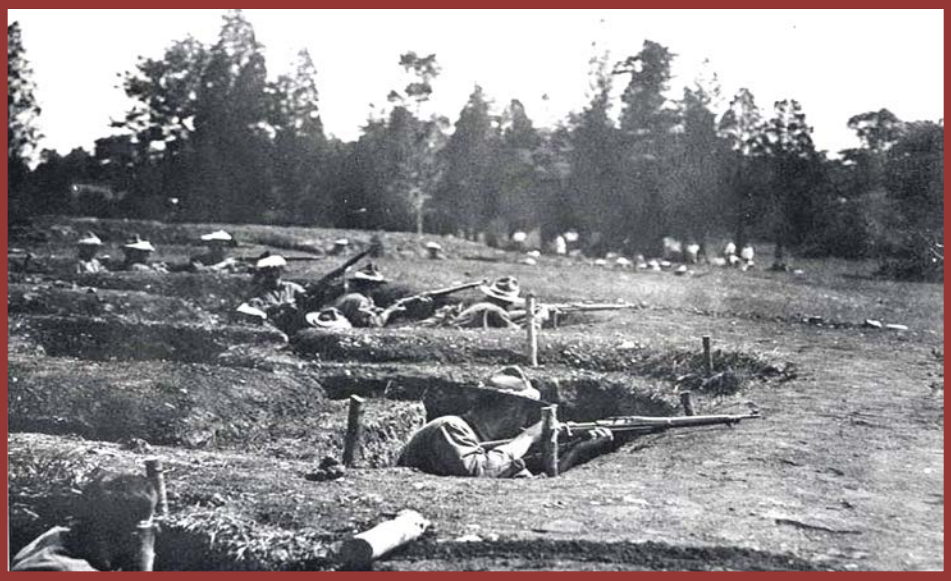
FINAL
SVFUDS SITE-WIDE
HUMAN HEALTH RISK ASSESSMENT
WORK PLAN

SPRING VALLEY FORMERLY USED DEFENSE SITE
WASHINGTON, D.C.

Contract No.: W912DR-09-D-0061, Delivery Order 0011
DERP FUDS MMRP/CWM Project No. C03DC091801 and
DERP FUDS HTRW Project No. C03DC091802



US Army Corps of Engineers®
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Prepared for:

US ARMY CORPS OF ENGINEERS
BALTIMORE DISTRICT

Prepared by:

ERT, Inc.
Laurel, MD 20707

FEBRUARY 10, 2014

February 10, 2014

Attn: Lan Reeser
CENAB-EN-HN
10 S. Howard Street
Baltimore, MD 21201-1715

Dear Mr. Reeser,

ERT, Inc., is pleased to present the Final SVFUDS Site-Wide Risk Assessment Work Plan for the Spring Valley FUDS Integrated Site-Wide Remedial Investigation/Feasibility Study, Washington, DC.

This version incorporates Stakeholder comments on the Draft-Final version.

Electronic distribution has been made as shown below. Please do not hesitate to call me at 301-323-1442 if you need anything more.

Sincerely,

Thomas J. Bachovchin
Project Manager

DISTRIBUTION:

CENAB – Reeser (4)
CEHNC – Anderson-Hudgins (1)
USEPA – Hirsh (1)
DCDOE – Sweeney (1)
RAB TAPP – deFur (1)
AU – Bridgham (1)

- **Written Comments were received January 23, 2014, via email from the USEPA on the December 18, 2013 Draft-Final SVFUDS Site-Wide Human Health Risk Assessment Work Plan.**

- **Written Comments were received January 22, 2014, from the RAB TAPP on the December 18, 2013 Draft-Final SVFUDS Site-Wide Human Health Risk Assessment Work Plan.**

- **Written Comments were received January 31, 2014, from the American University on the December 18, 2013 Draft-Final SVFUDS Site-Wide Human Health Risk Assessment Work Plan.**

USEPA

From: **Hirsh, Steven** [mailto:Hirsh.Steven@epa.gov]
Sent: Thursday, **January 23, 2014** 01:58 PM Pacific Standard Time
To: Reeser, Leland H NAB; 'Mr. Jim Sweeney' <james.sweeney@dc.gov>
Subject: [EXTERNAL] RE: SVFUDS - Draft-Final SVFUDS Site-Wide HHRA Work Plan (UNCLASSIFIED)

Hi Lan,
EPA has completed its review of the Site-Wide Human Health Risk Assessment Work Plan for the Spring Valley FUD site. The report is thorough and clear. EPA agrees with the proposed approach, and has no comments.

Steven Hirsh
U.S. EPA, Region III (3HS10)
Office of Federal Facility Remediation
1650 Arch Street (3HS10)
Philadelphia, PA 19103-2029

USACE RESPONSE:
Noted.

RAB TAPP

To: Lan Reeser, CENAB (received January 22, 2014)
From: Peter deFur, ESC, LLC

January 13, 2014
Comments prepared by TAPP advisor, ESC, LLC, Dr. Peter L. deFur, President.

Spring Valley Draft-Final SVFUDS Risk Assessment Work Plan

3.5 Potential Exposure Pathways

"Two different soil exposure intervals will be evaluated. The current potential receptors will be evaluated using an exposure interval of 0 to 2 feet below ground surface (bgs), to represent routine landscaping, gardening, and outdoor play activities. The soil exposure interval for future potential receptors includes mixed soils from 0 to 10 feet bgs. This exposure interval takes into account soil mixing that may occur due to future construction."

- Why not 0 to 10 ft bgs for both current vs future? Construction is taking place in the "current" scenario that is more than shallow, and would warrant the greater depth.

USACE RESPONSE:

The category termed "future potential receptors," with risks estimated using the 0 to 10 foot interval, will provide information on any risks that may be faced by residents during any current or future construction. The text has been re-worded as follows: The soil exposure interval for future potential receptors is mixed soils from 0 to 10 feet bgs, which includes the 0 to 2 foot interval to which current receptors could be exposed. This exposure interval takes into account soil mixing that may occur due to construction.

3.5.1 Southern AU EU

"Also, possible future exposure to mixed surface/subsurface soil for outdoor workers, construction workers, students, and residents will be evaluated, and will include the exposure pathways of incidental soil ingestion, dermal contact, inhalation outdoors, home-grown vegetable ingestion and inhalation of vapors indoors, if the criteria described above for volatility are met."

- It is not clear why there is no vegetable garden ingestion for current exposure scenarios. Wouldn't that be possible if 0 to 2 ft bgs covers routine gardening?

USACE RESPONSE:

The vegetable ingestion exposure pathway has been added for the 0 to 2 foot depth at Southern AU for current students to account for any current gardening that may be occurring on the site.

Table 4.8: Toxicity values

- IRIS is listed as the top source in the hierarchy of primary sources and this table states that chromium VI does not have any observed effects at a daily intake of 3.00E-03 mg/Kg-day. However, on closer inspection, IRIS's "Confidence in the Oral RfD" for chromium VI is as follows: "Study – Low; Database – Low; RfD – Low" and the last revision is date 09/03/1998. The section for Chromium VI from the Region II Regional Screening Levels is copied and inserted below. This web site indicates that NJ has concluded that Cr VI is carcinogenic and ATSDR has determined an oral RfD of 4.0e -4, according to RAIS (http://rais.ornl.gov/tools/profile.php). The toxicity of chromium, notably chromium VI seems to be under discussion by regulatory agencies, suggesting a more cautious approach is warranted. At the least, a discussion of the uncertainties is needed.

USACE RESPONSE:

A discussion of the uncertainties associated with the chromium RfD will be included in the HHRA.

Excerpt from the EPA Region III web site concerning screening levels

EPA Regional Screening Levels, Region III.

http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/usersguide.htm

"5.6 Chromium (VI)

It is recommended that valence-specific data for chromium be collected when chromium is likely to be an important contaminant at a site, and when hexavalent chromium (Cr (VI)) may exist. For Cr(VI), IRIS shows an air unit risk of 1.2E-2 per ($\mu g/m^3$). While the exact ratio of Cr(VI) to Cr(III) in the data used to derive the IRIS air unit risk value is not known, it is likely that both Cr(VI) and Cr(III) were present. The RSLs calculated using the IRIS air unit risk assume that the Cr(VI) to Cr(III) ratio is 1:6. Because of various sources of uncertainty, this assumption may overestimate or underestimate the risk calculated. Users are invited to review the document ?Toxicological Review of Hexavalent Chromium? in support of the summary information on Cr(VI) on IRIS to determine whether they believe this ratio applies to their projects and to consider consulting with an EPA regional risk assessor.

In the RSL Table, the Cr(VI) specific value (assuming 100% Cr(VI)) is derived by multiplying the IRIS Cr(VI) value by 7. This is considered to be a health-protective assumption, and is also consistent with the State of California's interpretation of the Mancuso study that forms the basis of Cr(VI)'s estimated cancer potency.

If you are working on a chromium site, you may want to contact the appropriate regulatory officials in your region to determine what their position is on this issue.

The Maximum Contaminant Level (MCL) of 100 µg/L for "Chromium (total)", from the EPA's MCL listing is applied to the "Chromium, Total" analyte on this website.

Tier 3 sources were used to derive the screening levels for Cr(VI).

The New Jersey Department of Environmental Protection (NJDEP) determined that Cr(VI) by ingestion is likely to be carcinogenic in humans. NJDEP derived an oral cancer slope factor, based on cancer bioassays conducted by the National Toxicology Program (http://www.state.nj.us/dep/dsr/chromium/soil-cleanup-derivation.pdf). The New Jersey assessment did not make a determination that Cr(VI) was mutagenic by mode of action for carcinogenesis.

EPA?s Office of Pesticide Programs (OPP) made a determination that Cr(VI) has a mutagenic mode of action for carcinogenesis in all cells regardless of type, following administration via drinking water. OPP recommended that Age-Dependent Adjustment Factors (ADAFs) be applied when assessing cancer risks from early-life exposure (< 16 years of age). This determination was reviewed by OPP?s Cancer Assessment Review Committee and published in a peer review journal).

Therefore, in 2009 the RSL workgroup adopted the Tier III NJDEP values and the OPP recommendation with respect to mutagenicity. More recently, in 2011, external peer reviewers provided input on the EPA?s Office of Research and Development Integrated Risk Information System draft Toxicological Review of Hexavalent Chromium (http://cfpub.epa.gov/ncea/iris_drafts/recordisplay.cfm?deid=221433). The majority of reviewers questioned the evidence used to support a mutagenic mode of action for carcinogenesis for Cr(VI). Furthermore, in 2011 California Environmental Protection Agency finalized its drinking water Public Health Goal for Cr(VI). CalEPA?s Technical Support Document concluded in numerous studies that Cr(VI) is both genotoxic and mutagenic. (http://www.oehha.ca.gov/water/phg/072911Cr6PHG.html)

Therefore, the RSL workgroup acknowledges that there is uncertainty associated with the assessment of hexavalent chromium. However, no updated consensus IRIS assessment (Tier I) has yet appeared, and chromium is still under review by the IRIS program. With respect to RSLs, the more health-protective approach of applying ADAFs for early life exposure via ingestion, dermal and inhalation was used to calculate screening levels for all exposure pathways. Application of ADAFs for all exposure pathways results in more health-protective screening levels.

As always, consult EPA toxicologists in the Superfund program of the regional office when developing site specific screening levels. "

American University

AMERICAN UNIVERSITY COMMENTS ON SVFUDS SITE-WIDE HUMAN HEALTH RISK ASSESSMENT WORK PLAN

January 29, 2014

American University (AU) is pleased to have this opportunity to review and comment on the SVFUDS Site-Wide Human Health Risk Assessment Work Plan (HHRAWP) dated December 18, 2013. This is one of a series of documents that will ultimately lead to a site-wide HHRA as a component of a site-wide RI/FS. AU has commented on earlier documents in this series including

- American University's Comments on the Draft-Final Evaluation of Remaining Sampling Requirements for SVFUDS.
- American University Response to "Final Evaluation of Remaining Sampling Requirements": Site-Wide Remedial Investigation/Feasibility Study.
- AU Comments on Draft-Final Addendum 1 to the Final Pre-2005 Human Health Risk Assessment Review

Many of AU's concerns have not been addressed or have been addressed inadequately in responses to these comments. AU's comments at this stage should be considered to incorporate by reference our comments and concerns as transmitted in the previous documents, above.

Section 1.2. The fact that information was presented to AU or that U representatives were present where information was shared should not be construed as agreement or approval by AU.

As noted previously in AU comments, it is quite unusual to perform a risk assessment independent of the remainder of the RI and when the nature and extent of contamination have not been defined. In fact, EPA guidance1.is clear in showing that risk assessment is an integral part of the RI at various stages in its development. Some of the information to be included in the RI is identified in Section 1.3.2 of this HHRAWP. This information should be fully integrated in the risk assessment rather than being included as separate components in the RI as shown in EPA guidance. Since an RI is not available, AU reserves its right to further comment on this HHRAWP if information contained in the RI requires modification of the risk assessment.

USACE RESPONSE: Noted.

Several sections of the HHRAWP including 3.3, 3.4.2, and 3.5 include subsurface soil. Section 3.5 defines subsurface soil as that which occurs to depths up to 10 ft bags. It is not clear anywhere in the document; however, what data represents surface soil and what data represents subsurface soil. At the very least, each data point presented in the appendices should include the soil depth, sampling interval, and degree of vertical compositing. Although AU has not gone back and evaluated every data point, it is our distinct impression that the subsurface in the area now known as the AU EU has been poorly characterized. A data summary, preferably with a map, should show the extent of subsurface characterization in this area.

USACE RESPONSE: On the Appx B tables of detections, or the raw complete data summary tables forwarded by Lan Reeser, January 14, 2014, the subsurface samples have the depth as the last character in the name, within parenthesis.

Section 3.4.2. The term "conservatively" is a value judgment and should be deleted.
USACE RESPONSE: This term has been deleted.

Section 3.5.1. EPA's 2002 draft vapor intrusion guidance is considered to be obsolete. EPA's web site (://www.epa.gov/oswer/vaporintrusion/) should be consulted for more recent developments concerning vapor intrusion assessments. Mercury should be included in the vapor intrusion assessment since elemental mercury has been found at SVFUDS. This section and Figure 6 include home-grown vegetable ingestion as an exposure scenario. AU supports this inclusion; however, no further information is included in the work plan. This scenario should be fully detailed in Section 4.5 and the exposure factors tables. In addition, necessary parameters such as transfer coefficients should be presented in chemical-specific tables.
USACE RESPONSE: According to the website cited, EPA is currently preparing its final guidance for the vapor intrusion pathway, and up to this point in time, only external review drafts of the guidance documents (annotated with "Do Not Cite or Quote") have been made public. However, a Vapor Intrusion Screening Levels spreadsheet calculator that lists chemicals considered to be volatile and sufficiently toxic through the inhalation pathway has been added to the EPA website. This EPA reference will be used in place of the 2002 guidance document to support the vapor intrusion screening approach outlined in the Work Plan. Mercury will be included in the vapor intrusion assessment, if it is selected as a COPC. The specific information for the vegetable ingestion pathway will be provided in the HHRA, along with transfer coefficients.

Section 4.1. Although several guidance documents are cited in this section, it is unclear if the HHRA will be compliant with the requirements in these documents. For example, RAGS D is prominently cited; however, risk assessments performed by USACE contractors at the SVFUDS have never been compliant with RAGS D. In the 13 years since RAGS D was published, its use has become commonplace and risk assessors have come to rely on the information in the planning tables. The Tables in the HHRAWP are not as informative as the RAGS D planning tables. For example, RAGS D Table 2 includes the exposure point, minimum concentration, qualifiers, location of maximum concentration, detection frequency, and range of detection limits. None of this information is presented in the HHRAWP Table C.3. The guidance explicitly states, "The approach contained in RAGS Part D is strongly recommended for all CERCLA human health risk assessments." EPA Region III requires private PRPs to be fully compliant with RAGS D and there is no reason why a federal agency should not adhere to this same standard. AU's position is that this HHRA should be fully compliant with EPA guidance and that EPA should not approve the HHRA unless this compliance is demonstrated.
USACE RESPONSE: As noted in Section 1.3.1 of the Work Plan, the RAGS D table formats will be used in the HHRA.

Section 4.2 discusses several elements considered during data evaluation; however, the data evaluation is not presented in the document. The suitability of data for use in the HHRA should be fully evaluated based on EPA Guidance2. The impact of data quality issues on the HHRA should be addressed in the uncertainty section.
USACE RESPONSE: Each of the individual sampling efforts upon which these HHRAs are built, has had work plans reviewed, commented upon, and approved, prior to work commencing. Each of the reports has included discussion of data usability in data validation sections.

Section 4.2.1. Background comparison—Although never explicitly discusses, for screening purposes, USACE appears to continue to rely on a point estimate of background (UTL) rather than the entire distribution as per EPA guidance3 . The statistical meaning of comparing a maximum to a UTL is not clear. Although UTLs are useful for identifying outliers, they are not advocated by EPA for background

comparisons. As noted on prior comments, the reasons for this include the sensitivity of the UTL to the form of the underlying distribution and the fact that the UTL is intrinsically non-conservative. As the uncertainty in the background dataset increases, it becomes easier to dismiss site contamination as representing background conditions using a UTL. The reasons for disregarding EPA guidance are inexplicable especially since all of the data have been or will be input to ProUCL which contains all the necessary routines to perform the statistical calculations of the types called for in the guidance.
USACE RESPONSE: As described in the Section 4.2.1, "The COPCs are typically derived during the actual RA. However, because they have already been screened for these EUs in the Addendum 1 [to the Pre-2005 HHRA Review] document, they are included as Appendix C in this Work Plan. The Appendix C tables represent the screen of all available data for that EU, screened to the provisional COPC stage (as defined in that document). That is, all provisional COPCs derived in Addendum 1 for the three EUs (and as shown in Appendix C Tables C.1, C.2, C.3, and C.4) are COPCs for the quantitative RA." The screen at the Provisional COPC stage was done using the standard SVFUDS background values as determined in the SVFUDS Background Soil Sampling Report (2008).

Section 4.2.2. AU continues to have reservations regarding the handling of exposure units. The EU should be based on exposure scenarios and activity patterns. As stated earlier, residential exposure units of 0.5 acre are not unusual and, in fact, are consistent with the SSL guidance for soil sampling.
USACE RESPONSE: Noted

Section 4.3. The version of ProUCL used should be cited. Line 22 refers to the "latest version of USEPA's ProUCL", however the citations point to 2010 releases which do not reflect the latest version (ProUCL 5, released in 2013). AU assumes that the latest version (ProUCL 5) will be the version used. This section also discusses summarization of exposure point concentrations. The appropriate means for doing this is RAGD D Table 3. In Addition, EPA Region 3 requires private PRPs to provide copies of all ProUCL inputs and outputs that are used in the risk assessment. There is no reason that this requirement should not apply to federal facilities in Region 3.
USACE RESPONSE: The most current version of ProUCL will be used (ProUCL version 5.0.00), and the reference will be updated in the Work Plan. The ProUCL output will be provided in an appendix to the HHRA.

Section 4.4.6. There is no evidence to support the contention that a groundkeeper/landscaper/gardener will have a lower exposure to soil than a construction worker. EPA's dermal exposure guidance4, in fact, shows that a gardener has one of the highest adherence factors of all occupations cited. It is hard to visualize a gardener who has less intensive soil contact than a heavy equipment operator. This sentence should be deleted and the exposure assumptions for the outdoor worker should be revised to reflect intensive exposures.
USACE RESPONSE: As mentioned in the second paragraph of Section 4.4.6, and as shown in Tables 4.3 and 4.7, the exposure assumptions are the same for both construction and outdoor workers (RME incidental soil ingestion rate of 330 mg/day and CTE soil ingestion rate of 100 mg/day; soil-to-skin adherence factor of 0.1566 mg/cm^2), except for exposure duration.

Section 4.4.7. This should be made consistent with RAGS E as noted above.
USACE RESPONSE: The dermal exposure assessment will be conducted in accordance with RAGS Part E, as described in Section 4.5.2. However, the dermal adherence factors used have been updated by EPA, and are found in the EPA's Exposure Factors Handbook (EPA, 2011).

Section 4.5.4. AU has a standing objection to the use of a PEF intended for residential exposure to calculate particulate exposure to construction workers and grounds crew who have much more

intensive exposure to soil borne dust. The PEF derived in the HHRAWP is based on a mean wind velocity at Philadelphia. Grounds workers use equipment such as leaf blowers, outdoor vacuums, lawn mowers, etc which generate significant more particulate matter than an average wind. For example, Fitz et al.5 have measured emission factors for PM10 up to 130 mg/m2 for leaf blowing. Even using a push broom on a concrete surface generated PM10 up to 80 mg/m2. Use of a generic PEF for these work practices would significantly under-estimate exposures. In cases where particulate exposure is greater than that described by the assumptions of the PEF, EPA6 recommends using a site-specific method to calculate particulate exposure. EPA has also developed a series of equations specifically for construction workers in this regard. AU endorses this recommendation by EPA for outdoor workers and construction workers at the AU EU.

USACE RESPONSE: USACE stands by its initial response to this issue, one provided in response to AU comments on the Lot 18 risk assessment (2008) wherein AU had asked USACE to consider AU's industrial hygiene measurements for dust for groundskeepers and asked that they be used in place of default values. That response is as follows:

"Standard EPA defaults that are very conservative were used to estimate risk associated with exposure to soil at this site. USACE will not use AU's unpublished data without validation from EPA. Should EPA provide validation of these values, USACE would consider using them, but our communication with EPA suggests that their acceptance of AU inputs would require an intensive peer-review process that would likely be a lengthy process. USACE reviewed the 2001 report AU provided with site-specific measurements. These have been reviewed and considered qualitatively in the uncertainty discussion in this document."

The use of a default PEF is a standard approach for HHRAs, and previous SVFUDS HHRAs, reviewed and accepted by regulators, in addition to Lot 18 and the PSB, have used this approach (4825 HHRA - Section 3.5.1.1, and 4835 HHRA - Section 3.4.1.1).

Section 4.7. Risk characterization should be presented as described in RAGS D, especially Tables 7-10. This will ensure that all appropriate combinations of exposure routes, exposure pathways and receptors have been assessed.

USACE RESPONSE: The HHRA tables will be presented in RAGS D formats, as explained in Section 1.3.1 of the Work Plan.

Section 4.8. . The uncertainty analysis discussed here is totally inadequate and is not consistent with EPA guidance. Rather than presenting a complete uncertainly analysis, USACE has opted to use a *pro forma* discussion that does not fully characterize site uncertainties. Since the publication of the Superfund Public Health Evaluation Manual in 1986, EPA has emphasized a complete and transparent discussion of uncertainties in the Superfund risk assessment process including an overall expression of confidence in the risk estimates. This was followed by a continued emphasis on uncertainty in virtually every guidance document produced by EPA in addition to reports of the National Academy of Sciences regarding risk assessment in the federal government. Two specific requirements for inclusion in risk characterization from EPA's Risk Assessment Guidance for Superfund are especially important:

- level of confidence in the quantitative toxicity information used to estimate risks and presentation of qualitative information on the toxicity of substances not included in the quantitative assessment.
- level of confidence in the exposure estimates for key exposure pathways and related exposure parameter assumptions.

Neither of these requirements is included in this HHRAWP. This is particularly important given the lack of adequate site characterization and the failure to toxicologically evaluate most of the COPCs. It needs to be kept in mind that this assessment is built on the shoulders of several other assessments, all with a degree of uncertainty. The uncertainty from these early assessments may be propagated through and compounded in the final result. In an assessment as complex as the one USACE is proposing here, a quantitative uncertainty analysis using Monte Carlo or error propagation analysis needed.
This section, especially Part 1 –data evaluation and identification of COPCs" discusses the "representativeness" of soil sampling and analysis, but not the adequacy. AU is highly concerned that an insufficient number of samples have been obtained or that the samples have not been analyzed for an adequate number of parameters. The only statements regarding adequacy that have been made by USACE refer to the number of samples per acre, which is a highly subjective criterion. For example, in a previous comment response USACE stated that there were "115 sets of results from 86 sample locations for an approximately 9 acre area, averaging to approximately 12+ samples per acre." Not only is this a subjective criterion of representativeness, it is actually inaccurate. Although there may have been 115 samples, there appear to be only 82 valid datapoints for arsenic, the primary COPC at the site. This translates into about 9 samples per acre or about 4 samples per exposure unit. Additionally almost all (over 90%) of the arsenic samples are concentrated in one portion of the AU EU.
USACE RESPONSE: The Work Plan Uncertainty section is a general presentation of the potential uncertainties associated with any HHRA; the site-specific uncertainties associated with the data used, exposure assessment, and toxicity assessment, will be addressed in the uncertainty section of the HHRA. Further, USACE is using EPA approved toxicity values to toxicologically evaluate these COPCs. With regard to the comment about error propagation, by updating these older studies with toxicity and exposure inputs based on newer and more updated studies, our evaluations would tend to decrease uncertainties rather than "compound" them.

A simple way of doing an objective analysis of adequacy and representativeness is to calculate the number of samples necessary to meet a DQO with acceptable levels of Type I and Type II errors. EPA statistical guidance7 discusses this concept and presents calculation examples for parametric (Box 3-1) and non-parametric (Box 3-18) evaluations. Similar methods are presented in EPA's SSL guidance. Supplementary material may be found in texts such as W. Ott's *Environmental Statistics and Data Analysis* or R.O. Gilbert's *Statistical Methods for Environmental Pollution Monitoring.* Since all of the data will have been input to ProUCL, implementation of these calculations is a simple task. An important part of this evaluation should be an investigation into the probability that all hotspots have been identified.
USACE RESPONSE: USACE has previously explained, primarily in the development of the Evaluation Document (June 2012) that laid the groundwork for the screening and evaluation of all data, old and new, why it believes the number of samples for the subject area is sufficient.

AU previously has been on record advocating the use of state-of-the-art geostatistical techniques to evaluate adequacy of sampling8. USACE has been resistant to using these methods. AU recommends that calculations of sample size be performed as above to determine sample number adequacy for RSL comparison and that geostatistical methods, as outlined in our earlier comments, be used to determine spatial adequacy.
USACE RESPONSE: USACE has previously explained, primarily in the development of the Evaluation Document (June 2012) that laid the groundwork for the screening and evaluation of all data, old and new, why it believes the number of samples for the subject area is sufficient.

Finally, there is little information available regarding quality assurance of the data that was obtained in early investigations. Concepts of DQOs, validation, and analytical methods have changed over the years since SVFUDS investigations started. This uncertainty section should include a complete evaluation of data validity in the light of contemporary quality assurance requirements for Superfund sites.
USACE RESPONSE: Each of the individual sampling efforts upon which these HHRAs are built, has had work plans reviewed, commented upon, and approved, prior to work commencing. Each of the reports has included discussion of data usability in data validation sections. The uncertainty section will acknowledge that analytical methods have changed over the years.

Table 4.3-4.7 mentions chemical-specific DAFs, however, values are not provided for these factors anywhere in this HHRAWP. In standard risk assessment practice, oral absorption efficiency and dermal absorbed cancer slope factors are included in RAGS D Table 6 which should be provided in this HHRA. The exposure factors presented in Table 4.4 do not seem to accurately reflect student activities. The most exposed students will be athletes and this activity should be taken into account. For example, EF is an over-estimate, and both IR and AF values are under-estimates. All of the values in this table should accurately reflect a student athlete based on data presented in the Exposure Factors Handbook and scientific literature.
USACE RESPONSE: The RAGS D Table 6 will be provided with the HHRA and will include the information mentioned. The IR and AF exposure factors used for the student athlete are those that are standard for adults, and, while the exposure frequency is likely an over-estimate, as stated in Section 4.4.2, "The standard high-end default residential exposure frequency of 350 days/year recommended by USEPA (1991a, 1997a) will be used for both residents and students for the RME scenario. This value is based on the assumption that residents and students might be exposed to contaminants on a daily basis, except during a two-week period when they are away from the home or school (e.g., on vacation) (USEPA, 1991a, 1997a)". Although the actual outdoor time for students may be lower, this value was selected as a conservative approach.

Table 4.8. This table seems to omit many toxicity values for significant COPCs. Despite the fact that inhalation exposure is to be evaluated as evident in Section 4.5.3, there are no RfCs or IURs. There is no oral slope cancer factor for arsenic listed although oral exposure to arsenic is certainly driving the activities at the SVFUDS. The table has listings for both chromium (VI) and chromium (III) despite the fact that chromium speciation has not been performed at this site. In lieu of speciation evidence, a protective approach should be taken and all chromium should be assumed to be chromium VI. The entry under lead refers to use of a blood lead model but no information is provided regarding the model or its parameterization. Also note that the target organ(s) for lead overlap with target organs for other COPCs and the effects could be additive. The table does not show the combined uncertainty/modifying factors for RfDs. Again, many of the problems in this section could be avoided if the SOW was compliant with RAGS D.
USACE RESPONSE: Table 4.8 lists both chromium VI and chromium III for completeness, but for the HHRA, both for the screening of COPCs and for the risk calculations, we will assume that chromium in soil is chromium III. For various previous investigations, chromium VI has been analyzed but has not often been detected. It is a reasonable assumption that chromium is chromium III; there are no known sources of chromium VI based on AUES activities. Further, Kimbrough et al., 1999, concluded that most naturally occurring chromium is trivalent. Therefore, it is our conclusion that trivalent chromium is likely the predominant species at the site. Table 4.8 has been updated for all selected COPCs that will be carried through the risk assessment.

Figures

An overall figure showing the context needs to be provided. This would include the currently proposed AU EU along with other parts of the SVFUDS that may have considered elsewhere but are still part of the site-wide context. These should include Lot 18, SB, CDC, Glenbrook Road properties, the athletic field TCRA as well as another other important locations. It would be useful to include sample locations and arsenic concentration contours in these figures.

USACE RESPONSE: The figure shows the EU footprint that is the subject of the HHRA.

Fig 5 – in a previous response to comments, USACE noted that a portion of this EU had been backfilled with clean fill. It would be useful to show this area on this or a similar figure.

USACE RESPONSE: The sample data summary previously submitted indicates which sample locations were replaced by clean fill. This is an HHRA Work Plan and is not intended to provide information previously provided in much more detail in reports such as the TCRA Athletic Fields Post Removal Report, etc.

Fig 6 – although a graphic conceptual model is useful, it should not take the place of the appropriate AGS D tables, particularly Table 1 and subsequent tables that refer to exposure points.

USACE RESPONSE: All required RAGS D tables will be included in the HHRA.

Additional Delineation

The excavation and replacement activities in the AU EU have never been verified. In addition, because of the nature of the activities that have been conducted to date, many data gaps remain. Investigations have been discrete and limited rather than comprehensive and coordinated9, some investigations have measured only a limited number of chemicals of concern, very few subsurface samples have been obtained, some investigations have measured only metals despite a reasonable probability that organics were present. TICs have not been adequately assessed, previously unsuspected contaminated areas have been discovered serendipitously, scientifically unsubstantiated statements regarding the adequacy of sampling have been made, and geographical locations remain unsampled. AU proposes that the USACE undertake a comprehensive verification or confirmatory site investigation of the portion of the AU campus that is suspected to have been impacted by AUES activities or that has been a component of a limited investigation or removal action. This area would not be limited to the AU EU but would include Lot 18, CDC, PSB, SDA, Critical Lots TCRA areas and others. This proposal is consistent with the NCP concept of transition from a removal program to a remedial program. The investigation should be conducted in accordance with EPA guidance10and include:

a. A statistical sampling plan over a randomly spaced grid
b. Power calculations to assess the adequacy of sampling
c. Confirmation sampling and analysis of all significant Spring Valley parameters (CWM, ABP, explosives, VOC, SVOC, metals, inorganics including perchlorate)
d. Adequate evaluation of TICs
e. Integration into the site-wide risk assessment.

USACE RESPONSE: USACE has previously explained, primarily in the development of the Evaluation Document (June 2012) that laid the groundwork for the screening and evaluation of all data, old and new, why it believes the number of samples for the subject area is sufficient.

A simple method for planning confirmation sampling is the random grid over the area of concern. This can be developed using a variety of simple formulas available in the regulatory and scientific literature. Once the grid is developed, a fixed number, usually 25%, of the grid nodes can be sampled at random using a random number generator. Since exposure pathways involve contacts with soil to a depth of

10feet, sampling should occur to this depth. A full range of QA/QC sampling should accompany the soil samples to include duplicates and field blanks

USACE RESPONSE: USACE has previously explained, primarily in the development of the Evaluation Document (June 2012) that laid the groundwork for the screening and evaluation of all data, old and new, why it believes the number of samples for the subject area is sufficient.

[1] EPA 1989. Risk Assessment Guidance for Superfund Volume I, Human Health Evaluation Manual (Part A). EPA/540/1-89/002. The material in Chapter 1 is particularly instructive regarding the role and timing of risk assessment activities in the RI/FS process .

[2] In addition to EPA 1992 Guidance for Data Usability in Risk Assessment, other data quality documents found at http://www.epa.gov/quality/qa_docs.html should be consulted.

[3] Guidance for comparing background and chemicals concentrations in soil for CERCLA sites. EPA 540-R-01-003

[4] EPA 2004. RAGS Part E, Supplemental Guidance for Dermal Risk Assessment.

[5] Fitz, D. et al. 2006. Determination of Particulate Emission Rates from Leaf Blowers.

[6] EPA 2002. Supplemental guidance for developing soil screening levels for superfund sites. OSWER 9355.4-24

[7] EPA 2006. Data quality assessment: statistical methods for practitioners. EPA QA/G-9S

[8] AU (2012) American University Response to “Final Evaluation of Remaining Sampling Requirements”: Site-Wide Remedial Investigation/Feasibility Study dated June 22, 2012

[9] A good example of this is the several investigations at the Small Disposal area, Lot 18, Bamboo Area, Kreeger, and Public Safety Building. Although these areas are proximate to each other, they have been investigated individually and no comprehensive assessment has been made of chemical or geographical data gaps.

[10] See Soil Sampling Quality Assurance User’s Guide EPA 600/8-89/046 and Data Quality Assessment: Statistical Methods for Practitioners EPA/240/B-06/003

FINAL

SVFUDS SITE-WIDE
HUMAN HEALTH RISK ASSESSMENT WORK PLAN

SPRING VALLEY FORMERLY USED DEFENSE SITE (SVFUDS)
WASHINGTON, DC

DERP FUDS MMRP/CWM Project No. C03DC091801 and
HTRW Project No. C03DC091802
Contract No.: W912DR-09-D-0061, Delivery Order 0011

Prepared for:

Baltimore District

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PROJECT MANAGER

COMPLETION OF SENIOR TECHNICAL REVIEW

This document has been produced within the framework of the ERT, Inc. (ERT) quality management system. As such, a senior technical review has been conducted. This included review of all elements addressed within the document, proposed or utilized technologies and alternatives and their applications with respect to project objectives and framework of U.S. Army Corps of Engineers regulatory constraints under the current project, within which this work has been completed.

Jennifer Harlan, PMP Date: 11/15/13

SENIOR TECHNICAL REVIEWER/PROGRAM MANAGER

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LIST OF ACRONYMS AND ABBREVIATIONS

AF	Adherence Factor
AU	American University
AOI	Area of Interest
AUES	American University Experiment Station
bgs	Below Ground Surface
CDI	Chronic Daily Intake
CENAB	United States Army Corps of Engineers, Baltimore District
COPC	Chemical of Potential Concern
CSEFH	Child-Specific Exposure Factors Handbook
CSM	Conceptual Site Model
CTE	Central Tendency Exposure
CWM	Chemical Warfare Materiel
DAF	Dermal Absorption Factor
DERP	Defense Environmental Restoration Program
EFH	Exposure Factors Handbook
EPC	Exposure Point Concentration
ERT	ERT, Inc.
EU	Exposure Unit
FUDS	Formerly Used Defense Site
HEAST	Health Effects Assessment Summary Tables
HI	Hazard Index
HQ	Hazard Quotient
HTRW	Hazardous, Toxic, and Radiologic Waste
IRIS	Integrated Risk Information System
IUR	Inhalation Unit Risk
kg	Kilogram
m	Meter
MEC	Munitions of Environmental Concern
mg	Milligram
MMRP	Military Munitions Response Program

PEF	Particulate Emission Factor
POI	Point of Interest
PPRTV	Provisional Peer Reviewed Toxicity Value
Q/C	Inverse of Mean Concentration at Center of Source
RA	Risk Assessment
RAGS	Risk Assessment Guidance for Superfund
RfC	Reference Concentration
RfD	Reference Dose
RI/FS	Remedial Investigation and Feasibility Study
RME	Reasonable Maximum Exposure
RSL	Regional Screening Level
SA	Skin Surface Area
SF	Slope Factor
SVFUDS	Spring Valley Formerly Used Defense Site
UCL	Upper Confidence Limit
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency

1.0 RISK ASSESSMENT OVERVIEW

1.1 Project Overview

This document is a Work Plan for the Spring Valley Formerly Used Defense Site (SVFUDS) Site-Wide Risk Assessment. The Work Plan documents the procedures to be used to perform Human Health Risk Assessments (RAs) to estimate the potential risks/hazards to current and future receptors from site-related contamination at three exposure units (EUs) within the SVFUDS in Washington, D.C. One RA will assess risk at two residential use EUs within the residential section of the SVFUDS and be completed as a standalone report, and another RA will be completed for the Southern American University (AU) EU (completed as a standalone report). The RAs, which will be presented in the Site-Wide Remedial Investigation (Site-Wide RI) document, will be based on historical information and analytical data from previous investigation reports. This Work Plan also describes risk-related elements, beyond these quantitative RAs, that will be included in the Site-Wide RI.

ERT, Inc. (ERT) has been contracted by the U.S. Army Corps of Engineers (USACE), Baltimore District (CENAB), to perform a Remedial Investigation and Feasibility Study (RI/FS) for the SVFUDS (Defense Environmental Restoration Program [DERP] Formerly Used Defense Sites [FUDS] Military Munitions Response Program/Chemical Warfare Materiel [CWM] Project No. C03DC091801 and DERP FUDS Hazardous, Toxic, and Radioactive Waste (HTRW) Project No. C03DC091802). ERT is performing activities in support of ongoing sampling and remedial investigations addressing munitions and explosives of concern (MEC) and CWM under Contract W912DR-09-D-0061, Task Order 0011.

1.2 Risk Assessment Process for the SVFUDS

Significant investigation, sampling, and remediation, has been performed at the SVFUDS over the course of many years of ongoing project activity. Several discrete RAs of individual areas, a Site-Wide Screening Level Ecological RA, and a Site-Wide Groundwater RA, prepared by multiple contractors at various times, have been completed or are in process.

In order to develop a strategy to organize and assess this existing information, to evaluate the need for additional data, and to integrate this information into a cohesive plan, USACE convened a meeting of key SVFUDS stakeholders in 2010 and presented a Position Paper that outlined a path forward for resolving these issues. The stakeholders included personnel from the US Environmental Protection Agency (USEPA), the District of Columbia Department of the Environment, the community Restoration Advisory Board consultant, and American University personnel.

The overall goal was to integrate the previous and ongoing risk assessment studies and findings into a comprehensive site-wide risk assessment that would address all elements of human health and ecological risk, and which would be presented as part of the Site-Wide RI/FS for the SVFUDS. The primary actions determined to be required included review of the previously completed (pre-2005) human health RAs to assess whether they remained protective, and additional soil sampling to address data gaps. To achieve the overall goal, three separate efforts were conducted, each one building off of the findings of the previous one. The efforts focused on identifying specific areas where further risk assessment was warranted, concluding with the identification of the EUs requiring full RAs, as described in this RA Work Plan.

The first effort was the completion of the *Final Evaluation Document for the Spring Valley FUDS Integrated Site-Wide Remedial Investigation/Feasibility Study, Washington, DC* (USACE, 2012). This 'Evaluation' document was a work plan presenting the methodology to review pre-2005 human health RAs completed at various times for various areas of the SVFUDS. The objective was to determine whether the chemicals of potential concern (COPCs) identified, the exposure pathways considered, and the toxicity evaluations, would still be appropriate when considering updated USEPA guidance and site-specific background concentrations, and to identify remaining areas that required additional risk screening and risk assessment. Additionally, this document presented a plan for supplemental sampling to fill identified data gaps and to ensure that areas were fully characterized with regard to making conclusions about risk posed to human receptors; the sampling was completed in late 2012.

The second effort (using the Evaluation document as a work plan) was completion of the *Final Pre-2005 Human Health Risk Assessment (HHRA) Review* (USACE, August 2013). This document provided the results of a review of the five pre-2005 HHRAs and conducted re-screening of all soil data from SVFUDS using updated risk-based screening levels and background data, to ensure that any potential risks associated with soils still in place were evaluated. The review was based on the historical information, analytical data, and conclusions presented in the five pre-2005 discrete HHRAs. The review resulted in the development of multiple EUs still containing COPCs, for which further risk assessment was recommended.

The third effort was the completion of *Addendum 1 to the Final Pre-2005 Human Health Risk Assessment Review* (USACE, 2013). Addendum 1 started with the EUs identified in the Pre-2005 HHRA Review document, and using the screening procedure developed for that document, presented a follow-on screening effort that incorporated additional sampling data collected during investigations not associated with the older RAs. The objective was to integrate all remaining sampling results in the SVFUDS and identify remaining areas that required additional human health risk assessment. Addendum 1 concluded with the recommendation of RAs for the three EUs that are the subject of this work plan.

1.3 Scope of the Site-Wide Risk Assessment

This Work Plan addresses both the quantitative RAs to be conducted on the identified EUs, and the other risk-related elements that will be presented in the Site-Wide RI document.

1.3.1 Quantitative RAs for Identified EUs

The scope is to conduct a site-specific quantitative risk assessment for human receptors at the three EUs that remain following the screening process described above. Data previously collected during site investigation activities, suitable for use in an RA as defined by the USEPA (USEPA, 1992c), will be used to identify and screen COPCs at each EU. For the receptors present at each EU, the RA will estimate the magnitude of exposure to COPCs, identify potential exposure pathways, and quantify exposure. This information, in conjunction with toxicity information for the COPCs, will be used to quantitatively estimate the risk posed to human receptors associated with exposure to the COPCs in soil at each of the three EUs. This RA does not address explosive hazards that may exist due to the presence of ordnance; those hazards are addressed separately in the MEC Hazard Assessment.

The project background and a summary of previous investigative activities are discussed in Section 2. A Conceptual Site Model for the three EUs is presented in Section 3. The

methodology to be used for evaluating potential human health risks is presented in Section 4. References are provided in Section 5. USEPA Risk Assessment Guidance for Superfund (RAGS) Part D tables (USEPA, 2001) will be included in the RA as appropriate.

1.3.2 Site-Wide RA

The assessment of remaining risk at the identified EUs will be presented in the Risk Assessment section of the Site-Wide RI. However, to ensure that the presentation of risk within the SVFUDS integrates all risk-related issues on a site-wide basis, that section will also address various other topics. Other risk-related elements that contribute to a comprehensive understanding of risk within the SVFUDS include:

- Ecological Risk Assessment;
- Groundwater Risk Assessment;
- MEC Hazard Assessment (MEC HA);
- External Health-related Studies (prepared by others, to be summarized only);
- Derivation and Protectiveness of 20 parts-per-million (ppm) of arsenic as the SVFUDS soil cleanup goal;
- Arsenic in soil potentially remaining beneath city streets (where excavation is impractical); and
- Sufficiency of the existing sampling to adequately characterize risk within the SVFUDS.

Each of these efforts has largely been completed as separate studies or investigations, and they will be presented in detail in the Site-Wide RI.

2.0 PROJECT BACKGROUND

2.1 SVFUDS Background

The SVFUDS is an area of northwest Washington, DC, that was formerly occupied by the American University Experiment Station (AUES). During World War I, the U.S. government established the AUES to investigate the testing, production, and effects of noxious gases, antidotes, and protective masks. The AUES was located on the grounds of the current AU and used additional property in the vicinity to conduct this research and development on CWM, including mustard and lewisite agents, as well as adamsite, irritants, and smokes. After the war, these activities were transferred to other locations and the site was returned to the owners. The SVFUDS site location is shown in Figure 1. A map of the three EUs is presented as Figure 2 (all figures are presented in Appendix A).

2.2 Previous Investigation Activities and Findings

Each of the efforts described in Section 1.2 above provided greater focus on identifying specific areas of the SVFUDS requiring formal risk assessment. The Pre-2005 HHRA Review document showed that for some of the five previously conducted HHRAs, COPCs still remained in various Points of Interest (POIs) or areas of investigation through the initial and additional screening steps. The POIs or areas of investigation with remaining COPCs were developed into larger EUs based on similar past practices, similar receptor populations and exposure pathways, and geography, so that the area could be assessed based on all data available, without regard as to when the data were collected. Recommendations to address the remaining COPCs focused on integrating the pre-2005 HHRA samples with more recent samples and conducting risk evaluations on a single data set for each larger EU.

Using the screening procedure presented in the Pre-2005 HHRA Review, the Addendum 1 document conducted the follow-on screening of the larger EUs with the objective of further identifying specific remaining areas of the SVFUDS that required formal RAs. The older pre-2005 risk assessment samples were combined with the newer more recent sample results into a single data set for each of the EUs, and then the screening steps were applied. This follow-on screening of the combined data sets was completed for all chemicals in the data set.

The follow-on screen determined that three EUs required formal RAs (see Figure 2):

- The Area of Interest (AOI) 9 EU;
- The Spaulding-Rankin EU; and,
- The Southern AU EU.

The AOI 9 EU contains POI 1, the circular trenches where static testing of CWM munitions was conducted, and POI 7, where agent persistency testing was reportedly conducted. There are also a number of ground scars in AOI 9 in the vicinity of POI 1 that became POIs 2, 3, 4, 5, 6, and 8. Portions of AOI 9 fall within the downrange impact areas of the Range Fan. This EU currently comprises neighborhood residential properties.

The Spaulding-Rankin area EU is defined by previous areas of investigation at this location. It is limited to a single residential property where the Range Fan firing point and concrete shell pits were located. The EU includes POIs 21, 22, 23, and 25. Although there are other residential properties nearby that were included in the pre-2005 HHRAs, the Pre-2005 HHRA Review

document recommended that this property be maintained as a separate EU based on past activities that occurred within it versus the other nearby residential properties.

The Southern AU EU is an active university campus with no full time permanent residences and is defined by previous areas of investigation at this location. The intent of this EU boundary was to integrate all previous investigations and define an area with common receptors and exposure pathways.

2.3 Summary of Sample Data Used in the RA

As described in the Addendum 1 document, three sets of sample data were used in the follow-on screen. Each of the three EUs contained samples from all three sets. The first data set comprised all of the samples used in the pre-2005 risk assessments, i.e., all the data points used in the Pre-2005 HHRA Review document. On Figures 3, 4, and 5 (Apprendix A), these samples are color-coded using black dots.

The second data set comprised samples from miscellaneous sampling efforts conducted during anomaly investigations, or other samples collected for various reasons, which were not captured in any prior risk assessments. These included samples with collection dates from as early as 2001 to as late as 2011. On the figures, these samples are color-coded using blue dots.

The third data set comprised samples resulting from the Evaluation document recommendations. The sampling was based on possible historical AUES impacts not addressed in ongoing investigations, or possible data gaps. This relatively recent sampling was primarily completed in 2012. On the figures, these samples are color-coded using red dots.

These three data sets, specific to the three identified EUs requiring an RA, will be used in the quantitative RA. Figures 3, 4, and 5 (Appendix A), present the sample locations for the AOI 9, Spaulding-Rankin, and Southern AU EUs, respectively. Note that in some cases, these locations represent more than one sample result, for example, where a sample location contained multiple depth increments, or where a single location contained a split result (as was the case for some of the USACE 1995 and USEPA 1999 risk assessment locations). Due to map scale and space limitations, not every individual sample name is shown on the figures and some of the sample names shown are abbreviated. Also, multiple results for a single location, as in the case of split samples, are not shown (i.e., a dot may represent more than one set of data). However, all results will be used in the RA, including all depth increments and all split results.

For areas that have previously been excavated and the locations backfilled with clean soil, Appendix C of the Pre-2005 HHRA Review document details how the backfill data results were used in place of the original sample result for the screening process presented in the two screening documents. Those backfill results will similarly be used, where applicable, in the data set for the quantitative RA.

Data tables containing all the detected analytes for each of the three EUs are presented in Appendix B. A CD has also been included presenting the more complete raw data sets for each EU (the difference between what is presented in the Appendix B tables and what is presented on the CD are the non-detect results, i.e., analyzed chemicals that were never detected).

3.0 CONCEPTUAL SITE MODEL

To begin the RA, a conceptual site model (CSM) was completed. A CSM is an effective tool to define site dynamics, streamline the risk evaluation, and develop appropriate response actions. The CSM provides an overall assessment of the primary and secondary sources of contamination at a site and the corresponding release mechanisms and impacted media. The CSM also identifies the potential human receptors and the associated pathways of exposure to the affected media. CSMs are dynamic tools that can be updated as necessary. For example, if changes in site conditions occur, or additional site characterization information is collected, the CSM can be revised to more accurately reflect the most current information. Additionally, the CSM can be revised during the risk assessment planning process to include input from stakeholders. Understanding site conditions and land uses helps to accurately identify potential receptors under current and likely future scenarios, as well as the most appropriate corrective action(s) necessary.

A preliminary CSM for current and future human receptor exposure scenarios at the three EUs has been developed following USEPA (1989a, 1996a) guidance and is included as Figure 6 to aid in understanding and describing the EUs, and to present assumptions regarding:

- Suspected sources and types of contaminants present,
- Contaminant release and transport mechanisms,
- Affected media,
- Potential receptors that could contact site-related contaminants in affected media under current or future land use scenarios, and
- Potential routes of exposure.

An exposure pathway is not considered to be complete unless all five of the elements listed above are present.

3.1 Suspected Sources and Types of Contaminants Present

Based on the historical use of the site, buried wastes and testing associated with the AUES research and development of CWM are potential sources of contamination. Historical sampling of the SVFUDS has included analyses for metals, organics, CWM, and CWM breakdown products. The previously referenced Pre-2005 HHRA Review and Evaluation documents contain more detailed summaries of the past activities that could contribute to contamination in the SVFUDS.

3.2 Contaminant Release and Transport Mechanisms

Release of contaminants from past practices would be directly to surface or subsurface soil. Excavation activities (e.g., tree planting or construction) could transport contaminants to the surface through mixing of the soil column associated with digging. Leaching of soil contaminants to groundwater is also a potential transport mechanism; however, this will be evaluated in a separate site-wide groundwater RA (in process).

3.3 Affected Media

This RA Work Plan focuses on the three EUs with potential COPCs in soil. Previous investigations at the SVFUDs have shown that past activities have impacted surface and subsurface soil. There are no surface water and sediment locations at the three EUs that are the

focus of this RA Work Plan. SVFUDS groundwater data will be assessed in a separate site-wide groundwater RA.

3.4 Potential Receptors

A potential receptor evaluation should consider criteria such as:

- Current and future land use on and near the site;
- Zoning status and/or deed restrictions of the site and adjacent properties;
- Current and future access to the site and to the affected media;
- Existing and/or planned exposure controls (e.g., engineered containment structures);
- Present and planned site activities;
- Extent that the site is developed and vegetated; and
- Potential for soils to be disturbed (e.g., soil-invasive activities).

Potential human receptors are defined as individuals who may be exposed to site-related contaminants in environmental media. Consistent with USEPA (1989a) guidance, current and reasonably anticipated future land uses were considered in the receptor selection process.

3.4.1 Residential Use EUs

The two residential use EUs are AOI 9 and Spaulding-Rankin. Currently, these two EUs comprise residential properties and their future use is not expected to change. Current potential exposure to surface soil will be evaluated for:

- Outdoor workers (i.e., landscapers); and
- Adult and child residents.

Future exposures to mixed surface/subsurface soil will be evaluated for:

- Outdoor workers (i.e., landscapers);
- Construction workers; and
- Adult and child residents.

3.4.2 Southern AU EU

As a currently active university campus, current groups that may contact surface soil include:

- Outdoor workers (i.e., landscapers and maintenance); and
- Student recreational users (as associated with a 4-year college student).

Future exposures to surface/subsurface soil for the following receptors will be evaluated:

- Outdoor workers;
- Student recreational users;
- Construction workers and
- Adult and child residents.

3.5 Potential Exposure Pathways

USEPA (1989a) defines an exposure pathway as: "The course a chemical or physical agent takes from a source to an exposed organism. An exposure pathway describes a unique mechanism by which an individual or population is exposed to chemicals or physical agents at or originating from a site. Each exposure pathway includes a source or release from a source, an exposure point, and an exposure route. If the exposure point differs from the source, a transport/exposure medium (e.g., air) or media (in cases of intermedia transfer) is also included." The CSM links the sources, locations, and types of environmental releases with receptor locations and activity patterns to determine exposure pathways of potential concern.

Two different soil exposure intervals will be evaluated. The current potential receptors will be evaluated using an exposure interval of 0 to 2 feet below ground surface (bgs), to represent routine landscaping, gardening, and outdoor play activities. The soil exposure interval for future potential receptors includes mixed soils from 0 to 10 feet bgs, which includes the 0 to 2 foot interval to which current receptors could be exposed. This exposure interval takes into account soil mixing that may occur due to construction.

3.5.1 Southern AU EU

Currently, the Southern American University EU is an active university campus, where outdoor workers and students spending time outdoors could be exposed to surface soil (0 to 2 foot interval) by incidental soil ingestion, dermal contact, and inhalation. The potential for surface soil COPCs to migrate to indoor air will be evaluated based on their volatility, as defined by USEPA, 2002a (chemicals with a Henry's law constant greater than 10^{-5} atm m^3 mol^{-1} at room temperature), and as listed in an USEPA Excel spreadsheet, the Vapor Intrusion Screening Levels spreadsheet calculator, as chemicals with sufficient volatility and toxicity. (Note that USEPA's draft vapor intrusion guidance USEPA, 2002b, is scheduled to be finalized in 2014.) If indoor air is a potential exposure route, the Johnson-Ettinger vapor intrusion model (USEPA on-line tool) will be used to estimate indoor air concentrations, in order to evaluate the exposure pathway of inhalation of indoor air for current students based on current surface soil concentrations. The vegetable ingestion exposure pathway will be included for the 0 to 2 foot depth at Southern AU for current students and for the 0 to 10 foot depth for future students to account for any gardening that may be occurring on the site.

In the future, construction workers, outdoor workers, and students using outdoor areas could be exposed to mixed surface/subsurface soil (0 to 10 foot interval) by incidental soil ingestion, dermal contact, and inhalation outdoors, and students could be exposed to inhalation of vapors indoors, if the criteria described above for volatility are met. Also, possible future exposures to mixed surface/subsurface soil for students and residents will be evaluated, and will include the exposure pathways of incidental soil ingestion, dermal contact, inhalation outdoors, home-grown vegetable ingestion, and inhalation of vapors indoors, if the criteria described above for volatility are met.

For both current and future scenarios, the inhalation of dust indoors will be discussed qualitatively, based on published studies of transfer factors for outdoor-to-indoor transfer of dust.

3.5.2 Residential Use EUs

The AOI 9 and Spaulding-Rankin EUs comprise residential properties and their future use is not expected to change. For these EUs, the potential soil exposure pathways, both currently to surface soil and in the future to mixed surface/subsurface soil, include the exposure pathways of incidental soil ingestion, dermal contact, inhalation outdoors, inhalation of vapors indoors, and home-grown vegetable ingestion.

Inhalation of dust indoors will be discussed qualitatively, based on published studies of transfer factors for outdoor-to-indoor transfer of dust.

Infiltration of volatile compounds from soil can occur due to vapor intrusion through basements. The potential for vapor intrusion into current or future buildings will be evaluated as described above.

4.0 HUMAN HEALTH RISK ASSESSMENT PROCESS

4.1 Introduction

The RA will be conducted using reference and guidance documents from USEPA and will include:

- Risk Assessment Guidance for Superfund (RAGS), Volume 1, Human Health Evaluation Manual (Part A), Interim Final (USEPA, 1989a);
- Risk Assessment Guidance for Superfund (RAGS): Volume I - Human Health Evaluation Manual, Part D, Standardized Planning, Reporting and Review of Superfund Risk Assessments, Final (USEPA, 2001);
- Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final (USEPA, 2004);
- Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual, Part F, Supplemental Guidance for Inhalation Risk Assessment (USEPA, 2009a);
- Exposure Factors Handbook (USEPA, 2011); and Child-Specific Exposure Factors Handbook (CSEFH) (USEPA, 2008a);
- Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions (USEPA, 1991b);
- Guidance for Data Usability in Risk Assessment (Part A) (USEPA, 1992c);
- Supplemental Guidance to RAGS: Calculating the Concentration Term (USEPA, 1992d);
- Guidance for Risk Characterization (USEPA 1995);
- Soil Screening Guidance (USEPA, 1996a); and
- Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (USEPA, 2002).

The specific sub-tasks to be performed for the development of the RA will include:

- Data evaluation (including COPC selection);
- Exposure assessment;
- Toxicity evaluation;
- Risk characterization; and
- Qualitative uncertainty analysis.

The following sections provide the details of these steps.

4.2 Data Evaluation

Section 2.3 describes the data that will be used to perform the RA (see Appendix B). The available analytical data have been evaluated based on USEPA protocols to determine an appropriate set of data for use in performing a quantitative RA. Data previously collected during site investigation activities are suitable for use in an RA as defined by USEPA (1992c). Data elements considered included:

- Type of validation (including an assessment of blanks)
- Sample locations and parameters
- Number of samples
- Sample quantitation limits
- Laboratory qualifiers and codes (e.g., J-qualified [estimated] data will be used in the RA, R-qualified [rejected] data will not)
- Likelihood of a contaminant to be present given site history

These data were generated during various investigation activities as previously described and additional details concerning data quality can be found in reports specific to those investigations. The quantitative RA will be performed on the soil within the EUs as represented by the samples shown on Figures 3, 4, and 5 (Appendix A).

4.2.1 COPC Selection Process

The Addendum 1 document identified the three EUs requiring a formal RA. The basis of identifying the three EUs was a COPC screen that will also be used for this RA. The initial screen of all detected chemicals in soil was conducted using current criteria, comparing the maximum detected value of each constituent against current risk-based screening levels and current background concentrations. Analytes were eliminated as COPCs if the maximum detected concentration was less than the greater of the background value or the RSL. The two steps used to select COPCs in Addendum 1, the results of which will be used in the HHRA, are listed below, and are presented in the tables in Appendix C:

- The maximum detected concentration of a chemical in soil was compared to the USEPA residential soil risk-based screening level (RSL) that is protective to a risk level of 1×10^{-6} (for carcinogens) or a hazard quotient level of 0.1 (to account for cumulative effects for non-carcinogens). The generic residential soil RSLs are based on potential exposures via the dermal, ingestion, and inhalation routes, and reflect current toxicity values from sources used in the USEPA's toxicity hierarchy.
- Additionally, the maximum detected concentration was compared to the current 2008 SVFUDS soil background data (*Background Soil Sampling Report for SVFUDS*, USACE, 2008). In general, COPCs may be eliminated from quantitative evaluation in the HHRA if the maximum detected concentration is less than the background concentration. Comparison to background to determine which COPCs are elevated over background is consistent with USEPA (1989, 1992b, 2002) guidance.

The COPCs are typically derived during the actual RA. However, because they have already been screened for these EUs in the Addendum 1 document, they are included as Appendix C in this Work Plan. The Appendix C tables are a screen of all available data for each EU, screened to the provisional COPC stage (as defined in the Addendum 1 document). That is, all provisional COPCs derived in Addendum 1 for the three EUs (and as shown in Appendix C Tables C.1, C.2, and C.3) are COPCs for the quantitative RA. The COPCs are also shown in Table 4.1.

4.2.2 Additional Screen for Outlier Locations

As part of the Addendum 1 additional screen, detected concentrations using the combined data sets were reviewed to ensure that the identified EUs were not so large that they diluted higher concentrations of a chemical over the larger area. This process evaluated whether maximum concentrations of each chemical were more than 10 times higher than the average of the remaining concentrations of that chemical (i.e., identifies whether the maximum was an outlier). Where an outlier was determined, that sample location was removed from the data set and the EU was evaluated using the remaining samples. Eight samples from six discrete locations were identified as outliers for the Southern AU EU. Each of these six discrete outlier locations will be evaluated separately for risk (i.e., a risk determination will be made about that discrete location). The outlier locations and the samples they represent are shown in Figure 5 (Appendix A). Note that there were no outliers for the two residential use EUs.

These six outlier locations were not screened through the provisional COPC step in the Addendum 1 document, but have been screened for this Work Plan; they are included in Appendix C. Tables C.4A, B, C, D, E, and F, represent the six outlier locations (comprising eight total samples). Table 4.2 also summarizes the selected COPCs for each outlier location.

4.3 Derivation of Exposure Point Concentrations

Exposure Point Concentrations (EPCs) are the concentrations of constituents in a given medium to which human receptors are exposed at the point of contact (e.g., exposure to soil during gardening). EPCs are used to calculate the constituent intakes for human receptors based on methodology provided in RAGS (USEPA, 1989a).

The 95% Upper Confidence Limit of the mean (95% UCL) of each COPC can be used to estimate the concentration of a contaminant that a receptor would be exposed to over a length of time. This EPC can then be used to estimate risk. For selected COPCs, the 95% UCL concentration will be calculated using the latest version of USEPA's ProUCL software version 5.0.00 (USEPA, 2013b, c), and using the method recommended by the software. The lesser of the recommended UCL and the maximum detected value will be used as the EPC for the Reasonable Maximum Exposure (RME) scenario. For the Central Tendency Exposure (CTE) scenario, the central tendency estimate from the method used to calculate the recommended UCL will be used as the EPC. ProUCL uses the Kaplan-Meier method to account for non-detects in the calculation of UCLs (USEPA 2013c, d).

For sample sets with few detects (either <4-6 detected samples, or <4%-5% detects) or a small sample size (<5 samples), the maximum detected concentration will be used as the EPC for the RME scenario and the mean of the detected concentrations (using ½ the detection limit for non-detects) will be used as the EPC for the CTE scenario.

The EPCs for RME and CTE scenarios calculated using ProUCL will be summarized in a table, and the summary statistics for the RME and CTE EPC values will be shown in an appendix.

4.4 Exposure Assessment

The objectives of the exposure assessment are to characterize the exposure setting, identify potentially exposed populations and potential exposure pathways, and quantify the exposures to potential human receptors at the site. The potentially exposed populations, exposure media, and exposure pathways were presented in the CSM (Section 3).

USEPA (1992d, 1995) typically requires two types of exposure evaluations: an RME and an average, or CTE, estimate. The RME scenario is defined as the maximum exposure that is reasonably expected to occur (USEPA, 1989a), while the CTE scenario is defined as the average exposure that is expected to occur. For the RME exposure scenario, exposure parameters were chosen so that the combination of variables for a given pathway would result in an estimate of the RME for that pathway (USEPA 1992d, 1995). Under this approach, some variables may not be at their individual maximum values, but when combined with other variables, they will result in estimates of the RME. CTE risk estimates will be calculated using central tendency, or average, estimates for each of the exposure parameters (USEPA, 1992d, 1995).

Default and site-specific exposure assumptions are selected in this section in order to quantify the magnitude, frequency, and duration for each exposure pathway. The RME and CTE exposure parameters for each potentially exposed population are outlined in Tables 4.3 through 4.7. Generally, contact rate, exposure frequency, and exposure duration are the most sensitive parameters (i.e., most likely to drive exposure estimates). The following subsections discuss the justification for the selected exposure parameters.

4.4.1 Body Weight

Although the USEPA Exposure Factors Handbook (EFH) (USEPA, 2011) reports an average body weight for all adults (males and females between the ages of 18 and 75 years) of 80 kilograms (kg), the previous USEPA default value of 70 kg is still generally used in risk assessments. This body weight will be used for all adult exposure scenarios.

An average body weight of 15 kg will be used for children. The average body weight for children ages 1 year to 6 years as presented in Table 8-1 of the Child-Specific Exposure Factors Handbook (CSEFH) (USEPA, 2008a) is 14.6 kg, which is rounded to 15 kg.

4.4.2 Exposure Frequency

Exposure frequency is based on expected activities for each of the receptors at the site. USEPA standard default values based on national data on the distribution of exposure frequencies will be used.

For the outdoor worker, a high-end exposure frequency of 250 days/year will be used for the RME scenario, representing a worker that is present on site every working day during the year, assumed to be 5 days/week for 50 weeks/year. The estimated CTE outdoor worker exposure frequency will be one-half a year, or 125 days/year, in order to account for time likely spent landscaping at other locations, and to account for lower work levels in the winter months.

For the construction worker, an exposure frequency of 250 days/year will be used for both the RME and the CTE scenarios.

The standard high-end default residential exposure frequency of 350 days/year recommended by USEPA (1991a, 1997a) will be used for both residents and students for the RME scenario. This value is based on the assumption that residents and students might be exposed to contaminants on a daily basis, except during a two-week period when they are away from the home or school (e.g., on vacation) (USEPA, 1991a, 1997a). For the CTE scenario, an exposure frequency of 160 days/year is assumed, based on eight months per year (March through October) for 5 days/week.

4.4.3 Exposure Duration

The outdoor worker exposure durations are 30 years for the RME scenario and 8 years for the CTE scenario (USEPA, 2011). For the student, a four-year exposure period is assumed for both the RME and the CTE scenario. For the future construction worker, an exposure duration of 1 year is assumed to be the time period of construction for the RME scenario and one-half year for the CTE scenario.

National statistics are available for residential occupancy periods based on U.S. Bureau of Census data, as summarized in the USEPA (2011) EFH. The residential exposure durations of 33 years for RME and 8 years for CTE will be used (USEPA, 2011). Although there are no statistical data available on childhood residential occupancy periods, it will be assumed that a child (0-6 years old) would reside for six years at a residence.

4.4.4 Averaging Time

The averaging time selected depends on the type of toxic effect being assessed (USEPA, 1989a). For non-carcinogens, exposure is averaged over the period of exposure (i.e., the exposure duration). For carcinogens, exposure is averaged over an individual's lifetime; although current data suggest that 75 years would be an appropriate value to reflect the average life expectancy of the general population (USEPA, 1997a), an averaging time of 70 years will be used to be consistent with the use of 70 years in the derivation of USEPA cancer slope factors and unit risks.

4.4.5 Skin Surface Area

The surface area (SA) parameter describes the amount of skin exposed to the contaminated media. The amount of skin exposed depends upon the exposure scenario. Clothing is expected to limit the extent of the exposed SA in cases of soil contact. Body-part-specific SAs were calculated using those listed by USEPA (2011) for adults and children assuming that head, arms, hands, legs, and feet could be exposed to soil, and for workers assuming that head, arms, and hands could be exposed to soil (Tables 4.3 to 4.7).

4.4.6 Incidental Soil Ingestion Rate

Incidental soil ingestion rates are receptor-specific. The recommended incidental soil ingestion rates from the USEPA's Exposure Factors Handbook (USEPA, 2011) are a CTE of 50 milligrams per day (mg/day) for an adult; because no RME value was derived by USEPA, 50 mg/day will also be used for the RME estimate for adult incidental soil ingestion. The recommended soil ingestion rates (which are combined soil + dust) for children are 100 mg/day for CTE and 200 mg/day for RME (see Table 5-1 of EFH, USEPA, 2011).

For the outdoor worker and construction worker, the EPA default intensive contact ingestion rate of 330 mg/day (USEPA, 2002) will be used to represent the RME incidental soil ingestion by a groundskeeper or landscaper, and 100 mg/day will be assumed for the CTE incidental soil ingestion rate. It is noted that this RME soil ingestion rate is for intensive contact, and is usually applied only to construction workers, and it may be too conservative for the outdoor worker scenario.

4.4.7 Soil Adherence Factors

The soil adherence factors were obtained from USEPA (2011) and represent the recommended soil adherence factors for given receptors and activities.

4.4.8 Inhalation Rates

The inhalation chronic toxicity factors derived by USEPA (2000) (i.e., inhalation unit risks [IURs] and reference concentrations [RfCs]) are expressed as air concentrations. USEPA (1996a) recommends direct comparison of measured or modeled air concentrations to inhalation toxicity factors rather than using daily inhalation rates to convert to internal doses (i.e., mg/kg-day). Given that USEPA uses dosimetric adjustments (e.g., ventilation rate) based on adult ventilatory parameters (2000) in the derivation of select RfCs, a degree of uncertainty is introduced when applying these values to child receptors. However, as stated by USEPA (2000), "An inhalation reference concentration (RfC) is defined as an estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious non-cancer health effects during a lifetime." Therefore, direct comparison of measured or modeled air concentrations to inhalation toxicity factors, without converting to internal doses, is appropriate.

4.4.9 Fraction Ingested from Site

The fraction ingested from the site is dependent on the medium and exposure pathway being evaluated. A value of 1 (100%) for the fraction ingested from the site will be used for the RME and CTE outdoor worker and construction worker scenarios. For residential receptors and students, a value of 1 (100%) for the fraction ingested from the site will be used for both RME and CTE scenarios. This approach conservatively assumes that 100 percent of a receptor's daily exposure to the specified medium via a particular exposure pathway (e.g., soil ingestion) occurs on-site.

4.4.10 Other Exposure Parameters

Additional pathway- and chemical-specific exposure parameters listed in Tables 4.1 through 4.4 are discussed in this subsection.

Chemical-specific parameters to be used in the quantification of risk/hazard are based on appropriate site-specific data, USEPA recommendations, values reported in the scientific literature, or best scientific judgment. A reference for each value (e.g., dermal soil absorption factors, soil-to-air volatilization factors, etc.) is included in Tables 4.3 through 4.7.

The particulate emission factor (PEF) is defined as the factor that relates the concentration of the COPC in surface soil to the concentration of dust particles in air (USEPA, 1996a). Per USEPA (1996a), the PEF represents an annual emission rate based on wind erosion and should be used only for estimating chronic exposures.

4.5 Estimation of Intake

Human intakes over a long-term period of exposure, called chronic daily intakes (CDIs), will be calculated for each COPC identified. Intake is defined as "a measure of exposure expressed as the mass of a substance in contact with the exchange boundary per unit body weight per unit time (e.g., mg chemical/kg body weight-day)" (USEPA, 1991a). Calculation of the chronic daily intake (CDI) also takes into account exposure variables (assumptions about patterns of exposure

to contaminated media), and whether the chemical is a carcinogen or a noncarcinogen. The total exposure is divided by the time period of interest to obtain an average exposure over time. The averaging time is a function of the toxic endpoint: for carcinogenic effects it is the lifetime of an individual; for non-carcinogenic effects is the exposure duration.

4.5.1 Incidental Ingestion of Contaminants in Soil

To estimate an oral CDI for the incidental ingestion of COPCs in soil by residential receptors and on-site outdoor workers, the following equation (USEPA, 1989a) will be used:

$$CDI = \frac{EC \text{ x } IR \text{ x } FI \text{ x } EF \text{ x } ED \text{ x } CF}{BW \text{ x } AT}$$

Where:

CDI	=	Chronic daily intake (mg/kg-d)
EC	=	Exposure concentration in soil (mg/kg)
IR	=	Soil ingestion rate (mg/day)
FI	=	Fraction ingested from contaminated source (unitless)
EF	=	Exposure frequency (days/yr)
ED	=	Exposure duration (yrs)
CF	=	Conversion factor, 1E-06 (kg/mg)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

4.5.2 Dermal Contact with Contaminants in Soil

Dermal exposure to contaminants in soil will be estimated using the methodology and algorithms described in RAGS, Part E (USEPA, 2004), as follows:

$$CDI = \frac{DA_{event} \text{ x } EV \text{ x } EF \text{ x } ED \text{ x } SA}{BW \text{ x } AT}$$

Where:

CDI	=	Chronic daily intake (absorbed dose) (mg/kg d)
DAevent	=	Absorbed dose per event (mg/cm^2 - event)
SA	=	Skin surface area available for contact (cm^2)
EF	=	Exposure frequency (days/yr)
ED	=	Exposure duration (yrs)
EV	=	Event frequency (events/day)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

DAevent (mg/cm^2-event) for contaminants in soil will be calculated using the following equation (USEPA, 2004):

$$DA_{event} = (C_{soil})(AF)(DAF)(CF)$$

Where:

DAevent	=	Absorbed dose per event (mg/cm^2 - event);
Csoil	=	Contaminant concentration in soil (mg/kg);

AF = Soil-to-skin adherence factor (mg/cm^2-day);
DAF = Dermal absorption fraction (unitless); and
CF = Conversion factor (1E-06 kg/mg).

4.5.3 Inhalation of Particulates from Soil

USEPA (1996a and 2002) guidance does not recommend estimating intakes (i.e., mg/kg-day) for the air inhalation pathway. Rather, risks and hazards are determined by comparing estimated particulate air concentrations, adjusted for exposure frequencies/durations/time, with inhalation toxicity values. This subsection describes methods to be used for estimating concentrations of COPCs entrained in airborne dusts.

Per USEPA (1996a and 2002), exposure-point concentrations for COPCs in airborne fugitive dust should be based on soil exposure-point concentrations and estimated using the following equation:

$$C_{air} = \frac{C_{soil}}{PEF}$$

Where:
C_{air} = COPC concentration in air at the exposure point (mg/m^3);
C_{soil} = COPC exposure-point concentration soil (mg/kg); and
PEF = Particulate emission factor (m^3/kg).

The PEF relates the concentration of the soil COPC to the concentration of dust particles in the air. This calculation addresses dust generated from open sources, which is termed "fugitive" because it is not discharged into the atmosphere in a confined flow. PEF calculations include a Q/C specific to the site's size and meteorological conditions. The PEF calculation is based on default values from USEPA 1996a and 2002 and is provided below:

$$PEF = (Q/C)\left(\frac{3600 s/h}{(0.36)(1-V)\left(\frac{U_m}{U_t}\right)^3 (F(x))}\right)$$

Where:
Q/C = 87.37 g/m^2-s per kg/m^3, based on 0.5 acre source for Zone VIII (Philadelphia) PA, from Table 3 of USEPA, 1996a. s/h is seconds per hour.
V = 0.5, fraction of vegetative cover (USEPA, 1996a and 2002)
U_m = 4.29 meter per second (m/s), mean annual wind speed in Philadelphia (PA) (USEPA, 1996a)
U_t = 11.32 m/s, equivalent threshold value of wind speed at 7 m (USEPA, 1996a)
F(x) = 0.0993, wind speed distribution function for Philadelphia (PA) (USEPA, 1996a)

4.5.4 Age-Adjusted Residential Exposure

To better protect human health, exposure to carcinogenic compounds is often assumed to occur during the first 30 years of life. Thus, exposure is assumed to occur during childhood when the intake is greater and the child is more susceptible to the effects of carcinogenic compounds.

These 30 years are usually divided into 6 years of child exposure and 24 years of adult exposure. This risk associated with each of these exposures is combined to obtain an age-adjusted risk that is often more conservative than an evaluation of either the child or adult alone. For residential receptors, this risk assessment presents the non-carcinogenic risk to a child, and the carcinogenic risk to an integrated child/adult resident. An adult is evaluated for all outdoor worker exposure pathways.

4.6 Toxicity Assessment

The purpose of the toxicity assessment is to weigh available evidence regarding the potential for COPCs to cause adverse effects in exposed individuals and to provide, where possible, an estimate of the relationship between the extent of exposure to a contaminant and the increased likelihood and/or severity of adverse effects. The steps to be performed in the toxicity assessment will include:

- Gathering toxicity information for the COPCs being evaluated;
- Identifying exposure periods for which toxicity values are necessary (e.g., chronic or sub-chronic); and
- Compiling toxicity values for carcinogenic and non-carcinogenic effects (i.e., carcinogenic slope factors [SFs] and IURs for carcinogens, and reference dose (RfDs) and RfCs for noncarcinogens).

Following USEPA (2003, 2010a) guidance, as well as the hierarchy provided for the source of toxicity values in the USEPA's RSL table (USEPA, 2013a), toxicity information will be obtained from the following hierarchy of primary sources:

- USEPA's IRIS (2013);
- USEPA's Provisional Peer Reviewed Toxicity Values (PPRTVs);
- Agency for Toxic Substances and Disease Registry's Minimal Risk Levels;
- Office of Environmental Health and Human Assessment's (OEHHA) Toxicity Criteria Database (OEHHA, 2009); and
- USEPA's Health Effects Summary Tables (USEPA 1997b).

The toxicity values are listed in Table 4.8. Some COPCs (e.g., aluminum, cobalt, iron, thallium, and vanadium) are PPRTVs, that is, provisional values are not yet published on USEPA's IRIS database.[1] PPRTVs may be published as regular or "screening" PPRTVs - PPRTVs that are classified as "screening" are considered less well-supported and are approved for use only in a screening assessment (USEPA, 2013a). PPRTVs will be used in these RAs, with the exception of thallium, for which only a screening PPRTV is available. The PPRTV document for thallium (USEPA, 2012) states the following:

[1] A Provisional Peer-Reviewed Toxicity Value (PPRTV) is defined as a toxicity value derived for use in the Superfund Program. PPRTVs are derived after a review of the relevant scientific literature using established Agency guidance on human health toxicity value derivations. All PPRTV assessments receive internal review by a standing panel of National Center for Environment Assessment (NCEA) scientists and an independent external peer review by three scientific experts. The PPRTV review process provides needed toxicity values in a quick turnaround timeframe while maintaining scientific quality. When a final Integrated Risk Information System (IRIS) assessment is made publicly available on the Internet (www.epa.gov/iris), the respective PPRTVs are removed from the database.

"For the reasons noted in the main document, it is inappropriate to derive a subchronic or chronic p-RfD for thallium. However, information is available which, although insufficient to support derivation of a provisional toxicity value, under current guidelines, may be of limited use to risk assessors. In such cases, the Superfund Health Risk Technical Support Center summarizes available information in an appendix and develops a screening value. Users of screening toxicity values in an appendix to a PPRTV assessment should understand that there is considerably more uncertainty associated with the derivation of a supplemental screening toxicity value than for a value presented in the body of the assessment."

The uncertainty section will address the uncertainties associated with the use of these PPRTVs to evaluate the human health toxicity of COPCs, and the limitations on their use for site decision-making.

For the evaluation of carcinogenic polynuclear aromatic hydrocarbons, toxicity equivalency factors based on the toxicity of benzo(a)pyrene will be used (USEPA, 1993).

4.7 Risk Characterization

Following USEPA (1995) guidance, the risk characterization step will integrate the toxicity and exposure assessment outputs into quantitative expressions of risk. Specifically, the carcinogenic risk and non-carcinogenic hazard posed by a given chemical to a given receptor in a given exposure pathway will be calculated as described in the following sections:

Carcinogenic Risk Estimates

$$\mathbf{Risk_{oral/dermal}} = (CDI)(SF)$$

$$\mathbf{Risk_{inhalation}} = \frac{C_{air} \times EF \times ED \times ET \times IUR}{AT \times 365\,days/year}$$

Where:

Risk = carcinogenic risk posed by the chemical through the pathway
CDI = chronic daily intake, the intake of the chemical through the pathway
SF = cancer slope factor
Cair = COPC concentration in airborne dust or outdoor air
ED = exposure duration
EF = exposure frequency
ET = fraction of day spent at the site
IUR = inhalation unit risk factor
AT = averaging time

The total carcinogenic risk for a receptor, that is, the risk associated with exposure to all COPCs for all exposure pathways, will be derived by adding all the pathway-specific carcinogenic risks.

Non-carcinogenic Hazards

$$\mathbf{HQ_{oral/dermal}} = CDI/RfD$$

$$\mathbf{HQ_{inhalation}} = \frac{C_{air} \times EF \times ED \times ET}{RfC \times AT \times 365\,days/year}$$

Where:

HQ = the hazard posed by the chemical through the pathway
CDI = chronic daily intake, the intake of the chemical through the pathway
RfD = reference dose
Cair = COPC concentration in airborne dust or outdoor air
EF = exposure frequency
ED = exposure duration
ET = fraction of day spent at the site
RfC = reference concentration
AT = averaging time

The total potential non-carcinogenic hazard, that is, the hazard associated with exposure to all COPCs by all exposure routes, will be determined by summing the HQs for all non-carcinogenic COPCs to derive a total hazard index (HI) for each receptor. If a receptor-specific hazard index is greater than one, target organs will be identified based on the critical toxicity study that was used to develop the non-cancer reference dose for each COPC. Those COPCs affecting the same target organ will be summed and a separate HI will be calculated for each target organ.

The risk characterization results will be summarized in tables to facilitate the comparison of the derived total risks and hazards to established risk management criteria as follows:

- The risk range of $1x10^{-6}$ to $1x10^{-4}$ will be used when evaluating total cancer risks
- An HI of 1 will be used when evaluating total non-carcinogenic hazards and/or total target organ hazards for each receptor

4.8 Uncertainty Discussion

All RAs involve the use of assumptions, judgments, and imperfect data to varying degrees resulting in uncertainties in the final estimates of risk. These uncertainties are generally associated with each step of the RA process (USEPA, 1989a). The parameters used in the RA are characteristically conservative and tend to over-estimate potential site-related risks. The uncertainty section will qualitatively discuss the inherent and site-specific uncertainties associated with the four steps of the RA.

Some of the assumptions that will be discussed in the uncertainty section of the RA will include:

1. Data Evaluation and Identification of COPCs:
   - The representativeness of soil sampling at the site;
   - Lab blank contamination and other data validation conclusions;
   - The use of generic screening levels for selection of COPCs; and
   - The use of screening values based on PPRTVs.
2. Exposure Assessment:
   - Generally, the selection of conservative exposure assumptions for the RME scenario;
   - The possible existence of pica (i.e., the deliberate ingestion of soils) on the risk estimates for child residents at the site; and

- The effect of activities that generate dust (e.g., lawn mowing, leaf blowing, soil tilling, etc.) on potential inhalation exposures by outdoor workers.

3. Toxicity Assessment:
   - The use of PPRTVs;
   - Treatment of COPCs without toxicity values; and
   - The uncertainties associated with EPA's published toxicity values.
4. Risk Characterization:
   - The potential for interactions between multiple chemicals, multiple pathways and other combinations;
   - Uncertainties associated with summing risks or hazard indices for several substances (the assumption of dose additivity); and
   - Combining estimates for different toxic endpoints into a single risk estimate.

Table 4.1: Provisional COPCs from the Initial Screen[1]

COPC	AOI 9 EU	Spaulding-Rankin EU	Southern AU EU (with outliers removed)
Aluminum	YES	YES	YES
Antimony	YES	YES	YES
Arsenic		YES	YES
Cadmium		YES	
Chromium		YES	
Cobalt	YES	YES	YES
Copper		YES	
Iron	YES	YES	YES
Lead		YES	
Magnesium	YES	YES	YES
Manganese	YES	YES	YES
Mercury		YES	YES
Nickel		YES	YES
Selenium		YES	
Thallium		YES	YES
Vanadium	YES	YES	YES
Zinc		YES	
Benzo(a)anthracene			YES
Benzo(a)pyrene			YES
Benzo(b)fluoranthene			YES

Notes:

[1] Initial Screen from Addendum 1 to the Pre-2005 HHRA Review report.

YES means this chemical is a COPC for this EU.

Table 4.2: Screening of Outlier Samples for Additional COPCs at the Southern AU EU

	Outlier Sample Location Name					
COPC	**SV-04**	**SV-AU-05**	**AU-10**	**SV-12A**	**AU-03 and SV-AU-03**	**BAKER-03 and SV-BAKER-03**
Aluminum				YES	YES	
Antimony			YES		YES	YES
Beryllium				YES		
Cobalt	YES		YES	YES	YES	
Iron			YES	YES	YES	
Magnesium				YES	YES	
Mercury	YES	YES				
Thallium					YES	
Vanadium			YES	YES	YES	
Benzo(a)anthracene						YES
Benzo(a)pyrene						YES
Benzo(b)fluoranthene						YES
Benzo(k)fluoranthene						YES
Dibenz(a,h)anthracene						YES
Indeno(1,2,3-c,d)pyrene						YES
Phenanthrene						YES

Notes: YES means this chemical is a COPC for this outlier location.

Table 4.3: Exposure Factors for the Outdoor Worker Exposure Scenario

Exposure Variable	Scenario [a/]	Rationale	Reference
BW = Body Weight 70 kg [b/]	RME and CTE	Standard reference weight for adult males.	USEPA, 1989a
EF = Exposure Frequency 250 days/yr [c/] 125 days/yr	RME CTE	Assumes year-round weekday exposure. Assumed some days working at other locations.	Assumed
ED = Exposure Duration 30 years 8 years	RME CTE	Upper bound time at one place of employment. Average time at one place of employment.	USEPA, 2011
SA = Surface Area 5,000 cm^2 5,900 cm^2 [d/]	RME CTE	95% percentile and mean adult skin surface area for head, arms, hands.	USEPA, 2011
AT = Averaging Time 25,550 days (carcinogens) ED x 365 days/year (noncarcinogens)	RME CTE	Conventional human lifespan. Intakes for carcinogens are averaged over the duration of exposure. Equal to the exposure duration (in days).	USEPA, 1989a USEPA, 1989a
FI = Fraction Ingested (unitless) 1.0 0.20	RME CTE	RME conservatively assumes 100 percent of daily soil incidental ingestion occurs on-site. CTE assumes 1/5 of time spent at this site.	Professional judgment
DAF = Dermal Absorption Fraction Chemical-specific	RME and CTE	Chemical-specific.	USEPA, 2004
IR = Incidental Soil Ingestion Rate 330 mg/day [e/] 100 mg/day	RME CTE	Standard default soil incidental ingestion rate for workers. Assumed.	USEPA, 2002
AF = Soil-to-Skin Adherence Factor 0.1566 mg/cm^2 [f/] 0.1566 mg/cm^2	RME CTE	Activity and body part-specific weighted based on exposed body parts. Activity and body part-specific weighted based on exposed body parts.	USEPA, 2011 USEPA, 2011
ET = Exposure Time 8 hours/day	RME and CTE	Based on 100 percent of working day spent.	Professional Judgment
PEF = Particulate emission factor 3.23E+09 (m^3/kg) [g/]	RME and CTE	Calculated using site-specific Q/C term and default parameters listed in USEPA 1996a and 2002.	USEPA, 1996a, Equation 10, and 2002
Q/C = Inverse of mean concentration at center of source 87.37 g/m^2-s per kg/m^3 [h/]	RME and CTE	Q/C value of 0.5 acre source area of Zone VIII, Philadelphia. Philadelphia is the nearest eastern seaboard city to Washington, D.C. for which a Q/C is derived.	USEPA, 1996a Table 3.

a/ RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure
b/ kg = kilogram
c/ days/yr = days per year
d/ cm^2 = square centimeters. For head, arms, hands.
e/ mg/day = milligrams per day
f/ mg/cm^2 = milligrams per square centimeter
g/ m^3/kg = cubic meters per kilogram
h/ g/m^2-s per kg/m^2 = grams per square meters – second per kilograms per cubic meters

Table 4.4: Exposure Factors for the Student Exposure Scenario

Exposure Variable	Scenario [a/]	Rationale	Reference
BW = Body Weight 70 kg [b/]	RME and CTE	Standard reference weight for adult males.	USEPA, 1989
EF = Exposure Frequency 350 days/yr [c/] 160 days/yr	 RME CTE	 Assumes year-round exposure with one 2-week vacation. Mean exposure to soil by residents.	USEPA, 1991 Assumed based on 8 months March-October, 5 days/week
ED = Exposure Duration 4 years 4 years	RME CTE	Upper bound time at one residence. Average time at one residence.	USEPA, 2011
SA = Surface Area 15,474 cm^2 12,680cm^2 [d/]	RME CTE	Skin surface area for head, arms, hands, legs, and feet.	USEPA, 2011
AT = Averaging Time 25,550 days (carcinogens) ED x 365 days/year (noncarcinogens)	 RME CTE	Conventional human lifespan. Intakes for carcinogens are averaged over the duration of exposure. Equal to the exposure duration (in days).	USEPA, 1989a USEPA, 1989a
FI = Fraction Ingested 1.0 (unitless**)**	RME and CTE	Conservatively assume 100 percent of daily soil incidental ingestion occurs on-site.	Professional Judgment
DAF = Dermal Absorption Fraction Chemical-specific	RME and CTE	Chemical-specific.	USEPA, 2004
IR = Incidental Soil Ingestion Rate 50 mg/day [e/] 50 mg/day	RME CTE	Assumed adult residential incidental soil ingestion rate.	 USEPA, 2011
AF = Soil-to-Skin Adherence Factor 0.07592 mg/cm^2 [f/]	RME and CTE	Mean adherence factor for face, arms, hands, legs, and feet for gardening activities.	USEPA, 2011
ET = Exposure Time 8 hours/day	RME and CTE	Assumed 8 hours/day outdoors.	Assumed
PEF = Particulate emission factor 3.23E+09 (m^3/kg) [g/]	RME and CTE	Calculated using Equation 10 and site-specific Q/C term and default parameters listed in USEPA 1996a and 2002.	USEPA, 1996a, Equation 10, and 2002
Q/C = Inverse of mean concentration at center of source 87.37 g/m^2-s per kg/m^3 [h/]	RME and CTE	Q/C value of 0.5 acre source area of Zone VIII, Philadelphia. Philadelphia is the nearest eastern seaboard city to Washington, D.C. for which a Q/C is derived.	USEPA, 1996a, Table 3.

a/ RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure
b/ kg = kilogram
c/ days/yr = days per year
d/ cm^2 = square centimeters
e/ mg/day = milligrams per day
f/ mg/cm^2 = milligrams per square centimeter
g/ m^3/kg = cubic meters per kilogram
h/ g/m^2-s per kg/m^2 = grams per square meters – second per kilograms per cubic meters

Table 4.5: Exposure Factors for the Adult Resident Exposure Scenario

Exposure Variable	Scenario [a/]	Rationale	Reference
BW = Body Weight 70 kg [b/]	RME and CTE	Standard reference weight for adult males.	USEPA, 1989
EF = Exposure Frequency 350 days/yr [c/] 160 days/yr	RME CTE	Assumes year-round exposure with one 2-week vacation. Mean exposure to soil by residents.	USEPA, 1991 Assumed based on 8 months March-October, 5 days/week.
ED = Exposure Duration 33 years 12 years	RME CTE	Upper bound time at one residence. Average time at one residence.	USEPA, 2011
SA = Surface Area 15,474 cm^2 12,680cm^2 [d/]	RME CTE	Skin surface area for head, arms, hands, legs, and feet.	USEPA, 2011
AT = Averaging Time 25,550 days (carcinogens) ED x 365 days/year (noncarcinogens)	RME CTE	Conventional human lifespan. Intakes for carcinogens are averaged over the duration of exposure. Equal to the exposure duration (in days).	USPEA, 1989a USEPA, 1989a
FI = Fraction Ingested 1.0 (unitless)	RME and CTE	Conservatively assume 100 percent of daily soil incidental ingestion occurs on-site.	Professional Judgment
DAF = Dermal Absorption Fraction Chemical-specific	RME and CTE	Chemical-specific.	USEPA, 2004
IR = Incidental Soil Ingestion Rate 50 mg/day [e/] 50 mg/day	RME CTE	Assumed adult residential incidental soil ingestion rate. Central tendency adult residential incidental soil ingestion rate.	USEPA, 2011
AF = Soil-to-Skin Adherence Factor 0.07592 mg/cm^2 [f/]	RME and CTE	Mean adherence factor for face, arms, hands, legs, and feet for gardening activities.	USEPA, 2011
ET = Exposure Time 8 hours/day	RME and CTE	Assumed 8 hours/day outdoors.	Assumed
PEF = Particulate emission factor 3.23E+09 (m^3/kg) [g/]	RME and CTE	Calculated using Equation 10 and site-specific Q/C term and default parameters listed in USEPA 1996a and 2002.	USEPA, 1996a, Equation 10, and 2002
Q/C = Inverse of mean concentration at center of source 87.37 g/m^2-s per kg/m^3 [h/]	RME and CTE	Q/C value of 0.5 acre source area of Zone VIII, Philadelphia. Philadelphia is the nearest eastern seaboard city to Washington, D.C. for which a Q/C is derived.	USEPA, 1996a, Table 3

a/ RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure
b/ kg = kilogram
c/ days/yr = days per year
d/ cm^2 = square centimeters
e/ mg/day = milligrams per day
f/ mg/cm^2 = milligrams per square centimeter
g/ m^3/kg = cubic meters per kilogram
h/ g/m^2-s per kg/m^2 = grams per square meters – second per kilograms per cubic meters

Table 4.6: Exposure Factors for the Child Resident Exposure Scenario

Exposure Variable	Scenario [a/]	Rationale	Reference
BW = Body Weight 15 kg [b/]	RME and CTE	Average body weight for children (1 to 6 years).	USEPA, 2008a
EF = Exposure Frequency 350 days/yr [c/] 160 days/yr	 RME CTE	Assumes year-round exposure with one 2-week vacation. Assumed	USEPA, 1991a, Section 2.1. Assumed
ED = Exposure Duration 6 years	RME and CTE	Time for ages 0 to 6 at one residence.	USEPA, 1997
SA = Surface Area 4,070 cm^2 3.465 cm^2 [d/]	 RME CTE	Assumed contact with head, arms, hands, legs, and feet.	USEPA, 2011
AT = Averaging Time 25,550 days (carcinogens) ED x 365 days/year (noncarcinogens)	 RME CTE	Conventional human lifespan. Intakes for carcinogens are averaged over the duration of exposure. Equal to the exposure duration (in days).	USEPA, 1989a USEPA, 1989a
FI = Fraction Ingested 1.0 (unitless**)**	RME and CTE	Conservatively assume 100 percent of daily soil incidental ingestion occurs on-site.	Professional Judgment
DAF = Dermal Absorption Fraction Chemical-specific	RME and CTE	Chemical-specific.	USEPA, 2004
IR = Incidental Soil Ingestion Rate 200 mg/day 100 mg/day	 RME CTE	 Default EPA soil ingestion rates for children.	USEPA, 2011
AF = Soil-to-Skin Adherence Factor 0.054 mg/cm^2 [f/]	RME and CTE	Mean adherence factor for arms, hands, legs, and feet for daycare children, playing both indoors and outdoors.	USEPA, 2011
ET = Exposure Time 8 hours/day	RME and CTE	Assumed 8 hours/day outdoors.	Assumed
PEF = Particulate emission factor 3.23E+09 m^3/kg [g/]	RME and CTE	Calculated using site-specific Q/C term and default parameters listed in USEPA 1996a and 2002.	USEPA, 1996, Equation 10, and 2002
Q/C = Inverse of mean concentration at center of source 87.37 g/m^2-s per kg/m^3 [h/]	RME and CTE	Q/C value of 0.5 acre source area of Zone VIII, Philadelphia. Philadelphia is the nearest eastern seaboard city to Washington, D.C. for which a Q/C is derived.	USEPA, 1996a, Table 3.

a/ RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure
b/ kg = kilogram
c/ days/yr = days per year
d/ cm^2 = square centimeters
e/ mg/day = milligrams per day
f/ mg/cm^2 = milligrams per square centimeter
g/ m^3/kg = cubic meters per kilogram
h/ g/m^2-s per kg/m^2 = grams per square meters – second per kilograms per cubic meters

Table 4.7: Exposure Factors for the Construction Worker Scenario

Exposure Variable	Scenario [a/]	Rationale	Reference
BW = Body Weight 70 kg [b/]	RME and CTE	Standard reference weight for adult males.	USEPA, 1997a, Section 7.3.
EF = Exposure Frequency 250 days/yr [c/] 125 days/yr	 RME CTE	Assumes year-round weekday exposure. Default for industrial workers.	USEPA, 1991a, Section 2.1. USEPA, 2004
ED = Exposure Duration 1 year 0.5 year	 RME CTE	Upper bound time at one place of employment. Average time at one place of employment.	USEPA, 2011
SA = Surface Area 5,000 cm^2 5,900 cm^2 [d/]	RME CTE	Skin surface area for head, arms, hands.	USEPA, 2011
AT = Averaging Time 25,550 days (carcinogens) ED x 365 days/year (noncarcinogens)	 RME CTE	Conventional human lifespan. Intakes for carcinogens are averaged over the duration of exposure. Equal to the exposure duration (in days).	USEPA, 1989a USEPA, 1989a.
FI = Fraction Ingested (unitless) 1.0 0.20	 RME CTE	 RME conservatively assumes 100 percent of daily soil incidental ingestion occurs on-site. CTE = assumes 1/5 of time spent at this site	Professional judgment
DAF = Dermal Absorption Fraction Chemical-specific	RME and CTE	Chemical-specific.	USEPA, 2004
IR = Incidental Soil Ingestion Rate 330 mg/day [e/] 100 mg/day	 RME CTE	Default soil incidental ingestion rate for workers. Assumed	USEPA, 2002.
AF = Soil-to-Skin Adherence Factor 0.1566 mg/cm^2 [f/] 0.1566 mg/cm^2	RME CTE	Activity and body part-specific weighted based on exposed body parts. Activity and body part-specific weighted based on exposed body parts.	USEPA, 2011 USEPA, 2011
ET = Exposure Time 8 hours/day	RME and CTE	Based on 100 percent of working day spent.	Professional Judgment
PEF = Particulate emission factor 3.23E+09 (m^3/kg) [g/]	RME and CTE	Calculated using site-specific Q/C term and default parameters listed in USEPA 1996a and 2002.	USEPA, 1996a, Equation 10, and 2002
Q/C = Inverse of mean concentration at center of source 87.37 g/m^2-s per kg/m^3 [h/]	RME and CTE	Q/C value of 0.5 acre source area of Zone VIII, Philadelphia. Philadelphia is the nearest eastern seaboard city to Washington, D.C. for which a Q/C is derived.	USEPA, 1996a, Table 3.

a/ RME = Reasonable Maximum Exposure; CTE = Central Tendency Exposure
b/ kg = kilogram
c/ days/yr = days per year
d/ cm^2 = square centimeters
e/ mg/day = milligrams per day
f/ mg/cm^2-day = milligrams per square centimeter-day
g/ m^3/kg = cubic meters per kilogram
h/ g/m^2-s per kg/m^2 = grams per square meters – second per kilograms per cubic meters

Table 4.8: Toxicity Values

Table 4.8 A Non-Cancer Toxicity Data
Spring Valley Site-Wide HHRA

Chemical of Potential Concern	Chronic Oral Reference Dose (RfD) (mg/kg-day)	Primary Target Organ(s)	Uncertainty Factor(UF)/ Modifying Factor (MF)	Oral Absorption Efficiency for Dermal [5]	Absorbed RfD for Dermal (mg/kg-day)	Source [1]	Inhalation Reference Concentration (RfC) (mg/m^3)	Primary Target Organ(s)	Uncertainty Factor(UF)/ Modifying Factor (MF)	Source[1]
aluminum	1.00E+00	nervous system	UF=100; MF=1	1	1.00E+00	PPRTV, from RSL table and USEPA, 2006b	5.00E-03	nervous system	UF=300; MF=1	PPRTV, from RSL table and USEPA, 2006b
antimony	4.00E-04	hematological	UF = 1000; MF=1	0.15	6.00E-05	IRIS	NA			
arsenic	3.00E-04	cancer: skin	UF = 3; MF=1	1	3.00E-04	IRIS	1.50E-05		NA	RSL table
beryllium	2.00E-03	GI	UF = 300; MF=1	0.007	1.40E-05	IRIS	2.00E-05	beryllium sensitization and progression to chronic beryllium disease	UF=10; MF=1	IRIS
cadmium	1.00E-03	kidney	UF = 10; MF=1	0.025	2.50E-05	IRIS	NA			IRIS
chromium VI	3.00E-03	no effects observed	UF = 300 MF = 1	0.025	7.50E-05	IRIS	1.00E-04	respiratory effects	UF=300; MF=1	IRIS
chromium III	1.50E+00	no effects observed	UF = 100; MF=1	0.013	1.95E-02	IRIS	NA			
cobalt	3.00E-04	thyroid	UF=300; MF=1	1	3.00E-04	PPRTV, from RSL table and USEPA, 2008b	6.00E-06	respiratory effects	UF=300; MF=1	PPRTV, from RSL table and USEPA, 2008b
copper	4.00E-02	GI	NA	1	4.00E-02	HEAST, from RSL table	NA			
iron	7.00E-01	GI	UF=1.5; MF=1	1	7.00E-01	PPRTV, from RSL table and USEPA, 2006c	NA			

Table 4.8 A Non-Cancer Toxicity Data
Spring Valley Site-Wide HHRA

Chemical of Potential Concern	Chronic Oral Reference Dose (RfD) (mg/kg-day)	Primary Target Organ(s)	Uncertainty Factor(UF)/ Modifying Factor (MF)	Oral Absorption Efficiency for Dermal [5]	Absorbed RfD for Dermal (mg/kg-day)	Source [1]	Inhalation Reference Concentration (RfC) (mg/m^3)	Primary Target Organ(s)	Uncertainty Factor(UF)/ Modifying Factor (MF)	Source[1]
lead	NA	neurotoxicity, developmental delays, hypertension, impaired hearing acuity, impaired hemoglobin synthesis, and male reproductive impairment				NA[2]	NA			
magnesium	NA	NA				not available in IRIS or RSL table	NA			
manganese	1.40E-01	nervous system	UF = 1000; MF=1	1	1.40E-01	IRIS	5.00E-05	nervous system	UF = 1; MF=1	IRIS
mercury[6]	3.00E-04	immune system	UF = 1000; MF=1	1	3.00E-04	IRIS	3.00E-04	nervous system	UF=30; MF=1	IRIS
nickel[7]	2.00E-02	body weight	UF=300; MF=1	0.04	8.00E-04	IRIS	NA			
selenium	5.00E-03	selenosis (liver, hair, nail effects)	UF=3; MF=1	1	5.00E-03	IRIS	NA			
thallium[8]	1.00E-05	skin	UF = 3000; MF=1	1	1.00E-05	Screening PPRTV[3]	NA			
vanadium	5.00E-03	kidney	UF=100; MF=1	0.026	1.30E-04	IRIS/RSL table[4]	NA			
zinc	3.00E-01	hematological	UF = 3; MF=1	1	3.00E-01	IRIS	NA			

Notes: 1. Nov 2013 RSL Table or currently available in IRIS or specific references as noted.

2. HHRA will use the Integrated Exposure-Uptake Biokinetic Model (IEUBK) if soil concentrations are greater than 400 mg/kg. EPA Office of Solid Waste recommends that soil lead levels less than 400 mg/kg are generally safe for residential use. Above that level, the document suggests collecting data and modeling blood-lead levels with the IEUBK model.

3. Thallium RfD will not be used in this HHRA for the reasons outlined in the text, Section 4.6 (reference: USEPA, 2012. Provisional Peer-Reviewed Toxicity Values for Thallium and Compounds. Final, 10-25-2012).

4. The vanadium RfD is from the November 2013 RSL table, with the following explanation provided: The oral RfD toxicity value for Vanadium, used in this website, is derived from the IRIS oral RfD for Vanadium Pentoxide by factoring out the molecular weight of the oxide ion. Vanadium Pentoxide has a molecular weight of 181.88. The two atoms of Vanadium contribute 56% of the MW. Vanadium Pentoxide's oral RfD of 9E-03 mg/kg-day multiplied by 56% gives a Vanadium oral RfD of 5.04E-03 mg/kg-day. (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/usersguide.htm).

5. Oral reference doses are converted to dermal reference doses by multiplying by the oral absorption efficiency (USEPA, 2004); oral absorption efficiency from USEPA RSL table (November, 2013), noted as being from U.S. EPA 2004 (Exhibit 4-1) (as in the RSL tables, if the oral absorption is >50% then it is set to 100% for the calculation of dermal toxicity values).

6. RfD for mercuric chloride

7. RfD for nickel soluble salts

8. Screening chronic provisional RfD for soluble thallium (USEPA, 2012). NA=not provided in IRIS or RSL table

Table 4.8 B Cancer Toxicity Data
Spring Valley Site-Wide HHRA

Chemical of Potential Concern	Oral Cancer Slope Factor (CSF) $(mg/kg\text{-}day)^{-1}$	Oral Absorption Efficiency for Dermal [3]	Absorbed CSF for Dermal $(mg/kg\text{-}day)^{-1}$	CSF Weight of Evidence	Source [1]	Inhalation Unit Risk (UR) $(ug/m^3)^{-1}$	Source[1]	Inhalation UR Weight of Evidence
aluminum	NA					NA		
antimony	NA					NA		
arsenic	1.5	1	1.5	A (Human carcinogen - based on sufficient evidence from human data)	IRIS	4.30E-03	IRIS	A (Human carcinogen - based on sufficient evidence from human data)
beryllium	NA					2.40E-03	IRIS	B1 (Probable human carcinogen - based on limited evidence of carcinogenicity in humans)
cadmium	NA					1.80E-03	IRIS	B1 (Probable human carcinogen - based on limited evidence of carcinogenicity in humans)
chromium VI	NA					1.20E-02	IRIS	A (Human carcinogen) (Inhalation route)
chromium III	NA					NA		
cobalt	NA					9.00E-03	PPRTV, from RSL table and USEPA, 2008b	Likely to be carcinogenic to humans by the inhalation route[4]
copper	NA					NA		
iron	NA					NA		
lead	NA					NA		
magnesium	NA					NA		
manganese	NA					NA		
mercury	NA					NA		
nickel	NA					NA		
selenium	NA					NA		
thallium	NA					NA		
vanadium	NA					NA		
zinc	NA					NA		
Benzo(a) anthracene	7.30E-01	1		B2 (Probable human carcinogen - based on sufficient evidence of carcinogenicity in animals) (from IRIS)	RSL table[2]	NA		

Table 4.8 B Cancer Toxicity Data
Spring Valley Site-Wide HHRA

Chemical of Potential Concern	Oral Cancer Slope Factor (CSF) (mg/kg-day)$^{-1}$	Oral Absorption Efficiency for Dermal [3]	Absorbed CSF for Dermal (mg/kg-day)$^{-1}$	CSF Weight of Evidence	Source [1]	Inhalation Unit Risk (UR) (ug/m^3)$^{-1}$	Source[1]	Inhalation UR Weight of Evidence
Benzo(a)pyrene	7.30E+00	1		B2 (Probable human carcinogen - based on sufficient evidence of carcinogenicity in animals) (from IRIS)	IRIS	NA		
Benzo(b)fluoranthene	7.30E-01	1		B2 (Probable human carcinogen - based on sufficient evidence of carcinogenicity in animals) (from IRIS)	RSL table[2]	NA		
Benzo(k)fluoranthene	7.30E-02	1		B2 (Probable human carcinogen - based on sufficient evidence of carcinogenicity in animals) (from IRIS)	RSL table[2]	NA		
Indeno(1,2,3-c,d) Pyrene	7.30E-01	1		B2 (Probable human carcinogen - based on sufficient evidence of carcinogenicity in animals) (from IRIS)	RSL table[2]	NA		
Phenanthrene	NA	1		D (Not classifiable as to human carcinogenicity)	IRIS	NA		

Notes: 1. USEPA RSL table dated November 2013
2. Noted in RSL table (Nov. 2013) as from: Environmental Criteria and Assessment Office

3. Oral slope factors are converted to dermal slope factors by dividing by the oral absorption efficiency; oral absorption efficiency from USEPA RSL table (November, 2013), noted as being from U.S. EPA 2004 (Exhibit 4-1) (as in the RSL tables, if the GIABS is >50% then it is set to 100% for the calculation of dermal toxicity values).

4. Under the 2005 Guidelines for Carcinogen Risk Assessment (U.S. EPA, 2005a), cobalt sulfate (soluble) is described as "likely to be carcinogenic to humans by the inhalation route," based on both the limited evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in animals. From: USEPA, 2008. Provisional Peer Reviewed Toxicity Values for Cobalt (CASRN 7440-48-4). Superfund Health Risk Technical Support Center, National Center for Environmental Assessment, Office of Research and Development.
NA=not provided in IRIS or RSL table or COPC not known to be carcinogenic

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APPENDIX A: SITE FIGURES

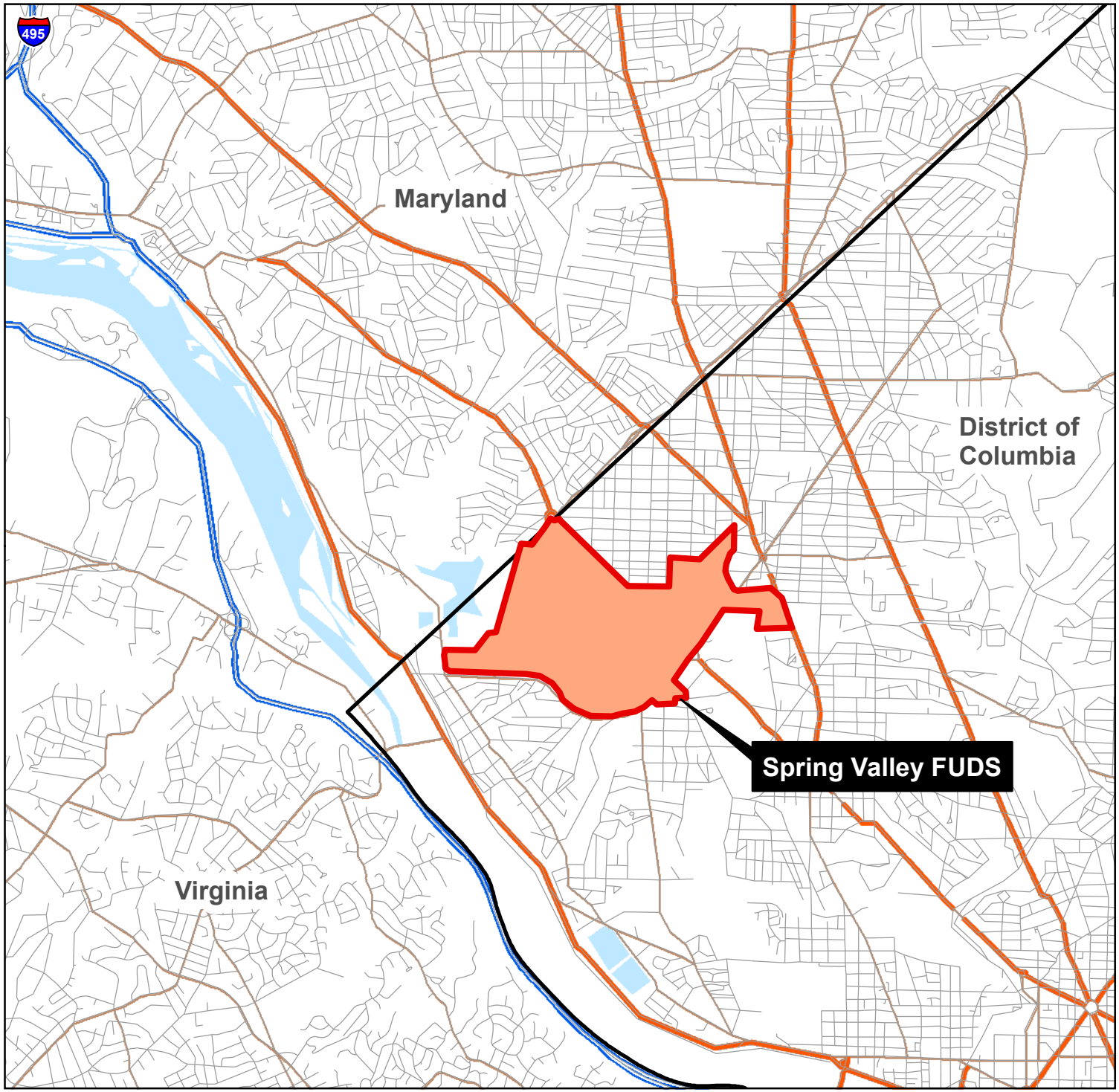

Figure 1
Site Location Map

Spring Valley FUDS
Washington, DC

Legend

- Spring Valley Site
- District of Columbia Boundary
- Urban Freeway
- Urban Interstate
- Local Streets
- Rivers and Lakes

FUDS - Formerly Used Defense Site

N
W E
S

0 0.25 0.5 1
Mile

ERT

November 2013

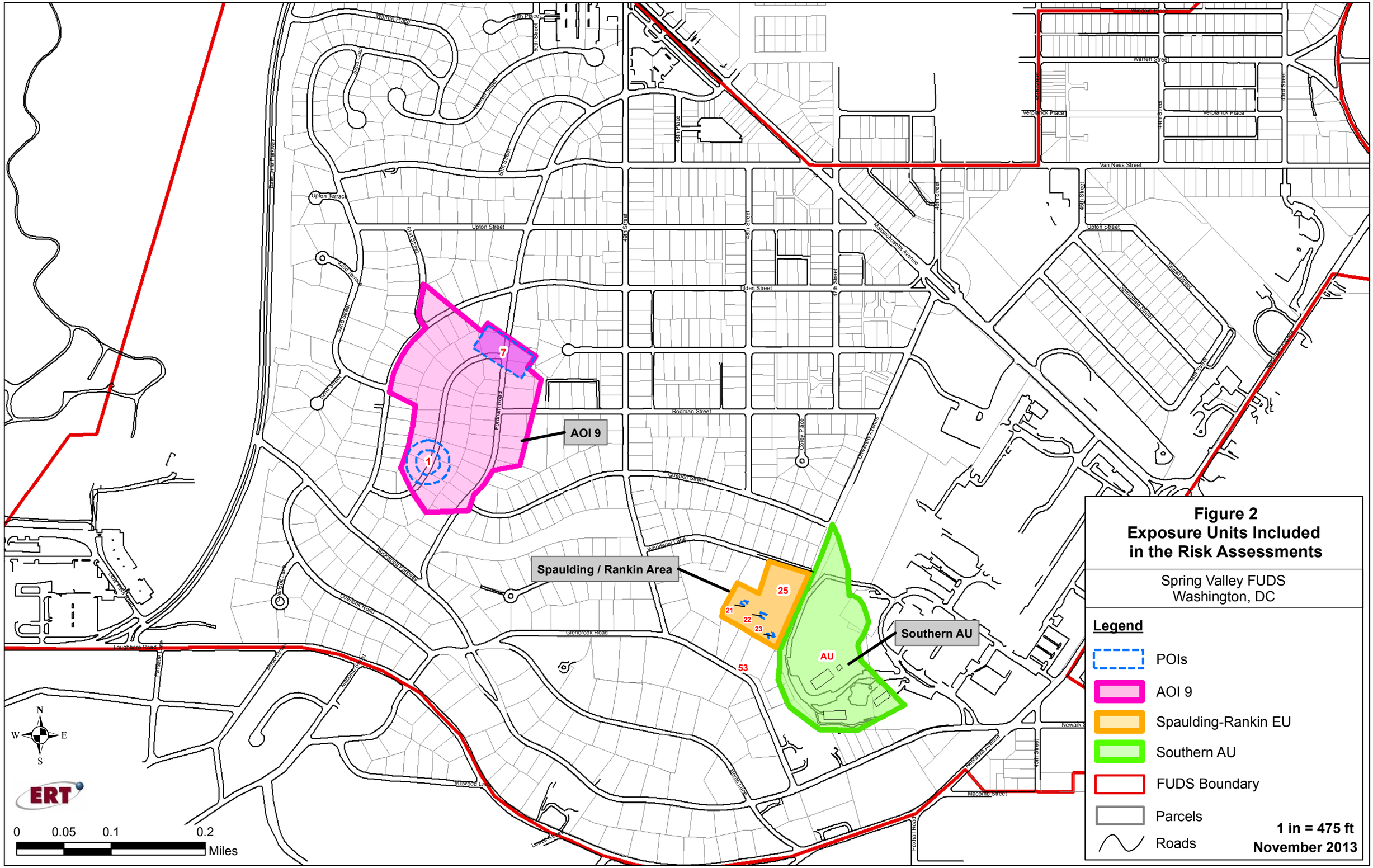

Figure 2
Exposure Units Included in the Risk Assessments

Spring Valley FUDS
Washington, DC

Legend

- POIs
- AOI 9
- Spaulding-Rankin EU
- Southern AU
- FUDS Boundary
- Parcels
- Roads

1 in = 475 ft
November 2013

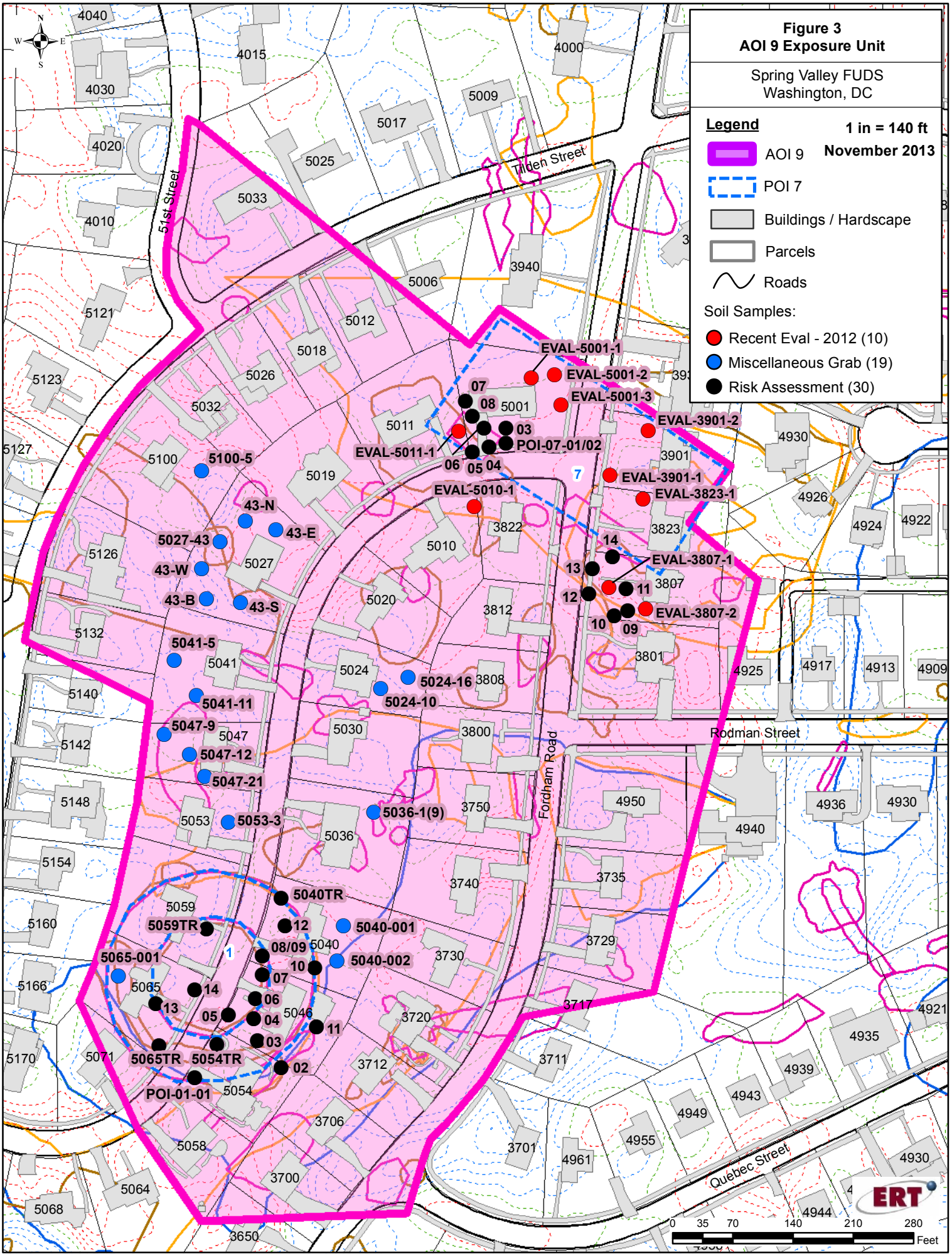
Figure 3
AOI 9 Exposure Unit
Spring Valley FUDS
Washington, DC
Legend
1 in = 140 ft
November 2013
AOI 9
POI 7
Buildings / Hardscape
Parcels
Roads
Soil Samples:
Recent Eval - 2012 (10)
Miscellaneous Grab (19)
Risk Assessment (30)
EVAL-5001-1
EVAL-5001-2
EVAL-5001-3
EVAL-3901-2
EVAL-3901-1
EVAL-3823-1
EVAL-5011-1
EVAL-5010-1
EVAL-3807-1
EVAL-3807-2
POI-07-01/02
5100-5
43-N
43-E
5027-43
43-W
43-B
43-S
5041-5
5041-11
5047-9
5047-12
5047-21
5053-3
5024-16
5024-10
5036-1(9)
5040TR
5059TR
5040-001
5040-002
5065-001
5065TR
5054TR
POI-01-01
07
08
03
06
05
04
14
13
12
11
10
09
08/09
02
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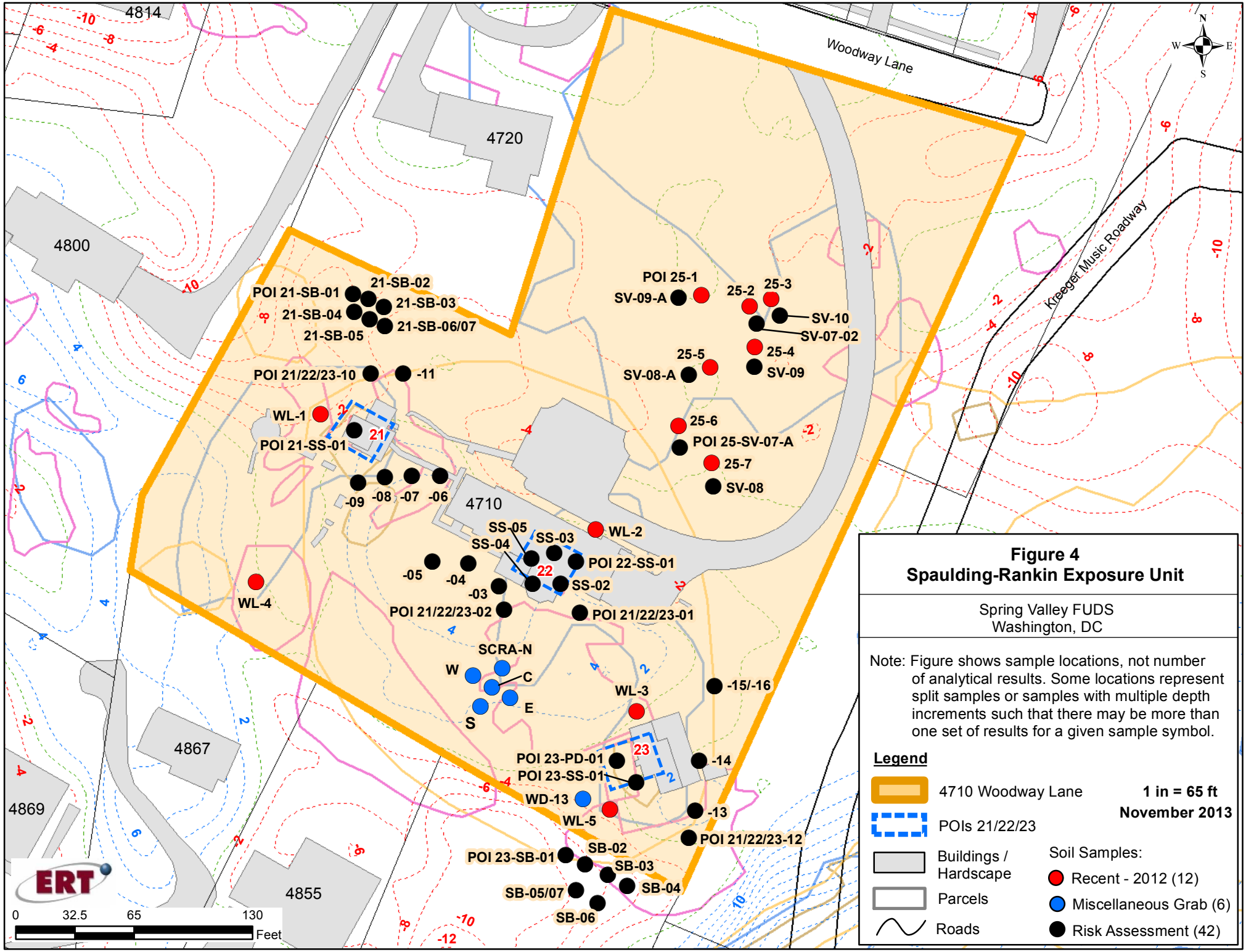


Figure 4
Spaulding-Rankin Exposure Unit

Spring Valley FUDS
Washington, DC

Note: Figure shows sample locations, not number of analytical results. Some locations represent split samples or samples with multiple depth increments such that there may be more than one set of results for a given sample symbol.

Legend

- 4710 Woodway Lane
- POIs 21/22/23
- Buildings / Hardscape
- Parcels
- Roads

1 in = 65 ft
November 2013

Soil Samples:
- Recent - 2012 (12)
- Miscellaneous Grab (6)
- Risk Assessment (42)

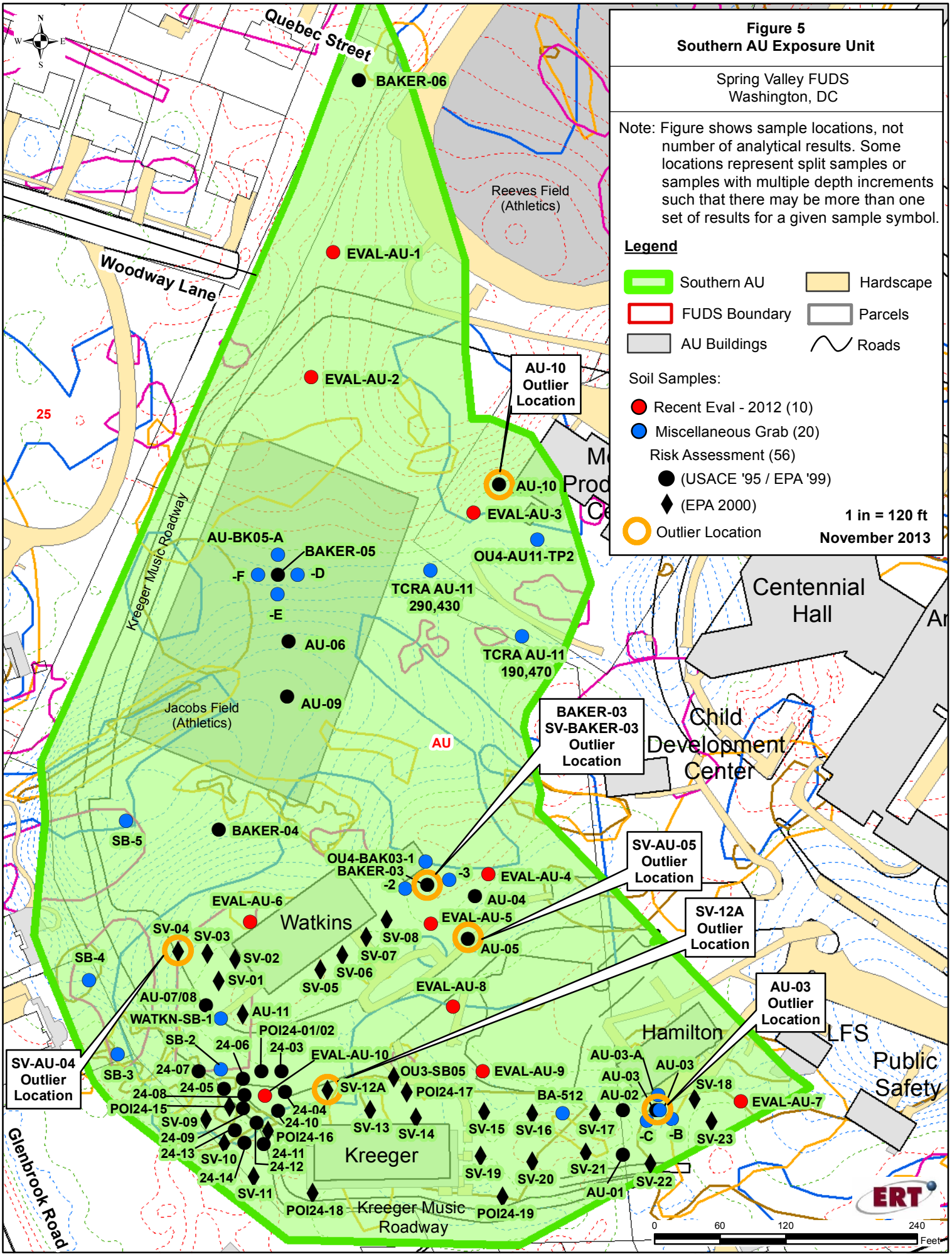
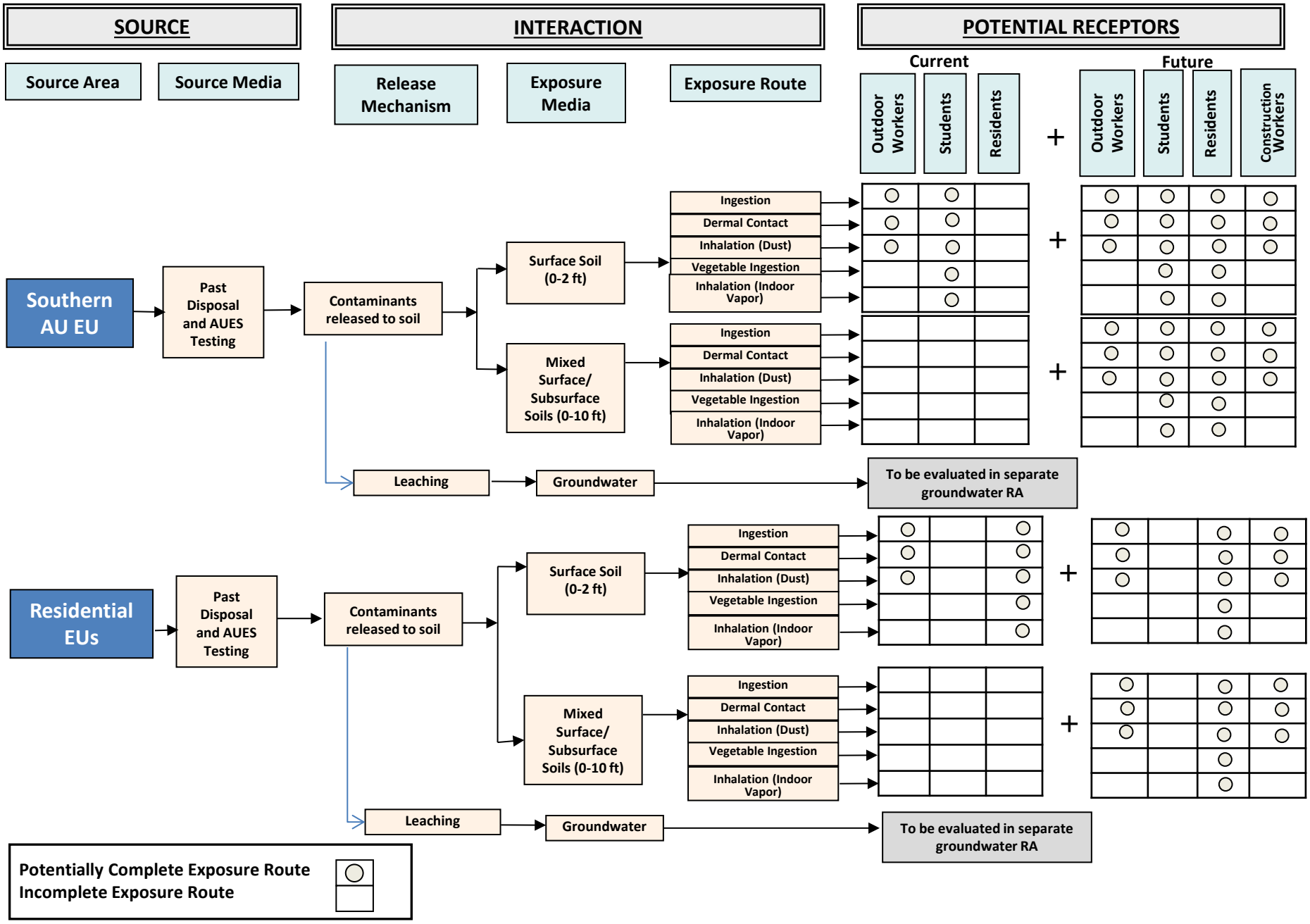


Figure 5
Southern AU Exposure Unit
Spring Valley FUDS
Washington, DC
Note: Figure shows sample locations, not number of analytical results. Some locations represent split samples or samples with multiple depth increments such that there may be more than one set of results for a given sample symbol.
Legend
Southern AU
FUDS Boundary
AU Buildings
Hardscape
Parcels
Roads
Soil Samples:
Recent Eval - 2012 (10)
Miscellaneous Grab (20)
Risk Assessment (56)
(USACE '95 / EPA '99)
(EPA 2000)
Outlier Location
1 in = 120 ft
November 2013
Quebec Street
Woodway Lane
Reeves Field (Athletics)
Kreeger Music Roadway
Jacobs Field (Athletics)
Centennial Hall
Child Development Center
Watkins
Kreeger
Hamilton
LFS Public Safety
Glenbrook Road
Kreeger Music Roadway
AU
AU-10 Outlier Location
BAKER-03 SV-BAKER-03 Outlier Location
SV-AU-05 Outlier Location
SV-12A Outlier Location
AU-03 Outlier Location
SV-AU-04 Outlier Location
BAKER-06
EVAL-AU-1
EVAL-AU-2
AU-10
EVAL-AU-3
AU-BK05-A
BAKER-05
-F
-D
-E
OU4-AU11-TP2
TCRA AU-11 290,430
TCRA AU-11 190,470
AU-06
AU-09
SB-5
BAKER-04
OU4-BAK03-1
BAKER-03
-3
-2
EVAL-AU-4
AU-04
EVAL-AU-6
EVAL-AU-5
AU-05
SV-04
SV-03
SV-02
SV-01
SV-08
SV-07
SV-06
SV-05
SB-4
EVAL-AU-8
AU-07/08
WATKN-SB-1
AU-11
POI24-01/02
SB-2
24-06
24-03
EVAL-AU-10
SB-3
24-07
24-05
24-08
POI24-15
SV-09
24-09
24-13
SV-10
24-14
SV-11
24-04
24-10
POI24-16
24-11
24-12
SV-12A
OU3-SB05
EVAL-AU-9
POI24-17
SV-13
SV-14
SV-15
SV-16
BA-512
SV-17
AU-03-A
AU-03
AU-02
-C
-B
SV-18
EVAL-AU-7
SV-23
SV-19
SV-20
SV-21
SV-22
AU-01
POI24-18
POI24-19
ERT
0
60
120
240
Feet

FIGURE 6: Conceptual Site Model



APPENDIX B: DATA SUMMARY TABLES

Table B.1: All AOI 9 EU Detections

Table B.2: All Spaulding-Rankin EU Detections

Table B.3: All Southern American University EU Detections

(Also see CD for XL tables presenting all data, detects and non-detects—not presented in hard copy)

TABLE B.1 AOI 9 DETECTIONS	ERT 'Recent' Samples										'OTHER' Samples															
Sample ID	3807FR-1(0.5)		3807FR-2(0.5)		3823FR-1(0.5)		3901FR-1(0.5)		3901FR-2(0.5)		5001SS-1(0.5)		5001SS-2(0.5)		5001SS-3(0.5)		5010SS-1(0.5)		5011SS-1(0.5)		5024-SE-10 5/24/10 2.0-2.5		5024-SE-16 5/24/10 0-0.5		5027-SE-43 2/1/10		5027-SE-43B 2/1/10		5027-SE-43E 2/1/10		5027-SE-43W 2/1/10		5027-SE-43N 2/1/10	
Sample Date	9/20/2012		9/20/2012		9/20/2012		11/7/2012		11/7/2012		9/20/2012		9/20/2012		9/20/2012		9/20/2012		9/20/2012													
Parameter																																		
Metals (mg/kg)																																		
Aluminum																					11300		9820		12800	J	11600	J	10800	J	10600	J	10200	J
Antimony	5.26 UL	UL	5.1 UL	UL	0.363	L	0.275	L	0.338		5.1 UL	UL	0.194	L	5.36 UL	UL	2.36 UL	UL	0.319	L	1.1 UL	UL	1.8 UL	UL	3.9 UL	UL	3.8 UL	UL	2.2 UL	UL	1.8 UL	UL	2.3 UL	UL
Arsenic																					2.6	J	5.4	J	5.1 U	U	5.1 U	U	6.6	J	5	J	7.2	J
Barium																					57.5	J	74.1	J	46.6	J	44.7	J	40.2	J	53.5	J	33.9	J
Beryllium																					0.76	J	0.89 U	U	1.9	J	1.8	J	2.1	J	1.8	J	2	J
Boron																																		
Calcium																																		
Chromium																					32.4	J	29.4	J	16.5		15.4		15		14.7		13.1	
Cobalt																					69.2	J	14.8	J	25.4	K	34	K	40.3	K	28.1	K	15.6	K
Copper																					30.5		65		32.8		38.6		26.7		49.2		24.5	
Iron																																		
Lead																					45.5	J	51.6	J	13.9	K	14.6	K	11.5	K	18.5	K	13.7	K
Magnesium																																		
Manganese																					1090	J	806	J	563	J	538	J	502	J	669	J	516	J
Mercury																					0.047	J	0.071	J	0.021	K	0.021	K	0.025	K	0.032	K	0.012 U	U
Nickel																					39.4	J	21.3	J	17.1	K	18.7	K	15.9	K	17.2	K	16.1	K
Phosphorus																																		
Potassium																																		
Silicon																																		
Silver																																		
Sodium																																		
Sulfur																																		
Strontium																					3.7	J	2.6	J	1.6		2.2		1.2		3		2.3	
Tellurium																					0.39	B	0.038	B	0.032	J	0.26 U	U	0.028	J	0.24 U	U	0.26 U	U
Thallium					0.647	L	0.355	J	2.44 U	U	0.266	L	2.26 UL	UL	2.23 UL	UL	0.98 UL	UL	0.573	L														
Tin																					0.74	J	30.5											
Titanium																																		
Vanadium					22.2	J	26.8	J	20.3	J	20.8	J	45.8	J	20.7	J	23.2	J	35.9	J	29.2	J	27.6	J	25.1	J	21.9	J	22.3	J	21.2	J	20.1	J
Zinc																					95.8	L	82.5	L	56.4	K	84.5	K	49.4	K	68.6	K	43.8	K
Zirconium																					6.38	L	5.07	L	3.38	J	4.37	J	3.28	J	4.31	J	4.17	K
Additional Parameters																																		
Perchlorate (µg/kg)																					2.4 U	U	0.75	J	2.4 UL	UL	2.6 UL	UL	2.4 UL	UL	2.4 UL	UL	2.6 UL	UL
Cyanide (mg/kg)																					0.14	L	0.51	L	0.060 U	U	0.060 U	U	0.064 U	U	0.070 U	U	0.066 U	U
Fluoride (mg/kg)																									1.6	L	1.5	L	1.8	L	1.9	L	1.2	L
ABPs (µg/kg)																																		
1,4-dithiane	96 U	U	100 U	U	100 U	U	100 U	U	100 U	U	100 U	U	100 U	U	100 U	U	100 U	U	100 U	U	100 U	U	100 U	U	100 U	U								
1,4-oxathiane	96 U	U	100 U	U	100 U	U	100 U	U	100 U	U	100 U	U	100 U	U	100 U	U	100 U	U	100 U	U	100 U	U	100 U	U	100 U	U								
VOCs (µg/kg)																																		
Acetone																																		
Acrolein																																		
1,2-Dichloroethane																																		
2-HEXANONE																																		
4-METHYL-2-PENTANONE																																		
Benzene																																		
Chloroethane																																		
CHLOROMETHANE																																		
DIBROMOCHLOROMETHANE																																		
Naphthalene																																		
Ethyl benzene																																		
Methyl Tertbutyl Ether																																		
Methylene chloride																																		
Toluene																																		
Total Xylenes																																		

TABLE B.1 AOI 9 DETECTIONS	ERT 'Recent' Samples										'OTHER' Samples							
Sample ID	3807FR-1(0.5)	3807FR-2(0.5)	3823FR-1(0.5)	3901FR-1(0.5)	3901FR-2(0.5)	5001SS-1(0.5)	5001SS-2(0.5)	5001SS-3(0.5)	5010SS-1(0.5)	5011SS-1(0.5)	5024-SE-10 5/24/10 2.0-2.5	5024-SE-16 5/24/10 0-0.5	5027-SE-43 2/1/10	5027-SE-43B 2/1/10	5027-SE-43E 2/1/10	5027-SE-43W 2/1/10	5027-SE-43N 2/1/10	
Sample Date	9/20/2012	9/20/2012	9/20/2012	11/7/2012	11/7/2012	9/20/2012	9/20/2012	9/20/2012	9/20/2012	9/20/2012								
Parameter																		
SVOCs (µg/kg)																		
Benzo(a)pyrene																		
Benzo(b)fluoranthene																		
Benzo(k)fluoranthene																		
Anthracene																		
Benzo(a)anthracene																		
Benzo(g,h,i)perylene																		
Benzoic Acid																		
Bis(2-Ethylhexyl)phthalate																		
Chrysene																		
DI - N - BUTYLPHTH ALATE																		
Diphenylamine																		
HEXACHLOROCYCLOPENTADIENE																		
PENTACHLOROPHENOL																		
PHENOL																		
Fluoranthene																		
Phenanthrene																		
Pyrene																		
Pesticides/PCBs (µg/kg)																		
HEPTACHLOR EPOXIDE																		
ENDOSULFAN I																		
DIELDRIN																		
4,4'-DDE																		
ENDOSULFAN II																		
4,4'-DDD																		
4,4'-DDT																		
ALPHA-CHLORDANE																		
GAMMA-CHLORDANE																		

NOTES:
Blank cell means no analysis for this parameter.

TABLE B.1
AOI 9 DETECTIONS

'OTHER' Samples

Sample ID	5027-SE-43S 2/1/10	SW5036SWAN007GS01[9]	SW5036SWAN012GS01[4]	5040-AN4F-002; Date: 3/24/2004	5040-AN4F-001; Date 3/23/2004	SW-5065SEGS-AN3A-001 3/18/2004	5041-SE-5 2/4/10	5041-SE-11 3/23/10 0-0.5	5047-SE-9 2/3/10	5047-SE-21 2/3/10	5047-SE-12 2/4/10	5053-SE-3 11/17/09 1.0-1.5	5100-TI-5 3/27/10 0-0.5
Sample Date		12/11/09	12/11/09										
Parameter													
Metals (mg/kg)													
Aluminum	11000 J	13700	12900				19500 J	20100 J	13800 J	13100 J	12500 J	10800	11300 J
Antimony	2.3 UL UL	2.5 U U	2.8 U U				1.8 UL UL	0.23 UL UL	1 UL UL	0.85 UL UL	2 B	1.4 UL UL	2.3 UL UL
Arsenic	6.7 J	1.9	1.5	5.8	7.6 L	3.5	4.8 J	3.2 L	5.3	4.2	5.7 J	2.6 L	8.4 L
Barium	40 J	72.7	78.4				61 J	110 L	63.7	62.7	47.9 J	62.3	47.2 L
Beryllium	2.1 J	0.97	1.4				1.8 J	1.4	1.4	1.3	1.8 J	1.2 J	1.9 J
Boron		8.9 J	7.9 J										
Calcium													
Chromium	16	56.8 L	46 L				25	118 L	29.2	33.4	17.7	15.7	18.9 L
Cobalt	46.8 K	15.1	18.1				25.7 K	20.7 J	20.8 K	18.8 K	24 K	14.7 J	19.9 J
Copper	29	38.7	37				37.1	53.1 L	31.9	37.9	66.2	21 J	34.1 L
Iron		25800	22700										
Lead	15.7 K	45.1	45				367 K	20.6 L	28.4 K	32.1 K	40.8 K	13.6 J	13.8 J
Magnesium		4380	5020										
Manganese	675 J	470	370				472 J	799 J	621 J	840 J	523 J	521 J	339 J
Mercury	0.011 U U	0.32	0.16 J				0.065 K	0.062 J	0.076 K	0.087 K	0.036 K	0.032 J	0.026 J
Nickel	17.2 K	25	28.1				29.4 K	50.9 J	26.3 K	32.8 K	23.2 K	17.8 J	26.7 J
Phosphorus													
Potassium													
Silicon													
Silver													
Sodium													
Sulfur													
Strontium	2.2	5.6	5				3.7	9.3 J	3.3 J	3.8 J	3	2.8	4.4 J
Tellurium	0.26	2.9	3.4				0.24 U U	0.031 J	0.052 J	0.04 J	0.032 J	1 UL UL	1 U U
Thallium		3.8 U U	4.2 U U				12 U U	15 UL UL	14 U U	11 U U	10 U U	9.7 U U	15 UL UL
Tin		6.4 U U	4.1 J				8.8 J	0.36 UL UL	1.7 U U	1.3 U U	3 U U	2 U U	3.6 UL UL
Titanium		388	701										
Vanadium	22.7 J	36	26.3				34.9	71.3 J	26.1	26.8	24.7	19.8 J	28.5 J
Zinc	43 K	99.5	95.9				127 K	61.2 J	146 K	162 K	138 K	59.4 J	67.9 J
Zirconium	4.4 J	0.93 J	1.3 J				4.24 J	2.94 L	4.72	4.24	4.12 J	3.38	2.44 L
Additional Parameters													
Perchlorate (µg/kg)	2.6 UL UL	2.7 UJ UJ	2.6 UJ UJ				2.4 UL UL	2.4 UL UL	2.4 UL UL	2.7 UL UL	2.4 UL UL	2.5 UL UL	2.5 U U
Cyanide (mg/kg)	0.070 U U	0.33 U U	0.36 U U				0.065 U U	0.069 UL UL	0.066 U U	0.085 J	0.066 U U	0.067 U U	0.066 U U
Fluoride (mg/kg)	1.4 L	9.7	9.7				2.1 L	3.8 L	2.1 L	1.5 L	2.1 L	2.3 L	0.95 L L
ABPs (µg/kg)													
1,4-dithiane				240 U U	250 U U	240 U U	100 U U	9.6 L	100 U U	100 U U	100 U U	100 U U	100 U U
1,4-oxathiane				480 U U	490 U U	480 U U	100 U U	12 L	100 U U	100 U U	100 U U	100 U U	100 U U
VOCs (µg/kg)													
Acetone		429	67.8										
Acrolein		30.3 J	61 U U									49.8 R R	
1,2-Dichloroethane		2.5 U U	2.4 U U									2 U U	
2-HEXANONE													
4-METHYL-2-PENTANONE													
Benzene		2.5 U U	2.4 U U									2 U U	
Chloroethane		6.3 U U	6.1 U U										
CHLOROMETHANE													
DIBROMOCHLOROMETHANE													
Naphthalene													
Ethyl benzene		2.5 U U	1.5 J										
Methyl Tertbutyl Ether		0.84 J	2.4 U U										
Methylene chloride		2.6 J	1.7 J										
Toluene		2.5 U U	2.4 U U									11.3	
Total Xylenes		7.5 U U	3.5 J									4 U U	

Old RA Samples

Sample ID	POI01-01	POI01-02	POI01-03	POI01-04	POI01-05	POI01-06	BACKFILL DATA REPLACES POI01-07	BACKFILL DATA REPLACES POI01-08/09
Sample Date								
Parameter								
Metals (mg/kg)								
Aluminum	18500	19200	19800	20000	18600	26900	4007	4007
Antimony	9.6 UJ UJ	10.5 UJ UJ	9.5 UJ UJ	10.3 UJ UJ	9.8 UJ UJ	10.4 UJ UJ	1.1 U U	1.1 U U
Arsenic	3.6	3.3	0.7	2.4	4.2	3.8	2.79	2.79
Barium	72.9	82.3	73.6	76.8	75.3	80.5	33	33
Beryllium	2.4	1.8	1.5	1.7	3.9	2	0.49	0.49
Boron							5.92 U U	5.92 U U
Calcium							858	858
Chromium	23.3	33.1	28.9	32.3	29.4	45	8.17	8.17
Cobalt	31.3	20.9	16.9	31.3	18	20.9	4.33	4.33
Copper	39.5	49.6	43.3	45.4	47.6	43.5	8.44	8.44
Iron	21200	31200	24500	31300	36100	39900	16317	16317
Lead	8.4	25.3	12.3	15	10.9	29.8	6.31	6.31
Magnesium	6980	6490	8190	5320	7520	6070	535	535
Manganese	355 J	441 J	478 J	799 J	1100 J	477 J	89	89
Mercury	0.11 U U	0.12 U U	0.11 U U	0.12 U U	0.11 U U	0.12 U U	0.02	0.02
Nickel	36.9	32.6	36.2	28.2	30.9	38.3	9.90	9.90
Phosphorus								
Potassium	6130	4760	4410	4230	6050	4840	572.00 B	572.00 B
Silicon								
Silver	2 U	2 U	1.4 J	2 U	2 U	2 U	1.00	1
Sodium	145 B	191 B	166 B	201 B	169 B	196 B	66.00 JB	66 JB
Sulfur								
Strontium								
Tellurium								
Thallium	0.94	0.49 U U	0.44 U U	0.48 U U	0.45 U U	0.48 U U	1.10	1.099
Tin								
Titanium								
Vanadium	27.8	43.6	33.2	45.4	45.2	60.4	0.66	0.66
Zinc	120 J	111 J	104	87.1 J	104 J	96.4 J	23	23
Zirconium								
Additional Parameters								
Perchlorate (µg/kg)								
Cyanide (mg/kg)							0.28 U U	0.28 U U
Fluoride (mg/kg)								
ABPs (µg/kg)								
1,4-dithiane								
1,4-oxathiane								
VOCs (µg/kg)								
Acetone	14 U	14 U	14 U	14 U	14 U	14 U	4.80 U	4.80
Acrolein							5.00	5.00
1,2-Dichloroethane	14 U	14 U	14 U	14 U	14 U	14 U	3.5 U	1.7 U
2-HEXANONE	14 U	14 U	14 U	14 U	14 U	14 U	7.0 U	3.5 U
4-METHYL-2-PENTANONE	14 U	14 U	14 U	14 U	14 U	14 U	7.0 U	3.5 U
Benzene	14 U	14 U	14 U	14 U	14 U	14 U	3.5 U	1.7 U
Chloroethane	14 U	14 U	14 U	14 U	14 U	14 U	3.5 U	1.7 U
CHLOROMETHANE	14 U	14 U	14 U	14 U	14 U	14 U	7 U	7 U
DIBROMOCHLOROMETHANE	14 U	14 U	14 U	14 U	14 U	14 U	3.5 U	1.7 U
Naphthalene							1.0 J	1.0 J
Ethyl benzene							2.99 U U	2.99 U U
Methyl Tertbutyl Ether							2.99 U U	2.99 U U
Methylene chloride							2.99 U U	2.99 U U
Toluene							2.99 U U	2.99 U U
Total Xylenes	14 U	14 U	14 U	14 U	14 U	14 U	2.99 U U	2.99 U U

TABLE B.1
AOI 9 DETECTIONS

'OTHER' Samples

Sample ID	5027-SE-43S 2/1/10	SW5036SWAN007GS01[9]	SW5036SWAN012GS01[4]	5040-AN4F-002; Date: 3/24/2004	5040-AN4F-001; Date 3/23/2004	SW-5065SEGS-AN3A-001 3/18/2004	5041-SE-5 2/4/10	5041-SE-11 3/23/10 0-0.5	5047-SE-9 2/3/10	5047-SE-21 2/3/10	5047-SE-12 2/4/10	5053-SE-3 11/17/09 1.0-1.5	5100-TI-5 3/27/10 0-0.5
Sample Date		12/11/09	12/11/09										
Parameter													
SVOCs (µg/kg)													
Benzo(a)pyrene		24.5 J	71.8 U U										
Benzo(b)fluoranthene		28.2 J	71.8 U U										
Benzo(k)fluoranthene		25.9 J	71.8 U U										
Anthracene		67.4 U U	71.8 U U										
Benzo(a)anthracene		67.4 U U	71.8 U U										
Benzo(g,h,i)perylene		67.4 U U	71.8 U U										
Benzoic Acid		419 J	1010 U U									830 U U	
Bis(2-Ethylhexyl)phthalate		27.5 B	144 U U										
Chrysene		24.3 J	71.8 U U										
DI - N - BUTYLPHTH ALATE													
Diphenylamine		135 U U	144 U U										
HEXACHLOROCYCLOPENTADIE		364 U U	388 U U										
PENTACHLOROPHENOL		728 U U	775 U U										
PHENOL		364 U U	388 U U										
Fluoranthene		58.1 J	71.8 U U										
Phenanthrene		21.9 J	71.8 U U										
Pyrene		35.5 J	71.8 U U										
Pesticides/PCBs (µg/kg)													
HEPTACHLOR EPOXIDE													
ENDOSULFAN I													
DIELDRIN													
4,4'-DDE													
ENDOSULFAN II													
4,4'-DDD													
4,4'-DDT													
ALPHA-CHLORDANE													
GAMMA-CHLORDANE													

Old RA Samples

Sample ID	POI01-01	POI01-02	POI01-03	POI01-04	POI01-05	POI01-06	BACKFILL DATA REPLACES POI01-07	BACKFILL DATA REPLACES POI01-08/09
Sample Date								
Parameter								
SVOCs (µg/kg)								
Benzo(a)pyrene							168	
Benzo(b)fluoranthene	367 U U	402 U U	363 U U	402 U U	375 U U	393 U U	165	
Benzo(k)fluoranthene							155	
Anthracene	330 U	330 U	330 U	330 U	330 U	330 U	226.0 U	226 U
Benzo(a)anthracene	820 U	820 U	820 U	820 U	820 U	820 U	103.0 J	103 J
Benzo(g,h,i)perylene	330 U	330 U	330 U	330 U	330 U	330 U	62.9 J	62.9 J
Benzoic Acid							250 U U	
Bis(2-Ethylhexyl)phthalate	17 J	26 J	330 U	330 U	330 U	330 U	101 U U	101 U U
Chrysene	27 J	820 U	820 U	820 U	820 U	820 U	103.0 J	103 J
DI - N - BUTYLPHTH ALATE	330 U	330 U	330 U	330 U	330 U	330 U	226.0 U	226 U
Diphenylamine	330 U	330 U	330 U	330 U	330 U	330 U	402 U	402 U
HEXACHLOROCYCLOPENTADIE	330 U	330 U	330 U	330 U	330 U	330 U	58.9 J	58.9 J
PENTACHLOROPHENOL	330 U	330 U	330 U	330 U	330 U	330 U	134.0 J	134 J
PHENOL	330 U	330 U	330 U	330 U	330 U	330 U	204.0 J	204 J
Fluoranthene							402	
Phenanthrene							350	
Pyrene	330 U	330 U	330 U	330 U	330 U	330 U	204.0 J	204 J
Pesticides/PCBs (µg/kg)								
HEPTACHLOR EPOXIDE	1.9 U	1.9 U	1.9 U	1.9 U	2.6 J	1.1 J	1.1 U	1.1 U
ENDOSULFAN I	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.1 U	1.1 U
DIELDRIN	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	1.1 U	1.1 U
4,4'-DDE	3.6 U	3.8 J	3.6 J	3.6 U	3.6 U	3.6 U	1.1 U	1.1 U
ENDOSULFAN II	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	1.1 U	1.1 U
4,4'-DDD	3.6 U	3.6 U	2 J	3.6 U	3.6 U	3.6 U	1.1 U	1.1 U
4,4'-DDT	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	1.1 U	1.1 U
ALPHA-CHLORDANE	1.4 J	1.9 U	1.9 U	1.9 U	1.9 U	1.8 J	1.1 U	1.1 U
GAMMA-CHLORDANE	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.1 U	1.1 U

NOTES:
Blank cell means no analysis for th

TABLE B.1 AOI 9 DETECTIONS	Old RA Samples																					
Sample ID	POI01-10	POI01-11	POI01-12	POI01-13	POI01-14	POI07-01/02	POI07-03	POI07-04	POI07-05	POI07-06	POI07-07	POI07-08	POI07-09	POI07-10	POI07-11	POI07-12	POI07-13	POI07-14	5040TR-SB	5054TR-SB	5059TR-SB	5065TR-SB
Sample Date																						
Parameter																						
Metals (mg/kg)																						
Aluminum	22400	20700	21600	16800	23200	36800	15900	30900	51900	22700	41100	22900	34200	28800	23200	23000	21700	24400	16100	18800	12600	14800
Antimony	10.4 UJ UJ	10.5 UJ UJ	10.9 UJ UJ	10.4 UJ UJ	10.7 UJ UJ	31.6 L	11.1 L	26.4 L	44.2 L	17.1 L	31 L	20.9 L	14.1 L	11.4 L	7.9 L	10.7 L	8.8 L	9.5 L	1.2 U UJ	1 UJ UJ	1.1 U UJ	0.97 UJ UJ
Arsenic	1.3	2.2	0.46 UL UL	4	2.4	6.5	2.8 K	5.2	7.2	3.8 K	8.6	4.5	5.3	4.8 K	2.1 K	6.1	4.9	5.4	2.2	1.1	1.3	0.7
Barium	86	75.5	81.6	71.5	79.8	174	54.5	103	204	34.9	110	56.3	104	110	69.1	91.1	76.1	81.4	75.4	85.4	66.5	74.6
Beryllium	1.6	1.9	2.6	1.6	1.8	2.2	1.5	2.6	6	1.9	2.9	1.9	1.9	1.8	1.7	2.2	1.5	1.7	1.6	2.1	1.6	1.5
Boron																						
Calcium																						
Chromium	33.6	32.3	28	26.9	33	82.9 L	114 L	67.3 L	74.3 L	39.8	66.3	39 L	44.2 L	30.7	14 L	16.3 L	23.9 L	22.4 L	26.5	20.3	26.4	21.4
Cobalt	17.1	16.6	18.5	16.8	20.1	41	18.9	68.6	70.1	26.5	39.8	30.7	13.9	16	13.2	21.7	15.4	16.7	18	15.5	21.1	14.4
Copper	40.3	36.4	40.7	37.3	38.3	152	56.8	122	227	60.8	108 L	31.8 L	37.4 L	28.2 L	20.5 L	49.1	31.4 L	35.3 L	31.4	38.2	34.1	27.9
Iron	31800	30500	25600	25400	32100	63000	26200	56800	91100	45000	64400	45700	29600	25000	19100	23100	22400	23700	26800	18000	24200	19400
Lead	17.3	31.6	4	15.2	12.4	20.9	8.2	23.7	23.5	8.6	26.4	10.2	17.5	25.3	18.2	46.2	21.2	27.3	11.1	5	12.8	7.4
Magnesium	6040	5360	7600	4540	5020	9750	3090	4710	13600	6080	7680	6350	5300	5050	7050	7190	5540	6560	7490	7440	6170	7410
Manganese	376 J	447 J	417 J	381 J	289 J	936	363 J	1480 J	2040 J	727 J	789 J	717 J	318 J	523 J	448 J	982 J	512 J	532 J	602 J	438 J	460 J	384 J
Mercury	0.12 U U	0.12 U U	0.12 U U	0.12 U U	0.12 U U	0.12 U U	0.12 U U	0.12 U U	0.12 U U	0.12 U U	0..15 U U	0.11 U U	0.12 U U	0.13 U U	0.12 U U	0.12 U U	0.13	0.12 U U	0.06 U U	0.05 U U	0.05	0.04 U U
Nickel	33.2	30.2	34.8	26.3	30.5	39.3	19	39.3	73.5	53.1	60.7	40.1	31.2	26.7	24.4	39.4	26.1	26.2	32.4	32.1	29.3	29.4
Phosphorus																			22	502	234	217
Potassium	4670	4010	5820	3140	3470	9020	2800	3870	10400	2050	5190	4810	5690	4920	7750	7530	5550	5540	6010	5700	4750	6020
Silicon																			2340	2320	2410	2110
Silver	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	0.59 U	0.52 U	0.57 U	0.49 U
Sodium	171 B	181 B	167 B	187 B	189 B	1000 U	1000 U	1000 U	1000 U	232	297	228	256	323	185	1000 U	196	1000 U	58.6 U	55.9 U	57.3 U	53.7
Sulfur																			116	51	98.8	21
Strontium																			4.2	7.9	2.3	3.9
Tellurium																						
Thallium	0.48 U; UL	0.49 U U	0.46 UL UL	0.49 U U	0.50 U U	1.4 U U	2.1 B	1.5 B	1.5 U U	1.4 U U	1.8 U U	1.4 U U	1.4 U U	1.5 U U	1.4 U U	1.5 U U	1.4 U U	1.4 U U	1.2 U U	1 U U	1.1 U U	0.97 U U
Tin																			2.3 U U	2.1 U U	2.3 U U	1.9 U U
Titanium																			922	930	899	923
Vanadium	45	42.1	35	37	50.2	186	73.9	172	307	58.7	115	64.6	39.5	31.5	15.7	22.3	29.3	29	39.8	23.1	32.8	23.4
Zinc	104 J	93.1 J	107 J	77.3 J	83 J	81.4	33.8	64.8	121	90.9	123	88.2	63.8	65.2	56.4	68.1	74.7	68.9	92.7	96.7	80.4	91.9
Zirconium																						
Additional Parameters																						
Perchlorate (μg/kg)																						
Cyanide (mg/kg)																			0.61 U U	0.56 U U	0.58 U U	0.53 U U
Fluoride (mg/kg)																			1.22 R R	1.1 R R	1.17 R R	1.08 R R
ABPs (μg/kg)																						
1,4-dithiane																			102 U U	90 U U	101 U U	87 U U
1,4-oxathiane																			99 U U	87 U U	101 U U	84 U U
VOCs (μg/kg)																						
Acetone	14 U	6 B	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	1 UB UB	3 UB UB	2 UB UB	2 UB UB
Acrolein																			5.2 U U	6.3 U U	5.4 U U	5.3 U U
1,2-Dichloroethane	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	1 UJ	1.3 UJ	1.1 UJ	1.1
2-HEXANONE	14 U	14 U	14 U	14 U	5 B	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	1 UJ	1.3 UJ	1.1 UJ	1.1 UJ
4-METHYL-2-PENTANONE	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	1 UJ	2 J	1.1 UJ	1.1 UJ
Benzene	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	1 UJ	1.3 UJ	1.1 UJ	1.1
Chloroethane	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	1 UJ	1.3 UJ	1.1 UJ	1.1
CHLOROMETHANE	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	1 UJ	1.3 UJ	1.1 UJ	1.1
DIBROMOCHLOROMETHANE	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	1 UJ	1.3 UJ	1.1 UJ	1.1
Naphthalene																						
Ethyl benzene																			1 UJ UJ	1.3 UJ UJ	1.1 UJ UJ	1.1 UJ UJ
Methyl Tertbutyl Ether																			1 UJ UJ	1.3 UJ UJ	1.1 UJ UJ	1.1 UJ UJ
Methylene chloride																			1 UJ UJ	1.3 UJ UJ	1.1 UJ UJ	1.1 UJ UJ
Toluene																			1 UJ UJ	1.3 UJ UJ	1.1 UJ UJ	1.1 UJ UJ
Total Xylenes	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	14 U	2 J	1.3 UJ	1 UJ	1.1 UJ

TABLE B.1
AOI 9 DETECTIONS

						Old RA Samples															
Sample ID	POI01-10	POI01-11	POI01-12	POI01-13	POI01-14	POI07-01/02	POI07-03	POI07-04	POI07-05	POI07-06	POI07-07	POI07-08	POI07-09	POI07-10	POI07-11	POI07-12	POI07-13	POI07-14	5040TR-SB	5054TR-SB	5059TR-SB	5065TR-SB
Sample Date																						
Parameter																						
SVOCs (µg/kg)																						
Benzo(a)pyrene																			82 U U	140	81 U U	74 U U
Benzo(b)fluoranthene	402 U U	402 U U	384 U U	398 U U	407 U U	446 UJ UJ	413 UJ UJ	388 UJ UJ	413 UJ UJ	375 UJ UJ	393 U U	380 U U	402 U U	413 U U	393 U U	407 U U	398 U U	407 U U	82 U U	300	81 U U	74 U U
Benzo(k)fluoranthene																			82 U U	130	81 U U	74 U U
Anthracene	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	82 U	75 J	81 U	74 U
Benzo(a)anthracene	820 U	820 U	820 U	820 U	21 J	820 U	820 U	820 U	820 U	820 U	820 U	820 U	820 U	820 U	820 U	820 U	820 U	820 U	82 U	340	81 U U	74 U U
Benzo(g,h,i)perylene	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	82 U	97	81 U	74 U
Benzoic Acid																			250 U U	230 U U	240 U U	220 U U
Bis(2-Ethylhexyl)phthalate	330 U	330 U	24 J	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	82 U U	51 J	81 U U	74 U U
Chrysene	820 U	820 U	820 U	820 U	21 J	820 U	820 U	820 U	820 U	820 U	820 U	820 U	820 U	820 U	820 U	820 U	820 U	820 U	82 U	160	81 U	74 U
DI - N - BUTYLPHTH ALATE	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	82 U	34 J	81 U	74 U
Diphenylamine	330 U	330 U	330 U	330 U	51 J	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	82 U U	650	81 U U	74 U U
HEXACHLOROCYCLOPENTADIE	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	82 U	120	81 U	74 U
PENTACHLOROPHENOL	330 U	330 U	330 U	330 U	27 J	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	82 U U	270	81 U U	74 U U
PHENOL	330 U	330 U	330 U	330 U	34 J	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	82 U U	450	81 U U	74 U U
Fluoranthene																			82 U U	650	81 U U	74 U U
Phenanthrene																			82 U U	270	81 U U	74 U U
Pyrene	330 U	330 U	330 U	330 U	34 J	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	330 U	82 U U	450	81 U U	74 U U
Pesticides/PCBs (µg/kg)																						
HEPTACHLOR EPOXIDE	1.9 U	1.9 U	1 J	46 J	4.3 J	1.9 U	2.7 J	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U				
ENDOSULFAN I	1.9 U	1.9 U	1.9 U	2.6 J	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U				
DIELDRIN	3.6 U	3.6 U	2 J	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U				
4,4'-DDE	27 J	3.6 U	3.6 U	3.6 U	3.6 U	5.5 J	6.5 J	1.5 J	7.9 J	31 J	13	50	25	110	17	12	110	250				
ENDOSULFAN II	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	4.6	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U				
4,4'-DDD	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U				
4,4'-DDT	8.7 J	3.6 U	3.6 U	3.6 U	3.6 U	6.1 J	1.5 J	3.6 U	2.2 J	20 J	5.5	52	15	12	3.9 J	2.9 J	56 J	58				
ALPHA-CHLORDANE	1.2 J	1.9 U	2.6 J	45 J	9.1 J	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	0.9 J	5.3	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U				
GAMMA-CHLORDANE	1.9 U	1.9 U	1.3 J	24 J	6.8 J	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	3.4	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U				

NOTES:
Blank cell means no analysis for th

NA not applicable
mg/kg milligrams per kilogram, µg/kg micrograms per kilogram
J analyte present; the reported value may not be accurate or precise
K Analyte detected, reported value is biased high, actual value may be lower.
L analyte present; reported value may be biased low, the actual value is expected higher
U not detected; the associated number indicates the approximate sample concentration necessary to be detected
UJ Analyte not detected, reported PQL may be inaccurate or imprecise.
UL not detected; quantitation limit may be inaccurate or imprecise
R unreliable result; analyte may or may not be present in the sample, supporting data necessary to confirm result
B Blank contamination, the analyte was detected in the associated blank at a comparable concentration.

TABLE B.2 SPAULDING-RANKIN DETECTIONS	ERT 'RECENT' Samples																							
Sample ID	A4710WL1(0.5)		A4710WL1(2-4)		A4710WL2(0.5)		A4710WL2(1-3)		A4710WL3(0.5)		A4710WL3(5-7)		A4710WL4(0.5)		A4710WL4(7-9)		A4710WL5(0.5)		A4710WL5(5-7)		A4710WL6(0.5)		A4710WL6(5-7)		A4710WL7(0.5)	
Sample Date	9/19/2012		9/19/2012		9/19/2012		9/19/2012		9/19/2012		9/19/2012		9/19/2012		9/19/2012		9/19/2012		9/19/2012		9/19/2012		9/19/2012		9/19/2012	
Parameter																										
Metals (mg/kg)																										
Aluminum	12600	J	13300	J	11800	J	17100	J	10700	J	14900	J	11600	J	17600	J	11700	J	17500	J	12100	J	21800	J	13500	J
Antimony	1.44	J	0.798	J	1.2	J	1.47	J	1.37	J	1.33	J	1.25	J	0.454	J	1.39	J	1.24	J	1.38	J	1.32	J	1.26	J
Arsenic																										
Barium	69.8	J	36.3	J	91.1	J	32.6	J	91.7	J	41.1	J	105	J	70.3	J	91	J	63.7	J	73.6	J	104	J	76.9	J
Beryllium	0.83		1.07		0.805		1.08		0.774		0.938		0.801		2.08		0.875		1.72		0.774		1.67		0.772	
Cadmium	0.811		0.662		0.829		0.731		1.44		0.617		1.19		0.75		3.18		1.1		0.792		1.75		0.828	
Calcium	2210	J	398	J	4030	J	811	J	2380	J	656	J	3230	J	328	J	2680	J	250	J	3270	J	346	J	3700	J
Chromium	539	J	392	J	520	J	742	J	443	J	511	J	431	J	164	J	547	J	526	J	626	J	544	J	580	J
Cobalt	52.7		46.7		43.8		92.5		46.3		49		47.8		36.8		51.3		77.8		43.5		87.6		48.9	
Copper	20.9	J	28.2	J	25.2	J	22.4	J	19.8	J	29.3	J	38.1	J	16.3	J	15.1	J	56.8	J	17.5	J	23.1	J	19.5	J
Iron	40200	J	46400	J	37500	J	55700	J	32900	J	44000	J	34400	J	50600	J	38400	J	58400	J	42100	J	58600	J	40600	J
Lead	47		6.25		43.8		2.84		76		7.82		93.8		12.6		77.5		3.4		74		2.53		94.4	
Magnesium	4170	J	4670	J	3850	J	4950	J	3670	J	4660	J	4580	J	5530	J	3700	J	7000	J	4080	J	14900	J	5690	J
Manganese	1100	J	703	J	1230	J	1010	J	1710	J	743	J	1860	J	848	J	1590	J	1190	J	1230	J	1980	J	1190	J
Mercury	0.09	J	0.055 U	U	0.15	J	0.055 U	U	0.19		0.07	J	0.16		0.055 U	U	0.2		0.055 U	U	0.14	J	0.055 U	U	0.08	J
Nickel	84.4	J	74	J	69.5	J	114	J	75.9	J	89.2	J	83.7	J	66.2	J	91.1	J	156	J	81.7	J	275	J	84.9	J
Potassium	524	J	1680	J	391	J	482	J	443	J	964	J	488	J	2130	J	406	J	426	J	394	J	105	J	537	J
Selenium	7.17	L	7.74	L	7	L	9.23	L	5.92	L	7.53	L	6.36	L	8.5	L	7.15	L	9.16	L	7.64	L	8.52	L	7.48	L
Silver	0.752	L	0.633	L	0.725	L	0.871	L	0.668	L	0.655	L	0.742	L	0.73	L	0.822	L	0.784	L	0.734	L	0.883	L	0.778	L
Sodium	26.9	J	15.7	J	29.9	J	200.5 U	U	44.5	J	25.5	J	41.2	J	27.7	J	48.3	J	33.5	J	43.5	J	31.9	J	33.4	J
Strontium Total	13		3		24		3.85		16.2		4.34		22.5		2.97		16.6		1.91		16.5		2.09		17.6	
Thallium	3.76	L	4.39	L	3.6	L	6.16	L	3.43	L	4.28	L	3.18	L	5.38	L	3.59	L	4.8	L	4.25	L	7.89	L	4.2	L
Tin	1.75		0.245	J	1.2		0.22	J	4.07		0.301	J	3.51		1.3		1.87		0.023	J	2.72		0.64		1.89	
Titanium	373	J	492	J	357	J	471	J	296	J	449	J	340	J	685	J	378	J	601	J	426	J	319	J	369	J
Vanadium	83.8	J	84.6	J	79.6	J	104	J	69.9	J	83.9	J	85.8	J	69.6	J	84.9	J	127	J	93.3	J	109	J	84.3	J
Zinc	92.2	J	59.5	J	84.8	J	76	J	121	J	65.5	J	139	J	80.5	J	103	J	94.5	J	96.9	J	145	J	94.1	J
Zirconium	0.241 U	U	1.87		0.275 U	U	1.7		0.2595 U	U	2.09		0.2935 U	U	0.711		0.277 U	U	0.202 U	U	0.2875 U	U	0.1995 U	U	0.2525 U	U
Additional Parameters (mg/kg)																										
Cyanide																										
VOCs (µg/kg)																										
2-HEXANONE																										
ACETONE																										
CHLOROFORM																										
ETHYLBENZENE																										
METHYLENE CHLORIDE																										
TOLUENE																										
TOTAL XYLENES																										

TABLE B.2 SPAULDING-RANKIN DETECTIONS	ERT 'RECENT' Samples												
Sample ID	A4710WL1(0.5)	A4710WL1(2-4)	A4710WL2(0.5)	A4710WL2(1-3)	A4710WL3(0.5)	A4710WL3(5-7)	A4710WL4(0.5)	A4710WL4(7-9)	A4710WL5(0.5)	A4710WL5(5-7)	A4710WL6(0.5)	A4710WL6(5-7)	A4710WL7(0.5)
Sample Date	9/19/2012	9/19/2012	9/19/2012	9/19/2012	9/19/2012	9/19/2012	9/19/2012	9/19/2012	9/19/2012	9/19/2012	9/19/2012	9/19/2012	9/19/2012
Parameter													
SVOCs (µg/kg)													
Benzo(a)anthracene													
Benzo(a)pyrene													
Benzo(b)fluoranthene													
Chrysene													
BIS(2 - ETHYLH EXYL) PHTH ALATE													
DI - N - BUTYLPHTH ALATE													
FLUORANTHENE													
Pesticides/PCBs (µg/kg)													
4,4'-DDD													
4,4'-DDE													
4,4'-DDT													
ALPHA-CHLORDANE													
METHOXYCHLOR													
Notes:													
Blank cell means no analysis for this parameter.													

TABLE B.2 SPAULDING-RANKIN DETECTIONS			ERT 'RECENT' Samples												'OTHER' Samples															
Sample ID	A4710WL7(5-7)		POI4710WL1(0.5)		POI4710WL2(0.5)		POI4710WL3(0.5)		POI4710WL4(0.5)		POI4710WL5(0.5)		WD-13 0-0.5		SCRA-BURN-CENTER (2)		SCRA-BURN-SW-N		SCRA-BURN-SW-E		SCRA-BURN-SW-S		SCRA-BURN-SW-W		POI21-23-07		POI21-23-10	
Sample Date	9/19/2012		9/19/2012		9/19/2012		9/19/2012		9/19/2012		9/19/2012		5/2/2011		2/18/2004		2/18/2004		2/18/2004		2/18/2004		2/18/2004		EPA '99		EPA '99	
Parameter																														
Metals (mg/kg)																														
Aluminum	16100	J											2530												9680		4830	
Antimony	1.26	J											8.1	J											10.2 U	U	10.2 U	U
Arsenic													7.5	B	27.6	K	6.5	K	14.3	K	11.9	K	25.6	K	0.25 UJ	UJ	1	J
Barium	73.8	J											32.4												22.7		27.3	
Beryllium	1.57												0.21	J											1.1		0.63	
Cadmium	1.57												30.1												10 U	U	10 U	U
Calcium	366	J																							957		264	
Chromium	491	J											179												988		333	
Cobalt	113												22.8												74.4		99.2	
Copper	23.1	J											481												21.4		18.5	
Iron	52100	J																							52200		22900	
Lead	3.95												313		135		20.4		66.1		92.1		127		5	J	17.1	J
Magnesium	6310	J																							3300	J	1040	J
Manganese	1200	J											1080												409	J	705	J
Mercury	0.055 U	U											0.19												0.03		0.03	
Nickel	270	J	94.5	J	55.2	J	108	J	62.4	J	49.2		129												120		61.7	
Potassium	598	J																							148	J	5	U
Selenium	7.72	L											17.7													R		R
Silver	0.691	L																							5 U	U	5 U	U
Sodium	47.8	J																							30.9		24.4	
Strontium Total	3.84												8.4	L														
Thallium	4.89	L	5.21	L	3.43	L	2.05	L	4.63	L	6.91		4.9	J											0.25 UJ	UJ	0.25	J
Tin	0.628												25.2	B														
Titanium	469	J																										
Vanadium	90.9	J	94.4	J	101	J	48.6	J	80.8	J	53.7	J	24	J											81.3		36.1	
Zinc	92.4	J											13600												38.4		19	
Zirconium	0.2095 U	U											3.94															
Additional Parameters (mg/kg)																														
Cyanide													0.29															
VOCs (µg/kg)																														
2-HEXANONE																									14 U	U	14 U	U
ACETONE																									11	J	16	J
CHLOROFORM																									14 U	U	14 U	U
ETHYLBENZENE																									14 U	U	4	J
METHYLENE CHLORIDE																									5	B	5	B
TOLUENE																									14 U	U	15	J
TOTAL XYLENES																									14 U	U	21	J

TABLE B.2 SPAULDING-RANKIN DETECTIONS		ERT 'RECENT' Samples					'OTHER' Samples								
Sample ID	A4710WL7(5-7)	POI4710WL1(0.5)	POI4710WL2(0.5)	POI4710WL3(0.5)	POI4710WL4(0.5)	POI4710WL5(0.5)	WD-13 0-0.5	SCRA-BURN-CENTER (2)	SCRA-BURN-SW-N	SCRA-BURN-SW-E	SCRA-BURN-SW-S	SCRA-BURN-SW-W	POI21-23-07		POI21-23-10	
Sample Date	9/19/2012	9/19/2012	9/19/2012	9/19/2012	9/19/2012	9/19/2012	5/2/2011	2/18/2004	2/18/2004	2/18/2004	2/18/2004	2/18/2004	EPA '99		EPA '99	
Parameter																
SVOCs (µg/kg)																
Benzo(a)anthracene								390 U	U	420 U	U	410 U	U	430 U	U	110	J	810 U	U	820 U	U
Benzo(a)pyrene								34	J	420 U	U	34	J	430 U	U	86	J	810 U	U	820 U	U
Benzo(b)fluoranthene								390 U	U	420 U	U	410 U	U	430 U	U	84	J	810 U	U	820 U	U
Chrysene								42	J	420 U	U	42	J	430 U	U	110	J	810 U	U	820 U	U
BIS(2 - ETHYLH EXYL) PHTH ALATE																		330 U	U	330 U	U
DI - N - BUTYLPHTH ALATE																		700	J	610	J
FLUORANTHENE																		330 U	U	330 U	U
Pesticides/PCBs (µg/kg)																					
4,4'-DDD																		48		3.6 U	U
4,4'-DDE																		26		60	
4,4'-DDT																		87	J	32	
ALPHA-CHLORDANE																		1.3	J	1.9 U	U
METHOXYCHLOR																		3.2	B	3.9	B

Notes:
Blank cell means no analysis for this parameter.

TABLE B.2 SPAULDING-RANKIN DETECTIONS							Old RA Samples																			
Sample ID	POI21-23-12		POI21-23-13		POI21-23-15/16		SVPOI21/23-1		SVPOI21/23-2		SVPOI21/23-3		SVPOI21/23-4		SVPOI21/23-5		SVPOI21/23-6		SVPOI21/23-7		SVPOI21/23-8		SVPOI21/23-9		SVPOI21/23-10		SVPOI21/23-11		SVPOI21/23-12	
Sample Date	EPA '99		EPA '99		EPA '99		USACE '95		USACE '95		USACE '95		USACE '95		USACE '95		USACE '95		USACE '95		USACE '95		USACE '95		USACE '95		USACE '95	
Parameter																												
Metals (mg/kg)																												
Aluminum	17900		9550		8170		18252.86		22683.84		18834.99		19085.5		15596.53		20371.46		22088.34		14645.7		14385.25		16946.38		13467.14		24661.58	
Antimony	10.4 U	U	9.8 U	U	10.3 U	U	3.4 UJ	UJ	8.14 UJ	UJ	3.64 UJ	UJ	3.48 UJ	UJ	7.23 UJ	UJ	7.05 UJ	UJ	6.91 UJ	UJ	7.51 UJ	UJ	3.67 UJ	UJ	9.03 UJ	UJ	3.25 UJ	UJ	3.41 UJ	UJ
Arsenic	1	J	0.58	J	2.5	J	2.25	J	6.78	J	6.78	J	4.87	J	1.26	J	1.38	J	1.72	J	1.26	J	1.54	J	1.42	J	1.6	J	1.54	J
Barium	41.2		49.6		18.1		73.07	J	36.73	JB	78.88	J	31.16	JB	69.78	JB	51.37	JB	29.45	JB	32.64	JB	28.69	JB	33.12	JB	25.55	JB	31.01	JB
Beryllium	0.87		0.58	J	0.7		0.98	B	1.31	B	1.15	B	1.33		1.13	B	1.53	B	1.71	B	1.35	B	0.99	B	2.76	B	1.2		1.37	
Cadmium	10 U	U	10 U	U	10 U	U	1.38		1.64	B	1.7		1.51		1.53	B	1.75	B	1.36	B	1.45	B	1.09	B	2.51	B	1.02	B	1.04	B
Calcium	518		800		936		4330.78	JB	1134.7	JB	25590.57	J	688.81	JB	398.09	JB	431.34	JB	572.83	JB	545.2	JB	715.3	JB	120.14	JB	234.78	JB	365.39	JB
Chromium	453		465		449		353.9		754.31		782.77		1366.05		1794.18		1089.95		2066.87		1460.72		1138.34		15866.71		1202.58		691.83	
Cobalt	34.3		27.8		46.8		58.76		40.43		287.82		80.26		210.77		426.52		76.32		78.52		32.41		239.15		142.27		38.3	
Copper	29.1		14.2		41.2		32.09		33.5		52.83		51.76		49.58		167.32		33.89		19.17		38.96		96.41		23.49		34.78	
Iron	44900		31600		40100		28128.15		61985.95		44962.78		65104.09		76918.32		80030.75		87330.06		76324.78		62480.04		140536.16		56620.89		53390.59	
Lead	18.1	J	12.8	J	8.3	J	31.27		46.83		55.43		48.59		22.03	B	19.66	B	14.82	B	19.7	B	15.85		59.91		30.85		28.38	
Magnesium	3420	J	3890	J	702	J	12553.78		2272.6	B	5758.56		6134.2		1354.95	B	1535.06	B	1403.31	B	1477.28	B	2819.16		1368.2	B	5354.11		4338.93	
Manganese	374	J	643	J	303	J	1233.98		372.53		3069.85		833.92		2397.03		3247.97		446.93		391.82		221.98		2533.42		1031.95		354.68	
Mercury	0.03		0.05		0.03		0.11 R	R	0.27	J	0.19	J	0.2	J	0.11 R	R	0.11 R	R	0.12	J	0.67	J	0.12	J	0.12 UJ	UJ	0.12	J	0.13 UJ	UJ
Nickel	51		64.4		35.9		166.86		87.59		198.54		177.86		180.05		334.53		141.88		211.76		87.13		312.51		140.79		64.25	
Potassium	1570	J	1110	J	117	J	1644.62		656.22	B	2127.92		440.01	B	359.25	B	458.97	B	315.57	B	338.14	B	393.9	B	525.46	B	285.16	B	1321.5	
Selenium		R		R		R	7.05 U	U	16.9 U	U	7.54 U	U	7.24 U	U	15 U	U	14.62 U	U	14.34 U	U	15.6 U	U	7.61 U	U	18.73 U	U	6.74 U	U	7.07 U	U
Silver	5 U	U	5 U	U	5 U	U	1.99	B	2.31	B	1.7	B	1.21	B	2.14	B	1.82	B	1.33 U	U	1.72	B	1.7	B	3.18	B	1.75	B	1.76	B
Sodium	44.5		31.2		22.9		57.25	B	48.63	B	117.97	B	26.72	B	31.4 U	U	30.6 U	U	30.01 U	U	32.63 U	U	23.6	B	39.19 U	U	14.11 U	U	21.78	B
Strontium Total																														
Thallium	0.35	J	0.24 UJ	UJ	0.25 UJ	UJ	5.29 UJ	UJ	12.66 UJ	UJ	5.65 UJ	UJ	5.42 UJ	UJ	11.24 UJ	UJ	10.96 UJ	UJ	10.75 UJ	UJ	11.68 UJ	UJ	5.7 UJ	UJ	14.03 UJ	UJ	7.39	J	5.29 UJ	UJ
Tin																														
Titanium																														
Vanadium	93.2		69.2		102		60.33		141.14		90.25		125.19		118.12		194.85		141.08		129.14		100.8		192.09		98.73		109.38	
Zinc	48.8		48.6		20.2		73.2		57.32		135.53		72.13		47.09		70.23		58.97		49.73		42.17		64.28		55.79		58.3	
Zirconium																														
Additional Parameters (mg/kg)																														
Cyanide							1.14 U	U	1.16 U	U	1.24 U	U	1.24 U	U	1.23 U	U	1.23 U	U	1.22 U	U	1.26 U	U	1.26 U	U	1.25 U	U	1.17 U	U	1.26 U	U
VOCs (µg/kg)																														
2-HEXANONE	14 U	U	14 U	U	14 U	U																								
ACETONE	10	J	7	J	14 U	U																								
CHLOROFORM	14 U	U	14 U	U	14 U	U																								
ETHYLBENZENE	14 U	U	14 U	U	14 U	U																								
METHYLENE CHLORIDE	6	B	6	B	14 U	U																								
TOLUENE	13	J	14 U	U	14 U	U																								
TOTAL XYLENES	18	J	7	J	14 U	U																								

TABLE B.2 SPAULDING-RANKIN DETECTIONS							Old RA Samples											
Sample ID	POI21-23-12		POI21-23-13		POI21-23-15/16		SVPOI21/23-1	SVPOI21/23-2	SVPOI21/23-3	SVPOI21/23-4	SVPOI21/23-5	SVPOI21/23-6	SVPOI21/23-7	SVPOI21/23-8	SVPOI21/23-9	SVPOI21/23-10	SVPOI21/23-11	SVPOI21/23-12
Sample Date	EPA '99		EPA '99		EPA '99		USACE '95	USACE '95	USACE '95	USACE '95	USACE '95	USACE '95	USACE '95	USACE '95	USACE '95	USACE '95	USACE '95	USACE '95
Parameter																		
SVOCs (µg/kg)																		
Benzo(a)anthracene	840 U	U	780 U	U	840 U	U												
Benzo(a)pyrene	840 U	U	780 U	U	840 U	U												
Benzo(b)fluoranthene	840 U	U	780 U	U	840 U	U												
Chrysene	840 U	U	780 U	U	840 U	U												
BIS(2 - ETHYLH EXYL) PHTH ALATE	330 U	U	330 U	U	330 U	U												
DI - N - BUTYLPHTH ALATE	650	J	390	J	530	J												
FLUORANTHENE	330 U	U	330 U	U	330 U	U												
Pesticides/PCBs (µg/kg)																		
4,4'-DDD	3.6 U	U	3.6 U	U	3.6 U	U												
4,4'-DDE	1.6	J	3.6 U	U	33													
4,4'-DDT	1.5	J	3.6 U	U	3.6 U	U												
ALPHA-CHLORDANE	0.8	J	1.9 U	U	1.9 U	U												
METHOXYCHLOR	2.8	B	18.7 U	U	18.7 U	U												
Notes:																		
Blank cell means no analysis for this parameter.																		

TABLE B.2 SPAULDING-RANKIN DETECTIONS							Old RA Samples							
Sample ID	SVPOI21/23-13		SVPOI21/23-14		SVPOI21/23-15		SV-POI21SS-01		SV-POI22SS-01		SV-POI22SS-02		SV-POI22SS-03	
Sample Date	USACE '95		USACE '95		USACE '95		USACE '95		USACE '95		USACE '95		USACE '95	
Parameter														
Metals (mg/kg)														
Aluminum	22107.37		20570.66		21713.57									
Antimony	3.78 UJ	UJ	3.9 UJ	UJ	6.91 UJ	UJ								
Arsenic	1.35	J	3.3	J	8.82	J	0.32		3.6	J	26.9	J	2.4	J
Barium	78.45	J	293.57	J	39.5	JB								
Beryllium	1.6		1.43		1.85	B								
Cadmium	1.35		1.51		1.67	B								
Calcium	841.93	JB	43.87.48	J	878.53	JB								
Chromium	833.86		128.88		925.23									
Cobalt	33.95		19.69		54.02									
Copper	24.67		185.96		68.86									
Iron	56922.38		26308.21		81773.87									
Lead	50		217.56		47.56									
Magnesium	4242.95		6578.33		1764.66	B								
Manganese	742.39		1029.57		478.94									
Mercury	0.11	J	0.15	J	0.18	J								
Nickel	98.19		36.38		112.74									
Potassium	1146.43	B	3246.43		713.2	B								
Selenium	7.84 U	U	8.09 U	U	14.35 U	U								
Silver	1.66	B	2.38	B	3.73	B								
Sodium	28.87	B	199.29	B	30 U	U								
Strontium Total														
Thallium	5.87 UJ	UJ	6.06 UJ	UJ	10.74 UJ	UJ								
Tin														
Titanium														
Vanadium	118.93		47.23		177.39									
Zinc	82.79		236		67.44									
Zirconium														
Additional Parameters (mg/kg)														
Cyanide	1.29 U	U	1.33 U	U	1.24 U	U	1 U	U	1 R	R	1	U	1.86	
VOCs (µg/kg)														
2-HEXANONE														
ACETONE														
CHLOROFORM														
ETHYLBENZENE														
METHYLENE CHLORIDE														
TOLUENE														
TOTAL XYLENES														

	Old RA Samples (cont.)													
Sample ID	SV-POI22SS-04		SV-POI22SS-05		SV-POI21SB-01		SV-POI21SB-02		SV-POI21SB-03		SV-POI21SB-04		SV-POI21SB-05	
Sample Date	USACE '95		USACE '95		Jan-95		Jan-95		Jan-95		Jan-95		Jan-95	
Parameter														
Metals (mg/kg)														
Aluminum														
Antimony														
Arsenic	2.2	J	1.9	J	1.56		2.5		2.26		2.3		2.39	
Barium														
Beryllium														
Cadmium														
Calcium														
Chromium														
Cobalt														
Copper														
Iron														
Lead														
Magnesium														
Manganese														
Mercury														
Nickel														
Potassium														
Selenium														
Silver														
Sodium														
Strontium Total														
Thallium														
Tin														
Titanium														
Vanadium														
Zinc														
Zirconium														
Additional Parameters (mg/kg)														
Cyanide	1 U	U	1 U	U	1 U	U	1 U	U	1 U	U	1 U	U	1 U	U
VOCs (µg/kg)														
2-HEXANONE														
ACETONE														
CHLOROFORM														
ETHYLBENZENE														
METHYLENE CHLORIDE														
TOLUENE														
TOTAL XYLENES														

TABLE B.2 SPAULDING-RANKIN DETECTIONS				Old RA Samples										
Sample ID	SVPOI21/23-13	SVPOI21/23-14	SVPOI21/23-15	SV-POI21SS-01	SV-POI22SS-01	SV-POI22SS-02	SV-POI22SS-03	SV-POI22SS-04	SV-POI22SS-05	SV-POI21SB-01	SV-POI21SB-02	SV-POI21SB-03	SV-POI21SB-04	SV-POI21SB-05
Sample Date	USACE '95	USACE '95	USACE '95	USACE '95	USACE '95	USACE '95	USACE '95	USACE '95	USACE '95	Jan-95	Jan-95	Jan-95	Jan-95	Jan-95
Parameter														
SVOCs (µg/kg)														
Benzo(a)anthracene														
Benzo(a)pyrene														
Benzo(b)fluoranthene														
Chrysene														
BIS(2 - ETHYLH EXYL) PHTH ALATE														
DI - N - BUTYLPHTH ALATE														
FLUORANTHENE														
Pesticides/PCBs (µg/kg)														
4,4'-DDD														
4,4'-DDE														
4,4'-DDT														
ALPHA-CHLORDANE														
METHOXYCHLOR														
Notes:														
Blank cell means no analysis for this parameter.														

TABLE B.2 SPAULDING-RANKIN DETECTIONS	Old RA Samples																							
Sample ID	SV-POI21SB-06		SV-POI21SB-07		SV-POI23SS-01		SV-POI23SB-01		SV-POI23SB-02		SV-POI23SB-03		SV-POI23SB-04		SV-POI23SB-05		SV-POI23SB-06		SV-POI23SB-07		SV-POI23PD-01		POI21SS-01		POI21SB-02		POI21SB-05	
Sample Date	Jan-95		Jan-95		Dec-94		Dec-94		Dec-94		Dec-94		Dec-94		Dec-94		Dec-94		Dec-94		Dec-94		EPA '99		EPA '99		EPA '99	
Parameter																												
Metals (mg/kg)																												
Aluminum																							8520		11000		9660	
Antimony																							8.7	B	9.2 U	U	9.1 U	U
Arsenic	2.44		2.35		0.2	J	0.78		1.2		1.16		1.03		0.91		1.04		1.06		131		1 U	U	3	B	1.6	B
Barium																							16	B	41.9	B	61.5	
Beryllium																							0.65	B	0.84	B	0.85	B
Cadmium																							0.49 U	U	0.49 U	U	0.49 U	U
Calcium																							200	B	181	B	544	B
Chromium																							718		365		449	
Cobalt																							39.9	J	34.3	J	43.8	J
Copper																							16.1		34.3		26	
Iron																							26100		32600		27800	
Lead																							0.82		19.1		19.6	
Magnesium																							7470		2800		4350	
Manganese																							789	J	1130	J	1890	J
Mercury																							0.17		0.13 U	U	0.13 U	U
Nickel																							142		58.7		74	
Potassium																							138 U	U	161 U	U	493	B
Selenium																							1.2 U	U	1.2 U	U	1.2 U	U
Silver																							1.5 U	U	1.5 U	U	1.5 U	U
Sodium																							108 U	U	85.1 U	U	84.2 U	U
Strontium Total																												
Thallium																							1 U	U	1.3 U	U	1.2 U	U
Tin																												
Titanium																												
Vanadium																							61.3		74		61	
Zinc																							48.7		47.1		52.9	
Zirconium																												
Additional Parameters (mg/kg)																												
Cyanide	1 U	U	1 U	U	ND	U	1 U	U	1 U	U	1 U	U	1 U	U	1 U	U	1 U	U	1 U	U	1.66							
VOCs (µg/kg)																												
2-HEXANONE																							11 U	U	13 U	U	13 U	U
ACETONE																							11 U	U	13 U	U	13 U	U
CHLOROFORM																							11 U	U	13 U	U	13 U	U
ETHYLBENZENE																							11 U	U	13 U	U	13 U	U
METHYLENE CHLORIDE																							5	JB	6	JB	8	JB
TOLUENE																							11 U	U	13 U	U	13 U	U
TOTAL XYLENES																							11 U	U	13 U	U	13 U	U

TABLE B.2 SPAULDING-RANKIN DETECTIONS			Old RA Samples												
Sample ID	SV-POI21SB-06	SV-POI21SB-07	SV-POI23SS-01	SV-POI23SB-01	SV-POI23SB-02	SV-POI23SB-03	SV-POI23SB-04	SV-POI23SB-05	SV-POI23SB-06	SV-POI23SB-07	SV-POI23PD-01	POI21SS-01	POI21SB-02	POI21SB-05
Sample Date	Jan-95	Jan-95	Dec-94	Dec-94	Dec-94	Dec-94	Dec-94	Dec-94	Dec-94	Dec-94	Dec-94	EPA '99	EPA '99	EPA '99
Parameter														
SVOCs (µg/kg)														
Benzo(a)anthracene												370 U U	430 U U	430 U U
Benzo(a)pyrene												370 U U	430 U U	430 U U
Benzo(b)fluoranthene												370 U U	430 U U	430 U U
Chrysene												370 U U	430 U U	430 U U
BIS(2 - ETHYLH EXYL) PHTH ALATE												370 U U	430 U U	430 U U
DI - N - BUTYLPHTH ALATE												370 U U	430 U U	430 U U
FLUORANTHENE												370 U U	430 U U	430 U U
Pesticides/PCBs (µg/kg)														
4,4'-DDD												3.7 U U	4.2 U U	4.2 U U
4,4'-DDE												3.7 U U	2.8 J	6.9
4,4'-DDT												3.7 U U	4.2 U U	4.2 U U
ALPHA-CHLORDANE												1.9 U U	2.2 U U	2.2 U U
METHOXYCHLOR												19 U U	22 U U	22 U U
Notes:														
Blank cell means no analysis for this parameter.														

TABLE B.2
SPAULDING-RANKIN
DETECTIONS

					Old RA Samples												
Sample ID	POI21SB-06	POI22SS-01	POI22SS-02	POI22SS-03	POI22SS-04	POI23SS-01	POI23SB-01	POI23SB-03	POI23SB-04	POI23SB-06	SV-07-A	SV-08-A	SV-09-A	SV-07-02	SV-08	SV-09	SV-10
Sample Date	EPA '99	EPA '99	EPA '99	EPA '99	EPA '99	EPA '99	EPA '99	EPA '99	EPA '99	EPA '99	USACE DATA AS REPORTED IN EPA '99						
Parameter																	
Metals (mg/kg)																	
Aluminum	8650	4520	10200	7870	9680	13500	9090	10500	9190	9180	23659	23504	23753	19341	37428	23026	20850
Antimony	9.4 U U	14.7 U U	18.5 L	R	3.7 L	3.7 J	4.3 UL UL	2.6 L	4.1 UL UL	4 UL UL	7.2	7.8	11.7	8.9	16.5	11.2	7.8
Arsenic	1.8 B	2.8	59.1	2.2	3.2	0.83 UL UL	1.1	1.3 L	0.83 UL UL	0.83	2.1 U U	2.1 U U	2.9	2.1 U U	2.3	2 U U	2 U U
Barium	76.9	44.8	55.2	36.3	26.3	55	30.8	30.9	26	30.2	48.69	46.68	52.38	30.86	173.2	63.45	41.29
Beryllium	0.62 B	0.41	0.79	0.6	0.75	0.93 J	0.7	0.98	0.59	0.64	1.4	1.5	1.3	1.3	1.9	2	1.8
Cadmium	0.49 U U	0.36 U U	0.62 L	0.36 U U	0.36 U U	0.12 U U	0.33 U U	0.33 U U	0.33 U U	0.33 U U	0.98 B	0.89 B	0.84 B	0.84 B	1.05 B	110	0.55
Calcium	590 B	1900	1380	1520	1550	350 J	206 J	324 J	198 J	216 J	428.4 B	563.5 B	959.5 B	1078.6 B	246.15 B	412.88 B	165.58 B
Chromium	430	243	646	549	590	670	482	539	451	465	642	633	659	721	157	84.7	49.3
Cobalt	42.5 J	93.1	77.4	49.2	41.3	34 L	35.3	29 J	32.7	36.3	80.57	38.64	53.46	49.63	32.93	25.74	11.96
Copper	28.6	18.8	43.8	71.1	21.1	5.7 K	12.9 B	17.5 K	13 B	13.2 B	32.56	45.15	28.52	24.91	76.03	44.12	61.45
Iron	25100	18400	50000	37500	47900	38800	31600 J	40500	29700 J	33500 J	65812	67324	64091	71859	72090	54809	42823
Lead	19.3	10.7	868	17.3	10	2.2 L	6.6 J	11.8 J	7.2 J	7.1 J	12.1	11.4	26	12.5	23.7	18.2	12.1
Magnesium	4780	1050	1550	1460	1040	9570	3880	3810	3980	3720	8942	8932	6261	5712	14476	8395	7230
Manganese	2310 J	2020	1170	686	638	1120 J	821	478	450	549	1564	818	902	873	760	900	517
Mercury	0.13 U U	0.96 K	2.5 K	0.45 K	0.17 K	0.11 U U	0.06 UL UL	0.1 U U	0.06 UL UL	0.06 UL UL							
Nickel	77.3	105 J	57.8 J	47.2 J	47.3 J	96.7 L	57.2	71.3	47.4	50.7	135	97.6	77.6	83.1	67.3	49.1	31.7
Potassium	163 U U	220	196	141	179	2590 U U	374 U U	887	429 U	322 B							
Selenium	1.2 U U	0.91 J	0.79 J	0.66 U U	0.97 J	1 U U	0.72 U U	0.72 U U	0.72 U U	0.25 L	33.8	34.6	37.3	35.2	47.1	38	30.5
Silver	1.5 U U	0.49 U U	0.49 U U	0.49 U U	0.49 U U	R	1.6 J	0.49 U U	1.7 J	2.8 J	1.61 U U	1.61 U U	1.5 U U	1.51 U U	1.61 B	1.5	0.77 U U
Sodium	86.1 U U	35.1 B	36.6 B	48.5 B	63 B	31.8 U U	26.5 B	30.2	46.9 B	37.2 B	26.08 B	65.47 B	31.11 B	18.47 B	99.62 B	65.4 B	31.6 B
Strontium Total																	
Thallium	1.2 U U	0.95 U U	0.98 U U	1 U U	1.1 U U	1.3 U U	0.43 UL UL	0.22 U U	0.42 UL UL	0.41 UL UL	40.9	45.8	41.2	43.2	75.7	45.1	41.3
Tin											45.24	44.83	43.36	44.72	59.95	40.07	34.36
Titanium											614.06	720.82	637.88	524.66	1383	722.32	376.94
Vanadium	53	39.6	97.9	73.2	95.5	86.3	65.4	86.5	59.2	67.5	103	110	107	109	136	64.3	42.8
Zinc	50.8	58.4	82.5	151	40.9	54.8	34.7 J	36.7 L	29.6 J	29 J	92.9	79.8	72.58	60.35	133.96	127.02	88.11
Zirconium																	
Additional Parameters (mg/kg)																	
Cyanide											1.18 U U	1.17 U U	1.17 U U	1.19 U U	1.16 U U	1.13 U U	1.11 U U
VOCs (µg/kg)																	
2-HEXANONE	13 U U	30 U U				10 U U	12 U U		12 U U	12 U U	18.01	14.95	13.65	5.83 U U	5.79 U U	5.67 U U	5.56 U
ACETONE	13 U U	18.2 U				10 U U	12 U U		12 U U	12 U U	23.54	12.26	14.93	11.27	24.33	10.31	23.48
CHLOROFORM	13 U U	10 U U				10 U U	12 U U		12 U U	12 U U	6.94	10.86	5.83 U U	21.35	13.44	5.67 U U	5.01
ETHYLBENZENE	13 U U	10 U U				10 U U	12 U U		12 U U	12 U U	5.88 U U	5.84 U U	5.83 U U	5.83 U U	5.79 U U	5.67 U U	5.56 U
METHYLENE CHLORIDE	14 JB	10 U U				10 U U	1 B		12 U U	12 U U	38.84	66.58	30.32	74.72	49.83	14.17	19.81
TOLUENE	13 U U	10 U U				10 U U	12 U U		12 U U	12 U U	5.88 U U	5.84 U U	5.83 U U	5.83 U U	5.79 U U	5.67 U U	5.56 U
TOTAL XYLENES	13 U U	10 U U				10 U U	12 U U		12 U U	12 U U	5.88 U U	5.84 U U	5.83 U U	5.83 U U	5.79 U U	5.67 U U	5.56 U U

TABLE B.2
SPAULDING-RANKIN
DETECTIONS

Old RA Samples

Sample ID	POI21SB-06		POI22SS-01		POI22SS-02		POI22SS-03		POI22SS-04		POI23SS-01		POI23SB-01		POI23SB-03		POI23SB-04		POI23SB-06	
Sample Date	EPA '99		EPA '99		EPA '99		EPA '99		EPA '99		EPA '99		EPA '99		EPA '99		EPA '99		EPA '99	
Parameter																				
SVOCs (µg/kg)																				
Benzo(a)anthracene	430 U	U	665 U	U							330 UL	UL	398 U	U	410 U	U	393 U	U	388 U	U
Benzo(a)pyrene	430 U	U	665 U	U							330 UL	UL	398 U	U	410 U	U	393 U	U	388 U	U
Benzo(b)fluoranthene	430 U	U	665 U	U							330 UL	UL	398 U	U	410 U	U	393 U	U	388 U	U
Chrysene	430 U	U	665 U	U							330 UL	UL	398 U	U	410 U	U	393 U	U	388 U	U
BIS(2 - ETHYLH EXYL) PHTH ALATE	46	J	665 U	U							330 U	U	61	B	410 U	U	390 U	U	390 U	U
DI - N - BUTYLPHTH ALATE	430 U	U	665 U	U							330 U	U	23	B	410 U	U	570	B	840	B
FLUORANTHENE	65	J	665 U	U							330 U	U	400 U	U	410 U	U	390 U	U	390 U	U
Pesticides/PCBs (µg/kg)																				
4,4'-DDD	4.2 U	U	1.6 U	U							3.3 U	U	4 U	U	4.2 U	U	3.9 U	U	3.9 U	U
4,4'-DDE	11		1.6 U	U							3.3 U	U	4 U	U	4.2 U	U	3.9 U	U	3.9 U	U
4,4'-DDT	6.1	J	1.6 U	U							3.3 U	U	4 U	U	4.2 U	U	3.9 U	U	3.9 U	U
ALPHA-CHLORDANE	2.2 U	U	1.6 U	U							1.7 U	U	2 U	U	2.1 U	U	2 U	U	2 U	U
METHOXYCHLOR	22 U	U	2.8 U	U							17 U	U	20 U	U	21 U	U	20 U	U	20 U	U

Sample ID	SV-07-A		SV-08-A		SV-09-A		SV-07-02		SV-08		SV-09		SV-10	
Sample Date	USACE DATA AS REPORTED IN EPA '99													
Parameter														
SVOCs (µg/kg)														
Benzo(a)anthracene	23.54 U	U	23.36 U	U	23.33 U	U	23.72 U	U	23.17 U	U	22.67 U	U	22.26 U	U
Benzo(a)pyrene	23.54 U	U	23.36 U	U	23.33 U	U	23.72 U	U	23.17 U	U	22.67 U	U	22.26 U	U
Benzo(b)fluoranthene	23.54 U	U	23.36 U	U	23.33 U	U	23.72 U	U	23.17 U	U	22.67 U	U	22.26 U	U
Chrysene	23.54 U	U	23.36 U	U	23.33 U	U	23.72 U	U	23.17 U	U	22.67 U	U	22.26 U	U
BIS(2 - ETHYLH EXYL) PHTH ALATE	23.54 U	U	23.36 U	U	23.33 U	U	23.72 U	U	23.17 U	U	22.67 U	U	22.26 U	U
DI - N - BUTYLPHTH ALATE	23.54 U	U	23.36 U	U	23.33 U	U	23.72 U	U	23.17 U	U	22.67 U	U	22.26 U	U
FLUORANTHENE	23.54 U	U	23.36 U	U	23.33 U	U	23.72 U	U	23.17 U	U	22.67 U	U	22.26 U	U
Pesticides/PCBs (µg/kg)														
4,4'-DDD														
4,4'-DDE														
4,4'-DDT														
ALPHA-CHLORDANE														
METHOXYCHLOR														

Notes:

Blank cell means no analysis for this parameter.

mg/kg milligrams per kilogram, µg/kg microgr mg/kg milligrams per kilogram, µg/kg micrograms per kilogram

J analyte present; the reported value may not be accurate or precise
K Analyte detected, reported value is biased high, actual value may be lower.
L analyte present; reported value may be biased low, the actual value is expected higher
U not detected; the associated number indicates the approximate sample concentration necessary to be detected
UJ Analyte not detected, reported PQL may be inaccurate or imprecise.
UL not detected; quantitation limit may be inaccurate or imprecise
R unreliable result; analyte may or may not be present in the sample, supporting data necessary to confirm result
B Blank contamination, the analyte was detected in the associated blank at a comparable concentration.

TABLE B.3 SOUTHERN AU DETECTIONS	ERT 'Recent' Samples										'OTHER' Samples					
Sample ID	EVAL-AU-1(0.5)	EVAL-AU-2(0.5)	EVAL-AU-3(0.5)	EVAL-AU-4(0.5)	EVAL-AU-5(0.5)	EVAL-AU-6(0.5)	EVAL-AU-7(0.5)	EVAL-AU-8(0.5)	EVAL-AU-9(0.5)	EVAL-AU-10(2)	AU11-TP2-01	OU4-BAK03-1	OU4-BAK03-2	OU4-BAK03-3	OU4-BAK03-SB-2	OU4-BAK03-SB-4
Sample Date	9/18/2012	9/18/2012	9/18/2012	9/18/2012	9/18/2012	9/18/2012	9/18/2012	9/18/2012	9/18/2012	9/18/2012	9/23/2009	3/14/2001	3/14/2001	3/14/2001	3/14/2001	3/14/2001
Parameter																
Metals (mg/kg)																
Aluminum											13700					
Antimony	0.681 J	0.492 J	0.721 J	0.435 J	0.726 J	0.613 J	0.367 J	0.65 J	0.416 J	0.795 J	0.93 U U					
Arsenic											2.5					
Barium											56.8					
Beryllium											1.4					
Cadmium											0.19 U U					
Calcium											593 J					
Chromium											21.8					
Cobalt											17.3					
Copper											31					
Iron											21900					
Lead											36.4					
Magnesium											5420					
Manganese											394					
Mercury											0.16					
Nickel											16.4					
Phosphorous																
Potassium											3640					
Selenium											0.6 U U					
Silicon																
Silver											0.23 U U					
Sodium											160 U U					
Strontium																
Sulfur																
Thallium	1.33 J	1.04	0.763 J	1.29 J	2.5	4.73	1.7 J	1.89 J	0.95 U U	2.64	13 U U					
Tin																
Titanium																
Vanadium	26.6	39	30.3	36.6	54.1	68	37.6	35	46.2	44.6	23.4					
Zinc											99.1					
Additional Parameters (mg/kg)																
Cyanide											0.073 J					
VOCs (µg/kg)																
Methylene Chloride											6.8 J					
1,1,1-Trichloroethane											4.8 U U					
2-Butanone											4.8 U U					
Acetone											48 U U					
Chloroform											4.8 U U					
Chloromethane																
Dichlorodifluoromethane																
Toluene											4.8 U U					

TABLE B.3 SOUTHERN AU DETECTIONS	ERT 'Recent' Samples										'OTHER' Samples					
Sample ID	EVAL-AU-1(0.5)	EVAL-AU-2(0.5)	EVAL-AU-3(0.5)	EVAL-AU-4(0.5)	EVAL-AU-5(0.5)	EVAL-AU-6(0.5)	EVAL-AU-7(0.5)	EVAL-AU-8(0.5)	EVAL-AU-9(0.5)	EVAL-AU-10(2)	AU11-TP2-01	OU4-BAK03-1	OU4-BAK03-2	OU4-BAK03-3	OU4-BAK03-SB-2	OU4-BAK03-SB-4
Sample Date	9/18/2012	9/18/2012	9/18/2012	9/18/2012	9/18/2012	9/18/2012	9/18/2012	9/18/2012	9/18/2012	9/18/2012	9/23/2009	3/14/2001	3/14/2001	3/14/2001	3/14/2001	3/14/2001
Parameter																
SVOCs (µg/kg)																
Anthracene											190 U U	396 U U	90.6 J	434 U U	457 U U	391 U U
Benzo(a)anthracene											190 U U	143 J	773	210 J	457 U U	391 U U
Benzo(a)pyrene											190 U U	127 J	595	216 J	457 U U	391 U U
Benzo(b)fluoranthene											190 U U	175 J	895	322 J	457 U U	391 U U
Benzo[g,h,i]perylene											190 U U	396 U U	244 J	107 J	457 U U	391 U U
Benzo[k]fluoranthene											190 U U	396 U U	377 J	95.4 J	457 U U	391 U U
Benzoic Acid											940 U U					
Bis(2-ethylhexyl) phthalate											190 U U	55.1 J	58 J	67.7 J	457 U U	391 U U
Chrysene											190 U U	128 J	666	248 J	457 U U	391 U U
Dibenz(a,h)anthracene											190 U U	396 U U	423 U U	434 U U	457 U U	391 U U
Dibenzofuran											190 U U	396 U U	423 U U	434 U U	457 U U	391 U U
Diethyl Phthalate											380 U U	396 U U	423 U U	434 U U	457 U U	391 U U
Fluoranthene											190 U U	205 J	1260	485	457 U U	391 U U
Indeno(1,2,3-c,d)Pyrene											190 U U	65.8 J	273 J	112 J	457 U U	391 U U
Phenanthrene											190 U U	74.5 J	327 J	239 J	457 U U	391 U U
Pyrene											190 U U	201 J	908	408 J	457 U U	391 U U
Pesticides/PCBs (µg/kg)																
4,4'-DDD																
4,4'-DDE																
4,4'-DDT																
Alpha-Chlordane																
Dieldrin																
Endosulfan II																
Endrin																
Endrin Aldehyde																
Endrin Ketone																
Heptachlor																

Notes:
Blank cell means no analysis for this parameter.

TABLE B.3 SOUTHERN AU DETECTIONS	'OTHER' Samples												
Sample ID	OU4-BAK03-SB-6	TCRA-AU-BK05A	TCRA-AU-BK05B	TCRA-AU-BK05C	TCRA-AU-BK05D	TCRA-AU-BK05E	TCRA-AU-BK05F	TCRA-AU-03-(0-6)	TCRA-AU-03-(3')	TCRA-AU-03-(5')	TCRA-AU-03-A(1)	TCRA-AU-03-B(1)	TCRA-AU-03-C(1)	BA-512 SW-AU18- (160,280)GB-3
Sample Date	3/14/2001	8/23/2002	8/23/2002	8/23/2002	8/23/2002	8/23/2002	8/23/2002	12/17/2002	12/17/2002	12/17/2002	12/19/2002	12/19/2002	12/19/2002	12/6/2009
Parameter														
Metals (mg/kg)														
Aluminum														12800
Antimony														0.24 UL JL
Arsenic														10.1 J
Barium														33.8
Beryllium														0.39 J
Cadmium														0.017 U U
Calcium														1180
Chromium														43.7
Cobalt														4.7
Copper														16.1
Iron														27000
Lead														13.4
Magnesium														1280 J
Manganese														128 J
Mercury														0.028 J
Nickel														11.4
Phosphorous														
Potassium														522
Selenium														0.18 U U
Silicon														
Silver														0.048 U U
Sodium														95 J
Strontium														5.3
Sulfur														
Thallium		0.26	0.39	0.67	0.38	0.51	0.65	0.15 U U	0.91 U U	0.85 U U	1.97 U U	0.43 JB	1.6 JB	1 J
Tin														2.7 B
Titanium														194
Vanadium														45.7
Zinc														33.3
Additional Parameters (mg/kg)														
Cyanide														
VOCs (µg/kg)														
Methylene Chloride														
1,1,1-Trichloroethane														
2-Butanone														
Acetone														
Chloroform														
Chloromethane														
Dichlorodifluoromethane														
Toluene														

TABLE B.3 SOUTHERN AU DETECTIONS		'OTHER' Samples													
Sample ID	OU4-BAK03-SB-6	TCRA-AU-BK05A	TCRA-AU-BK05B	TCRA-AU-BK05C	TCRA-AU-BK05D	TCRA-AU-BK05E	TCRA-AU-BK05F	TCRA-AU-03-(0-6)	TCRA-AU-03-(3')	TCRA-AU-03-(5')	TCRA-AU-03-A(1)	TCRA-AU-03-B(1)	TCRA-AU-03-C(1)	BA-512 SW-AU18- (160,280)GB-3
Sample Date	3/14/2001	8/23/2002	8/23/2002	8/23/2002	8/23/2002	8/23/2002	8/23/2002	12/17/2002	12/17/2002	12/17/2002	12/19/2002	12/19/2002	12/19/2002	12/6/2009
Parameter														
SVOCs (µg/kg)														
Anthracene	375 U U													
Benzo(a)anthracene	375 U U													
Benzo(a)pyrene	375 U U													
Benzo(b)fluoranthene	375 U U													
Benzo[g,h,i]perylene	375 U U													
Benzo[k]fluoranthene	375 U U													
Benzoic Acid														
Bis(2-ethylhexyl) phthalate	20.3 J													
Chrysene	375 U U													
Dibenz(a,h)anthracene	375 U U													
Dibenzofuran	375 U U													
Diethyl Phthalate	375 U U													
Fluoranthene	375 U U													
Indeno(1,2,3-c,d)Pyrene	375 U U													
Phenanthrene	375 U U													
Pyrene	375 U U													
Pesticides/PCBs (µg/kg)														
4,4'-DDD														
4,4'-DDE														
4,4'-DDT														
Alpha-Chlordane														
Dieldrin														
Endosulfan II														
Endrin														
Endrin Aldehyde														
Endrin Ketone														
Heptachlor														

Notes:

Blank cell means no analysis for this parameter.

TABLE B.3
SOUTHERN AU
DETECTIONS

'OTHER' Samples

Sample ID	OU4-WATKN-SB-1		OU4-WATKN-SB-2		OU4-WATKN-SB-3		OU4-WATKN-SB-4		WATKN-SB-5 (4-5)		WATKN-SB-5 (5-6)		WATKN-SB-5 (6-7)		WATKN-SB-5 (7-8)		190, 470 TCRA-AU-(540,380)-8		290, 430 TCRA-AU-(640,340)-4		BACKFILL replaces OU3 - SB05		SV-02A	
Sample Date	3/14/2001		3/14/2001		3/14/2001		3/14/2001		3/14/2001		3/14/2001		3/14/2001		3/14/2001		3/2/2003		3/2/2003					
Parameter																								
Metals (mg/kg)																								
Aluminum	31800		19200		25100		19600		17400		13500		16000		13600						17653		13700	J
Antimony	1.3 UJ		1.2 UJ		1.5	J	1.6	J	1 UJ	UJ	1	J	0.88	J	0.79	J					0.657		0.84	B
Arsenic	0.64 R		0.61 R		2.1	J	0.64	J	4.1		1.9	J	1.2	J	0.74	J	7.3		15.3		5.85		2.8	L
Barium	50.5		37.2		71.1		60.8		93.2		60.2		83.7		46.7						170		36	J
Beryllium	4.5		1.6		0.82		0.68		1.3		1.1		1.2		0.96						0.994		1.2	
Cadmium	0.64 U	U	0.61 U	U	0.54		0.55 U	U	0.52 U	U	0.51 U	U	0.39 U	U	0.36 U	U					0.204		1.23 U	U
Calcium	416		723		1080		1710		534		490		6540		1080						3729		1030	
Chromium	136		209		373		359		207		228		197		254						44.8		448	J
Cobalt	40.7	J	107	J	43	J	27.4	J	35.6	J	31.4	J	26.6	J	24.5	J					17.3		61.2	J
Copper	19.9		90.1		111		50.6		50.7		34.7		46.6		34.8						42.2		32.2	J
Iron	33900		21200		33800		24900		26500		22300		25000		17300						36181		32100	J
Lead	12.2		9.1		3	J	5.3	J	32.3	J	21.9	J	17.7	J	11.8	J					19.5		144	J
Magnesium	2600		6050		10700		17100		7580		5960		7480		7490						13025		5690	J
Manganese	677		1860		1080	J	470	J	1310	J	728	J	624	J	594	J					294		1020	J
Mercury	0.06 U		0.06 U		0.05 U	U	0.05 U	U	0.76		1.2		0.46		1.7						0.046		0.12	
Nickel	57.6		142		129	J	101	J	57.3	J	45.5	J	49	J	56.5	J					17.5		0.12	
Phosphorous	71.9	J	27.5	J	42.7	J	79.4	J	198	J	148	J	170	J	79.1	J								
Potassium	230		716		1820		2400		3070		1960		3010		2030						9081		976	J
Selenium	0.64 UJ	UJ	0.61 UJ	UJ	0.47 UJ	UJ	0.58	J	0.52 UJ	UJ	0.51 UJ	UJ	0.39 UJ	UJ	0.36 UJ	UJ					1.05		0.51	K
Silicon	2240	J	1480	J	1250	J	831	J	1300	J	1440	J	1470	J	1240	J								
Silver	0.64 U	U	0.61 U	U	0.47 U	U	0.55 U	U	0.52 U	U	0.51 U	U	0.39 U	U	0.36 U	U								
Sodium	600		165		389		302		52.5 U	U	50.6 U	U	54		47.5						119		1228.5 U	U
Strontium	2.9		5		7.5		6.4		20		3.8		20.7		4.1									
Sulfur	255		6.1 U	U	43.9		18.9		130		122		114		55.4									
Thallium	1.3 U	U	1.2 U	U	0.94 U	U	1.1 U	U	1 U	U	1 U	U	0.78 U	U	0.72 U	U					0.703		2.46 UL	UL
Tin	2.6 U	U	2.4 U	U	1.9 U	U	2.2 U	U	2.1 U	U	2 U	U	1.6 U	U	1.4 U	U								
Titanium	290		327		668		896		609		454		575		475									
Vanadium	89.2		51.9		55.8		55.3		63.1		50.9		57.9		37.5						55		72.4	J
Zinc	25.6		76.3		77		45.6		64.8		60.1		70.9		74						88.95		81.3	J
Additional Parameters (mg/kg)																								
Cyanide																	0.25 UL	UL	0.64	L	0.81			
VOCs (µg/kg)																								
Methylene Chloride																								
1,1,1-Trichloroethane																					2.85	U		
2-Butanone																					5.71	U		
Acetone																					9.32	U		
Chloroform																					2.85	U		
Chloromethane																					5.71	U		
Dichlorodifluoromethane																					2.90	U		
Toluene																					2.85	U		

TABLE B.3
SOUTHERN AU
DETECTIONS

'OTHER' Samples

Sample ID	OU4-WATKN-SB-1		OU4-WATKN-SB-2		OU4-WATKN-SB-3		OU4-WATKN-SB-4		WATKN-SB-5 (4-5)		WATKN-SB-5 (5-6)		WATKN-SB-5 (6-7)		WATKN-SB-5 (7-8)		190, 470 TCRA-AU-(540,380)-8		290, 430 TCRA-AU-(640,340)-4		BACKFILL replaces OU3 - SB05		SV-02A	
Sample Date	3/14/2001		3/14/2001		3/14/2001		3/14/2001		3/14/2001		3/14/2001		3/14/2001		3/14/2001		3/2/2003		3/2/2003					
Parameter																								
SVOCs (µg/kg)																								
Anthracene																								
Benzo(a)anthracene	74 U	U	70 U	U	80 U	U	77 U	U	11	J	11	J	73 U	U	71 U	U								
Benzo(a)pyrene																								
Benzo(b)fluoranthene	74 U	U	70 U	U	80 U	U	77 U	U	15	J	74 U	U	73 U	U	71 U	U								
Benzo[g,h,i]perylene																					192	U		
Benzo[k]fluoranthene																					188	U		
Benzoic Acid	220 U	U	210 U	U	240 U	U	230 U	U	56	J	220 U	U	210	J	210 U	U								
Bis(2-ethylhexyl) phthalate																								
Chrysene	74 U	U	70 U	U	80 U	U	77 U		11	J	13	J	73 U	U	71 U	U					194	U		
Dibenz(a,h)anthracene																								
Dibenzofuran																					188	U		
Diethyl Phthalate	24	J	13	J	80 U	U	13	J	73 U	U	16	J	19	J	9	J								
Fluoranthene	74 U	U	70 U	U	80 U	U	77 U	U	22	J	14	J	73 U	U	71 U	U					217	U		
Indeno(1,2,3-c,d)Pyrene																								
Phenanthrene	74 U	U	70 U	U	80 U	U	77 U	U	11	J	74 U	U	73 U	U	71 U	U								
Pyrene	74 U	U	70 U	U	80 U	U	77 U	U	17	J	20	J	73 U	U	71 U	U					200	U		
Pesticides/PCBs (µg/kg)																								
4,4'-DDD																					1.07	U		
4,4'-DDE																					1.13	U		
4,4'-DDT																					1.37	U		
Alpha-Chlordane																					0.98	U		
Dieldrin																					0.97	U		
Endosulfan II																					0.95	U		
Endrin																					0.95	U		
Endrin Aldehyde																					0.95	U		
Endrin Ketone																					0.95	U		
Heptachlor																					0.95	U		

Notes:
Blank cell means no analysis for this parameter.

TABLE B.3 SOUTHERN AU DETECTIONS	Old RA Samples																																			
Sample ID	SV-03A		SV-04A		SV-12A		SV-13A		SV-14A		BACKFILL replaces AU-11		BACKFILL replaces POI24-15		POI24-16		BACKFILL replaces POI24-17		POI24-18		POI24-19		BACKFILL replaces SV-01		SV-02		SV-03		SV-19	
Sample Date																																				
Parameter																																				
Metals (mg/kg)																																				
Aluminum	17900	J	13700	J	26900	J	13000	J	16000	J	17653		17653		8720		17653		11600		6350		17653		8190	J	8010	J	13500	J
Antimony	0.83	B	1.6	L		R	1	J		R	0.657		0.657		7 UL	UL	0.657		8 UL	UL	0.76	L	0.657		0.77	B	14.89 UL	UL	14.78 UL	UL
Arsenic	2.54 UL	UL	2.36 U	U	2.1	K	5.5		1.2	K	5.85		5.85		8.2		5.85		6.3		17.1		5.85		3.9	L	4.2	L	4	L
Barium	37.8	J	20.4		155		20.6		56.2		170		170		37.1		170		58.9		54.8		170		51	J	37.4	J	20.9	J
Beryllium	1.9		1.3		19		1.2		1.4		0.994		0.994		0.45		0.994		0.71		0.4		0.994		0.86		0.89		0.94	
Cadmium	1.27 U	UL	1.18 U	U	1.24 U	U	1.26 U	U	1.14 U	U	0.204		0.204		0.65		0.204		0.69		0.55		0.204		0.83	B	0.25	B	1.23 U	U
Calcium	1269.04 U	UL	1210	J	2550	J	731	J	717	J	3729		3729		1120		3729		1570		3070		3729		1880		945		1218.03 U	U
Chromium	460	J	586	J	155	J	331	J	23.7	J	44.8		44.8		34.8		44.8		85.1		80.9		44.8		168	J	257	J	365	J
Cobalt	62.2	J	29.5		26.5		67.4		15.3		17.3		17.3		5.5		17.3		16.9		15.7		17.3		35.2	J	103	J	43.2	J
Copper	19.5	J	41.9	J	55.5	J	21.1	J	15.6	J	42.2		42.2		17.3		42.2		29.8		17.7		42.2		19.7	J	15.1	J	40.9	J
Iron	44900	J	36300	J	45600	J	33900	J	24400	J	36181		36181		23000		36181		24400		13000		36181		21700	J	26200	J	28300	J
Lead	8.3	J	2.7		13.8		6.9		11.8		19.5		19.5		40.8		19.5		25.9		60.6		19.5		41.6	J	49.6	J	15.8	J
Magnesium	5480	J	6590	J	14000	J	4100	J	7740	J	13025		13025		2240		13025		5860		2550		13025		14100	J	2410	J	5700	J
Manganese	473	J	242	J	815	J	407	J	367	J	294		294		213		294		524		429		294		391	J	1090	J	326	J
Mercury	0.08		0.11		0.08		0.08		0.08		0.046		0.046		0.21	B	0.046		0.13	B	0.97		0.046		0.19		0.45		0.25	
Nickel	0.08		0.11		0.08		0.08		0.08		17.5		17.5		18.7		17.5		37.6		21		17.5		158	J	53.5	J	57.3	J
Phosphorous																																				
Potassium	242	J	209	J	5400	J	363	J	5110	J	9081		9081		1080	J	9081		2810	J	471	J	9081		1010	J	443	J	372	J
Selenium	1.27 U	U	1.18 UL	UL	1.24 UL	UL	1.26 UL	UL	1.14 UL	UL	1.05		1.05			R	1.05			R		R	1.05		0.54	K	0.69	K	1.23 U	U
Silicon																																				
Silver																																				
Sodium	1269.04 U	U	61.8	B	1243.78 U	U	U	U	1144.16 U	U	119		119		589 U	U	119		652 U	U	740 U	U	119		1381.22 U	U	1240.69 U	U	38.1	B
Strontium																																				
Sulfur																																				
Thallium	2.54 UL	UL	2.36 U	U	2.49 U	U	2.52 U	U	2.29 U	U	0.703		0.703		0.14	L	0.703		0.27	L	0.12	L	0.703		2.76 UL	UL	2.48 UL	UL	2.46 UL	UL
Tin																																				
Titanium																																				
Vanadium	89.8	J	76.2		105		82		30.5		55		55		37.6		55		45.4		37.5		55		51.1	J	54.1	J	58.9	J
Zinc	64.3	J	52.1		85.1		58.7		83.6		88.95		88.95		45.7		88.95		70.5		61		88.95		209	J	68.4	J	78.2	J
Additional Parameters (mg/kg)																																				
Cyanide															0.36		0.58	U	0.65 U	U	0.74															
VOCs (µg/kg)																																				
Methylene Chloride																																				
1,1,1-Trichloroethane											2.85	U	2.85	U			2.85	U					2.85	U												
2-Butanone											5.71	U	5.71	U			5.71	U					5.71	U												
Acetone											9.32	U	9.32	U			9.32	U					9.32	U												
Chloroform											2.85	U	2.85	U			2.85	U					2.85	U												
Chloromethane											5.71	U	5.71	U			5.71	U					5.71	U												
Dichlorodifluoromethane											2.90	U	2.90	U			2.90	U					2.90	U												
Toluene											2.85	U	2.85	U			2.85	U					2.85	U												

TABLE B.3 SOUTHERN AU DETECTIONS	Old RA Samples														
Sample ID	SV-03A	SV-04A	SV-12A	SV-13A	SV-14A	BACKFILL replaces AU-11	BACKFILL replaces POI24-15	POI24-16	BACKFILL replaces POI24-17	POI24-18	POI24-19	BACKFILL replaces SV-01	SV-02	SV-03	SV-19
Sample Date															
Parameter															
SVOCs (µg/kg)															
Anthracene															
Benzo(a)anthracene															
Benzo(a)pyrene															
Benzo(b)fluoranthene															
Benzo[g,h,i]perylene						192 U	192 U		192 U			192 U			
Benzo[k]fluoranthene						188 U	188 U		188 U			188 U			
Benzoic Acid															
Bis(2-ethylhexyl) phthalate															
Chrysene						194 U	194 U		194 U			194 U			
Dibenz(a,h)anthracene															
Dibenzofuran						188 U	188 U		188 U			188 U			
Diethyl Phthalate															
Fluoranthene						217 U	217 U		217 U			217 U			
Indeno(1,2,3-c,d)Pyrene															
Phenanthrene															
Pyrene						200 U	200 U		200 U			200 U			
Pesticides/PCBs (µg/kg)															
4,4'-DDD						1.07 U	1.07 U		1.07 U			1.07 U			
4,4'-DDE						1.13 U	1.13 U		1.13 U			1.13 U			
4,4'-DDT						1.37 U	1.37 U		1.37 U			1.37 U			
Alpha-Chlordane						0.98 U	0.98 U		0.98 U			0.98 U			
Dieldrin						0.97 U	0.97 U		0.97 U			0.97 U			
Endosulfan II						0.95 U	0.95 U		0.95 U			0.95 U			
Endrin						0.95 U	0.95 U		0.95 U			0.95 U			
Endrin Aldehyde						0.95 U	0.95 U		0.95 U			0.95 U			
Endrin Ketone						0.95 U	0.95 U		0.95 U			0.95 U			
Heptachlor						0.95 U	0.95 U		0.95 U			0.95 U			

Notes:
Blank cell means no analysis for this parameter.

TABLE B.3 SOUTHERN AU DETECTIONS	Old RA Samples																							
Sample ID	SV-20		SV-21		SV-22		SV-23		SV-04		SV-05		SV-06		SV-07		SV-08		BACKFILL replaces SV-09		BACKFILL replaces SV-10		SV-11		SV-12		SV-13		SV-14	
Sample Date																														
Parameter																														
Metals (mg/kg)																														
Aluminum	20100	J	19600	J	23300	J	27800	J	9570	J	13000	J	13500	J	10800	J	5930	J	17653		17653		19500	J	17100	J	9840	J	12600	J
Antimony	15.44 UL	UL	15.69 UL	UL	15.09 UL	UL	16.88 UL	UL	1.5	L		R	0.76	L	0.9	L		R	0.657		0.657			R	0.83	J		R		R
Arsenic	5	L	3.3	J	0.76	[J]	2	[J]	3.5	K	3.6	K	3.6	K	5.1	K	1.7	K	5.85		5.85		9.1		4.2	K	15		2.2	K
Barium	41.6	J	41.1	J	62.6	J	55.8	J	40.7		46.8		35.6		45.4		27.9		170		170		69.9		101		36.7		78.3	
Beryllium	1.6		1.7		1.3		2.6		0.84		1.1		0.95		0.92		0.61		0.994		0.994		1.2		1.2		0.91		1.1	
Cadmium	1.29 U	U	1.31 U	UL	1.26 U	U	0.51	B	0.15	B	1.38 U	U	1.32 U	U	1.36 U	U	0.25	K	0.204		0.204		1.41 U	U	1.32 U	U	1.25 U	U	1.37 U	U
Calcium	1130		1360		1257.85 U	U	2780		1060	J	1379.31 UJ	UJ	1315.79 UJ	UJ	978	J	1650	J	3729		3729		2490	J	1500	J	1250	J	1910	J
Chromium	145	J	105	J	293	J	274	J	277	J	190	J	289	J	299	J	176	J	44.8		44.8		311	J	128	J	162	J	30.9	J
Cobalt	14.3	J	121	J	68.1	J	120	J	32.7		39.2		51.3		22.9		21.1		17.3		17.3		41.7		19.1		48.7		12.2	
Copper	34.5	J	152	J	154	J	128	J	23.6	J	20.1	J	17.4	J	14.1	J	8.8	J	42.2		42.2		44.4	J	35.1	J	20.4	J	31.6	J
Iron	28000	J	44400	J	64400	J	64800	J	21500	J	29400	J	40500	J	32800	J	17100	J	36181		36181		38800	J	29400	J	24400	J	23100	J
Lead	9.7	J	53.5	J	6.5	J	28.9	J	104		42.1		25		35.4		22.9		19.5		19.5		28.5		30.8		22.2		36.7	
Magnesium	3580	J	3200	J	3340	J	4400	J	4830	J	2720	J	1610	J	2140	J	951	J	13025		13025		9590	J	6840	J	2800	J	5680	J
Manganese	96.9	J	673	J	739	J	1390	J	497	J	584	J	414	J	352	J	350	J	294		294		1090	J	752	J	457	J	380	J
Mercury	0.09		0.12		0.08		0.1		2.3		0.62		0.32		0.76		0.22		0.046		0.046		0.13		0.11		0.22		0.14	
Nickel	32.7	J	56.8	J	69.6	J	150	J	51.2		35.4		51.2		39.3		16	K	17.5		17.5		143		51.7		39		25	
Phosphorous																														
Potassium	628	J	949	J	328	J	379	J	760	J	1060	J	502	J	536	J	495	J	9081		9081		1330	J	3190	J	1060	J	4540	J
Selenium	1.29 U	U	0.92	K	0.51	K	1.41		1.28 UL	UL	1.38 UL	UL	1.32 UL	UL	1.36 UL	UL	1.27 UL	UL	1.05		1.05		1.41 UL	UL	1.32 UL	UL	1.25 UL	UL	1.37 UL	UL
Silicon																														
Silver																														
Sodium	1287 U	U	1307.19 U	U	1257.86 U	U	1283.7 U	U	1379.31 U	U	1379.31 U	U	1315.79 U	U	1356.85 U	U	1270.65 U	U	119		119		1.41 U	U	1324.5 U	U	1250 U	U	1366.12 U	U
Strontium																														
Sulfur																														
Thallium	2.57 UL	UL	2.61 UL	UL	2.52 UL	UL	2.81 UL	UL	2.57 U	U	2.76 U	U	2.63 U	U	2.71 U	U	2.54 U	U	0.703		0.703		2.82 U	U	2.65 U	U	2.5 U	U	2.73 U	U
Tin																														
Titanium																														
Vanadium	53.5	J	75.6	J	293	J	170	J	51.3		67.4		87.6		72.5		37.2		55		55		81.4		63.6		50.4		34.8	
Zinc	47.3	J	71	J	73.6	J	189	J	73.4		60.1		50.2		55.9		35.6		88.95		88.95		95.1		85.9		43.4		75.9	
Additional Parameters (mg/kg)																														
Cyanide																														
VOCs (µg/kg)																														
Methylene Chloride																														
1,1,1-Trichloroethane																			2.85	U	2.85	U								
2-Butanone																			5.71	U	5.71	U								
Acetone																			9.32	U	9.32	U								
Chloroform																			2.85	U	2.85	U								
Chloromethane																			5.71	U	5.71	U								
Dichlorodifluoromethane																			2.90	U	2.90	U								
Toluene																			2.85	U	2.85	U								

TABLE B.3 SOUTHERN AU DETECTIONS	Old RA Samples																																	
Sample ID	SV-20		SV-21		SV-22		SV-23		SV-04		SV-05		SV-06		SV-07		SV-08		BACKFILL replaces SV-09		BACKFILL replaces SV-10		SV-11		SV-12		SV-13		SV-14						
Sample Date																																		
Parameter																																		
SVOCs (µg/kg)																																		
Anthracene																																		
Benzo(a)anthracene																																		
Benzo(a)pyrene																																		
Benzo(b)fluoranthene																																		
Benzo[g,h,i]perylene																			192	U	192	U												
Benzo[k]fluoranthene																			188	U	188	U												
Benzoic Acid																																		
Bis(2-ethylhexyl) phthalate																																		
Chrysene																			194	U	194	U												
Dibenz(a,h)anthracene																																		
Dibenzofuran																			188	U	188	U												
Diethyl Phthalate																																		
Fluoranthene																			217	U	217	U												
Indeno(1,2,3-c,d)Pyrene																																		
Phenanthrene																																		
Pyrene																			200	U	200	U												
Pesticides/PCBs (µg/kg)																																		
4,4'-DDD																			1.07	U	1.07	U												
4,4'-DDE																			1.13	U	1.13	U												
4,4'-DDT																			1.37	U	1.37	U												
Alpha-Chlordane																			0.98	U	0.98	U												
Dieldrin																			0.97	U	0.97	U												
Endosulfan II																			0.95	U	0.95	U												
Endrin																			0.95	U	0.95	U												
Endrin Aldehyde																			0.95	U	0.95	U												
Endrin Ketone																			0.95	U	0.95	U												
Heptachlor																			0.95	U	0.95	U												
Notes:																																		
Blank cell means no analysis for this parameter.																																		

TABLE B.3 SOUTHERN AU DETECTIONS	Old RA Samples								Old RA Samples							
Sample ID	BACKFILL replaces SV-15	BACKFILL replacesSV-16	SV-17	SV-18	AU-01	AU-02	AU-03	AU-04	AU-05	BACKFILL replaces AU-06	BACKFILL replaces AU-07/08	BACKFILL replaces AU-09	AU-10	BAKER-03	BACKFILL replaces BAKER-04	BACKFILL replaces BAKER-05
Sample Date																
Parameter																
Metals (mg/kg)																
Aluminum	17653	17653	25900 J	3740 J	38700	42800	57700	11700	9120	27131	27131	27131	18300	16000	27131	27131
Antimony	0.657	0.657	R	0.54 L	16.3 L	19.1 L	40.4 L	11.1 L	8.7 B	1.46 U U	1.46 U U	1.46 U U	36.3 L	6.9 B	1.46 U U	1.46 U U
Arsenic	5.85	5.85	5.7	4.6 K	2.1 L	2.6 L	10.6 L	9 L	11.4 L	2.21	2.21	2.21	4.3 L	8.4 L	2.21	2.21
Barium	170	170	61.5	170	73.9	32.6	77.4	25.7	15.2	170	170	170	50	47.8	170	170
Beryllium	0.994	0.994	0.7	0.27	1.3	2	3.3	0.51	0.23 U U	1.72	1.72	1.72	0.96	0.84	1.72	1.72
Cadmium	0.204	0.204	1.34 U U	0.76	1.4 K	1.3 K	1.9 K	0.58 K	ND	0.204	0.204	0.204	ND	0.61 K	0.204	0.204
Calcium	3729	3729	2880 J	3040 J	283	196	985	632	216	3,729	3,729	3,729	598	3,600	3,729	3,729
Chromium	44.8	44.8	93.5 J	33.8 J	424	391	651	33.9	24.9	73.7	73.7	73.7	56	95	73.7	73.7
Cobalt	17.3	17.3	61	15.4	55.7	193	54.5	3	1.1	17.3	17.3	17.3	25.4	11.1	17.3	17.3
Copper	42.2	42.2	37.5 J	59 J	156	157	209	11.1 L	19.3 L	42.2	42.2	42.2	54 K	18.2 L	42.2	42.2
Iron	36181	36181	36900 J	17600 J	58,300	62,500	135,000	35,100	20,300	36,181	36,181	36,181	46,900	27,100	36,181	36,181
Lead	19.5	19.5	20.4	158	14.9	11.5	7.2	14.6	13.2	40.5	40.5	40.5	13.2	48.1	40.5	40.5
Magnesium	13025	13025	1190 J	13900 J	11,600	4,580	12,200	475	249	13,025	13,025	13,025	3,710	2,690	13,025	13,025
Manganese	294	294	432 J	528 J	1760 J	1610 J	701 J	73.5 J	23.9 J	681	681	681	475 J	287 J	681	681
Mercury	0.046	0.046	0.12	0.18	0.12 U U	0.13 U U	0.15 U U	0.27	1.3	0.024	0.024	0.024	0.56	0.72	0.024	0.024
Nickel	17.5	17.5	12.9	170	107	112	143	7.7	2.3	43.3	43.3	43.3	21 J	22.1	43.3	43.3
Phosphorous																
Potassium	9081	9081	631 J	447 J	1,250	166	456	621	896	9081	9081	9081	2,290	766	9081	9081
Selenium	1.05	1.05	1.34 UL UL	0.47 B	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.05	1.05	1.05	1.3 U	1.3 U	1.05	1.05
Silicon																
Silver																
Sodium	119	119	1340.48 U U	191 B	256	256	603	329	317	119	119	119	262	365	119	119
Strontium																
Sulfur																
Thallium	0.703	0.703	2.68 U U	2.46 U U	1.5 U U	1.6 U U	1.8 U U	1.4 U U	1.4 U U	1.74	1.74	1.74	1.4 U U	1.4 U U	1.74	1.74
Tin																
Titanium																
Vanadium	55	55	82.7	24.6	133	178	627	46.7	28	85.2	85.2	85.2	77.8	52.8	85.2	85.2
Zinc	88.95	88.95	36.3	96.4	87.5	57.8	147	34 K	18 K	89.0	89.0	89.0	55.5	68.4	89.0	89.0
Additional Parameters (mg/kg)																
Cyanide																
VOCs (µg/kg)																
Methylene Chloride																
1,1,1-Trichloroethane	2.85 U	2.85 U			13 U	13 U	13 U	13 U	13 U	2.75 U	2.75 U	2.75 U	13 U	13 U	2.75 U	2.75 U
2-Butanone	5.71 U	5.71 U			13 U	13 U	13 U	13 U	13 U	5.50 U	5.50 U	5.50 U	13 U	13 U	5.50 U	5.50 U
Acetone	9.32 U	9.32 U			13 U	13 U	13 U	13 U	13 U	16.9	16.9	16.9	13 U	13 U	16.9	16.9
Chloroform	2.85 U	2.85 U			13 U	13 U	2 J	13 U	13 U	2.75 U	2.75 U	2.75 U	13 U	13 U	2.75 U	2.75 U
Chloromethane	5.71 U	5.71 U			13 U	13 U	13 U	13 U	13 U	5.50 U	5.50 U	5.50 U	13 U	13 U	5.50 U	5.50 U
Dichlorodifluoromethane	2.90 U	2.90 U			13 U	13 U	13 U	13 U	13 U				13 U	13 U		
Toluene	2.85 U	2.85 U			13 U	13 U	13 U	13 U	13 U	2.75 U	2.75 U	2.75 U	13 U	13 U	2.75 U	2.75 U

TABLE B.3 SOUTHERN AU DETECTIONS	Old RA Samples									Old RA Samples					
Sample ID	BACKFILL replaces SV-15	BACKFILL replacesSV-16	SV-17	SV-18	AU-01	AU-02	AU-03	AU-04	AU-05	BACKFILL replaces AU-06	BACKFILL replaces AU-07/08	BACKFILL replaces AU-09	AU-10	BAKER-03	BACKFILL replaces BAKER-04	BACKFILL replaces BAKER-05
Sample Date																
Parameter																
SVOCs (µg/kg)																
Anthracene																
Benzo(a)anthracene					402 U U	458 U U	478 UJ UJ	398 U U	371 U U	192	192	192	398 U U	3800	192	192
Benzo(a)pyrene					402 U U	458 U U	478 UJ UJ	398 U U	371 U U	186	186	186	398 U U	2800	186	186
Benzo(b)fluoranthene					402 U U	458 U U	478 UJ UJ	398 U U	371 U U	210	210	210	398 U U	3400	210	210
Benzo[g,h,i]perylene	192 U	192 U			330 U	330 U	330 U	330 U	330 U	182	182	182	330 U	330 U	182	182
Benzo[k]fluoranthene	188 U	188 U			330 U	330 U	330 U	330 U	330 U	178	178	178	330 U	330 U	178	178
Benzoic Acid																
Bis(2-ethylhexyl) phthalate																
Chrysene	194 U	194 U			330 U	330 U	330 U	330 U	330 U	195 U	195 U	195 U	330 U	330 U	195 U	195 U
Dibenz(a,h)anthracene					402 U U	458 U U	478 U U	398 U U	371 U U					1100		
Dibenzofuran	188 U	188 U			330 U	330 U	330 U	330 U	330 U	177 U	177 U	177 U	330 U	69 J	177 U	177 U
Diethyl Phthalate																
Fluoranthene	217 U	217 U			330 U	330 U	330 U	330 U	330 U	278 U	278 U	278 U	330 U	330 U	278 U	278 U
Indeno(1,2,3-c,d)Pyrene					402 U U	458 U U	478 UJ U	398 U U	371 U U	177	177	177	407 U U	2000	177	177
Phenanthrene																
Pyrene	200 U	200 U			330 U	330 U	330 U	330 U	330 U	231 U	231 U	231 U	330 U	330 U	231 U	231 U
Pesticides/PCBs (µg/kg)																
4,4'-DDD	1.07 U	1.07 U			3.3 U	3.3 U	3.3 U	9.8	78 J	1.26 U	1.26 U	1.26 U	3.3 U	1500 J	1.26 U	1.26 U
4,4'-DDE	1.13 U	1.13 U			3.3 U	3.3 U	3.3 U	3.3 U	3.9 J	1.45 U	1.45 U	1.45 U	3.3 U	100 J	1.45 U	1.45 U
4,4'-DDT	1.37 U	1.37 U			3.3 U	3.3 U	3.3 U	23 J	100	2.16 U	2.16 U	2.16 U	3.3 U	560 J	2.16 U	2.16 U
Alpha-Chlordane	0.98 U	0.98 U			1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	0.988 U	0.988 U	0.988 U	1.7 U	1.7 U	0.988 U	0.988 U
Dieldrin	0.97 U	0.97 U			3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	0.981 U	0.981 U	0.981 U	3.3 U	22 J	0.981 U	0.981 U
Endosulfan II	0.95 U	0.95 U			3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	0.916 U	0.916 U	0.916 U	3.3 U	14 J	0.916 U	0.916 U
Endrin	0.95 U	0.95 U			3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	0.916 U	0.916 U	0.916 U	3.3 U	23 J	0.916 U	0.916 U
Endrin Aldehyde	0.95 U	0.95 U			3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	0.916 U	0.916 U	0.916 U	3.3 U	3.3 U	0.916 U	0.916 U
Endrin Ketone	0.95 U	0.95 U			3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	0.916 U	0.916 U	0.916 U	3.3 U	26 J	0.916 U	0.916 U
Heptachlor	0.95 U	0.95 U			1.7 U	2.7 J	3.6 J	2.2 J	2.8	0.916 U	0.916 U	0.916 U	1.7 U	2 J	0.916 U	0.916 U

Notes:
Blank cell means no analysis for this parameter.

TABLE B.3 SOUTHERN AU DETECTIONS							Old RA Samples																			
Sample ID	SV-AU-01		SV-AU-02		SV-AU-03		SV-AU-04		SV-AU-05		BACKFILL replaces SV-AU-06		BACKFILL replaces SV-AU-07		BACKFILL replaces SV-AU-08		BACKFILL replaces SV-AU-09		SV-AU-10		SV-BAKER-03		BACKFILL replaces SV-BAKER-04		BACKFILL replaces SV-BAKER-05	
Sample Date																										
Parameter																										
Metals (mg/kg)																										
Aluminum	56137.93		47198.63		40004.96		11907.91		8679.24		27131		27131		27131		27131		19293.41		10711.29		27131		27131	
Antimony	9.15 UJ	UJ	10.34 UJ	UJ	9.29 UJ	UJ	9.01 UJ	UJ	8.81 UJ	UJ	1.46 U	U	1.46 U	U	1.46 U	U	1.46 U	U	8.98 UJ	UJ	8.79 UJ	UJ	1.46 U	U	1.46 U	U
Arsenic	0.10 U	U	4.6		4.23		5.64		7.32		2.21		2.21		2.21		2.21		1.68		5.93		2.21		2.21	
Barium	87.46		78.64		62.52		26.82		14.5		170		170		170		170		49.38		60.78		170		170	
Beryllium	1.96 U	U	2.7		2.38		1.03		0.67		1.72		1.72		1.72		1.72		1.1		0.97		1.72		1.72	
Cadmium	2.96		2.3		3.21		1.18		1.04		0.204		0.204		0.204		0.204		0.29		1.98		0.204		0.204	
Calcium	416.35		351.85		776.49		709.1		387.42		3,729		3,729		3,729		3,729		406.36		1046.8		3,729		3,729	
Chromium	479.66	J	406.18	J	375.3	J	33.13	J	24.47	J	73.7		73.7		73.7		73.7		55.54	J	44.05	J	73.7		73.7	
Cobalt	108.82		193.12		48.46		3.15		1.59 U	U	17.3		17.3		17.3		17.3		18.78		7.24		17.3		17.3	
Copper	180.86		175.12		172.32		11.43		18.93		42.2		42.2		42.2		42.2		57.83		16.95		42.2		42.2	
Iron	66141.63		68056.16		90475.19		29730.81		21004.59		36,181		36,181		36,181		36,181		46582.04		21004.66		36,181		36,181	
Lead	39.38		33.9		17.56		15.63 U	UJ	15.29 U	U	40.5		40.5		40.5		40.5		15.59 U	U	39.95		40.5		40.5	
Magnesium	21639.16		5180.68		10963.52		531.92		316.54		13,025		13,025		13,025		13,025		3462.28		3811.64		13,025		13,025	
Manganese	3069.83	J	2562.47	J	967.28	J	69.49	J	32.19	J	681		681		681		681		447.59	J	414.18	J	681		681	
Mercury	0.11 UJ	UJ	0.11 UJ	UJ	0.09 UJ	UJ	0.27		9.74	J	0.024		0.024		0.024		0.024		0.56		0.54	J	0.024		0.024	
Nickel	176.49		160.84		110.17		10.93		5.8		43.3		43.3		43.3		43.3		24.68		15.77		43.3		43.3	
Phosphorous																										
Potassium	1433.37		521.21 U	U	468.36 U	U	453.8 U	U	695.25		9081		9081		9081		9081		1793.89		891.73		9081		9081	
Selenium	23.89 U	U	27.03 U	U	24.28 U	U	23.53 U	U	23.02 U	U	1.05		1.05		1.05		1.05		23.47 U	U	22.97 U	U	1.05		1.05	
Silicon																										
Silver																										
Sodium	85.2 U	U	96.34 U	U	288.04		83.88 U	U	82.06 U	U	119		119		119		119		83.68 U	U	106.98		119		119	
Strontium																										
Sulfur																										
Thallium	16.28 U	U	18.41 U	U	28.56		16.03 U	U	15.69 U	U	1.74		1.74		1.74		1.74		15.99 U	U	15.66 U	U	1.74		1.74	
Tin																										
Titanium																										
Vanadium	147.99		212.93		488.01		43.02		28.98		85.2		85.2		85.2		85.2		17.07		34.12		85.2		85.2	
Zinc	118.35		66.55		116.15		16.56		24.44		89.0		89.0		89.0		89.0		50.96		68.24		89.0		89.0	
Additional Parameters (mg/kg)																										
Cyanide																										
VOCs (µg/kg)																										
Methylene Chloride	10 U	U	10 U	U	36		10 U	U	13 U	U	6.86		6.86		6.86		6.86		10 U	U	68	J	6.86		6.86	
1,1,1-Trichloroethane	10 U	U	10 U	U	10 U	U	10 U	U	10 U	U	2.75	U	2.75	U	2.75	U	2.75	U	10 U	U	10 UJ	UJ	2.75	U	2.75	U
2-Butanone	10 U	U	10 U	U	3J	J	10 U	U	10 U	U	5.50	U	5.50	U	5.50	U	5.50	U	2J	J	3J	J	5.50	U	5.50	U
Acetone	10 U	U	10 U	U	10 U	U	10 U	U	10 U	U	16.9		16.9		16.9		16.9		10 U	U	16J	J	16.9		16.9	
Chloroform	10 U	U	10 U	U	10 U	U	10 U	U	10 U	U	2.75	U	2.75	U	2.75	U	2.75	U	10 U	U	5J	J	2.75	U	2.75	U
Chloromethane	1 J	J	3 J	J	10 U	U	10 U	U	1 J	J	5.50	U	5.50	U	5.50	U	5.50	U	1 J	J	10 UJ	UJ	5.50	U	5.50	U
Dichlorodifluoromethane	10 U	U	10 U	U	10 U	U	10 U	U	10 U	U									2 J	J	10 UJ	UJ				
Toluene	10 U	U	10 U	U	10 U	U	10 U	U	10 U	U	2.75	U	2.75	U	2.75	U	2.75	U	10 U	U	2J	J	2.75	U	2.75	U

TABLE B.3 SOUTHERN AU DETECTIONS							Old RA Samples																			
Sample ID	SV-AU-01		SV-AU-02		SV-AU-03		SV-AU-04		SV-AU-05		BACKFILL replaces SV-AU-06		BACKFILL replaces SV-AU-07		BACKFILL replaces SV-AU-08		BACKFILL replaces SV-AU-09		SV-AU-10		SV-BAKER-03		BACKFILL replaces SV-BAKER-04		BACKFILL replaces SV-BAKER-05	
Sample Date																										
Parameter																										
SVOCs (µg/kg)																										
Anthracene	400 U	U	400 U	U	400 U	U	400 U	U	400 U	U	181	U	181	U	181	U	181	U	400 U	U	400 U	U	181	U	181	U
Benzo(a)anthracene	400 U	U	400 U	U	400 U	U	400 U	U	400 U	U	192		192		192		192		400 U	U	2400		192		192	
Benzo(a)pyrene	400 U	U	400 U	U	400 U	U	400 U	U	400 U	U	186		186		186		186		400 U	U	2000		186		186	
Benzo(b)fluoranthene	400 U	U	400 U	U	400 U	U	400 U	U	400 U	U	210		210		210		210		400 U	U	1700		210		210	
Benzo[g,h,i]perylene	400 U	U	400 U	U	400 U	U	400 U	U	400 U	U	182		182		182		182		400 U	U	400 U	U	182		182	
Benzo[k]fluoranthene	400 U	U	400 U	U	400 U	U	400 U	U	400 U	U	178		178		178		178		400 U	U	2200		178		178	
Benzoic Acid	400 U	U	400 U	U	400 U	U	400 U	U	400 U	U									400 U	U	400 U	U				
Bis(2-ethylhexyl) phthalate	400 U	U	400 U	U	400 U	U	400 U	U	400 U	U	131		131		131		131		400 U	U	400 U	U	131		131	
Chrysene	400 U	U	400 U	U	400 U	U	400 U	U	400 U	U	195	U	195	U	195	U	195	U	400 U	U	2700		195	U	195	U
Dibenz(a,h)anthracene											184 U	U	184 U	U	184 U	U	184 U	U			400 U	U	184 U	U	184 U	U
Dibenzofuran	400 U	U	400 U	U	400 U	U	400 U	U	400 U	U	177	U	177	U	177	U	177	U	400 U	U	400 U	U	177	U	177	U
Diethyl Phthalate	400 U	U	400 U	U	400 U	U	400 U	U	400 U	U	184 U	U	184 U	U	184 U	U	184 U	U	400 U	U	400 U	U	184 U	U	184 U	U
Fluoranthene	400 U	U	400 U	U	400 U	U	400 U	U	400 U	U	278	U	278	U	278	U	278	U	400 U	U	4200		278	U	278	U
Indeno(1,2,3-c,d)Pyrene	400 U	U	400 U	U	400 U	U	400 U	U	400 U	U	177		177		177		177		400 U	U	400 U	U	177		177	
Phenanthrene	400 U	U	400 U	U	400 U	U	400 U	U	400 U	U	212		212		212		212		400 U	U	2000		212		212	
Pyrene	400 U	U	400 U	U	400 U	U	400 U	U	400 U	U	231	U	231	U	231	U	231	U	400 U	U	5500		231	U	231	U
Pesticides/PCBs (µg/kg)																										
4,4'-DDD											1.26	U	1.26	U	1.26	U	1.26	U					1.26	U	1.26	U
4,4'-DDE											1.45	U	1.45	U	1.45	U	1.45	U					1.45	U	1.45	U
4,4'-DDT											2.16	U	2.16	U	2.16	U	2.16	U					2.16	U	2.16	U
Alpha-Chlordane											0.988	U	0.988	U	0.988	U	0.988	U					0.988	U	0.988	U
Dieldrin											0.981	U	0.981	U	0.981	U	0.981	U					0.981	U	0.981	U
Endosulfan II											0.916	U	0.916	U	0.916	U	0.916	U					0.916	U	0.916	U
Endrin											0.916	U	0.916	U	0.916	U	0.916	U					0.916	U	0.916	U
Endrin Aldehyde											0.916	U	0.916	U	0.916	U	0.916	U					0.916	U	0.916	U
Endrin Ketone											0.916	U	0.916	U	0.916	U	0.916	U					0.916	U	0.916	U
Heptachlor											0.916	U	0.916	U	0.916	U	0.916	U					0.916	U	0.916	U

Notes:

Blank cell means no analysis for this parameter.

TABLE B.3 SOUTHERN AU DETECTIONS									Old RA Samples																							
Sample ID	BACKFILL replaces SV-POI24-12		POI24-13		POI24-14		BAKER-06		POI24-01/02		POI24-03		POI24-04		BACKFILL replaces POI24-05		BACKFILL replaces POI24-06		BACKFILL replaces POI24-07		BACKFILL replaces POI24-08		BACKFILL replaces POI24-09		BACKFILL replaces POI24-10		BACKFILL replaces POI24-11			
Sample Date																																
Parameter																																
Metals (mg/kg)																																
Aluminum	27131								14100		17600		21500		12914		12914		12914		12914		12914		12914		12914			
Antimony	1.46 U	U							6.3	B	11.2	B	14.9	B	0.244 U	U	0.244 U	U	0.244 U	U	0.244 U	U	0.244 U	U	0.244 U	U	0.244 U	U		
Arsenic	2.21								7.5	L	7.7	L	11.6	L	7.67		7.67		7.67		7.67		7.67		7.67		7.67			
Barium	170								66.8		56.7		54.8		34.46		34.46		34.46		34.46		34.46		34.46		34.46			
Beryllium	1.72								0.58		0.62		0.86		0.632		0.632		0.632		0.632		0.632		0.632		0.632			
Cadmium	0.204								0.57	K	0.58	K	0.53	K	0.08		0.08		0.08		0.08		0.08		0.08		0.08			
Calcium	3,729								1,320		1,530		1,860		428.5		428.5		428.5		428.5		428.5		428.5		428.5			
Chromium	73.7								26.2		44.7		59.3		30.3		30.3		30.3		30.3		30.3		30.3		30.3			
Cobalt	17.3								5.9		6.7		5.9		2.6		2.6		2.6		2.6		2.6		2.6		2.6			
Copper	42.2								13.4	L	26.1	L	23.2	L	9		9		9		9		9		9		9			
Iron	36,181								16,100		30,200		39,300		27416		27416		27416		27416		27416		27416		27416			
Lead	40.5								40.5		59.2		32.4		8.97		8.97		8.97		8.97		8.97		8.97		8.97			
Magnesium	13,025								1,930		2,590		3,830		498.4		498.4		498.4		498.4		498.4		498.4		498.4			
Manganese	681								210	J	169	J	177	J	100		100		100		100		100		100		100			
Mercury	0.024								0.18		0.26		0.15		0.057		0.057		0.057		0.057		0.057		0.057		0.057			
Nickel	43.3								12.7		24		29.8		4.53		4.53		4.53		4.53		4.53		4.53		4.53			
Phosphorous																																
Potassium	9081								864		1,290		1,870		483.8		483.8		483.8		483.8		483.8		483.8		483.8			
Selenium	1.05								1.3	U	1.3	U	1.3	U	0.81		0.81		0.81		0.81		0.81		0.81		0.81			
Silicon																																
Silver															0.02		0.02		0.02		0.02		0.02		0.02		0.02			
Sodium	119								230		326		323		65.7		65.7		65.7		65.7		65.7		65.7		65.7			
Strontium																																
Sulfur																																
Thallium	1.74								10 U	U	10 U	U	10 U	U	0.183 UL	UL	0.183 UL	UL	0.183 UL	UL	0.183 UL	UL	0.183 UL	UL	0.183 UL	UL	0.183 UL	UL		
Tin															2.4		2.4		2.4		2.4		2.4		2.4		2.4			
Titanium																																
Vanadium	85.2								33.9		64.2		70.1		39.9		39.9		39.9		39.9		39.9		39.9		39.9			
Zinc	89.0								44	K	53		44.5	K	14.1		14.1		14.1		14.1		14.1		14.1		14.1			
Additional Parameters (mg/kg)																																
Cyanide			1.15 U	U	1.13	U	1.12	U																								
VOCs (µg/kg)																																
Methylene Chloride	6.86																															
1,1,1-Trichloroethane	2.75	U							13	U	13	U	1	J	2.90	U	2.90	U	2.90	U	2.90	U	2.90	U	2.90	U	2.90	U		
2-Butanone	5.50	U							13	U	13	U	13	U	5.81	U	5.81	U	5.81	U	5.81	U	5.81	U	5.81	U	5.81	U		
Acetone	16.9								13	U	13	U	13	U	5.81	U	5.81	U	5.81	U	5.81	U	5.81	U	5.81	U	5.81	U		
Chloroform	2.75	U							13	U	1	J	13	U	2.90	U	2.90	U	2.90	U	2.90	U	2.90	U	2.90	U	2.90	U		
Chloromethane	5.50	U							13	U	13	U	13	U	5.81	U	5.81	U	5.81	U	5.81	U	5.81	U	5.81	U	5.81	U		
Dichlorodifluoromethane									13	U	13	U	13	U	2.90	U	2.90	U	2.90	U	2.90	U	2.90	U	2.90	U	2.90	U		
Toluene	2.75	U							13	U	13	U	13	U	2.90	U	2.90	U	2.90	U	2.90	U	2.90	U	2.90	U	2.90	U		

TABLE B.3 SOUTHERN AU DETECTIONS									Old RA Samples																							
Sample ID	BACKFILL replaces SV-POI24-12		POI24-13		POI24-14		BAKER-06		POI24-01/02		POI24-03		POI24-04		BACKFILL replaces POI24-05		BACKFILL replaces POI24-06		BACKFILL replaces POI24-07		BACKFILL replaces POI24-08		BACKFILL replaces POI24-09		BACKFILL replaces POI24-10		BACKFILL replaces POI24-11			
Sample Date																																
Parameter																																
SVOCs (µg/kg)																																
Anthracene	181	U													188	U	188	U	188	U	188	U	188	U	188	U	188	U				
Benzo(a)anthracene	192								87	J	29	J	28	J	188	U	188	U	188	U	188	U	188	U	188	U	188	U				
Benzo(a)pyrene	186								90	J	418	J	23	J	193	U	193	U	193	U	193	U	193	U	193	U	193	U				
Benzo(b)fluoranthene	210								88	J	28	J	393	U	193	U	193	U	193	U	193	U	193	U	193	U	193	U				
Benzo[g,h,i]perylene	182												30	J	197	U	197	U	197	U	197	U	197	U	197	U	197	U				
Benzo[k]fluoranthene	178								64	J	16	J			193	U	193	U	193	U	193	U	193	U	193	U	193	U				
Benzoic Acid																																
Bis(2-ethylhexyl) phthalate	131																															
Chrysene	195	U							77	J	25	J	35	J	193	U	193	U	193	U	193	U	193	U	193	U	193	U				
Dibenz(a,h)anthracene	184	U U																														
Dibenzofuran	177	U							330	U	330	U	330	U	193	U	193	U	193	U	193	U	193	U	193	U	193	U				
Diethyl Phthalate	184	U U																														
Fluoranthene	278	U							130	J	50	J	34	J	186	U	186	U	186	U	186	U	186	U	186	U	186	U				
Indeno(1,2,3-c,d)Pyrene	177								388	U U	418	U U	29	J	193	U	193	U	193	U	193	U	193	U	193	U	193	U				
Phenanthrene	212																															
Pyrene	231	U							100	J	40	J	32	J	185	U	185	U	185	U	185	U	185	U	185	U	185	U				
Pesticides/PCBs (µg/kg)																																
4,4'-DDD	1.26	U							34	L	3.3	U	3.3	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U				
4,4'-DDE	1.45	U							4.4	J	3.3	U	3.3	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U				
4,4'-DDT	2.16	U							45	J	3.3	U	3.3	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U				
Alpha-Chlordane	0.988	U							1.7	U	2.5	J	1.7	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U				
Dieldrin	0.981	U							3.3	U	3.3	U	3.3	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U				
Endosulfan II	0.916	U							3.3	U	3.3	U	3.3	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U				
Endrin	0.916	U							3.3	U	3.3	U	3.3	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U				
Endrin Aldehyde	0.916	U							3.3	U	3.3	U	6.6	J	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U				
Endrin Ketone	0.916	U							3.3	U	3.3	U	3.3	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U				
Heptachlor	0.916	U							1.7	U	1.7	U	1.7	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U	0.969	U				

Notes:

Blank cell means no analysis for this parameter.

mg/kg milligrams per kilogram, µg/kg micrograms per kilogram

J analyte present; the reported value may not be accurate or precise

K Analyte detected, reported value is biased high, actual value may be lower.

L analyte present; reported value may be biased low, the actual value is expected higher

U not detected; the associated number indicates the approximate sample concentration necessary to be detected

UJ Analyte not detected, reported PQL may be inaccurate or imprecise.

UL not detected; quantitation limit may be inaccurate or imprecise

R unreliable result; analyte may or may not be present in the sample, supporting data necessary to confirm result

B Blank contamination, the analyte was detected in the associated blank at a comparable concentration.

APPENDIX C: COPC SCREENING TABLES

Table C.1: AOI 9 EU COPC Screening

Table C.2: Spaulding-Rankin EU COPC Screening

Table C.3: Southern AU EU COPC Screening

Table C.4a: Southern AU EU COPC Screening - Outlier Location SV-04

Table C.4b: Southern AU EU COPC Screening - Outlier Location SV-AU-05

Table C.4c: Southern AU EU COPC Screening - Outlier Location AU-10

Table C.4d: Southern AU EU COPC Screening - Outlier Location SV-12A

Table C.4e: Southern AU EU COPC Screening - Outlier Location SV-AU-03 and AU-03

Table C.4f: Southern AU EU COPC Screening - Outlier Location SV-BAKER-03 and BAKER-03

Table C.1								
AOI 9 - Provisional COPCs							**INITIAL SCREEN**	
Exposure Unit	Detected Analytes*	Units		USEPA Nov 2013 RSLs[1]	2008 Background Conc.	Maximum Detected Value	Provisional COPC (max > higher of current RSL or 2008 background)?	Rationale
AOI 9	Aluminum	mg/kg	NC	7700	19100	51900	**YES**	**MAX > BG and RSL**
	Antimony	mg/kg	NC	3.1	5.2	44.2	**YES**	**MAX > BG and RSL**
60 samples	Arsenic	mg/kg	C	0.61	12.6	8.6	NO	MAX < BG
	Barium	mg/kg	NC	1500	172	110	NO	MAX < BG and RSL
	Beryllium	mg/kg	NC	16	1.9	6.0	NO	MAX < RSL
	Boron	mg/kg	NC	160	NS	8.9	NO	MAX < RSL
	Calcium	mg/kg		NS	NS	858	NO	essential nutrient
	Chromium	mg/kg	NC	12000	51.3	118	NO	MAX < RSL
	Cobalt	mg/kg	NC	2.3	17.8	70.1	**YES**	**MAX > BG and RSL**
	Copper	mg/kg	NC	310	49.65	227	NO	MAX < RSL
	Iron	mg/kg	NC	5500	32400	91100	**YES**	**MAX > BG and RSL**
	Lead	mg/kg	--	400	194	367	NO	MAX < RSL
	Magnesium	mg/kg	NS	NS	6950	13600	**YES**	**MAX > BG**
	Manganese	mg/kg	NC	180	968	2040	**YES**	**MAX > BG and RSL**
	Mercury	mg/kg	NC	1	0.25	0.32	NO	MAX < RSL
	Nickel	mg/kg	NC	150	33.5	73.5	NO	MAX < RSL
	Phosphorus	mg/kg		NS	NS	502	NO	essential nutrient
	Potassium	mg/kg		NS	NS	10400	NO	essential nutrient
	Silicon	mg/kg		NS	NS	2410	NO	limited toxicity at level detected[2]
	Silver	mg/kg	NC	39	0.87	1.4	NO	MAX < RSL
	Sodium	mg/kg		NS	NS	323	NO	essential nutrient
	Strontium	mg/kg	NC	4700	53	9.3	NO	MAX < BG and RSL
	Sulfur	mg/kg		NS	NS	116	NO	limited toxicity at level detected[2]
	Tellurium	mg/kg	NS	NS	5	3.4	NO	MAX < BG
	Thallium	mg/kg	NC	0.078	2.2	2.1	NO	MAX < BG
	Tin	mg/kg	NC	4700	8.4	30.5	NO	MAX < RSL
	Titanium	mg/kg		NS	2690	930	NO	MAX < BG
	Vanadium	mg/kg	NC	39	75.5	307	**YES**	**MAX > BG and RSL**
	Zinc	mg/kg	NC	2300	158	162	NO	MAX < RSL
	Zirconium	mg/kg	NC	0.63	48.3	6.38	NO	MAX < BG
	Perchlorate	µg/kg	NC	5500	0.612	0.75	NO	MAX < RSL
	Cyanide	mg/kg	NC	2.2	0.26	0.51	NO	MAX < RSL
	Fluoride	mg/kg	NC	310	11	9.7	NO	MAX < BG and RSL
	1,4-dithiane	µg/kg		61000	NS	9.6	NO	MAX < RSL
	1,4-oxathiane	µg/kg	NC	61000	NS	12	NO	MAX < RSL
	1,2-Dichloroethane	µg/kg	C	430	18	1.1	NO	MAX < BG and RSL
	2-Hexanone	µg/kg	NC	21000	18	5	NO	MAX < BG and RSL
	4-Methyl-2-pentanone	µg/kg	NC	530000	18	2	NO	MAX < BG and RSL
	Acetone	µg/kg	NC	6100000	554.7	429	NO	MAX < BG and RSL
	Acrolein	µg/kg	NC	150	NS	30.3	NO	MAX < RSL

Table C.1								
AOI 9 - Provisional COPCs							**INITIAL SCREEN**	
Exposure Unit	Detected Analytes*	Units		USEPA Nov 2013 RSLs[1]	2008 Background Conc.	Maximum Detected Value	Provisional COPC (max > higher of current RSL or 2008 background)?	Rationale
	Benzene	µg/kg	C	1100	18	1.1	NO	MAX < BG and RSL
	Chloroethane	µg/kg	NC	NS	18	1.1	NO	MAX < BG
	Chloromethane	µg/kg	NC	12000	18	1.1	NO	MAX < BG and RSL
	Dibromochloromethane	µg/kg	C	680	18	1.1	NO	MAX < BG and RSL
	Ethyl benzene	µg/kg	C	NS	18	1.5	NO	MAX < BG
	Methyl Tertbutyl Ether	µg/kg	C	150	357.5	0.84	NO	MAX < BG and RSL
	Methylene chloride	µg/kg	C	56000	18	2.6	NO	MAX < BG and RSL
	Naphthalene	µg/kg	C	3600	510	0.987	NO	MAX < BG and RSL
	Toluene	µg/kg	NC	500000	18	11.3	NO	MAX < BG and RSL
	Total Xylenes	µg/kg	NC	63000	18	3.5	NO	MAX < BG and RSL
	Anthracene	µg/kg	NC	1700000	510	75	NO	MAX < BG and RSL
	Benzo(a)anthracene	µg/kg	C	150	357.5	340	NO	MAX < BG
	Benzo(g,h,i)perylene	µg/kg		NS	331.5	97	NO	MAX < BG
	Benzo(a)pyrene	µg/kg	C	15	375	168	NO	MAX < BG
	Benzo(b)fluoranthene	µg/kg	C	150	365.7	300	NO	MAX < BG
	Benzo(k)fluoranthene	µg/kg	C	1500	356.6	155	NO	MAX < BG and RSL
	Benzoic Acid	µg/kg		NS	510	419	NO	MAX < BG
	Bis(2-Ethylhexyl)phthalate	µg/kg	C	35000	1479	51	NO	MAX < BG and RSL
	Chrysene	µg/kg	C	15000	400.9	169	NO	MAX < BG and RSL
	di-n-Butylphthalate	µg/kg	NC	610000	510	34	NO	MAX < BG and RSL
	Diphenylamine	µg/kg	NC	150000	510	650	NO	MAX < BG and RSL
	Fluoranthene	µg/kg	NC	230000	699.9	650	NO	MAX < BG and RSL
	Hexachlorocyclopentadiene	µg/kg	NC	37000	510	120	NO	MAX < BG and RSL
	Pentachlorophenol	µg/kg	C	890	1200	270	NO	MAX < BG and RSL
	Phenanthrene	µg/kg		NS	407.4	350	NO	MAX < BG
	Phenol	µg/kg	NC	1800000	510	450	NO	MAX < BG and RSL
	Pyrene	µg/kg	NC	170000	626.4	450	NO	MAX < BG and RSL
	Heptachlor Epoxide	µg/kg	C	53	NS	46	NO	MAX < RSL
	Endosulfan I	µg/kg	NC	37000	NS	2.6	NO	MAX < RSL
	Dieldrin	µg/kg	C	30	NS	2	NO	MAX < RSL
	4,4'-DDE	µg/kg	C	1400	NS	250	NO	MAX < RSL
	Endosulfan II	µg/kg	NC	37000	NS	4.6	NO	MAX < RSL
	4,4'-DDD	µg/kg	C	2000	NS	2	NO	MAX < RSL
	4,4'-DDT	µg/kg	C	1700	NS	58	NO	MAX < RSL
	Alpha-chlordane	µg/kg	C	1600	NS	45	NO	MAX < RSL
	Gamma-chlordane	µg/kg	C	1600	NS	24	NO	MAX < RSL

1. USEPA November 2013 RSLs. NC adjusted downward by factor of 10

2. No SL or BG available = these compounds (silicon, sulfur) have limited toxicity at the levels detected, therefore are not further evaluated

NA not applicable

NC non-carcinogen, C carcinogen

mg/kg milligrams per kilogram, µg/kg micrograms per kilogram

Provisional COPC

	Table C.2							
	Spaulding-Rankin - Provisional COPCs						**INITIAL SCREEN**	
Exposure Unit	Detected Analytes*	Units		USEPA Nov 2013 RSLs[1]	2008 Background Conc.	Maximum Detected Value	Provisional COPC (max > higher of current RSL or 2008 background)?	Rationale
Spaulding-Rankin	Aluminum	mg/kg	NC	7700	19100	37428	**YES**	**MAX > BG and RSL**
	Antimony	mg/kg	NC	3.1	5.2	18.5	**YES**	**MAX > BG and RSL**
60 samples	Arsenic	mg/kg	C	0.61	12.6	131	**YES**	**MAX > BG and RSL**
	Barium	mg/kg	NC	1500	172	293.57	NO	MAX < BG
	Beryllium	mg/kg	NC	16	1.9	3.3	NO	MAX < RSL
	Cadmium	mg/kg	NC	7	2.36	110.0	**YES**	**MAX > BG and RSL**
	Calcium	mg/kg		NS	NS	25590.57	NO	essential nutrient
	Chromium	mg/kg	NC	12000	51.3	15866.71	**YES**	**MAX > BG and RSL**
	Cobalt	mg/kg	NC	2.3	17.8	426.52	**YES**	**MAX > BG and RSL**
	Copper	mg/kg	NC	310	49.65	481	**YES**	**MAX > BG and RSL**
	Iron	mg/kg	NC	5500	32400	140536.16	**YES**	**MAX > BG and RSL**
	Lead	mg/kg	--	400	194	868	**YES**	**MAX > BG and RSL**
	Magnesium	mg/kg		NS	6950	14900	**YES**	**MAX > BG**
	Manganese	mg/kg	NC	180	968	3248	**YES**	**MAX > BG and RSL**
	Mercury	mg/kg	NC	1	0.25	2.5	**YES**	**MAX > BG and RSL**
	Nickel	mg/kg	NC	150	33.5	335	**YES**	**MAX > BG and RSL**
	Potassium	mg/kg		NS	NS	3246.43	NO	essential nutrient
	Selenium	mg/kg	NC	39	1.2	47.07	**YES**	**MAX > BG and RSL**
	Silver	mg/kg	NC	39	0.87	3.73	NO	MAX < RSL
	Sodium	mg/kg		NS	NS	199.29	NO	essential nutrient
	Strontium Total	mg/kg	NC	4700	53	24	NO	MAX < RSL
	Thallium	mg/kg	NC	0.078	2.2	75.72	**YES**	**MAX > BG and RSL**
	Tin	mg/kg	NC	4700	8.4	45.24	NO	MAX < RSL
	Titanium	mg/kg		NS	2690	1383	NO	MAX < BG
	Vanadium	mg/kg	NC	39	75.5	195	**YES**	**MAX > BG and RSL**
	Zinc	mg/kg	NC	2300	158	13600	**YES**	**MAX > BG and RSL**
	Zirconium	mg/kg	NC	0.63	48.3	3.94	NO	MAX < BG
	Cyanide	mg/kg	NC	2.2	0.26	1.86	NO	MAX < RSL
	Benzo(a)anthracene	µg/kg	C	150	357.5	110	NO	MAX < BG and RSL
	Benzo(a)pyrene	µg/kg	C	15	375	86	NO	MAX < BG
	Benzo(b)fluoranthene	µg/kg	C	150	365.7	84	NO	MAX < BG and RSL
	Bis(2-ethylhexyl)phthalate	µg/kg	C	35000	1479	61	NO	MAX < BG and RSL
	di-n-Butylphthalate	µg/kg	NC	610000	510	840	NO	MAX < RSL
	Fluoranthene	µg/kg	NC	230000	699.9	65	NO	MAX < BG and RSL
	2-Hexanone	µg/kg	NC	21000	18	18.01	NO	MAX < RSL
	Acetone	µg/kg	NC	6100000	554.7	24.33	NO	MAX < BG and RSL
	Chloroform	µg/kg	C	290	18	21.35	NO	MAX < RSL
	Chrysene	µg/kg	C	15000	400.9	110	NO	MAX < BG and RSL
	Ethylbenzene	µg/kg	C	NS	18	5.56	NO	MAX < BG
	Methylene Chloride	µg/kg	C	56000	18	74.72	NO	MAX < RSL
	Toluene	µg/kg	NC	500000	18	15	NO	MAX < BG and RSL
	Total Xylenes	µg/kg	NC	63000	18	21	NO	MAX < RSL
	4,4'-DDD	µg/kg	C	2000	NS	48	NO	MAX < RSL
	4,4'-DDE	µg/kg	C	1400	NS	60	NO	MAX < RSL
	4,4'-DDT	µg/kg	C	1700	NS	87	NO	MAX < RSL
	Alpha-chlordane	µg/kg	C	1600	NS	1.3	NO	MAX < RSL
	Methyoxychlor	µg/kg	NC	31000	NS	3.9	NO	MAX < RSL

1. USEPA November 2013 RSLs. NC adjusted downward by factor of 10

NA not applicable, NC non-carcinogen, C carcinogen

mg/kg milligrams per kilogram, µg/kg micrograms per kilogram

Provisional COPC

Table C.3													
Southern AU - Provisional COPCs							**INITIAL SCREEN**						
Exposure Unit	Detected Analytes*	Units		USEPA Nov 2013 RSLs[1]	2008 Background Conc.	Maximum Detected Value	Provisional COPC (max > higher of current RSL or 2008 background)?	Rationale	**Outlier Test 1** Is Max ≥ 10X the Avg of Remaining Data?	NEXT Maximum Detected Value	Provisional COPC (NEXT max > higher of current RSL or 2008 background)?	Rationale
Southern AU	Aluminum	mg/kg	NC	7700	19100	57700	**YES**	**MAX > BG and RSL**	NO, but max was from removed sample	56138	**YES**	**MAX > BG and RSL**
	Antimony	mg/kg	NC	3.1	5.2	**40.4**	**YES**	**MAX > BG and RSL**	**YES, remove sample AU-03**	**36.3**	**YES**	**MAX > BG and RSL**
115	Arsenic	mg/kg	C	0.61	12.6	17.1	**YES**	**MAX > BG and RSL**	NO			
samples	Barium	mg/kg	NC	1500	172	170	NO	MAX < BG and RSL				
	Beryllium	mg/kg	NC	16	1.9	**19**	**YES**	**MAX > BG and RSL**	**YES, remove sample SV-12A**	4.5	NO	MAX < BG
	Cadmium	mg/kg	NC	7000	2.36	3.21	NO	MAX < RSL				
	Calcium	mg/kg		NS	NS	6540	NO	essential nutrient				
	Chromium	mg/kg	NC	12000	51.3	651	NO	MAX < RSL				
	Cobalt	mg/kg	NC	2.3	17.8	193	**YES**	**MAX > BG and RSL**	NO			
	Copper	mg/kg	NC	310	49.65	181	NO	MAX < RSL				
	Iron	mg/kg	NC	5500	32400	90475	**YES**	**MAX > BG and RSL**	NO, but max was from removed sample	68056	**YES**	**MAX > BG and RSL**
	Lead	mg/kg	--	400	194	158	NO	MAX < BG and RSL				
	Magnesium	mg/kg		NS	6950	21639	**YES**	**MAX > BG**	NO			
	Manganese	mg/kg	NC	180	968	3070	**YES**	**MAX > BG and RSL**	NO			
	Mercury	mg/kg	NC	1	0.25	**9.74**	**YES**	**MAX > BG and RSL**	**YES, remove sample SV-AU-05**	**2.3**	**YES**	**MAX > BG and RSL**
	Nickel	mg/kg	NC	150	33.5	176	**YES**	**MAX > BG and RSL**	NO			
	Phosphorous	mg/kg		NS	NS	198	NO	essential nutrient				
	Potassium	mg/kg		NS	NS	9081	NO	essential nutrient				
	Selenium	mg/kg	NC	39	1.2	1.41	NO	MAX < RSL				
	Silicon	mg/kg		NS	NS	2240	NO	limited toxicity at level detected[2]				
	Silver	mg/kg	NC	39	0.87	0.023	NO	MAX < BG and RSL				
	Sodium	mg/kg		NS	NS	600	NO	essential nutrient				
	Strontium	mg/kg	NC	4700	53	20.7	NO	MAX < BG and RSL				
	Sulfur	mg/kg		NS	NS	255	NO	limited toxicity at level detected[2]				
	Thallium	mg/kg	NC	0.078	2.2	**28.6**	**YES**	**MAX > BG and RSL**	**YES, remove sample SV-AU-03**	4.73	**YES**	**MAX > BG and RSL**
	Tin	mg/kg	NC	4700	8.4	2.7	NO	MAX < BG and RSL				
	Titanium	mg/kg		NS	2690	896	NO	MAX < BG				
	Vanadium	mg/kg	NC	39	75.5	627	**YES**	**MAX > BG and RSL**	NO, but max was from removed sample	293	**YES**	**MAX > BG and RSL**
	Zinc	mg/kg	NC	2300	158	209	NO	MAX < RSL				
	Cyanide	mg/kg	NC	2.2	0.26	0.81	NO	MAX < RSL				
	1,1,1-Trichloroethane	µg/kg	NC	870000	18	1	NO	MAX < BG and RSL				
	2-Butanone	µg/kg	NC	2800000	18	3	NO	MAX < BG and RSL				
	Acetone	µg/kg	NC	6100000	554.7	17	NO	MAX < BG and RSL				
	Chloroform	µg/kg	C	290	18	5	NO	MAX < BG and RSL				
	Chloromethane	µg/kg	NC	12000	18	3	NO	MAX < BG and RSL				

Table C.3													
Southern AU - Provisional COPCs							**INITIAL SCREEN**						
Exposure Unit	Detected Analytes*	Units		USEPA Nov 2013 RSLs[1]	2008 Background Conc.	Maximum Detected Value	Provisional COPC (max > higher of current RSL or 2008 background)?	Rationale	**Outlier Test 1** Is Max ≥ 10X the Avg of Remaining Data?	NEXT Maximum Detected Value	Provisional COPC (NEXT max > higher of current RSL or 2008 background)?	Rationale
	Dichlorodifluoromethane	µg/kg	NC	9400	18	2	NO	MAX < BG and RSL				
	Methylene Chloride	µg/kg	C	56000	18	68	NO	MAX < RSL				
	Toluene	µg/kg	NC	500000	18	2	NO	MAX < BG and RSL				
	Anthracene	µg/kg	NC	1,700,000	510	181.25	NO	MAX < BG and RSL				
	Benzo(a)anthracene	µg/kg	C	150	357.5	**3800**	**YES**	**MAX > BG and RSL**	**YES, remove sample BAKER-03**	773	**YES**	**MAX > BG and RSL**
	Benzo(a)pyrene	µg/kg	C	15	375	2800	**YES**	**MAX > BG and RSL**	NO, but max was from removed sample	595	**YES**	**MAX > BG and RSL**
	Benzo(b)fluoranthene	µg/kg	C	150	365.7	**3400**	**YES**	**MAX > BG and RSL**	**YES, remove sample BAKER-03**	895	**YES**	**MAX > BG and RSL**
	Benzo(g,h,i)perylene	µg/kg		NS	331.5	244	NO	MAX < BG				
	Benzo(k)fluoranthene	µg/kg	C	1500	356.6	**2200**	**YES**	**MAX > BG and RSL**	**YES, remove sample SV-BAKER-03**	377	NO	MAX < RSL
	Benzoic Acid	µg/kg	NC	24000000	510	210	NO	MAX < BG and RSL				
	Bis(2-ethylhexyl) phthalate	µg/kg	C	35000	1479	131	NO	MAX < BG and RSL				
	Chrysene	µg/kg	C	15000	400.9	2700	NO	MAX < RSL				
	Dibenz(a,h)anthracene	µg/kg	C	15	510	1100	**YES**	**MAX > BG and RSL**	Remaining data all ND, but max was from removed sample	ND (DL=184-478)	NO	DL < BG
	Dibenzofuran	µg/kg	NC	7800	510	69	NO	MAX < BG and RSL				
	Diethyl Phthalate	µg/kg	NC	4900000	510	24	NO	MAX < BG and RSL				
	Fluoranthene	µg/kg	NC	230000	699.9	4200	NO	MAX < RSL				
	Indeno(1,2,3-c,d) Pyrene	µg/kg	C	150	334.7	**2000**	**YES**	**MAX > BG and RSL**	**YES, remove sample BAKER-03**	273	NO	MAX < BG
	Phenanthrene	µg/kg		NS	407.4	**2000**	**YES**	**MAX > BG**	**YES, remove sample SV-BAKER-03**	327	NO	MAX < BG
	Pyrene	µg/kg	NC	170000	626.4	5500	NO	MAX < RSL				
	Arochlor-1260	mg/kg	C	0.22	NS	1.3	**YES**	**MAX > RSL**	NO		NO. Max result excavated; remainder ND	
	4,4'-DDD	µg/kg	C	2000	NS	1500	NO	MAX < BG				
	4,4'-DDE	µg/kg	C	1400	NS	100	NO	MAX < BG				
	4,4'-DDT	µg/kg	C	1700	NS	560	NO	MAX < BG				
	Alpha-Chlordane	µg/kg	C	1600	NS	2.5	NO	MAX < BG				
	Dieldrin	µg/kg	C	30	NS	22	NO	MAX < BG				
	Endosulfan II	µg/kg	NC	37000	NS	14	NO	MAX < BG				
	Endrin	µg/kg	NC	1800	NS	23	NO	MAX < BG				
	Endrin Aldehyde	µg/kg		NS	NS	6.6	NO	No BG or RSL				
	Endrin Ketone	µg/kg		NS	NS	26	NO	No BG or RSL				
	Heptachlor	µg/kg	C	53	NS	3.6	NO	MAX < BG				

1. USEPA November 2013 RSLs. NC adjusted downward by factor of 10

2. No SL or BG available = these compounds (silicon, sulfur) have limited toxicity at the levels detected, therefore are not further evaluated

NA not applicable

NC non-carcinogen, C carcinogen

mg/kg milligrams per kilogram, µg/kg micrograms per kilogram

Provisional COPC

Table C.4A									
Southern AU - Screening Review for Outlier Sample SV-04							**INITIAL SCREEN**		
Exposure Unit	Detected Analytes*	Units		USEPA Nov 2013 RSLs[1]	2008 Background Conc.	Maximum Detected Value	Provisional COPC (max > higher of current RSL or 2008 background)?	Rationale	NOTES
	Aluminum	mg/kg	NC	7700	19100	9570	NO	MAX < BG	
	Antimony	mg/kg	NC	3.1	5.2	1.5	NO	MAX < BG and RSL	
Sample	Arsenic	mg/kg	C	0.61	12.6	3.5	NO	MAX < BG	
SV-04	Barium	mg/kg	NC	1500	172	40.7	NO	MAX < BG and RSL	
	Beryllium	mg/kg	NC	16	1.9	0.84	NO	MAX < BG and RSL	
	Cadmium	mg/kg	NC	7000	2.36	0.15	NO	MAX < BG and RSL	
	Calcium	mg/kg		NS	NS	1060	NO	No BG or RSL	
	Chromium	mg/kg	NC	12000	51.3	277	NO	MAX < RSL	
	Cobalt	mg/kg	NC	2.3	17.8	33	**YES**	**MAX > BG and RSL**	
	Copper	mg/kg	NC	310	49.65	24	NO	MAX < BG and RSL	
	Iron	mg/kg	NC	5500	32400	21500	NO	MAX < BG	
	Lead	mg/kg	--	400	194	104	NO	MAX < BG and RSL	
	Magnesium	mg/kg		NS	6950	4830	NO	MAX < BG	
	Manganese	mg/kg	NC	180	968	497	NO	MAX < BG	
	Mercury	mg/kg	NC	1	0.25	2.3	**YES**	**MAX > BG and RSL**	
	Nickel	mg/kg	NC	150	33.5	51	NO	MAX < RSL	
	Potassium	mg/kg		NS	NS	760	NO	No BG or RSL	
	Vanadium	mg/kg	NC	39	75.5	51.3	NO	MAX < BG	
	Zinc	mg/kg	NC	2300	158	73.4	NO	MAX < BG and RSL	

1. USEPA November 2013 RSLs. NC adjusted downward by factor of 10

NA not applicable, NC non-carcinogen, C carcinogen, NS none specified

mg/kg milligrams per kilogram

Provisional COPC

Table C.4B									
Southern AU - Screening Review for Outlier Sample SV-AU-05							**INITIAL SCREEN**		
Exposure Unit	Detected Analytes*	Units		USEPA Nov 2013 RSLs[1]	2008 Background Conc.	Maximum Detected Value	Provisional COPC (max > higher of current RSL or 2008 background)?	Rationale	NOTES
	Aluminum	mg/kg	NC	7700	19100	8679.24	NO	MAX < BG	
Sample	Arsenic	mg/kg	C	0.61	12.6	7.32	NO	MAX < BG	
SV-AU-05	Barium	mg/kg	NC	1500	172	14.5	NO	MAX < BG and RSL	
	Beryllium	mg/kg	NC	16	1.9	0.67	NO	MAX < BG and RSL	
	Cadmium	mg/kg	NC	7000	2.36	1.04	NO	MAX < BG and RSL	
	Calcium	mg/kg		NS	NS	387.42	NO	essential nutrient	
	Chromium	mg/kg	NC	12000	51.3	24.47	NO	MAX < BG and RSL	
	Copper	mg/kg	NC	310	49.65	19	NO	MAX < BG and RSL	
	Iron	mg/kg	NC	5500	32400	21005	NO	MAX < BG	
	Magnesium	mg/kg		NS	6950	317	NO	MAX < BG	
	Manganese	mg/kg	NC	180	968	32	NO	MAX < BG and RSL	
	Mercury	mg/kg	NC	1	0.25	9.74	**YES**	**MAX > BG and RSL**	
	Nickel	mg/kg	NC	150	33.5	6	NO	MAX < BG and RSL	
	Potassium	mg/kg		NS	NS	695	NO	essential nutrient	
	Vanadium	mg/kg	NC	39	75.5	28.98	NO	MAX < BG and RSL	
	Zinc	mg/kg	NC	2300	158	24.44	NO	MAX < BG and RSL	
	Chloromethane	µg/kg	NC	12000	18	1	NO	MAX < BG and RSL	

1. USEPA November 2013 RSLs. NC adjusted downward by factor of 10

NA not applicable, NC non-carcinogen, C carcinogen, NS none specified

mg/kg milligrams per kilogram

Provisional COPC

Table C.4C									
Southern AU - Screening Review for Outlier Sample AU-10							**INITIAL SCREEN**		
Exposure Unit	Detected Analytes*	Units		USEPA Nov 2013 RSLs[1]	2008 Background Conc.	Maximum Detected Value	Provisional COPC (max > higher of current RSL or 2008 background)?	Rationale	NOTES
	Aluminum	mg/kg	NC	7700	19100	18300	NO	MAX < BG	
Sample	Antimony	mg/kg	NC	3.1	5.2	36.3	**YES**	**MAX > BG and RSL**	
AU-10	Arsenic	mg/kg	C	0.61	12.6	4.3	NO	MAX < BG	
	Barium	mg/kg	NC	1500	172	50	NO	MAX < BG and RSL	
	Beryllium	mg/kg	NC	16	1.9	0.96	NO	MAX < BG and RSL	
	Calcium	mg/kg		NS	NS	598	NO	essential nutrient	
	Chromium	mg/kg	NC	12000	51.3	56	NO	MAX < RSL	
	Cobalt	mg/kg	NC	2.3	17.8	25.4	**YES**	**MAX > BG and RSL**	
	Copper	mg/kg	NC	310	49.65	57.83	NO	MAX < BG	
	Iron	mg/kg	NC	5500	32400	46900	**YES**	**MAX > BG and RSL**	
	Lead	mg/kg	--	400	194	13.2	NO	MAX < BG and RSL	
	Manganese	mg/kg	NC	180	968	475	NO	MAX < BG	
	Magnesium	mg/kg		NS	6950	3710	NO	MAX < BG	
	Mercury	mg/kg	NC	1	0.25	0.56	NO	MAX < RSL	
	Nickel	mg/kg	NC	150	33.5	21	NO	MAX < BG and RSL	
	Potassium	mg/kg		NS	NS	2290	NO	essential nutrient	
	Sodium	mg/kg		NS	NS	262	NO	essential nutrient	
	Vanadium	mg/kg	NC	39	75.5	77.8	**YES**	**MAX > BG and RSL**	
	Zinc	mg/kg	NC	2300	158	55.5	NO	MAX < BG and RSL	
	2-Butanone	µg/kg	NC	2800000	18	2	NO	MAX < BG and RSL	
	Chloromethane	µg/kg	NC	12000	18	1	NO	MAX < BG and RSL	
	Dichlorodifluoromethane	µg/kg	NC	9400	18	2	NO	MAX < BG and RSL	
1. USEPA November 2013 RSLs. NC adjusted downward by factor of 10									
NA not applicable, NC non-carcinogen, C carcinogen, NS none specified									
mg/kg milligrams per kilogram									
	Provisional COPC								

Table C.4D									
Southern AU - Screening Review for Outlier Sample SV-12A							**INITIAL SCREEN**		
Exposure Unit	Detected Analytes*	Units		USEPA Nov 2013 RSLs[1]	2008 Background Conc.	Maximum Detected Value	Provisional COPC (max > higher of current RSL or 2008 background)?	Rationale	NOTES
	Aluminum	mg/kg	NC	7700	19100	26900	**YES**	**MAX > BG and RSL**	
	Arsenic	mg/kg	C	0.61	12.6	2.1	NO	MAX < BG	
Sample	Barium	mg/kg	NC	1500	172	155	NO	MAX < BG and RSL	
SV-12A	Beryllium	mg/kg	NC	16	1.9	19	**YES**	**MAX > BG and RSL**	
	Calcium	mg/kg		NS	NA	2550	NO	No BG or RSL	
	Chromium	mg/kg	NC	12000	51.3	155	NO	MAX < RSL	
	Cobalt	mg/kg	NC	2.3	17.8	27	**YES**	**MAX > BG and RSL**	
	Copper	mg/kg	NC	310	49.65	56	NO	MAX < RSL	
	Iron	mg/kg	NC	5500	32400	45600	**YES**	**MAX > BG and RSL**	
	Lead	mg/kg	--	400	194	13.8	NO	MAX < BG and RSL	
	Magnesium	mg/kg		NS	6950	14000	**YES**	**MAX > BG**	
	Manganese	mg/kg	NC	180	968	815	NO	MAX < BG	
	Mercury	mg/kg	NC	1	0.25	0.08	NO	MAX < BG and RSL	
	Nickel	mg/kg	NC	150	33.5	0.08	NO	MAX < BG and RSL	
	Potassium	mg/kg		NS	NA	5400	NO	No BG or RSL	
	Vanadium	mg/kg	NC	39	75.5	105	**YES**	**MAX > BG and RSL**	
	Zinc	mg/kg	NC	2300	158	85.1	NO	MAX < BG and RSL	
1. USEPA November 2013 RSLs. NC adjusted downward by factor of 10									
NA not applicable, NC non-carcinogen, C carcinogen, NS none specified									
mg/kg milligrams per kilogram									
	Provisional COPC								

Table C.4E									
Southern AU - Screening Review for Outlier SV-AU-03 and AU-03 Samples							**INITIAL SCREEN**		
Exposure Unit	Detected Analytes*	Units		USEPA Nov 2013 RSLs[1]	2008 Background Conc.	Maximum Detected Value	Provisional COPC (max > higher of current RSL or 2008 background)?	Rationale	NOTES
	Aluminum	mg/kg	NC	7700	19100	57700	**YES**	**MAX > BG and RSL**	
	Antimony	mg/kg	NC	3.1	5.2	40.4	**YES**	**MAX > BG and RSL**	
	Arsenic	mg/kg	C	0.61	12.6	10.6	NO	MAX < BG	
2 samples:	Barium	mg/kg	NC	1500	172	77.4	NO	MAX < BG and RSL	
SV-AU-03	Beryllium	mg/kg	NC	16	1.9	3.3	NO	MAX < RSL	
AU-03	Cadmium	mg/kg	NC	7000	2.36	3.21	NO	MAX < RSL	
	Calcium	mg/kg		NS	NA	985	NO	No BG or RSL	
	Chromium	mg/kg	NC	12000	51.3	651	NO	MAX < RSL	
	Cobalt	mg/kg	NC	2.3	17.8	54.5	**YES**	**MAX > BG and RSL**	
	Copper	mg/kg	NC	310	49.65	209	NO	MAX < RSL	
	Iron	mg/kg	NC	5500	32400	135000	**YES**	**MAX > BG and RSL**	
	Lead	mg/kg	--	400	194	17.56	NO	MAX < BG and RSL	
	Magnesium	mg/kg		NS	6950	12200	**YES**	**MAX > BG**	
	Manganese	mg/kg	NC	180	968	967.28	NO	MAX < BG	
	Nickel	mg/kg	NC	150	33.5	143	NO	MAX < RSL	
	Potassium	mg/kg		NS	NS	468	NO	essential nutrient	
	Sodium	mg/kg		NS	NA	603	NO	essential nutrient	
	Thallium	mg/kg	NC	0.078	2.2	28.56	**YES**	**MAX > BG and RSL**	
	Vanadium	mg/kg	NC	39	75.5	627	**YES**	**MAX > BG and RSL**	
	Zinc	mg/kg	NC	2300	158	116.15	NO	MAX < BG and RSL	
	2-Butanone	µg/kg	NC	2800000	18	3	NO	MAX < BG and RSL	
	Chloroform	µg/kg	C	290	18	2	NO	MAX < BG and RSL	
	Methylene Chloride	µg/kg	C	56000	18	36	NO	MAX < RSL	
	Heptachlor	µg/kg	C	53	NS	3.6	NO	MAX < RSL	

1. USEPA November 2013 RSLs. NC adjusted downward by factor of 10

NA not applicable, NC non-carcinogen, C carcinogen, NS none specified

mg/kg milligrams per kilogram, µg/kg micrograms per kilogram

	Provisional COPC

Table C.4F									
Southern AU - Screening Review for Outlier BAKER-03 and SV-BAKER-03 Samples							**INITIAL SCREEN**		
Exposure Unit	Detected Analytes*	Units		USEPA Nov 2013 RSLs[1]	2008 Background Conc.	Maximum Detected Value	Provisional COPC (max > higher of current RSL or 2008 background)?	Rationale	NOTES
	Aluminum	mg/kg	NC	7700	19100	16000	NO	MAX < BG	
	Antimony	mg/kg	NC	3.1	5.2	6.9	**YES**	**MAX > BG and RSL**	
	Arsenic	mg/kg	C	0.61	12.6	8.4	NO	MAX < BG	
2 samples:	Barium	mg/kg	NC	1500	172	60.78	NO	MAX < BG and RSL	
BAKER-03	Beryllium	mg/kg	NC	16	1.9	0.97	NO	MAX < BG and RSL	
SV-BAKER-03	Cadmium	mg/kg	NC	7000	2.36	1.98	NO	MAX < BG and RSL	
	Calcium	mg/kg		NS	NS	3600	NO	essential nutrient	
	Chromium	mg/kg	NC	12000	51.3	95	NO	MAX < RSL	
	Cobalt	mg/kg	NC	2.3	17.8	11.1	NO	MAX < BG	
	Copper	mg/kg	NC	310	49.65	18.2	NO	MAX < BG and RSL	
	Iron	mg/kg	NC	5500	32400	27100	NO	MAX < BG	
	Lead	mg/kg	--	400	194	48.1	NO	MAX < BG and RSL	
	Magnesium	mg/kg		NS	6950	3811.64	NO	MAX < BG	
	Manganese	mg/kg	NC	180	968	414.18	NO	MAX < BG	
	Mercury	mg/kg	NC	1	0.25	0.72	NO	MAX < RSL	
	Nickel	mg/kg	NC	150	33.5	22	NO	MAX < BG and RSL	
	Potassium	mg/kg		NS	NS	891.73	NO	No BG or RSL	
	Sodium	mg/kg		NS	NS	365	NO	essential nutrient	
	Vanadium	mg/kg	NC	39	75.5	52.8	NO	MAX < BG	
	Zinc	mg/kg	NC	2300	158	68.4	NO	MAX < BG and RSL	
	2-Butanone	µg/kg	NC	2800000	18	3	NO	MAX < BG and RSL	
	Acetone	µg/kg	NC	6100000	554.7	16	NO	MAX < BG and RSL	
	Chloroform	µg/kg	C	290	18	5	NO	MAX < BG and RSL	
	Methylene Chloride	µg/kg	C	56000	18	68	NO	MAX < RSL	
	Toluene	µg/kg	NC	500000	18	2	NO	MAX < BG and RSL	

Table C.4F									
Southern AU - Screening Review for Outlier BAKER-03 and SV-BAKER-03 Samples							**INITIAL SCREEN**		
Exposure Unit	Detected Analytes*	Units		USEPA Nov 2013 RSLs[1]	2008 Background Conc.	Maximum Detected Value	Provisional COPC (max > higher of current RSL or 2008 background)?	Rationale	NOTES
	Anthracene	µg/kg	NC	1,700,000	510	181.25	NO	MAX < BG and RSL	
	Benzo(a)anthracene	µg/kg	C	150	357.5	3800	**YES**	**MAX > BG and RSL**	
	Benzo(a)pyrene	µg/kg	C	15	375	2800	**YES**	**MAX > BG and RSL**	
	Benzo(b)fluoranthene	µg/kg	C	150	365.7	3400	**YES**	**MAX > BG and RSL**	
	Benzo(k)fluoranthene	µg/kg	C	1500	356.6	2200	**YES**	**MAX > BG and RSL**	
	Chrysene	µg/kg	C	15000	400.9	2700	NO	MAX < RSL	
	Dibenz(a,h)anthracene	µg/kg	C	15	510	1100	**YES**	**MAX > BG and RSL**	
	Dibenzofuran	µg/kg	NC	7800	510	69	NO	MAX < BG and RSL	
	Fluoranthene	µg/kg	NC	230000	699.9	4200	NO	MAX < RSL	
	Indeno(1,2,3-c,d) Pyrene	µg/kg	C	150	334.7	2000	**YES**	**MAX > BG and RSL**	
	Phenanthrene	µg/kg		NS	407.4	2000	**YES**	**MAX > BG**	
	Pyrene	µg/kg	NC	170000	626.4	5500	NO	MAX < RSL	
	4,4'-DDD	µg/kg	C	2000	NS	1500	NO	MAX < RSL	
	4,4'-DDE	µg/kg	C	1400	NS	100	NO	MAX < RSL	
	4,4'-DDT	µg/kg	C	1700	NS	560	NO	MAX < RSL	
	Dieldrin	µg/kg	C	30	NS	22	NO	MAX < RSL	
	Endosulfan II	µg/kg	NC	37000	NS	14	NO	MAX < RSL	
	Endrin	µg/kg	NC	1800	NS	23	NO	MAX < RSL	
	Endrin Ketone	µg/kg		NS	NS	26	NO	No BG or RSL	
	Heptachlor	µg/kg	C	53	NS	2	NO	MAX < RSL	
1. USEPA November 2013 RSLs. NC adjusted downward by factor of 10									
NA not applicable, NC non-carcinogen, C carcinogen, NS none specified									
mg/kg milligrams per kilogram, µg/kg micrograms per kilogram									
	Provisional COPC								