



# Niagara Falls Storage Site Remedial Investigation Report Addendum

**U.S. Army Corps of Engineers  
Buffalo District**

**Building Strong®**

## **Formerly Utilized Sites Remedial Action Program (FUSRAP)**

April 2011

Completion and Availability of the Remedial Investigation Report (RIR) Addendum

Purpose of the RIR Addendum

The U.S. Army Corps of Engineers has completed the RIR Addendum for the Niagara Falls Storage Site (NFSS). The objective of the RIR Addendum investigation was to address potential data gaps and concerns expressed by stakeholders following release of the RIR in December 2007. Now that the RIR Addendum is complete, the Corps will be focusing on the Feasibility Study for the Interim Waste Containment Structure (IWCS) Operable Unit. This Feasibility Study will identify and evaluate various remedial action alternatives and assist in the development of a protective and cost-effective remedy for the IWCS. Additional field investigations are planned for the remainder of the site.

Key Topics of the RIR Addendum

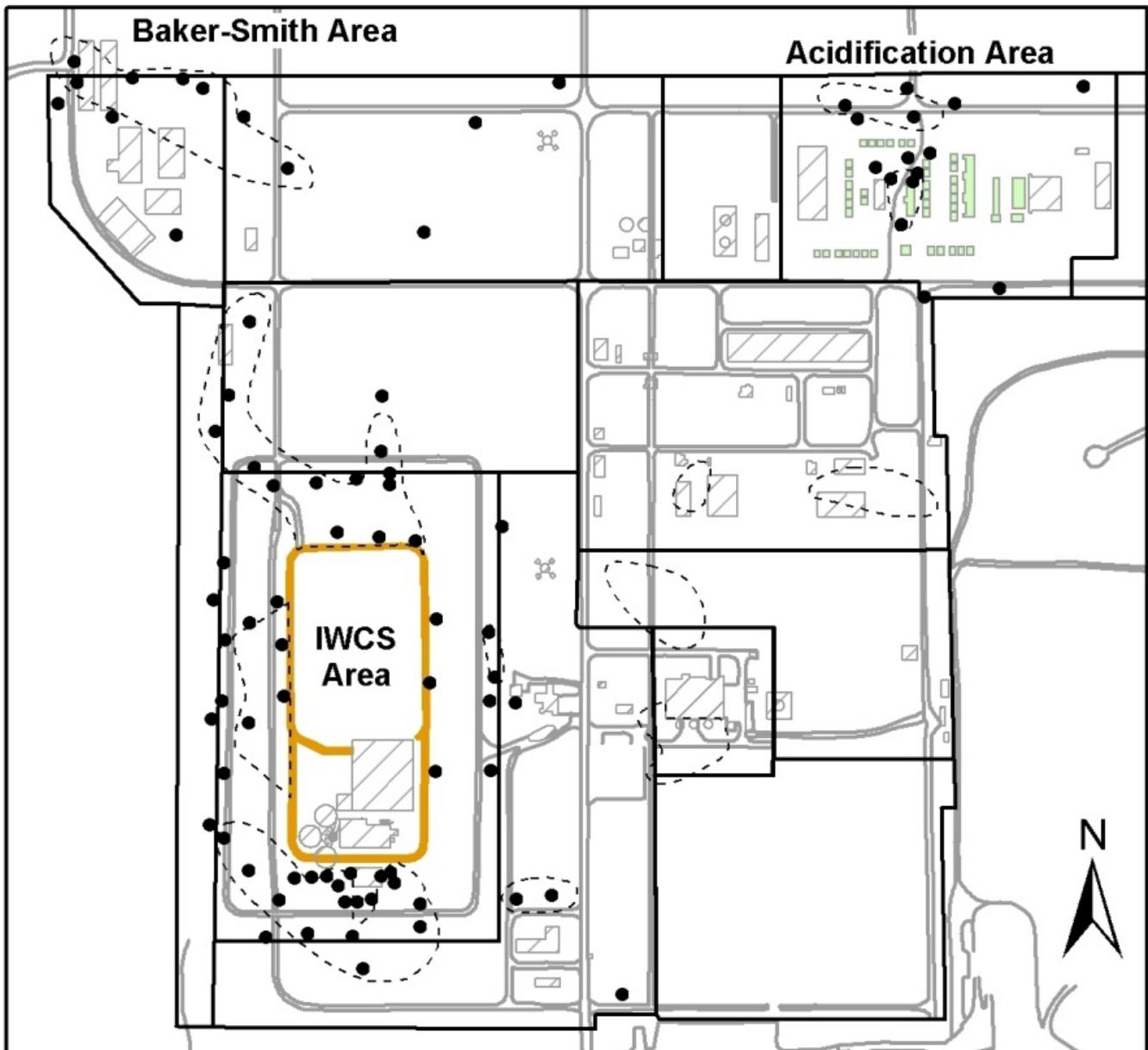
Activities performed for the RIR Addendum included environmental sampling, as well as review of supplemental data and documents, to address the following key topics:

- Installation of new wells and refinement of the nature and extent of select radiological and/or chemical groundwater plumes in the upper-water bearing zone in the northwest corner of the site (Baker-Smith Area), north-central portion of the site (Acidification Area), and vicinity of the IWCS;
- Assessment of IWCS integrity;
- Re-assessment of the NFSS background groundwater data set;
- Comparison of NFSS soil background levels to U.S. and New York State area soil background levels;
- Review of environmental data for former Building 401 floor core and underlying soil samples, railroad ballast samples, and core samples of road pavement from across the site;
- Review of on-site Environmental Surveillance Program (ESP) data for groundwater, surface water and sediments;
- Review of radiological data for underground utility lines on the former Lake Ontario Ordnance Works property; and
- Investigation findings for plutonium in soil.

Key Findings of the RIR Addendum

### **Nature and Extent of Groundwater Contamination in the Baker-Smith Area, Acidification Area, and Vicinity of the IWCS (see figure)**

- A total of 23 temporary wells were installed, 10 of which were converted into permanent wells.
- In general, groundwater modeling results indicate that groundwater contamination at the site is not migrating laterally.



**Total Uranium, Dissolved Site Background = 16.7 µg/L**

**Total Uranium, Drinking Water Standard = 30 µg/L**

**Legend**

-  Structure abandoned above grade
-  Former structure
-  WCS cutoff wall
-  Groundwater Sample Location
-  Total Uranium Plumes (Dissolved) - Concentrations Exceeding Site Background

***Dissolved Total Uranium in Groundwater at the NFSS***

- A well installed just beyond the NFSS property near the northwestern corner of the Baker-Smith Area exhibited dissolved total uranium at a concentration of 37.5 micrograms per liter ( $\mu\text{g/L}$ ), which slightly exceeds the drinking water standard of 30  $\mu\text{g/L}$ . Clean-up criteria have not yet been determined for the site and the drinking water standard is presented to provide perspective. The dissolved total uranium plume is bounded to within the Town of Lewiston property by three wells located within 620 feet of the northern NFSS property boundary. Public access to the Town of Lewiston property is restricted and groundwater in this area is not a source of drinking water.
- Two isolated areas of groundwater in the central and north-central portions of the Acidification Area exhibited dissolved total uranium concentrations up to 36.7  $\mu\text{g/L}$ . The north-central plume is not bounded off-site to the northwest; however, groundwater in this area is not used as a source of drinking water. The area beyond the NFSS fenceline north of this plume is privately owned and public access is restricted.
- A source area was identified within the previously detected organic plume in the Acidification Area; the downgradient extent of the plume remains 150 feet from the northern property boundary. Groundwater modeling results show that the plume will not extend off-site and that maximum on-site concentrations in the upper water-bearing zone are expected to biodegrade to concentrations below their respective drinking water standards within 300 years.
- Two previously identified dissolved total uranium groundwater plumes north of the IWCS may be one continuous plume that extends off-site west of the property boundary. One off-site groundwater monitoring well within and another just south of this plume (both east of the West Drainage Ditch) exhibited dissolved total uranium at concentrations up to 37.51  $\mu\text{g/L}$ . The previously identified plume located west of the IWCS is well delineated using densely spaced sampling points and remains unchanged from the RI. The presence of a dissolved total uranium groundwater plume south of the IWCS was found to extend further west but is not likely to extend east along a former water line.

### **Assessment of IWCS Integrity**

- An assessment of pertinent information concluded that the IWCS is currently functioning as designed. This conclusion is supported by a review of:
  - Ground surface elevation survey information for the IWCS cap,
  - IWCS cap maintenance procedures,
  - ESP data,
  - Historical aerial photos,
  - Groundwater conditions in the vicinity of the IWCS, and
  - Trending of uranium and radium concentrations in groundwater monitoring wells sampled for the ESP.
- Historical documents and as-built construction drawings indicate that subsurface piping within the planned confines of the IWCS were excavated from building perimeters inside the IWCS to an area immediately outside the planned cutoff wall. Pipelines within the IWCS were either completely removed or filled and the ends plugged to eliminate possible pathways for the migration of radionuclides and to prevent future subsidence of compacted wastes.

### **Re-assessment of the NFSS Background Groundwater Data Set**

- A re-examination of the NFSS groundwater background data set was performed to assess the effects of combining data from the upper water-bearing zone and lower water-bearing zone to determine site-related groundwater constituents. Results of this assessment suggest that dividing the background groundwater data set into separate data sets for the two water-bearing zones does not result in more descriptive background statistics or a more reliable delineation of site-related constituents. This assessment supports the continued use of a combined background data set to determine site-specific groundwater background levels and site-related constituents, as was done for the 2007 RIR.
- A review of mean and maximum values for radium-226, radium-228 and uranium levels in NFSS background groundwater data provides a qualitative indication that NFSS background groundwater

levels for these radionuclides are comparable to typical levels observed in domestic groundwater sources. According to results of this review, it is appropriate to use NFSS background groundwater data for assessing current groundwater conditions at the NFSS.

#### **Comparison of NFSS Soil Background Levels to those in New York State and throughout the U.S.**

- A comparison of NFSS soil background levels to soil background data collected for the U.S., New York State, and Tonawanda, New York, supports the conclusion that the NFSS soil background data set is appropriate for evaluating the nature and extent of contaminants at the NFSS. The comparison of statistical values for parameters in the NFSS soil background data set to other background soil data set statistics indicate that, in many cases, the NFSS background levels appear to be less than background levels observed elsewhere in U.S., New York State, and Tonawanda soils. In cases where NFSS background levels appear to be greater than other soil background levels, the differences in the background values are often relatively small.
- Literature research revealed that in undisturbed areas, the U.S. average concentrations of radium-226 and uranium-238 show a nearly 1:1 correlation. The close relationship between radium-226 and uranium-238 activities observed in NFSS subsurface background soil lends credence to the conclusion that NFSS background soil locations are from an undisturbed area not affected by previous site operations.

#### **Review of Environmental Data for Former Building 401 Floor Core and Underlying Soil Samples, Railroad Ballast Samples, and Core Samples of Road Pavement from across the NFSS**

- Railroad ballast and road pavement core samples from across the site were screened using the NFSS site-specific background levels for surface soil, and no new site-related constituents were identified.
- Based on the calculated ratio of radium-226 and uranium-238 concentrations detected in Building 401 floor core and underlying soil samples and railroad ballast samples, it was determined that these materials were not impacted by former site operations but rather represent naturally-occurring radioactive material.
- Several road pavement core samples exhibited an elevated ratio of radium-226 to uranium-238 suggesting that these materials may be associated with former site operations. This issue will be re-examined during the Balance of Plant Feasibility Study.

#### **Review of NFSS ESP Data for Groundwater, Surface Water and Sediments**

- Enhancements to the ESP initiated in 2008 included the addition of 10 groundwater-monitoring wells analyzed for water quality parameters, supplemental radionuclides and isotopic uranium. Analytical results for these supplemental radionuclides in groundwater for 2008 and 2009 were below analytical detection limits.
- Enhancements to the ESP also included 5 new surface water and sediment locations (bringing the total number of locations up to 10). These were sampled twice a year (rather than annually) and analyzed for an expanded list of radiological and chemical parameters. Analytical results for surface water and sediment from the enhanced ESP sampling were merged with the RI data set and screened for site-related constituents to identify chemicals of potential concern (COPCs) or radionuclides of potential concern (ROPs) using the same technique as was used for the RI. No additional COPCs or ROPs were identified in surface water. Additional COPCs and ROPs were identified in sediment, but several of these locations are near the NFSS property boundary and may have been impacted by runoff onto the NFSS from adjacent properties. Because new COPCs and ROPs were identified in sediments, these constituents will be subjected to further risk evaluation to confirm whether or not they are constituents of concern (COCs) (rather than simply COPCs and ROPs) during the Balance of Plant Feasibility Study.

### **Review of Radiological Data for Underground Utility Lines on the Former Lake Ontario Ordnance Works Property**

- To investigate the possibility that radiological contaminants migrated to the north of the NFSS via pipelines, split soil, sediment, and waste water samples collected in and/or around pipelines during the Lake Ontario Ordnance Works Underground Utility Remedial Investigation (performed between 2005 and 2007) were analyzed for radiological constituents. Based on process knowledge, the most heavily investigated and also most contaminated lines were the acid waste and sanitary lines since these lines carried operational wastewater to the former Lake Ontario Ordnance Works wastewater treatment plant. Fire suppression, drinking, process and cooling water pipelines were pressurized and carried clean water and were not expected to convey contamination.
- Low concentrations of NFSS-related radiological constituents were detected in several soil, sediment, and wastewater samples collected from the acid waste and sanitary pipelines. These pipelines were grouted in 2006 at the northern property boundary to prevent future migration off-site. In addition, no porous bedding material was observed around pipelines leaving the NFSS reducing the likelihood that pipelines act as preferential pathways for contaminant migration.

### **Investigation Findings for Plutonium in Soil**

- The conclusion regarding the nature and extent of plutonium contamination in site soils presented in the 2007 RIR was re-evaluated using plutonium results from an additional 107 samples, including
  - 17 samples collected during the RI that were inadvertently omitted from the RIR,
  - 40 soil samples collected during RIR Addendum activities, and
  - 50 drum samples containing waste soil from the RI and submitted for laboratory analysis during the RIR Addendum.

In addition, americium-241 data from 768 samples collected during the RI were reviewed since americium is considered an indicator of other transuranics associated with the nuclear industry, including plutonium.

- The re-evaluation concluded that:
  - Among the 17 samples analyzed for plutonium, 3 low-level detections were found but one of the detections had significant tracer interference and is not believed to be a plutonium detection;
  - Plutonium was not detected in any of the 40 soil or 50 drum samples collected during RIR Addendum activities; and
  - Among the 768 samples analyzed for americium, nine detections (about 1%) of americium were identified, so americium-241 was not determined to be a contaminant of concern at the NFSS, suggesting that other transuranics, such as plutonium, are unlikely to be present at significant concentrations or to be widespread in NFSS soils/sediments.
- During the NFSS RIR and RIR Addendum field investigations, a total of 166 samples of various environmental media were analyzed for plutonium. Of these samples, seven were reported as detections for plutonium-239/240; however, two contained significant tracer interference and are not believed to be positive plutonium results. Based on the low number and concentration of detections, as well as the analytical uncertainties of these findings, plutonium is not a significant or widespread contaminant at the NFSS.

## Administrative Record File

The Administrative Record File for the NFSS FUSRAP Site contains the RIR, RIR Addendum, Baseline Risk Assessment, Groundwater Flow and Contaminant Transport Modeling and other Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-related documentation for the NFSS. Reports and documents in the Administrative Record may be viewed at the following locations:

### **Electronic and Paper Versions**

US Army Corps of Engineers  
(by appointment only)  
1776 Niagara Street  
Buffalo, New York 14207  
Phone: (800) 833-6390 (Option 4)

Town of Lewiston Public Library  
305 South 8th Street  
Lewiston, NY 14092  
Phone: (716) 754-4720

### **Electronic Version**

Youngstown Free Library  
240 Lockport Street  
Youngstown, NY 14174  
Phone: (716) 745-3555

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**U.S. ARMY CORPS OF ENGINEERS – BUFFALO DISTRICT FUSRAP TEAM**

1776 NIAGARA STREET, BUFFALO, N.Y. 14207

Phone: 800-833-6390 (Option 4)

Email: [fusrap@usace.army.mil](mailto:fusrap@usace.army.mil)

Website: [www.lrb.usace.army.mil/fusrap/nfss/index.htm](http://www.lrb.usace.army.mil/fusrap/nfss/index.htm)