

ATTACHMENT 1: QUALITY ASSURANCE/QUALITY CONTROL SUMMARY

This attachment summarizes the field and laboratory quality assurance (QA), data verification and data validation procedures utilized for the JPL groundwater monitoring program. Data validation was performed by an independent contractor, Environment Standards, Inc., of Valley Forge, Pennsylvania. Data verification and validation indicated that all volatile organic compounds (VOCs), perchlorate, and metals results obtained from the fourth quarter 2021 groundwater monitoring event were acceptable for their intended use of characterizing the aquifer.

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Field and laboratory quality control (QC) samples were collected and analyzed to fulfill quality requirements. Proper sample collection and handling procedures were utilized to ensure the integrity of the analytical results. A comprehensive QA/QC plan for groundwater monitoring is described in the *Work Plan for Performing a Remedial Investigation/Feasibility Study* (Ebasco, 1993).

FIELD QUALITY ASSURANCE/QUALITY CONTROL

The field QA/QC samples collected for JPL groundwater monitoring included field duplicate samples, equipment rinsate blanks and trip blanks. The QC sample results were used for the qualitative evaluation of the data. Table 1-1 summarizes analytical results for the QC samples (equipment blanks, source blanks [no source blanks collected], and trip blanks) during the fourth quarter 2021 groundwater monitoring event.

Field Duplicate Samples. Duplicate samples were collected to evaluate the precision of the sample collection process. Duplicate samples for VOCs, perchlorate, metals were collected from monitoring wells MW-3 (Screen 2), MW-4 (Screen 2), MW-11 (Screen 2), MW-12 (Screen 2), MW-17 (Screen 3), MW-18 (Screen 4), MW-19 (Screen 2), and MW-20 (Screen 3). The analytical results for the field duplicate samples were comparable to the results of the original groundwater samples for VOCs (Table 1) and metals (Table 2), with some exceptions:

- Perchlorate in the MW-3 (Screen 2) duplicate pair (1.4J $\mu\text{g/L}$ vs. non-detect), MW-4 (Screen 2) duplicate pair (59.1 $\mu\text{g/L}$ vs. 57.2 $\mu\text{g/L}$), MW-17 (Screen 3) duplicate pair (1.5J $\mu\text{g/L}$ vs. 1.2J $\mu\text{g/L}$), MW-18 (Screen 4) duplicate pair (15.0 $\mu\text{g/L}$ vs. 15.8 $\mu\text{g/L}$), and MW-19 (Screen 2) duplicate pair (3.6 $\mu\text{g/L}$ vs. 3.5 $\mu\text{g/L}$).
- Carbon tetrachloride in MW-18 (Screen 4) duplicate pair (3.1J $\mu\text{g/L}$ vs. 1.8J $\mu\text{g/L}$).
- TCE in the MW-18 (Screen 4) duplicate pair (1.6J $\mu\text{g/L}$ vs. 1.0J $\mu\text{g/L}$), MW-19 (Screen 2) duplicate pair (0.5J $\mu\text{g/L}$ vs. 1.5J $\mu\text{g/L}$), and MW-20 (Screen 3) duplicate pair (non-detect vs. 0.2J $\mu\text{g/L}$).
- PCE in the MW-18 (Screen 4) duplicate pair (1.1 $\mu\text{g/L}$ vs. 0.8 $\mu\text{g/L}$), MW-19 (Screen 2) duplicate pair (0.7J $\mu\text{g/L}$ vs. 2.4J $\mu\text{g/L}$), and MW-20 (Screen 3) duplicate pair (0.7J $\mu\text{g/L}$ vs. 1.8J $\mu\text{g/L}$).
- Hexavalent chromium in the MW-3 (Screen 2) duplicate pair (0.79J vs. 0.74J $\mu\text{g/L}$), and MW-18 (Screen 4) duplicate pair (2.30J $\mu\text{g/L}$ vs. 2.20J $\mu\text{g/L}$).
- Total chromium in the MW-3 (Screen 2) duplicate pair (0.5J $\mu\text{g/L}$ vs. 0.7J $\mu\text{g/L}$), MW-18 (Screen 4) duplicate pair (2.5J $\mu\text{g/L}$ vs. 2.6J $\mu\text{g/L}$), and MW-19 (Screen 2) duplicate pair (1.2J $\mu\text{g/L}$ vs. 0.9J $\mu\text{g/L}$).

The source of the differences could not be determined.

Equipment Rinsate Blanks. Equipment rinsate blanks were collected each day that non-dedicated sampling equipment was used. The equipment rinsate blanks, consisting of distilled water run through the sampling equipment after decontamination, were

analyzed for all contaminants of concern to monitor possible cross-contamination of the samples due to inadequate decontamination.

- Hexavalent chromium was detected at estimated levels in EB-1-102621 (0.08J $\mu\text{g/L}$), EB-2-102721 (0.12J $\mu\text{g/L}$), EB-3-102821 (0.10J $\mu\text{g/L}$), EB-4-102921 (0.11J $\mu\text{g/L}$), EB-5-110121 (0.11J $\mu\text{g/L}$), EB-6-110221 (0.08J $\mu\text{g/L}$), EB-7-110321 (0.12J $\mu\text{g/L}$), and EB-8-110421 (0.12J $\mu\text{g/L}$).
- Total chromium was detected at estimated levels in EB-5-110121 (0.5J $\mu\text{g/L}$), and EB-7-110321 (0.5J $\mu\text{g/L}$).
- Methylene chloride was detected in EB-1-102621 (0.4J $\mu\text{g/L}$), EB-2-102721 (0.7 $\mu\text{g/L}$), EB-3-102821 (0.6 $\mu\text{g/L}$), EB-4-102921 (0.6 $\mu\text{g/L}$), EB-5-110121 (0.6 $\mu\text{g/L}$), EB-6-110221 (0.6 $\mu\text{g/L}$), and EB-8-110421 (0.9 $\mu\text{g/L}$).

The source of the hexavalent chromium, total chromium and methylene chloride contamination in the equipment blanks could not be determined. Detected hexavalent chromium, total chromium and methylene chloride concentrations in the equipment blanks were compared to the detected concentrations in the associated monitoring wells during the data validation process to determine if data validation qualifiers were necessary.

No other VOC contaminants, metals or tentatively identified compounds (TICs) were detected in the equipment blanks as shown in Table 1-1.

Trip Blanks. Trip blanks, which consisted of reagent-grade water in vials transported with the sample bottles to and from the field, were submitted to the laboratory with each shipment of groundwater samples. Trip blanks were used to help identify cross-contamination of groundwater samples during transport and sample handling procedures. No total chromium, hexavalent chromium, VOC contaminants or TICs were detected in the trip blanks as shown in Table 1-1.

Source Blanks. No source blanks were collected during the fourth quarter groundwater monitoring event.

LABORATORY QUALITY ASSURANCE/QUALITY CONTROL

Laboratory QC samples included surrogate compounds (for VOC analyses), matrix spike samples, blank spike samples, and method blanks. The results of the laboratory QC samples were used by the laboratory to determine the accuracy and precision of the analytical techniques, and to identify anomalous results due to laboratory contamination or instrument malfunction.

DATA VERIFICATION AND VALIDATION

The purpose of data verification and validation is to ensure that the data collected meet the data quality objectives (DQOs) outlined in the Quality Assurance Project Plan of the Groundwater Monitoring Plan (Ebasco, 1993).

Data Verification. Data verification is a review of the analytical data that includes confirming that the sample identification numbers on the laboratory reports match those on the chain-of-custody records. Data verification also includes a review of the analytical data reports to confirm that all samples were analyzed and all required

analytes were quantified for each sample.

Data Validation. Data validation is a systematic review of the analytical data to determine the compliance with established method performance criteria. Validation of a data package included review of the technical holding time requirements, review of sample preparation, review of the initial and continuing calibration data, review and recalculation of the laboratory QC sample data, review of the equipment performance, reconciliation of the raw data with the reduced results, identification of data anomalies, and qualification of data to identify data usability limitations.

Data validation was performed by an independent contractor, Environment Standards, Inc., of Valley Forge, Pennsylvania. All of the data provided by BC Laboratories, Inc., of Bakersfield, California were validated. Ninety percent of the data were subjected to Level III validation and 10 percent of the data were subjected to Level IV validation in accordance with the EPA Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review (U.S. EPA, 2017; 2017).

Data Validation Qualifiers. Analytical data were qualified based on the data validation. Data qualifiers were assigned in accordance with EPA guidelines.

All samples were analyzed for VOCs, perchlorate and metals within the analytical holding times. Data validation indicated that all the data from the fourth quarter 2021 groundwater monitoring event were acceptable for their intended use of characterizing aquifer quality. The data validation reports are included in Attachment 2.

REFERENCES

- Ebasco. 1993. *Work Plan for Performing a Remedial Investigation/Feasibility Study*. National Aeronautics and Space Administration Jet Propulsion Laboratory, Pasadena, California. December.
- U.S. EPA. 2017. *USEPA National Functional Guidelines for Organic Superfund Methods Data Review*. January.
- U.S. EPA. 2017. *USEPA National Functional Guidelines for Inorganic Superfund Methods Data Review*. January.

**TABLE 1-1
SUMMARY OF CONTAMINANTS DETECTED IN QUALITY CONTROL SAMPLES
COLLECTED DURING THE 4th QUARTER 2021 SAMPLING EVENT
(All concentrations reported in µg/L.)**

Sample ID Number	Associated Samples	Total Chromium		Hexavalent Chromium		1, 2, 3-Trichloropropane		Methylene Chloride		2-Butanone		Other Organic Compounds			TICs		
		Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Compound	Result	Qualifier	Compound	Result	Qualifier
Equipment Blanks																	
EB-1-102621	MW-14-2, MW-14-3, MW-14-4, MW-14-5, MW-25-1, MW-25-2, MW-25-3, MW-25-4, MW-25-5	ND		0.08	J	ND		0.4	J	ND		ND					ND
EB-2-102721	MW-22-2, MW-22-3, MW-22-4, MW-22-5, MW-24-1, MW-24-2, MW-24-3, MW-24-4, MW-24-5	ND		0.12	J	ND		0.7		ND		ND					ND
EB-3-102821	MW-17-2, MW-17-3, MW-17-4, MW-17-5, MW-3-2, MW-3-3, MW-3-4, MW-3-5	ND		0.10	J	ND		0.6		ND		ND					ND
EB-4-102921	MW-23-2, MW-23-3, MW-23-4, MW-23-5	ND		0.11	J	ND		0.6		ND		ND					ND
EB-5-110121	MW-12-2, MW-12-3, MW-12-4, MW-12-5, MW-4-2, MW-4-3, MW-4-4, MW-4-5	0.5	J	0.11	J	ND		0.6		ND		ND					ND
EB-6-110221	MW-18-2, MW-18-3, MW-18-4, MW-18-5, MW-20-2, MW-20-3, MW-20-4, MW-20-5	ND		0.08	J	ND		0.6		ND		ND					ND
EB-7-110321	MW-11-1, MW-11-2, MW-11-3, MW-11-4, MW-11-5, MW-21-2, MW-21-3, MW-21-4, MW-21-5	0.5	J	0.12	J	ND		ND		ND		ND					ND
EB-8-110421	MW-1, MW-9, MW-15, MW-19-1, MW-19-2, MW-19-3, MW-19-4, MW-19-5	ND		0.12	J	ND		0.9		ND		ND					ND
Source Blanks																	
No Source Blanks collected																	
Trip Blanks																	
EB-1-10262	MW-14-2, MW-14-3, MW-14-4, MW-14-5, MW-25-1, MW-25-2, MW-25-3, MW-25-4, MW-25-5	NA		NA		ND		ND		ND		ND					ND
EB-2-102721	MW-22-2, MW-22-3, MW-22-4, MW-22-5, MW-24-1, MW-24-2, MW-24-3, MW-24-4, MW-24-5	NA		NA		ND		ND		ND		ND					ND
EB-3-102821	MW-17-2, MW-17-3, MW-17-4, MW-17-5, MW-3-2, MW-3-3, MW-3-4, MW-3-5	NA		NA		ND		ND		ND		ND					ND
EB-4-102921	MW-23-2, MW-23-3, MW-23-4, MW-23-5	NA		NA		ND		ND		ND		ND					ND
TB-5-110121	MW-12-2, MW-12-3, MW-12-4, MW-12-5, MW-4-2, MW-4-3, MW-4-4, MW-4-5	NA		NA		ND		ND		ND		ND					ND
EB-6-110221	MW-18-2, MW-18-3, MW-18-4, MW-18-5, MW-20-2, MW-20-3, MW-20-4, MW-20-5	NA		NA		ND		ND		ND		ND					ND
EB-7-110321	MW-11-1, MW-11-2, MW-11-3, MW-11-4, MW-11-5, MW-21-2, MW-21-3, MW-21-4, MW-21-5	NA		NA		ND		ND		ND		ND					ND
EB-8-110421	MW-1, MW-9, MW-15, MW-19-1, MW-19-2, MW-19-3, MW-19-4, MW-19-5	NA		NA		ND		ND		ND		ND					ND
Notes																	
NA Not Analyzed																	
ND Not/None Detected																	
J Analyte concentration is an estimated value																	
U Analyte was analyzed for but not detected at or above the stated limit																	
UJ Analyte was analyzed for but not detected; analyte concentration is an estimated value																	