



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2

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February 23, 2022

Susan Edwards, P.E., Acting Director
Division of Environmental Remediation
New York State Department of Environmental Conservation
625 Broadway
Albany, NY 12233-7014

Dear Ms. Edwards:

This is in response to your December 8, 2021, letter regarding the Former Citizens Gas Works Manufactured Gas Plant (MGP) site.

In your letter, the U.S. Environmental Protection Agency's (EPA's) concerns related to the remedy for the site are framed as a list of 10 items, each representing topics discussed during the four technical meetings held between EPA and its consultants, the New York State Department of Environmental Conservation (NYSDEC), and National Grid and its consultants between August 27 and November 12, 2021. You state that the technical meetings, the materials provided to EPA from the NYSDEC/National Grid technical team, the historical project-related documents, such as NYSDEC's 2007 Record of Decision (ROD), 2017 remedial design, and 2020 Explanation of Significant Differences, and the information provided in your letter, support NYSDEC's and the New York State Department of Health's conclusion that the selected Former Citizens MGP site remedy appropriately addresses EPA's concerns and that the remedy will be protective of public health and the environment upon completion.

In addition to the items that you cite in your letter, EPA considered the requirements of EPA's 2013 ROD for the contaminated sediments and source controls at the Gowanus Canal Superfund site. The 2013 ROD, which serves as the primary basis for EPA's concerns, states "the upland former MGP facility source controls...are expected to be protective of human health and the environment by controlling the primary source areas and minimizing the migration pathways into the Canal" (EPA, 2013). This language and the EPA ROD as a whole predicates the necessity for a remedy that controls the primary source areas associated with the Former Citizens MGP site. In addition, the EPA ROD anticipated that discharges from upland MGP sites may affect the remedy "as a result of the concentrated levels and widespread prevalence of MGP-related [nonaqueous phase liquid (NAPL)], [and that] the degree of MGP source control may also affect cap design for the sediment remedy."

To provide a summary of EPA's position following the technical meetings and our review of project documents, each of the 10 concerns outlined in your letter have been more broadly categorized under the following three areas of concern:

- A. The potential for post-remediation off-site migration of remaining NAPL and/or contaminated groundwater (NYSDEC list items 4, 5, 8, 9, 10).
- B. The potential for post-remediation direct contact with contaminated soil or groundwater (NYSDEC list items 1, 2 and 6).
- C. The potential for post-remediation vapor intrusion into future buildings (NYSDEC list items 3 and 7).

There is also an outstanding concern that was not addressed in your letter--the anticipated periodic pumping of tar extraction wells in the vicinity of future public recreation areas. NYSDEC provided documentation to EPA regarding the extraction of the tar, which focused on the use of best management practices for minimizing volatilization of tar as it is being transferred directly from the wellhead into a drum or other appropriate container for subsequent disposal off-site. While EPA concurs that best management practices should be employed and documented in a Site Management Plan, EPA believes that NYSDEC should consider the utilization of underground vaults or other types of housing to enclose the extraction wells and odor suppression mechanisms within those enclosures.

With regard to categories B and C, based on the technical discussions, EPA expects that any direct contact and vapor intrusion pathways at the Former Citizens MGP site will be mitigated in a manner that protects human health. Details have yet to be provided as to how the construction of appropriate and effective measures (*e.g.*, foundation drains and vapor intrusion mitigation systems) will accommodate the predicted shallow groundwater mounding. It is, however, EPA's expectation, given NYSDEC's comments in Table A-1 of your letter, that under the supervision of NYSDEC, National Grid and any future property owner will employ appropriate building designs and engineering controls to eliminate any direct contact or vapor intrusion pathways in the future. At this time, assuming that NYSDEC will provide the detailed designs for the engineering measures mentioned above and those designs will be reviewed by EPA, the items in categories B and C are no longer current concerns.

With respect to the items in category A above, EPA is still concerned that following the implementation of the upland remedy, NAPL and contaminated groundwater will continue to migrate off-site at levels that may not satisfy the expectations of EPA's ROD with regard to source control and migration of contaminated groundwater. The basis for EPA's concerns regarding the potential for post-remediation NAPL and dissolved phase contaminant migration at the site is provided below.

Nonaqueous Phase Liquid

To date, there has been minimal presentation of site-specific conditions that would support National Grid's assertion of low to no NAPL migration potential at the site. National Grid appears to be relying on the age of the releases and the cessation of operations (and associated additional coal tar inputs) as a basis for presuming a lack of migration potential. The data that were presented has focused on the distribution and properties of the NAPL beneath the Canal; the mobility of the upland NAPL mass is not sufficiently characterized. The relatively low

viscosities¹ of the NAPL, measured hydraulic conductivities,² the widespread extent of NAPL impacts, and the available recoverability/NAPL transmissivity information all suggest migration potential exists and further reduction of this potential is required for effective source control. Interim recovery efforts have been successful at removing NAPL from the subsurface, but information that supports the proposed full-scale design and its optimization for ensuring source control in accordance with the EPA ROD is not available (*e.g.*, how recovery wells are sited, borehole impacts are confirmed, and NAPL recovery is monitored). The potential for continued lateral migration and the resulting changes in the distributions of off-site NAPL and groundwater contamination following remediation remains a primary concern. Upward migration of NAPL at depth to the Canal following implementation of the Canal remedy is not currently a major concern.

Key technical observations and issues include:

- Remedial actions have largely focused on shallow on-site NAPL impacts and spot excavation of areas perceived to have significant NAPL impacts. These actions appear largely to target direct contact exposure pathways to the general public and construction workers. Less attention is given to the more widespread deeper NAPL impacts, where the absence of active groundwater use appears to have been used as a reason to limit further study and select a remedy that involves passive recovery of a limited area of the mobile NAPL within the parcel boundaries.
- NAPL extends approximately 400 to 800 feet off-site to the south, east (beneath the Canal) and north of the former facility (GEI, 2012; Arcadis 2021). Attachment A (enclosed) highlights the historical off-site NAPL investigation locations where there has been visual evidence of NAPL (tar). The lateral extent of NAPL within the intermediate zone to the south and east does not appear to be clearly established based on the Data Summary Report for Off-Site Area recently provided (Arcadis, 2021).
 - NAPL extends beyond the flanks of the recently constructed sheet pile wall to the south and east. The absence of NAPL transmissivity estimates or other NAPL mobility characterization data in these areas remains a concern for understanding if the current upland remedy/strategy is sufficient to mitigate migration potential.
 - NAPL remains adjacent to the sheet pile wall above the elevation proposed for in-situ stabilization (ISS) in the Canal. This requires reliance on the sheet pile wall and limited NAPL recovery for preventing lateral recontamination of clean Canal materials that will be above the ISS layer. This is of particular concern near the gas tunnel where there is a large opening in the sheet pile wall and farther north across Parcel II, where NAPL saturated intervals have been observed within the shallow zone and upper portions of the intermediate zone between elevations of approximately -5 and -25 feet. Impacts of a similar nature and elevation also remain at the southern end of Parcel III and farther south beyond Huntington Street.

¹ Estimated to be in the range of approximately 80 to 280 centipoise at 55 °F based on viscosity data for a site NAPL sample provided in the Supplemental Design Investigation Report (Arcadis, 2016)

² Hydraulic conductivity estimates for the shallow, intermediate, and deep zones general range from approximately 1×10^{-3} and 1×10^{-4} centimeters per second (Arcadis, 2016).

- To date, no site-specific data have been presented to quantify current NAPL mobility, its recoverability throughout the NAPL footprint, and the potential for continued migration; only the age of the initial release and the termination of site operations have been cited as reasons to presume a lack of migration potential. While, at many MGP sites, the age of the release can represent a line of evidence that ongoing migration is unlikely, the observed large volume and widespread extent of NAPL undermines this assertion.
- Historically, NAPL transmissivity testing and interim NAPL recovery efforts have indicated that NAPL recovery is practicable.
 - Pilot testing performed between 2009 and 2011 indicated that “recoverable tar exists at all three parcels” (GEI, 2011). NAPL transmissivity testing performed at select wells across the site in 2015 indicated NAPL transmissivities of up to 9.2 square feet per day (ft²/day) (Arcadis, 2016). The estimated NAPL transmissivities at several of the interim recovery wells tested at this time were above the threshold for which fluid recovery is considered impracticable (0.1 to 0.8 ft²/day) (Interstate Technology and Regulatory Council, 2018).
 - Tens of thousands of gallons of NAPL have reportedly been removed from recovery wells at the site as part of the interim NAPL recovery efforts.
- While EPA understands that recoverability metrics such as NAPL transmissivity are not a means to definitively determine migration potential, they can be used as a line of evidence to assess the overall stability and migration potential of a NAPL body (ITRC, 2018). With appropriate coverage throughout all NAPL impacted areas these data could be used to design a recovery remedy that minimizes migration potential by recovering mobile NAPL to the extent practicable. The NAPL recovery remedy as proposed does not appear to consider more than the goal of achieving even spatial coverage along the shoreline within the boundaries of the former Citizen’s MGP. Available data suggest additional coverage may be needed for an effective recovery well network. The NAPL recovery design should be based on a greater density of NAPL transmissivity/recovery data which should extend to all areas where NAPL is present, not just those within the parcel boundaries or adjacent to the sheet pile wall. These metrics should drive the specifics of the NAPL recovery remedy, such as the density of recovery wells, screen intervals, sump sizing, frequency of recovery, and recovery endpoints.

Dissolved-Phase Contaminants

Groundwater modeling outputs that were presented indicate that the combined upland/Canal remedy will alter the direction of groundwater flow and will result in mounding in the vicinity of proposed new structures. In addition, the Canal will no longer serve as a major sink for site groundwater. Shallow and intermediate groundwater contamination will inevitably be redirected, to some degree, which has the potential to alter the distribution of groundwater impacts. The effects of the upland and Canal remediation on the distribution of dissolved contaminants should be considered.

Key technical observations and issues include:

- The current distribution of dissolved contaminants has not been documented for the zones of interest.

- Measured concentrations of the relatively more soluble site-related compounds benzene and naphthalene in the shallow zone have been discussed and are currently reported to be as high as 16 and 8.7 milligrams per liter (mg/L), respectively. To date, no discussion of groundwater data from the deeper zones has occurred. These data are sparser, but the presence of NAPL in many intermediate zone wells suggests similar concentrations. Intermediate zone groundwater data from 2005 indicated that benzene and naphthalene plumes extended at least 400 feet to the east and across the Canal where they were observed at concentrations of up to 0.25 and 1.3 mg/L, respectively (Arcadis, 2021).
- The effect on the distribution and final disposition of the mass of PAHs in the groundwater that will be diverted from the Canal to upland areas because of the Canal remedy have to be considered.
 - Information presented during the November 12, 2021, teleconference with National Grid and its consultants indicates that the Gowanus Canal Trust’s selected ISS area (Scenario 4), which was more expansive than EPA’s directed minimum ISS area (Scenario 3) in combination with sealed bulkheads will alter the direction of groundwater flow within the intermediate zone relative to the baseline condition (pre-Canal remediation). Specifically, groundwater modeling outputs presented indicate that groundwater within the southern portions of the site will be deflected from the south to the southwest (west of Canal) and from the northwest to the west (east of the Canal).
 - To better quantify the groundwater discharge that will be redirected, following the November 12, 2021, meeting, our consultant, Jacobs, used data provided by the Gowanus Canal Trust and the existing groundwater model to estimate the change in PAH flux to the Canal resulting from the Gowanus Canal remedy. This analysis, provided as Attachment B (enclosed), indicates the following:
 - Under the baseline condition, approximately 1,000 kilograms (kg) of PAHs discharge to the Gowanus Canal adjacent to the Former Citizens MGP site per year.
 - Implementation of the Scenario 3 remedy (smaller ISS footprint than Scenario 4) will reduce the mass flux to the Canal by approximately 200 kg/year (approximately 20 percent). However, the cap thickness required to treat the dissolved phase was estimated to be 70 inches, which is well beyond a typical cap thickness. A PAH flux too high for a “reasonable” carbon treatment layer, where source control would be needed to offset this flux, was anticipated in the EPA ROD.
 - Implementation of the Scenario 4 remedy will reduce the mass flux to the Canal by 900 kg/year (approximately 90 percent). Scenario 4 calls for a larger ISS footprint but allows for thinner caps in this area of the site (range of thickness).
 - The 900 kg of PAHs each year that will no longer enter the Canal will be redirected away from the Canal and remain in the intermediate aquifer.
- It was indicated by National Grid and its consultants that there is currently no use of groundwater around the site, and, thus, intermediate zone groundwater impacts should not be a concern. However, the State administrative record does not contain a feasibility study where a no action alternative for groundwater was evaluated, nor was this addressed in the State ROD.

- The remedy as currently proposed will allow the redirection of contaminant mass that currently discharges to the Canal. In the absence of site-specific information that demonstrates that the dissolved plumes will remain stable following implementation of the remedy, consideration should be given to additional source and groundwater control measures to mitigate the potential for plume expansion. These measures should be evaluated and documented in appropriate technical and administrative documents.

While EPA concurs that the concerns related to direct contact and vapor intrusion pathways (categories B and C) at the Former Citizens MGP site will be mitigated in a manner that will be protective of human health under current and future planned use of the property, EPA does not agree that existing data support that concerns related to controlling the primary source areas and minimizing the migration pathways into the Canal (category A) will be sufficiently addressed. Unless additional site-specific data is gathered to demonstrate that the current remedy for the Former Citizens MGP site meets the requirements for source control as specified in EPA's ROD, supplemental remedial measures should be considered. EPA is prepared to support DEC with respect to additional investigations and/or the implementation of supplemental measures, including pursuing the PRP to perform work under CERCLA if appropriate. We are available to discuss appropriate next steps at your convenience.

Should you have any questions regarding this response, please contact me at (212) 637-4447.

Sincerely,

Pat Evangelista, Director
Superfund and Emergency Management Division

Enclosures

References

Environmental Protection Agency. Record of Decision, Gowanus Canal Superfund Site, Brooklyn, Kings County, New York. September.

Arcadis, 2021. Data Summary Report for Off-Site Area. Site Remediation Former Citizens Gas Works Manufactured Gas Plant Site, Carroll Gardens/Public Place, Borough of Brooklyn, Kings County, New York, Site No. C224012. November.

Arcadis, 2016. Supplemental Design Investigation Report. Former Citizens Gas Works Manufactured Gas Plant Site, Carroll Gardens/Public Place, Borough of Brooklyn, Kings County, New York, Site No. C224012. June.

GEI, 2012. Supplemental Remedial Investigation (SRI) Work Plan Addendum No. 2 Former Citizens Gas Works Manufactured Gas Plant (MGP) Site, Operable Unit 2 (OU-2), Brooklyn, New York, Brownfield Cleanup Program, Site No.: 224012. February 10.

GEI, 2011. Data Report. Remedial Design Program. Former Citizens Gas Works Manufactured Gas Plant Site, Carroll Gardens/Public Place, Brooklyn, New York, Site No. C224012. October 14.

Interstate Technology & Regulatory Council. 2009. Evaluating LNAPL Remedial Technologies for Achieving Project Goals. December.