

**MEMORANDUM**

**TO:** Priscilla De La Cruz  
 Director of Sustainability, City of Providence.

**FROM:** Eric Cordis, PE  
 Patrick Dowling, CPG

**DATE:** November 12, 2025

**RE:** Public Street Drainage Pipe - Petroleum Impact Source Review

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Fuss & O'Neill has reviewed the following documents related to the observed environmental impacts present within Public Street, the Public Street drainage pipe, and adjacent properties:

- Monthly Status Reports – April 1, 2022 through June 30, 2022, 170 Allen’s Avenue, RIDEM Case No. 98-042(98-042a & 98-042b). Prepared by GZA GeoEnvironmental, Inc., dated February 22, 2023.
- Annual Monitoring Report, 170 Allens Avenue, Providence, Rhode Island Case Number 98-042 (Including 98-042a & 98-042b). Prepared by GZA GeoEnvironmental, Inc., dated October 2023.
- Environmental Forensic Report, Allens Avenue. Prepared by META Environmental, Inc, dated November 2, 2022 (pages 415 through 534).
- Figure showing approximate extent of video survey of Public Street drain line. Prepared by GZA GeoEnvironmental, Inc. for RI Energy, dated February 14, 2023.
- Public Street Drain Line Inspection Video file Prepared for RI Energy, (Unknown Vendor) Dated July 15, 2022.

The intent of this review was to evaluate the likelihood that the documented petroleum contamination and associated petroleum sheen observed within the drainage line in Public Street is related to the documented petroleum contamination present in the subsurface within Public Street and the adjacent properties.

**1 Regulatory Implications**

The migration of petroleum into the drainage pipe beneath Public Street and the subsequent discharge of petroleum from the drainage pipe to the Providence River are not acceptable to CRMC or RIDEM. The City is in the process of designing and permitting an improvement project within Public Street. As part of the permitting process for this project, CRMC staff have indicated in a preliminary meeting that they would not approve the development plans and grant the necessary permits for that work unless a resolution to the petroleum releases from the pipe and manholes within the Public Street right of way are resolved as part of the project.

**2 Drain Line Construction**

The 38” diameter brick construction drainage line was installed as a combined sewer overflow (CSO) stormwater drain. The drainage line includes a chimney style connection to a deeper 102” diameter sanitary sewer which crosses the 38” diameter line at the intersection of Public Street and Allens Avenue. The 38” line functioned as a CSO and it is shown on the city of Providence utility drawing from Drawer 164 – Sheet 26, with a documented

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slope of 0.001 ft/ft. The discharge point is located at the edge of the Providence River past the end of Public Street. The waterward portion of the line was constructed on timber piles to support the weight of the pipe as it traversed the sediments at the transition from an underground buried line to the discharge location in the coastal waters of the Providence River.

The pipe was originally constructed with three manholes within Public Street. An additional manhole was added between July 2013 and June 2014 as part of environmental remediation activities conducted by National Grid in accordance with a Rhode Island Department of Environmental Management (RIDEM) approved Remedial Action Work Plan to manage migration and discharge of petroleum to the Providence River. An as-built survey prepared in July 2014 shows a 4-foot stub where the 38" diameter brick piping transitions to a 36" diameter Ductile Iron Pipe (DIP) just upstream of the new manhole installation. This new manhole serves as a junction point for the stormwater discharge from two National Grid sand filters located to the north and south of Public Street and the existing outfall. As part of that installation work, National Grid found the outfall pipe to be unstable, and therefore replaced the outfall pipe downstream, from the newly installed manhole to a new outfall, located approximately 38 feet to the east of the new manhole. The new outfall pipe is constructed of 42" DIP, and the invert of the outfall was lowered 1.24 feet during this reconstruction.

The pipe passes through a partial cutoff wall constructed by National Grid as part of remediation work detailed in the RIDEM-approved Remedial Action Work Plan. The intent of the cutoff wall is to intercept separate phase floating petroleum (light non-aqueous phase liquids) that may be present at or near the groundwater surface, to mitigate discharge of petroleum to the Providence River. The 42" DIP outfall pipe was installed with a cement/bentonite seal around the pipe as it penetrates the partial cutoff wall. The cutoff wall has a top elevation of 2.8' and a bottom elevation of -5.5' (NGVD 1929 Datum). The partial cutoff wall is constructed of a washed sand filled trench which has a 40-mil High Density Polyethylene (HDPE) liner installed on the eastern side of the trench from an elevation of 1 foot below the engineered cap (generally 1 foot thick, so approximately 2 feet below the ground surface) with a bottom depth of -5.5 feet (NGVD 1929 datum). The cutoff wall is located just landward (western side) of the CRMC coastal boundary, traversing from the property to the north of Public Street, across Public Street, and terminating on the property to the south of Public Street.

As part of Rhode Island Energy's maintenance of the cutoff wall, the outfall discharge of the pipe end was modified to discharge into a riprap lined basin. The upper lip of the outfall pipe is situated at or slightly above the low tide level of the Providence River.

### **3 Documented Petroleum Contamination and Monitoring**

The land within the Public Street Right of Way (from Allens Ave to the Providence River) is impacted by environmental contamination associated with past industrial activities at adjacent properties, including releases related to historical Manufactured Gas Plant (MGP) operations, urban fill placement, and storage of petroleum products in above and below ground tanks.

Ongoing monitoring activities conducted on behalf of RI Energy have documented that petroleum products including petroleum light non-aqueous phase liquid (LNAPL) as well as dense non-aqueous phase liquids (DNAPL) are present adjacent to and within the Public Street right of way. The cumulative effect of these releases and the tidally influenced groundwater levels has resulted in contaminated soils in the groundwater

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smear zone and throughout the soil horizon beneath Public Street. These conditions require appropriate soil, sediment, and groundwater management during any construction, maintenance, or disturbance activities within Public Street.

The 38" drain line beneath Public Street is situated at an elevation that is either below or partially below the depth to groundwater. The porous nature of the brick pipe mortar joints and the elevation of the line below the water table suggests that the line may be acting as a subsurface trench drain, receiving groundwater and LNAPL due to the presence of these contaminants at and near the groundwater/soil interface in areas adjacent to the pipe.

The evidence of this petroleum LNAPL migration into the pipe has been supported by the presence of LNAPL in the various manholes along the length of the pipe, as well as a sheen regularly observed in the Providence River at the pipe discharge location. On-going environmental monitoring of petroleum observations in the pipe and the manholes is being performed by GZA, on behalf of RI Energy. These activities have included at least one documented period of monitoring of the Providence River for a visible sheen adjacent to the pipe outfall manually and with a remote camera. Manual monitoring activities during this period recorded sheens on 8 separate days between April 21 and June 28, 2022. Camera monitoring documented twelve (12) instances between July 5<sup>th</sup> and August 23 2022 and periodically (no totals documented) between November 30<sup>th</sup> and December 27, 2022 of a petroleum release to the River as evidenced by a visible sheen. Additionally, the associated monitoring report provided evidence of a correlation between the sheen appearances and the timing of low tide events. A direct correlation between rainfall events and sheen observance was not documented, as sheen observance was documented in both dry and wet weather conditions. RI Energy's consultant has also been documenting the presence of LNAPL in the manhole and have been maintaining an oil absorbent sock in the manhole to intercept floating petroleum in the manhole prior to discharge to the Providence River.

#### **4 Pipe Condition Inspection**

A pipe inspection by video camera was attempted by RI Energy and their consultants in July of 2022. The success of these efforts was limited in nature and ultimately abandoned when it was confirmed the pipe was underwater and that debris, which blocked the access of the camera equipment, was present in the pipe in the vicinity of Pete's Tire Barn.

Fuss & O'Neill reviewed the inspection video of the pipe section that was successfully filmed. The video of the inspection depicts evidence of active water intrusion in the form of visible dripping water in front of the camera in multiple locations (see Photo -1). There is also extensive calcium deposits (white staining streaks) which are indicative of long-term water infiltration in most areas that were inspected (Photo - 2 through Photo - 8).

#### **5 Environmental Forensic Report**

Rhode Island Energy enlisted a laboratory (Meta Environmental) to perform an analysis of the environmental impacts at the site.

Non-aqueous phase liquid (NAPL) and oil spill sampling net samples were collected and analyzed for hydrocarbon fingerprint and an expanded list of monocyclic aromatic hydrocarbons (MAHs), including benzene, toluene, ethylbenzene, and xylenes, and polycyclic aromatic hydrocarbons (PAHs), and saturated hydrocarbons.

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The resulting report documents the analysis of two NAPL samples (from monitoring wells MW-435R and MW-240R) and four "net samples" (from pipe access manholes - MH-1, MH-3, MH-4, and monitoring well GZ-12), analyzed using GC/FID and GC/MS techniques. Data were normalized to Total Petroleum hydrocarbons (TPH) content for comparability, and diagnostic ratios were evaluated such as pristane/phytane, C3D/C3PA, and fluoranthene/pyrene, which were used to evaluate source similarities.

Net sampling is a field method used to collect petroleum residues, sheens, or free product from water bodies, storm drains, or manholes. Specialized Teflon® oil spill sampling nets are lowered into the water column or laid across a flow path where they adsorb or physically trap hydrocarbons over a short period. After retrieval, the nets are placed into clean jars and sent to the laboratory, where the hydrocarbons are solvent-extracted. The extract is then analyzed using various laboratory equipment for hydrocarbon fingerprinting and other comparison analysis.

This method of sampling and analysis is particularly effective for:

- Collecting thin surface sheens or LNAPL that cannot be recovered by pumping.
- Preserving the chemical profile for forensic source identification and weathering assessment.
- Providing samples that are representative of site conditions when free product is discontinuous or difficult to collect by conventional bailers.

According to the Meta Environmental report, LNAPL samples MW-435R and MW-240R were very similar weathered heavy distillate fuel oils such as No. 2 fuel oil or diesel oil. Meta indicated the data suggests that the NAPLs were the same.

All four net samples contained similar diesel range products at various degrees of weathering. The extent of weathering, from most to least weathered, was MH-1 > MH-3 > MH-4 > GZ-12.

Net samples MH-1, MH-3, and MH-4 also contained a regular series of high molecular weight normal alkanes in the residual oil or asphalt range indicative of a contribution from a source of heavy petroleum.

Both NAPL samples and all net samples contained high molecular weight PAHs (HPAHs) from an unknown source. The amount of HPAHs relative to PAHs from the diesel range material was greater in the net samples than in the NAPL samples. Meta indicated the PAH ratios of the NAPL and net samples were similar, suggesting that the source(s) of the HPAHs found in the soils and within the pipeline were the same.

## 6 Summary

Review of the documentation generated during the previous and ongoing environmental investigations, remediation actions, and environmental monitoring activities conducted by RI Energy documents the presence of petroleum impacts in the soil and groundwater, including LNAPL, within the Public Street right of way and the adjacent industrial properties. Observations of LNAPL and sheens have also been well documented within the 38" brick drain pipe that transverses the petroleum impacted area, within the associated manhole structures associated with the drain pipe, and regular evidence of petroleum releases at the pipe discharge point into the Providence River have been documented.

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The Meta Environmental forensic analysis report evaluated the similarities of the composition of the petroleum product samples collected from within the pipe/manhole infrastructure to the samples collected from other subsurface monitoring points outside of the pipe/manhole infrastructure. The results of this analysis concluded that the petroleum products have a similar composition and are likely from similar sources.

Video examination of the pipe interior provides visual evidence of past and ongoing infiltration of groundwater through the pipe wall.

Based on our review and evaluation, the observations, inspections, monitoring results, and data included in the documents summarized herein support the conclusion that petroleum products present in the subsurface beneath Public Street and the adjacent properties are migrating from the soil and groundwater into the Public Street drain pipe and associated manhole infrastructure, with periodic discharge via the outfall to the Providence River.

Attachment:

- A. Cover Letter and Executive Summary from Environmental Forensics Report, prepared by META Environmental, Inc., dated November 23, 2022.
- B. Log of Video Stills from July 15, 2022 Public Street Pipe Inspection Video

# Environmental Forensic Report

**Allens Ave**

**SDG: F220067, F220068**



*Report To:*

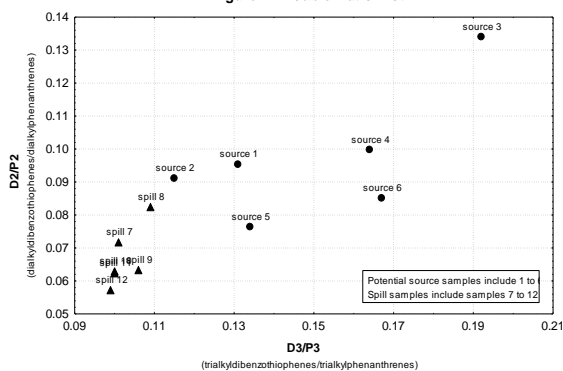
**GZA GeoEnvironmental, Inc.  
95 Glastonbury Blvd.  
Glastonbury, CT 06033**

*Report By:*

**META Environmental, Inc.  
1000 Turk Hill Road  
Fairport, NY 14450**

**November 23, 2022**

Figure 1. Double Ratio Plot



**Identifying and allocating sources of pollutants in complex environments.**



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## Executive Summary

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One non-aqueous phase liquid (NAPL) sample and five oil spill sampling net samples from the Allens Ave site in Providence RI were analyzed for hydrocarbon fingerprint and an expanded list of monocyclic aromatic hydrocarbons (MAHs), including benzene, toluene, ethylbenzene, and xylenes, polycyclic aromatic hydrocarbons (PAHs), and saturated hydrocarbons.

Net sample MW-240R was sufficiently coated with NAPL that a subsample of the NAPL was collected and analyzed by ESS instead of the entire net. This resulted in there being 2 NAPL samples and 4 net samples reported.

NAPL samples MW-435R and MW-240R were very similar weathered heavy distillate fuel oils such as No. 2 fuel oil or diesel oil. The data suggest that the NAPLs were the same.

All four net samples contained similar diesel range products at various degrees of weathering. The extent of weathering, from most to least weathered, was MH-1 > MH-3 > MH-4 > GZ-12.

Net samples MH-1, MH-3, and MH-4 also contained a regular series of high molecular weight normal alkanes in the residual oil or asphalt range indicative of a contribution from a source of heavy petroleum.

Both NAPL samples and all net samples contained high molecular weight PAHs (HPAHs) from an unknown source. The amount of HPAHs relative to PAHs from the diesel range material was greater in the net samples than in the NAPL samples. PAH ratios of the NAPL and net samples were similar, suggesting that the source(s) of the HPAHs was the same.

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Photo 1: Active water infiltration observed in video

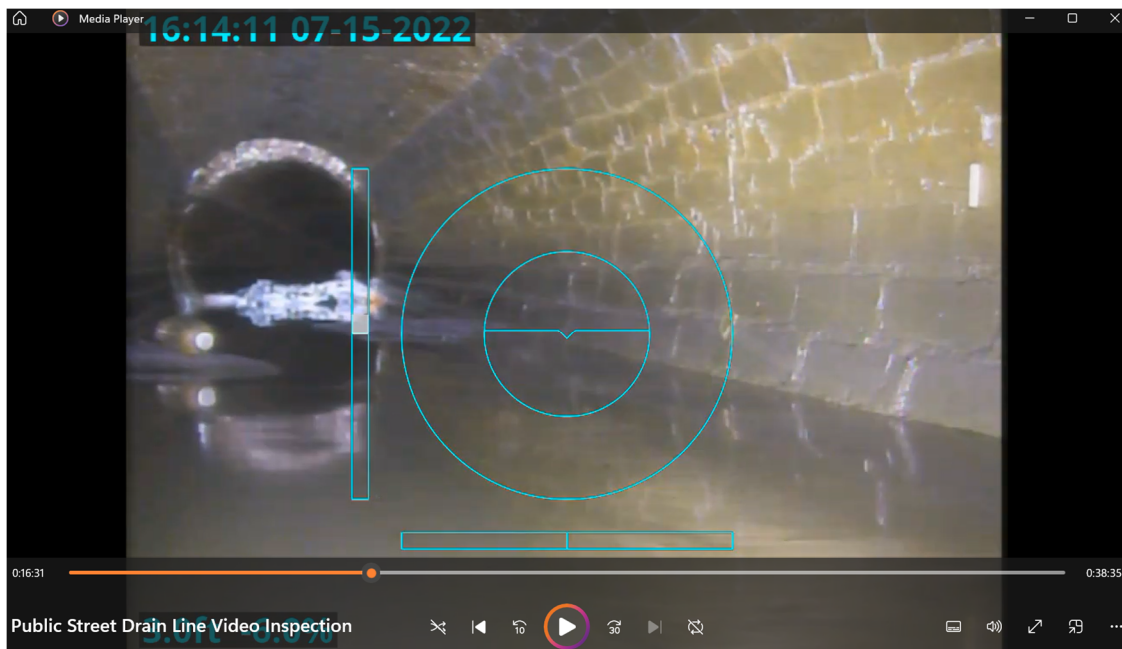


Photo 2: Calcium staining indicating long-term water leakage

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Photo 3: Calcium staining indicating long-term water leakage

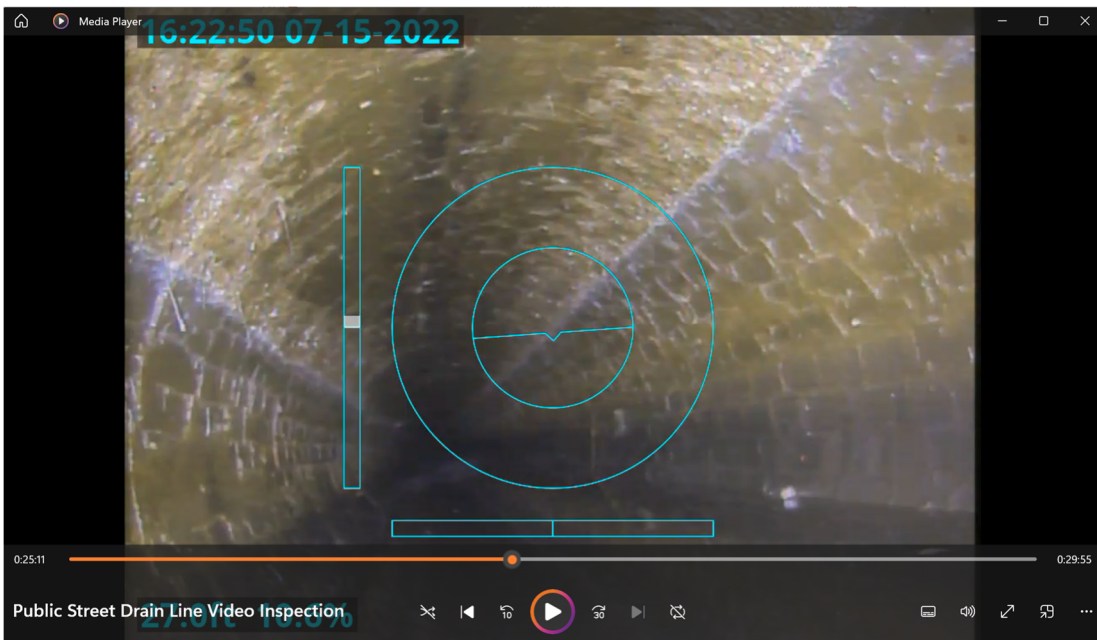


Photo 4: Calcium staining indicating long-term water leakage

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Photo 5: Calcium staining indicating long-term water leakage



Photo 6: Calcium staining indicating long-term water leakage

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Photo 7: Calcium staining indicating long-term water leakage



Photo 8: Calcium staining indicating long-term water leakage