

Targeted Bacteria Monitoring Project Field Investigation Final Report Assessment Unit 1007U_01 Mimosa Ditch



May 12, 2023

Prepared by:

Jenny Oakley, Ph.D., Associate Director, Research Programs

Kaylei Chau, Research Associate

Sherah McDaniel, Research Associate

Environmental Institute of Houston, University of Houston-Clear Lake

2700 Bay Area Blvd, MC 540, Houston TX 77058

Segment Description

Mimosa Ditch is a tributary to Brays Bayou and the Segment ID is 1007U (Figure 1). This segment consists of one assessment unit (AU) of concern, AU 1007U_01, that is 3 km long and is defined as from the Brays Bayou confluence upstream 2.9 km to the Chimney Rock bridge crossing. There is one current surface water quality monitoring (SWQM) station located on this AU (station ID: 18691). This AU has been selected for targeted monitoring due to a bacteria (*Escherichia coli*) seven-year geometric mean of 1,457.4 MPN/100 mL (H-GAC QAPP, 2022) and has a current impairment category of 4a (TCEQ, 2022). The potential sources of bacteria impairments are non-point source pollution, urban runoff, and sanitary sewer overflows (TCEQ, 2022). This AU was monitored previously as part of the FY20-21 Targeted Monitoring Study.

The contributing watershed for this segment is 10 km² (Data source: H-GAC, SWRC, 2023). The soil types in the watershed have very slow infiltration rates (Data source: United States Department of Agriculture Hydrologic Soil Groups from gSSURGO 2016), and land cover is dominated by 99.99% developed land (Data source: National Land Cover Database NLCD 2019). There is one permitted wastewater outfall in the watershed (Data source: H-GAC). There is also one documented permitted and zero documented unpermitted on-site sewage facilities (OSSF) within the watershed (Data source: H-GAC).

Background

Clean Rivers Program (CRP) routine monitoring data are analyzed each year as part of the Houston-Galveston Area Council (H-GAC) Basin Summary/Basin Highlights Report process. Bacteria continues to be the most prevalent pollutant in the H-GAC CRP Basins (H-GAC, 2022). The Bacteria Implementation Group (BIG), formed in 2008, oversees the Total Maximum Daily Load (TMDL) Implementation Plan (I-Plan). The BIG requested that H-GAC produce a list of the water bodies with the highest bacteria concentrations in the BIG project area and conduct targeted monitoring to identify potential bacteria sources.

Houston-Galveston Area Council, using information from previous Basin Highlights/Summary Reports, BIG annual reports, and previous targeted monitoring efforts, identified and selected waterways for targeted bacteria monitoring to refine our understanding of the spatial distribution of elevated bacterial concentrations contributing to these waterways. Phase 1 of this targeted monitoring project includes an intensive desktop review of the most up to date imagery available and compilation of data from field investigations (FI) conducted in 2021. Phase 2 of this targeted monitoring project includes a FI of the entire AU conducted during dry conditions where all flowing point and non-point sources are evaluated.

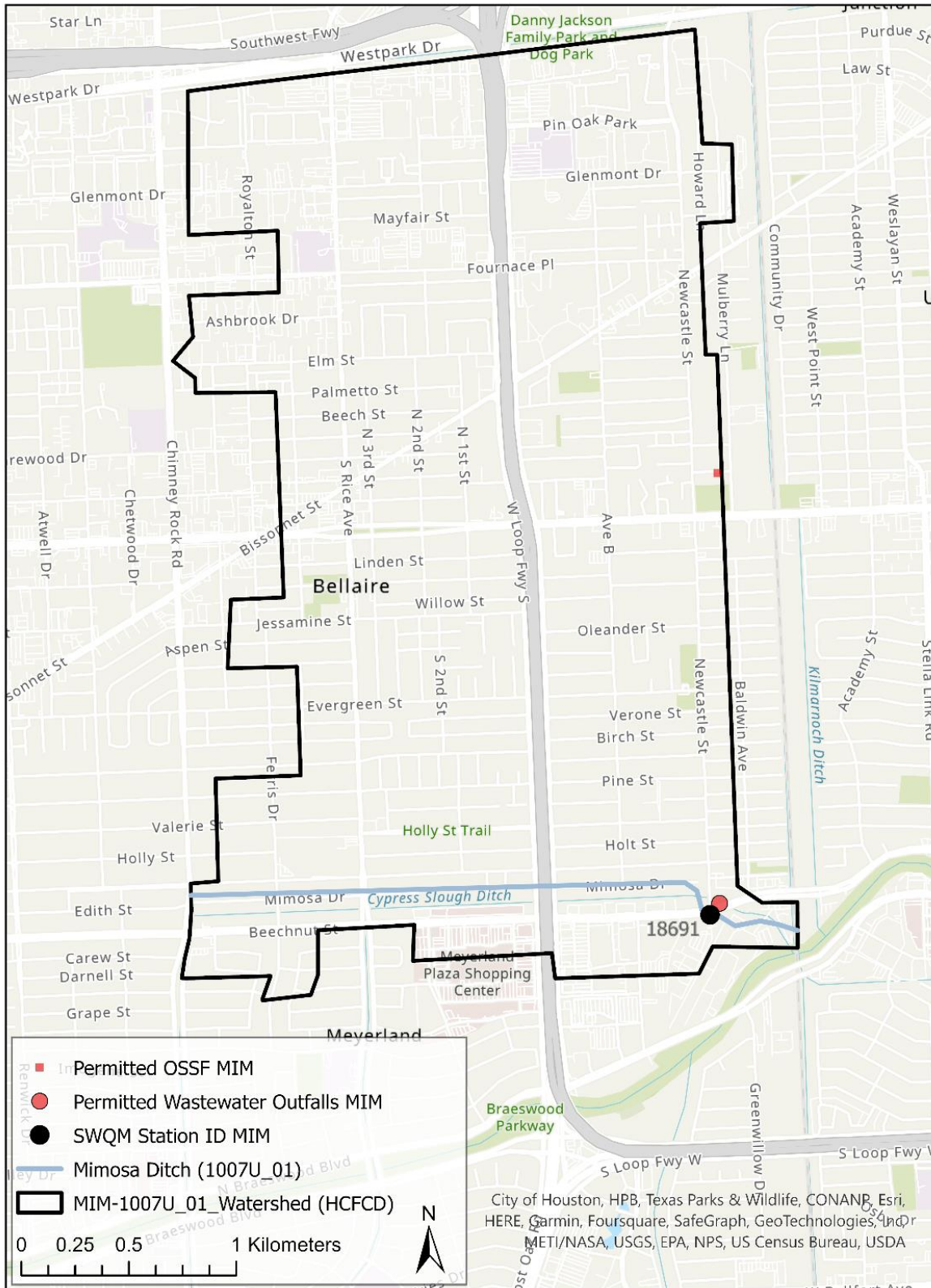


Figure 1: Watershed Map for Mimosas Ditch (Assessment Unit 1007U_01).

Desktop Review

Methods

The intensive desktop review included an evaluation of permitted discharges, outfalls, and potential sources of point and nonpoint source pollution that may contribute to bacteria loading in the AU. Using Google Earth imagery and GIS, the locations of wastewater treatment facilities, permitted on-site sewage facilities (OSSFs), and potential locations of unpermitted OSSFs were identified. If present, other potential sources such as landfills and industrial facilities were also identified. Parks were noted as they can contribute to bacterial sources through runoff of animal wastes but also provide opportunity for contact recreation. Bridge crossings and other public entry points were identified to provide access into the stream to collect bacteriological samples. The Environmental Institute of Houston conducted this review in 2021 and AU 1007U_01 was reviewed again prior to beginning the 2023 FI.

Results

The results of the desktop review indicated that there is one permitted OSSF and one permitted wastewater discharge on the segment. The segment is surrounded by wastewater treatment plants, commercial businesses, and a residential neighborhood. Publicly accessible entry points into the stream were identified at the confluence of Mimosa Ditch and Brays Bayou on South Braeswood Boulevard, Beechnut Street and Newcastle Street, West Loop South, South Rice Avenue, Ferris Drive, and finally at Chimney Rock Road.

Windshield Survey

Methods

Field events must take place during dry weather (after 3 or more days without significant rainfall in the watershed). This ensures that any flowing water into the segment is not stormwater. Windshield surveys (WS) of the watershed were conducted in 2021 and bacteria sampling was performed at public access points throughout the AU (primarily at bridge crossings). The survey consisted of driving the catchment area to confirm identified pollution sources found during the desktop review and to find any potential sources not identified during that review. Bridge crossings chosen for sampling were spatially distributed to provide a spatial snapshot of bacteria concentrations in the AU and identify sections of the AU where elevated bacteria concentrations were found. Those areas with elevated bacteria levels identified in the WS monitoring were focused on during the FI of the FY20-21 study. The results from the 2021 sampling events were used to plan the 2023 FI. Therefore, a WS was not completed in 2023.

Assessment Units, sample collection and laboratory methods, and data handling practices for the 2021 study are detailed in Appendix J of the FY 2020-2021 H-GAC Multi-Basin Clean Rivers Program Quality Assurance Project Plan (H-GAC QAPP, 2020). For all WS bacteria monitoring conducted in 2021, field personnel documented the latitude and longitude of sample location. All bacteria samples were analyzed by a National Environmental Laboratory Accreditation Program (NELAP)-Accredited laboratory.

Results

The WS and ground-truthing was conducted on March 9, 2021. At that time, it had been eight days since the last significant rainfall in the watershed. A total of 7 samples were collected on AU 1007U_01 during the WS. Bacteria results from the ambient water samples collected during the WS ranged from < 10 to 399 MPN/100ML.

Field Investigation

Methods

The following methods were conducted for the FI in 2021 and were also used for the 2023 FI. Assessment Units, collection and laboratory methods, and data handling practices for the 2023 FI are detailed in Appendix J of the FY 2022-2023 H-GAC Multi-Basin Clean Rivers Program Quality Assurance Project Plan (H-GAC QAPP, 2022). The FI was a thorough survey where a team of two either walked or paddled the entire assessment unit and sampled dry-weather flow into the segment. Water could be flowing in from a pipe, culvert, natural tributary, or earthen/concrete-lined ditch. Flowing water was categorized into two source types: permitted outfalls or unpermitted outfalls. Permitted outfalls included wastewater facilities and municipal separate storm sewer systems (MS4). Any pipe greater than 12 inches (in.) in diameter was assumed to be permitted by our field crews.

When flowing water was observed from a permitted outfall, two samples were collected. One sample was collected immediately downstream of the outfall where the flowing outfall was mixing with the ambient water. The second sample was taken upstream of the flowing outfall outside of the realm of influence from the outfall to provide the ambient bacteria levels of the assessment unit in that area. The second type of source was an unpermitted outfall, which was any other flowing source of water that was not assumed to be permitted including flowing small (<12 in. diameter) “homemade” pipes and tributaries.

When a flowing unpermitted outfall was observed, the bacteria sample was taken directly from the source. If the source was a flowing pipe, the sample was collected directly from the pipe, before it entered the segment. If it was an open-top earthen ditch or natural tributary, the sample was collected from far enough into the inflow source that there was no mixing with the receiving water. In some cases, when no flowing permitted or unpermitted outfalls were

observed in an extended section of the segment, a single ambient reference sample was taken mid-stream. Left and right bank references are oriented with the observer facing downstream.

For all FIs the field team recorded location of the flowing outfall (latitude and longitude), the diameter, material, and water depth of the flowing outfall, and documented site conditions by taking photos and other relevant notes. All bacteria samples were collected following procedures listed in Appendix J of the FY 2022-2023 H-GAC Multi-Basin Clean Rivers Program Quality Assurance Project Plan (H-GAC QAPP, 2022) and analyzed by a National Environmental Laboratory Accreditation Program (NELAP)-Accredited laboratory.

2021 Results and Recommendations

The 2021 FI was conducted on March 12, 2021 (11 days since last significant rainfall) and a total of 26 bacteria samples were collected. The values of the bacteria samples collected from downstream of permitted outfalls, or directly from unpermitted outfalls are illustrated in Figure 2. A total of four referral locations with elevated *E. coli* bacteria levels measured during the FI in 2021 were recommended for further investigation by the proper authorities (Oakley and Leshar 2021).

A leaking metal pipe was present within the wastewater treatment facility property downstream of Beechnut Street (referral site: MIM-FI-01). A sample was collected where the leaking/spraying water was entering the segment and a bacteria value of 169 MPN/100ML was recorded. The ambient sample collected just upstream of the bridge outside of the influence of the leaking pipe had a bacteria value of 108 MPN/100 mL (MIM-FI-02) indicating that the leaking pipe may be a source of elevated bacteria. Water from an additional metal pipe downstream of the permitted wastewater treatment facility outfall between Newcastle St. and Beechnut St. was sampled in 2021 (Referral site: MIM-FI-05). The sample collected in the mixing zone, just downstream of the outfall, had a bacteria value of 683 MPN/100 mL, and the ambient sample collected just upstream of the outfall (mid channel) had a bacteria value of 119 MPN/100 mL indicating that the outfall is likely a source of elevated bacteria. Another metal pipe discharging water in the segment is believed to be the permitted wastewater treatment facility outfall between Newcastle St. and Beechnut St. (Referral site: MIM-FI-07). The sample collected in the mixing zone, just downstream of the outfall had a bacteria value of 313 MPN/100 mL, and the ambient sample collected just upstream of the outfall (mid channel) had a bacteria value of 160 MPN/100 mL indicating that the outfall is most likely a source of elevated bacteria. It is important to note that the field crew made a remark on the field datasheet that they did not observe any aquatic vegetation, fish, or invertebrates in the downstream of the permitted wastewater treatment facility outfall, but that all of those things were observed upstream of it. Chlorine levels were not tested. Based on these results, a second FI on this segment was recommended to be sampled in 2023.

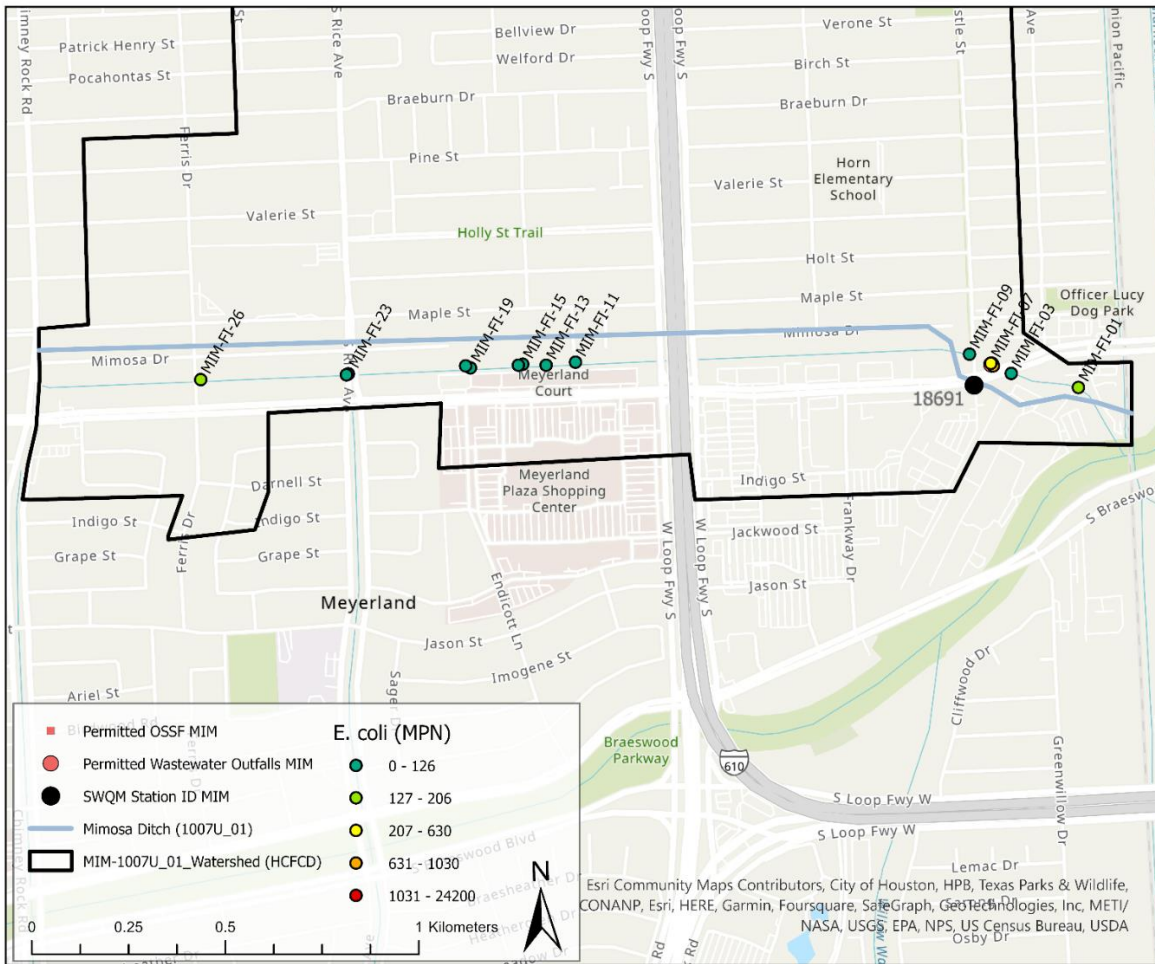


Figure 2: Field investigation results from 03/12/2021 on Mimosa Ditch (AU 1007U_01).

2023 Results

The FI was conducted on April 04, 2023 (seventeen days since last significant rainfall) and a total of 27 bacteria samples were collected. The values of the bacteria samples collected from downstream of permitted outfalls, directly from unpermitted outfalls, or as ambient samples are summarized in Table 1 and Figure 3. Based on the data collected, four locations with elevated *E. coli* bacteria levels measured during the field investigation are recommended for high priority, and one location for low priority investigation by the proper authorities. High priority sites had the highest potential bacteria loading observed and are recommended to be the areas for local authorities to focus efforts on should there be insufficient resources to address all referral sites. As time and resources allow the low priority and investigate further referrals also are recommended for further investigation. These locations are summarized in Table 1 and Figure 4. Each of these referral summaries listed in order of priority (High, Low, then Further Investigation). Within each priority group, sites are listed from downstream to upstream.

Table 1: Field investigation bacteria results from sampling on 04/04/2023 on Mimosa Ditch (Assessment Unit 1007U_01). Referrals: N = No, Y-H = Yes – High Priority, Y-L = Yes-Low Priority, IF = Investigate Further, US = Upstream, DS = Downstream.

Sample ID	Lat	Long	DS or Direct <i>E. coli</i> Sample Results (MPN/100 mL)	US <i>E. coli</i> Sample Results (MPN/100 mL)	Difference* DS - US (MPN/100 mL)	Referral	Comments
MIM-FI2-01	29.68757	-95.44731	100	NA	NA	N	Ambient sample US of confluence with Brays Bayou.
MIM-FI2-02-D	29.68904	-95.44832	< 100	< 100	0	N	The pipe that goes over waterway is leaking. Pipe measurements are estimated.
MIM-FI2-NS-1	29.68920	-95.44870	NA	NA	NA	N	Not sampled. Evidence of pipe on left bank discharging recently but water not reaching ditch.
MIM-FI2-NS-2	29.68919	-95.44878	NA	NA	NA	N	Not sampled. Weep hole. Evidence of possible leak (wet concrete) but no flow on left bank.
MIM-FI2-03-D	29.68941	-95.45010	< 100	< 100	0	N	Right bank.
MIM-FI2-04-D	29.68959	-95.45056	1,690	100	1,590	Y-H	Left bank downstream of permitted wastewater discharge.
MIM-FI2-05-D	29.68965	-95.45067	< 100	100	0	N	Heavy flow creating large mixing zone on left bank. Wastewater discharge.
MIM-FI2-06-D	29.68987	-95.45118	200	100	100	N	Left bank; Large square concrete pipe adjacent to another concrete pipe, this one is furthest DS. Sheen on outflowing water.
MIM-FI2-07-D	29.68989	-95.45123	100	100	0	N	Left bank; Large square concrete pipe adjacent to another concrete pipe, this one is further US. Upstream sample same as previous MIM-FI2-06-U. Sheen on outflowing water.
MIM-FI2-08	29.68996	-95.45837	100	NA	NA	N	Large square concrete outflow that goes underground/under the freeway seems to divert to the right. No light visible to confirm.
MIM-FI2-09	29.68989	-95.45840	200	NA	NA	N	Right bank culvert is main stem of Mimosa Ditch but does flow through an underground tunnel.
MIM-FI2-10	29.68990	-95.45979	< 100	NA	NA	N	Ambient sample upstream of bridge.
MIM-FI2-11-D	29.68990	-95.46250	970	100	870	Y-H	Right bank; lots of algae growing on wet concrete on wall and all along section of segment.
MIM-FI2-12-D	29.68993	-95.46312	< 100	100	0	N	Vegetation growing in and around pipe on left bank.
MIM-FI2-13-D	29.68989	-95.46452	410	200	210	Y-L	Vegetation growing in and around pipe right bank.

Sample ID	Lat	Long	DS or Direct <i>E. coli</i> Sample Results (MPN/100 mL)	US <i>E. coli</i> Sample Results (MPN/100 mL)	Difference* DS - US (MPN/100 mL)	Referral	Comments
MIM-FI2-NS-4	29.68986	-95.46741	NA	NA	NA	N	Not sampled. Cracked concrete with some flow.
MIM-FI2-14-D	29.68991	-95.46774	9,330	630	8,700	Y-H	Two large square pipes left bank under the bridge, pretty good flow.
MIM-FI2-NS-3	29.68990	-95.46950	NA	NA	NA	N	Not sampled. Cracked concrete with some flow.
MIM-FI2-15-D	29.68982	-95.47025	3,730	NA	NA	N	Ambient sample.
MIM-FI2-16-D	29.68984	-95.47175	2,990	1,200	1,790	Y-H	Two large square pipes on left bank just DS of the bridge.
MIM-FI2-17	29.68975	-95.47202	< 100	NA	NA	N	Waterway is dry upstream of flowing pipe. Only flowing water to source stream is from pipe at this point. Water is very cloudy and milky. Verified that waterway is dry to top of AU from here.

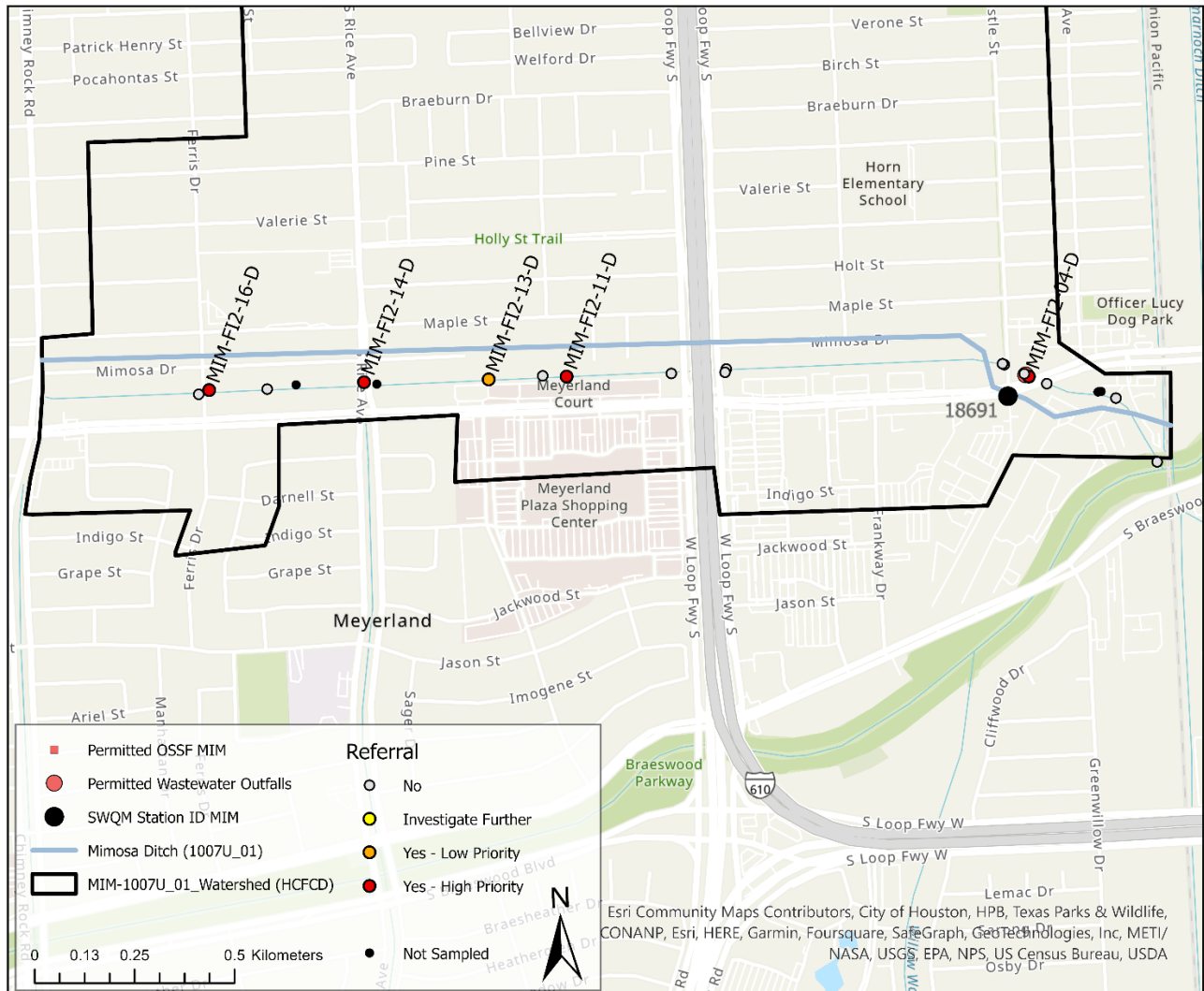


Figure 4: Field investigation sites sampled on 4/4/23 and identified for referral to the proper authorities on Mimosa Ditch (Assessment Unit 1007U_01).

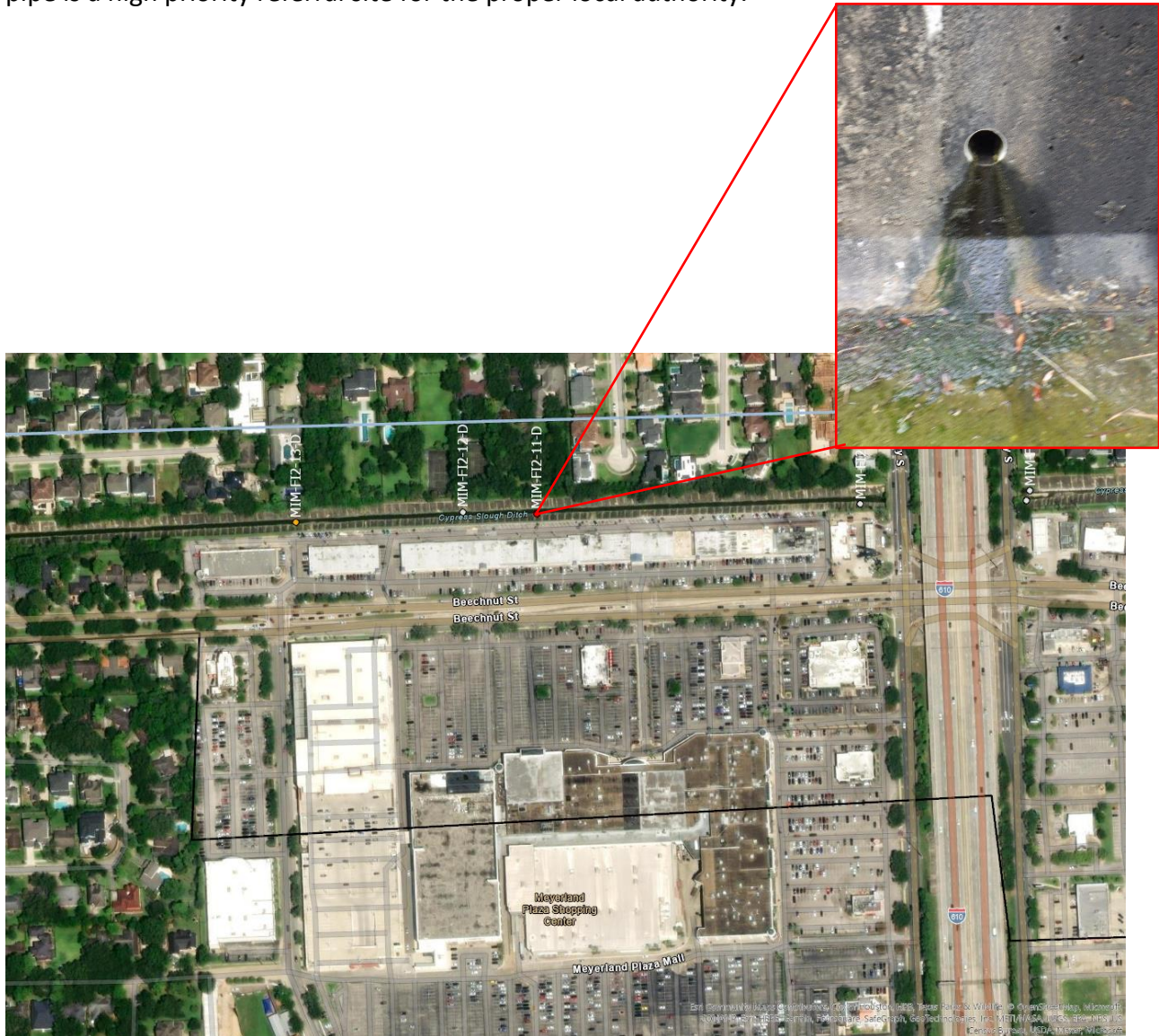
Referral site: MIM-FI2-04-D - High Priority

This is a 78 in. diameter metal pipe located on the left bank of Mimosa Ditch. Water within the pipe was 1.0 in. deep and flowing down algae-coated concrete before entering the segment. There is a permitted wastewater treatment discharge located in the area on the left bank. A sample taken 0.2 m downstream of the pipe had a bacteria value of 1,690 MPN/100 mL. The ambient sample collected upstream of the pipe had a bacteria value of 100 MPN/100 mL. This pipe is a high priority referral site for the proper local authority.



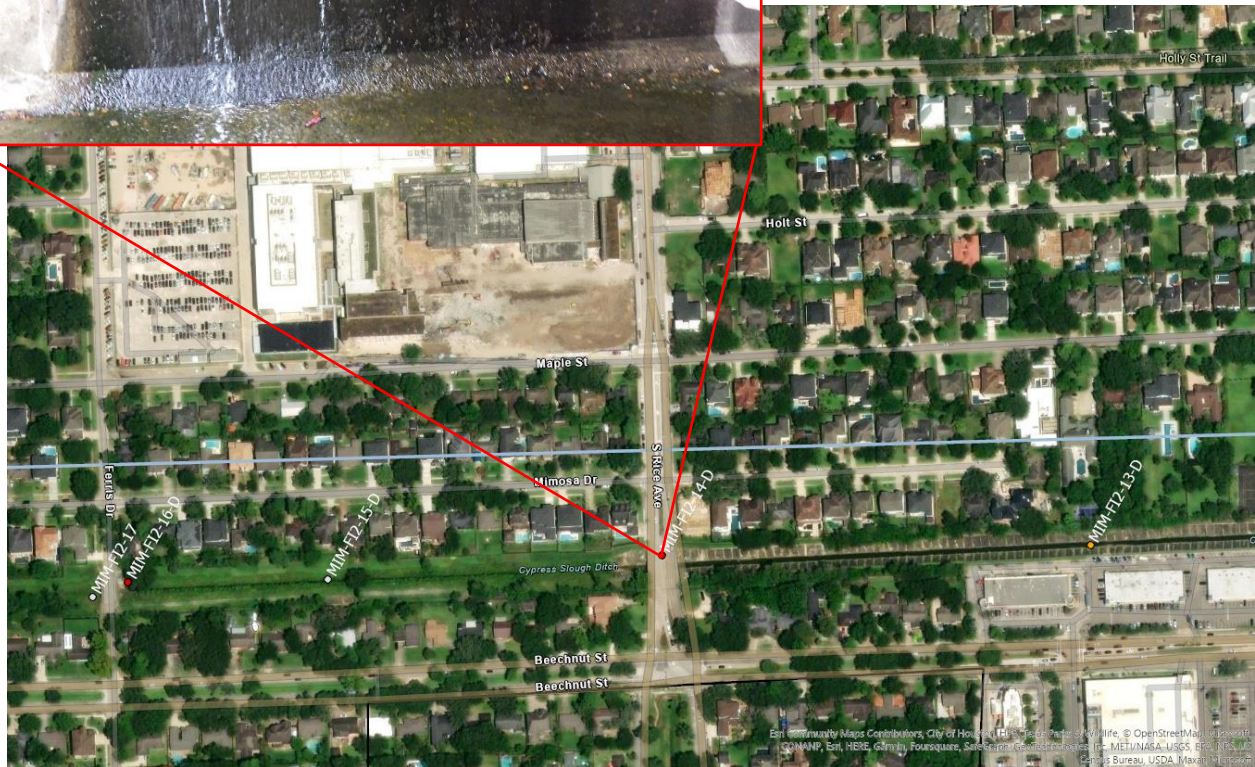
Referral site: MIM-FI2-11-D – High Priority

This is a 4 in. diameter PVC pipe located on the right bank of Mimosa Ditch. Water within the pipe was 0.25 in. deep and flowing down algae-coated concrete before entering the segment. There are multiple restaurants and a shopping plaza located in the area on the right bank. A sample taken 1.0 m downstream of the pipe had a bacteria value of 970 MPN/100 mL. The ambient sample collected upstream of the pipe had a bacteria value of 100 MPN/100 mL. This pipe is a high priority referral site for the proper local authority.



Referral site: MIM-FI2-14-D - High Priority

This is a 98 in. wide, square concrete pipe located under the bridge of S. Rice Ave. on the left bank of Mimosa Ditch. Water within the pipe was 0.25 in. deep and flowing into the segment. The area is mostly residential around this site, but there is a high school undergoing construction about 200 m north of the bridge on S Rice Avenue. A sample taken 0.6 m downstream of the pipe had a bacteria value of 9,330 MPN/100 mL. The ambient sample collected upstream of the pipe had a bacteria value of 630 MPN/100 mL. This pipe is a high priority referral site for the proper local authority.



Referral site: MIM-FI2-16-D - High Priority

This is a 72 in. diameter square cement pipe located on the left bank of Mimosa Ditch. Water within the pipe was 0.13 in. deep and flowing into the AU. The pipe that was flowing at the time of samples was the most upstream of the two pipes at this location. A sample taken 0.1 m downstream of the pipe had a bacteria value of 2,990 MPN/100 mL. The ambient sample collected upstream of the pipe had a bacteria value of 1,200 MPN/100 mL. This pipe is a high priority referral site for the proper local authority.



Referral site: MIM-FI2-13-D- Low Priority

This is a 36 in. diameter metal pipe located on the right bank of Mimosa Ditch. Water within the pipe was 6.0 in. deep and flowing down the vertical concrete bank and into the segment. There was vegetation growing and trash around the pipe at the time of sampling. There are several restaurants and a shopping plaza located in the area on the right bank. A sample 1.25 m downstream of the pipe had a bacteria value of 410 MPN/100 mL. The ambient sample collected upstream of the pipe had a bacteria value of 200 MPN/100 mL. This pipe is a low priority referral site for the proper local authority.



List of Acronyms and Abbreviations

AU	Assessment Unit
BIG	Bacteria Implementation Group
CRP	Clean Rivers Program
DS	Downstream
E. Coli	Escherichia coli
FI	Field Investigation
FY	Fiscal Year
GIS	Geographic Information Systems
H-GAC	Houston-Galveston Area Council
IF	Investigate Further
in.	inch
I	Implementation Plan
km	kilometer
LB	Left Bank
m	meter
MIM	Mimosa Ditch 1007U_01
mL	milliliter
MPN	Most probable number
N	No
NELAP	National Environmental Laboratory Accreditation Program
NLCD	National Land Cover Database
OSSF	On-Site Sewage Facilities
QAPP	Quality Assurance Project Plan
RB	Right Bank
SWQM	Surface Water Quality Monitoring
SWRC	Stroud Water Research Center
T or trib.	Tributary
TCEQ	Texas Commission on Environmental Quality
TMDL	Total Maximum Daily Load
US	Upstream
WS	Windshield Survey
Y-H	Yes – High Priority
Y-L	Yes-Low Priority

Literature Cited

- Houston-Galveston Area Council (H-GAC). 2022. How's the Water? Basin Highlights Report. On-line resource, accessed March 21, 2023. Available from: https://www.h-gac.com/getmedia/42de64a6-36cf-4a3f-afd2-ba119322f853/How_s-the-Water_2022-FINAL-05-12-2022_1
- Houston-Galveston Area Council Multi-Basin Quality Assurance Project Plan (H-GAC QAPP). 2020. Appendix J to the Houston-Galveston Area Council (H-GAC) Multi-Basin Clean Rivers Program FY 2020/2021. Targeted Monitoring in Selected Assessment Units (AUs). Houston, TX. Pp 44.
- Houston-Galveston Area Council Multi-Basin Quality Assurance Project Plan (H-GAC QAPP). 2022. Appendix J to the Houston-Galveston Area Council (H-GAC) Multi-Basin Clean Rivers Program FY 2022/2023. Targeted Monitoring in Selected Assessment Units (AUs). Houston, TX. Pp 74.
- Oakley, J.W. 2021. MIMOSA DITCH (TCEQ ASSESSMENT UNIT 1007U_01) BACTERIA MONITORING REPORT. Technical Report submitted to Houston-Galveston Area Council. EIH Report, 10pp.
- Stroud Water Research Center (SWRC). 2023. Model My Watershed [Software]. On-line resource, accessed March 20, 2023. Available from: <https://wikiwatershed.org/>
- Texas Commission on Environmental Quality (TCEQ). 2012. Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods. Austin, TX. RG-415. Pp 202.
- Texas Commission on Environmental Quality (TCEQ). 2022. 2022 Texas Integrated Report of Surface Water Quality for Clean Water Act Sections 305(b) and 303(d). On-line resource, accessed March 21, 2023. Available from: <https://www.tceq.texas.gov/waterquality/assessment/22twqi/22txir>