3.0 DATA QUALITY ASSURANCE SUMMARY

3.1 DATA QUALITY REVIEW METHODS

A quality assurance/quality control (QA/QC) data review was performed on all samples. This review included the evaluation of the following QA/QC elements: verification of compliance with the quality assurance project plan (QAPP), sample preservation and handling procedures, holding times, initial and continuing calibrations, method reporting limits (MRLs), QC results (i.e., surrogates, internal standards, matrix spike/matrix spike duplicates [MS/MSD], laboratory control samples [LCS], field duplicates), rinsate blanks, laboratory blank and trip blank contamination, data completeness, and data qualifiers assigned by the laboratory.

A data validation was performed on 10 percent of the samples. The data validation included all of the elements of the data review, as well as the evaluation of raw data and calculation verification of 10 percent of the analytical results.

The analytical data were validated following the guidelines and procedures outlined in the EPA's *Contract Laboratory Program National Functional Guidelines for Organic Data Review* (USEPA 1999c) and *Inorganic Data Review* (USEPA 1994), modified for the methods used and project-specific QA/QC criteria.

Qualifiers were added to the data during the review as necessary:

- U The analyte was analyzed for but was not detected above the reporting limit.
- J The analyte was positively identified; the associated numerical value is an estimate of the concentration of the analyte in the sample.
- UJ The analyte was not detected above the sample reporting limit. However, the reporting limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- R The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Qualification modifies the usefulness of the individual values to which they are assigned. Estimated values are still usable. Sample results requiring qualification based on the data review are summarized in the data quality review report and addendum in Appendix D. Results of the

QA/QC reviews were evaluated to determine how well the sampling and analysis process met the project data quality objectives for precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS). Overall, project data quality objectives were met and the data, as qualified, are acceptable for project uses. Data quality issues that affect the uncertainty associated with specific data sets are presented below.

3.2 SUMMARY OF PARCCS REVIEW FOR CHEMICAL ANALYSES

3.2.1 Precision

Precision is defined as the degree of agreement between or among independent, similar, or repeated measures. Precision is expressed in terms of analytical variability. For this project, analytical variability is measured as the relative percent difference (RPD) or coefficient of variation between analytical laboratory duplicates and between the MS and MSD analyses. Monitoring variability is measured by analysis of blind field duplicate samples. The required frequency of soil and water field duplicate (10 percent) collection and analysis was met.

Laboratory duplicate RPDs were generally within control limits. There were some soil field duplicate RPD exceptions. The soil field duplicate RPD exceptions occurred primarily for the samples with high concentrations of polycyclic aromatic hydrocarbons (PAHs). The field duplicate exceptions may have been caused by sample heterogeneity. Sample results were not qualified based on field or laboratory duplicate RPDs.

3.2.2 Accuracy

Accuracy is the amount of agreement between a measured value and the true value. It is measured as the percent recoveries of matrix spikes and matrix spike duplicates, organic surrogate compounds, and the laboratory control samples. Additional potential bias is quantitated by the analysis of calibration standards and blank samples (e.g., method, rinsate, and trip blanks).

Soil and water method, rinsate, and trip blanks analyzed for VOCs had detections of common laboratory contaminants (methylene chloride, acetone, toluene, and styrene). Common laboratory contaminants were also detected in all of the method blanks associated with the SVOC analysis. Rinsate blanks associated with the SVOC analysis also exhibited contamination. Some calibration and rinsate blanks associated with the metals analysis exhibited contamination. Samples associated with the contaminated method, rinse, trip, and calibration blanks were qualified as nondetect if the concentrations in the samples were less than 5 times the concentrations in the blanks. For common laboratory contaminants, the samples were qualified as nondetect if the concentrations in the samples were less than 10 times the concentrations in the

blanks. Method, rinsate, and calibration blanks associated with all other analyses were free of contamination.

Surrogates showed poor recovery for soil sample SS-033-01 in the VOC analysis and SS-021-04 in the SVOC analysis due to matrix interference. Surrogates for concrete sample DC-001 (and the associated field duplicate) and product sample PD-001 also exhibited poor surrogate recoveries in the SVOC analysis. Detected compounds in the affected samples were qualified as estimated, and nondetected samples were qualified as rejected.

All monitoring well and microwell groundwater samples collected during September 2001 were qualified as estimated for phenol and 4-nitrophenol due to low MS/MSD percent recovery (<45 percent). Three soil metals matrix spike samples exhibited both high and low recoveries of several compounds, including aluminum (high), mercury, calcium, iron, and lead (all low). All analyte results associated with the matrix spike samples outside of the control limits were qualified as estimated. One water matrix spike exhibited a low percent recovery for dissolved sodium. The associated samples were qualified as estimated. The required frequency of MS/MSD sample analysis (20 percent) was met for all analyses.

All soil and water LCS percent recoveries were within the associated QC requirements, with some exceptions in the VOC, SVOC, and reactive cyanide analyses. One soil VOC LCS/LCSD percent recovery was less than 10 percent for cyclohexane. Associated sample cyclohexane results were rejected. Samples associated with LCS/LCSD results outside the percent recovery criteria were qualified as estimated.

Internal standard percent recoveries and retention times were acceptable. No data were qualified due to internal standards.

All instrument checks and initial and continuing calibration checks were generally within criteria. The VOC initial calibration associated with groundwater samples MW-003, MW-004, MW-303, and TB-021302 exhibited a low response for 2-butanone. The nondetect 2-butanone results were qualified as rejected in the associated sample. The SVOC initial calibration for caprolactum was outside of the control limit. All of the associated sample results for caprolactum were nondetects; therefore, the caprolactum results in the associated samples were qualified as rejected. Some groundwater monitoring well and microwell samples were qualified as estimated for total and dissolved mercury due to low initial and continuing calibration verification samples. Note that the “low” recoveries occurred because project-specific requirements are different from method requirements.

3.2.3 Representativeness

Representativeness is the degree to which sample results represent the system under study. This component is generally considered during the design phase of a project. This project uses the results of all analyses to evaluate the data in terms of its intended use. Site locations for sampling are placed using a biased approach to maximize the likelihood of locating and identifying site contamination, if present. Areas of apparent contamination have been selected to be representative of potential impacts from past activities. Representativeness is evaluated by examining chain-of-custody (COC) paperwork, field notes, and sample labels to verify that analysis was performed within allowable holding times and that proper documentation was maintained to allow traceability of analytical results to specific field sampling locations.

All soil and groundwater samples were received at the laboratory intact and under proper COC documentation. The samples were properly preserved, and extracted and analyzed within the required holding times, with one exception. The secondary dilution of sample SS-013-12 was performed 2 days outside of the holding time. The diluted result was qualified as estimated.

The laboratory noted that only one sample container was received for concrete sample DC-301 (duplicate of DC-001). The sample consisted of large concrete pieces, which required pulverization by laboratory personnel in order to run the analyses. As a result of this action, the laboratory noted that common laboratory contaminants (i.e., methylene chloride, acetone, 2-butanone, and cyclohexane) might be detected in the sample. Sample DC-301 did exhibit laboratory contamination; however, the primary sample DC-001 (with which the laboratory did not experience sample preparation problems) exhibited similar concentrations of the same contaminants. The sample results were not qualified on the basis of the laboratory notation.

Sampling representativeness can also be evaluated using the field duplicates collected and laboratory analyzed. As discussed under Section 3.2.1, laboratory duplicates and field duplicates were generally within control limits. Instances of higher variability were noted, particularly in samples that contained high levels of PAHs. Such heterogeneous conditions are expected in soil matrices and are especially common in areas of known contamination.

3.2.4 Comparability

Comparability is the degree to which data from one study can be compared with data from historical studies at the site, other similar studies, reference values (such as background), reference materials, and screening values. This goal is achieved through the use of standard techniques to collect samples, EPA- and state-approved methods to analyze samples, and consistent units to report analytical results. Data comparability also depends on data quality. Data of unknown quality cannot be compared.

Compound identification was reevaluated for 100 percent of the SVOC samples. The retention times were within the calibration criteria; however, several compound spectra did not meet method identification criteria (i.e., relative intensities of the major ions within ± 20 percent of the corresponding ions in the reference spectra). Analytes that did not meet spectra identification criteria were qualified as nondetect at the appropriate quantitation level.

Alumina and sulfur cleanup procedures were performed on the samples analyzed for PCB hydrocarbon mixtures and pesticides. Florisil, gel permeation chromatography, and acid cleanup procedures were not performed on the sample extracts. No significant matrix interference was noted in the chromatograms reviewed.

3.2.5 Completeness

Completeness is evaluated by calculating the amount of data acceptable for project uses. It is the ratio of the number of acceptable results divided by the planned number of samples. Results for some groundwater and soil samples were rejected because the quality control data were outside of the control limits. These data should be used with caution. Overall completeness for this project is 99 percent. The project target goal for completeness of 98 percent was attained.

3.2.6 Sensitivity

The sensitivity of the analytical methods (i.e., MRLs) identified for this project is insufficient to allow comparison of the analytical data to project screening values. This insufficiency is due in part to the low values of some of the criteria and also to the necessary dilution of some of the samples due to matrix interference and/or high analyte concentration. The laboratory reported compounds detected below the MRL and above the method detection limit (MDL). These estimated compound concentrations are used, in addition to the fully quantitated concentrations, for comparison to screening criteria.

Actual reporting limits were compared with required reporting limits and were determined to be acceptable for this project. The laboratory performed all analyses according to standard operating procedures approved for this project.

3.3 OVERALL DATA USABILITY

After review of information contained in the laboratory deliverables, an evaluation was performed to determine how well the analytical portion of the project was executed and to what extent the chemical data achieved the project-specific data quality objectives.

The purpose of the SI at the NPD laboratory site was to complete a consistent sampling and analysis scope that can be used to fill the data gaps remaining after previous investigations. Soil, sediment, groundwater, concrete, and product samples were collected to meet project objectives described in Section 1.2.

The data are acceptable for use on this project. There were no major quality control issues that would prevent the project data from being used to prepare a risk assessment, for evaluating compliance with regulatory screening levels, or for other potential uses. Uncertainty in data quality was primarily the result of high concentrations of target analytes in project samples and matrix interference, which resulted in poor QC sample results. The low-level SVOC results should be used with caution due to the inability of the laboratory to provide spectra to support its findings.