

## **National Remedy Review Board Discussions Regarding the Remedy at the West Lake Landfill Superfund Site**

### **Purpose**

The Board conducted this consultation on February 29, 2012. The review of the West Lake Landfill operable unit 1 (OU1) potential remedial action was planned to be a full review culminating in a recommendations memo. After the presentation to the Board and based on feedback from Board members, the Region concluded that additional work was appropriate and requested an optional early consultation. Under NRRB guidelines, Regions may request an optional NRRB consultation on remedial alternatives at any time prior to the draft proposed plan. The discussion captured in this document reflects basic ideas and general suggestions based on the Board's professional experience and knowledge of regional practices.

### **Site Summary**

The West Lake Landfill Site (the Site) is on a parcel of approximately 200 acres located in the northwestern portion of the St. Louis metropolitan area. The Site consists of the 1) Bridgeton Sanitary Landfill (Former Active Sanitary Landfill), 2) Radiological Area 1, 3) Radiological Area 2, 4) Buffer Zone/Crossroad Property, and 5) Closed Demolition Landfill. The Site was used agriculturally until a limestone quarrying and crushing operation began in 1939. The quarrying operation continued until 1988 and resulted in two quarry pits. Beginning in the early 1950s, portions of the quarried areas and adjacent areas were used for landfilling municipal solid waste (MSW), industrial solid wastes, and construction/demolition debris. These operations were not subject to state permitting because they occurred prior to the formation of the Missouri Department of Natural Resources (MDNR) in 1974. Two landfill areas were radiologically contaminated in 1973 when they received soil mixed with leached barium sulfate residues.

The barium sulfate residues, containing traces of uranium, thorium, and their long-lived daughter products, were some of the uranium ore processing residues initially stored by the Atomic Energy Commission (AEC) on a 21.7-acre tract of land in a then undeveloped area of north St. Louis County, now known as the St. Louis Airport Site (SLAPS), which is part of the St. Louis Formerly Utilized Sites Remedial Action Program managed by the U.S. Army Corps of Engineers.

In 1966 and 1967, the remaining residues from SLAPS were purchased by a private company for mineral recovery and placed in storage at a nearby facility on Latty Avenue under an AEC license. Most of the residues were shipped to Canon City, Colorado, for reprocessing except for the leached barium sulfate residues, which were the least valuable in terms of mineral content, i.e., most of the uranium and radium was removed in previous precipitation steps. Reportedly, 8,700 tons of leached barium sulfate residues were mixed with approximately 39,000 tons of soil and then transported to the Site. According to the landfill operator, the soil was used as cover for municipal refuse in routine landfill operations.

The Site has been divided into two OUs. OU 1 consists of Radiological Area 1 and Radiological Area 2 (Areas 1 and 2) and the Buffer Zone/Crossroad Property. OU 2 consists of the other landfill areas that are not impacted by radionuclides, i.e., the Closed Demolition Landfill, the Inactive Sanitary Landfill, and the Former Active Sanitary Landfill. OU 1 is the subject of this review.

## **Comments**

### **Site Characterization**

Based on the information presented to the Board, it appeared that there were some samples of site groundwater that exceed standards considered to be applicable and relevant or appropriate requirements (ARARs). Also, the package provided to the Board states that the OU1 and OU2 RODs provide the final remedial actions for both source control and groundwater and complete the CERCLA decision-making for the Site. In addition, the Region stated that since no discernible plume was identified at this site, the Region's preferred approach was to take no remedial action at the present time but to continue monitoring groundwater. The Board notes that under existing Agency guidance, action "may be warranted if a chemical specific standard that defines acceptable risk is violated" (Office of Solid Waste and Emergency Response (OSWER) Directive No. 9355.0-30, April 1991, *Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions*). OSWER Directive No. 9283.1-33, June 2009, *Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration* also discusses whether CERCLA remedial action is warranted under these types of conditions. Since the NCP's expectation in §300.430(a)(1) (iii)(F) states that wherever practicable "EPA expects to return usable ground waters to their beneficial uses", the Board suggests that the Region consider adding wells at the site to better delineate the vertical and lateral extent of potential site-related contamination previously identified from limited sampling in Areas 1 and 2. These additional wells would be instrumental in clarifying the presence of isolated groundwater contamination versus a groundwater plume in the complex subsurface geologic setting, and would help inform a decision about whether CERCLA response authority is warranted to address any additional contamination.

The package provided to the Board at page 22 states that "Only four wells exhibited a total radium concentration above 5 picoCuries per liter (pCi/l). These exceedances ranged from 5.74 pCi/l to 6.33 pCi/l. The slight exceedances are isolated spatially. Two of the four wells with total radium exceedances are located in areas that are not downgradient of either Radiological Area 1 or Radiological Area 2." The chart on page 21 of the package, however, indicates that there were two wells with exceedances and that the maximum detected concentration was 8 pCi/l. The Board suggests that the Region reconcile these discrepancies.

### **Waste Characterization**

Location of Radiologically Impacted Material - The site review package and power point presentation provided to the Board characterized radiologically impacted material (RIM) at the site to be: 1) intermixed throughout the landfill matrix, 2) consisting of municipal refuse in Area 1, and mostly construction and demolition debris in Area 2, 3) dispersed both laterally and vertically at depths up to 15

feet in Area 1 and 12 feet in Area 2 with some localized occurrences that are deeper , and 4) representing an amount of hazardous fill equal to 500,000 cubic yards (cy). The Board notes that the remedial investigation (RI), the 1982 Nuclear Regulatory Commission (NRC) Radiological Survey and the 1988 NRC report describe the RIM to be in an identifiable and relatively localized area (e.g., a thin layer in the upper part of the landfill) which is consistent with the short time period that RIM was brought to the landfill relative to its long operating life. The Board also notes that some of the RI boring data indicating deeper contamination was footnoted as not credible or representative (i.e., RIM knocked into the boring holes during drilling or logging activities). The Board is concerned that inconsistencies in the waste characterization may have led to significant uncertainties in determining the location and volume of RIM in the landfill.

Volume of RIM - The site review package and power point presentation provided to the Board indicated an amount of hazardous material to move equal to 500,000 cubic yards (cy). Though using different reference levels, the Board notes that the RI report estimated the volume of RIM to be about 143,000 cy, which is similar to the amount (approximately 150,000 cy) identified in the 1982 and 1988 NRC reports. The large uncertainty related to the location and volume of RIM could negatively impact the alternatives evaluation process (including how the cost and feasibility of various implementation options have been evaluated) and lead to a preferred alternative that may not be protective or cost effective. Thus, a smaller volume of RIM would make consideration of other alternatives (i.e., an on-site disposal cell or off-site disposal at a commercial facility) more feasible and realistic.

The Board suggests that the Region carefully examine the data and information contained in the RI and NRC reports to ensure that the location and volume of RIM is accurately characterized and if necessary consider conducting further investigations possibly using test trenches. Furthermore, the range of alternatives should include options for addressing the likely volume and location (including hot spots) of RIM at the Site.

### **Future Land Use**

The supplemental feasibility study (SFS, page 62) indicates that “the cleanup standards to be used for the development and evaluation of the ‘complete rad removal’ are background-based standards.” The SFS also appears to have used unrestricted land use in estimating the volume of RIM that would have to be removed under a “complete rad removal” scenario. The Region indicated that the West Lake Landfill property is zoned industrial/commercial and will stay that way. The Board believes that using background-based standards and unrestricted use may have led to overstating the volume of RIM that would have to be excavated and possibly treated under a “complete rad removal” alternative. The Board suggests that the Region use a more reasonable future use assumption of industrial/commercial and based on this land use, recalculate the volume of RIM to be removed.

### **Principal Threat Waste**

Based on the documents provided to the Board, it appears that there are potentially significant amounts of RIM that are highly toxic (e.g., based on NRC estimates in the 1982 and 1988 reports, radium up to

22,000 picoCuries per gram (pCi/g), bismuth-214 up to 19,000 pCi/g, and average thorium-230 concentrations of 9,000 pCi/gr; the package at page 44 notes that the RI report discussed thorium-230 at levels as high as 57,300 pCi/gr and that the highest gamma peak intensity readings are at shallow depths). The FS states (page 84) that most of Area 2 contains RIM at levels above 100 pCi/gr. The NRC reports also discuss how the toxicity of this RIM will continue to increase over time: “Ra-226 activity will increase in time (for example, over the next 200 years, Ra-226 activity will increase nine-fold over the present level). This increase in Ra-226 must be considered in evaluating the long-term hazard posed by this radioactive material.” (1988 NRC report, page 14). The SFS also acknowledges this fact. Thus, based on the data, it appears there is discrete, accessible highly toxic principal threat waste at this site. OSWER Directive No. 9380.3-06FS, November 1991, *A Guide to Principal Threat and Low Level Threat Wastes*, provides guidance on several related issues, including the NCP’s expectations for treatment of principal threats posed by the site, wherever practicable. The Board suggests that the Region carefully consider the range of alternatives developed for this site and explain in its decision documents how the preferred alternative, when selected, will be consistent with CERCLA and NCP, or publish an explanation as to why not. In particular, the Region should more fully explain how its approach to treatment is consistent with the statute and the NCP, including specifically CERCLA § 121(b)(1)’s preference for treatment “to the maximum extent practicable;” CERCLA § 121(d)(1)’s requirements regarding protectiveness and applicable or relevant and appropriate requirements; 40 CFR § 300.430(a)(1)(iii)(A)’s expectation that “treatment [be used] to address the principal threats posed by a site, wherever practicable”; and 40 CFR § 300.430(f)(1)(ii)(E)’s preference for treatment “to the maximum extent practicable” while protecting human health and the environment, attaining ARARs identified in the ROD, and balancing the five primary criteria listed in the NCP.

## Remedy Performance

Removal/excavation - In light of the waste characterization (above) and treatment (below) comments, and data indicating that much of the RIM may be located relatively near the surface; it appears feasible to remove more highly contaminated material and significantly reduce long-term risk at the site. The Board is aware of ongoing cleanups in other Regions where the reduction of radiologically-impacted source material is being safely and efficiently undertaken in a manner that is protective both to the workers and the community. If the RIM is located near the surface in a discreet layer, it can be sorted out in the field with instruments that provide instantaneous measurements to ensure that only contaminated material is retrieved which, in turn, minimizes disposal costs. The Board suggests that the Region consider developing an alternative that includes sorting and removing the RIM in a precise manner using performance standards for the excavation process and includes treatment to the maximum extent practicable. The Board also suggests that cleanup levels reflect the fact that the site is zoned industrial/commercial and is most likely to stay that way given the reasonably anticipated future land use.

Treatment - The Board notes that several treatment technologies were evaluated and screened out during the FS process. The Region did evaluate a “complete rad removal” approach and indicated “that none of the 13 treatment technologies were able to deal with the extremely heterogeneous mixture of the radiologically contaminated soil and MSW. Thus, none of the remedies evaluated in the SFS meet the

preference for treatment.” (package, page 34). The Board notes that “treatment” can include measures taken to reduce volume. So, regardless of whether the RIM resides in a heterogeneous or a homogeneous distribution, volume separation techniques (volume reduction) and off-site disposal in a dedicated and regulated radioactive disposal unit may result in a more permanent remedy if short-term risks are minimized by engineering controls, personal protection equipment, or administrative controls, as well as if the radioactive waste is able to be physically sorted from the other waste in the landfill. If some, most or all of the RIM can be detected, distinguished by emission signals, and resides in distinct homogeneous layers, field screening techniques or an on-site laboratory can be used for isolation followed by removal. If the waste resides in a more heterogeneous distribution, commercial sorting technologies, using multiple scanning spectroscopic techniques (that have been used on federal facility sites) and/or an on-site laboratory, should be considered and evaluated. This is especially true for the RIM in Area 2, since it appears that “construction fill” (as opposed to “sanitary” fill) was added to cover the contamination on this portion of the site, and Area 2 contains the majority of the RIM and overburden. A reduction in volume may make off-site disposal a more cost-effective alternative. These radioactive signal sorting processes could also be considered if a portion of the surface radioactive waste is planned to be consolidated under a final cover. The Board suggests that the Region reconsider treatment alternatives or provide more explanation for ruling out an in-situ or ex-situ solidification/stabilization process that is specifically designed for both the high sulfate content and saturated conditions found at this site.

Short-term Effectiveness - The package provided to the Board includes a comparison of the short-term effectiveness of the three action alternatives. The comparison is presented as risk estimates that are presumed to potentially occur to nearby residents during remedy implementation. The lowest carcinogenic risk presented is for the capping alternative, while the risks to residents during remedy implementation estimated for the two alternatives that include removal of radiation-related material is an order of magnitude higher. However, all of the short-term risks were within the risk range of  $10^{-4}$  to  $10^{-6}$ .

The Board notes reduction of rad-impacted source material currently is being undertaken at other sites in a manner that is protective and without unacceptable short-term impacts, where it has been determined that eliminating the source is an important objective of the cleanup. Therefore, based on the fact that the Agency has safely cleaned up numerous hazardous waste sites with radiological contamination across the country, including many in residential areas, the cleanup work can be done safely without unacceptable risk in accordance with approved health and safety plans and appropriate engineering controls as necessary to ensure that any risks to the community are minimized and mitigated. The Board suggests that the Region re-evaluate the alternatives against the nine criteria, including those listed on page 32 of the package, pursuant to 40 CFR § 300.430(e)(9)(iii).

The short-term effectiveness comparison also includes effects from transportation accidents. Truck and other industrial injuries/fatalities are not generally environmental risks that should be considered in a short-term effectiveness analysis, especially for common earthmoving/hauling alternatives such as these. While an unusually high incidence of accidents may be of concern, potential worker accidents are typically addressed through project health and safety plans. Consistent with the NCP (§300.430(e)(9)(iii)), the Board suggests that the comparison be re-evaluated focusing on the extent to

which accidents expose workers or the community to possible releases resulting from such accidents, and considering “mitigative measures during implementation.”

The short-term effectiveness section described impacts to the community during implementation. The presentation also included a discussion of potential environmental justice (EJ) issues that may be encountered if waste is transported off-site. The Board notes that impacts to the community or EJ issues were not included in the section describing the long-term effects of leaving the waste in place. Consistent with NCP §300.430(e)(9)(iii), the Board suggests that an analysis of both short-term and long-term effects on the community (including any sensitive or potentially high-exposure subpopulations) be included in the detailed analysis in future decision documents.

Also, in the presentation to the Board, one of the Region’s points for not carrying forward the excavation and off-site disposal alternative is the possibility of constrained funding (\$10M/year if cleanup is done as a Fund-lead). The presentation states that it could take from 22-28 years to complete the work if funded at \$10M/year. The Board notes that the short-term effectiveness provision in the NCP (§300.430(e)(9)(iii)(E)) does not include funding as a consideration.

Long-term Effectiveness - The package presented to Board described an alternative as a hybrid cap/cover design incorporating both Resource Conservation and Recovery Act (RCRA) Subtitle D and Uranium Mill Tailings Radiation Control Act (UMTRCA) cover design features applied to an existing unlined landfill. However, the package lacked sufficient information on the long-term protectiveness of this alternative. Specifically, how the cap/cover remains protective given the increasing daughter ingrowth concentrations of radium 226/228, radon 222, and the increase in toxicity over time (1,000 years).

Both of these cover designs (RCRA Subtitle D and UMTRCA) have shortcomings for RIM waste itself, especially in a humid region. A comparison of various landfill capping designs addressing both humid region conditions and long-term protection from RIM (1,000 years) would be an important concept for the preferred remedy. However, the package did not appear to include alternative cap designs, i.e., EPA landfill cap guidance design, existing cap designs for similar RIM at Weldon Springs, or evapotranspiration cover cap system designs (OSWER Fact Sheets: EPA 542-F11-001, February 2011, *Fact Sheet on Evapotranspiration Cover Systems for Waste Containment*). For example, a RCRA Subtitle C/UMTRCA hybrid may be suitable for both long-term infiltration management and radiation shielding protection. The Board suggests that the Region include in its remedy selection process evaluations of cap designs similar to, but not limited to, the above conditions and guidances. The package also does not address several aspects of the potential for future migration of contamination to groundwater. The fact that the Region believes there is no discernible plume above MCL levels may not be a sufficient basis to determine there is little or no potential for groundwater contamination that should be addressed consistent with the NCP’s expectations. Particularly in light of the long-lived toxic nature of the radioactive contaminants as well as chemical and physical changes over time at the landfill, the Board suggests that a more rigorous evaluation of potential migration to groundwater be undertaken. The evaluation should not assume that pumping at the former active sanitary landfill will continue, unless that is part of this remedy. For these reasons, the Board suggests that the Region consider

examining additional information on alternative cap designs plus fate and transport of groundwater that supports long-term protectiveness.

### **Applicable or Relevant and Appropriate Requirements**

UMTRCA - In the package provided to the Board, the ARARs discussion (page 45) states that UMTRCA is an ARAR for waste that eroded off Area 2, yet only a to-be-considered (TBC) criteria for the design of the cap over Areas 1 and 2; the reason provided by the Region being that the eroded waste resembles a mine tailings pile while the MSW landfill areas do not.

The Board suggests that the Region further clarify why UMTRCA is considered an ARAR for purposes of cleaning up RIM that has eroded from Area 2 onto adjoining land (which does not in fact resemble a staging pile), but not for purposes of cleaning up RIM that appears to be located in Area 2 at and just below the surface. Since the RIM on the adjacent property apparently comes from RIM in Area 2 and is the same material, and the contamination is similarly situated in both Area 2 and the adjacent property (i.e., at or near the surface), and neither location serves or was intended to serve as a waste pile, the basis for the distinction being made for ARARs purposes between Area 2 and the adjacent property is not clear.

The Board agrees that the UMTRCA standards most likely was not written for a situation where contamination such as the RIM here would be disposed of in an unlined (i.e., no sides and no liner on the bottom) solid waste disposal unit; however, to the extent UMTRCA is designed to address contamination somewhat like the RIM at this site (even though those standards appear to be designed for similar contaminants but at concentrations of only up to 1000 pCi/gr), it provides a useful regulatory benchmark on how to handle, dispose of, and cap this kind of material. Nonetheless, the UMTRCA standards would appear potentially relevant and appropriate for ARAR purposes when evaluating factors like the longevity/integrity of a unit serving as a repository for centuries.

The Board notes that even if UMTRCA standards are considered as an ARAR, meeting those standards may not ensure protectiveness over the long-term for several reasons, including RIM at levels currently measured at up to 57,300 pCi/gr of thorium, as well as the increasing daughter ingrowth concentrations of radium 226/228, radon 222, and the increase in toxicity projected to peak at about 700,000 pCi/gr. over time (1,000 years). While the package states that “consistent with UMTRCA, the cap design will include a rubble layer and the final caps on Areas 1 and 2 will meet the radon emission standards provided for in UMTRCA” it does not state that the cap design will meet the UMTRCA standards. The Board suggests that the Region evaluate whether the alternatives under consideration for Area 2 will meet the UMTRCA standards as ARARs, as well as any NRC standards (and guidance that might serve as TBCs) that exist for licensed facilities storing or disposing of radiological waste.

RCRA - The package indicates that RCRA subtitle D regulations “represent the primary standards for design and implementation of a containment remedy.” The Board notes that OSWER Directive No. EPA/540/P-91/001, February 1991, *Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites* does state that RCRA Subtitle D closure requirements are generally

applicable. However, it is not clear to the Board how a municipal solid waste regulation (e.g., provisions governing an MSW landfill) could be considered as a controlling ARAR for disposal of non-MSW material, especially material as hazardous as the RIM at this site (e.g., RIM at levels currently measured at up to 57,300 pCi/gr., with increase in toxicity projected to peak at about 700,000 pCi/gr). The Board notes that Areas 1 and 2 were not permitted as subtitle D landfills or licensed as an NRC facility, and is not aware of other sites where RCRA Subtitle D standards have been considered as the correct benchmark for management of waste like the RIM at this site. The Board suggests that the Region carefully consider the appropriateness of using RCRA Subtitle D regulations for RIM, where radium-226 activity will increase by a factor of thirty-five 1,000 years from now, as an ARAR for this site.

Federal Aviation Administration Guidance - With regard to the Federal Aviation Administration (FAA) Guidance, the Board agrees with the Region that this guidance is not an ARAR, and acknowledges the importance of ensuring flight safety in the vicinity of the site. The Board notes that all of Area 2 of the site is more than 10,000 feet from the runway, that it appears that about half of Area 1 is also more than 10,000 feet from the runway, and that for the relatively small portion of Area 1 that is inside the 10,000 foot perimeter, it should be feasible to use netting or other devices (e.g., movable tent or building) for the short amount of time that would be needed to excavate or treat (e.g., solidification) the RIM material found at or near the surface of Area 1, if an alternative reflecting that approach were to be selected. Thus, the FFA guidance may inform, but does not inhibit, actions involving the processing of materials if an alternative including excavation and hauling is chosen. During the presentation, the Region mentioned an agreement between the landowner and the FAA addressing property that may be partially addressed by the FAA guidance. The Board also notes that while important to acknowledge, the agreement is not an ARAR and does not otherwise limit EPA's broad response authority under CERCLA.

Executive Orders - Furthermore, the review package indicates in the section discussing ARARs (page 45) that Executive Order 11988 and Missouri Governor's Order 82-19 are "regulations [that] are remedy drivers." The Board notes that while executive orders like these are important considerations, neither of these orders represent the kind of promulgated, enforceable, generally applicable (or waiveable) regulations or standards that qualify as ARARs. However, to the extent they are considered as remedy drivers, the Region should evaluate and explain in its future decision documents how these orders provide for a protective remedy.

List of ARARs - Finally, the Board also notes that some of the citations included in the ARARs tables provided in the SFS may not be described in enough detail pursuant to EPA/540/G-89/006, August 1988, *CERCLA Compliance With Other Laws Manual*. The Region should work closely with their Office of Regional Council to clarify the list of ARARs.

## **Cost**

According to the information presented to the Board, the discount rate used for the net present worth cost calculations in the SFS was 2.3 percent. However, the Board notes that in accordance with current EPA guidance, OSWER Directive No. 9355.0-75, July 2000, *A Guide to Developing and Documenting*



*Cost Estimates During the Feasibility Study*, a discount rate of 7 percent should generally be used for all non-Federal facility FS present value analyses and, if a different discount rate is selected, a specific explanation should be provided and/or a sensitivity analysis performed to evaluate the discount rate impacts. The Region should either: (1) use a discount rate of 7 percent for all present worth calculations (as was done for the 2008 ROD), or (2) provide an explanation and sensitivity analysis in accordance with the above-noted 2000 EPA guidance. The Board also suggests that if the 2.3 percent rate is carried forward that both the 7 and 2.3 percent rates be provided, with appropriate explanation, for comparison purposes.

In addition, a containment alternative that will require perpetual operation and maintenance to remain protective was presented to the Board. Based on the information provided in the SFS, the cost estimate for this alternative does not appear to include all costs that would be necessary to effectively maintain the remedy in perpetuity and because of this, there may not be an accurate evaluation of costs. The costs identified only include mowing grass and filling holes that develop over time. The Board suggests that the Region recalculate (and explain in its decision documents) the cost of this alternative to include all of the components of the cap, what perpetual operation and maintenance is required for each of these components (which likely includes repair and replacement), and the costs associated with that work.