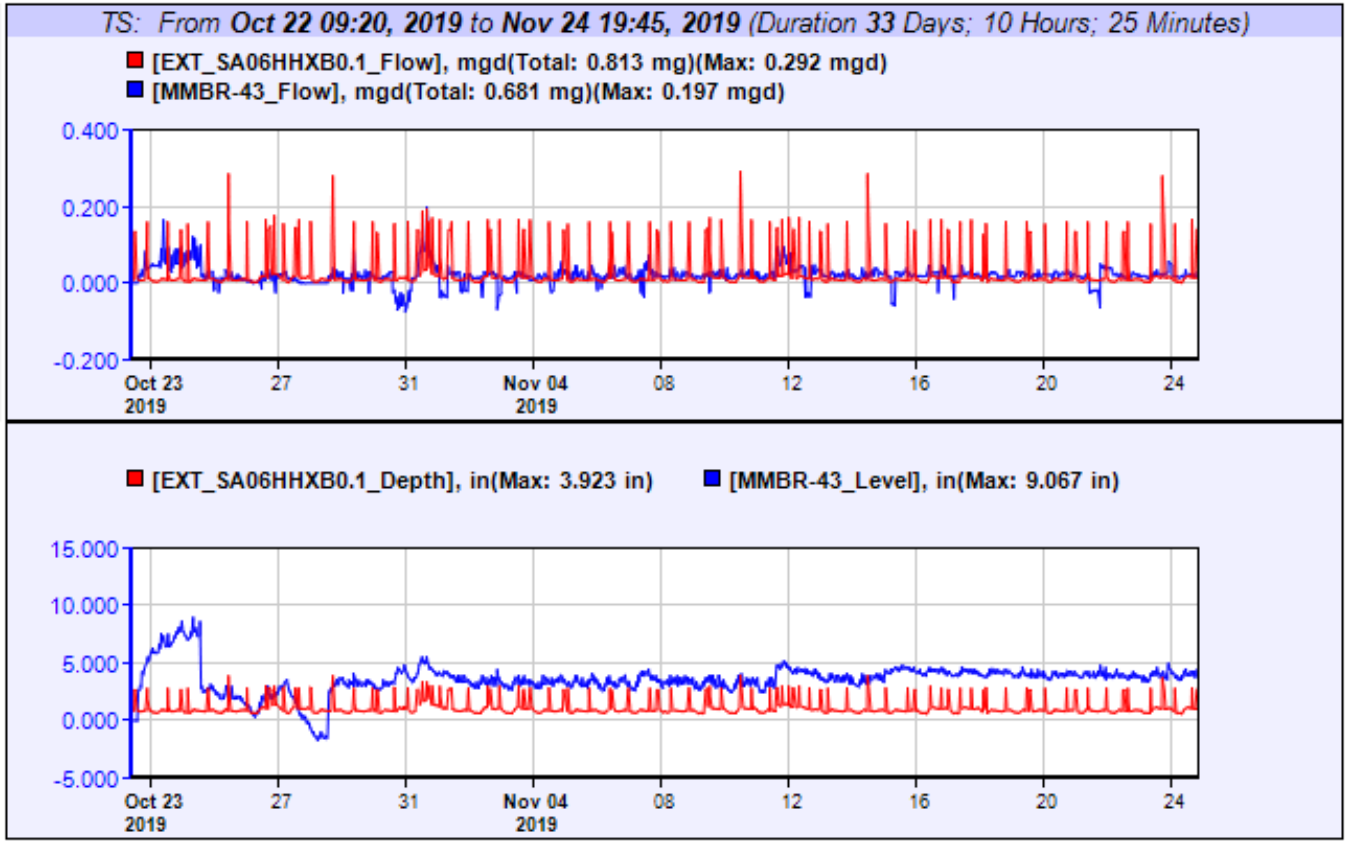
- Micrometer Comparison
  - 10/22/19 – 11/25/19
  - Modeled volume is about 275% too high (Oct 31 only)
  - Model peak flows are about 156% higher than observed data (Oct 31 only)
  - Observed depths show a blockage or restriction.
  - No data on upstream pump stations
- R-values in the calibrated model to be reduced



BE-09

Tier 3 Model for Optimization
Remaining BBUs

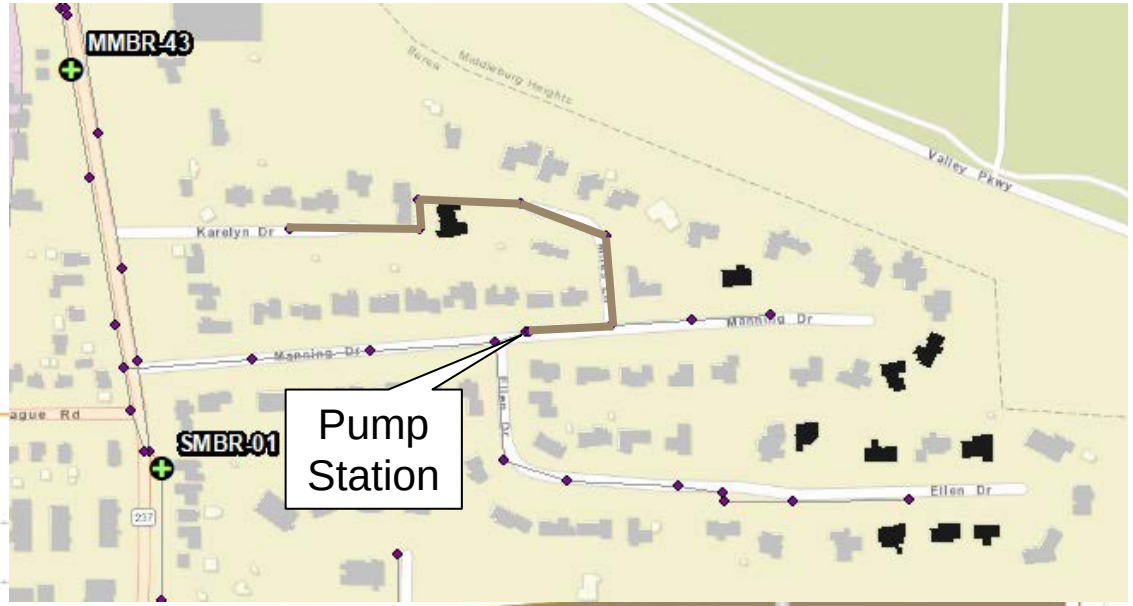
- Micrometer Comparison
  - **10/22/19 – 11/25/19**
  - **Modeled volume is about 1.89% too low (Oct 31 only)**
  - **Model peak flows are about 48.2% higher than observed data (Oct 31 only and <0.1 mgd different)**
  - **Observed depths show a blockage or restriction.**
- Adjusted R-values considered acceptable

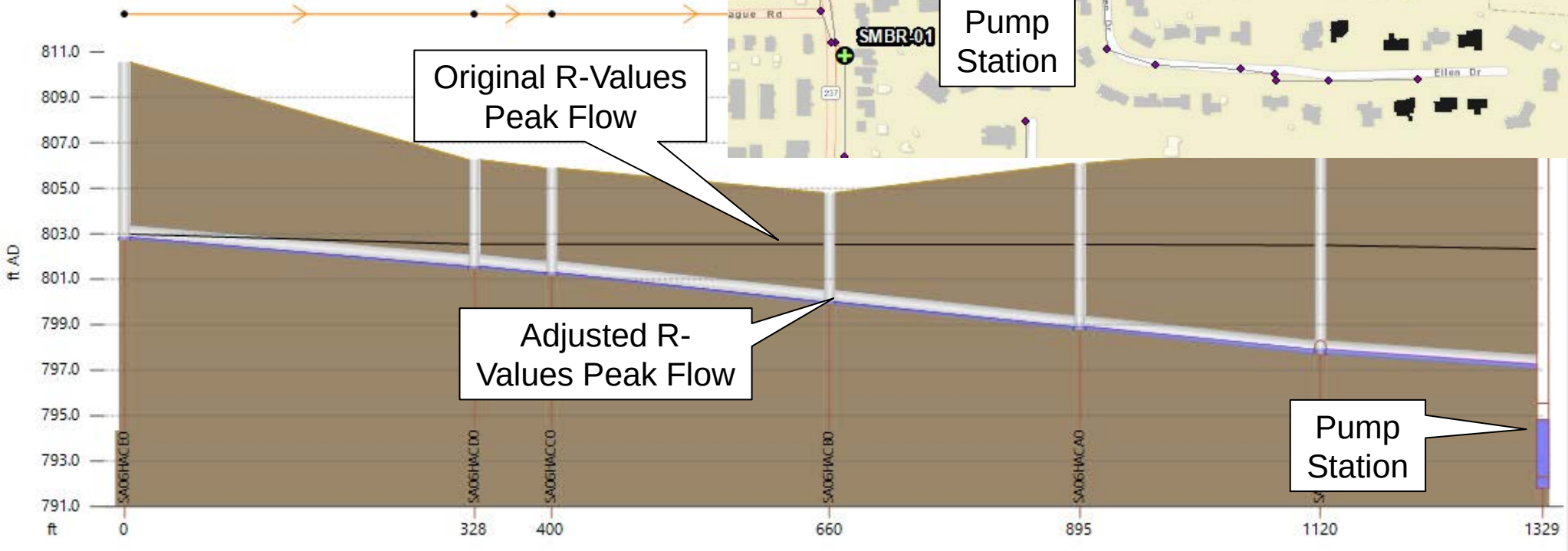


BE-09

Tier 3 Model for Optimization
Remaining BBUs

- 5-yrProfile Comparison



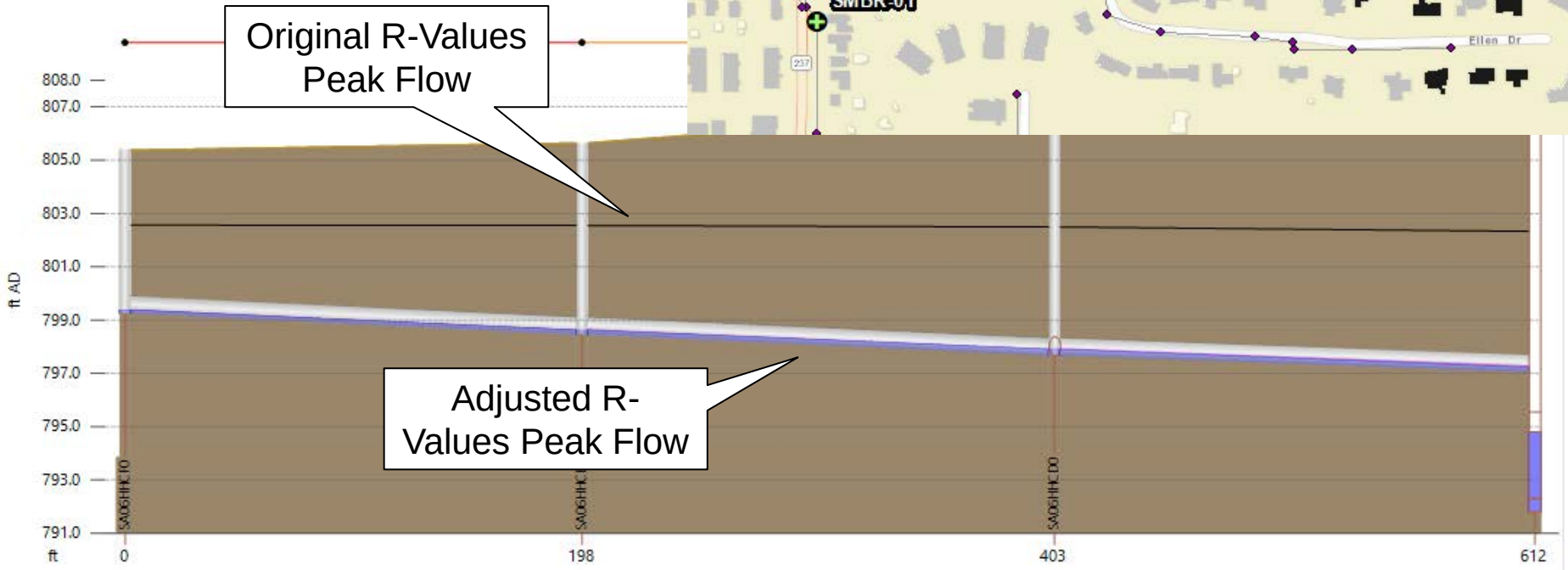


BE-09

Tier 3 Model for Optimization
Remaining BBUs

- 5-yrProfile Comparison

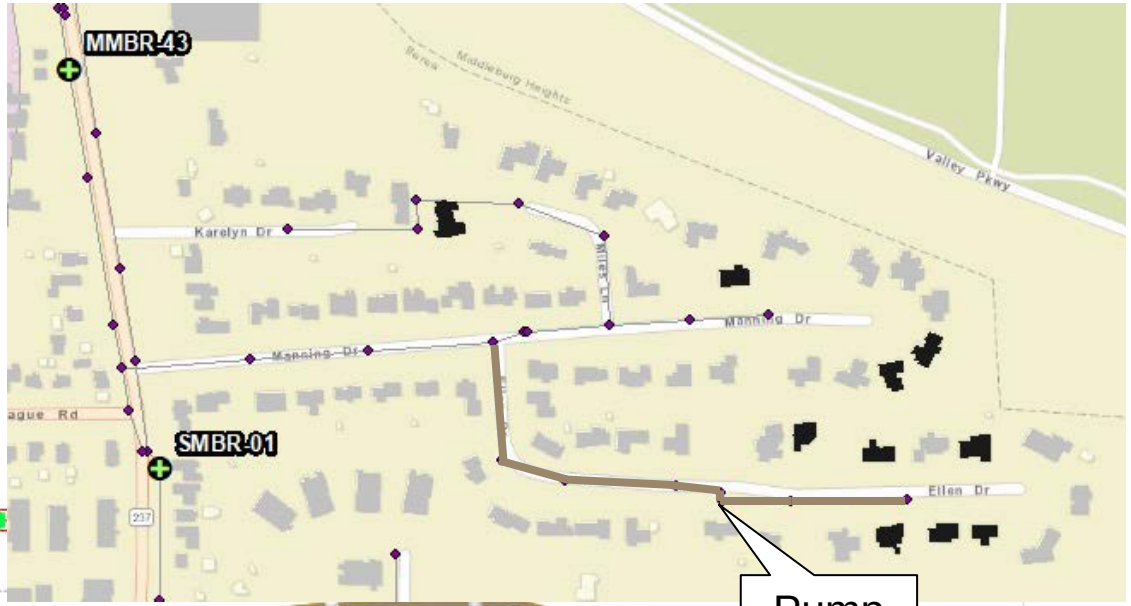


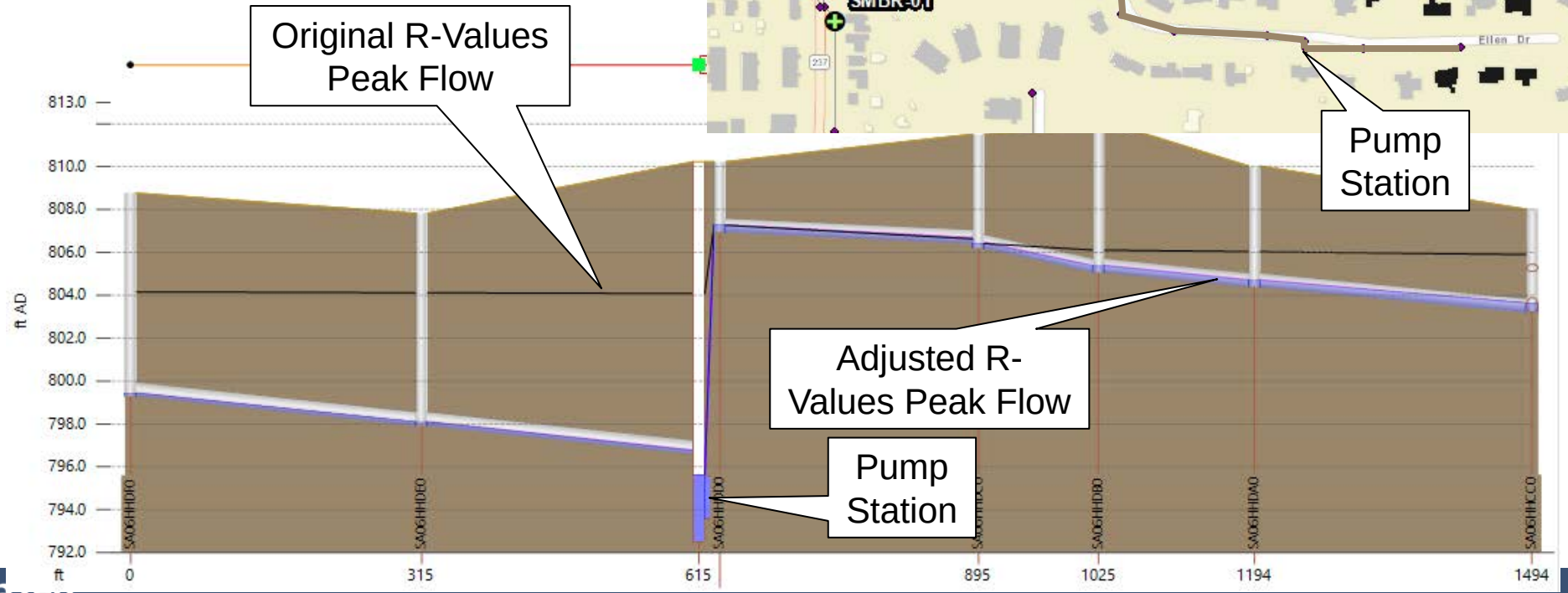


BE-09

Tier 3 Model for Optimization
Remaining BBUs

- 5-yrProfile Comparison



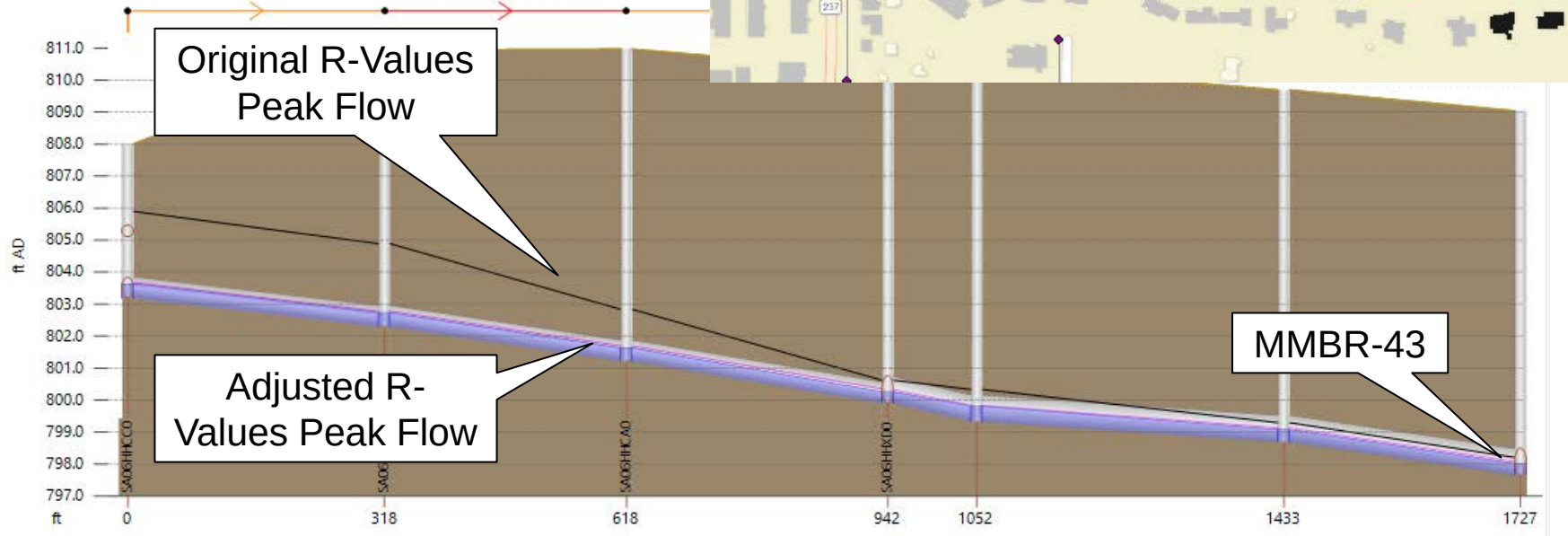


BE-09

Tier 3 Model for Optimization
Remaining BBUs

- 5-yrProfile Comparison





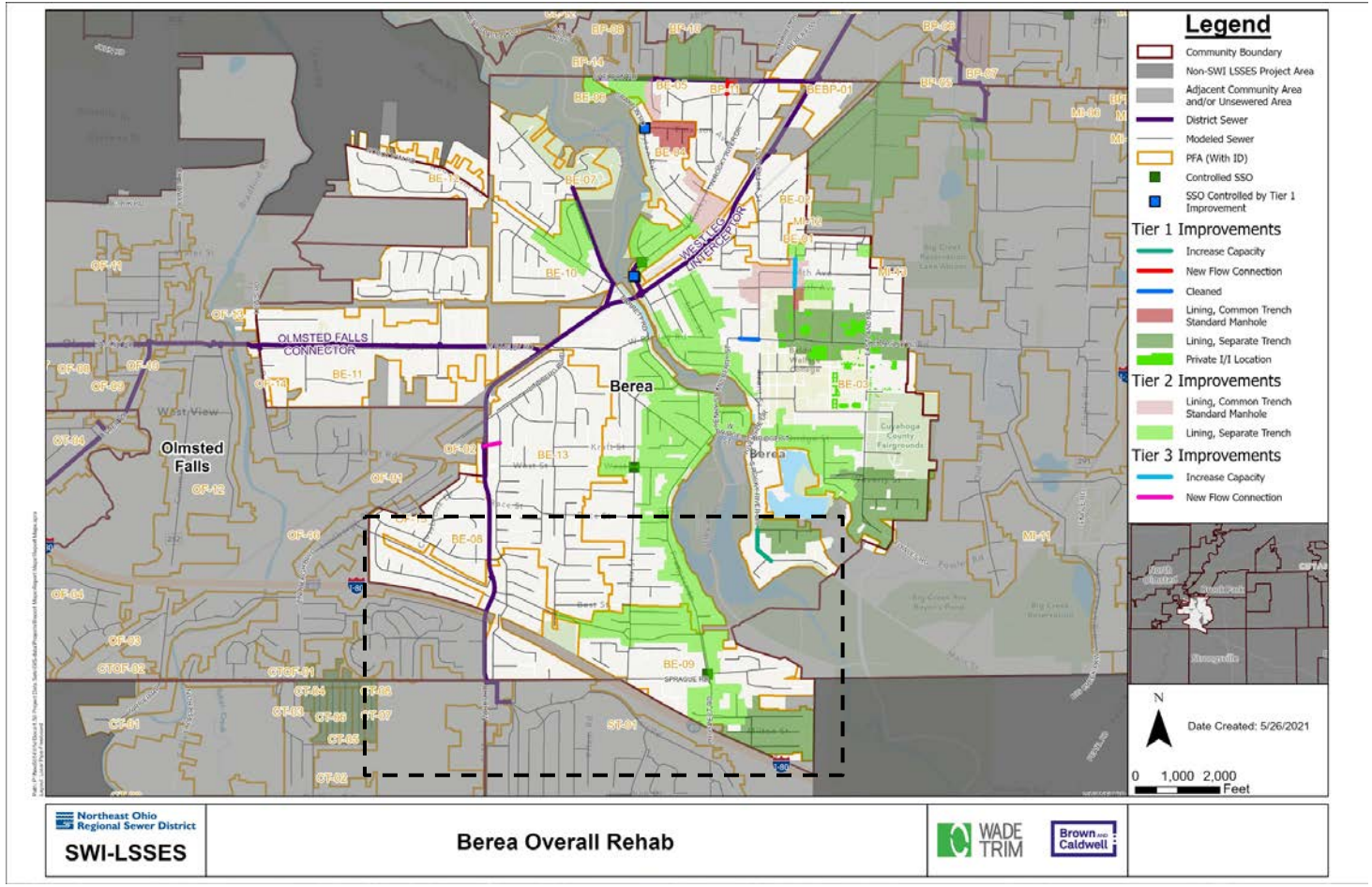
BE-09

Tier 3 Model for Optimization
Remaining BBUs

- Conclusion
  - **Adjusted R-values considered acceptable.**
  - **The HGL is lower than the crown of the pipe in the R-value adjusted area.**
  - **BBUs no longer predicted by the model.**
  - **No Tier 3 Solution required.**

BE-09 Final

- Final recommendation after refinement
- Tier 1
  - Separate trench rehab = 5,822 LF
  - Total cost = $3,012,000
- Tier 2
  - Separate trench rehab = 14,978 LF
  - Total cost = $8,639,000
- Tier 3 N/A
- Total Cost = Total Capital Cost + Contingency + Project Definition Investigation



Indicates the location of the PFA. (Map includes adjacent PFAs.)

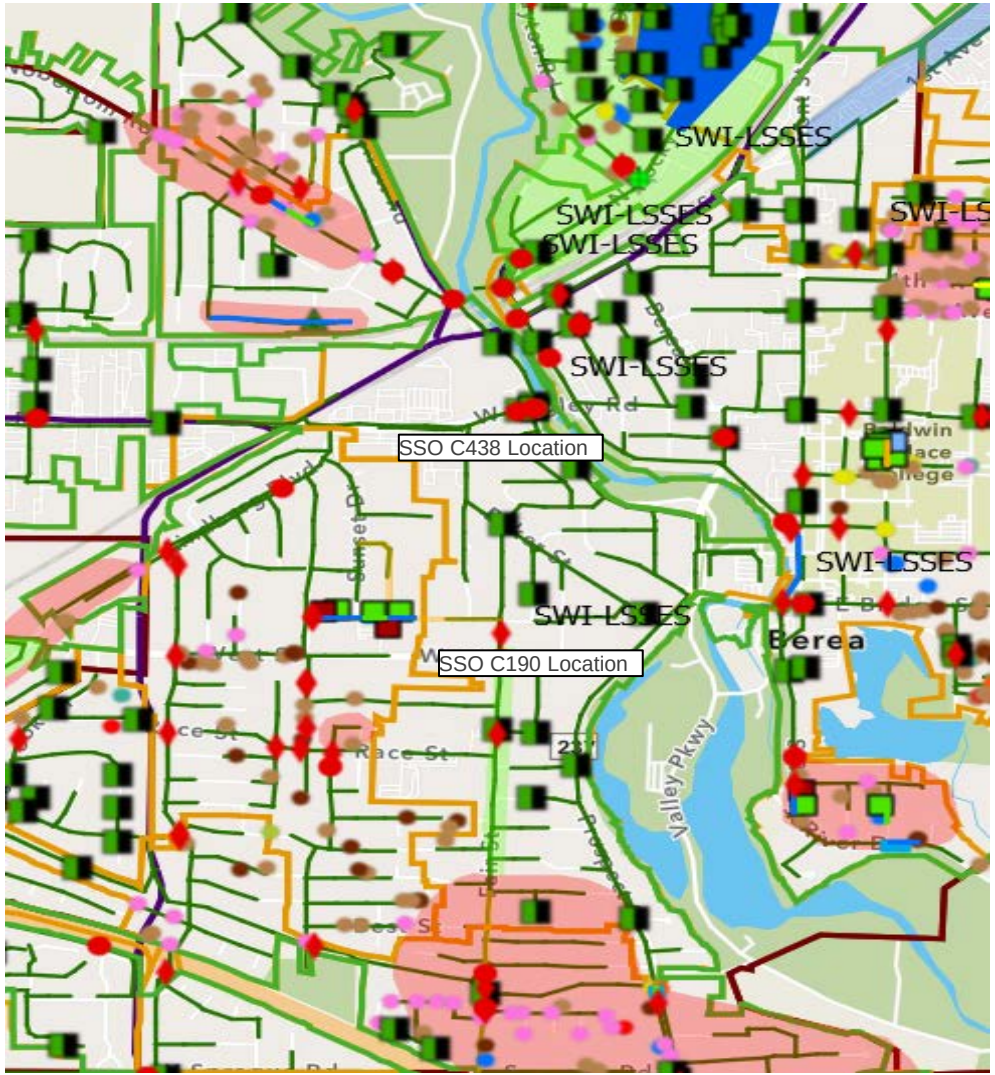
Hazen

SWI-LSSES PFA BE-10 and BE-07 Optimization

BE-10 and BE-07

Optimization - Field Data

- Three CIPAs
- Two SSOs



Legend

Field - Calibration Meter Locations

Field - Micrometer Locations

Field - Private/Residential Dye Test Results
- Negative
- Positive Light
- Positive Rapid

Field - Infiltration Inflow Test
- Negative
- Positive

Field - Catch Basin I/I Test Results
- Negative
- Positive

Field - MACP Inspection Locations
- Complete

Field - Manhole Depth (Rim to Invert)
- Completed

Field - Smoke Test Results
- Area Drain
- Downspout
- Ground
- Cleanout
- Storm Manhole
- Storm Drain
- Sanitary Manhole
- No Smoke From Vent
- Other
- Foundation

Field Results - Rehab Recommendation Levels - Sanitary Sewers
- 1 - Monitor
- 2 - Perform Maintenance
- 3 - Stabilize Existing Sewer (Spot Repair)
- 4 - Line Existing Sewer
- 5 - Replace Existing Sewer
- Reinspect
- Other

Field - Mainline Sewer Dye Test Results

I/I Score
- >50
- 20 - 50
- <20
- Passed

Field - Sewers with FOG Buildup

Field - Sewers with Debris Buildup

Field - Sewers with Root Intrusion

Basemap Data - Past Rehab Locations (Source: CCDPW)

Basemap Data - Modeled Local Sewers

Basemap Data - Modeled District Interceptors

Basemap Data - MCIP Project Locations
- 2017
- 2018
- 2019

Basemap Data - Past Rehab Projects (Other)

Basemap Data - SWI Problem Areas
- Basement Backup Locations
- Current/Previous Project
- Failing Septic Tanks
- Illicit Discharge Location
- Surface Flooding

Basemap Data - Model Study Areas
- 2018 SWI Model Area
- 2019 SWI Model Area

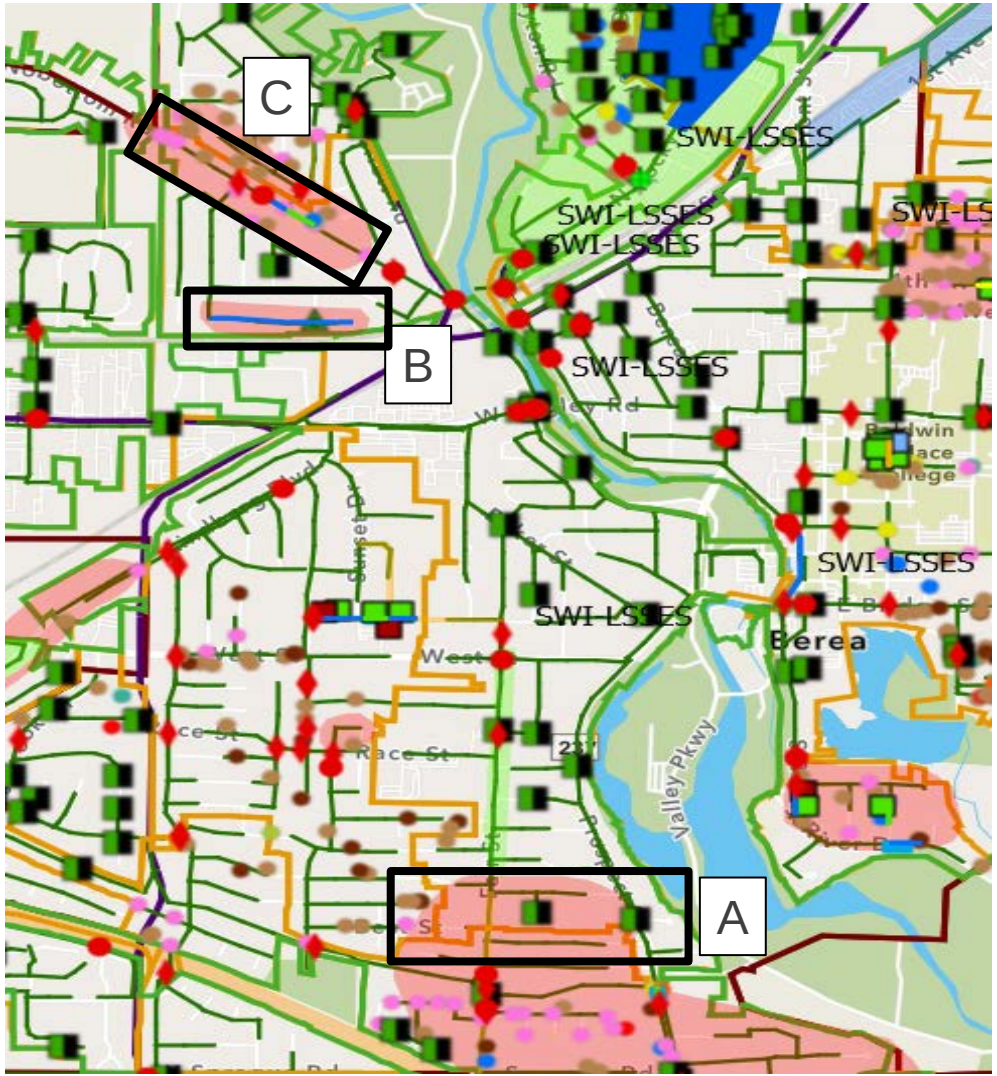
Basemap Data - Peak Flow Areas

Basemap Data - Community Boundaries

BE-10 and BE-07

Optimization - Field Data

- Three CIPAs
  - Broken down into three different areas

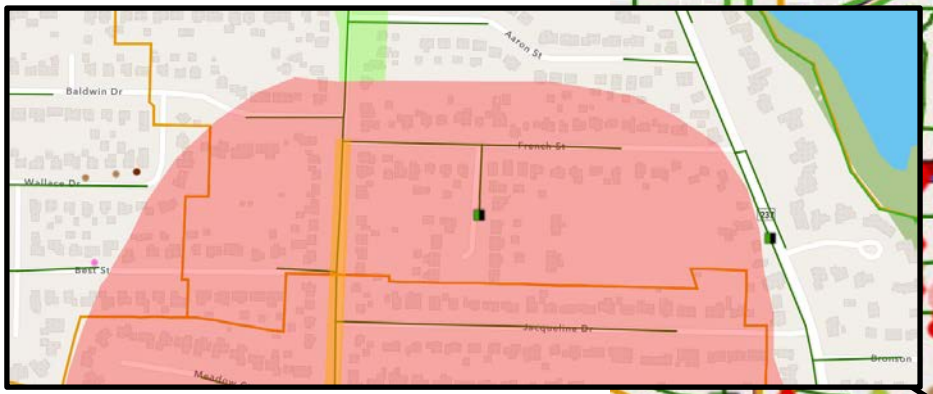


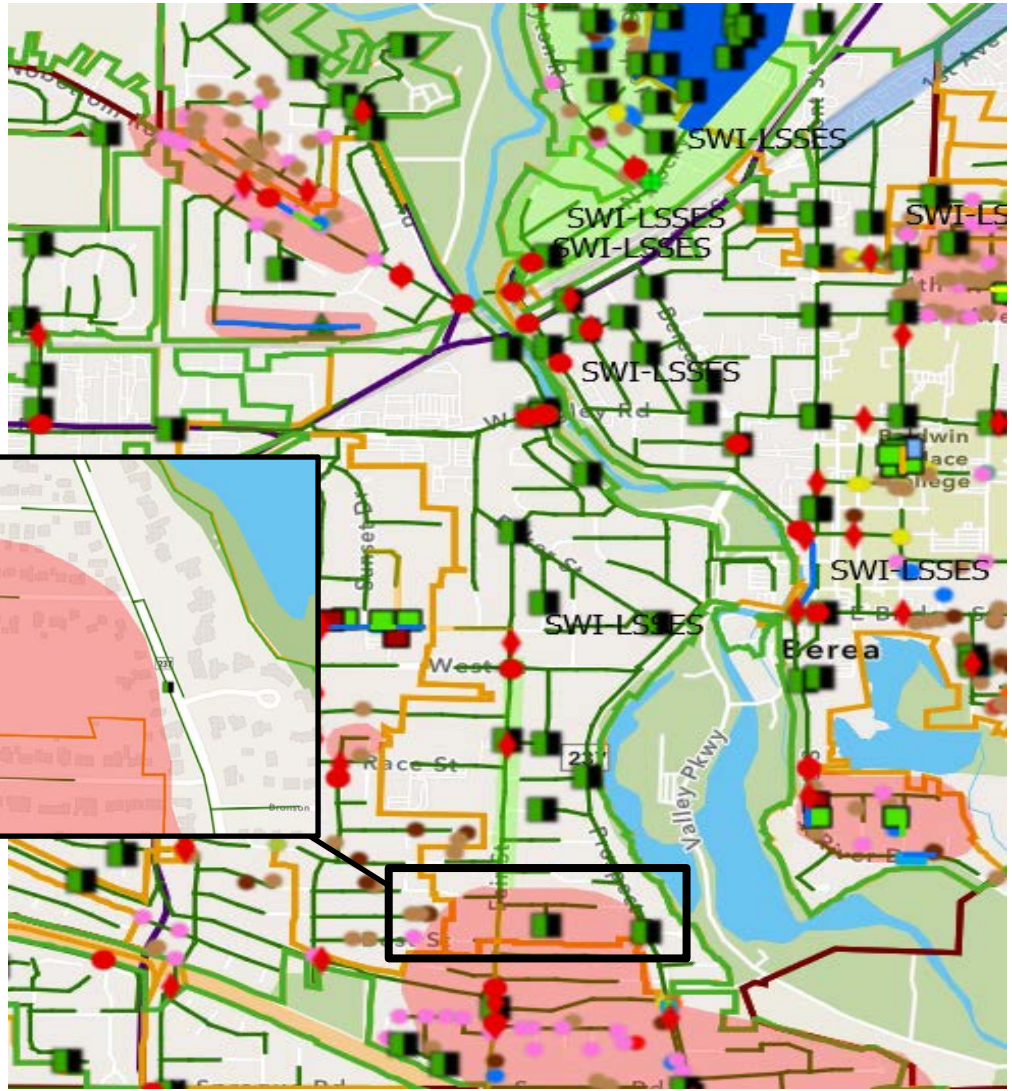


BE-10 and BE-07

Optimization – Area A Field Data

- No dye test or smoke tests
- One manhole measure down

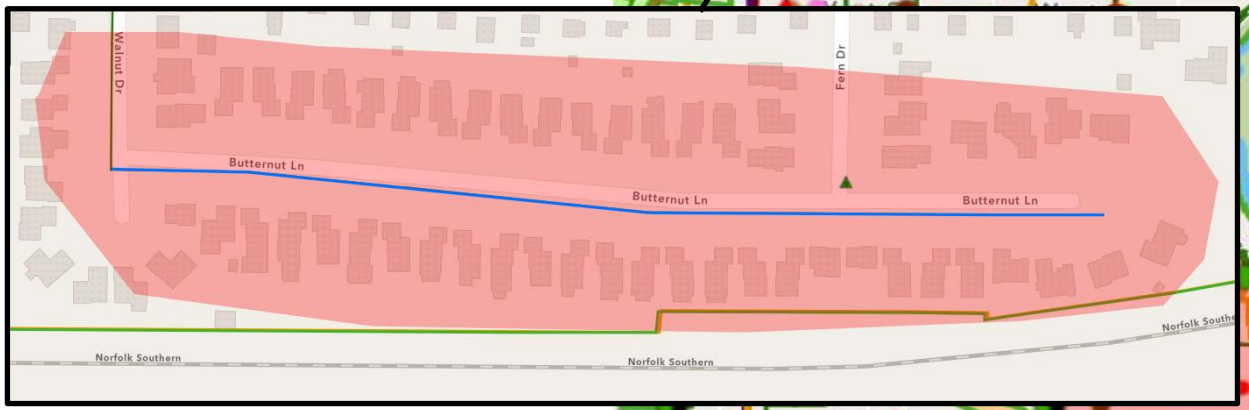


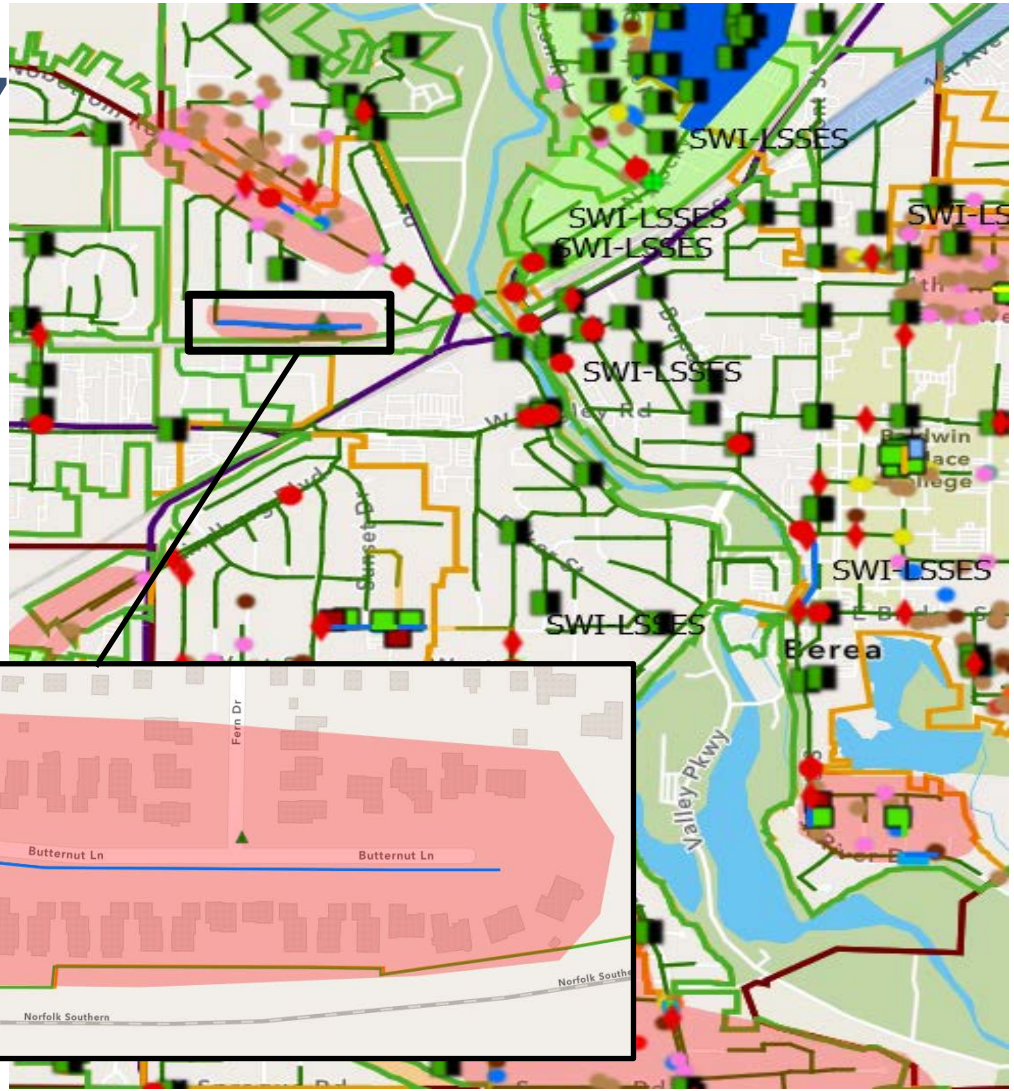


BE-10 and BE-07

Optimization – Area B Field Data

- No smoke tests
- One negative catch basin dye test. Catch basin connection crosses street to catch basin south, flows to storm manhole
- Dye tested sewer : no infiltration defects found



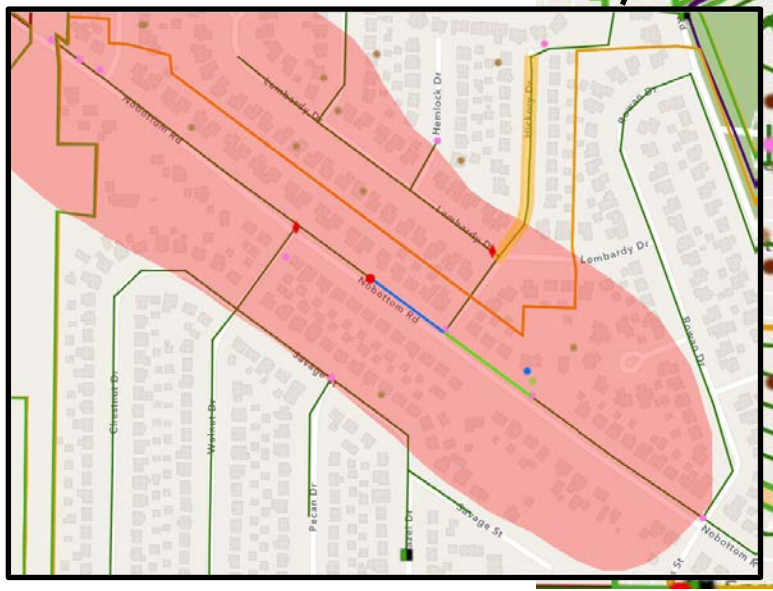


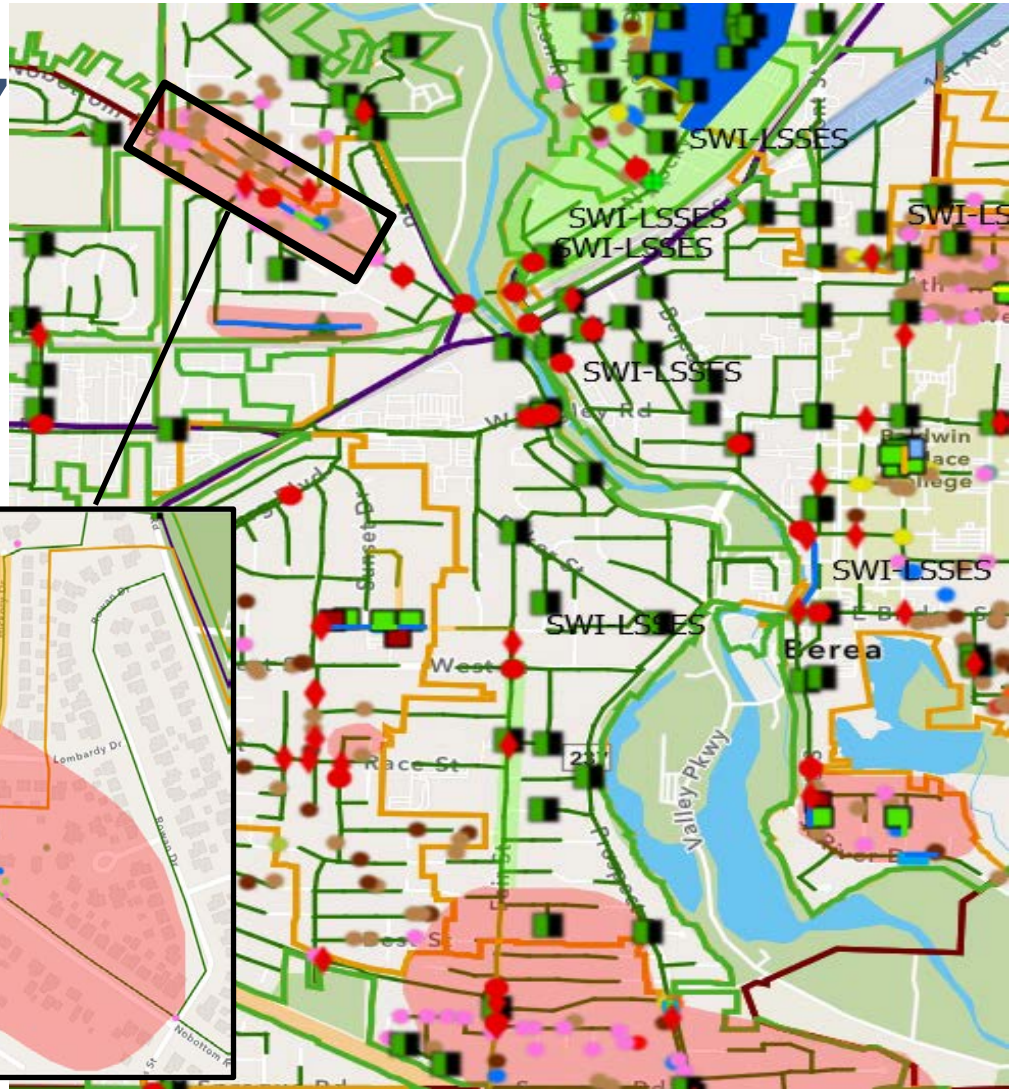


BE-10 and BE-07

Optimization – Area C Field Data

- Several smoke test defects (ground, manhole, downspout, vent)
- Two dye tested sewers : one found connections



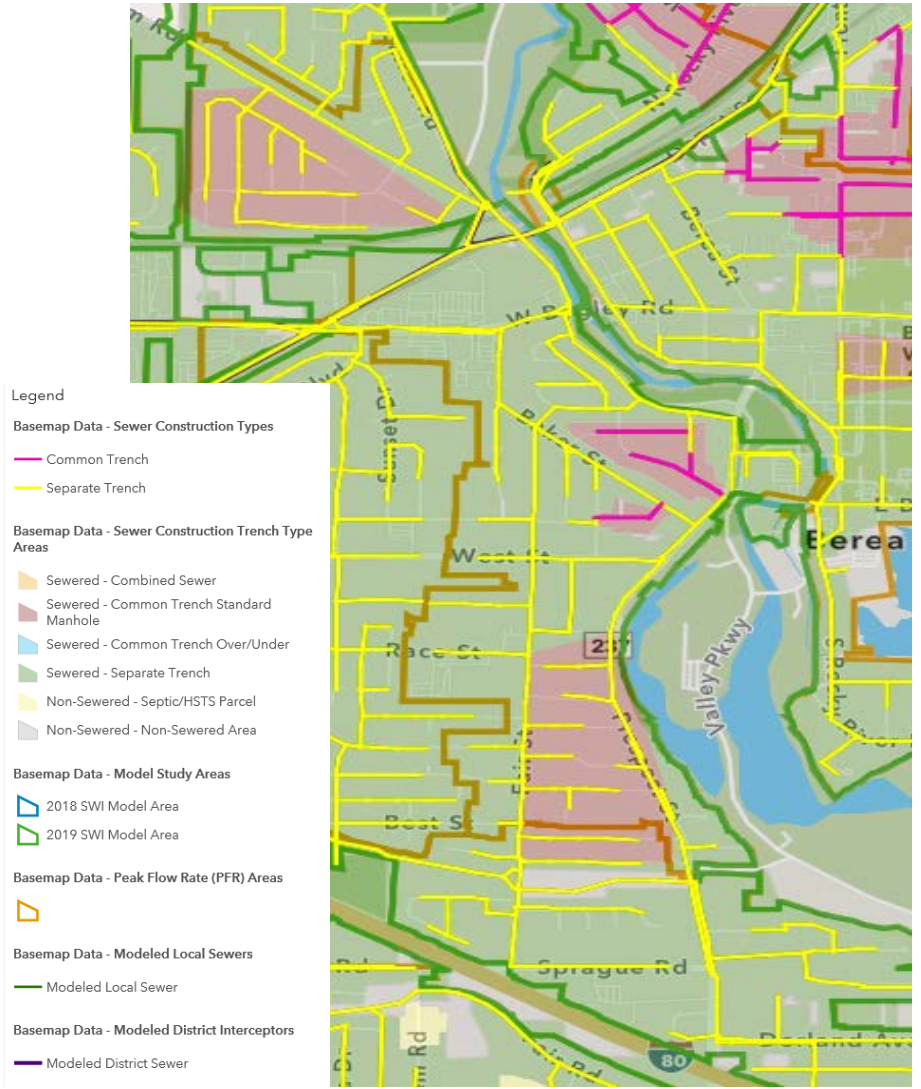




BE-10 and BE-07

Optimization – Trench Type

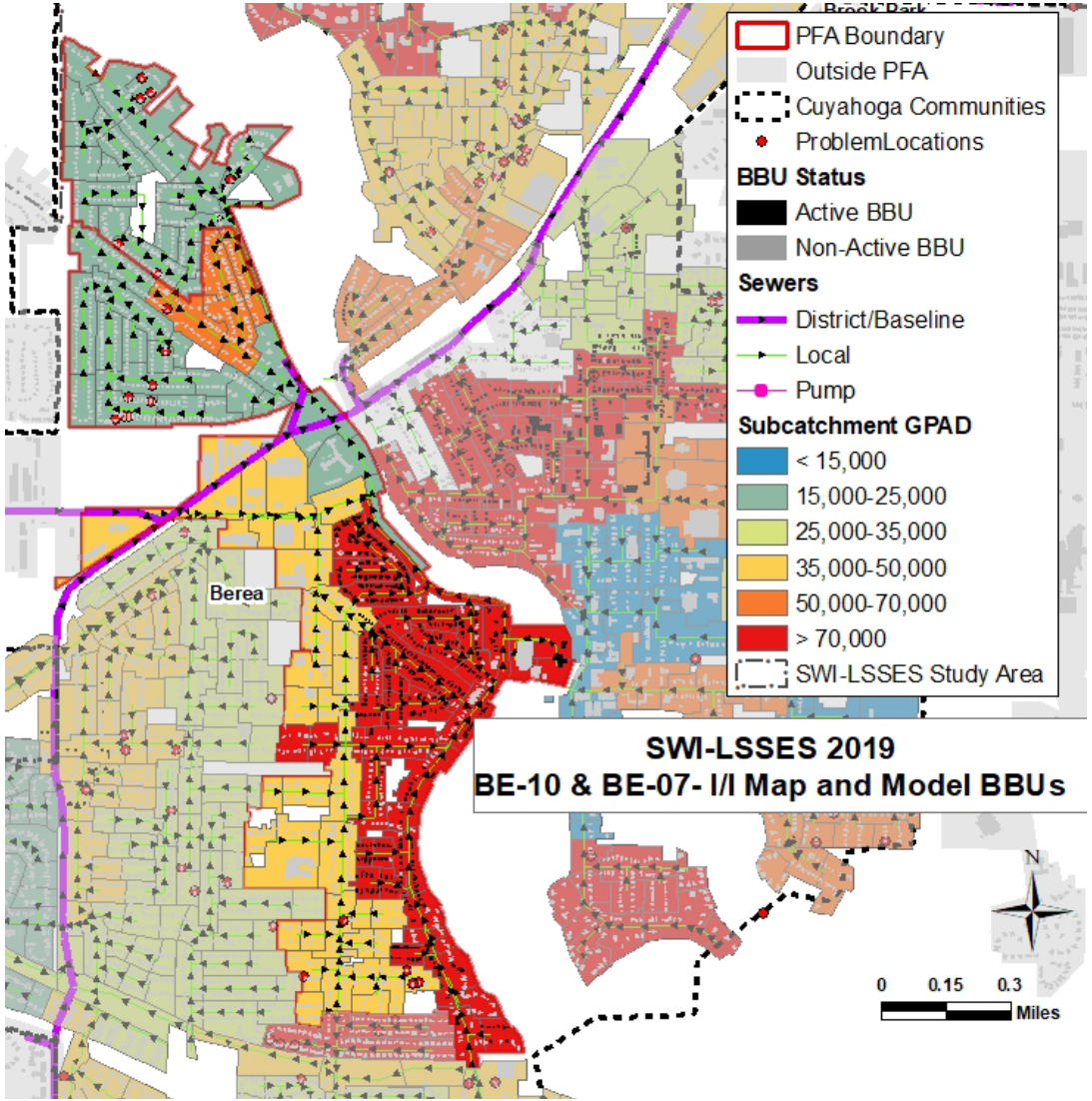
- Mostly Separate Trench with one Common Trench area



BE-10 and BE-07

Model Predicted BBUs and I/I

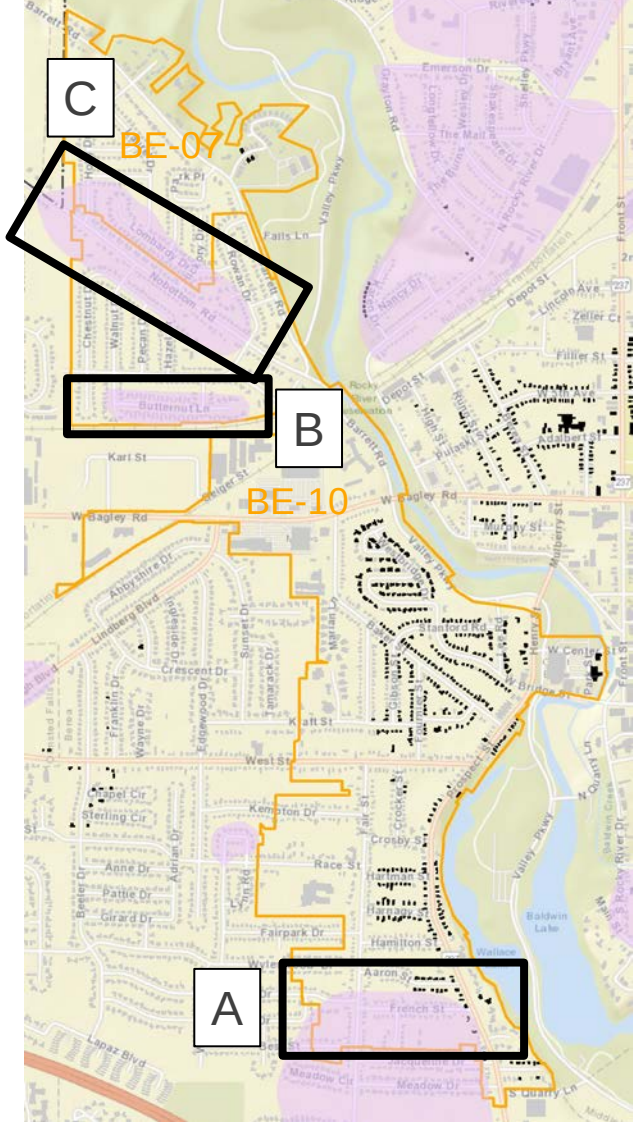
- Rate of I/I varies by metershed
- There are several problem locations within the BE-10 and BE-07 PFAs. At these locations basement and backyard flooding was reported during the 5/15/2020 storm event which had 10-year return interval.



BE-10 and BE-07

Base Model for Optimization BBUs

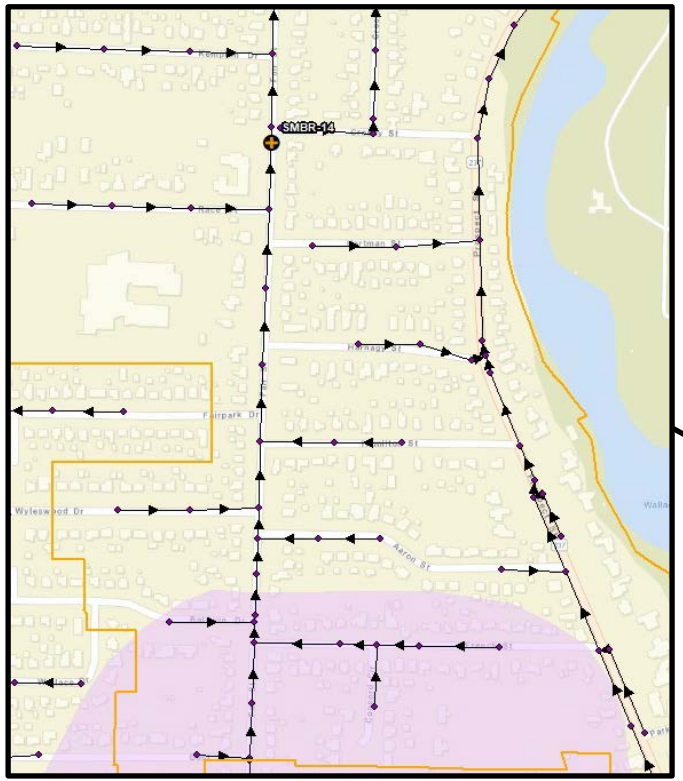
- There are no model predicted BBUs within any of the three CIPA areas. The BBUs shown at the eastern edge of Area A are associated with the sewer that extends north on Prospect Street and not with the Area A CIPA

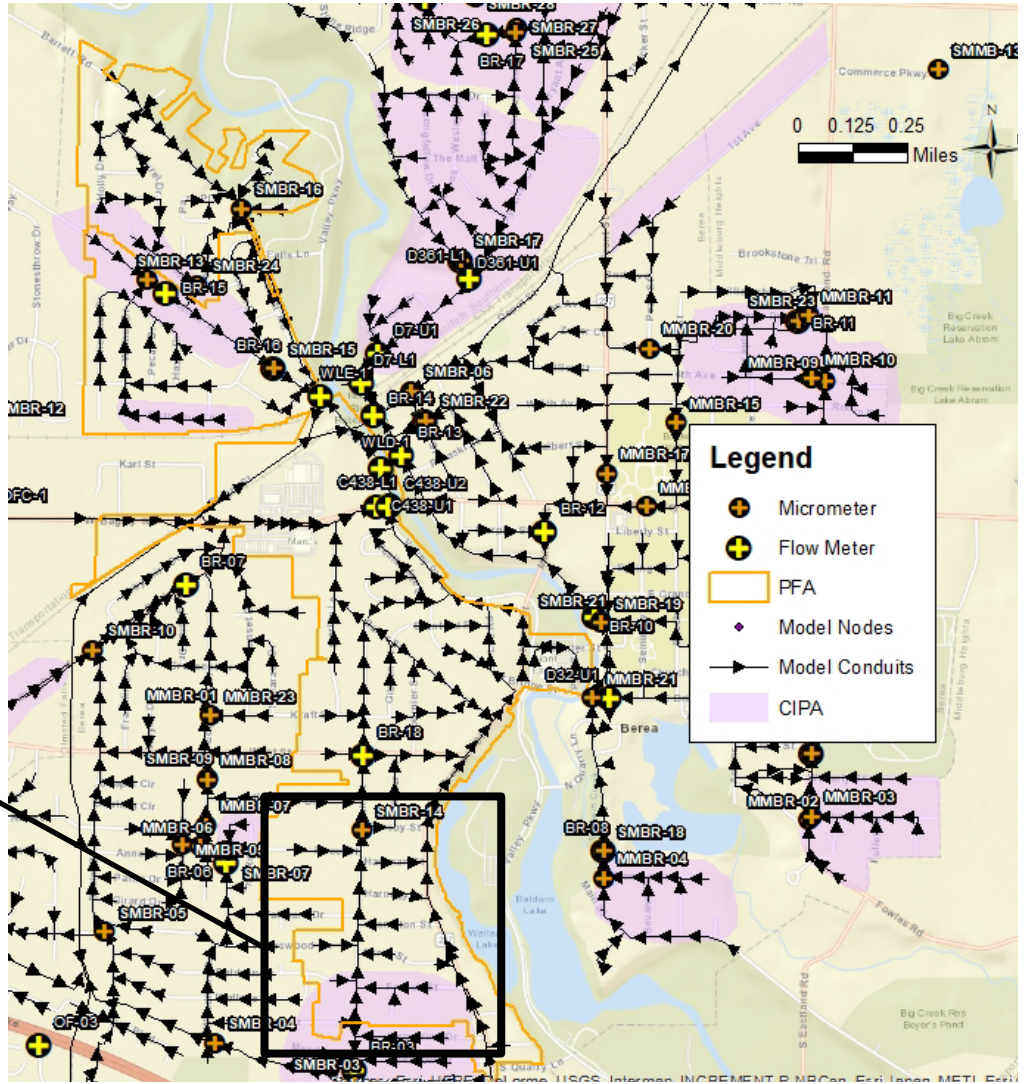


BE-10 and BE-07 (Area A)

Tier 1 Micrometer Data and Flow Meter Data: Area A

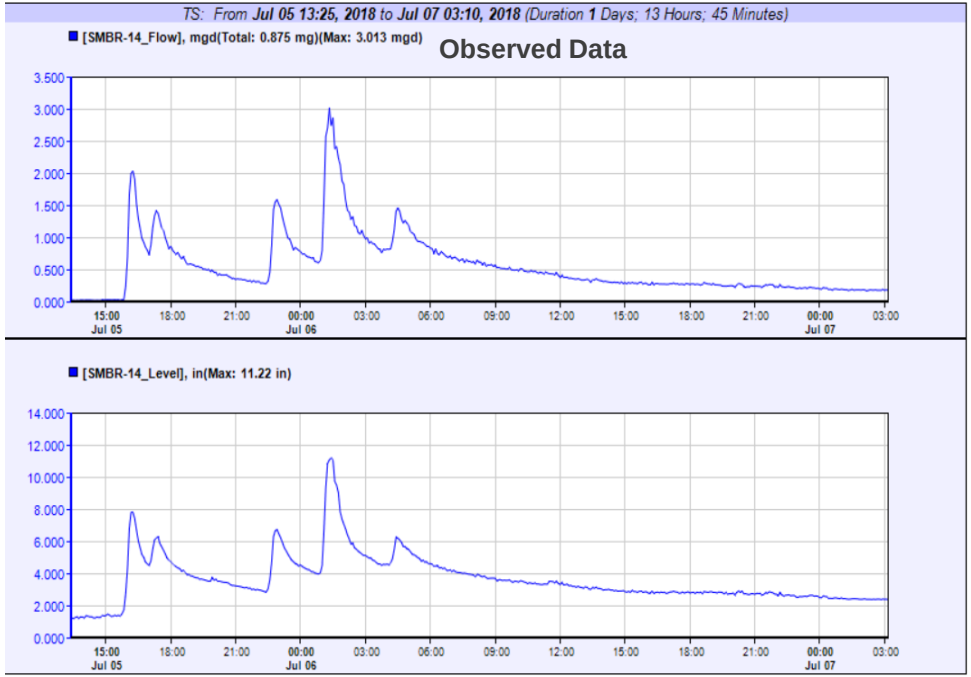
- Micrometer data and flow monitoring data was collected and used in calibration



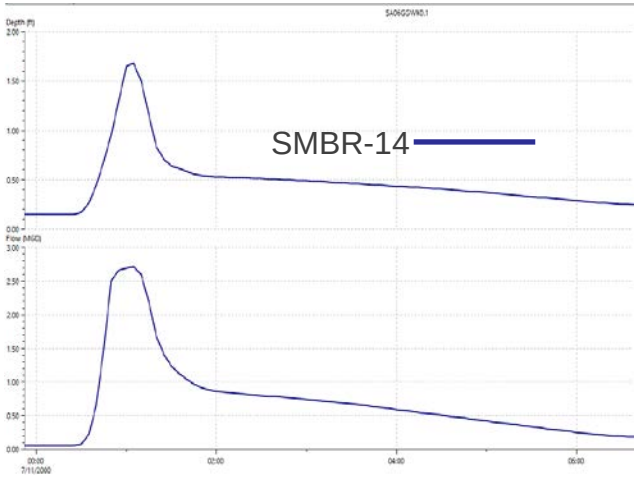


BE-10 and BE-07 : SMBR-14

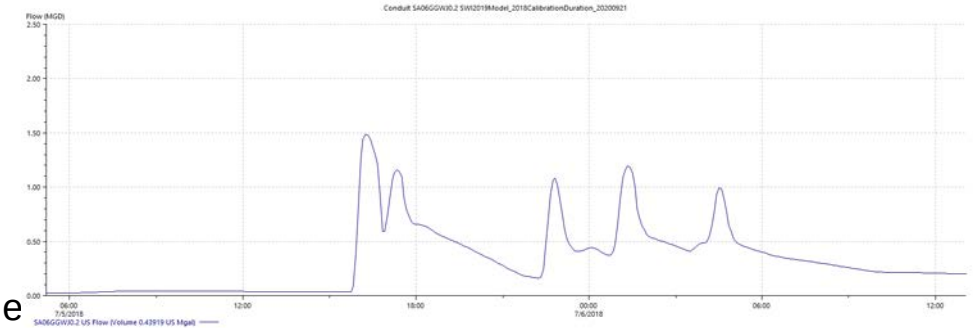
Tier 1 Micrometer Data (Area A)



Modeled Design Storm : 5yr, 1hr



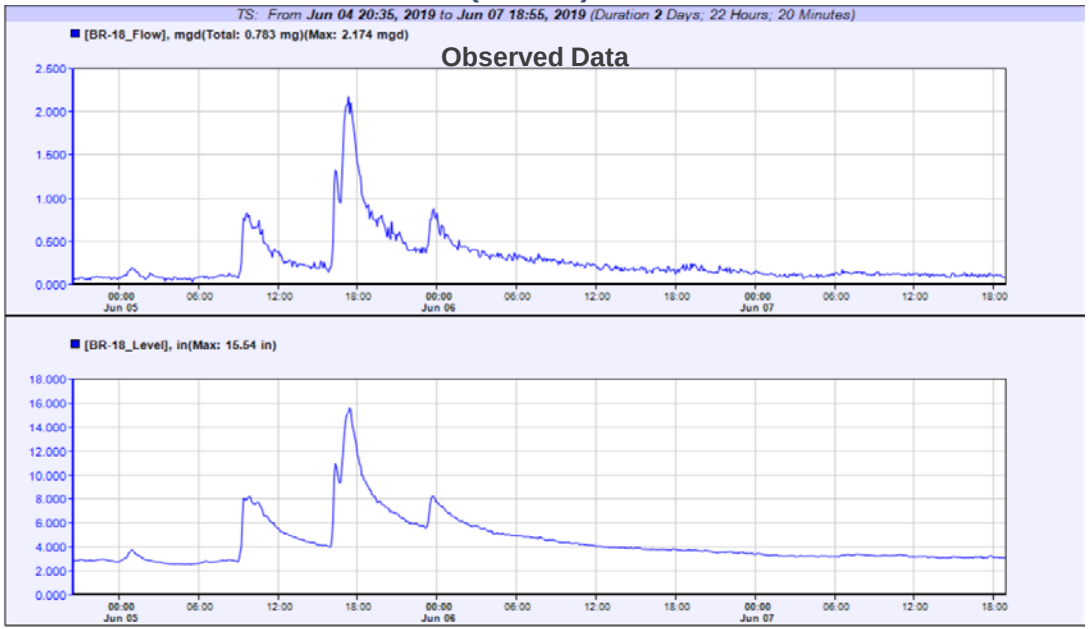
Modeled MM period

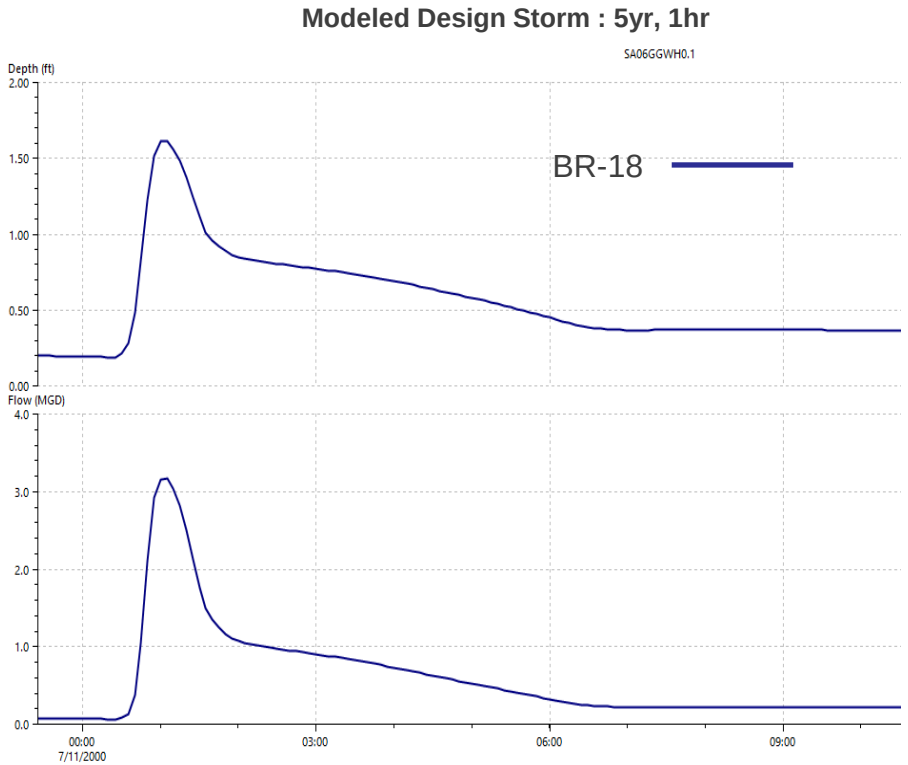


- Surcharge was not observed during the monitoring period; an e
- Model does not predict surcharge during the monitoring period but does predict about 2 inches of surcharge during the design storm
- Model shows flows underpredicted at this site

BE-10 and BE-07 : BR-18

Tier 1 Calibration Meter Data (Area A)





- Surcharge was observed once during the monitoring period (June 5, left plot)
- Model predicts surcharge once during the same event (June 5) as well as during the design storm. Modeled depths reasonably match observed depths during events but are rather low during dry weather. The sewer is about 10 feet deep, surcharge does not result in BBUs.
- Model shows a reasonable match between the ratio of flow at the meter location.

BE-10 and BE-07

Tier 1 Micrometering (Area A)

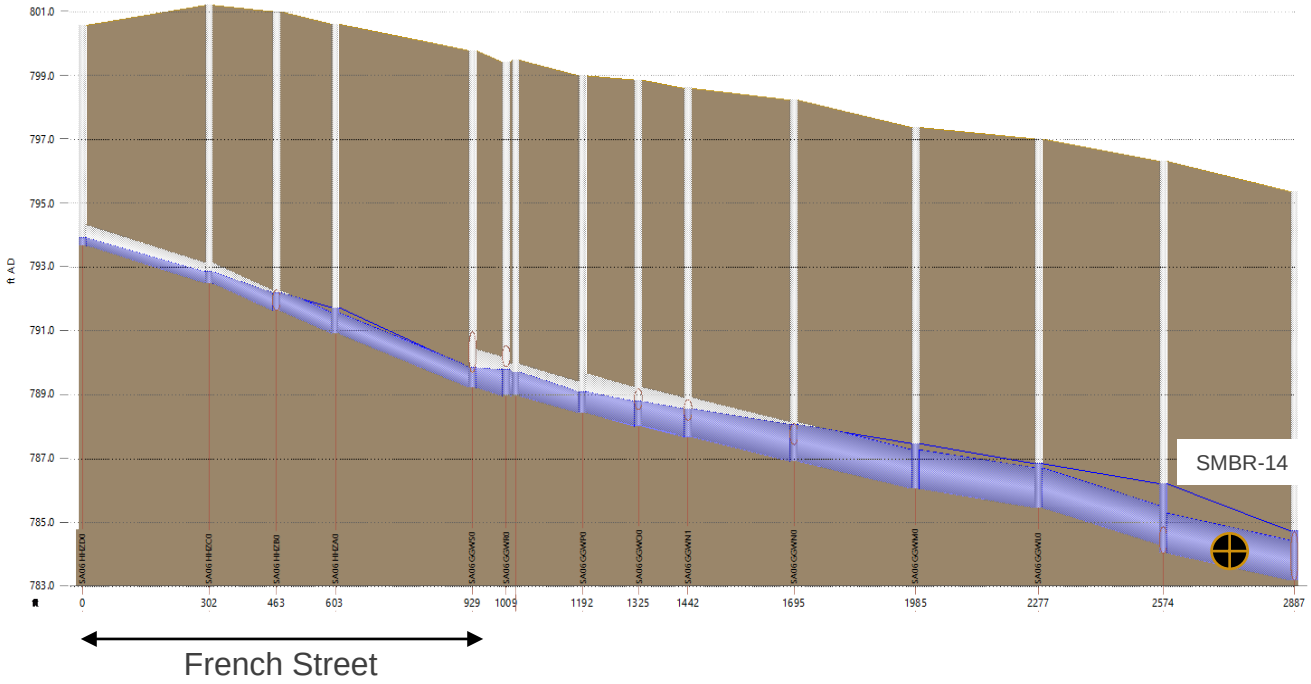
- **The following micrometer data from 2018 was collected at the following relevant locations:**
  - *SMBR-14: same location as Calibration Meter BR-16 (slide 11)*

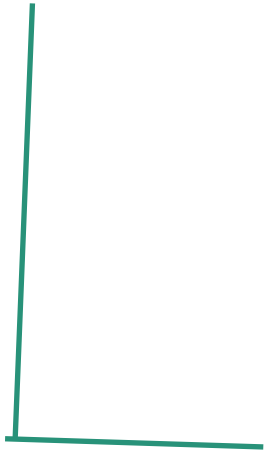
- Conclusions
  - **MM site did not show surcharging**
  - **MM data suggests that the model may be underpredicting**
  - **MM data shows generally higher flows than the CM downstream**
    - *There are no cross connections between*
  - **Typically CMs are considered more reliable than the MMs, however BR-18 was installed at a 90-degree bend, which could cause data issues.**

BE-10 and BE-07: Area A (French/Fair Street)

Tier 1 5-Year Model Design Storm Profile

- Model
  - Elevated HGL at the bottom of French Street and in the vicinity of SMBR-14



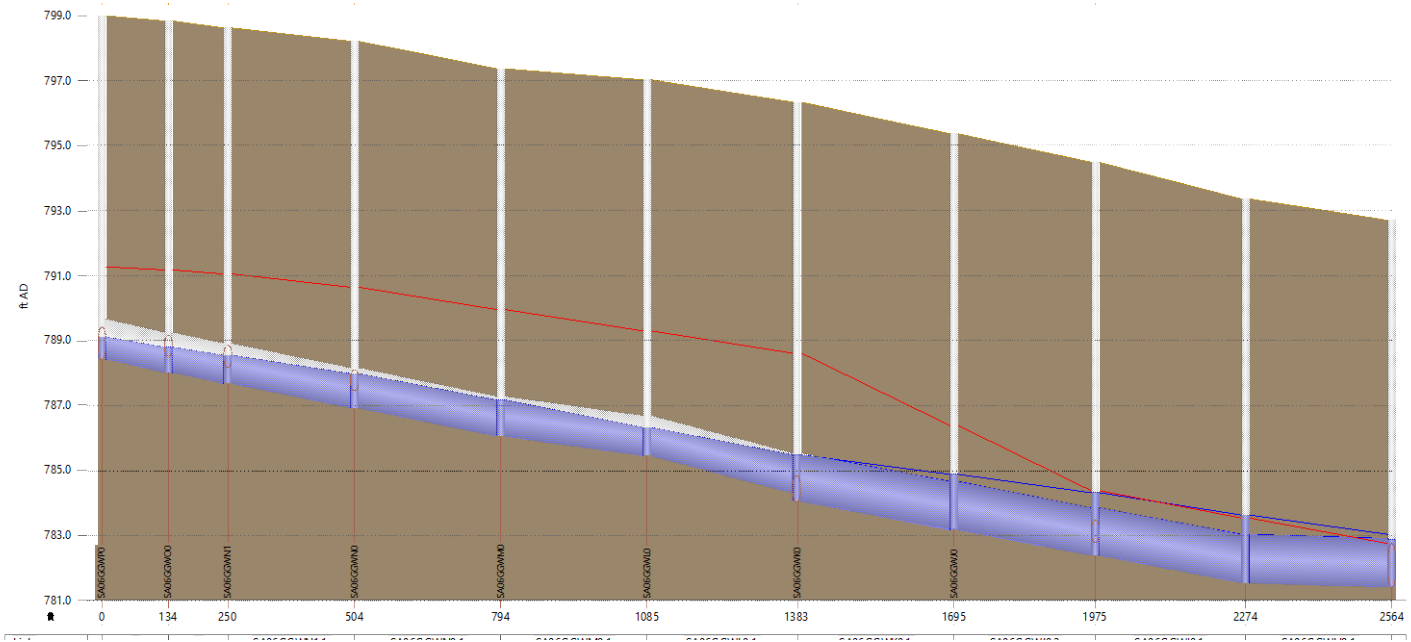


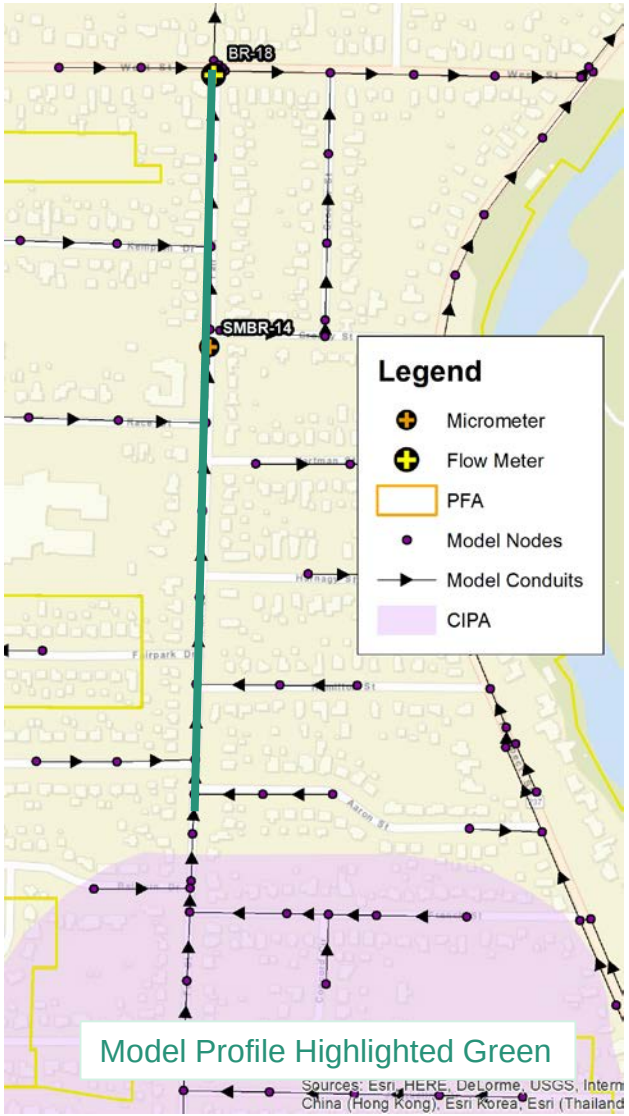
Model Profile Highlighted Green

BE-10 and BE-07: Area A

Model Update

- The sewer along Fair Street (area shown to the right) was updated in 2018 – the base model reflected the updates to inverts but not to pipe sizes. As part of this assessment, the model was updated to reflect the increased pipe sizes associated with the 2018 upgrade. As shown in the profiles below, the 2018 upgrades result in a significant HGL reduction in this area. The HGL prior to the updates is shown in red.

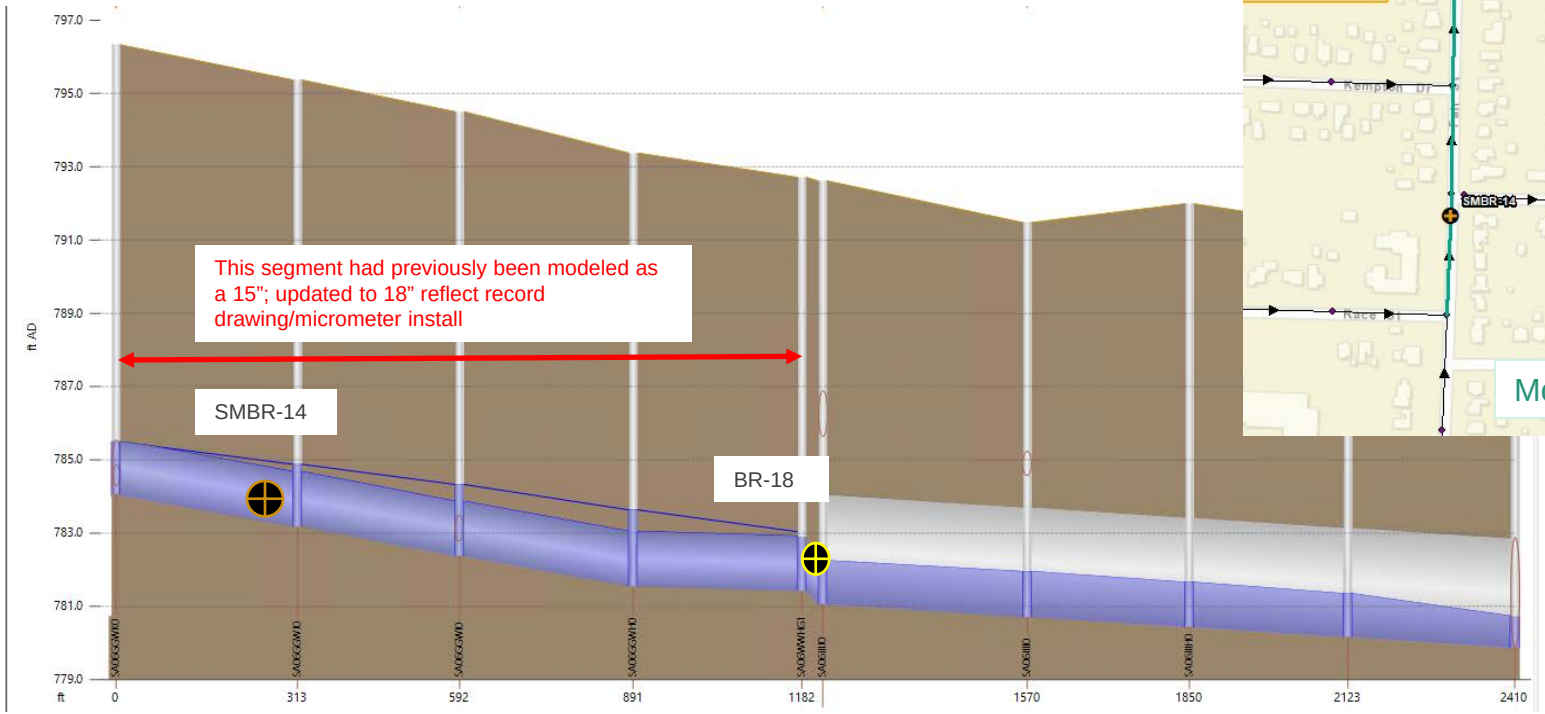


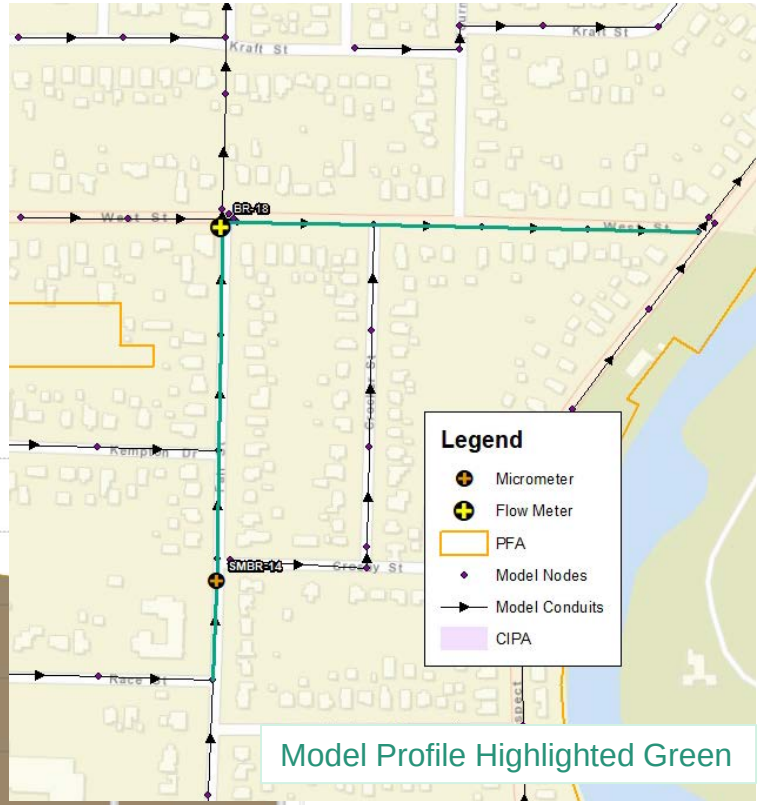


BE-10 and BE-07: Area A (Fair Street)

Tier 1 5-Year Model Design Storm Profile

- Fair Street in Calibration Model
  - **Fair street sewer updated in Base Model per record drawings.**





Model Profile Highlighted Green

BE-10 and BE-07: Area A (French Street)



Tier 1 Assessment

- This area is upstream of Fair Street which was newly constructed in 2018. Modeling indicates that these improvements have significantly reduced the design storm HGL
- Three instances of basement flooding were reported on French Street on 5/15/2020; the 5/15/2020 storm event had a 10-year return interval which is higher than any of the events evaluated as part of this exercise
- GPAD in this area is around 48,000
  - **Flows may be higher, but more confidence was given to the CM over MM.**
- Most downspouts in the area are routed to the surface as no storm sewers are available on the side streets
- As shown on Slides 20 and 21, during the design storm there are areas of slightly elevated HGL on French Street and in the vicinity of 2018 micrometer SMBR-14, but sufficient capacity downstream of calibration meter BR-18

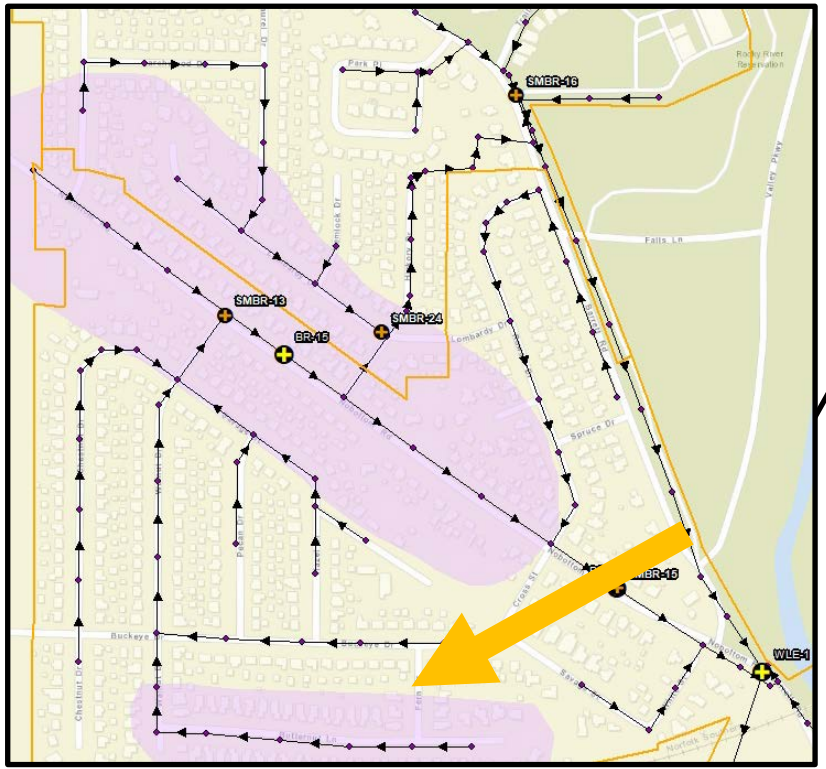
Tier 1 Recommendation

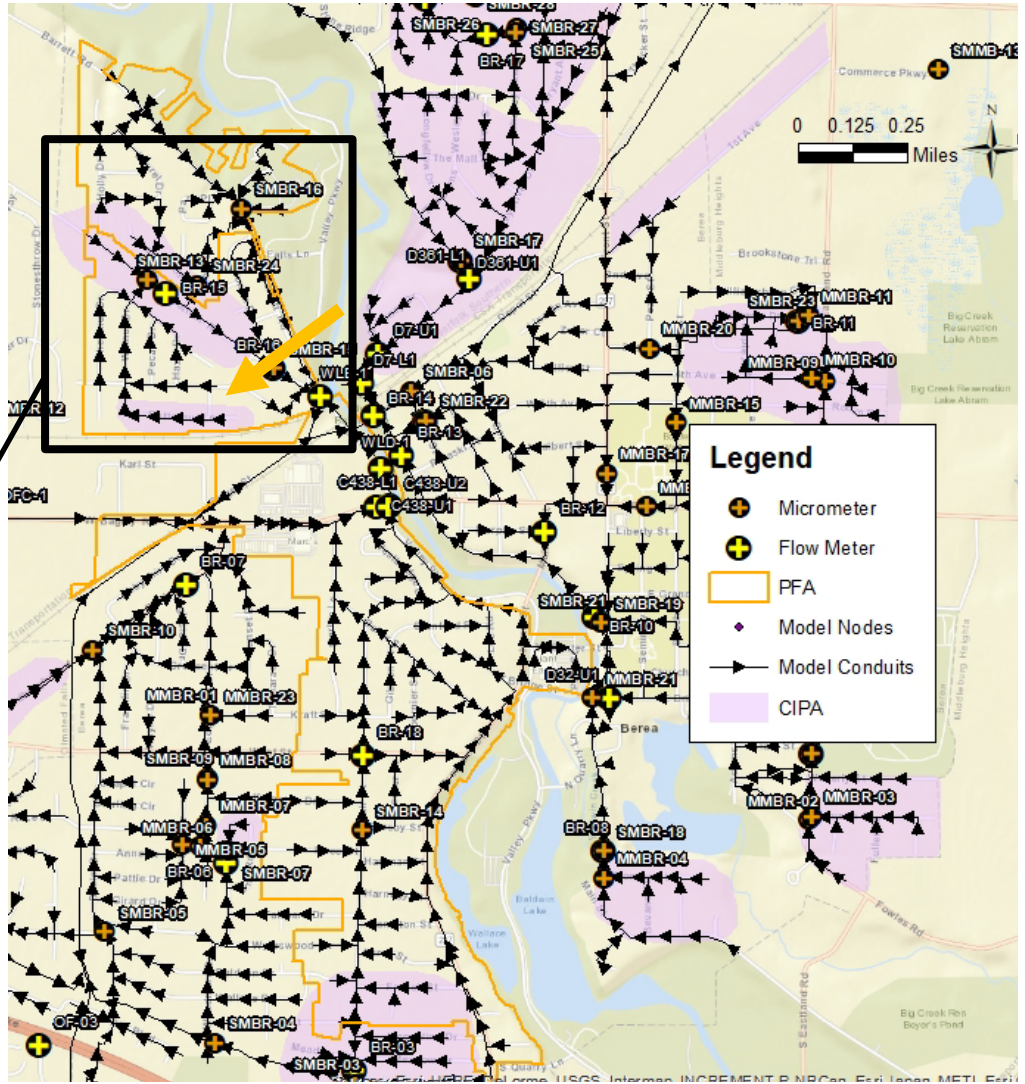
- **Further Field Work / Investigations**
  - *Investigate area for any connected downspouts. Model appear to be properly routed to the surface, but it would only take a few direct connections for cause issues*
  - *Flow monitor the area*
- **If problems persist, recommend rehab, public or private, depending on field investigation. (Do we include in Tier 1 costs?)**

BE-10 and BE-07

Area B

- No MM available

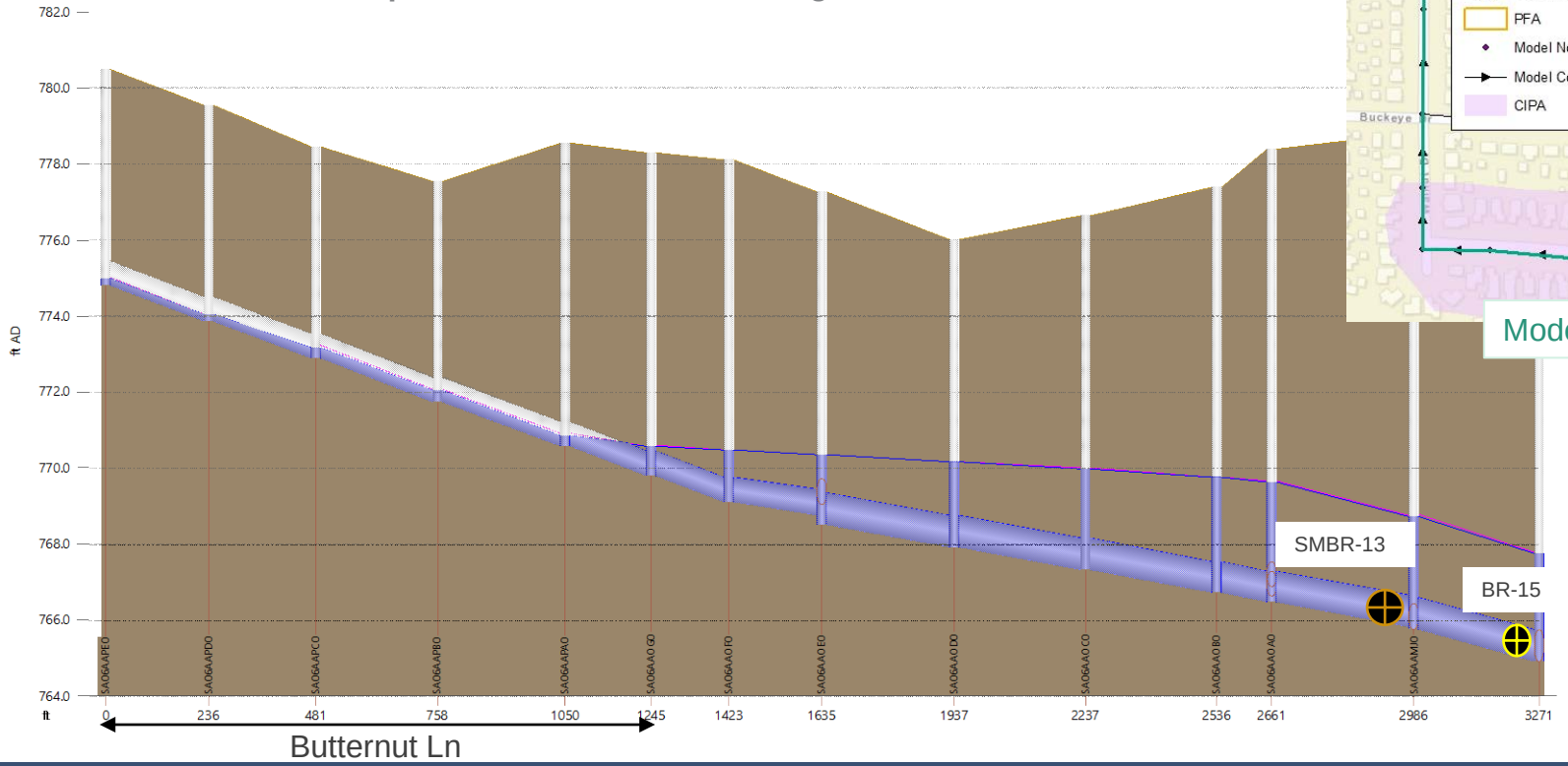


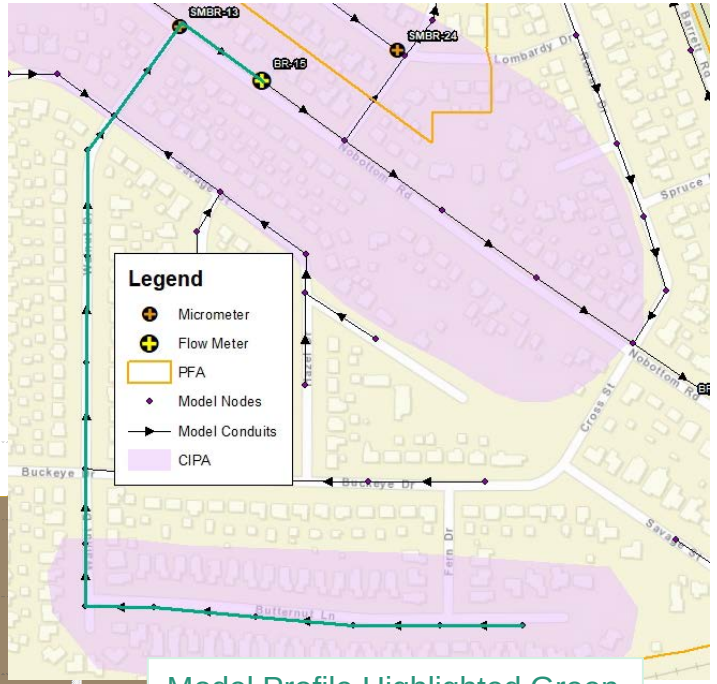


BE-10 and BE-07: Area B (Butternut Ln)

Tier 1 5-Year Model Design Storm Profile

- Model
  - The sewer is deep at this location so surcharge does not result in BBUs





Model Profile Highlighted Green

BE-10 and BE-07: Area B (Butternut Ln)



Tier 1 Assessment

- 2019 field investigations did not show any majors issues
- Modeling shows no reason for flooding given assumed flows an alignment
- Five instances of basement flooding were reported on the downstream end of Butternut Ln on 5/15/2020; the 5/15/2020 storm event had a 10-year return interval which is higher than any of the events evaluated as part of this exercise
- Based on the profile shown on Slide 22, issues on Butternut Ln are likely due to downstream conditions or potentially a blockage

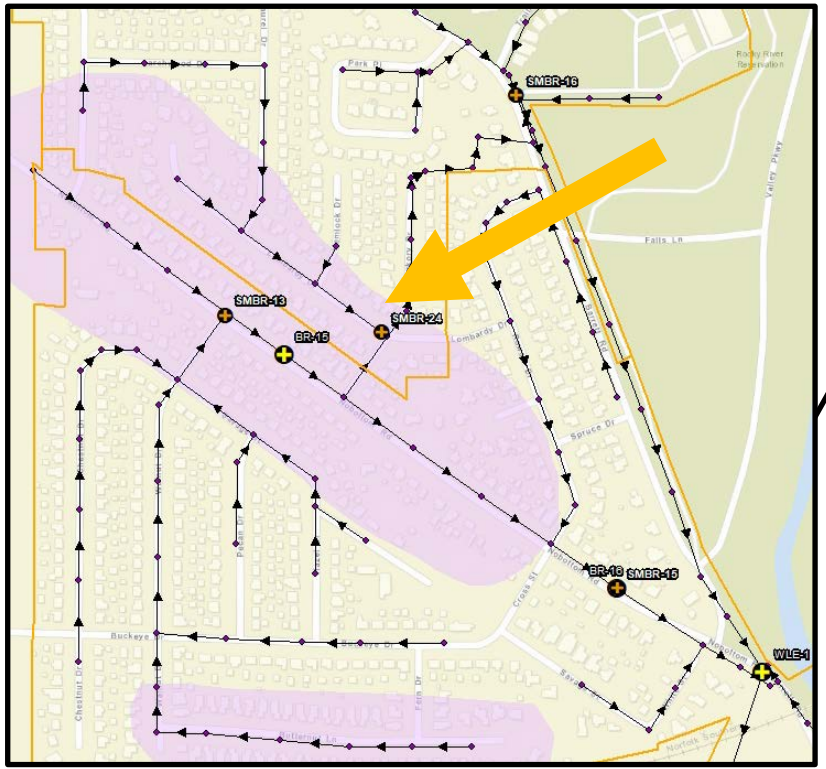
Tier 1 Recommendation

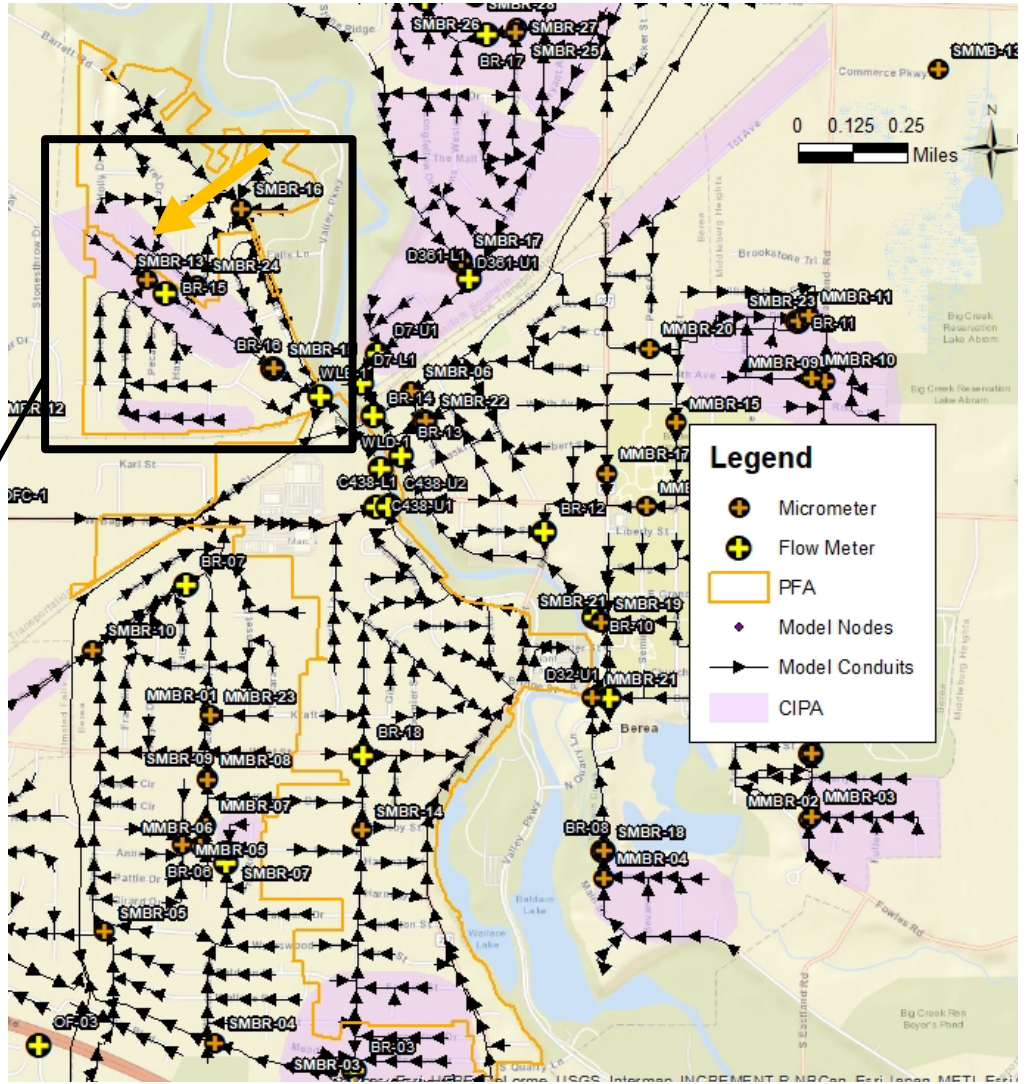
- **Further Field Work / Investigations**
  - *Perform CCTV at the downstream end of Butternut Lane and along Walnut Drive*
  - *Install a flow monitor along Walnut Drive after a field investigation.*

BE-10 and BE-07

Tier 1 Micrometer Data and Flow Meter Data: Area C

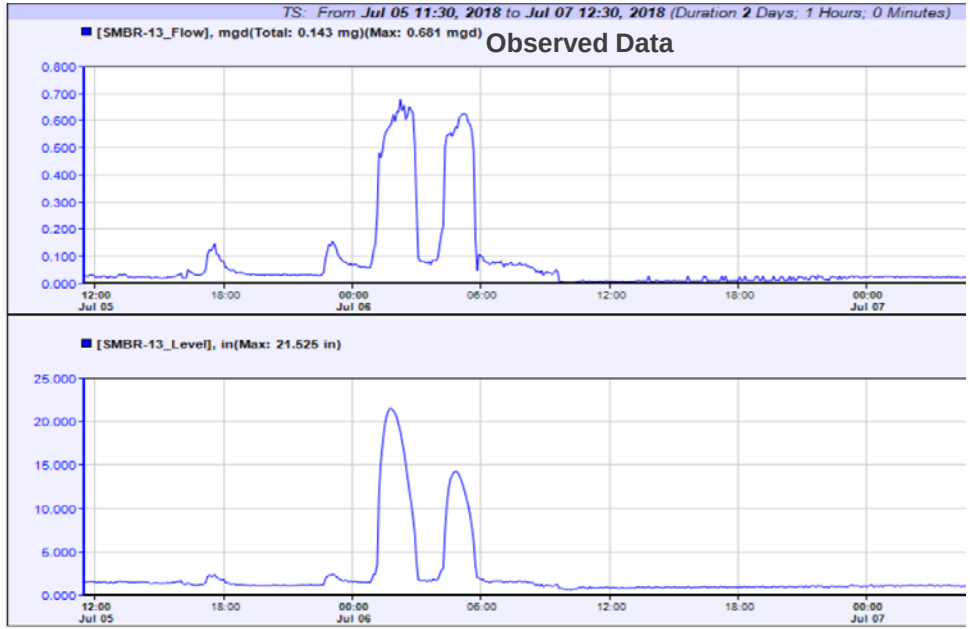
- Micrometer data and flow monitoring data was collected and used in calibration

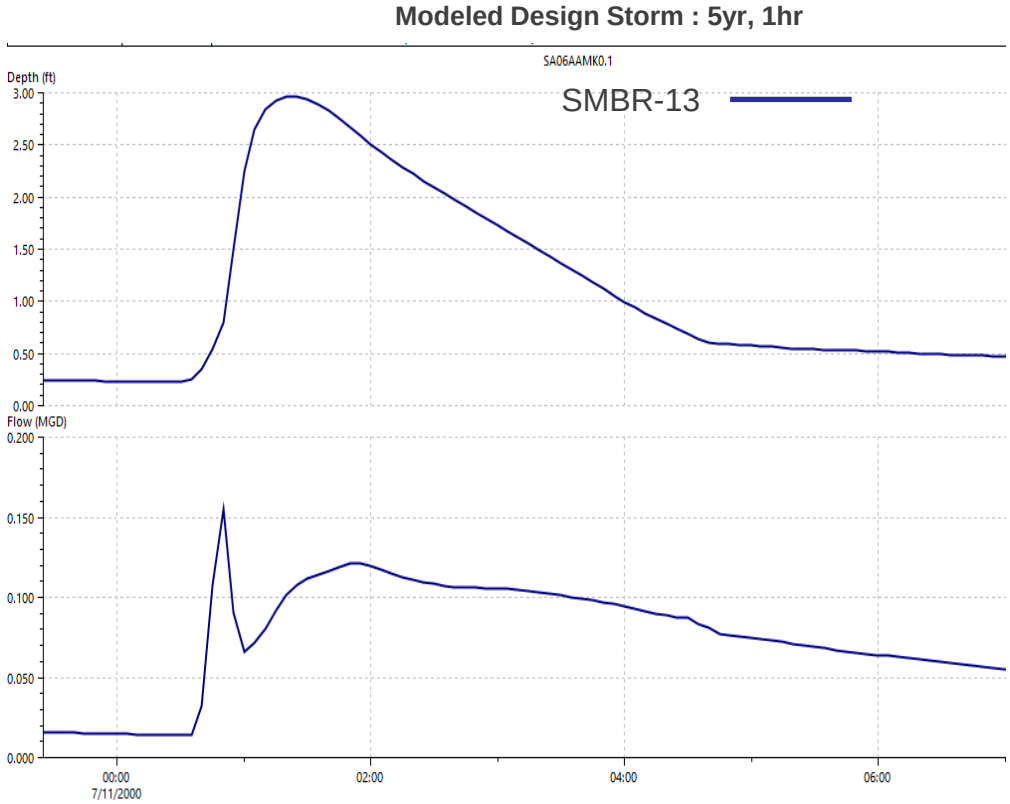




BE-10 and BE-07 : SMBR-13

Tier 1 Micrometer Data

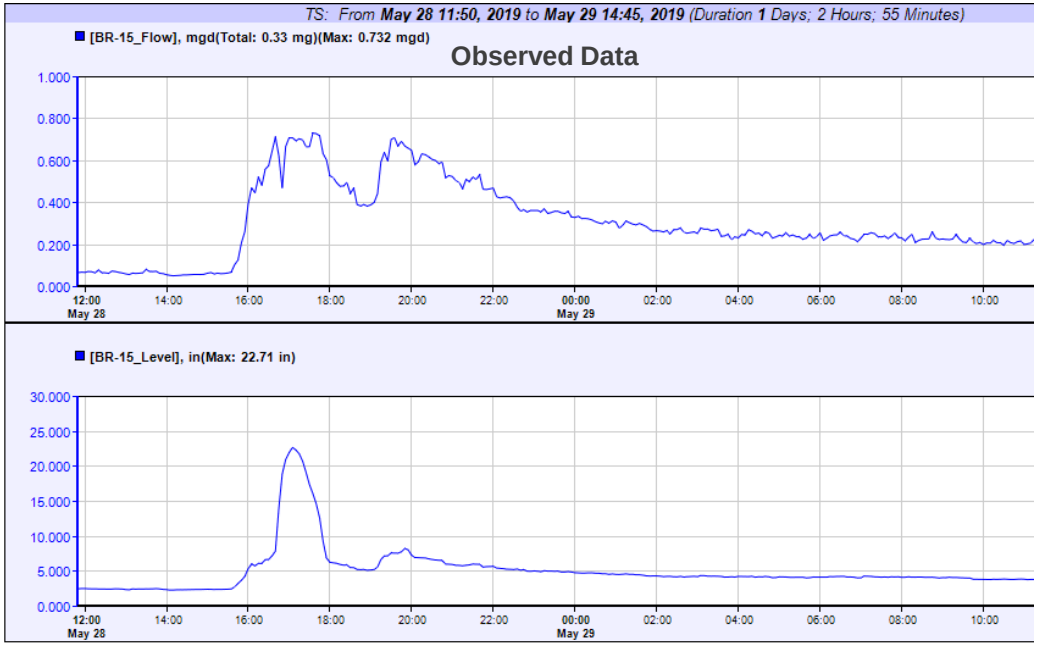




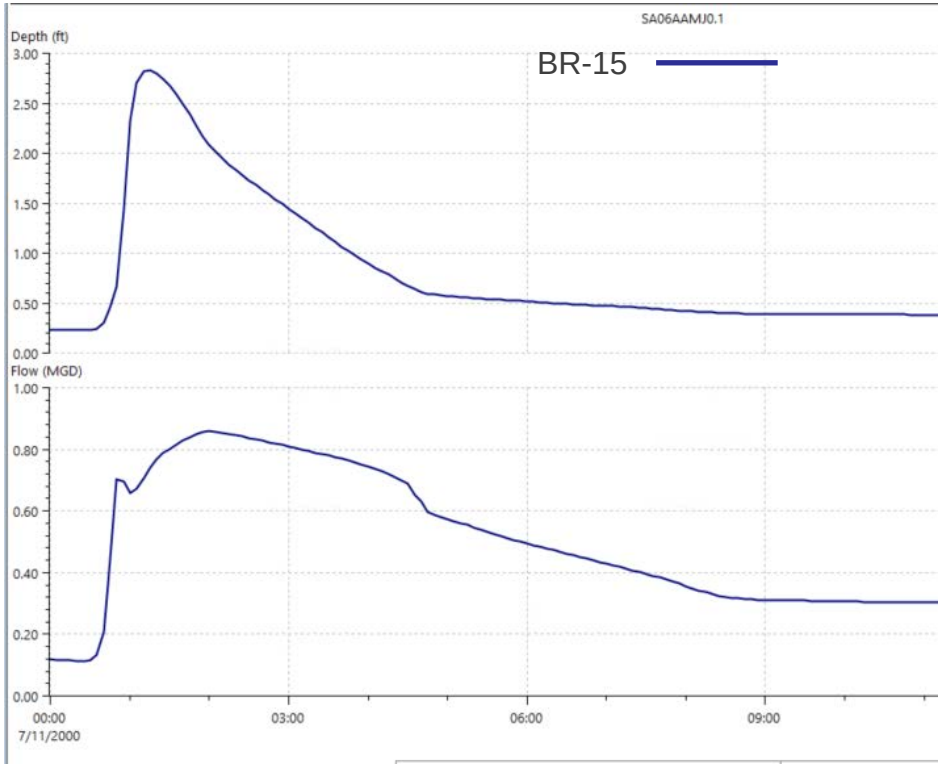
- Surcharge was observed during monitoring period on July 5, 2018 (see plot on left)
- The model also predicted surcharge during this event, however the general calibration was poor
- The 2018 micrometer data represents a condition with a blockage in place; this blockage was removed prior to the BR-015 flow monitoring in 2019 which is likely why that calibration is better than this one

BE-10 and BE-07 : BR-15

Tier 1 Calibration Meter Data



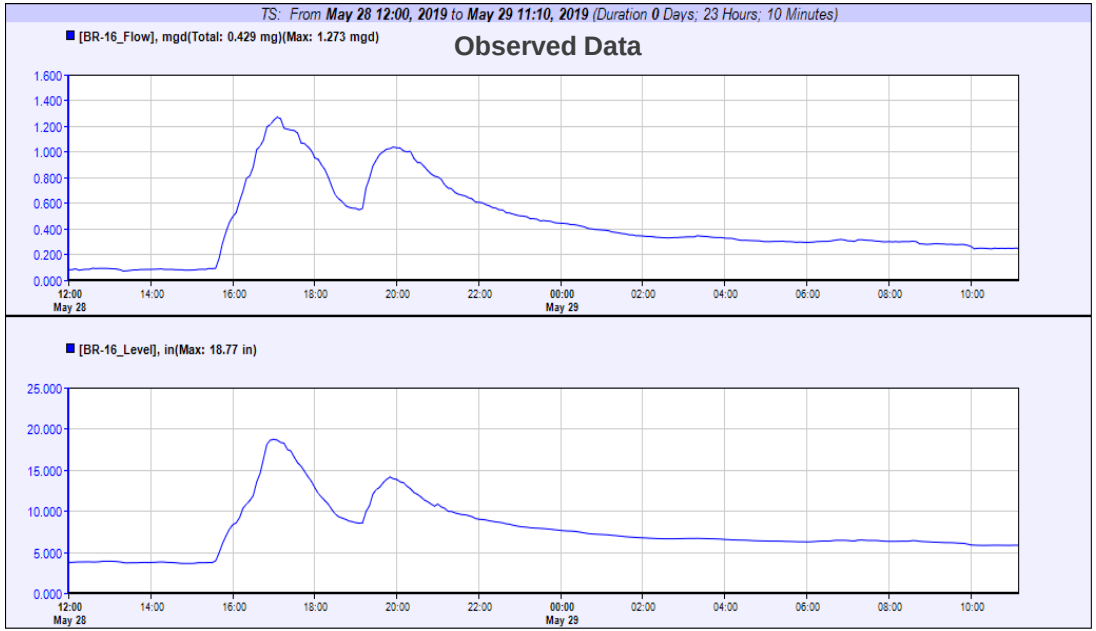
Modeled Design Storm : 5yr, 1hr



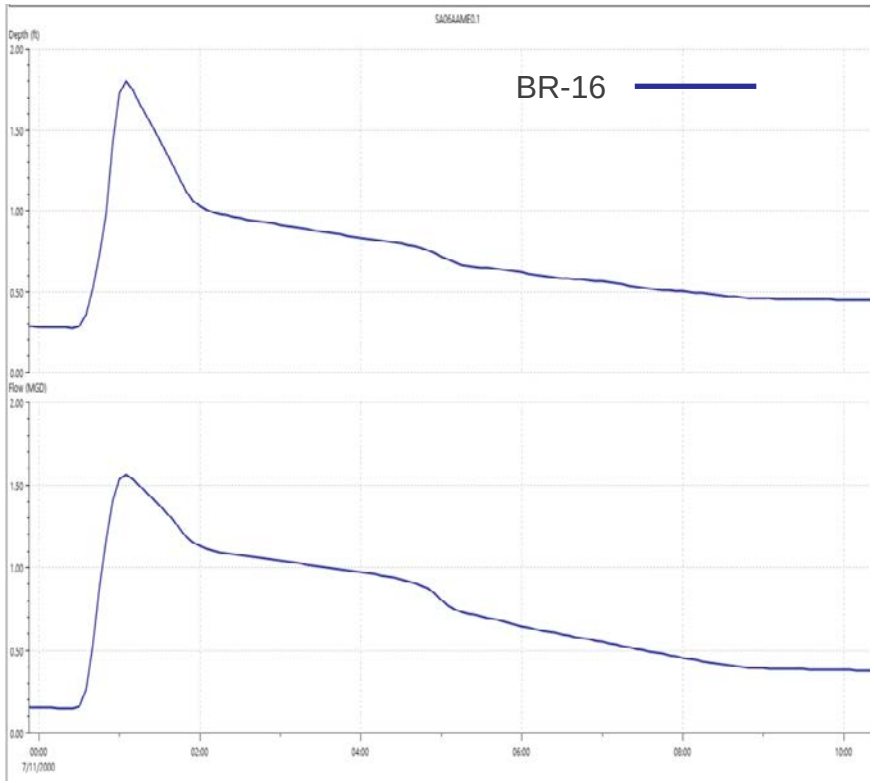
- Surcharge observed three times during monitoring period, May 28 shown as an example in the left plot.
- Model also predicts surcharge three times during the monitoring period, as well as during the design storm. Modeled depths reasonably match observed depths. The sewer is about 12 feet deep, surcharge does not result in BBUs.
- Model shows a reasonable match between the ratio of flow at the meter location

BE-10 and BE-07 : BR-16

Tier 1 Calibration Meter Data



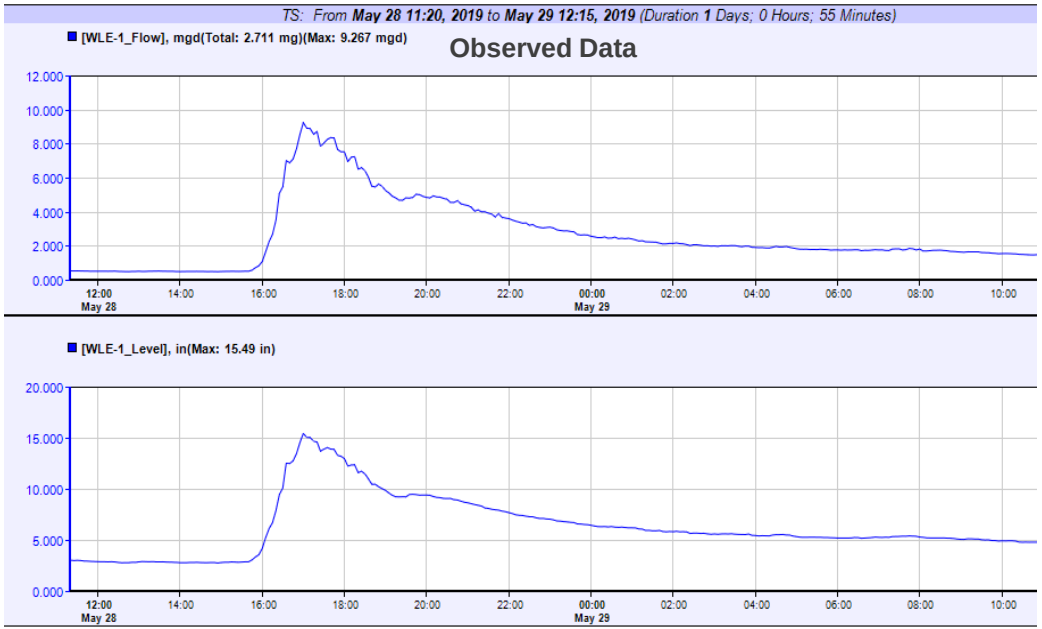
Modeled Design Storm : 5yr, 1hr



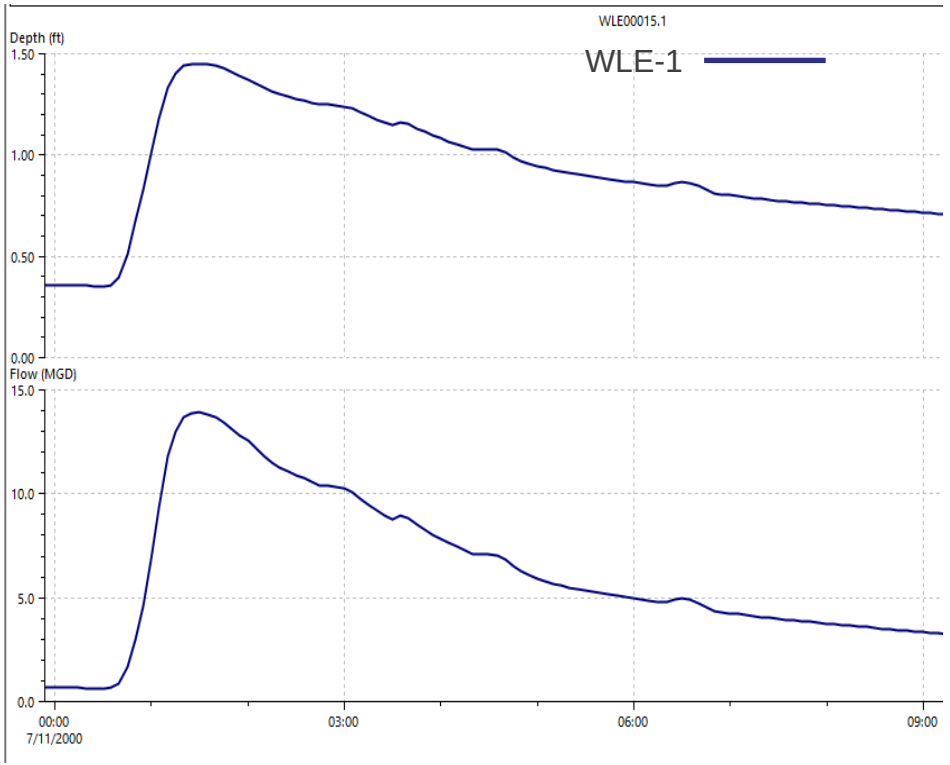
- Surcharge observed six times during monitoring period, May 28 shown as an example in the left plot
- Model predicts surcharge during five of the monitoring period events as well as the design storm. Modeled depths reasonably match observed depths. The sewer is about 17 feet deep at this location, surcharge does not result in BBUs.
- Model shows a reasonable match between the ratio of flow.

BE-10 and BE-07 : WLE-1

Tier 1 Calibration Meter Data



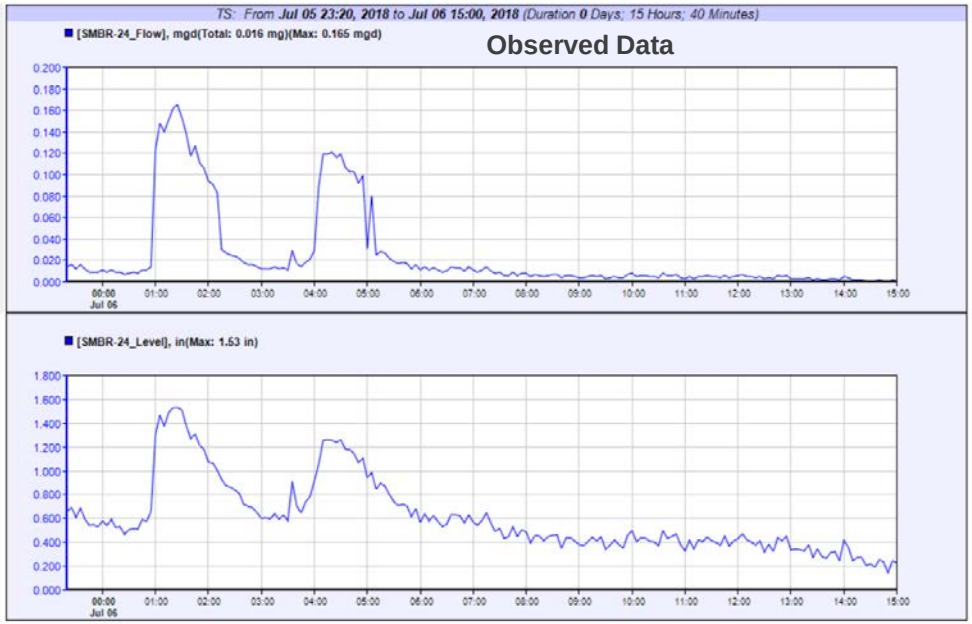
Modeled Design Storm : 5yr, 1hr

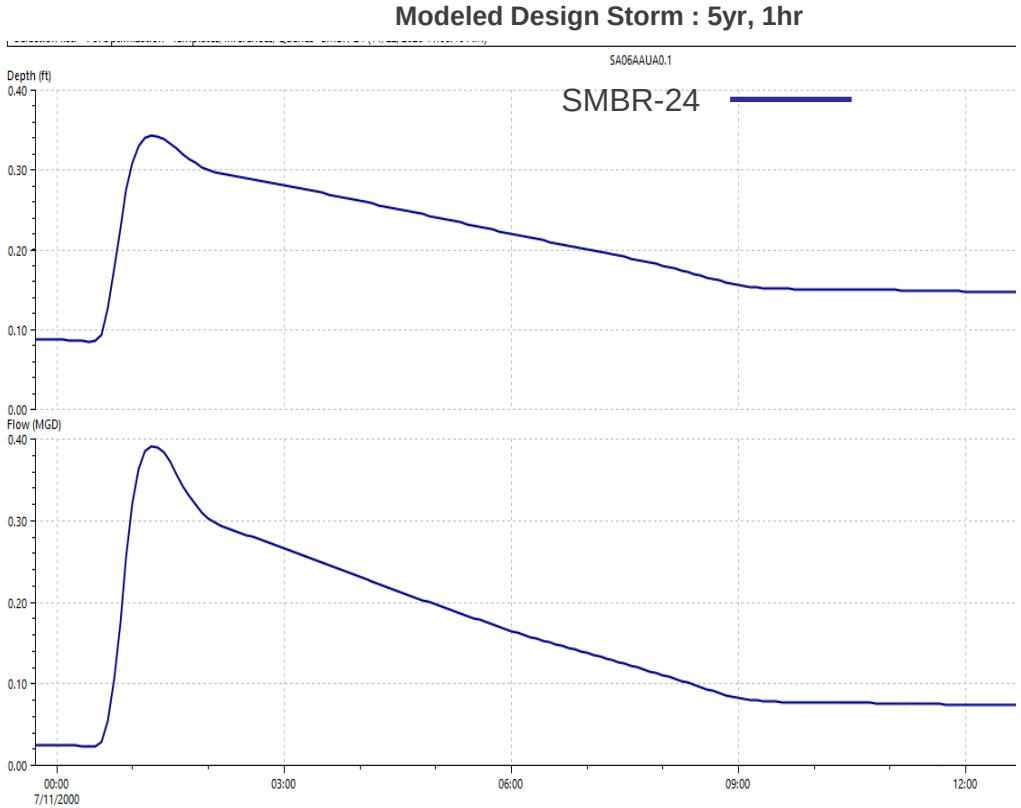


- Surcharge was not observed during monitoring period
- The model does not predict surcharge during the monitoring period or during the design storm
- Model shows a reasonable match between the ratio of flow at the meter location. The observed data may be impacted by the complicated hydraulics at the trash rack downstream of WLE-1.

BE-10 and BE-07 : SMBR-24

Tier 1 Micrometer Data





- Surcharge was not observed during the monitoring period. Both flows and depths were extremely low during this time, Example of low observed flow/depths shown to the left
- The model did not predict any surcharge during the monitoring period or the 5-year storm. The 2018 calibration is generally poor but additional 2019 metering was not performed at this location

BE-10 and BE-07

Tier 1 Micrometering

- **The following micrometer data from 2018 was collected at the following relevant locations:**
  - *SMBR-15: same location as Calibration Meter BR-16 (slide 11)*
- **Since the micrometer data was collected at the same locations as the calibration meter data and was collected earlier, the calibration meter data was prioritized**

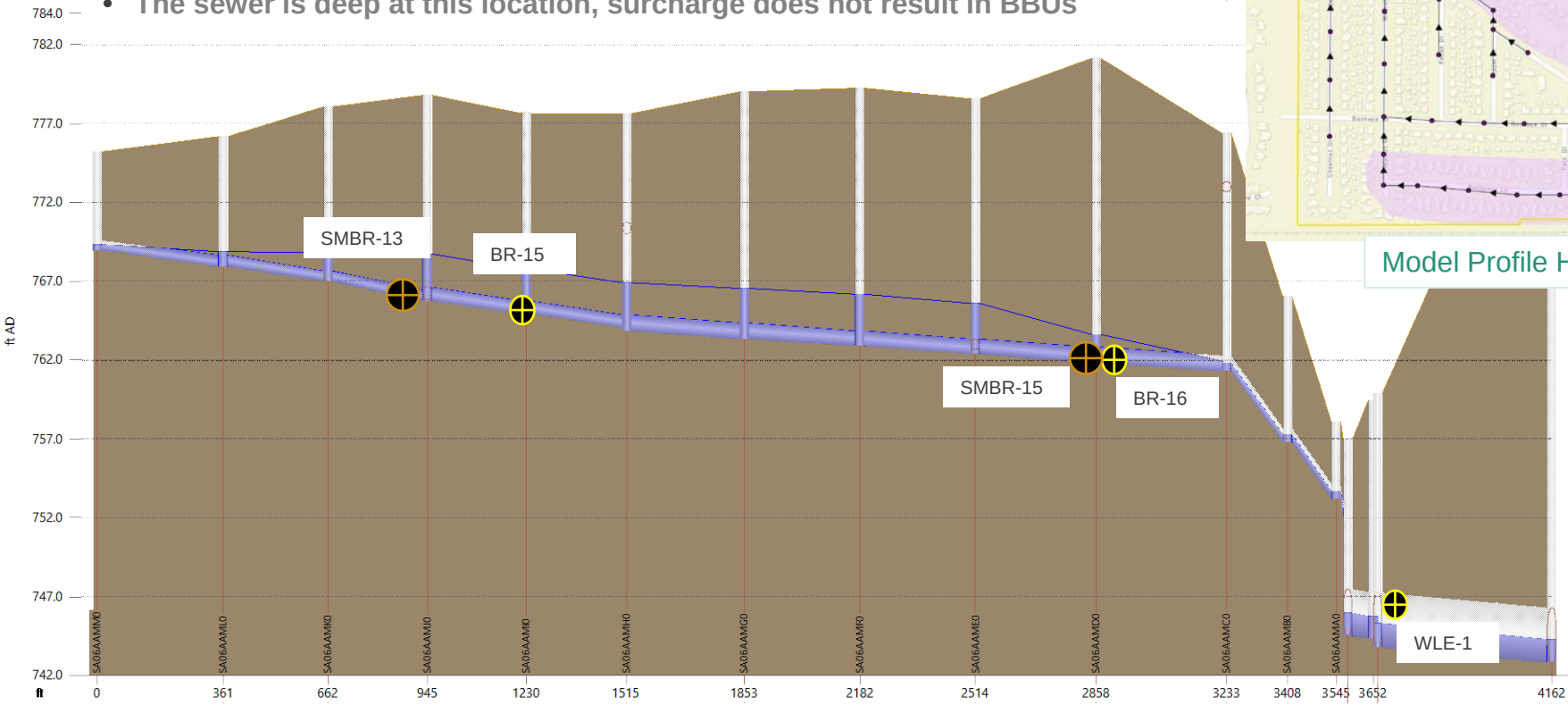
Calibration Meter Data

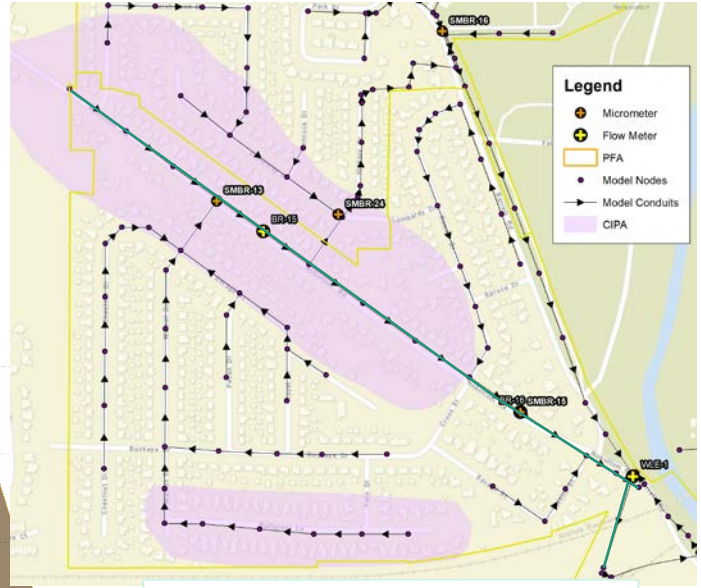
- Conclusions
  - **No evidence to show that the model flows should be redistributed**
    - *Meter data was used during calibration, it was already incorporated into the model*
  - **No evidence to show that the model level calibration should be adjusted**
    - *The 5-year design storm shows surcharge at meter locations that experienced surcharge during the monitoring period*

BE-10 and BE-07: Area C (Nobottom Rd)

5-Year Model Design Storm Profile

- Model
  - The sewer is deep at this location, surcharge does not result in BBUs





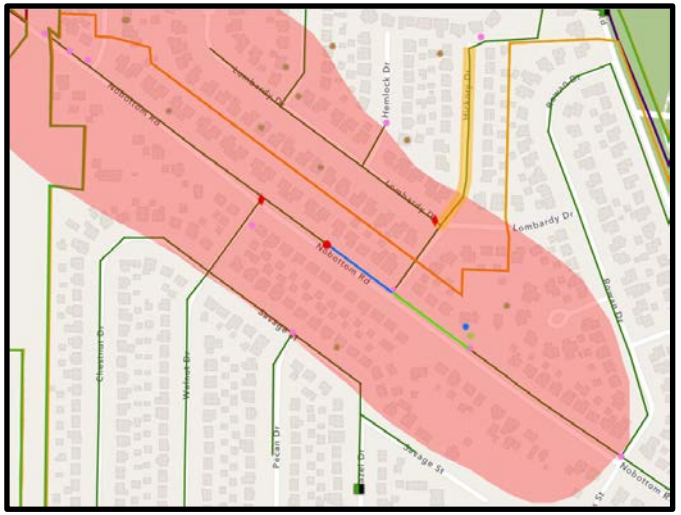
Model Profile Highlighted Green

BE-10 and BE-07: Area C (Nobottom Rd)

Tier 1 Assessment

- No model predicted BBUs.
- I&I is relatively low in the area, except metershed BR-16, and there is low confidence in the modeled representation downstream of BR-16.
- Several alternatives were evaluated to reduce the surcharge on Nobottom Rd despite the model no predicting BBUs:
  - *The sewers immediately downstream of BR-16 were increased in size from 12” to 18” to match downstream size.*
  - *The West Leg Interceptor along Barrett Rd was increased to an 18” and the sewer extending from Hickory Drive was redirected into this increased interceptor near Falls Ln*
  - *Lining of public sewers on Rowan Drive*
  - *Lining of high I/I public sewers in metershed BR-16 (part of Tier 2 Solution).*
  - *No inline storage was considered.*
- The four alternatives lists above do not provide a significant reduction in the HGL along Nobottom Rd. (i.e. sewer still surcharges) and were, therefore, not cost.
- A significant reduction in the HGL along Nobottom Rd was only achieved by replacing

  ***2,708 LF of pipe at a cost of $3,621,314*.**



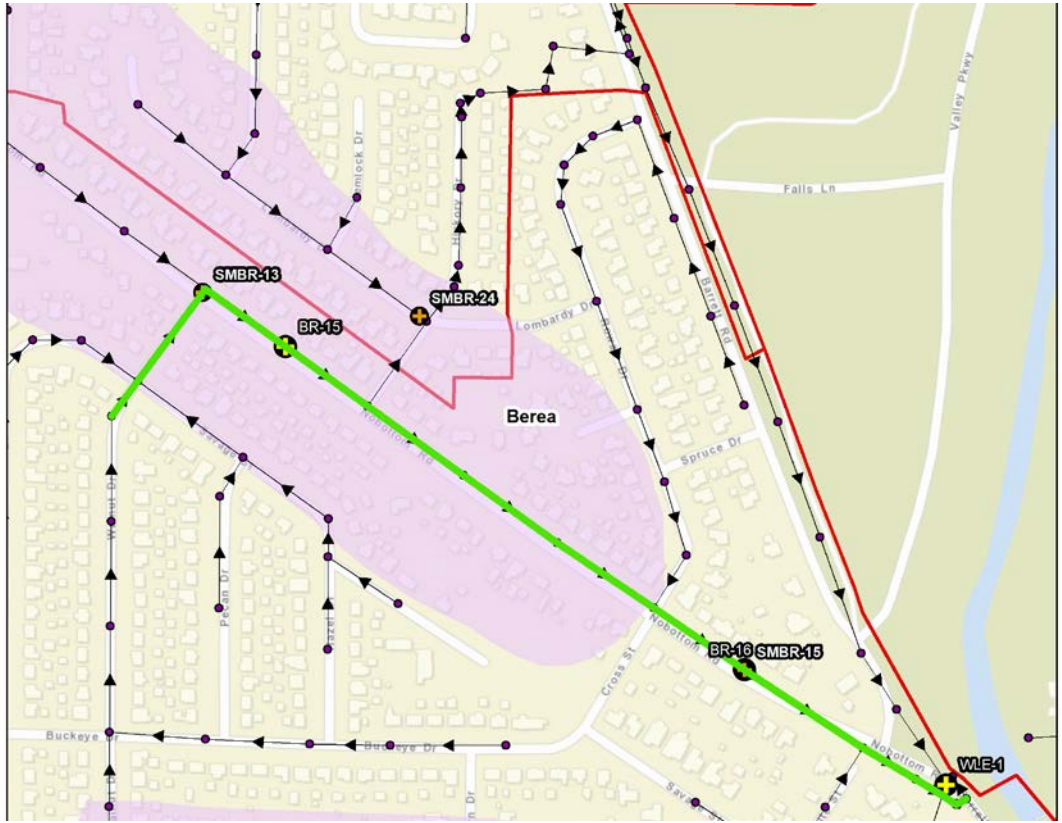
Tier 1 Recommendation

- **Maintenance and Additional Field Work / Investigations**
  - *Clean regularly and evaluate for potential blockages*
  - *Flow monitor the area*
  - *If issues persist, pursue capacity enhancement*

BE-10 and BE-07: Area C (Nobottom Rd)

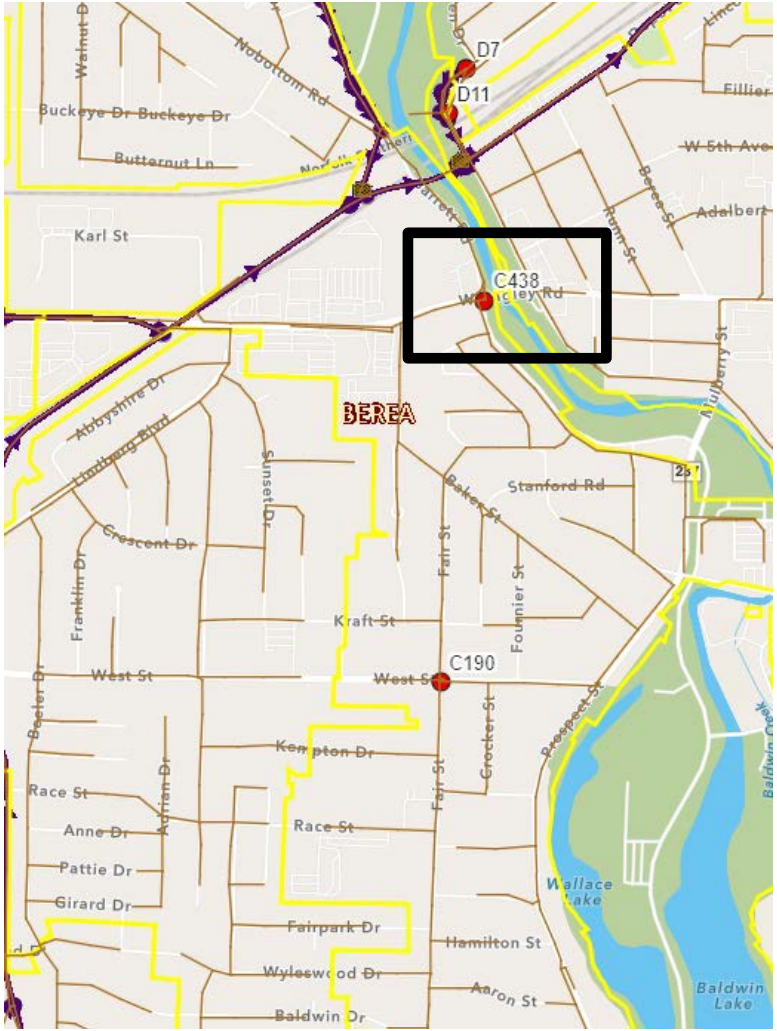
Tier 1 Analysis Discussion

- A significant reduction in the HGL along Nobottom Rd was only achieved by replacing ***2,708 LF of pipe at a cost of $3,621,314***.
- Several enhancement configurations were evaluated but the 4,408 LF of replacement was found necessary to substantially reduce surcharge along Nobottom, Barrett Rd, and Walnut Drive:
  - *Capacity enhancement starting at BR-15 and extending to the downstream end of Nobottom Rd (close to the confluence with the District Sewer) resulted in a substantial HGL decrease on Nobottom Rd, but did not alleviate surcharge on Barrett Road or Walnut Drive (slide 31)*
  - *Capacity enhancement of the sewers feeding Nobottom Rd did not provide a significant HGL reduction within the CIPA*

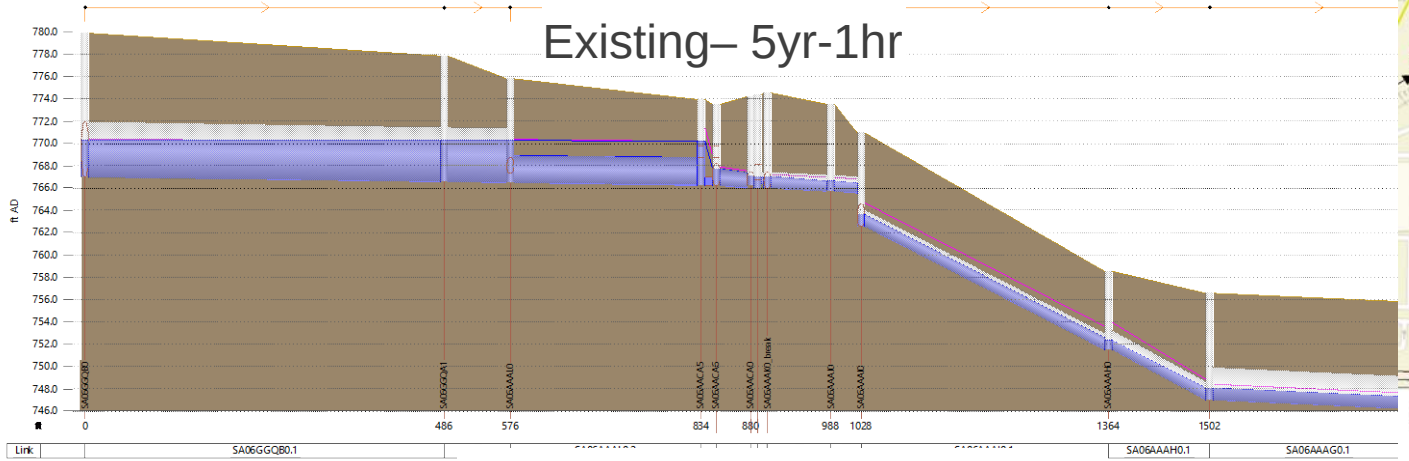


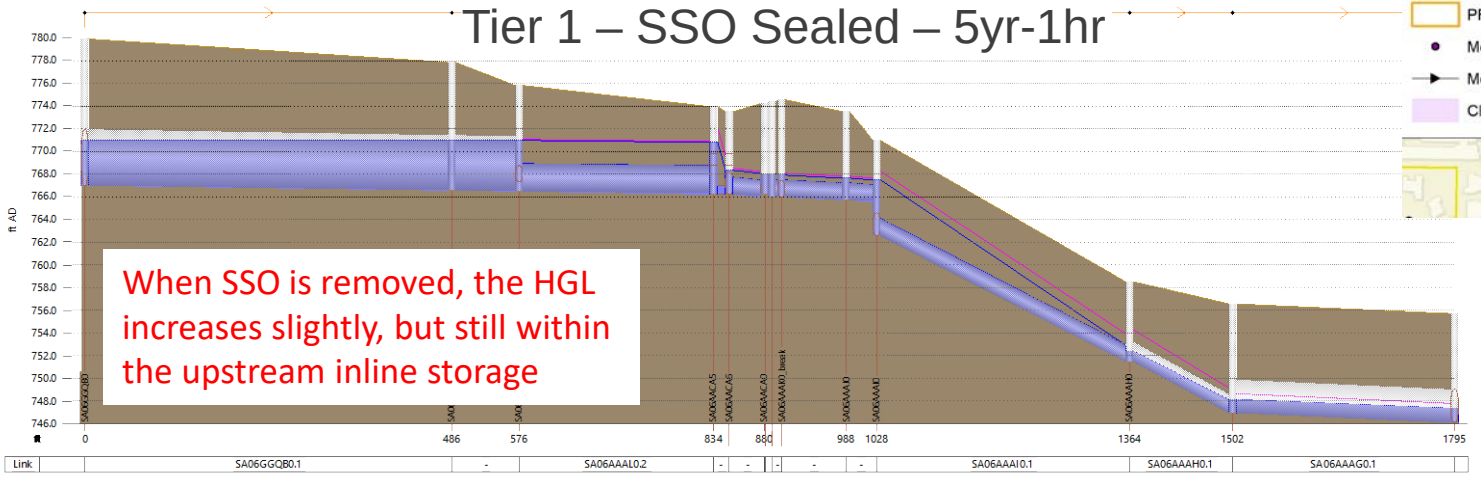
BE-10 and BE-07: SSO C438

- This SSO overflows frequently
  - **During the 5yr-1hr storm, approximately 0.192 MG overflows**
  - **During the 5yr-6hr storm, approximately 0.393 MG overflows**
- Upstream is an inline storage sewer
  - **Storage not fully utilized during 5-yr, 1-hr**
- SSO manhole is half full of debris
  - **SSO frequency is potentially increased by the debris, but the SSO is primarily driven by downstream capacity**
- SSO Removed from the model
  - **As result, the HGL is increased slightly, but still within the upstream inline storage**
  - **SSO weir needs raised 1 foot to eliminate SSO during the 5yr-1hr and 5yr-6hr storms**
- **<u>Recommendation: Clean manhole and raise weir 1 ft. Perform monitoring to determine whether it should be sealed.</u>**

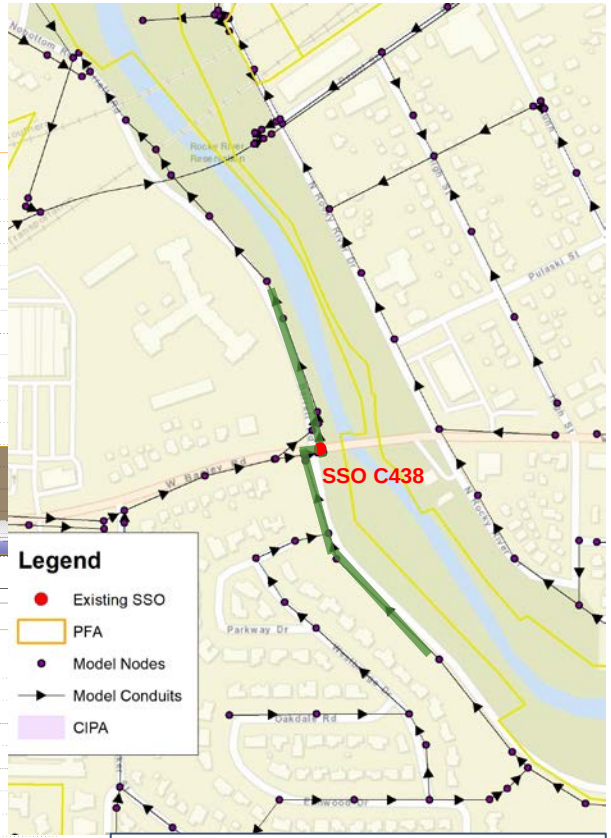


BE-10 and BE-07: Impacts to SSO C438



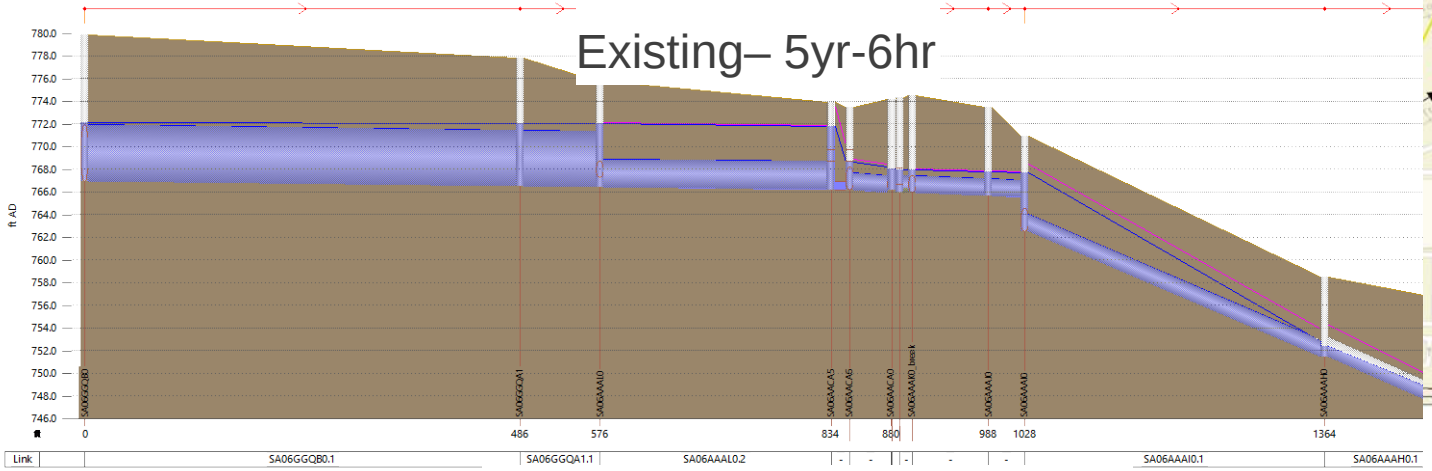


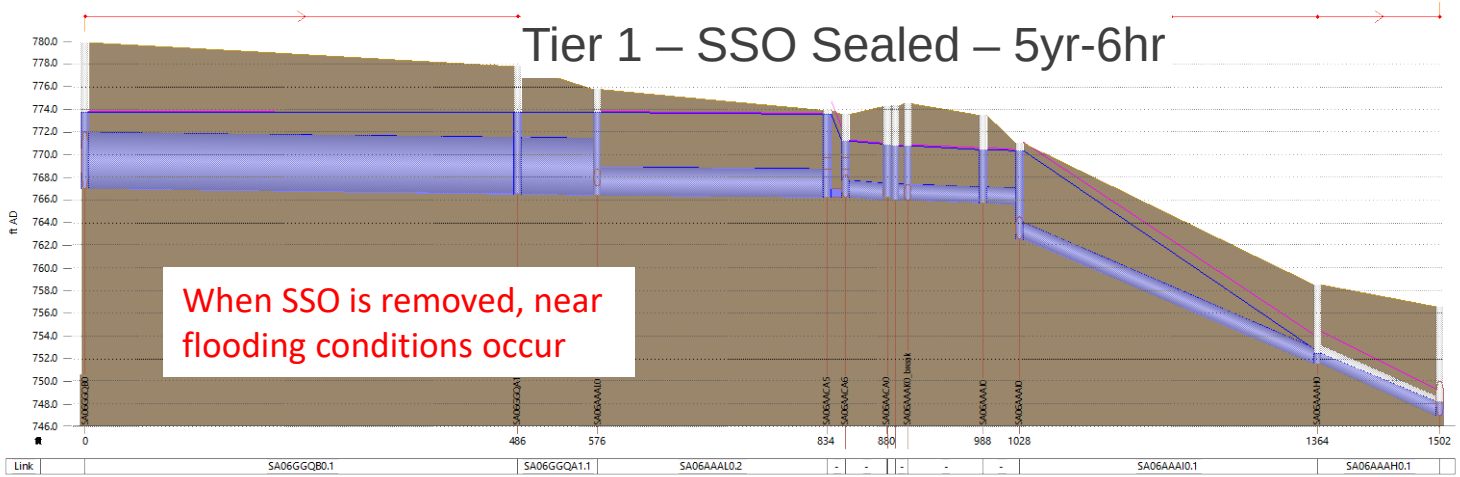
When SSO is removed, the HGL increases slightly, but still within the upstream inline storage



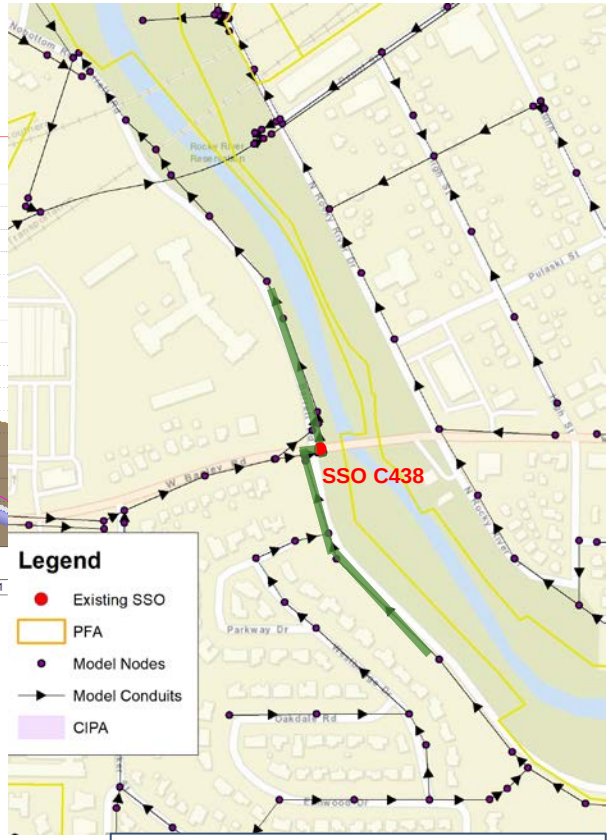
Model Profile Highlighted Green

BE-10 and BE-07: Impacts to SSO C438





When SSO is removed, near flooding conditions occur

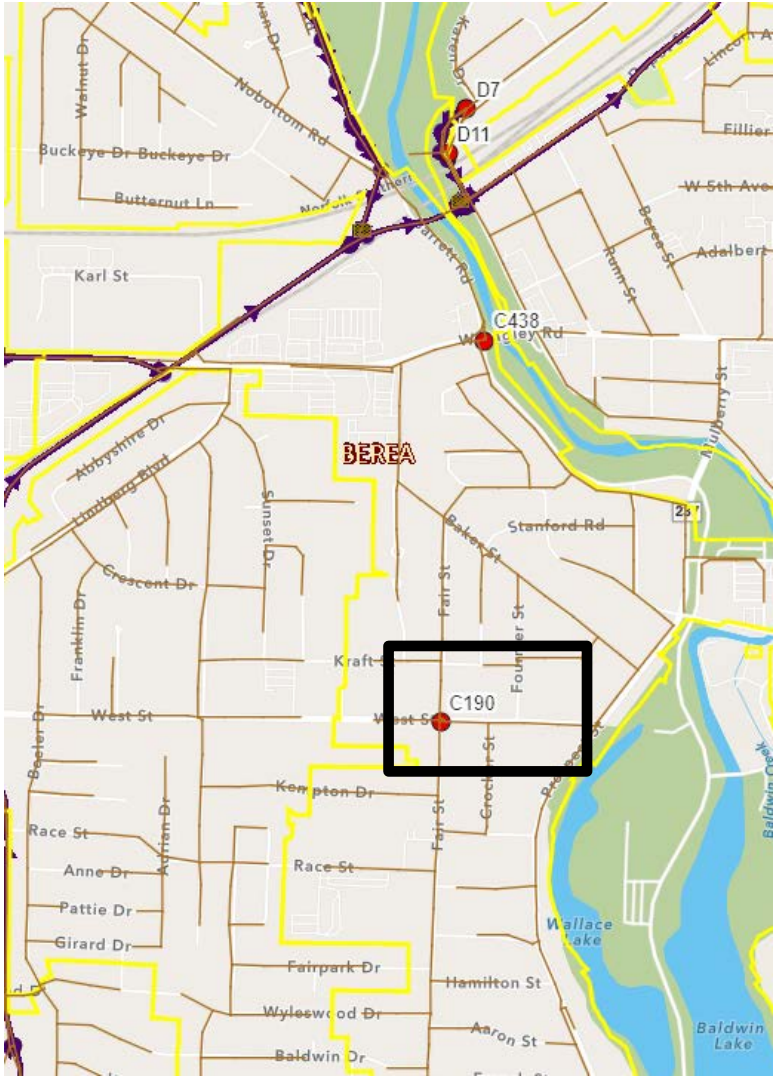


Model Profile Highlighted Green

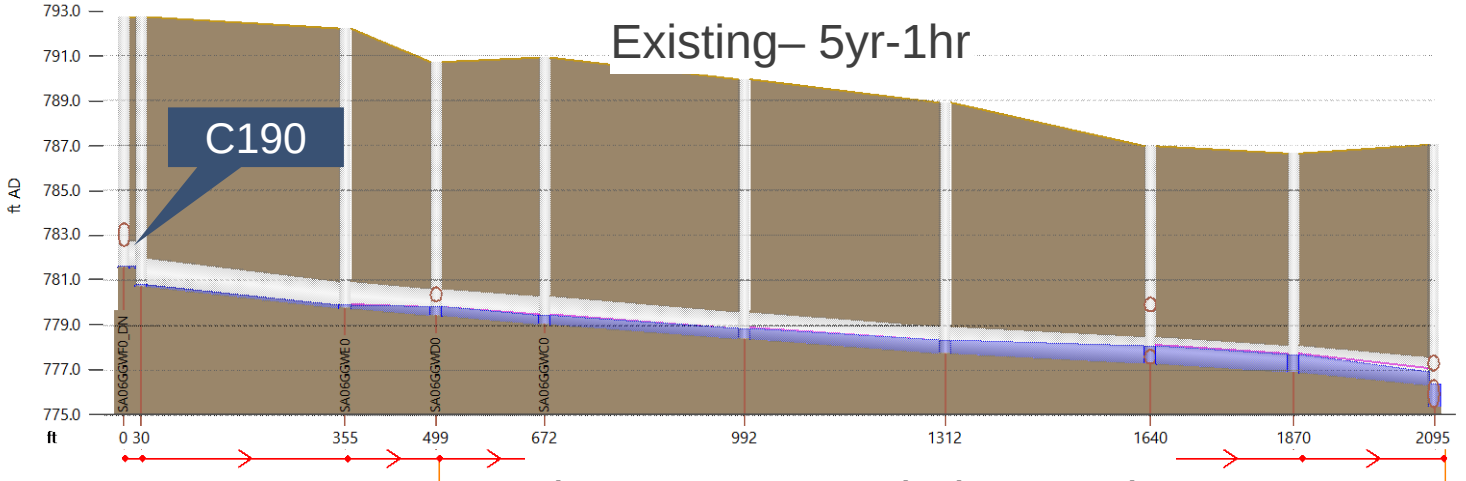
BE-10 and BE-07: SSO 190

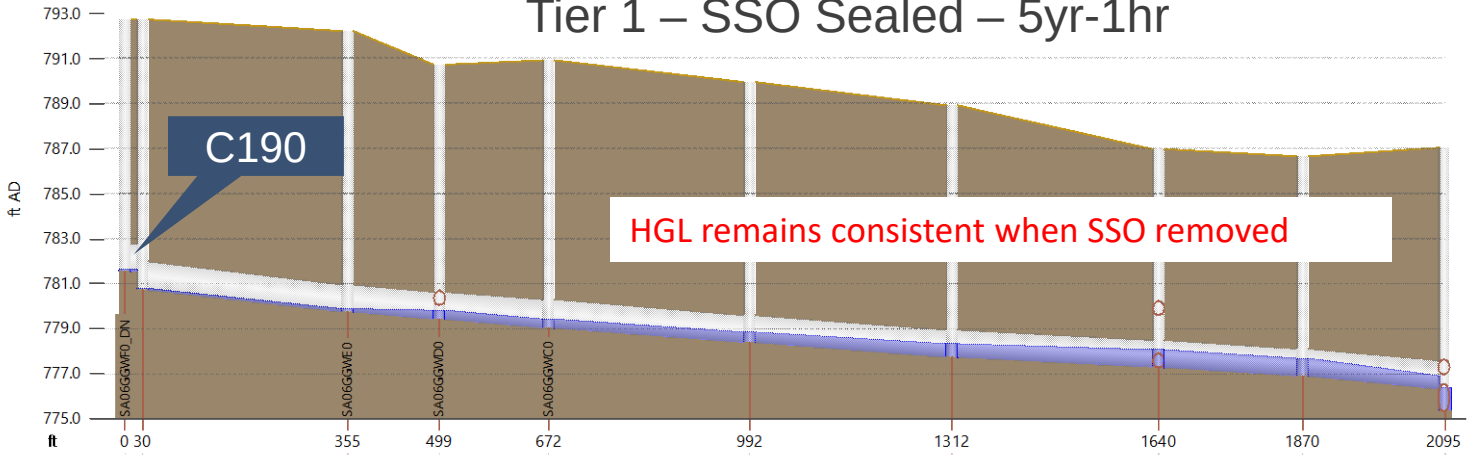
SSO C190

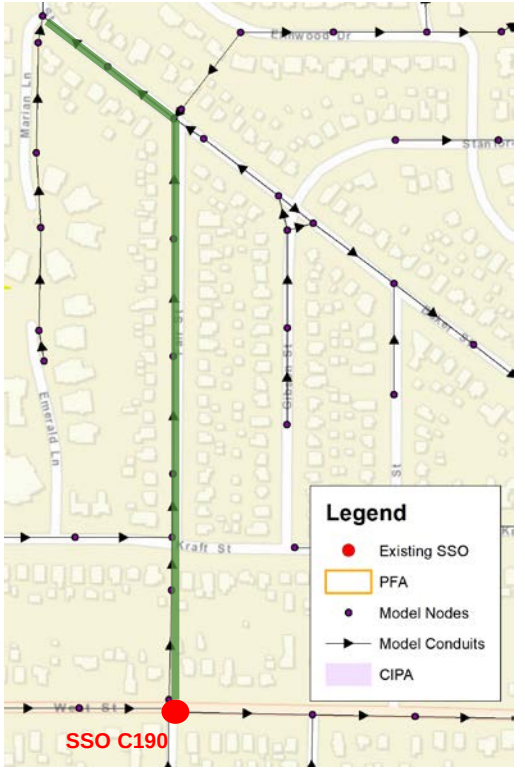
- This SSO does not overflow during the existing condition
  - **Only backwater would cause SSO and the current modeling does not show any indication of backwater..**
- Fair Street replacement and redirection appears to have solved the SSO
  - **Fair St routing changed from north past West St to the east in the West St. sewer, away from the SSO**
  - **SSO weir does not need to be raised at all since no SSO occurring during existing condition**
- **<u>Recommendation: Seal SSO to prevent storm flows from backflowing into the sanitary system</u>**



BE-10 and BE-07: Impacts to SSO C190







Model Profile Highlighted Green

BE-10 and BE-07 Summary

Tier 1 Summary

- CIPA Area A
  - **Monitor and Field Investigations**
- CIPA Area B
  - **Monitor and Field Investigations**
- CIPA Area C
  - **Capacity Enhancement**
- SSO C438
  - **Clean out SSO manhole**
  - **Raise SSO Weir 1 foot**
- SSO C190
  - **Seal SSO**

BE-10 and BE-07

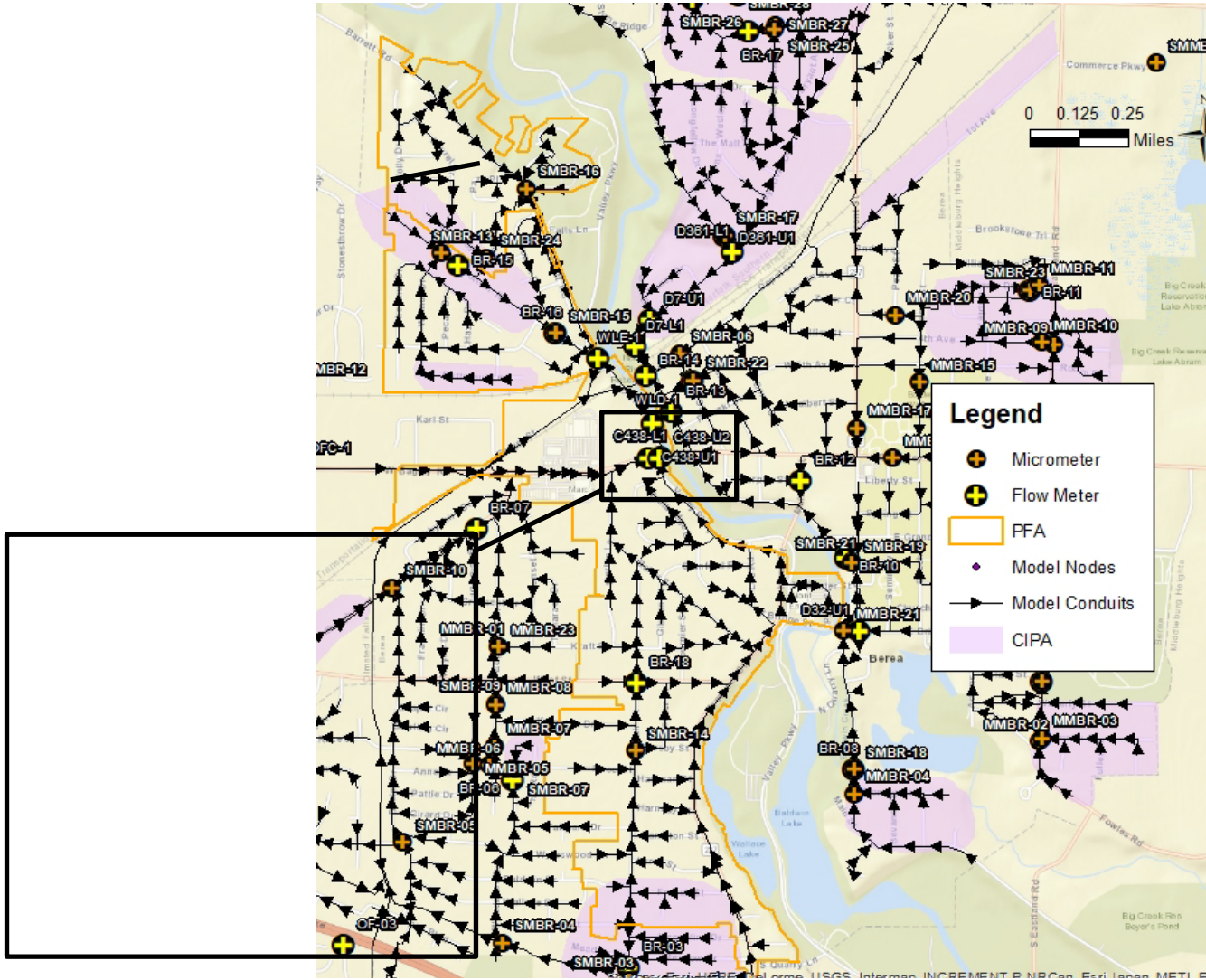
Tier 2 Model-Predicted BBUs and I/I

- BBUs and high I/I (> 50,000 GPAD) in two metersheds:
  - **C438-U2**
  - **BR-16**

BE-10 and BE-07

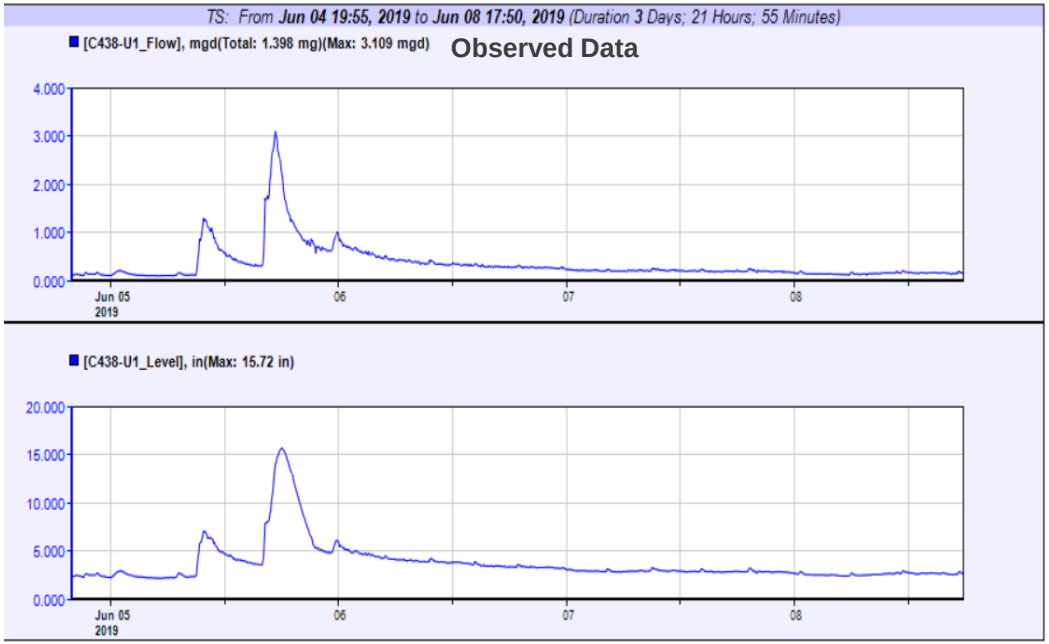
Tier 2 Calibration Meter and Micrometer Data

- There were three sets of calibration meter data (in addition to those reviewed as part of Tier 1) installed in/near areas of high I/I:
  - C438-U1
  - C438-U2
  - C438-L1
- Micrometer data in areas of high I/I was reviewed in Tier 1

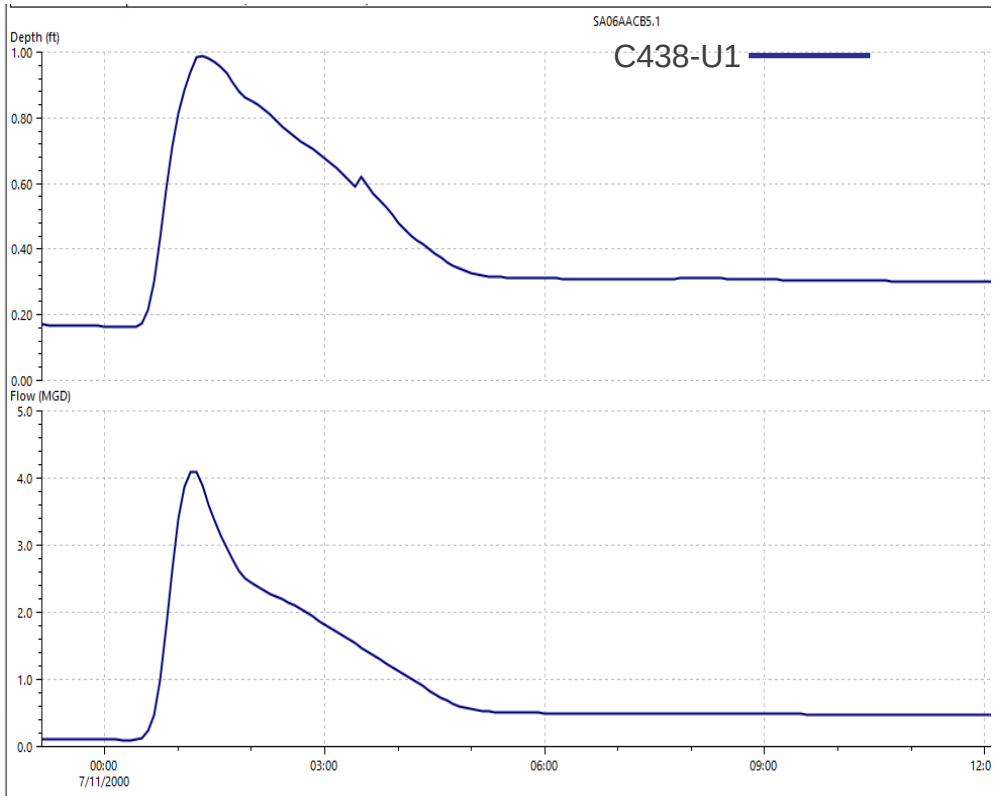


BE-10 and BE-07 : C438-U1

Tier 2 Calibration Meter Data



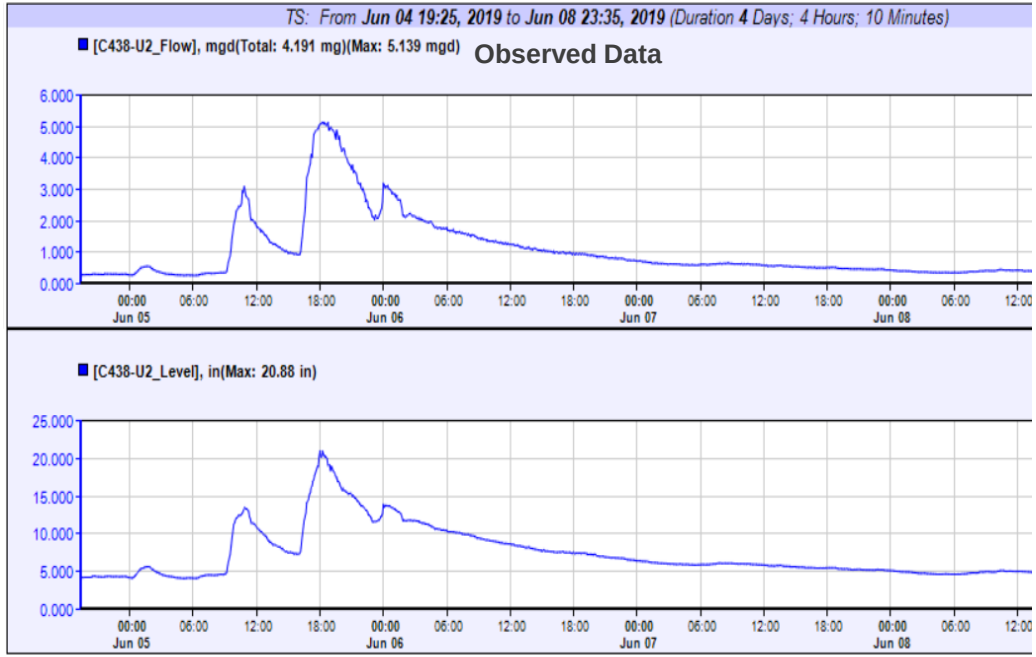
Modeled Design Storm : 5yr, 1hr



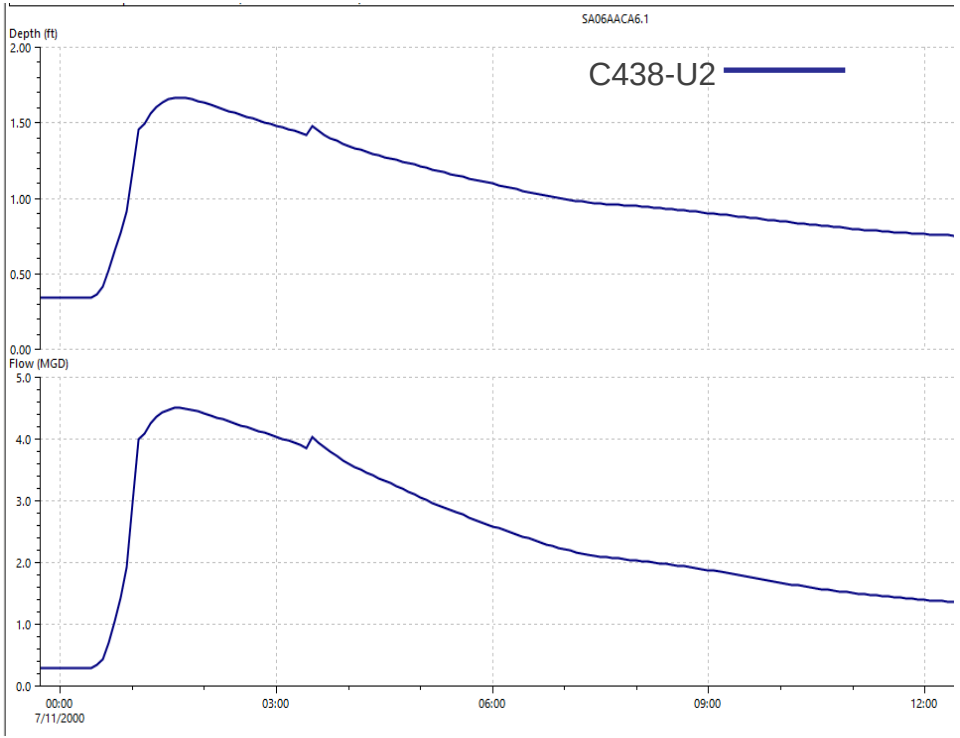
- Surcharge was not observed during the monitoring period
- Model does not predict surcharge during the monitoring period or the design storm. Modeled depths reasonably match observed depths.
- Model shows a reasonable match between the ratio of flow at the meter location.

BE-10 and BE-07 : C438-U2

Tier 2 Calibration Meter Data



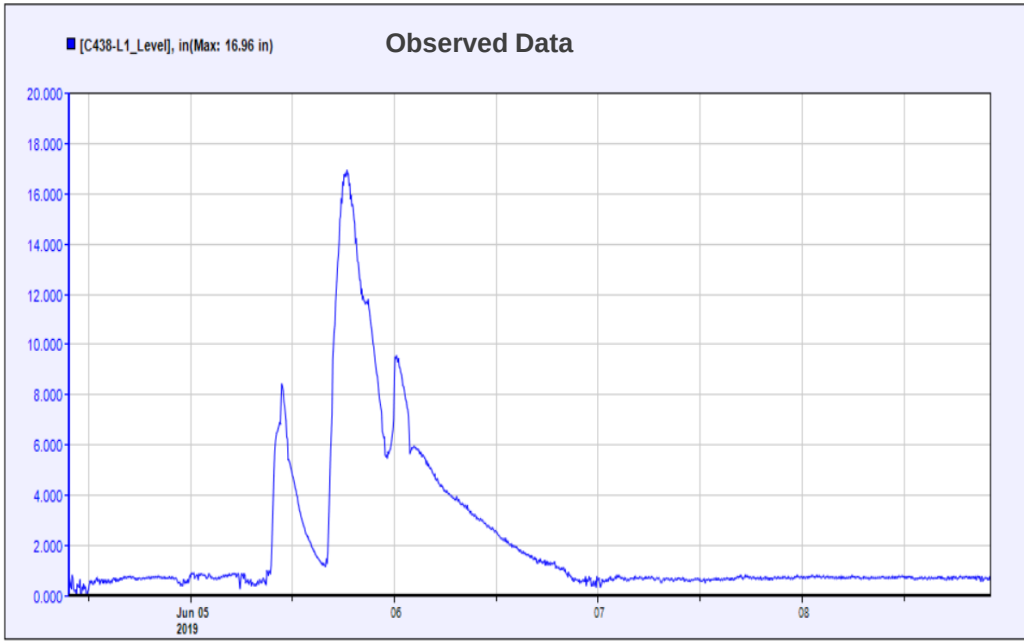
Modeled Design Storm : 5yr, 1hr



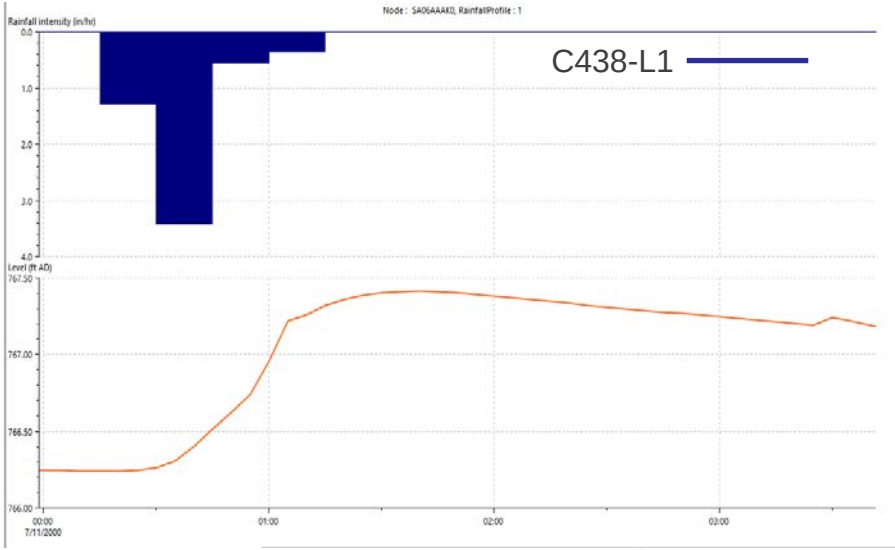
- Surcharge was observed once during the monitoring period on June 5 (plot to the left)
- Model does not predict surcharge during the monitoring period or the design storm. Modeled depths are generally slightly lower than observed depths but 80% of the events meet WaPug for depth.
- Model shows a reasonable match between the ratio of flow at the meter location.

BE-10 and BE-07 : C438-L1

Tier 2 Calibration Meter Data



Modeled Design Storm : 5yr, 1hr

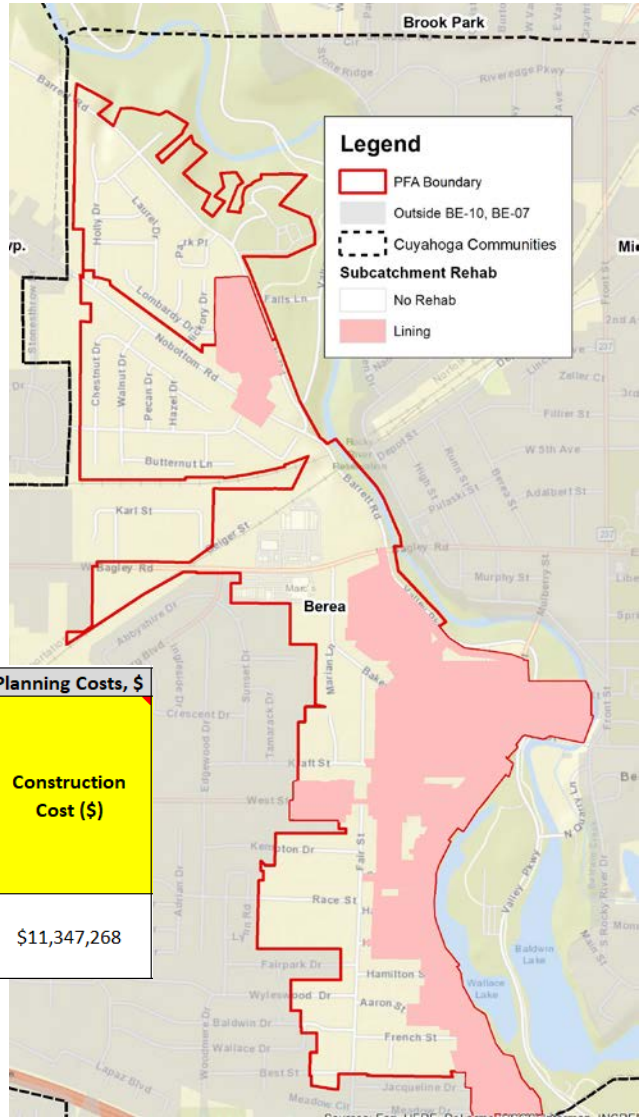


- The greatest depth was measured on June 5 (plot to the left)
- Modeled levels generally match observed.

BE-10 and BE-07

Tier 2 Assessment

- Public rehab of all subcatchments with > 50,000 GPAD



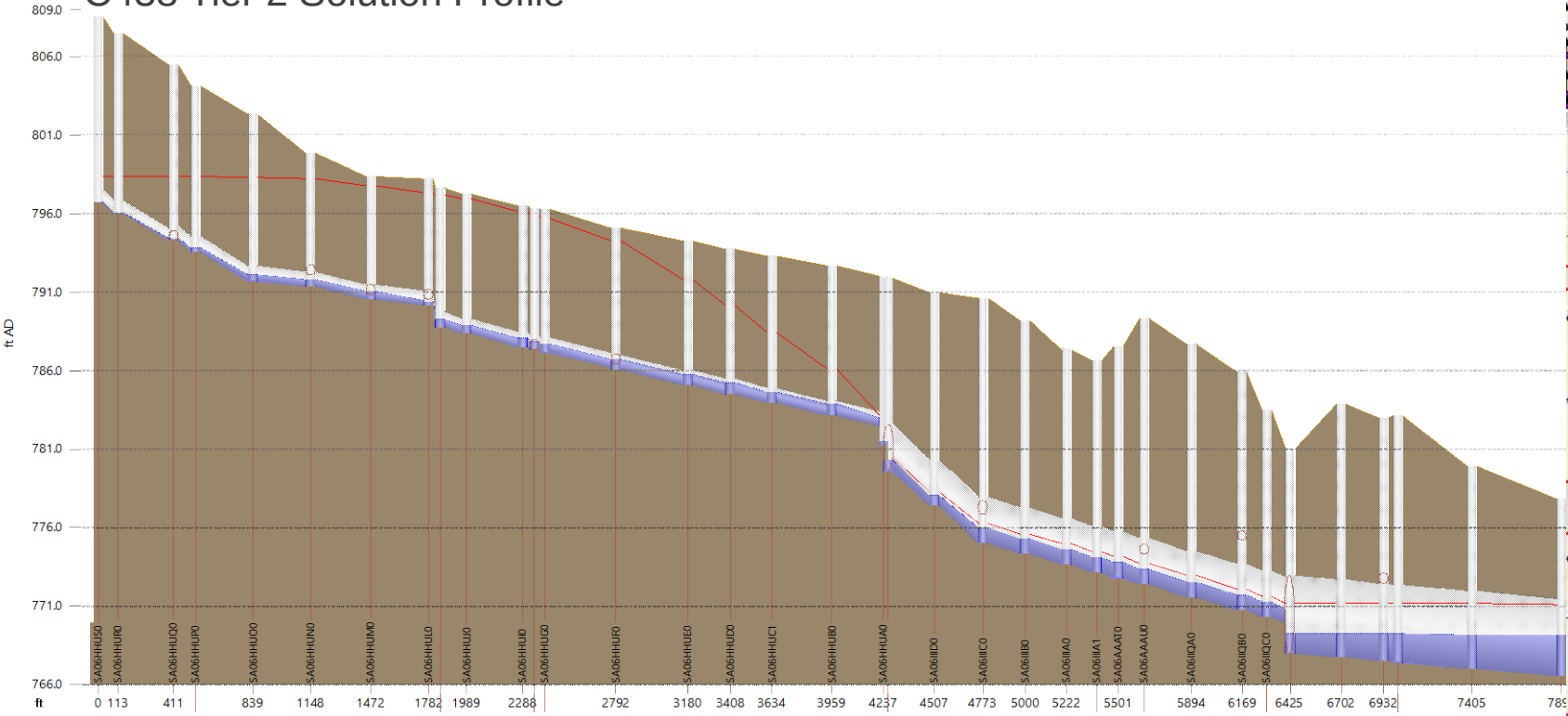
NEORSD Branch	PFL Area	Alternative		Summary										Planning Costs, $
		Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
SWI2019	BE-10	A2	Tier 2 Public Lining	0	0	0	0	26452	0	0	0	0	388	$11,347,268

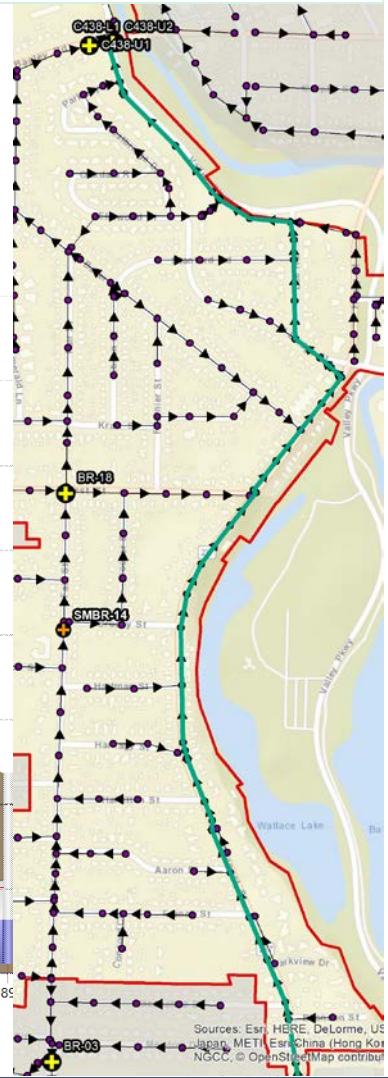
Model Profile Highlighted Green

BE-10 and BE-07

Tier 2 Model Profiles

- C438 Tier 2 Solution Profile



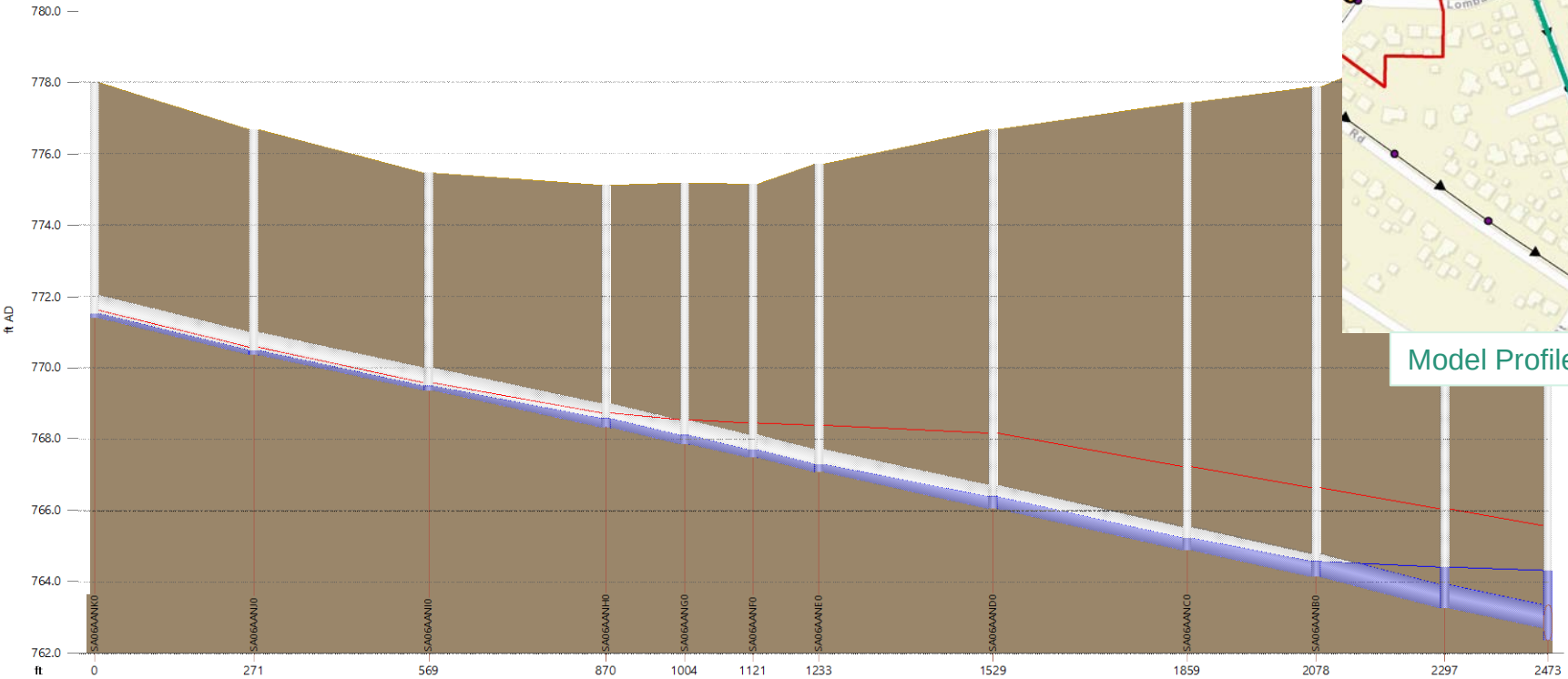


HGL associated with Tier 2 solution is shown in blue. Prior HGL (Sewer Cleaning Model) is shown in red.

BE-10 and BE-07

Tier 2 Model Profiles

- BR-16 Tier 2 Solution Profile





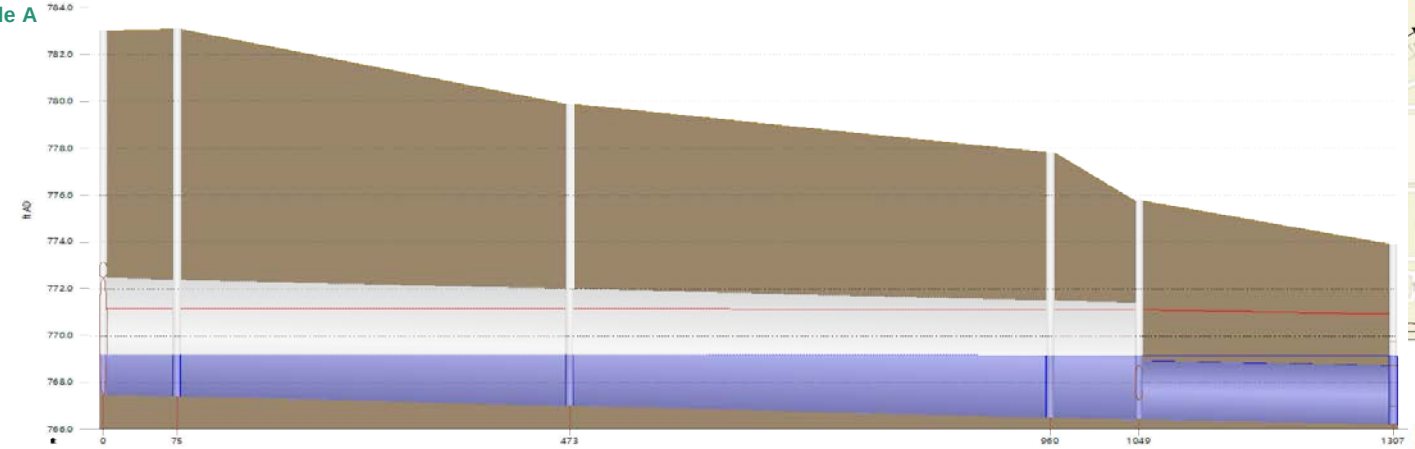
Model Profile Highlighted Green

HGL associated with Tier 2 solution is shown in blue. Prior HGL (Sewer Cleaning Model) is shown in red.

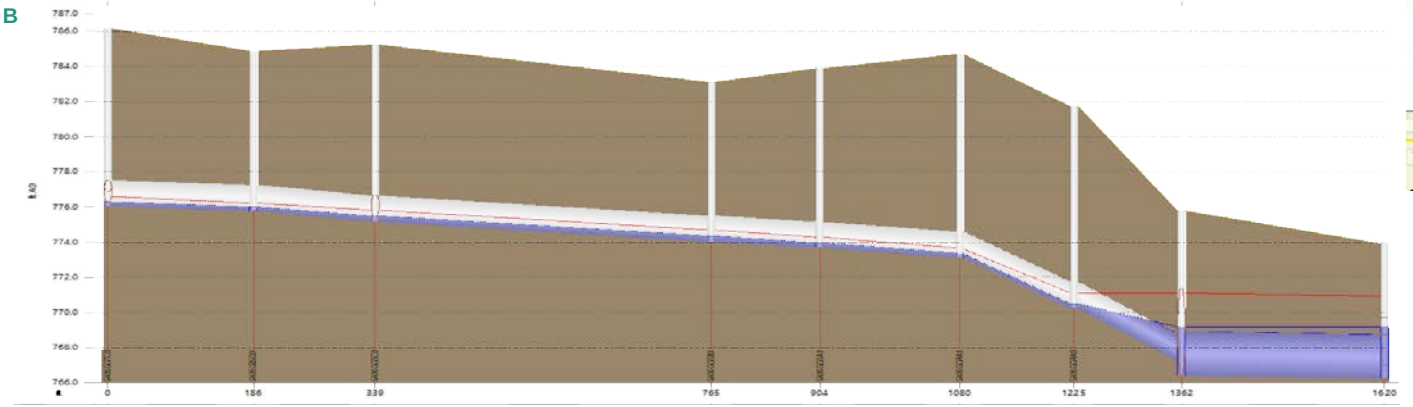
BE-10 and BE-07: Tier 2 Impacts to SSO C438

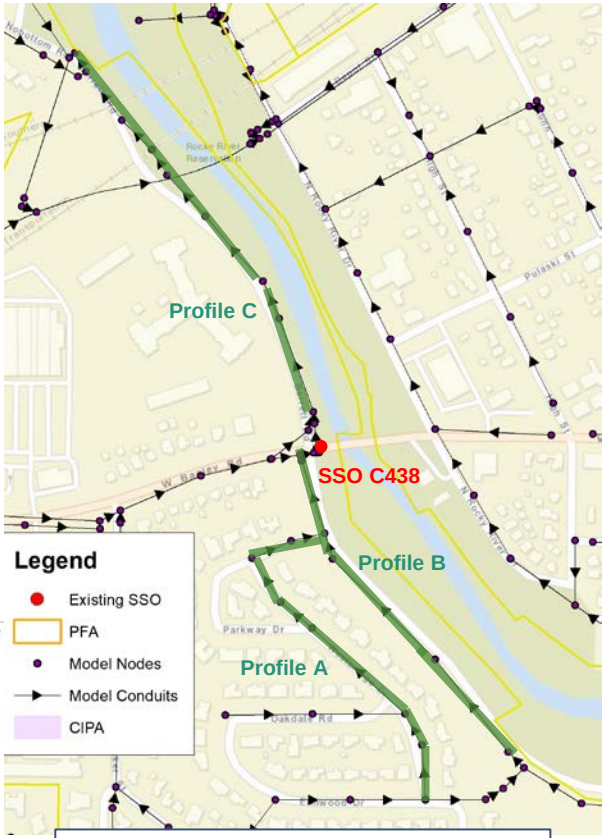
5-Year Model Design Storm Profiles

Profile A



Profile B





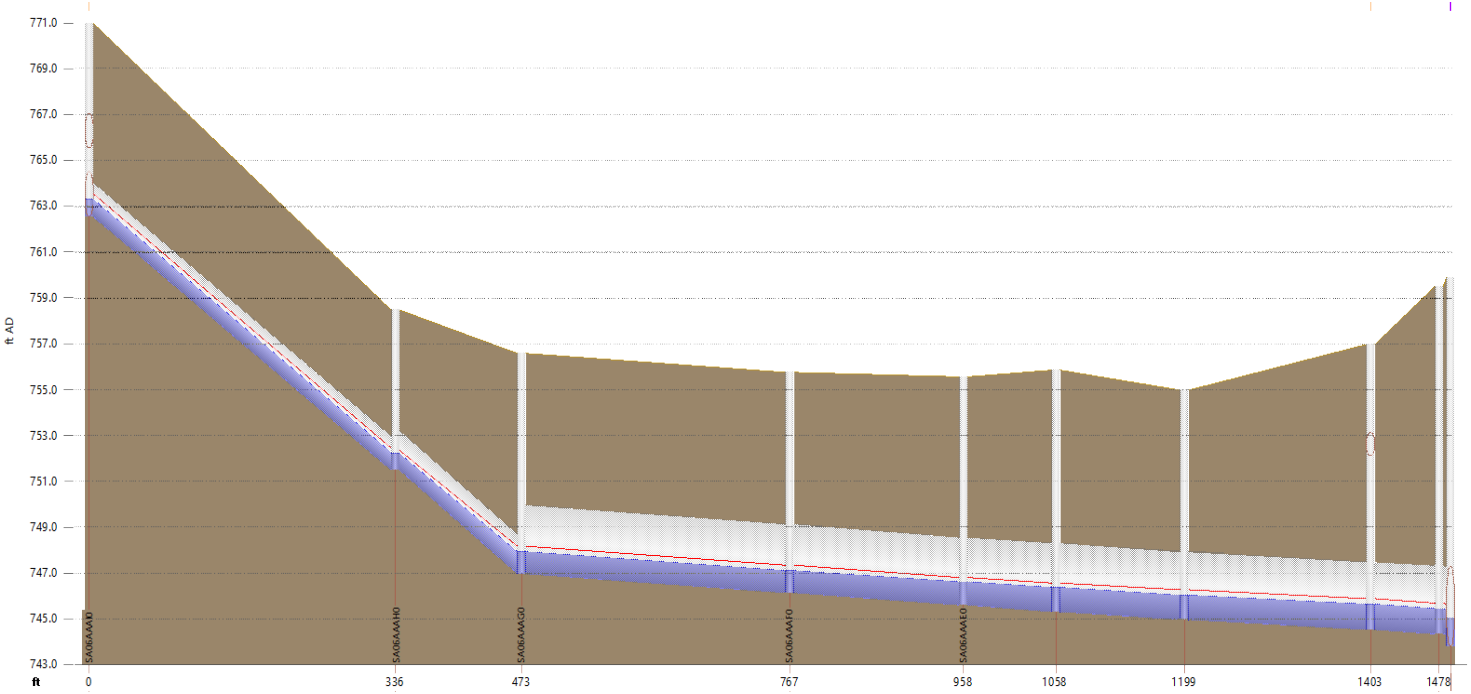
Model Profile Highlighted Green

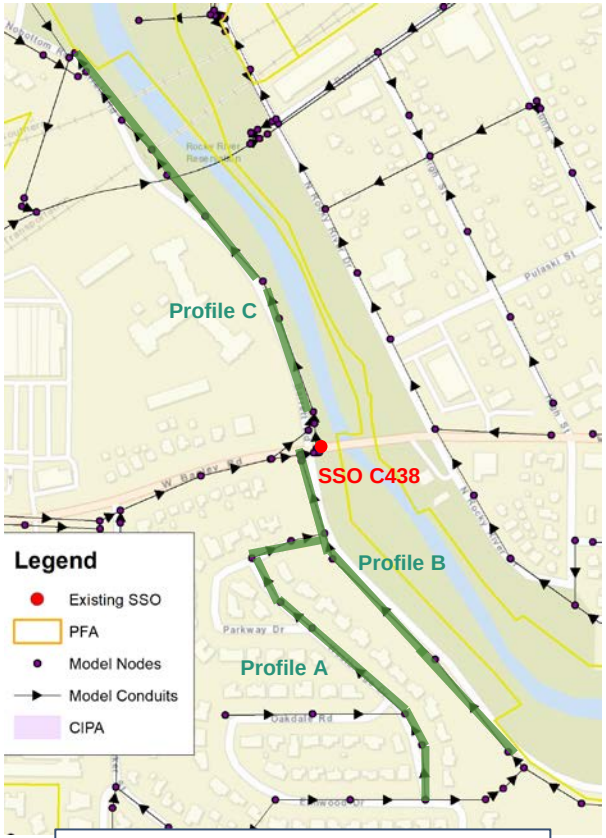
HGL associated with Tier 2 solution model is shown in blue. Prior HGL (Sewer Cleaning Model) is shown in red. Reduction

BE-10 and BE-07: Tier 2 Impacts to SSO C438

5-Year Model Design Storm Profiles

Profile C



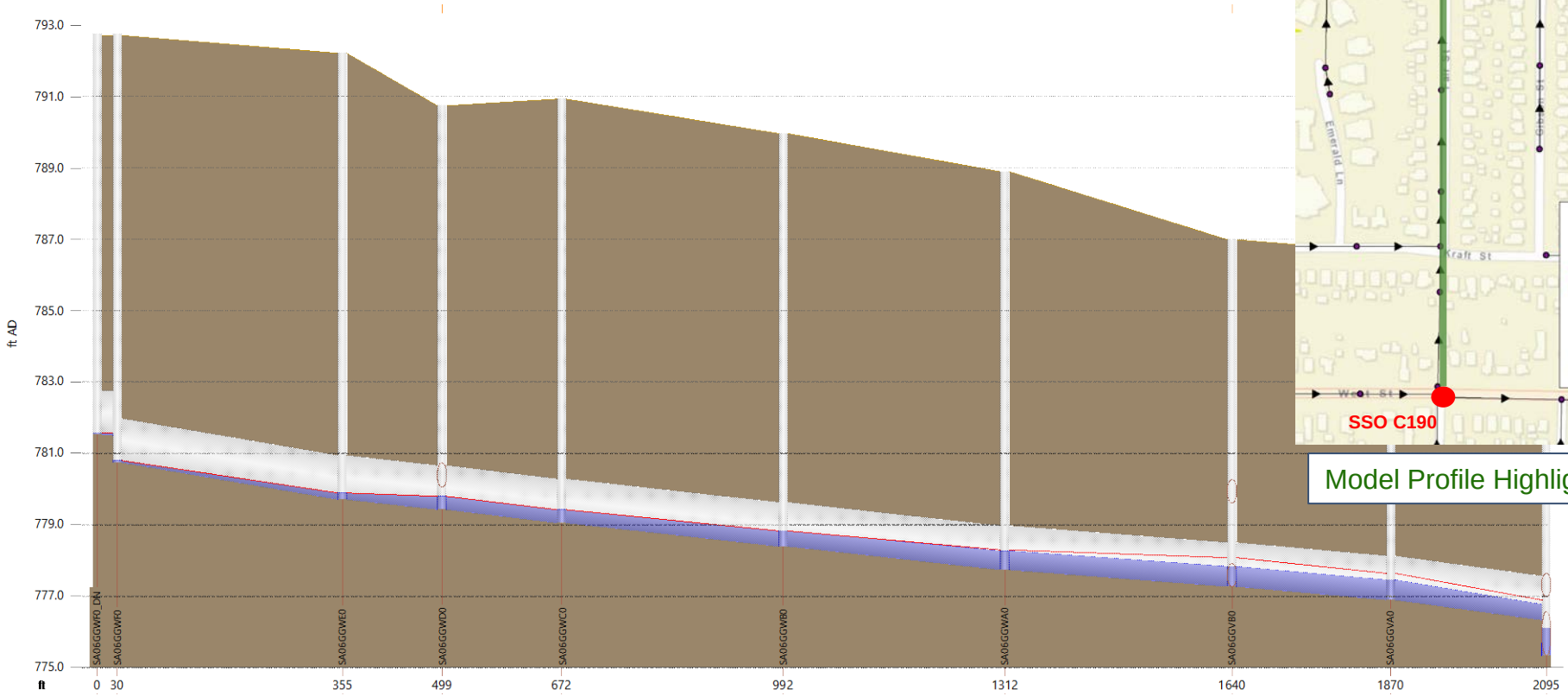


Model Profile Highlighted Green

HGL associated with Tier 2 solution model is shown in blue. Prior HGL (Sewer Cleaning Model) is shown in red. Reduction

BE-10 and BE-07: Tier 2 Impacts to SSO C190

5-Year Model Design Storm Profiles





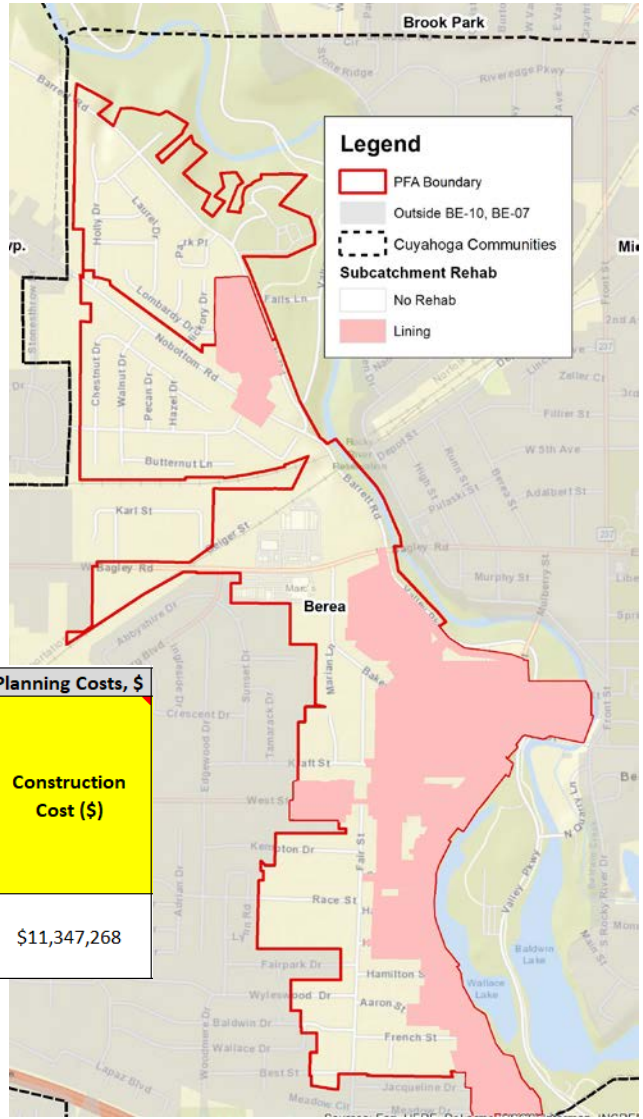
Model Profile Highlighted Green

HGL associated with Tier 2 solution model is shown in blue. Prior HGL (Sewer Cleaning Model) is shown in red. Reduction

BE-10 and BE-07

Tier 2 Solution

- To resolve excessive I/I, public rehab only
- No further BBUs in BE-10
- Three BBUs remain in BE-07; do not qualify as excessive I/I

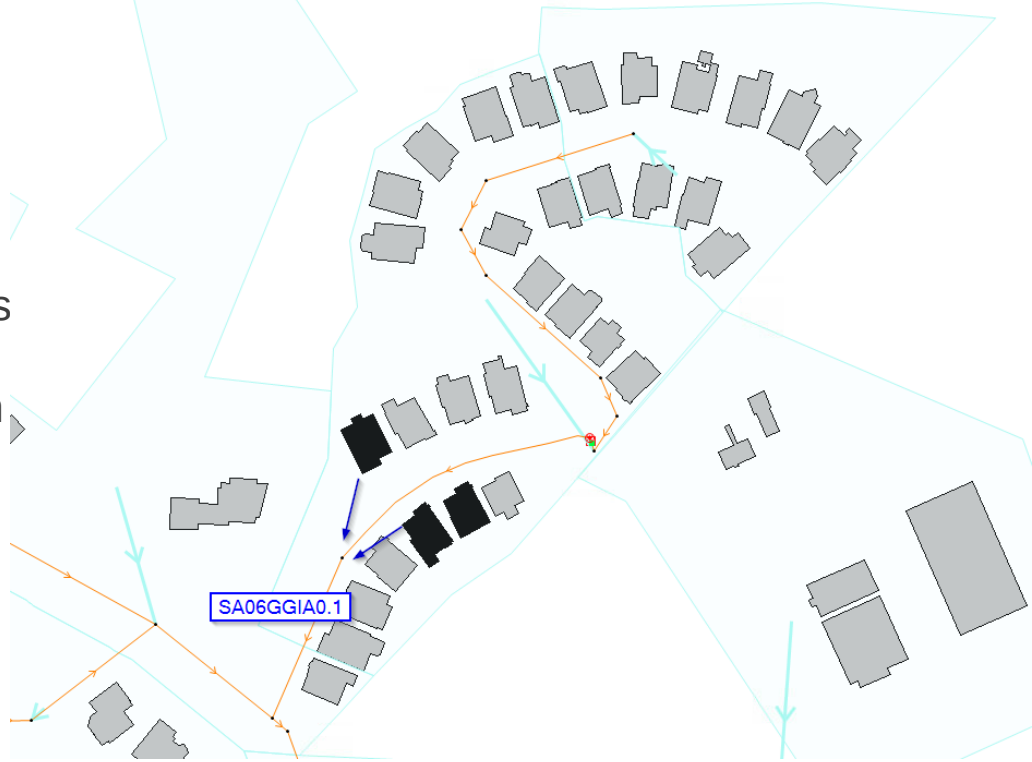


NEORSD Branch	PFL Area	Alternative		Summary										Planning Costs, $
		Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
SWI2019	BE-10	A2	Tier 2 Public Lining	0	0	0	0	26452	0	0	0	0	388	$11,347,268

BE-10 and BE-07

Tier 3 Model-Predicted BBUs in BE-07

- Three BBUs remain in BE-07, on Trailhead Lane (BldgId 349266, 429412, 442743). These buildings are within subcatchment WLE-1_012 and associated with model asset SA06GGIA0.1, which appears to be incorrect
- It would appear that these locations should be linked instead to the Trailhead Ln Pump Station, which shows no surcharge; if they are newly constructed residences in the vicinity of the pump station they are unlikely to have issues. **Record drawings along Trailhead Lane are needed to confirm sewer depths but are also unmodeled.**



BldgID	ModelYear	PFL ID	SC ID	Basemen	Area_SqF	Bldg Age	Bmt Type	Model Asset ID
349266	2019	BE-07	WLE-1_012	Yes	2090.41309	2012	BMT	SA06GGIA0.1
429412	2019	BE-07	WLE-1_012	Yes	2390.58292	2013	BMT	SA06GGIA0.1
442743	2019	BE-07	WLE-1_012	Yes	2451.843452	2006	BMT	SA06GGIA0.1

BE-10 and BE-07

Tier 3 Model-Predicted BBUs in BE-07

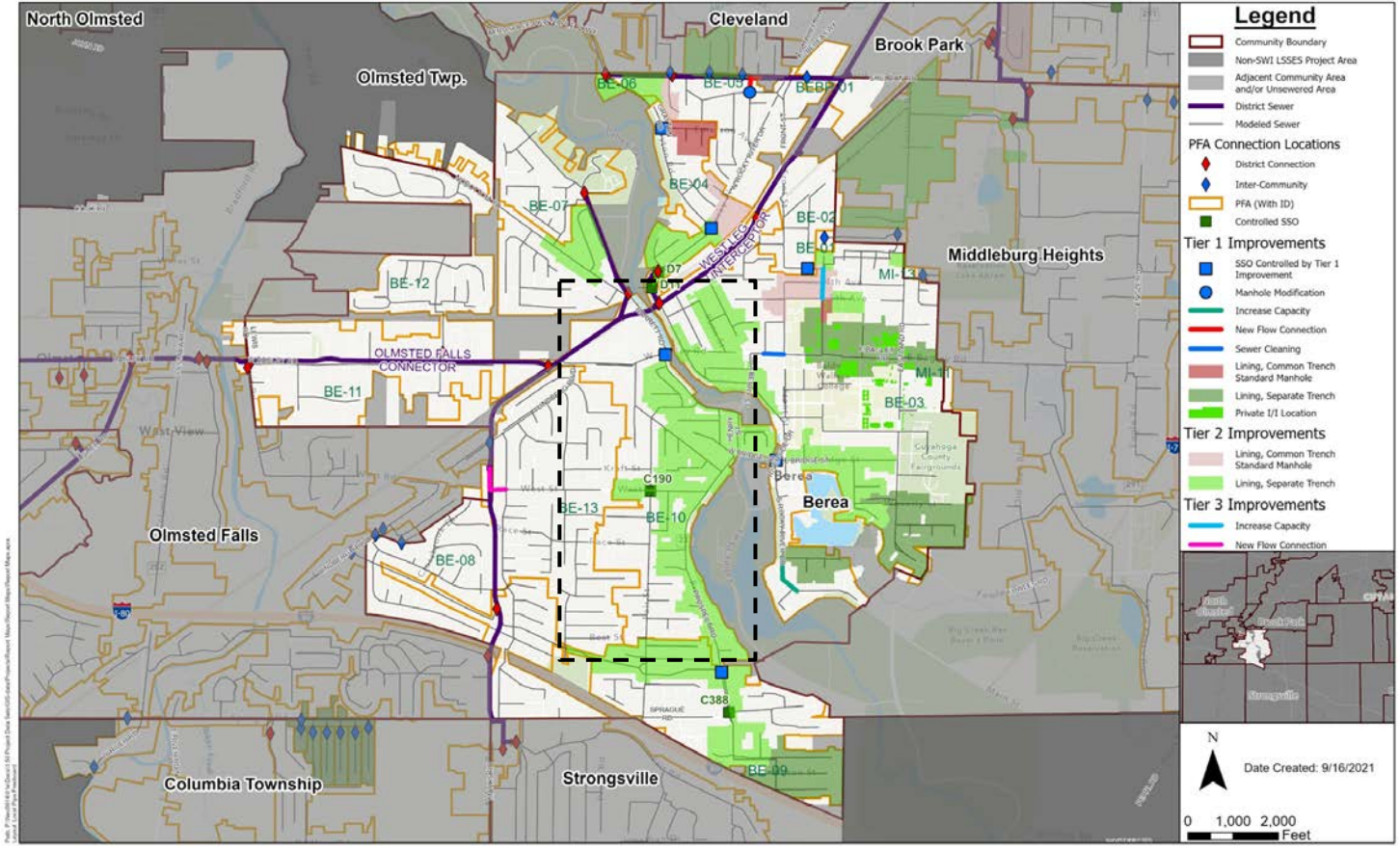
- Correct location shown
- **No Tier 3 projects recommended**



BldgID	ModelYear	PFL ID	SC ID	Basemen	Area_SqF	Bldg Age	Bmt Type	Model Asset ID
349266	2019	BE-07	WLE-1_012	Yes	2090.41309	2012	BMT	SA06GGIA0.1
429412	2019	BE-07	WLE-1_012	Yes	2390.58292	2013	BMT	SA06GGIA0.1
442743	2019	BE-07	WLE-1_012	Yes	2451.843452	2006	BMT	SA06GGIA0.1

BE-10 Final

- Final recommendation after refinement
- Tier 1
  - 1 miscellaneous structural improvement
  - Total cost = $16,000
- Tier 2
  - Common trench rehab = 3,840 LF
  - Separate trench rehab = 29,097 LF
  - Total cost = $22,456,000
- Tier 3 N/A
- Total Cost = Total Capital Cost + Contingency + Project Definition Investigation



Indicates the location of the PFA. (Map includes adjacent PFAs.)

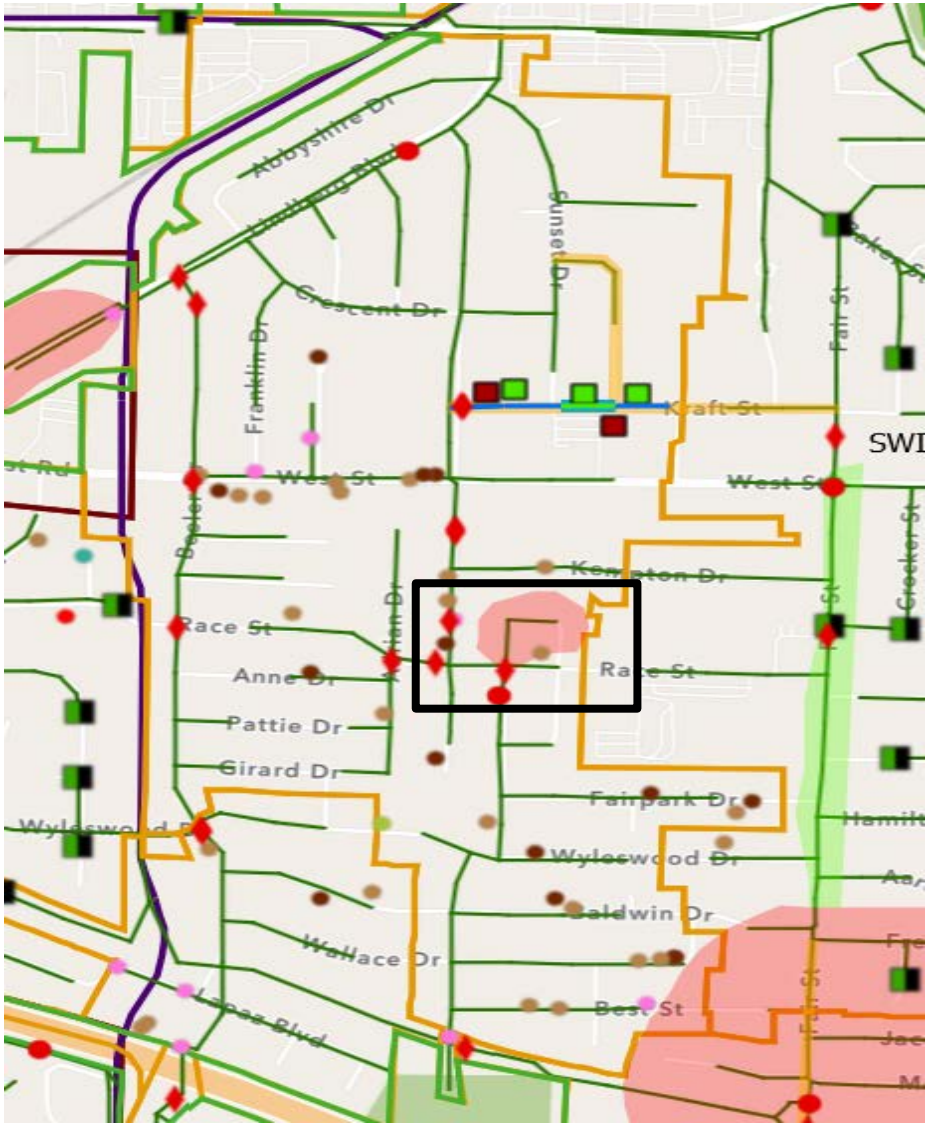
Hazen

SWI-LSSES PFA BE-13 Optimization

BE-13

Tier 1 Optimization - Field Data

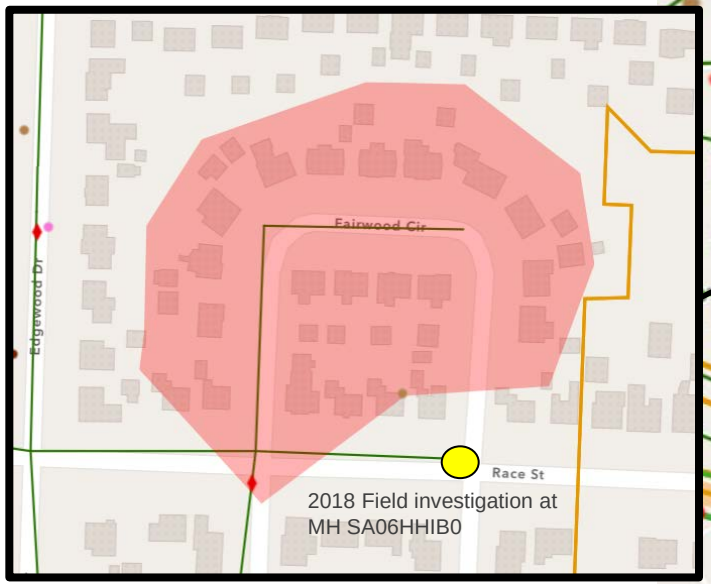
- One CIPA
- There are no active SSOs in this area

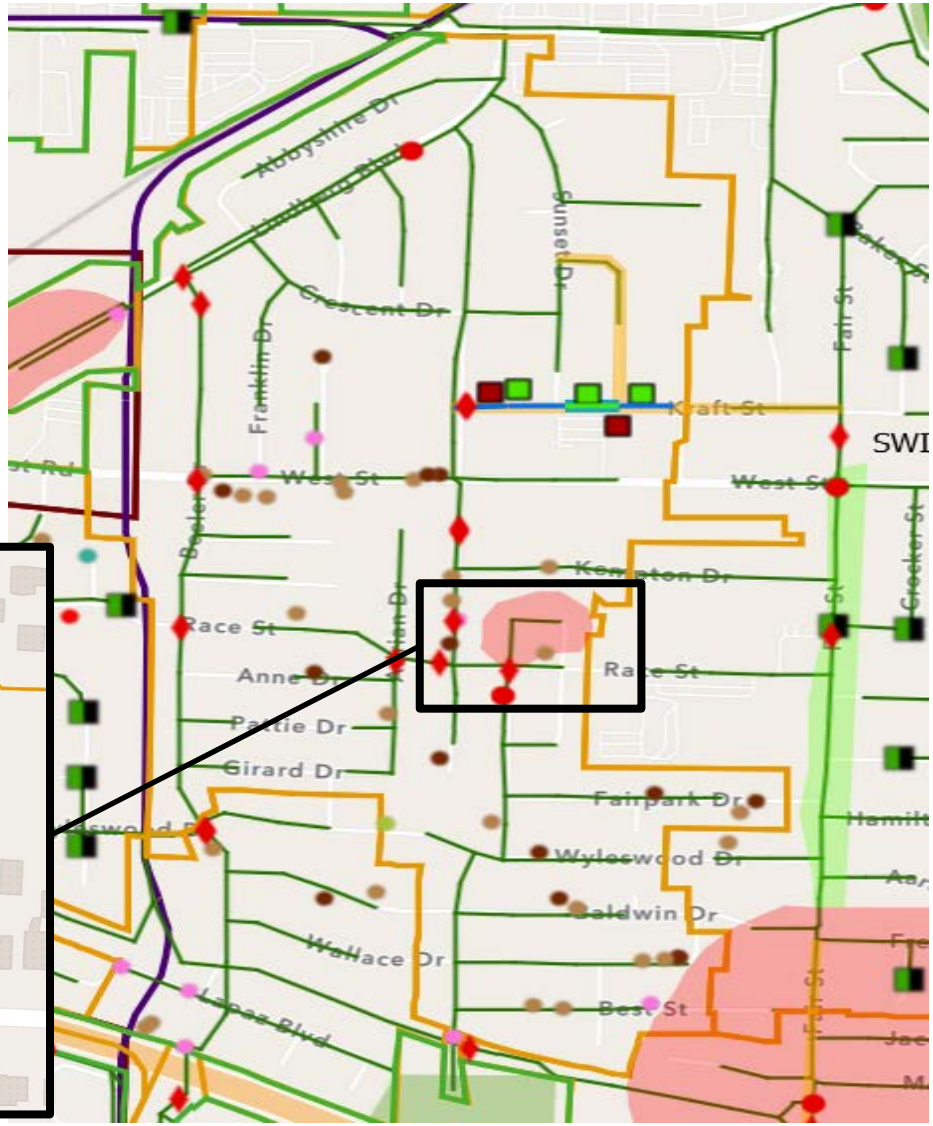


BE-13

Tier 1 Optimization –Field Data

- One smoke test defect– no smoke from vent
- 2018 field investigation at MH SA06HHIB0 showed that this MH has additional connections (not storm) that are not shown on mapping. No evidence of SSO

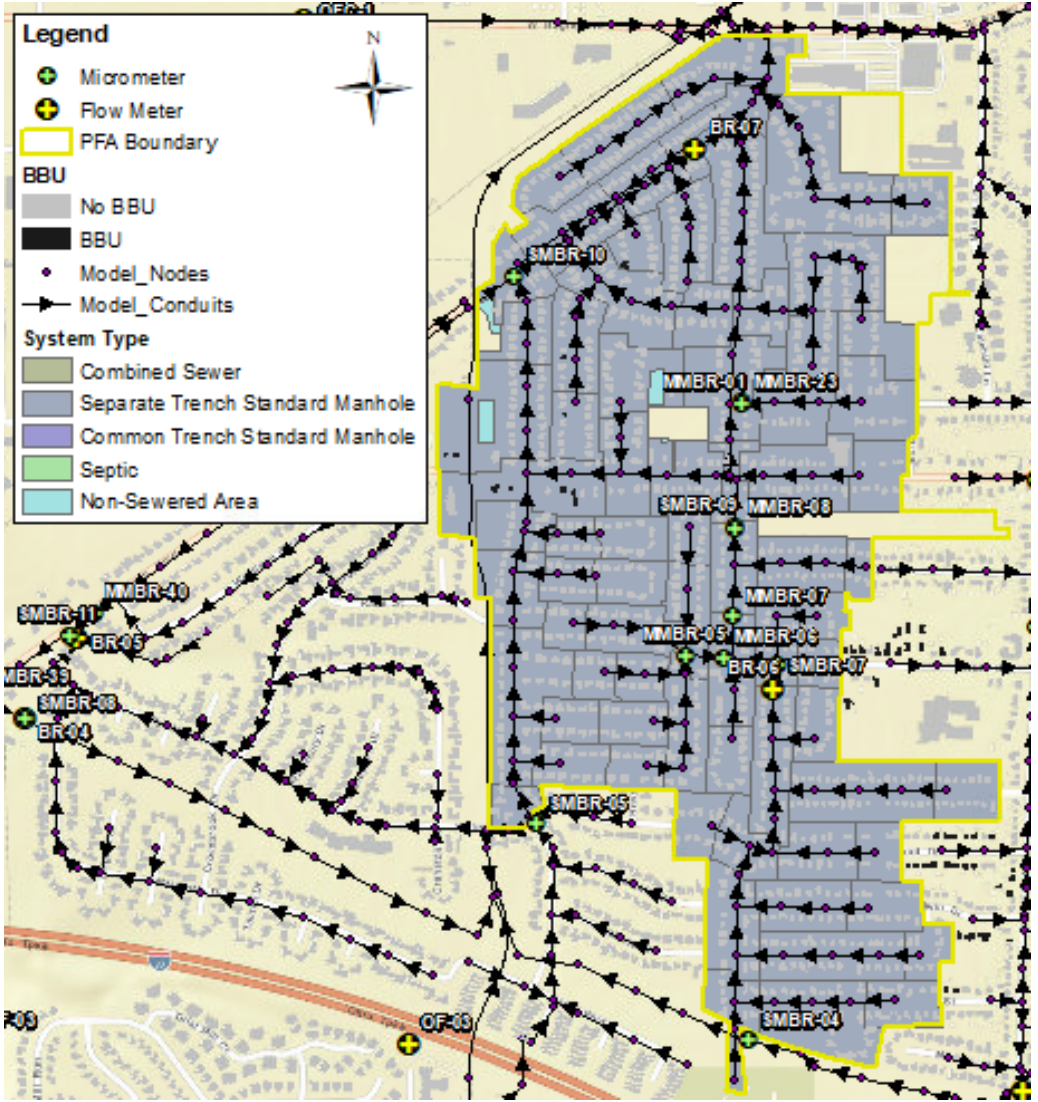






BE-13

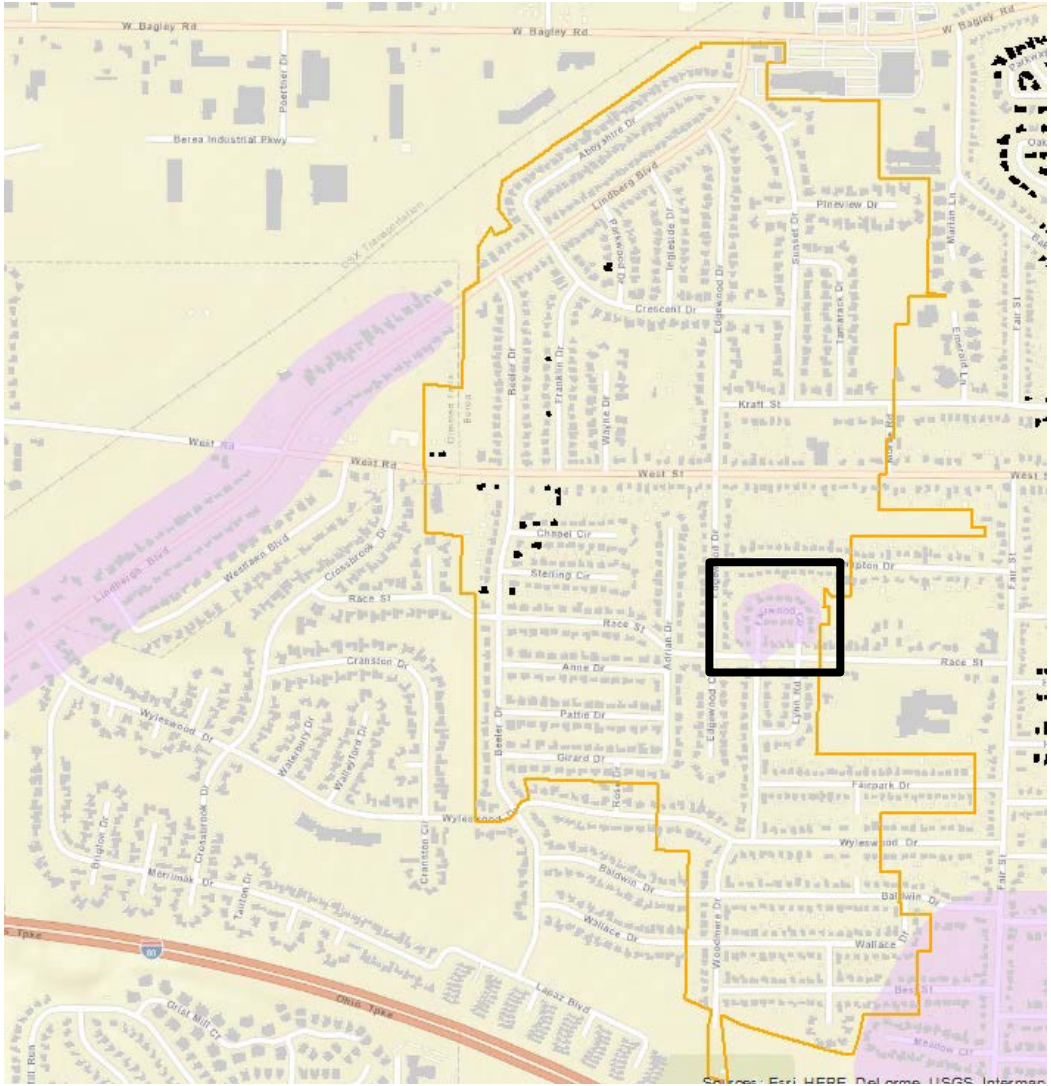
Optimization – Trench Type (all separate trench)



BE-13

Base Model for Optimization BBUs

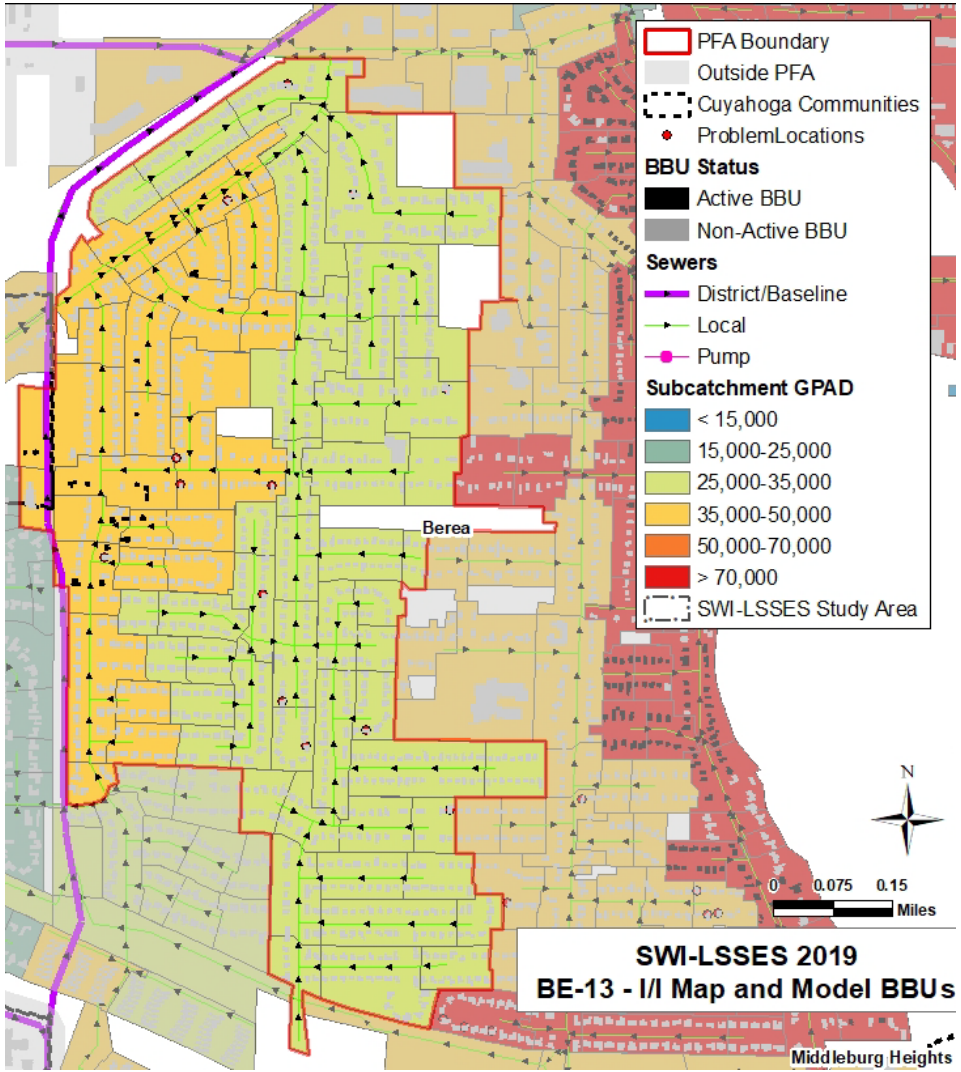
- There are no model predicted BBUs within this CIPA, but surcharge is predicted during the 5 year storm
- 17 homes within this area; 15 have basements, 2 are slab. These 17 homes with basements are the only ones in this general area.



BE-13

Model Predicted BBUs and I/I

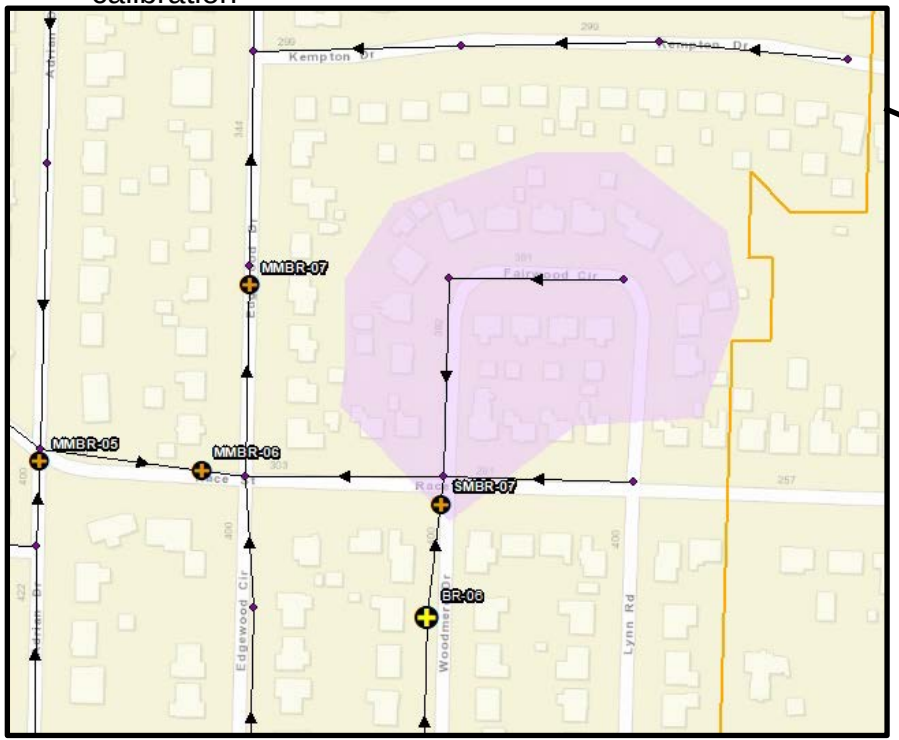
- Rate of I/I varies between 25,000 to 50,000;
- There are several problem locations within the BE-13 PFA. At these locations basement flooding was reported during the 5/15/2020 storm event which had 10-year return interval



BE-13

Micrometer Data and Flow Meter Data

- Micrometer data and flow monitoring data was collected; BR-06 and MMBR-08 were used in the 2019 calibration

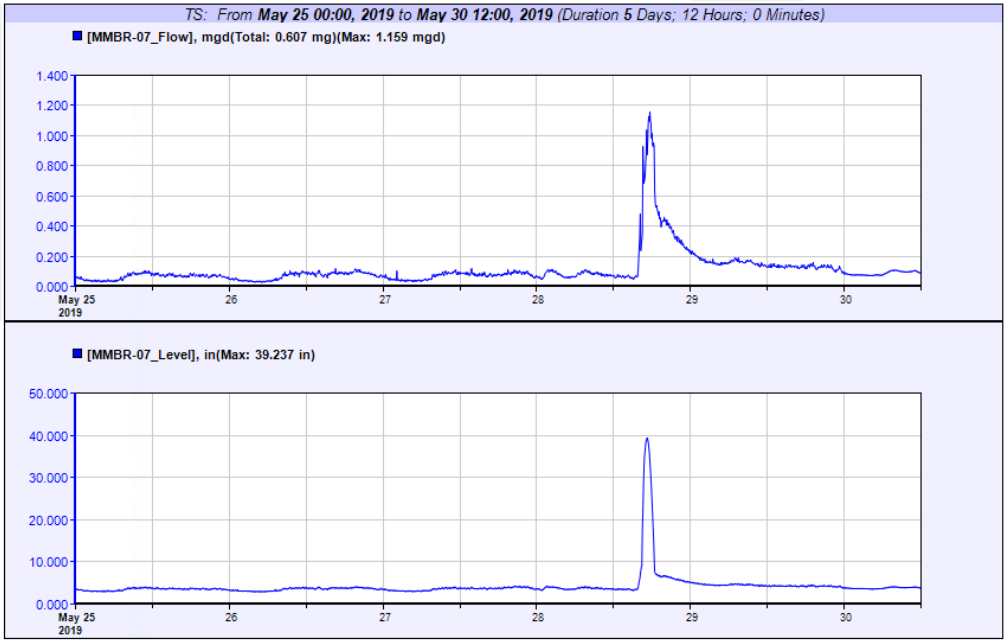




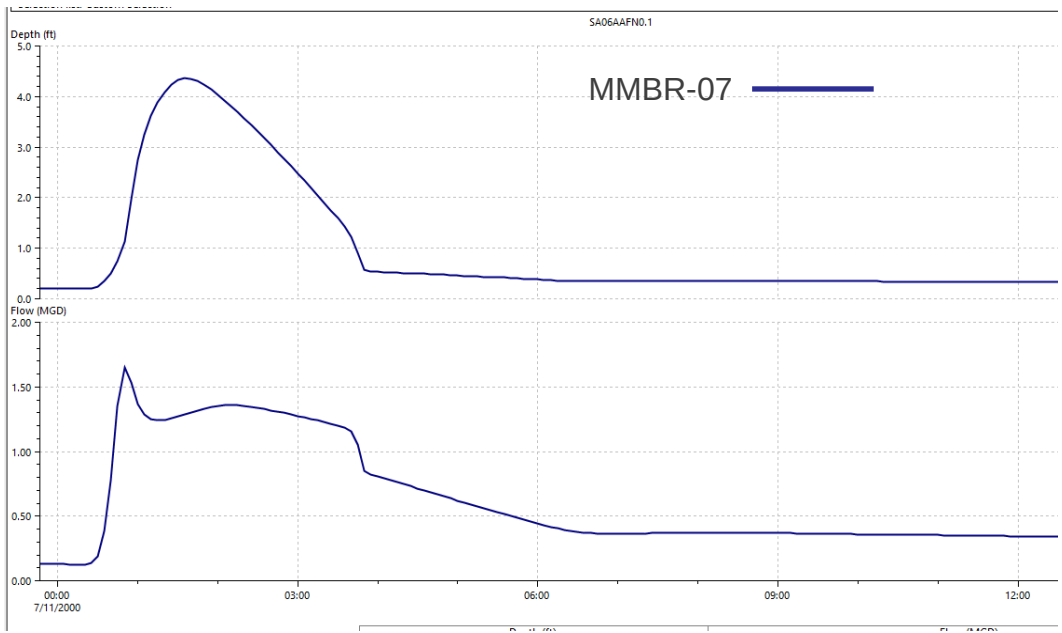
BE-13: MMBR-07

Micrometer Data

Observed Flow and Depth



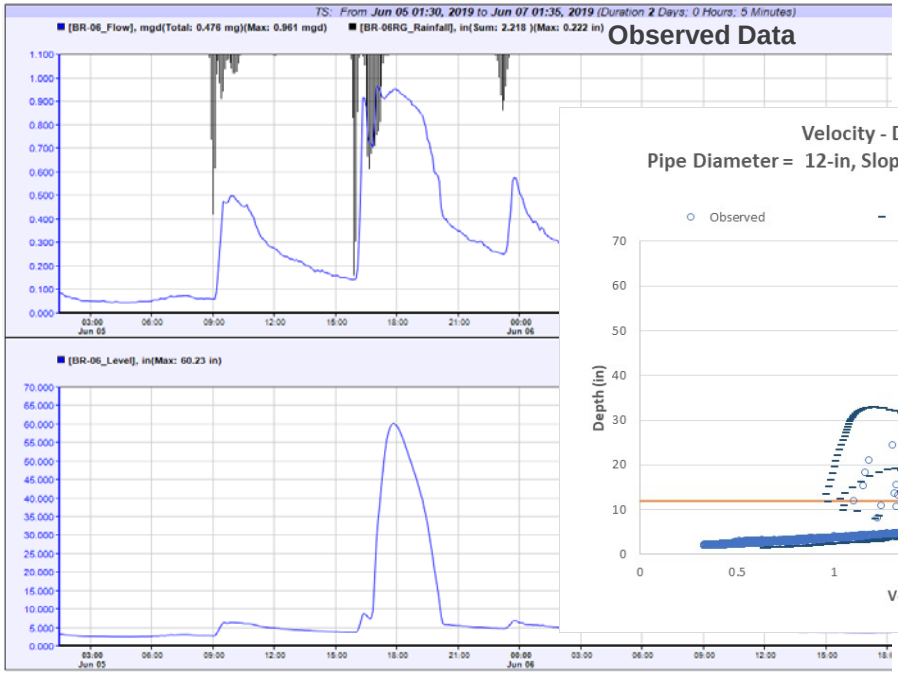
Modeled Design Storm : 5yr, 1hr

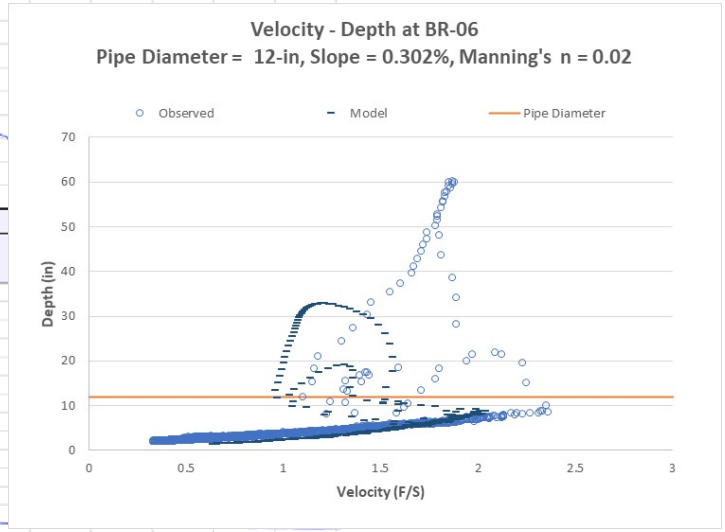


- Model slightly under-estimates peak flow at the micrometer immediately downstream of the CIPA. As shown on slide 3, a 2018 investigation showed that there are additional connections at MH SA06HHIB0, which is upstream; if these additional connections contribute flow, the model would likely underestimate since it does not include these additional connections
- Model slightly over-estimates peak depth at the micrometer immediately downstream of the CIPA.
- Model shows a reasonably conservative match, by depth, between the ratio of observed versus modeled flow.
- No Changes to the model or redistribution of flow is recommended.

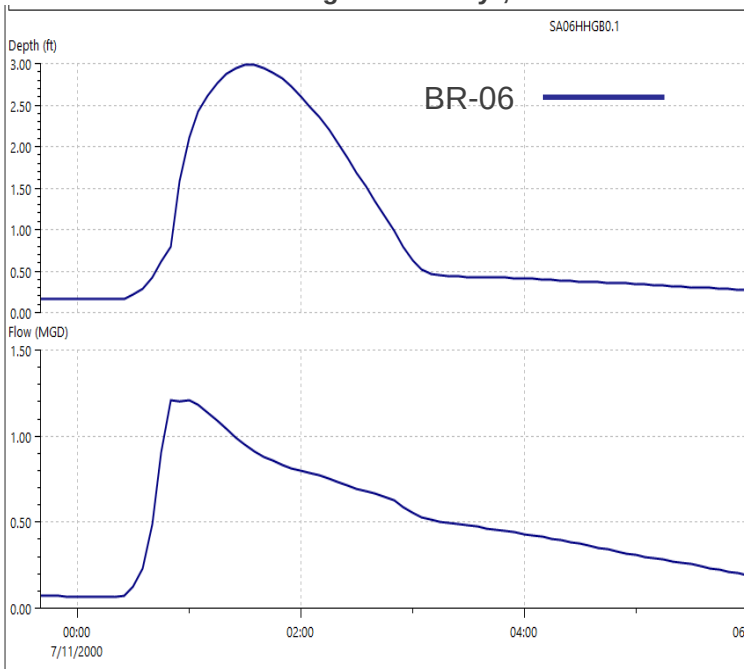
BE-13: BR-06

Calibration Meter Data





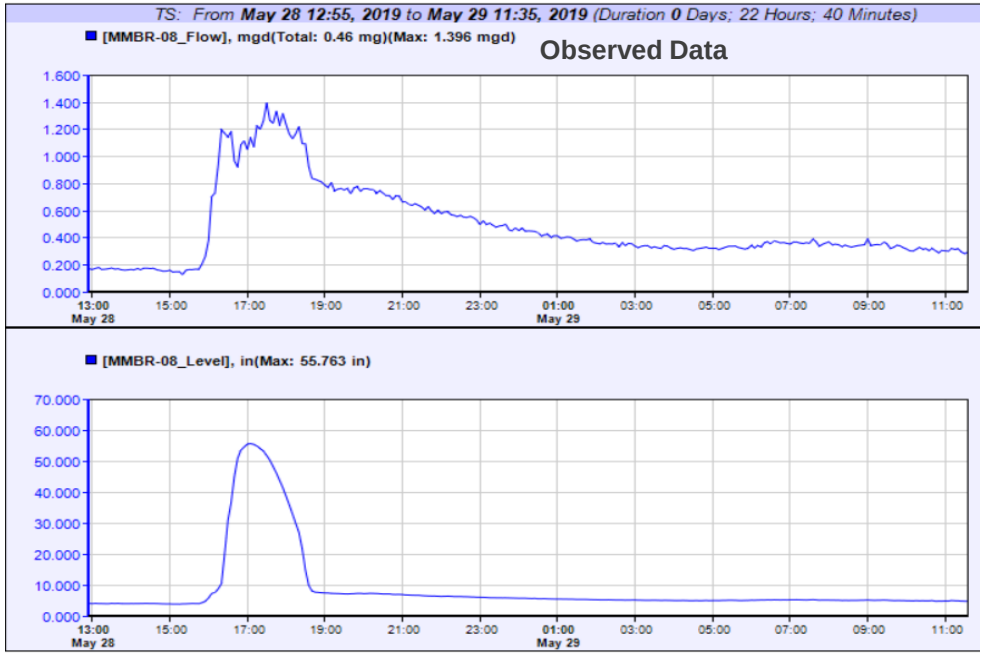
Modeled Design Storm : 5yr, 1hr



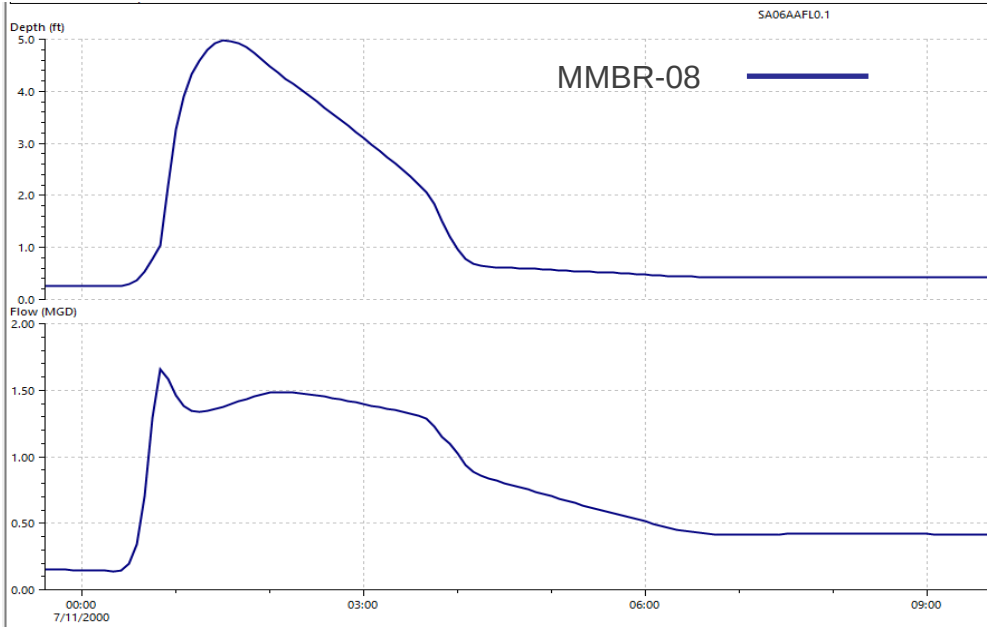
- Surcharge observed three times during monitoring period; June 5, shown as an example in the left plot. A scatterplot of observed data indicates a downstream obstruction/flow restriction that could result in sewer surcharge condition
- Model predicts surcharge during two of the same monitoring period events as well as the design storm. Modeled depths reasonably match observed depths.
- Model shows a reasonable match between the ratio of flow.

BE-13: MMBR-08

Micrometer Data



Modeled Design Storm : 5yr, 1hr



- Surcharge observed once during monitoring period on May 28 (shown on left plot)
- Model predicts similar surcharge the same event as well as the design storm. Modeled depths reasonably match observed depths.
- Model shows a reasonable match between the ratio of flow.

BE-13

Micrometering

- **The following micrometer data from 2018 was collected at the following relevant locations:**
  - *SMBR-07: Same location as BR-06 (slide 9)*
- **Since the micrometer data was collected at the same locations as the calibration meter data and was collected earlier, the calibration meter data was prioritized**

Calibration Meter Data

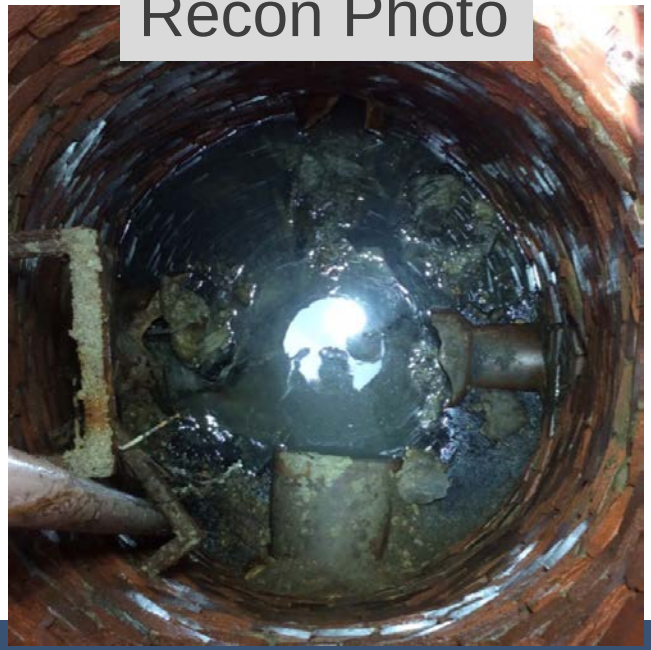
- Conclusions
  - **No evidence to show that the model flows should be redistributed**
    - *Meter data was used during calibration, it is already incorporated into the model*
  - **No evidence to show that the model level calibration should be adjusted**
    - *The 5-year design storm shows surcharge at meter locations that experienced surcharge during the monitoring period*

BE-13

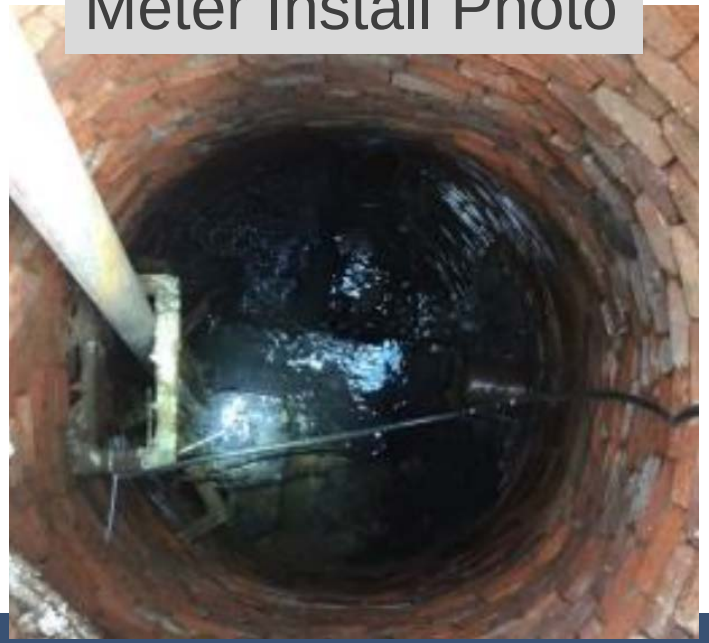
Obstruction

- An obstruction was observed in the manhole d/s of the CIPA (intersection of Woodmere and Race)
- The object was observed during the screening meter recon but appears to have been removed before the meter was installed
- This obstruction may have caused or contributed to the CIPA basement flooding (main sewer still surcharges regularly)

Recon Photo



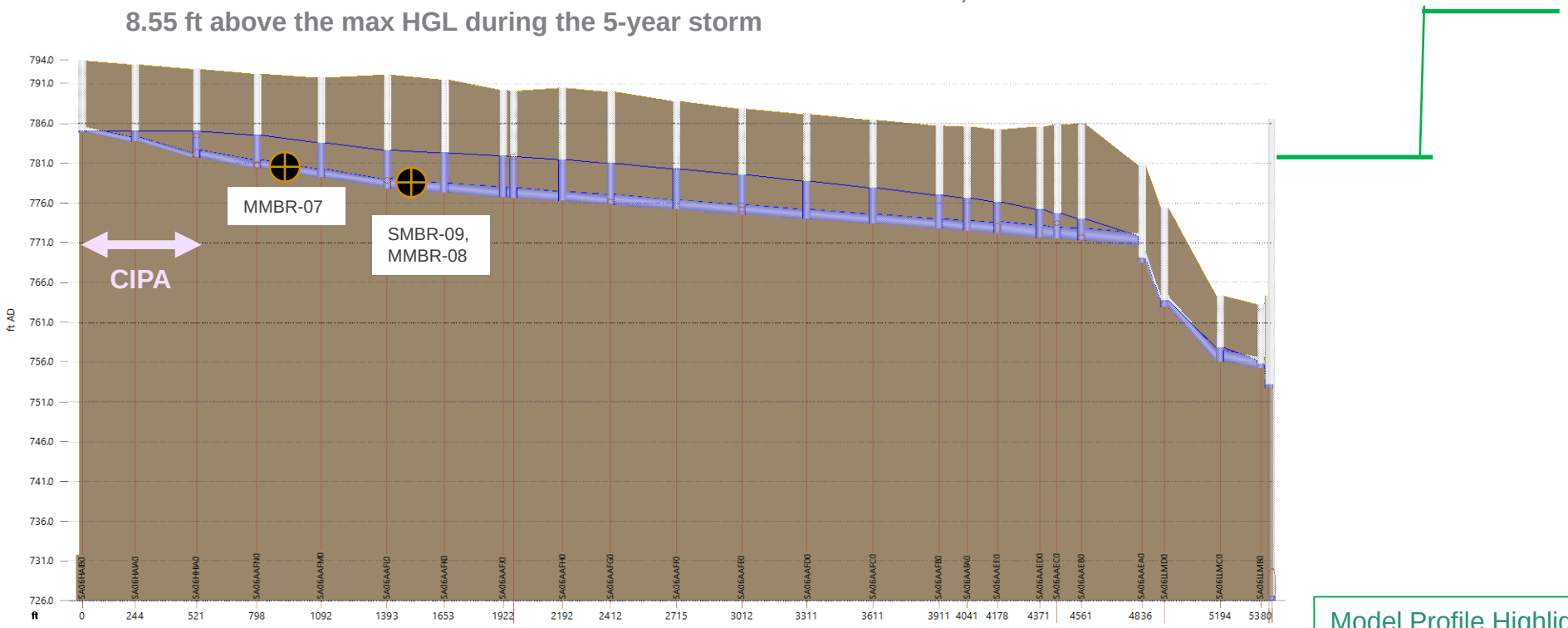
Meter Install Photo



BE-13

5-Year Model Design Storm Profile

- Model
  - **The sewer is relatively deep at this location, surcharge does not result in BBUs. Minimum elevation of homes in this CIPA is El. 793.55 ft AD, about 8.55 ft above the max HGL during the 5-year storm**



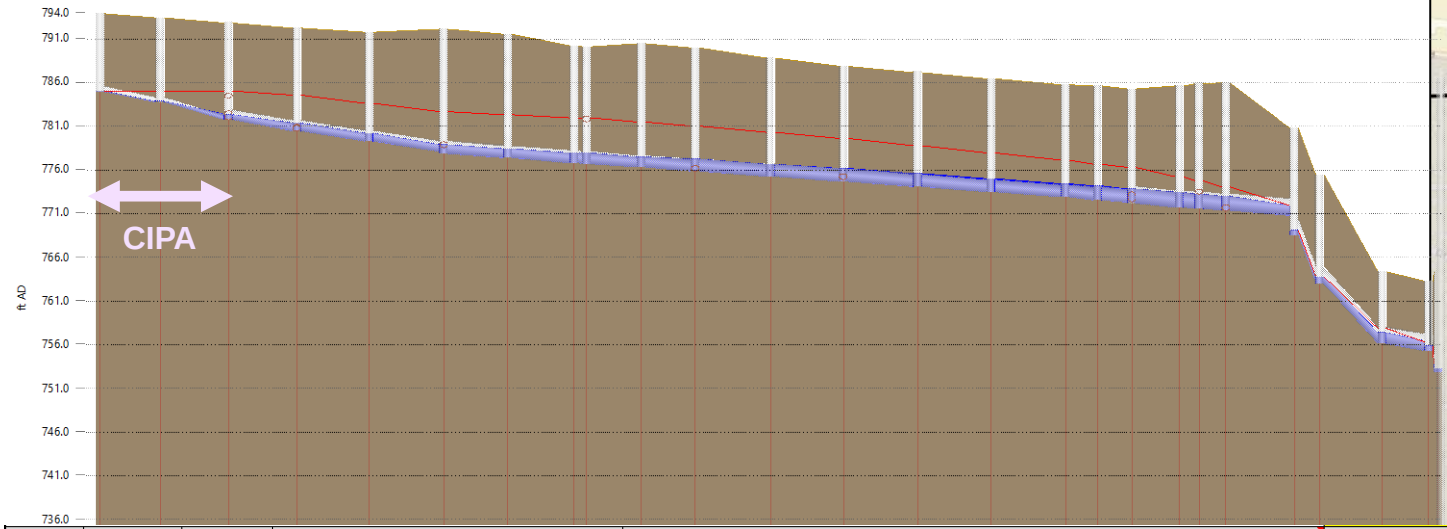
Model Profile Highlighted Green

Tie into District Sewer

BE-13

Tier 1 – Capacity Enhancement Assessment (A)

- Replace **4,315 LF** of sewer for a total construction cost of **$4,750,000**
- As shown on the profile below, this would effectively completely reduce the HGL to be within the pipe.





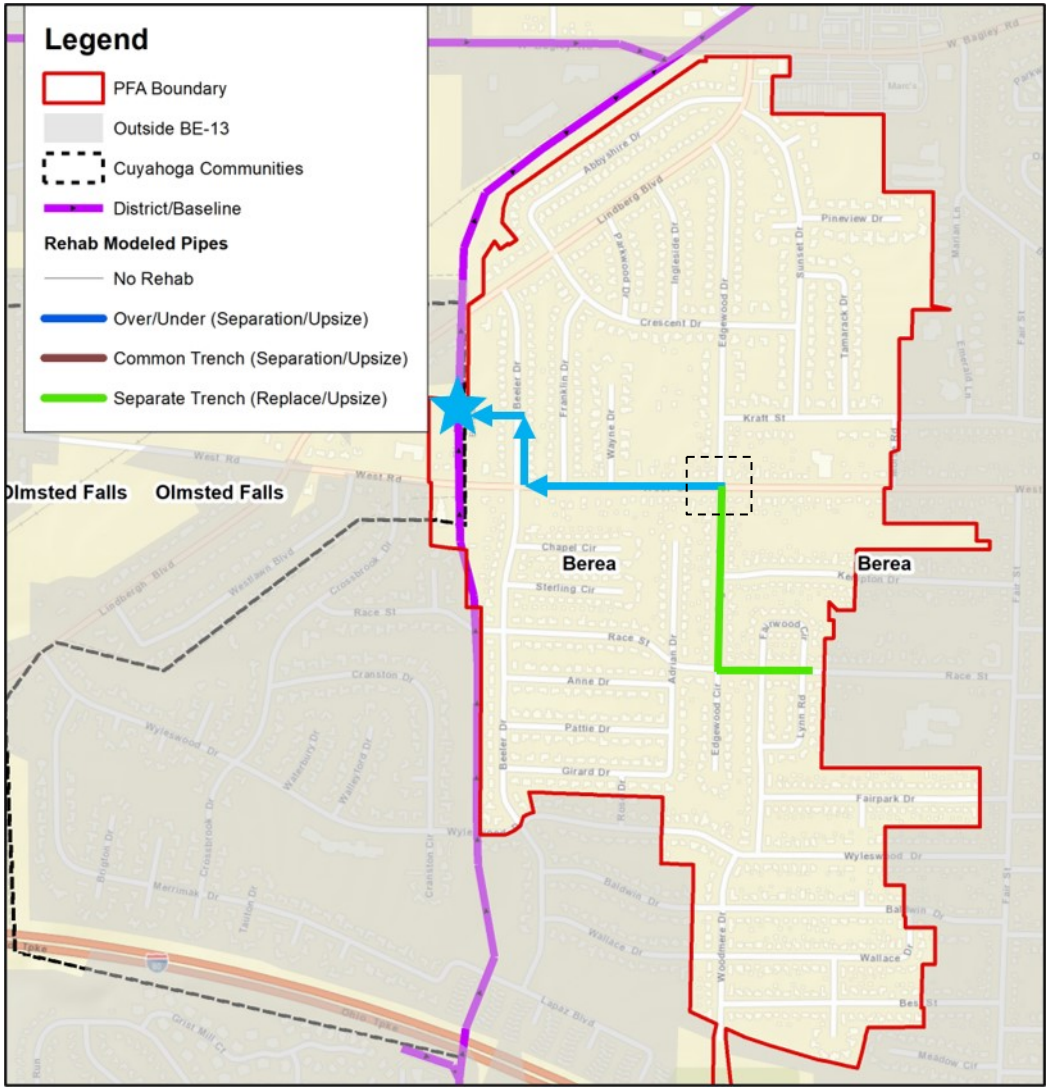
NEORSD Branch	PFL Area	Catchment ID (Use "ALL" to cost for all catchments within PFL)	Alternative		Summary										
			Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
SWI2019	BE-13	ALL	A1	Capacity Enhancement Only	4315										$4,754,127.00

SWI-LSSES 2019 Screening Alternatives
Capacity Enhancement

BE-13

Tier 1 – Capacity Enhancement Assessment *Alternate Route*

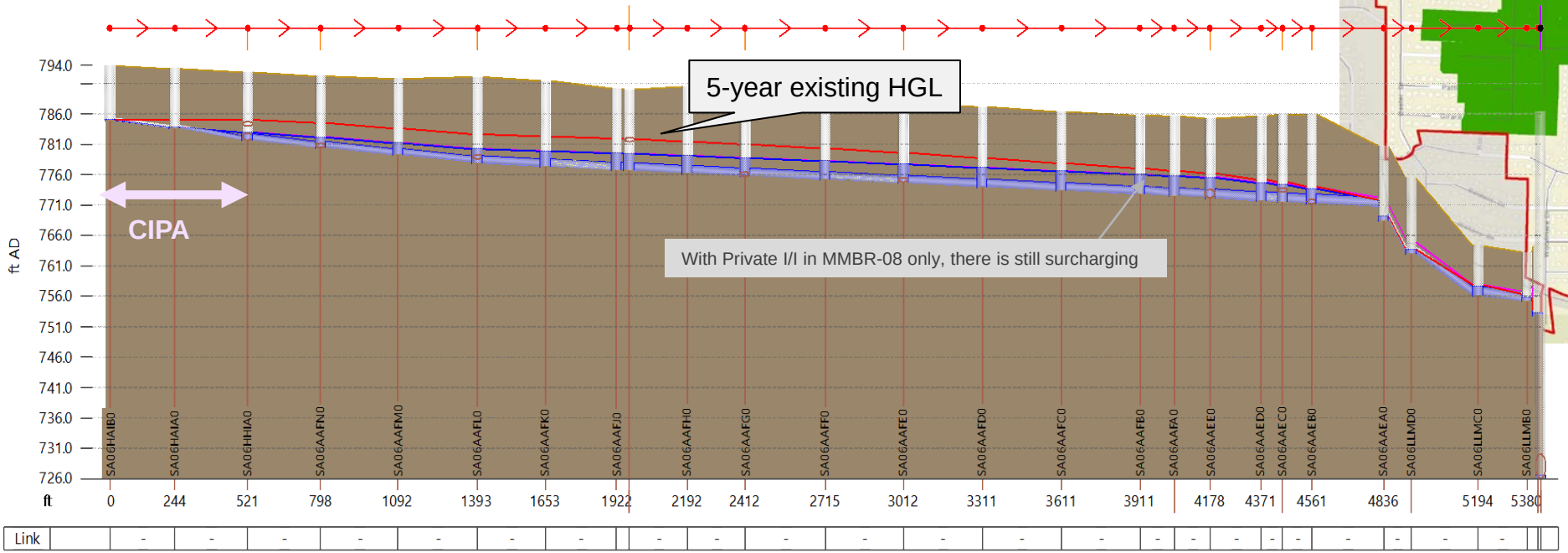
- As part of this capacity enhancement an alternative route was accessed, as shown in blue on the figure to the right
- The purpose of this alterative assessment was to determine if it was possible to develop a more direct route to the district interceptor by going west on West Street, North on Beeler Drive, and then connecting to a manhole in on the district interceptor
- Ultimately it was determined that this alternative route would not be feasible because the Edgewood Drive sewer is higher than the West Street sewer, so this route would require dropping the inverts of the West Street and Beeler Drive sewers all the way to the connection with the District Interceptor and would not be more cost effective or direct than the proposed route (previous slide)

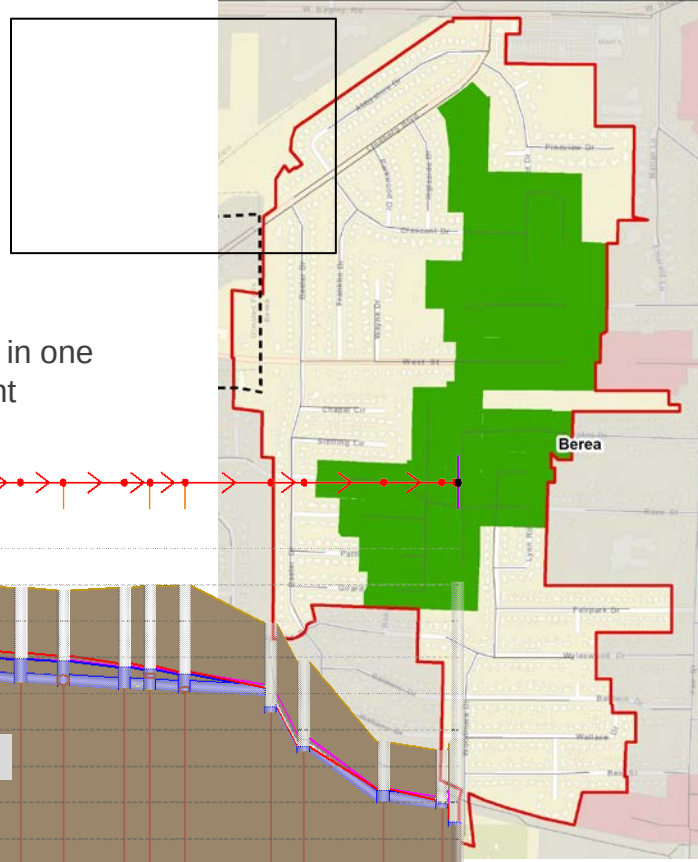


BE-13

Tier 1 – Private I/I in Metershed MMBR-08 Only

- Remove Private I/I from **365 parcels** for a total construction cost of **$3,650,000**
- As shown on the profile below, this would reduce the HGL, but surcharging would still occur in one area during the 5-year storm. In order to reduce this surcharge, some capacity enhancement would be required in addition to private I/I

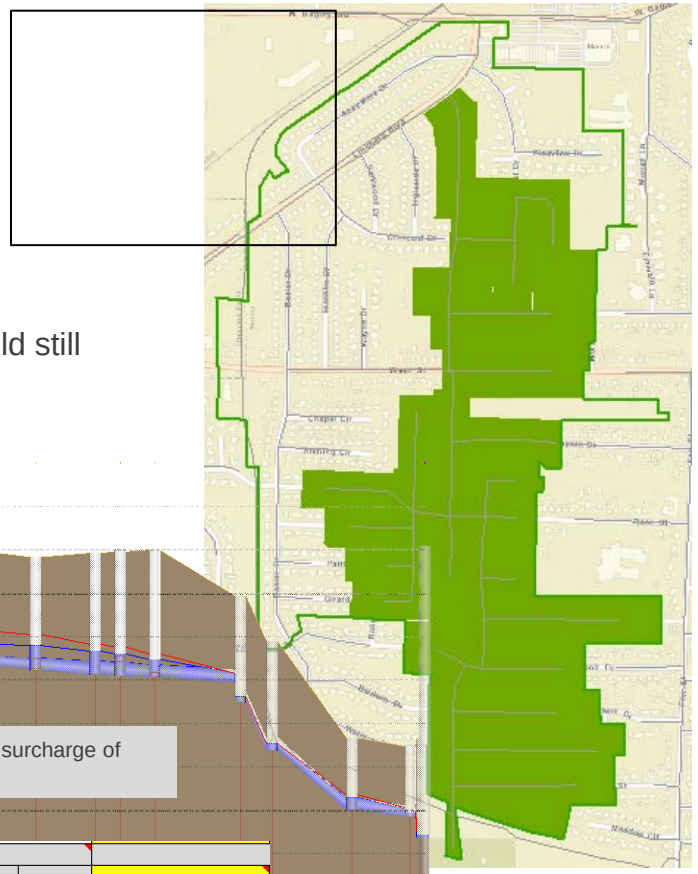


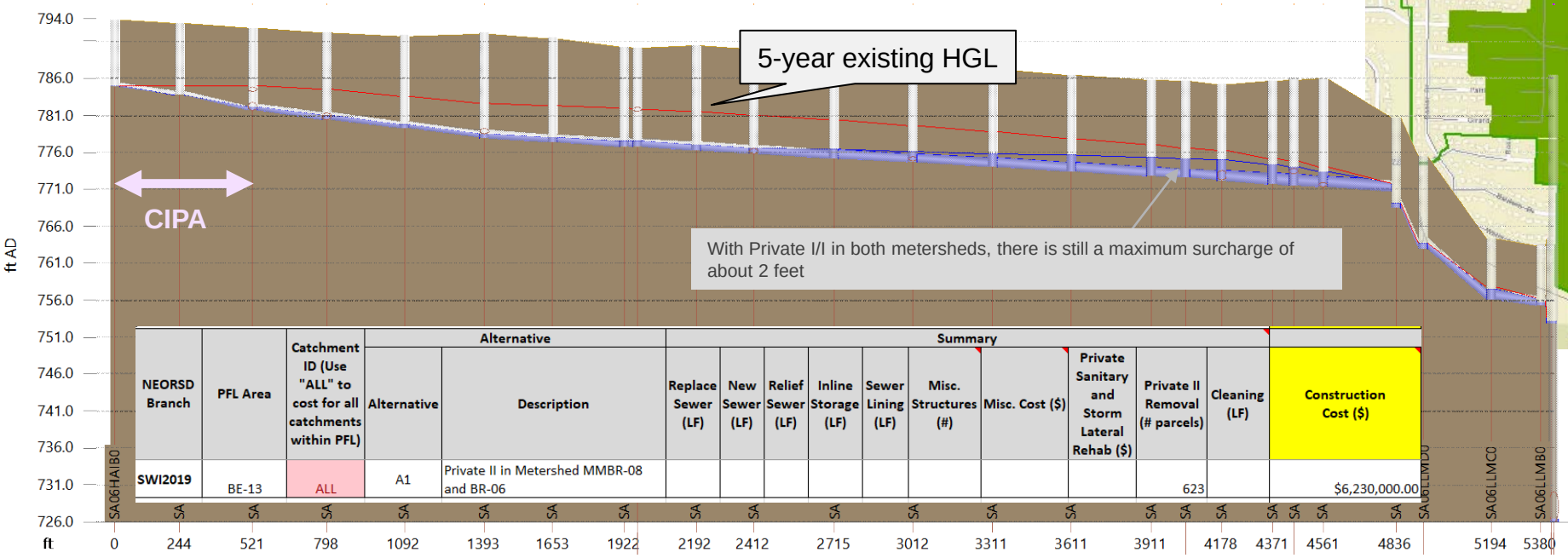


BE-13

Tier 1 – Private I/I in Metershed MMBR-08 and BR-06

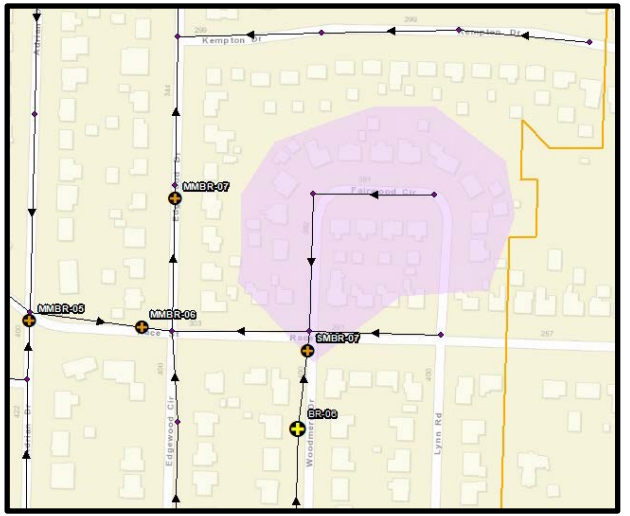
- Remove Private I/I from **623 parcels** for a total construction cost of **$6,230,000**
- As shown on the profile below, this would reduce the HGL significantly, but surcharging would still occur in one area during the 5-year storm. In order to reduce this surcharge, some capacity enhancement would be required in addition to private I/I





NEORSD Branch	PFL Area	Catchment ID (Use "ALL" to cost for all catchments within PFL)	Alternative		Summary										
			Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
SWI2019	BE-13	ALL	A1	Private II in Metershed MMBR-08 and BR-06									623		$6,230,000.00

BE-13



Tier 1 Analysis Discussion

- There is limited field data in this area – 2018 inspection at MH SA06HHIB0 stated that there are additional (not modeled) connections at this location, which is upstream of where this area ties into the line on Race Street
- Calibration meter data at BR-06, which ties into the same MH on Race Street, indicated a potential downstream obstruction/blockage. Other micrometers in the area also show surcharge.
- Capacity enhancement will completely alleviate surcharge in this CIPA and downstream

Private I/I

- **MMBR-08 will reduce surcharge in this CIPA and downstream, with the exception of one area; requires removal from 365 parcels at a cost $3,650,000**
- **MMBR-08 and BR-06 a will reduce surcharge in this CIPA and downstream, with the exception of one area; requires removal from 623 parcels at a cost of $6,230,00**

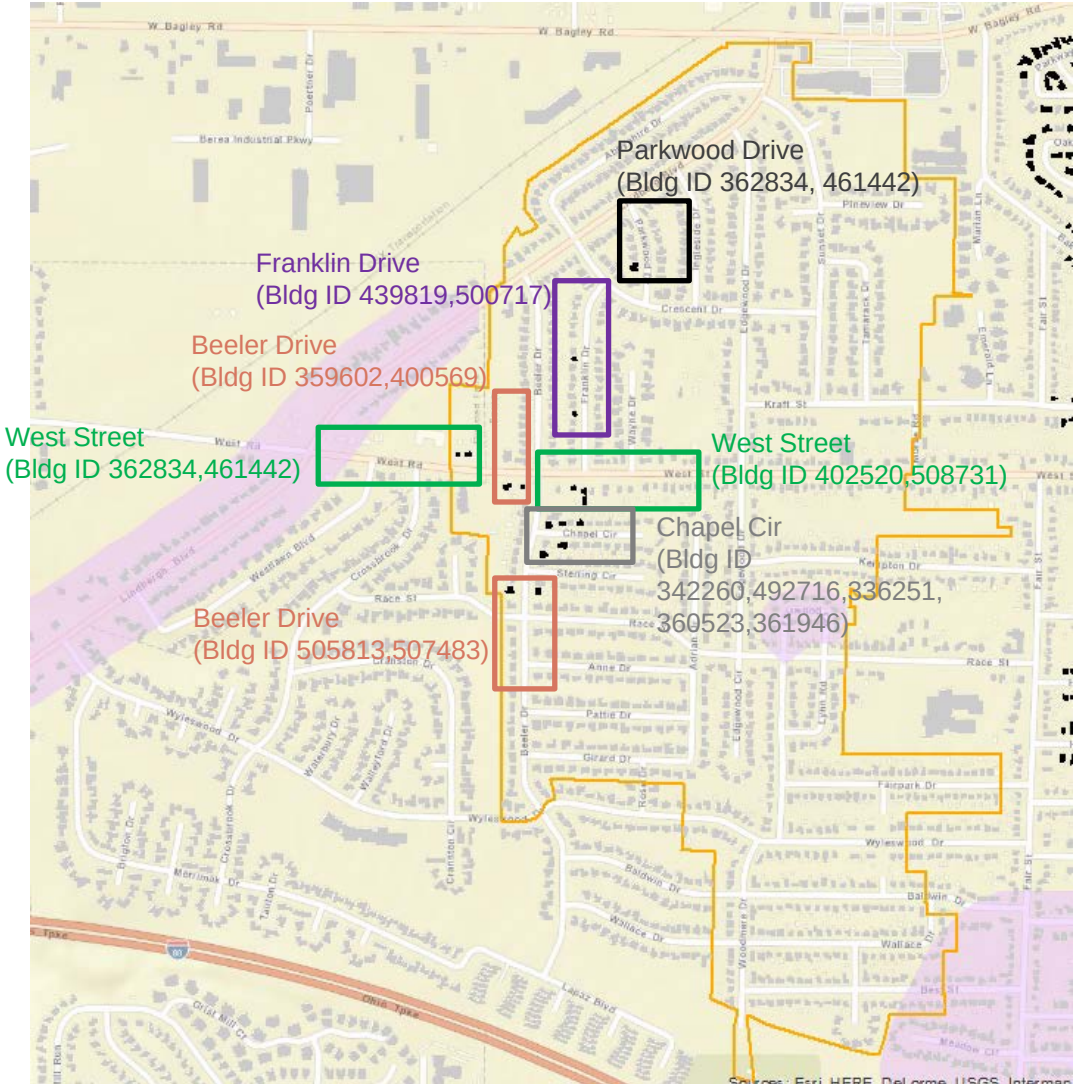
Tier 1 Recommendation

- **Further Field work**
  - *Flow monitor around MH SA06HHIA0 (influent lines from Fairwood Circle, Race Street, and Woodward Drive, and effluent line on Race Street). Pay close attention to MH losses and velocities to determine if the 90º bend in the influent from Fairwood Circle might be causing issues)*
  - *Flow monitor the downstream area and investigate for obstructions*
  - *Investigate MH SA06HHIB0 for additional connections*
- **If problems persist, recommend rehab, public or private, depending on the results of the field investigation.**
- **No Tier 2 Projects (Rate of I/I varies between 25,000 to 50,000)**

BE-13

Tier 3

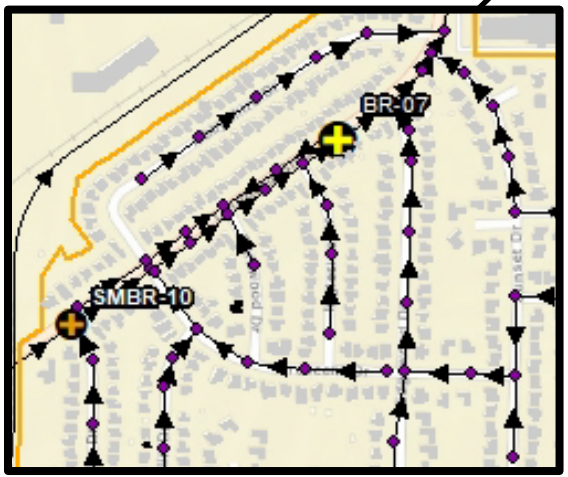
- There are 16 model predicted BBUs within BE-13. These locations are not associated with the CIPA or with area of high I/I
- These locations were reviewed, and stairs were added to 13 locations; this did not resolve any of the BBUs



BE-13

Tier 3 Calibration Meter and Micrometer

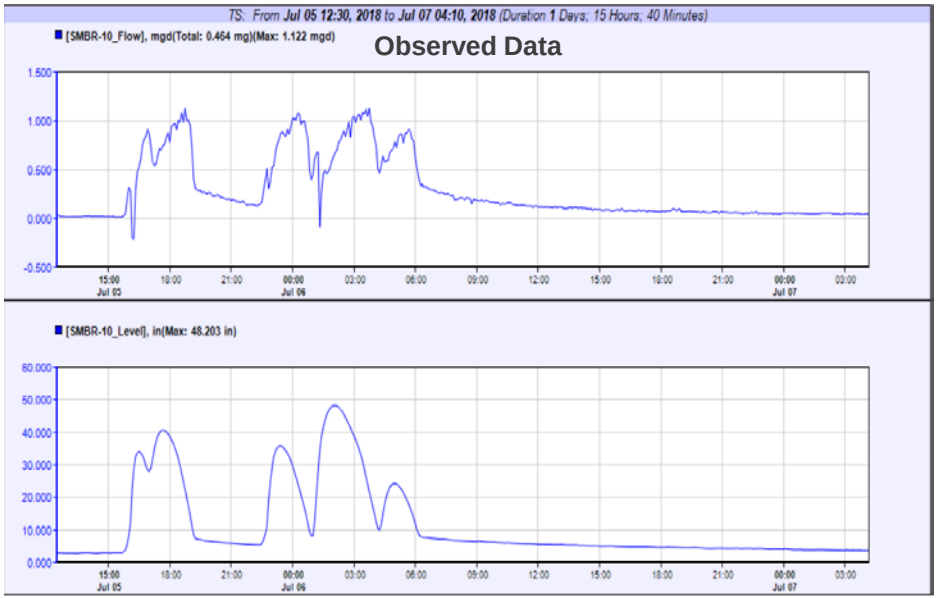
- There was one set of calibration meter data and one set of micrometer data (in addition to those reviewed as part of Tier 1) installed near the BBU areas:
  - BR-07
  - SMBR-10



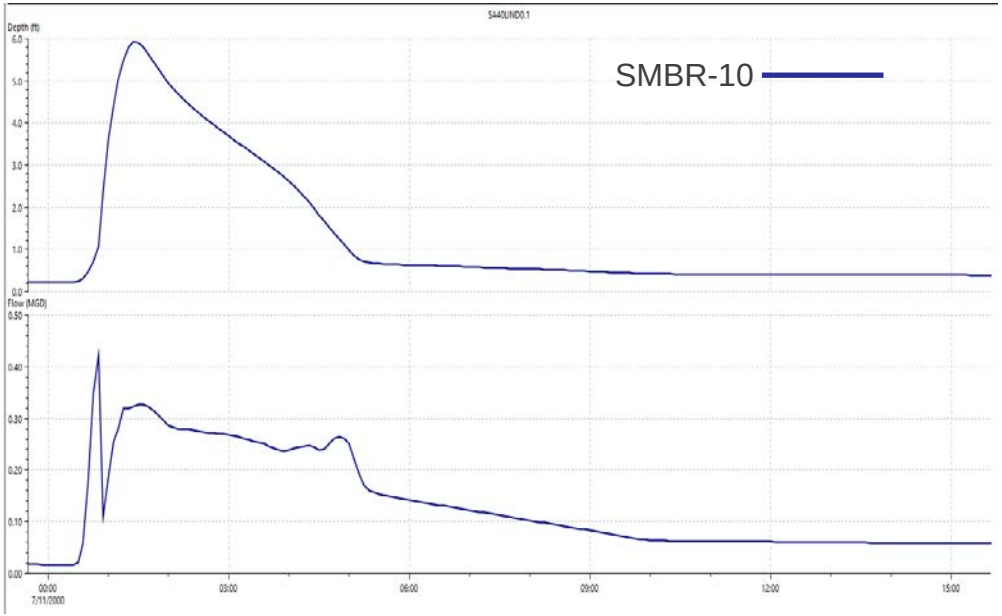


BE-13: SMBR-10

Micrometer Data



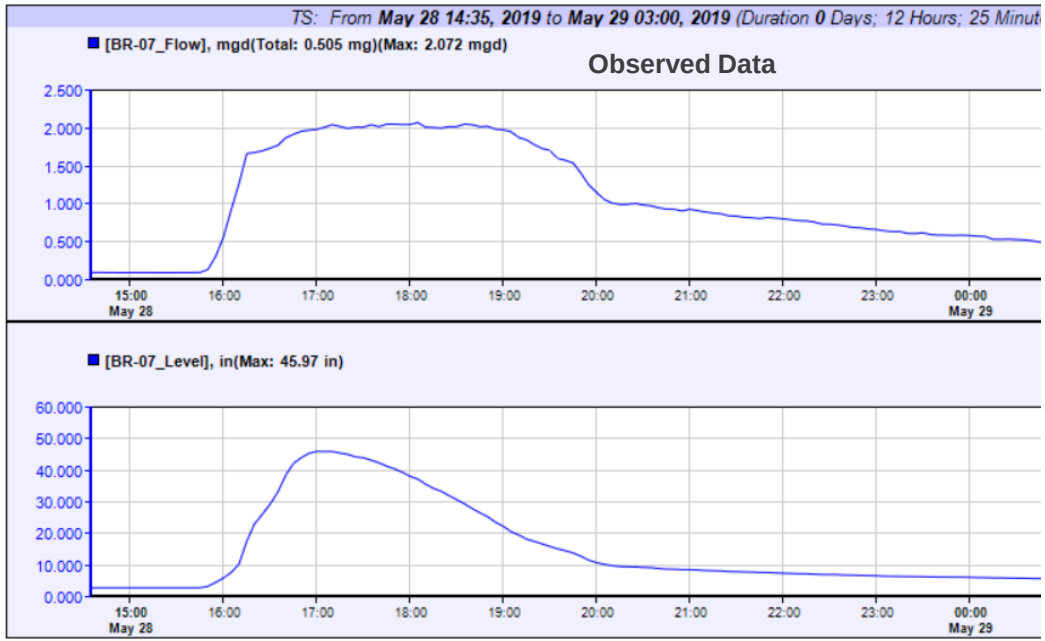
Modeled Design Storm : 5yr, 1hr



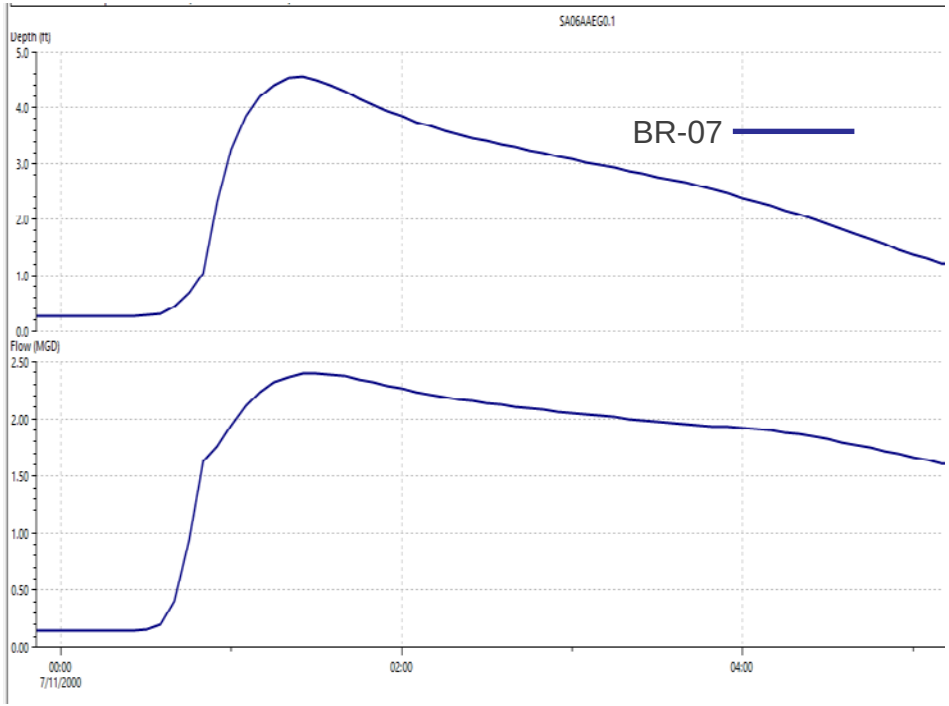
- Surcharge observed once during monitoring period on July 5, shown as an example in the left plot
- Model predicts surcharge during the same monitoring period event as well as the design storm. Modeled results slightly underpredict depth

BE-13: BR-07

Calibration Meter Data



Modeled Design Storm : 5yr, 1hr

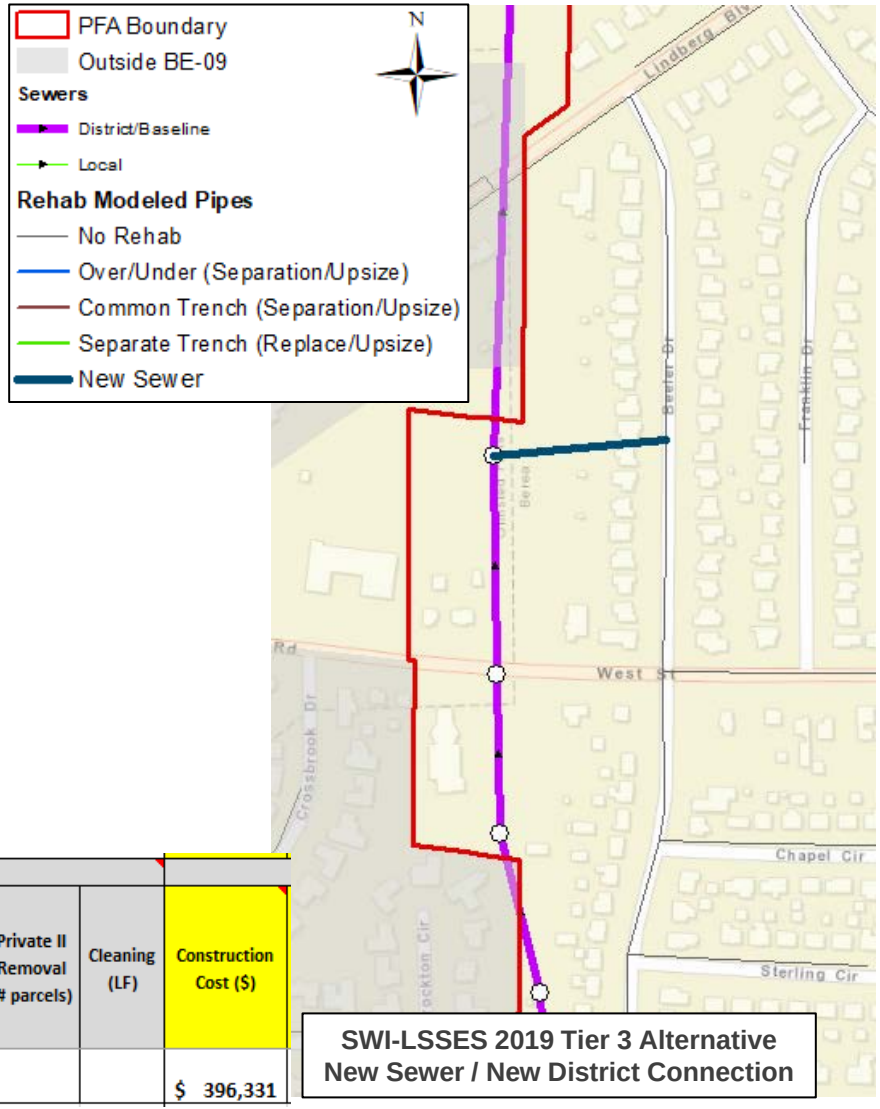


- Surcharge observed several times during monitoring period; May 28 is shown as an example on the left
- Model predicts similar surcharge the May 28 event, as well as several others and the design storm, but generally slightly underpredicts during other events (particularly in June)
- Model shows a reasonable match between the ratio of flow.

BE-13

Tier 3 –New District Connection

- Add **380 LF** of new sewer for a total construction cost of **$396,331**
  - **Cost includes $10,000 for new District connection. Occurs at existing structure so no 'drill drop' installation is assumed.**
  - **Potential sewer alignment needs to be purchased and is excluded from the costs.**
- All remaining BE-13 BBUs have been resolved

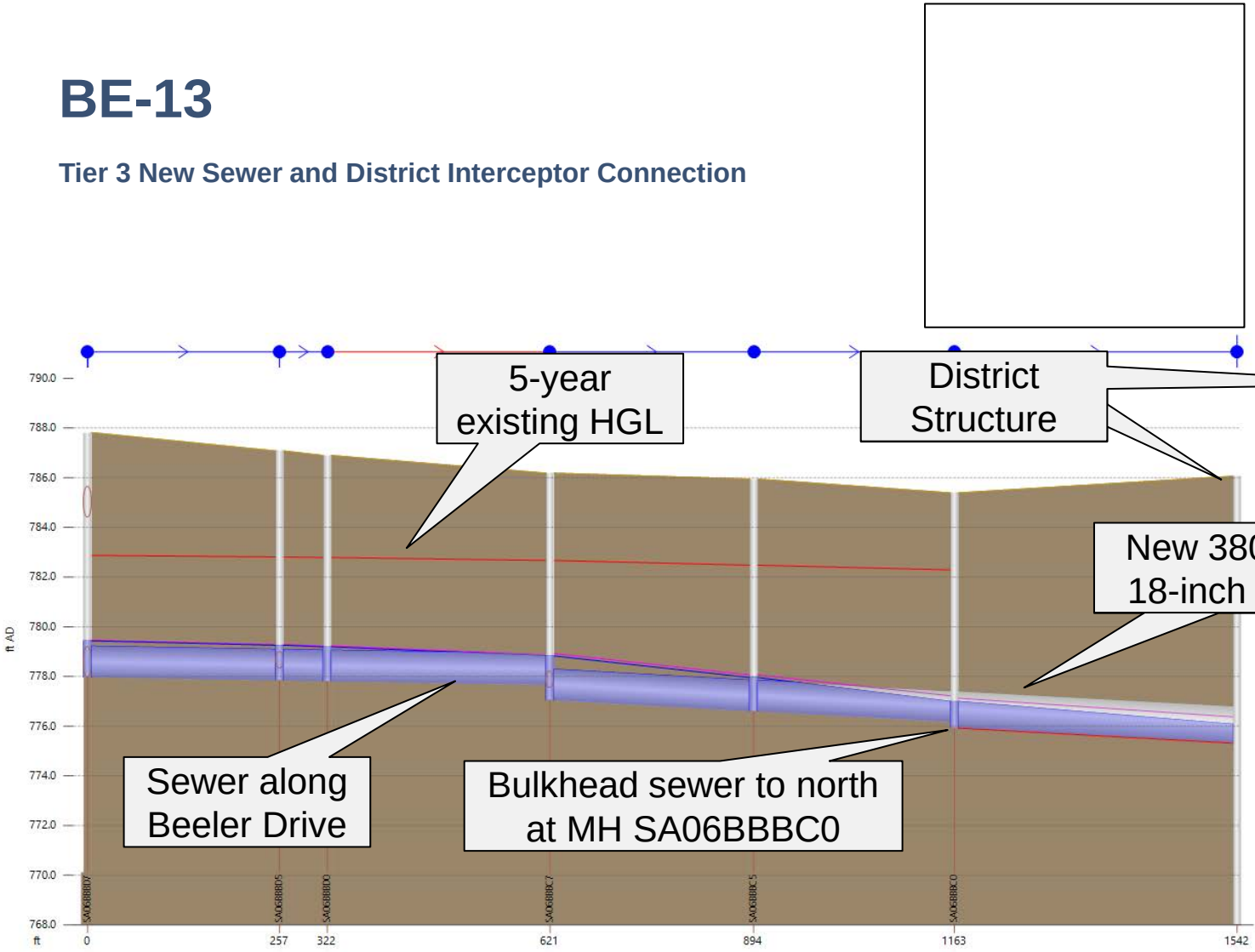


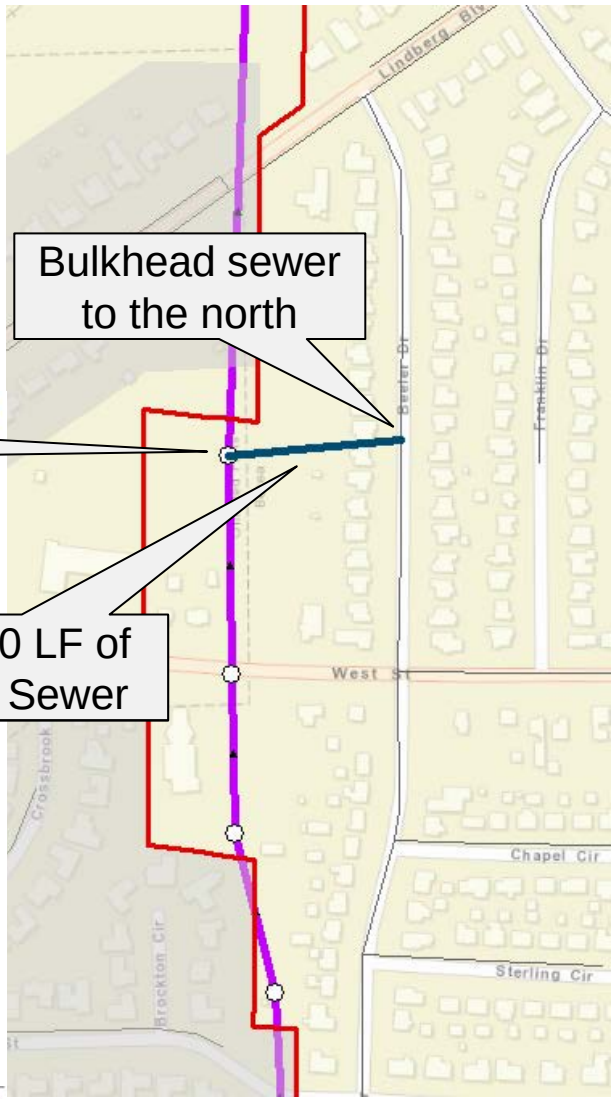
NEORSD Branch	PFL Area	Catchment ID (Use "ALL" to cost for all catchments within PFL)	Alternative		Summary										
			Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
SWI2019	BE-13	ALL	Tier3	New Sewer and District Connection		380					$ 10,000				$ 396,331

SWI-LSSES 2019 Tier 3 Alternative
New Sewer / New District Connection

BE-13

Tier 3 New Sewer and District Interceptor Connection

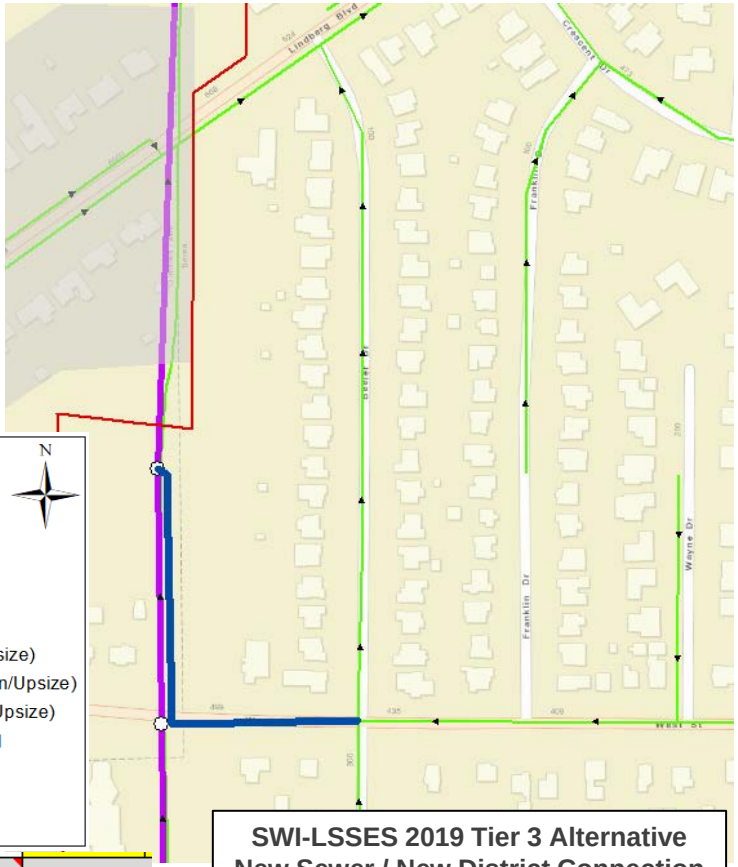




BE-13

Tier 3 –New District Connection

- Add ~**828 LF** of new sewer for a total construction cost of **$868,333**
  - **Cost includes $10,000 for new District connection. Occurs at existing structure so no 'drill drop' installation is assumed.**
  - **Potential sewer alignment needs to be purchased and is excluded from the costs.**
- All remaining BE-13 BBUs have been resolved

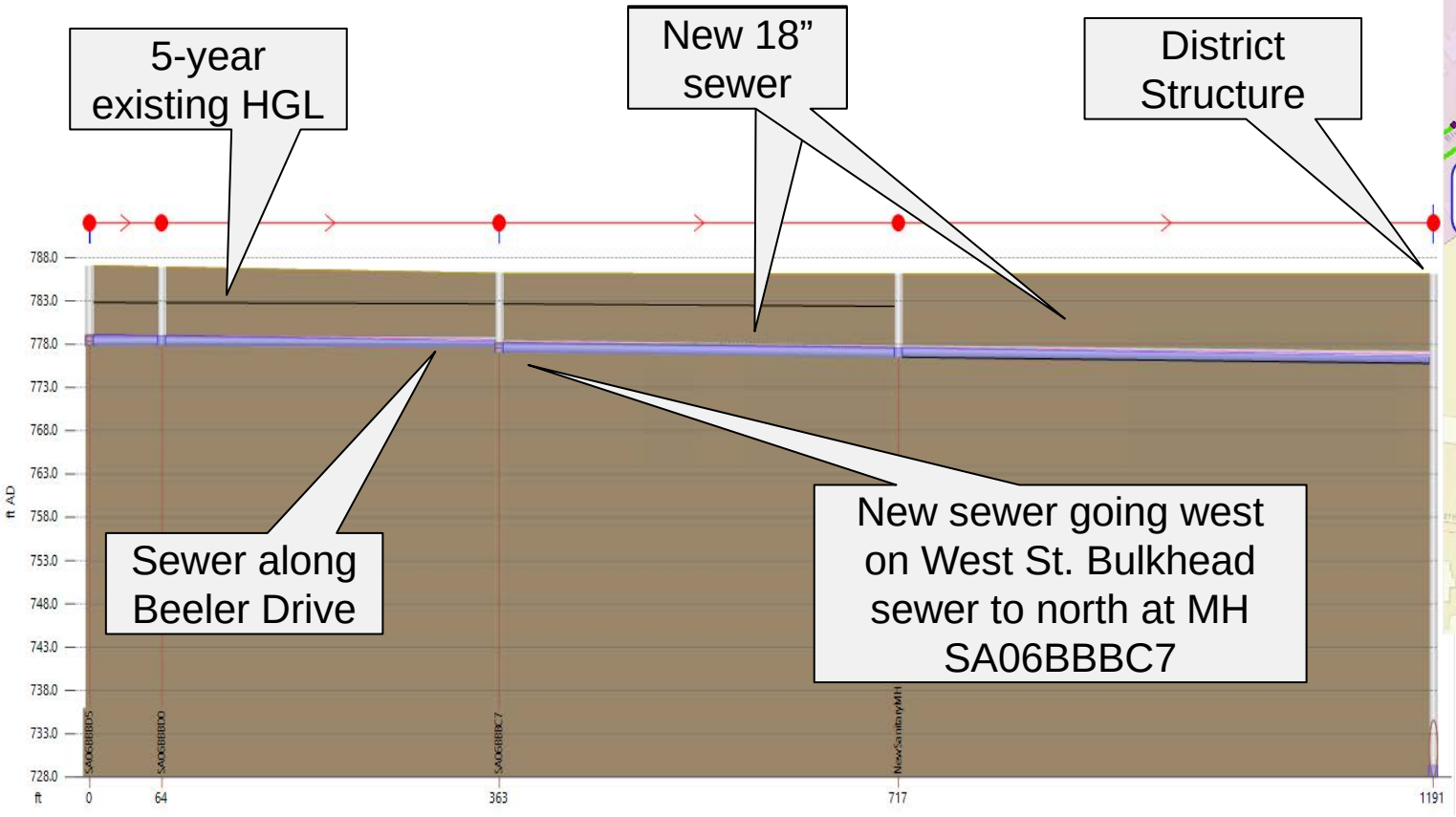


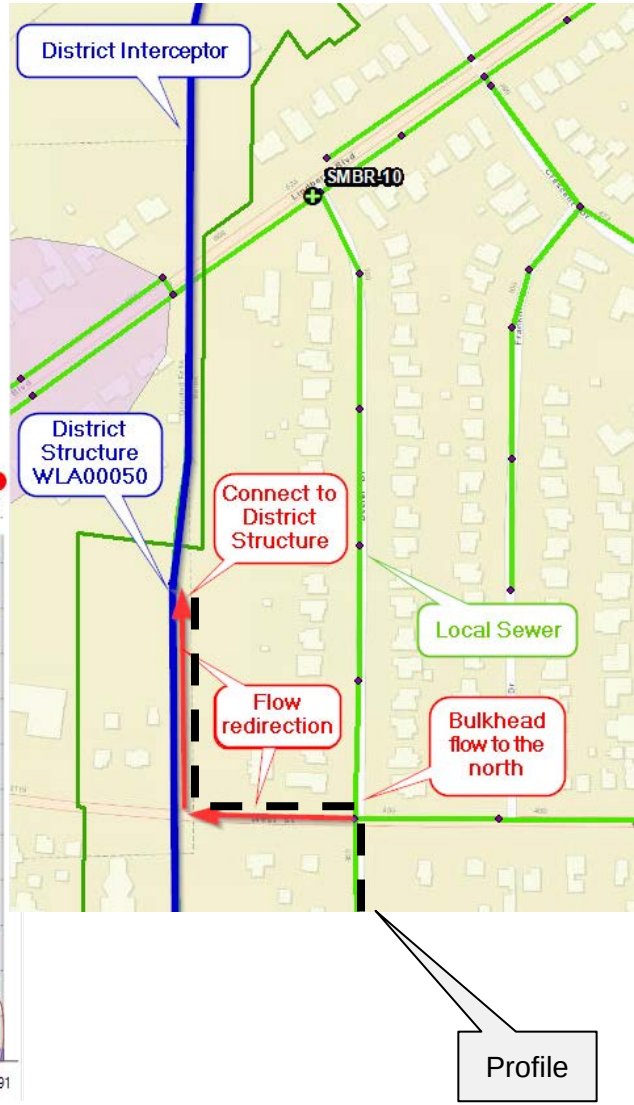
SWI-LSSES 2019 Tier 3 Alternative
New Sewer / New District Connection

NEORSD Branch	PFL Area	Catchment ID (Use "ALL" to cost for all catchments within PFL)	Alternative		Summary										
			Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
SWI2019	BE-13	ALL	Tier3	New Sewer and District Connection		828					$ 10,000			2785	$ 868,333

BE-13

Tier 3 New Sewer and District Interceptor Connection





BE-13

Tier 3 – Capacity Enhancement Assessment (A)

- Replace **4,140 LF** of sewer for a total construction cost of **$4,569,050**
- As shown on the profiles on the subsequent slides, this would effectively reduce the HGL in these areas, within pipe in sewer replacement areas, and eliminate model predicted BBUs

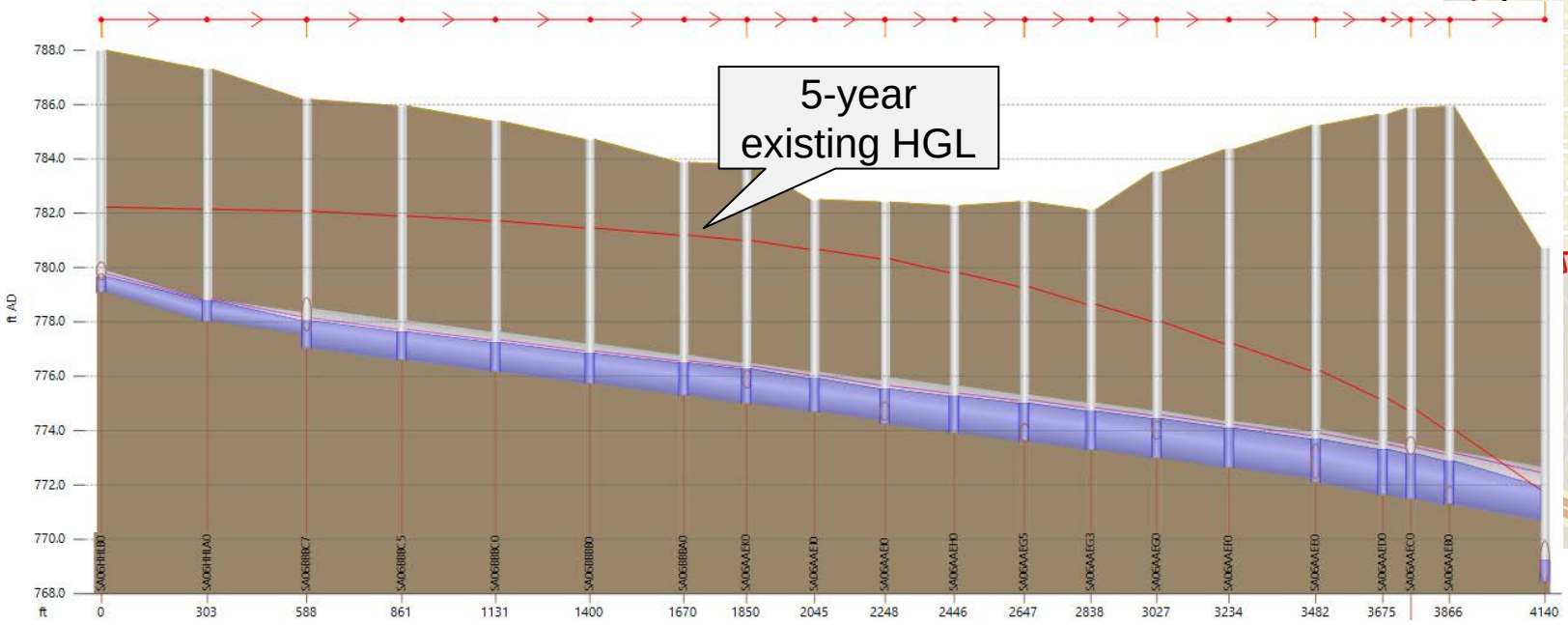
NEORSD Branch	PFL Area	Catchment ID (Use "ALL" to cost for all catchments within PFL)	Alternative		Summary										
			Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
SWI2019	BE-13	ALL	A1T3	Capacity Enhancement Only.	4140										$ 4,569,050

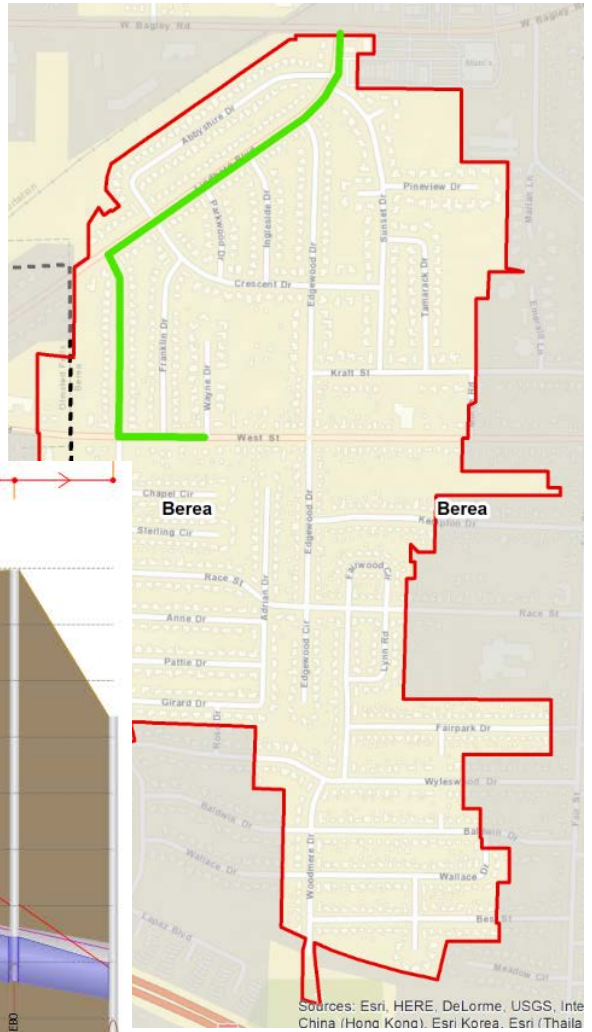


SWI-LSSES 2019 Tier 3 Alternative Capacity Enhancement

BE-13

Tier 3 Capacity Enhancement (A) – Capacity Enhancement Profile

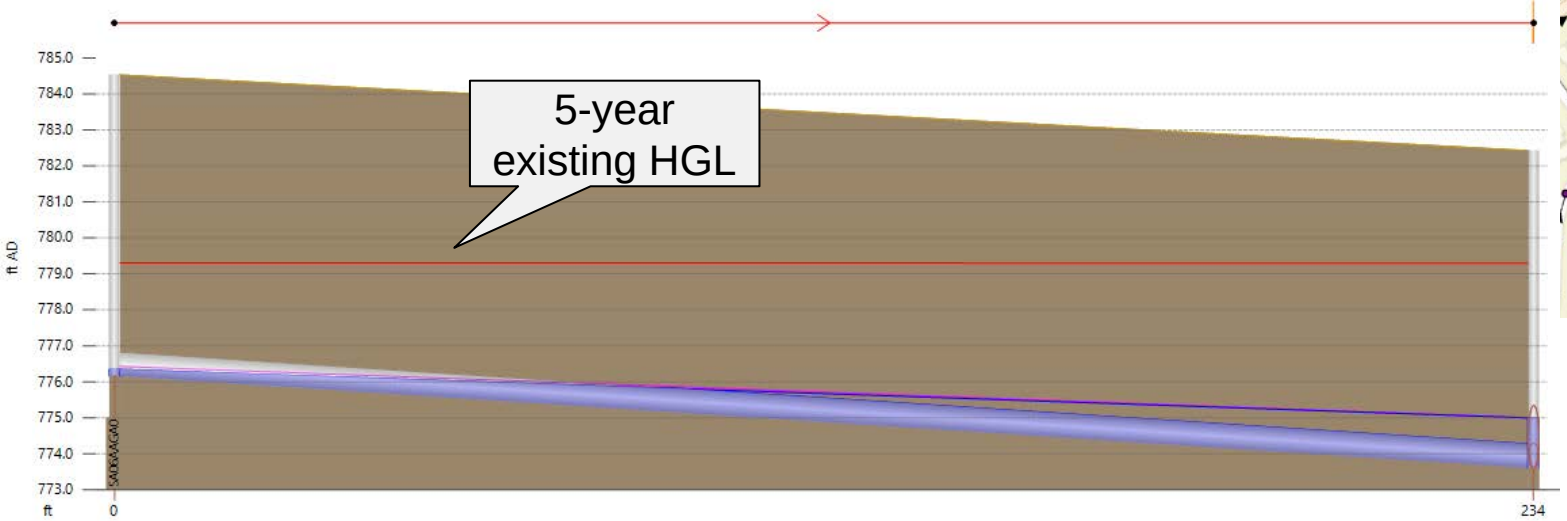


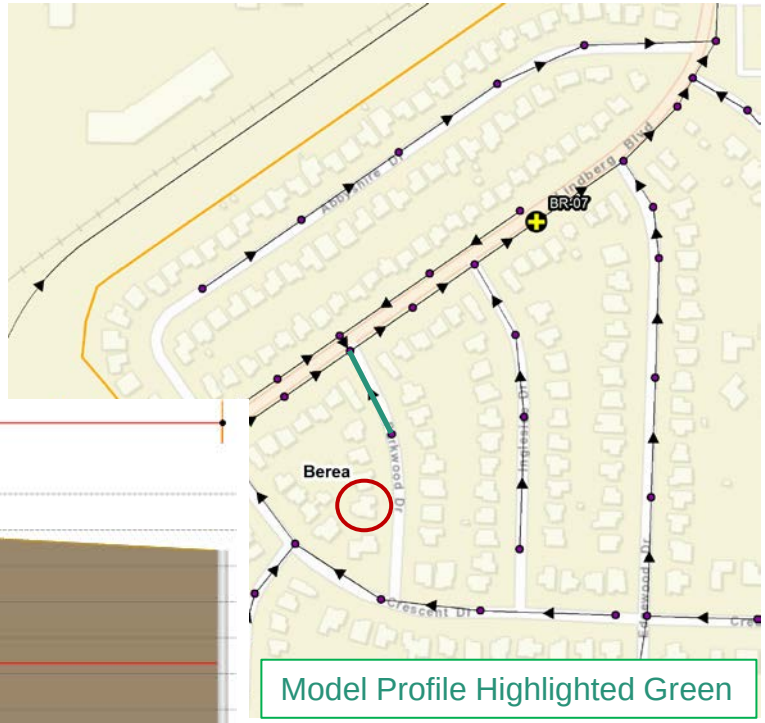


BE-13

Tier 3 Capacity Enhancement – Parkwood Drive

- No Capacity Enhancement on Parkwood Drive – BBU resolved and along an non-modeled sewer



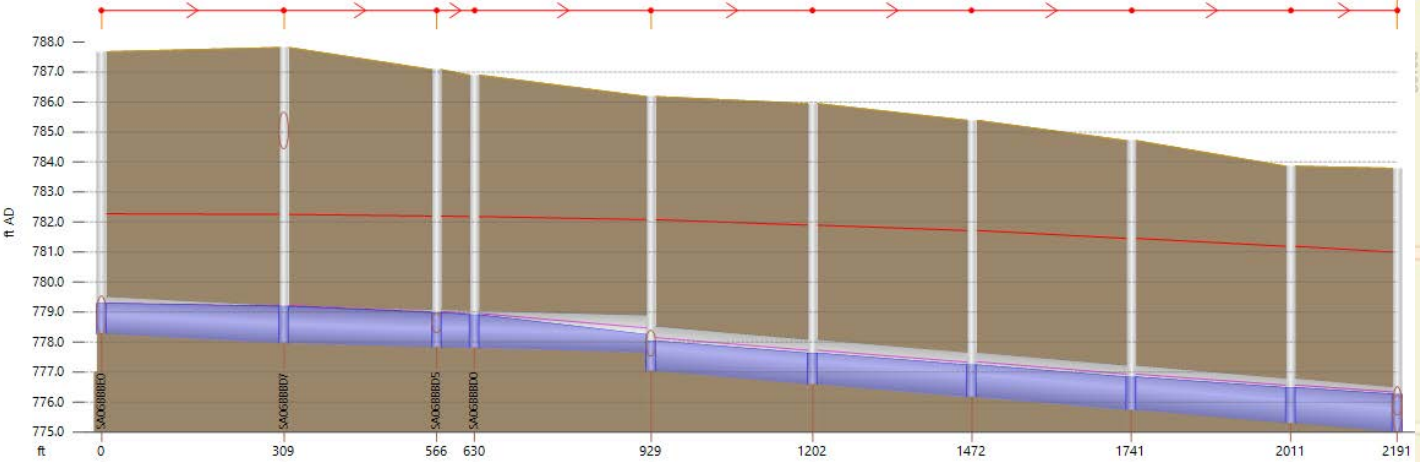


Model Profile Highlighted Green

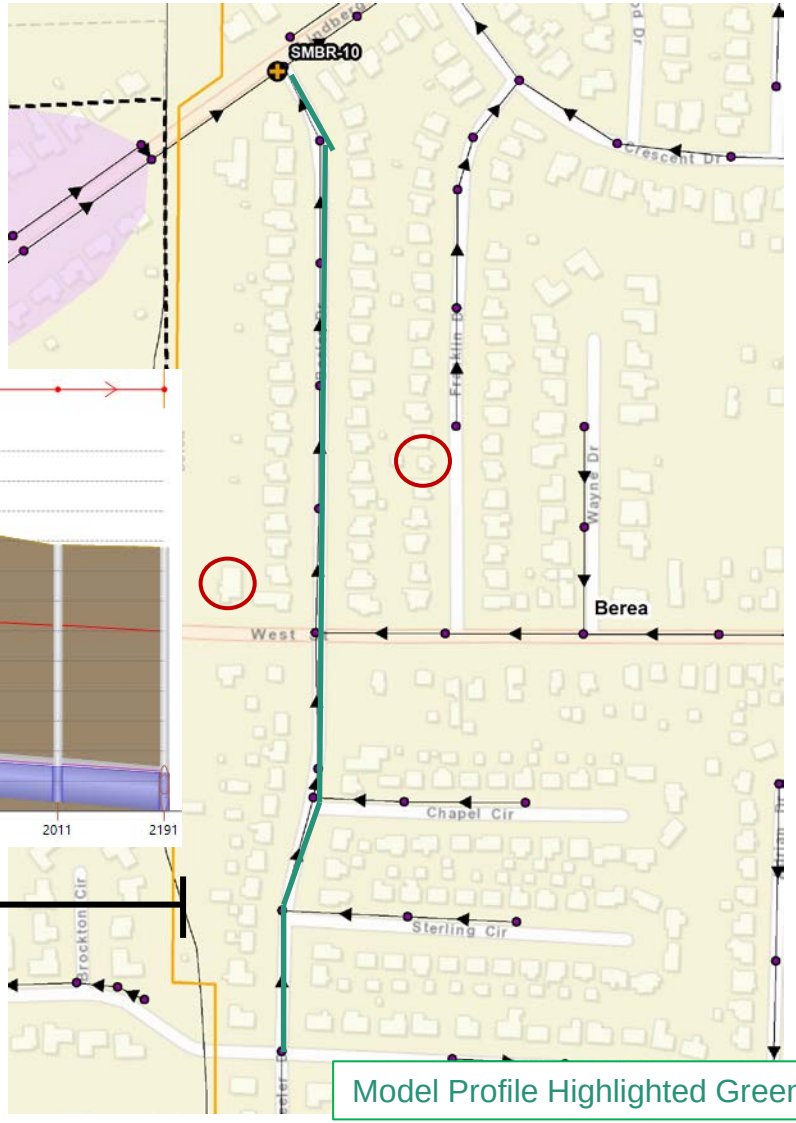
Shows resolved BBU location along non-modeled sewer

BE-13

Tier 3 Capacity Enhancement – Beeler Drive Profile



Capacity Enhancement



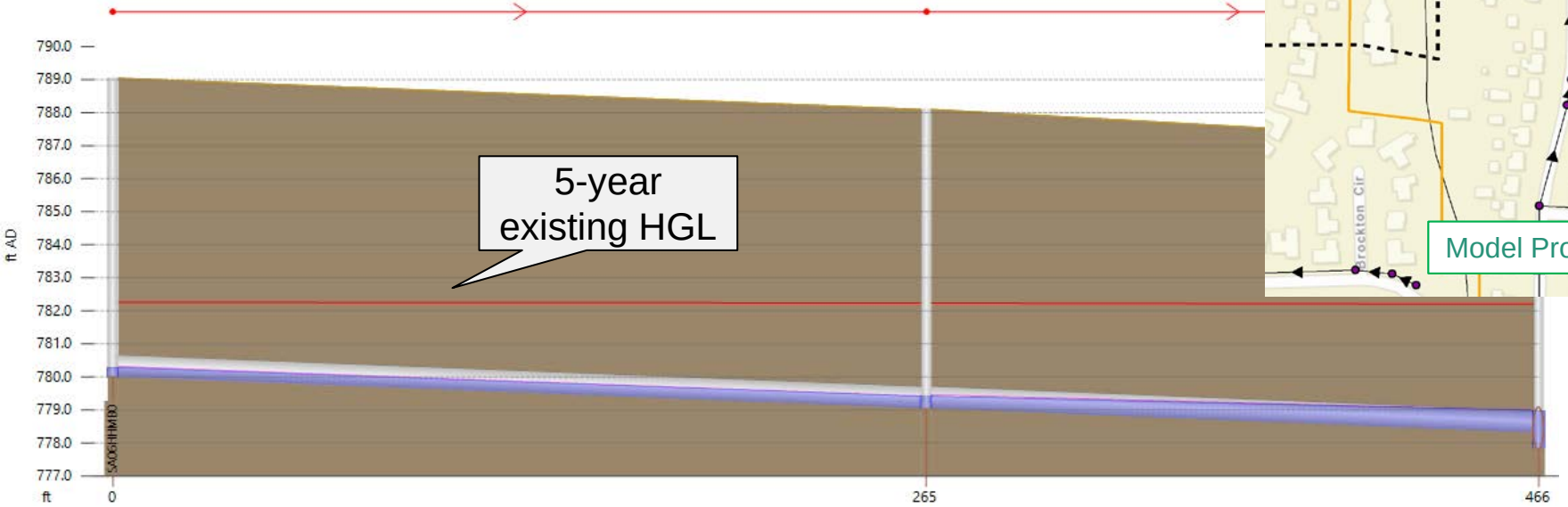
Shows resolved BBU location along non-modeled sewer

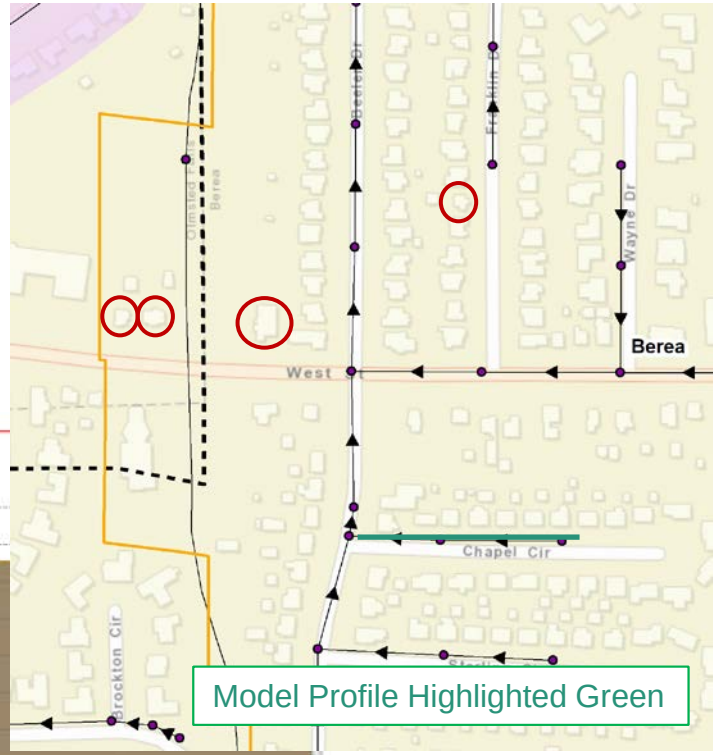
Model Profile Highlighted Green

BE-13

Tier 3 Capacity Enhancement – Chapel Circ.

- No Capacity Enhancement on Chapel Circle – BBU resolved

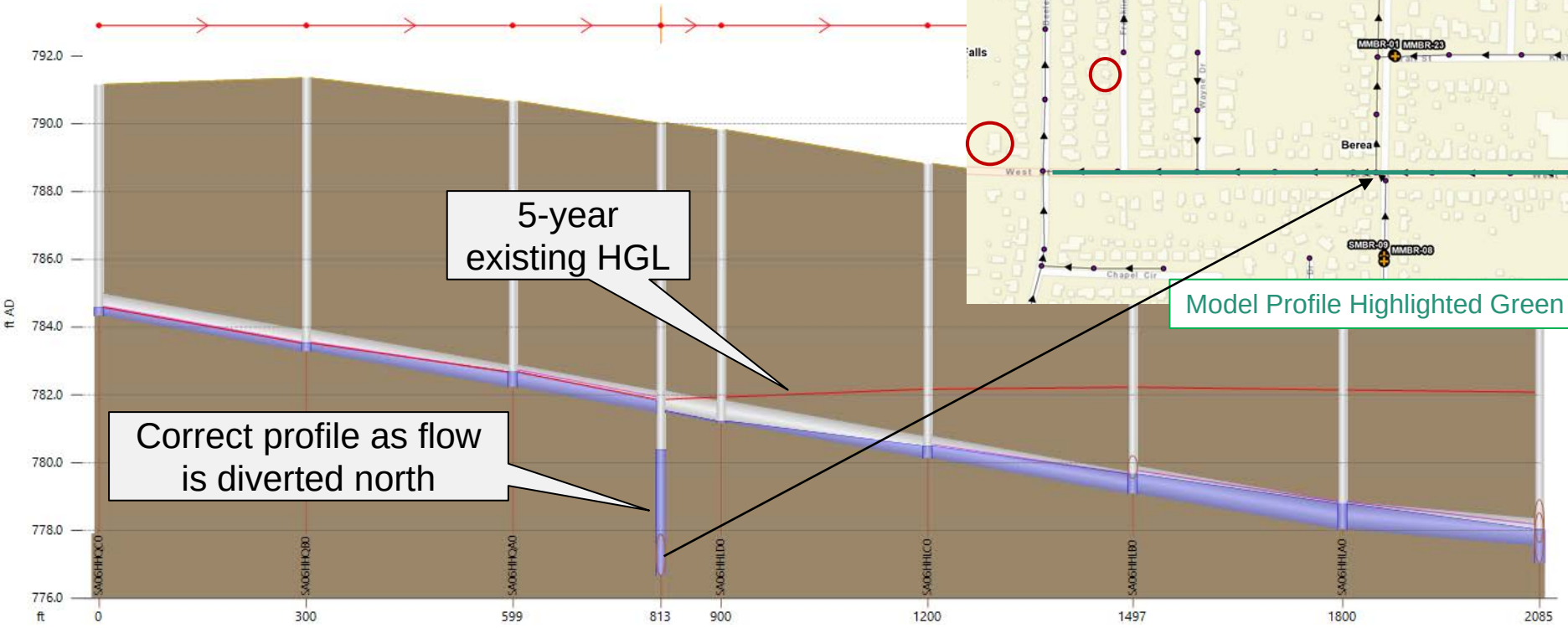


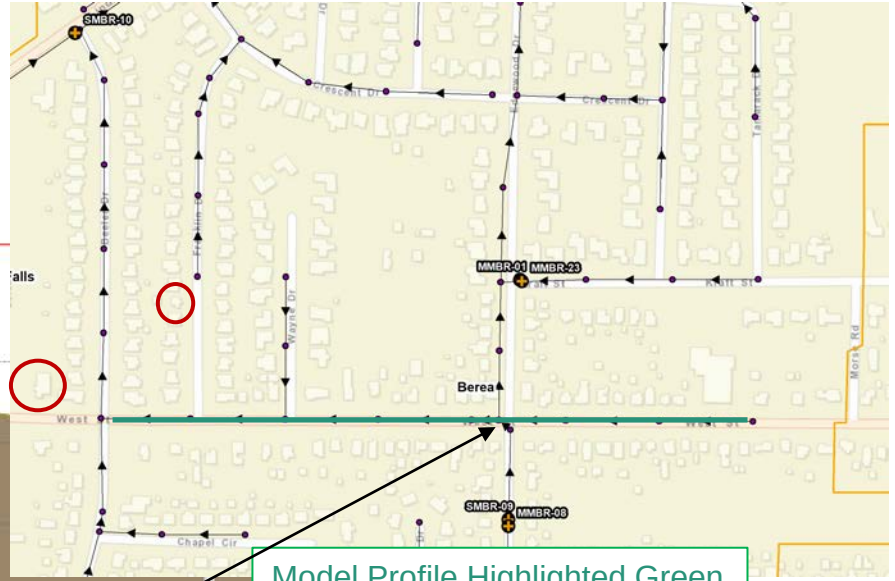


Shows resolved BBU location along non-modeled sewer

BE-13

Tier 3 – Capacity Enhancement West Rd





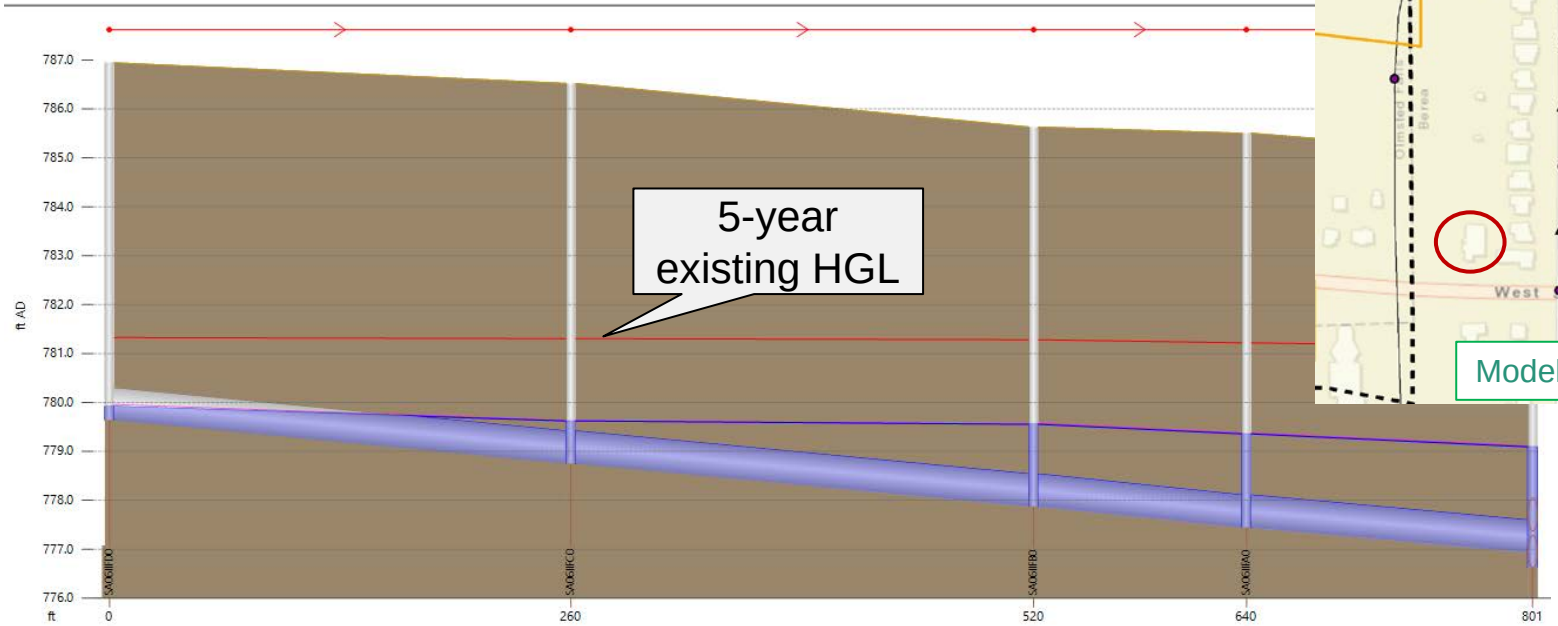
Shows resolved BBU location along non-modeled sewer

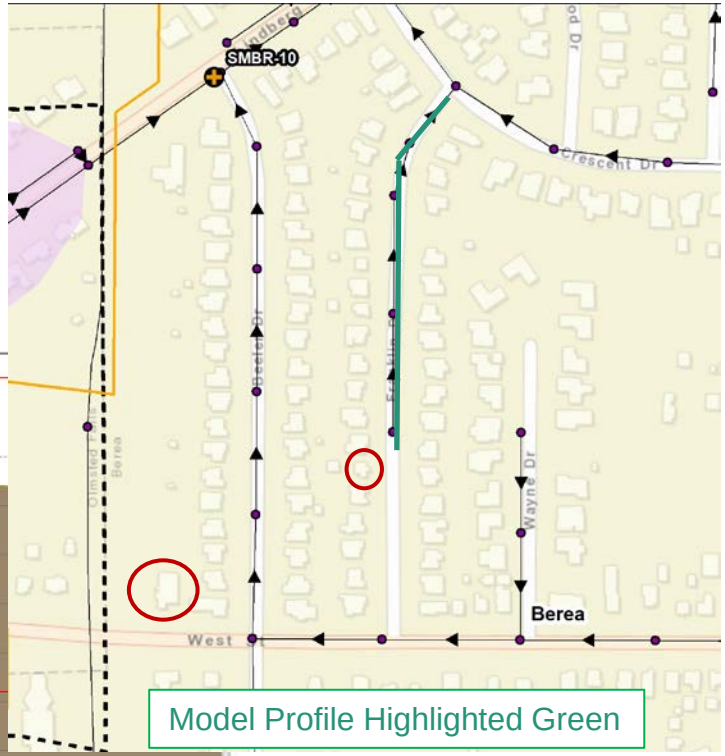
Capacity Enhancement

BE-13

Tier 3 – Capacity Enhancement Franklin Drive

- No Capacity Enhancement on Franklin Drive – BBU resolved and along an non-modeled sewer





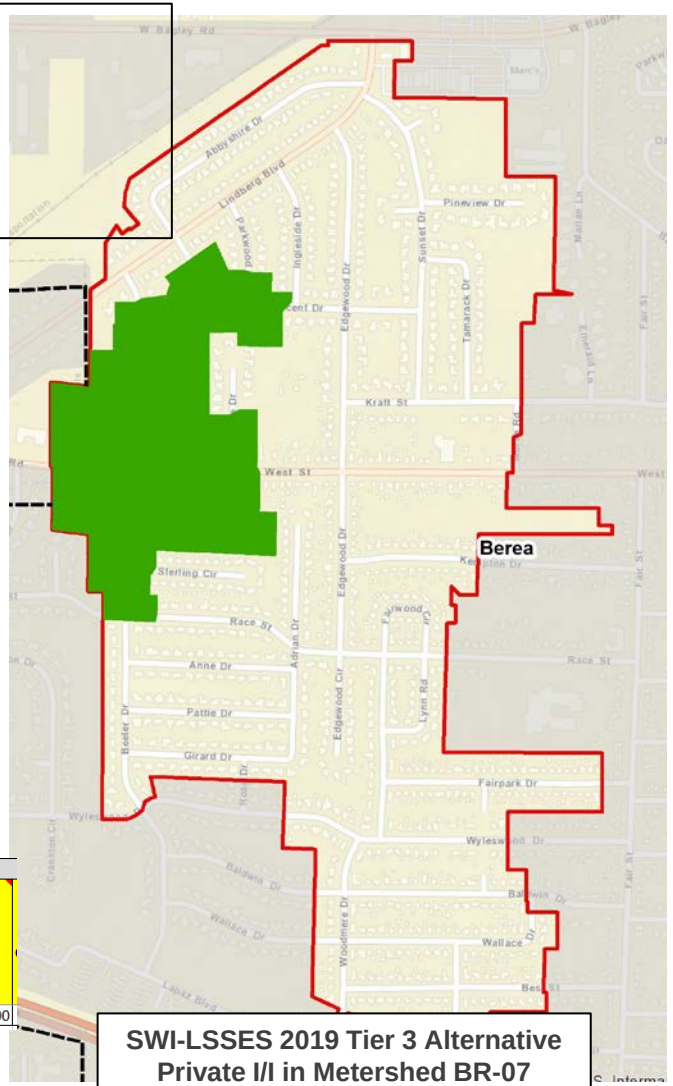
Shows resolved BBU location along non-modeled sewer

BE-13

Tier 3 – Private I/I in Metershed BR-07

- Remove Private I/I from **171 parcels** for a total construction cost of **$1,710,000**
- As shown on the profiles on the subsequent slides, this would effectively reduce the HGL in these areas and would eliminate BBUs

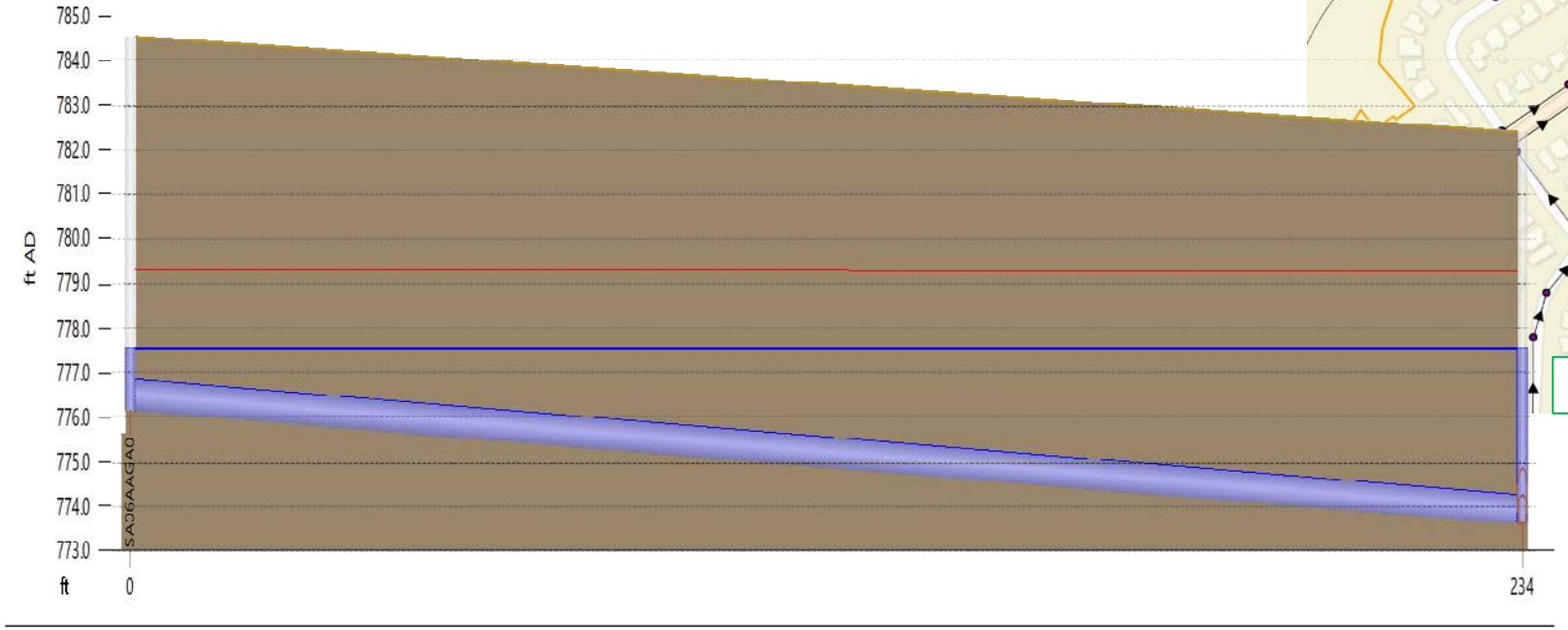
NEORSD Branch	PFL Area	Catchment ID (Use "ALL" to cost for all catchments within PFL)	Alternative		Summary										
			Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
SWI2019	BE-13	ALL	A1	Private II in Metershed BR-07									171		$1,710,000.00

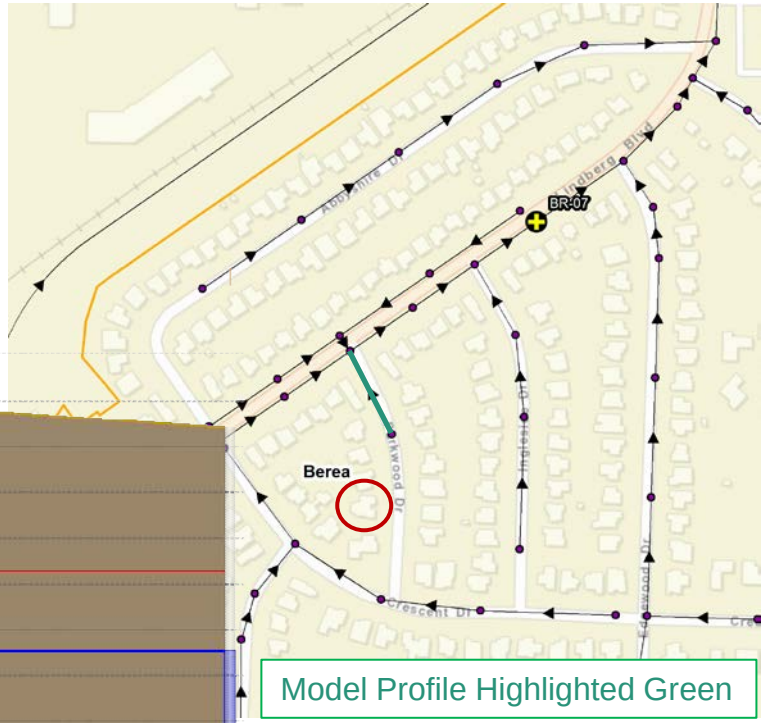


SWI-LSSES 2019 Tier 3 Alternative
Private I/I in Metershed BR-07

BE-13

Tier 3 Private I/I Reduction in Metershed BR-07– Parkwood Drive



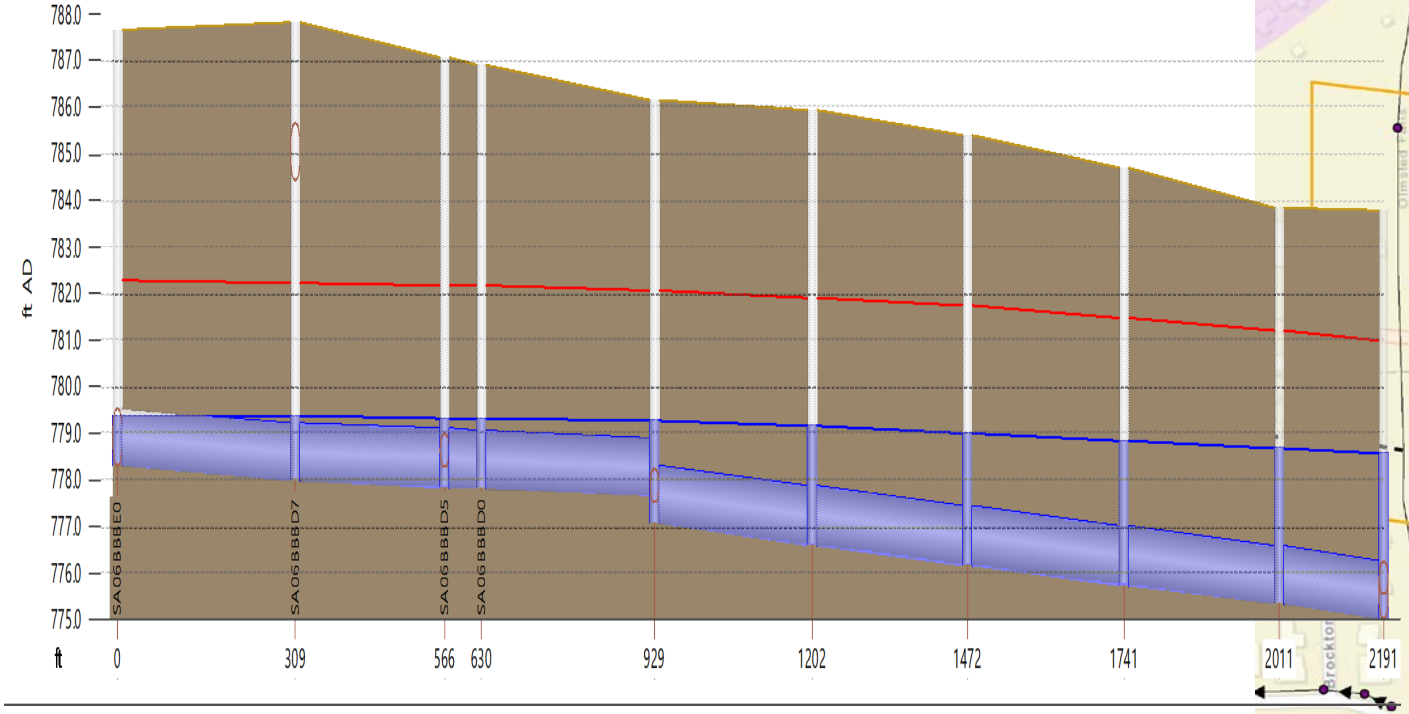


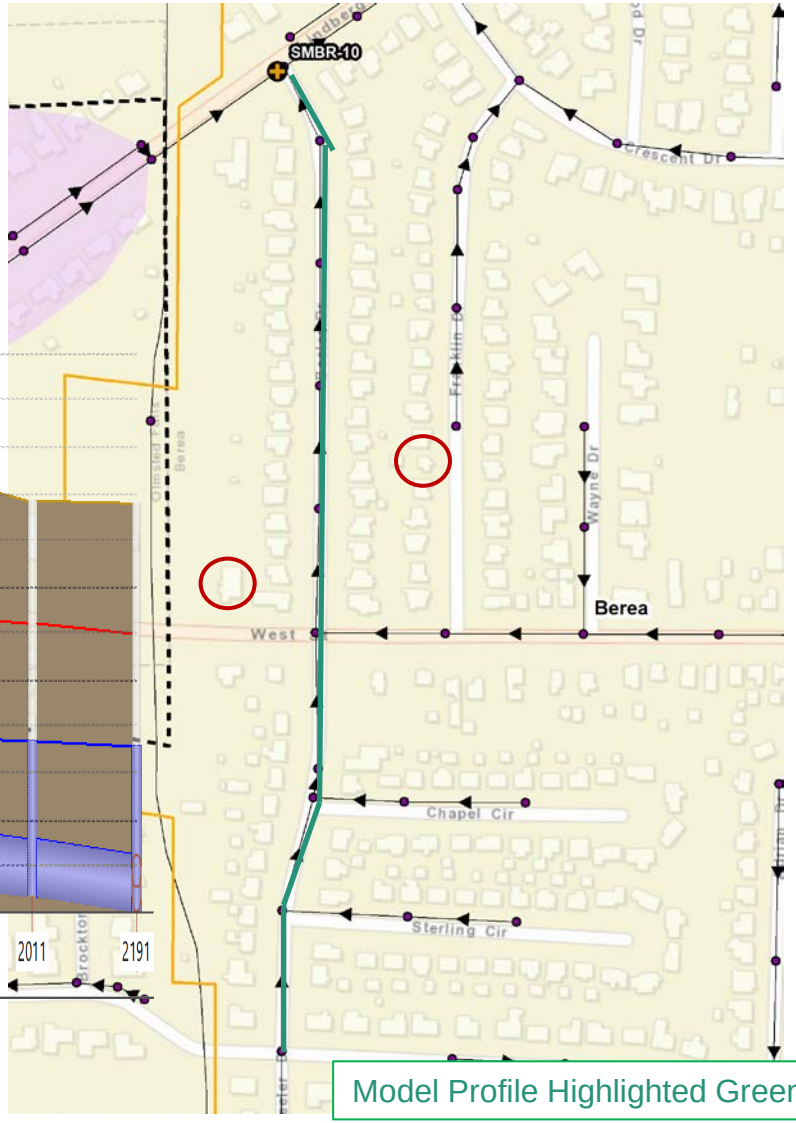
Model Profile Highlighted Green

Shows resolved BBU location along non-modeled sewer

BE-13

Tier 3 Private I/I Reduction in Metershed BR-07– Beeler Drive



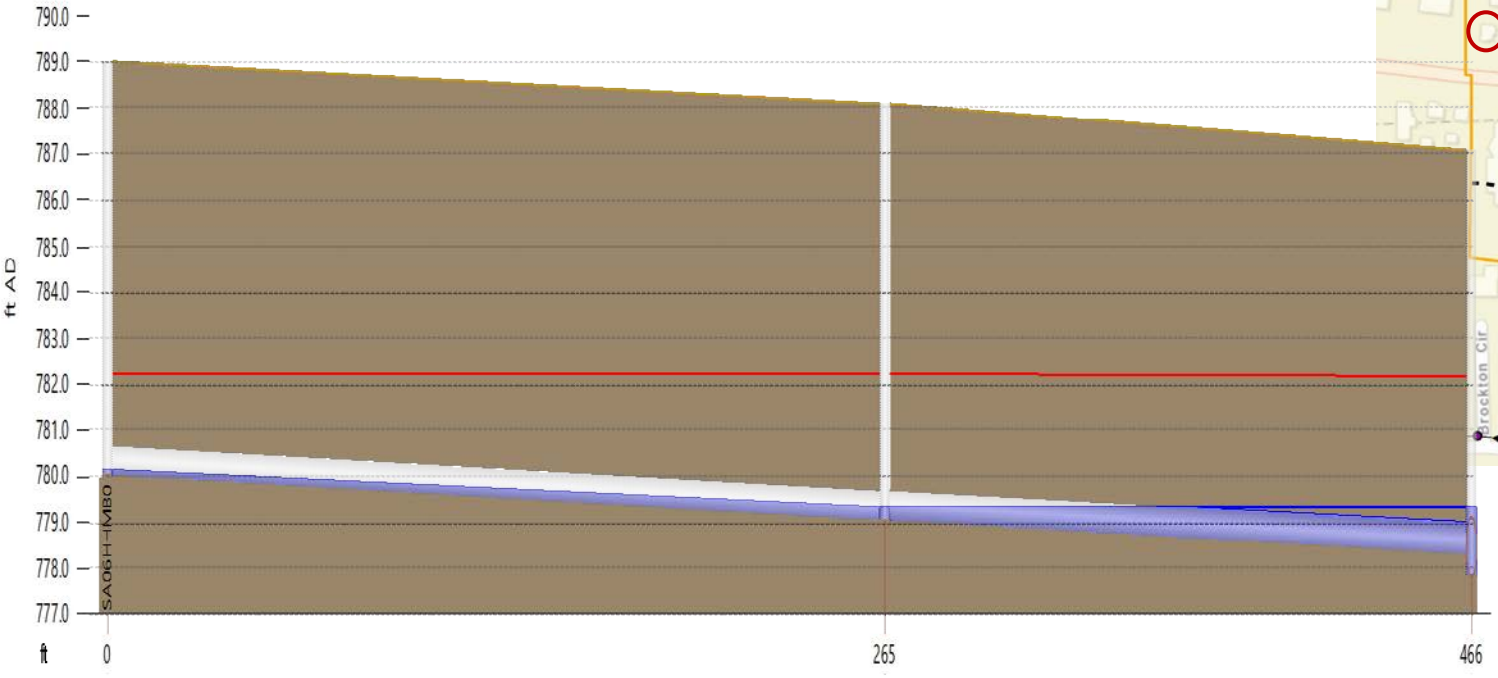


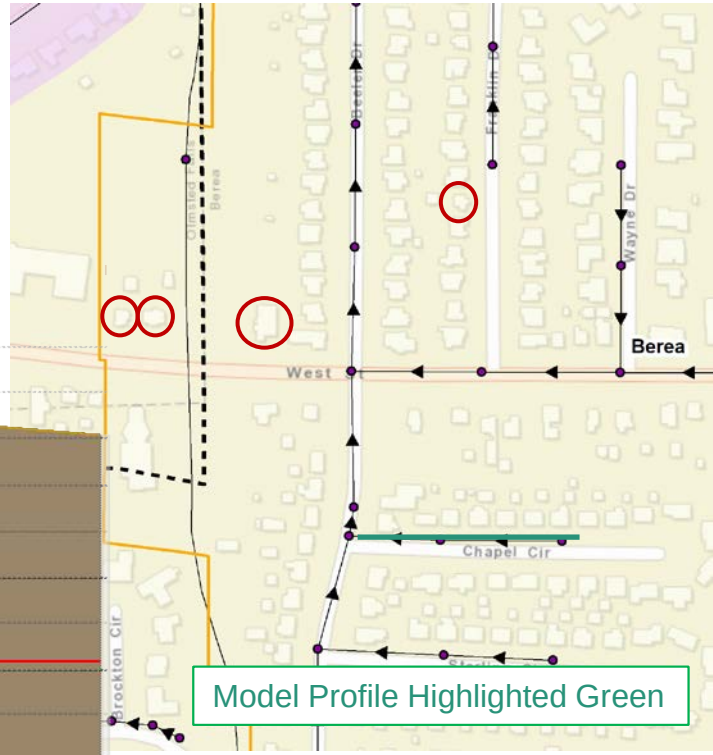
Shows resolved BBU location along non-modeled sewer

Model Profile Highlighted Green

BE-13

Tier 3 Private I/I Reduction in Metershed BR-07– Chapel Circ.

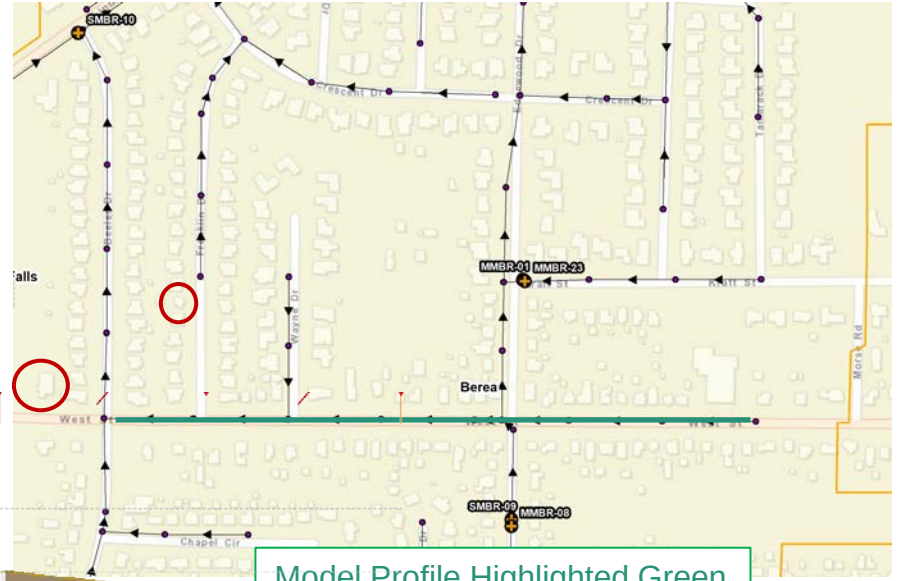




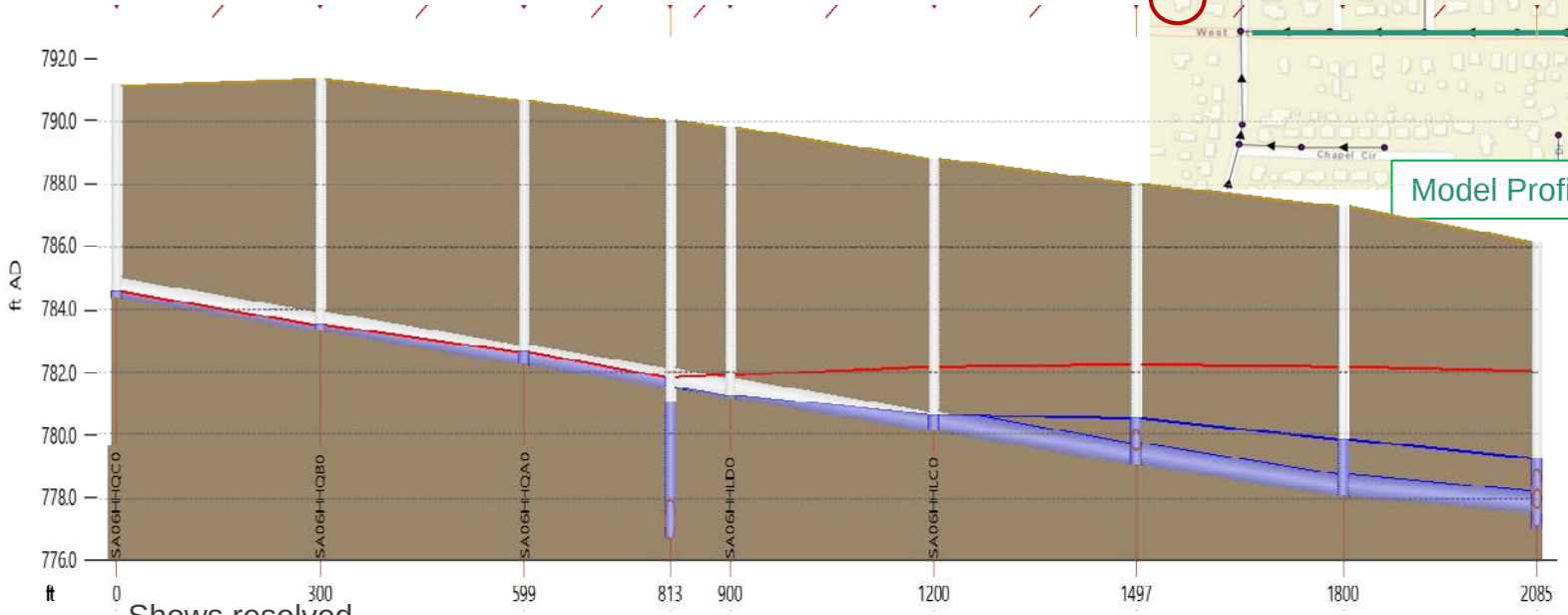
Shows resolved BBU location along non-modeled sewer

BE-13

Tier 3 – Private I/I Reduction in Metershed BR-07 West Rd



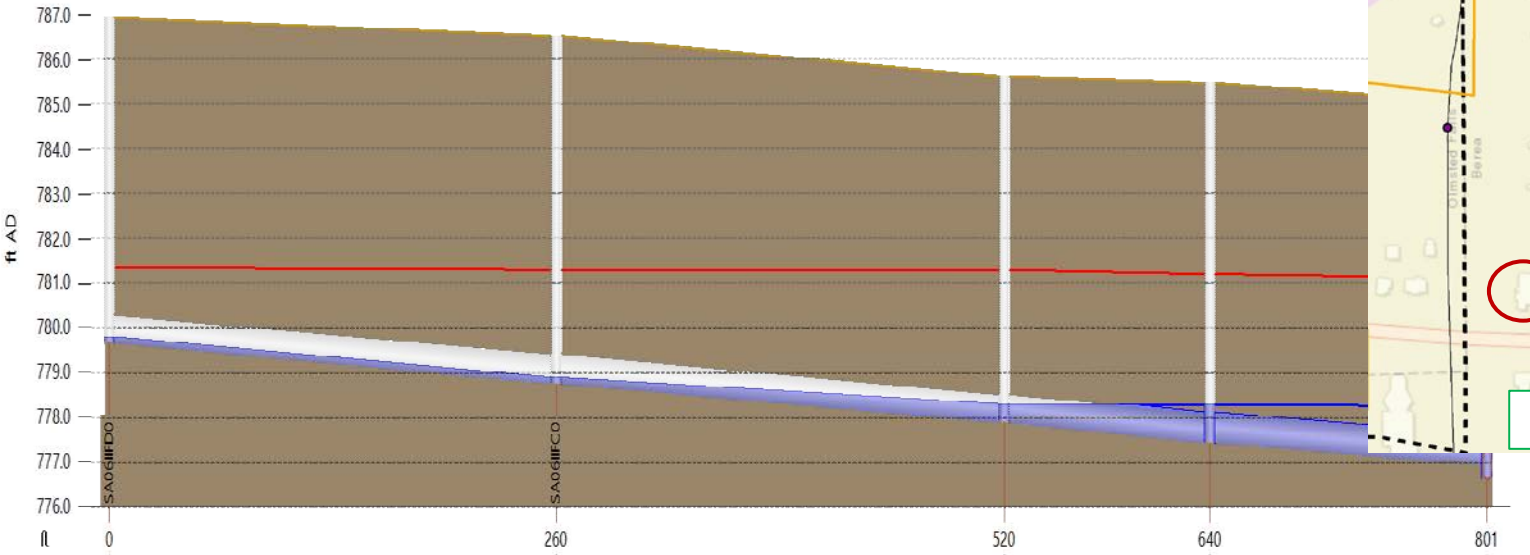
Model Profile Highlighted Green

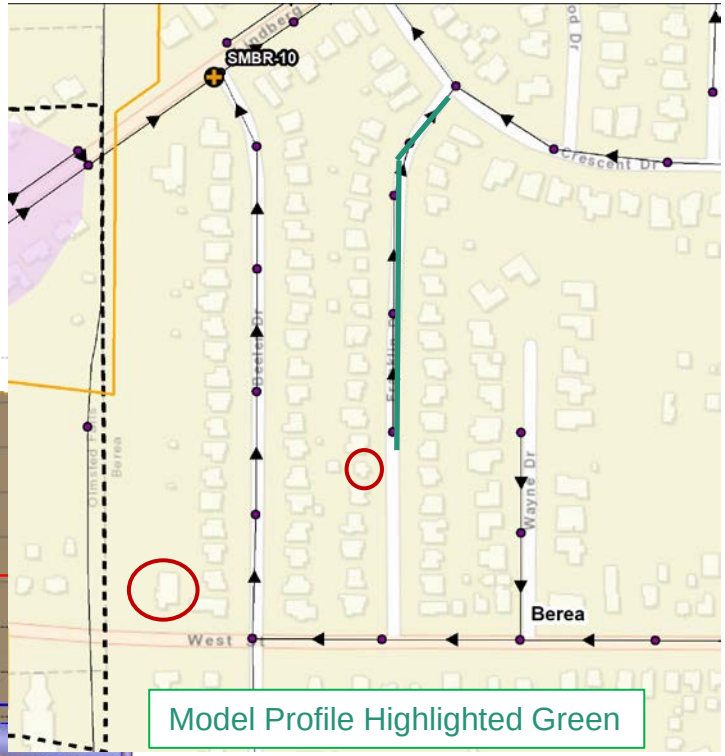


Shows resolved BBU location along non-modeled sewer

BE-13

Tier 3 – Capacity Enhancement Franklin Drive



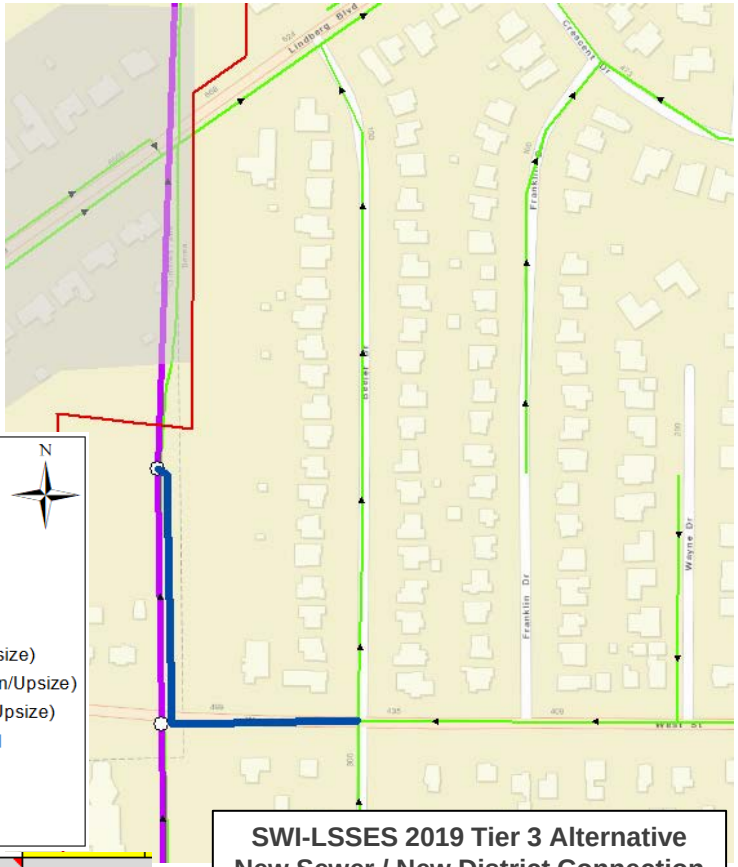


Shows resolved BBU location along non-modeled sewer

BE-13

Tier 3 –New District Connection

- Add ~**828 LF** of new sewer for a total construction cost of **$868,333**
  - **Cost includes $10,000 for new District connection. Occurs at existing structure so no 'drill drop' installation is assumed.**
  - **Potential sewer alignment needs to be purchased and is excluded from the costs.**
- All remaining BE-13 BBUs have been resolved

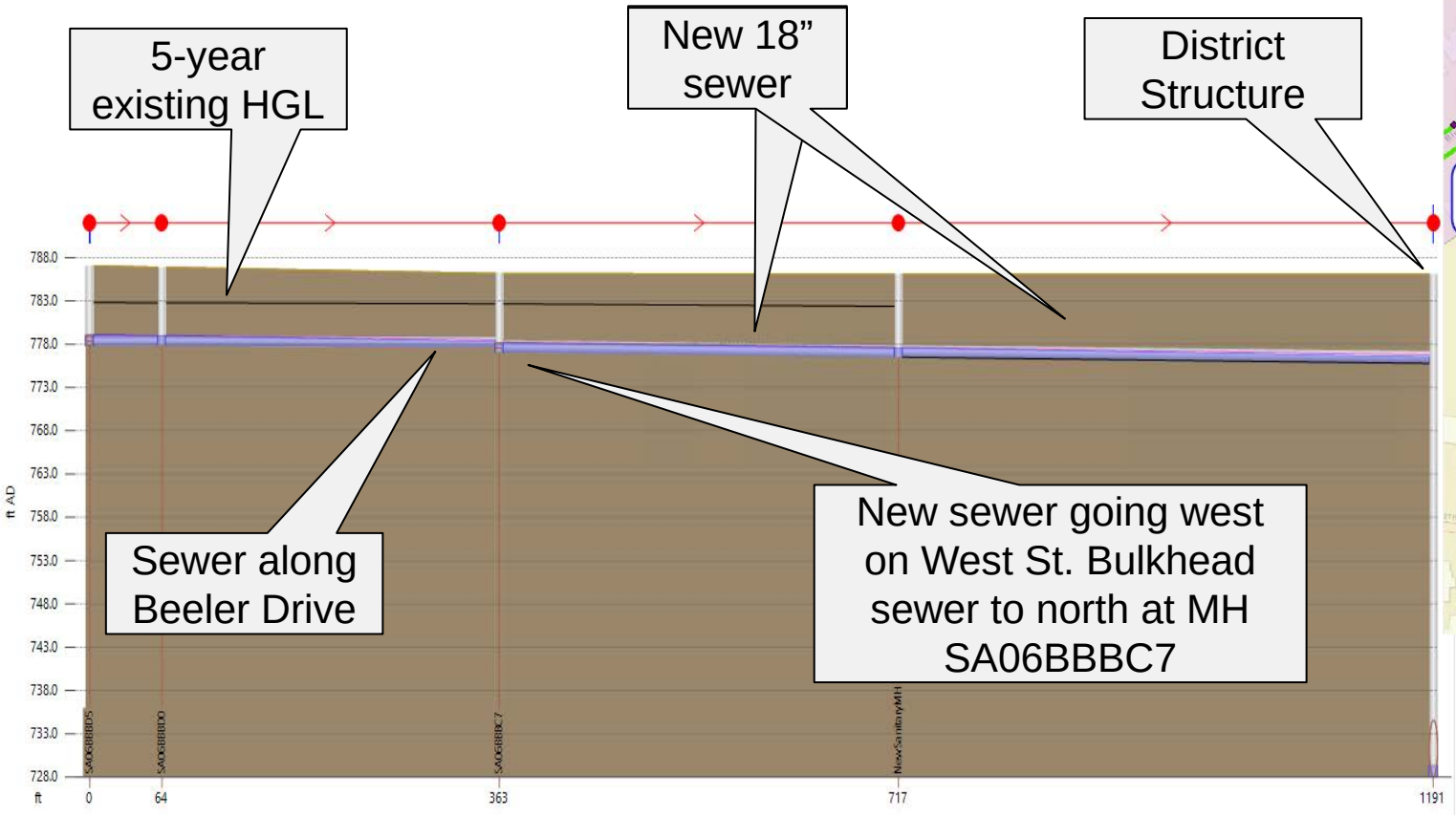


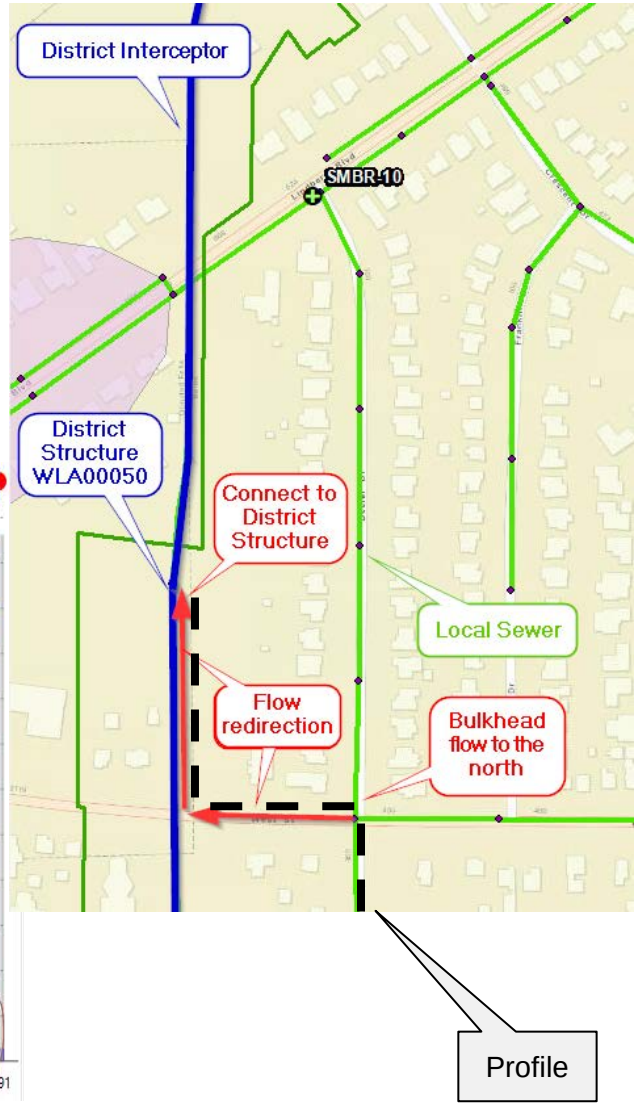
SWI-LSSES 2019 Tier 3 Alternative
New Sewer / New District Connection

NEORSD Branch	PFL Area	Catchment ID (Use "ALL" to cost for all catchments within PFL)	Alternative		Summary										
			Alternative	Description	Replace Sewer (LF)	New Sewer (LF)	Relief Sewer (LF)	Inline Storage (LF)	Sewer Lining (LF)	Misc. Structures (#)	Misc. Cost ($)	Private Sanitary and Storm Lateral Rehab ($)	Private II Removal (# parcels)	Cleaning (LF)	Construction Cost ($)
SWI2019	BE-13	ALL	Tier3	New Sewer and District Connection		828					$ 10,000			2785	$ 868,333

BE-13

Tier 3 New Sewer and District Interceptor Connection





BE-13

Tier 3 Analysis Discussion

- New connection to District Interceptor north of 22950 West Road and west of Beeler Drive; requires ~828 LF of new 18-inch sewer to construct the new sewer at a cost of $858,333. A new District connection is required with costs assumed to be $10,000 for a total project cost of **$868,333**.
- Capacity enhancement will completely alleviate BBUs and will not result in HGL increases downstream; requires replacement of 4,140 LF of sewer at a cost of **$4,569,050**.
- Private I/I in metershed BR-07 will completely alleviate BBUs and will not result in HGL increases downstream; requires removal from 171 parcels at a cost of **$1,710,000**.

Tier 3 Recommendation

- **Further Field work**
  - *Flow monitor closer to the BBUs and investigate to confirm no obstructions are in the existing sewers*
- **If problems persist, recommend new sewer to District Interceptor depending on the results of the field investigation.**

BE-13

Tier 3 Analysis Discussion

- New connection to District Interceptor north of 22950 West Road and west of 254 Beeler Drive; requires 380 LF of new 18-inch sewer and the acquisition of an easement (no cost included) west of Beeler Drive to construct the new sewer at a cost of $386,331. A drill drop installation is assumed to not be required as a large District structure exists at the location of the connection. Connection costs are assumed to be $10,000 for a total project cost of **$396,331**. This solution is undesirable since it would require work through residential properies.

- New connection to District Interceptor north of 22950 West Road and west of Beeler Drive; requires ~828 LF of new 18-inch sewer to construct the new sewer at a cost of $858,333. A new District connection is required with costs assumed to be $10,000 for a total project cost of **$868,333**.

- Capacity enhancement will completely alleviate BBUs and will not result in HGL increases downstream; requires replacement of 4,140 LF of sewer at a cost of **$4,569,050**.

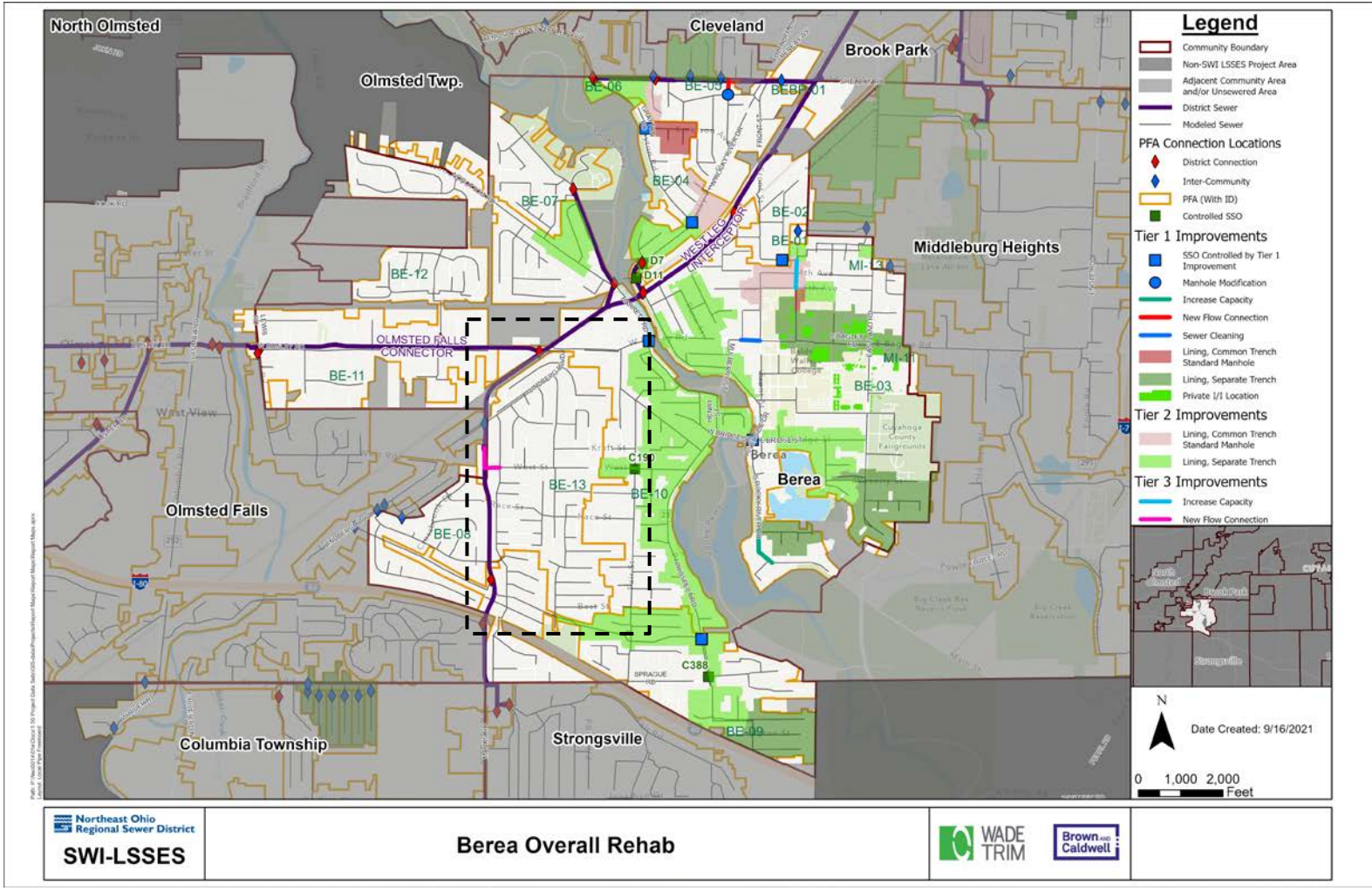
- Private I/I in metershed BR-07 will completely alleviate BBUs and will not result in HGL increases downstream; requires removal from 171 parcels at a cost of **$1,710,000**.

Tier 3 Recommendation

- **Further Field work**
  - *Flow monitor closer to the BBUs and investigate to confirm no obstructions are in the existing sewers*
- **If problems persist, recommend new sewer to District Interceptor depending on the results of the field investigation.**

BE-13 Final

- Final recommendation after refinement
- Tier 1 N/A
- Tier 2 N/A
- Tier 3
  - New/relief sewers = 828 LF
  - Total cost = $1,370,000
- Total Cost = Total Capital Cost + Contingency + Project Definition Investigation



Indicates the location of the PFA. (Map includes adjacent PFAs.)

NEORSD
Heights Hilltop Interceptor
Local Sewer System Evaluation Study
(HHI-LSSES)

Project Cost Opinion Development for LSSES Improvement Alternatives Analysis

Technical Memorandum

Revision 2

Prepared For

Northeast Ohio Regional Sewer District

September 2018

WADE TRIM

Brown AND Caldwell

ACKNOWLEDGEMENTS

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Project Cost Opinion Development for LSSES Improvement Alternatives Analysis (Revision No. 2)

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Appendix A. ENR Construction Cost Index (CCI) for Cleveland through May 2018

Appendix B. AACE Recommended Practice No. 18R-97, Cost Estimate Classification System

LIST OF ACRONYMS

AFP	Advanced Facilities Plan
CCI	Construction Cost Index
CCTV	Closed Circuit Television
CIPPL	Cured-In-Place-Pipe Lining
CSO	Combined Sewer Overflow
CT	Common Trench
DWO	Dry Weather Outlet
EI	Easterly Interceptor
ENR	Engineering News Record
EWWTP	Easterly Wastewater Treatment Plant
ft	feet or foot
I/I	Infiltration and Inflow
LF	Linear Feet
LSSES	Local Sewer System Evaluation Study
ROW	Right of Way
SSO	Sanitary Sewer Overflow
SW	Stormwater

1.0 Introduction

This report summarizes AACE[1] Class 5 planning level capital cost information for sewer system improvement alternatives developed for the Heights Hilltop Interceptor Local Sewer System Evaluation Study (HHI-LSSES) project. The cost opinions are developed to compare alternatives and provide preliminary costs for proposed improvements during Task 4 of the project, which may include the following:

- New sewers to control sanitary sewer overflows (SSOs) and/or provide adequate capacity for peak wet weather flow rates
- Sewer separation/replacement in common trench over-under (invert plate) areas
- Sewer system rehabilitation in common trench standard and dividing wall manhole areas using cured-in-place-pipe lining (CIPPL)
- Alternative stormwater separation within the public ROW and on private property
- Illicit discharge remediation
- Correction of failing septic tanks

1.1 Project Benefits

Quantification of project benefits, including reduced pollutant loading to streams and Lake Erie and reduced frequency of sanitary sewer basement backups, will be summarized in a subsequent HHI-LSSES report.

2.0 Development of Unit Construction Costs and Project Costs

Class 5 unit construction costs were developed using previous NEORSD and local municipality construction project bid tabs and costing reports. Per AACE, Class 5 estimates are prepared based on very limited information and subsequently have wide accuracy ranges. Typical purpose of the estimate is for concept screening and typical accuracy ranges for Class 5 estimates are -20% to -50% on the low side, and +30% to +100% on the high side. Development of the

[1] AACE – From AACE website: *The legal name since 1992 is AACE International. In 1956 the organization was established as the American Association of Cost Engineers. While you may have seen that "AACE" stands for the Association for the Advancement of Cost Engineering, this is only a statement that encompasses the work of the Association, not a legal name.*

estimated unit construction and project costs is summarized in the following sections of this report for each alternative.

Unit construction costs were extracted from the project bid tabs and costing reports from 2011 to 2017, and an average unit price was calculated and escalated to 2018 costs. Escalation of the cost basis for the unit prices from the communities was updated to May 2018 using an Engineering News Record (ENR) Construction Cost Index (CCI) of 12,325 for Cleveland. Summary of recent ENR CCI values is included in **Appendix A**. The AACE Recommended Practice No. 18R-97, Cost Estimate Classification System summary is included in **Appendix B**.

2.1 Project Costs

The unit construction cost tables provided in this report do not include construction contingencies, design engineering, construction engineering and administration costs. This section identifies the additional markups to be added based on construction costs to obtain planning level project costs.

Engineering and administration costs for capital projects of similar complexity typically decrease as a percentage of construction cost with increasing project size and cost. **Table 2-1** summarizes standard assumptions for NEORSD design and construction engineering and administration updated during the 2013 Advanced Facilities Plan (AFP) Project.

Table 2-1. Revised Professional Services Cost Estimates by Project Size

Project Size (Construction Costs, $ Million)	Design, % of Construction Cost	CA/RE, % of Construction Cost
Up to 10	15	10
10 to 20	10	7
20 to 80	7	7
Greater than 80	6	4

Individual project construction costs for the LSSES project improvements are expected to average less than $10 million. Based on this assumption, and on the planning level information developed for the LSSES projects, project costs for the LSSES improvements are being developed from construction costs using the following percentages:

- Construction contingency: 30% of construction cost
- Design engineering: 15% of construction cost including the contingency
- Construction resident engineering and administration: 10% of construction cost including the contingency

This results in a project cost multiplier of 1.625 times the construction cost, e.g.

Project Cost = Construction cost*1.3*(1.0+0.15+0.10) = 1.625*Construction cost

2.2 Project Definition Investigation Cost

NEORSD LSSES projects are planning level studies, and prioritized field investigations are completed in up to 10% of the project area on average. In addition to standard construction, engineering and administrative activities/costs discussed in the previous paragraphs, many of the potential improvements proposed in the HHI area may benefit significantly from additional investigations to refine the proposed work areas and preferred improvements. For example, even though dyed water testing in one portion of a subcatchment may identify pipe reaches with high infiltration in the public ROW, private property I/I may actually be a significant, if not greater source of wet weather flows, particularly in areas with pre-WWII vintage homes. As another example, even though elevated wet weather flows may be a partial cause of some basement backup problem or SSO, a system bottleneck, structural or recurrent debris or other O&M problems may also be a significant cause of the problem.

Improved definition of these types of potential unknown system characteristics will help to further optimize cost-effectiveness and resulting performance. The *HHI-LSSES Project Summary Report, Final, [month] 2018* and individual community reports discuss implementation activities such as CCTV, micromonitoring and dyed water testing that may be beneficial in many potential improvement areas to better define the specific extents and causes of problems to be addressed.

These investigation activities will add up front cost to planning and implementing the projects but will also help reduce overall project costs and improve cost-effectiveness by properly defining the work areas and specific system improvements to be implemented, particularly in common trench project areas. Based on HHI-LSSES investigation costs, an allowance of $10,000 per acre is suggested as a planning level allowance for project definition investigations in common trench remediation areas and will be included as a separate line item for these work areas.

2.3 Available Cost Data Reviewed

Many bid tabs, invoices and costing references from existing construction projects performed by NEORSD and municipalities in the HHI-LSSES area were compiled and evaluated to estimate the unit construction costs for the collection system improvement alternatives. Costs used from recent projects were escalated using appropriate ENR CCI values.

The following NEORSD projects provided bid tabs and costing references that were evaluated for applicability:

- Combined Sewer Overflow Advanced Facilities Plan and Integrated Planning (2013 CSO AFP)
- CSO Relining and Replacement Contract (CSORARC - 2012)
- CSO Rehabilitation Contract (CSORC - 2010)
- Dugway West Interceptor Relief Sewer (DWIRS - 2013)
- Easterly District Interceptor Relining/Replacement Contract (EDIRARC - 2007)
- Mill Creek Interceptor Relief (MCIR - 2009)
- NEORSD Professional Services for the Asset Management Implementation Phase I Project, Report for Task Order 8 Calculate Cost of Lining District Sewers (April 26, 2012)
- Southerly & Westerly Interceptors Service Agreement Contract (SWDISAC - 2010)
- Southerly & Westerly Interceptors Replacement and Rehabilitation Contract (SWDIRARC - 2008)

The following municipalities provided project bid tabs and applicable costing references that were assessed for applicability:

- Beachwood
- Highland Heights
- Lakewood, City of; Integrated Wet Weather Improvement Plan (September 2016)
- Lyndhurst
- Mayfield Heights
- Shaker Heights
- South Euclid

The bid tabs and costing references provided by NEORSD and municipalities were used to estimate the cost of the components in each alternative. These components are listed under the assumptions sections for each alternative in the following section.

3.0 Sewer System Improvement Alternatives and Construction Costs

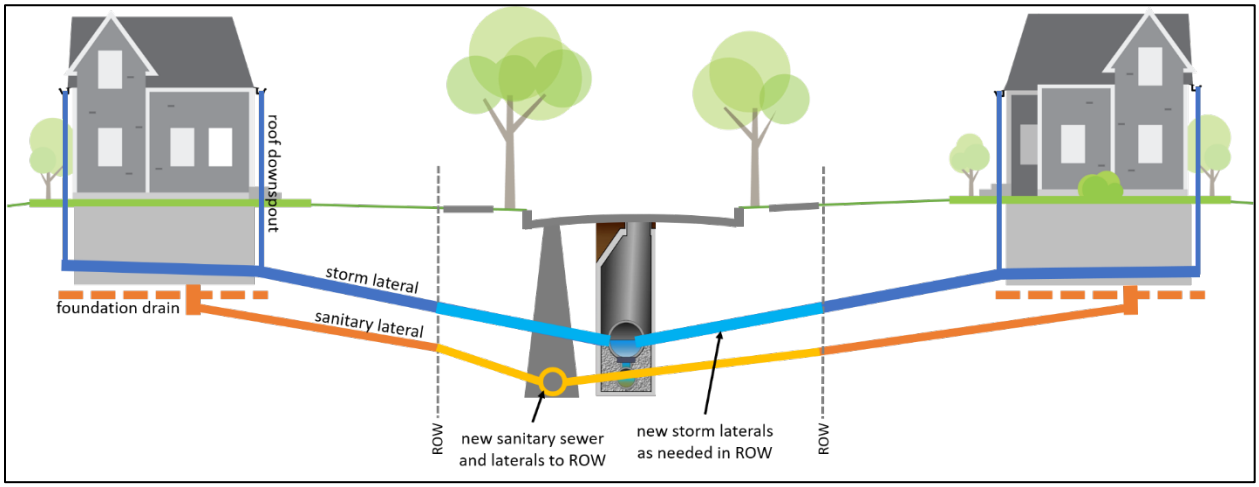
The following sections describe the typical sewer system improvements that were considered for control of SSOs, sanitary sewer basement backups, illicit discharges and failing septic tanks in the HHI-LSSES area. Stormwater control measures such as swales and rain gardens may also be considered in selected areas using available District guidance but are not considered in this technical memorandum. The improvement alternatives are developed at a planning level for comparison and to summarize the potential scope of work for each community. Implementation of individual projects will require further field investigation, problem definition and updated cost information to confirm the extents and types of improvements to be constructed. Implementation considerations are provided in subsequent HHI-LSSES reports.

3.1 New Sanitary Sewers for SSO Control and/or Capacity Increase

This improvement assumes construction of a new sanitary sewer to route SSO flow to a District sewer or other local sanitary sewer with adequate capacity, or to increase capacity in a sewer reach with insufficient capacity. A new sewer in this alternative may be constructed in parallel with a separate or common trench system and would allow for abandonment of the existing sanitary sewer if desirable. This would be determined based on specific site conditions during

preliminary design. This improvement could also be used to improve separation of sanitary and stormwater flows in common trench reaches where the sanitary sewer is in poor condition and storm sewer can be allowed to remain. This improvement assumes the existing storm sewer remains in good condition. **Figure 3-1** shows a sketch of the concept for a new sanitary sewer. Additional assumptions for this improvement are summarized after the figure.

Figure 3-1. New Sanitary Sewer for Added Capacity or Flow Rerouting



Assumptions

- Construction is within the 40-ft wide ROW and assumes a typical 24-ft wide residential roadway.
- Excavations are constructed using standard trench boxes. Sheeting is not included.
- New sanitary sewers of acceptable material under Uniform Standards are provided in standard diameters at up to 15 feet deep and 16-20 feet deep.
- New manholes are included at 48-inch diameter for sewers 8-30 inches in diameter, and 84-inch diameter for sewers 36-48 inch in diameter. Manholes are assumed at every 300 feet along the sanitary sewer line.
- Sanitary manholes are included at 15 feet deep, or deeper to match the sewer.
- Two 25-foot-long residential sanitary sewer laterals and stormwater service laterals are included every 50 feet along the sanitary sewer line.
- Restoration assumes a 40-foot-wide ROW with a 24-foot-wide roadway and 5-foot-wide sidewalks.

- Asphalt pavement includes removal and replacement of 24-foot-wide roadway (6-inch bituminous base, 1.5-inch intermediate asphalt layer, 1.5-inch asphalt road surface (top layer)).
- Includes removal and replacement of 6-inch-high concrete curb.
- Concrete sidewalks are replaced - five feet wide, 4.5 inches thick.
- Concrete residential drive aprons include removal and replacement of two 12-ft wide concrete aprons every 50 feet along the street at six inches thick.
- Grass seeded tree lawns include four inches of topsoil, seeding, fertilizing and mulch.
- Assumes protection of existing utilities. New utilities may increase cost.

Construction Costs

Table 3-1 summarizes the unit costs used to estimate construction costs (without contingencies and engineering) to install sanitary sewer pipe per linear foot of right of way. The unit costs are categorized by sewer pipe diameter. Diameters assumed to have the same excavated trench width have the same unit construction cost because the material cost of the pipe is considered insignificant to the overall unit construction cost per linear foot of ROW.

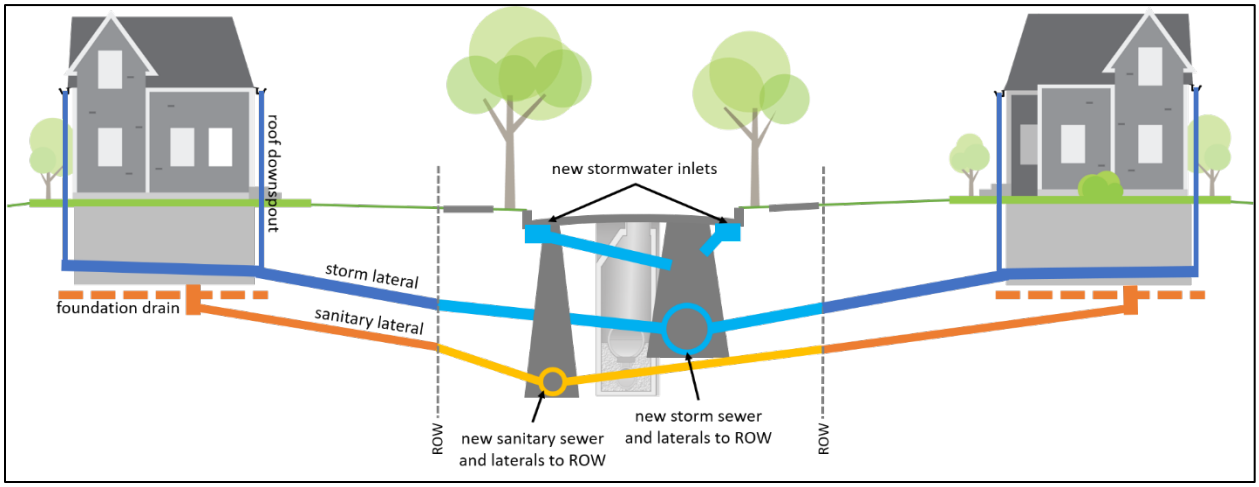
Table 3-1. Sanitary Sewer Construction Unit Costs

Inside Diameter (inches)	0-15 feet deep ($/LF)	16-20 feet deep ($/LF)
10	923	1,546
12	943	1,556
15	943	1,556
18	1,018	1,629
21	1,018	1,629
24	1,018	1,629
30	1,018	1,629
36	1,073	1,690
42	1,073	1,690
48	1,153	1,787

3.2 Sewer System Replacement in Common Trench Over-Under (invert plate) Areas

New sanitary and storm sewers will be constructed in urban residential streets by removing the existing sewers, service laterals and catch basins, and reconstructing new separate sanitary and storm sewer systems in the ROW. The costs estimated are costs per linear foot of ROW and include flow maintenance, as well as removal and replacement of entire roadway, curb, sidewalks, and landscaping. The sanitary sewer would typically be constructed in approximately the same location as the existing sanitary sewer and a new storm sewer would be constructed in a parallel separate trench in the roadway. **Figure 3-2** summarizes the proposed sewer system replacement/separation concept. Additional assumptions for this improvement are summarized following the figure.

Figure 3-2. Sewer System Replacement in Common Trench Over/Under Areas



Assumptions

- Construction is within the 40-ft wide ROW and assumes a typical 24-ft wide residential roadway.
- Excavations are constructed using standard trench boxes. Sheeting is not included.
- New sanitary sewers of acceptable material under Uniform Standards are provided in standard diameters up to 15 feet deep and 16-20 feet deep.
- New storm sewers of acceptable material under Uniform Standards are included using existing piping sizes provided and adjusted to standard diameters at eight feet deep.
- New manholes are included as 48-inch diameter and assumed at every 300 feet along sanitary and storm lines.
- Sanitary manholes are included at 15 feet deep, or deeper to match the sewer. Storm manholes are included at eight feet deep.
- Two new catch basins with 12-inch storm pipe from the catch basins to the new storm sewer are included every 300 feet.
- Two residential storm service laterals are included at 25 feet long each, every 50 feet along the storm sewer.
- Two residential sanitary service laterals are included at 25 feet long each, every 50 feet along the sanitary sewer.
- Restoration assumes a 40-foot-wide ROW with a 24-foot-wide roadway and 5-foot-wide sidewalks.

- Asphalt pavement includes removal and replacement of 24-foot-wide roadway (6-inch bituminous base, 1.5-inch intermediate asphalt layer, 1.5-inch asphalt road surface (top layer))
- Six-inch concrete curb is removed and replaced.
- Concrete sidewalk is removed and replaced at five feet wide, 4.5 inches thick.
- Concrete residential drive aprons include removal and replacement of two 12-ft wide concrete aprons every 50 feet along the street at six inches thick.
- Grass seeded tree lawns include four inches of topsoil and seeding, fertilizing and mulch.
- Assumes protection of existing utilities. New utilities may increase cost.

Construction Costs

Table 3-2 summarizes the unit costs to install sanitary sewer pipe per linear foot of right of way, and **Table 3-3** summarizes the unit costs to install a storm sewer of the same size as existing in a parallel separate trench. The unit costs in **Table 3-2** are categorized by sewer pipe diameter. Diameters assumed to have the same excavated trench width have the same unit construction cost because the material cost of the pipe is considered insignificant to the overall unit construction cost per linear foot of ROW. Restoration costs covering the entire ROW are included with the sanitary sewer replacement unit costs. The storm sewer replacement unit costs include excavation, bedding, storm pipe, backfill, two storm laterals every 50 feet, and two catch basins every 300 feet; no restoration is included.

Table 3-1. Sanitary Sewer Replacement Unit Costs

Inside Diameter (inches)	0-15 feet deep ($/LF)	16-20 feet deep ($/LF)
10	1,022	1,712
12	1,042	1,719
15	1,042	1,719
18	1,117	1,787
21	1,117	1,787
24	1,117	1,787
30	1,117	1,787
36	1,172	1,846
42	1,172	1,846
48	1,252	1,941

Table 3-3. Storm Sewer Replacement Unit Costs When Replaced with Sanitary Sewer

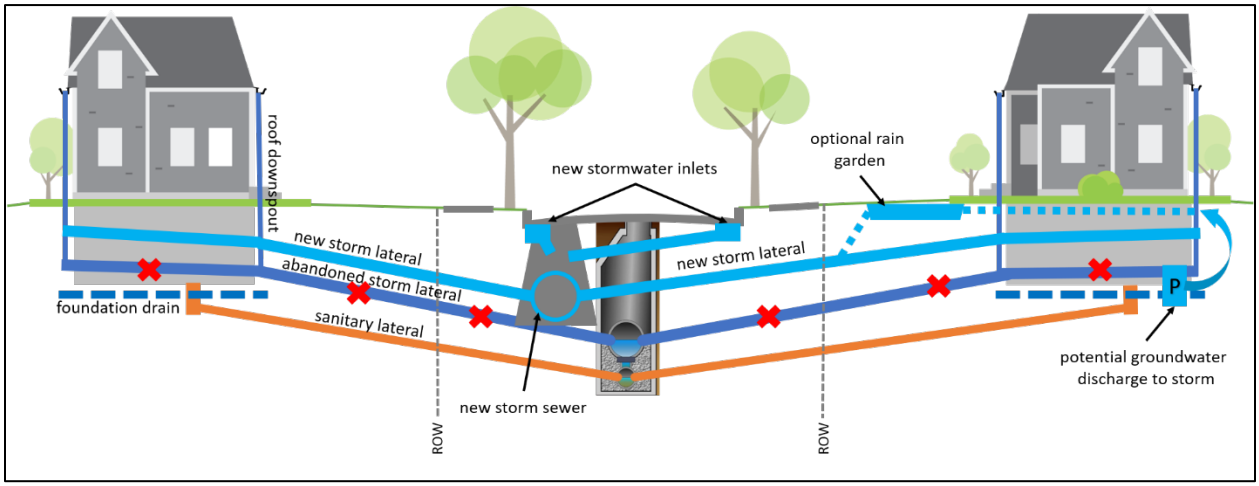
Inside Diameter (inches)	eight feet deep ($/LF)
15	234
18	251
21	269
24	290
30	312
36	337
42	364
48	393

3.3 Stormwater Separation Alternative for Common Trench Areas

The stormwater separation improvement alternative assumes construction of a new storm sewer in the street ROW to collect stormwater from the ROW, and replacement of the stormwater service lateral piping on private property where feasible to reduce sanitary system I/I. This alternative would construct a new storm sewer the same size as existing in the street, and may be applicable in over/under separation, or in other common trench areas where the storm sewer may be in poor condition. Providing increased storm sewer capacity may also be feasible, contingent on available downstream capacity. Stormwater service lateral rehabilitation may also be feasible but may require the new storm sewer to be constructed deeper to collect water from existing stormwater laterals. The proposed work would include removal and replacement of the entire roadway, curb, and sidewalks within the ROW. **Figure 3-3** shows a conceptual cross section of the alternative. Additional cost assumptions for this improvement are summarized following the figure. Additional considerations regarding this improvement concept include the following:

- May not be applicable if the existing storm and/or sanitary sewers are in poor structural condition.
- May allow shallower construction compared to common trench separation concept.
- May allow both pipes of existing common trench system to remain as a wet sanitary system that collects and treats runoff from small rainfalls.
- Could include private property raingardens with overflow to new storm sewer lateral.
- Could allow sump pump discharge of groundwater to new stormwater lateral or rain garden.

Figure 3-3. Stormwater Separation Concept for Common Trench Areas



Assumptions

Work in Public ROW:

- All storm sewer mainline construction is within residential road ROWs.
- New storm sewers of acceptable material under Uniform Standards are included using existing piping sizes provided and adjusted to standard diameters at approximately eight feet deep.
- New manholes are included as 48-inch diameter and assumed at every 300 feet along the new storm sewer at eight feet deep.
- Two new catch basins with 12-inch storm leads to the new storm sewer are included every 300 feet.
- Two residential service stormwater service laterals are included at 25 feet long each (from storm sewer to ROW), every 50 feet along the storm sewer.
- All excavations use standard trench boxes. Sheeting is not included.
- Restoration within the ROW assumes a 40-foot-wide ROW with a 24-foot-wide roadway and 5-foot-wide sidewalks.
- Asphalt pavement includes removal and replacement of roadway (6-inch bituminous base, 1.5-inch intermediate asphalt layer, 1.5-inch asphalt road surface (top layer))
- Includes removal and replacement of 6-inch-high concrete curb.
- Concrete sidewalk removal and replacement - 5-foot-wide, 4.5-inchesthick.

- Remove and replace two 12-ft wide concrete residential drive aprons every 50 feet along the street at six inches thick.
- Restore tree lawns with four inches of topsoil, seeding, fertilizing and mulch.
- Assumes protection of existing utilities. New utilities may increase cost.

Work on Private Property:

- Private property work assumes two parcels every 50 feet requiring separation.
- Replace/construct 50 LF of 6-inch stormwater lateral from ROW to house, and 80 LF of 6-inch lateral around three sides of house connecting downspouts. Restoration is assumed to be topsoil and grass. Re-pitching gutters and/or trenchless construction may be cost-effective to limit disruption of existing landscaping and reduce cost.

Construction Costs

Table 3-4 summarizes the unit costs to construct new storm sewer pipe per linear foot of ROW and includes the private property stormwater lateral improvements at a cost of $10,000 per parcel. This parcel cost is based on recent experience in the City of Lakewood, and separate discussion with a local plumbing contractor active in the HHI-LSSES area. The unit costs are categorized by sewer pipe diameter. Diameters assumed to have the same excavated trench width have the same unit construction cost because the material cost of the pipe is considered insignificant to the overall unit construction cost per linear foot of ROW.

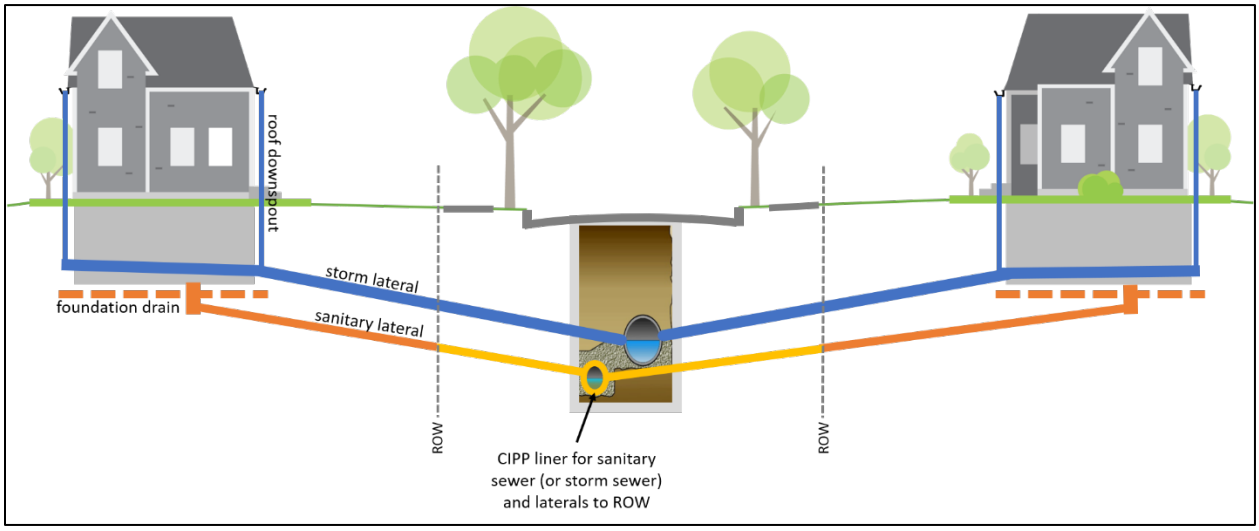
Table 3-4. Storm Sewer Separation Unit Costs

Inside Diameter (inches)	Eight feet deep ($/LF)
15	1,249
18	1,316
21	1,316
24	1,316
30	1,316
36	1,366
42	1,366
48	1,438

3.4 Sewer Rehabilitation in Common Standard and Dividing Wall Manhole Areas

The sewer rehabilitation improvement includes installing a cured-in-place pipe liner (CIPPL) inside the sanitary sewer in a residential street within the ROW. The cost estimated is per linear foot of ROW and includes CCTV and light cleaning of the existing sanitary sewer, flow control, installation of CIPPL in sewer pipe, installation of CIPPL in sanitary sewer laterals to the ROW, and CCTV of final lining. For dividing wall systems, the dividing wall manholes are reconstructed to eliminate the hydraulic connectivity and provide separate access to both storm and sanitary sewers. Common standard manholes are not expected to require significant rehabilitation. This improvement would also be applicable in separate trench areas. **Figure 3-4** shows the concept. Additional assumptions for this improvement are summarized after the figure.

Figure 3-4. CIPP Sewer and Lateral Rehabilitation Concept



Assumptions

- Condition of existing sewer to be lined is acceptable for CIPPL with no major repairs or preparation work required.
- CIPPL unit prices for sewer internal diameters less than 36 inches assume the lining can be performed from manhole to manhole without manhole reconstruction.
- For sewers 36 inches and greater in diameter, the top sections of existing manholes will be removed to perform the work and replaced once lining is completed.
- Includes reinstatement of two residential sanitary service laterals every 50 feet.
- Includes CIPP lining of two residential service laterals for a length of 25 LF every 50 feet along the sewer from the main sewer to the ROW.
- Unit costs include light sewer cleaning and pre- and post-construction CCTV. Sewers requiring heavy cleaning would add cost.

Construction Costs

Table 3-5 summarizes the unit cost to install CIPPL inside an existing sanitary or storm sewer and associated service laterals per linear foot of right of way.

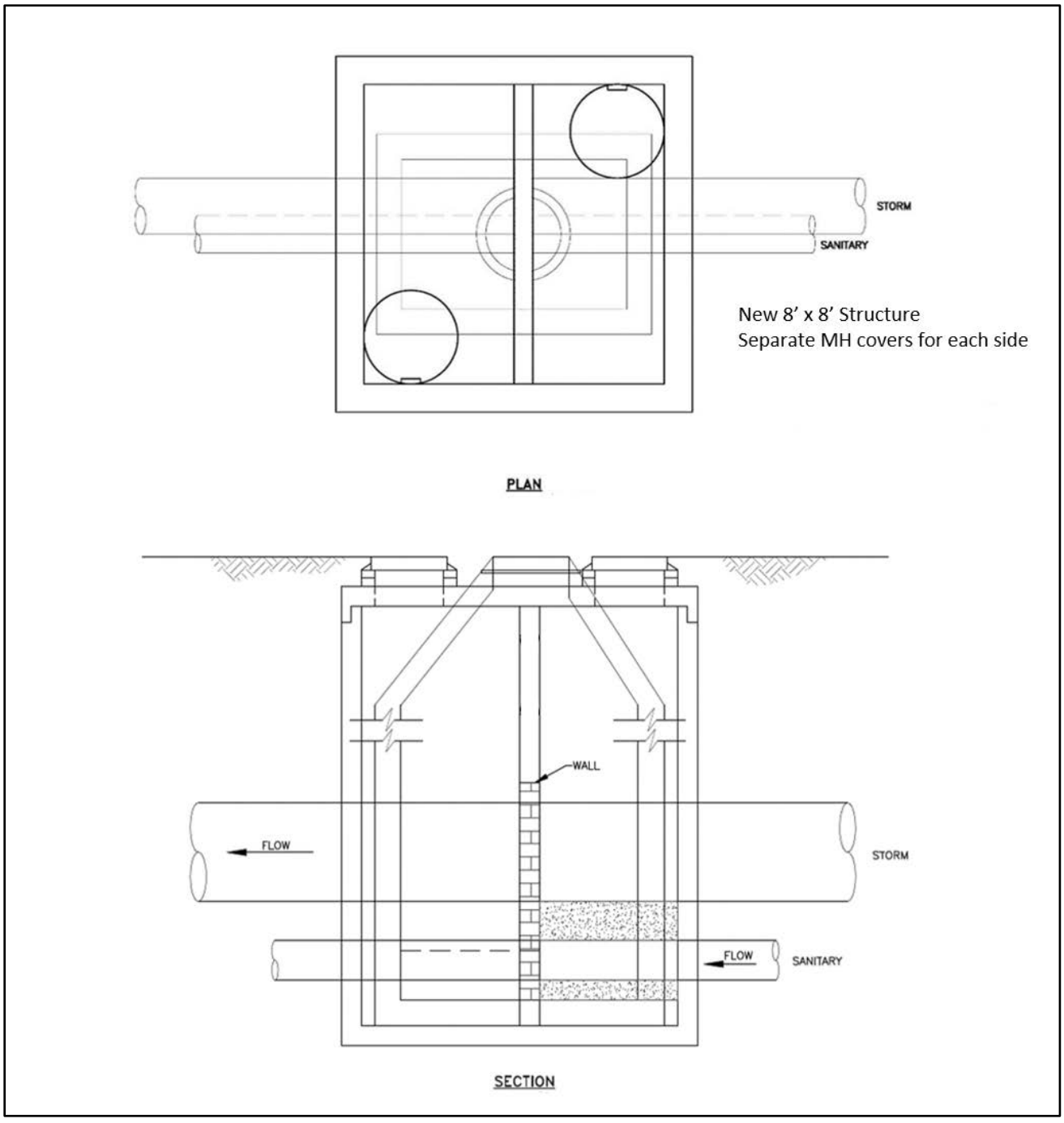
Table 3-5. Mainline CIPPL Rehabilitation with Lateral Lining in ROW Unit Costs

Inside Diameter (inches)	Unit Price ($/LF)
10	344
12	355
15	375
18	398
21	428
24	458
30	534
36	627
42	737
48	864

Dividing Wall Manhole Reconstruction

For dividing wall manhole systems, the dividing wall manholes are recommended to be reconstructed to eliminate hydraulic connectivity between the storm and sanitary sewers, and to provide separate maintenance access to both sewers. Concepts were developed in 2014 as part of the AFP Integrated Planning study and cost estimates were prepared. The proposed work would remove and reconstruct the manhole with an 8 x 8-foot rectangular structure that includes separate chambers and access manhole covers for each sewer. **Figure 3-5** shows conceptual plan and section views.

Figure 3-5. Dividing Wall Manhole Reconstruction Concept Plan and Section Views



The following assumptions were used to develop the unit cost for replacing existing dividing wall manholes with new structures to separate the existing storm and sanitary sewers.

- All work is below a residential 24-foot-wide roadway within the ROW. Neither curb or sidewalk will require replacement.

- Manhole structure is up to 15 feet deep.
- 8 x 8-foot structure constructed of cast-in-place concrete.
- Restoration assumes full depth asphalt pavement removal and replacement of 10 x 10-foot area of roadway (6-inch bituminous base, 1.5-inch intermediate asphalt layer, 1.5-inch asphalt road surface (top layer))

The unit construction cost to reconstruct the dividing wall manholes, as shown, is updated from the construction cost that was prepared for the AFP Integrated Planning project by Regency Construction in August 2014. The cost in 2014 was $50,000 (ENR CCI 11,860) and is escalated to $51,960 (May 2018 ENR CCI 12,325). A 2018 unit construction cost of $52,000 is suggested for HHI-LSSES alternatives cost opinion development.

3.5 Private Property I/I Remediation

Some PFL areas likely have significant I/I originating on private property. In these areas, the most cost-effective solution may involve reducing I/I on private property. Typical I/I control methods used on private property include pipe rehabilitation and infrastructure replacement.

Suburban communities with larger lots may find low-cost options such as discharging downspouts to grade to be effective and acceptable. Other more densely situated parcels in urban neighborhoods may not allow for this due to resulting surface drainage problems. In these areas, I/I mitigation may likely involve replacement or trenchless rehabilitation of stormwater and/or sanitary service laterals to eliminate I/I. This work may need to be completed from the downspouts to the sewers in the street to be effective, and dyed water testing at each parcel under consideration is recommended. Typical methods include the following:

- New sanitary and or stormwater service laterals
  - New shallower stormwater piping may help reduce cost and disruption
  - Trenchless construction methods such as pilot tube microtunneling may be effective
  - Re-pitching eaves troughs may help redirect roof water to minimize trenching in heavily landscaped areas
- CIPP lining of laterals if in acceptable condition

While actual costs may vary widely for I/I remediation on private property an average allowance of $10,000 per parcel is assumed for this study. This cost is based on recent experience in the City of Lakewood, and separate discussion with a local plumbing contractor active in the HHI-LSSES area.

3.6 Illicit Discharge Remediation

Correction of illicit discharges is discussed in the May 2017 Integrated Planning report, which used information from the Cuyahoga County Board of Health, Illicit Discharge Detection and Elimination Manual, 2006, to estimate an average cost for illicit discharge, detection and elimination of $15,000. Elimination construction assumes disconnection from the existing discharge location and reconnection to the sanitary sewer, which is assumed to be in the same street ROW. Escalation from 2014 (CCI-ENR 11,860) results in a 2018 construction cost of $15,600. This includes investigation and construction but no other soft costs for administration and enforcement, and so is considered as an average construction cost, to which will be added the contingency, engineering and administrative percentages for a project cost of $25,300 per site.

3.7 Correction of Failing Septic Systems

Individual failing septic tanks in the HHI service area may be repaired or replaced to bring them into compliance, or new sewerage improvements may be constructed to discharge the flows to the HHI sewer system. The Integrated Planning report developed a planning level project cost of $20,300 per unit to abandon the existing septic system, construct new local mainline sewers and connect the home service lateral to the new sewer system. Specific projects may result in costs higher or lower than this. Escalation of this cost to 2018 results in a project cost of $21,100 per property. Locations where costs may be higher than this would likely be candidates for a new septic system.

Based on internet searches, replacement of an individual drain field septic system can range from approximately $3,000 to $15,000, with a national average of $5,500. For this study, an average project cost of $10,000 is assumed to replace a single failing septic system.

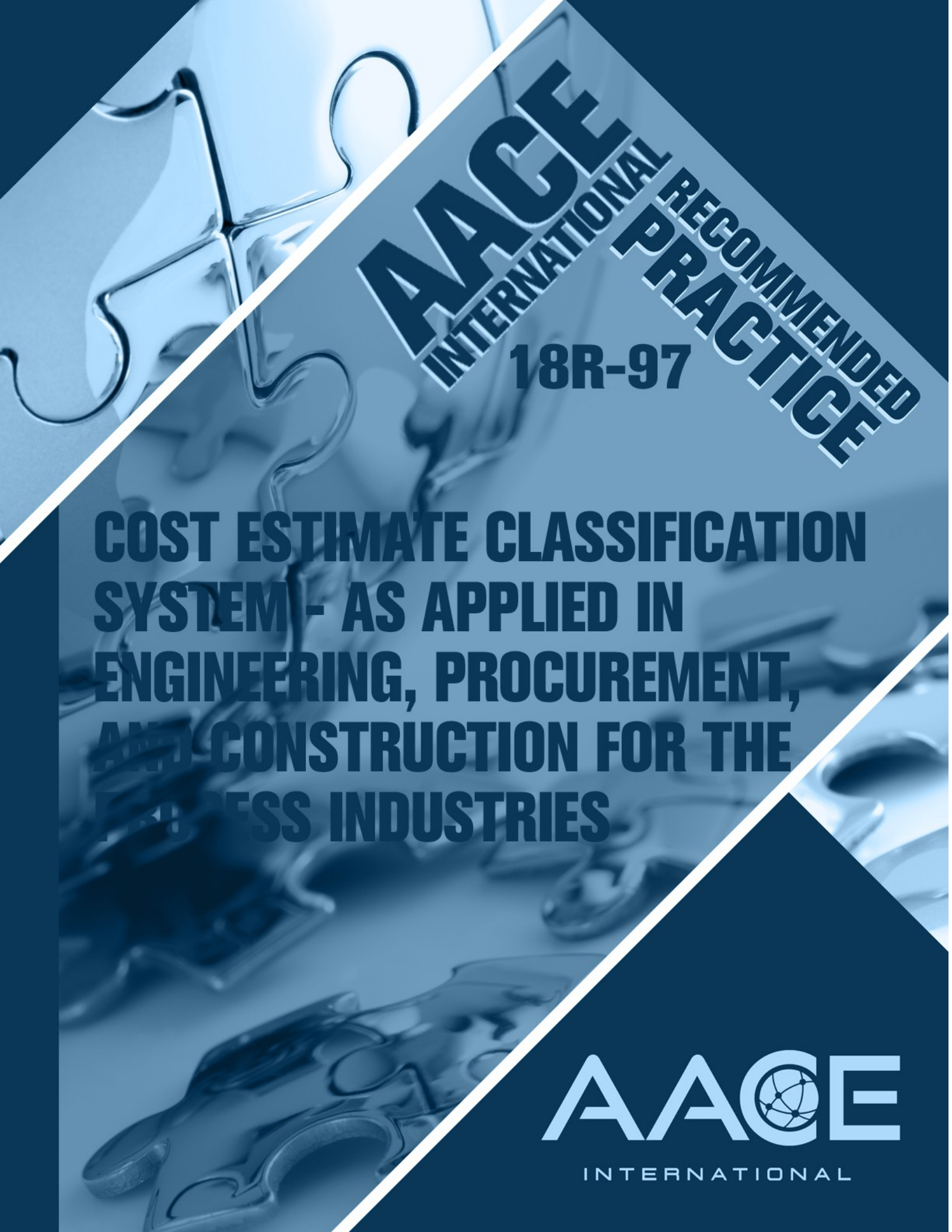
Appendix A.
ENR Construction Cost Index (CCI) for Cleveland through May 2018

Appendix A
ENR Construction Cost Index (CCI)
for Cleveland through May 2018

Cleveland CCI - updated May 2018								
	YEAR	**MONTH**	**BCI**	**%CHG**	**CCI**	**%CHG**		
	2018	May	5782	0	12325	0		
	2018	Apr	5789	0	12331	0		
	2018	Mar	5745	8	12287	17		
	2018	Feb	5745	0	12287	0		
	2018	Jan	5756	1	12299	0		
	2017	Dec	5745	1	12287	0		
	2017	Nov	5735	1	12277	2		
	2017	Oct	5715	0	12258	2		
	2017	Sept	5797	2	12339	3		
	2017	Aug	5799	2	12341	3		
	2017	Jul	5795	–1.8	12338	–2.4		
	2017	Jun	5788	2	12331	3		
	2017	May	5779	1	12322	2		
	2017	Apr	5776	1	12319	2		
	2017	Mar	5339	–3.9	10494	–11.9		
	2017	Feb	5339	–3.9	10494	–11.9		
	2017	Jan	5725	4	12268	3		
	2016	Dec	5697	4	12240	3		
	2016	Nov	5699	4	12052	1		
	2016	Oct	5698	4	12051	1		
	2016	Sep	5680	3	12032	1		
	2016	Aug	5694	4	12046	2		
	2016	Jul	5694	4	12047	2		
	2016	Jun	5683	4	12035	1		
	2016	May	5699	4	12051	2		
	2016	Apr	5707	4	12060	2		
	2016	Mar	5556	2	11908	0		
	2016	Feb	5555	2	11907	0		
	2016	Jan	5503	1	11896	0		
	2015	Dec	5494	0	11887	0		
	2015	Nov	5496	0	11887	–0.10		
	2015	Oct	5487	0	11877	0		
	2015	Sep	5493	1	11884	0		
	2015	Aug	5480	1	11870	0		
	2015	Jul	5480	0	11870	0		
	2015	Jun	5475	–0.15	11865	–0.07		
	2015	May	5483	0	11873	0		
	2015	Apr	5471	1	11861	1		
	2015	Mar	5467	6	11857	6		
	2015	Feb	5464	6	11870	6		
	2015	Jan	5476	6	11882	6		
	2014	Dec	5473	6	11879	6		
	2014	Nov	5488	6	11894	6		
	2014	Oct	5465	6	11871	6		
	2014	Sep	5443	7	11861	6		
	2014	Aug	5443	7	11860	6		
	2014	Jul	5443	6	11860	6		
	2014	Jun	5445	6	11862	6		
	2014	May	5441	6	11859	6		
	2014	Apr	5440	7	11757	5		
	2014	Mar	5161	2	11234	4		
	2014	Feb	5152	1	11225	4		
	2014	Jan	5154	3	11227	5		
	2013	Dec	5146	3	11218	5		
	2013	Nov	5148	3	11220	5		
	2013	Oct	5134	2	11207	5		
	2013	Sep	5108	2	11180	4		
	2013	Aug	5107	2	11179	4		
	2013	Jul	5131	3	11204	4		
	2013	Jun	5125	3	11197	5		
	2013	May	5118	3	11191	4		
	2013	Apr	5098	2	11170	4		
	2013	Mar	5082	2	10760	1		
	2013	Feb	5083	3	10761	6		
	2013	Jan	5029	2	10742	6		

Appendix B.

AACE Recommended Practice No. 18R-97, Cost Estimate Classification System



AACE INTERNATIONAL RECOMMENDED PRACTICE

18R-97

COST ESTIMATE CLASSIFICATION SYSTEM - AS APPLIED IN ENGINEERING, PROCUREMENT, AND CONSTRUCTION FOR THE PROCESS INDUSTRIES

AACE INTERNATIONAL



AACE International Recommended Practice No. 18R-97

COST ESTIMATE CLASSIFICATION SYSTEM – AS APPLIED IN ENGINEERING, PROCUREMENT, AND CONSTRUCTION FOR THE PROCESS INDUSTRIES

TCM Framework: 7.3 – Cost Estimating and Budgeting

Rev. March 1, 2016

Note: As AACE International Recommended Practices evolve over time, please refer to www.aacei.org for the latest revisions.

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AACE® International Recommended Practice No. 18R-97

COST ESTIMATE CLASSIFICATION SYSTEM – AS APPLIED IN ENGINEERING, PROCUREMENT, AND CONSTRUCTION FOR THE PROCESS INDUSTRIES

TCM Framework: 7.3 – Cost Estimating and Budgeting

March 1, 2016

PURPOSE

As a recommended practice of AACE International, the *Cost Estimate Classification System* provides guidelines for applying the general principles of estimate classification to project cost estimates (i.e., cost estimates that are used to evaluate, approve, and/or fund projects). The *Cost Estimate Classification System* maps the phases and stages of project cost estimating together with a generic project scope definition maturity and quality matrix, which can be applied across a wide variety of process industries.

This addendum to the generic recommended practice (17R-97) provides guidelines for applying the principles of estimate classification specifically to project estimates for engineering, procurement, and construction (EPC) work for the process industries. This addendum supplements the generic recommended practice by providing:

- A section that further defines classification concepts as they apply to the process industries.
- A chart that maps the extent and maturity of estimate input information (project definition deliverables) against the class of estimate.

As with the generic recommended practice, the intent of this addendum is to improve communications among all of the stakeholders involved with preparing, evaluating, and using project cost estimates specifically for the process industries.

The overall purpose of this recommended practice is to provide the process industry with a project definition deliverable maturity matrix that is not provided in 17R-97. It also provides an approximate representation of the relationship of specific design input data and design deliverable maturity to the estimate accuracy and methodology used to produce the cost estimate. The estimate accuracy range is driven by many other variables and risks, so the maturity and quality of the scope definition available at the time of the estimate is not the sole determinate of accuracy; risk analysis is required for that purpose.

This document is intended to provide a guideline, not a standard. It is understood that each enterprise may have its own project and estimating processes and terminology and may classify estimates in particular ways. This guideline provides a generic and generally acceptable classification system for process industries that can be used as a basis to compare against. This addendum should allow each user to better assess, define, and communicate their own processes and standards in the light of generally-accepted cost engineering practice.

INTRODUCTION

For the purposes of this addendum, the term “process industries” is assumed to include firms involved with the manufacturing and production of chemicals, petrochemicals, and hydrocarbon processing. The common thread among these industries (for the purpose of estimate classification) is their reliance on process flow diagrams (PFDs) and piping and instrument diagrams (P&IDs) as primary scope defining documents. These documents are key deliverables in determining the degree of project definition, and thus the extent and maturity of estimate input information.

Estimates for process facilities center on mechanical and chemical process equipment, and they have significant amounts of piping, instrumentation, and process controls involved. As such, this addendum may apply to portions of other industries, such as pharmaceutical, utility, water treatment, metallurgical, converting, and similar industries.

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This addendum specifically does not address cost estimate classification in non-process industries such as commercial building construction, environmental remediation, transportation infrastructure, hydropower, "dry" processes such as assembly and manufacturing, "soft asset" production such as software development, and similar industries. It also does not specifically address estimates for the exploration, production, or transportation of mining or hydrocarbon materials, although it may apply to some of the intermediate processing steps in these systems.

The cost estimates covered by this addendum are for engineering, procurement, and construction (EPC) work only. It does not cover estimates for the products manufactured by the process facilities, or for research and development work in support of the process industries. This guideline does not cover the significant building construction that may be a part of process plants.

This guideline reflects generally-accepted cost engineering practices. This RP was based upon the practices of a wide range of companies in the process industries from around the world, as well as published references and standards. Company and public standards were solicited and reviewed, and the practices were found to have significant commonalities. These classifications are also supported by empirical process industry research of systemic risks and their correlation with cost growth and schedule slip[8].

COST ESTIMATE CLASSIFICATION MATRIX FOR THE PROCESS INDUSTRIES

A purpose of cost estimate classification is to align the estimating process with project stage-gate scope development and decision-making processes.

Table 1 provides a summary of the characteristics of the five estimate classes. The maturity level of project definition is the sole determining (i.e., primary) characteristic of class. In Table 1, the maturity is roughly indicated by a percentage of complete definition; however, it is the maturity of the defining deliverables that is the determinant, not the percent. The specific deliverables, and their maturity or status are provided in Table 3. The other characteristics are secondary and are generally correlated with the maturity level of project definition deliverables, as discussed in the generic RP [2]. The post sanction classes (Class 1 and 2) are only indirectly covered where new funding is indicated. Again, the characteristics are typical and may vary depending on the circumstances.

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	Primary Characteristic	*Secondary Characteristic*		
ESTIMATE CLASS	**MATURITY LEVEL OF PROJECT DEFINITION DELIVERABLES** Expressed as % of complete definition	**END USAGE** Typical purpose of estimate	**METHODOLOGY** Typical estimating method	**EXPECTED ACCURACY RANGE** Typical variation in low and high ranges
Class 5	0% to 2%	Concept screening	Capacity factored, parametric models, judgment, or analogy	L: -20% to -50% H: +30% to +100%
Class 4	1% to 15%	Study or feasibility	Equipment factored or parametric models	L: -15% to -30% H: +20% to +50%
Class 3	10% to 40%	Budget authorization or control	Semi-detailed unit costs with assembly level line items	L: -10% to -20% H: +10% to +30%
Class 2	30% to 75%	Control or bid/tender	Detailed unit cost with forced detailed take-off	L: -5% to -15% H: +5% to +20%
Class 1	65% to 100%	Check estimate or bid/tender	Detailed unit cost with detailed take-off	L: -3% to -10% H: +3% to +15%

Table 1 – Cost Estimate Classification Matrix for Process Industries

This matrix and guideline outline an estimate classification system that is specific to the process industries. Refer to the generic estimate classification RP[1] for a general matrix that is non-industry specific, or to other addendums for guidelines that will provide more detailed information for application in other specific industries. These will provide additional information, particularly the project definition deliverable maturity matrix which determines the class in those particular industries.

Table 1 illustrates typical ranges of accuracy ranges that are associated with the process industries. The +/- value represents typical percentage variation of actual costs from the cost estimate after application of contingency (typically to achieve a 50% probability of project overrun versus underrun) for given scope. Depending on the technical and project deliverables (and other variables) and risks associated with each estimate, the accuracy range for any particular estimate is expected to fall into the ranges identified (although extreme risks can lead to wider ranges).

In addition to the degree of project definition, estimate accuracy is also driven by other systemic risks such as:

- Level of non-familiar technology in the project.
- Complexity of the project.
- Quality of reference cost estimating data.
- Quality of assumptions used in preparing the estimate.
- Experience and skill level of the estimator.
- Estimating techniques employed.
- Time and level of effort budgeted to prepare the estimate.
- Unique/remote nature of project locations and the lack of reference data for these locations.
- The accuracy of the composition of the input and output process streams.

Systemic risks such as these are often the primary driver of accuracy, especially during the early stages of project definition. As project definition progresses, project-specific risks (e.g. risk events) become more prevalent and also drive the accuracy range[3]. Another concern in estimates is potential pressure for a predetermined value that may

result in a biased estimate. The goal should be to always have an unbiased and objective estimate. The stated estimate ranges are dependent on this premise and a realistic view of the project.

Failure to appropriately address systemic risks (e.g. technical complexity) during risk analysis impacts the resulting probability distribution of the estimate costs, and therefore the interpretation of estimate accuracy.

Another way to look at the variability associated with estimate accuracy ranges is shown in Figure 1. Depending upon the technical complexity of the project, the availability of appropriate cost reference information, the degree of project definition, and the inclusion of appropriate contingency determination, a typical Class 5 estimate for a process industry project may have an accuracy range as broad as -50% to +100%, or as narrow as -20% to +30%.

Figure 1 also illustrates that the estimating accuracy ranges overlap the estimate classes. There are cases where a Class 5 estimate for a particular project may be as accurate as a Class 3 estimate for a different project. For example, similar accuracy ranges may occur if the Class 5 estimate of one project that is based on a repeat project with good cost history and data and, whereas the Class 3 estimate for another is for a project involving new technology. It is for this reason that Table 1 provides ranges of accuracy range values. This allows application of the specific circumstances inherent in a project, and an industry sector, to provide realistic estimate class accuracy range percentages. While a target range may be expected of a particular estimate, the accuracy range is determined through risk analysis of the specific project and is never pre-determined. AACE has recommended practices that address contingency determination and risk analysis methods.

If contingency has been addressed appropriately, approximately 80% of projects should fall within the ranges shown in Figure 1. However, this does not preclude a specific actual project result from falling inside or outside of the bands shown in Figure 1 indicating the expected accuracy ranges.

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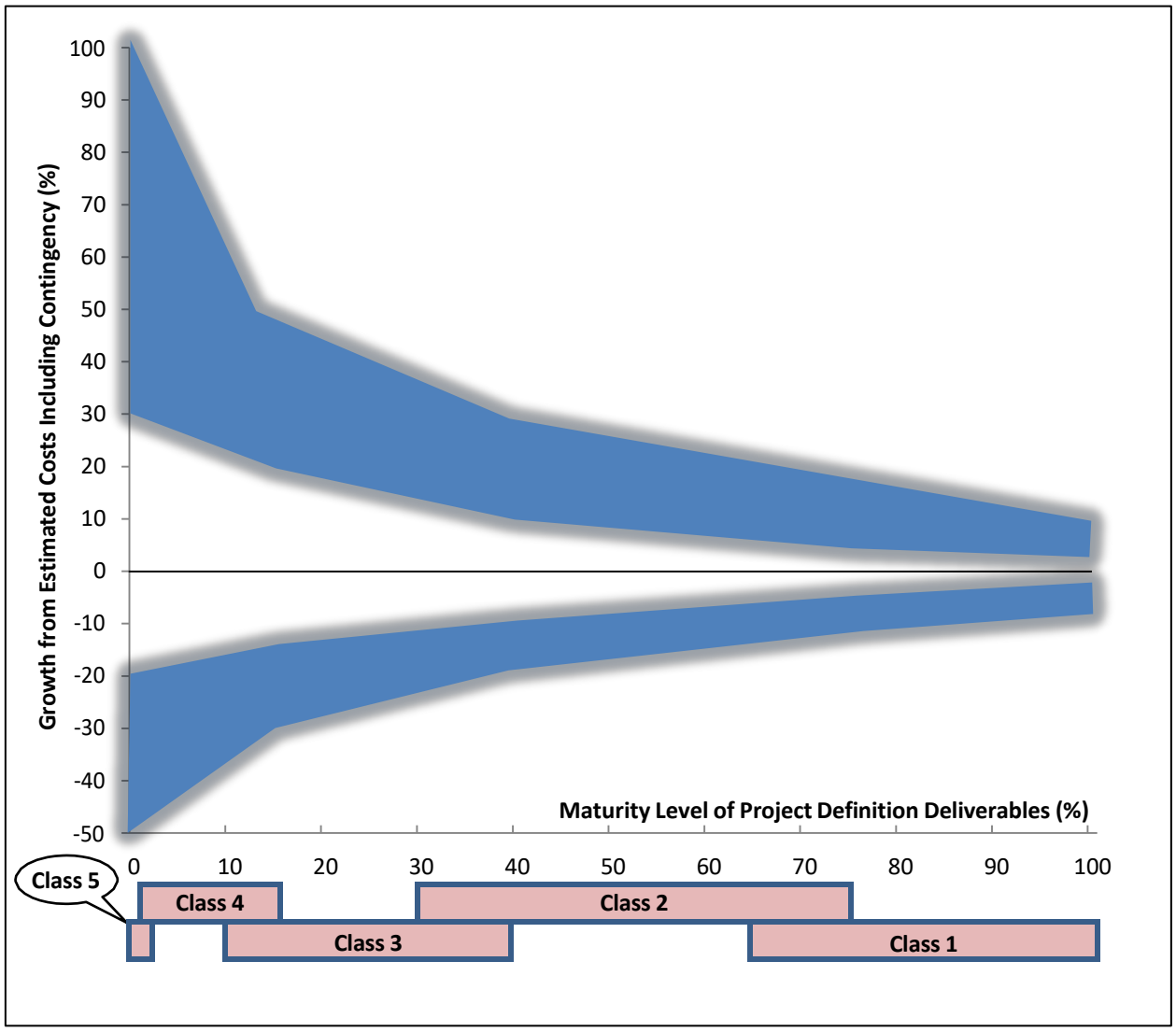
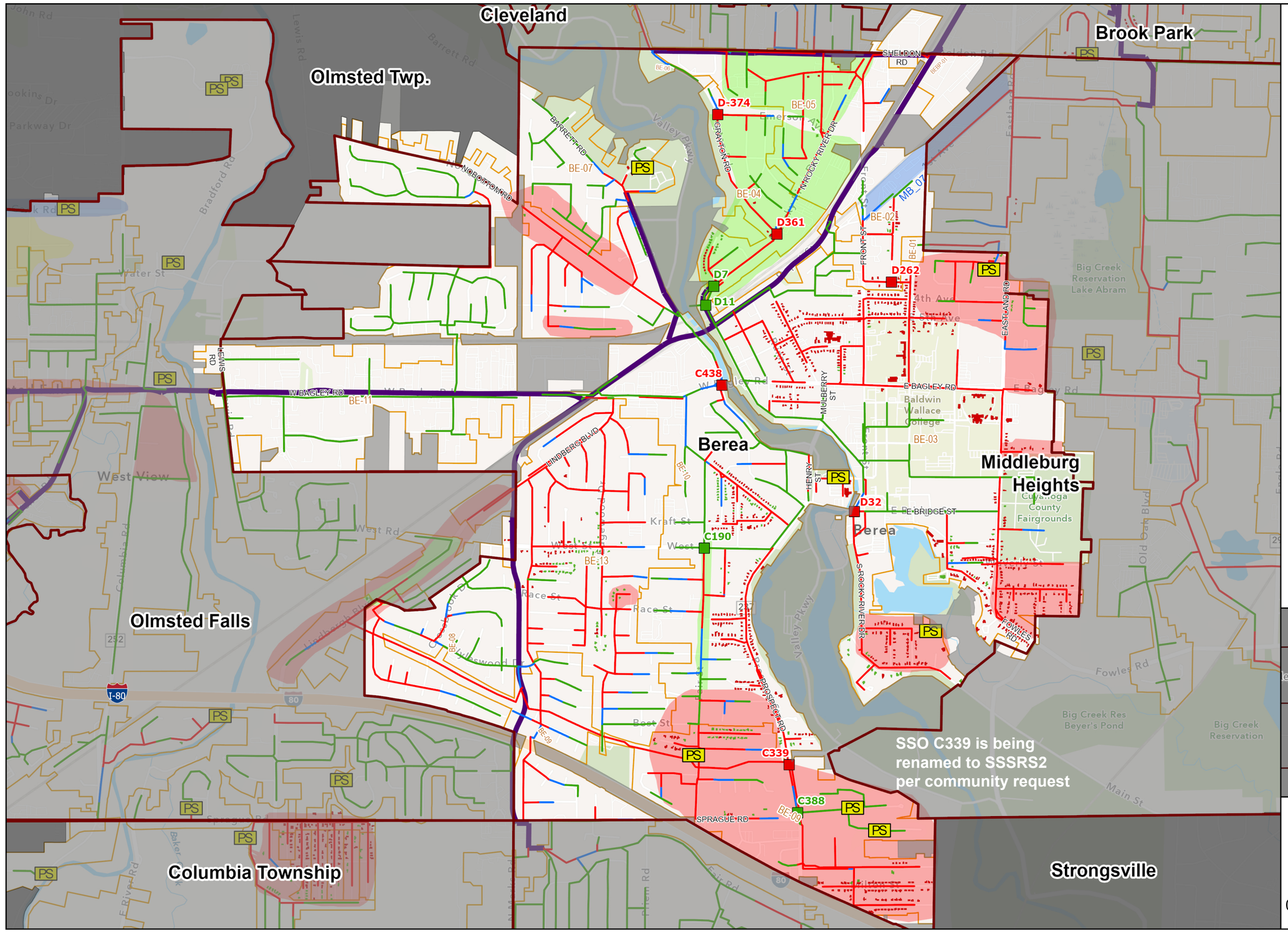


Figure 1 – Example of the Variability in Accuracy Ranges for a Process Industry Estimate

DETERMINATION OF THE COST ESTIMATE CLASS

The cost estimator makes the determination of the estimate class based upon the maturity level of project definition based on the status of specific key planning and design deliverables. The percent design completion may be correlated with the status, but the percentage should not be used as the estimate class determinant. While the determination of the status (and hence the estimate class) is somewhat subjective, having standards for the design input data, completeness and quality of the design deliverables will serve to make the determination more objective.

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Legend

- Community Boundary
- Non-SWI LSSES Project Area
- Adjacent Community Area and/or Unsewered Area
- District Sewer
- PFA (With ID)
- PS — Pump Station
- Basement Backup

Community Reported Problem Area

- Basement Backup Locations
- Failing HSTSs
- Surface Flooding
- Current/Previous Project or Other

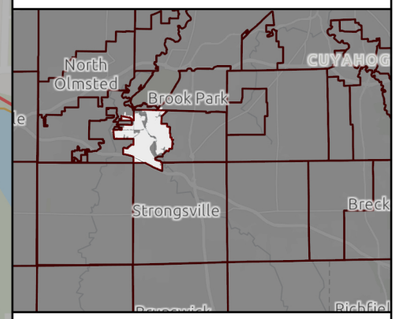
Modeled Local Sewers

FirstStormSur_20210608

- First Surcharges During 5Yr
- First Surcharges During 10Yr
- Non-Surcharged Sewer

Basement Backups

- 5Yr and 10Yr
- 10Yr Only



N

Date Created: 9/16/2021

0 1,000 2,000 Feet

Folder: P:\Neo50140\1e\Docs\1.50 Project Data Sets\GIS-data\Projects\Report Maps\Report Maps\
Name: Task3_5 and 10 Yr Performance

Northeast Ohio Regional Sewer District

SWI-LSSES

Berea 5 and 10 Yr Performance

WADE TRIM

Brown AND Caldwell

Figure H1. Future Development Areas and Model Loading Points

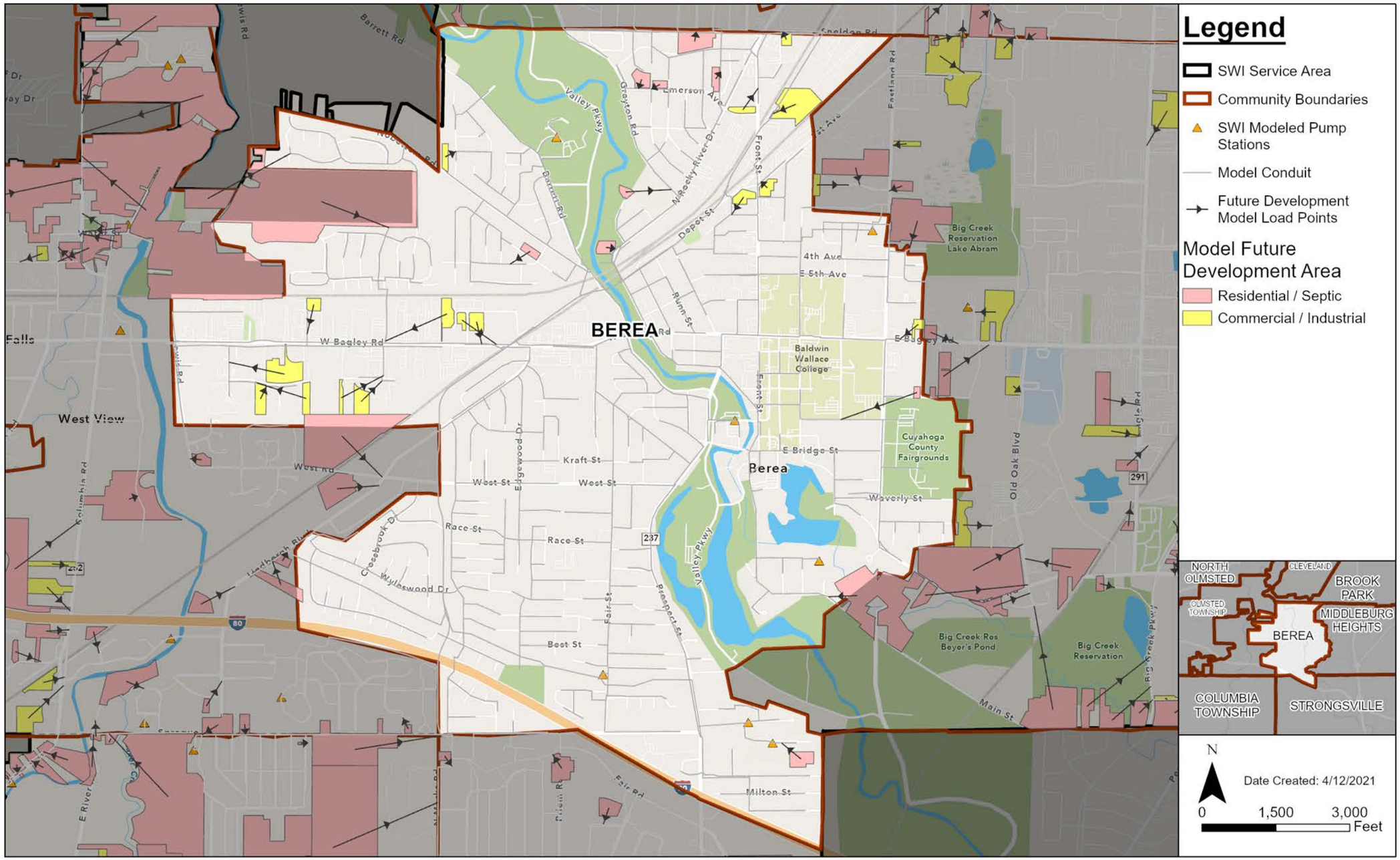


Figure H2. Berea Existing vs. Future Conditions Base System Model Results

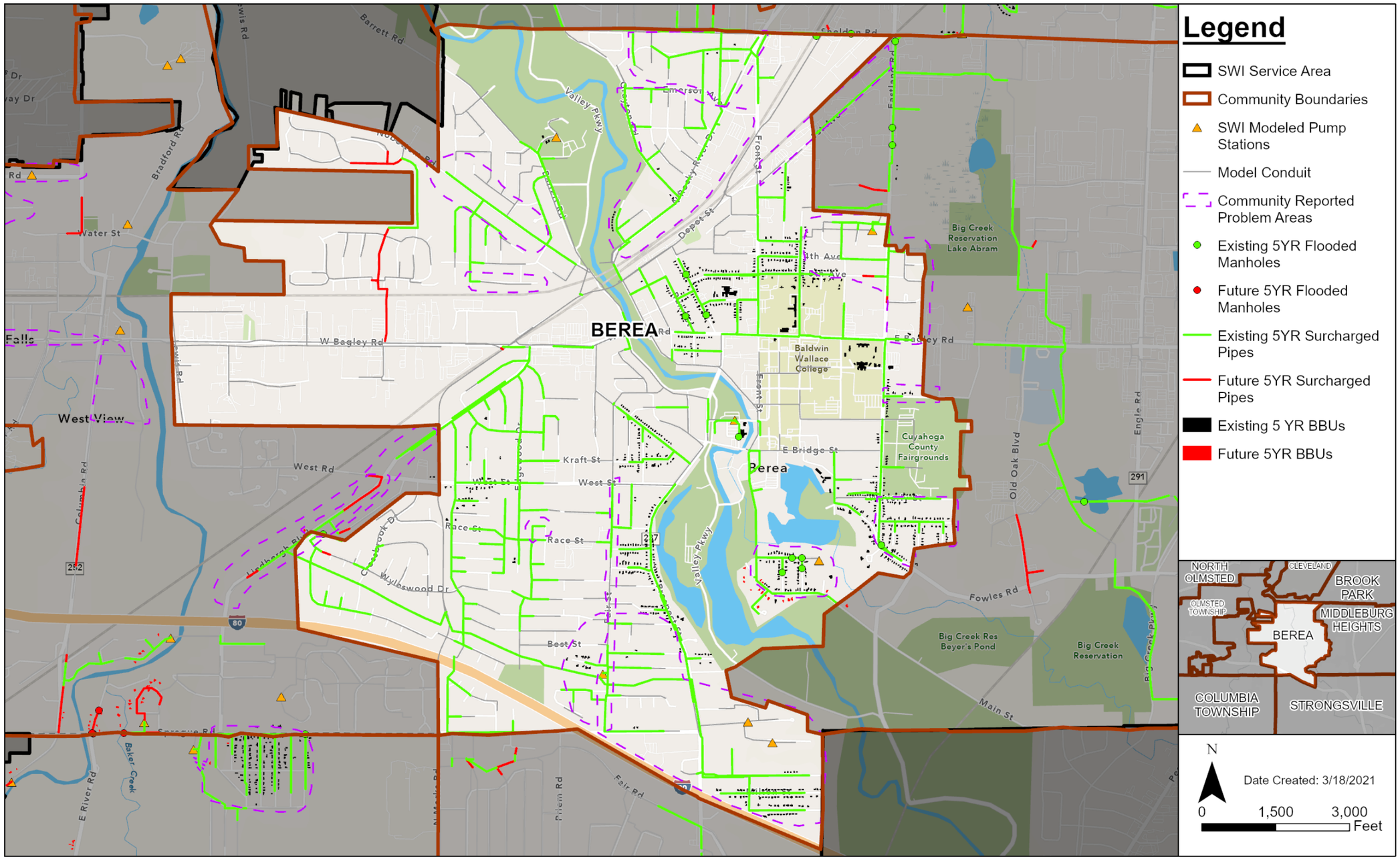


Figure H3. Existing Versus Future Conditions Tier 1 Improvements Model Results

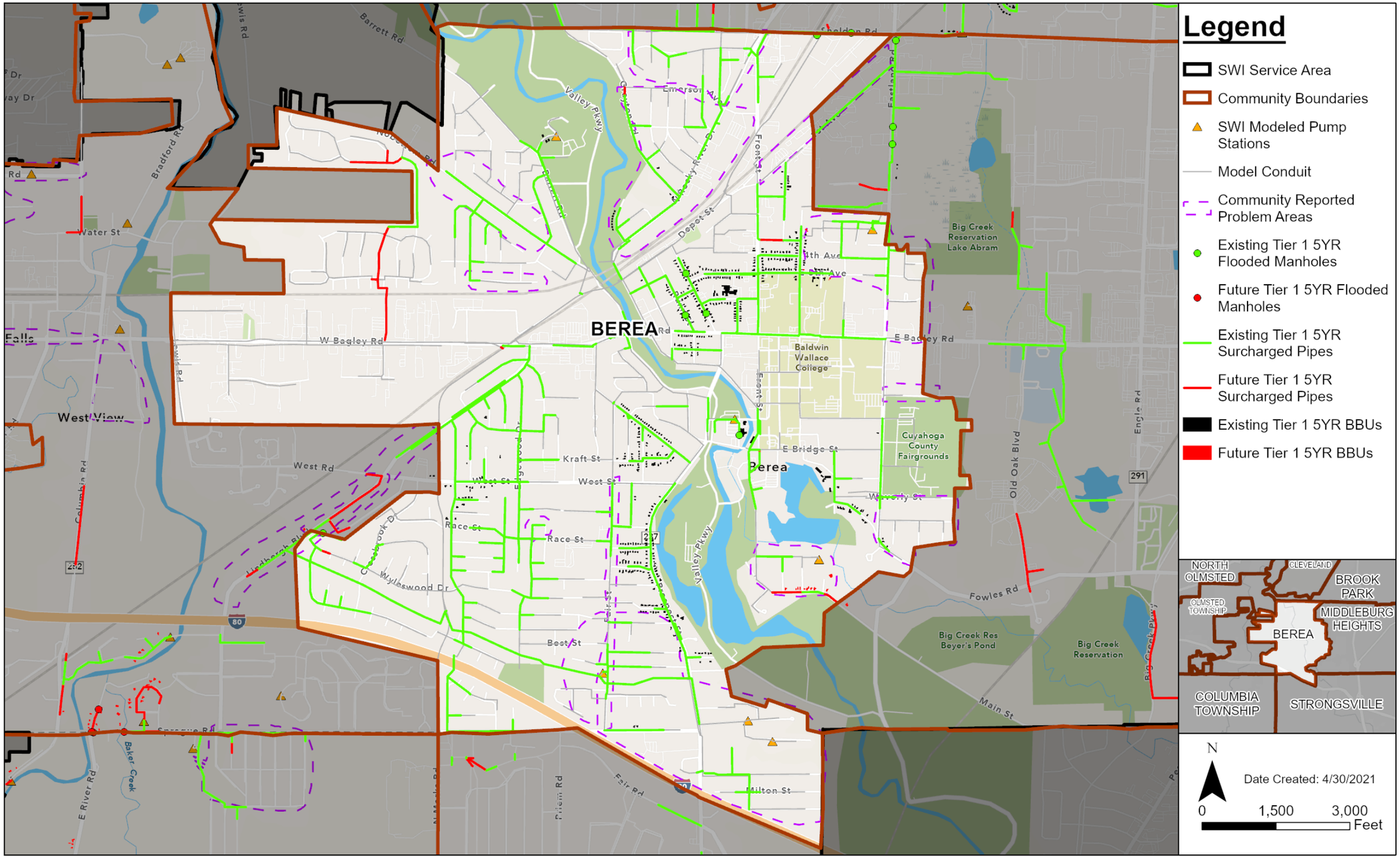
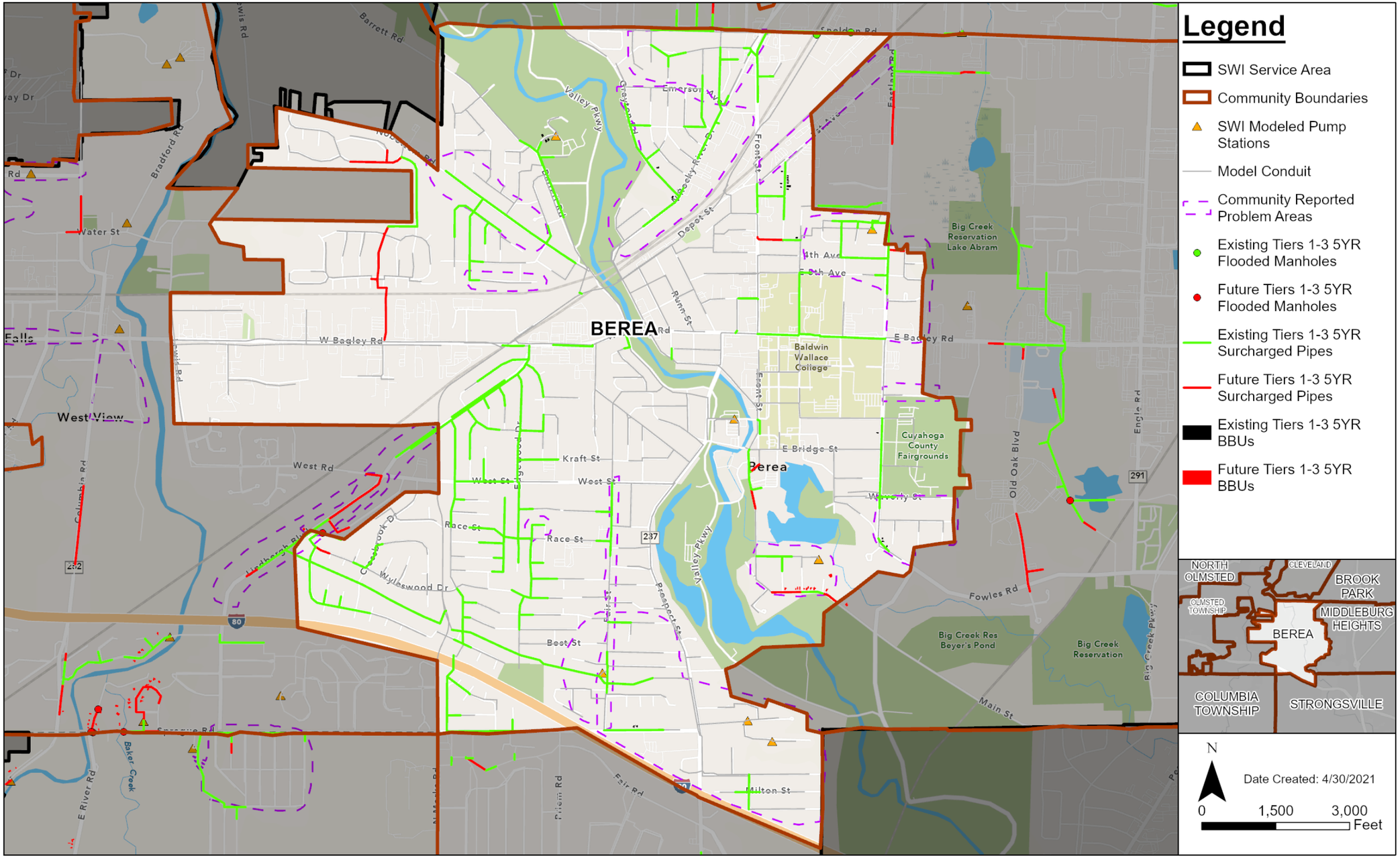


Figure H4. Existing Versus Future Conditions Tiers 1-3 Improvements Model Results

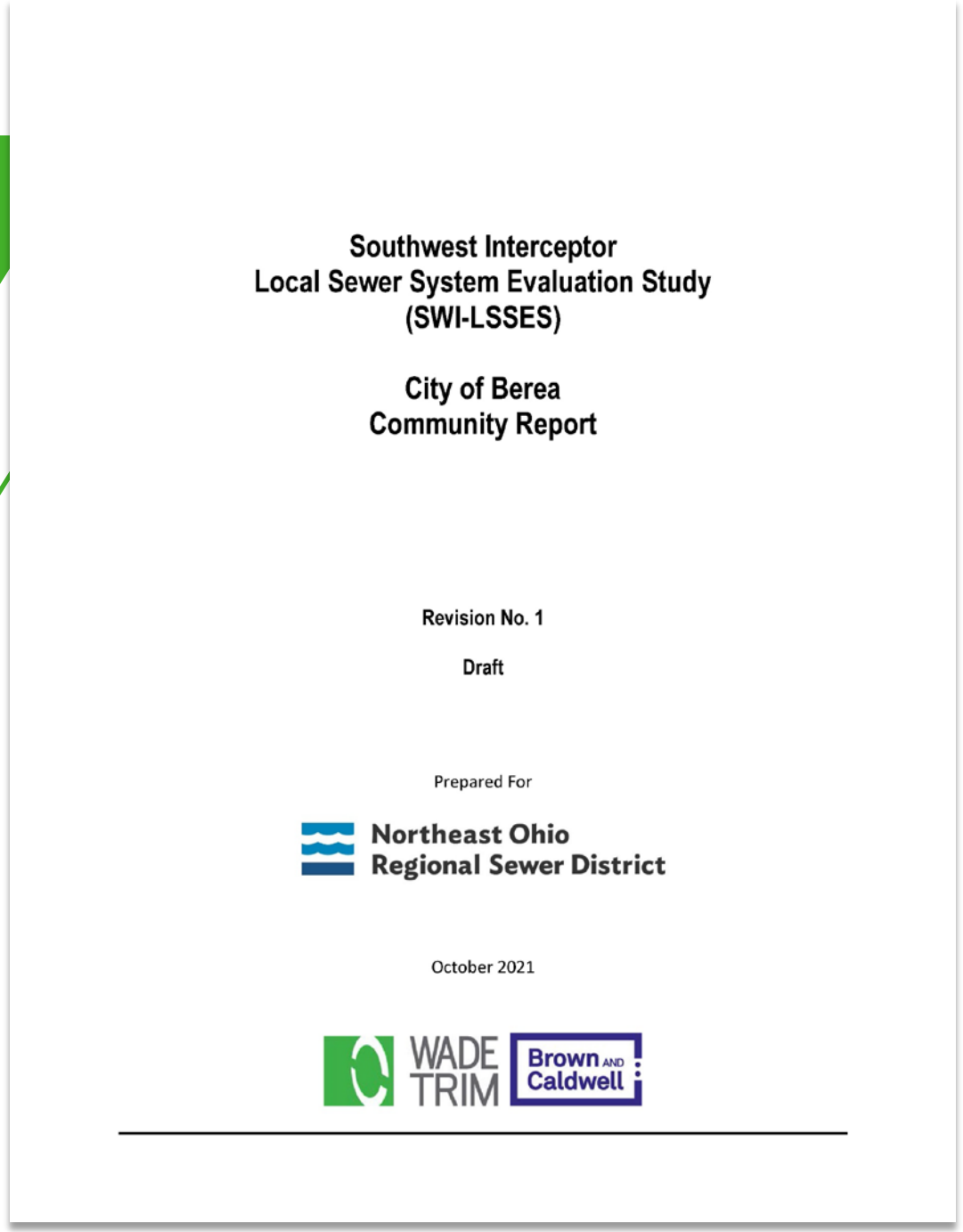


1485 SWI-LSSES
City of Berea
Community Meeting
Overview and Potential Solutions

January 6, 2022

Northeast Ohio Regional Sewer District

WADE TRIM | Brown AND Caldwell | Hazen



Southwest Interceptor
Local Sewer System Evaluation Study
(SWI-LSSES)

City of Berea
Community Report

Revision No. 1

Draft

Prepared For

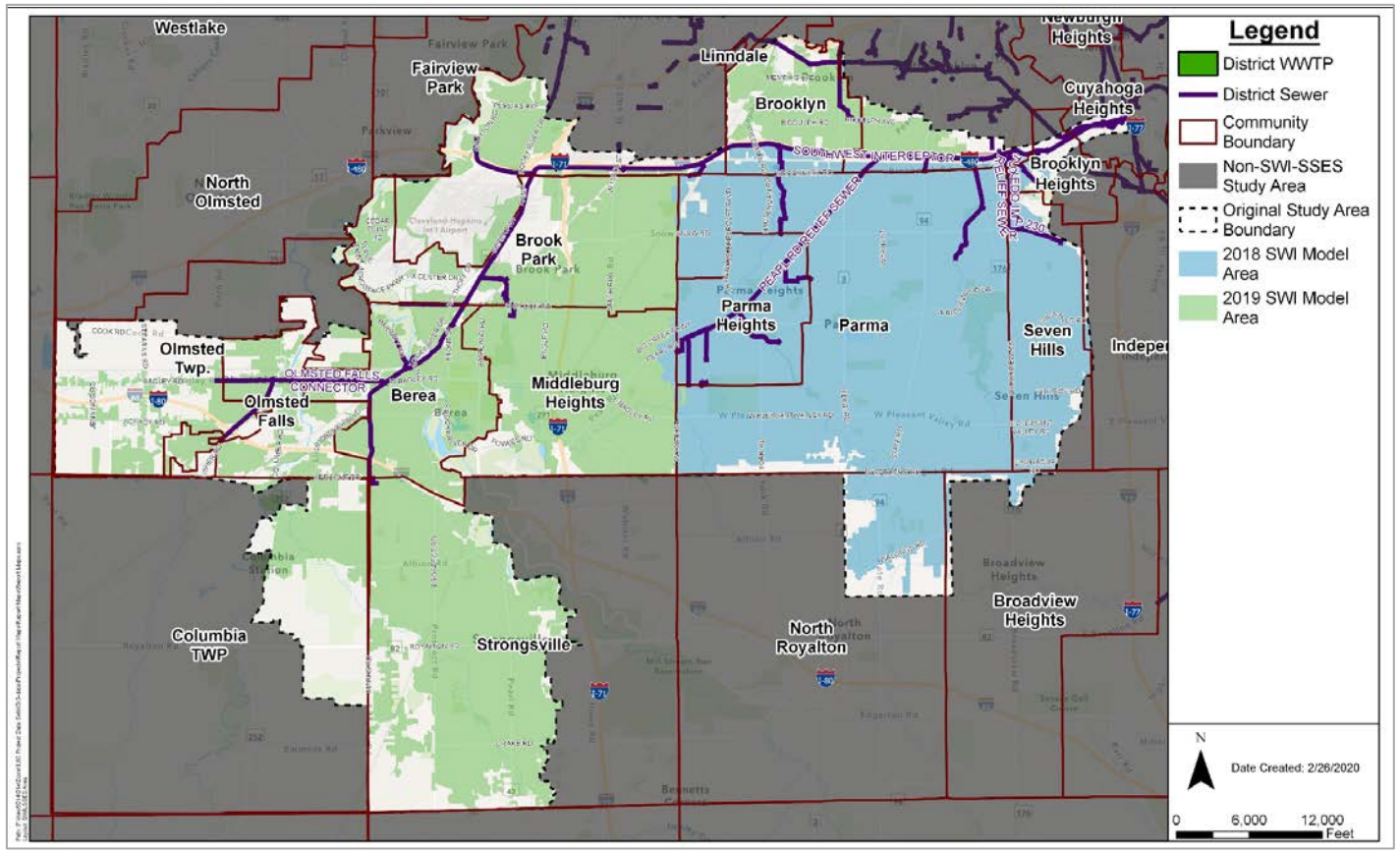
Northeast Ohio
Regional Sewer District

October 2021

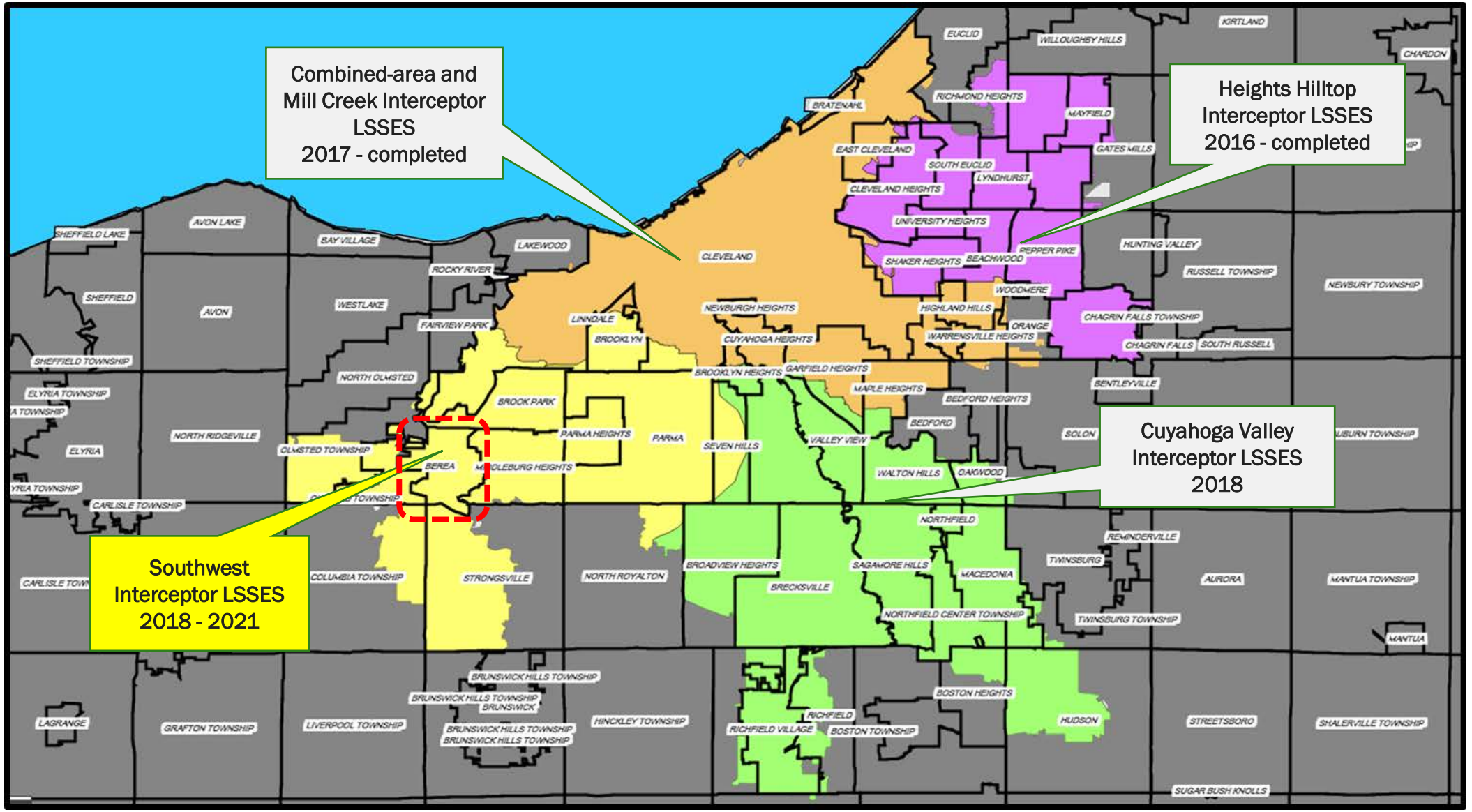
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Agenda

1. Introductions
2. Project status, meeting purpose
3. Local system evaluation
4. Potential improvements
5. Implementation considerations
6. Next steps



LSSES Project Areas and Status



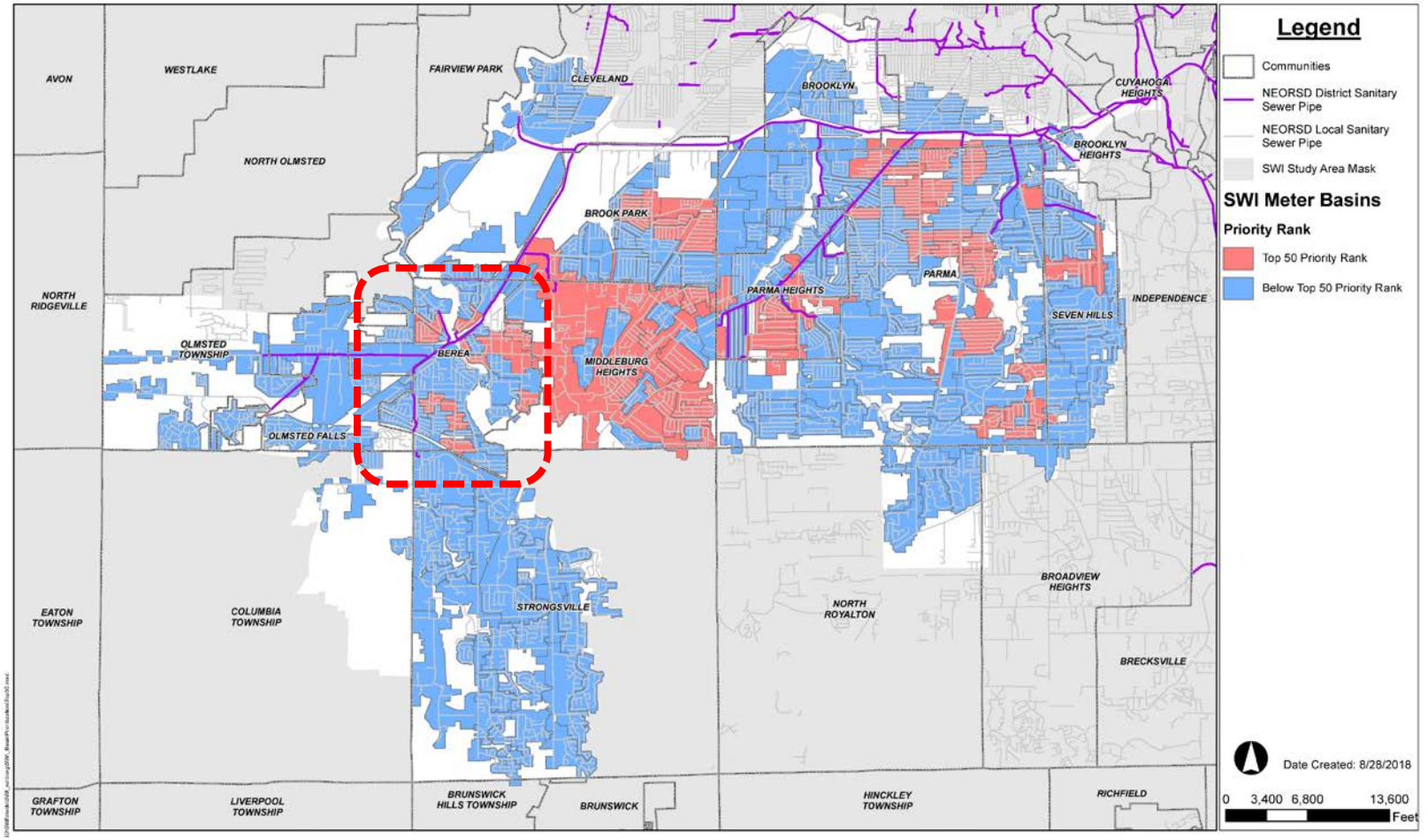
Local System Sewer Evaluation Study Targets

- Flow monitoring and field investigations
- Trench types
- System modeling results
  - Sewer system surcharge and basement backups (BBUs)
  - SSO activations
  - Excessive infiltration and inflow (I/I)
- Sewage/stormwater cross flows and pollution
- Illicit discharges and failing HSTSs (septics)

Original Study Area Investigations Prioritization

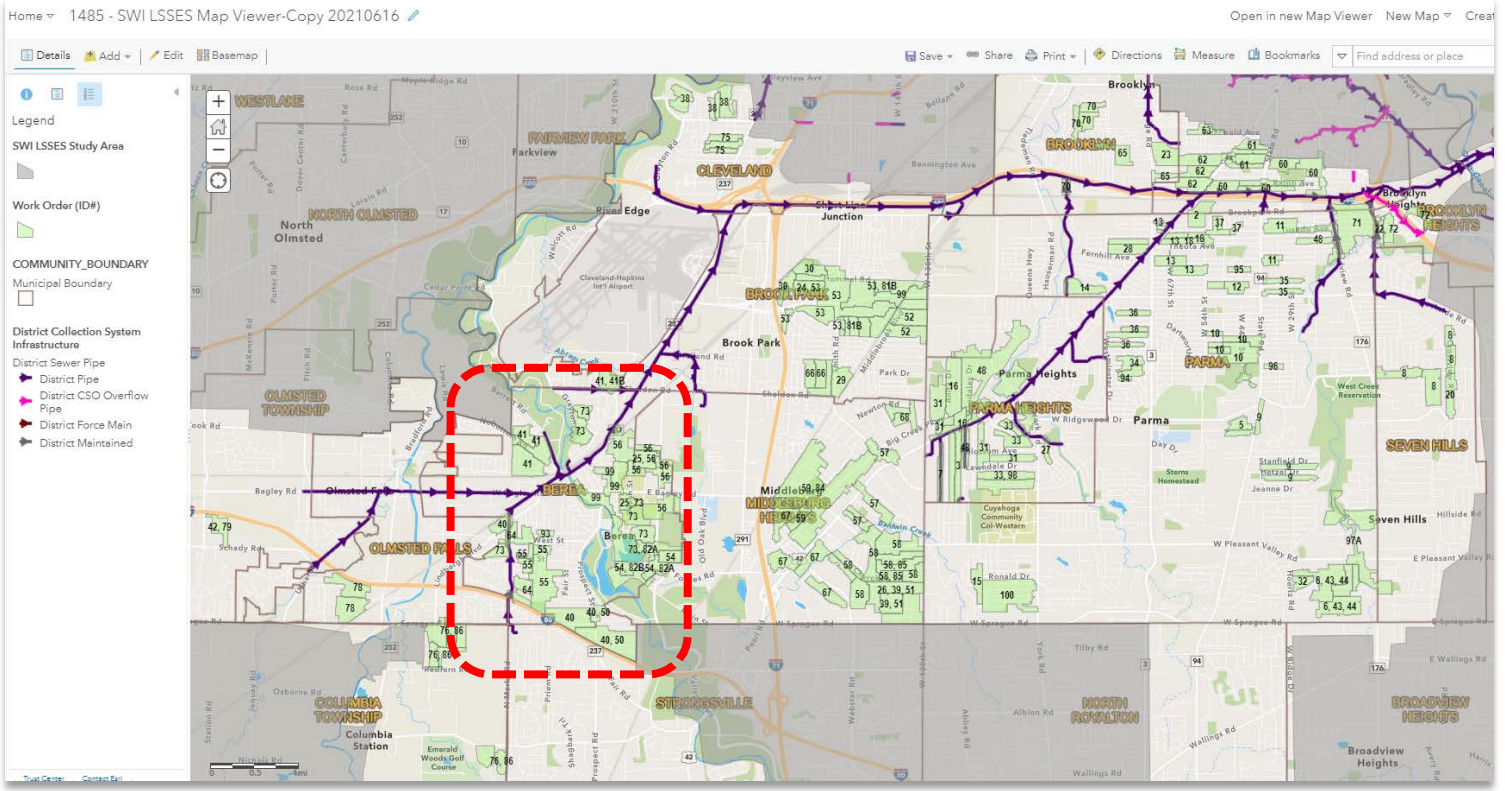
Prioritization Targeted

- SSOs
- Community reported problems
- High wet weather flows
- Observed surcharge
- Projected problems
- Common trench sewers



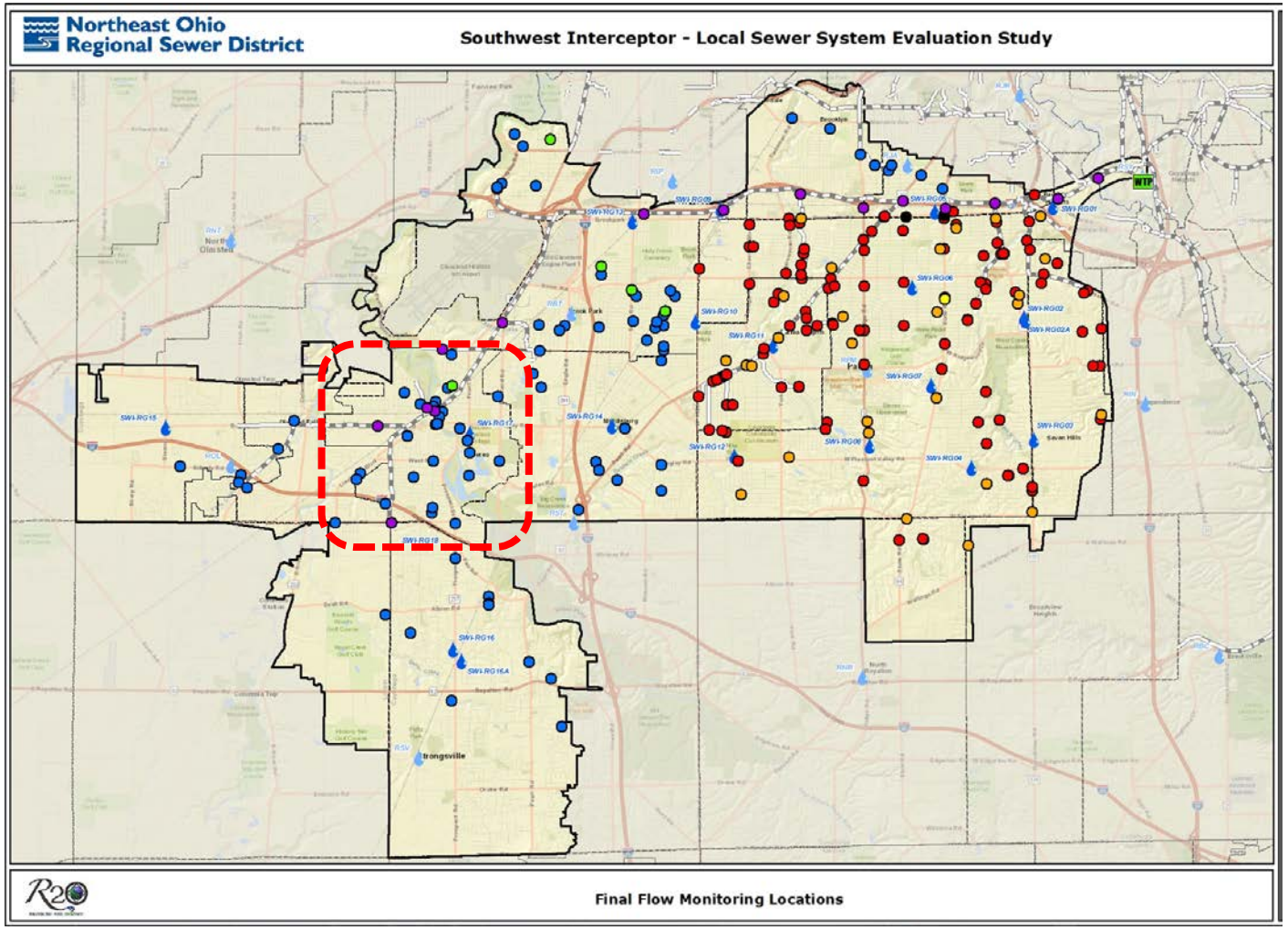
100 Field Work Orders Completed, 16 in Berea

- Focused on priority areas first
- Adapted later work orders to new information
- 28 miles dyed water/CCTV testing
- 8 miles additional CCTV
- Dye tested at over 400 private properties (17 in Berea)
- 1000+ spot dye tests
- 1000+ MH inspections
- 52 days smoke testing



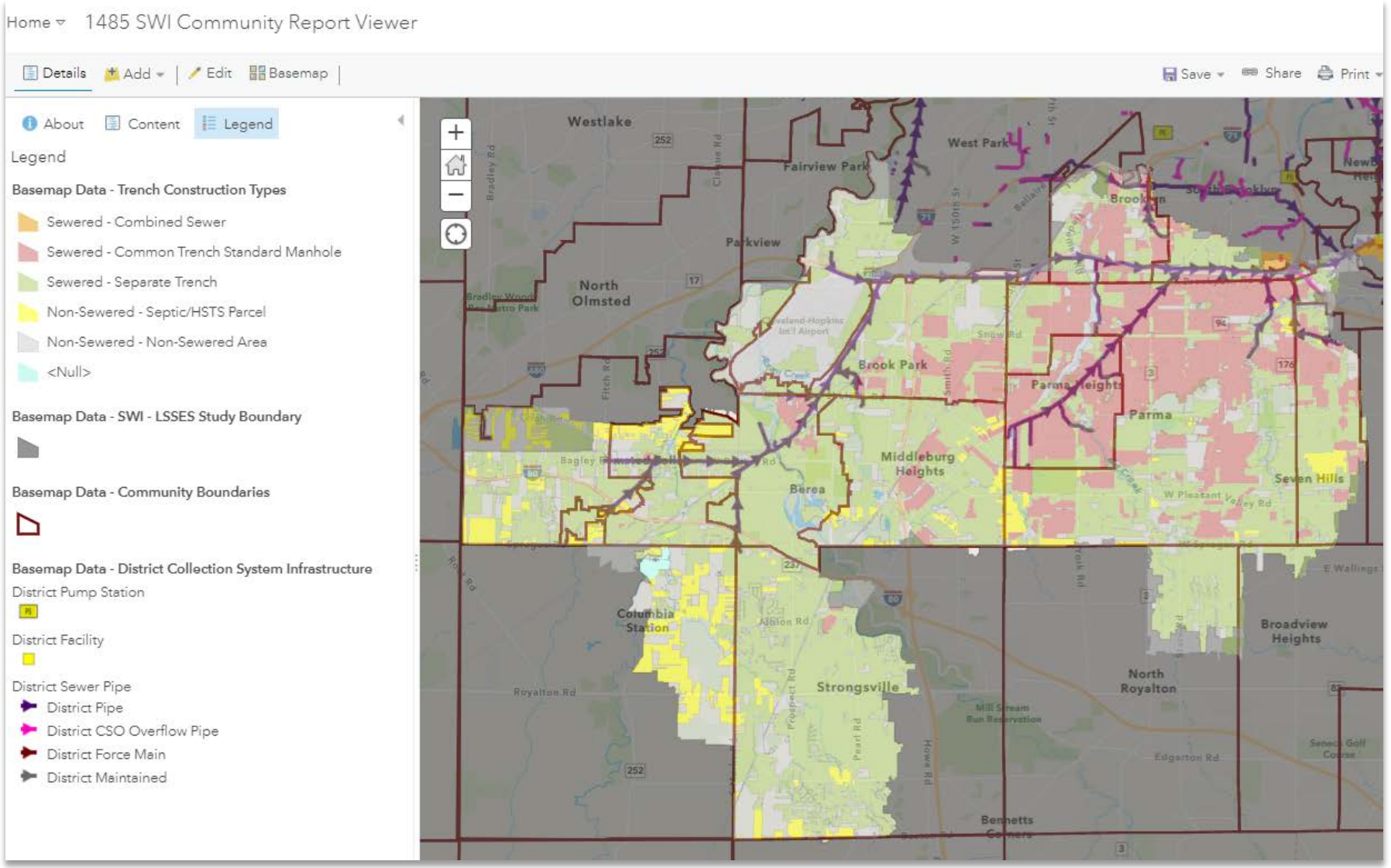
Flow/Rainfall Monitoring

- Two years
- 269 model calibration meters (25 Berea, 3+ months)
- 529 shorter term micromonitoring locations (61 Berea)
- 17 temporary rain gauges
- District permanent gauges



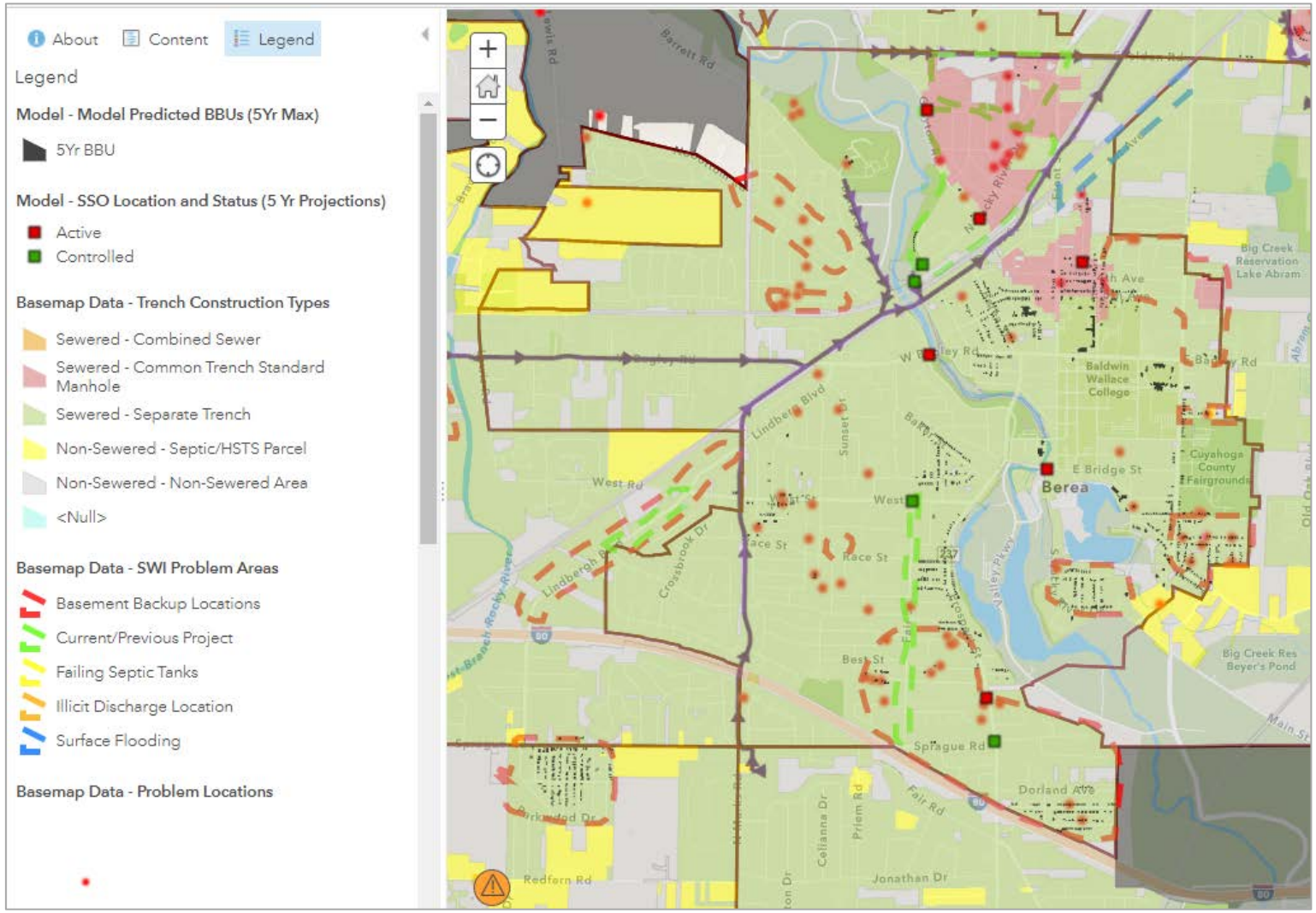
Sanitary Sewer Trench Types

- Total sanitary sewer length ~ 850 miles tributary to SWI
- 66% separate trench sewers, 34% common trench sewers (tributary to SWI)



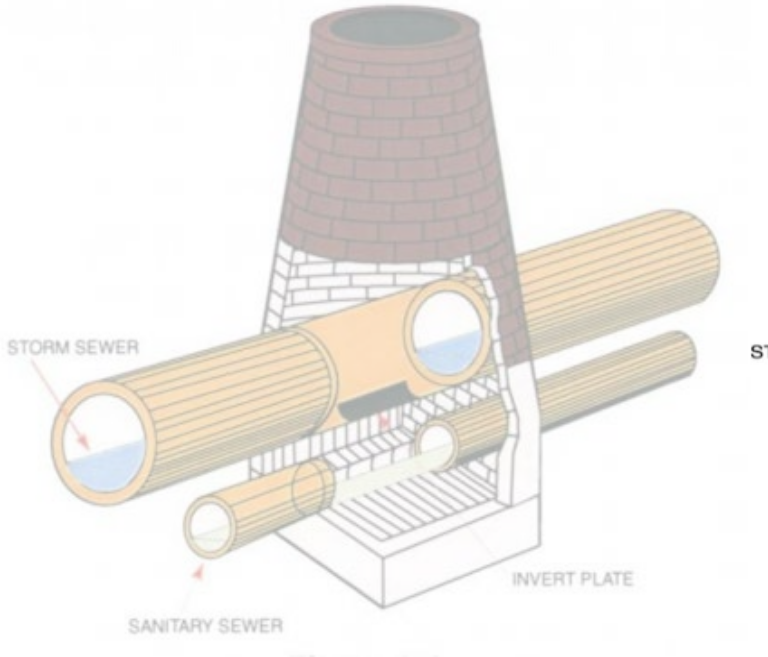
Berea Trench Types and Problem Areas

- Limited areas of common trench sewer (9%)
- Basement backups (BBUs) are projected in reported problem areas
- 840/6,590 (13%) of properties projected at risk of BBUs for 5-yr rainfall
- 6 of 10 SSOs projected to be active (2 are less than 0.01MG)



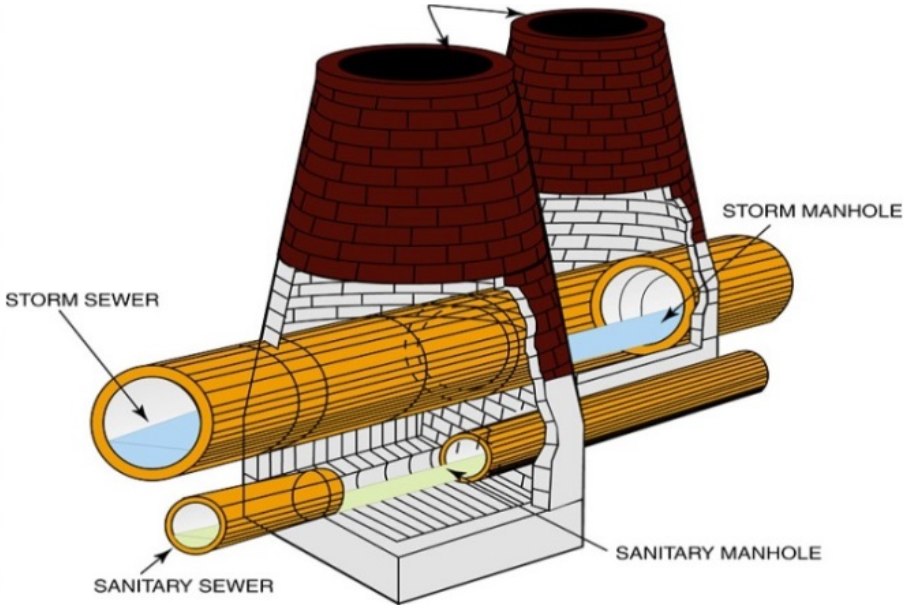
Common Trench Sewer Types

Over/Under Sewers



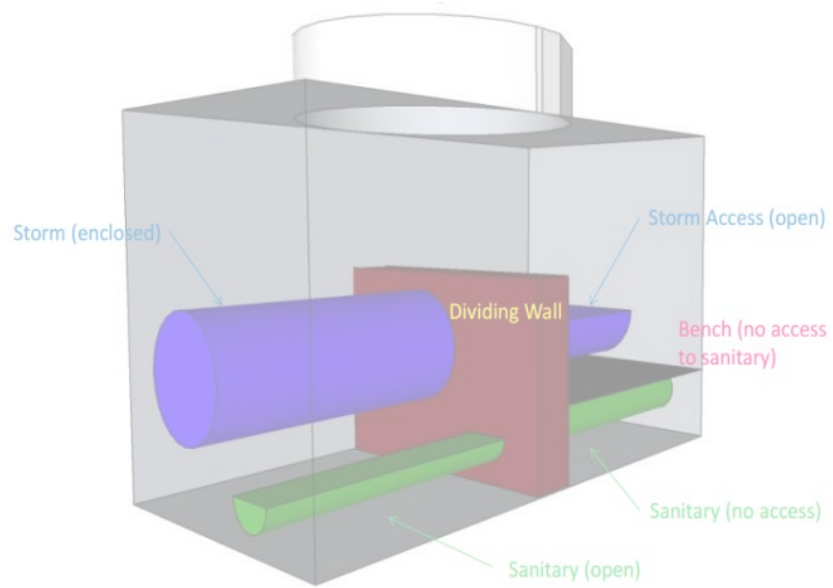
Common Standard Sewers

Common Standard Manholes



~9% of sewers in Berea

Dividing Wall Sewers



WEAT
North Texas Section

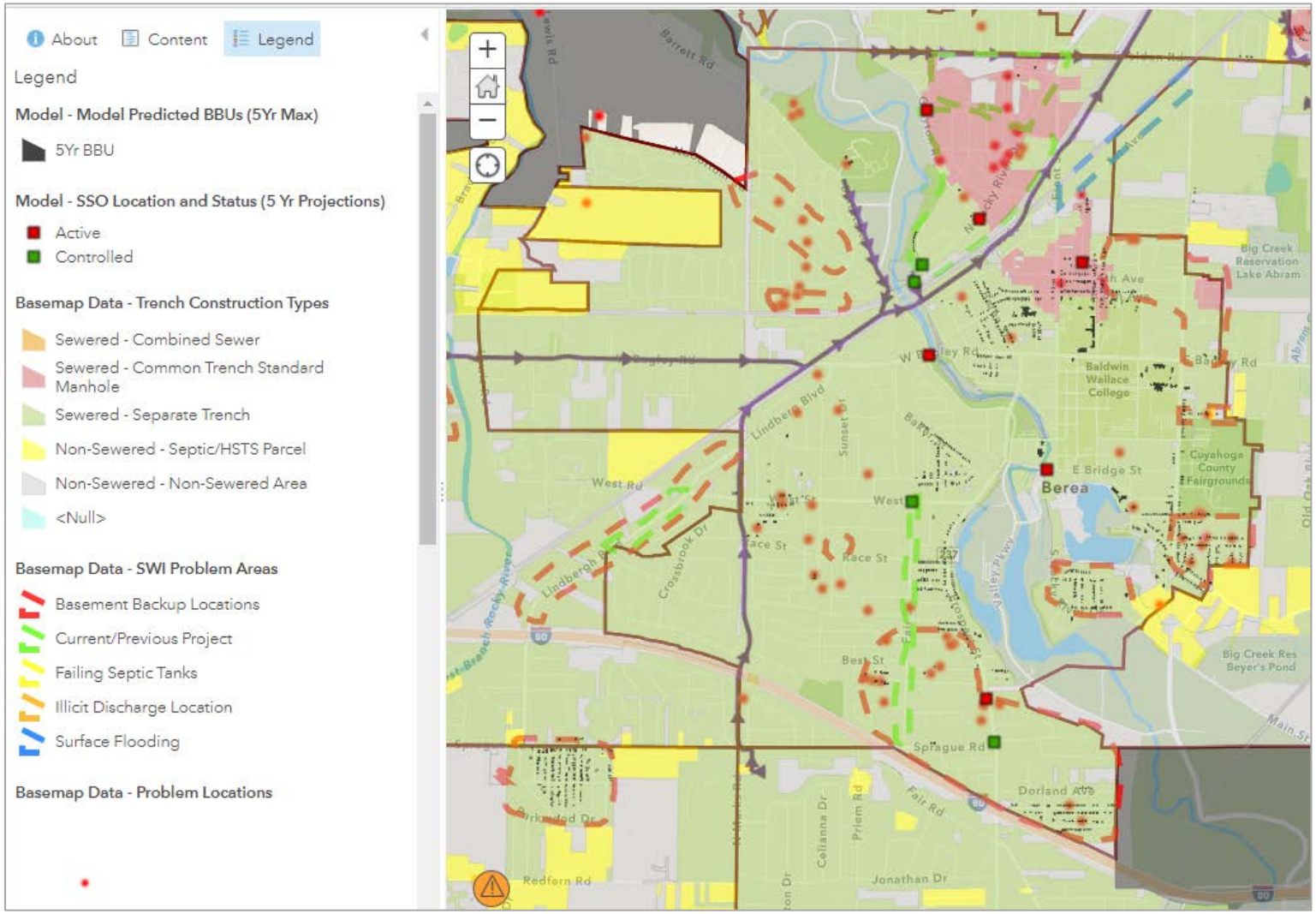
Berea Trench Types and Problem Areas

- City reported 12 problem areas
- Three areas have been at least partially resolved.

Table 2-1. Community-Reported Problem Areas

Problem Area ID	Location	Reported Problem
BR-01	Dorland Avenue, Milton Street, and Maplelawn Drive	BBUs
BR-02	North of Sprague Road, West of Prospect Street, north to French Street and west to Fair Street including Best Street, Meadow Circle and Jananna Drive	BBUs
BR-03	Along Fair Street from Sprague Road to West Street	Other (sewer replacement project 2017)
BR-04	Monroe Street to S. Rocky River Drive	BBUs
BR-05	South of Cuyahoga County Fairgrounds to Fowles Road, Eastland Road and east to past Andrew Street	BBUs
BR-06	Barberry Drive south to E. 5th Avenue west of Eastland Road, east of Eastland Road, Wendy Drive to E. Bagley Road	BBUs
BR-07	Riveredge Parkway north to Sheldon Road, south to Emerson Avenue, including N. Rocky River Drive to the east	Other (Phase I of 2016 MCIP project to address I/I and BBUs)
BR-08	N. Rocky River Drive northeast of Karen Drive, north to Emerson Avenue and west to Grayton Road	Other (Phase II of 2016 MCIP project to address I/I and basement flooding)
BR-09	Lombardy Drive, Nobottom Road between Holly Drive and Cross Street, and Savage Street north of Chestnut to Hazel Drive	BBUs
BR-10	University Street west to Eastland Road and east to Pleasant Avenue	BBUs
BR-11	Fairwood Circle	BBUs
BR-12	Butternut Lane	BBUs
MB-07*	1st Avenue	Other (surface flooding)

** Problem area identified by neighboring community and overlaps into City of Berea.*



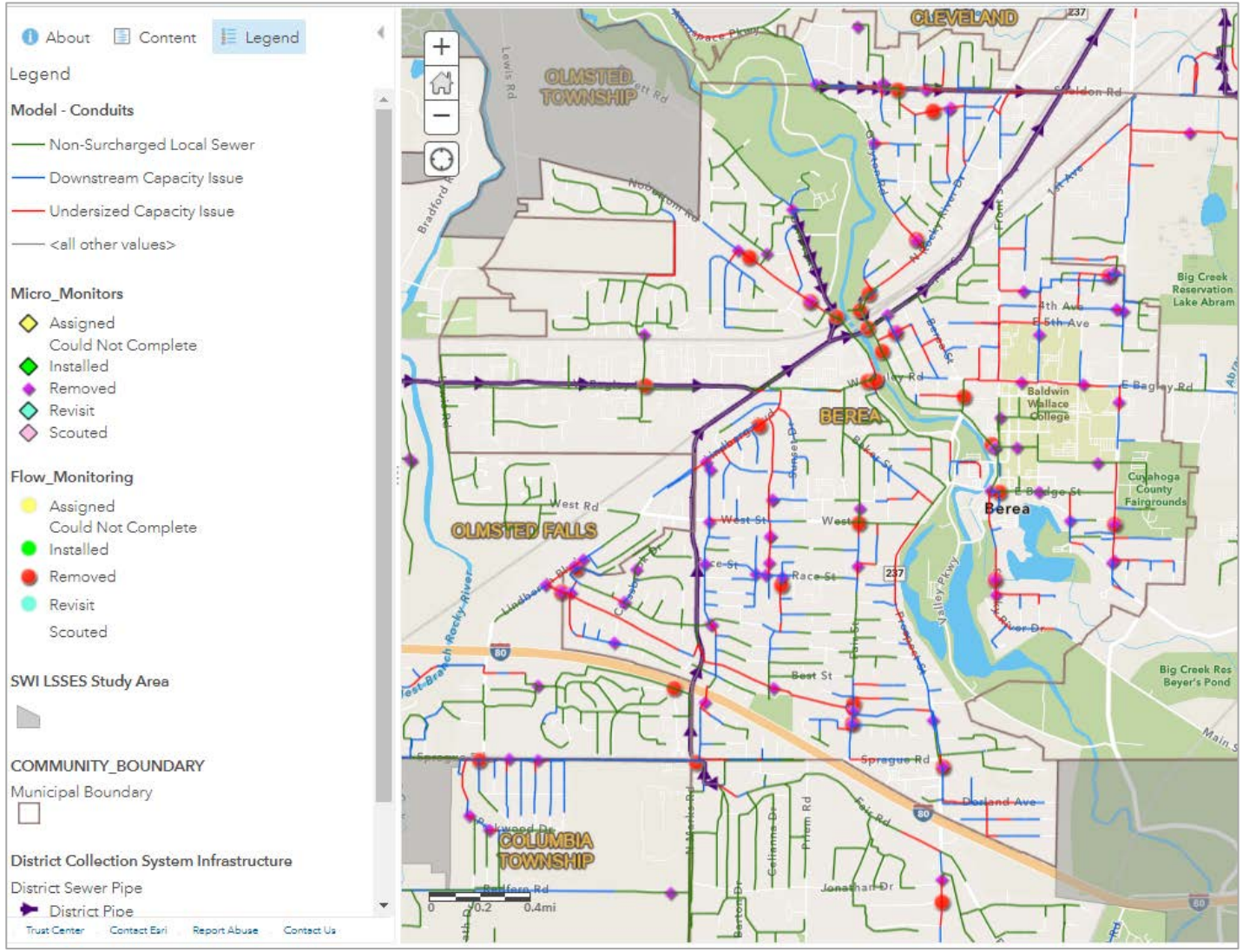
Flow Monitoring and Modeling

Flow monitoring:

- 25 calibration meters
- 61 micrometers

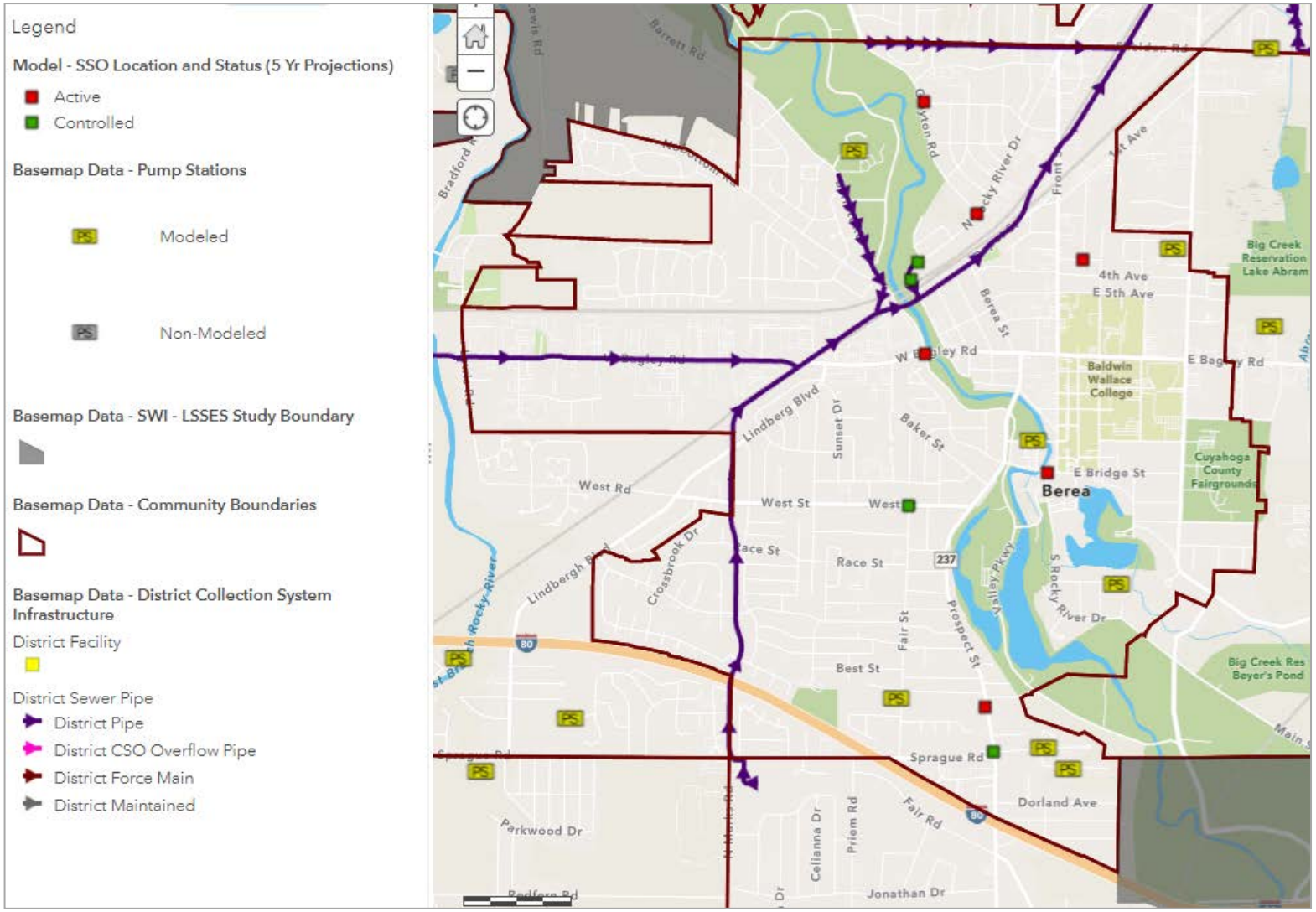
Sanitary sewer modeling

- 340,000 LF (88% of 384,000 LF total)



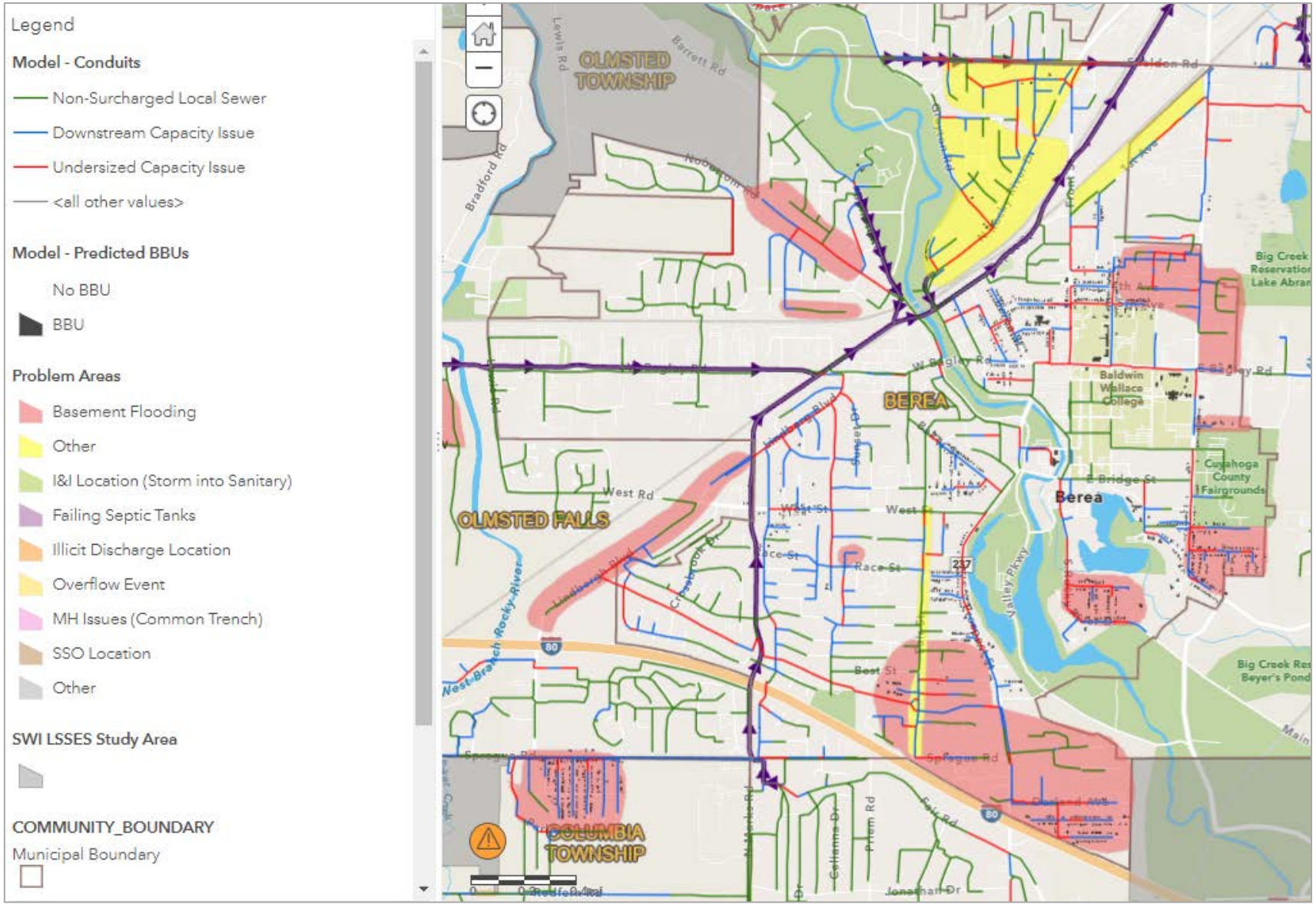
Modeled Pump Stations and SSOs

- 7 pump stations modeled
- 6 of 10 SSOs projected active during 5-yr, 1-hr rainfall



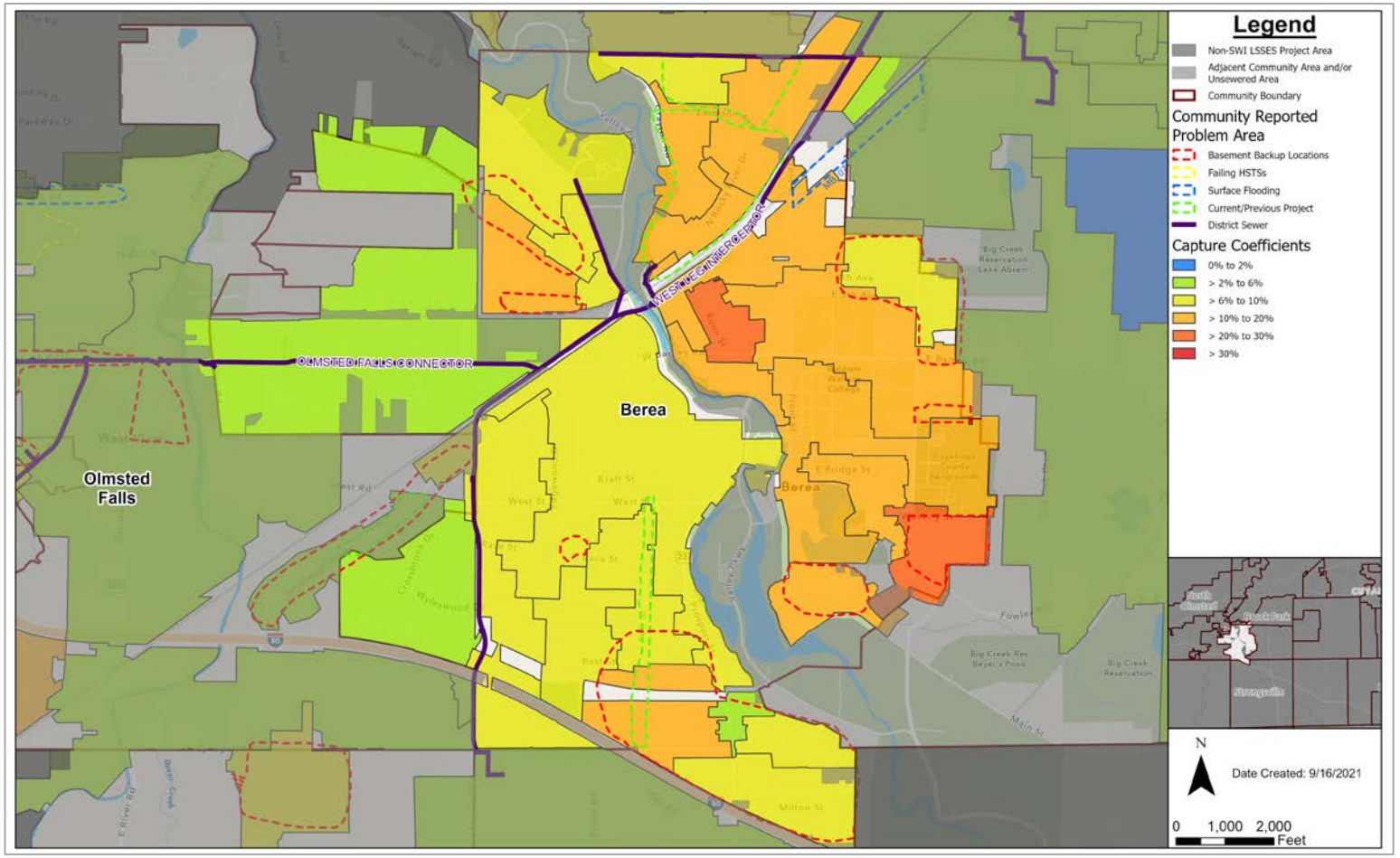
Projected Problems

- Model Projected Issues
  - 840 BBUs projected during 5-year rainfall
    (~ 13% of 6,590 structures)
  - 33 miles surcharged sewers
    (51% of modeled system)
- Most projected problems are in or near reported problem areas and/or common trench areas



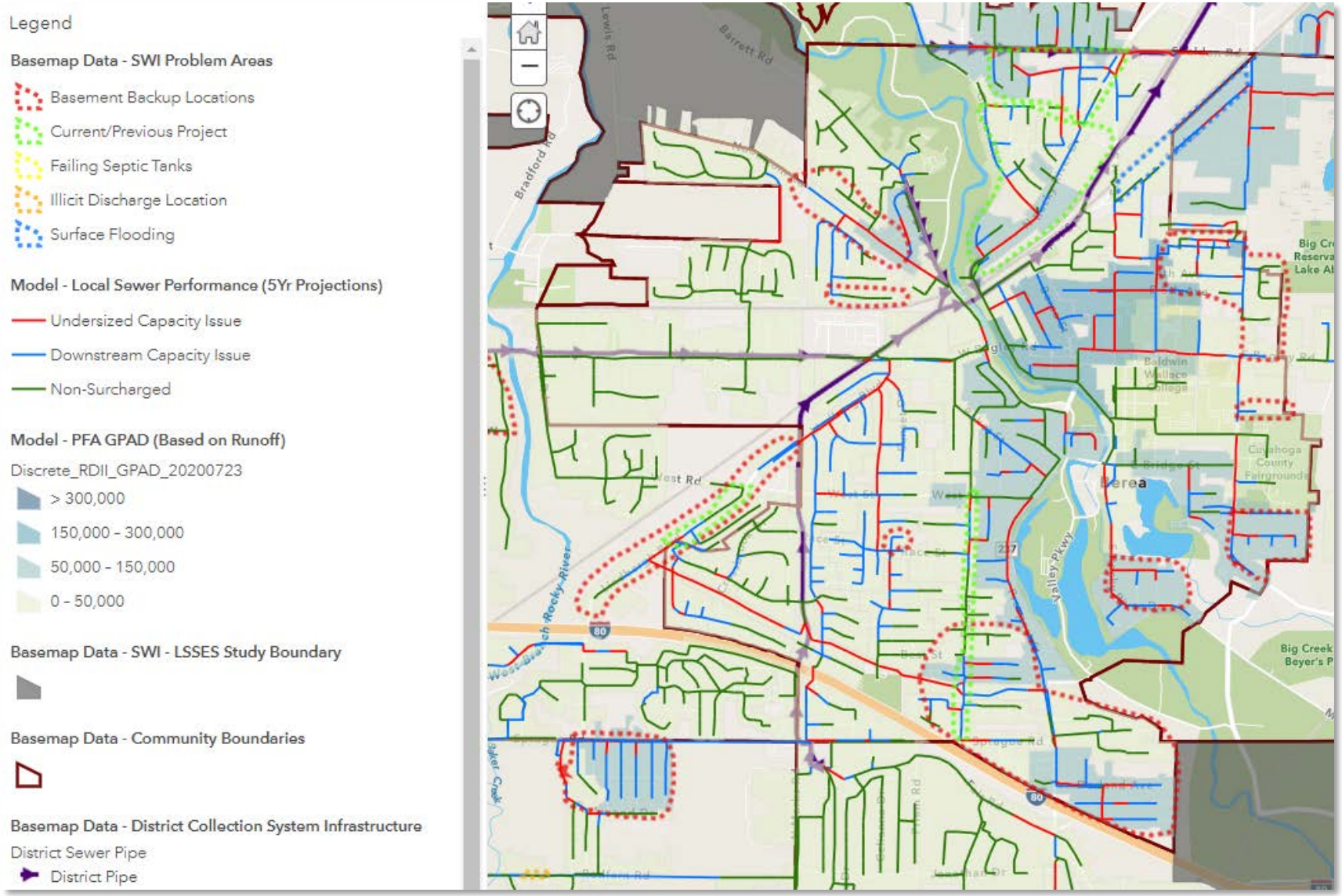
Wet Weather Capture – Some Areas are High

- Capture - % of measured rainfall logged at flow meters
- Typically target less than 10% for acceptable performance
- Berea has a range of capture values, from 2 to 26%
- 7% area weighted average
- Most reported problem areas correlate with elevated capture

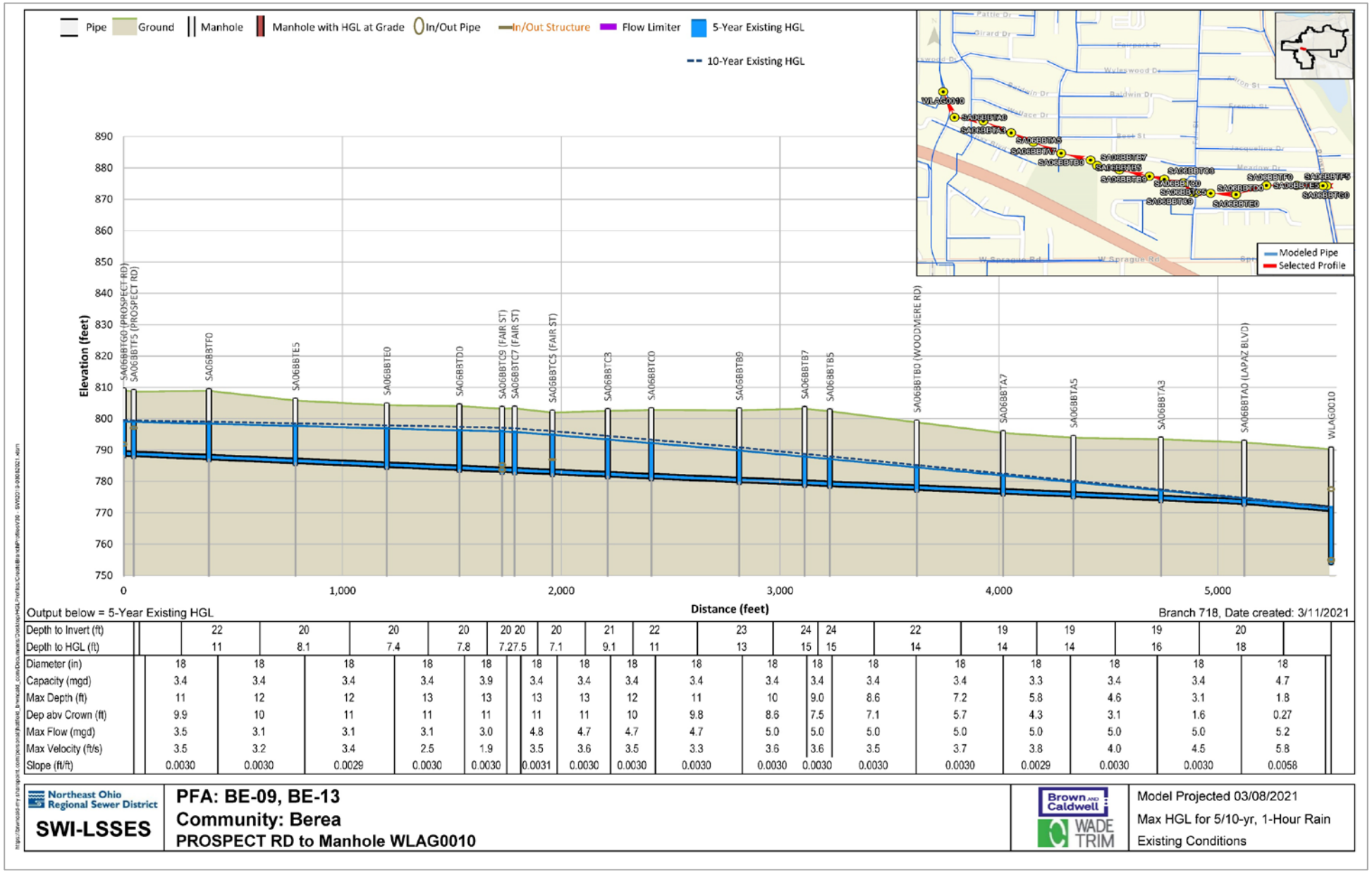


Peak Wet Weather Flows – Some Areas Are Excessive

- Peak wet weather flows range from low to high
- Several areas exceed the study excessive level of 50,000 gallons per acre per day (GPAD)
- Several high flow areas also correlate with reported and projected problem areas.



Sewer HGL Profiles (5- and 10-yr Rainfalls) – Available on AGOL



Depth to Invert (ft)	22	20	20	20	20	20	20	21	22	23	24	24	22	19	19	19	20	
Depth to HGL (ft)	11	8.1	7.4	7.8	7.27.5	7.1	9.1	11	13	15	15	14	14	14	16	18		
Diameter (in)	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Capacity (mgd)	3.4	3.4	3.4	3.4	3.9	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.3	3.4	3.4	4.7	
Max Depth (ft)	11	12	12	13	13	13	13	12	11	10	9.0	8.6	7.2	5.8	4.6	3.1	1.8	
Dep abv Crown (ft)	9.9	10	11	11	11	11	11	10	9.8	8.6	7.5	7.1	5.7	4.3	3.1	1.6	0.27	
Max Flow (mgd)	3.5	3.1	3.1	3.1	3.0	4.8	4.7	4.7	4.7	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.2	
Max Velocity (ft/s)	3.5	3.2	3.4	2.5	1.9	3.5	3.6	3.5	3.3	3.6	3.6	3.5	3.7	3.8	4.0	4.5	5.8	
Slope (ft/ft)	0.0030	0.0030	0.0029	0.0030	0.0030	0.0031	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0030	0.0029	0.0030	0.0030	0.0058	

Private Property Dyed Water Testing

- Response lower than SWI overall
- May be worth finding and disconnecting rapid connections in some areas

Figure 3-5. Individual Downspout Testing Connectivity Results (SWI-LSSES and Berea)

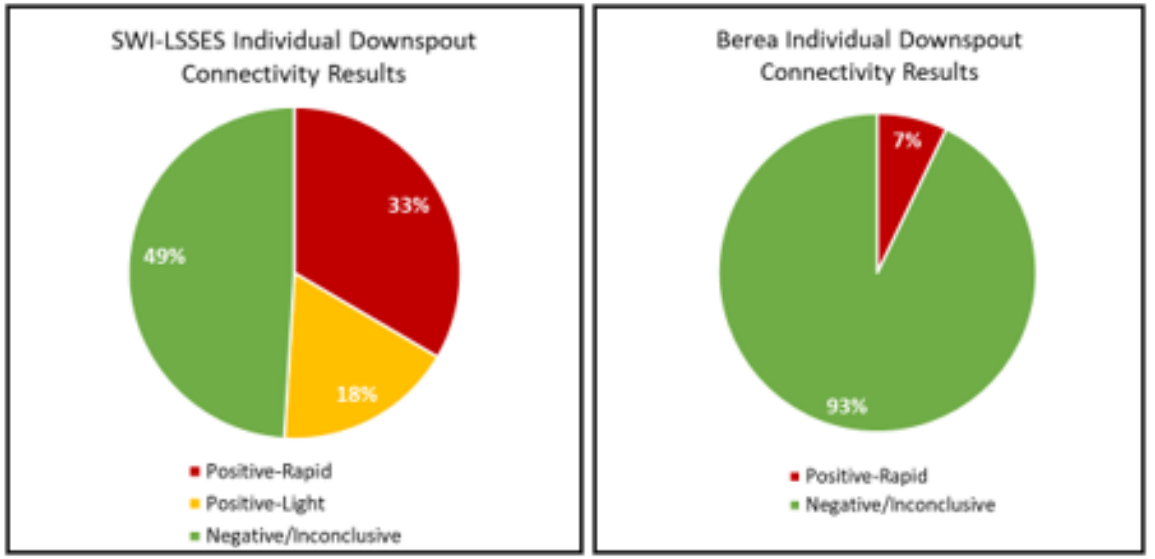
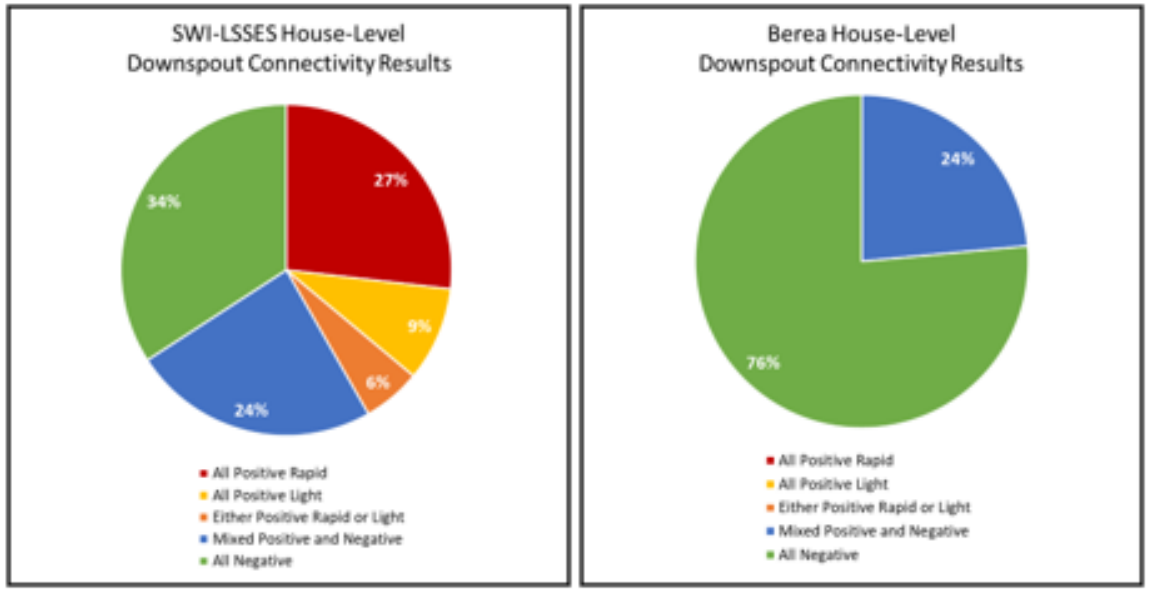


Figure 3-6. House-Level Downspout Testing Results (SWI-LSSES and Berea)



Problems & Potential Solutions – Prioritized into 3 Tiers

1

Known problems

- Community reported problems (generally BBUs)
- Known SSOs active during 5-year rainfall
- Critical operational or water quality issues

2

Areas of excessive I/I

- PFAs > 50,000 GPAD / 70,000 GPDIM
- Over/under common trench systems
- Significant operational or water quality issues

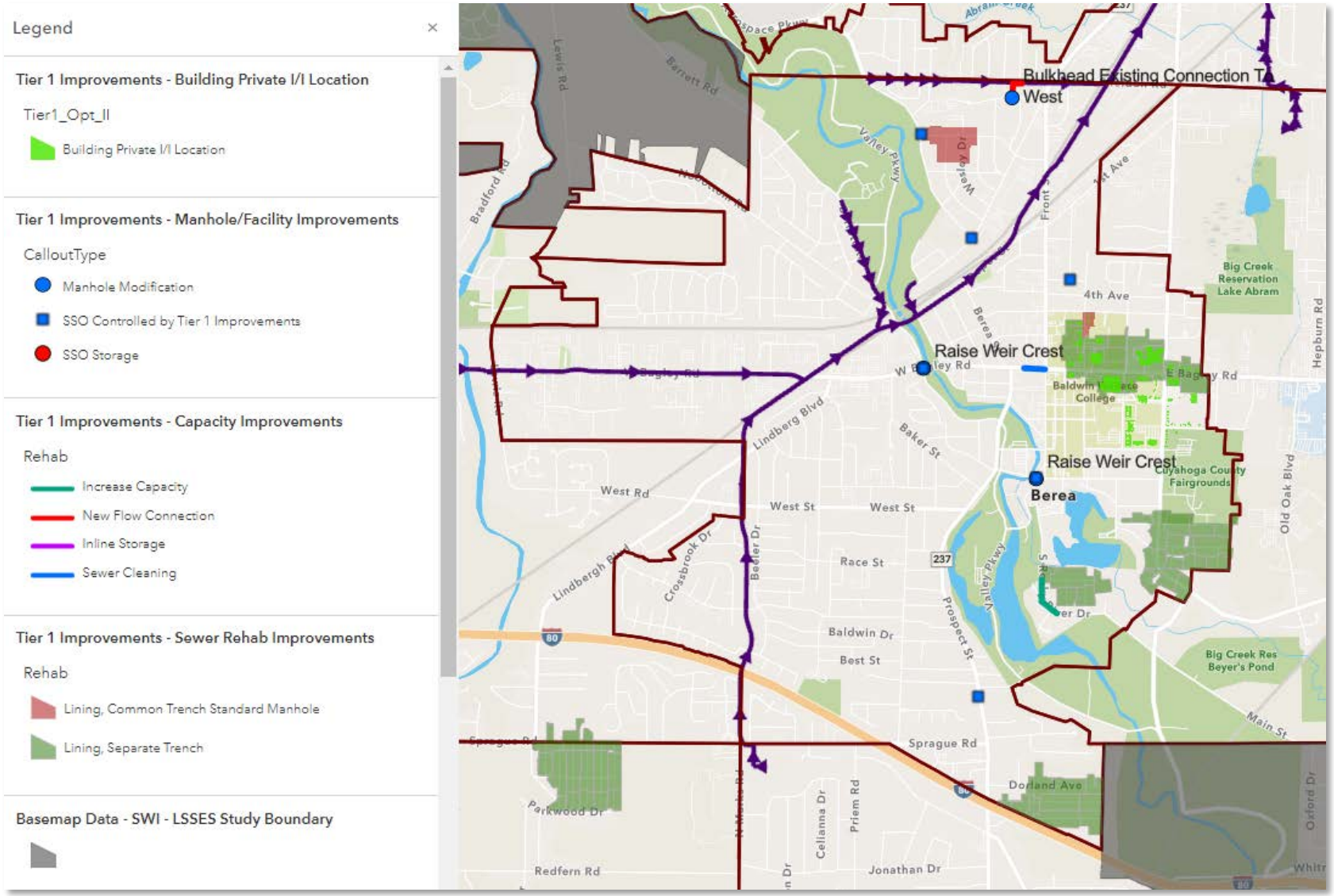
3

Other projected problem areas

- Projected BBUs/flooded manholes in isolated or lower peak flow areas

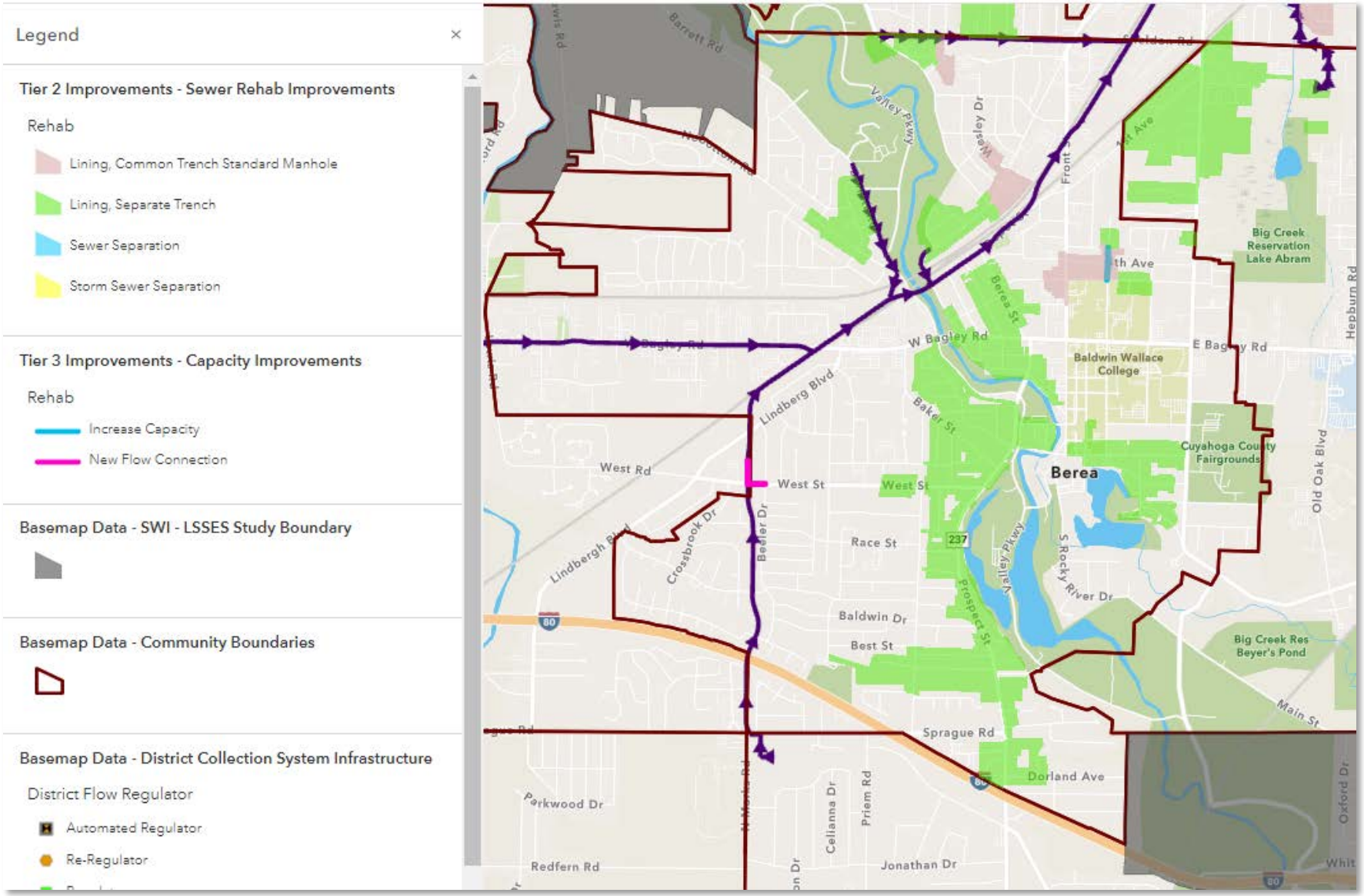
Potential Tier 1 Improvements

- Sewer cleaning
- Common trench rehab
- Separate trench rehab
- Capacity improvements
- SSO weir modifications

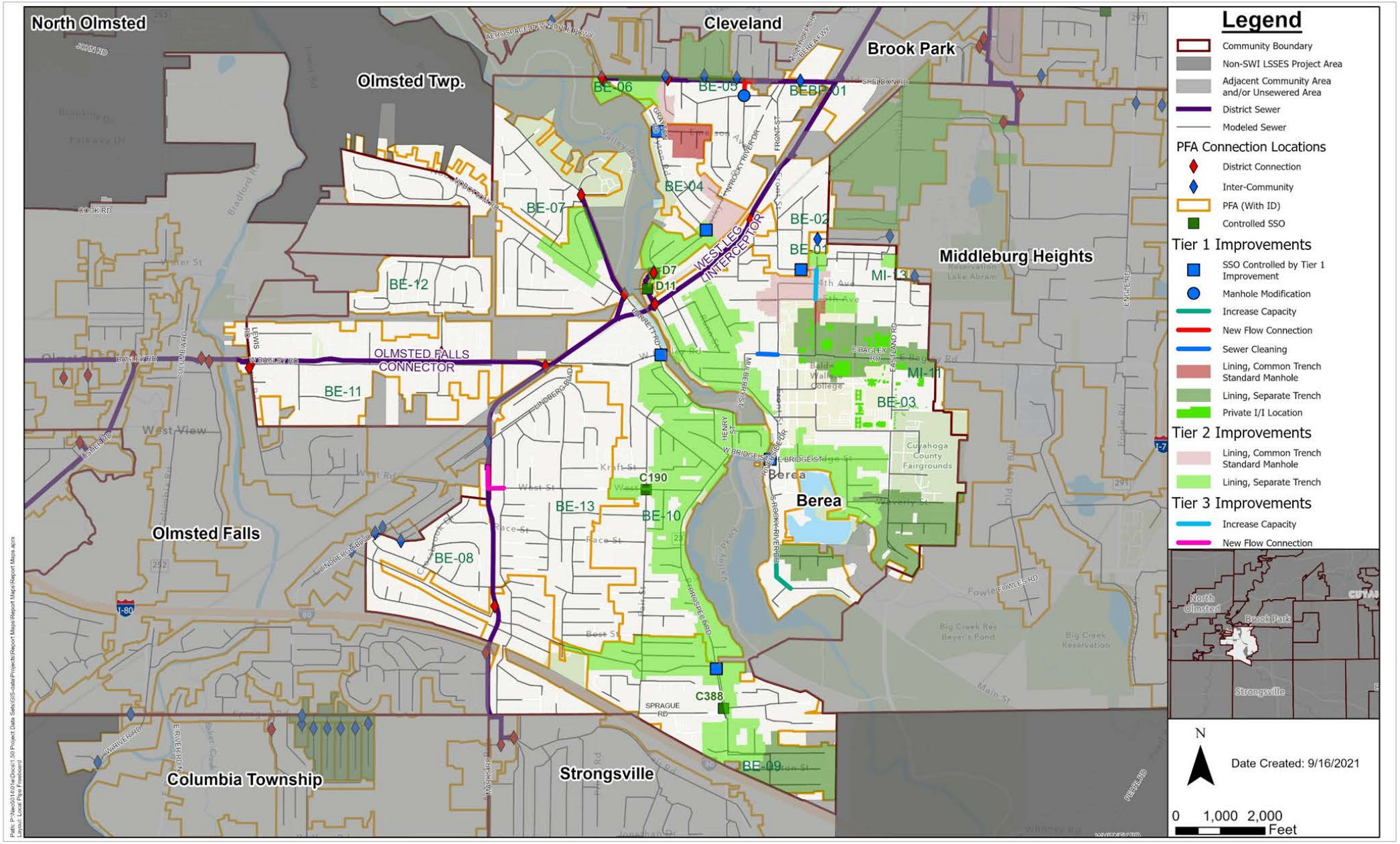


Potential Tiers 2 & 3 Improvements

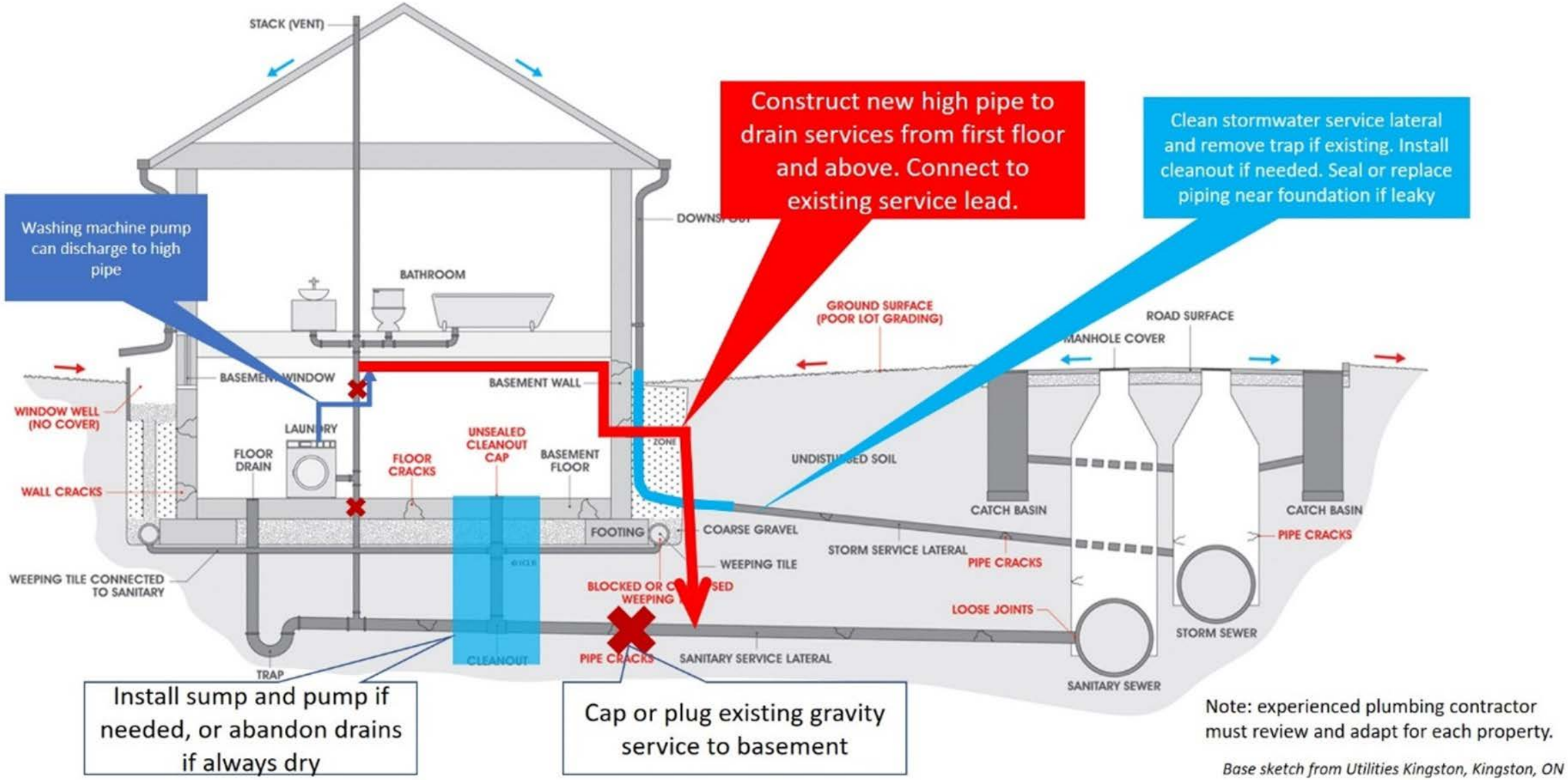
- Sewer rehab to reduce excessive wet weather flows
- Increased capacity and a new flow connection to mitigate projected BBUs



Proposed Tiers 1, 2 & 3 Improvements Overall



High Pipe Concept for Isolated Basement Backups



SWI Area Planning-level Potential System Improvements Costs - Berea

#PFAs[1]	Optimized Solution Total Costs (2018 $, Class 5) [2]			
	Tier 1 (known problems)	Tier 2 (excessive I/I)	Tier 3 (projected problems)	Overall
7	$16,900,000	52,900,000	2,500,000	$72,300,000

Includes:

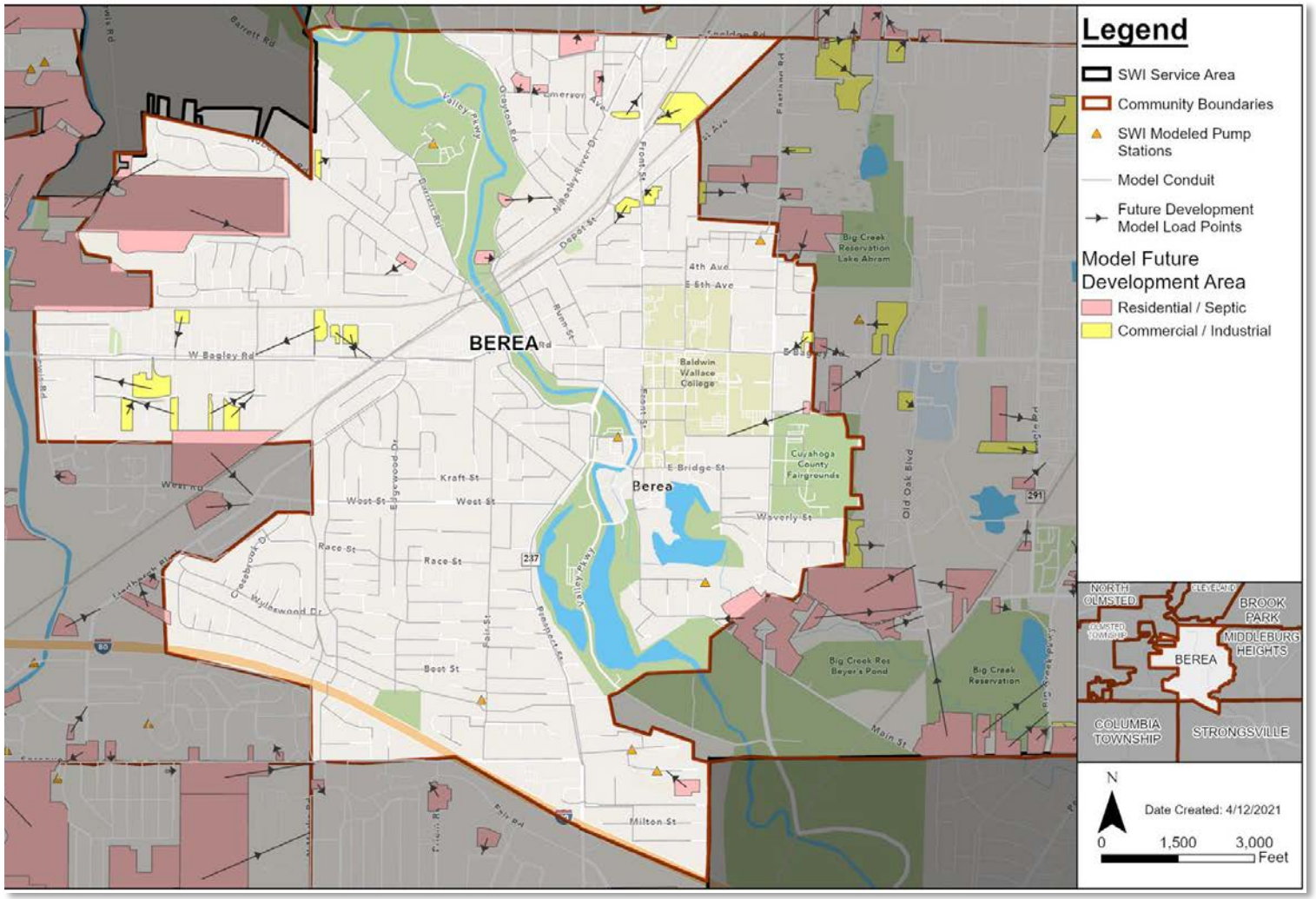
- 30% contingency
- 15% design
- 10% construction administration and resident engineering
- Project definition investigation cost for common trench areas ($10K/acre), $2.5 M total Berea

1 – Peak flow areas

2 - AACE Class 5 – concept planning cost ranges from 50% low to 100% high as compared to the actual cost

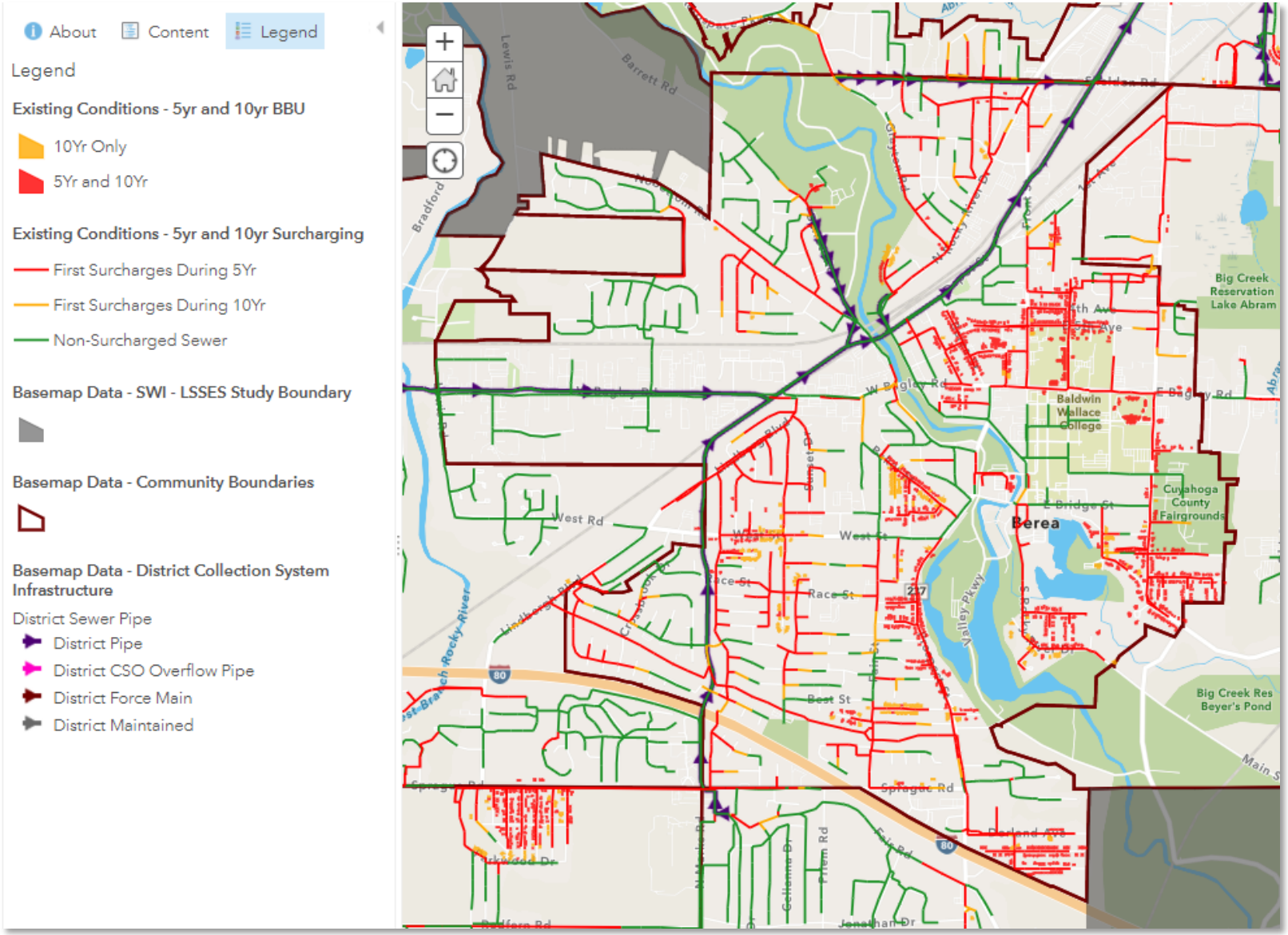
Future Conditions Modeling

- Full build-out on undeveloped land and connection of all septic areas
- 101 acres identified for connection
  - 45 ac commercial
  - 37 ac septic
  - 19 ac residential
- 2% increase in projected BBUs
- Relatively minor impact expected



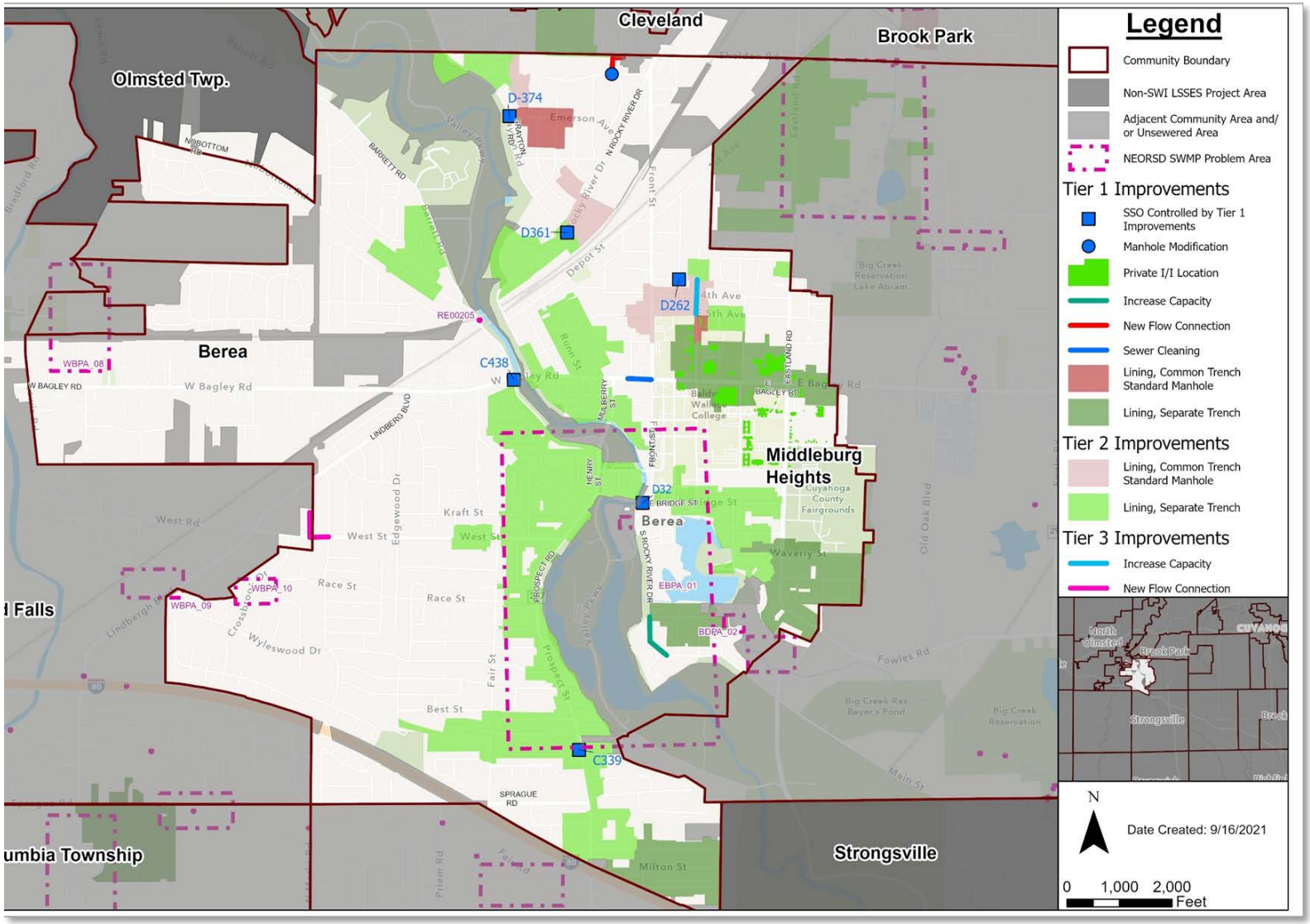
Comparison of 5- and 10-Year Rainfalls

- Projected BBUs increase from 840 to 1,036 (23% increase)
- Primarily in 5-year rainfall problem areas
- Same 6 SSOs projected to be active for 10-year rainfall



Stormwater Master Plan Project Areas

- Stormwater drainage improvements may also improve sanitary sewer system performance.
- Coordinate any potential improvements with stormwater improvements where cost effective.



Implementation Considerations

- Confirm extent of problems – maintain a uniform electronic complaint system.
- Consider periodic survey or online tracking.
- Update the SWI-LSSES proposed work as appropriate.
- Integrate work with other planned improvements.
- Submit improvements for potential MCIP funding.
- Conduct pre- and post-construction monitoring and analysis to confirm effectiveness and adapt projects as needed.
- Consider doing I/I rehabilitation/reduction work on private property if indicated by further investigations.
- Use public information and education information to help reduce I/I.

Next Steps

- Berea to provide any comments on draft final community report
- District team to provide final report and attachments
- Project definition investigations suggested before design to confirm I/I sources and identify optimal solutions.
- Coordinate with any potential stormwater improvements

Vander Tuig, Kevin

From: Vander Tuig, Kevin
Sent: Thursday, January 6, 2022, 6:47 PM
To: Meiring Borcherds; Antonio Armagno; Lita Laven
Cc: Mary Maciejowski; Keith McClintock; Andrea Remias; William Fussner; Ryan Theberge; Cox, David
Subject: RE: Berea Final Draft Community Report Meeting for SWI LSSES
Attachments: 1485_SWI-LSSES _PRE_Berea_20220106.pdf

Lita, all,

The slides from our Teams call today are attached and will be included in an appendix of the final community report to be provided. This email will also be included as part of the meeting summaries in the report appendix. Following are notes from the meeting.

Attendees – Tony Armagno, Ryan Theberge, Lita Laven, Meiring Borcherds, Keith McClintock, Bill Fussner, Mary Maciejowski, Dave Cox, Kevin Vander Tuig

Notes

1. **88% Modeled Sewer** – the reaches of sewer not included in the model are typically the upstream reaches serving approximately 5 acres or less. The upstream sewer reaches tend to have very low flows and fewer performance problems.
2. **Baldwin Wallace area private I/I and separate sewer rehab Tier 1 vs. Tier 2** – It appears this was included in Tier 1 because reducing peak flows in these areas is projected to reduce the peak wet weather hydraulic grade lines (HGLs) in E Bagley Rd and Eastland Rd to help mitigate the BBUs reported and projected problem areas along Bagley Rd and University Street east of Eastland Rd as shown in the AGOL snip **figures 1 and 2** included below. There is also an SSO D262 on 3rd Ave that is projected to activate. Reducing the HGL in the system downstream would help control this SSO. The proposed problem and solution tiers are developed at a planning level like the entire project, so the prioritization is flexible to accommodate new information as it becomes available.
3. **SSO D32 (S. RR Drive and E Bridge St)** - Berea has a record of that SSO being eliminated; did we see evidence of overflow or is it just based on visual inspection? Our project subconsultant Brown & Caldwell accompanied a C&K crew to this SSO early in the day (10/19/2018) while still dark and used a crawler camera and light to check connectivity and confirmed the SSO was still open at the time of the site visit (**figures 3 and 4 below**). The City will send out crew to confirm. If the SSO remains open, and the City elects to abandon it as was previously indicated by design drawings, it may be desirable to monitor and/or install a temporary plug to confirm acceptable operation during wet weather prior to abandonment. Alternatively, the City may wish to try the suggested control of raising the SSO activation weir to reduce overflow frequency, while retaining the overflow for emergency high flow conditions.
4. **Barberry Area Tier 1/Tier 2 description in report** – The report will be clarified to better define suggested Tier 1 and Tier 2 improvements.
5. **SSO C339 vs. MH C339** – The current SWI-LSSES/District ID for the SSO located along Prospect St at the Cleveland Electric Illuminating (CEI) Co easement just south of S Quarry Ln is based on old information that creates confusion with respect to Berea's asset nomenclature, e.g. there is a Berea manhole C339 located a short distance to the north. This SSO will be renamed SSSRS2 to match the local nomenclature for this structure. Mary will coordinate with the City to revise the NEORSD SSO ID to SSSRS2, and the ID will also be updated in the SWI-LSSES project documentation as well.
6. **North End MCIP projects Phases 1 and 2** – The Phase 1 and 2 system improvement projects are noted in the report (Section 3.4) and shown in Figure 3-16. The report text and figure will be updated to indicate that Phase 1

was completed prior to the 2019 flow monitoring in Berea, and that Phase 2 completion is expected this year. in a darker red area completed in fall of 2021. The City is planning post-construction monitoring. Meiring noted that the community report is a public document and needs to reflect the current status at the time of the final report.

7. **Future Conditions analysis** – The analysis considered parcels without buildings as available for development, and a GIS proximity analysis assigned each developable parcel to the nearest modeled sewer. This in no way approves or confirms any potential development or discharge location, but rather provides a what-if scenario to consider identify portions of the system may be negatively affected based on potential development discharging to the existing system configuration. One area of Olmsted Twp west of Stonesthrow Dr that was assumed to discharge to the Berea sanitary sewer flowing south in Stonewater Ct is projected to cause local sewer surcharging for the 5-year, 1-hour rainfall. This area was recently proposed for development and potential discharge to Berea, but this was not approved. The report describes the analysis as a what-if scenario, but in no way indicates where development will occur or where resulting flows should be discharged.
8. **2023 MCIP program** – the next MCIP program is expected to start this spring, but dates have not been finalized.
9. **Funding for SSO Control** – USEPA's Sewer Overflow and Stormwater Reuse Municipal Grants (OSG program) are prioritized for distressed communities implementing a long-term plan for control of CSOs or SSOs. Funding can apply to planning, design, and construction. Ohio share in FFYs2020/21 is $4.7 million. https://www.epa.gov/cwsrf/sewer-overflow-and-stormwater-reuse-municipal-grants-program
10. **Report Update –** The Berea community report will be updated as discussed in the meeting and summarized above and will be resubmitted as a final draft for review. Another meeting will be scheduled as desired to discuss prior to issuing the report as final.

Thanks for joining the call today. Please let me know if anything above needs revision.

Kevin

Figure 1 - Problem areas along Bagley and University

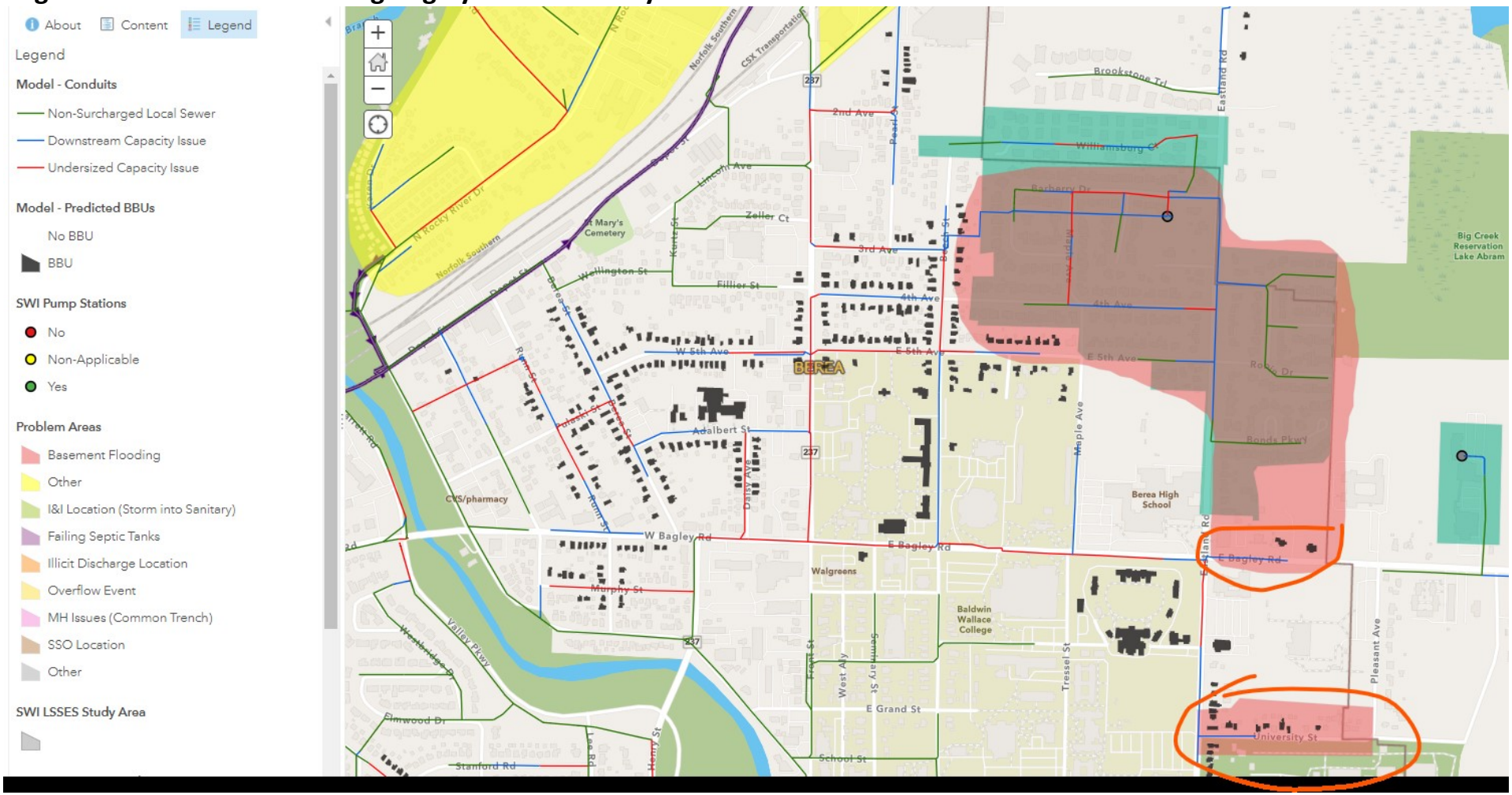


Figure 2 – T1 Improvements for Problem areas along Bagley and University

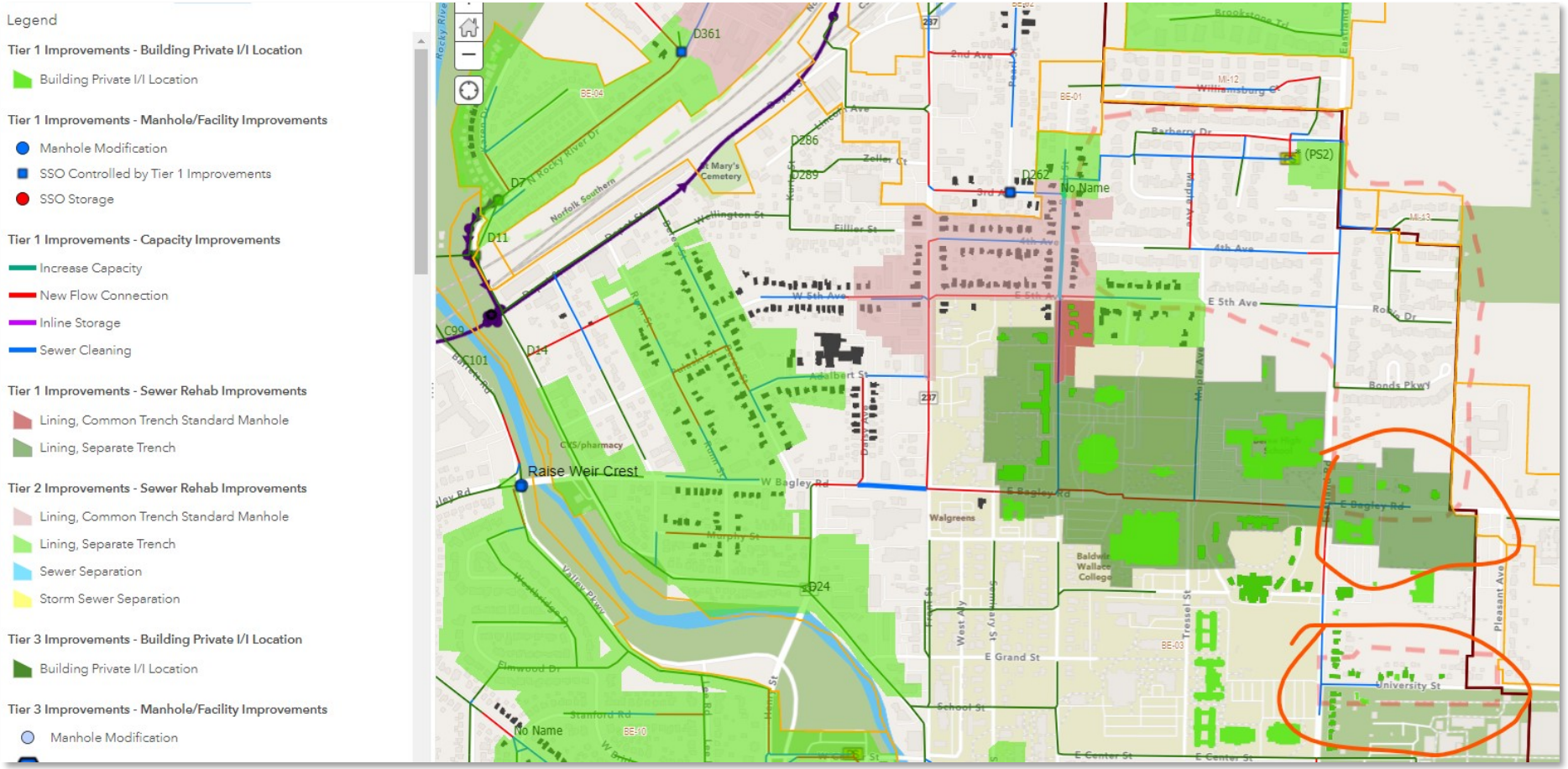
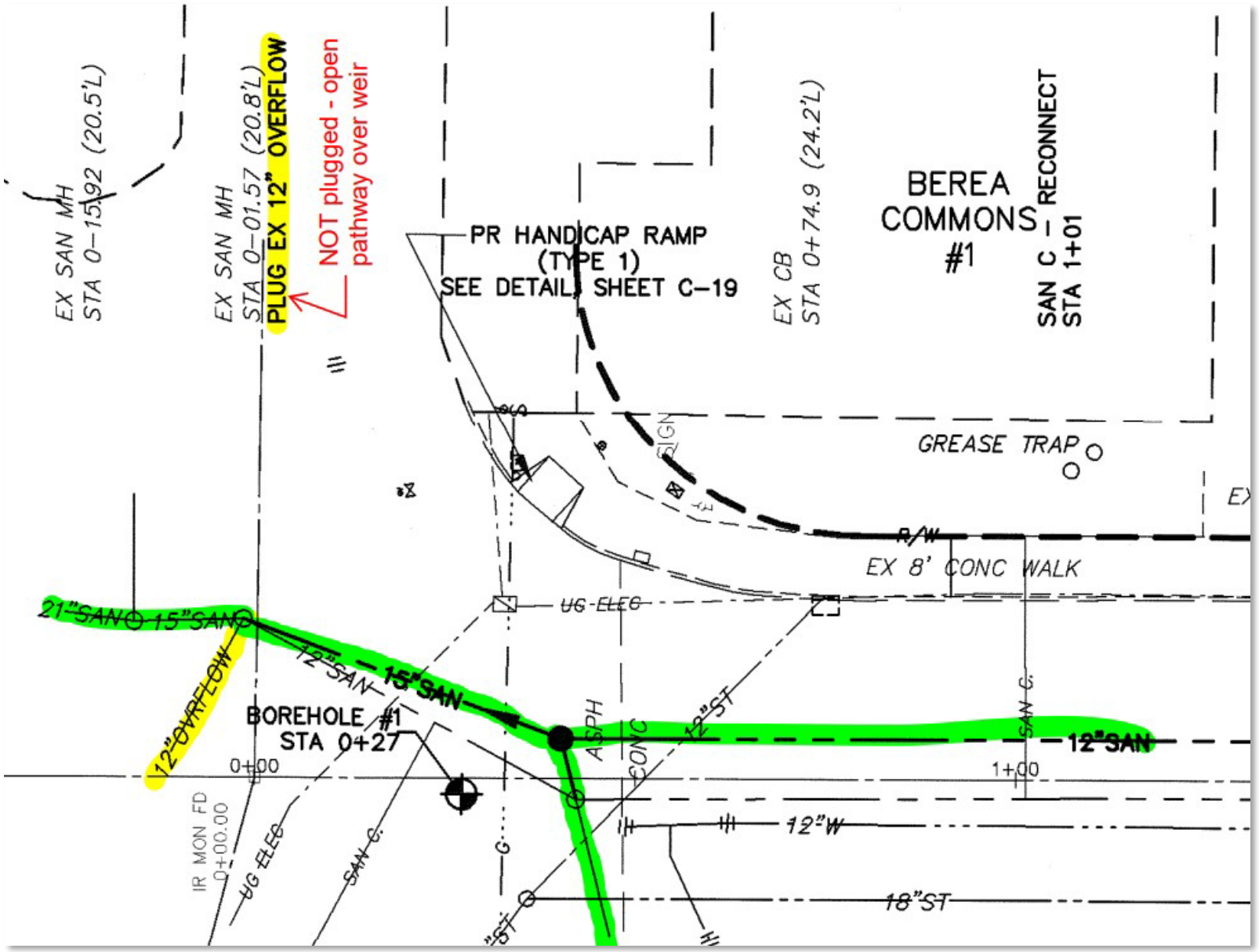


Figure 3 - SSO D32 Field Visit



Figure 4 – SSO D32 Field Visit



1485 SWI-LSSES
City of Berea Community Meeting
Capacity and Problem ID Summary

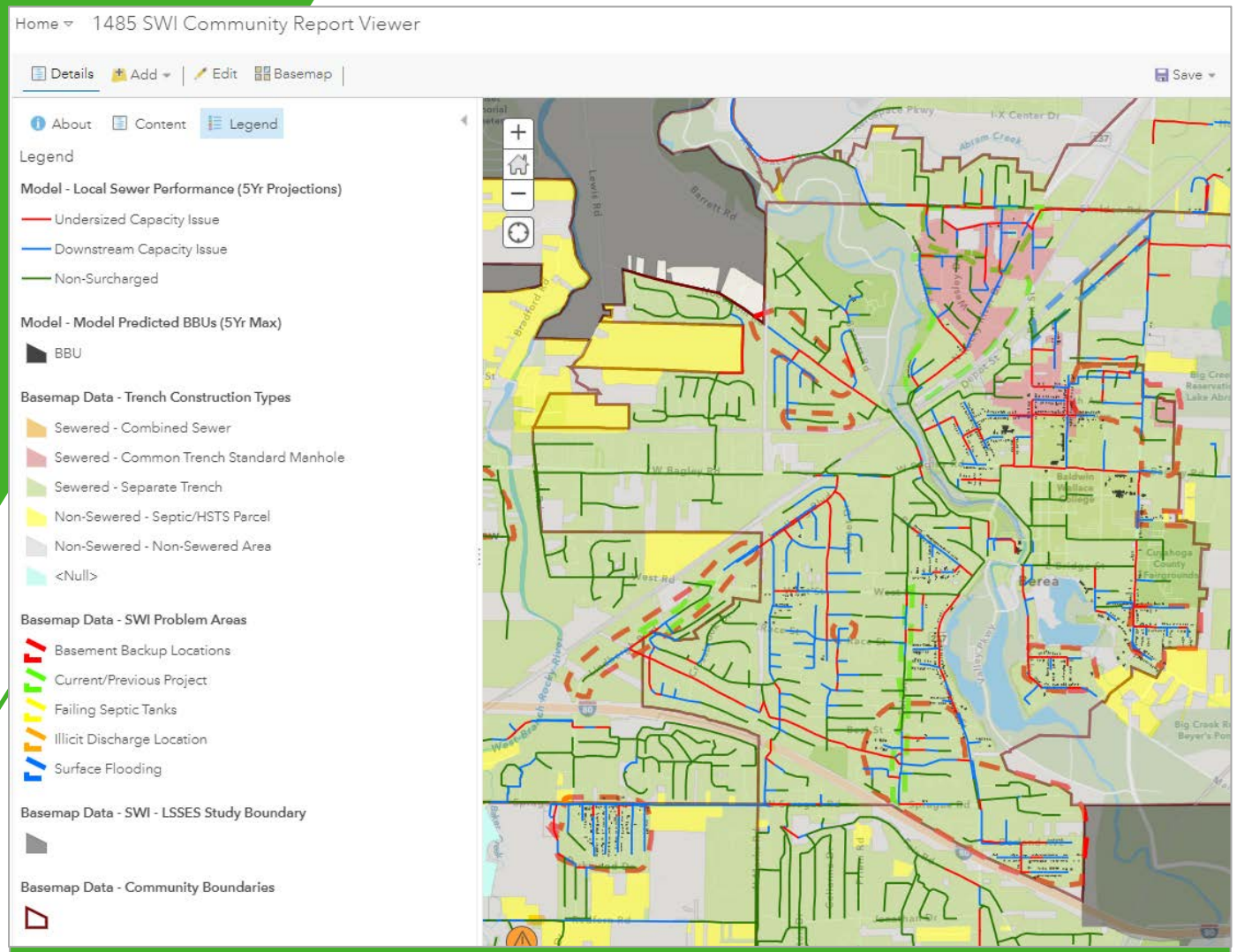
March 25, 2021

Northeast Ohio Regional Sewer District

WADE TRIM

Brown AND Caldwell

Hazen



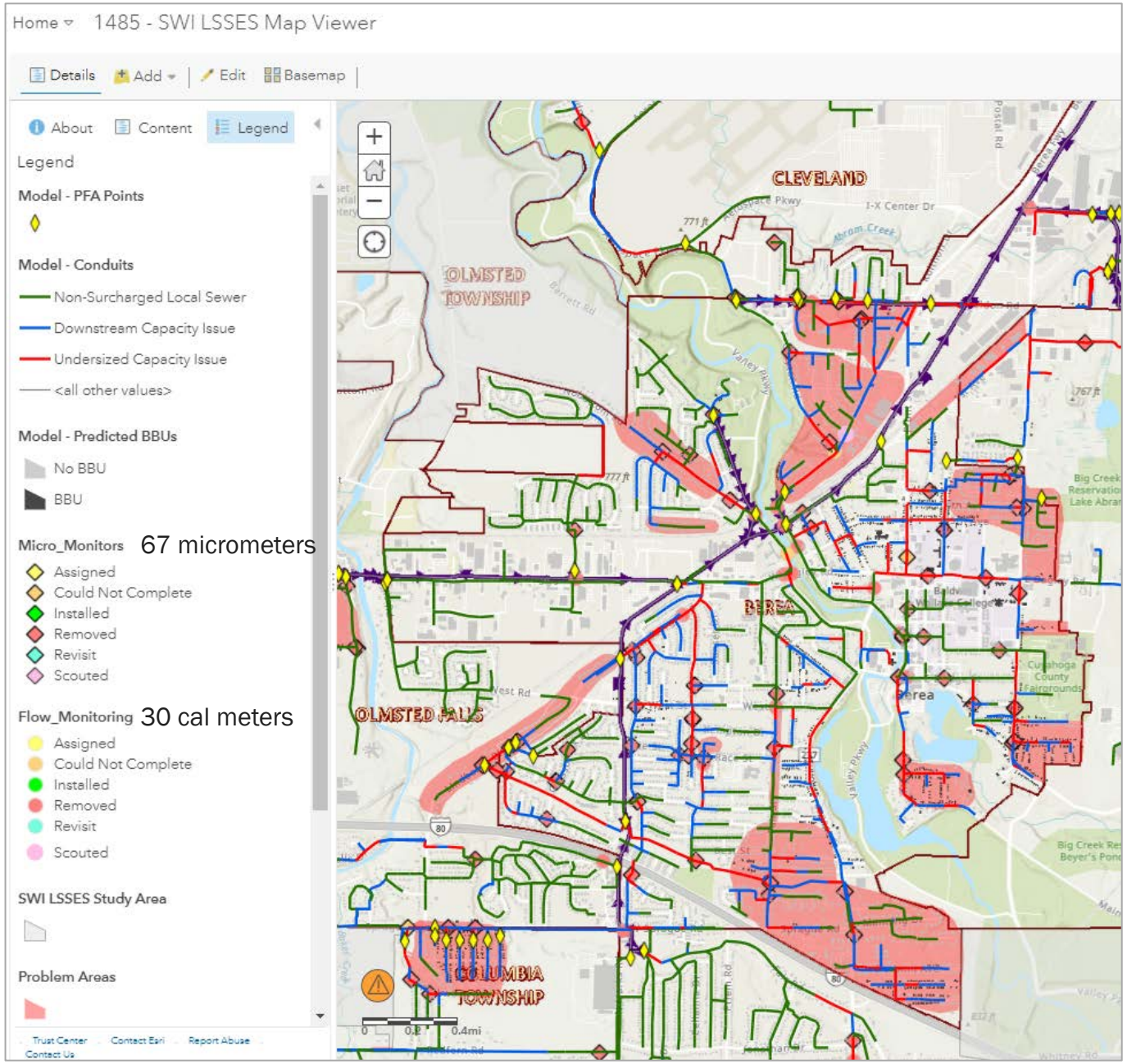
Berea Information in ArcGIS Online (AGOL)

Local SSES Objectives

- Identify and help communities address sewer system problems including basement backups (BBUs) and SSOs
- Provide technical support for communities seeking financial support via the District's Member Community Infrastructure Program (MCIP)
- Ultimately support communities to reduce risks to human health, property and the environment

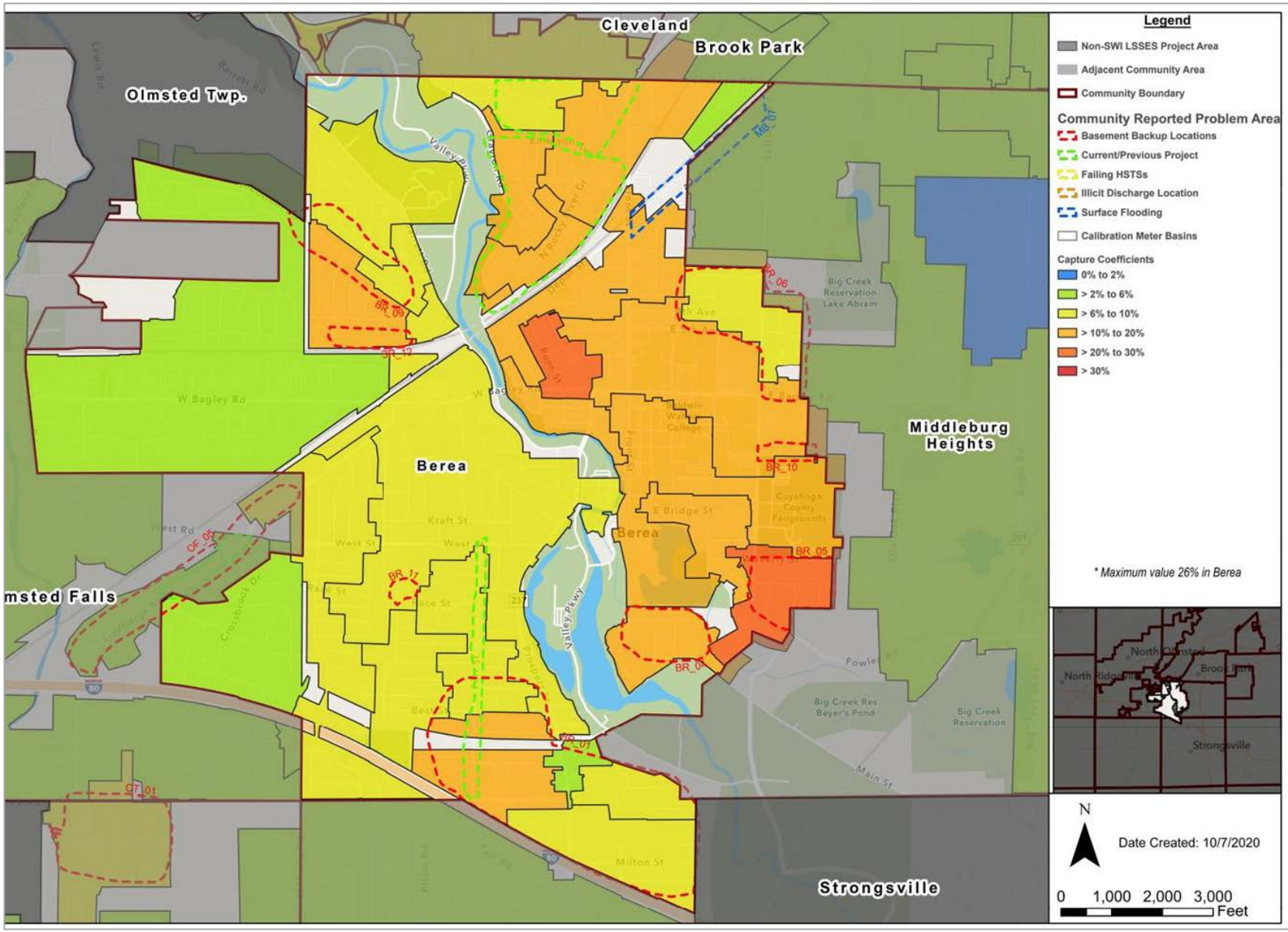
Berea Reported Problem Areas, Flow Monitoring and Modeling

- Reported basement flooding in 11 areas
- Three areas have been at least partially addressed
- Significant surcharging is projected



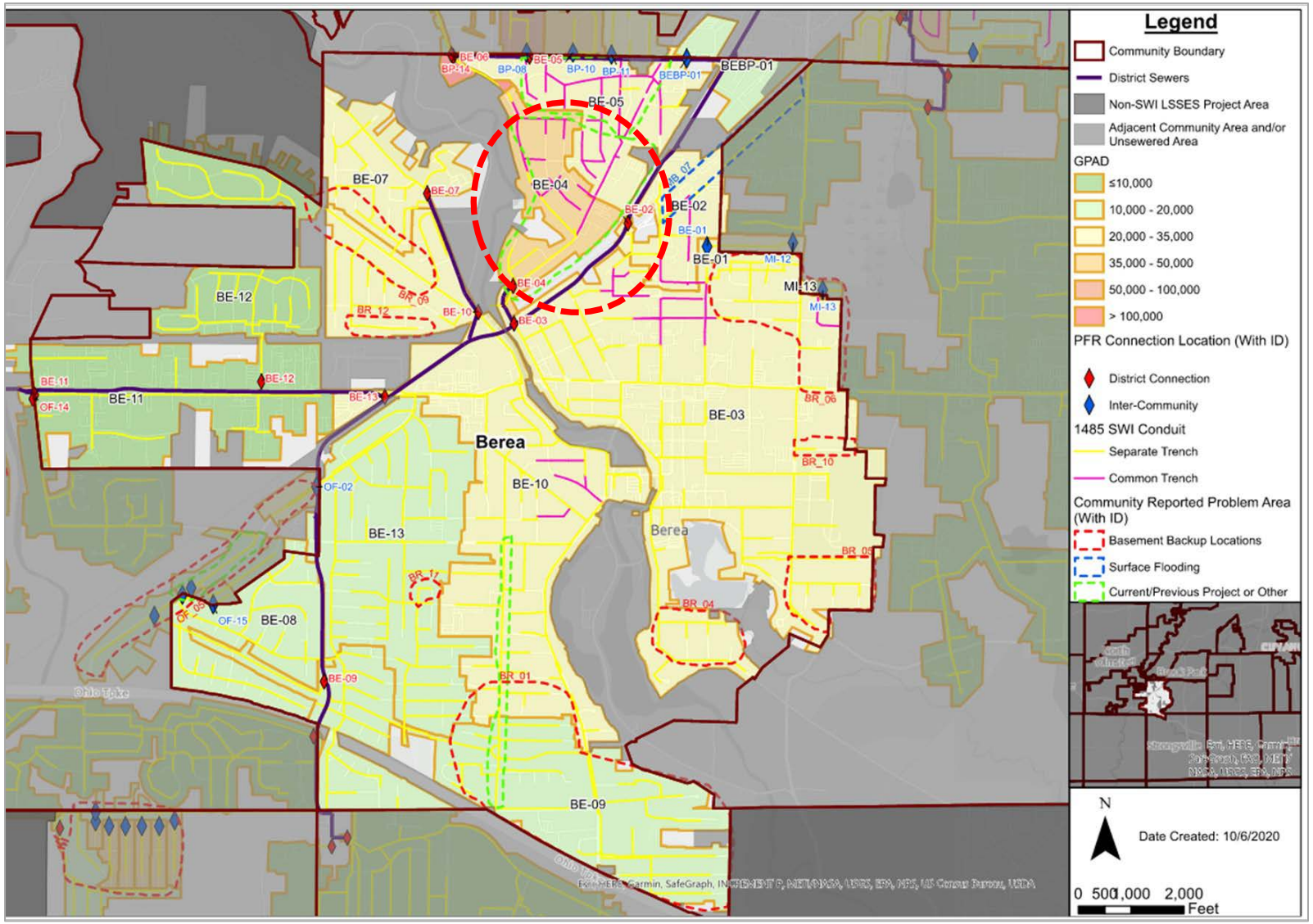
Wet Weather Capture – Mixed Results

- Capture - % of measured rainfall logged at flow meters
- Typically target less than 10% for acceptable performance.
- Several Berea flow meter areas exhibit high capture
- These tend to correlate with the problem areas



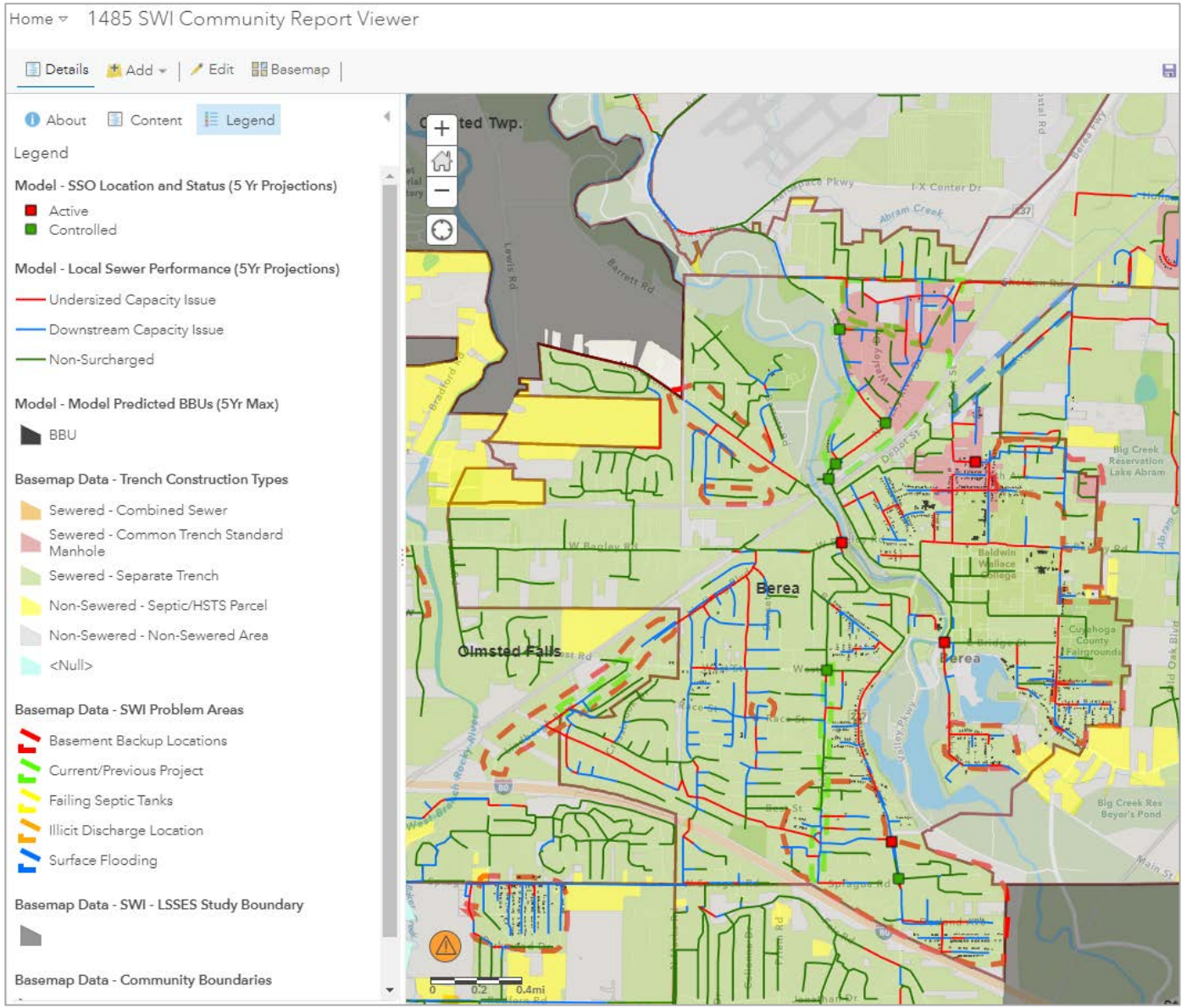
Peak Wet Weather Flows

- Peak wet weather flows range significantly
- Previous/ongoing rehab in the North End project is addressing one of the higher flow areas



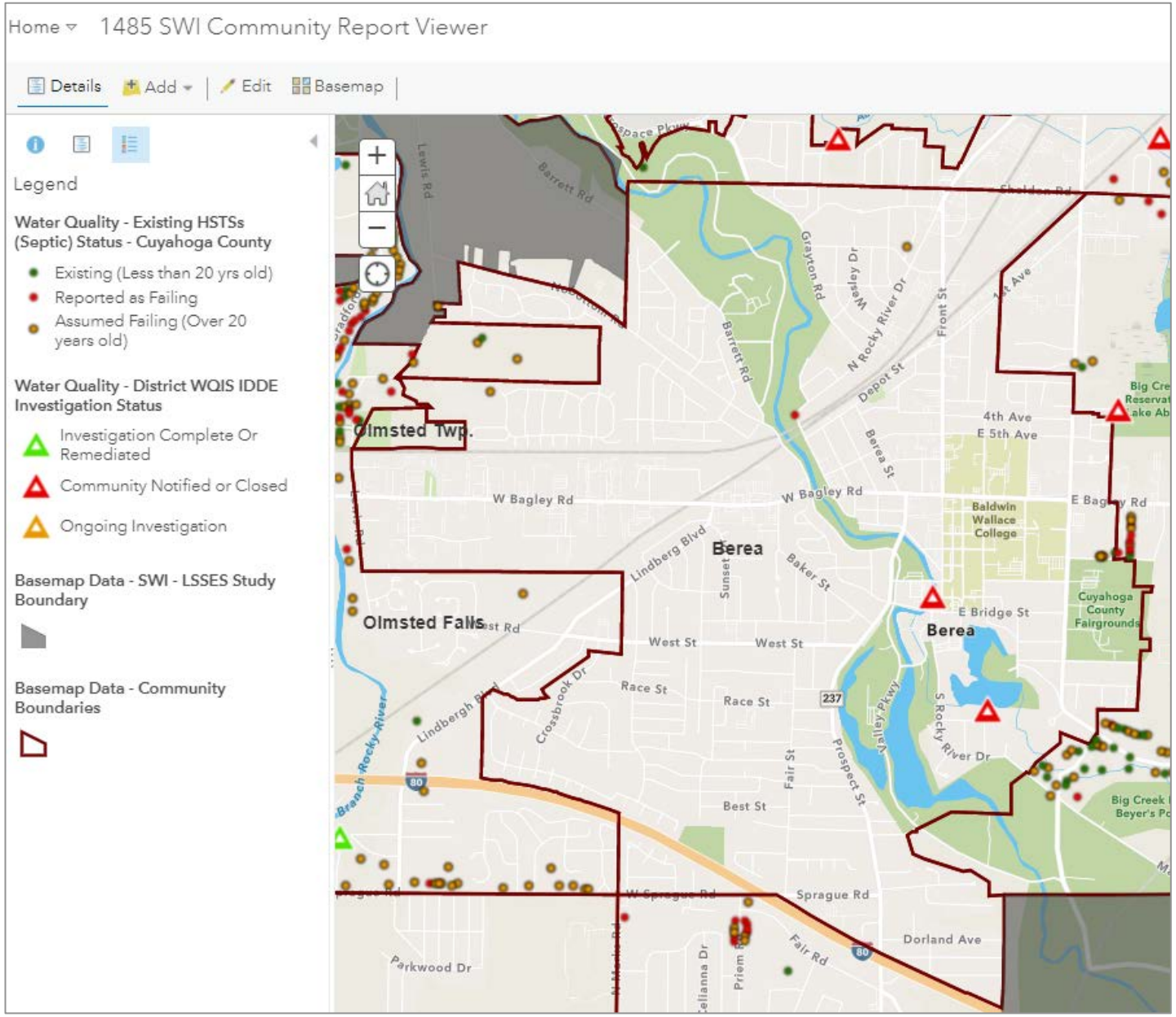
Berea Trench Types and Problem Areas

- Limited areas of common trench sewer
- Basement backups (BBUs) are projected in reported problem areas
- 700/6,700 (10%) of properties projected at risk of BBUs for 5-yr rainfall
- 6 of 10 SSOs projected to be active (2 are less than 0.01MG)



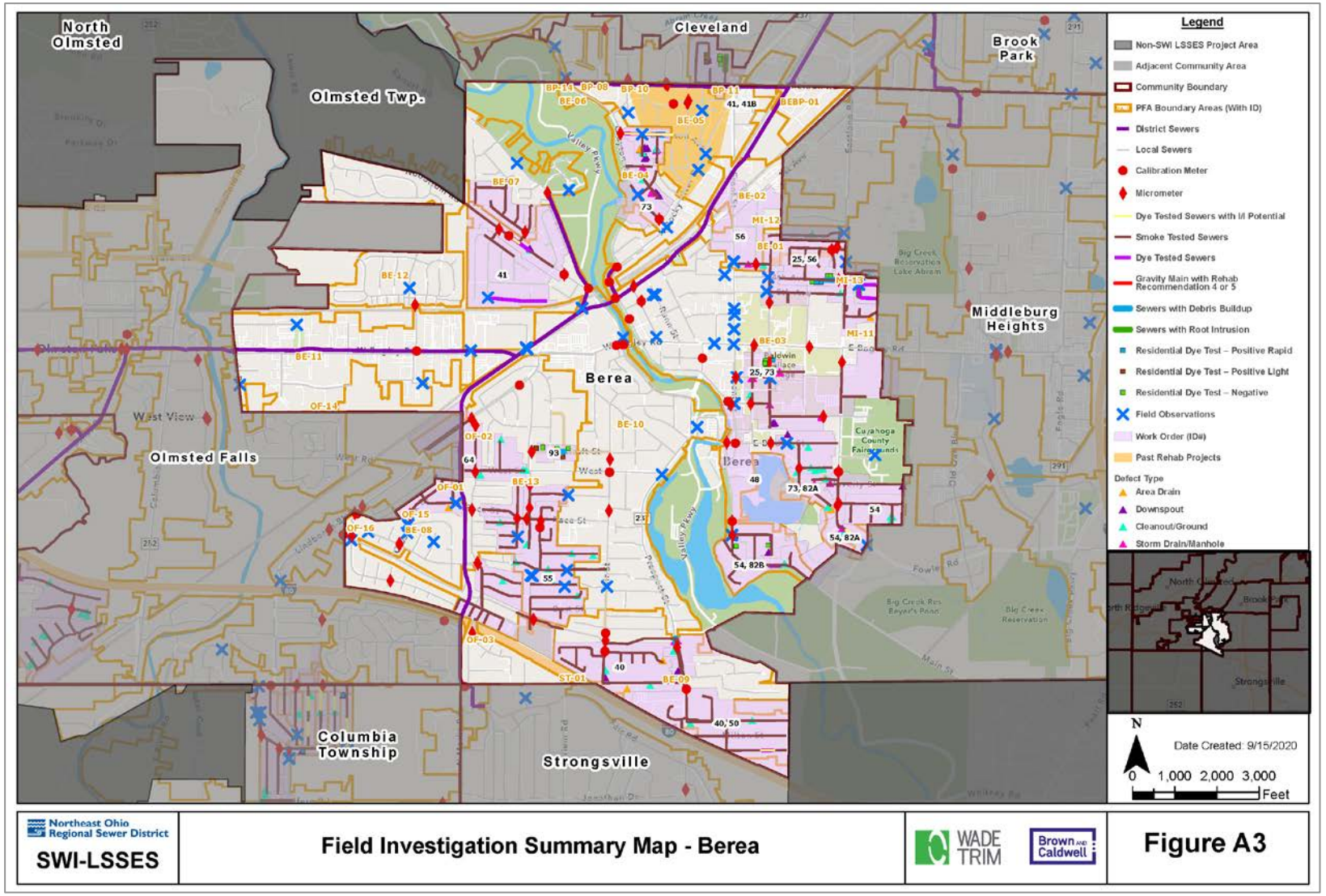
Berea Trench Types and Problem Areas

- 8 aging septics remain and may be failing
- Two potential illicit discharge Investigations have been remediated and closed



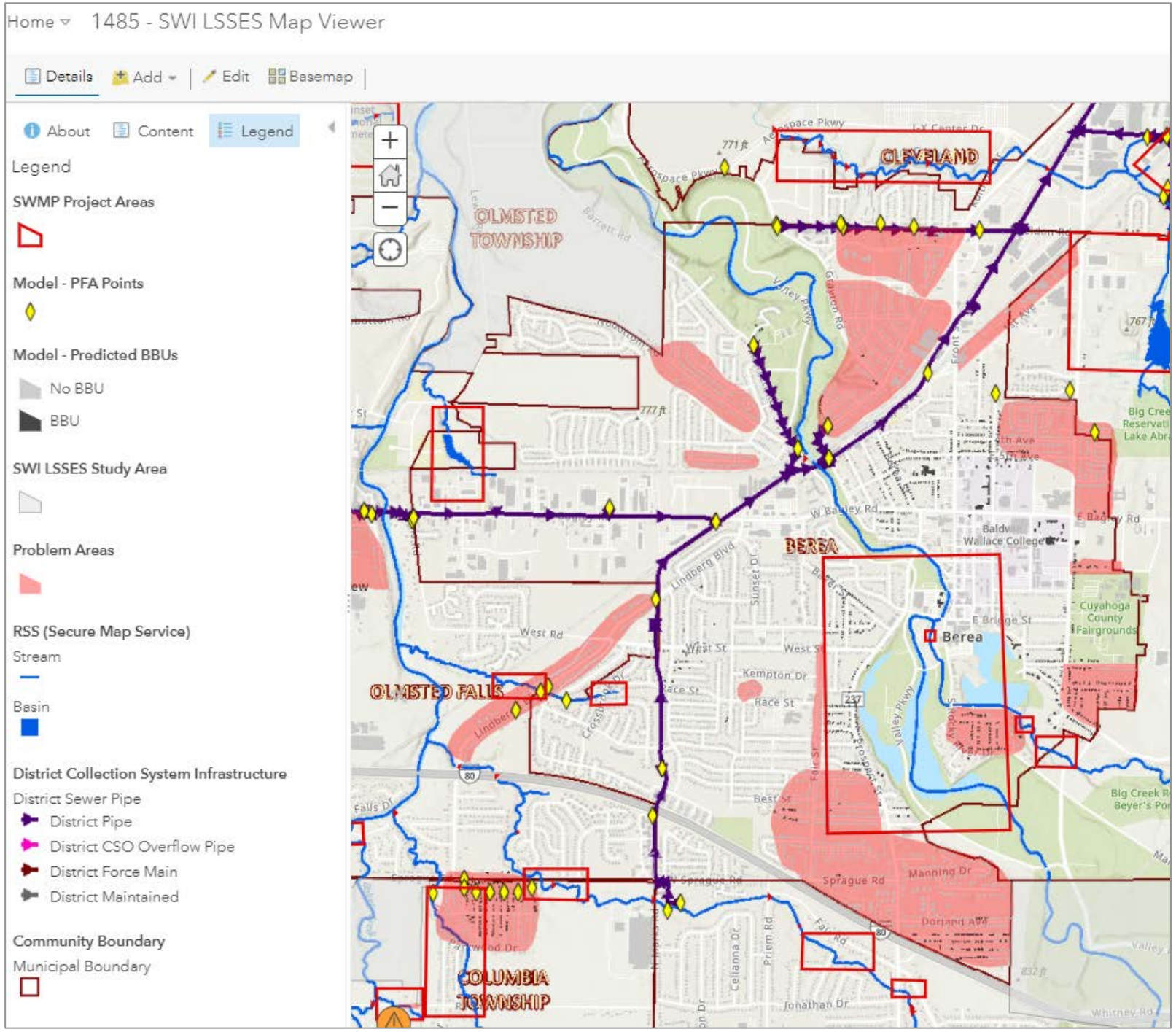
Fieldwork Results Available in AGOL

- 16 field work orders including dyed water, CCTV, smoke and private I/I testing
- Smoke testing found typical I/I sources
- Private I/I testing at 17 properties found some I/I, but lower than study avg
- Several buried MH/cover access issues



SWMP Coordination

- Some sewer problems may be associated with stormwater problems
- Coordinated solutions may be cost-effective



Potential Solutions – 3 Tiers

1

Known problems

- Community reported problems (generally BBUs)
- Known SSOs active during 5-year rainfall
- Critical operational or water quality issues

2

Areas of excessive I/I

- PFAs > 50,000 GPAD / 70,000 GPDIM
- Over/under common trench systems
- Significant operational or water quality issues

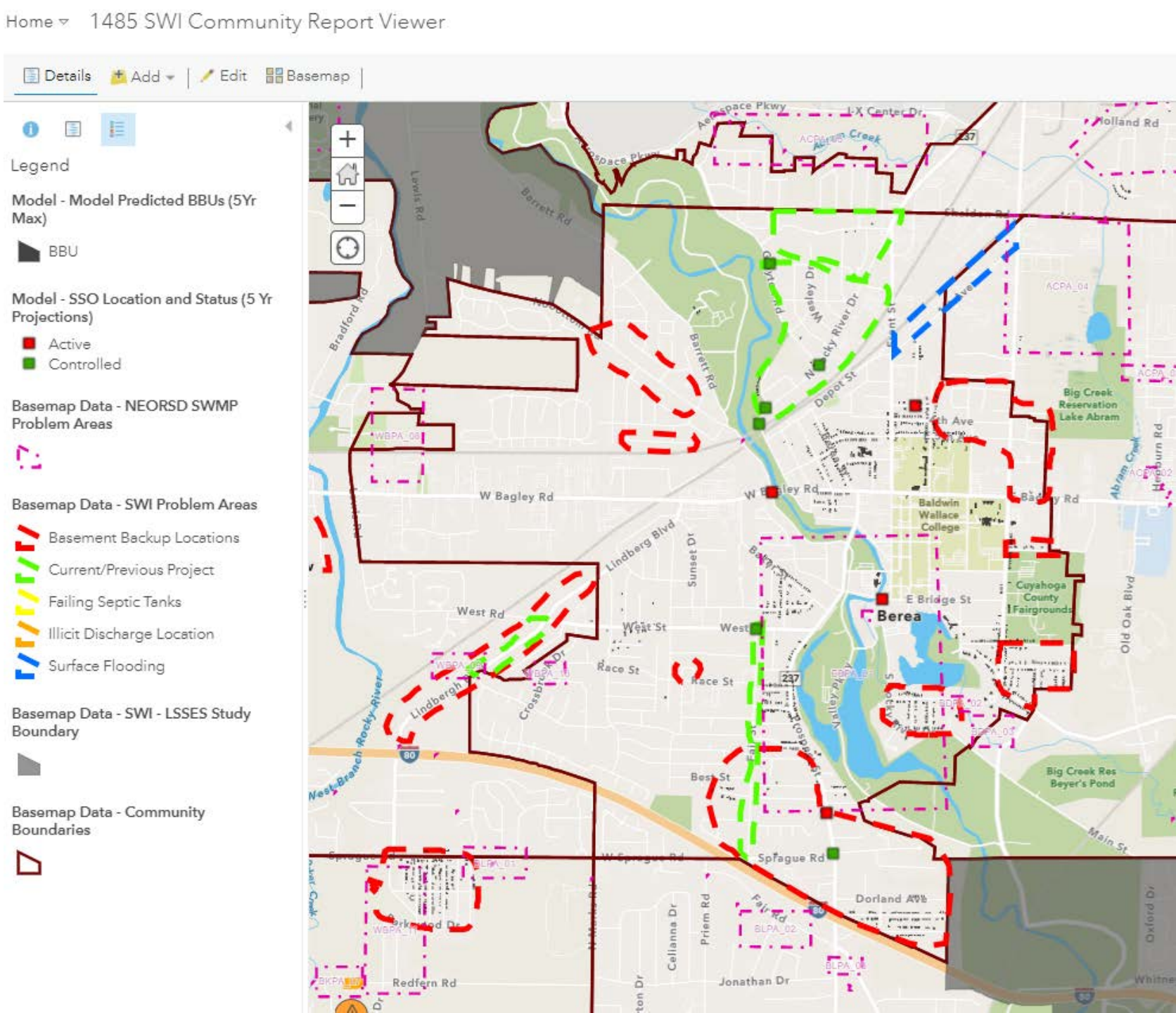
3

Other projected problem areas

- Projected BBUs/flooded manholes in isolated or lower peak flow areas

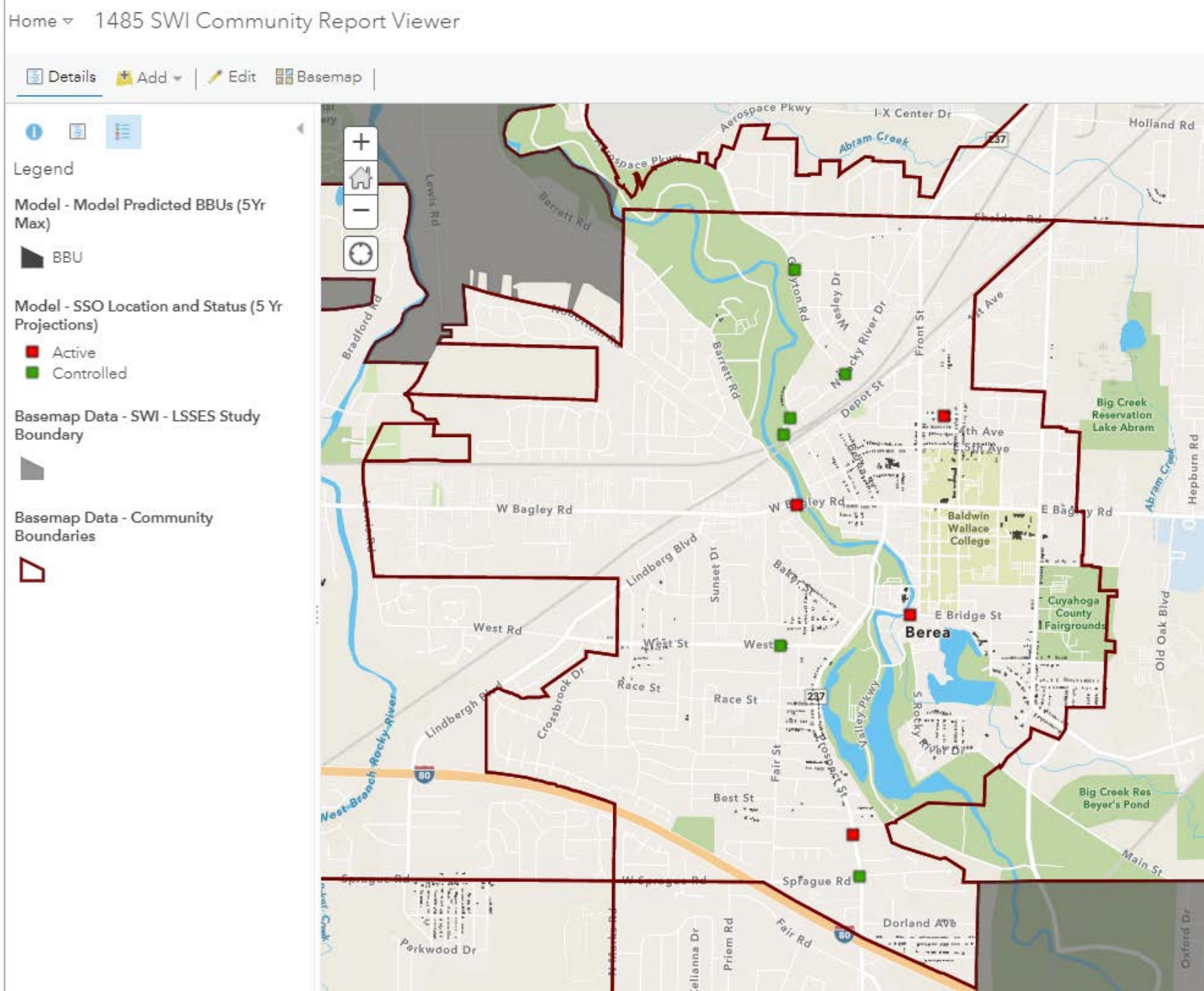
Preliminary Potential Solutions

- Some sewer problems may be associated with stormwater problems
- Coordinated solutions may be cost-effective



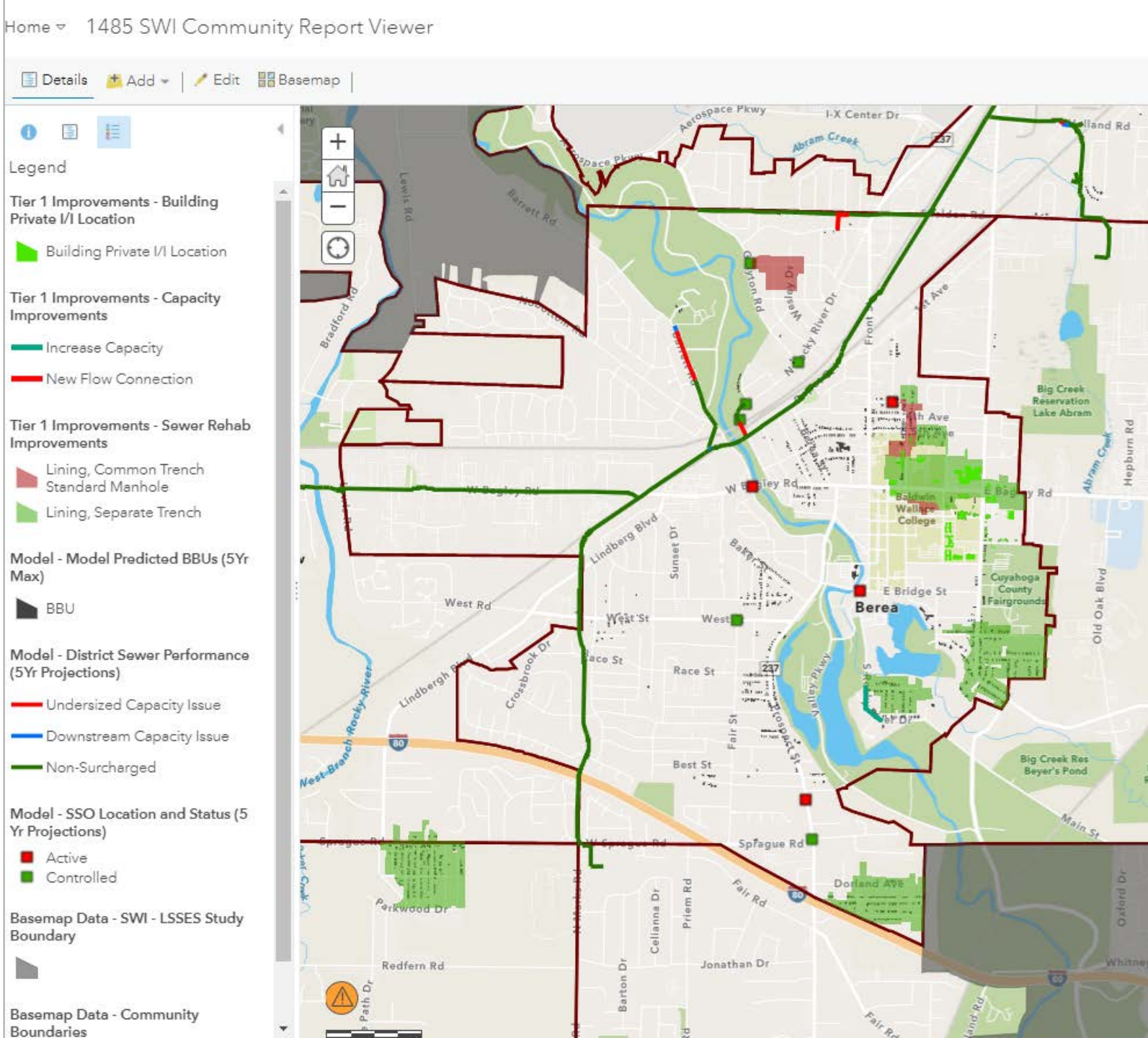
Preliminary Potential Solutions

- Tier 1 – Community reported problems and active SSOs
- Tier 2 – High flow areas
- Tier 3 - Other model projected problems



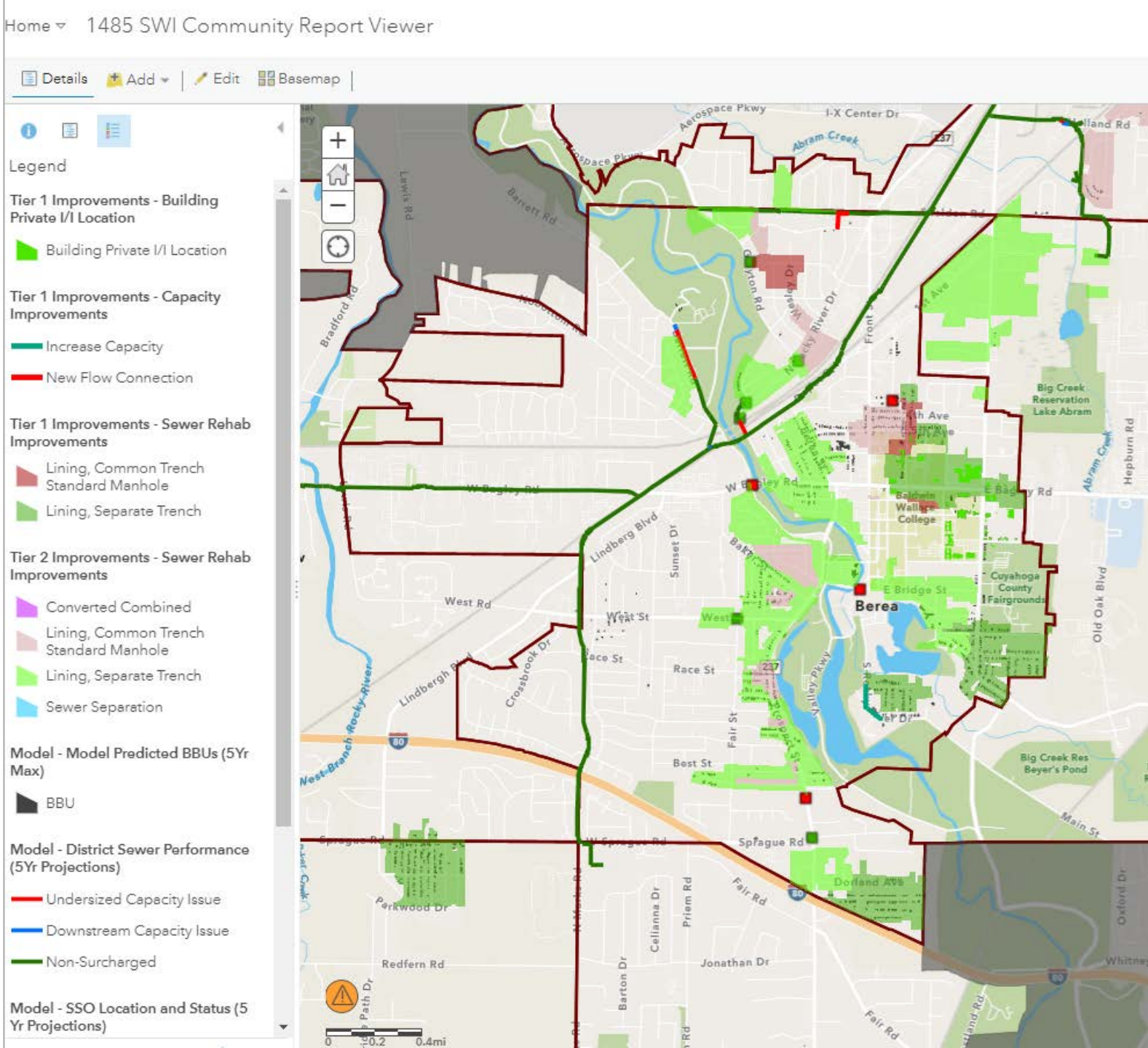
Preliminary Potential Tier 1 Solutions

- Tier 1 – Community reported problems and active SSOs



Preliminary Potential Tier 1 & 2 Solutions

- Tier 1 – Community reported problems and active SSOs
- Tier 2 – High flow areas
- Tier 3 - Other model projected problems



Potential Solutions and Next Steps

- Potential solutions for problems are in final QC review
- Targeting 5-year rainfall peaks:
  - <35,000 GPAD common trench
  - <20,000 GPAD separate trench
- Improvements expected to include a mix of sewer system rehab, capacity improvements and private I/I remediation
- Coordination with stormwater improvements may also be indicated.
- Community report in development to summarize capacity results, ID problems and describe potential solutions
- Project definition investigations likely needed before design to confirm I/I sources and identify optimal solutions.

Vander Tuig, Kevin

From: Vander Tuig, Kevin
Sent: Thursday, March 25, 2021 3:21 PM
To: Meiring Borcherds; Antonio Armagno; Paul Anzalone; Lita Laven; Cox, David; Mary Maciejowski
Cc: Keith McClintock; St. Pierre, Matthew
Subject: RE: City of Berea Community Meeting for Task 3 of the SWI Study
Attachments: 1485_SWI-LSSES_PRE_Berea_Task3_CommunityMtg_20210325.pdf; High pipe concept.pdf

All,

Thanks for meeting with us. The PDF slides from today's Team call are attached. A few notes from the meeting are summarized below.

1. Berea will review the draft community report and note any items to be addressed or updated. The team is available for further discussion regarding problem areas and potential solutions that can be considered/noted in the report if desired.
2. The LSSES project analysis is focused on the 5-year, 1-hour rainfall (1.46 inches per hour), but is also looking at the 10-year rainfall. Higher rainfalls can be considered, but model accuracy/utility would be expected to diminish for the larger rainfalls due to several factors.
3. A couple items we did not discuss, or only touched on:
    a. District and local sewer system record drawings are available via ArcGIS Online (AGOL). Contact the District for access.
    b. The LSSES team will include a graphic of a high pipe concept as a potential solution to consider for isolated basement flooding locations. (forgot to mention/include in the slides…PDF attached)

Please let us know if anything should be corrected or added to the notes above.

Thanks.

Kevin

Kevin Vander Tuig
Wade Trim
216.306.2568 work
216.318.1171 cell

-----Original Appointment-----
From: Meiring Borcherds <BorcherdsM@neorsd.org>
Sent: Thursday, March 4, 2021 5:32 PM
To: Meiring Borcherds; Antonio Armagno; Paul Anzalone; Lita Laven; Vander Tuig, Kevin; St. Pierre, Matthew; Cox, David; Mary Maciejowski
Cc: Keith McClintock
Subject: City of Berea Community Meeting for Task 3 of the SWI Study
When: Thursday, March 25, 2021 2:00 PM-3:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

This message originated from outside your organization

Good Day Tony,

FUNDING SOURCES FOR PUBLIC WATER AND WASTEWATER PROJECTS IN OHIO

Planning/ Design/ Construction	Agency/ Program/ Contact	Grant/ Loan	Water/ Wastewater	Amount Available/Criteria	Date Rates Effective	Rate Type/Term	Interest Rate
Planning/ Design/ Construction	**Ohio EPA** **Drinking Water Assistance Fund (DWAF)** **Water Supply Revolving Loan Account (WSRLA)** Kevin Spurbeck (614) 644-3645	Loan*	Water	➢ *Limited principal forgiveness is available each year ➢ Program Management Plan and Project Priority List are updated annually ➢ Program year runs from July 1 to June 30 ➢ Nomination forms due March 1 each year ➢ Priority project ranking with an emphasis on public health, meeting SDWA requirements, and economic affordability ➢ Loans made at monthly OWDA board meetings on last Thursday of every month (one board meeting for November & December is held in early December) ➢ Scope of services approved before planning loan, facilities plan approved before design loan, design plans approved before construction loan ➢ Semi-annual payments in Jan /July (principle and interest) ➢ Applicants must demonstrate the financial, managerial, and technical capability necessary to complete the project ➢ Federal prevailing wage rates must be used ➢ OWDA/OEPA app fee of 1.35% can be included in loan ➢ MHI is based on annual updates to the ACS data ➢ http://epa.ohio.gov/ddagw/financialassistance.aspx	Interest rates calculated monthly	**Standard Rate** Loan Terms 5 to 20 Years	www.owda.org
						Small Systems & Economic Affordability Rate (<10,000 population) Loan Terms 5 to 20 Years	www.owda.org
						Disadvantaged Community Rates http://epa.ohio.gov/Portals/29/documents/ofa/2018%20WSRLA%20PMP%20-%20FINAL.pdf ALL PLANNING AND DESIGN LOANS ARE 0% INTEREST FOR 0-5 YEARS. PLANNING AND DESIGN PROJECTS CAN BE NOMINATED THROUGHOUT YEAR. HAB PROJECTS CAN BE NOMINATED THOUGHOUT YEAR.	
Planning/ Design/ Construction	**Ohio EPA** **Water Pollution Control Loan Fund (WPCLF)** Kevin Spurbeck (614) 644-3645	Loan*	Wastewater	➢ *Limited principal forgiveness is available each year ➢ Program Management Plan and Project Priority List are updated annually ➢ Program year runs from January 1 to December 31 ➢ Nomination Forms for new projects and Project Schedule Forms for carryover projects are accepted in August. This step is needed for placement on the Project Priority List. ➢ Loans made at monthly OWDA board meetings on last Thursday of every month (one board meeting for November & December is held in early December) ➢ Project planning concept approved before design loan for each program, design plans approved before construction loan ➢ Semi-annual payments January & July (principle/interest) ➢ Federal prevailing wage rates must be used ➢ OWDA app fee of 0.35% cannot be included in loan ➢ MHI is based on annual updates to the ACS data ➢ http://epa.ohio.gov/defa/ofa.aspx	Interest rates calculated monthly	**Standard Rate** Loan Terms 5 to 20 Years Loan Terms 21 to 30 Years	www.owda.org
						Small Systems Rate (<10,000- includes Economic Affordability) Loan Terms 5 to 20 Years Loan Terms 21 to 30 Years Applicants must have a population less than 5,000 OR a project service population of 5,000 or less and that charges entire debt for project solely to project service population.	www.owda.org
						Hardship Rate (up to 20 years) ALL PLANNING AND DESIGN LOANS ARE 0% INTEREST FOR 0-5 YEARS. PLANNING AND DESIGN PROJECTS CAN BE NOMINATED THROUGHOUT YEAR. NUTRIENT REDUCTION PROJECTS CAN BE NOMINATED THOUGHOUT YEAR.	0% or 1.00 %

FUNDING SOURCES FOR PUBLIC WATER AND WASTEWATER PROJECTS IN OHIO

Planning/ Design/ Construction	Agency/ Program/ Contact	Grant/ Loan	Water/ Wastewater	Amount Available/Criteria	Date Rates Effective	Rate Type/Term	Interest Rate
Planning/ Design/ Construction	**Ohio Water Development Authority (OWDA)** **Revolving Loan Fund** Ken Heigel (614) 466-5822	Loan	Water/ Wastewater	➢ Open cycle, applications due by 1st of each month, loans made at monthly OWDA board meetings on last Thursday of every month (one board meeting for Nov/Dec is held the 2nd Thursday of December), application fee of 0.35% ($400 min) cannot be included in loan ➢ For a design loan to a new system, system must either institute rates or be sponsored by county. For a design loan to an existing system, system must show revenue is adequate or institute rates for repayment period ➢ Design loan accrues interest as funds are drawn. Planning/design loans must be repaid in 5 years as balloon payment or when construction financing is obtained (rolled into OWDA construction loan). Semi-annual payments in January and July (principle and interest). No prepayment penalty for planning/design loans, construction loans cannot be prepaid. 1st planning loan semi-annual payment due Jan 1 or July 1 one year after loan approval, will equal 1/40th of original loan amount ➢ Interim financing loans maximum term is 3 years ➢ MHI based on the most recent ACS data ➢ http://www.owda.org	Interest rates calculated monthly	**Market Rate Program** Loan Terms 5 to 20 Years Loan Terms 21 to 30 Years 5-year balloon payment for plan/design loans, 5-30 year term for construction loans. 1/2% discount for: 1) Previous borrower, 2) Findings & Orders, 3) Regionalizing (connecting to existing or purchasing another system). Maximum discount is 1.0% (applies to construction loans.	www.owda.org
						Community Assistance Program (construction loans only) Loan Terms 5 to 20 Years Loan Terms 21 to 30 Years $5M maximum. Applicant must have population < 5,000 or be district serving < 2,000. Water rates must be 1.1% of MHI, sewer rates 1.5%, or both rates 2.6%.	www.owda.org
					Interest rates calculated monthly	Loan Advance Program- Interim financing at a short-term interest rate to local government agencies that have received a funding commitment from USDA-RD or US Army Corp. Submit application 2 months prior to loan approval with estimated costs. http://www.owda.org/docs/document_selector/upload/Loan%20Advance%20Program.pdf	
Construction	**Ohio Water Development Authority (OWDA)** Un-Sewered Area Assistance Program Ken Heigel (614) 466-5822	Grant	Wastewater	➢ http://www.owda.org/docs/document_selector/upload/Un-Sewered%20Area%20Assistance%20Program.pdf ➢ Open cycle, applications due by 1st of each month, grants awarded at monthly OWDA board meetings on last Thursday of every month (one board meeting for Nov/Dec is held in early December)			

FUNDING SOURCES FOR PUBLIC WATER AND WASTEWATER PROJECTS IN OHIO

Planning/ Design/ Construction	Agency/ Program/ Contact	Grant/ Loan	Water/ Wastewater	Amount Available/Criteria	Date Rates Effective	Rate Type/Term	Interest Rate
Construction	**USDA- Rural Development (USDA-RD)** **Water and Waste Disposal Program** David Douglas (614) 255-2391	Grant/ Loan	Water/ Wastewater	➢ Open cycle, no maximum dollar amount ➢ USDA reviews an applicant's rates and cash reserves when determining grant eligibility, single utility rates should be 1.5% of MHI and combined utility rates should be 3.0% ➢ Public bodies and non-profit organizations eligible ➢ Projects must serve areas with a population less than 10,000 ➢ Applicants must be unable to finance project through conventional sources ➢ Annual payments for public bodies due on the first day of the month of loan closing ➢ For non-profits, monthly payments due on the day of loan closing every month except for the 29th, 30th, 31st which are all due on the 28th of the month ➢ No penalty for early repayment ➢ MHI based on ACS 2006-2010 data ➢ http://www.rurdev.usda/OH/wtrwaste.htm	Interest rates calculated quarterly	Poverty- MHI<$44,173 (80% of state non-metro MHI) and correcting existing health hazard, up to 40 years Intermediate- MHI between $44,173 - $55,216 (80-100% of state non-metro MHI), up to 40 years Market- MHI > $55,216, up to 40 years http://www.rd.usda.gov/programs-services/water-waste-disposal-loan-grant-program	
Construction	**Ohio Public Works Commission (OPWC)** Linda Bailiff (614) 644-1823	Grant/ Loan/ Loan Assist	Water/ Wastewater	➢ Up to 90% grant for repair/replacement and up to 50% grant for new/expanded infrastructure ➢ See http://www.pwc.state.oh.us for application due dates and funding amounts. Schedules and methodologies vary by districts who approve the project applications. ➢ Each district has annual 20% new construction limitation ➢ Loan assistance is grant for interest on non-OPWC loans for a project's construction period payable up to 12 months prior to the date of the project agreement ➢ Governments with population < 5,000 may be considered by Small Government Commission if forwarded by district ➢ Small Government Program bases MHI on most recent 5-year American Community Survey as published by the Ohio Development Services Agency; Districts MHI data Sources vary	Constant	Loans available in combination with grant or as standalone as much as 100% of project costs District establishes term but usually 0% Life of loan cannot exceed the lesser of 30 years or weighted useful life of project Loans billed biannually with no prepay penalty and payments may exceed invoiced amount to pay off loan more quickly, if desired Semi-annual payments due July 1 and January 31 beginning the first billing cycle after project completion	

FUNDING SOURCES FOR PUBLIC WATER AND WASTEWATER PROJECTS IN OHIO

Planning/ Design/ Construction	Agency/ Program/ Contact	Grant/ Loan	Water/ Wastewater	Amount Available/Criteria	Date Rates Effective	Rate Type/Term	Interest Rate
Construction	**Appalachian Regional Commission (ARC)** **Area Development Program**	Grant	Water/ Wastewater	➢ Maximum $250,000 State funds or Federal ARC funds available ➢ No more than 80% of total project cost provided ➢ Matching funds required (based on ARC's designation of county economic status - contact LDDs for match requirements) ➢ Applicants must be located in 1 of 32 Ohio Appalachian Counties ➢ Priority to economic development projects with job creation or retention ➢ http://development.ohio.gov/cs/cs_goa.htm	*For Clermont, Brown, Highland, Adams, Ross, Pike, Scioto, Vinton, Jackson, Lawrence, Gallia counties contact Jessica Keeton with the **Ohio Valley Regional Development Commission (OVRDC)** at (800) 223-7491 and jkeeton@ovrdc.org *For Hocking, Athens, Meigs, Perry, Morgan, Washington, Noble and Monroe counties contact Melissa Zoller with the **Buckeye Hills Regional Council (BHRC)** at (740) 374-9436 and mzoller@buckeyehills.org		
Construction	**Appalachian Regional Commission (ARC)** **Distressed Counties Program**	Grant	Water/ Wastewater	➢ Maximum $250,000 State funds or Federal ARC funds available ➢ Applicants must be located in an Ohio Appalachian Distressed County (ARC classified its member counties within one of five economic status designations each fiscal year - contact LDDs for current designations) ➢ Match required; eligible applicants may receive up to 80% of the total project cost ➢ Priority to water and wastewater projects ➢ http://development.ohio.gov/cs/cs_goa.htm	*For Holmes, Coshocton, Muskingum, Tuscarawas, Guernsey, Carroll, Harrison, Belmont, Columbiana, and Jefferson counties contact Alan Knapp with the **Ohio Mid-Eastern Governments Association (OMEGA)** at (740) 439-4471 and alank@omegadistrict.org *For Ashtabula, Mahoning, and Trumbull counties contact Kathy Zook with the **Eastgate Regional Council of Governments (Eastgate)** at (330) 779-3800 and kzook@eastgatecog.org		
Planning/ Design/ Construction	**WSOS/RCAP** **Rural Community Loan Fund** Kristin Woodall (419) 332-2029	Loan	Water/ Wastewater	➢ Maximum amount available based on availability ➢ Low-income rural communities receive priority ➢ Intended for gap financing ➢ Available for public and private entities ➢ 1% origination fee ➢ Open cycle application process with financing available on a first come first serve basis ➢ Technical assistance available to applicants from RCAP ➢ http://www.glrcap.org/ohio	Constant	Construction projects- term is 10 years Planning and design projects- term is 5 years	4.0%

FUNDING SOURCES FOR PUBLIC WATER AND WASTEWATER PROJECTS IN OHIO

Planning/ Design/ Construction	Agency/ Program/ Contact	Grant/ Loan	Water/ Wastewater	Amount Available/Criteria	Date Rates Effective	Rate Type/Term	Interest Rate
Construction	**Ohio Development Services Agency (ODSA)** (614) 466-2285 **CDBG Residential Public Infrastructure Grant Program**	Grant	Water/ Wastewater	➢ Open cycle, maximum grant request $750,000, minimum grant request $100,000, minimum total project cost $200,000 ➢ Cities and villages will be limited to one grant award per program year. Counties will be limited to four awards per program year (two for itself and two on behalf of one or more eligible sub-units of general local government (villages and cities) within the county jurisdiction. County must apply on behalf of villages that do not have a water or sewer utility. ➢ Projects must meet the following criteria in order to be eligible: (1) Projects must serve at least 51% LMI households, (2) Project must have an identified health hazard, violation, or replace functionally obsolete facilities (if replacing functionally obsolete facilities applicant must show that it is more cost effective to construct new facility than repairing existing facility), (3) CDBG funds must be matched 1:1 (for every $1 of CDBG funds other funds must equal $1), including $100,000 for on-site improvements, (4) Projects must serve at least 60% residential customers. ➢ Water or sewer rates must equal 1% of the Median Household Income or $30 per month and combined water and sewer rates must equal 2.0% of the Median Household Income or $60 per month ➢ 10% or $30,000, whichever is less, of the total grant amount may be used for general administration ➢ Grantee may qualify project using 2006-2019 ACS LMI data or an income survey following Policy Notice 17-02 http://development.ohio.gov/cs/cs_cdbg.htm		
Planning/ Construction	**CDBG Community Development Program**	Grant	Water/ Wastewater	➢ Distributed to 79 non-urban counties and 51 small cities ➢ Funds are limited ➢ Each county generally accepts applications in April/May ➢ Projects must serve at least 51% LMI households and must be completed in 12 months http://development.ohio.gov/cs/cs_cdbg.htm			
Construction	**CDBG Economic Development Loan/Public Infrastructure Grant Program**	Grant/ Loan	Water/ Wastewater	➢ Loan program creates and retains permanent, private sector job opportunities for low- and moderate-income citizens through the expansion and retention of business and industry in Ohio communities. Both Fixed Assets Loans and Public Off-site Infrastructure Assistance are available. Non-entitlement cities and counties may apply on behalf of for-profit businesses committing to create at least five jobs within its jurisdiction. ➢ Open cycle, $500,000 maximum loan ceiling, $25,000 maximum cost per job, $1 to $1 leverage requirement, 15% total project must be private, 5% cash equity, low-interest fixed-asset loans to for-profit entities related to creation, expansion, and retention, gap financing mechanism. ➢ Grant program provides funding to create and retain permanent, private-sector job opportunities, principally for low- and moderate-income persons, through the expansion and retention of business and industry in Ohio communities. ➢ Open cycle, $500,000 maximum grant ceiling, $9,999 maximum cost per job, $1 to $1 leverage requirement for offsite costs, and 15% total project must be private. http://development.ohio.gov/cs/cs_cdbg.htm		
Planning/ Design/ Construction	**CDBG Economic Development Revolving Loan Fund**	Grant	Water/ Wastewater	➢ Capitalized by loan payments made by private companies awarded CDBG ED loans. ➢ RLF can assist with CDBG ED and Community Development program activities that meet national objective such as onsite loans, offsite infrastructure or community improvements. CDBG RLF loans are a gap financing mechanism http://development.ohio.gov/cs/cs_cdbg.htm			
Planning/ Design/ Construction	**Tax Increment Financing (TIF)**	N/A	Water/ Wastewater	➢ Tax Increment Financing (TIF) is an economic development mechanism available to local governments in Ohio to finance public infrastructure improvements. A TIF works by locking in the taxable worth of real property at the value it holds at the time the authorizing legislation was approved. Payments derived from the increased assessed value of any improvement to real property beyond that amount are directed towards a separate fund to finance the construction of public infrastructure defined within the TIF legislation. http://development.ohio.gov/bs/bs_tif.htm			
Design/ Construction	**Alternative Stormwater Infrastructure Loan Program**	Loan	Stormwater	➢ Offers below-market rate loans for the design and construction of green infrastructure as part of economic development projects. Up to $5,000,000 in loan funds per project are available to governmental entities through the program. Development partners are encouraged to partner with the governmental entity for their projects. The funds can pay for design, demolition, construction, materials and administrative costs associated with the green infrastructure project. This program targets a specific challenge of redevelopment projects by reducing the cost to businesses and communities that need to minimize both the financial and environmental impact of their stormwater runoff. http://development.ohio.gov/cs/cs_altstormwater.htm		

FUNDING SOURCES FOR PUBLIC WATER AND WASTEWATER PROJECTS IN OHIO

Planning/ Design/ Construction	Agency/ Program/ Contact	Grant/ Loan	Water/ Wastewater	Amount Available/Criteria	Date Rates Effective	Rate Type/Term	Interest Rate
Construction	---------- **CDBG Critical Infrastructure Program**	Grant	Water/ Wastewater	➢ Projects are designed to assist applicant communities with high-priority, single-component projects such as roads, flood and drainage and other public infrastructure improvements with a high community-wide impact. Critical Infrastructure projects are designed to serve primarily residential populations. Funds cannot be used to support public improvements for future or speculative developments. ➢ https://development.ohio.gov/cs/cs_cdp.htm			
Construction	**Ohio EPA** **Drinking Water Emergency Loan Fund (DWELF)** Susan Schell (614) 752-9725	Loan	Water	➢ Open cycle, up to $25,000 available ➢ Water system is required to submit a schedule indicating how the loan will be repaid within one year ➢ For repayment purposes, Ohio EPA may complete a background check on the water system requesting a loan ➢ $200,000 total available each state fiscal year, loans processed on a "first come, first served" basis ➢ Priority given to public water systems that meet the following criteria: 1. Hold a valid License to Operate (LTO), 2. Able to document a "threat of contamination", 3. No other source of potable drinking water available, 4. Unable to secure other sources of funding ➢ http://www.epa.state.oh.us/ddagw	Constant	Short Term- Loans must be repaid within 12 months.	0%
Planning/ Design/ Construction	**Ohio Water Development Authority (OWDA)** **Security Assistance Fund for Emergency Preparedness** Ken Heigel (614) 466-5822	Loan	Water/ Wastewater	➢ This safety program will provide loans to local governments to protect the communities' water, wastewater, and stormwater systems ➢ Eligible items under the program are lighting, fencing, cameras, motion detectors, gating and security systems, and terrorism preparedness plans ➢ Open cycle, loans made at monthly OWDA board meetings on last Thursday of every month (one board meeting for Nov/Dec is held in early December) ➢ Application submitted by 15th day of the month and approved last Thursday of the month ➢ Application fee of 0.35% ($400 minimum) can be included in loan ➢ Maximum amount of the loan is $100,000 for communities less than 10,000 in population, and $200,000 for communities greater than 10,000 ➢ http://www.owda.org	Constant	Planning and design loan terms 0-5 yrs Construction loan term 5-30 years	2.00%

FUNDING SOURCES FOR PUBLIC WATER AND WASTEWATER PROJECTS IN OHIO

Planning/ Design/ Construction	Agency/ Program/ Contact	Grant/ Loan	Water/ Wastewater	Amount Available/Criteria	Date Rates Effective	Rate Type/Term	Interest Rate
Construction	**Economic Development Administration (EDA)** **Public Works Program** (800) 686-2603	Grant	Water/ Wastewater	➢ Open cycle, generally between $500,000 and $1,000,000 ➢ EDA funds will typically not exceed 50% of TPC ➢ Must be governmental entity within EDA Distressed Counties ➢ Must be related to economic development (job creation/retention/private investment) ➢ Must be consistent with comprehensive economic development strategy (CEDS) of the EDA District where project is located ➢ Applicants must demonstrate the financial, managerial, and technical capability to complete the project in a timely manner ➢ http://www.eda.gov			
Construction	**Ohio Capital Asset Financing Program (OhioCAF)** David J. Conley Managing Director Robert W. Baird & Co. (888) 792-0039	Loan	Water/ Wastewater	The Ohio Capital Asset Financing program is a financing cooperative offered by the Center for Local Government to Ohio communities as an alternative to cash purchases or other forms of financing. The program: Allows multiple communities to combine their borrowing needs in a manner that enables them to enjoy better interest rates and lower financing costs, permits the financing of "Capital Asset" purchases over a period up to 25 years, based on asset life, reduces interest cost and financing expenses because of credit enhancements and economies of scale gained from the issuance of a single large bond issue compared to smaller individual issues, allows communities that cannot afford large capital outlays to spread the cost of capital assets over time, eliminates the need to prepare an individual Official Statement, does not require the participant to obtain a bond rating, minimizes the time and effort required for financing capital assets compared to using traditional methods. http://www.ohiocaf.org/	Current rates as of 01/21/13 for borrowing amount of $5 million are:	Bond Length / Estimated Interest Rate 1 — 2.64% 5 — 2.64% 10 — 2.86% 15 — 3.27% 20 — 3.56% 25 — 3.82% Repayment period can be from one to 25 years subject to the estimated life of the asset.	
Planning/ Design/ Construction	**Investment Banking Firms/ Commercial Banks**	Loan	Water/ Wastewater	➢ Limited to financial institution's guidelines and criteria and ability of applicant to repay	Constant	Market rate and term based on financial institution's guidelines and criteria	
Planning/ Design/ Construction	**U.S. Army Corp of Engineers** **Ohio Environmental Infrastructure Program Section 594**	Grant	Water/ Wastewater	Submit SCEIG Project Profile (http://www.sceig.org/docs/document_selector/upload/SCEIG%20ProjectProposalForm%202014Dec.doc) to Ken Heigel at OWDA at kheigel@owda.org			
Planning/ Design/ Construction	**USEPA State and Tribal Assistance Grant (STAG)**	Grant	Water/ Wastewater	Currently no funds available under this program.			

FUNDING SOURCES FOR PUBLIC WATER AND WASTEWATER PROJECTS IN OHIO

Planning/ Design/ Construction	Agency/ Program/ Contact	Grant/ Loan	Water/ Wastewater	Amount Available/Criteria	Date Rates Effective	Rate Type/Term	Interest Rate
Construction	**Ohio Bureau of Workers' Compensation (BWC)** **Safety Grants** (800) OHIOBWC	Grant	Water/ Wastewater	➢ For the purchase of ergonomic, safety, and/or industrial equipment to reduce or eliminate injuries and illnesses ➢ Remote meter readers are now on the moratorium list, so they are currently ineligible for funding. Maximum of $40,000, BWC will match 3:1 ➢ Must be a state-fund employer, maintain active coverage, be current on all monies owed BWC, demonstrate the need for safety intervention, provide two-year baseline data, and establish payroll periods (2) for the purpose of defining employer eligibility cycle. ➢ Policy year is January 1 through December 31 ➢ https://www.bwc.ohio.gov/employer/programs/safety/EmpGrants.asp			
Planning/ Design	**United States Environmental Protection Agency (EPA)** **Green Infrastructure Technical Assistance Program**	Grant	Water/ Wastewater	➢ Provides assistance to help communities 1) overcome the most significant barriers to green infrastructure, and 2) develop innovative approaches to implementation that meet multiple environmental, social, and economic goals ➢ A total of $400,000 will be provided to 5-7 communities in 2014 (approximately $57,000-$80,000 per community) ➢ Funds are for technical assistance, analyses, and studies ➢ Contact GI_Tech_Assistance@epa.gov with questions ➢ http://water.epa.gov/infrastructure/greeninfrastructure/gi_support.cfm#2014TechnicalAssistance			
Planning/ Design	**Community Engineering Corps (CEC)** Lauren Butner Domestic Program Manager (720) 593-1890	Engineering	Water/ Wastewater	➢ Leveraging the membership of Community Engineering Corps' alliance partners – American Society of Civil Engineers, the American Water Works Association, and Engineers Without Borders USA –the CEC brings more than 200,000 technical professionals and students together to serve communities across the United States. These individuals volunteer their time and expertise to assist communities that do not have the resources to access engineering services. With a strong commitment to community-driven projects, CEC volunteers work alongside community members to design solutions to identified problems. ➢ Income requirement- community's MHI must be equal to or below 80% of state MHI or community's poverty rate must be equal to or greater than the national poverty rate. ➢ http://www.communityengineeringcorps.org/			
Construction	**Ohio Facilities Construction Commission** **Lead Plumbing Fixture Replacement Assistance Grants**	Grant	Water	➢ The program provides funding to eligible schools to reimburse for the assessment and replacement of drinking fountains, water coolers, plumbing fixtures and limited connected piping. Schools built before 1990 can apply for reimbursement up to $15,000 for the assessment of eligible fixtures and the material costs to replace fixtures identified as being over the federal action level for lead in drinking water. The program is open to traditional public schools, community schools and chartered nonpublic schools. ➢ http://ofcc.ohio.gov/Services-Programs/Grants/Lead-Fixture-Replacement-Grants-Round-2			

*Contact Kurtis Strickland, Ohio State RCAP MIS Coordinator, with questions or revisions at (740) 682-8414 or kmstrickland@wsos.org

FUNDING AGENCY ELIGIBLE APPLICANTS

Type of Utility	ARC	CDBG	EPA Water	EPA Waste	OPWC	OWDA	USDA	WSOS SWF
Village	X	X	X	X	X	X	X	X
City	X	X	X	X	X	X	X	X
Township	1	2			X			
6103 Water District	X	X	X		4	X	X	X
6117 Sewer District	X	X		X	4	X	X	X
6119 Regional W/S District	X	2	X	X	X	X	X	X
501c3 Not-for-Profit Company	2	2	X		4		X	X
Conservancy District	X	2	X	X		X	X	X
Private-For-Profit System		2	X	3				X

1 ODSA will not allow a township to apply for ARC funding if the funding is state ARC funds or state administered but a county can apply on behalf of township.
2 County can apply on behalf of entity.
3 Non-point source entities only.
4 County and/or township can apply on behalf of entity if they own, operate, and maintain the infrastructure.

For more information, please contact: kmstrickland@wsos.org
Source: www.ohiorcap.org
For non-public funding, please click here.

Current and Future Infrastructure Funding in Ohio

Steve Malone
Division of Environmental and Financial Assistance

Ohio Environmental Protection Agency

Water/Wastewater Funding

- State Revolving Funds
- Infrastructure Bill
- H2Ohio
- WIIN Grants
- Sewer Overflow and Storm Water Grants
- ARPA/HB 168

Ohio Environmental Protection Agency

Ohio's Two State Revolving Funds

	Water Pollution Control Loan Fund	Water Supply Revolving Loan Account
Authorization (year)	CWA 1987	SDWA 1996
First Loan	Sept. 1989	Feb. 1999
Total Projects	2,786 loans - $10.7 billion	943 loans - $2.07 billion
Federal Seed Money	$2.5 billion	$674 million
State Matching Funds	$495 million	$135 million
Annual Capacity	**$500 million/year**	**$150 million/year**

Standard Rate for October 2021 = 0.42%!

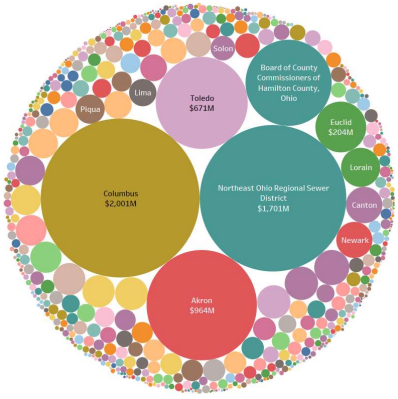
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How the SRFs Work



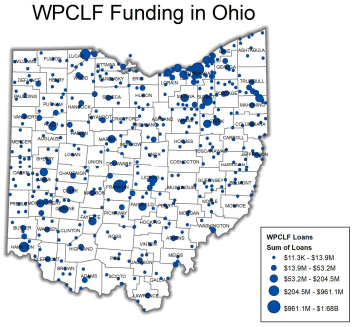
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WPCLF Loan Awards



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WPCLF Funding in Ohio

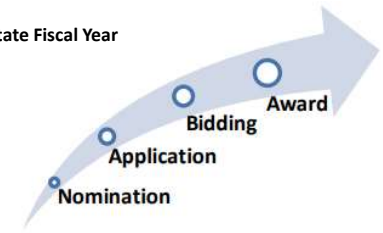


Ohio Environmental Protection Agency

SRF Funding Process

WPCLF = Calendar Year

WSRLA = State Fiscal Year



Ohio Environmental Protection Agency

SRF Principal Forgiveness

- Principal forgiveness has been a component of the SRFs since ARRA (Stimulus Act during Obama administration)
- Water/Wastewater Infrastructure, HSTS Repair and Replacement
- Disadvantaged Communities

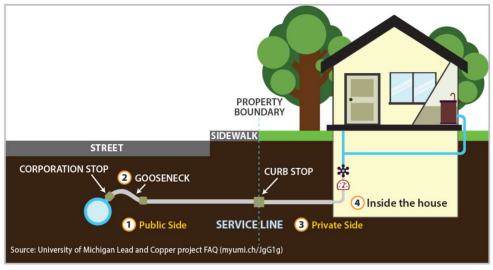
WPCLF ~ $35M/year

WSRLA ~ $13M/year

- Regionalization
- Readiness to Proceed
- Water Quality

Ohio Environmental Protection Agency

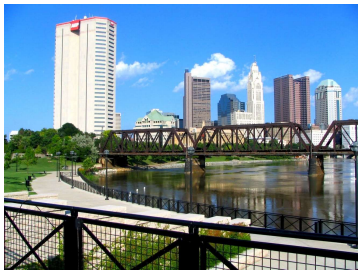
Lead Service Line Principal Forgiveness



$20 million in funding available for LSL replacement - WIFTA

Ohio Environmental Protection Agency

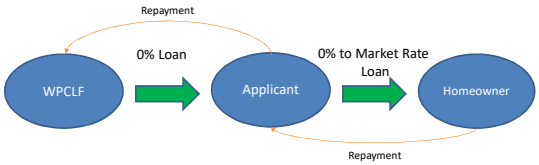
Blueprint Columbus



- Green Infrastructure
- Lateral Lining
- Roof Water Redirection
- Sump Pump Program

Ohio Environmental Protection Agency

Local Lateral Loan Programs



Ohio Environmental Protection Agency

SRF Funding

- Can co-fund with other funders. SRF requirements apply to whole project.

- **OWDA** – Market-rate loans, some discounts, limited grants. New refinance program
- **CDBG** – Administered by ODOD, typical grants $500k-$750k
- **OPWC** – Usually loan or loan/grant combos
- **USDA** – Usually loan/grant combos. Higher rates, long terms
- **ARC** – Administered by several partners; local development districts, Governor's Office of Appalachia, ODOD. Grant funding for communities in Appalachia

Ohio Environmental Protection Agency

U.S. Senate Releases Bipartisan Comprehensive Infrastructure Package

- In early August, the U.S. Senate released text of the bipartisan bill for infrastructure which includes $43.426 billion in new funding for water infrastructure.
- The bill provides three pots of funding for SRFs – one for any eligible SRF project, one dedicated to remediation of emerging contaminants with a focus on PFAS/PFOA, and one dedicated to lead service line replacement, including planning, identification, and design.
- The funding is appropriated in the bill, meaning it is actual funding.
- The funding is in addition to funding in the annual budget.
- The funding is available "until expended."
- The legislation also expands Buy American requirements for SRF projects to construction materials and manufactured products.

Ohio Environmental Protection Agency

Year	Clean Water SRF Any Eligible Project	Drinking Water SRF Any Eligible Project	Total	State Match	Mandated Additional Subsidy
2022	1,902,000,000	1,902,000,000	3,804,000,000	10%	49%
2023	2,202,000,000	2,202,000,000	4,404,000,000	10%	49%
2024	2,403,000,000	2,403,000,000	4,806,000,000	20%	49%
2025	2,603,000,000	2,603,000,000	5,206,000,000	20%	49%
2026	2,603,000,000	2,603,000,000	5,206,000,000	20%	49%
Total	$11,713,000,000	$11,713,000,000	$23,426,000,000		
Year	Clean Water SRF Emerging Contaminants	Drinking Water SRF Emerging Contaminants	Total	State Match	Mandated Additional Subsidy
2022	100,000,000	800,000,000	900,000,000	0%	100%
2023	225,000,000	800,000,000	1,025,000,000	0%	100%
2024	225,000,000	800,000,000	1,025,000,000	0%	100%
2025	225,000,000	800,000,000	1,025,000,000	0%	100%
2026	225,000,000	800,000,000	1,025,000,000	0%	100%
Total	$1,000,000,000	$4,000,000,000	$5,000,000,000		
Year		Drinking Water SRF Lead	Total	State Match	Mandated Additional Subsidy
2022		3,000,000,000	3,000,000,000	0%	49%
2023		3,000,000,000	3,000,000,000	0%	49%
2024		3,000,000,000	3,000,000,000	0%	49%
2025		3,000,000,000	3,000,000,000	0%	49%
2026		3,000,000,000	3,000,000,000	0%	49%
Total		$15,000,000,000	$15,000,000,000		
Total	$12,713,000,000	$30,713,000,000	$43,426,000,000		

Ohio Environmental Protection Agency

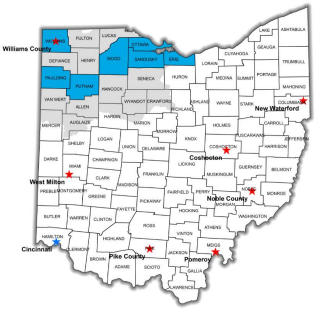
H2Ohio

- $172 million made available in 2020-2021 biennium. ODA, ODNR, and Ohio EPA
- Ohio EPA focus areas:
  - HSTS Repair and Replacement
  - Daycare LSL Replacement
  - Water/Wastewater Infrastructure
  - Technology Assessment
  - Water Quality Modeling

Ohio Environmental Protection Agency

H2Ohio

Ohio EPA
Year 1



Ohio Environmental Protection Agency

H2Ohio





Ohio EPA
Year 2

Ohio Environmental Protection Agency

H2Ohio **Technology Assessment Program**

Harmful Algal Blooms

Harmful algal blooms (HAB) have been a concern in Lake Erie for decades, and the State of Ohio has a long history of developing solutions to address them. In support of these efforts, State agencies are often presented with new and innovative approaches for addressing HABs and other emerging issues. Since these technologies are typically innovative, proprietary, and span multiple scientific disciplines, state agencies alone are not best positioned to evaluate the efficacy and feasibility of these technologies. To guide the State in addressing HABs in Lake Erie, we are initiating the H2Ohio Technology Assessment Program (TAP) to solicit and evaluate emerging technologies that:



- reduce nutrient loading to rivers, streams, and lakes;
- remove nutrients from rivers, streams, and lakes;
- reduce the intensity or toxicity of algal blooms;
- recover nutrients from manure; and
- improve nutrient removal in wastewater treatment plants.

Ohio Environmental Protection Agency

WIIN Grants

- Water Infrastructure Improvements for the Nation Act
- Two grants the state has received:
  - **Small, Underserved, and Disadvantaged Communities Grant Program**
  - **Lead Testing in School and Child Care Grant Program**

Ohio Environmental Protection Agency

WIIN Grants

Small, Underserved, and Disadvantaged Communities Grant Program

- Small – Under 10,000 service area
- Underserved – No public drinking water
- Disadvantaged – Meets state disadvantaged community loan program criteria
- $1,069,000 with 45% cost share

Ohio Environmental Protection Agency

WIIN Grants

Lead Testing - Administered by ODH



Ohio Lead Testing in Child Care Programs

For a limited time, the Ohio Department of Health (ODH) is offering *FREE* testing for lead in water for licensed child care providers in your county.

Water is lead-free when it leaves your area's public water treatment plant. However, lead can be found in lead pipes and plumbing fixtures in homes and child care facilities. This lead can get into the water.

Children are particularly vulnerable to the effects of lead, so please contact us today to learn how to ensure the water in your home or facility is lead-free.

Call or email us at 513-333-3694 or OhioLeadTesting@tetratech.com. *

See how to register for FREE testing on back. More information about the program can be found at: https://storymaps.arcgis.com/stories/e7866bd9100e4c5681871e71132eaeca.

** Tetra Tech is a contractor working with ODH.*

Ohio Environmental Protection Agency

Sewer Overflow and Storm Water Reuse Municipal Grants (OSG)

- Reauthorized by America's Water Infrastructure Act of 2018 (AWIA)
- U.S. EPA to award grants to states to assist communities in meeting CSO, SSO, and storm water management infrastructure needs
- $67.3 million total FFY20 and FFY21
  $4.682 million available to Ohio

Ohio Environmental Protection Agency

Use of Funds

- (1) . . . to a municipality or municipal entity for planning, design, and construction of—
- (A) treatment works to intercept, transport, control, treat, or reuse municipal combined sewer overflows, sanitary sewer overflows, or stormwater; and
- (B) any other measures to manage, reduce, treat, or recapture stormwater or subsurface drainage water eligible for assistance under section 603(c).

Ohio Environmental Protection Agency

Prioritization

- financially distressed communities;
- implementing a long-term control plan for CSOs or SSOs;
- requesting funds for a project included on a state's Intended Use Plan for the Clean Water State Revolving Fund; or
- ~~an Alaskan Native Village.~~

Ohio Environmental Protection Agency

Fine Print

- 20% of grant must be used for green infrastructure
- 45% cost-share required
  - CWSRF funds may be used as cost-share
- CWSRF requirements apply
  - AIS
  - Davis-Bacon
  - Environmental Review

Ohio Environmental Protection Agency

ARPA/House Bill 168

INVESTING in Ohio's FUTURE

The Water and Wastewater Infrastructure Grant

$250,000,000 for design and construction of water and wastewater infrastructure

Ohio Environmental Protection Agency

ARPA/House Bill 168

- $250 million sounds like a lot of money!
- It is, but the needs are great in the water sector.

2012 Wastewater Needs Survey 20-year Need for Ohio:	**$14.5 billion**
2015 Drinking Water Needs Survey 20-year Need for Ohio:	**$13.4 billion**

Ohio Environmental Protection Agency

Contact Information
DEFA – Office of Financial Assistance

epa.ohio.gov/defa/ofa

Jon Bernstein, Assistant Chief Jonathan.Bernstein@epa.ohio.gov 614-644-3715	
Katie Courtright, Manager Loans and Grants Section Katie.Courtright@epa.ohio.gov 614-705-1147	Steve Malone, Manager Technical Review Section Steven.Malone@epa.ohio.gov 614-644-2798

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