Approximately one week prior to the workshop, all confirmed attendees received a binder of handout materials consisting of tables and figures for their review before the workshop.

The first day of the workshop (December 13, 2005) consisted of discussions regarding the contaminants of potential ecological concern (COPEC) selection process, the conceptual site model (CSM), exposure pathways, and potential receptors. The second day of the workshop (December 14, 2005) consisted of discussions regarding problem formulation and potential assessment and measurement endpoints.

**Day 1 - December 13, 2005**

A sign-in sheet was circulated and emailed as a PDF file to all participants following the workshop on December 15, 2005.

Chuck Nace presented introductory slides reviewing the CERCLA process and where the baseline ecological risk assessment (BERA) fits into USEPA's regulations.

The first topic discussed was the COPEC selection process. Battelle presented a table of revised COPECs based on a proposed two-tiered selection process. The decision process for the selection of COPECs was presented in a flow diagram. Significant comments and/or decisions were made regarding the proposed COPEC selection process:

- It was clarified that the elements of the screening-level ecological risk assessment (SLERA) will be incorporated into the BERA.
- The criteria used to horizontally delineate contaminant "hot spots" in surficial sediments need to be defined.
- Background or regional concentration data will be used to assist in refining inorganic COPECs only; however, further discussion on appropriate background datasets for the Lower Passaic will be necessary. The USGS surface water dataset for the watershed may be worth evaluating along with regional sediment datasets.
- It was recommended that correlations in the spatial distribution of contaminants be considered during the COPEC selection process.
- The procedures for calculating exposure point concentrations (EPCs) need to be decided.
- Appropriate reference area(s) need to be selected. Although the Mullica River was used previously for the six-mile analysis, there may be metal contamination in the freshwater section of the river.
- With relation to Newark Bay, it was clarified that Newark Bay is a separate project and a set of COPECs will be independently identified for evaluation. Chemicals screened out of the Passaic River will not automatically be screened out of Newark Bay. However, it is anticipated that the COPEC selection process will be similar between the two projects.
Standard groupings for COPECs were also discussed:

- Current collection and analytical strategy is for both PCB congeners and aroclors.
- Total PCBs can be defined by either USEPA method 1668A, which provides all 209 congeners, or by NOAA’s accepted method of summing 18 “NOAA congeners” and multiplying by 2. The cost implications of both methods will be evaluated.
- The use of high molecular weight and low molecular weight groupings will be used for PAHs.
- It was recommended that individual PAHs (e.g., fluoranthene, anthracene, pyrene, etc.) be assessed for potential phototoxicity.
- TEQ approach will be used for dioxins/furans and co-planar PCB congeners that can produce dioxin-like effects.

The next topic discussed was the conceptual site model (CSM), which incorporates the food web model, hydrodynamics, sediment transport, and fate and transport of COPECs. Handout materials in the binder were discussed and the preliminary CSM from the Pathways Analysis Report (PAR) was presented. The following comments and/or decision points were captured:

- USFWS would like to see bird tissue body burdens incorporated into the food web model.
- HydroQual’s model will help estimate sediment concentrations (where data are lacking) to be incorporated into the risk exposure models.
- HydroQual’s model consists of 3-5 cells horizontally across the River, 10 cells vertically with depth of the River, and the length of each River segment is 500 m. It will be important to consider these dimensions when identifying EPCs for specific receptors.
- The biological component of HydroQual’s food web model will estimate COPEC bioaccumulation through the fish trophic levels only; exposures to wildlife receptors will be estimated in the BERA using receptor-specific dose models.
- Two sets of receptors will be developed – one for the estuarine portion of the River and one for the freshwater portion. A separate set of ecological receptors is not necessary for the transitional section of the River.
- NOAA recommended that atmospheric deposition be considered as a separate source term in the CSM.
- NOAA would like to see total suspended solids (TSS) incorporated into HydroQual’s model.

The next topic discussed was the exposure pathways:

- Previous work by BBL indicated that submerged aquatic macrophytes are not present in the lower six-mile stretch of the River; however, the emergent grass, Spartina sp., does occur sporadically and should be considered in the CSM.
- NOAA recommended keeping phytoplankton as a source in the food web and the CSM, but to exclude it as a specific receptor of concern because there is too much variability and too many stressors, which would lead to a large amount of uncertainty.
- NOAA recommended that the zooplankton community be retained as a specific receptor group. There are sufficient data and zooplankton is a major component of the aquatic
food web. The measurement endpoint could be water quality criteria (discussed further on Day 2).

- An herbivorous mammal such as a muskrat was suggested as a receptor by USACE.
- USFWS would like to see floodplain soils addressed, which would be inhabited by a muskrat or other herbivorous receptor. USFWS recommends obtaining flood demarcation boundary maps, with possible field collaboration during the WRDA surveys, to determine whether sufficient floodplain habitat exists to warrant specific consideration in the BERA.
- BBL suggested that the only area for floodplain soils was just south of the Dundee Dam and at confluences with other rivers (e.g., Third River, Saddle River), but data are limited from those areas.
- Amphibians may also be an important receptor associated with floodplain soils.

Community groups and receptors were discussed. The following issues were captured:

- USFWS recommended the addition of the herring gull (*Larus argentatus*) for a piscivorous bird receptor because toxicological data for this species exist, the herring gull is commonly found within the study area, and tissue sampling is feasible.
- Recommended plant receptors were spatterdock (*Nuphar luteum*) for the freshwater portion and *Spartina* sp. for the estuarine portion.
- Benthic invertebrates will be treated as a community group, not individual species. Toxicity to individual species (*e.g.*, *Amphelisca abdita*) will be assessed as specific measurement endpoints.
- USFWS recommended oysters as a potential receptor in the lower six miles because they were historically present (pre-1900s) in this area.
- For the crustaceans, blue crabs were recommended for the estuarine portion and crayfish were recommended for the freshwater portion.
- It was agreed that zooplankton would be considered at the community level similar to the benthic invertebrates; they will not be evaluated as individual species.
- BBL noted that there is a seasonal abundance of grass shrimp, which likely serve as a major food source for fish.
- For forage fish receptors, the mummichog was recommended as a receptor for the estuarine portion; it was suggested that the striped killifish (*Fundulus majalis*) be a candidate species for the freshwater portion.
- NOAA recommended using winter flounder as a benthic species for the estuarine portion.
- For the pelagic fish, white perch, American eel, and striped bass were recommended, which are also important for the human health evaluation.
- USFWS recommended the Atlantic tomcod for a pelagic estuarine fish (Fernandez *et al.*, 2004).


- For the freshwater portion of the River, USFWS recommended a bullfrog for the amphibian receptor and a snapping turtle or tarpin for the reptile. It was agreed that there is no estuarine amphibian analog.
• BBL has done extensive bird surveys on the River and noted that great egrets were more common than snowy egrets. Also kingfishers are very common year-round residents along the entire River and have a smaller home range than the cormorant.
• USFWS suggested the following bird species: Scaups and Canada geese for freshwater omnivorous birds - potentially obtain tissue data from hunters; herring gull, kingfisher, and great egret for piscivorous birds - potentially collect tissue data where appropriate; black-crowned night herons are common along the River for the bentivorous birds; also recommended raptors such as the bald eagle and peregrine falcon.
• For mammals, the following were recommended: muskrat for an herbivorous mammal, raccoon for an omnivorous mammal, and mink for a piscivorous mammal.
• De maximis raised a concern regarding CSOs and the release of pathogens as potentially confounding stressors in the system. USEPA clarified that pathogens are not addressed under the CERCLA program, but there are other programs that will address these contaminants (e.g., TMDL).

Day 2 - December 14, 2005

The second day of the workshop consisted of discussions regarding the BERA problem formulation and potential assessment and measurement endpoints. Slides were presented with preliminary assessment and measurement endpoints. The workshop participants were asked to comment on and prioritize appropriate endpoints for the selected receptors.

Aquatic Plants
• The assessment endpoint was revised to read: Maintenance of healthy aquatic plant populations as food resource and habitat for fish and wildlife populations.
• For measurement endpoints, NJDEP noted the difficulty in performing toxicity tests on the selected aquatic plants (Spartina sp. and spatterdock). NJDOT indicated that there may be some data from on-going Spartina restoration studies in the Lower Passaic River which may provide some useful information.
• It was recognized that plants are not likely to be the most sensitive species for the majority of COPECs and would be a lower priority than other receptors.
• NOAA and USFWS noted the two distinct functions of plants: as a food source (CERCLA component) and as a “healthy, normal” habitat (WRDA component).
• It was recommended that this assessment endpoint be evaluated using screening benchmarks for plants (e.g., ORNL, USACE WES) rather than a field study comparing to reference areas.

Benthic Invertebrates
• NJDEP and NJDOT recommended that future work on the Passaic River consider the existing knowledge and data from previous work on the lower six miles.
• BBL mentioned that the sediment triad approach was used to assess benthic invertebrates in 2000. These studies showed that polychaetes were not a sensitive receptor; amphipods were more sensitive. However, BBL was unable to identify a cause-effect relationship between sediment chemistry and toxicity using a TIE study.
• USFWS questioned what populations in the River should be protected – current or future populations (post remediation). This idea ties into the WRDA component of the program.
and the need for a "healthy" or "normally" functioning population. The term "survival and maintenance" will be defined in the text of the BERA to demonstrate that actions will do more than just protect current populations. Rather, the assessment endpoint is meant to protect the populations that will be established after contaminants have been removed.

- Assessment endpoint was revised to read: *Protection and maintenance (i.e., survival, growth, and reproduction) of a normally functioning benthic invertebrate community that serves as a forage base for fish and wildlife populations.*
- It was agreed that the sediment triad approach is the most appropriate approach for assessing this endpoint.

**Macroinvertebrates (Crustaceans)**

- The assessment endpoint reads: *Protection and maintenance (i.e., survival, growth, and reproduction) of healthy populations of blue crab and crayfish that serve as a forage base for fish and wildlife populations.*
- For the blue crab (estuarine receptor) and crayfish (freshwater receptor), toxicity tests and tissue samples were recommended as measurement endpoints, along with comparison to appropriate water and sediment toxicity benchmarks.
- A reproductive measurement endpoint based on consideration of egg tissue concentrations, egg viability, and/or total fecundity was also suggested.
- BBL suggested that grass shrimp represent a seasonally significant food source and should be considered for tissue collection and analysis.

**Molluscs (Oysters)**

- USFWS recommended oyster populations as an endpoint because historical (pre-1900s) data indicate that they existed in the lower portions of the river. This ties into the WRDA/NRDA components of the project because it is unknown if oysters could survive in the River in the absence of contaminated sediments.
- BBL noted that caged mussel studies were performed in the lower six miles; there are good survival and bioaccumulation data from these studies. There were no hard-shelled clams present in the lower six miles, but there were both soft- and hard-shelled clams present in Newark Bay (e.g., *Mya arenaria*, *Macoma* sp, and *Mercenaria mercenaria*).
- The assessment endpoint reads: *Protection and maintenance (i.e., survival, growth, and reproduction) of healthy mollusc populations in the Passaic River.*
- NOAA suggested a comparison to sediment and/or water quality benchmarks as a measurement endpoint.
- Other measurement endpoints include: *in situ* caged bivalve study (e.g., *Mytilus edulis*, *Elliptio* sp. [for freshwater]) and laboratory bioaccumulation/toxicity test with oysters.

**Fish**

- The assessment endpoint was revised to read: *Protection and maintenance (i.e., survival, growth, and reproduction) of healthy fish populations.*
- Forage fish are not only demersal and benthivorous, but can also be pelagic.
- For the measurement endpoints, BBL recommended doing a thorough histopathological analysis on fish tissue; a limited study was conducted by BBL.
- BBL stated that comparing fish populations in the River with a reference area is difficult because there is no way to distinguish between the various stressors (i.e., habitat.
constraints vs. contaminant effects). In addition, many fish species are migratory and there is temporal variability.

- Toxicity tests could include endpoints for survival, growth, and reproduction (e.g., early life stage, eggs, and larvae), as well as possible *in situ* studies.
- NOAA also recommended using older, adult fish to conduct studies regarding endocrine disruption.
- Fish tissue concentrations will be compared to Critical Body Residues (CBR).
- It was agreed that a comparison of study area surface water and sediment to toxicological benchmarks (including criteria) was appropriate.
- USFWS recommended linking measurement endpoints to specific COPEC impacts. For instance, metals cause direct toxicity, TCDD causes genetic mutations.

**Amphibians**
- The assessment endpoint reads: *Protection and maintenance (i.e., survival, growth, and reproduction) of healthy amphibian populations.*
- Because amphibians are limited to the upper (freshwater) reaches of the River and are likely limited in numbers, USFWS recommends collecting only a few large bullfrogs for tissue analysis. USFWS noted that they often reside in or around CSOs in the late spring to avoid predators.
- Another appropriate measurement endpoint would be to compare surface and sediment concentrations to amphibian toxicity values, recognizing that these data are limited.

**Birds**
- Birds were discussed as a group because the assessment and measurement endpoints are similar for each feeding guild.
- It was agreed that WRDA community bird surveys are important to understand what types of birds inhabit the River and where they are nesting and foraging.
- NOAA recommended evaluating available Christmas count survey data to assess presence/absence of species.
- For the measurement endpoints, USFWS recommended using tissue samples from the herring gull for a piscivorous species.
- NJDOT recommended using metrics other than field-collected tissue samples to measure toxicity for the kingfisher (e.g., fledging success, use of feathers, egg viability).
- Participants recommended a dose-assessment model as a measurement endpoint for the avian receptors.
- The inclusion of a raptor species (e.g., peregrine falcon, eagle) should be considered as a separate guild for evaluation in the BER.
- The possibility of obtaining tissue samples from diving ducks and geese that were collected by hunters was discussed. BBL noted that most birds seen in the Lower Passaic River spend time in the Meadowlands.

**Mammals**
- Population surveys may be available from the NJDEP database (from hunters/trappers) to indicate presence/absence of species.
• For piscivorous mammals, such as the mink, it was decided that it is not necessary to do full toxicity tests because the cost is high and this population is already expected to show a high risk.
• It was agreed that the primary measurement endpoint for this receptor would be the comparison of receptor-specific dose estimates to toxicological benchmarks (i.e., TRVs).
• The raccoon will be retained as a potential receptor, even though much of its diet could be derived from residential garbage. A conservative assumption that this receptor obtained all its food from the River could be re-evaluated if the BERA identified a potential risk for this receptor.
• Discussion concluded that an herbivorous mammal may not be an appropriate receptor because it is not the most sensitive mammal; however, it may have a higher rate of incidental ingestion of sediment because of consumption of plant roots. The inclusion of this receptor in the BERA will be based on whether or not floodplain soils are included.

Zooplankton
• Assessment endpoint reads: Maintenance of zooplankton communities that serve as a food base for juvenile fish.
• NOAA suggested that the zooplankton community is too seasonally variable to allow for a meaningful (i.e., with adequate study power) comparison of population metrics with reference areas.
• The measurement endpoint will be to compare surface water concentrations of COPECs with appropriate benchmarks.

The workshop concluded with a summary of the days’ discussions and a review of the next steps that will be taken with regard to the BERA. This includes finalizing Steps 1 through 3 of the Risk Assessment Guidelines for Superfund (USEPA, 1997), which includes the Screening Level and Problem Formulation steps. Then, Step 4 will be an update to the Field Sampling Plan (FSP 2) to address concerns and issues identified at this workshop and will be implemented accordingly. Finally, once the data are gathered, risks will be analyzed, characterized, and reported in the BERA.

Major Stakeholder Issues

Several reoccurring concerns from stakeholders arose during the two-day discussions:

1.) How will the three components of the LPRRP (CERCLA/WRDA/NRDA) come together in the broader, overall project? Will they?
   • Both CERCLA and WRDA are expected to contribute to FSP 2. NJDOT showed concern because WRDA is lacking funding to complete FSP 2.
   • Natural Resource Damage Assessment (NRDA) was mentioned several times by USFWS – how will this multi-stressor relationship (contaminants vs. physical limitations, lack of habitat, pathogens, etc.) be addressed during the project?
   • The typical restoration goal recognized by CERCLA as “fishable, swimmable” was not considered a realistic goal without consideration of other programmatic efforts (i.e., WRDA, NRDA).
• Stakeholders suggested a re-wording of the assessment endpoints and management goals to include the terms “healthy” and “normal” with regard to future populations once the River is restored. However, these adjectives need to be objectively described upfront.

2.) Stakeholders want to ensure that existing data from the lower six-mile portion of the River get incorporated into any future work.

Action Items/Next Steps

- Alice to distribute participant list.
- Alice to distribute meeting minutes and slides to participants.
- Grass shrimp will be further evaluated as an input to the food web model.
- Flood boundary maps will be reviewed to determine if floodplain soils provide adequate habitat for receptors.
- Finalize Steps 1 through 3 of the BERA.
- Complete FSP 2.
- Implement FSP 2.
- Complete the BERA.
Lower Passaic River: Baseline Ecological Risk Assessment Workshop

December 13 and 14, 2005
USEPA Edison Facility
Conference Room #2
Regional Response Center
Edison, NJ

Agenda

1. Welcome and Introductions
2. Workshop Objectives
3. Identification of COPECs
4. Conceptual Site Model
   a. Environmental Fate and Effects of COPECs
   b. Key Exposure Pathways
   c. Ecological Receptors Potentially at Risk
5. Management Goals and Risk Hypotheses
6. Assessment Endpoints
7. Measurement Endpoints
8. Summary of Meeting Proceedings
Welcome and Introductions

➢ Circulate sign-in sheet
➢ Everyone introduce themselves
➢ This symbol and yellow text indicates that a straw proposal is being presented for discussion and to reach consensus on the specific issue

Ecological Risk Assessment

➢ The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) authorizes USEPA to protect public health and the environment
➢ USEPA's primary regulation in Superfund is the National Contingency Plan (NCP)
  • Identification and mitigation of environmental impacts, and
  • Selection of remedial actions to protect the environment
Ecological Risk Assessment

➢ Evaluation of environment impacts are addressed though conducting an ecological risk assessment using current agency guidance

➢ USEPA guidance follows an eight-step process with Steps 1 and 2 typically associated with screening-level assessment (SLERA) and Steps 3-8 typically associated with baseline assessment (BERA)

Ecological Risk Assessment

➢ Steps 1 and 2 have been evaluated for portions of the Passaic River in the following documents
  - Pathways Analysis Report for Lower Passaic River Restoration Project – USEPA/USACE/Battelle, July 2005
Ecological Risk Assessment

➢ The result of previous screening evaluations have indicated a need to conduct a baseline ecological risk assessment (BERA)

➢ Focus of this workshop is to refine information presented in the screening evaluations, discuss technical issues associated with Steps 3 through 8 of the BERA, and develop a consensus approach for conducting the BERA

Goals and Objectives

➢ To refine the list of chemicals of potential ecological concern (COPECs) in the lower Passaic River

➢ To refine the conceptual site model that links sources, COPECs, and receptors
  - To reach consensus on the environmental fate and effects of the selected COPECs
  - To refine key exposure pathways
  - To refine ecological receptors

➢ To focus the risk hypotheses regarding the potential effects of COPECs

➢ To refine the assessment and measurements endpoints for the BERA
Identification of COPECs

> Several lists of COPECs have been developed in the screening-level assessments
  > The two most recent have identified a total of ~110 compounds, with ~70 compounds being identified in both
> Issue 1 - The most significant differences were associated with grouping compounds by class
> Issue 2 - Refining list to focus on the primary compounds associated with risk

Identification of COPECs

**Issue 1**
> PAHs – Individual identification or by weight
> PCBs – Aroclors or congeners
> Pesticides – Individual (e.g., DDD, DDE, DDT) or total (e.g., ΣDDT)
> Dioxin – 2,3,7,8-TCDD or all dioxin/furan congeners
Identification of COPECs

Propose standard grouping for PAHs, PCBs, pesticides and dioxins –
- Use individual PAHs (34) and sum by weight for assessment,
- Use both a subset of congeners and Aroclor data for PCBs,
- Sum pesticide analogs (e.g., endrin, endrin ketone = total endrin), and
- Include all dioxin/furan congeners with TEQ analysis

Identification of COPECs

Issue 2
- Select methodology to focus COPEC list to those compounds that are the primary risk drivers
- Factors to consider:
  - Hazard quotients with refined assumptions
  - Exposure point concentration adjustment
  - Bioavailability
  - Background comparison
Identification of COPECs

➢ Methodology to use for refining COPECs (see flow chart, Figure 1, in handouts)
  • Screen the maximum concentration
  • Consider detection frequency (5%)
  • Consideration of background for inorganics
  • Dose calculation using realistic parameters
  • Compare dose calculation to PCL

  • PCL = wildlife protective concentration level; will be derived based on realistic assumptions appropriate for the BERA (e.g., receptor-specific foraging frequency, chemical-specific bioavailability)

Break

Please be back in 15 minutes
Conceptual Site Model

A conceptual site model (CSM) is a basic description of how contaminants enter a system, how they are transported within the system, and where routes of exposure to organisms (and humans) occur. As such, it provides an essential framework for assessing risks from contaminants, developing remedial strategies, determining source control requirements, and how to address unacceptable risks.

Characterize environment, identify sources, transport mechanisms, environmental fate, exposure routes, and receptors.

Conceptual Site Model

Large river system that transitions from freshwater to an estuarine system
  • Affect transport and fate, as well as receptors

Various inputs to the system and contaminant sink(s) in the system
  • Affect transport and fate

Limited resources to collect data
  • Affect all areas of the CSM

Combine environmental characteristics, historic data, and current data to develop the CSM – modeling useful for this step.
Overview of Modeling Program

➢ Hydrodynamic model
  • Simulates flow of water in estuary system as input parameter to sediment transport model

➢ Sediment Transport model
  • Provides for movement of sediments to which contaminants bind

➢ Fate and Transport model
  • Provides concentrations of organic carbon and contaminants as input for food web model

➢ Food web model
  • Provides tissue concentration for invertebrates (benthic and crustacean), and fish (forage and predatory)

Overview of Modeling Program

➢ Model uses:
  • Projection (e.g., what will fish concentrations be at some point in time)
  • Evaluation of remedial options (e.g., what will fish concentrations be if remedial option X is completed?)
  • Use output of models in risk assessment to estimate risk and to evaluate assessment and/or measurement endpoints
Overview of Modeling Program

- Limitations and Customizing for our needs
  - Pathways
    - Limited to sediment and aquatic receptors
  - Contaminant availability, biology, and habitat
  - Number and type of species/trophic levels
    - Due to computational resources there is a limit on the number and type of species that can be modeled
  - Number and type of contaminants
    - Due to computational resources there is a limit on the number and type of contaminants that can be modeled
  - Spatial and functional limitations
    - Hot spots, average over wide area, etc.
Conceptual Site Model

- Food web CSM further defines relationships between environment and biota

Contaminant Exposure Pathways:
- Water
- Sediments
- Food Web Interactions

For illustration only (BBL, 2001)
processes shown in Figure 4 are applicable to Figure 5. However, for simplicity, arrows presented in Figure 4 are not duplicated in Figure 5. Note that some sources may be less significant or absent in certain river sections. Future iterations of the CSM will prioritize these physical processes. Note that the chemical fate and transport processes are depicted in subsequent figures.

The color scheme used in Figure 4 reflects different media, including air (light blue), water (dark blue), and sediment (brown), and it represents the media depicted in Figure 3.

General Sources & Physical Release Mechanisms for Contaminants in Sediment, Water, and Air

**Figure 4**

Conceptual Site Model
Lower Passaic River Restoration Project

Sources of air, water, or sediment to the Lower Passaic River

**Figure 5**

Sources in Each River Section

Conceptual Site Model
Lower Passaic River Restoration Project
Lunch

Please be back at 1:30

Key Exposure Pathways

- Exposure pathways that have been identified in previous reports represent the same media
  - Sediment
  - Surface water
  - Biota
- Other issues to consider
  - Non-chemical stressors
  - Terrestrial and wetland habitats
Key Exposure Pathways

- Sediment
- Mud flats
- Surface water
- Biota
  - Invertebrates
  - Fish
  - Birds
  - Mammals

Community Groups

- Community Groups that are or should be in the study area may include (see Table 3):
  - Microbial
  - Plant
    - Phytoplankton
    - Periphyton
    - Aquatic - Macrophytes
  - Invertebrate
    - Zooplankton
    - Benthic
    - Crustaceans
    - Mollusks
  - Fish
    - Forage
    - Predatory
  - Amphibians
  - Reptiles
  - Birds
    - Benthivorous
    - Piscivorous
    - Omnivorous
    - Insectivorous
  - Mammals
    - Piscivorous
    - Omnivorous
    - Insectivorous
Community Groups

➢ Propose:

➢ Plant
  • Aquatic - macrophyte
➢ Invertebrate
  • Benthic
  • Crustacean
➢ Fish
  • Forage
  • Predatory
➢ Amphibians
➢ Birds
  • Benthivorous
  • Piscivorous
  • Omnivorous
➢ Mammals
  • Piscivorous
  • Omnivorous

Break

Please be back in 15 minutes
Ecological Receptors

- Selection of representative species for each community group that was previously selected
- Should meet one or more of the following criteria:
  - Sensitive species
  - Species that have wealth of toxicity data
  - Species that have tissue data available or can be readily sampled
  - Species that inhabit or have a high likelihood of inhabiting the area
  - Species of importance to human consumers

<table>
<thead>
<tr>
<th>Community Group</th>
<th>Candidate Focal Species</th>
<th>USEPA 2005</th>
<th>BBL 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary consumer</td>
<td>Benthic macroinvertebrate</td>
<td>Benthic invertebrate (polychaete/oligochaete)</td>
<td></td>
</tr>
<tr>
<td>Omnivorous crustacean</td>
<td>Blue crab</td>
<td>Grass shrimp and blue crab</td>
<td></td>
</tr>
<tr>
<td>Forage fish</td>
<td>Mummichog</td>
<td>Mummichog and Atlantic silverside</td>
<td></td>
</tr>
<tr>
<td>Predatory fish</td>
<td>American eel, striped bass, carp, channel catfish</td>
<td>Striped bass, American eel, and white perch</td>
<td></td>
</tr>
<tr>
<td>Piscivorous bird</td>
<td>Black-crowned night heron, American bittern, Snowy egret</td>
<td>Herons, egrets and belted kingfisher</td>
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<td>Omnivorous bird</td>
<td>Ducks/geese</td>
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<td></td>
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<td>Reptile</td>
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</tr>
<tr>
<td>Mammalian</td>
<td>River otter</td>
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</table>

> Comparison of exposure pathways from two reports
### Ecological Receptors

<table>
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<th>Community Group</th>
<th>Propose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant – aquatic (macrophyte)</td>
<td><em>Spartina alterniflora</em></td>
</tr>
<tr>
<td>Invertebrate – benthic</td>
<td><em>Ampelisca abdita</em> (amphipod)</td>
</tr>
<tr>
<td>Invertebrate - crustacean</td>
<td>Blue crab</td>
</tr>
<tr>
<td>Forage fish</td>
<td>Mummichog</td>
</tr>
<tr>
<td>Predatory fish</td>
<td>American eel, striped bass, largemouth bass, channel catfish</td>
</tr>
<tr>
<td>Amphibian</td>
<td>Bullfrog</td>
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<td>Benthivorous bird(s)</td>
<td>Greater yellowlegs, black-crowned night heron</td>
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<tr>
<td>Piscivorous bird(s)</td>
<td>Cormorant, snowy egret</td>
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<tr>
<td>Omnivorous bird(s)</td>
<td>Mallard duck, Canada goose</td>
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<td>Piscivorous mammal(s)</td>
<td>River otter, weasel</td>
</tr>
<tr>
<td>Omnivorous mammal</td>
<td>Raccoon</td>
</tr>
</tbody>
</table>

### Conceptual Site Model

> Workgroup should revise the conceptual site model to include the pathways and ecological receptors that were agreed upon during the discussion period
Problem Formulation

➤ Management goals

A Fishable, Swimmable River
- Remediate Contaminated Sediments
- Improve Water Quality
- Restore Degraded Shorelines
- Restore and Create New Habitats
- Enhance Human Use

Problem Formulation

➤ Fundamental Questions for the Study:
- If we take no action on the River, when will contaminants of concern recover to acceptable concentrations?
- What actions can we take on the River to significantly shorten the time required to achieve acceptable concentrations for hum & ecol health?
- Are there contaminated sediments now buried that are likely to become exposed following a major flood, possibly resulting in an increase in contaminants in the biota of the River?
- What actions can we take on the River to significantly improve the functionality of the Lower Passaic River watershed?
- If the risk assessments for Newark Bay demonstrate unacceptable risks due to contaminant export from the Passaic River, will the plan proposed for the River significantly shorten the time required to achieve acceptable conc.’s in the Bay, or will additional actions be required on the River?
- What actions can we take on the River to significantly reduce the cost of dredged material management for the navigational dredging program?
- What actions can we take to restore injured resources and compensate the public for their lost use?
Summary – Day 1

➢ We have focused our list of COPECs
➢ We have revised the CSM to focus on exposure pathways and receptors of interest
➢ We have begun to discuss the questions that need to be answered...tomorrow we will focus on assessment endpoints and measurement endpoints

Assessment Endpoints

➢ Identified as "an explicit expression of the environmental value that is to be protected"
➢ Focus on particular components of the ecosystem that could be adversely affected by contaminants from the site
  • Typically related to the pathways and receptor groups identified in the CSM
➢ Once selected, testable hypotheses and measurement endpoints can be developed to determine whether or not a potential threat to the assessment endpoints exists
Measurement Endpoints

- Identified as "a measurable ecological characteristic that is related to the valued characteristic chosen as the assessment endpoint"
- Is a measure of biological effects (e.g., mortality, reproduction, growth)
- Frequently numeric expressions of observations that can be statistically compared to a control or reference site
- May want to pursue more than one line of evidence to identify site-specific thresholds for effects

Several measurement endpoints were identified in the USEPA 2005 Pathways Analysis Report, such as:

- Comparing sediment/surface water/tissue concentrations to toxicity-based screening values
- Conducting in situ and/or laboratory toxicity testing
- Conducting field-based surveys and community assessments
- Comparing incidence of gross and/or histopathological lesions in study area to reference area
Measurement Endpoints

- Measurement endpoints are dependant upon the specific assessment endpoint that is identified.
- Important that the selected measurement endpoint provides adequate data to satisfy the assessment endpoint.

Measurement Endpoints

- Workgroup should focus efforts on developing a list of assessment and associated measurement endpoints for each receptor group that was identified in the previous section.
- Try to get consensus on assessment and measurement endpoints – move to flip chart.
Assessment Endpoint #1

➢ Aquatic Plants
  • Low priority
  • Focus on comparison of sediment concentrations to toxicity values

➢ Benthic invertebrates
  • Agreed to use triad approach
  • Define specific toxicity test

➢ Crustaceans
  • Include crayfish
  • Evaluate the need to include grass shrimp
  • Critical body residue
  • Egg/reproduction study

Assessment Endpoint #2

➢ Benthic Invertebrates
  • Survival and maintenance of a normally functioning benthic invertebrate community (BBL)
  • Protection and maintenance (i.e., survival, growth, and reproduction) of benthic invertebrate communities that serve as a forage base for fish and wildlife populations (USEPA)

➢ Workgroup draft one statement for consensus, if appropriate, and develop measurement endpoint
Assessment Endpoint #3

- Macroinvertebrate (Crustacean)
  - Survival and maintenance of healthy, reproducing populations of blue crab (BBL)
  - Protection and maintenance (i.e., survival, growth, and reproduction) of populations of blue crab that serve as a forage base for fish and wildlife populations (USEPA)

- Workgroup draft one statement for consensus, if appropriate, and develop measurement endpoint

Assessment Endpoint #4

- Forage Fish
  - Survival and maintenance of healthy, reproducing populations of fish (BBL)
  - Protection and maintenance (i.e., survival, growth, and reproduction) of demersal, benthivorous fish populations that serve as a forage base for fish and wildlife populations (USEPA)

- Workgroup draft one statement for consensus, if appropriate, and develop measurement endpoint
Assessment Endpoint #5

➢ Predatory Fish
  • Protection and maintenance (i.e., survival, growth, and reproduction) of pelagic, piscivorous, or semi-piscivorous fish populations that serve as a forage base for wildlife populations or sports fishery in the Passaic River

➢ Workgroup draft one statement for consensus, if appropriate, and develop measurement endpoint

Break

Please be back in 15 minutes
Assessment Endpoint #6

➢ Amphibian
  • Protection and maintenance (i.e., survival, growth, and reproduction) of amphibian populations

➢ Measurement Endpoints:
  • Compare surface water concentration to toxicity values
  • Conduct laboratory FeTox study
  • Compare relative population abundance to appropriate reference area
  • Compare tissue residues to appropriate CBRs

Workgroup draft one statement for consensus, if appropriate, and develop measurement endpoint.

Assessment Endpoint #7

➢ Benthivorous Bird
  • Protection and maintenance (i.e., survival, growth, and reproduction) of benthivorous bird populations

➢ Workgroup draft one statement for consensus, if appropriate, and develop measurement endpoint.
Assessment Endpoint #8

- **Piscivorous Bird**
  - Survival and maintenance of healthy, reproducing populations of piscivorous birds (BBL)
  - Protection and maintenance (i.e., survival, growth, and reproduction) of piscivorous bird populations (USEPA)
- Workgroup draft one statement for consensus, if appropriate, and develop measurement endpoint

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Assessment Endpoint #9

- **Omnivorous Bird**
  - Protection and maintenance (i.e., survival, growth, and reproduction) of omnivorous bird populations (USEPA)
- Workgroup draft one statement for consensus, if appropriate, and develop measurement endpoint
Assessment Endpoint #10

➢ Piscivorous Mammal
  • Protection and maintenance (i.e., survival, growth, and reproduction) of piscivorous mammal populations (USEPA)

➢ Workgroup draft one statement for consensus, if appropriate, and develop measurement endpoint

Assessment Endpoint #11

➢ Omnivorous Mammal
  • Protection and maintenance (i.e., survival, growth, and reproduction) of piscivorous mammal populations

➢ Workgroup draft one statement for consensus, if appropriate, and develop measurement endpoint
Assessment Endpoint #12

➢ Zooplankton Community
  • Maintenance of zooplankton communities that serve as a food base for juvenile fish

➢ Measurement Endpoints
  • Compare surface water concentrations to appropriate surface water toxicity values
  • Conduct 7-day *Daphnia* reproduction study
  • Evaluate abundance, diversity, and palatability of species (during critical period of early fish life stage)

Workgroup draft one statement for consensus, if appropriate, and develop measurement endpoint.

Assessment Endpoint #13

➢ Mollusc Population
  • Protection and maintenance (i.e., survival, growth, and reproduction) of mollusc populations in the Passaic River

➢ Measurement Endpoints
  • Conduct *in situ* caged bivalve study (e.g., *Mytilus edulis, Elliptio sp.*?)
  • Conduct laboratory bioaccumulation/toxicity test
  • Field surveys?

Workgroup draft one statement for consensus, if appropriate, and develop measurement endpoint.
Lunch

Please be back at 1:30

Workshop Summary

➢ Aquatic Plants
  • Low priority
  • Focus on comparison of sediment concentrations to toxicity values

➢ Benthic Invertebrates
  • Agreed to use triad approach
  • Define specific toxicity test
Workshop Summary

➤ Crustaceans
  • Include crayfish in freshwater section
  • Evaluate the need to include grass shrimp
  • Measure contaminant body residues
  • Consider egg/reproduction study

➤ Molluscs
  • Consider toxicity test specific to oyster larvae
  • Consider freshwater analog

Workshop Summary

➤ Fish
  • Recommend Critical Body Residue comparisons
  • Consider histopathology study
  • In situ reproduction study – sticky egg
  • Limited power associated with community surveys
  • Identify contaminant specific endpoints

➤ Amphibians
  • Recommend Critical Body Residue comparisons
  • No need to consider FeTox at this stage
Workshop Summary

Birds
- Recommend Dose-Model approach
- Consider tissue sampling of Herring Gulls
- Consider field measurements of reproductive success in Kingfisher
- Take advantage of available community data/nesting areas
- Qualitatively evaluate trends from Audubon Christmas bird counts and other data sources

Workshop Summary

COPEC Screening
- Agreement with the framework for the screening process
- Follow-on activities:
  - Agree on background data set for inorganic compounds
  - Definition for hot spot assessment
  - Methodologies for spatial area averaging
  - Correlation among contaminants
  - Decide on PCB method for total PCBs (agreed to assess dioxins/furans/co-planar PCBs in a TEQ approach)
Workshop Summary

» Conceptual Site Model
  - Agreement to focus on freshwater and estuarine zones;
  - No need for a separate CSM or receptor set for the transitional zone
  - Geochemical model will include the transitional zone

» Pathways
  - Agreement on key exposures pathways
  - Assess the need to include flood plain

Workshop Summary

» Community Groups
  - BERA will consider adding:
    • Zooplankton
    • Mollusc (i.e., oyster)
    • Reptiles
    • Herbivorous mammals

» Ecological Receptors
  - BERA will consider adding recommended species and freshwater analogs where appropriate
Workshop Summary

➤ Mammals
  • Recommend Dose-Model approach
  • No tissue sampling at this stage
  • Take advantage of fur-bearing tag data

➤ Other Items
  • Identify linkages to WRDA
  • Use existing data from previous studies (6-mile stretch)
  • Evaluate epibenthic community assessment
  • Spatial considerations for deriving exposure point concentrations (EPCs)
  • Re-word Assessment Endpoints

Next Steps

➤ Begin work on the BERA
  • Document the discussions from this workshop, in conjunction with the PAR, to finalize Steps 1 through 3
  • Update the field sampling plan to address concerns (Step 4) and implement
  • Analyze data and complete the remaining steps of the BERA