

Targeted Bacteria Monitoring Project

Field Investigation Final Report

Assessment Unit 1017D_01,
Unnamed Tributary of White Oak Bayou



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Segment Description

Segment 1017D is an unnamed tributary of White Oak Bayou (Figure 1). This segment consists of one assessment unit (AU) of concern. AU 1017D_01 is 2.95 km long and is a freshwater, perennial stream spanning from the confluence with White Oak Bayou Above Tidal, near IH-610 and TC Jester, upstream to Mitchelldale St. west of US 290 in Harris County. There is one current (station ID: 22094) and one historic (station ID: 16595) surface water quality monitoring (SWQM) station located on this AU. This AU has been selected for targeted monitoring due to a bacteria (*Escherichia coli*) seven-year geometric mean of 1225.9 MPN/100 mL (H-GAC QAPP, 2022). The AU was listed for exceedances of bacteria in the water (Recreation use) and has a current impairment category of 4a and a 5c impairment for dissolved oxygen (Aquatic Life Use) (TCEQ, 2022). The potential sources of bacteria are non-point source pollution, urban runoff, and sanitary sewer overflows (TCEQ, 2022).

The contributing watershed for this segment is 6 km² (SWRC, 2023) (Data source: USGS National Hydrology Dataset (NHD) Plus V2). The soil groups in the watershed range from very slow to slow infiltration rates, while land cover is predominately developed (98.35%) (Data source: United States Department of Agriculture Hydrologic Soil Groups from gSSURGO 2016 and National Land Cover Database NLCD 2019). There are no permitted wastewater outfalls in the watershed and there are also no documented permitted or 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 and a windshield survey (WS) of each AU catchment area, and sampling of the AU from primary road crossings. Phase 2 of this targeted monitoring project includes a field investigation (FI) of the entire AU conducted during dry conditions where all flowing point and non-point sources are evaluated.

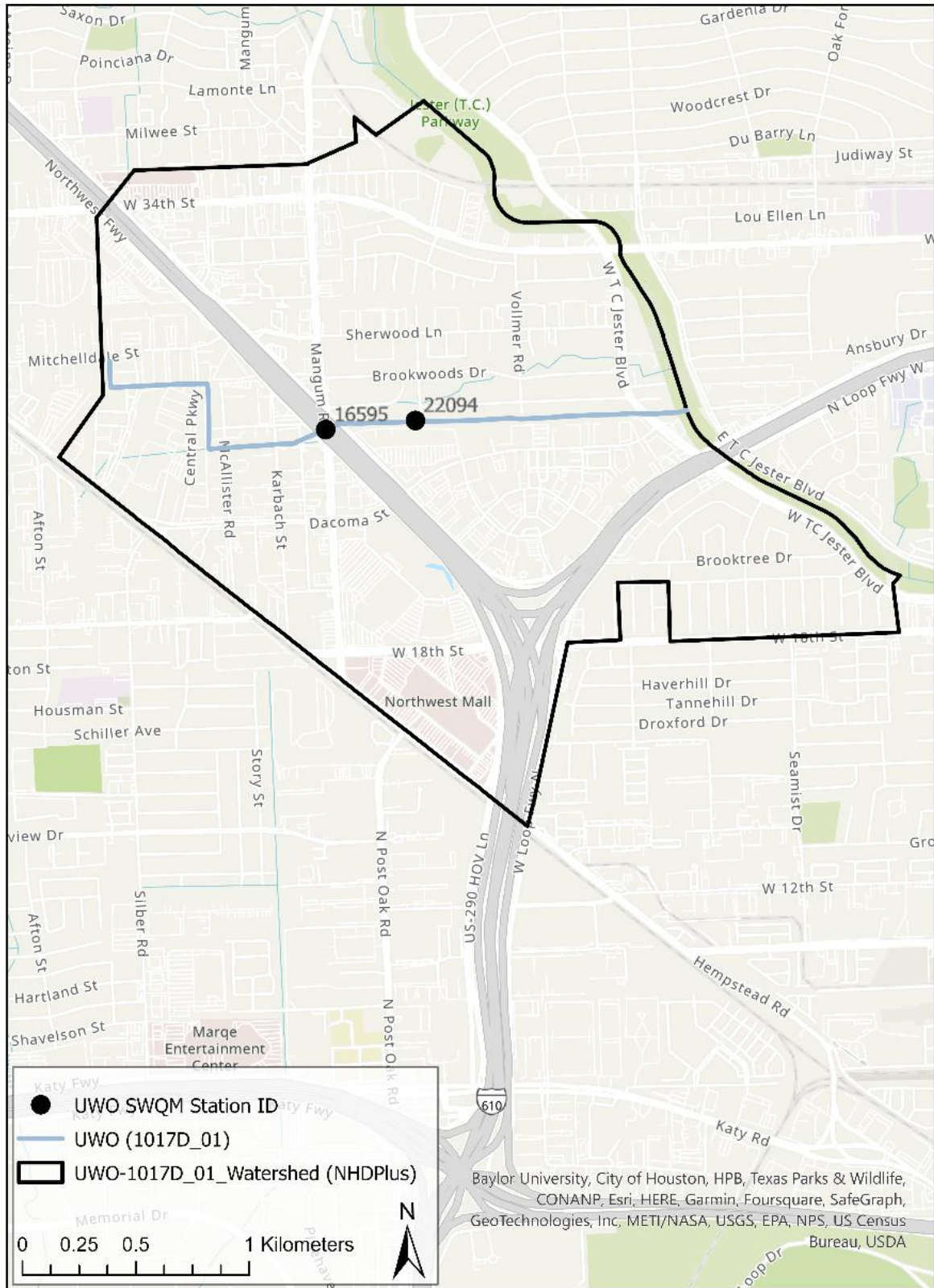


Figure 1 Watershed Map for AU 1017D_01.

Desktop Review

Methods

The intensive desktop review included an evaluation of permitted discharges, outfalls, and potential sources of point source 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 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 these can contribute to bacterial sources through runoff of animal wastes but also provide opportunity for contact recreation. Bridge crossings and other entry points were identified in order to provide access into the stream to collect bacteriological samples.

Results

The results of the desktop review indicated that the segment is highly urbanized with a mix of concrete banks and vegetated banks. Many businesses, manufacturers, parking lots, roads, and major freeways surround this AU as well as a small stretch of neighborhoods that border the tributary. The following potential sources were identified:

- newly constructed apartments on Dacoma St. near US 290 that border the unnamed tributary (Figure 2)
- a small (0.45 acre) farm that may have runoff into the AU (Figure 3)

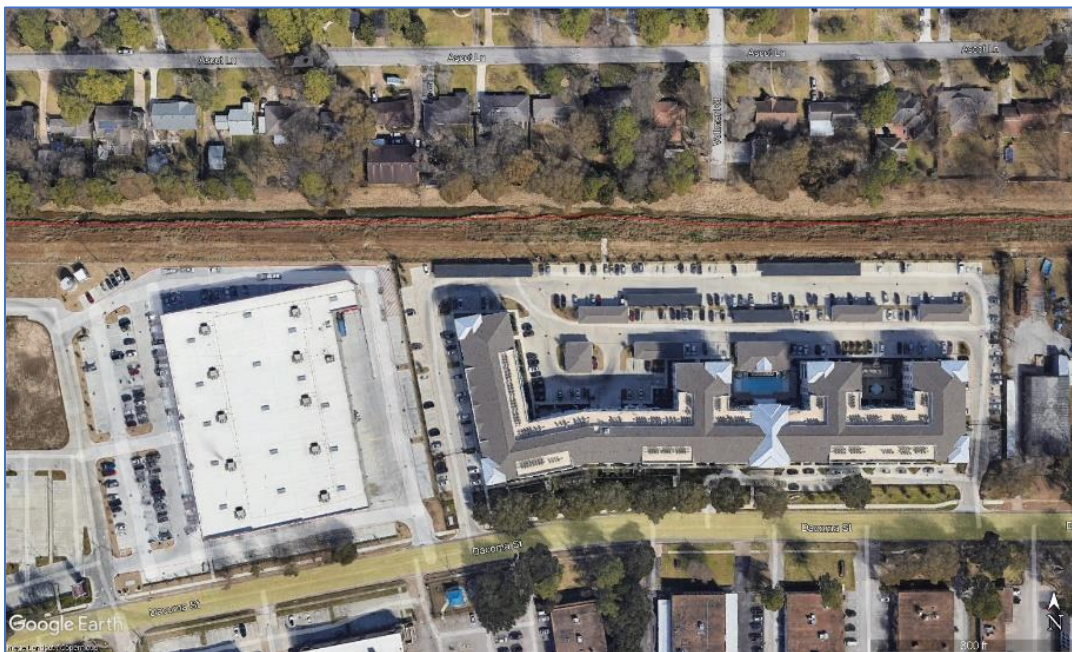


Figure 2. Possible source identified during desktop review.

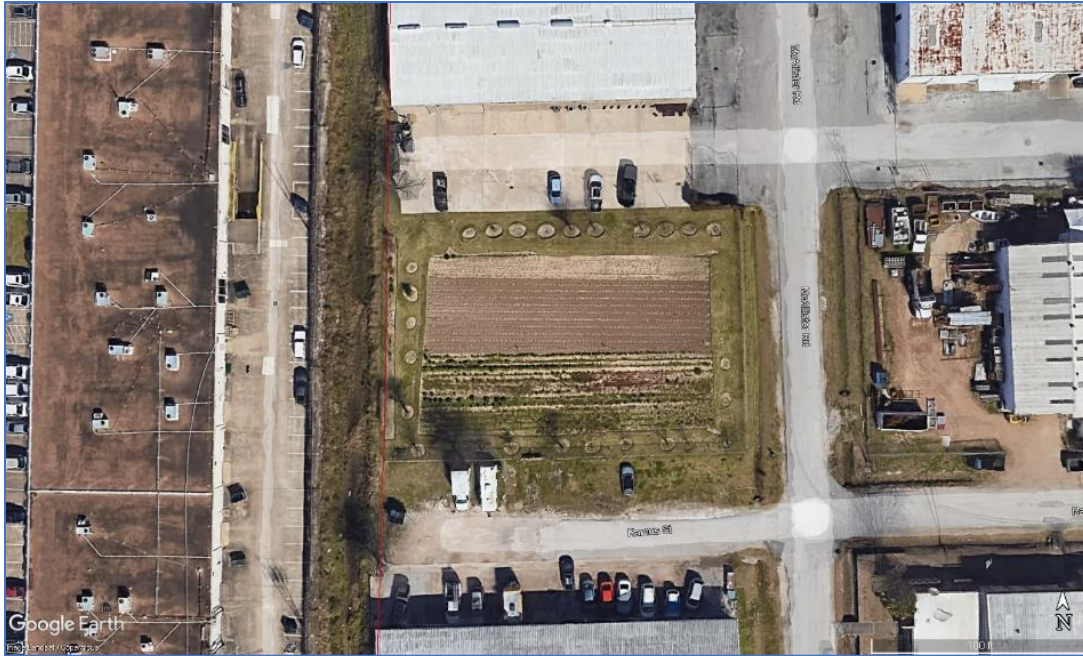


Figure 3. Possible source identified during desktop review.

Publicly accessible entry points into the stream were identified at the bridge at TC Jester Blvd., the dead end of Vollmer Rd. that abuts the tributary, where the AU intersects with the Northwest Fwy. on the upstream side, and the bridge over the tributary at Karbach St. The stream runs dry after it intersects with McAllister Rd.

Windshield Survey

Methods

All field events must take place during dry weather (after three or more days without significant rainfall in the watershed). This ensures that any flowing water into the AU is not stormwater. Windshield surveys of the watershed were conducted, 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.

Assessment Units, collection and laboratory methods, and data handling practices 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). For all WSs, bacteria monitoring field personnel documented

the latitude and longitude of sample location. All bacteria samples were collected following SWQM procedures (TCEQ, 2012) and analyzed by a National Environmental Laboratory Accreditation Program (NELAP)-Accredited laboratory.

Results and Recommendations

The WS was conducted on March 14, 2023. At that time, it had been 12 days since the last significant rainfall in the watershed. A total of five samples were collected on AU 1017D_01 during the WS (Table 1 and Figure 4). While the AU continues past UWO-WS-05 at McAllister Rd., there was no surface water observed upstream of this point. While AU 1017D_01 is 2.96 km long, the distance of the wetted stream for the WS was 2.1 km. Based upon the results of the WS, no sections of the AU were identified for focus during future FIs. A detailed FI throughout the entire assessment unit was still conducted.

Table 1: Windshield survey bacteria results from sampling on 03/14/2023 on Unnamed Tributary of White Oak Bayou (AU 1017D_01). Samples were taken at bridge crossings and other publicly accessible points. US = Upstream, DS = Downstream, RB = Right Bank, LB = Left Bank.

Sample ID	Latitude	Longitude	<i>E. coli</i> Sample Results (MPN/100 mL)	Comments
UWO-WS-01	29.81062	-95.44406	<100	Best access DS RB, will need step ladder to access most DS stretch
UWO-WS-02	29.81062	-95.45016	<100	Steep, but looks like it will be nice to walk the stream
UWO-WS-03	29.81061	-95.45798	<100	US LB best access; seems stagnant, very shallow
UWO-WS-04	29.80983	-95.46139	<100	
UWO-WS-05	29.80978	-95.46352	<100	Top of segment with water

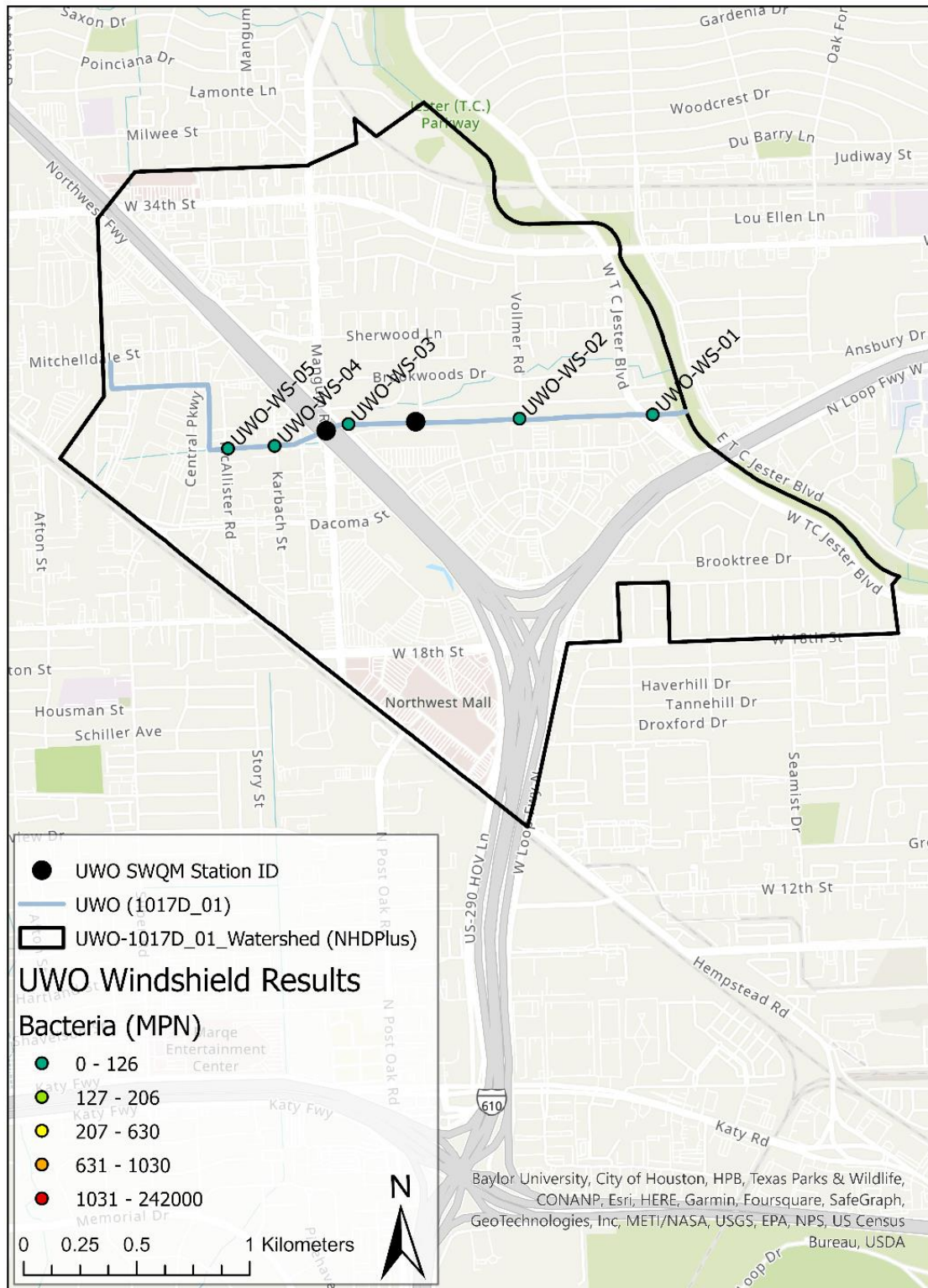


Figure 4 Windshield survey/ground truthing bacteria results from sampling on 03/14/2023 on Unnamed Tributary of White Oak Bayou (AU 1017D_01). Samples were taken at bridge crossings and other easily accessible points.

Field Investigation

Methods

The FI was a thorough survey where a team of two, either walked or paddled the entire assessment unit and sampled any water observed flowing into the stream. Water could be flowing in from a pipe, culvert, natural tributary, or earthen 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 AU. 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 AU, a single ambient reference sample was taken mid-stream. Left and right bank references are oriented with the observer facing downstream.

Assessment Units, collection and laboratory methods, and data handling practices 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). For all field investigations 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.

Results

The FI was conducted on March 31, 2023 (14 days since last significant rainfall) and a total of 23 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 2 and Figure 3. Based on the data collected, two 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. These locations are summarized in Table 2 (highlighted in grey) and Figure 4. In addition, one location was flagged for investigate further where the upstream sample had elevated bacteria levels with no obvious explanations. 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. Each of these referral summaries are listed in order of priority (High, Low, then Investigate Further). Within each priority group, sites are listed from downstream to upstream.

Table 2: Field investigation bacteria results from sampling on 3/31/2023 on Unnamed Tributary of White Oak Bayou (Assessment Unit 1017D_01). Referrals: N = No, Y-H = Yes – High Priority, Y-L = Yes-Low Priority, IF = Investigate Further, US = Upstream, DS = Downstream, RB = Right Bank, LB = Left 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
UWO-FI1-01-D	29.81073	-95.44265	100	< 100	0	N	Under water pipes flow into White Oak Bayou.
UWO-FI1-02-P	29.81065	-95.44395	200	NA	NA	N	Taken directly from trickling weep hole in concrete-lined segment on left bank.
UWO-FI1-03-P	29.81065	-95.44405	410	NA	NA	N	Taken directly from trickling weep hole in concrete-lined segment on right bank.
UWO-FI1-04-D	29.81062	-95.44415	< 100	3,320	-3,220	IF	Used tampon and feminine pad at sample site on right bank.
UWO-FI1-05	29.81063	-95.44657	< 100	NA	NA	N	Ambient sample.
UWO-FI1-06-D	29.81061	-95.45042	< 100	< 100	0	N	Right bank.
UWO-FI1-07-D	29.81063	-95.45300	3,990	< 100	3,890	Y-H	Pipe on right bank pours into pool.
UWO-FI1-NS-1	29.81056	-95.45352	NA	NA	NA	N	Not sampled. Slow drip from pipe.
UWO-FI1-NS-2	29.81058	-95.45445	NA	NA	NA	N	Not sampled. Pool below pipe. Not currently flowing.
UWO-FI1-NS-3	29.81057	-95.45517	NA	NA	NA	N	Not sampled. Slow drip from pipe.
UWO-FI1-NS-4	29.81058	-95.45654	NA	NA	NA	N	Not sampled. Rainbow sheen on water surface. A potential source is a trash bag in water.
UWO-FI1-08-D	29.81058	-95.45686	< 100	< 100	0	N	Pipe in stream underwater. Unsure if it is leaking but took samples. Pipe just upstream of this pipe on right bank. Moist inside but no flow.
UWO-FI1-NS-5	29.81034	-95.45776	NA	NA	NA	N	Not sampled. Leaking valve on bank, not flowing into segment that we can see.
UWO-FI1-09	29.81058	-95.45810	< 100	NA	NA	N	Three sections of square culverts. Same latitude and longitude used. This one is on the right bank and heads southeast.
UWO-FI1-10	29.81058	-95.45810	< 100	NA	NA	N	Three sections of square culverts. Same latitude and longitude used. This one is the middle culvert.

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
UWO-FI1-11	29.81058	-95.45810	< 100	< 100	NA	N	Three sections of square culverts. Same latitude and longitude used. This culvert is on the left bank. The water is pooled in this area.
UWO-FI1-12-D	29.80988	-95.46031	520	< 100	420	Y-H	US sample taken upstream of 290 where segment resurfaces after. DS sample taken from pipe on LB (2nd to last pipe) ~15m DS of upstream sample coordinates. Pipe on RB (across from pipe we sampled) has barely a trickle not sampled.
UWO-FI1-NS-6	29.80984	-95.46042	NA	NA	NA	N	Not sampled. Pipe is metal and rusty. Goes underground in center of segment and comes out from right bank.
UWO-FI1-13-P	29.80988	-95.45959	< 100	NA	NA	N	Pipe pouring in underground and using a stormwater drain into underground tunnel of tributary. Sample taken ~64m from where tributary resurfaces from underground. Latitude and longitude are estimates (under bridge).
UWO-FI1-14-D	29.80980	-95.46139	410	100	310	Y-L	Pipe is submerged and we are unable to tell if it is leaking but the concrete bank around it is collapsed and there is a deep pool under it.
UWO-FI1-15	29.80977	-95.46404	< 100	NA	NA	N	Ambient sample. White film on substrate. Small pool amidst very narrow and shallow section of tributary. Possible chemical (grease?) smell to sample. Flow is just a trickle.
UWO-FI1-16	29.80979	-95.46436	< 100	NA	NA	N	Top of wetted segment. Pipe seems to be main source of flow as it is completely dry upstream of here (after it turns 90 degrees to north) pipe comes from underground to west.

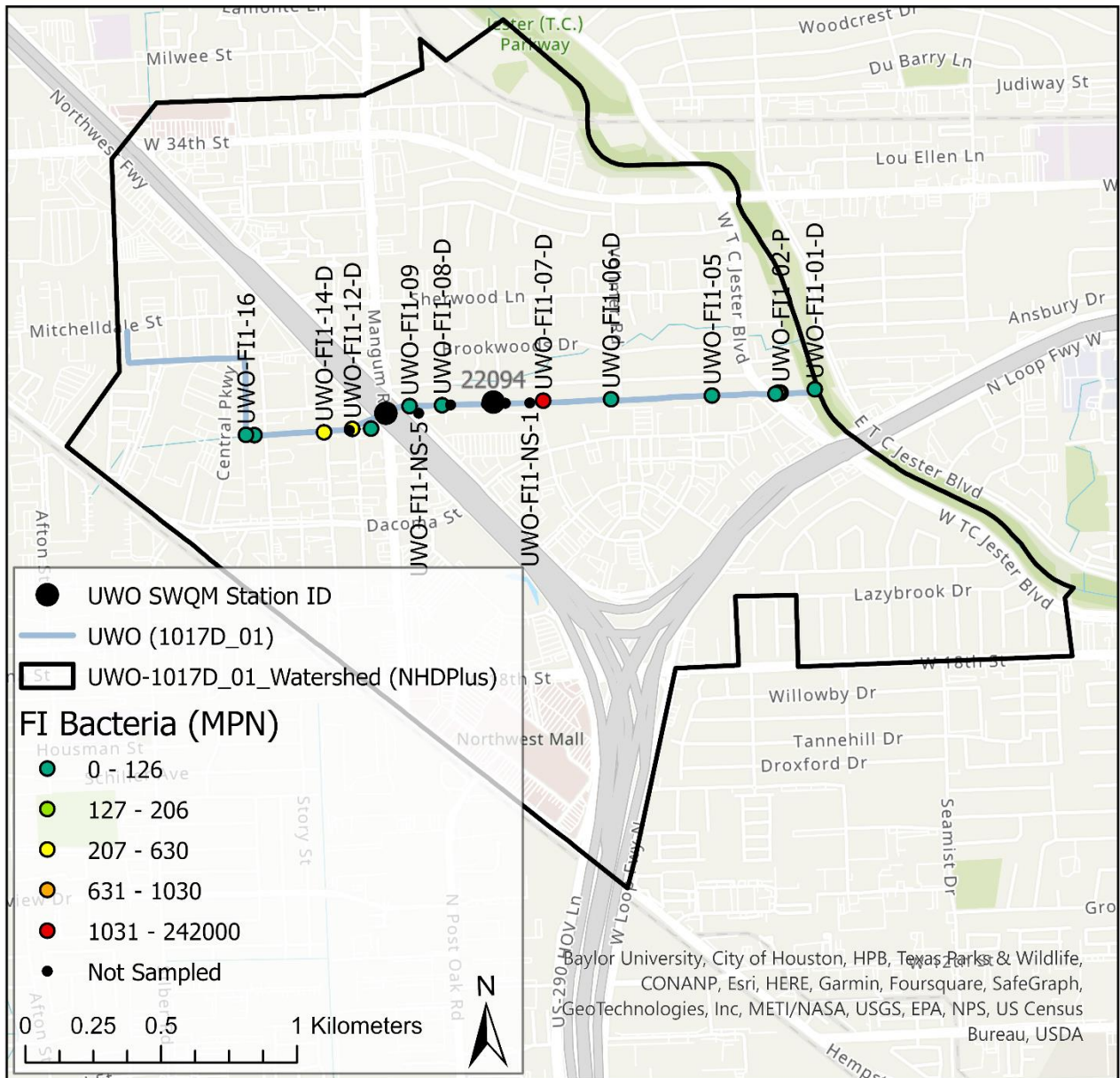
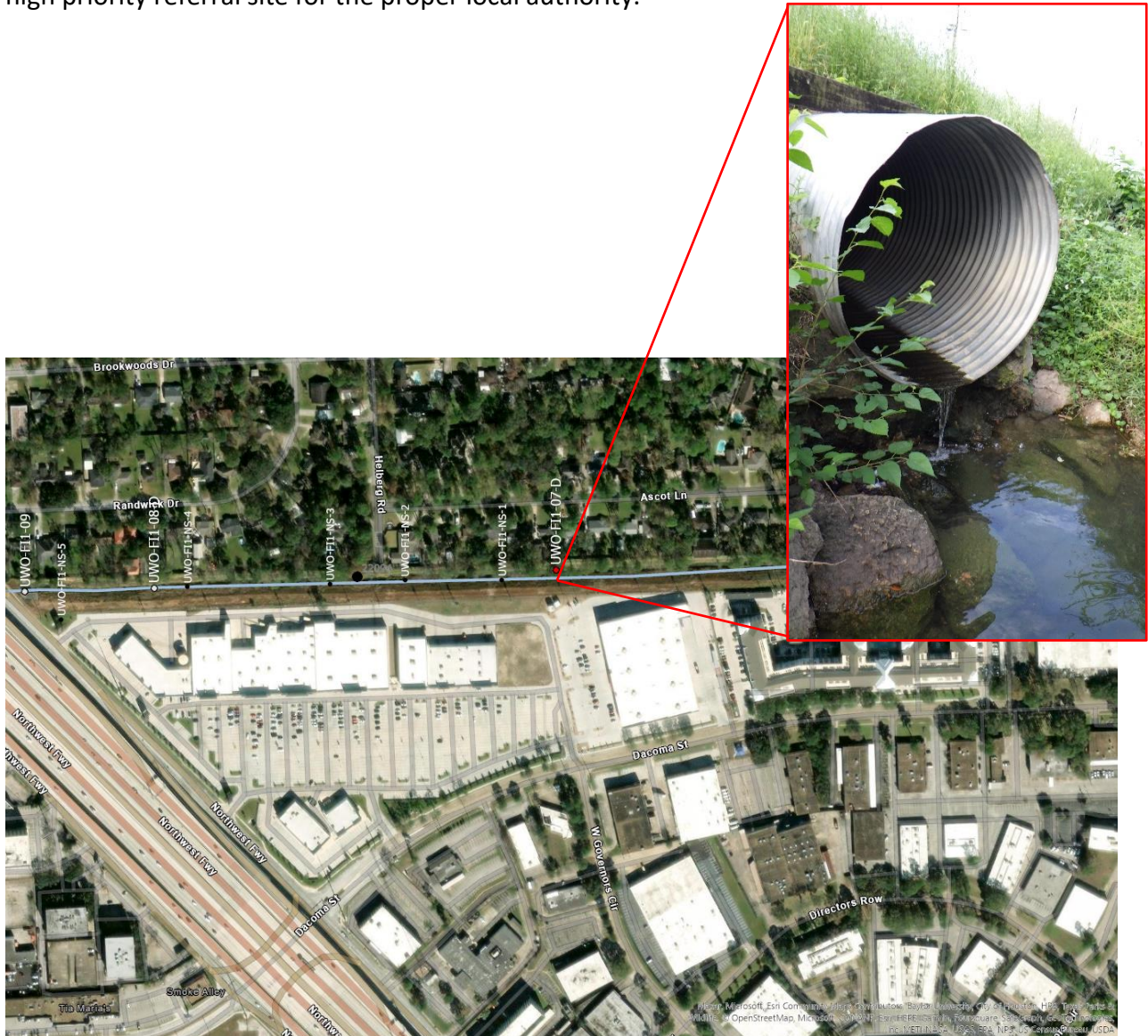


Figure 3: Field investigation bacteria sampling Results from 3/31/2023 on Unnamed Tributary of White Oak Bayou (Assessment Unit 1017D_01).

Referral site: UWO-FI1-07-D- High Priority

This is a 48 in. diameter metal pipe located on the right bank of the Unnamed Tributary to White Oak Bayou. Water within the pipe was 0.33 in. deep and flowing into a pooled area of the segment. There are commercial buildings located in the area on the right bank. A sample taken 0.3 m downstream of the pipe had a bacteria value of 3,990 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.



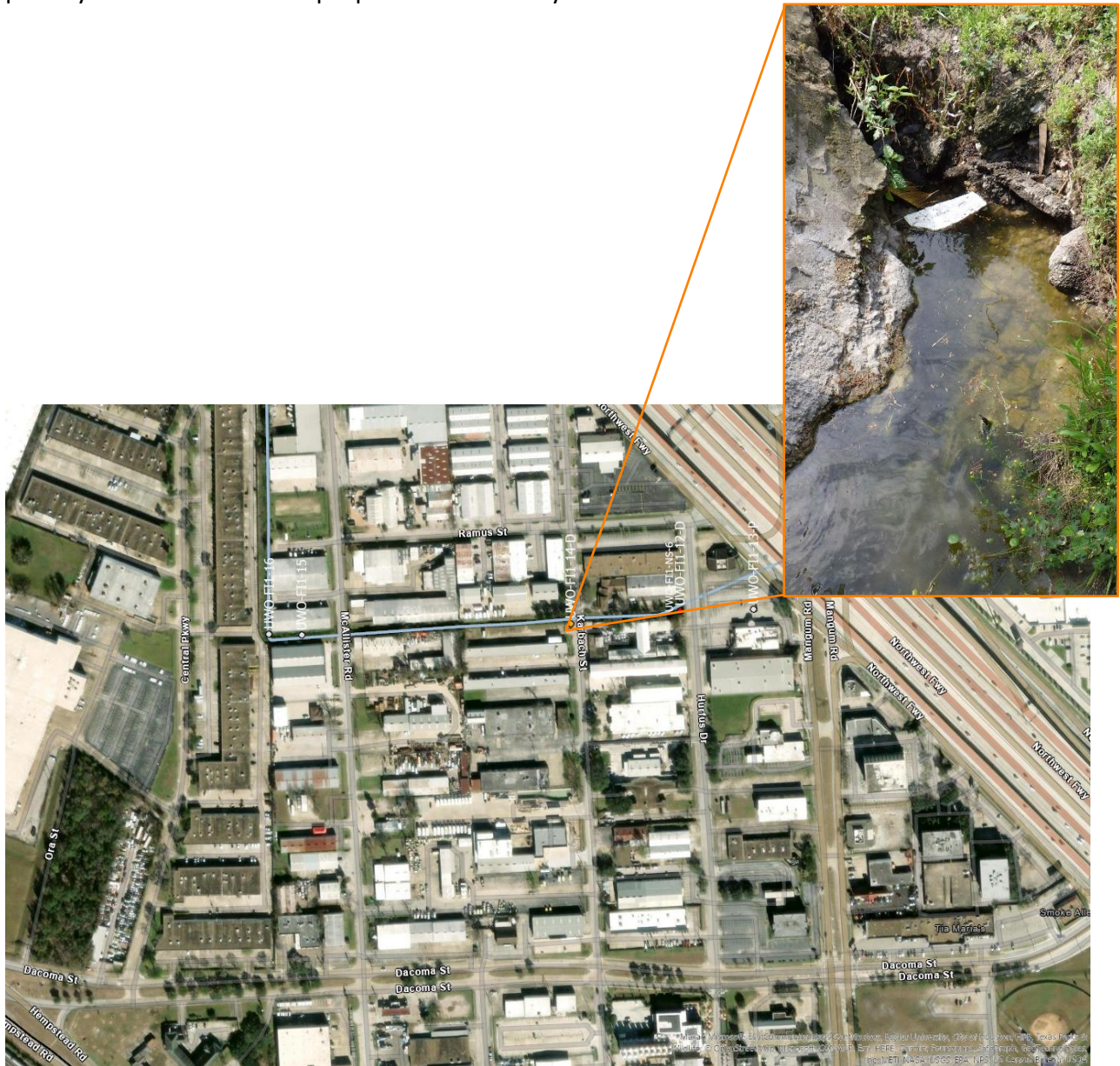
Referral site: UWO-FI1-12-D- High Priority

This is a 54 in. diameter cement pipe located on the left bank approximately 15 m downstream of the upstream side of the bridge on the Unnamed Tributary to White Oak Bayou. Water within the pipe was 0.6 in. deep and flowing into the segment. There was a pipe across from the sampled pipe that was barely trickling and not sampled. There are commercial buildings located in the area on the left bank. A sample taken 0.1 m downstream of the pipe had a bacteria value of 520 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.



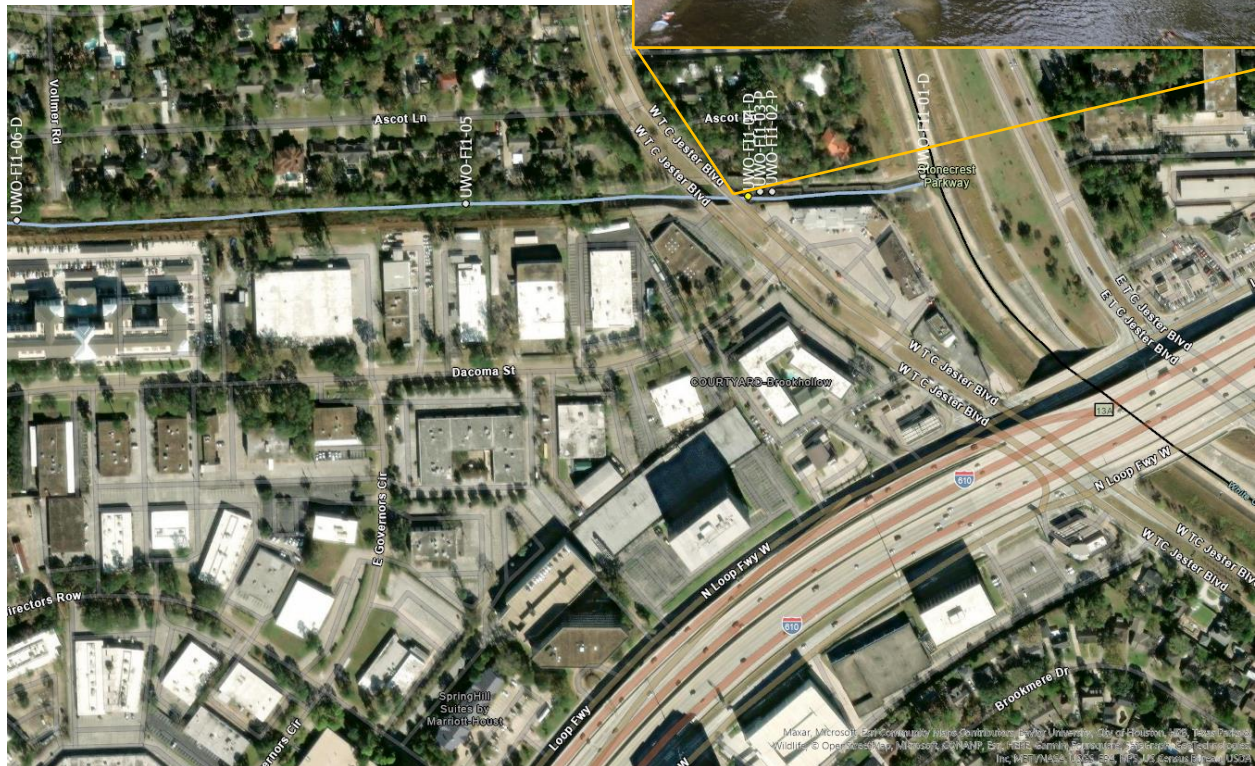
Referral site: UWO-FI1-14-D- Low Priority

This is a 12 in. diameter cement pipe located on the right bank of the Unnamed Tributary to White Oak Bayou. The pipe is completely submerged and the field crew was unable to tell if it was flowing, but the cement bank around it was collapsed and there is a pool under it. There are commercial buildings located in the area on the right bank. A sample taken 1 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 100 MPN/100 mL. This pipe is a low priority referral site for the proper local authority.



Referral site: UWO-FI1-04-U – Investigate Further

This was an ambient upstream sample taken on the Unnamed Tributary of White Oak Bayou for reference with the sample UWO FI1-04-D taken at a pipe on the right bank near the TC Jester bridge crossing. The ambient sample taken just downstream of the bridge crossing had a bacteria value of 3,320 MPN/100 mL. Another ambient sample was taken approximately 235 m further upstream and had a bacteria value of < 100 MPN/100 mL. No potential point sources were observed within this reach. Further investigation is recommended by the proper local authority to determine the source of elevated bacteria in this section of the segment. There are single-family homes located on the left bank and commercial building located on the right bank in this section of the segment.



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
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
UWO	Unnamed Tributary of White Oak Bayou 2 1017D_01
WS	Windshield Survey
Y-H	Yes – High Priority
Y-L	Yes-Low Priority

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