



Technical Memorandum

MISSOULA ODOR CHARACTERIZATION STUDY

EXECUTIVE SUMMARY

City of Missoula

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1. INTRODUCTION

On December 1, 2008, the City of Missoula received a Notice of Violation (Notice) and Order to Take Corrective Action (Order) from the Missoula City-County Health Department (Health Department) regarding odors from EKO Compost and the City's Wastewater Treatment Plant (WWTP). The Notice provides documented odor complaints from the public dating back to April 2006 and requires that the City, in cooperation with EKO Compost, complete an odor characterization study and submit a plan for corrective action before December 1, 2009. The Notice and Order is contained in Appendix ES-A to this Technical Memorandum. The City engaged Morrison-Maierle to help develop and execute the odor characterization study and assist in development of a corrective action plan. The project is documented in three Technical Memoranda (TM) as follows:

- TM No. 1 – Protocol for Sampling and Analysis Plan
- TM No. 2 – Odor Identification and Evaluation
- TM No. 3 – Corrective Action Plan

The complete scope of service associated with this assistance is contained in Appendix ES-B.

2. ODOR SAMPLING AND ANALYSIS PLAN (TM NO. 1)

The odor sampling and analysis plan was multi-faceted and attempted to capture: on-site (WWTP and EKO) analytical odor potential and generation data; off-site odor measurement, and public perception and odor detection. This was accomplished as follows:

- Liquid sewage was collected from the headworks of the WWTP and analyzed to assess and predict “odor potential” of the sewage. Similarly, the head-space air of the influent sewer was monitored for Hydrogen Sulfide (H₂S), a typical odorous compound, on a diurnal basis for several days.
- A comprehensive set of air samples from throughout the WWTP and EKO site were collected over a 3-day period in late July 2009, during a calendar period of historically high off-site odor detection, using EPA industry-standard procedures. These samples were analyzed in the field and in the laboratory for a variety of odorous constituents.
- Two “odor survey routes” were established in areas surrounding the WWTP/EKO site with historically high levels of odor complaints. A trained City staff member traced these routes during a 20+ week period, during all hours of the day, attempting to detect and document odorous air using a Nasal Ranger™ odor detection device.
- Citizen volunteers in the area of study were also recruited to monitor, detect and record odors over a 20+ week period.
- A 24-hour odor phoneline was established to record and document citizen complaints regarding odors believed to emanate from the WWTP/EKO site.

In addition, a new weather station was installed at the WWTP to more accurately and precisely record conditions of wind speed, direction, temperature, moisture, etc. that could be correlated with odor measurements in the study area.

This odor sampling and analysis plan was developed in the spring of 2009, approved by the Missoula City/County Health Department, and implemented in May 2009.

3. ODOR IDENTIFICATION AND ANALYSIS

Field data confirm that the Missoula WWTP and EKO Compost presently generate odor emissions of approximately equal magnitudes as measured during a comprehensive emissions sampling event from July 27th-29th, 2009. A comprehensive off-site odor survey conducted by City of Missoula staff, combined with the observations of voluntary citizen participants and the compilation of data from an Odor Phone Line monitored by the City, confirm that odors of a sewage and compost nature are regularly detected in the study area, and at times beyond the 1-mile study area radius.

Ambient odor surveys conducted by a trained City staff member along two different predetermined routes within the 1-mile radius study area captured odor data ranging from diesel exhaust to fast food but also routinely detected periodic sewery/compost odors, with most of these detections being south/southeast of the WWTP/EKO site. Survey locations at or near the WWTP/EKO site nearly always had sewery/compost odors present. Odor complaints received during the study continue to show a hot zone of complaints to the east/southeast of the site.

Finally, odor dispersion modeling results, based on the field sampling and analytical odor results, predict and confirm that off-site impacts of odors generated from the WWTP and EKO sites are likely under meteorological conditions common during the summer-time in Missoula. Target “Dilution to Threshold” (D/T) values are predicted to be as high as 70 at some off-site receptor sites when values of no more than 10 are desirable. Physical or operational changes

to both the WWTP and EKO sites will be necessary to mitigate these odors. In the case of the WWTP, the City has already initiated design for upgraded Headworks facilities that will eliminate the most offending odor source.

4. RECOMMENDATIONS AND CORRECTIVE ACTION PLAN

Sampling of sources combined with modeling of odor dispersion from the WWTP and EKO sites shows that sources from both facilities should be addressed in order to insure that off-site odor detection is mitigated. As multiple offending odor sources at both the WWTP and EKO sites have been identified, a comprehensive approach to mitigation will be necessary, focusing on the highest-level emitters. The Missoula WWTP already provides effective treatment of odorous air from two potentially offending sources. The recommendations and action plan for permanent correction will require substantial capital investment, and planning/implementation time.

City of Missoula WWTP Action Plan

The City's action plan for addressing the identified off-site odor sources is:

- The City currently has a Headworks Upgrade and Replacement Project under design that will address odorous emissions from the current Influent Wet Well and Aerated Grit Chamber sources through air collection and treatment. (Design 2010; Construction 2011/12.)
- Following the successful testing of odor treatment equipment on the TWAS tank exhaust during the summer of 2009, the City will design and construct permanent odor treatment works in coordination with the on-going Headworks Upgrade and Replacement Project. (Design 2010, Construction 2011/12)
- The unit process changes resulting from the Headworks Upgrade and Replacement Project will likely result in some additional emissions from Primary Clarifiers. The City will initiate a study and subsequent design and construction of facilities for collection and treat odors from this unit process. (Study 2010; Design 2011/12; Construction 2013)
- The City will make near-term changes to the Solids Handling Building to better separate odor generating areas from occupied process areas, reducing the opportunity for emissions via powered ventilation equipment. (Implement 2009/2010)
- The City will initiate further study and subsequent design and construction of additional air collection and odorous air treatment facilities for the Solids Handling Building. Treatment is likely to be combined with the permanent TWAS tank treatment unit. (Study/Design 2010, Construction 2011/12).

EKO Compost Action Plan

EKO Compost's action plan for addressing the identified off-site odor sources is:

- Pre-mix Pile Management. EKO Compost will continue to work through the existing inventory of "old" pre-mix piles. Additionally, a new O&M plan will be developed such that pre-mix pile inventory is minimized and material is put up into aerobic piles according to the O&M plan. This will prevent the large surface area of piles which are

effectively anaerobic from being a significant odor source. (O&M Procedures June 2010)

- Aerobic Pile Biofilter Design. EKO Compost will test, develop and implement an improved biofilter design to treat the exhaust from the aerobic compost piles. (Study/Test 2010/11; Design 2011; Construction 2012)

City/EKO Cooperative Action Plan

- Site Conveyance and Mixing. Physical and chemical means/methods will be studied and implemented to minimize off-site odors created by the conveyance and preliminary handling of sludge from the WWTP to the EKO site. (Study 2012; Design/Construction TBD)

Additional Evaluations

Pending the completion of the Headworks Upgrade Project and Aerobic Pile Biofilter, during the summer of 2012, the City will develop and implement a follow-up odor characterization and sampling plan to confirm new emission levels from the WWTP/EKO site. This plan will focus on measurable emissions changes and develop information for the final design of primary clarifier odor control systems. Additional downstream sources such as the bioreactors may also be retested to confirm odor emission rates from these sources. Further odor emission reduction efforts will be developed as necessary.