



State of Ohio Environmental Protection Agency

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Ted Strickland, Governor  
Lee Fisher, Lieutenant Governor  
Chris Korleski, Director

Re: Statistical Report of Groundwater Quality  
Wapakoneta Landfill, Auglaize County  
Notice of Violation

September 15, 2008

Mr. Rex A. Kattereinrich, P.E.  
Director of Public Service and Safety  
City of Wapakoneta  
City Hall  
P. O. Box 269  
Wapakoneta, Ohio 45895-0269

Dear Mr. Kattereinrich:

The Ohio Environmental Protection Agency (Ohio EPA) completed a review of the statistical report of ground water quality for the May 2008, sampling event for the Wapakoneta Landfill. The submittal was dated July 24, 2008, and received July 25, 2008. Following are Ohio EPA comments relating to the review.

**VIOLATIONS**

1. **The owner/operator, Wapakoneta Sanitary Landfill, continues to be in violation of Ohio Administrative Code (OAC) Rule 3745-27-10 (C)(3), Effective March 1, 1990, which requires that, the permittee establish background ground-water quality, unless the exception in paragraph (C)(4) of the rule applies, by analyzing ground-water samples collected from hydraulically upgradient well(s) for each of the monitoring parameters or constituents required in the particular ground-water monitoring program that applies to the sanitary landfill facility as determined by paragraphs (D), (E), or (F) of this rule. OAC Rule 3745-27-10 (C)(4)(a) and (b), effective March 1, 1990, requires that background ground-water quality at existing sanitary landfill facilities may be based on sampling of wells that are not hydraulically upgradient where: (a) Hydrogeological conditions do not allow the permittee to determine which wells are upgradient; and (b) sampling of other wells will provide an indication of background ground-water quality that is as representative or more representative than that provided by upgradient wells. The permittee needs to establish an appropriate background well(s) and establish background ground water quality for comparison to the downgradient wells in the significant zones of saturation.**

While the owner/operator has installed additional wells on the site in the significant zones of saturation no background well has been designated and no interwell analyses have been performed for the significant zones of saturation. The owner/operator is cautioned that background wells must be unaffected by the landfill. In addition it should be noted that there are several significant zones of saturation at the site and these zones must be properly correlated. The owner/operator is cautioned that while the significant zones of saturation are, at least in part, interconnected, there are several significant zones of saturation at the site and all of these zones must be properly correlated; all of these zones need to be monitored; and any contamination found in them needs to be addressed.

2. **The owner/operator continues to be in violation of OAC Rule 3745-27-10 (C)(1) by utilizing inappropriate statistical methods. This rule requires that the ground-water monitoring program include consistent sampling and analysis procedures that are protective of human health and the environment and that are designed to ensure monitoring results that provide an accurate representation of ground-water quality at the background and downgradient wells installed in accordance with paragraph (B) of this rule. In order to meet the requirements of OAC Rule 3745-27-10 (C)(1) the owner/operator needs to review the data and perform interwell statistical analyses using a proper background well or utilize some other means to prove that the significant saturated wells are not affected prior to using intrawell methods.**

On page 3 of the submittal, in the section labeled, "Statistical Evaluation" the owner/operator states, "In general, statistical evaluations of the January 2008, data were completed using "intra-well" procedures." In the same section the owner/operator states, "No statistical significance was identified for any monitoring well/parameter combination in the detection monitoring program with the exception of specific conductance in monitoring well MW-8. No statistical significance was identified for any monitoring well/parameter combination in the assessment monitoring program with the exception of specific conductance in monitoring well SW-7 and specific conductance and total dissolved solids (TDS) in monitoring well MW-10."

The observation, that only specific conductance was determined to be a statistical exceedance in SW-7, is likely a function of the intrawell statistical methods which do not detect the exceedances in wells which are already contaminated unless there are continued statistical increases in concentration. SW-7 has been known to be affected for at least the past 10 years. The latest analytical results indicate that vinyl chloride was again detected, this time at 13.1 µg/L in SW-7. Monitoring well SW-1, for example, displays high levels of chloride, sodium, total dissolved solids and specific conductance when compared to some other significant saturated zone wells.

Below is a table of analytical results in several wells. The table is based on the May 2008 event data and consists of: affected well SW-7, apparently unaffected well SW-13, and possibly affected wells SW-1, SW-4, SW-5 and SW-8.

ANALYTE	SW-1	SW-8	SW-7	SW-5	SW-4	SW-13
pH	6.82	6.73	6.7	6.7	6.54	7.03
Specific Conductance mg/L	1430	2140	3430	2400	960	790
TDS mg/L	888	1030	1640	1350	594	422
TOC	3.3	4.9	4.8	4	1.2	1.7
Sodium mg/L	81.6	88.1	349	51.7	30.7	9.1
Calcium mg/L	120	193	169	290	122	87.2
Magnesium mg/L	75.6	80.4	75.5	140	40.5	37.8
Potassium mg/L	3.2	4.6	5.7	5.7	2.9	1.2
Chloride mg/L	105	157	602	120	67	32
Sulfate mg/L	124	165	174	610	58	35
Alkalinity mg/L	511	544	483	527	388	313
Arsenic	<0.001	<0.001	0.0041	0.0056	0.005	<0.001
Iron mg/L	<0.05	4.95	5.5	7.33	<0.05	0.35
Manganese mg/L	0.22	0.11	0.06	0.33	0.03	0.11
Nickel mg/L	0.05	0.01	0.01	0.02	<0.01	<0.10
Ammonia mg/L	0.19	0.17	0.96	0.46	0.19	0.12
COD mg/L	<10	<10	18	330	<10	65

Significant saturated zone wells SW-1, SW-5, and SW-8 may be affected since concentrations of many analytes in each of these wells are greater than those in SW-13. The use of intrawell statistical techniques without first determining if the well is affected by the landfill would not indicate the presence of contaminants in a contaminated well.

The use of intrawell statistical methods, on analytical results from a well that was contaminated before the statistical methods are applied, is not protective of human health and the environment and is not designed to provide an accurate representation of ground water quality.

3. **The owner/operator continues to be in violation of OAC Rule 3745-27-10 (C)(3) and OAC Rule 3745-27-10 (C)(8). For rule citation of OAC Rule 3745-27-10 (C)(3) (Effective March 1, 1990) see comment number 1 above. OAC Rule 3745-27-10 (C)(8) (Effective March 1, 1990) requires that the permittee determine whether or not there is a statistically significant increase (or decrease in the case of pH) from background values for each parameter or constituent required in the particular ground-water monitoring program that applies to the sanitary landfill facility, as determined in accordance with paragraph (D), (E), or (F) of this rule.**

The permittee shall make this determination each time he assesses ground water quality. To determine whether a statistically-significant increase or decrease has occurred the owner or operator needs to compare the ground-water quality of each parameter or constituent at each downgradient ground-water monitoring well to the background value of that parameter or constituent according to the statistical procedures specified in paragraphs (C)(5) and (C)(6) of this rule. The exception in paragraph (C)(4) as expressed in OAC Rule 3745-27-10 (C)(3) has not been shown to apply. The owner/operator needs to perform interwell statistical analyses until it can be proven that the downgradient wells are not affected.

In Appendix C of the submittal the owner/operator presents statistical analyses for significant zone of saturation wells SW-1, SW-4, SW-7, and SW-8; and uppermost aquifer system wells SW-5, SW-6, MW-5, and MW-8. The statistical procedures for these wells utilized intrawell methods. In order to meet the requirements of OAC Rule 3745-27-10 (C)(8) the owner/operator needs to statistically compare the downgradient well results to the background well results in order to show that these wells are not affected. This was not done.

4. **The owner/operator continues to be in violation of OAC Rule 3745-27-10 (C)(1) by updating using inappropriate data. For rule citation see comment 2 above. In order to meet the requirements of OAC Rule 3745-27-10 (C)(1) the owner/operator needs to test for outliers and submit the results and any corrected control charts to Ohio EPA.**

Ohio EPA, in a response to the July 2000, sampling event, indicated that the owner/operator should not update the background data set until appropriate tests for statistical differences and outliers have been performed on the background data set. Ohio EPA further indicated that the results of these tests needed to be submitted to Ohio EPA along with the any corrected control charts resulting from this testing as soon as possible. The owner/operator has not provided information relating to the test for outliers and had indicated that it has updated the background data set. The use of outliers in the background data set is not protective of human health and the environment and is not providing data which is representative of the ground water of the site.

In addition, the use of data in the background data set which is no longer representative of the ground water of the site is not protective of human health and the environment.

5. **The owner/operator continues to be in violation of OAC Rule 3745-27-10 (C)(1) by using data in the background data set which is not representative of the ground water of the site. For rule citation see comment 2 above. In order to meet the requirements of OAC Rule 3745-27-10 (C)(1) the owner/operator should remove all TOC data which is not representative of the ground water of the site. This is often the data associated with excessive turbidity values.**

In the Ohio EPA comments regarding the May 29, 2003, sampling event the agency made the following statement: "A review of the historical analytical data indicates downward trends in statistical parameter, total organic carbon (TOC). Ohio EPA calculated correlation coefficient values for several of the wells at the site to determine if changes in TOC concentration are related to changes in turbidity. Following is a list of the analyzed wells where correlation coefficient values were determined for TOC and turbidity. These were performed where values were available and there appeared to be TOC trends.

WELL	TOC/TURBIDITY CORRELATION COEFFICIENT
MW-5	0.994354
SW-6	0.96332
SW-7	0.786882
SW-4	0.609568
SW-1	0.594808
MW-10	0.561779

These wells display fair to excellent correlation between TOC and turbidity implying that increased TOC is related to increased turbidity. Both the TOC and turbidity values display a downward trend over time suggesting the wells took some time to develop and the early data is no longer representative of the current conditions. Total organic carbon is a statistical parameter for both the uppermost aquifer system and the significant zones of saturation. The data used in the statistical analysis should be representative of the ground water of the site. It should be noted that some high TOC values have been removed from the background data set as outliers, but anomalously high values still appear to be present. Also, wells SW-1, SW-5, SW-7, SW-8, and MW-10 appear to display a significant decrease in TOC values all occurring during the April 1999 sampling event and continuing through the current event."

Response to this agency comment has not been provided by the owner/operator. The owner/operator continues to be in violation of OAC Rule 3745-27-10 (C)(1).

Previously, the owner/operator had performed a test for trends on selected well/parameter combinations. Some of these trend test results indicate that there is no upward trend, but the data indicate a downward trend. Downward trends may mean old data is no longer representative of the conditions in the ground water at the site.

6. **The owner/operator continues to be in violation of the requirements of OAC Rule 3745-27-10 (C)(8) by not performing the appropriate statistical analysis. For rule citation of OAC Rule 3745-27-10 (C)(8) (Effective March 1, 1990) see comment number 3 above. In order to meet the requirements of OAC Rule 3745-27-10 (C)(8) the owner/operator needs to utilize a two-tailed test for all statistical analyses for pH.**

In the statistical analysis section of the submittal the owner/operator provides parametric prediction interval analysis using interwell comparisons for pH for well MW-10. The provided information indicates the prediction interval is 0 to 7.852 (logged value 2.0608). This is a one-tailed test. OAC Rule 3745-27-10 (C)(8) indicates that the owner/operator shall determine whether or not there is a statistically significant increase (or decrease in the case of pH). This requires a two-tailed test and a lower prediction limit needs to be determined. In addition, the Shewhart-CUSUM Control Chart analysis for pH in wells SW-1, SW-4, SW-5, SW-6, SW-7, SW-8, MW-5, MW-6R, and MW-8 utilize one-tailed procedures

7. **The owner/operator continues to be in violation of OAC Rule 3745-27-10(C)(1). For rule citation for OAC Rule 3745-27-10 (C)(1) see comment number 2 above. In order to return to compliance with OAC Rule 3745-27-10 (C)(1) the owner/operator needs to provide documentation when the wells recharged sufficiently to collect a sample. Also, the owner/operator needs to ensure that representative samples are collected, and that the procedures used for collecting samples are documented in the plan.**

A review of the field data sheets for the wells sampled at the site indicates that ground water field parameter values did not display stable conditions or displayed conditions which were not consistent with purge data. In wells which were not purged dry, there are typically seven (7) readings for field parameters: pH, temperature and corrected conductance. These represent readings labeled: initial, 1, 1.5, 2, 2.5, 3 and Final. When properly purged, field data from the wells should display consistent results for the last three readings. When compared to each other the last three readings ideally should be within 0.1 S.U. for pH, within 3% for conductance, and within 0.5°C for temperature.

Based on review of current technical literature, Ohio EPA considers the criteria for stabilization of these field parameters to be  $\pm 0.1$  S.U. for pH,  $\pm 3\%$  for conductivity,  $\pm 0.5^\circ\text{C}$  for temperature and  $\pm 10\%$  for turbidity (when turbidity is  $> 10$  NTU). A parameter can be considered stable when at least three consecutive readings have stabilized.

A review of the field data sheets indicates that all wells were purged on either May 27 or May 28, 2008, but were sampled the next day (May 28 or May 29, 2008, respectively), whether they could produce enough water immediately following purging or not. It is understood that several wells recharge slowly and it might take several hours before enough water is available for sampling. However, many of the wells cannot be purged dry and enough water is available for sampling immediately following purging. OAC Rule 3745-27-10 (C)(1) requires that procedures be used which will produce representative samples. This usually means that samples are collected as soon as enough water is available for sampling. Waiting 18 or more hours to sample a well which had recharged immediately following purging, could result in samples of "stagnant" water and would not result in representative samples. A review of the stabilization data recorded as field parameters for wells that were not bailed dry indicates the chemistry of the water in several of the wells changed significantly between the end of purging and the time of sampling. The chemistry of the sampled water is significantly different from that removed from the well at the end of purging and is not representative of the ground water of the site. The sampled water appears to be stagnant. Following is a table comparing the field parameters of some of the wells which were not bailed dry. Bold values exceed new stabilization criteria. Values with an asterisk indicate values equal or exceed a 10% difference.

WELL	Time from purge to sampling (hrs)	pH at third volume (SU)	Final pH (SU)	Temp. at third volume ( $^\circ\text{C}$ )	Final Temp ( $^\circ\text{C}$ )	Conduct. at third volume ( $\mu\text{mohs/cm}$ )	Final Conduct. ( $\mu\text{mohs/cm}$ )
SW-2*	19:49	6.56	6.59	<b>11.3</b>	<b>11.9</b>	<b>11330*</b>	<b>14170*</b>
SW-6	21:25	7.18	7.24	12.2	12.1	<b>956*</b>	<b>826*</b>
SW-12	21:50	7.02	6.97	11.9	11.5	<b>1530</b>	<b>1410</b>
MW-6R*	21:45	7.14	7.20	12.1	12.3	<b>900*</b>	<b>810*</b>
MW-8	22:15	7.04	6.98	12.2	11.8	<b>1010</b>	<b>960</b>
MW-10	21:10	6.96	7.00	<b>12.4</b>	<b>11.8</b>	4000	3780
IAW-1*	19:33	6.68	6.72	9.8	10.1	<b>2850*</b>	<b>3190*</b>
IAW-3	19:49	6.68	6.73	10.2	10.5	<b>4750</b>	<b>4460</b>

WELL	Time from purge to sampling (hrs)	pH at third volume (SU)	Final pH (SU)	Temp. at third volume (°C)	Final Temp (°C)	Conduct. at third volume (µmohs/cm)	Final Conduct. (µmohs/cm)
IAW-4*	19:20	6.92	7.00	10.4	10.6	2720*	3510*
SAW-4*	19:30	6.58	6.62	11.1	11.1	7060*	8300*
SAW-5	19:32	6.46	6.52	10.8	11.7	8030	7570
DAW-2	19:10	6.61	6.70	12.6	12.2	6710	7200
AW-1*	19:20	7.19	7.30	13.4	13.8	914*	1070*
AW-7*	UNK	6.96	9.95	13.0	13.1	1120*	1580*
AW-9	19:15	7.11	7.18	13.2	13.8	830	820

Based on stabilization criteria: pH  $\pm 0.1$  standard units, specific conductance  $\pm 3\%$ , and temperature  $\pm 0.5^\circ$  Celsius.

\* Exceeds 10% criteria set by owner/operator.

Wells should be sampled as soon as enough water is available in the well to sample. A similar comment was made regarding the May 2006 sampling event, but no owner/operator response has been received.

8. **The City of Wapakoneta is in violation of OAC Rule 3745-27-10 (B)(3)(e) which requires that the monitoring wells, piezometers, and other measurement, sampling, and analytical devices be operated and maintained to perform to design specifications. Wells which display siltation and fill-up need to be cleaned, redeveloped or replaced in order to provide representative samples.**

The owner/operator had previously indicated that the wells had been surveyed for location and elevation and that the well total depths were measured. The measured total depths were recorded on the field data sheets as "Measured Total Depth (Referenced from Top of Casing)". There is also a total depth recorded as "As-Constructed Well Depth (Referenced from Top of Casing)". A review of the field data sheets indicates that several wells indicate a significant change in total depth. In some cases the measured well TDs were shallower than the as-constructed value and in other cases the measured TDs were deeper than the as-constructed value. These changes could be due to fill-up of the well by silt or other damage.

Following is a table indicating significant changes in TD values at some of the wells:

WELL	Measured TD	As-constructed TD	Difference in TD (minus is shallower)
SW-6	79.28'	79.92'	-0.64'
DAW-2	44.37'	40.40'	+3.97'
MW-6R	109.97'	111.48'	-1.51'

9. **The owner/operator is in violation of OAC Rule 3745-27-10 (C)(3), OAC Rule 3745-27-10 (C)(4), and OAC Rule 3745-27-10 (C)(7) which requires that the owner/operator determine the presence of statistically significant change from background values. For rule citation of OAC Rule 3745-27-10 (C)(3) and OAC Rule 3745-27-10 (C)(4) see comment number 1 above. The owner/operator must perform interwell statistical analyses on the uppermost aquifer system well data, including data from the new uppermost aquifer system wells. In addition, the owner/operator must perform interwell statistical analyses on the significant zone of saturation well data to determine the presence of statistically significant change.**

In the last paragraph on page one of the statistical analysis memorandum the owner/operator states, "Based on the geologic, hydrogeologic, and geochemical conditions at the facility, statistical evaluations completed for shallow significant saturated zone and uppermost aquifer monitoring wells were generally completed using "intra-well" procedures. However, monitoring well MW-10 was evaluated using "inter-well" procedures upon the request of Ohio EPA." It has not been shown that uppermost aquifer system monitoring wells, other than the upgradient well MW-6R, will provide data which are as representative or more representative. Downgradient well MW-10 has been shown to be affected and requires interwell procedures. The exception in OAC Rule 3745-27-10 (C)(4), therefore, does not apply to the other uppermost aquifer system monitoring wells. The owner/operator must determine the presence of statistically significant change utilizing interwell methods using upgradient well MW-6R for all uppermost aquifer system monitoring wells until it can be adequately shown that the exceptions in OAC Rule 3745-27-10 (C)(4) are applicable. In addition, the owner/operator must utilize an appropriate and unaffected upgradient background well to determine the presence of statistically significant change at the significant zone of saturation wells.

10. **The City of Wapakoneta continues to be in violation of the requirements of OAC Rule 3745-27-10 (C)(7), which requires that the permittee determine if there is a statistically significant increase (or decrease in the case of pH) by comparing the downgradient well data to the background data. The City is in violation of this rule by not determining the presence of a statistically significant change. The permittee must properly determine the presence of a statistically significant change for all appropriate wells.**

Regarding Ohio EPA comments relating to the January 2008, sampling event the agency made the following comment. The owner/operator has not responded. "In the last paragraph on page 3 of the statistical memorandum the owner/operator states, "No statistical significance was identified for any monitoring well/parameter combination evaluated for the January 2008, sampling event with the exception of specific conductance in monitoring well SW-7 and specific conductance and TDS in monitoring well MW-10." Tables C-1 and C-2 provide a summary of statistical evaluations of monitoring wells screened in the significant saturated units and uppermost aquifer system. The tables only note statistical significance for specific conductance in well SW-7 and specific conductance and total dissolved solids in well MW-10. Statistical analyses were performed for pH in other wells, but none were noted as being an exceedance.

A review of the statistical analyses results was performed by Ohio EPA. Wells SW-4, SW-8 and MW-8 all show an apparent significant change exceeding standardized units for pH on Shewhart-CUSUM control charts. The statistical limits on control charts are set at 4.5 and 5.0 units. Additional review and statistical analyses by Ohio EPA indicates that the low pH readings in wells SW-4, SW-8, and MW-8 are, indeed, statistically significant changes. These changes were not determined by the City of Wapakoneta as required by OAC Rule 3745-27-10 (C)(7).

11. **The City of Wapakoneta is in violation of OAC Rule 3745-27-10 (C)(6)(e), which requires that any practical quantitation limit (PQL) utilized in the statistical analyses be the lowest concentration level that can be reliably achieved within the specified limits of precision and accuracy during routine laboratory operating conditions that are available to the facility. The owner/operator should not utilize the total organic carbon non-parametric prediction limit which is based on a PQL that is greater than the current PQL. The owner/operator should appropriately recalculate the statistical limit after removing outliers and not including PQL values which are not the lowest.**

A review of the determination of the non-parametric limit for TOC, as calculated from well MW-6/MW-6R data, indicates that the statistical limit is one half of a former PQL value of <25 mg/L. The lowest PQL for background is now 0.5 mg/L. Based on OAC Rule 3745-27-10 (C)(6)(e) it is inappropriate to utilize the PQL of 25 mg/L or even one half of 25 mg/L.

12. **The owner/operator is in violation of OAC Rule 3745-27-10 (D)(8)(b), which requires that the permittee resample a well that displayed a statistically significant increase and of which the permittee notified Ohio EPA as displaying the increase within fifteen days of that notification; also the permittee is required to notify Ohio EPA when the resampling will be performed. The City of Wapakoneta needs to resample well SW-16 for benzene, and notify Ohio EPA of the sampling event.**

**Subsequent to the resampling notification needs to be made to the director regarding the results of the resampling per OAC Rule 3745-27-10 (D)(8)(c).**

In the second paragraph on page 3 of the submittal the owner/operator states, "Two VOCs were reported in both the sample and the duplicate sample collected from monitoring well SW-3R including benzene (1.9 and 2.1) and acetone (12 µg/L). Benzene was also reported at 1.1 µg/L in the sample collected from investigative well SW-16. During future sampling events, these wells will be closely monitored to determine if the reporting of benzene and acetone resulted from the landfill or were the result of field/laboratory conditions at the time of sample collection/analysis." Well SW-3R has, for some time, been considered an assessment well, however, well SW-16 has now been sampled and a statistically significant increase has been observed. The well is a detection well which must be resampled per OAC Rule 3745-27-10 (D)(8)(b).

#### **MORE INFORMATION NEEDED TO DETERMINE COMPLIANCE**

13. **Compliance with OAC Rule 3745-27-10 (C)(1) and (C)(1)(d) cannot be determined at this time. For rule citation for OAC Rule 3745-27-10 (C)(1) see comment number 2 above. OAC Rule 3745-27-10 (C)(1)(d) requires that the sampling and analysis plan include, "a detailed description of the equipment, procedures, and techniques to be used for (d) performance of field analysis..." To assure compliance with OAC Rules 3745-27-10(C)(1) and (C)(1)(d) in the future, the owner/operator needs to do one of the following: a) revise the Groundwater Detection Monitoring Sampling and Analysis Plan to document the new field parameter stabilization criteria noted above, followed by field implementation; or 2) demonstrate to Ohio EPA how the current field parameter stabilization criteria in the Groundwater Detection Monitoring Sampling and Analysis Plan meet the requirements of OAC Rule 3745-27-10(C)(1).**

According to the owner/operator's Revised Groundwater Detection Monitoring Sampling and Analysis Plan (July 2002) page 8, "Prior to sample collection, all monitoring wells will be purged to remove any stagnant water in the casing and to ensure that a representative groundwater sample is being collected. Hull's SOP No. F3008 included in Appendix B-1 outlines the proper purging procedures and documentation utilized. Note that in all cases, the monitoring well will be purged until the temperature, conductivity and pH values of the purge water have stabilized." Hull's SOP 3008 provided in Appendix B of the plan states in part, "The temperature, pH, and conductivity will be measured initially, as well as after each well volume is purged. The last two values obtained must be within 10 percent of one another."

Based on review of current technical literature, Ohio EPA now considers the criteria for stabilization of these field parameters to be  $\pm 0.1$  S.U. for pH,  $\pm 3\%$  for conductivity,  $\pm 0.5^\circ\text{C}$  for temperature and  $\pm 10\%$  for turbidity (when turbidity is  $> 10$  NTU). A parameter can be considered stable when at least three consecutive readings have stabilized.

14. **Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For rule citation see comment 2 above. In order to determine compliance with OAC Rule 3745-27-10 (C)(1) the owner/operator needs to provide documentation relating to when the wells recharged sufficiently to collect a sample.**

A review of the field data sheets indicates that wells SW-4, SW-5, P-1, MW-5, SAW-9, SW-3R, SW-14, SW-15, and SW-16, were purged dry. The wells were then sampled the next day. OAC Rule 3745-27-10 (C)(1) requires that procedures be used which will produce representative samples. This usually means that samples are collected as soon as enough water is available for sampling. Waiting 18 to 22 hours to sample a well which had recharged shortly after going dry could result in samples of "stagnant" water and would not result in representative samples. There is no information provided by the owner/operator which clearly indicates when these wells recharged with enough water to sample. It can be determined from the data provided that several of the wells which were purged dry were recharging at a rapid rate. Well SW-4, for example, was purged of 2.3 volumes before it went dry, SW-5 was purged of 2.2 volumes before it went dry, MW-5 was purged of 2.6 volumes before it went dry, and SAW-9 was purged of 2.3 volumes before it went dry. Even though these wells were recharging rapidly, they were sampled the next day. The samples may have been of stagnant water.

Wells should be sampled as soon as enough water is available in the well to sample. A similar comment was made regarding the May 2006, sampling event, but no owner/operator response has been received.

15. **Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For rule citation see comment 2 above. In order to determine compliance with OAC Rule 3745-27-10 (C)(1) the owner/operator needs to provide documentation that the procedure utilized for purging and sampling is providing representative samples with low turbidity. Alternatively, the owner/operator may modify their procedure in such a manner as to produce representative samples. This may include purging at a slower rate.**

A review of the laboratory reports indicates that several wells produced excessively turbid samples. These wells, SW-5 (5060 NTU), SW-7 (200 NTU), SW-2 (161 NTU), SAW-9 (194 NTU), SW-12 (146 NTU), SW-13 (114 NTU), and SW-16 (640 NTU), were purged using bailers. Well DAW-2 (40.8 and 104 NTU) was purged with a Keck Pump at the rate of 1.0 to 1.5 gallons per minute.

Of these wells SW-5, SAW-9 and SW-16 were purged dry. Sampling on these high turbidity wells typically occurred over 19 hours after purging. The samples recorded from these wells recorded high turbidity readings ranging as high as 5060 NTUs (well SW-5). In general wells purged with bailers recorded higher turbidity readings than those purged with an electric pump. Even after letting the wells set for over 19 hours, these wells still produced turbid water. OAC Rule 3745-27-10 (C)(1) requires that procedures be used which will produce representative samples. With these high turbidity readings, it is clear that the procedures utilized may not be producing representative samples. It appears that purging and/or sampling methods are causing an increase in intergranular velocities resulting in the movement of clay and fine silt size fraction materials.

16. **Compliance with OAC Rule 3745-27-10 (C)(1) and (C)(5) cannot be determined at this time. OAC Rule 3745-27-10 (C)(5) (Effective March 1, 1990) requires, in part, that, "The statistical method specified shall ensure protection of human health and the environment and shall comply with the performance standards outlined in paragraph (C)(6) of this rule." OAC Rule 3745-27-10 (C)(1) (Effective March 1, 1990); see comment 2 for rule citation. The owner/operator needs to provide information as to which wells were updated, when they were updated, and what data were involved. In addition, the owner/operator needs to justify the updating of the wells on the site.**

In Ohio EPA comments to the ground water report for the May 2006, sampling event, the agency stated the following for which no owner/operator response has been received regarding this agency comment:

"On page 2 of the statistical memorandum the owner/operator states, "However, Ohio EPA has requested that prior to updating the background data set, the data be evaluated for small increasing trends that would not be evident when individual data point comparisons are completed"."

In the Ohio EPA comments to the June 2003, sampling event the following comment was made:

"A review of the control charts for several analyte-well combinations was performed by Ohio EPA. The background data bases for these combinations appear to have been updated by the owner/operator. The review indicates that updating of these data bases may be inappropriate. Following is a table indicating some of the well-analyte combinations and reasons for not updating and also associated comments. Decreasing trends are based on Mann-Kendall trend analysis and variation in population is based on rank sum.

Well/Analyte	Reason for not Updating	Comments
SW-1/Total Organic Carbon (TOC)	Decreasing Trend and Variation in Population	Difference in population between first 8 data points and subsequent data.
SW-4/TOC	Decreasing Trend and Variation in Population	Difference in population between first 16 data points and subsequent data.
SW-6/TOC	Decreasing Trend and Variation in Population	Difference in population between last 4 data points and prior data.
SW-7/TOC	Decreasing Trend and Variation in Population	Difference in population between earlier data and subsequent data.
SW-8/TOC	Decreasing Trend and Variation in Population	Difference in population between first 14 and last 9 data points.
MW-5/TOC	Decreasing Trend	Decreasing trend continues until 9 greatest values removed which are 9 earliest values.
MW-5/pH	Decreasing Trend and Variation in Population	Difference in population between first 12 data points and subsequent data.
MW-6R/TOC	Decreasing Trend and Variation in Population	Difference in population between first 8 data points and subsequent data.

In order to continue to meet the requirements of OAC Rule 3745-27-10 (C)(1) and (C)(5) the owner/operator needs to again determine the presence of trends, including downward trends and variations in population. Any anomalies need to result in the data bases not being updated until there are no significant trends and no population differences. The owner/operator may also show that these data bases had been appropriately updated."

For each sampling event, at least since June 2003, the owner/operator has updated background data sets even though decreasing trends and/or variations in population are indicated. In the case of TOC, these decreasing trends are associated with decreasing turbidity values. The early data no longer appears to be representative of the ground water of the site.

The updating of these data bases with data that no longer appear to be representative of the ground water of the site is not protective of human health and the environment. One way to comply would be for the owner/operator to review the background data bases and incrementally test the data bases for statistical change beginning with the first eight values compared to the next four values. If there is no upward or downward trend, or no significant variation in population the background data may be updated. Where trends or variation in population does occur additional justification would need to be provided before the data could be used.

In addition, the owner/operator's statement as quoted above indicates the background data for several wells may have been updated; however, it is not clear which wells were updated and which data were involved in the updating. For the November 2005, sampling event data, at least for the well/parameter combination for MW-6R (total organic carbon) the data appears to have been updated even though no documentation was presented demonstrating no differences in the population were observed over time. This comment was previously expressed to the owner/operator regarding other updating periods without owner/operator reply.

17. **Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For rule citation see comment 2 above. The owner/operator needs to explain why there is a significant difference between the turbidity recorded in the field and that recorded in the laboratory. The owner/operator should also explain how they will change their procedure to ensure that there is consistency in the data and the results are representative of the ground water of the site.**

A review of the turbidity values recorded in the laboratory and those recorded in the field indicates that there are significant differences between the two values for several wells. These discrepancies bring into question both the field and laboratory procedures. In addition, if there is a problem with field procedures, these results also bring into question the other field readings. Since this facility is controlled by the 1990 rules, field parameters pH and conductivity are two of the statistical parameters. If the data provided by the field personnel are not accurate the determination of statistically significant increases are not accurate and are, therefore, not representative as required by OAC Rule 3745-27-10 (C)(1). Below is a table indicating the different turbidity values.

WELL	LABORATORY TURBIDITY VALUES (NTU)	FIELD TURBIDITY VALUES (NTU)
SW-5	5060	1000
SW-7	200	3
MW-10	76	14
SW-2	161	2
SAW-9	194	469

WELL	LABORATORY TURBIDITY VALUES (NTU)	FIELD TURBIDITY VALUES (NTU)
DAW-2	40.8 and 104	11
SW-12	146	21
SW-13	114	4
SW-16	640	10

18. **Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For rule citation see comment 2 above. In order to determine compliance with OAC Rule 3745-27-10 (C)(1), the owner/operator should provide an explanation regarding this discrepancy or make necessary corrections.**

Relative to the ground water report for the May 2006, sampling event Ohio EPA made the following comment for which no owner/operator response has been received regarding this agency comment:

"The field data sheet indicates a 5 foot screen was installed in well DAW-3. This is consistent with table 1 in the sampling and analysis plan. The boring log, however, indicates that a 10 foot screen was installed. The boring log is considered to be a primary source of information in this instance since the field geologist indicated what size screen was installed at the time of well construction. The owner/operator needs to provide consistent data regarding the wells at the site. If the boring log is in error it needs to be corrected and documentation of why the boring log is in error needs to be provided. This documentation could include copies of original field notes, photos, etc.

Ohio EPA has commented on this error since December 13, 2002. There has been no owner/operator response. Again it is noted that the field data sheets for the May 2006 sampling event show the same discrepancy (5' screen on field data sheet)."

19. **Compliance with OAC Rule 3745-27-10 (C)(5) cannot be determined at this time. This rule requires, in part, that, "The statistical method specified shall ensure protection of human health and the environment and shall comply with the performance standards outlined in paragraph (C)(6) of this rule." In order to determine compliance with OAC Rule 3745-27-10 (C)(5) the owner/operator should provide the current background data base and provide the background data bases for previous sampling events where the specific background data sets were not provided.**

Relative to the ground water report for the May 2006, sampling event Ohio EPA made the following comment for which no owner/operator response has been received regarding this agency comment:

"Currently and in the past the owner/operator has supplied some statistical information in the submittals. This is, in part, consistent with OAC Rule 3745-27-10 (D)(7); however, from the data provided, it is difficult to determine the population of the utilized background data base. Compliance with OAC Rule 3745-27-10 (C)(5) cannot be determined since a listing of background was not provided. In accordance with OAC Rule 3745-27-10(D)(7) the owner/operator needs to provide a list of the current background data base for each well/analyte combination in order for Ohio EPA to determine compliance with OAC Rule 3745-27-10 (C)(5)."

20. **Compliance with OAC Rule 3745-27-10 (B)(3)(e) cannot be determined at this time. For rule citation see comment 8 above. The owner/operator has not responded to the following historical comment. In order to determine compliance with OAC Rule 3745-27-10 (B)(3)(e) the owner/operator should respond to this comment.**

Relative to the ground water report for the May 2006, sampling event Ohio EPA made the following comment. "Well DAW-3 is installed with a ten foot screen in a zone containing a total of three feet of sand based on the boring log. When purged by a bailer, the well went dry in 1.4 volumes during the May 2004, sampling event and went dry at less than 1 volume in November 2001. This well went dry at 1.07 volumes in November 2004, using an electric pump and at 1.41 volumes in May 2005, 1.23 volumes in November 2005, and 1.04 volumes in May 2006. With three feet of saturated sand exposed to the screen it would be expected that this well would be more productive.

In addition, in November 2004, well P-1 went dry at 1.3 volumes (4.6 gallons), in May 2005, P-1 went dry at 1.58 volumes (7.5 gallons) using an electric pump, in November 2005, this well went dry at 1.76 volumes (7.5 gallons) and in May 2006, this well went dry at 1.48 volumes (4.81 gallons) using an electric pump. In 2001 this well went dry at 8.5 gallons. Well P-1 is constructed with a 10 foot screen with a 16 foot sand pack across a continuous saturated sand zone. Well P-1 also would be expected to produce more water than this volume before being bailed dry.

These wells might require redevelopment or the wells might need to be replaced. It is also possible a slower pump rate may be required. The stated rate for both wells, 1.0 to 1.5 gallons per minute, may be excessive for these wells. Purging wells dry may result in stripping of volatile organic compounds, increasing turbidity, trapping air resulting in lingering effects on dissolved gas levels and redox states and producing affects on sample chemistry. In order to determine compliance with OAC Rule 3745-27-10 (B)(3)(e) the owner/operator needs to provide data indicating that these wells are performing to design specifications and that the sampling method is producing representative samples. Otherwise the wells should be redeveloped or replaced. The owner/operator also needs to provide information demonstrating that the samples were collected as soon as the wells recovered."

21. **Compliance with OAC Rule 3745-27-10 (B)(1)(a) and (b) cannot be determined at this time. OAC Rule 3745-27-10 (B)(1)(a) and (b) requires that, "A ground-water monitoring system shall consist of a sufficient number of wells, installed at appropriate locations and depths, to yield ground-water samples from both the uppermost aquifer system and any significant zones of saturation that exist above the uppermost aquifer system that: (a) represent the quality of the ground water that has not been affected by past or present operations at the sanitary landfill facility; and (b) represent the quality of the ground water passing directly downgradient of the limits of solid waste placement." In order to determine compliance with OAC Rule 3745-27-10 (B)(1)(a) and OAC Rule 3745-27-10 (B)(1)(b) the owner/operator should respond to the following historical comment.**

Relative to the ground water report for the May 2006, sampling event and continuing in this submittal Ohio EPA made the following comment and no owner/operator response has been received: "A review of Figure 2, Potentiometric Surface Map for the Uppermost Aquifer System (5/08/06) and Figure 6, Potentiometric Surface Map for the MW-10 Area, indicates, for well P-1, "Value not used in the construction of the potentiometric surface map." Data collected needs to be representative. If the data is representative, it should be used in the map. The owner/operator does not indicate why the value was not used.

Since these data were not utilized a complete understanding of the ground water flow regime cannot be determined and; therefore, it cannot be determined if the requirements of OAC Rule 3745-27-10 (B)(1)(a) and (b) are being met. It should be noted that Figure 2, Potentiometric Surface map for the Uppermost Aquifer System (5/08/06), indicates ground water flow to be in a general westerly direction, toward wells P-1, MW-10, DAW-1, DAW-2 and DAW-3. Figure 6, Potentiometric Surface Map for the MW-10 Area (5/8/06), said to be constructed using MW-10, DAW-1, DAW-2 and DAW-3, displays a general south southwest flow direction. If all the data is used from all wells, the flow on the east is generally toward the west impinging on well P-1 and the flow on the west side of the site, in the MW-10 area, is generally toward the southeast, which is generally toward well P-1. Well P-1 displays the lowest ground water elevation of the wells in this zone. A map using all of the data might show a ground water low area under the southwest portion of the facility.

In order to determine compliance with OAC Rule 3745-27-10 (B)(1)(a) and (b) the owner/operator needs to show why the data was not used and show if it is representative. If the data is representative it should be utilized in the maps and new maps should be drawn which include this data point. The new maps should be submitted to Ohio EPA. A similar comment was made by Ohio EPA regarding maps in the May 2004, sampling event submittal, the November 2004, sampling event submittal, the May 2005, sampling event submittal, and the November 2005, sampling event submittal.

While not listed on Figure 2, the ground water elevation data for wells DAW-1, DAW-2 and DAW-3, which are located in the MW-10/P-1 area, are not noted as anomalous, but were not utilized in the map on Figure 2. All of the data should be utilized and properly honored. Since all of the data are not being utilized, the maps may provide an erroneous picture of ground water flow."

22. **Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For rule citation see comment 2 above. In order to determine compliance with OAC Rule 3745-27-10 (C)(1), the owner/operator should respond to this historical and continuing comment.**

Relative to the ground water report for the May 2006, sampling events and not corrected in this submittal, Ohio EPA made the following comment for which no owner/operator response has been received:

"A review of the historical TDS values for well SW-7 indicates that an outlier is included in this group of values. The value, 115 mg/L appears to have been included. All other values exceed 1124 mg/L and are typically between 1800 mg/L and 3890 mg/L. Outlier analysis of this data set indicates that the value 115 mg/L is an outlier. In order to determine compliance with OAC Rule 3745-27-10 (C)(1) the owner/operator needs to adequately explain how the value in question is not an outlier or remove it and any other outliers from the data set and perform any statistical analyses again."

23. **Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For rule citation see comment 2 above. In order to determine compliance with OAC Rule 3745-27-10 (C)(1), the owner/operator should respond to this historical comment.**

Relative to the ground water report for the May 2006, sampling event, Ohio EPA made the following comment for which no owner/operator response has been received:

"A review of the field data sheet for well SW-5 indicates that the difference between the top of casing elevation and the ground level (a.k.a. stickup) is 2.34 feet. The difference between the total depth measured from the top of casing and the total depth measured from ground level is 1.28 feet. These values should be the same. One or more of the four values involved are in error and need to be corrected.

In order to determine compliance with OAC Rule 3745-27-10 (C)(1) the owner/operator needs to review the data, determine the source of the error and make necessary changes. This information should be reported to Ohio EPA." In order to determine compliance with OAC Rule 3745-27-10 (C)(1), the owner/operator should respond to this comment.

24. **Compliance with OAC Rule 3745-27-10 (B)(3)(e) and OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. For rule citation of OAC Rule 3745-27-10 (B)(3)(e) see comment 8 above. For rule citation of OAC Rule 3745-27-10 (C)(1) see comment 2 above. In order to determine compliance with OAC Rule 3745-27-10 (B)(3)(e) and OAC Rule 3745-27-10 (C)(1), the owner/operator should respond to this historical comment.**

In comments relating to the May 2006, sampling event Ohio EPA made the following comment. "A review of the field data sheets indicates that the total depths in two wells (SW-3R and MW-6R) were not measured during this sampling event. In light of the errors in total depth values as discussed above, it is possible that the total depths in these wells are not accurate or there is fill-up in the wells." A review of the current submittal indicates that the total depths of these wells were not measured during the latest event.

On page 5 of the facility sampling and analysis plan the owner/operator states, "The total depth of each monitoring well will be recorded annually, unless a dedicated pump is installed or if an obstruction in the well casing prohibits the collection of a total depth measurement." There are no dedicated pumps in the wells. It appears that either the owner/operator has failed to perform the plan-required procedures or there is an obstruction in the wells.

In order to determine compliance with OAC Rule 3745-27-10 (B)(3)(e) and OAC Rule 3745-27-10 (C)(1), the owner/operator needs to provide accurate total depth measurements for these wells. Explain why the consistent procedure for measuring total depths was not followed. Ensure that total depths are measured as required by the plan."

25. **Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. The owner/operator is not providing proper information relating to the trends in some well/parameter combinations. The City of Wapakoneta should respond to the historical comment as discussed below.**

In response to the owner/operator's submittal of the ground water report for the May 2006 sampling event, Ohio EPA made the following comment for which no response has been received by the agency:

*A review of the statistical reports indicates that Mann-Kendall Trend Analyses were performed on several well/analyte combinations. Typically the reports contain a statement ending in the phrase, "...indicating no evidence of an upward trend." These statements are made even for analyses which result in a Z score which is negative. While the statement may be true, the negative Z score is indicative of a downward trend. The analyses presented by the owner/operator do not determine if that downward trend is statistically significant. Following is a table of well/parameter combinations and their negative Z scores:*

Well	Parameter	Z Score
SW-1	TDS	-3.8942
SW-4	TOC	-4.69269
SW-5	pH	-2.07877
SW-5	TOC	-2.26184
SW-6	TDS	-2.55853
SW-7	pH	-0.405874
SW-7	TOC	-4.46934
SW-8	TOC	-2.90762
MW-5	pH	-2.55092
MW-5	TDS	-1.91229
MW-5	TOC	-4.18564
MW-6R	TDS	-1.46436
MW-6R	TOC	-4.76174
MW-8	CONDUCTANCE	-0.944215
MW-8	TDS	-2.33233

*It is important to determine if a trend, upward or downward is statistically significant. Downward trends in pH are important since the updating of this data may mask a statistically significant change in pH toward low pH. A downward trend for other parameters may be indicative of early data which is no longer representative of ground water in the well. A trend analysis of a few of the parameter/well combinations indicates that pH in well MW-5 displays a statistically significant decreasing trend (Mann-Kendall Statistic -126, Critical Value -106, n = 29 and Mann-Kendal Statistic -128, Critical Value -101, n = 28). Also, total organic carbon in well MW-5 displays a statistical significant decreasing trend (Mann-Kendall Statistic -190, Critical Value -85, n = 25 and Mann-Kendall Statistic -169, Critical Value -81, n = 24).*

*In order to determine compliance the owner/operator needs to determine if the downward trends are statistically significant. Any statistically significant downward trends, especially for pH, should be reported to Ohio EPA. These downward trends should be taken into account when updating background. If there are/were downward trends for pH, the data should not be updated. If the data was updated, the updated values should be removed from the background data base.*

The owner/operator should address all historical issues relative to apparent negative Z Scores.

26. **Compliance with OAC Rule 3745-27-10 (C)(1) cannot be determined at this time. Significant differences exist for several parameters between the two values recorded in the duplicate data sample set. The owner/operator should demonstrate how the use of procedures which produce results with large RPD values meets the requirements of this rule. In addition, the owner/operator needs to ensure that sampling and analytical procedures are used which do not produce large RPD values in field duplicate sample sets.**

The laboratory analytical reports for the two samples in the two duplicate sample sets collected from wells DAW-2 and SW-3R in May 2008, indicated a series of excessive relative percent differences (RPD) for several parameters. Following is a table of these RPD values:

WELL	PARAMETER	RELATIVE PERCENT DIFFERENCE
DAW-2	COD	RPD equals 66.67%
DAW-2	TSS	RPD equals 46.0%
DAW-2	Turbidity	RPD equals 87.29%
SW-3R	Nitrite/Nitrate	RPD equals 107.29%

Excessive RPD values may be indicative of the use of procedures which will produce results which are not representative of the ground water of the site.

27. **Compliance with OAC Rule 3745-27-10 (C)(6)(a), which requires that the statistical method be appropriate for the distribution of the parameters, cannot be determined at this time. The owner/operator may be inappropriately determining normality. The City of Wapakoneta should provide details relating to how the W statistic was determined. This information should include the list of coefficients  $a_{n-i+1}$  which were utilized in the Shapiro-Wilks Normality calculation. A similar comment was made by Ohio EPA regarding the owner/operator's submittal regarding the May and November 2006, sampling events. The owner/operator needs to respond to the following historical comment.**

Regarding the January 2008, sampling event Ohio EPA made the following comment. The owner/operator has not responded to this comment.

"A review of the owner/operator-provided Shapiro-Wilks Test of Normality for field conductance at upgradient background well MW-6R indicates that the data is normally distributed at both 5% and 1% with a W statistic of 1.08995. Few details relative to how the W statistic was calculated were provided by the owner/operator. Ohio EPA used the same apparent 28 background values, but could not calculate the same sample standard deviation or the same mean.

The W statistic calculated by Ohio EPA was (0.9292) for non-transformed data using Sanitas® statistical software and hand calculation using the 1992 U.S. EPA guidance assuming a 95% level of significance. The Ohio EPA calculations indicate that the non-transformed data is normally distributed, but the difference between the W statistic and the critical value (Tabulated) is smaller than that indicated by the owner/operator. It is unclear if the method used by the owner/operator is properly determining the normality of the data."

28. **Compliance with OAC Rule 3745-27-10 (C)(6)(a), which requires that the statistical method be appropriate for the distribution of the parameters, cannot be determined at this time. The owner/operator may be inappropriately transforming the data. The City of Wapakoneta should provide details relating to how the W statistic was determined. The owner/operator should show how the use of natural log transformation is more appropriate than raw data when performing Shewhart-CUSUM Control Charts. Typically the need for transformation should be based on the best "W". The default method should be the use of untransformed data.**

A review of the control chart for specific conductance at well MW-5 indicates that the data was transformed using a natural logarithm transformation. Ohio EPA determined the "W" coefficient for both the normality of the raw data and the log transformed data. The best "W" was for the raw data (0.9577) rather than the log transformed data (0.9379). The owner/operator should use the raw data. This comment was also made regarding the January 2008, event.

29. **Compliance with OAC Rule 3745-27-10 (C)(1), which requires the use of procedures which will result in the collection of representative samples, cannot be determined at this time. The owner/operator did not use the ground water elevation determined for well SW-16 because of "gas pressure", but the data suggest gas pressure did not impact the ground water elevation. The City of Wapakoneta needs to explain how much pressure was in the well and explain how this pressure affected the ground water elevation. Otherwise, the city should use this data in a properly constructed potentiometric surface map.**

The field data sheet for well SW-16 indicates the well was bailed dry, and that prior to purging the well contained 3.59' feet of water which covered part of its 5 foot screen. On Figure 1, Potentiometric Surface Map for the Significant Saturated Zone (5/27/08), well SW-16 contains a note which states, "Piezometer not used to develop potentiometric surface map due to impacts from gas pressure." Actual gas pressure was not provided by the City. It is unclear what "impacts" the gas pressure had on the ground water level in the well since the gas was open to the well in the about 1.5 feet of open screen above water level. It is also unclear how those impacts were caused.

A review of the cross sections provided in the sampling and analysis plan and a review of the ground water elevations in this area of the facility indicates that the ground water elevation in well SW-16 is more similar to the levels in the uppermost aquifer system wells than the several significant zones of saturation. This sand unit may be in communication with the uppermost aquifer system.

30. **Compliance with OAC Rule 3745-27-10 (C)(2) cannot be determined at this time. This rule requires that, "Ground-water elevations shall be measured in each well immediately prior to purging and sampling. The permittee shall determine, for the uppermost aquifer system and for all significant zones of saturation monitored, the direction of ground-water flow each time ground-water elevation measurements are performed." In order to determine compliance with OAC Rule 3745-27-10 (C)(2), the owner/operator should respond to this historical comment.**

Relative to the ground water report for the May 2006, sampling event Ohio EPA made the following comment for which no owner/operator response has been received:

"Note 1 in Figure 5, Groundwater Elevation map for the SW-7 Area (11/15/05), states, "Due to the small variation in groundwater elevations no discernable groundwater is apparent." It is not clear what the owner/operator intended to say since elevations determined from the ground water present in the wells are provided in the table on the map. It may be that the word "flow" is missing from the statement, but this is not clear. Based on the data provided, however, there appears to be ground water gradient, and therefore, ground water flow.

In order to determine compliance with OAC Rule 3745-27-10 (C)(2) the owner/operator needs to clarify their statement in Note 1 and provide this clarification to Ohio EPA. If there is ground water present in the wells, per OAC Rule 3745-27-10 (C)(2) the ground water flow direction must be provided."

31. **Compliance with OAC Rule 3745-27-10 (C)(1), cannot be determined at this time. For rule citation see comment 2 above. The owner/operator needs to clarify their statement.**

In the third paragraph on page 3 of the submittal the owner/operator states, "Four parameters were reported above laboratory PQLs in FB-1 including alkalinity at 7 mg/L, chloride at 3 mg/L, dissolved sodium at 0.5 mg/L, and turbidity at 0.2 NTU. Three parameters were reported above laboratory PQLs including alkalinity at 7 mg/L, dissolved sodium at 0.5 mg/L, and turbidity at 0.2 NTU." From this statement it is unclear if there are four or three parameters detected in FB-1.

32. **Compliance with OAC Rule 3745-27-10 (C)(1), cannot be determined at this time. For rule citation see comment 2 above. The owner/operator needs to clarify their statement.**

At the bottom of page 2 and continuing on page 3 the owner/operator states, "The statistical significance identified for specific conductivity in detection well MW-8 will be identified for affected monitoring wells SW-7 and MW-10, The statistical significances identified for affected monitoring wells SW-7 and MW-10, along with the reporting of vinyl chloride in monitoring wells IAW-1 (both the original and the duplicate samples), IAW-3, and SW-7 and benzene in monitoring wells SW-2 and SAW-4, are currently under investigation as outlined in the facility's AMSAP." This statement is confusing and needs to be clarified.

33. **Compliance with OAC Rule 3745-27-10 (C)(1), cannot be determined at this time. For rule citation see comment 2 above. The owner/operator should clearly indicate how the potentiometric surface map in Figure 1 meets the requirements of this rule. Alternatively, the owner/operator may produce one potentiometric surface map for each of the significant zones of saturation.**

On page 4 of the submittal the owner/operator states, "Figure 1, included in Appendix D-2, provides a potentiometric surface map constructed for the significant saturated zone using groundwater elevation data collected on May 27, 2008." A review of Figure 1, Potentiometric Surface Map for the Significant Saturated Zone (5/27/08), indicates that the map incorporates data from all wells considered by the owner/operator to be screened in the significant zone of saturation. A review of the cross sections provided by the owner/operator in March of 2008 indicates that there are likely three significant zones of saturation under the site. While these zones are, to some extent, interconnected, locally they tend to display different ground water elevations. In addition, locally the chemistry of these zones tends to vary. For example, well SW-2, located near the Auglaize River and screened at about 870' amsl, shows the presence of volatile organic compounds (VOC) benzene and chloroethane. However, well SW-7, located in the same area, but screened about 10 feet deeper at about 860' amsl, has only reported VOC vinyl chloride. Since there are multiple significant zones of saturation there should likely be several potentiometric surface maps.

34. **Compliance with OAC Rule 3745-27-10 (C)(1), cannot be determined at this time. For rule citation see comment 2 above. The owner/operator needs to clarify their statement.**

On page 4 of the submittal the owner/operator discusses the significant zone of saturation potentiometric surface map (Figure 1) and states, "Groundwater flow within the significant saturated zone is to the northeast in the northern portion of the facility and to the southwest in the southern portion of the facility." A review of Figure 1, as presented by the owner/operator, indicates that the map does not support this statement. It appears that the statement may be indicating the presence of radial flow, but the map is not drawn to show radial flow.

35. **Compliance with OAC Rule 3745-27-10 (C)(1), cannot be determined at this time. For rule citation see comment 2 above. The owner/operator needs to provide the time of purging for well AW-7.**

The field data sheet for well AW-7 indicates that the well was purged on May 28, 2008, and sampled at 10:12 on May 29, 2008. There is no notation as to the time the well was purged. In order to determine if representative samples are collected Ohio EPA needs to know if there was an excessive amount of time between purging and sampling. In order to know this the time of purging is necessary.

36. **Compliance with OAC Rule 3745-27-10 (C)(1), cannot be determined at this time. For rule citation see comment 2 above. The owner/operator needs to explain how the use of potentially compromised data in the background data set meets the requirements of this rule. Alternatively the data from well MW-6 may be purged from the MW-6/MW-6R data set until such time that it can be shown to be representative of the ground water of the site.**

Prediction limits were calculated by the owner/operator for the uppermost aquifer system (UAS) wells using data purportedly from well MW-6R dating back to October 1993. Well MW-6R, however, is a replacement well for well MW-6 which observed the presence of methane in the well. In addition, well MW-6 displayed damage to the surface casing. Well MW-6 was not considered to be operating to design specifications. Based on the entrance of the methane, damage to the surface casing, and the well not operating to design specifications, the data from well MW-6 is in question. In particular, the total organic carbon data from 1993 through 1999 appears to be anomalous compared to the data collected from 2000 to the present. Well MW-6(R) was installed in July 2000.

37. **Compliance with OAC Rule 3745-27-10 (C)(1), cannot be determined at this time. For rule citation see comment 2 above. The owner/operator needs to explain how the ground water level in well DAW-1 is anomalous.**

On Figure 2 Potentiometric Surface Map for the Uppermost Aquifer (5/27/08) the owner/operator provides two note references next to well DAW-1. Reference "2" refers to the note which states, "Piezometer not used to develop potentiometric surface map due to anomolous [sic] measurement." There is no discussion why the owner/operator considers this measurement to be anomalous. All representative data should be used. If the data is not representative it should be explained.

## STATEMENTS

38. **Wells MW-10, P-1, DAW-1, DAW-2 and DAW-3 are affected by operations at the landfill.** On page 3 of the memorandum on the statistical analysis located in Appendix C it is stated,

"Therefore, the calculated statistical significances identified in monitoring well MW-10 are considered to be the result of the statistical method used in the evaluation of the data (inter-well procedure). None-the-less, these statistical significances are currently under investigation as outlined in the facility's AMSAP."

Although errors in the statistical method may sometimes result in the calculation of statistical significances that do not exist, the inappropriate use of a statistical method may show no statistical significance where one exists. A review of the conductivity and TDS results for the uppermost aquifer system wells indicates that the results from MW-10 are significantly greater than those for the upgradient well, MW-6R, and even other downgradient wells. The use of interwell statistical analysis was appropriate and correctly determined that well MW-10 is an affected well. Since this well is affected, the use of intrawell methods would be inappropriate. In addition, interwell statistical procedures indicate that wells P-1, DAW-1, DAW-2, and DAW-3 are affected by operations at the landfill.

39. **Phenolics, benzene, and acetone have been observed in the ground water and are considered to be present in the ground water of well SW-3R.** A review of the analytical results for the samples collected in the duplicate sample set from well SW-3R indicates that benzene (1.9 and 2.1 µg/L) was reported from both samples in the duplicate set. Based on the presence of benzene reported since May 25, 2005, this volatile organic compound must be considered to be present in this well. In addition, acetone has now been detected five times since May 25, 2005. Phenolics, while not observed in the current event, have been sporadically observed since March 2003. These organic compounds are considered to be present in the samples and, therefore, in the ground water of the well.
40. **In addition to well MW-10, wells P-1, DAW-1, DAW-2, and DAW-3 have displayed exceedances for field conductance and total dissolved solids when comparing the data to the non-parametric prediction limit for these parameters.** Similar comparisons also indicate that well DAW-1 also had displayed exceedances for pH and total organic carbon (TOC) and DAW-2 displayed an exceedance for pH.
41. **The presence of benzene in wells SW-3R and SW-16 and acetone in SW-3R are considered statistically significant increases.** On page 3 of the submittal the owner/operator states regarding the presence of acetone and benzene in well SW-3R and benzene at well SW-16, "During future sampling events, these wells will be closely monitored to determine if the reporting of benzene and acetone resulted from the landfill or were the result of field/laboratory conditions at the time of sample collection /analysis."

The owner/operator should understand that benzene has been observed in well SW-3R since May 25, 2005 and acetone has been observed in samples collected from well SW-3R in May 2005, May 2006, August 2006, November 2006 and May 2008. Appropriately, well SW-3R is in the assessment program.

Well SW-16 is currently declared to be an "investigative" well however, since benzene has been observed, this detection will be treated as a statistically significant increase since benzene is not naturally present in the ground water. The owner/operator is reminded that OAC Rule 3745-27-10 (D)(8)(b) requires that for any monitoring well that is determined to display a statistically significant increase the permittee needs to resample the well not later than fifteen days after notification of the director. In addition OAC Rule 3745-27-10 (D)(8)(c) requires that not later than sixty days after the resampling the permittee should confirm or reject the original notification in a written notification. Failure to do so may result in a violation of these rules.

42. **There may be complete radial flow from SW-14 in all directions around this well resulting in the presence of leachate or leachate-derived constituents in the significant zones of saturation west of the landfill as wells as in other directions.** Figure 1, Potentiometric Surface Map for the Significant Saturated Zone (5/14/07), shows that ground water flows from well SW-14 in a partial radial manner in generally northerly, easterly and southerly directions. The latest data and map from the May 2008, sampling event can be interpreted in a similar fashion. There are no wells, interpreted by the owner/operator to be in the significant zones of saturation, within at least 500 feet in any direction of well SW-14.

In addition, a review of the cross sections provided by the owner/operator in March 2008 indicate that well SW-14 is in a significant zone of saturation which is stratigraphically higher than other significant zones of saturation. The zone screened in SW-14 is located at about 885' amsl. The prominent zone screened in well SW-2, by contrast, is observed across the southern half of the site at about 870' to 875' amsl.

Also, cross sections provided by the owner/operator in September 2002, indicate the "Approximate Minimum Elevation of Landfill" is at 883' amsl. Since well SW-14 is located within about 5' to 10' of the limit of solid waste, based on the maps provided by the owner/operator in the current submittal, the zone screened in SW-14 can reasonably be interpreted to be in connection with waste in the landfill since they are both about the same elevation and located near each other. It may be erroneous to include ground water elevations from this well in the potentiometric surface map which includes ground water elevations from other significant zones of saturation. The inclusion of this zone in these maps will result in a flow direction and gradient that is not representative of the ground water of the site.

43. **All of the zones in the area of the plume(s) near wells MW-10, P-1, SW-16, DAW-1, DAW-2, and DAW-3 are not completely defined as required by OAC Rule 3745-27-10 (E)(6).** In item 4 on page 2 of the submittal the owner/operator states, "As documented in the AMSAP, uppermost aquifer assessment monitoring wells DAW-1 and DAW-3 will no longer be monitored as part of the assessment monitoring program as they are not performing to design specifications." The owner/operator also states that these wells will be decommissioned and they are, "...evaluating locations for potential replacement wells..." The owner/operator is reminded that the ground water in several of the zones in this area has displayed significant impact from leachate or leachate-derived constituents.
44. **The field data sheet for well SW-16, located in the general P-1, MW-10, DAW-1, DAW-2, DAW-3 affected area, indicates an explosive gas reading of 62% methane and 100% LEL from this well.** Ground water samples from this well, collected in May 2008, have also indicted the presence of 1.1 µg/L benzene.
45. **There are six wells in the uppermost aquifer system which displays statistically significant increases above background.** In Appendix C the owner/operator has provided prediction limits for conductivity, total dissolved solids (TDS), total organic carbon (TOC) and pH. As indicated the pH prediction limit is in error since it was determined using a one-tailed test. For this reason Ohio EPA determined the two-tailed prediction limits for pH. The Ohio EPA pH limits and the owner/operator's conductivity, TDS, and TOC limits were used to compare to the recent results of the wells that the owner/operator considers uppermost aquifer system (UAS) wells. Based on these prediction limits several wells were found to display statistically significant increases above background. The table below lists these exceedances.

WELL	CONDUCTIVITY EXCEEDED?	TDS EXCEEDED?	TOC EXCEEDED?	pH EXCEEDED?
SW-5	Yes	Yes	No	Yes (low)
MW-5	Yes	No	No	Yes (low)
MW-8	Yes	No	No	Yes (low)
MW-10	Yes	Yes	No	Yes (low)
P-1	Yes	Yes	No	Yes (low)
DAW-2	Yes	Yes	No	Yes (low)

In the report the owner/operator only determined interwell statistically significant increases for well MW-10. The other wells were not analyzed. The owner/operator is reminded that these other wells display statistically significant increases.

46. **The facility is generally in the shape of a triangle and contamination has been determined to exist on all three sides of the triangle.**

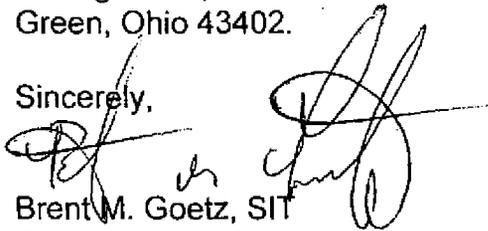
Mr. Rex A. Kattereinrich, P.E.  
Wapakoneta Landfill  
September 15, 2008  
Page 30 of 30

On page 3 of the submittal the owner/operator states, "No statistical significance was identified for any monitoring well/parameter combination evaluated for the May 2008, sampling event with the exception of specific conductance in detection monitoring well MW-8, specific conductance affected monitoring well SW-7, and specific conductance and TDS in affected monitoring well MW-10." This statement leaves the impression that the amount of contamination is not significant. Data from all of the wells around the site, however, indicate significant contamination around the facility.

**Please respond in writing within 30 days of receipt of this letter. The response shall adequately address each specific comment under the "Notice of Violations" and the "Additional Information Needed to Determine Compliance" sections of this letter.**

If you have any questions, please feel free to contact Randy Skrzyniecki at the Ohio EPA Northwest District Office (419) 373-3149. Any written correspondence needs to be sent to the attention of Brent M. Goetz, SIT, Division of Solid and Infectious Waste Management, Ohio EPA Northwest District Office, 347 North Dunbridge Road, Bowling Green, Ohio 43402.

Sincerely,



Brent M. Goetz, SIT  
Environmental Specialist  
Division of Solid and Infectious Waste Management

//lr

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