RESOLUTION OF THE BOARD OF TRUSTEES OF MT. OLYMPUS IMPROVEMENT DISTRICT ADOPTING THE 2022 MASTER PLAN ADDENDUM: FLOW STUDY AND MASTER PLAN PROJECT RANKINGS

RESOLUTION 19-021523-01

MT. OLYMPUS IMPROVEMENT DISTRICT

RESOLUTION OF THE BOARD OF TRUSTEES OF MT. OLYMPUS IMPROVEMENT DISTRICT ADOPTING THE 2022 MASTER PLAN ADDENDUM: FLOW STUDY AND MASTER PLAN PROJECT RANKINGS

WHEREAS, on or about August 18, 2021, Mt. Olympus Improvement District, a local district and political subdivision of the State of Utah (the "District"), by and through its Board of Trustees, by District Resolution 19-081821-01, adopted a *Wastewater Collection System Master Plan* prepared by Hansen Allen & Luce, Inc. dated July 2021 (the "Master Plan").

WHEREAS, the Master Plan has been in effect since its adoption on August 18, 2021 and is currently in full force and effect.

WHEREAS, the District and others are responsible for (i) the control, safety, and disposition of all water and wastewater discharged to the District system by owners and users of the system or collected by the District, and (ii) for the safe and efficient operation of the District system and facilities.

WHEREAS, the Board of Trustees of the District has determined that it is in the best interest of the District, its customers, and the general public, to formulate and adopt an addendum to the Master Plan.

WHEREAS, the District has the power and authority to adopt addendums to the Master Plan and to enact rules, regulations, and ordinances governing and regulating the District's operations, facilities, and funding, and governing and regulating users, owners, contractors, and

other persons operating within the District's boundaries or affecting the District or its facilities in any respect.

WHEREAS, on or about December 23, 2022, Hansen Allen & Luce, a professional engineering firm retained by the District, prepared a *2022 Master Plan Addendum: Flow Study and Master Plan Project Rankings* (the "Addendum") in order to supplement and amend the Master Plan.

WHEREAS, the Board of Trustees of the District is desirous of adopting the Addendum in its entirety.

NOW, THEREFORE BE IT RESOLVED BY THE BOARD OF TRUSTEES OF MT. OLYMPUS IMPROVEMENT DISTRICT:

(1) That the Addendum, a copy of which is attached hereto as Exhibit A and incorporated herein by reference is hereby adopted by the Board of Trustees of the District.

(2) That this Resolution shall be effective immediately upon adoption.

This Resolution has been adopted at a duly called and noticed meeting and after receiving input at a public meeting held by the Board of Trustees of the District on February 15, 2023 at 9:00 a.m.

AMILI NEFF: AYE
C. KIM BLAIR: AYE
GILES DEMKE: AYE

Amili Neff

C. Kim Blair

Giles Demke

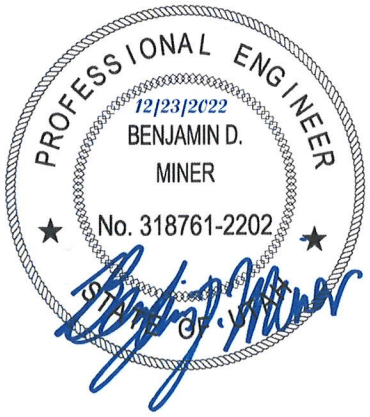
This Resolution was posted on the District's website and on the Utah Public Notice Website on February 15, 2023.

EXHIBIT A

HANSEN ALLEN & LUCE inc
ENGINEERS

MEMORANDUM

DATE: December 23, 2022



TO: Dean Ayala, P.E.
Mt. Olympus Improvement District
3392 S 500 E
Millcreek, UT 84107

FROM: Benjamin D. Miner, P.E.
Hansen, Allen & Luce, Inc. (HAL)
859 West So. Jordan Pkwy – Suite 200
South Jordan, Utah 84095

SUBJECT: 2022 Master Plan Addendum: Flow Study and Master Plan Project Rankings

PROJECT NO.: 429.05.100

INTRODUCTION

In 2021, Hansen, Allen & Luce (HAL) completed a wastewater collection system master plan for Mount Olympus Improvement District (District). This year (2022), the District asked HAL to perform a flow study to confirm model results and prioritize the master plan projects list. As part of this study, flow meters were installed in manholes located near "deficiencies" identified in the master plan with the goal of validating and prioritizing the recommended capacity improvements.

MASTER PLAN PROJECTS

The 2021 master plan studied the existing and future capacity of the District's collection system and identified projects necessary to meet capacity projections. These capital improvement projects were selected based on the ratio between depth of flow (d) divided by the pipe diameter (D). The d/D ratio describes how high the water level is within the pipe, with a d/D value of 1 indicating that a pipe is completely full. There were two criteria for d/D used to identify improvement projects:

- A d/D of 0.5 or greater for pipes 12 inches in diameter and smaller
- A d/D of 0.75 or greater for pipes larger than 12 inches in diameter

After evaluating the existing collection system with the hydraulic model, a list of recommended improvement projects was developed for the existing system based on the criteria listed above.

Table 1 lists the recommended projects from the master plan for the existing deficiencies plus project F-1 which is a future improvement (See Tables 6-4 and 6-5 in the master plan).

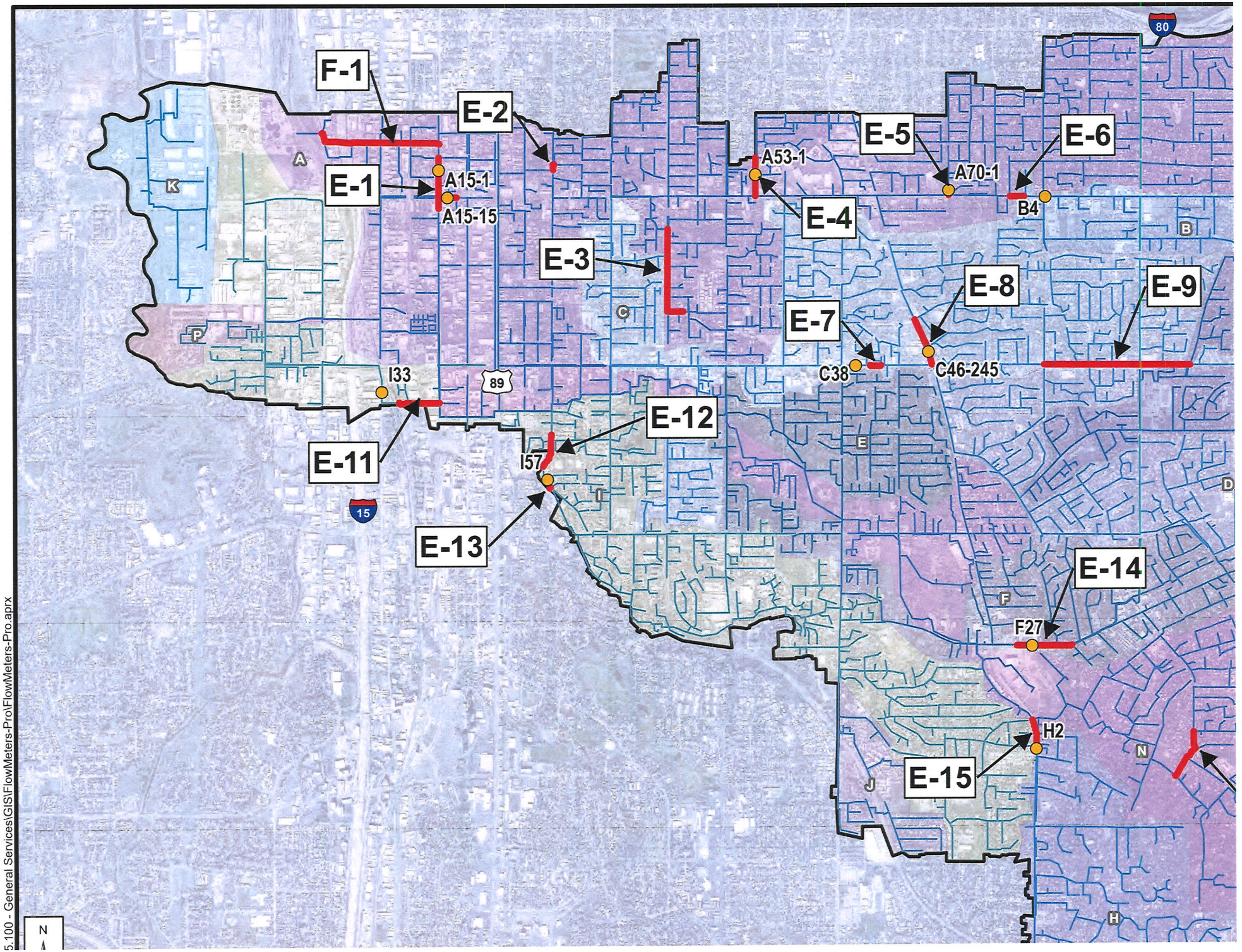
TABLE 1: EXISTING PROJECTS

PROJECT ID	LOCATION	ISSUE	SOLUTION
E-1	Along West Temple between Silver Ave. and Angelo Ave. Along 3300 South between Sue Street and West Temple	Pipe exceeds capacity because d/D > 0.5 (0.76) Pipe exceeds capacity because d/D > 0.5 (0.67)	Remove and upgrade existing 10" and 12" gravity lines to 310 ft of 12" and 1,100 ft of 15" gravity line from A15-53 to A15. Remove and upgrade existing 10" gravity line and 500 ft of 12" gravity line from A15-16 to A15-11.
E-2	Along 300 East between Lambourne Ave and Crestone Ave.	Pipe exceeds capacity because d/D > 0.5 (0.69)	Remove and upgrade existing 12" gravity line to 190 ft of 15" gravity line from A27-7 to A27.
E-3	Along 3680 South between 750 East and 700 East Along 700 East between 3680 South and 3390 South	Pipe exceeds capacity because d/D > 0.5 (0.71) Pipe exceeds capacity because d/D > 0.5 (0.61)	Remove and upgrade existing 8" gravity line to 2,740 ft of 10" gravity line from A42-99 to A42-25 and from A42-209 to A42-253.
E-4	Along 1000 East between Mansfield Ave. and 3300 South	Pipe exceeds capacity because d/D > 0.5 (0.55)	Remove and upgrade existing 10" gravity line to 1,050 ft of 12" gravity line from A53-5 to A53.
E-5	Along Imperial Street between Lahar Dr. and 3300 South	Pipe exceeds capacity because d/D > 0.5 (0.69)	Remove and upgrade existing 10" gravity line to 140 ft of 15" gravity line from A70-1 to A70.
E-6	Along 3300 South between Mill Creek Drive and 1885 East	Pipe exceeds capacity because d/D > 0.5 (0.53)	Remove and upgrade existing 10" gravity line to 390 ft of 15" gravity line from B1 to A77.
E-7	Along 3900 South between 1500 East and 1300 East	Pipe exceeds capacity because d/D > 0.75 (0.78)	Install 315 ft of parallel 10" gravity line next to existing 18" gravity line from C40A to C40.
E-8	Along Highland Drive between Siggard Drive and 3900 South	Pipe exceeds capacity because d/D > 0.5 (0.6)	Remove and upgrade existing 8" gravity line to 1,350 ft of 10" gravity line from C46-28 to C46.
E-9	Along 3900 South between Hillside Lane and 2000 East	Pipe exceeds capacity because d/D > 0.5 (0.58)	Remove and upgrade existing 10" gravity line to 4,020 ft of 12" gravity line from L17-63C71 to C56.
E-10	Along Craig Drive between 3140 East and 3100 East	Pipe exceeds capacity because d/D > 0.5 (0.54)	Remove and upgrade existing 8" gravity line to 85 ft of 10" gravity line from C83-7 to C83-6.

PROJECT ID	LOCATION	ISSUE	SOLUTION
E-11	Along approximately 4000 South between West Temple and beyond Howick Street	Pipe exceeds capacity because d/D > 0.75 (0.83)	Install 1,160 ft of parallel 18" gravity line next to existing 27" gravity line from I41 to I35. A bore crossing is required at the TRAX crossing.
E-12	Along 300 E between Gordon Lane and 4140 South	Pipe exceeds capacity because d/D > 0.75 (0.77)	Install 960 ft of parallel 15" gravity line next to existing 24" gravity line from I55 to I52A.
E-13	Intersection of 400 East and Doreen Street	Pipes upstream exceed capacity because d/D > 0.75 (0.83)	Install 40 ft of parallel 24" inverted siphon next to existing 24" inverted siphon from I59 to I58.
E-14	Along Murray Holladay Road between Viewmont Street and 1850 East	Pipe exceeds capacity because d/D > 0.5 (0.55)	Remove and upgrade existing 8" gravity line to 1,520 ft of 10" gravity line from F31 to F26A.
E-15	Along Highland Drive between Highland Down Lane and Arbor Lane	Pipe exceeds capacity because d/D > 0.5 (0.60)	Remove and upgrade existing 12" gravity line to 820 ft of 15" gravity line from H2 to H1.
E-16	Through backyards near Holladay Blvd between Castro Lane and Haven Lane	Pipe exceeds capacity because d/D > 0.5 (0.89)	Remove and upgrade existing 10" gravity line to 1,470 ft of 15" gravity line from N137-16 to N137.
F-1	Intersection of Gregson Ave. and I-15	MTOID requested a redundant line under I-15	Install 1,000 ft of 48" gravity line from A8 to A3. A bore crossing is required a the I-15 crossing.

FLOW DATA COLLECTION

The 2022 flow study was carried out between 4/19/22 and 7/26/22 at several locations throughout the service area. Manholes were selected near improvement projects from the master plan. During the study, flow meters were placed for a period of about two weeks. The status of each flow meter was assessed after one week. Figure 1 shows the locations of the manholes selected for the flow study as well as the projects listed in Table 1.



5.100 - General Services\GIS\FlowMeters-Pro\FlowMeters-Pro.aprx

RESULTS AND DISCUSSION

After the flow data was collected, the measured flows at each location were compared to the flows predicted by the model. The majority of measured flows from this study yielded similar results to the master plan flow study and to the flow projections from the hydraulic model. While some manholes showed lower flow values than model results, the differences were not considered significant enough to warrant reconsidering improvement projects from the master plan. The data that was collected as part of this flow study is provided in the Appendix. The flow data is presented in graphical format. If data was collected at the same site in both 2019 and 2022 a comparison graph is provided. A graph for all the data collected in 2022 is presented with results from the model overlayed on the same graph. Model results without inflow and 90% of the total infiltration are provided for comparison purposes. It was estimated that most of the data was collected during a time of year where infiltration is approximately 90% of peak infiltration.

Results

On October 19, 2022, HAL met with District personnel to discuss the results of the 2022 flow study. In this meeting, HAL presented the results of the study in comparison with the results from the 2019 flow study, as well as the results from the hydraulic model. Most manholes studied in the 2022 flow study had similar flow rates to the 2019 flow study, though flow rates were slightly lower in the 2022 study.

As with the 2019 flow study, the predicted flowrates within the model were marginally higher than the measured flows. This is likely the result of the models including inflow and infiltration values that were higher than the measured flows. Since the flow measurement periods were relatively short, the metered flows do not account for higher levels of inflow and infiltration that may occur. The capital improvement projects are based on the model results which account for high flow events.

Discussion

The results of the 2022 flow study generally confirm the findings of the 2021 master plan. The 2022 flow study verified that the recommended improvement projects from the master plan are still recommended. These improvement projects were not prioritized in the master plan. The project prioritization is included with this study. Table 2 includes prioritization of the project list from Table 1 according to the following criteria:

- Model predicted flowrate.
- Depth divided by Diameter
- Operator and engineering judgement

Each identified project is assigned a ranking based on the point system presented in Table 2, below below (Total maximum points possible is 90 points).

TABLE 2: RANKING CRITERIA AND BASIS

Criteria	Ranking Basis
Model Predict Flowrate	One point for each 300 gpm of modeled peak flow (maximum of 30 points)
Depth divided by Diameter	The d/D point system is as follows: d/D — Small Pipes (<=12" dia.) — Large Pipes (> 12" dia) 0.5 — 1 — 0 0.6 — 2 — 0 0.7 — 5 — 0 0.75 — 8 — 8 0.8 — 12 — 12 0.9 — 20 — 20 1 — 30 — 30 (maximum of 30 points)
Criticality	Based on judgement of District personnel (maximum of 30 points)

Using the criteria and point system provided in Table 2, each of the projects was placed in a prioritized list. This list is provided as Table 3. It may be observed in Table 3 the the prioritized ranking is provided, as are the total number of RE's supported by the line and the estimated project cost.

TABLE 3: PRIORITIZED PROJECT LIST

Project	Diameter (in)	Model Flow (gpm)	d/D	Flow Ranking	d/D Ranking	Criticality	Total Ranking	Total # of RE's[1]	Cost Estimate
F-1	48	9,000	0.69	30.0	0	30	60.0	32,881	$2,910,000
F-1 Extension[2]	48	9,000	0.69	30.0	0	30	60.0	32,881	$3,300,000
E-1	10	550	0.76; 0.67	9.9	15	10	34.9	8,864	$1,130,000
E-11	27	2,975	0.83	8.3	15	10	33.3	5,989	$940,000
E-13	24	2,500	0.83	11.3	10	10	31.3	8,904	$40,000
E-7	18	3,400	0.78	1.8	8	20	29.8	952	$180,000
E-12	24	2,550	0.77	8.5	10	10	28.5	7,793	$590,000
E-16	10	530	0.89	1.8	20	5	26.8	611	$900,000
E-2	12	500	0.69	1.7	5	5	11.7	679	$130,000
E-15	12	725	0.60	2.4	2	5	9.4	1,044	$510,000
E-5	10	220	0.69	0.7	5	2	7.7	1,066	$100,000
E-3	8	200	0.71; 0.61	0.7	5	2	7.7	1,236	$1,490,000
E-9	10	745	0.58	2.5	2	2	6.5	2,589	$2,290,000
E-6	10	630	0.53	2.1	2	2	6.1	2,544	$250,000
E-4	10	500	0.55	1.7	2	2	5.7	1,095	$620,000
E-8	8	200	0.60	0.7	2	2	4.7	846	$740,000
E-14	8	275	0.55	0.9	1	2	3.9	876	$830,000
E-10	8	200	0.54	0.7	1	2	3.7	494	$50,000

1. Total number of Residential Equivalents (RE's) includes various development types including: residential, commercial, high density, and schools. Each are modeled with unique demand and peaking factors coupled with I & I. These factors lead to differences in flowrates even when total # of RE's are similar.
2. Including the crossing the rail road properties to the Central Valley Waster Water Reclamation Facility.

FLOW STUDY RECOMMENDATIONS

- It is recommended that the District pursue the remedy of existing deficiency projects and the redundancy project (F-1 and F-1 Extension) in accordance with available budget according to the prioritization list in Table 3. The F-1 Extension is from the F-1 project to the Central Valley Water Reclamation Facility. The District should review the prioritized list and underlying criteria and scoring with each project to ensure that the most recent data has been considered before construction. Additional data may become available that effects the score. The highest priority projects are the F-1 and F -1 Extension redundancy projects. The high score is based on the large flow conveyed in the sewer, the relatively high d/D and the high criticality of the project.

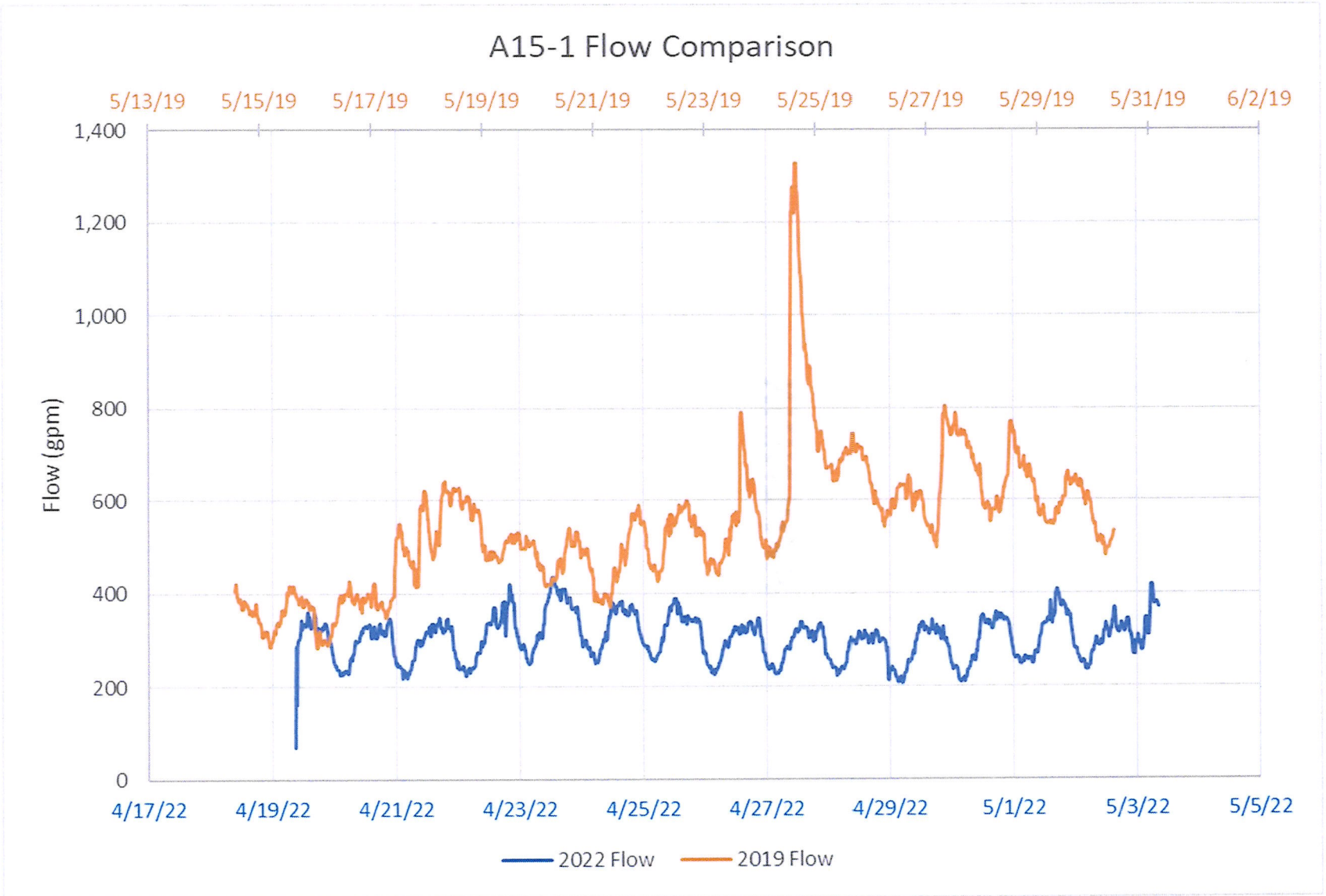
- HAL recommends that the District continue to perform long-term flow studies at critical locations throughout the system. The 2019 and 2022 flow studies were carried out during late spring/summer months, and studied manholes were only monitored for a period of approximately two weeks. While this data is sufficient for master planning and small flow studies, long-term flow studies could improve the understanding of the wastewater collection system. HAL recommends that the District study a handful of manholes in critical locations over the course of a few months. These long-term flow studies should span the course of several months to capture seasonal trends, high flow events, and low flow periods. Performing these long-term flow studies will enable the District to better plan for system improvement projects and to predict how high flow events will effect the wastewater collection system more accurately.

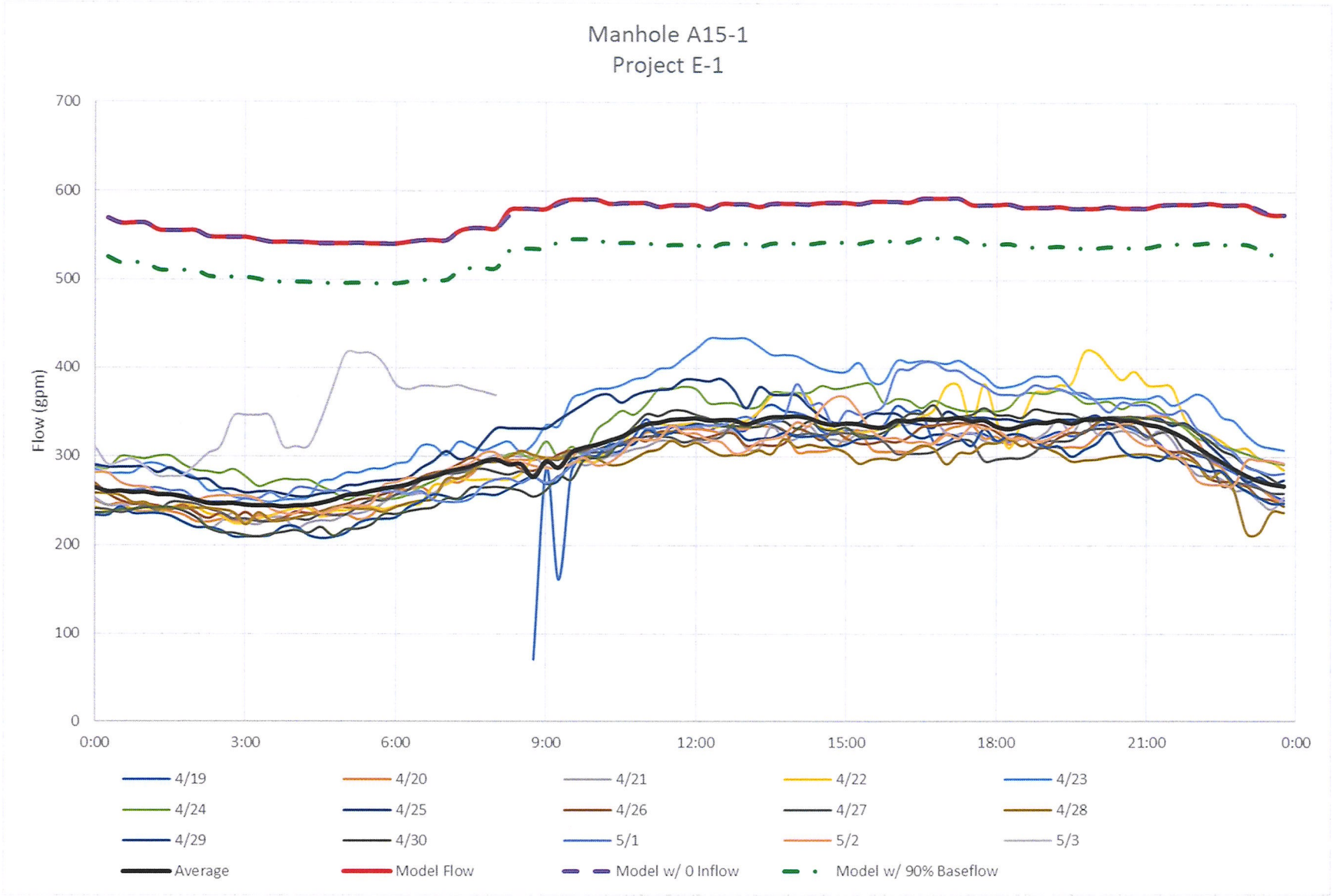
CONCLUSION

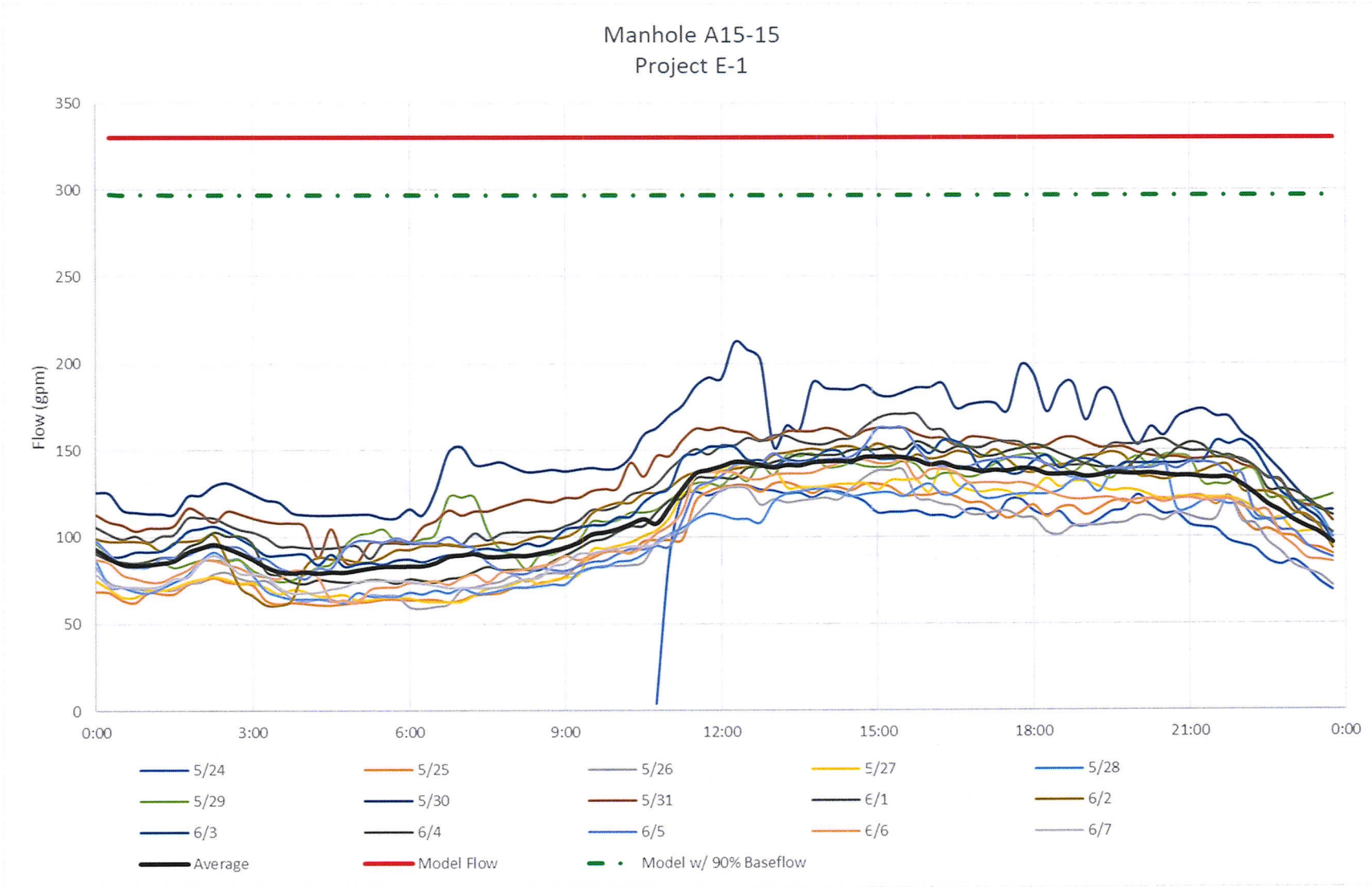
This study confirms that the improvement projects in the master plan are still necessary. These projects are prioritized in Table 2 according to modeled flow rate, d/D, and criticality. Redundancy project F-1 and extension has highest priority based on the scoring.

In addition to the improvement projects suggested in the master plan, HAL also recommends the District conducts long-term flow studies near deficient pipelines and in other critical locations. These long-term flow studies will improve the overall understanding of the system and will help facilitate system improvements.

APPENDIX


A15-1 Flow Comparison
5/13/19
5/15/19
5/17/19
5/19/19
5/21/19
5/23/19
5/25/19
5/27/19
5/29/19
5/31/19
6/2/19
1,400
1,200
1,000
800
600
400
200
0
Flow (gpm)
4/17/22
4/19/22
4/21/22
4/23/22
4/25/22
4/27/22
4/29/22
5/1/22
5/3/22
5/5/22
2022 Flow
2019 Flow


Manhole A15-1
Project E-1
Flow (gpm)
700
600
500
400
300
200
100
0
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
4/19
4/20
4/21
4/22
4/23
4/24
4/25
4/26
4/27
4/28
4/29
4/30
5/1
5/2
5/3
Average
Model Flow
Model w/ 0 Inflow
Model w/ 90% Baseflow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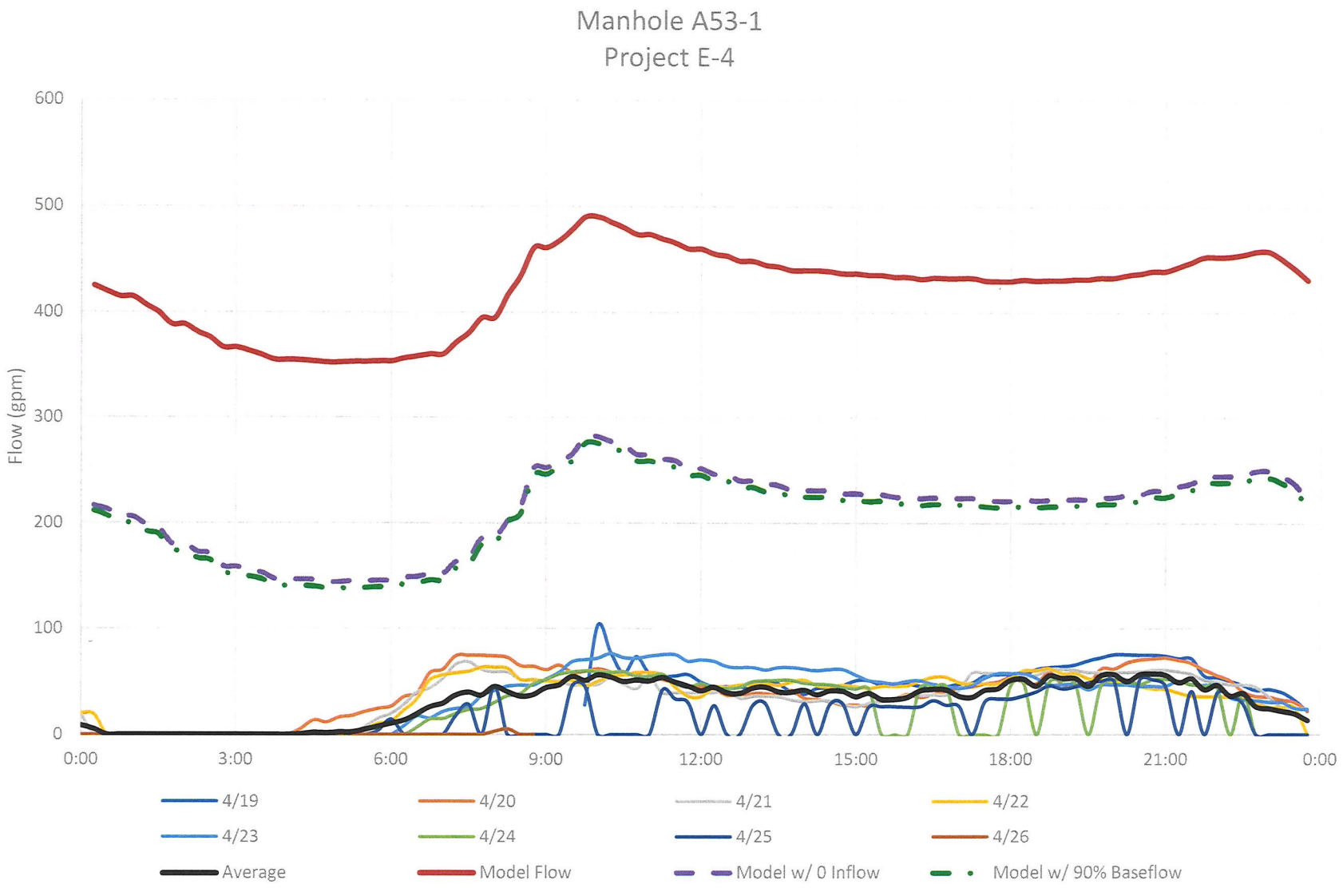
Project E-1
Flow (gpm)
350
300
250
200
150
100
50
0
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
5/24
5/25
5/26
5/27
5/28
5/29
5/30
5/31
6/1
6/2
6/3
6/4
6/5
6/6
6/7
Average
Model Flow
Model w/ 90% Baseflow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Project E-4
Flow (gpm)
600
500
400
300
200
100
0
0:00
3:00
6:00
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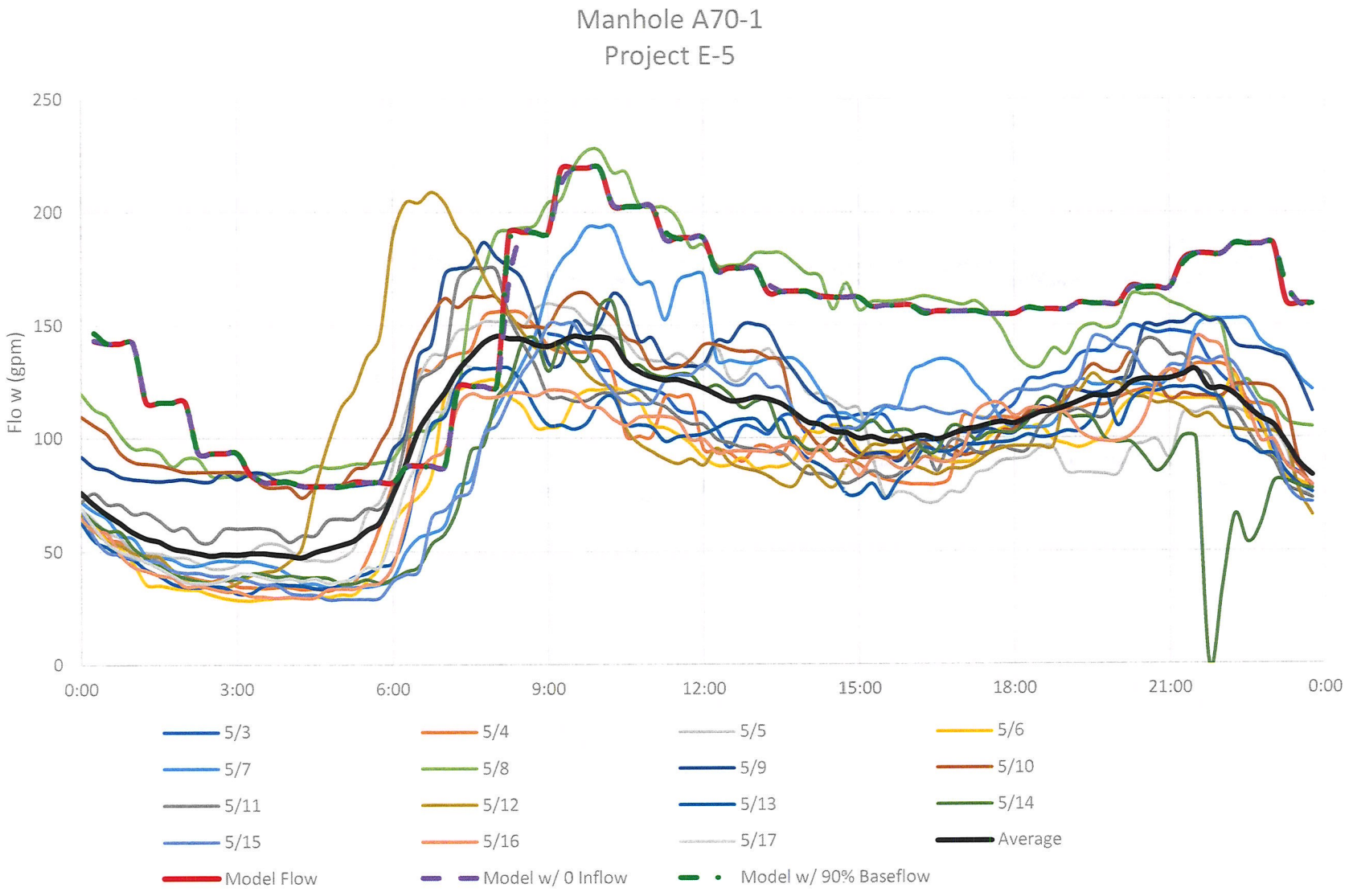
12:00
15:00
18:00
21:00
0:00
4/19
4/20
4/21
4/22
4/23
4/24
4/25
4/26
Average
Model Flow
Model w/ 0 Inflow
Model w/ 90% Baseflow


Manhole A70-1
Project E-5
Flo w (gpm)
250
200
150
100
50
0
0:00
3:00
6:00
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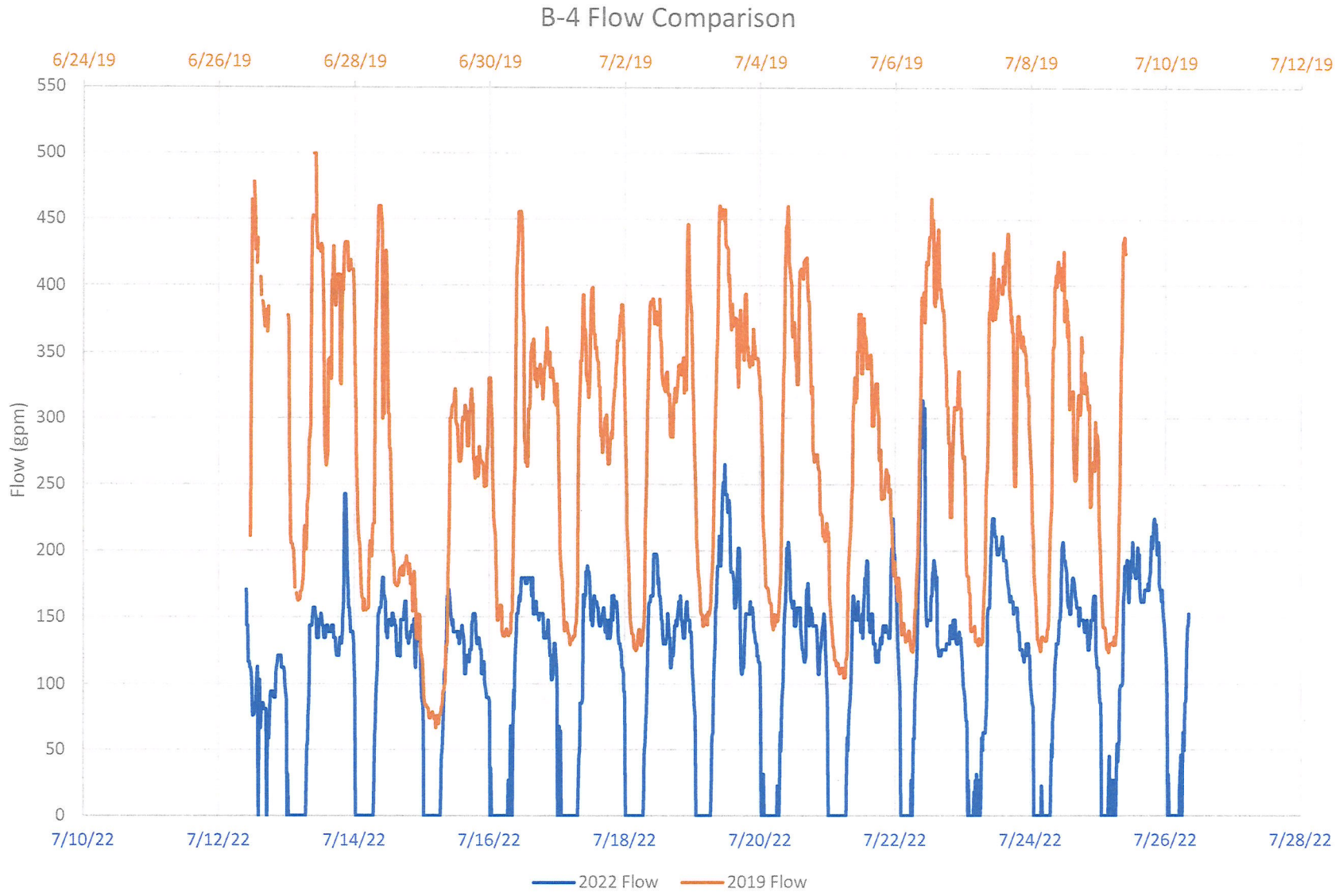
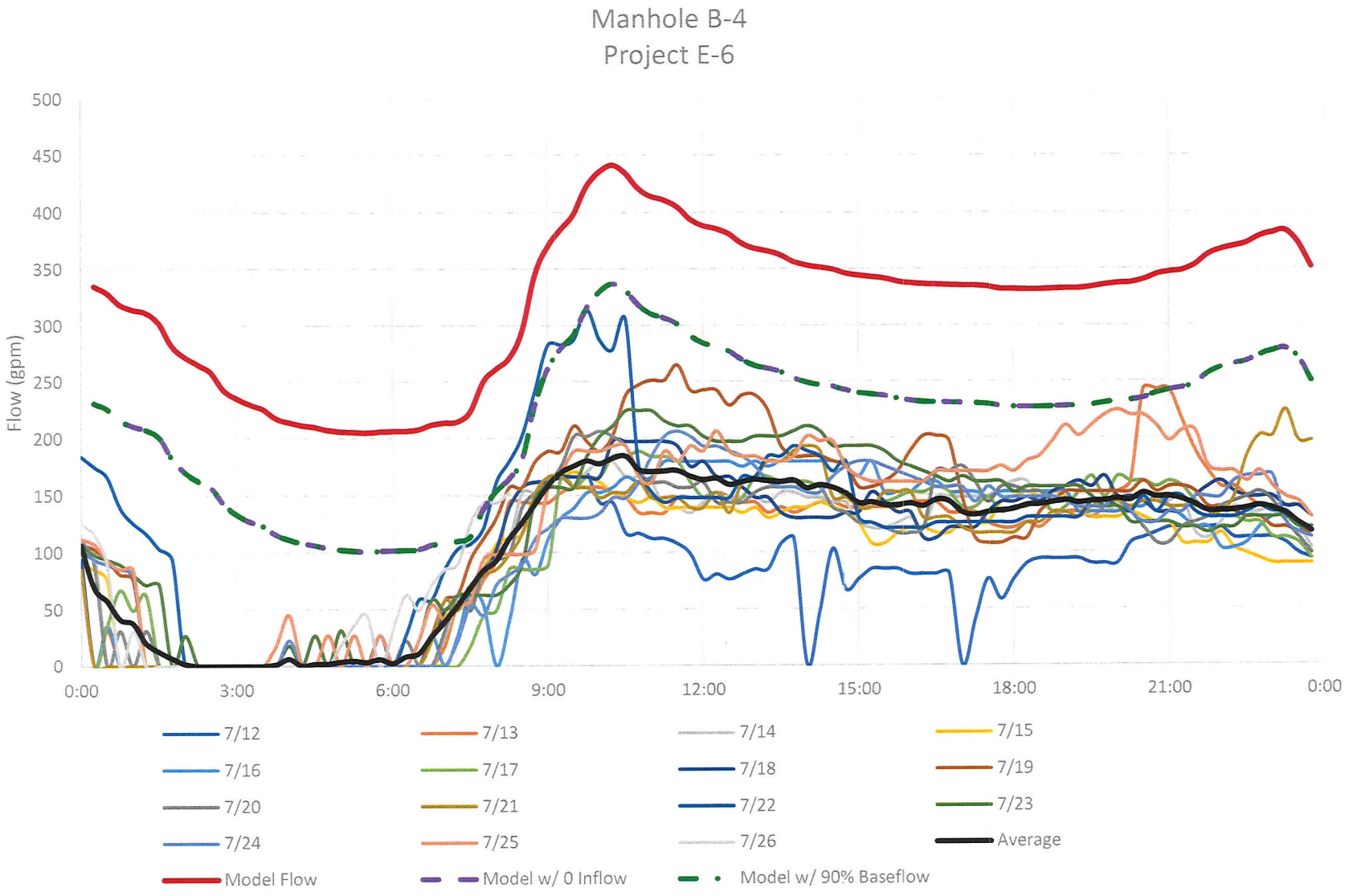
12:00
15:00
18:00
21:00
0:00
5/3
5/4
5/5
5/6
5/7
5/8
5/9
5/10
5/11
5/12
5/13
5/14
5/15
5/16
5/17
Average
Model Flow
Model w/ 0 Inflow
Model w/ 90% Baseflow


B-4 Flow Comparison
6/24/19
6/26/19
6/28/19
6/30/19
7/2/19
7/4/19
7/6/19
7/8/19
7/10/19
7/12/19
550
500
450
400
350
300
250
200
150
100
50
0
Flow (gpm)
7/10/22
7/12/22
7/14/22
7/16/22
7/18/22
7/20/22
7/22/22
7/24/22
7/26/22
7/28/22
2022 Flow
2019 Flow


Manhole B-4
Project E-6
Flow (gpm)
500
450
400
350
300
250
200
150
100
50
0
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
7/12
7/13
7/14
7/15
7/16
7/17
7/18
7/19
7/20
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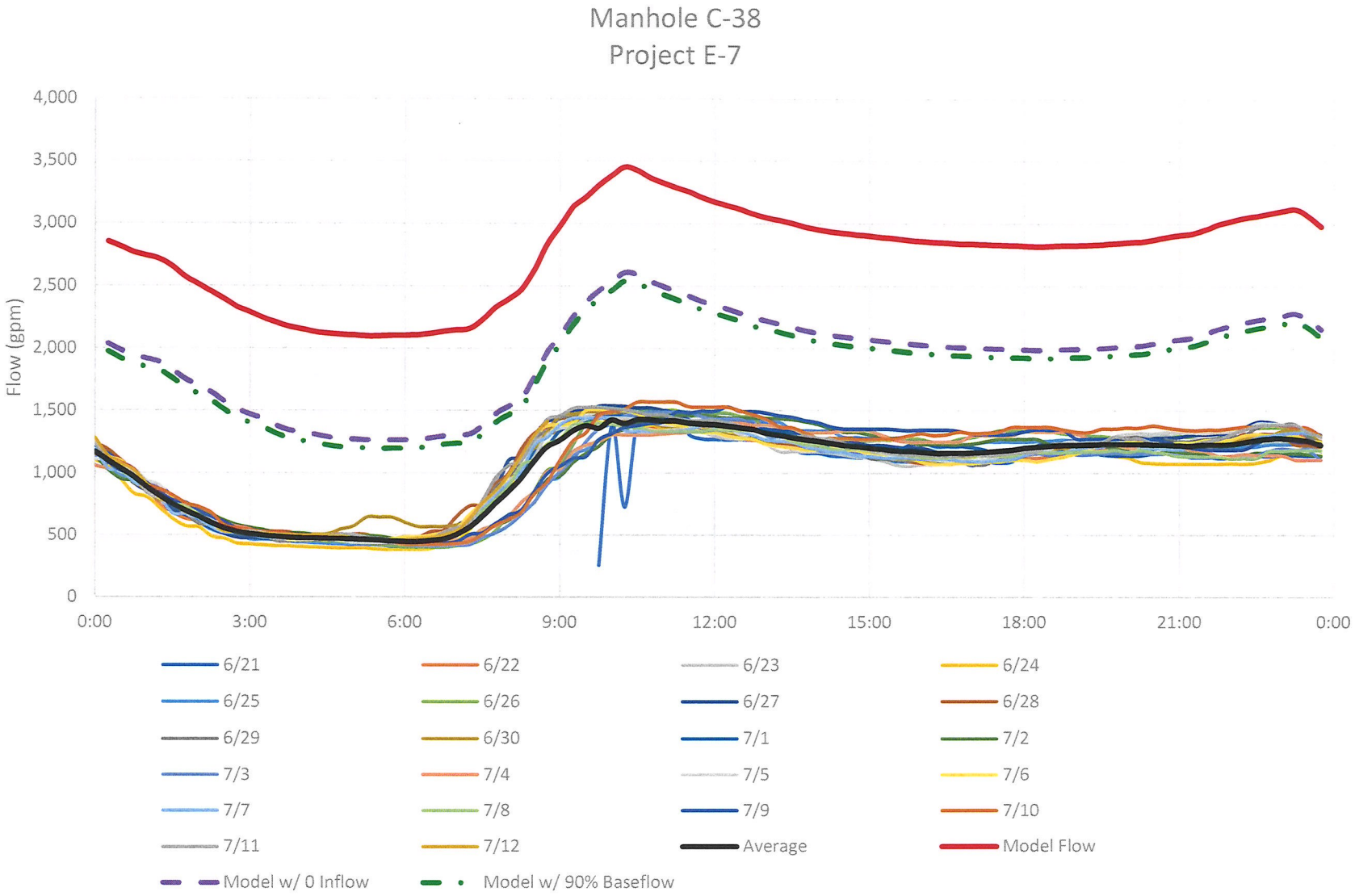
7/22
7/23
7/24
7/25
7/26
Average
Model Flow
Model w/ 0 Inflow
Model w/ 90% Baseflow


Manhole C-38
Project E-7
Flow (gpm)
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
6/21
6/22
6/23
6/24
6/25
6/26
6/27
6/28
6/29
6/30
7/1
7/2
7/3
7/4
7/5
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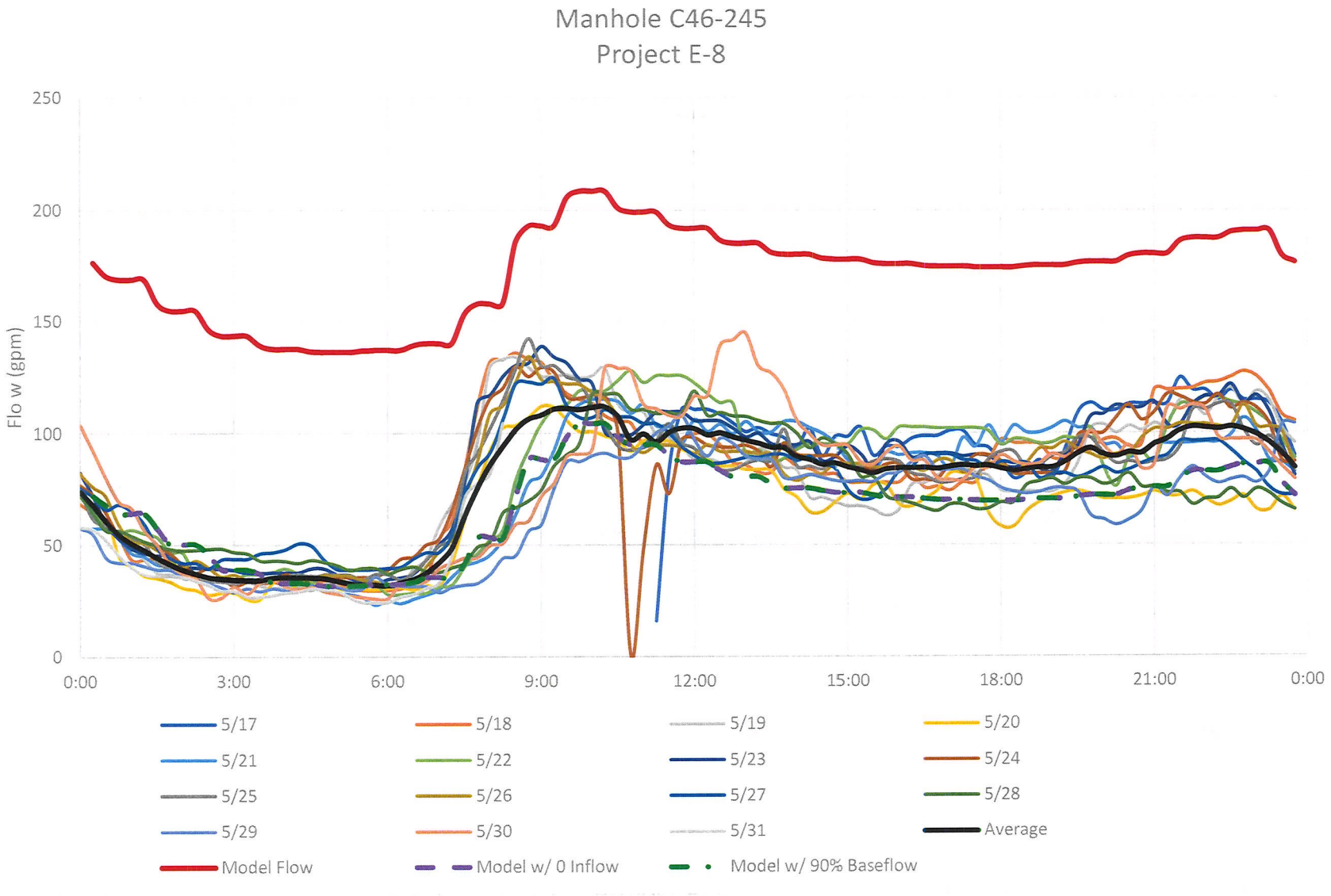
7/9
7/10
7/11
7/12
Average
Model Flow
Model w/ 0 Inflow
Model w/ 90% Baseflow


Manhole C46-245
Project E-8
Flo w (gpm)
250
200
150
100
50
0
0:00
3:00
6:00
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12:00
15:00
18:00
21:00
0:00
5/17
5/18
5/19
5/20
5/21
5/22
5/23
5/24
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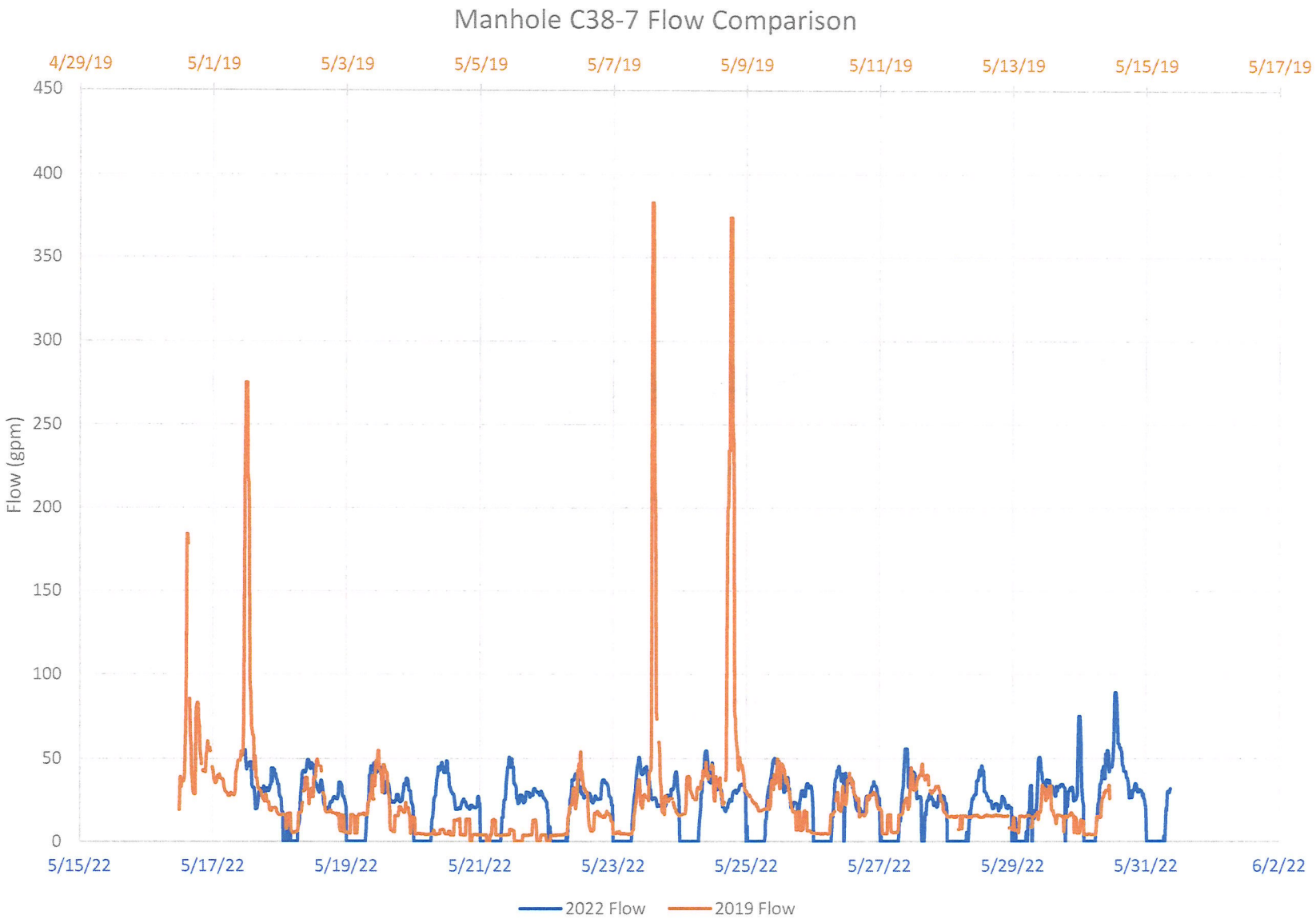
5/29
5/30
5/31
Average
Model Flow
Model w/ 0 Inflow
Model w/ 90% Baseflow


Manhole C38-7 Flow Comparison
4/29/19
5/1/19
5/3/19
5/5/19
5/7/19
5/9/19
5/11/19
5/13/19
5/15/19
5/17/19
450
400
350
300
250
200
150
100
50
0
Flow (gpm)
5/15/22
5/17/22
5/19/22
5/21/22
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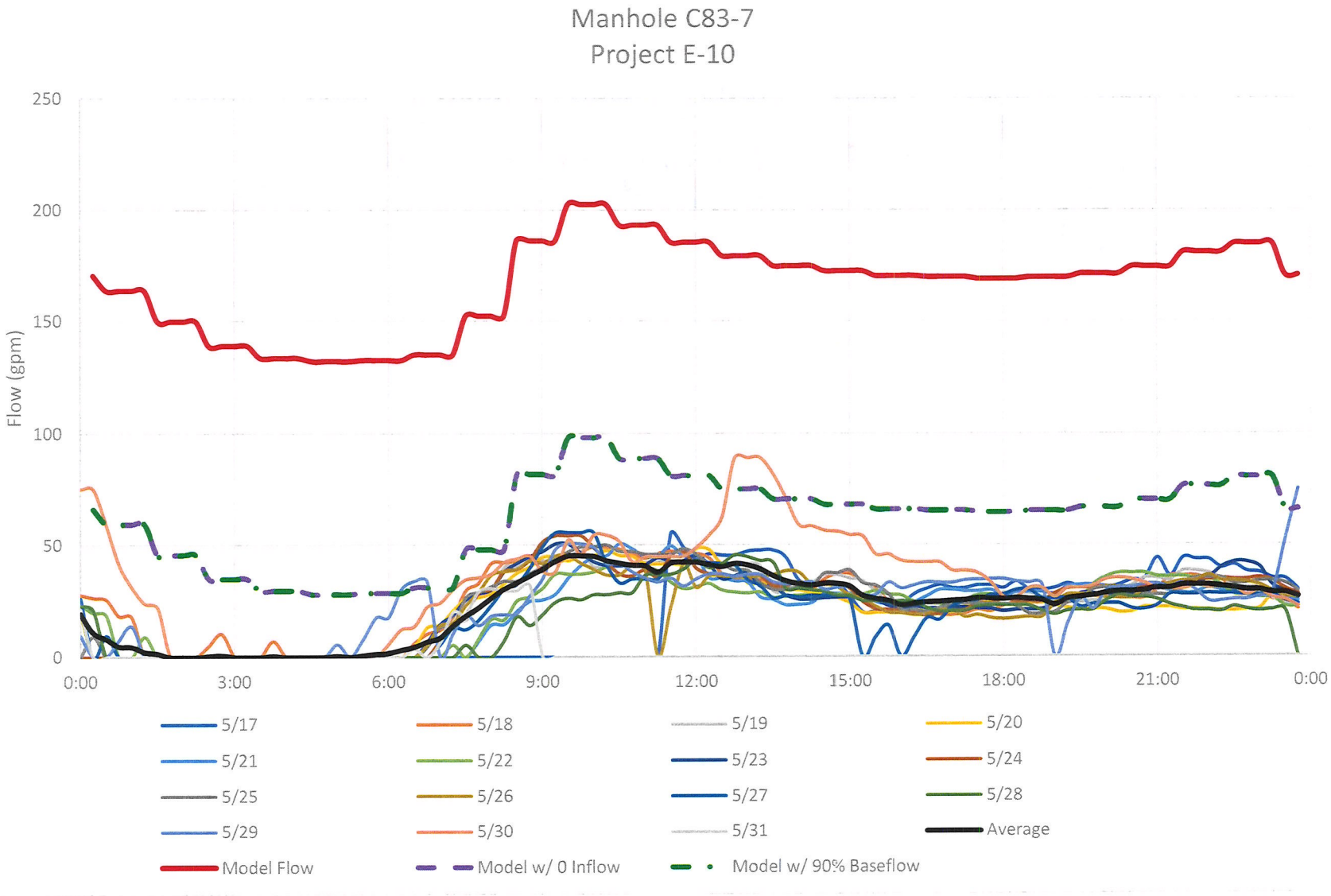
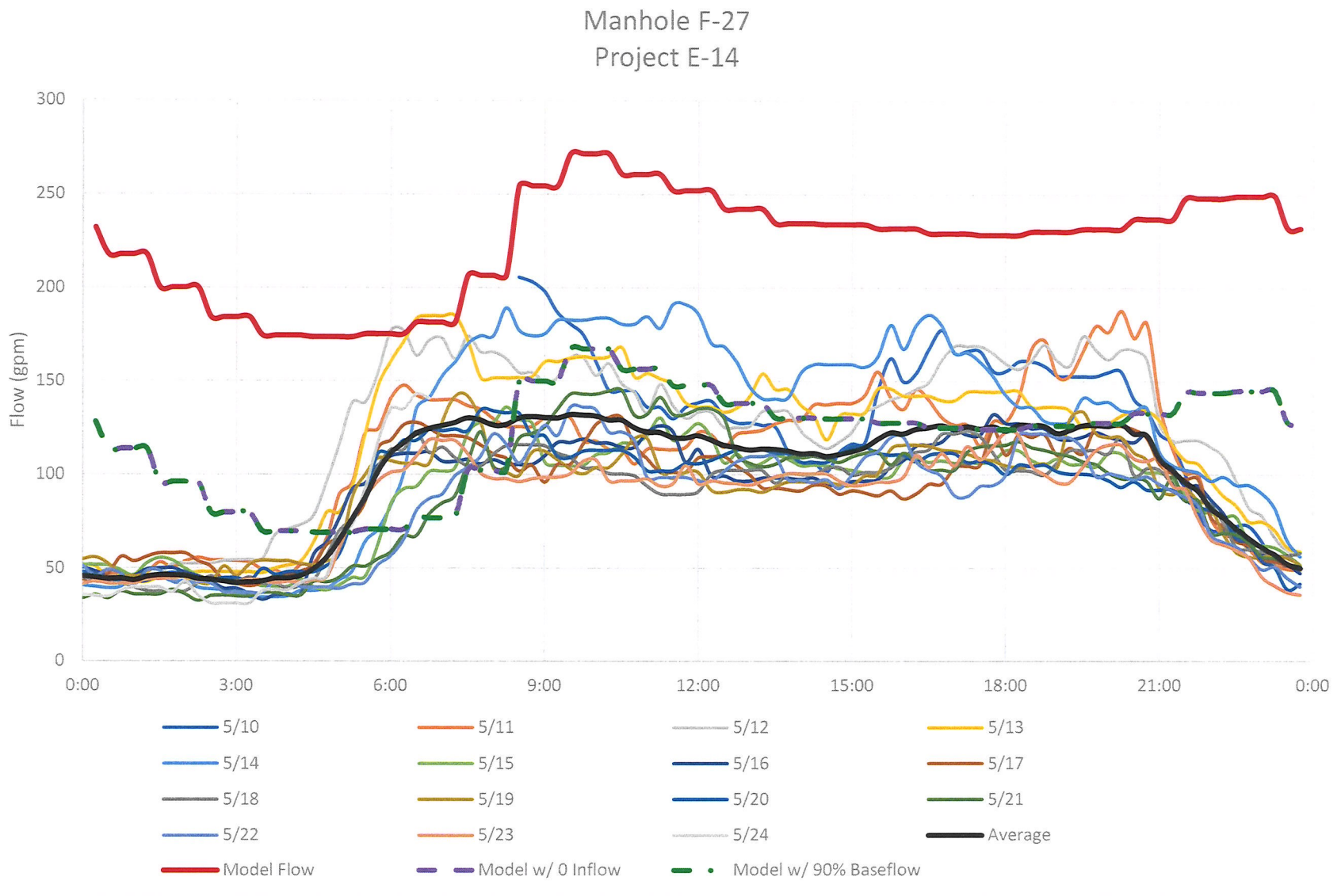
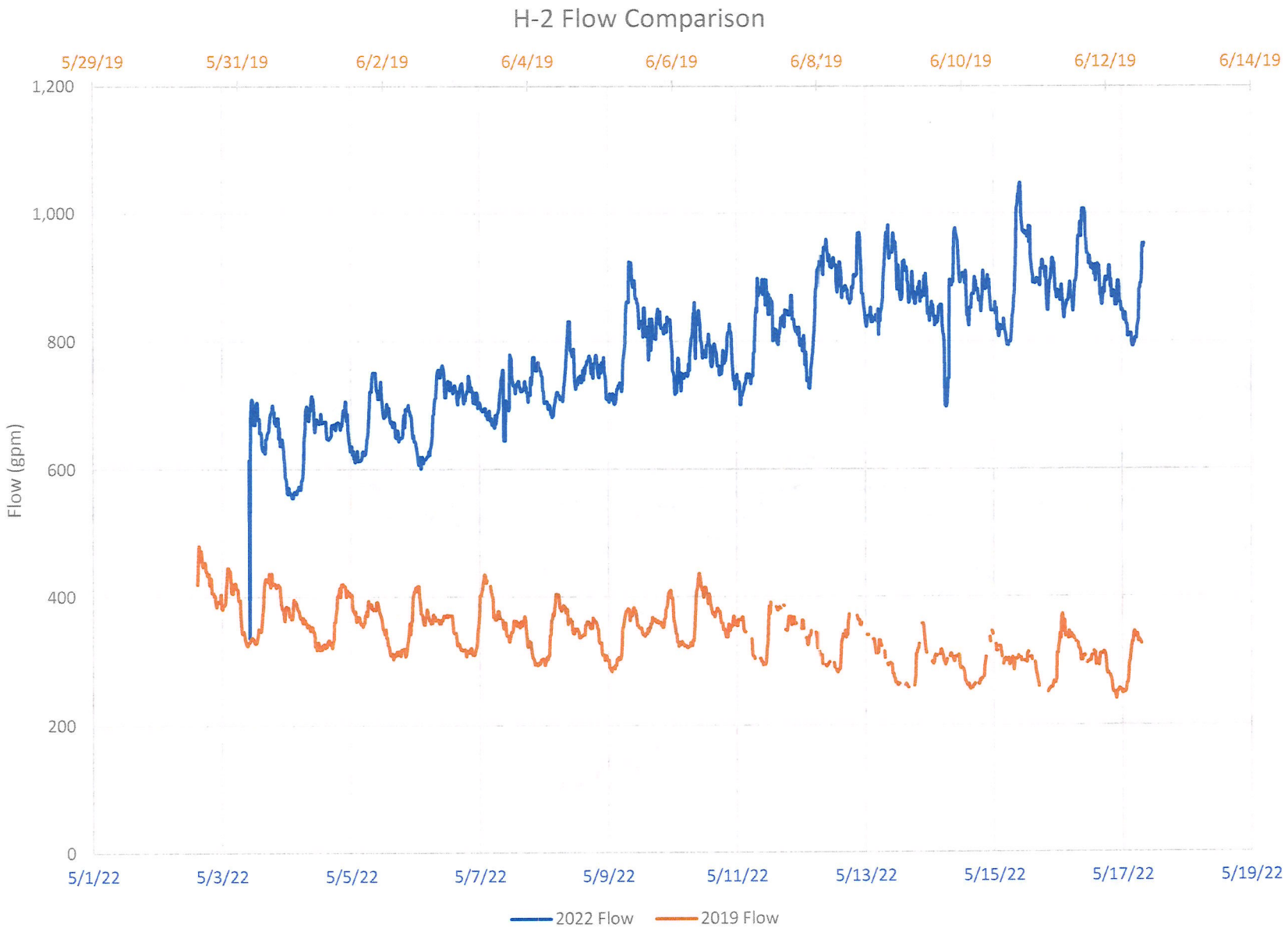
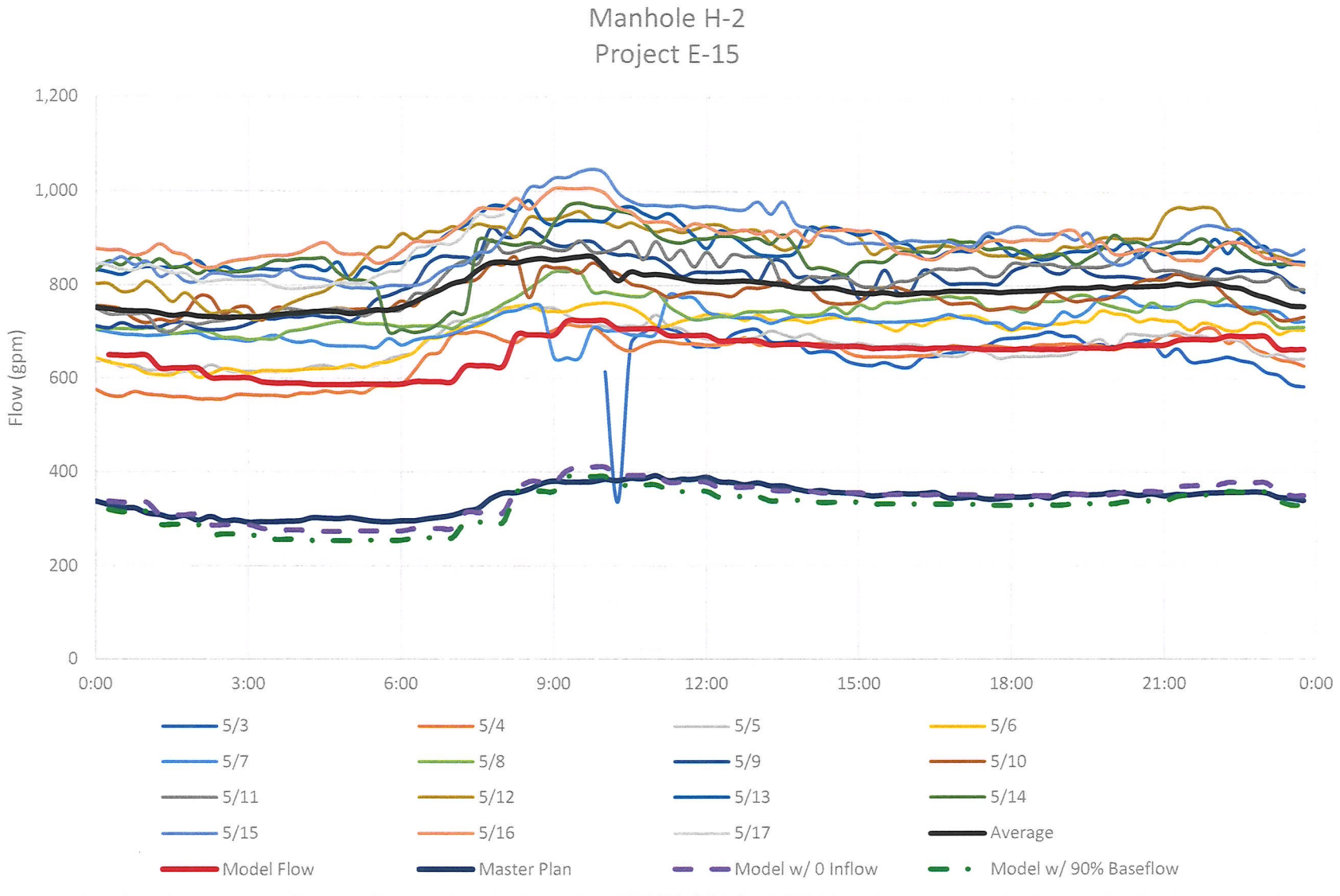
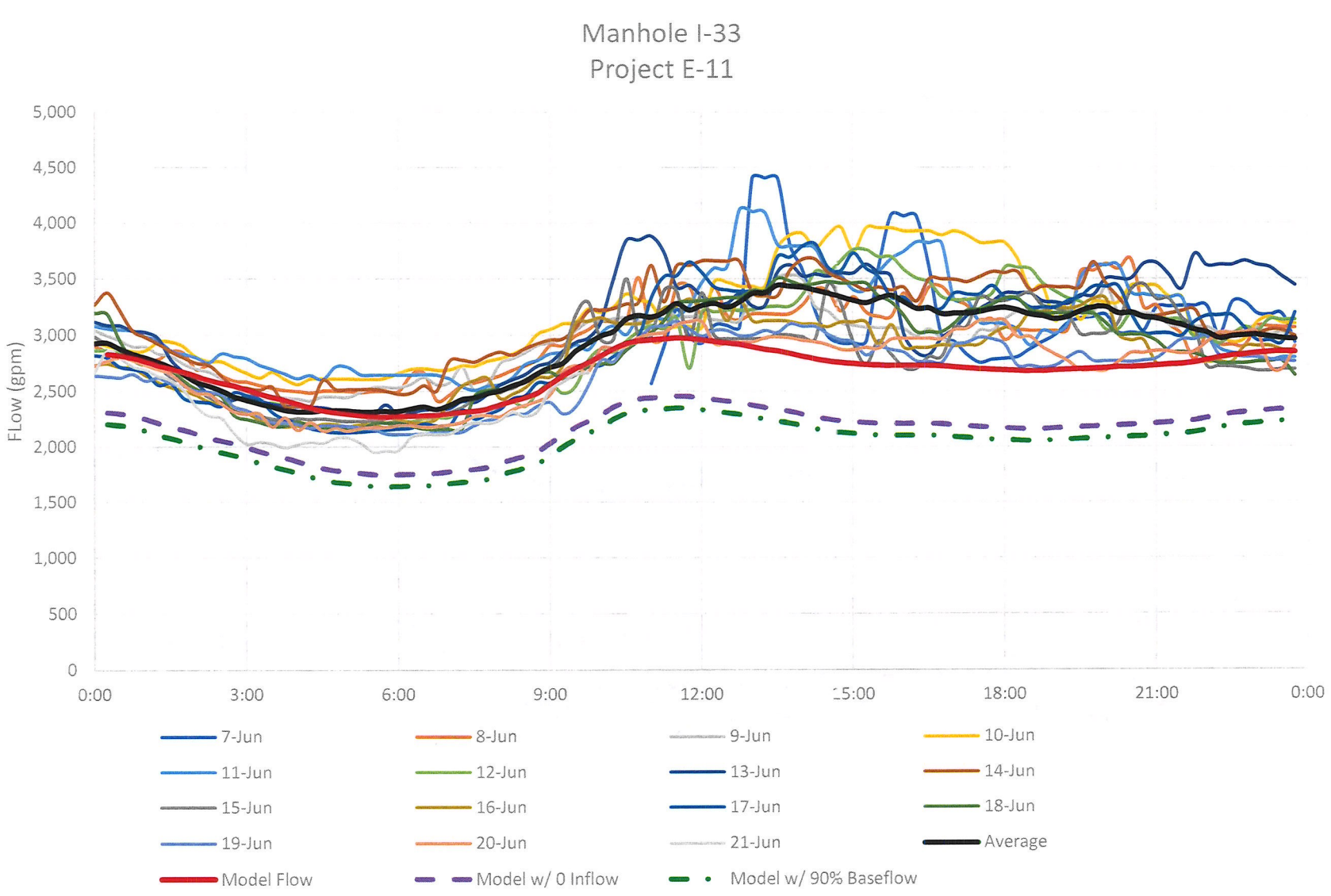
5/25/22
5/27/22
5/29/22
5/31/22
6/2/22
2022 Flow
2019 Flow

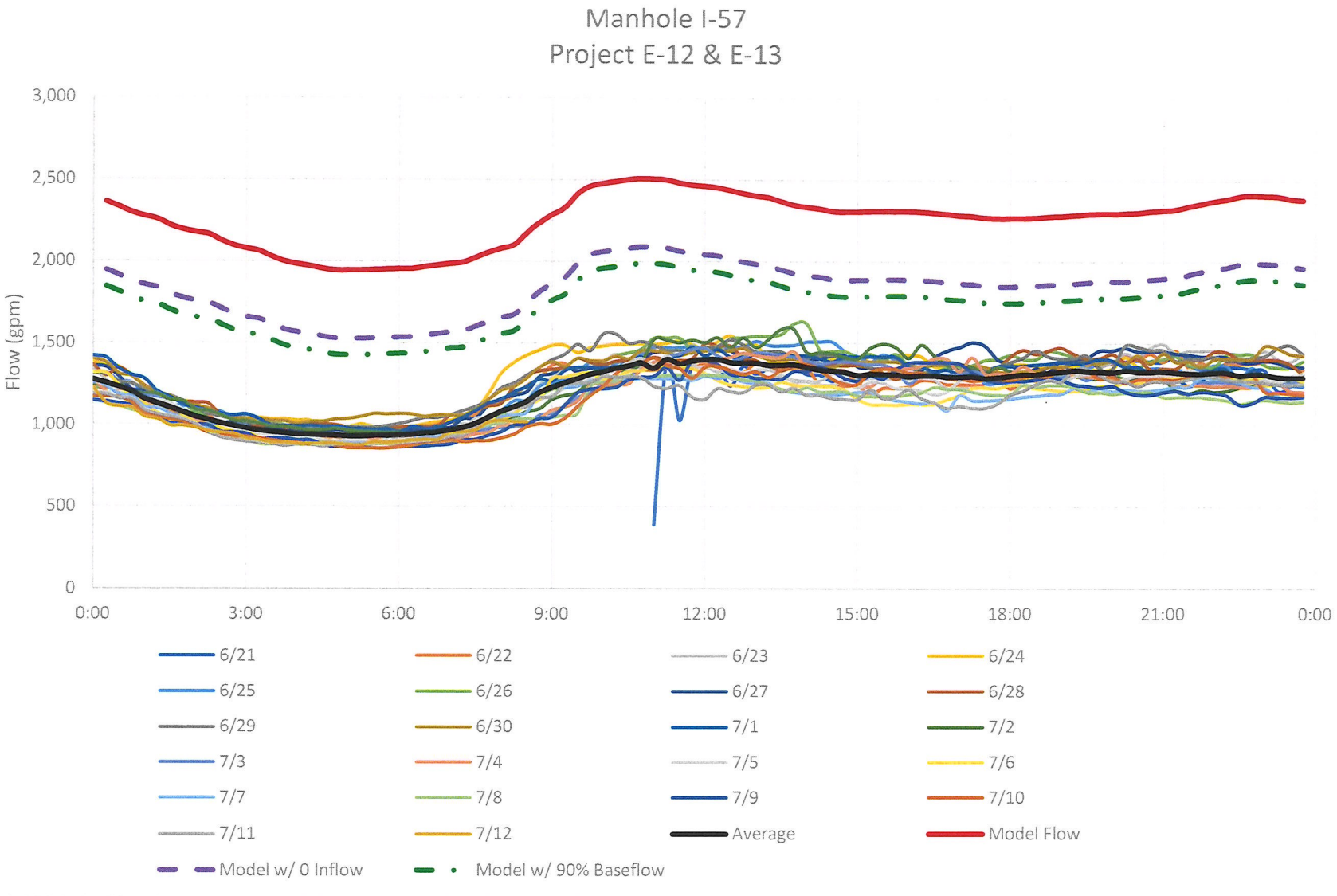

Manhole C83-7
Project E-10
Flow (gpm)
250
200
150
100
50
0
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
5/17
5/18
5/19
5/20
5/21
5/22
5/23
5/24
5/25
5/26
5/27
5/28
5/29
5/30
5/31
Average
Model Flow
Model w/ 0 Inflow
Model w/ 90% Baseflow


Manhole F-27
Project E-14
Flow (gpm)
300
250
200
150
100
50
0
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
5/10
5/11
5/12
5/13
5/14
5/15
5/16
5/17
5/18
5/19
5/20
5/21
5/22
5/23
5/24
Average
Model Flow
Model w/ 0 Inflow
Model w/ 90% Baseflow


H-2 Flow Comparison
5/29/19
5/31/19
6/2/19
6/4/19
6/6/19
6/8/19
6/10/19
6/12/19
6/14/19
1,200
1,000
800
600
400
200
0
Flow (gpm)
5/1/22
5/3/22
5/5/22
5/7/22
5/9/22
5/11/22
5/13/22
5/15/22
5/17/22
5/19/22
2022 Flow
2019 Flow


Manhole H-2
Project E-15
Flow (gpm)
1,200
1,000
800
600
400
200
0
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
5/3
5/4
5/5
5/6
5/7
5/8
5/9
5/10
5/11
5/12
5/13
5/14
5/15
5/16
5/17
Average
Model Flow
Master Plan
Model w/ 0 Inflow
Model w/ 90% Baseflow


Manhole I-33
Project E-11
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
FLow (gpm)
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
7-Jun
8-Jun
9-Jun
10-Jun
11-Jun
12-Jun
13-Jun
14-Jun
15-Jun
16-Jun
17-Jun
18-Jun
19-Jun
20-Jun
21-Jun
Average
Model Flow
Model w/ 0 Inflow
Model w/ 90% Baseflow


Manhole I-57
Project E-12 & E-13
Flow (gpm)
3,000
2,500
2,000
1,500
1,000
500
0
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:00
0:00
6/21
6/22
6/23
6/24
6/25
6/26
6/27
6/28
6/29
6/30
7/1
7/2
7/3
7/4
7/5
7/6
7/7
7/8
7/9
7/10
7/11
7/12
Average
Model Flow
Model w/ 0 Inflow
Model w/ 90% Baseflow