

Targeted Bacteria Monitoring Project

Field Investigation Final Report

Assessment Unit 10140_01

Spring Branch (Tributary of Buffalo Bayou)



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Segment Description

Segment 1014O is a freshwater, perennial stream referred to as Spring Branch (Figure 1) and is a tributary of Buffalo Bayou. This segment consists of one assessment unit (AU) of concern, AU 1014O_01. This AU is 6.9 km and is defined as spanning from Buffalo Bayou Above Tidal confluence to 1.4 km (0.87 mi) upstream of Long Point Road in Harris County. There is one current (station ID: 16592) and two historic (station IDs: 16591, 11192) surface water quality monitoring (SWQM) stations located on this AU. This AU has been selected for targeted monitoring due to a bacteria (*Escherichia coli*) seven-year geometric mean of 1206.2 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 (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 AU is 29 km² (Data source: HGAC and SWRC, 2023). The predominant soil group in the watershed is medium/very slow infiltration coverage and the land cover in the watershed is dominated by 99.95% developed land (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 or documented unpermitted on-site sewage facilities (OSSF), but there are seven documented permitted OSSFs 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, have 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 where all flowing point and non-point sources are evaluated.

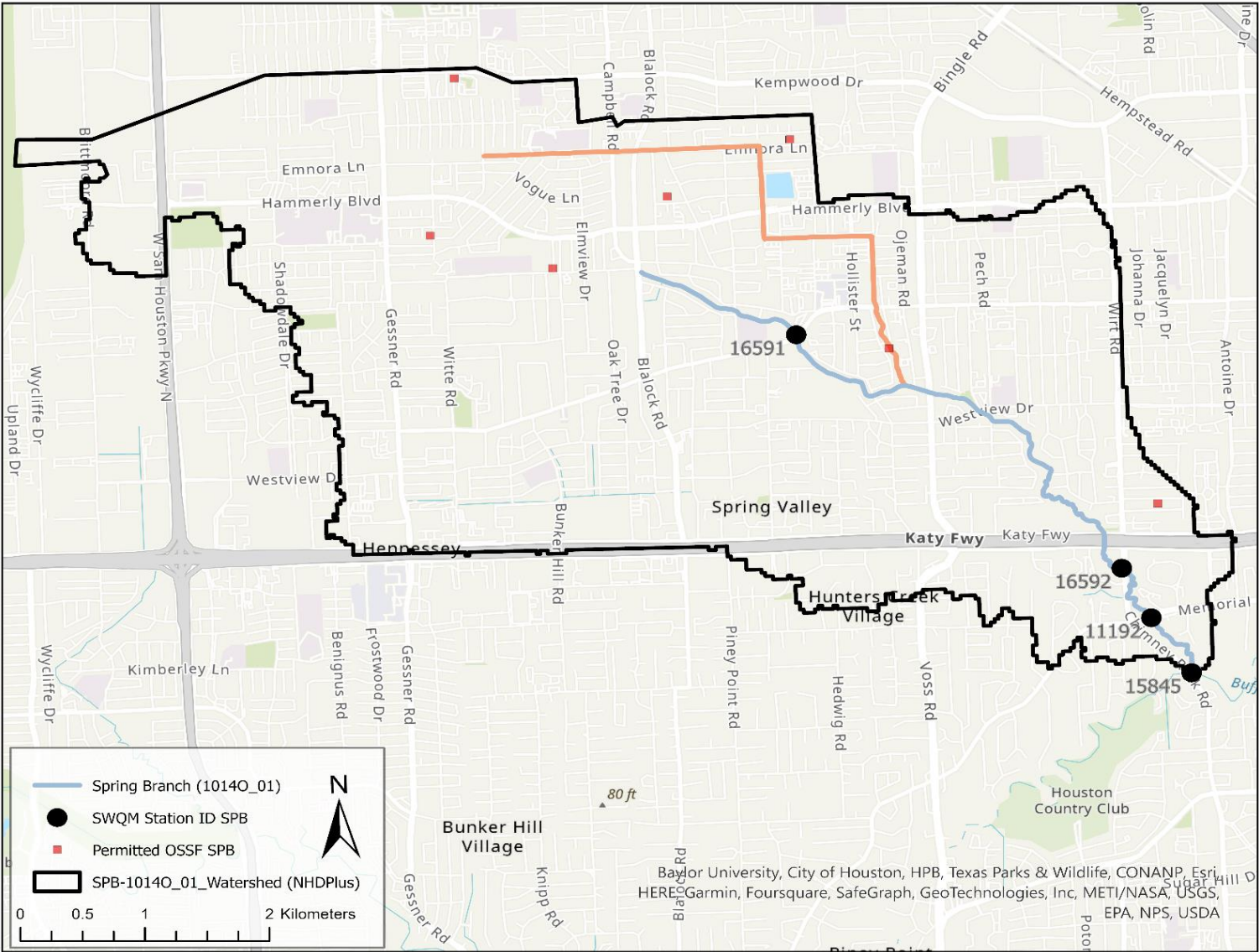


Figure 1 Watershed Map for Assessment Unit 10140_01, Spring Branch (Tributary of Buffalo Bayou).

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. 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 to provide access into the stream to collect bacteriological samples.

Results

The results of the desktop review indicated that the AU lies within a mix of mostly suburban and some urban environments. It spans through many residential neighborhoods and schools/parks with some businesses and manufacturing facilities. From our desktop review there were some potential sources identified, such as a recycling facility that borders Spring Branch near Long Point Rd, a permitted OSSF on the east side of Spring Branch near the Katy freeway, and the Moritz Pech Family Park that has a drainage spillway leading directly into the AU. Publicly accessible entry points into the stream were identified at Memorial Dr., Chimney Rock Rd., I-10 Frontage Rd., Burkhart Rd., Pech Rd., Bingle Rd., Bracher St., Ruland Rd., Longpoint Rd., and Campbell Rd.

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 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 Phase 2, 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 the WS, field personnel documented the latitude and longitude of sample location. 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 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 nine samples were collected on AU 1014O_01 and two on contributing tributaries during the WS (Table 1 and Figure 2).

Table 1. Windshield survey bacteria results from sampling on 03/14/2023 on Spring Branch (AU 1014O_01). Samples were taken at bridge crossings and other publicly accessible points. US = Upstream, DS = Downstream. LB = Left Bank, RB = Right Bank.

Sample ID	Latitude	Longitude	<i>E. coli</i> Sample Results (MPN/100 mL)	Comments
SPB-WS-01	29.77774	-95.48256	3,180	On DS LB pipe leak (photo)
SPB-WS-02	29.78357	-95.48636	>242,000	Sampled from bridge; steep banks and encampment under bridge
SPB-WS-03	29.78947	-95.49078	<100	
SPB-WS-04	29.79404	-95.49557	520	Good access; Poison ivy; Evidence of fishing; Site becomes concrete lined
SPB-WS-05	29.79612	-95.50024	310	HCFCD gauge site; need step ladder
SPB-WS-06	29.79606	-95.50515	<100	On US RB is best access
SPB-WS-07	29.79871	-95.50999	200	
SPB-WS-08	29.80091	-95.51128	24,800	Stairs to water DS RB; encampment under bridge; Sampled just DS of 2 outfalls, one on RB white w/odor
SPB-WS-09	29.80293	-95.51622	<100	Can hear water flow in tunnel, LB culvert majority of flow
SPB-T1-WS-01	29.80025	-95.50388	410	Trickling flow
SPB-T1-WS-02	29.80866	-95.50672	<100	US RB pooled water, turbid greyish

Based upon the results of the WS and ground-truthing, a FI covering the entire length of the AU and the unnamed tributary was recommended. Based on the results of the WS, we expected to identify potential point or non-point sources of elevated bacteria near the following portions of the AU:

- 1) SPB-WS-02 was collected on the downstream side of the Interstate 10 Frontage Road and had a bacteria level of > 242,000 MPN/100 mL. The notes indicate that there was an encampment under the bridge upstream of where the sample was collected. This could be a potential source, as the sample collected ~0.6 miles upstream had a result of < 100 MPN/100

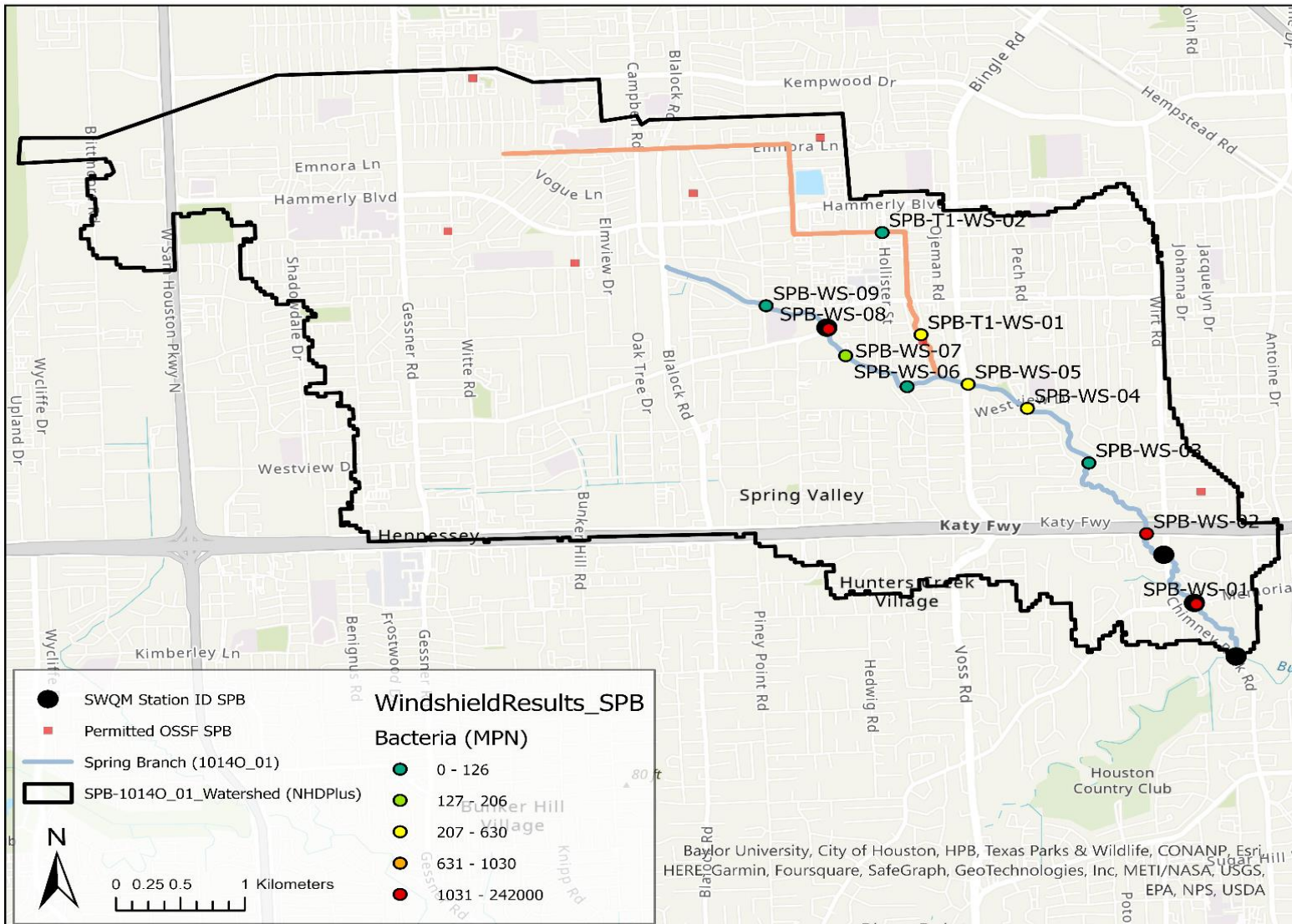


Figure 2 Windshield survey/ground truthing bacteria results from sampling on 03/14/2023 on Spring Branch (Tributary of Buffalo Bayou) (AU 10140_01). Samples were taken at bridge crossings and other easily accessible points.

mL and that stretch of the stream is surrounded by single-home residences and a large church compound. The one sample collected downstream of this site also had a high level of bacteria (3,180 MPN/100 mL).

2) SPB-WS-04 was collected at Pech Road and had a higher result than the samples collected just upstream and downstream. The right bank is bordered by single-family residences and the left bank has some newly constructed business built close to the stream.

3) SPB-WS-08 was collected at Long Point Road and had a bacteria result of 24,800 MPN/100 mL despite the upstream sample, which was ~0.35 miles upstream, resulting in < 100 MPN/100 mL.

4) SPB-T1-WS-01 was collected from a tributary nestled between a single-family residence neighborhood off Bracher Street and a multi-family residence off Ojeman Road. This sample had a bacteria level of 410 MPN/100 mL and may be a potential source of bacteria.

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 inch (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, sample 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 analyzed by a National Environmental Laboratory Accreditation Program (NELAP)-Accredited laboratory.

Results

The FI was conducted on May 3rd, 2023 (five days since last significant rainfall) and a total of 70 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, three locations with elevated *E. coli* bacteria levels measured during the FI are recommended for high priority and two locations 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 2 (highlighted in grey) and Figure 4. In addition, nine locations were flagged where ambient or upstream samples had elevated bacteria levels with no obvious explanations. Further investigation of these areas by the proper authorities are recommended. Each of these referrals are summarized by site, herein. The 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 5/03/2023 on Spring Branch (Assessment Unit 10140_01). Referrals (gray rows): N = No, Y-H = Yes – High Priority, Y-L = Yes-Low Priority, IF = Investigate Further, US = Upstream, DS = Downstream. LB = Left Bank, RB = 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
SPB-FI1-01	29.77387	-95.47906	100	NA	NA	N	Ambient sample taken from tributary to Spring Branch in the mixing zone; Left bank.
SPB-FI1-02	29.77398	-95.47927	980	NA	NA	IF	Ambient sample taken upstream of estimated mixing zone. Bottom of SPB segment.
SPB-FI1-03	29.77664	-95.48180	410	NA	NA	N	Ambient sample.
SPB-FI1-04-D	29.77674	-95.48190	100	630	-530	N	Water flowing down from left bank from unknown source.
SPB-FI1-05-D	29.77796	-95.48293	740	410	330	Y-L	Pipe located at small waterfall where water is mixing; RB.
SPB-FI1-06-P	29.77809	-95.48262	< 100	NA	NA	N	LB; leaking pipe over waterway; took sample directly from pipe.
SPB-FI1-07	29.77930	-95.48409	1460	NA	NA	IF	Ambient sample taken on LB of tributary.
SPB-FI1-08-D	29.77946	-95.48443	< 100	8,390	-8,290	IF	US sample taken first; RB; DS of bridge where bats are; beavers swimming; pipe dripping.
SPB-FI1-09	29.77935	-95.48492	630	NA	NA	IF	Ambient sample of tributary Briar Branch at Chimney Rock bridge US; RB (include in future FI).
SPB-FI1-10-D	29.78096	-95.48409	200	860	-660	N	LB; Slow trickle down bank US of left pipe.
SPB-FI1-11	29.78203	-95.48595	410	NA	NA	IF	Ambient sample taken at RB at small tributary.
SPB-FI1-12	29.78265	-95.48650	630	NA	NA	N	Ambient sample taken.
SPB-FI1-13-D	29.78347	-95.48649	1,340	740	600	Y-L	Pipe measurements estimated; on left bank.
SPB-FI1-14-D	29.78532	-95.48670	310	200	110	N	LB, Bottom of pipe rusted out, just trickling; in a large pooled area.
SPB-FI1-15-D	29.78559	-95.48687	1,210	100	1,110	Y-H	Extremely large pipe on LB; substantial flow coming from pipe; coordinates may not be exact due to tree cover.
SPB-FI1-16-D	29.78789	-95.49136	100	200	-100	N	Smells like sewage; RB.

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
SPB-FI1-17-D	29.78815	-95.49140	410	310	100	N	Almost stagnant pool under pipe with oily sheen on surface; RB; unable to tell where connected took DS sample from pool.
SPB-FI1-18-D	29.79264	-95.49229	100	4570	-4,470	N	Took sample directly from tributary; Took US directly from main AU; LB.
SPB-FI1-19-D	29.79383	-95.49542	43,500	77,000	-33,500	N	Material of pipe; Outside is metal, opening lining is plastic, and body is concrete; RB.
SPB-FI1-20-D	29.79412	-95.49556	> 242,000	17,800	224,200	Y-H	Submerged pipe; LB. Took sample in pipe. Bats under bridge US of samples.
SPB-FI1-21-D	29.79485	-95.49672	< 100	< 100	0	N	LB rusted out pipe; Water not flowing out of pipe but flow on concrete below. US of bridge with bats.
SPB-FI1-22-D	29.79596	-95.49923	< 100	< 100	0	N	Several weep holes on both banks; Same US sample as 23; Flowing & 1 rusted out; Metal pipe. No water in pipe but wet concrete below; LB.
SPB-FI1-23-D	29.79600	-95.49933	1,340	< 100	1,240	Y-H	Water started flowing while at site out of metal pipe on RB. Smells of effluent.
SPB-FI1-24-D	29.79615	-95.50028	300	< 100	200	N	LB - pipe dripping down concrete before mixing in stream.
SPB-FI1-25	29.79684	-95.50263	630	NA	NA	N	Ambient sample of trib. on LB.
SPB-FI1-26	29.79680	-95.50258	< 100	NA	NA	N	Ambient sample US of trib.
SPB-FI1-27-D	29.79604	-95.50526	< 100	< 100	0	N	RB; trickling, wet pipe DS of this one on other side of bridge - no flow.
SPB-FI1-28-D	29.79730	-95.50732	< 100	< 100	0	N	RB; Sheet flow from pipe to bank.
SPB-FI1-29-D	29.79755	-95.50771	100	<100	0	N	Submerged pipe on LB; unable to tell if flowing. ~20m US of this pipe, another on RB, wet, no flow.
SPB-FI1-30-D	29.79830	-95.50944	100	< 100	0	N	RB - 2 metal pipes: US one flowing, DS one wet but no flow; sheet flow to stream.
SPB-FI1-31-D	29.79841	-95.50958	< 100	100	0	N	RB; Sheet flow to stream.
SPB-FI1-32-D	29.79875	-95.51005	200	< 100	100	N	LB; Sheet flow on concrete before reaching stream; flow ~15m US coming from broken concrete on LB.

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
SPB-FI1-33-D	29.80094	-95.51128	100	< 100	0	N	RB; white growth in pipe extending to stream.
SPB-FI1-34-D	29.80097	-95.51133	< 100	< 100	0	N	LB; several weep holes flowing and encampment under bridge.
SPB-FI1-35	29.80127	-95.51156	750	NA	NA	N	Ambient sample taken just US of bridge.
SPB-FI1-36	29.80298	-95.51620	410	NA	NA	IF	Ambient sample; LB pipe can hear flow. Top of segment - goes underground.
SPB-FI1-37	29.80298	-95.51623	750	NA	NA	IF	Ambient sample; RB pipe. Top of segment - continues underground.
SPB-FI1-NS-01	29.77800	-95.48283	NA	NA	NA	N	Stagnant pool in front of pipe; not sampled; LB; Water is cloudy.
SPB-FI1-NS-02	29.78177	-95.48527	NA	NA	NA	N	Metal pipe not sampled along RB; wet inside but not flowing.
SPB-FI1-NS-03	29.78573	-95.48776	NA	NA	NA	N	Unsampled pipe along RB; metal; one drip per minute.
SPB-FI1-NS-04	29.79570	-95.49784	NA	NA	NA	N	Not sampled. Metal pipe LB - no flow, water inside, wet concrete with orange growth; wet concrete DS of this pipe too.
SPB-FI1-NS-04	29.79664	-95.50166	NA	NA	NA	N	Unsampled metal pipe on LB, wet, no flow. 2nd metal pipe ~15m US of this one. Wet concrete. No water in pipe – LB.
SPB-FI1-NS-06	29.80229	-95.51276	NA	NA	NA	N	Not sampled; Metal pipe on LB, wet but not flowing.
SPB-T1-FI1-01	29.79770	-95.50301	34,500	NA	NA	IF	Ambient sample.
SPB-T1-FI1-02	29.80035	-95.50394	310	NA	NA	N	Ambient sample.
SPB-T1-FI1-03	29.80309	-95.50474	< 100	NA	NA	N	Ambient sample; LB and RB pipes both wet but no flow, encampment on LB.
SPB-T1-FI1-04	29.80442	-95.50488	< 100	NA	NA	N	Ambient sample. At this location there is dry trib. on RB.
SPB-T1-FI1-05-D	29.80867	-95.50492	100	100	0	N	LB; rusted out pipe. Two pipes; Sample taken from US pipe.
SPB-T1-FI1-06	29.80871	-95.50645	510	NA	NA	N	Ambient sample.
SPB-T1-FI1-07-D	29.80871	-95.50670	520	860	-340	IF	Submerged pipe on LB. Unable to tell if flowing. Trib. continues, sample from WS was < 100MPN.

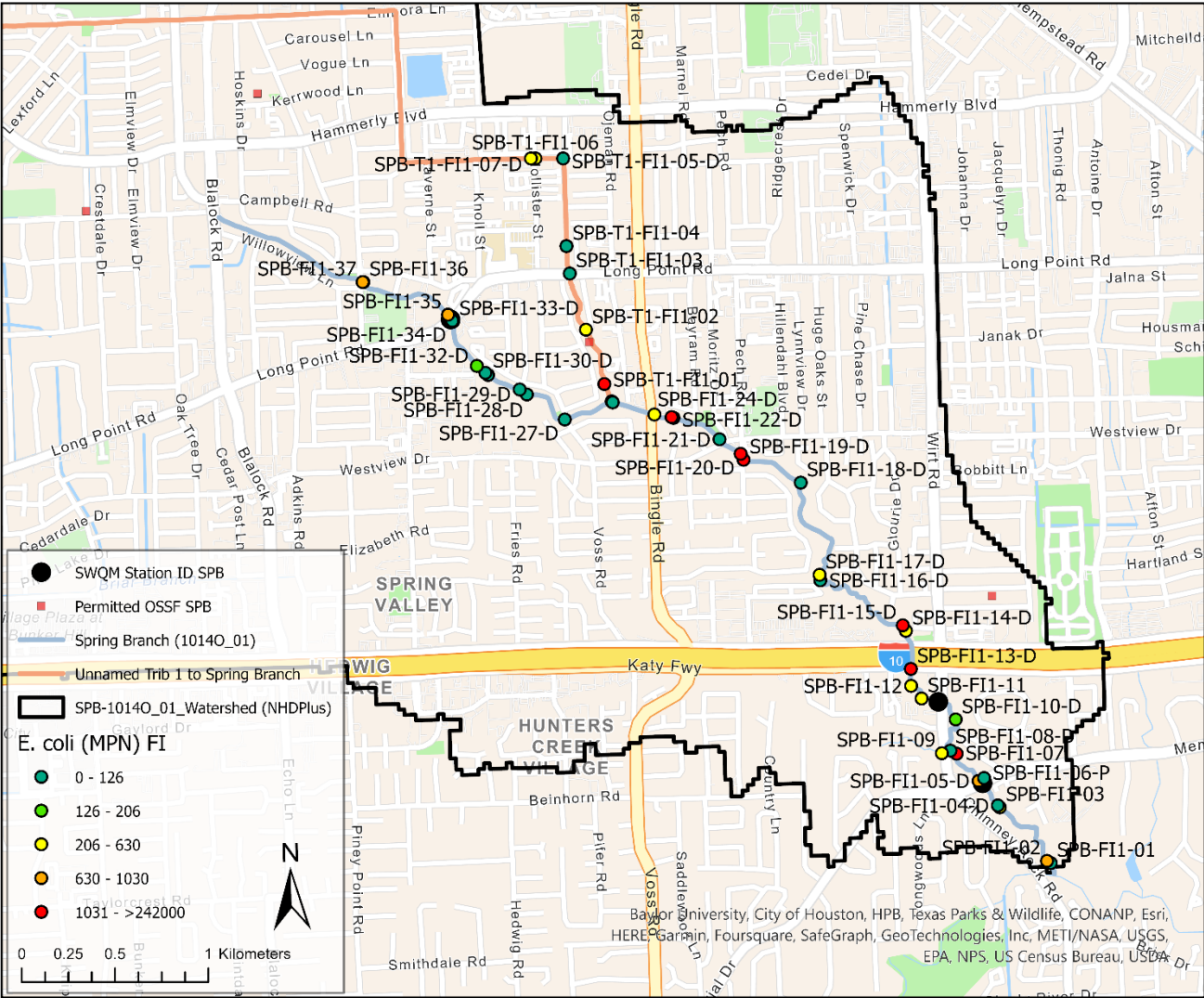


Figure 3: Field investigation bacteria sampling Results from 5/03/2023 on Spring Branch (Assessment Unit 10140_01).

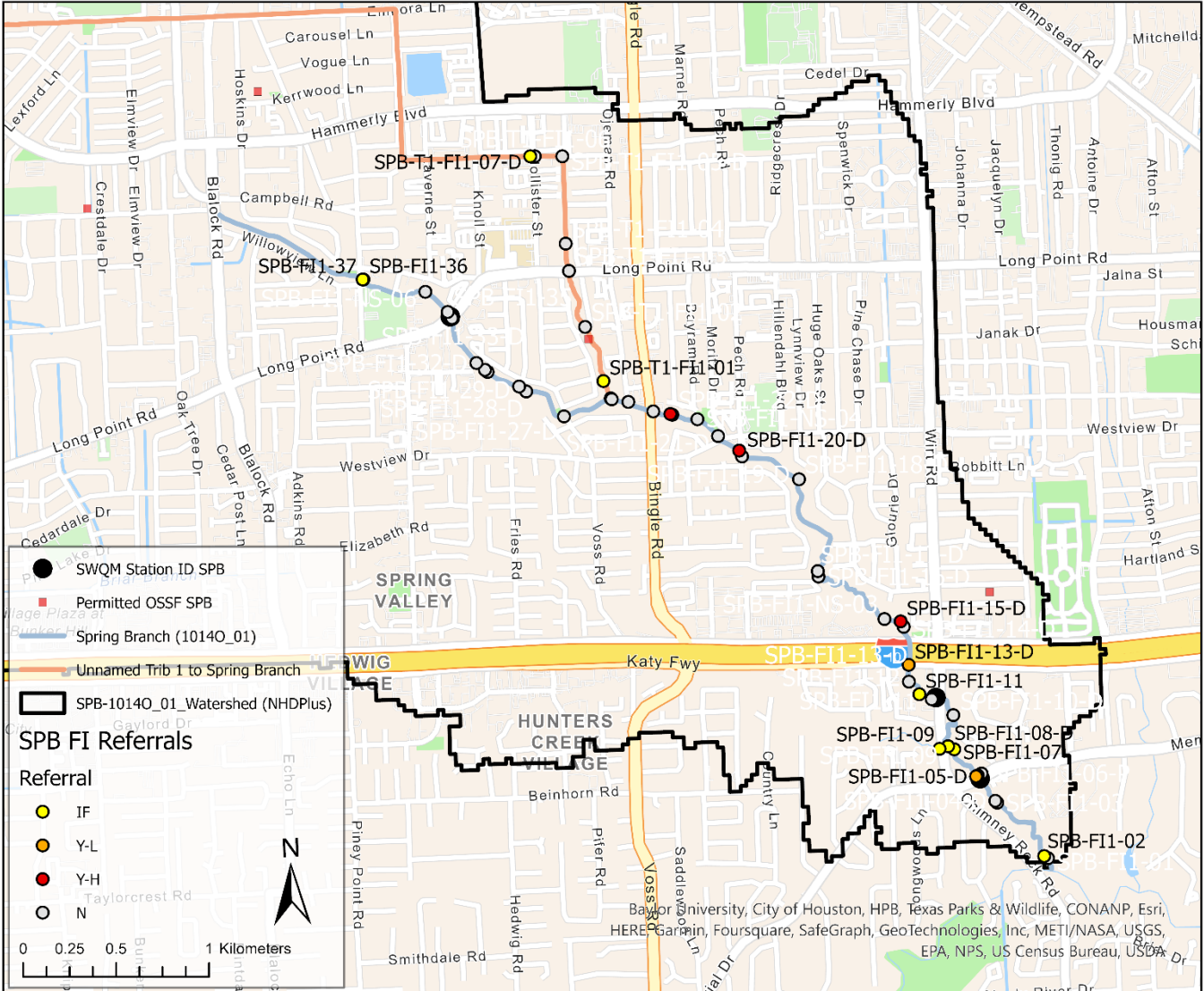


Figure 4: Field investigation sites identified for referral to the proper authorities on Spring Branch (Assessment Unit 10140_01).

Referral site: SPB-FI1-15-D- High Priority

This is a 124 in. diameter concrete pipe located on the left bank of Spring Branch. Water within the pipe was 2 in. deep with a substantial flow into the segment. There are single family homes in the area. A sample taken 0.25 m downstream of the pipe had a bacteria value of 1,210 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: SPB-FI1-20-D- High Priority

This is a 104 in. diameter concrete pipe located on the left bank of Spring Branch. Water within the submerged pipe was 22 in. deep. Bats are present under the bridge upstream of where these samples were taken. There are single family homes, commercial businesses, schools, and parks in the area. A sample taken at the mouth of the submerged pipe had a bacteria value of > 242,000 MPN/100 mL. The ambient sample collected upstream of the pipe had a bacteria value of 17,800 MPN/100 mL. This pipe is a high priority referral site for the proper local authority.



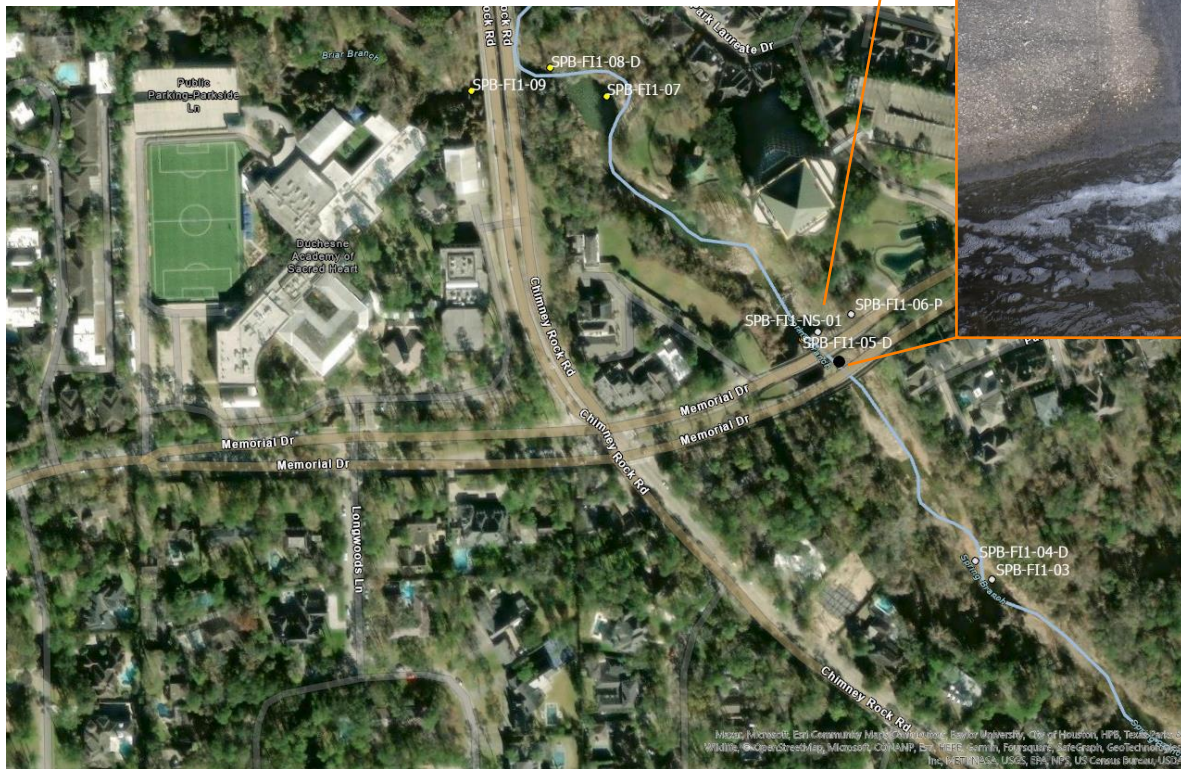
Referral site: SPB-FI1-23-D- High Priority

This is a 32 in. diameter metal pipe located on the right bank of Spring Branch. Water within the pipe was 0.5 in. deep. While the pipe was not flowing initially, water started flowing out of the pipe while the team was present and it smelled of effluent. There are single-family homes in the area and commercial businesses on the left bank. A sample was taken 1.8 m downstream of the pipe and it had a bacteria value of 1,340 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: SPB-FI1-05-D- Low Priority

This is a 48 in. diameter metal pipe located on the right bank of Spring Branch where a small waterfall mixes with the outflow of the pipe. Water within the pipe was 0.5 in. deep. There are single family homes in the area and a high school on the right bank. A sample 1.5 m downstream of the pipe had a bacteria value of 740 MPN/100 mL. The ambient sample collected upstream of the pipe had a bacteria value of 410 MPN/100 mL. This pipe is a low priority referral site for the proper local authority.



Referral site: SPB-FI1-13-D- Low Priority

This is a ~72 in. diameter concrete pipe located on the left bank of Spring Branch. Water within the pipe was estimated to be 0.125 in. The pipe is parallel with Interstate 10 and there are commercial businesses, condos, and single-family homes in the area. Outflow from the pipe runs down ~15 m of concrete into cracks before entering the stream. A sample taken downstream of the pipe had a bacteria value of 1,340 MPN/100 mL. The ambient sample collected upstream of the pipe had a bacteria value of 740 MPN/100 mL. This pipe is a low priority referral site for the proper local authority.



Referral site: SPB-FI1-02– Investigate Further

This was an ambient sample taken upstream of the estimated mixing zone of the confluence of Spring Branch and Buffalo Bayou. The ambient sample had a bacteria value of 980 MPN/100 mL while another ambient sample taken ~400 m further upstream had a bacteria value of 410 MPN/100 mL. 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 and a seminary in the area.



Referral site: SPB-FI1-07- Investigate Further

This was an ambient sample taken from a tributary to Spring Branch on the left bank. The ambient sample had a bacteria value of 1,460 MPN/100 mL. Further investigation is recommended by the proper local authority to determine the source of elevated bacteria in this tributary. There are single-family homes and commercial buildings in the area.



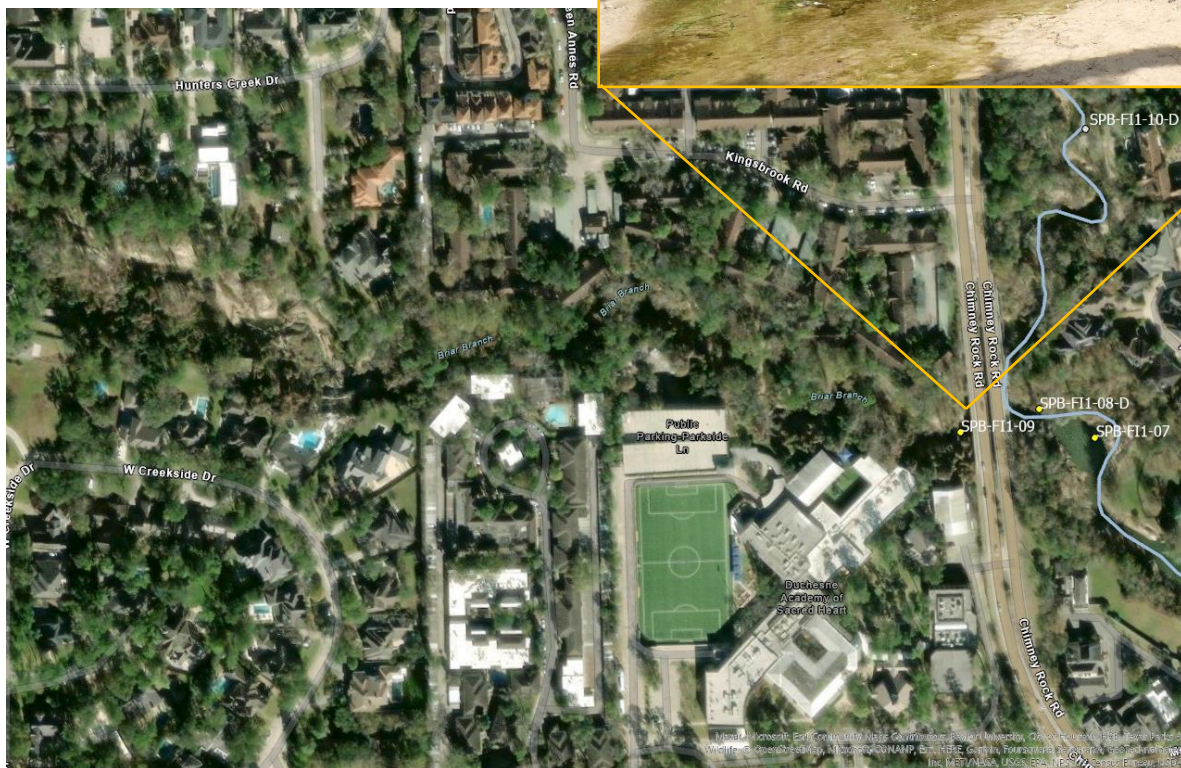
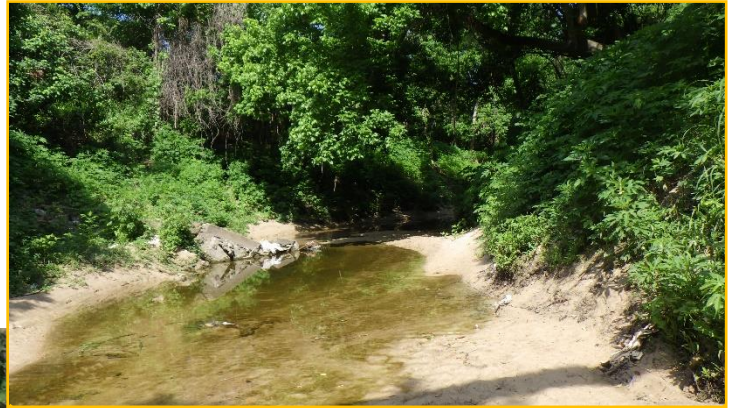
Referral site: SPB-FI1-08-D- Investigate Further

This is a 24 in. metal pipe that was dripping on the left bank of Spring Branch. This sample had a bacteria value of <100 MPN/100 mL but the upstream sample had a bacteria value of 8,390 MPN/100 mL. Bats are present under the bridge upstream of where samples were taken, and a beaver was observed in the water at the site. The next sample taken upstream of this site was SPB-IF1-10D where the upstream sample was 860 MPN/100 mL. There are single-family homes in the area and a high school on the right bank. Further investigation is recommended by the proper local authority to determine the source of elevated bacteria in this section of the segment.



Referral site: SPB-FI1-09– Investigate Further

This was an ambient sample taken from a tributary (Briar Branch) on the right bank of Spring Branch upstream of the Chimney Rock Bridge. This sample had a bacteria value of 630 MPN/100 mL. A FI or further investigation of this tributary is recommended. There are single-family homes in the area and a high school on the right bank of this tributary.



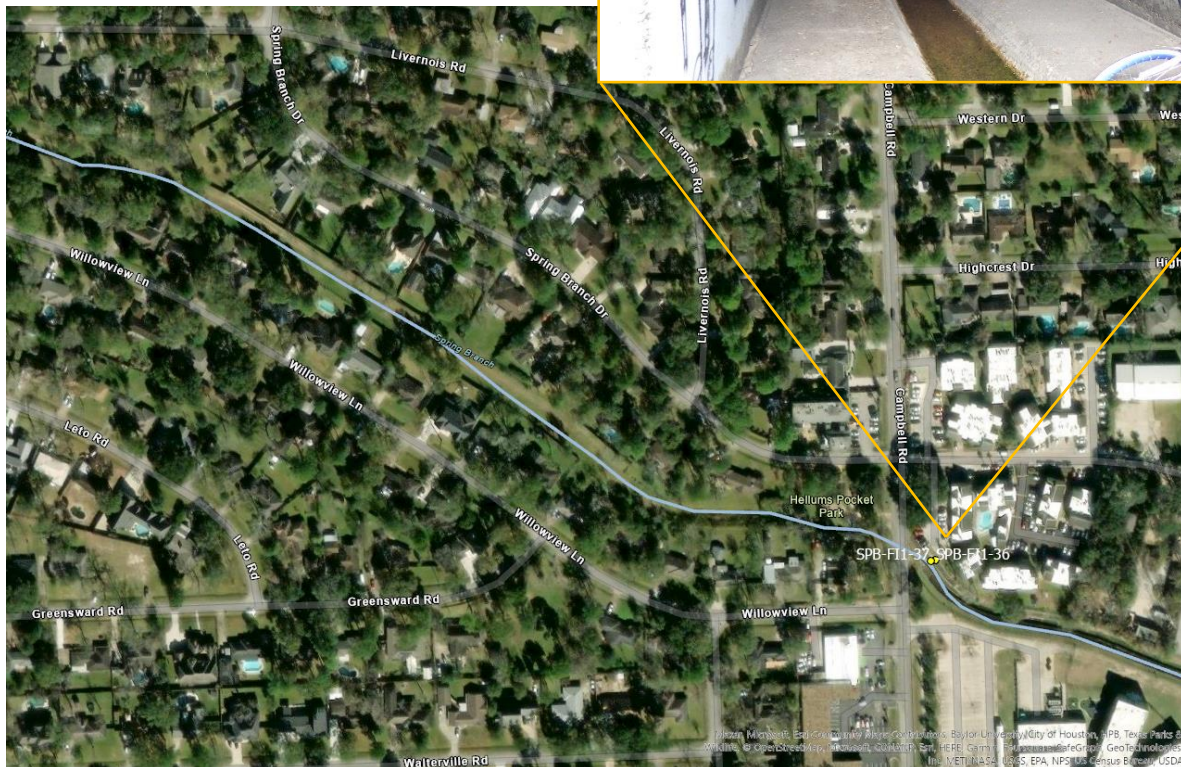
Referral site: SPB-FI1-11- Investigate Further

This was an ambient sample taken from a small tributary that is located the right bank of Spring Branch. This sample had a bacteria value of 410 MPN/100 mL. Further investigation is recommended by the proper local authority to determine the source of elevated bacteria in this tributary. There are apartments on the right bank where it looks like this tributary originates.



Referral site: SPB-FI1-36- Investigate Further

This was an ambient sample taken from the opening of the left bank pipe at the top of the segment that had a bacteria value of 410 MPN/100 mL. The segment goes underground after this point and flow could be heard entering the somewhere further upstream. Further investigation is recommended by the proper local authority to determine the source of elevated bacteria underground and upstream of the segment. There are apartments in the area and a park is located upstream on the right bank.



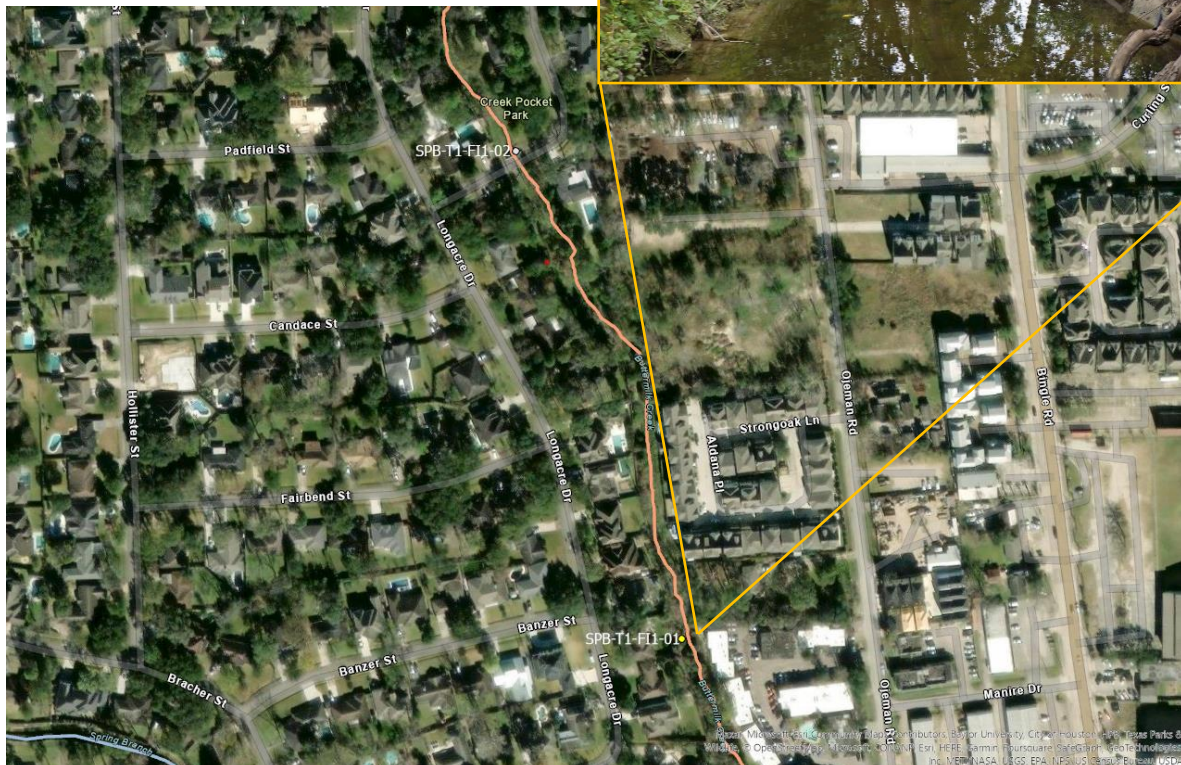
Referral site: SPB-FI1-37- Investigate Further

This was an ambient sample taken from the opening of the right bank pipe at the top of the segment that had a bacteria value of 750 MPN/100 mL. The segment goes underground after this point. Further investigation is recommended by the proper local authority to determine the source of elevated bacteria underground and upstream of the segment. There are apartments in the area and a park is located upstream on the right bank.



Referral site: SPB-T1-FI1-01- Investigate Further

This was an ambient sample taken from a tributary of Spring Branch that had a bacteria value of 34,500 MPN/100 mL. Another ambient sample taken ~300 m further upstream in the tributary and had a bacteria value of 310 MPN/100 mL. No evidence of flow entering the stream was observed between the two samples. Further investigation is recommended by the proper local authority to determine the source of elevated bacteria in this section of the tributary. There are apartments and single-family homes located in the area.



Referral site: SPB-T1-FI1-07- Investigate Further

This is a 36 in. diameter rusted out metal pipe located on the left bank of the tributary of Spring Branch. Water within the submerged pipe was 5 in. deep and the team was unable to determine if it was flowing into the tributary. There are apartments and commercial buildings located in the area. A sample taken at the mouth of the submerged pipe had a bacteria value of 520 MPN/100 mL. The sample collected upstream of the pipe had a bacteria value of 860 MPN/100 mL. A sample from this location during the WS resulted in a bacteria value of < 100 MPN/100 mL and therefore the FI ended at this site. Due to the higher bacteria levels during the FI, further investigation is recommended by the proper local authority to determine the source of elevated bacteria upstream in the tributary.



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-Plan	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
SPB	Spring Branch (Trib of Buffalo Bayou) 1014O_01
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

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