COOK-JOYCE INC.
ENGINEERING AND CONSULTING
812 WEST ELEVENTH
AUSTIN, TEXAS 78701-2000
(512) 474-9097 FAX (512) 474-8463

WASTE CONTROL SPECIALISTS
2002 ANNUAL GROUNDWATER MONITORING REPORT

JANUARY 25, 2003

Prepared for:

Waste Control Specialists, LLC
9998 Highway 176
Andrews, Texas

WCS\FINAL\01098.02\2002 REPORT\
R010327_GW MONITORING.DOC

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

Provision VI.Q. of Permit No. HW-50358 requires, among other things, the submittal of a *summary of all background ground-water quality values, ground-water monitoring analyses, ground-water flow rates, and statistical calculations.* In addition, Provision III.J.6. states: *The permittee shall determine the ground-water flow rate and direction in the uppermost aquifer for upgradient, downgradient and supplemental detection monitoring wells required by this permit at least semi-annually. The documentation shall include a calculation of ground-water flow rate and direction, and a contour map of piezometric water levels in the uppermost aquifer based, at a minimum, upon concurrent measurements in all monitoring wells. The results and documentation shall be included in the annual report required by* Provision VI.X [*sic*]. This report is submitted to fulfill the cited permit requirements for report year 2002.

In addition to the presentation of the required information, a discussion of the status of the current detection monitoring program is provided. Technical issues and concerns regarding the current program are identified and action items for addressing these issues and concerns are presented.

2.0 BACKGROUND INFORMATION

The permit, as originally issued, required the installation and sampling of both upgradient and downgradient monitoring wells near the landfill. The locations of the detection monitor wells are shown on Figure 2-1. During the first year of groundwater monitoring WCS was to collect and analyze samples from the upgradient monitoring wells on a quarterly basis to determine the background concentrations of specified monitoring parameters in the groundwater. Each downgradient monitoring well was to be sampled semi-annually after the first year of monitoring. For each sampling event, four separate samples from each downgradient well were to be collected and analyzed for the specified monitoring parameters. The semi-annual data for the downgradient wells were to be compared to the background values using the Analysis of Variance (ANOVA) statistical procedure.

For many of the constituents, the reporting limits that were available during the first year of monitoring (1997) were higher than those available in subsequent years. For numerous parameters, primarily metals, statistically significant increases were determined and it was suggested that a more appropriate statistical method might be employed. In addition, it was suggested that rather than performing interwell comparisons of downgradient to upgradient, the more appropriate comparison might be intrawell comparisons, comparison of the constituent concentration in each well to the previous constituent concentrations in that well. A permit modification request was submitted to the TNRCC by letter dated April 30, 1999 and was subsequently approved on October 28, 1999, which among other things allowed the use of intrawell comparisons using the Fischer's Exact Test statistical method. In addition, the modification allowed for arsenic, barium and vanadium to only be monitored and reported until the first semi-annual sampling event in 2000, at which time the statistical analyses for these parameters were to be resumed with a new baseline data set.

The following action items (shown in italics) were proposed in the 2001 Annual Groundwater Monitoring Report for resolution of technical concerns and issues identified with the detection monitoring program. The status of each item is indicated following the item.

1. *Applicable characteristics of the uppermost aquifer, including hydraulic conductivity, effective porosity, and hydraulic gradient will be evaluated to determine the most appropriate interval of time between sample events to ensure that independent*

samples of groundwater are obtained to the greatest extent technically feasible. An initial evaluation of the appropriate sampling interval has been completed and discussed in this report.

2. *Alternative procedures for collecting samples representative of the groundwater quality at the point of compliance will be investigated to identify the least intrusive and most effective method for sample collection.* Sample collection procedures have been assessed and recommended modifications are included in this report.

3. *Leachate samples will be collected from individual leachate collection system risers and analyzed separately for priority pollutant volatile organics, semi-volatile organics, metals, and PCBs.* Samples were collected and analyzed. Complete analytical results will be submitted with a permit modification request to change the current detection monitoring parameters.

4. *Significant constituents in the leachate will be evaluated to identify those constituents that are anticipated to be the most mobile constituents in the groundwater.* Analytical results for the leachate samples have been reviewed to identify more appropriate detection monitoring parameters. Documentation will be submitted with the permit modification request to change the current detection monitoring parameters.

5. *To the extent that groundwater data is available for the leachate constituents identified in Item 4., the distribution of the data will be evaluated and potentially viable statistical evaluation methodologies will be identified and assessed.* This activity is underway and the results of the evaluation will be submitted with the permit modification request to change the current detection monitoring parameters.

6. *Statistical evaluation methodologies for constituents that have not typically been detected or are not anticipated to be naturally-occurring in the groundwater will be researched and candidate methods identified.* This activity is underway and the results of the evaluation will be submitted with the permit modification request to change the current detection monitoring parameters.

7. *An application for modification of the permit will be prepared to provide the results of the action items listed above and request appropriate changes in the permit and the*

sampling and analysis plan. A Class 1[1] permit modification request to change the sampling methodology is being submitted in concert with this report. A Class 2 permit modification request to revise the analytical parameters and statistical procedures will be submitted by May 2003.

During 2002, numerous activities relating to refinement of the detection monitoring system were performed. These activities included surveying the locations and top of casing elevations for all of the wells and piezometers that were identified as potentially completed in the water bearing zone of interest; monthly measurement of depth to groundwater and determination of water level elevations in those wells and piezometers; alteration of purging and sampling procedures for the DW and MW wells as agreed with the TCEQ staff; and participation in several meetings and other communications to inform members of the staff of the TCEQ about the status of these activities and their results. This report presents the data and the findings of the activities performed relative to the detection monitoring system in 2002. Sections 3.0 and 4.0 provide information on the groundwater gradient and velocity evaluations. Section 5.0 discusses the analytical results and the conclusions from evaluation of those results. Section 6.0 presents conclusions and proposed activities for 2003 to further refine the understanding of the complex hydrogeology of the site and develop a more appropriate detection monitoring system.

3.0 2002 GROUNDWATER GRADIENT EVALUATION ACTIVITIES

Provision III.J.6 requires at least semi-annual groundwater elevation measurements in the upgradient and downgradient groundwater monitoring wells and determination of rate and direction of groundwater flow. The 2002 groundwater gradient and flow rate were determined based on the methods and recommendations of the 18 December 2001 Groundwater Gradient Monitoring Report, a copy of which was included as an appendix to the 2001 Annual Groundwater Monitoring Report. The determination of the 2002 groundwater gradient and flow rate is discussed in Section 4 of this report.

The general purpose of the 2001 Groundwater Gradient Monitor Report was to present the results of a review of data from the site's upgradient and downgradient wells, supplemented with existing data from other areas of the site, to more accurately generate an groundwater gradient map and determine flow rate of the water bearing zone of interest, so that the collected information could be as a tool to evaluate and update the groundwater monitoring program based on site-specific conditions. The 2001 Gradient Report recommended several activities to be conducted during 2002 in order to improve the quality of available data to be used to refine the determination of the groundwater gradient and flow rate at the site. The activities identified to be completed in 2002 included:

- Identification of existing monitor wells and piezometers that may be useful in developing a site wide groundwater gradient map;
- Performance of a top of casing survey for each of these existing monitor wells and piezometers;
- Conduct hydrogeologic analyses of the identified monitor wells and piezometers to determine if the identified monitor wells and piezometers have been completed in a zone that reflects the hydrologic head of the water bearing zone of interest;
- Measure groundwater levels during the year and determine which of the monitor wells and piezometers constructed in the water bearing zone of interest have static water levels and are not continuing to be affected by purging and sampling activities; and

- Select monitor wells and piezometers that accurately reflect the static hydrologic head of the water bearing zone of interest that can be utilized to construct the groundwater gradient maps.

The activities recommended for 2002 have been completed and the results are presented in the following subsections. In addition, responses to TCEQ comments, as outlined in Items 4 and 5 of a 2 May 2002 letter, are addressed.

3.1 SITE MONITOR WELLS AND PIEZOMETERS

The monitor wells and piezometers which were identified as being those most likely screened in the water bearing zone of interest consist of:

Downgradient Wells	Upgradient Wells	Supplemental Wells	Supplemental Piezometers
DW-32A	MW-1A	2-G	TP-0001
DW-32B	MW-1B	4-G2	TP-0002
DW-33A	MW-2A	4-G3	TP-0003
DW-33B	MW-2B	7-G	TP-0004
DW-34A	MW-3A	6B-2	TP-0005
DW-34B	MW-3B	A-22	PM-0003
DW-35A	MW-4A	A-24	PM-0006
DW-35B	MW-4B	NMB-23	PM-0009
DW-36A		NMB-24	PM-0012
DW-36B			

3.2 SURVEY DATA

Surveying of the site monitor wells and piezometers was conducted by West Texas Consultants, Inc. Surveying of the TP and PM series piezometers was conducted in October 2001, and the remaining identified monitor wells were surveyed in March 2002. Piezometer and monitor well location coordinates and top of casing elevations are summarized in Table 3-1.

The survey resulted in an adjustment in the top of casing elevations of all of supplemental wells and to many of the upgradient and downgradient wells. The 2002 survey indicated that the top of casing elevations of the supplemental wells are approximately 9 feet lower than previously surveyed. The new survey resulted in only minor adjustments for the upgradient and downgradient wells. The adjusted survey results have been incorporated into the reported groundwater gauging data for the 2002 reporting period.

3.3 HYDROGEOLOGIC DESCRIPTION OF THE SITE

The boring logs and well completion diagrams for each of the identified wells and piezometers were analyzed to determine if the wells and piezometers were completed in the water bearing zone of interest. The analyses of the data included construction of geologic cross sections, groundwater gradient maps based on groundwater elevations from validated wells and piezometers, and a structure map of the top of the water bearing zone of interest.

The two geologic cross sections are depicted in Figures 3-1 and 3-2. Section A-A' and B-B' are generally orientated east-west. Section A-A' is located north of the landfill and is approximately 8,000 feet in length. Section B-B' is located through the landfill area and is approximately 9,000 feet in length. Boring logs and well completion diagrams for the identified wells and piezometers are presented in Appendix A. As depicted on the geologic cross sections, surface caprock is continuous across the site and varies in thickness. Underling the caprock, interbedded clays and claystones with transmissive zones of siltstone and sandstone are found.

The first transmissive zone is described as a sandstone to silt and is encountered at elevations ranging from 3,393 to 3,359 feet msl. This zone appears to be laterally continuous across the site. While the strata was not shown in NMB-23, this well is not within the permitted facility boundary. Further, the log for this boring is very general, so the strata may be actually be present but not identified. Groundwater has never been encountered in this zone. In the area of the landfill, there are five monitor wells (SW series) completed in this zone; none of these wells has ever yielded any groundwater. To the east of the landfill, piezometer TP-0002 is also screened in this zone and has been dry since construction in August of 2001.

The second transmissive zone is a sandstone to siltstone. This zone appears to be discontinuous across the site. Where absent, it grades into a silty clay. Where present, it is encountered at elevations ranging from 3,307 to 3,273 feet msl. Piezometer PM-0012 is screened into this zone and has been dry since construction in August of 2001. Piezometers

PM-0009 and TP-0003 are also completed in lenses of the second transmissive zone and have encountered groundwater.

The third transmissive zone is the water bearing zone of interest in which the landfill's upgradient and downgradient monitor wells are screened. This zone is laterally continuous across the site and is encountered at elevations ranging from 3,280 to 3,225 feet msl. This zone is generally described as a sandstone and silt. Wells and piezometers screened in this zone indicate it is saturated and confined, with hydraulic heads (distance above top of transmissive zone) ranging from approximately 40 feet to 130 feet.

3.4 STATIC CONDITION OF WELLS AND PIEZOMETERS

Due to the low hydraulic conductivity of the water bearing zone of interest, the static groundwater elevations of wells disturbed by sampling activities do not fully recover between sampling events and have not fully recovered to date. Therefore, the groundwater elevations that were recorded during the year are not reflective of the actual static groundwater elevation of the water bearing zone of interest. To determine which wells and piezometers have not recovered from past sampling activities, hydrographs of the groundwater elevations during 2002 have been constructed for each of the wells and piezometers. The hydrographs are included in Appendix B as Hydrograph Plots 3-1 through 3-36.

The hydrographs indicate the upgradient (MW series) and downgradient (DW series) wells did not equilibrate during 2002 from past groundwater sampling activities.

The 2002 hydrograph for Monitor Well NMB-23 indicates that the well is recharging. A review of the hydrograph from 2001 for NMB-23 (Hydrograph Plot 3-15) also indicated that the well was recharging. A review of the facility records indicates this well was installed for groundwater gradient purposes in September 1998 and has never been sampled. Gauging data during 2002 indicates an increase in the groundwater elevation of approximately 14.5 feet (1.2 feet per month). Gauging data from July through December 2001 indicates an increase in the groundwater elevation of approximately 5.75 feet (1.15 feet per month). The total thickness of the groundwater in the well by the end of 2002 was approximately 139 feet. With the well being constructed in September 1998, 51 months ago, the well has recharged at an average rate of 2.72 feet per month since construction.

3.5 EVALUATION OF WELLS AND PIEZOMETERS FOR GRADIENT MONITORING

The monitor wells and piezometers which were identified as being those most likely screened in the water bearing zone of interest are listed in Section 3.1. A tabulation of these identified monitor wells and piezometers and the circumstances that either support or do not allow for the use of these data points in developing the final groundwater gradient map are shown on Table 3-2.

An additional review of the identified wells and piezometers listed in Section 3.1 was also conducted by comparing the groundwater elevation measurements from these points to one another in the form of groundwater gradient maps. Groundwater gauging events occurred monthly throughout 2002 for the identified wells and piezometers.

The list of the identified wells and piezometers that was transmitted to site personnel to be gauged during 2002 erroneously excluded well 4G-2. As was suggested in the TCEQ letter dated 2 May 2002 (Item 4), the water level shown on Figure 5-17 for well 4G-3 was inconsistent with the water level reported in Tables 4-1 and 5-1 of the 18 December 2001 Gradient Report. The water level shown for well 4G-3 on Figure 5-17 of the Gradient Report was actually the water level for 4G-2, as shown on Tables 4-1 and 5-1 of the Gradient Report. (With regard to the other comment in Item 4 of the 2 May 2002 TCEQ letter, the correct groundwater elevation for well G2 was 3298.73. The elevation of 3298.23 shown on Figure 5-17 was an error.) As noted in Item 5 of the 2 May 2002 letter, based on the cross-section shown in Figure 3-2, it does appear that well 4G-2 is the well that is completed in the water bearing zone of interest and that well 4G-3 is completed in a thin and essentially dry siltstone zone below the water bearing zone of interest.

After completion and evaluation of the cross-sections, site personnel were requested to gauge well 4G-2, and on 24 January 2003, the well was gauged. The January 2003 elevation was compared to the 2001 data for 4G-2 and the level was within 0.5 feet. Therefore, the groundwater elevation appears to be stable through 2002 and the groundwater elevation recorded on 24 January 2003 was used in the evaluation of the groundwater gradient for the water bearing zone of interest.

Piezometers TP-0002 and PM-0012 were included in the points identified in Section 3.1 as potential sources for groundwater elevation data representative of the water bearing zone of interest. These piezometers have been determined from the cross-sections to be completed in the first and second transmissive zones and are dry; therefore, they were not used to construct the final 2002 groundwater contour maps for the water bearing zone of interest.

Figure 3-3 is a groundwater contour map utilizing all wells determined to be completed in the water bearing zone of interest, as identified in Section 3.1. If a specific well or piezometer caused an anomaly in the contouring, such as a significant depression or mounding of the groundwater, that point was evaluated to determine the possible cause and the resultant usefulness in characterizing the groundwater gradient of the water bearing zone of interest. These anomalies are identified and discussed below.

The groundwater gradient map depicted in Figure 3-3, in concert with the hydrographs discussed previously, indicates that the groundwater elevation in the wells downgradient of the landfill (DW series) are depressed due to past sampling events. Consequently, these wells cannot be relied on at this time as accurately reflecting the static water level elevation of the water bearing zone of interest.

Piezometer TP-0003 has an anomalously low groundwater elevation resulting in as apparent depression of the groundwater contours in the area of the piezometer. A review of the cross section (Figure 3-2) indicates that TP-0003 is completed in the discontinuous siltstone lens located above the water bearing zone of interest. Therefore, groundwater elevation data from this point was not considered representative of the water bearing zone of interest and was not used in the development of the final site gradient maps (see Section 4).

Piezometer PM-0009 has a groundwater elevation that results in an apparent mounding of groundwater in the area of the piezometer. A review of the completion record for this piezometer indicates that the bottom of PM-0009 is at an elevation of 3269.65 feet msl. Based on the structure map of the top of the water bearing zone of interest (Figure 3-4), the elevation of this zone in the area of PM-0009 is approximately 3255 feet msl. As a result, it is believed that this piezometer is not screened in the water bearing zone of interest and therefore was not used in the development of the final site gradient maps discussed in Section 4.1.

4.0 GROUNDWATER RATE AND DIRECTION

Based on the groundwater elevations (Table 4-1) from the identified wells and piezometers that have been determined to be properly screened and have stabilized groundwater levels, groundwater gradient maps have been constructed from semi-annual gauging events recorded in May 2002 and September 2002 (Table 4-1).

4.1 GROUNDWATER GRADIENT

Figures 4-1 and 4-2 are the groundwater gradient maps which result after considering the above discussions in Section 3.5. These two figures represent the groundwater elevation data collected during the Spring and Fall 2002 groundwater monitoring events, and also include the groundwater elevation for well 4G-2, which was collected in January 2003. As discussed above, the January 2003 groundwater elevation for well 4G-2 is within 0.5 feet of the water level elevations measured for this well in 2001, and it has not been sampled or purged since 2001. The groundwater elevation at this well, however, is not consistent with the groundwater elevations for the other wells determined to be suitable for gradient determination. Given the apparent anomalous water elevation at well 4G-2, a separate set of groundwater gradient maps for the Spring and Fall 2003, excluding the groundwater elevation data for well 4G-2, were constructed and are shown in Figures 4-3 and 4-4.

The reason for the anomalous water level in well 4G-2 in unclear. Given that well 4G-3 is completed in a lower, thin siltstone that is believed to be essentially dry, and that well 4G-3 is very near well 4G-2, it is possible that there is leakage from the water bearing zone of interest into the lower siltstone formation, thus depressing the water level in 4G-2 somewhat. This is inconclusive and bears further evaluation to determine the use of 4G-2 in the future groundwater gradient determinations. For now, both sets of groundwater gradient contours are being presented, although the gradient calculated without well 4G-2 is used in the determination of the groundwater flow rate below.

The groundwater gradient maps for Spring and Fall 2002 are similar in both the indicated direction and gradient. The groundwater flow direction is to the south-southwest at an average gradient of 0.017 feet per foot across the site.

Future equilibration of the groundwater in the upgradient MW series wells and in NMB-23 will allow for additional control north of the landfill. It is estimated that groundwater recharge to NMB-23, based on its current recharge rate 14.5 feet per year and an anticipated decrease in the recharge rate as it near equilibration, will be fully recharged by early to mid of 2004. It is estimated that to fully recover DW-32A will have to reach an elevation of approximately 3315 feet msl. Currently, the well will require approximate recharge of 65 feet to fully recover. At the current recharge rate of approximately 30 feet per year, it is estimated that DW-32A will require more than 2 years to fully recover. Potential modification of the sampling frequency of the downgradient DW-35 and DW-36 series monitor wells may provide sufficient time for these wells to equilibrate between monitoring events, thereby providing additional control along the southern perimeter of the landfill. Nonetheless, an additional piezometer is proposed to be constructed to the southwest of the landfill to supply an additional control point in the area to the south and west of the landfill.

4.2 GROUNDWATER VELOCITY

The velocity of the groundwater in the water bearing zone of interest has been calculated based on the groundwater gradient, the hydraulic conductivity, and the porosity using the following expression:

$$\text{Groundwater velocity} = \frac{Ki}{\theta}$$

The hydraulic conductivity of the water-bearing zone of interest at the WCS facility has been calculated by evaluating groundwater recharge data as a rising head slug test, using the Hvorslev method. Groundwater elevation data were collected from recharge of monitor well DW-36A following the purging and sampling activities in September 2001. Data from DW-36A were chosen for the evaluation because, based on past experience, recharge rates in the 36-series wells are greater than in the other DW wells. Use of the more rapid recharge data will result in a more conservative or higher hydraulic conductivity than from wells with slower recharge. The hydraulic conductivity calculations are included in Appendix C. The calculation based on site-specific conditions resulted in a hydraulic conductivity of 6.13E-08 cm/sec.

The hydraulic gradient in the water-bearing zone of interest is approximately 0.017 ft/ft based on the 2002 groundwater gradient maps previously presented. A porosity of 15% was used for calculation of velocity, based on published literature. The literature review included porosity ranges as stated in *Groundwater and Wells*; F.G. Driscoll, Ph.D., *Applied Hydrologeology*, C.W. Fetter, Jr., *Groundwater Hydrology*; H. Bouwer, and *Groundwater*, Freeze and Cherry. Generally, the porosity of consolidated sandstone ranges from 3% to 30%.

Therefore, the calculation of the groundwater velocity is:

$$\text{Groundwater velocity} = \frac{Ki}{\theta}$$

Hydraulic conductivity (K)	=	6.13E-08 cm/s
Hydraulic gradient (i)	=	0.017
Porosity (θ)	=	0.15

$$= \frac{6.13E-08\text{cm/sec x } 0.017 \text{ ft/ft x } 86{,}400\text{sec/day x } 365\text{day/yr x } 1\text{ft}/30.48\text{cm}}{0.15}$$

= 0.0072 ft/year, or 0.0006 ft/month

If we assume a porosity of 0.30, the velocity would be 0.0036 ft/year, and if we assume a porosity of 0.05, the velocity will be 0.022 ft/year.

4.3 DISCUSSION OF GROUNDWATER SAMPLE COLLECTION

An evaluation of groundwater recharge data and the groundwater gradient in the water bearing zone of interest at the WCS site has been performed. The purpose of the evaluation was to estimate the amount of time necessary for "new" groundwater to be available for sampling based on site-specific conditions. "New" groundwater is desired to be sampled at each monitoring event so that independent samples are collected for data evaluation purposes, as required by applicable regulations.

The sampling procedure, including purging the well dry before sample collection and the sample volume itself, removes an approximate volume of 3.8 ft^3, as calculated below.

Water column height = 40 ft

Unit volume within the well bore for a 4" well = 0.087 ft^3/ft depth

Sample volume required for current monitoring parameters
(one sample set only) = 3 gal = 0.401 ft^3

Total volume (V) of water removed for sampling

$$V = (40\ ft \times 0.087\ ft^3/ft) + 0.401\ ft^3$$

$$V = 3.8\ ft^3$$

This volume does not consider the volume of water that is drained from the sand pack when bailing the well to dryness, which results in a conservative calculation of the volume of water removed, relative to the actual amount of water that has to recharge the well for sampling.

The radius of influence of this volume of removed water in the water-bearing zone of interest is estimated at 0.733 ft, as calculated below.

Volume (V) of water removed	=	3.8 ft^3
Water-bearing zone of interest screen length (h)	=	15 ft
Water-bearing zone of interest porosity (θ)	=	15 percent

$$= \frac{\sqrt{V}}{\sqrt{\pi \theta h}}$$

$$= \frac{\sqrt{3.8\ ft^3}}{\sqrt{\pi x 0.15 x 15\ ft}}$$

radius = 0.733 ft

Using the same range of potential porosities as described above, the radius of influence for a porosity of 0.30 would be 0.52 ft, and the radius of influence for a porosity of 0.05 would be 1.27 ft.

In order for "new" and "independent" groundwater for a sampling event to occupy a well after a sampling event, groundwater must flow under natural conditions from the upgradient end of the radius of influence to the downgradient end, i.e., a total distance of 2 x 0.733 ft, or 1.466 ft. Another way to say this is that although one would expect water to refill the well from 360 degrees, only the water from upgradient is new water, or water that has not been sampled previously. Therefore, it takes water that moves twice the distance of the radius of influence to be new water.

The minimum time taken for "new" groundwater to occupy the sampling volume and provide an "independent" sample is about 2,443 months (1.466 ft divided by 0.0006 ft/month) for a porosity of 0.15, 3467 months for a porosity of 0.30, and 1385 months for a porosity of 0.05.

If the wells are not purged prior to sampling, the volume of water removed from each of the wells to collect one sample set will be approximately 3 gallons, or 0.401 ft^3, for analysis of the current monitoring parameters. The radius of influence from removal of this volume of groundwater would be 0.476 feet assuming the average case of 15% porosity. Based on this radius of influence, it would require approximately 793 months for "new" groundwater to migrate past the well to provide an independent sample at a hydraulic conductivity of 6.0E-8 cm/sec. WCS is preparing a permit modification request to eliminate purging of the detection monitoring wells prior to sampling, since they are still recharging after a six-month monitoring interval, and therefore the groundwater present in the wells is as "fresh" as it would be if purging occurred.

These calculations approximating site-specific conditions of the water-bearing zone of interest demonstrate that the interval between sampling events must be much longer than six months in order to collect independent samples from the monitoring wells at each sampling event.

5.0 GROUNDWATER SAMPLING AND ANALYSIS

Groundwater samples were collected from the third transmissive zone on a semi-annual basis, in general accordance with the provisions of Permit No. HW-50358-001. Some adjustments to the sample collection procedures were made in 2002, in consultation with the TCEQ permits staff. Sampling and analytical procedures are described below.

Downgradient monitoring wells were purged for the first semi-annual event in late January/early February to allow the groundwater to recharge approximately 60 days prior to sample collection in April and May of 2002. Purging was accomplished by evacuating all water within the well casing using a bailer. Purging of the wells in prior years was conducted using an electric pump. The upgradient wells were not purged for the Spring 2002 monitoring event.

In the Spring 2002 monitoring event, four sample sets were collected from all downgradient monitoring wells in accordance with permit requirements, with the exception of wells DW-32A and DW-33A. In these two wells, the groundwater did not recharge enough to supply sufficient water for the collection of four sample sets. Samples from the downgradient wells were analyzed for all parameters currently specified by the permit. A single sample was collected from upgradient wells MW-3A, MW-3B, MW-4A, and MW-4B during the Spring 2002 monitoring event. Each of these samples was analyzed for the metal parameters identified in the permit.

As agreed in a meeting with TCEQ staff on 29 August 2002, downgradient well pairs DW-32 through DW-34 were not going to be purged prior to the Fall 2002 monitoring event. However, site personnel had completed purging of well pairs DW-34 through DW-36 on 25 August 2002, so well pairs DW-32 and DW-33 were not purged prior to this event. Purging was again accomplished by evacuating all water within the well casing using a bailer. The upgradient wells were not purged.

In the Fall 2002 monitoring event, four sample sets were collected from all downgradient monitoring wells in accordance with permit requirements. Samples from the downgradient wells were analyzed for all parameters currently specified by the permit. A single sample was collected from upgradient wells MW-3A, MW-3B, MW-4A, and MW-4B. Each of these samples was analyzed for the metal parameters identified in the permit.

As discussed in the semi-annual report documenting the Fall 2001 sampling event, included in the Annual Report for 2001, metal pieces from an electric line used to gauge the water level in DW-36A separated from the e-line and dropped to the bottom of the well. All metal objects, other than the stainless steel nipple and a magnet encased within stainless steel (lost when trying to recover the e-line parts), were recovered from this well prior to the Fall 2002 sampling event, but after the well was purged.

Groundwater samples were analyzed by Severn Trent Laboratory in Denver, Colorado. Summary tables of the 2002 and previous analytical data are contained in Appendix D. CJI prepared these tables by adding the 2002 data to the tables prepared last year for the 2001 Annual Report. Last year's tables were developed by review of previously assembled tables prepared by others and verification of the 2001 and 2000 data, with a combination of complete reviews for parameters with significant detected values and spot checks for data that were reported as non-detects. The consolidated laboratory reports for the Spring and Fall 2002 events are provided as Appendices G and H, respectively.

5.1 STATISTICAL DATA EVALUATION OVERVIEW

In accordance with Permit Provision III.J.4., the monitoring data for each downgradient monitoring well were statistically evaluated using Fisher's Exact Test and the previously-established background database. In addition, the metals data from the upgradient wells collected for the Spring and Fall 2002 monitoring event were also evaluated statistically, using the same procedure. Results of the statistical evaluations of all parameters that were detected in either the Spring or Fall 2002 monitoring event are tabulated in Appendix E. Of the 28 monitoring parameters that are statistically evaluated, the only parameters that were detected at quantifiable levels in the Spring and/or Fall 2002 monitoring events were: barium, chromium, cobalt, copper, lead, nickel, silver, vanadium, and zinc. Results of the statistical evaluations that were determined to be significant through application of the Fisher's Exact Test to the background data are summarized in Table 5-1. Parameters that were indicated as significant detections in one or both of the monitoring events are barium, chromium, cobalt, lead, nickel, and copper.

The current analytical laboratory's reporting limits constitute quantification levels. Estimated concentrations of analytes are reported when the analytical results indicate the presence of an analyte at levels below the quantification level. Since the current statistical procedure is based on the number of detections, regardless of concentration, the estimated concentrations reported below the quantification limit are not considered to be detectable values for the purposes of statistical evaluation. Each of the parameters with apparent statistically significant detections is discussed further in Section 5.3.

5.2 QUALITATIVE EVALUATION

A qualitative evaluation was conducted of the cumulative data for the parameters that were identified as having statistically significant increases in one or more of the DW wells. As part of this evaluation, the data for these parameters in the DW wells were plotted over time. The data plots are provided in Appendix F. Results of this evaluation are discussed below.

Barium

The data for barium in the DW wells are shown graphically in Plots 5-1A through 5-1J in Appendix F. Detections of barium were first reported in Fall 1998, after detection limits lowered to 0.01 mg/L from the previous value of 0.4 mg/L or greater. Barium is detected in both the upgradient and downgradient wells. Historically, quantified detections were most frequently reported in the range of 0.01 mg/L (which is the reporting limit) to 0.03 mg/L, although occasional values on the order of 0.04 to 0.09 mg/L have been reported.

The background dataset for barium was allowed to be re-established under a permit modification approved in October 1999, due to the elevated reporting limit of 0.4 mg/L or greater during the initial background period. Barium was detected at this lower reporting limit during the new background period (Fall 1998 through Fall 1999) in all DW wells. However, barium detections were reported in one or both of the first two semi-annual events of the background period and the third semi-annual event in well pairs DW-32 through DW-34, but only in the third semi-annual event of the background period in well pairs DW-35 and DW-36. The reason for this difference is not known. DW-35 and DW-36 were sampled three times, two at the lower reporting limit, before barium was routinely detected, whereas DW-32 through DW-34 were sampled quarterly for a year and for one semi-annual event before the barium detection limit dropped and barium was detected.

Subsequent to the collection of the new background dataset, barium detections have increased in frequency. Barium has been detected at quantifiable levels in virtually all wells, including the MW wells, in all monitoring events since the Fall 2000 event. This increase in frequency of quantifiable barium concentrations may reflect the fact that these wells did not yield sufficient water at construction for proper development and removal of sediment fines from the drilling process.

In the 2002 data, the barium results from the sample sets collected from the downgradient wells generally exhibited greater variability than in prior years. (Since only one sample was collected from upgradient well pairs MW-4 and MW-5, the potential variability at upgradient wells in 2002 cannot be assessed.) In most cases, a marked increase in reported concentrations is observed from the initial sample set through the subsequent sample sets. Initial concentrations are consistent with historical concentration ranges, while the higher concentrations are frequently an order of magnitude greater than historical concentrations. The variation in reported concentration of the sample sets is believed to be associated with the amount of entrained sediment in the samples, since total metals are analyzed. In general, the amount of sediment increases as the sample sets are collected and groundwater nearer to the bottom of the well casing is sampled. Naturally occurring metallic elements in the sediment, which are not mobile in the groundwater, will be dissolved by the acid digestion step in the analytical procedure, resulting in higher detected concentrations as the amount of sediment increases. The increased sediment that was apparently encountered in the 2002 groundwater samples may reflect the fact that these wells did not yield sufficient water at construction for proper development and removal of sediment fines from the drilling process, and/or may be influenced by changes in the well sampling procedures.

Chromium

The data for chromium in the DW wells are shown graphically in Plots 5-2A through 5-2J in Appendix F. Prior to Fall 1999, chromium was not detected in the DW wells, with detection limits ranging from 0.01 to 0.10 mg/L. In Fall of 1999, detection limits lowered to 0.005 mg/L and chromium detections were reported Chromium has historically been detected in both the upgradient and downgradient wells, with quantified detections most frequently reported in the range of 0.005 mg/L (the reporting limit) to 0.010 mg/L, although occasional values on the order of 0.012 to 0.015 mg/L have been reported.

The statistical tables in Appendix E were originally developed by others, and subsequently reformatted and revised by CJI to reflect 2001 and 2002 detections. Review of the tabulated data for chromium in Appendix D and the source file for the statistical tables in Appendix E indicates that the source file used the chromium data for Spring 1999 through Spring 2000 as the background dataset. These data are more appropriate for use as the background dataset for chromium, given the elevated reporting limits that were embodied in the original background periods; however, it does not appear that re-establishment of the background dataset for chromium was expressly authorized by the October 1999 permit modification.

Subsequent to the collection of the new background dataset, chromium detections have increased in frequency, although quantifiable concentrations are not reported as routinely for chromium as they are for barium. Chromium has been detected at quantifiable levels in one or more monitoring events since the Fall 2000 event in all wells, including the MW wells. Given the hydrogeologic characteristics of the transmissive zone as discussed in Sections 4.1 and 4.2, this increase in frequency of quantifiable chromium concentrations is believed to reflect the transition of more nearly "new" water to the well in the more recent data.

In the 2002 data, the chromium results from the sample sets collected from the downgradient wells generally exhibited greater variability than in prior years. (Since only one sample was collected from upgradient well pairs MW-4 and MW-5, the potential variability at upgradient wells in 2002 cannot be assessed.) In most cases, a marked increase in reported concentrations is observed from the initial sample set through the subsequent sample sets. Initial concentrations are generally consistent with historical concentration ranges, while the higher concentrations are two to ten times greater than historical concentrations. The variation in reported concentration of the sample sets is believed to be associated with the amount of entrained sediment in the samples, as discussed for barium.

Lead

The data for lead in the DW wells are shown graphically in Plots 5-3A through 5-3J in Appendix F. Early monitoring data for 1997 and 1998 indicated lead was typically not detected at reporting limits varying from 0.004 to 0.02 mg/L. However, a number of detections at concentrations ranging from 0.02 mg/L to 0.33 mg/L were reported in both the upgradient and downgradient wells during this time period, based on data previously tabulated by others. Lead results for 2001 and 2002 are most typically not detectable at a reporting limit of 0.003 mg/L or estimated concentrations below that reporting limit.

In the 2002 data, the lead results from the sample sets collected from the downgradient wells generally exhibited greater variability than in prior years, although not to extent exhibited by the barium and chromium data. (Since only one sample was collected from upgradient well pairs MW-4 and MW-5, the potential variability at upgradient wells in 2002 cannot be assessed.) In some cases, a marked increase in reported concentrations is observed from the initial sample set through the subsequent sample sets. Initial concentrations are generally consistent with historical concentration ranges, while the higher concentrations are typically two to ten times greater than historical concentrations. A singular, anomalously high lead concentration (0.079 mg/L) was reported for the third (and final) sample set collected from DW-33A in Spring 2002. The variation in reported concentration of the sample sets is believed to be associated with the amount of entrained sediment in the samples, as discussed for barium.

Nickel

The data for nickel in the DW wells are shown graphically in Plots 5-4A through 5-4J in Appendix F. Prior to Fall 2000, nickel was not detected in the DW wells, with detection limits generally ranging from 0.01 to 0.10 mg/L. In Fall of 2000, detection limits lowered to 0.005 mg/L, and quantifiable nickel concentrations have been reported in at least one sample from each of the DW wells since that time. Nickel was also detected in upgradient wells MW-1A, MW-1B, MW-2AA, MW-2B, and MW-3A in the Fall 2000 event, one of two monitoring events for which all MW wells were analyzed for nickel at a reporting limit of 0.005 mg/L. The nickel data from Fall 2000 forward contain a substantial fraction of non-detect or estimated concentrations below the reporting limit of 0.005 mg/L. Quantified detections are most frequently reported in the range of 0.005 mg/L (the reporting limit) to 0.020 mg/L.

In the 2002 data, the nickel results from the sample sets collected from the downgradient wells generally exhibited greater variability than in prior years. (Since only one sample was collected from upgradient well pairs MW-4 and MW-5, the potential variability at upgradient wells in 2002 cannot be assessed.) In most cases, a marked increase in reported concentrations is observed from the initial sample set through the subsequent sample sets. Initial concentrations are generally consistent with historical concentration ranges, while the higher concentrations are two to ten times greater than historical concentrations. The variation in reported concentration of the sample sets is believed to be associated with the amount of entrained sediment in the samples, as discussed for barium.

Copper

The data for copper in the DW wells are shown graphically in Plots 5-5A through 5-5J in Appendix F. Early monitoring data for 1997 and 1998 indicated copper was typically not detected at reporting limits varying from 0.02 to 0.03 mg/L. However, a number of detections at concentrations ranging from 0.02 mg/L to 0.087 mg/L were reported in one or more samples from MW-4A, DW-32A, DW-32B, DW-33A, and DW-33B during this time period, based on data previously tabulated by others. Copper results for 2001 and 2002 contain a substantial number of non-detectable or estimated concentrations at a reporting limit of 0.005 mg/L, but also contain a substantial number of quantifiable concentrations generally ranging between 0.005 and 0.01 mg/L.

In the 2002 data, the copper results from the sample sets collected from the downgradient wells tended to exhibit a somewhat greater variability than in prior years, although the variability was much less pronounced in comparison to that exhibited by the previously discussed metals. (Since only one sample was collected from upgradient well pairs MW-4 and MW-5, the potential variability at upgradient wells in 2002 cannot be assessed.) An increase in reported concentrations from the initial sample set through one or more of the subsequent sample sets is observed in some cases, while others are relatively stable or do not display a consistent pattern. Reported copper concentrations even in wells with increasing copper concentrations trends were generally consistent with historically observed concentrations. The lesser variation in reported copper concentrations for the sample sets indicates that the copper content of the entrained sediment is not as significant as the previously discussed metals.

Cobalt

Cobalt concentrations for 2001 and 2002 were typically not detectable or estimated concentrations below the reporting limit of 0.01 mg/L. However, quantifiable concentrations of cobalt were reported in well DW-33A. In Spring of 2002, one of the three samples from DW-33A was reported to contain cobalt at 0.025 mg/L, and two of the four samples collected from DW-33A in Fall 2002 were reported to contain cobalt at 0.012 and 0.016 mg/L. Detection limits for prior years varied between 0.01 and 0.05 mg/L. Relatively isolated detections of cobalt were reported in the historical data tabulation for both upgradient and downgradient wells, ranging from 0.025 to 0.065 mg/L. Plot 5-6A in Appendix F depicts the cobalt concentration record for DW-33A.

5.3 DISCUSSION OF APPARENT SIGNIFICANT DETECTIONS

The apparent significant detections of certain metals that occur naturally in soils and groundwater clearly represent false positive results given the construction of the landfill, the climate of the region, and the hydrogeology of the site. The landfill is a state-of-the-art design with a double liner system, a leachate collection system over the upper liner, and a leak detection system between the liners. The upper transmissive zone, in which the SW wells are completed, has been and remains consistently dry based on semi-annual gauging of the SW wells. While numeric evaluation of the potential for a release to reach the groundwater has not been performed, qualitative evaluation indicates this potential to be remote. Further, even if a release could have occurred and could have reached the groundwater, the results of the gradient evaluation (see Appendix C) demonstrates that the rate of groundwater movement is so slow that it would take on the order of 10,000 years for the groundwater to move from the downgradient limit of the landfill unit to the nearest downgradient well, using conservative assumptions about the properties of the saturated transmissive zone.

The apparent significant detections are discussed in more detail below.

Barium and Chromium

The initial background datasets for barium and chromium were replaced with subsequent data collected at appropriate detection limits. However, the very slow rate of groundwater movement makes the collection of a valid background dataset, merely comprised of near-independent observations in lieu of truly independent observations, virtually impossible. Initial calculations of the potential time to obtain "new" water between monitoring events indicate that many years, if not decades, would have to transpire between sampling events to ensure truly independent measurements. The more recent data with significantly greater frequencies of detection than in previous years with the same analytical reporting limits reflects a gradual transition in groundwater chemistry over time, consistent with the very slow rate of groundwater movement. Barium and chromium concentrations in the initial sample sets are consistent with the concentration ranges in the background dataset; increasing concentrations in the subsequent sample sets are associated with the presence of increasing amounts of entrained sediment.

Copper, Lead and Nickel

The background data for copper, nickel and lead are all comprised of a significant portion of non-detect results at reporting limits that are substantially greater than current reporting limits. As a result, the current statistical test yields apparent statistically significant increases based on low level detections that are well within the typical concentration ranges observed for these parameters. Concentrations of lead and nickel in the initial sample sets are consistent with the concentration ranges in the background dataset; increasing concentrations in the subsequent sample sets are associated with the presence of increasing amounts of entrained sediment. Reported concentrations of copper even in wells with increasing concentration trends over the sample sets were generally consistent with historically observed ranges.

Cobalt

The reported concentrations for cobalt in 2002 are less than previously observed values. The apparent statistically significant increases for cobalt in DW-33A are a result of the non-detect results for cobalt in the background data at a reporting limit that is substantially greater than the current reporting limit.

6.0 CONCLUSIONS AND 2003 ACTIVITIES

6.1 Water Bearing Zone of Interest

Sections 3.0 and 4.0 presented data, information and results of various evaluations of the water bearing zone of interest. From this it has been determined that the water bearing zone of interest is not uniform in hydraulic conductivity characteristics.

New Mexico Well NMB-23, which is reported to never have been purged or sampled, has yet to equilibrate since it was first completed in October 1998. It recharged during 2002 at a rate of approximately 14.5 feet per year. It is estimated that the groundwater will reach equilibration by early to mid 2004, based on the estimate that the groundwater will stabilize at an elevation approximately 5 feet above its current level and that the rate of recharge to the well will decrease as it nears equilibration. Contrasted with NMB-23, New Mexico Well NMB-24, which is approximately 1600 feet south of NMB-23 and was also installed in October 1998, reached equilibrium prior to October 2000. As evidenced by the information presented in Section 3.0, the detection monitoring wells do not recover between the semi-annual monitoring events when the wells are purged and four "replicate" samples (i.e., four sample sets) are collected.

Because of the previous lack of recovery of the detection monitoring wells, particularly at DW-32 which is located near the southwest corner of the landfill, there is inadequate undisturbed groundwater elevation control in the vicinity of the southwest corner of the landfill. To address this issue, three additional activities will be undertaken to increase groundwater elevation control in this area. First, in concert with this report, a Class 1[1] permit modification request is being submitted to the TCEQ to change sampling procedures to eliminate purging and require collection of only one sample set, rather than four "replicates". This will significantly reduce the amount of water removed a each monitoring event, thereby decreasing the time required for groundwater levels to recover. Second, a letter will be submitted to the TCEQ requesting that the DW-32 wells not be sampled as part of the Spring 2003 sampling event, which is currently scheduled to be conducted during April 2003. As discussed in Section 4.1, if the DW-32 wells are not sampled in the spring, and the wells are not purged and only one sample set is collected from the wells in subsequent sampling events, it is anticipated that it will take more than two years for the DW-32 well pair to fully recover to provide valid groundwater elevation data. In order to more timely fill the data gap for the groundwater elevation in the vicinity of the southwest corner of the landfill, WCS will install a piezometer completed in the water bearing zone of interest, at the location shown on Figure 6-1, for the sole purpose of determining groundwater elevations in the future.

Given that the nature of the water bearing zone of interest is highly variable, and based on observed development characteristics after completion of the new piezometer, alternate development techniques may be implemented in order to facilitate well development and groundwater equilibrium. If the groundwater recharge rate of the proposed piezometer responds in the same manner as NMB-23, then natural development and gradient equilibrium will take several years. NMB-23 is currently developing at a rate of approximately 14 feet per year and the well is estimated to be relatively near to reaching equilibrium. If it becomes evident, after measuring the water level frequently for two months, that the proposed piezometer is not developing such that equilibrium will be achieved within six months, then it is planned to add water to the well to a level near the anticipated equilibrium elevation. Such action may result in more timely data collection from the piezometer to fill the gradient data gap near the southwest corner of the landfill.

6.2 Detection Monitoring Program

As noted above, a Class 1[1] permit modification request is being submitted in concert with this report. This permit modification request seeks revision of permit provision III.H.1 to allow groundwater sample collection without first purging the wells, as is currently required by provision III.H.1. This is requested because the monitor wells do not fully recover between sampling events (see Section 4.1) and therefore the groundwater available for sampling in the wells is equally as "fresh" or representative of groundwater from the formation as it would be if purging were continued.

The Class 1[1] permit modification request also seeks authorization to implement an alternate sampling procedure to that which is currently required by permit provision III.J.1.b. and 30 TAC §335.163(7)(A), as provided under 30 TAC §335.163(7)(B). The purpose of this request is to allow collection of only one set of samples for each well for each detection monitoring event. Section 4.3 presents information that demonstrates that independent samples cannot be collected during one sampling event. Groundwater velocity is so slow that "new" water does not move into the well so as to be able to collect an independent sample even at a six-month sampling interval. This Class 1[1] permit modification request is being submitted in order to implement the no purging and alternate sampling with the Spring 2003 sampling event, which will be conducted in April.

An additional permit modification request will be submitted to the TCEQ by May 2003 to authorize different analytical parameters for the detection monitoring program and more appropriate statistical evaluation methodologies. It is anticipated that this Class 2 permit modification request will be acted upon prior to October 2003, when the fall groundwater monitoring event is scheduled.

6.3 2003 Activities

The additional piezometer will be installed by no later than the time of the Spring 2003 sampling event. Appropriate geological logging will be performed of the boring in order to collect additional geologic data in the area of the new piezometer.

Water level measurements will be collected for the previously selected wells and piezometers, installed in the water bearing zone of interest, every other month. Well 4G-2 will be added to the list for the continuing water level measurements. Well 4G-2 will be further evaluated to try to determine if the well is representative of the static water level of the water bearing zone of interest.

A plan will be developed for additional transmissive zone characterizations, which may include but are not limited to: identification and selection of appropriate historical boring cores for further evaluation and testing, additional historical boring geophysical log comparison and evaluations, and slug testing of selected wells/piezometers. The plan will be transmitted to the TCEQ for review and comment prior to the Spring 2003 sampling event.

TABLES

TABLE 3-1
WASTE CONTROL SPECIALISTS
MONITOR WELL TOP OF CASING ELEVATIONS

Well ID	2002 Survey TOC Elevation (ft)	Previous Survey TOC Elevation (ft)	Survey Discrepancy	2002 Survey Northing	2002 Survey Easting
DW32A	3461.52	3461.520	0	6873779.82	561178.95
DW32B	3461.46	3461.440	-0.02	6873775.51	561187.80
DW33A	3464.99	3465.000	0.01	6873728.26	561321.08
DW33B	3465.12	3465.150	0.03	6873724.02	561329.87
DW34A	3468.70	3468.650	-0.05	6873673.92	561463.85
DW34B	3468.94	3468.910	-0.03	6873669.60	561472.83
DW35A	3467.86	3467.770	-0.09	6873621.74	561583.27
DW35B	3467.95	3467.870	-0.08	6873618.32	561592.62
DW36A	3467.59	3467.520	-0.07	6873577.70	561708.27
DW36B	3467.93	3467.790	-0.14	6873574.37	561717.37
NMB-23	3467.85	3476.830	8.980	6876221.09	559328.28
NMB-24	3439.15	3448.110	8.960	6874754.32	559238.66
MW1A	3480.79	3489.670	8.880	6875849.83	561434.11
MW1B	3480.61	3489.627	9.017	6875855.32	561442.62
MW2A	3481.72	3490.728	9.008	6875934.44	561558.00
MW2B	3481.93	3490.919	8.989	6875939.12	561567.30
MW3A	3483.04	3491.953	8.913	6876011.00	561687.05
MW3B	3483.10	3492.020	8.920	6876015.93	561696.15
MW4A	3484.70	3493.637	8.937	6876099.58	561805.86
MW4B	3484.74	3493.720	8.980	6876104.92	561814.61
A-22-99	3460.00	3468.940	8.940	6870486.35	566186.58
A-24-99	3464.20	3473.160	8.960	6870962.73	567389.93
2G	3440.76	3449.650	8.890	6871955.32	564367.73
4G-2	3440.22	3449.180	8.960	6872424.69	563497.51
4G-3	3439.88	3449.112	9.232	6872426.30	563467.22
6B-2	3487.07	3496.050	8.980	6875082.71	563755.97
7G	3448.57	3457.560	8.99	6873076.60	562123.75
TP-0001	3485.38	NA	NA	6875530.62	567764.77
TP-0002	3463.14	NA	NA	6872824.80	565091.45
TP-0003	3487.98	NA	NA	6872640.64	568169.40
TP-0004	3489.05	NA	NA	6874473.10	566186.43
TP-0005	3488.35	NA	NA	6874805.18	567481.73
PM-0003	3487.99	NA	NA	6874858.36	567445.80
PM-0006	3489.59	NA	NA	6874526.98	566142.11
PM-0009	3483.03	NA	NA	6872792.74	567459.53
PM-0012	3474.66	NA	NA	6872795.55	566424.24

TABLE 3-2
STABILIZED GROUNDWATER/SCREENED INTERVALS

Monitor Points	Stabilized Groundwater	Properly Screened	Groundwater Data
DW-32A	NO	YES	NO
DW-32B	NO	YES	NO
DW-33A	NO	YES	NO
DW-33B	NO	YES	NO
DW-34A	NO	YES	NO
DW-34B	NO	YES	NO
DW-35A	NO	YES	NO
DW-35B	NO	YES	NO
DW-36A	NO	YES	NO
DW-36B	NO	YES	NO
MW-1A	NO	YES	NO
MW-1B	NO	YES	NO
MW-2A	NO	YES	NO
MW-2B	NO	YES	NO
MW-3A	NO	YES	NO
MW-3B	NO	YES	NO
MW-4A	NO	YES	NO
MW-4B	NO	YES	NO
2-G	YES	YES	YES
4-G2	YES	YES	YES
4-G3	YES	NO	NO
7-G	YES	YES	YES
6B-2	YES	YES	YES
A-22	YES	YES	YES
A-24	YES	YES	YES
NMB-23	NO	YES	NO
NMB-24	YES	YES	YES
TP-0001	YES	YES	YES
TP-0002	NO	NO	NO
TP-0003	NO	NO	NO
TP-0004	YES	YES	YES
TP-0005	YES	YES	YES
PM-0003	YES	YES	YES
PM-0006	YES	YES	YES
PM-0009	NO	NO	NO
PM-0012	NO	NO	NO

TABLE 4-1
WASTE CONTROL SPECIALISTS
JANUARY - FEBRUARY 2002
GROUNDWATER ELEVATIONS

Well ID	TOC Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)
DW32A	3461.52	1/22/02	1305	215.49	231.90	3246.03	2/25/02	1324	211.18	231.90	3250.34					
DW32B	3461.46	1/22/02	1309	200.11	248.80	3261.35	2/25/02	1329	195.19	248.80	3266.27					
DW33A	3464.99	1/22/02	1314	222.57	234.64	3242.42	2/25/02	1335	219.99	234.64	3245.00					
DW33B	3465.12	1/22/02	1318	211.41	247.15	3253.71	2/25/02	1339	207.48	247.15	3257.64					
DW34A	3468.70	1/22/02	1322	198.62	238.40	3270.08	2/25/02	1344	195.51	238.40	3273.19					
DW34B	3468.94	1/22/02	1324	201.52	252.94	3267.42	2/25/02	1348	197.65	252.94	3271.29					
DW35A	3467.86	1/22/02	1329	191.54	235.82	3276.32	2/25/02	1352	189.91	235.82	3277.95	2/28/02	1409	190.33	235.82	3277.53
DW35B	3467.95	1/22/02	1331	191.49	250.59	3276.46	2/25/02	1357	189.88	250.59	3278.07	2/28/02	1029	189.77	250.59	3278.18
DW36A	3467.59	1/22/02	1334	190.86	241.00	3276.73	2/25/02	1402	189.12	241.00	3278.47					
DW36B	3467.93	1/22/02	1336	190.98	255.52	3276.95	2/25/02	1409	189.27	255.52	3278.66	2/27/02	1355	189.19	255.52	3278.74
NMB-23	3467.85	1/21/02	1428	139.97	264.06	3327.88	2/22/02	1153	138.79	264.06	3329.06					
NMB-24	3439.15	1/21/02	1434	116.19	232.87	3322.96	2/22/02	1139	116.16	232.87	3322.99					
MW1A	3480.79	1/21/02	1444	151.11	260.47	3329.68	2/22/02	1147	148.48	260.47	3332.31					
MW1B	3480.61	1/21/02	1446	142.02	274.84	3338.59	2/22/02	1152	140.89	274.84	3339.72					
MW2A	3481.72	1/21/02	1449	158.58	264.25	3323.14	2/22/02	1156	156.50	264.25	3325.22					
MW2B	3481.93	1/21/02	1451	190.58	277.55	3291.35	2/22/02	1159	185.22	277.55	3296.71					
MW3A	3483.04	1/21/02	1455	154.56	268.00	3328.48	2/22/02	1203	152.98	268.00	3330.06					
MW3B	3483.10	1/21/02	1456	153.81	283.15	3329.29	2/22/02	1206	152.26	283.15	3330.84					
MW4A	3484.70	1/21/02	1458	139.78	271.45	3344.92	2/22/02	1209	139.05	271.45	3345.65					
MW4B	3484.74	1/21/02	1500	139.63	286.50	3345.11	2/22/02	1212	138.94	286.50	3345.80					
A-22-99	3460.00	1/21/02	1537	168.69	255.00	3291.31	2/22/02	1325	167.91	255.00	3292.09					
A-24-99	3464.20	1/21/02	1532	158.09	267.00	3306.11	2/22/02	1318	159.26	267.00	3304.94					
2G	3440.76	1/21/02	1523	151.69	250.00	3289.07	2/22/02	1308	150.80	250.00	3289.96					
**4G-2	3440.22			157.64	200.00	3282.58			157.64	200.00	3282.58					
4G-3	3439.88	1/21/02	1517	238.27	246.26	3201.61	2/22/02	1301	238.20	246.26	3201.68					
6B-2	3487.07	1/21/02	1506	137.61	272.00	3349.46	2/22/02	1217	136.43	272.00	3350.64					
7G	3448.57	1/21/02	1621	138.35	215.00	3310.22	2/22/02	1500	138.04	215.00	3310.53					
TP-0001	3485.38	1/22/02	1422	98.5	242.30	3386.88	2/22/02	1348	98.50	242.30	3386.88					
TP-0002	3436.14	1/22/02	1349	122.62	122.94	3313.52	2/22/02	1434	122.62	122.94	3313.52					
TP-0003	3487.98	1/22/02	1408	225.81	230.40	3262.17	2/22/02	1333	223.78	230.40	3264.20					
TP-0004	3489.05	1/22/02	1502	133.85	230.55	3355.20	2/22/02	1356	134.07	230.55	3354.98					
TP-0005	3488.35	1/22/02	1450	119.72	233.30	3368.63	2/22/02	1340	119.62	233.30	3368.73					
PM-0003	3487.99	1/22/02	1435	119.73	212.33	3368.26	2/22/02	1344	119.77	212.33	3368.22					
PM-0006	3489.59	1/28/02	1637	134.08	134.60	3355.51	2/22/02	1353	134.26	134.60	3355.33					
PM-0009	3483.03	1/28/02	1646	117.35	213.38	3365.68	2/22/02	1446	100.82	213.38	3382.21					
PM-0012	3474.66	1/28/02	1606	184.06	184.25	3290.60	2/22/02	1441	dry	184.25						

**4G-2 groundwater elevation was recorded on 1/24/03.

TABLE 4-1
WASTE CONTROL SPECIALISTS
JANUARY - FEBRUARY 2002
GROUNDWATER ELEVATIONS

Well ID	TOC Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)
DW32A	3461.52	3/11/02	1414	209.43	231.90	3252.09	3/26/02	1218	227.28	231.90	3234.24
DW32B	3461.46	3/11/02	1101	193.45	248.80	3268.01	3/26/02	1222	235.37	248.80	3226.09
DW33A	3464.99	3/8/02	1400	218.67	234.64	3246.32	3/26/02	1227	230.34	234.64	3234.65
DW33B	3465.12	3/8/02	1047	207.61	247.15	3257.51	3/26/02	1231	239.11	247.15	3226.01
DW34A	3468.70	3/8/02	858	194.87	238.40	3273.83	3/26/02	1235	222.94	238.40	3245.76
DW34B	3468.94	3/7/02	1323	196.71	252.94	3272.23	3/26/02	1238	238.67	252.94	3230.27
DW35A	3467.86						3/26/02	1240	205.04	235.82	3262.82
DW35B	3467.95						3/26/02	1242	204.11	250.59	3263.84
DW36A	3467.59	3/13/02	1227	201.52	241.00	3266.07	3/26/02	1245	205.36	241.00	3262.23
DW36B	3467.93						3/26/02	1247	204.41	255.52	3263.52
NMB-23	3467.85						3/26/02	1130	137.72	264.06	3330.13
NMB-24	3439.15						3/26/02	1134	116.13	232.87	3323.02
MW1A	3480.79						3/26/02	1143	146.25	260.47	3334.54
MW1B	3480.61						3/26/02	1147	139.81	274.84	3340.80
MW2A	3481.72						3/26/02	1149	154.62	264.25	3327.10
MW2B	3481.93						3/26/02	1151	180.40	277.55	3301.53
MW3A	3483.04						3/26/02	1155	151.50	268.00	3331.54
MW3B	3483.10						3/26/02	1158	150.81	283.15	3332.29
MW4A	3484.70						3/26/02	1200	138.35	271.45	3346.35
MW4B	3484.74						3/26/02	1202	138.22	286.50	3346.52
A-22-99	3460.00						3/26/02	1334	167.56	255.00	3292.44
A-24-99	3464.20						3/26/02	1329	159.61	267.00	3304.59
2G	3440.76						3/26/02	1320	150.38	250.00	3290.38
**4G-2	3440.22								157.6	200.00	3282.58
4G-3	3439.88						3/26/02	1315	238.07	246.26	3201.81
6B-2	3487.07						3/26/02	1306	135.90	272.00	3351.17
7G	3448.57						3/26/02	1251	137.61	215.00	3310.96
TP-0001	3485.38						3/26/02	1357	98.31	242.30	3387.07
TP-0002	3436.14						3/26/02	1414	122.63	122.94	3313.51
TP-0003	3487.98						3/26/02	1343	221.58	230.40	3266.40
TP-0004	3489.05						3/26/02	1404	134.04	230.55	3355.01
TP-0005	3488.35						3/26/02	1350	119.51	233.30	3368.84
PM-0003	3487.99						3/26/02	1353	119.63	212.33	3368.36
PM-0006	3489.59						3/26/02	1401	134.27	134.60	3355.32
PM-0009	3483.03						3/26/02	1340	90.77	213.38	3392.26
PM-0012	3474.66						3/26/02	1408	dry	184.25	

**4G-2 groundwater elevation was recorded on 1/24/03.

TABLE 4-1
WASTE CONTROL SPECIALISTS
JANUARY - FEBRUARY 2002
GROUNDWATER ELEVATIONS

Well ID	TOC Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)
DW32A	3461.52	4/10/02		227.71	231.90	3233.81	4/19/02		224.86	231.90	3236.66					
DW32B	3461.46						4/19/02		228.07	248.80	3233.39					
DW33A	3464.99	4/10/02		229.35	234.64	3235.64	4/19/02		228.78	234.64	3236.21					
DW33B	3465.12						4/19/02		229.91	247.15	3235.21					
DW34A	3468.70						4/19/02		214.52	238.40	3254.18					
DW34B	3468.94						4/19/02		225.91	252.94	3243.03					
DW35A	3467.86						4/19/02		198.37	235.82	3269.49	4/30/02	1410	197.1	235.82	3270.80
DW35B	3467.95						4/19/02		198.13	250.59	3269.82	4/30/02	1035	196.7	250.59	3271.27
DW36A	3467.59						4/19/02		198.10	241.00	3269.49	4/30/02	815	198.6	241.00	3269.00
DW36B	3467.93						4/19/02		198.00	255.52	3269.93	4/29/02	1410	196.7	255.52	3271.26
NMB-23	3467.85															
NMB-24	3439.15															
MW1A	3480.79															
MW1B	3480.61															
MW2A	3481.72															
MW2B	3481.93															
MW3A	3483.04															
MW3B	3483.10															
MW4A	3484.70															
MW4B	3484.74															
A-22-99	3460.00															
A-24-99	3464.20															
2G	3440.76															
**4G-2	3440.22															
4G-3	3439.88															
6B-2	3487.07															
7G	3448.57															
TP-0001	3485.38															
TP-0002	3436.14															
TP-0003	3487.98															
TP-0004	3489.05															
TP-0005	3488.35															
PM-0003	3487.99															
PM-0006	3489.59															
PM-0009	3483.03															
PM-0012	3474.66															

**4G-2 groundwater elevation was recorded on 1/24/03.

TABLE 4-1
WASTE CONTROL SPECIALISTS
JANUARY - FEBRUARY 2002
GROUNDWATER ELEVATIONS

Well ID	TOC Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)
DW32A	3461.52	5/1/02	1040	223.75	231.90	3237.77	5/29/02	1417	225.52	231.90	3236.00
DW32B	3461.46	5/1/02	1043	224.98	248.80	3236.48	5/29/02	1421	226.72	248.80	3234.74
DW33A	3464.99	5/1/02	1027	227.92	234.64	3237.07	5/29/02	1428	230.56	234.64	3234.43
DW33B	3465.12	5/1/02	1023	225.68	247.15	3239.44	5/29/02	1434	228.92	247.15	3236.20
DW34A	3468.70						5/29/02	1437	215.93	238.40	3252.77
DW34B	3468.94	5/1/02	855	220.85	252.94	3248.09	5/29/02	1440	224.37	252.94	3244.57
DW35A	3467.86						5/29/02	1446	199.11	235.82	3268.75
DW35B	3467.95						5/29/02	1449	198.91	250.59	3269.04
DW36A	3467.59						5/29/02	1452	199.50	241.00	3268.09
DW36B	3467.93						5/29/02	1456	199.39	255.52	3268.54
NMB-23	3467.85	5/6/02	1309	136.37	264.06	3331.48	5/28/02	1430	135.65	264.06	3332.20
NMB-24	3439.15	5/6/02	1313	116.13	232.87	3323.02	5/28/02	1436	115.92	232.87	3323.23
MW1A	3480.79	5/6/02	1320	143.8	260.47	3336.99	5/28/02	1444	142.62	260.47	3338.17
MW1B	3480.61	5/6/02	1323	138.48	274.84	3342.13	5/28/02	1448	137.94	274.84	3342.67
MW2A	3481.72	5/6/02	1325	152.38	264.25	3329.34	5/28/02	1453	151.26	264.25	3330.46
MW2B	3481.93	5/6/02	1327	174.86	277.55	3307.07	5/28/02	1457	172.11	277.55	3309.82
MW3A	3483.04	5/2/02	1455	149.72	268.00	3333.32	5/28/02	1501	149.58	268.00	3333.46
MW3B	3483.10	5/2/02	1505	149.22	283.15	3333.88	5/28/02	1504	148.89	283.15	3334.21
MW4A	3484.70	5/2/02	1510	137.57	271.45	3347.13	5/28/02	1510	137.43	271.45	3347.27
MW4B	3484.74	5/2/02	1520	137.46	286.50	3347.28	5/28/02	1513	137.30	286.50	3347.44
A-22-99	3460.00	5/6/02	1355	167.7	255.00	3292.30	5/30/02	1010	169.00	255.00	3291.00
A-24-99	3464.20	5/6/02	1359	159.61	267.00	3304.59	5/30/02	1015	160.56	267.00	3303.64
2G	3440.76	5/6/02	1338	149.94	250.00	3290.82	6/30/02	1036	151.38	250.00	3289.38
**4G-2	3440.22			157.64	200.00	3282.58			157.64	200.00	3282.58
4G-3	3439.88	5/6/02	1343	237.89	246.26	3201.99	5/30/02	1026	237.72	246.26	3202.16
6B-2	3487.07	5/6/02	1333	135.49	272.00	3351.58	5/29/02	1510	138.37	272.00	3348.70
7G	3448.57	5/6/02	1500	142.56	215.00	3306.01	5/29/02	1500	138.84	215.00	3309.73
TP-0001	3485.38	5/6/02	1418	98.16	242.30	3387.22	5/30/02	1401	98.18	242.30	3387.20
TP-0002	3436.14	5/6/02	1348	122.61	122.94	3313.53	5/30/02	1343	122.53	122.94	3313.61
TP-0003	3487.98	5/6/02	1404	218.66	230.40	3269.32	5/30/02	1410	216.77	230.40	3271.21
TP-0004	3489.05	5/6/02	1426	134.86	230.55	3354.19	5/30/02	1356	133.64	230.55	3355.41
TP-0005	3488.35	5/6/02	1412	119.32	233.30	3369.03	5/30/02	1407	119.31	233.30	3369.04
PM-0003	3487.99	5/6/02	1415	119.43	212.33	3368.56	5/30/02	1404	119.41	212.33	3368.58
PM-0006	3489.59	5/6/02	1423	134.27	134.60	3355.32	5/30/02	1353	134.20	134.60	3355.39
PM-0009	3483.03	5/6/02	1434	95.96	213.38	3387.07	5/30/02	1415	86.73	213.38	3396.30
PM-0012	3474.66	5/6/02	1443	dry	184.25		5/30/02	1349	DRY	184.25	

**4G-2 groundwater elevation was recorded on 1/24/03.

TABLE 4-1
WASTE CONTROL SPECIALISTS
JANUARY - FEBRUARY 2002
GROUNDWATER ELEVATIONS

CJI

Well ID	TOC Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)
DW32A	3461.52	6/25/02	1149	223.1	231.90	3238.42	7/30/02	1228	220.06	231.90	3241.46
DW32B	3461.46	6/25/02	1151	219.16	248.80	3242.30	7/30/02	1231	209.78	248.80	3251.68
DW33A	3464.99	6/25/02	1157	228.46	234.64	3236.53	7/30/02	1237	225.67	234.64	3239.32
DW33B	3465.12	6/25/02	1200	221.65	247.15	3243.47	7/30/02	1239	215.95	247.15	3249.17
DW34A	3468.70	6/25/02	1203	209.18	238.40	3259.52	7/30/02	1242	203.28	238.40	3265.42
DW34B	3468.94	6/25/02	1205	215.48	252.94	3253.46	7/30/02	1244	207.44	252.94	3261.50
DW35A	3467.86	6/25/02	1209	196.13	235.82	3271.73	7/30/02	1247	193.73	235.82	3274.13
DW35B	3467.95	6/25/02	1211	196.02	250.59	3271.93	7/30/02	1249	193.71	250.59	3274.24
DW36A	3467.59	6/25/02	1216	195.92	241.00	3271.67	7/30/02	1252	193.16	241.00	3274.43
DW36B	3467.93	6/25/02	1218	195.98	255.52	3271.95	7/30/02	1255	193.26	255.52	3274.67
NMB-23	3467.85	6/24/02	1257	134.78	264.06	3333.07	7/29/02	1121	133.22	264.06	3334.63
NMB-24	3439.15	6/24/02	1302	115.81	232.87	3323.34	7/29/02	1126	115.54	232.87	3323.61
MW1A	3480.79	6/24/02	1308	141.46	260.47	3339.33	7/29/02	1131	140.21	260.47	3340.58
MW1B	3480.61	6/24/02	1311	137.42	274.84	3343.19	7/29/02	1134	136.90	274.84	3343.71
MW2A	3481.72	6/24/02	1315	150.14	264.25	3331.58	7/29/02	1139	148.86	264.25	3332.86
MW2B	3481.93	6/24/02	1317	169.13	277.55	3312.80	7/29/02	1141	165.08	277.55	3316.85
MW3A	3483.04	6/24/02	1320	148.46	268.00	3334.58	7/29/02	1144	147.37	268.00	3335.67
MW3B	3483.10	6/24/02	1322	147.82	283.15	3335.28	7/29/02	1147	146.77	283.15	3336.33
MW4A	3484.70	6/24/02	1326	136.93	271.45	3347.77	7/29/02	1149	136.42	271.45	3348.28
MW4B	3484.74	6/24/02	1328	136.86	286.50	3347.88	7/29/02	1151	136.43	286.50	3348.31
A-22-99	3460.00	6/24/02	1402	168.45	255.00	3291.55	7/30/02	1345	167.81	255.00	3292.19
A-24-99	3464.20	6/24/02	1357	159.47	267.00	3304.73	7/30/02	1341	158.81	267.00	3305.39
2G	3440.76	6/24/02	1346	150.63	250.00	3290.13	7/30/02	1357	150.22	250.00	3290.54
**4G-2	3440.22			157.64	200.00	3282.58			157.64	200.00	3282.58
4G-3	3439.88	6/24/02	1340	237.61	246.26	3202.27	7/30/02	1402	237.51	246.26	3202.37
6B-2	3487.07	6/24/02	1332	136.92	272.00	3350.15	7/30/02	1308	136.00	272.00	3351.07
7G	3448.57	6/25/02	1144	137.9	215.00	3310.67	7/30/02	1259	137.70	215.00	3310.87
TP-0001	3485.38	6/24/02	1424	98.66	242.30	3386.72	7/30/02	1319	98.32	242.30	3387.06
TP-0002	3436.14	6/24/02	1350	122.54	122.94	3313.60	7/30/02	1354	122.55	122.94	3313.59
TP-0003	3487.98	6/24/02	1409	214.78	230.40	3273.20	7/30/02	1330	211.38	230.40	3276.60
TP-0004	3489.05	6/24/02	1431	133.67	230.55	3355.38	7/30/02	1316	133.54	230.55	3355.51
TP-0005	3488.35	6/24/02	1418	119.34	233.30	3369.01	7/30/02	1325	119.45	233.30	3368.90
PM-0003	3487.99	6/24/02	1421	119.44	212.33	3368.55	7/30/02	1322	119.51	212.33	3368.48
PM-0006	3489.59	6/24/02	1428	134.22	134.60	3355.37	7/30/02	1314	134.23	134.60	3355.36
PM-0009	3483.03	6/24/02	1414	85.83	213.38	3397.20	7/30/02	1336	87.02	213.38	3396.01
PM-0012	3474.66	6/24/02	1436	DRY	184.25		7/30/02	1350	DRY	184.25	

**4G-2 groundwater elevation was recorded on 1/24/03.

TABLE 4-1
WASTE CONTROL SPECIALISTS
JANUARY - FEBRUARY 2002
GROUNDWATER ELEVATIONS

Well ID	TOC Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)
DW32A	3461.52						8/27/02	1444	216.59	231.90	3244.93
DW32B	3461.46						8/27/02	1448	203.85	248.80	3257.61
DW33A	3464.99						8/27/02	1453	223.44	234.64	3241.55
DW33B	3465.12						8/27/02	1456	212.69	247.15	3252.43
DW34A	3468.70	8/25/02	1300	199.93	238.40	3268.77	8/27/02		232.59	238.40	3236.11
DW34B·	3468.94	8/25/02	900	203.16	252.94	3265.78	8/27/02		248.03	252.94	3220.91
DW35A	3467.86	8/22/02	818	200.79	235.82	3267.07	8/27/02		226.54	235.82	3241.32
DW35B	3467.95	8/21/02	1305	192.37	250.59	3275.58	8/27/02		217.99	250.59	3249.96
DW36A	3467.59	8/21/02	505	197.40	241.00	3270.19	8/27/02		222.3	241.00	3245.29
DW36B	3467.93	8/20/02	1330	191.85	255.52	3276.08	8/27/02		217.89	255.52	3250.04
NMB-23	3467.85						8/27/02	1308	131.18	264.06	3336.67
NMB-24	3439.15						8/27/02	1314	115.29	232.87	3323.86
MW1A	3480.79						8/27/02	1321	139.28	260.47	3341.51
MW1B	3480.61						8/27/02	1323	136.42	274.84	3344.19
MW2A	3481.72						8/27/02	1326	147.87	264.25	3333.85
MW2B	3481.93						8/27/02	1329	163.09	277.55	3318.84
MW3A	3483.04						8/27/02	1333	146.51	268.00	3336.53
MW3B	3483.10						8/27/02	1336	145.94	283.15	3337.16
MW4A	3484.70						8/27/02	1339	136.14	271.45	3348.56
MW4B	3484.74						8/27/02	1341	136.07	286.50	3348.67
A-22-99	3460.00										
A-24-99	3464.20										
2G	3440.76										
**4G-2	3440.22								157.64	200.00	3282.58
4G-3	3439.88										
6B-2	3487.07						8/27/02	1346	137.73	272.00	3349.34
7G	3448.57						8/27/02	1518	139.13	215.00	3309.44
TP-0001	3485.38										
TP-0002	3436.14										
TP-0003	3487.98										
TP-0004	3489.05										
TP-0005	3488.35										
PM-0003	3487.99										
PM-0006	3489.59										
PM-0009	3483.03										
PM-0012	3474.66										

**4G-2 groundwater elevation was recorded on 1/24/03.

TABLE 4-1
WASTE CONTROL SPECIALISTS
JANUARY - FEBRUARY 2002
GROUNDWATER ELEVATIONS

Well ID	TOC Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)
DW32A	3461.52										
DW32B	3461.46										
DW33A	3464.99										
DW33B	3465.12										
DW34A	3468.70	8/28/02		231.75	238.40	3236.95	8/30/02		230.5	238.40	3238.22
DW34B	3468.94	8/28/02		247.47	252.94	3221.47	8/30/02		246.5	252.94	3222.4
DW35A	3467.86	8/28/02		225.17	235.82	3242.69	8/30/02		222.9	235.82	3244.96
DW35B	3467.95	8/28/02		216.94	250.59	3251.01	8/30/02		215.5	250.59	3252.49
DW36A	3467.59	8/28/02		220.18	241.00	3247.41	8/30/02		217.1	241.00	3250.52
DW36B	3467.93	8/28/02		216.54	255.52	3251.39	8/30/02		214	255.52	3253.89
NMB-23	3467.85										
NMB-24	3439.15										
MW1A	3480.79										
MW1B	3480.61										
MW2A	3481.72										
MW2B	3481.93										
MW3A	3483.04										
MW3B	3483.10										
MW4A	3484.70										
MW4B	3484.74										
A-22-99	3460.00	8/28/02	1119	168.64	255.00	3291.36					
A-24-99	3464.20	8/28/02	1115	158.59	267.00	3305.61					
2G	3440.76	8/28/02	1059	151.12	250.00	3289.64					
**4G-2	3440.22			157.64	200.00	3282.58			157.64	200.00	3124.94
4G-3	3439.88	8/28/02	1053	237.41	246.26	3202.47					
6B-2	3487.07										
7G	3448.57										
TP-0001	3485.38	8/28/02	1135	98.32	242.30	3387.06					
TP-0002	3436.14	8/28/02	1102	122.57	122.94	3313.57					
TP-0003	3487.98	8/28/02	1125	208.46	230.40	3279.52					
TP-0004	3489.05	8/28/02	1140	133.51	230.55	3355.54					
TP-0005	3488.35	8/28/02	1130	119.35	233.30	3369.00					
PM-0003	3487.99	8/28/02	1132	119.45	212.33	3368.54					
PM-0006	3489.59	8/28/02	1138	134.24	134.60	3355.35					
PM-0009	3483.03	8/28/02	1110	88.68	213.38	3394.35					
PM-0012	3474.66	8/28/02	1106	DRY	184.25						

**4G-2 groundwater elevation was recorded on 1/24/03.

TABLE 4-1
WASTE CONTROL SPECIALISTS
JANUARY - FEBRUARY 2002
GROUNDWATER ELEVATIONS

Well ID	TOC Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)
DW32A	3461.52						9/12/02	1151	215.82	231.90	3245.70
DW32B	3461.46						9/12/02	1154	201.13	248.80	3260.33
DW33A	3464.99						9/12/02	1159	222.26	234.64	3242.73
DW33B	3465.12						9/12/02	1201	211.30	247.15	3253.82
DW34A	3468.70	9/3/02		227.96	238.40	3240.74	9/11/02	1533	224.64	238.40	3244.06
DW34B	3468.94	9/3/02		244.48	252.94	3224.46	9/11/02	1530	240.94	252.94	3228.00
DW35A	3467.86	9/3/02		216.66	235.82	3251.2	9/11/02	1506	209.22	235.82	3258.64
DW35B	3467.95	9/3/02		212.57	250.59	3255.38	9/11/02	1502	207.93	250.59	3260.02
DW36A	3467.59	9/3/02		211.97	241.00	3255.62	9/11/02	1459	206.85	241.00	3260.74
DW36B	3467.93	9/3/02		210.51	255.52	3257.42	9/11/02	1455	206.19	255.52	3261.74
NMB-23	3467.85						9/12/02	755	130.22	264.06	3337.63
NMB-24	3439.15						9/12/02	801	115.28	232.87	3323.87
MW1A	3480.79						9/12/02	807	138.91	260.47	3341.88
MW1B	3480.61						9/12/02	809	136.27	274.84	3344.34
MW2A	3481.72						9/12/02	812	147.41	264.25	3334.31
MW2B	3481.93						9/12/02	815	161.38	277.55	3320.55
MW3A	3483.04						9/12/02	819	146.19	268.00	3336.85
MW3B	3483.10						9/12/02	822	145.63	283.15	3337.47
MW4A	3484.70						9/12/02	824	136.07	271.45	3348.63
MW4B	3484.74						9/12/02	826	135.99	286.50	3348.75
A-22-99	3460.00						9/12/02	915	168.33	255.00	3291.67
A-24-99	3464.20						9/12/02	920	157.38	267.00	3306.82
2G	3440.76						9/12/02	902	150.68	250.00	3290.08
**4G-2	3440.22								157.64	200.00	3282.58
4G-3	3439.88						9/12/02	856	237.35	246.26	3202.53
6B-2	3487.07						9/12/02	830	137.02	272.00	3350.05
7G	3448.57						9/12/02	745	138.38	215.00	3310.19
TP-0001	3485.38						9/12/02	937	98.40	242.30	3386.98
TP-0002	3436.14						9/12/02	850	122.57	122.94	3313.57
TP-0003	3487.98						9/12/02	925	206.72	230.40	3281.26
TP-0004	3489.05						9/12/02	945	133.46	230.55	3355.59
TP-0005	3488.35						9/12/02	931	119.41	233.30	3368.94
PM-0003	3487.99						9/12/02	933	119.51	212.33	3368.48
PM-0006	3489.59						9/12/02	942	134.24	134.60	3355.35
PM-0009	3483.03						9/12/02	950	88.91	213.38	3394.12
PM-0012	3474.66						9/12/02	846	DRY	184.25	

**4G-2 groundwater elevation was recorded on 1/24/03.

TABLE 4-1
WASTE CONTROL SPECIALISTS
JANUARY - FEBRUARY 2002
GROUNDWATER ELEVATIONS

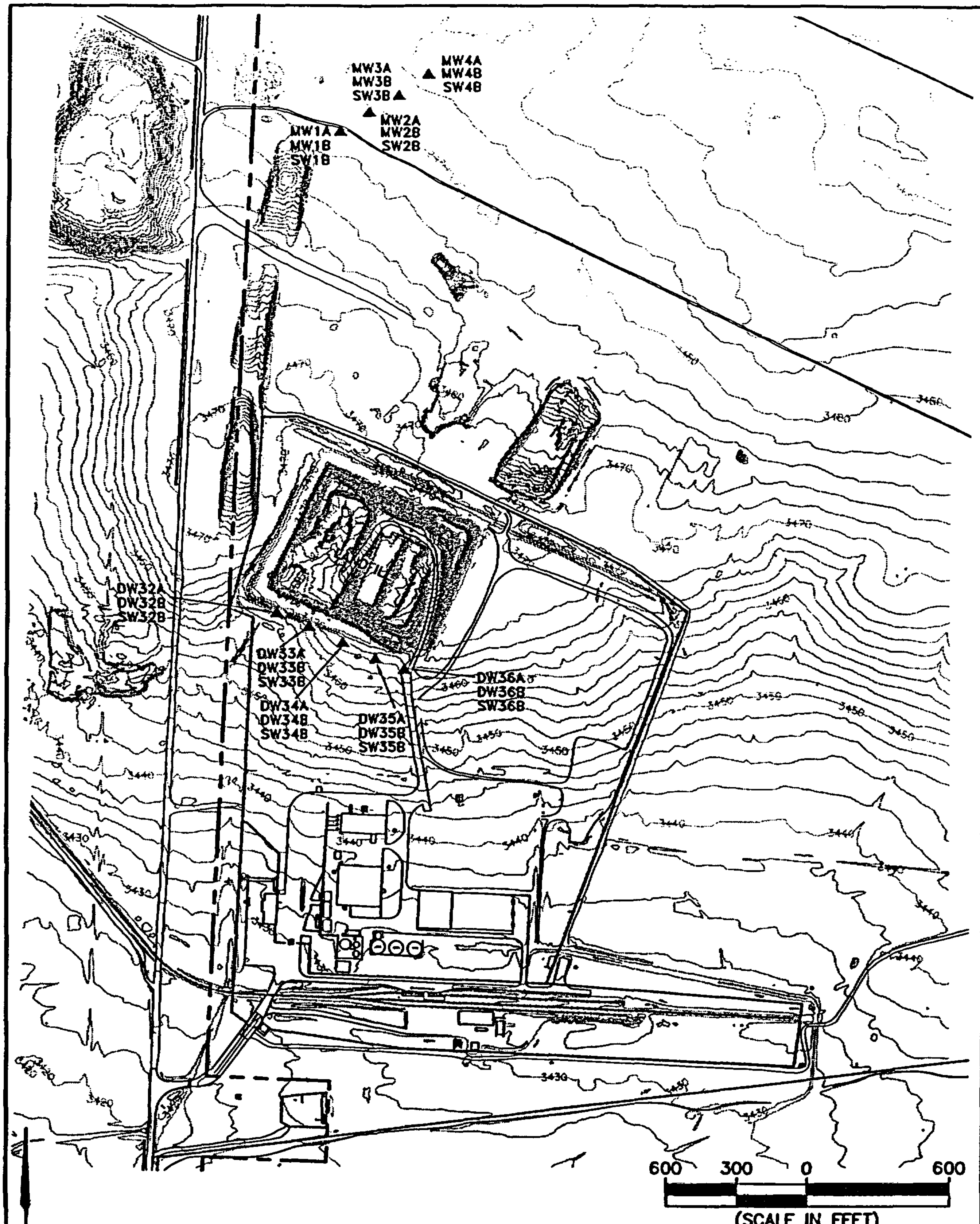
Well ID	TOC Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)	Date	Time	DtW (ft)	Total Depth (ft)	GW Elevation (ft)
DW32A	3461.52	10/29/02	1440	220.98	231.90	3240.54	11/25/02	1058	218.38	231.90	3243.14	12/20/02	1108	215.43	231.90	3246.09
DW32B	3461.46	10/29/02	1442	205.32	248.80	3256.14	11/25/02	1100	200.45	248.80	3261.01	12/20/02	1110	196.77	248.80	3264.69
DW33A	3464.99						11/25/02	1117	224.51	234.64	3240.48	12/20/02	1118	222.41	234.64	3242.58
DW33B	3465.12						11/25/02	1120	212.56	247.15	3252.56	12/20/02	1122	209.97	247.15	3255.15
DW34A	3468.70						11/25/02	1123	212.04	238.40	3256.66	12/20/02	1130	207.48	238.40	3261.22
DW34B	3468.94						11/25/02	1126	219.71	252.94	3249.23	12/20/02	1132	212.96	252.94	3255.98
DW35A	3467.86						11/25/02	1128	199.27	235.82	3268.59	12/20/02	1135	197.06	235.82	3270.8
DW35B	3467.95						11/25/02	1131	199.13	250.59	3268.82	12/20/02	1137	196.99	250.59	3270.96
DW36A	3467.59	10/29/02	1433	202.91	241.00	3264.68	11/25/02	1134	199.03	241.00	3268.56	12/20/02	1141	196.59	241.00	3271
DW36B	3467.93	10/29/02	1430	202.75	255.52	3265.18	11/25/02	1136	199.05	255.52	3268.88	12/20/02	1143	196.64	255.52	3271.29
NMB-23	3467.85	10/29/02	1045	127.62	264.06	3340.23	11/25/02	1312	126.32	264.06	3341.53	12/19/02	1254	125.29	264.06	3342.56
NMB-24	3439.15	10/29/02	1051	115.21	232.87	3323.94	11/25/02	1316	115.38	232.87	3323.77	12/19/02	1300	115.38	232.87	3323.77
MW1A	3480.79	10/29/02	1104	137.78	260.47	3343.01	11/25/02	1321	137.18	260.47	3343.61	12/19/02	1307	136.65	260.47	3344.14
MW1B	3480.61	10/29/02	1106	135.6	274.84	3345.01	11/25/02	1323	135.06	274.84	3345.55	12/19/02	1309	134.57	274.84	3346.04
MW2A	3481.72	10/29/02	1110	146.08	264.25	3335.64	11/25/02	1325	145.33	264.25	3336.39	12/19/02	1311	144.65	264.25	3337.07
MW2B	3481.93	10/29/02	1112	158.35	277.55	3323.58	11/25/02	1327	156.58	277.55	3325.35	12/19/02	1313	155.12	277.55	3326.81
MW3A	3483.04	10/29/02	1116	146.32	268.00	3336.72	11/25/02	1329	145.34	268.00	3337.7	12/19/02	1315	144.61	268.00	3338.43
MW3B	3483.10	10/29/02	1118	145.72	283.15	3337.38	11/25/02	1331	144.78	283.15	3338.32	12/19/02	1317	144.05	283.15	3339.05
MW4A	3484.70	10/29/02	1121	136.1	271.45	3348.60	11/25/02	1333	135.64	271.45	3349.06	12/19/02	1319	135.27	271.45	3349.43
MW4B	3484.74	10/29/02	1124	135.94	286.50	3348.80	11/25/02	1335	135.57	286.50	3349.17	12/19/02	1321	135.19	286.50	3349.55
A-22-99	3460.00	10/29/02	1337	168.02	255.00	3291.98	11/25/02	1424	169.71	255.00	3290.29	12/20/02	1008	168.97	255.00	3291.03
A-24-99	3464.20	10/29/02	1332	159.64	267.00	3304.56	11/25/02	1420	161.84	267.00	3302.36	12/20/02	1015	160.39	267.00	3303.81
2G	3440.76	10/29/02	1322	150.09	250.00	3290.67	11/25/02	1408	151.92	250.00	3288.84	12/20/02	1024	150.82	250.00	3289.94
**4G-2	3440.22			157.64	200.00	3282.58			157.64	200.00	3282.58			157.64	200.00	3282.58
4G-3	3439.88	10/29/02	1312	237.18	246.26	3202.7	11/25/02	1402	237.16	246.26	3202.72	12/20/02	1029	237.09	246.26	3202.79
6B-2	3487.07	10/29/02	1137	135.81	272.00	3351.26	11/25/02	1339	140.59	272.00	3346.48	12/19/02	1324	138.64	272.00	3348.43
7G	3448.57	10/29/02	1424	138.8	215.00	3309.77	11/25/02	1139	139.26	215.00	3309.31	12/20/02	1147	137.91	215.00	3310.66
TP-0001	3485.38	10/29/02	1357	98.32	242.30	3387.06	11/25/02	1441	98.38	242.30	3387	12/20/02	1407	98.31	242.3	3387.07
TP-0002	3436.14	10/29/02	1318	122.58	122.94	3313.56	11/25/02	1412	122.6	122.94	3313.54	12/20/02	1340	122.59	122.94	3313.55
TP-0003	3487.98	10/29/02	1344	200.04	230.40	3287.94	11/25/02	1430	193.87	230.40	3294.11	12/20/02	1355	188.35	230.4	3299.63
TP-0004	3489.05	10/29/02	1405	133.55	230.55	3355.5	11/25/02	1448	133.86	230.55	3355.19	12/20/02	1415	133.8	230.55	3355.25
TP-0005	3488.35	10/29/02	1351	119.34	233.30	3369.01	11/25/02	1436	119.45	233.30	3368.9	12/20/02	1401	119.39	233.3	3368.96
PM-0003	3487.99	10/29/02	1353	119.43	212.33	3368.56	11/25/02	1438	119.54	212.33	3368.45	12/20/02	1403	119.5	212.33	3368.49
PM-0006	3489.59	10/29/02	1403	134.26	134.60	3355.33	11/25/02	1446	134.29	134.60	3355.3	12/20/02	1412	134.29	134.6	3355.3
PM-0009	3483.03	10/29/02	1410	83.02	213.38	3400.01	11/25/02	1452	82.97	213.38	3400.06	12/20/02	1351	83.07	213.38	3399.96
PM-0012	3474.66	10/29/02	1414	dry	184.25		11/25/02	1457	dry	184.25		12/20/02	1346	dry	184.25	

**4G-2 groundwater elevation was recorded on 1/24/03.

TABLE 5-1
SIGNIFICANT DETECTIONS FOR 2002
BY SAMPLING EVENT AND CONSTITUENT

	BARIUM	CHROMIUM	COPPER	LEAD	NICKEL	COBALT
	DW-34A	DW-32A	DW-32B	DW-34A	DW-32B	
	DW-34B	DW-32B	DW-33B		DW-33A	
	DW-35A	DW-33A	DW-34A		DW-33B	
	DW-35B	DW-33B	DW-34B		DW-34A	
	DW-36A	DW-34A	DW-35A		DW-34B	
	DW-36B	DW-34B			DW-35A	
		DW-35A			DW-35B	
					DW-36A	
					DW-36B	
	DW-34A	DW-32A	DW-34A	DW-34A	DW-32A	DW-33A
	DW-34B	DW-32B	DW-34B	DW-34B	DW-32B	
	DW-35A	DW-33A	DW-35A	DW-35A	DW-33A	
	DW-35B	DW-33B	DW-35B	DW-35B	DW-33B	
	DW-36A	DW-34A	DW-36A	DW-36A	DW-34A	
	DW-36B	DW-34B			DW-34B	
		DW-36A			DW-35A	
					DW-35B	
					DW-36A	
					DW-36B	

FIGURES



REV.	DATE	DESCRIPTION	DR BY	APP BY

COOK-JOYCE INC.
ENGINEERING AND CONSULTING
812 WEST ELEVENTH 512-474-9097
AUSTIN, TEXAS 78701

PROJECT:
WASTE CONTROL SPECIALISTS, LLC
ANDREWS COUNTY, TEXAS

SHEET TITLE:
LOCATION OF DETECTION MONITORING SYSTEM WELLS

DES BY			SCALE: SEE BAR SCALE
DR BY	SDB	SDB	PROJECT NO. 01098.02
CHK BY	KLM		CJI NO. 01098022
APP BY	SLC		SHEET 1 OF 1 SHEETS
DATE ISSUED: 01-27-2003			FIGURE NO. 2-1
PURPOSE: TECQ REVIEW			