



State of Ohio Environmental Protection Agency

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Ted Strickland, Governor
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Chris Korleski, Director

Re: May 2007 Sampling Event
Wapakoneta Landfill
Auglaize County

September 25, 2007

Mr. Rex Katterheinrich
Safety Service Director
City of Wapakoneta
P.O. Box 269
Wapakoneta, Ohio 45895

Dear Mr. Katterheinrich:

The Ohio Environmental Protection Agency (Ohio EPA) completed a review of the July 13, 2007, report describing the results of the May 14-16, 2007, sampling event at the Wapakoneta Landfill. Based upon Ohio EPA's evaluation, the facility is presently operating under the correct ground water monitoring phases for the significant zone of saturation, but the well system is not adequate, and assessment is incomplete.

In addition, the entire uppermost aquifer system in the MW-10 area should be included in the assessment program, the well system may not be adequate and assessment is incomplete. Also, the owner or operator should move toward implementation of an effective corrective measure. Following are Ohio EPA comments relating to the review.

COMMENTS

VIOLATIONS

1. **The City of Wapakoneta continues to be in violation of Ohio Administrative Code (OAC) Rule 3745-27-10 (C)(3) which requires that the permittee establish background ground water quality by analyzing samples from hydraulically upgradient wells. To return to compliance, the owner/operator needs to review the data and determine which well or wells is/are upgradient or install background wells for all the zones and collect a sufficient amount of samples to establish background ground water quality.**

In the Statistical Procedures and Methodologies section on page 1 and continuing on page 2 of the memorandum discussing "Statistical Analysis of Detection Monitoring Data Collected During the May 2007, Groundwater Sampling Event at the Wapakoneta Sanitary Landfill; KWAP041.100.0024.DOC" dated July 13, 2007, and included in the submittal, the owner/operator states, "Based on the geologic, hydrogeologic, and the 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."

Also, in the Introduction on page 1 of the same memorandum the owner/operator states, "Note that, given that two-dimensional horizontal groundwater flow does not exist within the shallow significant saturated zones, the shallow significant saturated zone monitoring wells are not designated with respect to the hydraulic gradient." Similar statements were made in the reports for November 2000, May 2001, November 2001, May 2002, November 2002, May 2003, November 2003, May 2004, November 2004, May 2005 November 2005, May 2006, and November 2006, sampling events. At those times Ohio EPA responded in similar fashion to the following:

If the owner/operator indicates that it cannot "determine which wells are upgradient" per OAC Rule 3745-27-10 (C)(4)(a), effective March 1, 1990, it may choose a well that is not upgradient which is "as representative or more representative than that provided by upgradient wells." However, it must first prove that well is not affected by the landfill.

Additional information provided by the owner/operator, including potentiometric surface maps for the areas of SW-2 and SW-3R, and chemical analyses results for the wells in the general areas of SW-2, SW-3R and SW-7, also indicates that horizontal flow exists in the significant zones of saturation; the sands are, at least in part, interconnected; and the upgradient position may be able to be determined. Correlations of the significant saturated zones can be made.

- 2. The City of Wapakoneta continues to be in violation of OAC Rule 3745-27-10 (C)(1) which requires that the sampling and analysis procedures be consistent and protective of human health and the environment and be designed to ensure results which are an accurate representation of ground water quality. To return to compliance, the owner/operator needs to review the data and perform interwell statistical analyses or utilize some other means to prove that the significant saturated wells are not affected prior to using intrawell methods.**

On page 4 of the submittal, in the section labeled, "Statistical Evaluation" the owner/operator states, "No statistical significance was identified for any monitoring well/parameter combination 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 determination 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. SW-7 has been known to be affected for at least the past 11 years. The latest analytical results indicate that vinyl chloride was again detected. This time it was detected at 16.1 µg/L in well 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 2007 event data and consists of: affected well SW-7, possibly unaffected well SW-4, possibly affected well SW-1 and possibly affected wells SW-8 and SW-5.

ANALYTE	SW-1	SW-8	SW-7	SW-5	SW-4
pH	7.1	6.74	7.02	6.86	7.06
Specific Conductance	1464	1810	3390	2100	947
TDS mg/L	864	1020	1650	1530	528
TOC mg/L	3.5	5.1	5.0	2.2	1.3
Sodium mg/L	76.8	81.2	349	49.2	27.1
Calcium mg/L	118	198	163	268	124
Magnesium mg/L	71.4	83.3	80.3	125	39.8
Potassium mg/L	3.1	4.1	5.9	4.9	2.3
Chloride mg/L	118	177	544	58	51
Sulfate mg/L	121	160	204	743	58
Alkalinity mg/L	499	551	539	493	391
Iron mg/L	<0.05	5.05	3.31	2.75	<0.05
Manganese mg/L	0.27	0.12	0.15	0.21	0.03
Nickel mg/L	0.09	<0.01	<0.01	0.01	0.03
Ammonia mg/L	0.11	<0.1	0.6	0.17	0.18
COD mg/L	16	20	19	89	<10

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-4. 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 City of Wapakoneta continues to be in violation of the requirements of OAC Rule 3745-27-10 (C)(5) (Effective March 1, 1990) requiring that the permittee utilize the PQLs from the Appendix I list in any statistical procedure. To return to compliance the owner/operator needs to ensure that, at a maximum, the PQLs in Appendix I are utilized in all future analytical reports.**

In the case narrative the laboratory states, "The PQL (Limit) of 1 µg/L for 1,2 - Dichloroethane, 1,1,2,2-Tetrachloroethane, 1,1,2-Trichloroethane and Trichloromethane by EPA Method 8260 are greater than the PQLs listed in the 1990 OAC regulations but are consistent with the PQLs contained in Ohio EPA Guidance Document #406 dated 4/24/07."

Practical Quantitation Limits (PQLs) utilized in the laboratory results were compared to the PQLs listed in Appendix I of OAC Rule 3745-27-10 (Effective March 1, 1990). Several of the utilized PQLs exceed those in Appendix I. Following is a table which lists the analytes in question, the utilized PQLs and the required PQLs according to Appendix I.

ANALYTE	UTILIZED "LIMIT" (µg/L)	RULE- REQUIRED PQL (µg/L)	STATED PQL (µg/L)
Chloroform (Trichloromethane)	1	0.5	1
1,2-Dichloroethane	1	0.5	1
1,1,2,2-Tetrachloroethane	1	0.5	1
1,1,2-Trichloroethane	1	0.2	1

The owner/operator performed the required statistical analyses for the volatile organic compounds by comparing the analytical results to the PQLs for detection monitoring program wells like SW-4. In these instances, any detection would be considered to be a statistically significant increase since no volatile organic compound is expected to occur naturally in the ground water of this site.

The use of improper PQLs was also reported in the results from the November 2000, May 2001, November 2001, May 2002, November 2002, May 2003, November 2003, May 2004, November 2004, May 2005, November 2005, May 2006 and November 2006 sampling events. It is understood that the owner/operator has requested a change in the PQL values for the above-stated four parameters consistent with OAC Rule 3745-27-10 (C)(5). This request requires a director's approval and, as yet, this has not occurred.

The utilization of improper PQLs in statistical analyses has already occurred and, as such, is in violation of OAC Rule 3745-27-10 (C)(5). Until such time as the director approves the owner/operator's request or the PQLs are lowered to the appropriate level, the owner/operator will continue to be in violation of this rule. Also, the owner/operator is reminded that they have chosen to be regulated by the 1990 regulations and, therefore, are required to operate consistent with those regulations.

- 4. The City of Wapakoneta continues to be in violation of OAC Rule 3745-27-10 (C)(3), which requires that the permittee establish background ground water quality by analyzing samples from hydraulically upgradient wells, and OAC Rule 3745-27-10 (C)(8), 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. In order to return to compliance 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-5, SW-6, SW-7, and SW-8. The statistical procedures utilized intrawell methods.

Since the exception in paragraph (C)(4) does not apply, 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 (upgradient) well results. This was not done for the significant zone of saturation wells.

5. **The City of Wapakoneta continues to be in violation of the requirements of OAC Rule 3745-27-10 (C)(8), 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 performing the appropriate statistical analysis. To return to compliance the owner/operator needs to utilize a two-tailed test for all current statistical analyses for pH and for all those performed in the future.**

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 7.8530 (logged value 2.06102). 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.

6. **The City of Wapakoneta continues to be in violation of OAC Rule 3745-27-10 (C)(2) and OAC Rule 3745-27-10 (C)(3) by not providing a potentiometric surface map for the significant zones of saturation. OAC Rule 3745-27-10 (C)(2) requires that ground-water elevations be measured in each well immediately prior to purging and sampling; and the direction of ground-water flow be determined each time ground-water elevation measurements are performed. OAC Rule 3745-27-10 (C)(3) requires that background ground-water quality be established by analyzing ground-water samples collected from hydraulically upgradient wells. To return to compliance relative to OAC Rule 3745-27-10 (C)(2), the owner/operator should provide the agency with a potentiometric surface map of the significant zone of saturation. This zone is shown to be interconnected. To return to compliance relative to OAC Rule 3745-27-10 (C)(3) the owner/operator should establish background water quality.**

On page 4 the owner/operator states, "No potentiometric surface map was developed using groundwater elevation data collected from the shallow significant saturated zone monitoring wells due to the discontinuous nature of the granular deposits within the glacial till material." In the second full paragraph on page 5, however, the owner/operator states, "Potentiometric surface maps for assessment areas SW-2, SW-3R, SW-7 and MW-10 (Figures 3-6 respectively), included in Appendix D-2, were constructed using groundwater elevation data collected on May 14, 2007." Wells SW-2, SW-3R, and SW-7 are in the significant zone of saturation.

Also, on page 1 of the statistical memorandum the owner/operator states, "Note, given that two-dimensional horizontal groundwater flow does not exist within the shallow significant saturated zones, the shallow significant saturated zone monitoring wells are not designated with respect to the hydraulic gradient."

On page 3 of the submittal, however, the owner/operator states, "Potentiometric surface maps for assessment areas SW-2, SW-3R, SW-7, and MW-10 (Figures 3-6 respectively), included in Appendix D-2, were constructed using groundwater elevation data collected on May 14, 2007. The general groundwater flow direction in the SW-2 assessment area is toward the Auglaize River with average hydraulic gradients of 0.008 ft/ft for the northwest and 0.005 ft/ft for the southeast riverbanks. The general groundwater flow direction in the SW-3 assessment area is to the east with an average hydraulic gradient of 0.012 ft/ft."

It is unclear whether the owner/operator believes potentiometric maps cannot be produced in the shallow zones since they provide localized maps in the submittal. Ohio EPA has provided information indicating the continuity of these zones on the site to the owner/operator. In recent submittals, the owner/operator has provided cross sections indicating the continuity of these units. It appears that the statement about not being able to produce potentiometric surface maps is not valid. A map of the ground water flow in the entire area of the significant zone of saturation should be produced.

Also, the fact that confirmed contamination has spread over a considerable distance including the areas around SW-2, SW-3, SW-7 and MW-10, indicates that the zones are interconnected. This interconnection is present, at least, in the landfill area. A review of previously submitted maps and cross sections indicates that the zones, especially in the southern portion of the site are interconnected. Also, new data indicate that the sands are interconnected and, based on depositional environment, would be expected to be interconnected. Since they are interconnected, an upgradient well can be established.

MORE INFORMATION NEEDED TO DETERMINE COMPLIANCE

7. **Compliance with OAC Rule 3745-27-10 (C)(1), which requires the collection of representative samples, and (C)(1)(d), which requires that the sampling and analysis plan include a detailed description of the equipment, procedures, and techniques to be used for performance of field analysis, cannot be determined at this time. Actual stabilization of the field parameters might not be occurring in the monitoring wells during purging. The City of Wapakoneta should do one of the following:**

- **revise the Groundwater Detection Monitoring Sampling and Analysis Plan to document the new field parameter stabilization criteria noted above, followed by field implementation;**

OR

- **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 0.1 S.U. for pH, 3% for conductivity, 0.5°C for temperature and 10% for turbidity (when turbidity is >10 NTU). Also, a parameter can be considered stable when at least three consecutive readings have stabilized.

8. **Compliance with OAC Rule 3745-27-10(C)(1), which requires that representative samples be collected, cannot be determined at this time. Stagnant samples may have been collected from some wells. The City of Wapakoneta should provide documentation when the wells recharged sufficiently to collect a sample. Wells should be sampled as soon as enough water is available in the well to sample. Also, the owner/operator should explain how not meeting stabilization criteria has produced samples which are representative of the ground water of the site. A similar comment was made regarding the May 2006, and November 2006, sampling events, but no owner/operator response has been received.**

Based on review of current technical literature, Ohio EPA now considers the criteria for stabilization of these field parameters to be 0.1 S.U. for pH, 3% for conductivity, 0.5°C for temperature and 10% for turbidity (when turbidity is >10 NTU). Also, 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 and field parameters were determined and recorded by Mike Charchol on either May 14 or May 15, 2007, but were sampled by Mike Charchol the next day (May 15 or May 16, 2007 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 17 to 23 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 the wells which were purged. Bold values exceed new stabilization criteria.

WELL	Time from purge to sampling (hrs)	pH at last volume (SU)	Final pH (SU)	Temp. at last volume - (°C)	Final Temp (°C)	Conduct. at last volume (µmohs/cm)	Final Conduct. (µmohs/cm)
SW-1	21:25	7.35	7.10	12.20	12.00	1412	1464
SW-2	19:32	6.82	6.80	11.3	10.9	10780	10650
SW-3R	23:05	6.81	6.63	15.0	13.4	5310	5300
SW-4*	21:34	7.14	7.06	12.2	12.2	892	947
SW-5	21:15	6.83	6.86	12.4	12.6	2040	2100
SW-6	21:04	7.67	7.55	14.4	14.2	730	737
SW-7	19:34	7.01	7.02	10.4	10.2	3540	3390
SW-8	21:20	6.99	6.74	12.7	12.8	1940	1810
MW-5	21:30	7.67	7.58	12.6	13.0	697	717
MW-6R	21:20	7.71	7.68	13.3	13.5	772	763
MW-8	21:24	7.30	6.95	12.8	12.6	820	847
MW-10	19:38	7.25	7.20	13.4	13.2	3920	3820
P-1*	21:19	7.32	7.97	13.7	13.0	3300	2870
DAW-1	21:10	6.82	6.76	13.2	13.3	8300	8220
DAW-2	20:47	6.98	7.06	12.9	13.1	5460	4370
DAW-3*	20:26	7.53	7.48	13.6	13.7	996	1042
IAW-1	19:23	7.10	7.02	10.2	10.4	3110	2820
IAW-3	19:13	7.01	6.98	10.3	10.5	4670	4530
IAW-4	19:00	7.18	7.12	10.9	10.6	2020	2050
SAW-4	19:20	7.17	7.00	11.4	12.0	7970	7890
SAW-5	19:23	7.04	6.77	11.5	11.5	5000	4350
SAW-9*	19:16	7.56	7.12	11.6	11.5	1540	1960
AW-1	19:40	7.56	7.53	13.4	13.0	744	778
AW-7	17:20	7.40	7.28	13.8	13.6	1163	1200
AW-9	19:33	7.54	7.46	13.8	13.6	785	783
SW-12	21:37	7.52	7.46	12.9	13.0	1750	1800
SW-13	21:04	7.61	7.59	11.4	11.8	758	800
SW-14	20:17	6.98	6.88	11.7	12.0	2180	2200
SW-15*	20:35	7.45	7.42	15.3	14.8	1370	1247

WELL	Time from purge to sampling (hrs)	pH at last volume (SU)	Final pH (SU)	Temp. at last volume - (°C)	Final Temp (°C)	Conduct. at last volume (µmohs/cm)	Final Conduct. (µmohs/cm)
SW-16*	Not sampled	6.84	na	13.2	na	3400	na

Based on stabilization criteria: pH 0.1 standard units, specific conductance 3%, temperature 0.5° Celsius.

* - Well purged dry.

9. **Compliance with OAC Rule 3745-27-10(C)(1), which requires that representative samples be collected, cannot be determined at this time. Stagnant samples may have been collected from some wells. The City of Wapakoneta should provide documentation relating to when the wells recharged sufficiently to collect a sample. 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, and November 2006, sampling events, but no owner/operator response has been received.**

A review of the field data sheets indicates that wells SW-3R, SW-4, MW-5, P-1, and DAW-3 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 17 to 23 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-1, for example was purged of 2.36 volumes before it was purged dry; well SW-4 was purged of 2.36 volumes before it went dry; well P-1 was purged of 1.46 volumes in seven minutes (7 gallons at one gallon per minute) before it went dry and well SAW-9 was purged of 1.75 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. Several of these wells displayed significant differences in field parameters between the last and final field readings.

10. **Compliance with OAC Rule 3745-27-10(C)(1), which requires that representative samples be collected, cannot be determined at this time. Non-representative samples may have been collected from some wells. The City of Wapakoneta should 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 field data sheets indicates that wells SW-3R, SW-6, SW-15, MW-5, MW-6R, MW-8, MW-10, P-1, DAW-1, DAW-2, and DAW-3 were purged with a "Keck Pump" at the rate of 1.0 to 1.5 gallons per minute. Wells P-1, DAW-3, SW-3R, and SW-15 were purged dry. Sampling occurred on these wells 19 to 23 hours after purging. The other wells were purged using a disposable bailer and were sampled the next day.

While some of these bailed wells recorded modest turbidity values some recorded excessive turbidity readings with one as high as 450 NTUs (well SW-5). Even after letting the well set for over 20 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.

11. **Compliance with OAC Rule 3745-27-10(C)(1), which requires that representative samples be collected, and compliance with OAC Rule 3745-27-10 (C)(5), which requires that the statistical method ensure protection of human health and the environment and compliance with the performance standards stated in the rules, cannot be determined at this time. Comments had been provided by Ohio EPA regarding updating with trends and variations in population, but no reply has been received. The current submittal has made positive changes, but also has provided a lack of clarity. The City of Wapakoneta should perform the trend tests on the appropriate representative population, after outliers have been removed, prior to any updating activities.**

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.

Well/Analyte	Reason for not Updating	Comments
SW-7/TOC	<i>Decreasing Trend and Variation in Population</i>	<i>Difference in population between earlier data and subsequent data.</i>
SW-8/TOC	<i>Decreasing Trend and Variation in Population</i>	<i>Difference in population between first 14 and last 9 data points.</i>
MW-5/TOC	<i>Decreasing Trend</i>	<i>Decreasing trend continues until 9 greatest values removed which are 9 earliest values.</i>
MW-5/pH	<i>Decreasing Trend and Variation in Population</i>	<i>Difference in population between first 12 data points and subsequent data.</i>
MW-6R/TOC	<i>Decreasing Trend and Variation in Population</i>	<i>Difference in population between first 8 data points and subsequent data.</i>

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 appears to have 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 appear 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 was 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. Again, the owner/operator needs to provide information as to which wells were updated, when they were updated, and what data were involved.

Without a response this situation is becoming more confused. In the current submittal the owner/operator has performed Dixon's and/or Rosner's test for outliers as appropriate. Outliers were removed as indicated. Ohio EPA appreciates this action; however, the owner/operator includes in the submittal a series of Mann-Kendall trend analyses which appear to include the outliers. It is unclear if the owner/operator intends to retain the outliers or not. Some of the trend tests show downward trends which appear to be caused by the outliers.

12. **Compliance with OAC Rule 3745-27-10(C)(1), which requires that representative samples be collected, cannot be determined at this time. Non-representative data is being provided on a field data sheet. The City of Wapakoneta should provide an explanation regarding the discrepancy discussed below 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 plans. 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 2007, sampling event show the same discrepancy (5' screen on field data sheet).

13. **Compliance with OAC Rule 3745-27-10(C)(5), which requires that the statistical method ensure protection of human health and the environment and compliance with the performance standards stated in the rules, cannot be determined at this time. Comments had been provided by Ohio EPA regarding the background population. The City of Wapakoneta 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).

14. **Compliance with OAC Rule 3745-27-10(B)(3)(e), which requires that the wells be maintained to perform to design specifications, cannot be determined at this time. Wells DAW-3 and P-1 do not appear to be as productive as could be expected. The City of Wapakoneta should respond to the comment as discussed below.**

From the current submittal it can be stated that well DAW-3 was purged of 1.01 volumes before it went dry and well P-1 was purged of 1.46 volumes before it went dry. 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. The owner/operator has not responded to this comment.

15. **Compliance with OAC Rule 3745-27-10 (B)(1)(a) and (b), which requires that the monitoring system consist of an appropriate number of properly positioned wells to provide representative samples of the ground water of the site, cannot be determined at this time. Ohio EPA had previously commented on maps produced without the benefit of all of the well data. The City of Wapakoneta should respond to the comment as discussed below.**

Relative to the ground water report for the May 2006, and November 2006, sampling events, 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), indicated 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.

16. **Compliance with OAC Rule 3745-27-10(B)(3)(e), which requires that the wells be maintained to perform to design specifications, cannot be determined at this time. Wells SW-8 and IAW-4 display significant discrepancies between the total depths on the boring logs and the total depths utilized on the field data sheets. This comment was also made relating to the November 2006, sampling event. The City of Wapakoneta should provide documentation why this information and all information stemming from it are accurate (including ground water levels, length of water columns, etc.). If the information is not accurate, the owner/operator needs to make corrections to the erroneous information and all data stemming from it.**

A review of the field data sheets indicates that the elevation of the total depth measurements for most of the wells is the same as the base of the screen elevations for those wells. Two wells, however, show discrepancies. The field data sheet for well SW-8, for example, indicates that the total depth (TD) is 42.33' below the top of the casing. This is an elevation of 873.20' amsl. The field data sheet shows the bottom of the screen to be at 872.50'. Also, the field data sheet for well IAW-4 indicates that the total depth is 59.00 feet below the top of casing. This results in a TD elevation of 831.48' amsl. The field data sheet, however, indicates that the base of the screen is at 857.89' amsl. This is 26.41' higher than the TD elevation. It appears that there is an error in the total depth or the bottom of the screen

17. **Compliance with OAC Rule 3745-27-10(B)(3)(e), which requires that the wells be maintained to perform to design specifications, cannot be determined at this time. Well MW-5 displays a discrepancy between the stated total depth and the measured total depth on the field data sheet. The City of Wapakoneta should clearly demonstrate that these wells are not displaying "fill-up". Alternatively, the owner/operator may repair or replace the wells.**

The stated total depth from the top of casing (TOC) on the field data sheet is 80' while the measured total depth (from TOC) is 77.37'. This is almost 3 feet shallower and may represent fill-up in the well. In addition, the field data sheet for well MW-8 indicates the total depth (from top of casing) to be 69.12', but the measured total depth is 43.25'. This indicates almost 26 feet of fill-up in this well. Also, the stated total depth for well IAW-4 is 59', but the measured TD is 32.43'. This suggests almost 27' of fill-up.

18. **Compliance with OAC Rule 3745-27-10(C)(1), which requires procedures that provide representative data be utilized, cannot be determined at this time. Non-representative data is being provided on a field data sheet. The City of Wapakoneta should respond to the comment as discussed below.**

Relative to the ground water report for the May 2006, and November 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 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.

19. **Compliance with OAC Rule 3745-27-10 (C)(2), which requires that the direction of ground water flow be determined each time ground water elevations are measured, cannot be determined at this time. There is an incomplete or confused statement expressed on Figure 5. The City of Wapakoneta should respond to the comment as discussed below.**

Relative to the ground water report for the May and November 2006, sampling events and not corrected in this submittal, 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. This problem also exists in the current submitted map.

20. **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 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.

A review of the current submittal indicates that a similar problem has occurred. A table of apparent downward trending data is provided below. The same comment made for the May 2006, data holds true for the data listed below.

Well	Parameter	Z Score
SW-6	TDS	-2.98173
MW-5	TDS	-1.86262
MW-5	TOC	-2.94227
MW-8	TOC	-2.83849

21. **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 meet 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 duplicate sample set collected from well SW-3R in November 2006 indicated a series of excessive relative percent differences (RPD) for several parameters. Following is a table of these RPD values:

PARAMETER	RELATIVE PERCENT DIFFERENCE
Nitrate/Nitrite	Difference in values (0.08 mg/L) exceeds PQL (0.05 mg/L)
Phosphorus	Difference in values (0.5 mg/L) exceeds PQL (0.1 mg/L)
Total Suspended Solids	PQL equals 62.5%

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.

22. **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.**

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 using the same apparent 28 background values with the same sample standard deviation of 45.2385 and same mean of 735.6786 arrived at a lower W statistic (0.963996) 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. In addition, the sum of the b values as determined by Ohio EPA (230.7957) is less than that determined by the owner/operator (245.41). It is unclear if the method used by the owner/operator is properly determining the normality of the data.

23. **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 clearly explain in detail how the use of a significance of 0.01 is appropriate and meets the requirements of this rule.**

The parametric prediction interval analysis for specific conductance at well MW-10 utilizes an interwell comparison, with one comparison, one future sample, 29 background samples, a background mean of 736.621 and a standard deviation of 44.7121. The calculated interval using these criteria was determined by the owner/operator to be 0 to 848.818. In order to arrive at this prediction interval a significance level of 0.01 needs to be used. Typically, for interwell single comparisons, a significance of 0.05 is utilized. The parametric prediction interval analysis provided by the owner/operator for total dissolved solids utilized a significance of 0.05 to determine the prediction limit.

STATEMENTS

24. **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.

25. **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 (duplicate sample set) collected from well SW-3R indicates that benzene (3.1 and 1.9 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 three times since May 10, 2006 and four times since May 25, 2005.

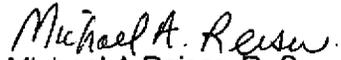
Phenolics have been observed sporadically since May 2006. These organic compounds are considered to be present in the samples and, therefore, in the ground water of the well.

26. **In addition to well MW-10, wells P-1, DAW-1, DAW-2, and DAW-3 display 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 displays exceedances for pH and total organic carbon (TOC).
27. **Contour lines were not drawn on Figure 5.** A review of the ground water elevation data provided in the table on Figure 5, Groundwater Elevation map for the SW-7 Area (05/14/07), indicates, while this map contains the statement, "Due to the small variation in groundwater elevations no discernable groundwater (sic) is apparent.", contour lines can be drawn. These lines are important to show localized changes in ground water flow direction, the location of potential recharge areas and the general direction of ground water flow. On this map, at a minimum, the "873.90" contour should be drawn.
28. **The owner/operator may be removing compliance data from possibly affected wells.** A review of the submittal indicates that tests for outliers have been performed on various data sets. It should be noted that while it is appropriate to test for outliers and remove outliers from background data sets, it may not be appropriate to test for outliers and remove apparent "outliers" from compliance data sets. The removal of excessively high (or low values in the case of pH) from compliance data sets may result in the inappropriate removal of statistically significant increases (or decreases in the case of pH) above (or below) background. As has been noted by Ohio EPA in the past, the monitoring system for the significant zone of saturation does not contain any background wells. It is inappropriate to perform intrawell statistical analyses on these wells until it can be shown that they are not impacted. To remove data from these wells when they have not been shown to be not impacted may be inappropriate.

Mr. Rex Katterheinrich
September 25, 2007
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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 should be sent to the attention of Mike Reiser, Division of Solid and Infectious Waste Management, Ohio EPA Northwest District Office, 347 North Dunbridge Road, Bowling Green, Ohio 43402.

Sincerely,



Michael A Reiser, R. S.
Environmental Supervisor
Division of Solid and Infectious Waste Management

/llr

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