UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF RESEARCH AND DEVELOPMENT

NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

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To: Carol Staniec
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Carol Staniec,

Please see the attached narrative and data PDFs for the review of data generated from the QAPP 'Carver County Compost Facility Groundwater Monitoring Quality Assurance Project Plan' for the dates of June 2017 to September 2018. The data has been checked for validity from the lab. The data was also compared to US EPA and Minnesota Department of Health standards for drinking water compliance. Any violations of drinking water standards or trends in data are discussed in the accompanying narrative.

Signed,

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Memo for the Carver County Composting Groundwater Sampling Results

June 2017-September 2018

Background

The Minnesota Pollution Control Agency (MPCA) requested assistance from the United States Environmental Protection Agency (EPA) in their efforts to evaluate the potential for ground water impacts at composting facilities. The Federal project partners include staff members from the Central Regional Laboratory (CRL-Chicago), the Land and Chemicals Division (Chicago) and the Office of Research and Development (ORD-Cincinnati). The Federal project partner's role is to ensure MPCA and their partner, Carver County, obtain representative ground water samples at the sites they selected for their study and receive appropriate analysis and results from those samples.

The MPCA's proposed project objectives were to gather information on how the use of a gravel pad at Source Separated Organics Material (SSOM) compost facilities, may impact the ability of contaminants to reach ground water and to compare the environmental impact of an unlined yard waste site with an unlined SSOM site. MPCA stated that the collection of the data will allow them to better balance design and operational practices governing compost facilities to ensure adequate protection of the environment, but not overly onerous to the point they curtail development of new sites.

This project involves the use of monitoring wells to sample and analyze groundwater at two compost facilities. One facility will be the SSOM facility located at the University of Minnesota Landscape Arboretum in Carver County, hereafter known as the **"Arboretum SSOM".** This facility collects food scraps co-mingled with yard waste, compostable paper and compostable plastics. The Arboretum SSOM site is unique in that it has a compacted gravel pad and has been operating for several years making it ideally situated to provide useful information through installation and utilization of monitoring wells. As of 2016, the site has only received yard waste; food waste collection began again in 2018. The MPCA installed four new monitoring wells at the start of this project. The wells are designated AR-MW 1, AR-MW 2, AR-MW 3 and AR MW 4. The up stream well is AR- MW 1.

The second site is located in the City of Watertown, hereafter known as **"Watertown**". This site only accepts yard wastes and no food scraps. The MPCA installed four new monitoring wells at the start of this project. The wells are designated WA-MW 1, WA-MW 2, WA-MW 3 and WA- MW 4. The upstream well is WA- MW 1.

Sampling of monitoring wells began in June 2017 and has occurred on a quarterly basis through 2018. The EPA, Central Regional Laboratory (CRL) and Office of Research and Development (ORD) has provided the analytical support; in addition, ORD agreed to develop a spreadsheet of the results and provide a narrative report on the data from the Arboretum SSOM and Watertown sites. This is the summary and narrative of the sampling results.

The review of the data was done first by comparing the data to both EPA and Minnesota Department of Health (MDH) contaminant regulations to determine if there were any exceedances. The next comparison examined the data to see if the up gradient well was different than the down gradient wells. There are several graphs embedded in the spreadsheet on the results.

Parameter Reviews

Semivolatile Organic Compounds and Volatile Organic Acids (SVOCs and VOAs)

SVOC extraction and analysis was performed by Chicago Regional Laboratory Standard Operating Procedure MS026, Version 2: The measure of acid and base/neutral organic compounds in water and soil by a GC/MS instrument. VOAs sample preparation and analysis occurred via the CRL-Chicago's standard operating procedure (SOP) MS023 v. 5, based on EPA Method 8260C for VOCs in water.

There were no detections of SVOCs and VOAs in the groundwater from either the Watertown or the Arboretum SSOM sites. There were 103 SVOCs and 62 VOAs compounds analyzed at the sites that had results recorded as non-detectable over the method detection limit(MDL).

Pesticides

Pesticide sample preparation and analysis occurred at the CRL-Chicago by standard operating procedure OM019 version 3. The data reported herein meets the requirements referenced in the analytical SOP and any laboratory specifications stated in the document Carver County Composting Groundwater QAPP, signed June 13, 2017 and updated May 17, 2018.

There were 54 pesticides and degradation products accessed for. There were no detections of pesticides above the MDLs at the Arboretum SSOM site. The Watertown site had detections of two compounds; Metolachlor ESA and Hydroxyatrazine. It is the authors belief that these results were both breakdown products of two common herbicides. Metolachlor ESA is the breakdown product of Metolachlor. The level found in the ground water is three orders of magnitude below EPA or Minnesota Department of Health (MDH) action levels. The other compound found at the site is Hydroxyatrazine which is a breakdown product of Atrazine. There is not an action level set for Hydroxyatrazine by either EPA or MDH. Both compounds were detected at around 100 ng/l. These compounds detection may be the result of the composting process since they were not found in the up gradient well. Also, these compounds could be brought into the composting facility through yard wastes.

Per and Polyfluoroalkyl Substances (PFAS)

Sample preparation and analysis occurred via the CRL-Chicago standard operating procedure OM021 Ver. 1 with the deviation outlined in pen-and-ink change #11017 (revised surrogate list). The data reported herein meets the requirements referenced in the analytical SOP and any laboratory specifications stated in the document Carver County Composting Groundwater QAPP, signed June 13, 2017 and updated May 13, 2018.

Twenty-four PFAS compounds were analyzed. Some PFAS compounds were detected, at both sites, but neither site had actionable levels as determined by EPA or MDH. EPA has an advisory level of 70ng/l individually for perfluorooctanoate(PFOA) and perfluorooctyl sulfonate(PFOS), Minnesota Department of Health advisory numbers for the same compounds are 35ng/l and 27ng/l respectively. The MDH also has set advisory numbers for perfluorobutyl sulfonate(PFBS) and perfluorobutanoate(PFBA) set at 7,000ng/l. The detection limits(DL) for the PFAS compounds will be listed as (DL#) in the narrative below.

The Arboretum SSOM site had two wells that are impacted by PFAS, but they are below actionable levels. The impacted wells are AR-MW3 and AR-MW4. The compounds impacting the wells are three regulated compounds; perfluorobutyl sulfonate(PFBS)(DL 0.807ng/l), perfluorobutanoate(PFBA)

(DL 4.64ng/l) and perfluorooctanoate(PFOA)(DL 1.72ng/l), and three unregulated compounds; perfluorohexanoate(DL 2.02ng/l) , perfluoropentanoate(DL 4.64ng/l), and perfluoroheptanoate(DL 1.01ng/l) . The levels of the contaminants present in the wells stayed consistent throughout 2017 sampling but there appeared to be a decrease in the levels in the 2018 sampling.

The Watertown site PFAS detections appeared in early sampling events at low levels and appeared at different well locations. The well WA-MW3 had two compounds, perfluorobutyl sulfonate and perfluorodecanoate detected in the June 2017 sampling event. The well WA-MW1 had a perfluorobutyl sulfonate reported level in the September 2017 sampling event.

Biological Oxygen Demand (BOD)

The measurement of BOD is recorded as O_2 usage in mg/l with the following general interpretation; 1-2 very clean, 3-5 clean, 6-9 somewhat polluted and 100 very polluted. One data point from well WA-MW4, in the September 2017 sampling event, had a somewhat polluted measure of 9. All other data values, for both sites, were recorded in the very clean and clean level for BOD. Composting at these sites currently does not appear to not be influencing the BOD measurement as there is no difference in upgradient well values and down gradient well values.

Nitrate

The EPA MCL limit is 10mg/l. None of the monitoring wells, were above this value. This measurement was not informative for Watertown site due to limited data sets, the result of sampling or analytical issues.

Total Kjeldahl Nitrogen (TKN)

There are no regulatory levels for TKN in ground or drinking water. At both sites, the up gradient well has lower values than the down gradient wells, therefore this measure maybe an indicator of the composting operations impacting groundwater.

Total Phosphorous

Natural freshwater background levels for phosphorous is < 0.03 mg/l and federal stream limits are set at 0.1mg/l. All values recorded at the Watertown site were above these levels and there is no discernable difference between upstream and downstream wells. Well WA-2 had the lowest values.

The Arboretum SSOM site had fifty percent of the measurements above the federal stream limit. There was no discernable difference between upstream and downstream wells.

Total Dissolved Solids (TDS)

The TDS values in drinking water set by EPA as an advisory level is 500mg/l and the World Health Organization set 1000mg/l as a value which is considered unfit for consumption. All the monitoring well measurements at the Watertown site were recorded above the 500mg/l advisory level. All the down gradient wells showed an increase in TDS values from the up gradient well. At the furthest

downgradient well (WA-MW4) the measurement was above the level set for unfit consumption by the World Health Organization (1000mg/l).

The Arboretum SSOM site up gradient well values were close to the 500mg/l level. All the down gradient wells are above the 500mg/l. Therefore, composting may be attributing to the TDS levels measured in the groundwater.

Total Suspended Solids (TSS)

The EPA has an advisory level set at 500mg/l for TSS in drinking water. The Watertown and Arboretum SSOM measurements exceeded the advisory level once. At well AR-MW4 on September 2017, the recorded value exceeded the TSS advisory level. Since this is the only value that we have for this well site, no comments can be made. It is recommended that further sampling for TSS occur to help understand the result or the abnormality.

Metals

Metals analysis was performed by two different methods at Region 5 CRL. EPA-200.7 method is an ICP-AES and EPA 200.8 method is a ICP-MS method. The detection limits for the metals discussed below will be shown as (DL#) after the metal. All the detection and reporting limits can be found in the data sheets provided by Region 5 CRL. At both compost sites, three metals were consistently over actionable levels set by EPA and the MDH. These metals were iron, manganese, and arsenic.

The Watertown up gradient well was over the EPA and MDH MCL limit of 10 ug/l for **arsenic** (DL 0.17ug/l) in drinking water. All wells at the Watertown site for arsenic were either above the EPA MCL or the EPA health advisory number (is 2ug/l). All wells stayed consistent in the levels of arsenic throughout the study.

All the Watertown wells exceeded the secondary drinking water standards for **iron** (DL 0.028mg/l) which is 0.3mg/l. Downstream wells WA-MW3 and WA-MW4 had higher levels than the up gradient well and well WA-MW2. The WA-MW2 well may be experiencing some influence for soluble metals from a drainage pipe near it. The drainage pipe had a constant flow that was observed during all of the sampling events. The source of the water was not definitively determined to originate from a storm drain at the waste water treatment plant, but staff from MPCA believe that may be the source.

Manganese (DL 0.08ug/l) levels at the Watertown sites are very high when compared to the MDH value of 100ug/l. The up gradient well was recorded at 1200 ug/l, and the down gradient wells are two to three times higher than that value. Therefore, composting may be attributing to the manganese levels measured in the groundwater.

The Arboretum SSOM site for **arsenic** had three recorded values over the EPA lowest health advisory number of 2ug/l. Two of the values were recorded in the up gradient well and the third value was in the downgradient well, AR-MW4. It is believed that this may be a natural variation at the site and not attributed to composting.

Iron recorded values at the Arboretum SSOM site are also above the secondary drinking water standard(0.3mg/l) for most of the sampling events. There was no noticeable difference in the up gradient and down gradient wells for the recorded iron results at the Arboretum SSOM site.

Manganese values were very high at the Arboretum site. The values ranged from the MDH standard of 100 ug/l to 800 ug/l. There was no pattern for manganese values at this site as the recorded values varied from sampling event to sampling event and well to well.

At both sites, **potassium** (DL 0.18 mg/l) and **boron** (DL 0.0071mg/l) demonstrated an increase in groundwater values from the up gradient well to the down gradient wells. Potassium is a good indicator for the impact of composting processes to the levels found in groundwater. Potassium is found in high values in vegetative matter and is easily leached from the composting process. For the parameter potassium, at the Watertown site, this trend is noticeable, with the data recorded at 2.4 mg/l in an up gradient well and then 9 to 11 mg/l in the down gradient wells.

Boron at both composting sites has also shown an increase in levels from the up gradient to down gradient wells. Boron can be measured on plant matter and can also be liberated from parent rock material by leaching organic acids from the composting process and increased sub-surface microbial activity.

All the other metal values detected did not show noticeable trends and were below regulatory levels.

Total Coliforms and E.coli

Total coliforms and E.coli were analyzed using Standards Methods 9223B. Colilert™. This method simultaneously detects total coliforms and E. coli in the water sample.

The Watertown and the Arboretum SSOM composting sites had measurable levels of E.coli, its presence indicates possible fecal contamination. There is no acceptable level in drinking water sources for E.coli. The Arboretum SSOM site had no detections of E.coli until the September 2018 sampling event. On that date, downstream wells AR-MW3 and AR-MW4 had detections; however no detections of E.coli were found in the next sampling event at these wells. In the November 2018 sampling event, upstream well AR-MW1, had detectable E.coli numbers. The Watertown site had multiple wells and sampling events that recorded E.coli detections. The contamination is found both up gradient and down gradient wells from the composting site. Since contamination was found at all sites, the composting operation does not appear to be the only factor contributing to the results. Based on the reported values, this site appears to have fecal contamination in the ground water.

Coliforms are naturally present in the environment and therefore it may be present at composting sites. As with E/coli, and according to EPA, there is no acceptable level of total coliforms in drinking water. Both composting sites have total coliforms present in the ground water. There appears to be a seasonal nature to these values and continued monitoring is recommended. The recorded values are found in the up gradient and down gradient wells, indicating that the presences of total coliforms may not solely be related to the composting operation.