40 years and moving forward
John R. Kasich, Governor
Mary Taylor, Lt. Governor
Scott J. Nally, Director

CERTIFIED

November 7, 2012

Mr. Wayne Willis
E-Town Landfill, Inc.
10978 Highway 50
North Bend, OH 45052

Re: Director's Final Findings & Orders

Dear Mr. Willis:

Transmitted herewith are Final Findings & Orders of the Director concerning the matter indicated.

You are hereby notified that this action of the Director of Environmental Protection (Director) is final and may be appealed to the Environmental Review Appeals Commission pursuant to Section 3745.04 of the Ohio Revised Code. The appeal must be in writing and set forth the action complained of and the grounds upon which the appeal is based. The appeal must be filed with the Commission within thirty (30) days after notice of the Director's action. The appeal must be accompanied by a filing fee of $70.00, made payable to "Treasurer, State of Ohio." The Commission, in its discretion, may reduce the fee if by affidavit it is demonstrated that payment of the full amount of the fee would cause extreme hardship. Notice of the filing of the appeal shall be filed with the Director within three (3) days of filing with the Commission. Ohio EPA requests that a copy of the appeal be served upon the Ohio Attorney General's Office, Environmental Enforcement Section. An appeal may be filed with the Environmental Review Appeals Commission at the following address:

Environmental Review Appeals Commission
77 South High Street, 17th FL
Columbus, Ohio 43215

Sincerely,

Georgia Frakes

Georgia Frakes, Management Analyst
Division of Materials & Waste Management

Enclosure: Director's Final Findings and Orders

cc: Aaron Shear/Joe Goicochea, DMWM, CO
Janine Maney, Legal
Tracy Buchanan, SWDO, CO
Lindsay Taliaferro/StephenChurchill, DDAGW-CO
Mike Cyphert, Walter Haverfield, LLP
Chuck DeJonckheere, Hamilton Co. Public Health

BEFORE THE
OHIO ENVIRONMENTAL PROTECTION AGENCY

In the Matter Of:

E-Town Landfill, Inc.
d.b.a. E-Town Landfill & Recycling, Inc.
10978 Highway 50
North Bend, OH 45052

Respondent

Director's Final Findings and Orders

I. JURISDICTION

These Director's Final Findings and Orders ("Orders") are issued to E-Town Landfill, Inc. ("Respondent") pursuant to the authority vested in the Director of the Ohio Environmental Protection Agency ("Ohio EPA") under Ohio Administrative Code ("OAC") Rule 3745-400-10(D) and Ohio Revised Code ("ORC") Chapter 3714 and Section 6111.03.

II. PARTIES BOUND

These Orders shall apply to and be binding upon Respondent and its successors in interest liable under Ohio law. No change in ownership of Respondent or of the Facility (as hereinafter defined) shall in any way alter Respondent's obligations under these Orders.

III. DEFINITIONS

Unless otherwise stated, all terms used in these Orders shall have the same meaning as defined in ORC Chapter 3714. and 6111. and the rules promulgated thereunder.

IV. FINDINGS

The Director of Ohio EPA has determined the following findings:

1. E-Town Landfill and Recycling, Inc. ("Facility") is a construction and demolition debris facility as that term is defined in OAC Rule 3745-400-01(G) located at 10978 Highway 50, North Bend, Hamilton County, Ohio.

2. E-Town Landfill, Inc. ("Respondent") is the "owner" and the "operator" of the Facility as those terms are defined in OAC Rule 3745-400-01(EE) and (I), and is also the license holder for the Facility.

3. The Facility design does not include a liner system or leachate collection system.

4. The Facility lies within the boundaries of the 100-year flood plain of the Great Miami River.

5. The Facility is located over the federally protected Great Miami Buried Valley Sole-source Aquifer System.

6. The Facility is a currently licensed "construction and demolition debris facility" as that term is defined by OAC Rule 3745-400-01(G) and is authorized to accept "construction and demolition debris" as that term is defined by ORC Section 3714.01(C) and OAC Rule 3745-400-01(F).

7. Respondent is a "person" as that term is defined by ORC Section 3714.01(H) and OAC Rule 3745-400-01(DD).

8. ORC Section 3714.02 requires the Director to adopt rules to ensure that construction and demolition debris facilities do not, among other things, create a nuisance or health hazard or cause or contribute to water pollution. The Director adopted OAC Rule 3745-400-10 as a result of this statutory requirement.

9. Pursuant to OAC Rule 3745-400-10(A), Respondent installed a ground water monitoring well system for the Facility.

10. Ground water monitoring wells MW-1, MW-2, MW-3, and MW-4 were installed at the Facility in 1997.

11. OAC Rule 3745-400-10(C) provides in relevant part: "The owner or operator shall determine the concentration or value of the parameters listed in the appendix of this rule in ground water and leachate in accordance with the following schedule: [***] (2) During the initial year of ground water monitoring, the owner or operator shall do the following: (a) At least quarterly, determine the initial background concentration or value in ground water samples from all monitoring wells for parameters 1 to 19 listed in the appendix of this rule. [***] (3) After the initial year, the owner or operator shall at least annually sample all monitoring wells and the leachate collection system and analyze the samples for the parameters 1 to 19 listed in the appendix of this rule."

12. Pursuant to OAC Rule 3745-400-10(C)(2)(a), the Respondent monitored MW-1, MW-2, MW-3, and MW-4 at the Facility quarterly during 1998.

13. On November 12, 1998, the Hamilton County General Health District/Hamilton County Public Health [hereinafter "HCGHD/HCPH"] sent a notice to Respondent stating that "Due to past site history of recurring leachate breakout violations and concerns over its effect on groundwater quality, the license application does not meet Section 400-10(A) and Section 400-10(B)."

14. In response to the HCGHD/HCPH letter, Respondent installed monitoring well 5 (MW-5) in February 1999.

15. The current ground water monitoring systems consists of five monitoring wells (MW-1, MW-2, MW-3, MW-4, and MW-5). Two monitoring wells MW-3 and MW-4 are located upgradient of the limits of debris placement and are used as background wells. Three monitoring wells MW-1, MW-2, and MW-5 are located downgradient of the limits of debris placement.

16. From 1999 through 2007 Respondent annually sampled MW-1, MW-3, MW-4, and MW-5 for Parameters 1-19 in the Appendix of OAC Rule 3745-400-10; from 1999 through 2001, in 2003, and from 2005 up until 2007 Respondent sampled MW-2 for Parameters 1-19 in the Appendix of OAC Rule 3745-400-10.

17. Beginning in 2007, Respondent has annually sampled MW-1, MW-2, MW-3, MW-4, and MW-5 for Parameters 1-19 in the Appendix of OAC Rule 3745-400-10, as well as the following compounds: arsenic, chromium, and copper.

OAC Rule 3745-400-10(D) Ground Water Assessment Determination Findings

18. OAC Rule 3745-400-10(D) provides: "Ground water assessment. The licensing authority or director may order the owner or operator to conduct a ground water assessment to determine the concentration of possible contaminants, and their extent and rate of migration within the ground water if the licensing authority or director determines that the facility may be affecting ground water quality. Such a determination shall be supported by leachate quality reports, if required by paragraph (B) of this rule and the following: (1) The ground water quality reports from a qualified ground water scientist. (2) Water quality data from documented leachate releases to seeps, springs, streams or other receptors."

19. On August 29, 2011Respondent submitted the Facility's annual ground water quality report pursuant to OAC Rule 3745-400-10(B) prepared by Civil & Environmental Consultants, Inc. (CEC) [hereinafter "the CEC Report"]. The CEC Report contains the following certification in relevant part: "This document has been prepared under the direction of a 'Qualified Groundwater Scientist' (as signed below) who meets the required qualifications as described in paragraph (GG) of rule 3745-400-01 of the Administrative Code."

20. The CEC Report submitted by Respondent stated:

    a. "If the sample exceeds the prediction limit, then a SSI has occurred....one parametric prediction limit was exceeded during the 2011 groundwater sampling event, magnesium in downgradient well W-1."

    b. "The non-parametric prediction limit simply compares each individual downgradient concentration, to the maximum concentration in the background dataset for the individual parameter. If the compliance sample result exceeds the maximum background concentration (ie., the non-parametric prediction limit) then

a SSI has occurred...non-parametric limits were exceeded for parameters sodium, ammonia, potassium, and sulfate at compliance well W-1."

21. Based upon existing data between 1998 and 2010, on October 19, 2011, an Ohio EPA, Division of Drinking and Ground Waters ("DDAGW") qualified ground water scientist finalized the "Report of Preliminary Hydrogeologic Investigation of E-Town C&DD Facility," a ground water quality report (hereinafter "the Ohio EPA Hydrogeological Report" or "pHGI"), which includes Appendix E, Time Series Plots for Ground Water Parameters at MW #1, MW #2, MW #3 (bg), MW #4 (bg), and MW #5, and Appendix F, Statistical Evaluation Data sheets for the Facility.

22. As depicted in tables, diagrams and plots, and specifically in Appendix F, the Ohio EPA Hydrogeological Report concluded that ground water at upgradient well MW-3 is impacted by agricultural fertilizers, and ground water at upgradient well MW-4 is impacted by human sewage and agricultural fertilizers. These differing upgradient impacts have produced statistically significant spatial variability between the MW-3 and MW-4 data sets for monitoring parameters bicarbonate, calcium, chloride, magnesium, nitrate, pH, potassium, sodium and sulfate. Therefore, pooling of data from MW-3 and MW-4 for these parameters is statistically invalid. Because of the different impacts and the resulting variability, the ground water monitoring system at the Facility should be divided into east and west "corridors" where MW-4 is the interwell background well for MW-1, and MW-3 is the interwell background well for MW-2 and MW-5.

23. As depicted in tables, diagrams and plots, and specifically in Appendix E and Appendix F, the Ohio EPA Hydrogeological Report indicates statistically significant increases ("SSI") over background during one or more detection monitoring events between 2006-2010, for the following debris-derived constituents at the following downgradient monitoring wells:

    a. MW-1: ammonia, bicarbonate, calcium, chloride, magnesium, manganese, potassium, sodium, and sulfate.

    b. MW-2: bicarbonate, calcium, chloride, iron, magnesium, manganese, potassium, sodium, and sulfate.

    c. MW-5: bicarbonate, chloride, magnesium, potassium, sodium, and sulfate.

24. The Ohio EPA Hydrogeological Report concluded statistically significant increasing trends over the period 2006-2010 at MW-1, for the following debris-derived constituents: ammonia, bicarbonate, calcium, chloride, magnesium, manganese, potassium, sodium, and sulfate.

25. Additionally, the Ohio EPA Hydrogeological Report concluded the slopes of the increasing trends for chloride and sodium results at MW-1 are significantly steeper

than the slopes of the increasing trends for chloride and sodium in upgradient well MW-4.

26. The Ohio EPA Hydrogeological Report concluded that results from evaluation of redox parameters confirm a significant source of organic carbon and nitrogen is being released to ground water near MW-1, with C&DD leachate being a probable source. The release of organic carbon and nitrogen began as early as 2005, continuing presently, and has altered ground water quality from being oxic to a moderately reducing state, now indicating a manganese (IV)-reducing condition, as evidenced in an increasing trend of manganese concentrations at MW-1.

27. At least two public water supply wells and seven private water supply wells are located less than one thousand (1,000) feet downgradient of the Facility. These water supply wells (public and private) are within the calculated one-year advective travel time for ground water migration from the Facility.

28. The Ohio EPA Hydrogeological Report concluded that several public and private wells are located downgradient of MW-1, and that data also indicate that the advective travel time for non-diluted contaminants at MW-1 to reach those public and private wells would be as little as 86 days.

29. HCGHD/HCPH collected a leachate sample from a March 2008 leachate outbreak. On April 7, 2008, Test America Dayton submitted an analytical report to the HCGHD/HCPH on leachate samples taken on March 25, 2008 from a leachate outbreak occurring within the Facility's limits of debris placement. Laboratory results from that March 2008 sample included detections of several Volatile Organic Compounds ("VOCs"), including acetone, methyl-ethyl-ketone, and toluene, as well as several metals detected above maximum contaminant levels (MCLs), including arsenic, antimony, and lead. The Ohio EPA Hydrogeological Report included the referenced analytical report in Appendix B, and identified the location of the March 25, 2008 Leachate Outbreak in Figure 2.

30. The Ohio EPA Hydrogeological Report concluded "statistical evaluation results and redox data evaluation results both indicate that the Facility is impacting ground water quality downgradient of the limits of debris."

31. HCGHD/HCPH stated in its January 3, 2012 license summary: "During the 2011 sampling event two secondary maximum contaminant levels (SMCL) were exceeded and a health advisory level was exceeded in one well, as follows:

    a. The SMCL for iron (0.3 mg/L) was exceeded in down-gradient well MW-5 and in up-gradient well MW-4;

b. The SMCL for manganese (0.05 mg/L) was exceeded in down-gradient monitoring wells MW-1, MW-2 and MW-5 and in up-gradient well MW-4; and,

c. The lower health advisory for sodium (30 mg/L) was exceeded in down-gradient monitoring well MW-1."

32. Based upon the ground water quality report submitted by an Ohio EPA, DDAGW qualified ground water scientist as identified in Finding numbers 21- 30, and having considered all of the above findings, pursuant to OAC Rule 3745-400-10(D), the Director has determined that the Facility may be affecting ground water quality and may order the owner or operator to conduct a ground water assessment pursuant to OAC Rule 3745-400-10(E) to determine the concentration of possible contaminants, and their extent and rate of migration within the ground water.

33. OAC Rule 3745-400-10(E) provides in part: "Ground water assessment plan and implementation. The ground water assessment shall include the submittal and implementation of a ground water assessment plan prepared by a qualified ground water scientist to the licensing authority or as required by the orders issued by the licensing authority or director. (1) The ground water assessment plan shall include the following sampling and analysis: (a) Sampling of the affected well(s) and background well(s) and analysis of those samples for all leachate or leachate-derived constituents including those constituents listed in the appendix of this rule."

34. Ohio EPA received a document dated August 27, 2012 from Respondent titled "*Ground-Water Quality Assessment Plan*" prepared for E-Town Landfill, Inc. by Eagon & Associates, Inc. DDAGW reviewed the plan for compliance with OAC Rule 3745-400-10. In correspondence dated October 12, 2012 Ohio EPA notified Respondent E-Town Landfill, Inc., the owner or operator ["O/O"] of inaccuracies, misleading terms and deficiencies, including the following:

a. Deficiency 1. "Rule 3745-400-10(E)(1) requires the Ground Water Assessment Plan to include provisions for sampling and analysis of the affected wells, background wells and all monitoring wells."

"'The Plan is deficient in that it does not include provisions for sampling the 'affected wells' (currently W-1, W-2 and W-5) and the 'background wells' (currently W-3 and W-4) and 'all monitoring wells' for 'those constituents listed in the appendix' in accordance with OAC 3745-400-10(E)(1).

The O/O must include provisions in the Plan for sampling of affected wells W-1, W-2 and W-5 and analysis for constituents found in the appendix to OAC 3745-400-10 prior to the sampling required by OAC 3745-400-10(E)(1)(b) or OAC 3745-400-10(E)(1)(c), and must include provisions for annual sampling and analysis for 'all monitoring wells' (assessment and detection wells) annually.

Furthermore, any newly-installed assessment wells are considered 'affected wells.' Therefore, the Plan should include a schedule for an initial sampling and analysis event similar to the provisions for sampling proposed wells W-2S and W-5S for any future assessment wells installed at the facility to conform to OAC 3745-400-10(E)(1)(a)."

b. Deficiency 2. "Rule 3745-400-10(E)(2)(a) requires the Ground Water Assessment Plan to include a summary of the hydrogeologic conditions at the facility."

"The O/O has presented undocumented assertions regarding hydrogeologic conditions at the facility which in turn has led to deficient conclusions regarding the hydrogeologic conditions and deficient assessment plan language, as detailed in Deficiency 3 below. Section 2.2, page 2-4, last paragraph of the Plan states that 'significant downward flow is anticipated' at the facility, but then describes 'downward flow' as *fact* in the very next sentence: 'because there is a downward component to ground-water flow in this area...,' and in Section 3.1, page 3-2: 'as shown on Figure 4, the primary ground-water flow direction is downward in this area.'

In order to summarize the hydrogeologic conditions as 'downward flow' the O/O is obligated to include documentation within the Plan demonstrating that ground water flow is vertical rather than following the natural gradient of the land surface towards the river. There is no site-specific data in the Plan in the form of ground water elevations from clustered/nested wells from the facility presented supporting the assertion that there is a 'downward flow' beneath the facility.

Therefore, the O/O must remove all language and illustrations in the Plan discussing 'downward flow' until site-specific ground water elevation data from clustered/nested wells at the facility are provided in the Plan demonstrating such 'downward flow.'"

c. Deficiency 3. "Rules 3745-400-10(E)(2)(c)(i) and 3745-400-10(E)(4) require the O/O to create a ground water assessment plan that includes 'a detailed description of the investigatory approach to be followed during the assessment,' including the 'proposed number, location, depth, installation method, and construction of additional monitoring wells for assessment purposes' such that the O/O can 'make a determination of the concentration of any contaminants, and their extent and rate of migration within the ground water' by following the Plan."

"The Plan is deficient for the purposes of determining the concentration of any contaminants, and their extent and rate of migration within the ground water in that it does not propose a shallower, clustered assessment well at the W-1 location. Section 4.1, page 4-1 of the Plan lists only two proposed assessment

wells as planned for the assessment (a shallower, clustered well adjacent to W-2 and a shallower, clustered well adjacent to W-5), but not a shallower, clustered well adjacent to W-1.

Hamilton County Public Health records report that leachate from a March 2008 leachate outbreak upgradient of W-1 contained high concentrations of several hazardous organic constituents, such as acetone [292 micrograms per liter (µg/L)], methyl-ethyl-ketone (156 µg/L) and toluene (24.7 µg/L), and several hazardous metals/metalloids above maximum contaminant levels (MCLs) including arsenic (28.2 µg/L), antimony (10.3 µg/L) and lead (71.2 µg/L).

As described in the Ohio EPA Preliminary Hydrogeologic Investigation Report (pHGI) for the Facility, data indicate that leachate from the facility is impacting ground water quality at W-1 and that 'concentrations of elevated parameters and arsenic in ground water *above* the MW-1 screened interval may be even higher and/or contain additional constituents' as compared to what the current screened section at W-1 can capture.

Furthermore, as described in the pHGI 'data indicate that several public and private water wells are located downgradient of MW-1' within a travel time of 'as little as 86 days.'

Provisions for installation of a shallower [5 or 10-foot screen intersecting the typical ground water table at approximately 461 feet above mean sea level (msl)], clustered well adjacent to W-1 must be included in the Plan in order to determine which C&DD-derived constituents have been released to ground water, and their rate and extent of migration and concentrations."

d. Deficiency 4. "Rules 3745-400-10(E)(2)(d) and 3745-400-10(E)(4) require the O/O to create a ground water assessment plan that includes 'a detailed description of the investigatory approach to be followed during the assessment,' including the 'detailed description of the techniques, procedures, and analytical equipment to be used for ground water sampling during the assessment' such that the O/O can 'make a determination of the concentration of any contaminants, and their extent and rate of migration within the ground water' by following the Plan."

"The descriptions in the Plan of the ground water sampling techniques and procedures to be followed are deficient for the purposes of determining the concentration of any contaminants, and their extent and rate of migration within the ground water in that they do not include dissolved oxygen (DO) and oxidation-reduction potential (ORP) as well purging and sampling parameters. Section 5, pages 5-5, 5-6 and 5-9 of the Plan only list temperature, pH, specific conductance and turbidity as the well purging stabilization and/or field sampling parameters.

The pHGI states that 'redox parameters confirm that a significant source of organic carbon is also being released to ground water near MW-1. This release of organic carbon began as early as 2005 and changed ground water quality from being oxic to a moderately reducing state, now indicating a manganese (IV)-reducing condition,' and that the 'reducing condition in ground water at MW-1 and especially the progressively reducing condition at MW-1 increases the chances for arsenic and/or metals to become mobilized from the aquifer matrix.'

Given the correlation of changing redox conditions at W-1 with other evidence of a release of C&DD-derived constituents to ground water (e.g. statistically significant increases above background and increasing trends in at least nine ground water monitoring parameters at W-1), and the fact that DO and ORP are two of the best indicators of changing redox conditions in ground water, use of DO and ORP as purge stabilization and field sampling parameters is essential for determining which constituents have been released to ground water and their rate and extent of migration and their concentrations in ground water."

e. Deficiency 5. "Rules 3745-400-10(E)(2)(e)(i) and 3745-400-10(E)(4) require the O/O to create a ground water assessment plan that includes 'detailed description of the data evaluation procedures to be used' including 'planned use of statistical data evaluation' such that the O/O can 'make a determination of the concentration of any contaminants, and their extent and rate of migration within the ground water" by following the Plan.'"

The descriptions in the Plan of the data evaluation procedures to be used are deficient for the purposes of determining the concentration of any contaminants, and their extent and rate of migration within the ground water in that they propose the use of non-site specific data to supplement site-specific background data, which would lead to statistical limits and/or other such assessment standards that are unrepresentative of background ground water quality.

On pages 2-7, 2-8, 6-1 and 6-2 the O/O proposes to compare concentrations of various monitoring parameters from an Ohio EPA Ambient Monitoring Network well (and possibly other data from the Great Miami River basin aquifer and/or region) to concentrations detected at assessment wells at the facility. [...]

As documented in the 2004 Ohio EPA report "Nitrates in PWS Wells, Elizabethtown" and in the pHGI, the various anthropogenic impacts to ground water quality coming from upgradient and side-gradient sources (sewage, agriculture) are already well understood and documented. Additionally, as described in Section V(A)(4)(a) of the pHGI the impact of those anthropogenic sources on background ground water quality is already well-understood and characterized through division of facility background ground water quality into the sewage-impacted West Corridor (W-4) and the agriculture-impacted East Corridor (W-3).

But any such far-removed, regional data (as proposed in the Plan) would not be representative of the anthropogenic-sourced variability present at the facility and would yield artificially-inflated statistical limits, thereby leading to a mischaracterization of the constituents released and their rate and extent of migration and concentrations in the release to ground water.

If the O/O wishes to obtain additional data from new locations to attempt to further refine the background data sets of specific parameters, the O/O may propose installation and sampling of an additional background well(s) at the facility. But the O/O must remove language from the Plan regarding use of Ohio EPA Ambient Monitoring Network and other such regional data in regards to determining representative background concentrations for assessment."

f. Deficiency 6. "Rules 3745-400-10(E)(2)(e)(iv) and 3745-400-10(E)(4) require the O/O to create a ground water assessment plan that includes 'detailed description of the data evaluation procedures to be used' including 'criteria which will be utilized to determine if additional assessment activities are warranted' such that the O/O can 'make a determination of the concentration of any contaminants, and their extent and rate of migration within the ground water' by following the Plan."

"Use in Section 6.5, page 6-2 of the qualifying phrase 'consistent with the approach proposed by Ohio EPA in the draft 506 rules, the objective will be to define the area of highest concentration, but not to determine the extent of any minor fluctuation in concentrations' is not appropriate since: a) the draft 3745-506 rules are not effective ; b) the proposed phrase is a mischaracterization of the content of the draft OAC 3745-506 rules; and, c) the proposed phrase may also prevent the determination of the concentrations of any contaminants, and their extent and rate of migration within the ground water at the facility. Therefore, this phrase must be removed from the Plan.

While determination of the area of highest concentration is an important objective in the determination of the rate and extent of migration and concentrations in a release of contaminants to ground water, it is not the only objective. Furthermore, the term 'minor fluctuation in concentration' is overly broad and not subject to quantification as is inherent to an accurate determination of rate and extent of migration and concentrations of a release to ground water.

It should be noted that determination of rate and extent through use of extrapolation or interpolation of concentrations based on well-established concentration gradients may be appropriate in lieu of installation of additional extent wells in some instances (e.g. see Statement 4 below), but the determination of the rate and extent of migration is still necessary, albeit through extrapolation or interpolation.

The O/O must remove from the Plan the phrase 'consistent with the approach proposed by Ohio EPA in the draft 506 rules, the objective will be to define the area of highest concentration, but not to determine the extent of any minor fluctuation in concentrations'."

g. Deficiency 7. "Rules 3745-400-10(E)(2)(e) and 3745-400-10(E)(4) require the O/O to create a ground water assessment plan that includes 'detailed description of the data evaluation procedures to be used' including 'criteria which will be utilized to determine if additional assessment activities are warranted' such that the O/O can 'make a determination of the concentration of any contaminants, and their extent and rate of migration within the ground water' by following the Plan."

"The use in Section 6.5 of the bulleted phrase 'comparison of water-quality data to site background data and regional aquifer data' under 'criteria to determine if additional assessment wells are warranted' is deficient in that it is vague and is merely a re-statement of a data evaluation procedure described in Sections 6.1 and 6.2 rather than a 'criteria' for evaluating the results of a comparison of background to assessment well data. Also, this phrase includes the use of 'regional aquifer data,' which as described in Deficiency 5 above is inappropriate.

Consistent with the statistical testing language used in Sections 6.1 and 6.2 of the Plan, this phrase must be replaced with wording that requires detection of monitoring parameter concentrations (statistically) above background in assessment well(s) as a criteria for determining if additional assessment wells are warranted, the same or very similar to the following phrase:

'A ground water monitoring parameter detected in an assessment well(s) at concentrations that are above background concentrations as determined using the statistical procedures described in Sections 6.1 and 6.2 of this Plan.'"

h. Deficiency 8. "Rules 3745-400-10(E)(2)(e) and 3745-400-10(E)(4) require the O/O to create a ground water assessment plan that includes 'detailed description of the data evaluation procedures to be used' including 'criteria which will be utilized to determine if additional assessment activities are warranted' such that the O/O can 'make a determination of the concentration of any contaminants, and their extent and rate of migration within the ground water" by following the Plan.'"

"The use in Section 6.5 of the bulleted phrase 'previous land use in the area downgradient and the likelihood of confounding ground-water impacts (e.g. adjacent auto salvage operation and pre-1992 C&DD waste disposal)'under 'criteria to determine if additional assessment wells are warranted' is overly broad with no objective, evidential qualifications for this criterion. In its current

form, this broad criterion language could be used to preclude installation of assessment wells directly downgradient of a known release from the regulated unit without presenting any objective evidence that previous land use activities may be 'confounding' the determination of rate, extent and concentrations of the release from the regulated unit.

Given the evidence of impact to ground water at W-1 and the existence of public and private water supply wells less than a one-year travel time downgradient of W-1, any such criterion must have more finely-crafted language that requires ground water quality data demonstrating impact to ground water from an alternate source(s) to be presented as qualifications under this criterion. Therefore, this criterion in Section 6.5 must either be removed or replaced with language consistent with the following language:

> 'Ground water quality data and other data or information that indicate that previous land use in the area downgradient of the limits of C&DD (e.g. adjacent auto salvage operation and pre-1992 C&DD waste disposal) is causing impact to ground water and/or is co-mingling with a release of C&DD-derived constituents from the regulated unit to ground water and thus preventing an accurate, segregated evaluation of the release of C&DD-derived constituents from the regulated unit to ground water.'"

i. Deficiency 9. "Rules 3745-400-10(E)(2)(e) and 3745-400-10(E)(4) require the O/O to create a ground water assessment plan that includes 'detailed description of the data evaluation procedures to be used' including 'criteria which will be utilized to determine if additional assessment activities are warranted' such that the O/O can 'make a determination of the concentration of any contaminants, and their extent and rate of migration within the ground water' by following the Plan."

"The use in Section 6.5 of the bulleted phrase 'the lack of hazardous parameters or concentrations of parameters above a primary MCL may be used as evidence that additional assessment investigations are not needed' under 'criteria to determine if additional assessment wells are warranted' is not consistent with the requirement in OAC 3745-506(E)(4) to make a determination of the concentration of 'any contaminants, and their extent and rate of migration within the ground water.'

There is no provision in OAC 3745-506(E)(4) limiting this determination to only hazardous contaminants or hazardous contaminants above a maximum contaminant level established for drinking water. This rule specifically requires the determination to include 'any contaminants.' Therefore, this phrase must be removed from the Plan."

j. Deficiency 10. "Rules 3745-400-10(E)(2)(e) and 3745-400-10(E)(4) require the O/O to create a ground water assessment plan that includes 'detailed description of the data evaluation procedures to be used' including 'criteria which will be utilized to determine if additional assessment activities are warranted' such that the O/O can 'make a determination of the concentration of any contaminants, and their extent and rate of migration within the ground water' by following the Plan."

"The use in Section 6.5 of the bulleted phrase 'results of sampling from the existing E-town Landfill water supply well' under 'criteria to determine if additional assessment wells are warranted' is deficient in that it is overly broad and no supporting data or information about the well was provided in the Plan.

No information (other than the implication that it is located at the facility) was provided in the Plan regarding the water supply well construction (e.g. screened interval, pump depth, total depth, diameter, sand pack, grouting, date of installation, etc.) and no details were provided regarding how 'results of sampling' from the well might be used as a criterion for determining if additional wells might be necessary. Therefore, this criterion must be removed from the Plan."

k. DDAGW identified statements regarding provisions throughout the Plan that contain inaccuracies or misleading terms that would likely lead to problems in the implementation of the ground water assessment program as specifically noted in the correspondence from Ohio EPA to Respondent dated October 12, 2012.

35. Ohio EPA received a document dated October 26, 2012 from Respondent titled "*Ground-Water Quality Assessment Plan, Revision 1*" prepared for E-Town Landfill, Inc. by Eagon & Associates, Inc. Ohio EPA reviewed the plan for compliance with OAC Rule 3745-400-10. The plan contains ambiguous terms, inaccurate statements, and is deficient, including the following deficiencies as noted:

a. Deficiency. Rules 3745-400-10(E)(2)(c)(i) and 3745-400-10(E)(4) require the Owner or Operator ("O/O") to create a ground water assessment plan that includes "a detailed description of the investigatory approach to be followed during the assessment," including the "proposed number, location, depth, installation method, and construction of additional monitoring wells for assessment purposes" such that the O/O can "make a determination of the concentration of any contaminants, and their extent and rate of migration within the ground water" by following the Plan.

The "*Ground-Water Quality Assessment Plan, Revision 1*" is deficient for the purposes of determining the concentration of any contaminants, and their extent and rate of migration within the ground water in that the Plan does not propose

unconditional installation of a shallower, clustered assessment well at the MW-1 location. Instead, Section 4.1, pages 4-1 and 4-2 of the Plan condition the potential installation of a shallower, clustered well at the MW-1 location as follows: "once wells W-2S and W-5S have been installed and developed, the vertical ground-water gradient will be determined based on ground-water level measurements. If there is a downward component to ground-water flow, the need for a shallow well at W-1 will be evaluated with a flow net. If there is not a downward component of flow at W-2S and W-5S or a very weak component, an additional well will be installed at W-1S." This conditional language is deficient for the following reasons:

i. As described in the Ohio EPA Preliminary Hydrogeologic Investigation Report (pHGI) for the Facility, data indicate that leachate from the facility is impacting ground water quality at MW-1 and that "concentrations of elevated parameters and arsenic in ground water above the MW-1 screened interval may be even higher and/or contain additional constituents" as compared to what the current screened section at MW-1 can capture. Additionally, results from a 2008 leachate outbreak upgradient of MW-1 contained high concentrations of several hazardous organic constituents, such as acetone [292 micrograms per liter (µg/L)], methyl-ethyl-ketone (156 µg/L) and toluene (24.7 µg/L), and several hazardous metals/metalloids above maximum contaminant levels (MCLs) including arsenic (28.2 µg/L), antimony (10.3 µg/L) and lead (71.2 µg/L).

ii. OAC 3745-400-10(E)(4) requires a "determination of the concentration of any contaminants, and their extent and rate of migration within the ground water." The "extent" includes not only the areal extent but also the vertical extent of contaminants in ground water. Given the contaminants already detected in the screened section at MW-1, the high potential for higher concentrations and/or presence of additional contaminants in ground water overlying the screened section of MW-1, ground water quality above the current screened section at MW-1 location must be evaluated in order to make an accurate and thorough "determination of the concentration of any contaminants, and their extent and rate of migration within the ground water."

iii. Evaluation of downward flow at the MW-2 and MW-5 locations as proposed in Section 4.1 of the Plan would not conclusively establish whether or not downward flow exists at the MW-1 location, nor would it be able to *quantify* downward flow at the MW-1 location, both of which are necessary to evaluate whether or not downward flow exists at MW-1 and if the vertical location of the screened section at MW-1 is adequate to capture all of the contaminants and the highest concentrations of contaminants at the MW-1 location.

iv. As described in the pHGI "data indicate that several public and private water wells are located downgradient of MW-1" within a travel time of "as little as 86 days." Thus the potential for contaminants to impact public and private wells exists.

v. It is necessary to install an additional assessment well(s) aerially downgradient of the MW-1 location to determine the areal extent and rate of migration of contaminants in ground water downgradient of the MW-1 location (especially between MW-1 and the Rosewood Mobile Home Park/Smitty's Bar public water supply wells located southwest of MW-1). The well screen of such an assessment well located aerially downgradient of MW-1 must be placed at the vertical interval most likely to intercept contaminants migrating in ground water downgradient of the MW-1 location.

To determine the vertical interval most likely to intercept contaminants migrating in ground water downgradient of the MW-1 location, a vertical profile, including concentration gradients of contaminants at the MW-1 location must first be determined. To determine the vertical profile of contaminants, it will be necessary to install a clustered assessment well(s) at the MW-1 location at a different vertical interval(s) than the existing screen at MW-1.

Given that "concentrations of elevated parameters and arsenic in ground water above the MW-1 screened interval may be even higher and/or contain additional constituents," as described in the pHGI, installation of a shallower, clustered well at the MW-1 location is necessary to obtain the data to determine the vertical profile of contaminants at the MW-1 location, and thereby allow the proper placement of the well screen of the additional assessment well(s) downgradient of the MW-1 location.

Therefore, Respondent must initially and unconditionally install and sample a shallower [5 or 10-foot screen intersecting the typical ground water table at approximately 461 feet above mean sea level (msl)], clustered well, W-1S, adjacent to MW-1 to "make a determination of the concentration of any contaminants, and their extent and rate of migration within the ground water."

b. Deficiency. Rules 3745-400-10(E)(2)(d) and 3745-400-10(E)(4) require the O/O to create a ground water assessment plan that includes "a detailed description of the investigatory approach to be followed during the assessment," including the "detailed description of the techniques, procedures, and analytical equipment to be used for ground water sampling during the assessment" such that the O/O can "make a determination of the concentration of any contaminants, and their extent and rate of migration within the ground water" by following the Plan.

Section 5.2.2.2 of Respondent's Plan provides: "Samples will be collected immediately after purging is complete at each well. Turbidity, dissolved oxygen, and redox, in addition to depth to water, temperature, pH, and specific conductance, will be measured at the end of purging." The descriptions in the Plan of the ground water sampling techniques and procedures to be followed are deficient for the purposes of determining the concentration of any contaminants, in that they do not include provisions for use of dissolved oxygen (DO) and oxidation-reduction potential (ORP) as well stabilization parameters or criteria to determine when purging has been completed in Section 5.2.2.2 of the Plan.

The pHGI states that "redox parameters confirm that a significant source of organic carbon is also being released to ground water near MW-1. This release of organic carbon began as early as 2005 and changed ground water quality from being oxic to a moderately reducing state, now indicating a manganese (IV)-reducing condition," and that the "reducing condition in ground water at MW-1 and especially the progressively reducing condition at MW-1 increases the chances for arsenic and/or metals to become mobilized from the aquifer matrix."

Given the evidence of changing redox conditions caused by a release of contaminants at W-1 and potentially other locations at the facility, DO and ORP would be the two best indicators of changing redox conditions in ground water and thus the best indicators of whether contaminated ground water is entering the well screen at MW-1 during purging. Furthermore, use of DO and ORP as only sampling parameters would not be good field quality assurance practice in that this practice would yield a single result per sampling event and thus not allow a progression of results for comparison to the final sample result. And given the lack of previous DO and ORP ground water data from wells at the facility this could render the single sample result meaningless.

Therefore, Respondent must utilize DO and ORP as well purging stabilization parameters. Additionally, in accordance with OAC Rule 3745-400-10(E)(2)(e) Respondent must evaluate the DO and ORP data, and use the results of this evaluation in determining the concentrations of contaminants and their rate and extent of migration in ground water.

c. Deficiency. Rules 3745-400-10(E)(2)(e) and 3745-400-10(E)(4) require the O/O to create a ground water assessment plan that includes "detailed description of the data evaluation procedures to be used" such that the O/O can "make a determination of the concentration of any contaminants, and their extent and rate of migration within the ground water" by following the Plan.

The following language in the document dated October 26, 2012 from Respondent titled "*Ground-Water Quality Assessment Plan, Revision 1*," Section 6.1 is deficient: "In addition to the statistical analysis conducted for comparison to upgradient well data, background data for the Great Miami River basin aquifer

will be compiled from available sources (e.g., Ohio EPA Ambient Ground Water Quality Database, Miami Conservancy District, Hamilton County Health Department, and other data that may be identified). These data will also be considered in the evaluation of the available background data to determine if the possible natural spatial variability is represented. The existing upgradient ground-water quality data is limited because Ohio EPA determined the upgradient data should not be pooled due to anthropogenic effects and spatial variability; therefore, only one upgradient well is used in the statistical analysis of each individual well. However, for upgradient well W-3 the anthropogenic effects are limited to those associated with agricultural land use. This effect is therefore limited to increased nitrate-nitrite. Consideration of other available data is appropriate when evaluating the rate, extent, and concentration of non-hazardous common water-quality parameters that typically have a wide potential range of concentrations in order to determine if the parameters detected above background are 'contaminants.'"

Use of such regional data as indicated in the Plan is both unnecessary and counterproductive for accurately determining the rate and extent of migration and concentrations of contaminants in ground water from the Facility.

As documented in the 2004 Ohio EPA report "Nitrates in PWS Wells, Elizabethtown" and in the pHGI, the various anthropogenic impacts to ground water quality coming from upgradient and side-gradient sources (sewage, agriculture) are already well understood and documented. Additionally, as described in Section V(A)(4)(a) of the pHGI the impact of those anthropogenic sources on background ground water quality is already well-understood and characterized through division of facility background ground water quality into the sewage-impacted West Corridor (W-4) and the agriculture-impacted East Corridor (W-3). But any such far-removed, regional data (as proposed in the Plan) would not be representative of the anthropogenic-sourced variability present at the facility and would yield artificially-inflated assessment standards for comparison to assessment well concentrations, thereby leading to a mischaracterization of the contaminants released and their rate and extent of migration and concentrations in ground water.

Additionally, the Respondent is not limited to using the existing background wells MW-3 and MW-4 to determine representative background at the facility, since Respondent may install and sample an additional background well(s) at other upgradient locations at the Facility, if the Respondent wishes to obtain additional background data.

Respondent must not utilize or rely upon regional ground water quality data as indicated in the Plan, including regional data from the Ohio EPA Ambient Monitoring Network/Ground Water Quality Database, the Miami Conservancy District, the Hamilton County Health Department or "other data that may be

identified" as referenced in Section 6.1, Paragraph 2 of the Plan in regards to determining representative background concentrations for assessment or for determining assessment standards for comparison to assessment well concentrations.

d. Deficiency. Rules 3745-400-10(E)(2)(e) and 3745-400-10(E)(4) require the O/O to create a ground water assessment plan that includes "detailed description of the data evaluation procedures to be used" including "criteria which will be utilized to determine if additional assessment activities are warranted" such that the O/O can "make a determination of the concentration of any contaminants, and their extent and rate of migration within the ground water' by following the Plan."

The following language in the document dated October 26, 2012 from Respondent titled "*Ground-Water Quality Assessment Plan, Revision 1*" Section 6.5, bulleted phrase is deficient: "For common non-hazardous water-quality parameters, the site background data will be compared to the available local and regional aquifer data to confirm that it is representative. This information will be used to evaluate the possibility that parameters determined to be above background are not in fact 'contaminants.'" Use of such "regional aquifer data" (regional data) is both unnecessary and counterproductive for accurately determining the rate and extent of migration and concentrations of contaminants in ground water from the Facility.

As documented in the 2004 Ohio EPA report "Nitrates in PWS Wells, Elizabethtown" and in the pHGI, the various anthropogenic impacts to ground water quality coming from upgradient and side-gradient sources (sewage, agriculture) are already well understood and documented. Additionally, as described in Section V(A)(4)(a) of the pHGI the impact of those anthropogenic sources on background ground water quality is already well-understood and characterized through division of facility background ground water quality into the sewage-impacted West Corridor (W-4) and the agriculture-impacted East Corridor (W-3). But any such far-removed, regional data (as proposed in the Plan) would not be representative of the anthropogenic-sourced variability present at the facility and would yield artificially-inflated standards for comparison to assessment well concentrations, thereby leading to a mischaracterization of the contaminants released and their rate and extent of migration and concentrations in ground water.

Respondent may install and sample an additional background well(s) at other upgradient locations at the Facility, if the Respondent wishes to obtain additional background data to attempt to further refine the background data sets of specific parameters. Respondent must not use or rely upon "regional aquifer data" or "regional data" as indicated in the Plan as a criteria for determining if additional assessment wells are warranted.

ORC Section 6111.03(H) Findings

36. ORC Section 6111.03(H) authorizes the director of Ohio EPA to "issue, modify, or revoke orders to prevent, control or abate water pollution by such means as the following: (1) prohibiting or abating discharges of sewage, industrial waste, or other waste into waters of the state."

37. Respondent is a person pursuant to ORC Section 6111.01(I) which defines a "Person" to include "the state, any municipal corporation, any other political subdivision of the state, any person as defined in section 1.59 of the Revised Code, any interstate body created by compact, or the federal government or any department, agency, or instrumentality thereof."

38. Pursuant to ORC Section 6111.01(D), "'Other wastes' means garbage, refuse, decayed wood, sawdust, shavings, bark, and other wood debris, lime, sand, ashes, offal, night soil, oil, tar, coal dust, dredged or fill material, or silt, other substances that are not sewage, sludge, sludge materials, or industrial waste, and any other 'pollutants' or 'toxic pollutants' as defined in the Federal Water Pollution Control Act that are not sewage, sludge, sludge materials, or industrial waste."

39. The construction and demolition debris-derived constituents from the Facility constitute "other wastes" as defined by ORC Section 6111.01(D).

40. Pursuant to ORC Section 6111.01(H) "'Waters of the state' means all streams, lakes, ponds, marshes, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and other bodies or accumulations of water, surface and underground, natural or artificial, regardless of the depth of the strata in which underground water is located, that are situated wholly or partly within, or border upon, this state, or are within its jurisdiction, except those private waters that do not combine or effect a junction with natural surface or underground waters."

41. The ground water with which the Ohio EPA Director is concerned in these Orders falls within the definition of "waters of the state" as defined by ORC Section 6111.01(H).

42. Based upon the Ohio EPA Hydrogeological Report as identified in Finding numbers 21- 30 and having considered all of the above findings, the Director has determined that there is an indication of a release of construction and demolition debris-derived constituents downgradient of the limits of debris placement.

43. Pursuant to ORC Section 6111.03(O) "the director of environmental protection may exercise all incidental powers necessary to carry out the purposes of this chapter."

44. The Director has determined that to protect the waters of the state pursuant to ORC Section 6111.03(H)(1) a ground water assessment order to determine the

concentration of possible contaminants, and their extent and rate of migration within the ground water is a necessary step to prohibit or abate discharges of debris-derived constituents from the Facility into ground waters as identified in Finding Number 42.

45. The Director has given consideration to, and based his determination on, evidence relating to the technical feasibility and economic reasonableness of complying with these Orders and to evidence relating to conditions calculated to result from compliance with these Orders, and its relation to the benefits to the people of the State to be derived from such compliance in accomplishing the purposes of ORC Chapter 6111.

V. ORDERS

Pursuant to OAC Rule 3745-400-10(D),and in accordance with Chapters 3714. and 6111. of the Ohio Revised Code, the Director hereby issues the following Orders:

1. Not later than seven hundred thirty (730) days after the effective date of these Orders, Respondent shall make a determination of the concentration of any contaminants in ground water released from the Facility and their extent and rate of migration within the ground water.

Implementation of Ground Water Quality Assessment Plan

2. Upon the effective date of these Orders, Respondent shall implement the Ground Water Assessment Plan, attached hereto and incorporated herein as Attachment 1, submitted by Respondent on October 26, 2012 titled "*Ground-Water Quality Assessment Plan, Revision 1*" ["the Plan"] with the following conditions:

   a. Not later than forty-five (45) days after the effective date of these Orders, Respondent shall install three ground water monitoring wells:

      - W-2S, in accordance with the Plan, and
      - W-5S, in accordance with the Plan, and
      - W-1S, a shallower well adjacent to MW-1 with a 5 or 10-foot screen intersecting the typical ground water table at approximately 461 feet above mean sea level (msl).

   b. Not later than ninety (90) days after the effective date of these Orders, Respondent shall commence sampling of the background wells, MW-3 and MW-4, and the assessment wells MW-1, MW-2, MW-5, W-1S, W-2S and W-5S, and shall analyze the samples for all the parameters listed in the appendix of OAC Rule 3745-400-10, attached hereto and incorporated herein as Attachment 2, and other applicable requirements. Thereafter, Respondent shall sample, at

least annually, all background and assessment wells, and shall analyze the samples for all the parameters listed in the appendix of OAC Rule 3745-400-10 and other applicable requirements.

c. Respondent shall collect dissolved oxygen (DO) and oxidation-reduction potential (ORP) as well purging stabilization parameters and as field sampling parameters at all background wells and assessment wells. Respondent shall evaluate and use DO and ORP data in determining the rate and extent of migration of a release of contaminants to ground water.

d. Respondent shall notify Ohio EPA at least fifteen (15) days in advance of each sampling event conducted under these Orders and the Plan, and provide Ohio EPA the opportunity to collect split samples during each sampling event.

e. Respondent shall not utilize regional ground water quality data in the evaluation of representative background ground water quality at the Facility as described in Section 6.1, Paragraph 2 of the Plan. Regional ground water quality data from the Ohio EPA Ambient Monitoring Network/Ground Water Quality Database, the Miami Conservancy District, and the Hamilton County Health Department, as referenced in Section 6.1, Paragraph 2 of the Plan, shall not be considered in the evaluation of representative background ground water quality at the Facility, including determining "if the possible natural spatial variability is represented" at the Facility.

f. Not later than one hundred twenty days (120) after sampling any well as required under OAC Rule 3745-400-10(E), this Order or the Plan, Respondent shall submit to Ohio EPA all data, including laboratory analytical data, and results of evaluation of the ground water quality data in accordance with Section 6 of the Plan and this Order.

g. Not later than one hundred twenty days (120) after collecting the first sample from monitoring wells MW-1, MW-2, MW-3, MW-4, MW-5, W-1S, W-2S and W-5S as required under this Order and the Plan, Respondent shall install and commence sampling one or more ground water monitoring well(s) to be located between monitoring well cluster MW-1/W-1S and the public water supply wells at Smitty's Lounge/ parcel number 630-0300-0173-00 and Redwood Mobile Home Park/ parcel number 630-0300-0052-00 to determine the rate and extent of migration and concentrations of contaminants in ground water downgradient of monitoring well cluster MW-1/W-1S, and shall sample at least annually thereafter. The monitoring well(s) installed pursuant to this Order shall have a screened section that does not exceed ten (10) feet in length and shall be installed at the interval most likely to intercept a release of contaminants to ground water based on sampling results from clustered monitoring wells MW-1/W-1S. Respondent shall analyze the samples for all the parameters listed in the appendix of OAC Rule 3745-400-10, attached hereto and incorporated

herein as Attachment 2, and other applicable requirements.

h. Respondent shall utilize the criteria in Section 6.5 of the Plan to determine whether additional assessment activities are warranted, except that Respondent shall not utilize as criteria to determine whether additional assessment activities are warranted the following: "regional aquifer data" as described in Section 6.5 of the Plan. Respondent may install and sample an additional background well(s) at other upgradient locations at the Facility, if the Respondent seeks to utilize additional background data to attempt to further refine the background data sets of specific parameters.

i. To the extent that any condition specified in this Order conflicts with a provision in the Plan, which is the Ground Water Quality Assessment Plan submitted by Respondent on October 26, 2012, and which is attached hereto as Attachment 1, this Order shall control.

Ground Water Assessment Report.

3. Not later than fifteen (15) days after making the determination required by Order number 1, Respondent shall submit to Ohio EPA a written ground water assessment report ["Assessment Report"] prepared by a qualified ground water scientist containing an assessment of the ground water quality including all data generated as part of the implementation of the Ground Water Assessment Plan.

4. If the Assessment Report confirms an indication of a release of contaminants to the ground water from the Facility, then the Respondent shall submit to the Director of Ohio EPA with the final Assessment Report a detailed analysis of potential options to continue monitoring or remediate the source of any ground water contamination.

5. If a qualified ground water scientist certifies that the Facility has not impacted the quality of ground water beneath the facility, then the owner or operator may resume monitoring in accordance with paragraph OAC Rule 3745-400-10(B) unless ordered otherwise by the licensing authority or director.

6. All documents submitted to Ohio EPA under these Orders shall contain the notarized signature of a qualified ground water scientist and shall contain the following statement:

"I certify that I am a qualified ground water scientist as defined in rule 3745-400-01 of the Administrative Code, and that I have prepared the information submitted in this document, and that to the best of my knowledge the information is true, accurate, and complete."

VI. TERMINATION

Respondent's obligations under these Orders shall terminate when Respondent demonstrates to the satisfaction of Ohio EPA that Respondent has performed all obligations under these Orders, and the Chief of the Division of Materials and Waste Management acknowledges, in writing, the termination of these Orders. If Ohio EPA does not agree that all obligations have been performed, then Ohio EPA will notify Respondent, in writing, of the obligations that have not been performed, in which case Respondent shall have an opportunity to address any such deficiencies and seek termination as described above.

The certification shall contain the following attestation: "I certify that the information contained in or accompanying this certification is true, accurate and complete."

This certification shall be submitted by Respondent to Ohio EPA and shall be signed by a responsible official of Respondent. For purposes of these Orders, a responsible official is a principal executive officer of at least the level of vice president or his duly authorized representative, if such a representative is responsible for the overall operation of the Facility.

VII. OTHER APPLICABLE LAWS

All actions required to be taken pursuant to these Orders shall be undertaken in accordance with the requirements of all applicable local, state, and federal laws and regulations. These Orders do not waive or compromise the applicability and enforcement of any other statutes or regulations applicable to Respondent or the Facility.

VIII. NOTICE

All documents required to be submitted by Respondent pursuant to these Orders shall be addressed to:

Ohio Environmental Protection Agency
c/o Central Office
Division of Materials and Waste Management
Attn: Joe Goicochea
50 West Town Street, Suite 700
Columbus, Ohio 43215

IX. RESERVATION OF RIGHTS

Nothing contained herein shall be construed to prevent Ohio EPA from seeking legal or equitable relief to enforce the terms of these Orders or from taking other administrative, legal or equitable action as deemed appropriate and necessary, including seeking penalties against Respondent for noncompliance with these Orders.

Ohio EPA reserves the right to take any action and pursue any claim against Respondent, and any other potentially liable parties, including but not limited to, any administrative, civil, or criminal enforcement action or claim, pursuant to any available legal authority as a result of past, present, or future violations of state or federal laws or regulations, as a result of the common law, or as a result of events or conditions arising from or related to the Facility. Ohio EPA expressly reserves the right to take any action and pursue any claim against Respondent or other liable parties with respect to any additional assessment or corrective actions necessary to abate or address the impacts to ground water associated with the Facility under ORC Chapter 3714., to perform additional activities pursuant to ORC Chapters 3714., 3734., 6111., or any other applicable law in the future, and to recover response costs incurred by the State of Ohio and/or recover natural resource damages under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 ("CERCLA"), as amended, 42 U.S.C. 9601 et. seq..

Nothing herein shall restrict the right of Respondent to raise any administrative, legal or equitable claim or defense with respect to such further actions which Ohio EPA may seek to require of Respondent. Nothing in these Orders shall be construed to limit the authority of Ohio EPA to seek relief for violations not addressed in these Orders.

X. EFFECTIVE DATE

The effective date of the Orders is the date these Orders are entered into the Ohio EPA Director's Journal.

IT IS SO ORDERED:

Ohio Environmental Protection Agency

Scott J. Nally, Director

GROUND-WATER QUALITY ASSESSMENT PLAN

E-TOWN LANDFILL

Hamilton County, Ohio

Prepared for:

E-Town Landfill, Inc.

Prepared by:

EAGON & ASSOCIATES, INC.
Worthington, Ohio

Revision 1
October 2012

ATTACHMENT 1

EAGON & ASSOCIATES, INC.
100 Old Wilson Bridge Road, Suite 115
Worthington, Ohio 43085
(614) 888-5760

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

GROUND-WATER QUALITY ASSESSMENT PLAN
E-TOWN LANDFILL

1.0 INTRODUCTION

1.1 Purpose

This Ground-Water Quality Assessment Plan has been prepared in accordance with OAC 3745-400-10(E)(4) in order to document the methods and procedures that will be used to evaluate the concentration, rate, and extent of water-quality parameters detected above background in downgradient wells at the E-Town Landfill. The plan outlines the investigatory approach that will be utilized in an effort to evaluate the concentration, rate, and extent of migration of presumed waste derived constituents.

The procedures in this Ground-Water Quality Assessment Plan will be followed unless circumstances arise where alternate procedures may be necessary. Any alternate procedure utilized will continue to ensure that representative samples are collected. If alternate procedures are followed, the deviation from this plan will be documented and justified in the data report.

1.2 Introduction

This assessment plan has been prepared in response to Ohio EPA concerns regarding the ground-water quality conditions at the E-Town Landfill in Elizabethtown, Ohio. The Ohio EPA conducted a hydrogeological investigation of the E-Town Landfill and Recycling, Inc. construction and demolition debris (C&DD) landfill facility (the facility) in the late summer and fall of 2011. The Ohio EPA investigation was documented in an October 2011 report titled "Report of Preliminary Hydrogeologic Investigation, E-Town C&DD Facility" and is included in Appendix C. The conclusion of the Ohio EPA report was that statistical analysis of the three downgradient wells indicated a possible waste-derived impact, and that all three downgradient wells were screened too far below the water table to effectively monitor shallow ground-water impacts. Sections 1.3, 2.2,

2.3, and 2.4 of this plan are derived from the October 2011 Ohio EPA report and modified as appropriate.

1.3 Facility Description and History

The facility is located in Elizabethtown, Whitewater Township in the southwestern corner of Hamilton County. Figure 1 shows an aerial photo of the facility and surrounding area and various features. The facility is bordered on the north by an agricultural field of rotating corn and soybeans; on the south and east by U.S. Route 50 (Cincinnati-Louisville Road) and a sand and gravel quarry operation; on the southwest by E-Town Recycling Center (not affiliated with the facility), a vacant office/warehouse, Smitty's Lounge, and Redwood Mobile Home Park; and on the west by several residential properties. The facility lies within the boundaries of the 100 year flood plain of the Great Miami River.

The E-Town facility has been in operation since prior to 1990 as a recycling and disposal facility. Aerial photos of the facility found in Appendix A of the October 2011 Ohio EPA report (enclosed in Appendix C) show the progression of debris placement from east to west across the facility since 1996.

There was a documented leachate outbreak in the northwest quadrant of the facility on March 25, 2008. This leachate outbreak was sampled by HCPH. Laboratory results from sampling of the March 25, 2008 leachate outbreak include detection of several volatile organic compounds (VOCs) at concentrations ranging from acetone (292 ug/L), methyl-ethyl-ketone (156 ug/L) and toluene (24.7 ug/L), as well as several metals/metalloids detected above maximum contaminant levels (MCLs), including arsenic (28.2 ug/L), antimony (10.3 ug/L) and lead (71.2 ug/L). The approximate location of the March 25, 2008 leachate outbreak is shown on Figure 2 (red circle) and a copy of the laboratory report from the leachate sampling is also included in Appendix B of the October 2011 Ohio EPA report (enclosed in Appendix C).

The facility is currently licensed by Hamilton County Public Health (HCPH) for a disposal area of 26.8 acres. Figure 2 depicts the current status of debris placement and related features at the E-Town facility, including the current working face, area with final cap, the location of stockpile cover, and location of adjacent auto salvage operations. At the current rate of debris placement and permitted acreage, the facility will be filled to capacity in approximately five years.

The E-Town Landfill only accepts C&DD waste. Therefore, consistent with the C&DD rules, the landfill does not have the engineering controls associated with a solid-waste landfill, because of the lack of putrescible material in this type of waste. Daily cover is applied to the waste and as shown on Figure 2, a significant portion of the site has been capped with a one to two foot thick soil cover. The facility does not have a leachate collection system. The facility has 3 to 15 feet of low permeability material (i.e., silt/clay) between the bottom of debris placement and the uppermost aquifer system (UAS) beneath the facility. The 1997 site characterization report indicates that no excavation occurred prior to debris placement, thus, the debris emplacement begins at ground surface.

The HCPH collected split samples during the July 2010 annual sampling event. The split samples were analyzed for all parameters required in the ground-water monitoring program (amended Appendix parameters 1 through 19 plus arsenic, copper, and chromium). No metals were detected above the MCL. Additionally, no VOCs or pesticides were detected in the samples collected by the HCPH. Results of the split sampling were summarized in the 2011 license from HCPH (Appendix B).

2.0 HYDROGEOLOGY

2.1 Topography

The topographic features in the vicinity of the E-Town Landfill are shown on Figure 3. The landfill is situated in the flood plain for the Great Miami River in an area of generally flat topography.

2.2 Hydrogeologic Setting

E-Town is located within the Bluegrass Section of the Interior Low Plateau Province. The western portion of the Bluegrass Section is characterized by moderately high relief (300 feet) and is comprised of dissected Ordovician carbonate rocks with plateaus capped by thin, pre-Wisconsinan glacial drift and the great Miami and Whitewater River valleys and associated tributaries.

Since the E-Town facility is located within the Great Miami River valley it overlies the Great Miami River buried valley aquifer, a federally-designated sole-source aquifer. The Great Miami River buried valley aquifer in this area is comprised dominantly of Wisconsinan glacial-age sand and gravel that was sorted and deposited by glacial meltwaters running through the ancestral Great Miami and Whitewater river basins.

The buried valley is incised into Ordovician-age limestone and interbedded shale bedrock. Nearby ODNR well logs and an ODNR glacial geology map indicate that the sand and gravel extends as deep as 100-125 feet near the facility. In the upland plateaus surrounding the buried valley the Ordovician bedrock is capped by a thin layer of approximately 10-20 feet of clayey silt (till). A hydrogeologic cross section (A-A') of the Great Miami River valley traversing the E-Town facility is shown in Figure 4, with the trace of the cross section shown on Figure 3.

As seen on Figure 5, local area wells within the Great Miami River buried valley aquifer yield on average in excess of 500 gallons per minute (gpm) in the eastern portion of Elizabethtown

(including most of the E-Town facility) and from 25 to 100 gpm in the western portion of Elizabethtown. The Ordovician bedrock underlying the Great Miami River buried valley aquifer and in the uplands is very low-yielding, with wells developed into it typically producing less than 3 gpm.

Figure 6 depicts a cross section (B-B') of the facility hydrogeology in the general direction of ground-water flow during the August 2009 ground-water sampling event, from W-3 towards W-1, with the trace of B-B' shown on Figure 7. Copies of soil boring and ground-water monitoring logs installed at the facility are included in Appendix A. The boring data and other sources indicate the following stratigraphy underlying debris at the facility.

- The upper 3 to 15 feet of native sediments consists of brown clayey silt, with trace sand and gravel. The thinnest clayey silt (three feet) was reported at B-1/W-1. The boring log for W-5 indicates no clayey silt or otherwise low-permeability material at ground surface, but rather sandy fill material overlying the sand and gravel aquifer. However, this well is located adjacent to Highway 50 in the general vicinity of the constructed drainage ditch. Based on the location of this well, soils were removed in this area during construction of the highway. There was no excavation of soil prior to landfilling with C&DD materials and the clayey silt floodplain deposits are likely to be laterally continuous. Due to these factors, it is likely that most if not all of the site is underlain by some thickness of clayey silt floodplain deposits. The thickness of clayey silt was reported as 3 feet thick at B-1/W-1, 7 feet thick at B-2/W-2, 9 feet thick at B-3/W-3, 12 feet thick at B-4/W-4, and 15 feet thick at B-5.

- Underlying the clayey silt, fine to coarse sand with intermittent gravel and cobble lenses down to at least 75 feet below ground surface (bgs) at W-5, with saturation occurring at an average of 17 feet bgs. This sand and gravel aquifer, that includes both the saturated and unsaturated portions, is laterally extensive across the facility and beyond, thus representing the first continuous zone of saturation (CZS) at the E-Town facility in accordance with the Ohio Administrative Code (OAC) Chapter 3745-400.

- Nearby ODNR well logs and an ODNR glacial geology map indicate that the sand and gravel aquifer extends as deep as 80-125 feet beneath the facility, where Ordovician bedrock marks the bottom of the Great Miami River buried valley aquifer.

Slug tests, laboratory vertical permeability tests, and other data collected during the 1997 site characterization and subsequent monitoring events indicate the following hydraulic characteristics in sediments beneath the facility:

- Vertical permeability of the surficial brown, clayey silt – 8.6×10^{-8} cm/sec based on analysis of Shelby tube sample from 1-3 feet bgs in boring B-6.

- Vertical permeability of the unsaturated and saturated sand and gravel – 2.9×10^{-3} cm/sec based on analysis of Shelby tube sample from 32-34 feet bgs in boring B-6.

- The sand and gravel aquifer beneath the E-Town facility is unconfined. The thickness of unsaturated sand in the upper portions and the consistency between depth to saturation and subsequent depth-to-water measurements demonstrate that the sand and gravel aquifer is unconfined beneath the facility.

- Horizontal conductivity/permeability of the sand and gravel aquifer beneath the E-Town facility – 2.4 cm/sec (2,518,500 feet/year) based on average of slug tests performed at monitoring wells W-1, W-2, W-3, and W-4 during the 1997 site characterization.

- The average and median hydraulic gradient based on the 2002-2004, 2006-2010 potentiometric maps submitted to HCPH is 0.00043 feet/foot. The ground-water flow direction varies between a southwest, southerly, and south-southeastern direction. Copies of the 2002-2004 and 2006-2010 potentiometric maps are included in Appendix D of the October 2011 Ohio EPA report (included as Appendix C). Table 1 of the October 2011 Ohio EPA report (Appendix C) shows the hydraulic gradients estimated from the 2002-2004 and 2006-2010 potentiometric surface maps.

- The average linear velocity of ground water (V_a) in the sand and gravel aquifer (Great Miami River buried valley aquifer) flowing beneath the E-Town facility is approximately 3,400 feet per year, based upon the following:

  The formula $V_a = Ki/n_e$, where:

  K = hydraulic conductivity = 2,518,500 feet/year
  i = hydraulic gradient = 0.00043 feet/foot
  n_e = effective porosity (unitless) estimated at 0.32 for a medium sand.

The five facility monitoring wells are shown on Figures 1, 2, 3, 7, and 8. There are two upgradient, background wells (W-3 and W-4) and three downgradient monitoring wells (W-1, W-2, and W-5). Based on the ground-water level measurement from the July 2011 ground-water sampling event and the September 2002 ground-water sampling event (lowest levels), the approximate range in depth to the top of the screened interval including the sand pack of the monitoring wells is as follows:

Year	GW Elevation At W-1 (ft. msl)	Distance Between Top of Screen and GW Table (ft. msl)	Distance Between Top of Sand Pack and GW Table (ft. msl)
2011	460.93	13.00	10.50
2010	461.19	13.26	10.76
2009	460.49	12.56	10.06
2008	460.49	12.56	10.06
2007	459.23	11.30	8.80
2006	461.15	13.22	10.72
2004	460.17	12.24	9.74
2003	464.95	17.02	14.52
2002	458.98	11.05	8.55
2001	460.13	12.20	9.70
Mean Distance between Top of Screen and GW Table			**13.84**
Median Distance Between Top of Screen and GW Table			**12.56**

Note: Top of Screen Elevation = TOC Reference 480.44 ft. msl. – 2.51 ft. stickup – 30 ft = 497.93 ft. msl.
Top of Sand Pack Elevation = TOC Reference 480.94 ft. msl – 2.51 ft stickup – 27.5 ft. = 450.43

Figure 6 shows the screened intervals of W-1 and W-5 in cross section. In this setting, significant downward flow is anticipated as ground water migrates downward into the Great Miami River valley aquifer where it will eventually discharge to the Great Miami River (Figure 4). Because there is a potential for a downward component to ground-water flow in this area and the top of the screened interval in W-1 is only approximately 13 feet below the ground-water surface, the existing screened interval of W-1 may be appropriate.

2.3 Local Water Supply and Potential Ground-Water Users Near the Facility

According to HCPH, the Elizabethtown area does not have a municipal water supply system. Most residents and businesses use wells developed in the Great Miami River buried valley aquifer for water supply. Figure 7 depicts the locations of nearby private and public water supply (PWS) wells relative to the facility, including source water protection (SWAP) areas for two public water supply wells. Smitty's Lounge (ID # 107496 on Figure 1) is currently operating. Smitty's was previously listed as a public water supply well but had shut down temporarily during 2010.

As seen on Figure 7, at least two PWS wells (three if Smitty's is counted) and seven private water supply wells are located less than 1,000 feet downgradient of the facility, with the SWAP area for the Redwood Mobile Home Park being located less than 300 feet downgradient of the limits of debris at the facility. Furthermore, all of the water supply wells shown to be located downgradient of the facility on Figure 7 are easily within the calculated one-year advective travel time for ground-water migration from the facility (i.e., average linear velocity of 3,400 feet/year) as described in Section 2.2 above.

2.4 Ohio EPA Data Analysis

Background ground-water concentrations for monitoring parameters for comparison with downgradient ground-water quality were determined by Ohio EPA based on evaluation and correlation of three data sets:

- Ambient ground-water concentrations and conditions,

  - According to HCPH and a 2004 Ohio EPA study, the Elizabethtown area does not have a municipal sanitary sewage treatment system. As shown on Figure 8, Elizabethtown residents and businesses instead use dry wells, cesspools, and septic systems with tanks and leach fields to treat raw sewage. Additionally, extensive croplands immediately north of the facility alternate corn and soybeans, likely requiring extensive application of nitrogen fertilizers.

    The 2004 Ohio EPA study concluded that elevated nitrate, chloride, and sodium concentrations detected in water supply wells in Elizabethtown (including the two or three PWS southwest of the facility) were coming from waste streams released from sewage treatment systems and from agricultural fertilizers applied in fields north of Elizabethtown. Nitrate concentrations were consistently elevated (i.e., >2 mg/L) in Elizabethtown wells and at times even exceeded the MCL for nitrate of 10 mg/L.

    As shown on Figure 8, ambient ground-water flow direction in the area of the facility flows from the large croplands and various small sewage treatment systems from the north underneath the facility. Therefore, background concentrations at upgradient ground-water monitoring wells at the facility are expected to be elevated for nitrate, and potentially chloride and sodium.

- Evaluation of potential effects of ground-water sample turbidity on laboratory results, and

  - As seen on Table 2 in the October 2011 Ohio EPA report (Appendix C), turbidity values in ground-water samples from the facility were elevated (i.e., >25 NTUs) during the period 1998-2000. This coincides with the use of bailing and/or submersible pump as the purging and sampling method. Turbidity dropped sharply with the beginning of low-flow purging and sampling at the facility in 2001.

As seen in the time-series graphs for ground-water monitoring parameters in Appendix E of the October 2011 Ohio EPA report (Appendix C), iron and manganese concentrations were greatly affected (high variation) by high turbidity during the period 1998-2000, but achieved normal variation after low-flow methods were utilized and turbidity was significantly lowered beginning in 2001. No other monitoring parameters appeared to be significantly affected by turbidity.

- Statistical evaluation of background data from the facility for statistical differences between upgradient wells and for potential statistical outliers or trends.

  - Statistical testing of background data. Statistical evaluations were conducted using Sanitas statistical software version 9.2.07.

The statistical analysis conducted by Ohio EPA determined that the following parameters were detected above background for the 2010 sampling event:

Parameter	Well	OEPA Statistical Limit	2010 Result (mg/L)	2011 Result (mg/L)	Ohio EPA 39HAM00041 Mean
Ammonia	W-1	0.2	9.58	2.29	0.09
Bicarbonate	W-1	395.6	690	380	282
Calcium	W-1	154.3	168	115	80
Chloride	W-1	54.9	88.2	45.9	57
	W-2	13.48	16.20	25.7	
	W-5	13.48	15.8	14.6	
Manganese	W-1	0.01	2.530	1.740	326
	W-2	0.04	0.044	0.169	
Potassium	W-1	6	19.4	8.76	3.7
Sodium	W-1	29.2	86	37.6	34
	W-2	8.09	9.20	17.5	
	W-5	8.09	8.6	7.27	
Sulfate	W-1	121.5	201	134	68

To put the statistical increases into perspective, the ground-water sampling results (mean) from an 82 foot deep irrigation well located in Hamilton County (Ohio EPA Ambient Ground Water Quality Well 39HAM00041) is presented. As can be seen, with the exceptions of ammonia, manganese, and potassium, the results for the downgradient wells are within a factor of 2-3 times the average concentration of this data from the Ohio EPA Ambient Ground Water Quality Network well. Considering that 1) the HCPH split samples collected in 2010 did not identify any VOCs, pesticide detections, or metals above the MCL and 2) that the parameters detected above are all naturally occurring non-hazardous ground-water quality parameters that typically have a fairly wide natural range in concentration, the available data does not indicate that an extensive assessment investigation is warranted.

3.0 GROUND-WATER DETECTION MONITORING PROGRAM

The ground-water monitoring system for the E-Town Landfill consists of five ground-water monitoring wells installed in coarse glacial outwash. These monitoring wells monitor ground-water quality within the first CZS. The location of each monitoring well is shown on Figures 1 and 2. The current status of each well with respect to the possible monitoring programs (detection or assessment) is shown on Table 1. Based on the statistical analysis conducted by Ohio EPA (October 2011), all of the downgradient detection monitoring wells are now in assessment. Installation and construction information for the existing monitoring wells is summarized on Table 1. All monitoring wells have been designed, installed, and developed in a manner that allows for the collection of ground-water samples that are representative of ground-water quality in the geologic unit being monitored.

A potentiometric surface map for July 26, 2011 of the glacial outwash CZS is presented on Figure 9. This map shows the upgradient/downgradient locations of wells completed in the CZS at the site. The construction details for all of the wells in the ground-water monitoring system are summarized on Table 1. Boring logs and well construction diagrams for each well are included in Appendix A.

3.1 Well Placement

There are three downgradient and two upgradient wells at the E-Town Landfill. All the wells are screened in the glacial outwash deposits of the Great Miami River valley aquifer. In upgradient wells W-3 and W-4 the top of the sand pack was 14 feet and 9 feet, respectively, below the unconfined ground-water surface, based on the July 2011 potentiometric surface. In downgradient wells W-1, W-2, and W-5 the top of the sand pack is 10.5, 20.0 and 31.3 feet below the unconfined ground-water surface, respectively, based on the July 2011 potentiometric surface. Comparing to the lowest potentiometric surface observed in September 2002, the top of the sand pack is 8.6, 18.2, and 29.3 feet below the top of the unconfined ground-water surface in downgradient wells W-1, W-2, and W-5, respectively. Ohio EPA has objected to the depth of the monitoring wells,

contending that they do not affectively monitor the landfill since it is built on the prior ground surface. We disagree with the Ohio EPA position that W-1 is too deep. The top of the sand pack is only 10.5 feet below the July 2011 ground-water surface and the top of the screen is only 13 feet below the ground-water surface. As shown on Figure 4, there may be a downward component to the ground-water flow in this area. Therefore, it is possible that the screen at W-1 is adequately positioned to monitor the movement of leachate-derived constituents in ground water. This will be evaluated in the assessment investigation.

3.2 Detection Monitoring Statistics

The purpose of detection ground-water monitoring at the facility is to determine whether the landfill has had an effect on site ground-water quality. A comparison of values of selected chemical constituents in ground water from background monitoring well data are compared to the same constituents in ground water from compliance monitoring well data. If there are no statistical differences between the background values and the compliance values, then it is concluded that no impact from the landfill has occurred. However, if a statistically significant difference is identified that is not determined to be the result of an alternative source, then an assessment investigation is initiated according to OAC 3745-400-10(E).

The statistical program used to previously analyze the ground-water quality data from the detection monitoring wells at the site include interwell comparisons based on parametric and nonparametric prediction limits. All downgradient detection monitoring wells were analyzed statistically to determine if the facility has potentially impacted ground water.

All results from ground water and statistical analyses are submitted to the Hamilton County Board of Health, prior to August 30th of each calendar year.

4.0 INVESTIGATORY APPROACH

The assessment investigation is being conducted to evaluate the concentration, rate, and extent of waste-derived constituents in ground water. Ground-water quality data collected from the assessment monitoring wells will be evaluated, and if additional parameters are detected above background, this will be evaluated. Table 1 lists the monitoring wells that are currently included in the ground-water assessment program. Table 4 lists the sampling schedule and parameters to be tested for wells in assessment. Data collected in this investigation will be used to determine the concentration, rate, and extent of migration of waste-derived constituents in ground water. Data collected or used during the investigation will be used to create data presentations necessary to understand ground-water flow and ground-water quality at the site. These data will be included in an assessment report. If it is necessary to conduct additional investigation activities, this assessment plan will be revised.

4.1 Proposed Assessment Investigation

An assessment investigation will be conducted to determine the concentration, rate, and extent of waste-derived constituents in ground water. The determination of concentration, rate, and extent will be made based on evaluation of the ground-water sampling results from assessment monitoring wells and consideration of the hydrogeologic setting and ground-water flow patterns. For the assessment investigation, the following additional ground-water monitoring wells are planned:

Well	Location	Approx. Screen Elevation	Monitored Unit
W-2S	Adjacent to W-2	463-453	First CZS
W-5S	Adjacent to W-5	463-453	First CZS

These wells will be installed with the objective of having the ground-water surface within the well screen, as directed by Ohio EPA. The actual screened depth will depend on the ground-water elevation when drilled and the subsurface materials encountered. Once wells W-2S and W-5S have

been installed and developed, the vertical ground-water gradient will be determined based on ground-water level measurements. If there is a downward component to ground-water flow, the need for a shallow well at W-1 will be evaluated with a flow net. If there is not a downward component of flow at W-2S and W-5S or a very weak component, an additional well will be installed at W-1 as follows:

Well	Location	Approx. Screen Elevation	Monitored Unit
W-1S	Adjacent to W-1	463-453	First CZS

4.2 Drilling in Unconsolidated Materials

Assessment monitoring wells installed in unconsolidated materials will be drilled with hollow stem augers (HSA). Since the proposed assessment wells W-2S and W-5S will be installed adjacent to existing ground-water monitoring wells where soil sampling was previously conducted and since the glacial outwash soils are typically uniform, soil samples will not be collected while drilling.

4.3 Monitoring Well Design

Monitoring wells will be installed using five or 10-foot sections of 2-inch diameter, 10-slot, schedule 40 PVC screen. Bottom caps will be schedule 40 PVC end caps. The riser will consist of 10-foot flush threaded sections of 2-inch diameter, schedule 40 PVC. The sand pack will be a Global No. 5 and/or No. 4 silica sand or equivalent which is specifically packaged for the environmental drilling industry. The sand pack will extend from the bottom of the well screen to a minimum of two feet above the screen slots. The annular space above the sand filter pack will be sealed with approximately two feet of bentonite chips or a thick bentonite slurry tremied into the hole. The remainder of the annular space will be sealed with bentonite grout mixed to manufacturer's specification bentonite per gallon water. The surface seal will consist of a steel or aluminum protector with a locking lid, which covers the monitoring well and is seated in a concrete pad. Specific monitoring well construction details are described in Section 4.4 below.

If additional monitoring wells are installed, they will be constructed in a manner similar to the methods described in this plan. The procedures in this Ground-Water Quality Assessment Plan will be followed unless circumstances arise where alternate procedures may be necessary. Any alternate procedure utilized will continue to ensure that the wells are properly constructed. If alternate procedures are followed, the deviation from the assessment plan will be documented in the well installation report. The monitoring wells will be installed and evaluated as potential assessment monitoring locations for the determination of concentration, rate, and extent. Monitoring locations installed into the assessment program for the determination of concentration, rate, and extent will be sampled annually. If the monitoring wells are not installed into the assessment monitoring system, they typically will be used to monitor ground-water levels and interpret direction of ground-water flow or to support an alternative source demonstration (ASD).

4.4 Monitoring Well Installation

The monitoring wells will be installed as the hollow-stem augers are withdrawn from the borehole. Typically, the monitoring wells will be installed immediately following drilling.

Monitoring well installation operations will be observed and directed by a qualified geologist. Initially, the borehole depth will be measured to confirm the borehole is open to the proposed monitoring zone.

Monitoring well screen and riser sections will be factory cleaned and sealed in plastic sleeves. Upon removal of the plastic sleeves, the riser and screen will be handled while wearing clean nitrile or latex gloves. The screen and riser sections will be assembled and lowered into the borehole. The length of casing extending above ground level will be calculated to properly position the monitoring well screen. The sand pack will be gravity placed into the annular space between the monitoring well screen and borehole wall. If possible depending on the yield of the screened interval, prior to placing the sand pack, the boring will be purged of water to facilitate settling of the sand into the screened interval. As the sand is slowly poured into the annulus, the depth will be measured with a weighted tape. This process of pouring a small volume of sand and measuring depth will continue until the sand pack is installed to approximately two feet above the screen slots. Above the sand pack an approximately two feet thick annular bentonite seal will be placed. The annular seal will consist of either bentonite chips or a bentonite grout seal, or a combination of both. If bentonite chips are used they will be slowly dropped into the open hole to prevent bridging. The depth to the seal will be periodically checked with a sounding tape. If bentonite chips are used above the water level in the well, after placement the bentonite chips will be hydrated with potable water from a known source. The bentonite chips will be allowed to hydrate for one hour. If bentonite slurry is used it will be mixed to the manufacture's specifications. The bentonite slurry will be pumped through a tremie pipe that is lowered to the top of the sand pack or bentonite chip seal. The tremie pipe will have a deflector to prevent slurry invasion into the sand pack or the hole. Above the bentonite seal, continuous bentonite slurry batches will be tremie placed until a thick bentonite slurry mixture is observed at land surface. The bentonite slurry at land surface will be observed over a 24-hour period to identify any settling. If any settling has occurred, the bentonite slurry will be topped off or the hole will be filled with bentonite chips.

The installation of a surface seal and protector will be undertaken after drilling operations are completed. Riser stick-up lengths will be cut off to appropriate heights for sampling, generally

between 2.0 to 2.5 feet from ground surface. A protective cover with locking lid will be positioned over the monitoring well and seated in concrete. Generally, the protective cover will extend above ground level between 2.5 to 3.0 feet. The concrete seal will extend from at least 18 inches below grade to slightly above ground level sloping away from the protector. A weep hole will be drilled in the protective casing just above the top of the concrete. The annulus between the monitoring well riser and the protective casing will be filled with concrete to the level of the concrete surface outside the protector. All of the protective covers will be secured with pad locks. Figure 10 shows a typical well completion diagram.

4.5 Monitoring Well Development

Monitoring wells will be developed to remove fines and produce representative ground-water samples. In general, monitoring wells will be bailed to remove heavy sediment from the monitoring well screen and the bottom of the monitoring well. A Teflon and stainless steel surge block may be used on some of the monitoring wells to dislodge sediment and facilitate development. Typically, a bladder pump or submersible pump will be used to complete well development, although a clean disposable bailer may be used.

Purge water volumes will be measured using a graduated five gallon bucket. Periodic measurements of specific conductance, pH, temperature, and turbidity will be recorded during the development process. Development will proceed until the purge water is visually clear (typically less than 10 NTU) and field parameters have stabilized, or until a minimum of 10 well volumes are removed. All development equipment inserted in the monitoring wells will be thoroughly decontaminated with laboratory grade soap (Alconox or equivalent) and thoroughly rinsed with distilled water. All equipment inserted in the monitoring wells will be handled while wearing nitrile gloves. New bailing string will be used at each monitoring well where bailing is employed.

4.6 Well Decommissioning Procedures

Abandonment of wells, if required, typically will be accomplished either by:

1) Over drilling with hollow stem auger and/or air rotary methods and backfilling the resultant hole with bentonite chips, bentonite slurry, or a combination of both, as appropriate;

2) Splitting the PVC casing from top to bottom by pushing a "blade" slightly wider than the outer diameter of the casing and attached to an "AW-type" drill rod to the bottom of the well, turning it ¼ turn, and withdrawing it. Bentonite slurry would then be pumped under pressure into the split casing. The split casing would then be removed to approximately three feet below the ground surface and the hole backfilled with cement and/or bentonite and one to two feet of soil;

3) Pressing the end plug out of the well and "AW-type" drill rods, then sand locking the rod into the screen interval and pulling the PVC casing from the well with the rig hydraulics as bentonite slowly is pumped into the well through the rods as the casing is withdrawn; or

4) Where it is not practical to overdrill, split, or pull the casing, wells may be abandoned by pumping grout into the bottom of the well casing with a tremie pipe.

Well abandonment methods will be in accordance with those detailed in Chapter 9 of the Ohio EPA Technical Guidance Manual for Hydrogeologic Investigations and Ground-Water Monitoring. Monitoring wells, piezometers, or any other monitoring device will be operated and maintained to perform to design specifications for the life of the monitoring program.

4.7 Surveying

Top of casing elevations and survey coordinates will be determined in the field by a surveyor.

4.8 Additional Data Collection

There are no plans at present for additional hydrogeologic data collection activities related to this assessment program. If additional field data collection activities are conducted that specifically relate to this assessment investigation, the applicable portions of this assessment plan will be revised.

4.9 Planned Use of Supporting Methodology

There are no plans for the use of supporting methodology (i.e., soil, gas, or geophysics) at this time.

5.0 SAMPLING PLAN

The objective of the E-Town Landfill Ground-Water Quality Assessment Monitoring Program is to evaluate the concentration, rate, and extent of waste-derived constituents in accordance with OAC 400(E)(4). The performance of the sampling team is an integral part of the monitoring program. Training of sampling personnel and periodic audits of the sampling procedures will be performed in order to maintain sampling consistency and integrity. Alloway analytical laboratory will be used for analysis of ground-water samples.

5.1 Sampling Event Preparation

Before the initiation of any sampling event at the Facility, the sampling team will review plans relevant to the sampling event and procure sample containers and sampling equipment necessary for completing the event. Prior to field work, the sampling team will identify well locations and characteristics, verify the sampling schedule, and determine sampling point order. The sampling team also will be responsible for coordinating timely bottle set delivery from the laboratory, inspecting bottle set shipments, and assembling necessary field records, sampling equipment, and supplies for completing the sampling event. Equipment will be checked to ensure it is operating properly prior to use in the field.

5.2 Sampling Procedure Summary

The plan for sampling ground water at the E-Town Landfill includes the following procedures and techniques:

(1) Procedures prior to sampling,
(2) Sample collection,
(3) Preservation and shipment, and
(4) Chain-of-Custody control.

The following subsections describe procedures and techniques for measurement of water levels; purging of wells; field measurements of pH, specific conductance, temperature, and turbidity; sample collection (bottles, preservation, and shipping); and Chain-of-Custody control.

5.2.1 Procedures Prior to Sampling

A general set of procedures will be followed prior to sample collection at each monitoring well. During annual sampling events, the condition of the well and its surrounding area will be recorded on the Monitoring Well Integrity Report (Figure 11). Sample appearance, weather conditions, and specific comments will be recorded in the "Field Comments" section of the Field Information Form (Figure 12). In accordance with the site license, the HCPH will be notified seven days prior to conducting the annual sampling event so that split samples can be collected, if necessary.

5.2.1.1 Measurement of Ground-Water Elevations

Static water levels will be measured at all wells prior to purging and sampling any of the wells within a period of time not to exceed 24-hours. Water-level measurements will be taken at all wells with a portable electric tape and will be recorded to the nearest 0.01 foot. The tip of the electric tape will be washed with a non-phosphate detergent (e.g., Alconox, Liquinox) and thoroughly rinsed with distilled water before and after use at each well. The water-level measurement will be recorded on the Water-Level Measurement Form (Figure 13) and in the "Well Data" section of the Field Information Form. The water-level indicator will only be used to measure water levels in monitoring wells and piezometers.

The top of the dedicated pump's cap assembly is used as the reference measuring point. All measuring-point elevations have been determined by a surveyor. Using the measuring-point elevations shown on Figure 13 and Table 1, the measured depths to water will be converted to water-level elevations.

5.2.1.2 Well Depth Measurements

The total depth of wells in the ground-water monitoring network that are equipped with dedicated sampling pumps will not be measured on a routine basis at this facility. If a dedicated pump is removed for maintenance, or if a visible, significant increase in turbidity is observed in any well, the depth of the well will be measured to the nearest 0.01 foot using a measuring tape. Non-routine well depth measurements will be recorded in the "Field Comments" section of the Field Information Form. Whenever a total well depth is measured, the tape to be used will be washed with a non-phosphate detergent (e.g., Alconox, Liquinox) and will be rinsed with distilled water.

5.2.1.3 Detection of Immiscible Layers

Purge water from wells equipped with dedicated bladder pumps will be discharged into a calibrated container and the water in the container will be visually inspected for immiscible layers. If any immiscible layers are detected in the purge water, it will be noted on the Field Information Form. In addition, the water-level probe will be visually inspected for film indicative of a floating layer. If observations during purging indicate the presence of an immiscible layer, the thickness of the layer will be measured with either a ground-water interface probe designed to measure free product thickness for environmental applications or a clear PVC bailer.

5.2.2 Well Purging Methods

5.2.2.1 Purging and Sampling Equipment

All purging and sampling equipment will be dedicated to the well, thus preventing any potential cross-contamination between wells that may otherwise occur using non-dedicated equipment. Samples will be extracted using dedicated low-flow sample pumps installed in the wells. Dedicated sampling equipment also helps prevent equipment from ground contact. Currently, all monitoring wells are equipped with dedicated bladder pumps. The purge control units for the bladder pumps will be supplied with compressed air from either an oil-less compressor or

nitrogen (N_2) or carbon dioxide (CO_2) from pressurized canisters. When a gasoline-powered engine is used to run the purge control unit, precautions will be taken to prevent contamination of equipment and samples. The engine and gasoline container will be segregated from other equipment during transport. Engine exhaust will be directed away and downwind from the well. Work gloves or nitrile gloves will be worn when fueling or adjusting the engine and removed before handling sampling equipment and containers. The sampler will re-glove with nitrile gloves before handling sampling equipment and containers.

Pressure hoses will be connected in-line from the well head air-inlet fitting on the pump cap to the control box, then to the oil-less air compressor. A graduated container will be used to measure the volumes purged.

5.2.2.2 Well Purging Criteria

The following purging and sampling techniques are meant to obtain ground-water samples representative of the formation water within the screened interval and to minimize exposure of the well screen to air that often occurs using traditional sampling practices (i.e., 3-5 well volume purge). The U.S. EPA paper "Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures," written by Puls and Barcelona (April 1996) and Chapter 10 (Ground Water Sampling) of Ohio EPA's Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring (February 2006) were used for guidance in developing the procedures for sampling ground water at the E-Town Landfill.

Actual purge volumes and times will be recorded on the Field Information Form. Any deviations from normal operating conditions (e.g., equipment malfunction) will be noted on the Field Information Form. Collected purge water from assessment monitoring wells will be contained and disposed of in the leachate collection system.

Low-flow (minimal drawdown) ground-water sampling procedures will be used for purging and sampling the E-Town Landfill ground-water monitoring wells. Water will be purged from these

wells at very low rates in order to minimize drawdown in the well during purging and sampling. Depth to water measurements and field water-quality parameters specific conductance, pH, and temperature collected during purging will be used as criteria to determine when purging has been completed. Sample collection will be initiated immediately after purging at each well.

Immediately prior to purging, a static water level will be measured, and the water level and the time of measurement will be recorded in the "stabilization data" section of the Field Information Form. Water-level measurements recorded during purging to verify water-level stabilization also will be recorded in the "stabilization data" section of the form.

During purging, wells will be pumped at very low rates. Purging rates in the range of 0.1-1.0 L/min (100-1000 ml/min) typically will be used and no well will be purged in excess of 1 L/min (1000 ml/min). The depth to water in the well will be measured during purging, typically every 3-5 minutes, and the pumping rate will be adjusted accordingly (within the range of 100 - 500 ml/min), if necessary, in an attempt to achieve stabilization in the water column. Stabilization of the water column will be considered achieved when three consecutive water-level drawdown measurements vary by less than 0.3 foot at a pumping rate of no less than 100 ml/min. The goal will be to achieve a stabilized pumping water level as quickly as possible with minimal drawdown in the water column. Purging rates will not exceed 1 L/min (1000 ml/min) at any time during purging. If any well is inadvertently purged at a rate greater than 1 L/min, the sampling team will stop purging, allow the well to recover, and re-purge at the appropriate pumping rate.

Field water-quality parameter measurements of pH, specific conductance, and temperature will be measured during purging at each well. Prior to collecting the initial set of field parameters, the water in the sampling pump and discharge tubing remaining from the previous sampling event will be removed. The amount of water in the pump and discharge tubing (pump system volume) has been determined at each well and is summarized on Table 1. The pump model and the pump system volume for each well are presented in the monitoring well construction summary (Table 1).

After evacuating the water in the pump and discharge tubing from each well, collection of field measurements can begin. Depth to water measurements and water-quality parameter measurements of temperature, pH, and specific conductance typically will be made every 3-5 minutes (or less frequently in wells that require sizable evacuation volumes prior to parameter stabilization) during purging. Stabilization will be considered achieved and purging will be considered complete when each of the following criteria have been met: three consecutive water-level measurements vary by 0.3 foot or less, three consecutive measurements of specific conductance agree to within 3 percent, three consecutive pH measurements vary by 0.2 S.U. or less, and three consecutive temperature measurements agree to within +/- 0.5 degrees Celsius. Samples will not be collected from any well unless all four criteria are met, with the following exception. Hydrogen sulfide gas in ground-water samples often cause pH probes to give erratic and erroneous readings. Therefore, if pH has not stabilized, but depth to water, specific conductance, and temperature measurements have met their respective stabilization criterion for five or more consecutive measurements, then purging will be considered complete without pH stabilization. Samples will be collected immediately after purging is complete at each well. Turbidity, dissolved oxygen, and redox, in addition to depth to water, temperature, pH, and specific conductance, will be measured at the end of purging. All field measurements, including the volume of water purged at the time of each field parameter measurement, will be recorded in the "Stabilization Data" section of the Field Information Form. The final set of field measurements recorded in the "Stabilization Data" section, and the date and time of sample collection will be recorded in the "Field Data" section of the form.

5.2.3 Sample Collection

5.2.3.1 Sample Withdrawal

After purging is complete, the sampler will re-glove with new disposable nitrile gloves before handling sample containers. Samples will be withdrawn from the wells with the same equipment used for purging. Sample bottles will be filled directly from the bladder pump discharge tube with minimal air contact and without allowing the sampling equipment or fingers to contact the

inside of the bottles. No samples for any parameter will be field filtered. If turbidity is consistently a problem at a particular well, then attempts will be made to reduce the turbidity by redeveloping the well or adjusting the purging and sampling pumping rate.

Samples will be collected based on decreasing sensitivity of the parameters and according to the U.S. EPA TEGD. The order of filling sample bottles will be: VOCs, total metals, sulfate and chloride, nitrate-nitrite, and ammonia. When collecting samples for those parameters listed in Appendix II to OAC 3745-27-10, sample bottles for semivolatile organic compounds (SVOCs), pesticides, herbicides, and poly-chlorinated biphenols (PCBs) will be filled before the bottle for total metals is filled. The bottles for cyanide and sulfide will be filled after the total metals bottle is filled.

Samples should be added to the VOC vial gently and in a manner that will minimize agitation and potential loss of VOCs due to aeration. The VOC vials will be filled so that a meniscus forms on top of the vial. The Teflon-lined caps will be replaced gently in order to prevent the capture of micro air bubbles in the sealed vial. The sampler will invert the vial and check for the presence of visible headspace. The presence of visible headspace in the sample is not acceptable, and if this occurs that vial will be discarded and another vial will be collected. If the samplers observe unusual bubble formation at the time of sample collections (for example, from the interaction of the sample and the preservative or from highly carbonated water), an unpreserved VOC vial will be collected and the lab will be notified so that holding times for unpreserved vials are met. If unpreserved vials are used, this will be documented on the Field Information Form. The analytical laboratory will evaluate the preservation of each sample and check for the presence of air bubbles in the VOC vials. If the analytical laboratory determines that there is an unacceptable volume of air (according to USEPA SW-846 Chapter 4) in any of the sample vials provided, they will be discarded. The laboratory also will follow their internal Standard Operating Procedures (SOPs), including method specific protocol in assessing the significance of any headspace in the sample. Typically there are 3 to 5 VOC vials collected at each sampling point and if there are not a sufficient number of acceptable VOC vials to complete the analysis, the well will be resampled. In addition to the above requirements for filling VOC vials, the bottle for alkalinity will be completely filled. The order for collecting samples at E-Town Landfill is listed on Table 2.

Sample bottles, caps, or septums that fall on the ground should be discarded and new pre-cleaned bottles used. In the event a new cap or septum is not available, before filling the bottle, the cap or septum must be washed with a non-phosphate detergent (e.g., Alconox, Liquinox), thoroughly rinsed with distilled water, and then sample water, before being used. All circumstances regarding dropped caps or bottles, and their subsequent decontamination and use, must be noted on the Field Information Form.

5.2.3.2 Sample Preservation and Containers

The appropriate pre-cleaned sample bottles that have been prepared at the laboratory will be used to collect samples from each well. Since multiple analyses will be required, different types of containers and preservatives are necessary. Labels for containers will be supplied by the laboratory for each sampling point. In most cases, the required preservatives will have been added to each container during sample bottle preparation by the laboratory, although preservatives can be added at the time the sample is collected. The minimum sample volume requirements, containers, preservatives, and holding times to be used for each sample analysis are listed on Table 2.

A label will be affixed to each individual sample bottle. An example of a typical label to be used during sampling is presented on Figure 14. The label will identify the site name, sample I.D., sample preservation, and requested analysis, and provide spaces for the date and time of sample collection and samplers initials.

Immediately after sample collection, bottles will be placed in coolers with "wet" ice packs in an attempt to maintain the ground-water samples at a temperature of approximately 4°C. Once the sample bottles are packed into the coolers, the coolers will be sealed and sent via courier to the laboratory. Signed Field Chain-of-Custody Records (Figure 15) and Field Information Forms (Figure 12) will accompany each sample shipment. Custody seals will be placed on the shipping containers if a third party courier is used (i.e., FedEx, UPS).

5.2.4 Field Analysis

Field measurements for temperature, pH, specific conductance, and turbidity will be made at each monitoring well. All results will be recorded on the Field Information Form. In the event that a field meter malfunctions, the sampling event will be suspended until the meter is fixed or a replacement meter is available. Sample water will be placed directly into the field measurement sample container from the bladder pump discharge tube. The field measurement sample container will be rinsed with sample water before readings are taken. Temperature will be measured first and then adjustments will be made to the pH and conductivity meters to reflect sample temperature (if required by the manufacturer). Temperature will be measured in degrees Celsius, pH will be measured in Standard Units (S.U.), specific conductance will be measured in umhos/cm, and turbidity will be measured in Nephelometric Turbidity Units (NTUs).

Specific conductance, pH, and ground-water temperature measurements will be taken at 3-5 minute (or less frequent) intervals during purging at each well and immediately prior to sample collection. Procedures provided with the instruments will be used for calibration and testing. In addition, turbidity will be measured immediately prior to sample collection. All calibration results will be recorded on the Field Meter Calibration Record (Figure 16).

Sampling personnel will ensure that field meters are in proper working order and capable of providing accurate and reliable data. The meters will be calibrated prior to use in the field each day. The brand name and model number of each field meter used for field analyses and all calibration checks and results, including the brand and expiration date of the standard solutions used, will be documented on the Field Meter Calibration Record.

The field pH meter will be calibrated with pH 4.0 and 7.0 buffers and then checked with a standard buffer solution. Calibration should be within 0.1 standard unit (S.U.). During sampling, the meter will be checked against the standard solution once each day, or more frequently if anomalous readings occur. If the meter does not read the standard buffer solution to within 0.1 unit, the meter will be recalibrated.

The field conductivity meter will be calibrated with 1413 umhos/cm (or similar) standard prior to use each day. The meter should read a known standard to within 5 percent. During sampling, the meter will be checked against the standard solution once each day, or more frequently if anomalous readings occur, and the results will be noted on the Field Meter Calibration Record. If the meter does not read the standard solution to within 5 percent, it will be recalibrated.

The field turbidity meter does not require frequent calibration. Instead, the meter will be checked each day using a known standard provided by the manufacturer. If the meter does not read the NTU standard to within five percent of the calibrated value of the standard, it will be recalibrated. Meters will be kept away from extreme temperatures and weather conditions as much as possible. Any meter that cannot maintain calibration will be repaired or replaced prior to use.

5.2.5 Decontamination of Field Devices

Dedicated sampling equipment will be used to preclude cross-contamination of samples. The electric water-level measuring tape will be the only non-dedicated sampling equipment. The tip of the electric tape will be washed with a non-phosphate detergent (e.g., Alconox, Liquinox) and thoroughly rinsed with distilled water before and after use at each well. Although pH, conductivity, and temperature probes do not come into contact with water to be analyzed, the probes will also be decontaminated with distilled water rinses between wells. If dedicated pumps fail or malfunction, they will be repaired or replaced with new dedicated equipment. Replacement equipment will be certified clean from the manufacturer.

5.2.6 Chain-of-Custody

A completed Chain-of-Custody Record will be included with each sample shipment. Upon transfer of sample possession to subsequent custodians, the Chain-of-Custody Record(s) will be signed by the person taking custody of the sample containers. Upon receipt of samples at the laboratory, the shipping container will be opened and the condition of samples, including temperature and the presence of ice, will be recorded by the receiver. The field records will be

included in the analytical report prepared by the laboratory, and will be considered an integral part of that report.

As part of the chain-of-custody procedure, each sample container will be labeled with the sample number and the parameters to be sampled. All sampling procedures, measurements, and observations will be recorded on the Field Information Forms. The following information will be documented on the Chain-of-Custody Record:

- Facility site name, sample point identification number, and other pertinent identifiers;
- Requested analyses;
- Sample date and time;
- Number of sample containers and preservatives used;
- Date and time sample container is sealed or custody is transferred; and
- Sampler's signature.

Upon receipt of the samples at the laboratory, the date and time of arrival will be noted on the Chain-of-Custody Records. The laboratory receiver also will make note of sample bottle condition on the forms if any unusual problems are present (i.e., broken bottles). These forms will be retained by the laboratory and returned with the results of the analysis.

5.2.7 Field Quality Assurance/Quality Control

5.2.7.1 Duplicates

Duplicates are used to confirm analytical results from a given sample point. Duplicates will be analyzed using the same laboratory procedures and methods that are used for the collected field samples. Duplicate samples are collected in the field and analyzed for the same parameters as the selected well. Duplicate samples will be collected on a basis of at least one per sampling event with a minimum frequency of one per 20 samples or one per 3 consecutive days of sampling, whichever results in the greater number of duplicate samples. Each duplicate sample should be collected by

alternating between the regular sample bottles and the duplicate sample bottles, proceeding in the designated parameter sampling order (i.e., VOCs first, etc.). The well at which the duplicate is collected will be identified on the Field Information Form for the duplicate sample. Once a duplicate is collected, it is handled and shipped in the same manner as the rest of the samples. Duplicate results will be reported in the laboratory results as separate samples, using the designations DUP-(#) as their sample designation point.

5.2.7.2 Trip Blanks

Trip blanks are used to identify VOC contamination that may be introduced in the field (either atmospheric or from sampling equipment), in transit (to or from the sampling site), or in the bottle preparation, sample log-in, or sample storage at the laboratory. Trip blank samples are prepared by the analytical laboratory and accompany the VOC vials in transit to and from the site. Because VOC detections at or above the PQL will be evaluated by resampling, analysis of trip blanks is not required (Ohio EPA Technical Guidance Manual for Hydrogeologic Investigation and Ground-Water Monitoring Chapter 10 pg. 10-50). Trip blanks may accompany the sample shipment but the trip blank samples will not typically be analyzed.

5.2.7.3 Field Blanks

The purpose of the field blank is to identify contamination that might be introduced into the ground water by the sampling environment. Statistically significant results will be evaluated by resampling the well rather than reliance on field blank results. Therefore, field blanks will not be collected on a routine basis. If a statistically significant result at a monitoring well is suspected to be related to the sampling environment, a field blank sample may be collected to investigate the sampling environment.

Field blanks will be collected at the discretion of the ground-water monitoring program manager. When collected, field blanks will be prepared in the field (at the sampling site) using laboratory-supplied bottles and distilled water. Each field blank will be prepared by pouring the

distilled water into the sample bottles at the sampling location. The well at which the field blank is prepared must be identified on the FIF. If applicable, note any observations that may help explain anomalous results (e.g., prevailing wind direction, up-wind potential sources of contamination, etc.). Once a field blank is collected, it is handled and shipped in the same manner as the rest of the samples. Field blank results will be reported in the laboratory results as separate samples, using the designations FB-(#) as their sample designation point.

5.2.7.4 Equipment Blanks

The purpose of the Equipment Blank is to identify contamination that might be introduced into the ground water by the sampling equipment. All purging and sampling equipment at the site is dedicated; therefore, equipment blanks will not be collected during routine sampling events.

5.3 Sample Contact

Sampling for the E-Town Landfill facility will be conducted under the direction of the E-Town Landfill Site Manager or designee (i.e. Program Manager) utilizing both in-house and/or outside contracted technicians.

The Site Manager is:

Mr. Jason Willis
E-Town Landfill
10978 Highway 50
North Bend, Ohio 45052
(513) 353-1200

5.4 Ground-Water Monitoring Well Integrity Program

The purpose of the Well Integrity Program is to ensure that the physical integrity of all monitoring wells is maintained at a level that ensures that samples obtained from the wells are of the highest quality. The program is accomplished through detailed inspections made by the Monitoring

Team during each routine sampling event. These inspections will be recorded on the Monitoring Well Integrity Report Form that is designed to supplement the Field Information Form.

5.4.1 Monitoring Well Integrity Inspection

The Monitoring Team is responsible for assessing the following conditions of the area surrounding the well and noting any problems on the Monitoring Well Integrity Report Form:

- Condition of the surface seal,
- Erosion or ponding of water around the casing,
- Subsidence of the soil materials surrounding the casing,
- Animal or insect activity in or around the casing,
- Obstructions which preclude access to the well, and
- Other conditions which affect access to or the obtaining of samples from the well.

The conditions near the casing are crucial in maintaining the integrity of the well. For example, the surface seal acts as a seal to prevent surface water from traveling along the casing to ground water. Any damage to the seal, including cracks, must be noted and subsequently corrected. Cracks in the surface seal may allow surface water near the well to seep around the seal and down the casing. Such seepage may allow surface water to mix with the ground water that is to be sampled.

The following observations of the external protective casing are to be noted and recorded by the Monitoring Team on the Monitoring Well Integrity Report Form:

- Presence of the well's identification sign,
- Lock on the external protective casing,
- Animal activity in or on the external protective casing,
- Water in the annular space,
- Severe bends or cracks in the external protective casing, and

- Other conditions affecting the external protective casing.

The external protective casing serves to protect the internal well casing. Weep holes must be drilled, if not present, as they allow water to drain from the annulus. Water in the annular space may freeze in the winter months applying a crushing force upon the casing. This may cause damage to the casing, which might prevent the lowering or removal of sampling equipment. If the external protective casing is loose, it must be stabilized.

The Monitoring Team shall perform a visual survey of the well casing and note the following on the Monitoring Well Integrity Report Form:

- Loose casing (check both horizontal and vertical axes),
- Bent or damaged casing,
- Any obstructions in the casing, and
- Missing casing cap.

As part of the sampling procedures, the Monitoring Team is responsible for inspecting the exposed portions of the dedicated sampling systems. Any exposed sample collection tubing or piping associated with the system is to be inspected for cracks, leaks, or other problems which may affect the performance of the system or the integrity of a sample withdrawn from the well by the system.

5.4.2 Reporting to the Site Manager

The Monitoring Team submits to the appropriate Site Manager a complete set of Monitoring Well Integrity Report forms after the sampling event. These forms identify the well integrity anomalies and problems to be corrected, as well as specific actions required to correct these. The Monitoring Team immediately notifies the Site Manager if it is impossible to sample a well.

5.4.3 Well Maintenance

Well integrity deficiencies (e.g., damaged well casing, severely cracked surface seal, etc.) will be repaired as soon as practical after the deficiency is identified to ensure that representative samples are collected from the monitoring wells. Minor repair work (e.g., replacing rusty padlocks, etc.) will be performed before or during the first sampling event following the observation of the deficiency.

6.0 ASSESSMENT DATA EVALUATION PROCEDURES

6.1 Data Evaluation Procedures

Data from the downgradient wells will be analyzed using a combination of data analysis procedures to determine if new monitoring results are present above site background concentrations. Where possible based on the amount of data in background, the statistical analysis procedures developed by Ohio EPA in the October 2011 investigation will be used in the analysis. The statistical methods used in the Ohio EPA report are contained in Appendix C. These methods include the use of interwell parametric and nonparametric prediction limits derived from upgradient monitoring wells W-3 and W-4. For the parameters where there is no existing background data (Sb, Ba, Cd, Co, Ni, Se, Ag, Tl, Va) the downgradient data will be compared to the highest concentration in the background data. The analytical and field data from the current detection monitoring wells are included in the October 2011 Ohio EPA report (Appendix C).

In addition to the statistical analysis conducted for comparison to upgradient well data, background data for the Great Miami River basin aquifer will be compiled from available sources (e.g., Ohio EPA Ambient Ground Water Quality Database, Miami Conservancy District, Hamilton County Health Department, and other data that may be identified). These data will also be considered in the evaluation of the available background data to determine if the possible natural spatial variability is represented. The existing upgradient ground-water quality data is limited because Ohio EPA determined the upgradient data should not be pooled due to anthropogenic effects and spatial variability; therefore, only one upgradient well is used in the statistical analysis of each individual well. However, for upgradient well W-3 the anthropogenic effects are limited to those associated with agricultural land use. This effect is therefore limited to increased nitrate-nitrite. Consideration of other available data is appropriate when evaluating the rate, extent, and concentration of non-hazardous common water-quality parameters that typically have a wide potential range of concentrations in order to determine if the parameters detected above background are "contaminants." Piper and Stiff diagrams, time-series plots, and box and whisker plots also may be used to aid in the identification of ground-water quality impacts.

6.2 Planned Use of Statistical Data Evaluation

The downgradient wells will be statistically analyzed using the procedures developed by Ohio EPA. Specifically, new downgradient monitoring results will be compared to the interwell parametric and nonparametric prediction limits to determine if these results are present above site background concentrations determined from upgradient wells.

6.3 Use of Computer Models

It is not anticipated that computer modeling will be used in the assessment investigation.

6.4 Use of Previously Gathered Data

Stiff and Piper diagrams will be prepared and the ground-water quality characteristics will be compared to leachate data and other available water-quality data. Spatial variations in ground-water characteristics will be correlated with ground-water flow patterns and potential sources or source areas in an effort to determine the cause of the apparent ground-water quality degradation. Previously gathered ground-water quality data will be evaluated to determine if it is representative. Existing and future water-level data will be used to prepare potentiometric maps.

6.5 Criteria to Determine if Additional Assessment Activities are Warranted

Additional assessment activities (including the installation of additional assessment wells) will be conducted if additional data is needed to determine the concentration rate and extent of migration of leachate-derived constituents in accordance with OAC 3745-400-10(E). Criteria that will be used to determine if additional activities are or are not warranted will be:

- Detection of ground-water monitoring parameter in an assessment well(s) at concentrations that are above background concentrations as determined using the statistical procedures described in Sections 6.1 and 6.2 of this Plan.

- Access limitations due to denial of access to neighboring parcels;

- Ground-water quality data and other data or information that indicate that previous land use in the area downgradient of the limits of C&DD (e.g., adjacent auto salvage operation and pre-1992 C&DD waste disposal) is causing impact to ground water and/or is co-mingling with a release of C&DD-derived constituents from the regulated unit to ground water and thus preventing an accurate, segregated evaluation of the release of C&DD-derived constituents from the regulated unit to ground water; and

- Extrapolation of concentrations where applicable.

- For common non-hazardous water-quality parameters, the site background data will be compared to the available local and regional aquifer data to confirm that it is representative. This information will be used to evaluate the possibility that parameters determined to be above background are not in fact "contaminants."

7.0 ASSESSMENT PLAN SCHEDULE

The assessment monitoring wells will be sampled annually. The sampling schedule for E-Town Landfill is presented on Table 4.

Samples from the assessment monitoring wells will be analyzed for all of the parameters listed in the amended Appendix to OAC 3745-400-10 (Table 3) during the annual sampling event.

Additional assessment wells W-2S and W-5S will be installed in the fall of 2012. These wells will be sampled within 90 days of installation. Based on the schedule of assessment activities planned at this time, the Ground-Water Quality Assessment Report discussing the concentration, rate, and extent of migration of waste-derived constituents in the ground water will be submitted by August 20, 2014.

If additional investigation and data collection is required this schedule may be revised. A written ground-water assessment report will be submitted to the Hamilton County Health Department no later than 15 days from making the first determination.

8.0 ANALYSIS PLAN

8.1 Laboratory Quality Control Procedures

The quality assurance program for the analytical laboratory is described in their quality assurance plan, which is available upon request. The laboratory is responsible for the implementation of and adherence to the quality assurance and quality control requirements outlined in their quality assurance plan.

Data Quality Reviews (DQR), or equivalent, are requests submitted to the laboratory to formally review results that differ from historical results, or that exceed certain permit requirements or quality control criteria. The laboratory prepares a formal written response to each DQR explaining the discrepancy. The DQR is the first line of investigation following any anomalous result.

8.2 Analytical Limits

Method detection limits (MDLs) utilized for each parameter are identified on the analytical reports provided by the laboratory, as are the practical quantitation limits (PQLs). The PQLs used will be below respective MCLs. Although not anticipated, there may be rare occurrences where PQLs equal to or above MCLs will be reported and considered acceptable due to matrix interferences in the sample water that require the laboratory to report levels above quantification limits (e.g., dilution).

8.3 Analytical Methodologies

The analytical reports provided by the laboratory will identify the methodologies used by the laboratory for each parameter (or group of parameters). All methods are EPA approved. The analysis of ground-water samples will be conducted in accordance with U.S. EPA SW-846 analytical procedures.

8.4 Laboratory Contacts

The laboratory contact is located at:

Julie Bigford
Alloway
1776 Marion Waldo Rd.
Marion, Ohio 43302

FIGURES

TABLES

APPENDIX A.

BORING LOGS AND WELL CONSTRUCTION DETAILS

APPENDIX B.

HCPH 2011 LICENSE

APPENDIX C.

OCTOBER 2011 OHIO EPA REPORT OF PRELIMINARY HYDROGEOLOGIC INVESTIGATION ON COMPACT DISK

Westlaw

OAC 3745-400-10, App.

Ohio Admin. Code 3745-400-10, App.

Baldwin's Ohio Administrative Code Annotated Currentness
3745 Environmental Protection Agency (Refs & Annos)
Chapter 3745-400. Construction and Demolition Debris Facilities (Refs & Annos)
➡➡ 3745-400-10 Appendix

List of Ground Water Monitoring Parameters

Compound or parameter	CAS RN
(1) Temperature	
(2) pH	
(3) Specific conductance	
(4) Chemical oxygen demand	
(5) Sodium	
(6) Chloride	
(7) Bicarbonate/carbonate	
(8) Turbidity	
(9) Ammonia	
(10) Calcium	
(11) Iron	
(12) Lead	
(13) Magnesium	
(14) Manganese	
(15) Nitrate-nitrite	
(16) Phosphorous	
(17) Potassium	
(18) Sulfate	
(19) Zinc	
(20) Acetone	67-64-1
(21) Acrylonitrile	107-13-1
(22) Benzene	71-43-2
(23) Bromochloromethane	74-97-5
(24) Bromodichloromethane	75-27-4
(25) Bromoform; tribromomethane	75-25-2
(26) Carbon disulfide	75-15-0

ATTACHMENT 2

(27) Carbon tetrachloride	56-23-5
(28) Chlorobenzene	108-90-7
(29) Chloroethane; ethyl chloride	75-00-3
(30) Chloroform; trichloromethane	67-66-3
(31) Dibromochloromethane; CHLORODIBROMOMETHANE	124-48-1
(32) 1,2-Dibromo-3-chloropropane; DBCP	96-12-8
(33) .1,2-DIBROMOETHANE; ethylene dibromide; EDB	106-93-4
(34) o-Dichlorobenzene; 1,2-dichlorobenzene	95-50-1
(35) p-Dichlorobenzene; 1,4-dichlorobenzene	106-46-7
(36) trans-1,4-Dichloro-2-butene	110-57-6
(37) 1,1-Dichloroethane; ethylene chloride	75-34-3
(38) 1,2-Dichloroethane; ethylene dichloride	107-06-2
(39) 1,1-Dichloroethylene; 1,1-dichloroethene; vinylidene chloride	75-35-4
(40) trans-1,2-Dichloroethylene; trans-1,2-dichloroethene	56-60-5
(41) 1,2-Dichloropropane; propylene dichloride	78-87-5
(42) cis-1,3-Dichloropropene	10061-01-5
(43) trans-1,3-Dichloropropene	10061-02-6
(44) Ethylbenzene	100-41-4
(45) 2-Hexanone; methyl butyl ketone	591-78-6
(46) Methyl bromide; bromomethane	74-83-9
(47) Methyl chloride; chloromethane	74-87-3
(48) Methylene bromide; dibromomethane	74-95-3
(49) Methylene chloride; dichloromethane	75-09-2
(50) Methyl ethyl ketone; MEK; 2- BUTANONE	78-93-3
(51) Methyl iodide; iodomethane	74-88-4
(52) 4-Methyl-2-pentanone; methyl isobutyl ketone	108-10-1
(53) Styrene	100-42-5
(54) 1,1,1,2-Tetrachloroethane	630-20-6
(55) 1,1,2,2-Tetrachloroethane	79-34-5
(56) Tetrachloroethylene; tetrachloroethene; perchloroethylene	127-18-4
(57) Toluene	108-88-3
(58) 1,1,1-Trichloroethane; methylchloroform	71-55-8
(59) 1,1,2-Trichloroethane	79-00-5
(60) Trichloroethylene; trichloroethene	79-01-6
(61) 1,2,3-Trichloropropane	96-18-4

(62) Vinyl acetate	108-05-4
(63) Vinyl chloride	75-01-4
(64) Xylenes	
(65) Antimony	
(66) Arsenic	
(67) Barium	
(68) Beryllium	
(69) Cadmium	
(70) Chromium	
(71) Cobalt	
(72) Copper	
(73) Nickel	
(74) Selenium	
(75) Silver	
(76) Thallium	
(77) Vanadium.	

[Comment: Method 8260 of the USEPA SW 846 manual, "Testing Methods for Evaluating Solid Waste", is appropriate for monitoring leachate and the ground water to detect or assess the above VOCs.]

Eff. 8-31-02

3745-400-10, App., OH ADC 3745-400-10, App.

Rules are complete through September 30, 2012; Appendices are current to February 28, 2010

END OF DOCUMENT