Appendix A-2

NJDEP Approval of Sampling Plan for Vanadium Only Area

Archived: Thursday, July 1, 2021 12:32:52 PM
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Sent: Tue, 24 Nov 2020 17:44:13 +0000ARC
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Subject: RE: PPG- Site 107- Draft Sampling Plan for Vanadium-Only Area_107-015
Sensitivity: Normal

On behalf of the New Jersey Department of Environmental Protection (Department), please find herein comments on the *Site 107 Fashionland, Jersey City, New Jersey; SRP Program Interest No. G000008728; Sampling Plan for Vanadium-Only Area* (Plan)and the *Site 107 Fashionland, Jersey City, New Jersey; Responses to Weston Comments dated September 4, 2020 and October 9, 2020 on the Sampling Plan for Vanadium-Only Area* (RTC Memo); both of which were submitted per the email below.

Overall, the Plan and RTC Memo are acceptable and the Department requests that PPG move forward with the implementation of the Plan, while addressing or acknowledging the relatively minor issues noted in these comments. The Department will not require PPG to revise and resubmit the Plan, except that revised Figure 1 should be provided to Weston as specified in comment 3, below.

1. The Plan did not include instructions to the laboratory documenting that the laboratory will extract 100-gram sample aliquots each for SPLP, hexavalent chromium, and TAL metals analysis in SOP Modifications Step 9.6 of the *Addendum to SGS Standard Operating Procedure for Wand Mixer Homogenization of Soil Samples (DAYT-WET-0275-02-SOPT-HOMOGENIZATION)*. Please ensure that the laboratory digestion section implements the revised preparation methods to include the larger sample aliquot sufficient that the necessary reporting limits will achieved, as discussed in the October 28, 2020 sample preparation flowchart/associated bullets.
2. Page 5/8, Impact to Ground Water Pathway Evaluation, 2nd paragraph, 1st sentence: The phrase "*Consistent with NJDEP Chromium Workgroup guidance*," is incorrect, since the Workgroup did not develop specific guidance on how to evaluate the potential for impact to groundwater for soil/COPR mixtures. The Workgroup's final report stated that more research was needed in this area.
3. Figure 1: The Department requests that the proposed sampling locations be shifted as follows; please provide a revised Figure 1 to Weston in advance of, or upon, field mobilization. It is understood that the sample locations may be further revised based on field observations.
   a. Proposed sample location MSA-BC26 should be shifted approximately 15 feet to the south proximate to the intersection of grids B/C and 25/26.
   b. Proposed sample location MSA-BC28 should be shifted approximately 15 feet to the south proximate to the intersection of grids B/C and 27/28.
   c. Proposed sample location MSA-BC30 should be shifted approximately 15 feet to the south proximate to the intersection of grids B/C and 29/30.
   d. Proposed sample MSA-D2627 should be moved to a location relatively equidistant between proposed sample MSA-B2122 and (historic) Remedial Investigation boring 107_K036.
   e. In the event that COPR nodules or CCPW impacts are observed in proposed locations MSA-B2223 and/or MSA-C2223, PPG may wish to add an additional boring proximate to the intersection of grids B/C and 23/24.
4. November 6, 2020 Addendum to SGS Standard Operating Procedure for Particle Size Reduction (Crushing) of Solid Matrices (DAYT-WET-0276-02-SOPT-CRUSH): For consistency with NJDEP Specific Comment 10 from the Department's September 4, 2020 comment set and with Addendum to SGS SOP for Wand Mixer Homogenization, add "Step 11.3- Add to state the following: • Photo document the crushed portion of the sample following particle size reduction prior to homogenization with the remainder of the sample aliquot, as well as the homogenized sample material. Photos will be included in client report."

Thank you.

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Subject: RE: PPG- Site 107- Draft Sampling Plan for Vanadium-Only Area_107-015

**** External Email ****
Thank you for your partial review of the draft *Sampling Plan for Vanadium-Only Area* at the Non-Garfield Avenue Group (NGA) chromium Site 107 in Jersey City, Hudson County, New Jersey. Arcadis, on behalf of PPG, has revised the attached responses to incorporate Department comments emailed on October 9, 2020, and also in accordance with the *Preliminary Draft Site 107 MSA Process for Soil/COPR Mixtures* (Flowchart) received on October 28, 2020. Per the Department's request, both "clean" and "changes tracked" versions of the response document are provided to streamline review.

Also attached is a revised *Sampling Plan for Vanadium-Only Area*.

As noted in the attached submittal summary sheet (SSS), review of these documents is appreciated by November 25, 2020 (10 days).

Regards,
Jim McLaughlin

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Subject: RE: PPG- Site 107- Draft Sampling Plan for Vanadium-Only Area_107-015

On behalf of the New Jersey Department of Environmental Protection (Department), please find herein comments on PPG's September 24, 2020 revision to the *Site 107 Fashionland Sampling Plan for Vanadium-Only Area* (Sampling Plan), and the *Site 107 Fashionland Responses to Weston Comments dated September 4, 2020 on the Sampling Plan for Vanadium-Only Area* (RTC Memo), submitted per the email below.

PPG's proposal to not include crushed nodules in the sample aliquot being assessed for the leachability (to determine site-specific impact to groundwater standards) of total chromium (Cr) and hexavalent chromium (Cr^{+6}) is not acceptable. The Department has emphasized on numerous occasions the importance of including the crushing of COPR nodules into any site-specific impact to groundwater analysis. More specifically, as previously stated in the Department's comments submitted on September 4, 2020, "*…the Department requires that PPG crush only the chromite ore processing residue (COPR) nodule component of each sample to make the hexavalent chromium component of the COPR more available for leaching (from the COPR itself). … The crushed nodules would subsequently be homogenized into the remainder of the entire soil matrix for the associated soil sample prior to obtaining the aliquot(s) used for digestion/extraction as required by the analytical laboratory method.*" For the impact to groundwater evaluation, PPG is proposing an alternate strategy to what the Department requested per the above, one administering crushed COPR nodules versus another which does not. The Department's original request was for the inclusion of crushed COPR nodules in the entirety of the leachability analysis. PPG's proposal to not include crushed COPR in the leachability analysis would likely yield inaccurate site-specific impact to groundwater values for the concentration of Cr and Cr^{+6} in the COPR-soil mixture considered to be protective of groundwater.

PPG's proposal to not crush the COPR nodules for the leachability analysis is not acceptable to the Department, and therefore, the Department has opted to not conduct a detailed review of this version of the Sampling Plan. To that end, these comments are solely limited to a discussion of the adequacy of the responses to the Department's September 4, 2020 General Comments. Please note that the General Comments were considered acceptable unless otherwise presented herein. PPG must revise the Sampling Plan to adequately address the Department's concern articulated above, and the adequacy assessment presented herein. Once this is accomplished by PPG, the Department will then move forward with a detailed review of the revised Sampling Plan.

Adequacy Assessment of Prior Responses to General Comments

9/4/20 General Comment #1: *As previously discussed with PPG on multiple occasions, the Department reiterates that the approach proposed in this Sampling Plan would only be applicable to the Site 107 Material Staging Area (MSA) area, and is not to serve as a precedent for use at other chromate sites.*

Response to General Comment #1: PPG understands NJDEP's position that the approach proposed in the Sampling Plan will not serve as a precedent for use at other chromate sites. PPG respectfully maintains that the cooperation among the NJDEP, Weston, PPG, and Arcadis has resulted in development of a sampling approach that will provide data to facilitate remedial action decisions when removal of all visual COPR nodules in a COPR-soil mixture is not necessary for protection of human health and safety and the environment. As such, PPG respectfully requests that the NJDEP defer its final judgment until after reviewing the results and findings for the Site 107 MSA. If the results and findings show that conditions in the MSA are protective and/or that the IGW pathway is incomplete, the same established confirmatory sampling protocol should be considered for use in determining the limits of remedial action for material containing minimal COPR at other chromate sites.

Adequacy of PPG General Comment #1 RTC: *Comment acknowledged. However, the Department reiterates that the approach proposed in the Sampling Plan, once approved, would only be applicable to the Site 107 MSA, and may not necessarily be appropriate for application at other chromate sites based on the site-specific technical considerations at those sites. The Department's position, first and foremost, prioritizes the use of established technical guidance and methods (e.g., the ITRC Incremental Sampling Methodology) for the remediation of the chromate sites. PPG, in the case of Site 107 MSA, has asked the Department to consider a site-specific sampling strategy in lieu of using established technical guidance or methods. The Department has been working with PPG in this regard, for over a year now, in the interest of the property owner's redevelopment plans and schedule.*

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9/4/20 General Comment #3: *As discussed with PPG on July 30, 2020 and again with Arcadis on August 4, 2020, there is a concern that particle-size reduction of the entire sample would render the sample unrepresentative of the soil matrix in the field, and may also bias the sample results by creating a larger surface area for hexavalent chromium to adsorb to (and not be available for leaching). Therefore, the Department requires that PPG crush only the chromite ore processing residue (COPR) nodule component of each sample to make the hexavalent chromium component of the COPR more available for leaching (from the COPR itself). PPG should have the field team, who are knowledgeable in the identification of COPR nodules, separate the COPR from the entirety of the remainder of the soil sample matrix in the field, and ship the nodules to the laboratory with the remainder of the soil sample (e.g., in a separate container or plastic zip-top bag). The laboratory would then reduce particle size of the COPR nodules using a mortar and pestle (instead of using the mechanical crusher as proposed in the Sampling Plan) to a fine powder as evidenced by passing a No. 200 sieve. The crushed nodules would subsequently be homogenized into the remainder of the entire soil matrix for the associated soil sample prior to obtaining the aliquot(s) used for digestion/extraction as required by the analytical laboratory method. In order to have sufficient sample volume for all analyses, it is recommended that each sample be collected in a single 16-ounce sample jar. PPG should revise the Sampling Plan to specify one consistent field sample processing procedure for both MSA sidewall and MSA interior boring sample collection to avoid confusion in the field.*

Response to General Comment #3: Sampling Plan text has been updated to include the revised sample processing steps, and to streamline the field sample processing procedure for both MSA sidewall and MSA interior boring sample collection to avoid confusion in the field. PPG notes for the record that crushing COPR nodules to a powder capable of passing a No. 200 sieve is unrepresentative of the potential state of nodules in the field. Furthermore, potential laboratory leaching from COPR nodules in such a state is also unrepresentative of potential leaching in the field over time. Per the Unified Soil Classification System, particle size capable of passing a No. 200 sieve is representative of the silt/clay fraction. As described in the logs of historical soil borings advanced within the MSA, the MSA material is comprised primarily of sand and gravel. Therefore, crushing nodules using the requested method results in a finer particle size than the COPR-soil matrix which exists in situ. Lastly, it is not anticipated that earthwork or other activities associated with potential redevelopment of the site would crush the nodules in a manner that would result in silt/clay sized particles.

The laboratory has not had an opportunity to attempt crushing nodules using a mortar and pestle into a material capable of passing a No. 200 sieve, but efforts will be made to ensure all material passes to the extent practicable.

Rather than submitting every sample in a 16-ounce jar, PPG proposes that total and hexavalent chromium samples will be collected in an 8-ounce sample jar accompanied by a Ziplock bag of nodules extracted from that soil sample aliquot for crushing. Samples designated for leachability testing will be collected from the same homogenized bulk sample volume in the field and placed in separate jars sufficient to meet lab volume requirements for analysis of SPLP/SESOIL parameters. Nodules in the additional jars submitted for leachability testing will not be separated nor crushed.

Adequacy of PPG General Comment #3 RTC: *PPG's proposal to exclude crushed COPR nodules from samples submitted for leachability testing is not acceptable. The Department recognizes that crushing the nodules results in a finer particle size (for a portion of the samples) than what exists at the Site 107 MSA. The purpose of crushing the COPR nodules is to include a portion of the chromium mass which would potentially be slowly released from the COPR nodules over time, which would otherwise not be accounted for. Further, in order for the leachability tests to be able to be correlated to the totals analysis, the samples should be processed in the same manner. The Department maintains the requirement to include crushed COPR nodules in sample aliquots submitted for leachability testing.*

9/4/20 General Comment #5: *Although Synthetic Precipitation Leaching Procedure (SPLP) was specifically identified in the Chromium Moratorium memorandum, PPG should consider alternative leaching methods (e.g., United States Environmental Protection Agency [EPA] Leaching Environmental Assessment Framework [LEAF]) to determine whether one or more of these methods would be more appropriate for conditions at this site. As noted in the EPA's LEAF FAQ document,* "LEAF provides a consistent approach to estimating leaching of COPCs from a wide range of solid materials including …

mining and mineral processing wastes…". *As a result, PPG should consider the appropriateness and use of alternative leaching methods to determine the potential for impact to groundwater. Note that the LEAF method did not exist, and was therefore not available for evaluation, during the time that the NJDEP Chromium Work Group was active.*

Response to General Comment #5: Per NJDEP suggestion, Arcadis has reviewed EPA's LEAF methods, which comprise SW846 methods 1313, 1314, 1315, and 1316. Note that Arcadis' R&D laboratory supported EPA development of the LEAF methods. These methods, which while applicable to a wide array of solids (industrial wastes, soils, sludges, combustion residues, sediments, stabilized materials, construction materials, and mining wastes), were designed primarily to address leaching of constituents associated with coal combustion residuals (CCR) or fly ash wastes. For the reasons discussed below, the LEAF methods are not suitable to assess leaching behavior of the COPR-soil mixture in the Site 107 MSA and develop an impact to groundwater criteria.

- Method 1313 entails varying the pH of the leaching solution to assess liquid-solid partitioning (LSP). The pH is varied from highly acidic (pH 2 S.U.) to highly basic conditions (pH 13 S.U.), which are typically encountered at CCR sites. The average soil pH measured to date in samples collected from the MSA sidewalls is 7.6 S.U. The potential IGW pathway in the MSA is via rainfall and infiltration as considered in the SPLP/SESOIL model, so the extreme pH conditions of method 1313 are not representative of site conditions. Additionally, the analytes for which the method underwent an interlaboratory validation did not include chromium.
- Method 1314 is an upflow percolation column test to assess liquid-solid partitioning (LSP) as a function of liquid-solid ratio. The flow through the soil sample column and therefore the leaching behavior is governed by mobile and immobile porosities created in the column by the manual packing/compaction method. Porosities and the resulting preferential flow paths created in the column would not be representative of rainfall percolation through the unsaturated zone at the site. Furthermore, the batch SPLP/SESOIL method entails complete mixing and resulting particle attrition and leaching, which is a more conservative procedure to determine leaching than the upflow column procedure in method 1314. Additionally, the analytes for which the method underwent an interlaboratory validation did not include chromium, and as discussed below for method 1316, the liquid-solid ratio does not control the aqueous concentration of highly soluble hexavalent chromium.
- Method 1315 is designed to assess mass transfer rates (release rates) from a monolith (e.g., concrete materials, bricks, tile) or compacted granular material (soil, sediment, fly ash) that behaves like a monolith. Therefore, this method is not applicable to a COPR-soil mixture, and is also not in alignment with the sample processing/crushing planned for the COPR-soil mixture samples.
- Method 1316 involves an assessment of the LSP at natural pH of solid material as a function of liquid-solid ratio in parallel batch experiment where the ratio is varied from 10 to 0.5. The SPLP liquid-solid ratio of 20 represents a more conservative approach as larger eluent volume will allow higher concentration gradient for mass to desorb from solid phase to aqueous phase prior to reaching aqueous phase saturation or solubility limit. However, for highly soluble hexavalent chromium, the aqueous concentration is not controlled by a solid phase (or liquid-solid equilibrium). As method 1316 states, "This method provides solutions that are considered to be indicative of leachate under field conditions only where… the LSP is controlled by aqueous-phase saturation of the constituent of interest". Therefore, the liquid: solid ratio does not influence the leaching of hexavalent chromium. Furthermore, the analytes for which the method underwent an interlaboratory validation did not include chromium.

***Adequacy of PPG General Comment #5 RTC**: The application of LEAF methods to determine chromium leaching from various solid wastes is clearly demonstrated in the May 2019 LEAF guidance document. Also based on the 2012 EPA "Interlaboratory Validation of the Leaching Environmental Assessment Framework (LEAF) Method 1314 and Method 1315 reports, chromium was included in the interlaboratory validation. The LEAF methods can be performed in a stepwise fashion and tailored to best evaluate site-specific environmental conditions (e.g. known pH range) and project objectiv*

Method 1313 is a multi-point tests capable of bracketing and representing leaching in the pH range present in the heterogeneous fill in the Site MSA; whereas the SPLP method is a single-point test, and represents leaching at a single pH value. Regarding Method 1314, the Department does not agree with the statement "…the liquid: solid ratio does not influence the leaching of hexavalent chromium." This method, because it is a multi-point test, provides information on the extent to which hexavalent chromium is solubility or availability controlled, whereas the single-point SPLP method does not. Both Method 1314 and the SPLP are performed on disturbed samples, and the upflow configuration of Method 1314 is advantageous because it minimizes potential preferential flow effects. The combined use of Method 1313 and Method 1314 can provide an upper bound leaching estimate for the range of environmental conditions specific to the Site 107 MSA.

Because the LEAF methods have the ability to be designed to quantify chromium leaching from a COPR-soil mixture representative of the range of environmental conditions present in the Site 107 MSA, the Department requests that LEAF Method 1313 and Method 1314 be retained for further evaluation of their impact to groundwater exposure pathway However, as stated in the Adequacy of PPG General Comment #1 RTC above, the Department is conscious of the property owner's redevelopment plans and schedule, and is willing to have further discussions with PPG on this issue.

Thank you.

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Subject: RE: PPG- Site 107- Draft Sampling Plan for Vanadium-Only Area_107-015

**** External Email ****
Thank you for your review of the draft *Sampling Plan for Vanadium-Only Area* at the Non-Garfield Avenue Group (NGA) chromium Site 107 in Jersey City, Hudson County, New Jersey. Arcadis has prepared the attached responses to your comments on behalf of PPG. Also attached is a revised *Sampling Plan for Vanadium-Only Area* and associated attachments.

As noted in the attached submittal summary sheet (SSS), review of these documents is appreciated by October 9, 2020 (10 days).

Regards,
Jim McLaughlin

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Subject: RE: PPG- Site 107- Draft Sampling Plan for Vanadium-Only Area_107-015

On behalf of the New Jersey Department of Environmental Protection (Department), please find herein comments on PPG's August 6, 2020 revision to the *Site 107 Fashionland… Sampling Plan for Vanadium-Only Area* (Sampling Plan) submitted per the email below.

General Comment

1. As previously discussed with PPG on multiple occasions, the Department reiterates that the approach proposed in this Sampling Plan would only be applicable to the Site 107 Material Staging Area (MSA) area, and is not to serve as a precedent for use at other chromate sites.
2. In consideration of the chromium groundwater quality standard (GWQS) being based on total chromium, the Department is requiring PPG to determine site-specific impact-to-groundwater soil remediation standards (IGWSRS) for both total and hexavalent chromium for the Site 107 MSA. Both site-specific IGWSRSs should be developed to be protective of the chromium GWQS of 70 micrograms per liter (ug/L). Therefore, both total and hexavalent chromium must be analyzed separately to develop independent site-specific IGWSRSs. Further, to ensure that the site-specific IGWSRSs have been achieved for total and hexavalent chromium, PPG must analyze all soil and COPR-soil mixture samples collected from above the static water table for total and hexavalent chromium. The revised Sampling Plan should include a sample summary table.
3. As discussed with PPG on July 30, 2020 and again with Arcadis on August 4, 2020, there is a concern that particle-size reduction of the entire sample would render the sample unrepresentative of the soil matrix in the field, and may also bias the sample results by creating a larger surface area for hexavalent chromium to adsorb to (and not be available for leaching). Therefore, the Department requires that PPG crush only the chromite ore processing residue (COPR) nodule component of each sample to make the hexavalent chromium component of the COPR more available for leaching (from the COPR itself). PPG should have the field team, who are knowledgeable in the identification of COPR nodules, separate the COPR from the entirety of the remainder of the soil sample matrix in the field, and ship the nodules to the laboratory with the remainder of the soil sample (e.g., in a separate container or plastic zip-top bag). The laboratory would then reduce particle size of the COPR nodules using a mortar and pestle (instead of using the mechanical crusher as proposed in the Sampling Plan) to a fine powder as evidenced by passing a No. 200 sieve. The crushed nodules would subsequently be homogenized into the remainder of the entire soil matrix for the associated soil sample prior to obtaining the aliquot(s) used for digestion/extraction as required by the analytical laboratory method. In order to have sufficient sample volume for all analyses, it is recommended that each sample be collected in a single 16-ounce sample jar. PPG should revise the Sampling Plan to specify one consistent field sample processing procedure for both MSA sidewall and MSA interior boring sample collection to avoid confusion in the field.
4. In order to be able to bias "interior MSA" sample locations to locations of surficial COPR nodules, the surface of the MSA area must have vegetation removed (mowed short and/or brush removed) and a complete visual survey of the presence of COPR on the surface of the MSA must be made, with PPG's consultants accompanied by Department/Weston oversight personnel. Areas of observed COPR must be documented on a figure and these locations used to bias borings as discussed in Specific Comment 6, below. Further, areas where nodules were previously identified (and covered by fabric/stone) must also be included in the biased sample locations.
5. Although Synthetic Precipitation Leaching Procedure (SPLP) was specifically identified in the Chromium Moratorium memorandum, PPG should consider alternative leaching methods (e.g., United States Environmental Protection Agency [EPA] Leaching Environmental Assessment Framework [LEAF]) to determine whether one or more of these methods would be more appropriate for conditions at this site. As noted in the EPA's LEAF FAQ document, "*LEAF provides a consistent approach to estimating leaching of COPCs from a wide range of solid materials including … mining and mineral processing wastes…*". As a result, PPG should consider the appropriateness and use of alternative leaching methods to determine the potential for impact to groundwater. Note that the LEAF method did not exist, and was therefore not available for evaluation, during the time that the NJDEP Chromium Work Group was active.

Specific Comments

1. Page 1, 3rd paragraph: Please remove the phrase "*in accordance with the TEP*." Since the Technical Execution Plan (TEP) called for confirmation of the removal of visible chromate chemical production waste (CCPW) prior to collection of confirmation post-excavation soil samples, the characterization of the MSA sidewalls was not performed in accordance with the TEP.
2. Page 2, 2nd paragraph: The sampling program in which ten samples were crushed was implemented against the Department's specific recommendation, and therefore the Department will not consider the results of this sampling in any remedial decision-making.
3. Page 2, Supplemental MSA Sidewall Sampling, 2nd paragraph, 1st sentence: The revisions are an attempt to characterize the nature of the COPR-soil mixture(s) present at Site 107 and not the COPR nodules themselves. Please change "*COPR nodules*" to "*COPR-soil mixture(s) specific to Site 107 MSA area.*"
4. Page 2, Supplemental MSA Sidewall Sampling, Field Procedure: The field procedure should include collection of a 16-ounce sample and COPR nodule separation as per General Comment 3 following step 6 of the field procedure. The COPR nodules and associated remaining sample should be photo-documented for each sample.
5. Page 3, Supplemental MSA Interior Sampling, 1st paragraph, 1st and 2nd sentence: The investigation discussed was part of the site-wide Remedial Investigation for Site 107; the March 2013 Remedial Investigation Report (RIR) should be referenced rather than the May 2013 memorandum *Vanadium Exceedances in Fill Unrelated to CCPW* (Vanadium Exceedances memo). Further, five of the twelve referenced borings within the MSA area had rejected hexavalent chromium analytical results, as reported on Figure 9 of the RIR, specifically 107_K036, 107_M040, 107_M042, 107_M044, and 107_M046. Where results were rejected, PPG must evaluate whether they are useable. If the results are not considered useable, then they cannot be used to support the objectives of this Sampling Plan.
6. Page 3, Supplemental MSA Interior Sampling, 2nd paragraph, 2nd sentence: Visible COPR nodules have been identified on the ground surface of the MSA interior area. Therefore, prior to finalization of the soil boring grid locations, Arcadis and Weston must conduct a non-intrusive surface survey to identify the locations/areas where COPR nodules are visible on the ground surface, mark the locations of nodules with stakes/pin flags/surveyor's tape, and document those locations on a figure. This figure should be used to help guide the determination of the final interior MSA boring locations in the revised Sampling Plan. See General Comment 4.
7. Page 3, Supplemental MSA Interior Sampling, 2nd paragraph, last sentence: It is acknowledged that historically on the other JCO chromate sites, pre-design investigation (PDI) data is typically collected on a non-biased grid pattern to determine the remedial excavation limits. However, in addition to achieving the "*approximately one boring per 900-square foot coverage*", the MSA interior samples must be biased to observations of presumed contamination as evidenced by the more recent observations of COPR nodules on the ground surface of the MSA area. Collection of data biased to suspected impacted areas is consistent with the Department's *Technical Guidance for Site Investigation of Soil, Remedial Investigation of Soil, and Remedial Action Verification Sampling for Soil* (March 2015). Also see General Comment 4, Specific Comment 5, and Specific Comment 6.
8. Page 3, Supplemental MSA Interior Sampling, Field Procedure.: The field procedure for each 2-ft depth interval that contains COPR nodules, developed to be consistent with General Comment 3 and Specific Comment 4, must be implemented for the MSA Interior Sampling borings. See also General Comments 2, Specific Comment 5, and Specific Comment 7.
9. Page 4, Sample Homogenization and Laboratory Analysis, 4.: For those samples which may be analyzed for both "totals" analysis and "leachability" analysis, the Department has determined that the COPR-soil mixture samples should be collected in a 16-ounce jar to allow the two samples to be more closely representative of each other. This sample volume should be reconsidered if PPG determines that a leachability method other than SPLP will be used. See also General Comment 3, General Comment 5 and Specific Comment 4.
10. Page 4, Sample Homogenization and Laboratory Analysis, 4.: Photo-documentation of the crushed portion of the sample, and of the sample once the crushed COPR has been homogenized into the bulk sample, must be provided by the laboratory. See General Comment 3.
11. Page 4, Sample Homogenization and Laboratory Analysis, Laboratory Procedure, 3., 4., and 5.: See General Comment 3.
12. Page 5, Site-Specific Impact to Groundwater Criterion: The Sampling Plan should be revised to specify the groundwater elevation proposed to evaluate the impact to groundwater pathway within the Site 107 MSA area and the data used to support this elevation. Consistent with what has been done under this program at other JCO chromate sites, the 50th percentile water table elevation data should be used to establish the water table elevation above which site-specific IGWSRS would apply. See also General Comment 2.
13. Page 5, Site-Specific Impact to Groundwater Criterion, 3rd bullet: Given the uncertainties associated with COPR-soil mixtures and the use of SPLP for such mixtures, the use of SESOIL for the evaluation of the impact to groundwater pathway may be more appropriate. The Sampling Plan should be revised to include a SESOIL section which identifies proposed site-specific SESOIL input parameters and sampling needed to establish or refine these parameters.
    Additional data for total chromium and hexavalent chromium may be required to populate the SESOIL model (if used); therefore, PPG may wish to collect additional samples for total chromium and hexavalent chromium analysis from the interior MSA borings during the field implementation of

the revised Sampling Plan. In addition, throughout the interior MSA area, samples should be collected for grain size analysis to determine site-specific soil textures to support an impact-to-groundwater evaluation in the event that SESOIL analysis is needed. This would apply primarily in vadose zone soils below identified COPR-soil mixtures.

14. Page 5, Site-Specific Impact to Groundwater Criterion, last bullet: See General Comment 5.
15. Page 6, Site Specific Impact to Groundwater Criterion, second paragraph: In addition to evaluating the impact-to-groundwater pathway for hexavalent chromium, that pathway must also be evaluated for total chromium. See General Comment 2.
16. Page 6, Synthetic Precipitation Leaching Procedure, 1st sentence: Although the Department's November 2013 guidance document (*Development of Site-Specific Impact to Ground Water Soil Remediation Standards Using the Synthetic Precipitation Leaching Procedure*) requires a minimum of 3 soil samples for each area of concern, it also says the samples must be "*…representative of the variation in soil conditions over the area of concern, including variations with soil depth*." Given the uncertainties associated with the COPR-soil mixtures, the absence of established methods, variability of soil texture in fill, and the size of the MSA area, the Department is requesting more than the minimum of 3 soil samples for SPLP analysis at the Site 107 MSA area. Based on the cross sections generated by CB&I (presented in the Vanadium Exceedances memo) from borings installed by Dresdner Robin (presented in the RIR), it appears that there are two primary fill types within the MSA area (e.g., with shingles and without shingles). Therefore, the Department is requiring that PPG collect at least 3 soil samples for leachate analysis from each fill type. These fill types should be confirmed in the field, with the appropriate number of samples confirmed at that time.
17. Page 6, Synthetic Precipitation leaching Procedure, 2nd paragraph: The sample aliquot used for the leachability test must be obtained from the bulk sample that included crushed nodules. See General Comment 2, General Comment 3, General Comment 5, and Specific Comment 4.
18. Page 6, Synthetic Precipitation Leaching Procedure, bullet list: Please include and specify the proposed dilution attenuation factor (DAF).
19. Page 6, Synthetic Precipitation Leaching Procedure, last paragraph: See General Comment 2, General Comment 5, and Specific Comment 13.
20. Figure 1. See Specific Comment 7.
21. Procedure for Wand Mixer Homogenization of Soil Samples, Procedure 9.3 and 9.4: Note that the laboratory homogenization procedure is applied only to a portion of the sample aliquot (i.e., "*…enough sample… to fill a beaker approximately 1.5 to 2 inches full*" before the sample is "*…ready for homogenization*." Consistent with the stated goal of the sample being representative of the total soil material collected, the laboratory must homogenize the entire soil sample volume following grinding of the COPR nodules (see General Comment 3) it would be preferable for the laboratory homogenization procedure to be applied to the entire sample volume. Since the Wand Mixer Homogenization of Soil Samples procedure states "*If there is too much sample in the beaker, it will not mix well*," PPG should work with the lab to develop an appropriate homogenization method to achieve homogenization of the crushed COPR nodules with the entire sample aliquot. The Sampling Plan must be revised to include the appropriate laboratory homogenization Standard Operating Procedure.
22. Procedure for Particle Size Reduction (Crushing) of Solid Matrices, Procedure 9.1: This procedure is designed for an aliquot of the homogenized sample to be crushed. The procedure must be modified to be consistent with the sample processing method developed pursuant to this Sampling Plan and this comment set; see General Comment 3 and Specific Comment 4.
23. Procedure for Particle Size Reduction (Crushing) of Solid Matrices, Procedure 9.2: This procedure allows for hand-crushing to a particle size of 1 centimeter or less with a hammer, as the "*…preferred handling for metals samples…*" The procedure must be modified to be consistent with the sample processing method developed pursuant to this Sampling Plan and this comment set; see General Comment 3 and Specific Comment 4.

Thank you.

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From: McLaughlin Jr., James (ARCADIS) [mailto:James.S.McLaughlin@arcadis.com]
Sent: Thursday, August 6, 2020 6:10 PM
To: david.doyle@dep.nj.gov
Cc: wayne.howitz@dep.nj.gov; Amin, Prabal <Prabal.Amin@WestonSolutions.com>; Amend-Babcock, Laura <Laura.Amend-Babcock@WestonSolutions.com>; Costa, Ralph <Ralph.Costa@WestonSolutions.com>; Laguzza, Dorothy M. <Dorothy.Laguzza@klgates.com>; Joe Lagrotteria (joseph.lagrotteria@klgates.com) <joseph.lagrotteria@klgates.com>; ncolson@mdmc-law.com; rriccio@mdmc-law.com; acampbell@eastern-millwork.com; James M. Bonalsky, Esq. <jbonalsky@ancamllc.com>; Terril, Mark <terril@ppg.com>; Overmyer, Jody <overmyer@ppg.com>; Feinberg, Richard [C] <feinberg@ppg.com>; rriccio@mdmc-law.com; 'Terril, Mark' <terril@ppg.com>; jray <jray@mdmc-law.com>
Subject: PPG- Site 107- Draft Sampling Plan for Vanadium-Only Area_107-015

** **External Email** **
Arcadis has prepared this revised *Draft Sampling Plan for Vanadium-Only Area* on behalf of PPG, to present the approach to further characterize soils along the perimeter of the Vanadium-Only Area footprint (aka "Material Staging Area") at the Non-Garfield Avenue Group (NGA) chromium Site 107 in Jersey City, Hudson County, New Jersey. This revision replaces the version submitted by Arcadis on July 16, 2020. A submittal summary sheet (SSS) is also included in this email with further details.

Regards,
Jim McLaughlin

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From: James D. Ray <Jray@mdmc-law.com>
Sent: Friday, July 17, 2020 4:57 PM
To: 'Terril, Mark' <terril@ppg.com>
Cc: wayne.howitz@dep.nj.gov; prabal.amin@westonsolutions.com; Amend-Babcock, Laura <laura.amend-babcock@westonsolutions.com>; ralph.costa@westonsolutions.com; Laguzza, Dorothy M. <Dorothy.Laguzza@klgates.com>; Joe Lagrotteria (joseph.lagrotteria@klgates.com) <joseph.lagrotteria@klgates.com>; ncolson@mdmc-law.com; rriccio@mdmc-law.com; acampbell@eastern-millwork.com; James M. Bonalsky, Esq. <jbonalsky@ancamllc.com>; Terril, Mark <terril@ppg.com>; Overmyer, Jody <overmyer@ppg.com>; Feinberg, Richard [C] <feinberg@ppg.com>; rriccio@mdmc-law.com; McLaughlin Jr., James (ARCADIS) <James.S.McLaughlin@arcadis.com>; david.doyle@dep.nj.gov
Subject: RE: PPG- Site 107- Draft Sampling Plan for Vanadium-Only Area

Mark: When we spoke this morning you requested that Ron, in essence, extend his deadline for another week to allow PPG and Weston/NJDEP to consider the sampling methodology for the MSA at Site 107 and whether a resolution was in the cards. Although Arcadis had circulated yesterday at 3:10 P M a proposed new version of the sampling plan that called for the sampling of the interior of the MSA, in our call this morning you indicated that your management was not prepared to proceed with that plan until further information was obtained from Weston/NJDEP as to why sampling in the interior of the MSA was necessary when sampling was previously conducted by PPG in the that area. In this regard, I understand you are trying to schedule a conference call with Weston/NJDEP for next Friday, July 24.

In an attempt to answer PPG's question about the basis of the requirement for additional sampling in the interior of the MSA and in order to attempt to avoid further delays and technical meetings, I offer the following for your consideration.

I assume your reference to prior sampling by PPG in the interior of the MSA is based upon the following statement in the July 17, 2020 Arcadis sampling plan: "The northeastern portion of Site 107, which includes the MSA, was previously investigated and determined not to contain COPR nodules or exceedances of the CrSCC based on findings of an investigation documented in the *Vanadium Exceedances in Fill Unrelated to CCPW Fill* memo (CB&I, May 2013)."

It is my understanding that the investigations referenced in the CB&I 2013 memo were based upon 60 x 60 grids at 4 intervals instead of the current requirement (as set forth, for instance, in the TIP for Sit 107), which is based upon 30' x 30' grids and 2' intervals. In addition, over the course of the last several years as the excavation and backfilling work at Site 107 was conducted, COPR nodules were identified on the surface of the MSA, as well as the sidewalls. Those sidewalls are located in areas that the CB&I 2013 memo determined would be clean zones or areas not impacted by CCPW.

I also direct your attention to General Comment 3 of the May 7, 2020 Weston technical memo where the following is stated:

> In addition to the inherent variability in the characteristics of COPR nodules and COPR-soil mixtures mentioned above, there exists spatial variability in the amounts and distribution (area and depth) of COPR nodules at HEC Site 107, by virtue of the fact these nodules were originally physically emplaced at the site as part of construction fill ing and grading activities. It is largely unknown as to what amounts and frequency additional COPR nodules may exist (i n remaining unexcavated areas) beyond the excav faces of the "MSA" area. Given this variability in spatial distribution, PPG should develop and propose a statistically-significant sampling approach as part of the revised sampling procedure to address this variability throughout the balance of the "MSA" area beyond just the working face of the excavation.

Weston and the Department may have additional information for you and your management to consider. These are my thoughts that I offer to simply avoid further delays. This issue is on the agenda for Monday's Principals call when I hope we can all agree on a path forward.

Best,
Jim

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From: McLaughlin Jr., James (ARCADIS) [mailto:James.S.McLaughlin@arcadis.com]
Sent: Thursday, July 16, 2020 3:10 PM
To: david.doyle@dep.nj.gov
Cc: wayne.howitz@dep.nj.gov; prabal.amin@westonsolutions.com; Amend-Babcock, Laura; ralph.costa@westonsolutions.com; Laguzza, Dorothy M.; Joe Lagrotteria (joseph.lagrotteria@klgates.com); James D. Ray; Nancy Colson; Ronald Riccio; acampbell@eastern-millwork.com; James M. Bonalsky, Esq.; Terril, Mark; Overmyer, Jody; Feinberg, Richard [C]; Ronald Riccio
Subject: RE: PPG- Site 107- Draft Sampling Plan for Vanadium-Only Area

This message originated from outside your organization

Arcadis has prepared the attached revised *Draft Sampling Plan for Vanadium-Only Area* on behalf of PPG, to present the approach to further characterize soils within the Vanadium-Only Area footprint (aka "Material Staging Area") at the Non-Garfield Avenue Group (NGA) chromium Site 107 in Jersey City, Hudson County, New Jersey. The scope of this submittal has been expanded to incorporate elements requested by NJDEP. A submittal summary sheet (SSS) is also included in this email with further details.

Regards,
Jim McLaughlin

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From: Doyle, David <David.Doyle@dep.nj.gov>
Sent: Monday, July 6, 2020 3:41 PM
To: McLaughlin Jr., James (ARCADIS) <James.S.McLaughlin@arcadis.com>
Cc: wayne.howitz@dep.nj.gov; prabal.amin@westonsolutions.com; Amend-Babcock, Laura <laura.amend-babcock@westonsolutions.com>; ralph.costa@westonsolutions.com; Laguzza, Dorothy M. <Dorothy.Laguzza@klgates.com>; Joe Lagrotteria (joseph.lagrotteria@klgates.com) <joseph.lagrotteria@klgates.com>; jray <jray@mdmc-law.com>; ncolson@mdmc-law.com; rriccio@mdmc-law.com; acampbell@eastern-millwork.com; James M. Bonalsky, Esq. <jbonalsky@ancamllc.com>; Terril, Mark <terril@ppg.com>; Overmyer, Jody <overmyer@ppg.com>; Feinberg, Richard [C] <feinberg@ppg.com>; rriccio@mdmc-law.com
Subject: Re: PPG- Site 107- Draft Sampling Plan for Vanadium-Only Area

Jim,

As a follow-up to the Principals call this morning, the fact that I am on furlough the rest of this week, and to satisfy Ron Riccio's request to arrive at a resolution of this issue by the next Principals call, NJDEP's expectation is that the Site 107 sampling plan incorporate the following two elements that were omitted.

- A 30' x 30' gridding approach to sample the balance of the entire MSA area (not just the sidewalls) similar to that conducted by PPG during pre-design Investigation (PDI) boring programs to support Terminal Excavation Elevation (TEE) evaluations at other JCO sites. This approach in concept was suggested by PPG, during a conference call held on May 14, 2020 between NJDEP, PPG, Weston and Jim Ray, as an alternative to ISM to satisfy the concern raised in General Comment #3 of Weston's May 7, 2020 independent analysis.

- An approach for determining a site-specific criterion for hexavalent chromium in the COPR-soil mixture in the balance of the MSA area that would be protective of impacts to groundwater, as highlighted in General Comment #1 of Weston's May 7, 2020 independent analysis.

Please let me know if PPG is willing to revise the sampling plan to incorporate the above elements. As I mentioned previously, NJDEP will refrain from a full technical review of the submitted sampling plan until such time that these elements are adequately incorporated by PPG into a revised sampling plan for the balance of the MSA area.

Dave

(609) 498-4095

David S. Doyle, Case Manager

New Jersey Department of Environmental Protection

Site Remediation and Waste Management Program

Division of Remediation Management

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From: McLaughlin Jr., James (ARCADIS) <James.S.McLaughlin@arcadis.com>
Sent: Thursday, July 2, 2020 5:01 PM
To: Doyle, David <David.Doyle@dep.nj.gov>
Cc: Howitz, Wayne <Wayne.Howitz@dep.nj.gov>; prabal.amin@westonsolutions.com <prabal.amin@westonsolutions.com>; Amend-Babcock, Laura <laura.amend-babcock@westonsolutions.com>; ralph.costa@westonsolutions.com <ralph.costa@westonsolutions.com>; Laguzza, Dorothy M. <Dorothy.Laguzza@klgates.com>; Joe Lagrotteria (joseph.lagrotteria@klgates.com) <joseph.lagrotteria@klgates.com>; jray <jray@mdmc-law.com>; ncolson@mdmc-law.com <ncolson@mdmc-law.com>; rriccio@mdmc-law.com <rriccio@mdmc-law.com>; acampbell@eastern-millwork.com <acampbell@eastern-millwork.com>; James M. Bonalsky, Esq. <jbonalsky@ancamllc.com>; Terril, Mark <terril@ppg.com>; Overmyer, Jody <overmyer@ppg.com>; Feinberg, Richard [C] <feinberg@ppg.com>
Subject: [EXTERNAL] RE: PPG- Site 107- Draft Sampling Plan for Vanadium-Only Area

Hello Dave,

You have indicated that the *Draft Sampling Plan for Vanadium-Only Area* does not fully address the need for sampling of the "MSA" area beyond the sidewalls, nor the need for a site-specific impact to groundwater analysis for hexavalent chromium. As a supplement to detail included in the sampling plan submitted to this group yesterday, this email provides further context to both points:

1. **Sampling the MSA Interior**

   PPG's position is that characterization beyond the excavated sidewalls of the Vanadium-Only Area footprint (aka "MSA") at NGA chromium Site 107 has been previously completed. Historical investigations have provided information on the occurrence of nodules which exist within the remaining unexcavated areas of the MSA. These investigations include the following:

   a. **Vanadium-Only Area Soil Boring Investigation (Dresdner Robin, February 2011)**
      - This investigation included Geoprobe advancement of 3-inch diameter soil borings to between 10 and 20 feet below ground surface. Eighteen soil borings were advanced within the Vanadium-Only area, at least 12 of which fall within the remaining MSA area footprint. No COPR nodules were observed in any of the 18 borings. It should be noted that AECOM observed this investigation conducted by Dresdner Robin. Soil samples collected at varying depths from the 18 borings exhibited no hexavalent chromium exceedances of NJDEP's soil cleanup criteria. Detail of this investigation was presented in the *Final Remedial Action Work Plan- Non-Residential Chromate Chemical Production Waste Sites, Hudson County Chrome Site 107* (CB&I, 2013), and also in the *Response to Specific Comments on the Sampling Procedure for the Vanadium-Only (aka "MSA") Area, HCC Site 107 by Weston, dated May 7, 2020* (Arcadis 2020).

   b. **MSA Test Pit Investigation (May 2019)**
      - Subsequent to observance of COPR nodules in the southern MSA sidewall, on May 28, 2019 a test pit was advanced within the MSA interior. The test pit was approximately 30-feet north of the southern sidewall, and was advanced with the intent of delineating the extent of nodules within the MSA. The test pit was approximately 40-feet in length, with a sloped bottom reaching 12 to 15 feet in depth. This depth generally aligns with the depth of remedial excavation adjacent to the MSA. Stockpiles of excavated material were screened by Weston and Arcadis and five nodules were found. No additional MSA area test pits were advanced considering the sparse amount of nodules observed.

   c. **MSA Surface Inspection (October 2019)**
      - On October 11, 2019, Weston and Arcadis inspected the surface of the MSA area. Two areas which constitute approximately 1/5 of the total MSA surface were not inspected because they were covered with fabric and crushed stone. Nine COPR nodules were identified during inspection, eight of which were found in the southern portion of the MSA near the former test pit location (#2 above). Thirteen locations were also identified with apparent surface discoloration (spots). All nodules and visually discolored soil were removed by hand. Six subsequent MSA surface inspections conducted by Arcadis through March 2020 identified no additional nodules or surface discoloration.

   These historical investigations are sufficient to demonstrate a zero to low frequency of nodules existing beyond the excavated faces of the MSA area. In keeping with typical HCC site remedial approach, characterization of the MSA Area sidewalls is proposed as described in the *Draft Sampling Plan for Vanadium-Only Area*. If the analytical results show no exceedances of applicable criteria, further investigation and excavation will not be performed and an unrestricted use remedial action will be achieved. Exceedances may be addressed via further excavation or engineering controls.

2. **Site-Specific Impact to Groundwater Analysis**

   Arcadis, on behalf of PPG, collected 13 samples from the southern MSA sidewall on May 31, 2019. To evaluate impact to groundwater of the MSA COPR-soil mixture, SPLP testing was performed on three of those samples. The laboratory confirmed that COPR nodules were present in each of the three samples, crushed the nodules, returned them to the soil matrix, and then analyzed each via SPLP. All three samples passed SPLP for CCPW metals. Detail regarding this investigation was summarized in an Arcadis email to NJDEP dated July 22, 2019, and the *Response to Specific Comments on the Sampling Procedure for the Vanadium-Only (aka "MSA") Area, HCC Site 107 by Weston, dated May 7, 2020* (Arcadis 2020).

   The Chromium Moratorium (NJDEP 2007) indicates NFA approval is contingent upon removal of hexavalent chromium contamination in excess of 20 ppm, and any contamination which fails the SPLP test for impact to groundwater. The *Draft Sampling Plan for Vanadium-Only Area* presents the approach for recharacterization of the MSA sidewalls to ensure that hexavalent chromium contamination does not exceed 20 ppm, and analytical results demonstrate that the material does not fail the SPLP test for impact to groundwater. To address the concern that COPR nodule dissolution over time may result in future failure of the SPLP test, nodules were crushed as part of the 2019 MSA SPLP analysis. We believe this approach aligns with the Chromium Moratorium and is protective of groundwater. Protectiveness is further demonstrated by the absence of hexavalent chromium groundwater impacts in the vicinity of the MSA.

If beneficial, I'd be happy to arrange a meeting to discussion this in more detail.

Best regards,
Jim McLaughlin

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ARCADIS | Design & Consultancy for natural and built assets

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From: Doyle, David <David.Doyle@dep.nj.gov>
Sent: Thursday, July 2, 2020 12:14 PM
To: McLaughlin Jr., James (ARCADIS) <James.S.McLaughlin@arcadis.com>
Cc: wayne.howitz@dep.nj.gov; prabal.amin@westonsolutions.com; Amend-Babcock, Laura <laura.amend-babcock@westonsolutions.com>; ralph.costa@westonsolutions.com; Laguzza, Dorothy M. <Dorothy.Laguzza@klgates.com>; Joe Lagrotteria (joseph.lagrotteria@klgates.com) <joseph.lagrotteria@klgates.com>; jray <jray@mdmc-law.com>; ncolson@mdmc-law.com; rriccio@mdmc-law.com; acampbell@eastern-millwork.com; James M. Bonalsky, Esq. <jbonalsky@ancamllc.com>; Terril, Mark <terril@ppg.com>; Overmyer, Jody <overmyer@ppg.com>; Feinberg, Richard [C] <feinberg@ppg.com>
Subject: Re: PPG- Site 107- Draft Sampling Plan for Vanadium-Only Area

Jim,

The New Jersey Department of Environmental Protection (Department) is in receipt of the Sampling Plan for Vanadium-Only Area (Sampling Plan) dated July 1, 2020. The Department is refraining from moving forward with a technical review of this Sampling Plan since the plan does not fully address the technical considerations brought to light through previous exchanges, including among other items, the need for sampling of the "MSA" area beyond just the sidewalls and does not address the need for a site-specific impact to groundwater analysis for hexavalent chromium.

Dave

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From: McLaughlin Jr., James (ARCADIS) <James.S.McLaughlin@arcadis.com>
Sent: Wednesday, July 1, 2020 5:51 PM
To: Doyle, David <David.Doyle@dep.nj.gov>
Cc: Howitz, Wayne <Wayne.Howitz@dep.nj.gov>; prabal.amin@westonsolutions.com <prabal.amin@westonsolutions.com>; Amend-Babcock, Laura <laura.amend-babcock@westonsolutions.com>; ralph.costa@westonsolutions.com <ralph.costa@westonsolutions.com>; Laguzza, Dorothy M. <Dorothy.Laguzza@klgates.com>; Joe Lagrotteria (joseph.lagrotteria@klgates.com) <joseph.lagrotteria@klgates.com>; jray <jray@mdmc-law.com>; ncolson@mdmc-law.com <ncolson@mdmc-law.com>; rriccio@mdmc-law.com <rriccio@mdmc-law.com>; acampbell@eastern-millwork.com <acampbell@eastern-millwork.com>; James M. Bonalsky, Esq. <jbonalsky@ancamllc.com>; Terril, Mark <terril@ppg.com>; Overmyer, Jody <overmyer@ppg.com>; Feinberg, Richard [C] <feinberg@ppg.com>
Subject: [EXTERNAL] PPG- Site 107- Draft Sampling Plan for Vanadium-Only Area

Arcadis has prepared this *Draft Sampling Plan for Vanadium-Only Area* on behalf of PPG, to present the approach to further characterize soils along the perimeter of the Vanadium-Only Area footprint (aka "Material Staging Area") at the Non-Garfield Avenue Group (NGA) chromium Site 107 in Jersey City, Hudson County, New Jersey. A submittal summary sheet (SSS) is also included in this email with further details.

Regards,
Jim McLaughlin

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ARCADIS Design & Consultancy for natural and built assets

Be green, leave it on the screen.

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