

# 4

## Quality Assurance/ Quality Control

QA/QC data are necessary to determine precision and accuracy and to demonstrate the absence of interferences and/or contamination of sampling equipment, glassware and reagents. Specific QC requirements for laboratory analyses are incorporated in the *Contract Laboratory Program Statement of Work for Organic Analyses* (EPA 2007). These QC requirements or equivalent requirements found in the analytical methods were followed for analytical work on the IA. This section describes the QA/QC measures taken for the IA and provides an evaluation of the usability of data presented in this report.

Data from the Manchester Environmental Laboratory were reviewed and validated by EPA chemists. Data qualifiers were applied as necessary according to the following guidance:

- EPA (2008) *Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review*.

In the absence of other QC guidance, method- and/or SOP-specific QC limits were also utilized to apply qualifiers to the data.

### 4.1 Satisfaction of Data Quality Objectives

The following EPA (EPA 2000) guidance document was used to establish data quality objectives (DQOs) for this IA:

- *Guidance for the Data Quality Objectives Process* (EPA QA/G-4), EPA/600/R-96/055.

The EPA Task Manager determined that definitive data without error and bias determination would be used for the sampling and analyses conducted during the field activities. The data quality achieved during the field work produced sufficient data that met the DQOs stated in the SQAP (E & E 2008a). A detailed discussion of accomplished IA objectives is presented in the following sections.

### 4.2 QA/QC Samples

QA samples (trip blanks) were collected. QA samples included five trip blank samples. Trip blank samples were collected at the required frequency of at least one per VOC sample cooler. Rinsate blank samples were not required as all samples were collected with dedicated sampling equipment. QC samples

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included matrix spike (MS)/matrix spike duplicate (MSD) samples for organic analyses at a rate of one MS/MSD per 20 samples per matrix.

### 4.3 Project-Specific Data Quality Objectives

The laboratory data were reviewed to ensure that DQOs for the project were met. The following describes the laboratory's abilities to meet project DQOs for precision, accuracy and completeness and the field team's ability to meet project DQOs for representativeness and comparability. The laboratory and the field team were able to meet DQOs for the project.

#### 4.3.1 Precision

Precision measures the reproducibility of the sampling and analytical methodology. Laboratory and field precision is defined as the relative percent difference (RPD) between duplicate sample analyses. The laboratory duplicate samples measure the precision of the analytical method. The RPD values were reviewed for all laboratory samples. No sample results were qualified based on laboratory duplicate QC outliers. The project DQO for precision of 90% was met.

#### 4.3.2 Accuracy

Accuracy measures the reproducibility of the sampling and analytical methodology. Laboratory accuracy is defined as the MS or laboratory control sample (LCS) percent recoveries (%Rs) for all laboratory analyses. A total of 15 sample results (approximately 0.35% of the data) were qualified as estimated quantities (J or UJ) and 14 sample results (approximately 0.32% of the data) were rejected (R) based on LCS results.

The MS %R values were reviewed for all MS analyses. No sample results were qualified based on MS outliers. The project DQO for accuracy of 90% was met.

#### 4.3.3 Completeness

Data completeness is defined as the percentage of usable data (usable data divided by the total possible data). All laboratory data were reviewed for data validation and usability. A total of 14 results were rejected (approximately 0.32% of the data); therefore, the project DQO for completeness of 90% was met.

#### 4.3.4 Representativeness

Data representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point or environmental condition. The number and selection of samples were determined in the field to account accurately for site variations and sample matrices. The project DQO for representativeness of 90% was met.

#### 4.3.5 Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Data produced for this site followed applicable field sampling techniques and specific analytical methodology. The project DQO for comparability of 90% was met.

#### **4.4 Laboratory QA/QC Parameters**

The laboratory data also were reviewed for holding times/temperatures, laboratory blank samples, and trip blank samples. These QA/QC parameters are summarized below. In general, the laboratory and field QA/QC parameters were considered acceptable.

##### **4.4.1 Holding Times/Temperatures**

All samples were analyzed within holding time limits and were maintained within temperature limits.

##### **4.4.2 Laboratory Blanks**

All laboratory blanks met the frequency criteria. The following potential contaminant of concern was detected in the laboratory blanks.

- Volatile Organic Compound: Acetone.

See the data validation memoranda for qualifiers applied based on laboratory blank contamination.

##### **4.4.3 Trip Blanks**

The water trip blanks were collected from a deionized water source. Five water trip blank samples were collected during the field event and were combined into one cooler; therefore, meeting the frequency criteria of at least one trip blank per cooler per 20 VOC samples. When the same contaminant was detected in more than one trip blank, the highest trip blank concentration was used to compare against field sample results. 2-Butanone and tetrahydrofuran were detected in one or more trip blanks and sample results were qualified as not detected (U) if the associated sample result was less than five times the trip blank concentration (or 10 times for the common laboratory contaminant 2-butanone). The qualifiers are included in the data tables and in the data validation memorandum.

#### **4.5 Field and Fixed Laboratory Comparison**

A total of 55 water samples were collected for this project, including five trip blank samples. Fifty-four samples were analyzed at a fixed laboratory following EPA SW-846 Method 8260 and 50 samples were analyzed at the field laboratory following EPA Method 8260. Correlation values for TCE were created in Tables 4-1 and 4-2 to allow for the correlation of data that were provided in incompatible formats. Non-detect values were converted to one-half of the quantitation limit and data validation qualifiers were ignored to generate the correlation values.

According to EPA guidance, a minimum coefficient of determination ( $r^2$ ) of 0.700 is necessary to consider field analytical results acceptable when compared with laboratory confirmation results. All sample results were initially grouped together (Table 4-1) and the  $r^2$  value was 0.836 (Figure 4-1). The high proportion of results less than the respective sample quantitation limits relative to the sample population possibly skewed the data; therefore, the 12 samples which had positive



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results in the field and/or fixed laboratory were also grouped as a separate set of data. The  $r^2$  of the 12 positive sample results was 0.797 (Table 4-2; Figure 4-2). The remainder of the results (38 samples which were all non-detects in both field and fixed laboratory) were not statistically analyzed as all correlation values for the field laboratory were 0.5 and all results for the fixed laboratory were 0.25, yielding one point on the graph for 38 samples, so a determination of  $r^2$  was not possible. Both  $r^2$  values (i.e.,  $r^2$  values inclusive and exclusive of outliers) were greater than 0.700, therefore the field TCE results are considered acceptable in relationship to the fixed laboratory results.

Table 4-1 Field versus Fixed Laboratories TCE Results Correlation - All Sample Results

Sample Number	EPA Regional Tracking Number	TCE Concentration (µg/L)				Correlation Value	
		Field Laboratory	Qualifier	Fixed Laboratory	Qualifier	Field Laboratory	Fixed Laboratory
LD01GW	08494001	1.0	U	0.50	U	0.5	0.25
LD02GW	08494002	1.0	U	0.50	U	0.5	0.25
LD03GW	08494003	1.0	U	0.50	U	0.5	0.25
LD04GW	08494004	1.0	U	0.50	U	0.5	0.25
LD05GW	08494006	1.0	U	0.50	U	0.5	0.25
LD06GW	08494007	<b>18.4</b>		<b>3.0</b>		<b>18.4</b>	<b>3</b>
LD07GW	08494008	<b>0.7</b>	<b>J</b>	0.50	U	<b>0.7</b>	0.25
LD08GW	08494009	<b>0.7</b>	<b>J</b>	0.50	U	<b>0.7</b>	0.25
LD09GW	08494010	1.0	U	0.50	U	0.5	0.25
LD10GW	08494011	1.0	U	0.50	U	0.5	0.25
LD11GW	08494012	<b>1.6</b>		<b>2.8</b>		<b>1.6</b>	<b>2.8</b>
LD12GW	08494013	1.0	U	0.50	U	0.5	0.25
LD13GW	08494014	1.0	U	0.50	U	0.5	0.25
LD14GW	08494015	1.0	U	0.50	U	0.5	0.25
LD15GW	08494016	1.0	U	0.50	U	0.5	0.25
LD16GW	08494017	1.0	U	0.50	U	0.5	0.25
LD17GW	08494018	<b>3.6</b>		<b>8.2</b>		<b>3.6</b>	<b>8.2</b>
LD18GW	08484019	<b>6.6</b>		<b>15</b>		<b>6.6</b>	<b>15</b>
LD19GW	08494022	1.0	U	0.50	U	0.5	0.25
LD20GW	08494023	1.0	U	0.50	U	0.5	0.25
LD21GW	08494024	1.0	U	0.50	U	0.5	0.25
LD22GW	08494025	1.0	U	0.50	U	0.5	0.25
LD23GW	08494026	1.0	U	0.50	U	0.5	0.25
LD24GW	08494027	1.0	U	0.50	U	0.5	0.25
LD25GW	08494028	1.0	U	0.50	U	0.5	0.25
LD26GW	08494029	1.0	U	<b>1.0</b>		0.5	<b>1</b>
LD27GW	08494030	1.0	U	0.50	U	0.5	0.25
LD28GW	08494031	1.0	U	0.50	U	0.5	0.25
LD29GW	08504001	1.0	U	0.50	U	0.5	0.25
LD30GW	08504002	1.0	U	0.50	U	0.5	0.25
LD31GW	08504003	1.0	U	0.50	U	0.5	0.25
LD32GW	08504004	1.0	U	0.50	U	0.5	0.25
LD33GW	08504005	1.0	U	0.50	U	0.5	0.25
LD34GW	08504006	1.0	U	0.50	U	0.5	0.25
LD35GW	08504007	1.0	U	0.50	U	0.5	0.25
LD36GW	08504008	1.0	U	0.50	U	0.5	0.25
LD37GW	08504009	1.0	U	0.50	U	0.5	0.25
LD38GW	08504010	1.0	U	0.50	U	0.5	0.25
LD39GW	08504011	1.0	U	0.50	U	0.5	0.25
LD40GW	08504013	1.0	U	0.50	U	0.5	0.25
LD41GW	08504014	<b>28.5</b>	<b>J</b>	<b>43</b>		<b>28.5</b>	<b>43</b>
LD41GW1	08504015	<b>32.3</b>	<b>J</b>	<b>43</b>		<b>32.3</b>	<b>43</b>
LD42GW	08504016	1.0	U	0.50	U	0.5	0.25
LD43GW	08504017	1.0	U	0.50	U	0.5	0.25
LD44GW	08504018	1.0	U	0.50	U	0.5	0.25
LD45GW	08504019	1.0	U	0.50	U	0.5	0.25
LD46GW	08504020	<b>3.3</b>		<b>16.0</b>		<b>3.3</b>	<b>16.0</b>
LD47GW	08504021	<b>9.9</b>		<b>6.3</b>		<b>9.9</b>	<b>6.3</b>
LD48GW	08504022	<b>18.1</b>		<b>28</b>		<b>18.1</b>	<b>28</b>
LD49GW	08504023	1.0	U	0.50	U	0.5	0.25

Note:

Positive results are bolded.

Data qualifiers have been removed from correlation values.

Key:

EPA = United States Environmental Protection Agency.

J = Estimated quantity.

TCE = trichloroethene.

U = Not detected at the listed quantitation limit.

mg/L = micrograms per liter.

**Table 4-2 Field versus Fixed Laboratories TCE Results Correlation - Positive Sample Results**

Sample Number	EPA Regional Tracking Number	TCE Correlation Value (µg/L)	
		Field Laboratory	Fixed Laboratory
LD06GW	08494007	<b>18.4</b>	<b>3</b>
LD07GW	08494008	<b>0.7</b>	0.25
LD08GW	08494009	<b>0.7</b>	0.25
LD11GW	08494012	<b>1.6</b>	<b>2.8</b>
LD17GW	08494018	<b>3.6</b>	<b>8.2</b>
LD18GW	08484019	<b>6.6</b>	<b>15</b>
LD26GW	08494029	0.5	<b>1</b>
LD41GW	08504014	<b>28.5</b>	<b>43</b>
LD41GW1	08504015	<b>32.3</b>	<b>43</b>
LD46GW	08504020	<b>3.3</b>	<b>6.3</b>
LD47GW	08504021	<b>9.9</b>	<b>16.9</b>
LD48GW	08504022	<b>18.1</b>	<b>28</b>

Note:

Positive results are bolded.

Data qualifiers have been removed for correlation values.

Key:

EPA = United States Environmental Protection Agency.

TCE = trichloroethene.

mg/L = micrograms per liter.

Figure 4-1  
Trichloroethene Field versus Fixed Laboratory Correlation  
All Sample Results

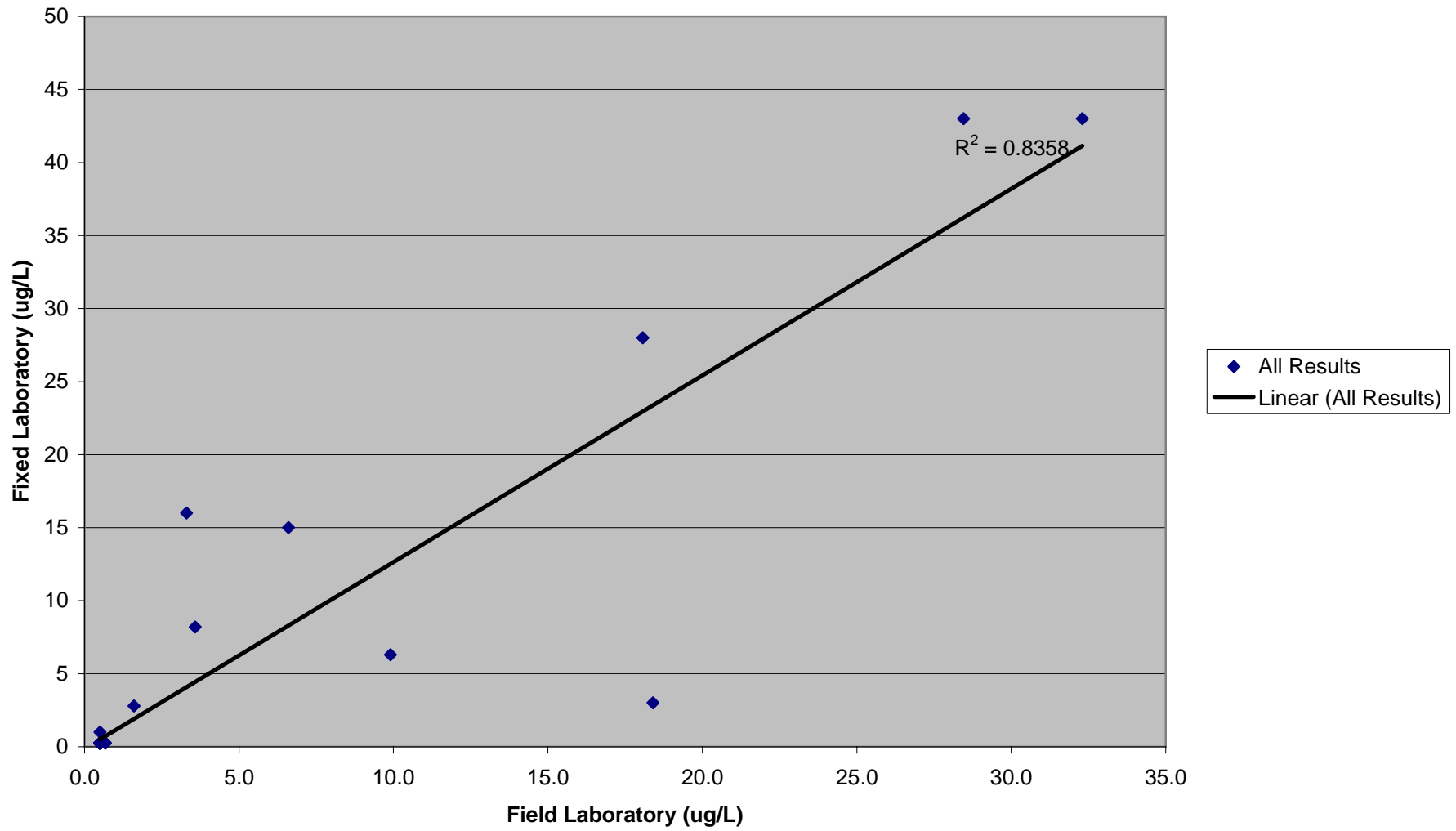
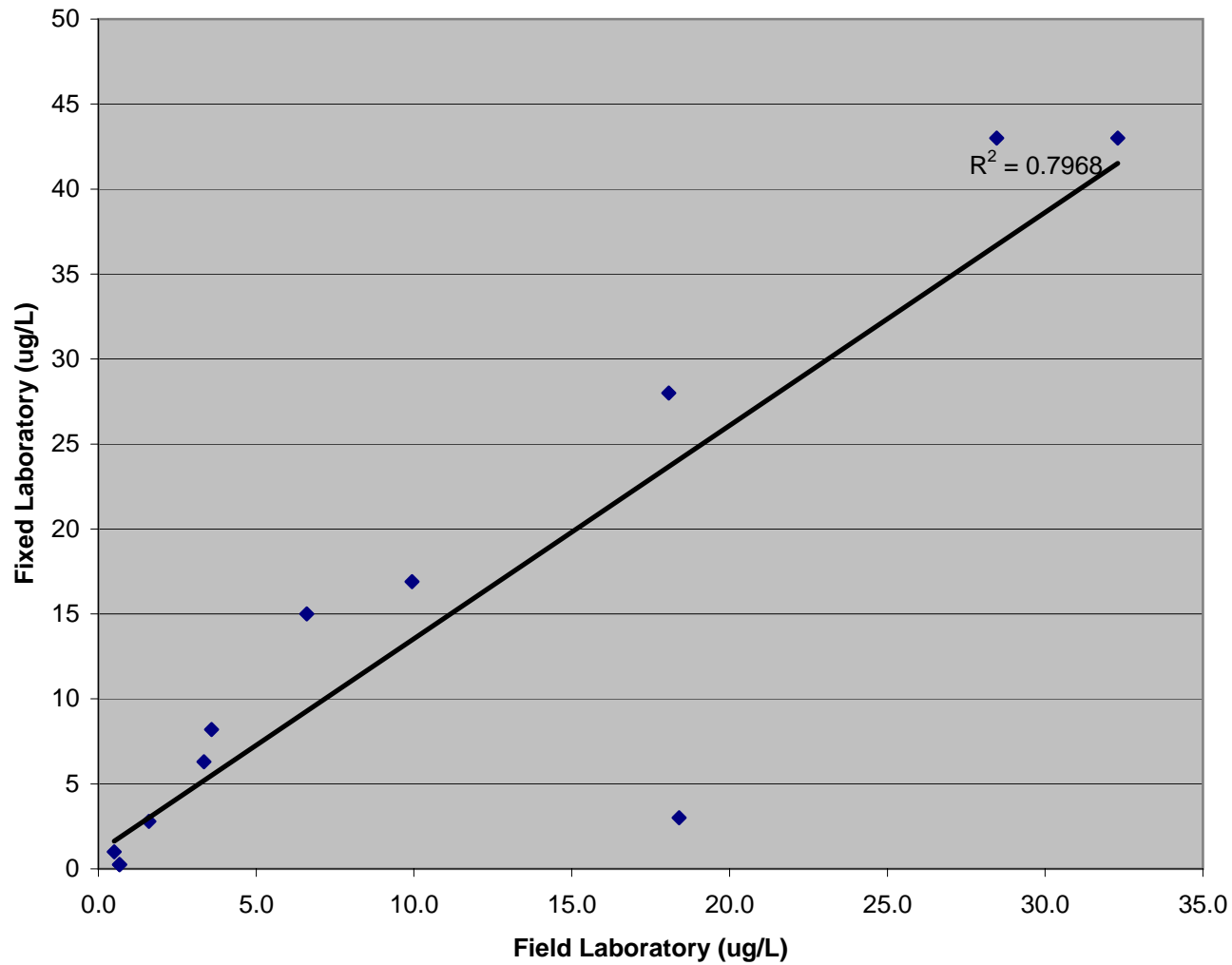


Figure 4-2  
Trichloroethene Field versus Fixed Laboratory Correlation  
Positive Sample Results



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- ◆ Positive Sample Results
- Linear (Positive Sample Results)

# 5

## Analytical Results Reporting and Background Samples

This section describes the reporting and methods applied to analytical results presented in Section 6 (Ground Water Migration Pathway) of this report, and discusses background locations and sample results. Table 3-1 lists all samples collected for laboratory analysis. Chain-of-custody forms are provided in Appendix D and Data Validation Memoranda and Fixed Laboratory Data Forms are provided in Appendix E.

### 5.1 Analytical Results Evaluation Criteria

Analytical results presented in the data summary table contained in Section 6 show all analytes detected above laboratory detection limits in bold type. Analytical results indicating elevated concentrations of contaminants in target samples with respect to background concentrations are shown underlined and in bold type. For the purposes of this investigation, elevated concentrations are those concentrations that are:

- Equal to or greater than the sample's Contract Required Quantitation Limit (CRQL) or the Sample Quantitation Limit (SQL) when a non-CLP laboratory was used; and
- Equal to or greater than the background sample's CRQL or SQL when the background concentration was below detection limits; or
- At least three times greater than the background concentration when the background concentration equals or exceeds the detection limits.

When samples were diluted for re-analysis at a laboratory, the dilution results were considered for evaluation and are provided in the tables.

### 5.2 Background Samples

Background samples were collected for each of the naturally occurring media from which IA samples were collected. These media included ground water only. Results for the background samples are shown in the first columns of the analytical results summary table in Section 6 for comparison against target results.

#### 5.2.1 Background Ground Water Sample Locations and Results

Designated background samples were not collected since it was known that many of the wells planned for sampling had a history of a lack VOC contamination. Based on well depth information, well location, and analytical results, sample LD10GW collected from a well estimated to be 100 feet deep at 178 Laureldale

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## **5. Analytical Results Reporting and Background Samples**

Lane on the southwestern end of the study area; and sample LD32GW collected from a well estimated to be 60 feet deep at 201 Nancy Place also on the southwestern side of the study area were selected to represent background conditions. Neither of these wells have treatment systems. It should be noted that the majority of wells did not exhibit VOC contamination; hence, several other wells could have been used to represent background conditions. No VOCs were detected in either background sample.