2018 Illicit Discharge Investigations in Oakland County's Portion of the Rouge River Watershed

Final Report

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January 31, 2019

EXECUTIVE SUMMARY

Illicit discharge investigations were conducted in 2018 on multiple Oakland County storm drains within the Rouge River Watershed. Investigations were conducted by the Oakland County Water Resources Commissioner's Office (WRC) as follow up to ongoing potential illicit discharge source investigations work conducted in 2014 through 2017. IDEP investigations to date have identified 3 illicit sanitary connections and 2 septic systems as illicit discharge sources and have identified numerous other potential illicit discharges sources which remain under investigation. Identified illicit sanitary connections were corrected and eliminated in 2017. Follow up sampling and investigations were conducted in 2018 on the following five (5) County Drains: US 16 Drain in Farmington, the Fracassi and 8 Mile Road Drains in Southfield and the Claude H. Stevens No. 3 and No. 4 Drains in Bloomfield Twp.

Follow up sampling on the US 16 drain in Farmington Hills confirmed the correction of previous illicit connections and eliminated the drain as being a suspected source of additional upstream illicit discharges.

Additional sampling and investigations on the Fracassi Drain in Southfield identified an additional five (5) suspected illicit connections with seven (7) additional suspect properties as potential sources of illicit discharges in need of further investigation. Dye testing of suspect properties has yet to confirm a source of sanitary discharge to the drain.

Sampling of the 8 Mile Drain indicates that Drain has a high potential for containing upstream sanitary discharges. An inspection and sampling of inlets to the drain has identified two (2) connected drain systems as possible sources in need of further investigation.

Follow up sampling and investigations on the Claude H. Stevens No. 3 and No. 4 drains in Bloomfield Twp. continues to indicate that both drains have a high probability of having additional upstream illicit discharges. Additional Investigations have narrowed down the potential sources to local storm drain systems but have not yet identified an illicit connection or specific source of contamination to the drains.

A summary of the illicit discharges corrected and additional suspect illicit discharge sources along with follow up recommendations appears table below. A "suspect illicit connection" is indicated in the table when *E. coli* counts exceeded 10,000 CFU /100 ML, but a specific source has not been identified. A "potential illicit discharge" is indicated when *E. coli* counts were below the 10,000 CFU/100 ML and no physical signs of sanitary sewage is observed. Additional follow up investigations of the suspect and potential sources will be conducted on these drains in 2019.

Table 1. Summary of 2018 identified potential illicit connections and suspect discharge sources and recommended follow up actions.

Drain Community	Identified potential and suspect Illicit connections and discharge sources	Recommended Follow-up Actions
US-16 Farmington	(3) Illicit Discharges from residential homes connected to the drain were eliminated in 2017 by the City of Farmington. No other illicit connections suspected.	Additional upstream investigation of the drain is not recommended at this time. Scheduled Dry Weather Screening of the drain under Oakland County's IDEP program will continue. Animal feces in the drain system may be a potential source of contamination. Additional sampling under Oakland County's TMDL Monitoring Plan is being considered
Fracassi Southfield	<u>Indian Street:</u> Suspected illicit connection from John Grace Community Center. Wildlife is likely another E. coli source <u>Negaunee Street:</u> Suspected illicit connection from unknown source(s). Wildlife is likely another E. coli source. <u>Poinciana Street</u> Suspected illicit connection from unknown source(s). Wildlife is likely another E. coli source. <u>Seminole Street</u> Suspected illicit connection from unknown source(s). Wildlife is likely another E. coli source.	<u>Indian Street:</u> Consult with the City on completing a plumbing inspection of the Community Center. <u>Negaunee Street:</u> Review sanitary sewer inspection records and conduct MST sampling to confirm a sewage source. <u>Poinciana Street</u> Dye test 6 remaining suspect homes. Review sanitary sewer inspection records and conduct MST sampling to confirm a sewage source. <u>Seminole Street</u> Dye test 2 remaining suspect homes. Review sanitary sewer inspection records and conduct MST sampling to confirm a sewage source.
8 Mile Drain Southfield	Suspected illicit connection upstream of manhole 11. Source unknown. Potential illicit connection upstream of manhole 5.	Segment the storm drains tributary to manholes 5 and 11 with manhole inspections and sampling.
Claude H Stevens 3 Bloomfield Twp.	One (1) failed Septic System on Charing Cross identified 2016 was eliminated by Bloomfield Twp. in 2017. Additional suspected illicit connection from unknown source(s). Wildlife is likely another E. coli source.	Drain cleaning and resampling to eliminate wildlife fecal matter as a source. Conduct additional investigations MST and E. coli sampling to verify sewage sources. Dye testing of suspect homes as needed
Claude H Stevens 4 Bloomfield Twp.	Suspected illicit connection from unknown source(s)	CCTV the Dover St. drain. Dye test suspect homes.

BACKGROUND

Five (5) County Drains were identified by WRC within the Rouge River Watershed as needing illicit discharge investigations to identifying and eliminating potential sources of sewage contamination to the drains and to the Main and Upper Branches of the Rouge River in Oakland County. Drains selected for further investigation during this project period include:

- US-16 Drain in Farmington;
- Fracassi and 8 Mile Drains in Southfield;
- Claude H. Stevens No. 3 and 4 Drain sections in Bloomfield Township;

Drain locations are depicted in Figure 1. These drains were selected for investigation based upon historical elevated *E. coli,* dry weather screening data collected by WRC under their Illicit Discharge Elimination Program (IDEP) for Oakland County and follow up sampling and IDEP investigations conducted in 2013 thorough 2017. Drains with elevated counts of *E. coli* bacteria can indicate that upstream illicit discharge sources are present. Therefore, additional sampling and investigations were deemed necessary to determine if illicit discharges are occurring and to locate potential sources of those discharges within the drains.

These efforts support the activities required under Oakland County's municipal stormwater permit and the Alliance of Rouge Communities (ARC) Rouge River Collaborative Illicit Discharge Elimination Plan. This work is being funded by the ARC and carried out by the WRC.

INTRODUCTION

The following work was performed on five (5) County Drains during the project period in 2018:

- Follow up sampling was conducted to confirmed elimination of (3) illicit connections from residential homes to the US 16 Drain;
- Additional sampling, investigation, Closed Circuit Televised (CCTV) inspections and dye testing was conducted on the Fracassi Drain;
- An inspection of the 8 Mile Drain and sampling of inlets to the drain was completed; and
- Additional sampling and investigations of upstream local drain systems were conducted on the Claude H. Stevens No 3. and No. 4 Drains

Maps of local connecting storm drain systems were obtained from the communities. The drains have been segmented based on manhole locations. Surveys were conducted at select manholes for evidence of sewage contamination (toilet paper, grey water, soap suds, staining, etc.). Water samples were collected at locations exhibiting dry weather flow. Samples were analyzed for *E. coli* bacteria at the Walled Lake–Novi Waste Water Treatment Facility (WWTF). Samples from select locations were also taken to the Department of Fisheries and Wildlife Laboratory at Michigan State University for MST analysis for DNA associated with human specific strains of *E. coli*. Physical observation and sampling data were reviewed and used to identify segments of each drain with suspected sanitary discharges.

Additional samples were collected and observations were made to isolate specific segments of the drains, where possible, to identify specific inlet(s) with evidence of sanitary sewage. Closed Circuit Televised (CCTV) inspections were further used to identify specific possible sanitary illicit connections to the drain. Dye testing was used to confirm the presence of an illicit connection to the drain and or verify connections of internal plumbing fixtures to the sanitary sewer at suspect properties.

A summary of sampling results and investigations conducted on each drain is provided herein. Maps of drain locations and locations of investigations and sampling with results are included as attached figures for each drain. Notes, observations and photos from drain surveys and manhole inspections are included in Appendix A. Copies of CCTV inspections and dye testing inspections and reports are included in Appendix B. A complete list of *E. coli* sampling results is included in Appendix C

US-16 DRAIN INVESTIGATION

Background

The US-16 Drain is a large enclosed storm drain located along the northern border of Farmington and Farmington Hills. The drain parallels Grand River Ave and Shiawassee Road and discharges to the Upper Rouge River in Shiawassee Park near Farmington Road. The Drain services local storm water road drain laterals in residential subdivisions on both the north and south side of Shiawassee Road and from businesses along Grand River Ave. west of Shiawassee. Historically the US 16 Drain was a combined sewer system with sanitary sewer overflow connections to the drain. The local storm drains were separated and overflows eliminated with the construction of a new sanitary system in the 1990s.

Previous Investigation Summary

Segmenting and sampling of the drain for *E. coli* in 2013 and 2014 isolated a segment of the drain along Shiawassee with potential illicit discharges of sanitary sewage. Smoke testing of the drain in this area indicated multiple potential illicit connections from residences along Shiawassee, along with possible potential issues with sanitary bulkheads and possible connections between the sanitary and storm laterals on Hillcrest and Glenview Streets.

In 2015, the City of Farmington completed a CCTV inspection of the US 16 Drain and the sanitary sewer system along Shiawassee Road. Results identified three illicit connections to the drain with evidence of sanitary sewage from 3 houses, 33550 and 33431 Shiawassee Road and 33840 Grand River Avenue to the US 16 Drain. Dye testing of the residences by WRC and the City of Farmington was conducted to confirm sanitary connections to the drain. A follow up survey and sampling of the storm drain laterals by WRC on Hillcrest and Glenview Streets did not identify any additional issues.

In 2016, staff from WRC met with the City of Farmington to discuss the status of the illicit connections to the drain on Shiawassee Road. The homeowners were notified of the illicit connections. The City Farmington indicated that because house lateral connections should have been eliminated and connected to the Farmington sanitary system during upgrades to the system in the 1990s, that they would agree to make corrections. Due to location of the drain in Shiawassee Road and the complexity of

going under the US 16 Drain to connect to the sanitary sewer, the City put out bids and hired an engineering firm to complete construction, design plans and a budget for a project to eliminate the illicit connections. The project was submitted to the City Council for approval and funding in 2017. The project was completed and the connections were eliminated in September of 2017. Costs for eliminating the Illicit connections include; $15,000 for the project preparation of the bid proposal and funding securement and $86,000 for the illicit connection elimination and connection to the sanitary sewer by the City of Farmington and contractors.

Current 2018 Follow up sampling

Follow up sampling for *E. coli* during dry weather was conducted in 2018 to confirm elimination of the (3) illicit connections to the US 16 Drain on Shiawassee from residential homes by The City of Farmington and to evaluate the drain for the potential of containing any additional upstream illicit discharge sources. Samples were collected at the outlet of the drain to the Rouge River at the Shiawassee Rd crossing and at three (3) manhole locations downstream and upstream of the residential sanitary connections to the drain on Shiawassee that were eliminated. A map of showing sampling locations and locations of the corrected properties is included as Figure 2.

Results

Sampling results for *E. coli* indicates elevated counts above 1,000 CFU / 100 ML at the outlet and at manhole locations downstream of the eliminated sanitary connections. Counts ranged from 2,814 CFU / 100 ML at the outlet to 5,310 CFU / 100 ML at manhole 4406 at Shiawassee and Varner St (Figure 2). The upstream manhole location at Grand River and Shiawassee, manhole 4415, was 100 CFU / 100 ML, which is below the State Water Quality Standard of 300 CFU /100 ML. This indicates that the portion of the enclosed drain west of Shiawassee Road on Grand River Avenue is no longer a concern. Although counts along Shiawassee Road are above the State Water Quality Standard, the highest being manhole 4406 at 5,310 CFU / 100 ML, they are not high enough to be considered indicative a sanitary sewage source which is typically greater than 10,000 CFU / 100 ML. Considering no physical sign of sanitary sewage was evident in the drain it is not believed that these conditions are related to a continual sanitary sewage source and no additional IDEP investigations are planned. It should also be noted that the drain experiences continual dry weather flow from upstream connected drainage ponds and the outlet of the drain is at river level at its confluence under the bridge on Shiawassee. This provides direct access to the drain system for animals to migrate along and or live in the drain system between the River and upstream ponds. Muskrats and animal fecal matter have been seen in the drain system during past inspections and drain cleanings which could contribute to the elevated *E. coli* counts in the drain.

Recommendation

No additional IDEP investigations are recommended at this time. The Drain will remain on the list for periodic Dry Weather Screening under Oakland County's IDEP Program. The drain outlet is also being considered as a sampling point under Oakland County's TMDL Monitoring Plan and a possible candidate for additional MST sampling.

FRACASSI DRAIN INVESTIGATIONS

Background

The Fracassi Drain is a series of interconnected enclosed drains located in the southwest corner of Southfield at Inkster Rd. and 8 Mile Rd. The drains services residential neighborhoods and extends four blocks east of Inkster Rd. and from 8 Mile Rd north to Adeline St. Historically, the Fracassi Drain was part of the Hazel Drain, which is an older Chapter 4 Drain built in the 1920s servicing sub divisions west of Inkster Road. and south of Shiawassee Road. The Hazel Drain connects to the Clareville Drain which discharges to Upper Branch of the Rouge River south of 8 Mile Rd in Farmington Hills. In the early 1970s, the Drain was improved by the City of Southfield and disconnected at Emmet St. and Inkster Rd. which is the community border between Southfield and Farmington Hills. Portions of the drain running east to west on Emmet Street were abandoned and storm laterals on the side streets east of Inkster were connected to a new line constructed on Byron St running west to east. The Fracassi Drain currently connects to the Emily Drain on Indian Street south of Byron Street. The Emily Drain discharges to Middle Branch of the Rouge River at Beech Daly Road just north of Shiawassee Road.

Previous Investigation Summary

In 2013 and 2014 elevated *E. coli* levels were detected in the storm drain laterals connecting to the Fracassi Drain on Byron Street. Additional samples were taken to locate segments of the drain with suspected illicit connections. Samples revealed elevated *E. coli* counts between 20,000 CFU /100 ML and 592,000 CFU /100 ML within the main trunk line along Byron Street and in the drain laterals located along Seminole, Poinciana, Negaunee, and Indian Streets. See the "2014 Illicit Discharge Investigation in Oakland County's Portion of the Rouge River Watershed Final Report" for further details.

In 2016, staff from WRC met with the City of Southfield to obtain plans for local drain and sanitary systems and develop a plan for additional IDEP investigations to locate illicit discharges to the drain. Dry weather screening inspections and sampling for *E. coli* were conducted at forty-eight (48) manhole locations on storm laterals connecting to Byron Street from Indian, Negaunee, Poinciana and Seminole Streets and on Inkster Road at Byron, Emmett, Sedalia, Shiawassee Road and Adeline Streets.

Based on *E. coli* results and manhole inspections, it was decided to conduct CCTV inspections of the laterals on Seminole, Negaunee, Poinciana, and Indian from Byron Street north to Adeline Street and on lateral storm drain connections from Inkster Road to Seminole Street, at Emmet, Sedalia, and Adeline Streets. In 2016, CCTV inspections of storm drain segments located four (4) 6-inch clay tile pipe connections to the drain from residential properties at 21705, 21351, 21317 and 21159 Seminole Street. No flow or sanitary debris was indicated at these connections. In addition, an examination of connections to catch basin 13703 and manhole 6193 on Seminole St. were conducted. These are both 12- inch reinforced concrete pipe (RCP) connections from the west running under the driveway at 21823 Seminole St. and through the yard at 21681 Seminole St. No dry weather flow or visual evidence of sanitary flow was seen at these connections.

In 2017, additional observations were conducted on the drain and connecting street laterals at twenty-nine (29) manhole locations and *E. coli* samples were collected from twenty-four (24) manholes exhibiting dry weather flow. Sampling results continued to show high *E. coli* levels on the storm laterals on Seminole, Poinciana, Negaunee and Indian St. Sampling data was used to further evaluate the project area for potential illicit discharge sources and prioritize areas in need of additional CCTV work. Additional sample results and results of CCTV Inspections in these areas were used also to help evaluate, identify and prioritize suspect properties with potential illicit connections for dye testing. Six (6) residential properties on Seminole were identified as suspect, and the property owners were sent Dye Testing Notification Letters. Additional CCTV inspections were competed on storm drain laterals on Indian Street and a portion of Negaunee Street. CCTV Inspections identified one (1) additional unknown 6-inch clay tile connection to the Drain in front of the John Grace Community Center on Indian Street and arrangements were made with the City of Southfield to dye test the Community Center. Dye testing of one (1) residential property on Seminole and the John Grace Community Center on Indian was conducted in 2017. No illicit connections were found. Testing of the Community Center was inconclusive as dye from fixtures in the kitchen area, bathrooms, and maintenance room utility sink and floor drains on the eastern side of the building did not show up in either the sanitary sewer or storm drain systems. The only plans showing storm and sanitary drains for the property that the City of Southfield could locate is the 1971 diagram of sanitary sewer improvements which shows abandonment and connection of 3 septic systems for the building in the front of the property along Indian St. Dye testing confirmed the sanitary connections for fixtures in the west half of the building to the sanitary sewer on Indian Street, but did not confirm connections for fixtures in the east half of the building. The City has checked with the School District but no additional plans for the building or property have been located.

Current 2018 Investigations

Follow up sampling for E. coli was conducted at sixteen (16) manhole locations on the Fracassi Drain and connected laterals on Indian, Negaunee, Poinciana, and Seminole Streets in 2018. Samples were also collected at five (5) select manhole locations and taken to the Department of Fisheries and Wildlife Laboratory at Michigan State University for MST analysis for DNA associated with human strains of *E. coli.* A map of sampling locations with sampling results is included as Figure 3. A complete table of sampling results is included in Appendix C. Further discussion of sampling results appears below.

Additional CCTV Inspections were conducted on the remaining laterals on Negaunee, Poinciana and Bryon Streets in 2018. An additional five (5) unknown 6-inch clay tile connections to the drain were located on Poinciana Street. An additional seven (7) properties associated with these connections were identified as suspect and added to the list of properties for dye testing. Dye Testing Notices were re-sent to the reaming five (5) suspect residential properties on Seminole Street and the additional seven (7) properties identified on Poinciana Street. Dye testing was completed three (3) houses on Seminole and one (1) house on Poinciana during the project period. An attempt was also made to inspect the unknown six-inch clay tile pipe connected to drain on Indian Street in front of the John Grace Community Center, but was unsuccessful.

No illicit discharges have been confirmed. A map of CCTV inspection locations and along with results and locations of suspect properties are included as Figure 4. A summary table of suspect properties

identified to date, along with the results of dye testing and status of each property appears as Table 2. Copies of CCTV inspections dye testing Inspections records are included in Appendix B.

Table 2. Results and Status of Dye Testing

Address	Dye Test Date	Results	Status
20130 Indian St. (John Grace Community Center)	12/4/2017	Fixtures on W. side of building are properly connected to the sanitary sewer. A connection for fixtures on E. side of building (kitchen, Gym Bathrooms, Utility Room) could not be confirmed by dye testing. A CCTV inspection of unidentified connection to the storm drain was attempted but failed.	Connections of fixtures on E. side of building remain unconfirmed. Building is currently vacant and property is for sale. No additional inspections are planned. Referred to City of Southfield
21159 Seminole St.	12/11/2017	All fixtures properly connected to the sanitary sewer	Completed- No issues found
21317 Seminole St.	9/27/2018	Dye Test Incomplete. Connection of kitchen fixtures could not be verified	Referred to City of Southfield Building Dept.
21337 Seminole St.	Pending	Pending	Owner has not responded to Notifications
21351 Seminole St.	Pending	Pending	Occupant Reused Entry- Referred to City of Southfield
21341 Seminole St.	9/13/2018	All fixtures properly connected to the sanitary sewer	Completed- No issues found
21705 Seminole St.	9/27/2018	All fixtures properly connected the sanitary sewer. Sump pump is also connected to the sanitary sewer	Sump pump issue referred to the City of Southfield
21365 Poinciana St.	Pending	Pending	Owner has not responded to Notification
21216 Poinciana St.	Pending	Pending	Owner has not responded to Notification
21208 Poinciana St.	Pending	Pending	Owner has not responded to Notification
21207 Poinciana St.	Pending	Pending	Owner has not responded to Notification
21185 Poinciana St.	Pending	Pending	Owner has not responded to Notification
21120 Poinciana St.	12/17/2018	All fixtures properly connected to the sanitary sewer	Completed- No Issues found
21130 Poinciana St.	Pending	Pending	Owner contacted, dye test to be scheduled

Results

Indian Street

Additional samples for *E. coli* were collected on the Indian Street drain lateral from Byron Street to Emmett Street. All counts were below 1,000 CFU/100 ML (Figure 3). These concentrations do not indicate that a continued source of sanitary sewage is present. Additionally, results of an MST sample taken at the outlet at manhole 6217 was non-detectable (ND) for human DNA markers. However, in 2017 manhole 6210 (located directly across from the John Grace Community Center and just downstream of the unknown six-inch clay tile inlet) showed *E. coli* concentrations greater that 1,002,500

CFU / 100 ML and what appeared to be evidence of dissolved toilet paper. The 2017 observations were made when the Community Center was occupied. The Community Center was vacant in 2018.

A diagram of the sanitary improvements at the Community Center in 1971 shows that three (3) septic systems located in the front lawn on the west side of the building were abandoned and the sanitary leads were re-routed and connected to the sanitary sewer on Indian.

Dye testing of the building in 2017 confirmed that the bathroom and break room plumbing fixtures on the west side of the building located at the north, center and south end are properly connected to the sanitary system. However, dye testing of the plumbing fixtures on the east side of the building in the kitchen, gym bathrooms and a utility room mop sink and floor drains was inconclusive. Tracing dyes from these fixtures did not show up in either the sanitary sewer or the storm drain system for the property.

The City has been unsuccessful in locating additional building or plumbing plans for the property. An attempted was made in to 2018 to do a CCTV inspection of the unknown six-inch clay tile connection at the street storm drain into the facility was but unsuccessful. The property is in the process of being sold and the building is currently vacant. The City was contacted and additional investigations have been put on hold until future ownership and use of the building and property is known. It should be noted that the *E. coli* concertation in manhole 6211 at the corner of Indian and Emmett was 927 CFU / 100 ML which is above the State Water Quality Standard. This manhole is located upstream of the Community Center. It is believed that elevated *E. coli* counts may be related to animal sources. A survey of manholes on the system in 2016 indicated that upstream manholes near Grand River Ave, although dry, showed evidence of animal fecal matter on the floor of the manholes. MST testing of the drain lateral in 2018 did not indicate the presence of human DNA the drain. The drainage system for the area is open ditch with inlets to the enclosed drain which gives easy access for animals living in the area.

Based on the extremely high E. coli when the Community Center was active in 2017, the inconclusive tracer dye test, and the low E. coli and DNA results in 2018 when the Center was vacant, it is believed that the fixtures on the east end of the Community Center are illicitly connected to storm sewer. Furthermore, it is suspected that wildlife is responsible for the elevated E. coli upstream of the Community Center. No other issues are suspected along Indian Street upstream of Byron Street.

Negaunee Street

Additional samples were collected on the Negaunee Street storm drain lateral in 2018 (Figure 3). Elevated E. coli concentrations in the drain, the highest being manhole 6220 at 69,767 CFU / 100 ML, continue to indicate the likelihood of an illicit discharge of sanitary sewage upstream of Emmett Street. . *E. coli* concentrations from pervious samplings have been as high as 649,000 CFU / 100 ML in 2017 at MH 6219. A CCTV inspection of the drain was completed in 2017 and 2018. The inspection did not locate any unidentified connections to the drain. Inspections of upstream drainage manholes and connected drainage ditch inlets have not identified any directly connected sources of contamination to the drain. MST sampling at manhole 6216 indicated a low human Bacteroides concentration (503.47 gene pairs / 100 ML). The corresponding E. coli concentration was relatively low (3,615 CFU/100 ML) as well. These concentrations are less than what would be expected from a direct discharge of sanitary sewage.

Additional upstream MST sampling of the drain could be beneficial in determining if elevated E. coli concentrations are sewage related and in narrowing down a section of the drain where concentrations are highest. Additionally, CCTV inspections of the storm drain found cracks in the pipe at ten (10) locations, seven (7) of which showed signs of infiltration. A CCTV inspection of the Evergreen Farmington sanitary sewer was conducted in this area in 2010. A review of the Evergreen Farmington inspection records and any more current inspection and maintenance records may help determine if the sanitary sewer is impacting E. coli levels in the storm drain.

Poinciana Street

Manhole inspections and sampling of dry weather flow on Poinciana Street drain lateral in 2018 continued to show high *E. coli* concentrations in the drain south of Shiawassee Rd. to Byron St. indicative of a sanitary source of contamination. The highest concertation of 69,767CFU / 100 ML was at manhole 6228 at Emmet Street. Sampling from previous years at this location have shown concentrations as high as 214,500 CFU/100 ML.

A CCTV inspection of drain was conducted in 2018 which located (5) unknown 6-inch clay pipe connections to the drain. Two (2) connections showed active flow but no signs of sanitary debris and another two (2) connections showed some evidence of deposits and staining. Based on the locations of the connections to the drain, seven (7) properties were identified as "suspect" and in need of dye testing.

Dye Testing Notices were sent to the owners of suspect properties. Dye testing of one (1) residence at 21120 Poinciana was completed during the project period. Dye testing results found all internal plumbing fixtures to be properly connected to the sanitary sewer. The property owner at 21130 responded to the notice and a dye test was scheduled but was cancelled and will need to be rescheduled. Owners of the other five (5) properties have not responded to the notice. The remaining six (6) properties still need to be scheduled for dye testing in 2019. No illicit connections on Poinciana Street have been found to date.

MST sampling of the drain at is connection to the Byron Street lateral at manhole 6227 indicates the presence of human DNA, but the human Bacteroides concentration was relatively low at 428.8. gene copies / 100 ML. Minimal flow levels in drain prevented the collection of MST samples at upstream manhole locations. The corresponding E. coli concentration was relatively low as well (3,865 CFU/100 ML). Additional MST sampling could be useful in confirming if elevated *E. coli* concentrations are due to human or animal sources and in further isolating sections of the drain with potential sanitary discharges.

The CCTV inspection of the drain also found nineteen (19) locations with cracks in the pipe, seven (7) of which showed signs of infiltration. Infiltration of sewage to the drain from the sanitary system is also a possibility. A review sanitary sewer CCTV and maintenance inspection records should be conducted to identify any potential issues with the sanitary system in this area.

Seminole Street

Additional sampling conducted in 2018 indicates that Seminole Street drain lateral is continuing to experience high concentrations of *E. coli* from dry weather flow sources. Results indicate that potential sanitary sources may exist over the entire length of the drain from its upper terminus at Adeline Street south to the drain outlet on Byron St. Sampling at the outlet of drain to connecting manhole 3426 on

Bryon Street showed a relatively low E. coli concentration of 3,865 CFU / 100 ML with corresponding low human Bacteroides concentration at 385.47 gene copies / 100 ML. Sampling at upstream manholes 6237, 6239, and 6190 at the intersections of Emmet Street, Sedalia Street and Shiawassee Rd. showed *E. coli* concentrations of 18,234 CFU / 100 ML, 42,094 CFU / 100 ML and 89,583 CFU, 100 ML. Previous sampling at manholes on Seminole Street have been found to be greater than 1,002,500 CFU / 100 ML at manhole 6240 in 2016. Additionally, sampling of flow from a connected local storm drain to the north of manhole 6195 at Adeline and Inkster showed E. coli concentrations of 26,199 CFU / 100ML indicating an upstream discharge may be present. An upstream investigation of the local drain has not yet been conducted.

Additional MST sampling could be useful in confirming if elevated *E. coli* concentrations are due to human or animal sources and in further isolating sections of the drain with potential sanitary discharges.

CCTV inspection of the drain on Seminole was completed in 2016. Four (4) 6-inch clay tile connections to the drain were found on Seminole. Based on locations of the connections to the drain, six (6) properties were identified as "suspect". Homeowners were sent dye testing notification letters and one home, 21159 Seminole, was dye tested in 2017. Dye testing confirmed that all sanitary fixtures in the home are properly connected to the sanitary sewer on Seminole Street. In 2018, second Dye Test Notices were mailed to the remaining five (5) suspect properties. An additional (3) houses, 21705, 21341, and 21317 on Seminole Street were dye tested in 2018. All the plumbing fixtures at 21705 Seminole Street were found to be properly connected to the sanitary sewer, however, the basement sump pump was also found to be connected to the sanitary sewer. The sanitary fixtures do not run through the sump pump. This issue has been forwarded to City of Southfield for review. All the plumbing fixtures at 21341 Seminole Street were found to be properly connected to the sewer. No further action is necessary. Dye testing of 21731, found fixtures in the bathroom and utility room to be properly connected to the sanitary, however, tracing dye from kitchen fixtures did not show up in the either the sanitary sewer or storm drain system. This issue has been referred to the City of Southfield Building Department for follow up. The occupant at 21337 Seminole refused entry to the property. It is believed the occupant is a tenant and not the property owner. The property owner has not responded to Dye Testing Notice Letters. This issue has been referred to the City of Southfield. The property owner at 21351 Seminole Street has not responded to notices. Occupants have not been home during several attempts to contact them in the field.

Additionally, CCTV inspections of the storm drain found cracks in the pipe at three (3) locations and one (1) defective joint with signs of infiltration at twelve points. Infiltration of sewage to the drain from the sanitary system is also a possibility. A review sanitary sewer CCTV and maintenance inspection records should be conducted to identify any potential issues with the sanitary system in this area.

Recommendations

The following activities are recommended

- Coordinate with City of Southfield to complete dye testing of the remaining eight (8) properties identified as "suspect" on Seminole and Poinciana Streets to confirm or eliminate them as illicit discharge sources. Follow up with the City of Southfield with corrections of any identified illicit connections identified as needed.
- Follow up with City of Southfield to verify connectivity of unconfirmed fixtures at 21317 Seminole Street.

- City of Southfield should insure that plumbing fixtures at the Community Center at 20130 Indian Street be verified upon sale of the property before issuing a Certificate of Occupancy.
- Conduct a review of sanitary sewer CCTV and maintenance inspection records to identify any areas with potential for sanitary infiltration to the storm drain.
- Coordinate conducting additional sampling and investigations with the City of Southfield as needed to confirm or eliminate the connected local drain to MH 6195 on Inkster Rd. as an illicit discharge source.
- Grating should be installed on road drain ditch inlets to the drain to limit access of animals to the enclosed drain system

8 MILE DRAIN INVESTIGATION

Background

The 8 Mile Drain is large 12-foot diameter storm water tunnel that was constructed during the early to mid-1960s. The drain is located in the Cities of Southfield and Oak Park in Oakland County and borders the City of Detroit in Wayne County. The drain begins in Oak Park at just east of Greenfield Road and travels west along the median for 8 Mile Road (M 102) for approximately 3.5 miles where it outlets to the Rouge River at the 8 Mile Road bridge crossing just west of Berg Road in Southfield. The drain services an area of approximately 3.33 square miles and includes a small commercial district along 8 Mile Road in Oak Park and commercial and industrial properties along 8 Mile Road from Greenfield Road west to Berg Road and along Northwestern Hwy. and Southfield Road from 8-mile Rd to just north of 9 Mile Rd in Southfield. The drain also services residential sub divisions in Southfield west of Northwestern Hwy to Lahser Road and north of 8 Mile Road to 9 Mile Road along with a small residential sub division along Southfield Road south of 10 Mile Road. The drain receives flow from connected State Highway, County road drain and local road drain systems and receives flow from seven (7) other County drains and numerous local subdivision drain systems in the area. A map of the 8 Mile drain location and drainage area is included as Figure 5.

Historical Sampling Summary

Historically the 8 Mile Drain outlet has been found to have continual flow and has been screened and sampled on numerous occasions by WRC under their IDEP Program. It was surveyed and sampled under the Rouge Program outfall surveys in 1999 and found to have an *E. coli* counts of 1,139 CFU / 100 ML. Sampling occurred again in preparation for the 2018 Storm Water Permit re-application and was found to have an *E.* coli count of 4,237 CFU / 100 ML. The bridge over the Rouge River at the 8 Mile Road was reconstructed in 2010 and the outlet of drain was replaced with a concrete flow channel connecting drain's first upstream manhole to west side of the bridge embankment at the River. The channel was sampled and had an E. coli concentration of 493 CFU /100 ML. In 2016, a complaint was received of a sewage smell on the Rouge River at the 8 Mile Bridge Crossing. E. coli sampling conducted at the outlet channel showed concentrations of 26,922 CFU / 100 ML. A sample was also taken from the Rouge River just upstream of the 8 Mile Drain outlet and was found to have an *E. coli* concentration of 18,737 CFU / 100 ML. An additional upstream survey and sampling was conducted at connecting manholes for the Owens, Morgan, and Flannery Drains. One (1) branch of the Owens Drain showed an *E. coli* concentration of 7,095 CFU /100 ML and two (2) branches of the Flannery Drain showed *E. coli* concentrations of 8,855 CFU / 100 ML and 5,075 CFU / 100 ML. The Drain was placed on WRC's prioritized list of Drains in need of further investigation in the Rouge Watershed.

Current 2018 Sampling and Investigation

The outlet of the 8 Mile Drain and the Rouge River upstream of the 8 Mile drain outlet were both re-sampled for *E. coli* in 2018. Additional samples were also collected for MST and taken to the lab at Michigan State University for DNA analysis. Additionally, an inspection of the 8 Mile drain was scheduled and conducted by WRC. Due to the size and depth of the drain, a consultant was hired to walk the length of the drain and perform the inspection. As part of the inspection consulting staff located and examined inlets to the drain for evidence of illicit discharges and samples of inlets with dry weather flow were collected and taken to the Walled Lake / Novi for *E. coli* analysis. A total of 13 inlets with dry weather flow were sampled during the inspection. A map of sampling locations and results is included as Figure 6. A table of sampling results appears as Table 3 below. Results are also included in Appendix C. Further discussion on the results of *E. coli* sampling occurs below. A detailed report of the 8 Mile drain inspection is still in the process of being compiled by the consultant and was unavailable for review and discussion.

Table 3. 8 Mile Drain Sampling Results

WRC Dry Weather Screening Sample Results					
Sample Date	**Sample ID**	**Sample Location**	**Parameter**	**Results**	**Units**
8/29/18	8 Mile Drain Outlet	In E. side of 8 Mile Bridge Crossing	E. coli	866	CFU/100 ML
8/29/18	Rouge @ 8 Mile	Rouge @ N. side of 8 Mile Rd Bridge Crossing	E. coli	1,246	CFU/100 ML
8/29/18	8 Mile Drain Outlet	In E. side of 8 Mile Bridge Crossing	MST	1,486.80	Gene Copies/100 ML
8/29/18	Rouge @ 8 Mile	Rouge @ N. side of 8 Mile Rd Bridge Crossing	MST	3,697.33	Gene Copies/100 ML

8 Mile Drain Inspection Sample Results				
10/18 /2018 Samples				
Sample	**Sta.**	**Location Description**	**Sample Point Description**	***E. coli* Results**
A	77+27	633 Feet West of MH 7	30" Drop Inlet	<50
B	48+00	MH 5	Inlet Pipe in Manhole	1,035
C	36+77	MH 4	Inlet Pipe in Manhole	50
D	31+10	MH 3	Inlet Pipe in Manhole	<50
E	22+17	657 Feet East of MH 2	12" Inlet @ 11:00 (S)	555
F	15+60	MH 2	Inlet Pipe in Manhole	100
10/30/2018 Samples				
Sample	**Sta.**	**Location Description**	**Sample Point Description**	***E. coli Results***
A	174+20	MH 14	Inlet Pipe in Manhole	50
B	182+55	410 Feet East of MH 15	48" Brick Eye	<50
C	171+37	283 Feet West of MH 14	48" RCP Eye	50
D	145+01	1042 Feet East of MH 12	Inlet Pipe	<50
E	143+39	880 Feet East of MH 12	24" Inlet (S)	<50
F	128+91	MH 11	Inlet Pipe in Manhole	11640
G	99+50	MH 8	Inlet Pipe in Manhole	<50

Results

E. coli concentrations from dry weather screening samples taken at both the outlet of the 8 Mile Drain and upstream on the Rouge River at 8 bridge crossing, although elevated, were not as high levels seen in the 2016 sampling. However, MST samples taken in 2018 do show the presence of human DNA, at levels that would seem to indicate that a source of sewage contamination is occurring, both upstream on the 8 Mile Drain and to the Rouge River north of 8 Mile Road. Samples collected it inlets exhibiting dry weather flow during the Inspection of the 8 Mile Drain show two (2) inlets as possible sources of illicit discharges to the drain. An inlet pipe to manhole 5 showed an E. coli concentration of 1,035 CFU / 100 ML. and an Inlet pipe to manhole 11 showed a concentration of 11,600. Additional sampling and upstream investigations of these connections will need to be scheduled.

Samples were taken to the Walled Lake / Novi Laboratory and results were readily available. A report from the consulting firm that performed the 8 Mile Drain inspection is still in the process of being compiled. Notes and observations for the inlets that were sampled and additional inlets inspected will be reviewed when the report is available.

Recommendations

The following activities are recommended

- WRC will follow up with additional sampling and investigations as needed to confirm and identify any illicit discharge sources from suspect inlets to manholes 5 and 11.
- WRC will review the 8 Mile Drain inspection report when available and address any additional issues found.
- Additional upstream sampling on the Rouge River north of 8 Mile Road should be conducted to confirm and isolate any discharge sources.

CLAUDE H. STEVENS DRAINS NO. 3 & 4 INVESTIGATIONS

Background

The Claude H. Stevens Drain is a conglomeration of 10 separate sections of enclosed storm drains located throughout Bloomfield Township. Outlets for the separate drain sections have been dry weather screened and sampled for *E. coli* by WRC under their IDEP Program. Four (4) sections of the drain, Claude H. Stevens 3, Claude H. Stevens 4 and Claude H. Stevens 10, showed evidence of possible illicit discharges and were placed on the list for additional investigations. Additional sampling and investigations of these four (4) sections of the drain were conducted in 2014 through 2017. During this period, the Claude H. Sevens No. 1 and No. 10 drains were eliminated as suspected sources and one (1) illicit discharge source on the Claude H. Stevens. No 3. was isolated and removed. The Claude H. Stevens. No 3. and No. 4 Drains both remain suspected of containing additional upstream illicit discharge sources and were continued to be investigated in 2018. A summary of sampling and investigations conducted on Claude H. Stevens No. 3 and 4 Drains drain follows.

Claude H. Stevens No. 3 Drain

Background

The Claude H. Stevens No. 3 Drain is located east of Squirrel Road and North of Wattles Road and services residential subdivisions in this area. The drain runs east from Squirrel Road and discharges to a branch of the Rouge River just east of Farhill Street.

Previous Investigation Summary

In 2013, sampling of the outlet of the drain showed an *E. coli* concentration of 7,194 CFU/100 ML. In 2014, the Claude H. Stevens 3 Drain was investigated and sampled for *E. coli* at select upstream manhole locations in order to identify potential illicit discharge sources. Segmenting and sampling of the drain at upstream road crossings indicated elevated *E. coli* counts at all manholes the highest being manhole 408 on Charing Cross with concentration of 226,500 CFU/100 ML. High *E. coli* and physical evidence of sewage at this location (floatable, soap suds, solids) indicated a likely illicit discharge of sanitary sewage.

In 2016. local drainage and septic system information was obtained. Additional sampling and investigations were conducted by WRC which identified the septic system drain field at 4158 Charring Cross located adjacent to MH 408 as a possible source of contamination. The property was referred to Health Department for follow up investigation.

In 2017 the property was investigated by the Health Department and found to have a failed septic field leaching into the storm drainage ditch on Charring Cross. Illicit Discharge and Violation Notices were sent to the homeowner and septic the system was eliminated by Bloomfield Township by connecting the home to sanitary system. Follow up sampling in the fall of 2017, after corrections if the illicit discharge had been completed, continued to show elevated E. coli concentrations at MH 408 greater than 1,002,500 CFU / 100 ML. Low flow levels in the upstream potions of the drain prevented additional sampling from being conducted at that time. See the “2017 Illicit Discharge Investigation in Oakland County’s Portion of the Rouge River Watershed Final Report” for further details.

2018 Sampling and Investigations

In 2018 additional sampling and investigations were conducted on the CH Stevens No. 3 Drain at manhole 408 and upstream manhole locations and on the local drain systems for subdivisions on Whipple Lane, Steeple Chase and Hunt Master. A map of sampling locations and results are included as Figure 6. Upstream inspections were conducted at seven (7) manhole and catch basin structures on the CH Stevens No. 3 drain and (5) manhole and catch basin structures from the local connected drain systems. During the survey, manhole, catch basin and inlets structures were located, photographed and examined for dry weather flow and any evidence of pollutants associated with illicit discharges. Samples were collected at thirteen (13) locations and taken to the Walled Lake / Novi Waste Water Treatment Facility (WWTF) for *E. coli* analysis. A map of locations with results of E. coli sampling is included as Figure 7. Copies of manhole, catch basin, and inlet inspections, notes and photographs are included in

Appendix A. Sampling results are included in Appendix C. The results of sampling and inspections and are further discussed below.

Results

Results of *E. coli* sampling indicates that the drain is still experiencing elevated *E. coli* concentrations indicative of an upstream source of sewage contamination. *E. coli* concentrations at manhole 408 were at 27,837 CFU / 100 ML. An examination of the manhole showed light flow from the north and pooling of a brown material with suds. The manhole also has brown staining on the manhole floor, inlet pipe, walls and outlet. The manhole is an elbow for a north to east transition of flow in the drain and flow tends to pool at the outlet pipe for the manhole.

Light flow was seen in the ditch line just north of manhole 408 on the west side of Charring Cross Sampling of the flow in the ditch line showed an *E. coli* concentration of 2,263 CFU / 100 ML but did not show any evidence of sewage contamination. The ditch line does not connect to manhole 408, but has an inlet which connects to manhole 410 on the east side of Charring Cross. Manhole 410 is the connector manhole for flow from manhole 408 going east. Sampling of this manhole showed *E. coli* concentrations of 15,387 CFU / 100 ML. The manhole also has inlets for local road drainage for Charring Cross from the north and south which were dry.

A survey of upstream areas revealed that manholes 407, 7318 and 7317 are pass through manholes and all had light flow and some signs of staining on the flow channels. All of the manholes also had piles of animal fecal material on the manhole floors. Sampling results of flow in these manholes were, 8,200 CFU / 100 ML. 10,932 CFU / 100 ML and 42,259 CFU /100 ML, respectively. Manhole 407 has an inlet for the road drain system on the east side of Charring Cross which was dry. Manhole 7317is the connecting manhole for the drain from the west. It also has a connected catch basin 13369 to the south west which picks up flow from a natural drainage ditch in backyards for subdivision west on Steeple Chase, and Whippers Lane. Flow in the ditch the inlet was clean. Sample results for *E. coli* from this flow was 50 CFU/ 100 ML and it does not seem to be a source of contamination to the Drain.

Upstream manhole 7316 is the upper terminus of the drain for the Claude H. Steven No. 3 drain. The manhole is located in the backyard of 493 Whippers Lane. It picks up flow from a connected beehive catch basin to the west for sub divisions on Whippers Lane and Hunt Master and has an inlet for a connected beehive catch basin from the south for the subdivision on Steeple Chase. Sampling for *E. coli* showed concentrations of 826,000 CFU / 100 ML. Examination of light flow coming in from the west and a trickle flow coming from the south inlets showed some physical signs of sewage contamination and piles of animal feces were present on the manhole floor.

An examination of the upstream connected local storm drain catch basins for Whippers Lane, Steeple Chase and Hunt Master was performed. A beehive catch basin west of manhole 7216 located in the backyard between 482 and 493 Whippers Lane located and inspected. The catch basin has inlets from storm catch basins north on Whippers Lane and west on Hunt Master. Examination of the catch basin manhole showed that inlets the from the north and west were both dry there was no active flow in the manhole. There was, however, water ponded at the outlet of the manhole to the east connecting to

manhole 3716 on the Claude H Stevens Drain. Sampling of ponded water showed *E. coli* concentrations of 31,554 CFU / 100 ML. There was some black staining on the manhole floor but no presence of sanitary debris or fecal material. There is also a four-inch diameter black plastic corrugated PVC drain that is connected to the top of the beehive cover. The connected drain had no flow and is partially buried. It looks like the drain comes from 482 Whippers Lane and is probably for footing or roof drainage for the residence. An examination of the connected catch basins on Whippers Lane, and Hunt Master found that both are connecting manholes with inlets for open ditch drains for the cul-de-sacs and streets in each subdivision. Inlets from the drainage diches were dry but there was water in both catch basin sumps. Sampling of the catch basin sumps for *E. coli* showed concentrations of 9,406 CFU / 100 ML in catch basin for Whipper's Lane and 3,456 CFU / 100 ML in the catch basin for Hunt Master. There was no physical evidence of sanitary debris in either catch basin. A survey of connected drainage ditches around the cull-des-sacs and along the street in each sub division found no flow or evidence of an illicit discharge. A catch basin at the end of the cul-de-sac for Steeple Chase connects to manhole 7316 south on the Claude H. Stevens drain. This catch basin is a connecting manhole for drainage ditch inlets around the cull-de-sac and along Steeple Chase. There was flow coming into the catch basin from the drainage ditch to the east. Sampling of flow for *E. coli* showed a concentration of 960 CFU / 100 ML. Flow in the ditch line was clear and there was no evidence of sanitary sewage in the dich line or catch basin sump. Tracking flow in the ditch line east, showed that it did not go beyond the first driveway culvert for 475 Steeple Chase. It is suspected that the home has footing drains with groundwater flow connected to the driveway culvert. A survey of drainage ditches around the cul-de-sac and along the street did not find any additional flow or evidence of an illicit discharge occurring.

High *E. coli* concentrations manhole 7316 are indicative of an upstream illicit discharge, however, sanitary flow, debris and *E. coli* concentrations in upstream subdivision catch basins and surveys of sub division drainage ditches have not located a potential source of contamination. Furthermore, evidence of large amounts animal fecal matter in the drain suggests at least some of elevated *E. coli* counts are animal related. A direct connection from properties adjacent to the drain on Whipple Lane and Steeple Chase is possible, but consultation with Bloomfield Township indicates that the three (3) subdivisions have sanitary sewer and none of the properties in this area are on septic systems.

Recommendations

The following activities are recommended:

- Cleaning and resampling of the drain upstream of manhole 408 should be done to determine if an illicit discharge is still occurring. MST sampling to determine if human DNA is present may also be beneficial.
- Additional monitoring and possibly MST sampling of the connected subdivision drains is needed to eliminate them as potential sources of sanitary discharges.
- A CCTV inspection of the system west of manhole 7316 may be needed to locate any illicit connections to the drain if cleaning and resampling indicates that an illicit discharge is still occurring.
- Dye testing of homes starting with 493 Whippers Lane.

- Grating should be installed on road drain and backyard inlets to the drain to limit access of animals to the drain system

Claude H. Stevens No. 4 Drain

Background

The Claude H. Stevens No. 4 Drain is located south of Wattles Road east of Kensington Road and services residential subdivisions south of Wattles Road between Kensington and Adams Road. The drain runs east of Kensington Road and discharges to a branch of the Rouge River just east of Burnley Street.

Previous Sampling and Investigation Summary

In 2013, sampling of the outlet of the drain showed an *E. coli* concentration of 10,909 CFU/100 ML.

In 2014, the drain was segmented and sampled for *E. coli* at the first upstream manhole location and MH locations at Tullamore and Haddington streets. All manholes had elevated *E. coli* counts ranging from 876 CFU/100 ML to 4,802 CFU/100 ML. Inspections of manholes did not find any other physical evidence of sanitary sewage in the drain. Upstream manhole locations in Kensington Road were not sampled due to concerns of working in the road right of way. No additional sampling of the drain was conducted in 2016. In 2017 the drain was sampled for *E. coli* at four (4) locations including; MH 3375 near the outlet of the Drain on Burnley Street, at MH 420 on Haddington Street and at MH 417 in Kensington Rd. A connected MH from a local drain system on Dover Street was also sampled. The MH exhibited dry weather flow was found to be from a 15-inch clay tile crock drain under the center of the street. Sampling of flow in the connected drain showed *E. coli* concentrations of 14,308 CFU/100 ML. The route and location of the of the upstream drain system was unknown. See the "2017 Illicit Discharge Investigation in Oakland County's Portion of the Rouge River Watershed Final Report" for further details.

2018 Sampling and Investigations

Additional upstream investigations and sampling of the drain were conducted in 2018 in response to an illicit discharge seen at the outlet of the drain located at 4851 Burnley Street. Upstream manholes at the road / drain crossings at Burnley Street (7315), Tullamore Street (7312), Haddington Street, (420) and the connected local storm drain on Dover Street at Kensington Road (417 A) were examined and sampled. Maps of the local storm drain system on Dover Street were obtained and a survey of manhole and catch basin structures was completed by WRC with assistance from Bloomfield Township. During this survey five (5) upstream manhole structures between Dover and Charring Cross were located. Four (4) of the structures were able to be opened and examined and sampled for *E. coli.* A map of manhole and sampling locations with results is included as Figure 8. Notes, observations and photos of drain surveys and investigations are included in Appendix A. Sampling results are included in Appendix C

Results

E. coli concentrations were elevated at all manhole locations on the Claude H. Stevens Drain and at the outlet of the local drain at Dover Street and Kensington Road. The highest concentration was 252,000

CFU / 100 ML at the connected local drain manhole, 417A. Observations at this manhole showed a connected 15" clay tile pipe with the top cut off as it passes through the manhole. There was heavy flow with a sanitary odor at this location but no sign sanitary solids or debris. A map of the location of the storm drain system and manhole structures on Dover Street was obtained from Bloomfield Twp. A survey of the drain and inspection of the manhole structures and catch basin inlets was performed by WRC and Bloomfield Twp. staff.

Dover Street is a dirt road with an enclosed storm drain that is located in the property easements along Dover Street. The drain follows the road going northeast toward Charing Cross. It is located along properties on the north side of Dover at Kensington Road and traverses to the south side of road where the road bends to the north to intersect with Charing Cross. There is a manhole in the intersection of Dover Street and Charing Cross which has inlets for road drainage from the north and south on Charing Cross. The manhole also connects a beehive manhole structure across the street. The beehive structure receives upstream flow from a drainage ditch and connected retention pond south of Wattles Road.

During the survey total of five (5) structures were located. All the manholes were able to be opened and examined except Dover 3 which has a beehive cover that is encased by tree roots growing around manhole. All of the examined manhole structures along Dover Street have inlets for the property ditch lines along the roadside. All the inlets, including the road drain inlets to the manhole in Charing Cross were dry. There was flow in the pass though channels of all the manholes which is emanating from the upstream connected retention pond. Flow in the manholes and connected channel for the retention pond was clean and clear with no physical evidence of an upstream illicit discharge occurring.

E. coli samples were collected at the (4) manhole locations and taken to the Walled Lake / Novi WWTF Laboratory for analysis. Results of the *E. coli* sampling indicates that a discharge upstream of Dover manhole 1 is highly unlikely. E. coli concentrations at all upstream manhole locations were all relatively low, with the highest concentration being 980 CFU / 100 ML at Dover 2. Based on this information it is suspected that a discharge may be occurring from one of the properties located on Kensington Road or Dover Street between manholes 417A and Dover 1.

The Road Commission for Oakland County (RCOC) was contacted. RCOC and Bloomfield Township are in the process of making arrangements to have the section of drain between manhole 417A and Dover 1 cleaned and CCTV inspected to locate any illicit connections to the drain. It should be noted that Bloomfield Township has indicated that all the properties in this area are on septic systems and sanitary sewer is not available.

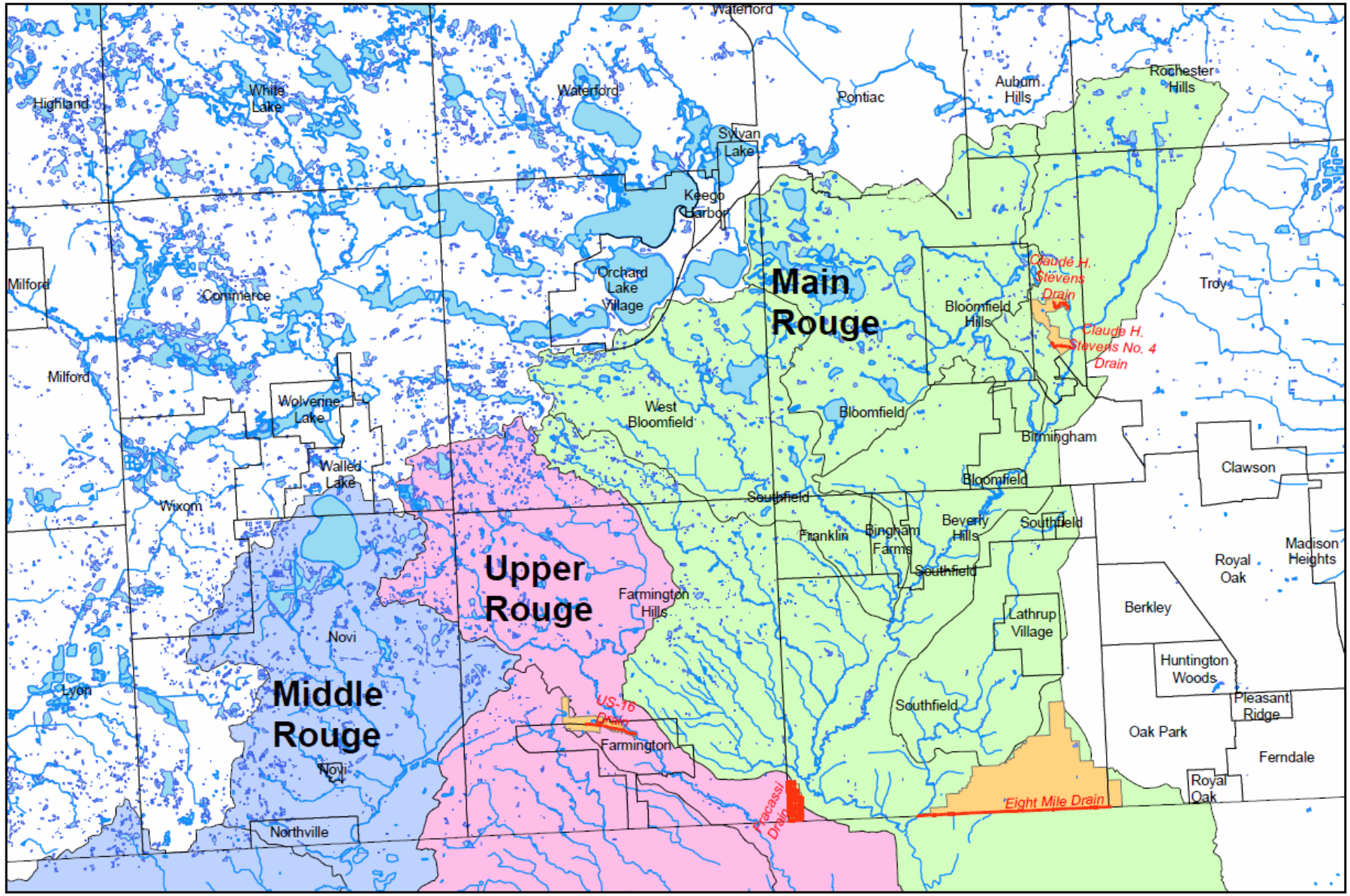
Recommendations

The following follow up activities are recommended:

- Ensure completion of CCTV inspection of the local storm drain on Dover St. by Bloomfield Township or RCOC.
- Ensure dye testing is completed by the Health Department on suspect residences.
- Once corrections are complete, perform follow up sampling of the drain to verify and identified illicit discharges have been eliminated and no additional illicit discharges are occurring.

FIGURES

Figure 1: Location of 2018 Rouge IDEP Project Drains



2018 IDEP Project Area Locations

Legend

- Main Rouge
- Middle Rouge
- Upper Rouge
- County Drains
- Watercourse
- Water Body
- Drain District Area
- Municipal Boundaries

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Figure 2: US 16 Drain, 2018 E. coli Sampling Results

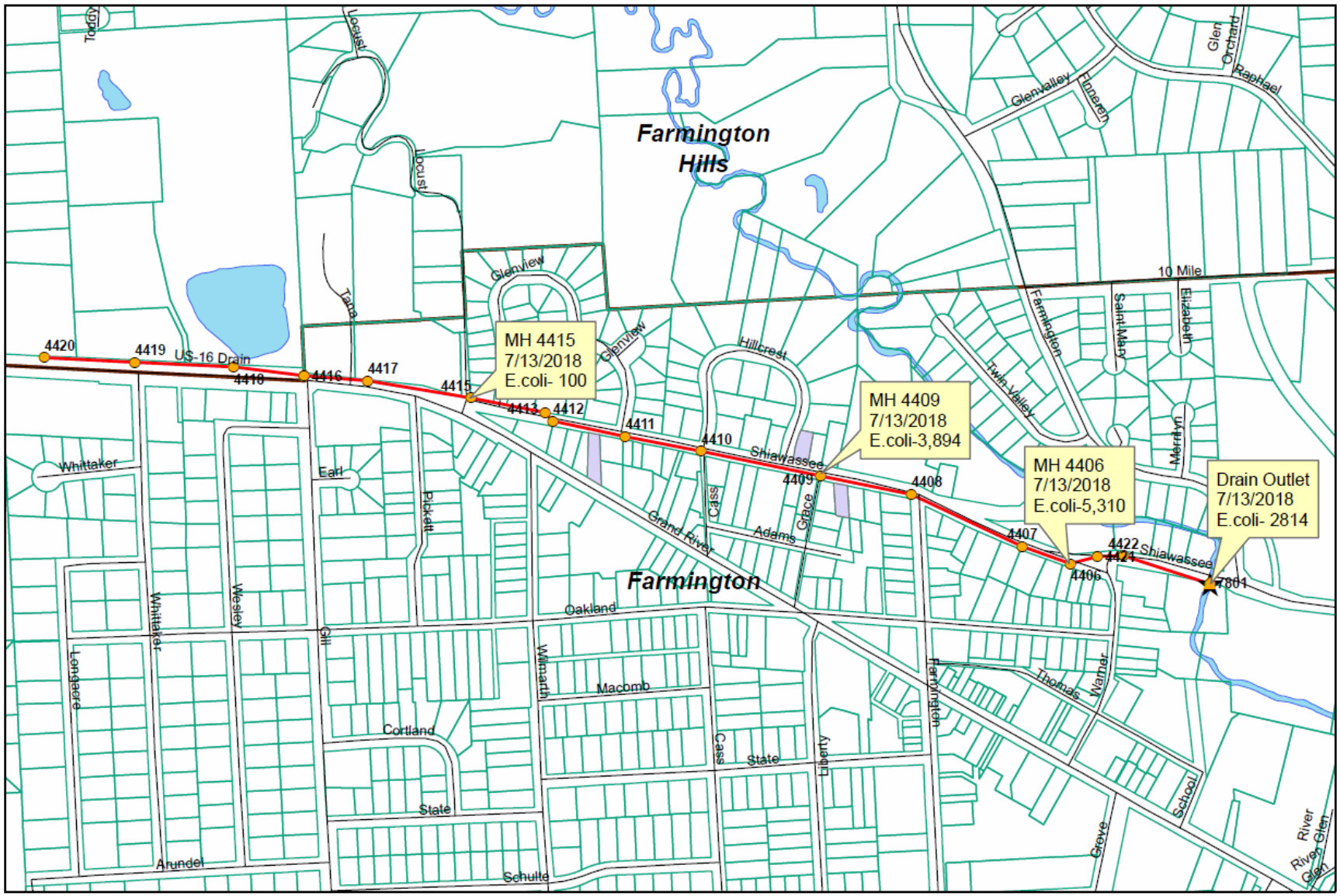

Figure 3: Fracassi Drain, 2018 Sampling Results.

Fracassi Drain, 2018 IDEP Project E.coli Sampling, Southfield

Legend

- ★ Drain Outlet
- MH Locations
- Sampling Locations
- Fracassi Drain
- Emily Drain
- Open Water Course
- Municipal Boundary

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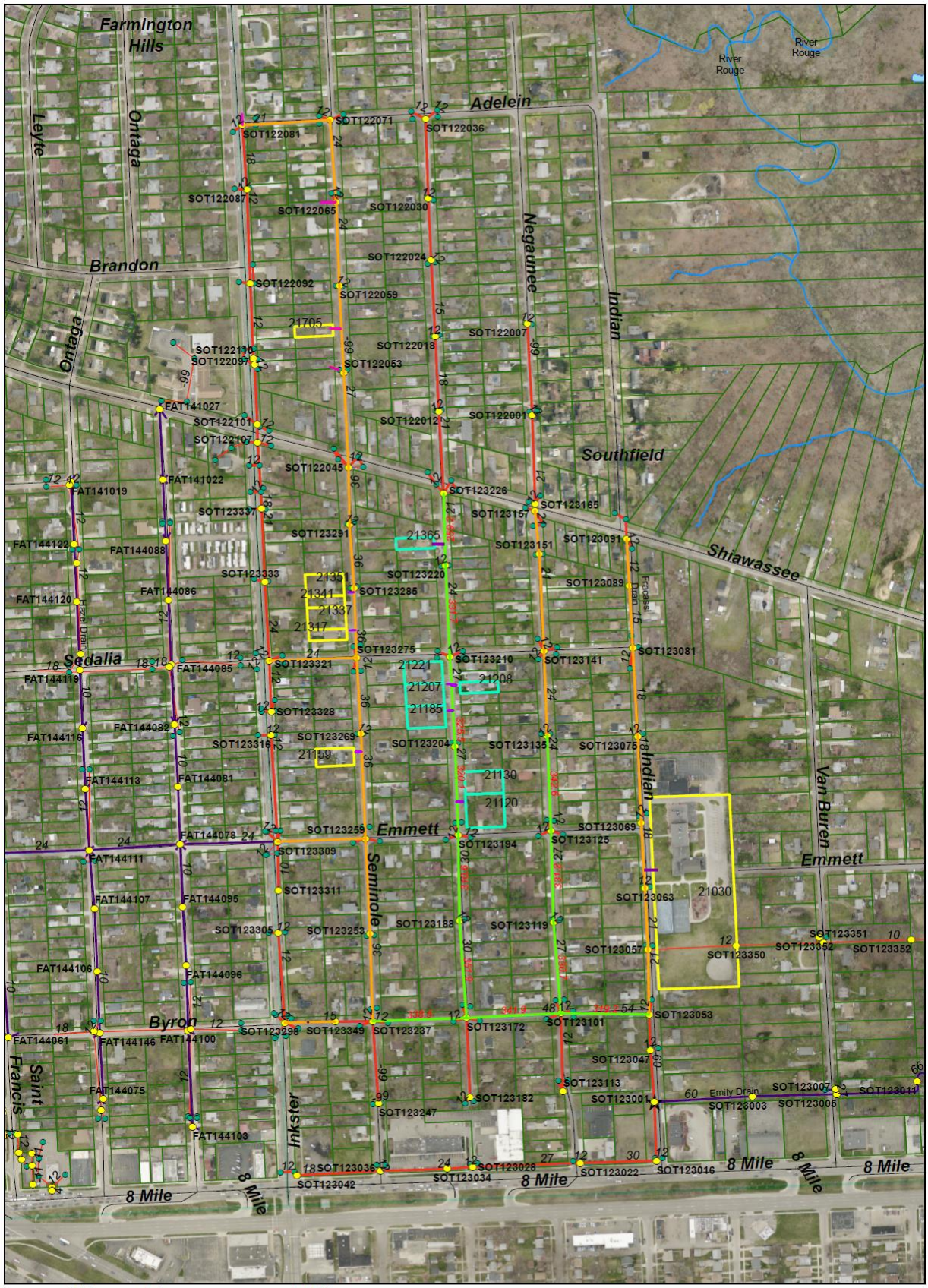
Jim Nash

Figure 4: Fracassi Drain CCTV & Suspect Property Locations



Fracassi Drain, 2018 IDEP Project, CCTV & Suspect Property locations, Southfield

Legend

- MH Locations
- Road / Drainage Ditch CB Inlet Structures
- Fracassi Drain
- Emily Drain
- 2016/2017 CCTV Sections
- Completed 2018 CCTV Sections
- Suspect Properties (2016/2017)
- Suspect Properties (2018)

2018 Complted CCTV
12 Segments
Total Linear Feet=3,912.6
(lincludes cleaning & CCTV)

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Figure 5: Eight Mile Drain Location

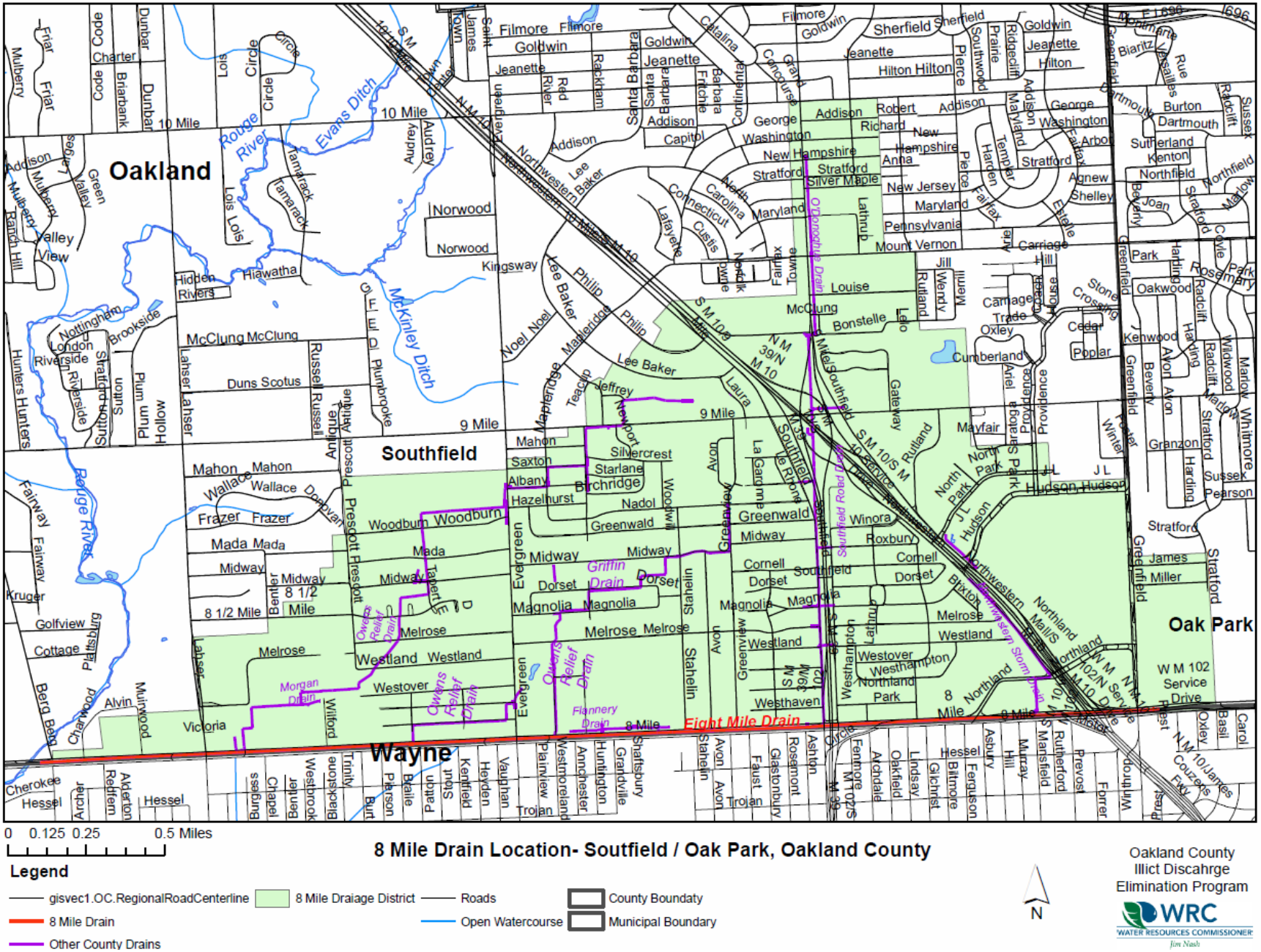


Figure 6: 8 Mile Drain 2018 Sampling Results

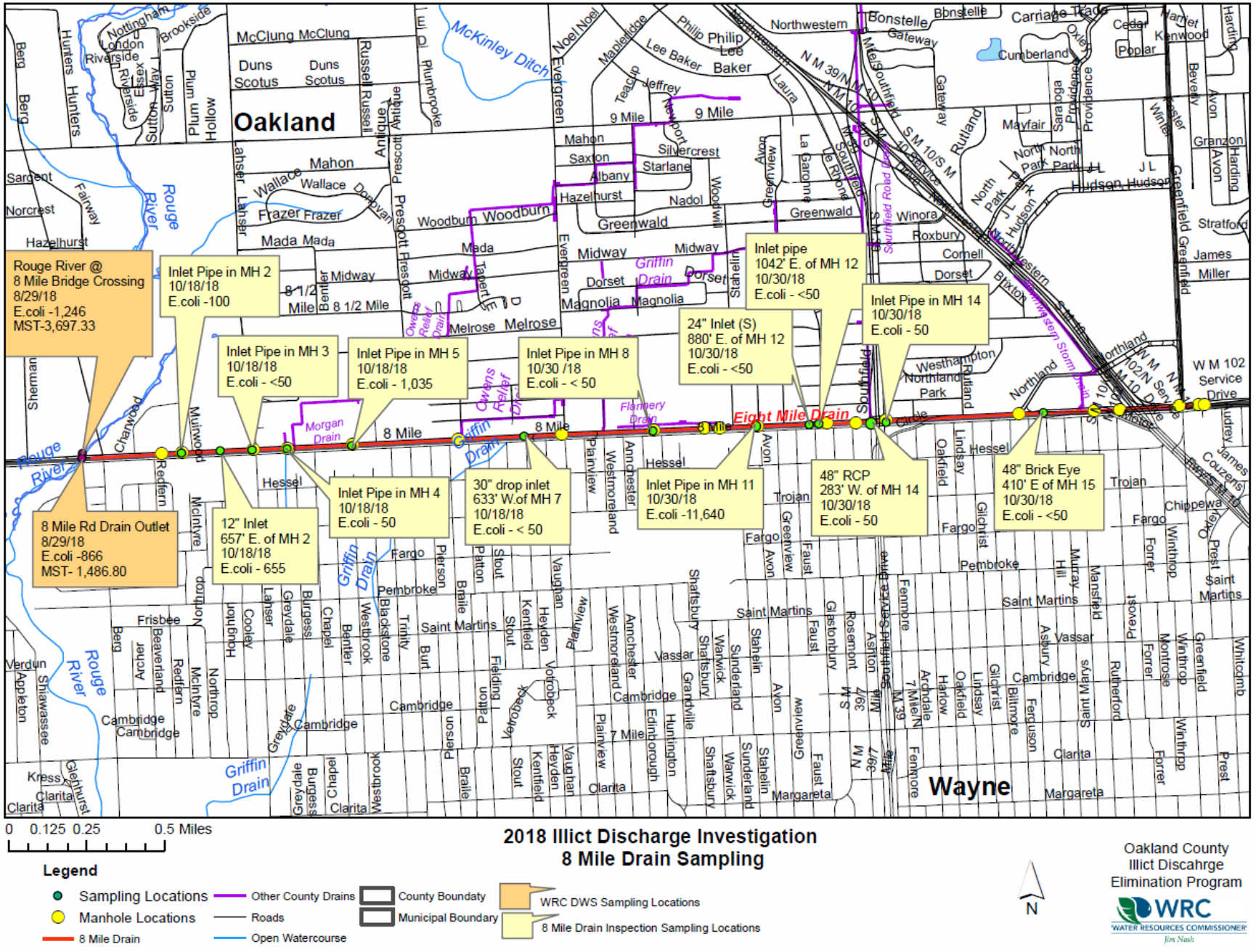
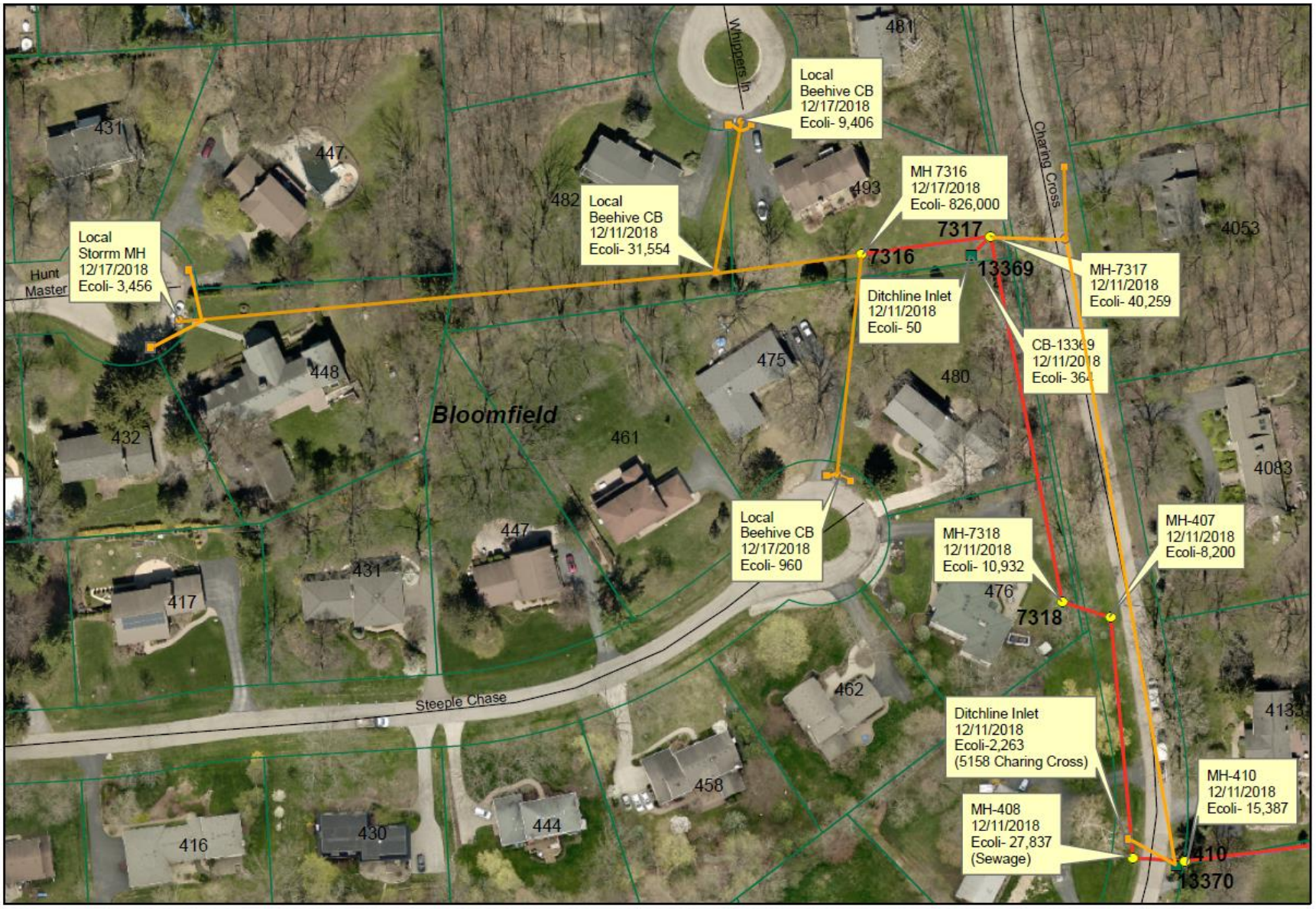


Figure 7: Claude H. Stevens No. 3 Drain, 2018 Sampling and Investigation Map



Claude H. Stevens No. 3 Drain Investigation
E.coli Sampling 12/11 & 12/17/2018
Bloomfield Twp.

Legend

- County Manhole Structures
- local MH Structure
- County Inlet Structures
- Local Ilnet Structures
- Claude H Stevens Drain
- Local Storm Drains
- Open Water Course
- Municipal Boundary

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Elimination Program

WRC

Figure 8: Claude H. Stevens No. 4 Sampling and Investigation Map.

Claude H. Stevens No. 4 Drain Investigation
2018 E.coli Sampling Results
Bloomfield Twp.

Legend

- MS4 Discharge Point
- County Drain MH Structures
- Local Drain MH Structures
- Inlet Structures
- Claude H Stevens Drain
- Open Water Course
- Municipal Boundary

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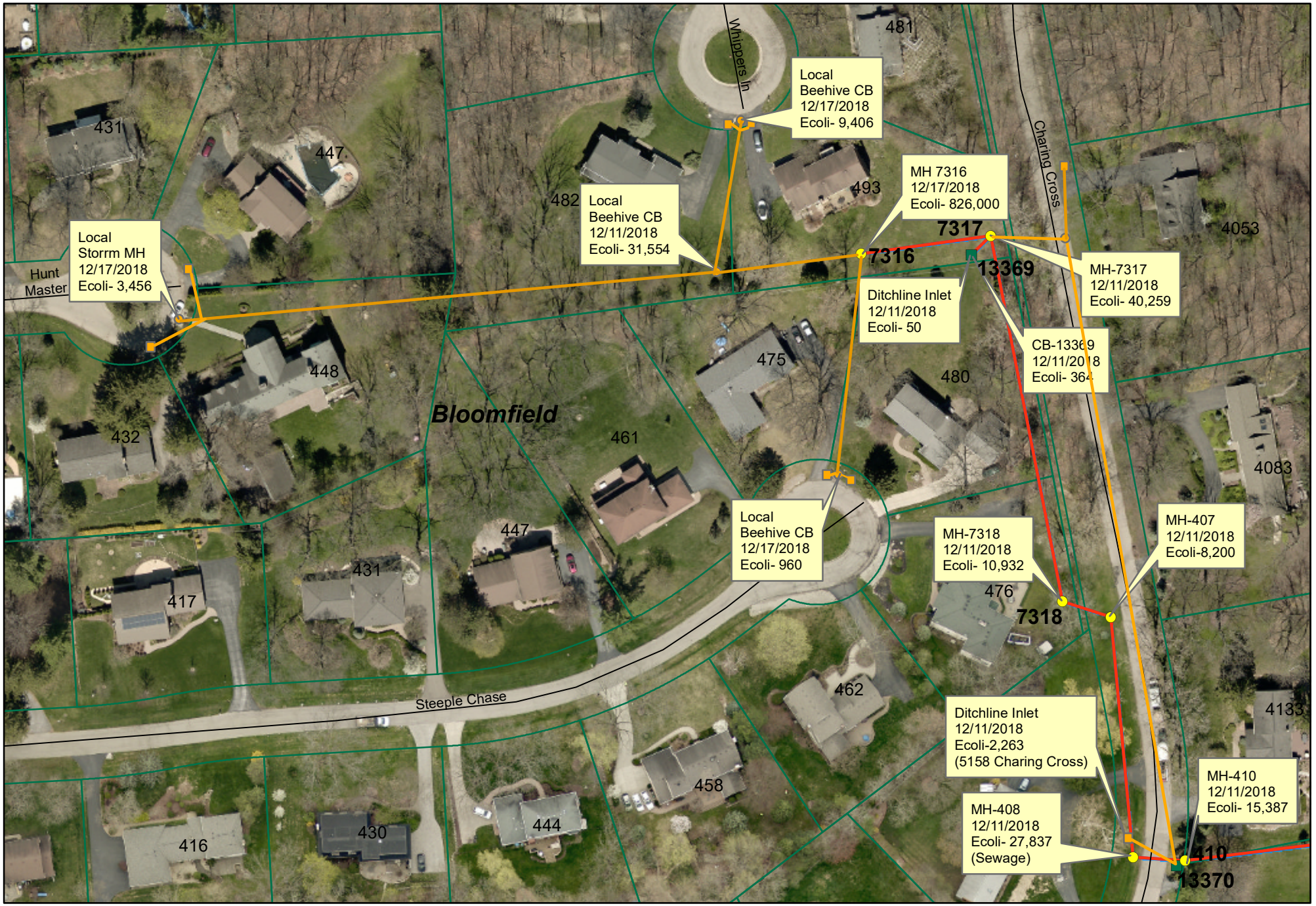
APPENDIX A: DRAIN SURVEY AND MANHOLE INSPECTION, NOTES, OBSERVATIONS & PHOTOS



Claude H. Stevens No. 3 Drain Investigation
E.coli Sampling 12/11 & 12/17/2018
Bloomfield Twp.

Legend

- County Manhole Structures
- local MH Structure
- County Inlet Structures
- Local Ilnet Structures
- Claude H Stevens Drain
- Local Storm Drains
- Open Water Course
- Municipal Boundary

N

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Claude H. Stevens No. 3 Manhole Inspections

MH 408 . Flow from N. is pooled at elbow going E. Brown with suds, staining on MH wall

Drainage Ditch N. of MH 408. Flow is clear. Inlet pipe in ditch connected to MH 410.

CB 13378- Flow from MH 408 to MH 410. Road dain Inlets N. & S. Low flow. No sample

MH 410 – Connecting MH CB B 13378 to drain going E. Animal feces in MH. Sampled

MH 407 flow from N. Rd drain inlet E. is dry w/ animal feces in MH. Sampled

local storm MH for connected Rd drains on E. side of Charring Cross. Dry w animal feces

MH 7318 Connected to MH 407. Animal Feces on MH floor and channel. Sampled

MH 7317. Elbow from W. to S. Possible sewage in MH. Sampled. Connected CB to the S.

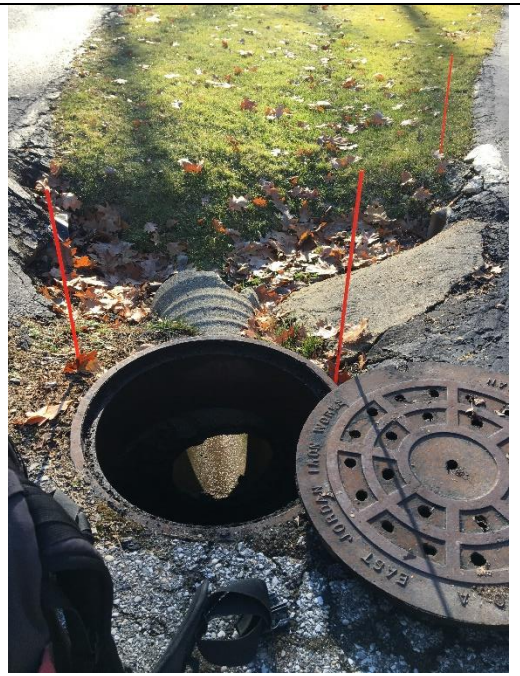
CB 13369 connected to MH 7317. Inlet flow from ditch line W. Looks clean. Sampled

Inlet to CB 13369 w flow from drainage ditch to the W. Flow is clean

MH 7316. Terminus MH. Connects local drains W.& S. Sewage and animal Feces in MH

CB connects inlets for Whippers LN. & Hunt Master to MH 7316. Ponding at E outlet

Plastic PVC drain from 482 Whippers LN connected to Back Yard CB Beehive. No flow.



MH on Whippers Lane. Connects Rd drain ditches to drain. Water in sump. Sampled

MH on Hunt Master. Connects Rd drain ditches to drain. Water in CB sump. Sampled

Beehive CB on Steeplechase. Connects Rd drain ditches. Flow in E. ditch line. Sampled

Claude H. Stevens No. 4 Drain Investigation
2018 E.coli Sampling Results
Bloomfield Twp.

Legend

- MS4 Discharge Point
- County Drain MH Structures
- Local Drain MH Structures
- Inlet Structures
- Claude H Stevens Drain
- Open Water Course
- Municipal Boundary

N

Oakland County
Illicit Discharge
Elimination Program

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WATER RESOURCES COMMISSIONER
John P. McCulloch

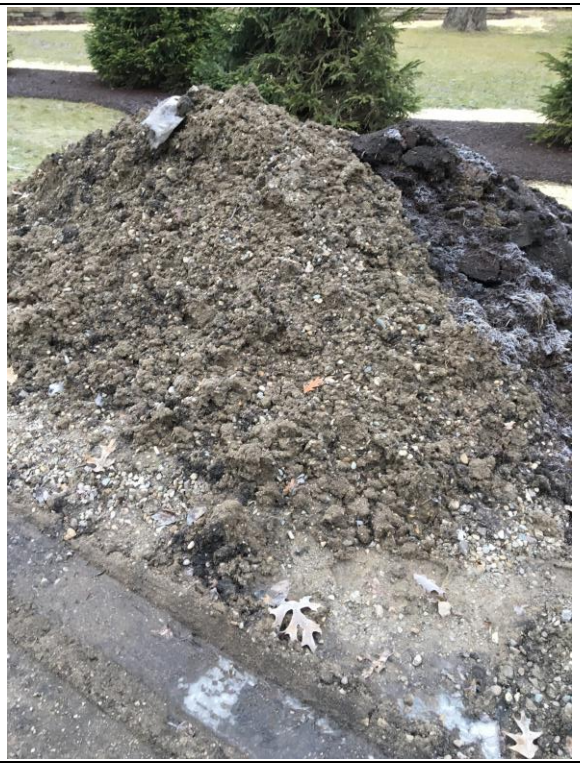
Claude H. Stevens No. 4- Dover Street Manhole Survey

MH 417A located in Dover at Kensington. Connects to MH 417 on the CH Stevens Drain

Dover 1 CB located W. of drive at 4810 Dover. Cover buried under landscaping rocks

Dover 2 CB located W. of drive at 4790 Dover. 4” PVC to drain was dry. Sampled flow

Dover 3 CB located E. of drive at 4725 Dover in woods. Beehive is locked in by tree roots



Soil pile from construction along road at 4525 Dover

Dover 4 MH in Charring Cross at Dover. Rd rain Inlets E & W. Inlet. N with flow. Sampled

Dover 5 CB. N. of Charring Cross. Connect channel from pond to the N.

Flow channel connected to CB 5 from upstream pond S. of Wattles Rd. Sampled

APPENDIX B – CCTV INSPECTION AND DYE TESTING REPORTS

Fracassi Drain 2018 CCTV Inspection Summary Table

Street	USPSTREAM MH	DOWNSTREAM MH	Direction	Distance	Clock from	Clock to	Code	Description	Dimension	Type	Notes
Poinciana	SOT1232226	SOT123220	D	0.0 ft			AMH	Manhole			
				0.0 ft			MWL	Miscellaneous Water Level			
				23.0 ft	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				47.0 ft	7 o'clock		DAE	Deposits Attached Encrusted			
				55.1 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				71.3 ft	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				83.0 ft	12 o'clock		CL	Crack Longitudinal			
				119.7 ft	7 o'clock	1 o'clock	DAE	Deposits Attached Encrusted			
				127.3 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				135.4 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				160.0 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				182.2 ft.	1 o'clock		TB	Tap Break in/Hammer	6"	Clay Tile	
				207.8 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				224.1 ft	11 o'clock		ID	Infiltration Dripper			
				224.1	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				258.4			AMH	Manhole			
Poinciana	SOT123220	SOT123210	D	0.0 ft.			AMH	Manhole			
				0.0 ft.			MWL	Miscellaneous Water Level			
				84.6 ft	1 o'clock		CL	Crack Longitudinal			
				115.6	2 o'clock		CL	Crack Longitudinal			
				216.0 ft.	7 o'clock	12 o'clock	DAE	Deposits Attached Encrusted			
				228.4 ft.	12 o'clock		CL	Crack Longitudinal			
				252.5 ft.	12 o'clock		CL	Crack Longitudinal			
				258.7 ft.	12 o'clock		CL	Crack Longitudinal			

				237.9 ft.	12 o'clock		CL	Crack Longitudinal			
				330.6 ft.			AMH	Manhole			
Poinciana	SOT123210	SOT123204	D	0.0 ft.			AMH	Manhole			
				0.0 ft.			MWL	Miscellaneous Water Level			
				22.1 ft.	11 o'clock		DAE	Deposits Attached Encrusted			
				99.0 ft.	2 o'clock		TB	Tap Break in/Hammer	6"	Clay tile	with deposits
				102.1 ft.	11 o'clock		TB	Tap Break in/Hammer	6"	Clay tile	with active flow
				194.7 ft.	1 o'clock		TB	Tap Break in/Hammer	6"	Clay tile	w active flow
				228.0 ft.	12 o'clock		CL	Crack Longitudinal			
				262.5 ft.	1 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				321.4 ft.			AMH	Manhole			
Poinciana	SOT123204	SOT123194	U	0.0 ft			AMH	Manhole			
				0.0 ft.			MWL	Miscellaneous Water Level			
				67.8 ft.	12 o'clock		CL	Crack Longitudinal			
				119.0 ft	11 o'clock		TB	Tap Break in/Hammer	6"	Clay tile	staining
				239.1 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				249.8 ft.	12 o'clock		CL	Crack Longitudinal			
				256.2	7 o'clock	3 o'clock	CC	Crack Circumferential			
				256.2 ft.	7 o'clock	12 o'clock	DAE	Deposits Attached Encrusted			
				295.9 ft.	7 o'clock	8 o'clock	DAE	Deposits Attached Encrusted			
				320.4			AMH	Manhole			
Poinciana	SOT123194	SOT123188	D	0.0 ft.			AMH	Manhole			
				0.0 ft.			MWL	Miscellaneous Water Level			
				15.2 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				39.2 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				55.4 ft.	12 o'clock		ID	Infiltration Dripper			
				55.4 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			

				111.3 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				183.2 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				191.0 ft.	12 o'clock		ID	Infiltration Dripper			
				191.0 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				231.2 ft.	12 o'clock		IR	Infiltration Runner			
				231.2 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				235.0 ft.	12 o'clock		CL	Crack Longitudinal			
				241.5 ft.	12 o'clock		CL	Crack Longitudinal			
				255.8 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				259.3 ft.	12 o'clock		CL	Crack Longitudinal			
				265.3 ft.	12 o'clock		CL	Crack Longitudinal			
				280.4 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				295.6 ft.	12 o'clock		ID	Infiltration Dripper			
				305.9 ft.			AMH	Manhole			
Poinciana	SOT123188	SOT123172	D	0.0 ft.			AMH	Manhole			
				0.0 ft.			MWL	Miscellaneous Water Level			
				7.3 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				31.6 ft.	7 o'clock	9 o'clock	DAE	Deposits Attached Encrusted			
				48.6 ft.	12 o'clock		CL	Crack Longitudinal			
				56.4 ft.	12 o'clock		CL	Crack Longitudinal			
				78.8 ft.	12 o'clock		ID	Infiltration Dripper			
				78.8 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				81.1 ft.	12 o'clock		CL	Crack Longitudinal			
				87.6 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				103.6 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			

				159.9 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				204.8 ft.	2 o'clock		CL	Crack Longitudinal			
				208.0 ft.	12 o'clock		ID	Infiltration Dripper			
				208.0 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				232.2 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				304.1 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				324.9 ft.	8 o'clock	11 o'clock	DAE	Deposits Attached Encrusted			
				352.7 ft.			AMH	Manhole			
Negaunee	SOT123135	SOT123125	D	0.0 ft.			AMH	Manhole			
				0.0 ft.			MWL	Miscellaneous Water Level			
				192.0 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				304.0 ft.	11 o'clock		ID	Infiltration Dripper			
				339.6 ft.			AMH	Manhole			
Negaunee	SOT123125	SOT123119	U	0.0 ft.			AMH	Manhole			
				0.0 ft.			MWL	Miscellaneous Water Level			
				13.7 ft.	1 o'clock		CL	Crack Longitudinal			
				23.4 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				38.1 ft.	12 o'clock		CL	Crack Longitudinal			
				71.7 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				96.1 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				127.7 ft.	1 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				136.2 ft.	7 o'clock	12 o'clock	DAE	Deposits Attached Encrusted			
				136.4 ft.	12 o'clock		CL	Crack Longitudinal			
				152.7 ft.	10 o'clock	2 o'clock	ID	Infiltration Dripper			
				152.7 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				158.8 ft.	12 o'clock		CL	Crack Longitudinal			
				210.0 ft.	11 o'clock		CL	Crack Longitudinal			

				221.4 ft.	12 o'clock		CL	Crack Longitudinal			
				224.5 ft.	1 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				240.3 ft.	10 o'clock	2 o'clock	ID	Infiltration Dripper			
				240.3 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				312.9 ft.	12 o'clock		ID	Infiltration Dripper			
				312.9 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				323.9			AMH	Manhole			
Negaunee	SOT123119	SOT123101	D	0.0 ft.			AMH	Manhole			
				0.0 ft.			MWL	Miscelaneous Water Level			
				24.6 ft.	2 o'clock		CL	Crack Longitudinal			
				37.4 ft.	2 o'clock	3 o'clock	CS	Crack Spiral			
				54.3 ft.	4 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				55.4 ft.	12 o'clock		CL	Crack Longitudinal			
				70.7	5 o'clock		DAE	Deposits Attached Encrusted			
				118.9 ft.	12 o'clock		ID	Infiltration Dripper			
				118.9 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				127.0 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				166.9 ft.	12 o'clock		CL	Crack Longitudinal			
				231.0 ft.	12 o'clock		DAE	Deposits Attached Encrusted			
				286.8 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				295.4 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				303.6 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				336.0 ft.			AMH	Manhole			
Byron	SOT123237	SOT123172	U	0.0 ft.			AMH	Manhole			
				0.0 ft.			MWL	Miscellaneous Water Level			
				179.1 ft.	2 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				226.2 FT.	8 o'clock		IR	Infiltration Runner			

				226.2 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				282.9 ft.	11 o'clock		ID	Infiltration Dripper			
				299.0 ft.			JOM	Joint Offset Medium			
				336.1 ft.			AMH	Manhole			
Byron	SOT123172	SOT123101	D	0.0 ft.			AMH	Manhole			
				0.0 ft.			MWL	Miscellaneous Water Level			
				223.8 ft.	12 o'clock		CL	Crack Longitudinal			
				254.1 ft.	4 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				340.9 ft.			AMH	Manhole			
Byron	SOT123101	SOT123053		0.0 ft			AMH	Manhole			
				0.0 ft			MWL	Miscellaneous Water Level			
				58.8 ft.	7 o'clock	5 o'clock	DAE	Deposits Attached Encrusted			
				67.8 ft.	7 o'clock	11 o'clock	DAE	Deposits Attached Encrusted			
				306.5 ft.			LR	Line Right			
				306.5 ft.			MSA	Miscellaneous Survey Abandoned			
Byron	SOT123101	SOT123053	U	0.0 ft.			AMH	Manhole			
				0.0 ft.			MWL	Miscellaneous Water Level			
				14.2 ft.			LL	Line Left			
				14.2 ft.			MSA	Miscellaneous Survey Abandoned			

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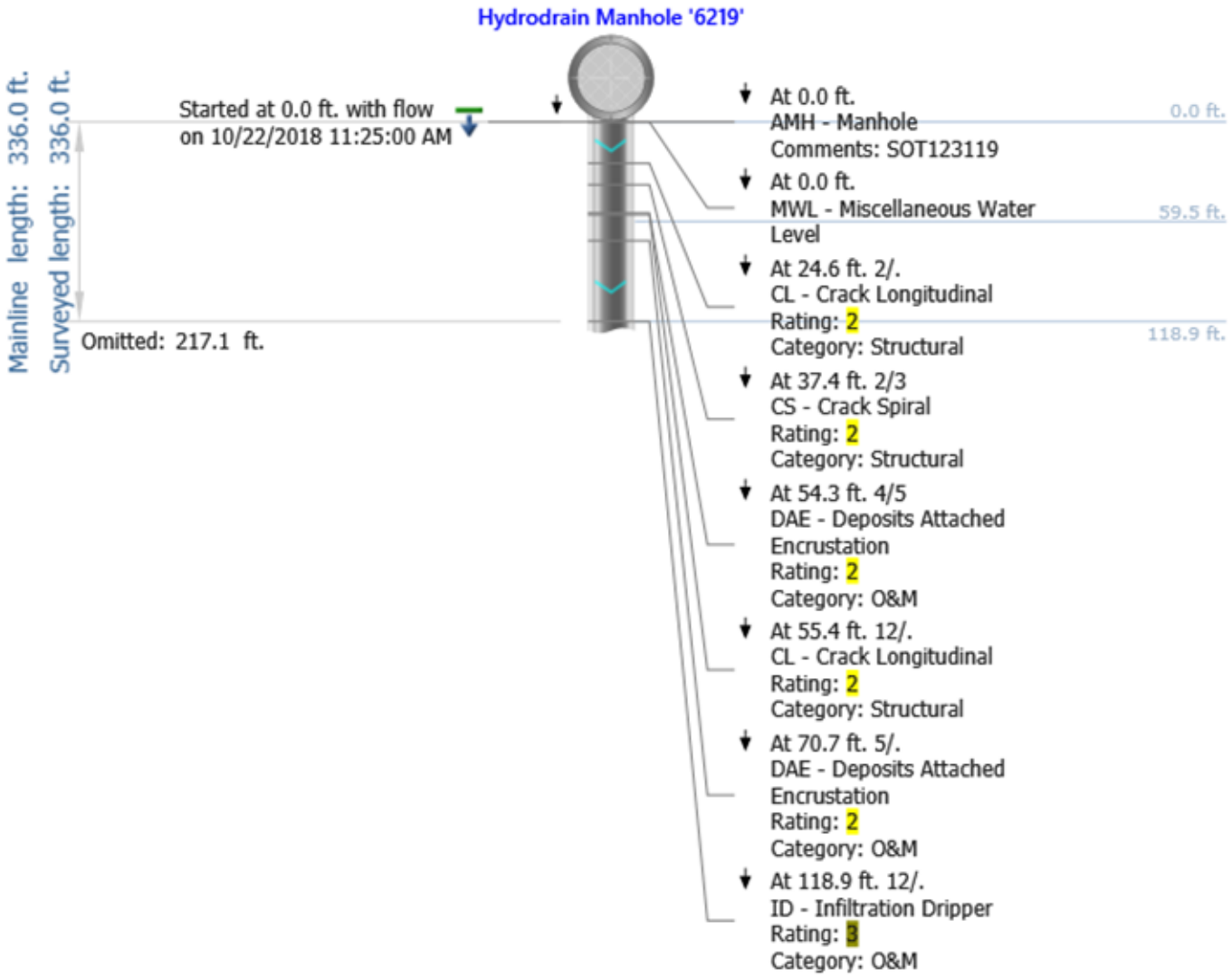
Main Inspections Pipe Run

Project name:	Mainline ID:	City/Village/Township:	Street Address:
FRACASSI DRAIN_PACP	**19621**	**SOUTHFIELD**	**NEGAUNEE**
Start date/time:	Direction:	Weather:	Location code:
10/22/2018 11:25 AM	**D**		
Shape:	Material:	Height:	Width:
C	**RCP**	**27 in.**	



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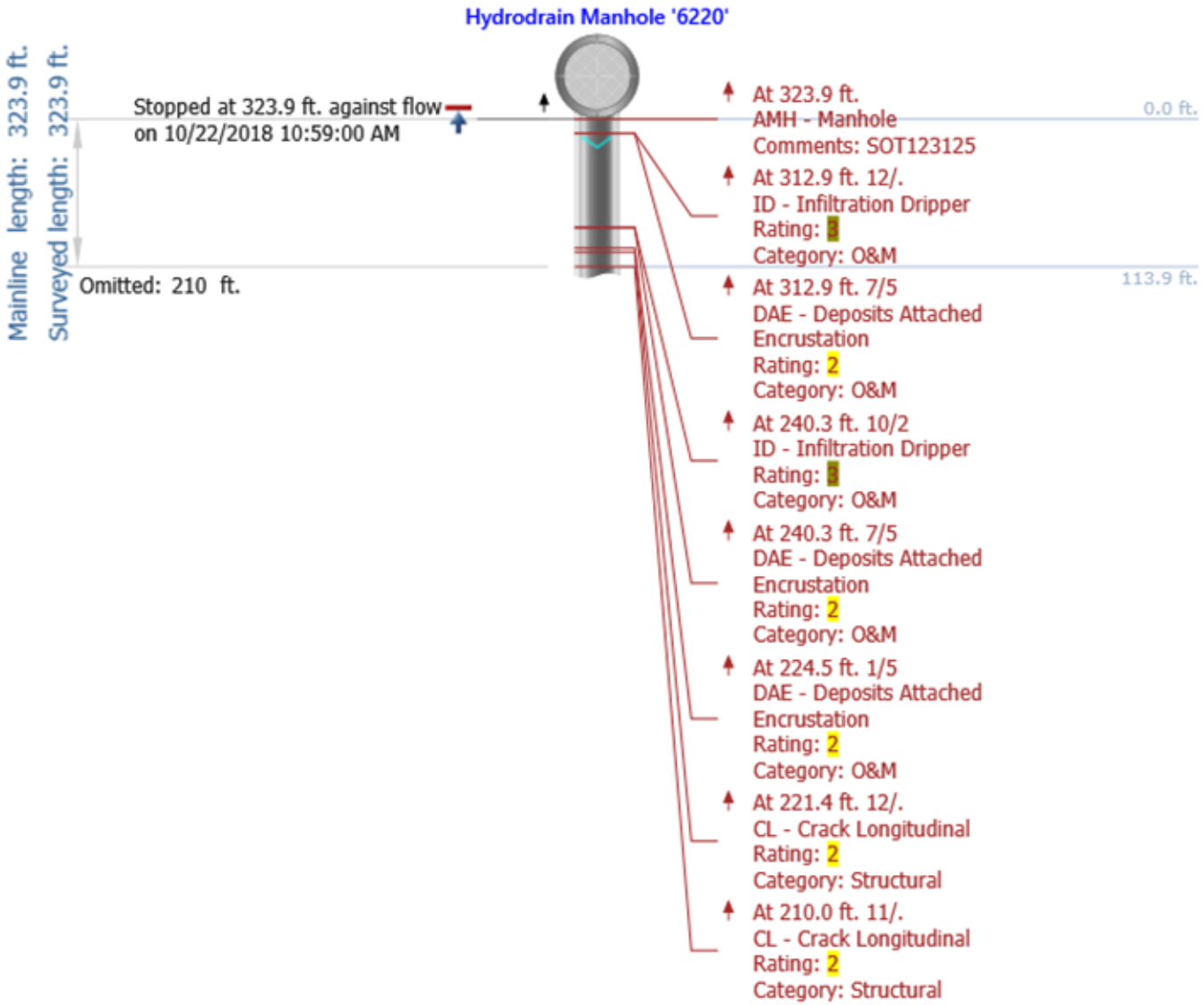
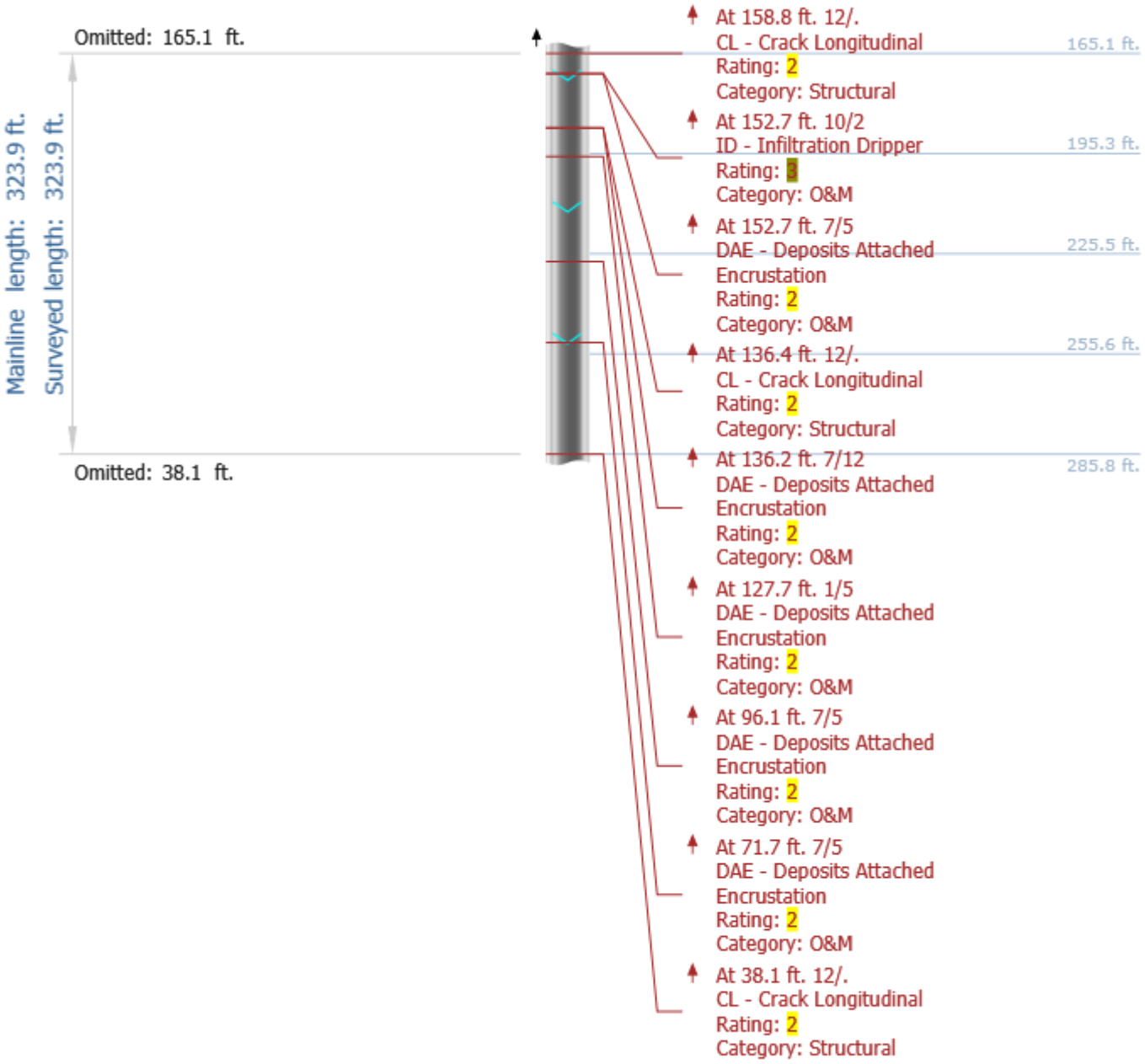
Main Inspections Pipe Run

Project name:	Mainline ID:	City/Village/Township:	Street Address:
FRACASSI DRAIN_PACP	**19624**	**SOUTHFIELD**	**NEGAUNEE**
Start date/time:	Direction:	Weather:	Location code:
10/22/2018 10:59 AM	**U**		
Shape:	Material:	Height:	Width:
C	**RCP**	**27 in.**	



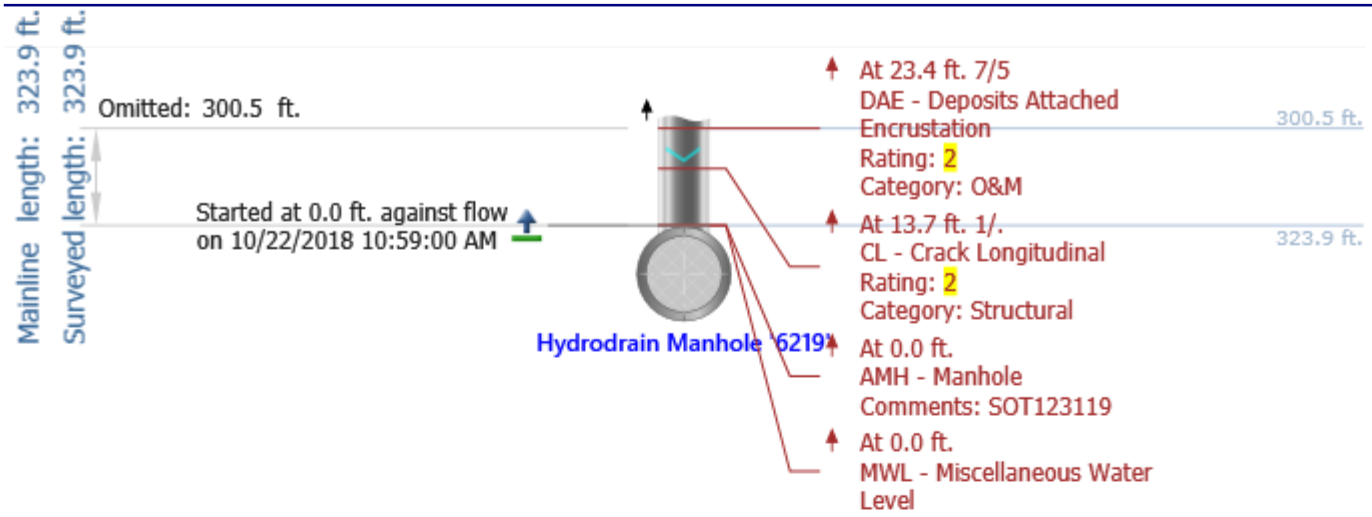
Project name:	Mainline ID:	Start date/time:	Direction:
FRACASSI DRAIN_PACP	**19624**	**10/22/2018 10:59 AM**	**U**

Weather:



Project name:	Mainline ID:	Start date/time:	Direction:
FRACASSI DRAIN_PACP	**19624**	**10/22/2018 10:59 AM**	**U**

Weather:



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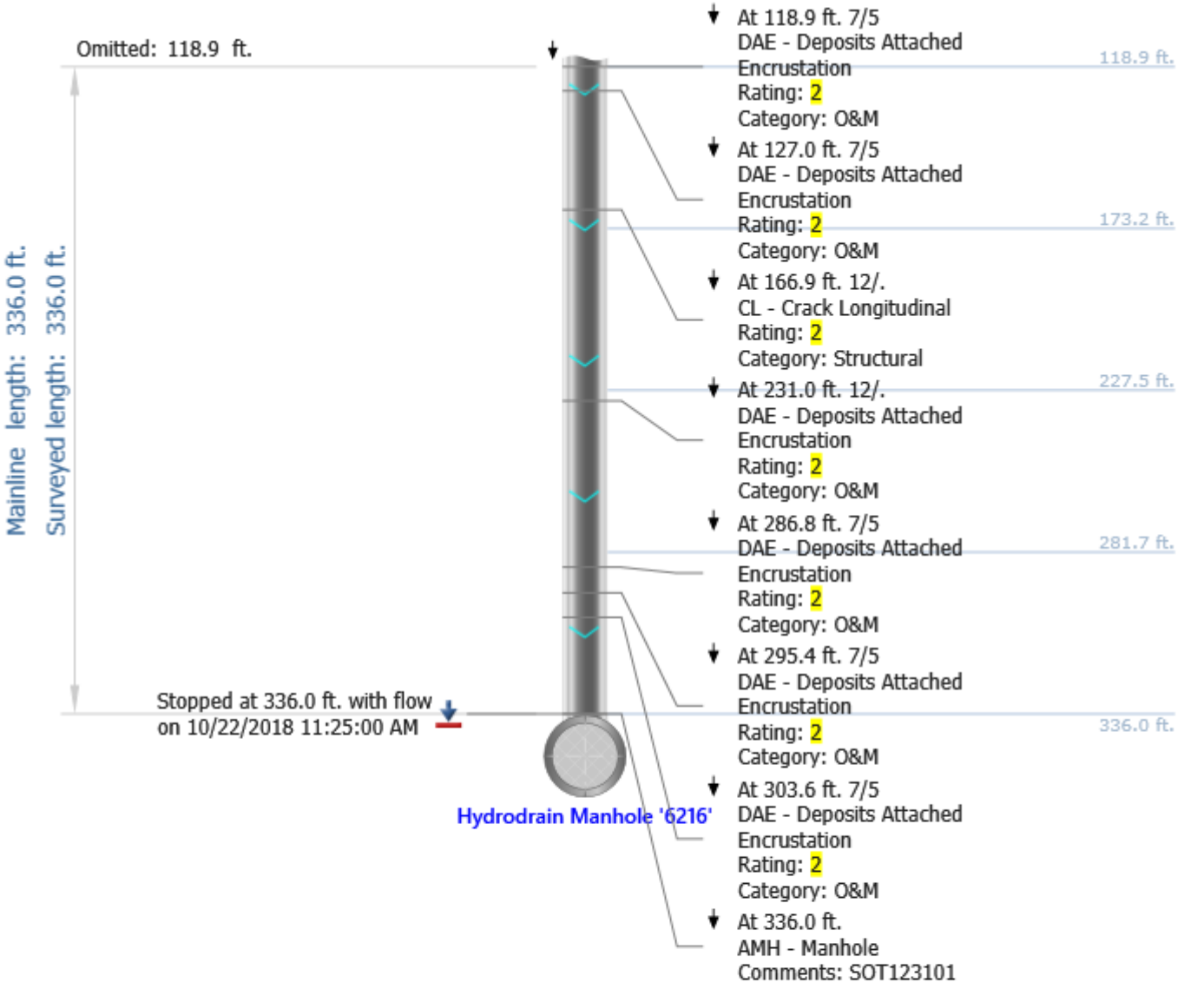
Weather:



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Main Inspections Pipe Run

Project name:	Mainline ID:	City/Village/Township:	Street Address:
FRACASSI DRAIN_PACP	**19635**	**SOUTHFIELD**	**NEGAUNEE**
Start date/time:	Direction:	Weather:	Location code:
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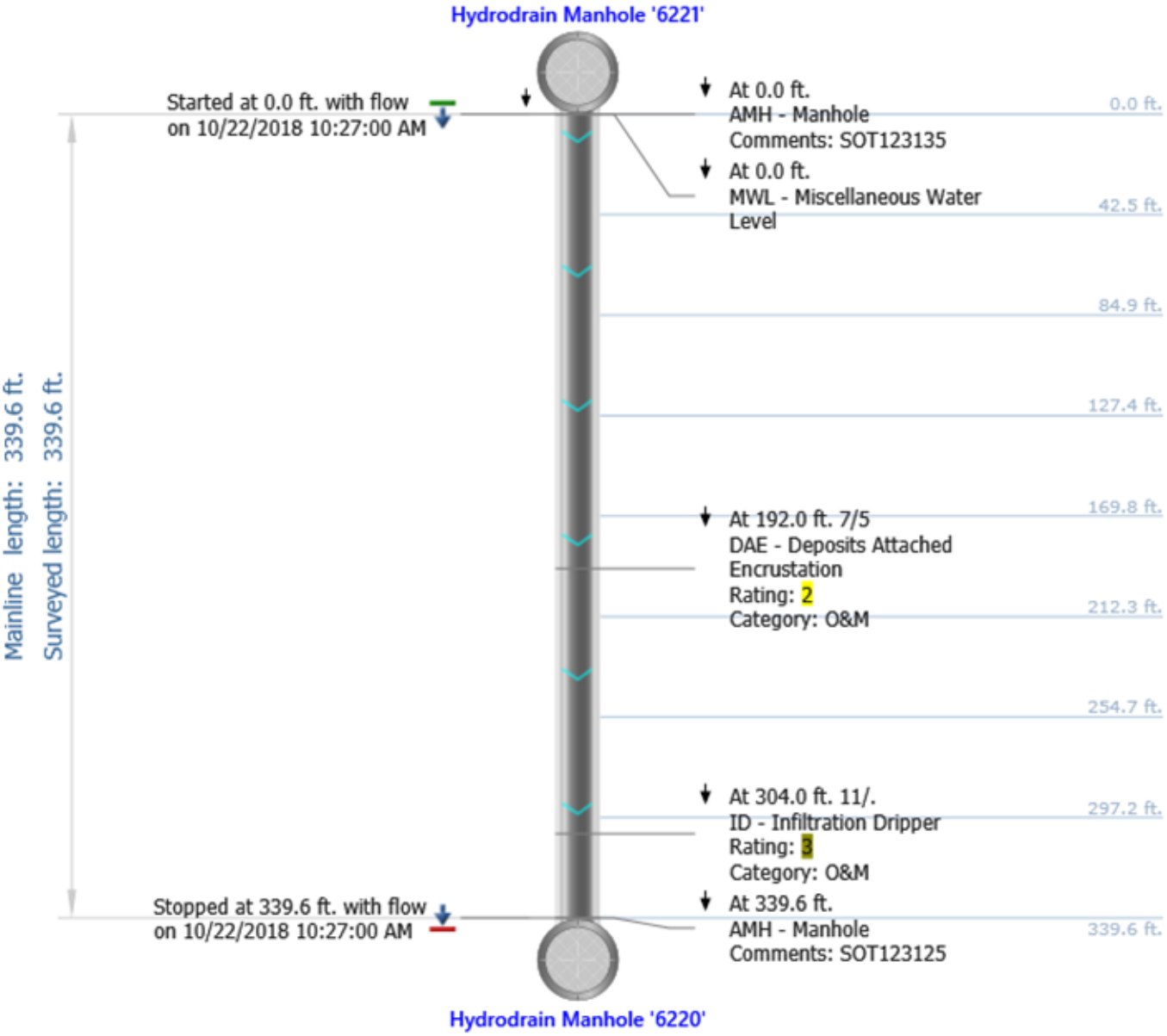
Shape:	Material:	Height:	Width:
C	**RCP**	**24 in.**	



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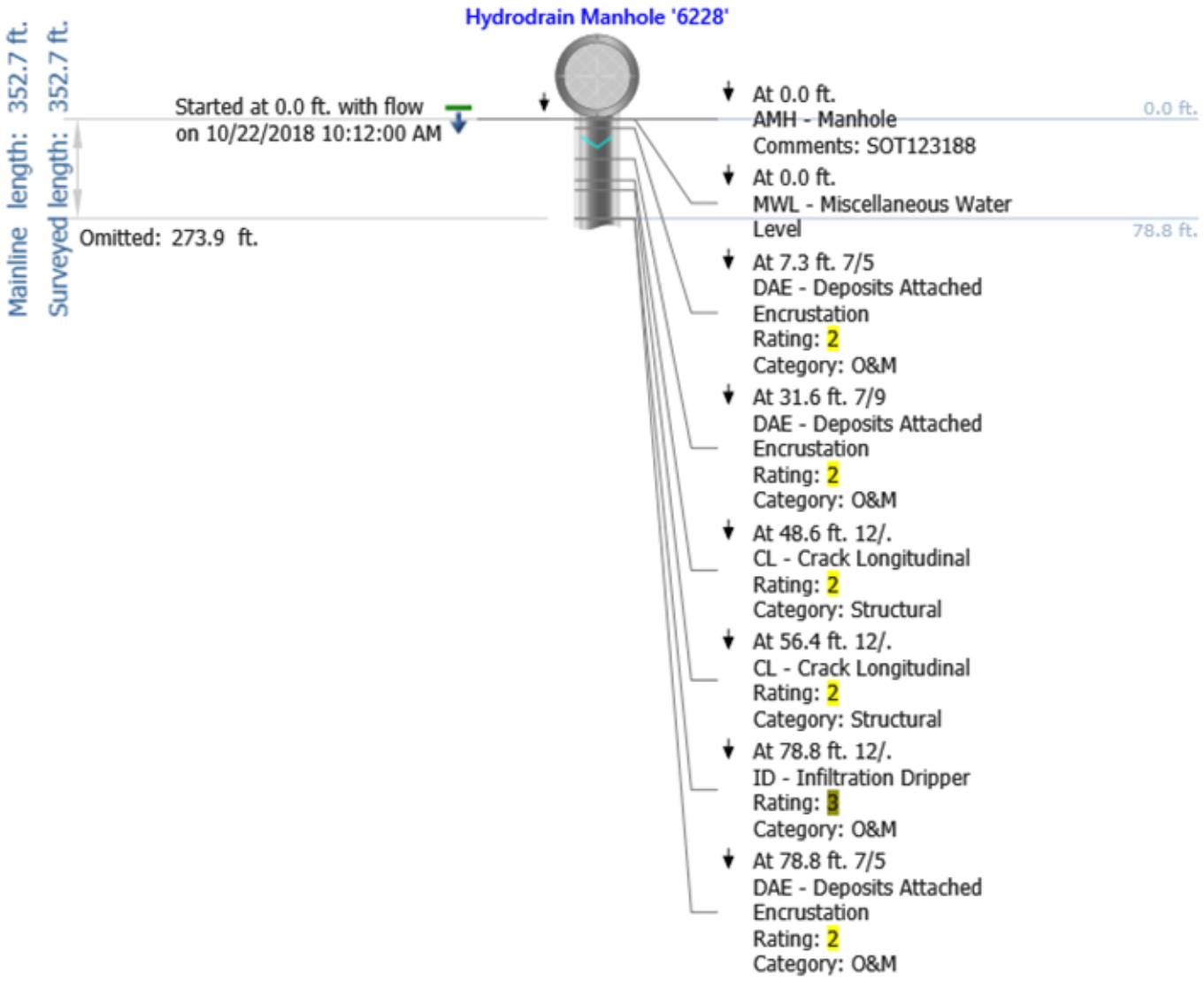
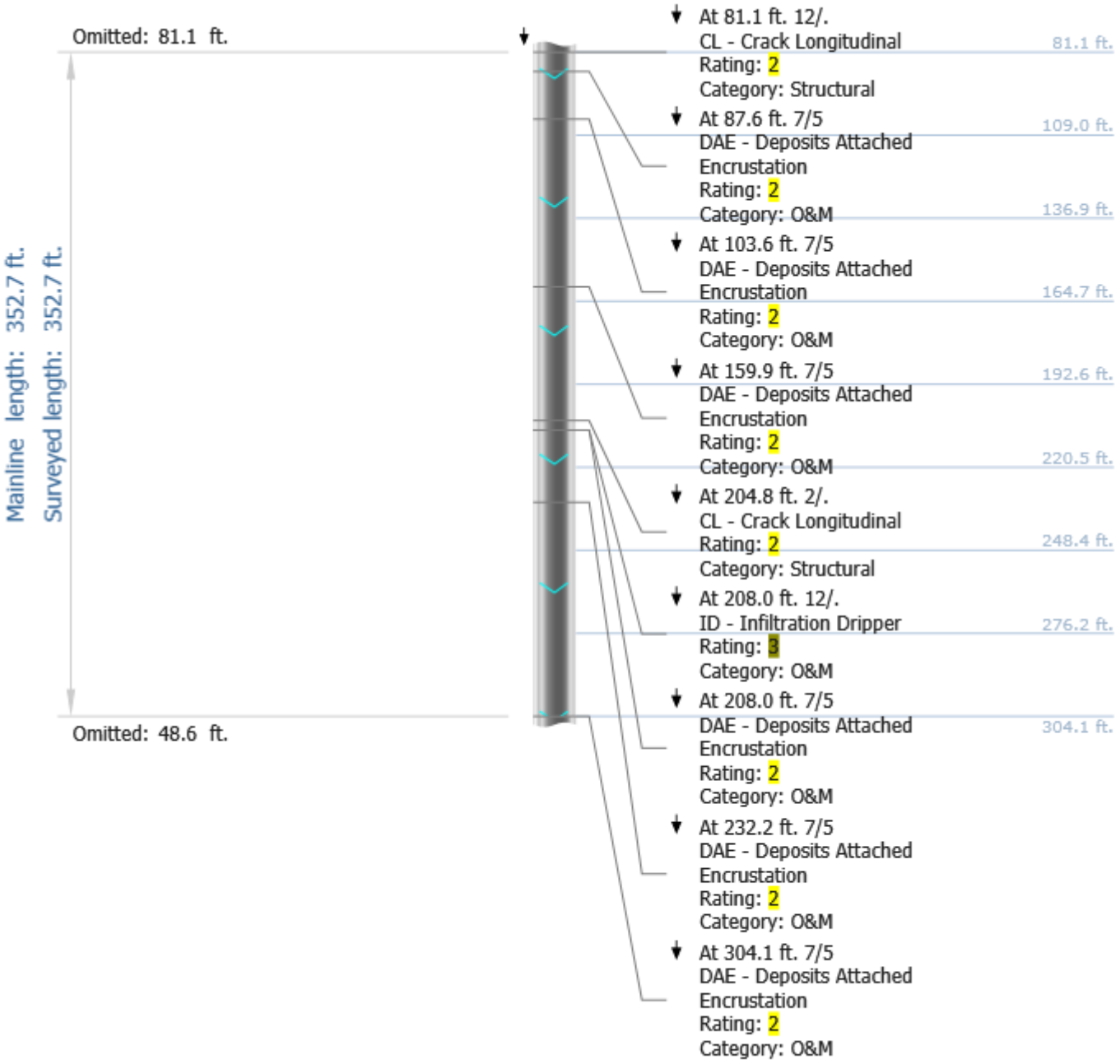
Main Inspections Pipe Run

Project name:	Mainline ID:	City/Village/Township:	Street Address:
FRACASSI DRAIN_PACP	**19674**	**SOUTHFIELD**	**POINCIANA**
Start date/time:	Direction:	Weather:	Location code:
10/22/2018 10:12 AM	**D**		
Shape:	Material:	Height:	Width:
C	**RCP**	**30 in.**	



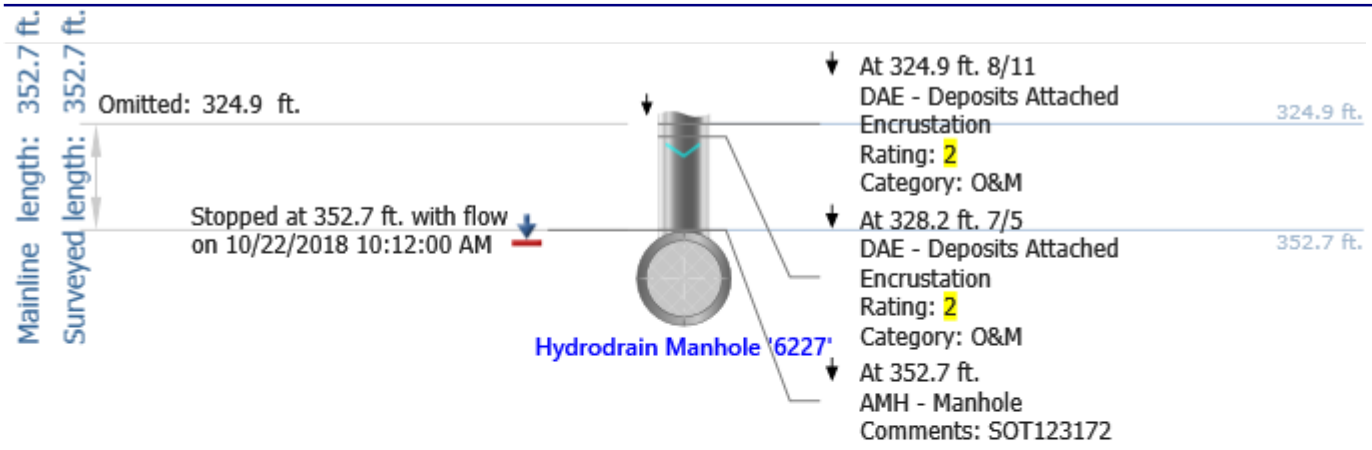
Project name:	Mainline ID:	Start date/time:	Direction:
FRACASSI DRAIN_PACP	**19674**	**10/22/2018 10:12 AM**	**D**

Weather:



Project name:	Mainline ID:	Start date/time:	Direction:
FRACASSI DRAIN_PACP	**19674**	**10/22/2018 10:12 AM**	**D**

Weather:



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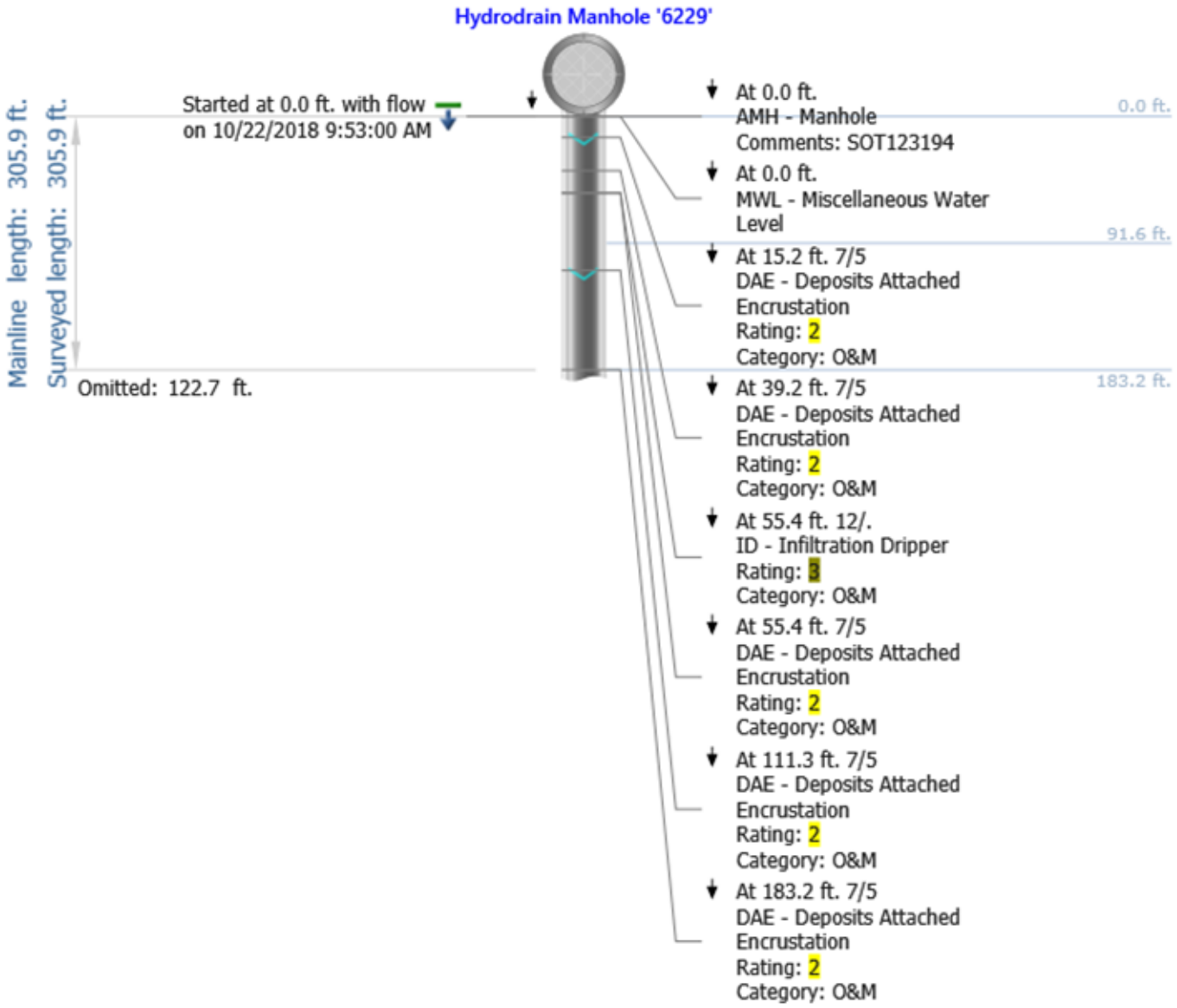
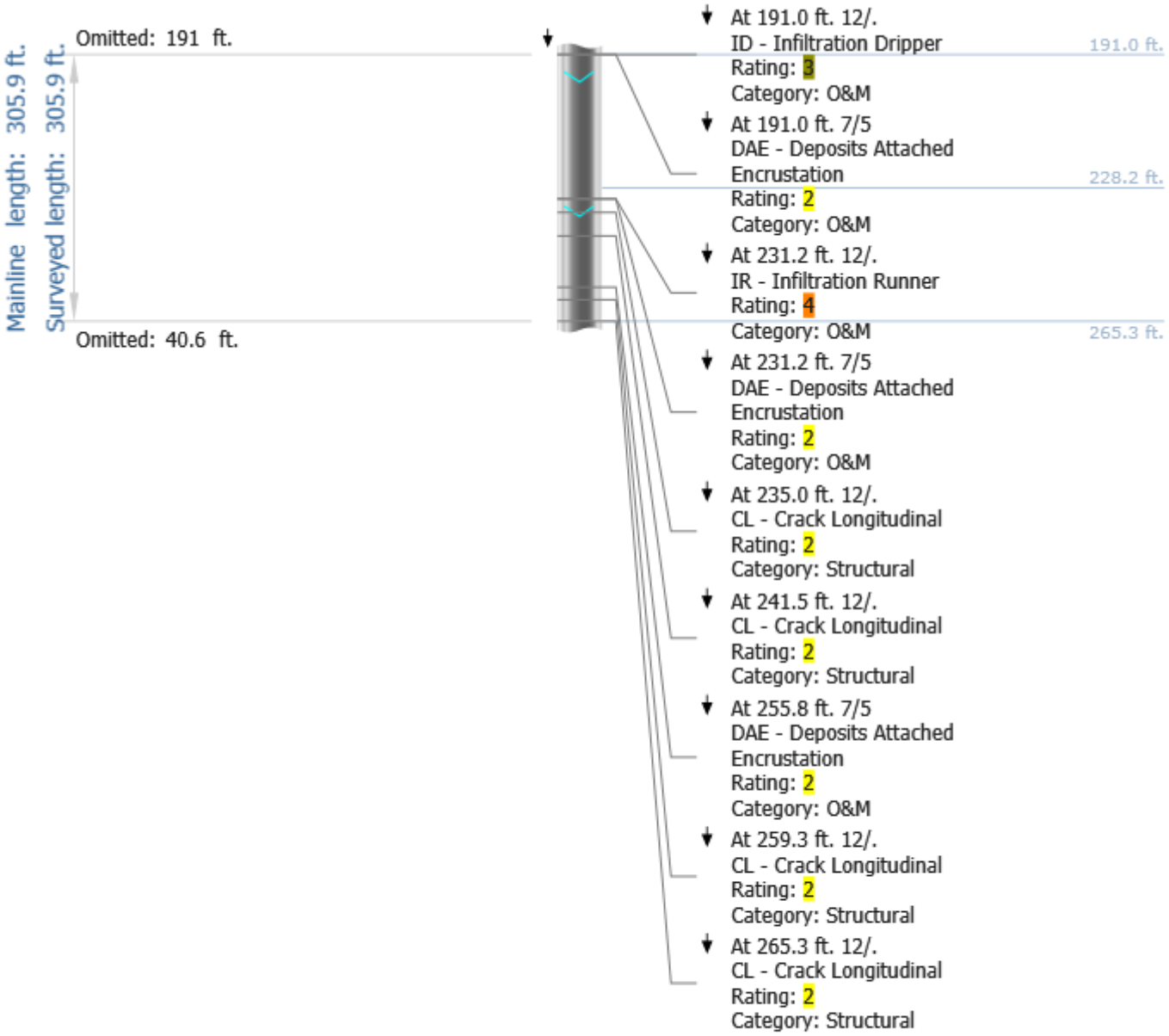
Main Inspections Pipe Run

Project name:	Mainline ID:	City/Village/Township:	Street Address:
FRACASSI DRAIN_PACP	**19677**	**SOUTHFIELD**	**POINCIANA**
Start date/time:	Direction:	Weather:	Location code:
10/22/2018 9:53 AM	**D**		
Shape:	Material:	Height:	Width:
C	**RCP**	**30 in.**	



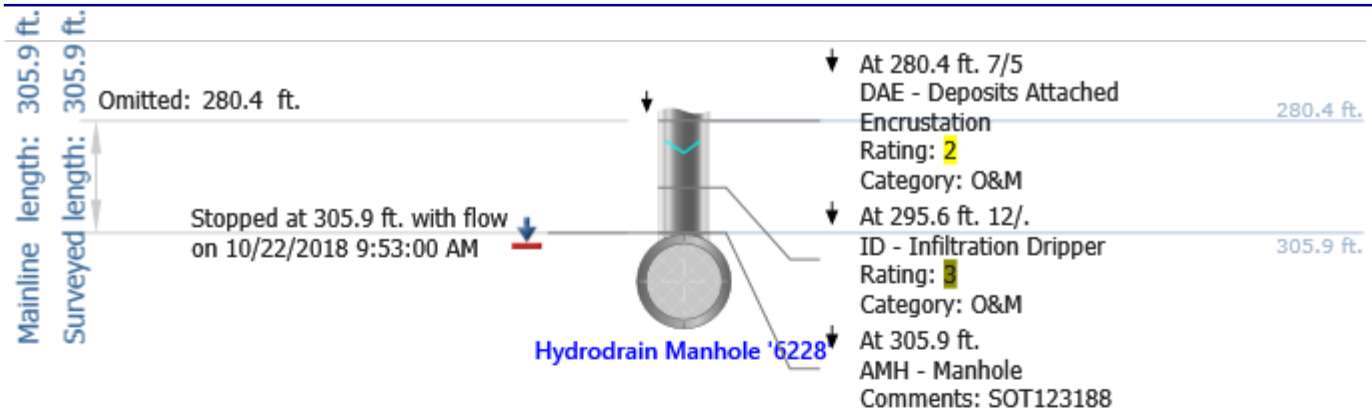
Project name:	Mainline ID:	Start date/time:	Direction:
FRACASSI DRAIN_PACP	**19677**	**10/22/2018 9:53 AM**	**D**

Weather:



Project name:	Mainline ID:	Start date/time:	Direction:
FRACASSI DRAIN_PACP	**19677**	**10/22/2018 9:53 AM**	**D**

Weather:



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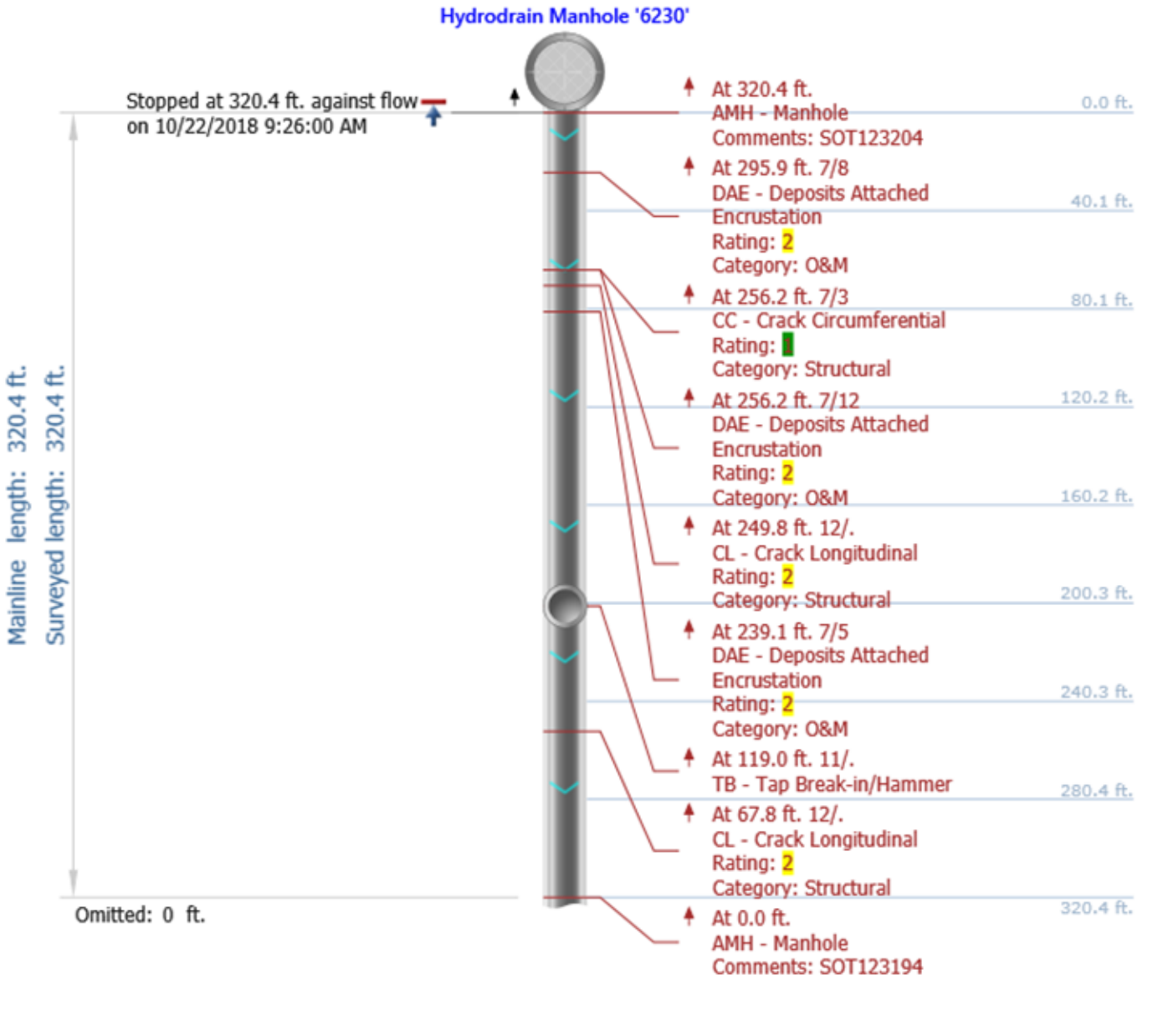
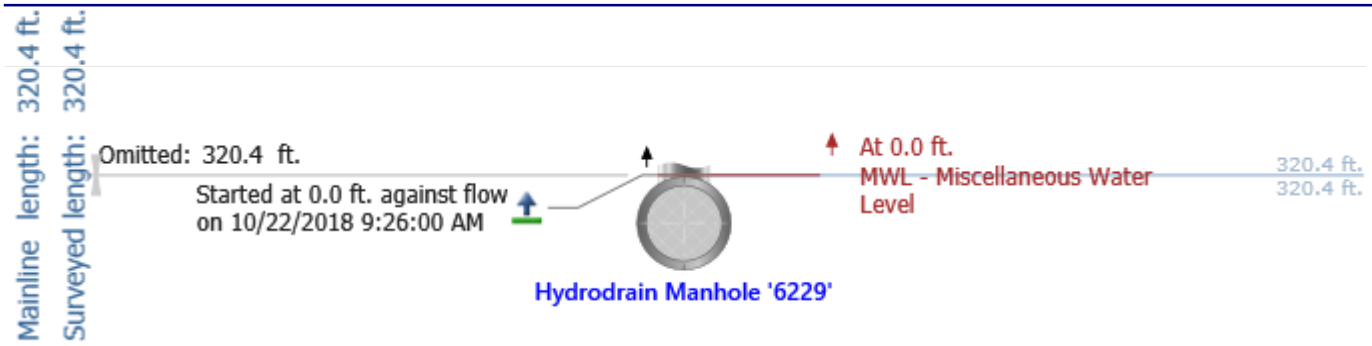
Main Inspections Pipe Run

Project name:	Mainline ID:	City/Village/Township:	Street Address:
FRACASSI DRAIN_PACP	**19688**	**SOUTHFIELD**	**POINCIANA**
Start date/time:	Direction:	Weather:	Location code:
10/22/2018 9:26 AM	**U**		
Shape:	Material:	Height:	Width:
C	**RCP**	**27 in.**	



Project name:	Mainline ID:	Start date/time:	Direction:
FRACASSI DRAIN_PACP	**19688**	**10/22/2018 9:26 AM**	**U**

Weather:



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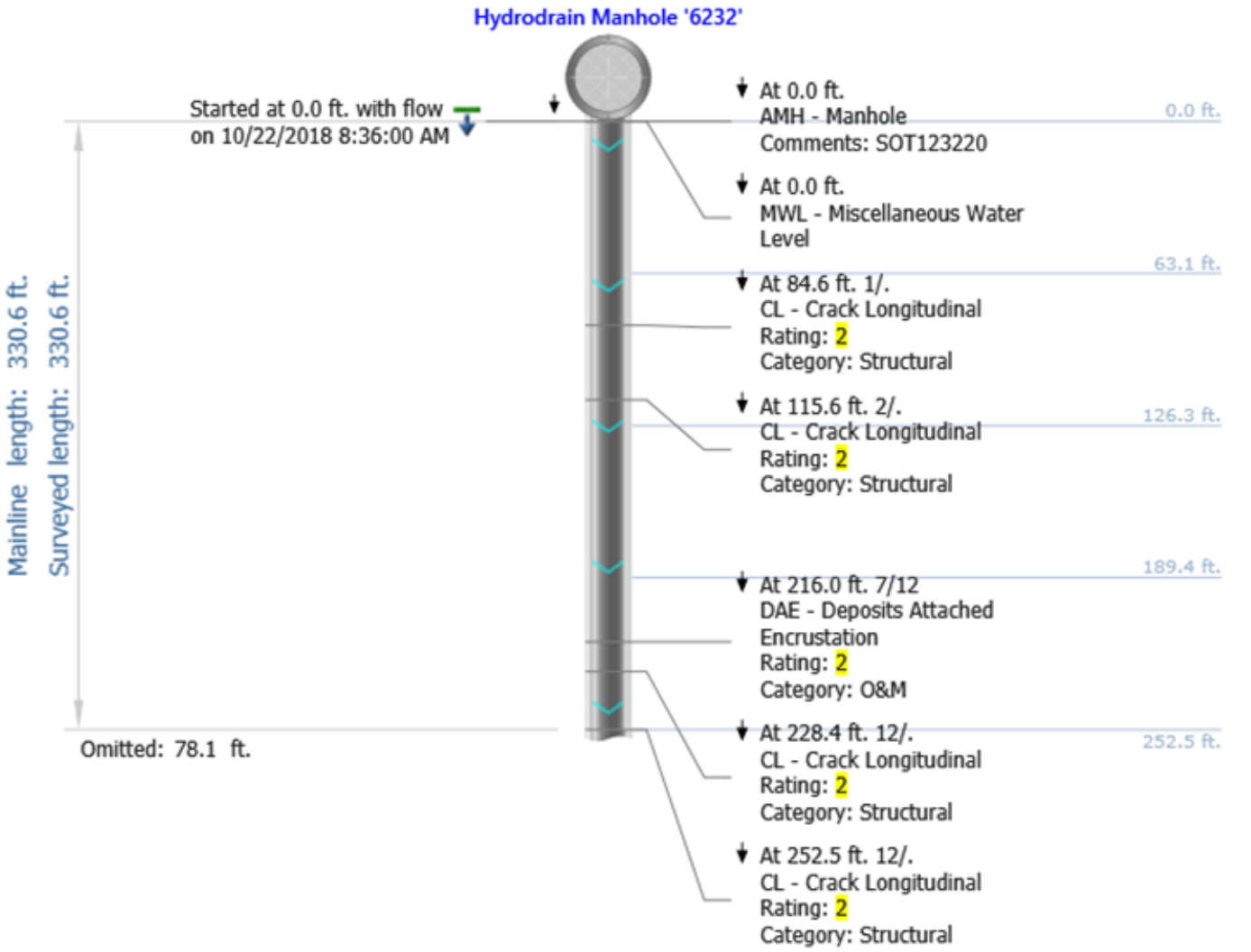
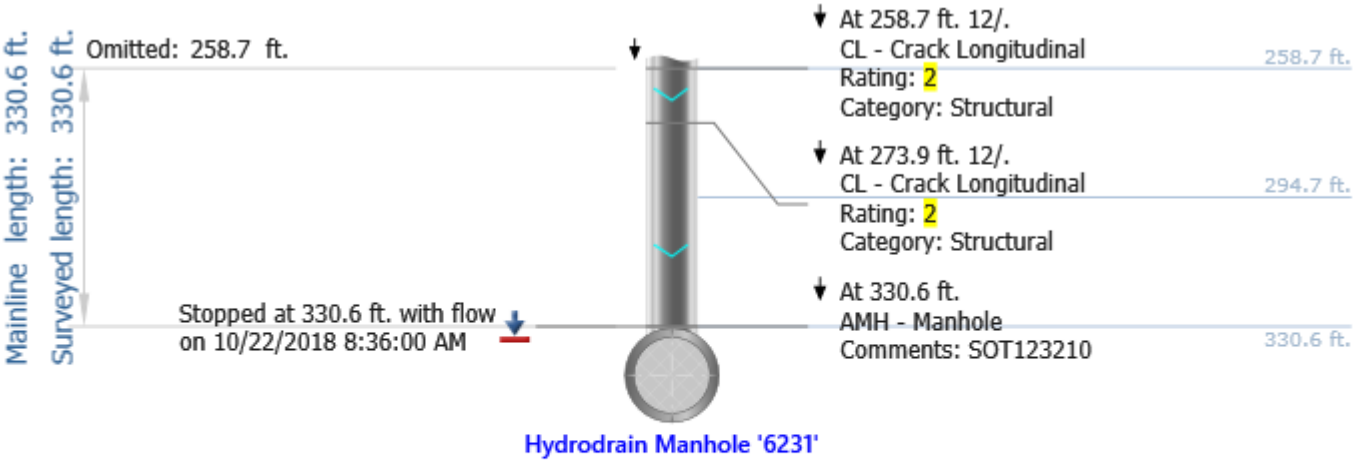
Main Inspections Pipe Run with Images

Project name:	Mainline ID:	City/Village/Township:	Street Address:
FRACASSI DRAIN_PACP	**19696**	**SOUTHFIELD**	**POINCIANA**
Start date/time:	Direction:	Weather:	Location code:
10/22/2018 8:36 AM	**D**		
Shape:	Material:	Height:	Width:
C	**RCP**	**24 in.**	

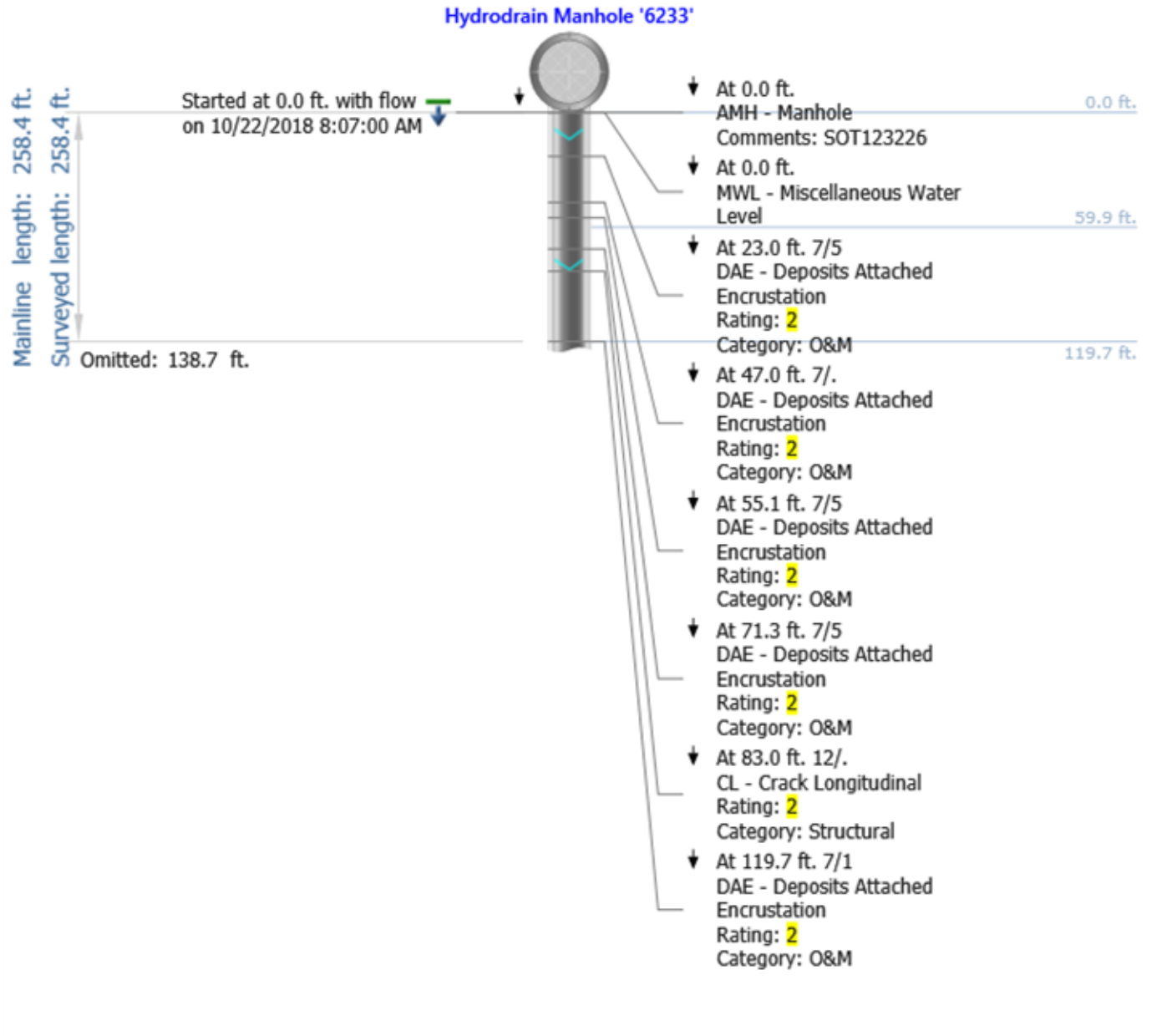



Mainline length: 330.6 ft.
Surveyed length: 330.6 ft.
Omitted: 258.7 ft.
Stopped at 330.6 ft. with flow
on 10/22/2018 8:36:00 AM
At 258.7 ft. 12/.
CL - Crack Longitudinal
Rating: 2
Category: Structural
258.7 ft.
At 273.9 ft. 12/.
CL - Crack Longitudinal
Rating: 2
Category: Structural
294.7 ft.
At 330.6 ft.
AMH - Manhole
Comments: SOT123210
330.6 ft.
Hydrodrain Manhole '6231'

CUES, Inc.
3600 Rio Vista Avenue
Orlando, FL 32805
Phone: 407-849-0190
Fax: 407-425-1569

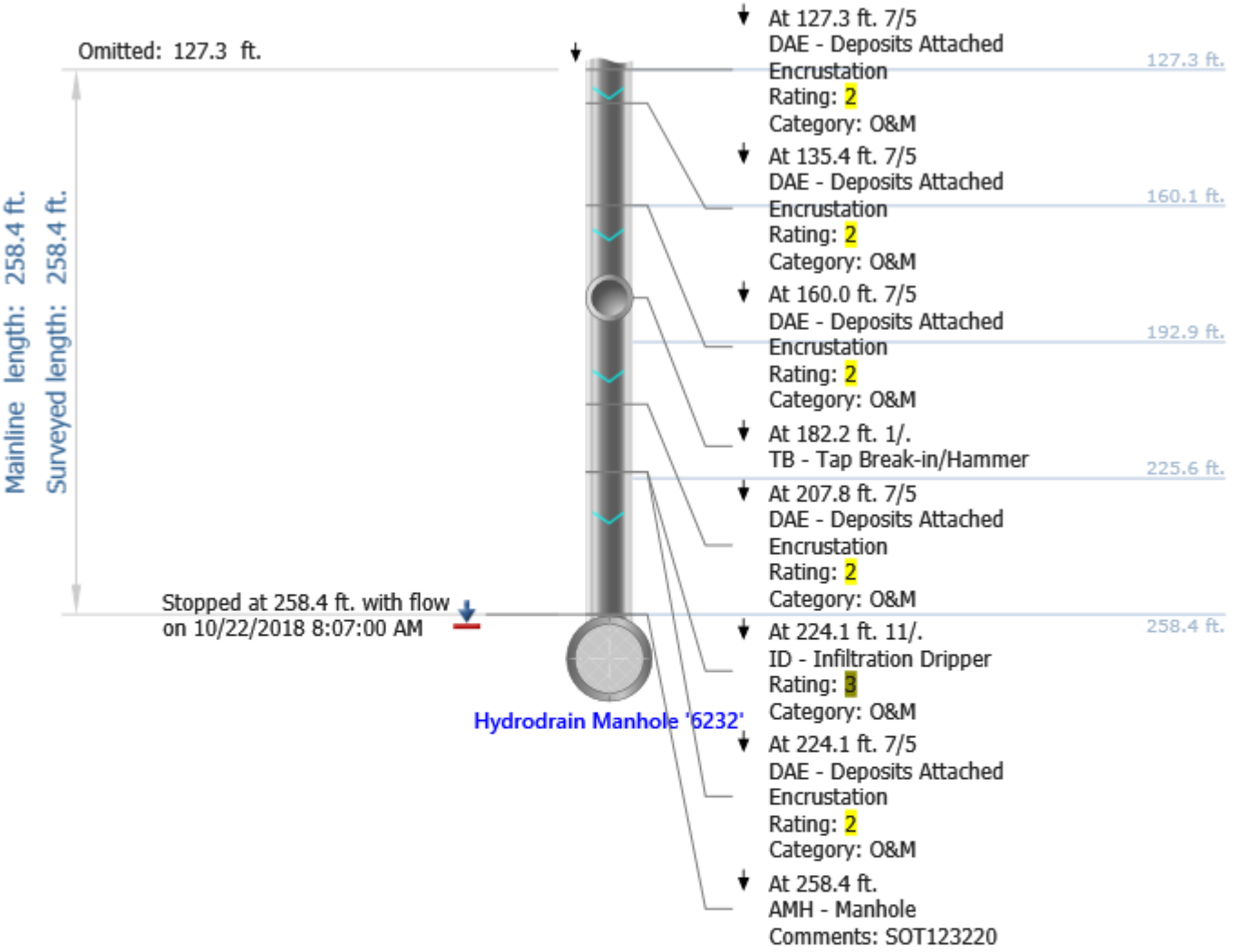
Main Inspections Pipe Run and Map

Project name:	Mainline ID:	City/Village/Township:	Street Address:
FRACASSI DRAIN_PACP	**19699**	**SOUTHFIELD**	**POINCIANA**
Start date/time:	Direction:	Weather:	Location code:
10/22/2018 8:07 AM	**D**		
Shape:	Material:	Height:	Width:
C	**RCP**	**21 in.**	



Project name:	Mainline ID:	Start date/time:	Direction:
FRACASSI DRAIN_PACP	**19699**	**10/22/2018 8:07 AM**	**D**

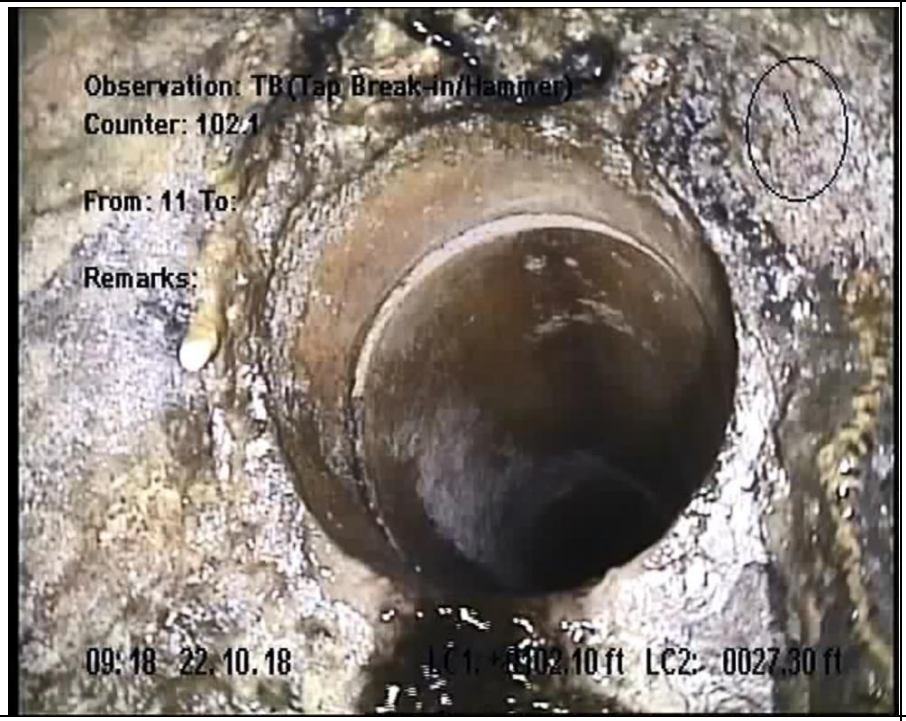
Weather:



Locations and Photos of unidentified Taps to the Fracassi Drain from 2018 CCTV Inspection

6" Clay Tile Tap 182.20 ft. S..of MH SOT123226 @ 21365 Poinciana

6" Clay Tile Tap at 102.1 ft. S. of MH SOT123210 under driveway for 21208 Poinciana



6" Clay Tile Tap 99 ft. S of MH SOT123210 between 21207 and 21121 Poinciana active flow

6" Clay Tile Tap 194.7 ft. S. of MH SOT123210 @ 21185 Poinciana w active Flow

Location of un Identified Taps to the Fracassi Drain from 2018 CCTV Inspection (continued)	
	
6 “Clay Tile Tap 119.0 ft. N of MH SOT123194 between 21120 & 21130 Poinciana	

2016-2018 CCTV Summary Table

GraniteNet
ASSET INSPECTION / DECISION SUPPORT SOFTWARE

CUES, Inc. 3600 Rio Vista Avenue Orlando, FL 32805
Phone: 407-849-0190 Fax: 407-425-1569

CCTV Defects by Inspection

Organization:		City:		Submission date:	
Project name:	**FRACASSI DRAIN_PACP**	Status:	**Completed**	Submitted to:	**Oakland County WRC**
Comments:					

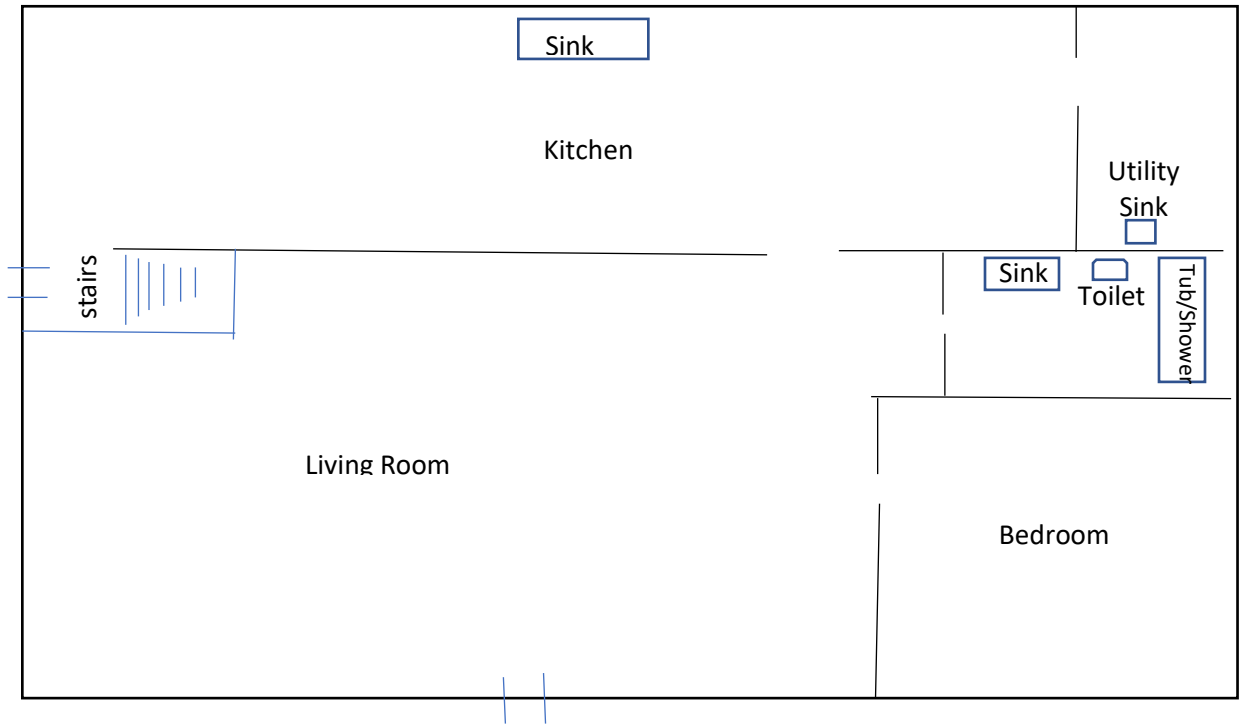
Inspections						Structural conditions							O and M conditions										Misc	
Date/time	Street	Upstream MH	Downstream MH	Dir	Length surveyed	Break in pipe	Collapse	Cracks	Fracture	Deformation	Defective Joints	Defective Lining	Defective Taps	Roots	Grease	Encrustation & Scale	Settled Deposits	Infiltration	Obstruction	Line Deviations	Water Level +20%	Survey Abandoned	Camera Underwater
11/28/2016 11:02 AM	**Adelein**	**6195**	**6194**	**U**	**239.1 ft.**											4		1				1	
11/28/2016 1:41 PM	**Seminole**	**6194**	**6193**	**D**	**20.3 ft.**														4			1	
11/28/2016 1:57 PM	**Seminole**	**6193**	**6192**	**D**	**292.3 ft.**			1								3	58	1					
11/29/2016 8:40 AM	**Seminole**	**6192**	**6191**	**D**	**312.2 ft.**											5	61	1					
11/29/2016 8:57 AM	**Seminole**	**6191**	**6190**	**D**	**347.0 ft.**											2	53						
11/29/2016 9:31 AM	**Seminole**	**6190**	**6241**	**D**	**199.6 ft.**											1	1	1					
11/29/2016 12:46 PM	**Seminole**	**6240**	**6239**	**D**	**249.7 ft.**											2		1					
11/30/2016 9:06 AM	**Seminole**	**6239**	**6238**	**D**	**268.7 ft.**											54		1					
11/30/2016 11:23 AM	**Seminole**	**6238**	**6237**	**D**	**379.8 ft.**								1			2		1					
11/30/2016 1:26 PM	**Seminole**	**6237**	**6236**	**D**	**346.2 ft.**											1		1					
12/1/2016 8:17 AM	**Seminole**	**6236**	**6235**	**D**	**316.5 ft.**			1								5		4					
12/1/2016 9:21 AM	**Byron**	**6242**	**976010**	**D**	**203.8 ft.**											3							
12/1/2016 10:22 AM	**Byron**	**976010**	**6235**	**D**	**104.5 ft.**											2							
12/1/2016 11:08 AM	**Emmett**	**6245**	**6237**	**D**	**312.9 ft.**																		
12/1/2016 12:37 PM	**Seminole**	**6194**	**6193**	**D**	**295.7 ft.**											1		1					
12/5/2016 8:11 AM	**Indian**	**6215**	**6214**	**U**	**165.9 ft.**											2							
12/5/2016 9:08 AM	**Indian**	**6214**	**6213**	**D**	**221.8 ft.**			1								4	1						
12/5/2016 1:05 PM	**Indian**	**6213**	**6212**	**D**	**89.1 ft.**											2						1	
CCTV Defects by Inspection			**Totals**		**10,221.7 ft.**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**93**	**174**	**13**	**4**	**0**	**0**	**3**	**0**

DYE TESTING INSPECTION

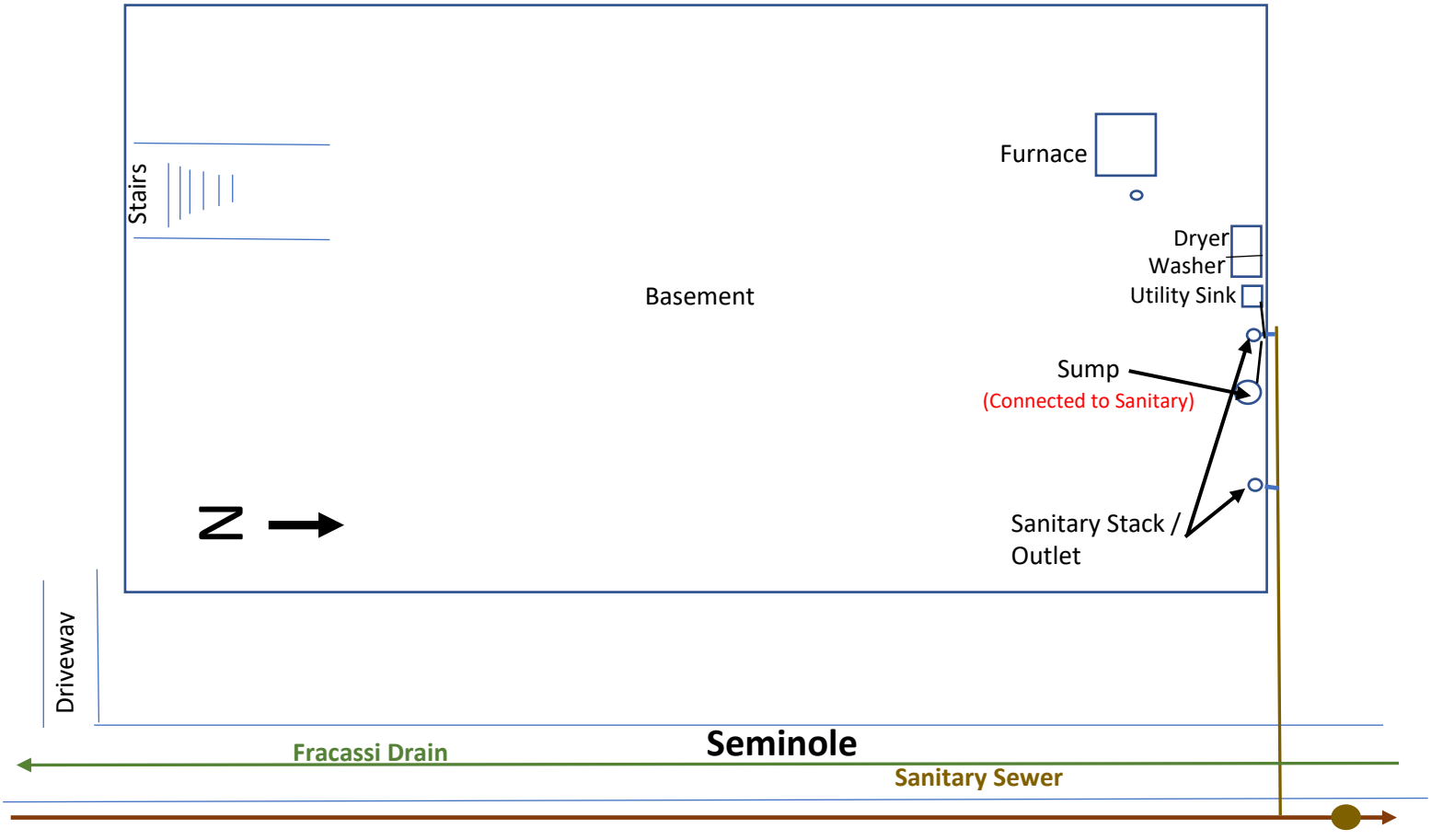
Date: 9/27/18

Address: ____21705 Seminole_____ Contact: __Jennifer McGregor____ Number: __(248) 734-6346___

Upstairs



Downstairs



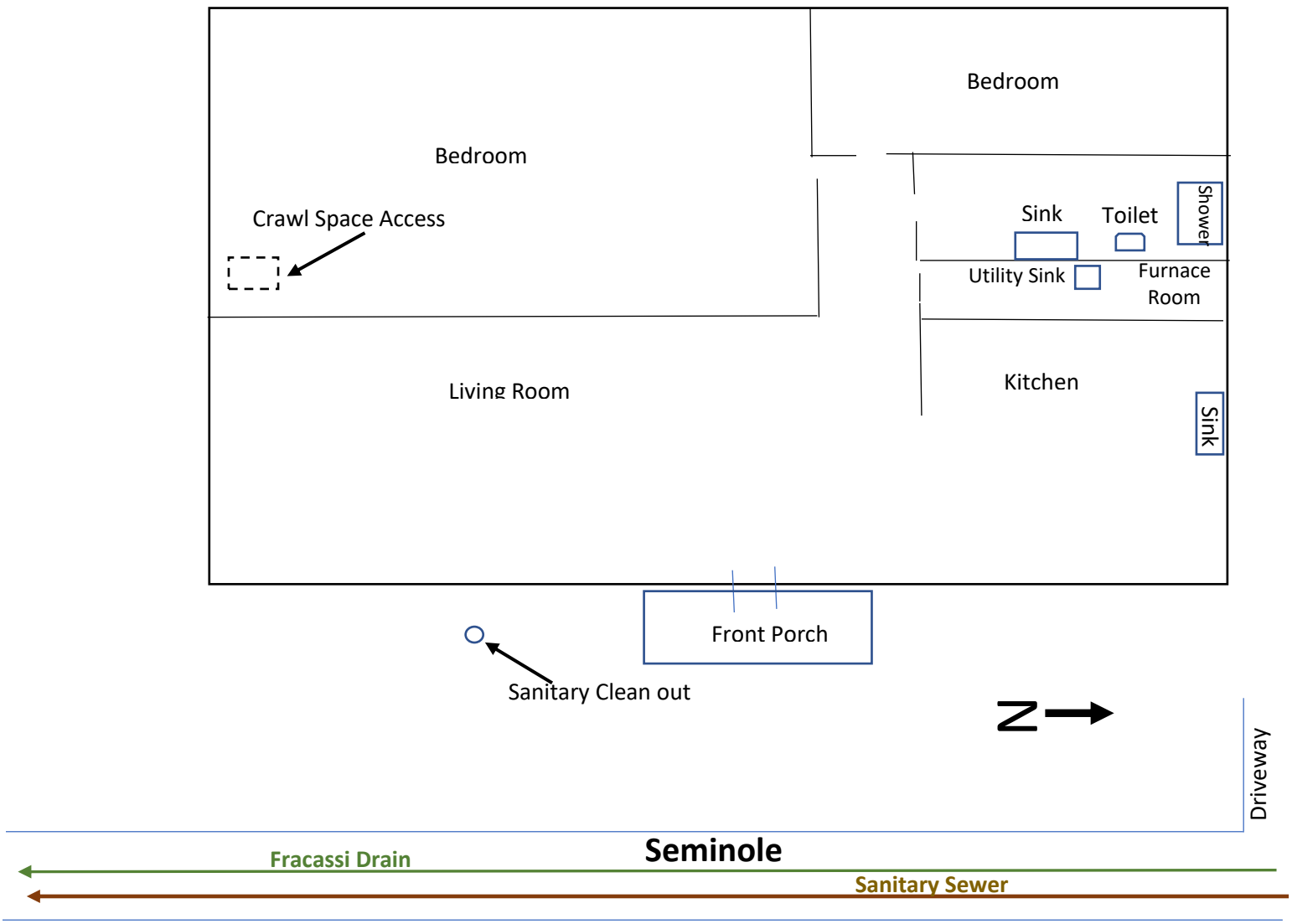
Result: All fixtures connected to the sanitary sewer. The building has 2 sanitary connections. All upstairs fixtures are connected to the E. lead. The basement utility sink, washer and sump are connected to the W. lead.

DYE TESTING INSPECTION

Date: 9/27/18

Address: 21317 Seminole Contact: Dan Borovoy Number: (248) 210-4999

Diagram: One Level House with Crawl Space



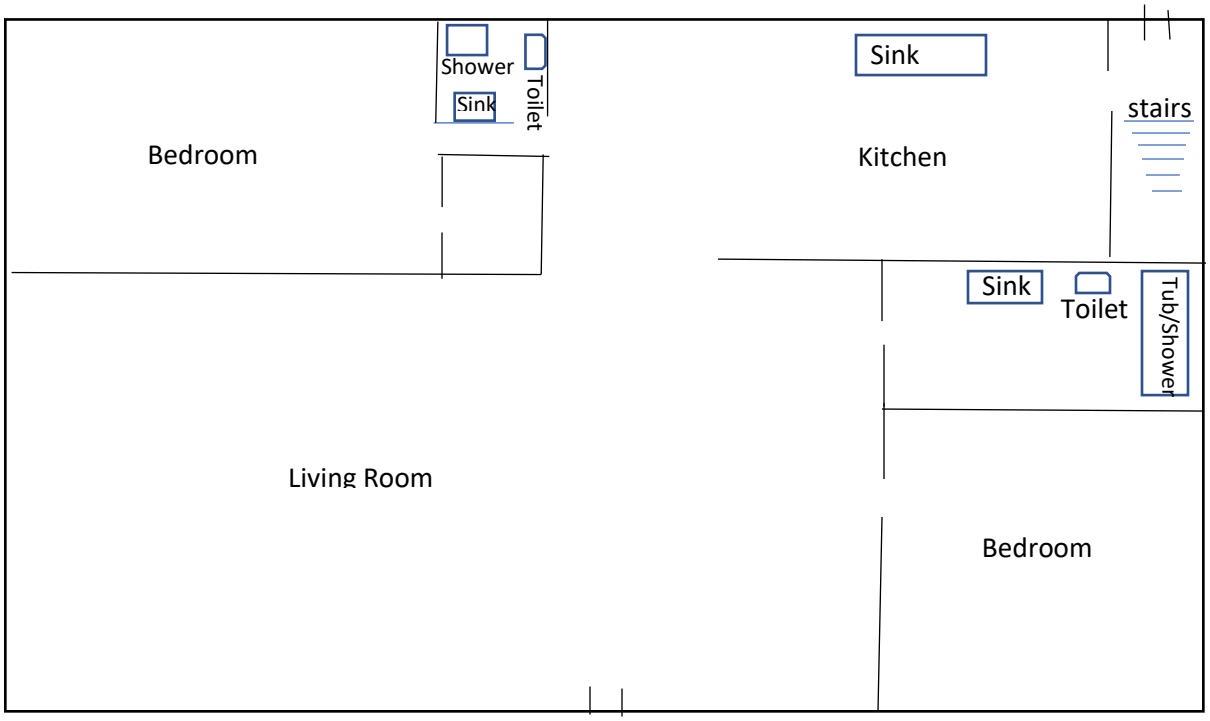
Result: House is 1 level with crawl space. Bathroom and utility room fixtures are connected through cleanout to the sanitary sewer. Kitchen sink is not tied in through the cleanout connection. Flow from kitchen sink did not show up in storm or sanitary sewer

Note: Recent Change in ownership as of September 2018. Homeowner states final inspection was just completed.

Date: 9/13/18

Address: 21341 Seminole Contact: Ray Oliver Number: 248) 352- 4386

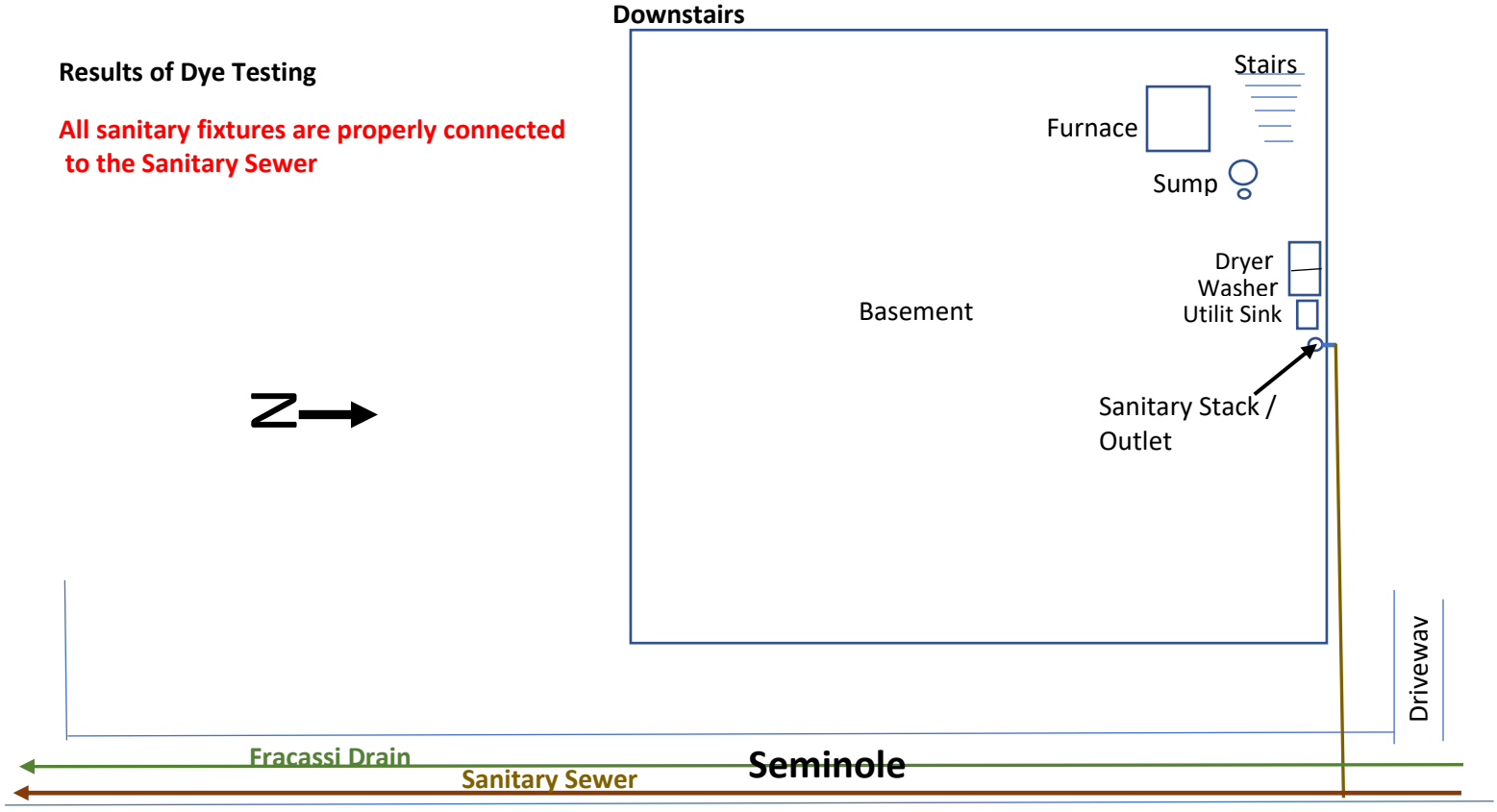
Upstairs



Downstairs

Results of Dye Testing

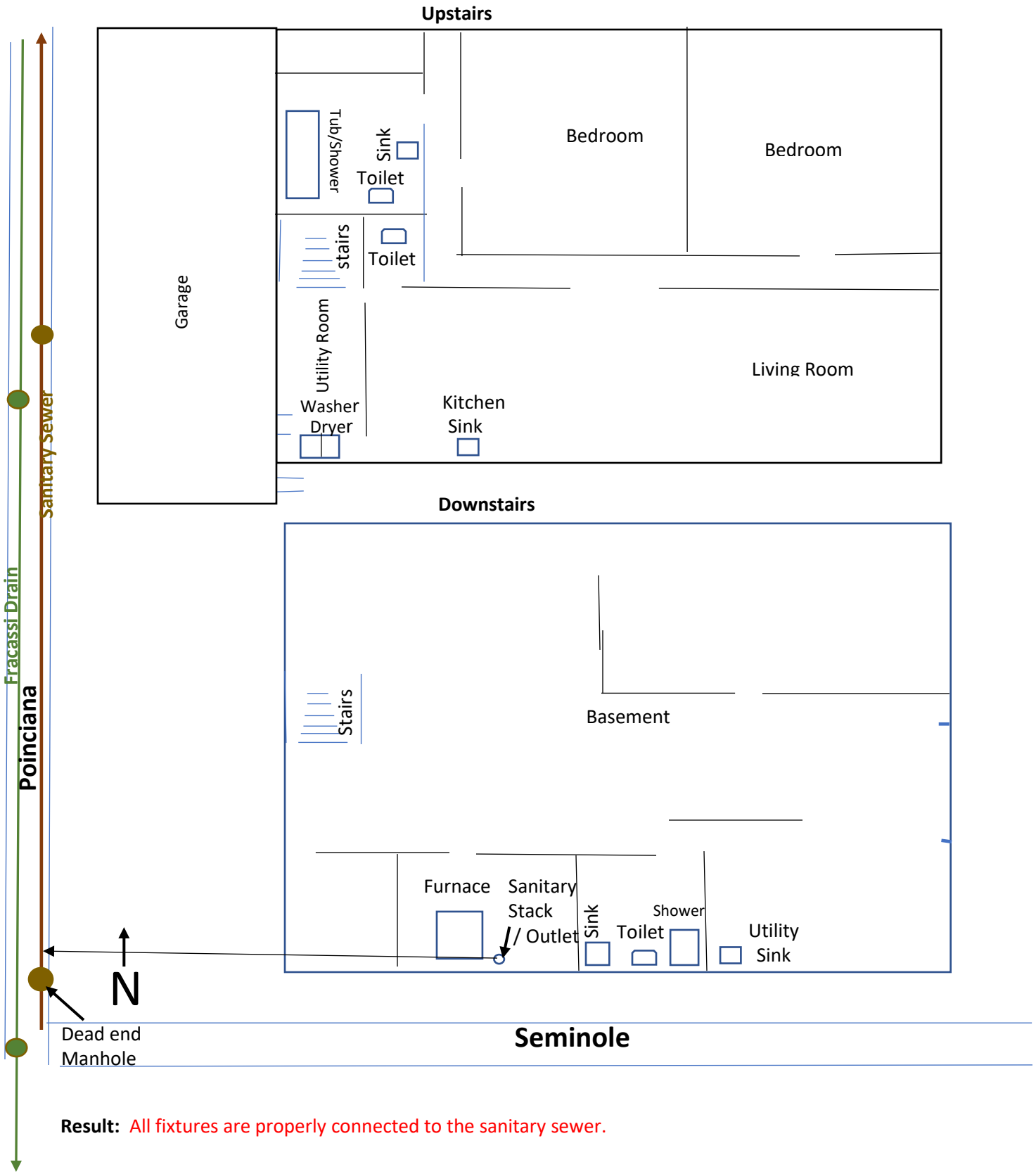
All sanitary fixtures are properly connected to the Sanitary Sewer



DYE TESTING INSPECTION

Date: 12/12/2018

Address: 21120 Poinciana Contact: Laura Wilkinson Number: (248) 6335-2226



Result: All fixtures are properly connected to the sanitary sewer.

WRC
WATER RESOURCES COMMISSIONER
Jim Nash

December 7, 2018

COPY

RICHARD WALSH JR.
21216 POINCIANA ST
SOUTHFIELD MI
48033-5042

RE: Dye Testing of Sanitary Sewer House Leads and Plumbing Fixtures

Dear Water / Sewer Customer:

An investigation and inspection of the storm drainage system in your neighborhood has indicated the presence of sanitary sewage in the storm drain. Some of the homes in your area may have connections to the storm drain instead of the sanitary sewer. Connection of the sanitary service leads to the storm drains is a direct source of pollution to the Rouge River. To determine if this is the case with your residence, our office needs to perform a dyed water test of the plumbing fixtures in your home to verify that they are connected to the sanitary sewer system.

This testing will require entry into your house and will take approximately one hour to complete. During the test, an inspector will flush an approved environmentally safe tracing dye through a representative number of plumbing fixtures in your home and the sanitary sewer and storm drain pipes in the roadway will be monitored for the presence of the dye. The result will be verification of your plumbing system connection.

This test is being done in cooperation with the City of Southfield as part of Federal stormwater permit requirements issued to Oakland County and the City of Southfield. Your cooperation is necessary in helping eliminate this potential public health concern and in protecting and improving water quality in the Rouge River

Please contact our Office between the hours of 8:00 a.m. and 4:30 p.m.at (248) 858-5248 at your earliest convenience to schedule an appointment for dye testing.

Your cooperation in this matter is greatly appreciated.

Respectfully,

Ronald J Fadoir
Environmental Planner
Oakland County Water Resources Commissioner's Office.

CC:
Brandy Bakita Siedlaczek, City of Southfield

One Public Works Drive • Building 95 West • Waterford, MI 48328-1907
Phone: 248.858.0958 • Fax: 248.858.1066 • www.oakgov.com/water

APPENDIX C –SAMPLING RESULTS

2018 Rouge IDEP Sampling Results

Sample Date	Time	CVT	Drain Name	Sample Identification	Sample Location	Parameter	Results	Units	Lab
7/13/2018	12:29 PM	Farmington	US 16 Drain	Outlet @ Rouge River	Outlet in W. side of Bridge @ Rouge River	E. coli	2814	CFU/100 ML	WLN
7/13/2018	12:41 PM	Farmington	US 16 Drain	US 16 MH 04	MH on Shiawassee @ Warner	E. coli	5310	CFU/100 ML	WLN
7/13/2018	12:55 PM	Farmington	US 16 Drain	US 16 MH 02	MH on Shiawassee @ Grace St	E. coli	3894	CFU/100 ML	WLN
7/13/2018	1:01 PM	Farmington	US 16 Drain	US 16 MH 08	MH at NE Corner of Shiawassee @ Lotus St	E. coli	100	CFU/100 ML	WLN
8/29/2018	10:07 AM	Southfield	8 Mile Drain	8 Mile Drain Outlet	In E. wall of 8 Mile Bridge Crossing	E. coli	866	CFU/100 ML	WLN
8/29/2018	10:10 AM	Southfield	Rouge River	Rouge @ 8 Mile	Rouge @ N side of 8 Mile Rd Bridge Crossing	E. coli	1246	CFU/100 ML	WLN
8/29/2018	10:07 AM	Southfield	8 Mile Drain	8 Mile Drain Outlet	In E. side of 8 Mile Bridge Crossing	MST	1,486.80	Gene Copies / 100 ml +/-	MSU
8/29/2018	10:10 AM	Southfield	Rouge River	Rouge @ 8 Mile	Rouge @ N side of 8 Mile Rd Bridge Crossing	MST	3,697.33	Gene Copies / 100 ml +/-	MSU
10/18/2018	10:00 AM	Southfield	8 Mile Drain	A-77+27	633 Feet West of MH 7	E. coli	<50	CFU / 100 ML	WLN
10/18/2018	10:30 AM	Southfield	8 Mile Drain	B-48+00	MH 5	E. coli	1035	CFU / 100 ML	WLN
10/18/2018	10:45 AM	Southfield	8 Mile Drain	C-36+77	MH 4	E. coli	50	CFU / 100 ML	WLN
10/18/2018	11:00 AM	Southfield	8 Mile Drain	D-31+10	MH 3	E. coli	<50	CFU / 100 ML	WLN
10/18/2018	11:30 AM	Southfield	8 Mile Drain	E-22+17	657 Feet East of MH 2	E. coli	555	CFU / 100 ML	WLN
10/18/2018	12:00 PM	Southfield	8 Mile Drain	F-15+60	MH 2	E. coli	100	CFU / 100 ML	WLN
10/30/2018	9:30 AM	Southfield	8 Mile Drain	A-174+20	MH 14	E. coli	50	CFU / 100 ML	WLN
10/30/2018	10:00 AM	Southfield	8 Mile Drain	B-182+55	410 Feet East of MH 15	E. coli	<50	CFU / 100 ML	WLN
10/30/2018	10:20 AM	Southfield	8 Mile Drain	C-171+37	283 Feet West of MH 14	E. coli	50	CFU / 100 ML	WLN
10/30/2018	11:00 AM	Southfield	8 Mile Drain	D-145+01	1042 Feet East of MH 12	E. coli	<50	CFU / 100 ML	WLN
10/30/2018	11:00 AM	Southfield	8 Mile Drain	E-143+39	880 Feet East of MH 12	E. coli	<50	CFU / 100 ML	WLN
10/30/2018	11:30 AM	Southfield	8 Mile Drain	F-128+91	MH 11	E. coli	11640	CFU / 100 ML	WLN
10/30/2018	12:00 PM	Southfield	8 Mile Drain	G-99+50	MH 8	E. coli	<50	CFU / 100 ML	WLN
8/29/2018	11:35 AM	Southfield	Fracassi Drain	MH 6217	MH @ SW corner of Byron St	E. coli	1440	CFU/100 ML	WLN
8/29/2018	11:59 AM	Southfield	Fracassi Drain	MH 6209	N. Inlet from Indian to MH on Byron St	E. coli	155	CFU/100 ML	WLN
8/29/2018	12:15 PM	Southfield	Fracassi Drain	MH 6219	N. Inlet from Negaunee to MH on Byron St	E. coli	3615	CFU/100 ML	WLN
8/29/2018	12:35 PM	Southfield	Fracassi Drain	MH 6227	N. Inlet from Poinciana to MH on Byron St	E. coli	3865	CFU/100 ML	WLN
8/29/2018	12:50 PM	Southfield	Fracassi Drain	MH 6235	N. inlet from Seminole to MH on Byron St.	E. coli	3436	CFU/100 ML	WLN
8/29/2018	11:35 AM	Southfield	Fracassi Drain	MH 6217	MH @ SW corner of Byron St	MST	616.93	Gene Copies / 100 ml +/-	MSU
8/29/2018	11:59 AM	Southfield	Fracassi Drain	MH 6209	N. Inlet from Indian to MH on Byron St	MST	ND	Gene Copies / 100 ml +/-	MSU
8/29/2018	12:15 PM	Southfield	Fracassi Drain	MH 6219	N. Inlet from Negaunee to MH on Byron St	MST	503.47	Gene Copies / 100 ml +/-	MSU

8/29/2018	12:35 PM	Southfield	Fracassi Drain	MH 6227	N. Inlet from Poinciana to MH on Byron St	MST	424.8	Gene Copies / 100 ml +/-	MSU
8/29/2018	12:50 PM	Southfield	Fracassi Drain	MH 6235	N. inlet from Seminole to MH on Byron St.	MST	385.47	Gene Copies / 100 ml +/-	MSU
9/18/2018	11:59 AM	Southfield	Fracassi Drain	MH 6209	Across John Grace Community Center	E. coli	324	CFU / 100 ML	WLN
9/18/2018	12:01 PM	Southfield	Fracassi Drain	MH 6211	MH @ Indian & Emmett	E. coli	927	CFU / 100 ML	WLN
9/18/2018	12:06 PM	Southfield	Fracassi Drain	MH 6222	MH @ Negaunee & Sedalia	E. coli	58,156	CFU / 100 ML	WLN
9/18/2018	12:10 PM	Southfield	Fracassi Drain	MH 6220	MH @ Negaunee & Emmett	E. coli	69,767	CFU / 100 ML	WLN
9/18/2018	12:25 PM	Southfield	Fracassi Drain	MH 6229	MH @ Poinciana & Emmett	E. coli	29,550	CFU / 100 ML	WLN
9/18/2018	12:28 PM	Southfield	Fracassi Drain	MH 6231	MH @ Poinciana & Sedalia	E. coli	42,764	CFU / 100 ML	WLN
9/18/2018	12:31 PM	Southfield	Fracassi Drain	MH 6190	MH @ Seminole & Shiawassee	E. coli	89,553	CFU / 100 ML	WLN
9/18/2018	12:40 PM	Southfield	Fracassi Drain	MH 6239	MH @ Seminole & Sedalia	E. coli	42,094	CFU / 100 ML	WLN
9/18/2018	12:44 PM	Southfield	Fracassi Drain	MH 6237	MH @ Seminole & Emmett	E. coli	18,234	CFU / 100 ML	WLN
9/18/2018	12:50 PM	Southfield	Fracassi Drain	MH 6245	MH @ Inkster & Emmett (Tap to Hazel Drain)	E. coli	1273	CFU / 100 ML	WLN
9/18/2018	1:00 PM	Southfield	Fracassi Drain	MH 6196	MH @ Inkster & Adeline	E. coli	26,199	CFU / 100 ML	WLN
12/11/2018	11:30 AM	Bloomfield Twp.	CH Stevens No 3 Drain	MH 408	MH in front of 5158 Charring Cross	E. coli	27837	CFU / 100 ML	WLN
12/11/2018	11:40 AM	Bloomfield Twp.	Local Storm Drain	408 B	Drainage Ditch N of MH 408	E. coli	2,263	CFU / 100 ML	WLN
12/11/2018	11:45 AM	Bloomfield Twp.	CH Stevens No 3 Drain	MH 410	MH in front of 4133 Charring Cross	E. coli	13,387	CFU / 100 ML	WLN
12/11/2018	11:57 AM	Bloomfield Twp.	CH Stevens No 3 Drain	MH 407	MH in lawn of 476 Steeple Chase	E. coli	8,200	CFU / 100 ML	WLN
12/11/2018	12:07 PM	Bloomfield Twp.	CH Stevens No 3 Drain	MH 7318	MH located N W of MH 407	E. coli	10,932	CFU / 100 ML	WLN
12/11/2018	12:17 PM	Bloomfield Twp.	Local Storm Drain	7317 A	Drainage Ditch Inlet to CB 13369	E. coli	50	CFU / 100 ML	WLN
12/11/2018	12:19 PM	Bloomfield Twp.	CH Stevens No 3 Drain	7317 B	CB 13369 connected to MH 7317	E. coli	364	CFU / 100 ML	WLN
12/11/2018	12:30 PM	Bloomfield Twp.	CH Stevens No 3 Drain	7317	MH off Charring cross at east property edge for 493 Whippers Ln.	E. coli	40,259	CFU / 100 ML	WLN
12/11/2018	12:38 PM	Bloomfield Twp.	Local Storm Drain	7316 A	Beehive CB in Back Yard of 482 Whipper Ln & 475 Steeple Chase	E. coli	31,554	CFU / 100 ML	WLN
12/18/2018	11:48 AM	Bloomfield Twp.	CH Stevens No. 3 Drain	7316	MH W of 7317, Back Yard 0f 482 Whippers Ln	E. coli	826,00	CFU / 100 ML	WLN
12/18/2018	11:51 AM	Bloomfield Twp.	Local Storm Drain	Whippers Ln.	MH In Whippers Ln cull-de-sac	E. coli	9,406	CFU / 100 ML	WLN
12/18/2018	12:06 PM	Bloomfield Twp.	Local Storm Drain	Steeple Chase	CB in Steeple Chase cull-de sac	E. coli	960	CFU / 100 ML	WLN
12/18/2018	12:27 PM	Bloomfield Twp.	Local Storm Drain	Hunt Master	MH in Hunt Master cull-de-sac	E. coli	3,546	CFU / 100 ML	WLN
12/13/2018	10:58 AM	Bloomfield Twp.	CH Stevens No 4 Drain	7315	Near Street @ 4872 Burnley	E. coli	1054	CFU / 100 ML	WLN
12/13/2018	12:00 PM	Bloomfield Twp.	CH Stevens No 4 Drain	7312	In Front of 4820 Tullamore	E. coli	89,000	CFU / 100 ML	WLN

12/13/2018	**12:23 PM**	**Bloomfield Twp.**	**CH Stevens No 4 Drain**	**420**	**S of Drive for 4848 Haddington**	**E. coli**	**203,000**	**CFU / 100 ML**	**WLN**
12/13/2018	**12:50 PM**	**Bloomfield Twp.**	**CH Stevens No 4 Drain**	**417**	**MH in Easement to Road Inlet MH 417**	**E. coli**	**2,506**	**CFU / 100 ML**	**WLN**
12/13/2018	**12:45 PM**	**Bloomfield Twp.**	**Local Storm Drain**	**417 A**	**In Dover at Kensington**	**E. coli**	**252,000**	**CFU / 100 ML**	**WLN**
12/17/2018	**9:22 AM**	**Bloomfield Twp.**	**Local Storm Drain**	**Dover 2**	**CB w. of drive at 4790 Dover St.**	**E. coli**	**980**	**CFU / 100 ML**	**WLN**
12/17/2018	**9:50 AM**	**Bloomfield Twp.**	**Local Storm Drain**	**Dover 4**	**MH in Charring Cross at Dover St**	**E. coli**	**<50**	**CFU / 100 ML**	**WLN**
12/17/2018	**10:00 AM**	**Bloomfield Twp.**	**Local Storm Drain**	**Dover 5**	**CB N. of Charring Cross / Dover Intersection**	**E. coli**	**155**	**CFU / 100 ML**	**WLN**
12/220/2018	**8:53 AM**	**Bloomfield Twp.**	**Local Storm Drain**	**Dover 1**	**CB w. of drive at 4810 Dover St.**	**E. coli**	**155**	**CFU/100 ML**	**WLN**