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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
NATIONAL RISK MANAGEMENT RESEARCH LABORATORY
ENGINEERING TECHNICAL SUPPORT CENTER
CINCINNATI, OHIO 45268

March 28, 2014

MEMORANDUM

SUBJECT: Observations on the EMSI report: *Evaluation of Possible Impacts of a Potential Subsurface Smoldering Event on the Record of Decision – Selected Remedy for Operable Unit-1 at the West Lake Landfill*, Dated January 14, 2014

FROM: John McKernan, ScD, CIH
Director, ORD Engineering Technical Support Center (ETSC)

TO: Dan Gravatt, RPM
U.S. EPA Region 7

This memorandum was prepared in response to your e-mail dated January 14, 2014, that requested the ORD Engineering Technical Support Center (ETSC) provide scientific observations on the report prepared by Engineering Management Support, Inc. (EMSI), a contractor for the site's potentially responsible parties (PRPs). In a letter dated July 3, 2013, the United States Environmental Protection Agency (EPA), Region 7 requested that the PRPs expand the risk analysis section of the December 2011 Supplemental Feasibility Study (SFS) for the West Lake Landfill, Operable Unit-1 (OU-1). It was requested that the expanded analysis consider the risk from a subsurface smoldering event (SSE) originating in the adjacent Bridgeton Landfill, or within OU-1.

ETSC and its contractors prepared this memorandum to provide a summary of our observations on the seven bullet points listed in EMSI's January 14, 2014 report. The responses in the memorandum are based on the following: 1) a review of the January 14, 2014, EMSI report, 2) a focused review of the May 2008 Record of Decision (ROD) for OU-1 and the 2011 Supplemental Feasibility Study (SFS), 3) our knowledge of the SSE and related data collected at the Bridgeton Landfill, and 4) our general knowledge of landfill operations and SSEs.

This memorandum is intended to be a high-level summary. We did not comment on the likelihood of a SSE occurring in or traveling to the OU-1 cell. Each bullet point from the EMSI January 2014 report is presented below in **bold type**, and our observations related to these bullet points are presented in normal type.

Thank you for the opportunity to review and provide input on referenced report. Please feel free to contact me with any questions or comments.

EMSI Executive Summary Bullet Point #1: The radiologically-impacted material (RIM) disposed of in West Lake Areas 1 and 2 will not become more or less radioactive in the presence of heat. Likewise, the RIM is not explosive and will not become explosive in the presence of heat.

ETSC Observations: We agree that the RIM in OU-1 is not expected to be more or less radioactive in the presence of heat. However, we do not have a full accounting of the non-RIM solid waste in OU-1. At this time, we have no evidence that would indicate that the RIM and non-RIM material known to be in OU-1 will become explosive in the presence of heat, even at the elevated temperatures observed in the Bridgeton Landfill. It is notable that in the event of a SSE there could be chemical reactions between the RIM and non-RIM materials in OU-1. These reactions could cause a rapid buildup of heat or gas and subsequent reactions or reactive conditions in the landfill.

EMSI Executive Summary Bullet Point #2: An SSE does not create conditions that could carry RIM particles or dust off the site. The heat of an SSE is not high enough to ignite non-RIM wastes or chemical compounds or to cause them to explode.

ETSC Observations: The temperatures in the SSE at the Bridgeton Landfill are consistent with levels corresponding to pyrolysis^a. If a SSE in OU-1 could reach similar temperatures, we would not expect the non-RIM material to ignite. However, using the higher temperatures observed in the Bridgeton Landfill as a worse-case scenario, these

^a Namdari, R. (2006). Seasonal and long-Term Storage of Baled Municipal Solid Waste, Lund University, Sweden, ISBN 91-7422-118-3.

temperatures may cause the structural integrity of the cap called for in the 2008 ROD to be adversely affected. This could potentially include surface cracks and fissures in the cap extending down into the waste material, and potentially cause permeation of the cover used. Surface cracks and fissures may allow gases (such as radon and steam) to escape, and potentially create conditions that could allow fine particulates to escape from the landfill. Since we do not have a full accounting of the material in OU-1, we cannot make a definitive assessment regarding the potential for chemical reactions between the RIM and non-RIM materials if an SSE were to occur. If these reactions were to occur, they could cause a rapid buildup of heat or gas, and subsequent reactions or reactive conditions in the landfill.

EMSI Executive Summary Bullet Point #3: An SSE may allow radon gas to more easily rise through the ground and reach the surface of the landfill than would otherwise occur, because heat will/would reduce the amount of moisture in the buried solid waste (trash) thereby increasing the amount of air between the soil particles and thus limiting the ability of the buried solid waste to retain radon below ground. Any radon gas that does make it to the surface would dissipate quickly in open air. This potential increase in the rate of release of radon gas at the surface of the landfill would be limited to the area of the SSE and would stop when the SSE ends.

ETSC Observations: A SSE in OU-1 would be expected to create increased pressure conditions within the landfill and force out entrained gases, including radon. Possible damage to the cap called for in the 2008 ROD from the SSE may allow these gases to escape. Also, a SSE may be present in OU-1 for a long period of time before it is detected, because the only apparent means to detect a SSE after closure is through annual visual inspections. Given that measurements of radon in air during the SFS were close to a Uranium Mill Tailings Radiation Control Act (UMTRCA) standard, there is the potential for radon releases at levels of concern if a SSE occurs in OU-1. This observation does not consider other environmental conditions that could cause radon and other landfill gas concentrations to increase at ground level, such as atmospheric inversions.

EMSI Executive Summary Bullet Point #4: An SSE in West Lake Area 1 or 2 would create no long-term additional risks to people or the environment.

ETSC Observations: We do not support the conclusion that no additional long term risks would be created in the event of a SSE at OU-1. There are at least two risk pathways that could exist from a SSE. The first is through increased air exposures to contaminants such as radon. As airborne concentrations of radon increase, so would the risk to people. The second pathway is increased leachate production that could move contaminants and dissolved radon gas from OU-1 into the groundwater. Sampling would be needed to monitor whether either of these two exposure pathways becomes an issue.

EMSI Executive Summary Bullet Point #5: Any short-term risks would be associated with the temporary increase in radon gas coming from the surface of the landfill if no cap is installed on the landfill, or if the cap called for by the 2008 ROD was not properly maintained.

ETSC Observations: Short-term effects of a SSE could also include greater amounts of leachate production, which has been observed at the Bridgeton Landfill from condensation of large amounts of steam. A SSE may result in increased emissions of radon and other contaminants in the air and groundwater, even with annual inspections and proper maintenance of designs discussed in the 2008 ROD and 2011 SFS.

EMSI Executive Summary Bullet Point #6: These short-term risks can be addressed by designing, building, and maintaining the landfill cap called for by the 2008 ROD, and by maintaining the land use restrictions already in place on the entire West Lake property, which prevent certain site uses.

ETSC Observations: As stated earlier, if a SSE occurs, short-term risks may be present even with proper cap design, inspection and maintenance.

EMSI Executive Summary Bullet Point #7: There are no additional ARARs associated with an SSE.

ETSC Observations: There do not appear to be additional Applicable or Relevant and Appropriate Requirements (ARARs) for the site if a SSE were to occur.