Quality Assurance Project Plan

RI Low Resolution Coring/Sediment Sampling

Lower Passaic River Restoration Project RI/FS

Revision 1, July 18, 2008

Document No.: 12182-003-0220

CV08031a-TC

Quality Assurance Project Plan
RI Low Resolution Coring / Sediment Sampling May 2, 2008 Revision 0
CPG's Responses to EPA June 13, 2008 Comments
June 27, 2008

FIELD SAMPLING PLAN

SYSTEMATIC SAMPLING PLAN

1. The proposed coring plan includes systematic coring on transects spaced every half mile between RM0 and RM1 with three cores per transect. Consequently, the mouth of the Lower Passaic River has a lower coring density than the other sections of the river due to the comparatively large length of each transect. EPA, thru Malcolm Pirnie, Inc., is conducting surface sediment sampling in the mudflats between RM0 and RM1 to support the *Source Control Early Action: Focused Feasibility Study*. This program will include 11 surface sediment samples arranged in a triangular fashion on the mudflat. EPA recommends that coring locations be established to re-occupy these sampling locations to increase data density on the mudflats. See figures 1 and 2.

   ***Response**: Per EPA acknowledgement, this comment has been tabled until the EMBM QAPP Addendum (May 2008) sediment grab data from RM 0 to RM 1 is made available to the CPG.*

2. The rationale for a systematic sampling plan between RM1 and RM7 is unclear, especially since this section of the river has been extensively sampled. Using historic data, the following comments provide direction on the movement of certain sample cores and request additional cores to more fully complete characterization of the sediment.

   ***Response**: As stated in the QAPP/FSP Addendum, the sampling is proposed at 1-mile intervals. The following rationale will be added to the QAPP/FSP Addendum for clarification:*

   1) Refresh surface sediment concentrations, the Passaic River Study Area (PRSA) sediment data were obtained in 1995

   2) Characterize cores that are considered "incomplete" (i.e., cores with elevated concentrations in the deepest segment analyzed). Note that the goals for the two studies differ. The goal for sampling the PRSA (i.e., RM1 to RM7) was to define the 1940 horizon. The RI/FS goal is to characterize sediment to the red brown clay, sand, or refusal. However, where PRSA cores are "complete" (i.e., low concentrations were detected at depth) the CPG will sample from the 2008 sediment-water interface to the sediment-water interface sampled in 1995, including a 0-6inch BAZ sample, with then the agreed upon segment sampling from -6 inches to the 1995 elevation.

3) Complete RI/FS requirements for determining nature and extent.

3. EPA recommends the movement of stations 15 and 16 downriver to re-occupy TSI cores 201 and 202, respectively, and the movement of stations 33 and 34 upriver to TSI cores 293 and 259, respectively. Station 38 could also be moved downriver to TSI core 268. See figures 3, 8 and 9.

   Response*: Per discussion with EPA on June 20, 2008, the proposed locations will be retained as planned.*

4. EPA recommends that movement of coring station number 21 to TSI 214 which has a high historical concentration along with an incomplete mercury inventory along. See figure 4.

   Response*: Comment will be incorporated in the revised plan.*

5. EPA recommends the movement of CLRC 022 to the vicinity of former TSI 284, which is likely more depositional. Also, there doesn't seem to be a reason to locate CLRC 022 and CLRC 023 so closely in the center of the channel. See figure 5.

   Response*: Comment will be incorporated in the revised plan.*

6. EPA recommends the movement of CLRC 030 downriver to re-occupy TSI 243, which has elevated historical concentrations. See figure 7.

   Response*: Per discussion with EPA on June 20, 2008, the proposed location will be retained as planned. A new core will be placed in the location of TSI core 243 as requested during the discussion.*

7. The rationale for changing the systematic sampling plan from 3 cores per transect from RM0 to RM8 to 2 cores per transect above RM8 is unclear. Please provide further explanation. Sampling may also explore both channel and shoal locations along each transect.

   Response*: The CPG approach was to obtain data that represent sediment conditions within each transect. Therefore, the CPG used geomorphology data— bathymetry and surface sediment type—to locate proposed samples. In the lower river, the data suggested that three samples per transect were required; whereas, in the upper river, above RM8, two samples per transect could meet the objective. The CPG believes this level of effort is reasonable for this phase of the low resolution coring (LRC) program. Text will be added to QAPP/FSP Addendum to clarify.*

8. Above RM13 (stations 78 through 92) and above RM16 (stations 93 through 97), gravel, cobble, and silty-gravel areas may be encountered. While sediment samples composed of varying combinations of silts, sands, and fine gravel are expected to provide useful data, it is possible that usable samples can be obtained from gravel/cobble areas. The CPG should

consider adding a probing or another reconnaissance step in these areas prior to attempting core collection. An appropriate location might be identified within the 25-foot target radius identified in Attachment A to the draft FSP prior to attempting to recover vibracores. If an acceptable core cannot be obtained after three attempts (as stated in Attachment A to the FSP), additional vicinity probing prior to departing, in consultation with sediment texture maps, may provide crucial information for recommendation of a new target location within 300 feet. Without careful consideration of sediment texture and probing data, the planned 3 attempts at the original location plus only one attempt each at alternative upstream and downstream locations may not be a robust enough approach to ensure that adequate samples are obtained in upstream areas where sediment types may vary widely.

***Response**: Comment noted. The CPG's field effort plans to include one day a week for recon and probing of the next week's locations. The first week of the LRC program will accommodate this probing effort. The probing will be conducted to ensure obstructions are not present. The purpose of the RI/FS is to determine nature and extent of contamination, not to specifically find small pockets of silt and sand. If a river section is composed of a sediment type that can not easily be sampled, it is important to know this and note it in the RI Report. An RI/FS should document the presence and absence as part of site conditions. It is CPG's goal to sample all reasonable and acceptable locations. EPA agreed to this approach during our discussion on June 18, 2008. The QAPP/FSP Addendum will be updated to include probing locations before sampling.*

ADDITIONAL CORING LOCATIONS

EPA and its partner agencies have identified additional locations which should be sampled. The CPG may incorporate these locations, which are identified below, in its upcoming field sampling program or may include them in subsequent sampling rounds.

9. Additional cores are needed along the banks at RM 4 at TSI 240 and TSI 237 and TSI 242. See figure 6.

   ***Response**: Per discussion with EPA on June 20, 2008, these locations will be considered in future mudflat sampling.*

10. A transect of corings is needed between former TSI transects 14 and 15, which coincides with Riverbank Park and has been identified as an area of potential high contaminant inventory based on existing data.

    ***Response**: The transect with core locations CLRC-030, -031, and -032 will be moved to this location, as requested. However, this area has a bridge and pipeline crossings; exact locations will be determined in the field.*

11. Additional judgmental cores should be positioned in mudflat habitat throughout the Lower Passaic River, especially at the mouth of tributaries along the east and west bank near RM2 (including the vicinity of the wetland immediately upriver of the western bridge support at RM1.75).

    Response*: Due to the different goals and Data Use Objectives suggested by this comment, as compared with the LRC program, EPA on June 20, 2008 agreed that this sampling will be conducted in association with FSP1 Task 5.3.6 Mudflat Sampling rather than FSP1 Task 5.3.3, Low Resolution Coring.*

OTHER CORING STATIONS

12. Several historical sediment grab samples were collected on both banks of the river near RM3.1 and RM3.2; some of these locations (e.g., 14SDM and 14SDU) have higher contamination levels than the referenced historical grab 5SDM. Consequently, the positioning of station 26 is unclear, and the rationale for the extended chemistry list is unclear. EPA recommends the movement of station 26 to the opposite bank of the river near the former Diamond Alkali Superfund site. See figure 5.

    Response: *EPA agreed, on June 20, 2008, to leave station 26 in the proposed location.*

13. The rationale for the cores at stations 50 through 53 near Second River and stations 88 through 90 near Saddle River for potential source track down is unclear. These locations are located very close to the confluence of these tributaries and the Lower Passaic River; tidal mixing will likely obscure any local gradients between these station clusters. Stations located above the head-of-tide should be compared to stations in the main stem to assess impacts of these tributaries to the river. See figures 12 and 15.

    Response: *This comment contradicts comment #17, below. In discussion with EPA on June 20, 2008, CPG explained that historical sediment data may be best represented at the confluence between the Passaic and its tributaries. As a result, EPA agreed to leave these sample locations as proposed.*

14. The rationale for the cores at stations 59 and 60 near an unnamed creek for potential source track down is unclear, especially if no samples are anticipated to be collected in the unnamed creek. EPA recommends that these stations be moved upriver. Tidal mixing will likely obscure any unique contaminated signature associated with a potential source on the unnamed creek. See figure 14.

    Response: *See response to comment #13. In addition, as discussed with EPA on June 20, 20008, the CPG will add a sample location above the head of tide in the unnamed creek. A reconnaissance will be performed during the field program to determine a proposed location which will be discussed with EPA prior to collection.*

15. The proposed sampling plan includes re-occupying 5 of the 2008 low resolution cores collected by Malcolm Pirnie, Inc. (e.g., cores 2, 5, 10, 14, and 17). The rationale for selecting these locations is unclear.

    Response: *Where the transect samples were on, or close to, the 2008 EMBM cores, the locations were included for sampling. This is intended to determine, more precisely, the vertical distribution of contaminants in the sediment column because the 2008 EMRM cores were segmented into only two samples: a 6-inch surface sample and a composite sample of the remaining core length.*

    This rationale will be clarified in FSP Addendum Table 1 and Worksheet #18.

16. The sampling plan rationale above Dundee Dam is unclear and needs to address the potential for changing field conditions since sediment types are unknown. EPA recommends a field reconnaissance be conducted prior to coring and a contingency plan be developed.

    Response*: As discussed with EPA on June 18, 2008, EPA indicated that the addition of limited probing would address this comment. The QAPP/FSP Addendum will be updated to clarify the sampling plan rationale consistent with the response to comment #8.*

17. Table 1 indicates that proposed low resolution cores on Second River, Third River, and Saddle River will be positioned below the head-of-tide. However, the maps on Figure 2-I indicate that one core will be positioned above the head-of-tide and two cores will be positioned below the head-of-tide. It is important to collect cores above the head-of-tide, below the head-of-tide, and at the confluence with the Lower Passaic River to investigate potential gradients along the tributaries. Field notes have been provided to the CPG to assist in the selection of suitable coring locations based on our 2007-2008 field reconnaissance efforts on these tributaries.

    Response: *The tables and figures have been updated. As discussed with EPA on June 20, 2008, the tributary sampling will be revised as requested in this comment. Note, the sample at the confluence may be moved downstream to ensure a sample can be collected based on sediment type. The locations will be field determined and discussed with EPA prior to collection.*

TARGET DEPTHS

18. Low resolution cores collected in 2006 by Malcolm Pirnie, Inc. showed that the underlying sand layer is contaminated with mercury and polycyclic aromatic hydrocarbon (PAH) compounds. Consequently, all proposed 2008 low resolution cores should penetrate the underlying sand layer/red-clay layer (or refusal). Also, the underlying sands should be sampled and analyzed.

    Response*: The goal for core collection is to reach the red brown clay layer, sand, or refusal, as stated in the AOC/SOW. This may not be achievable in the upper parts of the river where*

finer-grained sediments (e.g., silt, silt and sand, and sand) may not be encountered at all locations.

Limited sampling to include analysis of PAHs, metals, cyanide, SVOCs, TEPH, TOC, grain size, and volatiles will be performed where sand is encountered at the bottom of the core, as agreed with EPA on June 18, 2008 and via e-mail from EPA on June 20, 2008. As agreed to with EPA, the analytes will be taken out of the primary core only, so all analytes may not be achievable in all samples.

In addition, in a follow up e-mail from Mr. Len Warner, Malcolm Pirnie (MPI), on June 20, 2008, MPI suggested that a small subset of the samples from the sand layer (even under a significant depth of fine-grained sediment) be analyzed for a larger suite of contaminants (including pesticides and PCBs) for verification of the characterization of the apparent product contamination in the sand layer. The CPG does not plan to do this additional analysis at this time.

19. The rationale for the target depths for stations 36 and 37 is unclear (e.g., transition from silt to gravel is 10 feet). Please clarify why this depth was selected. Moreover, station 35 in this transect is classified differently and has a target depth of 5 feet. Station 35 should penetrate to similar depth as the other cores in the transect or more clarification on coring rationale should be provided.

Response*: The UFP-QAPP requires an estimate of the total number of samples (Worksheet #20). The target depth was estimated for each location in order to estimate a reasonable number of samples for the program. The estimated target depth was determined by reviewing available core logs and MPI probing data, which included depth to refusal. The cores will be collected to the red brown clay layer, sand, or refusal.*

The target depth of 5 feet applies to eight of the proposed locations where the transect fell on a PRSA core that was considered complete. The recently deposited sediment will be sampled (core is not estimated to be longer than 5 feet). FSP Addendum Table 1 and Worksheet #18 will be revised to more clearly state the sample segmentation for this subset of samples.

20. Geotechnical borings at RM16 indicate silty-gravel at the surface and refusal at 2 feet. More explanation on sampling approach is needed for cores in this area (e.g., stations 91 and 92) that are anticipated to extend 6 feet. Similarly, geotechnical borings at RM14 indicate a heterogeneous mix of gravels and sands with refusal at less than 5 feet. The proposed cores in this area (stations 83 and 84) are anticipated to extend 8 feet. Although the 2008 low resolution cores in fine-grained sediment deposits between RM8 and RM14 yielded recoveries up to 9.5 feet of sediment, a contingency plan for these proposed target depths may be needed.

Response*: See response to comment #19 above; no change necessary.*

21. Several target depths listed in Table 1 may be too shallow (based on historical data or nearby geotechnical borings) to characterize the depth of contamination. The CPG should anticipate collecting deeper cores before penetrating the underlying sand layer/red-clay layer. Table A below lists cores and corresponding target depths that may be too shallow.

Table A: Stations with Shallow Target Depths

Coring Station	CPG Estimated Target Depth	Evidence from Historical Cores or Geotechnical Boring Suggesting that Target Depth is Shallow
Stations 1, 5, and 9	10 feet	Station 13 at RM0.75 (near geotechnical boring 1A-B) indicates a target depth of 18 feet. In addition, a comparison of the 2004 bathymetric survey and the authorized depth of the federal navigation channel suggests that approximately 15 feet of sediments may have deposited in portions of the channel between RM0 and RM1 since maintenance halted (refer to the Conceptual Site Model, Malcolm Pirnie, Inc., February 2007).
Station 19	5 feet	A nearby geotechnical boring indicates 10 feet of silt, and mercury contamination in TSI core 208 extends greater than 15 feet.
Station 30, 31, and 32	5 feet	Historical mercury contamination from the TSI cores extends to 14 feet. Low resolution cores (LR05 and LR10) collected by Malcolm Pirnie, Inc. also indicate that mercury contamination extends to the underlying sand layer.
Station 40, 41, and 42	5 feet	TSI cores 273, 274, and 275 indicate that mercury contamination is greater than 5 ppm at a 5-foot depth. Note that the 2005 low resolution core (LR08) also indicated a contaminated underlying sand layer.
Stations 43 through 52	8 feet	The authorized depth of the former navigational channel was 16 feet.
Station 67	6 feet	The high resolution core at RM11 (HRC29A) penetrated approximately 8 feet.
Station 74	3 feet	The high resolution core at RM12.6 (HRC32A) penetrated 6 feet.

Response: *See comment response #19.*

TABLE 1 TERMINOLOGY

22. The geomorphic region for station 24 is identified as a "channel, dredge area." This identification may be incorrect since only station 25 is located in the 2005 Environmental Dredge Pilot Study area. Please clarify the reference to "dredge area."

Response: *Comment will be incorporated in the revised plan.*
Revised Response: Station 24 is located in the side channel, not dredge area. Edit was made to Table 1 and Worksheet #18.

23. For several stations, the rationale for the target depth is labeled "recent seds only" (e.g., stations 40, 41, and 42). This terminology is unclear, especially if the siting rationale states that the proposed coring location is intended to confirm the nature and extent of

contamination. All proposed 2008 low resolution cores should penetrate to the underlying sand layer/red-clay layer (or refusal), and the underlying sands should be sampled.

Response: *See comment response #19.*

24. For several stations, the rationale for the target depth is labeled "refusal" (e.g., stations 43, 44, 45, and 49). All proposed 2008 low resolution cores should penetrate to the underlying sand layer/red-clay layer (or refusal), and the underlying sands should be sampled.

Response: *The column information will be updated to indicated that the low resolution cores will penetrate to the underlying sand layer/red-clay layer (or refusal), and the underlying sands and will be sampled and analyzed for PAHs, metals, cyanide, SVOCs, TEPH, TOC, grain size, and VOCs. As agreed to with EPA, the analytes will be taken out of the primary core only, so all analytes may not be achievable in all samples.*

25. The rationale for the target depth at station 74 is unclear (i.e, "HRC complete") since this high resolution core (HRC32A) penetrated to refusal in the underlying sand layer. Please explain.

Response*: Text will be modified to indicate that the high resolution core was completed.*

TABLE 2: ANALYTE LIST

26. Table 2 provides a proposed analytical list for the 2008 coring program. Analytes in Group B and Group C will only be reported for select coring stations in the 0-6 inch sediment sample. The rationale for selecting these coring stations is unclear – it appears that stations positioned near combined sewer overflow (CSO) sites or stations co-located with historical cores (e.g., station 67) were selected. Further rationale for these locations should be provided on these locations in Table 1 or 2.

Response*: CPG will provide further rationale in the text of the QAPP/FSP Addendum. For Group B analytes, sample locations were selected by reviewing the sample maps to ensure coverage within the full length of the river, with a focus on areas of finer-grained sediments, and review of station details in terms of depths and expected sediment type. Group C samples will be determined based on lab screening as discussed in comment response 78.*

27. Between RM0 and RM1, only station 1 is designated for an extended chemistry list. This station is located in the channel; consequently, the mudflats near Kearny Point will not be tested for the extended chemistry list. Another location in the mudflats near Kearny Point is needed for the extended chemistry list.

Response: *The CPG will add one more station in this area at 2008 CLRC-007 for extended chemistry (Group A, B, and C).*

Additional locations will be added as part of the mudflat sampling task (FSP1 Task 5.36), rather than with the Low Resolution Coring (FSP1 Task 5.3.6).

28. More rationale should be provided regarding why only 12 core tops are designated for Group B analyses. This sample size yields an insufficient number of methylmercury and AVS/SEM samples.

***Response**: As discussed with EPA on June 18, 2008, the purpose of these samples is to determine the relevance of these analytes for future investigations. EPA agreed to the 12 proposed sample locations.*

29. The list of alkyl PAH compounds is ambiguous; which compounds will be analyzed?

***Response:** The alkyl PAHs are summed as a homolog group. All the specific isomers within the group are unknown and it is not the purpose of the analysis to characterize them individually. Due to the complexity of the isomer mix and the limited availability of isomer-specific reference materials, it is not possible to analyze every isomer separately.*

OTHER CONCERNS

30. The maps presented in Figures 2A-F and the information in Table 1 occasionally contradict each other. For example, stations 23 and 24 on the map identify different co-located cores than those cores mentioned in Table 1. The rationale for station 30 appears to contradict the location on the map.

***Response**: The transcription error at stations 23 and 24 will be corrected, in addition figures and tables will be checked closely prior to submittal to EPA for approval.*

FINE SEGMENTATION SAMPLING FOR RISK ASSESSMENT AND MODELING

The following locations identify eight coring locations for collecting finely segmented core top samples to support the risk assessment and modeling efforts. These locations should replace those locations discussed during the conference call on May 27, 2008, between EPA, and de maximus. Note that the results of these samples will be a subset of the full fine segmentation effort. In order to properly characterize the entire study area, additional samples will be needed.

- Core 2008-CLRC-078 should be relocated to RM13.23 since it appears to be currently located in a rock and gravel area. Alternately, the CPG could locate an additional core at RM13.23

  ***Response:** As discussed with EPA on June 20, 2008, core 2008-CLRC-078 will be relocated to RM13.23.*

- RM10 – Core 2008-CLRC-062. (RM10 has some of the highest detected surface sediment dioxin concentrations.)

Response: *Comment will be incorporated in the revised plan.*

- RM7.5 – Core 2008-CLRC-047.

  Response: *Comment will be incorporated in the revised plan.*

- RM5.3 – Core 2008-CLRC-034.

  Response*: Comment will be incorporated in the revised plan.*

- RM4.5 – Locate a core at RM4.5 at former TSI 243.

  Response: *Comment will be incorporated in the revised plan.*

- RM3.5 – Core 2008-CLRC-028.

  Response: *Comment will be incorporated in the revised plan.*

- RM2.6 – The proposed coring locations (2008-CLRC-022 through 024) seem to be co-located with historic TSI cores 222-224. A finely segmented core should be collected at TSI 223.

  Response: *As clarified by EPA on June 20, 2008, the requested location is -022. Comment incorporated.*

- RM1.5 – Core 2008-CLRC-019.

  Response: *Comment will be incorporated in the revised plan.*

Response: *At the meeting with EPA on June 18, 2008, the CPG requested consideration of the use of a box corer for this data collection. The box corer will reliably collect 20 inches of sediment. With the extensive analyte list, this is the best collection device to use for obtaining sufficient sample volume. EPA approved the use of a box corer. The deepest segment identified by EPA for collection was 30 cm to 2 feet. The bottom depth of these eight locations will be clearly identified when they are less than 2 feet (where the fifth segment is not collected as deep as requested). EPA agreed this was an acceptable approach.*

Note, as agreed to with EPA, the objective of the program is to sample potentially erosional areas to determine if there is fine scale vertical variation in sediment properties and contamination.

Quality Assurance Project Plan

General Comments

31. Introduction, page 3 (and elsewhere in the QAPP and appendices). The CPG is proposing to use a modified Van Veen grab sampler to collect a surface sediment sample at each sampling location. The grab sample will provide a 0-1 inch segment for the analysis of beryllium-7 (Be-7), which is an acceptable approach; however, the CPG is also proposing to collect a 0-6 inch sediment sample with the Van Veen grab sampler, which would replace the 0-6 inch segment from the corresponding low resolution sediment core for chemical analysis. The 0-6 inch segment from the corresponding low resolution core would be discarded and the core would be processed from 6 inches to the core bottom. This core processing approach is flawed because low resolution cores should be processed in a continuous fashion from the core top to the core bottom. Grab samples should only be used for the collection of surface sediment for beryllium-7 analysis. The QAPP should be revised so that the most significant chemical parameters are collected continuously from the sediment core, from the surface to the target depth/refusal, with consideration of analytical volume requirements.

***Response**: As discussed with EPA on June 18, 2008, the use of a vibracorer for surface samples is listed as a disadvantage according to EPA guidance (Appendix E—Methods for Collection, Storage, and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual 2001), as the surface is disturbed in the vibracoring process. Because it is not one of CPG's DQOs to date the cores, the CPG proposed to continue using the grab sampler.*

EPA stated their concern with the sediment grab sample being disconnected from the core and that they would prefer the CPG prioritize the analyte list to maximize the key analyte collection out of the core with the remainder out of the grab sample. The CPG agreed to do this. CPG and EPA further agreed to use the Phase II Newark Bay RI/FS Work Plan Table 6-6 as the base for this prioritization. On June 20, 2008 via e-mail from Len Warner, EPA provided a suggested prioritization of analyses from the 0-6 inch core sample, as shown below:

1. *Radionuclides Cs-137, Pb-210 and K-40*
2. *Dioxins/Furans*
3. *PCB Congeners and PCB Aroclors*
4. *HR Pesticides (EPA suggested the CPG not perform Method 8081A Pesticides on 0-6 inch segment)*
5. *Hg*
6. *SVOCs and PAHs*
7. *TAL Metals and Titanium*
8. *Herbicides*
9. *Cyanide*
10. *TEPH*
11. *Butyltins*
12. *VOCs*

13. Total Sulfide
14. Grain Size
15. Specific Gravity
16. Bulk Density
17. Atterberg Limits
18. Be-7 (always collected from co-located grab sample)

The CPG has reviewed this suggested prioritization and will comply with it, a table has been added as attached to address this prioritization. Method 8081A pesticides will not be completed on the 0-6" samples. It was agreed by all that the list of analytes from the core would vary due to the varying moisture content which affects the available sample volume. It was noted by all that the list of analytes from the core will be flexible as the moisture content affects the available sample volume. The CPG will make best effort to keep the core(s) and grab samples at a location within 10 feet of each other with the same sediment type.

Note, a second core will also be necessary to obtain sample mass needed for the 1-foot intervals. The above prioritization will be used for this section as well. To investigate the lateral heterogeneity, the CPG would recommend adding copper and nickel analysis to all locations in the one core, and the grab.

32. Acronyms. Please revise the document to ensure that the acronym list is complete and that each acronym employed is spelled out in the text or tables at the first use.

Response*: Comment will be incorporated in the revised plan.*

33. Worksheets 12 and 28. Many of the terms and limits provided in these tables do not correspond as they should. The terms and acceptance limits in Worksheets 12 and 28 must be revised to be internally consistent. Examples are highlighted in the specific comments. The Measurement Performance Criteria and QC Sample tables should also reflect the QC acceptance limits given in the referenced analytical SOPs and USEPA methods.

Response: *Comment will be incorporated in the revised plan; however, note that the QC limits in the analytical methods or USEPA methods may be superseded by project-specific QC limits if the project-specific limits are more stringent.*

34. Radiological Data. The QAPP should be revised to state that error bars on the radiological data will be provided in the final data package.

Response: C*omment will be incorporated in the revised plan.*

35. To meet the analytical demands of the project, samples will need to be split among many individual laboratory facilities (five lab subcontractors are listed and two have multiple facilities; CAS has three facilities and Test America has seven). The SOP for Core Processing, LPR-S-O4, does not contain nearly enough guidance to aid the field technicians

in the logistical challenges associated with providing "representative aliquots" to each of the designated facilities within 24 hours of sampling.

Response: *Per discussion with EPA on June 18, 2008, this information, while important, is not typically included in SOPs due to their program-wide nature. The field facility staff will be provided with written guidelines on the containers and sample volumes needed for each laboratory involved in the LRC sampling effort.*

Specific Comments

36. Introduction, page 3. Include a reference to Appendix D.

Response: *Reference to Appendix D is included on Page 4 with the Group C analytes. No change is necessary.*

37. QAPP Worksheet 2, QAPP Identifying Information, page 10. The required information column of this worksheet indicated that the streamlining data review information will be completed following data evaluation. However, this information should be completed in the appropriate worksheet along with the rationale behind streamlining the data review process.

Response: *Per discussion with EPA on June 18, 2008, it was agreed that addition of the requested information is not appropriate at this time. Streamlining the data may be appropriate for future data presentation and in the Site Characterization Report. No change is necessary.*

38. Worksheet 4. Include a blank sign-off sheet to be employed by assigned team members to document that they have read the applicable sections of the QAPP/FSP.

Response: *Comment will be incorporated in the revised plan.*

39. Worksheet 4, Project Personnel Sign-Off Sheet. Each of the laboratories should review and sign off on the QAPP as a final check regarding their commitment.

Response: *Comment will be incorporated in the revised plan.*
Revised Response: Will be sent after finalized and distributed. Signed Worksheet #4 will be submitted under separate cover.

40. Worksheet 10. Add a 5th bullet to highlight the "Need to understand how shallow shoreline habitat sediment may differ from depositional and erosional locations along the main stem of the river." A 4th station is recommended at the shallow end of 10-12 transects spread from RM0-15 to produce a sufficient number of cores to characterize these habitats and allow an evaluation of whether pertinent risk assessment exposure point concentrations ought to be derived from main stem core results.

Response: *EPA agreed, during our discussion on June 18, 2008, that this comment will be addressed in association with FSP1 Task 5.3.6 (mudflat sampling) and will most logically be implemented with the grab sampling in FSP2.*

41. QAPP Worksheet 12. The worksheets should also include the criteria associated with analysis for the water matrix and the sediment associated with Group C samples that will be used towards the development of a project specific method for sediment/pore water coefficients for PCB.

Response: *Please see response to comment #149.*
Revised Response: There was a typo in the comment response, it should have referenced #148. There is no change necessary.

42. Worksheet 12, pages 32-56. In general, the measurement performance criteria listed in the Worksheet 12 and 28 tables are not consistent. Evaluate and revise these to be consistent. Some specific comments follow.

Response: *Comment will be incorporated in the revised plan.*

43. Worksheet 12, page 30. "Contamination" is listed as a DQI for method blanks and field blanks, while the corresponding DQI in Worksheet 28 tables appears as "Accuracy/Bias-Contamination". Revise the blank DQI entries to "Accuracy/Bias" or "Accuracy/Bias-Sensitivity". Also revise the terminology used for DQIs to be consistent throughout the Worksheet 12 and 28 tables.

Response: *Comment will be incorporated in the revised plan. "Accuracy/Bias" will be used.*

44. Worksheet 12, pages 30- 56. Revise the "Completeness" Measurement Performance Criteria to be 95% instead of 90% in all the applicable Worksheet 12 tables.

Response: *Region 2 CERCLA guidance does not specify a required completeness objective. The MPI 2005 QAPP includes 95% completeness for field sampling and 90% for analytical completeness. These completeness goals will be adopted for the LRC program. The completeness discussion in Worksheet 37 will also be expanded to include field completeness.*

45. Worksheet 12, pages 30-56. Performance Evaluation Samples are specified as QA samples. Please provide the EPA with additional information on the proposed Performance Evaluation Samples including a list of the individual parameters in these samples and the acceptance limits.

Response: *This information cannot be included in the QAPP because the labs get the QAPP. It will be sent to EPA as a separate submittal. EPA also requested on June 18, 2008 that the certificates be included; certificates will be provided.*

46. Worksheet 12, page 30. The measurement performance criterion for the Laboratory Control Sample is listed as "compound-specific, approximately 70-130%". This is not consistent with the "60-140% , Compound Specific" QC acceptance limits for the Laboratory Control Sample listed in Worksheet 28, QC Samples Table, on page 151. Reconcile and revise the acceptance limits given in the Worksheet 12 and 28 tables for the Laboratory Control Samples to be consistent. Also ensure that the limits given in all Worksheets 12 and 28 tables are consistent and reflect the acceptance criteria in the EPA methods referenced in the lab SOPs in Appendix C.

    Response: *Comment will be incorporated in the revised plan. Please refer to Comment 33 regarding the agreement of the QC limits with the EPA methods.*

47. Worksheet 12, footnote "d". The footnote states the "Analyte specific limits may be found in Appendix C." Revise this note for each analytical group table to specify the SOP or method reference with the section, page and or table number where the referenced acceptance limits can be found.

    Response: *Comment will be incorporated in the revised plan.*

48. Worksheet 12, page 32. For PAHs, evaluate and reconcile the differences in the acceptance criteria given in Worksheet 12 and Worksheet 28, page 155, for "Pre-extraction internal standards" (60-140% vs. 30-120%). Also resolve the difference between the limits given for the "Laboratory Control Standard" in these tables.

    Response: *Comment will be incorporated in the revised plan.*

49. Worksheet 12, page 33. For the Organochlorine Pesticides (GC/ECD), surrogates are not listed in this table as a QC yet they are listed in the corresponding Worksheet 28 on page 157. Evaluate and revise to be consistent.

    Response: *Comment will be incorporated in the revised plan.*

50. Worksheet 12, page 34. For the Organochlorine Pesticides (HRGC/HRMS), the table includes a Laboratory Control Sample with recovery limits. The corresponding Worksheet 28 table on page 159 indicates that the Laboratory Control Standard is also an Ongoing Precision and Recovery Sample. If this standard will be employed to track precision then precision limits should be given or referenced. In addition, the measurement performance columns in Worksheets 12 and 28 for Organochlorine Pesticides (HRGC/HRMS) are not consistent and need to be reconciled.

    Response: *Comment will be incorporated in the revised plan.*

51. Worksheet 12, page 37. For Herbicides, the Matrix spike recovery is unusually broad (10%-120%). Please determine if the lab can tighten these limits and revise the document appropriately.

    Response: *The CPG will discuss this further with the lab; however, these are the limits provided by the lab. The analysis of herbicides is notoriously difficult.*
    Revised Response: Received revised control limits from lab; recovery limits are down to 10% for individual analytes as previously reported. No change

52. Worksheet 12, page 40. For Radiochemistry, evaluate and revise as appropriate the acceptance criteria and limits given in this table with those in Worksheet 28, page 169 and the lab's SOP to ensure that they are appropriate and consistent.

    Response: *Comment will be incorporated in the revised plan.*

53. Worksheet 12, page 43. For Mercury, the Method Blank criteria are not consistent with the acceptance limits in Worksheet 28, page 172. Please evaluate and revise to be internally consistent.

    Response: *Comment will be incorporated in the revised plan.*

54. Worksheet 12, page 47. For General Chemistry – AVS/SEM, this table does not include the Laboratory Control Sample (LCS) acceptance limits for metals. Provide the LCS acceptance limits in a revised table.

    Response: *The LCS limits for the metals associated with the AVS/SEM analysis should be the same as those for routine ICP/Mercury LCS values. Comment incorporated.*

55. Worksheet 13. Please revise the stated data limitations in consultation with EPA. Almost all USEPA/Malcolm Pirnie, Inc. programs have listed limitations while CPG data is categorized as usable without limitation. For example, the CPG incorrectly states that the Newark Bay Phase I dataset has no limitations – on the contrary, analytical problems rendered much of the pesticide data as non-detect.

    Response: *Comment will be incorporated in the revised plan.*
    Revised Response: Limitations addressed in Worksheet 13 are not data use limitations but rather qualifications to data sets. A statement was added to each entry where this is applicable.

56. Worksheet 14, Summary of Project Tasks, Page 61 of 240, Third Paragraph. The proposed reduction in segment length due to observation of a different sediment texture should not result in an alteration of the segmentation scheme. For comparability between stations, maintaining the segmentation scheme at each coring location is desirable and it is therefore preferable to subsample the segment if there is an obvious change in sediment within a

segment. This comment applies to this issue throughout the QAPP as well as Attachment 1, Data Quality Objectives, and Appendix A, Field Sampling Plan.

Response: *As discussed with EPA on June 18, 2008, the CPG is concerned that, in most cases, the sample volume may not be sufficient to subsample and that this information would not be known until the core is processed. It was agreed that the existing QAPP/ FSP Addendum text is sufficient; no change is necessary.*

57. Worksheet 15 should be checked for inconsistencies (e.g., method references SW 8082 vs. SW 8082A).

Response: *Comment will be incorporated in the revised plan.*

58. Worksheet 15. The limits appear low for sediment and need to consider the high water content of this matrix.

Response: *As discussed with EPA on June 18, 2008, the CPG has certainly considered the high water content and attempted to get accurate information on the typical percent moisture levels encountered by others. For the Worksheet 15 limits, the CPG can only report the best limits the lab estimates it can achieve with a full understanding of the moisture and matrix issues they are likely to encounter with these samples. EPA agreed that no change is necessary.*

59. Worksheet 15. Phosphorus is reported in aqueous units (mg/L) but there is no information provided on how the aqueous extract will be collected. The SOP included in Appendix C (L-26) references Method 365.3 which specifies a 10 gram soil aliquot but does not detail the procedure for a soil/sediment extraction.

Response: *The laboratory has been requested to add more detail to its SOP.*

60. Worksheet 15. The reporting units provided on the worksheets (e.g., mg/kg) do not provide reference to "wet" or "dry" weight. All sample size estimates need to consider the dry weight correction (expecting an average of 50% solids). Worksheet #19 includes a footnote regarding the need for additional sample to meet dry weight reported project quantitation limits. Worksheet #23 notes the modification with increased aliquot size to achieve the DQLs. When cleanup procedures are proposed (e.g., GPC in L-15), the sample size required may be altered (e.g., GPC cleanup can increase the reporting limit twofold unless the extract concentration procedures are modified).

Response: *Worksheet #15 should have been referenced as dry weight and will be revised accordingly. The CPG is aware of the moisture issue, but would prefer not to estimate the reporting limits based on an average moisture level. EPA agreed on June 18, 2008 to this approach. The laboratory cleanups, such as GPC, will not cause any analytical losses requiring reporting limit adjustments. The comment about cleanup above has been addressed with updated methods and is no longer relevant.*

Revised Response: The original response was incorrect. The worksheet should have referenced wet weight which is now included.

61. Worksheet 15. If the sediment units are to be expressed on a dry weight basis, each of the facilities processing samples need to do their own in-house moisture determination. The QAPP includes SOPs (L-40 and L-43) from only two laboratories.

Response: *Agreed. CPG will obtain specific percent moisture SOPs from other labs.*

62. Worksheet 15.Final dry weight reporting limits for ammonia and phosphorus can be calculated knowing the initial weight of sediment extracted and the percent solids of the representative aliquot.

Response: *Comment will be incorporated in the revised plan.*

63. Worksheet 15. Please include a description of the considerations for optimization of detection limits for those methods that do not meet the project quantitation limit goals (e.g., larger sample size, extra cleanup/concentration, etc.). With the exception of the comment included on Worksheet #23 for L-3, no direct reference to increasing sample size is listed in the QAPP. Two other SOPs include reference to sample size adjustments (L-7 Section 2.2.3 and L-11 Section 1.1.2).

Response: *Comment will be incorporated in the revised plan. The information will be added to Worksheet 15.*

64. Worksheet 15. In the discussion of Group A COPCs, it states that toxaphene will be analyzed by two different methods but it is not clear whether the full complement will be reported for each method. How will the data user know which result is most appropriate? There is also a possible error on page 78 where both the MDL and the QL are identical. The SOP for his method states 0.010 mg/kg as the QL. Page 80 includes the same detail; if this is correct, then the HRGC/HRMS appears to also report at 0.010 mg/kg. If both methods have the same reporting limits, it is unclear why both methods are proposed.

Response: *As discussed with EPA on June 18, 2008, the CPG will report all pesticides using both methods. The HRMS method may provide more accurate compound identification than the GC/ECD technique in complex matrices. The method is more sensitive and less subject to noise from interferences. The CPG will review this comment with the most current versions of the lab SOPs and respond or clarify.*

Revised Response: As discussed with EPA on June 18, 2008, the CPG will report the same target analyte pesticides using both methods. The HRMS method may provide more accurate compound identification than the GC/ECD technique in complex matrices. The HRMS method is generally more sensitive and less subject to interferences, however for toxaphene the sensitivity is limited by calibration with a complex mixture and the highly fragmented mass spectra of the polychlorinated bornane components. The specificity of the HRMS method for accurate toxaphene detection should be better than GC/ECD even if the sensitivity is roughly the same.

65. Worksheet 15. The footnote states that the actual EDLs will be reported for PAHs and alkyl PAHs rather than the QLs. It is unclear why the table includes only QLs for the alkyl naphthalenes.

Response: *See response to comment #29. The CPG will review the worksheet and footnote and clarify as needed.*
Revised Response: There are no reference standards used for the homolog PAH groups. Therefore, there are not official QLs for these groups. No change to QAPP necessary.

66. Worksheet 15. For VOCs by 8260B:
    a. The SW 5035A reference should be added that will allow low level reporting.
    b. The footnotes say that 1,4-dioxane will be analyzed by Method 8270. The reporting details included may be incorrectly from the semivolatile method. 1,4-dioxane is not included in the target compounds listed for Method 8270C.

Response:
a) The values in Worksheet 15 are based on low-level reporting. Reference to method 5035Awill be added.
b) Determination of 1,4-dioxane from the SVOC method is believed to be more technically sound; this compound is frequently rejected from the VOC run due to low response factors.

67. Worksheet 15. For TPH-purgeables, add reference to SW 5035A.

Response: *Comment will be incorporated in the revised plan.*

68. Worksheet 15. For metals:
    a. MDLs and IDLs are not typically the same. Confirm the most appropriate header.
    b. SW 6010B and 6020 are both referenced for the hardness metals.
    c. The detail appears to be from an ICP run; please remove the ICP/MS reference.
    d. MDLs and MQLs for some metals are the same; please check.

Response: *Comment will be incorporated in the revised plan.*
Revised Response:
a) The analytical methods list IDLs. The MDL reference is removed from this worksheet.
b) The reference to 6020 for these metals have been removed.
c) Adjusted worksheet to show which method MDLs and QL are from.
d)This is consistent with the data provided by the lab.

69. Worksheet 15. The values provided in the reference limit tables should be presented in consistent units to those given in the applicable lab SOPs in Appendix C. Currently, all the units are expressed in exponential notation and some of the significant figures given appear to differ from those given for the reporting limits in the applicable lab SOPs. This comment applies to all of the Worksheet 15 tables.

Response: *Comment will be incorporated in the revised plan.*

70. Worksheet 15. Revise the second sentence in Worksheet 15, footnote a, "DQLs are very conservative, generic analytical goals used solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or preliminary remediation goals." to state the following: "DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or preliminary remediation goals and are not approved by the USEPA as the appropriate risk assessment criteria for this project". Make this change in all the applicable worksheet 15 tables.

    Response: *Comment will be incorporated in the revised plan.*

71. Worksheet 15, Reference Limits. The CPG references the Lower Passaic River Restoration Project 2005 QAPP (prepared by Malcolm Pirnie, Inc.) for their analytical reporting limits (RLs) and project quantitation limits (QLs); however, the achievable laboratory limits for many contaminants across the various chemical classes are higher than the RLs and QLs.

    Response: *As discussed with EPA on June 18, 2008, the CPG reviewed the limits requested by the risk assessors and those listed by MPI in the QAPP/FSP Addendum for Lower Passaic River Restoration Project Empirical Mass Balance Evaluation (December, 2007) and asked the labs to attempt to reach the lower of those two limits for each analyte. In some cases, the lab felt those limits could not be achieved in light of the high percent moisture and likely matrix interferences that would be encountered. If the limits provided by the lab were higher than the goals, the lab limit was highlighted in the worksheet.*

72. Worksheet 15, page 81, PAHs. Benzo [j] fluoranthene is not listed as an analyte. Please ask the lab to determine if this compound co-elutes with another compound such as Benzo[k] fluoranthene. If so please list it as a co-eluting compound.

    Response: *This compound was not in the 2005 MPI Quality Assurance Project Plan, but was apparently added in the December 2007 QAPP/FSP Addendum for Lower Passaic River Restoration Project Empirical Mass Balance Evaluation as benzo(j,k)fluoranthene. The CPG will explore the addition of this analyte with the lab; it likely will co-elute with benzo(k)fluoranthene. CPG will confirm with TestAmerica and add as appropriate.*
    Revised Response: Per confirmation from the lab, benzo j and k co-elute, this was added to Worksheet 15.

73. Worksheet 15, pages 75-76. If available, please include in the table or footnotes the range of estimated sample specific reporting limits for the Dioxins/Furans which the lab anticipates that they can achieve based upon their experience analyzing similar sediment samples.

    Response: *The lab has been requested to respond to this comment.*

74. Worksheet 16, page 104. Add entries describing the deliverables in the "Deliverables" column for all the activities including "Collection of Samples and Submission for Analysis," "Laboratory Analysis" and "Evaluation of Sample Data."

    Response: *Comment will be incorporated in the revised plan. Note that this table will also be updated to reflect the schedule based on EPA's approval.*

75. Worksheet 17. The text states that "2-foot segments continue to the red-brown clay layer, sand, or refusal." It should be clarified throughout the document that the target sand layer is a layer that completely underlies the recent, contaminated, fine-grained sediments to distinguish it from a potential shallow sand lens that could be encountered. A sample should be collected from this sand layer for analysis, as contamination was encountered in this stratum in the 2005-2006 coring efforts.

    Response: *See comment response #18.*

76. Worksheet 17, Sampling Design and Rationale. While it is understood that the surficial sample (0 – 0.5 ft) will be collected from the grab sample, consideration should be made to initially save the 0-0.5 ft segment of the corresponding Vibracore sample. This is for the case when there is a need for additional sample volume to meet the required minimum as outlined in Worksheet #19.

    Response: *This comment contradicts comment #31; EPA indicated this comment should be disregarded.*

77. Worksheet 18. Revise the QAPP to provide data on ranges of water depths in the proposed sampling areas so that EPA can verify that there are sufficient samples proposed to evaluate specific risk scenarios, such as exposure of piscivorous and invertivorous wading birds at mudflat locations.

    Response: *Where the water depth is known, the information is included in Worksheet #18. This information will be gathered along with the LRC program and will be updated appropriately. No change is necessary.*

78. Table 1 to the FSP - The QAPP indicates that six stations will be analyzed for Group C analytes as provided in Table 2, of the Field Sampling Plan Addendum; however, it is not clear where these six samples will be collected. Neither Table 1 of Appendix A nor Worksheet 18, Sampling Locations and Methods/SOP Requirements, provide such information. In addition, Appendix D Bioavailability Protocols indicates that a screening level PCB analysis on the surface sediments will be used along with the physical description to select the six samples for testing. The information in the QAPP should be revised to reflect the type of screening level PCB analysis and the specific physical description that will used for sample selection

Response: *To select the six samples for method development, the CPG will use the laboratory screening level PCB analysis conducted prior to conducting high resolution GC/MS quantification of PCB congeners along with the physical description. The CPG will revise the information provided in the QAPP/ FSP Addendum to provide clarification of the screening level PCB analysis being conducted and the specific physical description that will used for sample selection.*

79. Worksheet 18, pages 107 to 118. Define the terms "NGVD" and "MLW" in the table and also add these to the list of acronyms.

Response: *Comment will be incorporated in the revised plan.*

80. Worksheet 18, pages 107 to 119. The "Target Core Length/Analyses" includes "Estimated Lengths" for each core that are all below 30 feet. Experience obtained during the 2005-2006 coring efforts indicate that it may be necessary to advance cores to the limits of the vibracoring equipment (about 28-29 feet) to reach the underlying sand/clay at some locations in the lower 8 miles. Please make it clear in a footnote or text that the field team will be equipped to advance the individual cores to a deep of at least 30 feet to reach the red-brown clay layer or refusal, where necessary.

Response: *See comment response #19. As discussed with the EPA on June 18, 2008 the field team will be equipped to advance cores to the limits of the vibracoring equipment.*

81. Worksheet 19. This worksheet should to be clearly organized in a way that will allow for easy recognition by the field crew of common sample containers and what sample splits need to go where. Shipping "representative samples" is one of the most critical responsibilities of any field effort. These samples will need to be handled, processed, and shipped to multiple laboratory facilities within 24 hours of collection. SOP LPR-S-04 also does not provide sufficient guidance for the field crew. Perhaps the Project Chemist can work with the labs to combine appropriate tests and list the total sample size required for all tests that will be performed in each facility to minimize the glassware and provide more representative split samples for related analyses (e.g., SVOCs, PAHs, OC Pesticides and PCBs may all be analyzed from common 8 oz wide-mouth jars). Similar information should be added to the Core Processing SOP (LPR-S-04).

Response: *Per discussion with EPA on June 18, 2008, no text changes are needed.*

82. Worksheet 19. The table footnotes should include some reference to the additional sample volumes required for the site-specific QC (MS/MSD).

Response: *Comment will be incorporated in the revised plan.*

83. Worksheet 19. Clarify temperature requirements for thermal preservation. The final 2003 NELAC guidance (Section 5.5.8.3.1) considers arrival temperature acceptable when the representative sample container is either within 2°C of the required temperature or the

method-specified range. Samples with temperatures ranging from just above the freezing temperature of water to 6°C shall be acceptable. The table recognizes the low end a 0°C but should be extended to 6°C.

Response: *Comment will be incorporated in the revised plan.*

84. Worksheet 19. Method 5035A preservation should be reviewed to confirm that a 48-hour delay is allowable prior to "field preservation." Method 5035A assumes immediate in-field transfer and the maximum refrigerated 48-hour hold is in an air tight coring device or container.

Response: *Comment will be incorporated in the revised plan.*
Revised Response: In accordance with method 5035A, VOCs will be collected with sodium bisulfate preservation option, which includes cooling at 0-6°C in the field and at the laboratory for up to 14 days before analysis. If samples effervesce, the samples will be collected using the DI water option of method 5035A. This allows cooling (0-6°C) for 48 hour before freezing (-7°C) at the laboratory (and analysis within 14 days of collection).

85. Worksheet 19. Clarify holding times. For those analyses with 14/40, this represents 14 calendar days from field collection to extraction and 40 calendar days from extraction (not from collection) to analysis.

Response: *Comment will be incorporated in the revised plan.*

86. Worksheet 19. Frozen storage of PCB sediments and waters needs to be confirmed. Typically sediment can be held at around -20oC. The QAPP should specify who will decide when samples will be stored frozen, whether samples will be processed prior to freezing, or whether sample analyses will be expedited so that samples can be frozen before the primary holding time expires.

Response: *QAPP will be updated to specify the requested information on freezing.*

87. Worksheet 19. TPH-Extractables must be extracted within seven days of collection.

Response: *Section 9.2.3 of the 2/25/2008 version of the NJDEP TPH extractables method states 14 days to extraction. No change is needed.*

88. Worksheet 19. Hexavalent Chromium must be analyzed within seven days of extraction.

Response: *Comment will be incorporated in the revised plan.*

89. Worksheet 20, page 125. Provide the EPA with a list of the Performance Test samples, the components or analytes that they will contain and acceptance criteria which will be used to evaluate them.

Response: *See response to comment #45. This cannot be included in the QAPP because it is sent to the labs. It will be provided separately to EPA.*

90. Worksheet 20. The trip blank including field preservation for low level VOC sediments by Method 5035A is different than the representative TPH trip blank. Also, these analyses are scheduled for different laboratories. One set of representative trip blanks for each of the above analyses must be provided from the associated laboratories for return sample transport to each facility.

    Response: *Comment noted. The CPG is aware that each lab will have to provide trip blanks.*

91. Worksheet 20. A footnote references two potential sources of PTs but it does not specify if the contractor will be providing PTs. The only information regarding PT samples references supplier certified limits as a measurement of performance. There is no information on when or how the PTs will be introduced to the laboratories. There should be clarification between PTs and certified reference materials that are typically analyzed along with the sediment lab batches.

    Response: *Performance samples have been sent to the labs ahead of the field samples. Results of the performance samples will be submitted to EPA in a separate memorandum.*

92. Worksheet 20. It is unclear whether Method 1669 is being used as guidance for field sampling of the low level mercury. Special sample handling and field blank requirements may be necessary.

    Response: *The CPG will review with lab and field staff. Our understanding is that mercury levels in the sediment are expected to be above the levels for which the "clean/dirty hands" method is required; however, the CPG will revisit this issue and revise if necessary.*

93. Worksheet 20. No rinsate blanks are included for any of the wet chemistry parameters.

    Response: *Comment will be incorporated in the revised plan. We will include rinsate blanks for the wet chemistry parameters.*

94. Worksheet 21. Project Sampling SOP References Table, page 127 – The referenced SOP for the Operation and Calibration of a Photoionization Detector was not included in Appendix B, as indicated.

    Response: *Comment will be incorporated in the revised plan.*

95. Worksheet 23. This worksheet is not consistent with Table 2 (included in Attachment 1). For example, this worksheet references SOP L-4 for organochlorine pesticides by Method 8081A while Table 2 references Method 8081 (the SOP provided is for Method 8081A), the worksheet references SOP L-5 for PCBs by Method 8082 while Table 2 references PCB Aroclors by Method 8082A, etc. The two tables must be consistent.

    Response: *Comment will be incorporated in the revised plan.*

96. Worksheet 23. Neither this worksheet nor Table 2 include all SOPs for sediment extraction and extract clean-up steps. Only some of the method SOPs (e.g., L-6 for PAHs) include specific extraction procedures (soxhlet) and optional cleanups. Other SOPs (e.g., L-2) include multiple options and the project-preferred extraction procedure is not identified. Both tables must clearly identify all preparation and analytical methods.

    Response: *As discussed with EPA on June 18, 2008, it may not be possible to specify the exact procedures that will be used until the samples are submitted for analysis to the lab. EPA agreed that no change was necessary.*

97. Worksheet 23. SOP L-2 in the Appendix is from the Test America Pittsburg lab. Please supply the actual SOP referenced instead.

    Response: *Comment will be incorporated in the revised plan.*

98. Worksheet 23. Modifications to the Project Work listed for L-15 are incorrect (L-43 is percent moisture and L-2 is not from West Sacramento).

    Response: *Comment will be incorporated in the revised plan. CPG will correct as needed.*

99. Worksheet 23. L-44 is now Appendix D.

    Response: *Comment will be incorporated in the revised plan.*

100. Worksheet 23. L-38 and L-39 do not appear to have reference to sediment samples
.

    Response: *There are two additional, one-page attachments that detail the modifications used for analyzing sediment. Those will be provided.*

101. Worksheet 28. The listed QC samples do not include field blanks or rinsate/equipment blanks. Please revise as appropriate.

    Response: *Comment will be incorporated in the revised plan.*
    Revised Response: Changed field blank to Equipment rinsate blank and trip blanks in Worksheet 12. Same change to Worksheet 28. Deleted equipment rinsate blank for AVS/SEM for consistency with attachments to grab and core SOPs. Added equipment rinsate blanks for wet chemistry.

102. Worksheet 28. Indicate in the tables when the performance samples will be analyzed by the lab. Will they be evaluated as a pre-qualification before samples from the site are analyzed? The corrective action for Performance Samples should include investigation and correction of the problem before samples are analyzed and data are reported.

Response: *Comment will be incorporated in the revised plan. Worksheets 31 and 32 will be revised to include performance samples.*

103. Worksheet 28. "Performance Samples" are listed in the Worksheet 28 tables. In the Worksheet 12 tables, "Performance Evaluation Samples" are listed instead, while in Worksheet 19 the numbers of "PT" or "Performance Test" samples are given. Clarify if these terms are intended to be the same and if so, revise them to be consistent throughout the document.

Response: *Comment will be incorporated in the revised plan. CPG will revise for consistency where needed.*

104. Worksheet 28. In some cases method spike duplicates are listed in Worksheet 12 but are not included as a QC sample in the corresponding Worksheet 28. Investigate and revise these to be consistent.

Response: *Comment will be incorporated in the revised plan.*

105. Worksheet 28. Check the QC acceptance criteria and measurement performance criteria (MPC) and evaluate and revise to make sure they are consistent and reflect the criteria in the applicable EPA methods or lab SOPs.

Response: *Comment will be incorporated in the revised plan.*

106. Worksheet 28, pages 151-152. The worksheet does not list a field blank for VOCs. Reconcile this with Worksheet 12 on page 30, which lists a field blank. Please evaluate and revise the field blanks in the other Worksheet 28 and 12 tables for consistency.

Response: *Comment will be incorporated in the revised plan.*

107. Worksheet 28, page 155. Add the applicable SOP number, table number and or page number to the references made to the "Laboratory % Recovery Control Limits (Appendix C).

Response: *Comment will be incorporated in the revised plan.*
Revised Response: All lab recovery limits are now referenced and listed in Appendix C-2.

108. Worksheet 28, page 162. PCB Aroclors are not listed as a field duplicate parameter, while Worksheet 12 does include these field duplicates. Please reconcile all the Worksheet 28 and 12 tables to resolve this inconsistency.

Response: *Comment will be incorporated in the revised plan.*

109. Worksheet 28 (and 12). PCB Congener limits should be evaluated and revised to be consistent with the QA method performance criteria in USEPA Method 1668A. For example, the Ongoing Precision and Recovery criteria should include precision criteria in addition to accuracy/bias criteria.

Response: *This will be reviewed with the laboratory and revised as needed.*

110. Worksheet 28. In many cases, the tables reference laboratory control limits in Appendix C but this appendix only includes control limits from Test America Knoxville.

Response: *Laboratory limits are included in SOPs for many analyses; TestAmerica Knoxville was the only lab that provided a separate table. All labs were provided an opportunity to review and correct limits listed in the worksheets.*

111. Worksheet 28. Tables similar to those provided by Test America Knoxville should be included from all participating laboratories.

Response: *Same as Comment #110.*

112. Worksheet 28. This table would be more complete if expressions like "compound specific" and in-house "laboratory control limits" were added where applicable.

Response*: Comment will be incorporated in the revised plan.*

113. Worksheet 28. This worksheet is not consistent with QAPP Worksheet #12 which, for example, includes laboratory control sample limits from 70-130% and compound specific 60-140%. It would be best to create one series of tables that contain the measurement performance criteria for each of the methods for clarification. At a minimum, the two worksheets should be revised to be consistent with one another.

Response: *Worksheets will be reviewed for consistency. A separate table will be included as an appendix.*
Revised Response: Appendix C-2 tables were referenced.

114. Worksheet 28. The relationship between the Method/SOP QC Acceptance Limits and the Measurement Performance Criteria should be provided.

Response: *As discussed with EPA on June 18, 2008, the table headings came from the UFP QAPP format; no change is necessary.*

115. Worksheet 28. For biological, the corrective action presented is to reanalyze the samples but this does not appear realistic. The environmental sample will most likely be past the recognized holding time (from collection) before contamination is recognized. Clarify whether the requiring resampling is really necessary.

Response: *If this occurs, a decision will be made whether resampling is required or whether a result obtained after the expiration of holding time will be reported as qualified data.*

116. Worksheet 29, page 188. Please complete the last two entries in the table that are incomplete.

Response: *The table information will be corrected.*
Revised Response: Additional information was added. Note that Table is read by column not by row.

117. Worksheet 29, Data Storage and Retrieval. Add a statement that data transfer to USEPA will include a Multi-media Electronic Data Deliverable (MEDD) that conforms to the 2007 EPA Region 2 MEDD format. Also note that the MEDD will include all qualified and rejected data (including the reported, numerical value for rejected data).

Response: *Comment will be incorporated in the revised plan.*

118. Worksheet 30. Footnote "a" is not included for reference.

Response: *Will add footnote a.*

119. Worksheet 30. The analytical services information associated with the Group C analytes was not provided with the worksheet.

Response: *This information is included in Appendix D.*

120. Worksheet 31. Many of the specified methods and/or program-specific requirements may not be addressed in a routine external audit

Response: *Will revise to state that audits will be project-specific.*

121. Worksheet 33. The CPG is proposing that non-conformance with the QAPP and subsequent corrective actions will be documented and addressed by the Project Quality Assurance Manager. The CPG should also communicate non-conformance and corrective actions to the EPA.

Response: *Comment will be incorporated in the revised plan.*

122. Worksheet 35 indicates a full data validation on polychloro-dibenzodioxins/furans (PCDD/F) and polychlorinated biphenyl (PCB) compounds. A full data validation should also be conducted for pesticides since these compounds are most likely to be impacted by matrix interferences, potentially resulting in data that are biased low or not detected.

Response: *Per discussion with EPA on June 18, 2008, as the pesticides are being analyzed using both HR/MS and 8081A, the requested 100% full validation will not be required. However, note that 10% will receive full data validation (which will include 10% of the data for each pesticide method) as part of the proposed approach and a 100% completeness check will be done on all data to ensure that future validation could be completed if necessary.*

123. Worksheet 35, page 206. The rationale behind performing a limited data validation of certain analytes (outside of the dioxin/furan and PCB homologs/congeners) should be provided. In addition, what will be the action required if significant issues (high frequency of not meeting the measurement performance criteria) were found during the limited validation? The process of addressing the issues should be provided. This should include any corrective actions that will be required.

Response: *As discussed with EPA on June 18, 2008 the proposed approach is consistent with MPI QAPP 2005 requirements. EPA agreed this would be acceptable. Worksheet 35 will be revised to address EPA's concern regarding significant issues.*

124. Worksheet 36, page 208, Validation Criteria. Confirm the SOP referenced for the validation of the PAH data. Region 2 SOP HW-25, which is referenced, is for the validation of dioxin data. Correct as necessary.

Response: *Comment will be incorporated in the revised plan.*
Revised Response: Worksheet 36 has been revised to reference the most applicable validation guidance, where specific guidance is not provided by USEPA Region 2.

125. Worksheet 36. Include a brief summary of the modifications made to the validation SOPs referenced. The worksheet indicates that the validation criteria referenced will be modified for some analytical methods. Modifications to the SOPs employed to validate the data must be documented in the data validation reports. When applicable, the QA acceptance criteria in the applicable EPA method should also be referenced.

Response: *Comment will be incorporated in the revised plan.*

126. Worksheet 37, paragraph 2. It is an incorrect statement that DQO noncompliance will be noted in the database. This is not practical since a given datum can have numerous usability levels, i.e., a datum can satisfy usability for one DQO while also failing usability for a second DQO. The validation annotation should be revised to read "Data that do not meet the quality acceptance limits of worksheet 28, or quality levels of worksheet 15, or

analytical performance criteria specified in worksheet 12 will be clearly identified in the database so data users are aware of any limitations associated with data usability."

Response: *Comment will be incorporated in the revised plan.*

127. Attachment 1, pages 216 to 240. The DQOs should present the overall objectives, questions to be answered and the data needs, but should not include all the details regarding each task. The details of the proposed tasks to be performed to meet the DQOs should be presented separately in the QAPP Worksheets. The DQOs currently include specific details describing the task which will be performed to meet the objectives such as an exact number of samples to be collected and the type of grab sampler which will be employed. If the details of each task are included in the DQOs, it should be made clear that proposed number of samples and analyses described may not be sufficient to entirely answer the questions posed in the DQOs and that additional sampling and analyses may be necessary.

Response: *It was agreed with EPA that the DQOs would be reviewed to ensure that the language does not infer this sampling is the only sampling necessary for fulfillment of the DQO and LRC program.*

128. Attachment 1, DQOs. It appears that the DQOs from the 2005 QAPP have been reformatted and included in their entirety. This is not entirely appropriate, since the planned sampling activities in the Low Resolution Coring QAPP do not address the majority of these DQOs. The DQOs from the 2005 QAPP should probably be removed from the document.

Response: *Comment will be incorporated in the revised plan.*

129. Attachment 1, DQOs. There are missing articles/words in a number of the phrases, for example the fifth bullet under DQO 1, Step 2. Re-check the attachment for editorial errors and revise as necessary in final document.

Response: *Comment will be incorporated in the revised plan.*

130. Attachment 1 – DQO 1, Step 2, Principal Study Questions, 6th bullet. Exposure pathways themselves can not be at risk. Risk occurs because of complete exposure pathways. A more appropriate question would be, "How does the relative stability or instability of sediments in the various geomorphologic segments of the Lower Passaic affect exposure concentrations, pathways and routes for human and ecological receptors of concern?"

Response: *Comment will be incorporated in the revised plan.*

131. Attachment 1 – DQO 1, Step 2, Principal Study Questions , 4th bullet. Please revise "…natural recovery of the contaminated sediments…" to "…natural attenuation of the contaminated sediments…"

Response: *Comment will be incorporated in the revised plan.*

132. Attachment 1 – DQO 1, Step 2, Decision 1. Reword to clarify use of term 'sufficient'. "If the sediment transport model can be successfully calibrated and validated with the new data plus select historical data, then there is no need to evaluate the utility of collecting additional physical characteristics data."

Response: *Comment will be incorporated in the revised plan.*

133. Attachment 1 – DQO 1, Step 2, Decision 4: Given the absence of defined decision tolerance limits, it is impractical to condition this proposed rule by the term "sufficient." A rule may not be warranted because geochemical evaluation will be conducted as part of this work. The need for future sampling will automatically be considered based on variability observed.

Response: *Comment will be incorporated in the revised plan.*

134. Attachment 1 – DQO 1, Step 7, 2nd bullet of sampling program. Indicate number of days anticipated for the single sampling event. Also, completing sampling in a single sampling event only minimizes temporal variability, not spatial variability. Spatial variability can only be minimized by the sample collection method/technique, and should be limited by completing sampling at a location once it has begun and minimizing drift during the collection of consecutive samples.

Response: *Comment will be incorporated in the revised plan.*

135. Attachment 1 – DQO 2, Step 1. Change "…main stem of river (RM0 to RM17), its major tributaries…" to "…main stem of the river (RM0 to RM17); the thalweg, shoals, and nearshore areas; its major tributaries; and above Dundee dam…"

Response: *Comment will be incorporated in the revised plan.*

136. Attachment 1 – DQO 2, Step 1. Change "…provide characterization of LPRSA background conditions…" to "…provide characterization of LPRSA baseline conditions…"

Response: *Comment will be incorporated in the revised plan.*

137. Attachment 1 – DQO 2, Step 1 - State the problem, last sentence - The results of the analyses of the limited suite of Non Hazardous Substance stressors including pathogens will not be used to support the risk assessment portions of the RI/FS. Please revise this sentence.

Response: *Comment will be incorporated in the revised plan as discussed with EPA all collected data will be reported in the RI.*

138. Attachment 1 – DQO 2, Step 2. Add question 1.5 "Is the nature of the contamination different between the main stem of the river and the shallow shoreline habitats?"

Response: *See response to Comment #40.*

139. Attachment 1 – DQO 2, Step 2. Program Goals, 3rd bullet. Assessment of human and ecological health should be in accordance with EPA risk assessment guidance, rather than RI/FS guidance. Also, this bullet should not limit the assessment of potential impacts to human health and ecological receptors to just the top 6 inches of sediment.

Response: *Comment will be incorporated in the revised plan.*

140. Attachment 1 – DQO 2, Step 2, Program Goals, analyses. EPA recommends that, 25% of the stations should have the additional analyses rather than 10% or less. Specifically, 30 stations are recommended to be analyzed for purgeable TPHs, methyl mercury, hexavalent chromium, AVS and SEM, instead of only 12 stations, and 30 stations should be analyzed for PCB sediment-water partitioning instead of only 6 stations.

Response: *As discussed with EPA on June 18, 2008, the stated purposes of analyses of Group B is to determine relevance for future investigations and for Group C is to allow for evaluation of the analytical technique for future investigations. The CPG proposed, and EPA agreed, that the planned sample size is adequate for these purposes.*

141. Attachment 1, Data Quality Objectives, Data Quality Objective 2, Step 2, Identify the goals of the study, Program Goals, Fourth Bullet, Page 226 of 240. The Non Hazardous Substance stressors including pathogens will not be used for background risk characterization. Please revise this bullet to indicate that this information will not be used for the human or ecological risk assessments.

Response: *See comment response #137.*

142. Attachment 1 – DQO 2, Step 2, Decision Statements, 3rd bullet. This statement does not make sense. Please, reword as a complete "if" "then" statement.

Response: *Comment will be incorporated in the revised plan.*

143. Attachment 1 –DQO, Step 2, Decision Statements, 4th bullet – In addition to presenting the results of the proposed geostatistical evaluations, the CPG should present all validated data from the low resolution coring effort (for each sample, core segment and parameter)in tabular and/or database form for review. In addition, numerical concentrations are to be reported for all sample results, including data that was rejected by the validators.

Response: *Agreed.*

144. Attachment 1, DQO 2, Step 2, Decision Statements. In several instances (e.g., bottom of page 227 of 240), the QAPP states that "If multiple lines of evidence…suggest a stable sediment bed…then no further coring will be conducted." More detail will be required on the criteria that will be used to assess the collected data for this decision process, alternately, this statement can be deleted and this decision revisited in the future data evaluation report for the low resolution coring program. This comment also applies to the corollary (first bullet at top of page 228 of 240).

Response: *Following discussion with EPA on June 20, 2008, all agreed that the text does not require revision. However, it is important to note that the need for further sampling (or not) will be presented and discussed with EPA.*

145. Attachment 1 – DQO 2, Step 2, Decision 5. Given the absence of defined decision tolerance limits, it is impractical to condition this proposed rule by the term "sufficient." A rule may not be warranted because geochemical evaluation will be conducted during this work. The need for future sampling will automatically be considered based on variability observed.

Response: *Comment will be incorporated in the revised plan.*

146. Attachment 1 – DQO 2, Step 5, Anticipated Data Evaluation 5. Reword "recovery of detected chemicals" to "attenuation of detected chemicals."

Response: *Comment will be incorporated in the revised plan.*

147. Attachment 1 – DQO 2, Step 5, Anticipated Data Evaluation 6. Reword "…inform the sediment transport and chemical fate and transport models." to "…calibrate and validate the sediment transport and chemical fate and transport models."

Response: *Comment will be incorporated in the revised plan.*

148. Attachment 1 – DQO 2, Step 7, 2nd bullet of sampling program. As for DQO 1, please indicate number of days anticipated for the single sampling event. Also, completing sampling in a single sampling event only minimizes temporal variability. Spatial variability should be limited by completing sampling at a location on any given day.

Response: *Comment noted.*

149. Attachment 1 – DQO 2, Step 2. The PCB partitioning study may provide useful information for the current and future site investigations. More than six samples should be collected to provide sufficient data for the study, especially in consideration of the range of environmental/sediment quality parameters encountered on-site. The number of samples should be increased to 30, cover a range of water and sediment quality parameters and a range of PCB concentrations, since all of these factors will affect partitioning. Because this study is independent of the site characterization work on many levels, a separate set of QC

Response: *The PCB partitioning study may provide useful information for the current and future site investigations. The current study is designed to evaluate the feasibility of using a new project-specific testing protocol to measure sample sediment-water partitioning coefficients for PCBs (and potentially other highly hydrophobic organic contaminants). It is premature to commit resources to characterization of a large number of sediment samples for the RI until the testing protocol for PCBs is further developed, the analytical sensitivity is assessed and evaluated against DQOs, a method SOP is prepared, and QA/QC procedures are established .*

The CPG agrees that a large range of environmental/sediment quality parameters may be encountered on the LPR and that a number of sediment samples may be ultimately required in order to characterize (1) the sediment-water partitioning of PCBs over a range of water quality (i.e., mesohaline, oligohaline fresh), (2) sediment quality conditions (nature and type of sediment organic carbon), and (3) a range of PCB concentrations. However, the number and characteristics of the sediment samples to be analyzed and the number of field duplicate QC samples should not be pre determined until the basic information on the method is developed (e.g., accuracy, precision, and sensitivity) and the value of the data to the RI and RA is assessed.

The CPG understands that the results will be most useful for estimating the dissolved concentration of PCBs in sediment porewater, as well as the water column and corresponding exposure and uptake via ventilation; not necessarily most useful for estimating exposure via ingestion by potential receptors. The CPG anticipates that, if the measured aqueous partitioning is substantially different than the assumed partitioning reported in the literature, these data will provide useful information for evaluating different remedial options and such information could be confirmed in field pilot studies. The CPG discussed this comment with EPA on June 18, 2008. It was agreed that no change is necessary.

150. Attachment A, Core Processing (SOP Number S4, Step 5.3.7). The CPG is proposing to process their cores in a longitudinal fashion (e.g., cores will be cut lengthwise and separated into two core halves). The SOP should be revised to state that sediments from both core halves (extending the entire length of the segment) will be combined into each collected sample (with the exception of VOCs).

Response: *Comment will be incorporated in the revised plan.*

Revised Response: EPA comment reference to Attachment A. Assuming this and following comments are specific to field SOPs in Appendix B.

151. Attachment A, Coring Attempts. The CPG is proposing to make three attempts at collecting a low resolution core at each sampling location. If a core cannot be retrieved with adequate recovery (defined as greater than 80 percent of the actual penetration depth), the location will be abandoned. Two alternate locations will then be provided (one upriver and one downriver of the original sampling location). The CPG will make one attempt at collecting a low resolution core at each alternative location. If a core cannot be recovered, the CPG will abandon the location (refer to FSP Attachment A and elsewhere in the document). The document should to be revised to include a more robust effort to select alternate locations. Above RM8, zones of varying sediment texture will need to be considered carefully so that relocated cores have the greatest possible opportunity to achieve target recovery.

Response: *See comment response #8. The SOP will be edited appropriately.*

152. Attachment A (SOP LPR-S-01). The QAPP does not indicate the use of a petite ponar or box core sampler, as indicated in this site-specific SOP. If the other pieces of equipment may be used, they need to be mentioned in the QAPP and FSP, along with the decision points and objectives for their use. Otherwise, there is no need to mention them, since this SOP is specific to the planned sampling. Also, please include a statement that sediment samples will be collected either down-current or after water quality data and water sampling have been completed for each location to avoid possible affects from potential sediment loss as the grab is retrieved.

Response: *Comment will be incorporated in the revised plan.*
Revised Response: No statement was added regarding water quality data collection as this task is not part of the proposed scope.

153. Appendix B, SOP LPR-S-01. Some Van Veen grab samplers have rubber flaps and screens that cover the top of the sampling device to prevent loss of collected sediment during retrieval. Please expand the SOP to confirm that the surficial sample for Be-7 will be removed from the retrieved Van Veen sampler through its top (by removing flaps and screens, if necessary), without opening the bottom scoops. Whether recovered using a small dredge or box core, the subsample for Be-7 must be removed from the surface of the collected sample without releasing the collected sediment from the sampling device for other potential processing and subsampling.

Response: *Comment will be incorporated in the revised plan.*

154. Appendix B, SOP LPR-S-01, Attachment 4. Procedure for VOC sampling attached to grab sampling SOP refers to "cores" and "decanting" water (as opposed to siphoning, as required by the SOP. Please correct.

Response: *Comment will be incorporated in the revised plan.*

155. Appendix B, SOP LPR-S-04, Section 5.0. Please add a discussion regarding the planned management of cores that have a high water content, should they be encountered. The management of these cores would be expected to include separation of segments while the core is kept vertical, for example.

Response: *Comment will be incorporated in the revised plan. SOPs will be updated to include the method of collection of samples which have high water content.*

156. Appendix B, SOP LPR-S-03, Section 5.1.3, Item 10. The vibracore should not be allowed to penetrate the sediment under its own weight before the motor is turned on. The motor should be turned on immediately after the core tube penetrates the most surficial sediment (upper inch or two), so that sediment in contact with the tube walls remains liquefied during nearly the entire process of advancing the tube to the target depth. Doing otherwise may result in discontinuous retrieval of sediment during the process of advancing the tube (some deeper strata may be simply 'pushed out of the way' as the friction between the initial amount of recovered sediment and the tube is overcome).

Response: *Comment will be incorporated in the revised plan.*

157. Appendix B, SOP LPR-S-03, Section 5.1.3, Item 12. The CPG states in the QAPP that low resolution cores will penetrate to the red-brown clay, sand, or refusal. Consequently, the intent of the "target depths" is unclear. Several "target depths" appear shallow compared to available data. There is concern that the field crew may not achieve the desired coring penetration to the sand layer or clay that underlies the recent sediments by merely following the target depth recommendation for each core. Please add text that describes how the field crew is to make additional attempts to fully penetrate the fine-grained sediments, even if they meet recovery criteria, but do not obtain underlying sand or clay in the core tube. It is recommended that probing be conducted at each location to investigate the thickness of the fine-grained sediment layer and revise the target coring depth accordingly.

Response: *Comment will be incorporated in the revised plan.*

158. Appendix B, SOP LPR-S-03, Section 5.1.3, Item 21. The core should be allowed to settle overnight with overlying water maintained in the tube and the water drained through a small hole on the following day, immediately prior to processing.

Response: *Per agreement with EPA on June 18, 2008, the core will be allowed to settle, however overnight is not required. The water will be drained, as will be discussed in the updated SOP.*

159. Appendix B, SOP LPR-S-02, Section 5.3, Item no. 21. The core should be allowed to settle overnight with overlying water maintained in the tube and the water drained through a small hole on the following day, immediately prior to processing.

Response: *See response to comment# 158.*

160. Appendix C. This appendix containing the lab SOPs is nearly 1,500 pages long, therefore an index or table of contents would be useful so to assist the reader when locating the applicable SOPs and acceptance criteria. Please revise to include bookmarks in the .pdf document.

Response: *Comment will be incorporated in the revised plan.*

161. Appendix C, SOP No. WS-ID-0014, Rev. 3, Analysis of Organochlorine Pesticides by High Resolution Gas Chromatography/High Resolution Mass Spectrometry [EPA Methods 1699 and NYSDEC HRMS]. The SOP includes a number of optional cleanup procedures. Please note that for Passaic sediment samples experience has shown that samples for pesticides will require sulfur cleanup (mercury cleanup), Florisil cleanup, and Gel Permeation Chromatography cleanup.

Response: *Comment noted; all appropriate cleanup procedures will be used.*

162. Appendix D. The proposed plan neglects to describe a quality control/quality assurance program for the bioavailability-partitioning experiments. For example, Test America Laboratories should be required to run a black carbon standard reference material, such as the National Institute of Standards and Technology (NIST) standard reference material 1650 or 2975.

Response: *Additional quality control information will be provided for laboratory methods for which SOPs have been prepared (e.g., soot carbon analysis).*

163. Appendix D, Sample Screening. The CPG is unclear on the "screening level analysis" proposed to identify appropriate sediment samples for the partitioning experiments. On PDF page 6, under the section called "Sample Selection," the CPG states that "Screening level analysis of PCB concentrations, as measured in each of the bulk surface sediment samples, will be used to select a subset of samples with moderate to high concentrations of PCB for additional testing." Please provide more detail on the screening level analysis.

Response: *As described in CPG's response to comment 78, above, screening level PCB analysis is conducted by the laboratory prior to high resolution GC/MS quantification of*

PCB congeners. This qualitative analysis will be used to select six samples that have moderate to high relative concentrations of PCBs for method develop.

164. Appendix D, Partitioning Experiments. The CPG is proposing to conduct partitioning experiments in 1-liter bottles containing 200 milliliters (mL) of wet sediment and 800 mL of site water or de-ionized water. Recent water column experiments conducted by Malcolm Pirnie, Inc. for the EPA have demonstrated that large volumes of water are necessary to analyze for dissolved-phase PCB congeners. Similar results were reported by the United States Geological Survey (USGS) during the water column program conducted in conjunction with the Environmental Dredging Pilot Study. EPA also cautions against the use of de-ionized water in these experiments. The CPG should be required to compare their results from the 1-liter partitioning experiments with the large volume partitioning experiments conducted by Malcolm Pirnie, Inc. and the USGS.

Response: *The proposed analytical approach for characterizing sediment water partitioning includes the use of equilibrium passive samplers constructed of polyoxymethylene (POM). This approach had been developed and published in the scientific peer-reviewed literature by Ghosh et al (2003), McDonough (2007) and Cornelissen et al (2007). These sampling devices are being evaluated as promising analytical tools to determine freely dissolved aqueous concentrations (C_W,free) of hydrophobic organic compounds. The approach proposed for evaluation is designed to address the inherent limitations and confounding factors associated with the analytical methods used by Malcolm Pirnie, Inc. and USGS. The proposed POM method is expected to provide a significant reduction in field sampling costs and provide many orders of magnitude greater sensitivity. The experimental approach described for characterizing the aqueous partitioning will enable the detection of most dissolved PCB congeners using the POM method and will enable detection of the congeners having the concentrations using conventional water extraction and analysis. It is neither necessary nor feasible to compare all congeners using large volume partitioning experiments due to the confounding analytical problems associated with the presence of micro-particulates and colloidal materials following ultra filtration techniques.*

Ghosh, U., J.R. Zimmerman, and R.G. Luthy. 2003. PCB and PAH speciation among particle types in contaminated harbor sediments and effects on PAH bioavailability. Environ. Sci. Technol. 37:2209-2217.

McDonough, K. M., J. L. Fairey, G. V. Lowry, Adsorption of polychlorinated biphenyls to activated carbon: Equilibrium isotherms and a preliminary assessment of the effect of dissolved organic matter and biofilm loadings. Water Research, 2007.

Cornelissen G, Pettersen A, Broman D, Mayer P, Breedveld GD. 2008. Field testing of Equilibrium Passive Samplers to Determine Freely Dissolved Native Polycyclic Aromatic Hydrocarbon Concentrations. Environmental Toxicology and Chemistry. 27: 499-508.

165. It is unclear why the scope of work presented in this appendix is limited to PCBs. Preliminary information on pore water chemistry for the purposes of evaluating exposure to ecological receptors should include, at a minimum, hydrogen sulfide, ammonia, pH, temperature, and select metals.

Response: *As described above in CPG's response to comment #149, the current scope of work is designed to evaluate the feasibility of using a new project-specific testing protocol to measure sample sediment-water partitioning coefficients for PCBs (and potentially other highly hydrophobic organic contaminants).*

Quality Assurance Project Plan

RI Low Resolution Coring/Sediment Sampling
Lower Passaic River Restoration Project
Newark, New Jersey

RI Low Resolution Coring / Sediment Sampling

July 2008

Revision 2

Approved By: Debra L. Simmons — Date: July 24, 2008
Debra L. Simmons, Project QA Manager

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Jenny Phillips, RI Task Manager

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David Nakles, ENSR RI/FS PM

Contents

List of Acronyms

Acronym	Definition
^{63}NI	Nickel
AET	Apparent Effects Threshold
ASTM	American Society for Testing and Materials
AVS/SEM	Acid Volatile Sulfides/Simultaneously Extracted Metals
BAZ	Biological Active Zone
Be-7	Beryllium 7
BFB	Bromofluorobenzene
BHC	Benzene hexachloride
BrCl	Bromide Chloride
C	Celsius
CAS	Columbia Analytical Services
CAS Number	Chemical Abstracts Services
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CCC	Calibration Check Compounds
CCV	Continuing Calibration Verification
CLRC	CPG Low Resolution Core
cm	centimeter(s)
COC	Chain of Custody
COPC	Chemical of Potential Concern
CPG	Cooperating Parties Group
CRM	Certified Reference Material
CSM	Conceptual Site Model
CSO	Combined Sewer Overflow
Cs-137	Cesium 137
Cu/Mn	Copper/Manganese
CVAAS	Cold Vapor Atomic Absorption Spectrometry
CVAFS	Cold Vapor Atomic Fluorescence Spectrometry
dGPS	Differential Global Positioning System
DDD	Dichlordiphenyldichloroethane
DDE	Dichlordiphenyldichloroethylene
DDT	Dichlordiphenyltrichloroethane
DFTPP	Decafluorotriphenylphosphine
DoD	Department of Defense
DQI	Data Quality Indicators

List of Acronyms (Continued)

Acronym	Definition
DQL	Data Quality Level
DQO	Data Quality Objectives
ECD	Electron Capture Detector
EDD	Electronic Data Deliverable
EDL	Estimated Detection Limit
EHS	Environmental Health and Safety
EML	Environmental Measurements Laboratory
ER-L	Effects Range-Low
F	Farenheit
FID	flame ionization detector
Ft	feet
FS	Feasibility Study
FSP	Field Sampling Plan
g	gram
GC	Gas Chromatography
GC/ECD	Gas Chromatography/Electron Capture Detector
GC/FID	Gas Chromatography/Flame Ionization Detector
GC/FPD	Gas Chromatography/ Flame Photoionization Detector
GC/MS	Gas Chromatography/Mass Spectrometry
GEL	General Engineering Laboratatories, LLC
GPC	Gel Permeation Chromatography
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HHRA	Human Health Risk Assessment
HRC	high resolution core
HRGC/HRMS	High Resolution Gas Chromatography-High Resolution Mass Spectrometry
HRGC/LRMS	High Resolution Gas Chromatography-Low Resolution Mass Spectrometry
HR/MS	High Resolution/Mass Spectrometry
H&S	Health and Safety
ICAL	Initial Calibration
ICS A	Interference Check Sample
ICP/AES	Inductively Coupled Plasma-Atomic Emission Spectrometry
ICP/MS	Inductively Coupled Plasma-Mass Spectrometry
ICV	Initial Calibration Verification
IDL	Instrument Detection Limit
IEC	Interelement Correction

List of Acronyms (Continued)

Acronym	Definition
K & L Gates	Kirkpatrick and Lockhart Preston Gates Ellis LLP
K-40	Potassium 40
LCS	Laboratory Control Sample
LCS/LCSD	Laboratory Control Sample/Laboratory Control Sample Duplicate
LIMS	Laboratory Information Management System
LPR	Lower Passaic River
LPR/NB	Lower Passaic River/Newark Bay
LPRRP	Lower Passaic River Restoration Project
LPRSA	Lower Passaic River Study Area
MARLAP	Multi-Agency Radiological Laboratory Analytical Protocols
MB	Method Blank
MDL	Method Detection Limit
MEED	multi-media electronic data deliverable
mg/kg	milligrams/kilogram
MLW	mean low water
MPI	Malcolm Pirnie, Inc
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NA	Not Available
N/A	Not Applicable
ND	Not Determined
ng/L	Nanograms per Liter
NGVD	National Geodetic Vertical Datum
NIST	National Institute of Standards and Technology
NJDEP	New Jersey Department of Environmental Protection
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No Observable Adverse Effects Level
NYSDEC	New York State Department of Environmental Conservation
OPR	On-going Precision and Recovery
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
oz	ounce
PAH	Polycyclic Aromatic Hydrocarbons
Pb-210	Lead Isotope 210
pCi/g	Picocuries/gram
PCB	polychlorinated biphenyl
PCDD	Polychlorinated Dibenzodioxins
PCDF	Polychlorinated Dibenzofurans

List of Acronyms (Continued)

Acronym	Definition
PE	Performance Evaluation
PFK	Perfluorokerosene
PID	Photoionization Detector
PM	Project Manager
PQO	Project Quality Objectives
PREmis	Passaic River Estuary Management Information System
PRG	Preliminary Remediation Goals
PRSA	Passaic River Study Area
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QL	Quantitation Limit
QMP	Quality Management Plan
% R	Percent Recovery
RCL	Recovery Control Limits
RF	Response factor
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RI FTM	RI Field Task Manager
RL	Reporting Limit
RM	River Mile
RRF	Relative Response Factor
RPD	Relative Percent Difference
RPM	Remedial Project Manager
RSD	Relative Standard Deviation
SDG	sample delivery group
S/N	Serial Number
SIM	Selective Ion Monitoring
SOP	Standard Operating Procedure
SOW	Statement of Work
SPCC	System Performance Check Compounds
SRM	Standard Reference Material
SSO	Site Safety Officer
SVOC	Semivolatile Organic Compounds
SWO	Stormwater Outfall
TBD	To be determined
TEL	Threshold Effects Level
TKN	Total Kjeldahl Nitrogen

List of Acronyms (Continued)

Acronym	Definition
TOC	Total Organic Carbon
TPH	total petroleum hydrocarbons
TRV	Toxicity Reference Value
UFP	Uniform Federal Policy
µg	micrograms
umoles/g	micro moles per gram
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency
USGS	United States Geological Service
USFWS	United States Fish and Wildlife Service
UV-VIS	Ultraviolet-Visible Spectroscopy
VOC	Volatile Organic Compounds

Introduction

This Quality Assurance Project Plan and Field Sampling Plan (QAPP/FSP) Addendum is an addendum to the August 2005 Lower Passaic River Restoration Project (herein referred to as the LPRRP) QAPP and January 2006 FSP Volume 1. This QAPP/FSP Addendum details the planning and sampling processes for collecting low resolution sediment core samples to determine nature and extent of sediment impacts, including identification of potential source areas, and to characterize physical characteristics of the sediment, as required by the Settlement Agreement and Order on Consent (Settlement Agreement) and Statement of Work (SOW) of May 2007. This plan describes the implementation of the sampling, analysis, and associated Quality Assurance (QA) and Quality Control (QC) activities developed for this program.

This document adopts United States Environmental Protection Agency (USEPA) applicable Uniform Federal Policy (UFP) QAPP Worksheets [Publication Numbers: USEPA: EPA-505-B-04-900A; Department of Defense (DoD): DTIC ADA 427785] (USEPA 2005) and Standard Operating Procedures (SOPs) for the field activities. Note, the USEPA-approved Newark Bay Study Area Remedial Investigation Work Plan Sediment Sampling and Source Identification Program Phase II (Tierra Solutions, Inc. 2007) QAPP Worksheets and SOPs along with the approved QAPP/FSP Addendum for Lower Passaic River Restoration Project Empirical Mass Balance Evaluation (Malcolm Pirnie Inc. [MPI] 2007) were utilized for compilation of the QAPP/FSP Addendum format and content as they were reviewed and previously approved by USEPA.

This document includes the following components: the QAPP, the FSP Addendum (included as Appendix A of the QAPP), the field SOPs (Appendix B of the QAPP), the laboratory SOPs (Appendix C of the QAPP), and Appendix D, which includes the proposed bioavailability protocols for the polychlorinated biphenyls (PCB) partitioning study.

Background Information

The Lower Passaic River Study Area (LPRSA) encompasses the 17-mile tidal reach of the Passaic River below the Dundee Dam, its tributaries, and the surrounding watershed that hydrologically drains below the Dundee Dam (Figure 1 of the FSP Addendum, included as Appendix A to this QAPP). Overall goals of the Remedial Investigation/Feasibility Study (RI/FS) and a description of the associated investigations have been presented in the Work Plan (MPI 2005a), three Field Sampling Plans (FSP1 [MPI 2006a], FSP2 [MPI 2006b], and FSP3 [MPI 2005b]), and a QAPP (MPI 2005c).

The Cooperating Parties Group (CPG) agreed, in May 2007, to conduct an RI/FS that includes scopes of work identified in FSP1, FSP2, and FSP3. The purpose of this QAPP/ FSP Addendum is to provide field and analytical details for the initiation of FSP1 task – Low Resolution Sediment Coring (Section 5.0 of FSP1 [MPI, 2006a]). The CPG has met with USEPA on two occasions and had multiple conference calls to discuss details of the upcoming field program. USEPA's recommendations, to which the CPG agreed, are included in this QAPP/FSP Addendum.

Low Resolution Sediment Coring and Sampling, Lower Passaic River, River Mile (RM) 0-17, Tributaries and Dundee Dam

The field sampling activities for this project include the following work elements:

- Sampling locations: A total of 115 sampling locations are proposed for this investigation, including 98 stations along the Lower Passaic River; 7 stations above Dundee Dam; 3 stations on each of the Second, Third, and Saddle Rivers, and one station on the unnamed creek (Figures 2A through 2I of the FSP Addendum). Sampling locations were chosen to provide representative nature and extent coverage, identify potential source areas, and gather physical characteristics data to understand sediment stability over the study area. Selection was based on the following considerations:
    - Transect spacing of 0.25 in RM 0 to 1 where previous sampling has not been conducted
    - General coverage with minimum approximate 0.5-mile spacing between transects of cores above RM 7
    - One-mile transect spacing minimum coverage within River Mile (RM) 1.5 to 6.5, with the goal to:

        1) Refresh surface sediment concentrations; the Passaic River Study Area (PRSA) sediment data were obtained in 1995.

        2) Characterize cores that are considered "incomplete" (i.e., cores with elevated concentrations in the deepest segment analyzed). Note that the goals for the two studies differ. The goal for sampling the PRSA (i.e., RM1 to RM7) was to define the 1940 horizon. The RI/FS goal is to characterize sediment to the red-brown clay, sand, or refusal. However, where PRSA cores are "complete" (i.e., low concentrations were detected at depth), the CPG will sample from the 2008 sediment-water interface to the sediment-water interface sampled in 1995, including a 0 to 6-inch biological active zone (BAZ) sample, with the agreed upon segment sampling from -6 inches to the 1995 elevation.

        3) Complete RI/FS requirements for determining nature and extent.

    - Geomorphic region (channel, mudflat, bend, etc.)
    - Previously characterized sediment type
    - Previous characterization as erosional/depositional
    - Proximity to previous sampling locations
    - Proximity to potential contamination sources
    - Dundee Dam and tributary samples are intended to characterize potential upgradient sources to the LPRSA

  A summary of how these selection criteria apply to each proposed location is presented in Table 1 of the FSP Addendum (Appendix A) and in QAPP Worksheet #18, along with target station coordinates. The "target coordinate area" will be checked for obstructions by probing, where necessary. In addition, in hard bottom areas where gravel is found, probing will be conducted to determine if vibracoring can be performed at the target coordinate. Where not amenable to coring, probing will check for other suitable areas within the 25-foot radius defined as a sample location. If no locations within the target radius appear amenable to coring, then the probing will move out (up- and down-stream), along a transect parallel to shore through the target location, to find the closest suitable

location for attempting a core(s). If no locations are found within 300 feet up- or down-stream, the cores will be attempted within original target zone.

To obtain data representative of sediment conditions within the transect, geomorphology data, including bathymetry and surface sediment type, was reviewed to locate proposed samples. In the lower river, the data suggested that three samples per transect were required; whereas, in the upper river, above RM 8, two samples per transect could meet the objective.

Target coring depths for each station were developed based on a review of available geotechnical boring, core, and probe data from the LPRSA and Newark Bay, and are utilized for estimation of the total number of samples in Worksheet #20. Target depths were selected to fully characterize the potential thickness of sediment deposited since the initiation of dredging along the LPRSA. Target coring depths for each station are presented in QAPP Worksheet #18 and Table 1 of the FSP Addendum. To verify the depth of contamination, low resolution cores are intended to penetrate to the red-brown clay, sand, or refusal.

In addition, per agreement with USEPA, to address a component of FSP1 Task 5.3.3, which includes the collection of fine segmentation of "core top" samples from a subset of the cores (to address sediment transport modeling and risk assessment data needs), eight of the planned locations will complete this additional analysis. The proposed core(s) segmentation and grab sampling will be completed at all locations as well. A box core will be utilized for collection of surface sediment to be split into five segments, per USEPA required segments:

- 0 to 2 centimeters (cm)
- 2 to 5 cm
- 5 to 10 cm
- 10 to 30 cm
- 30 cm to 2 feet

One box core will be collected at each of the eight locations, shown in Table 1 of the FSP Addendum as the Group D analyte group. The segments will be analyzed utilizing the sample prioritization scheme found in Table 3 in the FSP Addendum. The analytes will be collected in the order requested by USEPA on March 28, 2008. One box core will be collected from each location. The analytes not available from the box core finer segmentation will be available from the core and grab samples collected at the same location.

- The investigation proposed in this QAPP/FSP Addendum is considered a single event and the first phase of the Remedial Investigation (RI), which may require additional low resolution coring in select areas of the river. The sampling is estimated to have a duration of approximately three months.

- The sample collection approach includes the combination of both sediment grabs and vibracores. An initial grab sample will be collected at each station using a modified Van Veen grab. The goal of the grab sampling is to collect a relatively undisturbed, representative surficial sample, from 0 to 1 inch below the sediment-water interface for beryllium-7 and from 0 to 0.5 feet (ft) below the sediment-water interface for additional analytes.

A vibracore system will be used to collect sediment samples from the sediment surface to the target depth estimated for each station in QAPP Worksheet #18 and Table 1 of the FSP Addendum. The surface segment of the core will be used prior to the grab samples, following the prioritization presented in Tables 3 and 4 of the FSP Addendum. Low resolution cores are intended to penetrate to the red-brown clay, sand, or refusal, to verify the depth of contamination.

Longer cores will be sectioned as needed on the sampling vessel, to facilitate handling and to ensure that the cores are maintained upright during transport and storage. Sample processing and transfer to sample containers will be performed at the field facility. The field facility, located at the Kelways Industrial Park in East Rutherford (at approximately RM 13.5), will be the base for the sediment coring effort. Indoor space at the facility will be used for staging operations and for processing the cores prior to transmitting the samples to the laboratories for analysis. The floating dock located at the field facility will be used for vessel mobilization for stations located in the middle and upper sections of the study area. Samples will be collected according to the following segmentation scheme:

Depth below sediment water interface

0 to 0.5 ft	surface sediment (in conjunction with grab sampling of this layer)
0.5 to 1.5 ft	1-foot segment
1.5 to 2.5 ft	1-foot segment
2.5 to 3.5 ft	1-foot segment
3.5 to 5.5 ft	2-foot segment
5.5 + ft	2-foot segments continue to the to the red-brown clay layer, sand, or refusal

Where sand is encountered as a layer that completely underlies the recent, fine-grained sediments (rather than as a shallow sand lens), it will be sampled for a subset of analytes, as agreed to with USEPA. Limited analyses that include polycyclic aromatic hydrocarbons (PAHs), metals, cyanide, semivolatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH) extractables, total organic carbon (TOC), grain size, and volatile organic compounds (VOCs) will be performed where sand is found at the bottom of the core. The analytes will be taken out of the primary core only, so all analytes may not be achievable in all samples.

Under certain conditions, the segmentation scheme may be altered. With the agreement of the RI Field Task Manager (RI FTM), where a stratigraphic change in the sediment sequence (e.g., change in sediment size, obvious depositional boundary or unconformity) occurs within a segment, the sampling of that segment may be altered. This will prevent different material types, with possibly different depositional ages, from being mixed together in the same sample. Segments will be reduced below 1 foot only where it appears that the sediment density is such that sufficient solids are present to satisfy the laboratory sample volume requirement.

- As the initial phase of the overall RI/Feasibility Study (FS) sediment characterization, this investigation will include a wide range of sediment analyses. Four groups of analyses are proposed:

  Group A - A comprehensive list of physical and inorganic and organic chemical analyses is proposed for the full set of stations and depths. The list of chemical analyses includes VOCs, SVOCs, PAHs,

organochlorine pesticides, PCBs, herbicides, polychlorinated dibenzodioxins/polychlorinated dibenzofurans (PCDDs/PCDFs), TPH extractables, metals, butyltins, radionuclides, TOC, and total sulfide (surficial sample only).

Toxaphene is proposed to be analyzed by two methods – high resolution gas chromatography/high resolution mass spectrometry (HRGS/HRMS) and gas chromatography/mass spectrometry (GC/MS) (refer to Worksheet #23 and Appendix C). Toxaphene results and the associated QC data will be reviewed throughout the program. If toxaphene is not detected after an adequate number of analyses, the CPG may petition to drop the analysis of this parameter by HRGC/HRMS.

Group B - Additional organic, nutrient, and pathogen analyses are proposed for samples from 13 stations over the length of the study area to determine their relevance in future investigation phases. The 13 stations, shown in Worksheet #18, were selected by reviewing the sample maps to ensure coverage within the full length of the river, with a focus on areas of finer-grained sediments, and review of station details in terms of depths and expected sediment type. These analyses include TPH (purgeable), hexavalent chromium, methyl mercury, acid volatile sulfide/simultaneously extracted metals (AVS/SEM), total phosphorus, ammonia (as N), total Kjeldahl nitrogen (TKN), *E. Coli,* and Giardia.

Group C - Additional particle size-density classification, microscopy, petrography, and PCB sediment-water partitioning analysis is proposed for up to seven stations to allow for evaluation of this analytical technique for use in future investigation phases. To select the locations for the seven samples for method development, for five or six of the locations, the CPG will use the laboratory screening level PCB analysis conducted prior to conducting HRGC/HRMS quantification of PCB congeners, along with the physical description. In addition, location 2008 CLRC-007 was specifically requested for analysis by USEPA (Note: CLRC = CPG Low Resolution Core). If this sample meets the screening criteria, five other locations will be selected. If the sample does not meet the screening criteria, it will still be analyzed and six other locations will be analyzed as well. Appendix D provides the details of this sampling effort.

Group D - For this analysis, the top segment of core will be divided into five layers (i.e., 0 to 2 cm, 2 to 5 cm, 5 to 10 cm, 10 to 30 cm, 30 cm to 2 feet) to provide the resolution required to define the sediment bed in the sediment transport model. For these five sediment core segments, HydroQual indicated that the following analyses would be required:

- Grain size
- Bulk density
- Concentration of any contaminant to be modeled via the future Contaminant Fate and Transport model

The chemical contaminants will be collected in the hierarchy presented in FSP Addendum Table 3.

HydroQual requested that the grain size analyses include the specific sieve sizes listed below

Particle Size Classes Required for Sediment Grain Size Analysis

Sieve Number	Size (µm)
NA	Fine Fraction1
230	63
140	106
100	150
60	250
40	425
30	600
16	1140
8	2360
4	4750

For sieve sizes smaller than 63 micrograms (µm), the hydrometer technique will be used. The recommended sizes for the hydrometer analysis are 63 to 31 µm, 31 to 16 µm, 16 to 8 µm, 8 to 4 µm, and less than 4 µm.

A summary of the analyses and methods for each group noted above is presented in Table 2 of the FSP Addendum. Specific stations designated for the additional Group B and D analyses are noted in QAPP Worksheet #18 and Table 1 of the FSP Addendum. The specific analytes associated with each analytical group are listed in QAPP Worksheet #15.

QAPP Worksheet #1 (UFP-QAPP Manual Section 2.1) Title and Approval Page

Document Title: QAPP/ FSP Addendum for Lower Passaic River Restoration Project: Low Resolution Sediment Coring

Lead Organization: Cooperating Parties Group and de maximis, inc.

Preparer's Name and Organizational Affiliation: Debra Simmons, ENSR

Preparer's Address, Telephone Number, and E-mail Address:

2 Technology Park Drive, Westford, MA 01886-3140

978-589-3000

dlsimmons@ensr.aecom.com,

Preparation Date (Day/Month/Year): May, 2008

Investigative Organization's Project Manager

David Nakles/ ENSR/ July 2008

Investigative Organization's Project QA Manager

Debra Simmons/ ENSR/ July 2008

Lead Organization's Project Manager

Bill Potter/ Robert Law/ de maximis, inc / July 2008

QAPP Worksheet #2 (UFP-QAPP Manual Section 2.2.4) QAPP Identifying Information

Site Name/Project Name: **Diamond Alkali Operable Unit (OU 2) - LPRRP RI/FS**

Site Location: **Lower Passaic River Study Area (LPRSA), New Jersey**
Site Number/Code: **CERCLA Document No. 02-2007-2009**
Operable Unit: **OU 2**
Contractor Name: **ENSR**
Contractor Number: **Not Applicable (N/A)**
Contract Title: **N/A**
Work Assignment Number: **N/A**

1. Identify guidance used to prepare QAPP:

   Uniform Federal Policy for Quality Assurance Project Plans. Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs. Part 1: UFP-QAPP Manual. Final Version 1. March 2005. Intergovernmental Data Quality Task Force (US Environmental Protection Agency, US Department of Defense, US Department of Energy). USEPA 505-B-04-900A.

2. Identify regulatory program: Comprehensive Environmental Response Compensation, and Liability Act. (CERCLA)

3. Identify approval entity: USEPA Region 2

4. Indicate whether the QAPP is a generic or a project-specific QAPP. (circle one)

5. List dates of scoping sessions that were held:

   February 6, 2008;
   February 27, 2008

6. List dates and titles of QAPP and FSP documents written for previous site work, if applicable:

Title
MPI, 2007. QAPP/FSP Addendum for Lower Passaic River Restoration Project Empirical Mass Balance Evaluation. December
Tierra Solutions, Inc., 2007. Newark Bay Study Area Remedial Investigation Work Plan Sediment Sampling and Source Identification Program Newark Bay, New Jersey Phase II. Revision 2 October.
MPI. 2005. *Lower Passaic River Restoration Project. Quality Assurance Project Plan.* Prepared for US Environmental Protection Agency and US Army Corps of Engineers. Malcolm Pirnie, Inc., White Plains, NY.
MPI. 2006. *Lower Passaic River Restoration Project. Field Sampling Plan.* Volume 1. Prepared for US Environmental Protection Agency, US Army Corps of Engineers. Malcolm Pirnie, Inc., White Plains, NY.

QAPP Worksheet #2 (UFP-QAPP Manual Section 2.2.4) QAPP Identifying Information

7. List organizational partners (stakeholders) and connection with lead organization:

   This work will be performed under the requirements of the Settlement Agreement and SOW with oversight conducted by USEPA and its government partners. de maximis, inc. (acting as Project Coordinator for the CPG), ENSR, and its subcontractors, are conducting the work on behalf of the CPG.

8. List data users: See item #7 above.

9. If any required QAPP elements and required information are not applicable to the project, then circle the omitted QAPP elements and required information on the attached table.
Provide an explanation for their exclusion below: N/A

QAPP Worksheet #2 (UFP-QAPP Manual Section 2.2.4) QAPP Identifying Information

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to QAPP Worksheet No. or Related Documents
Project Management and Objectives		
2.1 Title and Approval Page	- Title and Approval Page	1
2.2 Document Format and Table of Contents 2.2.1 Document Control Format 2.2.2 Document Control Numbering System 2.2.3 Table of Contents 2.2.4 QAPP Identifying Information	- Table of Contents - QAPP Identifying Information	2
2.3 Distribution List and Project Personnel Sign-Off Sheet 2.3.1 Distribution List 2.3.2 Project Personnel Sign-Off Sheet	- Distribution List - Project Personnel Sign-Off Sheet	3 4
2.4 Project Organization 2.4.1 Project Organizational Chart 2.4.2 Communication Pathways 2.4.3 Personnel Responsibilities and Qualifications 2.4.4 Special Training Requirements and Certification	- Project Organizational Chart - Communication Pathways - Personnel Responsibilities and Qualifications Table - Special Personnel Training Requirements Table	5 6 7 8
2.5 Project Planning/Problem Definition 2.5.1 Project Planning (Scoping) 2.5.2 Problem Definition, Site History, and Background	- Project Planning Session Documentation (including Data Needs tables) - Project Scoping Session Participants Sheet - Problem Definition, Site History, and Background - Site Maps (historical and present)	9 9 10 and Introduction FSP Addendum
2.6 Project Quality Objectives (PQOs) and Measurement Performance Criteria 2.6.1 Development of PQOs Using the Systematic Planning Process 2.6.2 Measurement Performance Criteria	- Site-Specific PQOs - Measurement Performance Criteria Table	11 – Attachment 1 contains the Data Quality Objectives (DQOs) 12
2.7 Secondary Data Evaluation	- Sources of Secondary Data and Information - Secondary Data Criteria and Limitations Table	13
2.8 Project Overview and Schedule 2.8.1 Project Overview 2.8.2 Project Schedule	- Summary of Project Tasks - Reference Limits and Evaluation Table - Project Schedule/Timeline Table	14 15 16

QAPP Worksheet #2 (UFP-QAPP Manual Section 2.2.4) QAPP Identifying Information

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to QAPP Worksheet No. or Related Documents
Measurement/Data Acquisition		
3.1 Sampling Tasks 3.1.1 Sampling Process Design and Rationale 3.1.2 Sampling Procedures and Requirements 3.1.2.1 Sampling Collection Procedures 3.1.2.2 Sample Containers, Volume, and Preservation 3.1.2.3 Equipment/Sample Containers Cleaning and Decontamination Procedures 3.1.2.4 Field Equipment Calibration, Maintenance, Testing, and Inspection Procedures 3.1.2.5 Supply Inspection and Acceptance Procedures 3.1.2.6 Field Documentation Procedures	- Sampling Design and Rationale - Sample Location Map - Sampling Locations and Methods/ SOP Requirements Table - Analytical Methods/SOP Requirements Table - Field QC Sample Summary Table - Sampling SOPs - Project Sampling SOP References Table - Field Equipment Calibration, Maintenance, Testing, and Inspection Table	17 FSP Addendum 18 19 20 Appendix B 21 22
3.2 Analytical Tasks 3.2.1 Analytical SOPs 3.2.2 Analytical Instrument Calibration Procedures 3.2.3 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Procedures 3.2.4 Analytical Supply Inspection and Acceptance Procedures	- Analytical SOPs - Analytical SOP References Table - Analytical Instrument Calibration Table - Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	Appendix C 23 24 25
3.3 Sample Collection Documentation, Handling, Tracking, and Custody Procedures 3.3.1 Sample Collection Documentation 3.3.2 Sample Handling and Tracking System 3.3.3 Sample Custody	- Sample Collection Documentation - Handling, Tracking, and Custody SOPs - Sample Container Identification - Sample Handling Flow - Example Chain-of-Custody Form and Seal	26 Appendix B 27 27 Appendix B
3.4 QC Samples 3.4.1 Sampling QC Samples 3.4.2 Analytical QC Samples	- QC Samples Table	28

QAPP Worksheet #2 (UFP-QAPP Manual Section 2.2.4) QAPP Identifying Information

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to QAPP Worksheet No. or Related Documents
3.5 Data Management Tasks 3.5.1 Project Documentation and Records 3.5.2 Data Package Deliverables 3.5.3 Data Reporting Formats 3.5.4 Data Handling and Management 3.5.5 Data Tracking and Control	- Project Documents and Records Table - Analytical Services Table - Data Management Procedures	29 30 Data Management Plan (ENSR 2007)
Assessment/Oversight		
4.1 Assessments and Response Actions 4.1.1 Planned Assessments 4.1.2 Assessment Findings and Corrective Action Responses	- Planned Project Assessments Table - Assessment Findings and Corrective Action Responses Table	31 32
4.2 QA Management Reports	- QA Management Reports Table	33
4.3 Final Project Report	To be completed following data collection	Not Available (NA)
Data Review		
5.1 Overview 5.2 Data Review Steps 5.2.1 Step I: Verification 5.2.2 Step II: Validation 5.2.2.1 Step IIa Validation Activities 5.2.2.2 Step IIb Validation Activities 5.2.3 Step III: Usability Assessment 5.2.3.1 Data Limitations and Actions from Usability Assessment 5.2.3.2 Activities	- Verification (Step I) Process Table - Validation (Steps IIa and IIb) Process Table - Validation (Steps IIa and IIb) Summary Table - Usability Assessment	34 35 36 37
5.3 Streamlining Data Review 5.3.1 Data Review Steps To Be Streamlined 5.3.2 Criteria for Streamlining Data Review 5.3.3 Amounts and Types of Data Appropriate for Streamlining	To be completed following data evaluation	NA

QAPP Worksheet #3 (UFP-QAPP Manual Section 2.3.1) Distribution List

The following persons will receive a copy of the approved Final QAPP, subsequent QAPP revisions, addenda, and amendments:

QAPP Recipients	Title	Organization	Telephone Number	E-mail Address	Document Control Number
Alice Yeh Tom Taccone	Remedial Project Manager (RPM)	USEPA Region 2	212.637.4427 212.637.4281	yeh.alice@epa.gov taccone.tom@epa.gov	
William Sy	Project QA Officer	USEPA Region 2	732.632.4766	sy.william@epa.gov	
Lisa Baron	Project Manager (PM)	United States Army Corps of Engineers (USACE)-NY District	917.790.8306	Lisa.A.Baron@usace.army.mil	
Janine MacGregor	Project Coordinator	New Jersey Department of Environmental Protection (NJDEP)	609.633.0784	Janine.MacGregor@dep.state.nj.us	
Tim Kubiak	Assistant Supervisor of Environmental Contaminants	United States Fish and Wildlife Service (USFWS)	609.646.9310 (ext. 26)	tim_kubiak@fws.gov	
Reyhan Mehran	Coastal Resource Coordinator	National Oceanographic and Atmospheric Administration (NOAA)	212.637.3257	reyhan.mehran@noaa.gov	

QAPP Worksheet #3 (UFP-QAPP Manual Section 2.3.1) Distribution List

QAPP Recipients	Title	Organization	Telephone Number	E-mail Address	Document Control Number
Bill Potter Robert Law	CPG Project Coordinator	de maximis, inc.	908.735.9315	otto@demaximis.com rlaw@demaximis.com	
William Hyatt	Coordinating Counsel	Kirkpatrick and Lockhart Preston Gates Ellis LLP (K&L Gates)	973.848.4045	william.hyatt@klgates.com	
Polly Newbold	CPG QA Coordinator	ddmis, inc	908.479.1975	pnewbold@ddmsinc.com	
Dave Nakles	ENSR RI/FS PM	ENSR	412.380.0140	DNakles@ensr.aecom.com	
Kris Carbonneau	Deputy RI/FS PM	ENSR	978.589.3377	KCarbonneau@ensr.aecom.com	
Kathy Harvey	ENSR Regional Environmental Health and Safety (EHS) Manager	ENSR	978.589.3325	KHarvey@ensr.aecom.com	
Jenny Phillips	RI Task Manager	ENSR	970.493.8878	JPhillips@ensr.aecom.com	
Don Boyé	RI FTM	ENSR	978.589.3177	DBoye@ensr.aecom.com	
Bruce Coulombe	RI FTM	ENSR	607.277.5716	BCoulombe@ensr.aecom.com	
Alek Modjeski	Onsite Field Coordinator/ Site Safety Officer (SSO)	ENSR	732.981.0200	AModjeski@ensr.aecom.com	
Debra Simmons	Project QA Manager	ENSR	978.589.3358	dlsimmons@ensr.aecom.com	
Mary Kozik	Project Chemist	ENSR	978.589.3338	moconnellkozik@ensr.aecom.com	

QAPP Worksheet #3 (UFP-QAPP Manual Section 2.3.1) Distribution List

QAPP Recipients	Title	Organization	Telephone Number	E-mail Address	Document Control Number
James Herberich	Data Management Task Manager	ENSR	978.589.3193	jherberich@ensr.aecom.com	
Marie Wojtas	Data Validation Coordinator	ENSR	978.589.3479	mwojtas@ensr.aecom.com	
David Kowaleski	Boat Operator	Ocean Survey, Inc.	860.388.4631	DaveK@oceansurveys.com	
Other project team members and stakeholders					None*

*Uncontrolled electronic copies will be available on www.ourpassaic.org

QAPP Worksheet #4 (UFP-QAPP Manual Section 2.3.2) Project Personnel Sign-Off Sheet

Organization: A completed sign-off sheet will be maintained in the files for each organization represented below.

Project Personnel	Title	Telephone Number	Signature*	Date QAPP Read
Bill Potter/Robert Law	CPG Project Coordinator	908.735.9315		
Polly Newbold	CPG QA Coordinator	908.479.1975		
Dave Nakles	ENSR RI/FS PM	412.380.0140		
Kris Carbonneau	ENSR Deputy RI/FS PM	978.589.3377		
Jenny Phillips	ENSR RI Task Manager	970.493.8878		
Don Boyé	ENSR RI FTM	978.589.3177		
Bruce Coulombe	ENSR RI FTM	607.277.5716		
Alek Modjeski	Onsite Field Coordinator/SSO	732.981.0200		
Debra Simmons	ENSR Project QA Manager	978.589.3358		
Mary Kozik	ENSR Project Chemist	978.589.3338		
James Herberich	ENSR Data Management Task Manager	978.589.3193		
Marie Wojtas	ENSR Data Validation Coordinator	978.589.3479		
David Kowaleski	Boat Operator	860.388.4631		
See Worksheet #30	Laboratory PM	See Worksheet #30		

*Signature indicates that personnel have read the applicable QAPP sections and will perform the tasks as described.

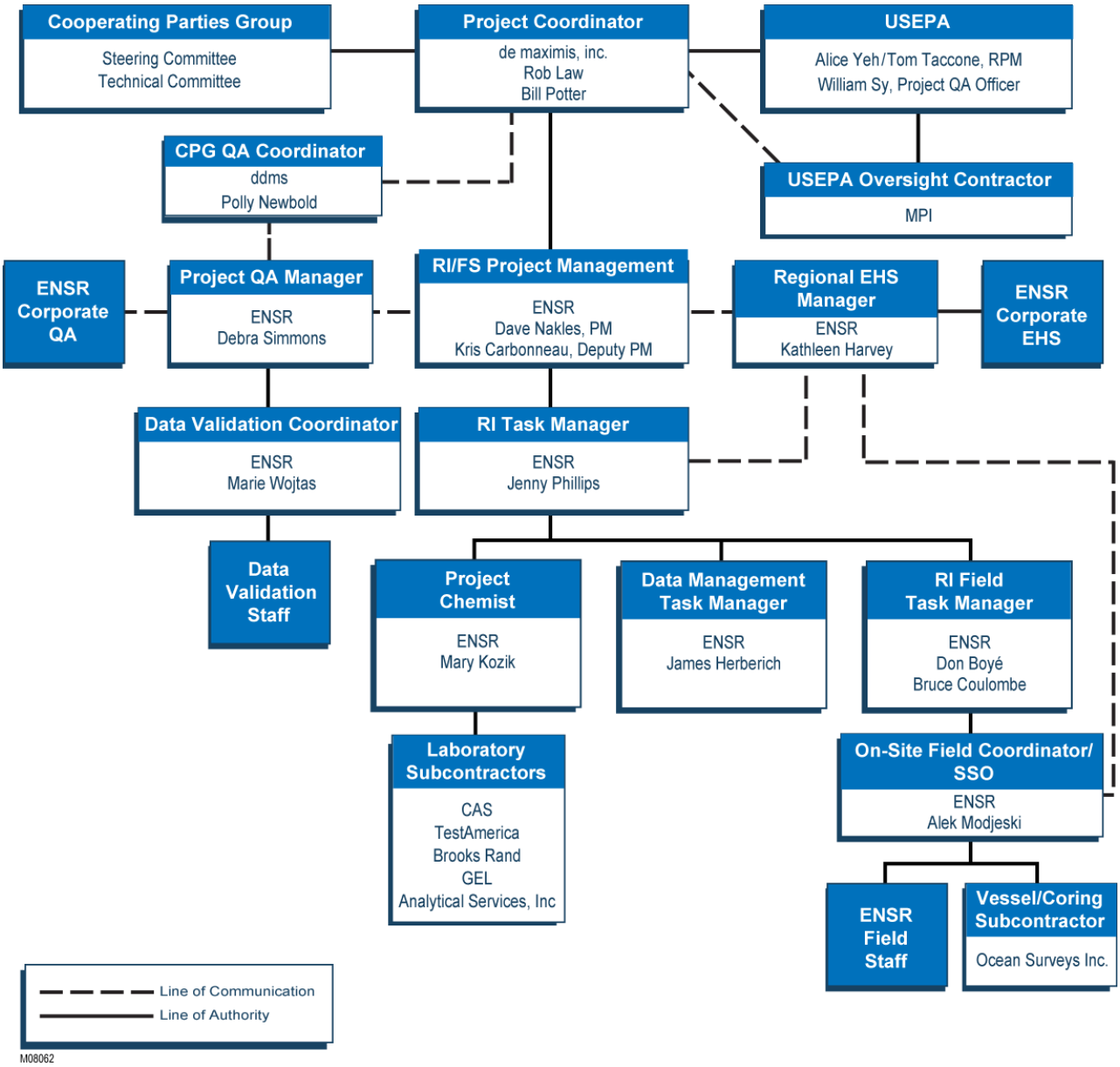
QAPP Worksheet #4 (UFP-QAPP Manual Section 2.3.2) Project Personnel Sign-Off Sheet

Organization:

Project Personnel	Title	Telephone Number	Signature*	Date QAPP Read

*Signature indicates that personnel have read the applicable QAPP sections and will perform the tasks as described.

QAPP Worksheet #5 (UFP-QAPP Manual Section 2.4.1) Project Organizational Chart



QAPP Worksheet #6 (UFP-QAPP Manual Section 2.4.2) Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (timing, pathways, etc.)
Field activities status and issues	ENSR RI FTM	Don Boyé Bruce Coulombe	978.589.3177 607.277.5716 607.351.9545 (cell)	Communicate daily, or as needed, with ENSR field personnel, subcontractors, and ENSR RI Task Manager directly, or via e-mail or phone. Minor work plan deviations and/or proposed revisions will be documented and communicated in writing, with a copy sent to USEPA.
Sampling progress/laboratory coordination	ENSR On-site Field Coordinator	Alek Modjeski	732.981.0200 Cell 732.589.5116	Communicate daily, or as needed, with ENSR RI FTM and Project Chemist via e-mail or phone.
Health and safety briefings and updates	ENSR SSO	Alek Modjeski	732.981.0200 Cell 732.589.5116	Communicate daily, or as needed, with field personnel and boat operators directly, or via e-mail or phone.
Significant health and safety concerns or incidents	ENSR SSO	Alek Modjeski	732.981.0200 Cell 732.589.5116	Communicate immediately with ENSR Regional EHS Manager and ENSR RI/FS PM.
Sampling vessel operations	Sampling Vessel Captain	David Kowaleski Ocean Surveys, Inc.	860.388.4631	Communicate daily, or as needed, with ENSR On-Site Coordinator or ENSR RI FTM directly. The sampling vessel captain has the ultimate authority for stopping work while working on water. The vessel captain, in consultation with the SSO, will follow guidelines documented in the site-specific Health and Safety Plan (HASP). In addition, standard safe boating practices related to weather conditions and vessel operations will also apply, even if not specifically addressed in the HASP.

QAPP Worksheet #6 (UFP-QAPP Manual Section 2.4.2) Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (timing, pathways, etc.)
Analytical laboratory issues, including coordination with field, schedule, and technical issues	ENSR Project Chemist	Mary Kozik	978.589.3338	Communicate with ENSR On-Site Coordinator and Laboratory PM as needed via phone or e-mail.
Analytical data validation issues	ENSR Data Validation Coordinator	Marie Wojtas	978.589.3479	Communicate with Laboratory PM as needed via phone or email.
Audit findings (field and/or laboratory)	ENSR Project QA Manager	Debra Simmons	978.589.3358	Communicate findings to ENSR RI FTM or Laboratory PM (as appropriate); transmit final audit reports, including corrective actions, to ENSR RI/FS PM, ENSR RI Task Manager, and CPG QA Coordinator.
Issues potentially affecting DQOs	ENSR RI FTM	Bruce Coulombe Don Boyé	607.277.5716 607.351.9545 (cell) 978.589.3177	Communicate as needed with ENSR QA Manager and ENSR RI Task Manager via e-mail or phone. Notification of the CPG QA Coordinator as appropriate.
	ENSR Project Chemist	Mary Kozik	978.589.3338	
	ENSR Data Validation Coordinator	Marie Wojtas	978.589.3479	
	ENSR RI Task Manager	Jenny Phillips	970.493.8878	Communicate with ENSR RI/FS PM as needed, via e-mail or phone. Significant work plan modifications will be reported to USEPA in writing prior to implementation.
Sediment coring task implementation, including sampling, analysis, and reporting	ENSR RI Task Manager	Jenny Phillips	970.493.8878	Communicate with ENSR RI/FS PM as needed, via e-mail or phone.

QAPP Worksheet #6 (UFP-QAPP Manual Section 2.4.2) Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (timing, pathways, etc.)
Project status and issues (internal)	ENSR RI/FS PM	Dave Nakles	412.380.0140	Communicate with CPG Project Coordinator daily, or as needed, via email or phone, and submit monthly progress reports.
Project status and issues (external)	CPG Project Coordinator	Bill Potter/ Robert Law (de maximis, inc)	908.735.9315	Communicate with USEPA RPM as needed via e-mail or phone.
	CPG Coordinating Counsel	William Hyatt / Emily Won (K&L Gates)	973.848.4045 or 4054	In the event the CPG Project Coordinator is unavailable for communication with USEPA, the ENSR RI/FS PM or ENSR Deputy RI/FS PM will notify the Coordinating Counsel prior to contacting USEPA.
Quality status and issues	CPG QA Coordinator	Polly Newbold	908.479.1975	Communicate with CPG Project Coordinator as needed via email or telephone
Data management	ENSR RI FTM	Bruce Coulombe Don Boyé	607.277.5716 607.351.9545 (cell) 978.589.3177	Communicate with the Data Management Task Manager via email; transmit final field locations and sample collection information
	Laboratory PM	See Worksheet #30	See Worksheet #30	Transmit EDDs to Data Management Task Manager
	ENSR Data Validation Coordinator	Marie Wojtas	978.589.3479	Communicate with Data Management Task Manager regarding final data qualifiers.
Stop Work (technical non-compliance)	ENSR Field team, Project QA Manager and PMs			Any personnel believing that a work stoppage is necessary shall first verbally notify their respective Task Manager or the RI/FS PM, who will in turn verbally notify de maximis, inc. and/or Project QA Manager, if necessary. Given the potential significance of such communications, this should occur as quickly as possible.

QAPP Worksheet #7 (UFP-QAPP Manual Section 2.4.3) Personnel Responsibilities and Qualification Table

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications[1]
Robert Law	CPG Project Coordinator	de maximis, inc.	Overall responsibility for the safe and proper execution of task. Be available to discuss and review technical and other issues that may arise during work. Periodically review and audit work to ensure that work plan, project QA/QC, Health and Safety including both boating and hazardous materials worker safety procedures are being followed. All deviations from approved project plans will be discussed with and approved by the CPG Project Coordinator. Primary point of contact with the USEPA, its oversight contractor and the LPRSA Partner Agencies.	PhD, Geology, 26 years experience
Willard Potter	CPG Project Coordinator	de maximis, inc.	Overall responsibility for the safe and proper execution of task. Be available to discuss and review technical and other issues that may arise during work. Periodically review and audit work to ensure that work plan, project QA/QC, Health and Safety including both boating and hazardous materials worker safety procedures are being followed. All deviations from approved project plans will be discussed with and approved by the CPG Project Coordinator. Primary point of contact with the USEPA, its oversight contractor and the LPRSA Partner Agencies.	BS, Chemical Engineering, 36 years experience.

QAPP Worksheet #7 (UFP-QAPP Manual Section 2.4.3) Personnel Responsibilities and Qualification Table

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications[1]
David Nakles	ENSR RI/FS PM	ENSR	Overall responsibility for completion of RI/ FS in accordance with and SOW requirements including technical, financial, and scheduling. Primary point of contact with CPG Project Coordinator.	PhD, Chemical Engineering and Engineering and Public Policy. 34 years experience.
Kristine Carbonneau	Deputy RI/FS PM	ENSR	Technical assistance. Alternate point of contact if PM not available. FS lead.	MS, Civil Engineering. 23 years experience.
Jenny Phillips	RI Task Manager	ENSR	Responsible for the execution and completion of the RI, including procurement of subcontractors, review of task deliverables, and serving as the focus for coordination of all field and laboratory tasks. The RI Task Manager will keep the ENSR RI/FS PM apprised of the status of the task, as well communicate any issues with the schedule, budget, or achievement of the task objectives.	MS, Environmental Toxicology. 20 years experience.
Bruce Coulombe	RI FTM	ENSR	Responsible for implementing field sampling activities in accordance with the approved plans (FSP, QAPP, HASP), pertinent SOPs, and this Addendum. Primary responsibilities will include directing activities on site, monitoring subcontractor performance in the field, reviewing field records, and communicating daily with the ENSR RI Task Manager regarding status, quality issues, or delays.	MS, Marine Geology. 19 years experience

QAPP Worksheet #7 (UFP-QAPP Manual Section 2.4.3) Personnel Responsibilities and Qualification Table

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications[1]
Debra Simmons	Project QA Manager	ENSR	Responsible for reviewing and approving QA procedures, ensuring that planned QA assessments (e.g., technical surveillance audits, data validation) are conducted according to the QAPP/FSP Addendum and the ENSR Quality Management Plan (QMP), and reporting on the adequacy of the QA Program to the ENSR RI/FS PM.	BS, Biology. 28 years experience
Kathleen Harvey	Regional EHS Manager	ENSR	Responsible for ensuring that the objectives of ENSR's Health and Safety Program are met and for monitoring task activities for conformance to the HASP.	MPH, Environmental Health. 24 years experience.
Donald Boyé	RI FTM	ENSR	Responsible for implementing field sampling activities in accordance with the approved plans (FSP, QAPP, HASP), pertinent SOPs, and this Addendum. Primary responsibilities will include directing activities on site, monitoring subcontractor performance in the field, reviewing field records, and communicating daily with the ENSR RI Task Manager regarding status, quality issues, or delays.	MS, Environmental Engineering. 29 years experience.
Alek Modjeski	On Site Field Coordinator/ SSO	ENSR	Responsible for implementing field effort in accordance with approved FSP, QAPP, HASP, and SOPs. Primary responsibilities will include coordinating activities on site. Will also monitor subcontractor/field team performance in the field and communicate daily with the ENSR RI FTMs regarding status, quality issues, sub-contractors, and health and safety, etc. Will ensure that the objectives of the project's Health and Safety Program are met.	BS, Marine Biology. 14 years experience.

QAPP Worksheet #7 (UFP-QAPP Manual Section 2.4.3) Personnel Responsibilities and Qualification Table

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications[1]
Mary Kozik	Project Chemist	ENSR	Responsible for laboratory procurement and monitoring of progress and will be the primary point of contact with the laboratory(ies). The Project Chemist will also be responsible for communicating any issues that could affect achievement of the DQOs to ENSR project management and the ENSR Project QA Manager.	MS, Chemistry. 32 years experience.
Marie Wojtas	Data Validation Coordinator	ENSR	Reporting to the Project QA Manager, the Data Validation Coordinator will be responsible for managing the validation task, including ensuring that validation is conducted and documented according to the requirements of this QAPP, and interacting with the laboratories to resolve any issues.	MS, Analytical Chemistry. 24 years experience.
James Herberich	Data Management Task Manager	ENSR	Data management for project. Including overall responsibility for database quality and structure, including graphical representation of data for completion of RI, Conceptual Site Model (CSM) and FS.	BA, Engineering Sciences. 22 years experience.

QAPP Worksheet #7 (UFP-QAPP Manual Section 2.4.3) Personnel Responsibilities and Qualification Table

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications[1]
Polly Newbold	CPG QA Coordinator	ddms, inc.	Oversight of project QA/QC. Periodically review and audit operations to ensure that QAPP/FSP Addendum QA/QC procedures are being followed.	BS, Textile Science, 26 years experience.
John Reynolds	Laboratory PM	TestAmerica	Acts as the primary point of contact at TestAmerica facilities for the ENSR Project Chemist to communicate and resolve sampling, receipt, analysis, and storage issues.	BS, Biology, 16 years experience.
Ed Wallace	Laboratory PM	Columbia Analytical Services (CAS)	Acts as the primary point of contact at CAS facilities for the ENSR Project Chemist to communicate and resolve sampling, receipt, analysis, and storage issues.	MS, Chemistry. 34 years experience.
Jennifer Holmes	Laboratory PM	Brooks Rand, LLC	Acts as the primary point of contact at Brooks Rand, LLC for the ENSR Project Chemist to communicate and resolve sampling, receipt, analysis, and storage issues.	PhD, Chemistry. 12 years experience.
Edith Kent	Laboratory PM	General Engineering Laboratories, LLC (GEL)	Acts as the primary point of contact at GEL Laboratories, LLC for the ENSR Project Chemist to communicate and resolve sampling, receipt, analysis, and storage issues.	MPA, Public Administration. 22 years experience.
Paul Warden	Laboratory PM	Analytical Services, Inc.	Acts as the primary point of contact at Analytical Services, Inc. for the ENSR Project Chemist to communicate and resolve sampling, receipt, analysis, and storage issues.	BS, Wildlife Biology. 18 years experience

[1] Resumes of all individuals are available upon request.

QAPP Worksheet #8 (UFP-QAPP Manual Section 2.4.4) Special Personnel Training Requirements Table

Project Function	Specialized Training by Title or Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates
RI FTM	40 hour HAZWOPER [a]	UMass Lowell	Dec 97	Don Boyé	RI FTM /ENSR	ENSR
	HAZWOPER 8-hr Refresher	ENSR	Jul 07			
	Occupational Safety and Health Administration (OSHA) 8-hr Training for Supervisors[b]	ENSR	Mar 00			
	Hazmat awareness	ENSR	Oct 06			
	Hazmat shipping	ENSR	Apr 06			
	First Aid	ARC	Dec 06			
RI FTM	40 hour HAZWOPER	Empire Soils Investigations, Michael Grasso, CIH	Feb 90	Bruce Coulombe	RI FTM /ENSR	ENSR
	HAZWOPER 8-hr Refresher	ENSR	Sep 07			
	HAZWOPER Training for Supervisors	ENSR	Apr 96			
	HAZWOPER 1st responder	ENSR	Dec 06			
	First Aid/CPR	ARC	May 06/Jun 07			

QAPP Worksheet #8 (UFP-QAPP Manual Section 2.4.4) Special Personnel Training Requirements Table

Project Function	Specialized Training by Title or Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates
On-Site Field Coordinator/ SSO	40 hour HAZWOPER	Compliance Solutions	Dec 2007	Aleksandr Modjeski	On-Site Field Coordinator/ENSR	ENSR
	OUPV Captain's License	United States Coast Guard (USCG)	Feb 2005			
	Smith System Advanced On-Road Defensive Driving Certificate	Smith System	Jul 2008			
	First Aid/CPR	American Red Cross of Central NJ	Jan 2007			
Field Personnel	40 hour HAZWOPER	University of Massachusetts (Umass) Lowell	Various	Various	Various/ENSR	ENSR
	HAZWOPER 8-hr Refresher	ENSR	w/in 12 mo			
	Hazmat awareness	ENSR	Various			

QAPP Worksheet #8 (UFP-QAPP Manual Section 2.4.4) Special Personnel Training Requirements Table

Project Function	Specialized Training by Title or Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates
Sampling Vessel Captain	40 hour HAZWOPER	Steve Gadomski	November 1992	David Kowaleski	Ocean Surveys Inc.	Ocean Surveys, Inc.
	CT Safe Boaters Certificate	State of Connecticut	May 1996			
	First Aid/CPR	To Be Determined	Jul 08			

[a] Hazardous Waste Operations and Emergency Response

[b] Occupational Safety and Health Administration

Quality Assurance Project Plan

Phase I RI Low Resolution Coring/Sediment Sampling
Lower Passaic River Restoration Project
Newark, New Jersey

QAPP Worksheet #9 (UFP-QAPP Manual Section 2.5.1) Project Scoping Session Participants Sheet

Project Name: Phase I RI Sediment Sampling, FSP 1 Implementation **Projected Date(s) of Sampling: May 2008** **Project Manager: Bill Potter/ Robert Law**	**Site Name : Diamond Alkali OU 2 - LPRRP RI/FS** **Site Location : LPRSA**
Date of Session: February 6, 2008 **Scoping Session Purpose: Discussion among agency and de maximis, inc./ ENSR for 2008 sediment coring sampling program.**	

Name	Affiliation	Phone #	E-mail Address	Project Role
Bill Potter	de maximis	908.735.9315	otto@demaximis.com	CPG Project Coordinator
Robert Law	de maximis	908.735.9315	rlaw@demaximis.com	CPG Project Coordinator
Dave Nakles	ENSR	412.380.0140	dnakles@ensr.aecom.com	RI/FS PM
Alice Yeh	USEPA	212.637.4427	yeh.alice@epa.gov	RPM
Tom Taccone	USEPA	212.637.4281	Taccone.tom@epamail.epa.gov	RPM
Ray Basso	USEPA	212.637.4417	Basso.ray@epamail.epa.gov	Strategic Integration Manager
Win Porter	Waste Policy Center	202.506.4028	jwp@winporter.com	CPG Project Consultant
Len Warner	MPI	914.641.2972	lwarner@pirnie.com	USEPA Contractor
Jenny Phillips	ENSR	970.493.8878	jphillips@ensr.aecom.com	RI Task Manager

Comments/Decisions:

Representatives of the Lower Passaic River (LPR) Project Team met with Ray Basso (via phone), Alice Yeh, and Tom Taccone on February 6 to review the 2008 shallow coring (i.e., three-foot cores) program. The locations of the proposed cores were presented, along with a proposed segmentation scheme for the cores and the analyte list. The DQOs for the proposed program were also discussed. As a result of this meeting, it was agreed that a scoping meeting with both USEPA and the Partner Agencies should be convened. This meeting was scheduled for late February/early March in Newark, NJ. It was further agreed that the scoping meeting would focus on the shallow coring program (i.e., FSP 1) and not on FSP 2 or FSP 3.

QAPP Worksheet #9 (UFP-QAPP Manual Section 2.5.1) Project Scoping Session Participants Sheet

Project Name: Phase I RI Sediment Sampling, FSP 1 Implementation **Projected Date(s) of Sampling: May 2008** **Project Manager: Bill Potter/ Robert Law**	**Site Name : Diamond Alkali OU 2 - LPRRP RI/FS** **Site Location : LPRSA**
Date of Session: February 27, 2008 **Scoping Session Purpose: Discussion among agency and de maximis, inc./ ENSR for 2008 sediment coring sampling program.**	

Name	Affiliation	Phone #	E-mail Address	Project Role
Bill Potter	de maximis	908.735.9315	otto@demaximis.com	CPG Project Coordinator
Robert Law	de maximis	908.735.9315	rlaw@demaximis.com	CPG Project Coordinator
Dave Nakles	ENSR	412.380.0140	dnakles@ensr.aecom.com	RI/FS PM
Alice Yeh	USEPA	212.637.4427	yeh.alice@epa.gov	RPM
Tom Taccone	USEPA	212.637.4281	Taccone.tom@epamail.epa.gov	RPM
Reyhan Mehran	NOAA	212.637.3257	Reyhan.mehran@noaa.gov	Partner agency lead
Janine MacGregor	NJDEP	609.633.0784	Janine.macgregor@dep.state.nj.us	Partner agency lead
Michael Barbara	ENSR/mab	973.543.5608	mabconsulting@verizon.net	Technical Consultant
Cliff Firstenberg	Tierra Solutions, Inc.	757.258.7720	cefirstenberg@cox.net	CPG member
Marcia Greenblatt	ENSR	978.589.3024	mgreenblatt@ensr.aecom.com	Modeling Task Manager
Betsy Ruffle	ENSR	978.589.3071	bruffle@ensr.aecom.com	Human Health Risk Assessment (HHRA) Task Manager
Lisa Saban	Windward	206.577.1288	lisas@windwardenv.com	Windward Ecological Risk Assessment Task Manager
Douglas Reid-Green	BASF	908.507.8820	Douglas.reid-green@basf.com	CPG member
Hank Martin	BASF	973.263.5820	hmartin@elminc.com	Consultant for CPG member
Kris Carbonneau	ENSR	978.589.3377	kcarbonneau@ensr.aecom.com	Deputy RI/FS PM
Bill Sy	USEPA	732.632.4766	Sy.william@epa.gov	QA Officer
Linda Mauel	USEPA	732.321.6766	Mauel.linda@epa.gov	USEPA participant
Ed Garvey	MPI	201.398.4326	egarvey@pirnie.com	USEPA contractor
Marion Olsen	USEPA	212.637.4313	Olsen.marian@epa.gov	USEPA participant
Charles Nace	USEPA	212.637.4164	Nace.charles@epa.gov	USEPA participant
Kate Mulvay	USACE-PLE	917.790.8216	Catherine.j.mulvay@usace.army.mil	Partner agency participant

QAPP Worksheet #9 (UFP-QAPP Manual Section 2.5.1) Project Scoping Session Participants Sheet

Name	Affiliation	Phone #	E-mail Address	Project Role
Tricia Aspinwall	USACE-PLE	917.790.8734	Tricia.aspinwall@usace.army.mil	Partner agency participant
Peter Weppler	USACE-PLE	917.790.8634	Peter.weppler@usace.army.mil	Partner agency participant
Tom Gulbransen	Batelle	631.941.3211	gulbran@batelle.org	USEPA contractor
Robin Miller	Hydro Qual	201.529.5151	rmiller@hydroqual.com	USEPA contractor
Betsy Barrows	Batelle	631.941.3213	barrowse@battelle.org	USEPA contractor
Len Warner	MPI	914.641.2972	lwarner@pirnie.com	USEPA contractor
Jenny Phillips	ENSR	970.493.8878	jphillips@ensr.aecom.com	RI Task Manager

Comments/Decisions: The above parties discussed the development of the proposed field sampling plans during this meeting. In addition, review of field sampling tasks for the RI was conducted and MPI provided an update on the status of ongoing field efforts and how they fit into the CSM. MPI indicated that the CSM is undergoing revision.

Action Items:

USEPA/Partner Agencies

- MPI to provide background notes on purposes of fine segmentation of sediment column and suggested analyses, originally developed for FSP1.
- MPI (with USEPA) to provide broader context of the scope of Draft FSP1 program, rather than the specific 10-core program currently summarized in FSP1.
- USEPA/CPG to work collaboratively using work groups to resolve DQO Step 6 in FSP1 (establishing data sufficiency for nature and extent).
- USEPA to supply field notes from 2008 MPI probing and coring programs.
- MPI to provide data from 2008 sampling program (once validation is complete).

CPG

- USEPA/CPG to work collaboratively through work groups to decide on DQO Step 6 in FSP1 for establishing data sufficiency for nature and extent
- Send suggestions for approach on deep coring locations (within the next week), including:
  - CPG to consider moving short core sediment sample locations on tributaries downstream from head of tide.
  - CPG will re-evaluate analyzing all 3 segments from short cores concurrently or archiving some segments.
  - CPG will re-evaluate approach to use multiple lines of evidence for evaluating short core data and making determination on need to go deeper.

QAPP Worksheet #10 (UFP-QAPP Manual Section 2.5.2) Problem Definition

The problem to be addressed by the project:

The proposed sampling consists of the collection of low resolution sediment cores to support the characterization of the nature and extent of contamination in the sediment and to understand the physical characteristics of the sediment in the main stem of the LPR (extending from RM 0 to just above the Dundee Dam) and in the tributaries to the LPR (Saddle River, Second River, Third River and the unnamed creek). Low resolution coring is a required element of FSP1 for completion of an RI/FS per Settlement Agreement and SOW requirements. The majority of cores within the LPR will be distributed along transects consisting of up to three cores each, that will span the width of the river with the goal of characterizing nature and extent of contamination, potential sources and the physical and contaminant characteristics of the sediment located in both erosional and depositional areas, as determined from previous radiodating, side scan sonar, and sediment probing studies.

The field and laboratory data collected during this program will be utilized in completion of the RI/ FS to:

- Provide a comprehensive characterization of the nature and extent of sediment contamination along the entire LPRSA (an extension of existing work in some areas and a first look at some areas);
- Aid in the characterization of potential internal and external sources of contaminants;
- Provide a comprehensive physical characterization of sediment along the entire LPRSA; and
- Aid in refinement of the characterization of erosional and depositional zones.

The introduction to the QAPP provides background site information. The DQOs provided in Attachment 1 include more detail for each sampling objective.

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

DQOs are fully described in Attachment 1 as 1.1 and 1.2.

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	VOCs				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-1	Accuracy/Bias-Contamination	No target compound >Quantitation Limit (QL), no common lab contaminants >5x QL	Method Blank (MB)/Instrument Blanks	A
	L-1	Accuracy/Bias-Contamination	No target compound >QL, no common lab contaminants >5x QL	Trip Blanks/Equipment Rinsate Blanks	S & A
	L-1	Accuracy/Bias	Compound-specific, see Appendix C-2	Laboratory Control Sample (LCS)	A
	L-1	Accuracy/Bias	Compound-specific, see Appendiix C-2	Matrix Spike (MS)	S & A
	L-1	Accuracy/Bias	Compound-specific, see Appendix C-2	Surrogates	A
	L-1	Accuracy/Bias	Supplier Certified Limits	Performance Evaluation (PE) Sample	A
	L-1	Precision	Compound-specific, see Appendiix C-2	Matrix Spike Duplicate (MSD)	S & A
	L-1	Precision	Relative Percent Difference (RPD) ≤ 50% if both samples are >5x QL	Field Duplicate	S & A
	L-1	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix C-2

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	SVOCs				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-2, L-3	Accuracy/Bias-Contamination	No target compound >QL, no common lab contaminants >5x QL	Method Blank/Instrument Blank	A
	L-2, L-3	Accuracy/Bias-Contamination	No target compound >QL, no common lab contaminants >5x QL	Equipment Rinsate Blanks	S & A
	L-2, L-3	Accuracy/Bias	Compound-specific, see Appendix C-2	LCS	A
	L-2, L-3	Accuracy/Bias	Compound-specific, see Appendix C-2	MS	S & A
	L-2, L-3	Accuracy/Bias	Compound-specific, see Appendix C-2	Surrogates	A
	L-2, L-3	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-2, L-3	Precision	Compound-specific, see Appendix C-2	MSD	S & A
	L-2, L-3	Precision	RPD ≤ 50% if both samples are > 5x QL	Field Duplicate	S & A
	L-2, L-3	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix C-2

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	PAHs and Alkyl PAHs (HRGC/LRMS – SIM)[e]				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-6	Accuracy/Bias-Contamination	No target compound >Environmental Measurements Laboratory (EML)	Method Blank/Instrument Blank	A
	L-6	Accuracy/Bias-Contamination	No target compound >EML	Equipment Rinsate Blanks	S & A
	L-6	Accuracy/Bias	60 -140% (see Appendix C-2)	LCS	A
	L-6	Accuracy/Bias	60 -140% (see Appendix C-2)	MS	S & A
	L-6	Accuracy/Bias	Compound-specific, see Appendix C-2	Pre-extraction Internal Standards	A
	L-6	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-6	Precision	RPD ≤ 30% (see Appendix C-2)	MSD	S & A
	L-6	Precision	RPD ≤ 50% if both samples are > 5x QL	Field Duplicate	S & A
	L-6	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix C-2
e HHRGC/LRMS: High Resolution Gas Chromatography/Low Resolution Mass Spectrometry – Selective Ion Monitoring

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	Organochlorine Pesticides (GC/ECD[e])				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-2, L-4, L-56	Accuracy/Bias - Contamination	No target compound >QL	Method Blank/Instrument Blank	A
	L-2, L-4, L-56	Accuracy/Bias- Contamination	No target compound >QL	Equipment Rinsate Blanks	S & A
	L-2, L-4, L-56	Accuracy/Bias	Compound-specific, see Appendix C-2	LCS	A
	L-2, L-4, L-56	Accuracy/Bias	Compound-specific, see Appendix C-2	MS	S & A
	L-2, L-4. L-56	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-2, L-4, L-56	Accuracy/Bias	Compound-specific, see Appendix C-2	Surrogates	A
	L-2, L-4, L-56	Precision	30% (see Appendix C-2)	MSD	S & A
	L-2, L-4, L-56	Precision	RPD ≤ 50% if both samples are > 5x QL	Field Duplicate	S & A
	L-2, L-4, L-56	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix C-2
[e] GC/ECD: Gas Chromatography/Electron Capture Detector

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	Organochlorine Pesticides (HRGC/HRMS)				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[cb]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-15	Accuracy/Bias - Contamination	No target compound >QL	Method Blank/Instrument Blank	A
	L-15	Accuracy/Bias- Contamination	No target compound >QL	Equipment Rinsate Blanks	S & A
	L-15	Accuracy/Bias	Compound-specific, see Appendix C-2	On-going Precision and Recovery (OPR) sample (or LCS)	A
	L-15	Accuracy/Bias	Compound-specific, see Appendix C-2	MS	S & A
	L-15	Accuracy/Bias	Compound-specific, see Appendix C-2	Surrogates	A
	L-15	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-15	Precision	RPD ≤ 30%	MSD	S & A
	L-15	Precision	RPD ≤ 50% if both samples are >5x QL	Field Duplicate	S & A
	L-15	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix C-2

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	PCBs Aroclors (GC/ECD)				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-12	Accuracy/Bias-Contamination	No target compound >QL	Method Blank/Instrument Blank	A
	L-12	Accuracy/Bias-Contamination	No target compound >QL	Equipment Rinsate Blanks	S & A
	L-12	Accuracy/BIas	Compound-specific, see Appendix C-2	LCS	A
	L-12	Accuracy/Bias	Compound-specific, see Appendix C-2	MS	S & A
	L-12	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-12	Precision	Compound-specific, see Appendix C-2	MSD	S & A
	L-12	Precision	RPD ≤ 50% if both samples are > 5x QL	Field Duplicate	S & A
	L-12	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix C-2

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	PCBs – Congeners (HRGC/HRMS)				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-7	Accuracy/Bias-Contamination	No target compound >EML	Method Blank/Instrument Blank	A
	L-7	Accuracy/Bias-Contamination	No target compound >EML	Equipment Rinsate Blanks	S & A
	L-7	Accuracy/Bias	Toxic Congeners: 50 - 150%; Non-toxic Congeners: 40 -160% (see Appendix C-2)	LCS	A
	L-7	Accuracy/BIas	Toxic Congeners: 50 - 150%; Non-toxic Congeners: 40 -160% (see Appendix C-2)	MS	S & A
	L-7	Accuracy/Bias	30 -140% (see Appendix C-2)	Pre-extraction Internal Standards	A
	L-7	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-7	Precision	RPD ≤ 50% (see Appendix C-2)	MSD	S & A
	L-7	Precision	RPD ≤ 50% if both samples are > 5x EML	Field Duplicate	S & A
	L-7	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix C-2

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	Herbicides (GC/ECD)				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-12	Accuracy/Bias-Contamination	No target compound >QL	Method Blank/Instrument Blank	A
	L-12	Accuracy/Bias-Contamination	No target compound >QL	Equipment Rinsate Blanks	S & A
	L-12	Accuracy/Bias	Compound-specific, see Appendix C-2	LCS	A
	L-12	Accuracy/Bias	Compound-specific, see Appendix C-2	MS	S & A
	L-12	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-12	Precision	Compound-specific, see Appendix C-2	MSD	S & A
	L-12	Precision	RPD ≤ 50% if both samples are >5x QL	Field Duplicate	S & A
	L-12	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix C-2

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	TPH, Extractables and Purgeables (Gas Chromatography [GC}/FID)				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-13, L-14	Accuracy/Bias-Contamination	No target compound >QL	Method Blank/Instrument Blank	A
	L-13, L-14	Accuracy/Bias-Contamination	No target compound >QL	Trip Blanks (for TPH-purgeables)/Equipment Rinsate Blanks	S & A
	L-13, L-14	Accuracy/Bias	Compound-specific, see Appendix C-2	LCS	A
	L-13, L-14	Accuracy/Bias	Compound-specific, see Appendix C-2	Surrogates	A
	L-13, L-14	Accuracy/Bias	Compound-specific, see Appendix C-2	MS	S & A
	L-13, L-14	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-13, L-14	Precision	RPD ≤30%	MSD	S & A
	L-13, L-14	Precision	RPD ≤ 50% if both samples are >5x QL	Field Duplicate	S & A
	L-13, L-14	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix C-2

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	PCDDs/PCDFs (Isotope Dilution Mass Spectrometry)				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-35	Accuracy/Bias-Contamination	No target compound >QL	Method Blank/Instrument Blank	A
	L-35	Accuracy/Bias-Contamination	No target compound >QL	Equipment Rinsate Blanks	S & A
	L-35	Accuracy/Bias	Compound-specific, see Appendix C-2	LCS	A
	L-35	Accuracy/Bias	Compound-specific, see Appendix C-2	MS	S & A
	L-35	Accuracy/Bias	Compound-specific, see Appendix C-2	Surrogates	A
	L-35	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-35	Precision	RPD ≤50% (see Appendix C-2)	MSD	S & A
	L-35	Precision	RPD ≤ 50% if both samples are > 5x QL	Field Duplicate	S & A
	L-35	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix C-2

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	Radiochemistry Beryllium 7(Be-7), Cesium 137 (Cs -137), Lead 210 (Pb-210)[g], Potassium 40 (K-40)				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-9, L-10, L-45, L-46	Accuracy/Bias-Contamination	No target analyte > QL	Method Blank	A
	L-9, L-10, L-45, L-46	Accuracy/Bias	75 - 125%	LCS	A
	L-9, L-10, L-45, L-46	Precision	RPD ≤ 20% if both samples are 5x QL	Laboratory Duplicate	A
	L-10, L-46	Accuracy/Bias	75-125%	MS[e]	S & A
	L-9, L-10, L-45, L-46	Accuracy/Bias	≤30%	Combined Standard Uncertainty[f]	A
	L-9, L-10, L-45, L-46	Precision	RPD ≤ 50% if both samples are 10x QL	Field Duplicate	S & A
	L-9, L-10, L-45, L-46	Completeness	≥ 90%	Data Completeness Check	S & A
	L-10, L-46	Accuracy/Bias	50 – 120%	Tracer[e]	A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix C-2
[e] Applicable to alpha spectrometry analysis only
[f] Sample results will be reported with associated combined standard uncertainty (2 sigma expanded measurement uncertainty)
[g] Lead 210 will be determined as polonium-210 and radium-226.

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	Inductively Coupled Plasma – Atomic Emission Spectrometry (ICP/AES) Metals				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-18	Accuracy/Bias-Contamination	No target compound >QL	Method Blank	A
	L-18	Accuracy/Bias-Contamination	No target compound >QL	Equipment Rinsate Blanks	S & A
	L-18	Accuracy/Bias	Compound-specific, see Appendix C-2	LCS	A
	L-18	Accuracy/Bias	Compound-specific, see Appendix C-2	MS	S & A
	L-18	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-18	Precision	RPD ≤ 30%	Laboratory Duplicate	A
	L-18	Precision	RPD ≤ 35% if both samples are >5x QL	Field Duplicate	S & A
	L-18	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix C-2

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	Inductively Coupled Plasma – Mass Spectrometry (ICP/MS) Metals				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-19	Accuracy/Bias-Contamination	No target compound >QL	Method Blank	A
	L-19	Accuracy/Bias-Contamination	No target compound >QL	Equipment Rinsate Blanks	S & A
	L-19	Accuracy/Bias	Compound-specific, see Appendix C-2	LCS	A
	L-19	Accuracy/Bias	Compound-specific, see Appendix C-2	MS	S & A
	L-19	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-19	Precision	RPD ≤ 20%	Laboratory Duplicate	A
	L-19	Precision	RPD ≤ 35% if both samples are > 5x QL	Field Duplicate	S & A
	L-19	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix C-2

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	Mercury (Low Level)				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-36	Accuracy/Bias-Contamination	Average MB <2x Method Detection Limit (MDL) and standard deviation <0.67x MDL or <0.1x the concentration of project samples	Method Blank	A
	L-36	Accuracy/Bias-Contamination	No target compound >QL	Equipment Rinsate Blanks	S & A
	L-36	Accuracy/Bias	80 -120%	LCS	A
	L-36	Accuracy/Bias	70 -130%	MS	S & A
	L-36	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-36	Precision	RPD ≤ 30%	MSD	S & A
	L-36	Precision	RPD ≤ 30%	Laboratory Duplicate	A
	L-36	Precision	RPD ≤ 50% if both samples are >5x QL	Field Duplicate	S & A
	L-36	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix C-2

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	Methyl Mercury				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-37	Accuracy/Bias-Contamination	Average MB <0.45 nanograms per liter (ng/L) and standard deviation <0.15 ng/L or <0.1x the concentration of project samples	Method Blank	A
	L-37	Accuracy/Bias-Contamination	No target compound >QL	Equipment Rinsate Blanks	S & A
	L-37	Accuracy/Bias	Within 35% of certified value	Certified Reference Material (CRM)	A
	L-37	Accuracy/Bias	65-135%	MS	S & A
	L-37	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-37	Precision	RPD ≤ 35%	MSD	S & A
	L-37	Precision	RPD ≤ 35%	Laboratory Duplicate	A
	L-37	Precision	RPD ≤ 50% if both samples are >5x QL	Field Duplicate	S & A
	L-37	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix C-2

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	Hexavalent Chromium (Ion Chromatography)				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01	L-34	Accuracy/Bias-Contamination	<QL	Method Blank	A
	L-34	Accuracy/Bias-Contamination	<QL	Equipment Rinsate Blanks	S & A
	L-34	Accuracy/Bias	80-120%	LCS	A
	L-34	Accuracy/Bias	75-125%	MS	S & A
	L-34	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-34	Precision	RPD ≤20%	MSD	S & A
	L-34	Precision	RPD ≤ 20%	Laboratory Duplicate	A
	L-34	Precision	RPD ≤ 50% if both samples are > 5x QL	Field Duplicate	S & A
	L-34	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #2

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	Butyltins				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-21	Accuracy/Bias-Contamination	No target compound >QL	Method Blank	A
	L-21	Accuracy/Bias-Contamination	No target compound >QL	Equipment Rinsate Blanks	S & A
	L-21	Accuracy/Bias	Compound-specific, see Appendix C-2	LCS	A
	L-21	Accuracy/Bias	Compound-specific, see Appendix C-2	MS	S & A
	L-21	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-21	Precision	RPD ≤ 40% (see Appendix C-2)	MSD	S & A
	L-21	Precision	RPD ≤ 50% if both samples are >5xQL	Field Duplicate	S & A
	L-21	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix C

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	General Chemistry - Sulfides				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-30	Accuracy/Bias-Contamination	< QL	Method Blank	A
	L-30	Accuracy/Bias-Contamination	<QL	Equipment Rinsate Blanks	S & A
	L-30	Accuracy/Bias	51-125% (see Appendix C-2)	LCS	A
	L-30	Accuracy/Bias	46-144% (see Appendix C-2)	MS	S & A
	L-30	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-30	Precision	RPD ≤ 43% (see Appendix C-2)	Laboratory Duplicate	A
	L-30	Precision	RPD ≤ 50% if both samples are > 5x QL	Field Duplicate	S & A
	L-30	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	General Chemistry – AVS/SEM				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-22	Accuracy/Bias-Contamination	No target compound >QL	Method Blank	A
	L-22	Accuracy/Bias	62-109% for AVS; Compound-specific, see Appendix C-2 for metals	LCS	A
	L-22	Accuracy/Bias	66-117% for AVS; Compound-specific, see Appendix C-2 for metals	MS	S & A
	L-22	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-22	Precision	RPD ≤ 45%	Laboratory Duplicate	A
	L-22	Precision	RPD ≤ 50% if both samples are >5x QL	Field Duplicate	S & A
	L-22	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	General Chemistry – Ammonia				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-23	Accuracy/Bias-Contamination	< QL	Method Blank	A
	L-23	Accuracy/Bias-Contamination	<QL	Equipment Rinsate Blanks	S & A
	L-23	Accuracy/Bias	58-131% (see Appendix C-2)	LCS	A
	L-23	Accuracy/Bias	66-127% (see Appendix C-2)	MS	S & A
	L-23	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-23	Precision	RPD ≤ 32% (see Appendix C-2)	Laboratory Duplicate	A
	L-23	Precision	RPD ≤ 50% if both samples are >5x QL	Field Duplicate	S & A
	L-23	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	General Chemistry – Cyanide				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-25	Accuracy/Bias-Contamination	< QL	Method Blank	A
	L-25	Accuracy/Bias-Contamination	<QL	Equipment Rinsate Blanks	S & A
	L-25	Accuracy/Bias	85-115% (see Appendix C-2)	LCS	A
	L-25	Accuracy/Bias	75 -125% (see Appendix C-2)	MS	S & A
	L-25	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-25	Precision	RPD ≤ 20%(see Appendix C-2)	Laboratory Duplicate	A
	L-25	Precision	RPD ≤ 50% if both samples are >5x QL	Field Duplicate	S & A
	L-25	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	General Chemistry – TKN				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-27	Accuracy/Bias-Contamination	< QL	Method Blank	A
	L-27	Accuracy/Bias-Contamination	<QL	Equipment Rinsate Blanks	S & A
	L-27	Accuracy/Bias	70-108% (see Appendix C-2)	LCS	A
	L-27	Accuracy/Bias	38-138% (see Appendix C-2)	MS	S & A
	L-27	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-27	Precision	RPD ≤ 20% (see Appendix C-2)	Laboratory Duplicate	A
	L-27	Precision	RPD ≤ 50% if both samples are >5x QL	Field Duplicate	S & A
	L-27	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	General Chemistry – Phosphorus				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-26	Accuracy/Bias-Contamination	< QL	Method Blank	A
	L-26	Accuracy/Bias-Contamination	<QL	Equipment Rinsate Blanks	S & A
	L-26	Accuracy/Bias	85- 115% (see Appendix C-2)	LCS	A
	L-26	Accuracy/Bias	75 -125% (see Appendix C-2)	MS	S & A
	L-26	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-26	Precision	RPD ≤ 20% (see Appendix C-2)	Laboratory Duplicate	A
	L-26	Precision	≤ 50% if both samples are >5x QL	Field Duplicate	S & A
	L-26	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix C

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	General Chemistry – TOC				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-28	Accuracy/Bias-Contamination	< QL	Method Blank	A
	L-28	Accuracy/Bias-Contamination	<QL	Equipment Rinsate Blanks	S & A
	L-28	Accuracy/Bias	74-123% (see Appendix C-2)	LCS	A
	L-28	Accuracy/Bias	75-114% (see Appendix C-2)	MS	S & A
	L-28	Accuracy/Bias	Supplier Certified Limits	PE Sample	A
	L-28	Precision	RPD ≤ 27% (see Appendix C-2)	Laboratory Duplicate	A
	L-28	Precision	RPD ≤ 50% if both samples are >5x QL	Field Duplicate	S & A
	L-28	Completeness	≥ 90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	Physical Testing – Grain Size Analysis				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-31	Precision	RPD ≤ 20%	Laboratory Duplicates	S & A
	L-31	Accuracy/Bias	Supplier Certified Limits	Performance Sample	A
	L-31	Completeness	>90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	General Chemistry – Atterberg Limits				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-32	Precision	1% Absolute	Laboratory Duplicates	A
	L-32	Completeness	>90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	General Chemistry – Specific Gravity				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**Analytical Method/SOP**[c]
LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04	L-33	Precision	RPD ≤ 20%	Laboratory Duplicates	A
	L-33	Completeness	>90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	Biological – *E. Coli*				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**[d]	**QC Sample and/or Activity Used to Assess Measurement Performance**	**Analytical Method/SOP**[c]
LPR-S-01	L-38, L-38a	Accuracy/Bias	Yellow color with fluorescence	Control Sample	A
	L-38, L-38a	Accuracy/Bias-Contamination	No color, no fluorescence	Method Blank	A
	L-38, L-38a	Completeness	>90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23
[d] Analyte specific limits may be found in Appendix C

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Sediment				
Analytical Group[a]	Biological – Giardia				
Concentration Level	Low				
Sampling Procedure[b]	**Analytical Method/SOP**[c]	**DQIs**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**Analytical Method/SOP**[c]
LPR-S-01	L-39. L-39a	Precision	±30%	Laboratory Duplicates	A
	L-39, L-39a	Accuracy/Bias	14 -100%	Control Sample	A
	L-39, L-39a	Accuracy/Bias-Contamination	Negative	Method Blank	A
	L-39, L-39a	Completeness	>90%	Data Completeness Check	S & A

[a] Refer to QAPP Worksheet #15 for a complete list of analytes for each analytical group
[b] Refer to QAPP Worksheet #21
[c] Refer to QAPP Worksheet #23

QAPP Worksheet #13 (UFP-QAPP Manual Section 2.7) Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/Collection Dates)	How Data Will Be Used	Limitations on Data Use
Work Performed by USEPA/MPI or other agencies on the Passaic				
Probing and core data from pre-coring reconnaissance work	USEPA sampling program conducted by MPI in 2007-08	USEPA. Inference on sediment type and thickness (probing) as well as sediment description (cores)	Recent surficial sediment conditions.	Subjective delineation and identification method subject to different interpretations. Comparison of core logs and these data required to verify results.
Analytical data from the LPR high resolution core program	USEPA sampling program conducted by MPI in 2005	USEPA. Sediment dating (Cs-137, Be-7) and contaminant concentrations (PCDD/PCDF, PCBs, PAHs, pesticides, metals). Cores collected Sept. 19 to Oct. 12, 2005.	Map aerial and vertical chemical distribution	Only 5 sediment cores were analyzed for limited and selected chemical parameters. 14 analyzed for Cs-137 over a 10 mile interval. Not all segments from all cores were analyzed. Core in erosional areas were either not utilized or not fully analyzed. Several cores did not produce recovery called for in SOPs. Summary narrative provided. Characterization report not produced to document field or analytical activities. Use data with the recognition that laboratory and/or validation qualifiers may impose limitations on specific datasets and/or data points.

QAPP Worksheet #13 (UFP-QAPP Manual Section 2.7) Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/Collection Dates)	How Data Will Be Used	Limitations on Data Use
Analytical data from the LPR low resolution core program	USEPA sampling program conducted by MPI in 2006	USEPA (performed by MPI) 2006 - 10 cores - Sediment dating (Cs-137, Be-7) and contaminant concentrations (PCDD/PCDF, PCBs, PAHs, pesticides, metals) - in the MPI database: Passaic River Estuary Management Information System (PREmis)	Map aerial and vertical chemical distribution	10 sediment cores were supposed to be collected in close proximity to Tierra location requirements of the SOPS were not met for several cores Several cores did not meet recovery requirements. USEPA/MPI have utilized these data in limited extent if at all. Summary narrative provided. Characterization report not produced to document field or analytical activities. Use data with the recognition that laboratory and/or validation qualifiers may impose limitations on specific datasets and/or data points.
Analytical data from the grab samples collected for sediment dating	USEPA sampling program conducted by MPI in 2005	USEPA (collected by MPI) - Aug 2005 - 45 locations - Be-7	Provide insight into potential deposition areas	Characterization report not produced to document field or analytical activities. Use data with the recognition that laboratory and/or validation qualifiers may impose limitations on specific datasets and/or data points.

QAPP Worksheet #13 (UFP-QAPP Manual Section 2.7) Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/Collection Dates)	How Data Will Be Used	Limitations on Data Use
Analytical data from short cores collected above Dundee Dam	USEPA sampling program conducted by MPI Jan. 11, 2007	USEPA. Sediment cores dated and analyzed for organic and inorganic contaminants	Characterize the Upper Passaic River source	Data from only two cores were completely analyzed. Summary narrative provided. Characterization report not produced to document field or analytical activities. Use data with the recognition that laboratory and/or validation qualifiers may impose limitations on specific datasets and/or data points.
Work Performed by Tierra Solutions, Inc. on the Passaic				
Analytical data from the LPR coring program	Tierra Solutions, Inc. Newark Bay Study Area RI WP	Tierra Solutions Inc. Sediment chemistry collected form 93 sediment core locations (658 samples) for chemical, radiological and geotechnical analysis.	Evaluation of various organic and inorganic chemicals.	Samples collected using vibracoring should be interpreted noting individual core recovery and the uncertainty of vertical placement of the recovered samples. Use data with the recognition that laboratory and/or validation qualifiers may impose limitations on specific datasets and/or data points.

QAPP Worksheet #13 (UFP-QAPP Manual Section 2.7) Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/Collection Dates)	How Data Will Be Used	Limitations on Data Use
Analytical data from the LPR sediment grab program	Tierra Solutions, Inc. Newark Bay Study Area RI WP	Tierra Solutions Inc. Surface sediment composite sampling of 45 samples, collected from lower 6miles of river for chemical analysis.	Evaluation of various organic and inorganic chemicals.	Tierra Solutions, Inc. collected 10 discrete samples that were composited into one sample that was intended to characterize a single mudflat. Use data with the recognition that laboratory and/or validation qualifiers may impose limitations on specific datasets and/or data points.
Work Performed by CPG/ENSR on the Passaic				
Aerial Photography and Digital Orthophotos, photogrammetric mapping and topography	CPG, LPRSA.	Produced by GEOD Corp on behalf of CPG. Data sent to EPA in November and December 2007.	In completion of RI/FS	Orthophotos - Valid for accuracy and map scales as explained in the metadata. Current only as of the date of photography, 3/12/2007 Photogrammetric Mapping Products - Valid for accuracy and map scales as explained in the metadata. Current only as of the date of photography, 4/11/2007.

QAPP Worksheet #13 (UFP-QAPP Manual Section 2.7) Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/Collection Dates)	How Data Will Be Used	Limitations on Data Use
Bathymetric survey	No report to date - data delivered to USEPA	CPG. Multi-beam and single beam survey performed by Gahagan and Bryant (subcontractor to ENSR) in Aug-Sept 2007	Characterize existing bathymetry, compare with previous surveys to assess sediment stability	Single beam - Coverage limited to project river miles 0.5 - 8.2 and 14.3 - 16.5. Current only as of the date of survey, August 2007. Multi-beam Coverage limited to project river miles 0 - 14.4, and to channel area in project river miles 0 - 0.9. Current only as of the date of survey, August 2007
Work Performed by Tierra Solutions Inc. on Newark Bay				
Analytical data from the Newark Bay Phase 1 Sampling Program	Tierra Solutions, Inc.	Tierra Solutions Inc. Sediment chemistry collected as part of the Newark Bay Study Area Phase 1 RI from Oct.-Dec. 2005	Characterize the Newark Bay source signature	Use data with the recognition that laboratory and/or validation qualifiers may impose limitations on specific datasets and/or data points.

QAPP Worksheet #14 (UFP-QAPP Manual Section 2.8.1) Summary of Project Tasks

Sampling Tasks: The low resolution core sediment survey includes the combination of both sediment grabs and vibracores. An initial grab sample will be collected at each station using a modified Van Veen grab. The goal of the grab sampling is to collect a representative surficial sediment sample, from the interval 0 to 1" below the sediment-water interface for Be-7 and 0 to 0.5 ft below the sediment-water interface (for all additional surficial analytes; refer to Table 2 of the FSP Addendum).

A vibracore system will be used to collect sediment samples between the sediment surface and the target depth or refusal at each station in Worksheet #18 and Table 1of the FSP Addendum (Appendix A). Target coring depths are utilized for estimation of the total number of samples in Worksheet #20. Longer cores will be sectioned as needed on the sampling vessel, to facilitate handling and to ensure that the cores are maintained upright during transport and storage. Sample processing and transfer to sample containers will be performed at the field facility. Additionally, piston coring or push coring may be used if more appropriate based on sediment depths encountered. Samples will be collected according to the following segmentation scheme:

Depth below sediment water interface	
0 to 0.5 ft	surface sediment (in conjunction with grab sampling)
0.5 to 1.5 ft	1-foot segment
1.5 to 2.5 ft	1-foot segment
2.5 to 3.5 ft	1-foot segment
3.5 to 5.5 ft	2-foot segment
5.5 + ft	2-foot segments continue to the red-brown clay layer, sand, or refusal

Where sand is encountered as a layer that completely underlies the recent, fine-grained sediments (rather than as a shallow sand lens), it will be sampled for a subset of analytes, as agreed to with USEPA. Limited analyses to include analysis of PAHs, metals, cyanide, SVOCs, TPH Extractables, TOC, grain size and VOCs will be performed where sand is found at the bottom of the core. The analytes will be taken out of the primary core only, so all analytes may not be achievable in all samples.

Under certain conditions, the segmentation scheme may be altered. With the agreement of the RI FTM, where a stratigraphic change in the sediment sequence (e.g., change in sediment size, obvious depositional boundary or unconformity) occurs within a segment, the sampling of that segment may be altered. This will prevent different material types, with possibly different depositional ages, from being mixed together in the same sample.

QAPP Worksheet #14 (UFP-QAPP Manual Section 2.8.1) Summary of Project Tasks

Segments will be reduced below 1-foot only where it appears that the sediment density is such that sufficient solids are present to satisfy the laboratory sample volume requirement.

In addition, per agreement with USEPA, to address a component of FSP1 Task 5.3.3, which includes the collection of fine segmentation of "core top" samples from a subset of the cores, (to address sediment transport modeling and risk assessment data needs), eight of the planned locations will be sampled to complete this additional analysis. The proposed core(s) segmentation and grab sampling will be completed at all locations as well. A box core will be utilized for collection of surface sediment to be split into five segments, per USEPA required segments:

- 0 to 2 cm
- 2 to 5 cm
- 5 to 10 cm
- 10 to 30 cm
- 30 cm to 2 feet

One box core will be collected at each of the eight locations, shown in Table 1 of the FSP Addendum as the Group D analyte group. The segments will be analyzed utilizing the sample prioritization scheme found in Table 3 of the FSP Addendum, which is based on the order requested by USEPA on March 28, 2008. One box core will be collected from each location. The analytes not available from the box core finer segmentation will be available from the core and grab samples collected at the same location.

Analysis Tasks: As the initial phase of the overall RI/FS sediment characterization, this investigation will include a wide range of sediment analyses. Four groups of analyses are proposed:

Group A - A comprehensive list of physical and inorganic and organic chemical analyses is proposed for the full set of stations and depths (refer to Worksheet #15). Toxaphene is proposed to be analyzed by two methods – HRGC/HRMS and GC/EDC (refer to Worksheet #23 and Appendix C). Toxaphene results and the associated QC data will be reviewed throughout the program. If toxaphene is not detected after an adequate number of analyses, the CPG may petition to drop the analysis of this parameter by HRGC/HRMS.

Group B - Additional organic, nutrient, and pathogen analyses are proposed for surficial samples from 13 stations over the length of the study area to determine their relevance in future investigation phases. The 13 stations, shown in Worksheet #18, were selected by reviewing the

QAPP Worksheet #14 (UFP-QAPP Manual Section 2.8.1) Summary of Project Tasks

sample maps to ensure coverage within the full length of the river, with a focus on areas of finer-grained sediments, and review of station details in terms of depths and expected sediment type.

Group C - Additional particle size-density classification, microscopy, petrography and PCB sediment-water partitioning analysis is proposed for up to seven stations to allow for evaluation of these analytical techniques for use in future investigation phases. To select the locations for the seven samples for method development, for five or six of the locations, the CPG will use the laboratory screening level PCB analysis conducted prior to conducting HRGC/HRMS quantification of PCB congeners, along with the physical description. In addition, location 2008 CLRC-007 was specifically requested for analysis by USEPA. If this sample meets the screening criteria, five other locations will be selected. If the sample does not meet the screening criteria, it will still be analyzed and six other locations will be analyzed as well. Appendix D contains details for these analytes.

Group D - For this analysis, the top segment of a core will be divided into five layers (i.e., 0 to 2 cm, 2 to 5 cm, 5 to 10 cm, 10 to 30 cm, 30 cm to 2 feet) to provide the resolution required to define the sediment bed in the sediment transport model. For these five sediment core segments, HydroQual indicated that the following analyses would be required:

- Grain size
- Bulk density
- Concentration of any contaminant to be modeled via the future Contaminant Fate and Transport model

The chemical contaminants will be collected in the hierarchy presented in FSP Addendum Tables 3 and 4.

HydroQual requested that the grain size analyses utilize specific sieve sizes listed below

Particle Size Classes Required for Sediment Grain Size Analysis

Sieve Number	Size (µm)
NA	Fine Fraction1
230	63
140	106
100	150

QAPP Worksheet #14 (UFP-QAPP Manual Section 2.8.1) Summary of Project Tasks

60	250
40	425
30	600
16	1140
8	2360
4	4750

[1]For sieve sizes smaller than 63 µm, hydrometer techniques will be used. The recommended sizes for the hydrometer analysis are 63 to 31 µm, 31 to 16 µm, 16 to 8 µm, 8 to 4 µm, and less than 4 µm.

A summary of the specific analyses and methods for each group noted above is presented in Table 2 of the FSP Addendum (Appendix A). Specific stations designated for the additional Group B and D analyses are noted in Worksheet #18 and FSP Addendum Tables 3 and 4. Tables 3 and 4 also present the prioritization of analytes from sediment at a given station.

Field measurements will include screening of select core intervals with a photoionization detector (PID) for sample selection purposes. Physical, chemical, radiochemical, and biological/pathogen tests will be performed on the sediment samples at fixed laboratories according to methods listed in Worksheet 23.

Quality Control Tasks: QC samples have been defined for the field and laboratory efforts. Field QC samples are summarized on Worksheet 20; laboratory QC samples are summarized on Worksheet 28.

Secondary Data: All relevant secondary/historical data are summarized on Worksheet 13.

Data Management Tasks: ENSR's Data Management Plan (ENSR 2007) covers all field-collected and laboratory-generated records/data. The handling of records and data are summarized on Worksheet #29.

Documentation and Records: Project related records (field, sample transfer/chain of custody, laboratory) are summarized on Worksheet #29.

Assessment/Audit Tasks: Field and laboratory audits are scheduled in accordance with Worksheet #31.

QAPP Worksheet #14 (UFP-QAPP Manual Section 2.8.1) Summary of Project Tasks

Data Review Tasks: Field data will be reviewed as described in Worksheet 34. Laboratories are contractually required to verify all laboratory data including electronic data deliverables (EDDs) as summarized in Worksheet 34. Data validation and usability assessments will be conducted as detailed in Worksheets #35, 36, and 37.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Note that all values have been changed from scientific notation to general numbers
Any changes in values from previous QAPP are shown in red font
Matrix: Sediment
Analytical Group: PCBs, Aroclors**;** Method 8082; Test America, Pittsburgh, PA
Concentration Level: Low

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c, f]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
Aroclor 1016	12674-11-2	NA	0.0033	0.0033	NA	NA	0.000124	0.000833
Aroclor 1221	11104-28-2	NA	0.0033	0.0033	NA	NA	0.000159	0.000833
Aroclor 1232	11141-16-5	NA	0.0033	0.0033	NA	NA	0.000143	0.000833
Aroclor 1242	53469-21-9	NA	0.0033	0.0033	NA	NA	0.000136	0.000833
Aroclor 1248	12672-29-6	NA	0.0033	0.0033	NA	NA	0.000079	0.000833
Aroclor 1254	11097-69-1	NA	0.0033	0.0033	NA	NA	0.000119	0.000833
Aroclor 1260	11096-82-5	NA	0.0033	0.0033	NA	NA	0.000118	0.000833
Aroclor 1262	37324-23-5	NA	0.0033	0.0033	NA	NA	0.000183	0.000833
Aroclor 1268	11100-14-4	NA	0.0033	0.0033	NA	NA	0.000107	0.000833

[a] Data Quality Levels (DQLs) based on the lower of : 1) NJDEP Residential Direct Contact Cleanup Criteria, May 1999, 2) USEPA Region 9 Preliminary Remediation Goals (PRGs) for Residential Soil, October 2004, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment criteria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005)

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual MDLs and QLs will vary based on percent moisture and other sample-specific factors. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the MDLs and QLs listed in Worksheet #15.

[f] mg/kg - milligrams per kilogram

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Matrix: Sediment
Analytical Group: PCBs – Homologs and Congeners**;** Method 1668A; Test America, Knoxville, TN
Concentration Level: Low

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	EDLs[g] (mg/kg)	QLs (mg/kg)
Monochlorobiphenyl	27323-18-8	0.0227	NA	0.0030	NA	NA	NA	0.000010
Dichlorobiphenyl	25512-42-9	0.0227	NA	0.0030	NA	NA	NA	0.000020
Trichlorobiphenyl	25323-68-6	0.0227	NA	0.0030	NA	NA	NA	0.000020
Tetrachlorobiphenyl	26914-33-0	0.0227	NA	0.0030	NA	NA	NA	0.000010
Pentachlorobiphenyl	25429-29-2	0.0227	NA	0.0030	NA	NA	NA	0.000010
Hexachlorobiphenyl	26601-64-9	0.0227	NA	0.0030	NA	NA	NA	0.000010
Heptachlorobiphenyl	28655-71-2	0.0227	NA	0.0030	NA	NA	NA	0.000010
Octachlorobiphenyl	55722-26-4	0.0227	NA	0.0030	NA	NA	NA	0.000010
Nonachlorobiphenyl	53742-07-7	0.0227	NA	0.0030	NA	NA	NA	0.000010
Decachlorobiphenyl	2051-24-3	0.0227	NA	0.0030	NA	NA	NA	0.000010
Congeners, Individual - PCB-1 through PCB-209	See below	0.0227	0.0000002 through 0.000002	0.0000002 through 0.000002	0.00000050	0.0000010	0.00000028 through 0.00000**223** (see below)	**0.000010** through **0.000020** (see below)
PCB 1	2051-60-7	0.0227	See above[f]	See above[f]	0.0000080	0.000020	0.00000028	**0.000010**
PCB 2	2051-61-8	0.0227	See above[f]	See above[f]	0.00000040	0.0000010	0.000000310	**0.000010**
PCB 3	2051-62-9	0.0227	See above[f]	See above[f]	0.0000090	0.000020	0.000000310	**0.000010**
PCB 4	13029-08-8	0.0227	See above[f]	See above[f]	0.000017	0.000050	**0.00000223**	**0.000020**
PCB 5	16605-91-7	0.0227	See above[f]	See above[f]	0.0000010	0.0000050	0.00000170	**0.000010**
PCB 6	25569-80-6	0.0227	See above[f]	See above[f]	0.0000010	0.0000050	0.00000162	**0.000010**
PCB 7	33284-50-3	0.0227	See above[f]	See above[f]	0.0000020	0.0000050	0.00000164	**0.000010**
PCB 8	34883-43-7	0.0227	See above[f]	See above[f]	0.000012	0.000050	0.00000159	**0.000020**

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	EDLs[g] (mg/kg)	QLs (mg/kg)
PCB 9	34883-39-1	0.0227	See above[f]	See above[f]	0.0000080	0.0000050	0.00000163	**0.000010**
PCB 10	33146-45-1	0.0227	See above[f]	See above[f]	0.0000020	0.0000050	0.00000177	**0.000010**
PCB 11	2050-67-1	0.0227	See above[f]	See above[f]	0.000010	0.000020	0.00000163	**0.000020**
PCB 12/PCB 13	2974-92-7/ 2974-90-5	0.0227	See above[f]	See above[f]	0.0000030	0.000010	0.00000162	**0.000010**
PCB 14	34883-41-5	0.0227	See above[f]	See above[f]	0.0000030	0.000010	0.00000140	**0.000010**
PCB 15	2050-68-2	0.0227	See above[f]	See above[f]	0.000018	0.000050	0.00000170	**0.000010**
PCB 16	38444-78-9	0.0227	See above[f]	See above[f]	0.0000040	0.000010	0.00000130	**0.000010**
PCB 17	37680-66-3	0.0227	See above[f]	See above[f]	0.0000090	0.000020	0.00000113	**0.000010**
PCB 18/PCB 30	37680-65-2/ 35693-92-6	0.0227	See above[f]	See above[f]	0.000017	0.000050	0.00000118	**0.000020**
PCB 19	38444-73-4	0.0227	See above[f]	See above[f]	0.0000040	0.000010	0.00000127	**0.000010**
PCB 20/PCB 28	38444-84-7/ 7012-37-5	0.0227	See above[f]	See above[f]	0.000019	0.000050	0.000000530	**0.000020**
PCB 21/PCB 33	55702-46-0/ 38444-86-9	0.0227	See above[f]	See above[f]	0.0000050	0.000020	0.000000520	**0.000010**
PCB 22	38444-85-8	0.0227	See above[f]	See above[f]	0.0000090	0.000020	0.000000540	**0.000010**
PCB 23	55720-44-0	0.0227	See above[f]	See above[f]	0.0000050	0.000020	0.000000550	**0.000010**
PCB 24	55702-45-9	0.0227	See above[f]	See above[f]	0.0000050	0.000020	0.000000840	**0.000010**
PCB 25	55712-37-3	0.0227	See above[f]	See above[f]	0.0000050	0.000020	0.000000480	**0.000010**
PCB 26/PCB 29	38444-81-4/ 15862-07-4	0.0227	See above[f]	See above[f]	0.0000080	0.000020	0.000000520	**0.000010**
PCB 27	38444-76-7	0.0227	See above[f]	See above[f]	0.0000060	0.000020	0.000000770	**0.000010**
PCB 31	16606-02-3	0.0227	See above[f]	See above[f]	0.000015	0.000050	0.000000530	**0.000020**
PCB 32	38444-77-8	0.0227	See above[f]	See above[f]	0.0000080	0.000020	0.000000760	**0.000010**

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	EDLs[g] (mg/kg)	QLs (mg/kg)
PCB 34	37680-68-5	0.0227	See above[f]	See above[f]	0.0000070	0.000020	0.000000540	**0.000010**
PCB 35	37680-69-6	0.0227	See above[f]	See above[f]	0.0000080	0.000020	0.000000550	**0.000010**
PCB 36	38444-87-0	0.0227	See above[f]	See above[f]	0.0000080	0.000020	0.000000520	**0.000010**
PCB 37	38444-90-5	0.0227	See above[f]	See above[f]	0.000013	0.000050	0.000000540	**0.000010**
PCB 38	53555-66-1	0.0227	See above[f]	See above[f]	0.0000080	0.000020	0.000000530	**0.000010**
PCB 39	38444-88-1	0.0227	See above[f]	See above[f]	0.0000090	0.000020	0.000000500	**0.000010**
PCB 40/PC B41/PCB 71	38444-93-8/ 52663-59-9/ 41464-46-4	0.0227	See above[f]	See above[f]	0.000012	0.000050	0.00000104	**0.000010**
PCB 42	36559-22-5	0.0227	See above[f]	See above[f]	0.0000060	0.000020	0.000000880	**0.000010**
PCB 43/PCB 73	70362-46-8/ 74338-23-1	0.0227	See above[f]	See above[f]	0.0000090/ 0.000016	0.000020/ 0.000050	0.000000790	**0.000010**
PCB 44/PCB 47/PCB 65	41464-39-5/ 2437-79-8/ 33284-54-7	0.0227	See above[f]	See above[f]	0.000019	0.000050	0.000000740	**0.000010**
PCB 45/PCB 51	70362-45-7/ 68194-04-7	0.0227	See above[f]	See above[f]	0.0000050	0.000020	0.000000890	**0.000010**
PCB 46	41464-47-5	0.0227	See above[f]	See above[f]	0.000010	0.000020	0.00000108	**0.000010**
PCB 48	70362-47-9	0.0227	See above[f]	See above[f]	0.0000080	0.000020	0.000000860	**0.000010**
PCB 49/PCB 69	41464-40-8/ 60233-24-1	0.0227	See above[f]	See above[f]	0.000011	0.000050	0.000000750	**0.000010**
PCB 50/PCB 53	62796-65-0/ 41464-41-9	0.0227	See above[f]	See above[f]	0.0000060	0.000020	0.000000820	**0.000010**
PCB 52	35693-99-3	0.0227	See above[f]	See above[f]	0.000019	0.000050	0.000000820	**0.000010**
PCB 54	15968-05-5	0.0227	See above[f]	See above[f]	0.000012	0.000050	0.000000980	**0.000010**
PCB 55	74338-24-2	0.0227	See above[f]	See above[f]	0.000012	0.000050	0.000000650	**0.000010**

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	EDLs[g] (mg/kg)	QLs (mg/kg)
PCB 56	41464-43-1	0.0227	See above[f]	See above[f]	0.000010	0.000020	0.000000620	**0.000010**
PCB 57	70424-67-8	0.0227	See above[f]	See above[f]	0.000012	0.000050	0.000000640	**0.000010**
PCB 58	41464-49-7	0.0227	See above[f]	See above[f]	0.000013	0.000050	0.000000600	**0.000010**
PCB 59/PCB 62/PCB 75	74472-33-6/ 54230-22-7/ 32598-12-2	0.0227	See above[f]	See above[f]	0.0000060	0.000020	0.000000590	**0.000010**
PCB 60	33025-41-1	0.0227	See above[f]	See above[f]	0.000013	0.000050	0.00000108	**0.000010**
PCB 61/PCB 70/PCB 74/ PCB 76	33284-53-6/ 32598-11-1/ 32690-93-0/ 70362-48-0	0.0227	See above[f]	See above[f]	0.000017	0.000050	0.000000636	**0.000020**
PCB 63	74472-34-7	0.0227	See above[f]	See above[f]	0.000014	0.000050	0.000000567	**0.000010**
PCB 64	52663-58-8	0.0227	See above[f]	See above[f]	0.0000070	0.000020	0.000000578	**0.000010**
PCB 66	32598-10-0	0.0227	See above[f]	See above[f]	0.000016	0.000050	0.000000589	**0.000010**
PCB 67	73575-53-8	0.0227	See above[f]	See above[f]	0.000015	0.000050	0.000000588	**0.000010**
PCB 68	73575-52-7	0.0227	See above[f]	See above[f]	0.000015	0.000050	0.000000572	**0.000010**
PCB 72	41464-42-0	0.0227	See above[f]	See above[f]	0.000016	0.000050	0.000000605	**0.000010**
PCB 77	32598-13-3	0.0227	See above[f]	See above[f]	0.000017	0.000050	0.000000628	**0.000010**
PCB 78	70362-49-1	0.0227	See above[f]	See above[f]	0.000017	0.000050	0.000000644	**0.000010**
PCB 79	41464-48-6	0.0227	See above[f]	See above[f]	0.000017	0.000050	0.000000552	**0.000010**
PCB 80	33284-52-5	0.0227	See above[f]	See above[f]	0.000018	0.000050	0.000000538	**0.000010**
PCB 81	70362-50-4	0.0227	See above[f]	See above[f]	0.000018	0.000050	0.000000582	**0.000010**
PCB 82	52663-62-4	0.0227	See above[f]	See above[f]	0.000013	0.000050	0.00000132	**0.000010**
PCB 83	60145-20-2	0.0227	See above[f]	See above[f]	0.000022	0.000050	0.00000103	**0.000010**
PCB 84	52663-60-2	0.0227	See above[f]	See above[f]	0.000012	0.000050	0.00000118	**0.000010**

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	EDLs[g] (mg/kg)	QLs (mg/kg)
PCB 85/PCB 116/PCB 117	65510-45-4/ 18259-05-7/ 68194-11-6	0.0227	See above[f]	See above[f]	0.000010	0.000020	0.000000817	**0.000010**
PCB 86/PCB 87/PCB 97/PCB 109/PCB 119/PCB 125	55312-69-1/ 38380-02-8/ 41464-51-1/ 74472-35-8/ 56558-17-9/ 74472-39-2	0.0227	See above[f]	See above[f]	0.000015	0.000050	0.000000827	**0.000010**
PCB 88/PCB 91	55215-17-3/ 68194-05-8	0.0227	See above[f]	See above[f]	0.000012	0.000050	0.00000110	**0.000010**
PCB 89	73575-57-2	0.0227	See above[f]	See above[f]	0.000019	0.000050	0.00000112	**0.000010**
PCB 90/PCB 101/PCB 113	68194-07-0/ 37680-73-2/ 68194-10-5	0.0227	See above[f]	See above[f]	0.000024	0.000100	0.000000809	**0.000010**
PCB 92	52663-61-3	0.0227	See above[f]	See above[f]	0.000012	0.000050	0.00000103	**0.000010**
PCB 93/PCB 100	73575-56-1/ 39485-83-1	0.0227	See above[f]	See above[f]	0.000022	0.000050	0.00000113	**0.000010**
PCB 94	73575-55-0	0.0227	See above[f]	See above[f]	0.000012	0.000050	0.00000114	**0.000010**
PCB 95	38379-99-6	0.0227	See above[f]	See above[f]	0.000022	0.000050	0.000000934	**0.000010**
PCB 96	73575-54-9	0.0227	See above[f]	See above[f]	0.000021	0.000050	0.000000788	**0.000010**
PCB 98/PCB 102	60233-25-2/ 68194-06-9	0.0227	See above[f]	See above[f]	0.000022	0.000050	0.000000972	**0.000010**
PCB 99/PCB 112	38380-01-7/ 74472-36-9	0.0227	See above[f]	See above[f]	0.000022	0.000050	0.00000103	**0.000010**
PCB 103	60145-21-3	0.0227	See above[f]	See above[f]	0.000023	0.000050	0.000000924	**0.000010**
PCB 104	56558-16-8	0.0227	See above[f]	See above[f]	0.000023	0.000050	0.000000696	**0.000010**

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	EDLs[g] (mg/kg)	QLs (mg/kg)
PCB 105	32598-14-4	0.0227	See above[f]	See above[f]	0.000011	0.000002	0.000000495	**0.000010**
PCB 106	70424-69-0	0.0227	See above[f]	See above[f]	0.000014	0.000050	0.000000562	**0.000010**
PCB 107	70424-68-9	0.0227	See above[f]	See above[f]	0.000027	0.00010	0.000000547	**0.000010**
PCB 108/PCB 124	70362-41-3/ 70424-70-3	0.0227	See above[f]	See above[f]	0.000015	0.000050	0.000000524	**0.000010**
PCB 110/PCB 115	38380-03-9/ 74472-38-1	0.0227	See above[f]	See above[f]	0.000024	0.00010	0.000000703	**0.000010**
PCB 111	39635-32-0	0.0227	See above[f]	See above[f]	0.000024	0.00010	0.000000707	**0.000010**
PCB 114	74472-37-0	0.0227	See above[f]	See above[f]	0.000012	0.000050	0.000000498	**0.000010**
PCB 118	31508-00-6	0.0227	See above[f]	See above[f]	0.000019	0.000050	0.000000498	**0.000010**
PCB 120	68194-12-7	0.0227	See above[f]	See above[f]	0.000015	0.000050	0.000000672	**0.000010**
PCB 121	56558-18-0	0.0227	See above[f]	See above[f]	0.000021	0.000050	0.000000723	**0.000010**
PCB 122	76842-07-4	0.0227	See above[f]	See above[f]	0.000012	0.000050	0.000000561	**0.000010**
PCB 123	65510-44-3	0.0227	See above[f]	See above[f]	0.000015	0.000050	0.000000515	**0.000010**
PCB 126	57465-28-8	0.0227	See above[f]	See above[f]	0.000014	0.000050	0.000000553	**0.000010**
PCB 127	39635-33-1	0.0227	See above[f]	See above[f]	0.000028	0.00010	0.000000519	**0.000010**
PCB 128/PCB 166	38380-07-3/ 41411-63-6	0.0227	See above[f]	See above[f]	0.000012	0.000050	0.00000112	**0.000010**
PCB 129/PCB 138/PCB 163	55215-18-4/ 35065-28-2/ 74472-44-9	0.0227	See above[f]	See above[f]	0.000021	0.000050	0.000000939	**0.000010**
PCB 130	52663-66-8	0.0227	See above[f]	See above[f]	0.000014	0.000050	0.00000122	**0.000010**
PCB 131	61798-70-7	0.0227	See above[f]	See above[f]	0.000012	0.000050	0.00000122	**0.000010**
PCB 132	38380-05-1	0.0227	See above[f]	See above[f]	0.000012	0.000050	0.00000122	**0.000010**
PCB 133	35694-04-3	0.0227	See above[f]	See above[f]	0.000017	0.000050	0.00000113	**0.000010**

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	EDLs[g] (mg/kg)	QLs (mg/kg)
PCB 134/PCB 143	52704-70-8/ 68194-15-0	0.0227	See above[f]	See above[f]	0.000013	0.000050	0.00000122	0.000010
PCB 135/PCB 151	52744-13-5/ 52663-63-5	0.0227	See above[f]	See above[f]	0.000011	0.000050	0.00000114	**0.000010**
PCB 136	38411-22-2	0.0227	See above[f]	See above[f]	0.0000090	0.000020	0.000000917	**0.000010**
PCB 137/PCB 164	35694-06-5/ 74472-45-0	0.0227	See above[f]	See above[f]	0.000030/ 0.000014	0.00010/ 0.000050	0.00000103	**0.000010**
PCB 139/PCB 140	56030-56-9/ 59291-64-4	0.0227	See above[f]	See above[f]	0.000020	0.000050	0.00000101	**0.000010**
PCB 141	52712-04-6	0.0227	See above[f]	See above[f]	0.0000090	0.000020	0.00000115	**0.000010**
PCB 142	41411-61-4	0.0227	See above[f]	See above[f]	0.000031	0.00010	0.00000118	**0.000010**
PCB 144	68194-14-9	0.0227	See above[f]	See above[f]	0.000017	0.000050	0.00000117	**0.000010**
PCB 145	74472-40-5	0.0227	See above[f]	See above[f]	0.000032	0.00010	0.000000871	**0.000010**
PCB 146	51908-16-8	0.0227	See above[f]	See above[f]	0.000018	0.000050	0.000000992	**0.000010**
PCB 147/PCB 149	68194-13-8/ 38380-04-0	0.0227	See above[f]	See above[f]	0.000018	0.000050	0.00000101	**0.000010**
PCB 148	74472-41-6	0.0227	See above[f]	See above[f]	0.000032	0.00010	0.00000119	**0.000010**
PCB 150	68194-08-1	0.0227	See above[f]	See above[f]	0.000033	0.00010	0.000000860	**0.000010**
PCB 152	68194-09-2	0.0227	See above[f]	See above[f]	0.0000240	0.00010	0.000000866	**0.000010**
PCB 153/PCB 168	35065-27-1/ 59291-65-5	0.0227	See above[f]	See above[f]	0.000013	0.000050	0.000000811	**0.000010**
PCB 154	60145-22-4	0.0227	See above[f]	See above[f]	0.000011	0.000050	0.00000113	**0.000010**
PCB 155	33979-03-2	0.0227	See above[f]	See above[f]	0.000034	0.00010	0.000000795	**0.000010**
PCB 156/PCB 157	38380-08-4/ 69782-90-7	0.0227	See above[f]	See above[f]	0.000013	0.000050	0.00000101	**0.000010**
PCB 158	74472-42-7	0.0227	See above[f]	See above[f]	0.000011	0.000020	0.000000727	**0.000010**

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	EDLs[g] (mg/kg)	QLs (mg/kg)
PCB 159	39635-35-3	0.0227	See above[f]	See above[f]	0.000035	0.00010	0.000000802	**0.000010**
PCB 160	41411-62-5	0.0227	See above[f]	See above[f]	0.000021	0.000050	0.000000939	**0.000010**
PCB 161	74472-43-8	0.0227	See above[f]	See above[f]	0.000035	0.00010	0.000000794	**0.000010**
PCB 162	39635-34-2	0.0227	See above[f]	See above[f]	0.000035	0.00010	0.000000802	**0.000010**
PCB 165	74472-46-1	0.0227	See above[f]	See above[f]	0.000036	0.00010	0.000000872	**0.000010**
PCB 167	52663-72-6	0.0227	See above[f]	See above[f]	0.000011	0.000050	0.000000539	**0.000010**
PCB 169	32774-16-6	0.0227	See above[f]	See above[f]	0.000016	0.000050	0.000000589	**0.000010**
PCB 170	35065-30-6	0.0227	See above[f]	See above[f]	0.000016	0.000050	0.000000930	**0.000010**
PCB 171/PCB 173	52663-71-5/ 68194-16-1	0.0227	See above[f]	See above[f]	0.000037	0.00010	0.000000945	**0.000010**
PCB 172	52663-74-8	0.0227	See above[f]	See above[f]	0.000038	0.00010	0.000000941	**0.000010**
PCB 174	38411-25-5	0.0227	See above[f]	See above[f]	0.000019	0.000050	0.000000854	**0.000010**
PCB 175	40186-70-7	0.0227	See above[f]	See above[f]	0.000038	0.00010	0.000000856	**0.000010**
PCB 176	52663-65-7	0.0227	See above[f]	See above[f]	0.000039	0.00010	0.000000630	**0.000010**
PCB 177	52663-70-4	0.0227	See above[f]	See above[f]	0.000014	0.000050	0.000000897	**0.000010**
PCB 178	52663-67-9	0.0227	See above[f]	See above[f]	0.000022	0.000050	0.000000888	**0.000010**
PCB 179	52663-64-6	0.0227	See above[f]	See above[f]	0.000023	0.000050	0.000000657	**0.000010**
PCB 180/PCB 193	35065-29-3/ 69782-91-8	0.0227	See above[f]	See above[f]	0.000014	0.000050	0.000000696	**0.000010**
PCB 181	74472-47-2	0.0227	See above[f]	See above[f]	0.000040	0.00010	0.000000809	**0.000010**
PCB 182	60145-23-5	0.0227	See above[f]	See above[f]	0.000040	0.00010	0.000000811	**0.000010**
PCB 183/PCB 185	52663-69-1/ 52712-05-7	0.0227	See above[f]	See above[f]	0.000040	0.00010	0.000000834	**0.000010**
PCB 184	74472-48-3	0.0227	See above[f]	See above[f]	0.000040	0.00010	0.000000669	**0.000010**
PCB 186	74472-49-4	0.0227	See above[f]	See above[f]	0.000041	0.00010	0.00000125	**0.000010**

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	EDLs[g] (mg/kg)	QLs (mg/kg)
PCB 187	52663-68-0	0.0227	See above[f]	See above[f]	0.000019	0.000050	0.000000650	**0.000010**
PCB 188	74487-85-7	0.0227	See above[f]	See above[f]	0.000023	0.000050	0.000000616	**0.000010**
PCB 189	39635-31-9	0.0227	See above[f]	See above[f]	0.000018	0.000050	0.000000503	**0.000010**
PCB 190	41411-64-7	0.0227	See above[f]	See above[f]	0.000023	0.000050	0.000000630	**0.000010**
PCB 191	74472-50-7	0.0227	See above[f]	See above[f]	0.000042	0.00010	0.000000641	**0.000010**
PCB 192	74472-51-8	0.0227	See above[f]	See above[f]	0.000042	0.00010	0.000000688	**0.000010**
PCB 194	35694-08-7	0.0227	See above[f]	See above[f]	0.000017	0.000050	0.000000797	**0.000010**
PCB 195	52663-78-2	0.0227	See above[f]	See above[f]	0.000043	0.000100	0.000000876	**0.000010**
PCB 196	42740-50-1	0.0227	See above[f]	See above[f]	0.000043	0.000100	0.00000101	**0.000010**
PCB 197/PCB 200	33091-17-7/ 52663-73-7	0.0227	See above[f]	See above[f]	0.000025	0.00010	0.000000712	**0.000010**
PCB 198/PCB 199	68194-17-2/ 52663-75-9	0.0227	See above[f]	See above[f]	0.000025	0.00010	0.00000100	**0.000010**
PCB 201	40186-71-8	0.0227	See above[f]	See above[f]	0.000044	0.00010	0.00000100	**0.000010**
PCB 202	2136-99-4	0.0227	See above[f]	See above[f]	0.000044	0.00010	0.000000762	**0.000010**
PCB 203	52663-76-0	0.0227	See above[f]	See above[f]	0.000044	0.00010	0.000000885	**0.000010**
PCB 204	74472-52-9	0.0227	See above[f]	See above[f]	0.000045	0.00010	0.000000731	**0.000010**
PCB 205	74472-53-0	0.0227	See above[f]	See above[f]	0.000045	0.00010	0.000000643	**0.000010**
PCB 206	40186-72-9	0.0227	See above[f]	See above[f]	0.000045	0.00010	0.00000103	**0.000010**
PCB 207	52663-79-3	0.0227	See above[f]	See above[f]	0.000045	0.00010	0.000000698	**0.000010**
PCB 208	52663-77-1	0.0227	See above[f]	See above[f]	0.000046	0.00010	0.000000707	**0.000010**
PCB 209	2051-24-3	0.0227	See above[f]	See above[f]	0.000015	0.000050	0.00000104	**0.000010**

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Note: Bold indicates chemicals for which the achievable laboratory limits exceed the project QL goal.

[a] DQLs based on the lower of : 1) NJDEP Residential Direct Contact Cleanup Criteria, May 1999, 2) USEPA Region 9 Preliminary Remediation Goals (PRGs) for Residential Soil, October 2004, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment criteria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods.

[e] Achievable estimated detection limits (EDLs) (derived from average method blank EDLs) and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual EDLs and QLs will vary based on percent moisture and other sample-specific factors. Individual congener reporting limits will be based on sample specific estimated detection limits (EDLs) rather than QLs. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the EDLs and QLs listed in Worksheet #15.

[f] Sediment RL from 2005 QAPP is listed as 2.00E-07 to 2.00-E06 for individual congeners PCB-1 through PCB-209. Note that the reference value of 2.00E-06 was used for comparing achievable laboratory limits to the project quantitation limit goal.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Matrix: Sediment
Analytical Group: Dioxin/Furan**;** Method 1613B; Columbia Analytical Services, Houston
Concentration Level: Low

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	EDLs (mg/kg)	QLs (mg/kg)
1,2,3,4,6,7,8-HPCDD	35822-46-9	0.00039	0.0000025	0.0000025	NA	0.0000050	0.00000026	0.0000025
1,2,3,4,6,7,8-HPCDF	67562-39-4	0.00039	0.0000025	0.0000025	NA	0.0000050	0.00000022	0.0000025
1,2,3,4,7,8-HxCDD	39227-28-6	0.000039	0.0000025	0.0000025	NA	0.0000050	0.00000019	0.0000025
1,2,3,4,7,8-HXCDF	70648-26-9	0.000039	0.0000025	0.0000025	NA	0.0000050	0.000000090	0.0000025
1,2,3,4,7,8,9-HPCDF	55673-89-7	0.00039	0.0000025	0.0000025	NA	0.0000050	0.00000035	0.0000025
1,2,3,6,7,8-HxCDD	57653-85-7	0.000039	0.0000025	0.0000025	NA	0.0000050	0.00000019	0.0000025
1,2,3,6,7,8-HXCDF	57117-44-9	0.000039	0.0000025	0.0000025	NA	0.0000050	0.00000010	0.0000025
1,2,3,7,8,9-HxCDD	19408-74-3	0.000039	0.0000025	0.0000025	NA	0.0000050	0.00000019	0.0000025
1,2,3,7,8,9-HXCDF	72918-21-9	0.000039	0.0000025	0.0000025	NA	0.0000050	0.00000015	0.0000025
1,2,3,7,8-PeCDD	40321-76-4	0.0000039	0.0000025	0.0000025	NA	0.0000050	0.00000015	0.0000025
1,2,3,7,8-PECDF	57117-41-6	0.00013	0.0000025	0.0000025	NA	0.0000050	0.00000014	0.0000025
2,3,4,6,7,8-HXCDF	60851-34-5	0.000039	0.0000025	0.0000025	NA	0.0000050	0.00000011	0.0000025
2,3,4,7,8-PECDF	57117-31-4	0.000013	0.0000025	0.0000025	NA	0.0000050	0.00000016	0.0000025
2,3,7,8-TCDD	1746-01-6	0.0000036	0.00000050	0.00000050	NA	0.0000010	0.00000017	**0.0000010**
2,3,7,8-TCDF	51207-31-9	0.000039	0.00000050	0.00000050	NA	0.0000010	0.00000012	**0.0000010**
OCDD	3268-87-9	0.013	0.0000050	0.0000050	NA	0.000010	0.00000059	0.0000050
OCDF	39001-02-0	0.013	0.0000050	0.0000050	NA	0.000010	0.00000057	0.0000050

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Note: Bold indicates chemicals for which the achievable laboratory limits exceed the project QL goal.

[a] DQLs based on the lower of : 1) NJDEP Residential Direct Contact Cleanup Criteria, May 1999, 2) USEPA Region 9 Preliminary Remediation Goals (PRGs) for Residential Soil, October 2004, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment criteria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods.

[e] Achievable EDLs (based on averaged clean matrix EDLs) and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. Actual EDLs and QLs will vary based on percent moisture and other sample-specific factors. For dioxins/furans, the EDL and QL are based on extraction of 10 grams/sample. The laboratory reporting limit will be based on the sample specific EDL. Matrix interference can increase EDLs by as much as a factor of 10x.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Matrix: Sediment
Analytical Group: Organochlorine Pesticides**;** Method 8081A; Test America, Knoxville, TN
Concentration Level: Low

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
2,4'-DDD[f]	53-19-0	0.00200	0.00020	0.00020	NA	NA	0.000027	0.00020
2,4'-DDE[f]	3424-82-6	0.00142	0.00020	0.00020	NA	NA	0.000029	0.00020
2,4'-DDT[f]	789-02-6	0.00100	0.00020	0.00020	NA	NA	0.0000301	0.00020
4,4'-DDD	72-54-8	0.00200	0.00020	0.00020	NA	NA	0.000025	0.00020
4,4'-DDE	72-55-9	0.00142	0.00020	0.00020	NA	NA	0.000026	0.00020
4,4'-DDT	50-29-3	0.00100	0.00020	0.00020	NA	NA	0.000026	0.00020
Aldrin	309-00-2	0.00200	0.00020	0.00020	NA	NA	0.000037	0.00020
alpha-Benzene hexachloride (BHC)	319-84-6	0.000940	0.00020	0.00020	NA	NA	0.000026	0.00020
beta-BHC	319-85-7	0.000940	0.00020	0.00020	NA	NA	0.000027	0.00020
cis-Chlordane	5103-71-9	0.0000200	0.00020	0.000020	NA	NA	**0.000022**	**0.00020**
cis-Nonachlor	5103-73-1	0.0000200	NA	0.000020	NA	NA	**0.000029**	**0.00020**
delta-BHC	319-86-8	0.000940	0.00020	0.00020	NA	NA	0.000041	0.00020
Dieldrin	60-57-1	0.0000200	0.00020	0.000020	NA	NA	**0.000028**	**0.00020**
Endosulfan I	959-98-8	0.0000400	0.00020	0.000040	NA	NA	0.000027	**0.00020**
Endosufan II	33213-65-9	0.0000400	0.00020	0.000040	NA	NA	0.000025	**0.00020**
Endosulfan sulfate	1031-07-8	36.7	0.00020	0.00020	NA	NA	0.000027	0.00020
Endrin	72-20-8	0.00267	0.00020	0.00020	NA	NA	0.000034	0.00020
Endrin aldehyde	7421-93-4	0.00267	0.00020	0.00020	NA	NA	0.000025	0.00020
Endrin ketone	53494-70-5	0.00267	0.00020	0.00020	NA	NA	0.000023	0.00020
gamma-BHC (Lindane)	58-89-9	0.000940	0.00020	0.00020	NA	NA	0.000050	0.00020

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
Hexachlorobenzene	118-74-1	0.00200	0.0020	0.0020	NA	NA	0.000030	0.00020
Heptachlor	76-44-8	0.00060	2.00E-04	0.00020	NA	NA	0.000028	0.00020
Heptachlor epoxide	1024-57-3	0.00060	2.00E-04	0.00020	NA	NA	0.000029	0.00020
Methoxychlor	72-43-5	0.0060	3.00E-04	0.00030	NA	NA	0.000030	0.00020
Oxychlordane	27304-13-8	0.000020	NA	0.000020	NA	NA	**0.000028**	**0.00020**
Toxaphene	8001-35-2	0.00010	1.70E-02	0.00010	NA	NA	**0.0050**	**0.0050**
trans-Chlordane	5103-74-2	0.000020	NA	0.000020	NA	NA	**0.000050**	**0.00020**
trans-Nonachlor	3734-49-4	0.000020	NA	0.000020	NA	NA	**0.000025**	**0.00020**

Note: Bold indicates chemicals for which the achievable laboratory limits exceed the project QL goal.

[a] DQLs based on the lower of : 1) NJDEP Residential Direct Contact Cleanup Criteria, May 1999, 2) USEPA Region 9 Preliminary Remediation Goals (PRGs) for Residential Soil, October 2004, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment criteria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual MDLs and QLs will vary based on percent moisture and other sample-specific factors. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the MDLs and QLs listed in Worksheet #15.

[f] Dichlordiphenyldichloroethane
Dichlordiphenyldichloroethylene
Dichlordiphenyltrichloroethane

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Matrix: Sediment
Analytical Group: Organochlorine Pesticides**;** HRGC/HRMS Method (based on USEPA Methods 1613B, 1668, 8081A and New York State Department of Environmental Conservation [NYSDEC] HRMS-2) TestAmerica, West Sacramento, CA
Concentration Level: Low

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
2,4'-DDD	53-19-0	0.00200	0.00020	0.00020	NA	NA	0.00000272	0.000040
2,4'-DDE	3424-82-6	0.00142	0.00020	0.00020	NA	NA	0.00000397	0.000040
2,4'-DDT	789-02-6	0.00100	0.00020	0.00020	NA	NA	0.00000364	0.000040
4,4'-DDD	72-54-8	0.00200	0.00020	0.00020	NA	NA	0.000000472	0.000040
4,4'-DDE	72-55-9	0.00142	0.00020	0.00020	NA	NA	0.00000419	0.000040
4,4'-DDT	50-29-3	0.00100	0.00020	0.00020	NA	NA	0.0000110	0.000040
Aldrin	309-00-2	0.00200	0.00020	0.00020	NA	NA	0.00000207	0.000040
alpha-BHC	319-84-6	0.000940	0.00020	0.00020	NA	NA	0.00000610	0.000040
beta-BHC	319-85-7	0.000940	0.00020	0.00020	NA	NA	0.00003373	0.000040
cis-Chlordane	5103-71-9	0.0000200	0.00020	0.000020	NA	NA	0.00000358	**0.000040**
cis-Nonachlor	5103-73-1	0.0000200	NA	0.000020	NA	NA	0.00000547	**0.000040**
delta-BHC	319-86-8	0.000940	0.00020	0.00020	NA	NA	0.0000127	0.000040
Dieldrin	60-57-1	0.0000200	0.00020	0.000020	NA	NA	0.00000706	**0.000040**
Endosulfan I	959-98-8	0.0000400	0.00020	0.000040	NA	NA	0.0000257	0.000040
Endosufan II	33213-65-9	0.0000400	0.00020	0.000040	NA	NA	0.00000823	0.000040
Endosulfan sulfate	1031-07-8	36.7	0.00020	0.00020	NA	NA	0.00000350	0.000040
Endrin	72-20-8	0.00267	0.00020	0.00020	NA	NA	0.00000380	0.000040
Endrin aldehyde	7421-93-4	0.00267	0.00020	0.00020	NA	NA	0.00000858	0.000040
Endrin ketone	53494-70-5	0.00267	0.00020	0.00020	NA	NA	0.00000795	0.000040
gamma-BHC (Lindane)	58-89-9	0.000940	0.00020	0.00020	NA	NA	0.00000366	0.000040
Hexachlorobenzene	118-74-1	0.00200	0.0020	0.0020	NA	NA	0.00000299	0.000040

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
Heptachlor	76-44-8	0.000600	0.00020	0.00020	NA	NA	0.00000198	0.000040
Heptachlor epoxide	1024-57-3	0.000600	0.00020	0.00020	NA	NA	0.00000465	0.000040
Methoxychlor	72-43-5	0.00600	0.00030	0.00030	NA	NA	0.00000341	0.000040
Oxychlordane	27304-13-8	0.0000200	NA	0.000020	NA	NA	0.00000926	0.000040
Toxaphene	8001-35-2	0.000100	0.017	0.00010	NA	NA	**0.00250**	**0.010**
trans-Chlordane	5103-74-2	0.0000200	NA	0.000020	NA	NA	0.00000544	**0.000040**
trans-Nonachlor	3734-49-4	0.0000200	NA	0.000020	NA	NA	0.00000379	**0.000040**

[a] DQLs based on the lower of : 1) NJDEP Residential Direct Contact Cleanup Criteria, May 1999, 2) USEPA Region 9 Preliminary Remediation Goals (PRGs) for Residential Soil, October 2004, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment criteria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual MDLs and QLs will vary based on percent moisture and other sample-specific factors. The actual reporting limit will be theEDL rather than the QL. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the MDLs and QLs listed in Worksheet #15.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Matrix: Sediment
Analytical Group: PAHs and Alkyl PAHs, Method KNOX-ID-0016, HRGC/LRMS-SIM, TestAmerica, Knoxville TN
Concentration Level: Low

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	EDLs (mg/kg)	QLs (mg/kg)
1-Methylnaphthalene	90-12-0	5.59	NA	5.59	NA	NA	0.0000160	0.0050
1-Methylphenanthrene	832-69-9	2190	0.0033	0.0033	NA	NA	0.0000321	0.0010
2,3,5-Trimethylnaphthalene	2245-38-7	NA	0.0033	0.0033	NA	NA	0.0000288	0.0020
2,6-Dimethylnaphthalene	581-42-0	NA	0.0033	0.0033	NA	NA	0.0000731	0.0020
2-Methylnaphthalene	91-57-6	0.0202	0.0033	0.0033	NA	NA	0.0000101	**0.010**
Acenaphthene	83-32-9	0.00671	0.0033	0.0033	NA	NA	0.0000462	0.0010
Acenaphthylene	208-96-8	0.00587	0.0033	0.0033	NA	NA	0.0000161	0.0010
Anthracene	120-12-7	0.0469	0.0033	0.0033	NA	NA	0.0000278	0.0010
Fluorene	86-73-7	0.0190	0.0033	0.0033	NA	NA	0.0000303	0.0010
Naphthalene	91-20-3	0.0346	0.0033	0.0033	NA	NA	0.0000119	**0.020**
Phenanthrene	85-01-8	0.0419	0.0033	0.0033	NA	NA	0.0000247	0.0010
Benzo[a]anthracene	56-55-3	0.0317	0.0033	0.0033	NA	NA	0.0000134	0.0010
Benzo[a]pyrene	50-32-8	0.0319	0.0033	0.0033	NA	NA	0.0000466	0.0010
Benzo[b]fluoranthene	205-99-2	0.621	0.0033	0.0033	NA	NA	0.0000285	0.0010
Benzo[e]pyrene	192-97-2	232	0.0033	0.0033	NA	NA	0.0000552	0.0010
Benzo[g,h,i]perylene	191-24-2	0.170	0.0033	0.0033	NA	NA	0.0000213	0.0010
Benzo[j and k]fluoranthene	207-08-9	0.240	0.0033	0.0033	NA	NA	0.0000337	0.0010
Chrysene	218-01-9	0.0571	0.0033	0.0033	NA	NA	0.0000099	0.0010
Dibenzo[a,h]anthracene	53-70-3	0.00622	0.0033	0.0033	NA	NA	0.0000216	0.0010
Dibenzothiophene	132-65-0	NA	0.0033	0.0033	NA	NA	NA	0.0010
Fluoranthene	206-44-0	0.111	0.0033	0.0033	NA	NA	0.0000262	0.0010
Indeno[1,2,3-c,d]-pyrene	193-39-5	0.200	0.0033	0.0033	NA	NA	0.0000209	0.0010

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	EDLs (mg/kg)	QLs (mg/kg)
Perylene	198-55-0	232	0.0033	0.0033	NA	NA	0.000122	0.0010
Pyrene	129-00-0	0.0530	0.0033	0.0033	NA	NA	0.0000262	0.0010
C2-Alkylnaphthalenes	NA	NA	NA	NA	NA	NA	NA	NA
C3-Alkylnaphthalenes	NA	NA	NA	NA	NA	NA	NA	NA
C1-Benzanthracene/chrysenes	NA	NA	NA	NA	NA	NA	NA	NA
C1-Dibenzothiophenes	NA	NA	NA	NA	NA	NA	NA	NA
C1-Fluorenes	NA	NA	NA	NA	NA	NA	NA	NA
C1-Phenanthrene/anthracenes	NA	NA	NA	NA	NA	NA	NA	NA
C1-Pyrene/fluoranthenes	NA	NA	NA	NA	NA	NA	NA	NA
C2-Benzanthracene/chrysenes	NA	NA	NA	NA	NA	NA	NA	NA
C2-Dibenzothiophenes	NA	NA	NA	NA	NA	NA	NA	NA
C2-Fluorenes	NA	NA	NA	NA	NA	NA	NA	NA
C2-Naphthalenes	NA	NA	NA	NA	NA	NA	NA	NA
C2-Phenanthrene/anthracenes	NA	NA	NA	NA	NA	NA	NA	NA
C3-Benzanthracene/chrysenes	NA	NA	NA	NA	NA	NA	NA	NA
C3-Dibenzothiophenes	NA	NA	NA	NA	NA	NA	NA	NA
C3-Fluorenes	NA	NA	NA	NA	NA	NA	NA	NA
C3-Naphthalenes	NA	NA	NA	NA	NA	NA	NA	NA
C3-Phenanthrene/anthracenes	NA	NA	NA	NA	NA	NA	NA	NA
C4-Benzanthracene/chrysenes	NA	NA	NA	NA	NA	NA	NA	NA
C4-Dibenzothiophenes	NA	NA	NA	NA	NA	NA	NA	NA
C4-Naphthalenes	NA	NA	NA	NA	NA	NA	NA	NA
C4-Phenanthrenes/anthracenes	NA	NA	NA	NA	NA	NA	NA	NA

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Note: Bold indicates chemicals for which the achievable laboratory limits exceed the project QL goal.

[a] DQLs based on the lower of : 1) NJDEP Residential Direct Contact Cleanup Criteria, May 1999, 2) USEPA Region 9 Preliminary Remediation Goals (PRGs) for Residential Soil, October 2004, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment criteria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated reference methods.

[e] Achievable EDLs (based on average blank EDL results) and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. Actual EDLs and QLs will vary based on percent moisture and other sample-specific factors. The actual reporting limit will be the EDL rather than the QL.

f Benzo[jkflouranthene will be reported by the laboratory with a “C” qualifier, indicating that it co-elutes with benzo[j]fluoranthere.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Matrix: Sediment
Analytical Group: SVOCs**;** Method 8270C; Test America, Knoxville, TN
Concentration Level: Low

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
1,1'-Biphenyl	4603-00-3	301	0.0033	0.0033	NA	NA	0.0260	**0.17**
1,2,4,5-Tetrachlorobenzene	95-94-3	1.83	0.17	0.17	NA	NA	0.0330	0.17
1,4-Dioxane	123-91-1	44.2	0.10	0.10	NA	NA	**0.0230**	**0.17**
~~1-Methylnaphthalene[f]~~	~~90-12-0~~	~~5.59~~	~~0.17~~	~~0.17~~	~~NA~~	~~NA~~	~~0.00380~~	~~0.0067~~
~~1-Methyl phenanthrene[f]~~	~~832-69-9~~	~~2190~~	~~0.0033~~	~~0.0033~~	~~NA~~	~~NA~~	~~0.00360~~	~~0.0067~~
2,2'-Oxybis (1-Chloropropane)	540-54-5	NA	0.17	0.17	NA	0.66	0.0350	0.17
2,3,4,6-Tetrachlorophenol	58-90-2	183	0.17	0.17	NA	NA	0.152	**0.33**
2,3,5-Trimethylnaphthalene[f]	2245-38-7	NA	0.0033	0.0033	NA	NA	**0.00360**	**0.0067**
2,4,5-Trichlorophenol	120-83-2	611	0.17	0.17	NA	0.66	0.0280	0.17
2,4,6-Trichlorophenol	105-67-9	0.610	0.17	0.17	NA	0.66	0.0260	0.17
2,4-Dichlorophenol	51-28-5	18.3	0.17	0.17	NA	0.66	0.0320	0.17
2,4-Dimethylphenol	121-14-2	122	0.17	0.17	NA	0.66	**0.260**	**0.33**
2,4-Dinitrophenol	4603-00-3	12.2	0.17	0.17	NA	3.3	**0.330**	**0.83**
2,4-Dinitrotoluene	95-94-3	1.00	0.17	0.17	NA	0.66	0.0340	0.17
~~2,6-Dimethylnaphthalene[f]~~	~~581-42-0~~	~~NA~~	~~0.0033~~	~~0.0033~~	~~NA~~	~~NA~~	~~0.00320~~	~~0.0067~~
2,6-Dinitrotoluene	606-20-2	1.00	0.17	0.17	NA	0.66	0.0400	0.17
2-Chloronaphthalene	91-58-7	494	0.17	0.17	NA	0.66	0.0410	0.17
2-Chlorophenol	95-57-8	6.34	0.17	0.17	NA	0.66	0.0340	0.17
2-Methylnaphthalene[f]	91-57-6	0.0202	0.0033	0.0033	NA	0.66	0.0330	**0.17**
2-Methylphenol	95-48-7	306	0.17	0.17	NA	0.66	0.0370	0.17
2-Nitroaniline	88-74-4	18.30	0.17	0.17	NA	3.3	0.100	0.17

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
2-Nitrophenol	88-75-5	1830	0.17	0.17	NA	0.66	0.100	0.17
3,3',-Dichlorobenzidine	91-94-1	1.08	0.17	0.17	NA	1.3	**0.200**	**0.33**
3-Nitroaniline	99-09-2	1.83	0.33	0.33	NA	3.3	0.190	0.33
4,6-Dinitro-2-methylphenol	534-52-1	0.611	0.33	0.33	NA	3.3	0.330	0.33
4-Bromophenyl-phenylether	101-55-3	NA	0.17	0.17	NA	0.66	0.0470	0.17
4-Chloro-3-methylphenol	59-50-7	10000.00	0.17	0.17	NA	1.3	0.0350	0.17
4-Chloroaniline	106-47-8	24.4	0.17	0.17	NA	1.3	0.170	0.17
4-Chlorophenyl-phenyl ether	7005-72-3	NA	0.17	0.17	NA	0.66	0.0420	0.17
4-Methylphenol	106-44-5	30.6	0.17	0.17	NA	0.66	0.0720	0.17
4-Nitroaniline	100-01-6	23.2	0.33	0.33	NA	NA	0.160	0.33
4-Nitrophenol	100-02-7	1830	0.17	0.17	NA	3.3	0.160	**0.33**
Acenaphthene[f]	98-86-2	0.0067	0.0033	0.0033	NA	0.66	**0.0370**	**0.17**
Acenaphthylene[f]	83-32-9	0.0059	0.0033	0.0033	NA	0.66	**0.0380**	**0.17**
Acetophenone	208-96-8	NA	0.17	0.17	NA	NA	0.0410	0.17
Anthracene[f]	120-12-7	0.0469	0.003	0.0033	NA	0.66	**0.0380**	**0.17**
Atrazine	1912-24-9	2.19	0.17	0.17	NA	NA	0.0300	0.17
Benzaldehyde	100-52-7	611	0.17	0.17	NA	NA	0.0220	0.17
Benzo(a)anthracene[f]	56-55-3	0.0317	0.0033	0.0033	NA	0.66	**0.0410**	**0.17**
Benzo(a)pyrene[f]	50-32-8	0.0319	0.0033	0.0033	NA	0.66	**0.0320**	**0.17**
Benzo(b)fluoranthene[f]	205-99-2	0.621	0.0033	0.0033	NA	0.66	**0.0450**	**0.17**
~~Benzo(e)pyrene[f]~~	~~192-97-2~~	~~232~~	~~0.0033~~	~~0.0033~~	~~NA~~	~~NA~~	~~0.0036~~	~~0.0067~~
Benzo(g,h,i)perylene[f]	191-24-2	0.170	0.0033	0.0033	NA	0.66	**0.0390**	**0.17**
Benzo(k)fluoranthene[f, h]	207-08-9	0.240	0.0033	0.0033	NA	0.66	**0.0500**	**0.17**

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
bis-(2-Chloroethoxy) methane	111-91-1	NA	0.17	0.17	NA	0.66	0.0320	0.17
bis-(2-Chloroethyl)ether	111-44-4	0.218	0.17	0.17	NA	0.66	0.0420	0.17
Bis (2-Ethylhexyl)phthalate	117-81-7	2.00	0.0033	0.0033	NA	0.66	**0.0450**	**0.17**
Butylbenzylphthalate	85-68-7	46.0	0.0033	0.0033	NA	0.66	**0.0460**	**0.17**
Caprolactam	105-60-2	3060	0.17	0.17	NA	NA	0.0430	0.17
Carbazole	86-74-8	24.3	0.0033	0.0033	NA	NA	**0.0440**	**0.17**
Chrysene[f]	218-01-9	0.0571	0.0033	0.0033	NA	0.66	**0.0480**	**0.17**
Dibenzo(a,h)-anthracene[f]	53-70-3	0.00622	0.0033	0.0033	NA	0.66	**0.430**	**0.17**
Dibenzofuran	132-64-9	14.5	0.17	0.17	NA	0.66	0.0410	0.17
Dibenzothiophene[f]	~~132-65-0~~	~~NA~~	~~0.003~~	~~0.0033~~	~~NA~~	~~NA~~	~~0.00299~~	~~0.0067~~
Diethylphthalate	84-66-2	46.0	0.17	0.17	NA	0.66	0.0400	0.17
Dimethylphthalate	131-11-3	46.0	0.17	0.17	NA	0.66	0.0390	0.17
Di-n-butylphthalate	84-74-2	46.0	0.17	0.17	NA	NA	0.0520	0.17
Di-n-octylphthalate	117-84-0	46.0	0.0033	0.0033	NA	0.66	**0.0300**	**0.17**
Fluoranthene[f]	206-44-0	0.111	0.0033	0.0033	NA	0.66	**0.0500**	**0.17**
Fluorene[f]	86-73-7	0.0190	0.0033	0.0033	NA	0.66	**0.0420**	**0.17**
Hexachlorobenzene[g]	118-74-1	0.00200	0.0020	0.0020	NA	0.66	**0.0350**	**0.17**
Hexachlorobutadiene	87-68-3	0.0160	0.016	0.016	NA	0.66	**0.0350**	**0.17**
Hexachloroethane	67-72-1	6.00	0.17	0.17	NA	0.66	0.0400	0.17
Hexchlorocyclo-pentadiene	77-47-4	0.00700	0.0070	0.0070	NA	0.66	**0.100**	**0.17**
Indeno(1,2,3-cd)-pyrene[f]	193-39-5	0.200	0.0033	0.0033	NA	0.66	**0.0400**	**0.17**
Isophorone	78-59-1	512	0.17	0.17	NA	0.66	0.0300	0.17
Naphthalene[f]	91-20-3	0.0346	0.0033	0.0033	NA	0.66	**0.0390**	**0.17**
Nitrobenzene	98-95-3	1.96	0.0033	0.0033	NA	0.66	**0.0340**	**0.17**

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
N-Nitroso-di-n-propylamine	621-64-7	0.0695	0.070	0.070	NA	0.66	0.0360	**0.17**
N-Nitrosodiphenylamine	86-30-6	99.3	0.0033	0.0033	NA	0.66	**0.0360**	**0.17**
Pentachlorophenol	87-86-5	0.400	0.0033	0.0033	NA	3.30	**0.120**	**0.33**
~~Perylene[f]~~	~~198-55-0~~	~~232~~	~~0.003~~	~~0.00~~	~~NA~~	~~NA~~	~~0.00359~~	~~0.0067~~
Phenanthrene[f]	85-01-8	0.0419	0.0033	0.0033	NA	0.66	**0.0430**	**0.17**
Phenol	108-95-2	1830	0.17	0.17	NA	0.66	0.0390	0.17
Pyrene[f]	129-00-0	0.0530	0.0033	0.0033	NA	0.66	**0.0460**	**0.17**

Note: Bold indicates chemicals for which the achievable laboratory limits exceed the project QL goal.

Values shown with ~~strike through~~ will not be reported by the lab by this method (see PAH HRGC/LRMS method)

[a] DQLs based on the lower of : 1) NJDEP Residential Direct Contact Cleanup Criteria, May 1999, 2) USEPA Region 9 Preliminary Remediation Goals (PRGs) for Residential Soil, October 2004, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment critieria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual MDLs and QLs will vary based on percent moisture and other sample-specific factors. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the MDLs and QLs listed in Worksheet #15..

[f] Analyte will also be reported from PAH HRGC/LRMS method.

[g] Analyte will also be reported from pesticide analysis.

[h] Benzo[k]flouranthene will be reported by the laboratory with a “C” qualifier, indicating that it co-elutes with benzo[j]fluoranthene.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Matrix: Sediment
Analytical Group: VOCs**;** Method 5035A/8260B; Test America, Knoxville, TN
Concentration Level: Low

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[e]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
1,1,1-Trichloroethane	71-55-6	210	0.0050	0.0050	NA	0.0050	0.000160	0.0050
1,1,2,2-Tetrachloroethane	75-34-3	0.408	0.0050	0.0050	NA	0.0050	0.000290	0.0050
1,1,2-Trichloro-1,2,2-trifluoroethane	75-35-4	5600	0.0050	0.0050	NA	0.0050	0.000780	0.0050
1,1,2-Trichloroethane	79-34-5							
1,1-Dichloroethane	76-13-1	0.729	0.0050	0.0050	NA	0.0050	0.000270	0.0050
1,1-Dichloroethene	79-00-5	50.6	0.0050	0.0050	NA	0.0050	0.000260	0.0050
1,2,3-Trichlorobenzene	96-12-8	8.00	0.0050	0.0050	NA	0.0050	0.000230	0.0050
1,2,4-Trichlorobenzene	106-93-4	6.22	0.0050	0.0050	NA	0.0050	0.000740	0.0050
1,2-Dibromo-3-chloropropane	95-50-1	0.460	0.0050	0.0050	NA	0.0050	0.000960	**0.010**
1,2-Dibromoethane	107-06-2	0.0320	0.0050	0.0050	NA	0.0050	0.000270	0.0050
1,2-Dichlorobenzene	78-87-5	0.120	0.0050	0.0050	NA	0.0050	0.000500	0.0050
1,2-Dichloroethane	87-61-6	0.278	0.0050	0.0050	NA	0.0050	0.000300	0.0050
1,2-Dichloropropane	120-82-1	0.342	0.0050	0.0050	NA	0.0050	0.000150	0.0050
1,3-Dichlorobenzene	541-73-1	0.120	0.0050	0.0050	NA	0.0050	0.000330	0.0050
1,4-Dichlorobenzene	106-46-7	0.120	0.0050	0.0050	NA	0.0050	0.000410	0.0050
~~1,4-Dioxane~~ [f]	~~123-91-1~~	~~44.2~~	~~0.10~~	~~0.10~~	~~NA~~	~~0.0050~~	~~0.0230~~	~~0.10~~
2-Butanone	78-93-3	1000	0.010	0.010	NA	0.0050	0.000850	**0.020**
2-Hexanone	591-78-6	NA	0.0050	0.005	NA	0.0050	0.00140	**0.020**
4-Methyl-2-pentanone	108-10-1	528	0.010	0.010	NA	0.0050	0.000750	**0.020**
Acetone	67-64-1	1000	0.010	0.010	NA	0.0050	**0.0110**	**0.020**

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[e]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
Benzene	71-43-2	0.260	0.0050	0.0050	NA	0.0050	0.000150	0.0050
Bromochloromethane	74-97-5	0.824	0.0050	0.0050	NA	0.0050	0.000370	0.0050
Bromodichloromethane	75-27-4	0.824	0.0050	0.0050	NA	0.0050	0.000170	0.0050
Bromoform	75-25-2	61.6	0.0050	0.0050	NA	0.0050	0.000710	0.0050
Bromomethane	74-83-9	0.390	0.0050	0.0050	NA	0.0050	0.00170	0.010
Carbon Disulfide	75-15-0	35.5	0.0050	0.0050	NA	0.0050	0.000190	0.0050
Carbon Tetrachloride	56-23-5	0.251	0.0050	0.0050	NA	0.0050	0.000300	0.0050
Chlorobenzene	75-00-3	0.0350	0.0050	0.0050	NA	0.0050	0.000150	0.0050
Chloroethane	74-87-3	3.03	0.0050	0.0050	NA	0.0050	0.00150	0.0050
Chloroform	156-59-2	0.221	0.0050	0.0050	NA	0.0050	0.000220	0.0050
Chloromethane	10061-01-5	4.69	0.0050	0.0050	NA	0.0050	0.000550	0.0050
cis-1,2-Dichloroethene	108-90-7	4.29	0.0050	0.0050	NA	0.0050	0.000200	0.0050
cis-1,3-Dichloropropene	67-66-3	0.777	0.0050	0.0050	NA	0.0050	0.000160	0.0050
Cyclohexane	110-82-7	140	0.0050	0.0050	NA	0.0050	0.000150	0.0050
Dibromochloromethane	124-48-1	1.11	0.0050	0.0050	NA	0.0050	0.000320	0.0050
Dichorodifluoromethane	75-71-8	9.39	0.0050	0.0050	NA	0.0050	0.000240	0.0050
Ethylbenzene	100-41-4	0.0640	0.0050	0.0050	NA	0.0050	0.000220	0.0050
Isopropylbenzene	98-82-8	57.2	0.0050	0.0050	NA	0.0050	0.000280	0.0050
m, p-Xylene	79-20-9	0.120	0.0050	0.0050	NA	0.0050	0.000710	0.0050
Methyl Acetate	108-87-2	2210	0.0050	0.0050	NA	0.0050	0.000500	0.0050
Methyl tert-Butyl Ether	75-09-2	16.7	0.0050	0.0050	NA	0.0050	0.000170	0.0050
Methylcyclohexane	1634-04-4	259	0.0050	0.0050	NA	0.0050	0.000280	0.0050
Methylene Chloride	100-42-5	9.11	0.0050	0.0050	NA	0.0050	0.000280	0.0050
o-Xylene	127-18-4	0.120	0.0050	0.0050	NA	0.0050	0.00100	0.0050

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[e]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
Styrene	108-88-3	23.0	0.0050	0.0050	NA	0.0050	0.000250	0.0050
Tetrachloroethene	156-60-5	0.484	0.0050	0.0050	NA	0.0050	0.000190	0.0050
Toluene	10061-02-6	0.450	0.0050	0.0050	NA	0.0050	0.000150	0.0050
Trans-1,2-Dichloroethene	79-01-6	6.95	0.0050	0.0050	NA	0.0050	0.000150	0.0050
Trans-1,3-Dichloropropene	75-69-4	0.777	0.0050	0.0050	NA	0.0050	0.000260	0.0050
Trichloroethene	179601-23-1	0.0530	0.0050	0.0050	NA	0.0050	0.000190	0.0050
Trichlorofluoromethane	95-47-6	38.6	0.0050	0.0050	NA	0.0050	0.000240	0.0050
Vinyl Chloride	75-01-4	0.0791	0.0050	0.0050	NA	0.0050	0.000230	0.0050

Note: Bold indicates chemicals for which the achievable laboratory limits exceed the project QL goal.

[a] DQLs based on the lower of : 1) NJDEP Residential Direct Contact Cleanup Criteria, May 1999, 2) USEPA Region 9 Preliminary Remediation Goals (PRGs) for Residential Soil, October 2004, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment critieria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual MDLs and QLs will vary based on percent moisture and other sample-specific factors. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the MDLs and QLs listed in Worksheet #15.

[f] 1,4-Dioxane in sediments will be analyzed by SVOC method 8270C.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Matrix: Sediment
Analytical Group: Total Petroleum Hydrocarbons, NJ Method OQA-QAM-025-10/91 (for extractable TPH), method 5035A/8015B (for purgeable TPH); TestAmerica, Edison, NJ
Concentration Level: Low

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
Total Petroleum Hydrocarbons (Extractable)	NA	NA	20	20	10	30	1.8	6.7
Total Petroleum Hydrocarbons (Purgeable)	NA	NA	20	20	NA	NA	0.25[f]	2.5[f]

[a] DQLs based on the lower of : 1) NJDEP Residential Direct Contact Cleanup Criteria, May 1999, 2) USEPA Region 9 Preliminary Remediation Goals (PRGs) for Residential Soil, October 2004, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment critieria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual MDLs and QLs will vary based on percent moisture and other sample-specific factors. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the MDLs and QLs listed in Worksheet #15.

[f] Based on methanol preservation.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Matrix: Sediment

Analytical Group: Herbicides; Method 8151; Test America, Pittsburgh, PA
Concentration Level: Low

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
2,4-D	94-75-7	68.6	0.14	0.14	0.110 (ECD)[f] 1.25 (GC/MS)	NA	0.0201	0.080
2,4-DB	94-82-6	48.9	0.16	0.16	NA	NA	0.0180	0.080
2,4,5-T	93-76-5	61.1	0.020	0.020	NA	NA	0.0032	0.020
2,4,5-TP (Silvex)	93-72-1	48.9	0.020	0.020	0.280 (ECD) 4.50 (GC/MS)	NA	0.0025	0.020

[a] DQLs based on the lower of : 1) NJDEP Residential Direct Contact Cleanup Criteria, May 1999, 2) USEPA Region 9 Preliminary Remediation Goals (PRGs) for Residential Soil, October 2004, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment critieria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual MDLs and QLs will vary based on percent moisture and other sample-specific factors. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the MDLs and QLs listed in Worksheet #15.

[f] ECD – Electron Capture Detector.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Matrix: Sediment
Analytical Group: Butyltins, 8000B, NOAA 130 (modified), Columbia Analytical Services, Kelso, WA
Concentration Level: Low

Analyte	CAS Number	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
Dibutyl tin	14488-53-0	1.83	0.0013	0.0013	NA	NA	0.000028	0.0010
Monobuyltin	78763-54-9	1.83	0.0010	0.0010	NA	NA	0.000030	0.0010
Tetrabutyltin	1461-25-2	1.83	0.0017	0.0017	NA	NA	0.000070	0.0010
Tributyltin	36643-28-4	1.83	0.0015	0.0015	NA	NA	0.000056	0.0010

[a] DQLs based on the lower of : 1) NJDEP Residential Direct Contact Cleanup Criteria, May 1999, 2) USEPA Region 9 Preliminary Remediation Goals (PRGs) for Residential Soil, October 2004, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment critieria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual MDLs and QLs will vary based on percent moisture and other sample-specific factors. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the MDLs and QLs listed in Worksheet #15.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Matrix: Sediment
Analytical Group: Metals**;** see methods below, Columbia Analytical Services, Kelso, WA
Concentration Level: Low

Analyte	CAS Number	Method	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
						IDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
Aluminum	7429-90-5	USEPA 6010/6020	7610	20	20	3.0	NA	0.50	2.0
Antimony	7440-36-0	USEPA 6020	2.00	1.0	1.0	2.1	NA	0.030	0.050
Arsenic	7440-38-2	USEPA 6020	0.390	0.25	0.25	3.5	NA	0.10	**0.50**
Arsenic	7440-38-2	USEPA 7062	0.390	0.25	0.25	NA	0.30	0.030	0.10
Barium	7440-39-3	USEPA 6010/6020	537	5.0	5.0	0.087	NA	0.030	0.050
Beryllium	7440-41-7	USEPA 6020	2.00	0.25	0.25	0.018	NA	0.020	0.020
Cadmium	7440-43-9	USEPA 6020	0.596	0.25	0.25	0.23	NA	0.0080	0.020
Calcium	7440-70-2	USEPA 6010B	NA	500	500	0.67	NA	2.0	10
Chromium (total)	7440-47-3	USEPA 6020	32.0	1.0	1.0	0.47	NA	0.040	0.20
Chromium (hexavalent)	18540-29-9	USEPA 7199/3060A	30.1	0.010	0.010	NA	NA	0.101	**0.40**
Cobalt	7440-48-4	USEPA 6020	73.0	0.50	0.50	0.47	NA	0.0030	0.020
Copper	7440-50-8	USEPA 6020	34.0	1.0	1.0	0.36	NA	0.10	0.10
Iron	57-12-5	USEPA 6010B	2350	10	10	0.41	NA	0.60	4.0
Lead	7439-89-6	USEPA 6020	35.0	0.50	0.50	2.8	NA	0.020	0.050
Magnesium	7439-92-1	USEPA 6010B	NA	500	500	2.0	NA	2.0	4.0
Manganese	7439-95-4	USEPA 6010/6020	176	0.50	0.50	0.093	NA	0.040	0.050
Nickel	7440-02-0	USEPA 6020	18.0	0.50	0.50	1.0	NA	0.050	0.20
Potassium	7440-09-7	USEPA 6010B	NA	500	500	Variable	NA	200	200

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Analyte	CAS Number	Method	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
						IDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
Selenium	7782-49-2	USEPA 6020	13.0	0.50	0.50	5.0	NA	0.40	**1.0**
Silver	7440-22-4	USEPA 6020	1.00	0.25	0.25	0.47	NA	0.020	0.020
Sodium	7440-23-5	USEPA 6010B	NA	500	500	1.9	NA	20	20
Thallium	7440-28-0	USEPA 6020	0.516	0.50	0.50	2.7	NA	0.0030	0.020
Titanium	7440-32-6	USEPA 6010B	100000.00	100	100	0.50	NA	0.50	2.0
Vanadium	7440-62-2	USEPA 6020	7.82	0.50	0.50	0.50	NA	0.040	0.20
Zinc	7440-66-6	USEPA 6020	123	1.0	1.0	1.2	NA	0.20	0.50

Note: Bold indicates chemicals for which the achievable laboratory limits exceed the project QL goal.

[a] DQLs based on the lower of : 1) NJDEP Residential Direct Contact Cleanup Criteria, May 1999, 2) USEPA Region 9 Preliminary Remediation Goals (PRGs) for Residential Soil, October 2004, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment critieria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods. Values listed are estimated instrument detection limits (IDLs) from method 6010B (assuming 100x DF for sediment matrix). Method 6020A does not list MDLs or IDLs.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual MDLs and QLs will vary based on percent moisture and other sample-specific factors. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the MDLs and QLs listed in Worksheet #15. The MDLs and QLs shown are for the associated method referenced in the “Method” column.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Matrix: Sediment
Analytical Group: Mercury**;** see methods below, Brooks Rand LLC, Seattle, WA
Concentration Level: Low

Analyte	CAS Number	Method	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg)[b]	Project QL Goal (mg/kg)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
						MDLs (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
Mercury, low level	7439-97-6	USEPA 1631	0.150	0.030	0.030	NA	NA	0.000030	NA
Methyl Mercury	22967-92-6	USEPA 1630 modified	0.611	0.00020	0.00020	NA	NA	0.0000080	NA

[a] DQLs based on the lower of : 1) NJDEP Residential Direct Contact Cleanup Criteria, May 1999, 2) USEPA Region 9 Preliminary Remediation Goals (PRGs) for Residential Soil, October 2004, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment critieria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual MDLs and QLs will vary based on percent moisture and other sample-specific factors. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the MDLs and QLs listed in Worksheet #15.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Matrix: Sediment
Analytical Group: AVS/SEM USEPA Methods 821R91100, 6010C/6020, Columbia Analytical Services, Kelso, WA
Concentration Level: Low

Analyte	CAS Number	Method	DQL (umoles/g)[a]	Sediment RL from 2005 QAPP micro moles per gram (umoles/g)[b]	Project QL Goal (umoles/g)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
						MDLs	Method QLs	MDLs	QLs (umoles/g)
AVS/SEM	18496-25-8	USEPA Method 821R91100	NA	0.01	0.01	NA	NA	**NA**	**0.016**
SEM-cadmium	7440-43-9	USEPA Method 821R91100/ 6010C/6020	NA	1[f]	1[f]	NA	NA	NA	0.0018
SEM-copper	7440-50-8	USEPA Method 821R91100/ 6010C/6020	NA	1[f]	1[f]	NA	NA	NA	0.0063
SEM-lead	7439-89-6	USEPA Method 821R91100/ 6010C/6020	NA	0.5[f]	0.5[f]	NA	NA	NA	0.0145
SEM-mercury	7439-97-6	USEPA Method 821R91100/ 6010C/6020	NA	0.02[f]	0.02[f]	NA	NA	NA	0.00005
SEM-nickel	7440-02-0	USEPA Method 821R91100/ 6010C/6020	NA	0.5[f]	0.5[f]	NA	NA	NA	0.0085
SEM-zinc	7440-66-6	USEPA Method 821R91100/ 6010C/6020	NA	1[f]	1[f]	NA	NA	NA	0.0061

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

[a] DQLs based on the lower of : 1) NJDEP Residential Direct Contact Cleanup Criteria, May 1999, 2) USEPA Region 9 Preliminary Remediation Goals (PRGs) for Residential Soil, October 2004, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment critieria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. Actual MDLs and QLs will vary based on sample-specific factors.

[f] In extract.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Matrix: Sediment
Analytical Group: Wet Chemistry (see methods below), Columbia Analytical Services, Kelso, WA
Concentration Level: Low

Analyte	CAS Number	Method	DQL (mg/kg)[a]	Sediment RL from 2005 QAPP (mg/kg, except as noted below)[b]	Project QL Goal (mg/kg, except as noted below)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
						MDLs	Method QLs (mg/kg)	MDLs (mg/kg, except as noted below)	QLs (mg/kg, except as noted below)
Ammonia as N	7664-41-7	USEPA 350.1	NA	0.020 mg/L[f,g] 0.20 mg/kg[g]	0.020 mg/L[f,g] 0.20 mg/kg[g]	NA	NA	0.0080 mg/L[g] 0.04 mg/kg	**0.050 mg/L[g]** **0.50 mg/kg**
Cyanide	57-12-5	USEPA 9010C/9014	122	2.5	2.5	NA	NA	0.10	0.20
Total Phosphorus	14265-44-2	USEPA 365.3	NA	0.010 mg/L[f,g] 0.10 mg/kg[g]	0.010 mg/L[f,g] 0.10 mg/kg[g]	NA	NA	0.0040 mg/L[g] NA	0.010 mg/L[g] 0.10 mg/kg
TKN	7727-37-9	ASTM[h] D3590-89-02	NA	150	150	NA	NA	5.0	20
TOC	7440-44-0	Lloyd Kahn Method	NA	100	100	NA	NA	0.040	0.50
Total Sulfide	18496-25-8	SW846 9030 modified	NA	0.20	0.20	NA	0.20	0.050	0.50

Note: Bold indicates chemicals for which the achievable laboratory limits exceed the project QL goal.

[a] DQLs based on the lower of : 1) NJDEP Residential Direct Contact Cleanup Criteria, May 1999, 2) USEPA Region 9 Preliminary Remediation Goals (PRGs) for Residential Soil, October 2004, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment critieria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP Lower Passaic River Restoration Project, August 2005).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual MDLs and QLs will vary based on percent moisture and other sample-specific factors. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the MDLs and QLs listed in Worksheet #15.

[f] RLs provided in the 2005 MPI QAPP were in aqueous units (mg/L). The values were converted to solid uints (mg/kg) by ENSR using a 10x dilution factor...

[g] milligrams per liter.

[h] ASTM – American society for Testing and Materials.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Matrix: Sediment
Analytical Group: Radionuclides, United States Department of Energy (DOE) EML HASL-300/USEPA 900, GEL, Charleston, SC
Concentration Level:

Analyte	CAS Number	DQL (Picocuries/ gram [pCi/g])[a]	Sediment RL from 2005 QAPP (pCi/g)[b]	Project QL Goal (pCi/g)[c]	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs	Method QLs	MDLs	QLs (pCi/g)
Beryllium-7	13966-02-4	NA	0.30	0.30	NA	NA	NA	0.30
Cesium-137	10045-97-3	NA	0.050	0.050	NA	NA	NA	0.050
Lead -210[f]	14255-04-0	NA	0.10	0.10	NA	NA	NA	0.10
Potassium -40	13966-00-2	NA	NA	NA	NA	NA	NA	1.0

[a] DQLs based on the lower of : 1) NJDEP Residential Direct Contact Cleanup Criteria, May 1999, 2) USEPA Region 9 Preliminary Remediation Goals (PRGs) for Residential Soil, October 2004, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment critieria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method and are typically based on wet weight. Actual MDLs and QLs will vary based on percent moisture and other sample-specific factors. Where possible, the laboratory will increase sample weight to adjust for sample-specific moisture content, thereby, attaining the MDLs and QLs listed in Worksheet #15.

[f] Lead-210 will be determined as polonium-210 and radium-226.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Matrix: Sediment
Analytical Group: Physical Testing, ASTM Methods D2974-07A (Moisture), D422 or D4464 (Grain Size), ASTM D854 (Specific Gravity), ASTM D4318 (Atterberg Limits), Columbia Analytical Services, Kelso, WA
Concentration Level: NA

Analyte	CAS Number	DQL	Sediment RL from 2005 QAPP[b]	Project QL Goal	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs	Method QLs	MDLs	QLs
Percent Moisture	NA	NA	NA	NA	NA	NA	NA	NA
Grain Size	NA	NA	NA	NA	NA	NA	NA	NA
Specific Gravity	NA	NA	NA	NA	NA	NA	NA	NA
Atterberg Limits	NA	NA	NA	NA	NA	NA	NA	NA

[a] DQLs based on the lower of : 1) NJDEP Residential Direct Contact Cleanup Criteria, May 1999, 2) USEPA Region 9 Preliminary Remediation Goals (PRGs) for Residential Soil, October 2004, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment critieria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. Actual MDLs and QLs will vary based on sample-specific factors.

QAPP Worksheet #15 (UFP-QAPP Manual Section 2.8.1) Data Quality Levels and Analytical Method Evaluation

Matrix: Sediment
Analytical Group: Biological Testing, Standard Methods 9223B, Modified (*E. Coli*), USEPA Method 1623, Modified (Giardia), Analytical Services, Inc. Williston, VT
Concentration Level: Low-High

Analyte	CAS Number	DQL	Sediment RL from 2005 QAPP[b]	Project QL Goal	Analytical Method[d]		Achievable Laboratory Limits[e]	
					MDLs	Method QLs	MDLs	QLs
E. Coli	NA	NA	NA	NA	NA	NA	NA	NA
Giardia	NA	NA	NA	NA	NA	NA	NA	NA

[a] DQLs based on the lower of : 1) NJDEP Residential Direct Contact Cleanup Criteria, May 1999, 2) USEPA Region 9 Preliminary Remediation Goals (PRGs) for Residential Soil, October 2004, and 3) applicable ecological thresholds based on No observable adverse effects level (NOAELs), Toxicity reference value (TRVs), Apparent effects threshold (AETs), Effects range-low (ER-Ls) and Threshold effects level (TELs). DQLs are analytical goals listed solely for the purpose of evaluating laboratory analytical methods and achievable laboratory limits; these are not project-specific screening levels or PRGs and are not approved by the USEPA as the appropriate risk assessment critieria for this project. These values will be developed in subsequent phases of the project.

[b] RLs were taken from Tables 2-1 through 2-21 (MPI QAPP, Lower Passaic River Restoration Project, August 2005).

[c] The project QL goal is selected as the lower of the DQL and the Sediment RL.

[d] Analytical MDLs and QLs are those documented in validated methods.

[e] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. Actual MDLs and QLs will vary based on sample-specific factors.

QAPP Worksheet #16 (UFP-QAPP Manual Section 2.8.2) Project Schedule/Timeline Table

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Project Status	de maximis/ ENSR	Monthly	Monthly	Progress report	15th of each month
Planning and Development of Study Objectives	de maximis/ ENSR	Completed	Completed	QAPP/ FSP Addendum	Submitted May 2, 2008 Revision 1 July 18, 2008
Collection of Samples and Submission for Analysis	ENSR	July 2008	October 2008	Sample submission to laboratories	At time of collection per SOP
Laboratory Analysis	ENSR	July 2008	December 2008	Analytical data to CPG	Beginning at 30 days after collection. See Worksheet #30 for turnaround times.
Data Validation and Verification of Sediment Data	ENSR	September 2008	January 2008	Validated data with progress report	When completed.
Evaluation of Sample Data	de maximis/ ENSR	September 2008	May 8, 2009	Included in Draft Site Characterization Report	May 8, 2009
Preparation and Delivery of Characterization Summary to USEPA	de maximis/ ENSR	October 2008	May 8, 2009	Draft Site Characterization Report	May 8, 2009

QAPP Worksheet #17 (UFP-QAPP Manual Section 3.1.1) Sampling Design and Rationale

Describe and provide a rationale for choosing the sampling approach (e.g., grid system, biased statistical approach): The proposed sampling locations are presented in Figures 2-A through 2-I of the FSP Addendum (Appendix A) for this work. Sampling locations were chosen to provide representative nature and extent coverage, determine potential source areas and gather data on physical characteristics to further the understanding of sediment stability over the study area. Selection was based on the following specific considerations:

- Transect spacing of 0.25 in RM 0 to 1 where previous sampling has not been conducted
- General coverage with minimum approximate 0.5 mile spacing between transects of cores above RM 7
- One-mile transect spacing minimum coverage within RM 1.5 to 6.5, with the goal to:

  1) Refresh surface sediment concentrations, the PRSA sediment data were obtained in 1995.

  2) Characterize cores that are considered "incomplete" (i.e., cores with elevated concentrations in the deepest segment analyzed). Note that the goals for the two studies differ. The goal for sampling the PRSA (i.e., RM1 to RM7) was to define the 1940 horizon. The RI/FS goal is to characterize sediment to the red brown clay, sand, or refusal. However, where PRSA cores are "complete" (i.e., low concentrations were detected at depth), the CPG will sample from the 2008 sediment-water interface to the sediment-water interface sampled in 1995, including a 0 to 6 inch BAZ sample, with the agreed upon segment sampling from 6 inches to the 1995 elevation.

  3) Complete RI/FS requirements for determining nature and extent

- One mile transect spacing minimum coverage within RM 1.5 to 6.5
- Geomorphic region (channel, mudflat, bend, etc.)
- Previously characterized sediment type
- Previous characterization as erosional/depositional
- Proximity to previous sampling locations
- Proximity to potential contamination sources
- Dundee Dam and tributary samples are intended to characterize potential upgradient sources to the LPRSA.

A summary of how these selection criteria apply to each proposed location in presented in QAPP Worksheet #18 and Table 1 of the FSP Addendum for this work. The "target coordinate area" will be checked for obstructions by probing, where necessary. In addition, in hard bottom areas where gravel is found, probing will be conducted to determine if vibracoring can be performed at the target coordinate. Where not amenable to coring, probing will

QAPP Worksheet #17 (UFP-QAPP Manual Section 3.1.1) Sampling Design and Rationale

check for other suitable areas within the 25 foot radius defined as a sample location. If no locations within the target radius appear amenable to coring, then the probing will move out (up- and down-stream), along a transect parallel to shore through the target location, to find the closest suitable location for attempting a core(s). If no locations are found within 300 feet up- or down-stream, the cores will be attempted within original target zone.

To obtain data representative of sediment conditions within the transect, geomorphology data, including bathymetry and surface sediment type, was reviewed to locate proposed samples. In the lower river, the data suggested that three samples per transect were required; whereas, in the upper river, above RM8, two samples per transect could meet the objective.

Describe the sampling design and rationale in terms of what matrices will be sampled, what analytical groups will be analyzed and at what concentration levels, the sampling locations (including QC, critical, and background samples), the number of samples to be taken, and the sampling frequency (including seasonal considerations):

As Phase 1 of the overall sediment characterization, this effort will focus on implementation of the RI FSP1 low resolution core investigation. Four groups of sediment analyses are proposed: 1) A comprehensive list of physical and inorganic and organic chemical analyses is proposed for the full set of stations. 2) Additional analyses are proposed for surficial samples from 13 stations over the length of the study area to determine their relevance in future investigation phases. 3) Additional particle size-density classification, microscopy, petrography and PCB sediment-water partitioning analysis is proposed for six to seven stations to allow for evaluation of this analytical technique for use in future investigation phases. 4) A subset of eight locations is propsed for a finer segmentation for fate and transport modeling data needs. Table 2 of the FSP Addendum (Appendix A) provides a summary of the analyses to be performed for each group.

The sample collection approach includes the combination of both sediment grabs and vibracores. An initial grab sample will be collected at each station using a modified Van Veen grab. The goal of the grab sampling is to collect a surficial sediment sample, from 0 to 1" below the sediment-water interface for Be-7 testing and from 0 to 0.5 ft below the sediment-water interface (for other surficial analytes).

A vibracore system will be used to collect the sediment samples for the 0-6" segment (to be sampled prior to collection from the grab as described in FSP Addendum Table 3), and between 0.5 ft and the red brown clay, sand, or refusal at each station in Worksheet #18 and Table 1 of the FSP Addendum (Appendix A). Longer cores will be sectioned as needed on the sampling vessel, to facilitate handling and to ensure that the cores are maintained upright during transport and storage. Sample processing and transfer to sample containers will be performed at the field facility. Additionally, piston coring or push coring may be used if more appropriate based on sediment depths encountered. Samples will be collected according to the following segmentation scheme:

QAPP Worksheet #17 (UFP-QAPP Manual Section 3.1.1) Sampling Design and Rationale

Depth below sediment water interface

0 to 0.5 ft	surface sediment (in conjunction with grab sampling)
0.5 to 1.5 ft	1-foot segment
1.5 to 2.5 ft	1-foot segment
2.5 to 3.5 ft	1-foot segment
3.5 to 5.5 ft	2-foot segment
5.5 +	2-foot segments continue to the red-brown clay layer, sand, or refusal

Where sand is encountered as a layer that completely underlies the recent, fine-grained sediments (rather than as a shallow sand lens) it will be sampled for a subset of analytes as agreed to with USEPA. Limited analyses including PAHs, metals, cyanide, SVOCs, TPH Extractables, TOC, grain size and VOCs will be performed where sand is found at the bottom of the core. The analytes will be taken out of the primary core only, so all analytes may not be achievable in all samples.

Under certain conditions, the segmentation scheme may be altered. With the agreement of the RI FTM, where a stratigraphic change in the sediment sequence (e.g., change in sediment size, obvious depositional boundary or unconformity) occurs within a segment, the sampling of that segment may be altered. This will prevent different material types, with possibly different depositional ages, from being mixed together in the same sample. Segments will be reduced below 1-foot only where it appears that the sediment density is such that sufficient solids are present to satisfy the laboratory sample volume requirement.

In addition, per agreement with USEPA, to address a component of FSP1 Task 5.3.3, which includes the collection of fine segmentation of “core top” samples from a subset of the cores, (to address sediment transport modeling and risk assessment data needs), eight of the planned locations will sampled by box core to complete this additional analysis. The proposed core(s) segmentation and grab sampling will be completed at all locations as well. A box core will be utilized for collection of surface sediment to be split into five segments per USEPA required segments:

QAPP Worksheet #17 (UFP-QAPP Manual Section 3.1.1) Sampling Design and Rationale

- 0 to 2 cm
- 2 to 5 cm
- 5 to 10 cm
- 10 to 30 cm
- 30 cm to 2 feet

One box core will be collected at each of the 8 locations, shown in Table 1 as the Group D analyte group. The segments will be analyzed utilizing the sample prioritization scheme found in FSP Addendum Table 3, which is based on the order requested by USEPA on March 28, 2008. One box core will be collected from each location. The analytes not available from the box core finer segmentation will be available from the core and grab samples collected at the same location.

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Lower Passaic River
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QAPP Worksheet #18 (UFP-QAPP Manual Section 3.1.1) Sampling Locations and Methods/SOP Requirements Table

Station Location			Previous Characterization/Siting Rationale							Target Core Length/Analyses			NAD 83 NJ State Plane Ft	
River Mile	Station ID	Station #	Water Depth[1] (National Geodetic Vertical Datum [NGVD] ft)	Geomorphic region[2]	Surficial sediment type[3]	Subsurface sediment type[4]	Preliminary Estimate (Qualitative) erosion/ deposition[5]	Co-located with [Located nearby]	Siting rationale [10]	Estimated Length (ft)	Rationale for Target Length[4]	Analyses[6]	Easting	Northing
RM 0 -2.2 Point-No-Point Reach - last dredged to 30 ft depth, 300 ft width in 1983														
0.00	2008 CLRC-001	1	-25	channel	silt	silt over clay	depositional-static	[geotech 1A]	half mile transect/ determine nature and extent	10	transition from silt to clay	A, B	597505	682497
0.00	2008 CLRC-002	2	-5!	mudflat	silt-sand	Not determined (ND)	depositional-static		half mile transect/ determine nature and extent	20	initial data	A	598286	683951
0.00	2008 CLRC-003	3	-5!	mudflat	silt-sand	ND	depositional-static		half mile transect/ determine nature and extent	20	initial data	A	599310	685714
0.05	2008 CLRC-004	4	-19	side channel	silt	ND	depositional		side channel sample/ determine nature and extent	20	initial data	A	597078	683257
0.25	2008 CLRC-005	5	-24	channel	silt	ND	depositional-static		lack of previous data and historical depositional area/ determine nature and extent	10	initial data	A	596969	684208
0.25	2008 CLRC-006	6	-19*	mudflat	silt-sand	ND	depositional-static		lack of previous data and historical depositional area/ determine nature and extent	20	initial data	A	597726	685164
0.25	2008 CLRC-007	7	-3!	mudflat	silt-sand	ND	depositional-static		lack of previous data and historical depositional area/ determine nature and extent	20	initial data	A, B	598383	686011
0.35	2008 CLRC-008	8	-15	side channel	silt	ND	depositional		side channel sample/ determine nature and extent	20	initial data	A	596614	685405
0.50	2008 CLRC-009	9	-24	channel	silt	ND	depositional-static		half mile transect/ determine nature and extent	10	initial data	A	596737	686124
0.50	2008 CLRC-010	10	-4	mudflat	silt-sand	ND	depositional-static		half mile transect/ determine nature and extent	20	initial data	A	597168	686354
0.50	2008 CLRC-011	11	-3	mudflat	silt-sand	ND	depositional-static		half mile transect/ determine nature and extent	20	initial data	A	597909	686696
0.67	2008 CLRC-012	12	-12	side channel	silt	ND	depositional	[geotech 1A-B]	side channel sample/ determine nature and extent	20	initial data	A	596647	687125

QAPP Worksheet #18 (UFP-QAPP Manual Section 3.1.1) Sampling Locations and Methods/SOP Requirements Table

Station Location			Previous Characterization/Siting Rationale							Target Core Length/Analyses			NAD 83 NJ State Plane Ft	
River Mile	Station ID	Station #	Water Depth[1] (National Geodetic Vertical Datum [NGVD] ft)	Geomorphic region[2]	Surficial sediment type[3]	Subsurface sediment type[4]	Preliminary Estimate (Qualitative) erosion/ deposition[5]	Co-located with [Located nearby]	Siting rationale [10]	Estimated Length (ft)	Rationale for Target Length[4]	Analyses[6]	Easting	Northing
0.75	2008 CLRC-013	13	-19	channel	silt	silt over clay	depos.-static		lack of previous data and historical depositional area/ determine nature and extent	18	transition from silt to clay	A	596898	687639
0.75	2008 CLRC-014	14	-3	mudflat	silt-sand	ND	depos.-static		lack of previous data and historical depositional area/ determine nature and extent	20	initial data	A	597430	687665
1.10	2008 CLRC-015	15	-5*	side channel	silt	silt over peat or sand	depositional	[Tierra 201]	half mile transect adjusted upstream due to bridge, Roanoke Ave combined sewer outfall (CSO)/ determine nature and extent/ potential source identification	10	transition from silt to peat or sand	A	597193	689657
1.10	2008 CLRC-016	16	-16	channel	silt	silt over sand	depositional-static	[Tierra 202, geotech core 2B]	half mile transect adjusted upstream due to bridge	15	transition from silt to sand or clay	A	597437	689554
1.10	2008 CLRC-017	17	-7	side channel	silt	silt over sand	depositional-static	HRC5A [Tierra Core 203]	half mile transect adjusted upstream due to bridge/ determine nature and extent/ adjusted to co-locate with high resolution core (HRC) 5A where chemistry was not completed	15	transition from silt to sand	A	597667	689292
1.45	2008 CLRC-018	18	-6	side channel	silt	silt over sand	depositional	Tierra 207 [geotech 2A]	one mile transect/ determine nature and extent	15	extend Tierra core to sand or clay	A	597701	691423
1.45	2008 CLRC-019	19	-17	channel	silt	silt	depos.-static	Tierra 208 [geotech 2B]	one mile transect/ determine nature and extent	5	Tierra 208 was a completed core, therefore the recent sediments only will be analyzed, estimated to be 5 feet or less.	A,D	597976	691370
1.45	2008 CLRC-020	20	-6	side channel	silt	silt over sand	depositional-static	Tierra 209 [geotech 2C, HRC7	one mile transect/ determine nature and extent	15	extend Tierra core to sand or clay	A	598203	691321

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QAPP Worksheet #18 (UFP-QAPP Manual Section 3.1.1) Sampling Locations and Methods/SOP Requirements Table

Station Location			Previous Characterization/Siting Rationale							Target Core Length/Analyses			NAD 83 NJ State Plane Ft	
River Mile	Station ID	Station #	Water Depth[1] (National Geodetic Vertical Datum [NGVD] ft)	Geomorphic region[2]	Surficial sediment type[3]	Subsurface sediment type[4]	Preliminary Estimate (Qualitative) erosion/ deposition[5]	Co-located with [Located nearby]	Siting rationale [10]	Estimated Length (ft)	Rationale for Target Length[4]	Analyses[6]	Easting	Northing
1.90	2008 CLRC-021	21	-22	channel	silt	silt	potentially erosional	Tierra 214	EPA requested location in this area due to high historical concentration and incomplete mercury inventory	15	extend Tierra core to sand or clay	A,B	598324	693855
RM 2.2-4.4 Harrison Reach - last dredged to 20 ft depth, 300 ft width in 1949														
2.62	2008 CLRC-022	22	-2	mudflat	silt	silt	depositional -static	Tierra 284	one mile transect (relocated due to underground gas lines and bridge crossing), co-located with Tierra 284 to complete nature and extent determination	15	silt to sand or clay transition	A,D	595458	695202
2.62	2008 CLRC-023	23	-7	channel	silt	silt	depositional	[Tierra 223, HRC10A]	one mile transect (relocated due to underground gas lines and bridge crossing), located near Tierra 223 to complete nature and extent determination	15	silt to sand or clay transition	A	595563	695459
2.62	2008 CLRC-024	24	-11	side channel	silt	silt	depositional	Tierra 224	one mile transect (relocated due to underground gas lines and bridge crossing), co-located with Tierra 224 to complete nature and extent determination	15	silt to clay transition	A	595561	695766
2.85	2008 CLRC-025	25	-10	channel, dredge area	silt	silt over sand	depositional	Tierra 226 [LRC 1, geotech 3C]	co-located with Tierra 227 to complete nature and extent determination	10	silt to sand transition	A	594361	695470
3.15	2008 CLRC-026	26	-1	side channel/mudflat	silt and sand	silt	depositional	[Tierra grabs 2000 5sdm, 1999 5sdm]	Tierra grabs on mudflat/ determine nature and extent	15	initial data	A, B	592599	695423
3.51	2008 CLRC-027	27	-11	side channel	silt	silt over sand	erosional	Tierra 234 [LRC3]	one mile transect/ co-located with Tierra 234 to complete nature and extent determination	15	silt to sand transition	A	591239	694157

QAPP Worksheet #18 (UFP-QAPP Manual Section 3.1.1) Sampling Locations and Methods/SOP Requirements Table

Station Location			Previous Characterization/Siting Rationale							Target Core Length/Analyses			NAD 83 NJ State Plane Ft	
River Mile	Station ID	Station #	Water Depth[1] (National Geodetic Vertical Datum [NGVD] ft)	Geomorphic region[2]	Surficial sediment type[3]	Subsurface sediment type[4]	Preliminary Estimate (Qualitative) erosion/ deposition[5]	Co-located with [Located nearby]	Siting rationale [10]	Estimated Length (ft)	Rationale for Target Length[4]	Analyses[6]	Easting	Northing
3.51	2008 CLRC-028	28	-16	channel	silt	silt	erosional	Tierra 235	one mile transect/ co-located with Tierra 235 to complete nature and extent determination	10	silt to sand transition	A,D	591151	694213
3.51	2008 CLRC-029	29	-16	side channel	silt	silt over clay	erosional	Tierra 236 [HRC 17]	one mile transect/ co-located with Tierra 236 to complete nature and extent determination	10	silt to sand/clay transition	A	591048	694264
RM 4.4-5.8 Newark Reach - last dredged to 16 ft depth, 300 ft width in 1949														
4.20	2008 CLRC-115	115	-15	side	silt and sand	silt	depositional-static	Tierra 243	EPA requested additional location for determination of nature and extent	10	silt to sand/clay transition	A,D	588403	692312
4.25	2008 CLRC-030	30	-13	side channel	sand and silt	silt	potentially erosional	[Tierra 243]	one mile transect, relocated per EPA request to this area of potential high contaminant inventory	10	silt to sand/clay transition	A	588236	692271
4.25	2008 CLRC-031	31	-15	channel	silt	silt	depositional -static	[Tierra 244]	one mile transect, relocated per EPA request to this area of potential high contaminant inventory	10	silt to sand/clay transition	A	588233	692388
4.25	2008 CLRC-032	32	-10	side channel	silt	silt	depositional -static	[Tierra 245, LRC 5]	one mile transect, relocated per EPA request to this area of potential high contaminant inventory	15	silt to sand/clay transition	A	588227	692539
5.00	2008 CLRC-033	33	-16	channel	silt	silt over sand	static	[MPI geotech 6B, Tierra grab 9909sdu]	multiple CSOs/ potential source identification/ determine nature and extent	10	silt to sand transition	A	585378	694444
5.30	2008 CLRC-034	34	-18	channel	silt	silt over gravel	depositional-erosional	[Tierra 259, LRC 7]	multiple CSOs/ potential source identification/ determine nature and extent	5	silt to gravel transition	A,B,D	584862	695962

QAPP Worksheet #18 (UFP-QAPP Manual Section 3.1.1) Sampling Locations and Methods/SOP Requirements Table

Station Location			Previous Characterization/Siting Rationale							Target Core Length/Analyses			NAD 83 NJ State Plane Ft	
River Mile	Station ID	Station #	Water Depth[1] (National Geodetic Vertical Datum [NGVD] ft)	Geomorphic region[2]	Surficial sediment type[3]	Subsurface sediment type[4]	Preliminary Estimate (Qualitative) erosion/ deposition[5]	Co-located with [Located nearby]	Siting rationale [10]	Estimated Length (ft)	Rationale for Target Length[4]	Analyses[6]	Easting	Northing
5.50	2008 CLRC-035	35	-13	channel	silt and sand	silt	static	Tierra 262	one mile transect, downstream from Orange St. CSO/potential source determination/ confirmation of nature and extent in Tierra262	5	Tierra 262 was a completed core, therefore the recent sediments only will be analyzed, estimated to be 5 feet or less.	A	584733	697058
5.50	2008 CLRC-036	36	-24	side channel	silt and sand	silt over gravel	static	Tierra 261	one mile transect/ co-located with Tierra 261 to complete nature and extent determination	10	silt to gravel transition	A	584571	697029
5.50	2008 CLRC-037	37	-15	side channel	silt and sand	silt over gravel	static	Tierra 263	one mile transect, downstream from New Street CSO/ potential source identification/ co-located with Tierra 263 to complete nature and extent determination	10	silt to gravel transition	A	584808	697060
RM 5.8-6.8 Kearny Reach - last dredged to 16 ft depth, 300 ft width in 1950														
6.00	2008 CLRC-038	38	-15	side channel	silt	silt	static	[Tierra 269]	Below 2 CSOs[9] / potential source identification/ determine nature and extent	15	extend Tierra core to sand or clay	A	585066	699604
6.30	2008 CLRC-039	39	-10	side channel	silt	silt, peat/organic matter	depositional	Tierra 272	At CSO/ potential source identification/ co-located with Tierra 272 to complete nature and extent determination	15	extend Tierra core to sand or clay	A	585244	701011
6.50	2008 CLRC-040	40	-16	side channel	silt	silt	erosional-static	Tierra 273	one mile transect/ co-located with Tierra 273 to complete nature and extent determination	5	Tierra 273 was a completed core, therefore the recent sediments only will be analyzed, estimated to be 5 feet or less.	A, B	585518	702181

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QAPP Worksheet #18 (UFP-QAPP Manual Section 3.1.1) Sampling Locations and Methods/SOP Requirements Table

Station Location			Previous Characterization/Siting Rationale							Target Core Length/Analyses			NAD 83 NJ State Plane Ft	
River Mile	Station ID	Station #	Water Depth[1] (National Geodetic Vertical Datum [NGVD] ft)	Geomorphic region[2]	Surficial sediment type[3]	Subsurface sediment type[4]	Preliminary Estimate (Qualitative) erosion/ deposition[5]	Co-located with [Located nearby]	Siting rationale [10]	Estimated Length (ft)	Rationale for Target Length[4]	Analyses[6]	Easting	Northing
6.50	2008 CLRC-041	41	-16	channel	silt	silt	static	Tierra 274	one mile transect/ co-located with Tierra 274 to complete nature and extent determination	5	Tierra 274 was a completed core, therefore the recent sediments only will be analyzed, estimated to be 5 feet or less.	A	585602	702137
6.50	2008 CLRC-042	42	-14	side of wide channel	silt	silt	static	Tierra 275 [HRC 24A]	one mile transect/ co-located with Tierra 275 to complete nature and extent determination	5	Tierra 275 was a completed core, therefore the recent sediments only will be analyzed, estimated to be 5 feet or less.	A	585643	702116
RM 6.8-17.4 Upstream - last dredged to 16 ft depth, 200 ft width in 1950														
7.00	2008 CLRC-043	43	-10	side channel	sand	organic material	static		half mile transect/ determine nature and extent	8	red brown clay layer, sand, or refusal[11]	A	586932	704435
7.00	2008 CLRC-044	44	-17	channel	silt	sand	static		half mile transect/ determine nature and extent	8	red brown clay layer, sand, or refusal[11]	A	587070	704369
7.00	2008 CLRC-045	45	-5	side channel	silt	organic material	static		half mile transect/ determine nature and extent	8	red brown clay layer, sand, or refusal[11]	A, B	587161	704313
7.45	2008 CLRC-046	46	-10	side channel	silt-sand	ND	static	geotech 8A	half mile transect adjusted to co-locate with geotech cores/ determine nature and extent	8	initial data	A	587705	706679
7.45	2008 CLRC-047	47	-14	channel	silt	ND	static	geotech 8B	half mile transect adjusted to co-locate with geotech cores/ determine nature and extent	8	initial data	A,D	587831	706609
7.45	2008 CLRC-048	48	-2	mudflat	silt	ND	static	geotech 8C	half mile transect adjusted to co-locate with geotech cores/ determine nature and extent	8	initial data	A	587985	706484

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Station Location			Previous Characterization/Siting Rationale							Target Core Length/Analyses			NAD 83 NJ State Plane Ft	
River Mile	Station ID	Station #	Water Depth[1] (National Geodetic Vertical Datum [NGVD] ft)	Geomorphic region[2]	Surficial sediment type[3]	Subsurface sediment type[4]	Preliminary Estimate (Qualitative) erosion/ deposition[5]	Co-located with [Located nearby]	Siting rationale [10]	Estimated Length (ft)	Rationale for Target Length[4]	Analyses[6]	Easting	Northing
7.85	2008 CLRC-049	49	-11	channel	silt	ND	erosional	[HRC 26A]	Second River Joint Meeting ERP/ potential source identification/ determine nature and extent	8	red brown clay layer, sand, or refusal[11]	A	589179	708327
7.95	2008 CLRC-050	50	-2	mudflat	silt-sand	ND	depositional		half mile transect adjusted to avoid coarse gravel below Second River / determine nature and extent	8	initial data	A	589357	708818
7.95	2008 CLRC-051	51	-13	channel	sand	ND	erosional		half mile transect adjusted to avoid coarse gravel below Second River / determine nature and extent; determine vertical distribution in sediment column	8	initial data	A	589473	708766
7.95	2008 CLRC-052	52	-6*	side channel	coarse	ND	depositional		half mile transect adjusted to avoid coarse gravel below Second River / determine nature and extent determine vertical distribution in sediment column	8	initial data	A	589616	708721
Second River RM 8.05														
8.10	2008 CLRC-053	53	-14	channel	sand		static		upstream of Second River/ potential source identification/ determine nature and extent	8	initial data	A	589474	709581
8.45	2008 CLRC-054	54	-16	channel	sand	sand/gravel	static		half mile transect, adjusted due to bridge and utility crossing/ determine nature and extent	8	silt to sand transition	A	589586	711235
8.45	2008 CLRC-055	55	-7	side channel	silt	silt over sand	static	EMBM core 2	half mile transect, adjusted due to bridge and utility crossing/ determine nature and extent	8	silt to sand transition, MPI core depth	A,B	589694	711214

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Station Location			Previous Characterization/Siting Rationale							Target Core Length/Analyses			NAD 83 NJ State Plane Ft	
River Mile	Station ID	Station #	Water Depth[1] (National Geodetic Vertical Datum [NGVD] ft)	Geomorphic region[2]	Surficial sediment type[3]	Subsurface sediment type[4]	Preliminary Estimate (Qualitative) erosion/ deposition[5]	Co-located with [Located nearby]	Siting rationale [10]	Estimated Length (ft)	Rationale for Target Length[4]	Analyses[6]	Easting	Northing
9.00	2008 CLRC-056	56	-16	channel	sand	sand over silt	static		half mile transect/ determine nature and extent	10	probe data silt to sand transition	A	590945	713740
9.00	2008 CLRC-057	57	-2	side channel	silt	silt over sand/rock	likely erosional		half mile transect/ determine nature and extent	8	probe data silt to sand transition	A	591108	713659
9.40	2008 CLRC-058	58	-8	side channel	silt	silt over sand	static	EMBM core 5	shoal sample (silt deposit)/ determine nature and extent determine vertical distribution in sediment column	6	silt to sand transition	A	592071	715758
9.60	2008 CLRC-059	59	-16	channel	silt	silt over silty sand	static		half mile transect, adjusted for fine-grained deposit, at unnamed tributary[9] /potential source identification/ determine nature and extent	6	silt to sand transition	A	592264	716454
9.60	2008 CLRC-060	60	0*	side / shoal area at minor tributary junction	sand-gravel	sand, gravel	static	[EMBM core 6]	half mile transect, adjusted for fine-grained deposit, at unnamed tributary[9] /potential source identification/ determine nature and extent	6	silt to sand transition	A	592488	716442
10.00	2008 CLRC-061	61	-11	channel	sand	sand	ND		half mile transect/ determine nature and extent determine vertical distribution in sediment column	6	initial data	A	591892	718819
10.00	2008 CLRC-062	62	-5	side channel	silt	sandy silt	ND	EMBM Core 10 [HRC 13A]	half mile transect/ determine nature and extent determine vertical distribution in sediment column	15	silt to sand transition	A, D	592093	718741
10.25	2008 CLRC-063	63	-12	side channel	silt	silt over silty sand	ND		silt pocket/ determine nature and extent	6	silt to sand transition	A	592082	720029
10.50	2008 CLRC-064	64	-14	channel	sand		static		half mile transect/ determine nature and extent	6	initial data, coarse material expected	A	592228	721507

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Station Location			Previous Characterization/Siting Rationale							Target Core Length/Analyses			NAD 83 NJ State Plane Ft	
River Mile	Station ID	Station #	Water Depth[1] (National Geodetic Vertical Datum [NGVD] ft)	Geomorphic region[2]	Surficial sediment type[3]	Subsurface sediment type[4]	Preliminary Estimate (Qualitative) erosion/ deposition[5]	Co-located with [Located nearby]	Siting rationale [10]	Estimated Length (ft)	Rationale for Target Length[4]	Analyses[6]	Easting	Northing
10.50	2008 CLRC-065	65	-1*	side shoal	sand		likely static		half mile transect/ determine nature and extent	6	initial data, coarse material expected	A	592388	721477
10.94	2008 CLRC-066	66	-11	channel	sand	sand	depositional	[SedFlume RM10.9]	half mile transect[9] / determine nature and extent determine vertical distribution in sediment column	6	initial data	A	593072	723331
10.94	2008 CLRC-067	67	-1*	mud flat	silt	silt over sand	static	EMBM core 14 [HRC 29A]	half mile transect[9] / determine nature and extent determine vertical distribution in sediment column	6	silt to sand transition	A, B	593181	723166
Third River RM 11.2														
11.30	2008 CLRC-068	68	-9	side channel	silt and sand	silt over gravel	depositional	EMBM core 17 [geotech 12B]	upstream of Third River[9] / potential source identification/ determine nature and extent determine vertical distribution in sediment column	6	silt to gravel transition	A	595000	724016
11.50	2008 CLRC-069	69	-9	side channel	silt and sand	sandy silt over sand	depositional		half mile transect/ determine nature and extent	6	silt to sand transition	A	595819	724484
11.50	2008 CLRC-070	70	-9	side channel	sand and gravel	ND	depositional		half mile transect, downstream of Rutherford Ave CSO/ potential source identification / determine nature and extent	6	initial data	A	595944	724353
11.95	2008 CLRC-071	71	-14	channel	sand	ND	erosional		half mile transect/ determine nature and extent	4	initial data - coarse material expected	A	596759	726685
11.95	2008 CLRC-072	72	-13	channel	sand	ND	depositional		half mile transect/ determine nature and extent	4	initial data - coarse material expected	A	596854	726667
12.30	2008 CLRC-073	73	-8	side channel	silt	silt over sand	depositional	HRC 1A [EMBM cores 18, 20]	examination of results at location of previous cluster of cores to confirm the determination of nature and extent	6	transition to sand	A,B	596913	728361

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Station Location			Previous Characterization/Siting Rationale							Target Core Length/Analyses			NAD 83 NJ State Plane Ft	
River Mile	Station ID	Station #	Water Depth[1] (National Geodetic Vertical Datum [NGVD] ft)	Geomorphic region[2]	Surficial sediment type[3]	Subsurface sediment type[4]	Preliminary Estimate (Qualitative) erosion/ deposition[5]	Co-located with [Located nearby]	Siting rationale [10]	Estimated Length (ft)	Rationale for Target Length[4]	Analyses[6]	Easting	Northing
12.55	2008 CLRC-074	74	-3	channel	sand-gravel	silt over sand	static	HRC 32A	half mile transect, downstream of McDonald Brook/ potential source determination/ determine nature and extent	3	high resolution core was complete, coarse material expected	A	596404	729621
12.55	2008 CLRC-075	75	-16	channel	gravel	silty sand	static		half mile transect, downstream of McDonald Brook/ potential source determination/ determine nature and extent	6	initial data - coarse material expected	A	596522	729656
12.85	2008 CLRC-076	76	-14	side channel	silt-sand	sand	static		half mile transect, adjusted due to bridge, upstream of McDonald Brook/ determine nature and extent	4	initial data - coarse material expected	A	596110	731058
12.85	2008 CLRC-077	77	-13	side channel	silt-sand	sand	depositional		half mile transect, adjusted due to bridge, upstream of McDonald Brook/ determine nature and extent	4	initial data - coarse material expected	A	596225	731023
13.23	2008 CLRC-078	78	-10	side channel	silt and sand	sand and silty sand	likely erosional		EPA requested location, area coverage[9] / determine nature and extent	6	initial data	A,D	596800	732963
13.60	2008 CLRC-079	79	-10	side channel	silty sand	silty sand	erosional	[geotech 14B]	half mile transect/ determine nature and extent	6	initial data	A	597243	734738
13.60	2008 CLRC-080	80	-12	side channel	silty sand	silty sand	erosional	[geotech 14C]	half mile transect, adjusted to siltier area/ determine nature and extent	6	initial data	A	597368	734715
14.10	2008 CLRC-081	81	-16	channel	sand	silt sand	static		half mile transect, 3 CSOs[9] / potential source identification/ determine nature and extent	6	probing depth	A	597321	737374
14.10	2008 CLRC-082	82	0	mudflat	silt and sand	silt over sand	likely static		half mile transect, 3 CSOs[9] / potential source identification/ determine nature and extent	6	probing depth	A, B	597457	737355

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Station Location			Previous Characterization/Siting Rationale							Target Core Length/Analyses			NAD 83 NJ State Plane Ft	
River Mile	Station ID	Station #	Water Depth[1] (National Geodetic Vertical Datum [NGVD] ft)	Geomorphic region[2]	Surficial sediment type[3]	Subsurface sediment type[4]	Preliminary Estimate (Qualitative) erosion/ deposition[5]	Co-located with [Located nearby]	Siting rationale [10]	Estimated Length (ft)	Rationale for Target Length[4]	Analyses[6]	Easting	Northing
14.20	2008 CLRC-083	83	-16	channel	sand	silty sand	depositional	[geotech core 15B]	Weasel Brook (Dundee Canal)[9] / potential source identification/ determine nature and extent	6	initial data	A	597459	737973
14.20	2008 CLRC-084	84	-5	mudflat	silt and sand	silty sand	depositional	[SedFlume RM14.2,geotech core 15C]	Weasel Brook (Dundee Canal)[9] / potential source identification/ determine nature and extent	8	silt over sand	A	597562	737988
14.81	2008 CLRC-085	85	-4	side channel	sand	ND	likely static		area coverage/ determine nature and extent	6	initial data	A	599480	736942
15.10	2008 CLRC-086	86	-6	uniform shallow channel	sand	ND	ND		half mile transect, adjusted upstream away from bridge/ determine nature and extent	6	initial data, coarse material expected	A	600476	737112
15.10	2008 CLRC-087	87	-6	uniform shallow channel	sand	ND	ND		half mile transect, adjusted upstream away from bridge/ determine nature and extent	6	initial data, coarse material expected	A	600623	737046
15.50	2008 CLRC-088	88	-5	uniform shallow channel	sand	ND	ND		half mile transect, downstream of Saddle River/ potential source identification/ determine nature and extent	6	initial data, coarse material expected	A, B	600699	739256
15.50	2008 CLRC-089	89	-1	bar/flat	gravel	ND	ND		half mile transect, downstream of Saddle River/ potential source identification/ determine nature and extent	6	initial data, coarse material expected	A	600861	739285
Saddle River RM 15.5														
15.64	2008 CLRC-090	90	0	bar	sand	ND	ND		upstream of Saddle River, downstream of Dundee Island lateral CSO/ potential source identification/ determine nature and extent	6	initial data	A	600361	739764

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Station Location			Previous Characterization/Siting Rationale							Target Core Length/Analyses			NAD 83 NJ State Plane Ft	
River Mile	Station ID	Station #	Water Depth[1] (National Geodetic Vertical Datum [NGVD] ft)	Geomorphic region[2]	Surficial sediment type[3]	Subsurface sediment type[4]	Preliminary Estimate (Qualitative) erosion/ deposition[5]	Co-located with [Located nearby]	Siting rationale [10]	Estimated Length (ft)	Rationale for Target Length[4]	Analyses[6]	Easting	Northing
16.00	2008 CLRC-091	91	-2	uniform shallow channel	gravel and sand	ND	ND	[geotech 16A]	half mile transect/ determine nature and extent	6	initial data	A	599354	741319
16.00	2008 CLRC-092	92	-2	uniform shallow channel	gravel and sand	ND	ND	[geotech 16C]	half mile transect/ determine nature and extent	6	initial data	A	599463	741354
16.50	2008 CLRC-093	93	1	uniform shallow channel	gravel and sand	ND	ND		half mile transect, downstream of Fleischer Brook/ determine nature and extent	6	initial data	A	598434	743699
16.50	2008 CLRC-094	94	2	uniform shallow channel	gravel and sand	ND	ND		half mile transect, downstream of Fleischer Brook/ determine nature and extent	6	initial data	A	598547	743747
17.10	2008 CLRC-095	95	4*	uniform shallow channel	gravel and sand	ND	ND		half mile transect, adjusted north of river and island/ determine nature and extent	6	initial data	A	596669	746040
17.10	2008 CLRC-096	96	3*	uniform shallow channel	gravel and sand	ND	ND		half mile transect, adjusted north of river and island/ determine nature and extent	6	initial data	A	596784	746212
17.35	2008 CLRC-097	97	10*	uniform shallow channel	gravel and sand	ND	ND		uppermost LPR, below dam/ determine nature and extent	6	initial data	A	595533	746798
Above Dundee Dam														
>17.4	2008 CLRC-098	98	ND	Lake	silt and organic matter	ND	ND		Dundee Lake[7] /potential upgradient source identification/ determine nature and extent	8	initial data	A	595077	747203
>17.4	2008 CLRC-099	99	ND	Lake	silt and organic matter	ND	ND		Dundee Lake[7] /potential upgradient source identification/ determine nature and extent	8	initial data	A	594943	747037
>17.4	2008 CLRC-100	100	ND	Lake	silt and organic matter	ND	ND		Dundee Lake, CSO (Garden state paper) [7] / potential upgradient source identification/determine nature and extent	8	initial data	A, B	594601	747934

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Station Location			Previous Characterization/Siting Rationale							Target Core Length/Analyses			NAD 83 NJ State Plane Ft	
River Mile	Station ID	Station #	Water Depth[1] (National Geodetic Vertical Datum [NGVD] ft)	Geomorphic region[2]	Surficial sediment type[3]	Subsurface sediment type[4]	Preliminary Estimate (Qualitative) erosion/ deposition[5]	Co-located with [Located nearby]	Siting rationale [10]	Estimated Length (ft)	Rationale for Target Length[4]	Analyses[6]	Easting	Northing
>17.4	2008 CLRC-101	101	ND	Lake	silt and organic matter	ND	ND		Dundee Lake[7] /potential upgradient source identification/ determine nature and extent	8	initial data	A	594316	747817
>17.4	2008 CLRC-102	102	ND	Lake	silt and organic matter	ND	ND		Dundee Lake[7] /potential upgradient source identification/ determine nature and extent	8	initial data	A	594035	747696
>17.4	2008 CLRC-103	103	ND	Lake	silt and organic matter	ND	ND		Dundee Lake behind Island (backwater)/ potential upgradient source identification/ determine nature and extent	8	initial data	A	594080	748441
>17.4	2008 CLRC-104	104	ND	Lake	silt and organic matter	ND	ND		Dundee Lake[7] /potential upgradient source identification/ determine nature and extent	8	initial data	A	594346	751403
Tributaries														
8.05T	2008 CLRC-105	105	ND	Tributary	ND	ND	ND		Second River, above HOT[8] / potential source identification/ determine nature and extent	3	initial data	A	ND	ND
8.05T	2008 CLRC-106	106	ND	Tributary	ND	ND	ND		Second River, below HOT[8] / potential source identification/ determine nature and extent	3	initial data	A	ND	ND
8.05T	2008 CLRC-107	107	ND	Tributary	ND	ND	ND		Second River, below HOT[8] / potential source identification/ determine nature and extent	3	initial data	A	ND	ND
9.60	2008 CLRC-114	114	ND	Tributary	ND	ND	ND		Unnamed tributary above HOT	3	initial data	A	ND	ND
11.2T	2008 CLRC-108	108	ND	Tributary	ND	ND	ND		Third River, above HOT[8] / potential source identification/ determine nature and extent	3	initial data	A	ND	ND

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Station Location			Previous Characterization/Siting Rationale							Target Core Length/Analyses			NAD 83 NJ State Plane Ft	
River Mile	Station ID	Station #	Water Depth[1] (National Geodetic Vertical Datum [NGVD] ft)	Geomorphic region[2]	Surficial sediment type[3]	Subsurface sediment type[4]	Preliminary Estimate (Qualitative) erosion/ deposition[5]	Co-located with [Located nearby]	Siting rationale [10]	Estimated Length (ft)	Rationale for Target Length[4]	Analyses[6]	Easting	Northing
11.2T	2008 CLRC-109	109	ND	Tributary	ND	ND	ND		Third River, below HOT[8] / potential source identification/ determine nature and extent	3	initial data	A	ND	ND
11.2T	2008 CLRC-110	110	ND	Tributary	ND	ND	ND		Third River, below HOT[8] / potential source identification/ determine nature and extent	3	initial data	A	ND	ND
15.5T	2008 CLRC-111	111	ND	Tributary	ND	ND	ND		Saddle River, above HOT[8] / potential source identification/ determine nature and extent	3	initial data	A	ND	ND
15.5T	2008 CLRC-112	112	ND	Tributary	ND	ND	ND		Saddle River, below HOT[8] / potential source identification/ determine nature and extent	3	initial data	A	ND	ND
15.5T	2008 CLRC-113	113	ND	Tributary	ND	ND	ND		Saddle River, below HOT[8] / potential source identification/ determine nature and extent	3	initial data	A	ND	ND

Notes:

CLRC – CPG Low Resolution Core

[1]Water depths from CPG 2007 bathymetry surveys except where noted: ! = estimated from NOAA Chart 12337, * = MPI 2004 bathymetry survey (2.4 ft subtracted from mean low water (MLW) values to achieve National Geodetic Vertical Datum (NGVD))

[2]Geomorphic region approximated from MPI 2004 bathymetry. ND = No data

[3]Surficial sediment types as mapped by ASI Geophysical Survey, Spring 2005 (MPI CSM, Feb 2007); except where identified as "assumed," where sediment types were based on inference from bathymetry and location within river. ND = No data

[4]Geology and depth to refusal based on MPI Probing Survey (2007) and MPI coring results (geotechnical, high resolution, low resolution, and limited 2008 coring data), Tierra Solutions Inc. (1995 coring data) and morpholologic setting for each location. Additionally, if core complete, then proposing sampling of recent sediments only.

[5]Erosion/deposition evaluated from MPI erosion/deposition analysis developed from several sets of bathymetry data (MPI 2007). ND = No data

[6]Analyses - Refer to complete list of analytes in Table 2
A - Base analyte list for all samples in Table 2
B - Additional chemical and biological analyses in Table 2, including TVPH, methylmercury, hexavalent chromium, AVS/SEM, P, N, coliforms, and Giardia
C - Additional physical analyses in Table 2, including size-density classification, microscopy, petrography, PCB sediment-water partitioning. Samples will be identified by laboratory following laboratory screening of PCB concentration.
D - Fine-segmentation of 0-20/24 inch upper layer

[7]Dundee Lake locations will be finalized following confirmation of previous sample locations.

[8]Head-of-Tide (HOT) as specified by NJDEP (1986), locations may be adjusted in the field during the sampling effort.

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[9] Location requires field examination and possible relocation if subsurface utility lines are present.

[10] All locations will be evaluated for physical characteristic data to combine with other measures of sediment stability for evaluation of sediment transport in the RI/FS.

[11]The underlying sands and will be sampled and analyzed for PAHs, metals, cyanide, SVOCs, TPH Extractables, TOC, grain size, and VOCs. As agreed to with EPA, the analytes will be taken out of the primary core only, so all analytes may not be achievable in all samples.

[12] Target core length/ analyses are estimated only for the purpose of estimating the number of samples for Worksheet #20. The estimated target depth was determined by reviewing available core logs and MPI Probing data, which included depth to refusal. The cores will be collected to the red brown clay layer, sand or refusal.

QAPP Worksheet #19 (UFP-QAPP Manual Section 3.1.1) Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[a]	Sample Size[b]	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time[c] (preparation/ analysis)
Sediment	VOCs	Low	L-1	4 x 10 gram[g]	2 40mL VOA vials: (NaHSO4) + 1 40mL VOA vial (MeOH). 1 vial (unpreserved) collected for % solids. Note: Vials containing DI water will be used for low-level samples if NaHSO4 samples efferversce.	0-6°C; store in the dark	Field preservation upon collection (MeOH or NaHSO4); 48 hours to preservation in laboratory if unpreserved vials used; 14 calendar days to preparation and analysis
Sediment	SVOCs	Low	L-2, L-3	125 g minimum	8 ounce (oz) wide-mouth glass jar	0-6°C; store in the dark	14 calendar days to preparation[e]; 40 calendar days from preparation to analysis
Sediment	PAHs-HRGC/ LRMS-SIM	Low	L-6	45 g minimum	8 oz wide mouth glass jar	During shipment: 0-6°C; store in the dark Upon arrival at lab: store at <-10°C in the dark [h]	14 calendar days to preparation[e,f]; 40 calendar days from preparation to analysis
Sediment	Organochlorine Pesticides (GC/ECD)	Low	L-2, L-4	125 g minimum	8 oz wide mouth glass jar	0-6°C; store in the dark	14 calendar days to preparation[e,g]; 40 calendar days from preparation to analysis

QAPP Worksheet #19 (UFP-QAPP Manual Section 3.1.1) Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[a]	Sample Size[b]	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time[c] (preparation/ analysis)
Sediment	Organochlorine Pesticides (HRGC/HRMS)	Low	L-15	40 g minimum	4 oz wide mouth glass jar	During shipment: 0-6°C; store in the dark; upon arrival at lab: store at <-10°C in the dark [h]	365 calendar days for preparation and analysis
Sediment	PCBs (Aroclors)	Low	L-2, L-5	50 g minimum	8 oz wide mouth glass	0-6°C; store in the dark	14 calendar days to preparation [e, i]; 40 calendar days from preparation to analysis
Sediment	PCBs (Homologs and Congeners)	Low	L-7	45 g minimum	8 oz wide mouth glass	During shipment: 0-6°C; store in the dark; upon arrival at lab: store at <-10°C in the dark [h]	365 calendar days for preparation and analysis
Sediment	Herbicides	Low	L-11, L-12	50 g	4 oz wide mouth glass	0-6°C; store in the dark	14 calendar days to preparation; 40 calendar days from preparation to analysis
Sediment	TPH-Extractables	Low	L-13	100 g	8 oz wide mouth glass	0-6°C; store in the dark	14 calendar days to preparation; 40 calendar days from preparation to analysis

QAPP Worksheet #19 (UFP-QAPP Manual Section 3.1.1) Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[a]	Sample Size[b]	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time[c] (preparation/ analysis)
Sediment	TPH-Purgeables	Low	L-14	3 x 10 g	2 40mL VOA vials (DI water) + 1 40mL VOA vial (MeOH). 1 vial (unpreserved) collected for % solids.	0-6°C; store in the dark	Field preservation upon collection (MeOH); 48 hours to freezing in the laboratory for DI water vials; 14 calendar days for preparation and analysis
Sediment	Dioxins/Furans	Low	L-35	20 g	2 oz wide mouth glass	During shipment: 0-6°C; store in the dark; upon arrival at lab: store at <-10°C in the dark [h]	365 calendar days for preparation and analysis
Sediment	Radiochemistry (Be-7, Cs-137, Pb-210, K-40)	Low	L-9, L-10	500 g	8 oz wide mouth glass or plastic	0-6°C; store in the dark	180 calendar days (6 months) for preparation and analysis, **EXCEPT** 30 days for Be-7
Sediment	Radiochemistry Be-7 only	Low	L-9, L-10	100 g	8 oz wide mouth glass or plastic	0-6°C; store in the dark	30 days to analysis
Sediment	Metals	Low	L-16, L-17, L-18, L-19	20 g	8 oz wide mouth glass	0-6°C	180 calendar days (6 months) for preparation and analysis **EXCEPT** mercury and hexavalent chromium

QAPP Worksheet #19 (UFP-QAPP Manual Section 3.1.1) Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[a]	Sample Size[b]	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time[c] (preparation/ analysis)
Sediment	Low Level Mercury	Low	L-36	20 g	2 oz wide mouth glass	0-6°C during shipment; ≤ -15°C in lab	28 calendar days to analysis
Sediment	Methyl Mercury	Low	L-37	10 g	2 oz wide mouth glass	0-6°C during shipment; ≤ -15°C in lab	28 calendar days to analysis
Sediment	Hexavalent Chromium	Low	L-34	20 g	2 oz wide mouth glass	0-6°C	30 calendar days to preparation; 7 calendar days from preparation to analysis
Sediment	Butyltin	Low	L-20, L-21	20 g	8 oz wide mouth glass	0-6°C	14 calendar days to preparation; 40 calendar days from preparation to analysis
Sediment	AVS/SEM	Low	L-22	20 g	2 oz wide mouth glass	0-6°C, minimize headspace	AVS: evolution within 14 calendar days; analysis within 24 hours of evolution. SEM: analysis within 14 calendar days of extraction
Sediment	Ammonia	Low	L-23	20 g	8 oz wide mouth glass	0-6°C	7 calendar days to extraction; extracts preserved by lab with 9N sulfuric acid; 28 calendar days to analysis

QAPP Worksheet #19 (UFP-QAPP Manual Section 3.1.1) Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[a]	Sample Size[b]	Containers (number, size, and type)	Preservation Requirements	Maximum Holding Time[c] (preparation/ analysis)
Sediment	Cyanide	Low	L-24, L-25	20 g	8 oz wide mouth glass	0-6°C	14 calendar days to analysis.
Sediment	Total Kjeldahl Nitrogen	Low	L-27	20 g	8 oz wide mouth glass	0-6°C	None established for soils/sediments
Sediment	Total Phosphorus	Low	L-26	20 g	8 oz wide mouth glass	0-6°C	28 calendar days to analysis
Sediment	TOC	Low	L-28	20 g	8 oz wide mouth glass	0-6°C	28 calendar days to analysis
Sediment	Total Sulfide	Low-High	L-30	20 g	2 oz wide mouth glass	Fill jar completely with sediment. Pour 10 mL NaOH/Zinc Acetate solution over the top of the sample. Ship on ice 0-6°C	7 calendar days to analysis
Sediment	Grain Size	N/A	L-31	250 g[c]	16 oz wide mouth glass	0-6°C	None established
Sediment	Atterberg Limits	N/A	L-32	See footnote d	Included in above	0-6°C	None established
Sediment	Specific Gravity	N/A	L-33	See footnote d	Included in above	0-6°C	None established
Sediment	*E. coli*	Low -High	L-38	100 g	4 oz glass or plastic, sterile container	ice, 0-10°C; not frozen, store in the dark	30 hours to analysis
Sediment	Giardia	Low- High	L-39	100 g	4 oz glass or plastic, sterile container	ice, 0-20°C; not frozen, store in the dark	96 hours to analysis

QAPP Worksheet #19 (UFP-QAPP Manual Section 3.1.1) Analytical SOP Requirements Table

[a] Refer to Worksheet #23 for SOP titles, SOP L-40 (CAS) or L-43 (TestAmerica), Percent Solids, applies to all sediment analyses performed by the referenced laboratory.

[b] Sample size is the minimum requested by each laboratory to perform the requested analysis; minimum sample size requirements reflect the additional sample needed permit the lab to obtain a dry aliquot of sufficient size to reach project QL goals assuming samples may contain up to 50% moisture. Additional sample volume is need for field QC samples (e.g., matrix spikes)

[c] Begins at time of collection of core, grab, or boxcore

[d] 250 g includes sufficient sample to perform Grain Size, Atterberg Limits, and Specific Gravity

[e] Samples will be frozen at the laboratory (< -10°C) after aliquot is removed for extraction.

[f] The holding time for frozen samples is extended to 100 days per MPI QAPP modification (January 2007)

[g] The holding time for frozen samples is extended to 299 days per MPI QAPP modification (January 2007)

[h] Samples will be stored frozen (< -10°C) and in the dark after receipt and log-in at the laboratory. When samples are scheduled for extraction, they will be removed from the freezer and allowed to thaw at room temperature until at a consistency where the sample can be mixed and a representative aliquot taken for analysis. The time samples are removed from the freezer and the time the remaining sample is returned to storage will be recorded; extraction will begin within 8 hours of the time samples are removed from the freezer.

[i] The holding time for frozen samples is extended to 365 days per MPI QAPP modification (January 2007).

QAPP Worksheet #20 (UFP-QAPP Manual Section 3.1.1) Field Quality Control Sample Summary Table

Matrix	Analytical Group	Conc. Level	Analytical and Preparation SOP Reference [a]	No. of Sampling Locations (No. of Samples)[b]	No. of Field Replicates[c]	No. of Rinsate Blanks [d]	No. of PE Samples[e]	Total No. of Samples to Lab
Sediment	Volatile Organics	Low	L-1	115 (345)[f, g]	18	24	1	388
Sediment	Semivolatile Organics	Low	L-2, L-3	115 (695)	35	25	1	756
Sediment	PAHs-HRGC/LRMS-SIM	Low	L-6	115 (695)	35	25	1	756
Sediment	Organochlorine Pesticides (GC/ECD)	Low	L-2, L-4, L-56	115 (605)	31	24	1	661
Sediment	Organochlorine Pesticides (HRGC/HRMS)	Low	L-15, L-42	115 (645)	33	25	1	704
Sediment	PCBs (Aroclors)	Low	L-2, L-5	115 (645)	33	25	1	704
Sediment	PCBs (Homologs and Congeners)	Low	L-7	115 (645)	33	25	1	704
Sediment	Herbicides	Low	L-11, L-12	115 (645)	33	25	1	704
Sediment	TPH Extractables	Low	L-13	115 (695)	35	25	1	756
Sediment	TPH Purgeables	Low	L-14	13 (13)[g,h]	1	12	1	27
Sediment	Dioxins/Furans	Low	L-35	115 (645)	33	25	1	704
Sediment	Be-7	Low	L-9, L-10	115 (230)[h]	12	0	None Identified	242
Sediment	Cs-137, Pb-210, K-40	Low	L-9, L-10	115 (490)	25	0	None Identified	515
Sediment	TAL Metals, Titanium	Low	L-16, L-17, L-18, L-19	115 (695)	35	25	1	756
Sediment	Metals (Cu and Ni)	Low	L-16, L-17, L-18, L-19	115 (115)	6	24	1	146
Sediment	Low Level Mercury	Low-High	L-36	115 (695)	35	25	1	756
Sediment	Methyl Mercury	Low	L-37	13 (13)[h]	1	12	1	27
Sediment	Hexavalent Chromium	Low	L-34	13 (13)[h]	1	24	1	39
Sediment	Butyltins	Low	L-21	115 (645)	33	25	1	704

QAPP Worksheet #20 (UFP-QAPP Manual Section 3.1.1) Field Quality Control Sample Summary Table

Matrix	Analytical Group	Conc. Level	Analytical and Preparation SOP Reference [a]	No. of Sampling Locations (No. of Samples)[b]	No. of Field Replicates[c]	No. of Rinsate Blanks [d]	No. of PE Samples[e]	Total No. of Samples to Lab
Sediment	AVS/SEM	Low	L-22	13 (13)[h]	1	NA	None identified	14
Sediment	Ammonia	Low	L-23	13 (13)[h]	1	24	1	39
Sediment	Cyanide	Low	L-24, L-25	115 (695)	35	24	1	755
Sediment	TKN	Low	L-27	13 (13)[h]	1	24	1	39
Sediment	Total Phosphorus	Low	L-26	13 (13)[h]	1	24	1	39
Sediment	TOC	Low	L-28	115 (695)	35	24	1	755
Sediment	Total Sulfide	Low-High	L-30	115 (115)[h]	6	24	1	146
Sediment	Grain Size	N/A	L-31	115 (695)	35	NA	1	731
Sediment	Atterberg Limits	N/A	L-32	115 (605)	31	NA	None Identified	636
Sediment	Specific Gravity	N/A	L-33	115 (605)	31	NA	1	637
Sediment	*E. Coli*	Low-High	L-38, L-38a	13 (13)[h]	1	0	1	15
Sediment	Giardia	Low	L-39, L-39a	13 (13)[h]	1	0	None Identified	14
Sediment	Percent Moisture	High	L-40, L-43, L-48, L-49, L-50, L-51, L-52, L-53, L-54, L-55	115 (605)	31	NA	1	637

QAPP Worksheet #20 (UFP-QAPP Manual Section 3.1.1) Field Quality Control Sample Summary Table

a. Refer to Worksheet #23 for SOP title

b. The estimated number of samples was based on the following assumptions:

A surface grab sample and core(s) will be taken at each location. Except as noted, samples will be collected from the grab (0 to 0.5 ft) and from core intervals 0.0 to 0.5 ft, 0.5 to 1.5 ft, 1.5 to 2.5 ft, 2.5 to 3.5 ft, and at 2-ft intervals to the bottom of the core. The cores will be collected to the red brown clay layer, sand or refusal. If red-brown sand is encountered at the bottom of the core, a sample will be collected and analyzed for PAHs, TAL metals, Titanium, low-level Hg, cyanide, SVOCs, TPH - extractables, TOC, grain size and VOCs (as allowed by the available sample volume). The estimated maximum number of samples per analyses is based on the assumed target core depth (Worksheet #18) and analytical suite for each location (Table 2 of the FSP Addendum), and assumes that sand will be encountered and sampled for all parameters at 50 locations.

Additionally, a box core will be utilized at 8 locations to collect sediment samples to be split into 5 finer segments (see previous discussion in Worksheet #14) and analyzed for the Group D analyte group shown in Table 3 of the FSP Addendum. For the purpose of estimating sample numbers, a total of 40 samples from the boxcore effort was assumed.

c. Field duplicates will be collected at a frequency of 1 per 20 samples unless noted otherwise.

d. Equipment rinsate blanks will be collected at a frequency of one per week per sampling team for each set of decontaminated equipment utilized for a particular task (for example, grab sampling, core collection, boxcore collection, and sample processing in the facility). One equipment rinsate blank per task was assumed, based on a 12-week field program, with the exception of the boxcore sampling, which was assumed to be one week in duration.

e. PE (also known as Proficiency Testing) Samples will be obtained from National Institute of Standards and Technology (NIST) or R.T.Corporation. These samples will be sent to the laboratories in advance of field sample collection. Note that these samples should not be confused with standard reference material (SRM) or CRM samples which are analyzed at laboratories as part of their method or on-going QC programs.

f. VOC samples will be collected as discrete, nonhomogenized samples at three depths: 0 to 0.5 ft (grab); 2.5 to 3.5 ft (core); and from the red-brown sand (if encountered), at the bottom of the core or the interval above the red-brown clay.

g. Trip blanks will be associated with VOC and TPH Purgeables analyses. One trip blank per analyses will be included in each cooler transporting sediment samples for these analyses to the respective laboratories.

h Surficial sample only (Be-7 will be collected from 0 to 1 inch from a dedicated grab and from the 0.0 to 0.5 ft core interval; the remaining surficial parameters will be collected from the 0.0 to 0.5 ft core interval).

QAPP Worksheet #21 (UFP-QAPP Manual Section 3.1.2) Project Sampling SOP References Table

The following is a list of all Standard Operating Procedures (SOPs) associated with project sampling including, but not limited to, sample collection, sample preservation, equipment cleaning and decontamination, equipment testing, inspection and maintenance, supply inspection and acceptance, and sample handling and custody.

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comments
LPR-G-01	Field Records	ENSR	NA	No	Appendix B
LPR-G-02	Navigation/Positioning	ENSR	Differential Global Positioning System (dGPS)	No	Appendix B
LPR-G-03	Equipment decontamination	ENSR	Various – see Appendix B	No	Appendix B
LPR-G-04	IDW handling and disposal	ENSR	Various – see Appendix B	No	Appendix B
LPR-G-05	Sample custody	ENSR	NA	No	Appendix B
LPR-G-06	Packaging and shipping	ENSR	NA	No	Appendix B
LPR-S-01	Sediment grab sampling	ENSR	Grab sampler, box corer	No	Appendix B
LPR-S-02	Sediment coring using a piston push core	ENSR	Piston corer	No	Appendix B
LPR-S-03	Sediment coring using a vibracorer	ENSR	Vibracorer	No	Appendix B
LPR-S-04	Sediment core processing	ENSR	NA	No	Appendix B
SOP-8	Procedure for sediment probing	MPI	Steel rod	Yes (see below)	Appendix B
7315	Operation and Calibration of a Photoionization Detector	ENSR	PID	No	Appendix B

SOP-8 – Section III.1 will be modified to be "Using the on-board dGPS system, maneuver the sampling vessel to the pre-programmed target coordinates for each core sample location, and stabilize the vessel as much as possible."

Procedural modifications to these documents may be warranted depending upon field conditions, equipment limitations, or limitations imposed by the procedure. Substantive modification will be approved in advance by the Project QA Manager and RI Task Manager and communicated to the CPG Coordinator and to the USEPA RPM. Deviations will be documented in the field records.

QAPP Worksheet #22 (UFP-QAPP Manual Section 3.1.2.4) Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
PID	Initial: Each time the instrument is turned on, or if the instrument gives erratic results. Check: Every 15 samples and at the end of the day. 100 ppm isobutylene standard	Refer to SOP	Refer to SOP	Refer to SOP	Refer to SOP	Within 10% for calibration	Recalibrated or replaced	Field Task Manager or designee	7315
Refractometer	Calibrate daily with distilled water	Clean	Confirm that scale is set to zero and tighten set screw	Daily for functionality	Daily	Boundary line at zero	Recalibrated or replaced	Field Task Manager or designee	LPR-S-01

[1]Refer to the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #23 (UFP-QAPP Manual Section 3.2.1) Analytical SOP References Table[a]

Reference Number[b]	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
L-1	Determination of Volatile Organics by GC/MS Based on Method 8260B, KNOX-MS-0015, Rev. 10, 10/09/2007	Definitive	Organics (VOCs)	GC/MS	TestAmerica-Knoxville, TN	N, Field preserved sample option used
L-2	Extraction and Cleanup of Organic Compounds from Waters, Soils, Solids and Wastes Based on SW-846 3500 and 3600 Methods KNOX-OP-0011, Rev. 9, 6/6/2007	Definitive	Organics (Sample Preparation)	N/A	TestAmerica-Knoxville, TN	N
L-3	GC/MS Analysis Based on Method 8270C, KNOX-MS-0016, Rev. 7, 2/9/2007	Definitive	Organics (SVOCs)	GC/MS	TestAmerica-Knoxville, TN	Y, Sonication prep option (in L-2) with increased aliquot size to achieve project DQLs
L-4	Analysis of Organochlorine Pesticides Based on NOAA Technical Memorandum NOS ORCA 130 and Methods 8081A/8081, KNOX-GC-0019, Rev. 1, 7/7/2008	Definitive	Organics (Organochlorine Pesticides)	GC with Nickel (^{63}Ni) Detector	TestAmerica-Knoxville, TN	Y, Sonication prep option (in L-2) with increased aliquot size to achieve project DQLs; cleanup by Florisil and Gel Permeation Chromatography (GPC) (in L-2)
L-6	Extraction and Isotope Dilution of Alkylated PAHs and Selected Semivolatile Organic Compounds by HRGC/LRMS-SIM, KNOX-01-0016, Rev. 6, 10/9/2007	Definitive	Organics (PAHs)	HRGC/LRMS-SIM	TestAmerica-Knoxville, TN	Y, Cleanup by GPC(in L-2) and silica gel (in L-6)

QAPP Worksheet #23 (UFP-QAPP Manual Section 3.2.1) Analytical SOP References Table

Reference Number[b]	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
L-7	Analysis of PCB Isomers by Isotope Dilution HRGC/HRMS, KNOX-ID-0013, Rev. 7, 7/10/2008	Definitive	Organics	HRGC/HRMS	TestAmerica-Knoxville	N
L-9	Standard Operating Procedure for the Determination of Gamma Isotopes, GL-RAD-A-013, Revision 14	Definitive	Radiochemistry (Be-7, Cs-137, K-40, Pb-210)	Gamma Spectroscopy System	GEL Charleston, SC	Y, use 21-day in-growth time for radium-226; the associated combined 2 sigma uncertainty (total propagated uncertainty) must be ≤30% with a maximum count time of 1000 minutes.
L-10	Standard Operating Procedure for the Determination of Radiometric Polonium, GL-RAD-A-016, Revision 10	Definitive	Pb-210 as Po-210[c]	Alpha Spectroscopy System	GEL Charleston, SC	Y, the associated combined 2 sigma uncertainty (total propagated uncertainty) must be ≤30% with a maximum count time of 1000 minutes.
L-11	Extraction and Cleanup of Organic Compounds from Waters and Solids, PT-OP-001, Rev. 10, 10/19/2007	Definitive	Organics (Sample Preparation, Herbicides and PCB-Aroclors)	N/A	TestAmerica-Pittsburgh, PA	Y, Cleanup by GPC required
L-12	Gas Chromatographic Analysis Based on SW-846 Methods, PITT-GC-001, Rev. 13, 3/31/2008	Definitive	Organics (Herbicides and PCB-Aroclors)	GC with ^{63}Ni Detector	TestAmerica-Pittsburgh, PA	Y, second column confirmation, and acid clearnup required for PCBs

QAPP Worksheet #23 (UFP-QAPP Manual Section 3.2.1) Analytical SOP References Table

Reference Number[b]	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
L-13	NJDEP OQA-QAM-025, Quantitation of Semivolatile Petroleum Products in Water, Soil, Sediment and Sludge, EDS-GCS-011, Rev. 2, 3/23/2007	Definitive	Organics (TPH)	GC/FID	TestAmerica-Edison, NJ	N
L-14	Gasoline Range Organics Using GC/FID Method 8015, EDS-GCV-006, Rev. 8, 2/18/2008	Definitive	Organics (TPH)	GC/FID	TestAmerica-Edison, NJ	N
L-15	Analysis of Organochlorine Pesticides By High Resolution GC/MS, WS-ID-0014, Rev. 4, 7/11/2008	Definitive	Organics (Pesticides)	HRGC/HRMS	TestAmerica-West Sacramento, CA	Y, Deactivated silica gel cleanup (described in method) + GPC in L-47
L-16	SOP for Metals Digestion, MET-3050, Rev. 10, 7/12/2007	Definitive	Metals (Sample Preparation-sediment)	N/A	CAS-Kelso, WA	N
L-17	SOP for Metals Digestion, MET-3010A, Rev., 10, 7/12/2007	Definitive	Metals (Sample Preparation-Aqueous)	N/A	CAS-Kelso, WA	N
L-18	Determination of Metals and Trace Elements by Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP), MET-ICP, Rev. 18, 12/14/2006	Definitive	Metals	ICP/AES	CAS-Kelso, WA	N

QAPP Worksheet #23 (UFP-QAPP Manual Section 3.2.1) Analytical SOP References Table

Reference Number[b]	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
L-19	Determination of Metals and Trace Elements by Inductively Coupled Plasma-Mass Spectrometry, EPA Method 6020, MET-6020, Rev. 11, 5/1/2007	Definitive	Metals	ICP/MS	CAS-Kelso, WA	N
L-20	Extraction of Organotins in Sediment, Water and Tissue Matrices, SOC-OSWT, Rev. 5, 1/20/2006	Definitive	Organics (Sample Preparation)	N/A	CAS-Kelso, WA	N
L-21	Butyltins, SOC-BUTYL, Rev. 8, 7/31/2007	Definitive	Organics (Butyltin)	GC/Flame Photoionization Detector (FPD)	CAS-Kelso, WA	N
L-22	Sulfides, Acid Volatile, GEN-AVS, Rev. 5, 1/26/2005	Definitive	AVS/SEM	Ultraviolet Visible-Spectroscopy (UV-Visible), ICP, Cold Vapor Atomic Absorption Spectometry (CVAAS)	CAS-Kelso, WA	N
L-23	Ammonia by Flow Injection Analysis, GEN-350.1, Rev 7, 5/1/07	Definitive	General Chemistry	Rapid Flow Analyzer Colorimeter	CAS-Kelso, WA	Y, modified to include sulfide cleanup procedures in Nitrogen, ammonia, colorimetry, salicylate-hypochlorite, automated-segmented flow, United States Geological Service (USGS) I-6522-90

QAPP Worksheet #23 (UFP-QAPP Manual Section 3.2.1) Analytical SOP References Table

Reference Number[b]	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
L-24	Cyanide Extraction of Solids and Oils, GEN-9013, Rev. 0, 2/8/1998	Definitive	General Chemistry (Sample Preparation)	N/A	CAS/Kelso, WA	N
L-25	Total Cyanides and Cyanides Amenable to Chlorination, GEN-335, Rev. 12, 4/12/2007	Definitive	General Chemistry	Lachat Quik-Chem Analyzer	CAS/Kelso, WA	N
L-26	Phosphorus Determination Using Colorimetric Procedure, GEN-365.3, Rev. 9, 7/11/2008 (Includes sample preparation)	Definitive	General Chemistry	Ultraviolet-Visible Spectrophotometry (UV-VIS)	CAS-Kelso, WA	N
L-27	Nitrogen, Total and Soluble Kjeldahl, GEN-TKN, Rev. 9, 5/8/2007 (Includes sample preparation)	Definitive	General Chemistry	Ion Selective Electrode	CAS-Kelso, WA	N
L-28	Carbon, Total Organic in Soil, GEN-ASTM, Rev. 5, 9/5/2006	Definitive	General Chemistry	Induction Furnace	CAS-Kelso, WA	N
L-29	Total Organic Carbon in Water, GEN-TOC, Rev. 8, 4/12/2007	Definitive	General Chemistry	TOC Analyzer (Persulfate Oxidation Method)	CAS-Kelso, WA	N
L-30	Total Sulfides by Methylene Blue Determination, GEN-9030M, Rev. 8, 1/5/2006 (Includes sample preparation)	Definitive	General Chemistry	UV-VIS	CAS-Kelso, WA	N

QAPP Worksheet #23 (UFP-QAPP Manual Section 3.2.1) Analytical SOP References Table

Reference Number[b]	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
L-31	Particle Size Determination, GEN-PSP, Rev. 4, 11/11/2003	Definitive	Physical Testing	WS Tyler-RX Sieve Shaker, Sieves	CAS-Kelso, WA	Y, sieve sizes will conform to those specified L-31a (memo dated March 28, 2008 from Leonard Warner/MPI to Tom Taccone/EPA, entitled "Core Top" Modeling and Risk Assessment Data Needs, Lower Passaic River Restoration Project. Hydrometer for finer fractions will be utilized).
L-31a	"Core Top" Modeling and Risk Assessment Data Needs Lower Passaic River Restoration Project", Malcolm Pirnie, March 28,2008 (modification to grain size determination)	Definitive	Physical Testing	NA	CAS-Kelso, WA	N
L-32	Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils, ASTM D-4318-84, 10/26/1984	Definitive	Physical Testing	Liquid Limit Device	CAS-Kelso, WA	N
L-33	Specific Gravity, GEN-SPECGRAV, Rev. 0, 6/6/2005	Definitive	Physical Testing	Pycnometer	CAS-Kelso, WA	N
L-34	Hexavalent Chromium by Ion Chromatography, GEN-7199, Rev. 2, 9/30/2005	Definitive	Metals	Ion Chromatograph	CAS-Rochester, NY	N

QAPP Worksheet #23 (UFP-QAPP Manual Section 3.2.1) Analytical SOP References Table

Reference Number[b]	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
L-35	Tetra-through Octa-Chlorinated Dioxins and Furans by Isotope Dilution HRGC/HRMS, SOP Code HRMS-1613B, Rev. 6.1, 4/24/08	Definitive	Organics	Isotope Dilution Mass Spectrometry	CAS-Houston, TX	N
L-36	BRL Procedure for EPA Method 1631, Total Mercury in Tissue, Sludge, Sediment, and Soil by Acid Digestion and Bromide Chloride (BrCl) Oxidation by CVAFS, BR-0002, Rev. 010, 4/9/2008	Definitive	Metals (Total and Low Level Mercury)	CVAF0053	Brooks Rand-Seattle, WA	N
L-37	Determination of Methyl Mercury by Aqueous Phase Ethylation, Trapping, Pre-Collection, Isothermal GC Separation, and CVAFS Detection: BRL Procedure for EPA Method 1630, BR-0011, Rev. 012, 4/1/2008	Definitive	Metals (Methyl Mercury)	CVAFS	Brooks Rand-Seattle, WA	N, solvent extraction option using $KBr/H_2SO_4/CuSo_4$ will be used
L-38	Total Coliform and E. *coli* Using the Colilert and Quanti-Tray® System, ASI SOP No. ASI204-1, Modified Procedure for Coliform and E. *coli* in Sediment	Definitive	Biological	Incubator, Ultraviolet Lamp, Thermometer, pH Meter	Analytical Services-Williston, VT	Y, modified for sediment (L-38a)

QAPP Worksheet #23 (UFP-QAPP Manual Section 3.2.1) Analytical SOP References Table

Reference Number[b]	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
L-38a	Modification to SOP AS1204-1 for the Analysis of Sediment or Manure Samples for the Detection of Coliforms and *E. coli* Using Colilert-18 and Quanti-Tray 2000	Definitive	Biological	NA	Analytical Services-Williston, VT	N
L-39	Cryptosporidium and Giardia in Water by Filtration/IMS/FA, ASI SOP No. ASI224, Modified Procedure for 1623 and ColorSeed for Sediment Samples	Definitive	Biological	Microscope	Analytical Services-Williston, VT	Y, modified for sediment (L-39a)
L-39a	Modification to Method 1623 for the Detection and Enumeration of Cryptosporidium and Giardia from Sediment or Manure Samples and Determination of Recovery Efficiency using ColorSeed C&G	Definitive	Biological	NA	Analytical Services-Williston, VT	N
L-40	Total Solids, GEN-160.3, Rev. 11, 4/10/2007	Definitive	General Chemistry	Analytical Balance	CAS-Kelso, WA	N
L-43	Percent Moisture, KNOX-WC-0012, Rev. 5, 1/30/07	Definitive	General Chemistry	Analytical Balance	TestAmerica-Knoxville, TN	N
L-45	Standard Operating Procedure for Gamma Spectroscopy System Operation, GL-RAD-I-001, Rev. 12	Definitive	Radiochemistry	Gamma Spectroscopy System	GEL Charleston, SC	N

QAPP Worksheet #23 (UFP-QAPP Manual Section 3.2.1) Analytical SOP References Table

Reference Number[b]	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
L-46	Standard Operating Procedure for Alpha Spectroscopy System, GL-RAD-I-009, Rev. 9	Definitive	Radiochemistry	Alpha Spectroscopy System	GEL Charleston, SC	N
L-47	Gel Permeation Cleanup [Method 3640A], WS-OP-0012, rev 4, 10/5/2007	Definitive	Organics (Pesticides)	HRGC/HRMS	TestAmerica-West Sacramento, CA	N
L-48	Determination of Solids in Water and Wastes, PT-WC-001, Rev. 1, 5/27/08	Definitive	General Chemistry	Analytical Balance	TestAmerica-Pittsburgh, PA	N
L-49	Percent Solids Determination, SOP No. ED-WET-032, Rev. 3, 5/8/2006	Definitive	General Chemistry	Analytical Balance	TestAmerica-Edison, NJ	N
L-50	Determination of Percent Moisture, WS-OP-0013, Rev. 3, 2/13/08	Definitive	General Chemistry	Analytical Balance	TestAmerica-West Sacramento, CA	N
L-51	Standard Operating Procedure for Total Solids, SMO-TS, Rev. 0, 7/7/08	Definitive	General Chemistry	Analytical Balance	CAS-Houston, TX	N
L-52	Standard Operating Procedure Dry Weight Perent Solids/Modified EPA 160.3/SM2540G, GEN-DWPS, Rev.1, 4/19/04	Definitive	General Chemistry	Analytical Balance	CAS-Rochester, NY	N

QAPP Worksheet #23 (UFP-QAPP Manual Section 3.2.1) Analytical SOP References Table

Reference Number[b]	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
L-53	Standard Operating Procedure for Soil Sample Preparation for the Determination of Radionuclides, GL-RAD-A-021, Rev. 13, 3/08	Definitive	General Chemistry	Analytical Balance	GEL Charleston, SC	Y, note on sample preparation log a description of sample (e.g., silt, sand, pebble, unusual color or items present)
L-54	Standard Operating Procedure for Soil Sample Ashing for the Determination of Radionuclides, GL-RAD-A-021B, Rev. 6, 4/05	Definitive	General Chemistry	Analytical Balance	GEL Charleston, SC	N
L-55	Dry Weight Determination, BR-1501, Rev. 3, 6/6/06	Definitive	General Chemistry	Analytical Balance	Brooks Rand-Seattle, WA	N

[a] All SOPs are contained in Appendix C-1. Bioavailability protocols are provided in Appendix D.

[b] It is expected that the procedures outlined in these SOPs will be followed. Procedural modifications to individual SOPs may be warranted depending upon an individual sample matrix, interferences encountered, or limitations imposed by the procedure. Deviations from individual SOPs will be documented in the laboratory records. Substantive modification to any SOP will be approved in advance by the Project QA Manager and RI Task Manager and communicated to the CPG Coordinator and to the USEPA Remedial Project Manager. The ultimate procedure employed will be documented in the report summarizing the results of the sampling event or field activity.

[c] Alpha spectrometry analysis optional depending on results of Pb-210 from gamma spectrometry analysis.

Notes:

CAS – Columbia Analytical Services, Inc.

QAPP Worksheet #24 (UFP-QAPP Manual Section 3.2.2) Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[a]
GC/MS (VOC)	Bromofluorobenzene (BFB) tune; Initial and Continuing Calibration as Required in SOP	Verify tuning every 12 hours; initial calibration after instrument set up, after major instrument changes and when continuing calibration criteria are not met.	Initial Calibration % relative standard deviation (RSD) ≤30% for CCCs; initial calibration (ICAL) % RSD ≤15% or linear curve r≥ 0.995, or quadratic curve $r^2 \geq 0.990$. Continuing calibration verification (CCV) %D ≤20% for CCCs; system performance check compounds (SPCC) minimum average Response factors (RF).	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-1
GC/MS (SVOC)	Decafluorotriphenylphosphine (DFTPP) tune; Initial and Continuing Calibration as required in SOP	Verify tune every 12 hours; Initial calibration after instrument set up, after major instrument changes and when continuing calibration criteria are not met.	Initial Calibration %RSD ≤30% for CCCs; ICAL %RSD ≤15% or linear curve r ≥ 0.995, or quadratic curve $r^2 \geq 0.990$. CCV %D ≤20% for CCCs; SPCC minimum avg. RF.	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-3
HRGC/LRMS-SIM (PAH)	DFTPP tune; Initial and Continuing Calibration as required in SOP	Verify tune every 12 hours; Initial calibration after instrument set up, after major maintenance, and/or instrument changes have occurred	Initial Calibration %RSD ≤30% CCV %D ≤30%.	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-6

QAPP Worksheet #24 (UFP-QAPP Manual Section 3.2.2) Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[a]
GC/ECD (Pesticides)	Column degradation mix (PE) before initial calibration and every 12 hours. Initial and continuing calibration as required in SOP.	Initial calibration after instrument set up, after major instrument changes and when continuing calibration criteria are not met. Continuing calibration daily or every 12 hours	Initial Calibration %RSD ≤ 20% or linear curve r≥ 0.995, or quadratic curve r^2 ≥0.990. CCV %D ≤ 25% Breakdown Mix: DDT and Endrin ≤ 15%	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-4
HRGC/HRMS (Pesticides)	Instrument tuning, initial and continuing calibration as required in SOP	Initial calibration after instrument set up, after major maintenance and/or instrument changes have occurred. Calibration verification minimum every 12 hours	RSD for mean relative response factors (RRF) calibrated by isotope dilution ≤ 20%; all other compounds ≤ 30%; initial calibration verification (ICV) ≤ 30% of true value	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-15
GC/ECD (PCB-Aroclors)	Initial and continuing calibration as required in SOP	Initial calibration after instrument set up, after major instrument changes and when continuing calibration criteria are not met. Continuing calibration daily or every 12 hours	Initial Calibration %RSD ≤ 20%. CCV ≤ 15% Drift.	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-12

QAPP Worksheet #24 (UFP-QAPP Manual Section 3.2.2) Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[a]
HRGC/HRMS (PCB Congeners)	Retention time calibration, initial calibration, continuing calibration as required in SOP	Initial calibration after instrument set up, after major instrument changes and when continuing calibration criteria are not met. Calibration verification minimum every 12 hours	Initial Calibration %RSD ≤ 20% for target analytes calculated by isotope dilution. %RSD ≤ 35% for target analytes calculated by internal standard. CCV ≤ 30% Drift for Toxics and LOC congeners CCV 40-160% for non-Toxic congeners.	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-7
GC/ECD (Herbicides)	Initial and continuing calibration as required in SOP.	Initial calibration after instrument set up, after major instrument changes and when continuing calibration criteria are not met. Calibration verification minimum every 12 hours	Initial Calibration %RSD ≤ 20%; ICV ± 20%; continuing calibration ± 15%; retention time windows ± 3x SD update daily	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-12
GC/FID (TPH)	Initial and continuing calibration as required in SOP	Initial calibration after instrument set up, after major instrument changes and when continuing calibration criteria are not met. Calibration verification every 10 samples	Initial Calibration %RSD ≤ 20%; continuing calibration ± 15%	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-13, L-14

QAPP Worksheet #24 (UFP-QAPP Manual Section 3.2.2) Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[a]
Isotope Dilution Mass Spectrometry (Dioxins/Furans)	Perfluorokerosene (PFK) Tune; initial and continuing calibration as required in SOP	Initial calibration after instrument set up, after major instrument changes and when continuing calibration criteria are not met. Continuing calibration minimum every 12 hours	%RSD for mean response of unlabeled standards ≤ 20%; labeled reference compounds ± 35% Continuing calibration per SOP Table 6	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-35
Germanium Spectroscopy Detector (Radionuclides)	Calibration procedures as outlined in GL-RAD-A-013 and GL-RAD-I-001, Rev. 12	Daily or with each use; count calibration spectrum, initial energy and shape calibration	Within limits defined in SOP	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-9, L-45
Alpha Spectroscopy Detector (Radionuclides)	Calibration procedures as outlined in GL-RAD –A-016 and GL-RAD-I-009, Rev. 9	Monthly energy and efficiency calibration Daily pulser checks	Within limits defined in SOP	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-10, L-46
ICP (Metals)	Initial and continuing calibration per SOP	Profile instrument; Cu/Mn ratio daily; blank, RL and high standard daily; ICS at start and every 8 hours; CCB, CCV every 10 samples	Copper/Manganese (Cu/Mn)ratio within 20% of value at time interelement corrections (IECs) determined. ICV, CCV ± 10% of true value; ICSAB ± 20% of true value	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-18
ICPMS (Metals)	Initial and continuing calibration per SOP	Intensity check, Cu/Mn ratio ; blank, RL and high standard daily; ICS at start and every 8 hours; CCB, CCV every 10 samples	Cu/Mn ratio within 20% of value at time IECs determined. ICV, CCV ± 10% of true value; ICSAB ± 20% of true value	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-19

QAPP Worksheet #24 (UFP-QAPP Manual Section 3.2.2) Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[a]
Cold Vapor Atomic Fluorescence Spectroscopy (CVAFS) (Mercury, Methyl Mercury)	Initial and continuing calibration per SOP	Calibrate daily with a minimum of 5 standards and ICV daily. CCV every 10 samples	ICV 80 -120% CCV 67 -133% (methyl mercury) CCV 77-123% (total mercury)	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-36, L-37
Ion Chromatograph (Hexavalent Chromium)	Initial and continuing calibration per SOP	Calibrate daily using a minimum of a blank and 3 standards; r ≥ 0.999; CCB, CCV every 10 samples	ICV, CCV ± 10% of true value	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-34
GC/FPD (Butyltins)	Initial and continuing calibration per SOP	External calibration prior to each use; continuing calibration every 10 injections or every 12 hours whichever is more frequent	ICV, CCV ± 25% of true value	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-21
UV-VIS (Sulfides, AVS)	Initial and continuing calibration per SOP	Allow spectrophotometer to warm up for 30 minutes. External calibration prior to each use; r ≥ 0.995; CCB, CCV every 10 samples	ICV, CCV ± 10% of true value	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-22, L-30
Rapid Flow Analyzer Colorimeter (Ammonia)	Initial and continuing calibration per SOP	Determine Linear Calibration range at initial calibration and verify at least every 6 months using a blank and 3 standards; r ≥ 0.995; CCB, CCV every 10 samples	Linearity check must be within ± 10% of original values; ICV, CCV ± 10% of true value	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-23

QAPP Worksheet #24 (UFP-QAPP Manual Section 3.2.2) Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[a]
Rapid Flow Analyzer Colorimeter (Cyanide)	Initial and continuing calibration per SOP	Determine Linear Calibration range at initial calibration and verify at least every 6 months using a blank and 3 standards; r ≥ 0.995; CCB, CCV every 10 samples	Linearity check must be within ± 10% of original values; ICV, CCV ± 10% of true value	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-25
Ion Selective Electrode (TKN)	Initial and continuing calibration per SOP	Calibrate daily, ICV, CCV every 10 samples	ICV, CCV ± 10% of true value	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-27
UV-VIS (Phosphorus)	Initial and continuing calibration per SOP	External calibration prior to each use; r ≥ 0.995; CCB, CCV every 10 samples	ICV, CCV ± 10% of true value	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-26
Induction Furnace (TOC)	Initial and continuing calibration per SOP	CCV each batch	CCV+/- 20% true value.	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-28
Analytical Balance (Grain Size, Percent Moisture)	Daily	Weigh and record NIST traceable standard weight in range of interest	± 5% of certified weight	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-31, L-40, L-43, L-48, L-49, L-50, L-51, L-52, L-53, L-54, L-55
Induction Furnace (TOC)	Initial and continuing calibration per SOP	CCV each batch	CCV+/- 20% true value.	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-28

QAPP Worksheet #24 (UFP-QAPP Manual Section 3.2.2) Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[a]
Analytical Balance (Grain Size, Percent Moisture)	Daily	Weigh and record NIST traceable standard weight in range of interest	± 5% of certified weight	Inspect system, correct problem, rerun calibration and affected samples	Analyst	L-31, L-40

[a] Refer to the Analytical SOP References table (Worksheet #23). All SOPs are contained in Appendix C.

QAPP Worksheet #25 (UFP-QAPP Manual Section 3.2.2) Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[a]
GC/MS (VOC)	Clean sources and quadrupole rods; maintain vacuum pumps	Tuning	Instrument performance and sensitivity	Service vacuum pumps twice per year; other maintenance as needed	See SOP	See SOP	Analyst or Section Supervisor	L-1
GC/MS (SVOC)	Clean sources and quadrupole rods; maintain vacuum pumps	Tuning	Instrument performance and sensitivity	Service vacuum pumps twice per year; other maintenance as needed	See SOP	See SOP	Analyst or Section Supervisor	L-3
HRGC/LRMS-SIM (PAH)	Clean sources and quadrupole rods; maintain vacuum pumps	Tuning	Instrument performance and sensitivity	Service vacuum pumps once per year; other maintenance as needed	See SOP	See SOP	Analyst or Section Supervisor	L-6
GC/ECD (Pesticides)	Change septa, clean injectors, change or trim columns, install new liners	Detector signals and chromatogram review	Instrument performance and sensitivity	As needed	See SOP	See SOP	Analyst or Section Supervisor	L-4
HRGC/HRMS (Pesticides)	Clean sources and quadrupole rods; maintain vacuum pumps	Tuning	Instrument performance and sensitivity	Service vacuum pumps twice per year; other maintenance as needed	See SOP	See SOP	Analyst or Section Supervisor	L-15
GC/ECD (PCB-Aroclors)	Change septa, clean injectors, change or trim columns, install new liners	Detector signals and chromatogram review	Instrument performance and sensitivity	As needed	See SOP	See SOP	Analyst or Section Supervisor	L-12

QAPP Worksheet #25 (UFP-QAPP Manual Section 3.2.2) Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[a]
HRGC/HRMS (PCB Congeners)	Clean sources; maintain vacuum pumps	Tuning	Instrument performance and sensitivity	Service vacuum pumps once per year; other maintenance as needed	See SOP	See SOP	Analyst or Section Supervisor	L-7
GC/ECD (Herbicides)	Change septa, clean injectors, change or trim columns, install new liners	Detector signals and chromatogram review	Instrument performance and sensitivity	Daily or as needed	See SOP	See SOP	Analyst or Section Supervisor	L-12
GC/FID (TPH)	Change septa, clean injectors, change or trim columns, install new liners	Detector signals and chromatogram review	Instrument performance and sensitivity	Daily or as needed	See SOP	See SOP	Analyst or Section Supervisor	L-13, L-14
Isotope Dilution Mass Spectrometry (Dioxins/Furans)	Clean sources and quadrupole rods; maintain vacuum pumps	Tuning	Instrument performance and sensitivity	Service vacuum pumps twice per year; other maintenance as needed	See SOP	See SOP	Analyst or Section Supervisor	L-35
Germanium Spectroscopy Detector (Radionuclides)	Check lead cave surrounding detector	Daily check source and Background check counts	Check for gaps in bricks surrounding detector and make sure bricks are aligned	Prior to use	See SOP	See SOP	Analyst or Section Supervisor	L-9, L-45

QAPP Worksheet #25 (UFP-QAPP Manual Section 3.2.2) Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[a]
Alpha Spectroscopy Detector (Radionuclides)	Background checks Recertification	Update detector background Recertification of rare-earth fluoride efficiency sources	Count blank planchets to update detector background Verify using reference solution	Weekly Annually	See SOP	See SOP	Analyst	L-10, L-46
ICP (Metals)	Replace disposables, flush lines	Cu/Mn ratio	Check connections	Daily or as needed	See SOP	See SOP	Analyst or Section Supervisor	L-18
ICPMS (Metals)	Replace disposables, flush lines	Cu/Mn ratio	Check connections	Daily or as needed	See SOP	See SOP	Analyst or Section Supervisor	L-19
CVAFS (Mercury, Methyl Mercury)	Replace disposables, flush lines	Sensitivity check	Check connections	Daily or as needed	See SOP	See SOP	Analyst or Section Supervisor	L-36, L-37
Ion Chromatograph (Hexavalent Chromium)	Replace columns as needed; check eluent and regenerant reservoirs	Analytical standards	Instrument performance and sensitivity	Daily or as needed	See SOP	See SOP	Analyst or Section Supervisor	L-34
GC/FPD (Butyltins)	Change septa, clean injectors, change or trim columns, install new liners	Detector signals and chromatogram review	Instrument performance and sensitivity	Daily or as needed	See SOP	See SOP	Analyst or Section Supervisor	L-21

QAPP Worksheet #25 (UFP-QAPP Manual Section 3.2.2) Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[a]
UV-VIS (Sulfides, AVS)	UV-VIS	Analytical standards	Instrument performance and sensitivity	Verify lamp is working	Daily or as needed	See SOP	Analyst or Section Supervisor	L-22, L-30
Rapid Flow Analyzer Colorimeter (Ammonia)	Replace disposables, flush lines	Analytical standards	Check connections	Daily or as needed	See SOP	See SOP	Analyst or Section Supervisor	L-23
Rapid Flow Analyzer (Cyanide)	Replace disposables, flush lines	Analytical standards	Check connections	Daily or as needed	See SOP	See SOP	Analyst or Section Supervisor	L-25
Ion Selective Electrode (TKN)	Replace membrane and filling solution; store electrode in ammonia solution	Verify standardization with solutions as required in SOP	Inspect membrane for signs of failure	Prior to use	See SOP	See SOP	Analyst or Section Supervisor	L-27
UV-VIS (Phosphorus)	UV-VIS	Analytical standards	Instrument performance and sensitivity	Verify lamp is working	Daily or as needed	See SOP	Analyst or Section Supervisor	L-26
Induction Furnace(TOC)	Replace disposables, clean quartz boat		Check connections	Daily or as needed	See SOP	See SOP	Analyst or Section Supervisor	L-28
Analytical Balance (Grain Size, Percent Moisture)	Clean balance after each use; service annually	NIST Traceable weights		Prior to every use	Measured weight within certified tolerance	Clean, verify zero on balance, reweigh; call for service	Analyst or Section Supervisor	L-31, L-40, L-43, L-48, L-49,L-50, L-51, L-52, L-53, L-54, L-55

[a] Refer to the Analytical SOP References table (Worksheet #23). All SOPs are contained in Appendix C.

QAPP Worksheet #26 (UFP-QAPP Manual Appendix A) Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): ENSR Field Team (see Worksheet 21 for a list of the sample collection methods)
Sample Packaging (Personnel/Organization): ENSR Field Team
Coordination of Shipment (Personnel/Organization): ENSR Field Team
Type of Shipment/Carrier: UPS or FedEx for overnight delivery or laboratory courier
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Assigned laboratory personnel (see Worksheet 30 for laboratories providing analytical services)
Sample Custody and Storage (Personnel/Organization): Assigned laboratory personnel (see Worksheet 30 for laboratories providing analytical services)
Sample Preparation (Personnel/Organization): Assigned laboratory personnel (see Worksheet 30 for laboratories providing analytical services)
Sample Determinative Analysis (Personnel/Organization): Assigned laboratory personnel (see Worksheet 30 for laboratories providing analytical services)
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): Samples will not be stored in the field but will be shipped to the designated laboratory the same day as collection or no later than the day after collection. If circumstances require that the samples be stored in the field, they will be maintained under the method-specified conditions (e.g., kept at 4±2° C).
Sample Extract/Digestate Storage (No. of days from extraction/digestion): Sample extraction and digestion holding times are summarized in Worksheet 19.
Biological Sample Storage (No. of days from sample collection): Sample storage time for biological tests is summarized in Worksheet 19.
SAMPLE DISPOSAL
Personnel/Organization: Assigned laboratory personnel (see Worksheet 30 for laboratories providing analytical services).
Number of Days from Analysis: Varies by laboratory; laboratory is required to give ENSR 30 days notice prior to intent to discard any project samples.

QAPP Worksheet #26 (UFP-QAPP Manual Appendix A) Sample Handling System

Sample Handling and Custody

Sample custody procedures ensure the timely, correct, and complete analysis of each samples for all parameters requested. A sample is considered to be in someone's custody if it:

- Is in his/her possession
- Is in his/her view, after being in his/her possession
- Is in his/her possession and has been placed in a secured location
- Is in a designated secure area

Sample custody documentation provides a written record of sample collection and analysis. The sample custody procedures require the specific identification of samples associated with an exact location and the recording of pertinent information associated with the sample, including time of collection and any preservation techniques, and a COC record which serves as physical evidence of sample custody. Custody procedures will be similar to the procedures outlined in USACE's *Requirements for the Preparation of Sampling and Analysis Plans* (USACE 2001) and the USEPA's *Contract Laboratory Program Guidance for Field Samplers* (USEPA 2007). The COC documentation system provides the means to individually identify, track, and monitor each sample from the time of collection through final data reporting. Sample custody procedures are developed for three areas: sample collection, laboratory analysis, and final evidence files, which are described in Worksheet 27 and SOP LPR-G-05.

Field Sample Handling and Custody

Field records provide a means of recording information for each field activity performed at the site. COC procedures document pertinent sampling data and all transfers of custody until the samples reach the analytical laboratory. The sample packaging and shipment procedures summarized in Worksheet 27 are designed to ensure that the samples arrive at the laboratory with the COC intact. Specific preservation procedures required for each analytical method are described in Worksheet 19.

QAPP Worksheet #27 (UFP-QAPP Manual Section 3.3.3) Sample Custody Requirements

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory): The field sample custody procedures including sample packing, shipment, and delivery requirements, are discussed in Worksheets 17 and 26. Sample management information is also provided in **SOPs LPR-G-05 and LPR-G-06.**

Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal): Each laboratory has a sample custodian who accepts custody of the samples and verifies that the information on the sample labels matches the information on the COC. The sample custodian will document any discrepancies, document sample condition upon receipt at the laboratory and will sign and date all appropriate receiving documents. Additional information on laboratory sample receiving procedures is provided in the text below this summary table.

Sample Identification Procedures: Each sample will be assigned a unique sample identification number using the Lower Passaic River Data Management System. This identification nomenclature will consist of an alphanumeric code that identifies the program, sample location (including depth interval if needed), and sample type.

Chain-of-Custody Procedures: A chain-of-custody will accompany all samples from the time of sampling through all custody transfers. Samples of the COC form and the Grab/Core Field Custody and Transfer Form are provided in LPR-G-05; the COC procedures are summarized below and in SOP LPR-G-05 provided in Appendix B

Chain of Custody Procedure

The COC form serves as an official communication to the laboratory detailing the specific analyses required for each sample. The COC record is prepared by the field sample custodian and accompanies samples from the time of sampling through all transfers of custody. The COC will be retained by the laboratory which analyzes and archives the samples. Three copies of the COC are created; one copy is retained in the field and two copies are sent to the laboratory.

Transfer of Custody and Shipment

Sample custody must be maintained form the time of sampling through shipment and receipt at the laboratory. The procedures for custody transfer are outlined in SOP LPR-G-05 (included in Appendix B).

QAPP Worksheet #27 (UFP-QAPP Manual Section 3.3.3) Sample Custody Requirements

Sample Packaging and Shipping Requirements

Sample custody must be maintained through shipment of samples to the contracted laboratory. All samples will be packaged and shipped at the end of each day unless other arrangements have been made with the laboratory. Samples will be delivered directly to the laboratory by sampling personnel or will be shipped using the procedures outlined in SOP LPR-G-6 (Appendix B).

Laboratory Custody Procedures

Each contracted laboratory will have a SOP that details the procedures used to document sample receipt and custody within the laboratory. The following procedures must be addressed in the laboratory custody SOP:

- Each laboratory must have a designated sample custodian who accepts custody of the samples at the time of delivery to the laboratory and verifies that the information on the sample labels matches the information on the COC. The sample custodian must sign and date all appropriate receiving documents and note any discrepancies in sample documentation as well as the condition of the samples at the time of receipt.
- Once the samples have been accepted by the laboratory, checked, and logged in, they must be maintained in accordance with laboratory custody and security requirements as outlined in the laboratory QMP.
- To ensure traceability of samples during the analytical process the laboratory will assign a sample ID number based on procedures outlined in the laboratory QMP or laboratory SOP.
- The following procedures, at a minimum, must be documented by the laboratory:
  - Sample extraction /preparation
  - Sample analysis
  - Data reduction
  - Data reporting
- Laboratory personnel are responsible for sample custody until the samples are returned to the sample custodian.
- When sample analysis and QC procedures are completed any remaining sample must be stored in accordance with contractual terms. A minimum of 30 days notice must be provided before disposal of any sample. Data sheets, custody documents and all other laboratory records must be retained in accordance with contractual agreements.

QAPP Worksheet #27 (UFP-QAPP Manual Section 3.3.3) Sample Custody Requirements

Final Evidence Files

Laboratory records including COCs and other sample receiving records, sample preparation and analysis records, and the final data package become part of the laboratory final evidence file and must be retained as required by the contractual agreement. An original copy of the data package and associated electronic deliverable must be provided to ENSR in accordance with the contractual agreement and will be retained by ENSR along with associated field records and other related correspondence.

Final evidence files as retained by ENSR will include, but not be limited to, correspondence (paper and email), plans, contractual documents, maps and drawings, field data, calculations, assessment reports, laboratory deliverables, progress and data reports. This information will be maintained in a secure area according to the procedures outlined in the Lower Passaic River Quality Management Plan (ENSR, 2007).

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	VOCs
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-1
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	TestAmerica (Knoxville)
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank, Equipment Rinsate Blank, and Trip Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team Trip Blank: 1 per cooler of VOC samples	No Target Compounds>QL; no common lab contaminants >5xQL.	If sufficient sample is available, reanalyze samples. Qualify data as needed. Report results if sample results >20x blank result or sample results ND.	Analyst/Section Supervisor	Accuracy/Bias-Contamination	No Target Compounds>QL; no common lab contaminants >5xQL.
Surrogates	Every sample	See Laboratory % Recovery Control Limits (RCLs) (Appendix C-2)	Check calculations and instrument performance; recalculate, reanalyze	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)
LCS	1/Batch (20 samples)	See Laboratory % RCLs (Appendix C-2)	If sufficient sample is available, reanalyze samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
MS/MSD	1/Batch (20 samples)	See Laboratory % RCLs/RPD Control Limits (Appendix C-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias-Precision	See Laboratory % Recovery/RPD Control Limits (Appendix C-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	SVOCs
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-2, L-3
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	TestAmerica (Knoxville)
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank and Equipment Rinsate Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team	No Target Compounds>QL; no common lab contaminants >5xQL.	If sufficient sample is available, reanalyze samples. Qualify data as needed. Report results if sample results >20x blank result or sample results ND.	Analyst/Section Supervisor	Accuracy/Bias-Contamination	No Target Compounds>QL; no common lab contaminants >5xQL.
Surrogates	Every sample	See Laboratory % RCLs (Appendix C-2)	Check calculations and instrument performance; recalculate, reanalyze	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)
LCS	1/Batch (20 samples)	See Laboratory % RCLs (Appendix C-2)	If sufficient sample is available, reanalyze samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLts (Appendix C-2)
MS/MSD	1/Batch (20 samples)	See Laboratory % RCLs/ RPD Control Limits (Appendix C-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias-Precision	See Laboratory % Recovery/ RPD Control Limits (Appendix C-2)

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	PAHs and Alkyl PAHs (HRGC/LRMS-SIM)
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-6
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	TestAmerica (Knoxville)
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank and Equipment Rinsate Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team	No Target Compounds>EML.	If sufficient sample is available, reanalyze samples. Qualify data as needed. Report results if sample results >20x blank result or sample results ND.	Analyst/Section Supervisor	Accuracy/Bias-Contamination	No Target Compounds>EML.
Pre-extraction Internal Standards	Every sample	See Laboratory % RCLs (Appendix C-2)	Check calculations. Ensure that instrument performance is acceptable. If signal/noise ratio is <10, reprepare and reanalyze sample. If signal/noise ratio is >10, flag the data	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)
LCS	1/Batch (20 samples)	See Laboratory % RCLs (Appendix C-2)	If sufficient sample is available, reanalyze samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
MS/MSD	1/Batch (20 samples)	See Laboratory % RCLs/ RPD Control Limits (Appendix C-2	Flag Data. Discuss in narrative..	Analyst/Section Supervisor	Accuracy/Bias-Precision	See Laboratory % RCLs (Appendix C-2
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	Organochlorine Pesticides (GC/ECD)
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-2, L-4, L-56
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	TestAmerica (Knoxville)
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank and Equipment Rinsate Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team	No Target Compounds>QL.	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Compounds>QL.
Surrogates	Every sample	See Laboratory % RCLs (Appendix C-2)	Check calculations and instrument performance; recalculate, reanalyze	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)
LCS	1/Batch (20 samples)	See Laboratory % RCLs (Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)
MS/MSD	1/Batch (20 samples)	See Laboratory % RCLs/RPD Control Limits (Appendix C-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias-Precision	See Laboratory % Recovery/RPD Control Limits (Appendix C-2)

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	Organochlorine Pesticides (HRGC/HRMS)
Concentration Level	Low
Sampling SOP	LPR-s-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-15
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	TestAmerica (West Sacramento)
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank and Equipment Rinsate Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team	No Target Compounds>QL.	1) Report results if sample results >10x blank result or sample results ND. 2) If results are <20x blank and if sufficient sample is available, re-extract and reanalyze samples. 3) If insufficient sample is available, reanalyze extracts. 4) Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias-Contamination	No Target Compounds>QL.
Instrument Blank	Once per 12 hours if method blank is not run	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed	Analyst/Section Supervisor	Accuracy/Bias-Contamination	No Target Compounds>QL.

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
OPR Sample (or LCS)	1/Batch (20 samples)	See Laboratory % RCLs (Appendix C-2)	1) Check calculations. 2) Reanalyze LCS. Repeated reanalysis is acceptable if the failure is attributed to instrument variability. 3) If repeated failures occur on consecutive LCS's for the same analyte, the cause of the failure will be investigated and corrected before any re-extraction is performed. 4) If sufficient sample is available, re-extract and reanalyze samples. 5) If insufficient sample is available, reanalyze extracts. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Labeled Isotope Dilution Internal Standards	Spiked into every sample and QC sample	. See Laboratory % RCLs (Appendix C-2)	Check all calculations for error; ensure that instrument performance is acceptable; recalculate the data and/or reanalyze the extract if either of the above checks reveals a problem. If S/N<10 for the quantitation ion, reprepare and reanalyze the sample. If S/N>10, flag the data.	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)
MS/MSD or MS/ Laboratory Duplicate	1/Batch (20 samples)	See Laboratory % RCLS/RPD Control Limits (Appendix C-2)	1) Review Internal Standards. 2) If %R or RPD exceeds limit, re-inject extract. 3) Narrate any outliers.	Analyst/Section Supervisor	Accuracy/Bias-Precision	See Laboratory % Recovery/RPD Control Limits (Appendix C-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	PCB Aroclors (GC/ECD)
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-12
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	TestAmerica (Knoxville)
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank and Equipment Rinsate Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Compounds>QL
Instrument Blank	Once per 12 hours if method blank is not run	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed	Analyst/Section Supervisor	Accuracy/Bias-Contamination	No Target Compounds>QL.
LCS	1 Per batch of 20 samples	See Laboratory % RCLs (Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)
MS/MSD	1/Batch (20 samples)	See Laboratory % RCLS/RPD Control Limits (Appendix C-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias-Precision	See Laboratory % Recovery/RPD Control Limits (Appendix C-2)

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	PCBs – Congeners (HRGC/HRMS)
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-7
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	TestAmerica (Knoxville)
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank and Equipment Rinsate Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team	No Target Compounds>EML	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Compounds>EML
Instrument Blank	Once per 12 hours if method blank is not run	No Target Compounds>EML	Reanalyze affected samples. Qualify data as needed	Analyst/Section Supervisor	Accuracy/Bias-Contamination	No Target Compounds>EML.
OPR Sample (or LCS)	1/Batch (20 samples)	See Laboratory % RCLs (Appendix C-2)	Reanalyze affected samples. Qualify data as needed	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Labeled Isotope Dilution Internal Standards	Spiked into every sample and QC sample.	See Laboratory % RCLs (Appendix C-2)	Check all calculations for error; ensure that instrument performance is acceptable; recalculate the data and/or reanalyze the extract if either of the above checks reveal a problem. If S/N<10 for the quantitation ion, reprepare and reanalyze the sample. If S/N>10, flag the data.	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)
MS/MSD or MS/ Laboratory Duplicate	1/Batch (20 samples)	See Laboratory % RCLS/RPD Control Limits (Appendix C-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias-Precision	See Laboratory % RCLS/RPD Control Limits (Appendix C-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	Herbicides (GC/ECD)
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-11, L-12
Field Sampling Organization	ENSR Field Staff
Analytical Organization	TestAmerica (Pittsburgh)
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank and Equipment Rinsate Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Compounds>QL
LCS	1/Batch (20 samples)	See Laboratory % RCLs (Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	RCLs (Appendix C-2)
MS/MSD	1/Batch (20 samples)	See Laboratory % RCLS/RPD Control Limits (Appendix C-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias-Precision	See Laboratory % Recovery/RPD Control Limits (Appendix C-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	TPH- Extractables (GC/FID)
Concentration Level	Low - High
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-13
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	TestAmerica (Edison)
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank and Equipment Rinsate Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Compounds>QL
Surrogates	Every sample	See Laboratory % RCLs (Appendix C-2)	Check calculations and instrument performance; recalculate, reanalyze	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)
LCS	1/Batch (20 samples)	See Laboratory % RCLs (Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)
MS/MSD	1/Batch (20 samples)	See Laboratory % RCLS/RPD Control Limits (Appendix C-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias-Precision	See Laboratory % Recovery/RPD Control Limits (Appendix C-2)

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	TPH-Purgeables (GC/FID)
Concentration Level	Low - High
Sampling SOP	LPR-S-01
Analytical Method/ SOP Reference	L-14
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	TestAmerica (Edison)
Number of Sample Locations	13

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank, Equipment Rinsate Blank, and Trip Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team Trip Blank : 1 per cooler of TPH-purgeable samples	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Compounds>QL
Surrogates	Every sample	See Laboratory % RCLs (Appendix C-2)	Check calculations and instrument performance; recalculate, reanalyze	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)
LCS	1/Batch (20 samples)	See Laboratory % RCLs (Appendix C-2	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLts (Appendix C-2

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
MS/MSD	1/Batch (20 samples)	See Laboratory % RCLs/RPD Control Limits (Appendix C-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias-Precision	See Laboratory % Recovery/RPD Control Limits (Appendix C-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	Dioxins/Furans (Isotope Dilution Mass Spectrometry)
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-35
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	Columbia Analytical Services (Houston)
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank and Equipment Rinsate Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias-Contamination	No Target Compounds>QL
Labeled Compounds	1/Batch (20 samples)	See Laboratory % RCLs (Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)
LCS or QC Standard	1/Batch (20 samples)	See Laboratory % RCLs (Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)
MS/MSD	1/Batch (20 samples)	See Laboratory % RCLs (Appendix C-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias-Precision	See Laboratory % RCLs (Appendix C-2)

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	Radiochemistry (Be-7, Cs-137, Pb-210[c], K-40)
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-9, L-10, L-45, L-46
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	GEL Laboratories, LLC, Charleston, SC
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per batch or 1 per 20 samples, whichever is more frequent	No Target Analyte>QL	Recount blank or re-analyze batch	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Analyte>QL
LCS	1 per batch or 1 per 20 samples, whichever is more frequent	75 -125%	Recount LCS or re-analyze batch	Analyst/Section Supervisor	Accuracy/Bias	75% - 125%
MS[a]	1 per batch or 1 per 20 samples, whichever is more frequent	75-125%	Recount MS or re-analyze batch	Analyst/Section Supervisor	Accuracy/Bias	75% - 125%
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Combine Standard Uncertainty[b]	All results	≤30%	Recount to a maximum of 1000 minutes or increase sample size	Analyst/Section Supervisor	Accuracy/Bias	≤30%

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Duplicate	1 per batch or 1 per 20 samples, whichever is more frequent	RPD ≤20%, if both samples >5x QL	Recount or re-analyze Sample & Duplicate	Analyst/Section Supervisor	Precision	RPD ≤20%, if both samples > 5x QL
Tracer[a]	1 per batch or 1 per 20 samples, whichever is more frequent	50 - 120%	RE, if still out then re-prep and re-analyze	Analyst/Section Supervisor	Accuracy/Bias	50 - 120%

[a] Applicable to alpha spectrometry analysis only.
[b] Combined standard uncertainty is the 2-sigma expanded measurement uncertainty.
[C] Lead 210 will be determined as polonium-210 and radium-226.

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	Metals: ICP/AES 6010B
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-16, L-18
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	Columbia Analytical Services (Kelso)
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank and Equipment Rinsate Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section	Accuracy/Bias Contamination	No Target Compounds>QL
LCS or QC Standard	1/Batch (20 samples)	See Laboratory % RCLs (Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)
Laboratory Duplicates	1/Batch (20 samples)	RPD 30%	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD 30%
MS	1/Batch (20 samples)	See Laboratory % RCLs (Appendix C-2)	Flag Data. Discuss in narrative.	Analyst/Section	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1/20 field samples	RPD ≤ 35% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 35% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	Metals: ICP/MS
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-16, L-19
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	Columbia Analytical Services (Kelso)
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank and Equipment Rinsate Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section	Contamination	No Target Compounds>QL
LCS or QC Standard	1/Batch (20 samples)	See Laboratory % RCLs (Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)
Laboratory Duplicates	1/Batch (20 samples)	RPD 20%	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD 20%
MS	1/Batch (20 samples)	See Laboratory % RCLs (Appendix C-2)	Flag Data. Discuss in narrative.	Analyst/Section	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1/20 field samples	RPD ≤ 35% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 35% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	Metals: Mercury, Low Level Mercury
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-36
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	Brooks Rand, LLC
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1/Batch (20 samples);	Average MB <2x MDL and standard deviation <0.67x MDL or <0.1x the concentration of project samples	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Contamination	Average MB <2x MDL and standard deviation <0.67x MDL or <0.1x the concentration of project samples
Equipment Rinsate Blank	1 per week per sampling team	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section	Contamination	No Target Compounds>QL
LCS	1/batch	80 -120%	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	80 -120% of expected value
CRM	1/Batch (10 samples)	Within 25% of certified value	Reanalyze affected samples. Qualify data as needed.	Analyst/Section	Accuracy/Bias	Within 25% of certified value
Laboratory Duplicates	1/Batch (10 samples)	RPD 30% (or ±2x the QL if result is ≤5x the QL)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD 30% (or ±2x the QL if result is ≤5x the QL)
MS/MSD	1/Batch (10 samples)	70-130% R ≤30% RPD	Flag Data. Discuss in narrative.	Analyst/Section	Accuracy/Bias-Precision	70-130% R 30 RPD

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	Metals: Methyl Mercury
Concentration Level	Low
Sampling SOP	LPR-S-01
Analytical Method/ SOP Reference	L-36
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	Brooks Rand, LLC
Number of Sample Locations	13

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	Minimum of four method blanks with each batch (10 samples)	Average MB ≤0.45 ng/L and standard deviation <0.15 ng/L or <0.1x the concentration of project samples	Reanalyze affected samples. Qualify data as needed.	Analyst/Section	Contamination	Average MB ≤0.45 ng/L and standard deviation <0.15 ng/L or <0.1x the concentration of project samples
Equipment Rinsate Blank	1 per week per sampling team	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section	Contamination	No Target Compounds>QL
CRM	1/Batch (10 samples)	Within 35% of certified value	Reanalyze affected samples. Qualify data as needed.	Analyst/Section	Accuracy/Bias	Within 35% of certified value
Laboratory Duplicates	1/Batch (10 samples)	RPD 35% (or ±QL if result is ≤5x the QL)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD 35% (or ± QL if result is ≤5x the QL)
MS/MSD	1/Batch (10 samples)	65-135% R ≤35% RPD	Flag Data. Discuss in narrative.	Analyst/Section	Accuracy/Bias-Precision	60-135% R 35 RPD

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	Hexavalent Chromium (Ion Chromatography)
Concentration Level	Low
Sampling SOP	LPR-S-01
Analytical Method/ SOP Reference	L-34
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	Columbia Analytical Services (Rochester)
Number of Sample Locations	13

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank andEquipment Rinsate Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section	Accuracy/Bias Contamination	No Target Compounds>QL
LCS	1/Batch (20 samples)	80-120%	Reanalyze affected samples. Qualify data as needed.	Analyst/Section	Accuracy/Bias	80 – 120%
Laboratory Duplicates	1/Batch (20 samples)	RPD 20%	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD 20%
MS/MSD	1/Batch (20 samples)	75 -125% RPD 20%	Flag Data. Discuss in narrative.	Analyst/Section	Accuracy/Bias	75 – 125% RPD 20%
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	Butyltins
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-20, L-21
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	Columbia Analytical Services (Kelso)
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank and Equipment Rinsate Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Compounds>QL
LCS	1/Batch (20 samples)	See Laboratory % RCLs (Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	See Laboratory % RCLs (Appendix C-2)
MS/MSD	1/Batch (20 samples)	See Laboratory % RCLS/RPD Control Limits (Appendix C-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias-Precision	See Laboratory % RCLs/RPD Control Limits (Appendix C-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	General Chemistry - Sulfides
Concentration Level	Low -High
Sampling SOP	LPR-S-01
Analytical Method/ SOP Reference	L-30
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	Columbia Analytical Services (Kelso)
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank and Equipment Rinsate Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Compounds>QL
LCS	1/Batch (20 samples)	51-125% (see Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	51-125% (see Appendix C-2)
Laboratory Duplicates	1/Batch (20 samples)	RPD ≤ 43% (see Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD ≤ 43% (see Appendix C-2)
MS	1/Batch (20 samples)	46-144% (see Appendix C-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias	46-144% (see Appendix C-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	General Chemistry – AVS/SEM
Concentration Level	Low
Sampling SOP	LPR-S-01
Analytical Method/ SOP Reference	L-22
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	Columbia Analytical Services (Kelso)
Number of Sample Locations	13

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	Method Blank - 1/Batch (20 samples);	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Compounds>QL
LCS	1/Batch (20 samples)	62-109%% for sulfide; See Laboratory % RCLs for metals (Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	62-109% for sulfide; See Laboratory % RCLs for metals (Appendix C-2)
Laboratory Duplicates	1/Batch (20 samples)	RPD≤ 45% for sulfide; RPD ≤ 30% for metals	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD 45% for sulfide; RPD 30% for metals
MS	1/Batch (20 samples)	66-117% for sulfide; See Laboratory % RCLs for metals (Appendix C-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias	66-117% for sulfide; See Laboratory % RCLs for metals (Appendix C-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	General Chemistry – Ammonia -N
Concentration Level	Low
Sampling SOP	LPR-S-01
Analytical Method/ SOP Reference	L-23
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	Columbia Analytical Services (Kelso)
Number of Sample Locations	13

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank and Equipment Rinsate Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Compounds>QL
LCS	1/Batch (20 samples)	58-131% (see Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	58-131% (see Appendix C-2)
Laboratory Duplicates	1/Batch (20 samples)	RPD 32% (see Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD 32% (see Appendix C-2)
MS	1/Batch (20 samples)	66-127% (see Appendix C-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias	66-127% (see Appendix C-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	General Chemistry - Cyanide
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-25
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	Columbia Analytical Services (Kelso)
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank and Equipment Rinsate Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Compounds>QL
LCS	1/Batch (20 samples)	85-115% (see Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	85-115% (see Appendix C-2)
Laboratory Duplicates	1/Batch (20 samples)	RPD 20% (see Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD 20% (see Appendix C-2)
MS	1/Batch (20 samples)	75-125% (see Appendix C-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias	75-125% (see Appendix C-2)

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	General Chemistry - TKN
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-27
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	Columbia Analytical Services (Kelso)
Number of Sample Locations	13

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank and Equipment Rinsate Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Compounds>QL
LCS	1/Batch (20 samples)	70-108% (see Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	70-108% (see Appendix C-2)
Laboratory Duplicates	1/Batch (20 samples)	RPD 20% (see Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD 20% (see Appendix C-2)
MS	1/Batch (20 samples)	38-138% (see Appendix C-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias	38-138% (see Appendix C-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	General Chemistry - Phosphorus
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-26
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	Columbia Analytical Services (Kelso)
Number of Sample Locations	13

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank and Equipment Rinsate Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Compounds>QL
LCS	1/Batch (20 samples)	85-115% (see Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	85-115% (see Appendix C-2)
Laboratory Duplicates	1/Batch (20 samples)	RPD 20% (see Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD 20% (see Appendix C-2)
MS	1/Batch (20 samples)	75-125% (see Appendix C-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias	75-125% (see Appendix C-2)

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	General Chemistry – TOC
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-28
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	Columbia Analytical Services (Kelso)
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank and Equipment Rinsate Blank	Method Blank - 1/Batch (20 samples); Equipment Rinsate Blank: 1 per week per sampling team	No Target Compounds>QL	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias Contamination	No Target Compounds>QL
LCS	1/Batch (20 samples)	74-123% (see Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Accuracy/Bias	74-123% (see Appendix C-2)
Laboratory Duplicates	1/Batch (20 samples)	RPD 27% (see Appendix C-2)	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD 27% (see Appendix C-2)
MS	1/Batch (20 samples)	75-114% (see Appendix C-2)	Flag Data. Discuss in narrative.	Analyst/Section Supervisor	Accuracy/Bias	75-114% (see Appendix C-2)
Field Duplicate	1/20 field samples	RPD ≤ 50% if both samples are > 5x QL	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50% if both samples are >5x QL
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	Physical Testing – Grain Size Analysis
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-31
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	Columbia Analytical Services (Kelso)
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	N/A	N/A	N/A	N/A	N/A	N/A
LCS	N/A	N/A	N/A	N/A	N/A	N/A
Laboratory Duplicates	1 Per batch of 20 samples	RPD ≤ 20%	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD ≤20%
Field Duplicate	1/20 field samples	RPD ≤ 50%	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50%
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

N/A – Not applicable to this analysis.

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	Physical Testing – Atterberg Limits
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-32
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	Columbia Analytical Services (Kelso)
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	N/A	N/A	N/A	N/A	N/A	N/A
LCS	N/A	N/A	N/A	N/A	N/A	N/A
Laboratory Duplicates	1 Per batch of 20 samples	1% Absolute	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	1% Absolute
Field Duplicate	1/20 field samples	RPD ≤ 50%	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50%
Performance Evaluation Sample	N/A	N/A	N/A	N/A	N/A	N/A

N/A – Not applicable to this analysis.

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	Physical Testing – Specific Gravity
Concentration Level	Low
Sampling SOP	LPR-S-01, LPR-S-02, LPR-S-03, LPR-S-04
Analytical Method/ SOP Reference	L-33
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	Columbia Analytical Services (Kelso)
Number of Sample Locations	115

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	N/A	N/A	N/A	N/A	N/A	N/A
LCS	N/A	N/A	N/A	N/A	N/A	N/A
Laboratory Duplicates	1 Per batch of 20 samples	RPD ≤ 20%	Reanalyze affected samples. Qualify data as needed.	Analyst/Section Supervisor	Precision	RPD ≤ 20%
Field Duplicate	1/20 field samples	RPD ≤ 50%	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50%
Performance Evaluation Sample	N/A	N/A	N/A	N/A	N/A	N/A

N/A – Not applicable to this analysis.

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	Biological –*E Coli*
Concentration Level	Low -High
Sampling SOP	LPR-S-01
Analytical Method/ SOP Reference	L-38, L-38a
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	Analytical Services, Inc.
Number of Sample Locations	13

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per batch of 20 samples	No color, no fluorescence	Reanalyze associated samples, dependent upon extent of holding time exceedance	Analyst or Section Supervisor	Accuracy Contamination	No color, no fluorescence
LCS	1 per batch of 20 samples	Yellow color with fluorescence	Reanalyze associated sample, dependent upon extent of holding time exceedance	Analyst or Section Supervisor	Accuracy/Bias	Within established control limits
Performance Evaluation Sample	1	Supplier Certified Limits	Provide feedback to lab/lab reviews data	ENSR Chemists/ Laboratory Staff	Accuracy/Bias	Supplier Certified Limits

QAPP Worksheet #28 (UFP-QAPP Manual Section 3.4) QC Samples Table

Matrix	Sediment
Analytical Group	Biological –Giardia
Concentration Level	Low -High
Sampling SOP	LPR-S-01
Analytical Method/ SOP Reference	L-39, L-39a
Sampler's Name	ENSR Field Staff
Field Sampling Organization	ENSR
Analytical Organization	Analytical Services, Inc.
Number of Sample Locations	13

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per batch of 20 samples	Negative	Reanalyze associated samples, dependent upon extent of holding time exceedance	Analyst or Section Supervisor	Accuracy Contamination	Negative results
LCS	1 per batch of 20 samples	14 -100%	Reanalyze associated samples, dependent upon extent of holding time exceedance	Analyst or Section Supervisor	Accuracy/Bias	Within control limits
Laboratory Duplicate	1 per batch of 20 samples	±30%	Reanalyze associated samples, dependent upon extent of holding time exceedance	Analyst or Section Supervisor	Precision	Within control limits
Field Duplicate	1/20 field samples	RPD ≤ 50%	Evaluate during data validation. Qualify data.	ENSR Data Validators	Precision	RPD ≤ 50%
Performance Evaluation Sample	N/A	N/A	N/A	N/A	N/A	N/A

QAPP Worksheet #29 (UFP-QAPP Manual Section 3.5.1) Project Documents and Records Table

Sample Collection Documents and Records	On-site Analysis Documents and Records	Off-site Analysis Documents and Records	Data Assessment Documents and Records	Other
Field notes, field data sheets, field logbooks	Field notes, field data sheets, field logbooks	Custody records and copies of airbills	Reports of field sampling audits	Progress reports
Custody records and airbills	Field instrument calibration records	Analytical data packages and EDDs	Reports of laboratory audits	Final report - Prepared and submitted to clients and USEPA.
Communication logs, records or copies of pertinent e-mails	Field measurement data	Communication logs	Validation reports	
QAPP/FSP Addendum and HASP	QAPP/FSP Addendum and HASP	Laboratory notebooks and bench sheets documenting sample preparation and analysis	QA reports to management	
Correction action reports and results	Correction action reports and results	Instrument maintenance and calibration records, standard preparation and traceability records	Correction action reports and results	
Documentation of field modifications	Documentation of field modifications	Laboratory SOPs and documentation of method modifications	Internal laboratory assessments, including internal audits, third-party audit reports, and PE results	
Daily Acitivity Log	Dail Activity Log	Corrective action logs and documentation of corrective action results	Results of pre-analysis PE samples	

QAPP Worksheet #29 (UFP-QAPP Manual Section 3.5.1) Project Documents and Records Table

This section describes the project data management process tracing the data from their generation through final use and/or storage. All project data, communications, and other information must be documented in a format useable to project personnel.

Project Document Control System

Project documents are controlled by ENSR's Project Document Control Manager who will maintain and manage hardcopies and electronic copies of all project related documents according to the Lower Passaic River Quality Management Plan (ENSR, 2007). Electronic copies of all information relating to this project are maintained on the project network files which are backed up at least once per day; access to these files is limited to authorized project personnel. All project data and information must be documented in a standard format which is usable by all project personnel.

Data Recording

Data generated during this project will be captured electronically or entered by hand into bound field or laboratory logbooks or preprinted forms (refer to SOP LPR-G-01 in Appendix B). Computer generated laboratory data will be managed using the laboratory information management system (LIMS); the LIMS used by subcontracted laboratories are described in their QA documentation.

Data Quality Assurance Procedures

ENSR will monitor the progress of sample collection to verify that samples are collected as planned. The progress of sample collection and processing will be monitored through the documentation of samples collected and shipped each day. The participating laboratories must maintain a formal QA Plan to which they adhere and which addresses all data generating aspects of daily operations. A policy of continuous improvement will allow all data generation processes to be reviewed and modified as needed to meet project objectives. Periodic audits of field and laboratory operations will ensure that data collection, documentation and QC procedures are being followed.

Laboratory Data Transmittal

Laboratory data are managed by the laboratory's LIMS beginning with the sample receiving process. Laboratories are required to provide validated data reports (sample results, QC summary information, and supporting raw data) including EDDs within the turnaround times specified in Worksheet #30. EDDs will be provided in an Earthsoft EQuIS® four-file format (modified by ENSR), using reference file tables provided by ENSR. All EDDs will be checked prior to transmittal to ENSR using current versions of Earthsoft's Electronic Data Processor (EDP).

QAPP Worksheet #29 (UFP-QAPP Manual Section 3.5.1) Project Documents and Records Table

Data Storage and Retrieval

Completed forms, logbooks, photographs, data packages, and electronic files will be transmitted regularly to the Project Document Control Manager. Each laboratory will maintain copies of all documents it generates as well as backup files of all electronic data relating to the analysis of samples. Raw data and electronic files of all field samples, QC analyses and blanks must be archived from the date of generation and maintained by each laboratory in accordance with the terms of the contract between ENSR and the laboratory. Project closeout will be conducted in accordance with contractual guidance. As required by the Settlement Agreement all data and other project records will be made available to USEPA.

Data transfer to USEPA will include a Multi-media Electronic Data Deliverable (MEDD) that conforms to the 2007 EPA Region 2 MEDD format. The MEDD will include all qualified and rejected data (including the reported, numerical value for rejected data).

QAPP Worksheet #30 (UFP-QAPP Manual Section 3.5.2.3) Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Locations/ ID Number	Analytical SOP	Data Package Turnaround Time[a]	Laboratory/ Organization	Backup Laboratory/ Organization)
Sediment	VOCs	Low	All	L-1	30 days	Test America 5815 Middlebrook Pike Knoxville, TN 37921 John Reynolds 865.291.3000	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222
Sediment	SVOCs	Low	All	L-2, L-3	30 days	Test America 5815 Middlebrook Pike Knoxville, TN 37921 John Reynolds 865.291.3000	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222
Sediment	PAHs – HRGC/LRMS SIM	Low	All	L-6	35-56 days	Test America 5815 Middlebrook Pike Knoxville, TN 37921 John Reynolds 865.291.3000	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222
Sediment	Organochlorine Pesticides (GC/ECD)	Low	All	L-2, L-4	45 days	Test America 5815 Middlebrook Pike Knoxville, TN 37921 John Reynolds 865.291.3000	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222
Sediment	Organochlorine Pesticides (HRGC/HRMS)	Low	All	L-15	45 days	Test America 880 Riverside Parkway West Sacramento, CA 95605 David Alltucker 865.291.3000	N/A

QAPP Worksheet #30 (UFP-QAPP Manual Section 3.5.2.3) Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Locations/ ID Number	Analytical SOP	Data Package Turnaround Time[a]	Laboratory/ Organization	Backup Laboratory/ Organization)
Sediment	PCBs (Aroclors)	Low	All	L-12	30 days	Test America 301 Alpha Drive Pittsburgh, PA 15238 Chris Kovitch 412.963.7058	Columbia Analytical Services (CAS) 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222
Sediment	PCBs (Homologs and Congeners)	Low	All	L-7	45-84 days	Test America 5815 Middlebrook Pike Knoxville, TN 37921 John Reynolds 865.291.3000	CAS 19408 Park Row Suite 320 Houston, TX 77084 Jane Freemyer 713.266.1599
Sediment	Herbicides	Low	All	L-11, L-12	45 days	Test America 301 Alpha Drive Pittsburgh, PA 15238 Chris Kovitch 412.963.7058	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222
Sediment	TPH –Purgeables	Low	2008-CLRC-001 2008-CLRC-007 2008-CLRC-021 2008-CLCR-026 2008-CLCR-034 2008-CLRC-040 2008-CLRC-045 2008-CLRC-055 2008-CLRC-067 2008-CLRC-073 2008-CLRC-082 2008-CLRC-088 2008-CLRC-100	L-14	30 days	Test America 777 New Durham Road. Edison, NJ 08817 Jamie Capaci 732.549.3900	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222

QAPP Worksheet #30 (UFP-QAPP Manual Section 3.5.2.3) Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Locations/ ID Number	Analytical SOP	Data Package Turnaround Time[a]	Laboratory/ Organization	Backup Laboratory/ Organization)
Sediment	TPH – Extractables	Low	All	L-13	30 days	Test America 777 New Durham Road. Edison, NJ 08817 Jamie Capaci 732.549.3900	Test America 30 Community Drive, Suite 11 South Burlington, VT 05403 John Reynolds 865.291.3000
Sediment	Dioxins/Furans	Low	All	L-35	45 days	CAS 19408 Park Row Suite 320 Houston, TX 77084 Jane Freemyer 713.266.1599	Test America 5815 Middlebrook Pike Knoxville, TN 37921 John Reynolds 865.291.3000
Sediment	Radiochemistry (Be-7, Cs-137, Pb-210, K-40)	Low	All	L-9, L-10, L-45, L-46	45 days	GEL Laboratories, LLC 2040 Savage Road Charleston, SC29407 Edith Kent 843.769.7385 x 4453	Test America 2800 George Washington Way Richland, WA 99352 Ken Miller 509.375.3131
Sediment	Metals	Low	All	L-16, L-17, L-18, L-19	30 days	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222	Brooks Rand, LLC 3958 6th Ave. NW Seattle, WA 98107 Misty Kennard-Mayer 206-632-6206
Sediment	Low Level Mercury	Low - High	All	L-36	30 days	Brooks Rand, LLC 3958 6th Ave. NW Seattle, WA 98107 Misty Kennard-Mayer 206-632-6206	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222

QAPP Worksheet #30 (UFP-QAPP Manual Section 3.5.2.3) Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Locations/ ID Number	Analytical SOP	Data Package Turnaround Time[a]	Laboratory/ Organization	Backup Laboratory/ Organization)
Sediment	Methyl Mercury	Low	2008-CLRC-001 2008-CLRC-007 2008-CLRC-021 2008-CLCR-026 2008-CLCR-034 2008-CLRC-040 2008-CLRC-045 2008-CLRC-055 2008-CLRC-067 2008-CLRC-073 2008-CLRC-082 2008-CLRC-088 2008-CLRC-100	L-37	30 days	Brooks Rand, LLC3958 6th Ave. NW Seattle, WA 98107 Misty Kennard-Mayer 206-632-6206	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222
Sediment	Hexavalent Chromium	Low	2008-CLRC-001 2008-CLRC-007 2008-CLRC-021 2008-CLCR-026 2008-CLCR-034 2008-CLRC-040 2008-CLRC-045 2008-CLRC-055 2008-CLRC-067 2008-CLRC-073 2008-CLRC-082 2008-CLRC-088 2008-CLRC-100	L-34	30 Days	CAS 1 Mustard St. Suite 250 Rochester, NY 14609 Janice Jaeger 585.288.5380	Test America 777 New Durham Road. Edison, NJ 08817 Jamie Capaci 732.549.3900

QAPP Worksheet #30 (UFP-QAPP Manual Section 3.5.2.3) Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Locations/ ID Number	Analytical SOP	Data Package Turnaround Time[a]	Laboratory/ Organization	Backup Laboratory/ Organization)
Sediment	Butyltins	Low	All	L-20, L-21	30 days	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222	Test America 30 Community Drive, Suite 11 South Burlington, VT 05403 John Reynolds 865.291.3000
Sediment	AVS/SEM	Low	2008-CLRC-001 2008-CLRC-007 2008-CLRC-021 2008-CLCR-026 2008-CLCR-034 2008-CLRC-040 2008-CLRC-045 2008-CLRC-055 2008-CLRC-067 2008-CLRC-073 2008-CLRC-082 2008-CLRC-088 2008-CLRC-100	L-22	30 days	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222	Test America 301 Alpha Drive RIDC Park Pittsburgh, PA 15238 Chris Kovitch 412.963.7058

QAPP Worksheet #30 (UFP-QAPP Manual Section 3.5.2.3) Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Locations/ ID Number	Analytical SOP	Data Package Turnaround Time[a]	Laboratory/ Organization	Backup Laboratory/ Organization)
Sediment	Ammonia-N	Low	2008-CLRC-001 2008-CLRC-007 2008-CLRC-021 2008-CLCR-026 2008-CLCR-034 2008-CLRC-040 2008-CLRC-045 2008-CLRC-055 2008-CLRC-067 2008-CLRC-073 2008-CLRC-082 2008-CLRC-088 2008-CLRC-100	L-23	30 days	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222	Test America 4101 Shuffel St. NW North Canton, OH 44720 John Reynolds 865.291.3000
Sediment	Cyanide	Low	All	L-24, L-25	30 days	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222	Test America 4101 Shuffel St. NW North Canton, OH 44720 John Reynolds 865.291.3000
Sediment	TKN	Low	2008-CLRC-001 2008-CLRC-007 2008-CLRC-021 2008-CLCR-026 2008-CLCR-034 2008-CLRC-040 2008-CLRC-045 2008-CLRC-055 2008-CLRC-067 2008-CLRC-073 2008-CLRC-082 2008-CLRC-088 2008-CLRC-100	L-27	30 days	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222	Test America 4101 Shuffel Dr. NW North Canton, OH 44720 John Reynolds 865.291.3000

QAPP Worksheet #30 (UFP-QAPP Manual Section 3.5.2.3) Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Locations/ ID Number	Analytical SOP	Data Package Turnaround Time[a]	Laboratory/ Organization	Backup Laboratory/ Organization)
Sediment	Total Phosphorus	Low	2008-CLRC-001 2008-CLRC-007 2008-CLRC-021 2008-CLCR-026 2008-CLCR-034 2008-CLRC-040 2008-CLRC-045 2008-CLRC-055 2008-CLRC-067 2008-CLRC-073 2008-CLRC-082 2008-CLRC-088 2008-CLRC-100	L-26	30 days	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222	Test America 4101 Shuffel Dr. NW North Canton, OH 44720 John Reynolds 865.291.3000
Sediment	TOC	Low	All	L-28	30 days	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222	Test America 301 Alpha Drive RIDC Park Pittsburgh, PA 15238 Chris Kovitch 412.963.7058
Sediment	Total Sulfide	Low	All	L-30	30 days	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222	Test America 301 Alpha Drive Pittsburgh, PA 15238 Chris Kovitch 412.963.7058
Sediment	Grain Size	N/A	All	L-31	30 days	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222	Test America 30 Community Drive, Suite 11 South Burlington, VT 05403 John Reynolds 865.291.3000

QAPP Worksheet #30 (UFP-QAPP Manual Section 3.5.2.3) Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Locations/ ID Number	Analytical SOP	Data Package Turnaround Time[a]	Laboratory/ Organization	Backup Laboratory/ Organization)
Sediment	Atterberg Limits	N/A	All	L-32	30 days	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222	Test America 30 Community Drive, Suite 11 South Burlington, VT 05403 John Reynolds 865.291.3000
Sediment	Specific Gravity	N/A	All	L-33	30 days	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222	Test America 30 Community Drive, Suite 11 South Burlington, VT 05403 John Reynolds 865.291.3000
Sediment	*E. Coli*	Low - High	2008-CLRC-001 2008-CLRC-007 2008-CLRC-021 2008-CLCR-026 2008-CLCR-034 2008-CLRC-040 2008-CLRC-045 2008-CLRC-055 2008-CLRC-067 2008-CLRC-073 2008-CLRC-082 2008-CLRC-088 2008-CLRC-100	L-38	30 days	Analytical Services, Inc. 130 Allen Brook Lane Williston, VT 05495 Paul Warden 800.723.4432	CAS 1317 South 13th Ave. Kelso, WA 98626 Ed Wallace 360.577.7222

QAPP Worksheet #30 (UFP-QAPP Manual Section 3.5.2.3) Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Locations/ ID Number	Analytical SOP	Data Package Turnaround Time[a]	Laboratory/ Organization	Backup Laboratory/ Organization)
Sediment	Giardia	Low-High	2008-CLRC-001 2008-CLRC-007 2008-CLRC-021 2008-CLCR-026 2008-CLCR-034 2008-CLRC-040 2008-CLRC-045 2008-CLRC-055 2008-CLRC-067 2008-CLRC-073 2008-CLRC-082 2008-CLRC-088 2008-CLRC-100	L-39	30 Days	Analytical Services, Inc. 130 Allen Brook Lane Williston, VT 05495 Paul Warden 800.723.4432	N/A

[a] Turnaround time is in calendar days from receipt of the last sample in the data package sample delivery group.

QAPP Worksheet #31 (UFP-QAPP Manual Section 4.1.1) Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment	Person(s) Responsible for Responding to Assessment Findings	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA)	Person(s) Responsible for Monitoring Effectiveness of CA
Safety Audit	Once, during the first week of field work	Internal	ENSR	ENSR Regional EHS Manager	ENSR RI FTM, SSO, and RI Task Manager	ENSR RI FTM, SSO and RI Task Manager	ENSR Regional EHS Manager
Technical Audit of Field Activities	Once during the first few days of field operations; follow-up audits as necessary	Internal	ENSR	ENSR Project QA Manager	ENSR On-Site Coordinator, RI FTM and RI Task Manager	ENSR On-Site Coordinator, RI FTM and RI Task Manager	ENSR Project QA Manager
Internal Lab Audits	Per laboratory QA Manual; at least annually	Internal	Laboratory	Laboratory QA Officer or designee	Laboratory management and staff	Laboratory management and staff	Laboratory QA Officer
External Lab Audits	Audit will be performed in advance of field work or during the initial stages; follow-up audits as necessary.	External	State or national certifying authority and/or ENSR	State or national certifying authority auditor or ENSR Project QA Manager or designee	Laboratory management and staff	Laboratory management and staff	Laboratory management and staff; ENSR Project QA Manager or designee.

QAPP Worksheet #31 (UFP-QAPP Manual Section 4.1.1) Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment	Person(s) Responsible for Responding to Assessment Findings	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA)	Person(s) Responsible for Monitoring Effectiveness of CA
Project-Specific External Lab Audit	Audit will be performed in advance of field work or during the initial stages; follow-up audits as necessary.	External	ENSR	ENSR Project QA Manager or designee	Laboratory management and staff	Laboratory management and staff	Laboratory management and staff; ENSR Project QA Manager or designee.
PE samples	PE samples will be sent to the laboratories for analysis in advance of initiation of field work; with follow-up PEs as necessary.	External	ENSR	ENSR Project QA Manager or designee	Laboratory management and staff	Laboratory management and staff	Laboratory management and staff; ENSR Project QA Manager or designee.

QAPP Worksheet #32 (UFP-QAPP Manual Section 4.1.2) Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response	Timeframe for Response
Field System Audit	Written audit report	RI/FS PM, RI Task Manager, RI FTM, On-Site Coordinator, CPG QA Coordinator	Verbal summary of major findings within 24 hours; written report within one week.	Memo with possible reaudit	Project QA Manager, RI/FS PM, RI Task Manager, CPG QA Coordinator	One week
Internal Laboratory Audits	Written audit report	Laboratory Manager,	Major deficiencies within 24 hours; written report as required by laboratory QA Manual	Memo or as required by laboratory QA Manual	Laboratory Manager, Laboratory PM ENSR Project Chemist and Project QA Manager (if project DQOs are affected)	As required by laboratory QA Manual
External Laboratory Audits by third-party entities	Written audit report	Laboratory Manager	Major deficiencies communicated orally at exit meeting; written report based on policy of external auditing organization	Letter or as required by external auditing organization with possible reaudit	External auditing organization ENSR Project Chemist and ENSR Project QA Manager (if project DQOs are affected)	As required by external auditing organization.
External Laboratory Audits by ENSR	Written audit report	Laboratory Manager	Major deficiencies communicated orally at exit meeting written report within 1 month	Letter with possible reaudit	ENSR Project Chemist, Project QA Manager, and CPG QA Coordinator	One month

QAPP Worksheet #32 (UFP-QAPP Manual Section 4.1.2) Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response	Timeframe for Response
PE samples	Written PE results evaluation report	Laboratory Manager	Deficiencies (results outside acceptance range) identified within one week of receiving laboratory results	Letter with request for laboratory investigation into deficiencies and corrective action, if necessary, before project field samples are analyzed. Corrective action may include investigation and preparation by the laboratory of a corrective action report, analysis of a new PE sample, or if ENSR deems appropriate, the analyses may be moved to another lab.	ENSR Project Chemist, Project QA Manager, and CPG QA Coordinator	One week

Non-Conformance/QC Reporting

A non-conformance is defined as an identified or suspected deficiency in, or deviation from, procedures described in an approved document (e.g., improper sampling procedures, improper instrument calibration, errors in calculations or errors in computer algorithms); an item where the quality of the end product itself or subsequent activities conducted using the document or item would be affected by the deficiency; or an activity that is not conducted in accordance with established plans or procedures. Any project staff member that discovers or suspects a non-conformance is responsible for initiating a non-conformance report to the Project QA Manager. The Project QA Manager will evaluate each non-conformance report and provide a response describing the actions to be taken and assigning responsibility for the corrective action. The appropriate Task Manager will verify that the nonconforming item or procedure is not used until the corrective action has been performed and found to produce acceptable results. If the non-conformance involves instrumentation or equipment, the device must be tagged to indicate it is defective and not to be used.

A copy of each non-conformance report will be added to the project file. Original non-conformance reports will be maintained by the Project QA Manager.

QAPP Worksheet #32 (UFP-QAPP Manual Section 4.1.2) Assessment Findings and Corrective Action Responses

Assessment

Assessment activities will measure the effectiveness of the project implementation and associated QA/QC activities. Audits are used as a means of monitoring the performance of field and laboratory activities and are conducted by the Project QA Manager or another member of the QA staff. Audits will include systems audits which are more qualitative in nature and will be made at appropriate intervals to ensure that all aspects of the QA program are operative. Performance audits are quantitative audits which are conducted to assess the accuracy of measurement systems; this would include the use of performance evaluation samples.

Systems audits will be conducted for field and laboratory operations to assess implementation of QA/QC requirements and determine if the systems under review are capable of meeting project DQOs. Any minor deficiencies noted during an audit will be corrected as soon as possible according to an agreed upon schedule. If a major deficiency is noted during an audit a stop work order will be issued until the deficiency can be corrected and the effectiveness of the corrective action measured and documented. A stop work order may be issued by the Project QA Manager who will notify the RI Task Manager and the RI/FS PM. The conditions which lead to a stop work order must be documented in sufficient detail to clearly define the problem and identify possible corrective measures. All communications among project staff which address evaluation of the problem and appropriate solutions must be attached to the stop work order. The Project QA Manager, the RI Task Manager, and RI/FS PM must agree in writing to resume work after review of the data supporting correction of the deficiency. The Project QA Manager will maintain a corrective action log which lists deficiencies that were noted, the individual(s) responsible for follow-up, documentation of the effectiveness of the corrective actions taken, and implementation of procedures to prevent recurrence of the problem.

A written report will be prepared for all audits regardless of the outcome and submitted to the RI Task Manager and the RI/FS PM. Any modifications to the existing program, corrective actions required, or the need for additional audits will be documented.

In addition to participation in any audits conducted by ENSR QA personnel, participating laboratories are required to take part in regularly scheduled performance evaluations and audits required by state and federal agencies as part of ongoing certification or participation in specific contracts and to provide copies of the results of these performance evaluations and audits to the Project Chemist. Any change in laboratory ownership, management, or certification status must be immediately reported to the Project Chemist. If any laboratory analysis is found to be out of control, the laboratory must immediately implement corrective action and notify the Project Chemist. The laboratory PM will be responsible for documenting the effectiveness of the corrective action measures before continuing analysis of project samples.

QAPP Worksheet #33 (UFP-QAPP Manual Section 4.2) QA Management Reports Table

Type of Report	Frequency	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation	Report Recipient(s)
Progress Reports	Monthly	Due the 15th of each month	ENSR RI/FS PM/ CPG Project Coordinator	USEPA RPM
Audit Reports	During first week of sampling, at least annually during analytical program and as needed for follow up.	Within one month after field work begins and at least annually or as required during program	ENSR Project QA Manager	ENSR RI Task Manager, ENSR RI/FS PM, CPG QA Coordinator
Data Validation Reports	After laboratory data are received and validated	See Worksheet 16	ENSR Data Validation Task Manager	ENSR Project QA Manager, RI Task Manager, and ENSR RI/FS PM
Nonconformance report	As needed	When a nonconformance is identified	ENSR staff	ENSR Project QA Manager, applicable ENSR Task Manager, USEPA RPM
Corrective Action Reports	When corrective action is required	When corrective action is implemented	ENSR Project QA Manager or designated Task Manager	ENSR RI/FS PM, RI Task Manager, applicable Task Managers and Project Team Members, CPG QA Coordinator, CPG Project Coordinator, USEPA RPM

The monthly management report will address the results of any corrective actions or audits which took place during the reporting period as well as any trends noted during the data validation process. Problems or issues which arise between regular reporting periods may be identified to management at any time. Information included in the monthly progress report will include:

- Results of audits conducted during the reporting period;
- Discussion of problems with measurement data including issues related to precision, accuracy, completeness, representativeness, and comparability that could affect achievement of the DQOs; and
- A listing of any non-conformance reports or stop-work orders, the associated corrective actions taken, and the outcome of these corrective actions.

QAPP Worksheet #34 (UFP-QAPP Manual Section 5.2.1) Verification (Step I) Process Table

Verification Input	Description	Internal/ External	Responsible for Verification)
Field data	Field data will be reviewed for completeness, accuracy and agreement with SOP LPR-G-01 (Field Records).	Internal	ENSR RI FTM or designee
Chain-of-Custody	The COC will be reviewed initially in the field for complete and correct information.	Internal	ENSR On-Site Coordinator, RI FTM, or designee
	Upon receipt at the lab the COC will be compared to sample containers and any discrepancies will be resolved.	External	Laboratory Sample Custodian
	During validation the COC will be verified against laboratory receipt and reporting information.	External	ENSR Data Validator
Laboratory Data Packages and EDD	Laboratory data (hard copy and EDDs) will be verified by the laboratory performing the work for completeness and technical accuracy prior to release.	Internal	Laboratory
	Laboratory data will be assessed using the validation procedures described in Worksheets 35 and 36	External	ENSR Data Validator
Audit Reports	Audit reports will be reviewed to confirm that specified corrective actions have been taken, the corrective action has been effective and all documentation of corrective action is attached to the audit report.	Internal	ENSR Project QA Manager
Assessment actions and reports	QA/QC process will be reviewed for agreement with QAPP/FSP Addendum	External	ddmis, inc.

QAPP Worksheet #35 (UFP-QAPP Manual Section 5.2.2) Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description	Responsible for Validation
IIa	Field SOPs, field records	Verify conformance to approved sampling and field measurement procedures; ensure that activities met performance criteria; and verify that deviations from procedures or criteria were documented.	Debra Simmons, Project QA Manager/ENSR
IIa	Analytical data deliverables, contractual documents	Verify the required deliverables, analyte lists, method holding times, analytical procedures, laboratory qualifiers, measurement criteria, project quantitation limits, and analyses of PE samples conform to specifications. Verify that deviations from procedures or criteria were documented.	Marie Wojtas, Validation Coordinator/ENSR
IIa	Field records, database output	Verify transcription of field data from field forms to database.	Jim Herberich, Data Management Task Manager/ENSR
IIa	Custody records, analytical data reports	Review traceability from sample collection through reporting.	Marie Wojtas, Validation Coordinator/ENSR
IIa	Laboratory EDDs, analytical data reports, database output	Verify EDDs against hard-copy analytical reports.	Jim Herberich, Data Management Task Manager/ENSR
IIa	Data validation reports, database output	Verify that entry of qualifiers was correct and complete.	Marie Wojtas, Validation Coordinator/ENSR
IIb	Analytical data reports	Verify that reported analytes, holding times, analytical procedures, measurement critieria, and project quantitation limits conform to the QAPP. Verify that deviations from procedures or criteria were documented.	Marie Wojtas, Validation Coordinator/ENSR
IIb	Analytical data reports, validation guidance	One hundred percent of the data will be validated (see details below)	Marie Wojtas, Validation Coordinator/ENSR
IIb	QAPP, analytical data reports, validation guidance	Verify that the qualifiers applied during validation were in conformance with the QAPP and specified validation guidance.	Marie Wojtas, Validation Coordinator/ENSR
IIb	Analytical data reports	Verify that PE samples were analyzed at the frequency specified in the QAPP and met the acceptance criteria.	Marie Wojtas, Validation Coordinator/ENSR

QAPP Worksheet #35 (UFP-QAPP Manual Section 5.2.2) Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description	Responsible for Validation
IIb	QAPP, data validation reports	Verify that data validation was performed in accordance with the QAPP specifications and that all required peer reviews were conducted. If validation actions deviated from the QAPP specifications and/or regional validation guidance based on professional judgment, verify that rationale was documented.	Debra Simmons, Project QA Manager/ENSR

Data Validation

At a minimum, 100% full validation (includes review of raw data and spot check for verification of calculations) will be conducted for Dioxins/Furans, and PCB Homologs and Congeners for each sample delivery group (SDG). For all other parameters, 100% full validation (as appropriate to the analyses) will be peformed on the first two SDGs. The remaining SDGs will be subject to full validation for every ten SDGs, and limited validation for the remaining SDGs.

Limited validation will be based on information provided by the laboratory on their QC forms, and will include no or minimal raw data review. At a minimum, limited validation will include the following data elements:

- Agreement of analyses conducted with COC requests
- Holding times and sample preservation
- Initial and continuing calibrations and analytical sequence
- Mass spectrometer tuning (GC/MS only)
- Internal standard performance (GC/MS only)
- Laboratory blanks/equipment blanks/ field blanks/ trip blanks
- Surrogate recoveries
- Laboratory control sample/laboratory control sample duplicate (LCS/LCSD) results
- Matrix spike/matrix spike duplicate (MS/MSD) results
- Laboratory duplicate results
- Field duplicate results
- Interference check sample (ICS) results (AB solution only)

QAPP Worksheet #35 (UFP-QAPP Manual Section 5.2.2) Validation (Steps IIa and IIb) Process Table

- Inductively Coupled Plasma (ICP) serial dilution results
- Chemical yield (tracers and carriers) (radiochemical only)
- Percent solids
- Quantitation limits and sample results (limited to evaluating dilutions and reanalyses)

If significant issues (e.g., those affecting achievement of the DQOs) are noted during full validation, the limited validation will be expanded to include this issue. Systematic or random errors that would not be detected during a review of the summary forms might include, for example, misidentification or quantitation of compounds, transcription errors, or calculation errors. In addition, limited validation will provide review of key laboratory QC elements, which would highlight potential underlying lab issues which may require further investigation (i.e., full validation effort). If a high frequency of measurement performance issues are found, the issue will be investigated and an additional validation effort may be implemented. ENSR plans to maintain communication/notification systems with the laboratory during the analytical process to circumvent significant QC issues. If QC issues do arise, investigations and corrective actions will be documented and implemented in a timely fashion to optimize the amount of un-qualified data.

In addition, data packages receiving limited validation will receive a completeness check so that full validation could be performed at a later data, if necessary. The check will verify that the raw data for each sample (including all reanalyses and dilutions) are present and complete. The data supporting the sample results, such as QC samples (method blanks, LCS, MS/MSD), calibrations, tunes, and preparation logs, will also be reviewed for overall completeness, however, an in-depth inventory to ensure specific association with all sample data will not be performed.

No additional completeness check will be performed for the geotechnical or pathogen tests due to limited back-up information provided and the nature of the tests.

Qualifiers will be applied based on the criteria in the QAPP, method-specific Region II validation SOPs, or professional judgement.

Reports summarizing data qualification as a result of the validation effort will be prepared.

QAPP Worksheet #36 (UFP-QAPP Manual Section 5.2.2) Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria*	Data Validator (title and organizational affiliation)
IIa	Sediment	Metals	Low	Region II validation SOP HW-2, modified for method	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIa	Sediment	Butyltins	Low	Region II validation SOP HW-44, modified for method	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIa	Sediment	Dioxins/Furans	Low	Region II validation SOP HW-25	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIa	Sediment	Low Level Mercury	Low	Region II validation SOP HW-2, modified for method	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIa	Sediment	Methyl Mercury	Low	Region II validation SOP HW-2, modified for method	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIa	Sediment	Hexavalent Chromium	Low	NJDEP SOP 5.A.10, rev. no. 2, modified	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIa	Sediment	Organochlorine Pesticides – GC/ECD	Low	Region II validation SOP HW-44	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIa	Sediment	Organochlorine Pesticides – HRGC/HRMS	Low	Region II validation SOP HW-25, modified for method	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIa	Sediment	PCBs – Aroclors	Low- High	Region II validation SOP HW-45	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIa	Sediment	PCBs – homologs and congeners	Low- High	Region II validation SOP HW-46	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIa	Sediment	SVOCs	Low	Region II validation SOP HW-22	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIa	Sediment	PAHs and Alkyl PAHs – HRGC/LRMS-SIM	Low	Region II validation SOP HW-22, modified for method	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIa	Sediment	VOCs	Low	Region II validation SOP HW-24	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIa	Sediment	TPH-DRO	Low	Region II validation SOP HW-44, modified for method	Marie Wojtas, Validation Coordinator/ENSR (or designate)

QAPP Worksheet #36 (UFP-QAPP Manual Section 5.2.2) Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria*	Data Validator (title and organizational affiliation)
IIa	Sediment	TPH-GRO	Low	Region II validation SOP HW-44, modified for method	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIa	Sediment	Herbicides	Low	Region II validation SOP HW-17	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIa	Sediment	Wet chemistry	Low	QAPP Worksheets 12, 15, 19, and 24	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIa	Sediment	Radiochemistry	Low	Multi-Agency Radiological Laboratory Analytical Protocols Manual (MARLAP), July 2004	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIa	Sediment	Physical Testing	N/A	QAPP Worksheets 12, 15, 19, and 24	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIb	Sediment	Metals	Low	Region II validation SOP HW-2, modified, and/or QAPP Worksheets 12, 15, 19, and 24	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIb	Sediment	Butyltins	Low	QAPP Worksheets 12, 15, 19, and 24	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIb	Sediment	Dioxins/Furans	Low	Region II validation SOP HW-25 and/or QAPP Worksheets 12, 15, 19, and 24, whichever is more stringent	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIb	Sediment	Low Level Mercury	Low	QAPP Worksheets 12, 15, 19, and 24	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIb	Sediment	Methyl Mercury	Low	QAPP Worksheets 12, 15, 19, and 24	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIb	Sediment	Hexavalent Chromium	Low	NJDEP SOP 5.A.10, rev. no. 2, modified, and/or QAPP Worksheets 12, 15, 19, and 24	Marie Wojtas, Validation Coordinator/ENSR (or designate)

QAPP Worksheet #36 (UFP-QAPP Manual Section 5.2.2) Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria*	Data Validator (title and organizational affiliation)
IIb	Sediment	Organochlorine Pesticides – GC/ECD	Low	Region II validation SOP HW-44 and/or QAPP Worksheets 12, 15, 19, and 24, whichever is more stringent	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIb	Sediment	Organochlorine Pesticides – HRGC/HRMS	Low	QAPP Worksheets 12, 15, 19, and 24	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIb	Sediment	PCBs – Aroclors	Low- High	Region II validation SOP HW-45 and/or QAPP Worksheets 12, 15, 19, and 24	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIb	Sediment	PCBs – homologs and congeners	Low- High	Region II validation SOP HW-46 and/or QAPP Worksheets 12, 15, 19, and 24	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIb	Sediment	SVOCs	Low	Region II validation SOP HW-22 and/or QAPP Worksheets 12, 15, 19, and 24, whichever is more stringent	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIb	Sediment	PAHs and Alkyl PAHs – HRGC/LRMS-SIM	Low	QAPP Worksheets 12, 15, 19, and 24	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIb	Sediment	VOCs	Low	Region II validation SOP HW-24 and/or QAPP Worksheets 12, 15, 19, and 24, whichever is more stringent	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIb	Sediment	TPH-DRO	Low	QAPP Worksheets 12, 15, 19, and 24	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIb	Sediment	TPH-GRO	Low	QAPP Worksheets 12, 15, 19, and 24	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIb	Sediment	Herbicides	Low	Region II validation SOP HW-17 and/or QAPP Worksheets 12, 15, 19, and 24, which is more stringent	Marie Wojtas, Validation Coordinator/ENSR (or designate)

QAPP Worksheet #36 (UFP-QAPP Manual Section 5.2.2) Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria*	Data Validator (title and organizational affiliation)
IIa	Sediment	Wet chemistry	Low	QAPP Worksheets 12, 15, 19, and 24	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIb	Sediment	Radiochemistry	Low	MARLAP, July 2004 and/or QAPP Worksheets 12, 15, 19, and 24	Marie Wojtas, Validation Coordinator/ENSR (or designate)
IIb	Sediment	Physical Testing	N/A	QAPP Worksheets 12, 15, 19, and 24	Marie Wojtas, Validation Coordinator/ENSR (or designate)

*Validation criteria includes professional judgment where appropriate and necessary. Note that modifications to the Region 2 data validation SOPs are performed when there is no SOP for the specified method. In those cases, the most relevant Region 2 data validation SOP is used as a reference, and modified for method specific criteria, with consistent Region 2 validation actions. Modifications to the Region 2 SOPs may also be made to incorporate the performance measurement criteria for this project. Modifications will be discussed in the data validation reports.

QAPP Worksheet #37 (UFP-QAPP Manual Section 5.2.3) Usability Assessment

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used:
ENSR's data validation staff will validate all laboratory data in accordance with the protocols described in Worksheet 36. The Project QA Manager, in conjunction with the project team, will determine whether the analytical data meet the requirements for use in making decisions related to further actions at the site. The results of laboratory measurements will be compared to the DQOs described in Attachment 1 of this document.

Describe the evaluative procedures used to assess overall measurement error associated with the project:
During the data validation process the validator will use information confirming sample identification; sample preparation; analysis within holding time; instrument calibration data; and results of QC samples designed to assess blank contamination, analytical precision, and accuracy to identify any limitations in data use and, if known, data bias. The validator will apply qualifiers as needed to reflect any limitations on the use of specific data points and prepare a report detailing the information reviewed, data limitations, and overall usability. Patterns of data use limitations or anomalies which become apparent during the validation process or as the users will be reviewed with the Project QA Manager and the appropriate laboratory. Data that do not meet the quality acceptance limits of Worksheet #28, or quality levels of Worksheet #15, or analytical performance criteria specified in Worksheet #12 will be clearly identified in the database so data users are aware of any limitations associated with data usability. Details of the problems identified during data validation and the bias in the data will be provided in the associated validation memorandum.

Identify the personnel responsible for performing the usability assessment:
Data validation will be performed by ENSR's data validation staff under the supervision of the Project QA Manager. The usability assessment will be performed jointly by the ENSR and CPG project teams and will include input by field personnel, QA staff, and project management.

Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:
The documentation generated during data validation will include a comprehensive memorandum that describes the information reviewed, the results of this review and provides a recommendation on overall data usability and limitations on specific data points. The memorandum and associated validation worksheets provide information on the samples included in the review and the date they were collected; the condition of samples when received at the laboratory and any discrepancies noted during the receiving process; verification of sample preparation and analysis within the method specified holding time; instrument calibration information; review of associated QC analyses including blanks, laboratory control samples, matrix spikes, and field and/or laboratory duplicates; verification of selected reported values from raw data. As a result of this review standard qualifiers are entered into the database so that data users can readily identify any limitations associated with a specific data point.

QAPP Worksheet #37 (UFP-QAPP Manual Section 5.2.3) Usability Assessment

Assessment of data usability will be performed by ENSR's data validation staff using current USEPA Region II data validation guidance. The results of the Data Usability Assessment will be summarized in the final project report. The following items will be assessed and conclusions drawn based on their results:

Holding Time: All sample data will be checked to verify that both sample preparation and analysis were performed within the method required holding time.

Calibration: Data associated with instrument calibration and verification of calibration will be reviewed to confirm that all data were generated using properly calibrated instrumentation.

Accuracy/Bias Contamination: Results for all field blanks, trip blanks, laboratory method blanks, and instrument calibration blanks will be checked against performance criteria specified in Worksheet # 28; results for analytes that exceed criteria will be identified and the impact on field sample data will be assessed. Data will be summarized by type of blank.

Accuracy/Bias Overall: Reported values of laboratory control samples, performance samples, and matrix spikes will be evaluated against the spiked or certified concentration and the percent recovery will be calculated and compared to the criteria specified in Worksheet #28. The percent recovery information will be used to assess the bias associated with the analysis. Recovery for matrix spikes in conjunction with the recovery reported for performance samples and laboratory control samples will provide information on the impact of the sample matrix on specific analyses. Average recoveries will be calculated and reported by analyte for each type of QC sample.

Precision: Results of the relative percent difference (RPD) will be calculated for each analyte in laboratory and field duplicates. These RPDs will be checked against measurement performance criteria presented on Worksheet #28; RPDs exceeding the stated criteria will be identified. Additionally the combined RPD of each analyte will be averaged across duplicate pairs whose original and duplicate values are both greater than the QL and a combined overall RPD average will be determined for each analyte in both laboratory and field duplicates. This information will be used to draw conclusions about the precision of the analyses and, for field duplicates, the precision of sampling and analysis. Any limitations on the use of the data will also be described.

Sensitivity: Reporting limits will be checked against the criteria presented on Worksheet #15 and QLs presented on Worksheet #15. Limitations on the use of the data and conclusions about the sensitivity of the analysis will be reported.

Representativeness: A review of field records will be used to confirm that sample collection and handling was performed in a manner that conformed to the designated SOP. Similarly laboratory preparation procedures will be reviewed during validation to ensure that a representative sample was

QAPP Worksheet #37 (UFP-QAPP Manual Section 5.2.3) Usability Assessment

selected for analysis. Any deviations or modifications to field or laboratory procedures which might impact the representativeness of the sample will be discussed in the project final report.

Comparability: The sampling and analytical procedures which will be used in this program have been selected to ensure that the resulting data will be comparable to data from similar programs conducted previously or which will be conducted in the future. Any modifications or deviations from stated procedures which might impact data comparability will be addressed in the project final report

Completeness: Completeness for the analytical program will be calculated as the number of data points that are accepted as usable based on the validation process divided by the total number of data points for each analysis. Completeness will be reported for each analytical category and an overall value will be reported. As shown in Worksheet #12, the analytical completeness goal is ≥90%. Completeness for the field program will be calculated as the number of samples successfully collected compared to the total number proposed in this QAPP/FSP Addendum. The completeness goal for the field sampling program is ≥95%.

Each of the PQOs presented on Worksheet #15 will be reviewed to determine if the stated objective was met. The major impacts observed from data validation, data quality indicators (DQI) and measurement performance criteria assessments will be used to assess the overall data quality and whether PQOs were achieved. The final report will summarize the information used to reconcile each objective and overall conclusions regarding data quality.

Attachment 1

Data Quality Objectives

DQO Step	Data Quality Objective 1 (DQO 1): Develop Understanding of Physical Characteristics of Impacted Sediment Description
STEP 1 **State the problem**	The stability of the impacted sediment in the Lower Passaic River Study Area (LPRSA) must be understood to permit an evaluation of sediment erosion, resuspension, and transport as one of the mechanisms for the transport of site chemicals. Physical characteristics of the sediment, such as particle size distribution, mineralogy bulk density, and shear strength, are required for this evaluation. Other important lines of evidence to assess sediment stability include radiodating, sediment probing, surface sediment grabs, Sedflume, and bathymetry time-series data. Understanding these physical characteristics is necessary to (1) support the continued development of the Lower Passaic River/Newark Bay (LPR/NB) Model components, including the hydrodynamic, sediment transport, and contaminant fate and transport models; (2) support our understanding of the conceptual site model (CSM); (3) provide information regarding the handling and settling characteristics of the material needed for the feasibility study (FS); and, (4) confirm the stability of the sediment has the potential to impact the evaluation of current and future potential risks to human health and the environment.
STEP 2 **Identify the goals of the study**	**<u>Principal Study Questions</u>** ▪ How do measured physical characteristics of the sediment support the assessment of sediment stability? ▪ What are the values of representative input parameters for the sediment transport model? ▪ What is the geomorphology of the river over its entire length? ▪ Using data obtained from this and DQO 2, how will sediment erosion and depositional mechanisms (including storm events and tidal influences) in the LPRSA affect the fate and transport of impacted sediment (e.g., will burial of contaminated sediment by new sediment impact the natural attenuation of the contaminated sediments)? ▪ How does the physical character of the sediment change throughout the river influence assumptions regarding dredge material handling, cap placement and in-situ stabilization? ▪ How does the relative stability or instability of sediments in the various geomorphologic segments of the Lower Passaic affect exposure concentrations, pathways, and routes for human and ecological receptors of concern?

DQO Step	Data Quality Objective 1 (DQO 1): Develop Understanding of Physical Characteristics of Impacted Sediment Description
	Program Goals Program goals for determining site physical characteristics were identified by EPA in the QAPP of August 2005, Attachment 1.1. The summary includes all media and data collection necessary for completion of the RI/FS. This sediment low resolution coring effort, fulfills a portion of these data requirements. This program will supplement the existing geotechnical data, which were used as the basis for the CSM, with a comprehensive data set that is collected synoptically throughout the LPRSA. Specifically this field effort will collect field data that will permit further assessment of the stability of the sediment, which includes the biologically active zone, over the entire main stem of the river and in the major tributaries, including the thalweg, shoals, and nearshore areas. Data collection will include analysis of: ▪ Radiochemistry (beryllium-7, cesium-137, lead-210, and potassium-40) ▪ Total organic carbon (TOC) ▪ Total sulfide ▪ Percent moisture ▪ Grain size ▪ Specific gravity ▪ Bulk density determined in field facility ▪ Atterberg Limits (using ASTM D4318) **Alternative Actions** The following alternative actions could result from resolution of the principal study questions: ▪ Confirm or revise the characterization of erosional and stable sediment, including location and extent as presented in the CSM, reconciling the most recent observations with those made in previous studies (i.e., historical core data, 2005 sediment texture map, and historical bathymetry data updated with the recent 2007 bathymetry data). ▪ Confirm or revise the geomorphological interpretations of river mile (RM) 1 to 7 based upon previous studies. ▪ Re-evaluate future potential risks to human health and the environment in the context of sediment stability concerns.

DQO Step	Data Quality Objective 1 (DQO 1): Develop Understanding of Physical Characteristics of Impacted Sediment Description
	<u>Decision Statements on Physical Characteristics of Sediment</u> ▪ If the sediment transport model can be successfully calibrated and validated with the new data plus select historical data, then there is no need to evaluate the utility of collecting additional physical characteristics data. ▪ If multiple lines of evidence (i.e., sediment physical characteristics, radiodating, analysis of temporal bathymetry data, and comparison of chemical impacts with 1995 horizon) suggest a stable sediment (or depositional environment) bed, and other lines of evidence (e.g., Sediment Profile Imaging [SPI]) suggest that the biologically active zone and the nature and extent of deeper buried contaminants have been determined (via historical and current [via DQO 2] chemical evaluation), then no further coring will be conducted at this location. ▪ If multiple lines of evidence (i.e., sediment physical characteristics, radiodating, analysis of temporal bathymetry data, and comparison of chemical impacts with 1995 horizon) suggest an unstable sediment (or erosional environment) bed, then chemical concentration data will be reviewed to determine if further coring/sediment sampling is necessary in the area to define extent.
STEP 3 **Identify the information inputs**	Information required to answer the decision statement will include the existing field data and data to be obtained from the planned sampling events (See Step 5 of DQO 1), as summarized below. **<u>New Data Needed</u>** Low resolution coring, as required by Field Sampling Plan (FSP) 1 (EPA, 2005), will be implemented throughout RM 0 - 17, the tributaries, and above Dundee Dam to obtain physical characteristics data including, radiodating chemistry and physical parameters detailed below in Step 5. Surface grab samples will be used to assess the 0-1" interval for evidence of recent deposition using beryllium-7. Vibracoring and grab sampling will be utilized for collection of the 0-6" segment for all analytes. Deeper samples (greater than 6") will be collected using vibracoring techniques, with analysis throughout the core to the red brown clay layer, sand, or refusal. In addition, at the request of EPA, at 8 locations, the top 2 feet of sediment will be further studied through finer segmentation of 5 layers with physical and chemical analyses. This finer segmentation sampling will be done with a box core device.

DQO Step	Data Quality Objective 1 (DQO 1): Develop Understanding of Physical Characteristics of Impacted Sediment Description
	Existing Field Data (to be Augmented) ▪ 1995 geotechnical cores collected by Tierra in RM 1 to 7 ▪ 1995 piezocone data collected by Tierra in RM 1 to 7 ▪ 1995 remedial investigation data collected by Tierra in RM 1 to 7 ▪ 2005 geotechnical cores collected by EPA/Malcolm Pirnie, Inc. ▪ 2005 Malcolm Pirnie, Inc., grab samples for radioisotope analysis ▪ 2005 EPA/Malcolm Pirnie, Inc.., high resolution cores in RM 1 to 7 ▪ 2005 EPA/Malcolm Pirnie, Inc., sediment stability samples ▪ 2006 EPA/Malcolm Pirnie, Inc., low resolution cores in RM 1 to 7 ▪ 2008 EPA/Malcolm Pirnie, Inc., sediment cores (data not yet available) ▪ 2007 EPA/Malcolm Pirnie, Inc., Dundee Lake cores ▪ 2005 EPA beryllium-7 field reconnaissance in the Lower Passaic River ▪ 2005 EPA sediment texture maps (as interpreted by Aqua Survey, Inc. side-scan sonar) of the Lower Passaic River ▪ Historical bathymetric surveys from 2004, 2001, 1999, 1997, 1996, 1995, and 1989, as well as the 2007 bathymetric data ▪ Sediment probing data collected during the 2007/2008 field program **Existing Reports** ▪ Malcolm Pirnie, Inc., 2007 Conceptual Site Model ▪ Malcolm Pirnie, Inc., 2006 Draft Geochemical Evaluation (Step 2) ▪ Malcolm Pirnie, Inc., 2007 Source Control Early Action Focused Feasibility Study ▪ Malcolm Pirnie, Inc., 2007/2008 Narratives for High Resolution Cores, Low Resolution Cores, Dundee Dam Coring

DQO Step	Data Quality Objective 1 (DQO 1): Develop Understanding of Physical Characteristics of Impacted Sediment Description
STEP 4 **Define the boundaries of the study**	**Geographic Area** The LPRSA includes the 17-mile tidal reach of the Lower Passaic River from below the Dundee Dam (RM 17.4) to the confluence with Newark Bay (RM 0). The LPRSA also includes the tributaries to this reach (e.g., Saddle River, Second River, and Third River) and the unnamed creek. This phase of the low resolution coring program will include sampling within RM 0 to 17, the tributaries, the unnamed creek and Dundee Lake above the dam. **Timeframe** Data will be collected over an estimated 3-month period between July and October 2008. **Sample Type** Sampling intervals will include recently deposited surface sediment (0–1-inch sediment depth); surface sediment (0–6 inches); three, 1-foot sediment segments; and then 2-foot segments down to the red-brown clay layer, the sand, or refusal, with sampling for selected analytes in the red-brown sand layer where encountered.
STEP 5 **Develop the analytical approach**	**Approach for Collecting Sediment Samples** An initial grab sample will be collected at each station using a Ted-Young-modified Van Veen grab sampler (per Standard Operating Procedure [SOP] LPR-S-01). The grab sampling effort will collect surface sediment samples, defined as the interval from 0 to 6 inches below the sediment-water interface. In addition, a 0–1-inch sample will be collected from the Van Veen Grab for beryllium-7 analysis. Vibracoring will be used to collect both surface and deeper sediment samples (per SOP LPR-S-04). Longer cores will be sectioned as needed on the sampling vessel to ensure the cores are maintained upright during handling, transport, and storage. Sample processing and transfer to sample containers will be performed at the field facility. In addition, piston coring or push coring may be used, if more appropriate, based on sediment depths encountered (per SOP LPR-S-02). Lastly, a box coring device will be utilized to collect data within the top two feet for finer segmentation analysis for fate and transport modeling. **Anticipated Analytical Methods for Sediment Cores** The following lists the analytical methods for sediment sampling:

DQO Step	Data Quality Objective 1 (DQO 1): Develop Understanding of Physical Characteristics of Impacted Sediment Description
	▪ Radiochemistry (for beryllium-7, cesium-137, lead-210, and potassium-40) using DOE EML HASL-300/EPA Method 900 ▪ TOC using the Lloyd Kahn Method ▪ Total sulfide using EPA Method 9030 mod. ▪ Percent moisture using ASTM Method D2974-07A ▪ Grain size using ASTM Method D422 ▪ Specific gravity using ASTM Method D854 ▪ Bulk density (method to be determined during field activity) ▪ Atterberg Limits using ASTM D4318 **Project Quantification Limits** The reporting limits are included in QAPP Worksheet #15. **Quality Assurance/Quality Control Program (QA/QC)** QA/QC samples will be analyzed with the sediment samples appropriate for each analytical test, such as field replicates, laboratory duplicates, lab control and matrix control spikes (optional), and performance samples. QAPP Worksheets # 12 and #28 provide performance criteria of these precision and accuracy measurements. Worksheet #20 provides frequency of field replicates and blanks. Data verification and validation protocols are detailed in Worksheets 34, 35, 36, and 37. QAPP Worksheet # 31provides auditing details for the program. **Anticipated Data Evaluations** ▪ Assessment of sediment grain size, texture, stability, and biological habitat substrate; ▪ Sediment stability evaluation by location and with depth for identification of depositional and erosional zones; ▪ Sediment stability evaluation by location and with depth to compare to contaminant data identified in DQO 2; ▪ Sediment stability evaluation by location and with depth to compare with physical structures, dredge events, and shoreline conditions; ▪ Geomorphological interpretations to support the LPRSA CSM; ▪ Multivariate evaluation of physical data to look for patterns or trends in data;

DQO Step	Data Quality Objective 1 (DQO 1): Develop Understanding of Physical Characteristics of Impacted Sediment Description
	▪ Comparison of data with bathymetry changes; ▪ Assessment and grouping of geotechnical data with location and depth into similar properties for the FS; ▪ Input of data into the sediment transport model;
STEP 6 **Specify performance or acceptance criteria**	Uncertainty is always present in the measurement and interpretation of environmental data. In this case, the focus is on collecting and interpreting data to understand the physical characteristics of the sediment in the LPRSA. In the absence of defined decision tolerance limits, the sampling design should still strive to identify possible sources of error and minimize them, to the extent practical. The most significant type of error that may be encountered includes that of sediment sampling. Both random and systematic errors can be introduced during the physical collection of the sample, sample handling, sample analysis, and data handling. Errors introduced through these steps will be controlled by preparing and following SOPs and establishing appropriate controls for data quality. These controls apply to field procedures (e.g., adherence to SOPs, field equipment calibration, and field duplicates), laboratory analytical errors (e.g., calibration standard, internal standard, surrogate recoveries, and laboratory control sample), and data validation. The QAPP worksheets provide further detail on error control procedures, both in the field and in the laboratory. Appendix B (Field SOPs) and Appendix C (Laboratory SOPs) provide supporting details. Sampling design error is the result of the inherent variability of the sampled population over space and time, the sample collection design, and the number of samples available upon which to base the decision. Because it is impossible to sample every inch of the LPRSA, there is always a possibility that some feature of the natural variability is missed. Sampling design error can increase the chance for misrepresenting the natural variability by random error (imprecision) or systematic error (bias) in sampling. Because the number of samples controls how well the sampled population (i.e., LPRSA sediment inventory) is characterized, use of the DQO process requires that the variability of data be understood to evaluate the trade off between uncertainty (confidence limit) and sampling intensity. In addition, as explained in this QAPP/FSP Addendum, the sampling plan includes the entire area of study in RM 0 to 17, contributing tributaries, and above Dundee Dam. This investigation is meant

DQO Step	Data Quality Objective 1 (DQO 1): Develop Understanding of Physical Characteristics of Impacted Sediment Description
	to characterize the physical and chemical qualities of the LPR sediments using a small but robust data set of the LPR sediments. This data set has a characteristic natural variability that will be represented by this data set if all other sources of variability are minimized. By reducing the errors associated with samples collection handling, analyses, and reporting with the strict adherence and use of standardized and documented procedures, as well as the noting of deviations from these procedures, the induced variability of the data set is minimized and the data set is a better representation of the LPR sediments allowing, among other things, increased power in statistic testing and improved parameterization of numeric and empirical models.
STEP 7 **Develop the detailed plan for obtaining data**	**<u>Sediment Sampling in the Lower Passaic River</u>** The currently proposed sampling program will consist of: ▪ 115 sampling locations ▪ One sampling event (up to3 months of field work) to minimize temporal variability At each location, collect one surface sediment grab sample using Ted-Young-modified Van Veen grab (SOP LPR-S-01). Samples will be collected to represent the surface sediment depth interval of 0–1 inch (for beryllium-7 only). Using vibracoring and sediment grab samples the 0–6 inch interval will be sampled. Samples should also have sufficient mass to analyze for the following suite of analytes: ▪ Radiochemistry (beryllium-7, cesium-137, lead-210, potassium-40) ▪ TOC ▪ Total sulfide ▪ Percent moisture ▪ Grain size ▪ Specific gravity ▪ Bulk density ▪ Atterberg Limits Two sediment cores using a vibracore will be obtained. Where more appropriate for field conditions, or a hand-held coring device, such as a piston-corer will be used. Each sediment core will be continuously analyzed in the following segments:

DQO Step	Data Quality Objective 1 (DQO 1): Develop Understanding of Physical Characteristics of Impacted Sediment Description
	▪ 0-6" segment (as described above) ▪ Three 1-foot segments followed by ▪ 2-foot segments to the red-brown clay layer, sand, or refusal ▪ Top portion of the red-brown sand layer, where encountered at the bottom of the core Sample interval segments may vary to accommodate collection of distinctly different layers of sediment, as described in the QAPP/FSP Addendum attached to this QAPP. The second core will be a shorter core of up to 4 feet to obtain the necessary sample mass for the 1 foot segments. The grab sampling effort will collect a surface sediment sample from 0 to 6 inches below the sediment-water interface. The surface sediment from the grab sampler will be utilized after the sediment sample mass from the vibracores has been exhausted. A prioritization of sample analytes is provided in Tables 3 and 4 of the FSP Addendum. Samples will be analyzed for the above parameters, with the exception of beryllium-7, which is only proposed for surface sampling (0 – 6 in). Data evaluations will be performed to inform the completion of a Phase II RI Work Plan to comply with the requirements of FSP1 and FSP2. Please see the attached QAPP/FSP Addendum for further details.

DQO Step	Data Quality Objective 2 (DQO 2): Characterize Nature and Extent of Contamination in Sediment within the Lower Passaic River Study Area (LPRSA) Description
STEP 1 **State the problem**	The nature and extent of contamination in the sediment must be understood (1) to permit an evaluation of all the sources of constituent loading to the LPRSA; (2) to assess the potential for environmental chemicals in sediment to pose a risk to human health and the environment; and 3) to support the requirements of the FS. The proposed low resolution core program will provide a comprehensive examination of the nature and extent of contamination in the sediment over the entire main stem of the river (RM 0 to 17); the thalweg, shoals, and nearshore areas; its major tributaries; and above Dundee Dam, collectively referred to as the LPRSA. Consistent with the requirements of the CERCLA RI/FS, this data set will be the first comprehensive synoptic data set of sediment contaminant nature and extent for the entire LPRSA that will have been collected within the same time period, using the same methods, and analyzing for the same parameters. The results will present a study-wide snapshot of the chemical characteristics of the sediment in these reaches, including the surface sediment, the biologically active zone, and, to the extent practical, the total vertical extent. The inclusion of the analysis of limited suite of Non- Hazardous Substance List (HSL) stressors including pathogens, will provide a study-wide snapshot of characteristics in surface sediment that impair biotic interaction in and on the sediment. This data will support both WRDA FS and restoration requirements and provide a characterization of the LPRSA baseline conditions to be reported in the RI/FS.
STEP 2 **Identify the goals of the study**	**Principal Study Questions** ▪ What is the nature and extent of the contamination in sediment in the LPRSA? ▪ How do the chemistry data compare to the previous chemical characterization data that were collected in the LPRSA (i.e., in 1995, 2005, and 2007/2008 sediment samples)? ▪ How do the chemistry data compare to screening level benchmarks for the protection of human health and the environment (This is specifically relevant to surficial sample intervals.)? ▪ What are the major sources and processes controlling chemical distribution in the sediment of the LPRSA? ▪ Using information gathered as part of DQO 1, is there any correlation between grain size, TOC, and chemical concentration/distribution in the LPRSA? ▪ Using information gathered as part of DQO 1, at what depth is sediment found to be stable and unlikely to mobilize chemical concentrations via erosional processes in the LPRSA? ▪ What non-HSL stressors that impact water quality are present and need to be understood in order to complete the WRDA FS and plan for restoration? **Program Goals** Program goals for determining nature and extent of contamination were identified by EPA in the QAPP of August 2005, Attachment 1.1. The summary includes all media and

DQO Step	Data Quality Objective 2 (DQO 2): Characterize Nature and Extent of Contamination in Sediment within the Lower Passaic River Study Area (LPRSA) Description
	data collection necessary for completion of the RI/FS. This sediment low resolution coring effort fulfills a portion of these data requirements. This program will supplement the existing sediment chemistry data (contaminant and radioisotope concentration data), which were used as the basis for the CSM, with a comprehensive synoptic contaminant chemistry of LPRSA sediment. Specifically in this field effort, field data will be collected to: ▪ Further assess the types of chemicals that are present, the concentrations of those chemicals, the vertical and horizontal extent of impacts within the sediment (the entire length of the river and between river banks based on distribution of sediment grain size), the co-occurrence of those chemicals, and the potential source and timing of impacts ▪ Provide additional information regarding the sediment deposition history in RM 1 to 7 since 1995, which was the last time the sediment column of the Lower Passaic River was systematically and comprehensively documented ▪ Assess human health and ecological risk in accordance with EPA Risk Assessment guidance and AOC/SOW requirements ▪ Provide information regarding background conditions associated with non-HSL stressors, including pathogens, in surface sediment for the WRDA FS restoration planning and will be reported in the RI/FS ▪ Investigate the potential relationships between the sediment contaminants concentrations and the physical characteristics of the sediment ▪ Further the conceptual understanding of where contaminants might be found in the LPRSA, their potential to be bioavailable, their association with stable sediment, and the likelihood that they will be transported throughout the system All samples will be analyzed for: ▪ TAL metals and titanium ▪ TCL VOCs ▪ SVOCs ▪ PAHs and alkyl PAHs ▪ PCBs (homologs, congeners, and aroclors) ▪ Dioxins/furans ▪ Organochlorine pesticides ▪ Chlorinated herbicides ▪ TPHs (extractable) ▪ Butyltins ▪ Mercury (low-level) ▪ Cyanide

DQO Step	Data Quality Objective 2 (DQO 2): Characterize Nature and Extent of Contamination in Sediment within the Lower Passaic River Study Area (LPRSA) Description
	Thirteen samples, identified in QAPP Worksheets #18 and #28, will be analyzed for: ▪ TPHs (purgeable) ▪ Methyl mercury ▪ Hexavalent chromium ▪ AVS and SEM ▪ Phosphorus (total) ▪ Total Kjeldahl Nitrogen ▪ Ammonia as N ▪ *E. Coli* ▪ Giardia Up to seven samples, identified in QAPP Worksheet #18 and #28, will be analyzed for: ▪ Additional size-density classification, microscopy, and petrography ▪ PCB sediment-water partitioning **Alternative Actions** The following alternative actions could result from resolution of the principal study questions: ▪ Confirm or revise the assessment of the nature and extent of contamination in the recently deposited sediment (1995 to present), which includes the biologically active zone, as presented in the CSM, reconciling the most recent observations with those made in previous studies (i.e., 1995, 2005, and 2007/2008 sediment samples). ▪ Focus the risk assessment sampling program relative to the refined understanding of the nature and extent of contamination and the potential for contaminants to be bioavailable via data generated through this effort. ▪ Focus the sampling program relative to expanding the understanding of pathogens and their contribution to background conditions in the study area. ▪ Additional collection of sediment quality data may be required as a result of this program to further resolve the nature and extent of contaminated sediment in the LPRSA. **Decision Statements on Nature and Extent of Contamination in Sediment** ▪ If multiple lines of evidence (i.e., sediment physical characteristics [DQO 1], radiodating, analysis of temporal bathymetry data, and comparison of contaminant impacts with 1995 horizon) suggest a stable sediment (or depositional environment) bed, and other lines of evidence (e.g., SPI) suggest that the biologically active zone and the nature and extent of deeper buried contaminants have been determined (via historical and current chemical evaluation), then no further coring will be conducted at this location.

DQO Step	Data Quality Objective 2 (DQO 2): Characterize Nature and Extent of Contamination in Sediment within the Lower Passaic River Study Area (LPRSA) Description
	▪ If multiple lines of evidence (i.e., sediment physical characteristics [DQO 1], radiodating, analysis of temporal bathymetry data, and comparison of contaminant impacts with 1995 horizon) suggest an unstable sediment (or erosional environment) bed, then chemical concentration data will be reviewed to determine if further coring/sediment sampling is necessary in the area to define extent. ▪ If sufficient data are collected to characterize internal and external sources and loads, to calibrate the sediment transport models and chemical fate transport; then the need for additional data collection will not be necessary. ▪ If following evaluation of chemical concentrations (from this event as well as other RI sampling events) through geostatistical analysis, along with sediment type data from geotechnical and geophysical surveys, the extent of contaminated sediment exceeding the project-specific action levels (to be determined) can be established, then the need for further data collection will not be necessary. This data along with all other data collected in the RI will be reported to EPA.
STEP 3 **Identify the information inputs**	Information required to answer the decision statement will include the existing field data and data to be obtained from the planned sampling event, as well as future RI scopes of work (See Step 5 of DQO 2). **New Data Needed** Low resolution coring as required by FSP 1 (EPA, 2005), will be implemented throughout RM 0-17, the tributaries, and above Dundee Dam to characterize the nature and extent of impacts and determine potential sources including extensive chemistry data collection as detailed below in Step 5. Vibracoring and surface grab sampling will be used to assess the 0-6" segment for all analytes. Deeper samples (greater than 6") will be collected using vibracoring techniques, with analysis throughout the core to the red brown clay layer, sand, or refusal. In addition, at the request of EPA, at 8 locations, the top 2 feet of sediment will be further studied through finer segmentation of 5 layers with physical and chemical analyses. This finer segmentation sampling will be done with a box core device. **Existing Field Data (to be Augmented)** ▪ 2005 EPA/Malcolm Pirnie, Inc., high resolution cores in RM 1 to 7 ▪ 2005 EPA/Malcolm Pirnie, Inc., sediment stability samples ▪ 2006 EPA/Malcolm Pirnie, Inc., low resolution cores in RM 1 to 7 ▪ 2007 EPA/Malcolm Pirnie, Inc., Dundee Lake cores ▪ 2005 Tierra Solutions, Inc., remedial investigation phase 1 program in Newark Bay ▪ 1995 Tierra Solutions, Inc., remedial investigation data ▪ 2008 Malcolm Pirnie, Inc., sediment coring program (data not available yet) **Existing Reports** ▪ Malcolm Pirnie, Inc., 2007 Conceptual Site Model

DQO Step	Data Quality Objective 2 (DQO 2): Characterize Nature and Extent of Contamination in Sediment within the Lower Passaic River Study Area (LPRSA) Description
	▪ Malcolm Pirnie, Inc., 2006 Draft Geochemical Evaluation (Step 2) ▪ Malcolm Pirnie, Inc., 2007 Source Control Early Action Focused Feasibility Study ▪ Malcolm Pirnie, Inc., 2007/2008 Narratives for High Resolution Cores, Low Resolution Cores, Dundee Dam Coring
STEP 4 **Define the boundaries of the study**	**Geographic Area** The LPRSA includes the 17-mile tidal reach of the Lower Passaic River from below the Dundee Dam (RM 17.4) to the confluence with Newark Bay (RM 0). The LPRSA also includes the tributaries to this reach (e.g., Saddle River, Second River, Third River, and an unnamed tributary). This phase of the low resolution coring program will include sampling within RM 0 to 17, the tributaries, and Dundee Lake above the dam. **Timeframe** Data will be collected over an estimated 3-month period between July and October 2008. **Sample Type** Sampling intervals will include surface sediment (0–6 inches); three 1-foot segment intervals; and then 2-foot segment intervals to the red-brown clay layer, sand, or refusal. The upper portion of the red-brown sand layer will be sampled where it is encountered at the bottom of the core..
STEP 5 **Develop the analytical approach**	**Approach for Collecting Sediment Samples** An initial grab sample will be collected at each station using a Ted-Young-modified Van Veen grab (SOP LPR-S-01). The grab sampling effort will collect a surface sediment sample, defined as the sequence from 0 to 6 inches below the sediment-water interface. Vibracoring will be used to collect the shallow (0-6") and deeper sediment samples (per SOP LPR-S-03). Longer cores will be sectioned as needed on the sampling vessel to ensure that the cores are maintained upright during handling, transport, and storage. Sample processing and transfer to sample containers will be performed at the field facility. In addition, piston coring or push coring may be used, if more appropriate, based on sediment depths encountered (per SOP LPR-S-02). Lastly, a box coring device will be utilized to collect data within the top two feet for finer segmentation analysis for fate and transport modeling. **Anticipated Analytical Methods for Sediment Cores** The following lists the analytical methods for all sediment samples: ▪ TAL metals and titanium using EPA Method 6010B/6020A/7471A ▪ TCL VOCs using EPA Method 8260B ▪ SVOCs using EPA Method 8270C ▪ PAHs and alkyl PAHs using HRGC/LRMS-SIM ▪ PCBs (homologs and congeners) using EPA Method 1668A ▪ PCBs (aroclors) using EPA Method 8082

DQO Step	Data Quality Objective 2 (DQO 2): Characterize Nature and Extent of Contamination in Sediment within the Lower Passaic River Study Area (LPRSA) Description
	▪ Dioxins/furans using EPA Method 1613B ▪ Organochlorine pesticides using EPA Method 8081A ▪ Organochlorine pesticides using HRGC/HRMS ▪ Chlorinated herbicides using EPA Method 8151A ▪ TPHs (extractable) using NJDEP Method OQA-QAM-025-02/08 ▪ Butyltins using EPA Method 8270 mod. or NOAA 130 ▪ Mercury, low-level using EPA Method 1631 ▪ Cyanide using EPA Method 9010C/9014 The following lists the analytical methods for 13 sediment samples only: ▪ TPHs (purgeable) using EPA Method 8015B ▪ Methyl mercury using EPA Method 1630 mod. ▪ Hexavalent chromium using EPA Method 7199/3060A ▪ AVS and SEM using EPA Methods 821R91100, 6010C/6020 ▪ Phosphate (total) and orthophosphate (total) using EPA Method 365.2 modified ▪ Total Kjeldahl Nitrogen using ASTM D3590-89-02 ▪ Ammonia as N using EPA 350.1 ▪ *E. Coli* using SM9223B with modifications ▪ Giardia using EPA Method 1623 modified The following lists the analytical methods for up to seven sediment samples only: ▪ Additional size-density classification, microscopy and petrography using University of Maryland ASTM D2797, D2798, D2799 ▪ PCB sediment-water partitioning using EPA Method 1668A **Project Quantification Limits** The reporting limits are included in QAPP Worksheet #15. **Quality Assurance/Quality Control Program (QA/QC)** QA/QC samples will be analyzed with the sediment samples appropriate for each analytical test such as field duplicates, laboratory duplicates, lab control and matrix control spikes (optional), and performance samples. QA/QC samples will be analyzed with the sediment samples appropriate for each analytical test, such as field replicates, laboratory duplicates, lab control and matrix control spikes (optional), and performance samples. QAPP Worksheets #12 and #28 provide performance criteria of these precision and accuracy measurements. Worksheet #20 provides frequency of field replicates and blanks. Data verification and validation protocols are detailed in Worksheets 34, 35, 36, and 37. QAPP Worksheet # 31 provides auditing details for the program.

DQO Step	Data Quality Objective 2 (DQO 2): Characterize Nature and Extent of Contamination in Sediment within the Lower Passaic River Study Area (LPRSA) Description
	Anticipated Data Evaluations ▪ Evaluation and determination of current inventory of contaminant concentration for determination of nature and extent and input into risk assessment, modeling, and the feasibility study ▪ Evaluation of potential contaminant contribution to Newark Bay ▪ Comparison of the analyte patterns (finger printing) in sediment ▪ Comparison of analyte ratios between existing data and new data for characterization of nature and extent of contamination ▪ Evaluation of the potential for natural attenuation of detected chemicals using the results of a geochemical evaluation of data, information from a literature research, and calibrated model output ▪ Evaluation and use of contaminant sediment loads, discharges, and other sources of external input to calibrate and validate the sediment transport and chemical fate and transport models inform the sediment transport and chemical fate and transport models. ▪ Evaluation of data in risk assessment context to help inform future risk assessment sampling and analysis activities ▪ Evaluation of sediment quality impacts by non-HSL stressors to support the WRDA FS and restoration planning
STEP 6 **Specify performance or acceptance criteria**	Uncertainty is always present in the measurement and interpretation of environmental data. In this case, the focus is on collecting and interpreting data to better characterize the nature and extent of chemicals of potential concern (COPCs) including identification of potential sources. In the absence of defined decision tolerance limits, the sampling design should still strive to identify possible sources of error and minimize them, to the extent practical. The most significant type of error that may be encountered includes that of sediment sampling. Both random and systematic errors can be introduced during the physical collection of the sample, sample handling, sample analysis, and data handling. Errors introduced through these steps will be controlled by preparing and following SOPs, and establishing appropriate controls for data quality. These controls apply to field procedures (e.g., adherence to SOPs, field equipment calibration, and field duplicates), laboratory analytical errors (e.g., calibration standard, internal standard, surrogate recoveries, and laboratory control samples), and data validation. The QAPP Worksheets provide further detail on error control procedures, both in the field and in the laboratory. Appendix B (Field SOPs) and Appendix C (Laboratory SOPs) provide supporting details. Sampling design error is the result of the inherent variability of the sampled population over space and time, the sample collection design, and the number of samples available upon which to base the decision. Because it is impossible to sample every inch of the LPRSA, there is always a possibility that some feature of the natural variability is missed. Sampling design error can increase the chance for misrepresenting the natural variability by random error (imprecision) or systematic error (bias) in sampling.

DQO Step	Data Quality Objective 2 (DQO 2): Characterize Nature and Extent of Contamination in Sediment within the Lower Passaic River Study Area (LPRSA) Description
	Because the number of samples controls how well the sampled population (i.e., LPRSA sediment inventory) is characterized, use of the DQO process requires that the variability of data be understood to evaluate the trade off between uncertainty (confidence limit) and sampling intensity. In addition, as explained in this QAPP/FSP Addendum, the sampling plan includes the entire area of study in RM 0 to 17, contributing tributaries, and above Dundee Dam. This investigation is meant to characterize the physical and chemical qualities of the LPR sediments using a small but robust data set of the LPR sediments. This data set has a characteristic natural variability that will be represented by this data set if all other sources of variability are minimized. By reducing the errors associated with samples collection handling, analyses, and reporting with the strict adherence and use of standardized and documented procedures, as well as the noting of deviations from these procedures, the induced variability of the data set is minimized and the data set is a better representation of the LPR sediments, allowing, among other things, increased power in statistical testing and improved parameterization of numeric and empirical models.
STEP 7 **Develop the detailed plan for obtaining data**	**<u>Sediment Sampling in the LPRSA</u>** The currently proposed sampling program will consist of: ▪ 115 sampling locations ▪ One sampling event (up to three months of field work) to minimize temporal variability Using vibracoring and sediment grab samples the 0–6 inch interval will be sampled. Samples should also have sufficient mass to analyze for an extensive set of chemical target analytes, as shown in QAPP Worksheet #15 and listed above in Step 5. Two sediment cores using a vibracore will be obtained. Where more appropriate for field conditions, or a hand-held coring device, such as a piston-corer will be used. Each sediment core will be continuously analyzed in the following segments: ▪ 0-6” interval ▪ Three 1-foot segments followed by ▪ 2-foot segments to the red-brown clay layer, sand, or refusal ▪ The top of the re-brown sand layer, where encountered for a subset of analytes Sample interval segments may vary to accommodate collection of distinctly different layers of sediment, as described in QAPP/FSP Addendum. The second core will likely be a shorter core of up to 4 feet to obtain the necessary sample mass for the 1 foot segments. The grab sampling effort will collect a surface sediment sample from 0 to 6 inches below the sediment-water interface. The surface sediment from the grab sampler will be utilized after the sediment sample mass from the vibracores has been exhausted. A prioritization of sample analytes is provided in Tables 3 and 4 of the FSP Addendum. Data evaluations will be performed to inform the completion of a Phase II RI Work Plan to comply with the requirements of FSP1 and FSP2. Please see the attached QAPP/FSP Addendum for further details.