I. General Comments:

1. Overall, EPA does not agree with the conclusion drawn in the BERA that there are no risks for any receptors in any of the evaluated areas. In particular, the amount of uncertainty surrounding many of the studies (Ex: plant toxicity study, amphibian toxicity study, amphibian survey) and corresponding results, leads EPA to conclude that unacceptable risks to ecological receptors are possible based upon a multiple lines of evidence approach. Below is a brief summary of our conclusions based on review of the BERA and other information. Detailed rationale for our conclusions is provided in the Specific Comments section.

    a. <u>Plants:</u> For plants in at least some parts of the Indiana Dunes National Lakeshore (IDNL) (e.g., Central Blag Slough [CBS]), the weight of evidence suggests that risks are unacceptable and negative impacts may be occurring. This conclusion is based on: (1) soil and/or groundwater concentrations that exceed plant toxicity reference values (TRVs), (2) the presence of barren soil at CBS that has been linked to low pH and elevated metals concentrations, and (3) our analysis of the 2010 plant survey data, which suggests that plant community composition is impacted at some of the site-related areas in comparison to reference areas. As presented in the BERA, the results of the plant toxicity study provides the only line of evidence that conflicts with the above three lines of evidence. However, our review of the plant toxicity study shows that the study was performed with relatively uncontaminated soils and had poor reference area plant survival. We therefore consider the toxicity test results to be highly uncertain and not a supportive line of evidence for a lack of plant impacts. Our detailed reasons are discussed in the specific comments on Appendix G. Additionally, the attached study conducted on Cowles Bog area vegetation appears to contradict this particular line of evidence.
    b. <u>Benthic Invertebrates and Wildlife in Aquatic Habitats:</u> In most of the aquatic habitats in the IDNL, the BERA does not evaluate risks to benthic invertebrates or risks to wildlife through aquatic food web pathways. These are major gaps in the assessment, and we have conducted some preliminary calculations for key chemicals and areas to fill these gaps (detailed in Specific Comment 15). The results of our calculations indicate potential risk to benthic receptors and to invertivorous birds.
    c. <u>Amphibians:</u> Based on the available data and current analyses, the weight of evidence suggests that risks to amphibian receptors may be low. However, we believe that the amphibian assessment is not "definitive", as characterized in the BERA, and that there are important uncertainties that should have been acknowledged in the BERA and carefully considered by risk managers. Also, additional analyses of the amphibian survey data

may change the conclusions of the survey. Refer to comments on Appendices C and E.

d. Terrestrial Invertebrates: The only available line of evidence for terrestrial invertebrates is the comparison of soil concentrations to TRVs or screening values. The results of this comparison do suggest potential for risk in some areas: SWMU 14 and 15 from arsenic, boron, manganese; Little Lake from chromium, manganese; and Eastern Wetland from boron, manganese. It's also noted that although CBS did not demonstrate exceedances of the TRVs, the position that HQs in CBS are lower than the reference area HQs is not appropriate. This risk should not be dismissed based solely on suggestions that screening values are highly conservative or uncertain. Note that the low pH soils in much of the study area may tend to increase the toxicity of some metals in comparison to soils used in standard laboratory tests.

e. Wildlife in Terrestrial Habitats: While risks for most wildlife receptors exposed through the terrestrial food web pathway may be lower than risks for other receptors in the IDNL, there are risks to receptors like shrews and robins that should not be dismissed without additional evaluation or further justification. We also are concerned that the use of literature-derived bioconcentration factors (BCFs) may be resulting in underestimated exposures at this site (refer to Specific Comment 23 and Attachment 3). In addition, note that we recalculated risks to robins for key areas/metals in order to incorporate many of the changes recommended in the comments below (see further discussion in General Comment 5, and complete calculations in Attachment 2). Based on our recalculated risks, hazard quotients (HQs) for robins are as high as 5.8 for boron in the Eastern Wetland (EW) and 14 for cadmium in solid waste management unit (SWMU) 14/15.

2. This assessment could have been greatly strengthened through the collection and evaluation of additional tissue residue data, which is normally an important component of a BERA. Currently, tissue residue data are only available for plants, and these data suggest that uptake in the IDNL study area is greater than uptake predicted by standard literature-based BCFs (refer to Specific Comment 23 and Attachment 3), perhaps due to low soil pH in the study area. This causes concern that modeled concentrations in other organisms may also be underestimated. Collection and analysis of tissue residue samples for terrestrial invertebrates, benthic invertebrates, amphibians, small mammals, and/or bird eggs is typically a component of a BERA, especially in such an ecologically sensitive area.
3. For receptors with no or limited mobility, such as plants and invertebrates, a spatial evaluation of the risk in the risk characterization section would have reduced uncertainty and been more accurate. In contrast to wildlife receptors that are exposed to contaminants over their entire home range (and so, a 95 percent upper confidence limit on the mean [95% UCL] may more accurately represent

exposures to individuals), plants and invertebrates are exposed to very localized concentrations.

4. Given the importance of boron and molybdenum as contaminants of potential ecological concern (COPECs) in the Area C BERA, and the relative paucity of toxicological data available for these two metals, we believe NIPSCO should have prepared detailed toxicological profiles to be included as attachments to the BERA. We noted that the BERA does include references to primary literature for some of the toxicity values used for these metals, but it is unclear how comprehensive the literature search was or how any given study was selected for use in TRV derivation. Additionally, there are some data gaps in TRVs and BCFs for these metals, and it is unclear whether a literature search was conducted in an attempt to fill these data gaps. These data gaps are important uncertainties in the BERA.

5. The specific comments below recommend numerous changes to exposure parameters and toxicity reference values for the wildlife risk calculations. Risks to some receptors in some areas are sufficiently low (e.g., all HQs are less than 0.01) that recalculation is not needed. We do believe, however, that the recommended changes will impact conclusions for some receptors in some areas. To illustrate, we recalculated risks to robins in SWMUs 14/15 and the EW. A summary of results is presented in the table below, and complete calculations are presented in **Attachment 2**. As shown below, our calculated HQs for many analytes are appreciably greater than HQs presented in the BERA

Area	**Analyte**	**Robin HQ from BERA Appendix L**	**Recalculated Robin HQ**
Eastern Wetland	Arsenic	0.25	0.5
	Boron	**2.84**	**5.7**
	Cadmium	0.23	**5.4**
	Chromium	0.16	0.6
	Manganese	**1.13**	**2.1**
	Molybdenum	0.5	**1.0**
	Selenium	0.41	**1.3**
SWMU 14/15	Arsenic	0.68	**1.5**
	Boron	0.66	**11**
	Cadmium	0.1	**14**

II. Specific Comments:

Page 3-3, Section 3.4.1, Refined Selection of contaminants of potential ecological concern (COPECs) in Soil

6. This section does not include any discussion regarding the adequacy of detection limits for nondetected chemicals, and detection limits are not reported in Table 3-

1. EPA guidance (USEPA 1997) recommends retaining nondetected chemicals as COPECs if detection limits are greater than screening values. This comment is also applicable to other media discussed in later text sections (i.e., surface water, groundwater and sediment).

7. The second paragraph that discusses aluminum should have been expanded to include some of the discussion presented in the RFI Section 6.5.2.2, to expand upon a weight-of-evidence approach. Although soil pH data are graphically represented in the RFI, they should have been tabulated in the BERA as an important line of evidence in the ecological risk evaluation.
8. EPA does not agree with the statement, "glyphosate is acutely toxic to both plants and amphibians, and can be considered a contributing factor…" Although some laboratory studies have been provided to EPA which support the conclusion that glyphosate can be acutely toxic, without more site specific studies, it is more accurate to state that glyphosate… "may be" a contributing factor to any observed impacts at NIPSCO.

Page 3-4, Section, 3.4.2, Refined Selection of COPECs in Surface Water and Groundwater

9. This section describes the derivation of the surface water screening value for aluminum. However, the screening value identified in the text (i.e., 750 µg/L) is inconsistent with the screening values listed in Tables 3-3 and 3-5 (i.e., 87 µg/L).
10. This section should have included rationale for using trivalent chromium screening values only, and excluding screening values for hexavalent chromium. If no data on the valence state of chromium in site-specific waters are available, then screening values for hexavalent chromium should have been included. This represents an area of uncertainty. See also Table 3-4.

Page 3-7, Section 3.4.3, Refined Selection of COPECs in Sediment

11. This section indicates that selenium was not selected as a COPEC in the Southeast Pond, but Table 3-6 indicates that selenium was selected as a COPEC in the Southeast Pond. Note that we do not concur with the justification provided for excluding selenium from the Southeast Pond, and we recommend retaining selenium as a COPEC in Southeast Pond sediment. The lack of detection of dissolved selenium in surface water does not preclude the possibility that selenium in sediment could cause toxicity either directly to benthic invertebrates or indirectly through foodweb exposures to wildlife because pore water concentrations of selenium are likely to be greater than surface water concentrations.

Page 3-9, Section 3.5.2, Habitat Areas

12. This section omits discussion of the "Other Wetlands," for which assessment and measurement endpoints are listed in Table 3-12.

Page 3-11, Section 3.5.2.2, Indiana Dunes National Lakeshore (IDNL) Habitats

13. Figure 3-4 is referenced and includes soil/sediments invertebrates as one of the ecological receptor groups for Northwest Blag Slough (NBS), CBS, Little Lake, and the EW. However, the text appears to omit the benthic invertebrates when listing the ecological receptors and feeding guilds in the four IDNL wetland areas. They are however, included as ecological receptors for the Southeast Pond.

    Additionally, in previous correspondence (i.e., letter from NIPSCO to EPA dated February 13, 2009), NIPSCO agreed to evaluate additional receptors in the IDNL (e.g., benthic invertebrates). These receptors do not appear to have been added to the BERA, and we maintain that additional receptors would have been appropriate to reduce uncertainty of risk. Specifically, benthic invertebrates should have been evaluated in all of the evaluated aquatic habitats at the IDNL. During the meeting on June 23, 2011, NIPSCO noted that benthic invertebrates were not evaluated because of the ephemeral nature of most of the Area C wetlands in the IDNL. We do not concur with this rationale, as many invertebrates are adapted to ephemeral pools and wetlands. If hydroperiods are sufficiently long to support larval amphibian development, then hydroperiods are also sufficiently long to support benthic invertebrate development.

    Also, evaluation of a representative invertivorous and/or omnivorous bird and mammal that would forage in aquatic habitats would have been appropriate and would have further reduced uncertainty. Based on personal communication with Randy Knutson (wildlife biologist at IDNL), wildlife species that have been observed in the NIPSCO-affected areas of the IDNL include the Virginia rail, sora, sandpipers (which are most commonly observed at the Lake Michigan shoreline, but sometimes venture inland), mallard, sandhill crane, great blue heron, raccoon, and muskrat. (Note that this list is not intended to be comprehensive.) Breeding populations of Virginia rail and sora occur at the IDNL. Based on this information, the Virginia rail, which feeds by probing in sediments, would have been appropriate and protective of other shorebird species. In areas where sediment concentrations for some metals are greater than soil concentrations (e.g., cadmium in CBS, molybdenum and selenium in EW), an herbivorous bird or mammal should have been selected for evaluation.

    To better understand the possible impacts of the addition of these receptors to the BERA, we conducted risk calculations for benthic invertebrates and the Virginia rail for a few selected analytes/areas (see summary in table below and more detailed information in **Attachment 1**). We attempted to include the analytes/areas that were most likely to result in the greatest risk. We also selected analytes that appeared to be present in the site-impacted areas at concentrations that exceed background concentrations.

Area	Analyte	Sediment EPC from Table 6-2 of the BERA (mg/kg)	Benthic Invertebrate TRV (mg/kg)*	Benthic Invertebrate HQ	Virginia Rail HQ**
Central Blag Slough	Cadmium	24.59	0.99	**25**	**9.1**
	Chromium	19.42	43.4	0.4	0.8
	Molybdenum	42.59	NA	NA	>0.4
Eastern Wetland	Arsenic	47.14	9.79	**4.8**	**3.0**
	Boron	28.65	NA	NA	>0.03
	Chromium	20.98	43.4	0.5	0.9
	Molybdenum	139.4	NA	NA	**>1.2**
	Selenium	4.304	2	**2.2**	**6.6**
Northwest Blag Slough	Chromium	31.75	43.4	0.7	**1.3**
	Mercury	0.658	0.174	**3.8**	0.7 to **52**
	Molybdenum	73.64	NA	NA	>0.6

*TRVs for cadmium, arsenic, chromium and mercury are Region 5 Ecological Screening Levels for sediment. TRV for selenium is from Lemly (2002) and was developed to protect both benthic invertebrates and wildlife. Benthic invertebrate TRVs for boron and molybdenum are not readily available from standard sources, and a literature search should have been conducted for benthic invertebrate toxicity data.
**Virginia rail HQs for mercury were calculated using TRVs for both inorganic mercury (HQ=0.7) and methylmercury (HQ = 52) to bracket the range of possible mercury risk. The HQs for boron and molybdenum are based on sediment ingestion only; prey ingestion should have been incorporated into the calculation in the BERA. Refer to Attachment 1 for additional information on these calculations.

Also note that the HQs for boron and molybdenum do not include the ingestion of contaminated prey, and include ingestion of sediment only, due to the lack of chemical-specific uptake factors into prey. Risks from prey ingestion could be 2-10 times greater than HQs from sediment ingestion, and prey ingestion should have been incorporated into the calculation in the BERA (refer also to General Comment 5 regarding data gaps for molybdenum and boron).

As shown in the table above, HQs for both benthic invertebrates and the Virginia rail exceeded 1 for several analytes in multiple areas, with highest HQs substantially greater than 1. These results confirm that it is important to quantify risks to these receptors in the BERA, and that risks to these receptors may be unacceptable for some analytes. Note that the table above is for illustration purposes only; the BERA should have included all COPECs in all areas, and should not have been limited to the analytes/areas included above. This represents a significant uncertainty in the risk.

14. If data are available, additional information about the hydroperiod for CBS, EW, NBS, and Little Lake should have been provided in this section.

Page 3-12, Section 3.5.2.3, Southeast Pond Habitat Area

15. Rather than just fish, this section should specify "fish and aquatic invertebrates" as receptors in this area. Also, it is unclear whether other avian species may have been needed in the Southeast Pond. NIPSCO should have clarified what bird species have been observed or are expected to occur in the Southeast Pond. If any wading birds or dabbling ducks are likely to occur, then a representative receptor should have been selected and evaluated.

Page 4-5, Section 4.1.3, IDNL Plant Toxicity Study

16. This section states, "For each Study Area and Reference Area wetland, sampling locations with the highest metals concentrations were selected in order to obtain the most conservative (i.e., worst case) toxicity testing results." However, it appears that locations with highest metals concentrations were not actually used; in fact the soils used had metals concentrations that were more similar to those in the reference areas. Refer to the discussion and table in the specific comments on Appendix G. We assume that locations with higher concentrations were omitted from the plant toxicity study because they were inundated at the time of sampling. This is an important uncertainty, and should have been highlighted in this section as well as Sections 7 and 8 and Appendix G.

Page 6-5, Section 6.2.1.1, Soil EPCs

17. It is unclear whether the depth-weighted averaging approach described in this section is appropriate. In cases where COPEC concentrations in the 0.5 to 2 ft interval are greater than concentrations in the 0 to 0.5 ft depth interval, then the depth-weighted approach may be needed to ensure protection of plants with deeper root systems. However, if COPEC concentrations are typically greater in the 0 to 0.5 ft depth interval, data from this depth interval alone should be used to ensure protection of plants with shallow root systems and to better characterize exposure for other receptors (e.g., invertebrates and wildlife). Risks to many receptors now have an added layer of uncertainty from not using the 0 to 0.5 ft data set.

Page 6-6, Section 6.2.1.2.1, Surface Water Outlier Samples

18. Additional analysis would have been appropriate to show that the concentrations designated as outliers are impacted by suspended sediment solids and are not representative of a truly elevated concentration. If high hits are due to suspended sediment, then most metals in the water sample should be elevated, not just one or two metals. With the exception of the April 2007 SW-07 sample, it is not clear that the outliers identified in this section should be removed from the dataset.

Page 6-8, Section 6.2.1.6, Dietary Component EPCs

19. This section should have specifically listed the dietary items and areas where concentrations were measured, rather than modeled (e.g., CBS plants). Also, Tables 3-7 through 3-12 should have indicated when tissue concentrations were measured rather than modeled.
20. In general, Section 6.2.1.6 and Table 6-3 do not provide enough information to allow reviewers to verify the acceptability of the BCFs used in the ERA. The following questions and comments illustrate the degree of uncertainty associated with this issue:
    - Were site-specific soil-to-plant BCFs used in all areas except SWMU 14/15? What was the rationale for using literature-derived soil-to-plant BCFs in preference to site-specific BCFs?
    - It appears as if water-to-plant bioconcentration factors were omitted; where these values exist, particularly for significant COCs such as boron (DOI, NIWQP Report #3, 1998), why were water-to-plant BCFs not considered?
    - How were reference area plant concentrations determined (metals for which measured concentrations were used)? References should have been provided to indicate where Reference Area plant data were tabulated. We could not find ProUCL output for Reference Area plants in Appendix J.
    - What soil concentrations were used in the calculation of the literature-derived plant BCF values? (For most metals, these values are calculated based on an equation that is dependent on the soil concentration.) Area-specific 95% UCL soil concentrations should have been used to calculate area-specific BCFs (i.e., literature-derived plant BCFs should vary by exposure area).
    - What wet weight-to-dry weight conversion factors were used?
    - Were water-to-aquatic invertebrate BCFs used exclusively in the Lake Michigan Beach area?
21. In order to better understand the differences between site-specific uptake factors and literature-derived uptake factor for plants, we tabulated soil-to-plant BCFs from three different sources: (1) Ecological Soil Screening Level (Eco-SSL) guidance documents (USEPA 2007), (2) literature-derived BCFs used by NIPSCO (from Table 6-3 of the BERA), and (3) site-specific BCFs (from Table 6-3 of the BERA). These values appear in Table 1 of **Attachment 3**. As shown in this table, the Eco-SSL BCFs and the literature-derived BCFs used in the BERA are generally fairly similar. However, the site-specific BCFs are often considerably different (usually greater) than the literature-derived BCFs. Of particular concern are the site-specific BCFs for boron and cadmium, which are about an order of magnitude greater than the literature-derived BCFs. These results suggest that the use of literature-derived BCFs may not be providing conservative estimates of exposures at the site.

In Table 2 of Attachment 3, we also tabulated plant concentrations for CBS, as calculated using the three different BCFs discussed above. For comparison, we included in Table 2 the plant concentrations that NIPSCO actually used in the wildlife risk calculations (from BERA Appendix L). As shown in Table 2, the plant concentrations used in wildlife risk calculations were different from (and usually less than) any of the plant concentrations that we calculated using the three different BCFs. It is unclear how NIPSCO determined these plant concentrations.

22. For aquatic exposure pathways, Table 6-3 includes only BCFs based on uptake from water. In general, depending on local chemistry, metals can partition more to sediments than surface water, and uptake to aquatic prey often should be estimated based on biota-sediment accumulation factors (BSAFs). (Note, however, that we concur that water-to-aquatic invertebrate BCFs should be applied to groundwater at Lake Michigan Beach.) A few good sources of information for BSAFs include Bechtel Jacobs (1998), USACE (2000), and USEPA (2000).

    Unfortunately, to our knowledge there are no comprehensive compilations of BSAFs for metals in fish. Our suggested approach would be to first use the Bechtel Jacobs (1998) reference to calculate metals BSAFs for benthic invertebrates. The USEPA (2000) reference can then be reviewed for fish BSAFs and to determine whether there is potential for biomagnification of any given metal in aquatic systems (refer to the "Food Chain Multipliers" sections under the "Aquatic Organisms" headings in the appendices of this document). In general, USEPA (2000) indicates little potential for biomagnification of most metals. For metals with little potential for biomagnification, fish concentrations can be estimated using the higher of values calculated using: (1) surface water concentrations and water-to-fish BCFs, and (2) sediment concentrations and Bechtel Jacobs (1998) BSAFs for benthic invertebrates. The latter calculation essentially assumes that fish concentrations will be equivalent to benthic invertebrate concentrations. Other ERAs we have reviewed have used primary literature sources to develop fish BSAFs for metals. For selenium, a useful reference is Lemly (2002). A more comprehensive literature review may be needed for any metals that may biomagnify (e.g., mercury).

23. For soil-to-plant, soil-to-earthworm, and soil-to-deer mouse BCFs, EPA's preferred source of literature-derived uptake factors is the Eco-SSL guidance document (Attachment 4-1) (USEPA 2007). Section 6.2.1.6 indicates that this source was used, but based on Table 6-3, it appears that it was not used for all constituents (cadmium, copper, and selenium).

24. Based on Table 6-3, NIPSCO used soil-to-earthworm BCFs for boron and molybdenum that are based on the geometric mean of other available metal BCFs. Considering the importance of these two metals at this site and the high site-

specific plant BCF that was calculated for boron (i.e., BCF of 34, from Appendix K and Table 6-3), this uncertainty is cause for concern. A literature search to determine whether any soil-to-earthworm BCFs for these metals are available would have been appropriate. The collection and analysis of tissue samples for terrestrial and benthic invertebrates as well as other potential receptors would have allowed for more site-specific data to be generated. This is a substantial data gap and area of uncertainty.

Page 6-12, Section 6.2.2.2, Habitat Use Factors

25. The application of Seasonal Use Factors (SUFs) for robins, woodcocks, and hawks at this site is not appropriate. An SUF should only be used in cases where the receptor is absent during the breeding season (the most toxicologically sensitive lifestage) and the toxicity studies on which the TRVs are based used exposure durations that are longer than the exposure durations experienced by receptors at the site. All three of these species (and other species within the same guild) occur locally during the breeding season. Also, it is likely that most of the toxicity studies used to derive TRVs employed relatively short exposure durations (i.e., from a few days to a few months). For example, a review of the avian data included in the Eco-SSL dataset for cadmium indicates that none of the 50 test results for reproduction, growth, and survival endpoints was based on exposure durations greater than 3 months. SUFs should have been omitted from the BERA, or an SUF of 1 should have been used for all receptors. Risks have likely been underestimated and this represents an uncertainty.

Page 6-14, Section 6.3.2, Mammalian TRVs

26. This section indicates that allometric scaling was used to derive mammalian TRVs. Refer to Allard et al. (2010) for a recent discussion of methods for interspecies extrapolation of toxicity data and reasons why allometric scaling is no longer recommended. Section 6.3.2, Table 6-9, and affected tables and text sections are not acceptable due to the use of allmostric scaling and represent an area of uncertainty.

Page 6-15, Section 6.3.3.3, Terrestrial and Wetland Plant TRVs

27. It appears that the molybdenum TRVs derived from the McGrath et al. (2010a, as cited in the BERA) study may not be adequately protective of plants in Area C. First, NIPSCO derived TRVs based solely on data from the Zegveld area. The molydbdenum ED10 values (i.e., doses causing 10% inhibition) for the Zegveld area (i.e., 1502 to 3476 mg/kg) are markedly greater than the ED10 values for any of the other nine tested locations (i.e., 3 to 330 mg/kg) (McGrath et al., 2010a). Based on a comparison of soil properties in Table 1 of McGrath et al. (2010b, as cited in the BERA) and those included in Table 3 of the plant toxicity study report (Appendix G) and Tables 4 through 24 of Appendix I, the Zegveld soils do not

appear to be adequately similar to IDNL study area soils to justify the use of the Zegveld data for TRV development. For example, pH in Zegveld soils is 4.4, while pH in the IDNL study area is higher (typically 5 to 7) in all areas except the southern portion of CBS. Also, the organic carbon content in Zegveld soils (30.7%) is greater than organic carbon in IDNL soils, based on data in BERA Appendices G and I. In Table 3 of the plant toxicity study report (Appendix G), total organic matter measurements range from 1.2% to 7.3% in IDNL study area soils. Total organic matter (based on data included in Appendix I) ranges from 7% to 26% for soils in the IDNL study area. Although grain size data are not presented in the BERA for IDNL study area soils, the text in Section 6.3.3.3 indicates that the grain size distribution in IDNL soils is different from Zegveld soils.

Taken together, this information indicates that the Zegveld soils are not similar to IDNL study area soils, and should not be used to derive TRVs in the Area C BERA. Summary statistics for available soil properties parameters (including grain size distribution, pH, organic matter content, and other relevant parameters) for the IDNL study area should have been tabulated by area to facilitate comparisons with soils tested by McGrath et al. and to more rigorously support the selection of a molybdenum TRV for plants.

Also, we do not agree that TRVs should be derived by calculating the geometric mean of ED10 values for the four species tested by McGrath et al. (2010). Considering the paucity of available toxicity data for molybdenum, it appears that very little is known about the relative species sensitivity of plants to molybdenum. When data are only available for such a small number of species (i.e., four species tested by McGrath et al.), it is more appropriate to use the lowest value for all species tested, particularly for use in a protected area like the IDNL study area. To the extent possible, the TRV should be derived using a methodology that attempts to protect all plant species at the IDNL study area and that minimizes the likelihood that risks are underestimated. That does not appear to have been done in the BERA and represents significant uncertainty.

Page 7-1, Section 7.1, Approach to Risk Characterization

28. In general, we advise against the BERA's approach to using reference area data in the risk characterization, in which reference area HQs are calculated using 95% UCL concentrations and compared to HQs in site-related study areas (as described in this section). This approach may not be appropriate if population distributions in site-related study areas are different from distributions in reference areas. To avoid this problem, risks should be characterized based primarily on: (1) site-related study area HQs and (2) a statistical comparison of study area and reference area media concentrations, rather than a direct comparison of study area and reference area HQs. Refer to EPA guidance (USEPA 2002) for detailed recommendations regarding statistical methodologies.

Using this alternative approach, the risk characterization can then discuss risks calculated based on study area HQs, but can qualify these risks by indicating which chemicals are present at concentrations comparable to reference area concentrations and which are present at concentrations exceeding reference area concentrations.

Page 7-3, Section 7.2, Risk Characterization Findings

29. This section states, "For food chain exposure models, because no site-specific tissue samples had been collected, all prey item tissue concentrations were modeled using highly conservative literature based BCFs." However, site-specific plant tissue samples were collected and site-specific soil-to-plant BCFs are derived in Appendix K and summarized in Table 6-3. This section, and other later sections that make similar statements, are inaccurate. Also, text describing the literature-derived BCFs as "highly conservative" is not appropriate (refer to Specific Comment 16).

Page 7-5, Section 7.2.1.2, Risk Characterization of Potential Exposures of Plants

30. The statement that the SWMU14/15 habitat area is on the industrial Facility property and therefore the NOAEL-based HQs may have overestimated the risk is not acceptable. One of the modes of contaminant migration is GW from SWMU 14/15 migrating into the IDNL. According to EPAs Superfund Ecological Risk Assessment Guidance (ERAGs), the National Landmark status of the IDNL and its designation as a National Park means NOAEL-based HQs are acceptable for estimating risks from COCs in this area. ERAGs considers this type of environment as one that merits special protections along the same lines as a T&E species. Provided the hydrologic connection between the source area, SWMU 14/15, and the receptor, IDNL, NOAEL-based HQs are appropriate for purposes of estimating risk.

31. Although HQs exceed one for several metals in SWMU 14/15, this section concludes, "Because of the levels of conservatism used in this BERA (see Section 7.2), the HQ results do not indicate that the SWMU 14/15 Upland Successional Meadow poses any risk to the survival, growth and viability of conservative plant communities." Without additional lines of evidence or further justification, we do not concur with this conclusion. A more appropriate conclusion might be, "The HQ results indicate a potential for risk to plant communities, but the uncertainty associated with these HQs is high." Below is a list of NIPSCO's arguments for this conclusion (in italics) and our responses to these arguments.
    - *EPCs overestimate exposure concentrations over much of the habitat and EPCs are biased toward higher values because the sampling approach was intentionally biased toward areas with greater potential impact*. A spatial approach to risk characterization for plants (e.g., a map delineating

areas with HQs>1) would allow risk managers to better understand the spatial extent of the potential risk.

- *Screening levels are based on no-effects levels and are more conservative than TRVs.* Efroymson et al. (1997, as cited in the BERA) screening levels are developed based on low-effect levels, not no-effect levels. Similarly, Eco-SSLs for plants and invertebrates are typically derived from low-effect levels, maximum acceptable toxicant concentrations, and EC20 values. Statements characterizing all screening levels as no-effect levels are inaccurate throughout the BERA, which frequently cites the conservatism of "NOAEL-based" screening values. Additionally, these screening levels are not necessarily any more conservative than TRVs, and the basis for this statement is unclear. In the absence of any other information, risks should not be dismissed due solely to the fact that they were calculated based on a screening value or a no-effect level. Further, the conceptual site model presents an on-site area of contamination directly up-gradient and in hydrologic communication with the off-site National Park and National Natural Landmark. The National Park Service has expressed an expectation that their land will not be impacted from site-related constituents above background levels in an effort to avoid damages to the Park. As such, conservative screening levels were deliberately selected as an appropriate risk measurement endpoint towards the protection of the National Park. This comment is applicable throughout the risk characterization section of the BERA.
- *Screening levels based on only a few toxicity studies (and characterized as "low confidence screening levels") can be disregarded.* These data are the best available data, and cannot be dismissed in the absence of other data. A screening value based on a small dataset is not necessarily a conservative value; rather, a small dataset could bias a screening value either high or low (depending on the available data). Determining whether the bias is high or low will vary from chemical to chemical, and cannot be determined without a detailed review of the data on which each screening value is based (an effort that may be outside of the scope of the BERA). This comment is applicable throughout the risk characterization section, which dismisses risks multiple times because of low confidence screening values.
- *Boron risks to plants from groundwater (HQ of 26) can be dismissed because the screening level (1 mg/L) is based on "unspecified toxic effects on plants".* Efroymson et al. (1997, as cited in the BERA) also summarized results from another study in which 35-45% decreases in root and leaf weights were observed at a test concentration of 5.4 mg/L. Risks calculated based on this other study's effect level (which should be considered under-protective due to the 35-45% reductions) would still result in an HQ of approximately five. This risk cannot be dismissed, particularly in light of the additional line of evidence provided by the recent study of vegetation (Attached).

Page 7-9, Section 7.2.2.3.2, Plant Toxicity Study Results

32. There are multiple issues with the plant toxicity test and the interpretation of the results. These issues are well articulated in the contractor's comments. Based on all these issues, this line of evidence should not be the primary measurement endpoint used to assess the level of protection of the survival, growth, and viability of conservative plant communities in the IDNL. In addition to the issues articulated in the contractor's comments, the NPS has also reviewed the data and expressed similar concerns with the study and the interpretation of its results. In particular, the NPS notes the lack of natural botanical diversity in areas within or directly adjacent to the most heavily contaminated soils. Those areas are dominated by exotic and invasive species while adjacent habitats maintain a more natural assemblage of plants. In addition, the NPS noted the lower level of plant fitness in restoration plantings within Cowles Bog versus other areas. At this time, the plant toxicity study cannot be used to point to metals as the definitive cause of poor survival and fitness in some of the wetland plants, therefore its overall usefulness is in question.

33. The BERA states, "it is likely that other wetland plants…would have shown better survival and growth rates". EPA had requested that a wetland species of plant be used as part of the plant toxicity study and was met with much resistance for numerous reasons. A compromise was reached to use the red clover, which survived and grew better in both the study and reference areas. However, it is clear that the use of a wetland species would have proved invaluable in this study and would have rendered the results more useful. Overall, the plant toxicity test is not a strong line of evidence and represents uncertainty in this area.

Page 7-12, Section 7.2.2.4.2.2, 2009/2010 Amphibian Survey Results

34. We do not concur with this section's conclusions, particularly the following statement, "The assessment endpoints have been conclusively addressed to demonstrate that BGS- related metals are not impacting amphibians in the IDNL." Refer to comments on Appendix C for rationale. This comment is also applicable to risk characterizations for other IDNL areas.

Page 7-13, Section 7.2.2.4.3, Amphibian Toxicity Study Results

35. This section states, "Toxicity study results are a definitive indication that Northwest Blag Slough sediments pose no BGS-related risk to amphibians in the IDNL." The use of the word "definitive" is inappropriate. Uncertainty associated with the toxicity tests should be acknowledged. Refer to comments on Appendix E. This comment is also applicable to risk characterizations for other IDNL areas.

36. EPA questions the validity of the test results given the statistically significant differences in length and width of the test species exposed to NBS sediment samples as compared to those exposed to the lab control. All of the test species exposed to reference area sediment samples measured statistically significant differences in length and in the case of REF-07, width as well. Because of these issues, EPA does not consider the amphibian toxicity study results reliable and their usefulness as a measurement endpoint is in question. This comment is also applicable to all of the other areas sampled in the study; the CBS, the EW, and Little Lake all reported statistically significant differences in length of the test species exposed to site sediments as compared to those exposed to the lab control, while reporting no differences when compared to the reference areas.

Page 7-15, Section 7.2.2.5, Overall Northwest Blag Slough Risk Conclusion

37. EPA does not agree with the conclusion as stated. This statement is not supported by the available data and is further called into question through the comments provided above.

Page 7-17, Section 7.2.3.3.1, Hazard Quotients for Plants

38. This section omits discussion of plant HQs for selenium in soil. Any HQs greater than one should be noted.

Page 7-19, Section 7.2.3.3.3, Assessment of Barren Soil and Vein Clearing

39. Refer to Appendix I comments regarding conclusions related to the Vein Clearing and Barren Soil Report. Also, this section states that there was "a slight elevation of molybdenum and cadmium in the barren soils relative to reference area rooting zone soil". Based on Figure 9 of Appendix I, these differences should not be characterized as "slight" elevations, as molybdenum concentrations in the barren soils were as much as 50 times greater than concentrations in the reference soils, and cadmium concentrations in the barren soils appear to be about four times greater than concentrations in the reference soils. Finally, the last sentence of this section, "The concentrations of COPECs in soil and groundwater do not pose any BGS-related risk to the survival, growth and viability of conservative plant communities in Central Blag Slough", is not supported by the available data (refer to Appendix I comments).

40. At one point in this discussion, low pH in surface soil was closely linked to the low fertility of the soil and therefore the barren areas in the CBS. However, later in the discussion, a USGS report is cited stating, "that the pH of the soil has increased an order of magnitude…improving growing conditions". In addition, the Vein Clearing and Barren Soil Report, as found in Appendix I, lists two NIPSCO-related historical sources, the formerly unlined surface impoundments, as possible causes for the low soil pH. The issue of pH and the low fertility of the

soil in CBS should have been discussed further. Given these data gaps, the statement that "concentrations of COPECs in soil and groundwater do not pose any BGS-related risk to…plant communities in CBS", is not valid and should be removed. Further, it should be noted, that NIPSCO's 2007 Corrective Measures Proposal concluded, "low pH levels in soil may pose an unacceptable potential risk to plants in localized areas…" Based on the weight of evidence presented, EPA concludes that there is unacceptable risk to plants in the CBS.

Page 7-23, Section 7.2.3.4.4, Conclusion for Risk Characterization of Amphibians

41. EPA does not agree with the conclusion that surface water and sediment in CBS ephemeral pools poses no BGS-related risk to the survival, growth reproductive success and population sustainability of the amphibian community in the IDNL. This statement is not supported by the available data and is further called into question through the comments provided above.

Page 7-24, Section 7.2.3.5, Summary of Central Blag Slough Risk Characterization

42. This section states, "None of the HQs for plants exposed to COPECs in soil or groundwater exceeded 1 for any COPEC." This statement is not accurate, as HQs for aluminum and selenium exceeded 1 (Table L-38).

43. Paragraph 3 states "the naturally low soil pH levels in the greenbelt portion of the CBS may pose risk to terrestrial and wetland plant in this small portion of CBS". There is not enough evidence presented to determine that the low pH levels found in this area of the CBS are "naturally" low. In fact, as mentioned above, the Vein Clearing and Barren Soil Report, as found in Appendix I, lists two NIPSCO-related historical sources as possible causes for the low soil pH. Again, NIPSCO's own 2007 Corrective Measures Proposal states, "The low pH values measured in settling pond surface water in the 1970s (Hardy, 1981) suggest the historic seepage may have contributed acidity to southern Central Blag Slough barren soils."

Page 7-25, Section 7.2.3.5, Overall Central Blag Slough Risk Conclusion

44. EPA does not agree with the overall CBS risk conclusion of no risk to wildlife, invertebrates, plants or amphibians. The evidence provided does not support such a conclusion. NIPSCO's own 2007 report does not support such a conclusion, as it concluded remediation was necessary in CBS to reduce the acidity of soil.

Page 7-30, Section 7.2.4.4.1, Comparison of Surface Water COPEC Concentrations to Amphibian Screening Values

45. Given EPA's above mentioned concerns with the amphibian field survey and amphibian toxicity study, the screening level comparisons of manganese in surface water must be weighted more heavily than other lines of evidence. Therefore, EPA does not agree with the statement that the HQ results do not indicate that surface water from Little Lake poses any risk to the survival, growth, reproduction, and population sustainability of amphibians. The evidence provided, an HQ of 68 for manganese, does not support such a conclusion. This comment applies to Section 7.2.4.4.4 as well.

Page 7-32, Section 7.2.4.4.3, Amphibian Toxicity Study Results

46. Given EPA's above mentioned concerns with the amphibian toxicity study, EPA does not agree with the statement that "toxicity study results are a definitive indication that Little Lake sediment poses no BGS-related risk to amphibians in IDNL".

Page 7-34, Section 7.2.4.5, Overall Little Lake Risk Conclusion

47. EPA does not agree with the conclusion as stated. This statement is not supported by the available data and is further called into question through the comments provided above.

Page 7-45, Section 7.2.5.6, Terrestrial and Wetland Plants

48. EPA does not agree with the plant toxicity testing being weighted more heavily than the other lines of evidence. Given the flaws inherent in the study, primarily the lower survival and growth weights of the plants due to the study not including a wetland species of plant for testing in the wetland soils and the resultant compromised study results, this line of evidence must be weighted less heavily than the others.

Page 7-45, Section 7.2.5.6, Overall Eastern Wetland Risk Conclusion

49. EPA does not agree with the conclusion as stated. This statement is not supported by the available data and is further called into question through the comments provided above.

Page 7-49, Section 7.2.6.5, Overall Southeast Pond Risk Conclusion

50. EPA does not agree with the conclusion as stated. A statement of low risk or acceptable risk would be more accurate than stating there is no risk.

Page 8-1, Section 8.0, Uncertainty Analysis

51. This section presents a very cursory discussion of the uncertainties in this risk assessment, and highlights only areas that may have overestimated risks. A more balanced and detailed discussion would have been appropriate, as number of additional uncertainties have been identified in these comments.

Table 6-4

52. It appears that the food ingestion rates used in Table 6-4 are not conservative estimates. For example, NIPSCO has selected a food ingestion rate for the robin of 0.89 kg diet ww/kg bw-d, but the Wildlife Exposure Factors Handbook (USEPA 1993, as cited in the BERA) lists two food ingestion rates, 0.89 kg diet ww/kg bw-d and 1.52 kg diet ww/kg bw-d. It is unclear why NIPSCO has selected the lower of these two values. Similarly, if an ingestion rate for the robin is calculated based on an allometric equation (from USEPA 1993), the resulting value is considerably greater than the value used by NIPSCO (see Attachment 2). Additionally, the food ingestion rates used for the shrew and the mourning dove are considerably less than the ingestion rates used in the development of the Eco-SSLs (USEPA 2007). The risk to applicable receptors has likely been underestimated and this represents an area of uncertainty.

Tables 6-6 and 6-7

53. Rather than using TRVs for inorganic mercury only, mercury risks to wildlife should be calculated using both inorganic mercury TRVs and a methylmercury TRVs, in order to bracket the range of possible mercury risks. Refer to Attachment 1 for example calculations.

Appendix C, 2010 Amphibian Survey Report for Area C

54. In general, we do not concur with conclusions that the amphibian surveys and toxicity tests have "conclusively addressed [assessment endpoints] to demonstrate that BGS-related metals are not impacting amphibians in IDNL". We consider the amphibian survey to be a very weak line of evidence in this BERA, and little weight should be placed on it in the weight-of-evidence evaluation. This comment discusses reasons why we believe the amphibian surveys are a highly uncertain piece of evidence.

    First, the Survey Report made no attempt to quantify the effectiveness of the sampling effort. The results often include observations of only one individual of a given species in a given wetland, which is an indication that the sampling effort may have been inadequate to capture true species richness (Colwell and Coddington, 1994, as cited in Werner et al., 2007).

Next, consistent with literature on amphibians in a similar metacommunity of ponds and wetlands (e.g., Werner et al., 2007), the results of the amphibian survey indicated that natural variability plays an important role in the dynamics of amphibians at the IDNL. Werner et al. (2007) reported that pond hydroperiod, surface area, and forest canopy cover were the most important variables in determining the presence or absence of a species in each pond/wetland. As noted in the Survey Report, the presence or absence of fish in ponds/wetlands also greatly affects amphibians. This effect can occur not only via predation, as noted in the Survey Report, but also via selection of oviposition sites by adult amphibians (i.e., adults of some species avoid ovipositing in ponds/wetlands with fish).

In the context of this study, these natural variables are confounded factors that will tend to obscure any potential toxicological effects of elevated metals concentrations. NIPSCO has not attempted to control these confounded factors, and it is not surprising that correlations were low between metals concentrations and amphibian metrics using a univariate statistical approach in this multivariate system. Conclusions have been drawn exclusively from these very simplistic regression analyses, which are insufficient to support the conclusion quoted above. Considering our concerns regarding sampling effectiveness and the variability in this dynamic system, it's not clear that conducting a more detailed statistical analysis of these data would produce any more reliable conclusions.

We also note that the analyses provided do indicate possible impacts in the EW, based on Sorensen's Quantitative Index at all EW locations except EW-01. Results for the Shannon Index are similar. These results should not be entirely dismissed based on the results at EW-01, which are different from results in the rest of EW.

It has also been noted the lack of discussion regarding visual observations of frog abnormalities as a potential uncertainty associated with the multiple lines of evidence approach. EPA was present in the field during some survey work and also observed these abnormalities.

Appendix E, Final 2010 Amphibian Toxicity Study Report, Section 4.0, Uncertainties, Pages 19-20

55. A number of important uncertainties have been omitted from this discussion. One of the key uncertainties in the amphibian toxicity study is uncertainty about the relative sensitivity of the test species, *Rana pipiens*, in comparison to other amphibian species at the IDNL. No information about relative species sensitivity has been provided in either Appendix E or Appendix D (2010 Amphibian Toxicity Study Plan). The most useful information that we have found regarding relative species sensitivity of amphibians to metals is a book chapter by Birge et al. (2000), who conducted a series of toxicity tests with numerous chemicals and

amphibian species. As summarized by Birge et al. (2000), amphibian species sensitivity varied by metal. Relative to other amphibian species, *R. pipiens* was tolerant of mercury. For several other metals (e.g., cadmium, copper, selenium), *R. pipiens* was among the more sensitive species, but *R. pipens* LC50 (50% lethal concentration) values were 2-3 times greater than LC50s for some other species (including species present at the IDNL wetlands) (Birge et al., 2000). Considering these indications that other amphibian species may be more sensitive to some COPECs than *R. pipiens*, coupled with the fact that this assessment is of a federally protected area with special status species, this uncertainty is critical for risk assessors and managers to consider.

Another important uncertainty is related to the fact that the test exposure duration was relatively short, and only larvae were exposed. Review of tabulated data in Sparling et al. 2000 (as cited in the BERA) indicates that, for some chemicals, amphibian embryos may be more sensitive than tadpoles. For example, a study that exposed *R. pipiens* tadpoles to mercuric chloride reported an LC50 of 1,000 µg/L, but tests using the same chemical and embryos of the same species reported LC50s of 7.3-10 µg/L (refer to Table 7-6 in Sparling et al. 2000). Note that, in some amphibian species (e.g., leopard frog, spotted salamander), eggs are often deposited on, or sink to, bottom substrates.

Another important uncertainty in the conduct of amphibian toxicity tests is that dietary exposures of metals are not included in the tests.

Additionally, although the uncertainty section notes that sediment sample manipulation and water quality characteristics of the laboratory water used can alter the toxicity of sediments in the tests (in comparison to toxicity that might actually occur in the field), the text does not discuss the direction of these possible impacts. For example, will oxidation of sediments tend to increase or decrease metals bioavailability in the toxicity test? Was the water hardness in the lab water higher than in the site surface waters, thereby decreasing bioavailability in the toxicity tests?

56. The last sentence of this section states, "Laboratory toxicity studies with amphibians yield a highly conservative measure of potential risk". In light of the factors discussed above, it is not clear that these tests are "highly conservative", and appear to represent a significant level of uncertainty.

Appendix G, 2010 Plant Toxicity Study Report

57. We believe that the usefulness of the plant toxicity study is compromised by the poor survival observed in ISBSP-11 and ISBAD-10. As noted in the study report, it does seem clear that some factor(s) other than metals must be a major contributor to the poor survival observed in at least some of the locations. The study report states that the variability in survival and growth responses is likely

related to the test species' ability to adapt to the sandy wetland soils used in the tests. Ultimately, it is impossible to know whether any toxicity may have been observed if a plant species better suited to the site's soils had been used for this particular test (see attached study on IDNL vegetation). All that can be concluded from this study is that metals-related toxic effects could not be differentiated from effects that likely occurred due to soil type. As a result, the report's conclusions, "...there are no BGS-related impacts apparent to IDNL vegetation community", are overstated and fail to reflect the important limitations of this study. See also Specific Comment 65 below regarding analyte concentrations in the tested samples. This is another critical limitation of this study that should have been made transparent in the study conclusions.

58. The Plant Toxicity Study Report does not provide information to allow reviewers to determine whether the tested locations adequately represent the study areas in terms of contaminant concentrations. In general, it is advisable to conduct tests at locations that span the range of concentrations observed in the study areas. We reviewed data presented in Table 3 of the Plant Toxicity Study Report (i.e., measured chemical concentrations in the toxicity test soil samples) and Tables 3-1 and 6-2 of the BERA (i.e., maximum and exposure point concentrations reported for soil in the BERA). The results of this review are concerning, as it appears that none of the samples used in the toxicity tests had contaminant concentrations that were similar to the maximum concentrations or, even more importantly, the EPCs in the study areas. In some cases, the BERA EPCs were more than an order of
59. magnitude greater than the concentrations in the toxicity test samples. Results for a few chemicals in CBS and the EW are listed in the table below for illustration. In addition, comparison of the maximum soil concentrations used in the plant toxicity study with reference area concentrations provided in Table 6-2 of the BERA indicates that many of the maximum analyte concentrations are close to or even below the reference area concentrations (e.g., maximum CBS molybdenum in plant toxicity tests was 2.6 mg/kg; reference area EPC for molybdenum was 2.7 mg/kg).

Area	Analyte	Maximum Concentration in the Plant Toxicity Study Soil Samples (mg/kg)	Maximum Concentration from Table 3-1 of the BERA (mg/kg)	EPC from Table 6-2 of the BERA (mg/kg)
Central Blag Slough	Arsenic	2.6	34	9.9
	Cadmium	1.9	29.3	5.5
	Copper	3.5	63.4	25.4
	Molybdenum	2.6	694	145.2
Eastern Wetland	Arsenic	10.8	200	34.1
	Boron	15.9	253	47.4
	Copper	7.6	63.4	21.5
	Manganese	889	23,600	3,078
	Molybdenum	2.7	804	75.7

The lack of toxicity tests at the upper end of the concentration range detected at the site appears to be a major source of uncertainty in the risk assessment for plants.

60. Table 5 presents and Section 3.6 discusses results of the plant species surveys that were conducted within 20-ft x 20-ft areas immediately surrounding the toxicity study soil sample locations. The analysis of these data is very cursory in the Plant Toxicity Study Report, and the report simply notes that plant species with high coefficients of conservatism were present (or, in some cases, dominant) in study area and reference area locations with low *Lolium* and/or *Trifolium* survival. These plant survey data could be more useful, and may yield different results, if subjected to a more comprehensive analysis. As noted by Charles Morris during the meeting on June 23, 2011, a simple visual inspection of the data in Table 5 does suggest that there may be important differences between study area and reference area locations. For example, the common invasive species Autumn olive (*Elaeagnus umbellata*) was frequently observed in survey plots but was never observed in reference area plots. In addition, for each of the samples in the Reference Areas, CBS and EW, we calculated a mean coefficient of conservatism (Mean C) and a Floristic Quality Index (FQI) using equations and coefficients from Rothrock (2004, as cited in the BERA). Mean C results are tabulated below; FQI results were similar to Mean C results and are not tabulated here. We calculated values for the CBS and EW samples because metals concentrations are highest in these two areas.

Reference Areas		**Central Blag Slough**		**Eastern Wetland**	
Sample Number	Mean C	Sample Number	Mean C	Sample Number	Mean C
ISBAD-08	3.5	AOC10-SB03	2.8	AOC9-SB04	0
ISBAD-010	3.6	IDNL-SD05	1.9	IDNL-SD15	1.7
ISBSP-11	3.3	IDNL-SD09	3.0	IDNL-SO13	1.8

Clearly, based on the limited dataset that is available, the above table shows that Mean C values in the Reference Areas tend to be higher than values in CBS and, particularly, EW. These results indicate that important differences in the plant communities may exist between the CBS and EW communities and those in reference areas, and it is not appropriate to conclude that no effects are occurring at this time. Also, Table 5 presents only presence/absence data from the surveys, but it appears that data regarding the relative abundances of each species within each plot are also available. These data should have been presented in Table 5. Finally, note that the concerns regarding the limited concentration range in the tested sample locations are also applicable to these plant survey data. Any conclusions drawn from these data must be qualified by the fact that sampled locations had relatively low concentrations of metals in comparison to the soil EPCs used in the ERA.

61. It would be useful if Tables 1 and 2 included some measure of the variability around the mean (e.g., standard deviation or standard error) for each of the endpoints to give reviewers some indication of the variability among replicates for each sample. Based on a cursory review of Appendix D, it appears that variability among replicates for any given sample was often quite high. This information should have been discussed more specifically in the uncertainty section, which included a paragraph about precision.

Appendix I, Vein Clearing and Barren Soil Report

62. This report concludes that barren areas in the southern portion of CBS are linked to low pH. Although not stated in the conclusions section, the report also describes two NIPSCO-related historical sources that may have caused the low pH. The report also concludes that metals concentrations in soils and plants are not good predictors of vein clearing. However, cadmium and molybdenum are elevated in barren soil rooting zones compared with reference area soils, and slight elevations of the same metals were found in soils of vein clearing vegetation compared with non-vein clearing vegetation collected from CBS. The report conclusions are not clear regarding the possible linkage of vein clearing to low pH and the possible linkage of metals concentrations to barren soil areas. In addition, the report does not attempt to explore the possible effect of low pH on metals availability as a cause, or contributing cause, of barren soil and/or vein clearing. This interaction may be important and could have been appropriately explored through multivariate statistical analyses.

    In general, the presentation of the data makes it difficult to evaluate possible relationships between metals/pH and barren soil/vein clearing. It would have been very useful to present box-and-whisker plots for some of the key metals and pH. For example, a series of box-and-whisker plots (e.g., showing median, 5th percentile, 25th percentile, 75th percentile, 95th percentile values) could be presented on a single page for molybdenum, including one box-and-whisker plot for concentrations in each of the following media: barren soil, vein clearing soil, reference area soil, vein clearing dewberry tissue, non-vein clearing dewberry tissue, reference area dewberry tissue, and so on for other plants.

63. This report concludes that areas of barren soil and vein clearing comprise 1-2% of the total area in CBS, and that this area is sufficiently small to assume that population-level risks to plants are acceptable. The data and analyses included in this report do not adequately support this conclusion. It is important to recognize that barren soil is a very severe effect (i.e., 100% mortality of all plant species). If severe effects are present in small areas, one must also be concerned that less severe, unmeasured effects (e.g., reduced density, changes in species composition) may be occurring over larger areas. Results from the 2010 plant survey (Appendix G) are suggestive that species composition may also be

affected (see Specific Comment 66). Conclusions should be reconsidered in light of these important points.

Appendix L, Hazard Quotient Calculation Tables

64. We were generally unable to replicate and verify hazard quotient calculations because Appendix L tables are inadequately annotated to facilitate verification. Refer to Attachments 1 and 2 for examples of how risk calculations can be presented to allow reviewers to verify calculations. Also note that in these attachments, there is very little need for wet weight/dry weight conversions because ingestion rates (from USEPA 1993, as cited in the BERA) are given on a dry weight basis and literature-derived bioaccumulation factors are typically given on a dry weight basis.

65. Based on review of Table L-26, amphibian exposures have been calculated by multiplying surface water exposure concentrations by a Water Use Factor (WUF) of 0.25. This methodology is not technically sound. The TRVs used in the HQ calculations are derived based on short-term (i.e., typically 10 days or less) toxicity studies in which amphibian embryos or tadpoles are exposed to water. A WUF would only be needed if amphibians at the site are normally exposed to water for less time than the amphibians exposed in the toxicity tests used to derive the TRVs. Clearly, with test exposure durations of 10 days or less, that is not the case here. Additionally, all of the wetlands and ponds evaluated in this BERA hold water (in at least some years) for sufficient time for amphibians to complete their larval development. Consequently, risks calculated based on measured surface water concentrations (without the application of a WUF) accurately represent risks in years that are hydrologically favorable to amphibians. It might be appropriate to note that risks due to toxics will be lower in years that are unfavorable hydrologically, but it is not appropriate to apply a WUF that would result in underestimated risks in the wetter years.

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