Table 4-1. Data Quality Objectives Summary Table

DQO Step	Details of DQO Step per EPA DQO Guidance (2006)	BFF Spill Groundwater Investigation Geophysics Lithology	BFF Spill Groundwater Investigation Geophysics LNAPL Extent	BFF Spill Groundwater Investigation Groundwater Flow	BFF Spill Groundwater Investigation LNAPL Extent	BFF Spill Groundwater Investigation Dissolved-Phase Extent
1) State the Problem	Summarize the contamination problem requiring new data, resources available, and CSM.	Identify/locate geologic units controlling the migration of LNAPL and migration of LNAPL dissolved phase.	Qualitative LNAPL limits on groundwater table at the BFF unknown.	Identification of groundwater gradient and probable contaminant flow paths at the site are required to predict current and future contamination trends and to support risk and IM assessments.	Delineation of LNAPL plume in the BFF Spill area.	Nature and extent of dissolved phase plume defined by new wells unknown.
2) Identify the Decision	Identify the decision that requires new environmental data to address the contamination problem.	Determine the location of fine-grained lithologic units within the vadose and saturated zones at the BFF that control LNAPL and dissolved-plume migration.	Determine the extent of the LNAPL plume on the water table.	Determine gradients and flow paths within all three groundwater horizons at the site.	Obtain LNAPL level measurements from monitoring wells at BFF.	Determine the nature and extent of the dissolved-phase contaminant plume that exceeds established MCLs for groundwater at the site.
3) Identify Inputs to the Decision	Identify the information needed to support the decision and specify which inputs require new environmental measurements.	Borehole gamma, induction, and neutron logging measured in newly installed monitoring wells. Identify the areas of high and low permeability (fine- and coarse-grained materials) and preferential flow-path limits of LNAPL using its physical properties as a non-conducting material.	Borehole gamma, induction, and neutron logging measured in newly installed monitoring wells. Identify the limits of LNAPL using its chemical properties as a non-conducting material.	Collect groundwater monitoring levels and calculate groundwater elevations and flow patterns. Collect synoptic data set from all newly installed and existing groundwater monitoring wells.	LNAPL thickness measurements in proposed monitoring wells installed for the purpose of LNAPL plume delineation. Groundwater samples collected from newly installed monitoring wells after installation and development have been completed. Samples will be analyzed for VOCs, EDB, TPH, SVOCs, lead, cations, anions, methane, dissolved iron and manganese, nitrate-nitrite, sulfate-sulfide, TOC, phosphorus, and alkalinity.	Groundwater samples collected from newly installed monitoring wells after installation and development have been completed provides types and concentrations of contaminants. Samples will be analyzed for VOCs, EDB, TPH, SVOCs, lead, cations, anions, methane, dissolved iron and manganese, nitrate-nitrite, sulfate-sulfide, TOC, phosphorus, and alkalinity.
4) Define the Study Boundaries	Specify the spatial and temporal aspects of the environmental media that the data must represent to support the decision.	Study boundaries are indicated on Figure 2-1.	Study boundaries are indicated on Figure 2-1.	Includes all existing monitoring wells and newly installed A, B, and C monitoring wells monthly during the completion of the groundwater investigation.	Proposed monitoring wells installed within the LNAPL plume as currently delineated.	All existing monitoring wells and newly installed shallow, intermediate, and deep monitoring wells.
5) Develop a Decision Rule	Develop a logical "if…then" statement that defined the conditions that would cause the decision maker to choose among alternative actions.	If proposed groundwater monitoring wells being installed for the purpose of monitoring contamination within the LNAPL plume do not address areas that have been delineated as possible preferential flow paths for LNAPL or dissolved LNAPL to the groundwater table or within groundwater, consider modifying proposed SVE and monitoring well locations within the LNAPL plume.	If proposed groundwater monitoring wells being installed for the purpose of monitoring contamination within the LNAPL plume are not within the plume, consider adjusting the location of these points or eliminate them from the drilling program. If monitoring wells being installed to monitor/delineate the dissolved-phase contaminant plume are located within the product boundary, adjust the locations of these points such that they are no longer within the boundary of the LNAPL plume.	Collect groundwater levels from all newly installed groundwater monitoring wells and existing monitoring wells as soon as enough new wells are installed to augment existing data. Calculate horizontal and vertical gradient to determine groundwater flow patterns and determine if the patterns are consistent with the current CSM on which the newly installed monitoring well locations are based. If the flow patterns are different, evaluate the locations of any monitoring wells that have not been installed and adjust locations if necessary.	If proposed monitoring wells installed for the purpose of monitoring the LNAPL plume do not contain LNAPL, determine if the data point adjusts the CSM enough that the proposed drilling program with regards to both the LNAPL and dissolved phase should be altered to reflect the new understanding of the site. Monitoring well locations should be adjusted or eliminated accordingly. LNAPL screening level 0.1 ft.	If groundwater samples in monitoring wells proposed for the purpose of delineating the extent of the groundwater plume (sentinel wells) are impacted above MCLs, the dissolved-phase plume has not been delineated and additional wells must be installed to complete the delineation. If all detected compounds are not identified then additional analyses must be performed.
6) Specify Limits on Decision Errors	Specify the decision maker's acceptable limits on decision errors, which are used to establish performance goals for limiting uncertainty in the data.	Borehole geophysics measurements obtained is less than 1 ft.	Borehole geophysics measurements obtained is less than 1 ft.	Synoptic or near synoptic data for comparability. Heads measured to 0.01 ft. Precision to within a 0.01 ft, measured using a water-level indicator. All horizons measured.	Synoptic or near synoptic data for comparability. LNAPL thickness measured to 0.01 ft. LNAPL thickness measured to 0.01 ft. Precision to within a 0.01 ft, measured using a product water interface probe.	Project QAPP will be used. A second confirmation sample will be collected from any monitoring well that exceeds QA/QC controls before implementation of the contingency.

Table 4-1. Data Quality Objectives Summary Table (concluded)

DQO Step	Details of DQO Step per EPA DQO Guidance (2006)	BFF Spill Groundwater Investigation Geophysics Lithology	BFF Spill Groundwater Investigation Geophysics LNAPL Extent	BFF Spill Groundwater Investigation Groundwater Flow	BFF Spill Groundwater Investigation LNAPL Extent	BFF Spill Groundwater Investigation Dissolved-Phase Extent
7) Optimized Design	Identify the most resource-effective sampling and analysis design for generating data that are expected to satisfy the DQOs.	Borehole geophysics measurements conducted following completion of each monitoring well prior to first sampling of well.	Borehole geophysics measurements conducted following completion of each monitoring well prior to first sampling of well.	Conducted monthly during groundwater investigation/drilling stage of the groundwater investigation.	Conducted monthly during groundwater investigation/drilling stage of the groundwater investigation.	Groundwater samples collected from newly installed monitoring wells after installation and development have been completed. Samples will be analyzed for VOCs, EDB, TPH, SVOCs, lead, cations, anions, methane, dissolved iron and manganese, nitrate-nitrite, sulfate-sulfide, TOC, phosphorus, and alkalinity.