

**REGIONAL WATER QUALITY CONTROL BOARD  
SAN DIEGO REGION**

**EXECUTIVE OFFICER SUMMARY REPORT  
November 13, 2024**

**ITEM 9**

**SUBJECT**

Report on the Responses to the Directives of Investigative Order R9-2019-0014 to Identify and Quantify the Sources and Transport Pathways of Human Fecal Material to the Lower San Diego River Watershed. (*Jimmy Smith*)

**STAFF RECOMMENDATION**

Informational item only; no recommendation.

**KEY ISSUES**

1. Results of monitoring conducted by the Southern California Coastal Water Research Project (SCCWRP) revealed uniformly high enterococci concentrations and detectable levels of a human-associated fecal source marker HF183 during two storm events at all thirteen monitoring stations that had flowing water in the 2016 and 2017 wet seasons at locations in the San Diego River and its tributaries from the mouth of the River to the City of Lakeside in the Lower San Diego River Hydrologic Area. In partial response to these results, Investigative Order R9-2019-0014 (Supporting Document No. 1) was issued in June 2019 to identify and quantify the sources and transport pathways of human fecal waste to the lower San Diego River.
2. The Responsible Parties contracted with SCCWRP to perform the technical investigations. The sewer exfiltration investigations required innovative techniques that included the development of a prototype testing apparatus, and the assessment of biofilms associated with sewer and storm drain linings.
3. To overcome the challenges of co-occurring human and non-human fecal pollution, HF183 (gene sequence of *Bacteroides*) was selected as the proxy for human fecal waste. While HF 183 is generally a reliable indicator of human fecal material, it is not believed to move through and persist in the environment in the same manner as viral pathogens usually at the center of human health impacts related to contact recreation. The investigative studies were not designed to assess human health risk nor impacts that affect the REC1 Beneficial Use of Contact Recreation; only to assess pathways and loading of human fecal waste by measuring for HF 183.
4. After five years of investigating the suspected sources, sanitary sewer overflows (SSOs) and exfiltration from the public sewage collection system were the two largest sources of human fecal waste to the lower San Diego River watershed. Onsite Waste Treatment Systems (OWTS) were identified as the third largest source, with significantly smaller contributions from private laterals, private SSOs, illicit connections and illegal discharges (IC/ID) and encampments.

5. Smaller loadings from other sources should not necessarily be equated with lower threat to beneficial uses. Proximity to high use recreational areas in time and distance may disproportionately impact more recreators during warm parts of the year. Better understanding of management prioritization of identified sources of human fecal waste is needed.
6. The investigative studies focused on wet weather sources after dry weather sampling revealed relatively low levels of HF 183 in receiving waters. Yet sewer exfiltration is a year-round issue highlighting the contrast between year-round discharges to the environment (soil, groundwater) vs wet weather detections in surface waters and storm drains. Better understanding of subsurface transport mechanisms is needed.
7. Public SSOs continue to occur in both dry and wet weather with roughly equal loading occurring between the two seasons. With spill frequency appearing to decrease, the biggest SSOs provide more and more of the total annual loading that remains relatively constant over time.
8. Both private lateral spills and loading seem to be increasing, yet the exact amount is unknown due to the voluntary nature of spill reporting.
9. This informational item is not a compliance assessment on the Responsible Parties submittals in response to the Directives of the Investigative Order.

## **PRACTICAL VISION**

The Investigative Order advances the Monitoring and Assessment chapter of the Practical Vision. Identifying and quantifying the relative contributions of sources of human fecal material in dry and wet weather discharges to the Lower San Diego River watershed is necessary to the development of a prioritization strategy that targets and abates sources of human fecal material. The Investigative Studies have increased understanding of the sources of such discharges and should evolve management measures in preventing the discharges.

## **DISCUSSION**

### **Background**

Water quality that supports the Contact Recreation Beneficial Use (REC1) is a long-standing priority of the San Diego Water Board. Two Total Maximum Daily Loads (TMDLs) (Project 1 – Twenty Beaches and Creeks in the San Diego Region and Project II – Baby Beach in Dana Point Harbor and Shelter Island Shoreline Park in San Diego Bay) were adopted to address fecal indicator bacteria (FIB) throughout the region. A Cost Benefit Analysis was conducted in 2015 to assess possible changes to water quality objectives supporting REC1 and found that targeting human sources is the most cost-effective strategy to improve public health. The development of a Key Use Key Area strategy by the San Diego Water Board in 2018 identified REC1 as a Key Use and oceans, bays and stream systems as Key Areas. Sewage spills affecting REC1 have also consistently ranked as one of the top enforcement priorities for the San Diego Water Board.

Starting in the winter of 2014 a Surfer Health Study (SHS) was conducted to determine if the REC1 Beneficial Use was supported in wet weather. Epidemiological studies conducted at beaches across San Diego County (including those at the mouth of the San Diego River) showed an increased rate of gastrointestinal illness following contact recreation in the ocean. Water quality sampling associated with the SHS revealed frequent detections of human pathogens, HF 183 and elevated concentrations of enterococci in the San Diego River. In particular, norovirus was detected in 96 percent of the samples and HF 183 was detected in 100 percent of the samples. Follow-up microbial source tracking up the San Diego River and its tributaries confirmed the troubling water quality findings when HF 183 was detected in 100 percent of the samples at all stations. In response to these results, the Investigative Order was issued in June 2019 to identify and quantify the sources and transport pathways of human fecal material to the Lower San Diego River.

The Investigative Order was issued to owners and operators of municipal storm sewer systems, public agencies owning sanitary sewer collection agencies, the County of San Diego who has responsibility for permitting the installation of and regulating onsite wastewater treatment systems (OWTS), and local entities holding land use authority over properties where encampments existed and were suspected of discharging human waste to the environment. The Responsible Parties are:

City of San Diego	County of San Diego
City of Santee	City of El Cajon
City of La Mesa	San Diego State University
California Department of Transportation	Metropolitan Transit System
Padre Dam Municipal Water District	San Diego County Sanitation District

### Technical Investigations

The Responsible Parties tasked SCCWRP with estimating pollutant loading of human fecal waste from public sewer system exfiltration, private lateral exfiltration, encampments, IC/ID, and faulty OWTS and SSOs. A Steering Committee (SC) was formed that included the Responsible Parties and representatives from the San Diego River Park Foundation, San Diego Coastkeeper, and the San Diego Water Board. A Technical Review Committee (TRC) was also formed and consisted of six national thought leaders representing hydrology, microbiology, social science, sanitary sewer engineering, stormwater engineering, and public health. From 2019 to 2024, the Responsible Parties timely submitted work plans and progress reports, while the SC met at least twice a year to discuss issues and results. Final estimates were timely submitted in *Summary of Technical Research: Quantifying the Sources of Human Fecal Pollution in the Lower San Diego River Watershed* (often mentioned as Volume 1 but not titled as such) (Supporting Document No. 2).

Loading estimates focused on wet weather discharges as dry weather detections of HF 183 were much less frequent and an order of magnitude lower in concentration. Those dry weather samples producing quantifiable concentrations of HF 183 were traced to site-specific human sources (specifically an SSO and an encampment). The choice to focus on wet weather discharges may have too quickly discounted dry weather conditions. SSO spill volumes were approximately equal between dry and wet weather conditions. The

classification of SSOs as occurring in either wet or dry weather is under further scrutiny and may alter loading estimates between the two hydrologic conditions. The dry weather sampling even detected one SSO further validating that spills from the public collection system are a year-round impact to receiving waters. Dry weather sampling was also the basis for IC/ID loading estimates.

Study design also differed as loading estimates from SSOs, encampments and private laterals were measured as discharges to the environment (soil); while estimates from OWTS and IC/ID were measured as detections in receiving waters. Public sewage collection system exfiltration was the most extensively investigated. Loading estimates were made both from a unique, custom-built prototype sampler that measured sewer pipe volume loss and by detecting the presence and measuring the concentration of biofilms (with genetic signatures unique to sewer systems) in receiving waters.

Results show SSOs and exfiltration from the public sewage collection system as the two largest sources of human fecal waste to the lower San Diego River Watershed. Onsite Waste Treatment Systems (OWTS) were identified as the third largest source, with significantly smaller contributions from private laterals and encampments. The contributions of IC/ID were the least of all. The sum of all source estimates approximates the total loading as measured near the bottom of the watershed, thus providing another line of evidence supporting the accuracy of study findings.

It must be noted that the technical studies were not intended to identify 'hot spots' of human waste sources nor to estimate human risk from exposure to human fecal waste in the environment. The low-level detections of HF 183 at approximately thirty percent of the stations in dry weather presents an interesting opportunity for further investigations. Understanding the mechanism of sub-surface transport from discharge to detection is one area needing further study. Better understanding the relationship and behavior differences in the environment of HF 183 and pathogens causing human illness needs assessment as well. A prioritized reduction strategy is needed to address all the suspected sources contributing some human fecal waste to receiving waters and the likelihood that much of the sewage collection system is leaking.

### **Program Assessments and Request for More Information**

The Investigative Order also required the Responsible Parties to report on how the data from the studies will be used to assess the effectiveness of their programs in preventing discharges of human fecal material. The Responsible Parties developed their responses to this Directive independent of both the SC and the TRC and submitted "Volume 2: Program Effectiveness Assessment Plans (Supporting Document No. 3). The Volume 2 report also addresses Directive 3c of the Investigative Order by describing suspected transport pathways for each source of human fecal waste and listing potential circumstances behind how the waste was entering the environment. This analysis is conducted at a high level and is not supported by technical investigations. Each Responsible Party follows with a detailed listing of their individual efforts to control sources of human fecal waste.

The San Diego Water Board staff requested additional information from the Responsible Parties on both volumes submitted in response to the Investigative Order Directives (Supporting Document No. 4). Questions were focused in three main areas:

1. Clarification regarding the focus on wet weather discharges when SSO spill volume was approximately equal in both dry and wet weather. This led to the discovery of potential errors on the classification of SSOs as occurring in wet or dry conditions. Responsible Agencies and SCCWRP are in the process of correcting these errors.
2. Questions about why none of the Responsible Parties are pursuing the additional subsurface transport pathways studies and validation of the exfiltration prototype sampler work as suggested in the report's Summary of Technical Research.
3. Additional information was requested as to how the Responsible Parties set priorities to prevent human fecal waste from reaching surface and groundwater and how those prioritization methods were influenced by the results of the technical studies.

In response to these questions, the Responsible Parties submitted additional information in an additional two volumes (Supporting Document No. 5) that addressed all the Board staff's requests for additional information. Their responses to the specific questions above are summarized below.

1. The Responsible Parties are working with SCCWRP to correct the classification of SSOs into wet vs dry conditions. They also clarify that dry weather conditions were considered when conducting their program effectiveness assessments.
2. None of the Responsible Parties committed to pursuing validation of the prototype exfiltration sampler nor to better understanding subsurface transport mechanisms. They did commit to conducting an Infiltration and Inflow (I&I) study they believe will help alleviate some wet weather SSOs and exfiltration. Further, the Responsible Parties have "...committed to ongoing collaboration and discussion of next steps based on the IO results."
3. The Responsible Parties expanded their discussion on priority setting by explaining how collection system maintenance is conducted and by stating that exceedances of FIB water quality objectives are a priority, if it can be confirmed that the source is from humans.

The Responsible Parties will be available during this information item to clarify and expand upon how they used the technical findings in assessing their programs.

### **Conclusions and Next Steps**

The technical investigations used innovative science and technology to estimate loadings from all suspected sources of human fecal waste in the watershed. Total loadings near the bottom of the watershed validated the summed loading from the individual source estimates. The TRC further corroborated the methods and conclusions drawn from the data. The sewage collection system is likely the single largest source of human fecal waste to receiving waters. Private laterals, private SSOs, most pipes of the collection system and the regular occurrence of SSOs in all weather conditions rank as the four of the top five sources of human waste out of the six categories studied.

Human waste collection and processing through OWTS ranks as the third largest source to the watershed. While the County of San Diego is the sole Responsible Party with jurisdiction over the OWTS design, citing and corrective actions, the San Diego Water Board also has a regulatory responsibility for these systems. While IC/ID and encampments ranks lower in total loading, their contributions should be considered in a broader context of risk and impacts to downstream REC1 activities.

Further studies are encouraged to validate the findings of the prototype exfiltration sampling device to validate findings and to expand understanding of how even pipes remediated through cured in place plastic linings continue to leak. Studies are also needed to explain subsurface transport mechanisms and the fate and transport relationship between HF 183 and human pathogens to accurately evaluate the distinction between discharges from collection systems versus detections in receiving waters. Studies could also determine the applicability of technical findings to other sewage collection systems in the San Diego Region.

Given the vast network of pipes in the region, a more robust method of priority setting should be established. Volume and frequency of discharge alone should not be the only criteria used in setting priorities for pipe repair or replacement. Targeting FIB exceedances of water quality objectives co-occurring with evidence of human sources is only a first step in a more wholistic approach to source control. Consideration of pipe size, age, material and proximity to receiving waters, vertical trench placement relative to storm drainpipes, extent of downstream REC1 uses, water quality data, capital improvement considerations and proximity to disadvantaged communities should all be considered in priority setting.

Permits regulating the collection of sewage should be revised and updated to prioritize the enforceability of maintenance and operational procedures necessary to prevent SSOs and exfiltration. While it is appreciated that I&I studies are planned and should help with system capacity and some wet weather discharges, such a study should already be part of standard operational procedures necessary to maintain permit compliance. This is especially the case in a time of climate change causing annual precipitation to arrive in fewer and more intense downpours. Regional Waste Discharge Requirements for sewage collection could be updated and/or National Pollutant Discharge Elimination System Permits for Publicly Owned Treatment Plans could be revised to make clear that the collection system owned by the POTW operator is part of the facility and subject to permit provisions.

New approaches are needed in the regulation of OWTS. While the Local Area Management Plans (LAMPs) of San Diego County provide detailed requirements for design and citing, additional regulations may be needed to ensure systems are operating as intended. Older systems designed and built under different rules and for a different climate may also need attention. The San Diego Water Board has not only a role in approving the LAMP, but also in ensuring all systems do not negatively impact water quality.

Private laterals are a largely unregulated source of human fecal waste to the environment. While any leakage that enters the Municipal Separate Storm Sewer System (MS4) becomes the responsibility of the MS4 owner and operator, more should be done to regulate and stop the source. The City of El Cajon is one of the few cities to require mandatory reporting of private lateral spills. For all others, it is only once cities and collection agencies know of a spill that State permits require them to report the incident. New laws making mandatory private lateral spill reporting a uniform requirement and private lateral leak detection inspections upon property sale or transfer are just two possible options to consider as source control measures from private laterals.

The MS4 owners and operators subject to the Twenty Beaches and Creeks Total Maximum Daily Load are under a Time Schedule Order to submit a bacteria source reduction plan by February 2025 and to meet FIB standards no later than September 2026. Those efforts will improve REC-1 water quality and should be informed by the technical investigations and program effectiveness assessments generated from the San Diego River Investigative Order.

An additional investigative order could be considered based upon the weight of evidence from the prototype exfiltration sampler, sewer biofilm detections in receiving waters and the detection of HF 183 downstream of a small watershed containing only private laterals and a public sewage collection system (i.e. no OWTS, observed IC/ID, nor encampments) showing exfiltration from either the private laterals and/or the public sewage collection system. The possible order would direct sewage collection agencies to confirm that their system is not the source of human fecal waste entering the receiving waters. The order could also seek information on the fate of all constituents known to be typically conveyed in sewage collection systems (beyond human fecal waste) that would enter the environment from exfiltration. Constituents such as nutrients, toxins, and pharmaceutical by-products can harm downstream beneficial uses other than REC1.

### **Informational Presentation**

San Diego Water Board Staff will introduce the item, provide background information and discuss key findings and implications for water quality regulations. The Board staff presentation will be followed by a SCCWRP technical presentation on the investigation study methods, findings, and limitations. SCCWRP's presentation will be followed by the Responsible Parties presentation on their program effectiveness assessments. San Diego Water Board Staff will conclude formal presentations by discussing on-going efforts to reduce the loading of human fecal waste to the environment with brief discussion on the status of the Time Schedule Order to meet the Twenty Beaches and Creeks TMDL; updating of permits for public sewer collection systems in the San Diego Region; ideas for regulating private lateral discharges; status of regulations for OWTS; revision to fecal indicator bacterial TMDLs, and efforts to build upon the scientific and technical advancements achieved by the technical studies of the Investigative Order.

### **LEGAL CONCERNS**

None

## **PUBLIC NOTICE**

The agenda notice for today's meeting was posted on the San Diego Water Board's website and sent to subscribers to the email list for Board meetings. This satisfies the Bagley-Keene Open Meeting Act requirements to publish the meeting notice and agenda.

## **SUPPORTING DOCUMENTS**

1. Investigative Order R9-2019-0014
2. Summary of Technical Research: Quantifying the Sources of Human Fecal Pollution in the Lower San Diego River Watershed (also referred to a Volume 1)
3. Volume 2: Program Effectiveness Assessment Plans
4. San Diego Water Board Request for Additional Information
5. Volume 1 and 2 Response to San Diego Water Board Request for Additional Information