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May 19, 2015

Mr. Anthony M. Bucco, Esq. (abucco@murphymckeonlaw.com) **VIA E-MAIL**
Murphy McKeon P.C. Counsellors-At-Law
Riverdale South
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Re: Groundwater Monitoring Results
Fenimore Landfill Site
Mountain Road, Roxbury Township, NJ
MC Project No. 13000078A

Dear Mr. Bucco:

Maser Consulting P.A. (Maser Consulting) provides this letter report in response to the request by the Township of Roxbury for a review of the ground-water quality data for samples collected by the New Jersey Department of Environmental Protection (NJDEP) on April 1, 2015 and subsequently analyzed by a NJDEP laboratory contractor (Test America, Burlington, VT) and by the NJ Department of Health (NJDOH). Maser Consulting bases its review on the following information provided electronically by your office:

- Table 1, Fenimore Landfill, Ground Water Sampling Summary, April 1, 2015 (electronic file author: Chad Van Sciver)
- NJDOH Analytical Data Report Package, Work Order 5040201, 91pp, for samples collected by Chad Van Sciver, NJDEP Publically Funded Sites
- Fenimore Landfill, Ground Water Results Summary Tables (6) for VOC, VOC TICs, SVOC, SVOC TICS, PCBs and Pesticides, and Metals (source unspecified; electronic file author: Allan Motter)
- An aerial photograph of the Fenimore Landfill showing the approximate monitoring well locations [from north to south (top to bottom): MW-8, MW-201, MW-202, MW-203, MW-7].

The summary tables are attached along with excerpts from the NJDOH laboratory report.

Sampling Protocol – Fenimore Landfill

As reported in Maser Consulting's April 7, 2015 letter, NJDEP correspondence from February 2015 indicated the following, and as confirmed via the electronic files provided to Maser Consulting:

- Ground-water monitoring wells MW-7, MW-8, MW-201, MW-202 and MW-203 were sampled on April 1, 2015
- Ground-water samples from the five monitoring wells were analyzed for the EPA Contract Laboratory Program (CLP) Volatile Organic Compounds (VOCs); EPA CLP Semi-Volatile Organic Compounds (SVOCs) including 1,4-Dioxane; EPA Target Analyte List (TAL) Metals, EPA Target Compound List (TCL) Pesticides and Polychlorinated Biphenyls (PCBs), collectively referred to as TCL/TAL+30
- Ground-water samples from the five monitoring wells were analyzed by the NJDOH Environmental and Chemical Laboratory Services for Ammonia as NH_3; Chlorides; and Total Dissolved Solids (TDS)
- Monitoring wells MW-201, MW-202 and MW-203 are wells that were recently installed by NJDEP between the foot of the eastern toe of the landfill and the previously existing leachate pond
- Monitoring wells MW-7 and MW-8 were the only previously existing wells determined by NJDEP's geologist to be available and useful for sampling.

Per standard NJDEP field-sampling protocol, field analysis parameters included temperature (°C), dissolved oxygen (D.O.), specific conductance (Sp. Cond.) and oxidation-reduction potential (ORP). The "depth to water" was measured in each well prior to, and after, purging. As suggested previously by Maser, NJDEP also recorded turbidity levels for the ground-water samples.

The NJDEP, however, did not add three parameters suggested by Maser to the laboratory analysis protocol: sulfate (SO_4), biological oxygen demand (BOD), or chemical oxygen demand (COD). These parameters were chosen because sulfate is generated by the oxygenation of gypsum, the major component of sheetrock. BOD and COD are basic measures of the biodegradable and the chemically-oxidizable fractions of organic contaminants in waters, and are useful indicators of contaminants not specifically measured in the TCL/TAL analyses.

According to Table 1, Ground Water Sampling Summary (**Attachment A**, herein), ground water was purged (pumped) from each monitoring well using a submersible pump and the purge water routed through PTFE-lined, polyethylene tubing. The ground-water samples were collected directly from the tubing. In total, six ground-water samples were collected for analysis; Sample "MW-21" was a duplicate sample collected from monitoring well MW-7. Field and trip blanks, which are used for quality assurance checks on the sampling and sample-handling procedures, also reportedly were collected and analyzed; however, the results of such analyses were provided only for the field blank analyzed by NJDOH (**Attachment B**), and not for the more precise TCL/TAL analyses where outside influences on sample quality are most critical to measure.

Analytical Results

The significantly lower ground-water sample temperature (3.4 °C) for sample MW-7 compared to the other ground-water samples, which had temperatures ranging from 10.75 °C to 13.5 °C (refer to **Attachment A**) suggests that the integrity of monitoring well MW-7 may be compromised, and the quality of ground water collected from this well may be influenced by inflow from the surface. The sample from MW-7, which is located southeast and most distant of the monitoring wells from the landfill, also contained the highest dissolved oxygen level, and correspondingly the highest ORP level. And, via the NJDOH laboratory analyses, the MW-7 sample (and the MW-21 sample, the duplicate sample for MW-7) was found to contain the lowest ammonia and Total Dissolved Solids levels. The lower ammonia levels could be due to the distance from the landfill, or could be the result of the inflow of cleaner water (during rainfall or snow melt) from the surface; this cannot be discerned until the integrity of MW-7 is verified.

TDS, ammonia and chloride were most concentrated in monitoring wells MW-201 and MW-202, which are located immediately east between the toe of the landfill and the former leachate pond, likely owing to the continued influence of the landfill on shallow ground-water quality.

The laboratory analysis data for the volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides and PCBs, and Target Analyte list (TAL) metals were compared to the NJDEP ground-water quality standards (GWQS), where applicable (refer to Attachment C). **None** of the PCBs or pesticides were found at concentrations exceeding the respective GWQS. We note, however, that nearly all of the Target Compound List (TCL) pesticides were detected (generally at estimated concentrations due to the low levels) in the samples from monitoring wells MW-8, MW-201, MW-202 and MW-203. These same samples contained trace levels of PCBs (Aroclor1016 and/or Aroclor 1221); both PCBs species were common in capacitors, and the latter also in rubber (Oregon Department of Environmental Quality Fact Sheet on Sources of Polychlorinated Biphenyls; undated).

The SVOCs, where detected, were at concentrations **below** the respective GWQS. The most-concentrated SVOCs were bis(2-chloroethyl)ether and bis(2-ethylhexyl)phthalate. The former was detected at each of the three wells located east of the toe of the landfill, while the latter was detected at similar levels in each of the well samples except for the duplicate sample (MW-21), suggesting that the levels of bis(2-ethylhexyl)phthalate were likely artifacts of the sampling equipment or the well construction materials. The majority of SVOCs that were detected were either polynuclear aromatic hydrocarbons (PAHs) or phthalates. The chemical 1,4-Dioxane, a mobile and persistent compound often associated with chlorinated solvents, was detected in samples from four of the five wells; it was not detected in the MW-7 sample.

Volatile organic compounds (VOCs) were most prevalent in MW-8 and the three new monitoring wells installed by the NJDEP. **Benzene was the only VOC detected above its respective GWQS** (1.0 microgram per liter, µg/l, or parts per billion, ppb; this is also the drinking water standard). Benzene, a known carcinogen, was detected in the samples from MW-

8, MW-201, MW-202 and MW-203, at concentrations ranging from 0.27 ppb to 15 ppb; the highest concentration was detected in the sample from MW-202. Other non-chlorinated VOCs that were detected (but at levels **below** the respective GWQS) included toluene, ethylbenzene and xylenes. Chlorinated VOCs also were detected at concentrations **below** the respective GWQS; notably, trichloroethene and tetrachloroethene, which have a GWQS of 1 ppb, were detected only in the sample collected from MW-202, the well located directly east of the east end of the landfill, and which also contained the highest benzene concentration. Chlorinated VOCs, therefore, are not a concern at this time.

The detection of benzene and other VOCs in ground water contrasts with the data reported by Matrix New World Engineering (Matrix) in a DRAFT Closure Plan for the Fenimore Landfill. That Plan indicated that prior ground-water monitoring conducted by NJDEP (1981, 1987) and Matrix (2005) did not detect VOCs. However, a ground-water sample collected by Matrix from MW-8 in May 2011, **before** the landfill was re-opened, contained benzene at 1.6 ppb, while the April 2015 sample from this well contained benzene at 2.1 ppm. Additionally, one of the six leachate (surface seep) samples collected and analyzed by Matrix in 2004 contained benzene at 0.6 ppb, which exceeded the NJDEP Surface Water Quality Standard for benzene (0.015 ppb).

Of the TAL Metals, arsenic, iron, manganese and sodium exceeded the respective GWQS in the April 2015 samples. Of these contaminants, iron and manganese, often found in landfill leachate, are included in the list of secondary drinking water standards because of aesthetic effects on drinking water and possible taste-related concerns. Sodium, which appears on the secondary standard list because of its potential dietary impacts, often is associated with contamination due to rock (roadway) salt and sewage.

Arsenic, which ranged in concentration from 0.61 ppb to 5.8 ppb (MW-202), exceeded its GWQS (3.0 ppb) in each monitoring well except for MW-7, the monitoring well sample with the lowest total dissolved solids (TDS) level. The arsenic concentrations at MW-8 and MW-202 also exceeded the Drinking Water Standard (5 ppb). Arsenic, while a potential concern, was highest in the ground-water samples having the highest TDS levels, and in three of the four samples with the highest turbidity levels, possibly owing to high silt content in the samples (perhaps due to incomplete well development, improper well construction or the sampling technique), which could therefore raise the arsenic level in the samples that are field-preserved with acid. Arsenic also was reported (by Matrix) in samples collected in 1987 from four monitoring wells (not specified), but was not detected in 2011. We note that studies have found arsenic in ground-water wells to exceed its GWQS due to naturally-occurring levels throughout New Jersey, including the Highlands Province.

Summary and Recommendations

In summary, the data for samples collected from five ground-water monitoring wells at the Fenimore Landfill on April 1, 2015 show that ground-water quality remains impacted to some degree, most notably by benzene and possibly by arsenic. Overall, the contaminants detected are not unusual or unanticipated at a landfill such as this.

Benzene exceeded its GWQS (1.0 ppb) in three of the five well samples, ranging up to 15 ppb at MW-202, which is some cause for concern. According to an earlier report, benzene was absent from monitoring well samples in 2005, but present in the 2011 sample from monitoring well MW-8 at 1.6 ppb. The April 2015 concentration in MW-8 was 2.1 ppb. It cannot be determined whether the benzene concentrations are strictly due to earlier landfill operations or partly influenced by more recent landfilling.

Arsenic was found above its GWQS (3.0 ppb) in four of the five monitoring wells, with the highest concentrations found at MW-8 and MW-202. The arsenic could be due to naturally-occurring processes and an artifact of the sampling methods.

Maser Consulting recommends conducting at least two rounds of follow-up ground-water monitoring for TCL/TAL+30 at each of the five monitoring wells to confirm the recent results. We again suggest the addition of SO_4, BOD, COD to the analytical parameter list. The ground-water samples should be collected in July and October 2015 to provide some perspective on possible seasonal variations. We suggest analyzing filtered and unfiltered samples for TAL Metals. Prior to the next round of sampling, the NJDEP should assess the integrity of monitoring well MW-7, which may have been breached. The NJDEP should also consider re-developing the monitoring wells if the well water was silty, as is suspected from the field data. At least one background (hydraulically upgradient) monitoring well, if available, should be incorporated into the monitoring program to help gauge the occurrence of natural arsenic concentrations. If such as well is not present or in suitable condition for monitoring, the NJDEP should install and upgradient well.

A survey map depicting the monitoring well locations and providing reference elevations for the ground-water monitoring wells should be provided by the NJDEP to complement the well location map (aerial photo location figure, **Attachment D**, herein). Well construction details also should be provided.

If the follow-up rounds of ground-water monitoring confirm the presence of contamination in excess of the Ground Water Quality Standards, further investigation, including installation of additional monitoring wells, should be conducted to delineate and assess the migration of the impacted ground water, and to assess potential impacts on surface-water quality.

Closing

We look forward to continuing our assistance to the Township of Roxbury in the pursuit of the protection of the environment and human health with respect to the Fenimore Landfill.

Thank you for this opportunity, and we look forward to continue working with you.

Very truly yours,

MASER CONSULTING P.A.

Robert L. Zelley, P.G., LSRP
Senior Principal
Director of Environmental Services

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Enclosure

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