EARLY-INTERIM RECORD OF DECISION
OPERABLE UNIT THREE
SAFETY LIGHT CORPORATION SUPERFUND SITE
BLOOMSBURG, PENNSYLVANIA

Prepared by:

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LIST OF ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirements
AOC	Administrative Order on Consent
bgs	below ground surface
BRP	Bureau of Radiation Protection
cpm	counts per minute
ccpm	corrected counts per minute
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
Ci	Curie
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
CSM	Conceptual Site Model
dpm	disintegrations per minute
EPA	United States Environmental Protection Agency
ERA	Ecological Risk Assessment
FS	Feasibility Study
HAZWOPER	Hazardous Waste Operations and Emergency Response
HHRA	Human Health Risk Assessment
HHRE	Human Health Risk Evaluation
HI	Hazard Index
HQ	Hazard Quotient
HRS	Hazard Ranking Score
IC	Institutional Control
IMC	Intermodal Container
mg/kg	milligram/kilogram
MERL	Mobile Environmental Radiation Laboratory
mR/hr	milliroentgens/hour
mrem	millirem
mrem/hr	millirem/hour
mrem/yr	millirem/year
NCP	National Contingency Plan
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
O&M	Operations and Maintenance
OSHA	Occupational Health and Safety Administration
OU	Operable Unit
PADEP	Pennsylvania Department of Environmental Protection
PCB	Polychlorinated Biphenyl Compounds
pCi	picocurie
pCi/g	picocurie/gram
PAH	Polynuclear Aromatic Hydrocarbon
PRG	Preliminary Remediation Goal

LIST OF ACRONYMS AND ABBREVIATIONS

PRAP	Proposed Remedial Action Plan
rem/hr	rems/hour
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RSL	Regional Screening Level
SVOC	Semivolatile Organic Compound
SLC	Safety Light Corporation
SSL	Soil Screening Level
SU	Survey Unit
TBC	To-Be-Considered
µg/kg	micrograms/kilogram
µR/hr	microroentgen/hour
USACE	U.S. Army Corps of Engineers
USRC	United States Radium Corporation
VOC	Volatile Organic Compound

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EARLY-INTERIM RECORD OF DECISION
OPERABLE UNIT THREE
SAFETY LIGHT CORPORATION SUPERFUND SITE
BLOOMSBURG, PENNSYLVANIA

1.0 DECLARATION

1.1 SITE NAME AND LOCATION

The Safety Light Corporation (SLC) Superfund Site (Site) is located at 4150-A Old Berwick Road, South Centre Township, Columbia County, Pennsylvania, approximately six miles east of Bloomsburg and six miles west of Berwick. The Site is approximately ten acres and formerly contained numerous radioactively-contaminated buildings/structures. Other contaminated areas, including lagoons, dumps, and an abandoned canal currently remain on-site. The National Superfund Database Identification Number is PAD987295276

1.2 STATEMENT OF BASIS AND PURPOSE

In this Early-Interim Record of Decision (ROD), EPA has selected an early-interim remedy (Selected Remedy) for the West Dump, West Lagoon, East Dump, and East Lagoon areas of Operable Unit Three (OU-3) of the Site. The Selected Remedy for OU-3 was selected in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, 42 U.S.C. § 9601 et seq., and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300, as amended.

This Early-Interim ROD is based on the Administrative Record for the Site, which has been developed in accordance with Section 113(k) of CERCLA, 42 U.S.C. § 9613(k). This Administrative Record is available for review online at http://www.epa.gov/arweb, at the U.S. Environmental Protection Agency (EPA) Region III Records Center in Philadelphia, Pennsylvania, and at the Bloomsburg Area Public Library in Bloomsburg, Pennsylvania. The Administrative Record Index (Appendix B) identifies each document contained in the Administrative Record upon which the Selected Remedy for OU-3 is based.

The Commonwealth of Pennsylvania concurs with the Selected Remedy identified for OU-3.

1.3 ASSESSMENT OF THE SITE

The response action selected in this Early-Interim ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

1.4 DESCRIPTION OF THE SELECTED REMEDY

This Early-Interim ROD addresses non-radionuclide and radionuclide-contaminated soils/debris which include radioactive discrete objects in the West Dump, West Lagoon, East Dump, and East Lagoon areas of OU-3 only. These areas have been impacted by radionuclides and other non-radionuclide contaminants (i.e., heavy metals and other organic compounds) as a result of

former operations at the Site. The remainder of OU-3 will be addressed in future response actions and documented in a Final ROD for OU-3. EPA is currently performing a Removal Action to address the contamination located in the West Lagoon, East Dump, and East Lagoon areas. EPA has decided to use this early-interim approach in order to expediently convert the ongoing Removal Action to an Early-Interim Remedial Action. The current Remedial Investigation (RI) for OU-3 will continue during and beyond the Early-Interim Remedial Action to determine the full nature and extent of the contamination in OU-3.

The Selected Remedy for OU-3 consists of the following:

1. Site Preparation - Mobilize and setup support facilities, remove vegetation, and establish soil erosion and sediment controls. Regularly inspect and maintain erosion and sediment controls during vegetation clearance, soil excavation and stockpiling, waste loading, backfilling, and regrading operations, until excavation and backfilling is complete and a gravel protective cover is established at the West Dump, West Lagoon, East Dump, and East Lagoon to minimize erosion.

2. Soil Excavation – Excavate all materials including soils/debris and radioactive discrete objects from the West Dump, West Lagoon, East Dump, and East Lagoon in the approximate area of concern depicted in Appendix C (Figures 4 to 7). Continue vertical excavation until ground water or the native soil interface (the point at which fill material meets the native soil surface) is encountered, whichever occurs first, or to the maximum extent practicable based on Site or excavation conditions. Excavation depths are expected to range from approximately 4 to 16 feet below ground surface (bgs). The total in-situ volume of material designated for removal is approximately 5,978 cubic yards.

3. Post-Excavation Sampling – Collect post-excavation samples from the floor and side walls of each excavation area, prior to backfilling and regrading, to determine and document the concentration of radionuclide and non-radionuclide soil contamination that may remain in-place. Conduct gamma walkovers of the excavated areas prior to backfilling to assess any remaining radiological activity.

4. Package all excavated material as radioactive waste and load into intermodal containers (IMCs) for shipment to disposal sites. Transfer excavated material by licensed vendors in accordance with transportation regulations to an off-site facility as described in #5, below.

5. Waste Disposal - Dispose off-site, at a Nuclear Regulatory Commission (NRC) licensed radioactive waste facility, and in accordance with Section 121(d)(3) of CERCLA, 42 U.S.C. § 121(d)(3), and Section 300.440 of the NCP, 40 C.F.R. §300.440, all materials excavated pursuant to item #2 above. Certain waste materials (including, but not limited to, dials and some discrete objects) may also exhibit chemical hazardous waste characteristics requiring treatment (e.g. stabilization) prior to permanent disposal. Such waste materials shall be sampled and analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) pursuant to the Resource Conservation and Recovery Act (RCRA) to determine if they exhibit hazardous waste characteristics. For those waste materials that

fail TCLP, such treatment shall be performed at the off-site licensed radioactive waste facility to render such materials non-hazardous prior to disposal at that licensed facility.

6. Site Restoration – Backfill excavated areas with clean material derived from an off-site borrow source. Backfill material shall meet Pennsylvania Criteria for Management of Fill specifications for chemical constituents, as certified through laboratory analysis. Regrade excavated areas to approximate original contours, ensuring appropriate site drainage. Install and place geotextile and a layer of gravel, with a minimum thickness of 12 inches, on disturbed surfaces of the West Dump, West Lagoon, East Dump, and East Lagoon as a protective cover to minimize erosion.

The estimated cost to complete the Selected Remedy is $9,133,000.

1.5 STATUTORY DETERMINATION

This early-interim action is protective of human health and the environment in the short term and is intended to provide adequate protection until a Final ROD for OU-3 is signed; complies with (or waives) those federal and state requirements that are applicable or relevant and appropriate for this limited-scope action; and is cost-effective. Although this early-interim action is not intended to address fully the statutory mandate for permanence and treatment to the maximum extent practicable, this early-interim action may utilize treatment and, if so, would support that statutory mandate. Because this action does not constitute the final remedy for OU-3, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed in this remedy, will be addressed by the final response action for OU-3. Subsequent actions are planned to address fully the threats posed by conditions at OU-3. This remedy may result in hazardous substances remaining in the lagoon/dump areas of the Site above health-based levels. Five-year reviews will be conducted in accordance with statutory requirements pursuant to Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), the NCP, 40 C.F.R. §300.430(f)(4)(ii), and EPA guidance, as appropriate. Because this is an early-interim action ROD, review of this Site and this early-interim remedy will be ongoing as EPA continues to develop remedial alternatives for OU-3.

Soils contaminated with significant concentrations of radionuclides are considered principal threat wastes (PTW). EPA has a preference to treat PTW, wherever practicable. However, there is no feasible technology to practicably treat radionuclides that will not result in larger volumes of waste, creating greater impracticability for disposal. The excavated material which includes soils/debris and radioactive discrete objects will be packaged appropriately for off-site disposal at an approved off-site NRC licensed radioactive waste disposal facility. Off-site disposal will be conducted in accordance with Section 121(d)(3) of CERCLA, 42 U.S.C. § 121(d)(3), and Section 300.440 of the NCP, 40 C.F.R. §300.440.

Certain waste materials (including, but not limited to, dials and some discrete objects) may also exhibit chemical hazardous waste characteristics requiring treatment (e.g. stabilization) prior to permanent disposal. Such waste materials shall be sampled and analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) pursuant to the Resource Conservation and Recovery Act (RCRA) to determine if they exhibit hazardous waste characteristics. For those waste

materials that fail TCLP, such treatment shall be performed at the off-site licensed radioactive waste facility to render such materials non-hazardous prior to disposal at that licensed facility.

The Selected Remedy for the West Dump, West Lagoon, East Dump, and East Lagoon areas of OU-3 may result in hazardous substances, pollutants, or contaminants remaining in the lagoon/dump areas of the Site above levels that would allow for unrestricted use and unlimited exposure. Five-year reviews will be conducted in accordance with statutory requirements pursuant to Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), the NCP, 40 C.F.R. §300.430(f)(4)(ii), and EPA guidance, as appropriate, to ensure that the remedy is, or will be, protective of human health and the environment.

1.6 ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary (Part 2.0) of this Early-Interim ROD, while additional information can be found in the Administrative Record for the Site:

- Contaminants of concern (COCs) and their respective concentrations;
- Baseline risk represented by the COCs;
- How source materials constituting principal threats are addressed;
- Current and reasonably anticipated future land use assumptions used in the baseline risk assessment and Early-Interim ROD;
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected; and
- Key factors that led to selecting the early-interim remedy.

1.7 AUTHORIZING SIGNATURE

This Early-Interim ROD documents the Selected Remedy for the West Dump, West Lagoon, East Dump, and East Lagoon areas of OU-3 at the Safety Light Corporation Site and is based on the Administrative Record for the Site. EPA selected this early-interim remedy with the concurrence of the Pennsylvania Department of Environmental Protection (PADEP). The Director of the Hazardous Sites Cleanup Division for EPA Region III has approved and signed this Early-Interim ROD.

Doug Lueckenhoff

Dominique Lueckenhoff, Acting Director
Hazardous Site Cleanup Division
EPA Region III

6/30/16
Date

2.0 DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND BRIEF DESCRIPTION

The Site is located at 4150-A Old Berwick Road, South Centre Township, Columbia County in central Pennsylvania, approximately six miles east of Bloomsburg and six miles west of Berwick (Figure 1). The Site is approximately ten acres and formerly contained numerous radioactively-contaminated buildings/structures and other contaminated areas, including lagoons, dumps, and an abandoned canal. A two-acre area of the ten-acre Site was utilized for manufacturing operations from approximately 1948 until December of 2007 (Figure 2). The northern Site boundary is Old Berwick Road and the southern Site boundary is the Susquehanna River. Residential tracts of land are adjacent to the northern, eastern, and western boundaries of the Site. Most of the Site is currently enclosed by fencing.

The CERCLA identification number for the Site is PAD987295276.

The EPA is the lead agency for Site activities and PADEP is the support agency. The cleanup of the Safety Light Corporation Site is being funded from the Superfund Trust under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA).

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Site History

The Site was most recently operated by SLC, which ceased manufacturing operations in approximately December 2007. When operating, SLC made lighting products with radioactive material (tritium) as the energy source under two licenses formerly administered by the NRC, now administered by PADEP. The licenses, which expired on December 31, 2007, were License Number 37-00030-02 for the characterization and cleanup of contaminated facilities, equipment, and land from past activities, and License Number 37-00030-08 for the use of byproduct material to make exit signs. Tritium (H-3) was used by SLC in the production of luminous signs and dials, paints, gas chromatograph foils, and accelerator targets. SLC also held a license administered by PADEP (License Number PA-0166), for the radium contamination at the Site and for sealed calibration and/or reference radium sources up to 10 millicuries. This license expired on March 31, 2008.

Historic activities at the Site varied over time and involved the use of a number of different radionuclides. The Site had also been used for metal finishing and plating. Site operations involved a variety of radionuclides, chemicals, fuel oil, solvents, and heavy metals.

In 1948, SLC's predecessor, the United States Radium Corporation (USRC), relocated its radium operations from Brooklyn, New York to the Site. At that time, USRC used mainly radium and minor amounts of polonium-210 (Po-210) in the manufacture of self-illuminating watch and instrument dials. During the 1950s, USRC expanded its operations to include the manufacture of civil defense check sources and radiation sources utilizing cesium-137 (Cs-137), and the production of deck markers for the U.S. Navy involving the use of strontium-90 (Sr-90). During

this same time period, radium was also used primarily for clocks and watches (dials and hands) and in the production of high level neutron and radiation therapy sources. During the production of the various devices, the company placed radioactive wastes in two underground silos located south of the Main Building on the Site. These two underground silos were closed in about 1960. According to historical documents for the Site, the underground silos were closed by pouring concrete over the existing silo lids.

During the 1950s, USRC began producing light sources using tritium (H-3), carbon-14 (C-14), and krypton-85 (Kr-85); low level ionization sources using nickel-63 (Ni-63) and tritium; and beta radiation sources using krypton. Waste from these operations was buried in the previously mentioned underground silos. Operations using radium-226 (Ra-226) reportedly were discontinued in 1968, and in 1969 USRC discontinued manufacturing with all radionuclides except tritium.

In 1980, USRC underwent a corporate restructuring resulting in the creation of a new entity, USR Industries, and the merger of USRC into USR Industries as a wholly owned subsidiary. In turn, USRC changed its name to SLC. At the same time, USRC's divisions separately incorporated into four new subsidiary corporations: USR Chemicals, Inc.; USR Lighting, Inc.; USR Metals, Inc.; and USR Natural Resources, Inc. SLC continued manufacturing operations (as described above) on the Site from 1980 until approximately December 2007. USR Metals operated a metal products business at the Site, and ceased operations at the Site in approximately 2007.

Waste Disposal History

Wastes generated at the Site included solid and liquid waste streams contaminated with radioactive materials, including radium-226, strontium-90, cesium-137, and tritium. These waste materials were disposed of in multiple areas of the Site throughout the years.

During Site operations, an unused canal adjacent to the Susquehanna River was divided into a series of lagoons and dump sites. The canal was used for the disposal of sewage, liquid waste (including silver plating wastes and anodizing solutions), low-level radioactive waste, radium-226 contaminated ductwork, radionuclide-contaminated debris (such as radium dials and possibly strontium deck markers), and process wastewater from the radium laboratory in the Main Building. In 1972, it is believed that the lagoons were flooded and their contents were dispersed onto the Site property and into the Susquehanna River.

Four aboveground storage tanks in the Liquid Waste Building contained tritium-contaminated wastewater from the Tritium (Nuclear) Building, which was diluted and released to the Susquehanna River during Site operations. Tritium-contaminated wastewater was also contained in two below-ground tanks in a vault in the basement of the Liquid Waste Building. In 1972, a flood uprooted one partially filled tank from the Liquid Waste Building. The tank vault was subsequently filled with soil and covered with a concrete slab. Plant personnel believe that radium waste was also placed in the vault before it was backfilled and capped.

History of Response Actions

National Priority Listing

On December 20, 2001, following NRC attempts to require SLC to conduct cleanup efforts at the Site, the NRC requested that EPA perform a site assessment of the Site, for purposes of scoring the Site for inclusion on EPA's National Priorities List (NPL). As a result, an initial investigation of the Site was conducted by EPA to determine the Hazard Ranking System (HRS) score for further evaluation under CERCLA. A HRS preliminary score of 65.84 was calculated for the Site, which was based on the various radionuclides detected on-site. The Site was proposed for the NPL on September 23, 2004, and listed as final on the NPL on April 27, 2005 making it eligible for long-term cleanup under the Superfund program.

Removal Actions

EPA has issued several Removal Action Memoranda for the Safety Light Site. A summary of the Action Memoranda, date of issuance, and estimated removal project ceiling costs is provided in Table D-1. These Action Memoranda are included in the Administrative Record for the Site. Further detailed information regarding the various EPA Removal Actions undertaken at the Site may also be found at www.epaosc.org/safetylight. Highlights of some of the Removal Actions are provided in the following sections below.

Radioactive Waste from Two (2) Underground Silos

Pursuant to a September 14, 1994 Settlement Agreement (Agreement) with the NRC, SLC had engaged in certain cleanup efforts at the Site. Cleanup pursuant to the Agreement resulted in the removal of radioactive wastes from the two above-mentioned underground silos and staging of the waste in drums and containers on-site. By June 20, 2000, SLC had staged 176 drums (55-gallon) and 26 B-25 containers (4ft x 4ft x 6ft) that contained various types of radioactive wastes. The staging area was near the southern edge of the Site, approximately 200 feet from the Susquehanna River. However, SLC did not arrange for the majority of the exhumed wastes to be disposed of off-site. After numerous attempts by the NRC to require SLC to remove the waste from the Site, NRC requested EPA's assistance in completing these actions at the Site. On July 3, 2002, following an EPA removal assessment of the radioactive wastes and storage area at the Site, EPA determined that the release and threatened release of radioactive waste from the Site into the environment presented an imminent and substantial endangerment to the public health or welfare or to the environment. On February 3, 2003, EPA and SLC entered into an Administrative Order on Consent (AOC) under Section 106 of CERCLA, 42 U.S.C. § 9606, to complete the silo waste characterization/staging activities. By May 2004, SLC had not completed the work required in the AOC. On July 12, 2004, EPA issued an Action Memorandum for the Site, which approved Superfund funding for a time-critical Removal Action to complete the characterization, packaging, and off-site disposal of the silo waste. The time-critical Removal Action began on June 13, 2005.

On September 23, 2005, EPA executed an Inter-Agency Agreement with the United States Army Corps of Engineers (USACE) to complete the characterization, packaging, and off-site disposal

of the silo waste. The waste materials from the underground silos were disposed of off-site in a secure licensed disposal facility for radioactive wastes.

Demolition of Seven Buildings

During the scoping activities for the OU-1 RI, EPA determined that four buildings on the Site were deteriorating, unoccupied, and unmaintained by the Site owner/operator. The four buildings were identified as the Old House, Radium Vault, Personnel Office Building, and a portion of the Etching Building. Three additional deteriorating buildings were also identified during performance of the OU-1 RI: the Lacquer Storage Building, Well House, and Pipe Shop. Based on their poor physical condition, EPA did not believe that radiological characterization of the buildings could be safely performed. Additionally, based on a records review, radioactive contamination at levels that would qualify building materials as regulated radioactive waste were identified in six of the seven buildings, with the exception of the Radium Vault. Therefore, EPA prepared an Engineering Evaluation/Cost Analysis, dated October 2006, for the demolition and disposal of these seven buildings.

EPA issued two Action Memoranda to address the seven aforementioned buildings on June 21, 2007, and July 11, 2008, which increased the budget of the demolition project. The demolition of the seven buildings and off-site disposal of the resultant demolition debris was performed during 2008/2009 and is complete. The completion of this work is documented in the "*Final Revised Completion Report for the Non-Time Critical Removal Action; Demolition of OU-1 Buildings*" prepared by USACE, dated May 2013.

West Dump and Six Outbuildings

In September 2011, the Susquehanna River rose to historic levels as a result of Tropical Storm Lee, partially flooding the Site. Several outbuildings were flooded and post-flood assessments conducted by PADEP's Bureau of Radiation Protection (BRP) revealed the presence of low levels of Site-related contamination on an adjacent residential property immediately downstream from the West Dump. Based on this information from PADEP BRP, the condition of the West Dump was assessed, and EPA made the decision to temporarily cap the area following the excavation of the impacted soils on the adjacent residential property. On June 11, 2013, EPA issued an Action Memorandum including, but not limited to, the following activities: 1) demolition of the Metal Silo, Liquid Waste Building, Solid Waste Building, Utility (SR-90) Vault, the 8x8 Building, and the Multi-Metals/Carpenter Shop; 2) excavation of soil determined to have migrated from the West Dump onto the adjacent property; 3) stabilization of the West Dump to minimize the potential for further releases; and 4) disposal of building contents, demolition debris, and excavated soils.

Between approximately June 2013 and February 2014, as part of the implementation of the June 2013 Action Memorandum, EPA completed the demolition of the six outbuildings and removed radionuclide-contaminated soil from the adjacent residential property and consolidated that soil with the radionuclide-contaminated soil and debris in the West Dump. The West Dump was graded and covered with gravel and soil as a temporary action to limit future erosion. The West Dump will be further addressed by the Selected Remedy in this Early-Interim ROD.

West Lagoon, East Dump, and East Lagoon

During the performance of the OU-1 Remedial Action for the demolition of the remaining SLC buildings, described in detail in the Remedial Actions section below, EPA identified additional on-site areas that warranted Removal Actions. These areas were identified as the West Lagoon, East Dump, and East Lagoon. On February 1, 2016, EPA issued an Action Memorandum to address these areas, consisting of the following activities: (1) the assessment, excavation, and removal of discrete, buried, high-activity, radiologically-contaminated items, soil and miscellaneous sources, as practicable; (2) disposal of such soils and materials off-site; (3) grading and capping, with an appropriately engineered cover, to prevent off-site migration of soils during a flood event; (4) securing adjacent areas of exposed soil with geo-fabric, stone and topsoil or an engineered cap to prevent off-site migration of soils during a flood event; and (5) arranging for appropriate post-removal site controls which would include long-term maintenance of the cap. This Removal Action is currently ongoing. These areas would continue to be addressed pursuant to the Selected Remedy in this Early-Interim ROD.

Remedial Actions

EPA divided the Site into three operable units (OUs). OU-1 addresses the Safety Light Buildings and Structures; OU-2 addresses Ground Water; and OU-3 addresses Soils, Sediment, and Surface Water. These OUs and response actions taken are further discussed below.

OU-1: Safety Light Buildings and Structures

OU-1 addressed the Safety Light buildings/structures and their contents. On September 2, 2010, EPA issued a ROD for OU-1. The Selected Remedy for OU-1 included demolition and off-site disposal of the remaining SLC buildings/structures (buildings, tanks, silo, etc.). The remedy was selected to remove buildings/structures and their contents from the Site, which represented a threat of release of hazardous substances (radionuclides) to the environment, and/or to facilitate future response actions at the Site, including the completion of the investigation of soil and ground water. A full description of the OU-1 Selected Remedy, threats posed by OU-1, and Site history are included in the OU-1 ROD and Administrative Record.

While awaiting remedial funding to implement the OU-1 ROD, time-critical removal response actions were undertaken to stabilize Site conditions to prevent the release of hazardous substances at and from the Site. These removal response actions are documented in Action Memoranda dated November 8, 2012, February 20, 2013, June 11, 2013, December 16, 2013, September 26, 2014, and June 17, 2015. Implementation of the OU-1 Remedial Action activities began in December 2013 and were substantially completed in September 2015. Demolition activities were completed by September 17, 2015. On September 26, 2015, EPA and its contractors performed a final inspection of the Site. Per the inspection, all buildings and aboveground structures pertaining to OU-1 had been demolished and shipped off-site for disposal. The removal of underground structures pertaining to OU-1 was also completed. Several IMCs containing concrete from underground structures and drums containing tritium-contaminated materials remained at the Site; however, these materials were shipped off-site for disposal in October 2015.

The following buildings/structures were demolished and disposed off-site, along with their contents, as part of the Removal Actions and/or the OU-1 Remedial Action:

- Metal Silo (aboveground)
- 8x8 Building
- Solid Waste Building
- Utility Building
- Liquid Waste Building
- Multi-Metals Building
- Carpenter Shop
- Butler Building
- Elevated Water Tower
- Main Building
- Tritium Building
- Machine Shop
- Water Tank
- Underground Structures

Because the OU-1 Remedial Action required demolition and off-site disposal of the SLC buildings/structures, the OU-1 ROD did not include "cleanup levels" (such as may be included in a ROD for cleanup of soil or ground water contamination), institutional controls, monitoring requirements, or operations and maintenance requirements.

The completion of the OU-1 Remedial Action is documented in the "*Final Remedial Action Completion Report; Operable Unit-1*", dated September 2015, and issued by EPA on November 23, 2015.

OU-2: Ground Water

OU-2 addresses ground water at the Site. The OU-2 Remedial Investigation/Feasibility Study (RI/FS) is being performed by EPA. A final response action for OU-2 will be determined by EPA when the RI/FS is complete.

OU-3: Soils, Sediments, and Surface Water

OU-3 addresses soils, sediment, and surface water. The OU-3 RI/FS is currently ongoing and will require additional data evaluation and field activities prior to finalizing the OU-3 RI/FS Report. However, sufficient information has been evaluated to support the Selected Remedy in this Early-Interim ROD for the West Dump, West Lagoon, East Dump, and East Lagoon areas of OU-3 to mitigate potential threats to human health and the environment. The remainder of OU-3 will be addressed by future response actions when the OU-3 RI/FS is complete. The final remedy will be documented in a Final ROD for OU-3.

2.3 COMMUNITY PARTICIPATION

On May 27, 2016, pursuant to Section 113(k)(2)(B) of CERCLA, 42 U.S.C. §113(k)(2)(B), EPA released for public comment the Proposed Remedial Action Plan (PRAP) setting forth EPA's early-interim preferred remedial alternative for the West Dump, West Lagoon, East Dump, and East Lagoon areas of OU-3 of the Site. The PRAP was based on documents contained in the Administrative Record. EPA made these documents available to the public in the EPA Administrative Record Room in EPA Region III's office located at 1650 Arch Street in Philadelphia, Pennsylvania, and at the local information repository at the Bloomsburg Area Public Library located at 225 Market Street in Bloomsburg, Pennsylvania. A notice of availability of these documents was published in the *Press Enterprise* on May 27, 2016. EPA opened a 30-day public comment period on May 27, 2016, to receive comments on EPA's early-interim preferred alternative and the other alternatives identified in the PRAP. Comments received during this public comment period, as well as EPA's response to such comments, are summarized in the Responsiveness Summary (Section 3.0) of this Early-Interim ROD. EPA and PADEP also held a public meeting, on June 15, 2016, at the Central Columbia Middle School located at 4777 Old Berwick Road, Bloomsburg, Pennsylvania. A detailed discussion of the recent community activities is presented in Section 2.10 under the subheading Community Acceptance.

More detailed documentation on the information contained in this Early-Interim ROD may be found in the Administrative Record, which contains the Draft 2014 RI Report for OU-3, "*Remedial Alternatives Evaluation Technical Memorandum for the West Dump, West Lagoon, East Dump, East Lagoon Areas*" (Alternatives Memorandum), and other information used by EPA in the decision making process. EPA encourages the public to review the Administrative Record in order to gain a more comprehensive understanding of the Site and the activities that have been and will be conducted there. The Administrative Record can be viewed at the Bloomsburg Area Public Library located at 225 Market Street in Bloomsburg, Pennsylvania and is also available at the EPA Region III Office located at 1650 Arch Street in Philadelphia, Pennsylvania. To review the Administrative Record at EPA's Philadelphia office, contact Mr. Paul Van Reed, Administrative Record Coordinator, at (215) 814-3157. The Administrative Record can also be accessed on the web at www.epa.gov/arweb. Copies of this Early-Interim ROD are available for public review in these information repositories.

2.4 SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

As with many Superfund sites, the problems at the Safety Light Corporation Site are complex. As a result, EPA has organized the work into three operable units (OUs):

- Operable Unit One (OU-1): Safety Light Buildings and Structures
- Operable Unit Two (OU-2): Ground Water
- Operable Unit Three (OU-3): Soils, Sediments, and Surface Water

This Early-Interim ROD sets forth the Selected Remedy for addressing non-radionuclide and radionuclide-contaminated soils/debris and radioactive discrete objects in the West Dump, West

Lagoon, East Dump, and East Lagoon areas of OU-3, consistent with the ongoing Removal Action. Soils within and near these areas contain elevated levels of radionuclide and non-radionuclide contamination and radionuclide-contaminated debris in surface and subsurface soils, which pose a threat to human health and the environment. Because the non-radionuclide and radionuclide-contaminated soils are comingled, all soils in these areas will be handled as radioactive waste materials.

Although a security fence restricts access to the Site, trespassing has been observed and documented at the Site. Trespassers could come into contact with non-radionuclide and radionuclide-contaminated soils and other debris or radioactive discrete objects in the fenced-in West Dump, West Lagoon, East Dump, and East Lagoon areas on the Site. These radioactive discrete objects could easily be retrieved by unsuspecting trespassers and cause considerable harm to trespassers or others if the radioactive discrete objects are removed from the Site. In addition, these non-radionuclide and radionuclide-contaminated soils and radioactive discrete objects lie within the 100-year floodplain of the Susquehanna River which is prone to flooding. Flood waters may transport radionuclide-contaminated soils and other radionuclide-contaminated debris/objects to adjacent downstream residential properties and other properties further downstream depending upon the severity of the flooding event. Immediate implementation of an early-interim remedial action would substantially reduce the threat to human health and the environment posed from the lagoon and dump areas until a final remedy is selected for OU-3.

This Early-Interim ROD addresses only the West Dump, West Lagoon, East Dump, and East Lagoon areas of OU-3. The remaining areas of OU-3 will be addressed in a future response action when the OU-3 RI/FS is completed. The final remedy will be documented in a Final ROD for OU-3.

In addition, this Early-Interim ROD does not address OU-2 Ground Water. The OU-2 RI/FS is currently being performed by EPA, and OU-2 will be addressed when the RI/FS is complete.

2.5 SITE CHARACTERISTICS

Physical Characteristics and Land Use

The Site, at an elevation of 490 feet above mean sea level, is located on an old terrace and floodplain on the north bank of the Susquehanna River. The topography of the Site has low relief with the ground surface sloping gently towards the River. A fence currently surrounds the Site. The northern portion of the Site comprises parking areas and a lawn. The central portion of the Site, which contained SLC's former operating facilities, consisted of multiple buildings/structures used for offices, manufacturing, shipping and receiving, and waste storage. The buildings/structures on-site have been demolished as described in Section 2.2 of this Early-Interim ROD. The floodplain of the Susquehanna River is immediately south of the former operations area and includes the West Dump, West Lagoon, East Dump, and East Lagoon, as well as an abandoned canal. The floodplain from the perimeter fence to the Susquehanna River is heavily vegetated.

Residential areas are located adjacent to the north of the Site, across Old Berwick Road, and adjacent to the east and west of the Site.

Site Drainage and Surface Water

The Susquehanna River is the only natural surface water body on or adjacent to the Site, and ground water flows south toward the Susquehanna River. The River has an estimated average flow rate of 10,000 to 100,000 cubic feet per second. Storm drains on the Site appeared to directly discharge surface water to the Susquehanna River; these storm drains were removed during the EPA Removal Actions. The southern portion of the Site, from the bank of the Susquehanna River to about 200 feet inland, is within the 100 year floodplain of the River. The West Dump, West Lagoon, East Dump, and East Lagoon lie within the 100 year floodplain.

Site Soils

Most of the Site is underlain by the Chenango gravelly sand loam. The Chenango series consists of deep, well-drained soils that formed in glacial outwash of gravel and sand. This outwash was derived principally from acid grey sandstone, shale and various erratics. Field observations of the fluvioglacial deposits uncovered gravels and sands having thickness totals of approximately 35 to 45 feet. These fluvioglacial deposits can be divided into two broad units:

- Upper unit: coarse sand and gravel with large sandstone boulders, approximately 15 to 25 feet thick;

- Lower unit: fine-grained sand and gravel, approximately 10 to 20 feet thick.

The other soil series present on the Site is the Middlebury silt loam. The Middlebury series consists of deep, moderately well drained to somewhat poorly drained soils that formed in relatively recent alluvium deposits of the Susquehanna River on nearly level and gently sloping floodplains. Field observations note that the River has cut a fairly steep bank against the sand and gravel outwash plain and has deposited a blanket of silts, fine sandy silts, clayey silts and coaly silts on the floodplains.

Also worth noting is an abandoned canal that follows the upper edge of the gravel bank and has been filled in over most of the Site. The canal was about 100 feet wide and 15 feet deep. The East and West Lagoons are actually remnants of the old canal. The canal was dug primarily in the silts and appears to have little influence on the hydrologic system. One test pit in the former canal encountered wood and radioactive debris with a strong oily smell.

Nature and Extent of Contamination – Soils

Radioactivity and Exposure Measurements and Units

In order to facilitate an understanding of the following discussions regarding radiological measurements and exposures at the Site, this information is offered to provide some context to the terms and measurements that EPA uses for radionuclide-contaminated Superfund Sites. Definitions of commonly used radiological terms and units of measurement used in the following sections are presented in the Glossary in Appendix A.

How is Radioactivity Measured

Radioactivity is measured by the activity of a material. The activity is the number of radionuclides that decay each second. When radionuclides decay, they release alpha, beta, and gamma radiation. EPA often uses a unit called a curie (Ci) to measure activity. One curie is 37 *billion* decays per second. This unit is too large to use at most Superfund sites to assess radiation risk, so EPA usually uses a unit called a picocurie (pCi). One picocurie is equal to one *trillionth* of a curie, or about 2.2 radionuclide decays per minute. EPA measures radioactive contamination by the number of picocuries measured in a specific amount of contaminated material. Soil contamination, for example, is measured in picocuries per gram (pCi/g).

How is Dose Measured

Under most situations, radiation exposure is measured in dose. Dose is related to the amount of radiation absorbed by a person's body. The unit for radiation dose that EPA uses is the millirem (mrem). Millirem relates the absorbed dose of radiation to the amount of biological damage from the radiation. According to the National Council for Radiation Protection and Measurements, the average person in the United States receives a radiation exposure of approximately 620 millirems per year (mrem/yr) from both natural and man-made sources. Background sources of radiation include cosmic radiation from space, medical procedures, radiation found naturally in the soil and water, and indoor radon. However, at Superfund sites, EPA compares levels of radioactive contaminants against background levels of the same radionuclides that may be naturally occurring in media such as soil and ground water.

OU-3 RI Field Investigation

OU-3 Survey Units

The Site and neighboring residential properties to the east and west of the Site were divided by EPA into 22 survey units (SU) during the OU-3 RI, based on the unit's history and results of previous characterization data (Figure 3). Radiological surveys were conducted in each SU with a radiological instrument detector approximately 30 centimeters above the ground (general area reading). A gamma walkover survey was done of all accessible areas of the unit to locate any areas with radiation levels higher than normal background. Areas of elevated activity were marked and a static count was taken to quantify the amount of contamination by placing the detector directly on the ground surface (contact reading) and taking a timed (usually one minute) count (i.e., counts per minute or cpm).

After the scan surveys were completed, grids were established in each SU and static measurements were taken on the grids to verify the results of the scan survey and to determine if contamination was consistent across a unit. Note, depending upon the type of radiation detector used, common readout units are roentgens per hour (R/hr), milliroentgens per hour (mR/hr), rem per hour (rem/hr), millirem per hour (mrem/hr), and cpm.

Because field instrumentation can only distinguish types of radiation (i.e., alpha, beta, and gamma), surface and subsurface soil sampling and analysis for identification of specific radionuclides was performed in a laboratory. Dependent upon the SU, approximately five to eleven surface soil samples were collected in each SU in known or suspected locations of contamination and/or grid locations used for the static measurements.

OU-3 RI Soil Sampling

Soil sampling was conducted to determine the nature and extent of the radiological contamination in soil at the Site. Because field instrumentation can only distinguish types of radiation (i.e., alpha, beta, and gamma), analysis for identification of specific radionuclides was performed in a laboratory. Soil samples were collected during the OU-3 RI and analyzed for radionuclides. The results were used to characterize the relative abundance of each of the specific radionuclides in each SU and to provide inputs to the risk assessment. In addition, several locations in each SU were analyzed for non-radionuclides (chemical parameters) including volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides and polychlorinated biphenyls (PCBs), and metals.

Results from the soil surveys and soil sampling generally indicated radiological contamination above background throughout most areas of the Site. A comprehensive summary of the OU-3 RI soil sampling results for all the SUs is provided in the June 2014 Draft OU-3 RI Report, which is part of the Administrative Record.

OU-3 Data Evaluation

Sampling results were compared to calculated soil screening levels (SSLs) developed by EPA. SSLs for non-radionuclides were calculated using EPA's Regional Screening Level calculator and direct contact with soil exposure assumptions. More information regarding EPA's RSL calculator may be found at https://www.epa.gov/risk/regional-screening-levels-rsls. SSLs for radionuclides were calculated using EPA's Preliminary Remediation Goals for Radionuclides (PRG) Calculator. The PRG calculator is a tool that allows EPA to calculate initial cleanup levels for radiation in soil, water, and air at Superfund Sites but also may be used for generating SSLs. The target risk for SSLs is a 1E-06 (one in one million) risk for carcinogens and a hazard quotient (HQ) of 0.1 for non-carcinogens due to cumulative effects. These SSLs are based on achieving acceptable risk ranges for exposure to contaminants on a specific Superfund Site. More information regarding EPA's PRG Calculator may be found at https://epa-prgs.ornl.gov/radionuclides/.

The calculated SSLs were used to determine the area of concern at the West Dump, West Lagoon, East Dump, and East Lagoon. SSLs with a target cancer risk threshold of 1E-06 from exposure to all carcinogens were used in the determination. Calculated SSLs for the site-related radionuclides and non-radionuclides for the Site are provided in Table D-2 of this Early-Interim ROD. The following table is an excerpt from Table D-2 summarizing the radionuclide SSLs calculated using EPA's PRG calculator corresponding to a 1E-06 cancer risk, and their respective background concentrations.

Table 1
SLC Superfund Site
Calculated Radionuclide Soil Screening Levels 1E-06 Risk

Radionuclide	SSL (pCi/g)	Background (pCi/g)
Americium-241 (Am-241)	0.049	NA
Cesium-137 (Cs-137)	0.047	0.431
Lead-210 (Pb-210)	0.0077	1.64
Neptunium-237 (Np-237)	0.046	0.13
Nickel-63 (Ni-63)	6.7	NA
Radium-226 (Ra-226)	0.0064	1.52
Strontium-90 (Sr-90)	0.066	0.604
Thallium-204 (Tl-204)	2.1	0.356
Tritium (H3)	0.23	3.78

Mobile Environmental Radiation Laboratory (MERL) Sampling

In addition to the OU-3 RI soil sampling data, supplemental information was collected in October 2015 during ongoing removal activities utilizing the EPA Mobile Environmental Radiation Laboratory (MERL). EPA conducted additional investigation of several potential source areas as part of the ongoing Removal Action. Elevated radiological activity and/or radiologically impacted debris have been identified during removal activities at various areas at the Site. The MERL team consists of EPA health physicists, nuclear scientists, and radiochemists, all with significant experience with radionuclide analysis and interpretation. This expertise allowed EPA to analyze on-site samples and provide the most up-to-date information on contaminants in addition to data collected during the OU-3 RI.

OU-3 RI and MERL Soil Results

Results of the radiological and chemical analyses performed during the OU-3 RI and MERL sampling, including field measurements and laboratory analyses, are summarized in the following sections. The Selected Remedy in this Early-Interim ROD addresses only Survey Unit 12 – West Dump, Survey Unit 13 – West Lagoon, Survey Unit 14 – East Dump, and Survey Unit 15 – East Lagoon. Therefore, only these areas of OU-3 are discussed in the following sections. Additional data evaluation and field activities may be necessary prior to finalizing the OU-3 RI/FS.

Background Radiation

Off-site background gamma measurements were collected in a vacant lot east of Survey Unit 22. Soil types were similar to those from the other SUs and radioactive material had not been used or stored in this area. A reference background level (i.e., normal background) was established by calculating the mean of 48 static measurements collected utilizing the same sampling procedures used for the on-site field survey. The calculated reference background value for the field survey during the OU-3 RI was 8,796 cpm. Dose rates from the background area ranged from 9 to 10

µR/hr. Background samples were also collected by USACE in 2015 to provide additional results for radium-226.

Background concentrations for specific radionuclides in soil are presented in Table 1 and Table D-2. These results are the calculated 95% upper prediction limit for radium-226 for the USACE data and the 95% upper tolerance limit from the OU-3 RI data for the other radionuclides.

West Dump – Survey Unit 12

This SU is approximately 3,122 square feet and includes the West Dump. The West Dump contained no buildings/structures and more than 50% of the West Dump was inaccessible due to unmovable debris; however, surface scans and gridded static count surveys were performed on the accessible areas. Scan results showed high activity on all accessible areas, averaging approximately 142,000 corrected counts per minute (i.e., cpm above background or ccpm). Only 20 of the required 23 gridded static measurements were taken due to inaccessibility and averaged approximately 58,000 ccpm, which was above background readings. Average dose rates were between 0.1 and 0.4 mR/hr. The highest result detected (1,090,439 ccpm with a dose rate of 231 microroentgen per hour (µR/hr)) was found in a depression in the eastern portion of the West Dump where a terracotta pipe was exposed. It should be noted that these measurements have dropped significantly because of the removal of discrete radionuclide-contaminated items and placement of the temporary cover during the West Dump Removal Action.

Eleven samples were taken from five biased sample locations and analyzed for radionuclides and non-radionuclides. Soil samples from the five biased locations were collected from various depths (0 to 0.5 feet and 0.5 to 2.0 feet in depth at each location and 3 to 4 feet at one location). Significant results (above the SSLs calculated by EPA's PRG calculator for radionuclides) were reported for lead-210 (up to 163 pCi/g) and radium-226 (up to 617 pCi/g). The sample collected from the area of highest static measurements (Biased Sample #5) showed low levels of radionuclides which did not correlate with the high counts and dose rates recorded near that location. It is likely that the high dose rates were associated with the terracotta pipe and not soil in that area. Table D-3 and Figure 4 show the OU-3 RI radionuclide sampling results and locations for the West Dump.

MERL on-site sampling was not conducted for the West Dump area soils.

Elevated concentrations of inorganic and organic contaminants were detected in surface soils and included chromium up to 230 milligrams per kilogram (mg/kg); iron (up to 35,100 mg/kg); and Aroclor-1254 up to 4,400 micrograms per kilogram (µg/kg).

West Lagoon – Survey Unit 13

Survey Unit 13 is approximately 8,600 square feet and includes the West Lagoon, which is south of the former Etching Building, the Pipe Shop, Survey Unit 4, and is located north of the Susquehanna River floodplain. The West Lagoon was the discharge point for the septic system overflow and is suspected of receiving liquid wastes during operations. The southern half of the West Lagoon is likely a filled portion of the abandoned canal.

Surface scan and static count surveys could not be performed during the OU-3 RI field activities conducted in 2007/2008 due to the presence of raw sewage. Only the perimeter of the West Lagoon was scanned and results consistently showed elevated activity averaging approximately 17,000 ccpm. Dose rates were measured with an extendable instrument and results were not detectable, with the exception of an area in the northwest corner which had a contact reading of 2.0 mR/hr. The highest contamination found in this unit was 68,772 ccpm and the highest dose rate was 35 μR/hr at an area in the northeast corner of the West Lagoon.

Ten samples were taken from five biased sample locations (0 to 0.5 feet and 0.5 to 2.0 feet in depth at each location) and analyzed for radionuclides. Significant results above SSLs were reported for tritium, lead-210, and radium-226 in all samples, neptunium-237 at two sample locations, and uranium-238 in one shallow surface soil sample. Contamination was distributed from surface to a depth of 2 feet; however, due to the inaccessibility of the West Lagoon from the sewage waste, samples below 2 feet were not obtained.

During the MERL sampling analysis event, an additional forty-one samples were taken from twenty-two boring locations distributed throughout the West Lagoon. MERL soil results indicated that elevated levels of radionuclides were detected at depths up to 12 feet bgs. The radionuclides detected at concentrations above SSLs were radium-226 (up to 181 pCi/g at thirteen boring locations), lead-210 (up to 193.6 pCi/g at fourteen boring locations), cesium-137 (up to 1.037 pCi/g at three boring locations), Americium-241 (up to 16.93 pCi/g at two boring locations), and neptunium-237 (up to 0.7401 pCi/g at one boring location).

The OU-3 RI and MERL soil sampling results from the West Lagoon are presented in Table D-4 and Table D-7, respectively. Figure 5 shows the OU-3 RI and MERL sampling locations for the West Lagoon.

Inorganic contaminants detected in West Lagoon surface soils at elevated concentrations included arsenic (up to 27.7 mg/kg); antimony (up to 68.5 mg/kg); cadmium (up to 198 mg/kg); chromium (up to 8,350 mg/kg); iron (up to 58,300 mg/kg); lead (up to 2,690 mg/kg); mercury (up to 74.7 mg/kg); and silver (up to 224 mg/kg). The West Lagoon is believed to have received wastewater from the Etching Building, which could account for the elevated concentrations of metals detected in this area.

Organic contaminants detected in West Lagoon surface soils at elevated concentrations include polynuclear aromatic hydrocarbons (PAHs) such as benzo(a)pyrene (up to 1,200 μg/kg); benzo(a)anthracene (up to 1,600 μg/kg); benzo(b)fluoranthene (up to 2,200 μg/kg); dibenzo(a,h)anthracene (up to 330 μg/kg); and indeno(1,2,3-cd)pyrene (up to 1,400 μg/kg). In addition, the PCBs aroclor-1254 (up to 23,000 μg/kg) and aroclor-1260 (up to 13,000 μg/kg) were detected in this area. The pesticides alpha-BHC (up to 190 μg/kg) and heptachlor epoxide (up to 81 μg/kg) also were present in several surface soils.

East Dump – Survey Unit 14

Survey Unit 14 includes the East Dump. This area is believed to be an older dump that was completely built up with soil and covered with grass to make a walkway between the West and East Lagoons. The East Dump is located south of the former Pipe Shop and north of Survey Unit 16 and the floodplain. EPA has documented that numerous radioactive dials found in the West Lagoon also extend into the subsurface soils of the East Dump (see section on *Radioactive Discrete Objects/Items*).

Scan results showed uniformly high activity across the East Dump averaging approximately 19,000 ccpm. All 15 gridded static counts were above background and averaged approximately 16,000 ccpm. The evidence of highest contamination in the East Dump was 30,214 ccpm and the highest dose rate was 16 µR/hr.

Fifteen samples were taken from five biased sample locations distributed throughout the East Dump and analyzed for radionuclides. Samples at each location were collected from depths of 0 to 0.5 feet bgs, 0.5 to 2.0 feet bgs, and at depths from 10 to 12 feet bgs (or 8 to 12 feet bgs in one sample). All samples exceeded the SSLs established by the PRG calculator for radium-226 and all but one sample exceeded the screening level for lead-210. Elevated levels of tritium and uranium-238 were also frequently detected while one subsurface sample had a level of neptunium-237 above the SSLs. Contamination was distributed from the surface to a depth of 12 feet with the highest levels observed at depth, particularly for lead-210 and radium-226.

Boring logs indicate that a clay layer was observed at depths ranging from approximately 2 to 3 feet bgs and, in some areas of the East Dump, at depths of approximately 11 to 12 feet bgs. This is consistent with other areas of the Site, as observed in test pits excavated during EPA Removal Actions and in other borings installed during the OU-3 RI. A layer of ash was also encountered at approximately 4 feet bgs in a boring (SU14-10) in the southwest end of the East Dump. Test pits in other areas of the Site (e.g. East Lagoon) excavated during EPA Removal Actions also showed ash material. The source and nature of this ash remains unknown. However, data suggest that the ash may have been used as a cover. Fill material was also noted at depths of 10 to 11 feet bgs on the eastern side of the East Dump area. The fill material showed the highest activity in the boring when surveyed. The highest radiological activity in the borings were typically recorded in the deepest intervals. Ground water was encountered at depths of approximately 14 feet bgs in the East Dump.

In 2015, utilizing the MERL, EPA collected an additional fifteen samples from seven boring locations distributed throughout the East Dump. MERL soil results indicated that elevated levels of radionuclides were detected at depths down to 16 feet bgs, confirming that contamination is concentrated in the subsurface soils. The radionuclides detected at concentrations above SSLs were radium-226 (up to 889.2 pCi/g at six boring locations), lead-210 (up to 844.5 pCi/g at all boring locations), americium-241 (up to 7.36 pCi/g at three boring locations), and neptunium-237 (up to 544 pCi/g at two boring locations).

The OU-3 RI and MERL soil sampling results from the East Dump are presented in Table D-5 and Table D-8, respectively. Figure 6 shows the OU-3 RI and MERL sampling locations for the East Dump.

Arsenic (up to 19 mg/kg) was detected in East Dump surface soils. PAHs were the only other contaminants detected at elevated concentrations in this area and include benzo(a)pyrene (up to 5,600 µg/kg); benzo(a)anthracene (up to 5,600 µg/kg); benzo(b)fluoranthene (up to 7,900 µg/kg); benzo(k)fluoranthene (up to 2,100 µg/kg); dibenzo(a,h)anthracene (up to 850 µg/kg); and indeno(1,2,3-cd)pyrene (up to 3,700 µg/kg). Subsurface soils did not show elevated concentrations of contaminants.

East Lagoon – Survey Unit 15

Survey Unit 15 is approximately 4,295 square feet and includes the East Lagoon; it is located east of the East Dump, south of the former Multi-Metals Waste Treatment Plant and Carpenters Shop, north of the floodplain, and west of Survey Units 5 and 16. The southern section of the East Lagoon appears to be a portion of the abandoned canal, which may have been filled in with plant production debris.

Most surfaces in the East Lagoon had elevated scan activity averaging approximately 144,000 ccpm. A tree root at the end of a discharge pipe read 1,856,627 ccpm and had the highest contact dose rate recorded in the East Lagoon (2.2 mR/hr). All 23 gridded static counts collected in the East Lagoon averaged approximately 75,000 ccpm and were all well above background (see Table 1 and Table D-2). Near the outfall pipe, a reading of 1,173,294 ccpm and the highest dose rate (591µR/hr) from the East Lagoon soils was recorded.

Eleven samples were taken from five biased sample locations during the OU-3 RI and analyzed for radionuclides. Samples were collected at depths of 0 to 0.5 feet bgs and 0.5 to 2.0 feet bgs at each location and a sample at location SU-15-4 (near the outfall pipe) was also collected at a depth of 9 to 11 feet bgs. The boring log from location SU-15-4 shows a thin clay layer at 4 feet bgs with ground water encountered at 11 feet bgs. While the soil in this location is contaminated, the survey readings are likely due to activity associated with the outfall pipe and not the surrounding soil. Significant results for cesium-137, lead-210, radium-226, and strontium-90 were detected in one or more samples with the highest levels detected in the central-western side of the East Lagoon (SU-15-11).

An additional thirty-seven MERL samples were collected from nineteen sample locations distributed throughout the East Lagoon ranging in depth from 0-4 feet to 12-18 feet bgs. MERL soil results indicated that elevated levels of radionuclides were detected at depths up to 16 feet bgs; however, an overall analysis of these results indicates that much of the contamination in the East Lagoon is concentrated in the 0-4 foot soils, which are those directly exposed to the elements.

The radionuclides that were detected at concentrations above SSLs were radium-226 (up to 3,366 pCi/g at fifteen boring locations), lead-210 (up to 3,016 pCi/g at sixteen boring locations), cesium-137 (up to 113.3 pCi/g at sixteen boring locations), americium-241 (up to 32.73 pCi/g at

ten boring locations), and neptunium-237 (up to 8.853 pCi/g at three boring locations). In comparison, these results are significantly higher than the results obtained during the OU-3 RI sampling. The highest radium-226 measurement in the East Lagoon detected during the OU-3 RI was 30.6 pCi/g.

The OU-3 RI and MERL soil sampling results from the East Lagoon are presented in Table D-6 and Table D-9, respectively. Figure 7 shows the OU-3 RI and MERL sampling locations for the East Lagoon.

Inorganics detected in the East Lagoon at significant levels include arsenic (up to 13.8 mg/kg); cadmium (up to 155 mg/kg); chromium (up to 942 mg/kg); iron (up to 27,800 mg/kg); lead (up to 1,010 mg/kg); and silver (up to 127 mg/kg). The highest concentrations of inorganic compounds were detected in surface soils with the exception of iron, where the highest concentration was detected at a depth of 9 to 11 feet bgs. Organic contaminants detected at elevated concentrations include the PAHs benzo(a)pyrene (up to 5,000 µg/kg); benzo(a)anthracene (up to 4,200 µg/kg); benzo(b)fluoranthene (up to 6,800 µg/kg); benzo(k)fluoranthene (up to 1,800 µg/kg); dibenzo(a,h)anthracene (up to 890 µg/kg); and indeno(1,2,3-cd)pyrene (up to 3,600 µg/kg). In addition, the PCB Aroclor-1254 (up to 840 µg/kg) was detected in this area. Organic contamination was limited to surface and shallow subsurface soil samples.

Radioactive Discrete Objects/Items

Based on findings in the West Lagoon and West Dump (from previous and current EPA Removal Actions), additional radioactive discrete objects similar in nature to those found in the West Lagoon and West Dump are also contained in the East Dump subsurface soils. Under the current Removal Action, EPA has documented that numerous radioactive dials found in the West Lagoon also extend into the subsurface soils of the East Dump (see Appendix G, Photos 1 and 2). Approximately 110 cubic yards of dials and other radioactive discrete objects have been removed from the West Lagoon/East Dump area to date under the current EPA Removal Action.

Other radioactive discrete objects and items as minute as a glass bead were found to emit elevated levels of radiation in the West Dump. One item, in particular, had transferable contamination of 27,000 disintegrations per minute (dpm) alpha contamination (see Appendix G, Photo 3). Removing and disposing of additional radioactive discrete objects, if any, from the West Dump, West Lagoon, East Dump, and East Lagoon will minimize the threat of exposure to human health.

2.5.1 Conceptual Site Model

During the OU-3 RI, a conceptual site model (CSM) was established to evaluate potential routes of exposure between Site-related contaminants and human receptors. The CSM, which depicts anticipated exposure pathways between Site hazardous substances in soils within the West Dump, West Lagoon, East Dump, and East Lagoon and future potential receptors, is included in Figure 8.

2.6 CURRENT & POTENTIAL FUTURE LAND & RESOURCE USES

The Site is in a residential community with some industrial land use. The current land use patterns near the Site are well established. Land use at the Site is currently limited, due to Site conditions, and is expected to be limited in the future. Although disparate potential receptors may potentially occupy the Site in the future, quantitative risks were estimated only for the lifetime adult/child scenario, as that represented the most conservative exposure scenario.

Residential areas are located adjacent to the north of the Safety Light Property, across Old Berwick Road, and adjacent to the east and west of the Safety Light Property. The Susquehanna River is located to the south of the Site.

2.7 SUMMARY OF SITE RISK

Based on the results of the OU-3 RI, data from ongoing removal assessments, and a review of Site conditions, two primary risks are currently associated with the West Dump, West Lagoon, East Dump, and East Lagoon areas of the Site: 1) threat of release of hazardous substances (radionuclides) from these areas to the environment; and 2) threat to human health in the event that a future adult/child or industrial/construction worker may come into contact with non-radionuclide and radionuclide-contaminated soils and/or radioactive discrete objects or items.

Threat of Release of Hazardous Substances to the Environment

Radiation surveys performed with on-site instrumentation and off-site laboratory analysis of samples indicate that the Site is contaminated with numerous hazardous substances listed at 40 C.F.R. §302.4, primarily radionuclides such as cesium-137, strontium-90, radium-226, lead-210, tritium, and non-radionuclides such as PAHs, PCBs, arsenic, cadmium, and chromium, among others. The ongoing Removal Action was initiated to address the radiologically-contaminated items and associated radionuclide-contaminated soils within and near the West Lagoon, East Dump, and East Lagoon, to secure this portion of the Site and significantly reduce the threat to public health and the environment posed by the Site (this Removal Action did not include the West Dump). Continuation of activities under the ongoing Removal Action by implementation of the Selected Remedy in this Early-Interim ROD would ensure that these threats are addressed until a final remedy is selected for OU-3.

In addition to non-radionuclide and radionuclide-contaminated soils, items buried on-site include radioactively-contaminated duct work and other contaminated items that had either been returned to the Site by their customers or were manufactured at the Site. During implementation of the ongoing Removal Action, extremely high-activity radiologically-contaminated items have been discovered buried within several inches of the ground surface of the flood prone lagoons. High-activity radiologically-contaminated sources found on or near the ground surface at the Site pose a long-term threat of release of hazardous substances if these items are uncovered by environmental conditions, including but not limited to flooding.

The Site is located on a terrace and floodplain on the north bank of the Susquehanna River. The Site has experienced flooding above the 100-year floodplain, during which several radioactively-contaminated buildings, prior to demolition under OU-1, were flooded. Following Tropical

Storm Lee in 2011, EPA determined that contamination had migrated from the West Dump to an adjoining residential property (prompting a Removal Action in the West Dump) and that further flooding could release additional hazardous substances, primarily the above-described radionuclides, into the environment. The assessment of the Site, including the Lagoons and dumps, identified items, such as gamma and beta sources, radium painted dials and other miscellaneous manufacturing waste materials, within a few inches of the current surface. The West Dump, West Lagoon, East Dump, and East Lagoon contain high levels of soil contamination. Soils and radioactive discrete objects may become mobile in flood conditions and may cause unacceptable exposures to the public. Flooding may also cause the migration of non-radionuclide and radionuclide-contaminated soil from the lagoons and dumps to other areas of the Site and cause further impacts to Site soils.

Threat to Human Health

The hazardous substances present at the Site include various radionuclides and non-radionuclide contaminants. The radionuclide-contaminated soils/debris and radioactive discrete objects/items are of primary concern. Residential areas are located directly to the north of the Site, across Old Berwick Road and directly to the east and west of the Site. The Susquehanna River is the southern border of the Site. Trespassing has been documented several times at the Site, and both residents and trespassers may become exposed to hazardous substances located at the Site if further action is not taken. Some of the highest levels of radionuclide soil contamination and concentration of radiological discrete objects/items are in the West Dump, West Lagoon, East Dump, and East Lagoon areas of the Site.

Human Health Risk Assessment

A Site-wide human health risk assessment (HHRA) was conducted as part of the OU-3 RI/FS for the Site, but EPA has not finalized the HHRA. The OU-3 RI/FS is currently ongoing, and the HHRA will be finalized when the OU-3 RI/FS is complete. However, a focused risk assessment methodology was conducted during the development of the "*Remedial Alternatives Evaluation Technical Memorandum for the West Dump, West Lagoon, East Dump, East Lagoon Areas*", dated May 2016, (Alternatives Memorandum) located in the Administrative Record. The focused human health risk evaluation (HHRE) was conducted to characterize the current and potential future human health risks that would occur if no remedial action was conducted to address contaminated media in the West Dump, West Lagoon, East Dump, and East Lagoon. The focused HHRE evaluates the potential for carcinogenic and non-carcinogenic effects to occur from exposure to Site contaminants. EPA has set a target risk range of 1E-04 (1 in 10,000) to 1E-06 (1 in 1,000,000) for a lifetime excess carcinogenic risk. For non-carcinogenic risk, EPA has set a target Hazard Index (HI) of no greater than 0.5.

The focused HHRE conducted during the development of the Alternatives Memorandum evaluated the current and future risks posed to humans by the contamination in the West Dump, West Lagoon, East Dump, and East Lagoon areas of the Site. All radionuclides are considered known human carcinogens, based on their property of emitting ionizing radiation and on the extensive weight of evidence provided by epidemiological studies of radiogenic cancers in humans.

The CSM, which depicts anticipated exposure pathways between Site hazardous substances in soils within the West Dump, West Lagoon, East Dump, and East Lagoon and future potential receptors is included in Figure 8.

Contaminants of Concern – West Dump, West Lagoon, East Dump, and East Lagoon

For non-radionuclides, contaminants of potential concern (COPCs) were selected using the June 2015 USEPA Regional Screening Levels (RSLs) for residential exposures to soil and migration from soil to ground water. For radionuclides, COPCs were selected using the SSLs (Table D-2) for residential exposures to soil and migration from soil to ground water. The SSLs for residential exposures to soil include exposures by incidental ingestion of soil, external radiation from contaminants in soil, inhalation of fugitive dust, and consumption of home grown produce. The SSLs for radionuclides correspond to an excess carcinogenic risk of 1E-06. Contaminants were considered as significant contributors to risk, and therefore are included as COPCs, if their individual carcinogenic risk contribution was greater than 1E-06 and their non-carcinogenic target organ HQ was greater than 0.1 contributing to a target organ HI greater than 0.5. COPCs were considered COCs if they exceeded their respective background concentrations, if available. Table D-10 presents the Site-related COPCs above background concentrations identified in the West Dump, West Lagoon, East Dump, and East Lagoon.

The radionuclides and non-radionuclides identified in Table D-10 are the contaminants of concern (COCs) for the Site. These contaminants (with the exception of aluminum, iron, and vanadium) are hazardous substances designated at 40 C.F.R. §302.4.

Summary of Human Health Risks – West Dump, West Lagoon, East Dump, and East Lagoon

Based on the focused HHRE, unacceptable risks to human health were identified in the West Dump, West Lagoon, East Dump, and East Lagoon areas of the Site. This focused risk evaluation calculated risks for the following scenarios:

- Lifetime Resident (Adult/Child)
- Lead exposure modeling for the child resident and for Industrial/Construction Worker (West Lagoon only)

Table D-11 summarizes the results of the focused risk evaluation. Risk ratio calculation tables for the non-radionuclide and radionuclide contaminants of concern are presented in Appendix E of this Early-Interim ROD. Further information concerning the HHRE is provided in the Administrative Record.

Cancer risks exceed the EPA target risk range of 1E-04 to 1E-06 at the West Dump, West Lagoon, East Dump, and East Lagoon. Hazard indices exceed acceptable levels at the West Dump, West Lagoon, and East Lagoon, but hazard indices on a target organ basis are within acceptable levels at the East Dump.

Ecological Risks

An Ecological Risk Assessment (ERA) and quantitative ecological risks have not been finalized at this time. The purpose of this Early-Interim ROD is to address risks to human health and the potential release of contaminants to the environment associated with the West Dump, West Lagoon, East Dump, and East Lagoon areas of OU-3. EPA will complete an ERA for the Site as part of the OU-3 RI/FS. Quantitative ecological risk, if any, will be addressed by subsequent response actions for OU-3.

2.7.1 Basis for Taking Action

Based on the non-radionuclide and radionuclide-contaminated surface and subsurface soils/debris and radioactive discrete objects at the West Dump, West Lagoon, East Dump, and East Lagoon, current Site conditions, and the results of the HHRE, the early-interim response action selected in this Early-Interim ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

2.8 REMEDIAL ACTION OBJECTIVES

To protect human health and the environment from potential current and future risks, the following remedial action objectives (RAOs) have been developed to address the West Dump, West Lagoon, East Dump, and East Lagoon:

Protection of Human Health RAO

- Prevent future potential human exposure to radionuclide and non-radionuclide contaminants in the West Dump, West Lagoon, East Dump, and East Lagoon areas.

Protection of the Environment RAO

- Prevent future potential release of radionuclide and non-radionuclide contaminants from the West Dump, West Lagoon, East Dump, and East Lagoon to adjacent land areas and the Susquehanna River.

At this time, these RAOs apply only to the West Dump, West Lagoon, East Dump, and East Lagoon. Additional RAOs may be developed for the remainder of OU-3 in future response actions. Any additional RAOs for the final remedy will be documented in a Final ROD for OU-3.

Soil Screening Levels

Human health risk-based soil SSLs were developed for soil COCs in the West Dump, West Lagoon, East Dump, and East Lagoon. These SSLs were used to determine the area of concern at the West Dump, West Lagoon, East Dump, and East Lagoon. SSLs with a target cancer risk threshold of 1E-06 from exposure to all carcinogens were used in the determination. The human health risk-based SSLs for non-radionuclides were calculated using EPA's Regional Screening Level calculator and direct contact with soil exposure assumptions. The human health risk-based

SSLs for radionuclides were calculated using EPA's PRGs for Radionuclides calculator and default exposure assumptions.

In developing SSLs, non-carcinogenic target risk goals for each COC were assumed to be an HQ of 0.1. SSLs for cumulative cancer risks were calculated to reflect cancer risks within EPA's target risk range of 1E-04 to 1E-06. The SSLs developed for the West Dump, West Lagoon, East Dump, and East Lagoon are shown in Table D-2.

The SSLs are not final soil cleanup numbers for the OU-3 soils. EPA will develop soil PRGs during the OU-3 RI/FS, which is currently being performed. The PRGs will be presented in a PRAP and become final cleanup levels in a Final ROD for OU-3 when completed.

2.9 DESCRIPTION OF ALTERNATIVES

Because this is an early-interim remedial response action, a feasibility study (FS) was not performed for the West Dump, West Lagoon, East Dump, and East Lagoon areas. Instead, EPA developed the "*Remedial Alternatives Evaluation Technical Memorandum for the West Dump, West Lagoon, East Dump, East Lagoon Areas*" based on the results of the OU-3 RI sampling data, focused HHRE, and other data obtained during past and ongoing Removal Actions and assessments. A final FS will be developed during the OU-3 RI/FS which will address all OU-3 Site soils.

The Alternatives Memorandum developed a limited number of Early-Interim Remedial Alternatives capable of achieving the RAOs identified above (see Section 2.8, above). A complete description of the evaluated Early-Interim Remedial Alternatives is included in the Alternatives Memorandum in the Administrative Record for the Site. A summary of each of these Early-Interim Remedial Alternatives is presented below and numbered to correspond with the numbering used in the Alternatives Memorandum.

Volume of Contaminated Soils

For the development of remedial alternatives, areas or volumes of media (i.e., soils and waste materials) to which general response actions might be applied were determined, taking into account not only SSLs, but also Site conditions and the nature and extent of contamination.

Volumes of non-radionuclide and radionuclide-contaminated soils were estimated based on OU-3 RI and MERL soil sampling results and comparison to appropriate SSLs. Based on the results of OU-3 RI and MERL soil results, it is estimated that a total volume of 7,268 cubic yards of in-place contaminated soils, including contaminated soils that may be below the ground water table, are present in the West Dump, West Lagoon, East Dump, and East Lagoon.

Component Common to All Alternatives

The following is a common component of all the Early-Interim Remedial Alternatives evaluated for the West Dump, West Lagoon, East Dump, and East Lagoon.

Security Fencing

Security fencing is installed and posted in accordance with NRC requirements to deter human and animal entry onto the Site. The fence is approximately 6 feet high and is topped with several strands of barbed wire. There are three locked gates which allow access to the Site. The current fence provides some protection of human health and the environment, provided no entry is made. Although the perimeter fence does not contain the entire Site, the West Dump, West Lagoon, East Dump, and East Lagoon areas are located within the fenced areas. The security fence limits access to the Site by the public/trespassers and thereby reduces the potential for exposure to radioactive constituents.

Early-Interim Preferred Remedial Alternative

EPA's Preferred Alternative is Alternative 2, Soil Excavation with Off-Site Disposal. The following section is a summary of the Early-Interim Remedial Alternatives that were considered in the Alternatives Memorandum and their associated costs.

Alternative 1 - No Action

Capital Cost:	$0
Annual Operation and Maintenance (O&M) Costs:	$0
Five-Year Review Costs	$30,000
Total Present Worth Cost:	$64,735

The No Action alternative was developed as a baseline case as required by the NCP. Under the No Action Alternative, no additional remedial measures would be implemented to address the West Dump, West Lagoon, East Dump, and East Lagoon.

Under this alternative, the existing security fence would remain in place at the Site. Although the security fence restricts access to the Site, trespassing has been observed and documented at the Site. Trespassers could come into contact with non-radionuclide and radionuclide-contaminated soils and other debris or radioactive discrete objects in the fenced-in West Dump, West Lagoon, East Dump, and East Lagoon areas on the Site. These radioactive discrete objects could easily be retrieved by unsuspecting trespassers and cause considerable harm. In addition, these non-radionuclide and radionuclide-contaminated soils and radioactive discrete objects lie within the 100-year floodplain of the Susquehanna River and are prone to flooding. Flood waters may transport radionuclide-contaminated soils and other radionuclide-contaminated debris/objects to adjacent downstream residential properties and other properties further downstream depending upon the severity of the flooding event.

This alternative would not reduce human health risk to acceptable levels, and would not achieve the RAOs.

Five-Year Reviews

Five-year reviews will be conducted in accordance with statutory requirements pursuant to Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), the NCP, 40 C.F.R. §300.430(f)(4)(ii), and EPA guidance, as appropriate.

Alternative 2 - Soil Excavation with Off-Site Disposal

Capital Cost:	$9,068,000
Annual O&M Costs:	$0
Five-Year Review Costs	$30,000
Total Present Worth Cost:	$9,133,000

Under Alternative 2, all materials including surface and subsurface soils and other debris or radioactive discrete objects in the approximate area of concern depicted in Appendix C (Figures 4 to 7) at the West Dump, West Lagoon, East Dump, and East Lagoon would be excavated and transported off-site as radioactive waste to a NRC licensed facility for appropriate disposal. The vertical extent of excavation would continue until ground water or the native soil interface (the point at which fill material meets the native soil surface) is encountered, whichever occurs first, and would be performed to the maximum extent practicable based on Site or excavation conditions. The West Dump, West Lagoon, East Dump, and East Lagoon areas would be backfilled and graded with clean soil from an off-site source and a gravel protective cover would be installed to minimize erosion. Key components of Alternative 2 are described below.

Institutional Controls (ICs) (i.e., land use restrictions) would be needed when contamination remains at a Site above levels that allow for unrestricted use and unlimited exposure. However, because this is an early-interim action for the West Dump, West Lagoon, East Dump, and East Lagoon areas of the Site and might not be the final response action for these areas, ICs would not be required at this time. Implementation of ICs will be further evaluated during the OU-3 RI/FS for the Site, as a whole, and be documented in a Final ROD for OU-3.

Site Preparation

Site preparation would include mobilization and setup of support facilities, vegetation removal, and establishment of soil erosion and sediment controls. During vegetation clearance, soil excavation and stockpiling, waste loading, backfilling, and re-grading operations, erosion and sediment controls would be regularly inspected and maintained until excavation and backfilling is complete and the gravel protective cover to minimize erosion is established at the West Dump, West Lagoon, East Dump, and East Lagoon.

Soil Excavation

All materials, including soils/debris and radioactive discrete objects, in the approximate area of concern depicted in Appendix C (Figures 4 to 7), would be excavated from the West Dump, West Lagoon, East Dump, and East Lagoon areas. The vertical extent of excavation would continue until ground water or the native soil interface (the point at which fill material meets the

native soil surface) is encountered, whichever occurs first, and would be performed to the maximum extent practicable based on Site or excavation conditions. Based on the results of OU-3 RI, boring logs, and MERL soil results, the excavation depths would range from 4 to 16 feet bgs. The total in-situ volume of non-radionuclide and radionuclide contaminated soils designated for removal would be approximately 5,978 cubic yards.

For excavation depths exceeding 4 feet bgs, measures would be taken to comply with relevant Occupational Health and Safety Administration (OSHA) standards for excavations (i.e., step excavation, side-wall shoring, or sloping).

Excavation operations would be performed by qualified excavation personnel with current Hazardous Waste Operations and Emergency Response (HAZWOPER) training, as required by OSHA. Operators would also be subject to site-specific radiological safety training. Standard dust control techniques would be used during removal activities to mitigate fugitive dust emissions. Because of risk associated with worker exposure to radioactive contamination, respirators or air monitoring would be required during excavation activities. As excavation occurs, health physics personnel would perform surveys and air sampling to ensure the health and safety of workers, the surrounding community, and the environment. Shipping containers would also be surveyed prior to off-site disposal to ensure radiation levels are within acceptable limits prior to transport.

Post-Excavation Sampling

Post-excavation samples would be collected from the floor and side walls of each excavation area prior to backfilling and regrading. This sampling would be conducted to determine and document the concentration of radionuclide and non-radionuclide soil contamination that may remain in-place. Gamma walkovers of the excavated areas would also be conducted prior to backfilling to assess any remaining radiological activity.

Waste Disposal

Based on the results of OU-3 RI and MERL soil sampling results, and because non-radionuclide and radionuclide-contaminated soils are comingled, it is anticipated that all excavated materials would be classified as radioactive waste. All excavated materials would be packaged as radioactive waste and loaded into IMCs for off-site disposal. There is no feasible technology to practicably treat radionuclides without creating larger volumes of waste and increased disposal difficulties. However, certain waste materials (including, but not limited to, dials and some discrete objects) may also exhibit chemical hazardous waste characteristics requiring treatment (e.g. stabilization) prior to permanent disposal. Such waste materials shall be sampled and analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) pursuant to the Resource Conservation and Recovery Act (RCRA) to determine if they exhibit hazardous waste characteristics. For those waste materials that fail TCLP, such treatment shall be performed at the off-site licensed radioactive waste facility to render such materials non-hazardous prior to disposal at that licensed facility.

No rail spur is located at the Site, but rail yards are nearby and would be used to facilitate transport by rail. Excavated materials would be transferred by licensed vendors in accordance with transportation regulations to a NRC licensed radioactive waste disposal facility. Off-site disposal would be conducted in accordance with Section 121(d)(3) of CERCLA, 42 U.S.C. § 121(d)(3), and Section 300.440 of the NCP, 40 C.F.R. §300.440.

Site Restoration

Backfill excavated areas with clean material derived from an off-site borrow source. Backfill material shall meet Pennsylvania Criteria for Management of Fill specifications for chemical constituents, as certified through laboratory analysis. Regrade excavated areas to approximate original contours, ensuring appropriate site drainage. Install and place geotextile and a layer of gravel, with a minimum thickness of 12 inches, on disturbed surfaces of the West Dump, West Lagoon, East Dump, and East Lagoon as a protective cover to minimize erosion.

Five-Year Reviews

Alternative 2 may result in hazardous substances remaining in the lagoon/dump areas (e.g., below the water table) of the Site above health-based levels. Five-year reviews will be conducted in accordance with statutory requirements pursuant to Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), the NCP, 40 C.F.R. §300.430(f)(4)(ii), and EPA guidance, as appropriate.

Alternative 3 – Complete Contaminated Soil Removal and Off-Site Disposal

Capital Cost:	$13,536,000
Annual O&M Costs:	$0
Five-Year Review Costs	$0
Total Present Worth Cost:	$13,536,000

Alternative 3 is similar to Alternative 2 except that Alternative 3 would involve the excavation of all materials (including soils/debris and radioactive discrete objects below the ground water table or native soil interface) in the approximate area of concern depicted in Appendix C (Figures 4 to 7) in the West Dump, West Lagoon, East Dump, and East Lagoon. Ground water control techniques including cut-off walls and pumping would be used to control ground water to allow excavation below the water table. During excavation, ground water would be excluded from the excavation area by steel sheet-piling installed around the perimeter of the excavation. Dewatering also would be conducted to lower ground water levels in the vicinity of the excavation using sump pumping, where ground water enters the excavation and is then collected in a sump and pumped away by robust solids handling pumps for on-site temporary storage and treatment. In addition, excavated saturated soils would either be mechanically dewatered by physical processes or otherwise conditioned using drying agents until it could pass the "paint filter test" and remain stable in a transport truck. A paint filter test is used to determine the presence of free liquids in a representative sample which could affect transportation/disposal of hazardous waste. All waste materials would be transported as radioactive waste to a NRC licensed facility for appropriate off-site disposal. The excavated area would be backfilled with clean off-site soil, regraded with

clean soil, and a gravel protective cover would be established to minimize erosion. Key components of Alternative 3 are described below.

Site Preparation

Site preparation would be performed as described in Alternative 2.

Soil Excavation

All materials (including soils/debris and radioactive discrete objects below the water table or native soil interface) in the approximate area of concern depicted in Appendix C (Figures 4 to 7) would be excavated in the West Dump, West Lagoon, East Dump, and East Lagoon. The non-radionuclide and radionuclide-contaminated soils below ground water level would be excavated and conditioned ex-situ using drying agents mixed at the Site. Ground water control techniques, including cut-off walls and pumping, would be used to control ground water to allow excavation below the water table. During excavation, ground water would be excluded from the excavation area by steel sheet-piling installed around the perimeter of the excavation. Dewatering also would be conducted to lower ground water levels in the vicinity of the excavation using sump pumping, where ground water enters the excavation and is then collected in a sump and pumped away by robust solids handling pumps for on-site temporary storage and treatment. Based on results of the OU-3 RI, EPA removal sampling boring logs and MERL soil results, the removal depths would range from 4 to 18 feet bgs. The total in-situ volume of materials designated for removal is approximately 7,268 cubic yards.

For excavation depths exceeding 4 feet bgs, measures must be taken to comply with relevant OSHA standards for excavations (i.e., step excavation, side-wall shoring, or sloping).

Excavation operations would be performed by qualified excavation personnel with current HAZWOPER training, as required by OSHA. Operators would also be subject to site-specific radiological safety training. Standard dust control techniques would be used during removal activities to mitigate fugitive dust emissions. Because of risk associated with worker exposure to radioactive contamination, respirators or air monitoring would be required during excavation activities. As excavation occurs, health physics personnel would perform surveys and air sampling to ensure the health and safety of workers, the surrounding community, and the environment. Shipping containers would also be surveyed prior to departure to ensure radiation levels are within acceptable limits prior to transport.

Confirmation Sampling

During excavation activities, confirmation samples would be collected from the floor and sidewalls of each excavation area prior to backfilling and regrading. Confirmation sampling and analysis would be conducted to ensure that the remaining soils do not exceed appropriate soil SSLs. If the confirmation sampling results show exceedances of the related SSLs, additional excavation would be conducted and new confirmatory samples would be collected.

Saturated Soil Conditioning

The saturated soil would be either mechanically dewatered by physical processes such as a belt filter press or otherwise conditioned on-site using drying agents until it could pass the paint filter test and remain stable in the transport truck. Saturated soils would be conditioned ex-situ using 12% drying agents by volume mixed at the Site or an equivalent process. Conditioning materials would consist of quick lime, lime kiln dust, cement kiln dust or other similar drying agents. An estimated 1,548 cubic yards of excavated soils would be conditioned prior to transport and off-site disposal.

Dewatering Waste Water

Due to the variety of radionuclides, organic compounds, and metals in the ground water, the dewatering waste water would be treated with cement solidification processes at the Site for off-site disposal as drummed waste. Cement solidification, or equivalent processes would be used to treat the dewatering waste water on-site prior to off-site disposal. Types of solidifying agents include Portland cement, gypsum and pozzolanic-based materials such as fly ash, blast furnace slag, kiln dust and pumice. After solidification processes, all waste water would be placed into 55-gallon drummed waste for off-site disposal.

Waste Disposal

Waste disposal, including dewatering waste water, would be performed as described in Alternative 2.

Site Restoration

Site Restoration would be performed as described in Alternative 2.

Five-Year Reviews

Five-year reviews will be conducted in accordance with statutory requirements pursuant to Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), the NCP, 40 C.F.R. §300.430(f)(4)(ii), and EPA guidance, as appropriate.

2.10 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

As part of the remedy selection process, EPA evaluates each proposed remedy against the nine criteria specified in the NCP (see 40 C.F.R. §300.430(e)(9)(iii)). The alternative selected must first satisfy the threshold criteria set out in the NCP. Next, the primary balancing criteria are used to weigh the tradeoffs, or advantages and disadvantages, of each of the alternatives. The modifying criteria, which are State and community acceptance, are evaluated at the end of the public comment period. This section of the Early-Interim ROD summarizes the relative performance of each alternative against the nine criteria, noting how it compares with the other options under consideration.

Below is a summary of the nine criteria used to evaluate the remedial alternatives.

THRESHOLD CRITERIA

1. Overall Protection of Human Health and the Environment

Evaluates whether an alternative provides adequate protection and how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Evaluates whether or not an alternative will meet all ARARs under Federal and State environmental statutes and regulations, and/or justifies a waiver.

PRIMARY BALANCING CRITERIA

3. Long-Term Effectiveness and Permanence

Addresses the ability of an alternative to afford long term, effective and permanent protection to human health and the environment over time.

4. Reduction of Toxicity, Mobility or Volume

Addresses the extent to which an alternative will reduce the toxicity, mobility, or volume of the contaminants causing the Site risks.

5. Short Term Effectiveness

Considers the length of time until protection is achieved and the short term risk or impact to the community, on-site workers and the environment that may be posed during the construction and implementation of the alternative.

6. Implementability

Considers the technical and administrative feasibility of an alternative, including the availability of materials and services needed to implement that remedy.

7. Cost

Includes estimated capital, O&M, and net present worth costs.

MODIFYING CRITERIA

8. State Acceptance

Addresses whether the State concurs with, opposes, or has no comment on the Preferred Alternative.

9. Community Acceptance

Considers whether the public agrees with EPA's analyses of the Preferred Alternative described in the PRAP.

The above criteria are used to evaluate the advantages and disadvantages of each alternative in order to select an appropriate remedy. The following is a summary evaluating and comparing each alternative against the nine criteria.

DETAILED ANALYSIS OF THE REMEDIAL ALTERNATIVES

Overall Protectiveness of Human Health and the Environment

Alternative 1 would not be protective of human health since no actions would be taken to prevent exposure to non-radionuclide and radionuclide-contaminated soils. Alternative 1 does not satisfy any RAOs and no risk reduction is anticipated under Alternative 1. Therefore, Alternative 1 will not be discussed further in the nine criteria analysis because it does not satisfy the threshold criterion of providing overall protection to human health and the environment.

Alternative 2 would provide for the overall protection of human health and the environment, because all materials including soils/debris and radioactive discrete objects from the West Dump, West Lagoon, East Dump, and East Lagoon in the approximate area of concern depicted in Appendix C (Figures 4 to 7) would be excavated and removed. The vertical excavation would continue until ground water or the native soil interface (the point at which fill material meets the native soil surface) is encountered, whichever occurs first, or to the maximum extent practicable based on Site or excavation conditions. The excavated material would be transported off-site to a NRC licensed disposal facility for disposal. Five-year reviews will be conducted in accordance with statutory requirements pursuant to Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), the NCP, 40 C.F.R. §300.430(f)(4)(ii), and EPA guidance, as appropriate.

Alternative 3 would provide for the overall protection of human health and the environment, because all the materials including soils/debris and radioactive discrete objects in the approximate area of concern (including those materials below the ground water table) depicted in Appendix C (Figures 4 to 7), would be excavated and transported off-site to a NRC licensed disposal facility for disposal. Unrestricted land use would be achieved at the West Dump, West Lagoon, East Dump, and East Lagoon following implementation of Alternative 3.

RAOs would be achieved for both Alternatives 2 and 3.

Compliance with Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA, 42 U.S.C. § 9621(d), and Section 300.430(f)(1)(ii)(B) of the NCP, 40 C.F.R. §300.430(f)(1)(ii)(B), require that remedial actions at CERCLA sites must at least attain legally applicable or relevant and appropriate federal and state environmental requirements, standards, criteria and limitations, which are collectively referred to as "ARARs," unless such ARARs are waived under Section 121(d)(4) of CERCLA, 42 U.S.C. § 9621(d)(4). *Applicable* requirements are those substantive environmental standards, requirements, criteria, or

limitations promulgated under federal or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at the Site. However, only those state standards that are more stringent than federal requirements may be applicable. *Relevant and appropriate* requirements, while not being directly applicable, address problems or situations sufficiently similar to those encountered at the site that their application is well-suited to the particular circumstance.

EPA will also consider to-be-considered material (TBCs) along with ARARs. TBCs are non-promulgated advisories or guidance issued by federal or state governments that are not legally binding and do not have the status of potential ARARs. However, EPA may use the TBCs in determining the necessary level of cleanup for protection of human health and the environment.

Alternatives 2 and 3 include soil removal and off-site disposal. Implementing these alternatives would trigger action-specific ARARs and TBCs pertaining to earth-moving, erosion and sediment control activities, surface run-off, and particulate emissions. Alternatives 2 and 3 would meet Federal and State ARARs and consider TBCs.

A complete listing of ARARs and TBCs for the Early-Interim Remedial Alternatives for the West Dump, West Lagoon, East Dump, and East Lagoon is presented in Appendix F to this Early-Interim ROD.

Long-Term Effectiveness and Permanence

This is an early-interim action remedy. Long-term effectiveness is not a criterion. EPA will evaluate long-term effectiveness and permanence in the evaluation for the final remedy for OU-3 in a subsequent PRAP and ROD.

Reduction of Toxicity, Mobility or Volume though Treatment

Alternatives 2 and 3 would reduce the toxicity, mobility, or volume of contamination by the excavation and off-site disposal of radionuclide-contaminated soils/debris and radioactive discrete objects and non-radionuclide-contaminated soil from the West Dump, West Lagoon, East Dump, and East Lagoon, but not through treatment of the contamination. There is no feasible technology to practicably treat radionuclides that would not result in larger volumes of waste, creating greater impracticability for disposal. However, certain waste materials (including, but not limited to, dials and some discrete objects) may also exhibit chemical hazardous waste characteristics requiring treatment (e.g. stabilization) prior to permanent disposal. Such waste materials shall be sampled and analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) pursuant to the Resource Conservation and Recovery Act (RCRA) to determine if they exhibit hazardous waste characteristics. For those waste materials that fail TCLP, such treatment shall be performed at the off-site licensed radioactive waste facility to render such materials non-hazardous prior to disposal.

Short Term Effectiveness

Alternatives 2 and 3 may pose minimum potential short-term threats to workers performing the work and to the nearby community. Because Alternative 2 and Alternative 3 each involve excavation and off-site disposal of non-radionuclide and radionuclide-contaminated soils/debris and radioactive discrete objects, neither of the alternatives offer comparative advantage with regard to short-term effectiveness for the nearby community. Exposure would be limited by the use of regulatory-driven radiological controls and on-site engineering control measures such as minimizing dust generation. Detailed work planning, air monitoring, dust suppression, and detailed transportation planning would be performed to minimize the potential for any adverse impacts to the community during the remedial action.

Alternative 3 would require more exposure of construction workers to non-radionuclide and radionuclide-contaminated soils/debris and ground water because Alternative 3 would take approximately 3 months longer to implement and requires the excavation and desaturation of an approximate additional 1,548 cubic yards of soil compared to Alternative 2, installation of sheet-piling, pumping and management of radionuclide-contaminated ground water from the excavation, and management and disposal of dewatering waste water. The process of keeping the excavation dewatered, while technically feasible, would be very challenging to implement effectively.

The estimated construction duration for each of the alternatives is as follows:

- Alternative 1: No implementation
- Alternative 2: Six (6) Months
- Alternative 3: Nine (9) Months

The RAOs for soil in the West Dump, West Lagoon, East Dump, and East Lagoon would be met at the completion of construction for Alternatives 2 and 3.

Implementability

Alternatives 2 and 3 are implementable with proper planning, and design and resources are available. However, only a limited number of companies exist with the trained personnel, equipment, and materials to perform site preparation, conduct soil removal, soil conditioning, and long-term periodic monitoring of radionuclide-contaminated sites.

Under Alternative 3, complete removal of all materials including soils/debris and radioactive discrete objects below the ground water table would be difficult. Sheet-piling and dewatering of the excavation would be necessary to effectively implement Alternative 3. In addition, management, storage, and disposal of radionuclide-contaminated ground water would be challenging. It is anticipated that Alternative 3 would generate approximately 18,000 gallons of radionuclide-contaminated ground water which would require cement-solidification resulting in approximately 600 drums of additional material for off-site disposal. Alternative 2 would be more implementable than Alternative 3.

No permits for on-site work would be necessary from other agencies because the Site would be addressed under the CERCLA program. However, the substantive requirements of such permits would be met for Alternative 2 and Alternative 3.

Cost

The capital cost for Alternative 2 is estimated to be $9,068,000. Five-year reviews would cost $30,000 per event. O&M requirements and estimated annual O&M costs for Alternative 2 are deferred until the selection of a final remedy for OU-3 of the Site, as a whole, and will be documented in a Final ROD for OU-3. The present value of the total cost for Alternative 2, based on a 30-year period and a seven percent (7%) discount rate, is estimated to be $9,133,000.

Alternative 3 is the most expensive alternative to implement. The estimated capital cost for Alternative 3 is $13,536,000. There are no recurring costs (i.e., O&M) associated with Alternative 3.

The cost estimates for the Alternatives are summarized in the table below:

Table 2
Summary of Early-Interim Remedial Alternative Costs

	Capital Costs	Annual O&M Costs	Five-Year Review Costs	Present Worth Costs*
Alternative 1	$0	$0	$30,000	$64,735
Alternative 2	$9,068,000	$0	$30,000	$9,133,000
Alternative 3	$13,536,000	$0	$0	$13,536,000

**Discount rate of 7% was used in calculation of Present Worth Costs*

The detailed cost estimates of the Early-Interim Remedial Alternatives are presented in the Alternatives Memorandum and Administrative Record.

State Acceptance

The Commonwealth of Pennsylvania concurs with the Selected Remedy identified for the West Dump, West Lagoon, East Dump, and East Lagoon areas of OU-3 in this Early-Interim ROD.

Community Acceptance

A thirty-day public comment period on EPA's PRAP for the Site began on May 27, 2016. An advertisement announcing the issuance of the PRAP and a public meeting to discuss the PRAP was placed in the *Press Enterprise*. The public meeting was held on June 15, 2016, at the Central Columbia Middle School located at 4777 Old Berwick Road, Bloomsburg, Pennsylvania. The meeting was attended by approximately five members of the community.

The community appeared to support EPA's findings and EPA's proposed early-interim remedy for OU-3. No one objected to EPA's preferred alternative, nor did anyone recommend an alternative approach. EPA did not receive any written comments during the public comment period.

A copy of the transcript of the public meeting is included in the Administrative Record. EPA's responses to questions/comments posed during the public meeting are provided in the Responsiveness Summary (Section 3.0) of this ROD.

2.11 PRINCIPAL THREAT WASTE

PTW is defined as source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. PTW includes soils containing significant concentrations of highly toxic materials and surface or subsurface soils containing high concentrations of contaminants that are, or potentially are mobile due to wind entrainment, surface runoff, or subsurface transport. The NCP states that "EPA expects to use treatment to address the principal threats posed by a site, wherever practicable" (40 C.F.R. § 300.430(a)(1)(iii)(A)).

The Site soils contaminated with significant concentrations of radionuclides are considered PTW. EPA has a preference to treat PTW, wherever practicable. However, there is no feasible technology to practicably treat the radionuclides at the Site that will not result in larger volumes of waste, creating greater impracticability for disposal. The excavated materials will be packaged appropriately for off-site disposal at an approved off-site NRC licensed radioactive waste disposal facility. Off-site disposal would be conducted in accordance with Section 121(d)(3) of CERCLA, 42 U.S.C. § 121(d)(3), and Section 300.440 of the NCP, 40 C.F.R. § 300.440.

2.12 SELECTED REMEDY

Summary of the Rationale for the Selected Remedy

The Selected Remedy for this early-interim action is Alternative 2, Soil Excavation with Off-Site Disposal. All materials including non-radionuclide and radionuclide-contaminated soils/debris and radioactive discrete objects will be excavated, removed, and disposed of in off-site waste disposal facilities. Based on the information available at this time, EPA believes that the Selected Remedy will be protective of human health and the environment, will comply with ARARs, and will be cost-effective.

Description of Selected Remedy and Performance Standards

The Selected Remedy for OU-3 consists of the following:

1. Site Preparation - Mobilize and setup support facilities, remove vegetation, and establish soil erosion and sediment controls. Regularly inspect and maintain erosion and sediment controls during vegetation clearance, soil excavation and stockpiling, waste loading, backfilling, and regrading operations, until excavation and backfilling is complete and a gravel protective cover is established at the West Dump, West Lagoon, East Dump, and East Lagoon to minimize erosion.

2. Soil Excavation – Excavate all materials including soils/debris and radioactive discrete objects from the West Dump, West Lagoon, East Dump, and East Lagoon in the approximate area of concern depicted in Appendix C (Figures 4 to 7). Continue vertical excavation until ground water or the native soil interface (the point at which fill material meets the native soil surface) is encountered, whichever occurs first, or to the maximum extent practicable based on Site or excavation conditions. Excavation depths are expected to range from approximately 4 to 16 feet below ground surface (bgs). The total in-situ volume of material designated for removal is approximately 5,978 cubic yards.

3. Post-Excavation Sampling – Collect post-excavation samples from the floor and side walls of each excavation area, prior to backfilling and regrading, to determine and document the concentration of radionuclide and non-radionuclide soil contamination that may remain in-place. Conduct gamma walkovers of the excavated areas prior to backfilling to assess any remaining radiological activity.

4. Package all excavated material as radioactive waste and load into intermodal containers (IMCs) for shipment to disposal sites. Transfer excavated material by licensed vendors in accordance with transportation regulations to an off-site facility as described in #5, below.

5. Waste Disposal - Dispose off-site, at a Nuclear Regulatory Commission (NRC) licensed radioactive waste facility, and in accordance with Section 121(d)(3) of CERCLA, 42 U.S.C. § 121(d)(3), and Section 300.440 of the NCP, 40 C.F.R. §300.440, all soils, materials, and items excavated pursuant to item #2 above. Certain waste materials (including, but not limited to, dials and some discrete objects) may also exhibit chemical hazardous waste characteristics requiring treatment (e.g. stabilization) prior to permanent disposal. Such waste materials shall be sampled and analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) pursuant to the Resource Conservation and Recovery Act (RCRA) to determine if they exhibit hazardous waste characteristics. For those waste materials that fail TCLP, such treatment shall be performed at the off-site licensed radioactive waste facility to render such materials non-hazardous prior to disposal at that licensed facility.

6. Site Restoration – Backfill excavated areas with clean material derived from an off-site borrow source. Backfill material shall meet Pennsylvania Criteria for Management of Fill specifications for chemical constituents, as certified through laboratory analysis. Regrade excavated areas to approximate original contours, ensuring appropriate site drainage. Install and place geotextile and a layer of gravel, with a minimum thickness of 12 inches, on disturbed surfaces of the West Dump, West Lagoon, East Dump, and East Lagoon as a protective cover to minimize erosion.

The estimated cost to complete the Early-Interim Preferred Alternative is $9,133,000.

Summary of the Estimated Remedy Costs

Appendix H includes details of the estimated costs to construct and implement this Selected Remedy for the OU-3 early-interim remedy. The information in Appendix H is based on the best

available information regarding the anticipated scope of the early-interim remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the implementation of the early-interim remedial alternative. This is an order of magnitude engineering cost estimate that is expected to be within +50 to -30% of the actual project cost.

Expected Outcome of the Selected Remedy

The expected outcome of the Selected Remedy is that all materials including soils/debris and radioactive discrete objects from the West Dump, West Lagoon, East Dump, and East Lagoon in the approximate area of concern depicted in Appendix C (Figures 4 to 7) would be excavated and removed. The vertical excavation would continue until ground water or the native soil interface (the point at which fill material meets the native soil surface) is encountered, whichever occurs first, or to the maximum extent practicable based on Site or excavation conditions. The excavated material will be disposed off-site, at a NRC licensed radioactive waste facility, and in accordance with Section 121(d)(3) of CERCLA, 42 U.S.C. § 121(d)(3), and Section 300.440 of the NCP, 40 C.F.R. §300.440. The threat of a release of hazardous substances (radionuclides) from the West Dump, West Lagoon, East Dump, and East Lagoon will be addressed. Further investigation of the soils at the Site will be completed as part of the OU-3 Remedial Investigation and will be addressed by a future response action and documented in a Final ROD for OU-3.

2.13 STATUTORY DETERMINATION

Under Section 121 of CERCLA, 42 U.S.C. § 9621, and the NCP (40 C.F.R. § 300.430(f)(5)(ii)), the lead agency must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. This early-interim action is protective of human health and the environment in the short term and is intended to provide adequate protection until a Final ROD for OU-3 is signed; complies with (or waives) those federal and state requirements that are applicable or relevant and appropriate for this limited-scope action; and is cost-effective. Although this early-interim action is not intended to address fully the statutory mandate for permanence and treatment to the maximum extent practicable, this early-interim action may utilize treatment and, if so, would support that statutory mandate. Because this action does not constitute the final remedy for OU-3, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed in this remedy, will be addressed by the final response action for OU-3. Subsequent actions are planned to address fully the threats posed by conditions at OU-3. This remedy may result in hazardous substances remaining in the lagoon/dump areas of the Site above health-based levels. Five-year reviews will be conducted in accordance with statutory requirements pursuant to Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), the NCP, 40 C.F.R. §300.430(f)(4)(ii), and EPA guidance, as appropriate. Because this is an early-interim action ROD, review of this Site and remedy will be ongoing as EPA continues to develop remedial alternatives for OU-3.

Protection of Human Health and the Environment

The Selected Remedy included in this Early-Interim ROD will be protective of human health and the environment during implementation and after completion. All materials including non-radionuclide and radionuclide-contaminated soils/debris and radioactive discrete objects will be excavated, removed, and disposed of off-site, which will mitigate the threat of a release of hazardous substances to the environment from the West Dump, West Lagoon, East Dump, and East Lagoon areas of the Site. Excavated materials will be disposed of in off-site disposal facilities which have been designed and permitted to receive radioactive waste material.

Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy will comply with all Federal and State requirements, standards, criteria, and limitations that are applicable or relevant and appropriate, as required by Section 121(d) of CERCLA, 42 U.S.C. § 9621(d), and the NCP Sections 300.430(f)(5)(ii)(B) and (C). Such requirements, standards, criteria and limitations are identified in Appendix F.

Cost Effectiveness

The NCP, at 40 C.F.R. § 300.430(f)(1)(ii)(D), requires EPA to evaluate cost-effectiveness by comparing all the alternatives meeting the threshold criteria--protection of human health and the environment and compliance with ARARs--against long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; and short-term effectiveness (collectively referred to as overall effectiveness). The NCP further states that overall effectiveness is then compared to cost to insure that the remedy is cost effective.

EPA concludes, following an evaluation of these criteria, that the selected remedy is cost-effective in providing overall protection in proportion to costs and meets all other requirements of CERCLA. The estimated present value of the selected early-interim remedial action is $9,133,000.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The hazardous substances identified within the West Dump, West Lagoon, East Dump, and East Lagoon are a variety of non-radionuclide and radionuclide-contaminated soils, which include radioactive discrete objects. However, there is no feasible technology to practicably treat radionuclides that will not result in larger volumes of waste, creating greater impracticability for disposal. The excavated material will be packaged appropriately for off-site disposal at approved off-site NRC licensed radioactive waste disposal facility. Off-site disposal would be conducted in accordance with Section 121(d)(3) of CERCLA, 42 U.S.C. § 121(d)(3), and Section 300.440 of the NCP, 40 C.F.R. §300.440.

However, certain waste materials (including, but not limited to, dials and some discrete objects) may also exhibit chemical hazardous waste characteristics requiring treatment (e.g. stabilization) prior to permanent disposal. Such waste materials shall be sampled and analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) pursuant to the Resource Conservation and

Recovery Act (RCRA) to determine if they exhibit hazardous waste characteristics. For those waste materials that fail TCLP, such treatment shall be performed at the off-site licensed radioactive waste facility to render such materials non-hazardous prior to disposal.

EPA has determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the Site. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and bias against off-site treatment and disposal, and considering State and community acceptance.

The Selected Remedy is an early-interim action that is not designed or expected to be final, but represents the best balance of alternatives recognizing the limited scope and early nature of the action. It is anticipated that this Selected Remedy will be incorporated into the final remedy of the Site. The final remedy will be documented in a Final ROD for OU-3.

Five-Year Review Requirements

The Selected Remedy in this Early-Interim ROD is for the West Dump, West Lagoon, East Dump, and East Lagoon areas of OU-3, and includes the excavation, removal, and off-site disposal of materials including non-radionuclide and radionuclide-contaminated soils/debris and radioactive discrete objects. This Selected Remedy may result in hazardous substances, pollutants, or contaminants remaining in the lagoon/dump areas of the Site above levels that allow for unlimited use and unrestricted exposure. Five-year reviews will be conducted in accordance with statutory requirements pursuant to Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), the NCP, 40 C.F.R. §300.430(f)(4)(ii), and EPA guidance, as appropriate.

Contaminated materials and ground water will remain at the Site at the completion of the OU-3 Selected Remedy (described in this Early-Interim ROD). Following completion of the RI/FSs for soil, sediment, and surface water (OU-3) and ground water (OU-2), EPA will select remedies for those media in accordance with CERCLA and the NCP.

2.14 DOCUMENTATION OF SIGNIFICANT CHANGES

The PRAP for the Safety Light Corporation Site was released for public comment on May 27, 2016. The public comment period for the PRAP was held from May 27, 2016 to June 27, 2016. EPA held a public meeting on June 15, 2016, to present the Preferred Alternative for OU-3 in the PRAP. EPA did not receive any written comments during the public comment period. EPA has responded to verbal comments posed during the public meeting in Part 3.0 of this Early-Interim ROD, the Responsiveness Summary. There are no significant changes from the Preferred Alternative presented in the PRAP.

3.0 RESPONSIVENESS SUMMARY

This Responsiveness Summary documents public participation in the remedy selection process for the Safety Light Corporation Site. The Responsiveness Summary contains a summary of the significant comments EPA received on the PRAP for the early-interim remedial action for OU-3, and EPA's responses to these comments. The PRAP was released for public comment on May 27, 2016 when EPA announced the comment period in the *Press Enterprise* newspaper. EPA's public comment period for the PRAP began on May 27, 2016 and continued through June 27, 2016. A public meeting was held at the Central Columbia Middle School on the evening of June 15, 2016. EPA received questions during the public meeting, which are summarized below. EPA did not receive any additional written or oral comments.

The transcript for the public meeting is provided in the Administrative Record for the Site.

3.1 STAKEHOLDER COMMENTS AND LEAD AGENCY RESPONSES

COMMENT #1:

A community member inquired about the depth of the ground water table at the Site, and whether seasonal fluctuations may affect the depth of excavation during the cleanup.

RESPONSE TO COMMENT #1:

EPA's investigation of the ground water at the Site currently is ongoing, as part of OU-2. The investigation, or RI/FS, is expected to be completed in 2017. However, ground water data has been collected over the years from on-site monitoring wells for chemical and radionuclide parameters, and water level measurements. Based on these ground water level measurements, there appear to be no significant seasonal fluctuations in ground water elevations. The lowest ground water level measured during the OU-2 ground water monitoring events was in late summer in August 2005. Given the Site's close proximity to the Susquehanna River, it is likely that the river's water level is the dominant factor influencing local ground water elevations. The water table depth ranges from 2 to 25 feet bgs across the Site. The water table in the lagoon/dump areas is approximately 16 to 18 feet bgs; therefore, this is the target depth of the excavation for the OU-3 early-interim remedy. Based on EPA's anticipated schedule for implementing this remedy, the excavation work should occur in the late summer months of 2016. During this time, ground water levels are typical low; therefore, there should be minimal impact to the depth of excavation.

COMMENT #2:

A community member requested a copy of the public presentation. The community member also asked about the length of the public comment period, and commented that only about 15 days remained for the public to review the document following the public meeting.

RESPONSE TO COMMENT #2:

EPA sent the community member a copy of the public presentation, on June 20, 2016. A copy of the presentation was also placed on EPA's website at www.epa.gov/superfund/safetylight.

The NCP, at 40 C.F.R. § 300.430(f)(3), requires EPA to implement community relation activities when selecting a Superfund remedy, including, but not limited to, providing no less than 30 calendar days for submission of written and oral comments on a PRAP, and holding a public meeting during the public comment period. The public comment period on this PRAP began on May 27, 2016, with public notice of availability of the PRAP published in the *Press Enterprise* newspaper, and continued until June 27. As mentioned above, EPA held its public meeting on June 15, 2016. Additional information regarding public participation in this remedy selection process is further discussed in Section 2.3 (Community Participation) of the ROD.

COMMENT #3

A community member asked about the total costs expended on the cleanup since the Site was listed on the National Priorities List in 2005.

RESPONSE TO COMMENT #3:

EPA has expended approximately $20 million in cleanup costs at the Site, related to implementing several removal actions and the OU-1 remedial action at the Site (see Appendix D, Table D-1). This cost figure does not include the estimated $9 million for the Selected Remedy in this Early-Interim ROD, or other costs associated with the investigations of the contamination at the Site.

COMMENT #4

A community member asked what EPA's five-year review of the Site will entail.

RESPONSE TO COMMENT #4:

Generally, five-year reviews consist of a review of relevant Site information, including any additional data generated, current performance of the selected remedy, and any other information that may come to light regarding the protectiveness of the remedy. Following EPA's assessment of the remedy, EPA would issue a Five-Year Review Report which would be made available to the public.

This Selected Remedy may result in hazardous substances, pollutants, or contaminants remaining in the lagoon/dump areas of the Site above levels that allow for unlimited use and unrestricted exposure. Five-year reviews will be conducted in accordance with statutory requirements pursuant to Section 121(c) of CERCLA, 42 U.S.C. § 9621(c), the NCP, 40 C.F.R. §300.430(f)(4)(ii), and EPA guidance, as appropriate.

COMMENT #5:

A community member asked: Who owns the Site property?

RESPONSE TO COMMENT #5:

According to information available to EPA, the property is owned by Safety Light Corporation and related entities.

COMMENT #6:

A community member asked whether the fence, which surrounds the former Safety Light Corporation property, eventually will be removed.

RESPONSE TO COMMENT #6:

EPA plans to leave the fence in place as part of the Early Interim OU-3 Remedy, to prevent trespassing and to secure the Site. During selection of the final remedy for OU-3, a final determination regarding the fence will be made by EPA and will be documented in a Final ROD for OU-3.

COMMENT #7:

A community member asked about the duration of the OU-3 early-interim cleanup.

RESPONSE TO COMMENT #7:

The estimated duration is 6 to 8 months for the entire action selected under this Early-Interim ROD for OU-3.

3.2 TECHNICAL AND LEGAL COMMENTS

EPA did not receive any written technical or legal comments during the public comment period.

APPENDIX A
GLOSSARY

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Glossary of Radiation Terms	
absorbed dose	The amount of radiation absorbed by an object or person. The unit for absorbed dose is the rad (U.S. unit).
alpha particle	A form of particulate ionizing radiation made up of two neutrons and two protons. Alpha particles pose no direct or external radiation threat; however, they can pose a serious health threat if ingested or inhaled. Alpha particles can be stopped by thin layers of light materials, such as a sheet of paper.
ambient air	The air that surrounds us.
background radiation	Radiation that is always in the environment. The majority of background radiation occurs naturally and a small fraction comes from man-made elements.
beta particle	A form of particulate ionizing radiation made up of small, fast-moving particles. Some beta particles are capable of penetrating the skin and causing damage such as skin burns. Beta-emitters are most hazardous when they are inhaled or swallowed.
counts per minute	The measurement of ionizing radiation expressed as being a *rate* of counts per unit time registered by a radiation monitoring instrument, of which **counts per minute** (cpm) is commonly used. Count rate measurements are normally associated with the detection of particles, such as alpha particles and beta particles.
corrected counts per minute	The rate of counts per unit time corrected for background radiation from naturally occurring sources.
curie	A measure of radioactivity. One curie of radioactive material will have 37 billion transformations of atoms (disintegrations) in one second.
disintegrations per minute	The measure of the activity of the source of radioactivity. This unit should not be confused with cpm, which is the number of counts received by an instrument from the source. One dpm is the number of atoms that have decayed in one minute, not the number of atoms that have been measured as decayed.
dose	The amount of radiation delivered to an object or person. Dose may refer to absorbed dose, the amount of energy deposited per unit mass, or to equivalent dose, the absorbed dose adjusted for the relative biological effect of the type of radiation being measured.
dose rate	The radiation dose delivered per unit time.
effective dose	The amount of radiation absorbed by an object or person, adjusted to account for the type of radiation received and the effect on particular organs. The unit used for effective dose is rem (U.S. unit).
exposure	Radiation exposure, also called irradiation, occurs when radioactive material or a radiation machine emits radiation.
gamma rays	A form of ionizing radiation that is made up of weightless packets of energy called photons. Gamma rays can pass completely through the human body; as they pass through, they can cause damage to tissue and DNA.
ionizing radiation	Radiation with so much energy it can knock electrons out of atoms. Ionizing radiation can affect the atoms in living things, so it poses a health risk by damaging tissue and DNA in genes.
isotope	A form of an element that has the same number of protons but a different number of neutrons in the nucleus, giving it a different atomic mass. For example, uranium has thirty-seven different isotopes, including uranium-235 and uranium-238.
mrem	The millirem is the U.S. unit used to measure effective dose. One millirem equals 0.001 rem.

Glossary of Radiation Terms	
picocurie	The picocurie is a U.S. unit used to measure radioactivity. One picocurie is one trillionth of a curie.
rad:	An acronym for Radiation Absorbed Dose. The rad is a basic unit of absorbed radiation dose.
radioactivity	The emission of ionizing radiation released by a source in a given time period. The units used to measure radioactivity is the curie (Ci).
radioisotope	Radioactive forms of the same element, with the same number of protons but different number of neutrons. For example, Radium-228, Radium-226, and Radium-224 are radioisotopes of radium. Radioisotopes are a subset of radionuclides.
radioactive decay:	The process in which a radioactive nucleus emits (gives off) radiation and changes to a different isotope or element. A number of different particles can be emitted by decay. The most typical are alpha, beta particles, and gamma rays.
radionuclide:	Radioactive forms of elements are called radionuclides. Radium-226, Cesium-137, and Strontium-90 are examples of radionuclides.
rem:	Roentgen Equivalent Man. A unit of absorbed dose.
roentgen	The roentgen (R) is the term used to describe radiation exposure. This term for exposure only describes the amount of ionization in air.

APPENDIX B

ADMINISTRATIVE RECORD INDEX

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SAFETY LIGHT SITE

OU 3 REMEDIAL ADMINISTRATIVE RECORD FILE [1*]

INDEX OF DOCUMENTS

III. REMEDIAL RESPONSE PLANNING

1. Report: Revised Draft Remedial Investigation Report for Operable Unit 3 (OU-3), Soils, Surface Water, and Sediment, Safety Light Corporation, Bloomsburg, Columbia County, Pennsylvania, prepared by Tetra Tech, 6/14. P. 300001-300950. [**]

2. Report: Final Technical Memorandum Remedial Alternatives Evaluation for West Dump, West Lagoon, East Dump, and East Lagoon Areas, Safety Light Corporation, Operable Unit 3 Soils, Bloomsburg, Columbia County, Pennsylvania, prepared by Tetra Tech, 5/16. P. 300951-301506.

3. Proposed Plan, Safety Light Corporation Superfund Site, Operable Unit 3, Bloomsburg, Columbia County, Pennsylvania, 5/16. P. 301507-301586.

4. Letter to Mr. John Banks, U.S. EPA, from Mr. Andrew Frebowitz, Tetra Tech, re: Transmittal of Revised Table 2-4 and Revised Table C-9 for the Remedial Alternatives Evaluation for West Dump, West Lagoon, East Dump, and East Lagoon, Operable Unit 3, 6/10/16. P. 2231221. Tables 2-4 and C-9 are attached.

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* Administrative Record File available 5/23/16, **updated //.** The *Safety Light Site Removal Administrative Record File,* dated 5/23/16, and *Safety Light Site OU 1 Remedial Administrative Record File,* dated 9/8/10, are incorporated herein by reference.

** Portions of the report body have been redacted to remove draft content that was not considered or relied on by EPA to select this Interim OU-3 Remedial Action and that EPA expects to revise for the final report.

V. COMMUNITY INVOLVEMENT/CONGRESSIONAL CORRESPONDENCE/IMAGERY

1. Draft for Release U.S. EPA Public Notice, Safety Light Corporation Superfund Site, Bloomsburg, PA, re: EPA Seeks Public Comments on the Safety Light Corporation Superfund Site, 5/27/16. P. 2231217.

2. U.S. EPA Fact Sheet: Safety Light Corporation Site, Bloomsburg, Pennsylvania, entitled, "EPA Seeks Public Comments on OU-3 Cleanup Plan," 6/1/16. P. 2217995.

3. U.S. EPA Public Presentation: Safety Light Corporation Superfund Site, Operable Unit 3, entitled, "Early-Interim Soil Remedy - West Dump, West Lagoon, East Dump, & East Lagoon," 6/15/16. P. 2231220.

4. Transcript of Public Meeting Minutes, Safety Light Corporation Superfund Site, 6/15/16. P. 2231219. ***

5. Newspaper article entitled, "Official: Cutbacks Won't Halt Safety Light Cleanup Progress," Press Enterprise, 6/18/16. P. 2231216.

*** Document has been redacted to protect the privacy of individuals. Redactions are evident from the face of the document.

APPENDIX C

FIGURES

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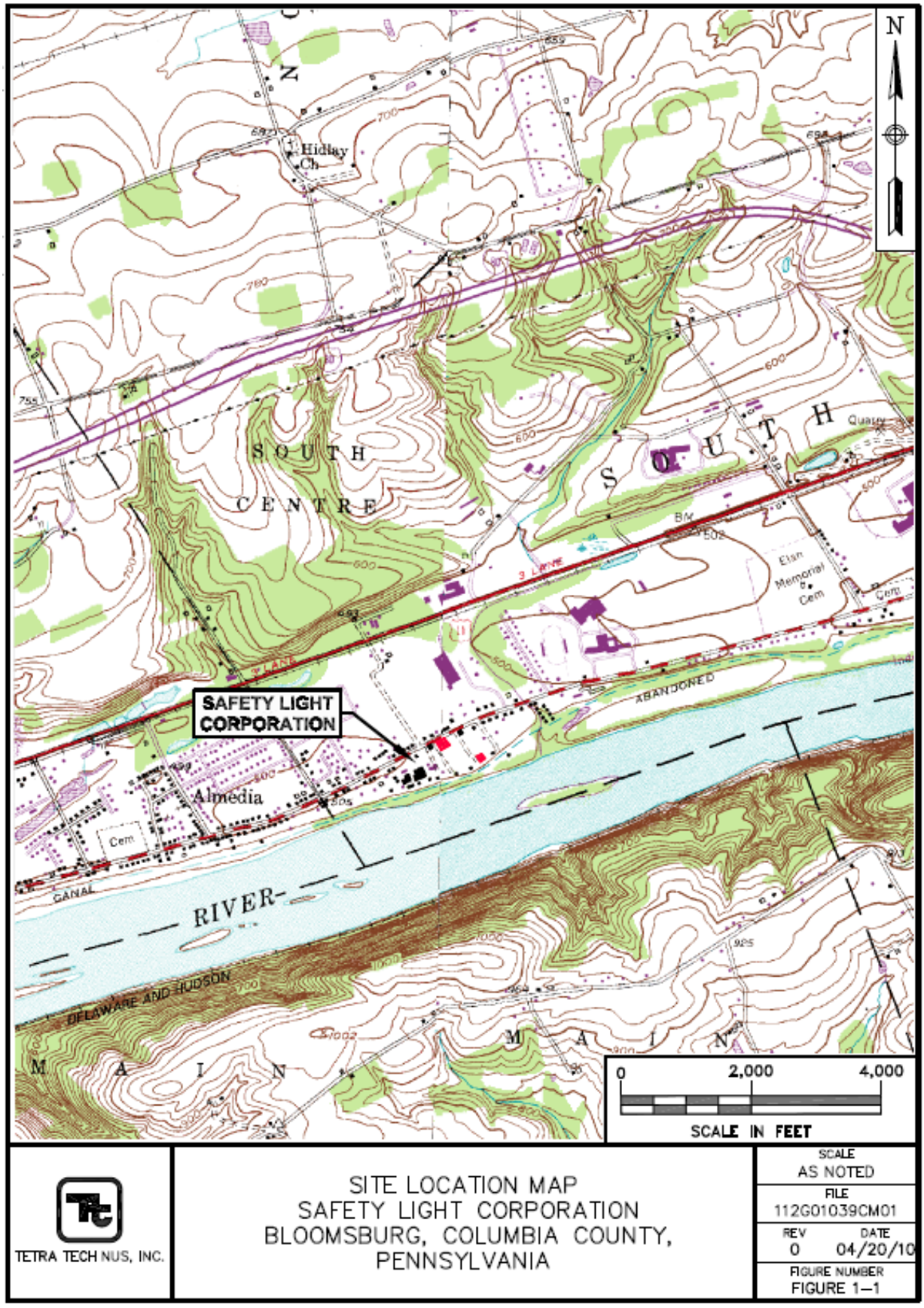

FIGURE 1: SITE LOCATION

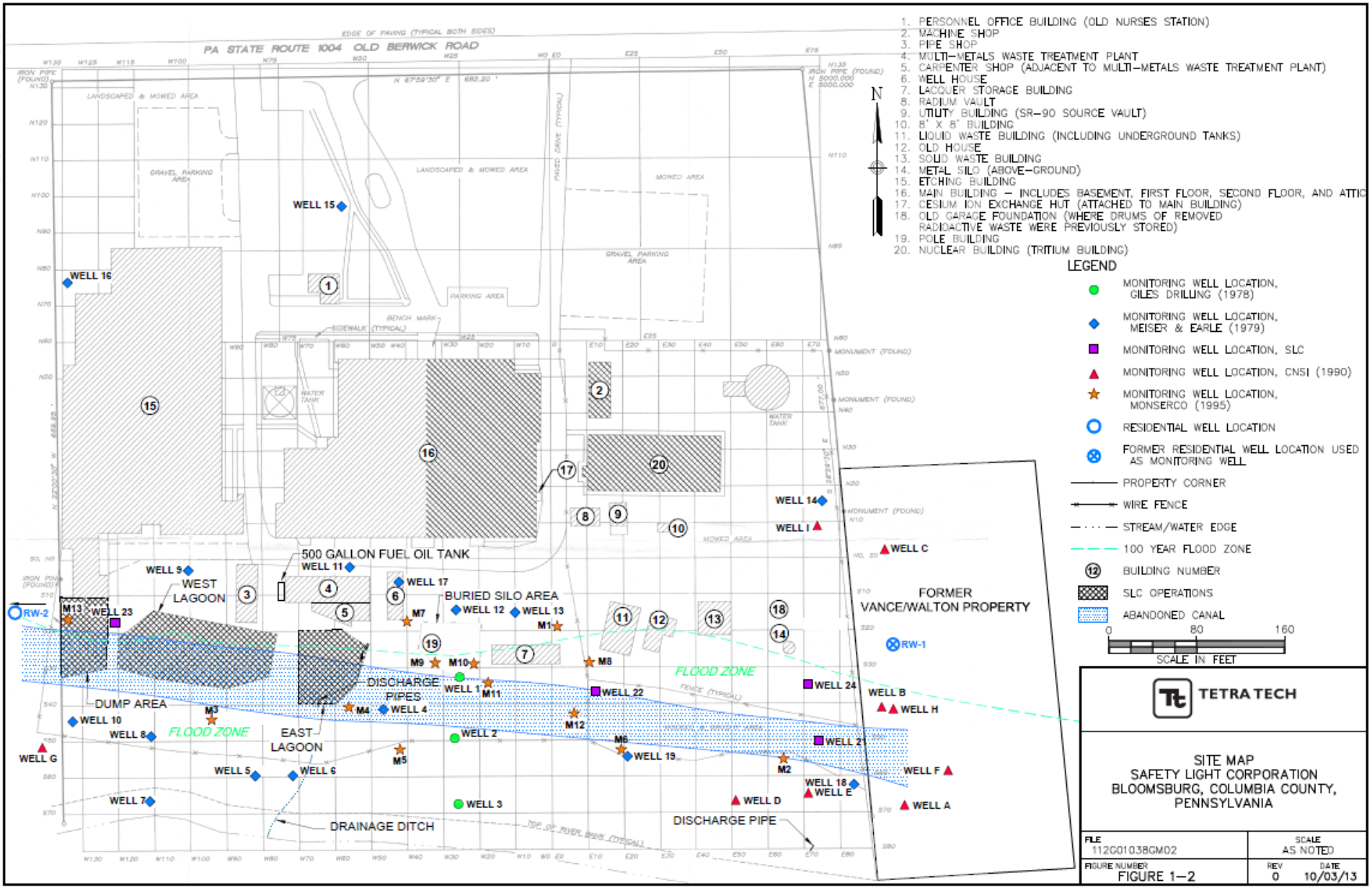

FIGURE 2: SITE MAP

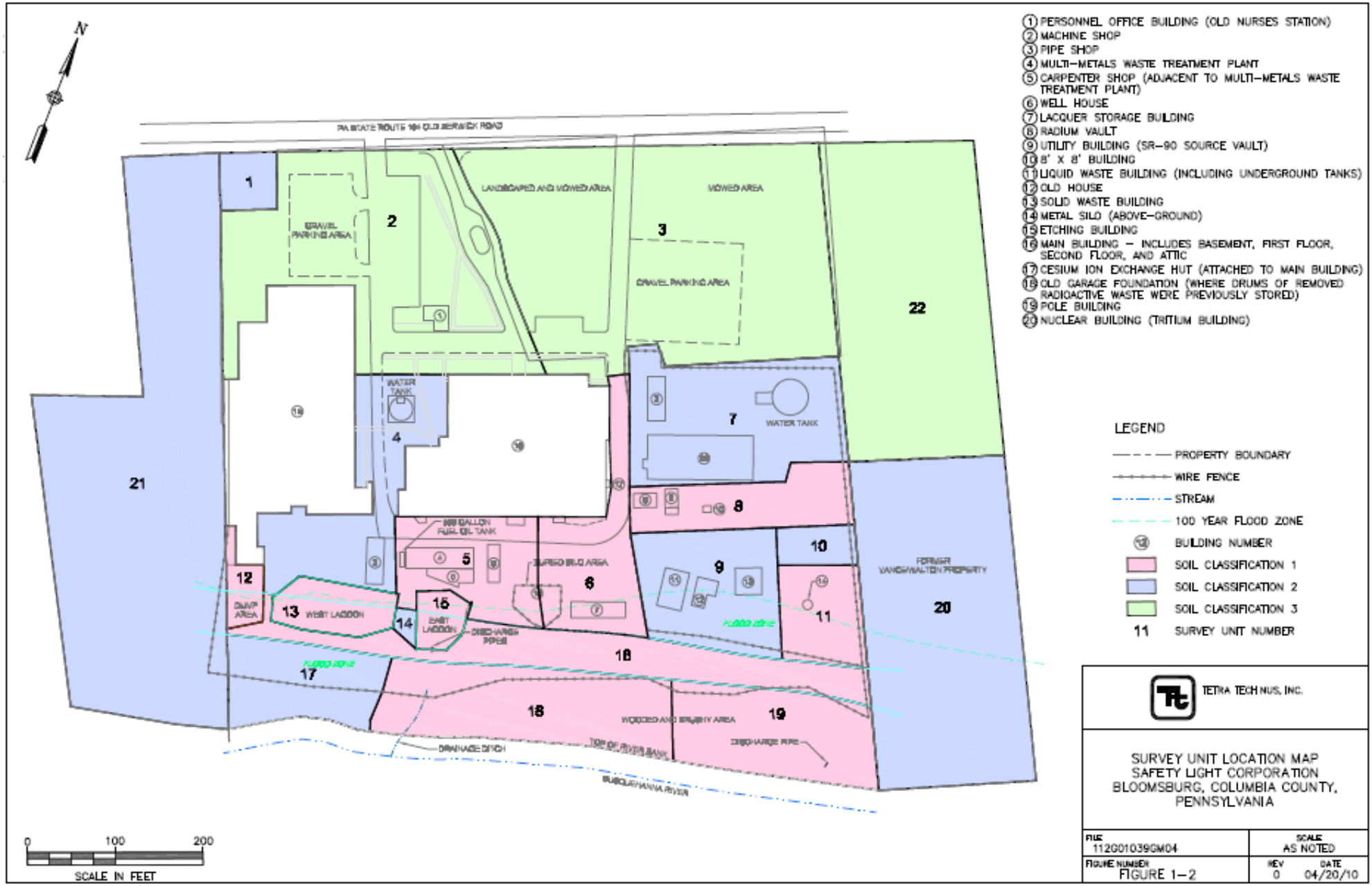

FIGURE 3: SURVEY UNITS

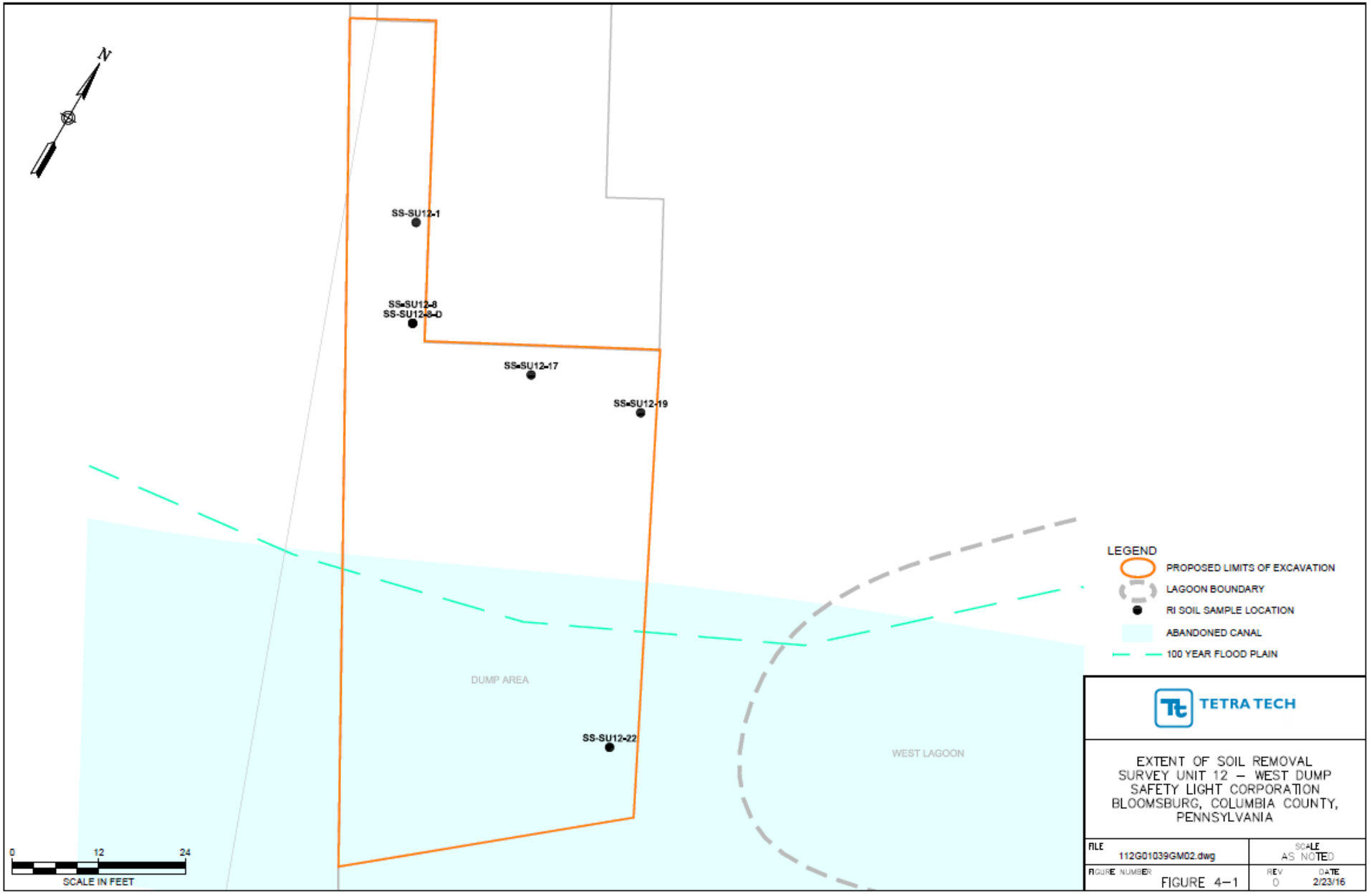

FIGURE 4: WEST DUMP SOIL SAMPLE LOCATIONS/APPROXIMATE EXCAVATION LIMITS

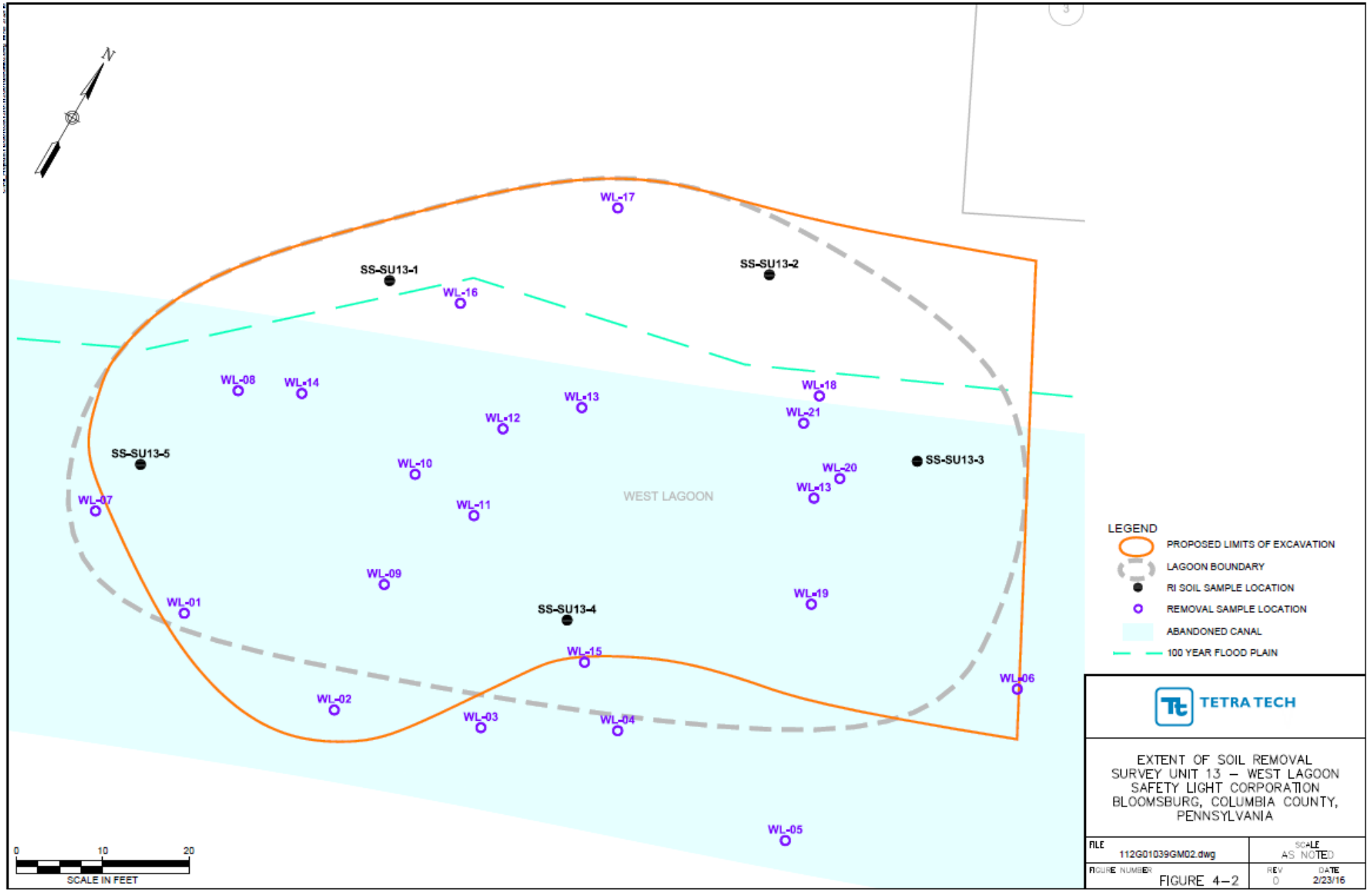

FIGURE 5: WEST LAGOON SOIL SAMPLE LOCATIONS/APPROXIMATE EXCAVATION LIMITS

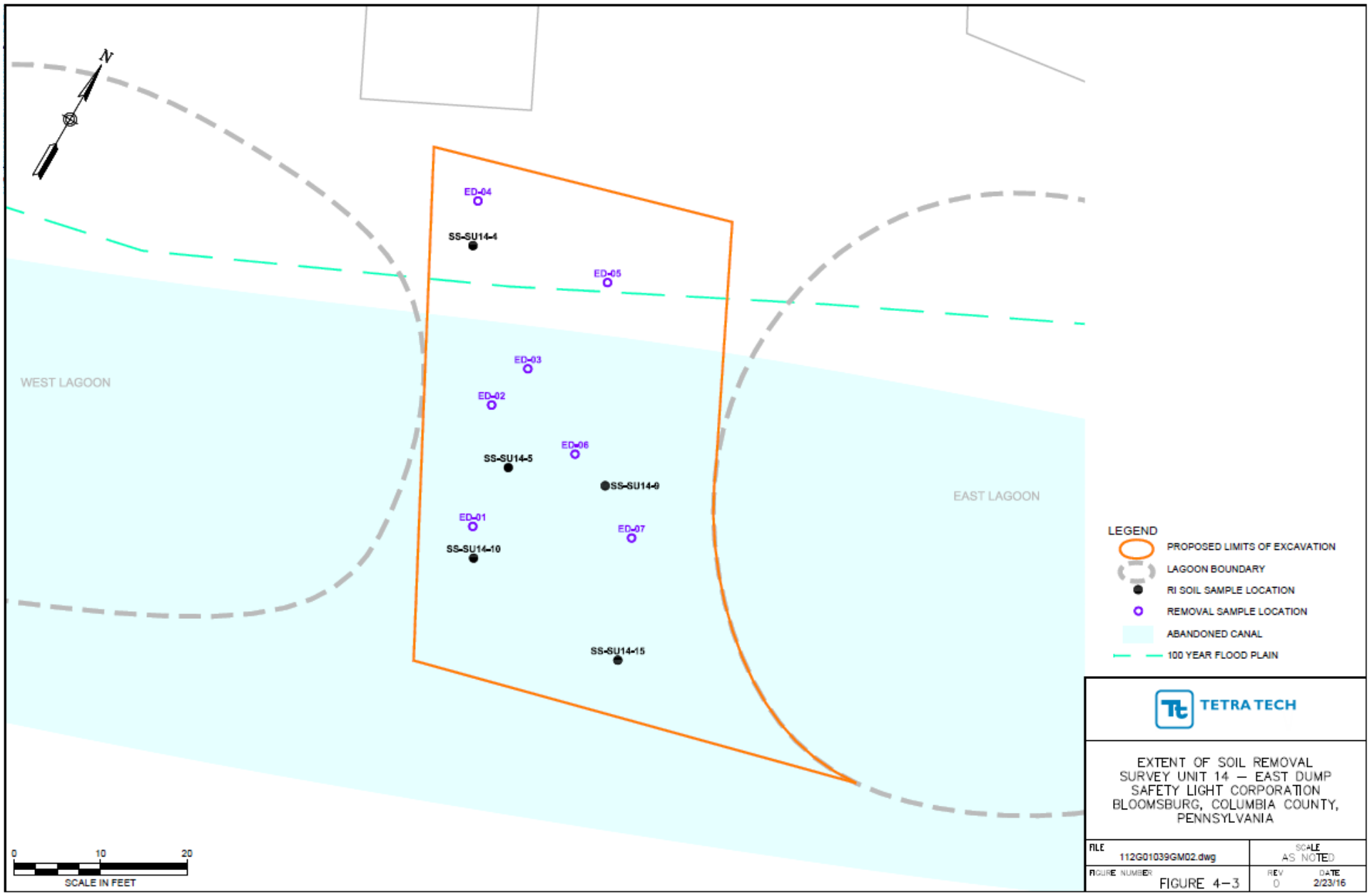

FIGURE 6: EAST DUMP SOIL SAMPLE LOCATIONS/APPROXIMATE EXCAVATION LIMITS

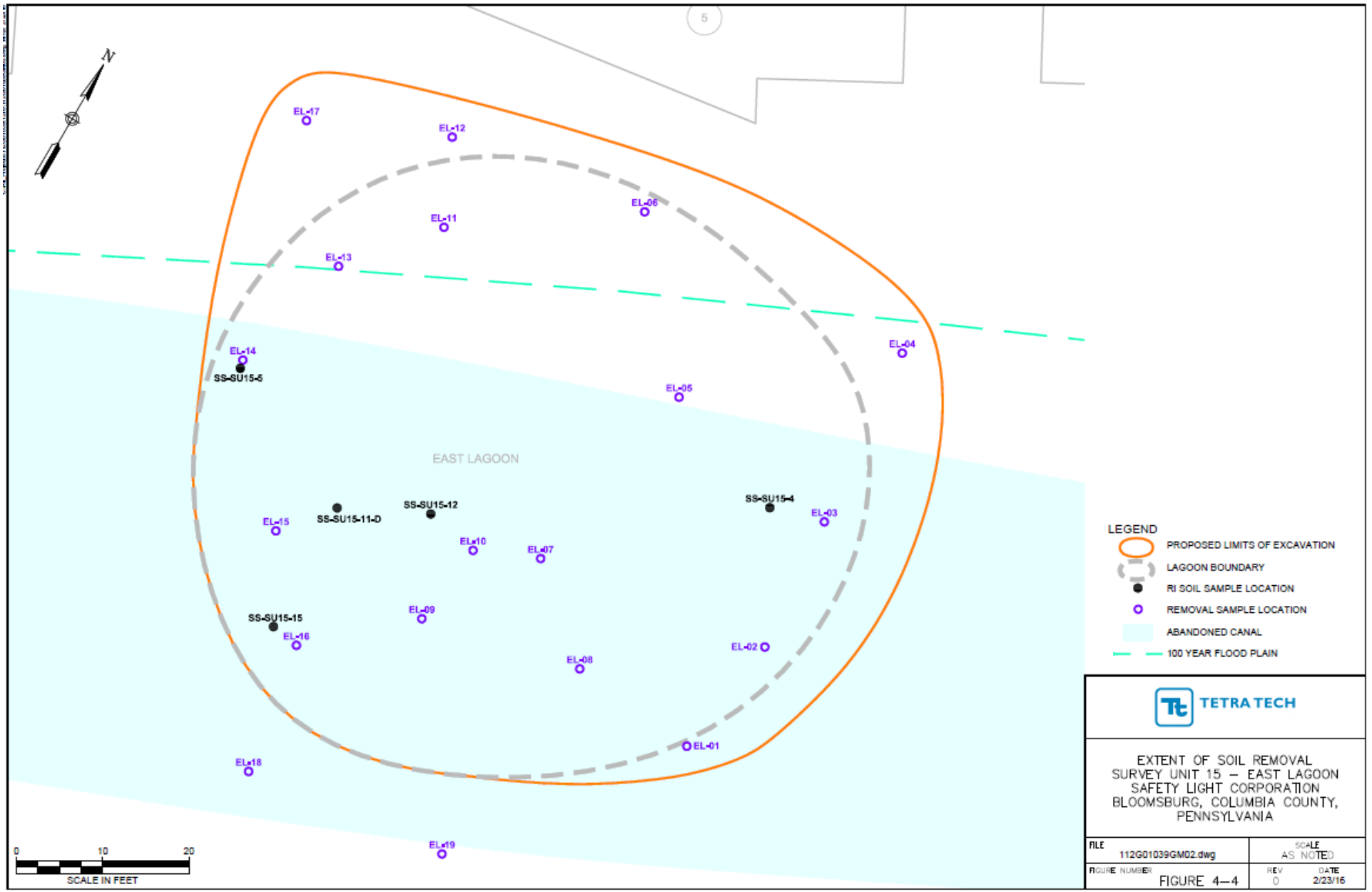

FIGURE 7: EAST LAGOON SOIL SAMPLE LOCATIONS/APPROXIMATE EXCAVATION LIMITS

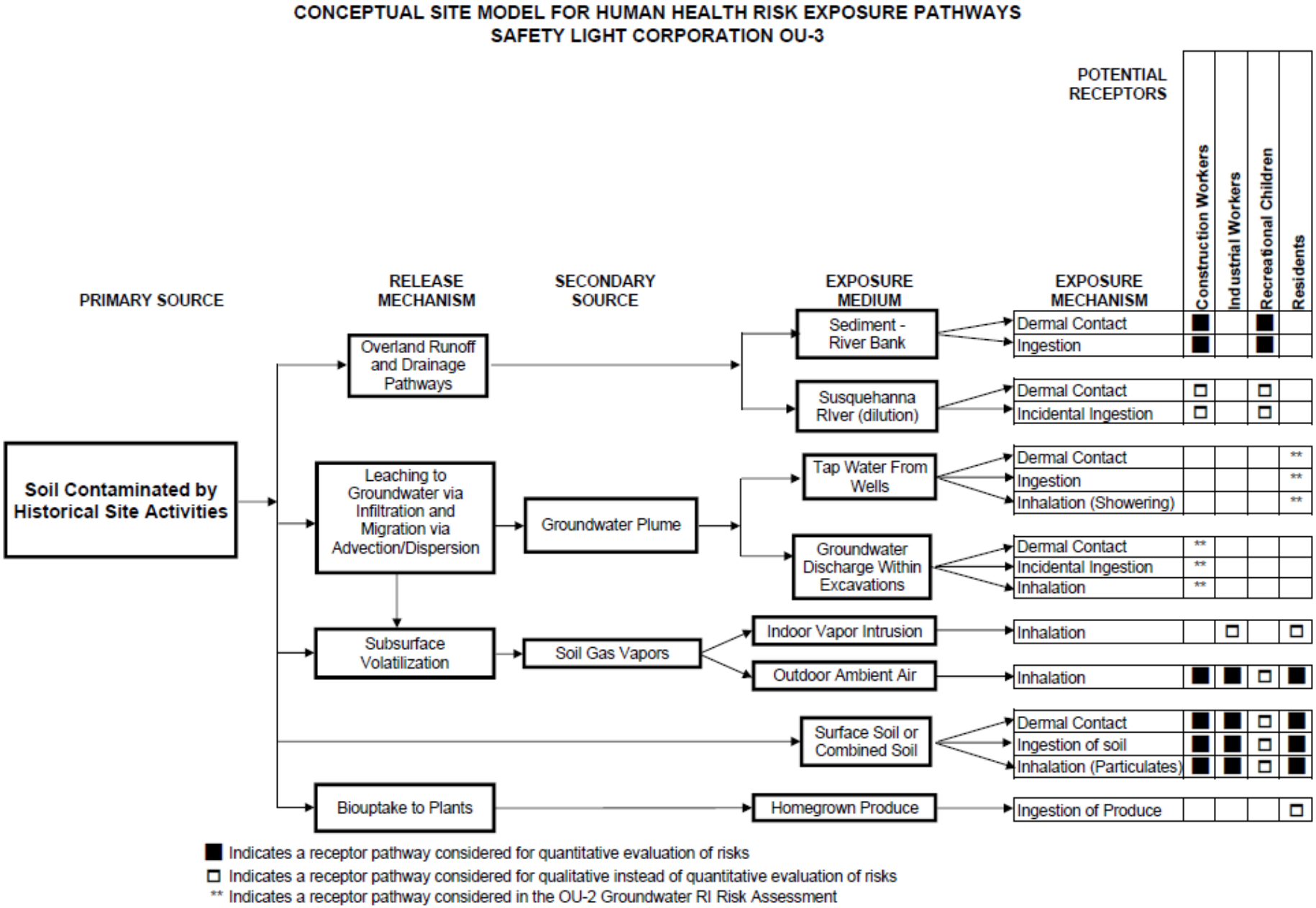

FIGURE 8: CONCEPTUAL SITE MODEL

APPENDIX D

TABLES

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TABLE D-1
ACTION MEMORANDA SUMMARY
SAFETY LIGHT CORPORATION SITE

Action Memorandum Date	Action Memorandum Summary	Removal Action Project Ceiling (Cumulative)
July 12, 2004	Approved funding for a time-critical removal action to complete the characterization, packaging, and off-Site disposal of the silo waste.	$1,955,972**
June 21, 2007	Approved a non-time critical removal action for the demolition of seven deteriorated, unused, and unmaintained buildings at the Site, and off-Site disposal of the majority of the resultant demolition debris as radioactive waste.	$3,060,766
October 2007	Approval to provide Site physical security; maintain Site fire protection systems; maintain Site utility services; and perform limited Site maintenance.	$3,156,766
July 11, 2008	Approved additional funding to for the non-time-critical removal action to complete the demolition of the seven buildings	$5,505,776
November 8, 2012	Approved a time critical removal action to repair the Main Building to stabilize Site conditions until the expected remedial response action."	$6,105,776
February 20, 2013	Approved funding increase and changes in scope to take additional measures needed to facilitate repair of the Main Building and to stabilize the Site. The additional measures included securing Butler Building, in which items removed from the Main Building were to be stored.	$6,530,776
June 11, 2013	Approved funding and authorized demolishing other deteriorating Site structures, including the Metal Silo, Liquid Waste Building, and Solid Waste Building and securing the West Dump which had eroded.	$9,363,976
December 16, 2013	Authorized demolition of the Main Building and Butler Building, which were further deteriorating due to severe weather events.	$12,255,175
September 26, 2014	Authorized excavation, removal and disposal of contaminated discrete buried objects, buried tanks, associated piping, and contaminated soils	$13,705,175
June 17, 2015	Approval to continue the ongoing removal and off-site disposal of buried radioactively contaminated items and certain other actions necessary to stabilize Site conditions pending long-term cleanup activities by the Remedial Program	$15,932,375
September 30, 2015	Approval to continue excavation, removal and disposal of contaminated discrete buried objects, buried tanks, associated piping, and contaminated soils including the West Lagoon and further assessment of the East Dump, and East Lagoon.	$18,914,791
February 1, 2016	Approval to continue excavation, removal and disposal of contaminated discrete buried objects, buried tanks, associated piping, and contaminated soils including the West Lagoon, East Dump, and East Lagoon.	$18,914,791

Notes:
** Removal Action Project Ceiling Costs for July 12, 2004 Action Memo are not included in cumulative costs
Action Memoranda may be found in the Administrative Record
Further information regarding all the EPA removal actions may also be found at www.epaosc.org

TABLE D-2
SOIL SCREENING LEVELS**
SURVEY UNITS 12, 13, 14 AND 15
SAFETY LIGHT CORPORATION OU-3

Chemical[1]	Target Cancer Risk Level[2]			Target Hazard Index[2]	Background[3]	Selected Soil Screening Level [7, 8]	Comments
	10^{-6}	10^{-5}	10^{-4}	0.1			
Semivolatile Organic Compounds (ug/kg)							
Benzo(a)anthracene	160	1,600	16,000	NA	22.1	160	Survey Units 12, 13, 14 and 15
Benzo(a)pyrene	16	160	1,600	NA	NA	16	Survey Units 12, 13, 14 and 15
Benzo(b)fluoranthene	160	1,600	16,000	NA	NA	160	Survey Units 12, 13, 14 and 15
Benzo(k)fluoranthene	1,600	16,000	160,000	NA	NA	1,600	Survey Unit 15
Dibenzo(a,h)anthracene	16	160	1,600	NA	ND	16	Survey Units 12, 13, 14 and 15
Indeno(1,2,3-cd)pyrene	160	1,600	16,000	NA	ND	160	Survey Units 13, 14 and 15
Pesticides/PCBs (µg/kg)							
alpha-BHC	86	860	8,600	51,000	NA	86	Survey Unit 13
Aroclor-1254	240	2,400	24,000	120	NA	120	Survey Units 12, 13 and 15
Aroclor-1260	240	2,400	24,000	NA	NA	240	Survey Units 12, 13
Aroclor-1268	240	2,400	24,000	NA	NA	240	Survey Unit 12
Metals (mg/kg)							
Aluminum	NA	NA	NA	7,700	8,770	8,770	Survey Units 14
Antimony	NA	NA	NA	3.1	NA	3.1	Survey Units 12 and 13
Arsenic	0.68	6.8	68	3.5	7.91	7.91	Survey Units 13, 14 and 15
Cadmium	2,100	21,000	210,000	7.1	0.24	7.1	Survey Units 12, 13 and 15
Chromium[4]	0.30	3	30	23	10.5	10.5	Survey Units 12, 13, 14 and 15
Cobalt	420	4,200	42,000	2.3	8.99	8.99	Survey Units 13
Copper	NA	NA	NA	310	33.4	310	Survey Units 12, 13 and 15
Iron	NA	NA	NA	5,500	16,700	16,700	Survey Units 12, 13, and 15
Lead	400 [6]				25.9	400	Survey Unit 13
Mercury	NA	NA	NA	2.3	0.039	2.3	Survey Unit 13
Silver	NA	NA	NA	39	NA	39	Survey Units 12, 13 and 15
Thallium	NA	NA	NA	0.078	0.77	0.77	Survey Unit 13, 14 and 15
Vanadium	NA	NA	NA	39	12.8	39	Survey Unit 15

Chemical[1]	Target Cancer Risk Level[2]			Target Hazard Index[2]	Background[3]	Selected Soil Screening Level [7, 8]	Comments
	10^{-6}	10^{-5}	10^{-4}	0.1			
Miscellaneous Parameter (mg/kg)							
Cyanide	NA	NA	NA	0.27	NA	0.27	Survey Unit 13
Radionuclides (pCi/g)							
Americium-241 (Am-241)	0.049	0.49	4.9	NA	NA	0.049	Survey Units 12, 13, 14 and 15
Cesium-137 (Cs-137)[9]	0.047	0.47	4.7	NA	0.431	0.431	Survey Units 12, 13, 14 and 15
Lead-210 (Pb-210)	0.0077	0.077	0.77	NA	1.64	1.64	Survey Units 12, 13, 14 and 15
Neptunium-237 (Np-237)[5]	0.046	0.46	4.6	NA	0.13	0.13	Survey Units 12, 13, and 15
Nickel-63 (Ni-63)	6.7	67	670	NA	NA	6.7	Survey Units 15
Radium-226 (Ra-226)[5]	0.0064	0.064	0.64	NA	1.52	1.52	Survey Units 12, 13, 14 and 15
Strontium-90 (Sr-90)[5]	0.066	0.66	6.6	NA	0.604	0.604	Survey Units 12, 13, 14 and 15
Thallium-204 (Tl-204)	2.1	21	210	NA	0.356	2.1	Survey Unit 14
Tritium (H3)	0.23	2.3	23	NA	3.78	3.78	Survey Units 12, 13, 14 and 15

**** Soil Screening Levels (SSLs) were used for determining the area of concern for soil remediation in the West Dump, West Lagoon, East Dump, and East Lagoon areas of the Site.**

Notes:
1 - A chemical was retained as a chemical of concern (COC) if the total ILCR for a medium exceeded $1x10^{-4}$ and the chemical specific ILCR exceeded 1x10-6 or if the total HI on a target organ basis exceeded 0.5 and the chemical specific HI exceeded 0.1.
2 - The Soil Screening Levels (SSLs) for nonradionuclides were calculated using USEPA's Regional Screening Level calculator and default exposure assumptions. The noncarcinogenic values correspond to a target hazard quotient of 0.1. The SSLs for radionuclides were calculated using USEPA's Preliminary Remediation Goals for Radionuclides calculator and default exposure assumptions.
3 - The 95 percent upper tolerance limit (UTL) from the risk assessment in the 2014 RI is presented for all nonradionuclides. For all radionuclides except radium-226 the 95 percent upper prediction limit (UPL) calculated using the data from the 2008 RI is presented. For radium-226 the upper 95 percent UPL from the 2015 Army Corp of Engineering dataset is presented. Actinium-227, cobalt-60, thallium-204, cesium-137, and stronium-90 concentrations were decay corrected.
4 - Values are for hexavalent chromium.
5 - Includes daughter products
6 - RSL User guide on lead for EPA Regional Screening Level (RSL)
7 - Lowest concentration of target cancer level at 1×10^{-6} or hazard index of 0.1 or background if greater than most conservative risk screening level
8 - Screening level based on EPA PRG calculator for radionuclides set at a target cancer level of 1.0E-06
NA - Not applicable/not available.
ND – Not detected

TABLE D-3
WEST DUMP
SURVEY AND SAMPLE RESULTS

WEST DUMP		Laboratory Results (pCi/g)				Field Readings
Sample Location	**Sample ID**	**Pb-210**	**Ra-226**	**Sr-90**	**Tl-204**	**(ccpm)**
Biased Sample #1	**SS-SU12-1-000.5**	**3.19**	1.71	~~0.317~~	1.7	232175
	SS-SU12-1-0.52.0	0.720	**19.1**	~~0.223~~	2.9	
Biased Sample #2	**SS-SU12-8-000.5**	**59.5**	**174**	0.946	~~**16.0**~~	460059
	SS-SU12-8-0.52.0	**163**	**617**	**3.92**	~~**18.7**~~	
Biased Sample #3	**SS-SU12-17-000.5**	**7.6**	**3.66**	~~1.14~~	3.3	473939
	SS-SU12-17-0.52.0	**12.0**	**4.67**	~~0.865~~	2.6	
Biased Sample #4	**SS-SU12-19-000.5**	**20.8**	**292**	0.521	~~**22.9**~~	337551
	SS-SU12-19-0.52.0	**22.3**	**94.0**	0.625	~~**61.7**~~	
	SB-SU12-19-0304	**54.4**	**88.9**	~~1.36~~	4.5	
Biased Sample #5	**SS-SU12-22-000.5**	**2.52**	2.07	0.156	~~1.1~~	1090439
	SS-SU12-22-0.52.0	0.496	0.873	~~0.164~~	1.1	

**Values in bold print indicate activity above screening criteria. Values with strikethroughs indicate invalid data.*

TABLE D-4
WEST LAGOON
SURVEY AND SAMPLE RESULTS

WEST LAGOON		Laboratory Results (pCi/g)						Field Readings
Sample Location	**Sample ID**	**Depth (Ft.)**	**H-3**	**Np-237**	**Pb-210**	**Ra-226**	**U-238**	**(ccpm)**
Biased Sample #1	**SS-SU13-1-000.5**	0-0.5	**10.4**	**0.45**	**329**	**652**	0.450	2 mrem/hr @ contact
	SS-SU13-1-0.52.0	0.5 to 2.0	**5.8**	**0.262**	**36.5**	**2,390**	0.632	
Biased Sample #2	**SS-SU13-2-000.5**	0-0.5	**120**	0.075	**37.1**	**163**	0.606	23,225
	SS-SU13-2-0.52.0	0.5 to 2.0	**8.4**	0.072	**10.4**	**87.9**	0.442	
Biased Sample #3	**SS-SU13-3-000.5**	0-0.5	**38.7**	0.039	**22.5**	**105**	0.534	68,772
	SS-SU13-3-0.52.0	0.5 to 2.0	**12.6**	**0.309**	**49.8**	**579**	0.435	
Biased Sample #4	**SS-SU13-4-000.5**	0-0.5	**55.2**	0.062	**3.34**	**57.7**	**0.974**	45,915
	SS-SU13-4-0.52.0	0.5 to 2.0	**8.8**	ND	**2.05**	**34.4**	0.505	
Biased Sample #5	**SS-SU13-5-000.5**	0-0.5	**141**	ND	**6.28**	**19.2**	0.421	32,510
	SS-SU13-5-0.52.0	0.5 to 2.0	**277**	0.055	**6.41**	**32.5**	0.386	

Note: Bold Values > Screening Level per EPA PRG Calculator

TABLE D-5
EAST DUMP
SURVEY AND SAMPLE RESULTS

EAST DUMP		Laboratory Results (pCi/g)						Field Reading
Sample Location	Sample ID	Depth (Ft.)	H-3	Np-237	Pb-210	Ra-226	U-238	(ccpm)
Biased Sample #1	**SS-SU14-4-000.5**	0-0.5	**1.6**	0.011	**2.19**	**4.23**	**0.926**	19,632
	SS-SU14-4-0.52.0	0.5 to 2.0	0.469	0.016	**2.33**	**14.2**	0.469	
	SB-SU14-4-1012	10 to 12	0.720	**0.313**	**203**	**273**	0.720	
Biased Sample #2	**SS-SU14-5-000.5**	0-0.5	0.926	0.006	**1.48**	**1.87**	**0.926**	16,576
	SS-SU14-5-0.52.0	0.5 to 2.0	0.635	0.006	**1.44**	**0.571**	0.635	
	SB-SU14-5-1012	10 to 12	0.598	0.075	**169**	**220**	0.598	
Biased Sample #3	**SS-SU14-9-000.5**	0-0.5	0.629	0.011	**2.65**	**3.84**	0.629	25,438
	SS-SU14-9-0.52.0	0.5 to 2.0	**0.939**	0.015	**1.23**	**0.914**	**0.939**	
	SB-SU14-9-1012	10 to 12	ND	0.011	**14.3**	**185**	**1.17**	
Biased Sample #4	**SS-SU14-10-000.5**	0-0.5	**1.8**	0.011	**3.08**	**4.63**	0.570	16,395
	SS-SU14-10-0.52.0	0.5 to 2.0	**3.0**	0.008	**1.47**	**0.264**	0.679	
	SB-SU14-10-0812	8 to 12	**3.8**	0.066	**234**	**189**	**0.744**	
Biased Sample #5	**SS-SU14-15-000.5**	0-0.5	**3.9**	0.012	**1.39**	**1.55**	**1.04**	19,472
	SS-SU14-15-0.52.0	0.5 to 2.0	**2.9**	0.010	0.653	**0.813**	**1.08**	
	SB-SU14-15-1012	10 to 12	**3.8**	0.009	**3.43**	**4.96**	**0.993**	

Note: Bold Values > Screening Level per EPA PRG Calculator

TABLE D-6
EAST LAGOON
SURVEY AND SAMPLE RESULTS

EAST LAGOON		Laboratory Results (pCi/g)							Field Reading
Sample Location	**Sample ID**	**Depth (Ft.)**	**Cs-137**	**H-3**	**Np-237**	**Pb-210**	**Ra-226**	**U-238**	**(ccpm)**
Biased Sample #1	**SS-SU15-4-000.5**	0-0.5	0.478	ND	ND	**1.79**	**0.623**	0.699	57,890
	SS-SU15-4-0.52.0	0.5 to 2.0	1.93	**6.5**	ND	**2.30**	**10.5**	0.716	
	SB-SU15-4-0911	9.0 to 11.0	1.04	**4.4**	ND	**1.37**	**2.24**	**0.841**	
Biased Sample #2	**SS-SU15-5-000.5**	0-0.5	0.639	0.657	ND	**7.19**	**3.17**	0.657	48,260
	SS-SU15-5-0.52.0	0.5 to 2.0	5.22	0.621	0.011	**53.9**	**5.88 (R)**	0.621	
Biased Sample #3	**SS-SU15-11-000.5**	0-0.5	18.7	0.852	0.012	**28.6**	**30.6**	**0.852**	92,597
	SS-SU15-11-0.52.0	0.5 to 2.0	**26.6**	**45.1**	**0.171**	**41.2**	**61.1**	**0.737**	
Biased Sample #4	**SS-SU15-12-000.5**	0-0.5	0.678	**6.4**	0.049	**2.68**	**6.34**	0.443	40,132
	SS-SU15-12-0.52.0	0.5 to 2.0	1.01	**9.2**	0.064	**1.93**	**6.23**	0.587	
Biased Sample #5	**SS-SU15-15-000.5**	0-0.5	0.307	**3.2**	0.013	**2.32**	**1.23 (R)**	0.509	24,830
	SS-SU15-15-0.52.0	0.5 to 2.0	0.148	**8.1**	0.013	**1.82**	**0.502 (R)**	0.574	

Notes: 1. Bold Values > Screening Level per EPA PRG Calculator.
2. (R) Data rejected during validation

TABLE D-7
WEST LAGOON
MERL SOIL SAMPLING RESULTS

MERL Soil Results - West Lagoon (pCi/g)									
Boring	**Depth**	**Ra-226**	**Np-237**	**Pb-210**	**Ac-227**	**Cs-137**	**Kr-85**	**Co-60**	**Am-241**
WL-01	0-4'	--	--	--	--	--	--	--	--
	8-12'	--	--	--	--	--	--	--	--
WL-02	0-4'	--	0.7401	--	--	--	--	--	--
	4-8'	--	--	--	--	--	--	--	--
WL-03	0-4'	1.782	--	--	--	--	--	--	--
	8-12'	--	--	--	--	--	--	--	--
WL-04	0-4'	--	--	--	--	--	--	--	--
	4-8'	--	--	--	--	--	--	--	--
WL-05	0-4'	--	--	--	--	--	--	--	--
	4-8'	--	--	--	--	--	--	--	--
WL-06	0-4'	--	--	--	--	--	--	--	--
	8-12'	18.2	--	20.53	--	--	--	--	--
	8-12'	15.3	--	--	--	--	--	--	--
WL-07	4-8'	--	--	--	--	--	--	--	--
	8-12'	--	--	--	--	--	--	--	--
WL-08	4-8'	--	--	--	--	--	--	--	--
WL-09	0-4'	--	--	2.137	--	--	--	--	--
	4-8'	3.43	--	--	--	--	--	--	--
WL-10	0-4'	5.797	--	--	--	--	--	--	--
	4-8'	4.906	--	10.16	--	--	--	--	--
WL-11	0-4'	9.69	--	--	--	--	--	--	--
	4-8'	6.069	--	5.904	0.1367	--	--	--	--
WL-12	0-4'	5.442	0.2416	--	--	--	--	--	--
	4-8'	2.144	--	5.169	--	--	--	--	--
WL-13	0-4'	16.27	--	--	--	--	--	--	--
	4-8'	2.431	--	9.082	--	--	--	--	--
WL-14	0-4'	14.75	--	13.47	--	0.4861	--	--	--
	4-8'	--	--	--	--	--	--	--	--
WL-15	0-4'	4.216	--	--	--	0.1235	--	--	--
	4-8'	--	--	--	--	--	--	--	--
WL-16	0-4'	12.03	--	10.99	--	--	--	--	--
	4-8'	--	--	--	--	--	--	--	--
WL-17	0-4'	11.82	--	8.029	--	0.3212	--	--	--
	4-8'	4.618	--	--	--	--	--	--	--

MERL Soil Results - West Lagoon (pCi/g)									
WL-18	0-4'	12.76	--	--	--	0.1702	--	--	--
	4-8'	--	--	6.984	--	--	--	--	--
WL-19	0-4'	36.08	--	38.62	--	0.5839	--	--	--
	4-8'	--	--	105.3	--	--	--	--	--
WL-20	0-4'	181	--	193.6	--	--	--	--	16.93
WL-21	0-3"	18.94	--	25.79	--	0.2832	--	--	--
WL-22	0-3"	43.22	--	63.13	--	1.037	--	--	0.777

Results not validated

-- Reported result was less than the minimum detectable activity.

WL-19 0-4' and WL-20 0-4' samples sent to NAREL for analysis.

Two depth intervals were selected from each boring to be sampled based on in-situ screening levels.

Abbreviations:

WL - West Lagoon

TABLE D-8
EAST DUMP
MERL SOIL SAMPLING RESULTS

MERL Soil Results - East Dump (pCi/g)									
Boring	**Depth**	**Ra-226**	**Np-237**	**Pb-210**	**Ac-227**	**Cs-137**	**Kr-85**	**Co-60**	**Am-241**
ED-01	0-4'	7.386	--	7.494	--	--	--	--	--
	8-12'	116	--	46.34	--	--	--	--	0.9776
ED-02	0-4'	2.407	--	2.06	--	--	--	--	--
	8-12'	285.1	--	262.2	--	--	--	--	--
ED-03	0-4'	--	--	--	--	0.08105	--	--	--
	8-12'	122.6	15.21	122.1	--	--	--	--	1.537
ED-04	4-8'	889.2	544	844.5	--	--	--	--	7.36
	8-12'	53.16	--	59.74	--	--	--	--	--
	12-16'	85.57	--	68.96	--	--	--	--	--
ED-05	0-4'	--	--	--	--	0.2357	--	--	--
	4-8'	5.848	--	8.972	--	0.1627	--	--	--
ED-06	0-4'	--	--	--	--	0.2944	--	--	--
	8-12'	12.96	--	14.68	--	--	--	--	--
ED-07	0-4'	2.365	--	2.48	--	0.1466	--	--	--
	4-8'	--	--	--	--	0.3064	--	--	--

Data is not validated.
-- Reported result was less than the minimum detectable activity.
ED-02 8-12' and ED-04 4-8' samples sent to NAREL for analysis.
Two depth intervals were selected from each boring to be sampled based on in-situ screening levels.
Abbreviations:
ED - East Dump

TABLE D-9
EAST LAGOON
MERL SOIL SAMPLING RESULTS

MERL Soil Results - East Lagoon (pCi/g)									
Boring	**Depth**	**Ra-226**	**Np-237**	**Pb-210**	**Ac-227**	**Cs-137**	**Kr-85**	**Co-60**	**Am-241**
EL-01	4-8'	29.04	--	37.1	--	7.227	--	--	--
EL-02	4-8'	124.5	--	--	--	18.35	--	--	--
	8-12'	73.69	--	71.42	--	2.828	--	--	--
EL-03	8-12'	44.83	--	55.06	--	6.013	--	--	--
	12-16'	60.32	--	57.49	--	12.5	--	--	--
EL-04	4-6'	13.44	--	17.2	0.1271	1.049	--	--	6.577
EL-05	0-4'	37.39	--	--	--	7.637	--	--	7.124
	8-12'	--	--	5.387	--	1.464	--	--	--
EL-06	0-4'	--	--	9.818	--	1.2	--	--	32.73
	4-8'	--	--	--	--	0.1182	--	--	0.498
EL-07	0-4'	257.3	--	374.6	--	8.937	--	--	5.955
	4-8'	16.33	--	18.66	--	2.521	--	--	--
EL-08	0-4'	236.7	--	244.4	--	75.03	--	--	4.729
	4-8'	--	--	--	--	0.1865	--	--	--
EL-09	0-4'	4.172	--	--	--	--	--	--	--
	4-8'	--	--	--	--	2.261	--	--	--
EL-10	0-4'	476.4	--	561.3	--	11.29	--	--	--
	4-8'	--	--	--	--	--	--	--	--
EL-11	0-4'	730.4	--	402.2	--	6.041	--	--	--
	4-8'	76.05	--	77.76	--	1.645	--	--	--
EL-12	0-4'	932.8	5.48	539	--	111.2	--	--	8.071
	4-8'	415.2	--	316.6	--	113.3	--	--	4.649
EL-13	0-4'	192.2	1.044	85.98	--	9.978	--	--	3.664
	4-8'	35.91	--	35.34	--	1.144	--	--	--
EL-14	0-4'	3,120 3,366	8.853 5.504	3,016 2,905	--	12.59 12.57	--	--	15.54 --
	0-4'	2253	--	1336	--	8.574	--	--	--
	8-12'	31.58	--	23.84	--	0.4073	--	--	--
EL-15	0-4'	79.67	--	91.81	--	17.34	--	--	2.201
	8-12'	6.265	--	5.356	--	0.882	--	--	--
EL-16	0-4'	100.2	--	72.4	--	28.1	--	--	--
	8-12'	6.377	--	5.384	--	1.301	--	--	--
EL-17	8-12'	86.64	--	--	--	0.4299	--	--	0.9261
	12-16'	13.79	--	11.39	--	0.1349	--	--	--
EL-18	0-4'	--	--	--	--	0.09325	--	--	--

MERL Soil Results - East Lagoon (pCi/g)									
	4-8'	--	--	--	--	--	--	--	--
EL-19	0-4'	--	--	--	--	0.1214	--	--	--
	4-8'	--	--	--	--	--	--	--	--
East Lagoon		325 L	--	344 L	--	39.66 L	--	--	3.895 L

:
Data is not validated.
-- Reported result was less than the minimum detectable activity.
L Activity calculated utilizing manufacturers software to model the sample geometry coupled with a manufacturer provided detector characterization.
EL-08 0-4', EL-11 0-4', EL-12 0-4, EL-12 4-8', EL-14 0-4', and EL-16 0-4' samples sent to NAREL for analysis.
Two sample jars were analyzed for sample EL-14 0-4'.
Two depth intervals were selected from each boring to be sampled based on in-situ screening levels.
Abbreviations:
EL - East Lagoon

TABLE D-10
SUMMARY OF CHEMICALS OF POTENTIAL CONCERN (COPCs)
ABOVE BACKGROUND
RESIDENTIAL EXPOSURES TO ALL SOIL - SURVEY UNITS 12, 13, 14 AND 15

COPC	West Dump (SU-12)	West Lagoon (SU-13)	East Dump (SU-14)	East Lagoon (SU-15)
Semivolatile Organic Compounds (µg/kg)				
Benzo(a)anthracene	x	x	x	x
Benzo(a)pyrene	x	x	x	x
Benzo(b)fluoranthene	x	x	x	x
Benzo(k)fluoranthene				x
Dibenzo(a,h)anthracene	x	x	x	x
Indeno(1,2,3-cd)pyrene		x	x	x
Pesticides/PCBs (µg/kg)				
alpha-BHC		x		
Aroclor-1254	x	x		x
Aroclor-1260	x	x		
Aroclor-1268 (1)	x			
Metals (mg/kg)				
Aluminum		x		
Antimony		x		
Arsenic	x	x	x	x
Cadmium	x	x		x
Chromium	x	x	x	x
Cobalt		x		
Copper	x	x		x
Iron	x	x		x
Lead		x		
Mercury		x		
Silver	x	x		x
Thallium		x		x
Vanadium				x
Miscellaneous Parameter (mg/kg)				
Cyanide		x		

TABLE D-10 -Continued
SUMMARY OF CHEMICALS OF POTENTIAL CONCERN (COPCs)
ABOVE BACKGROUND
RESIDENTIAL EXPOSURES TO ALL SOIL - SURVEY UNITS 12, 13, 14 AND 15

COPC	West Dump (SU-12)	West Lagoon (SU-13)	East Dump (SU-14)	East Lagoon (SU-15)
Radionuclides (pCi/g)				
Americium-241 (Am-241)	x	x	x	x
Cesium-137 (Cs-137)	x	x	x	x
Lead-210 (Pb-210)	x	x	x	x
Neptunium-237 (Np-237)	x	x		x
Nickel-63 (Ni-63)				x
Radium-226 (Ra-226)	x	x	x	x
Strontium-90 (Sr-90)	x	x	x	x
Thallium-204 (Tl-204)			x	
Tritium (H3)	x	x	x	x

These contaminants (with the exception of aluminum, iron, and vanadium) are hazardous substances designated at 40 C.F.R. §302.4.

TABLE D-11
SUMMARY OF CANCER RISKS AND HAZARD INDICES
SAFETY LIGHT CORPORATION OU-3

Exposure Unit	Estimated Risks					
	Surface Soil			All Soil		
	All COPCs	Site Related COPCs	Site Related COPCs Above Background	All COPCs	Site Related COPCs	Site Related COPCs Above Background
Survey Unit 12 West Dump						
Cancer Risks				No subsurface samples collected		
Nonradionuclides	5E-04	5E-04	5E-04			
Radionuclides	8E-02	8E-02	8E-02			
Total	8E-02	8E-02	8E-02			
Hazard Indices						
Total	7	7	6			
Survey Unit 13 West Lagoon						
Cancer Risks				No subsurface samples collected		
Nonradionuclides	2E-02	2E-02	2E-02			
Radionuclides	2E-01	2E-01	2E-01			
Total	2E-01	2E-01	2E-01			
Hazard Indices						
Total	53	53	53			
Survey Unit 14 East Dump						
Cancer Risks						
Nonradionuclides	6E-04	6E-04	6E-04	6E-04	6E-04	6E-04
Radionuclides	1E-03	1E-03	1E-03	6E-02	6E-02	6E-02
Total	2E-03	2E-03	2E-03	6E-02	6E-02	6E-02
Hazard Indices						
Total	2	2	1[(1)]	3	3	1[(1)]
Survey Unit 15 East Lagoon						
Cancer Risks						
Nonradionuclides	3E-03	3E-03	3E-03	2E-03	2E-03	2E-03
Radionuclides	2E-02	2E-02	2E-02	2E-02	2E-02	2E-02
Total	2E-02	2E-02	2E-02	2E-02	2E-02	2E-02
Hazard Indices						
Total	9	9	9	11	11	11

Notes:
1 - Target organs hazard index are less than or equal to 0.5.

APPENDIX E

RISK RATIO TABLES

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TABLE E-1

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR *ALL COPCs*
RESIDENTIAL EXPOSURES TO ALL SOIL - SURVEY UNIT 12
SAFETY LIGHT CORPORATION OU-3

Chemical	Incremental Lifetime Carcinogenic Risk (ILCR)			Estimated Non-Carcinogenic Hazard Quotient (HQ)		
	Exposure Point Concentration[1]	Residential Screening Level[2]	Estimated ILCR	Primary Target Organ	Residential Screening Level[2]	Estimated HQ
Semivolatile Organic Compounds (ug/kg)						
Benz(a)anthracene	367	160	2E-06	Cancer	NA	NA
Benzo(a)pyrene	279	16	2E-05	Cancer	NA	NA
Benzo(b)fluoranthene	369	160	2E-06	Cancer	NA	NA
Dibenz(a,h)anthracene	98	16	6E-06	Cancer	NA	NA
Indeno(1,2,3-cd)pyrene	205	160	1E-06	Cancer	NA	NA
Pesticides/PCBs (ug/kg)						
Aroclor-1254	4,400	240	2E-05	Immune System, Dermal, Ocular	1,200	4
Aroclor-1260	750	240	3E-06	Cancer	NA	NA
Aroclor-1268[3]	950	240	4E-06	Cancer	NA	NA
Metals (mg/kg)						
Antimony	8.6	NA	NA	Hematologic	31	0.3
Arsenic	6.55	0.68	1E-05	Cardiovascular System, Dermal	35	0.2
Cadmium	72.2	2,100	3E-08	Urinary	71	1
Chromium[4]	133	0.30	4E-04	None Specified	230	0.6
Cobalt	6.83	420	2E-08	Thyroid	23	0.3
Copper	770	NA	NA	Gastrointestinal System	3,100	0.2
Iron	24,200	NA	NA	Gastrointestinal System	55,000	0.4
Manganese	650	NA	NA	Nervous System	1,800	0.4
Silver	64.8	NA	NA	Dermal	390	0.2
Radionuclides (pCi/g)						
Actinium-227 (Ac-227)	0.0431	0.039	1E-06	Cancer	NA	NA
Americium-241 (Am-241)	15.7	0.049	3E-04	Cancer	NA	NA
Cesium-137 (Cs-137)[5]	1.98	0.047	4E-05	Cancer	NA	NA
Lead-210 (Pb-210)	105	0.0077	1E-02	Cancer	NA	NA
Polonium-210 (Po-210)[6]	105	0.14	8E-04	Cancer	NA	NA
Neptunium-237 (Np-237)[5]	0.12	0.046	3E-06	Cancer	NA	NA
Nickel-63 (Ni-63)	6.12	6.7	9E-07	Cancer	NA	NA
Radium-226 (Ra-226)[5]	425	0.0064	7E-02	Cancer	NA	NA
Strontium-90 (Sr-90)[5]	2.22	0.066	3E-05	Cancer	NA	NA
Tritium (H3)	46.5	0.23	2E-04	Cancer	NA	NA
Uranium-238 (U-238)[5]	1.3	0.05	3E-05	Cancer	NA	NA
Uranium-234 (U-234)[7]	1.3	0.066	2E-05	Cancer	NA	NA
Thorium-234 (Th-234)[5][7]	1.3	44	3E-08	Cancer	NA	NA
		Total ILCR - Chemicals	5E-04		**Total HI**	7
		Total ILCR - Radionuclides	8E-02			
		Total ILCR - Chemicals + Radionuclides	8E-02			

Target Organ HIs	
Total Immune System HI =	4
Total Dermal HI =	4
Total Ocular HI =	4
Total Hematologic HI =	0.3
Total Cardiovascular System HI =	0.2
Total Urinary HI =	1
Total None Specified HI =	0.6
Total Thyroid HI =	0.3
Total Gastrointestinal System HI =	0.7
Total Nervous System HI =	0.4

Notes:
1 - Exposure point concentration is the 95% upper confidence limit calculated by ProUCL Version 5.0.00.
2 - For non-radionuclides screening levels are USEPA RSLs for Chemical Contaminants at Superfund Sites, November 2015. The noncarcinogenic values correspond to a target hazard quotient of 1. Carcinogenic values represent an incremental cancer risk of $1x10^{-6}$.
For radionuclides screening levels are from the Radionuclide Preliminary Remediation Goals (PRG) Summary Table (TR=$1x10^{-6}$) November 2014.
3 - Screening level is for Aroclor-1260.
4 - Screening levels are for hexavalent chromium.
5 - Screening level includes daughter products.
6 - Polonium-210 is assumed to be in equilibrium with Pb-210.
7 - Uranium-234 and Thorium-234 are assumed to be in equilibrium with U-238.
NA - Not applicable. There is no cancer slope factor (CSF) or reference dose (RfD) available for this chemical.

TABLE E-2

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR *SITE RELATED COPCs*
RESIDENTIAL EXPOSURES TO ALL SOIL - SURVEY UNIT 12
SAFETY LIGHT CORPORATION OU-3

Chemical	Incremental Lifetime Carcinogenic Risk (ILCR)			Estimated Non-Carcinogenic Hazard Quotient (HQ)		
	Exposure Point Concentration[1]	Residential Screening Level[2]	Estimated ILCR	Primary Target Organ	Residential Screening Level[2]	Estimated HQ
Semivolatile Organic Compounds (ug/kg)						
Benz(a)anthracene	367	160	2E-06	Cancer	NA	NA
Benzo(a)pyrene	279	16	2E-05	Cancer	NA	NA
Benzo(b)fluoranthene	369	160	2E-06	Cancer	NA	NA
Dibenz(a,h)anthracene	98	16	6E-06	Cancer	NA	NA
Indeno(1,2,3-cd)pyrene	205	160	1E-06	Cancer	NA	NA
Pesticides/PCBs (ug/kg)						
Aroclor-1254	4,400	240	2E-05	Immune System, Dermal, Ocular	1,200	4
Aroclor-1260	750	240	3E-06	Cancer	NA	NA
Aroclor-1268[3]	950	240	4E-06	Cancer	NA	NA
Metals (mg/kg)						
Antimony	8.6	NA	NA	Hematologic	31	0.3
Arsenic	6.55	0.68	1E-05	Cardiovascular System, Dermal	35	0.2
Cadmium	72.2	2,100	3E-08	Urinary	71	1
Chromium[4]	133	0.30	4E-04	None Specified	230	0.6
Cobalt	6.83	420	2E-08	Thyroid	23	0.3
Copper	770	NA	NA	Gastrointestinal System	3,100	0.2
Iron	24,200	NA	NA	Gastrointestinal System	55,000	0.4
Manganese	650	NA	NA	Nervous System	1,800	0.4
Silver	64.8	NA	NA	Dermal	390	0.2
Radionuclides (pCi/g)						
Actinium-227 (Ac-227)	0.0431	0.039	1E-06	Cancer	NA	NA
Americium-241 (Am-241)	15.7	0.049	3E-04	Cancer	NA	NA
Cesium-137 (Cs-137)[5]	1.98	0.047	4E-05	Cancer	NA	NA
Lead-210 (Pb-210)	105	0.0077	1E-02	Cancer	NA	NA
Polonium-210 (Po-210)[6]	105	0.14	8E-04	Cancer	NA	NA
Neptunium-237 (Np-237)[5]	0.12	0.046	3E-06	Cancer	NA	NA
Nickel-63 (Ni-63)	6.12	6.7	9E-07	Cancer	NA	NA
Radium-226 (Ra-226)[5]	425	0.0064	7E-02	Cancer	NA	NA
Strontium-90 (Sr-90)[5]	2.22	0.066	3E-05	Cancer	NA	NA
Tritium (H3)	46.5	0.23	2E-04	Cancer	NA	NA
Uranium-238 (U-238)[5]	--	0.05	--	Cancer	NA	NA
Uranium-234 (U-234)[7]	--	0.066	--	Cancer	NA	--
Thorium-234 (Th-234)[5][7]	--	44	--	Cancer	NA	--
		Total ILCR - Chemicals	5E-04		**Total HI**	7
		Total ILCR - Radionuclides	8E-02			
		Total ILCR - Chemicals + Radionuclides	8E-02			

Target Organ HIs	
Total Immune System HI =	4
Total Dermal HI =	4
Total Ocular HI =	4
Total Hematologic HI =	0.3
Total Cardiovascular System HI =	0.2
Total Urinary HI =	1
Total None Specified HI =	0.6
Total Thyroid HI =	0.3
Total Gastrointestinal System HI =	0.7
Total Nervous System HI =	0.4

Notes:
1 - Exposure point concentration is the 95% upper confidence limit calculated by ProUCL Version 5.0.00.
2 - For non-radionuclides screening levels are USEPA RSLs for Chemical Contaminants at Superfund Sites, November 2015. The noncarcinogenic values correspond to a target hazard quotient of 1. Carcinogenic values represent an incremental cancer risk of $1x10^{-5}$.
For radionuclides screening levels are from the Radionuclide Preliminary Remediation Goals (PRG) Summary Table (TR=$1x10^{-5}$) November 2014.
3 - Screening level is for Aroclor-1260.
4 - Screening levels are for hexavalent chromium.
5 - Screening level includes daughter products.
6 - Polonium-210 is assumed to be in equilibrium with Pb-210.
7 - Uranium-234 and Thorium-234 are assumed to be in equilibrium with U-238.
NA - Not applicable. There is no cancer slope factor (CSF) or reference dose (RfD) available for this chemical.

TABLE E-3

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR *SITE RELATED COPCs ABOVE BACKGROUND*[1]
RESIDENTIAL EXPOSURES TO ALL SOIL - SURVEY UNIT 12
SAFETY LIGHT CORPORATION OU-3

Chemical	Incremental Lifetime Carcinogenic Risk (ILCR)			Estimated Non-Carcinogenic Hazard Quotient (HQ)		
	Exposure Point Concentration[2]	Residential Screening Level[3]	Estimated ILCR	Primary Target Organ	Residential Screening Level[2]	Estimated HQ
Semivolatile Organic Compounds (ug/kg)						
Benz(a)anthracene	367	160	2E-06	Cancer	NA	NA
Benzo(a)pyrene	279	16	2E-05	Cancer	NA	NA
Benzo(b)fluoranthene	369	160	2E-06	Cancer	NA	NA
Dibenz(a,h)anthracene	98	16	6E-06	Cancer	NA	NA
Indeno(1,2,3-cd)pyrene	205	160	1E-06	Cancer	NA	NA
Pesticides/PCBs (ug/kg)						
Aroclor-1254	4,400	240	2E-05	Immune System, Dermal, Ocular	1,200	4
Aroclor-1260	750	240	3E-06	Cancer	NA	NA
Aroclor-1268[4]	950	240	4E-06	Cancer	NA	NA
Metals (mg/kg)						
Antimony	8.6	NA	NA	Hematologic	31	0.3
Arsenic	- -	0.68	- -	Cardiovascular System, Dermal	35	- -
Cadmium	72.2	2,100	3E-08	Urinary	71	1
Chromium[5]	133	0.30	4E-04	None Specified	230	0.6
Cobalt	- -	420	- -	Thyroid	23	- -
Copper	770	NA	NA	Gastrointestinal System	3,100	0.2
Iron	24,200	NA	NA	Gastrointestinal System	55,000	0.4
Manganese	- -	NA	- -	Nervous System	1,800	- -
Silver	64.8	NA	NA	Dermal	390	0.2
Radionuclides (pCi/g)						
Actinium-227 (Ac-227)	- -	0.039	- -	Cancer	NA	NA
Americium-241 (Am-241)	15.7	0.049	3E-04	Cancer	NA	NA
Cesium-137 (Cs-137)[6]	1.98	0.047	4E-05	Cancer	NA	NA
Lead-210 (Pb-210)	105	0.0077	1E-02	Cancer	NA	NA
Polonium-210 (Po-210)[7]	105	0.14	8E-04	Cancer	NA	NA
Neptunium-237 (Np-237)[6]	0.12	0.046	3E-06	Cancer	NA	NA
Nickel-63 (Ni-63)	6.12	6.7	9E-07	Cancer	NA	NA
Radium-226 (Ra-226)[6]	425	0.0064	7E-02	Cancer	NA	NA
Strontium-90 (Sr-90)[6]	2.22	0.066	3E-05	Cancer	NA	NA
Tritium (H3)	46.5	0.23	2E-04	Cancer	NA	NA
Uranium-238 (U-238)[6]	- -	0.05	- -	Cancer	NA	NA
Uranium-234 (U-234)[8]	- -	0.066	- -	Cancer	NA	- -
Thorium-234 (Th-234)[6][8]	- -	44	- -	Cancer	NA	- -
		Total ILCR - Chemicals	5E-04		**Total HI**	6
		Total ILCR - Radionuclides	8E-02			
		Total ILCR - Chemicals + Radionuclides	8E-02			

Target Organ HIs	
Total Immune System HI =	4
Total Dermal HI =	4
Total Ocular HI =	4
Total Hematologic HI =	0.3
Total Urinary HI =	1
Total None Specified HI =	0.6
Total Gastrointestinal System HI =	0.7

Notes:
1 - Background for non-radionuclides was determined using the background evaluation presented in the risk assessment presented in the 2008 RI. The 95 percent upper prediction limit (UPL) was used to determine background for radionuclides (See COPC selection tables).
2 - Exposure point concentration is the 95% upper confidence limit calculated by ProUCL Version 5.0.00.
3 - For non-radionuclides screening levels are USEPA RSLs for Chemical Contaminants at Superfund Sites, November 2015. The noncarcinogenic values correspond to a target hazard quotient of 1. Carcinogenic values represent an incremental cancer risk of $1x10^{-6}$.
For radionuclides screening levels are from the Radionuclide Preliminary Remediation Goals (PRG) Summary Table (TR=$1x10^{-6}$) November 2014.
4 - Screening level is for Aroclor-1260.
5 - Screening levels are for hexavalent chromium.
6 - Screening level includes daughter products.
7 - Polonium-210 is assumed to be in equilibrium with Pb-210.
8 - Uranium-234 and Thorium-234 are assumed to be in equilibrium with U-238.
NA - Not applicable. There is no cancer slope factor (CSF) or reference dose (RfD) available for this chemical.

TABLE E-4

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR *ALL COPCs*
RESIDENTIAL EXPOSURES TO SURFACE SOIL (0 - 2 FEET) - SURVEY UNIT 13
SAFETY LIGHT CORPORATION OU-3

Chemical	Incremental Lifetime Carcinogenic Risk (ILCR)			Estimated Non-Carcinogenic Hazard Quotient (HQ)		
	Exposure Point Concentration[1]	Residential Screening Level[2]	Estimated ILCR	Primary Target Organ	Residential Screening Level[2]	Estimated HQ
Semivolatile Organic Compounds (ug/kg)						
Benzo(a)anthracene	1,000	160	6E-06	Cancer	NA	NA
Benzo(a)pyrene	900	16	6E-05	Cancer	NA	NA
Benzo(b)fluoranthene	1,700	160	1E-05	Cancer	NA	NA
Dibenzo(a,h)anthracene	330	16	2E-05	Cancer	NA	NA
Indeno(1,2,3-cd)pyrene	1,000	160	6E-06	Cancer	NA	NA
Pesticides/PCBs (ug/kg)						
alpha-BHC	500	86	6E-06	Liver	510,000	0.001
Aroclor-1254	16,000	240	7E-05	Immune	1,200	13
Aroclor-1260	13,000	240	5E-05	Cancer	NA	NA
Heptachlor Epoxide	81	70	1E-06	Liver	1,000	0.08
Metals (mg/kg)						
Aluminum	12,200	NA	NA	Central Nervous System	77,000	0.2
Antimony	69	NA	NA	Blood	31	2
Arsenic	20.9	0.68	3E-05	Skin, Cardiovascular System	35	0.6
Cadmium	134	2100	6E-08	Kidney	71	2
Chromium[3][4]	5780	0.3	2E-02	None Specified	230	25
Cobalt	19.2	420	5E-08	Thyroid	23	0.8
Copper	4,660	NA	NA	Gastrointestinal System	3100	2
Iron	48,000	NA	NA	Gastrointestinal System	55,000	0.9
Lead[5]	885	NA	NA	--	NA	NA
Manganese	479	NA	NA	Central Nervous System	1,800	0.3
Mercury[6]	45.7	NA	NA	Central Nervous System	23	2
Nickel	560	15000	4E-08	Body Weight	1,500	0.4
Silver	187	NA	NA	Skin	390	0.5
Thallium[7]	1.5	NA	NA	Skin	0.78	2
Vanadium	53.5	NA	NA	Kidney	390	0.1
Miscellaneous Parameters (mg/kg)						
Cyanide	4.6	NA	NA	Thyroid, Central Nervous System	2.7	2
Radionuclides (pCi/g)						
Americium-241 (Am-241)	27.6	0.049	6E-04	Cancer	NA	NA
Cesium-137 (Cs-137)[8]	1.35	0.047	3E-05	Cancer	NA	NA
Lead-210 (Pb-210)[4]	169	0.0077	2E-02	Cancer	NA	NA
Polonium-210 (Po-210)[9]	169	0.14	1E-03	Cancer	NA	NA
Neptunium-237 (Np-237)[8]	0.23	0.046	5E-06	Cancer	NA	NA
Radium-226 (Ra-226)[8]	1440	0.0064	2E-01	Cancer	NA	NA
Strontium-90 (Sr-90)[8]	0.434	0.066	7E-06	Cancer	NA	NA
Tritium (H3)	75.1	0.23	3E-04	Cancer	NA	NA
Uranium-238 (U-238)[8]	0.636	0.05	1E-05	Cancer	NA	NA
Uranium-234 (U-234)[10]	0.636	0.066	1E-05	Cancer	NA	NA
		Total ILCR - Chemicals	2E-02		**Total HI**	53
		Total ILCR - Radionuclides	2E-01			
		Total ILCR - Chemicals + Radionuclides	2E-01			

Target Organ HIs	
Total Blood HI =	2
Total Body Weight HI =	0.4
Total Cardiovascular System HI =	0.6
Total Central Nervous System HI =	4
Total Gastrointestinal System HI =	2
Total Immune HI =	13
Total Kidney HI =	2
Total Liver HI =	0.08
Total Skin HI =	3
Total Thyroid HI =	3
Total None Specified HI =	25

Notes:
1 - Exposure point concentration is the 95% upper confidence limit calculated by ProUCL Version 5.0.00, if applicable, or the maximum detected concentration.
2 - For non-radionuclides screening levels are USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, November 2015.
The noncarcinogenic values correspond to a target hazard quotient of 1. Carcinogenic values represent an incremental cancer risk of $1x10^{-5}$.
For radionuclides screening levels are from the Radionuclide Preliminary Remediation Goals (PRG) Summary Table (TR=1E-6), November 2014.
3 - Screening levels are for hexavalent chromium.
4 - Risk exceeded 1E-02; therefore, the following alternate equation was used: ILCR = 1-[exp(-Exposure Point Concentration*1E-06/RSL)].
5 - Risks for exposures to lead were evaluated using the IEUBK and ALM models.
6 - Screening levels are for mercuric chloride (and other mercury salts).
7 - Uncertainty is associated with the toxicity criterion for thallium (see text).
8 - Screening level includes daughter products.
9 - Polonium-210 is assumed to be in equilibrium with Pb-210.

TABLE E-5

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR *SITE RELATED COPCs*
RESIDENTIAL EXPOSURES TO SURFACE SOIL (0 - 2 FEET) - SURVEY UNIT 13
SAFETY LIGHT CORPORATION OU-3

Chemical	Incremental Lifetime Carcinogenic Risk (ILCR)			Estimated Non-Carcinogenic Hazard Quotient (HQ)		
	Exposure Point Concentration[1]	Residential Screening Level[2]	Estimated ILCR	Primary Target Organ	Residential Screening Level[2]	Estimated HQ
Semivolatile Organic Compounds (ug/kg)						
Benzo(a)anthracene	1,000	160	6E-06	Cancer	NA	NA
Benzo(a)pyrene	900	16	6E-05	Cancer	NA	NA
Benzo(b)fluoranthene	1,700	160	1E-05	Cancer	NA	NA
Dibenzo(a,h)anthracene	330	16	2E-05	Cancer	NA	NA
Indeno(1,2,3-cd)pyrene	1,000	160	6E-06	Cancer	NA	NA
Pesticides/PCBs (ug/kg)						
alpha-BHC	500	86	6E-06	Liver	510,000	0.001
Aroclor-1254	16,000	240	7E-05	Immune	1,200	13
Aroclor-1260	13,000	240	5E-05	Cancer	NA	NA
Heptachlor Epoxide	81	70	1E-06	Liver	1,000	0.08
Metals (mg/kg)						
Aluminum	12,200	NA	NA	Central Nervous System	77,000	0.2
Antimony	69	NA	NA	Blood	31	2
Arsenic	20.9	0.68	3E-05	Skin, Cardiovascular System	35	0.6
Cadmium	134.0	2100	6E-08	Kidney	71	2
Chromium[3][4]	5780	0.3	2E-02	None Specified	230	25
Cobalt	19.2	420	5E-08	Thyroid	23	0.8
Copper	4660	NA	NA	Gastrointestinal System	3100	2
Iron	48,000	NA	NA	Gastrointestinal System	55,000	0.9
Lead[5]	885	NA	NA	–	NA	NA
Manganese	479	NA	NA	Central Nervous System	1,800	0.3
Mercury[6]	45.7	NA	NA	Central Nervous System	23	2
Nickel	560	15000	4E-08	Body Weight	1,500	0.4
Silver	187	NA	NA	Skin	390	0.5
Thallium[7]	1.5	NA	NA	Skin	0.78	2
Vanadium	53.5	NA	NA	Kidney	390	0.1
Miscellaneous Parameters (mg/kg)						
Cyanide	4.6	NA	NA	Thyroid, Central Nervous System	2.7	2
Radionuclides (pCi/g)						
Americium-241 (Am-241)	27.6	0.049	6E-04	Cancer	NA	NA
Cesium-137 (Cs-137)[8]	1.35	0.047	3E-05	Cancer	NA	NA
Lead-210 (Pb-210)[4]	169	0.0077	2E-02	Cancer	NA	NA
Polonium-210 (Po-210)[9]	169	0.14	1E-03	Cancer	NA	NA
Neptunium-237 (Np-237)[8]	0.23	0.046	5E-06	Cancer	NA	NA
Radium-226 (Ra-226)[8]	1440	0.0064	2E-01	Cancer	NA	NA
Strontium-90 (Sr-90)[8]	0.434	0.066	7E-06	Cancer	NA	NA
Tritium (H3)	75.1	0.23	3E-04	Cancer	NA	NA
Uranium-238 (U-238)[8]	-	0.05	-	Cancer	NA	NA
Uranium-234 (U-234)[9]	-	0.066	-	Cancer	NA	NA
		Total ILCR - Chemicals	2E-02		**Total HI**	53
		Total ILCR - Radionuclides	2E-01			
		Total ILCR - Chemicals + Radionuclides	2E-01			

Target Organ HIs	
Total Blood HI =	2
Total Body Weight HI =	0.4
Total Cardiovascular System HI =	0.6
Total Central Nervous System HI =	4
Total Gastrointestinal System HI =	2
Total Immune HI =	13
Total Kidney HI =	2
Total Liver HI =	0.08
Total Skin HI =	3
Total Thyroid HI =	3
Total None Specified HI =	25

Notes:
1 - Exposure point concentration is the 95% upper confidence limit calculated by ProUCL Version 5.0.00, if applicable, or the maximum detected concentration.
2 - For non-radionuclides screening levels are USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, November 2015.
The noncarcinogenic values correspond to a target hazard quotient of 1. Carcinogenic values represent an incremental cancer risk of $1x10^{-6}$.
For radionuclides screening levels are from the Radionuclide Preliminary Remediation Goals (PRG) Summary Table (TR=1E-6), November 2014.
3 - Screening levels are for hexavalent chromium.
4 - Risk exceeded 1E-02; therefore, the following alternate equation was used: ILCR = 1-[exp(-Exposure Point Concentration*1E-06/RSL)].
5 - Risks for exposures to lead were evaluated using the IEUBK and ALM models.
6 - Screening levels are for mercuric chloride (and other mercury salts).
7 - Uncertainty is associated with the toxicity criterion for thallium (see text).

TABLE E-6

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR *SITE RELATED COPCs ABOVE BACKGROUND*[1]
RESIDENTIAL EXPOSURES TO SURFACE SOIL (0 - 2 FEET) - SURVEY UNIT 13
SAFETY LIGHT CORPORATION OU-3

Chemical	Incremental Lifetime Carcinogenic Risk (ILCR)			Estimated Non-Carcinogenic Hazard Quotient (HQ)		
	Exposure Point Concentration[2]	Residential Screening Level[3]	Estimated ILCR	Primary Target Organ	Residential Screening Level[3]	Estimated HQ
Semivolatile Organic Compounds (ug/kg)						
Benzo(a)anthracene	1,000	160	6E-06	Cancer	NA	NA
Benzo(a)pyrene	900	16	6E-05	Cancer	NA	NA
Benzo(b)fluoranthene	1,700	160	1E-05	Cancer	NA	NA
Dibenzo(a,h)anthracene	330	16	2E-05	Cancer	NA	NA
Indeno(1,2,3-cd)pyrene	1,000	160	6E-06	Cancer	NA	NA
Pesticides/PCBs (ug/kg)						
alpha-BHC	500	86	6E-06	Liver	510,000	0.001
Aroclor-1254	16,000	240	7E-05	Immune	1,200	13
Aroclor-1260	13,000	240	5E-05	Cancer	NA	NA
Heptachlor Epoxide	81	70	1E-06	Liver	1,000	0.08
Metals (mg/kg)						
Aluminum	12,200	NA	NA	Central Nervous System	77,000	0.2
Antimony	69	NA	NA	Blood	31	2
Arsenic	20.9	0.68	3E-05	Skin, Cardiovascular System	35	0.6
Cadmium	134.0	2100	6E-08	Kidney	71	2
Chromium[4][5]	5780	0.3	2E-02	None Specified	230	25
Cobalt	19.2	420	5E-08	Thyroid	23	0.8
Copper	4660	NA	NA	Gastrointestinal System	3100	2
Iron	48,000	NA	NA	Gastrointestinal System	55,000	0.9
Lead[6]	885	NA	NA	–	NA	NA
Manganese	-	NA	NA	Central Nervous System	1,800	-
Mercury[7]	45.7	NA	NA	Central Nervous System	23	2
Nickel	560	15000	4E-08	Body Weight	1,500	0.4
Silver	187	NA	NA	Skin	390	0.5
Thallium[8]	1.5	NA	NA	Skin	0.78	2
Vanadium	53.5	NA	NA	Kidney	390	0.1
Miscellaneous Parameters (mg/kg)						
Cyanide	4.6	NA	NA	Thyroid, Central Nervous System	2.7	2
Radionuclides (pCi/g)						
Americium-241 (Am-241)	27.6	0.049	6E-04	Cancer	NA	NA
Cesium-137 (Cs-137)[9]	1.35	0.047	3E-05	Cancer	NA	NA
Lead-210 (Pb-210)[4]	169	0.0077	2E-02	Cancer	NA	NA
Polonium-210 (Po-210)[10]	169	0.14	1E-03	Cancer	NA	NA
Neptunium-237 (Np-237)[9]	0.23	0.046	5E-06	Cancer	NA	NA
Radium-226 (Ra-226)[9]	1440	0.0064	2E-01	Cancer	NA	NA
Strontium-90 (Sr-90)[9]	0.434	0.066	7E-06	Cancer	NA	NA
Tritium (H3)	75.1	0.23	3E-04	Cancer	NA	NA
Uranium-238 (U-238)[9]	-	0.05	-	Cancer	NA	NA
Uranium-234 (U-234)[12]	-	0.066	-	Cancer	NA	NA
		Total ILCR - Chemicals	2E-02		**Total HI**	53
		Total ILCR - Radionuclides	2E-01			
		Total ILCR - Chemicals + Radionuclides	2E-01			

Target Organ HIs	
Total Blood HI =	2
Total Body Weight HI =	0.4
Total Cardiovascular System HI =	0.6
Total Central Nervous System HI =	4
Total Gastrointestinal System HI =	2
Total Immune HI =	13
Total Kidney HI =	2
Total Liver HI =	0.08
Total Skin HI =	3
Total Thyroid HI =	3
Total None Specified HI =	25

Notes:
1 - Background for non-radionuclides was determined using the background evaluation presented in the risk assessment presented in the 2008 RI.
The 95 percent upper prediction limit (UPL) was used to determine background for radionuclides (See COPC selection tables).
2 - Exposure point concentration is the 95% upper confidence limit calculated by ProUCL Version 5.0.00, if applicable, or the maximum detected concentration.
3 - For non-radionuclides screening levels are USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites, November 2015.
The noncarcinogenic values correspond to a target hazard quotient of 1. Carcinogenic values represent an incremental cancer risk of $1x10^{-6}$.
For radionuclides screening levels are from the Radionuclide Preliminary Remediation Goals (PRG) Summary Table (TR=1E-6), November 2014.
4 - Screening levels are for hexavalent chromium.
5 - Risk exceeded 1E-02; therefore, the following alternate equation was used: ILCR = 1-[exp(-Exposure Point Concentration*1E-06/RSL)].
6 - Risks for exposures to lead were evaluated using the IEUBK and ALM models.

TABLE E-7

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR *ALL COPCs*
RESIDENTIAL EXPOSURES TO SURFACE SOIL (0 - 2 FEET) - SURVEY UNIT 14
SAFETY LIGHT CORPORATION OU-3

Chemical	Incremental Lifetime Carcinogenic Risk (ILCR)			Estimated Non-Carcinogenic Hazard Quotient (HQ)		
	Exposure Point Concentration[1]	Residential Screening Level[2]	Estimated ILCR	Primary Target Organ	Residential Screening Level[2]	Estimated HQ
Semivolatile Organic Compounds (ug/kg)						
Benzo(a)anthracene	5,600	160	4E-05	Cancer	NA	NA
Benzo(a)pyrene	5,600	16	4E-04	Cancer	NA	NA
Benzo(b)fluoranthene	7,900	160	5E-05	Cancer	NA	NA
Benzo(k)fluoranthene	2,100	1,600	1E-06	Cancer	NA	NA
Dibenzo(a,h)anthracene	850	16	5E-05	Cancer	NA	NA
Indeno(1,2,3-cd)pyrene	3,700	160	2E-05	Cancer	NA	NA
Metals (mg/kg)						
Aluminum	8,510	NA	NA	Central Nervous System	77,000	0.1
Arsenic	19.0	0.68	3E-05	Skin, Cardiovascular System	35	0.5
Chromium[3]	19.7	0.30	7E-05	None Specified	230	0.09
Cobalt	8.8	420	2E-08	Thyroid	23	0.4
Iron	20,200	NA	NA	Gastrointestinal System	55,000	0.4
Manganese	760	NA	NA	Central Nervous System	1,800	0.4
Thallium	0.42	NA	NA	Skin	0.78	0.5
Radionuclides (pCi/g)						
Actinium-227 (Ac-227)	0.031	0.039	8E-07	Cancer	NA	NA
Americium-241 (Am-241)	0.149	0.049	3E-06	Cancer	NA	NA
Cesium-137 (Cs-137)[4]	0.616	0.047	1E-05	Cancer	NA	NA
Lead-210 (Pb-210)	2.22	0.0077	3E-04	Cancer	NA	NA
Polonium-210 (Po-210)[5]	2.22	0.14	2E-05	Cancer	NA	NA
Nickel-63 (Ni-63)	6.20	6.7	9E-07	Cancer	NA	NA
Radium-226 (Ra-226)[4]	5.67	0.0064	9E-04	Cancer	NA	NA
Strontium-90 (Sr-90)[4]	0.524	0.066	8E-06	Cancer	NA	NA
Tritium (H3)	20.1	0.23	9E-05	Cancer	NA	NA
Uranium-238 (U-238)[4]	0.893	0.05	2E-05	Cancer	NA	NA
Uranium-234 (U-234)[6]	0.893	0.066	1E-05	Cancer	NA	NA
		Total ILCR - Chemicals	6E-04		**Total HI**	2
		Total ILCR - Radionuclides	1E-03			
		Total ILCR - Chemicals + Radionuclides	2E-03			

Target Organ HIs	
Total Cardiovascular System HI =	0.5
Total Central Nervous System HI =	0.5
Total Gastrointestinal System HI =	0.4
Total Skin HI =	1
Total Thyroid HI =	0.4
Total None Specified HI =	0.09

Notes:
1 - Exposure point concentration is the 95% upper confidence limit calculated by ProUCL Version 5.0.00.
2 - For non-radionuclides screening levels are USEPA RSLs for Chemical Contaminants at Superfund Sites, June 2015. The noncarcinogenic values correspond to a target hazard quotient of 1. Carcinogenic values represent an incremental cancer risk of $1x10^{-6}$.
For radionuclides screening levels are from the Radionuclide Preliminary Remediation Goals (PRG) Summary Table (TR=1E-6) November 2014.
3 - Screening levels are for hexavalent chromium.
4 - Screening level includes daughter products.
5 - Polonium-210 is assumed to be in equilibrium with Pb-210.
6 - Uranium-234 is assumed to be in equilibrium with U-238.
NA - Not applicable. There are no cancer slope factors (CSF) or reference dose (RfD) available for this chemical.

TABLE E-8

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR *SITE RELATED COPCs*
RESIDENTIAL EXPOSURES TO SURFACE SOIL (0 - 2 FEET) - SURVEY UNIT 14
SAFETY LIGHT CORPORATION OU-3

Chemical	Incremental Lifetime Carcinogenic Risk (ILCR)			Estimated Non-Carcinogenic Hazard Quotient (HQ)		
	Exposure Point Concentration[1]	Residential Screening Level[2]	Estimated ILCR	Primary Target Organ	Residential Screening Level[2]	Estimated HQ
Semivolatile Organic Compounds (ug/kg)						
Benzo(a)anthracene	5,600	160	4E-05	Cancer	NA	NA
Benzo(a)pyrene	5,600	16	4E-04	Cancer	NA	NA
Benzo(b)fluoranthene	7,900	160	5E-05	Cancer	NA	NA
Benzo(k)fluoranthene	2,100	1,600	1E-06	Cancer	NA	NA
Dibenzo(a,h)anthracene	850	16	5E-05	Cancer	NA	NA
Indeno(1,2,3-cd)pyrene	3,700	160	2E-05	Cancer	NA	NA
Metals (mg/kg)						
Aluminum	8,510	NA	NA	Central Nervous System	77,000	0.1
Arsenic	19.0	0.68	3E-05	Skin, Cardiovascular System	35	0.5
Chromium[3]	19.7	0.30	7E-05	None Specified	230	0.09
Cobalt	8.8	420	2E-08	Thyroid	23	0.4
Iron	20,200	NA	NA	Gastrointestinal System	55,000	0.4
Manganese	760	NA	NA	Central Nervous System	1,800	0.4
Thallium	0.42	NA	NA	Skin	0.78	0.5
Radionuclides (pCi/g)						
Actinium-227 (Ac-227)	0.031	0.039	8E-07	Cancer	NA	NA
Americium-241 (Am-241)	0.149	0.049	3E-06	Cancer	NA	NA
Cesium-137 (Cs-137)[4]	0.616	0.047	1E-05	Cancer	NA	NA
Lead-210 (Pb-210)	2.22	0.0077	3E-04	Cancer	NA	NA
Polonium-210 (Po-210)[5]	2.22	0.14	2E-05	Cancer	NA	NA
Nickel-63 (Ni-63)	6.20	6.7	9E-07	Cancer	NA	NA
Radium-226 (Ra-226)[4]	5.67	0.0064	9E-04	Cancer	NA	NA
Strontium-90 (Sr-90)[4]	0.524	0.066	8E-06	Cancer	NA	NA
Tritium (H3)	20.1	0.23	9E-05	Cancer	NA	NA
Uranium-238 (U-238)[4]	-	0.05	-	Cancer	NA	-
Uranium-234 (U-234)[6]	-	0.066	-	Cancer	NA	-
		Total ILCR - Chemicals	6E-04		**Total HI**	2
		Total ILCR - Radionuclides	1E-03			
		Total ILCR - Chemicals + Radionuclides	2E-03			

Target Organ HIs	
Total Cardiovascular System HI =	0.5
Total Central Nervous System HI =	0.5
Total Gastrointestinal System HI =	0.4
Total Skin HI =	1
Total Thyroid HI =	0.4
Total None Specified HI =	0.09

Notes:
1 - Exposure point concentration is the 95% upper confidence limit calculated by ProUCL Version 5.0.00.
2 - For non-radionuclides screening levels are USEPA RSLs for Chemical Contaminants at Superfund Sites, June 2015. The noncarcinogenic values correspond to a target hazard quotient of 1. Carcinogenic values represent an incremental cancer risk of $1x10^{-6}$.
For radionuclides screening levels are from the Radionuclide Preliminary Remediation Goals (PRG) Summary Table (TR=1E-6) November 2014.
3 - Screening levels are for hexavalent chromium.
4 - Screening level includes daughter products.
5 - Polonium-210 is assumed to be in equilibrium with Pb-210.
6 - Uranium-234 is assumed to be in equilibrium with U-238.
NA - Not applicable. There are no cancer slope factors (CSF) or reference dose (RfD) available for this chemical.

TABLE E-9

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR *SITE RELATED COPCs ABOVE BACKGROUND*[1]
RESIDENTIAL EXPOSURES TO SURFACE SOIL (0 - 2 FEET) - SURVEY UNIT 14
SAFETY LIGHT CORPORATION OU-3

Chemical	Incremental Lifetime Carcinogenic Risk (ILCR)			Estimated Non-Carcinogenic Hazard Quotient (HQ)		
	Exposure Point Concentration[2]	Residential Screening Level[3]	Estimated ILCR	Primary Target Organ	Residential Screening Level[3]	Estimated HQ
Semivolatile Organic Compounds (ug/kg)						
Benzo(a)anthracene	5,600	160	4E-05	Cancer	NA	NA
Benzo(a)pyrene	5,600	16	4E-04	Cancer	NA	NA
Benzo(b)fluoranthene	7,900	160	5E-05	Cancer	NA	NA
Benzo(k)fluoranthene	2,100	1,600	1E-06	Cancer	NA	NA
Dibenzo(a,h)anthracene	850	16	5E-05	Cancer	NA	NA
Indeno(1,2,3-cd)pyrene	3,700	160	2E-05	Cancer	NA	NA
Metals (mg/kg)						
Aluminum	-	NA	-	Central Nervous System	77,000	-
Arsenic	19.0	0.68	3E-05	Skin, Cardiovascular System	35	0.5
Chromium[4]	19.7	0.30	7E-05	None Specified	230	0.09
Cobalt	8.8	420	2E-08	Thyroid	23	0.4
Iron	20,200	NA	NA	Gastrointestinal System	55,000	0.4
Manganese	-	NA	-	Central Nervous System	1,800	-
Thallium	-	NA	-	Skin	0.78	-
Radionuclides (pCi/g)						
Actinium-227 (Ac-227)	-	0.039	-	Cancer	NA	NA
Americium-241 (Am-241)	0.149	0.049	3E-06	Cancer	NA	NA
Cesium-137 (Cs-137)[5]	0.616	0.047	1E-05	Cancer	NA	NA
Lead-210 (Pb-210)	2.22	0.0077	3E-04	Cancer	NA	NA
Polonium-210 (Po-210)[6]	2.22	0.14	2E-05	Cancer	NA	NA
Nickel-63 (Ni-63)	6.20	6.7	9E-07	Cancer	NA	NA
Radium-226 (Ra-226)[5]	5.67	0.0064	9E-04	Cancer	NA	NA
Strontium-90 (Sr-90)[5]	0.524	0.066	8E-06	Cancer	NA	NA
Tritium (H3)	20.1	0.23	9E-05	Cancer	NA	NA
Uranium-238 (U-238)[5]	-	0.05	-	Cancer	NA	NA
Uranium-234 (U-234)[6]	-	0.066	-	Cancer	NA	NA
		Total ILCR - Chemicals	6E-04		**Total HI**	1
		Total ILCR - Radionuclides	1E-03			
		Total ILCR - Chemicals + Radionuclides	2E-03			

Target Organ HIs	
Total Cardiovascular System HI =	0.5
Total Gastrointestinal System HI =	0.4
Total Skin HI =	0.5
Total Thyroid HI =	0.4
Total None Specified HI =	0.09

Notes:
1 - Background for non-radionuclides was determined using the background evaluation presented in the risk assessment presented in the 2008 RI. The 95 percent upper prediction limit (UPL) was used to determine background for radionuclides (See COPC selection tables).
2 - Exposure point concentration is the 95% upper confidence limit calculated by ProUCL Version 5.0.00.
3 - For non-radionuclides screening levels are USEPA RSLs for Chemical Contaminants at Superfund Sites, June 2015. The noncarcinogenic values correspond to a target hazard quotient of 1. Carcinogenic values represent an incremental cancer risk of $1x10^{-6}$.
For radionuclides screening levels are from the Radionuclide Preliminary Remediation Goals (PRG) Summary Table (TR=1E-6) November 2014.
4 - Screening levels are for hexavalent chromium.
5 - Screening level includes daughter products.
6 - Polonium-210 is assumed to be in equilibrium with Pb-210.

TABLE E-10

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR *ALL COPCs*
RESIDENTIAL EXPOSURES TO ALL SOIL (0 - 10 FEET) - SURVEY UNIT 14
SAFETY LIGHT CORPORATION OU-3

Chemical	Incremental Lifetime Carcinogenic Risk (ILCR)			Estimated Non-Carcinogenic Hazard Quotient (HQ)		
	Exposure Point Concentration[1]	Residential Screening Level[2]	Estimated ILCR	Primary Target Organ	Residential Screening Level[2]	Estimated HQ
Semivolatile Organic Compounds (ug/kg)						
Benzo(a)anthracene	5,600	160	4E-05	Cancer	NA	NA
Benzo(a)pyrene	5,600	16	4E-04	Cancer	NA	NA
Benzo(b)fluoranthene	7,900	160	5E-05	Cancer	NA	NA
Benzo(k)fluoranthene	2,100	1,600	1E-06	Cancer	NA	NA
Dibenzo(a,h)anthracene	582	16	4E-05	Cancer	NA	NA
Indeno(1,2,3-cd)pyrene	2,544	160	2E-05	Cancer	NA	NA
Metals (mg/kg)						
Aluminum	8,510	NA	NA	Central Nervous System	77,000	0.1
Arsenic	16.0	0.68	2E-05	Skin, Cardiovascular System	35	0.5
Chromium[3]	19.0	0.30	6E-05	None Specified	230	0.08
Cobalt	8.61	420	2E-08	Thyroid	23	0.4
Iron	19,345	NA	NA	Gastrointestinal System	55,000	0.4
Manganese	649	NA	NA	Central Nervous System	1,800	0.4
Thallium	0.67	NA	NA	Skin	0.78	0.9
Radionuclides (pCi/g)						
Actinium-227 (Ac-227)	0.031	0.039	8E-07	Cancer	NA	NA
Americium-241 (Am-241)	0.149	0.049	3E-06	Cancer	NA	NA
Cesium-137 (Cs-137)[4]	0.578	0.047	1E-05	Cancer	NA	NA
Lead-210 (Pb-210)	233	0.0077	3E-02	Cancer	NA	NA
Polonium-210 (Po-210)[5]	233	0.14	2E-03	Cancer	NA	NA
Neptunium-237 (Np-237)[4]	0.038	0.046	8E-07	Cancer	NA	NA
Nickel-63 (Ni-63)	5.86	6.7	9E-07	Cancer	NA	NA
Radium-226 (Ra-226)[4]	189	0.0064	3E-02	Cancer	NA	NA
Strontium-90 (Sr-90)[4]	0.639	0.066	1E-05	Cancer	NA	NA
Thallium-204 (Tl-204)	3.84	2.1	2E-06	Cancer	NA	NA
Tritium (H3)	18.6	0.23	8E-05	Cancer	NA	NA
Uranium-238 (U-238)[4]	0.878	0.05	2E-05	Cancer	NA	NA
Uranium-234 (U-234)[6]	0.878	0.066	1E-05	Cancer	NA	NA
		Total ILCR - Chemicals	6E-04		**Total HI**	3
		Total ILCR - Radionuclides	6E-02			
		Total ILCR - Chemicals + Radionuclides	6E-02			

Target Organ HIs	
Total Cardiovascular System HI =	0.5
Total Central Nervous System HI =	0.5
Total Gastrointestinal System HI =	0.4
Total Skin HI =	1
Total Thyroid HI =	0.4
Total None Specified HI =	0.08

Notes:
1 - Exposure point concentration is the 95% upper confidence limit calculated by ProUCL Version 5.0.00.
2 - For non-radionuclides screening levels are USEPA RSLs for Chemical Contaminants at Superfund Sites, June 2015. The noncarcinogenic values correspond to a target hazard quotient of 1. Carcinogenic values represent an incremental cancer risk of $1x10^{-6}$.
For radionuclides screening levels are from the Radionuclide Preliminary Remediation Goals (PRG) Summary Table (TR=1E-6) November 2014.
3 - Screening levels are for hexavalent chromium.
4 - Screening level includes daughter products.
5 - Polonium-210 is assumed to be in equilibrium with Pb-210.
6 - Uranium-234 is assumed to be in equilibrium with U-238.
NA - Not applicable. There are no cancer slope factors (CSF) or reference dose (RfD) available for this chemical.

TABLE E-11

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR *SITE RELATED COPCs*
RESIDENTIAL EXPOSURES TO ALL SOIL (0 - 10 FEET) - SURVEY UNIT 14
SAFETY LIGHT CORPORATION OU-3

Chemical	Incremental Lifetime Carcinogenic Risk (ILCR)			Estimated Non-Carcinogenic Hazard Quotient (HQ)		
	Exposure Point Concentration[1]	Residential Screening Level[2]	Estimated ILCR	Primary Target Organ	Residential Screening Level[2]	Estimated HQ
Semivolatile Organic Compounds (ug/kg)						
Benzo(a)anthracene	5,600	160	4E-05	Cancer	NA	NA
Benzo(a)pyrene	5,600	16	4E-04	Cancer	NA	NA
Benzo(b)fluoranthene	7,900	160	5E-05	Cancer	NA	NA
Benzo(k)fluoranthene	2,100	1,600	1E-06	Cancer	NA	NA
Dibenzo(a,h)anthracene	582	16	4E-05	Cancer	NA	NA
Indeno(1,2,3-cd)pyrene	2,544	160	2E-05	Cancer	NA	NA
Metals (mg/kg)						
Aluminum	8,719	NA	NA	Central Nervous System	77,000	0.1
Arsenic	16.0	0.68	2E-05	Skin, Cardiovascular System	35	0.5
Chromium[3]	19.0	0.30	6E-05	None Specified	230	0.08
Cobalt	8.61	420	2E-08	Thyroid	23	0.4
Iron	19,345	NA	NA	Gastrointestinal System	55,000	0.4
Manganese	649	NA	NA	Central Nervous System	1,800	0.4
Thallium	0.67	NA	NA	Skin	0.78	0.9
Radionuclides (pCi/g)						
Actinium-227 (Ac-227)	0.031	0.039	8E-07	Cancer	NA	NA
Americium-241 (Am-241)	0.149	0.049	3E-06	Cancer	NA	NA
Cesium-137 (Cs-137)[4]	0.578	0.047	1E-05	Cancer	NA	NA
Lead-210 (Pb-210)	233	0.0077	3E-02	Cancer	NA	NA
Polonium-210 (Po-210)[5]	233	0.14	2E-03	Cancer	NA	NA
Neptunium-237 (Np-237)[4]	0.038	0.046	8E-07	Cancer	NA	NA
Nickel-63 (Ni-63)	5.86	6.7	9E-07	Cancer	NA	NA
Radium-226 (Ra-226)[4]	189	0.0064	3E-02	Cancer	NA	NA
Strontium-90 (Sr-90)[4]	0.639	0.066	1E-05	Cancer	NA	NA
Thallium-204 (Tl-204)	3.84	2.1	2E-06	Cancer	NA	NA
Tritium (H3)	18.6	0.23	8E-05	Cancer	NA	NA
Uranium-238 (U-238)[4]	-	0.05	-	Cancer	NA	-
Uranium-234 (U-234)[6]	-	0.066	-	Cancer	NA	-
		Total ILCR - Chemicals	6E-04		**Total HI**	3
		Total ILCR - Radionuclides	6E-02			
		Total ILCR - Chemicals + Radionuclides	6E-02			

Target Organ HIs	
Total Cardiovascular System HI =	0.5
Total Central Nervous System HI =	0.5
Total Gastrointestinal System HI =	0.4
Total Skin HI =	1
Total Thyroid HI =	0.4
Total None Specified HI =	0.08

Notes:
1 - Exposure point concentration is the 95% upper confidence limit calculated by ProUCL Version 5.0.00.
2 - For non-radionuclides screening levels are USEPA RSLs for Chemical Contaminants at Superfund Sites, June 2015. The noncarcinogenic values correspond to a target hazard quotient of 1. Carcinogenic values represent an incremental cancer risk of $1x10^{-6}$.
For radionuclides screening levels are from the Radionuclide Preliminary Remediation Goals (PRG) Summary Table (TR=1E-6) November 2014.
3 - Screening levels are for hexavalent chromium.
4 - Screening level includes daughter products.
5 - Polonium-210 is assumed to be in equilibrium with Pb-210.
6 - Uranium-234 is assumed to be in equilibrium with U-238.
NA - Not applicable. There are no cancer slope factors (CSF) or reference dose (RfD) available for this chemical.

TABLE E-12

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR *SITE RELATED COPCs ABOVE BACKGROUND*[1]
RESIDENTIAL EXPOSURES TO ALL SOIL (0 - 10 FEET) - SURVEY UNIT 14
SAFETY LIGHT CORPORATION OU-3

Chemical	Incremental Lifetime Carcinogenic Risk (ILCR)			Estimated Non-Carcinogenic Hazard Quotient (HQ)		
	Exposure Point Concentration[2]	Residential Screening Level[3]	Estimated ILCR	Primary Target Organ	Residential Screening Level[3]	Estimated HQ
Semivolatile Organic Compounds (ug/kg)						
Benzo(a)anthracene	5,600	160	4E-05	Cancer	NA	NA
Benzo(a)pyrene	5,600	16	4E-04	Cancer	NA	NA
Benzo(b)fluoranthene	7,900	160	5E-05	Cancer	NA	NA
Benzo(k)fluoranthene	2,100	1,600	1E-06	Cancer	NA	NA
Dibenzo(a,h)anthracene	582	16	4E-05	Cancer	NA	NA
Indeno(1,2,3-cd)pyrene	2,544	160	2E-05	Cancer	NA	NA
Metals (mg/kg)						
Aluminum	8,719	NA	NA	Central Nervous System	77,000	0.1
Arsenic	16.0	0.68	2E-05	Skin, Cardiovascular System	35	0.5
Chromium[4]	19.0	0.30	6E-05	None Specified	230	0.08
Cobalt	8.61	420	2E-08	Thyroid	23	0.4
Iron	19,345	NA	NA	Gastrointestinal System	55,000	0.4
Manganese	-	NA	-	Central Nervous System	1,800	-
Thallium	-	NA	-	Skin	0.78	-
Radionuclides (pCi/g)						
Actinium-227 (Ac-227)	-	0.039	-	Cancer	NA	NA
Americium-241 (Am-241)	0.149	0.049	3E-06	Cancer	NA	NA
Cesium-137 (Cs-137)[5]	0.578	0.047	1E-05	Cancer	NA	NA
Lead-210 (Pb-210)	233	0.0077	3E-02	Cancer	NA	NA
Polonium-210 (Po-210)[6]	233	0.14	2E-03	Cancer	NA	NA
Neptunium-237 (Np-237)[5]	-	0.046	-	Cancer	NA	NA
Nickel-63 (Ni-63)	5.86	6.7	9E-07	Cancer	NA	NA
Radium-226 (Ra-226)[5]	189	0.0064	3E-02	Cancer	NA	NA
Strontium-90 (Sr-90)[5]	0.639	0.066	1E-05	Cancer	NA	NA
Thallium-204 (Tl-204)	3.84	2.1	2E-06	Cancer	NA	NA
Tritium (H3)	18.6	0.23	8E-05	Cancer	NA	NA
Uranium-238 (U-238)[5]	-	0.05	-	Cancer	NA	-
Uranium-234 (U-234)[7]	-	0.066	-	Cancer	NA	-
		Total ILCR - Chemicals	6E-04		**Total HI**	1
		Total ILCR - Radionuclides	6E-02			
		Total ILCR - Chemicals + Radionuclides	6E-02			

Target Organ HIs	
Total Cardiovascular System HI =	0.5
Total Central Nervous System HI =	0.1
Total Gastrointestinal System HI =	0.4
Total Skin HI =	0.5
Total Thyroid HI =	0.4
Total None Specified HI =	0.08

Notes:
1 - Background for non-radionuclides was determined using the background evaluation presented in the risk assessment presented in the 2008 RI. The 95 percent upper prediction limit (UPL) was used to determine background for radionuclides (See COPC selection tables).
2 - Exposure point concentration is the 95% upper confidence limit calculated by ProUCL Version 5.0.00.
3 - For non-radionuclides screening levels are USEPA RSLs for Chemical Contaminants at Superfund Sites, June 2015. The noncarcinogenic values correspond to a target hazard quotient of 1. Carcinogenic values represent an incremental cancer risk of $1x10^{-5}$.
For radionuclides screening levels are from the Radionuclide Preliminary Remediation Goals (PRG) Summary Table (TR=1E-6) November 2014.
4 - Screening levels are for hexavalent chromium.
5 - Screening level includes daughter products.
6 - Polonium-210 is assumed to be in equilibrium with Pb-210.
7 - Uranium-234 is assumed to be in equilibrium with U-238.
NA - Not applicable. There are no cancer slope factors (CSF) or reference dose (RfD) available for this chemical.

TABLE E-13

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR *ALL COPCs*
RESIDENTIAL EXPOSURES TO SURFACE SOIL (0 - 2 FEET) - SURVEY UNIT 15
SAFETY LIGHT CORPORATION OU-3

Chemical	Incremental Lifetime Carcinogenic Risk (ILCR)			Estimated Non-Carcinogenic Hazard Quotient (HQ)		
	Exposure Point Concentration[1]	Residential Screening Level[2]	Estimated ILCR	Primary Target Organ	Residential Screening Level[2]	Estimated HQ
Semivolatile Organic Compounds (ug/kg)						
Benzo(a)anthracene	4,200	160	3E-05	Cancer	NA	NA
Benzo(a)pyrene	5,000	16	3E-04	Cancer	NA	NA
Benzo(b)fluoranthene	6,800	160	4E-05	Cancer	NA	NA
Benzo(k)fluoranthene	1,800	1,600	1E-06	Cancer	NA	NA
Dibenzo(a,h)anthracene	890	16	6E-05	Cancer	NA	NA
Indeno(1,2,3-cd)pyrene	3,600	160	2E-05	Cancer	NA	NA
Pesticides/PCBs (ug/kg)						
Aroclor-1254	426	240	2E-06	Immune System	1,200	0.4
Metals (mg/kg)						
Aluminum	8,787	NA	NA	Central Nervous System	77,000	0.1
Arsenic	8.92	0.68	1E-05	Skin, Cardiovascular System	35	0.3
Cadmium	155	2,100	7E-08	Kidney, Respiratory	71	2
Chromium[3]	905	0.30	3E-03	None Specified	230	4
Cobalt	8.38	420	2E-08	Thyroid	23	0.4
Copper	998	NA	NA	Gastrointestinal System	3,100	0.3
Iron	18,415	NA	NA	Gastrointestinal System	55,000	0.3
Lead[4]	158	NA	NA	NA	NA	NA
Manganese	382	NA	NA	Central Nervous System	1,800	0.2
Nickel	97.6	15,000	7E-09	Body Weight, Respiratory	1,500	0.07
Silver	77.2	NA	NA	Skin	390	0.2
Thallium	1	NA	NA	Skin	0.78	1
Vanadium	87.9	NA	NA	Kidney	390	0.2
Radionuclides (pCi/g)						
Actinium-227 (Ac-227)	0.036	0.039	9E-07	Cancer	NA	NA
Americium-241 (Am-241)	2.84	0.049	6E-05	Cancer	NA	NA
Carbon-14 (C-14)	0.066	0.15	4E-07	Cancer	NA	NA
Cesium-137 (Cs-137)[5]	16.2	0.047	3E-04	Cancer	NA	NA
Lead-210 (Pb-210)	37.8	0.0077	5E-03	Cancer	NA	NA
Polonium-210 (Po-210)[6]	37.8	0.14	3E-04	Cancer	NA	NA
Neptunium-237 (Np-237)[5]	0.079	0.046	2E-06	Cancer	NA	NA
Nickel-63 (Ni-63)	22.1	6.7	3E-06	Cancer	NA	NA
Radium-226 (Ra-226)[5]	61	0.0064	1E-02	Cancer	NA	NA
Strontium-90 (Sr-90)[5]	0.638	0.066	1E-05	Cancer	NA	NA
Thallium-204 (Tl-204)	2.80	2.1	1E-06	Cancer	NA	NA
Tritium (H3)	28.4	0.23	1E-04	Cancer	NA	NA
Uranium-238 (U-238)[5]	0.693	0.05	1E-05	Cancer	NA	NA
Uranium-234 (U-234)[7]	0.693	0.066	1E-05	Cancer	NA	NA
		Total ILCR - Chemicals	3E-03		**Total HI**	9
		Total ILCR - Radionuclides	2E-02			
		Total ILCR - Chemicals + Radionuclides	2E-02			

Target Organ HIs	
Total Immune System HI =	0.4
Total Cardiovascular System HI =	0.3
Total Central Nervous System HI =	0.3
Total Gastrointestinal System HI =	0.6
Total Skin HI =	2
Total Kidney HI =	2
Total Respiratory HI =	2
Total Thyroid HI =	0.4
Total Body Weight HI =	0.07
Total None Specified HI =	4

Notes:
1 - Exposure point concentration is the 95% upper confidence limit calculated by ProUCL Version 5.0.00.
2 - For non-radionuclides screening levels are USEPA RSLs for Chemical Contaminants at Superfund Sites, June 2015. The noncarcinogenic values correspond to a target hazard quotient of 1. Carcinogenic values represent an incremental cancer risk of $1x10^{-6}$.
For radionuclides screening levels are from the Radionuclide Preliminary Remediation Goals (PRG) Summary Table (TR=1E-6) November 2014.
3 - Screening levels are for hexavalent chromium.
4 - Risks for exposures to lead were evaluated using the IEUBK and ALM models.
5 - Screening level includes daughter products.
6 - Polunium-210 is assumed to be in equilibrium with Lead-210.
7 - Uranium-234 is assumed to be in equilibrium with U-238.
NA - Not applicable. There are no cancer slope factors (CSF) or reference dose (RfD) available for this chemical.

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR *SITE RELATED COPCs*
RESIDENTIAL EXPOSURES TO SURFACE SOIL (0 - 2 FEET) - SURVEY UNIT 15
SAFETY LIGHT CORPORATION OU-3

Chemical	Incremental Lifetime Carcinogenic Risk (ILCR)			Estimated Non-Carcinogenic Hazard Quotient (HQ)		
	Exposure Point Concentration[1]	Residential Screening Level[2]	Estimated ILCR	Primary Target Organ	Residential Screening Level[2]	Estimated HQ
Semivolatile Organic Compounds (ug/kg)						
Benzo(a)anthracene	4,200	160	3E-05	Cancer	NA	NA
Benzo(a)pyrene	5,000	16	3E-04	Cancer	NA	NA
Benzo(b)fluoranthene	6,800	160	4E-05	Cancer	NA	NA
Benzo(k)fluoranthene	1,800	1,600	1E-06	Cancer	NA	NA
Dibenzo(a,h)anthracene	890	16	6E-05	Cancer	NA	NA
Indeno(1,2,3-cd)pyrene	3,600	160	2E-05	Cancer	NA	NA
Pesticides/PCBs (ug/kg)						
Aroclor-1254	426	240	2E-06	Immune System	1,200	0.4
Metals (mg/kg)						
Aluminum	8,787	NA	NA	Central Nervous System	77,000	0.1
Arsenic	8.92	0.68	1E-05	Skin, Cardiovascular System	35	0.3
Cadmium	155	2,100	7E-08	Kidney, Respiratory	71	2
Chromium[3]	905	0.30	3E-03	None Specified	230	4
Cobalt	8.38	420	2E-08	Thyroid	23	0.4
Copper	998	NA	NA	Gastrointestinal System	3,100	0.3
Iron	18,415	NA	NA	Gastrointestinal System	55,000	0.3
Lead[4]	158	NA	NA	NA	NA	NA
Manganese	382	NA	NA	Central Nervous System	1,800	0.2
Nickel	97.6	15,000	7E-09	Body Weight, Respiratory	1,500	0.07
Silver	77.2	NA	NA	Skin	390	0.2
Thallium	1	NA	NA	Skin	0.78	1
Vanadium	87.9	NA	NA	Kidney	390	0.2
Radionuclides (pCi/g)						
Actinium-227 (Ac-227)	0.036	0.039	9E-07	Cancer	NA	NA
Americium-241 (Am-241)	2.84	0.049	6E-05	Cancer	NA	NA
Carbon-14 (C-14)	0.066	0.15	4E-07	Cancer	NA	NA
Cesium-137 (Cs-137)[5]	16.2	0.047	3E-04	Cancer	NA	NA
Lead-210 (Pb-210)	37.8	0.0077	5E-03	Cancer	NA	NA
Polonium-210 (Po-210)[6]	37.8	0.14	3E-04	Cancer	NA	NA
Neptunium-237 (Np-237)[5]	0.079	0.046	2E-06	Cancer	NA	NA
Nickel-63 (Ni-63)	22.1	6.7	3E-06	Cancer	NA	NA
Radium-226 (Ra-226)[5]	61	0.0064	1E-02	Cancer	NA	NA
Strontium-90 (Sr-90)[5]	0.638	0.066	1E-05	Cancer	NA	NA
Thallium-204 (Tl-204)	2.8	2.1	1E-06	Cancer	NA	NA
Tritium (H3)	28.4	0.23	1E-04	Cancer	NA	NA
Uranium-238 (U-238)[5]	-	0.05	-	Cancer	NA	-
Uranium-234 (U-234)[7]	-	0.066	-	Cancer	NA	-
		Total ILCR - Chemicals	3E-03		**Total HI**	9
		Total ILCR - Radionuclides	2E-02			
		Total ILCR - Chemicals + Radionuclides	2E-02			

Target Organ HIs	
Total Immune System HI =	0.4
Total Cardiovascular System HI =	0.3
Total Central Nervous System HI =	0.3
Total Gastrointestinal System HI =	0.6
Total Skin HI =	2
Total Kidney HI =	2
Total Respiratory HI =	2
Total Thyroid HI =	0.4
Total Body Weight HI =	0.07
Total None Specified HI =	4

Notes:
1 - Exposure point concentration is the 95% upper confidence limit calculated by ProUCL Version 5.0.00.
2 - For non-radionuclides screening levels are USEPA RSLs for Chemical Contaminants at Superfund Sites, June 2015. The noncarcinogenic values correspond to a target hazard quotient of 1. Carcinogenic values represent an incremental cancer risk of $1x10^{-5}$.
For radionuclides screening levels are from the Radionuclide Preliminary Remediation Goals (PRG) Summary Table (TR=1E-6) November 2014.
3 - Screening levels are for hexavalent chromium.
4 - Risks for exposures to lead were evaluated using the IEUBK and ALM models.
5 - Screening level includes daughter products.
6 - Polunium-210 is assumed to be in equilibrium with Lead-210.
7 - Uranium-234 is assumed to be in equilibrium with U-238.

TABLE E-15

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR *SITE RELATED COPCs ABOVE BACKGROUND*[1]
RESIDENTIAL EXPOSURES TO SURFACE SOIL (0 - 2 FEET) - SURVEY UNIT 15
SAFETY LIGHT CORPORATION OU-3

Chemical	Incremental Lifetime Carcinogenic Risk (ILCR)			Estimated Non-Carcinogenic Hazard Quotient (HQ)		
	Exposure Point Concentration[2]	Residential Screening Level[3]	Estimated ILCR	Primary Target Organ	Residential Screening Level[3]	Estimated HQ
Semivolatile Organic Compounds (ug/kg)						
Benzo(a)anthracene	4,200	160	3E-05	Cancer	NA	NA
Benzo(a)pyrene	5,000	16	3E-04	Cancer	NA	NA
Benzo(b)fluoranthene	6,800	160	4E-05	Cancer	NA	NA
Benzo(k)fluoranthene	1,800	1,600	1E-06	Cancer	NA	NA
Dibenzo(a,h)anthracene	890	16	6E-05	Cancer	NA	NA
Indeno(1,2,3-cd)pyrene	3,600	160	2E-05	Cancer	NA	NA
Pesticides/PCBs (ug/kg)						
Aroclor-1254	426	240	2E-06	Immune System	1,200	0.4
Metals (mg/kg)						
Aluminum	8,787	NA	NA	Central Nervous System	77,000	0.1
Arsenic	8.92	0.68	1E-05	Skin, Cardiovascular System	35	0.3
Cadmium	155	2,100	7E-08	Kidney, Respiratory	71	2
Chromium[4]	905	0.30	3E-03	None Specified	230	4
Cobalt	8.38	420	2E-08	Thyroid	23	0.4
Copper	998	NA	NA	Gastrointestinal System	3,100	0.3
Iron	18,415	NA	NA	Gastrointestinal System	55,000	0.3
Lead[5]	158	NA	NA	NA	NA	NA
Manganese	382	NA	NA	Central Nervous System	1,800	0.2
Nickel	97.6	15,000	7E-09	Body Weight, Respiratory	1,500	0.07
Silver	77.2	NA	NA	Skin	390	0.2
Thallium	1	NA	NA	Skin	0.78	1
Vanadium	87.9	NA	NA	Kidney	390	0.2
Radionuclides (pCi/g)						
Actinium-227 (Ac-227)	0.036	0.039	9E-07	Cancer	NA	NA
Americium-241 (Am-241)	2.84	0.049	6E-05	Cancer	NA	NA
Carbon-14 (C-14)	-	0.15	-	Cancer	NA	-
Cesium-137 (Cs-137)[6]	16.2	0.047	3E-04	Cancer	NA	NA
Lead-210 (Pb-210)	37.8	0.0077	5E-03	Cancer	NA	NA
Polonium-210 (Po-210)[7]	37.8	0.14	3E-04	Cancer	NA	NA
Neptunium-237 (Np-237)[6]	0.079	0.046	2E-06	Cancer	NA	NA
Nickel-63 (Ni-63)	22.1	6.7	3E-06	Cancer	NA	NA
Radium-226 (Ra-226)[6]	61	0.0064	1E-02	Cancer	NA	NA
Strontium-90 (Sr-90)[6]	0.638	0.066	1E-05	Cancer	NA	NA
Thallium-204 (Tl-204)	2.8	2.1	1E-06	Cancer	NA	NA
Tritium (H3)	28.4	0.23	1E-04	Cancer	NA	NA
Uranium-238 (U-238)[6]	-	0.05	-	Cancer	NA	-
Uranium-234 (U-234)[8]	-	0.066	-	Cancer	NA	-
		Total ILCR - Chemicals	3E-03		**Total HI**	10
		Total ILCR - Radionuclides	2E-02			
		Total ILCR - Chemicals + Radionuclides	2E-02			

Target Organ HIs	
Total Immune System HI =	0.4
Total Cardiovascular System HI =	0.3
Total Central Nervous System HI =	0.3
Total Gastrointestinal System HI =	0.7
Total Skin HI =	1
Total Kidney HI =	2
Total Respiratory HI =	2
Total Thyroid HI =	0.4
Total Body Weight HI =	0.07
Total None Specified HI =	4

Notes:
1 - Background for non-radionuclides was determined using the background evaluation presented in the risk assessment presented in the 2008 RI. The 95 percent upper prediction limit (UPL) was used to determine background for radionuclides (See COPC selection tables).
2 - Exposure point concentration is the 95% upper confidence limit calculated by ProUCL Version 5.0.00.
3 - For non-radionuclides screening levels are USEPA RSLs for Chemical Contaminants at Superfund Sites, June 2015. The noncarcinogenic values correspond to a target hazard quotient of 1. Carcinogenic values represent an incremental cancer risk of $1x10^{-6}$.
For radionuclides screening levels are from the Radionuclide Preliminary Remediation Goals (PRG) Summary Table (TR=1E-6) November 2014.
4 - Screening levels are for hexavalent chromium.
5 - Risks for exposures to lead were evaluated using the IEUBK and ALM models.
6 - Screening level includes daughter products.
7 - Polonium-210 is assumed to be in equilibrium with Pb-210.
8 - Uranium-234 is assumed to be in equilibrium with U-238.
NA - Not applicable. There are no cancer slope factors (CSF) or reference dose (RfD) available for this chemical.

TABLE E-16

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR *ALL COPCs*
RESIDENTIAL EXPOSURES TO ALL SOIL (0 - 10 FEET) - SURVEY UNIT 15
SAFETY LIGHT CORPORATION OU-3

Chemical	Incremental Lifetime Carcinogenic Risk (ILCR)			Estimated Non-Carcinogenic Hazard Quotient (HQ)		
	Exposure Point Concentration[1]	Residential Screening Level[2]	Estimated ILCR	Primary Target Organ	Residential Screening Level[2]	Estimated HQ
Semivolatile Organic Compounds (ug/kg)						
Benzo(a)anthracene	4,200	160	3E-05	Cancer	NA	NA
Benzo(a)pyrene	5,000	16	3E-04	Cancer	NA	NA
Benzo(b)fluoranthene	6,800	160	4E-05	Cancer	NA	NA
Benzo(k)fluoranthene	1,800	1,600	1E-06	Cancer	NA	NA
Dibenzo(a,h)anthracene	890	16	6E-05	Cancer	NA	NA
Indeno(1,2,3-cd)pyrene	3,600	160	2E-05	Cancer	NA	NA
Pesticides/PCBs (ug/kg)						
Aroclor-1254	382	240	2E-06	Immune System	1,200	0.3
Metals (mg/kg)						
Aluminum	8,572	NA	NA	Central Nervous System	77,000	0.1
Arsenic	8.84	0.68	1E-05	Skin, Cardiovascular System	35	0.3
Cadmium	196	2,100	9E-08	Kidney, Respiratory	71	3
Chromium[3]	678	0.30	2E-03	None Specified	230	3
Cobalt	8.51	420	2E-08	Thyroid	23	0.4
Copper	1625	NA	NA	Gastrointestinal System	3,100	0.5
Iron	20,263	NA	NA	Gastrointestinal System	55,000	0.4
Lead[4]	142	NA	NA	NA	NA	NA
Manganese	387	NA	NA	Central Nervous System	1,800	0.2
Nickel	78.9	15,000	5E-09	Body Weight, Respiratory	1,500	0.05
Silver	69.1	NA	NA	Skin	390	0.2
Thallium	1.22	NA	NA	Skin	0.78	2
Vanadium	125	NA	NA	Kidney	390	0.3
Radionuclides (pCi/g)						
Actinium-227 (Ac-227)	0.035	0.039	9E-07	Cancer	NA	NA
Americium-241 (Am-241)	2.60	0.049	5E-05	Cancer	NA	NA
Carbon-14 (C-14)	0.063	0.15	4E-07	Cancer	NA	NA
Cesium-137 (Cs-137)[5]	26.3	0.047	6E-04	Cancer	NA	NA
Lead-210 (Pb-210)	34.9	0.0077	5E-03	Cancer	NA	NA
Polonium-210 (Po-210)[6]	34.9	0.14	2E-04	Cancer	NA	NA
Neptunium-237 (Np-237)[5]	0.079	0.046	2E-06	Cancer	NA	NA
Nickel-63 (Ni-63)	55	6.7	8E-06	Cancer	NA	NA
Radium-226 (Ra-226)[5]	61	0.0064	1E-02	Cancer	NA	NA
Strontium-90 (Sr-90)[5]	0.593	0.066	9E-06	Cancer	NA	NA
Thallium-204 (Tl-204)	2.80	2.1	1E-06	Cancer	NA	NA
Tritium (H3)	31.4	0.23	1E-04	Cancer	NA	NA
Uranium-238 (U-238)[5]	0.715	0.05	1E-05	Cancer	NA	NA
Uranium-234 (U-234)[7]	0.715	0.066	1E-05	Cancer	NA	NA
Total ILCR - Chemicals			2E-03		**Total HI**	11
Total ILCR - Radionuclides			2E-02			
Total ILCR - Chemicals + Radionuclides			2E-02			

Target Organ HIs	
Total Immune System HI =	0.3
Total Cardiovascular System HI =	0.3
Total Central Nervous System HI =	0.3
Total Gastrointestinal System HI =	0.9
Total Skin HI =	3
Total Kidney HI =	3
Total Respiratory HI =	3
Total Thyroid HI =	0.4
Total Body Weight HI =	0.05
Total None Specified HI =	3

Notes:
1 - Exposure point concentration is the 95% upper confidence limit calculated by ProUCL Version 5.0.00.
2 - For non-radionuclides screening levels are USEPA RSLs for Chemical Contaminants at Superfund Sites, June 2015. The noncarcinogenic values correspond to a target hazard quotient of 1. Carcinogenic values represent an incremental cancer risk of $1x10^{-6}$.
For radionuclides screening levels are from the Radionuclide Preliminary Remediation Goals (PRG) Summary Table (TR=1E-6) November 2014.
3 - Screening levels are for hexavalent chromium.
4 - Risks for exposures to lead were evaluated using the IEUBK and ALM models.
5 - Screening level includes daughter products.
6 - Polunium-210 is assumed to be in equilibrium with Lead-210.
7 - Uranium-234 is assumed to be in equilibrium with U-238.
NA - Not applicable. There are no cancer slope factors (CSF) or reference dose (RfD) available for this chemical.

TABLE E-17

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR *SITE RELATED COPCs*
RESIDENTIAL EXPOSURES TO ALL SOIL (0 - 10 FEET) - SURVEY UNIT 15
SAFETY LIGHT CORPORATION OU-3

Chemical	Incremental Lifetime Carcinogenic Risk (ILCR)			Estimated Non-Carcinogenic Hazard Quotient (HQ)		
	Exposure Point Concentration[1]	Residential Screening Level[2]	Estimated ILCR	Primary Target Organ	Residential Screening Level[2]	Estimated HQ
Semivolatile Organic Compounds (ug/kg)						
Benzo(a)anthracene	4,200	160	3E-05	Cancer	NA	NA
Benzo(a)pyrene	5,000	16	3E-04	Cancer	NA	NA
Benzo(b)fluoranthene	6,800	160	4E-05	Cancer	NA	NA
Benzo(k)fluoranthene	1,800	1,600	1E-06	Cancer	NA	NA
Dibenzo(a,h)anthracene	890	16	6E-05	Cancer	NA	NA
Indeno(1,2,3-cd)pyrene	3,600	160	2E-05	Cancer	NA	NA
Pesticides/PCBs (ug/kg)						
Aroclor-1254	382	240	2E-06	Immune System	1,200	0.3
Metals (mg/kg)						
Aluminum	8,572	NA	NA	Central Nervous System	77,000	0.1
Arsenic	8.84	0.68	1E-05	Skin, Cardiovascular System	35	0.3
Cadmium	196	2,100	9E-08	Kidney, Respiratory	71	3
Chromium[3]	678	0.30	2E-03	None Specified	230	3
Cobalt	8.51	420	2E-08	Thyroid	23	0.4
Copper	1,625	NA	NA	Gastrointestinal System	3,100	0.5
Iron	20,263	NA	NA	Gastrointestinal System	55,000	0.4
Lead[4]	142	NA	NA	NA	NA	NA
Manganese	387	NA	NA	Central Nervous System	1,800	0.2
Nickel	78.9	15,000	5E-09	Body Weight, Respiratory	1,500	0.05
Silver	69.1	NA	NA	Skin	390	0.2
Thallium	1.22	NA	NA	Skin	0.78	2
Vanadium	125	NA	NA	Kidney	390	0.3
Radionuclides (pCi/g)						
Actinium-227 (Ac-227)	0.035	0.039	9E-07	Cancer	NA	NA
Americium-241 (Am-241)	2.6	0.049	5E-05	Cancer	NA	NA
Carbon-14 (C-14)	0.063	0.15	4E-07	Cancer	NA	NA
Cesium-137 (Cs-137)[5]	26.3	0.047	6E-04	Cancer	NA	NA
Lead-210 (Pb-210)	34.9	0.0077	5E-03	Cancer	NA	NA
Polonium-210 (Po-210)[6]	34.9	0.14	2E-04	Cancer	NA	NA
Neptunium-237 (Np-237)[5]	0.079	0.046	2E-06	Cancer	NA	NA
Nickel-63 (Ni-63)	55	6.7	8E-06	Cancer	NA	NA
Radium-226 (Ra-226)[5]	61	0.0064	1E-02	Cancer	NA	NA
Strontium-90 (Sr-90)[5]	0.593	0.066	9E-06	Cancer	NA	NA
Thallium-204 (Tl-204)	2.8	2.1	1E-06	Cancer	NA	NA
Tritium (H3)	31.4	0.23	1E-04	Cancer	NA	NA
Uranium-238 (U-238)[5]	-	0.05	-	Cancer	NA	-
Uranium-234 (U-234)[7]	-	0.066	-	Cancer	NA	-
		Total ILCR - Chemicals	2E-03		**Total HI**	11
		Total ILCR - Radionuclides	2E-02			
		Total ILCR - Chemicals + Radionuclides	2E-02			

Target Organ HIs	
Total Immune System HI =	0.3
Total Cardiovascular System HI =	0.3
Total Central Nervous System HI =	0.3
Total Gastrointestinal System HI =	0.9
Total Skin HI =	3
Total Kidney HI =	3
Total Respiratory HI =	3
Total Thyroid HI =	0.4
Total Body Weight HI =	0.05
Total None Specified HI =	3

Notes:
1 - Exposure point concentration is the 95% upper confidence limit calculated by ProUCL Version 5.0.00.
2 - For non-radionuclides screening levels are USEPA RSLs for Chemical Contaminants at Superfund Sites, June 2015. The noncarcinogenic values correspond to a target hazard quotient of 1. Carcinogenic values represent an incremental cancer risk of $1x10^{-5}$.
For radionuclides screening levels are from the Radionuclide Preliminary Remediation Goals (PRG) Summary Table (TR=1E-6) November 2014.
3 - Screening levels are for hexavalent chromium.
4 - Risks for exposures to lead were evaluated using the IEUBK and ALM models.
5 - Screening level includes daughter products.
6 - Polunium-210 is assumed to be in equilibrium with Lead-210.
7 - Uranium-234 is assumed to be in equilibrium with U-238.

TABLE E-18

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR *SITE RELATED COPCs ABOVE BACKGROUND*[1]
RESIDENTIAL EXPOSURES TO ALL SOIL (0 - 10 FEET) - SURVEY UNIT 15
SAFETY LIGHT CORPORATION OU-3

Chemical	Incremental Lifetime Carcinogenic Risk (ILCR)			Estimated Non-Carcinogenic Hazard Quotient (HQ)		
	Exposure Point Concentration[2]	Residential Screening Level[3]	Estimated ILCR	Primary Target Organ	Residential Screening Level[3]	Estimated HQ
Semivolatile Organic Compounds (ug/kg)						
Benzo(a)anthracene	4,200	160	3E-05	Cancer	NA	NA
Benzo(a)pyrene	5,000	16	3E-04	Cancer	NA	NA
Benzo(b)fluoranthene	6,800	160	4E-05	Cancer	NA	NA
Benzo(k)fluoranthene	1,800	1,600	1E-06	Cancer	NA	NA
Dibenzo(a,h)anthracene	890	16	6E-05	Cancer	NA	NA
Indeno(1,2,3-cd)pyrene	3,600	160	2E-05	Cancer	NA	NA
Pesticides/PCBs (ug/kg)						
Aroclor-1254	382	240	2E-06	Immune System	1,200	0.3
Metals (mg/kg)						
Aluminum	8,572	NA	NA	Central Nervous System	77,000	0.1
Arsenic	8.84	0.68	1E-05	Skin, Cardiovascular System	35	0.3
Cadmium	196	2,100	9E-08	Kidney, Respiratory	71	3
Chromium[4]	678	0.30	2E-03	None Specified	230	3
Cobalt	8.51	420	2E-08	Thyroid	23	0.4
Copper	1,625	NA	NA	Gastrointestinal System	3,100	0.5
Iron	20,263	NA	NA	Gastrointestinal System	55,000	0.4
Lead[5]	142	NA	NA	NA	NA	NA
Manganese	387	NA	NA	Central Nervous System	1,800	0.2
Nickel	78.9	15,000	5E-09	Body Weight, Respiratory	1,500	0.05
Silver	69.1	NA	NA	Skin	390	0.2
Thallium	1.22	NA	NA	Skin	0.78	2
Vanadium	125	NA	NA	Kidney	390	0.3
Radionuclides (pCi/g)						
Actinium-227 (Ac-227)	0.035	0.039	9E-07	Cancer	NA	NA
Americium-241 (Am-241)	2.6	0.049	5E-05	Cancer	NA	NA
Carbon-14 (C-14)	-	0.15	-	Cancer	NA	-
Cesium-137 (Cs-137)[6]	26.3	0.047	6E-04	Cancer	NA	NA
Lead-210 (Pb-210)	34.9	0.0077	5E-03	Cancer	NA	NA
Polonium-210 (Po-210)[7]	34.9	0.14	2E-04	Cancer	NA	NA
Neptunium-237 (Np-237)[6]	0.079	0.046	2E-06	Cancer	NA	NA
Nickel-63 (Ni-63)	55	6.7	8E-06	Cancer	NA	NA
Radium-226 (Ra-226)[6]	61	0.0064	1E-02	Cancer	NA	NA
Strontium-90 (Sr-90)[6]	0.593	0.066	9E-06	Cancer	NA	NA
Thallium-204 (Tl-204)	2.8	2.1	1E-06	Cancer	NA	NA
Tritium (H3)	31.4	0.23	1E-04	Cancer	NA	NA
Uranium-238 (U-238)[6]	-	0.05	-	Cancer	NA	-
Uranium-234 (U-234)[8]	-	0.066	-	Cancer	NA	-
		Total ILCR - Chemicals	2E-03		**Total HI**	11
		Total ILCR - Radionuclides	2E-02			
		Total ILCR - Chemicals + Radionuclides	2E-02			

Target Organ HIs	
Total Immune System HI =	0.3
Total Cardiovascular System HI =	0.3
Total Central Nervous System HI =	0.3
Total Gastrointestinal System HI =	0.9
Total Skin HI =	3
Total Kidney HI =	3
Total Respiratory HI =	3
Total Thyroid HI =	0.4
Total Body Weight HI =	0.05
Total None Specified HI =	3

Notes:
1 - Background for non-radionuclides was determined using the background evaluation presented in the risk assessment presented in the 2008 RI. The 95 percent upper prediction limit (UPL) was used to determine background for radionuclides (See COPC selection tables).
2 - Exposure point concentration is the 95% upper confidence limit calculated by ProUCL Version 5.0.00.
3 - For non-radionuclides screening levels are USEPA RSLs for Chemical Contaminants at Superfund Sites, June 2015. The noncarcinogenic values correspond to a target hazard quotient of 1. Carcinogenic values represent an incremental cancer risk of $1x10^{-5}$. For radionuclides screening levels are from the Radionuclide Preliminary Remediation Goals (PRG) Summary Table (TR=1E-6) November 2014.
4 - Screening levels are for hexavalent chromium.
5 - Risks for exposures to lead were evaluated using the IEUBK and ALM models.
6 - Screening level includes daughter products.
7 - Polonium-210 is assumed to be in equilibrium with Pb-210.
8 - Uranium-234 is assumed to be in equilibrium with U-238.
NA - Not applicable. There are no cancer slope factors (CSF) or reference dose (RfD) available for this chemical.

APPENDIX F

ARARS TABLES

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TABLE F-1

Action-Specific ARARs/TBCs
Safety Light Corporation OU-3

Standard, Requirement, Criterion, Or Limitation	Citation Or Reference	Description	Status	Comments
FEDERAL				
Pennsylvania Hazardous Waste Management Regulations PA Code, Title 25, Article VII Pennsylvania has an EPA authorized hazardous waste program; therefore the Pennsylvania hazardous waste regulations are identified here as the applicable Federal hazardous waste standard	25 PA Code §§ 261a.1 (incorporating by reference 40 CFR Part 261, but limited to Subparts A - E, 261a.2-8, 262a.32, and 262a.39)	Applicable	Waste characterization	Applicable for characterizing contaminated soil determined to be sent off-site for disposal.
	25 PA Code §§ 262a.10 (incorporating by reference 40 CFR Part 262, but limited to Subparts A - C, 262a.11, 262a.12, 262a.21, and 262a.34)	Applicable	Standards for recordkeeping of the management actions for hazardous wastes.	Applicable if remedial activities include the off-site transport of hazardous waste.
	25 PA Code §§ 264a.1 incorporating by reference 40 CFR Part 264, but limited to substantive parts of Subparts B – G and I – M)	Relevant and Appropriate	Standards for the storage of hazardous wastes. Requirements for spill response planning and control	Includes requirements if remedial activities include the storage of hazardous waste greater than 90 days.
	25 Pa. Code Chapter 266b: Universal Waste Management (Incorporating 40 CFR Part 273 except as expressly provided)	Applicable	Universal wastes, including lamps (if hazardous waste under 40 CFR Part 261) and "oil based finishes," are subject to specific waste management and handling requirements.	In the event that the specified universal wastes are identified at the Site and require disposal, the substantive requirements will apply. No permitting requirements apply.
	25 PA Code § 268a.1 (incorporating by reference 40 CFR Part 268, Subparts A- E, except as expressly provided)	Applicable	Restricts disposal of hazardous waste that could trigger land disposal regulations	Includes requirements for minimum treatment standards for hazardous waste prior to land disposal.
Packaging and Transportation of Radioactive Waste	10 C.F.R. Part 71, Subpart A – General Provisions §71.5 Transportation of licensed material; Subpart B – Exemptions- §71.14 – Exemption for low level materials Subpart E – Package Approval Standards; §71.43 – General standards for all packages; §71.45 – Lifting and tie-down standards for all packages; §71.47 – External radiation standards for all packages:	Relevant and Appropriate	Establishes requirements for packaging, preparation for shipment, and transportation of licensed material	The substantive portions of these requirements will be complied with during response actions at the Site.

TABLE F-1

Action-Specific ARARs/TBCs
Safety Light Corporation OU-3

Standard, Requirement, Criterion, Or Limitation	Citation Or Reference	Description	Status	Comments
PENNSYLVANIA				
Pennsylvania regulations governing Residual Waste Management	25 Pa. Code Chapter 287: §287.1-Definitions; §287.2 Scope 25 Pa. Code Chapter 299 §299.101-.117 Scope and Gen'l §299.121-.133 Types of containers; tanks; storage piles	Applicable	Provides requirements for persons who generate, manage or handle residual waste, and specifies that certain residual wastes (including construction/debris, waste from grubbing and excavation and friable asbestos containing waste) shall be regulated as municipal waste (Article VIII) rather than as a residual waste.	In the event that material from the OU3 activities meets the definition of "residual waste," the substantive requirements of these regulations would apply. No permitting requirements apply.
Pennsylvania regulations governing Municipal Waste Management (Article VIII)-Chapter 285	Subchapter A - Storage of Municipal Waste 25 Pa. Code Chapter 285	Applicable	Specifies requirements for persons who store municipal waste	The substantive requirements of this regulation will apply for material that meets the definition of municipal waste, or is otherwise subject to Article VIII pursuant to 25 Pa. Code Chapter 287. No permitting requirements apply.
Pennsylvania Regulations for Collecting and Transporting of Residual Wastes	25 PA Code § 299.211-216.	Applicable	Collection and transportation of residual waste	The substantive requirements of this regulation will apply for collection and transportation of residual wastes, if any. No permitting requirements apply.
Pennsylvania Standards for Contamination for Fugitive Particulate Matter	25 Pa. Code §123.2	Applicable	Prohibits release of visible fugitive particulate matter from outside the property boundary.	Applicable to earth-moving activities as well as to treatment processes that may include mixing or other processes that result in potential releases of particulates. No permitting requirements apply.
Pennsylvania Regulations for Packaging and Transport of Radioactive Materials	PA Code, Title 25, Chapter 230	Relevant and Appropriate	PADEP criteria for packaging and transportation of licensed material	Pennsylvania has incorporated the requirements of 40 CFR 71 (relating to packaging and transport of radioactive materials) by reference. Only the substantive requirements of this regulation will apply.
Pennsylvania Regulations for Erosion and Sediment Control	25 Pa. Code Chapter 102 §102.4(b)-erosion & sedimentation control reqts, §102.11-general reqts §102.22-site stabilization	Applicable	Identifies erosion and sediment control requirements and criteria for earth disturbance activities other than agricultural plowing or tilling or animal heavy use areas	The substantive portions of these regulations, including use of best management practices and design standards, apply to earth disturbance activities at the site including clearing, grading, and excavation. No permitting requirements apply.
Pennsylvania Storm Water Management Act	32 P.S. § 680.13 –Duties of Persons Engaged in Development of Land	Applicable	Provides storm water runoff control requirements during construction activities.	Applicable to alteration or development of land which may affect storm water runoff characteristics, if any, during the OU-3 remedial action. No permitting requirements apply.

TABLE F-1

Action-Specific ARARs/TBCs
Safety Light Corporation OU-3

Standard, Requirement, Criterion, Or Limitation	Citation Or Reference	Description	Status	Comments
Department of Environmental Protection Bureau of Land Recycling and Waste Management: Management of Fill	258-2182-773	TBC	Establishes clean fill requirements	TBC for soils used as clean fill at excavated areas at the site.
Pennsylvania's Land Recycling Program Technical Guidance Manual	253-0300-100	TBC	Establishes recommendations and guidance for attainment of site specific standards in soil at voluntary state cleanup Sites for land reuse.	TBC for remedial activities involving soil.

TABLE F-2

Contaminant-Specific ARARs/TBCs are the Safety Light Corporation OU-3 Bloomsburg, Pennsylvania

Standard, Requirement, Criterion, Or Limitation	Citation Or Reference	Description	Status	Comments
FEDERAL				
Cleanup of Radioactively Contaminated Superfund Sites	OSWER Directive 9200.4-18	TBC	EPA Guidance to use the Superfund remedy selection framework when addressing radionuclides.	Provides guidance that NRC rules are not protective and that even if they are ARARs, risk range should be achieved.
Standards for Protection Against Radiation	10 C.F.R. Part 20, Subpart C – Occupational Dose Limits; Subpart D – Radiation Dose Limits for the Public: Subpart G – Control of Exposures from External Sources; Respiratory Protection: Subpart I – Storage and Control; Subpart J Precautionary Measures: Subpart H - Appendix B, Table 2	Relevant and Appropriate	NRC regulation pertaining to radiological standards for discharge/emissions	The substantive portions of these requirements will be complied with during response actions at the Site.
Termination of Byproduct, Source, and Special Nuclear Material Licenses	NRC Policy and Guidance Directive FC83-23	TBC	Nuclear Regulatory Guidance for release of radiological contaminated materials.	This guidance will be considered for excavation activities, and segregation of debris as radioactively contaminated or nonradioactively contaminated
Termination of Operating Licenses for Nuclear Reactors	NRC Regulatory Guide 1.86	TBC	Nuclear Regulatory Guidance describes methods and procedures considered acceptable by NRC staff for the termination of operating licenses for nuclear reactors, and includes information and considerations for decontamination for release and unrestricted reuse	This guidance will be considered during OU-3 remedial activities
National Emission Standards for Hazardous Air Pollutants (NESHAP), Subpart H: National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities	40 CFR Part 61 § 61.92-standard § 61.93-emissions monitoring and testing procedures	Relevant and Appropriate	EPA regulation pertaining to limit of radiological dose to public from air emissions at DOE facilities.	Provides 10 millirem/year standard for protecting the public.

TABLE F-2

Contaminant-Specific ARARs/TBCs are the Safety Light Corporation OU-3 Bloomsburg, Pennsylvania

Standard, Requirement, Criterion, Or Limitation	Citation Or Reference	Description	Status	Comments
EPA Soil Screening Guidance	EPA/540/R-96/018 July 1996	TBC	Provides methodology for calculating risk-based, site-specific soil screening levels.	Used to standardize and accelerate site cleanup.
EPA Region III Risk-Based Concentration Table	www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/	TBC	Establishes chemical screening guidelines for use during risk assessment.	May be useful in development of screening levels.
Risk Assessment Guidance for Superfund, Volume 1, Part A	EPA/540/1-89/002	TBC	Defines Preliminary Remediation Goals and Remedial Action Levels for soil	Applicable when evaluating the adequacy of soil remediation activities.
PENNSYLVANIA				
Pennsylvania Radiological Health – Standards for Protection Against Radiation	PA Code, Title 25, Chapter 219	Relevant and Appropriate	Establishes standards of protection against ionizing radiation.	Pennsylvania has incorporated the requirements of 10 CFR 20 (relating to standards for protection against radiation) by reference. Only the substantive requirements of this regulation will apply.
Pennsylvania Radiological Health – Low Level Radioactive Waste Management and Disposal	PA Code, Title 25, Chapter 236 §236.501-524-Waste classification, characteristics, labeling and manifests	Applicable	Identifies radioactive waste classification considerations and minimum requirements for classes of radioactive wastes.	The substantive portions of these requirements will be complied with during the OU3 activities at the Site.
Pennsylvania National Emission Standards for Hazardous Air Pollutants (NESHAP)	25 Pa. Code Chapter 124 §124.3	Relevant and Appropriate		Pennsylvania has adopted the federal NESHAP (40 CFR Part 61) in its entirety
Pennsylvania Soil and Ground Water Remediation Levels	25 PA Code 250, §250.402 – Human Health and Environmental Protection Goals	Applicable	Protocol for developing site remediation standards	Applicable for use of site-specific standards

TABLE F-3

Location-Specific ARARs/TBCs are the Safety Light Corporation OU-3 Bloomsburg, Pennsylvania

Standard, Requirement, Criterion, Or Limitation	Citation Or Reference	Description	Status	Comments
FEDERAL				
National Historic Preservation Act of 1966, as amended	16 U.S.C. §470	Applicable	Requirements relating to preserving historical and archaeological resources; requires Federal agencies to evaluate the impact of their undertakings on properties included on, or eligible for inclusion in, the National Register of Historic Places.	The preferred alternative has the potential for disturbing historically significant resources (old canal). Further action will be taken to identify and mitigate adverse effects on such identified resources. The substantive requirements will be met.
PENNSYLVANIA				
Pennsylvania Floodplain Management	25 Pa. Code Chapter 106 §106.31 – Hydraulic capacity §106.32 – Site Drainage Structures	Relevant and Appropriate	Standards for construction in 100 year floodplain, wetlands and regulated waters.	The substantive portions of these regulations apply to activities at the site that occur in the floodplain, if any. No permitting requirements apply.

APPENDIX G

PHOTOS

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Photo 1: West Lagoon Excavation

Photo 2: Radium Dials/Items in Excavation

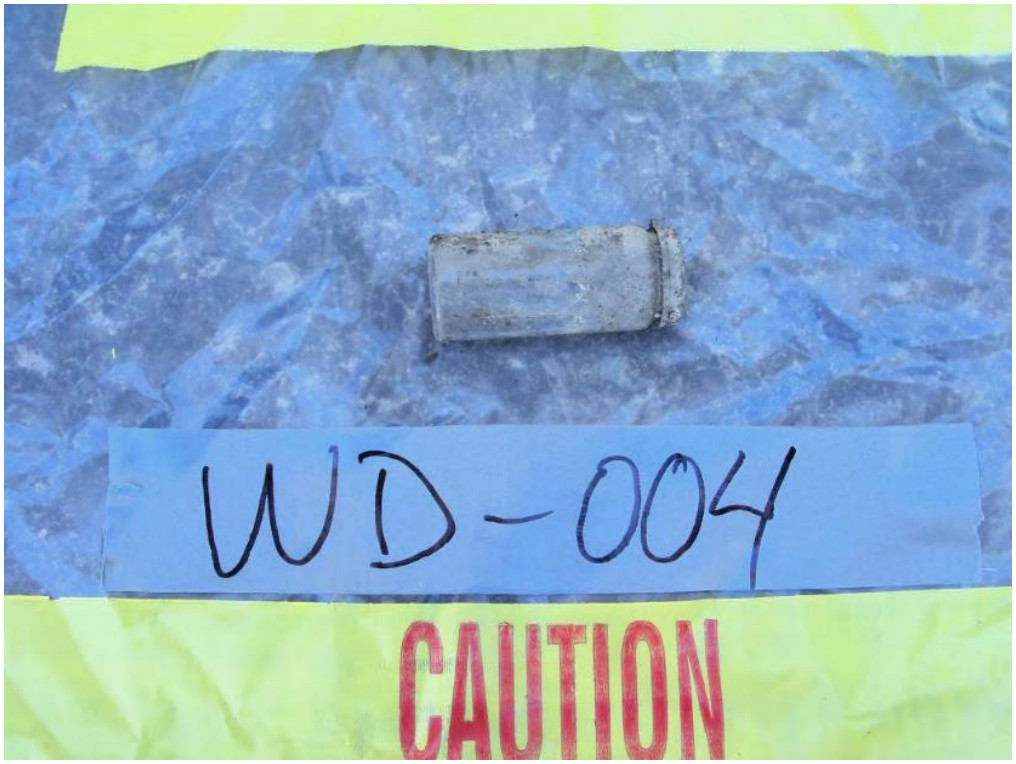

Photo 3: Item found in West Dump with 27,000 dpm alpha contamination.

Photo 4: Item Found in West Dump

APPENDIX H

REMEDIAL ALTERNATIVE COSTS

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TABLE H-1

SAFETY LIGHT CORPORATION ,BLOOMSBURG, PENNSYLVANIA
SURVEY UNITS 12, 13, 14, AND 15
REMEDIAL ALTERNATIVES SCREENING
ALTERNATIVE 2: SOIL EXCAVATION AND OFF-SITE DISPOSAL
Capital Cost

Item	Quantity	Unit	Unit Cost				Total Cost				Subtotal
			Subcontract	Material	Labor	Equipment	Subcontract	Material	Labor	Equipment	Direct Cost
1 PROJECT DOCUMENTS/INSTITUTIONAL CONTROLS											
1.1 Prepare Documents, Plans, and Permits	300	hr			$40.93		$0	$0	$12,279	$0	$12,279
1.2 Prepare Deed Notifications/Restrictions	1	ls	$10,000.00				$10,000	$0	$0	$0	$10,000
2 SITE PREPARATION AND FIELD SUPPORT											
2.1 Office Trailer	6	mo				$488.50	$0	$0	$0	$2,931	$2,931
2.2 Field Office Support	6	mo		$200.00			$0	$1,200	$0	$0	$1,200
2.3 Storage Trailer	6	mo				$108.00	$0	$0	$0	$648	$648
2.4 Utility Connection/Disconnection (phone/electric)	1	ls	1500.00				$1,500	$0	$0	$0	$1,500
2.5 Site Utilities	6	mo	350.00				$2,100	$0	$0	$0	$2,100
2.6 Construction Survey Support	2	days		$775.00	$43.50		$0	$1,550	$87	$0	$1,637
2.7 Equipment Mobilization/Demobilization	6	ea			$375.00	$375.00	$0	$0	$2,250	$2,250	$4,500
2.8 Site Superintendent	6	mo			$8,683.84		$0	$0	$52,103	$0	$52,103
2.9 Site Health & Safety and QA/QC (2 Persons)	12	mo			$7,203.68		$0	$0	$86,444	$0	$86,444
### Materials Storage Pad, 25' X 25'	1	ls		$1,000.00	$250.00	$200.00	$0	$1,000	$250	$200	$1,450
### Spray Truck for Dust Suppression	6	mo				$4,200.00	$0	$0	$0	$25,200	$25,200
### Water for Dust Suppression, 2,000 gal/month	12,000	gal		$0.20			$0	$2,400	$0		$2,400
### Cut & chip trees to 6" diam, Grub Stumps	1	ls	1800.00				$1,800	$0	$0	$0	$1,800
### Clear Site, grasses & brush	1	acre			$204.00	$185.00	$0	$0	$255	$231	$486
### Erosion and Sedimentation Controls	1	ls	8000.00				$8,000	$0	$0	$0	$8,000
3 DECONTAMINATION											
3.1 Equipment Decon Pad	1	ls		$2,500.00	$3,350.00	$400.00	$0	$2,500	$3,350	$400	$6,250
3.2 Radiation Decontamination Services	6	mo	$60,000.00				$360,000	$0	$0	$0	$360,000
3.3 Pre/Post Decontamination Survey	110	ea		$400.00			$0	$44,000	$0	$0	$44,000
4 EXCAVATION AND DISPOSAL											
4.1 Excavator, Crawler Mounted, 1-1/2 cy	4.5	mo			$15,613.98	$18,754.40	$0	$0	$70,263	$84,395	$154,658
4.2 Front End Loader, 3 cy (145HP)	4.5	mo			$12,132.66	$9,508.90	$0	$0	$54,597	$42,790	$97,387
4.3 Dozer, Crawler, 105 H. P.	3.5	mo			$12,132.66	$11,037.80	$0	$0	$42,464	$38,632	$81,097
4.4 LLRW Waste Acceptance Certification	1	ls	$10,000.00				$10,000	$0	$0	$0	$10,000
4.5 Confirmation Sampling and Testing -PAHs, metals, 1 week TAT	50	ea	$415.00	$30.00	$80.00	$30.00	$20,750	$1,500	$4,000	$1,500	$27,750
4.5 Confirmation Sampling and Testing -Radionuclides, 1 week TAT	50	ea	$800.00	$30.00	$80.00	$30.00	$40,000	$1,500	$4,000	$1,500	$47,000
4.6 Off Site Transportation & Disposal, Non-Hazardous	0	tons	$65.00				$0	$0	$0	$0	$0
4.7 Off Site Disposal as Radioactive Waste	9,683	tons	$300.00				$2,904,900	$0	$0	$0	$2,904,900
4.8 Transportation with Intermodal Container by Rail	7,173	cy	$170.00				$1,219,410	$0	$0	$0	$1,219,410
4.8 Container Liner	300	ea		$40.00			$0	$12,000	$0	$0	$12,000
4.9 Truck for Moving Container	5	mo				$4,200.00	$0	$0	$0	$21,000	$21,000
### Radiation/ Safety Monitoring Instruments & Supplies	5	mo	$5,000.00				$25,000	$0	$0	$0	$25,000
5 BACKFILL/ SITE REGRADING AND GRAVEL COVER											
5.1 Front End Loader, 3 cy (145HP)	1.5	mo			$12,132.66	$9,508.90	$0	$0	$18,199	$14,263	$32,462
5.2 Dozer, 105 H. P.	1.5	mo			$12,132.66	$11,037.80	$0	$0	$18,199	$16,557	$34,756
5.3 Vibratory Roller (35HP)	3	week			$2,802.00	$1,197.00	$0	$0	$8,406	$3,591	$11,997
5.4 Clean Backfill Soil	9,320	cy		$18.75			$0	$174,750	$0	$0	$174,750
5.4 Geotextile Soil Stabilization	1,884	sy		$0.95	$0.24		$0	$1,790	$452	$0	$2,242
5.5 Gravel Cover, 12" thickness	628	cy		$20.50			$0	$12,874	$0	$0	$12,874
5.6 Site Regrading	1	ls	$2,381.00				$2,381	$0	$0	$0	$2,381
6 POST CONSTRUCTION COST											
6.1 Contractor Completion Report	200	hr			$40.93		$0	$0	$8,186	$0	$8,186
Subtotal							$4,605,841	$257,064	$385,785	$256,088	$5,504,778
Local Area Adjustments							100.0%	93.2%	100.0%	100.0%	
							$4,605,841	$239,583	$385,785	$256,088	$5,487,297

SAFETY LIGHT CORPORATION ,BLOOMSBURG, PENNSYLVANIA
SURVEY UNITS 12, 13, 14, AND 15
REMEDIAL ALTERNATIVES SCREENING
ALTERNATIVE 2: SOIL EXCAVATION AND OFF-SITE DISPOSAL
Capital Cost

Item	Quantity	Unit	Unit Cost				Total Cost				Subtotal
			Subcontract	Material	Labor	Equipment	Subcontract	Material	Labor	Equipment	Direct Cost
Overhead on Labor Cost @ 30%									$115,735		$115,735
G & A on Labor Cost @ 10%									$38,578		$38,578
G & A on Material Cost @ 10%								$23,958			$23,958
G & A on Subcontract Cost @ 10%							$460,584				$460,584
G & A on Equipment Cost @ 10%										$25,609	$25,609
Tax on Materials and Equipment Cost @ 6%								$14,375		$15,365	$29,740
Total Direct Cost							$5,066,425	$263,542	$540,098	$281,697	$6,151,763
Indirects on Total Direct Cost @ 25%		(excluding transportation and disposal cost)									$506,863
Profit on Total Direct Cost @ 10%											$615,176
Subtotal											$7,273,802
Health & Safety Monitoring @ 2%		(includes air quality monitoring)									$145,476
Total Field Cost											$7,419,278
Contingency on Total Field Costs @ 20%											$1,483,856
Engineering on Total Field Cost @ 5%		(excluding transportation and disposal cost)									$164,748
TOTAL COST											**$9,067,882**

TABLE H-2

SAFETY LIGHT CORPORATION ,BLOOMSBURG, PENNSYLVANIA
SURVEY UNITS 12, 13, 14, AND 15
REMEDIAL ALTERNATIVES SCREENING
ALTERNATIVE 2

Item	Item Cost Years 1 through 30	Item Cost per 5 years	Notes
Groundwater Monitoring	$0		Groundwater monitoring will not be conducted. Groundwater will be the focus of OU-2.
Site Review		$30,000	Review of site conditions by two engineers for Years 5, 10, 15, 20, 25, and 30
TOTALS	$0	$30,000	

TABLE H-3

PRESENT WORTH ANALYSIS
ALTERNATIVE 2 - SOIL EXCAVATION AND OFF-SITE DISPOSAL,

REMEDIAL ALTERNATIVES SCREENING
SURVEY UNITS 12, 13, 14, AND 15
SAFETY LIGHT CORPORATION, BLOOMSBURG, PENNSYLVANIA

Year	Capital Cost	Annual Cost	Total Year Cost	Annual Discount Rate at 7%	Present Worth
0	**$9,067,882**		$9,067,882	1.000	$9,067,882
1		$0	$0	0.935	$0
2		$0	$0	0.873	$0
3		$0	$0	0.816	$0
4		$0	$0	0.763	$0
5		$0	$30,000	0.713	$21,390
6		$0	$0	0.666	$0
7		$0	$0	0.623	$0
8		$0	$0	0.582	$0
9		$0	$0	0.544	$0
10		$0	$30,000	0.508	$15,250
11		$0	$0	0.475	$0
12		$0	$0	0.444	$0
13		$0	$0	0.415	$0
14		$0	$0	0.388	$0
15		$0	$30,000	0.362	$10,873
16		$0	$0	0.339	$0
17		$0	$0	0.317	$0
18		$0	$0	0.296	$0
19		$0	$0	0.277	$0
20		$0	$30,000	0.258	$7,753
21		$0	$0	0.242	$0
22		$0	$0	0.226	$0
23		$0	$0	0.211	$0
24		$0	$0	0.197	$0
25		$0	$30,000	0.184	$5,527
26		$0	$0	0.172	$0
27		$0	$0	0.161	$0
28		$0	$0	0.150	$0
29		$0	$0	0.141	$0
30		$0	$30,000	0.131	$3,941

TOTAL PRESENT WORTH **$9,132,616**

Discount rate of 7% per OSWER Directive No. 9355.3-20, June 1993

APPENDIX I

PADEP CONCURRENCE LETTER

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pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

June 30, 2018

Dominique Lueckenhoff
Division Director
Hazardous Sites Cleanup Division
US EPA Region III
1650 Arch Street (3HS00)
Philadelphia, PA 19103-2029

Re: Early-Interim Record of Decision (ROD)
Safety Light Corporation Site
South Centre Township, Bloomsburg, PA

Dear Ms. Lueckenhoff:

The Department of Environmental Protection (DEP) has received and reviewed the Early-Interim Record of Decision (ROD) for the Safety Light Corporation site in South Centre Township, Clinton County. This Early-Interim ROD presents the selected remedial action for Operable Unit Three (OU3), which addresses the soils for the West Dump, West Lagoon, East Dump, and East Lagoon portions of the 10-acre site. These areas have been impacted by radionuclides and other non-radionuclide contaminants (i.e., heavy metals and other organic compounds) as a result of former operations at the Site. The remainder of OU-3 will be addressed in future response actions. EPA is currently performing a Removal Action to address the contamination located in the West Dump, West Lagoon, East Dump, and East Lagoon areas. EPA has decided to use this early-interim approach in order to expediently convert the ongoing Removal Action to an Early-Interim Remedial Action. The current Remedial Investigation (RI) for OU-3 will continue during and beyond the Early Interim Remedial Action to determine the full nature and extent of the contamination in OU-3.

The selected remedy for the OU-3 includes the following major components:

- Mobilize and setup support facilities, remove vegetation, and establish soil erosion and sediment controls. Regularly inspect and maintain erosion and sediment controls during vegetation clearance, soil excavation and stockpiling, waste loading, backfilling, and regrading operations, until excavation and backfilling is complete and a gravel protective cover is established at the West Dump, West Lagoon, East Dump, and East Lagoon to minimize erosion.

- Excavate all materials including soils/debris and radioactive discrete objects from the West Dump, West Lagoon, East Dump, and East Lagoon in the approximate area of concern depicted in Appendix C (Figures 4 to 7). Continue vertical excavation until ground water or the native soil interface (the point at which fill material meets the native soil surface) is encountered, whichever occurs first, or to the maximum extent practicable

based on Site or excavation conditions. Excavation depths are expected to range from approximately 4 to 16 feet below ground surface (bgs). The total in-situ volume of material designated for removal is approximately 5,978 cubic yards.

- Collect post-excavation samples from the floor and side walls of each excavation area, prior to backfilling and regrading, to determine and document the concentration of radionuclide and non-radionuclide soil contamination that may remain in-place. Conduct gamma walkovers of the excavated areas prior to backfilling to assess any remaining radiological activity.

- Package all excavated material as radioactive waste and load into intermodal containers (IMCs) for shipment to disposal sites. Transfer excavated material by licensed vendors in accordance with transportation regulations to an off-site facility as described in #5, below.

- Dispose off-site, at a Nuclear Regulatory Commission (NRC) licensed radioactive waste facility, and in accordance with Section 121(d)(3) of CERCLA, 42 U.S.C. § 121(d)(3), and Section 300.440 of the NCP, 40 C.F.R. § 300.440, all soils, materials, and items excavated pursuant to item #2 above. Certain waste materials (including, but not limited to, dials and some discrete objects) may also exhibit chemical hazardous waste characteristics requiring treatment (e.g. stabilization) prior to permanent disposal. Such waste materials shall be sampled and analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) pursuant to the Resource Conservation and Recovery Act (RCRA) to determine if they exhibit hazardous waste characteristics. For those waste materials that fail TCLP, such treatment shall be performed at the off-site licensed radioactive waste facility to render such materials non-hazardous prior to disposal at that licensed facility.

- Backfill excavated areas with clean material derived from an off-site borrow source. Backfill material shall meet Pennsylvania Criteria for Management of Fill specifications for chemical constituents, as certified through laboratory analysis. Regrade excavated areas to approximate original contours, ensuring appropriate site drainage. Install and place geotextile and a layer of gravel, with a minimum thickness of 12 inches, on disturbed surfaces of the West Dump, West Lagoon, East Dump, and East Lagoon as a protective cover to minimize erosion.

The DEP hereby concurs with EPA's proposed remedy with the following conditions:

- The DEP will be given the opportunity to review and comment on documents and concur with decisions related to the design and implementation of the remedial action, to assure compliance with Pennsylvania's Applicable, Relevant and Appropriate Requirements (ARARs) and to be considered requirements (TBCs).

- The DEP will have the opportunity to review and comment before any modification to the ROD and the issuance of an Explanation of Significant Difference (ESD).
- This concurrence with the selected remedial action is not intended to provide any assurances pursuant to CERCLA Section 104(c)(3), 42 U.S.C. 9604(c)(3).
- EPA will assure that the DEP is provided an opportunity to fully participate in any negotiations with responsible parties.
- The DEP reserves the right and responsibility to take independent enforcement actions pursuant to state law.

Thank you for the opportunity to comment and concur on this EPA Record of Decision. If you have any questions regarding this matter, please do not hesitate to contact me at 570.327.3695.

Sincerely,

Marcus Kohl
Director
Northcentral Region

cc: John Banks, EPA Region III
Chris Welther, DEP Region
Cheryl Sinclair, DEP Region
File