APPENDIX P
DATA USABILITY WORKSHEETS

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Appendix P – Worksheet P-1
Soil Data Usability

PFAS CERCLA Remedial Investigation Site Characterization Summary Report
Former Loring Air Force Base
Limestone, Maine

Activity	Comment
Field Sampling	
Discuss sampling problems and field conditions that affect data useability.	Soil samples collected during the Remedial Investigation (RI), including hydric soil samples collected for human health evaluations and surface soil collected for ecological evaluations are evaluated in this usability worksheet. Any adverse field conditions or sampling problems that were identified before sampling or encountered during sampling were addressed with adjustments to the applicable work plan prior to sampling, sampling plan deviations in real-time during field work, or appropriate qualification of data during validation. Refer to Appendix B of the PFAS CERCLA Remedial Investigation Site Characterization Summary Report (RI report) for a detailed discussion of deviations encountered in the field. No data were rejected due to sampling problems or field conditions.
Are samples representative of receptor exposure for this medium (e.g. sample depth, grab vs composite, filtered vs unfiltered, low flow, etc.)?	Yes, samples are representative of receptor exposure for this medium. Soil samples were collected in accordance with their respective work plans except where noted in Appendix B of the RI report. Work plans for the human health and ecological risk assessments developed as a part of the RI involved thorough proactive assessment of site-specific conditions and data quality objectives to ensure that data were collected in a manner that would be representative of receptor exposure when applicable.
Assess the effect of field QC results on data useability.	Field QC results (equipment blanks, field blanks, and field duplicates) were reviewed during data validation and used to assess the quality of associated sample results. Any necessary qualifications were added to the data during validation in accordance with the QPP and DoD guidelines. In general, any detections in equipment blank and/or field blanks or field duplicate results that were above QC limits presented in the QPP did not result in rejection of results and reported results are considered usable. Qualified results from exceedances in field QC samples are presented in the data validation reports (Appendix K of the RI report).

Activity	Comment
Summarize the effect of field sampling issues on the risk assessment, if applicable.	Sampling issues identified (e.g., hydric soil collected instead of unsaturated soil, and deep interval samples not collected due to drill rig access issues) during the collection of soil samples are presented in Appendix B of the RI report. If sampling issues were identified as a deviation to the work plans, adjustments were made to meet the data quality objectives described in the QPP.
Analytical Techniques	
Were the analytical methods appropriate for quantitative risk assessment?	The analytical methods used for the analysis of PFAS in soils evolved over the course of the RI. The analytical method at the start of the program was Method 537 modified. This was replaced by USEPA Method 1633. Detection limits (in general) decreased over the investigation. Efforts were made by the laboratories to increase sensitivity of instrumentation to lower detection limits. While data generated is considered usable, it is advisable to pay particular attention to reporting limits and acknowledge the change in methods over time when using data for quantitative risk assessment. Refer to QPP WS#15 for details.
Were detection limits adequate?	Reporting limits and method detection limits changed over the span of the RI due to analytical method changes and updates. As presented in QPP WS #15 and screening tables in the risk assessment, some detection limits for PFAS compounds in soil were above screening values (e.g., HFPO-DA, PFOA, PFOS, and PFDA). A detailed discussion of how reporting limits compare to USEPA RSLs or ESVs is included in QPP WS#15. This difference is taken into consideration for the risk assessment.
Summarize the effect of analytical technique issues on the risk assessment, if applicable.	Analytical technique did not affect data usability. No data were rejected due to analytical technique. Results that were rejected were generally due to matrix interferences of the individual sample and low extracted internal standard percent recoveries. In situations where an analyte is not detected and the LOD is greater than the PAL, risk assessment will acknowledge the discrepancy as described in WS#15 of the QPP.
Data Quality Objectives	
Precision - How were duplicates handled?	Duplicates were collected in accordance with the QPP at a rate of ten percent of field samples collected. When precision quality control criteria were exceeded, associated data were qualified as necessary in accordance with the QPP, DoD guidelines, and professional judgement. No data were rejected due to precision criteria exceedances.

Activity	Comment
Accuracy - How were split samples handled?	Two PFAS laboratories were used for analysis of samples throughout the program. Split samples were collected in accordance with the QPP (Appendix E). When accuracy quality control criteria were not met, data usability was discussed in the associated validation report and results were qualified in accordance with the QPP, DoD guidelines, and professional judgement. No data were rejected due to accuracy criteria exceedances in split samples.
Representativeness - Indicate any problems associated with data representativeness (e.g., trip blank or rinsate blank contamination, chain of custody problems, etc.).	No data were rejected due to problems associated with data representativeness. If detections were reported in rinsate blanks, data was evaluated in accordance with the QPP, and qualifiers were added if appropriate. Data Validation reports are presented in Appendix K of the RI report.
Completeness - Indicate any problems associated with data completeness (e.g., incorrect sample analysis, incomplete sample records, problems with field procedures, etc.).	Samples were analyzed by the methods presented in the QPP and no instances of incorrect sample analysis were identified during the RI. If problems were observed in the field, documentation was made on the appropriate field data records as presented in Appendix C of the RI report. In general, no problems were identified when evaluating the completeness of the soil data set that would affect the overall usability of the data set. There were however a low number of PFAS results (<10) that were rejected during validation of the soil data, representing less than 1% of the PFAS results reported. The results that were rejected were originally reported by the laboratory as not detected at the reporting limit. No detected results were rejected during the data validation process. A completeness goal of 95% of usable data was presented in the QPP and was met.
Comparability - Indicate any problems associated with data comparability.	No data were rejected due to problems associated with data comparability. During the RI program, at least two laboratories were utilized for sample analysis and split samples were collected at the required frequency presented in the QPP to ensure good comparability in the data set.
Were the DQOs specified in the QAPP satisfied?	The DQOs were presented in WS#11 of the QPP. Overall, the DQOs specified in the QPP were satisfied. There were reporting limits and method detection limits that were above screening values for a sub-set of PFAS compounds during the investigation. These compounds are presented in the risk assessment with a discussion of the overall impact.
Summarize the effect of DQO issues on the risk assessment, if applicable.	Other than the DQOs discussed above, there are no other DQO issues identified that should affect the overall risk assessment.

Activity	Comment
Data Validation and Interpretation	
What are the data validation requirements?	In accordance with the RI QPP, 100% of the soil PFAS data were subjected to Stage 2B validation. 10% of data were subjected to Stage 4 validation procedures. Refer to the data validation reports in Appendix K of the RI report for details.
What method or guidance was used to validate the data?	The QPP, applicable DoD and USEPA data validation guidelines, and professional judgement were used to validate the data. PFAS validation guidelines have evolved over the course of the RI along with the analytical methods as mentioned above. Refer to the associated data validation report presented in Appendix K of the RI report for specific references. Guidelines used were in alignment with DoD policy.
Was the data validation method consistent with guidance? Discuss any discrepancies.	Yes, the data validation method was consistent with guidance.
Were all data qualifiers defined? Discuss those which were not.	Yes, all data qualifiers were defined.
Which qualifiers represent useable data?	U, J, UJ, J+, J-, N
Which qualifiers represent unusable data?	R
How are tentatively identified compounds handled?	The laboratory did not report tentatively identified PFAS. In cases where qualitative identification of a PFAS was not certain or was called into question during validation, a full review of the raw data was performed, and the result was either determined to be non-detect and changed at the laboratory or qualified as “N” during validation.
Summarize the effect of data validation and interpretation issues on the risk assessment, if applicable.	Results that were qualified as R during data validation are considered unusable and will not be used in the risk assessment. Less than 10 PFAS soil results were rejected during validation (refer to validation reports for details) and were not used on the risk assessment.
Additional notes: none	None.

Note:
The purpose of this Worksheet is to succinctly summarize the data useability analysis and conclusions. Reference specific pages in the Remedial Investigation and/or the Risk Assessment text to further expand on the information presented here.

Appendix P – Worksheet P-2
Groundwater Data Usability

PFAS CERCLA Remedial Investigation Site Characterization Summary Report
Former Loring Air Force Base
Limestone, Maine

Activity	Comment
Field Sampling	
Discuss sampling problems and field conditions that affect data useability.	Aqueous data evaluated in this usability worksheet includes groundwater samples and private well water samples collected during the Remedial Investigation (RI) program. Sampling problems and field conditions that were recorded as deviations to the work plans are presented in Appendix B of the PFAS CERCLA Remedial Investigation Site Characterization Summary Report (RI report). Appendix B presents a detailed discussion of deviations encountered in the field. Monitoring wells: Groundwater sampling of monitoring wells as part of the RI was performed in accordance with SOP-03 the Standard Operating Procedures outlined in the Final Quality Program Plan (QPP) (Wood, April 2022 and Addendum, revision 1, WSP, March 2025). Problems and field conditions that affected collection of groundwater samples were documented in real time throughout the field sampling activities. Deviations that were encountered during sample collection were documented on the field data records and are presented in Appendix C of the RI report. Examples of general problems and field conditions noted in Appendix C include, samples collected from damaged wells, lack of saturated overburden, seasonal precipitation, water quality measurements did not stabilize, monitoring well running dry during sample collection and grab sample collected without purging the entire well volume. In general, when samples were not collected from monitoring wells due to sampling problems or field conditions, successful attempts were made to collect samples during subsequent rounds. Private Wells: Samples from Private Wells were collected during the RI. Deviations that were encountered during sample collection were documented on the field data records and are presented in Appendix C of the RI report. Deviations included in Appendix B that are associated with samples collected from private wells are presented in the sub-section: Well Not Associated with a Specific Source Area. After review of sampling problems and field conditions recorded, no issues warranted rejection of data.

Activity	Comment
Are samples representative of receptor exposure for this medium (e.g. sample depth, grab vs composite, filtered vs unfiltered, low flow, etc.)?	Samples collected as part of the Site groundwater programs, which included samples from private wells, were collected using low flow and grab procedures in accordance with the RI QPP and are considered representative of receptor exposure.
Assess the effect of field QC results on data useability.	Field QC results (equipment blanks, field blanks, and field duplicates) were reviewed during data validation and used to assess the quality of each associated sample result. Any necessary qualifications were added to the data during validation in accordance with the QPP and DoD guidelines. In general, any detections in equipment blank and/or field blanks or field duplicate results that were above QC limits presented in the QPP did not result in rejection of results and reported results are considered usable. Qualified results from exceedances in field QC samples are presented in the data validation reports.
Summarize the effect of field sampling issues on the risk assessment, if applicable.	Sampling issues identified (e.g., low yield monitoring wells, access to residential wells) during the collection of groundwater samples are presented on the associated field data records in Appendix C of the RI report. If sampling issues were identified as a deviation to the work plans, adjustments were made to meet the data quality objectives described in the QPP. Deviations are presented in Appendix B of the RI report.
Analytical Techniques	
Were the analytical methods appropriate for quantitative risk assessment?	The analytical methods used for the analysis of PFAS in groundwater evolved over the course of the RI. Method 537 modified was replaced by USEPA Method 1633. Detection limits (in general) decreased over the investigation. Efforts were made by the laboratories to increase sensitivity of instrumentation to lower detection limits. While data generated is considered usable, it is advisable to pay particular attention to reporting limits and acknowledge the change in methods over time when using data for quantitative risk assessment. Refer to QPP Worksheet (WS) #15 for details. In some cases the laboratories limit of detection (LOD) for select PFAS compounds was higher than applicable human health screening levels. These cases are presented in worksheet #15 and in the Pathway Analysis Report (PAR).
Were detection limits adequate?	Reporting limits and method detection limits were above screening values for a sub-set of PFAS compounds during the investigation (e.g., HFPO-DA, PFHxS, PFOA, PFOS, PFNA and PFDA). Discussion of these compounds are presented in the PAR and ecological risk assessment. A detailed discussion of how reporting limits compare to USEPA RSLs or ESVs is included in QPP WS#15. This difference is taken into consideration for the risk assessment.

Activity	Comment
Summarize the effect of analytical technique issues on the risk assessment, if applicable.	Analytical technique did not affect data usability. No data were rejected due to analytical technique. Results that were rejected were generally due to matrix interferences of the individual sample. In situations where an analyte is not detected and the LOD is greater than the project action limit (PAL), risk assessment will acknowledge the discrepancy as described in WS#15 of the QPP.
Data Quality Objectives	
Precision - How were duplicates handled?	Duplicates were collected in accordance with the QPP at a rate of ten percent of field samples collected. When precision quality control criteria were exceeded, associated data were qualified as necessary in accordance with the QPP, DoD guidelines, and professional judgement. No data were rejected due to precision criteria exceedances. Data are considered usable.
Accuracy - How were split samples handled?	Split samples were collected for PFAS analysis in accordance with the QPP as presented in Appendix E. When accuracy quality control criteria were not met, data usability was discussed in the associated validation report and sample results were qualified in accordance with the QPP, DoD guidelines, and professional judgement. Split results were used as an internal quality control checks and the split sample results were not used as a data point in evaluation of risk. There were no data rejected due to accuracy criteria exceedances in split samples.
Representativeness - Indicate any problems associated with data representativeness (e.g., trip blank or rinsate blank contamination, chain of custody problems, etc.).	No data were rejected due to problems associated with data representativeness. If detections were reported in rinsate blanks, data was evaluated in accordance with the QPP, and qualifiers were added if appropriate. Data Validation reports are presented in Appendix K of the RI report.
Completeness - Indicate any problems associated with data completeness (e.g., incorrect sample analysis, incomplete sample records, problems with field procedures, etc.).	Samples were analyzed by the methods presented in the QPP and no instances of incorrect sample analysis were identified during the RI. If problems were observed in the field documentation was made on the appropriate field data records as presented in Appendix C of the RI report. In general, no problems were identified when evaluating the completeness of the groundwater data set that would affect the overall usability of the data set. There were however a low number of PFAS results (<150) that were rejected during validation of the groundwater data, representing less than one percent of the PFAS reported results. The results that were rejected were originally reported by the laboratory as not detected at the reporting limit. No detected results were rejected during the data validation process. A complete goal of 95% of usable data was presented in the QPP and was met.

Activity	Comment
Comparability - Indicate any problems associated with data comparability.	No data were rejected due to problems associated with data comparability. During the RI program, at least two laboratories were utilized for sample analysis and split samples were collected at the required frequency presented in the QPP to ensure good comparability in the data set.
Were the DQOs specified in the QAPP satisfied?	The DQOs were presented in WS#11 of the QPP. Overall, the DQOs specified in the QPP were satisfied. There were reporting limits and method detection limits were above screening values for a sub-set of PFAS compounds during the investigation. These compounds are presented in the risk assessment with a discussion of the overall impact.
Summarize the effect of DQO issues on the risk assessment, if applicable.	Other than the DQOs discussed above, there are no other DQO issues identified that should affect the overall risk assessment.
Data Validation and Interpretation	
What are the data validation requirements?	In accordance with the RI QPP, 100% of the groundwater PFAS data were subjected to Stage 2B validation and 10% of data were subjected to Stage 4 validation procedures. Refer to the data validation reports in Appendix K of the RI report for details.
What method or guidance was used to validate the data?	The QPP, applicable DoD and USEPA data validation guidelines, and professional judgement were used to validate the data. PFAS validation guidelines have evolved over the course of the RI along with the analytical methods as mentioned above. Refer to the associated data validation report for specific references. Guidelines used were in alignment with DoD policy.
Was the data validation method consistent with guidance? Discuss any discrepancies.	Yes, the data validation method was consistent with guidance and is presented in WS#36 of the QPP.
Were all data qualifiers defined? Discuss those which were not.	Yes, all data qualifiers were defined.
Which qualifiers represent useable data?	U, J, UJ, J+, J-, N
Which qualifiers represent unusable data?	R
How are tentatively identified compounds handled?	The laboratory did not report tentatively identified PFAS. In cases where qualitative identification of a PFAS was not certain or was called into question during validation, a full review of the raw data was performed, and the result was either determined to be non-detect and changed at the laboratory or qualified as “N” during validation.

Activity	Comment
Summarize the effect of data validation and interpretation issues on the risk assessment, if applicable.	Results that were qualified as R during data validation are considered unusable and will not be used on risk assessment. Less than 150 PFAS groundwater results were rejected during validation (refer to validation reports for details) and were not used in the risk assessment.
Additional notes: none	

Note:
The purpose of this Worksheet is to succinctly summarize the data useability analysis and conclusions. Reference specific pages in the Remedial Investigation and/or the Risk Assessment text to further expand on the information presented here.

Appendix P – Worksheet P-3
Surface water and Porewater Data Usability

PFAS CERCLA Remedial Investigation Site Characterization Summary Report
Former Loring Air Force Base
Limestone, Maine

Activity	Comment
Field Sampling	
Discuss sampling problems and field conditions that affect data useability.	Surface water and porewater data evaluated in this usability worksheet includes storm water samples collected during the Remedial Investigation (RI) program. Sampling problems and field conditions that were recorded as deviations to the work plans are presented in Appendix B of the PFAS CERCLA Remedial Investigation Site Characterization Summary Report (RI report). Appendix B presents a detailed discussion of deviations encountered in the field. Surface water and porewater samples were not collected at some locations due to unsafe conditions to access the location, dry conditions, and restricted water flows. Storm water sampling was proposed and not completed at some locations due to flooding or strained flows caused by beaver dams, inability to locate the proposed storm sewer feature, unsafe access conditions, and dry locations. No data were rejected due to sampling problems or field conditions.
Are samples representative of receptor exposure for this medium (e.g. sample depth, grab vs composite, filtered vs unfiltered, low flow, etc.)?	Surface water and porewater samples were collected in accordance with their respective work plans except where noted in Appendix B of the RI report. Work plans for the human health and ecological risk assessments developed as a part of the RI involved thorough proactive assessment of site-specific conditions and data quality objectives to ensure that data were collected in a manner that would be representative of receptor exposure when applicable.
Assess the effect of field QC results on data useability.	Field QC results (equipment blanks, field blanks, and field duplicates) were reviewed during data validation and used to assess the quality of associated sample results. Any necessary qualifications were added to the data during validation in accordance with the QPP and DoD guidelines. In general, any detections in equipment blank and/or field blanks or field duplicate results that were above QC limits presented in the QPP did not result in rejection of results and reported results are considered usable. Qualified results from exceedances in field QC samples are presented in the data validation reports (Appendix K of the RI report).

Activity	Comment
Summarize the effect of field sampling issues on the risk assessment, if applicable.	Sampling issues identified (e.g., insufficient surface water or porewater for sample collection, unsafe access sample locations, or flooding from beaver dams) during the collection of surface water or porewater samples are presented in Appendix B of the RI report. If sampling issues were identified as a deviation to the work plans, adjustments were made to meet the data quality objectives described in the QPP.
Analytical Techniques	
Were the analytical methods appropriate for quantitative risk assessment?	The analytical methods used for the analysis of PFAS in surface water and porewater evolved over the course of the RI. The analytical method at the start of the program was Method 537 modified. This was replaced by USEPA Method 1633. Detection limits (in general) decreased over the investigation. Efforts were made by the laboratories to increase sensitivity of instrumentation to lower detection limits. While data generated is considered usable, it is advisable to pay particular attention to reporting limits and acknowledge the change in methods over time when using data for quantitative risk assessment. Refer to TO 1048 QPP WS#15 for details.
Were detection limits adequate?	Reporting limits and method detection limits changed over the span of the RI due to analytical method changes and updates. As presented in QPP WS #15 and screening tables in the risk assessment, some detection limits for PFAS compounds were above screening values (e.g., PFOA, PFOS, PFNA and PFDA). A detailed discussion of how reporting limits compare to USEPA RSLs or ESVs is included in QPP WS#15. This difference is taken into consideration for the risk assessment.
Summarize the effect of analytical technique issues on the risk assessment, if applicable.	Analytical technique did not affect data usability. No data were rejected due to analytical technique. Results that were rejected were generally due to matrix interferences of the individual sample and low extracted internal standard percent recoveries. In situations where an analyte is not detected and the LOD is greater than the PAL, risk assessment will acknowledge the discrepancy as described in WS#15 of the QPP.
Data Quality Objectives	
Precision - How were duplicates handled?	Duplicates were collected in accordance with the QPP at a rate of ten percent of field samples collected. When precision quality control criteria were exceeded, associated data were qualified as necessary in accordance with the QPP, DoD guidelines, and professional judgement. No data were rejected due to precision criteria exceedances.

Activity	Comment
Accuracy - How were split samples handled?	Two PFAS laboratories were used for analysis of samples throughout the program. Split samples were collected in accordance with the QPP (Appendix E). When accuracy quality control criteria were not met, data usability was discussed in the associated validation report and results were qualified in accordance with the QPP, DoD guidelines, and professional judgement. No data were rejected due to accuracy criteria exceedances in split samples.
Representativeness - Indicate any problems associated with data representativeness (e.g., trip blank or rinsate blank contamination, chain of custody problems, etc.).	No data were rejected due to problems associated with data representativeness. If detections were reported in rinsate blanks, data was evaluated in accordance with the QPP, and qualifiers were added if appropriate. Data Validation reports are presented in Appendix K of the RI report.
Completeness - Indicate any problems associated with data completeness (e.g., incorrect sample analysis, incomplete sample records, problems with field procedures, etc.).	Samples were analyzed by the methods presented in the QPP and no instances of incorrect sample analysis were identified during the RI. If problems were observed in the field, documentation was made on the appropriate field data records as presented in Appendix C of the RI Report. In general, no problems were identified when evaluating the completeness of the surface water and porewater data set that would affect the overall usability of the data set. There were however a low number of PFAS results (<150) that were rejected during validation of the surface water data, representing less than 1.5% of the PFAS results reported. The results that were rejected were originally reported by the laboratory as not detected at the reporting limit. No detected results were rejected during the data validation process. A completeness goal of 95% of usable data was presented in the QPP and was met.
Comparability - Indicate any problems associated with data comparability.	No data were rejected due to problems associated with data comparability. During the RI program, at least two laboratories were utilized for sample analysis and split samples were collected at the required frequency presented in the QPP to ensure good comparability in the data set.
Were the DQOs specified in the QAPP satisfied?	The DQOs were presented in WS#11 of the QPP. Overall, the DQOs specified in the QPP were satisfied. There were reporting limits and method detection limits that were above screening values for a sub-set of PFAS compounds during the investigation. These compounds are presented in the risk assessment with a discussion of the overall impact.
Summarize the effect of DQO issues on the risk assessment, if applicable.	Other than the DQOs discussed above, there are no other DQO issues identified that should affect the overall risk assessment.

Activity	Comment
Data Validation and Interpretation	
What are the data validation requirements?	In accordance with the RI QPP, 100% of the surface water and porewater PFAS data were subjected to Stage 2B validation. 10% of data were subjected to Stage 4 validation procedures. Refer to the data validation reports in Appendix K of the RI report for details.
What method or guidance was used to validate the data?	The QPP, applicable DoD and USEPA data validation guidelines, and professional judgement were used to validate the data. PFAS validation guidelines have evolved over the course of the RI along with the analytical methods as mentioned above. Refer to the associated data validation report presented in Appendix K of the RI report for specific references. Guidelines used were in alignment with DoD policy.
Was the data validation method consistent with guidance? Discuss any discrepancies.	Yes, the data validation method was consistent with guidance.
Were all data qualifiers defined? Discuss those which were not.	Yes, all data qualifiers were defined.
Which qualifiers represent useable data?	U, J, UJ, J+, J-, N
Which qualifiers represent unusable data?	R
How are tentatively identified compounds handled?	The laboratory did not report tentatively identified PFAS. In cases where qualitative identification of a PFAS was not certain or was called into question during validation, a full review of the raw data was performed, and the result was either determined to be non-detect and changed at the laboratory or qualified as “N” during validation.
Summarize the effect of data validation and interpretation issues on the risk assessment, if applicable.	Results that were qualified as R during data validation are considered unusable and will not be used in the risk assessment. Less than 150 PFAS surface water and porewater results were rejected during validation (refer to validation reports for details) and were not used on the risk assessment.
Additional notes: none	None.

Note:
The purpose of this Worksheet is to succinctly summarize the data useability analysis and conclusions. Reference specific pages in the Remedial Investigation and/or the Risk Assessment text to further expand on the information presented here.

Appendix P – Worksheet P-4
Sediment Data Usability

PFAS CERCLA Remedial Investigation Site Characterization Summary Report
Former Loring Air Force Base
Limestone, Maine

Activity	Comment
Field Sampling	
Discuss sampling problems and field conditions that affect data useability.	Sediment samples collected during the Remedial Investigation (RI) for human health evaluations and ecological evaluations are included in this usability worksheet. Any adverse field conditions or sampling problems that were identified before sampling or encountered during sampling were addressed with adjustments to the applicable work plan prior to sampling, sampling plan deviations in real-time during field work, or appropriate qualification of data during validation. Refer to Appendix B of the PFAS CERCLA Remedial Investigation Site Characterization Summary Report (RI report) for a detailed discussion of deviations encountered in the field. No data were rejected due to sampling problems or field conditions.
Are samples representative of receptor exposure for this medium (e.g. sample depth, grab vs composite, filtered vs unfiltered, low flow, etc.)?	Yes, samples are representative of receptor exposure for this medium. Sediment samples were collected in accordance with their respective work plans except where noted in Appendix B of the RI report. Work plans for the human health and ecological risk assessments developed as a part of the remedial investigation involved thorough proactive assessment of site-specific conditions and data quality objectives to ensure that data were collected in a manner that would be representative of receptor exposure when applicable.
Assess the effect of field QC results on data useability.	Field QC results (equipment blanks, field blanks, and field duplicates) were reviewed during data validation and used to assess the quality of associated sample results. Any necessary qualifications were added to the data during validation in accordance with the QPP and DoD guidelines. In general, any detections in equipment blank and/or field blanks or field duplicate results that were above QC limits presented in the QPP did not result in rejection of results and reported results are considered usable. Qualified results from exceedances in field QC samples are presented in the data validation reports (Appendix K of the RI report).

Activity	Comment
Summarize the effect of field sampling issues on the risk assessment, if applicable.	Sampling issues identified (e.g., sediment locations were determined to be unsafe to access, planned sediment and collocated surface water sample location was dry and no samples were collected) during the collection of sediment samples are presented in Appendix B of the RI report. If sampling issues were identified as a deviation to the work plans, adjustments were made to meet the data quality objectives described in the QPP.
Analytical Techniques	
Were the analytical methods appropriate for quantitative risk assessment?	The analytical methods used for the analysis of PFAS in sediment evolved over the course of the RI. The analytical method at the start of the program was Method 537 modified. This was replaced by USEPA Method 1633. Detection limits (in general) decreased over the investigation. Efforts were made by the laboratories to increase sensitivity of instrumentation to lower detection limits. While data generated is considered usable, it is advisable to pay particular attention to reporting limits and acknowledge the change in methods over time when using data for quantitative risk assessment. Refer to QPP WS#15 for details.
Were detection limits adequate?	Reporting limits and method detection limits changed over the span of the RI due to analytical method changes and updates. As presented in QPP WS #15 and screening tables in the risk assessment, some detection limits for PFAS compounds in soil were above screening values (e.g., PFOA, PFOS, and PFDA). A detailed discussion of how reporting limits compare to USEPA RSLs or ESVs is included in QPP WS#15. This difference is taken into consideration for the risk assessment.
Summarize the effect of analytical technique issues on the risk assessment, if applicable.	Analytical technique did not affect data usability. No data were rejected due to analytical technique. Results that were rejected were generally due to matrix interferences of the individual sample and low extracted internal standard percent recoveries. In situations where an analyte is not detected and the LOD is greater than the PAL, risk assessment will acknowledge the discrepancy as described in WS#15 of the QPP.
Data Quality Objectives	
Precision - How were duplicates handled?	Duplicates were collected in accordance with the QPP at a rate of ten percent of field samples collected. When precision quality control criteria were exceeded, associated data were qualified as necessary in accordance with the QPP, DoD guidelines, and professional judgement. No data were rejected due to precision criteria exceedances.

Activity	Comment
Accuracy - How were split samples handled?	Two PFAS laboratories were used for analysis of samples throughout the program. Split samples were collected in accordance with the QPP (Appendix E). When accuracy quality control criteria were not met, data usability was discussed in the associated validation report and results were qualified in accordance with the QPP, DoD guidelines, and professional judgement. No data were rejected due to accuracy criteria exceedances in split samples.
Representativeness - Indicate any problems associated with data representativeness (e.g., trip blank or rinsate blank contamination, chain of custody problems, etc.).	No data were rejected due to problems associated with data representativeness. If detections were reported in rinsate blanks, data was evaluated in accordance with the QPP, and qualifiers were added if appropriate. Data Validation reports are presented in Appendix K of the RI report.
Completeness - Indicate any problems associated with data completeness (e.g., incorrect sample analysis, incomplete sample records, problems with field procedures, etc.).	Samples were analyzed by the methods presented in the QPP and no instances of incorrect sample analysis were identified during the RI. If problems were observed in the field, documentation was made on the appropriate field data records as presented in Appendix C of the RI report. In general, no problems were identified when evaluating the completeness of the sediment data set that would affect the overall usability of the data set. There were however a low number of PFAS results (<5) that were rejected during validation of the sediment data, representing less than 1% of the PFAS results reported. The results that were rejected were originally reported by the laboratory as not detected at the reporting limit. No detected results were rejected during the data validation process. A completeness goal of 95% of usable data was presented in the QPP and was met.
Comparability - Indicate any problems associated with data comparability.	No data were rejected due to problems associated with data comparability. During the RI program, at least two laboratories were utilized for sample analysis and split samples were collected at the required frequency presented in the QPP to ensure good comparability in the data set.
Were the DQOs specified in the QAPP satisfied?	The DQOs were presented in WS#11 of the QPP. Overall, the DQOs specified in the QPP were satisfied. There were reporting limits and method detection limits that were above screening values for a sub-set of PFAS compounds during the investigation. These compounds are presented in the risk assessment with a discussion of the overall impact.
Summarize the effect of DQO issues on the risk assessment, if applicable.	Other than the DQOs discussed above, there are no other DQO issues identified that should affect the overall risk assessment.

Activity	Comment
Data Validation and Interpretation	
What are the data validation requirements?	In accordance with the RI QPP, 100% of the sediment PFAS data were subjected to Stage 2B validation. 10% of data were subjected to Stage 4 validation procedures. Refer to the data validation reports in Appendix K of the RI report for details.
What method or guidance was used to validate the data?	The QPP, applicable DoD and USEPA data validation guidelines, and professional judgement were used to validate the data. PFAS validation guidelines have evolved over the course of the RI along with the analytical methods as mentioned above. Refer to the associated data validation report presented in Appendix K of the RI report for specific references. Guidelines used were in alignment with DoD policy.
Was the data validation method consistent with guidance? Discuss any discrepancies.	Yes, the data validation method was consistent with guidance.
Were all data qualifiers defined? Discuss those which were not.	Yes, all data qualifiers were defined.
Which qualifiers represent useable data?	U, J, UJ, J+, J-, N
Which qualifiers represent unusable data?	R
How are tentatively identified compounds handled?	The laboratory did not report tentatively identified PFAS. In cases where qualitative identification of a PFAS was not certain or was called into question during validation, a full review of the raw data was performed, and the result was either determined to be non-detect and changed at the laboratory or qualified as “N” during validation.
Summarize the effect of data validation and interpretation issues on the risk assessment, if applicable.	Results that were qualified as R during data validation are considered unusable and will not be used in the risk assessment. Less than 5 PFAS sediment results were rejected during validation (refer to validation reports for details) and were not used on the risk assessment.
Additional notes: none	None.

Note:
The purpose of this Worksheet is to succinctly summarize the data useability analysis and conclusions. Reference specific pages in the Remedial Investigation and/or the Risk Assessment text to further expand on the information presented here.

Appendix P – Worksheet P-5
Biota Data Usability

PFAS CERCLA Remedial Investigation Site Characterization Summary Report
Former Loring Air Force Base
Limestone, Maine

Activity	Comment
Field Sampling	
Discuss sampling problems and field conditions that affect data useability.	Biota samples collected during the Remedial Investigation (RI) for human health evaluations and ecological evaluations are included in this usability worksheet. These samples include forage and fish tissue associated with the human health risk assessment and terrestrial and aquatic tissue and plant samples associated with the ecological risk assessment. Any adverse field conditions or sampling problems that were identified before sampling or encountered during sampling were addressed with adjustments to the applicable work plan prior to sampling, sampling plan deviations in real-time during field work, or appropriate qualification of data during validation. Refer to Appendix B of the PFAS CERCLA Remedial Investigation Site Characterization Summary Report (RI report) for a detailed discussion of deviations encountered in the field. No data were rejected due to sampling problems or field conditions.
Are samples representative of receptor exposure for this medium (e.g. sample depth, grab vs composite, filtered vs unfiltered, low flow, etc.)?	Yes, samples are representative of receptor exposure for this medium. Biota samples were collected in accordance with their respective work plans except where noted in Appendix B of the RI report. Work plans for the human health and ecological risk assessments developed as a part of the remedial investigation involved thorough proactive assessment of site-specific conditions and data quality objectives to ensure that data were collected in a manner that would be representative of receptor exposure when applicable.
Assess the effect of field QC results on data useability.	Field QC results (equipment blanks and field replicates) were reviewed during data validation and used to assess the quality of associated sample results. Any necessary qualifications were added to the data during validation in accordance with the QPP and DoD guidelines. In general, any detections in equipment blank and/or field blanks or field duplicate results that were above QC limits presented in the QPP did not result in rejection of results and reported results are considered usable. Qualified results from exceedances in field QC samples are presented in the data validation reports (Appendix K of the RI report).

Activity	Comment
Summarize the effect of field sampling issues on the risk assessment, if applicable.	Sampling issues identified (e.g., tissue samples not collected when specimen not present at location) during the collection of biota samples are presented in Appendix B of the RI report. If sampling issues were identified as a deviation to the work plans, adjustments were made to meet the data quality objectives described in the QPP.
Analytical Techniques	
Were the analytical methods appropriate for quantitative risk assessment?	The analytical methods used for the analysis of PFAS in biota evolved over the course of the RI investigation. The analytical method at the start of the program was Method 537 modified. This was replaced by USEPA Method 1633. Detection limits (in general) decreased over the investigation. Efforts were made by the laboratories to increase sensitivity of instrumentation to lower detection limits. While data generated is considered usable, it is advisable to pay particular attention to reporting limits and acknowledge the change in methods over time when using data for quantitative risk assessment. Refer to QPP WS#15 for details..
Were detection limits adequate?	Reporting limits and method detection limits changed over the span of the RI due to analytical method changes and updates. As presented in QPP WS #15 and screening tables in the risk assessment, some detection limits for PFAS compounds in biota samples were above screening values. A detailed discussion of how reporting limits compare to USEPA RSLs or ESVs is included in QPP WS#15. This difference is taken into consideration for the risk assessment.
Summarize the effect of analytical technique issues on the risk assessment, if applicable.	Analytical technique did not affect data usability. No data were rejected due to analytical technique. Results that were rejected were generally due to matrix interferences of the individual sample and low extracted internal standard percent recoveries. In situations where an analyte is not detected and the LOD is greater than the PAL, risk assessment will acknowledge the discrepancy as described in WS#15 of the QPP.

Activity	Comment
Data Quality Objectives	
Precision - How were duplicates handled?	Field duplicates were not collected for tissue samples because each sample is a unique specimen. In order to measure precision, the laboratory was instructed to perform a laboratory duplicate analysis on a separate aliquot after the sample had been homogenized prior to extraction. Precision of these laboratory duplicate analyses was evaluated during the validation process. When precision quality control criteria were exceeded, associated data were qualified as necessary in accordance with the QPP, DoD guidelines, and professional judgement. No data were rejected due to precision criteria exceedances.
Accuracy - How were split samples handled?	Multiple PFAS laboratories analyzed biota samples throughout the program. Split samples were not sent to separate laboratories because variations in sample matrix would not have provided data to evaluate accuracy. Laboratories analyzed internal quality control samples to measure accuracy. When accuracy quality control criteria were not met, data usability was discussed in the associated validation report and results were qualified in accordance with the QPP, DoD guidelines, and professional judgement. No data were rejected due to accuracy criteria exceedances in split samples.
Representativeness - Indicate any problems associated with data representativeness (e.g., trip blank or rinsate blank contamination, chain of custody problems, etc.).	No data were rejected due to problems associated with data representativeness. If detections were reported in rinsate blanks, data was evaluated in accordance with the QPP, and qualifiers were added if appropriate. Data Validation reports are presented in Appendix K of the RI report.
Completeness - Indicate any problems associated with data completeness (e.g., incorrect sample analysis, incomplete sample records, problems with field procedures, etc.).	Samples were analyzed by the methods presented in the QPP and no instances of incorrect sample analysis were identified during the RI. If problems were observed in the field, documentation was made on the appropriate field data records as presented in Appendix C of the RI report. In general, no problems were identified when evaluating the completeness of the biota data set that would affect the overall usability of the data set. There were however a low number of PFAS results (<160) that were rejected during validation of the biota data, representing less than 2% of the PFAS biota results reported. The results that were rejected were originally reported by the laboratory as not detected at the reporting limit. No detected results were rejected during the data validation process. A completeness goal of 95% of usable data was presented in the QPP and was met.

Activity	Comment
Comparability - Indicate any problems associated with data comparability.	No data were rejected due to problems associated with data comparability. During the RI program, the laboratories utilized internal quality control samples (e.g., standard reference materials and matrix spike samples) to ensure that concentrations reported by the laboratory had good compatibility to known concentrations.
Were the DQOs specified in the QAPP satisfied?	The DQOs were presented in WS#11 of the QPP. Overall, the DQOs specified in the QPP were satisfied. There were reporting limits and method detection limits that were above screening values for a sub-set of PFAS compounds during the investigation. These compounds are presented in the risk assessment with a discussion of the overall impact.
Summarize the effect of DQO issues on the risk assessment, if applicable.	Other than the DQOs discussed above, there are no other DQO issues identified that should affect the overall risk assessment.
Data Validation and Interpretation	
What are the data validation requirements?	In accordance with the RI QPP, 100% of the biota PFAS data were subjected to Stage 2B validation. 10% of data were subjected to Stage 4 validation procedures. Refer to the data validation reports in Appendix K of the RI report for details.
What method or guidance was used to validate the data?	The QPP, applicable DoD and USEPA data validation guidelines, and professional judgement were used to validate the data. PFAS validation guidelines have evolved over the course of the RI along with the analytical methods as mentioned above. Refer to the associated data validation report presented in Appendix K of the RI report for specific references. Guidelines used were in alignment with DoD policy.
Was the data validation method consistent with guidance? Discuss any discrepancies.	Yes, the data validation method was consistent with guidance.
Were all data qualifiers defined? Discuss those which were not.	Yes, all data qualifiers were defined.
Which qualifiers represent useable data?	U, J, UJ, J+, J-, N
Which qualifiers represent unusable data?	R
How are tentatively identified compounds handled?	The laboratory did not report tentatively identified PFAS. In cases where qualitative identification of a PFAS was not certain or was called into question during validation, a full review of the raw data was performed, and the result was either determined to be non-detect and changed at the laboratory or qualified as “N” during validation.

Activity	Comment
Summarize the effect of data validation and interpretation issues on the risk assessment, if applicable.	Results that were qualified as R during data validation are considered unusable and will not be used in the risk assessment. Less than 160 PFAS sediment results were rejected during validation (refer to validation reports for details) and were not used on the risk assessment.
Additional notes: none	None.

Note:
The purpose of this Worksheet is to succinctly summarize the data useability analysis and conclusions. Reference specific pages in the Remedial Investigation and/or the Risk Assessment text to further expand on the information presented here.