guidance (EPA 1990). To interpret these conventions, some background is needed to explain variations in reporting conventions.

Because data in the screening assessment employed many programs using many analytical laboratories, undetected concentrations were reported in several ways. In some cases, the reported concentration field contains a “less than” symbol followed by a number. This indicates that the analyte was not detected, and the number following the “less than” symbol is the equipment detection limit. In other cases, the report gives a “U” in the qualifier field. This indicates that the analyte was not detected and the reported concentration is the equipment detection limit. In the final case, “ND” is reported in the concentration field, and no numerical data are provided. The data evaluation conventions used in selecting and preparing the data are as follows:

- Data for both filtered and unfiltered water were used in the data selection process.
- If any non-radiological datum was reported by the laboratory as “less than” the equipment detection limit, then the data value (which is the equipment detection limit) was replaced with half the reporting limit for that datum.
- Any non-radiological data value labeled with a laboratory qualifier of “R” for “rejected” was removed from the data set. These data values were marked for rejection in a data validation process. Rejected radiological analyses were retained because of known validation errors for radiological analyses.
- Non-radiological data values labeled with a laboratory qualifier of “U” for “undetected” were not used when choosing maximum values but were considered in determining the stochastic parameters.
- If a contaminant in a medium in a segment was analyzed for, but never detected, then the maximum value was set to “ND” for “not detected,” and no stochastic parameters were selected.

3.4.3 Process Used to Select Groundwater Data

One of the key parameters in the screening assessment calculations is the concentration of the contaminants in the groundwater entering the Columbia River from the Hanford Site. For the screening assessment, Hanford groundwater data were compiled that represent water quality in the upper part of the unconfined aquifer. This hydrologic unit offers the most direct pathway for contaminants to reach environmental species and humans. It also is believed to contain the majority of contaminants. Where data exist for wells that monitor deeper zones, the general pattern is lower concentrations or non-existent contamination with increasing depth in the aquifer (Peterson 1994).

To estimate potential risk, we needed to

- **standardize all raw data so, for instance, all units of measurement are comparable**
- **reduce the number of raw data for the deterministic analysis to a single data value (a maximum representative value) for each segment**
- **reduce the number of raw data for the stochastic analysis to a distributional shape to account for the wide variety in quality, quantity, and sources of the raw data**
- **prepare all raw data in a form suitable for use in the computer models**

This section describes the methods we used to reduce and, thereby, select the data. Our goal was to ensure that each data value selected best represents its respective contaminant, media, and segment.

3.4.3.1 Selecting Groundwater Wells

The first step in selecting the set of groundwater wells as sources of data for the screening assessment was to identify all wells that have been sampled over the time period of interest. The next step was to use the Geographic Information System to determine which wells fell within the groundwater corridors specified for study. The well drilling information was then examined to determine the wells' screening depth. Groundwater data from wells that monitor zones deeper than the upper unconfined aquifer were not included in the data compilation. By segment, Table 3.5 lists wells that were eliminated because they monitor at depths below the upper unconfined aquifer.

Table 3.5. Groundwater Wells Eliminated as Sources of Data for the Screening Assessment

Segment	Well Name
2	199-B2-12
2	199-B3-2P
4	199-K-32B
6	199-N-69
6	199-N-80
6	199-N-8P
8	199-D8-54B
10	199-H4-12C
10	199-H4-15C
10	199-H4-2
13	199-F5-43B
20	399-1-16C
20	399-1-17C
20	399-1-9
21	699-S29-E16C

3.4.3.2 Selecting Data

This section presents the data selection process that was followed for each contaminant and river segment for groundwater data.

Process the Raw Data for Inconsistencies. All groundwater data used in the assessment were from HEIS. To standardize the data set, the Environmental Restoration Contractor supplied Microsoft Access macros, which are described in Ford et al. (1996). In addition, all data were converted to standardized units.

All non-radionuclide data were converted, if necessary, to micrograms/liter (μg/L). All radionuclide data were converted, if necessary, to picocuries/liter (pCi/L).

Identify at Most One Outlier. For each well, Dixon's test (Barnett and Lewis 1994) was conducted to determine if the largest data value is an outlier. The test assumes that the distribution (probability density function) of the data is normal except possibly for the potential single outlier. Because the groundwater data are assumed to be lognormally distributed, the data were log-transformed before this test was applied. If the data are lognormal, the log-transformed data will be normal as required by the test. When the data values were zero or negative, they were not used in testing the data for an outlier value.

The Dixon test examines the ratio between the difference in the largest and second largest data values and the range of the data. If this ratio is large, the largest point is declared to be an outlier. Figure 3.15 shows an example of outlier data. The confidence level used for the test was 0.05. Any data identified as an outlier by the Dixon test received individual attention to determine whether they should be deleted from the data set. This was done through a review of the data plots (see Appendix C in Miley et al. 1997). Table 3.6 presents all data points that were identified as outliers and thus removed from the data set.

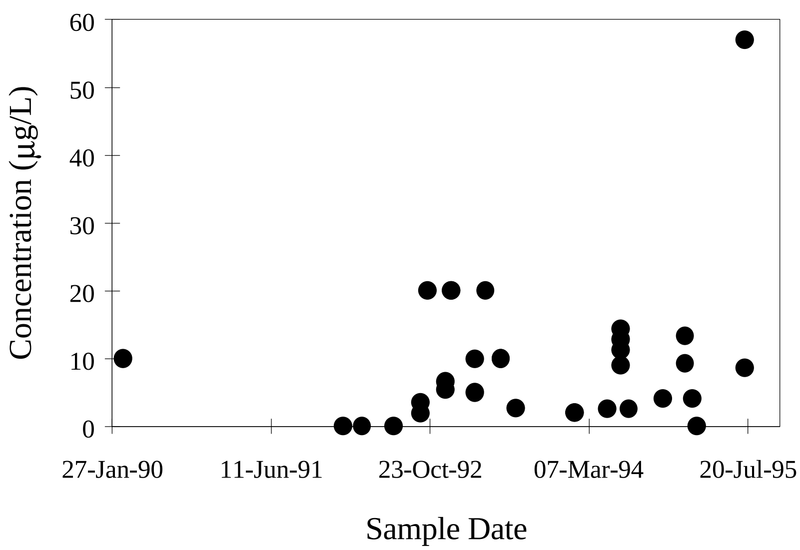

Figure 3.15. Example of Outlier in Data for Copper in Groundwater in Well 199-K-30

Test for a Trend Over Time. After outliers were removed, the concentration data were tested for an upward or downward trend over time using the Mann-Kendall test (Gilbert 1987). To determine what data value is representative of current conditions in a well, it was necessary to know if the well data had a consistent trend over time. The Mann-Kendall test can be used regardless of the underlying data distribution. To perform the test, the data were ordered by sample date; then the difference (plus or minus) between each measurement and all subsequent measurements was calculated.

Table 3.6. Outlier Data Eliminated from the Groundwater Data Set

Segment	Contaminant	Concen-tration	Units	Sample Number	Owner ID	Sample Date	Well Name
1	Ammonia	80	µg/L	B070H7	HEISPROD	19-Jul-92	199-B2-13
1	Lead	38.4	µg/L	B07ZG7	HEISPROD	23-Jan-93	199-B2-13
1	Nickel	74.8	µg/L	B070H7	HEISPROD	19-Jul-92	199-B2-13
1	Mercury	0.17	µg/L	B07K64	HEISPROD	22-Oct-92	199-B2-13
1	Sulfate	50,200	µg/L	B00L67	PNLGW	23-Aug-91	699-72-88
2	Nickel	122	µg/L	B0BNX6	HEISPROD	13-Apr-94	199-B3-1
2	Technetium-99	197	pCi/L	H000G134	PNLGW	1-Mar-90	199-B3-1
2	Xylenes (total)	10	µg/L	B06M65	PNLGW	7-May-92	199-B3-1
2	Ammonia	80	µg/L	B070K2	HEISPROD	18-Jul-92	199-B3-47
2	Carbon-14	130	pCi/L	B070K2	HEISPROD	18-Jul-92	199-B3-47
2	Cesium-137	12	pCi/L	B070K2	HEISPROD	18-Jul-92	199-B3-47
2	Europium-152	30	pCi/L	B07K46	HEISPROD	19-Oct-92	199-B3-47
2	Nickel	55.6	µg/L	B07K46	HEISPROD	19-Oct-92	199-B3-47
2	Sulfate	56,200	µg/L	B0F8R0	HEISPROD	13-Apr-95	199-B3-47
3	Cyanide	20	µg/L	B072X9	HEISPROD	21-Jul-92	699-72-73
3	Europium-152	23	pCi/L	B070G2	HEISPROD	21-Jul-92	699-72-73
3	Mercury	0.62	µg/L	B070G5	HEISPROD	21-Jul-92	699-72-73
3	Sulfate	36,300	µg/L	B072X9	HEISPROD	21-Jul-92	699-72-73
4	Chromium	2,500	µg/L	B09GZ4	WHCRCRA	9-Feb-94	199-K-106A
4	Copper	2,900	µg/L	B09GZ4	WHCRCRA	9-Feb-94	199-K-106A
4	Nickel	3,300	µg/L	B09GZ4	WHCRCRA	9-Feb-94	199-K-106A
4	Zinc	5,500	µg/L	B09GZ4	WHCRCRA	9-Feb-94	199-K-106A
4	Zinc	81	µg/L	B0C7L2	WHCRCRA	13-Jul-94	199-K-108A
4	Chromium	1,900	µg/L	B0BWD9	WHCRCRA	29-Aug-94	199-K-109A
4	Copper	1,800	µg/L	B0BWD9	WHCRCRA	29-Aug-94	199-K-109A
4	Nickel	2,100	µg/L	B0BWD9	WHCRCRA	29-Aug-94	199-K-109A
4	Nitrite	300	µg/L	B0D5K9	WHCRCRA	3-Nov-94	199-K-109A
4	Zinc	4,100	µg/L	B0BWD9	WHCRCRA	29-Aug-94	199-K-109A
4	Cyanide	20	µg/L	B088N1	HEISPROD	16-Mar-93	199-K-11
4	Tritium (H-3)	499,000	pCi/L	B09ZZ2	WHCRCRA	1-Mar-94	199-K-11
4	Chromium	410	µg/L	B0C233	WHCRCRA	28-Jun-94	199-K-111A
4	Copper	460	µg/L	B0C233	WHCRCRA	28-Jun-94	199-K-111A
4	Nickel	700	µg/L	B0C233	WHCRCRA	28-Jun-94	199-K-111A

Table 3.6. (Cont'd)

Segment	Contaminant	Concen- tration	Units	Sample Number	Owner ID	Sample Date	Well Name
4	Tritium (H-3)	2,480	pCi/L	B09H65	WHCRCRA	20-Jun-94	199-K-111A
4	Zinc	1,100	µg/L	B0C233	WHCRCRA	28-Jun-94	199-K-111A
4	Ammonia	100	µg/L	B08L10	HEISPROD	8-Jul-93	199-K-13
4	Cyanide	20	µg/L	B08L10	HEISPROD	8-Jul-93	199-K-13
4	Europium-154	20	pCi/L	B07QT9	HEISPROD	12-Dec-92	199-K-13
4	Zinc	370	µg/L	B0DLX3	HEISPROD	17-Jan-95	199-K-13
4	Ammonia	100	µg/L	B08L40	HEISPROD	6-Jul-93	199-K-23
4	Carbon-14	170	pCi/L	B07B16	HEISPROD	29-Sep-92	199-K-23
4	Cyanide	20	µg/L	B08L40	HEISPROD	6-Jul-93	199-K-23
4	Ammonia	100	µg/L	B08L45	HEISPROD	4-Jun-93	199-K-27
4	Cyanide	20	µg/L	B08L45	HEISPROD	4-Jun-93	199-K-27
4	Carbon-14	2,090	pCi/L	B0G864	HEISPROD	11-Jul-95	199-K-27
4	Europium-152	30	pCi/L	B079T6	HEISPROD	22-Sep-92	199-K-27
4	Nickel	77.6	µg/L	B07QN4	HEISPROD	5-Dec-92	199-K-27
4	Nitrate	48,000	µg/L	B09F61	WHCRCRA	25-Jan-94	199-K-27
4	Nitrite	1,000	µg/L	H0007B72	PNLGW	28-Feb-90	199-K-27
4	Cesium-137	9.67	pCi/L	B07J82	WHCRCRA	15-Oct-92	199-K-28
4	Nitrite	1,000	µg/L	H0007BC5	PNLGW	28-Feb-90	199-K-28
4	Tritium (H-3)	4,310	pCi/L	B09ZZ8	WHCRCRA	1-Mar-94	199-K-28
4	Benzene	5	µg/L	H0007BH8	PNLGW	5-Mar-90	199-K-29
4	Cesium-137	6.68	pCi/L	B09F65	WHCRCRA	19-Jan-94	199-K-29
4	Copper	89	µg/L	B09CY6	WHCRCRA	27-Oct-93	199-K-29
4	Nitrite	1,000	µg/L	H0007BH8	PNLGW	5-Mar-90	199-K-29
4	Zinc	840	µg/L	B09CY6	WHCRCRA	27-Oct-93	199-K-29
4	Ammonia	100	µg/L	B08L50	HEISPROD	3-Jun-93	199-K-30
4	Cyanide	20	µg/L	B08L50	HEISPROD	3-Jun-93	199-K-30
4	Chromium	27	µg/L	B0C7L4	WHCRCRA	11-Jul-94	199-K-30
4	Copper	57	µg/L	B0G817	HEISPROD	10-Jul-95	199-K-30
4	Nitrite	1,000	µg/L	H0007BN4	PNLGW	2-Mar-90	199-K-30
4	Carbon-14	200	pCi/L	B079V6	HEISPROD	23-Sep-92	199-K-31
4	Cyanide	20	µg/L	B088N5	HEISPROD	25-Mar-93	199-K-31
4	Mercury	0.29	µg/L	B079V9	HEISPROD	23-Sep-92	199-K-31
4	Nitrate	14,608.44	µg/L	B08L55	HEISPROD	16-Jun-93	199-K-31
4	Tritium (H-3)	3,100	pCi/L	B09W62	HEISPROD	24-Jan-94	199-K-31

Table 3.6. (Cont'd)

Segment	Contaminant	Concen-tration	Units	Sample Number	Owner ID	Sample Date	Well Name
4	Cyanide	20	µg/L	B08L60	HEISPROD	14-Jun-93	199-K-32A
4	Europium-152	30	pCi/L	B088F1	HEISPROD	17-Mar-93	199-K-32A
4	Europium-154	20	pCi/L	B088F1	HEISPROD	17-Mar-93	199-K-32A
4	Nickel	69.4	µg/L	B079W1	HEISPROD	23-Sep-92	199-K-32A
4	Zinc	278	µg/L	B079W1	HEISPROD	23-Sep-92	199-K-32A
4	Cyanide	20	µg/L	B08L70	HEISPROD	10-Jun-93	199-K-33
4	Strontium-90	4.5	pCi/L	B079X1	HEISPROD	30-Sep-92	199-K-33
4	Tritium (H-3)	35,000	pCi/L	B08L70	HEISPROD	10-Jun-93	199-K-33
4	Cyanide	20	µg/L	B08L75	HEISPROD	1-Jun-93	199-K-34
4	Cyanide	20	µg/L	B09W70	HEISPROD	13-Jan-94	199-K-34
5	Carbon-14	120	pCi/L	B079R1	HEISPROD	21-Sep-92	199-K-18
5	Cyanide	20	µg/L	B08L15	HEISPROD	7-Jun-93	199-K-18
5	Europium-152	30	pCi/L	B08886	HEISPROD	19-Mar-93	199-K-18
5	Phosphate	1,000	µg/L	B0DLX5	HEISPROD	4-Jan-95	199-K-18
5	Tritium (H-3)	21,200	pCi/L	B0FZ55	PNLGW	7-Jul-95	199-K-18
5	Lead	2.4	µg/L	B08891	HEISPROD	13-Mar-93	199-K-19
5	Carbon-14	630	pCi/L	B079R6	HEISPROD	21-Sep-92	199-K-20
5	Chromium	261	µg/L	B08896	HEISPROD	30-Mar-93	199-K-20
5	Nickel	57.9	µg/L	B08896	HEISPROD	30-Mar-93	199-K-20
5	Cyanide	20	µg/L	B08L25	HEISPROD	9-Jun-93	199-K-20
5	Chromium	2,040	µg/L	B088B1	HEISPROD	24-Mar-93	199-K-21
5	Copper	195	µg/L	B088B1	HEISPROD	24-Mar-93	199-K-21
5	Lead	91.9	µg/L	B088B1	HEISPROD	24-Mar-93	199-K-21
5	Nickel	953	µg/L	B088B1	HEISPROD	24-Mar-93	199-K-21
5	Strontium-90	100	pCi/L	B088B1	HEISPROD	24-Mar-93	199-K-21
5	Uranium-238	1.1	pCi/L	B088B1	HEISPROD	24-Mar-93	199-K-21
5	Zinc	168	µg/L	B088B1	HEISPROD	24-Mar-93	199-K-21
5	Mercury	0.14	µg/L	B079S6	HEISPROD	21-Sep-92	199-K-22
5	Sulfate	4,100,000	µg/L	B07QZ3	HEISPROD	7-Dec-92	199-K-22
5	Cyanide	20	µg/L	B08L35	HEISPROD	8-Jun-93	199-K-22
5	Benzene	10	µg/L	B07B30	HEISPROD	24-Sep-92	199-K-37
5	Phosphate	400	µg/L	B088J1	HEISPROD	23-Mar-93	199-K-37
5	Technetium-99	10.6	pCi/L	B07B40	HEISPROD	24-Sep-92	199-K-37
5	Uranium-238	3.6	pCi/L	B06M18	HEISPROD	28-May-92	199-K-37

Table 3.6. (Cont'd)

Segment	Contaminant	Concen-tration	Units	Sample Number	Owner ID	Sample Date	Well Name
6	Copper	91	µg/L	H0007C68	PNLGW	1-Feb-90	199-N-14
6	Mercury	0.36	µg/L	B09TC1	WHCRCRA	28-Feb-94	199-N-14
6	Nitrite	1,000	µg/L	H0007C68	PNLGW	1-Feb-90	199-N-14
6	Phosphate	11,000	µg/L	H00072X9	PNLGW	18-Sep-91	199-N-14
6	Zinc	95	µg/L	H0007C68	PNLGW	1-Feb-90	199-N-14
6	Tritium (H-3)	7,350	pCi/L	B08KL6	WHCRCRA	18-May-93	199-N-16
6	Chromium	910	µg/L	B0CJ43	WHCRCRA	15-Aug-94	199-N-17
6	Nickel	650	µg/L	B0CJ43	WHCRCRA	15-Aug-94	199-N-17
6	Phosphate	1,000	µg/L	H0007CS4	PNLGW	1-Feb-90	199-N-17
6	Copper	12	µg/L	B08HY5	WHCRCRA	11-May-93	199-N-2
6	Strontium-90	1,960	pCi/L	H0007D87	PNLGW	2-Feb-90	199-N-2
6	Tritium (H-3)	60,000	pCi/L	H0007D87	PNLGW	2-Feb-90	199-N-2
6	Zinc	77	µg/L	H0007D87	PNLGW	2-Feb-90	199-N-2
6	Chromium	24,000	µg/L	B0DX98	HEISPROD	3-Mar-95	199-N-21
6	Copper	24,000	µg/L	B0DX98	HEISPROD	3-Mar-95	199-N-21
6	Lead	24,000	µg/L	B0DX98	HEISPROD	3-Mar-95	199-N-21
6	Nickel	24,000	µg/L	B0DX98	HEISPROD	3-Mar-95	199-N-21
6	Strontium-90	4.77	pCi/L	B01VB4	PNLGW	14-Feb-92	199-N-21
6	Tritium (H-3)	5,230	pCi/L	B08722	WHCRCRA	26-Feb-93	199-N-23
6	Zinc	10	µg/L	B0CJ52	WHCRCRA	17-Aug-94	199-N-23
6	Lead	11	µg/L	H0007F50	PNLGW	12-Feb-90	199-N-26
6	Tritium (H-3)	20,300	pCi/L	B08KM0	WHCRCRA	21-May-93	199-N-26
6	Lead	40	µg/L	B0C235	WHCRCRA	13-Jun-94	199-N-3
6	Phosphate	1,000	µg/L	H0007G71	PNLGW	14-Feb-90	199-N-3
6	Strontium-90	83,500	pCi/L	B09KY0	WHCRCRA	9-Nov-93	199-N-3
6	Zinc	2,400	µg/L	B0C235	WHCRCRA	13-Jun-94	199-N-3
6	Ammonia	100	µg/L	B08J71	WHCRCRA	7-May-93	199-N-47
6	Chromium	81	µg/L	B01W15	WHCRCRA	10-Feb-92	199-N-47
6	Nickel	39	µg/L	B01W15	WHCRCRA	10-Feb-92	199-N-47
6	Nitrate	894,213.6	µg/L	B0GJT9	HEISPROD	7-Sep-95	199-N-51
6	Sulfate	90,300	µg/L	B0GJT9	HEISPROD	7-Sep-95	199-N-51
6	Ammonia	100	µg/L	B08J74	WHCRCRA	12-May-93	199-N-54
6	Lead	11	µg/L	B01BB4	WHCRCRA	5-Nov-91	199-N-54
6	Phosphate	1,000	µg/L	H0007JM9	PNLGW	1-Feb-90	199-N-54

Table 3.6. (Cont'd)

Segment	Contaminant	Concen-tration	Units	Sample Number	Owner ID	Sample Date	Well Name
6	Lead	5.5	µg/L	B01W20	WHCRCRA	10-Feb-92	199-N-55
6	Copper	44	µg/L	B00L94	WHCRCRA	5-Sep-91	199-N-56
6	Nitrite	1,000	µg/L	H0007JS3	PNLGW	1-Feb-90	199-N-56
6	Phosphate	2,400	µg/L	H0007JS3	PNLGW	1-Feb-90	199-N-56
6	Chromium	2,500	µg/L	B0C985	WHCRCRA	6-Sep-94	199-N-57
6	Nickel	1,300	µg/L	B0C985	WHCRCRA	6-Sep-94	199-N-57
6	Nickel	680	µg/L	B09KZ5	WHCRCRA	16-Nov-93	199-N-67
6	Ammonia	100	µg/L	B07P30	WHCRCRA	20-Nov-92	199-N-72
6	Lead	25	µg/L	B0BWN6	WHCRCRA	12-May-94	199-N-72
6	Ammonia	200	µg/L	B07P02	WHCRCRA	19-Nov-92	199-N-75
6	Nitrate	8,900	µg/L	B0C9B0	WHCRCRA	6-Sep-94	199-N-75
6	Sulfate	25,900	µg/L	B0GB60	HEISPROD	20-Jul-95	199-N-75
6	Ammonia	100	µg/L	B07P07	WHCRCRA	20-Nov-92	199-N-76
6	Strontium-90	154	pCi/L	B0GB61	HEISPROD	2-Aug-95	199-N-76
6	Xylenes (total)	1	µg/L	B0DTJ7	PNLGW	3-Mar-95	199-N-76
6	Zinc	120	µg/L	B07P07	WHCRCRA	20-Nov-92	199-N-76
6	Ammonia	500	µg/L	B07P40	WHCRCRA	19-Nov-92	199-N-77
7	Ammonia	60	µg/L	B09WW3	HEISPROD	6-Feb-94	199-D5-20
7	Europium-152	30	pCi/L	B07KZ0	HEISPROD	2-Nov-92	199-D5-20
7	Nitrate	1,035,871	µg/L	B0GF99	HEISPROD	14-Aug-95	199-D5-20
7	Phosphate	1,000	µg/L	B0DQX9	HEISPROD	7-Feb-95	199-D5-20
8	Carbon-14	39	pCi/L	B06CF0	HEISPROD	27-May-92	199-D5-13
8	Chromium	326	µg/L	B06CL9	HEISPROD	28-May-92	199-D8-3
8	Europium-152	23	pCi/L	B07336	HEISPROD	28-Jul-92	199-D8-3
8	Cyanide	20	µg/L	B07356	HEISPROD	28-Jul-92	199-D8-3
8	Lead	56	µg/L	B0GFD7	HEISPROD	9-Aug-95	199-D8-3
8	Lead	5	µg/L	B064Z1	WHCRCRA	16-Apr-92	199-D8-4
8	Sulfate	27,000	µg/L	B064Z1	WHCRCRA	16-Apr-92	199-D8-4
8	Zinc	35.8	µg/L	B0DR08	HEISPROD	14-Mar-95	199-D8-4
8	Nitrate	5,000	µg/L	B0C930	WHCRCRA	9-Aug-94	199-D8-5
8	Ammonia	140	µg/L	B072C4	HEISPROD	26-Jul-92	199-D8-53
8	Cesium-137	13	pCi/L	B06CM2	HEISPROD	17-May-92	199-D8-53
8	Ammonia	240	µg/L	B072F9	HEISPROD	26-Jul-92	199-D8-54A
8	Phosphate	800	µg/L	B072F9	HEISPROD	26-Jul-92	199-D8-54A

Table 3.6. (Cont'd)

Segment	Contaminant	Concen-tration	Units	Sample Number	Owner ID	Sample Date	Well Name
8	Ammonia	260	µg/L	B072L9	HEISPROD	26-Jul-92	199-D8-55
8	Phosphate	500	µg/L	B0GFB9	HEISPROD	14-Aug-95	199-D8-55
8	Chromium	820	µg/L	B0C935	WHCRCRA	9-Aug-94	199-D8-6
8	Copper	140	µg/L	B0C935	WHCRCRA	9-Aug-94	199-D8-6
8	Lead	4	µg/L	B08LR3	WHCRCRA	1-Jun-93	199-D8-6
8	Nickel	760	µg/L	B0C935	WHCRCRA	9-Aug-94	199-D8-6
8	Cobalt-60	14	pCi/L	B07387	HEISPROD	2-Aug-92	699-97-51A
8	Nickel	23.6	µg/L	B0DQZ7	HEISPROD	6-Feb-95	699-97-51A
9	Chromium	5.1	µg/L	B0DD94	PNLGW	15-Dec-94	699-101-48B
9	Copper	7.3	µg/L	B0DD94	PNLGW	15-Dec-94	699-101-48B
9	Nitrate	960	µg/L	B0GG99	PNLGW	16-Sep-95	699-101-48B
10	Zinc	950	µg/L	B0CJG0	HEISPROD	28-Jul-94	199-H4-10
10	Nitrate	66,000	µg/L	B00M20	WHCRCRA	12-Sep-91	199-H4-11
10	Nitrite	1,000	µg/L	H00076J5	PNLGW	23-Apr-90	199-H4-11
10	Ammonia	100	µg/L	B091V5	HEISPROD	26-Aug-93	199-H4-15A
10	Copper	66.3	µg/L	B0G048	HEISPROD	29-Jun-95	199-H4-15A
10	Nitrate	97,389.6	µg/L	B091V5	HEISPROD	26-Aug-93	199-H4-15A
10	Nitrite	1,000	µg/L	H0007702	PNLGW	18-Apr-90	199-H4-15A
10	Nitrite	1,000	µg/L	H0007762	PNLGW	20-Apr-90	199-H4-17
10	Sulfate	103,000	µg/L	H0007762	PNLGW	20-Apr-90	199-H4-17
10	Chromium	1,100	µg/L	B0CYC5	WHCRCRA	16-Sep-94	199-H4-3
10	Benzene	10	µg/L	B06CV2	HEISPROD	4-Jun-92	199-H4-4
10	Xylenes (total)	10	µg/L	B06CV2	HEISPROD	4-Jun-92	199-H4-4
10	Zinc	901	µg/L	H0007854	PNLGW	17-Jan-90	199-H4-4
10	Ammonia	70	µg/L	B072M9	HEISPROD	3-Aug-92	199-H4-45
10	Phosphate	500	µg/L	B0G055	HEISPROD	23-Jun-95	199-H4-45
10	Nickel	57.1	µg/L	B0DHN4	HEISPROD	20-Dec-94	199-H4-47
10	Phosphate	500	µg/L	B0G059	HEISPROD	22-Jun-95	199-H4-47
10	Chromium	210	µg/L	B08CP2	WHCRCRA	1-Apr-93	199-H4-5
10	Nitrite	1,000	µg/L	H00078R1	PNLGW	23-Apr-90	199-H4-7
10	Tritium (H-3)	4,790	pCi/L	H00072Q0	PNLGW	6-Jun-91	199-H4-7
10	Nitrite	1,000	µg/L	H00078T0	PNLGW	25-Apr-90	199-H4-8
10	Sulfate	81,900	µg/L	H00078T0	PNLGW	25-Apr-90	199-H4-8
10	Ammonia	290	µg/L	B072N4	HEISPROD	1-Aug-92	199-H6-1

Table 3.6. (Cont'd)

Segment	Contaminant	Concen-tration	Units	Sample Number	Owner ID	Sample Date	Well Name
10	Nitrate	1,164,248	µg/L	B0G067	HEISPROD	23-Jun-95	199-H6-1
10	Uranium-234	16	pCi/L	B06CQ5	HEISPROD	8-May-92	199-H6-1
10	Uranium-238	14	pCi/L	B06CQ5	HEISPROD	8-May-92	199-H6-1
12	Chromium	17	µg/L	B08QQ8	PNLGW	16-Aug-93	699-89-35
13	Ammonia	100	µg/L	B0BMP0	HEISPROD	17-May-94	199-F1-2
13	Carbon-14	82	pCi/L	B08Y11	HEISPROD	28-Jul-93	199-F1-2
13	Uranium-238	1.9	pCi/L	B08Y11	HEISPROD	28-Jul-93	199-F1-2
13	Chromium	1,710	µg/L	B0BMP5	HEISPROD	18-May-94	199-F5-1
13	Lead	5.3	µg/L	B07RG7	HEISPROD	15-Dec-92	199-F5-1
13	Nickel	625	µg/L	B0BMP5	HEISPROD	18-May-94	199-F5-1
13	Chromium	30.6	µg/L	B088R0	HEISPROD	7-Apr-93	199-F5-3
13	Cobalt-60	20	pCi/L	B07RD1	HEISPROD	14-Jan-93	199-F5-3
13	Europium-154	20	pCi/L	B07RD1	HEISPROD	14-Jan-93	199-F5-3
13	Phosphate	1,000	µg/L	H00074J2	PNLGW	28-Feb-90	199-F5-3
13	Ammonia	100	µg/L	B0BMR0	HEISPROD	11-May-94	199-F5-42
13	Europium-154	18	pCi/L	B0BMR0	HEISPROD	11-May-94	199-F5-42
13	Copper	13.4	µg/L	B0FK70	HEISPROD	25-May-95	199-F5-42
13	Cobalt-60	30	pCi/L	B07R56	HEISPROD	28-Jan-93	199-F5-43A
13	Europium-152	40	pCi/L	B07R56	HEISPROD	28-Jan-93	199-F5-43A
13	Technetium-99	56	pCi/L	B08Y41	HEISPROD	18-Jul-93	199-F5-43A
13	Ammonia	100	µg/L	B0BMR8	HEISPROD	11-May-94	199-F5-44
13	Phosphate	400	µg/L	B088V0	HEISPROD	1-Apr-93	199-F5-44
13	Cobalt-60	20	pCi/L	B08Y56	HEISPROD	18-Jul-93	199-F5-46
13	Europium-152	30	pCi/L	B08Y56	HEISPROD	18-Jul-93	199-F5-46
13	Europium-154	20	pCi/L	B08Y56	HEISPROD	18-Jul-93	199-F5-46
13	Cyanide	20	µg/L	B09DH0	HEISPROD	26-Oct-93	199-F5-6
13	Phosphate	1,000	µg/L	H00074Z3	PNLGW	14-May-90	199-F5-6
13	Ammonia	540	µg/L	B0BMT8	HEISPROD	12-May-94	199-F6-1
13	Carbon-14	39	pCi/L	B088X5	HEISPROD	6-Apr-93	199-F6-1
13	Nitrate	4,072.656	µg/L	B0BMT8	HEISPROD	12-May-94	199-F6-1
13	Copper	55.8	µg/L	B09DG2	HEISPROD	26-Oct-93	199-F6-1
17	Tritium (H-3)	153,000	pCi/L	B09QB4	PNLGW	19-Jan-94	699-44-4
17	Nitrate	34,900	µg/L	H00072V5	PNLGW	19-Jul-91	699-46-4
19	Nitrite	1,000	µg/L	H000BSW7	PNLGW	29-May-90	399-1-18A

Table 3.6. (Cont'd)

Segment	Contaminant	Concen-tration	Units	Sample Number	Owner ID	Sample Date	Well Name
19	Ammonia	180	µg/L	B01DK8	HEISPROD	6-Dec-91	399-1-18B
19	Ammonia	190	µg/L	B01F03	HEISPROD	6-Dec-91	399-1-18C
19	Benzene	5	µg/L	H000FQZ3	PNLGW	13-Apr-90	699-S19-E13
19	Chromium	6.3	µg/L	B0DTH7	PNLGW	15-Feb-95	699-S19-E13
19	Technetium-99	48.5	pCi/L	H0007157	PNLGW	1-Feb-91	699-S19-E13
19	Xylenes (total)	5	µg/L	H000FQZ3	PNLGW	13-Apr-90	699-S19-E13
19	Technetium-99	11	pCi/L	B062H9	HEISPROD	20-Apr-92	699-S19-E14
20	Tritium (H-3)	86,400	pCi/L	B01FP4	WHCRCRA	6-Dec-91	399-1-10A
20	Copper	3	µg/L	BOC1Z3	PNLGW	28-Jun-94	399-1-10B
20	Copper	28	µg/L	H00071T9	WHCRCRA	18-Jul-91	399-1-12
20	Lead	12	µg/L	B0FLN5	WHCRCRA	1-Jun-95	399-1-16A
20	Nitrite	1,000	µg/L	H000BS40	PNLGW	24-May-90	399-1-16A
20	Nitrite	1,000	µg/L	H000BS63	PNLGW	24-May-90	399-1-16B
20	Copper	31	µg/L	H00071V4	WHCRCRA	11-Jul-91	399-1-17A
20	Sulfate	48,000	µg/L	B0DTK3	PNLGW	21-Feb-95	399-1-17A
20	Nitrite	1,000	µg/L	H000BSQ8	PNLGW	22-May-90	399-1-17B
20	Ammonia	70	µg/L	B062L0	HEISPROD	30-Apr-92	399-1-21A
20	Cobalt-60	19	pCi/L	B062L0	HEISPROD	30-Apr-92	399-1-21A
20	Uranium-234	35	pCi/L	B062L0	HEISPROD	30-Apr-92	399-1-21A
20	Copper	11	µg/L	H0007090	PNLGW	18-Dec-90	399-1-6
20	Nitrate	16,3791.6	µg/L	B062C0	HEISPROD	27-Apr-92	399-1-6
20	Nitrite	120	µg/L	B062C0	HEISPROD	27-Apr-92	399-1-6
20	Uranium-238	160	pCi/L	B07P66	HEISPROD	13-Nov-92	399-1-7
20	Ammonia	100	µg/L	B01F11	HEISPROD	12-Dec-91	399-2-2
20	Copper	11.8	µg/L	B01F11	HEISPROD	12-Dec-91	399-2-2
20	Copper	8.8	µg/L	B01F13	HEISPROD	12-Dec-91	399-2-3
20	Lead	4.9	µg/L	B075X5	HEISPROD	11-Sep-92	399-2-3
20	Phosphate	400	µg/L	B062C7	HEISPROD	28-Apr-92	399-2-3
20	Nitrite	1,000	µg/L	H000C030	PNLGW	22-May-90	399-3-10
20	Nitrate	18,000	µg/L	B08ZT1	PNLGW	27-Aug-93	399-3-12
20	Tritium (H-3)	6,010	pCi/L	B01DN5	HEISPROD	9-Dec-91	399-3-12
20	Uranium-238	29	pCi/L	B07P94	HEISPROD	14-Nov-92	399-3-12
20	Copper	24	µg/L	H00071W1	WHCRCRA	15-Jul-91	399-3-9
20	Nickel	18	µg/L	B062W6	HEISPROD	13-May-92	399-3-9

Table 3.6. (Cont'd)

Segment	Contaminant	Concen-tration	Units	Sample Number	Owner ID	Sample Date	Well Name
20	Cesium-137	13.79	pCi/L	B01DY9	HEISPROD	3-Dec-91	399-4-1
20	Copper	5	µg/L	B01DY9	HEISPROD	3-Dec-91	399-4-1
20	Chromium	16.9	µg/L	B075Z9	HEISPROD	14-Sep-92	399-4-10
20	Nickel	10.4	µg/L	B075Z9	HEISPROD	14-Sep-92	399-4-10
20	Uranium-238	56	pCi/L	B07PB2	HEISPROD	12-Nov-92	399-4-10
20	Ammonia	100	µg/L	B076C1	HEISPROD	9-Sep-92	399-4-12
20	Uranium-234	8.1	pCi/L	B062F8	HEISPROD	22-Apr-92	399-4-12
20	Uranium-238	59	pCi/L	B07P98	HEISPROD	15-Nov-92	399-4-7
20	Nickel	20	µg/L	B01DY5	HEISPROD	3-Dec-91	399-4-9
21	Sulfate	12,000	µg/L	B08ZY0	PNLGW	5-Oct-93	3099-42-16
21	Ammonia	100	µg/L	B01DS8	HEISPROD	4-Dec-91	699-S29-E16A
21	Copper	11.7	µg/L	B062H0	HEISPROD	13-Apr-92	699-S29-E16A
21	Copper	6.1	µg/L	B062H3	HEISPROD	13-Apr-92	699-S29-E16B
21	Chromium	31.5	µg/L	B07627	HEISPROD	14-Sep-92	699-S30-E15A
21	Copper	10	µg/L	H000FT57F	PNLGW	21-Feb-90	699-S30-E15A
21	Sulfate	58,000	µg/L	B086N9	PNLGW	11-Mar-93	699-S30-E15A
21	Tritium (H-3)	1670	pCi/L	H0007020	PNLGW	16-Oct-90	699-S30-E15A
21	Uranium-234	6.05	pCi/L	B00D51	HEISPROD	29-Nov-90	699-S30-E15A
21	Uranium-238	3.03	pCi/L	B00D51	HEISPROD	29-Nov-90	699-S30-E15A

The Mann-Kendall statistic is the number of positive differences minus the number of negative differences. If the test statistic was a large positive number, then measurements taken later in time were larger than those taken earlier, and an upward trend was present. If the test statistic was a large negative number, then the measurements taken later in time were smaller than those taken earlier, and a downward trend was present. Figures 3.16 and 3.17 provide examples of downward and upward trends. A significance level of 0.01 was used in testing for an upward or downward trend in the concentration data. If the data showed no underlying trend, 1 percent of the time the test would incorrectly indicate that a trend did exist. For further discussion of trends in groundwater wells at Hanford, see the Hanford Site Environmental report (Dirkes and Hanf 1996).

Choose Representative Well Data. To support the deterministic and stochastic analyses, two representative values were selected for each well: a representative maximum and a representative median. Representative well data are selected after any outlier is removed. For a well that had no trend in its data, no data value is considered more representative than any other data value. In that case, all data values were considered in selecting the representative values. For a well with a trend in the data values, the most recent data were considered most representative of the current conditions in the well.

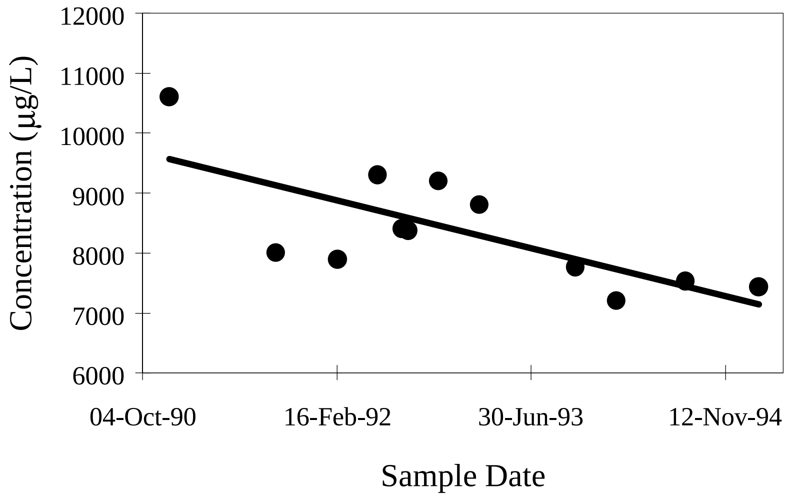

Figure 3.16. Example of a Downward Trend in the Data for Tritium (Hydrogen-3) in Groundwater in Well 699-97-51A at the 100-D Area

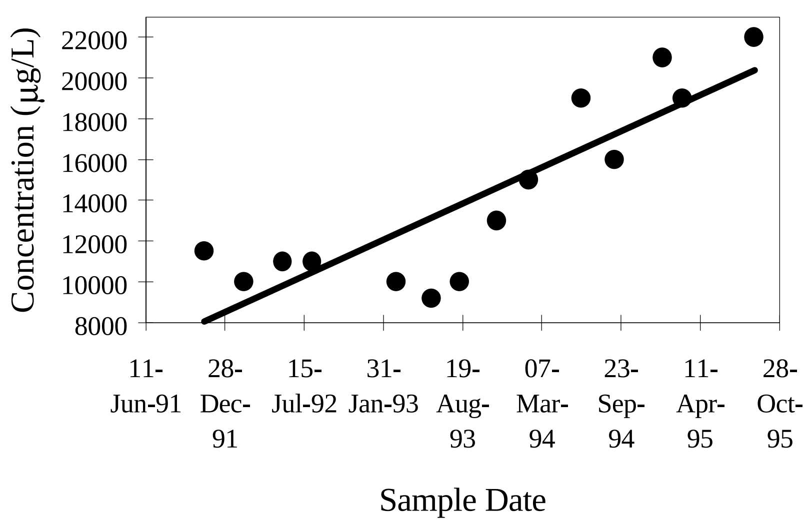

Figure 3.17. Example of an Upward Trend in the Data for Nitrate in Groundwater in Well 199-N-57 at the 100-N Area

Choose a Representative Well Maximum. A representative maximum value was used for the deterministic analysis to produce a conservative estimate of potential risk. For each groundwater well with non-trending data, the maximum concentration detected in the well was chosen for the representative maximum value. For upward trending wells, the overall maximum concentration may not occur in the current time period because of local variability. Therefore, the more conservative overall maximum concentration was used as the well maximum in the assessment. For downward trending data, the most recent detected measurement was used. If the most recent sampling period had more than one detected measurement (as in one of filtered water and one of unfiltered water), then the maximum of the measurements was chosen as the representative maximum value.

Choose a Representative Well Median. A representative median value was used in calculating stochastic parameters because the stochastic process requires a focus on best-estimate parameter values rather than conservative (maximal) values. If an upward or downward trend was detected, the median groundwater concentration measurements of the most recent time period were used to represent the well. If a well does not have a trend, then no single data point is considered more representative of the well than any other point. In that case, the median of the data is the single most representative concentration value for the well. This approach leads to the most representative probability density function to describe the uncertainty about the concentration data for the river segment being studied.

Compute Segment Parameters. For the groundwater medium, the representative values for individual wells must be combined into parameters that are representative of the river segment because no single well is representative of the segment. Whereas the process for the wells combines the data over time into a single value at the various well locations, the segment process combines the values over space into representative data for the segment.

Compute the Segment Maximum. The segment maximum is the highest of the well representative maximum values. This value is the maximum of all the observed concentrations in any well in the segment. This value is used to represent the segment in the deterministic risk calculations.

Compute Stochastic Parameters. The stochastic parameters (the geometric mean and geometric standard deviation) were calculated from the set of median (best-estimate) well values in the segment. The first step in calculating the geometric mean and geometric standard deviation was to take the natural logarithm of the median well values. The arithmetic mean of the log-transformed median values was calculated and then exponentiated to obtain the geometric mean. To calculate the geometric standard deviation, the standard deviation of the log-transformed median values was calculated and then exponentiated.

When some of the data were reported as negative or null values, they could not be log-transformed so were replaced with substitute values to represent the presence of small data values at the lower end of the data set. Log probability plotting was used to find replacement values for the data (Gilbert 1987). The null data were plotted on a line in log space using the inverse normal statistic. The replacement values were included when computing the stochastic parameters for the segment. The data were first ranked; then a statistic was computed, which is the rank in the data set divided by the number of values plus 1. The inverse normal function is applied to this statistic. This technique was only applied when at least four positive values were reported.

For the data with positive concentration values, the slope and intercept of the line that fit the log concentration versus the inverse normal statistic line were calculated. These values were used to find the log concentration for the rank of the negative or null concentration values. The geometric mean and geometric standard deviation were then calculated from the entire data set, with the log concentrations replaced for the negative or null concentration values.

An example of the fitting process is shown in Figure 3.18 for chromium in well 199-N-55 in Segment 6. There were sixteen analyses for chromium, six reported as undetected with no numerical value reported. The six null values were fit to the line determined by the ten reported values, and all sixteen values were used to compute the stochastic parameters.

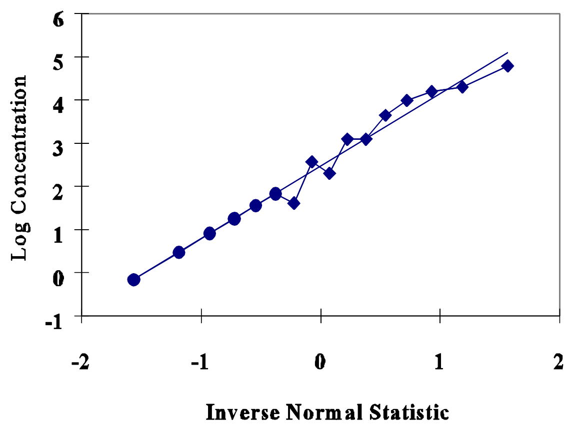

Figure 3.18. Example of Log Probability Plotting Used to Fit the Concentration Values

Some of the geometric standard deviations computed from the raw data were very large. This can occur when data over space with local high concentrations (hot spots) are combined. The problem is magnified by the fitting of the null or negative data using log probability plotting. While the actual measurements may be very similar, the fitted measurements will be spaced proportionally on the low end of a line, causing the standard deviation of the log transformed data to be artificially large. Sampling from the distribution specified using the large geometric standard deviations created input data sets whose maximum values far exceeded the actual measured deterministic maximum.

To ensure realism in the stochastic analyses, the geometric standard deviation was truncated such that the 99th percentile of the resulting distribution would be twice the deterministic maximum value. This technique was applied only if the truncated geometric standard deviation was greater than the original standard deviation for any deviation greater than 4. For example, the data for strontium-90 in the groundwater at Segment 4 resulted in a geometric mean of 0.02 and a geometric standard deviation of 282.3. Using this standard deviation, the stochastic routines would generate data with a 99th percentile in excess of 80,000 picocuries/liter. The actual maximum concentration observed in the segment is 803 picocuries/liter. In this case, the geometric standard deviation was truncated so that the 99th percentile of the stochastic distribution is 1606. This resulted in a truncated geometric standard deviation of 128. Table 3.7 lists the truncated standard deviations.

Table 3.7. Truncated Geometric Standard Deviations

Medium	Segment	Contaminant	Computed Geometric Standard Deviation	Truncated Geometric Standard Deviation
GW	2	Carbon-14	6.89E+01	1.51E+01
GW	4	Carbon-14	8.26E+00	6.04E+00
GW	4	Cesium-137	6.44E+00	5.33E+00
GW	6	Cesium-137	1.04E+01	9.96E+00
GW	19	Cesium-137	7.45E+00	1.82E+00
GW	8	Chromium	4.33E+00	3.85E+00
GW	4	Cobalt-60	6.27E+00	5.06E+00
GW	19	Cobalt-60	6.54E+00	1.25E+00
GW	21	Cobalt-60	7.37E+00	2.16E+00
GW	13	Europium-152	5.17E+00	3.22E+00
GW	5	Europium-154	8.95E+00	2.69E+00
GW	5	Iodine-129	1.20E+01	5.36E+00
GW	8	Nitrate	4.83E+00	4.14E+00
GW	9	Nitrate	7.10E+00	2.45E+00
GW	17	Nitrate	4.83E+00	2.18E+00
GW	19	Nitrate	5.85E+00	2.63E+00
GW	20	Nitrate	5.98E+00	2.21E+00
GW	21	Nitrate	1.24E+01	3.58E+00
GW	4	Strontium-90	2.82E+02	1.28E+02
GW	6	Strontium-90	1.05E+02	3.25E+01
GW	8	Strontium-90	5.46E+01	1.25E+01
GW	10	Strontium-90	1.29E+01	7.95E+00
GW	13	Strontium-90	5.58E+00	3.16E+00
GW	6	Sulfate	4.16E+00	3.21E+00
GW	19	Sulfate	9.97E+00	2.85E+00
GW	20	Sulfate	6.16E+00	2.10E+00
GW	21	Sulfate	7.83E+00	2.56E+00
GW	10	Technetium-99	1.02E+02	6.65E+01
GW	19	Technetium-99	4.93E+00	3.46E+00
GW	1	Tritium (H-3)	4.38E+00	2.65E+00
GW	5	Tritium (H-3)	5.00E+00	4.24E+00
GW	6	Tritium (H-3)	8.31E+00	4.99E+00
GW	8	Tritium (H-3)	1.32E+01	5.88E+00
GW	9	Tritium (H-3)	3.84E+01	4.08E+00
GW	12	Tritium (H-3)	1.01E+01	2.96E+00
GW	20	Tritium (H-3)	6.11E+00	3.08E+00
GW	20	Uranium-234	4.59E+00	3.61E+00
GW	19	Uranium-238	5.21E+00	3.06E+00
GW	20	Uranium-238	5.46E+00	5.04E+00
GW	20	Xylenes	4.85E+00	4.70E-01
GW	17	Zinc	8.46E+00	4.79E+00
SP	4	Cesium-137	4.56E+00	2.46E+00
SP	10	Cesium-137	1.15E+01	3.09E+00
SP	7	Chromium	5.58E+00	3.31E+00
SP	8	Chromium	6.53E+00	4.84E+00
SP	20	Cobalt-60	4.41E+00	4.02E+00
SP	9	Lead	5.75E+00	2.29E+00

Table 3.7. (Cont'd)

Medium	Segment	Contaminant	Computed Geometric Standard Deviation	Truncated Geometric Standard Deviation
SP	7	Nitrate	5.90E+00	2.80E+00
SP	8	Nitrate	1.32E+01	8.52E+00
SP	10	Nitrate	4.96E+00	2.60E+00
SP	2	Strontium-90	2.01E+01	1.04E+01
SP	5	Strontium-90	4.38E+00	2.28E+00
SP	6	Strontium-90	2.74E+02	3.42E+01
SP	8	Strontium-90	4.23E+00	2.29E+00
SP	8	Technetium-99	6.77E+01	1.59E+01
SP	17	Technetium-99	5.13E+00	2.15E+00
SP	5	Tritium (H-3)	8.66E+00	3.81E+00
SD	22	Benzene	4.31E+00	2.10E+00
SD	10	Cesium-137	4.75E+00	3.47E+00
SD	24	Cesium-137	4.91E+00	3.29E+00
SD	24	Chromium	2.73E+01	2.63E+00
SD	1	Cobalt-60	5.61E+00	3.33E+00
SD	23	Cobalt-60	7.24E+00	4.52E+00
SD	24	Cobalt-60	8.20E+00	4.00E+00
SD	26	Cobalt-60	4.92E+00	2.67E+00
SD	24	Copper	2.38E+01	2.78E+00
SD	10	Europium-152	9.73E+00	1.30E+00
SD	22	Europium-152	8.28E+00	2.56E+00
SD	24	Europium-152	1.22E+01	4.79E+00
SD	14	Europium-154	7.04E+00	2.73E+00
SD	20	Europium-154	5.08E+00	1.96E+00
SD	24	Europium-154	1.43E+02	1.79E+01
SD	27	Europium-154	4.20E+00	4.00E+00
SD	22	Lead	4.31E+00	2.10E+00
SD	24	Lead	2.71E+01	3.20E+00
SD	16	Mercury	4.03E+00	2.98E+00
SD	22	Mercury	9.56E+00	2.68E+00
SD	27	Nitrate	4.66E+00	3.13E+00
SD	2	Strontium-90	1.85E+01	5.72E+00
SD	6	Strontium-90	1.64E+01	7.57E+00
SD	8	Strontium-90	3.90E+01	1.57E+00
SD	9	Strontium-90	1.11E+01	3.78E+00
SD	14	Strontium-90	7.85E+00	2.82E+00
SD	16	Strontium-90	9.30E+00	1.01E+00
SD	22	Strontium-90	5.74E+00	2.29E+00
SD	24	Strontium-90	4.38E+00	4.00E+00
SD	14	Technetium-99	6.24E+00	2.35E+00
SD	21	Uranium-234	4.40E+00	2.53E+00
SD	14	Xylenes	6.13E+00	2.34E+00
SD	24	Zinc	3.68E+01	3.99E+00
SW	1	Benzene	9.90E+00	4.47E+00
SW	1	Cesium-137	4.85E+01	2.99E+01
SW	2	Cesium-137	9.38E+00	5.33E+00
SW	6	Cesium-137	4.98E+00	4.01E+00

Table 3.7. (Cont'd)

Medium	Segment	Contaminant	Computed Geometric Standard Deviation	Truncated Geometric Standard Deviation
SW	18	Cesium-137	4.49E+00	3.59E+00
SW	20	Cesium-137	2.56E+01	1.68E+01
SW	21	Cesium-137	6.97E+01	2.89E+01
SW	2	Chromium	4.49E+00	2.70E+00
SW	13	Chromium	4.83E+00	3.48E+00
SW	1	Cobalt-60	1.17E+02	6.44E+01
SW	6	Cobalt-60	4.45E+00	4.03E+00
SW	8	Cobalt-60	4.20E+00	3.01E+00
SW	20	Cobalt-60	5.39E+01	3.40E+01
SW	21	Cobalt-60	6.88E+01	2.01E+01
SW	1	Europium-154	9.08E+01	4.30E+01
SW	20	Europium-154	1.70E+02	2.00E+01
SW	21	Europium-154	9.61E+01	4.00E+01
SW	1	Mercury	5.77E+00	3.50E+00
SW	21	Mercury	1.20E+01	8.77E+00
SW	1	Nickel	4.45E+00	2.30E+00
SW	1	Nitrate	4.02E+00	3.07E+00
SW	2	Nitrate	7.17E+00	2.45E+00
SW	5	Nitrate	5.10E+00	2.21E+00
SW	10	Nitrate	5.02E+00	2.20E+00
SW	17	Nitrate	1.18E+01	7.27E+00
SW	18	Nitrate	4.09E+00	2.12E+00
SW	21	Nitrite	5.31E+00	2.47E+00
SW	9	Strontium-90	1.15E+01	2.01E+00
SW	10	Strontium-90	9.07E+00	3.29E+00
SW	19	Strontium-90	8.05E+00	4.30E+00
SW	20	Sulfate	1.78E+01	2.25E+00
SW	6	Technetium-99	2.68E+01	1.18E+01
SW	17	Technetium-99	1.03E+02	7.60E+01
SW	19	Technetium-99	5.86E+00	4.60E+00
SW	20	Technetium-99	1.30E+01	1.19E+01
SW	20	Uranium-234	4.01E+00	3.24E+00
SW	19	Uranium-238	6.08E+00	4.69E+00
SW	20	Uranium-238	6.94E+00	5.97E+00
GW	= Groundwater			
SP	= Seeps			
SD	= Sediment			
SW	= Surface water			