Ohio EPA
40 years and moving forward

John R. Kasich, Governor
Mary Taylor, Lt. Governor
Scott J. Nally, Director

January 29, 2013

Mr. Paul Quinn
Service Director
City of Westlake
27216 Hilliard Boulevard
Westlake, Ohio 44145

**RE: WESTLAKE CITY LANDFILL**
**CUYAHOGA COUNTY**
**GROUND WATER QUALITY ASSESSMENT PLAN**
**NOTICE OF VIOLATION**
**ADDITIONAL INFORMATION NEEDED TO DETERMINE COMPLIANCE**

Dear Mr. Quinn:

The Ohio Environmental Protection Agency (Ohio EPA), Northeast District Office (NEDO), has reviewed the following report for Westlake Landfill:

- Ground Water Quality Assessment Program Plan, Revision 1, dated December 2010

The document is dated December 2010. It was received December 28, 2010 and reviewed for compliance with OAC Rule 3745-27-10 of the 2003 revised Materials and Waste Management regulations. The report was prepared and submitted by Mr. Fraser Hamilton of Earth Consulting, LTD, on behalf of the City of Westlake.

Westlake Landfill closed under the 1990 Solid Waste Landfill Regulations, and is currently conducting post-closure ground water detection monitoring and ground water quality assessment monitoring in accordance with OAC Rule 3745-27-10 of the 2003 revised Solid and Infectious Waste Regulations. Monitoring wells WW-5, WW-9 and WW-10 are currently in the ground water quality assessment program and are being sampled in accordance with the ground water quality assessment plan. All other monitoring wells (i.e. WW-1, WW-2, WW-3R, WW-4, WW-6R, WW-7, WW-8) at the facility are in the detection monitoring program.

The sampling report was prepared and submitted to conform with OAC Rule 3745-27-10(C)(10) of the 2003 revised Solid and Infectious Waste regulations. Therefore, the October 2010 report was reviewed for compliance with OAC 3745-27-10 and the facility's revised 2004 ground water detection monitoring plan (GWDMP).

Ohio EPA has reviewed the above referenced document and has the following comments:

**Violations**

1) OAC Rule 3745-27-10(C)(6), states in part... The owner or operator shall submit to the operating record any changes made to the statistical method. For owners or operators not subject to Rule 3745-27-09 of the Administrative Code, submit to Ohio EPA any changes made to the statistical method. The submission of the revised statistical method shall be made thirty days prior to submitting to the operating record and/or Ohio EPA the first set of ground water analytical data analyzed using the revised statistical method.

   The owner or operator changed the statistical method used for barium from a parametric, log-transformed, Kaplan-Meier adjusted prediction limit in the June 2010 event to a non-parametric prediction limit in the October 2010 event. Ohio EPA did not receive notice of this change in statistical methods from the owner or operator prior to receiving the October 2010 report. Additionally, as described in Violation #2 and in More Information Needed to Determine Compliance #1 below, the owner or operator updated the background database for barium in violation of rule, and elevated the statistical limit for barium in a manner that may prevent the ground water monitoring program from determining the impact of the facility on the quality of ground water in the uppermost aquifer system at the facility.

   To return to compliance, the owner should report to Ohio EPA all such revisions of the statistical method(s) used on ground water data by revising the statistical analysis plan and submitting the revised plan at least thirty days prior to submitting the first set of ground water analytical data analyzed using the revised statistical method, in accordance with OAC 3745-27-10(C)(6).

2) OAC Rule 3745-27-10(C)(7)(g), Performance standards for statistical methods. Any statistical method chosen in accordance with paragraph (C)(6) of this rule shall comply with the following performance standards as appropriate: Background data can be added only in blocks of data resulting from the analysis of four or more statistically independent samples after the data have been statistically compared to the current background data and no statistical differences are detected, unless another method is deemed acceptable to the director.

   The owner or operator has updated the background database for virtually all Appendix I parameters using fewer than four samples per parameter. Page 11 of Appendix F (Statistical Analyses Methodology) in Revision 4.1 of the GWDMP states in the paragraph entitled "Updating The Background Data" that "Westlake Landfill will update the background data by consolidating more recent sampling observations with historical background data during each sampling event." Since Westlake Landfill only has two background wells (WW-4, WW-7), such updates would typically only include two results

for each parameter rather than four as required by OAC Rule 3745-27-10(C)(7)(g). For example, a comparison of Appendix D (Statistical Analyses) of the June 2010 report with that in the October 2010 report shows that the barium background was updated with only two samples (i.e. n=23 in June 2010 report vs. n=25 in October 2010 report). The background databases for virtually all other parameters were likewise updated in violation of OAC Rule 3745-27-10(C)(7)(g).

To return to compliance with this rule, the owner or operator should do the following:

a) Remove the October 2010 results at WW-4 and WW-7 from the background databases of all parameters.

b) Revise the statistical analysis plan to require that background be updated only with a minimum of four statistically independent samples (e.g. every two semi-annual events) per the requirement of OAC Rule 3745-27-10(C)(7)(g).

c) Follow the statistical analysis plan as revised for all future detection ground water monitoring events. Under this scenario, the October 2010 results could then be "re-updated" along with the Spring 2011 results for each parameter samples during the Spring 2011 event as long as there are at least four statistically independent samples to update (including the October 2010 results) and the sets of four statistically independent samples for each parameter pass the outlier and trend tests required in the statistical analysis plan.

**More Information Needed to Determine Compliance**

1) OAC Rules 3745-27-10(A)(1)(a)(ii) and 3745-27-10(C)(7)(a): which require that the owner or operator implement a ground water monitoring program that is capable of determining the impact of the facility on the quality of ground water in the uppermost aquifer system, including that the statistical method be conducted in accordance with OAC 3745-27-10(C), and that the statistical method be appropriate for the distribution of the parameter being statistically evaluated.

   The change in statistical method for barium between the June 2010 report and October 2010 report, and the resulting increase of the statistical limit from 0.2283 mg/L to 0.27 mg/L has not been properly documented or justified, and may make the ground water monitoring program incapable of determining the impact of the facility on ground water in regards to barium.

   As discussed in Violation #2 above, the owner or operator updated the background database for barium from twenty-three to twenty-five samples, in violation of the OAC 3745-27-10 rules. Apparently based on the improperly updated background, the October 2010 report changed the background distribution for barium from log-transformed,

parametric (June 2010 report) to non-parametric, with a short justification that the new distribution would have required "both a power transformation and Cohen's adjustment" to remain parametric. This explanation does not justify the change in methods, nor the change from using the Kaplan-Meier non-detects adjustment to Cohen's. Furthermore, use of Cohen's method in such situations is not prescribed in the statistical analysis plan.

Additionally, the June 2010 report showed that a statistically-significant increasing trend for barium has been building at WW-5 since 2004, with the June 2010 sample (0.2283 mg/L) actually exceeding the statistical limit for the first time. Furthermore, the assessment sampling at WW-9 in January 2011 reported a barium concentration (0.37 mg/L) even higher than nearby well WW-5. These data provide strong evidence that barium has been released to ground water from the facility in the area of WW-5 and WW-9, and thus that the barium concentrations detected at WW-5 and WW-9 represent a release from the facility, not the upper tail of background concentrations.

To demonstrate compliance with these rules, the owner or operator should do one of the following:

a) After complying with OAC Rule 3745-27-10(C)(7)(g) as described in Violation #2 above, demonstrate per the "methodology Westlake landfill will use for computing interwell prediction limits" flow chart on page 17 of the statistical analysis plan and text on pp. 23-29 that the background database for barium can no longer be normalized through transformation in conjunction with the Kaplan-Meier adjustment for non-detects, and thus justify that a non-parametric method must be used instead. This demonstration should include normality test results. Additionally, use of a non-parametric prediction limit for barium must meet the power requirements set forth on pages 10, 13-14 of the statistical analysis plan.

b) Return to using the log-transformed, parametric prediction limit with Kaplan-Meier adjustment for barium as previously used per the statistical analysis plan.

c) Revise the statistical analysis plan to include a revised methodology flow chart and text that includes a different statistical approach and/or methods for barium that are in accordance with OAC 3745-27-10(C)(6) and OAC 3745-27-10(C)(7), and begin implementing such changes with the Spring 2011 sampling event.

2) OAC Rule 3745-27-10(C)(7)(d): which requires that if a prediction interval is used to evaluate ground water monitoring data, the levels of confidence shall be protective of human health and safety and the environment. These parameters shall be determined after considering the number of samples in the background data base, the data distribution, and the range of the concentration values for each constituent of concern.

The non-parametric statistical limits determined for many of the metals and volatile organic compounds (VOCs) in the October 2010 report do not correspond to any values found in the background database shown for the corresponding parameter, and thus appear to represent a level of confidence that is not connected with the range of concentrations found in background, as required by OAC Rule 3745-27-10(C)(7)(d). For example, the non-parametric prediction limit listed for lead is shown as 0.05 mg/L, but the highest detection in the background data set (WW-4, WW-7) listed in the October 2010 report is 0.011 mg/L at WW-4 on March 19, 2004. The non-parametric prediction limit listed for selenium similarly does not reflect a background concentration listed in the October 2010 report.

Additionally, the non-parametric prediction limit shown for silver is 0.005 mg/L, but the entire background data set is reported as non-detect at various PQLs, with the current PQL being 0.005. Since the value 0.005 mg/L apparently has not been detected in background, the confidence level associated with a non-parametric prediction limit set at that value cannot be determined. The same is true for mercury and all of the non-parametric prediction limits for undetected VOCs shown in the October 2010 report.

The only formula known to Ohio EPA for determining a confidence level for a non-parametric prediction limit set to the background maximum is: confidence level = $(1-\alpha) = n/(n+1)$. If the background is all non-detect and an owner or operator elects not to utilize estimated data to calculate the limit, setting the non-parametric prediction limit equal to the PQL creates a limit outside of the current background (i.e. beyond "n"), and thus a confidence level cannot be determined for such a limit. In this scenario, the "background maximum" should be less than the current PQL, or "<PQL," and thus the non-parametric prediction limit should be set at "<PQL." Then the confidence level for a non-parametric prediction limit based on a background of say eight non-detects (e.g. <0.005, <0.005, <0.005, <0.005, <0.002, <0.002, <0.002, <0.002) should be set at less than the current PQL, and thus the limit would be "<0.002," or in order to quantify the limit perhaps 0.001 or even 0.0019.

To demonstrate compliance with this rule, the owner or operator should do one or more of the following:

a) Submit data and/or information to demonstrate that the background database shown in the October 2010 report (Appendix D) was in error and that the non-parametric prediction limits for lead, mercury, selenium, silver and all non-detect VOCs actually do correspond to background detections at those concentrations that were inadvertently omitted from the October 2010 report.

b) Change the non-parametric prediction limits for lead, mercury, selenium, silver and any non-detect metals or non-detect VOCs to the highest in background or less than the current PQL, whichever is greater.

c) Change the statistical method from prediction limits to another appropriate statistical method in accordance with OAC 3745-27-10(C)(6), revise the statistical analysis plan accordingly, and conduct the revised statistical method in accordance with the statistical analysis plan and OAC 3745-27-10(C)(7).

3) OAC Rules 3745-27-10(D)(5)(ii)(*a*) and 3745-27-10(C)(9): which require that the owner or operator collect a minimum of eight background samples during the initial year of sampling and analyze them for Appendix I parameters 1-66, to be used for the statistical provisions of this rule, and that the statistical background for each parameter be comprised of a minimum of eight statistically independent samples.

4) The facility has had sufficient time to obtain a background dataset of eight samples per Appendix I parameter. However, Appendix D (Statistical Analyses) of the October 2010 report indicates fewer than eight samples in the pre-October 2010 database (see Violation 1 above) for the following Appendix I metals:

- Antimony, beryllium, cobalt, thallium and vanadium.

Ohio EPA records indicate that there are additional sample results for all five of these metals that are not reflected in the background database represented in the October 2010 report, as follows:

| Parameter | Sample date | Well ID | Result (mg/L) |
|---|---|---|---|
| Antimony | 12/3/98 | WW-7 | 0.007 |
| | 1/23/99 | WW-7 | 0.009 |
| | 4/21/05 | WW-4 | BRL |
| | 4/21/05 | WW-7 | BRL |
| | 10/31/07 | WW-4 | 0.00173 J, NP |
| | 10/31/07 | WW-7 | 0.0000704 J, NP |
| Beryllium | 12/3/98 | WW-7 | <0.001 |
| | 1/23/99 | WW-7 | <0.001 |
| | 4/21/05 | WW-4 | BRL |
| | 4/21/05 | WW-7 | BRL |
| | 10/31/07 | WW-4 | <0.000039 J, NP |
| | 10/31/07 | WW-7 | 0.004 NP |
| Cobalt | 12/3/98 | WW-7 | <0.003 |
| | 1/23/99 | WW-7 | <0.003 |
| | 4/21/05 | WW-4 | BRL |
| | 4/21/05 | WW-7 | 0.11 (outlier)* |
| Thallium | 12/3/98 | WW-7 | 0.013 |
| | 1/23/99 | WW-7 | <0.005 |
| | 4/21/05 | WW-4 | BRL |
| | 4/21/05 | WW-7 | BRL |
| | 10/31/07 | WW-4 | <0.000017 NP |

| Parameter | Sample date | Well ID | Result (mg/L) |
|---|---|---|---|
| | 10/31/07 | WW-7 | 0.000871 J,NP |
| Vanadium | 12/3/98 | WW-7 | 0.004 |
| | 1/23/99 | WW-7 | <0.003 |
| | 4/21/05 | WW-4 | BRL |
| | 4/21/05 | WW-7 | BRL |
| | 10/31/07 | WW-4 | <0.000017 NP |
| | 10/31/07 | WW-7 | 0.000871 J,NP |
| BLR: below reporting limit – these data may be usable if actual reporting limit or PQL can be found from old report. | | | |
| J: estimated value between the MDL and PQL. | | | |
| NP: sample not preserved in field, but rather at laboratory, and thus some results may not be usable, especially non-detect results. | | | |
| * This value is an outlier and should not be used in background unless future background results confirm this high result. | | | |

To demonstrate compliance with this rule, the owner or operator should do one or more of the following:

a) Review historical reports associated with the metals data presented in the table above and evaluate the data as to whether it continues to be representative of background ground water at the facility in accordance with OAC 3745-27-10(C)(1), 3745-27-10(C)(4) and 3745-27-10(C)(7)(g). If "yes," the owner or operator should return any such results into the background database, and revise the statistical analysis plan and statistical limit(s).

b) Immediately begin collecting additional, statistically independent samples from WW-4 and/or WW-7 and have them analyzed for antimony, beryllium, cobalt, thallium and vanadium such that the background database for each of these metals has a minimum of eight statistically independent samples. Any such sample results must be updated in accordance with OAC 3745-27-10(C)(7)(g) [e.g. recent samples improperly updated per Violation #2 above could be combined with newly-collected sample results to comprise the minimum four samples].

5) OAC Rule 3745-27-10(D)(5)(a)(ii)(*b*): which requires that the owner or operator collect a sample from each detection monitoring well in the uppermost aquifer system at the facility and have each sample analyzed for parameters 1-66 of Appendix I of OAC 3745-27-10.

Section 6.0 of the October 2010 report indicated that monitoring well WW-3R did not produce enough samples to fill all containers for the full suite of Appendix I parameters 1-66 and that monitoring well WW-6R did not produce adequate volume for any sampling.

However, examination of the field data sheets in Appendix A of the October 2010 report indicated that two factors may be preventing the owner or operator from collecting enough

sample volume to fill part or all of the containers for the full suite of Appendix I parameters 1-66, and that these factors may be preventable:

a) The pumping rate used to purge the wells may be higher than necessary. Field data sheets indicate that the minimum pumping rate used by the owner or operator is 0.1 gallons per minute (~380 milliliters per minute). However, many bladder pumps used for low-flow sampling (as is utilized at the facility) are capable of rates as low as 0.03 gallons per minute (100 milliliters per minute). Since lower pumping rates facilitate longer well recovery periods and since drawdown must be stabilized before sampling using low-flow, lower pumping rates are often advantageous for low-yielding wells as at the facility.

b) The volume of water removed between stabilization parameter measurements (0.5-1.0 gallons) may be too high. In low-flow sampling, after the "dead" volume of water remaining in the pump, hoses, etc. (usually one equipment volume) and the volume of any drawdown is purged from the well, stabilization measurements may be taken as often as every one equipment volume (i.e. the volume of the pump, all hoses, flow-thru chamber). A common equipment volume is approximately one liter. If the equipment volume being used at the facility is one liter, the total volume purged prior to sampling could be as low as 4 liters (~1.1 gallons), provided no appreciable drawdown and the well stabilizes after 3 measurements.

The field data sheet for WW-3R indicates that 3.0 gallons were purged from WW-3R prior to sampling, and Section 6.0 of the October 2010 report indicates that 1.5 gallons were purged from WW-6R prior to it going dry. Furthermore, stabilization measurements recorded on the field data sheet for WW-3R indicate that WW-3R was stabilized after 2.5 gallons were removed ($5^{th}$ measurement), and thus 0.5 gallons more were unnecessarily purged from WW-3R prior to sampling. Had that last 0.5 gallons not been purged, sufficient water should have remained to fill all sample vials for WW-3R. Similarly, had a lower pumping rate and more frequent stabilization parameter measurements (i.e. every one equipment volume) been utilized at WW-6R, there may have remained a sufficient volume to fill some or all Appendix I, parameters 1-66 sample containers.

To demonstrate compliance with this rule, the owner or operator should do the following:

i) Submit data and/or information (i.e. specific volumes, lengths, copies of equipment manuals, etc.) that demonstrates:

- That the purging equipment volume used to conduct low-flow purging and sampling at the facility is large enough such that the owner or operator cannot purge less than 0.5 gallons between measurements at WW-3R and WW-6R;

- That the dedicated pumps used to conduct low-flow purging and sampling at the facility cannot achieve a pumping rate lower than the rate used during the October 2010 event (i.e. 0.1-0.2 gal/min).

- That it was necessary to purge 3.0 gallons from WW-3R and 1.5 gallons from WW-6R prior to sampling (or attempting to sample for WW-6R).

ii) Base the low-flow sampling stabilization parameter measurement intervals used at the facility on purging equipment volume, rather than a volumetric 0.5-1.0 gallon interval, as follows:

- Revise the GWDMP text and the blank field data sheets to describe the purging equipment volume for each ground water monitoring well at the facility. This could be done by describing the inner diameter and typical length of any hosing/tubing, volume of pump, flow-through cell, etc. in the GWDMP, and then simply record on the field data sheet any deviations from this standard that occurs in a particular sampling event.

- Revise the GWDMP text and blank field data sheets to include a field for describing any drawdown that occurs and if and at what level the water level stabilized prior to taking measurements and sampling, and include a statement in the GWDMP that measurement and sampling will not occur prior to water level stabilization.

These GWDMP revisions should then be implemented during the next sampling event.

iii) Revise the GWDMP to identify exactly which stabilization parameters are to be evaluated, and enumerate the exact stabilization criteria that are to be used. The current GWDMP merely states that low-flow sampling will be conducted "in general accordance with Ohio EPA's Technical Guidance For Ground Water Investigations" (TGM), and in practice the owner or operator is not always following the stabilization criteria found in Table 10.5 of the TGM. Specific conductance, dissolved oxygen and oxidation-reduction potential should be among the stabilization parameters used, as an abundance of literature states that these three parameters are the most sensitive to well stabilization.

Since the owner or operator is already measuring specific conductance, dissolved oxygen, oxidation-reduction potential, pH and temperature, Ohio EPA recommends that the owner or operator continue to use these five as stabilization parameters, but specifically revise the GWDMP to state that a well will be considered "stabilized" when the stabilization criteria in ASTM Standard D6771-02 are met for four of these five stabilization parameters across three consecutive purge volumes. The ASTM Standard D6771-02 criteria are as follows:

| Parameter | Stabilization criteria |
|---|---|
| Temperature | +/- 0.5° Celsius |
| pH | +/- 0.2 standard units |
| Specific conductance | +/- 3% |
| Oxidation-reduction potential | +/- 20 millivolts |
| Dissolved oxygen | +/- 10% of reading value or +/- 0.2 mg/L, whichever is greater |

These GWDMP revisions should then be implemented during the next sampling event. If the owner or operator reduces the pumping rate, reduces the purge volumes between stabilization measurements, and follows the ASTM Standard D6771-02 stabilization criteria, WW-3R will likely retain enough sample to fill all sample containers, and WW-6R may also retain enough water to fill some or all sample containers.

**Statements**

**1)** Status regarding statistically significant changes from background.

Results in the October 2010 report for the Westlake Landfill facility indicated statistically significant increases above background in downgradient ground water monitoring wells for the following well/parameter pairs:

- WW-2: cobalt
- WW-8: cobalt

The statistical analysis plan states that the owner or operator in utilizing a 1-of-2 resampling plan for all parameters. Therefore, in accordance with OAC 3745-27-10(D)(7)(c)(i), the owner or operator has 180 days (April 19, 2011) to resample WW-2 and WW-8 for cobalt and to submit a report documenting that the resample results for cobalt at WW-2 and WW-8 are non-detect (i.e. <PQL) in both resamples.

If the 1-of-2 resampling for cobalt at WW-2 and WW-8 does not disprove the statistical increase, or the owner or operator otherwise elects to try to demonstrate that these statistically significant increases above background were false positives due to a source other than the landfill (i.e. error in the sampling, analysis, statistical evaluation or natural variation in ground water quality), then in accordance with OAC 3745-27-10(D)(7)(c)(ii) the owner or operator has two hundred ten days from initial sampling to make an alternate source demonstration to the Director of Ohio EPA and to receive approval from the Director of Ohio EPA or his authorized representative to continue detection monitoring in accordance with OAC 3745-27-10(D)(7)(c)(ii). Therefore, if the owner or operator does not obtain written approval from the Director to continue detection monitoring at WW-2 and WW-8 by May 19, 2011, the owner or operator must conduct a ground water quality

assessment program by complying with paragraph (E) of OAC 3745-27-10 regarding the statistically significant increases for cobalt at WW-2 and WW-8.

Nothing in this letter shall be construed to authorize any waiver from the requirements of any applicable state or federal laws or regulations. This letter shall not be interpreted to release the City of Westlake from responsibility under Chapters 3704, 3714, 3734, or 6111 of the Ohio Revised Code or under the Federal Clean Water or Comprehensive Environmental Response, Compensation, and Liability Acts for remedying conditions resulting from any release of contaminants to the environment.

Please submit a response within 60 days of receipt of this letter, indicating how the facility has returned to compliance with OAC Rule 3745-27-10(C)(6) and OAC Rule 3745-27-10(C)(7)(g). The response should also include the information needed to determine compliance with OAC Rules 3745-27-10(A)(1)(a)(ii) and 3745-27-10(C)(7)(a), OAC Rule 3745-27-10(C)(7)(d), OAC Rules 3745-27-10(D)(5)(ii)(*a*) and 3745-27-10(C)(9), and OAC Rule 3745-27-10(D)(5)(a)(ii)(*b*).

If you have any technical questions regarding this review, please contact Steve Churchill of the Division of Drinking and Ground Waters at (614) 728-1225. Please submit all correspondence to Jennifer Carlin, Division of Materials and Waste Management, NEDO, Ohio EPA, 2110 East Aurora Road, Twinsburg, OH 44087.

If you have any questions regarding this letter, please feel free to contact me at (330) 963-1133, or e-mail me at "jennifer.carlin@epa.state.oh.us."

Sincerely,

Jennifer Carlin
Environmental Specialist
Division of Materials and Waste Management

JC/cl

cc: Mike Sekerak, Cuyahoga County Health Department
Fraser Hamilton, Earth Consulting, LTD
Stephen Churchill, DDAGW, CO
File: [Sowers/LAND/Westlake City LF/GRO/18]
DMWM # 3750