"relinquished by" or "received by" boxes, respectively. The signed chain-of-custody form demonstrates the transfer of sample custody from the sampler to the laboratory.

3.4.1 Sample Handling Procedures

After filling each sample container, immediately seal, label, and place the container into an iced cooler for the remainder of the day's sampling activities before packing the samples. Samples may also be transported and stored at a predetermined holding location in coolers with ice or in a sample holding refrigerator. Samples will be shipped daily for any method with sample holding times less than 3 days. If a sample is collected after sample packing and shipment is completed for the day, it may be held overnight in the sample holding refrigerator, pending the sample's laboratory holding time. The analytical sample matrix is presented in Table 3-3 and sample containers, preservation, and holding times are presented in Table 3-4 by analytical method.

Check container lids to verify that they are tight and will not leak during transport. Seal analytical samples in individual resealable plastic bags and position them within the cooler to prevent damage and to maintain sample integrity. Containers may be wrapped in bubble wrap, as necessary.

Ship samples in rigid plastic coolers or ice chests. Coolers or ice chests will be lined with contractor-provided trash bags; all bagged samples will be placed inside the trash bag, and ice will be placed outside the inner trash bag in sealed containment (such as secondary trash bag or resealable plastic bags) to prevent leakage. When ice and samples are packed in the cooler or ice chest, the contractor-provided trash bag will be sealed to prevent leakage outside of the cooler or ice chest.

3.4.2 Chain-of-Custody Requirements

The following information will either be printed clearly and legibly or typed on an electronic chain-of-custody form (Appendix B).

- Site name and project name or number.
- Each sample identification code, date the sample was collected, and sampling times (in military format).
- Total number of containers for each sample, the analysis, and associated number of sample bottles for each analysis.
- Signature of the sample team leader or sample collector.
- Carrier service (such as FedEx or UPS), air bill number, and custody seal number, if applicable.
- Signature, date, and time in the "relinquished by" section.

The signed chain-of-custody form will be placed in a plastic bag and taped to the inside of the lid in each cooler or ice chest. If more than one cooler or ice chest is being used, each cooler will have a copy of the chain-of-custody form. The cooler or ice chest will be closed and secured with strapping tape and custody seals. Custody seals will be placed so that if the cooler or ice chest is opened, the custody seal will be broken. Clear tape will be placed over the custody seal to prevent damage to the seal.

3.4.3 Sample Shipping

Samples will be analyzed at Eurofins TestAmerica (Eurofins) in Arvada, Colorado. All samples will be packed and shipped daily to Eurofins. If requested by USACE, a second laboratory (chosen by USACE) will be used to analyze triplicate samples.

3.5 ANALYTICAL METHODS

The Army has identified CoPCs for these eight quarters of groundwater monitoring based on the Parcel 3 Groundwater RFI conclusions and recommendations (Sundance, 2019). Sample analytical methods were selected based upon the CoPCs recommended for further monitoring (Sundance, 2019). The groundwater analytical program complies with the RCRA permit (NMED, 2015) and the Department of Defense (DoD) Quality Systems Manual (QSM) requirements (DoD/Department of Energy [DOE], 2021).

Attachment 7 of the RCRA permit (NMED, 2015) provides a hierarchy for the selection of screening value criteria applicable to the FWDA groundwater monitoring program. Section 1.2 of this Work Plan summarizes this screening-value hierarchy. Table 3-2 presents the list of analytes, with screening values and contract laboratory analytical limits.

Four analytes in Table 3-2 have screening values that are lower than the limit of quantitation (LOQ) (highlighted in blue), including three VOCs and one SVOC. None of these analytes have been previously detected in groundwater within the Parcel 3 southern groundwater area at concentrations above the limit of detection (LOD) as reported in the southern groundwater RFI work plan (Sundance, 2016). The following discusses each analyte in more detail.

- 1,2,3-Trichloropropane: 1,2,3-Trichloropropane is a chlorinated hydrocarbon with varying past and current uses. It is currently used as a chemical intermediate in the production of other chemicals, and in the synthesis of hexafluoropropylene. In addition, it is used as a cross-linking agent in the production of polysulfides (Pubchem, 2023). It is used as an industrial solvent and a cleaning and degreasing agent. In the agricultural industry, it has been found to be an impurity resulting from the production of soil fumigants (EPA, 2017). This compound is not associated with historical operations performed within Parcel 3 at FWDA. This compound is also not associated with any munitions demilitarization activities that were performed within Parcel 3. Although the LOQ is greater than the screening level for this constituent, the Army does not view this as a significant data quality exception because this constituent is not associated with any historical FWDA installation activities associated with Parcel 3. Results will be reported at the LOQ and qualified "U" or "J", as appropriate, and evaluated further under a separate work plan.
- 1,2-Dibromo-3-Chloropropane: 1,2-Dibromo-3-Chloropropane is an organic compound that was used as a pesticide to fumigate fields in the agricultural industry (Pubchem, 2023). It has been in the process of being phased out since 1977 (EPA, 2016). This compound is not associated with historical operations or any munitions demilitarization activities that were performed within Parcel 3. Although the LOQ is greater than the screening level for this constituent, the Army does not view this as a significant data quality exception because this constituent is not associated with any historical FWDA installation activities associated with Parcel 3. Results will be reported

at the LOQ and qualified "U" or "J", as appropriate, and evaluated further under a separate work plan.

- Hexachlorobutadiene (HCBD): HCBD is a man-made chlorinated chemical primarily produced as a byproduct in the production of carbon tetrachloride, tetrachloroethene, chlorinated hydrocarbons, perchloroethylene and, trichloroethylene (Pubchem, 2023). It is mainly used to make rubber compounds. It is also used as a solvent, and to make lubricants, in gyroscopes, as a heat transfer liquid, and as a hydraulic fluid. Commercial uses of HCBD include pesticides/agricultural fumigants, insecticides, algicide, herbicide, hydraulic fluid, gyroscope fluid, and as a laboratory reagent. This compound is not linked to historical operations or any munitions demilitarization activities that were performed within Parcel 3. Although the LOQ is greater than the screening level for this constituent, the Army does not view this as a significant data quality exception because this constituent is not associated with historical FWDA installation activities in Parcel 3. Results will be reported at the LOQ and qualified "U" or "J", as appropriate, and evaluated further under a separate work plan.
- 4,6-Dinitro-2-methylphenol: 4,6-Dinitro-2-methylphenol, also known as 4,6-dinitro-o-cresol, is a breakdown product of explosives that is a yellow solid with a slight odor that is slightly soluble in water. It was historically used as a pesticide and weed killer, but EPA banned its use as a pesticide in 1991 due to its toxicity. This compound is not associated with historical operations or any munitions demilitarization activities that were performed within Parcel 3. Although the LOQ is greater than the screening level for this constituent, the Army does not view this as a significant data quality exception because this constituent is not associated with any historical FWDA installation activities associated with Parcel 3. Results will be reported at the LOQ and qualified "U" or "J", as appropriate, and evaluated further under a separate work plan.

Sample analyses will be performed by Eurofins, the contracted DoD Environmental Laboratory Accreditation Program-certified laboratory selected to analyze samples. Reference limits for analytical methods are provided in Table 3-2. Analytical methods are selected IAW the most recent methods consistent with the DoD QSM (DoD/DOE, 2021) and consistent with RCRA regulations. The most recent EPA SW-846 solid waste methods were determined to be the most widely applicable and appropriate methods to conform to RCRA regulations and DoD guidance.

The Project Chemist and Project Manager will coordinate with the Eurofins Project Manager to schedule sample analysis, receive laboratory containers and supplies, resolve sample issues, and report results.

3.6 FIELD DOCUMENTATION

Field documentation will consist of one or more job- or area-specific field logbooks, field forms, sample chain-of-custody forms, and sample logs/labels.

3.6.1 Logbooks

Site and field logbooks provide a daily handwritten record of all field activities. All logbooks will be permanently bound and have a hard cover. Logbooks will be ruled, or ruled and gridded, with sequentially numbered pages. All entries into field logbooks will be made with indelible ink. Field logbooks are detailed daily records that are kept in real time and are assigned to

specific activities, positions, or areas within the site. Separate logbooks will be used for each sampling and field team.

Documentation in field logbooks will include the following, as necessary.

- Location
- Date and Time
- Names of field crew
- Names of subcontractors
- Weather conditions during field activity
- Sample type and sampling method
- Location of sample
- Sample identification number
- Decontamination and health and safety procedures
- Sampling notes (such as well condition, unexpected maintenance, work stoppage)

A separate logbook dedicated to calibration records will be maintained and will include the following information.

- Equipment make, model, and serial number (or another unique identifier)
- Date and time
- Calibration results
- Adverse trends in instrument calibration behavior
- Field instrument identification, date of calibration, and standards used

If entries in the field notebooks must be corrected or changed, corrections will be made by crossing out mistakes with a single line, writing the corrections, and initialing and dating the entry. The use of correction fluid is not permitted. After each field day, the sampling team leader will review each page of the logbook for errors and omissions. The sampling team leader will then date and sign each reviewed page.

3.6.2 Field Data Record Forms

In addition to the field logbooks, purging and sampling forms are used to document field efforts (Appendix B). These forms ensure that all required data and observations are recorded in a consistent manner. No blank spaces will be left; all non-applicable items will be marked “not applicable.” Forms will include well sampling forms and chain-of-custody forms.

3.6.3 Final Evidence File Documentation

All evidential file documentation will be maintained under an internal project file system. The USACE COR will ensure that all project documentation and QA records are properly stored and retrievable.

3.7 DECONTAMINATION

Non-dedicated measurement and sampling equipment, such as water level meters and submersible pumps, will be decontaminated before and after each use. Water level meters will be decontaminated during extraction from monitoring wells using deionized water and a non-

phosphate detergent cleaning solution. Submersible pumps will be decontaminated using the following procedure.

1. If necessary, remove particulate matter or debris using a brush or handheld sprayer filled with deionized water.
2. Scrub the surfaces of the equipment using deionized water and a non-phosphate detergent cleaning solution and reusable dedicated decontamination brushes.
3. Rinse the equipment thoroughly with deionized water.
4. Place the equipment on a clean surface and allow to air dry.
5. Containerize all decontamination liquids and manage as IDW, as described in Section 3.8.
6. After decontamination operations, handle equipment to prevent recontamination. The area where the equipment is stored before reuse will be free of contaminants.

Sampling equipment dedicated for use at specific wells will not require decontamination before use. Disposable sampling equipment that is used once and then disposed of will not require decontamination before use, provided it is wrapped in the manufacturer's packaging or otherwise protected from inadvertent contamination before use.

3.8 WASTE MANAGEMENT

Three types of IDW may be generated during the groundwater sampling events at FWDA: purge water and excess sample water from monitoring wells, decontamination liquids (non-hazardous soap and water), and solid waste (disposable sampling equipment and personal protective equipment [PPE]). These wastes will be managed in the following manner.

Purge water, decontamination water, and other liquid IDW will be containerized at the sample site in liquid waste containers, such as buckets with a watertight lid or polyethylene drums with a sealing bung. Depending on the volumes generated, water from multiple wells may be consolidated into one or more containers. At the end of the sampling day, the liquid IDW containers will be emptied into one of two low-density polyethylene-lined evaporation tanks. The evaporation tanks are located at the site of former Building 542 in Parcel 6.

All solid waste, such as disposable sampling equipment, PPE, and general refuse, will be placed in plastic trash bags. Small quantities of waste will be disposed of in a trash container (dumpster) located in the Administration Area.

3.9 QUALITY ASSURANCE AND QUALITY CONTROL

QA will be monitored by USACE IAW the Quality Assurance Surveillance Plan (QASP). USACE will evaluate field activities to verify the approved Work Plan is being followed. QA audits and inspections will be performed IAW established USACE guidelines and the project QASP.

The FTL will perform quality control (QC) procedures including reviewing the Work Plan and groundwater sampling procedures contained in this document with the field team. The FTL will inspect and approve daily instrument calibration logs and will perform periodic spot checks on the field team's adherence to sampling methods and procedures. The FTL will also review daily field logbooks and review each team's Groundwater Sampling Field Data Sheets for completeness and accuracy of the recorded data. In the event the FTL identifies any field

parameters outside of attainable limits, or readings do not indicate stabilized conditions were met prior to sampling, the FTL will document such findings in the daily summary report and will require the sampling team to resample the affected well.

3.9.1 Field Equipment Calibration and Preventative Maintenance

Field instruments will be calibrated, operated, and maintained IAW the manufacturer's instructions. Daily on-site field instrument calibrations will be performed before and during each day's use by trained technicians using certified standards. Instrument calibrations will be recorded in bound logbooks dedicated to calibration data, or as applicable, on standardized calibration forms and will include field instrument identification, date of calibration, standards used, and calibration results. All instrument calibration logs will be reviewed and approved by the FTL prior to deploying the instrument to the field. The review will ensure proper calibrations were performed with satisfactory performance. If an instrument does not pass calibration or inspection, that unit will be removed from service and another unit will be calibrated and used once certified.

If personnel suspect an equipment malfunction, the meter will be removed from service and tagged so that it is not used inadvertently, and a substitute piece of equipment will be used. Additionally, equipment that fails calibration or becomes inoperable during use will be removed from service and tagged. Such equipment will be repaired and satisfactorily recalibrated before reuse. The results of activities performed using equipment that has failed recalibration will be evaluated. If the results are adversely affected, the outcome of the evaluation will be documented and the USACE COR will be notified. Equipment that cannot be repaired will be replaced. Backup equipment will be available for use in the field in case of a malfunction.

Preventative maintenance procedures for the field instruments will be carried out IAW procedures outlined by the manufacturer's equipment manuals. All records of inspection and maintenance will be dated and documented in the appropriate field logbook. Critical spare parts for field instruments will be included in the sampling kits to minimize downtime. In addition, backup meters will be available, if needed. Spare parts will be purchased from accepted vendors. Daily inspections of field equipment will be conducted to ensure that equipment is functioning properly. If inspection results indicate that a piece of field equipment is deemed faulty or not usable, replacement equipment will be cleaned, calibrated (if necessary), and used in place of the faulty equipment. The faulty equipment will be shipped back to the vendor for repair.

3.9.2 Sample Collection Quality Assurance and Quality Control

Several types of field QC samples will be submitted to the analytical laboratory to assess the quality of the data resulting from the field sampling program IAW the DoD QSM (DoD/DOE, 2019). These samples will include field duplicate samples, trip blanks, equipment rinsate blanks, field blanks, and matrix spike (MS) and matrix spike duplicate (MSD) samples.

- Field duplicate samples will be collected at a frequency of one per 10 environmental samples.
- MS/MSD samples will be collected at a frequency of one per 20 environmental and field duplicate samples.

- QA split samples may be completed at the government's discretion to check the contractor's laboratory quality performance.
- Field equipment rinsate blanks will be collected from each non-dedicated sample pump used during a sampling event. Field equipment rinsate blanks are collected at the beginning of the sample event, once per 20 environmental samples, and/or one at the end of the sample event (minimum of two samples per event), for each non-dedicated pump.

Each shipment that contains samples for VOC analysis will contain trip blanks from each sampling team. Each sampling team collecting VOCs will carry a trip blank during each sampling day. The trip blank will be placed in a cooler containing VOC samples for that day and will stay with the cooler until the cooler is returned to the analytical laboratory.

3.10 DATA MANAGEMENT

After review and approval, the analytical and field data will be loaded into the FWDA electronic data management system (EDMS) database. An EDMS (or comparable) database is maintained for all groundwater monitoring results from 2008 to present. The sample result electronic data deliverables will be loaded into the automated data review (ADR) software for data validation. After validation, data output files from the ADR (or comparable) software will be exported to the FWDA database. The FWDA database will be used to prepare the validated data table output presented in reporting documents.

Geographic Information System data files will be managed using current ESRI™ ArcGIS software and will be delivered to the USACE and NMED upon request.

3.11 LABORATORY DATA REVIEW REQUIREMENTS

All analytical data generated by the laboratory will be verified before submittal to the Project Chemist. The internal data review process, which is multitiered, will include all aspects of data generation, reduction, and QC assessment.

In each laboratory analytical section, the analyst performing the tests will review 100% of the definitive data. After the analyst review has been completed, 100% of the data will be reviewed independently by a senior analyst or by the supervisor of the respective analytical section using the same criteria.

Elements for review or verification at each level must include, but is not restricted to, the following.

- Sample receipt procedures and conditions
- Sample preparation
- Appropriate standard operating procedures and analytical methodologies
- Accuracy and completeness of analytical results
- Correct interpretation of all raw data, including all manual integrations
- Appropriate application of QC samples and compliance with established control limits
- Documentation completeness (e.g., all anomalies in the preparation and analysis have been identified, appropriate corrective actions have been taken and documented in the case narrative[s], associated data have been appropriately qualified, and anomaly forms are complete)

- Accuracy and completeness of data deliverables (PDF and electronic)

Clear and proactive communication throughout sample analysis is critical to generating data of the type and quality required for project decision-making. As such, the laboratory point of contact shall contact the NDN Sundance Project Manager and Project Chemist, or designees, within 12 hours in the event that QC exceedances, required dilutions, or analytical irregularities occur. The project team must be notified of required dilutions prior to the dilution taking place, whether that dilution is performed on the first sample analysis or subsequent analyses. Once the NDN Sundance Project Manager and Project Chemist receive notice of such occurrence, the NDN Sundance Project Manager will inform the USACE Project Manager and Project Chemist, or designees, within 12 hours of receiving the notification.

3.11.1 Data Verification

Data verification is a completeness check to confirm that all required activities were conducted, all specified records are present, and the contents of the records are complete. It applies to both field and laboratory records. The objective of the data validation is to assess the performance associated with the analysis to determine the quality of the data.

Field data, records, logs, and other project generated documents will be subject to data review and verification. Discussions will summarize the findings of the data verification process in the Parcel 3 Groundwater RFI Supplemental Sampling Report (Final Report).

3.11.2 Data Validation

Data validation will be performed by an independent third party IAW the following hierarchy of applicable guidance documents for data review and validation.

- The latest DoD QSM (currently v5.4 2021)
- The latest DoD General Data Validation Guidelines (currently 2019)
- Engineer Manual 200-1-10 (2005)

Data validation will be accomplished by evaluating whether the collected data comply with the predefined project requirements (including method, procedural, or contractual requirements) and by comparing the collected data with criteria established based on the project quality objectives.

Analytical results will be subjected to 100% Stage 2b validation at a minimum using ADR software (or comparable). ADR output files will be entered into the FWDA EDMS database; 10% of the laboratory data packages will be subjected to Stage 4 validation.

Stage 4 validation will require level 4 data packages reported from the laboratory; however, level 2 data packages will also be requested from the laboratory and will be attached to and presented in the reporting phase. The level 4 data packages will be retained for 5 years following receipt and will be made available upon NMED request.

Data validation will be accomplished by evaluating whether the collected data comply with the predefined project requirements (including method, procedural, or contractual requirements) and by comparing the collected data with criteria established based on the project quality objectives.

Analytical results will be subjected to 100% Stage 2b validation at a minimum using ADR software (or comparable). ADR output files will be entered into the FWDA EDMS database; 10% of the laboratory data packages will be subjected to Stage 4 validation.

Stage 4 validation will require level 4 data packages reported from the laboratory; however, level 2 data packages will also be requested from the laboratory and will be attached to and presented in the reporting phase. The level 4 data packages will be retained for 5 years following receipt and will be made available upon NMED request.

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