



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 2  
290 BROADWAY  
NEW YORK, NY 10007-1866

AUG 30 2011

[REDACTED], Special Projects Branch Chief  
Buffalo District, U.S. Army Corps of Engineers  
1776 Niagara Street  
Buffalo, NY 14207-3199

Dear [REDACTED]:

The purpose of this letter is to transmit the comments of the U.S. Environmental Protection Agency (EPA) based on our review of the Remedial Investigation Report Addendum (RIRA) for the Niagara Falls Storage Site (NFSS) also known as the Lake Ontario Ordnance Works (LOOW). Our detailed comments are attached.

Overall, the data coverage and the methodology used by the USACE for this RIRA are professional, thorough and of high quality. This effort appears to be sufficient to move forward with the Feasibility Study (FS). The RI and its Addendum generally provide sufficient data to proceed with the FS. There are still minor data gaps and safety measures that need to be taken during the FS or the Pre-remedial Action Design phase. The USACE recognizes the need to further delineate the uranium plume in the Upper Water Bearing Zone (UWBZ) and EPA believes that radium-226 in the subsurface soil and possibly in the UWBZ require further assessment both near the Interim Waste Containment Structure (IWCS) and other parts of the NFSS such as in the northeast portion of the site (e.g., starting around well B02W20S). The potential source of radium contamination in such areas may be due to previous operations during the transfer of the K-65 from "the Silo" to the IWCS.

Additionally, installation of test pits near pre-existing underground pipelines to assess their integrities and the source of contamination can provide useful information for future decision-making. Based on the findings (i.e., the contaminant levels, and the potential spread of contamination), the USACE may want to consider performing removal actions on these old pre-existing pipelines to eliminate the spread of contamination and reduce any future remedial actions costs.

### Recommendations

We recommend delineating the uranium groundwater plume and restrict public access to the off-site shallow groundwater table until the USACE complete any necessary future remediation and restoration. In addition to the existing long term monitoring, given the implications of the contaminant presence in close proximity to the IWCS, if technically feasible and practically achievable to discriminate between the existing contamination near the IWCS and any potential contaminant breach from the IWCS, then we recommend that the USACE conduct long term groundwater monitoring in closer proximity to the IWCS to assess the trends of radiological contaminants (both radium and uranium).

We recommend further assessment and delineation of radium-226 both in subsurface soil and groundwater, more specifically around the IWCS and in the northeast portion of the NFSS.

We recommend further assessment of the integrity of the contaminated underground pipelines and the need for possible removal actions to eliminate any potential spread of contamination.

Our detailed comments follow. We appreciate the opportunity to provide comments to this RIRA.

Should you have any questions, please feel free to contact me at [REDACTED]

Sincerely,

[REDACTED]

Radiation and Indoor Air Branch

cc.: [REDACTED] Project Manager (NFSS), USACE, Buffalo District  
[REDACTED], Director, New York State Dept. of Environmental Conservation (NYSDEC)  
[REDACTED], Chief, Radiation Sites Section, NYSDEC  
[REDACTED], Ph.D., Professor and Chair, Dept. of Chemistry, University of Buffalo

bcc: [REDACTED], Senior HP, Scientist  
[REDACTED], DEPP/PRB, Environmental engineer

## GENERAL COMMENTS

1. The RI and its Addendum provided a detailed characterization of the radiological contaminants at the site; however, there are still minor gaps associated with radium contamination in subsurface soil and shallow groundwater that need to be addressed during the FS or the Pre-remedial Action Design phase.
  2. Further consideration should be given to further assess the uranium plume and potential radium contamination on the northern, western, and southern edges of the IWCS. While it is likely that the identified contamination near the IWCS is a result of previous operations, further delineation may be necessary to aid the remedial action design phase following the feasibility study. More importantly, given the implications of the contaminant presence in close proximity to the IWCS, if technically feasible and practically achievable to discriminate between the existing contamination near the IWCS and any potential contaminant breach from the IWCS, then we recommend that the USACE conduct long term groundwater monitoring in closer proximity of the IWCS to assess the trends of radiological contaminants (radium and uranium).
  3. The Addendum seems to be geared more towards assessing the uranium plume instead of any potential radium plume. What is the rationale for focusing more on uranium when radium is the primary contaminant? Was the radium contamination identified during the RI in both subsurface soil and groundwater assessed further during the RI Addendum? If not, what is the rationale?
  4. Further delineation of uranium plume and subsurface radium contamination would be necessary during the FS or as part of the Pre-remedial Action Design phase.
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5. The USACE should take the necessary steps to restrict access to off-site shallow groundwater contamination.
  6. The USACE should consider installing test pits near underground pipelines to assess their integrity and to verify the findings of the historical assessment.

## SPECIFIC COMMENTS

7. Section ES.1, page ES-2 – The paragraph talks about the use of the cancer risk level of E-4, the hazard index of 1, and the annual dose of 25 mrem. For clarification purposes, the EPA OSWER Directive 9355.0-30 "Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions" states that the risk number of 3 in 10,000 (3 E-4) equates to an annual effective dose



equivalent (EDE) of 15 mrem, when dealing with radiological carcinogens. EPA has considered cancer risk from radiation in a number of different contexts, and has consistently concluded that levels of 15 mrem/yr EDE (which equate to approximately a 3 E-4 cancer risk) or less are protective and achievable. EPA has explicitly rejected levels above 15 mrem/yr EDE as being not sufficiently protective. Also refer to OSWER Directive 9200-2-28.pdf, Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination. Consider, revising the text by stating that "by achieving the E-4 risk, the 25 mrem/yr is achieved.

8. **Section ES.4.1, page ES-3** – Given that the scope of the RI addendum sampling efforts did not include provisions for bounding the groundwater plume, The USACE should delineate the uranium groundwater plume and restrict access.
9. **Section ES.4.3, page ES-5, and ES.5.3, page ES-7** – Further consideration should be given to further assess the uranium and potential subsurface radium contamination on the northern, western, and southern edges of the IWCS. While it is likely that the identified contamination near the IWCS is a result of previous operations, further delineation may be necessary to aid the remedial action design phase following the feasibility study. More importantly, given the implications of the contaminant presence in close proximity to the IWCS, if technically feasible and practically achievable to discriminate between the existing contamination near the IWCS and any potential contaminant breach from the IWCS, then we recommend that the USACE conduct long term groundwater monitoring in closer proximity of the IWCS to assess the trends of radiological contaminants (radium and uranium).
10. **Section ES.5.4, page ES-8, 1<sup>st</sup> bullet** – The bullet talks about the use of "as-built drawings" and the presence of the clay layer to inhibit contaminant vertical migration. Consider installing test pit(s) along existing pipelines to confirm the findings from the "as-built drawings" and the absence of bedding material, which could also aid in assessing contaminant lateral migration.
11. **Section 3.3.2, page 3-13, 2<sup>nd</sup> paragraph** – The section talks about the uranium plume. Wasn't there radium contamination identified during the RI in EU-4? Was there an attempt to further assess the radium and to determine if there is a radium subsurface contamination in subsurface soil and shallow groundwater during the RI addendum in EU-4? This section may need to be revised to discuss radium investigations in EU-4 even if the results were below action levels.
12. **Section 3.3.3, page 3-16, 2<sup>nd</sup> paragraph** – This section talks about the uranium plume. Wasn't there radium contamination as well identified during the RI near the IWCS? Was there an attempt to further assess the radium during the RI addendum and to determine if there is a radium subsurface

contamination in subsurface soil and shallow groundwater near the IWCS?  
This section may need to be revised to discuss radium investigations in EU-4 even if the results were below action levels.

13. **Section 3.3.3.1.3, page 3-18, 1<sup>st</sup> paragraph** – The last sentence states “All TWPs in the IWCS area were sampled for filtered and unfiltered isotopic uranium analyses.” Please indicate why these samples were not analyzed for radium as well? If they were analyzed for radium, then such results need to be discussed even if they were below the action level.
14. **Sections 4.2 and 4.3** – The radiological results are sometimes reported in pCi/g and at other times in µg/g; whereas in the tables the results are reported in pCi/g. This can cause some confusion when correlating the data and possibly limited future usability for the remedial action phase when the cleanup levels and the risk assessment modeling are based on the Ci unit. Where deemed applicable, recommend using the Ci unit for any future sampling efforts or establish a reliable conversion to convert the µg to the Ci unit.
15. **Figure 4-2, legend** – More clarification needs to be included in the legend. That is, the yellow color indicates plume concentration > 18 pCi/L. Recommend adding an upper bound to this legend to indicate the maximum concentration in such area.
16. **Figure 4-3, legend** – More clarification need to be included in the legend. That is, the yellow color indicates plume concentration > 1 pCi/L. Recommend adding an upper bound to this legend to indicate the maximum concentration in such area.
17. **Figure 4-4, legend** – More clarification need to be included in the legend. That is, the yellow color indicates plume concentration > 12 pCi/L. Recommend adding an upper bound to this legend to indicate the maximum concentration in such area.
18. **Figure 4-5, legend** – The upper bound of the green legend is 30 µg/L, which is the action level. Recommend changing the upper bound of this legend to a number that is less than the action level.
19. **Figure 4-6, legend** – The upper bound of the green legend is 30 µg/L, which is the action level. Recommend changing the upper bound of this legend to a number that is less than the action level.
20. **Section 5.4, Pages 5-6 to 5-9** – This section talks about the definite trend increase of uranium in monitoring well OW11B and of radium-226 in monitoring well B02W20S (well number OW20S in the ESP dataset), and possible increasing radium trends in four other wells (i.e., wells number A50,



OW06B, OW15B, and OW17B). All these wells are in the upper water bearing zone (shallow groundwater). Below are the comments.

- *Uranium trend increase in well number OW11B located about 150 feet east of the IWCS.* The USACE suggests that the RI activities conducted near this well may have compromised the integrity of the contaminated pipeline near the well. Also, the closest well to OW11B is approximately 150 feet away. Recommend installing a test pit to assess the integrity of the pipeline and the source of the trend increase in uranium concentration. EPA also recommends installing additional wells in closer proximity to OW11B to determine the extent of contamination. Based on the findings, the USACE should also assess the need for a removal action to limit any potential spread of uranium contamination in the subsurface soil and shallow groundwater.
- *Radium increase in well number B02W20S located on the northeast portion of the site (near the southern edge of "O" Street).* The USACE indicates that this well is not located in the groundwater plume area. This may be true for the currently identified plume area. However, the Addendum does not mention the source of the increase in the radium concentration, nor that this well location is bounded by other wells to assess the extent of radium contamination both in subsurface soil and shallow groundwater. EPA recommends further assessment of radium in this area to bound the extent of radium contamination in subsurface soil and groundwater and to assess the potential presence of any radium plume.
- *Possible radium increase in well number A50 located in close proximity to the IWCS east wall.* The well is bounded by other wells. EPA recommends long term monitoring of radium at this location.
- *Possible radium increase in well number OW06B located approximately 30 feet from the IWCS south wall.* EPA recommends long term monitoring of radium at this location and further assessment of radium in this area to bound the extent of radium contamination in subsurface soil and groundwater.
- *Possible radium increase in well number OW15B located approximately 150 feet from the IWCS west wall and east of the West Drainage Ditch.* This well is fairly bounded by other wells on the north, south and east sides. EPA recommends long term monitoring of radium at this location and at closer proximity to the IWCS. The USACE should also consider bounding this well from the west side.
- *Possible radium increase in well number OW17B located approximately 150 feet from the IWCS west wall and east of the West*

*Drainage Ditch.* This well is fairly bounded by other wells on the north and south. EPA recommends long term monitoring of radium at this location and at closer proximity to the IWCS. The USACE should also consider binding this well from the east and west.

21. **Section 5.5, page 5-8, 2<sup>nd</sup> bullet** – The USACE should consider installing a test pit to verify that the 42-inch diameter pipeline was not underlain by bedding material.
  22. **Section 8.4.1, page 8-3, 2<sup>nd</sup> bullet** – It is unclear why gross alpha/beta analyses are performed on the ballast samples.
  23. **Section 8.5.1, page 8-4, 2<sup>nd</sup> bullet** – It is unclear why gross alpha/beta analyses are performed on the road core samples.
  24. **Section 9.2, page 9-2, 2<sup>nd</sup> bullet** – Whenever possible, EPA recommends assessing any potential groundwater contaminant trends on seasonal basis.
  25. **Section 9.2.2, page 9-3, 2<sup>nd</sup> paragraph** – The paragraph talks about the use of the cancer risk level of E-4, the hazard index of 1, and the annual dose of 25 mrem. For clarification purposes, the EPA OSWER Directive 9355.0-30 "Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions" states that the risk number of 3 in 10,000 (3 E-4) equates to an annual effective dose equivalent (EDE) of 15 mrem, when dealing with radiological carcinogens. EPA has considered cancer risk from radiation in a number of different contexts, and has consistently concluded that levels of 15 mrem/yr EDE (which equate to approximately a 3 E-4 cancer risk) or less are protective and achievable. EPA has explicitly rejected levels above 15 mrem/yr EDE as being not sufficiently protective. Also refer to OSWER Directive 9200-2-28.pdf, Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination. Consider, revising the text by stating that "by achieving the E-4 risk, the 25 mrem/yr is achieved."
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26. **Section 10.2, page 10-2, 2<sup>nd</sup> paragraph** – See previous comment vis-a-vis the 1E-4 cancer risk and the 25 mrem/year.
  27. **Section 10.4.2, page 10-4, last paragraph** – Explain what is the 2.43 pCi/g Ra-226 screen criterion is based on. Is it twice background?
  28. **Section 14, CONCLUSIONS** – This section may require revisions based on the above comments.

**EDITORIAL COMMENTS**

29. **Section ES.4.1, page ES-3** – This section talks about EU-1 and EU-2; whereas, the titles for Tables 3-6 through 3-14 is only for EU-1. Revise accordingly.
30. **Section 8.1, page 8-1, 2<sup>nd</sup> paragraph, 9<sup>th</sup> line** – Revise the sentence stating that “Demolition of Building 401 is scheduled for 2010”.
31. **Section 8.7.2, page 8-6, 2<sup>nd</sup> paragraph, beginning of 3<sup>rd</sup> line** – Replace “uranium-228” with “uranium-238”.