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ACRONYMS AND ABBREVIATIONS

CCV	continuing calibration verification
DAF	dilution attenuation factor
DCD	Deseret Chemical Depot
DL	detection limit
DoD	U.S. Department of Defense
DRO	diesel-range organics
DQA	Data Quality Assessment
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
GRO	gasoline-range organics
ICV	initial calibration value
IRA	Interim Remedial Action
IS	internal standard
Jacobs	Jacobs Engineering Group Inc.
LCL	lower control limit
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOQ	limit of quantitation
mg/L	milligrams per liter
MS	matrix spike
MSD	matrix spike duplicate
QAPP	quality assurance project plan
PCE	tetrachloroethene
QC	quality control
QSM	Quality Systems Manual
RPD	relative percent difference
RSL	risk-based screening level
SVOC	semivolatile organic compounds
SSL	soil screening level
SWMU	Solid Waste Management Unit
TEAD-S	Tooele Army Depot - South

UCL	upper control limit
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compounds
°C	degree Celsius

1.0 INTRODUCTION

This Data Quality Assessment (DQA) was performed to assess the overall quality and usability of the data collected to support the Solid Waste Management Unit (SWMU) 2 Interim Remedial Action (IRA) at the Deseret Chemical Depot (DCD) near Stockton, Utah. This DQA includes the Sample and Method Summary Table (Table 1) and analytical data tables (Table 2 and Table 3), and summary tables (Table 4 through Table 15) of sample results that did not meet the project data quality objectives (DQO).

Jacobs Engineering Group Inc. (Jacobs) performed a data review wrote a DQA for the records associated with the analytical data. The data review and DQA were performed in accordance with the *Deseret Chemical Depot Solid Waste Management Unit (SWMU 2) Quality Assurance Project Plan (QAPP)* (U.S. Army Corps of Engineers [USACE] 2012). Results were categorized as acceptable, estimated, or rejected (Section 1.1 of this DQA). A completeness check of the laboratory data was performed to verify that the data packages and electronic files included all information requested.

1.1 DATA REVIEW AND QUALIFICATION

The Jacobs Project Chemist reviewed all analytical data. This evaluation consisted of a review of chain-of-custody and sample receipt records, laboratory case narratives, laboratory data including analytical methodology, sample holding times, laboratory blanks, detection limits (DL), limits of detection (LOD), limit of quantitation (LOQ), surrogate recoveries, laboratory control sample (LCS) recoveries, matrix spike (MS) recoveries, and precision. Analytical DQOs were considered met when the quality of the sample data met precision, accuracy, representativeness, completeness, comparability, and sensitivity requirements specified in the QAPP (USACE 2012).

Analytical results were evaluated against DQOs listed in the QAPP (USACE 2012). the U.S. Department of Defense (DoD) Quality Systems Manual (QSM), version 5 (DoD 2013); analytical methods (U.S. Environmental Protection Agency [EPA] 1996); and laboratory

limits. Sample results are summarized in Table 2 and TCLP sample results are summarized in Table 3.

Qualification of data was not required in the following circumstances:

- Surrogate or MS recoveries were outside QC limits, and the sample was diluted by a factor of 5 or greater.
- MS recoveries were outside QC limits, and the spiked concentration was less than twice that of the parent sample.
- An analyte was detected in the method blank, but there was no detection in the sample.
- MS or LCS recoveries exceeded upper control limits, and there was no detection in the sample(s).
- Continuing calibration verification (CCV) recoveries exceeded upper control limits, and there was no detection in the sample(s).
- Field duplicate relative percent difference (RPD) results exceeded 50 percent for solid samples and the values were less than the LOD.

Data may be rejected on the following grounds:

- Initial calibration (per compound) criteria was not met
- Continuing calibration (per compound) was not verified
- All samples that were not detected where the continuing calibration recovery was less than control limits
- Any compound where the LCS recovery was less than 10 percent
- The sample holding time was greater than two times the method-specified holding time
- Surrogate recovery of less than 10 percent and a dilution factor of 5 or less

Completeness is a quantitative evaluation indicating the percentage of the data that was considered usable (not rejected) for the intent of the project. The completeness goal was considered met when 90 percent of sample data for solid results. During the DCD SWMU 2 sampling 3 results for the chemical agent degradate compound MPA in three samples and the results for the semivolatile organic compounds (SVOCs) 2,4-dintrophenol and 3-/4-methylphenol in one sample were rejected (flagged R) due to low MS and/or MSD recoveries, resulting in greater than 98 percent completeness for chemical agent degradate results and a

greater than 99 percent completeness for SVOC compounds. All other analyses had 100 percent data completeness; therefore the completeness goal of 95 percent was met.

2.0 DATA QUALITY SUMMARY

A review of the analytical results and associated QC samples found the overall quality of the project data to be acceptable. These data are considered usable with the limitations discussed in this DQA. Sample results that did not meet project DQOs are qualified as described in Section 1.1; Table 4 through Table 15 summarize the qualified results.

2.1 FIELD QUALITY CONTROL SAMPLE COLLECTION

The collection frequency of field QC samples of one field duplicate per every 10 field samples and one MS/MSD pair per 20 field samples outlined in the QAPP was met. Table 1 in lists the analytical methods and sample type for samples collected during this event.

2.2 SAMPLE HANDLING

All coolers were received intact with temperatures of 6 °C or less.

2.3 HOLDING TIMES

Several samples were analyzed outside of their hold-times but within two times the method specified hold times. For the volatile organic compound (VOC) and SVOC samples this was due to reanalysis past the initial hold times required due to either low surrogate recoveries or internal standard area count outliers. Sample S2WC-CD-GP-16, analyzed for diesel range organic compounds (DRO), was submitted to the laboratory after the initial hold time had expired but was analyzed to determine the extent of DRO contamination. Results from samples analyzed past their respective hold times have been qualified as estimated (J or UJ) and may be biased slightly low. These results are summarized in Table 4.

The extraction for the TCLP herbicide analysis on sample S2WC-PPE01 and TCLP SVOC analyses on several samples were not started until after the seven day hold time had expired. The non-detect TCLP herbicide and TCLP SVOC results were qualified as estimated (UJ). The analysis for cyanide and reactive sulfide in several samples were not completed until after the initial hold time had expired; the results were qualified as estimated (J or UJ). TCLP results associated with the missed hold times are summarized in Table 5.

2.4 METHOD BLANKS AND TRIP BLANKS

The following analytes were detected above the LOD in one or more method blank samples that resulted in the qualification of sample results:

- SW8015B: diesel range organic compounds (DRO)
- SW8260C: acetone, carbon disulfide, 2-hexanone, naphthalene

The following analytes were detected above the LOD in one or more trip blank samples that resulted in the qualification of sample results:

- SW8260C: acetone, carbon disulfide

The results associated with blank contamination have qualified with a "B", and are summarized in Table 6 (qualified due to associated method blank contamination) and Table 7 (qualified due to associated trip blank contamination). B-flagged results are likely due to laboratory contamination and are not representative of the *in situ* sample concentration. The results may be false positives or biased high.

The impact of the blank contamination on the data usability in these samples is likely minimal since the results that were B-flagged were all less than their respective project cleanup levels, indicating that any introduced bias did not elevate results above the action levels.

2.5 LABORATORY CONTROL SAMPLE RECOVERY

If LCS and/or LCSD results are above their respective upper control limits and associated data is non-detect, no qualifications are needed. Results were not qualified based on LSC and/or LCSD recoveries.

2.6 LABORATORY CONTROL SAMPLE PRECISION

Data was not qualified due to RPD values in LCS/LCSD samples.

2.7 SURROGATE RECOVERY

Surrogate recoveries were evaluated for all samples analyzed at a dilution factor less than 5. If surrogate recoveries were above the UCL but no analytes were detected, qualifications were

not applied. If surrogate recoveries were below the LCL, then all results in the sample were qualified as estimated with a possible low bias.

Several results were qualified as estimated (J or UJ) due to non-compliant surrogate recoveries (Table 8 and Table 9). The majority of the surrogates were recovered below their respective LCLs. Review of the data in most cases indicates that the samples were impacted by non-target matrix interferences. The exception is the surrogate recoveries for the TCLP pesticides analyses performed on the several samples collected on 8 August 2014 and 7 August 2014, where there was no obvious matrix interference. The low surrogate recoveries may indicate a low bias in the data results.

2.8 MATRIX SPIKE RECOVERY AND PRECISION

The MS and/or MSD recoveries for several analytes were outside of their respective recovery limits and resulted in the qualification of sample results. Results in the respective parent samples were qualified as estimated (J or UJ) or were rejected (coded R), depending on the MS/MSD recoveries. Parent samples with high MS and/or MSD recoveries were not qualified if the sample result was non-detect. Additionally, non-detect samples with high MS/MSD RPD values were not qualified if other QC criteria were within control.

The result for the VOC compound tetrachloroethane in sample S2WC-S1001 and the result for copper in sample S2GP-0206SW-2.0 had MS and/or MSD recoveries greater than their respective UCLs. The results were qualified as estimated (coded J) and may be biased slightly high. The impact on usability is minimal since the results are less than their respective project action limits despite the potential high bias.

The MS/MSD recoveries for several other analytes were below their respective LCLs, and associated results were qualified as estimated (J or UJ). These low MS and or MSD recoveries may indicate that the results in the parent samples are biased low.

The results for the chemical agent degradate compound MPA in three samples and the results for the SVOCs 2,4-dintrophenol and 3-/4-methylphenol in one sample were rejected (flagged

R) due to low MS and/or MSD recoveries. These results cannot be used for decision making or driving remedial design.

Samples results qualified due to MS/MSD recovery outliers are summarized in Table 10.

The results for lead, manganese and zinc in sample S2OB-BL-9 and the result for copper in sample S2GP-0109 were qualified as estimated (J) due to having serial dilution recoveries outside of the method recommended percent difference of 10 percent. These results are summarized in Table 11.

2.9 CALIBRATION VERIFICATIONS

Soil and Sediment

Several CCV samples had recoveries that were outside QC limits. If the CCV recovery was higher than the recovery limit, and the result was non-detect, qualifications were not required. If the CCV recovery was less than the recovery limit, all associated results were qualified as estimated with a possible low bias (JC-), and the results may be biased low. The following analytes were affected by non-compliant CCV recoveries:

- SW8260C: the result for dichlorodifluoromethane in sample S2WC-S101 was qualified as estimated (J) due to a low CCV recovery.
- SW8290: the non-detect results for 1,2,3,4,7,8-HxCDD and 2,3,7,8-TCDF in several samples were qualified as estimated (UJ) due to low CCV recoveries.

The impact in data usability for dichlorodifluormethane is minimal since the LOD is well below the project action limit, and the impact on the dioxin and furan results are also minimal since there are no project action limits associated with this data. Results that were qualified due to continuing calibration verification non-compliances are summarized in Table 12.

2.10 INTERNAL STANDARD AREA COUNTS

The results in several VOC analyses were reported as estimated (J or UJ) due to low Internal Standard (IS) area counts. When there was enough sample remaining, it was analyzed twice, with the second result similar to the first in most cases, indicating matrix interference in the

VOC samples. Detected results from samples with low IS area counts may be biased high. Results qualified due to low IS area counts are summarized in Table 13.

2.11 SECOND COLUMN VERIFICATION

The detected results for the explosive compound 2,4-dinitrotoluene in several samples and the explosive compounds 2,4,6-trinitrotoluene, RDX and tetryl in sample S2OB-ASH01 were qualified as estimated (J) due to having confirmation column RPD values of greater than 40 percent. The impact of the high RPD is minimal because the result from either column is less than the compounds respective project action limit. Results with the high column RPD values are summarized in Table 14.

2.12 FIELD DUPLICATE PRECISION

Field duplicate precision was evaluated against the recommended RPD limit of 50 percent for solid samples. All results were evaluated, but only results where both values exceeded the LOD were qualified based on RPD exceedances. Results where one value was non-detect were evaluated using the LOD value of the non-detect result for the RPD calculation. Results qualified due to high RPD values are summarized in Table 15. Results are minimally impacted by the high RPD values as in all cases both qualified results in the sample pair are either above or below their respective project action limit, indicating that sample inhomogeneity contributing to result uncertainty did not adversely impact samples results.

2.13 LIMIT OF DETECTION EXCEEDANCES

Laboratory detection limits for the methods established for this project were based on EPA Risk-Based Screening Levels (RSLs), not on Soil Screening Levels (SSLs). As a result, several of the non-detect LOD values are higher than the SSLs protective of groundwater screening criteria for many compounds. Non-detect results with LOD values higher than their respective SSL are summarized in Table 16. These non-detect results may be false negatives at the SSL limit, and should be evaluated carefully for use in remedial action decisions.

3.0 CONCLUSION

In general, the overall quality of the project data was acceptable. Although the results for the chemical agent degradate compound MPA in three samples and the results for the SVOCs 2,4-dintrophenol and 3-/4-methylphenol in one sample were rejected (flagged R) due to low MS and/or MSD recoveries, the project completeness goal of 90 percent was met. These rejected results are also reflected in the results summary Table 2.

All results were compared against SWMU 2 specific action levels, and the COPCs were additionally compared against EPA Residential Limits in soil, Tooele Army Depot South (TEAD-S) limits, and site specific dilution attenuation factor (DAF) soil to groundwater limits. The majority of the results were less than the SWMU 2 specific action levels. Notable exceptions were the arsenic detections in every sample, and the detections of the VOC compound tetrachoroethene (PCE) in one sample and the SVOC compounds hexachloroethane and hexachlorobenzene in several samples. These results are consistent with potential breakdown products from munitions that were disposed of in this area. The results that exceed their respective SWMU 2 project action limit are summarized in Table 17. COPCs detects that exceeded their EPA Residential Limits in Soil, TEAD-S limits or site specific DAF limits are summarized in Table 18, Table 19 and Table 20, respectively.

Note that the value for TCLP chromium (13 mg/L) in sample S2WC-PPE01 was greater than the TCLP Action limit of 5 mg/L.

Samples qualified with a B may be false positives or may be biased high and should be carefully evaluated before decisions are made using the data. The data, with the exception of the rejected results, is considered usable with the limitations discussed in this DQA.

4.0 REFERENCES

DoD (U.S. Department of Defense). 2013. *Department of Defense Quality Systems Manual for Environmental Laboratories*. DoD Environmental Quality Workgroup, Department of the Navy, Lead Service. Version 5.0.

EPA (U.S. Environmental Protection Agency). 1996 (September). *Test Methods for Evaluating Solid Waste*. Final Update III, SW-846.

USACE (U.S. Army Corps of Engineers). 2012 (October). *Deseret Chemical Depot Solid Waste Management Unit (SWMU) 2 Quality Assurance Project Plan (QAPP).* Prepared by Jacobs Engineering Group Inc.