COMMITMENT & INTEGRITY
DRIVE RESULTS

300 Penn Center Blvd. | Suite 800
Pittsburgh, Pennsylvania 15235
www.woodardcurran.com

T 800.426.4262
T 412.241.4500
F 412.241.7500

WOODARD &CURRAN

July 21, 2020

Dr. Josh Smeraldi
USEPA – Region II
Emergency and Remedial Response Division
290 Broadway, 19th Floor
New York, NY 10007

Re: U.S. Environmental Protection Agency July 10 and 14, 2020 Feasibility Study Report Comments
Riverside Industrial Park Superfund Site - Essex County, Newark, New Jersey
CERCLA Docket No. 02-2014-2011

Dear Dr. Smeraldi:

On behalf of PPG Industries, Inc. (PPG), as directed by the U.S. Environmental Protection Agency (USEPA) on July 10, 2020, Woodard & Curran, Inc. hereby submits this response to USEPA's July 14, 2020 letter regarding the Riverside Industrial Park Superfund Site (the Site) Feasibility Study Report (FSR). We were disappointed to receive USEPA's letter via email this afternoon stating that USEPA had finalized the FSR despite the fact that material technical issues remain unresolved, and despite the fact that USEPA had asked PPG to submit this letter today. USEPA's decision to proceed with finalizing the FSR without even considering this letter, which details material flaws in USEPA's FSR previously raised with USEPA, is arbitrary and capricious. Nevertheless, this letter responds to USEPA's July 14 letter, which provided USEPA's support for its July 10 revisions to the FSR. This letter makes clear that USEPA's FSR revisions (and therefore USEPA's FSR as finalized today) are arbitrary and capricious. Please place this letter in the administrative record for the Site.

USEPA's July 10 revisions reject Groundwater Alternative 5, as presented in the June 30, 2020 draft of the FSR, and retain other groundwater alternatives by evaluating how they address lead in Site groundwater. In its July 10 revisions and July 14 letter, USEPA presents a conceptual site model (CSM) that is based on a theory that metals pigments used in paint manufacturing are present in surface soil/fill and are being mobilized into subsurface soil/fill and then into saturated soil/fill, which then results in elevated lead concentrations in groundwater. However, further consideration of the mobility of lead and inspection of the observed concentration distributions reveal that the potential lead sources and resulting lead mobility are more complex and difficult to generalize than as described by the USEPA's CSM. Furthermore, USEPA has provided no information conclusively identifying metals pigments as the source of the elevated lead in surface soil/fill or its presence in saturated soil/fill. Indeed, it seems more likely that lead in the saturated soil/historic fill dominates as the source of lead in groundwater. In short, USEPA's assertion that lead in groundwater is related to site operations has no technical or factual basis, and is not supported by the record. USEPA and PPG should further evaluate what factors are causing or contributing to lead concentrations in groundwater rather than rushing forward based on an arbitrary schedule to adopt a remedy that may be wholly inappropriate for the actual site conditions.

As documented in the Remedial Investigation Report[1] (RIR) prepared by Woodard & Curran, historic fill is present in surface and subsurface soils throughout the Site. As USEPA is aware, historic fill in New Jersey commonly contains elevated levels of metals, including lead. NJDEP permits parties to assume that groundwater associated with historic fill material is contaminated above groundwater remediation standards (5 micrograms per liter [µg/L] for lead) and implement a groundwater classification exception area rather than active remediation. [NJDEP Historic Fill Material Technical Guidance at 8, 10 (April 29, 2013).] Groundwater wells were screened in historic fill, and USEPA required the collection of unfiltered samples. Unsurprisingly, the shallow groundwater samples taken in historic fill detected lead. We understood USEPA and PPG were in agreement on a CSM that recognized that historic fill is the source of lead impacts in shallow groundwater, as reflected in the RIR. USEPA's revisions on July 10 and its July 14 letter that unilaterally abandon this CSM were a surprise to PPG.

Though PPG is constrained by USEPA's accelerated schedule, including a seven-day window to review and respond to USEPA's July 14 letter, the work that we have been able to accomplish in this short period shows several fundamental flaws with USEPA's CSM. *First*, areas that USEPA asserts are not substantially impacted by lead contamination have groundwater lead concentrations greater than the preliminary remediation goal (PRG), indicating site-wide impacts unrelated to operations. *Second*, areas of elevated lead in soils and areas of elevated lead in groundwater across the Site are not collocated, which is inconsistent with USEPA's CSM. Instead, there are multiple examples of wells with low groundwater concentrations located near elevated soil concentrations and elevated groundwater concentrations located near low surface soil/fill concentrations. *Third*, groundwater lead concentrations show significant variability over time, which is inconsistent with surface soil impacts to groundwater. *Fourth*, USEPA has not considered multiple other factors that indicate material flaws in its CSM, including background lead levels, the collocation of lead and organics, and the presence of lead in Newark's water supply. This litany of material issues makes it plain that USEPA's CSM attributing lead to site operations does not have a technical or scientific basis. As a result, USEPA's proposed revisions to the FSR, specifically the groundwater remedies designed to address lead, are arbitrary and capricious. Any remedy selected in a Proposed Remedial Action Plan or Record of Decision before there is a clear understanding of the CSM related to lead in groundwater likewise would be arbitrary and capricious.

As the above analysis shows, and as further detailed below, there are material issues with USEPA's conclusions. USEPA is rushing to force significant changes into the FSR based on what amounts to an assumption at the very end of the RI/FS process, without undertaking a full analysis of site data. This issue is compounded by the fact that USEPA has implemented a very aggressive RI/FS schedule, leaving very little time to respond to USEPA's position, let alone undertake the fulsome analysis required to support it. PPG remains committed to cooperatively developing the FSR, but USEPA must recognize that its last-minute, unilateral changes to the FSR make it impossible to collaborate on a defensible FSR.

A. Spatial Analysis of Soil and Groundwater Impacts

USEPA's July 14 letter concludes that "the RI data have identified a site-related source of lead in the soils surrounding Building #7, and the shallow groundwater in the vicinity of this source material has been impacted." [USEPA Ltr. at 3.] USEPA's approach uses surface soil/fill concentrations to identify site-related groundwater impacts. This assumes that elevated lead concentrations in groundwater are the

[1] Woodard & Curran, Inc., 2020, "Corrected Final Remedial Investigation Report, Riverside Industrial Park Superfund Site, Newark, New Jersey," April 20.

result of transport from shallow unsaturated soil/fill. However, a simple review of site data shows that elevated lead levels in site soils and elevated lead levels in groundwater are not spatially correlated. Instead, there are multiple examples of wells with low lead concentrations located near elevated soil concentrations. Conversely, the examples given above from the northern portion of the Site demonstrate that the reverse is also true, in that wells with elevated groundwater concentrations are located near low soil/fill concentrations.

Table 1 provides several examples of where groundwater lead concentrations do not reflect surface soil/fill concentrations. Monitoring Wells E-1, E-6, E-7, MW-114 and MW-123 all have maximum groundwater lead concentrations below the PRG, but have nearby soil/fill concentrations over 1,000 milligrams per kilogram (mg/kg).[2] MW-103, MW-105, MW-106 and MW-120 provide another counterexample, similar to four of the wells in Table 2 below, where elevated groundwater lead concentrations (maximum of 48 micrograms per kilogram [µg/kg]) are present even though the maximum nearby soil/fill concentrations are near the PRG of 800 mg/kg or less.

Table 1. Comparison of Groundwater Lead and Nearby Soil/Fill Lead Concentrations

Well	Portion of the Site	Maximum Lead Groundwater (µg/L)	Nearest Soil Locations	Soil/ Fill Lead Concentrations (mg/kg)
Wells with Low Groundwater and Nearby Elevated Soil/Fill				
E-1	Southern	1.3	B-59, B-77	35 to 2,530
E-6 / E-7	Northern	3.3 / 2.0	B-4	650 to 1,070
MW-114	Northern	0.28	B-12, B-13	171 to 2,000
MW-123	Southern	1.2	B-56, B-57, B-82	17.5 to 1,060
Additional Wells with High Groundwater and Moderate Soil/Fill				
MW-103	Southern	18.7	B-51, B- 52, B-53	159 to 813
MW-105	Southern	47.6	B-38	18.1 to 794
MW-106	Southern	26.5	B-35, B-36, B-37, B-91	18.6 to 504
MW-120	Northern	25.3	B-61, B-62, B-101	6.4 to 849

Figure 1 shows the soil depth profiles for several of the wells listed in Table 1. In summary:

- E-1 is located in the southern portion of the Site. Elevated soil/fill lead concentrations, up to 2,530 mg/kg, are found at 6 feet below ground surface at B-59. Groundwater lead concentrations in E-1 are below the PRG.

- MW-114 is located in the northern portion of the Site. Elevated soil/fill lead concentrations are present up to 2,000 mg/kg at B-12 and 1,400 mg/kg at B-13. Groundwater lead concentrations in MW-114 are below the PRG.

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[2] USEPA's July 14, 2020 letter incorrectly implies Monitoring Wells MW-114, MW-115 and MW-124 were installed in "native material", but as referenced in RIR Appendix C, they were installed in fill, not native soil. [USEPA Ltr. at 1.] Though MW-124 may be outside of the original riverbed footprint, historic fill is present in this location to a depth of 14 feet. MW-124 is screened from 3 to 13 feet. It is therefore installed in historic fill, per the boring logs in RIR Appendix C.

- MW-123 is located in the southern portion of the Site. Elevated soil/fill lead concentrations, up to 1,060 mg/kg, are near the surface at B-56, B-57 and B-82. Groundwater lead concentrations in MW-123 are below the PRG.

- MW-106 is located in the southern portion of the Site. Elevated soil/fill lead concentrations, up to 504 mg/kg, are found at B-35, B-36, B-37 and B-91. The maximum groundwater lead concentration in MW-106 was 26.5 µg/L.

- MW-120 is located in the northern portion of the Site. Elevated soil/fill lead concentrations, up to 849 mg/kg, are found at B-61, B-62 and B-101. The maximum groundwater concentration in MW-120 was 25.3 µg/L.

These examples demonstrate that surface soil/fill lead concentrations are not sufficient to identify areas where elevated concentrations of lead in groundwater are present. Large portions of the Site have groundwater lead concentrations below the PRG, even though the surface soil/fill concentrations are elevated. In other areas, groundwater lead concentrations are significantly elevated above the PRG, while the nearby surface soil/fill concentrations are similar to or below the PRG. This indicates that historic fill is the likely source of lead in groundwater.

B. Analysis of Groundwater Impacts in Northern Portion of Site

USEPA presents the northern portion of the Site as an area that "has not been substantially impacted by lead contamination." [USEPA Ltr. at 1.] While it is accurate that site operations in the northern portion of the Site did not involve lead, lead is present in all media. Surface and sub-surface soil/fill concentrations vary from 97 to 2,800 mg/kg in this portion of the Site, while the maximum lead concentrations in groundwater range from 1.0 to 25.3 µg/L (excluding MW-118, which USEPA also excluded).

Table 2 compares elevated groundwater lead concentrations in five wells to lead soil/fill concentrations found in the nearest soil sampling locations. Maximum groundwater lead concentrations range from 7 to 25.3 µg/L for these wells. USEPA's CSM cannot account for soil/fill with elevated lead concentrations near the well locations with generally low lead concentrations (less than 800 mg/kg other than one outlier), indicating the presence of lead is attributable to historic fill, not a site release.

Table 2. Comparison of Groundwater and Nearby Soil/Fill Concentrations in the Northern Portion

Well	Maximum Lead Groundwater (µg/L)	Nearest Soil/Fill Locations	Soil/ Fill Lead Concentrations from RI data (mg/kg)
E-4	7.4	B-22, B-27, B-95	20.4 to 482
MW-117	17.7	B-10, B-11, B-105	31.2 to 211
MW-120	25.3	B-61, B-62	43.7 to 333
MW-122	7.0	B-102	174 to 264

Since lead in groundwater in the northern portion is not attributable to surface releases, groundwater lead levels are related to historic fill and its interactions with groundwater chemistry.

In addition, a comparison of the soil/fill concentrations with nearby monitoring wells in the northern, southern and Lot 63 (Building #7) portions of the Site (as described by USEPA) reveal similar distributions of groundwater lead concentrations (Figure 2). While there are more samples with elevated soil/fill lead

concentrations within Lot 63, the maximum depth of the elevated soil/fill concentrations is similar to the southern portion. More importantly, the groundwater lead concentration distribution is similar in all three areas. Each area has a majority of samples falling below 25 µg/L, but a significant number above 5 µg/L. As discussed below, a limited number of wells had at least one measurement above 25 µg/L and were found in each portion of the Site. Only two wells had two measurements above 25 µg/L (MW-105 and MW-107).[3]

These observations undermine the assumption that the nature of the groundwater lead within Lot 63 or within the entire southern portion of the Site is somehow distinct from the groundwater lead present in the northern portion that USEPA agrees is not attributable to site operations.

C. Groundwater Lead Concentration Variability Over Time

The general lack of mobility of lead is supported by the site observations, where elevated lead concentrations in surface and subsurface soil/fill are localized and there is no evidence of a groundwater plume. In addition, groundwater lead concentrations in many wells across the entire Site show significant variability over time. This is surprising, given that the transport of lead in soils and groundwater is typically controlled *via* adsorption and that soil/fill lead concentrations are stable over months-long timescales. This indicates that lead concentrations in saturated soil/fill are not the sole factor in determining groundwater concentrations. Background geochemistry can result in elevated concentrations without high soil lead concentrations. Because soil/fill concentrations are not changing on the same timescale as the groundwater lead concentrations, the background chemistry changes including brackish tide water likely accounts for the concentration variation. These factors are not accounted for in USEPA's CSM.

For example, the groundwater lead concentrations measured at MW-108 were 15.4, 7.1 and 109 µg/L in March 2018, June 2018 and February 2019, respectively, while the concentrations in the neighboring well at MW-109 were 21, 14.6 and 9.1 µg/L, respectively, over the same time. Even though they are located only 60 feet apart, both wells had significant variability in concentrations, but the timing and direction of the changes were different. Figure 3 presents the groundwater concentrations for 16 wells with a groundwater concentration above 5 µg/L at any time.[4] The groundwater concentrations are scaled to the first measurement in March 2018 to show both the direction and magnitude of the changes over time; the value of 1 represents no change in concentration, while 10 represents a 10-fold increase in concentration and 0.1 is a 10-fold decrease.

Figure 3 shows that there is significant variability in the groundwater lead concentrations in many wells, and that the timing and direction of these changes are different between the wells.

- Between March and June 2018, groundwater concentrations increased in 10 wells and decreased in 6 wells.

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[3] This excludes the March 2018 sample from MW-118 due to the known impacts associated with current operations at Building #10 (Lot 57).

[4] MW-118 was excluded from this analysis due to the impacted sample in March 2018; however, the concentration in this well changed from 568 to 26 to 13.8 µg/L. This further suggests that mechanisms beyond the soil/fill concentrations are controlling groundwater lead concentrations across the Site.

- Between June 2018 and February 2019, groundwater concentrations increased in 6 wells and decreased in 10 wells.

- Between March 2018 and February 2019, the overall effect of these changes was that concentrations in 8 wells were higher and decreased in the other 8 wells, with several wells increasing or decreasing more than 5-fold (such as MW-108, MW-110 and MW-120).

The timescale analysis suggests that lead mobility is controlled on a localized scale and is not present as part of a plume derived from surface soil/fill transport. Instead, it is more likely that the locally elevated concentrations in groundwater reflect both the heterogeneity present in the historic fill, which varied over time based on the source of the fill materials, and is influenced by changes in groundwater chemistry including pH and salinity. A fuller understanding of the primary features controlling lead dissolution from soil/fill to groundwater is needed to ensure that a remedy designed to address lead will succeed.

D. Analysis of Additional Lead Sources

USEPA's CSM and USEPA's revisions to the FSR do not account for other lead sources, including lead in historic fill present as background and in the City of Newark's water supply.

Historic fill on Site contributes metals, including lead, to groundwater. Metals attributable to historic fill are not the result of releases or operations at the Site and, therefore, constitute background concentrations (USEPA, 2002)[5]. Even if USEPA had demonstrated a nexus between elevated lead in soils and groundwater lead concentrations, groundwater lead concentrations in areas with soil/fill lead concentrations below the soil/fill lead PRG would constitute background.

Table 3 presents examples of monitoring wells where soil/fill concentrations are below lead soil PRG and lead groundwater concentrations are above the PRG (5 µg/L).

Table 3. Background Lead Levels in Groundwater

Monitoring Well	Maximum Lead Concentration (µg/l)	Nearest Remedial Investigation Soil/Fill Location	Soil/Fill Lead Concentration (mg/kg)
MW-102	12.8	B-44, B-77	152 to 424
MW-103	18.7	B-51, B-55	159 to 803
MW-104	10.4	B-45, B-84	29.7 to 236
MW-117	17.7	B-10, B-105	31.2 to 211
MW-120	25.3	B-61, B-62	43.7 to 333
MW-122	7	B-101, B-102	174 to 264

[5] U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Office of Emergency and Remedial Response, 2002, "Role of Background in the CERCLA Cleanup Program," OSWER 9285.6-07P, April 26.

The data show that historic fill in areas with soil concentrations of lead lower than the soil PRG is contributing lead to groundwater above the proposed lead PRG. Based on the results above, the lead PRG should be at least 25 µg/L to account for groundwater contamination due to historic fill. USEPA's CSM and revisions to the FSR must take background into account. Only 6 of the 20 wells have lead in groundwater present above background in one sample (out of three sampling rounds), and only two of the wells have lead above background in two samples (excluding MW-118). These two wells (MW-105 and MW-107) are in spatially distinct portions of the Site, further indicating localized influences. In addition, MW-105 is upgradient of Building #7. Therefore, the area supposedly impacted by site operations is extremely limited, and would be expected to be positively impacted by soil/fill remedial action.

In addition, USEPA does not account for potential impacts of lead present in the City of Newark's water supply. Recent water quality reports for the City of Newark show lead present in city water at concentrations of 17.8 parts per billion (ppb) to 47.9 ppb. [City of Newark Department of Water and Sewer Utilities, 2018 Water Quality Report at 6; City of Newark Department of Water and Sewer Utilities, 2017 Water Quality Report at 7.] City of Newark water was released on Site in 2012 when USEPA ruptured an active water line while digging test pits around underground storage tanks (USTs) on Lot 64. USEPA released this water, which likely contained lead, upgradient of the Lot 63 area identified in USEPA's July 14 letter as having elevated lead concentrations in groundwater. [RIR at 4-18, 4-19.] While USEPA attributes lead concentrations on Lot 63 to PPG's operations, its CSM does not account for USEPA's release of lead-containing water when USEPA ruptured the water line on Lot 64.

E. Analysis of Additional Contributing Factors

The movement of lead through the soil column is controlled by adsorption to soil, and the extent of adsorption is influenced by factors including the soil type (and available binding sites), organic matter content and pH. Yet USEPA's CSM also does not account for these controlling factors, including:

- Material changes in geochemistry. Lead dissolution tends to increase under more acidic conditions or in the presence of high chloride. At near neutral pHs, lead adsorption is greatest and therefore transport is typically limited. Both MW-105 and MW-107 (the only two wells with two groundwater lead samples above 25 µg/L) experienced a large drop in pH between March 2018 and February 2019 (from 6.8 to below 6), and the more acidic conditions are likely related to the higher groundwater lead concentrations (maximum concentrations above 40 µg/L, Figure 4). However, not all groundwater lead concentration increases, such as those at MW-110, were accompanied by pH changes.

- The heterogeneity of historic fill at the Site. Labile lead often forms colloid complexes with organic matter, clays and carbonates, which can influence its dissolution depending on the soil type. As documented on RIR Figure 1-3, certain portions of the Site were filled at different times, resulting in different historic fill characteristics and different chemicals present in historic fill in different areas. The greatest amount of filling occurred between approximately 1892-1901. This filled a significant portion of the southern portion of the Site, including Lot 63 (Building #7), half of Lot 64 (Building 12) and the associated UST area. The area filled during this period also corresponds to the highest number of samples exceeding the soil/fill PRG, even in areas outside of the Lot 63 area identified by USEPA as having elevated soil/fill lead concentrations (see Figure 5 [soil] and Figure 6 [groundwater]).

- Increased mobility due to organic contaminants. Lead tends to be more mobile with increasing availability of organic carbon. Lead can form colloids with organic matter, namely organic acids, and the formation of these colloids releases more lead into groundwater. The collocation of

higher lead concentrations in groundwater with higher concentrations of organics could indicate that the organic contaminants and their degradation by-products, including organic acids, are enhancing lead release from historic fill in organic impacted areas. Once these impacted areas are remedied, groundwater lead mobility should decline and reduce groundwater lead concentrations without intervention.

Without consideration of these factors, USEPA's CSM does not accurately account for site observations and site data.

F. Conclusion

As the above analysis demonstrates, the CSM presented in USEPA's July 14 letter is incomplete and inadequate. USEPA's CSM assumes that elevated lead present in surface soil/fill is attributable to site operations, and that lead in surface soil/fill is being mobilized into subsurface soil/fill and then into Site groundwater, but an actual analysis of site data does not support this CSM. Spatial and temporal analyses demonstrate that elevated soil/fill lead concentrations do not correspond to elevated shallow groundwater lead concentrations. A whole host of additional factors, including background and alternative lead sources, heterogeneous fill, collocation with of lead with organics, and geochemistry changes, show that USEPA's CSM attributing lead in shallow groundwater to operationally impacted surface soils does not reflect the reality of this Site. Instead, site data are consistent with historic fill as the source of shallow groundwater lead impacts.

USEPA's last minute, flawed changes to the CSM in the FSR mean that USEPA's July 10 FSR is likewise fundamentally flawed. The groundwater alternatives USEPA proposes are designed to address lead in shallow groundwater, despite the fact that lead in shallow groundwater has not been shown to be a site-related contaminant and that USEPA's CSM does not recognize historic fill contribution to groundwater contamination. USEPA rejected Groundwater Alternative 5 as presented in the June 30, 2020 draft of the FSR on the same basis. USEPA's decisions to do so are arbitrary and capricious because groundwater impacts from historic fill are not attributable to releases and are not actionable under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The consequences of this arbitrary and capricious decision-making are not abstract. USEPA has proposed multimillion dollar pump and treat or in-situ remedies for lead in shallow groundwater, yet USEPA's theory regarding the source of lead in shallow groundwater is materially flawed and not supported by the record. The result will be the selection of a remedy that USEPA can only hope will work to address lead in shallow groundwater, since there is no technical basis for presuming it will be effective. If USEPA is wrong (as it appears to be), the remedy will proceed indefinitely, at a cost of millions of dollars, to address background concentrations of lead that are not actionable under CERCLA in the first place.

In contrast to USEPA's groundwater alternatives, which do not reflect actual conditions at the Site, Groundwater Alternative 5, as presented in the June 30, 2020 draft FSR, presents a measured approach that incorporates site data into appropriate groundwater treatment. The FSR submitted on July 17, 2020 included targeted in-situ treatment for lead in Groundwater Alternative 5 in consideration of USEPA's comments. This alternative, in combination with Soil/Fill Alternatives 2 through 5, would address potential soil/fill contributions to groundwater pathways and have positive impacts on groundwater quality. It would also account for background concentrations due to historic fill. Groundwater Alternative 5 also allows for soil/fill alternatives to be implemented first, followed by an assessment of groundwater during the five-year review to determine whether a groundwater remedy is necessary (a sequence that any groundwater alternative implemented at the Site should implement). Unlike USEPA's proposals, Groundwater Alternative 5 is appropriate for this Site.

Thank you for your consideration of our responses. Though USEPA's unilateral, arbitrary action in finalizing the FSR likely will force PPG to invoke dispute resolution, PPG is open to a call to discuss the information presented in this letter and remains committed to working with USEPA on the RI/FS.

Sincerely,

WOODARD & CURRAN, INC.

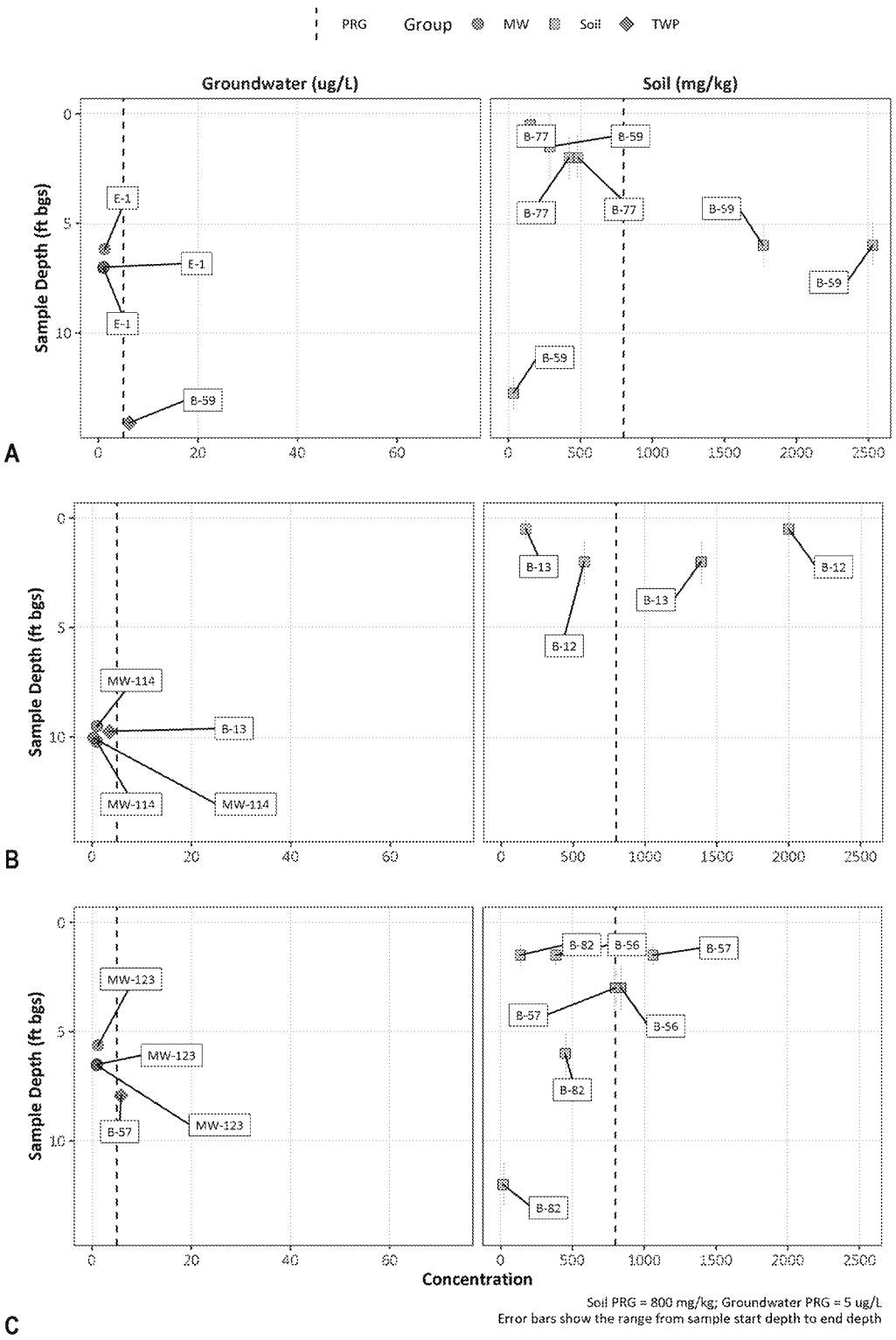
Kenneth J. Bird
Project Manager

BAG/KJB/cld
Attachments

cc: Mr. Scott Krall – PPG Industries, Inc.

PN: 0013620.22

FIGURES



Soil PRG = 800 mg/kg; Groundwater PRG = 5 ug/L
Error bars show the range from sample start depth to end depth

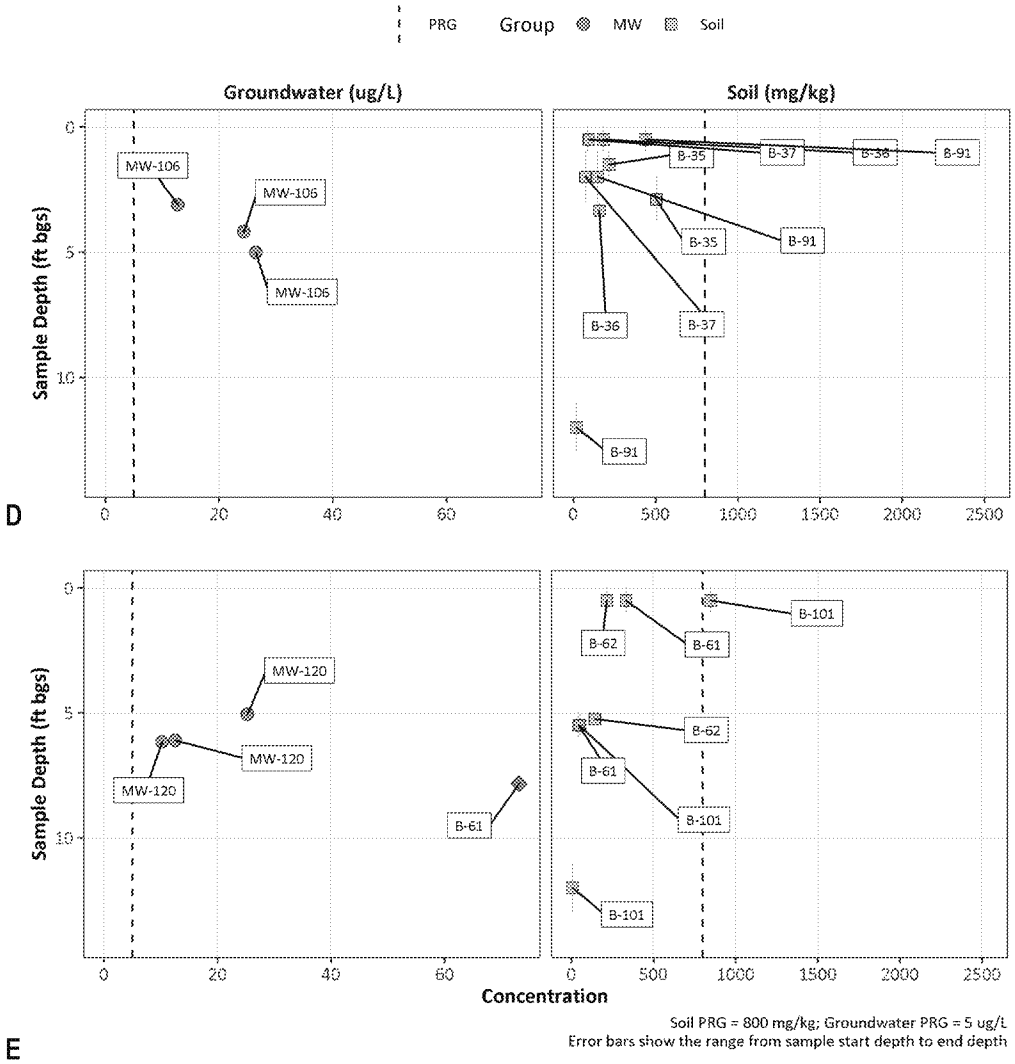


Figure 1. Depth Profiles of Groundwater and Soil/Fill Concentrations near Five Well Locations

Groundwater results shown are from the shallow unit monitoring wells and available temporary well points (TWP). Groundwater depths are the reported depth to water table or placement of the TWP. Soil/fill results are from the sample start and end depth and are shown as error bars on the depth. Duplicate samples are both shown. Well locations shown are E-1 (A), MW-114 (B), MW-123 (C), MW-106 (D) and MW-120 (E).

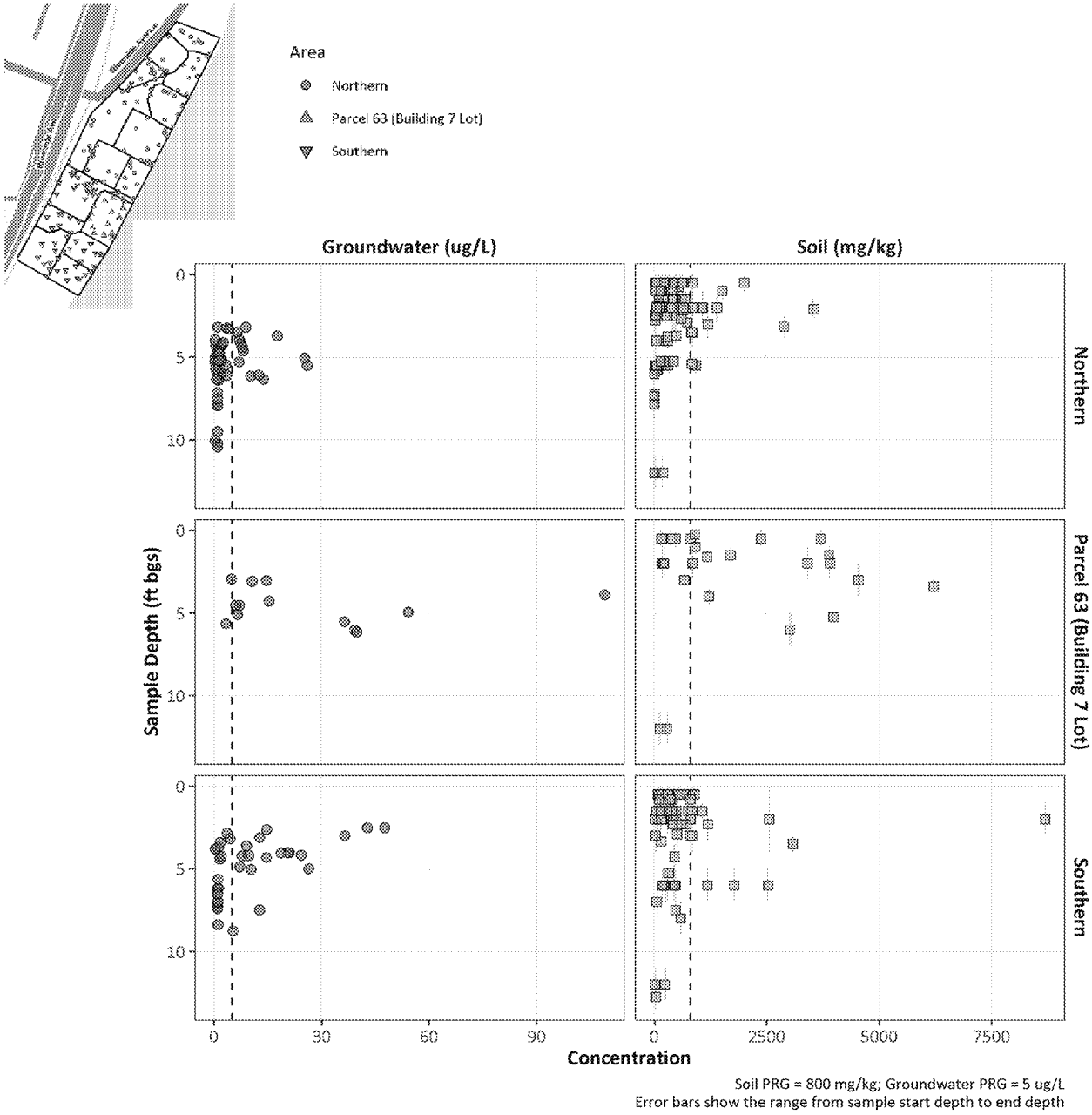


Figure 2. Groundwater and Soil/Fill Distributions within Three Portions of the Site

Groundwater results shown are from the shallow unit monitoring wells and exclude the March 2018 sample from MW-118. Groundwater depths are the reported depth to water table. Soil/fill results are from the boring locations from the RI and the sample start and end depth are shown as error bars on the depth. Duplicate samples are both shown.

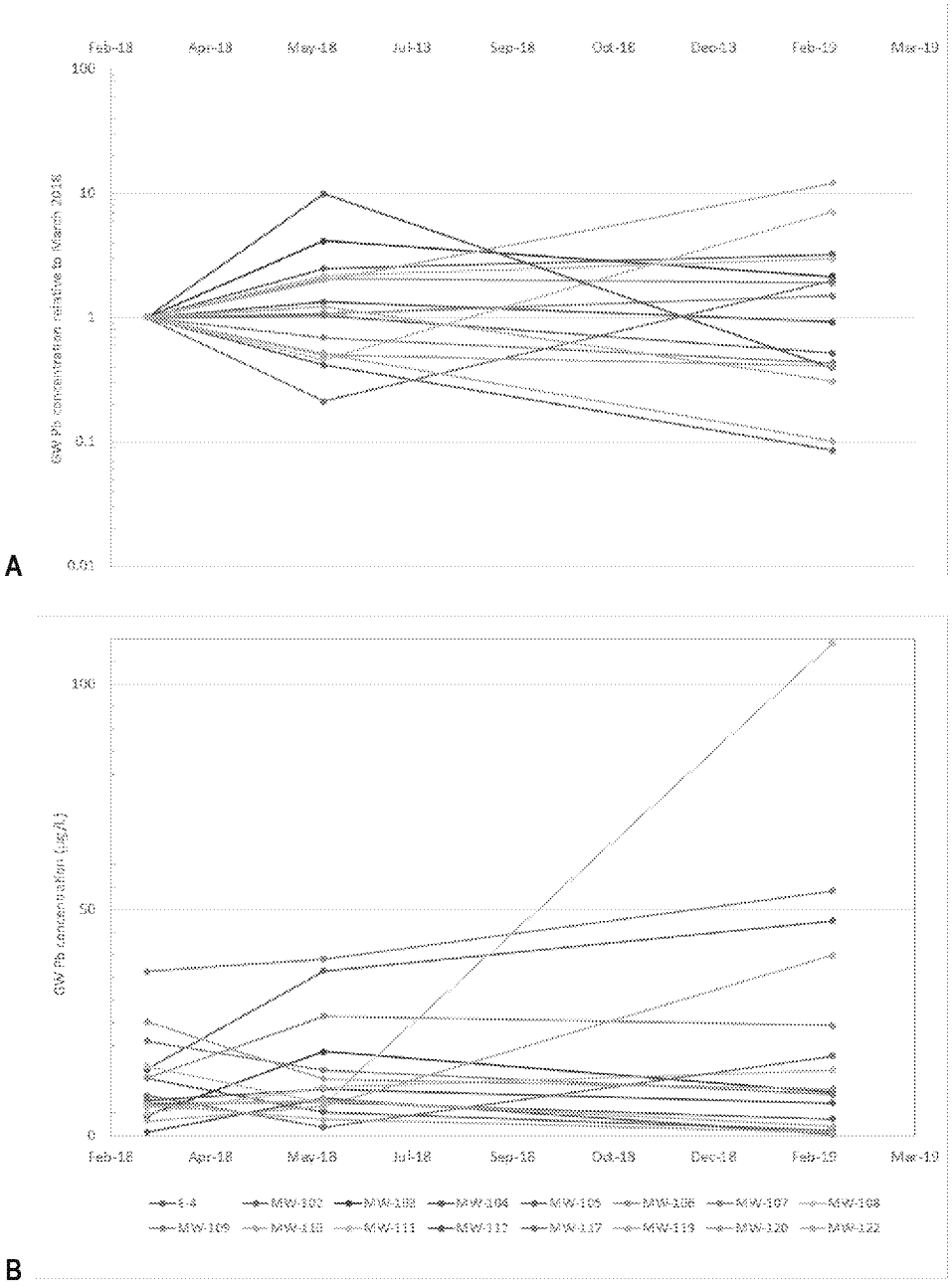


Figure 3. Relative Concentrations in 16 Wells with any Measurement above 5 µg/L

A) The groundwater concentrations are scaled to the first measurement in March 2018 to show both the direction and magnitude of the changes over time; the value of 1 represents no change in concentration, while 10 represents a 10-fold increase in concentration and 0.1 is a 10-fold decrease. B) Same wells are shown with the groundwater lead concentrations over time.

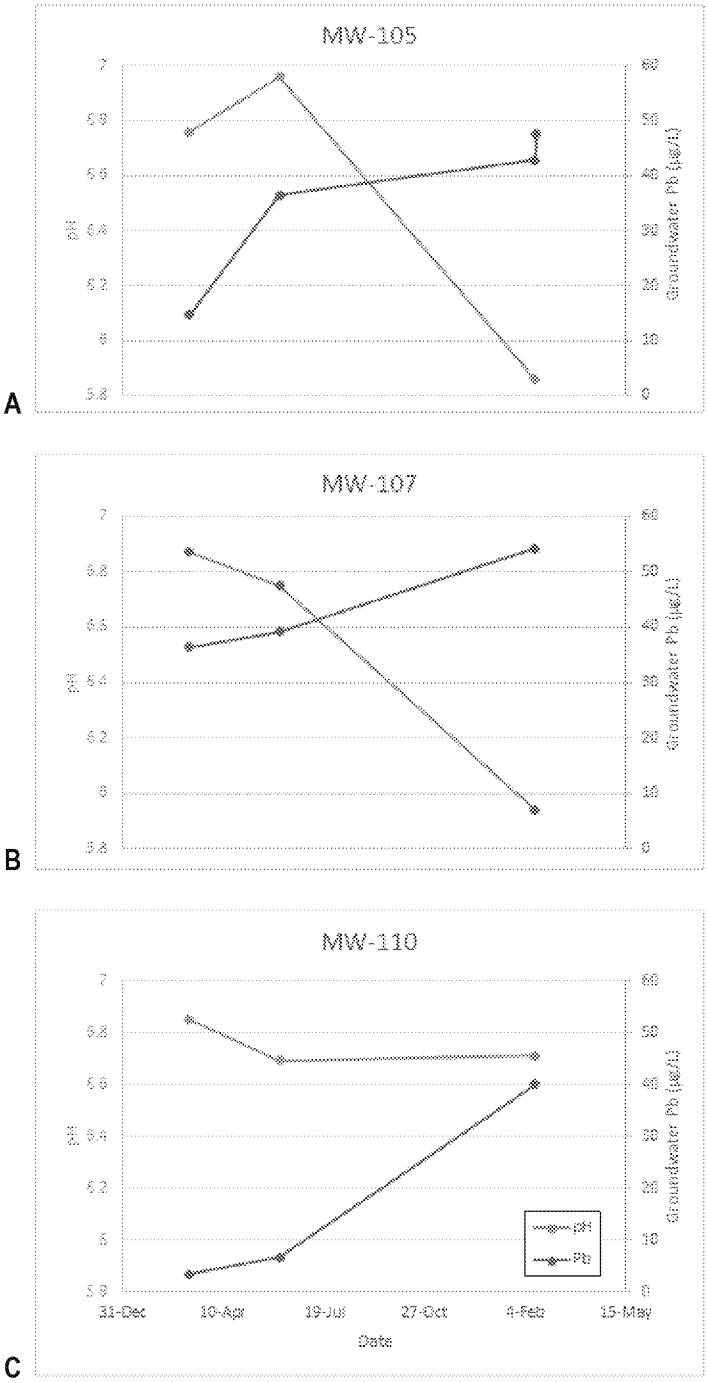


Figure 4. Groundwater Lead Concentrations and pH in Three Wells

Groundwater changes in lead and pH are shown in three wells with at least one elevated lead concentration in groundwater. Significant changes in groundwater lead concentrations and pH occur over time at MW-105 (A) and MW-107 (B), however, corresponding changes in pH did not occur at MW-110 (C), even though the groundwater lead concentration increased.

Figure 5
Site-Wide Soil Sampling Results

Lead

ARAR = 800 mg/kg

Riverside Industrial Park Superfund Site
29 Riverside Avenue
City of Newark, New Jersey

N

Legend

RIFS Soil Sampling Results (mg/kg)

- Result Not Detected (green)
- Detection Below ARAR (yellow)
- Detection Exceeds ARAR (blue)

Shoreline (Year)

- 1892
- 1901

- Buildings (Survey)
- Lot Boundary
- Historic Fill Placement 1892 - 1901

Notes:

1. Locations with multiple results represent multiple sample depth intervals at that location.
2. Surface samples taken < 2', subsurface samples taken ≥ 2' based on initial interval depth.
3. Field duplicate results not plotted.
4. See results tables for qualifier definitions
5. Shoreline extents are approximate and are subject to interpretation
6. Reference: April 2020 RIR, Figure 1-3.

0 100 200

Feet

1 inch = 130 feet

WOODARD & CURRAN

Project #: 0013620
Map Created: July 2020

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Figure 6

Lead Groundwater Sampling Results - Fill Unit

Riverside Industrial Park Superfund Site
29 Riverside Avenue
City of Newark, New Jersey

Legend

RIFS Groundwater Sampling Results (ug/L)

- Result Not Detected (green)
- Detection Below ARAR (yellow)
- Detection Exceeds ARAR (blue)
- Historic Fill Placement 1892 - 1901
- 1892
- 1901
- Buildings (Survey)

Notes:

1. See RIR results tables for qualifier definitions.
2. Shoreline extents are approximate and are subject to interpretation
3. Reference: April 2020 RIR, Figure 1-3.

N

0 75 150 Feet

1 inch = 150 feet

Project #: 0013620
Map Created: July 2020

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